Philco Radio & Television Corp.

	Model: 48-360	**Chassis:**	**Year:** Pre 1950
	Power:	**Circuit:**	**IF:**
	Tubes:		
	Bands:		

Resources
Riders 18 (XVIII) PHILCO 18-64
Riders 18 (XVIII) PHILCO 18-65
Riders 18 (XVIII) PHILCO 18-66
Riders 18 (XVIII) PHILCO 18-67
Riders 18 (XVIII) PHILCO 18-68
Riders 18 (XVIII) PHILCO 18-69
Riders 18 (XVIII) PHILCO 18-70
Riders 18 (XVIII) PHILCO 18-71

Circuit Description

Philco Model 48-360 is a six-tube, portable, superheterodyne radio, operating on a self-contained battery or a standard power source of a.c. or d.c. High sensitivity, selectivity, and power output are outstanding features. The frequency range is 540--1600 kc. The built-in loop aerial is adequate in most localities. Where signal strength is low, an external aerial may be used.

The tuned r-f stage, using a 1T4, provides a high signal-to-noise ratio. The converter employs a type 1R5 pentagrid converter.

The i-f stage, using another 1T4, has double-tuned transformers operating at 265 kc.; the voltage gain of this stage is increased considerably by positive screen feedback taken from the tertiary winding of the second i-f transformer.

The diode section of the 1U5 provides detection and a-v-c voltage. The pentode section functions as the first audio stage; this stage is resistance-coupled to the 3LF4 output amplifier. The speaker is a permanent-magnet dynamic type.

For a-c or d-c power-line operation, plate, screen, and filament power is supplied through the 117Z3 rectifier.

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.

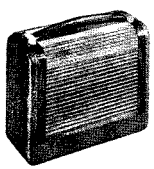
In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

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 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:



MODEL 48-360

SPECIFICATIONS

CABINET	Fabrikoid finish, wood trim
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	540—1600 kc.
AUDIO OUTPUT	160 milliwatts
OPERATING VOLTAGES	Battery: "B," 90 volts; "A," 9 volts. A.c./d.c.: 105—120 volts
POWER CONSUMPTION	Battery: "B," 12 ma. at 90 volts; "A," 50 ma. at 9 volts. A.c./d.c.: 25 watts
AERIAL	Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	265 kc.
PHILCO TUBES (6)	1T4 (2), 1R5, 1U5, 3LF4, 117Z3
BATTERY TYPE	Philco P-841A

TP-1564

1. Inspect the top and 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 by measuring between the A+ and A− pins on the battery-cable plug (disconnected from battery) while holding down the change-over switch, S100. If the resistance is higher than 100 ohms, one of the tube filaments is probably open.

3. With the change-over switch in the a.c./d.c. position, measure the resistance between B+ (pin 6 of the 117Z3 rectifier) and B−, test point B. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1100 ohms, check condensers C100A, C100B, and C100C for leakage or shorts.

The resistance value above, 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 I are performed.

Section 1 TROUBLE SHOOTING

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B—, 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 on the power, 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.

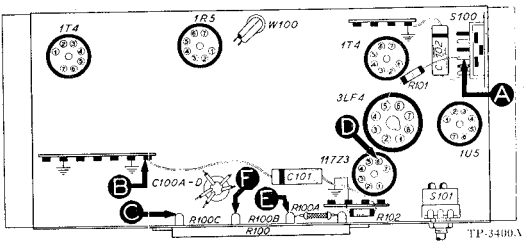


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A C	80 volts 8.5 volts		Trouble in this section. Isolate by the following tests.
2	D	105 volts	High voltage Low voltage No voltage	Open: R100A, R100B, R100C, R101, T200*. Defective: S100, S101. Defective: 117Z3. Leaky: C100A. Leaky or shorted: C100B, C100C, C100D. Defective: 117Z3, S100, S101, W100.
3	E	99 volts	Low voltage No voltage	Defective: R100A. Leaky: C100A. Shorted: C100B, C100C, C100D. Open: R100A. Shorted: C100A.
4	F	55 volts	Low voltage No voltage	Defective: R100B. Shorted: C100C, C100D. Leaky: C100B. Open: R100B. Shorted: C100B.
5	A	80 volts	Low voltage No voltage	Defective: R101. Leaky: C100C. Open: R101. Shorted: C100C.
6	C	8.5 volts	High voltage Low voltage No voltage	Defective: Any tube, R207*, S100, S101. Leaky: C100D. Defective: R100C. Open: R100C. Shorted: C100D.

