PHILCO SERVICE MANUAL

HOME RADIO • MODEL 124

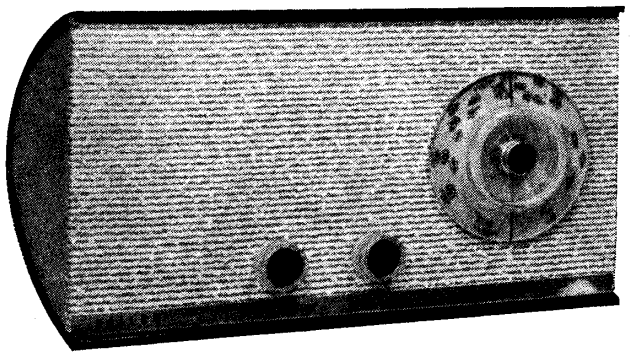
TRANSISTOR TABLE RECEIVER

SPECIFICATION

Batteries

The receiver operates from six 1½ volt cells (9V) any six of the following types being suitable :—

Drydex	T20
Ever Ready	U2
GEC	BA6103
Siemens	TI
Vidor	V0002



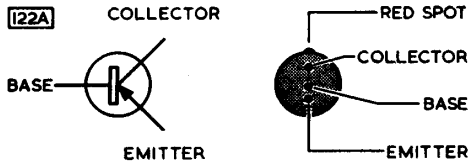
Waveranges

Medium	188—588 metres
Long	1,111—2,000 metres

Loudspeaker PM 5" diameter, 30Ω speech coil

Power Output .... 500 milliwatts

Overall Cabinet Dimensions 12¾" wide x 7¾" high x 6⅞" deep



CIRCUIT SYMBOL *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, new batteries should be used for checking purposes.

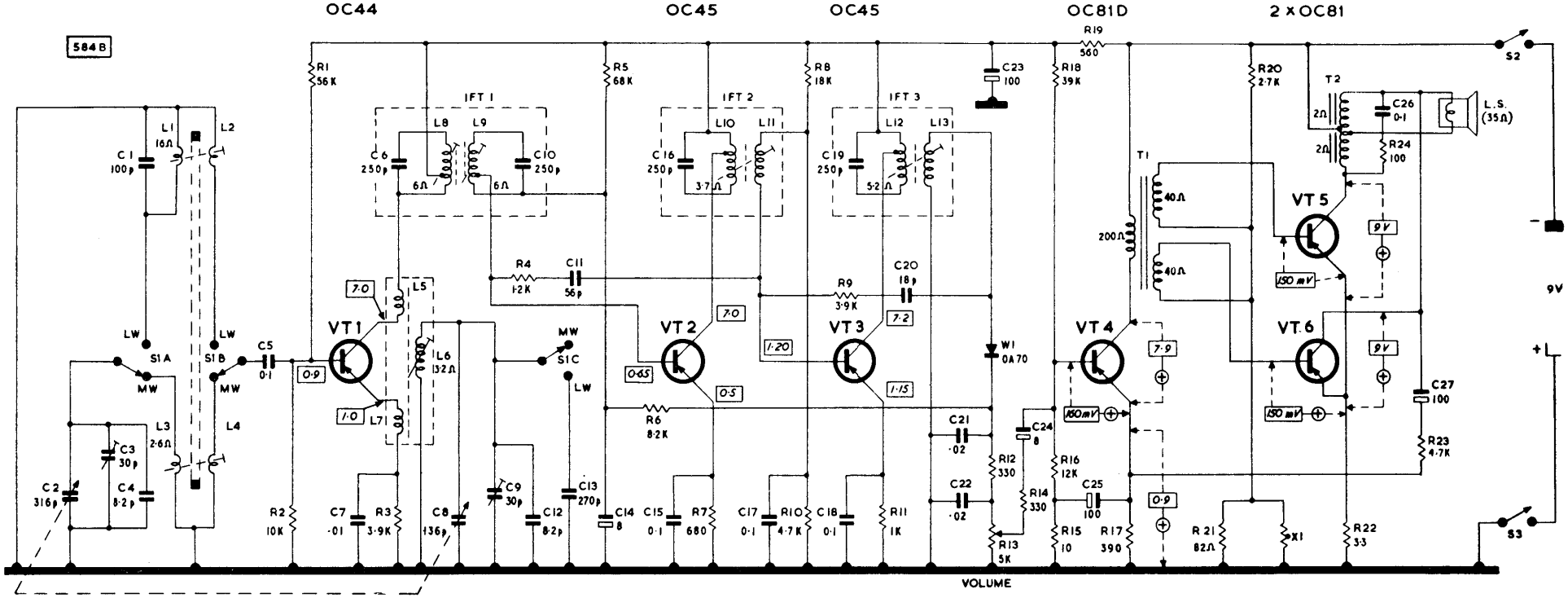
2. Apart from total current consumption, no other current measurements should be attempted. Under 'no signal' conditions, the total current consumption will be approximately 14mA. Consumption rises immediately a signal is applied, to approximately 50mA for 50mW output.

