



## Philco Radio & Television Corp.

	<b>Model:</b> <a href="#">49-1609</a>	<b>Chassis:</b>	<b>Year:</b> <a href="#">Pre 1951</a>
	<b>Power:</b>	<b>Circuit:</b>	<b>IF:</b>
	<b>Tubes:</b>		
	<b>Bands:</b>		

### Resources

[Riders 20 \(XX\) PHILCO 20-103](#)

[Riders 20 \(XX\) PHILCO 20-104](#)

[Riders 20 \(XX\) PHILCO 20-105](#)

[Riders 20 \(XX\) PHILCO 20-106](#)

[Riders 20 \(XX\) PHILCO 20-107](#)

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[Riders 20 \(XX\) PHILCO 20-110](#)

[Riders 20 \(XX\) PHILCO 20-111](#)

[Riders 20 \(XX\) PHILCO 20-112](#)

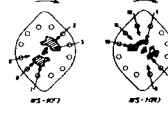
[Riders 20 \(XX\) PHILCO 20-113](#)

## SECTION



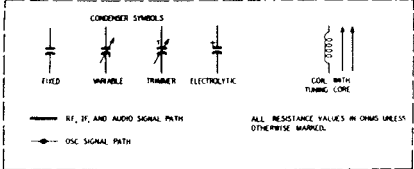
FROM MOTOR

PHONE NUMBER

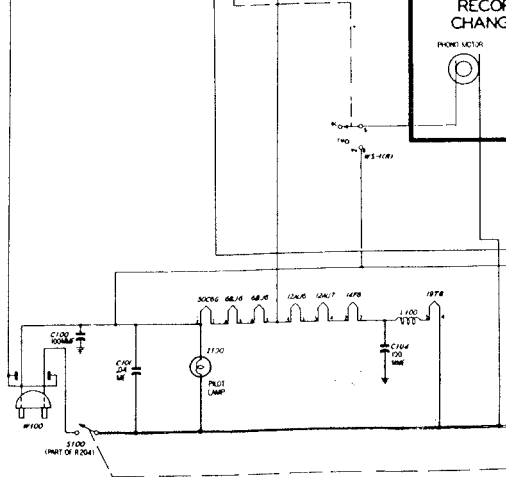


1. ALL VOLTAGES MEASURED FROM AUDIO GND.
2. THE RESISTANCE OF ALL COILS IS LESS THAN 1 OHM UNLESS OTHERWISE SPECIFIED.
3. ALL VOLTAGES MEASURED WITH 1 OHM VOLTAGE OF 117V.

IF1 INDICATES FRONT CONTACTS LOOKING FROM FRONT  
 IF2 INDICATES REAR CONTACTS LOOKING THROUGH FROM FRONT  
 WAFER SWITCH SHOWN IN BROADCAST POSITION WITH CHASSIS INVERTED



ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE MARKED.



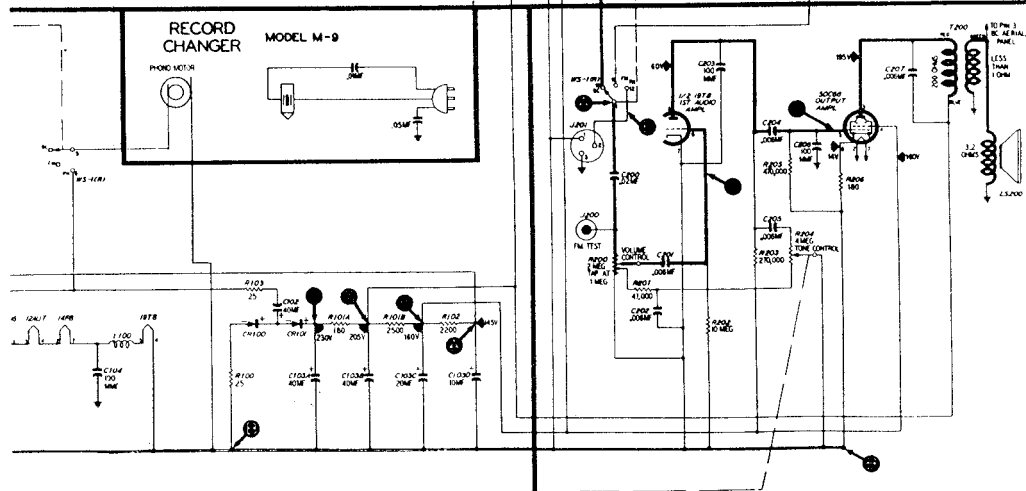
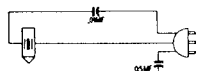
SECTION 1  
POWER SUPPLY

RECORD CHANGER: For Model 49-1606, See Philco Model M-9,  
Pages RCD.CH. 19-18 through RCD.CH. 19-34.

SECTION 3 - IF, DETECTOR, AND AVC



MODEL M-9



SECTION 1  
POWER SUPPLY

## SECTION 2-AUDIO

RECORD CHANGER: For Models 49-1609, 49-1611, See Philco Model M-9C, Pages RCD.CH. 19-35 to RCD.CH. 19-54.

