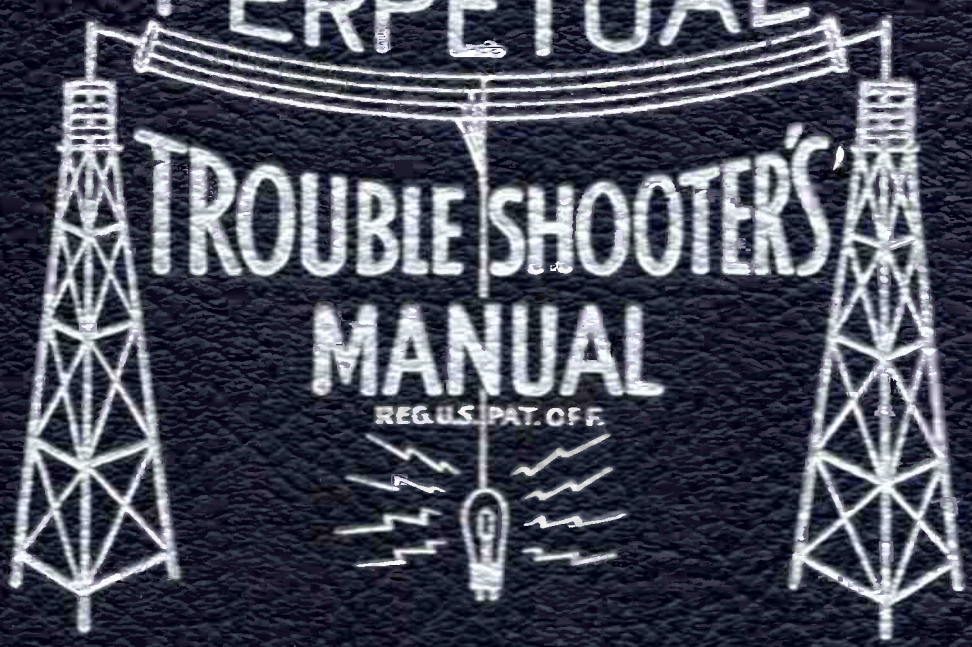
VOLUME XX

PERPETUAL TROUBLE SHOOTER'S MANUAL

REG. U.S. PAT. OFF.



JOHN F. RIDER

MODELS 5D8, 100, 581

SPECIFICATIONS

Overall Dimensions:

	581	5D8	100
Height	7⅜"	6"	5¾"
Width	11⅞"	9¼"	9¼"
Depth	6¼"	5"	4⅝"
Weight	7 lbs.	5¾ lbs.	5¼ lbs.

Electrical Rating:
Line Voltage.....110-120 volts AC-DC
Power Consumption....28 watts

Tuning Frequency Range:
540 to 1625 KC

Intermediate Frequency:
455 KC

Electrical Power Output:
Maximum . . . . . 1.7 watts

Loudspeaker:
Type .....Permanent Magnet
Outside Cone Diameter.....4"
Voice Coil Impedance.....3.2 ohms at 400 cycles
Magnet Rating.....1.0 Oz. Alnico V

Tubes:

Tube	Function
12SA7	Frequency Converter
12SK7	I-F Amplifier
12SQ7	Detector Amplifier
50L6/GT	Power Amplifier
35Z5/GT	Rectifier

GENERAL INFORMATION

Models 5D8, 581 & 100 are superheterodyne receivers employing four tubes plus one rectifier. These models are for operation on AC or DC current. All three models employ a four inch permanent magnet speaker and are virtually identical from an electrical standpoint. The model 100 does not utilize the Stationized Dial. Models 5D8 and 100 are enclosed in a plastic cabinet of ivory or walnut, while the 581 is housed in a wood cabinet of walnut or natural design.

SPECIAL SERVICE INFORMATION

Stage Gain Measurements:
Measurements taken with volume control maximum – AVC shorted out.

Standard Output.....50 milliwatts
Dummy Antenna.....200 Mmf.

Converter Grid to 1st I-F Grid.....71X at 1000 KC
Converter Grid to 1st I-F Grid.....78X at 455 KC
1st I-F Grid to 2nd Detector.....77X at 455 KC
Overall Audio Gain...0.8 volts at Volume Control for 0.5 watts output at 400 cycles.

Oscillator Grid Voltages:
At 117 volts AC line. Measurements made with an AC vacuum tube voltmeter, input loading above 10 megohms.
600 KC.....15 volts AC 1500 KC.....20 volts AC

D.C. Resistance Measurements:

1st I-F Coil Primary....17.5 ohms	Secondary.....17.5 ohms
2nd I-F Coil Primary....14.5 ohms	Secondary.....14.5 ohms
Oscillator Coil Primary.... 1.2 ohms	Secondary..... 4.5 ohms

NOTE: Due to the variation in winding methods, the D.C. resistance on all coils is subject to a 20% tolerance.

ALIGNMENT PROCEDURE

Alignment Procedure consists of the four steps outlined in the Alignment Precedure Chart.

For step No. 1, I-F Alignment, connect the leads of a test oscillator to the mixer grid and ground buss through an .01 Mfd. capacitor (dummy load). Upon completion of this step, "rock" the variable condenser to assure that the I-F's have been aligned to the correct frequency. Output should remain constant at any setting of the variable condenser.

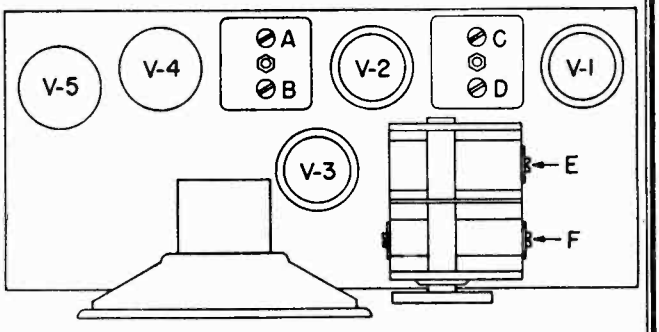
Steps 2 & 3 employ a Hazeltine Standard Test Loop No. 1150 or a reasonable substitute. Connect the test oscillator leads across this loop and place it in a vertical position about two feet from the receiver loop.

IMPORTANT NOTICE: Make certain that each step is done with a minimum input signal.

ALIGNMENT CHART

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Grd. (.01 Mfd. Cap)	455 KC	540 KC	Trimmers A,B,C & D
2	Standard Test Loop*	1600 KC	1600 KC	Trimmer E to 1600 KC
3	Standard Test Loop*	1500 KC	1500 KC	Trimmer F
4	Check Stationizing. Adjust pointer if stations are uniformly off in one direction.			

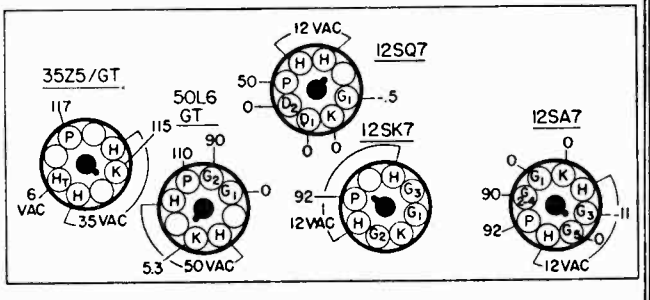
*NOTE: Hazeltine Standard Test Loop No. 1150 or a reasonable Substitute.



Trimmer Location

Socket Voltages:
All D.C. voltages measured with a vacuum tube voltmeter from socket contacts to ground buss. A.C. voltages measured with a 1000 ohms per volt A.C. meter from socket contacts to ground buss.* Volume Control maximum. No signal. 117 volts A.C. line. All voltages shown are positive D.C. unless otherwise noted.

*NOTE: Filament voltages should be measured across the filament of the tube.



MODELS 5D8,
100, 581

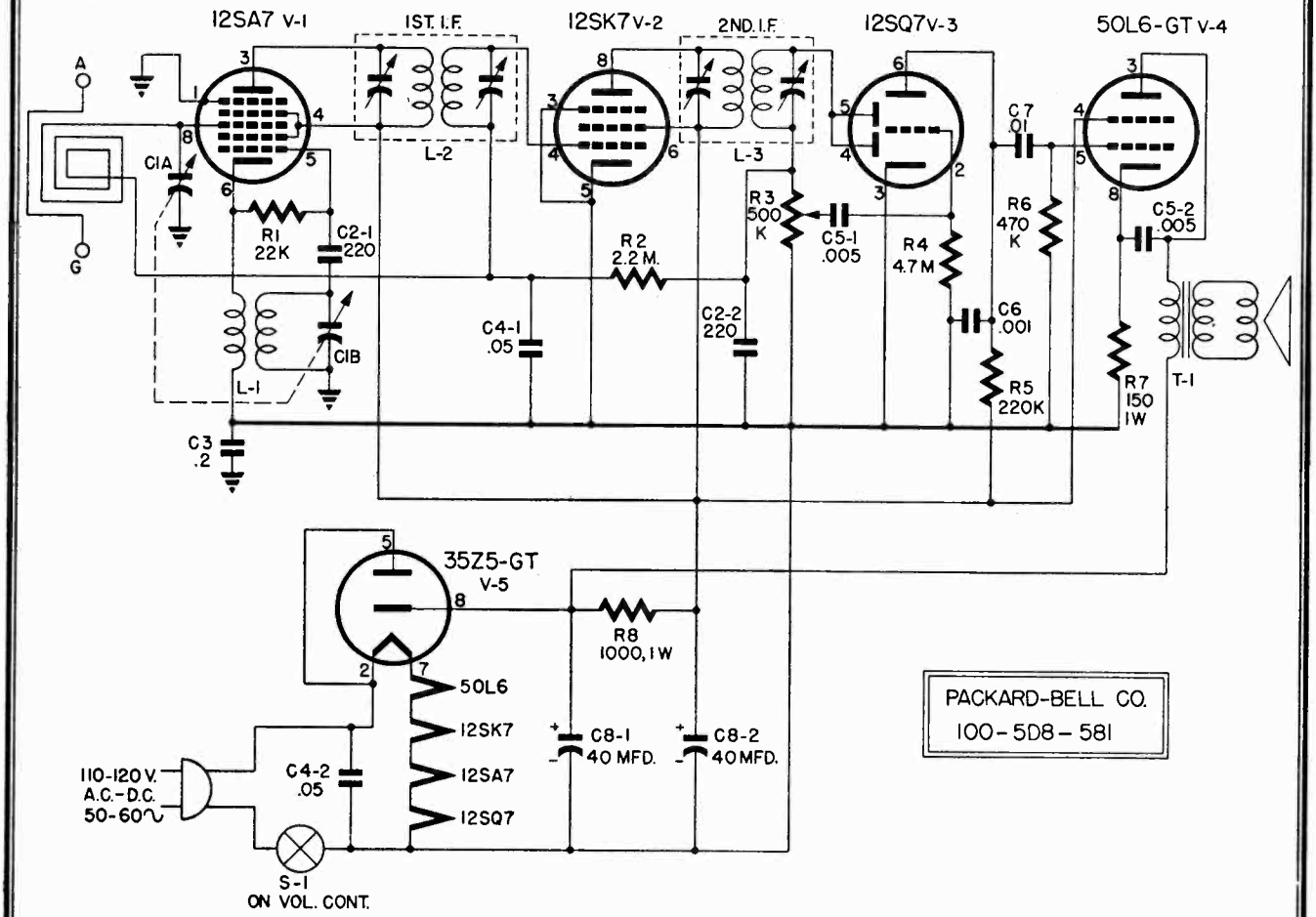
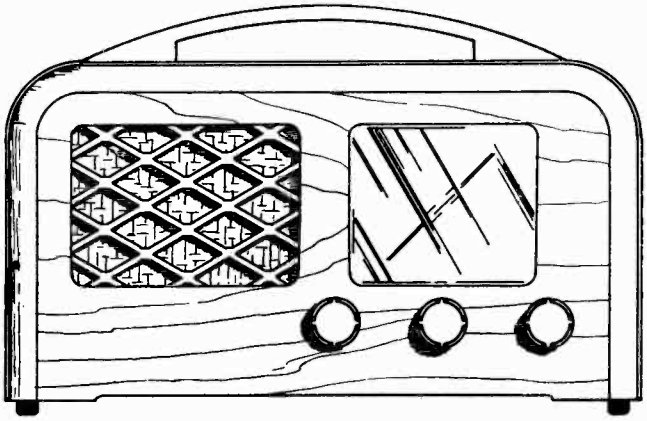


TABLE OF REPLACEABLE PARTS

Part No.	Ref. Symbol	Description
21067-BG		Cabinet, walnut (Model 581)
21067-CW		Cabinet, natural (Model 581)
21004-A-AL		Cabinet, plastic, ivory (Model 5D8)
21004-A-BG		Cabinet, plastic, walnut (Model 5D8)
21071-AL		Cabinet, plastic, ivory (Model 100)
21071-BG		Cabinet, plastic, walnut (Model 100)
23523B	C1A & B	Capacitor, variable
23503	C2-1 to 2	Capacitor, mica, 220 Mmf. 20%
23018	C3	Capacitor, paper, .2 Mfd. 200 V.
23009	C4-1 to 2	Capacitor, paper, .05 Mfd. 400 V.
23004	C5-1 to 2	Capacitor, paper, .005 Mfd. 600 V.
23001	C6	Capacitor, paper, .001 Mfd. 600 V.
23006	C7	Capacitor, paper, .01 Mfd. 600 V.
24011	C8-1 to 2	Capacitor, electrolytic, 40 Mfd. 350 WV.
29211	L1	Coil, oscillator
29014B	L2	Coil, 1st I-F
29024	L3	Coil, 2nd I-F
29308		Loop, Antenna
32007-1		Cord, AC, 6'
34019		Cover, back
38032-1		Dial scale, Stationized (Model 5D8)
38095A		Dial scale, Stationized (Model 581)
38047		Dial scale (Model 100)
40002		Dial drive cord
47018		Grille screen

Part No.	Ref. Symbol	Description
49009-AL		Handle, plastic, ivory (Model 581)
49009-BG		Handle, plastic, walnut (Model 581)
52001A-AL		Knob, ivory
52001A-BG		Knob, walnut
54002		Lamp, dial, T-47, 0.15 Amp.
55015		Crystal, dial
62000D		Panel, loop
67005		Pointer, dial
73041	R1	Resistor, carbon, 22,000 ohm, ½ W, 10%
73055	R2	Resistor, carbon, 2.2 megohms, ½ W, 20%
25014	R3	Control, volume, 500,000 ohm
73057	R4	Resistor, carbon, 4.7 megohms, ½ W, 20%
73049	R5	Resistor, carbon, 220,000 ohm, ½ W, 20%
73051	R6	Resistor, carbon, 470,000 ohm, ½ W, 20%
73081	R7	Resistor, carbon, 150 ohm, 1W, 10%
73071	R8	Resistor, carbon, 1000 ohm, 1W, 10%
77015B		Shaft, dial drive
79002-2		Socket, tube, octal base, 8 prong
79033		Socket, dial lamp
83004		Speaker, 4" P. M.
89417	T1	Transformer, output, 2500 to 3.2 ohms



SPECIFICATIONS

Electrical Rating:
Line Voltage . . . . . 110-120 volts, AC-DC
Power Consumption . . . . . 25 watts

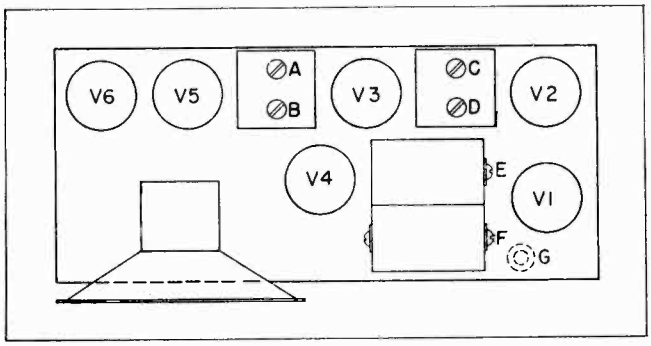
Tuning Frequency Range:
540 to 1620 KC

Intermediate Frequency:
455 KC

Loudspeaker:
Type . . . . . Permanent Magnet
Outside Cone Diameter . . . . 4"
Voice Coil Impedance . . . . 3.0 ohms at 400 cycles
Magnet Rating . . . . . 1.0 Oz. Alnico V

Tubes:

Tube	No.	Function
6SS7	V-1	R-F Amplifier
12SA7	V-2	Frequency Converter
6SS7	V-3	I-F Amplifier
12SQ7	V-4	Detector Amplifier
50L6	V-5	Power Amplifier
35Z5	V-6	Rectifier



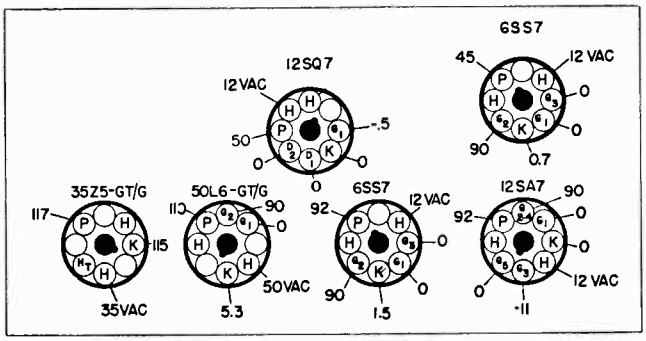
GENERAL INFORMATION

Model 682 is a superheterodyne receiver employing five tubes, plus one rectifier, and a permanent magnet speaker. The receiver is designed for operation on either AC or DC and is housed in a table model wooden cabinet.

SPECIAL SERVICE INFORMATION

Stage Gain Measurements:
Measurements taken with volume and tone controls maximum. AVC shorted out.

Standard Output . . . . . 50 milliwatts
Dummy Antenna . . . . . 200 Mmf.
R-F Grid to Converter Grid . . . 4X at 1000 KC
Converter Grid to 1st I-F Grid . . 71X at 1000 KC
Converter Grid to 1st I-F Grid . . 78X at 455 KC
1st I-F Grid to 2nd Detector . . . 77X at 455 KC
Overall Audio Gain . 0.8 volts at volume control for 0.5 watts output at 400 cycles.



Oscillator Grid Voltages:
Measured at 117 volts AC line voltage, with an AC type V.T.V.M. input loading above 10 megohms.
1500 KC . . . . . 20 volts AC
600 KC . . . . . 15 volts AC

D.C. Resistance Measurements:

1st I-F Coil			
Primary . .	17.5 ohms	Secondary .	17.5 ohms
2nd I-F Coil			
Primary . .	14.5 ohms	Secondary .	14.5 ohms
Oscillator Coil			
Primary . .	1.2 ohms	Secondary .	4.5 ohms

Socket Voltages:
All D.C. voltages measured with a V.T.V.M. from socket contacts to ground buss. A.C. voltages measured with a 1000 ohms per volt A.C. meter from socket contacts to ground buss. Volume and tone controls maximum. No signal. 117 volts A.C. line voltage. All voltages shown are positive D.C. unless otherwise noted.

NOTE: Filament voltages should be measured across the filament of the tube.

ALIGNMENT PROCEDURE:

Alignment procedure consists of the five steps outlined in the Alignment Chart. For step No. 1, I-F Alignment, connect the leads of a test oscillator to the mixer grid and the ground buss through an .01 Mfd. capacitor (dummy load). Upon completion of this step, "Rock" the variable condenser to assure that the I-F's have not been aligned to the signal frequency. Output should remain constant at any setting of the variable condenser.

Steps 3 to 5 employ a Hazeltine Standard Test Loop No. 1150 or a reasonable substitute. Connect the test oscillator leads across this loop and place it in a vertical position about two feet from the receiver loop.

IMPORTANT: Make certain that each step is done with a minimum input signal.

