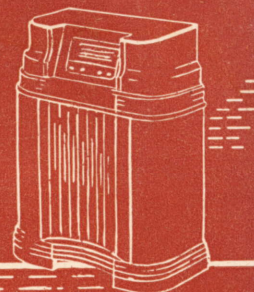


PHILCO SERVICE



PHILCO RADIO MODEL 48-150

Circuit Description

Philco Model 48-150 is a five-tube, battery-operated, superheterodyne radio providing reception on the standard broadcast band, 540 to 1720 kc. For best performance, the radio should be operated with an external aerial, such as Philco Part No. 45-1469.

A type 1LG5 pentode is used as the r-f amplifier and a type 1LA6 pentagrid converter as the mixer and oscillator, to provide high sensitivity and high signal-to-noise ratio. The r-f stage is coupled to the mixer by a transformer, and the oscillator is coupled to the mixer by the electron stream within the converter tube.

The 455-kc., i-f amplifier stage employs a type 1LN5 pentode. This stage is coupled to the output of the mixer by a double-tuned i-f transformer, and is coupled to the detector-diode section of the 1LH4 diode-triode by a single-tuned i-f transformer. The diode circuit of the 1LH4 rectifies the i-f signal and produces the audio signal and a-v-c voltage.

Two a-v-c filter circuits are used; one circuit couples the a-v-c voltage to the r-f amplifier; the other couples the a-v-c voltage to the mixer.

The audio output of the detector is resistance-coupled to the triode section of the 1LH4, which, in turn, is resistance-coupled to the type 3LF4 beam-tetrode output stage. Fixed bias is supplied to the output stage from a resistor in series with the negative return to the battery plug. The permanent-magnet, dynamic loud-speaker is transformer-coupled to the output stage.

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



MODEL 48-150

SPECIFICATIONS

CABINET	Wood
CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540 to 1720 kc.
AUDIO OUTPUT	220 mw.
POWER INPUT	Battery pack, Philco Type P-60D-11L: plate supply, 12 ma. at 90 volts; filament supply, 300 ma. at 1.5 volts; total power consumption, 1.4 watts
AERIAL	External, Philco Part No. 45-1469
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5)	1LA6, 1LG5, 1LH4, 1LN5, 3LF4

TP-3411A

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

The following preliminary checks should be made before turning on the radio:

1. Carefully inspect the top and bottom of the chassis. Be sure that all tubes are securely mounted in the proper sockets. Look for bad connections, burned resistors, or other obvious signs of trouble.

2. Disconnect the battery and measure the resistance between B+ (red lead of battery plug) and chassis. Use the ohmmeter polarity that gives the highest reading. If the resistance is lower than 10,000 ohms, check condensers C100, C203, C201, and C403 for leakage or shorts.

TROUBLE SHOOTING

Section 1

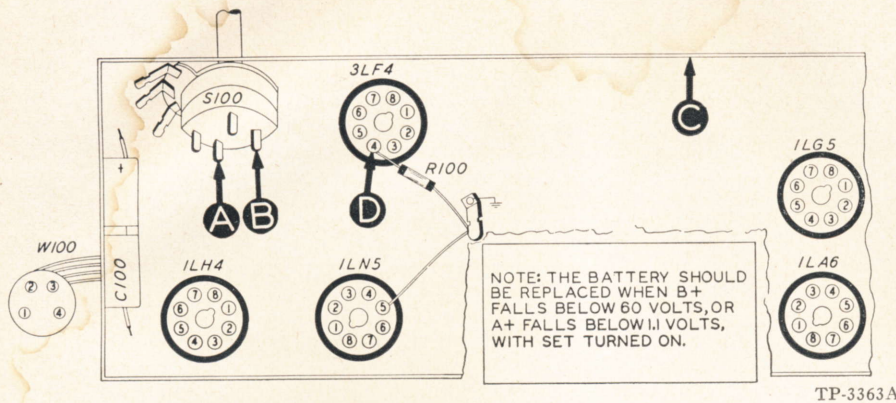


Figure 1. Bottom View, Showing Section 1 Test Points

Make the tests for this section with a d-c voltmeter. The voltages indicated in the chart were measured with a 20,000-ohms-per-volt meter, with a fresh battery pack installed, and with the radio turned on. Set the volume control to minimum and the dial pointer to 540 kc. Connect the meter between the radio chassis, test point C, and the test points indicated in the chart.

