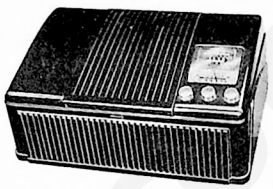
PHILCO RADIO-PHONOGRAPH MODEL 50-1420

SPECIFICATIONS

CABINET	Brown molded bakelite
RADIO CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540—1600 kc.
AUDIO OUTPUT	2 watts
OPERATING VOLTAGES	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	
Radio only	35 watts
Radio-phonograph	50 watts
AERIAL	Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5)	12BE6, 12BA6, 6AQ6, 35L6GT, 50Y7GT
PHONOGRAPH	Philco Automatic Record Changer Model M-9C (for service information see manual PR-1599)



MODEL 50-1420

TP-6527

Circuit Description

Philco Radio-Phonograph Model 50-1420 is a table-model 5-tube superheterodyne radio with a Model M-9C Automatic Record Changer. For service information on the record changer, refer to the Service Manual (PR-1599) for Model M-9C Automatic Record Changer.

Reception is provided on the standard broadcast band.

The built-in loop aerial normally provides adequate signal pickup; however, a terminal is provided for an external aerial, if additional pickup is required.

The loop works directly into a 12BE6 converter; no series padder is required for the oscillator, as the tuning-condenser plates are shaped for tracking.

The i-f stage employs a 12BA6, operating at 455 kc. Both transformers are permeability-tuned in both primary and secondary windings.

The diode section of a 6AQ6 provides detection and a-v-c voltage; the triode section is the 1st audio amplifier, and is resistance-coupled to a 35L6GT beam-power output amplifier, which works into a PM speaker.

The d-c operating voltages are supplied by a voltage-doubling circuit using a 50Y7GT rectifier and a resistance-capacitance filter.

The 120,000-ohm resistor, R103, is connected between B— and the chassis, to prevent hum due to condenser leakage under high-humidity conditions.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, as follows:

Section 1—the power supply
Section 2—the audio circuits
Section 3—the i-f, detector, and a-v-c circuits
Section 4—the r-f and converter circuits

Test points are specified for each section, and are indicated in the sectionalized 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 indications of trouble.

2. Measure the resistance between B+ (pin 4 of the 50Y7GT) and B—, test point B. 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 condenser C102A for leakage or a short. This resistance value, which is much lower than normal, does not represent a quality check of this condenser; 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

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 (audio circuits); if not, isolate and correct the trouble in this section.

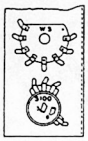
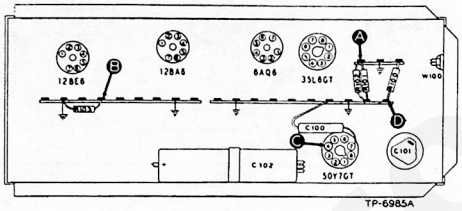


Figure 1. Bottom View, Showing Section 1 Test Points



STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	120 volts		Trouble in this section. Isolate by the following tests.
2	C	212 volts	No voltage	Defective: 50Y7GT, I100. Shorted: C100, C101, C102A.
			Low voltage	Leaky: C100, C101, C102A.
			High voltage	Open: R100.
3	D	205 volts	No voltage	Defective: 50Y7GT. Shorted: C102B. Open: R100.
			Low voltage	Leaky: C102B.
			High voltage	Open: R101, R102, T200*.
4	A	120 volts	No voltage	Shorted: C102C. Open: R101 and R102 (in parallel).
			Low voltage	Leaky: C102C.

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

Section 2—Audio Circuits

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, and the radio-phono switch as indicated in the chart.

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.

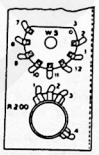
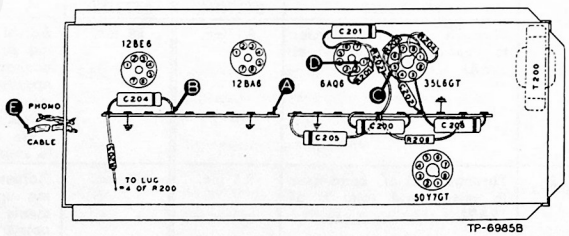


Figure 2. Bottom View, Showing Section 2 Test Points



STEP	TEST POINT	RADIO-PHONO SWITCH	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a)	A	Radio	Loud, clear speaker output with moderate generator input.	Trouble in this section. Isolate by the following tests.
1 (b)	E	Phono		
2	C	Radio	Clear output with strong input.	Defective: LS200, 35L6GT. Shorted: T200, C203, C201, C204, C202. Open: T200, R204, R205, R203. Leaky: C203.
3	D	Radio	Loud, clear output with moderate input.	Defective: 6AQ6. Shorted: C200, C205. Open: C201, R202, R201, R206. Leaky: C201.
4	A	Radio	Loud, clear output with moderate input.	Open: R200 (rotate), C200, WS. Shorted: WS.
5	E	Phono	Same as step 4.	Open or shorted: WS.
Listening Test: Distortion may be caused by leaky C201. Distortion on strong signals may be caused by shorted or leaky C200.				