Listening Test: Distortion or abnormal hum may be caused by open C100B, C100C, or C100D.

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

BATTERY VOLTAGE: Replace battery when (with radio turned on) "B" voltage falls below 60 volts, or "A" voltage falls below 7.2 volts.

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.

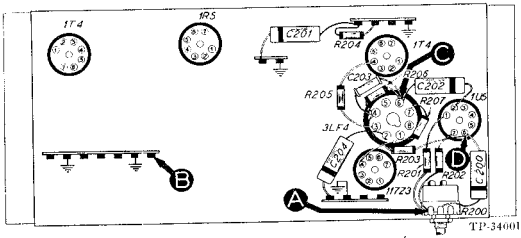


Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Defective: 3LF4, LS200, T200. Shorted: C203, C204.
3	D	Loud, clear signal with weak signal input.	Defective: 1U5. Open: C202, C201, R205, R204. Shorted or leaky: C202, C201.
4	A	Loud, clear signal with weak signal input.	Defective: R200. Open: C200, R201, R202.

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

Section 3 TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 265 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 the first step, 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 below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

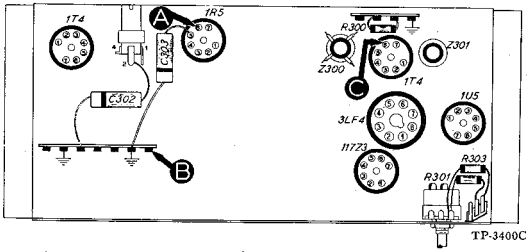


Figure 3. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Defective: 1T4, Z301. Misaligned: Z301. Open: R300, C302. Shorted or leaky: C302.
3	A	Loud, clear signal with weak signal input.	Defective: 1R5*, Z300. Misaligned: Z300. Shorted: C406*.

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

Section 4 TROUBLE SHOOTING

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 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.

Set the radio and signal-generator dials as indicated in the chart.

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

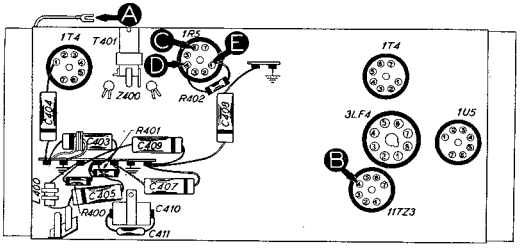
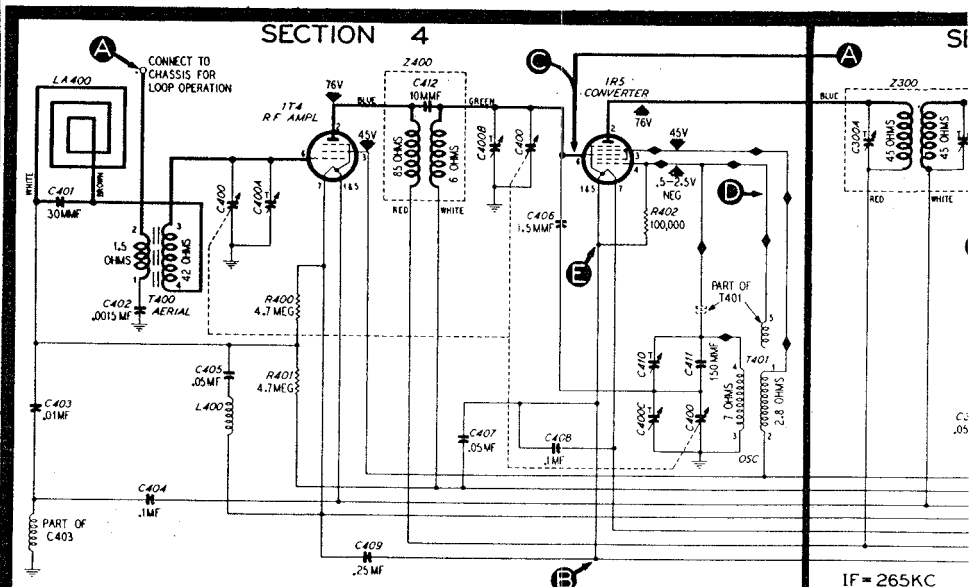
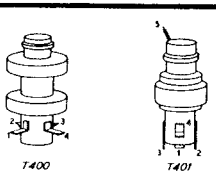


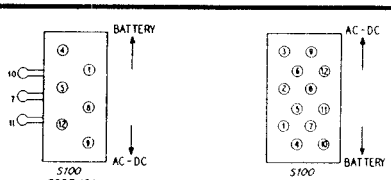
Figure 4. Bottom View, Showing Section 4 Test Points (Locations of C402 and T400 shown in figure 6.)

