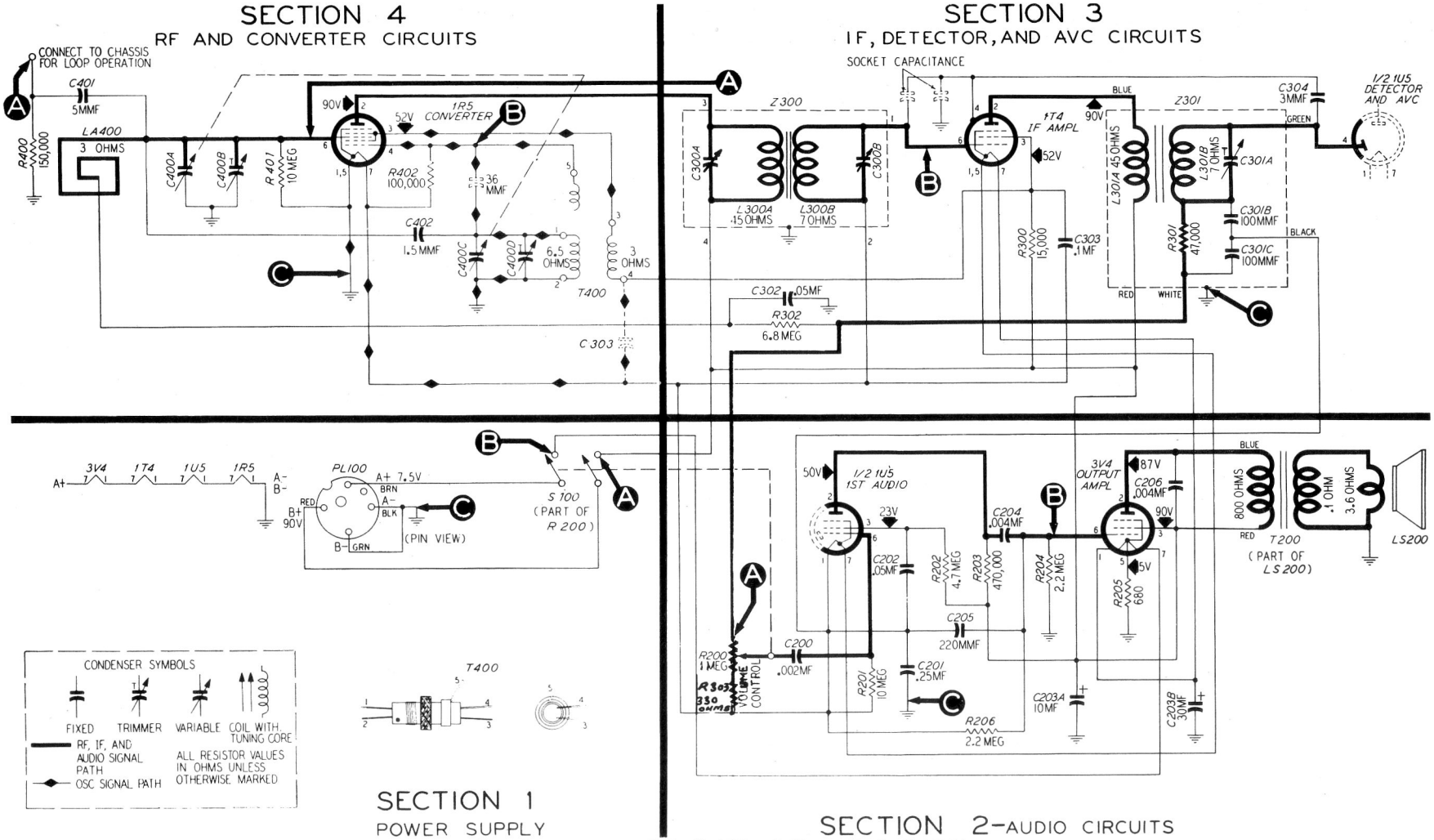

Figure 5. **Sectionalized Schematic Diagram, Showing Test Points**

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 4 of the 1R5), test point B. Use a suitable meter range such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage within the range given in the chart (measured with a 20,000-ohms-per-volt meter) throughout the tuning range.

