Philco Radio & Television Corp.

	Model: 49-1401	Chassis:	Year: Pre 1951
	Power:	Circuit:	IF:
	Tubes:		
	Bands:		

Resources
Riders Volume 20 - PHILCO 20-84
Riders Volume 20 - PHILCO 20-85
Riders Volume 20 - PHILCO 20-86
Riders Volume 20 - PHILCO 20-87
Riders Volume 20 - PHILCO 20-88
Riders Volume 20 - PHILCO 20-89

MODEL 49-1401

Circuit Description

Philco Model 49-1401 is a table-model radio-phonograph combination consisting of a 5-tube superheterodyne, which provides reception on the standard broadcast band, and a Philco Model M-7 Automatic Record Player. The built-in loop aerial normally provides adequate signal pickup. However, a terminal has been provided for connecting an external aerial, if required.

The loop works directly into a 12BE6 converter, where the incoming signal is converted to the 455-kc. intermediate frequency. The oscillator section of the tuning-condenser gang has a specially shaped rotor, to provide proper tracking without the use of a series padding condenser. The converter is transformer-coupled to a 12BA6 i-f amplifier, which, in turn, is transformer-coupled to the diode section of a 6AQ6. Both i-f transformers have permeability-tuned primary and secondary windings. The diode section of the 6AQ6 acts as a detector, and also provides a-v-c voltage, which is applied to the grids of the converter and the i-f amplifier. The triode section of the 6AQ6, the first audio amplifier, is resistance-coupled to a 35L6GT beam-power-output amplifier, which supplies approximately 2 watts of audio power to a p-m dynamic speaker.

The d-c operating voltages are furnished by a voltage-doubler circuit employing a 50Y6GT rectifier and a resistor-condenser filter. Resistor R103 is connected between B– and the chassis to prevent hum due to condenser leakage under high-humidity conditions.

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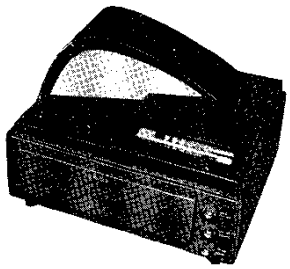

SPECIFICATIONS

CABINET	Wood, mahogany finish with black plastic top
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, 50Y6GT

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 sources of trouble.

2. Measure the resistance between B+, pin 4 of the 50Y6GT, 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

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

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.

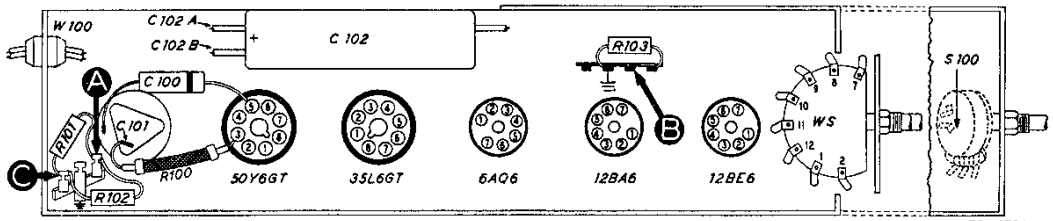

Figure 1. Bottom View, Showing Section 1 Test Points TP-5379A

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	110v		Trouble in this section. Isolate by the following tests.
2	C	200v	No voltage	Defective: 50Y6GT. Open: W100, S100, R100, C101. Shorted: C100.
			Low voltage	Defective: 50Y6GT. Open: C102A. Leaky: C102A, C101. Shorted: C101.
			High voltage	Open: R101, R102, C102B, R204*, T200*.
3	A	110v	No voltage	Shorted: C102B. Open: R101 and R102.
			Low voltage	Leaky: C102B. Shorted: C304. Open: R101, R102.
Listening Test: Abnormal hum may be caused by open or leaky C102A or C102B.				

*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.

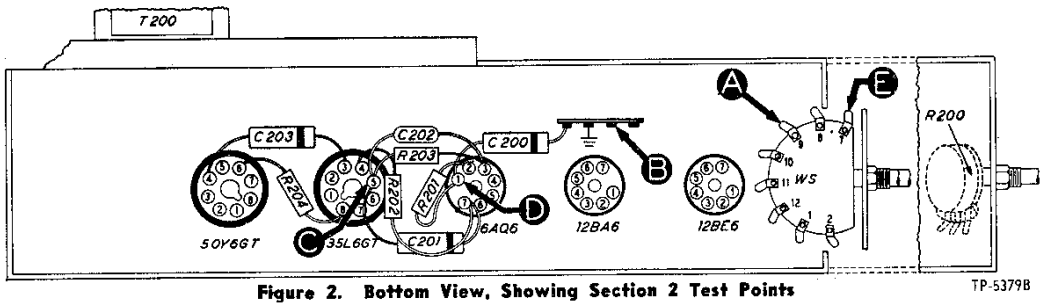

Figure 2. Bottom View, Showing Section 2 Test Points TP-5379B

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, C202. Open: T200, R204, R203. Leaky: C203.
3	D	Radio	Loud, clear output with moderate input.	Defective: 6AQ6. Shorted: C200. Open: C201, R202, R201. 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.				