ALIGNMENT CHART

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	R-F Grid & Grnd. .01 Mfd. Capac.	455 KC	540 KC	A, B, C, D
2	R-F Grid & Grnd. .01 Mfd. Capac.	455 KC	540 KC	G (I-F Trap) for minimum output
3	Standard Test Loop	1600 KC	1600 KC	Trimmer F to 1600 KC
4	Standard Test Loop	1500 KC	1500 KC	Trimmer E Max. Output

MODEL 682

TABLE OF REPLACEABLE PARTS

Part No.	Ref. Symbol	Description
21068-CW		Cabinet—Natural
21068-BG		Cabinet—Walnut
23523B	C1 A, B	Capacitor, Variable
23915	C2-1 to 3	Capacitor, Ceramic 220 mmf.
23017	C3-1 to 2	Capacitor, Tubular .05 mf.—200 V.
23004	C4-1 to 3	Capacitor, Tubular, .005 mf.—600 V.
23001	C5	Capacitor, Tubular .001 mf.—600 V.
23023-1	C6	Capacitor, Tubular .01 mf.—500 V.
23018	C8	Capacitor, Tubular 0.2 mf.—200 V.
29005	L-1	Coil—IF Trap
29211	L-2	Coil—Oscillator
29014B	L-3	Coil—1st IF
29024	L-4	Coil—2nd IF
32012		Cord—AC 6' Brown Rubber
34019		Cover—Back
38095A		Dial
47018		Grille—Screen
49001F-AL		Handle—Plastic Ivory
49001F-BH		Handle—Plastic Walnut
52001A-AL		Knob—Ivory
52001A-BG		Knob—Walnut
54002		Lamp—Dial, T-47, 0.15 Amp.
55015		Crystal—Dial
62000D		Panel—Loop

Part No.	Symbol Ref.	Description
67005		Pointer—Dial
73014	R1	Resistor, 120 ohm, ½ W. 10%
73033	R2	Resistor, 4700 ohm, ½ W. 10%
73053	R3	Resistor, 1 megohm ½ W. 20%
73055	R4	Resistor, 2.2 megohm, ½ W. 20%
73041	R5	Resistor, 22,000 ohm, ½ W. 10%
73017	R6	Resistor, 220 ohm, ½ W. 10%
25014	R7	Control—Colume 500,000 megohm
73057	R8	Resistor, 4.7 megohm, ½ W. 20%
73049	R9	Resistor, 220,000 ohm, ½ W. 20%
25509	R10	Control—Tone 3 megohm
73051	R11	Resistor, 470,000 ohm ½ W. 20%
73015	R12	Resistor, 150 ohm, ½ W. 10%
73077	R13	Resistor, 180 ohm, 1W. 10%
73071	R14	Resistor, 1000 ohm, 1W. 10%
77015B		Shaft—Dial Drive
79002-2		Socket—Tube
79033		Socket—Lamp, (79020 to make)
83005		Speaker—4" P.M.
84003A		Spring—Knob
84002		Spring—Dial
89417	T-1	Transformer—Output, 2500 to 3.2 ohm

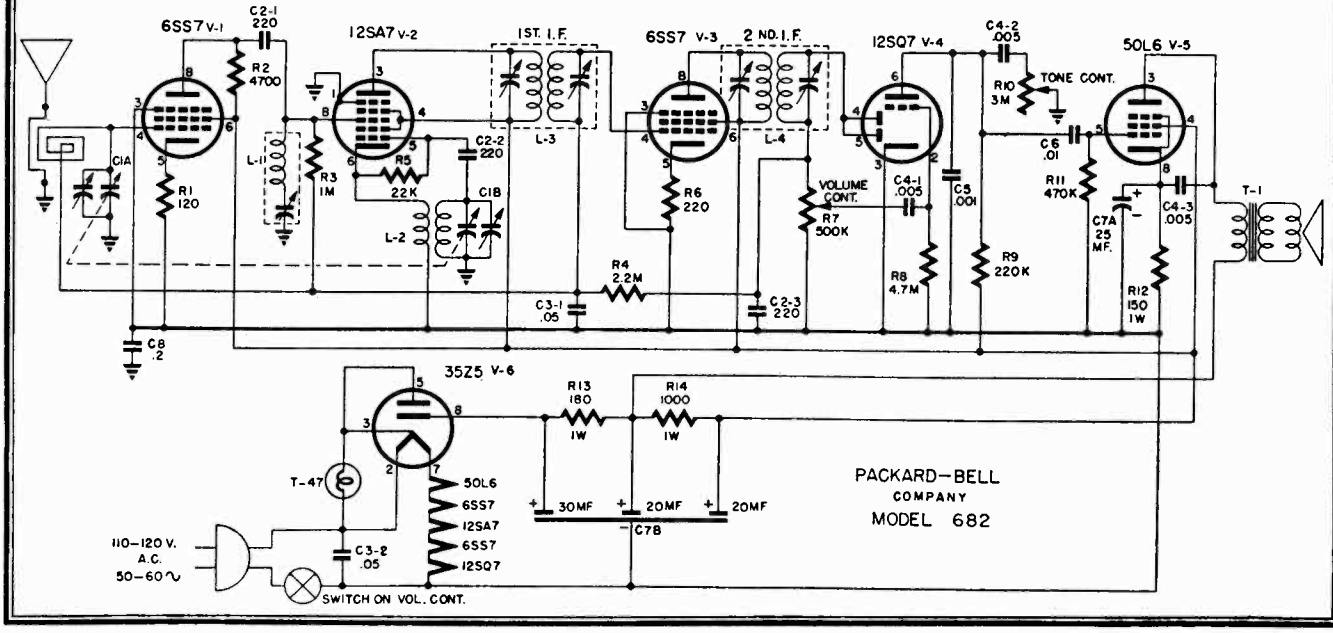


FIGURE 1 – CABINET

SPECIFICATIONS

Overall Dimensions:

Height	34⅞"	Depth	20¾"
Width	21⅜"	Weight	95 lbs.

Electrical Rating:

Line Voltage . . . . . 110-120 Volts, A.C. 50, 60 C.P.S.
Power Consumption . . 77 watts including phonograph

Tuning Frequency Range:

540 to 1620 KC

Intermediate Frequency:

455 KC

Electrical Power Output:

Undistorted . . . . . 2 watts
Maximum . . . . . 3.5 watts

Loudspeaker:

Type . . . . . Permanent Magnet
Outside Cone Diameter . . . . 10"
Voice Coil Impedance . . . . . 3.2 ohms at 400 C.P.S.
Magnet Rating . . . . . 3.16 Oz. Alnico V

Tubes:

Tube	Function
6SA7	Frequency Converter
6SK7	I-F Amplifier
6SF7	1st Audio Amplifier
6K6-GT/G	Power Amplifier
5Y3-GT/G	Rectifier
6H6	2nd Detector – Compressor Rectifier
6SQ7	Microphone Amplifier

GENERAL INFORMATION

Model 791 is a PhonOcord console employing six tubes plus a rectifier and a ten inch permanent magnet speaker.

Listed below are some of the features incorporated in this model.

1. Standard Broadcast Superheterodyne receiver.
2. Automatic Home Recording with Public Address System.
3. Phonograph with automatic record changer.

To service tubes, remove back. For tube location refer to tube layout diagram.

For service information concerning the automatic record changer and recorder, refer to service instructions, Automatic Record Changer – Recorder Combination (Packard-Bell Part No. 58004-B).

SPECIAL SERVICE INFORMATION

Stage Gain Measurements:

Measurements taken with volume and tone controls maximum. Selector Switch in Radio Receive position. AVC shorted out.

Standard Output . . . . 50 milliwatts
Dummy Antenna . . . . 200 Mmf.

Antenna to Converter Grid	4.25X at 1000 KC
Converter Grid to 1st I-F Grid	62X at 1000 KC
Converter Grid to 1st I-F Grid	71X at 455 KC
1st I-F Grid to 2nd Detector	69X at 455 KC
Overall Audio Gain . 260X at .5 watts 400 cycles	

Oscillator Cathode Voltages:

Measured at 117 volts AC line with AC vacuum tube voltmeter, input loading above 10 megohms.

1600 KC . . . . . 2.15 volts AC
1000 KC . . . . . 2.0 volts AC
600 KC . . . . . 2.2 volts AC

D.C. RESISTANCE MEASUREMENTS

1st and 2nd I-F Coils:
Primary . . . . . 17 ohms
Secondary . . . . . 17 ohms*

*NOTE: To obtain the true reading of the secondary of the 2nd I-F Coil it must be removed from the can. This is because of the 47K resistor inside the can.

Oscillator Coil:
Start to Finish . . . . 8 ohms
Start to Tap . . . . . 7 ohms

NOTE: Due to variation in winding methods, the D. C. resistance on all coils is subject to a 20% tolerance.

HOW TO CHECK COMPRESSION VOLTAGE

Turn the Selector Switch to Radio Record position. Feed a 1 volt (RMS) 1000 cycle signal into the diode return of the 2nd I. F. (brown lead). Connect the leads of a vacuum tube voltmeter to point "A" (see Schematic Diagram) and ground. The voltage at this point should be approximately a minus 2.25 volts.

BRIEF DESCRIPTION OF COMPRESSION CIRCUIT

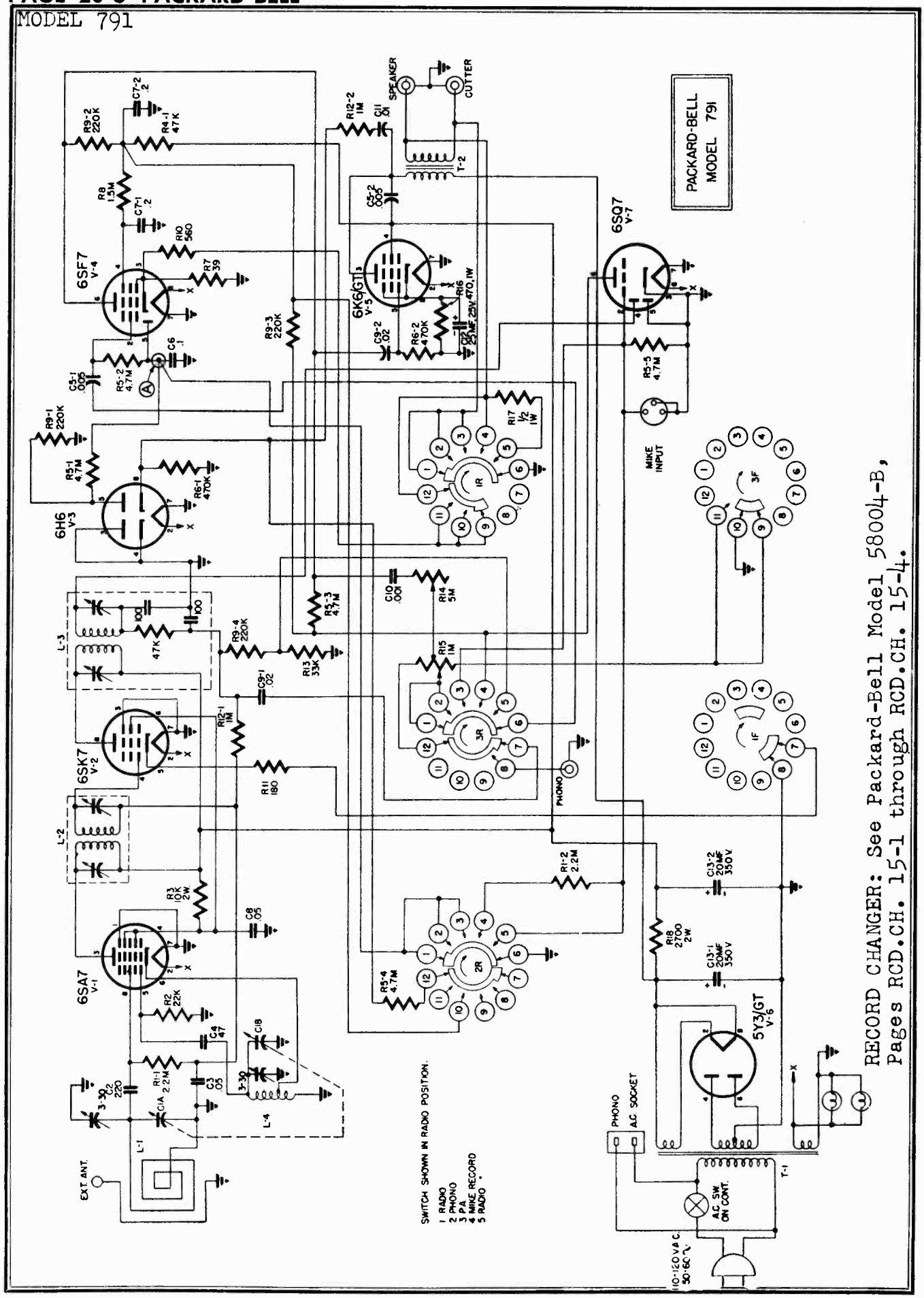
One diode section of the 6H6 serves as the compressor rectifier. The compressor system is automatic and is in the circuit on both record positions. A portion of the output voltage is rectified by the 6H6 and varies the grid bias of the first audio, 6SF7.

RECORDING HEAD PRESSURE

The proper recording head pressure is 1¼ Oz. Adjustment of this pressure is made by turning the small screw on the top of the recording arm. This adjustment is very critical and should be made in quarter turns. TURN THE SCREW CLOCKWISE TO INCREASE THE CUTTING DEPTH and COUNTERCLOCKWISE TO DECREASE THE CUTTING DEPTH.

This adjustment is made at the factory with an ordinary pocket postal scale, consequently, field adjustments should be made in a like manner.

MODEL 791



ALIGNMENT PROCEDURE

Alignment Procedure consists of the four steps outlined in the Alignment Procedure Chart.

Connect the test oscillator leads to the mixer grid and ground in series with an .01 Mfd. capacitor (dummy load) for step No. 1, I-F Alignment. Upon completion of this step, "Rock" the variable condenser to assure that the I-F's have been aligned to the proper frequency. Output should remain constant for any setting of the variable condenser.

Use the Hazeltine Test Loop No. 1150 or a reasonable substitute for the balance of the alignment. Place the test loop about two feet from the receiver loop in a vertical position.

IMPORTANT NOTICE: Make certain that each alignment step is done with a minimum input signal.

ALIGNMENT CHART

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Grd. (.01 Mfd. Cap.)	455 KC	540 KC	Trimmers A, B, C, & D
2	Standard Test Loop*	1620 KC	1620 KC	Trimmer F to 1620 KC
3	Standard Test Loop*	1500 KC	1500 KC	Trimmer E
4	Check stationizing. Slide pointer on string if stations are uniformly off in one direction.			

*NOTE: Hazeltine Test Loop No. 1150 (or a reasonable substitute).

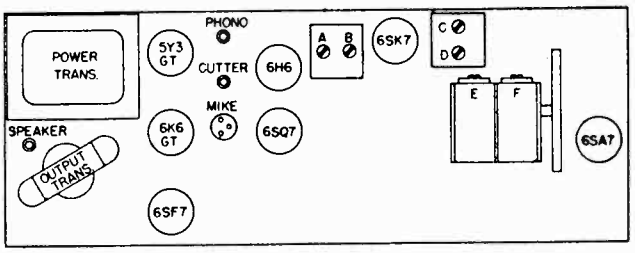


FIGURE 2 – TRIMMER LOCATION

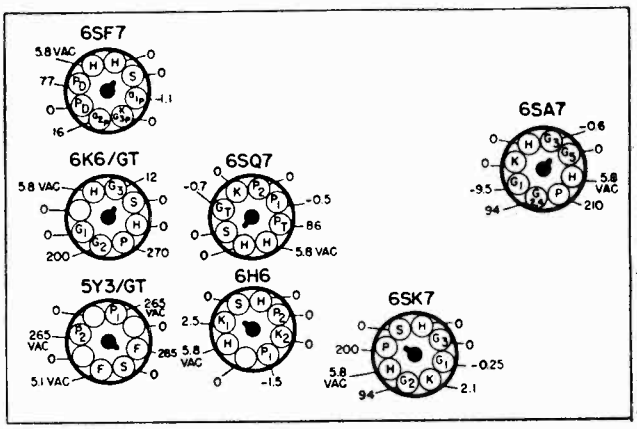


FIGURE 3 – SOCKET VOLTAGES

SOCKET VOLTAGES

All D.C. Voltages measured with a vacuum tube voltmeter from socket contacts to chassis. A.C. Voltages measured with a 1000 ohms per volt A.C. meter from socket contacts to chassis. Volume and tone controls maximum. Switch in Radio position. No signal. 117 volts A.C. line. All voltages shown are positive D.C. unless otherwise noted.

TABLE OF REPLACEABLE PARTS

Part No.	Ref. Symbol	Description
21077		Cabinet
23514	C1A,B	Capacitor, variable
23915	C2	Capacitor, ceramic, 220 Mmf. 20%
23017	C3	Capacitor, tubular, .05 Mf. 200 V.
23912	C4	Capacitor, ceramic, 47 Mmf. 20%
23004	C5-1 to 2	Capacitor, tubular, .005 Mf. 600 V.
23019	C6	Capacitor, tubular, .1 Mf. 200 V.
23020	C7-1 to 2	Capacitor, tubular, .2 Mf. 400 V.
23009	C8	Capacitor, tubular, .05 Mf. 400 V.
23007	C9-1 to 2	Capacitor, tubular, .02 Mf. 600 V.
23001	C10	Capacitor, tubular, .001 Mf. 600 V.
23023	C11	Capacitor, tubular, .01 Mf. 500 V.
24006	C12	Capacitor, electrolytic, 25 Mf. 25 V.
24003	C13-1 to 2	Capacitor, electrolytic, 20 Mf. 350 V.
29325	L-1	Coil, loop
29004	L-2	Coil, 1st. I-F Transformer
29007	L-3	Coil, 2nd I-F Transformer
29202	L-4	Coil, oscillator
32007-1		Cord, A.C. 8'
32011		Cord, A.C. 6'
36024		Cartridge, cutter (magnetic) 3.2ohms
38107		Dial, scale stationized
38108		Dial, Export and East
52037BG		Knob
54001		Lamp, dial, T-44, 0.250 Amp.
57010		Microphone, with cable (crystal)
57010-1		Microphone, base CB
58004E		Changer (RC-130L)
66004		Plug, pin
66013		Plug, mike
67031		Pointer, assembly
68029		Cartridge, phono pick-up (Shure P-30S) crystal
69001		Pulley
69003C		Pulley
69006A		Pulley
73165	R1-1 to 2	Resistor, 2.2 megohm ½W. 20%
73041	R2	Resistor, 22K ohm, ½W. 10%
73437	R3	Resistor, 10,000 ohm, 2W. 10%
73045	R4-1 to 2	Resistor, 47,000 ohm, ½W. 10%
73169	R5-1 to 5	Resistor, 4.7 megohm, ½W. 20%
73157	R6-1 to 2	Resistor, 470,000 ohms, ½W. 20%
73008	R7	Resistor, 39 ohm, ½W. 10%
73163	R8	Resistor, 1.5 megohm, ½W. 20%
73153	R9-1 to 4	Resistor, 220,000 ohm, ½W. 20%
73022	R10	Resistor, 560 ohm, ½W. 10%
73016	R11	Resistor, 180 ohm, ½W. 10%
73161	R12-1 to 2	Resistor, 1 megohm, ½W. 20%
73043	R13	Resistor, 33,000 ohm, ½W. 10%
25506C	R14	Control, tone
25010B	R15	Control, volume (tap @ 20K ohms
73221	R16	Resistor, 470 ohm, 1W. 10%
73601	R17	Resistor, ½ ohm, 1W. W.W.
73430	R18	Resistor, 2,700 ohm, 2W. 10%
77016B		Shaft, dial
78008		Shield, mike plug
79002		Socket, tube
79004		Socket, mike
79005		Socket, pickup
79007		Socket, A.C.
79010B		Socket, lamp
83705		Speaker
86009B		Switch, phono, etc.
89016B	T-1	Transformer, power
89402	T-2	Transformer, output 8000/3.2 ohms

MODELS 1181, 1181A

SPECIFICATIONS

Overall Dimensions:

	1181	1181A		1181	1181A
Height	33½"	25¼"	Depth	17"	30¼"
Width	36"	17¾"	Weight	109 lbs.	85 lbs.