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

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A B D	85 volts 1.5 volts Negative 5.5 volts		Trouble within this section; isolate by the following tests.
2	A	85 volts	No voltage Low voltage	Open battery cable or R100. Defective S100. Shorted C100. Weak battery. Change in value of R100. Leaky C100. Excessive current drain in Sections 2, 3, or 4.
3	B	1.5 volts	No voltage Low voltage	Open battery cable. Defective S100. Weak battery.
4	D	Negative 5.5 volts		Change in value of R100. Open R100. Excessive current drain in Sections 2, 3, or 4.

TROUBLE SHOOTING

Section 2

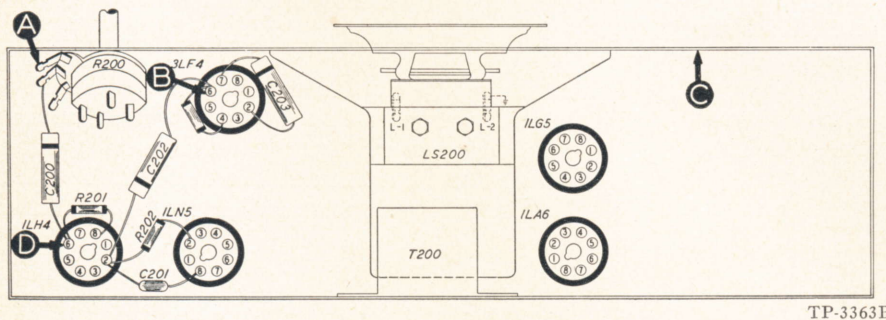


Figure 2. Bottom View, Showing Section 2 Test Points

Make the tests for this section with an audio-frequency signal generator. Connect the ground lead to the radio chassis, test point C, and the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the volume control to maximum. If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3; if not, isolate and correct the trouble within this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with moderate signal input.	Trouble in this section; isolate by the following tests.
2	B	Moderate, clear signal with strong signal input.	Defective 3LF4, T200, or LS200. Shorted C203 or C201. Leaky C203 or C201.
3	D	Same as step 1.	Defective ILH4. Open R202 or C202.
4	A	Same as step 1.	Open C200. Defective R200.

Listening Test: Distortion may be caused by leaky C201, C202, C203 or C200, or by open R203.

TROUBLE SHOOTING

Section 3

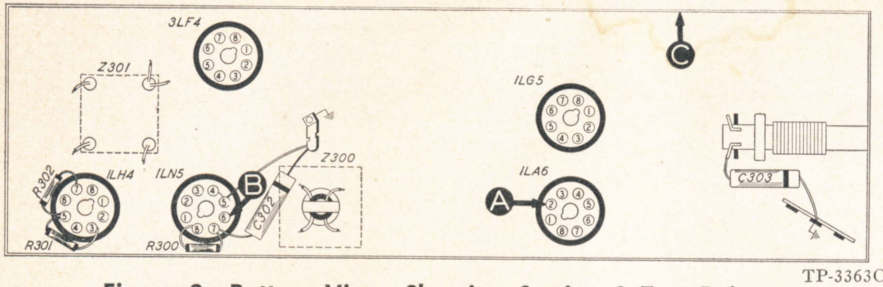


Figure 3. Bottom View, Showing Section 3 Test Points

Make the tests for this section with an r-f signal generator (modulated output); set the generator to 455 kc. Connect the ground lead to the radio chassis, test point C, and the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the 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 within this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with moderate signal input.	Trouble in this section; isolate by the following tests.
2	B	Same as step 1.	Defective ILN5 or ILH4 (diode section). Defective or misaligned Z301.
3	A	Same as step 1.	Defective or misaligned Z300.