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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.

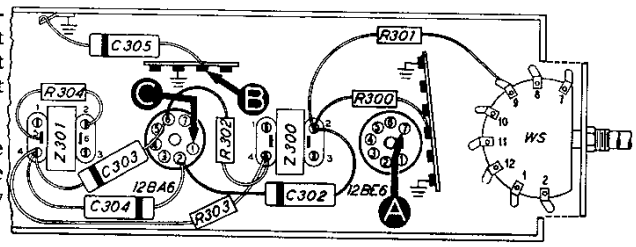

Figure 3. Bottom View, Showing Section 3 Test Points

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 converter in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the converter 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, 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.

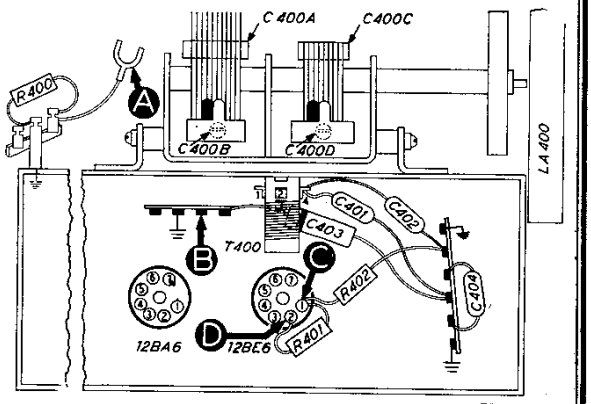

Figure 4. Bottom View, Showing Section 4 Test Points

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 4 to 5 volts.	Defective: 12BE6. Shorted: C400C, C400D, C402, C401, L400A, L400B. Open: C402, L400A, L400B, R401, R402.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Shorted: LA400, C400A, C400B. 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.

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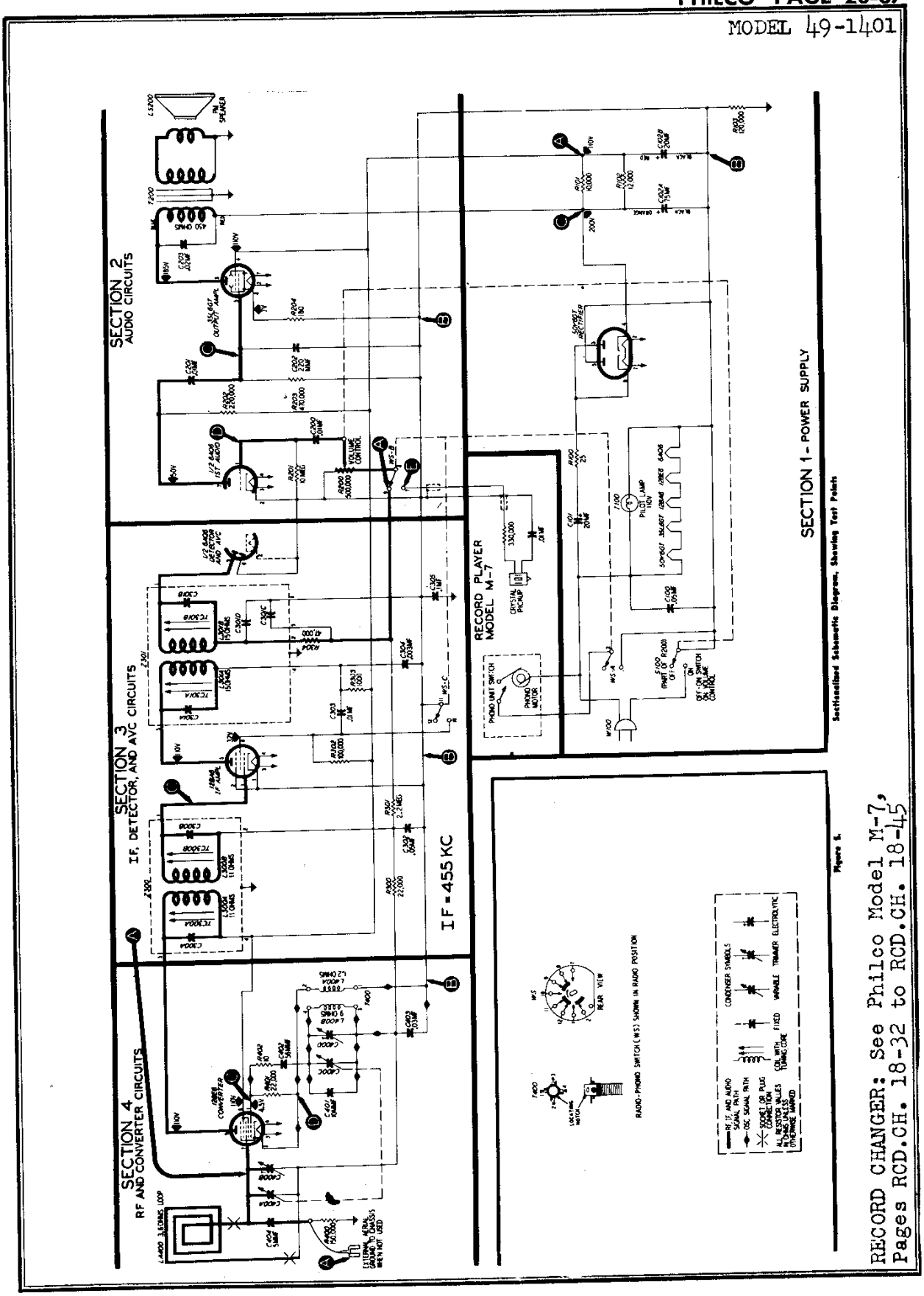