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

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, and the radio-phono switch to the radio position. Rotate the tuning control until the tuning condenser is fully meshed.

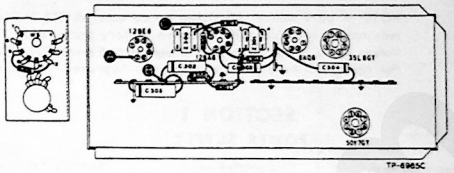


Figure 3. Bottom View, Showing Section 3 Test Points

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.

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	C	Loud, clear output with strong input.	Defective: 12BA6, 6AQ6. Shorted: C300B, C301A, C301B, C301C, C301D, C303, C304, WS, L300B, L301A, L301B. Open: R302, R303, R304, R305, L300B, L301A, L301B, R301, C301A, C301B. Leaky: C303, C304. Misaligned: Z301.
3	A	Loud, clear output with weak input.	Defective: 12BE6*. Shorted: C400A*, C400B*, C300A, L300A, L300B, C302. Open: L300A, R300, C300A, C300B. Misaligned: Z300.

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

Section 4—R-F and Converter Circuits

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, and the radio-phono switch to the radio position. 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.

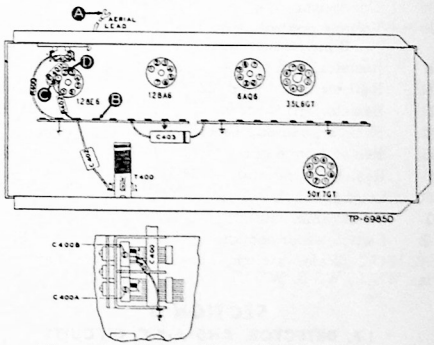


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
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	C—D Osc. Test (see note below).		Rotate through range.	Negative 1.8 to 3.2 volts.	Defective: 12BE6. Shorted: C400, C400B, C402, C401, L400A, L400B. Open: C402, L400A, L400B, R401, R402.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Shorted: LA400, C400, C400A. Open: LA400, C404.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to the oscillator cathode (pin 2 of 12BE6), test point D; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 1 of 12BE6), 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.