MODELS 49-1606,  
49-1609, 49-1611

### Circuit Description

Philco Model 49-1606 is a console-model radio-phonograph, which provides reception on the standard-broadcast and FM bands. The radio is a seven-tube superheterodyne, with two selenium rectifiers incorporated in the power supply.

A built-in, high-impedance loop aerial for the broadcast band and a line-cord aerial for the FM band normally provide adequate signal pickup; if additional pickup is required, Philco Dipole Aerial, Part No. 45-1462, may be used. When connecting the dipole aerial, disconnect the black lead from terminal 2 of TB400, and attach this lead to pin 1 of the dipole-aerial plug, which fits into J400. No additional coupler is required.

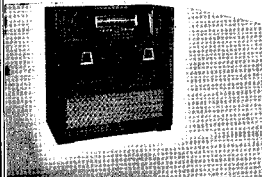
To eliminate complicated switching and to provide better stability and greater gain on both bands, separate converter tubes are used for broadcast and FM reception. A 12AU6 high-gain pentode is used in a tuned r-f amplifier on the FM band. The output of this tube is fed to the 14F8 dual triode, which functions as the converter for the FM signal. A 12AU7 dual triode is used as the converter for the broadcast signal. Band switching is accomplished by means of a single-wafer switch, which connects the B+ voltage to the proper mixer plate.

A 6BJ6 tube is used in each of the two i-f amplifier stages. Two sets of i-f transformers are used—one set is tuned to 455 kc. for broadcast, and the other set is tuned to 9.1 mc. for FM. The use of two sets of i-f transformers makes better shielding possible, so that undesirable beat signals and interaction between transformers are eliminated.

Two diode sections of a 19T8 triple-diode-triode are used in a ratio-detector circuit, for detection of FM signals. The other diode section is used in a half-wave rectifier circuit, for detection of AM (broadcast) signals and to provide a-v-c action.

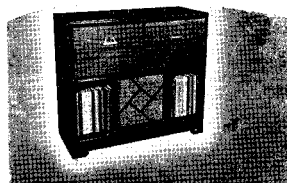
The triode section of the 19T8 functions as the first audio amplifier. The output of this stage is resistance-coupled to a 50C6G output tube, which is transformer-coupled to the permanent-magnet speaker.

Two selenium rectifiers are used in a half-wave voltage-doubler circuit, to supply the B+ voltage.



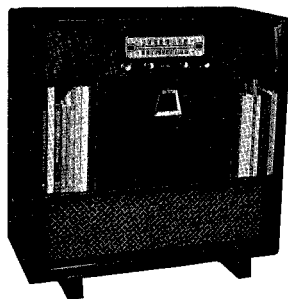
MODEL 49-1611

TP-4233A



MODEL 49-1609

TP-4330A



TP-5869B

MODEL 49-1606

### SPECIFICATIONS

CABINET	Wood console, mahogany and blonde walnut
CIRCUIT	Seven-tube superheterodyne plus rectifiers
FREQUENCY RANGES	
Broadcast	540—1620 kc.
FM	88—108 mc.
AUDIO OUTPUT	5 watts
OPERATING VOLTAGE	105—125 volts, 60 cycles, a.c.
POWER CONSUMPTION	
Radio	65 watts
Phonograph	85 watts
AERIALS	Built-in, low-impedance loop for broadcast; line-cord aerial for FM
INTERMEDIATE FREQUENCY	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES (7)	12AU6, 12AU7, 14F8, 6BJ6(2), 19T8, 50C6G, selenium rectifier (2)
PHONOGRAPH	Philco Automatic Record Changer Model M-9.

### GENERAL INFORMATION

The radio chassis of these two models are electrically and mechanically identical to that of Model 49-1606. The record changer used is a Model M-9C (see diagram below); for record changer service information, refer to Service Manual PR-1599.

Each model is housed in a different type of cabinet. Therefore, the loop aerials are of different dimensions. (The aerial circuits are electrically the same.)

MODELS 49-1606,  
49-1609, 49-1611

## SPECIFICATIONS

CABINET ..... Wood console: Model 49-1609, walnut or light finish; Model 49-1611, mahogany finish

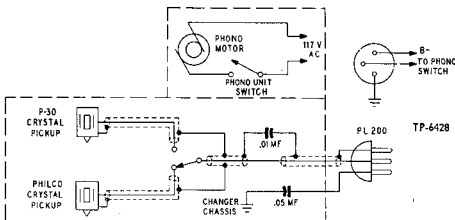
AERIALS ..... Semi-high-impedance loop; line-cord FM aerial; connector for external aerial

POWER CONSUMPTION:  
Radio ..... 40 watts  
Phonograph ..... 20 watts

PHONOGRAPH ..... Philco Automatic Record Changer, Model M-9C (for service information, refer to Service Manual PR-1599)

### Preliminary Checks

Measure the resistance between B+, test point C, 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 2500 ohms, check condensers C103A, C103B, and C316 for leakage or shorts. The resistance value given is much lower than normal, and 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 checks of Section 1 (power supply) are performed.



