

PHILCO RADIO MODEL 50-620

SPECIFICATIONS

CABINET	Molded Polystyrene (maroon, brown, or green)
CIRCUIT	Four-tube superheterodyne
FREQUENCY RANGE	540—1600 kc.
AUDIO OUTPUT	160 milliwatts
OPERATING VOLTAGES	Battery: "B", 90 volts; "A", 7.5 volts. A.c./d.c.: 105—120 volts
POWER CONSUMPTION	Battery: "B", 13 ma. at 90 volts; "A", 50 ma. at 7.5 volts. A.c./d.c.: 25 watts
AERIAL	Built-in high-impedance loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (4)	1R5, 1T4, 1U5, 3V4
BATTERY TYPE	Philco P-361



MODEL 50-620

TP-4523

Circuit Description

Philco Model 50-620 is a portable four-tube superheterodyne providing reception on the standard-broadcast band. A high-impedance loop within the cabinet normally provides adequate signal pickup. However, provisions have been made for connecting an external aerial, if required.

The aerial circuit works directly into a 1R5 converter, where the incoming signal is converted to the 455-kc. intermediate frequency. A 1T4 is used in a single high-gain stage of i-f amplification, which employs neutralization to suppress oscillation. A 1.5-mmf. condenser, C304, feeds part of the i-f voltage, of the proper phase, back to the 1T4 grid through the tube-socket capacitance.

A 1U5 diode-pentode is used in the detector, a-v-c, and first audio circuits. The pentode section is resistance-coupled to a 3V4 pentode output amplifier, which works into a p-m speaker.

The d-c operating voltages are obtained from either a battery pack, Philco type P-361, or from a 105—120 volt, a-c or d-c power line. For power-line operation, the plate, screen, and filament voltages are provided by a power supply using a selenium rectifier, CR100.

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 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, the battery plug disconnected from the battery, and the change-over switch in the battery position (power-cord plug inserted in receptacle on rear of chassis). 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 C202 before replacing the tube.

3. Measure the resistance between B+ (output of selenium rectifier), test point D, and B—, test point B. See figure 1. When the ohmmeter leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 2000 ohms, check condensers C101A and C101B for leakage or shorts.

The resistance value above, which is much lower than normal, does not represent a quality check of these condensers; it is the lowest value which will permit the rectifier to operate safely while the voltage checks of Section 1 (power supply) are performed.

Section 1—Power Supply

Make the tests for this section with 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.

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.

TROUBLE SHOOTING

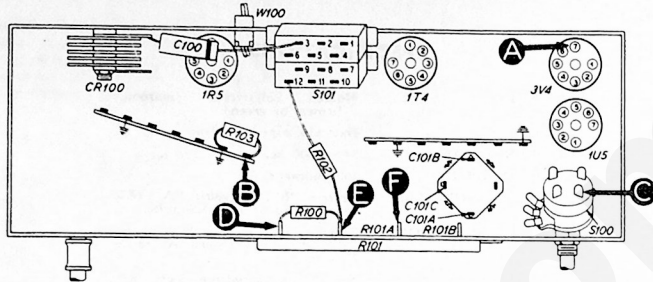


Figure 1. Bottom View, Showing Section 1 Test Points TP-5355A-1

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a)	A	7.5v		Trouble in this section. Isolate by the following tests.
1(b)	C	90v		
2	D	125v	Low voltage No voltage	Defective: CR100. Open C101A. Defective: CR100. Open: S100, S101.
3	E	120v	Low voltage No voltage	Changed resistance: R100. Leaky: C101A. Open: R100. Shorted: C101A.
4	F	65v	Low voltage No voltage	Changed resistance: R101A. Leaky: C101B. Open: R101A. Shorted: C101B.
5	A	7.5v	Low voltage High voltage No voltage	Changed resistance: R101B. Open: One or more filaments, R205*. Open: R101B, S101.
6	C	90v	Low voltage High voltage No voltage	Changed resistance: R102. Leaky: C101C. Open: R205*, T200*, S100. Open: R102, S101. Shorted: C101C.

