

# PHILCO SERVICE



## HOME RADIO

### PHILCO RADIO MODELS 48-460 and 48-460-I

#### Circuit Description

Philco Models 48-460 and 48-460-I are six-tube table-model superheterodyne radios, providing reception in the standard broadcast band. The two models are identical except for the cabinets.

The high-impedance loop aerial normally provides adequate signal pickup. If greater pickup is required, an external aerial may be connected.

The loop works into a 14AF7 converter. Variable condenser tuning is used. The two i-f stages employ 7B7 pentode tubes. To obtain good stability, resistance coupling is employed between the first and second i-f tubes. One diode (pin 5) of the 7C6 provides detection and a-v-c voltage. The triode section of this tube functions as the first audio amplifier, and is resistance-coupled to the 50L6GT output tube. The speaker is a permanent-magnet dynamic. The power supply employs a 35Y4, working into a resistance-capacitance filter system.

The 150,000-ohm resistor R102, connected between B- bus and chassis, prevents the hum which might otherwise occur under conditions of high humidity.

The two series-resonant circuits C304 and C305 function as by-passes of exceptionally low impedance; C304 is resonant at the i.f., 455 kc., while C305 is resonant at the 2nd harmonic of the i.f., 910 kc.

#### Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring the tube-electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

#### Preliminary Checks

To avoid possible damage to the radio, the following



MODEL 48-460 (Brown)  
MODEL 48-460-I (Ivory)

#### SPECIFICATIONS

##### CABINET

Model 48-460 ..... Plastic, brown  
Model 48-460-I ..... Plastic, ivory

CIRCUIT ..... 6-tube superheterodyne

FREQUENCY RANGE ..... 540—1620 kc.

AUDIO OUTPUT ..... 1 watt

OPERATING VOLTAGE . . 105—120 volts, a.c. or d.c.

POWER CONSUMPTION ..... 30 watts

AERIAL . . . Built-in loop; terminal also provided for external aerial

INTERMEDIATE FREQUENCY ..... 455 kc.

PHILCO TUBES (6) ..... 14AF7, 7B7 (2), 7C6, 50L6GT, 35Y4

TP-3184A

preliminary checks should be made before turning on the power:

1. Inspect both top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shortened connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 7 of 35Y4 rectifier tube) and B- (test point B). When the ohmmeter test leads are connected in proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C100A, C100B, and C100C for leakage or shorts.

This resistance value, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

**Section 1**

**TROUBLE SHOOTING**

For the tests in this section, use a d-c voltmeter. Connect the negative lead to the B- bus, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Turn the power switch "on," and set the volume control to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.

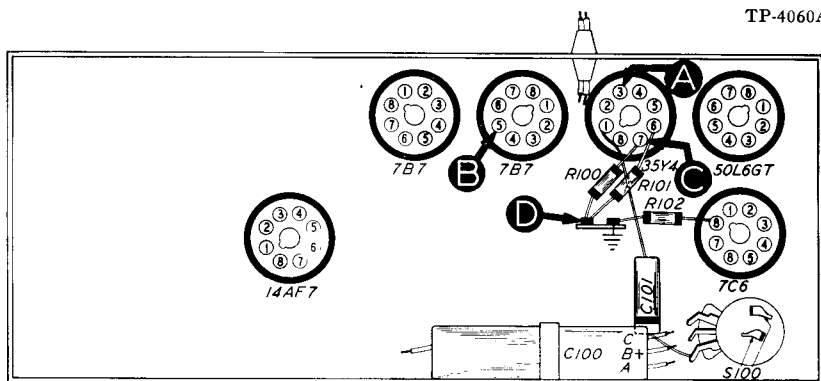


Figure 1. Bottom View, Showing Section 1 Test Points

TP-4060A

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	98 volts		Trouble within this section. Isolate by the following tests.
2	C	131 volts	No voltage Low voltage High voltage	Defective: 35Y4, W100, S100. Shorted: C100A. Defective: 35Y4. Open: C100A, I100. Leaky: C100A. Open: R100.
3	D	118 volts	No voltage Low voltage High voltage	Shorted: C100B. Leaky: C100B, C100C, C203*. Open: R101, T200*, R204*.
4	A	98 volts	No voltage Low voltage High voltage	Shorted: C100C. Open: R101. Leaky: C100C. Open: R204*.

Listening Test: Abnormal hum may be caused by open C100A, C100B, C100C, or R102.

\* This part, located in another section, may cause abnormal indication in this section.

**Section 2**

**TROUBLE SHOOTING**

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3. If not, isolate and correct the trouble in this section.