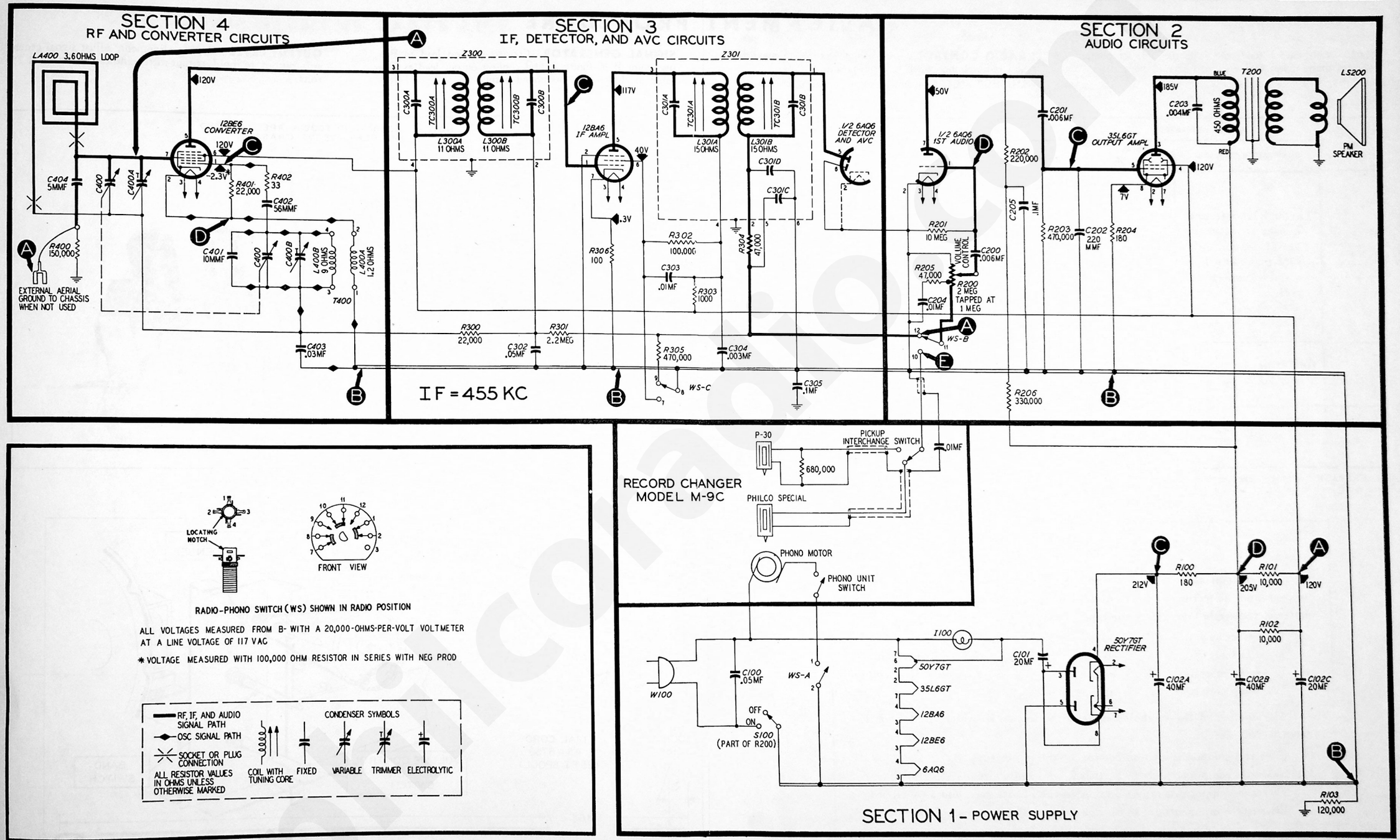


Figure 5. Philco Model 50-1420, Sectionalized Schematic Diagram, Showing Test Points

ALIGNMENT PROCEDURE

DIAL—With tuning condenser fully meshed, set pointer to index mark at low-frequency end of dial, beyond "55".

RADIO CONTROLS—Set volume control to maximum, and radio-phono switch to radio position.
OUTPUT METER—Connect to voice-coil terminals.

SIGNAL GENERATOR—Connect ground lead to B—, test point B in figure 4, and connect output lead as indicated in chart. Use modulated output.

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

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-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.	TC301B—2nd i-f sec. TC301A—2nd i-f pri. —SEE NOTE TC300B—1st i-f sec. TC300A—1st i-f pri. —SEE NOTE
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum output.	C400B—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output.	C400A—aerial

