

## SPECIFICATIONS

**TYPE OF CIRCUIT:** Model 38-116, code 121 employs a fifteen tube A.C. operated superheterodyne circuit with a spread-band dial having five tuning ranges covering a frequency range from 530 K.C. to 18.2 M.C.

Incorporated in this model are design features such as: magnetic tuning control on each tuning range; automatic volume control; treble-selectivity expander unit in the intermediate frequency circuit; audio bass compensation; acoustic clarifiers to eliminate cabinet resonance; special push-pull audio output circuit using 6L6G beam tubes, and the Philco automatic tuning mechanism.

POWER SUPPLY:	Voltage	Frequency Cycles	Power Consumption
	115	50 to 60	165 watts
	115	25 to 40	165 watts

Different transformers are required for operation on the voltages and frequencies listed above. The part numbers for these transformers are listed on page 4. A special transformer for operation on either 115 or 230 volt—50 to 60 cycle 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.

**INTERMEDIATE FREQUENCY:** 470 K.C.

FREQUENCY RANGES:	Range	One	Two	Three	Four	Five
		530 to 1600 K.C.	1.58 to 4.75 M.C.	4.7 to 7.4 M.C.	7.35 to 11.6 M.C.	11.5 to 18.2 M.C.

**UNDISTORTED OUTPUT:** 15 watts.

**PHILCO TUBES USED:** 6K7G R.F.; 6L7G Mixer; 6A8G Oscillator; 6N7G Oscillator control; two 6K7G I. F.; 6K7G 2nd Detector Magnetic tuning amplifier; two 6J5G discriminator; 6J5G A. V. C.; 6R7G 1st audio; 6J5G audio driver; two 6L6G audio output, and one 5X4G rectifier.

**tone Controls:** Two—1. High audio-frequency tone varied by Treble-Selectivity control.

2. Low audio-frequency tone varied by "Bass Tone Control," in the volume control circuit.

**PHILCO SPEAKERS USED:** One type "W4" with three acoustic clarifiers.

**CABINET:** Type XX.

## 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. and I. F. transformers and the range switch sections are shown on pages 2 and 3. Each part is marked with the corresponding schematic diagram circled number.

The leads and lugs of the R. F. and I. F. transformers are either numbered or the color of the wire marked to indicate the connecting point in the circuit diagram, which is also correspondingly marked.

Range switch lugs are marked with a letter and number—example (A2)—indicating the connecting point in the circuit diagram.

Speaker wiring is shown in Fig. 3 and the power transformer wire colors are marked on the schematic diagram.

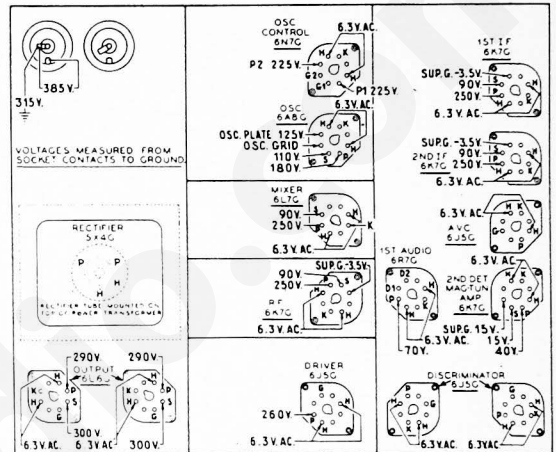


Fig. 1. Underside View of Chassis showing Socket Voltages

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. There are four automatic dial parts, however, which differ from those shown in bulletin 273. These parts are marked with an asterisk on page 4 of this bulletin.