Electrical Rating:

Line Voltage . . . . . 110-120 volts, A.C. 50,60 C.P.S.
Power Consumption . . 110 watts including phonograph

Tuning Frequency Range:

Standard Broadcast . . . . 540 to 1620 KC
Frequency Modulation . . . . 87.5 to 108.5 MC

Intermediate Frequency:

AM . . . . . 455 KC
FM . . . . . 10.7 MC

Electrical Output:

Undistorted . . . . . 4.0 watts
Maximum . . . . . 6.0 watts

Loudspeaker:

Type . . . . . Permanent Magnet
Outside Cone Diameter . . . . 10"
Voice Coil Impedance . . . . . 3.2 ohms at 400 C.P.S.
Magnet Rating . . . . . 4.6 Oz. Alnico V

Tubes:

Tube	No.	Function
6BA6	V-1	R-F Amplifier
6BA6	V-2	Mixer
6BA6	V-3	I-F Amplifier
6BA6	V-4	Driver
6AL5	V-5	FM Detector
6H6	V-6	AM Detector—AVC—Compressor
6SQ7	V-7	1st Audio Amplifier
6SK7	V-8	2nd Audio Amplifier
6AU6	V-9	Oscillator
6V6-GT	V-10	Output
5Y3-GT	V-11	Rectifier
6U5-6G5	V-12	Tuning Eye

GENERAL INFORMATION

These Models utilize a 2 band PhonOcord chassis. The Model 1181 is housed in a console cabinet, and the Model 1181A in an Armchair type cabinet. Both Models employ ten tubes plus rectifier and tuning eye and a 10 inch permanent magnet speaker. Listed below are some of the features included in these Models.

1. Standard Broadcast from 540 to 1620 KC.
2. Frequency Modulation from 87.5 to 108.5 MC.
3. Tuning Eye for accurate tuning of stations.
4. Automatic Home Recording combined with Automatic Record Changer.

For information concerning the Home Recording, Automatic Record Changer unit, refer to Service Instructions, Automatic Record Changer—Recorder Combination (Packard-Bell Part No. 58004-B).

RECORDING HEAD PRESSURE

The proper recording head pressure is 1¼ Oz. Adjustment of this pressure is made by turning the small screw on the top of the Recording Arm. This adjustment is very critical and should be made in quarter turns. TURN THE SCREW CLOCKWISE TO INCREASE CUTTING DEPTH, and COUNTER - CLOCKWISE TO DECREASE CUTTING DEPTH.

This adjustment is made at the factory with an ordinary pocket type postal scale, consequently, field adjustments should be made in a like manner.

BRIEF DESCRIPTION OF COMPRESSION CIRCUIT

One diode section of the 6H6 serves as the compressor rectifier. The compression system is automatic, and is in the circuit on both record positions. A portion of the output voltage is rectified by the 6H6 and varies the grid bias of the 2nd Audio, 6SK7.

HOW TO CHECK COMPRESSION VOLTAGE

Turn the Selector Switch to Radio Record position. Feed a 2 volt (RMS) 1000 cycle signal into the diode return of the 2nd I-F (point K, schematic). Connect the leads of a vacuum tube type voltmeter to point L (schematic) and ground. The voltage at this point should be approximately minus 2.5 volts.

SPECIAL SERVICE INFORMATION

Stage Gain Measurements, AM

Measurements taken with volume and tone controls maximum. Band Switch in Standard Broadcast position. AVC shorted out.

Standard Output . . . . 50 milliwatts
Dummy Antenna . . . . 200 Mmf.
Antenna Post to R-F Grid . . . . . 12X at 1000 KC
R-F Grid to Converter Grid . . . . . 9X at 1000 KC
Converter Grid to 1st I-F Grid . . . . 20X at 455 KC
1st I-F Grid to 2nd Detector . . . . . 40X at 455 KC
Overall Audio Gain . 30 millivolts to produce 50 milliwatts at 1000 cycles.

Stage Gain Measurements, FM

Measurements taken with volume and tone controls maximum. Band Switch in Frequency Modulation position. AVC shorted out.

Dummy Antenna . . . . 270 ohms
Dipole Terminal to R-F Grid . . . . . 0.9X at 98 MC
Converter Grid to 1st I-F Grid . . . . 12X at 10.7 MC
1st I-F Grid to Driver Grid . . . . . 45X at 10.7 MC

Oscillator Cathode Voltages

Measured at 117 volts AC line with an AC vacuum tube voltmeter, input loading above 10 megohms.

1620 KC . . . . . 8.5 volts AC
1200 KC . . . . . 8.2 volts AC
800 KC . . . . . 5.5 volts AC
540 KC . . . . . 2.5 volts AC

Oscillator Grid Current, FM

Measured at 117 volts AC line, with a DC microammeter connected in series with ground end of the 22,000 ohm grid resistor.

108 MC . . . . . 190 microamps
98 MC . . . . . 200 microamps
88 MC . . . . . 220 microamps

D.C. RESISTANCE MEASUREMENTS

I-F Coils:

Type	Primary	Secondary
1st AM	7.5	7.5
2nd AM	8.0	8.0
1st FM	0.75	0.75
2nd FM	1.5	0.5
Ratio Detector	1.5	0.1*

*Either side to tertiary, 0.25 ohms

Oscillator Coil:
Primary . . . . . 1 ohm
Secondary . . . . . 6 ohms
Antenna Coil:
Start to Finish . . . . 12.2 ohms
Start to Tap . . . . . 10.5 ohms
R-F Coil:
Primary . . . . . 5.8 ohms
Secondary . . . . . 4.2 ohms

NOTE: Due to the variation in winding methods, the D.C. resistance on all coils is subject to a 20% tolerance.

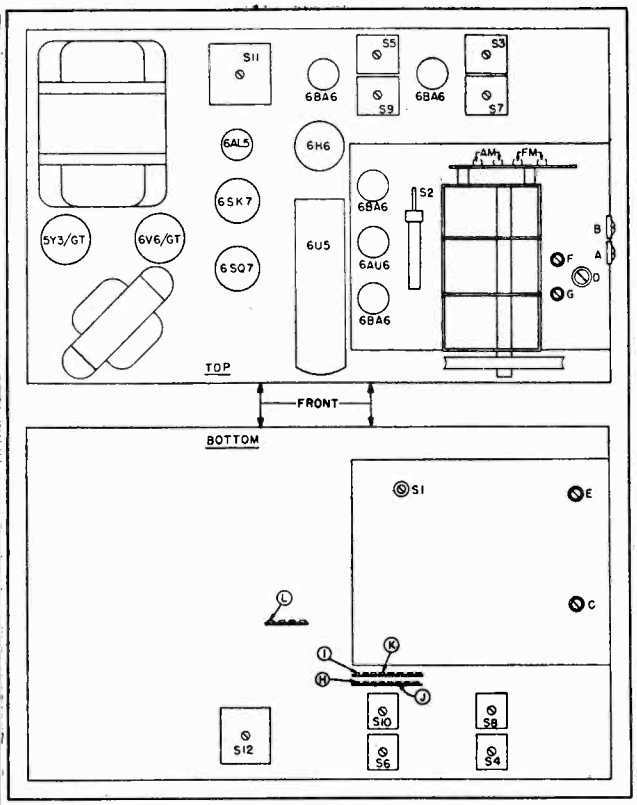


FIG. 1—TRIMMER LOCATION

A—Antenna Trimmer BC (C20A)

B—BC Padder 600 KC (C22)

C—FM R-F Trimmer (C23-2)

D—FM Osc. Trimmer (C21)

E—FM Antenna Trimmer (C23-1)

F—BC Osc. Trimmer (C24)

G—BC R-F Trimmer (C20B)

H—Ratio Detector, Zero Center

I—Ratio Detector, AVC

J—AVC

K—Diode

S1—FM Antenna (Bottom)

S2—FM R-F (Top)

S3—1st FM I-F Secondary (Top)

S4—1st FM I-F Primary (Bottom)

S5—2nd FM I-F Secondary (Top)

S6—2nd FM I-F Primary (Bottom)

S7—1st AM I-F Secondary (Top)

S8—1st AM I-F Primary (Bottom)

S9—2nd AM I-F Secondary (Top)

S10—2nd AM I-F Primary (Bottom)

S11—Ratio Detector Primary (Top)

S12—Ratio Detector Secondary (Bottom)

ALIGNMENT PROCEDURE—AM

Alignment procedure consists of the steps outlined in the Alignment Chart. Make certain that each step is done with a minimum input signal. Connect voltmeter to AVC (point J on schematic).

ALIGNMENT CHART—AM

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Ground	455 KC	540 KC	S7, 8, 9, 10
2	R-F Grid & Ground	1500 KC	1500 KC	Trimmers F & G
3	R-F Grid & Ground	600 KC	600 KC	Trimmer B
4	Repeat Step No. 2			
5	Standard Test Loop	1500 KC	1500 KC	Trimmer A
6	Check stationizing. Slide pointer on string if stations are uniformly off in one direction.			

Equipment Required for FM Alignment

1—Signal Generator to cover FM band (88 to 108 MC).

2—Vacuum Tube Type Voltmeter similar to "Voltohmyst" or "Polymeter."

ALIGNMENT CHART – FM

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	CONNECT VOLTMETER TO	ADJUST FOR MAX. OUTPUT
1	R-F Grid & Ground	10.7 MC	88 MC	Point I	S12, 6, 5, 4, 3
2	Adjust S11 for zero center			Point H	
3	Repeat Steps 1 and 2.				
4	Doublet Terminals thru 270 ohms	108 MC	108 MC	Point I	Trimmers D, C, E
5	Doublet Terminals thru 270 ohms	88 MC	88 MC	Point I	S1, 2
6	Repeat Step No. 4.				

Note: Rock variable condenser for Step No. 4.

SOCKET VOLTAGES

All D.C. voltages measured with a vacuum tube voltmeter from socket contacts to chassis. A.C. voltage measured with a 1000 ohms per volt A.C. meter from socket contacts to chassis. Volume and tone controls maximum. Switch in Radio position. No signal. 117 volts A.C. line. All voltages shown are positive D.C. unless otherwise noted.

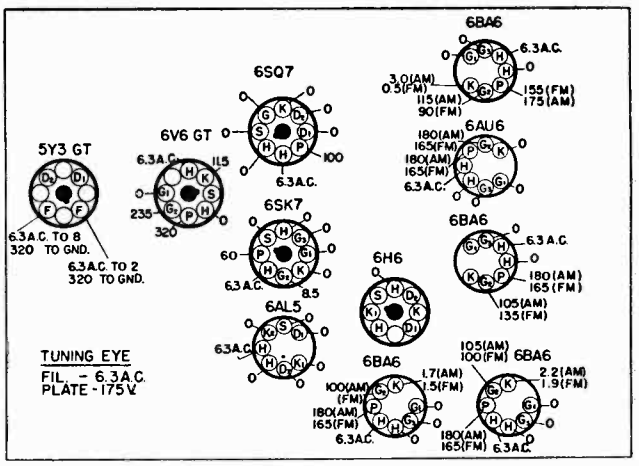
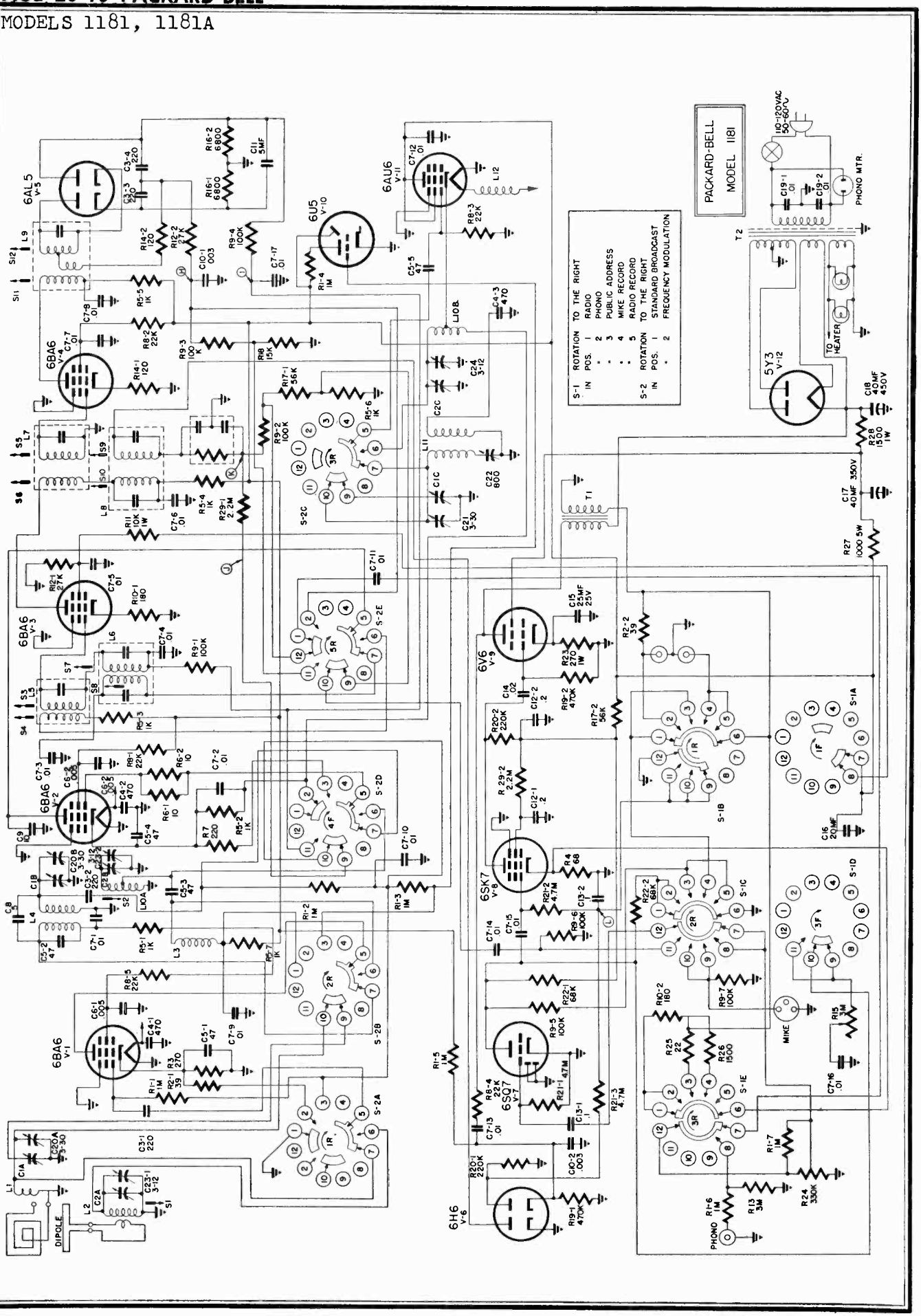


FIG. 2—SOCKET VOLTAGES

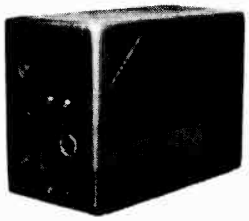
MODELS 1181, 1181A



REPLACEABLE PARTS LIST

Part No.	Ref. Symbol	Description
21064		Cabinet, 1181A
21065		Cabinet, 1181
23525	C1A,B,C, C2A,B,C,	Capacitor, variable
23915	C3-1 to 4	Capacitor, ceramic, 220 Mmf. 20%
23916	C4-1 to 3	Capacitor, ceramic, 470 Mmf. 20%
23912	C5-1 to 5	Capacitor, ceramic, 47 Mmf. 20%
23931	C6-1 to 2	Capacitor, tubular, .005 Mf.
23023-1	C7-1 to 17	Capacitor, tubular, .01 Mf. 500 V.
23908	C8	Capacitor, ceramic, 5 Mmf.
23923	C9	Capacitor, ceramic, 10 Mmf. 10%
23016	C10-1 to 2	Capacitor, tubular, .003 Mf. 600V.
24038	C11	Capacitor, electrolytic, 5 Mf. 50V.
23020	C12-1 to 2	Capacitor, tubular, .2 Mf. 400 V.
23019	C13-1 to 2	Capacitor, tubular, .1 Mf. 200 V.
23007	C14	Capacitor, tubular, .02 Mf. 600 V.
24006	C15	Capacitor, electrolytic, 25 MF. 25 V.
24012	C16	Capacitor, electrolytic, 20 Mf. 350 V.
24004B-1	C17	Capacitor, electrolytic, 40 Mf. 350 V.
24030	C18	Capacitor, electrolytic, 40 Mf. 450 V.
23932	C19-1 to 2	Capacitor, tubular, .01 Mf. 125 V.
23400	C20A, B	Capacitor, trimmer, 3-30 dual
23406	C21	Capacitor, trimmer, 3-30 single
23402	C22	Capacitor, padder, 800
23408	C23-1 to 2	Capacitor, trimmer, 3-12 single
23412	C24	Capacitor, trimmer, 3-12 single
29400C	L-1	Coil, BC Antenna
29409	L-2	Coil, FM Antenna
29104	L-3	Coil, choke, R-F
29102F	L-4	Coil, BC R-F
29020	L-5	Coil, 1st FM I-F
29021	L-6	Coil, 1st AM I-F
29022A	L-7	Coil, 2nd FM I-F
29023	L-8	Coil, 2nd AM I-F
29018	L-9	Coil, Ratio Detector
29109	L-10A, B	Coil, FM R-F Oscillator
29205C	L-11	Coil, BC Oscillator
32003-1		Cord, A.C.
32012		Cord, A.C.
38073		Dial, stationized
52020-BN		Knob, mahogany
52020-BC		Knob, bleached
54002-1		Lamp, dial
57009		Microphone with cable (Astatic)
57009-1		Microphone base
58004-E		Record changer, Recorder
66001		Plug, pin
66004		Plug, speaker
66013		Plug, mike
67015		Pointer, assembly
69001		Pulley
69013A		Pulley
69006A		Pulley

Part No.	Ref. Symbol	Description
73053	R1-1 to 6	Resistor, carbon, 1 megohm, ½w. 20%
73008	R2-1 to 2	Resistor, carbon, 39 ohm, ½w. 10%
73018	R3	Resistor, carbon, 270 ohm, ½w. 10%
73011	R4	Resistor, carbon, 68 ohm, ½w. 10%
73025	R5-1 to 6	Resistor, carbon, 1000 ohm, ½w. 10%
73001	R6-1 to 2	Resistor, carbon, 10 ohm, ½w. 10%
73017	R7	Resistor, carbon, 220 ohm, ½w. 10%
73041	R8-1 to 5	Resistor, carbon, 22,000 ohm, ½w. 10%
73047	R9-1 to 7	Resistor, carbon, 100,000 ohm, ½w. 10%
73016	R10-1 to 2	Resistor, carbon, 180 ohm, ½w. 10%
73073	R11	Resistor, carbon, 10,000 ohm, 1w. 10%
73042	R12-1 to 2	Resistor, carbon, 27,000 ohm, ½w. 10%
25017A	R13	Control, volume
73014	R14-1 to 2	Resistor, carbon, 120 ohm, ½w. 10%
25509	R15	Control, tone
73035	R16-1 to 2	Resistor, carbon, 6800 ohm, ½w. 10%
73060	R17-1 to 2	Resistor, carbon, 56,000 ohm, ½w. 10%
73903	R18	Resistor, wire wound, 15 ohm, 1w.
73051	R19-1 to 2	Resistor, carbon, 470,000 ohm, ½w. 20%
73049	R20-1 to 2	Resistor, carbon, 220,000 ohm, ½w. 20%
73057	R21-1 to 3	Resistor, carbon, 4.7 megohm, ½w. 20%
73046	R22-1 to 2	Resistor, carbon, 68,000 ohm, ½w. 10%
73074	R23	Resistor, carbon, 270 ohm, 1w. 10%
73050	R24	Resistor, carbon, 330,000 ohm, ½w. 20%
73005	R25	Resistor, carbon, 22 ohm, ½w. 10%
73027	R26	Resistor, carbon, 1500 ohm, ½w. 10%
73915	R27	Resistor, wire wound, 1000 ohm, 5w. 10%
73918	R28	Resistor, wire wound, 1500 ohm, 10w. 10%
73055	R29-1 to 2	Resistor, carbon, 2.2 megohm, ½w. 20%
79002		Socket, tube
79051		Socket, miniature
79004		Socket, microphone
79005		Socket, pickup
79018		Socket, speaker and cutter
79041		Socket, tuning eye
79007		Socket, AC
79010B		Socket, lamp
79056		Socket, lamp
79045		Socket, antenna terminal strip
83703		Speaker, 10" P.M.
86009B	S1A to E	Switch, PhonOcord
86017C	S2A to E	Switch, band
89409	T-1	Transformer, output, 5000 to 3.2 ohms
89024	T-2	Transformer, power



MODEL CR-10

SPECIFICATIONS

CIRCUIT	6-tube superheterodyne
FREQUENCY RANGES	
Broadcast (BC)	540—1600 kc.
Short Wave 1 (SW1)	2.7—5.2 mc.
Short Wave 2 (SW2)	5—7.1 mc.
Short Wave 3 (SW3)	7—10.1 mc.
Short Wave 4 (SW4)	9.2—14 mc.
Short Wave 5 (SW5)	13.8—18 mc.
AUDIO OUTPUT	3 watts
PUSH BUTTONS	6 (used for band switching)
POWER INPUT	7 amperes at 6.6 volts, d.c., with p-m speaker; 8 amperes at 6.6 volts, d.c., with electro-dynamic speaker
INTERMEDIATE FREQUENCY	455 kc.
AERIAL	Any Philco Auto-Radio Aerial
PHILCO TUBES (6)	6BA6 (2), 6BE6, 6AV6, 6X4, 7C5

Circuit Description

Philco Auto Radio Model CR-10 is a six-tube superheterodyne, providing reception on the standard broadcast band and five short-wave ranges between 2.7 mc. and 18.0 mc. The radio is of the universal-mounting type; the speaker and control head are mounted separately.