TROUBLE SHOOTING

Section 4

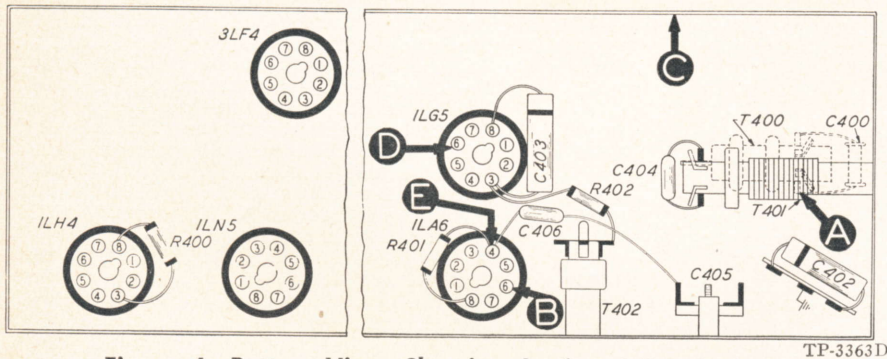


Figure 4. Bottom View, Showing Section 4 Test Points

Make the tests for this section with an r-f signal generator (modulated output); set the frequency as noted in the chart. Connect the generator ground lead to the radio chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Inspect the tuning condensers for bent plates, dirt, or poor wiper contacts; any of these conditions will cause noise. If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble within this section.

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 low signal input.	Trouble in this section; isolate by the following tests.
2	E Osc. test (See note below.)		540 to 1720 kc.	Negative voltage (at least 1.5 volts) over complete range.	Defective ILA6, T402, R401, R402 or C405. Shorted C403 or osc. section of C401.
3	B	540 kc.	540 kc.	Same as step 1.	Same as step 2.
4	D	540 kc.	540 kc.	Same as step 1.	Defective ILG5 or T401. Shorted ant. or r-f section of C401.
5	A	540 kc.	540 kc.	Same as step 1.	Defective T400. Open C402.

NOTE: Connect positive lead of a 20,000-ohms-per-volt meter to radio chassis, test point C; connect prod end of negative lead through a 100,000-ohm isolating resistor to test point E (osc. grid, pin 4 of ILA6).