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 VT1. 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 Depot) 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 must not be shorter than those of 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.



Circuit diagram. Figures in rectangles indicate voltages measured with a 20,000 Ω/V meter. DC resistances are shown against inductances where these are 1Ω or greater. On some early models R23 has a value of 2.2KΩ. Care should be taken to avoid short-circuiting transistor electrodes with the meter probes.

CIRCUIT DESCRIPTION

With the receiver switched to MW, the ferrite rod aerial windings **L3** and **L4** are connected into **VT1** base circuit by **S1A** and **S1B**. **L3** is tuned by **C2** section of the tuning gang, pre-set trimmer **C3** and fixed trimmer **C4**. When switched to LW, **L3** and **L4** are disconnected and the LW windings **L1** and **L2** with fixed trimmer **C1** are brought into circuit.

The signal from either **L2** or **L4** is injected into self-oscillating mixer **VT1** base circuit via **S1B** and coupling capacitor **C5**. Oscillatory feedback from collector to emitter circuit is provided by **L5** and **L7**. On MW the tertiary winding **L6** is tuned by **C8** section of the tuning gang, pre-set trimmer **C9** and fixed trimmer **C12** while on LW an additional fixed trimmer **C13** is brought into circuit by **S1C**.

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**. Emitter stabilizing is provided by **R7**. A single tuned IF transformer **IFT2** in **VT2** collector circuit couples the signal to the 2nd IF amplifier **VT3** (OC45). Another single tuned IF transformer **IFT3** provides the coupling to the crystal diode detector **W1** (OA70). **R11** provides emitter stabilizing for **VT3**.

Both IF stages require neutralizing to offset internal feedback within the transistors; **VT2** neutralizing being effected by **R4** and **C11** and **VT3** by **R9** and **C20**. The necessary phase reversal is obtained by including the IF transformers within the feedback loops.

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**.

No AGC is applied to the 2nd IF stage, the base bias being fixed by the potential divider comprising **R8** and **R10**.

The audio amplifier consists of a driver stage **VT4** (OC81D) feeding a push-pull output stage **VT5** and **VT6** (both OC81). The audio voltage developed across the volume control **R13** is applied to **VT4** base through **R14** and **C24**. **R15, R16** and **R18** stabilize 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 each half section of output transformer **T2** which provides auto transformer matching to the loudspeaker. **R24** and **C26** comprise a phase correction network. **R20** and **R21** with voltage stabilizing thermistor **X1** form a potential divider determining the amount of steady bias at the bases of **VT5** and **VT6**.

Negative feedback is applied to the emitter of the driver transistor from the output transformer via **C27** and **R23**.

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 30Ω 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.

IF Circuits

Switch receiver to MW and turn gang to minimum capacitance position. Apply a 470 Kc/s modulated signal through a 0.1uF capacitor across the aerial section of the tuning gang. Adjust **L12/L13, L10/L11, L9** and **L8** in that order, for maximum output. Repeat in the same order until no further improvement is obtainable.