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

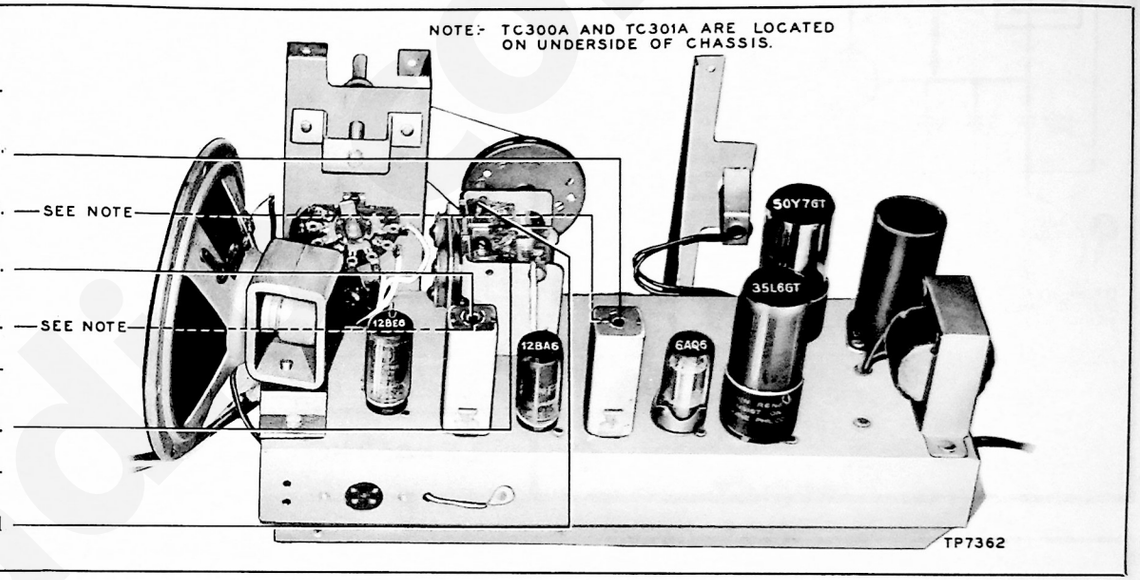


Figure 6. Top View, Showing Trimmer Locations

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	LS—loud-speaker	W—wire or cable
I—pilot lamp	R—resistor	WS—wafer switch
L—choke or coil	S—switch	Z—electrical assembly
LA—loop aerial	T—transformer	

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

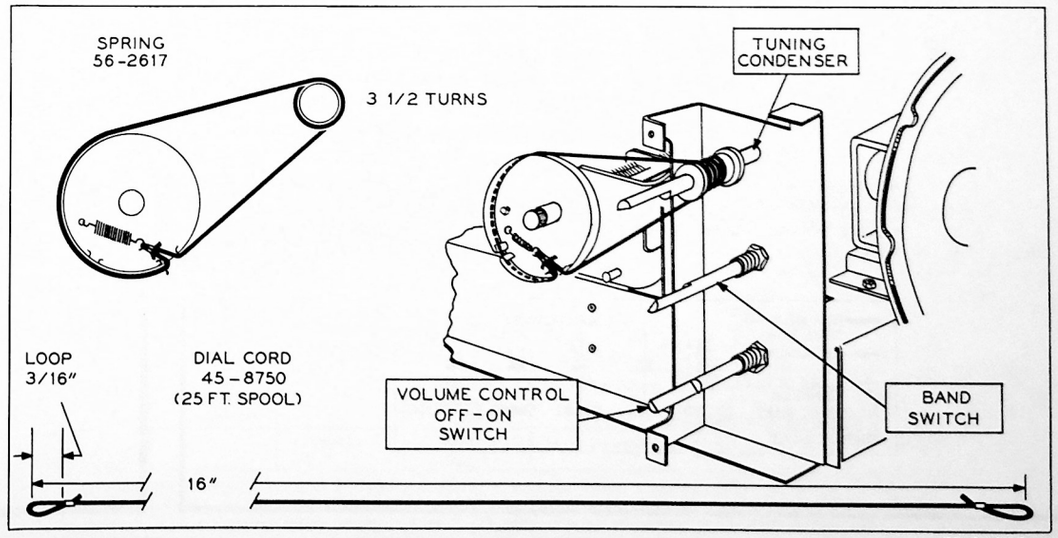


Figure 7. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

NOTE: A part number identified by an asterisk (*) indicates a general replacement item. The part numbers of these items may not be identical with those on factory parts; also, the electrical values of some replacement items may differ from the values given 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, .05 mf.	
C101	Condenser, electrolytic, filter, 20 mf.	30-2568-22
C102	Condenser, electrolytic, 3-section	30-2575-26
C102A:	Condenser, filter, 40 mf.	Part of C102
C102B:	Condenser, filter, 40 mf.	Part of C102
C102C:	Condenser, filter, 20 mf.	Part of C102
I100	Pilot lamp	34-2605
R100	Resistor, filter, 180 ohms	66-1184340*
R101	Resistor, filter, 10,000 ohms	66-3103340*
R102	Resistor, filter, 10,000 ohms	66-3103340*
R103	Resistor, isolating, 120,000 ohms	66-4123340*
S100	Switch, power on-off	Part of R200
W100	Line cord and plug	L2183*
WS-A	Switch-wafer section	Part of 42-1847-1†

SECTION 2
AUDIO CIRCUITS

C200	Condenser, d-c blocking, 006 mf.	45-3500-7*
C201	Condenser, d-c blocking 006 mf.	45-3500-7*
C202	Condenser, r-f by-pass, 220 mmf.	
C203	Condenser, tone compensation, .004 mf.	
C204	Condenser, tone compensation, .01 mf.	61-0120*
C205	Condenser, by-pass, .1 mf.	61-0113*
R200	Volume control (with power on-off switch), 2 megohms, tapped at 1 megohm	33-5535-15
R201	Resistor, grid return, 10 megohms	66-6103340*
R202	Resistor, plate load, 220,000 ohms	66-4223340*
R203	Resistor, grid return, 470,000 ohms	66-4473340*
R204	Resistor, cathode bias, 180 ohms	66-1183340*
R205	Resistor, tone compensation, 47,000 ohms	66-3473340*
R206	Resistor, dropping, 330,000 ohms	66-4333340*
LS200	Loud-speaker, PM	36-1625-3
T200	Transformer, output	32-8382
WS-B	Switch-wafer section	42-1847-2

† 42-1847-1 Wafer switch, single wafer, radio-phono (includes WS-A, WS-B, WS-C).