Listening Test: Abnormal hum may be caused by open C101B, C101C, or C202*.

*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 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 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

TROUBLE SHOOTING

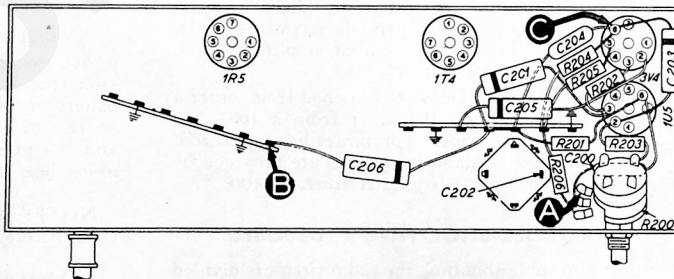


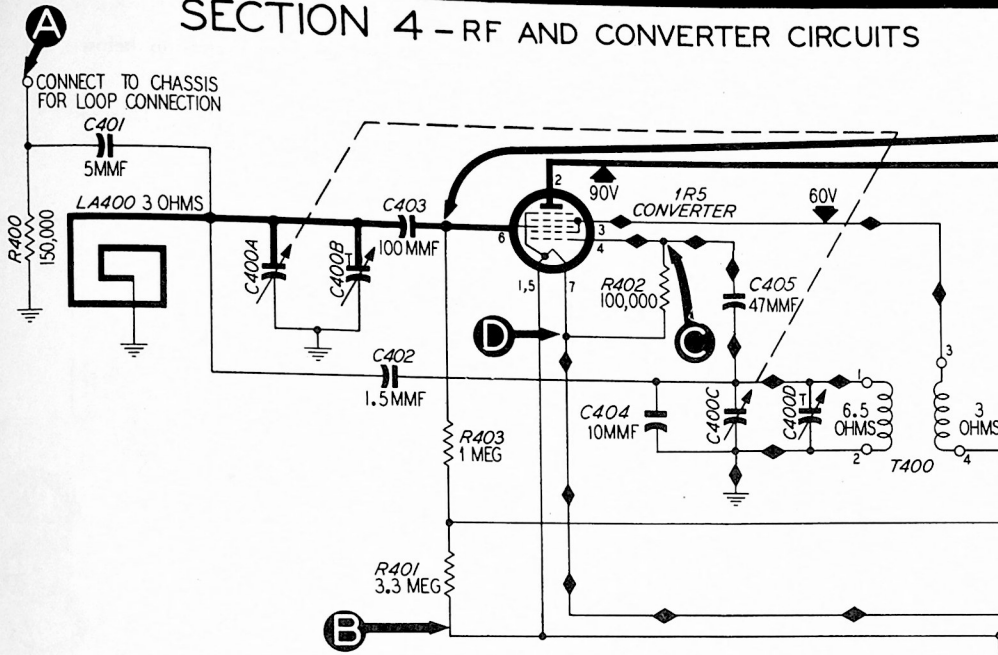
Figure 2. Bottom View, Showing Section 2 Test Points TP-5355B-1

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	C	Clear speaker output with strong generator input.	Defective: 3V4, LS200. Open: R204, T200. Shorted: C203, C204, C205, T200.
3	A	Same as step 1.	Defective: 1U5, R200 (rotate). Open: C200, R201, R202, R203, C203. Shorted: C201, C301C*.