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 simplfied test chart and a bottom view of the chassis showing the locations of the test points and the 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 chart.

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 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 preliminary checks should be made before turning on the power:

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

2. Check the total filament resistance, with the power switch turned on, and the battery plug disconnected from the battery. If the resistance between the A+ and A− pins on the battery plug is higher than 100 ohms, one of the tube filaments is probably open.

Note: If the 3V4 filament is open, check condenser C203B before replacing the tube.

3. Measure the resistance between the B+ and B− pins on the battery plug. If the reading is lower than 5000 ohms, check condenser C203A for leakage or a short.

The resistance value above, which is much lower than normal, does not represent a quality check of this condenser; it is the lowest value which will permit the voltage checks of Section 1 (power supply) to be performed without excessive battery drain.

I.F. = 460KC.

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DIAL—Calibration and pointer-index measurements are shown in figure 7. With tuning condenser fully meshed, set pointer to index mark.

RADIO CONTROLS—Set volume control to maximum.

OUTPUT METER—Connect across voice-coil terminals.

SIGNAL GENERATOR—Use modulated output.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below .5 volt.

SPECIAL NOTE—The orientation of the loop with respect to the chassis is critical for correct tracking. During alignment, with the cabinet back (containing the loop) laid down on the bench, the chassis should be laid on its back, in approximately its normal relation to the loop.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to chassis. Positive lead through .05-mf. condenser to external-aerial lead. Make sure that radio loop aerial is connected to radio.	460 kc.	Tuning condenser fully meshed.	Adjust, in order given, for maximum output.	C301A—2nd i-f sec. C300B—1st i-f sec. C300A—1st i-f pri. C400D—osc. C400B—aerial
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum output.	
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output while rocking tuning condenser.	

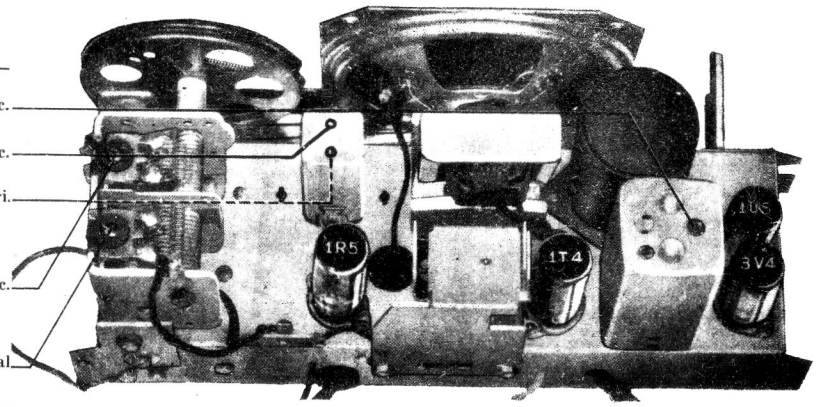

Figure 6. Top View, Showing Trimmer Locations

RADIATING LOOP: Make up a 6—8 turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop aerial. Make sure that radio loop aerial is connected to radio.

ALIGNMENT DATA

I.F. = 460 KC.