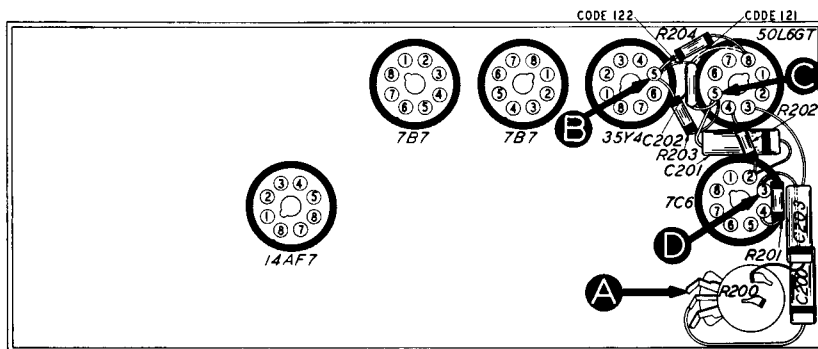


Figure 2. Bottom View, Showing Section 2 Test Points

TP-4060B

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Defective: 50L6GT, T200, LS200. Shorted or leaky: C203, C202. Open: R204, R203.
3	D	Same as step 1.	Defective: 7C6. Shorted or leaky: C201. Open: R201, R202, C201.
4	A	Same as step 1. Note: Rotate R200 through range.	Defective: R200. Shorted or leaky: C200. Open: R201, C200.

Listening Test: Distortion on strong signals may be caused by leaky C200 or open R201.

**Section 3**

**TROUBLE SHOOTING**

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

Since the circuit location of test point A for this section is the same as that of test point C for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

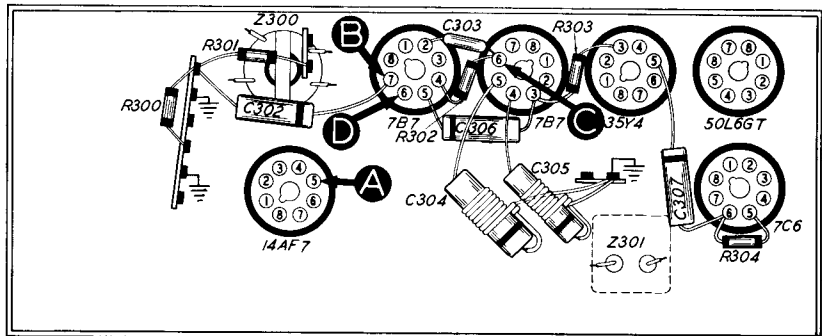


Figure 3. Bottom View, Showing Section 3 Test Points

TP-4060C

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear signal with strong signal input.	Defective: 7B7 (2nd i.f.), 7C6 (diode section), Z301. Shorted or leaky: C306. Open: R303. Misaligned: Z301.
3	D	Loud, clear signal with moderate signal input.	Defective: 7B7 (1st i.f.). Shorted or leaky: C303, C302. Open: R301, R302, R300, C303, C302.
4	A	Loud, clear signal with weak signal input.	Defective: 14AF7*, Z300. Open: R401*, R403*, C307. Shorted or leaky: C307. Misaligned: Z300.

\* This part, located in another section, may cause abnormal indication in this section.

**Section 4**

**TROUBLE SHOOTING**

For the tests in this section, use an r-f signal generator, with modulated output. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is not obtained in step 1, isolate the trouble by following the remaining steps.

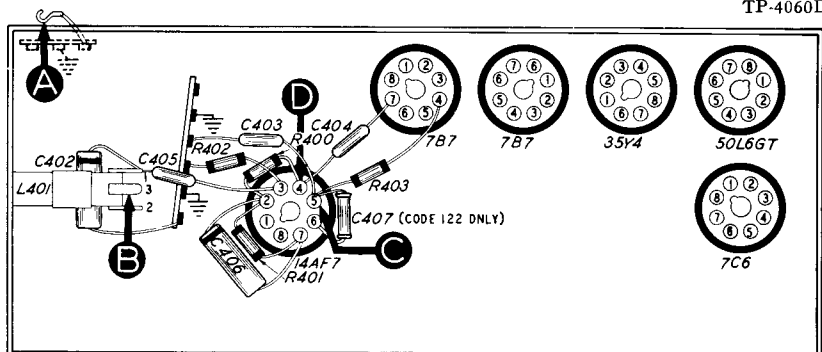


Figure 4. Bottom View, Showing Section 4 Test Points (locations of C401 and T400 shown in Figure 6)

TP-4060D

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc.	540 kc.	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	540 kc.	540 kc.	Same as step 1.	Defective: 14AF7. Open: C406, R402. Trouble in oscillator circuit. See step 3.
3	D Osc. Test (See note below.)		540 kc. to 1620 kc.	Negative voltage 1.6 volts to 1.8 volts.	Defective: L400. Open: R400, R402, C405, C404. Shorted: C402, C400, C405, C404, C400A.
4	A	540 kc.	540 kc.	Same as step 1.	Defective: T400, LA400, C400, C400B. Open or shorted: C403.