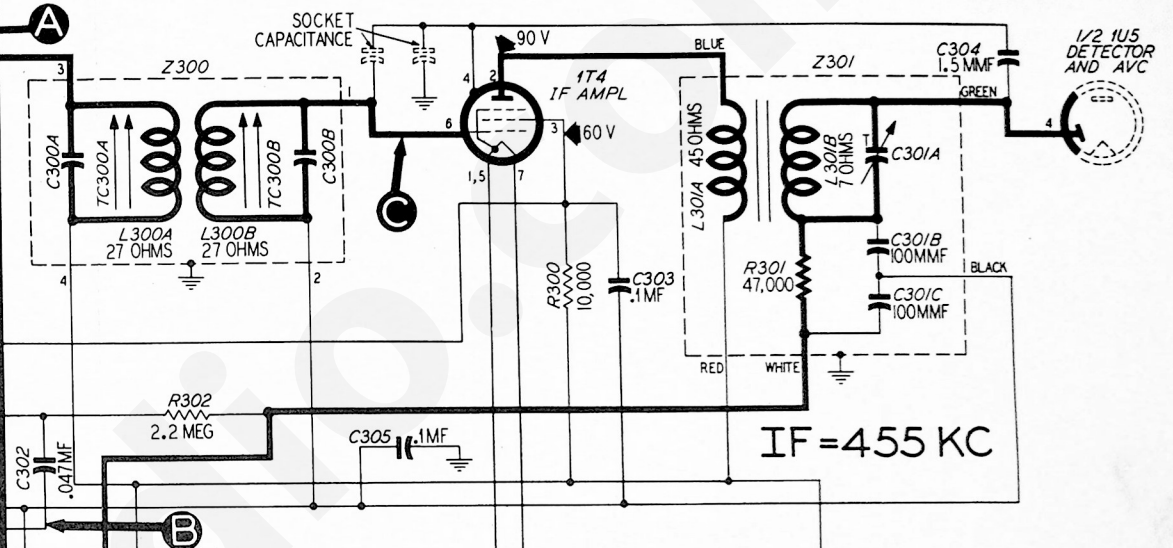
Listening Test: Distortion may be caused by leaky or shorted C203, or by changed resistance of R202. Distortion or strong signals may be caused by leaky or shorted C200.