## 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.

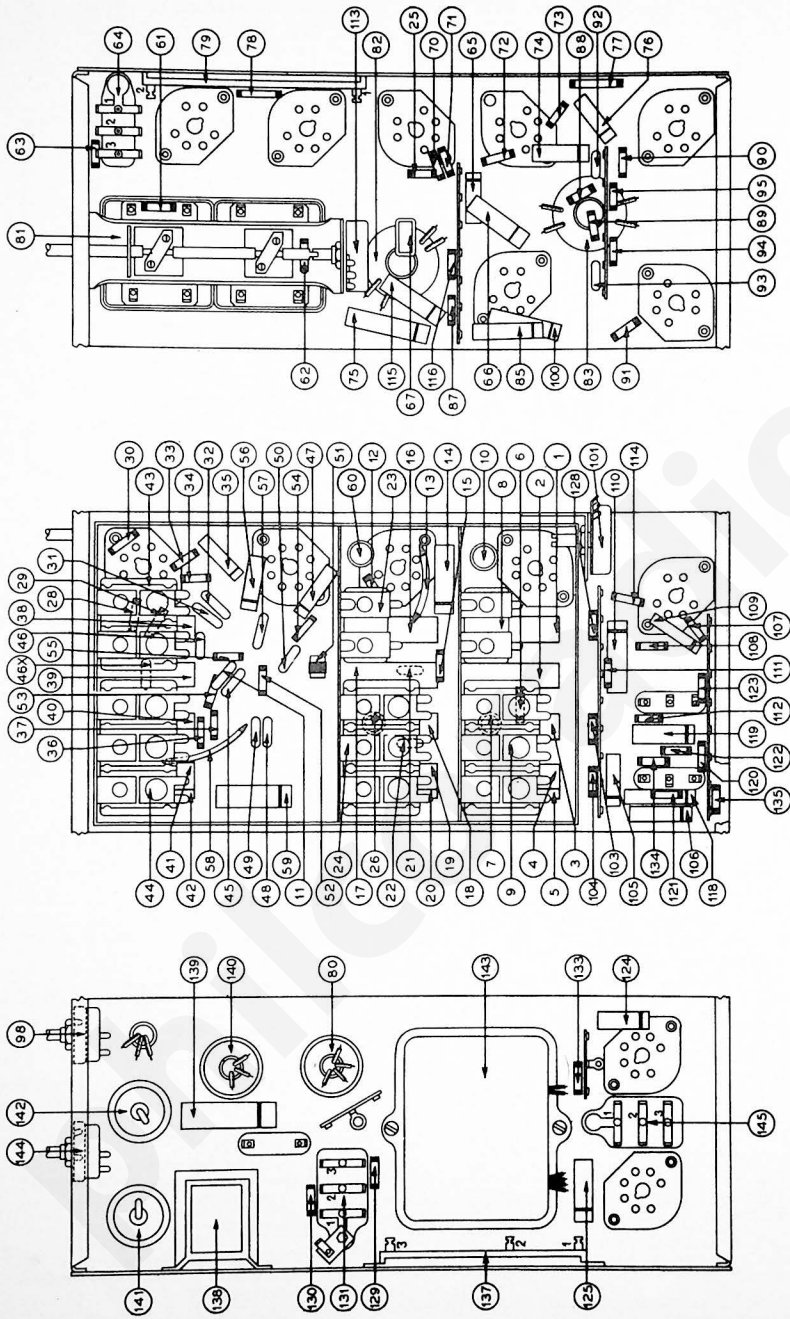


Fig. 2. Underside View of Chassis

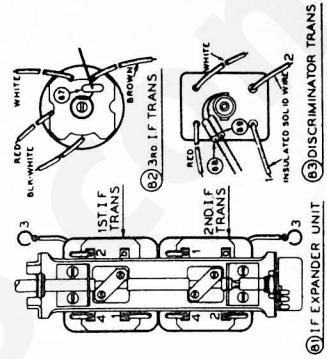


Fig. 3. Speaker Wiring

Fig. 4. I. F. Transformer Connections

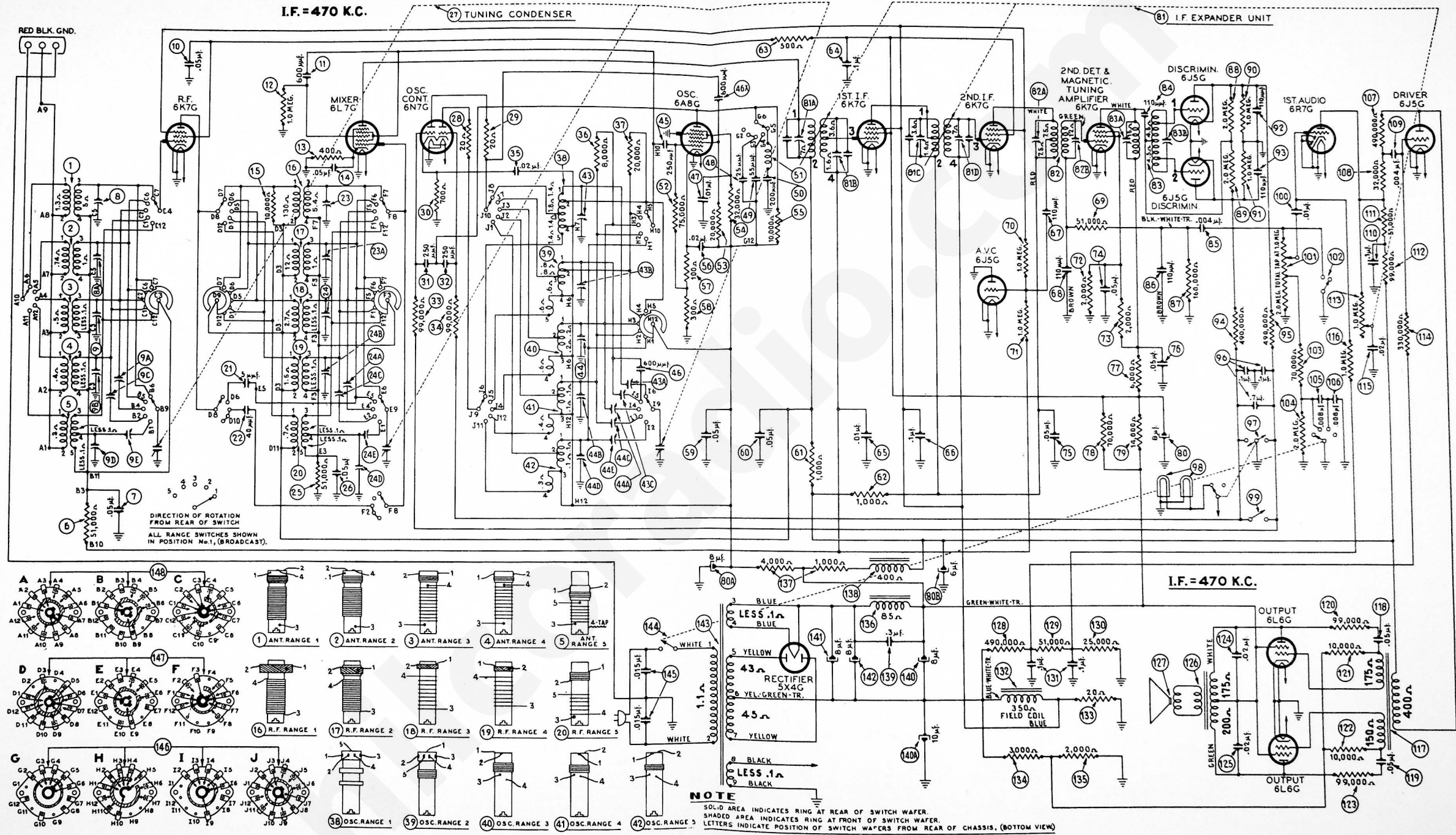


Fig. 5. Schematic Diagram Model 38-116, Code 121

# REPLACEMENT PARTS—Models 38-116, Code 121

Schem. No.	Description	Part No.	List Price	Schem. No.	Description	Part No.	List Price	Schem. No.	Description	Part No.	List Price
1	Ant. Trans. (Range 1)	32-3208		55	Resistor (10,000 ½ watt)	33-310339	\$0.20	144	Power and Tone Switch	42-1196	\$0.75
2	Ant. Trans. (Range 2)	32-2146	\$1.20	56	Condenser (.02 mf. tubular)	30-4481	.20	145	Condenser (.015—.015 Bakelite)	3793DG	.40
3	Ant. Trans. (Range 3)	32-2183	1.20	57	Resistor (10 ohms wire wound)	33-1219	.20	146	Range Switch (Osc.)	42-1217	2.00
4	Ant. Trans. (Range 4)	32-2186	1.20	58	Resistor (300 ohms, wire wound)	33-3121	.25	147	Range Switch (R. F.)	42-1255	1.60
5	Ant. Trans. (Range 5)	32-2175	.20	59	Condenser (.05 mf. tubular)	30-4123	.20	148	Range Switch (Ant.)	42-1211	1.60
6	Resistor (51,000—½ watt)	33-351339	.20	60	Condenser (.05 mf. tubular)	30-4123	.20	149	Pilot Lamp	34-2064	1.25
7	Condenser (.05 mf. tubular)	30-4444	.20	61	Resistor (1000 ohms, ½ watt)	33-210339	.20		Acoustic Clarifier	36-1155	
8	Compensator (Range 1 & 2 Ant.)	31-6093	.40	62	Resistor (1000 ohms, ½ watt)	33-210339	.20		Automatic Tuning Mech. Complete	31-2063	
9	Compensator (3, 4 & 5 Ant.)	31-6112	1.40	63	Resistor (500 ohms, ½ watt)	33-150339	.20		Bez. Assembly (Cabinet)	38-8553	
10	Condenser (.05 mf. tubular)	30-4123	.20	64	Condenser (1 mf. Bakelite)	4989SG	.35		Brace (Dial Mechanism)	28-4119	.05