MODELS 49-1606,  
49-1609, 49-1611

## Section 2

TROUBLE SHOOTING  
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 volume control to maximum, and turn the tone control to the midpoint of its range. Set the band

switch to the broadcast position for test points A, C, and D, and to the phono position for test point E.

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.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A E	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong input.	Defective: 50C6G, LS200. Open: T200, R205, R206. Shorted: C206, C207, T200.
3	D	Same as step 1.	Defective: 19T8. Open: C204, R202, R203. Shorted: C203, C205 (rotate R204), C204.
4	A	Same as step 1.	Open: R200 (rotate through range), C200, C201, WS-1 (R). Shorted: C200, C201, C305D.
5	E	Same as step 1.	Open: WS-1 (R).
Listening Test: Distortion may be caused by shorted or leaky C201 or C204. Distortion on strong signals may be caused by leaky or shorted C200.			

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

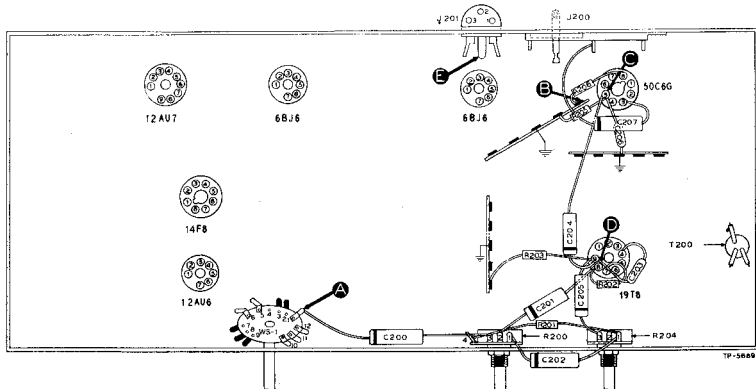


Figure 2. Bottom View, Showing Section 2 Test Points

## Section 3

TROUBLE SHOOTING  
I-F, DETECTOR, AND A-V-C CIRCUITS

## AM Circuits

For the following tests, 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 volume control to maximum, and turn the tone control to the midpoint of its range. Set the radio-phono switch to the radio position, and rotate the tuning control until the tuning condenser is fully meshed.

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 the "POSSIBLE CAUSE OF ABNORMAL INDICATION."

MODELS 49-1606,  
49-1609, 49-1611

## Section 3 (Cont.) TROUBLE SHOOTING

### I-F, DETECTOR, AND A-V-C CIRCUITS

#### AM Chart

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in AM circuits. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 6BJ6 (2nd i-f amplifier), 19T8 (diode section). Open: Z302, Z303, Z304, Z305, R307, R308, R309, R310, R311, WS-1 (F). Shorted: Z302, Z303, Z304, Z305, C314, C315, C316, C319. Misaligned: Z305.
3	D	Loud, clear output with moderate input.	Defective: 6BJ6 (1st i-f amplifier). Open: R303, R304, R305, R306, Z300, Z301, Z302, Z303. Shorted or leaky: C308, C310, Z300, Z301, Z302, Z303. Misaligned: Z303.
4	A	Same as step 1.	Defective: 12AU7. Open: Z301, R301, R302, R408*, R411*, R412*, WS-1 (F). Shorted or leaky: C307, Z301. Misaligned: Z301.

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

#### FM Circuits

The following tests are also made with an AM r-f signal generator, using modulated output.

Observe the instructions preliminary to the tests for the AM circuits, with these exceptions: Set the band switch to the FM position. Set the signal-generator frequency to 9.1 mc., and detune to one side or the other until a satisfactory test signal is obtained.

The best indication of satisfactory FM-detector operation is the ability of this circuit to take the alignment properly (see page 11).

The parts which were found to be satisfactory for AM operation, with the exception of those indicated in the chart, will usually be satisfactory for FM operation.

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 the FM circuits.

#### FM Chart

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	E	Loud, clear speaker output with weak generator input.	Trouble in FM circuits. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 6BJ6 (2nd i-f amplifier), 19T8 (diode sections). Open: Z304, C317, C318, C320, C321, C322, C323, R312, R313, R314, WS-1 (R)*. Shorted: Z304, C317, C318, C320, C321, C322, C323, WS-1 (R)*. Misaligned: Z304.
3	D	Loud, clear output with moderate input.	Defective: 6BJ6 (1st i-f amplifier). Misaligned: Z302. Shorted: Z302.
4	E	Same as step 1.	Defective: 14F8*. Open: Z300, R300, R405*, R410*, L402*, WS-1 (F). Shorted: C306, C420*, C328, Z300, WS-1 (F). Misaligned: Z300.