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

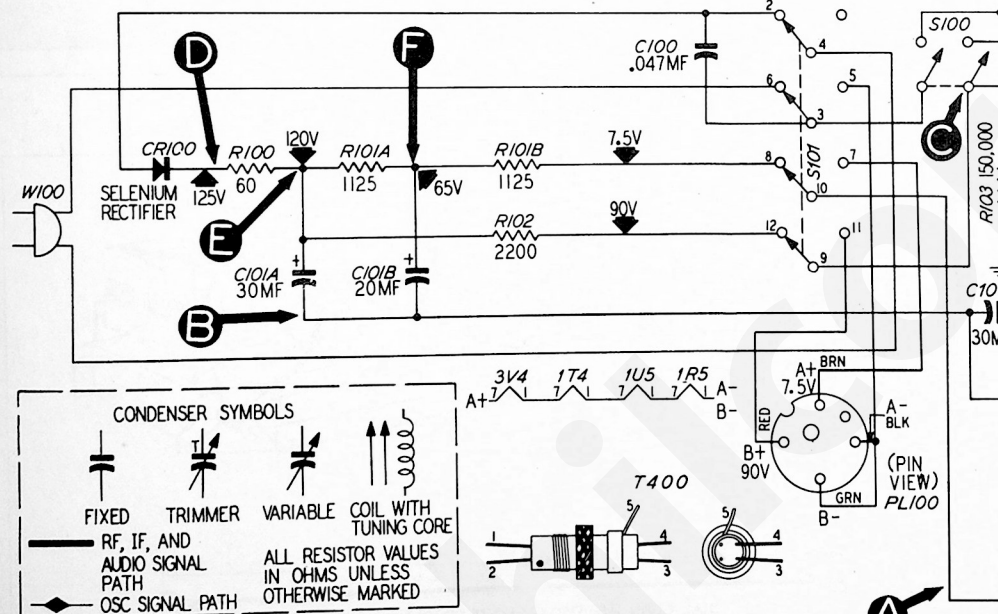
SECTION 4 - RF AND CONVERTER CIRCUITS



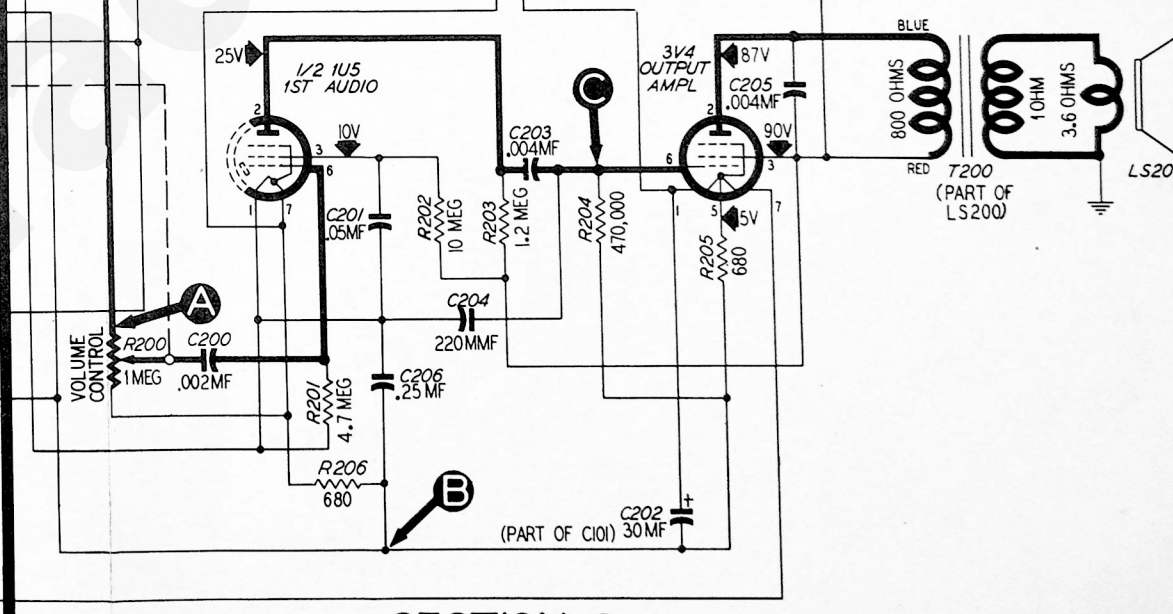
SECTION 3 - IF, DETECTOR AND AVC CIRCUITS



IF = 455 KC



SECTION 1 - POWER SUPPLY



SECTION 2 - AUDIO CIRCUITS

Figure 5. Philco Model 50-620, Sectionalized Schematic Diagram, Showing Test Points

TP-5355-1

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to test point D; 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 C. 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.

ALIGNMENT PROCEDURE

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 B— (test point B in figure 4). Positive lead through .05-mf. condenser to external-aerial lead. Make sure that radio loop aerial is connected to radio.	455 kc.	Tuning condenser fully meshed.	Adjust, in order given, for maximum output.	C301A—2nd i-f sec. TC300B—1st i-f sec. TC300A—1st i-f pri.
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum output.	C400D—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output while rocking tuning condenser.	C400B—aerial