11	Condenser (600 mmf. mica)	30-1049	.25	65	Condenser (.01 mf. tubular)	30-4512	.20		Clamp Locking Plate (R. F. unit)	28-3982	.01
12	Resistor (1 meg. ½ watt)	33-103339	.20	66	Condenser (.01 mf. tubular)	30-4499	.20		Clamp (I. F. Cord)	28-4147	.01
13	Resistor (400 ohms 1 watt wire wound)	33-1211	.20	67	Condenser (110 mmf. mica)	30-1031	.20		Cord (I. F. Expander Drive)	27-8411	.04
14	Condenser (.05 mf. tubular)	30-4444	.20	68	Condenser (110 mmf. Part of 82)	30-1031	.20		Coupling (Range Switch and Maak)	38-8693	
15	Resistor (10,000 ohms ½ watt)	33-310339	.20	69	Resistor (51,000 ohms, ½ watt, Part of 82)	33-351339	.20		Coupling (Tuning Condenser and Dial Mechanism)	31-1961	
16	R. F. Trans. (Range 1)	32-2105	1.00	70	Resistor (1 meg., ½ watt)	33-510339	.20		*Cover (Halter of Automatic Mech.)	28-5092	
17	R. F. Trans. (Range 2)	32-2147	.70	71	Resistor (1 meg., ½ watt)	33-510339	.20		*Dial	27-5340	.80
18	R. F. Trans. (Range 3)	32-2177	.70	72	Resistor (2000 ohms, ½ watt)	33-220339	.20		*Dial Screen Holder	31-2053	
19	R. F. Trans. (Range 4)	32-2178	.70	73	Resistor (2000 ohms, ½ watt)	33-220339	.20		*Eucotebon Assembly (Station Table)	45-2472	
20	R. F. Trans. (Range 5)	32-2176	1.20	74	Condenser (.05 mf. tubular)	30-4444	.20		*Fluorescent Socket Assembly, 4 Sockets	38-8210	
21	Condenser (5 mmf. mica)	30-1077	.20	75	Condenser (.05 mf. tubular)	30-4444	.20		Knob (Tuning)	27-4330	.10
22	Condenser (40 mmf. mica)	30-1076	.20	76	Condenser (.05 mf. tubular)	30-4444	.20		Knob (Vernier)	27-4331	.10
23	Compensator (R. F. Range 1 & 2 R. F.)	31-6093	.40	77	Resistor (6,000 1 watt)	33-260439	.20		Knob (Bass, Volume, Expander Magnetic)	27-4332	.10