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

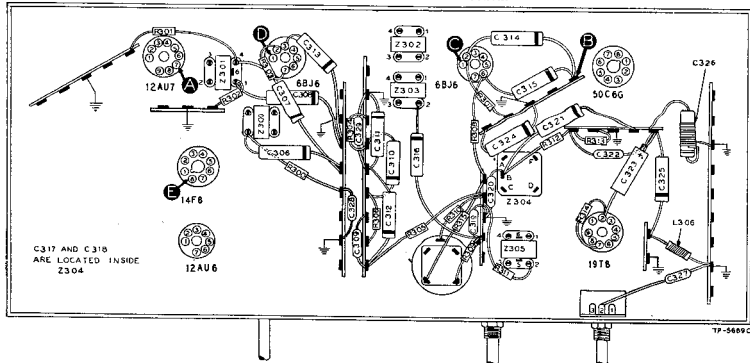


Figure 3. Bottom View, Showing Section 3 Test Points

MODELS 49-1606,  
49-1609, 49-1611

## Section 4

# TROUBLE SHOOTING R-F AND CONVERTER CIRCUITS

## AM Circuits

For the tests in this section, with the exception of the oscillator test, use an AM 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 volume control to maximum, and turn the tone control to the midpoint of its range. Set the band switch to the broadcast position, and set the tuning control and the signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in the AM circuits. If the trouble is not revealed by the tests for this section, check the alignment.

## FM Circuits

The following tests are also made with an AM r-f signal generator, using modulated output. Observe the instructions preliminary to the tests for the AM circuits with the following exceptions:

Set the band switch to the FM position.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in the FM circuits.

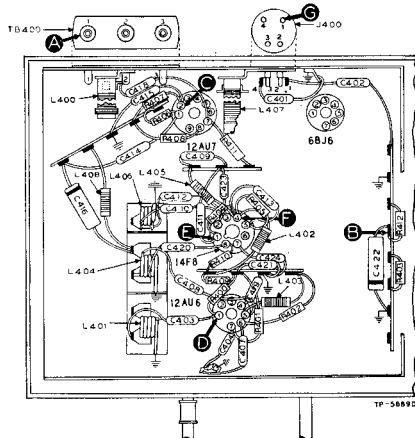


Figure 4. Bottom View, Showing Section 4 Test Points

## AM Chart

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 AM circuits. Isolate by the following tests.
2	C (Osc. test; see note below.)		Tune through range.	Negative 2 to 2.5 volts.	Defective: 12AU7 (osc. section). Shorted: C414, C415, C400, C405B, C417, L407. Open: C414, C416, L408, L407, R412, R407, R408.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Defective: 12AU7 (mixer section). Open: L400, C418, R411, R408. Shorted: C400, C405A, C406, C417.

**OSCILLATOR TEST:** Connect the positive lead of a high-resistance voltmeter to B-, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 2 of 12AU7), test point C. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage of approximately the value given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

## FM Chart

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	G	100 mc.	Tune to signal.	Loud, clear speaker output with weak generator input.	Trouble in FM circuits. Isolate by the following tests.
2	E to F (Osc. test; see note below.)		Tune through range.	Negative 1 to 1.5 volts.	Defective: 14F8 (osc. section). Open: R412, L402, L406, L405, C412, R404, C410, R403. Shorted: C400, C400C, L405, C411, C412, C423, C424, C410, C409.
3	D	100 mc.	Tune to signal.	Same as step 1.	Defective: 12AU6. Open: L403, R402, R409, R401, R400, C408, L404, C420, R410, R405, C413. Shorted: C405, C404, C407, C408, L404, C400B, C400, C420.
4	G	100 mc.	Tune to signal.	Same as step 1.	Open: C402, L401, C403. Shorted: L401, C400A, C400, C403.

**OSCILLATOR TEST:** Connect the positive lead of a high-resistance voltmeter to test point F; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 2 of 14F8), test point E. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage of approximately the value given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.



MODELS 49-1606,  
49-1609, 49-1611

# REPLACEMENT PARTS LIST

Model 49-1609  
Replacement parts are the same as those in Model 49-1606, with the exception of LA600 and the MIS

CELLANEONS parts listed below.

Symbol	Description	Service Part No.
LA600	Loop assembly	76-3583-10
	Model 49-1609	76-3583-10
	Model 49-1611	76-3583-10

## MISCELLANEOUS

Description	Service Part No.
Crystal pickup cartridge, P-30	36-2671-1
Needle for P-30 crystal	36-2670
Crystal pickup cartridge, Philco Special	36-2667
Needle for Philco Special crystal	36-2670
Model 49-1611	

Description	Service Part No.	Description	Service Part No.
Wound-Rail cabinet	Light cabinet	(Mahogany-Rail cabinet)	
Cabinet (less scale)	107058	10705C	10724
Baffle-and-cloth assembly	40-7598	40-7598	40-7548
Bezel	56-4878	56-4878	56-5855
Dial scale	56-5040	56-5040	56-5024
Door, (foot, 4)	45-6190	45-6190	45-6190
Door, matched set of 2	45-6434	45-6446	56-5886
Door pull (2)	56-5272	56-5272-1	45-6446
Hinge, knife, with stop (1)	56-5713-1	56-5713-5	56-5622
Hinge, knife (3)	56-5713-3	56-5713-7	46-4047
Knob (4)	56-4484	56-4484	46-4447
		Knob (4)	56-4484

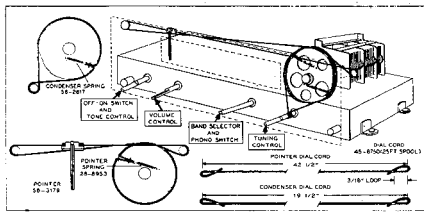


Figure 5. Drive-Cord Installation Details

NOTE: Part numbers identified by an asterisk (\*) indicate 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."