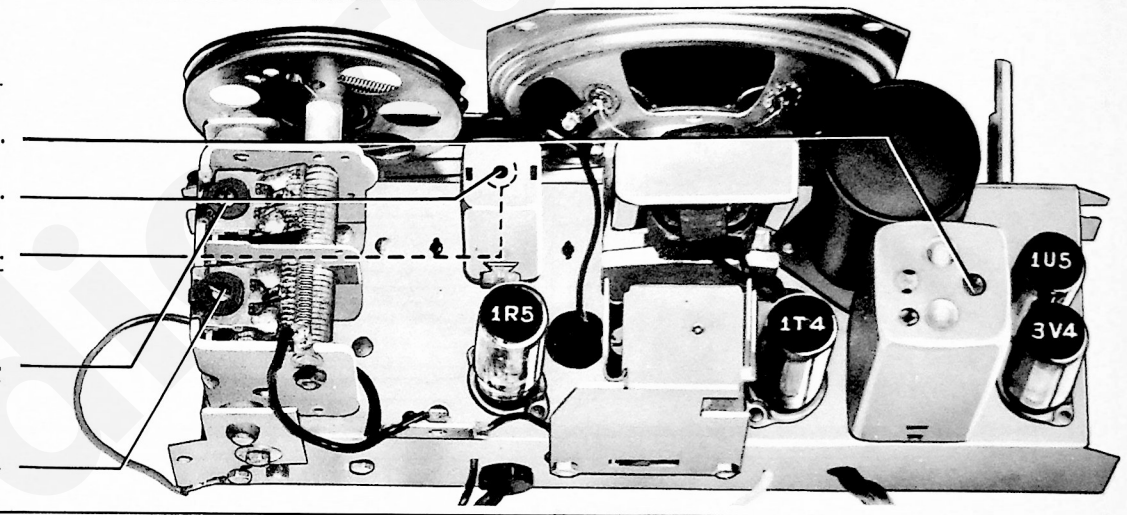


Figure 6. Top View, Showing Trimmer Locations

TP-5283

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.

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.

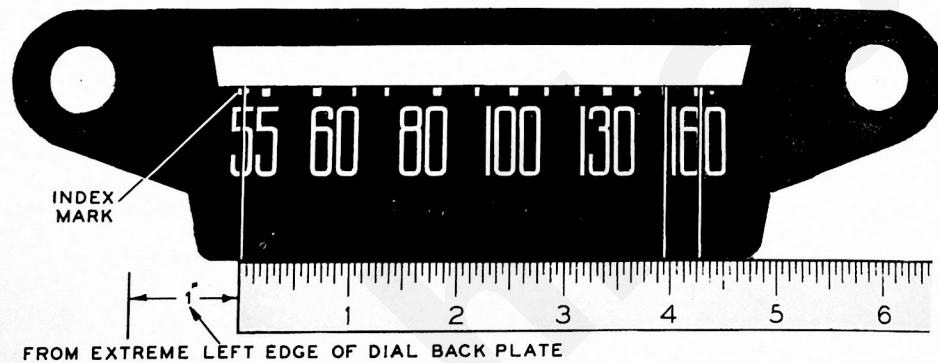


Figure 7. Dial-Backplate Calibration Measurements

TP-5776

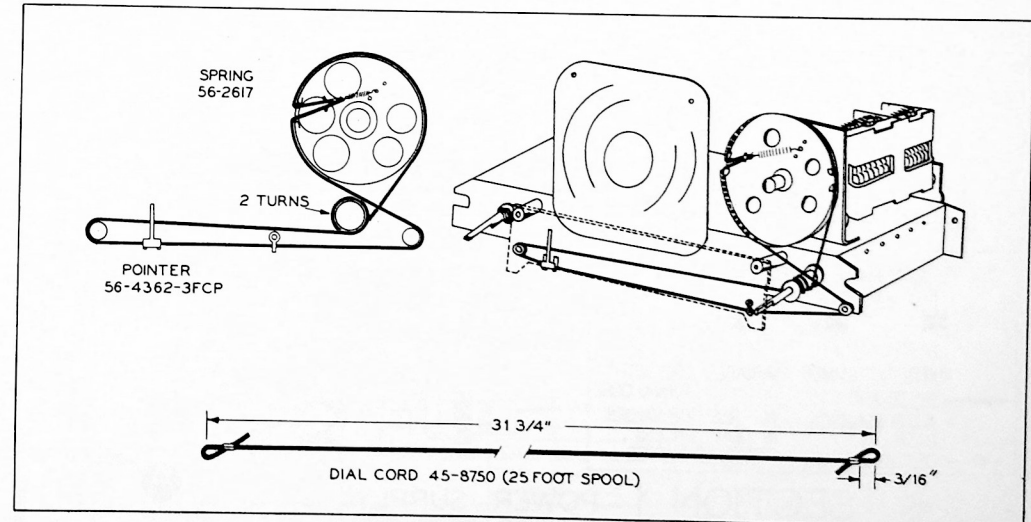


Figure 8. Drive-Cord Installation Details

TP-5354E-1

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 | L—choke or coil | LS—loud-speaker | S—switch |
| I—pilot lamp | LA—loop aerial | R—resistor | T—transformer |
| | | | W—line cord |
| | | | 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, detector, and a-v-c circuits
- 400-series components are in Section 4—the r-f and converter circuits