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

C300A	Condenser, fixed, 1st i-f primary	Part of Z300
C300B	Condenser, fixed, 1st i-f secondary	Part of Z300
C301A	Condenser, fixed, 2nd i-f primary	Part of Z301
C301B	Condenser, fixed, 2nd i-f secondary	Part of Z301
C301C	Condenser, fixed, i-f filter	Part of Z301
C301D	Condenser, fixed, i-f filter	Part of Z301
C302	Condenser, a-v-c filter, .05 mf.	61-0122*
C303	Condenser, screen by-pass, .01 mf.	61-0120*
C304	Condenser, plate by-pass, .003 mf.	61-0109*
C305	Condenser, r-f by-pass, .1 mf.	61-0113*
R300	Resistor, a-v-c filter, 22,000 ohms	66-3223340*
R301	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R302	Resistor, screen dropping, 100,000 ohms	66-4103340*
R303	Resistor, plate dropping, 1000 ohms	66-2103340*
R304	Resistor, a-v-c filter, 47,000 ohms	66-3473340*
R305	Resistor, diode load, 470,000 ohms	66-4473340*
R306	Resistor, bias, 100 ohms	66-1103340*
TC300A	Tuning core, 1st i-f primary	Part of Z300

SECTION 3 *(Cont.)*

Reference Symbol	Description	Service Part No.
TC300B	Tuning core, 1st i-f secondary	Part of Z300
TC301A	Tuning core, 2nd i-f primary	Part of Z301
TC301B	Tuning core, 2nd i-f secondary	Part of Z301
WS-C	Switch-wafer section	Part of 42-1847-1†
Z300	Transformer, 1st i-f	
Z301	Transformer, 2nd i-f	

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2727-6
C400A:	Condenser, trimmer, aerial	Part of C400
C400B:	Condenser, trimmer, oscillator	Part of C400
C401	Condenser, ceramic, 10 mmf.	30-1224-6
C402	Condenser, ceramic, 56 mmf.	60-00515307*
C403	Condenser, r-f by-pass, .03 mf.	45-3500-1*
C404	Condenser, aerial coupling, 5 mmf.	60-90505007*
LA400	Loop aerial	32-4375
R400	Resistor, leakage, 150,000 ohms	66-4153340*
R401	Resistor, grid return, 22,000 ohms	66-3223340*
R402	Resistor, parasitic suppressor, 33 ohms	66-0333340*
T400	Transformer, oscillator	32-4190-3

† 42-1847-2 Wafer switch, single wafer, radio-phono (includes WS-A, WS-B, WS-C).

MISCELLANEOUS

Description	Service Part No.
Bracket, scale	56-6500FA3
Cabinet and Cabinet Parts	
Baffle-and-cloth assy.	40-7640
Cabinet	10734
Foot, mtg. (4)	54-4645-1
Knob (3)	54-4557
Window, acetate	54-4665
Dial Scale and Hardware	
Dial cord (25-ft. spool)	45-8750
Pointer-and-spring assy.	
Scale	54-5047
Shaft assy., drive	76-4477
Spring, gang drive	56-2617
Pilot-lamp-socket assy.	76-1179-1
Reflector, pilot light	
Shield, tube	56-3979PA5
Socket, octal (2)	27-6174
Socket, miniature (3)	27-6226
Socket, test	
Speed nut, changer mtg. (3)	1W60083FE7
Spring, changer mtg. (6)	56-3043PA15

CORRECTIONS TO PARTS LIST

Reference Symbol	Description	Service Part No
C100	Condenser, line filter, .05 μf.	61-0137
C202	Condenser, r-f by-pass, 220 μμf.	62-122001001*
C203	Condenser, tone compensation, .004 μf.	61-0174
Z300	Transformer, 1st i-f	32-4160A
Z301	Transformer, 2nd i-f	32-4240A
	Pointer and spring ass'y	56-5956FCP
	Reflector, pilot light	56-6307-1FA3
	Socket, test	27-6214-1