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VOLUME CONTROL

Circuit Designation	Value	Mfrs. No.	IRC No.
R200	1 Meg.	33-5538-28	13-137 Sw.No. 22

CAPACITORS

			AEROVOX No.
C200	.002 mfd. pp.	61-0162	684
C201	.25 mfd. pp.	61-0125	284
C202,302	.05 mfd. pp.	61-0122	484
C203A,B	10-30 mfd. elec.	30-2575-21	PRT150,PRT25
C204,206	.004 mfd. pp.	61-0179	684
C205	220 mmfd. mica	62-122001001	1468
C300A,B	Parts of Z300		
C301A,B,C	Parts of Z301		
C303	.1 mfd. pp.	61-0113	284
C304	3 mmfd. mica	30-1221	1468
C400A,B,C,D	Tuning Gang	31-2727-2	
C401	5 mmfd. mica	30-1224-5	1468
C402	1.5 mmfd. mica	30-1221-3	1468

MISCELLANEOUS

			JENSEN No.
LS200	Speaker PM	36-1627-1	P4V 2410
T200	Output Trans.	With LS200	
Z300	1st. I.F. Trans.	32-3968-5	
Z301	2nd. I.F. Trans.	32-3987-2	
LA400	Ant. Loop	32-4274	
T400	Osc. Coil	32-4282	

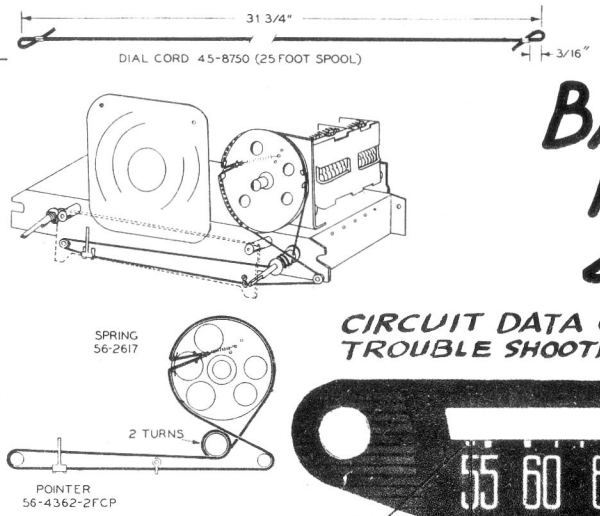

Figure 8. Drive-Cord Installation Details

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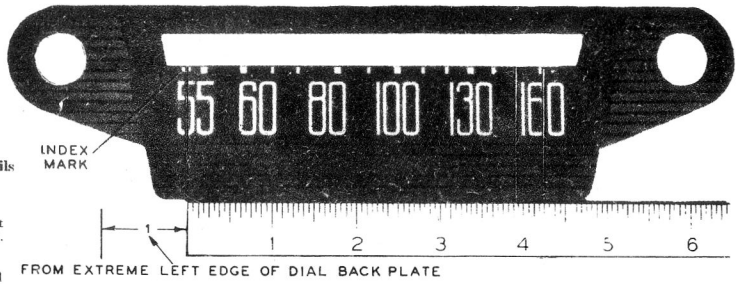

Figure 7. Dial-Backplate Calibration Measurements

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial calibration and alignment points may be marked on the dial (chassis) backplate at the end of the pointer with a pencil. The method of measuring for these points is illustrated in figure 7.

With the tuning gang fully meshed, the pointer should be adjusted on the dial-drive cord to coincide with the index mark.

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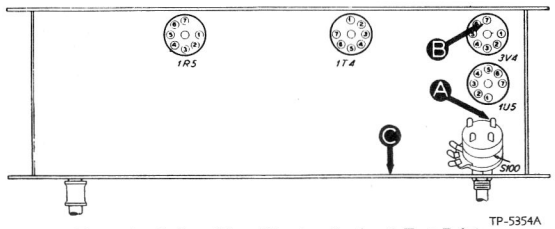
Section 1—Power Supply

Make the tests for this section with a d-c voltmeter. Connect the negative lead to the chassis, test point C; 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, with a new battery pack.

Set the volume control to minimum.

The battery pack should be replaced when the "A" voltage drops below 5 volts, or the "B" voltage drops below 60 volts.

