

SERVICE BULLETIN No. 294 for members of RADIO MANUFACTURERS SERVICE

A PHILCO Service Plan

Electrical Specifications

Model 38-2, Code 121, is an eleven tube, A. C. operated superheterodyne receiver with three tuning ranges covering the frequencies listed below, and employs the PHILCO AUTOMATIC TUNING DIAL MECHANISM. Additional design features incorporated in this receiver are: Magnetic Tuning Control on the broadcast tuning range; Automatic Volume Control; Bass Compensation; Special Push-pull Pentode Audio Output circuit designed for the reduction of harmonic distortion; Four Point Tone Control; R. F. Circuit completely shielded and contained in one unit; all aligning compensators accessible from the top of the chassis.

POWER SUPPLY:

Voltage	Cycles	Consumption		
115	50 to 60	140 Watts		
115	25 to 40	140 Watts		
115/230	50 to 60	140 Watts		

Different transformers are required for operation on the voltages and frequencies listed above. The part numbers for these transformers are listed on page 3. A special transformer for operation on either 115 or 230 volt—50 to 60 cycles A. C. power circuit can be obtained. This transformer is provided with a plug and socket for selection of either voltage rating. Place the plug with arrow pointing toward voltage being used.

FREQUENCY RANGES: Three.

Range one—530 to 1720 K. C. Range two—2.3 to 7.4 M. C. Range three—7.35 to 22.0 M. C.

INTERMEDIATE FREQUENCY: 470 K. C.

AUDIO OUTPUT: 7 Watts.

PHILCO TUBES USED: 6U7G, R. F. Amplifier; 6A8G, Det. Osc.; 6N7G Osc. Control; 6K7G, I. F. Amplifier; 6H6G, Magnetic Tuning Discriminator; 6R7G, 2nd Det., A.V.C., 1st. Audio; 6J5G, Audio Phase Inverter; 6J5G, 2nd Audio; Two 6F6G, Output; and 5X4G, Rectifier.

TONE CONTROL: Four Point.

- A. Brilliant—for speech.
- B. Bright-for normal reception of music.
- C. Mellow-first noise-reducing stage.
- D. Deep-Noise-reducing for distant reception.

PHILCO SPEAKER: H32.

CABINET: Type XX.

Aerial Connections

To obtain the full advantage of the sensitivity of this receiver the **Philco High Efficiency Aerial** supplied with the instrument must be used. Connect the aerial as follows:

The aerial terminal panel located on the rear of the chassis, contains three terminals marked "Red," "Blk" and "Gnd". Connect the red and black wires of the aerial lead in (Transmission Line) to the "Red" and "Blk" terminals respectively. Connect the "Gnd" terminal to a good ground source. If a temporary aerial is used, connect it to the "Red" terminal.

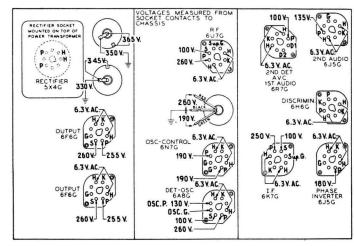


Fig. 1. Underside View of Chassis showing Socket Voltages

The voltages indicated by the arrows were measured with a **Philco 026 Circuit Tester**, which contains a sensitive voltmeter. Line voltage 115 A. C.—Volume control minimum—Dial set at point where no signal is present—Range Switch in broadcast position.

Automatic Tuning Mechanism Service Data

Service data and a complete parts list for the Automatic Tuning Mechanism of this receiver will be found in Service Bulletin 273. When referring to bulletin 273, use the dial parts list for Model 37-10 as the same parts are used on Model 38-2. There are four automatic dial parts, however, which differ from those shown in bulletin 273. These parts are marked with an asterisk on page 3 of this bulletin.

Service Notes

For reference between illustrations, Parts List, and for replacement of parts, the various diagrams in this bulletin are marked with "circled numbers" indicating a particular part.

Physical views of the R. F. transformers are shown on page 2. Each transformer is marked with the corresponding schematic diagram circled number. The connections of the R. F. transformer are numbered to indicate the connecting points in the circuit diagram which are correspondingly marked.