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

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by 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 POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .047 mf.	61-0122*
C101	Condenser, electrolytic, 4-section	30-2568-21
C101A	Condenser, filter, 30 mf., 150v	Part of C101
C101B	Condenser, filter, 20 mf., 150v	Part of C101
C101C	Condenser, filter, 30 mf., 150v	Part of C101
CR100	Rectifier, selenium	34-8003-1
PL100	Battery-cable-and-plug assembly	41-3712-2
R100	Resistor, current limiting, 60 ohms, 1 watt	33-1334
R101	Resistor, 2-section	33-3431-5
R101A	Resistor, filament-dropping, 1125 ohms, 3 watts	Part of R101
R101B	Resistor, filament-dropping, 1125 ohms, 3 watts	Part of R101
R102	Resistor, filter, 2200 ohms	66-2223340*
R103	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, on-off	Part of 33-5538-2
S101	Switch, change-over	42-1821
W100	Line-cord-and-plug assembly	L2183*

SECTION 2 AUDIO CIRCUITS

C200	Condenser, d-c blocking, .002 mf.	61-0062*
C201	Condenser, screen by-pass, .05 mf.	61-0122*
C202	Condenser, filter, 30 mf., 25v	Part of 30-2568-21
C203	Condenser, d-c blocking, .004 mf.	61-0179*
C204	Condenser, r-f by-pass, 220 mmf.	62-122001001*
C205	Condenser, tone compensation, .004 mf.	61-0179*
C206	Condenser, by-pass, .25 mf.	61-0125*
LS200	Loud-speaker, p-m	36-1627-9
R200	Volume control, 1 megohm	33-5538-28
R201	Resistor, grid return, 4.7 megohms	66-5473340*
R202	Resistor, screen dropping, 10 megohms	66-6103340*
R203	Resistor, plate load, 1.2 megohms	66-5123340*
R204	Resistor, grid return, 470,000 ohms	66-4473340*
R205	Resistor, bias, 680 ohms	66-1683340*
R206	Resistor, diode return, 470 ohms	66-1473340*
T200	Transformer, output	Part of LS200

SECTION 3 I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, shunt	Part of Z300
C300B	Condenser, shunt	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, filter	Part of Z301
C301C	Condenser, filter	Part of Z301
C302	Condenser, a-v-c filter, .047 mf.	61-0122
C303	Condenser, screen by-pass, .1 mf.	61-0113*
C304	Condenser, neutralizing, 1.5 mmf.	30-1221-3
C305	Condenser, i-f by-pass, .1 mf.	30-4527
L300A	Transformer primary, 1st i-f	Part of Z300
L300B	Transformer secondary, 1st i-f	Part of Z300
L301A	Transformer primary, 2nd i-f	Part of Z301
L301B	Transformer secondary, 2nd i-f	Part of Z301

SECTION 3 (Continued) I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
R300	Resistor, screen dropping, 10,000 ohms	66-3103340*
R301	Resistor, filter, 47,000 ohms (Part of Z301)	66-3473340*
R302	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
Z300	Transformer, 1st i-f	32-4160-4A
Z301	Transformer, 2nd i-f	32-3987-3*

SECTION 4 R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2727-2
C400A	Condenser, tuning, aerial section	Part of C400
C400B	Condenser, trimmer, aerial	Part of C400
C400C	Condenser, tuning, oscillator section	Part of C400
C400D	Condenser, trimmer, oscillator	Part of C400
C401	Condenser, isolating, 5 mmf.	30-1224-5*
C402	Condenser, neutralizing, 1.5 mmf.	30-1221-3
C403	Condenser, d-c blocking, 100 mmf.	60-10105407*
C404	Condenser, temperature amp., 10 mmf.	30-1224-26*
C405	Condenser, d-c blocking, 47 mmf.	60-00515307*
LA400	Loop aerial	32-4274
R400	Resistor, leakage, 150,000 ohms	66-4153340*
R401	Resistor, grid return, 3.3 megohms	66-5333340*
R402	Resistor, oscillator bias, 100,000 ohms	66-4103340*
R403	Resistor, a-v-c divider, 1 megohm	66-5103340*
T400	Transformer, oscillator	32-4263