**OSCILLATOR TEST:** Connect positive lead of a high-resistance voltmeter to B-, test point B; connect prod end of negative lead through a 100,000-ohm isolating resistor to 14AF7 oscillator grid, test point D. Use a suitable range, such as 0-10 volts. Proper operation of oscillator is indicated by negative voltage of 1.6v to 1.8v (measured with 20,000-ohms-per-volt meter) throughout range of tuning condensers.

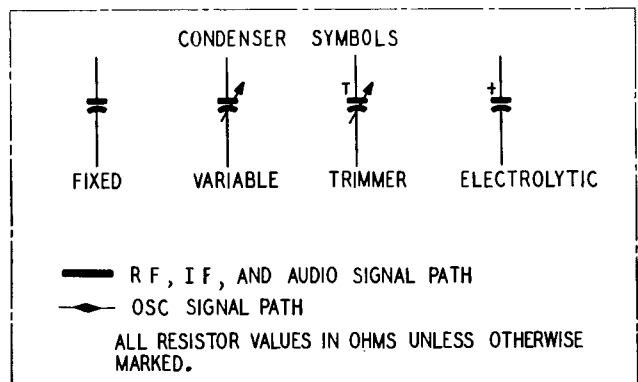
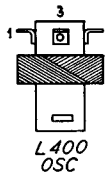
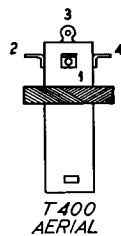
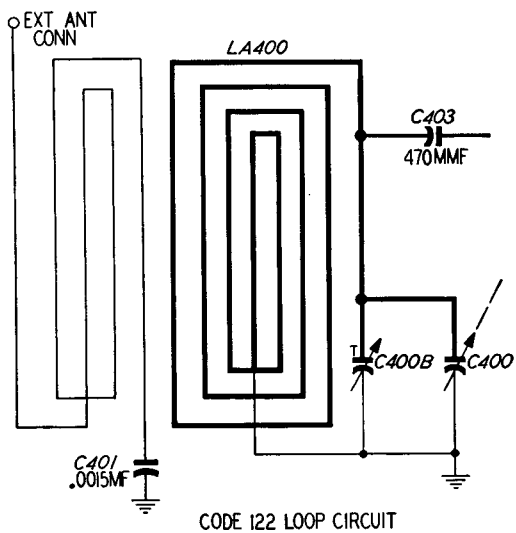
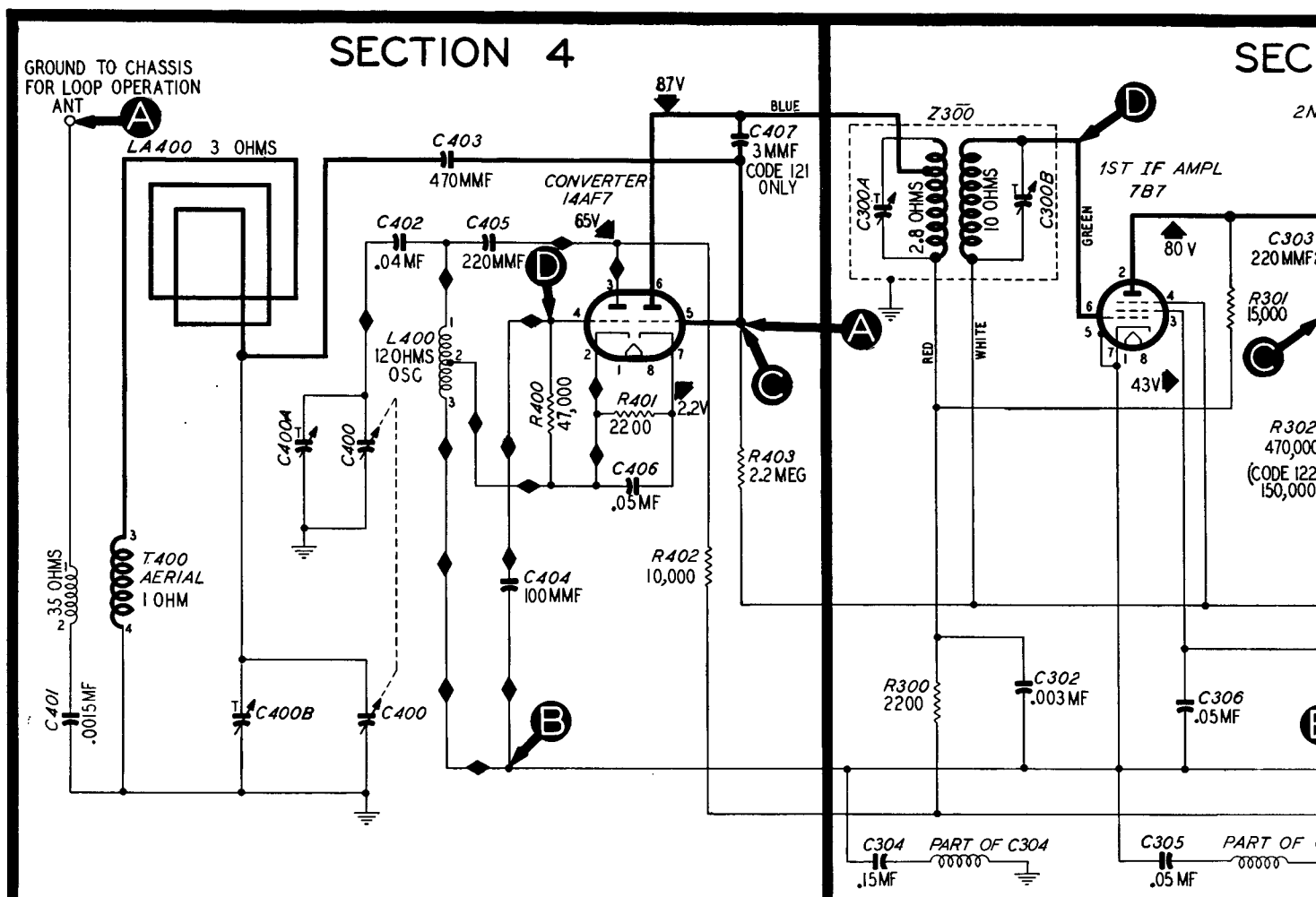
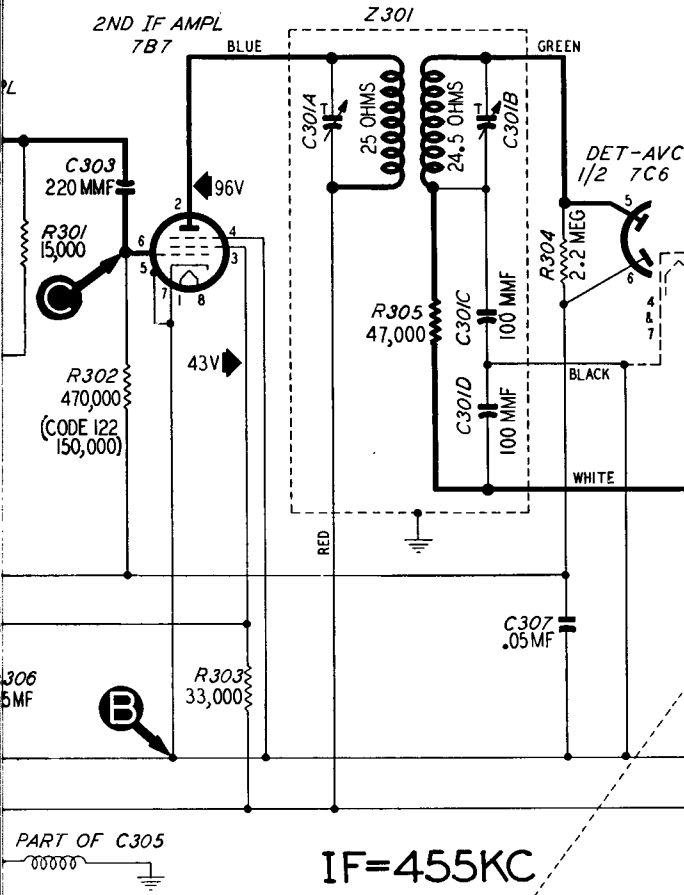
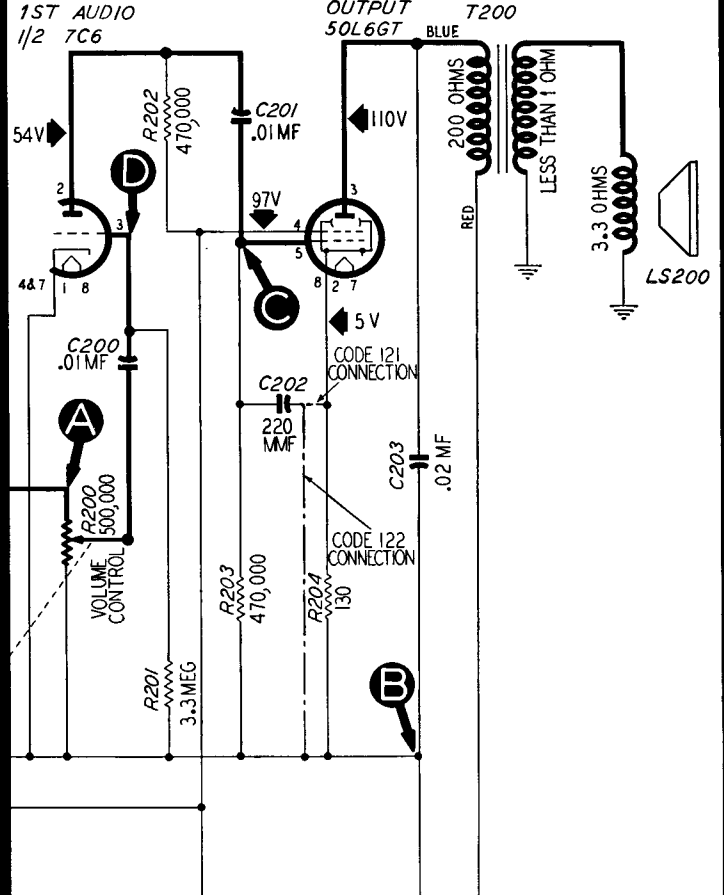