The colors of the I. F. transformer leads are marked on the schematic diagram.

Range switch lugs are marked with a letter and number—example (A2)—indicating the connecting point in the circuit diagram. Each range switch section is marked with a letter indicating the position of the section from the rear of the chassis. Section "A" is used in the oscillator circuit. Section "B" the "RF" circuit, and Section "C" the antenna circuit.

The colors of the connections on the power transformer and speaker unit are also marked on the schematic diagram.

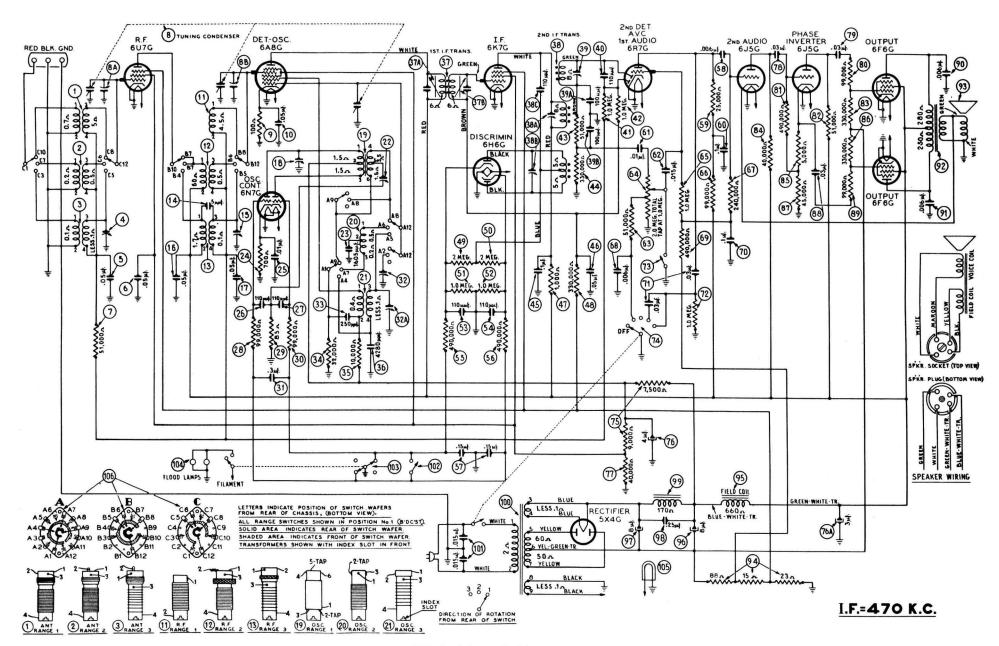


Fig. 2. Schematic Diagram Model 38-2, Code 121

Replacement Parts

	Replacement F	arts	
	nem.	Part	List
1	lo. Description	No. 32-2575	Price
2	Antenna Transformer (Range 1) Antenna Transformer (Range 2) Antenna Transformer (Range 3)	32-2576	\$0.70
3	Antenna Transformer (Range 3)	32-2573	.70 .70
4			.30
5	Condenser (.05µf tubular)	30-4519 3615DG	.20 .40
6 7 8	Resistor (51,000 Ω, ½ Watt)	33-351339	.20
8	Tuning Condenser Assembly	33-351339 31-2075	
9 10	Resistor (.100 Ω, ½ Watt)	33-110339	.20 .20
11 12	R. F. Transformer (Range 1)	32-2379	.40
12	R. F. Transformer (Range 2)	32-2382	1.00
13 14	R. F. Transformer (Range 3)	32-2385	1.20 .20
15	Compensator (R. F. Range 3)	31-6212	.20
16	Condenser—Part of 6		
17 18	Company to Company (Panga 1)	30-4519	.20
19	Osc. Transformer (Range 1)	32-2373	1.60
20	Osc. Transformer (Range 2)	32-2383	.70 .70
21 22	Osc. Transformer (Range 3)	32-2386	.70
23	Condenser (1605 unf Mica)	31-6101	.40 .40
24	Resistor (200 Ω , ½ Watt)	33-170339	.20
25	Condenser (.01 \mu f, Tubular)	30-4479	.20
26 27	Condenser (110 µµt, Mica)	30-1031	.20 .20
28	Resistor (99,000 Ω, ½ Watt)	33-399339	.20
29	Resistor (85 Ω, ½ Watt)	33-085339	.20
30 31	Resistor (99,000 Ω, ½ Watt)	33-399339	.20
32	Compensator (2 Sections)	31-6211	.40
33	Condenser (250 µµf, Mica)	30-1032	.25
34	Resistor (32,000 Ω, ½ Watt)	33-332339	.20
35 36	Condenser (4280 unf Mice)	33-310339	.20 .50
37	1st. I. F. Transformer	32-2604	2.20
38	2nd I. F. Transformer	32-2362	3.30
39 40	Condenser (110f Miss)	31-6203	.30 .20
41	Resistor (1.0 Meg., ½ Watt)	33-510339	.20