MISCELLANEOUS

Description	Service Part No.
Cabinets and Cabinet Parts	
Cabinet (M), maroon	10703
Cabinet (G), green	10703C
Cabinet (B), brown	10703D
Baffle	54-7577
Handle assembly (M) and (G)	76-4089
Handle assembly (B)	76-4089-2
Knob (M), 2 required	54-4557
Knob (G), 2 required	54-4557-3
Knob (B), 2 required	54-4557-4
Back (M)	54-4551
Back (G)	54-4551-3
Back (B)	54-4551-4
Dial Backplate	76-3668
Drive cord, 25-foot spool	45-8750*
Pointer	56-4362-3FCP
Spring, drive cord	56-2617
Lever assembly, switch	76-3666
Shaft-and-pulley assembly	76-3671-1
Socket, miniature	27-6203

PRODUCTION CHANGE

Run 2
To reduce microphonics, the temperature-compensating condenser, C404, was changed to 7.5 $\mu\text{mf.}$, Part No. 30-1224-65.

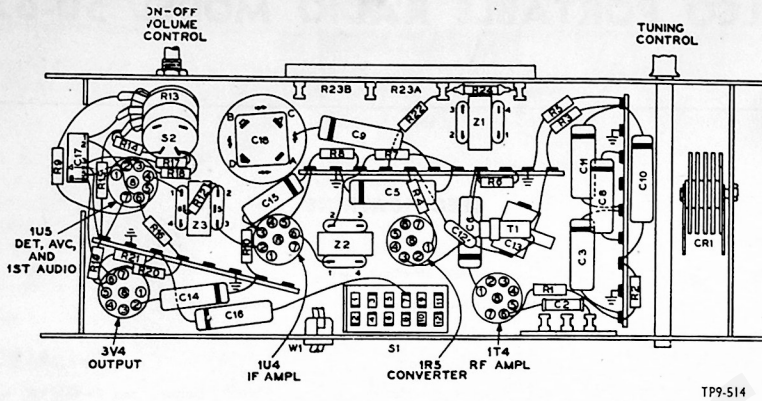


Figure 2. Bottom View, Showing Location of Parts

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts; 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."