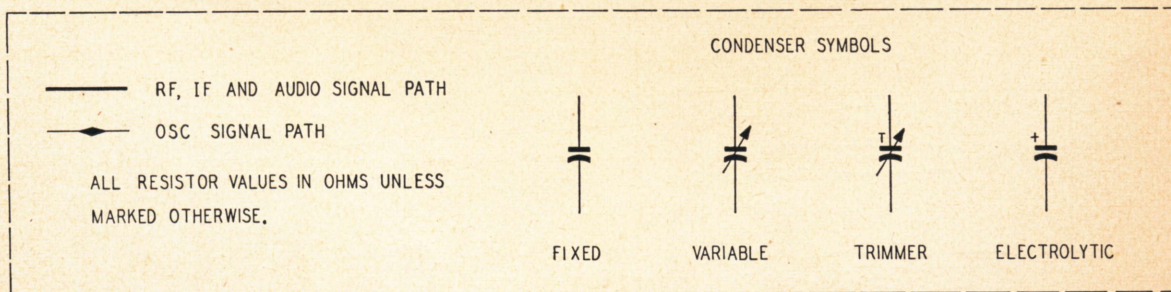
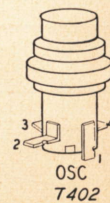
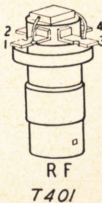
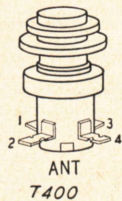
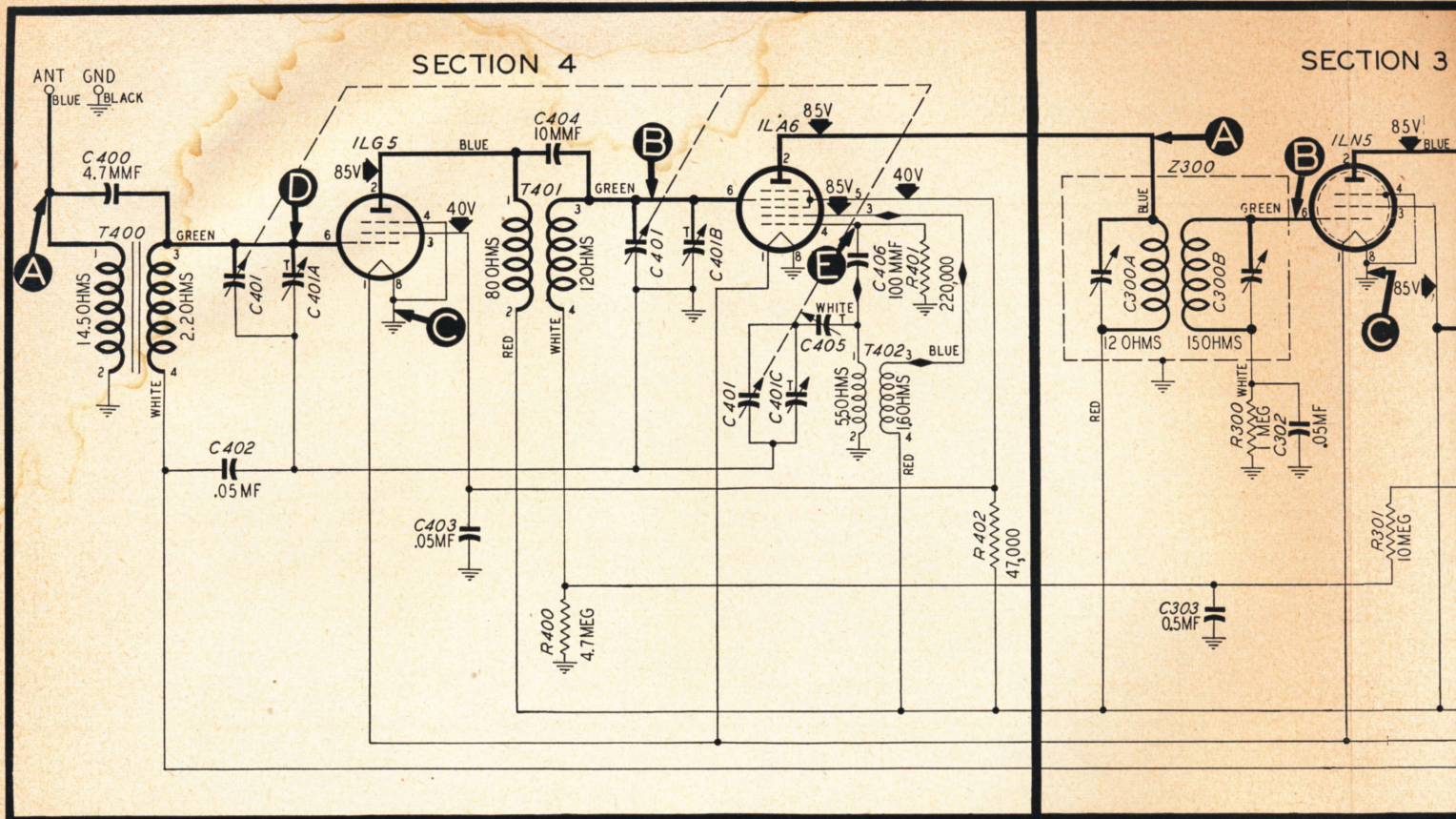