42	Resistor (1.0 Meg., ½ Watt)	33-510339	.20
43 44	Resistor (51,000 Ω, ½ Watt)	33-351339	.20
45	Condenser (.1 uf. Tubular)	30-4455	.20 .25
46	Condenser (.05, Bakelite)	3615SG	.35
47 48	Resistor (1000 Ω, ½ Watt)	33-210339	.20
49	Resistor (2.0 Meg., ½ Watt)	33-520339	.20
50	Resistor (2.0 Meg., ½ Watt)	33-520339	.20
51	Resistor (1.0 Meg., ½ Watt)	33-510339	.20
52 53	Condenser (110 meg., ½ Watt)	33-510339 30-1031	.20 .20
53 54	Condenser (110 µµf, Mica)	30-1031	.20
55	Resistor (490,000 Ω, ½ Watt)	33-449339	.20
56 57	Condenser (15 uf 15 uf Rakelita)	33-449339 6287DC	.20 .40
58	Condenser (.006 µf, Tubular)	30-4445	.20
59	Resistor (25,000 Ω, ½ Watt)	33-325339	.20
60 61	Condenser (.1 µf, Tubular)	30-4455	.25 .20
62	Condenser (.015 µf, Tubular)	30-4226	.20
63 64	Resistor (51,000 Ω, ½ Watt)	33-351339	.20
64 65	Volume Control.	33-5233	1.00
66	Resistor (99.000 Ω. 1/2 Watt)	33-399339	.20 .20
67	Resistor (240,000 Ω, ½ Watt)	33-424339	.20
68	Condenser (.006 \mu f, Tubular)	30-4467	.20
69 70	Condenser (.1 uf. Tubular)	33-449339 30-4490	.20 .20
71	Condenser (.03 µf—.03 µf, Bakelite)	8318DU	.40
72 73	Resistor (1.0 Meg., ½ Watt)	33-510339	.20
13	(16) Bulletin 273)		
74	Tone Control	42-1268	.75
75	Condenser (.05μf tubular). Condenser (.05μf tubular). Condenser (.05μf, Bakelite). Resistor (51,000 Ω, ½ Watt). Tuning Condenser Assembly. Resistor (.100 Ω, ½ Watt). Condenser (.05μf, tubular). R. F. Transformer (Range 1). R. F. Transformer (Range 2). R. F. Transformer (Range 3). Condenser (5μμf, Mica). Compensator (R. F. Range 3). Condenser (.05μf, Tubular). Compensator (R. F. Range 3). Condenser (.05μf, Tubular). Compensator (Range 1). Osc. Transformer (Range 1). Osc. Transformer (Range 1). Osc. Transformer (Range 1). Osc. Transformer (Range 3). Compensator (10μμf, Mica). Resistor (10μμf, Mica). Resistor (200 Ω, ½ Watt). Condenser (.10μμf, Mica). Resistor (99,000 Ω, ½ Watt). Resistor (99,000 Ω, ½ Watt). Resistor (99,000 Ω, ½ Watt). Resistor (32,000 Ω, ½ Watt). Resistor (10,000 Ω, ½ Watt). Resistor (100 Meg., ½ Wa	00.0000	
76	Wound) Electrolytic Condenser (4 μf—3 μf)	33-3320	.65 1.50
••		00-4470	1.00