Schematic and Schematic Diagram, Showing Test Points

Figure 6.

RECORD CHANGER: See Philco Model M-7,
Pages RCD.CH. 18-32 to RCD.CH. 18-45

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, and radio-phono switch to radio position.
OUTPUT METER — Connect to terminals indicated in figure 6.

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 maintain 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. 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.	C400B aerial

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.

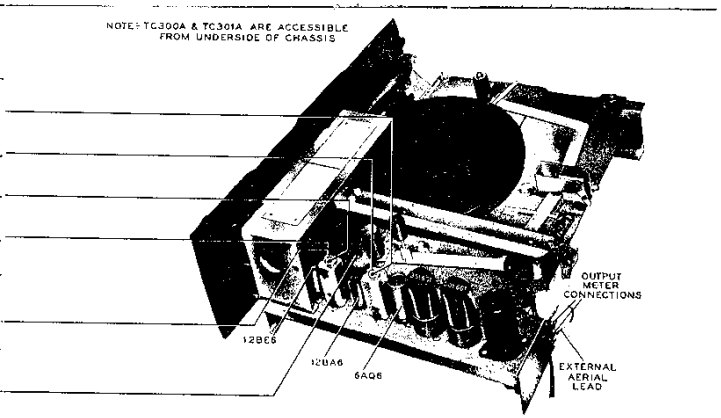

Figure 6. Top View, Showing Trimmer Locations

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial-calibration and alignment points should be marked on the dial backplate, below the pointer.

The method of measuring for these points is illustrated in figure 7. Hold a ruler against the backplate, with the start of the ruler at the reference line shown, and mark pencil dots at the proper points for the required frequency settings. When the ruler is correctly placed, the index mark is approximately 2-3/8 inches from the reference point indicated 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.

After installing the chassis in the cabinet, the dial pointer should be moved to coincide with the index mark on the dial. Coincidence of the pointer and index mark should occur with the tuning condenser fully meshed.