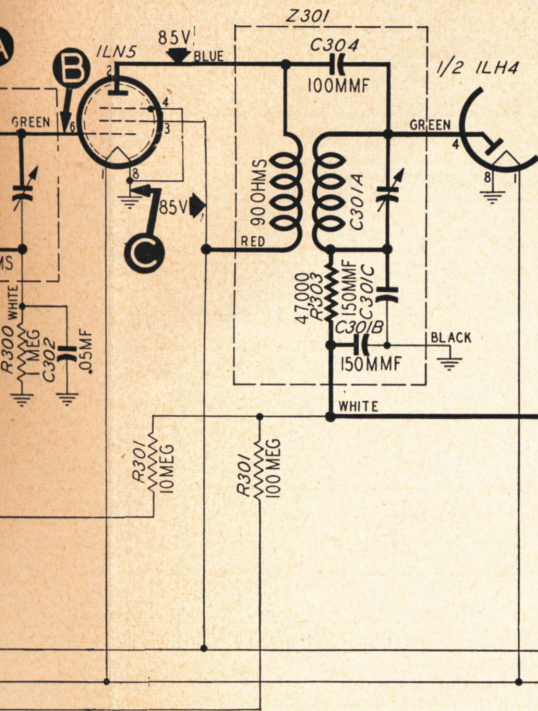
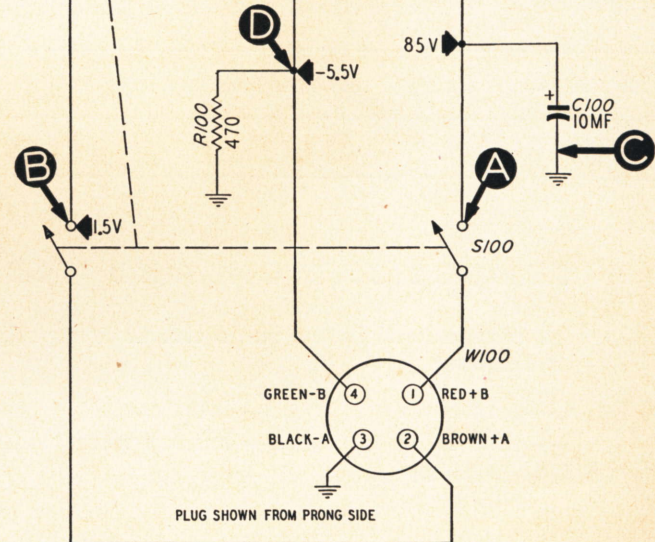
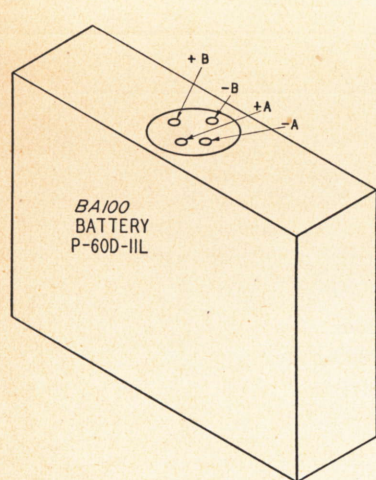
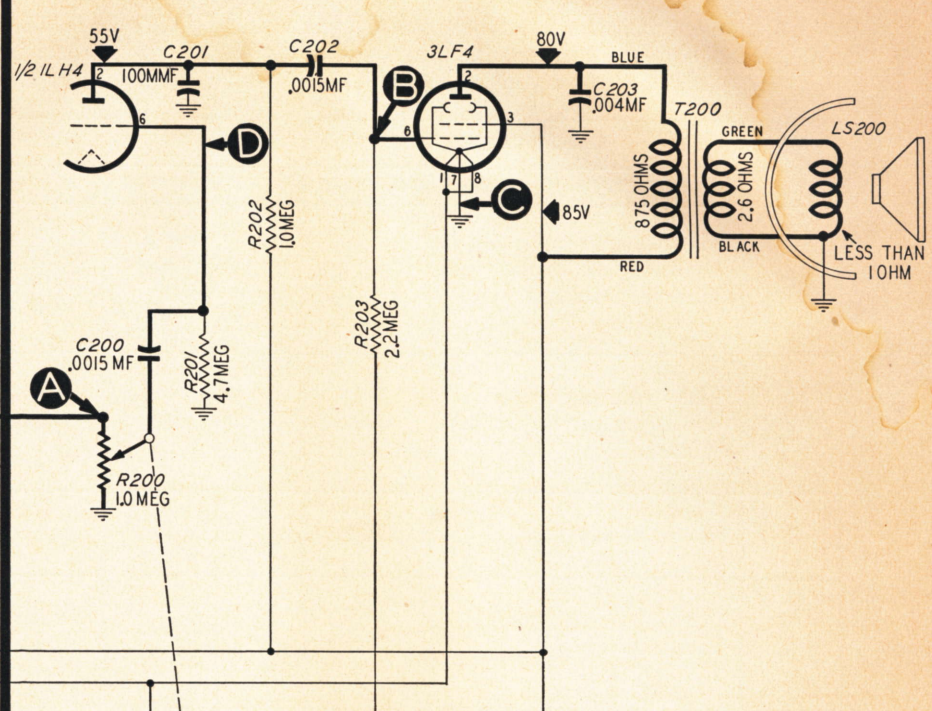