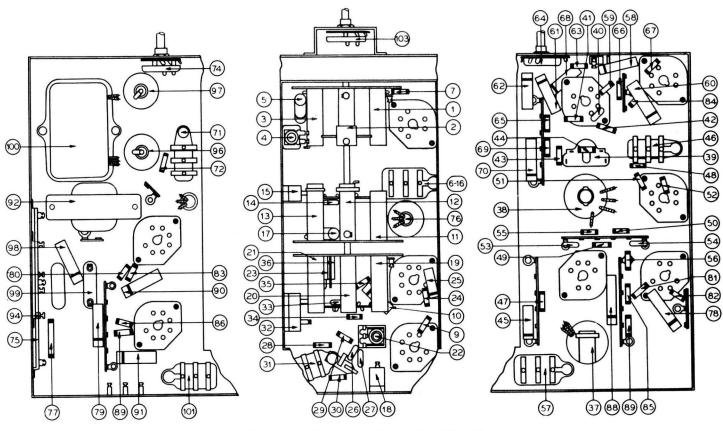


Fig. 3. Part Locations, Underside of Chassis

	em.	Part	List	Schem.		Part	List	Schem.	Description	Part	List
r	o. Description	No.	Price	No.	Description	No.	Price	No.	Description	No.	Price
77 78 79 80 81	Resistor (40,000 Ω, 1 Watt) Condenser (.03 μf, Tubular) Condenser (.03 μf, Tubular) Resistor (99,000 Ω, ½ Watt) Resistor (490,000 Ω, ½ Watt)	30-4449 30-4449 33-399339	\$0.20 .20 .20 .20 .20	Cycles Power Power	Transformer (115V — 50-60) Transformer(115V,25-40cycles) Transformer (115/230V, cycles)	32-7869 32-7870		Shield (R. F. Ùn Shield (Tube) (S Shield (Tube) (R Shield Base (Squ	ront of R. F. Unit) it)quare)	38-8969 28-2726 8005 28-2725	\$0.10 .10 .03
82 83 84 85 86 87	Resistor $(51,000 \Omega, \frac{1}{2} \text{Watt})$ Resistor $(330,000 \Omega, \frac{1}{2} \text{Watt})$ Resistor $(40,000 \Omega, \frac{1}{2} \text{Watt})$ Resistor $(5,000 \Omega, \frac{1}{2} \text{Watt})$ Resistor $(330,000 \Omega, \frac{1}{2} \text{Watt})$ Resistor $(45,000 \Omega, \frac{1}{2} \text{Watt})$	33-351339 33-433339 33-340339 33-250339 33-433339	.20 .20 .20 .20 .20 .20	 101 Condense 102 A. F. C. 103 A. F. C. 104 Flood La 105 Pilot Lan 	er (.015 µf—.015 µf, Bakelite) Shorting Switch Switch mp Bulb np	3793DG 45-2330 42-1269 34-2064 34-2064	\$0.40 1.20 .09 .09 3.00	Socket (6 prong) Socket (7 prong) Socket (7 prong) Speaker H-32	(6F6G tubes) R. F. Unit)	27-6086 27-6057 27-6087 36-1299	.11 .11 .11
88 89	Condenser (.03 μf, Tubular) Resistor (99,000 Ω, ½ Watt)	30-4449	.20	Automatic Tu	ning Mechanism (complete)	38-9145	.40	Terminal Panel (Antenna)	38-8746	.15
90 91 92 93	Condenser (.006 µf, Tubular) Condenser (.006 µf, Tubular) Output Transformer Cone & Voice Coil Assembly	30-4445 32-7754	.20 .20 1.50 1.40	Clip (R. F. Coil Coupling (Tun)	28-5002 31-1961	.02 .80	Cover (Back of c	abinet)	27-8864	2.50 1.00
94 95 96 97 98 99	Resistor (88—15—23 \(\Omega\) Field & Pot. Assembly Field & Pot. Assembly Electrolytic Condenser Electrolytic Condenser Condenser (.25 \(\mu \), Tubular) Cohoke	33-3321 36-3941 30-2211 30-2211 30-4446	1.40 .40 1.00 1.00 .25 1.80	Knob (Range S Knob (Tuning) Knob (Vernier Knob (Tone, V Mtg. Rubber (Switch (Mass) Switch (Mass) Solume) Chassis Rear of R. F. Unit)	27-4326 27-4330 27-4331 27-4332 27-4564	.10 .10 .10 .10 .10 .10	*Dial Screen Hol *Escutcheon Asse	der embly (Station tabs) c Tuning Mechanism Parts e Bulletin 273.	27-5358 31-2053 45-2472	.50 .75 those