24	Compensator (R. F. Range 3, 4, 5)	31-6113	1.40	78	Resistor (70,000 1 watt)	33-370439	.20		Mask Guide (Tuning Mechanism)	38-4118	.25
25	Resistor (51,000 ½ watt)	33-351339	.20	79	Resistor (14,000 wire wound)	33-3291	.40		Maak and Index Plate (Range Switch)	42-1208	.50
26	Condenser (.05 mf. tubular)	30-4519	.20	80	Condenser (Elec. 8—8—6 mf.)	30-2232	1.50		Shaft (I. F. Expander)	28-6496	.30
27	Tuning Condenser	31-1892	3.75	81	I. F. Expander Unit (For 1st and 2nd I. F. Trans. See Note)	32-2660			Shaft (Volume Control)	38-8061	.12
28	Resistor (20 ohms, ½ watt)	33-220339	.20	82	I. F. Transformer (3rd)	32-2661			Shield (Tube, Square)	28-2728	.10
29	Resistor (700 ohms, ½ watt)	33-170339	.20	83	Discriminator Trans	30-1031	.20		Shield (Round 6N7G)	8005	.10
30	Condenser (250 mmf. mica)	30-1032	.25	84	110 mf. Condenser (Part of 83)	30-4456	.20		Shield 3rd (I. F.)	38-1962	
31	Condenser (250 mmf. mica)	30-1032	.25	85	Condenser (Part of 82)	30-4456	.20		Shield (I. F. Expander)	38-9025	
32	Resistor (99,000 ohms ½ watt)	33-399339	.20	86	Resistor (180,000 ohms, ½ watt)	33-418339	.20		Shield Base (Square)	28-2725	.20
33	Resistor (99,000 ohms, ½ watt)	33-399339	.20	87	Resistor (2 meg., ½ watt)	33-520339	.20		Shield Base (Round 6N7G)	8004	.03
34	Condenser (.02 mf. tubular)	30-4481	.20	88	Resistor (2 meg., ½ watt)	33-520339	.20		Speaker (W4)	27-6057	.11
35	Resistor (8,000 ohms, ½ watt)	33-280339	.20	89	Resistor (2 meg., ½ watt)	33-520339	.20		Socket (1 prong, Power tubes)	27-6057	.11
36	Resistor (20,000, ½ watt)	33-320339	.20	90	Resistor (1 meg., ½ watt)	33-510339	.20		Socket (6 prong)	27-6087	.11
37	Osc. Trans. (Range 1)	32-2191	1.00	91	Resistor (1 meg., ½ watt)	33-510339	.20		Socket (Power Transformer)	27-8062	.11