The circuit employs a 6BA6 r-f amplifier, a 6BE6 converter, a 6BA6 i-f amplifier, a 6AV6 detector-a.v.c.—1st audio, and a 7C5 output amplifier. The power supply includes a non-synchronous vibrator and a 6X4 rectifier tube.

A ganged variable condenser tunes the aerial, r-f, and oscillator circuits. The i-f transformers are permeability tuned.

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, r-f by-pass, 330 mmf.	62-133001001
C101	Condenser, by-pass, .5 mf.	61-0137*
C102	Condenser, r-f by-pass, 330 mmf.	62-133001001
C103	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C104	Condenser, by-pass, .5 mf.	61-0137*
C105	Condenser, buffer, .005 mf.	30-4650-123
C106	Condenser, electrolytic, 3-section	61-0089
C106A	Condenser, filter, 15 mf., 350v	Part of C106
C106B	Condenser, filter, 10 mf., 350v	Part of C106
C107	Condenser, filter, .25 mf.	61-0125
C108	Condenser, by-pass, .5 mf.	61-0137*
F100	Fuse, 14 amperes	45-2559
I100	Lamp, pilot, PB1 (in Z101)	34-2040
I101	Lamp, pilot, PB2 (in Z101)	34-2040
I102	Lamp, pilot, PB3 (in Z101)	34-2040
I103	Lamp, pilot, PB4 (in Z101)	34-2040
I104	Lamp, pilot, PB5 (in Z101)	34-2040
I105	Lamp, pilot, PB6 (in Z101)	34-2064
J100	Socket, control head	27-6234
L100	Choke, "A"	65-0037
L101	Choke, "A"	32-1374-3
L102	Solenoid, band-switch actuating	Part of Z100

Band switching is accomplished by the solenoid-actuated wafer switch, which is operated by the push buttons on the control head. The pilot-lamp arrangement is such that the push button of the band in use is illuminated.

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 connecting the radio to a source of power.

1. Inspect both the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance between B+ (pin 7 of the 6X4 rectifier tube) and the radio chassis. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 2800 ohms, check condensers C106A and C106B for leakage or shorts.

The resistance value above, which is much lower than normal, does not represent 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.

Reference Symbol	Description	Service Part No.
L103	Choke, vibrator	32-4170
R100	Resistor, spark suppressor, 100 ohms	66-1104340*
R101	Resistor, spark suppressor, 100 ohms	66-1104340*
R102	Resistor, filter, 1000 ohms	66-2104340
R103	Resistor, filter, 4700 ohms	66-2473340*
S100	Switch, off-on (in control head)	Part of R202
S101	Switch, muting (in control head)	Part of Z101
S102	Switch, push-button, PB1 (in control head)	Part of Z101
S103	Switch, push-button, PB2 (in control head)	Part of Z101
S104	Switch, push-button, PB3 (in control head)	Part of Z101
S105	Switch, push-button, PB4 (in control head)	Part of Z101
S106	Switch, push-button, PB5 (in control head)	Part of Z101
S107	Swtich, push-button, PB6 (in control head)	Part of Z101
S108	Switch, solenoid	Part of Z100
T100	Transformer, power	32-8313
VB100	Vibrator	83-0026
WS-1 (F)	Switch-wafer section (homing)	Part of Z100

Reference Symbol	Description	Service Part No.
WS-1 (R)	Switch-wafer section (homing)	Part of Z100
Z100	Wafer-switch-and-motor assembly	76-3576
Z101	Switch-and-lamp-housing assembly (in control head)	76-2957

SECTION 2
AUDIO CIRCUITS

C200	Condenser, tone compensation, .01 mf. (in control head)	61-0120
C201	Condenser, d-c blocking, .004 mf.	61-0179
C202	Condenser, tone control, .01 mf.	61-0120
C203	Condenser, tone compensation, 100 mmf.	30-1224-18
C204	Condenser, d-c blocking, .01 mf.	61-0120
C205	Condenser, cathode by-pass, 20 mf., 25v	Part of C106
C206	Condenser, tone compensation, .006 mf.	61-0105*
J200	Socket, speaker	55-0438-1
LS200	Speaker, p-m	36-1609-12
R200	Volume control, 350,000 ohms (In control head)	33-5557
R201	Resistor, tone compensation, 15,000 ohms (in control head)	66-3153340*
R202	Tone control (with on-off switch), 5 megohms (in control head)	Part of 33-5557
R203	Resistor, grid return, 10 megohms	66-6103340*
R204	Resistor, plate load, 220,000 ohms	66-4223340*
R205	Resistor, grid return, 470,000 ohms	66-4473340*
R206	Resistor, cathode bias, 220 ohms	66-1223340*
T200	Transformer, output	32-8315

SECTION 3
I-F, DETECTOR, AND A-V-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
C302	Condenser, screen by-pass, .05 mf.	61-0122
C303	Condenser, cathode by-pass, .05 mf.	61-0122
C304	Condenser, a-v-c filter, .05 mf.	61-0122
C305	Condenser, r-f by-pass, 100 mmf.	60-10105407*
R300	Resistor, screen dropping, 15,000 ohms	66-3154340*
R301	Resistor, cathode bias, 820 ohms	66-1823340*
R302	Resistor, diode load, 27,000 ohms	66-3273340*
R303	Resistor, a-v-c filter, 1 megohm	66-5103340*
TC300A	Tuning core, 1st i-f primary	Part of Z300
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
Z300	Transformer, 1st i-f	32-4160
Z301	Transformer, 2nd i-f	32-4161

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2729
C400A	Condenser, aerial tuning	Part of C400
C400B	Condenser, r-f tuning	Part of C400
C400C	Condenser, osc. tuning	Part of C400
C401	Condenser, trimmer, 3-section	31-6504-1
C401A	Condenser, trimmer, BC aerial	Part of C401
C401B	Condenser, trimmer, SW1, 2 aerial	Part of C401
C401C	Condenser, trimmer, SW3, 4, 5 aerial	Part of C401
C402	Condenser, series tracking, SW5 aerial, 59 mmf.	30-1220-48
C403	Condenser, series tracking, SW4 aerial, 112 mmf.	30-1220-51
C404	Condenser, series tracking, SW3 aerial, 156 mmf.	30-1220-29*
C405	Condenser, series tracking, SW2 aerial, 131 mmf.	30-1220-30
C406	Condenser, series tracking, SW1 aerial, 525 mmf.	30-1220-58
C407	Condenser, d-c blocking, 220 mmf.	60-10205407*
C408	Condenser, cathode by-pass, .05 mf.	61-0122
C409	Condenser, d-c blocking, 220 mmf.	60-10205407*
C410	Condenser, trimmer, 3-section	31-6504
C410A	Condenser, trimmer, BC r.f.	Part of C410
C410B	Condenser, trimmer, SW1, 2 r.f.	Part of C410
C410C	Condenser, trimmer, SW3, 4, 5 r.f.	Part of C410
C411	Condenser, d-c blocking, 220 mmf.	60-10205407*
C412	Condenser, series tracking, SW5 r.f., 65.5 mmf.	30-1220-49
C413	Condenser, series tracking, SW4 r.f., 112 mmf.	30-1220-51
C414	Condenser, series tracking, SW3 r.f., 114 mmf.	30-1220-26*
C415	Condenser, series tracking, SW2 r.f., 131 mmf.	60-10135237*
C416	Condenser, series tracking, SW1 r.f., 525 mmf.	30-1220-18*
C417	Condenser, d-c blocking, 47 mmf.	60-00515307*
C418	Condenser, trimmer, 6-section	31-6505
C418A	Condenser, trimmer, BC osc.	Part of C418
C418B	Condenser, trimmer, SW1 osc.	Part of C418
C418C	Condenser, trimmer, SW2 osc.	Part of C418
C418D	Condenser, trimmer, SW3 osc.	Part of C418
C418E	Condenser, trimmer, SW4 osc.	Part of C418
C418F	Condenser, trimmer, SW5 osc.	Part of C418
C419	Condenser, r-f by-pass, 220 mmf.	60-10205407*
C420	Condenser, series tracking, BC osc., 465 mmf.	30-1220-47
C421	Condenser, series tracking, SW1 osc., 380 mmf.	30-1220-37
C422	Condenser, series tracking, SW2 osc., 117 mmf.	30-1220-26*
C423	Condenser, series tracking, SW3 osc., 160 mmf.	30-1220-54
C424	Condenser, series tracking, SW4 osc., 110 mmf.	30-1220-41
C425	Condenser, series tracking, SW5 osc., 55 mmf.	30-1220-50
C426	Condenser, shunt, 47 mmf.	30-1224-2
J400	Socket, aerial	57-1243FA33
L400	Coil, aerial	32-4266
L400A	Coil, BC aerial	Part of L400
L400B	Coil, SW1, 2 aerial	Part of L400
L401	Coil, SW3, 4, 5 aerial	32-4267
L402	Coil, r.f.	32-4266-1
L402A	Coil, BC r.f.	Part of L402
L402B	Coil, SW1, 2 r.f.	Part of L402
L403	Coil, SW3, 4, 5 r.f.	32-4266
L404	Coil, osc.	32-4270
L404A	Coil, BC osc.	Part of L404
L404B	Coil, SW1, 2 osc.	Part of L404
L405	Coil, SW3, 4, 5 osc.	32-4269
R400	Resistor, grid return, 1 megohm	66-5103340*
R401	Resistor, plate load, 22,000 ohms	66-3223340*
R402	Resistor, grid return, 1 megohm	66-5103340*
R403	Resistor, grid return, 22,000 ohms	66-3223340*
R404	Resistor, cathode bias, 820 ohms	66-1283340*
TC400	Tuning core, BC osc. tracking	Part of L404
WS-2 (F)	Switch-wafer section	Part of Z100
WS-2 (R)	Switch-wafer section	Part of Z100
WS-3 (F)	Switch-wafer section	Part of Z100
WS-3 (R)	Switch-wafer section	Part of Z100
WS-4 (F)	Switch-wafer section	Part of Z100
WS-4 (R)	Switch-wafer section	Part of Z100
WS-5 (F)	Switch-wafer section	Part of Z100
WS-5 (R)	Switch-wafer section	Part of Z100
WS-6 (F)	Switch-wafer section	Part of Z100
WS-6 (R)	Switch-wafer section	Part of Z100
WS-7 (F)	Switch-wafer section	Part of Z100
WS-7 (R)	Switch-wafer section	Part of Z100

MISCELLANEOUS

Description	Service Part No.
"A" lead	41-3187-1
Clip spring, cover grounding	57-1335
Cover, housing, wiring side	56-4421-3FJ20
Cover assembly, housing, tube side	76-3571
Housing assembly	76-2879-3FJ21
Socket, miniature	27-6226
Socket, loktal	27-6138*
Socket, vibrator	27-6153*
Socket, control-head plug	27-6234
Speaker cable	41-3801

CONTROL UNITS

Parts for control units are listed in CONTROL UNITS FOR PHILCO UNIVERSAL (CR-MODEL) AUTO RADIOS, PR-1508, with the following exceptions:

Chrysler

Dial	27-5986
Pointer	56-4362FCP

Ford

Dial	27-5987
Pointer	56-4362FCP

Chevrolet

Dial	54-5004
Pointer	56-4362FCP

Universal

Dial	27-5985
Pointer	56-4362FCP

DIAL CORDS

The details of drive-cord installations are illustrated in CONTROL UNITS FOR PHILCO UNIVERSAL (CR-MODEL) AUTO RADIOS, PR-1508. Use drive cord Part No. 45-8750 (25-ft. spool); lengths and loop sizes are given below.

CONTROL UNIT	CORD LENGTH	LOOP DIAMETER
Underdash	15-3/4"	5/16"
Ford	19"	5/16"
Chevrolet	18"	5/16"
Chrysler	14-3/4"	1/8"

TROUBLE SHOOTING

Section 1

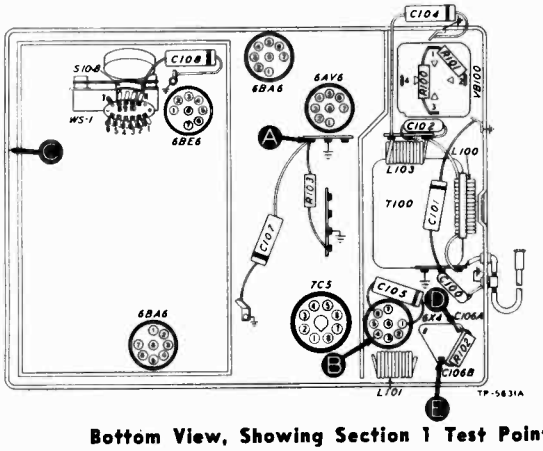
POWER SUPPLY

Make the tests for this section with a d-c voltmeter; connect the leads between the chassis, test point C, and the test points indicated in the chart.

The voltage readings given were taken with a 20,000-ohms-per-volt meter at an input voltage of 6.6 volts, d.c.

Set the volume control to minimum, and the tone control fully clockwise. Depress the BC push button.

Follow the steps in the order given. 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.



Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	168v		Trouble in this section. Isolate by the following tests.
2	B	6.6v	No voltage	Open: L100, L103, S100, F100. Shorted: C100, C101, C102, C103, C104.
			Low voltage	Leaky: C100, C101, C102, C103, C104. Defective battery.
3	D	245v	No voltage	Defective: 6X4, VB100. Open: T100. Shorted: C105, C106A. Leaky: C106B, C107.
			Low voltage	Defective: 6X4, VB100. Leaky: C106A. Shorted: C106B, C107.
			High voltage	Open: T200*, R206*.
4	E	230v	No voltage	Open: R102. Shorted: C106B.
			Low voltage	Increased resistance: R102. Leaky: C106B.
			High voltage	Shorted: C206*.
5	A	168v	No voltage	Open: R103. Shorted: C107, C419*.
			Low voltage	Increased resistance: R103. Leaky: C107.
Listening test: Abnormal hum may be caused by open or leaky: C105, C106A, C106B, C107.				

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

TROUBLE SHOOTING

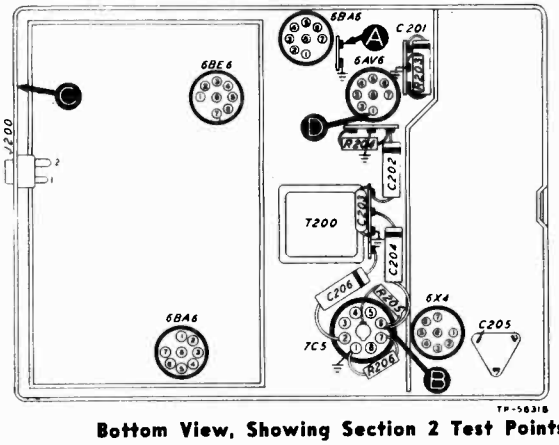
Section 2

AUDIO CIRCUITS

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control counterclockwise.

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.



Bottom View, Showing Section 2 Test Points

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	B	Clear output with strong input.	Defective: 7C5, LS200. Open: R206, R205, T200, C205. Shorted: C204, C205, C206.
3	D	Loud, clear output with moderate input.	Defective: 6AV6. Open: C204, R203, R204. Shorted: C203, C202 (rotate through range), S101*.
4	A	Loud, clear output with moderate input.	Open: R200 (rotate through range), C201. Open or shorted: J100, PL100.
Listening test: Distortion may be caused by leaky C201 or C204.			

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

TROUBLE SHOOTING

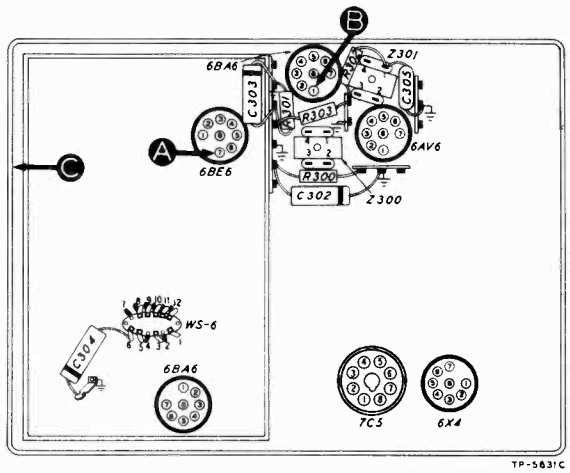
Section 3

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

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 the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully counterclockwise. Depress the BC push button, and set the radio tuning to the low-frequency end of the dial.

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.



Bottom View, Showing Section 3 Test Points (location of test point A shown in figure 4)

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 Section 4; 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	B	Loud, clear output with moderate input.	Defective: 6BA6. Misaligned: Z301. Open: R300, R301, R302, C301A, C301B, L301A, L301B. Shorted: C300B, C301A, C301B, C302, C303, C305, L300B, L301A, L301B.
3	A	Loud, clear output with weak input.	Defective: 6BE6*. Misaligned: Z300. Open: C300A, C300B, L300A, L300B. Shorted: C300A, L300A, L300B, C411*.

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

TROUBLE SHOOTING

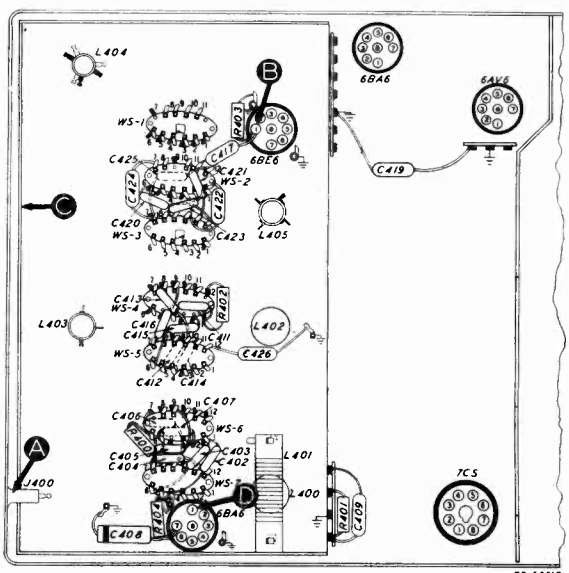
Section 4

R-F AND CONVERTER CIRCUITS

For the tests in this section, with the exception of the oscillator tests, use an r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully counterclockwise.

Set the band push-button, tuning control, and signal-generator frequency as indicated in the chart.
OSCILLATOR TESTS: Connect the positive lead of a high-resistance d-c voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the 6BE6 oscillator grid (pin 1), test point B. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltages of approximately the values given in the chart (measured with 20,000-ohms-per-volt meter), throughout the tuning range.



Bottom View, Showing Section 4 Test Points (location of C419 shown in figure 3)

If the "NORMAL INDICATION" is obtained in steps 1, 5, 9, 13, 17, and 21, 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.

Section 4 (Cont.)