Alignment of Compensators

EQUIPMENT REQUIRED: (1) Signal Generator, having a fundamental frequency range covering the intermediate and tuning frequencies of the receiver. Philco Model 077 Signal Generator which has a fundamental frequency range from 115 to 36000 K. C. is the correct instrument for this purpose; (2) Output Meter, Philco Model 026 Circuit Tester incorporates a sensitive output meter and is recommended; (3) Philco Fibre Handle Screw Driver, Part No. 27-7059 and Fibre Wrench, Part No. 3164.

OUTPUT METER: The 026 Output Meter is connected to the plate and cathode terminals of one of the 6F6G tubes. Adjust the meter to use the (0-30) voit scale and advance the attenuator control of the generator until a readable indication is noted on the output meter after signal is applied to stage being adjusted.

DIAL CALIBRATION: In order to adjust the compensators of this receiver correctly, the dial must be aligned to track properly with the tuning condenser. To do this proceed as follows:

- 1. Loosen the set screws on the shaft coupling of the tuning condenser. Then turn the tuning condenser until the plates are in the maximum capacity position. Now turn the dial until the glowing beam indicator is on the INDEX LINE at the low frequency end of Range 2. See Fig. 4. With dial and tuning condenser in this position, tighten set screws.
- 2. Turn the tuning condenser control until the indicator is on the 2.2 M. C. Mark.
- 3. With the dial in this position, loosen the shaft coupling set screws. Then turn the dial until the indicator is again on the INDEX LINE. Tighten the set screws in this position. Be careful when turning the dial that the position of the tuning condenser is not disturbed.

INTERMEDIATE FREQUENCY CIRCUIT

- A. Set the receiver and signal generator controls as follows:
 - 1. Range Switch (Broadcast)
 - 2. Volume Control (Maximum)
 - 3. Magnetic Tuning Switch "out"
 - 4. Tone control & A. C. switch first position.
 - 5. Signal generator dial 470 K. C.
- B. Connect the signal generator output cable through a .1 mfd. condenser to the grid of the 6A8G Det. Osc. tube and connect the cableground to the receiver chassis. Now adjust the following compensators for maximum output (38A), (39), (37B), and (37A).

RADIO FREQUENCY CIRCUIT

1. Set the controls as given under "Intermediate Frequency Circuit" 1 to 4 and set the range switch, signal generator and receiver dials as given under the adjustments of each tuning range in the following procedure.

Connect the Signal Generator output cable into the "Med" jack of the generator panel and connect the other end through a .1 mfd. condenser to the "Red" terminal of the receiver aerial panel (rear of chassis). The ground connection of the cable should be connected to the "Blk" terminal.

Adjust the "R. F." compensators for maximum output as follows:

Tuning Range: 530 to 1720 K. C.

Range Switch	Signal Generator
Position	and Receiver Dials
1	1550 K. C.
1	580 K. C.
1	1550 K. C.
Tuning Range	2.3 to 7.4 M. C.
Range Switch	Signal Generator
Position	and Receiver Dial
2	6.0 M. C.
Tuning Range	7.35 to 22.0 M. C.