## REPLACEMENT PARTS LIST

### SECTION 1 POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line by-pass, 100 mmf.	62-110009001*
C101	Condenser, line by-pass, .04 mf.	30-4119
C102	Condenser, electrolytic, filter, 40 mf., 200v	30-2568-28
C103	Condenser, electrolytic, 4-section	30-2568-24
C103A	Condenser, filter, 40 mf., 250v	Part of C108
C103B	Condenser, filter, 40 mf., 250v	Part of C108
C103C	Condenser, filter, 20 mf., 250v	Part of C108
C103D	Condenser, filter, 10 mf., 250v	Part of C108
C104	Condenser, r-f by-pass, 100 mmf.	62-110009001*
CR100	Rectifier, selenium, dry disc	34-8003-1
CR101	Rectifier, selenium, dry disc	34-8003-1
L100	Lamp, pilot	34-2605*
L100	Choke, filament, 100 microhenries	32-4143-4
R100	Resistor, current limiting, 25 ohms	33-1334-5
R101	Resistor, 2-section filter	33-3435-17
R101A	Resistor, filter, 180 ohms	Part of R101
R101B	Resistor, filter, 2500 ohms	Part of R101
R102	Resistor, filter, 2200 ohms	66-2224340
R103	Resistor, current limiting, 25 ohms	33-1334-5
S100	Switch, on-off	Part of R204
W100	Line cord and plug	12183*
WS-1 (R)	Switch-water section	Part of 42-1874*

### SECTION 2 AUDIO CIRCUITS

C200	Condenser, d-c blocking, .02 mf.	61-0108*
C201	Condenser, d-c blocking, .002 mf.	45-3500-7*
C202	Condenser, bass compensation, .006 mf.	45-3500-7*
C203	Condenser, by-pass, 100 mmf.	62-110009001*
C204	Condenser, d-c blocking, .006 mf.	45-3500-7*
C205	Condenser, tone compensation, .006 mf.	45-3500-7*
C206	Condenser, by-pass, 100 mmf.	62-110009001*
C207	Condenser, tone compensation, .006 mf.	45-3500-7*
Z201	Socket, FM test	27-6180
J201	Socket, phono input	27-6126
LS200	Speaker	36-1626-1
R200	Volume control, 2 megohms (tap at 1 megohm)	35-5535-17
R201	Resistor, bass compensation, 47,000 ohms	66-3473340*

### SECTION 2 (Continued) AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
R202	Resistor, grid return, 10 megohms	66-6103540*
R203	Resistor, plate load, 270,000 ohms	66-4273340*
R204	Tone control (with on-off switch), 4 megohms	33-5538-34
R205	Resistor, grid return, 470,000 ohms	66-4473340*
R206	Resistor, cathode bias, 180 ohms	66-1183340*
T200	Transformer, audio output	32-8367
WS-1 (R)	Switch-wafer section	Part of 42-1874*

### SECTION 3 I-F, DETECTOR, AND A-Y-C CIRCUITS

C300A	Condenser, shunt	Part of Z300
C300B	Condenser, shunt	Part of Z300
C301A	Condenser, shunt	Part of Z301
C301B	Condenser, shunt	Part of Z301
C302A	Condenser, shunt	Part of Z302
C302B	Condenser, shunt	Part of Z302
C303A	Condenser, shunt	Part of Z303
C303B	Condenser, shunt	Part of Z303
C305A	Condenser, shunt	Part of Z305
C305B	Condenser, shunt	Part of Z305
C305C	Condenser, i-f filter	Part of Z305
C305D	Condenser, i-f filter	Part of Z305
C306	Condenser, plate decoupling (FM), .01 mf.	61-0126*
C307	Condenser, plate decoupling (AM), .01 mf.	61-0126*
C308	Condenser, o-v-c by-pass, .01 mf.	61-0120*
C309	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C310	Condenser, plate decoupling, .004 mf.	61-0179*
C311	Condenser, r-f by-pass, .05 mf.	61-0122*
C312	Condenser, o-v-c filter, .01 mf.	61-0120*
C313	Condenser, r-f by-pass, .01 mf.	61-0120*
C314	Condenser, cathode by-pass, .01 mf.	61-0120*
C315	Condenser, screen by-pass, .01 mf.	61-0120*
C316	Condenser, plate decoupling, .01 mf.	61-0120*
C317	Condenser, i-f trimmer, fixed, 5 mmf.	Part of Z304
C318	Condenser, i-f trimmer, fixed, 68 mmf.	Part of Z304
C319	Condenser, plate decoupling, 100 mmf.	62-110009001*
	Condenser, r-f by-pass, 100 mmf.	62-110009001*
	Condenser, compensating, .01 mf.	61-0120*
	Condenser, decoupling, 2700 mmf.	60-20275404*