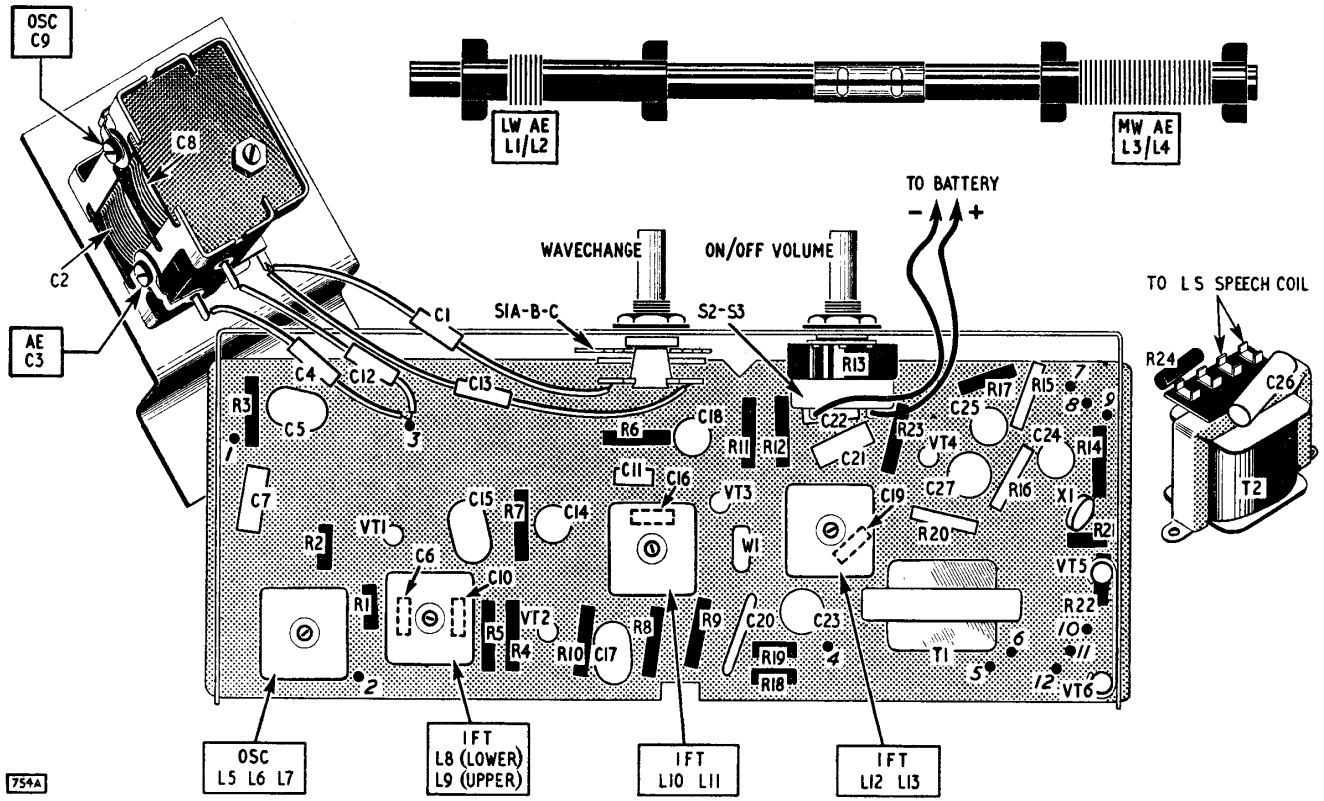
RF Circuits

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 ; Black dots on Medium Wave, Red dot on Long Wave.

	Range	Cursor Position	Adjust
MW	1500 Kc/s	MW Trim	C9, C3
	600 Kc/s	MW Pad	L6, L3*
LW	220 Kc/s	LW Trim	L1*

*Adjust by sliding coil along the aerial rod



The chassis and printed board, viewed from the components side. The tuning gang and its support bracket are shown detached from the chassis for clarity. Alignment positions are shown in rectangles. Printed board connection tags are also indicated. On some models the output transformer (with R24 and C26) is mounted on the loudspeaker

PRINTED BOARD CONNECTIONS

1. Chassis connection to ferrite rod aerial.
2. To **C8** (tuning gang)
3. To **C8** (via **C12**) and **C2** (via **C4**). To tuning gang frame and to chassis metalwork.
4. To on-off switch.
5. To **VT5** collector and to **T2**.
6. To **VT5** base.
7. To volume control.
8. To volume control wiper.
9. Chassis connections to volume control and on-off switch.
10. To **VT5/VT6** emitters.
11. To **VT6** base.
12. To **VT6** collector and to **T2**.

BATTERY CHANGING

Remove left-hand end panel by pulling out the locking lever which projects from the underside of the cabinet. The ends of the two tubes which carry the six batteries can then be seen. Remove used batteries by tipping the receiver on end so that they slide out of the tubes. Insert three batteries in each tube ; those in the lower tube must ALL be inserted brass end cap first and those in the upper tube must ALL be inserted flat base end first.

CHASSIS REMOVAL

The complete chassis is mounted on the front panel. Remove the two woodscrews which are located under the bottom front edge of the receiver. Slide the complete baffle assembly to the left-hand side of the cabinet and lift out. The battery connecting leads are of sufficient length for normal servicing operations. If, however, greater freedom of movement is required, the complete battery housing assembly may be removed from the cabinet in the following manner.