FIGURE 5. PHILCO RADIO, MODELS 48-460 AND 48-460-I, SECTION 4

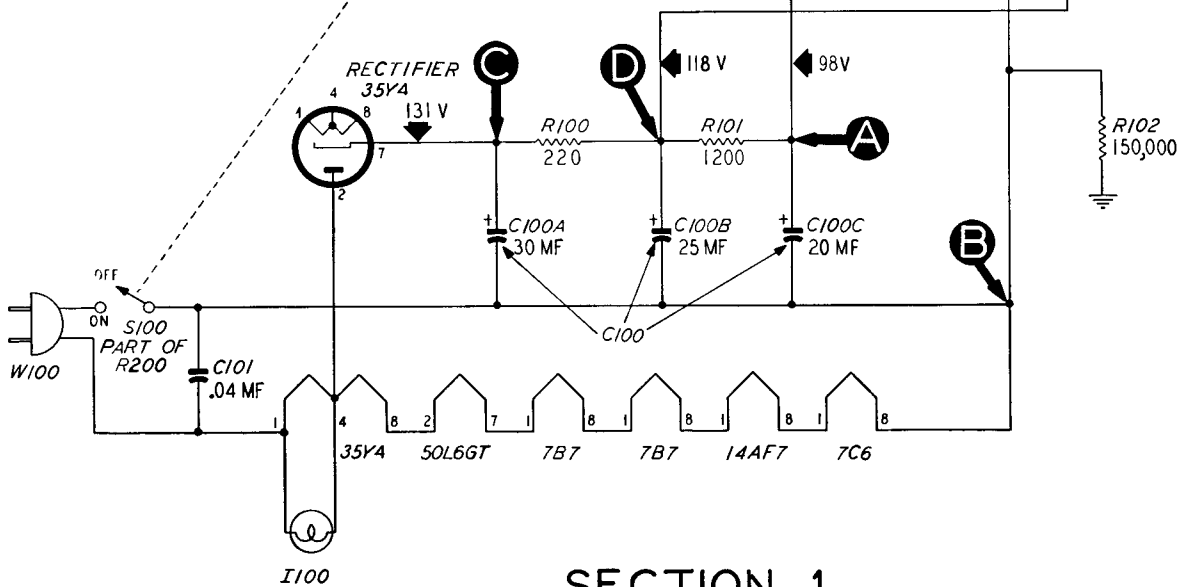
SECTION 3



SECTION 2



SECTION 1



SECTIONALIZED SCHEMATIC DIAGRAM, SHOWING TEST POINTS

**DIAL POINTER**—Turn tuning condensers to full-mesh position. Adjust dial pointer to coincide with index dot, located to left of “55.”