BC CIRCUITS

STEP	TEST POINT	SIG. GEN. FREQ.	BAND PUSH BUTTON	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	BC	Tune to signal.	Loud, clear output with very low generator input.	Trouble in BC circuits. Isolate by steps 2, 3, and 4.
2	B		BC	Tune through range.	–2.2v to –3.6v	Defective: 6BE6, WS-3 (F), WS-3 (R), WS-2 (F), WS-2 (R). Open: R403, C417, C420. Shorted: C417, L404A, C418A, C420, C400C.
3	D	1000 kc.	BC	Tune to signal.	Same as step 1.	Defective: 6BA6, 6BE6, WS-4 (F), WS-5 (F), WS-5 (R). Open: R404, R401, L402A, R402, C411, C409. Shorted: C409, C400B, C411.
4	A	1000 kc.	BC	Tune to signal.	Same as step 1.	Defective: WS-7 (F), WS-7 (R), WS-6 (F). Open: C401A, L400A, C407, R400, J400. Shorted: C400A, C401A, C407, L400A.

SW1 CIRCUITS

5	A	4.0 mc.	SW1	Tune to signal.	Same as step 1.	Trouble in SW1 circuits. Isolate by steps, 6, 7, and 8.
6	B		SW1	Tune through range.	–2.5v to –3.5v	Defective: WS-3 (F), WS-3 (R), WS-2 (F), WS-2 (R). Open: C418B, L404B, C421. Shorted: C418B, L404B, C421, C418C.
7	D	4.0 mc.	SW1	Tune to signal.	Same as step 1.	Defective: WS-5 (F), WS-5 (R), WS-4 (F), WS-4 (R). Open: L402B, C410B, C416. Shorted: L402B C410B, C416, C426.
8	A	4.0 mc.	SW1	Tune to signal.	Same as step 1.	Defective: WS-7 (F), WS-7 (R), WS-6 (F). Open: L400B, C401B, C406. Shorted: L400B, C401B, C406.

SW2 CIRCUITS

9	A	6.0 mc.	SW2	Tune to signal.	Same as step 1.	Trouble in SW2 circuits. Isolate by steps 10, 11, and 12.
10	B		SW2	Tune through range.	–3.7v to –4.2v	Defective: WS-3 (F), WS-3 (R), WS-2 (F), WS-2 (R). Open: C418C, C422, L404B. Shorted: C418C, C422, L404B.
11	D	6.0 mc.	SW2	Tune to signal.	Same as step 1.	Defective: WS-5 (F), WS-5 (R), WS-4 (F), WS-4 (R). Open: C415, L402B. Shorted: C415, L402B.
12	A	6.0 mc.	SW2	Tune to signal.	Same as step 1.	Defective: WS-7 (F), WS-7 (R), WS-6 (F), WS-6 (R). Open: C405, L400B. Shorted: C405, L400B.

SW3 CIRCUITS

13	A	9.0 mc.	SW3	Tune to signal.	Same as step 1.	Trouble in SW3 circuits. Isolate by steps 14, 15, and 16.
14	B		SW3	Tune through range.	–2.7v to –3.1v	Defective: WS-3 (F), WS-3 (R), WS-2 (F), WS-2 (R). Open: C418D, L405, C423, C418F. Shorted: C418F, C418D, L405, C423.
15	D	9.0 mc.	SW3	Tune to signal.	Same as step 1.	Defective: WS-5 (F), WS-5 (R), WS-4 (F), WS-4 (R). Open: L403, C410C, C414. Shorted: L403, C410C, C414.
16	A	9.0 mc.	SW3	Tune to signal.	Same as step 1.	Defective: WS-7 (F), WS-7 (R), WS-6 (F), WS-6 (R). Open: L401, C404, C401C. Shorted: L401, C401C, C404.

SW4 CIRCUITS

STEP	TEST POINT	SIG. GEN. FREQ.	BAND PUSH BUTTON	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
17	A	12.0 mc.	SW4	Tune to signal.	Same as step 1.	Trouble in SW4 circuits. Isolate by steps 18, 19, and 20.
18	B		SW4	Tune through range.	–3.3v to –3.6v	Defective: WS-3 (F), WS-3 (R), WS-2 (F), WS-2 (R). Open: C418E, C424, L405. Shorted: C418E, C424, L405.
19	D	12.0 mc.	SW4	Tune to signal.	Same as step 1.	Defective: WS-5 (F), WS-5 (R), WS-4 (F), WS-4 (R). Open: C413, L403. Shorted: C413, L403.
20	A	12.0 mc.	SW4	Tune to signal.	Same as step 1.	Defective: WS-7 (F), WS-7 (R), WS-6 (F), WS-6 (R). Open: C403, L401. Shorted: C403, L401.

SW5 CIRCUITS

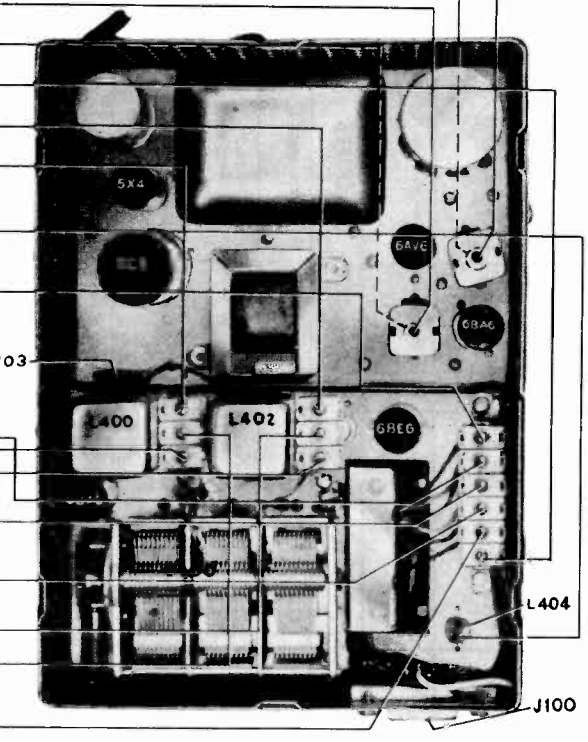
21	A	15.0 mc.	SW5	Tune to signal.	Same as step 1.	Trouble in SW5 circuits. Isolate by steps 22, 23, and 24.
22	B		SW5	Tune through range.	–3.9v to –4.0v	Defective: WS-3 (F), WS-3 (R), WS-2 (F), WS-2 (R). Open: C425, L405. Shorted: C425, L405.
23	D	15.0 mc.	SW5	Tune to signal.	Same as step 1.	Defective: WS-5 (F), WS-5 (R), WS-4 (F), WS-4 (R). Open: C412, L403. Shorted: C412, L403.
24	A	15.0 mc.	SW5	Tune to signal.	Same as step 1.	Defective: WS-7 (F), WS-7 (R), WS-6 (F), WS-6 (R). Open: C402, L401. Shorted: C402, L401.

ALIGNMENT PROCEDURE

NOTE: THE CONTROL UNIT SHOULD BE PLUGGED INTO THE RADIO

DIAL POINTER: With tuning cable disengaged, set tuning gang to full-mesh position; turn tuning control to low-frequency end until pointer stops, then engage cable.
OUTPUT METER: Connect across voice-coil terminals.
SIGNAL GENERATOR: Connect ground lead to chassis; connect output lead as indicated in chart. Use modulated output.
RADIO CONTROLS: Turn volume control to maximum, and tone control fully counterclockwise. Set dial as indicated in chart.
OUTPUT LEVEL: During alignment, signal generator must be attenuated to hold output-meter indication below 1 volt.

STEP	SIGNAL GENERATOR		RADIO			ADJUST
	CONNECTION TO RADIO	DIAL SETTING	BAND PUSH BUTTON	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .05-mf. condenser to aerial receptacle.	455 kc.	BC	1600 kc.	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	Dummy aerial (see note below).	1600 kc.	BC	1600 kc.	Adjust for maximum.	C418A—BC osc. (shunt)
3	Same as step 2.	1520 kc.	BC	1520 kc.	Adjust for maximum.	C410A—BC r.f. C401A—BC aerial
4	Same as step 2.	580 kc.	BC	580 kc.	Adjust for maximum while rocking tuning control.	TC400—BC osc. (padding)
5	Same as step 2.	18.0 mc.	SW5	18.0 mc.	Adjust for maximum.	C418F—SW5 osc.
6	Same as step 2.	17.0 mc.	SW5	17.0 mc.	Adjust for maximum while rocking tuning control.	C410C—SW5 r.f. C401C—SW5 aerial
7	Same as step 2.	13.0 mc.	SW4	13.0 mc.	Adjust for maximum while rocking tuning control.	C418E—SW4 osc.
8	Same as step 2.	9.5 mc.	SW3	9.5 mc.	Adjust for maximum while rocking tuning control.	C418D—SW3 osc.
9	Same as step 2.	7.0 mc.	SW2	7.0 mc.	Adjust for maximum.	C418C—SW2 osc.
10	Same as step 2.	6.0 mc.	SW2	6.0 mc.	Adjust for maximum.	C410B—SW2 r.f. C401B—SW2 aerial
11	Same as step 2.	4.0 mc.	SW1	4.0 mc.	Adjust for maximum while rocking tuning control.	C418B—SW1 osc.

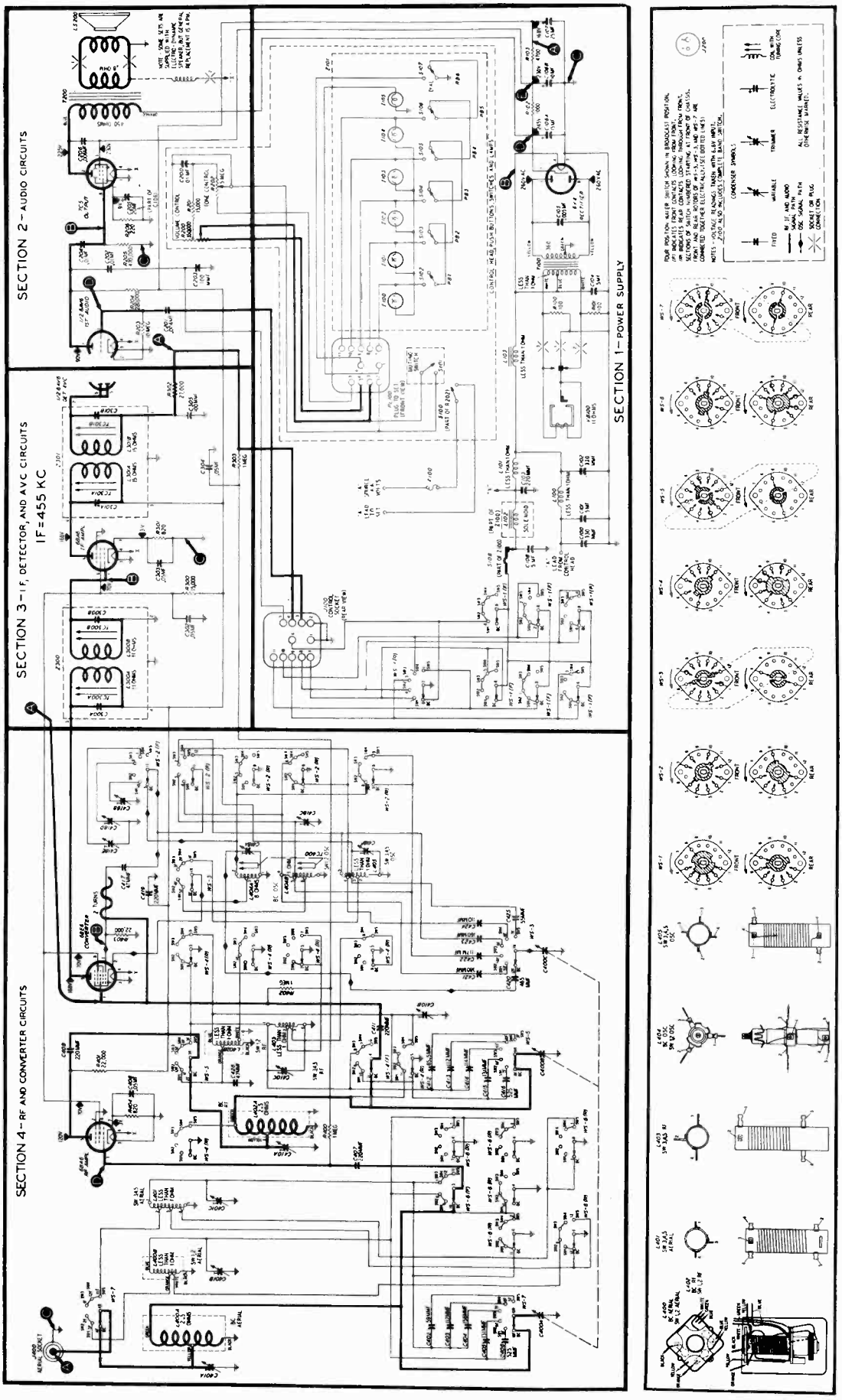


TP-5872

Top View, Showing Trimmer Locations

DUMMY AERIAL: Connect generator output lead through 30-mmf. condenser to aerial receptacle; connect another 30-mmf. condenser from aerial receptacle to chassis.

MODEL CR-10



Sectionalized Schematic Diagram, Showing Test Points

MODEL CR-12

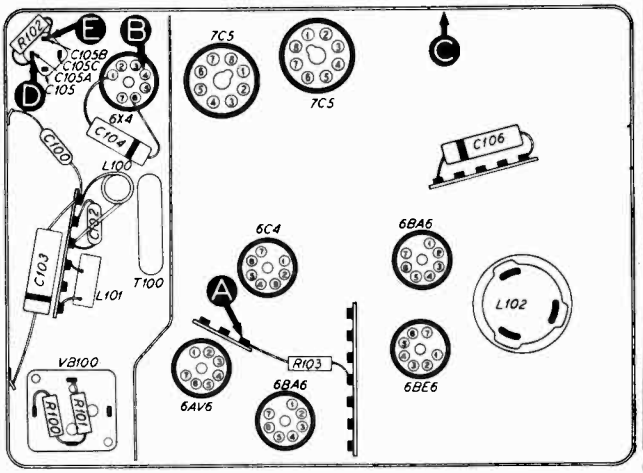
TROUBLE SHOOTING

Section 1

Make the tests for this section with a d-c voltmeter, connecting the leads between the chassis (test point C) and the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter.

Turn on the power and depress the manual-tuning button. Turn the volume control to minimum, and the tone control fully counterclockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.



Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A B	192v 6.6v		Trouble in this section. Isolate by the following tests.
2	B	6.6v	No voltage Low voltage	Open: F100, S100, L100, L101. Weak battery. Leaky: C101, C102, C103.
3	D	250v	No voltage Low voltage High voltage	Open: T100. Shorted: T100, C104, C105A. Defective: VB100, 6X4. Leaky: C105A. Defective: 6X4, VB100. Shorted: C105B, T100. Open: C105A, T100. Open: R102, R210*, T200*.
4	E	237v	No voltage Low voltage High voltage	Open: R102. Shorted: C105B. Leaky: C105B. Changed resistance: R102. Shorted: C207*. Open: R103, R210*.
5	A	192v	No voltage Low voltage	Open: R103. Shorted: C105C. Leaky: C105C. Changed resistance: R103.
Listening Test: Abnormal hum or hash may be caused by open C105B or C105C.				

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

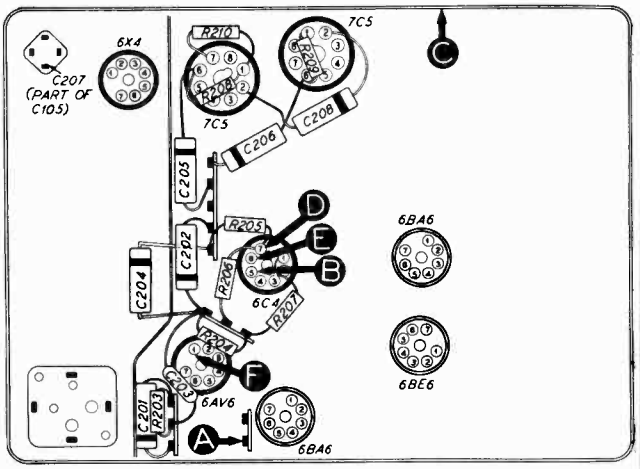
TROUBLE SHOOTING

Section 2

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Depress the manual-tuning button. Turn the volume control to maximum, and the tone control fully counterclockwise. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3; if not, isolate and correct the trouble in this section.



Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B (Remove 6C4)	Loud, clear signal with strong signal input.	Defective: 7C5, LS200. Open: L200, R209, R210, T200. Leaky: C206. Shorted: C206, C207.
3	D (6C4 removed)	Same as step 2.	Defective: 7C5. Shorted: C205. Open: C205, R208. Leaky: C205.
4	E (Replace 6C4)	Loud, clear signal with moderate signal input.	Defective: 6C4. Open: R205, R206, R207. Leaky: C204. Shorted: C204, C203, C202 (rotate through range).
5	F	Same as step 1.	Open: R203, R204, C204. Defective: 6AV6.
6	A	Same as step 1.	Open: R200 (rotate through range), C201, R201. Defective: PL100*, J100*, or cable.
Listening Test: Distortion may be caused by leaky or shorted C201, or by open R203.			

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

TROUBLE SHOOTING

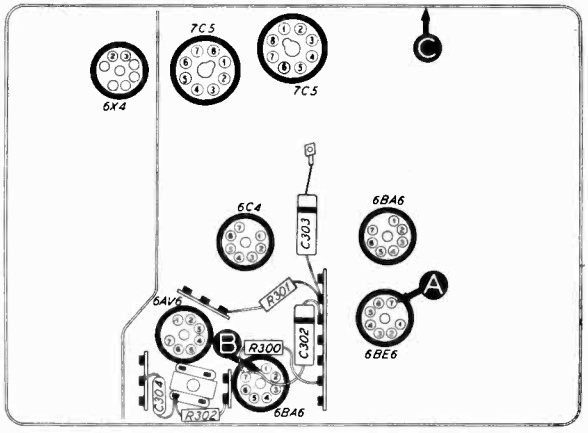
Section 3

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 the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Depress the manual-tuning button. Turn the volume control to maximum, and the tone control fully counterclockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

Since the circuit location of test point A for this section is the same as that of test point B for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."



Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B	Loud, clear signal with moderate signal input.	Open, shorted, or misaligned: Z301. Defective: 6BA6, 6AV6 (diode section). Open: R300, R301, R302. Shorted: C302, C303, C304.
3	A	Loud, clear signal with weak signal input.	Defective: 6BE6*. Open, shorted, or misaligned: Z300. Open: R403*, L403*.

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

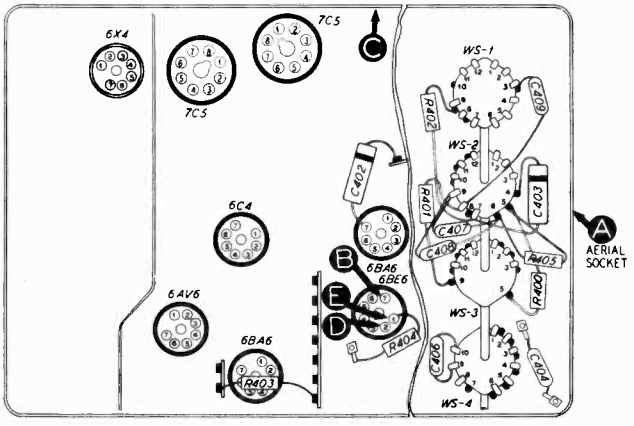
TROUBLE SHOOTING

Section 4

For the tests in this section, with the exception of the oscillator tests, use an r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the volume control to maximum, and the tone control fully counterclockwise.

If the "NORMAL INDICATION" is not obtained in step 1(a), isolate and correct the trouble before making the test in step 1(b).



Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a)	A	1000 kc.	Manual. Tune to signal.	Loud, clear signal with weak signal input.	Trouble in manual-tuning circuits; isolate by steps 2, 3, and 4, and correct trouble before proceeding.
1(b)	A	Tune to frequency of each push button.	Push button. Depress each button.	Loud, clear signal with weak signal input.	Trouble in push-button-tuning circuits; isolate by steps 5, 6, and 7.
MANUAL-TUNING TESTS					
2	B	1000 kc.	Manual. Tune to signal.	Loud, clear signal with moderate signal input.	Defective: 6BE6. Trouble in oscillator circuit (step 3).
3	E to D (Osc. test: see note, page 5.)		Manual. Tune through range.	Negative 2 to 4 volts	Defective: 6BE6, WS2(F). Open: L403, L402C, C406, C407, C408, R404. Shorted or leaky: C406, C407, C408. Shorted: L403, L402C.
4	A	1000 kc.	Manual. Tune to signal.	Loud, clear signal with weak signal input.	Defective: 6BA6, WS3(R), WS3(F), WS1(F), WS1(R), WS2(R). Open: L404, L402B, L402A, R400, R401, R402, R403, R405, C404, C409. Shorted or leaky: C409, C405, C404, C401.
PUSH-BUTTON-TUNING TESTS					
5	B	Tune to frequency of each button.	Push button. Depress each button.	Loud, clear signal with moderate signal input.	Defective: WS1(F), WS1(R). Trouble in oscillator circuit (step 6).