Reference Symbol	Description	Service Part No.
C1	Condenser, tuning gang, 3-section	31-2747
C1A	Condenser, aerial trimmer	Part of C1
C1B	Condenser, r-f trimmer	Part of C1
C1C	Condenser, osc. trimmer	Part of C1
C2	Condenser, d-c blocking, 100 μ f.	62-110009001*
C3	Condenser, bias filter, .05 μ f.	61-0122*
C4	Condenser, d-c blocking, 10 μ f.	Part of Z1
C5	Condenser, filament by-pass, .05 μ f.	61-0122*
C6	Condenser, screen by-pass, .05 μ f.	61-0122*
C7	Condenser, neutralization, 1.5 μ f.	30-1221-3
C8	Condenser, a-v-c filter, .05 μ f.	61-0122*
C9	Condenser, filament by-pass, .1 μ f.	61-0113*
C10	Condenser, filament by-pass, .1 μ f.	61-0113*
C11	Condenser, filament by-pass, .05 μ f.	61-0122*
C12	Condenser, d-c blocking, 47 μ f.	30-1224-2*
C13	Condenser, series padder, oscillator	31-6473-16
C14	Condenser, tone compensation, .004 μ f.	61-0179*
C15	Condenser, screen neutralizing, .003 μ f.	61-0109*
C16	Condenser, line by-pass, .04 μ f.	45-3500-2*
C17	Condenser, ceramic, 4-section	30-1237
C17A	Condenser, screen by-pass, .01 μ f.	Part of C17
C17B	Condenser, by-pass, 200 μ f.	Part of C17
C17C	Condenser, d-c blocking, .002 μ f.	Part of C17
C17D	Condenser, d-c blocking, .001 μ f.	Part of C17
C18	Condenser, electrolytic, 4-section	30-2568-26
C18A	Condenser, filament by-pass, 60 μ f.	Part of C18
C18B	Condenser, filter, 30 μ f.	Part of C18
C18C	Condenser, filter, 10 μ f.	Part of C18
C18D	Condenser, filter, 60 μ f.	Part of C18
CR1	Selenium rectifier	
LA1	Loop aerial	32-4052-36
LS1	Speaker, 4-inch, with output transformer	36-1627-9
PL1	Plug and cable, battery	41-3712-5
R1	Resistor, grid return, 1 megohm	66-5108340*
R2	Resistor, a-v-c divider, 4.7 megohms	66-5478340*
R3	Resistor, grid return, 2.2 megohms	66-5228340*
R4	Resistor, grid return, 100,000 ohms	66-4108340*
R5	Resistor, leakage, 150,000 ohms	66-4158340*
R6	Resistor, dropping, 15,000 ohms	66-3158340*
R7	Resistor, grid return, 2200 ohms	66-2228340*
R8	Resistor, grid return, 2200 ohms	66-2228340*
R9	Resistor, a-v-c filter, 4.7 megohms	66-5478340*
R10	Resistor, neutralization, 2200 ohms	66-2228340*
R11	Resistor, a-v-c filter, 4.7 megohms	66-5478340*
R12	Resistor, i-f filter, 100,000 ohms	66-4108340*
R13	Volume control, 1 megohm	33-5566-11
R14	Resistor, diode return, 680 ohms	66-1688340*
R15	Resistor, diode return, 120 ohms	66-1128340*
R16	Resistor, grid return, 4.7 megohms	66-5478340*

Reference Symbol	Description	Service Part No.
R17	Resistor, plate load, 470,000 ohms	66-4478340*
R18	Resistor, screen dropping, 2.2 megohms	66-5228340*
R19	Resistor, grid return, 4.7 megohms	66-5478340*
R20	Resistor, grid return, 2.2 megohms	66-5228340*
R21	Resistor, bias, 680 ohms	66-1688340*
R22	Resistor, filter, 2200 ohms	66-2228340*
R23	Resistor, wire wound 2-section	33-3431-5
R23A	Resistor, filament dropping, 1125 ohms, 3 watts	Part of R23
R23B	Resistor, filament dropping, 1125 ohms, 3 watts	Part of R23
R24	Resistor, wire wound, current limiting, 60 ohms	33-1334
S1	Switch, change-over	42-1899
S2	Switch, on-off	Part of R13
T1	Transformer, oscillator	32-4263-2
T2	Transformer, output	Part of LS1
W1	Line cord	L-2183*
Z1	Transformer, r-f	32-4399A
Z2	Transformer, 1st i-f	32-4160-2A
Z3	Transformer, 2nd i-f	32-4240-6A

MISCELLANEOUS

Description	Service Part No.
Cabinet, complete	
Back	
Baffle	54-7857
Handle assembly	76-4960
Dial-backplate assembly	76-4957
Drive cord, 25-ft. spool	45-8750*
Pointer	56-6513-2FCP
Spring, drive cord	28-8954
Shaft and pulley assembly	76-3671-4
Shield, 1U5 tube	56-5629FA3
Socket, tube, miniature	27-6203

CORRECTIONS TO PARTS LIST

Reference Symbol	Description	Service Part No.
CR1	Selenium rectifier, 100 ma.	34-8003-1
	Cabinet, brown	10781-3
	Cabinet, beige	10781-4
	Cabinet, green	10781-5
	Back, brown	54-4712-3
	Back, beige	54-4712-4
	Back, green	54-4712-5

NOTE: This model completed production without change; Run 1 only.