FIGURE 5. PHILCO RADIO MODEL 48-150, SECTIONALIZED SCHEMATIC

SECTION 3



SECTION 2



SECTION 1

ALIGNMENT PROCEDURE
TURN ON RADIO AND SET VOLUME CONTROL

DIAL—Alignment points should be marked on the dial backplate as shown in figure 8. Turn tuning gang until fully meshed, and set dial pointer to index mark.

OUTPUT METER—Connect meter to voice-coil lugs on loud-speaker. Set meter to 2.5-volt or similar range.

SIGNAL GENERATOR—Connect to chassis; see figure 8.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to stator of aerial tuning condenser.	455 kc.	Tuning condenser fully meshed.	Turn C300B fully clockwise. Adjust trimmers, in order given, for maximum output.	C301A C300A C300B
2	Through 200-mmf. condenser to aerial lead.	600 kc.	600 kc.	Adjust for maximum output.	C405
3	Same as step 2.	1700 kc.	1700 kc.	Same as step 2.	C401C
4	Same as step 2.	1500 kc.	1500 kc. (approx.)	Tune radio to generator signal and adjust trimmers for maximum output.	C401B C401A
5	Same as step 2.	600 kc.	600 kc. (approx.)	Adjust trimmers for maximum output while rocking tuning control.	C405
6	Repeat steps 3 and 5 until no further increase in output is noted.				

SYMBOLIZATION AND TERMINOLOGY

All components in the radio circuit are symbolized and located 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 |

100-series components are in Section 1—the power supply.

200-series components are in Section 2—the audio amplifier.

300-series components are in Section 3—the i-f amplifier, detector, and a-v-c circuits.

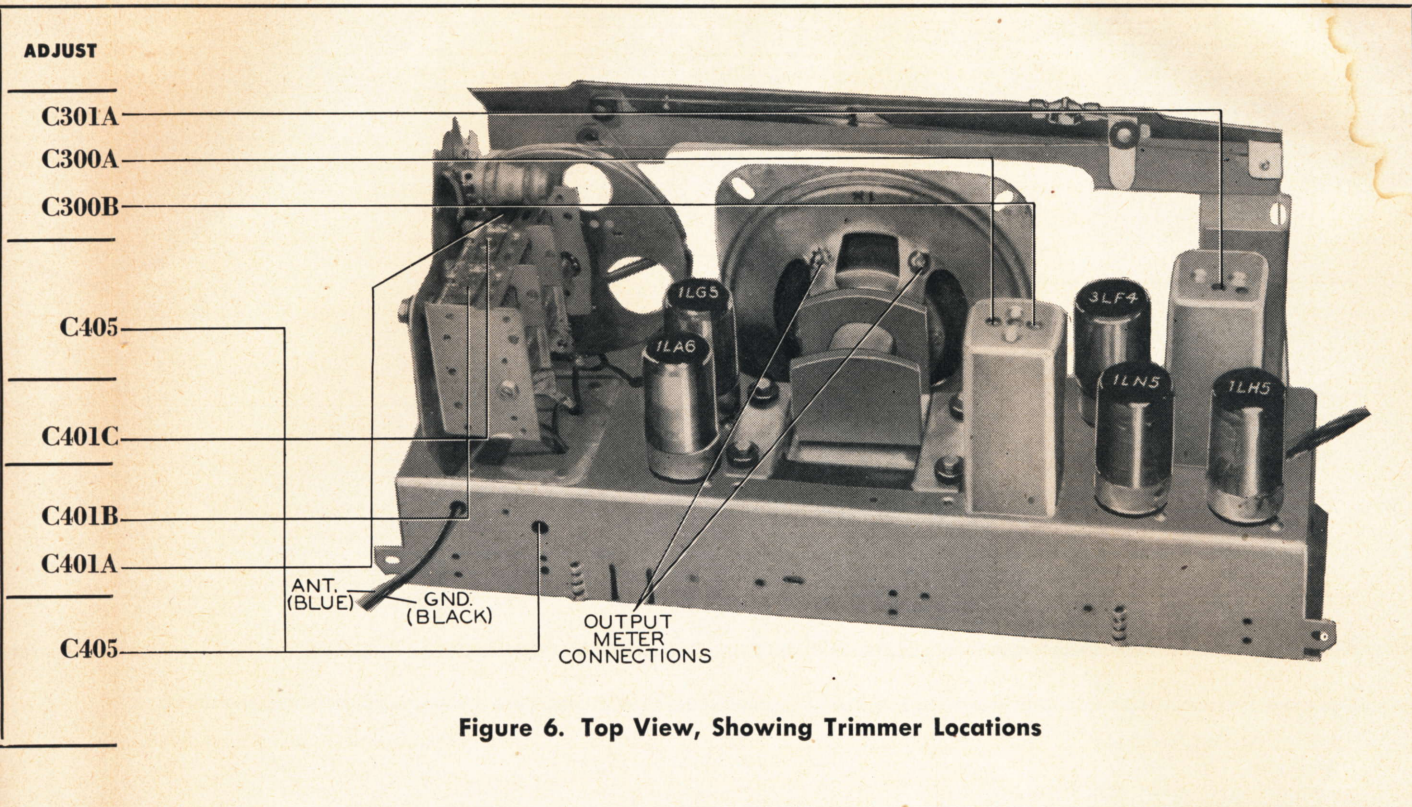
400-series components are in Section 4—the aerial, r-f, and oscillator circuits.