38	Osc. Trans. (Range 2)	32-2194	1.00	92	Condenser (110 mmf. mica)	30-1031	.20		Terminal Panel (Ant.)	38-8746	
39	Osc. Trans. (Range 3)	32-2197	.70	93	Condenser (110 mmf. mica)	30-1031	.20				
40	Osc. Trans. (Range 4)	32-2198	.70	94	Resistor (490,000 ohms, ½ watt)	33-449339	.20				
41	Osc. Trans. (Range 5)	32-2199	.70	95	Resistor (490,000 ohms, ½ watt)	33-449339	.20				
42	Compensator (Range 1 & 2 Osc.)	31-6124	1.00	96	Condenser (1—1—7 mf.)	30-4456	1.40				
43	Compensator (Range 3, 4 & 5 Osc.)	31-6117	1.20	97	A. F. C. Shorting Switch	42-1216	.75				
44	Condenser (250 mmf. mica)	30-1032	.25	98	Flood Lights	34-2064	.09				
45	Condenser (600 mmf. mica)	30-1049	.25	99	A. F. C. Shorting Switch (Part of Mech. Tuner)	45-2330	1.20				
46	Condenser (600 mmf. mica)	30-1049	.25	100	Tuner	30-4169	.20				
47	Condenser (600 mmf. mica)	30-1049	.25	101	Volume Control	33-5158	1.00				
48	Condenser (.01 mf. tubular)	30-4169	.20	102	Audio Shorting Switch (Part of Mech. Tuner—See parts (6) and (16) Bulletin 273)						
49	Condenser (.05 mmf. mica)	30-1067	.20	103	Resistor (70,000 ohms, ½ watt)	33-370339	.20				
50	Condenser (55 mmf. mica)	30-1045	.20	104	Resistor (70,000 ohms, ½ watt)	33-370339	.20				
51	Condenser (200 mmf. mica)	30-1078	.25	105	Condenser (.008 mf. tubular)	30-4112	.20				
52	Choke (R. F.)	32-2242	.30	106	Condenser (.008 mf. tubular)	30-4112	.20				
53	Resistor (75,000 ½ watt)	33-375339	.20	107	Condenser (.008 mf. tubular)	33-449339	.20				
54	Resistor (20,000 ½ watt)	33-320339	.20	108	Resistor (32,000 ohms, ½ watt)	33-332339	.20				
55	Resistor (32,000 ½ watt)	33-332339	.20	109	Condenser (.01 mf. tubular)	30-4455	.20				