MODEL CR-12

PUSH-BUTTON-TUNING TESTS

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
6	E to D (Osc. test: see note below.)		Push button. Depress each button.	Negative 2 to 4 volts.	Open: WS2(F). Open or shorted: L401F, L401G, L401H, L401I, L401J.
7	A	Tune to frequency of each button.	Push button. Depress each button.	Loud, clear signal with weak signal input.	Defective: WS3(R), WS3(F), WS1(F), WS1(R), WS2(R). Open: L401A, L401B, L401C, L401D, L401E. Open or shorted: Z400.

OSCILLATOR TESTS (steps 3 and 6): Connect positive lead of high-resistance voltmeter to test point D (pin 2, cathode of 6BE6); connect prod end of negative lead through 100,000-ohm isolating resistor to test point E (pin 1, oscillator grid, of 6BE6). Use suitable meter range, such as 0—10 volts. Proper operation of oscillator is indicated by negative voltage, 2 to 4 volts (measured with 20,000-ohms-per-volt meter), throughout range of manual tuning, step 3, and of push-button tuning, step 6.

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, r-f by-pass, 330 mmf.	62-133001001
C101	Condenser, by-pass, .5 mf.	61-0137*
C102	Condenser, by-pass, 330 mmf.	62-133001001
C103	Condenser, by-pass, .5 mf.	61-0137*
C104	Condenser, buffer, .0033 mf.	61-0115
C105	Condenser, electrolytic, 4-section	61-0150
C105A	Condenser, filter, 20 mf., 350 v.	Part of C105
C105B	Condenser, filter, 10 mf., 350 v.	Part of C105
C105C	Condenser, filter, 5 mf., 300 v.	Part of C105
C106	Condenser, by-pass, .5 mf.	61-0137*
I100	Pilot lamp	34-2040
I101	Pilot lamp	34-2040
I102	Pilot lamp	34-2040
I103	Pilot lamp	34-2040
I104	Pilot lamp	34-2040
I105	Pilot lamp	34-2040
J100	Socket, control plug	27-6234
J101	Socket, foot control	27-6186*
L100	Choke, "A"	32-4170
L101	Choke, "A"	32-1374-2
L102	Solenoid	Part of Z100
PB1	Push-button switch	Part of Z101
PB2	Push-button switch	Part of Z101
PB3	Push-button switch	Part of Z101
PB4	Push-button switch	Part of Z101
PB5	Push-button switch	Part of Z101
PB6	Push-button switch	Part of Z101
PL100	Plug, control head	76-3124
R100	Resistor, damping, 100 ohms	66-1104340*
R101	Resistor, damping, 100 ohms	66-1104340*
R102	Resistor, filter, 1000 ohms	66-2104340*
R103	Resistor, filter, 4700 ohms	66-2473340*
S100	Switch, off-on	Part of R200
S101	Switch, muting	Part of Z101
S102	Switch, solenoid interrupter	Part of Z100
T100	Transformer, power	32-8314
VB100	Vibrator	45-6307*
WS4(F)	Wafer section (homing)	Part of Z100
WS4(R)	Wafer section (homing)	Part of Z100
Z100	Solenoid-and-wafer-switch assembly	76-2945
Z101	Switch-and-lamp-housing assembly	76-2957

SECTION 2

C200	Condenser, tone compensation, .01 mf. (in control head)	61-0120*
C201	Condenser, d-c blocking, .004 mf.	61-0179*
C202	Condenser, tone compensation, .01 mf.	61-0120*
C203	Condenser, r-f by-pass, 100 mmf.	30-1224-18
C204	Condenser, d-c blocking, .004 mf.	61-0179*
C205	Condenser, d-c blocking, .01 mf.	61-0120*
C206	Condenser, d-c blocking, .01 mf.	61-0120*
C207	Condenser, by-pass, 10 mf., 25 v.	Part of C105
C208	Condenser, tone compensation, .006 mf.	61-0105*
L200	Speaker field	Part of LS200
LS200	Loud-speaker	36-1609-2
R200	Volume control, 350,000 ohms (in control head)	33-5557
R200	Volume control (Buick special)	33-5557-1
R201	Resistor, tone compensation, 15,000 ohms (in control head)	66-3153340*
R202	Tone control, 5 megohms (in control head)	Part of R200
R203	Resistor, grid return, 10 megohms	66-6103340*
R204	Resistor, plate load, 220,000 ohms	66-4223340*
R205	Resistor, grid return, 10 megohms	66-6103340*
R206	Resistor, cathode load 220,000 ohms	66-4223340*
R207	Resistor, plate load, 220,000 ohms	66-4223340*
R208	Resistor, grid return 470,000 ohms	66-4473340*
R209	Resistor, grid return 470,000 ohms	66-4473340*
R210	Resistor, bias, 330 ohms	66-1333340*
T200	Transformer, output	32-8316

SECTION 3

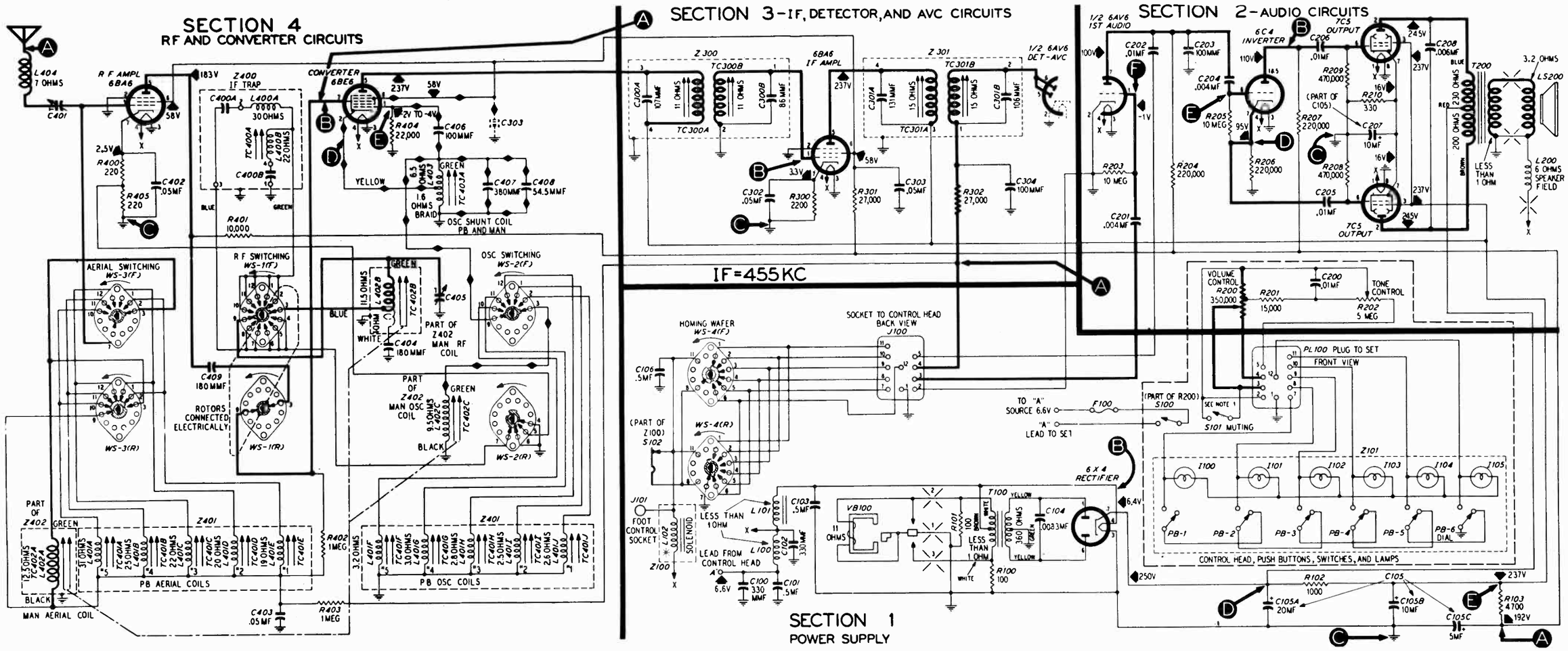
C300A	Condenser, fixed trimmer, 107 mmf.	Part of Z300
C300B	Condenser, fixed trimmer, 86 mmf.	Part of Z300
C301A	Condenser, fixed trimmer, 131 mmf.	Part of Z301
C301B	Condenser, fixed trimmer, 106 mmf.	Part of Z301
C302	Condenser, cathode by-pass, .05 mf.	61-0122
C303	Condenser, cathode by-pass, .05 mf.	61-0122
C304	Condenser, r-f by-pass, 100 mmf.	30-1224-18
R300	Resistor, cathode by-pass, 2200 ohms	66-2223340*
R301	Resistor, screen dropping, 27,000 ohms	66-3273340*
R302	Resistor, r-f filter, 27,000 ohms	66-3273340*
Z300	Transformer, 1st i-f, including C300A and C300B	32-4160
Z301	Transformer, 2nd i-f, including C301A and C301B	32-4161

SECTION 4

C400A	Condenser, d-c blocking	Part of Z400
C400B	Condenser, fixed padder	Part of Z400
C401	Condenser, aerial padder	63-0055*
C402	Condenser, cathode by-pass, .05 mf.	61-0122
C403	Condenser, a-v-c filter, .05 mf.	61-0122
C404	Condenser, coupling, 180 mmf.	60-10205307*
	Condenser, r-f trimmer	63-0055*
C405	Condenser, d-c blocking, 100 mmf.	30-1224-18
C407	Condenser, shunt, silver mica, 380 mmf.	30-1220-37
C408	Condenser, shunt, 54.5 mmf.	61-0149
C409	Condenser, d-c blocking, 180 mmf.	60-10205307*
L400A	Coil, i-f trap (series)	Part of Z400
L400B	Coil, i-f trap (shunt)	Part of Z400
L401A	Coil, aerial, push button	Part of Z401
L401B	Coil, aerial, push button	Part of Z401
L401C	Coil, aerial, push button	Part of Z401
L401D	Coil, aerial, push button	Part of Z401
L401E	Coil, aerial, push button	Part of Z401
L401F	Coil, osc. tuning, push button	Part of Z401
L401G	Coil, osc. tuning, push button	Part of Z401
L401H	Coil, osc. tuning, push button	Part of Z401
L401I	Coil, osc. tuning, push button	Part of Z401
L401J	Coil, osc. tuning, push button	Part of Z401
L402A	Coil, aerial, manual (Part of Z402)	65-0443-4
L402B	Coil, r-f, manual (Part of Z402)	65-0443-5
L402C	Coil, osc., manual (Part of Z402)	65-0443-6
L403	Coil, oscillator shunt	32-4110
L404	Choke, spark supptessor	65-0437
R400	Resistor, cathode bias, 220 ohms	66-1223340*
R401	Resistor, plate load, 10,000 ohms	66-3103340*
R402	Resistor, grid return, 1 megohm	66-5103340*
R403	Resistor, a-v-c filter, 1 megohm	66-5103340*
R404	Resistor, grid return, 22,000 ohms	66-3223340*
R405	Resistor, cathode bias, 220 ohms	66-1223340*
Z400	Trap assembly, i-f, including C400A, C400B, L400A, and L400B	32-4162
Z401	Coil assembly, push button, including L401A through L401J	76-2715
Z402	Coil assembly, manual tuner, including L402A, L402B, and L402C	76-2919
WS1(F)	Wafer section, r-f	Part of Z100
WS1(R)	Wafer section, r-f	Part of Z100
WS2(F)	Wafer section, osc.	Part of Z100
WS2(R)	Wafer section, osc.	Part of Z100
WS3(F)	Wafer section, aerial	Part of Z100
WS3(R)	Wafer section, aerial	Part of Z100

MISCELLANEOUS

"A"-lead assembly	41-3187-1
Bolt, hook	57-1340FA3
Braid, bonding	95-0073
Cap, lamp-housing	54-4408
Clip, anti-rattle spring	28-2488FA1
Clip, spring, cover grounding	57-1335
Cover, tube side	76-3015FJ21
Cover, wiring side	56-4421FJ21
Driver-and-shaft assembly	76-2716
Housing assembly	76-2879FJ21
Knob, push-button	56-4406
Resistor, distributor	33-1196
Screen, speaker	57-2385
Slider assembly, manual tuner	76-2730



Philco Auto Radio Model CR-12, Sectionalized Schematic Diagram, Showing Test Points

SPECIFICATIONS

CIRCUIT	Eight-tube superheterodyne
FREQUENCY RANGE	535—1600 kc.
INTERMEDIATE FREQUENCY	455 kc.
AUDIO OUTPUT	6 watts
POWER INPUT	8.6 amperes at 6.6 volts, d.c.
PUSH BUTTONS	Six: five station selectors and one manual-tuning selector
AERIAL	Any Philco auto-radio aerial
PHILCO TUBES (8)	6BA6 (2), 6BE6, 6AV6, 6C4, 7C5 (2), 6X4

Circuit Description

Philco Auto Radio Model CR-12 is an eight-tube superheterodyne of the universal-mounting type, designed for separate mounting of the speaker and control head.

The aerial input circuit is designed for maximum reduction of interference without loss of signal strength. Permeability tuning is used for all main circuits. Of the six push buttons, located on the control head, five are used for automatic station selection, and one selects manual tuning. The pilot lamps are connected through the switch wafers in a series-parallel circuit; the wiring is so arranged that the lamp which glows above the push button in use is in series with the parallel combination of the other five lamps.

A foot switch and cable assembly (Foot Control Kit, Part No. 45-1545) is available for automatic tuning of stations by foot control; the switch cable is connected by plugging it into pin jack J101.

A tuned-r-f-amplifier stage, incorporating a 6BA6 pentode, provides good sensitivity and selectivity. The 6BE6 converter works into a 6BA6 i-f amplifier, which operates at 455 kc.

The 6AV6 duo-diode, triode tube provides detection and a-v-c voltage in the diode section; the triode section functions as the first audio amplifier. The first-audio stage is coupled to the 6C4 inverter, which drives the two 7C5 output tubes in push-pull. Approximately six watts of audio power is supplied to the electrodynamic speaker.

The power supply includes a non-synchronous vibrator and a type 6X4 rectifier.

MODEL CR-12

ALIGNMENT PROCEDURE

DIAL POINTER—With tuning cable disengaged, set tuning-core gang to full-mesh position; turn dial of tuning control to low-frequency end until pointer stops, then engage tuning cable.

OUTPUT METER—Connect across voice-coil terminals.

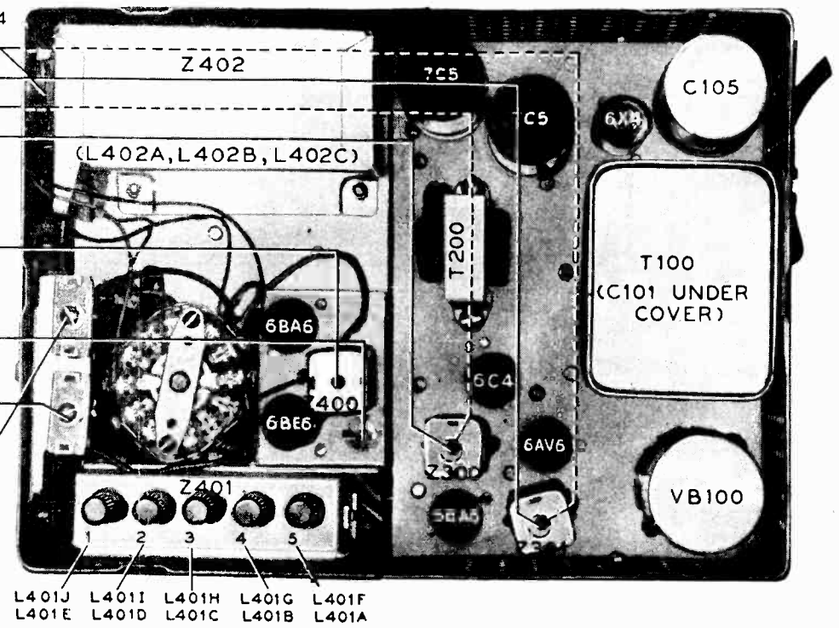
SIGNAL GENERATOR — Connect ground lead to chassis; connect output lead as indicated in chart. Use modulated output.

RADIO CONTROLS—Turn volume control to maximum, and tone control fully counterclockwise; use push buttons as directed in chart.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1 volt.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	FREQUENCY	TUNING	SPECIAL INSTRUCTIONS	
1	Through .05-mf. condenser to aerial receptacle.	455 kc.	Manual. 1600 kc.	Adjust, in order given, for maximum output. (TC301B and TC300B are reached through holes in bottom of i-f transformers.)	TC301B TC301A TC300B TC300A
2	Same as step 1.	455 kc.	Any push button except manual tuning.	Adjust for minimum output.	TC400A
3	Dummy aerial (see note below).	580 kc.	Manual. 580 kc.	Adjust for maximum output while rocking tuning control.	TC403A
4	Same as **step 3.**	1500 kc.	Manual. Tune to signal.	**Adjust**, in order given, for maximum output.	C405 C401
5	Same as **step 3.**	1400 kc.	Manual. Tune to signal.	Re-engage tuning cable for correct calibration.	
6	Repeat steps 3, 4, and 5 until no further improvement is obtained.				
7	After reinstalling radio in car, adjust C401 (manual tuning only) for maximum output while tuned to weak station near 1400 kc. Re-engage tuning control for correct dial calibration.				

DUMMY AERIAL: Connect generator output lead through 30-mmf. condenser to aerial receptacle; connect another 30-mmf. condenser between aerial receptacle and chassis.



Top View, Showing Trimmer and Tuning-Core Locations

SETTING PUSH BUTTONS

Each adjusting rod controls ganged tuning cores for both aerial and oscillator circuits, so that only a single adjustment is required for a given frequency. The ganged tuning cores are adjusted by turning the bakelite knobs, numbered 1, 2, 3, 4, and 5, located on the front of the radio.

1. Use an r-f signal generator to furnish test signals at the approximate frequencies of the desired stations. Connect the generator ground lead to the chassis. Connect the output lead through a 30-mmf. condenser to the aerial receptacle; connect another 30-mmf. condenser between the aerial receptacle and the chassis.

2. Turn on the power, set the volume control to maximum, and turn the tone control fully counterclockwise.

3. Starting with the lowest frequency desired, set the signal generator, depress push button No. 1 on the control head, and adjust knob No. 1 on the radio for maximum output. Repeat the procedure for buttons 2, 3, 4, and 5.

4. After the radio is installed in the car, and the aerial connected, allow a fifteen-minute warm-up period, then readjust the tuning for each button while listening to the station for which the adjustment is being made.

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 test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:

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 7 of the 6X4 rectifier) and the radio chassis (test point C), with the ohmmeter polarity such that the highest resistance reading is obtained. If the reading is lower than 5000 ohms, check condensers C105A and C105B for leakage or shorts.