ADJUSTMENT PROCEDURE

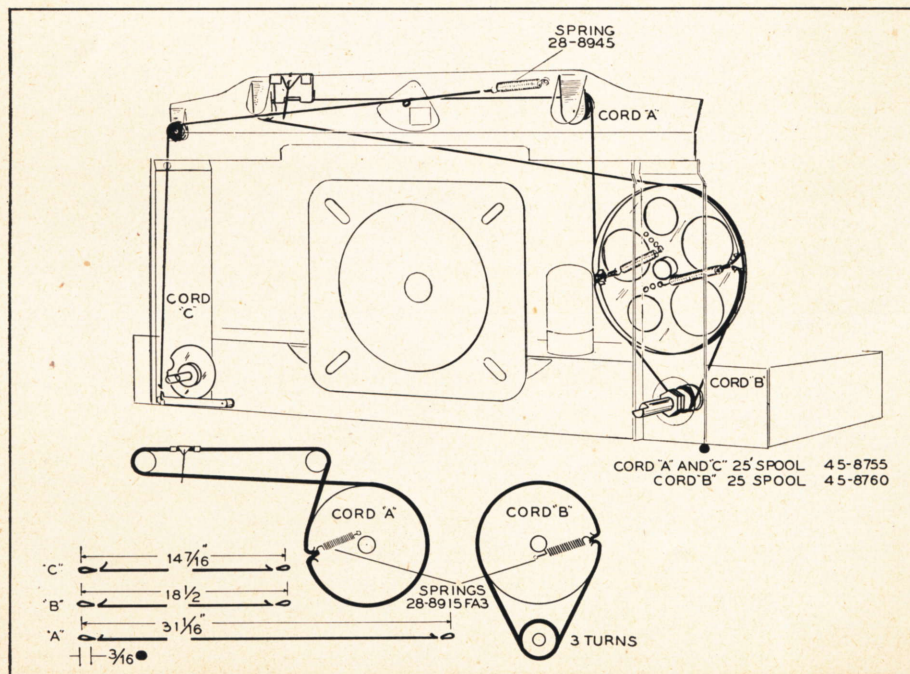
STEP 1: SET VOLUME CONTROL FULLY ON

Plugs on SIGNAL GENERATOR—Connect ground lead to radio chassis; connect output lead as indicated in chart.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1 volt.