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	1000 kc.	1000 kc.	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	1000 kc.	1000 kc.	Clear signal with strong signal input.	Defective: 1R5. Open: C407, C408. Trouble in oscillator circuit.
3	E to D (Osc. test; see note below.)		Rotate tuning control	Negative 2 to 4 volts.	Defective: 1R5 (osc. section), T401. Open: R402. Shorted: C410, C410A, C400, C400C.
4	A	1000 kc.	1000 kc.	Loud, clear signal with weak signal input.	Defective: 1T4, T400, Z400. Shorted: C400, C400A, C400B. Open: R400, R401.

OSCILLATOR-TEST NOTE: Connect positive lead of high-resistance voltmeter to 1R5 filament, test point E; connect prod end of negative lead through 100,000-ohm isolating resistor to 1R5 oscillator grid, test point D. Use suitable meter range, such as 0—10 volts. Proper operation of oscillator is indicated by negative voltage of 2 to 4 volts (measured with 20,000-ohms-per-volt meter) throughout range of tuning control.







CODES 121 AND 122 ARE FUNDAMENTALLY THE SAME, THE MAIN EXCEPTION BEING THE POWER CHANGE-OVER SWITCH, S100 WHICH IS 3 POLE FOR CODE 121 AND 4 POLE FOR CODE 122. THE TERMINAL LAYOUT OF EACH SWITCH IS SHOWN IN THE SKETCH ABOVE. CONNECTIONS PECULIAR TO CODE 122 ARE SHOWN BY DOTTED LINES IN SECTION 1 OF THE SCHEMATIC.

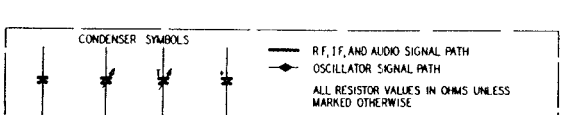
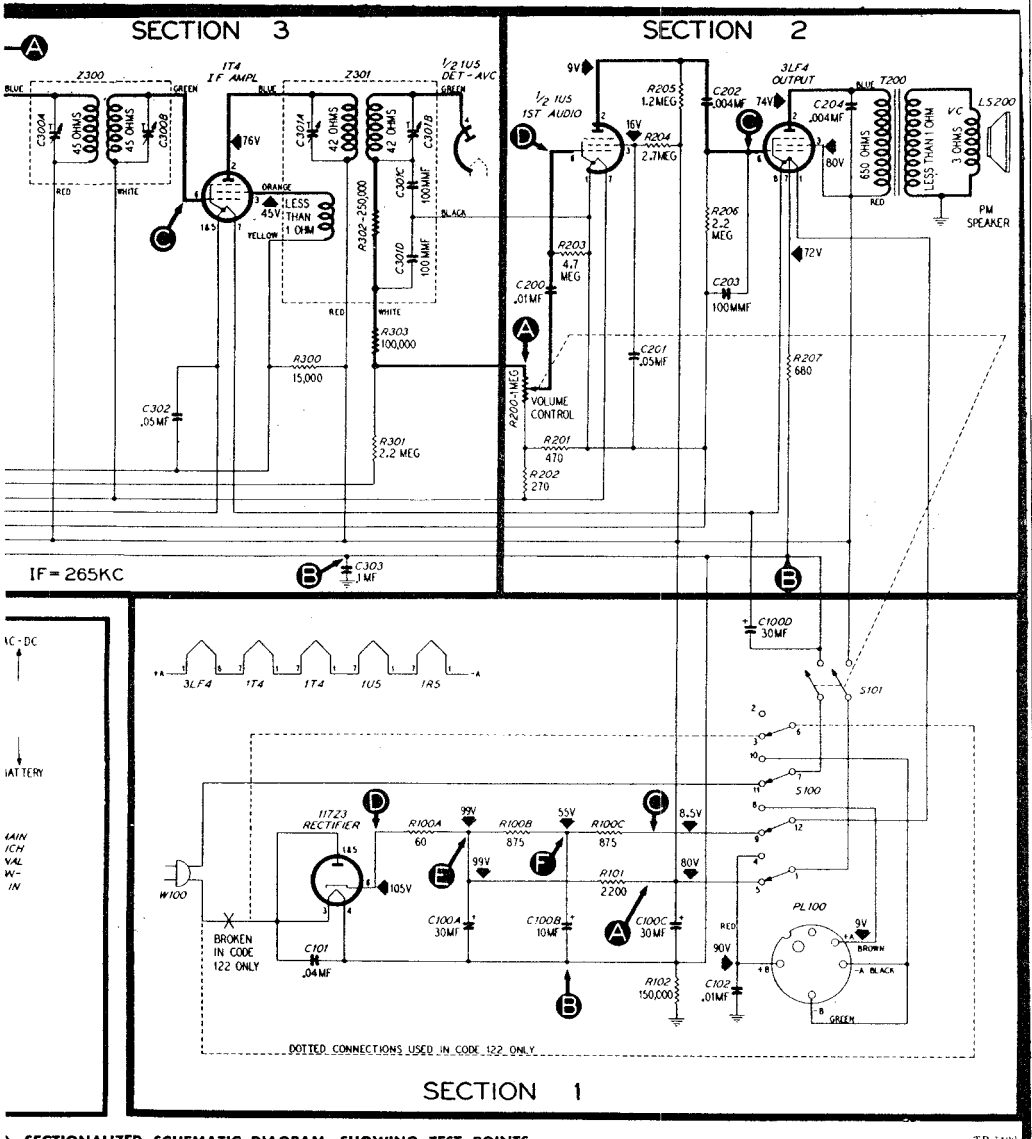