The resistance value above, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

3. If a fuse is blown, check the vibrator before installing a new fuse.

4. If the vibrator is defective, check C104 before installing a new vibrator.

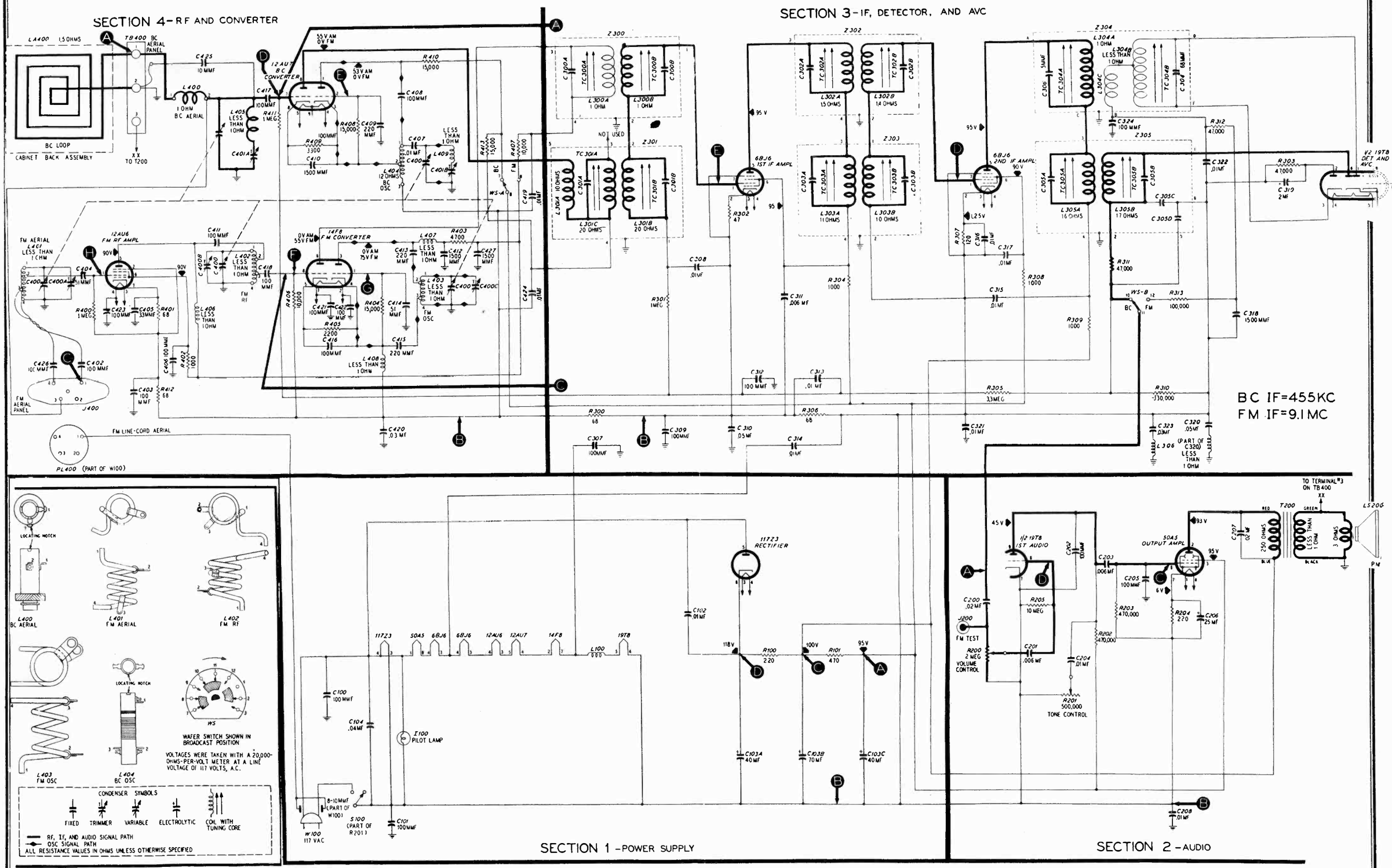


Figure 6. Philco Radio Model 49-906, Sectionalized Schematic Diagram, Showing Test Points

MODEL 49-906

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B—, test point B; output lead through .1-mf. condenser to terminal 1 of TB400.	455 kc.	540 kc.	Adjust each trimmer, in order given, for maximum output. Do not repeat adjustments.	TC305B—3rd i-f sec. TC305A—3rd i-f pri. TC303B—2nd i-f sec. TC303A—2nd i-f pri. TC301B—1st i-f sec. TC301A—1st i-f pri.
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum output.	C401B—BC osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output.	C401A—BC aerial

RADIATING LOOP: Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to the signal-generator leads and place near the radio loop.

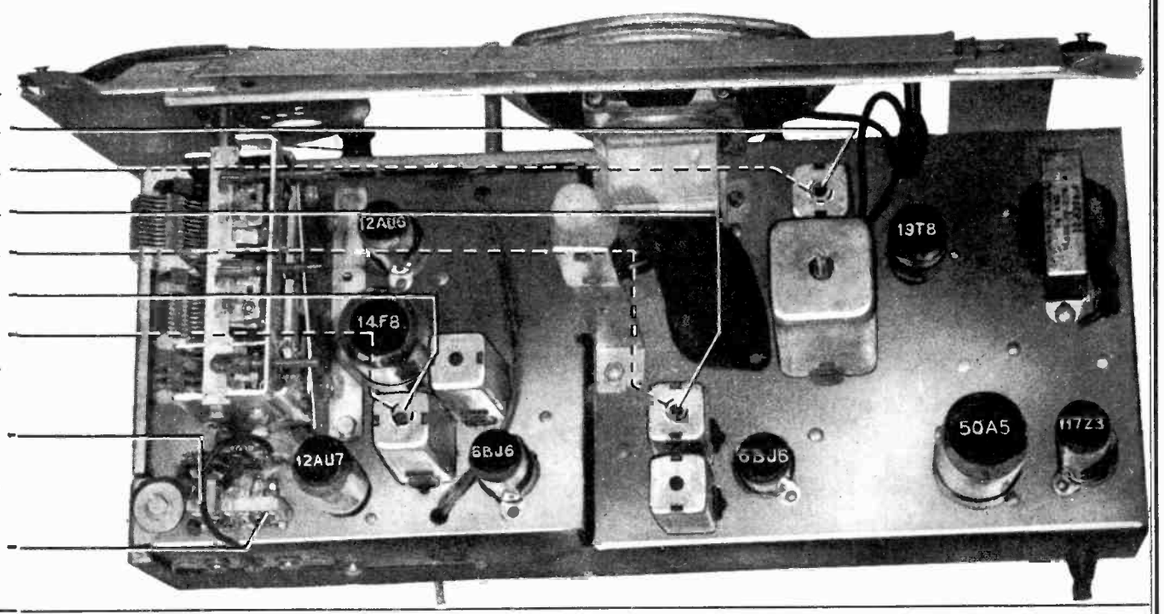


Figure 8. Top View, Showing AM Trimmer Locations

TP

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to pin 1 of 6BJ6, 1st i-f amplifier.	9.1 mc.	88 mc.	Adjust for maximum reading on alignment indicator. Attenuate signal generator to maintain reading of approximately 10 volts. Repeat adjustments until no further improvement is noted. After this step, do not disturb any of these trimmers except as directed in step 3.	TC304B—3rd i-f sec. TC304A—3rd i-f pri. TC302B—2nd i-f sec. TC302A—2nd i-f pri.
2	Through .1-mf. condenser to pin 8 of 14F8.	9.1 mc.	88 mc.	Adjust for maximum reading on alignment indicator. Repeat adjustments until no further improvement is noted. Do not disturb these trimmers after this step.	TC300B—1st i-f sec. TC300A—1st i-f pri.
3	Same as step 2.	9.1 mc.	88 mc.	Adjust for minimum reading on output meter. This adjustment is critical; repeat to make sure it is correct.	TC304B—3rd i-f sec.
4	To terminal 1 of J400.	105 mc.	105 mc.	Adjust for maximum reading on alignment indicator.	C400C—FM osc.
5	Same as step 4.	105 mc.	105 mc.	Same as step 4. Rock tuning control.	C400B—FM r-f
6	Same as step 4.	105 mc.	105 mc.	Same as step 4.	C400A—FM aerial
7	Same as step 4.	92 mc.	92 mc.	Same as step 4. See note on page 10.	L403—FM osc. (tracking)
8	Same as step 4.	92 mc.	92 mc.	Same as step 7.	L402—FM r-f (tracking)
9	Same as step 4.	92 mc.	92 mc.	Same as step 7.	L401—FM aerial (tracking)
10	Repeat steps 4 through 9 until no further improvement is obtained.				

NOTE: TC305A, TC304B, TC303A, TC302A, TC301A AND TC300A ARE AVAILABLE FROM UNDERSIDE OF CHASSIS.

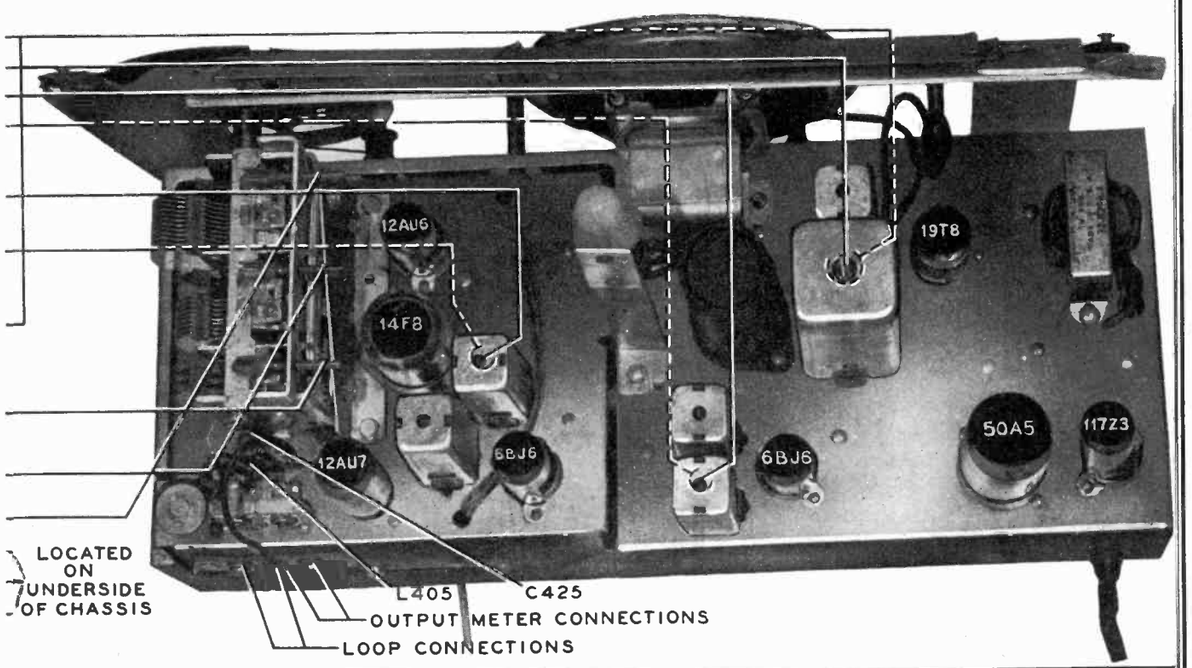


Figure 9. Top View, Showing FM Trimmer Locations

TP

MODEL 49-906

Circuit Description

Philco Radio Model 49-906 is an eight-tube superheterodyne which provides reception on the standard-broadcast band and on the FM band. A built-in high-impedance loop is used as the aerial on the broadcast band and the line cord is used as the aerial on the FM band. These aerials 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 it to pin 1 of the dipole-aerial plug which fits into J400. No additional coupler is required.

To eliminate complicated switching and to provide greater stability and gain on both bands, separate converter tubes are used for broadcast and FM reception. A 12AU6 high-gain pentode is used as a tuned r-f amplifier on the FM band. The output of this stage is fed to a 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.

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

Two diode sections of the 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 standard-broadcast signals and to provide a-v-c voltage.

The triode section of the 19T8 is employed as the first audio amplifier, and is resistance-coupled to the 50A5 output tube, which supplies an audio output of approximately one watt to the permanent-magnet dynamic speaker.

Philco TROUBLE-SHOOTING Procedure

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

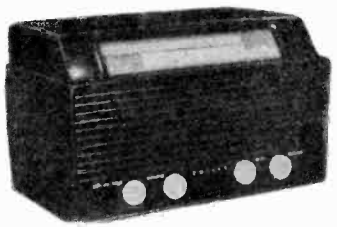
Section 1—the power supply
Section 2—the audio circuits
Section 3—the i-f, detector, and a-v-c circuits
Section 4—the r-f and converter circuits

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.



SPECIFICATIONS

CABINET	Plastic
CIRCUIT	Eight-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1620 kc.
FM	88—108 mc.
AUDIO OUTPUT	1 watt
OPERATING VOLTAGES	105—120 volts, a.c. or d.c.
POWER CONSUMPTION	40 watts
AERIALS	Built-in loop and FM line cord; provisions for connection of external aerial
INTERMEDIATE FREQUENCIES	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES (8)	12AU6, 12AU7, 14F8, 6BJ6-(2), 19T8, 50A5, 117Z3

REPLACEMENT PARTS LIST

NOTE: 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, r-f by-pass, 100 mmf.	62-110009001
C101	Condenser, r-f by-pass, 100 mmf.	62-110009001
C102	Condenser, r-f by-pass, .01 mf.	61-0120*
C103	Condenser, electrolytic, 3-section	30-2568-10
C103A:	Condenser, filter, 40 mf.	Part of C103
C103B:	Condenser, filter, 70 mf.	Part of C103
C103C:	Condenser, filter, 40 mf.	Part of C103
C104	Condenser, line filter, .04 mf.	45-3500-2
I100	Panel lamp, 110v, screw base	34-2605*
L100	Choke, filament, 100 millihenries	32-4143-4
R100	Resistor, filter, 220 ohms	66-1225340*
R101	Resistor, filter, 470 ohms	66-1474340
S100	Switch, power	Part of R201
W100	Line cord and plug (incl. FM line aerial)	41-3755-19*

SECTION 2

AUDIO CIRCUITS

C200	Condenser, d-c blocking, .02 mf.	61-0108*
C201	Condenser, d-c blocking, .006 mf.	45-3500-7*
C202	Condenser, plate by-pass, 100 mmf.	62-110009001
C203	Condenser, d-c blocking, .006 mf.	45-3500-7*
C204	Condenser, tone compensation, .01 mf.	61-0120*
C205	Condenser, r-f by-pass, 100 mmf.	62-110009001
C206	Condenser, electrolytic, cathode by-pass, 25 mf.	45-3001*
C207	Condenser, tone compensation, .02 mf.	61-0108*
C208	Condenser, r-f by-pass, .01 mf.	61-0120*
J200	Socket, FM test	27-6180
LS200	Loud-speaker, PM	36-1615-2
R200	Volume control, 2 megohms	45-5019
R201	Tone control (with a-c switch), 500,000 ohms	45-5009
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid return, 470,000 ohms	66-4473340*
R204	Resistor, cathode bias, 220 ohms	66-1224340*

REPLACEMENT PARTS LIST (Continued)

SECTION 2 (Continued)

AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
R205	Resistor, grid return, 10 megohms	66-6103340*
T200	Output transformer	32-8296-4

SECTION 3

I-F, DETECTOR, AND A-V-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 Z30.
C302B	Condenser, shunt	Part of Z302
C303A	Condenser, shunt	Part of Z303
C303B	Condenser, shunt	Part of Z303
C304	Condenser, shunt, 68 mmf.	Part of Z304
C305A	Condenser, shunt	Part of Z305
C305B	Condenser, shunt	Part of Z305
C305C	Condenser, a-v-c filter	Part of Z305
C305D	Condenser, a-v-c filter	Part of Z305
C306	Condenser, shunt (part of Z304), 5 mmf.	30-1224-5
C307	Condenser, r-f by-pass, 100 mmf.	62-110009001
C308	Condenser, a-v-c by-pass, .01 mf.	61-0120*
C309	Condenser, r-f by-pass, 100 mmf.	62-110009001
C310	Condenser, r-f by-pass, .05 mf.	61-0122*
C311	Condenser, screen by-pass, .006 mf.	45-3500-7*
C312	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C313	Condenser, a-v-c by-pass, .01 mf.	61-0120*
C314	Condenser, r-f by-pass, .01 mf.	61-0120*
C315	Condenser, plate by-pass, .01 mf.	61-0120*
C316	Condenser, cathode by-pass, .01 mf.	61-0120*
C317	Condenser, screen by-pass, .01 mf.	61-0120*
C318	Condenser, decoupling, 1500 mmf.	62-215001011*
C319	Condenser, electrolytic, filter, FM detector, 2 mf.	30-2417-7
C320	Condenser-and-choke assy., by-pass, .05 mf.	38-9851-6
C321	Condenser, r-f by-pass, .01 mf.	61-0120*
C322	Condenser, compensating, .01 mf.	61-0120*
C323	Condenser, i-f by-pass, .03 mf.	30-3500-1*
C324	Condenser, r-f by-pass, 100 mmf.	62-110009001*
L300A	Primary coil, 1st FM i-f trans.	Part of Z300
L300B	Secondary coil, 1st FM i-f trans.	Part of Z300
L301A	Primary coil, 1st AM i-f trans.	Part of Z301
L301B	Secondary coil, 1st AM i-f trans.	Part of Z301
L301C	Tertiary coil, 1st AM i-f trans.	Part of Z301
L302A	Primary coil, 2nd FM i-f trans.	Part of Z302
L302B	Secondary coil, 2nd FM i-f trans.	Part of Z302
L303A	Primary coil, 2nd AM i-f trans.	Part of Z303
L303B	Secondary coil, 2nd AM i-f trans.	Part of Z303
L304A	Primary coil, 3rd FM i-f trans.	Part of Z304
L304B	Secondary coil, 3rd FM i-f trans.	Part of Z304
L304C	Tertiary coil, 3rd FM i-f trans.	Part of Z304
L305A	Primary coil, 3rd AM i-f trans.	Part of Z305
L305B	Secondary coil, 3rd AM i-f trans.	Part of Z305
L306	Coil, r-f choke	32-4061-2
R300	Resistor, decoupling, 68 ohms	66-0683340*
R301	Resistor, grid return, 1 megohm	66-5103340*
R302	Resistor, cathode bias, 47 ohms	66-0473340*
R303	Resistor, FM-detector load, 47,000 ohms	66-3473340*
R304	Resistor, plate decoupling, 1000 ohms	66-2103340*

SECTION 3 (Continued)

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

Reference Symbol	Description	Service Part No.
R305	Resistor, a-v-c filter, 3.3 megohms	66-5333340*
R306	Resistor, r-f decoupling, 68 ohms	66-0683340*
R307	Resistor, cathode bias, 120 ohms	66-1123340*
R308	Resistor, screen dropping, 1000 ohms	66-2103340*
R309	Resistor, plate decoupling, 1000 ohms	66-2103340*
R310	Resistor, diode load, 330,000 ohms	66-4333340*
R311	Resistor, diode load, 47,000 ohms	66-3473340*
R312	Resistor, decoupling, 47,000 ohms	66-3473340*
R313	Resistor, decoupling, 100,000 ohms	66-4103340*
TC300A	Primary tuning core, 1st FM i-f trans.	Part of Z300
TC300B	Secondary tuning core, 1st FM i-f trans.	Part of Z300
TC301A	Primary tuning core, 1st AM i-f trans.	Part of Z301
TC301B	Secondary tuning core, 1st AM i-f trans.	Part of Z301
TC302A	Primary tuning core, 2nd FM i-f trans.	Part of Z302
TC302B	Secondary tuning core, 2nd FM i-f trans.	Part of Z302
TC303A	Primary tuning core, 2nd AM i-f trans.	Part of Z303
TC303B	Secondary tuning core, 2nd AM i-f trans.	Part of Z303
TC304A	Primary tuning core, 3rd FM i-f trans.	Part of Z304
TC304B	Secondary tuning core, 3rd FM i-f trans.	Part of Z304
TC305A	Primary tuning core, 3rd AM i-f trans.	Part of Z305
TC305B	Secondary tuning core, 3rd AM i-f trans.	Part of Z305
WS-B	Switch-wafer section	Part of 42-1834-1†
Z300	Transformer, 1st FM i-f	32-4257
Z301	Transformer, 1st AM i-f	32-4258
Z302	Transformer, 2nd FM i-f	32-4257-1
Z303	Transformer, 2nd AM i-f	32-4160-3
Z304	Transformer, 3rd FM i-f	32-4261-1
Z305	Transformer, 3rd AM i-f	32-4240-2