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TP-3320E

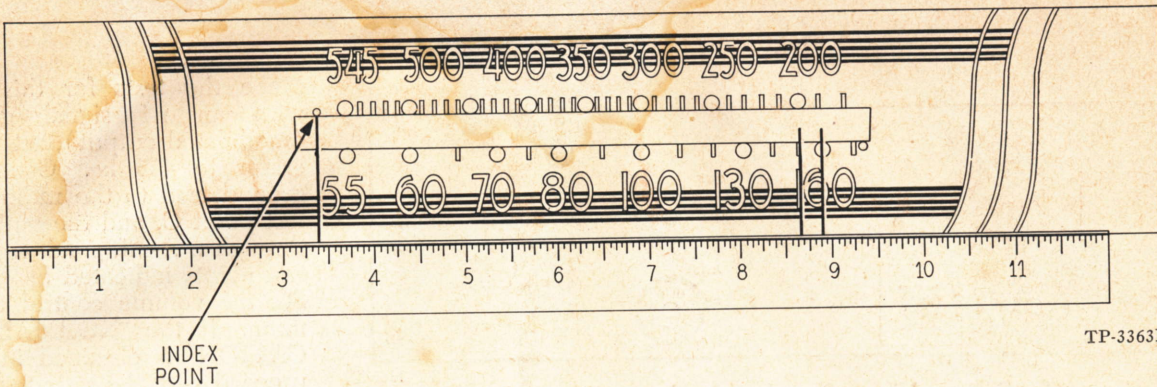


Figure 8. Composite Dial and Backplate, Calibration Details

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) in the following parts list 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.
BA100	Battery pack	P-60D-11L
C100	Condenser, electrolytic, 10 mf.	30-2540*
R100	Resistor, bias, 470 ohms	66-1473340*
S100	Power switch	Part of R200
W100	Battery-cable assembly	41-3710

SECTION 2

C200	Condenser, d-c blocking, .0015 mf.	45-3500-6*
C201	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C202	Condenser, d-c blocking, .0015 mf.	45-3500-6*
C203	Condenser, tone compensation, .004 mf.	61-0179*
LS200	Loud-speaker	36-1507-3
R200	Volume control (with power switch), 1 megohm	33-5554
R201	Resistor, grid return, 4.7 megohms	66-5473340*
R202	Resistor, plate load, 1 megohm	66-5103340*
R203	Resistor, grid return, 2.2 megohms	66-5223340*
T200	Output transformer	32-8323

SECTION 3

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, i-f filter, 150 mmf.	Part of Z301
C301C	Condenser, i-f filter, 150 mmf.	Part of Z301
C302	Condenser, r-f by-pass, .05 mf.	61-0122*
C303	Condenser, a-v-c filter, .05 mf.	61-0122*
C304	Condenser, coupling, 100 mmf., part of Z301	60-10105407*
R300	Resistor, grid return, 1 megohm	66-5103340*
R301	Resistor, a-v-c filter, 10 megohms	66-6103340*
R302	Resistor, a-v-c filter, 10 megohms	66-6103340*
R303	Resistor, i-f filter, 47,000 ohms, part of Z301	66-3473340*
Z300	Transformer, 1st i.f., includes C300A and C300B	32-3949-1
Z301	Transformer, 2nd i.f., includes C301A, C301B, C301C, C304, and R303	32-3897-2

SECTION 4

Reference Symbol	Description	Service Part No.
C400	Condenser, coupling, 4.7 mmf.	30-1221-5*
C401	Condenser, three-section tuning	31-2726
C401A	Condenser, trimmer	Part of C401
C401B	Condenser, trimmer	Part of C401
C401C	Condenser, trimmer	Part of C401
C402	Condenser, a-v-c filter, .05 mf.	61-0122*
C403	Condenser, r-f by-pass, .05 mf.	61-0122*
C404	Condenser, coupling, 10 mmf.	Part of T401
C405	Condenser, oscillator trimmer	31-6473-7
C406	Condenser, oscillator coupling, 100 mmf.	60-10105407*
R400	Resistor, a-v-c filter, 4.7 megohms	66-5473340*
R401	Resistor, grid return, 220,000 ohms	66-4223340*
R402	Resistor, screen dropping, 47,000 ohms	66-3473340*
T400	Transformer, aerial	32-3919-3
T401	Transformer, r-f	32-3974-2
T402	Transformer, oscillator	32-3385-3

MISCELLANEOUS

Description	Service Part No.
Cabinet, less accessories	10675
Baffle-and-felt assembly	40-6911
Felt foot	W2190
Knob	76-3051
Scale, dial	27-5966
Scale strap	56-4756
Scale plate, flag-and-upright assembly	76-3131
Cam plate	56-2700-1FA3
Drive cord, flag and pointer (25-foot spool)	45-8755
Drive cord, tuning gang (25-foot spool)	45-8760
Lever assembly	76-1655-1
Pointer	56-2896
Spring, gang and pointer drive	28-8913FA3
Spring, flag drive	28-8945
Spring, cam plate	57-0701FA1
Spring, retaining	57-1468FA1
Socket, Loktal	27-6138
Tuning Shaft	31-2484-2