MODELS 49-1606,  
 49-1609, 49-1611

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

Reference Symbol	Description	Service Part No.
C323	Condenser, electrolytic, FM-detector filter, 2 mf., 50v	30-2417-7
C324	Condenser, r-f by-pass, .01 mf.	61-0170*
C325	Condenser, tuned i-f by-pass, .03 mf.	45-3500-1*
C326	Condenser, tuned i-f by-pass, .05 mf.	61-0170*
C327	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C328	Condenser, r-f by-pass, 1500 mmf.	62-215001011
C329	Condenser, r-f by-pass, 100 mmf.	62-110009001*
L306	Coil, tuned i-f by-pass	32-4061-2
R300	Resistor, plate decoupling, 33,000 ohms.	66-3333340*
R301	Resistor, plate decoupling, 68,000 ohms.	66-3683340*
R302	Resistor, grid return, 1 megohm	66-5103340*
R303	Resistor, cathode bias, 47 ohms	66-0473340*
R304	Resistor, plate decoupling, 1000 ohms	66-2103340*
R305	Resistor, a-v-c filter, 3.3 megohms	66-5333340*
R306	Resistor, isolating, 68 ohms	66-0683340*
R307	Resistor, cathode bias, 68 ohms	66-0683340*
R308	Resistor, screen dropping, 1000 ohms	66-2103340*
R309	Resistor, plate decoupling, 1000 ohms	66-2103340*
R310	Resistor, a-v-c return, 330,000 ohms	66-4333340*
R311	Resistor, diode load, 47,000 ohms	66-3473340*
R312	Resistor, isolating, 47,000 ohms	66-3473340*
R313	Resistor, isolating, 100,000 ohms	66-4103340*
R314	Resistor, FM-detector load, 47,000 ohms	66-3473340*
R315	Resistor, dropping, 2200 ohms	66-2223340*
TC300A	Tuning core	Part of Z300
TC300B	Tuning core	Part of Z300
TC301A	Tuning core	Part of Z301
TC301B	Tuning core	Part of Z301
TC302A	Tuning core	Part of Z302
TC302B	Tuning core	Part of Z302
TC303A	Tuning core	Part of Z303
TC303B	Tuning core	Part of Z303
TC304A	Tuning core	Part of Z304
TC304B	Tuning core	Part of Z304
TC305A	Tuning core	Part of Z305
TC305B	Tuning core	Part of Z305
WS-1 (F)	Switch-wafer section	Part of 42-1874*
Z300	Transformer, FM 1st i-f	32-4257
Z301	Transformer, AM 1st i-f	32-4258
Z302	Transformer, FM 2nd i-f	32-4257-1
Z303	Transformer, AM 2nd i-f	32-4160-3
Z304	Transformer, FM 3rd i-f	32-4261-1
Z305	Transformer, AM 3rd i-f	32-4240-2

**SECTION 4**  
**R-F AND CONVERTER CIRCUITS**

C400	Condenser, tuning gang (3-section FM, 2-section AM)	31-3724-3
C400A	Condenser, trimmer, FM aerial	Part of C400
C400B	Condenser, trimmer, FM r-f	Part of C400
C400C	Condenser, trimmer, FM osc.	Part of C400
C401	Condenser, aerial coupling (FM), 100 mmf.	62-110009001*
C402	Condenser, aerial coupling (FM), 100 mmf.	62-110009001*
C403	Condenser, grid blocking, 51 mmf.	30-1224-2*
C404	Condenser, cathode by-pass, 100 mmf.	62-170009001*
C405	Condenser, trimmer assembly, 2-section	31-6476-18
C405A	Condenser, trimmer, AM aerial	Part of C405
C405B	Condenser, trimmer, AM osc.	Part of C405
C406	Condenser, isolating, 10 mmf.	62-010009001
C407	Condenser, screen by-pass, 100 mmf.	62-110009001*
C408	Condenser, blocking, 51 mmf.	30-1224-2*
C409	Condenser, by-pass, 1500 mmf.	62-215001011
C410	Condenser, blocking, 220 mmf.	62-122001001*
C411	Condenser, by-pass, 51 mmf.	30-1224-2*
C412	Condenser, blocking, 220 mmf.	62-122001001*
C413	Condenser, cathode by-pass, 100 mmf.	62-110009001*
C414	Condenser, blocking, 100 mmf.	62-110009001*
C415	Condenser, by-pass, 220 mmf.	66-122001001*
C416	Condenser, isolating, .01 mf.	61-0120*
C417	Condenser, cathode by-pass, 1500 mmf.	62-215001001
C418	Condenser, d-c blocking, 100 mmf.	62-110009001*
C419	Condenser, FM r-f by-pass, 100 mmf.	62-110009001*
C420	Condenser, d-c blocking, 100 mmf.	62-110009001*