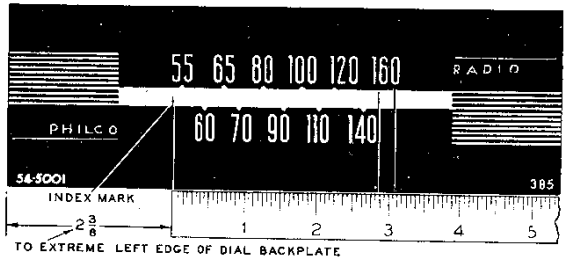

Figure 7. Dial-Backplate Calibration Measurements

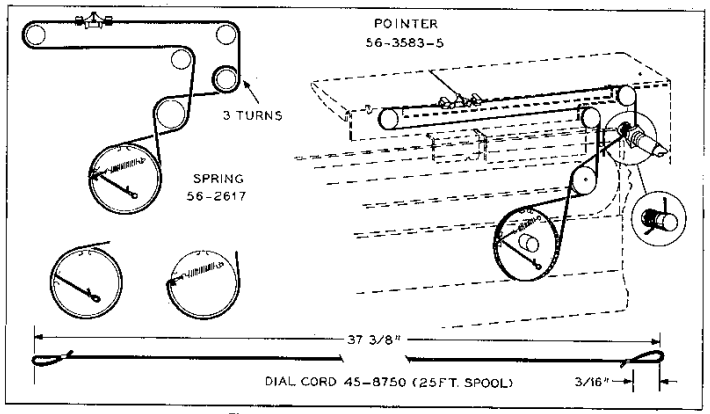

Figure 8. Drive-Cord Installation Details

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

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

REPLACEMENT PARTS LIST

NOTE: Parts 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 replacement 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.	61-0170*
C101	Condenser, filter, electrolytic, 20 mf., 200v	30-2568-22
C102	Condenser, electrolytic, two-section	30-2575-20
C102A	Condenser, filter, 75 mf., 250v	Part of C102
C102B	Condenser, filter, 20 mf., 250v	Part of C102
I100	Pilot lamp	32-2605*
R100	Resistor, current limiting, 25 ohms	33-1334-5
R101	Resistor, filter, 10,000 ohms	66-3104340*
R102	Resistor, filter, 12,000 ohms	66-3124340*
R103	Resistor, isolating, 120,000 ohms	66-4123340*
S100	Switch, off-on power	Part of 33-5538-30
W100	Line-cord-and-plug assembly	L-2183*
WS-A	Switch-wafer section	Part of 42-1847†

SECTION 2
AUDIO CIRCUITS

C200	Condenser, d-c blocking, .01 mf.	61-0120*
C201	Condenser, d-c blocking, .01 mf.	61-0120*
C202	Condenser, r-f by-pass, 220 mmf.	62-122001001*
C203	Condenser, tone compensation, .02 mf.	61-0108*
R200	Volume control, 500,000 ohms	33-5538-30
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
LS200	Loud-speaker, p-m	45-0002*
T200	Transformer, output	32-8351
WS-B	Switch-wafer section	Part of 42-1847†

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, i-f filter	Part of Z301
C301D	Condenser, 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, 1,000 ohms	66-2103340
R304	Resistor, a-v-c filter, 47,000 ohms	66-3473340
WS-C	Switch-wafer section	Part of 42-1847†
Z300	Transformer, 1st i-f	32-4160
Z301	Transformer, 2nd i-f	32-4240

SECTION 4
R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C400	Condenser, tuning gang	31-2727
C400A	Condenser, tuning, aerial section	Part of C400
C400B	Condenser, trimmer, aerial	Part of C400
C400C	Condenser, tuning, oscillator section	Part of C400
C40 D	Condenser, trimmer, oscillator	Part of C400
C401	Condenser, ceramic, 10 mmf.	30-1224-26
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	76-2127-7
R400	Resistor, leakage, 150,000 ohms	66-4103340
R401	Resistor, grid return, 22,000 ohms	66-3223340
R402	Resistor, parasitic suppressor, 10 ohms	66-0103340
T400	Transformer, oscillator	32-4190-2

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

MISCELLANEOUS

Description	Service Part No.
Cabinet and Cabinet Parts	
Baffle-and-cloth assembly	40-7504
Bracket, baffle-and-cloth mounting, 4 required	56-5466
Bracket, front top rail	56-5469FA3
Cabinet base, wood	10707
Cabinet top, plastic	54-4536
Connecting bar	76-2111
Cover, plastic top	54-4536
Dial scale	54-5001
Dial-scale strap	56-5465
Door	219113
Fastener, back	56-5476FA9
Fastener, front	56-5467FA3
Dial-Scale Hardware	
Dial cord, 25-foot spool	45-8750*
Panel, diffusing	54-7553
Pointer	56-3583-5
Shaft assembly	76-3731
Spring, diffusing panel, 2 required	56-3841
Spring, drive cord	56-2617
Clip, coil mounting	28-5002FCP
Knob, 3 required	54-4527-3
Panel, front	76-3741
Pin, door hinge, 2 required	56-5461FA15
Rail, record player	56-5464
Shield, tube	56-3979FA5
Socket, miniature	27-6226
Socket, octal	27-6174
Socket assembly, pilot lamp	27-8233-17