FIGURE 5. PHILCO RADIO, MODEL 48-360, SECTIONALIZED S



), SECTIONALIZED SCHEMATIC DIAGRAM, SHOWING TEST POINTS

TP-3400

ALIGNMENT PROC

THE ALIGNMENT SHOULD BE MADE WITH THE RADIO INSTALLED IN

DIAL—Turn tuning condensers to full-mesh position. Set dial pointer to coincide with index mark at low-frequency end of dial.

OUTPUT METER—Connect between chassis and voice-coil terminal on output transformer, T200.

SIGNAL cated i

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to lug on T400 (see figure 6); output lead to ext. aerial lug.	265 kc.	Set at index mark.	Turn C300B fully tight, then adjust trimmers, in order given, for maximum output.	C301B C301A C300A C300B
2	Radiating loop (see Note below).	1600 kc.	1600 kc.	Adjust for maximum.	C400C
3	Same as step 2.	580 kc.	580 kc.	Adjust for maximum while rocking tuning control.	C410
4	Same as step 2.	1600 kc.	1600 kc.	Adjust for maximum.	C400C
5	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C400B
6	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C400A
7	Repeat steps 3, 4, 5, and 6 until no further improvement is obtained.				

NOTE: 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, r-f, 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.

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ENT PROCEDURE

RADIO INSTALLED IN THE CABINET AND THE LOOP CONNECTED

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'200.

SIGNAL GENERATOR (modulated)—Connect as indicated in chart.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below .4 volt.