**SECTION 4 (Continued)**  
**R-F AND CONVERTER CIRCUITS**

Reference Symbol	Description	Service Part No.
C421	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C422	Condenser, r-f by-pass, .03 mf.	45-3500-1*
C423	Condenser, FM r-f by-pass, 100 mmf.	62-110009001*
C424	Condenser, FM r-f by-pass, 100 mmf.	62-110009001*
J400	Socket, FM aerial	67-6214-1
L400	Coil, AM aerial	32-4003-11
L401	Coil, FM aerial	32-4158-1
L402	Coil, r-f isolating (FM)	32-4061-2
L403	Coil, FM r-f plate load	32-4061-2
L404	Coil, FM r-f	32-4158-1
L405	Coil, FM osc. plate load	32-4061-2
L406	Coil, FM osc.	32-4018-5
L407	Coil, AM osc.	32-4221-1
L408	Coil, r-f isolating	32-4061-2
LA400	Loop aerial	76-5383-9
R400	Resistor, grid return, 1 megohm	66-5103340*
R401	Resistor, cathode bias, 100 ohms	66-1103340*
R402	Resistor, screen dropping, 15,000 ohms	66-3153340*
R403	Resistor, plate decoupling, 4700 ohms	66-2473340*
R404	Resistor, grid return, 15,000 ohms	66-3153340*
R405	Resistor, cathode bias, 1500 ohms	66-2153340*
R406	Resistor, plate load, 15,000 ohms	66-3153340*
R407	Resistor, grid return, 15,000 ohms	66-3153340*
R408	Resistor, cathode bias, 2200 ohms	66-2223340*
R409	Resistor, isolating, 68 ohms	66-0683340*
R410	Resistor, grid return, 10,000 ohms	66-103340*
R411	Resistor, grid return, 1 megohm	66-5103340*
R412	Resistor, isolating, 68 ohms	66-0683340*
TB400	Terminal board, aerial	38-9942

**MISCELLANEOUS**

Description	Service Part No.
Bracket-and-clip assembly, pilot lamp	76-3919
Cabinet (less scale)	
M	10725A
L	10725D
Back	54-7671
Baffle, speaker	219136
Baffle-and-cloth assembly	
M	40-7562
L	40-7562-1
Bezel	56-5855
Bin mechanism (L.H.)	76-3223-5
Bin mechanism (R.H.)	76-3223-6
Dome (4 required)	45-6190
Door, drop	
M	45-6463
L	45-6468
Door pull	
M	56-4420
L	56-4420-2
Frame, changer mounting	76-4104
Grommet, changer mounting	54-4313
Hinge (pair)	56-4066
Instrument panel	
M	45-6464
L	45-6469
Scale	54-5021
Scale strap	56-2234-2
Spring, bin mechanism (2 required)	56-4978
Spring, changer mounting (6 required)	56-3043F15
Dial-backplate assembly	76-3918
Drive cord (25-ft. spool)	45-8750
Fastener, snap (diffusing panel)	28-4342F33
Panel, diffusing	54-7593
Pointer	56-5830-2
Spring, diffusing panel (2 required)	56-3841
Spring, gang	56-2617
Spring, pointer	28-8953
Shaft, drive (radio)	76-3479-1
Bushing (2 required)	54-7512
Socket assembly, pilot lamp	27-8233
Socket, miniature (8B16)	27-8236
Socket, miniature (19T8)	27-8703-5
Socket, octal (50C9G)	27-6174-4

742-1874 is a single-section wafer switch (band switch).

MODELS 49-1606,  
49-1609, 49-1611

## AM ALIGNMENT PROCEDURE

Make alignment with loop aerial connected to radio. The AM alignment should be completed before the FM alignment is made.

**DIAL POINTER**—Calibration and pointer-index measurements are shown in figure 7. With tuning gang fully meshed, set pointer to index marker.

**OUTPUT METER**—Connect between terminal 3 of aerial terminal board TB400 and chassis.

**AM R-F SIGNAL GENERATOR**—Connect as indicated in chart. Use modulated output.

**RADIO CONTROLS**—Set volume control to maximum, turn tone control fully counterclockwise, and set band switch to broadcast position.

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

## FM ALIGNMENT PROCEDURE

### Make AM Alignment First

**OUTPUT METER**—Connect between terminal 3 of aerial terminal board TB400 and chassis.

**ALIGNMENT INDICATOR**—Connect negative lead of 20,000-ohms-per-volt meter to pin 2 of 19T8 tube; connect positive lead to B-. Use 10-volt range.

**AM R-F SIGNAL GENERATOR**—Generator must have sufficient output to give a reading of 8.5 volts on alignment indicator. Connect ground lead to B-; connect output lead as indicated in chart. Use modulated output.

**RADIO CONTROLS**—Set volume control to maximum, turn tone control fully counterclockwise, and set band switch to FM position. Allow radio and signal generator to operate for at least 15 minutes before making alignment.