3 20.0 M. C.

3 20.0 M. C.

Sional Generator

and Receiver Dial

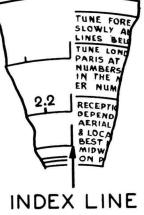


Fig. 4. Dial Calibration

Compensators in Order (18), (8B) and (8A) (22) Roll gang. Note B

(18), (8B), (8A)

Compensators in Order (32)

Compensators in Order

(32A), (15), (4) Roll Tuning condensers when adjusting (15) and (4). See Note B. Check image at 17.060. See Note A. (32A)

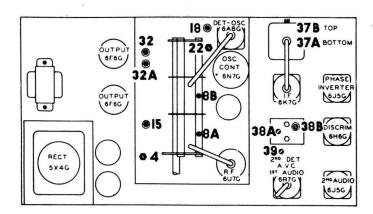


Fig. 5. Compensator Locations

MAGNETIC TUNING CIRCUIT ADJUSTMENTS

- 1. Set the Magnetic Tuning switch in the "out" position.
- 2. Turn the signal generator indicator to 1000 K. C. and adjust the "Attenuator" control for a weak signal.
 - 3. Adjust volume control for a readable indication on the output meter.
- 4. Now tune the receiver dial for maximum output at 1000 K. C. The dial must be tuned very accurately to the 1000 K. C. signal in order to make the following adjustment correctly.
- 5. Turn the Magnetic Tuning switch "in" and adjust compensator (38B) for maximum output.

The above adjustments are now checked for accuracy as follows:

FREQUENCY TEST

With the 1000 K. C. signal tuned for maximum output turn the Magnetic Tuning control back and forth; that is, from the "out" to "in" position. The reading of the output meter should not change in either position. If the output meter reading changes, the above magnetic tuning circuit adjustments should be repeated.

A further check on the Magnetic Tuning adjustment is to very carefully tune in a broadcasting station and turn the switch from the "out" to the "in" position. With the switch in either position, the tone of the station being received should not change. If a change of tone or hiss develops repeat the above Magnetic Tuning Adjustments.

SENSITIVITY TEST

- 1. To check the magnetic tuning circuit for sensitivity, turn the magnetic tuning switch to the "out" position, and tune in the 1000 K. C. signal. Then adjust the "attenuator" control of the signal generator for a good audible signal. Approximately 20 volts on the output meter.
- 2. Now detune the signal (first above and then below) the 1000 K. C. mark to a point at which the signal is weakly heard. At each point turn the magnetic tuning control "on". When the control is turned on the signal should return to normal output strength. If the magnetic tuning circuit does not pull the signal into resonance, the compensator should be carefully readjusted.

NOTE "A"—To accurately adjust the high frequency oscillator compensator to the fundamental instead of the image signal, turn the oscillator compensator to the maximum capacity position (clockwise). From this position slowly turn the compensator counter-clockwise until a second maximum peak is obtained on the output meter. Adjust the compensator for maximum output using this second peak. The first peak from maximum capacity position of the compensator is the image signal and must not be used in adjusting the compensator.

If the above procedure is correctly performed, the image signal will be found (much weaker) by turning the receiver dial 940 K. C. below the frequency being used on any high frequency range.

NOTE "B"—When adjusting the low frequency compensator of Range One (Broadcast) or the antenna and R. F. compensators of the high frequency tuning ranges; the receiver Tuning Condenser must be adjusted (rolled) as follows: First tune the compensator for maximum output, then vary the tuning condenser of the receiver for maximum output about the frequency dial mark. Now turn the compensator slightly to the right or left and vary the receiver tuning condenser for maximum or tput. If the out reading increases, turn the compensator in the same direction a trifle more, and again vary the tuning condenser for maximum output. If the output decreases, set the compensator in the opposite direction. This procedure of first setting the compensator and then varying the tuning condenser is continued until there is no further gain in output reading.

PHILCO RADIO AND TELEVISION CORPORATION

Parts and Service Division Philadelphia, Pa.

Range Switch

Position