**OUTPUT METER**—Connect to left-hand (output) and center (chassis) lug of terminal panel, shown in Figure 6.

**SIGN**  
Use

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1				Turn C300B down tight.	
2	(Chassis out of cabinet). Ground lead to B-; output lead through .1-mf. condenser to test point C, Section 4.	455 kc.	540 kc.	Adjust trimmers, in the order given for maximum output.	C301B _____ C301A _____ C300B _____ C300A _____
3	(Chassis in cabinet). Radiating loop. (See note below.)	1600 kc.	1600 kc.	Adjust for maximum output.	C400B _____
4	Same as step 3.	1500 kc.	1500 kc.	Adjust for maximum output.	C400A _____

**RADIATING LOOP:** Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop.

**SYMBOLIZATION**

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

- |                 |                 |                       |
|-----------------|-----------------|-----------------------|
| C—condenser     | LA—loop aerial  | S—switch              |
| I—pilot lamp    | LS—loud-speaker | T—transformer         |
| L—choke or coil | R—resistor      | Z—electrical assembly |

The number of the symbol designates the section in which the part is located, as follows:

- 100-series components are in Section 1—the power supply.
- 200-series components are in Section 2—the audio circuits.
- 300-series components are in Section 3—the i-f amplifier, detector, and a-v-c circuits.
- 400-series components are in Section 4—the aerial and oscillator circuits.

A suffix letter identifies the part as a non-replaceable component of the assembly which bears an identical number without a suffix letter, and with perhaps a different prefix letter.

# PROCEDURE

## CONTROL TO MAXIMUM

**SIGNAL GENERATOR**—Connect as indicated in chart.  
Use modulated output.

**OUTPUT LEVEL**—During alignment, adjust signal-generator output to maintain an output-meter indication below 1.25 volts.