**R-F COIL—NOTE:** Check resonance of coils L401, L404, and L406 by inserting each end of a powdered-iron tuning core, such as Philco Part No. 56-6100, into the coils. If the signal strength increases when the iron end is inserted, compress the turns slightly. If the signal strength increases when the brass end is inserted, spread the turns slightly. If the signal strength decreases when either the iron or the brass end is inserted, no further adjustment is necessary. Do not spread or compress turns of coil excessively; only a small change is required at these high frequencies.

## 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  
I—pilot lamp  
L—choke or coil  
LA—loop aerial

LS—loud-speaker  
R—resistor  
S—switch  
T—transformer

W—line cord  
WS—wafer switch  
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.

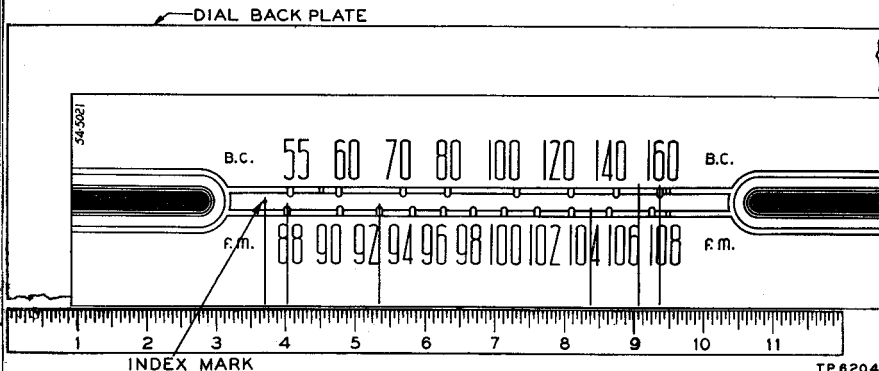


Figure 7. Dial-Backplate Calibration Measurements

STEP	SIGNAL GENERATOR CONNECTION TO DAISY	DNA SETTING	DNA SETTING	RANDO SPECIAL INSTRUCTIONS
1	Ground lead to B-1 input of 74141, connector to terminal of 74660.	435 kc.	540 kc.	Adjust timer count once only, in order to give for maximum output.
2	Redesigning loop (see note below).	1600 kc.	1600 kc.	Adjust trimmer for maximum output.
3	Same as step 2.	1900 kc.	1500 kc.	Adjust trimmer for maximum output.

STEP	SIGNAL GENERATOR CONNECTION TO RADIO	DIAL SETTING	DIAL BITTING	RADIO SPECIAL INSTRUCTIONS	TUNING ADJUST
1	Ground lead to B- pin of connector to pin 1 of CR101 in 14 pin 3 of CR102 in 14	9.1 mtc.	88 mtc.	Adjust tuning cone for maximum reading on alignment point. If not maximum, repeat until the best improvement is obtained. If the tuning cone is not at the top of these tuning cones accept as correct. If not, repeat 1 step	TC1044—FM 14 1 mtc. TC1045—FM 14 1 ptc. TC1046—FM 14 1 ptc. TC1047—FM 14 1 ptc.
2	Ground lead directly to pin 1 of CR101 in 14 pin 3 of CR102.	9.1 mtc.	88 mtc.	Adjust tuning cones for maximum reading on alignment point. If not maximum, repeat until the best improvement is obtained. After this step, do not touch these tuning cones.	TC1048—FM 14 1 mtc. TC1049—FM 14 1 ptc. TC1050—FM 14 1 ptc.
3	Same as step 2.	9.1 mtc.	88 mtc.	Adjust tuning cones for minimum reading on alignment point. This adjustment is critical! Repeat to note	TC1051—FM 14 1 ptc. TC1052—FM 14 1 ptc.
4	Same as step 2.	105 mtc.	105 mtc.	Adjust trimmer for maximum reading on alignment point. This adjustment is critical! Repeat to note	C4002—FM mtc.
5	Same as step 4.	105 mtc.	105 mtc.	Adjust trimmer for maximum reading on alignment point. This adjustment is critical! Repeat to note	C4003—FM 14 1 ptc.
6	Same as step 4.	105 mtc.	105 mtc.	Adjust trimmer for maximum reading on alignment point. This adjustment is critical! Repeat to note	C4004—FM mtc.
7	Same as step 4.	92 mtc.	92 mtc.	Adjust coil for maximum (see 1 coil test).	L4001—FM 14 1 coil L4002—FM 14 1 coil
8	Same as step 4.	92 mtc.	92 mtc.	Adjust coil for maximum (see 1 coil test).	L4003—FM 14 1 coil L4004—FM 14 1 coil
9	Repeat steps 4 through 8 until no further improvement is observed.	92 mtc.	92 mtc.	Adjust coil for maximum (see 1 coil test).	L4005—FM mtc coil test



Figure 8. Top View, Showing AM Trimmer Locations



**Figure 9. Top View, Showing FM Trimmer Locations**