1. Withdraw the two battery tubes.
2. Remove two woodscrews securing housing to cabinet.

RESISTORS

All ¼ Watt carbon, 10% tolerance unless otherwise stated

Ref	Value	Tolerance	Function and Part No.
R 1	56KΩ		VT1 base bias pot.
R 2	10KΩ		
R 3	3.9KΩ		VT1 emitter stabilizing
R 4	1.2KΩ		Part VT2 neutralizing
R 5	68KΩ		Part VT2 base bias pot.
R 6	8.2KΩ		AGC decoupling
R 7	680Ω		VT2 emitter stabilizing
R 8	18KΩ		Part VT3 base bias pot.
R 9	3.9KΩ		Part VT3 neutralizing
R10	4.7KΩ		Part VT3 base bias pot.
R11	1KΩ		VT3 emitter stabilizing
R12	330Ω		Part IF filter
R13	5KΩ	Pot.	Volume control Y20209/3
R14	330Ω		VT4 audio coupling
R15	10Ω		Negative feedback injection
R16	12KΩ		Part VT4 base bias pot.
R17	390Ω		VT4 emitter stabilizing
R18	39KΩ		Part VT4 base bias pot.
R19	560Ω		DC dropper and decoupling
R20	2.7KΩ	5%	VT5/VT6 base bias pot. 272GC02
R21	82Ω		
R22	3.3Ω	±0.5Ω	VT5/VT6 emitter stabilizing 33XHC02
R23	4.7KΩ		Negative feedback series
R24	100Ω	20%	Part phase correction

MECHANICAL SPARE PARTS

Description	Part No.
Cabinet	V50226
Control Knobs :—	
Tuning (including tuning scale)	Y50230
Clip	Z7057
Volume ON/OFF (Clip 375309)	Y50240
Wavechange	Y50241
Control fascia (Brass strip)	Y50232
Cursor Disc	Z50238
Battery tube	Z29958/1

INDUCTORS AND TRANSFORMERS

Ref	Function	Part No.
L 1	LW aerial coil	Y50243
L 2	LW aerial coupling	
L 3	MW aerial coil	
L 4	MW aerial coupling	
L 5	Oscillator coils	Y18409
L 6		
L 7		
L 8	1st IF transformer	Y29916
L 9		
L10	2nd IF transformer	Y29917
L11		
L12	3rd IF transformer	Y29918
L13		
T 1	Driver transformer	Z18413
T 2	Output transformer	Y32191

CAPACITORS

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

Ref	Value	Tol	Volts	Function and Part No.
C 1	100pF	5%		LW aerial trimmer (fixed) Y10IG35
C 2	316pF	Variable		Aerial tuning*
C 3	30pF	Pre-set		Aerial trimmer*
C 4	8.2pF	±0.5pF	120V	Aerial trimmer (fixed) Y82XH12
C 5	0.1uF		200V	VT1base coupling
C 6	250pF			L8 tuning
C 7	.01uF		400V	VT1 emitter bypass
C 8	136pF	Variable		Oscillator tuning*
C 9	30pF	Pre-set		Oscillator trimmer*
C10	250pF			L9 tuning
C11	56pF	5%	500V	Part VT2 neutralizing C560G50
C12	8.2pF	±0.5pF	120V	Aerial trimmer (fixed) Y82XH12
C13	270pF	1%		LW aerial trimmer (fixed) Y27IB35
C14	8uF	Elec	6V	AGC decoupling Y13222/7
C15	0.1uF		200V	VT2 emitter bypass
C16	250pF			L10 tuning
C17	0.1uF		200V	VT3 base bias decoupling
C18	0.1uF		200V	VT3 emitter bypass
C19	250pF			L12 tuning
C20	18pF	5%	500V	Part VT3 neutralizing P180G50
C21	.02uF		150V	Part IF filter
C22	.02uF		150V	
C23	100uF	Elec	12V	Supply decoupling Y13229/9
C24	8uF	Elec	6V	VT4 audio coupling
C25	100uF	Elec	6V	VT4 emitter bypass Y13229/11
C26	0.1uF		150V	Part phase correction
C27	100uF	Elec	12V	Negative feedback coupling Y13229/9

* Part tuning gang Y32136

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	
W1	OA70	Detector and AGC rectifier

MISCELLANEOUS

Ref	Description and Function	Part No.
S1A-B-C	Wavechange switch	Z33831
S2-3	On-Off switch (with volume control)	Y20209/3
X1	Thermistor	Z4558/13
LS	5" diameter loudspeaker (30Ω impedance)	Y16021/11-R

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