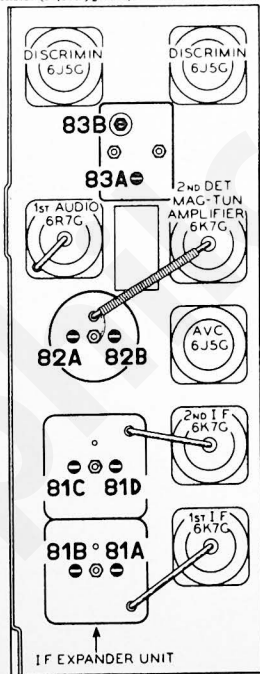


Fig. 7. I. F. Compensators

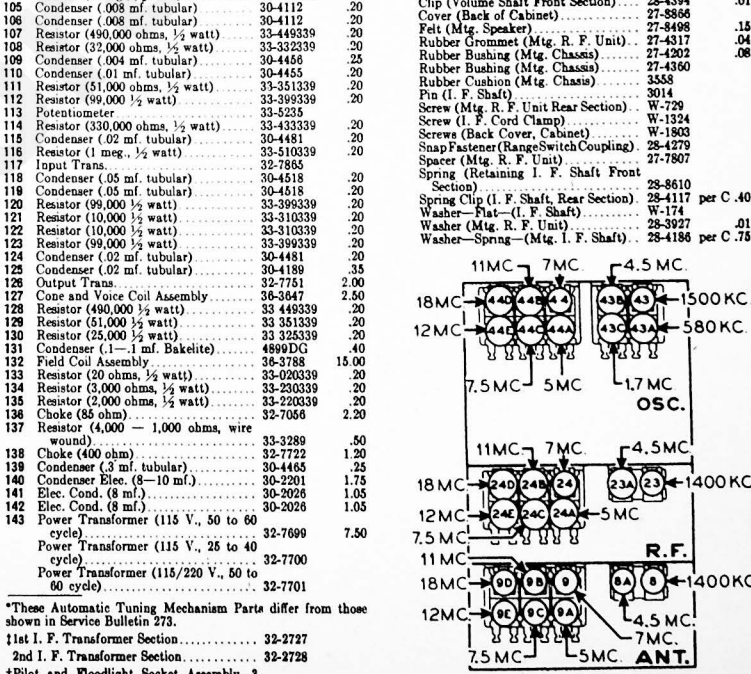


Fig. 8. R. F. Compensator Underside of Chassis

\*These Automatic Tuning Mechanism Parts differ from those shown in Service Bulletin 273.

1st I. F. Transformer Section ..... 32-2727  
 2nd I. F. Transformer Section ..... 32-2728  
 †Pilot and Floodlight Socket Assembly, 3 Sockets. Used on later type receivers ..... 38-8487

Prices Subject to Change without Notice



## Alignment of Compensators

**EQUIPMENT REQUIRED:** (1) Signal Generator, having a fundamental frequency range covering the tuning and intermediate 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 6L6G tubes. Adjust the meter to use the (0-30) volt 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:

- 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 the broadcast band. See Fig. 0. With dial and tuning condenser in this position tighten set screws.
- Turn the tuning condenser control until the indicator is on the 520 K.C. mark. See Fig. 6.
- 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.

**NOTE:** Be careful when turning the dial that the position of the tuning condenser is not disturbed.

### INTERMEDIATE FREQUENCY CIRCUIT

- Viewing each instrument from the front, set the receiver and Signal Generator controls as follows:

- Selectivity-fidelity control (clockwise)
- Volume Control at maximum (clockwise)
- Magnetic Tuning switch (off)
- Band Compensation switch first position from "off"
- Range Switch position one (broadcast)
- Receiver dial 580 K. C.
- Signal Generator indicator set at 470 K. C. and the "Attenuator" control for maximum output.

- Connect the Signal Generator output cable through a .1 mfd. condenser to the grid of the second 6K7G I. F. tube. Then adjust the I. F. compensators as follows:

- Close compensator (82B) by turning to the extreme clockwise position, then pad compensator (82A) for maximum output. Now readjust compensator (82B) for maximum output.
- Connect the Signal Generator output lead through the .1 mfd. condenser to the grid of the 6L7G tube, and adjust the following compensators for maximum output: (81D), (81C), (81A), (81B).
- Repad (82A)—See Note A. Check for two equal peaks. Fidelity control in expanded position (counter-clockwise).

### RADIO FREQUENCY CIRCUIT

- Set the controls as given under "Intermediate Frequency Circuit" (a-b-c-d) 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 to the "Red" and "Blk" terminals on the aerial panel (rear of chassis). The ground connection of the cable should be connected to the "Blk" terminal.