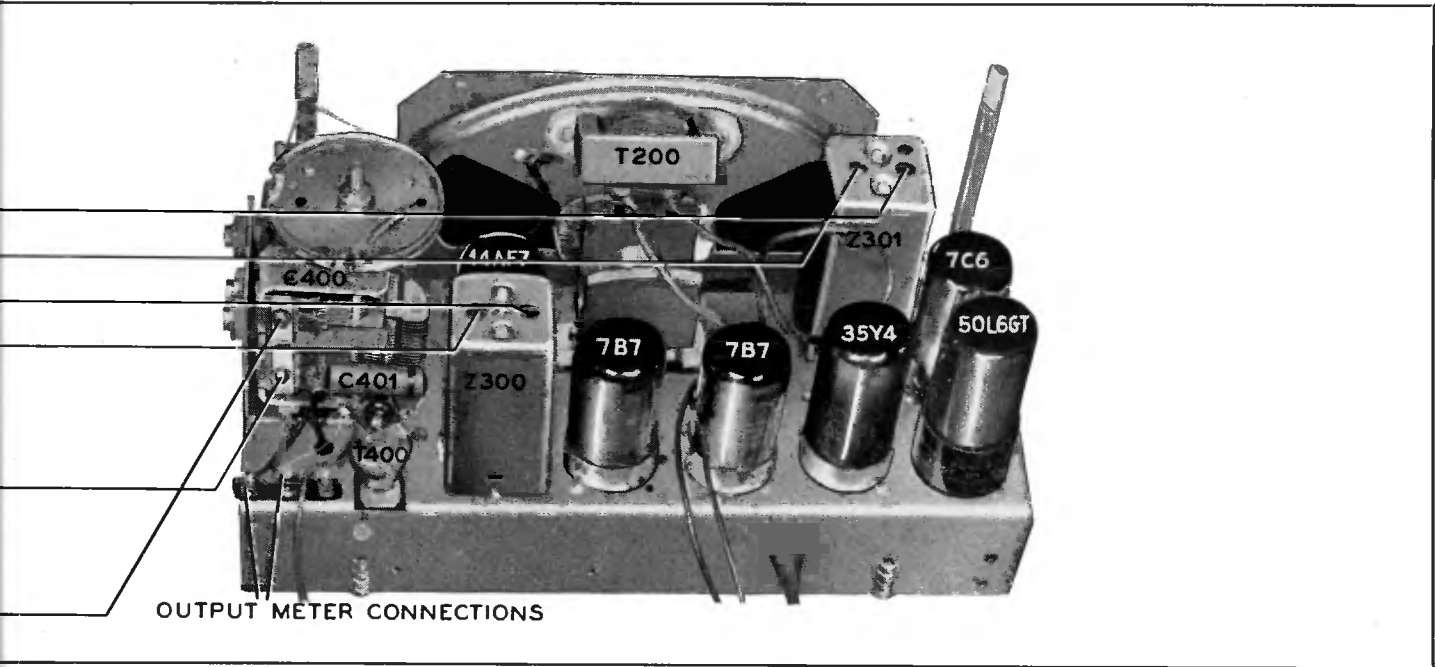


Figure 6. Top View, Showing Trimmer Locations

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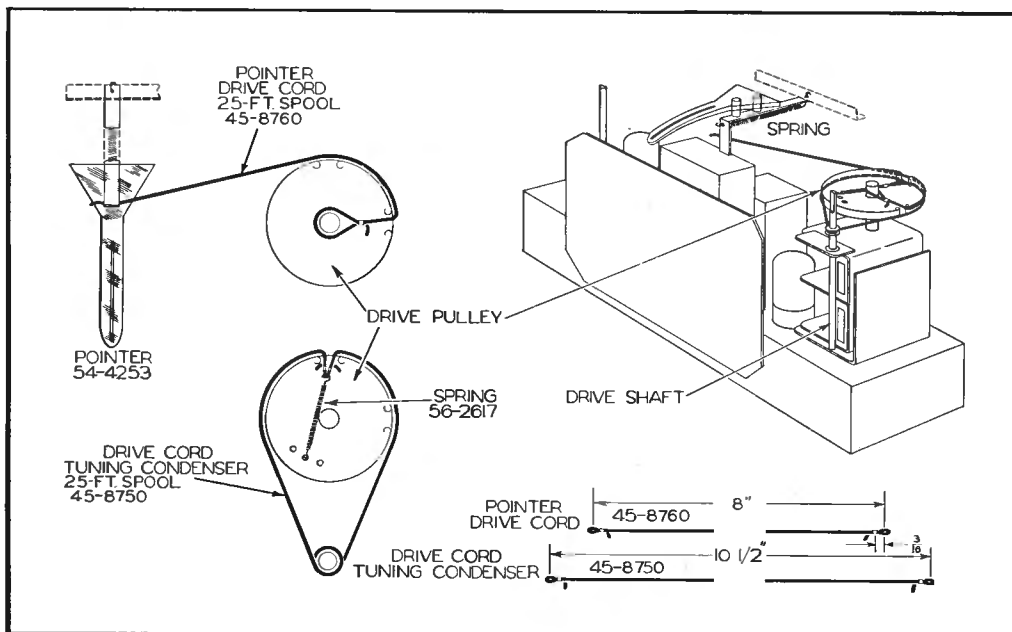


Figure 7. Drive-Cord Installation Details

TP-4060E

# REPLACEMENT PARTS LIST

## NOTE

Part numbers marked with an asterisk (\*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

### SECTION 1

Reference Symbol	Description	Service Part No.
<b>C100</b>	Condenser, electrolytic, 3-section...	<b>30-2540-1</b>
<b>C100A</b>	Condenser, filter, 30 mf. ....	Part of <b>C100</b>
<b>C100B</b>	Condenser, filter, 25 mf. ....	Part of <b>C100</b>
<b>C100C</b>	Condenser, filter, 20 mf. ....	Part of <b>C100</b>
<b>C101</b>	Condenser, line filter, .04 mf. ....	<b>45-3500-2*</b>
<b>I100</b>	Panel lamp .....	<b>34-2068</b>
<b>R100</b>	Resistor, filter, 220 ohms.....	<b>66-1224340</b>
<b>R101</b>	Resistor, filter, 1200 ohms.....	<b>66-2123340</b>
<b>R102</b>	Resistor, leakage, 150,000 ohms...	<b>66-4153340*</b>
<b>S100</b>	Switch, a-c power.....	Part of <b>R200</b>
<b>W100</b>	Power cord and plug.....	<b>L3199</b>

### SECTION 2

<b>C200</b>	Condenser, coupling, .01 mf. ....	<b>61-0120*</b>
<b>C201</b>	Condenser, coupling, .01 mf. ....	<b>61-0120*</b>
<b>C202</b>	Condenser, by-pass, 220 mmf. ...	<b>62-122001001</b>
<b>C203</b>	Condenser, plate, .02 mf. ....	<b>61-0108*</b>
<b>LS200</b>	Loud-speaker .....	<b>36-1615</b>
<b>R200</b>	Volume control (with a-c power switch) .....	<b>33-5491</b>
<b>R201</b>	Resistor, grid load, 3.3 megohms...	<b>66-5333340*</b>
<b>R202</b>	Resistor, plate load, 470,000 ohms...	<b>66-4473340*</b>
<b>R203</b>	Resistor, grid leak, 470,000 ohms...	<b>66-4473340*</b>
<b>R204</b>	Resistor, bias, 130 ohms.....	<b>66-1123340*</b>
<b>T200</b>	Transformer, output .....	Part of <b>LS200</b>