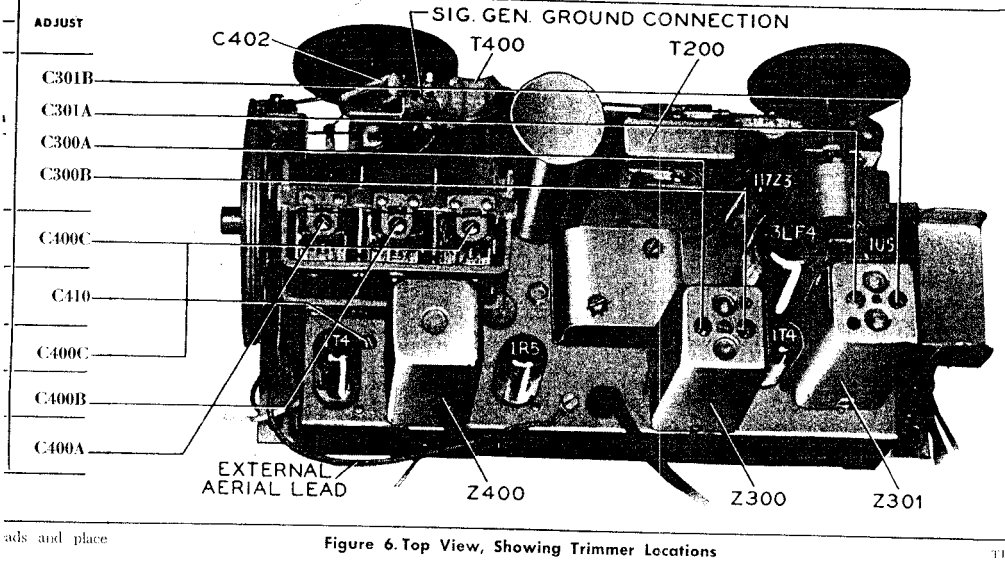

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Figure 6. Top View, Showing Trimmer Locations

TP-3637

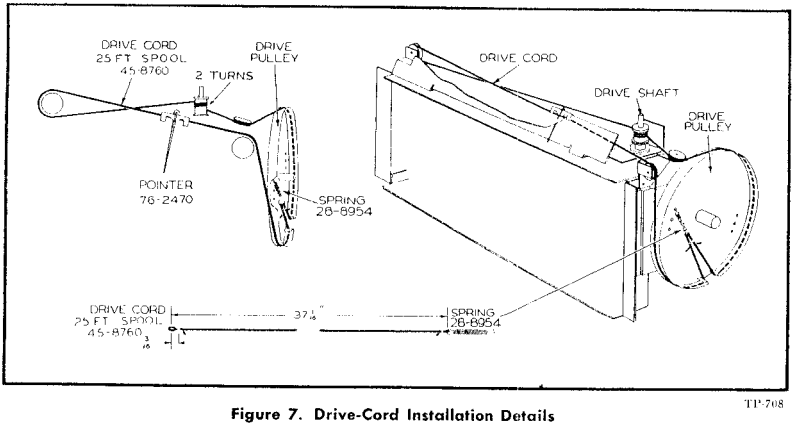

Figure 7. Drive-Cord Installation Details

TP-708

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.
C100	Condenser, electrolytic, 4-section	**30-2560**
C100A	Condenser, filter, 30 mf.	Part of **C100**
C100B	Condenser, filter, 10 mf.	Part of **C100**
C100C	Condenser, filter, 30 mf.	Part of **C100**
C100D	Condenser, bias-resistor by-pass, 30 mf.	Part of **C100**
C101	Condenser, line filter, .04 mf.	**30-4119**
C102	Condenser, by-pass, .01 mf.	**61-0120***
PL100	Plug, battery cable	**54-4272**
R100	Resistor, 3-section	**33-3431-4**
R100A	Resistor, filament dropping, 60 ohms	Part of **R100**
R100B	Resistor, filament dropping, 875 ohms	Part of **R100**
R100C	Resistor, filament dropping, 875 ohms	Part of **R100**
R101	Resistor, plate dropping, 2200 ohms.	**66-2223340***
R102	Resistor, leakage, 150,000 ohms	**66-4153340***
S100	Switch, change-over (code 121)	**42-1553-1**
S100	Switch, change-over (code 122)	**42-1821**
S101	Switch, on-off	Part of **R200**
W100	Power cord and plug (code 121)	**L-3339**
W100	Power cord and plug (code 122)	**41-3755-17**

SECTION 2

C200	Condenser, coupling, .01 mf.	**61-0120***
C201	Condenser, screen by-pass, .05 mf.	**61-0122***
C202	Condenser, d-c blocking, .004 mf.	**61-0179***
C203	Condenser, r-f by-pass, 100 mmf.	**62-110009001***
C204	Condenser, tone compensating, .004 mf.	**61-0179**
LS200	Speaker	**36-1598**
R200	Volume control, 1 megohm	**33-5526**
R201	Resistor, grid return, 470 ohms	**66-1473340***
R202	Resistor, grid return, 270 ohms	**66-1273340***
R203	Resistor, grid return, 4.7 megohms	**66-5473340***
R204	Resistor, screen dropping, 2.7 megohms	**66-5273340***
R205	Resistor, plate load, 1.2 megohms	**66-5123340***
R206	Resistor, grid return, 2.2 megohms	**66-5223340***
R207	Resistor, bias, 680 ohms	**66-1683340***
T200	Output transformer	**32-8259**