- Set the controls and adjust the compensators for maximum output as follows:

Range Switch	Signal Generator and Receiver Dial	Compensators in Order
Position 1	1500 K. C.	(43), (8), (23)
Position 1	580 K. C.	(43A) Roll Tuning Condenser. See Note B
Position 1	1500 K. C.	(43)
Position 1	1400 K. C.	(8), (23)
<b>Tuning Range 4.7 to 7.4 M. C.</b>		
Range Switch	Signal Generator and Receiver Dial	Compensators in Order
Position 3	7.0 M. C.	(44)
Position 3	5.0 M. C.	(44A)
Position 3	7.0 M. C.	(44), (9), (24)
Position 3	5.0 M. C.	(44A), (9A), (24A)
Position 3	7.0 M. C.	(44), (9), (24)

Range Switch	Signal Generator and Receiver Dial	Compensators in Order
Position 4	11.0 M. C.	(44B)
Position 4	7.5 M. C.	(44C)
Position 4	11.0 M. C.	(44B), (9B), (24B) Roll Tuning Condenser. See Note B
Position 4	7.5 M. C.	(44C), (9C), (24C)
Position 4	11.0 M. C.	(44B), (9B), (24B) Roll Tuning Condenser. See Note B

### Tuning Range 1.58 to 4.75 M. C.

Range Switch	Signal Generator and Receiver Dial	Compensators in Order
Position 2	4.5 M. C.	(43B), (8A), (23A)
Position 2	1.7 M. C.	(43C)
Position 2	4.5 M. C.	(43B), (8A), (23A)

### Tuning Range 11.5 to 18.2 M. C.

Range Switch	Signal Generator and Receiver Dial	Compensators in Order
Position 5	18.0 M. C.	(44D)
Position 5	12.0 M. C.	(44E)
Position 5	18.0 M. C.	(44D), (9D), (24D) Roll Tuning Condenser. See Note B and C. Check image at 17,060 M. C.
Position 5	12.0 M. C.	(44E), (9E), (24E) Roll Tuning Condenser. See Note B and C. Check image at 17,060 M. C.
Position 5	18.0 M. C.	(44D), (9D), (24D) Roll Tuning Condenser. See Note B and C. Check image at 17,060 M. C.

**NOTE "A"**—Slowly shift signal generator indicator between 460 and 480 K. C. As the indicator is turned, two peaks will be noted on the Output Meter; one about 465 K. C. and the other about 475 K. C. These peaks should give the same deflection or reading on the output meter. If the peaks are unequal Compensator (82A) must be slightly readjusted to the right or left (not more than  $\frac{1}{4}$  of a turn) until the peaks are equalized. This adjustment is used to compensate for slight differences between peaks. If the compensator must be turned more than  $\frac{1}{4}$  of a turn in either direction to equalize the peaks, all padders should be carefully readjusted as given under "Intermediate Frequency Circuit" adjustment procedure. Each time the compensator is set in another position, rotate the signal generator through the 460 or 480 K. C. range and note the reading of each peak.

**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 (roted) 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 output. 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.

**NOTE "C"**—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.

### MAGNETIC TUNING CIRCUIT ADJUSTMENT

- Set the Magnetic Tuning switch in the "out" position (counter-clockwise).
- Volume control maximum (extreme clockwise).
- Turn Treble-Selectivity control to the expanded position (extreme clockwise).
- Now, adjust the "Attenuator" control of the signal generator for a weak signal, and turn the indicator to 1000 K. C. Then adjust the receiver dial for maximum output at this frequency.

**NOTE:** The receiver dial MUST be tuned very accurately to the 1000 K. C. signal in order to make the following adjustments correctly.

- After adjusting the receiver dial, turn the Magnetic Tuning switch "on."
- Now, turn compensator (83B) slightly to the right or left (about  $\frac{1}{4}$  turn) and proceed with adjustment "g."
- Adjust compensator (83A) primary of the discriminator transformer for minimum output; then readjust compensator (83B) secondary of discriminator transformer 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.

**Sensitivity Test:**

1. To check the magnetic tuning circuit for sensitivity, turn the magnetic tuning switch to the "off" 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 1500 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 primary compensator (83A) should be carefully readjusted.

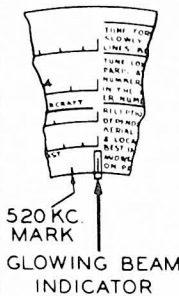


Fig. 6. Dial Calibration