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



TP-5354A

Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a) 1 (b)	A B	90v 7.5v		Trouble in this section. Isolate by the following tests.
2	A	90v	Low voltage No voltage	Weak battery. Leaky: C203A*. Defective battery. Open: S100. Shorted: C203A*.
3	B	7.5v	No voltage Low voltage	Weak battery. Leaky: C203B*. Defective battery. Shorted: C203B*. Open: S100.

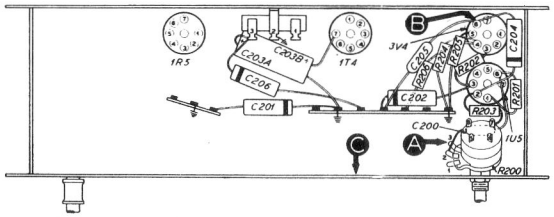
*This part, located in another section, may cause abnormal indication in this section.

Section 2—Audio Circuits

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; 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 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.



TP-5354B

Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with moderate generator input.	Trouble in this section. Isolate by the following tests.
2	B	Clear output with strong input.	Defective: 3V4, LS200. Open: R204, R205, T200. Shorted: C204, C205, C206. Leaky: C204.
3	A	Same as step 1.	Defective: 1U5. Open: R200 (rotate), C200, R201, R202, R203, C204. Shorted: C202, C301C*.
Listening Test: Distortion may be caused by leaky C204 or changed resistance of R202. Distortion on strong signals may be caused by leaky or shorted C200.			

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

Section 3—I-F, Detector, and A-V-C Circuits

For the tests in this section, use an r-f signal generator, with modulated output, set at 460 kc. Connect the generator ground lead to the chassis, test point C; 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 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

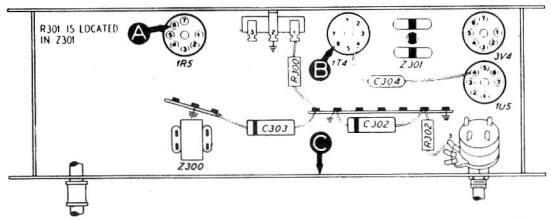


Figure 3. Bottom View, Showing Section 3 Test Points TP-5354C

To provide a complete i-f-amplifier check, test point A for this section is placed at the grid of the mixer in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	B	Loud, clear output with moderate input.	Defective: 1T4, 1U5 (diode section). Misaligned: Z301. Open: R300, C303, L301A, R301, L301B, C301A. Shorted: C300B, C303, L301A, L301B, C301A, C301B.
3	A	Same as step 1.	Defective: 1R5*. Misaligned: Z300. Open: C300A, L300A, L300B, C300B, T400*. Shorted: C400A*, C400B*, C300A, L300A, L300B.

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

Section 4—R-F and Converter Circuits

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

Set the radio volume control to maximum. Set the tuning control and signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is obtained in step 1, further tests should be unnecessary; if not, isolate and correct the trouble in this section. If the trouble is not revealed by the tests for this section, check the alignment.

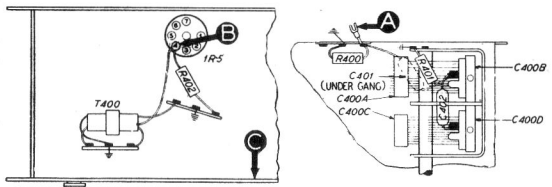


Figure 4. Bottom View, Showing Section 4 Test Points TP-5354D

STEP	TEST POINT	SIGNAL GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL IND CATION
1	A	1000 kc.	Tune to signal.	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	B (Osc. test; see note below.)		Rotate through range.	Negative 5 to 10 volts.	Defective: 1R5. Open: R402, T400. Leaky: C303*. Shorted: C400C, C400D.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Open: C401, R401, LA400.
Listening Test: Distortion may be caused by open R401. Instability may be caused by open C302* or C303*					

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

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BATTERY MODEL 410 TROUBLE SHOOTING

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