SECTION 3

C300A	Condenser, trimmer, primary	Part of **Z300**
C300B	Condenser, trimmer, secondary	Part of **Z300**
C301A	Condenser, trimmer, primary	Part of **Z301**
C301B	Condenser, trimmer, secondary	Part of **Z301**
C301C	Condenser, i-f filter, 100 mmf.	Part of **Z301**
C301D	Condenser, i-f filter, 100 mmf.	Part of **Z301**
C302	Condenser, screen by-pass, .05 mf.	**61-0122***
C303	Condenser, i-f by-pass, .1 mf.	**61-0113***
R300	Resistor, screen dropping, 15,000 ohms	**66-3153340***
R301	Resistor, a-v-c filter, 2.2 megohms	**66-5223340***
R302	Resistor, filter, 25,000 ohms	Part of **Z301**
R303	Resistor, a-v-c filter, 100,000 ohms.	**66-4103340**
Z300	Transformer, 1st i-f, including C300A and C300B	**32-3970**
Z301	Transformer, 2nd i-f, including C301A, C301B, C301C, and C301D	**32-3971-2**

SECTION 4

Reference Symbol	Description	Service Part No.
C400	Condenser, tuning, 3-section	**31-2689**
C400A	Condenser, aerial trimmer	Part of **C400**
C400B	Condenser, r-f trimmer	Part of **C400**
C400C	Condenser, oscillator trimmer	Part of **C400**
C401	Condenser, compensating, 30 mmf.	**60-00305307***
C402	Condenser, aerial blocking, .0015 mf.	**45-3500-6***
C403	Condenser-and choke-assembly, i-f by-pass, .01 mf.	**76-2271**
C404	Condenser, by-pass, .1 mf.	**61-0113***
C405	Condenser, by-pass, .05 mf.	**61-0122***
C406	Condenser, neutralizing, 1.5 mmf.	**30-1221-3**
C407	Condenser, by-pass, .05 mf.	**61-0122***
C408	Condenser, by-pass, .1 mf.	**61-0113***
C409	Condenser, by-pass, .25 mf.	**61-0125**
C410	Condenser, oscillator series padder	**31-6410**
C411	Condenser, tracking, 150 mmf.	**60-10155407***
C412	Condenser, coupling, 10 mmf. (part of Z400)	**62-010009001**
LA400	Loop aerial	**32-4080**
L400	Choke	**32-4007**
R400	Resistor, grid return, 4.7 megohms	**66-5473340***
R401	Resistor, a-v-c filter, 4.7 megohms	**66-5473340***
T400	Aerial transformer	**32-3972**
T401	Oscillator transformer	**32-4095-1**
Z400	R-f transformer (code 121), including C412	**32-3974**
Z400	R-f transformer (code 122), including C412	**32-4210**

MISCELLANEOUS

Description	Service Part No.
Bolt, speaker mounting	**W2022FA3**
Cabinet (less scale)	**10647F**
Back, cabinet (code 122)	**45-6391**
Back-catch assembly	**76-6182**
Foot	**45-6041**
Grille, metal front	**56-3351-1**
Handle loop	**56-3954**
Handle shield	**54-4390**
Hinge (code 121)	**45-6182**
Scale, dial	**27-5891**
Scale strap	**56-3846**
Clip, coil mounting	**28-5002FA1**
Dial-backing-and-pulley assembly	**76-2023**
Cord, drive (25-ft. spool)	**45-8760***
Pointer	**76-2470**
Pulley-and-bracket assembly	**76-2027**
Spring, drive cord	**28-8954**
Cover switch (volume control)	**56-3209**
Grommet, tuning-condenser mounting	**27-4596**
Knob	**54-4214**
Shaft and pulley	**76-2028**
Socket, Loktal	**27-6138**
Socket, miniature	**27-6203**
Switch-plunger assembly	
Code 121	**76-2025**
Code 122	**76-3061**