### SECTION 3

<b>C300A</b>	Condenser, trimmer .....	Part of <b>Z300</b>
<b>C300B</b>	Condenser, trimmer .....	Part of <b>Z300</b>
<b>C301A</b>	Condenser, trimmer .....	Part of <b>Z301</b>
<b>C301B</b>	Condenser, trimmer .....	Part of <b>Z301</b>
<b>C301C</b>	Condenser, i-f by-pass .....	Part of <b>Z301</b>
<b>C301D</b>	Condenser, i-f by-pass .....	Part of <b>Z301</b>
<b>C302</b>	Condenser, by-pass, .003 mf. ....	<b>61-0109*</b>
<b>C303</b>	Condenser, coupling, 220 mmf. ...	<b>62-122001001*</b>
<b>C304</b>	Condenser-and-choke assembly, .15 mf.	<b>76-2361</b>
<b>C305</b>	Condenser-and-choke assembly, .05 mf.	<b>76-2362</b>
<b>C306</b>	Condenser, screen by-pass, .05 mf. ....	<b>61-0122*</b>
<b>C307</b>	Condenser, a-v-c by-pass, .05 mf. ....	<b>61-0122*</b>
<b>R300</b>	Resistor, dropping, 2200 ohms.....	<b>66-2223340</b>
<b>R301</b>	Resistor, plate load, 15,000 ohms...	<b>66-3153340</b>
<b>R302</b>	Resistor (code 121), grid load, 470,000 ohms .....	<b>66-4473340*</b>
<b>R302</b>	Resistor (code 122), grid load, 150,000 ohms .....	<b>66-4153340*</b>
<b>R303</b>	Resistor, screen, 33,000 ohms.....	<b>66-3333340*</b>
<b>R304</b>	Resistor, a-v-c, 2.2 megohms.....	<b>66-5223340*</b>

### SECTION 3 (Continued)

Reference Symbol	Description	Service Part No.
<b>R305</b>	Resistor, diode load, 47,000 ohms...	<b>66-3473340</b>
<b>Z300</b>	Transformer, 1st i-f, including C300A and C300B .....	<b>32-4151</b>
<b>Z301</b>	Transformer, 2nd i-f, including C301A, C301B, C301C and C301D.....	<b>32-4152</b>

### SECTION 4

<b>C400</b>	Condenser, tuning, 2-section.....	<b>31-2636-1</b>
<b>C400A</b>	Condenser, trimmer .....	Part of <b>C400</b>
<b>C400B</b>	Condenser, trimmer .....	Part of <b>C400</b>
<b>C401</b>	Condenser, series blocking, .0015 mf.	<b>45-3500-6*</b>
<b>C402</b>	Condenser, isolating, .04 mf.....	<b>45-3500-2*</b>
<b>C403</b>	Condenser, coupling, 470 mmf. ...	<b>62-147001001*</b>
<b>C404</b>	Condenser, osc. grid, 100 mmf. ....	<b>60-10105407*</b>
<b>C405</b>	Condenser, osc. plate, 220 mmf. ...	<b>62-122001001*</b>
<b>C406</b>	Condenser, by-pass, .05 mf. ....	<b>61-0122*</b>
<b>C407</b>	Condenser, neutralizing (code 121 only), 3 mmf. ....	<b>30-1221</b>
<b>L400</b>	Coil, oscillator .....	<b>32-4153</b>
<b>LA400</b>	Loop aerial .....	<b>32-4052-7</b>
<b>R400</b>	Resistor, oscillator grid, 47,000 ohms	<b>66-3473340*</b>
<b>R401</b>	Resistor, bias, 2200 ohms.....	<b>66-2223340</b>
<b>R402</b>	Resistor, dropping, 10,000 ohms....	<b>66-3103340*</b>
<b>R403</b>	Resistor, grid, 2.2 megohms .....	<b>66-5223340*</b>
<b>T400</b>	Transformer, aerial .....	<b>32-3394</b>

### MISCELLANEOUS

Description	Service Part No.
<b>Cabinet (less scale)</b>	
Model 48-460 .....	<b>10629B</b>
Model 48-460-I .....	<b>10629C</b>
<b>Back, cabinet</b>	
Model 48-460 .....	<b>54-7096</b>
Model 48-460-I .....	<b>54-7097</b>
<b>Clip, dial-scale mounting</b> .....	<b>56-3290</b>
<b>Fastener, cabinet back</b> .....	<b>56-2726</b>
<b>Pointer</b> .....	<b>54-4253</b>
<b>Scale, dial</b> .....	<b>27-5916</b>
<b>Clip, coil mounting</b> .....	<b>28-5002FCP</b>
<b>Cord, pointer drive (25-ft. spool)</b> .....	<b>45-3760*</b>
<b>Cord, tuning-condenser drive (25-ft. spool)</b> .....	<b>45-3750</b>
<b>Knob</b> .....	<b>54-4218</b>
<b>Socket assembly, panel lamp</b> .....	<b>76-1981</b>
<b>Socket, Loktal</b> .....	<b>27-6138</b>
<b>Socket, octal</b> .....	<b>27-6174</b>
<b>Speed nut</b> .....	<b>1W56919FE7</b>
<b>Spring, tuning-condenser drive cord</b> .....	<b>56-2617</b>