SECTION 4

R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2724-2
C400A:	Condenser, trimmer, FM aerial	Part of C400
C400B:	Condenser, trimmer, FM r-f	Part of C400
C400C:	Condenser, trimmer, FM oscillator	Part of C400
C401	Condenser, trimmer, 2-section	31-6476-13
C401A:	Condenser, trimmer, BC aerial	Part of C401
C401B:	Condenser, trimmer, BC oscillator	Part of C401
C402	Condenser, aerial coupling, 100 mmf.	62-110009001
C403	Condenser, r-f by-pass, 100 mmf.	62-110009001
C404	Condenser, blocking, 51 mmf.	62-051009001*
C405	Condenser, cathode by-pass, 33 mmf.	62-033009001*
C406	Condenser, screen by-pass, 100 mmf.	62-110009001
C407	Condenser, isolating, .01 mf.	61-0120*
C408	Condenser, blocking, 100 mmf.	62-110009001
C409	Condenser, r-f by-pass, 220 mmf.	62-122001001
C410	Condenser, cathode by-pass, 1500 mmf.	62-215001011*
C411	Condenser, d-c blocking, 100 mmf.	62-110009001
C412	Condenser, r-f by-pass, 1500 mmf.	62-215001011*
C413	Condenser, d-c blocking, 220 mmf.	62-122001001
C414	Condenser, r-f by-pass, 51 mmf.	62-051009001*
C415	Condenser, d-c blocking, 220 mmf.	62-122001001
C416	Condenser, cathode by-pass, 100 mmf.	62-110009001
C417	Condenser, isolating, 100 mmf.	62-110009001
C418	Condenser, isolating, 100 mmf.	62-110009001
C419	Condenser, plate decoupling, .01 mf.	61-0120*
C420	Condenser, r-f by-pass, .03 mf.	45-3500-1*
C421	Condenser, r-f by-pass, 100 mmf.	62-110009001
C422	Condenser, r-f by-pass, 100 mmf.	62-110009001
C423	Condenser, r-f by-pass, 100 mmf.	62-110009001

SECTION 4 (Continued)

C424	Condenser, plate decoupling, .01 mf.	61-0120*
C425	Condenser, aerial coupling, 10 mmf.	62-010009001
C426	Condenser, aerial coupling, 100 mmf.	62-110009001
C427	Condenser, r-f by-pass, 1500 mmf.	62-215001011*
J400	Aerial socket	27-6214-1
L400	Coil, BC aerial	32-4217-1
L401	Coil, FM aerial	32-4158-1
L402	Coil, FM r-f	32-4159-1
L403	Coil, FM oscillator	32-4018-5
L404	Coil, BC oscillator	32-4221-1
L405	Coil, r-f choke	32-4061-2
L406	Coil, FM r-f plate load	32-4061-2
L407	Coil, FM oscillator plate load	32-4061-2
L408	Coil, r-f choke	32-4061-2
L409	Coil, r-f choke	32-4061-2
LA400	Loop aerial	32-4052-22
PL400	Plug, FM aerial	Part of W100
R400	Resistor, grid return, 1 megohm	66-5103340*
R401	Resistor, cathode bias, 68 ohms	66-0683340*
R402	Resistor, screen dropping, 1000 ohms	66-2103340*
R403	Resistor, plate decoupling, 4700 ohms	66-2473340*
R404	Resistor, grid return, 15,000 ohms	66-3153340*
R405	Resistor, cathode bias, 2200 ohms	66-2223340*
R406	Resistor, grid return, 10,000 ohms	66-3103340*
R407	Resistor, plate decoupling, 10,000 ohms	66-3103340*
R408	Resistor, grid return, 15,000 ohms	66-3153340*
R409	Resistor, cathode bias, 3300 ohms	66-2333340*
R410	Resistor, plate load, 15,000 ohms	66-3153340*
R411	Resistor, grid return, 1 megohm	66-5103340*
R412	Resistor, r-f decoupling, 68 ohms	66-0683340*
R413	Resistor, plate decoupling, 15,000 ohms	66-3153340*
TB400	Aerial terminal panel	38-9942
WS-A	Switch-wafer section	Part of 42-1834-1†

MISCELLANEOUS

Description	Service Part No.
Cabinet (less scale)	10715
Baffle-and-cloth assembly	40-7539
Cabinet back	54-7632
Dial scale	54-5013
Strap, scale mounting (L. H.)	56-5739FCP
Strap, scale mounting (R. H.)	56-5739-1FCP
Dial-Backplate Assembly	
Dial cord (25-ft spool)	45-8750*
Diffusing panel	54-7612
Diffusing-panel spring	56-3841
Pointer	56-5630-1FCP
Spring, pointer	28-8953
Spring, gang	56-2617
Upright assembly	76-4041
Dial drive shaft	76-3982
Bracket-and-clip assembly	76-4043
Bracket, speaker	56-5435FA3
Knob	54-4557-1
Plug-and-wire assembly (FM)	41-3791
Rubber mount, r-f chassis	54-4295
Socket assembly, pilot lamp	27-6233
Socket, electrolytic condenser mtg.	27-9508
Socket, 9-pin miniature	27-6203-5
Socket, 8-pin Loktal	27-6138*
Socket, 7-pin miniature	27-6226
Wave switch	42-1834-1

† 42-1834-1 is WS, wafer switch, single wafer (includes WS-A and WS-B).

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 6 of the 117Z3) 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 1250 ohms, check condensers C102, C103A, C103B, and C103C for leakage or shorts. This resistance value, 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.

3. If the 50A5 tube or the 6BJ6 (2nd i-f amplifier) tube is burned out, check condenser C314 for a short before installing a new tube.

Important!

To avoid altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical positions as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be changed.

Section 1 TROUBLE SHOOTING

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, turn the tone control fully clockwise, and set the band switch to the broadcast 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.

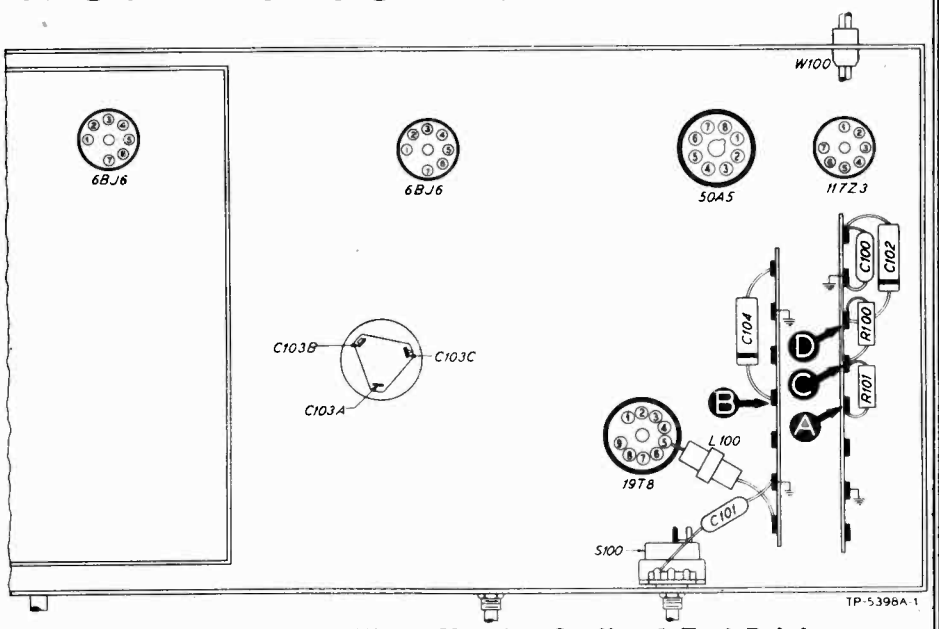


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	95 volts		Trouble in this section. Isolate by the following tests.
2	C	100 volts	No voltage	Defective: 117Z3. Open: W100, S100. Shorted: C103A, C103B, C102.
			Low voltage	Defective: 117Z3. Leaky: C103A, C103B, C103C. Shorted: C103C.
			High voltage	Open: R100, R101, T200*, R204*.
3	D	118 volts	No voltage	Open: R100. Shorted: C103B.
			Low voltage	Increased value: R100. Leaky: C103B. Shorted: C103C.
			High voltage	Open: R101, T200*, R204*.
4	A	95 volts	No voltage	Open: R101. Shorted: C103C.
			Low voltage	Leaky: C103C. Increased value: R101. Shorted: C312*, C311*, C317*, C419*, C406*, C315*, C318*, C411*.
Listening Test: Abnormal hum may be caused by open C103A, C103B, or C103C.				

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

MODEL 49-906

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 fully counterclockwise.

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	Loud, clear speaker output with moderate generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 50A5. Shorted: LS200, T200. Open: R203, R204, C205, LS200, T200. Shorted or leaky: C202, C204, C205, C206, C207.
3	D	Loud, clear output with moderate input.	Defective: 19T8. Open: R205, R202, C202. Shorted or leaky: C202, C203 (rotate R201 through range).
4	A	Loud, clear output with moderate input.	Open: R200 (rotate through range), C200, C201. Shorted or leaky: C200, C201.
Listening Test: Distortion may be caused by leaky C200, C201, or C202.			

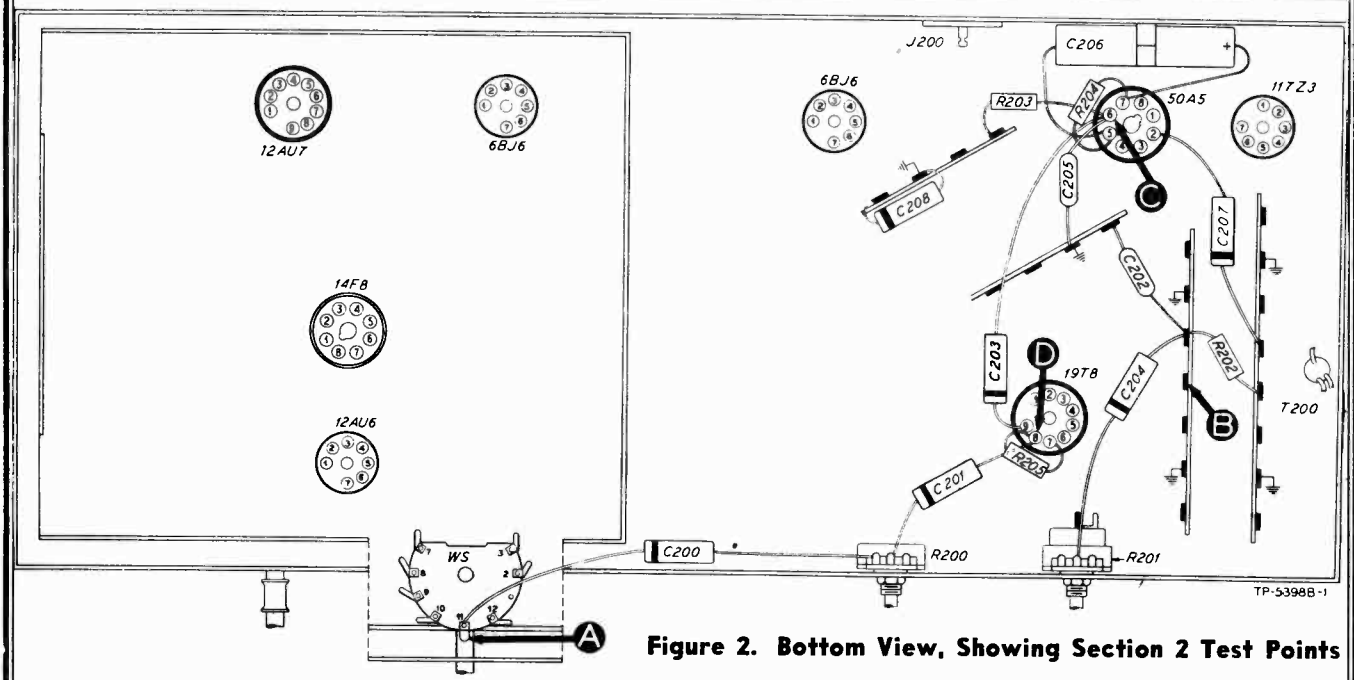


Figure 2. Bottom View, Showing Section 2 Test Points

Section 3 TROUBLE SHOOTING

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

AM Circuits

For the tests of the AM circuits, 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 fully counterclockwise. Set the band switch to the broadcast position, and rotate the tuning control until the tuning gang is fully meshed.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits; if not, isolate and correct the trouble in the AM circuits.

Since test point A for the AM circuits is placed at the grid of the 12AU7 mixer in Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

Section 3—Cont. TROUBLE SHOOTING

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	D	Loud, clear output with moderately strong input.	Defective: 19T8, 6BJ6 (2nd i-f amplifier). Open: R307, R308, R309, R311, R312, L305B, C317, L305A, L304A, WS. Shorted or leaky: C316, C317, C315. Shorted: L305A, L305B, WS.
3	E	Loud, clear output with moderate input.	Defective: 6BJ6 (1st i-f amplifier). Open: R301, R302, R304, R305, R306, C311, C313, L302A, L302B, L303A, L303B. Shorted or leaky: C311, C313, C308. Shorted: L303A, L303B.
4	A	Loud, clear output with weak input.	Defective: 12AU7*. Open: R411*, R413*, R409*, L300A, L300B, L301A, L301B, WS. Shorted or leaky: C424*, C410*. Shorted: L301A, L301B, L301C, WS.

Listening Test: Hum and distortion may be caused by shorted or leaky C309, C310, C314, C321, C320, C323, C307, C420*, C421*, C422*, C423*, C100*, C101*.

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

FM Circuits

For the tests of the FM circuits, use an AM r-f signal generator, set at 9.1 mc. 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. Detune the generator frequency to one side or the other until a satisfactory test signal is obtained.

Set the band switch to the FM position; set the other radio controls as directed under AM CIRCUITS.

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.

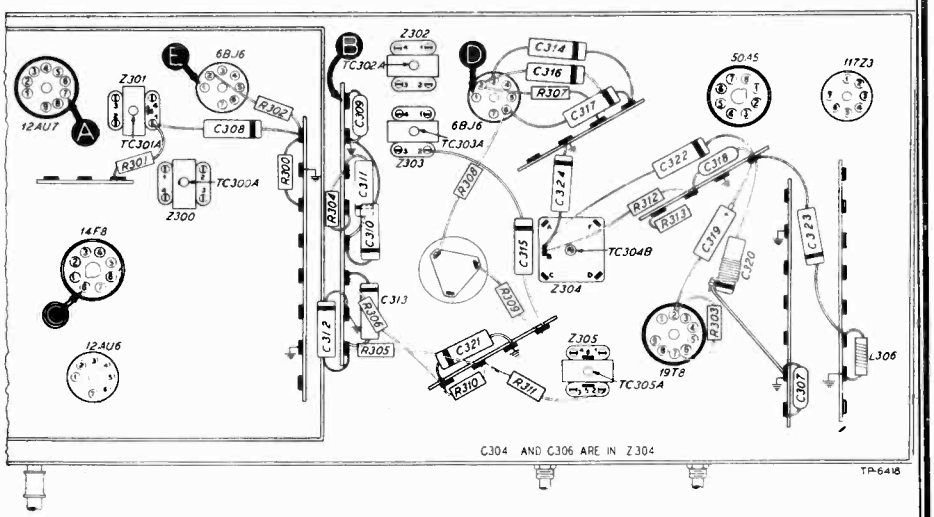


Figure 3. Bottom View, Showing Section 3 Test Points

The best indication of satisfactory FM-detector operation is the ability of this circuit to take the alignment properly (see page 10).

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 of this section.

Since test point C for the FM circuits is placed at the grid of the 14F8 mixer in Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

FM Chart

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	C	Loud, clear speaker output with weak generator input.	Trouble in FM circuits. Isolate by the following tests.
2	D	Loud, clear output with strong input.	Defective: 6BJ6 (2nd i-f amplifier), Z304, 19T8, WS. Misaligned: Z304. Open: R312, R313, R314, C320, C319, C318, C304, C306, C323, L306. Shorted or leaky: C319, C320, C304, C306, C323.
3	E	Loud, clear output with moderate input.	Defective: 6BJ6 (1st i-f amplifier). Misaligned: Z302. Shorted: L302A, L302B.
4	C	Loud, clear output with weak input.	Defective: 14F8*. Open: R300, R406*, R407*, R405*, L404*, L300A, WS. Shorted or leaky: C418*, C419*. Shorted: L300A, L300B, WS.

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

MODEL 49-906

Section 4

TROUBLE SHOOTING

R-F AND CONVERTER CIRCUITS

AM Circuits

For the tests of the AM circuits, 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 volume control to maximum, turn the tone control fully counterclockwise, and set the band switch to the broadcast position.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits; if not, isolate and correct the trouble in the AM circuits.

FM Circuits

Before proceeding with the tests for the FM circuits, set the band switch to the FM position.

If the "NORMAL INDICATION" is obtained in step 1, further tests should be unnecessary; if not, isolate and correct the trouble in the FM circuits. If the trouble is not revealed by the tests for the FM circuits, check the alignment.

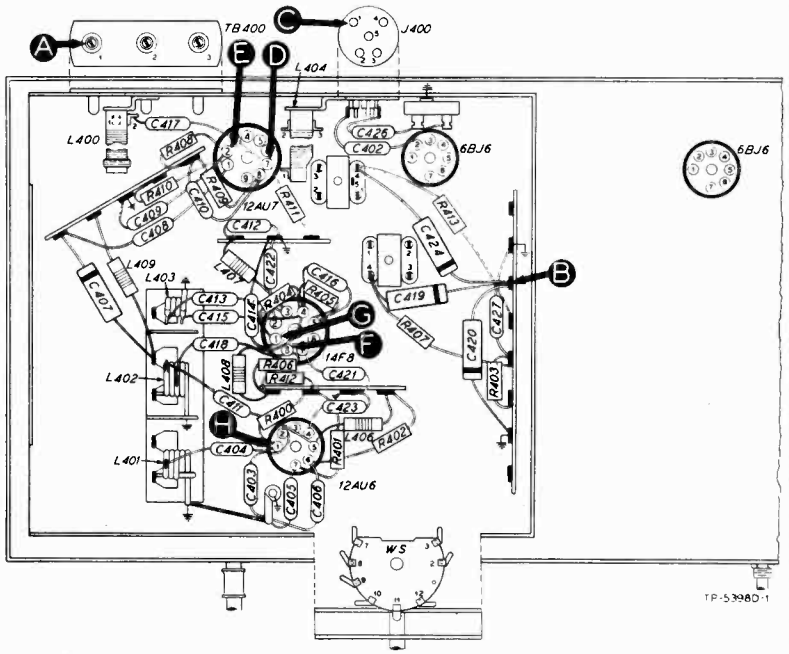


Figure 4. Bottom View, Showing Section 4 Test Points

AM Chart

STEP	TEST POINT	SIG. GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Loud, clear speaker output with weak generator input.	Trouble in AM circuits. Isolate by the following tests.
2	D	1000 kc.	1000 kc.	Loud, clear output with moderate in-	Defective: 12AU7, oscillator circuits. Shorted: C424, C410, WS. Open: R409, R411, R413, WS.
3	E to B (Osc. test; see note below.)		Rotate through range.	Negative 2 to 4 volts.	Defective: 12AU7. Open: R408, L404, C408, R410, C407. Shorted or leaky: C408, C409, C400, C401B.
4	A	1000 kc.	1000 kc.	Same as step 1.	Open: L400, C417, L405. Shorted: C400, C401A, C425.

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 E. 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.

FM Chart

STEP	TEST POINT	SIG. GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	C	95 mc.	Tune to signal.	Loud, clear speaker output with weak generator input.	Trouble in FM circuits. Isolate by the following tests.
2	F	95 mc.	Tune to signal.	Loud, clear output with moderate input.	Defective: oscillator circuits, 14F8. Open: C418, R406, R407, R405, L408, L402. Shorted: C418, C400, C400B, C419, C416, L402.
3	G to B (Osc. test; see note below.)		Tune through range.	Negative 1 to 2.5 volts.	Defective: 14F8. Open: R404, L408, L407, R403, C413, C415, L403. Shorted: C400, C400C, C413, C415, C414, C412, L403, L407.
4	H	95 mc.	Tune to signal.	Loud, clear output with weak input.	Defective: 12AU6. Open: L406, R402, R401, R400, C411, C406, C418, R412, L402. Shorted: C405, C406, C411, C400, C400B, C404, L402.
5	C	95 mc.	Tune to signal.	Loud, clear output with weak input.	Open: C402, C404, R412, L402. Shorted: C404, C400, C400A, L402.

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 1 of 14F8), test point G. 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.

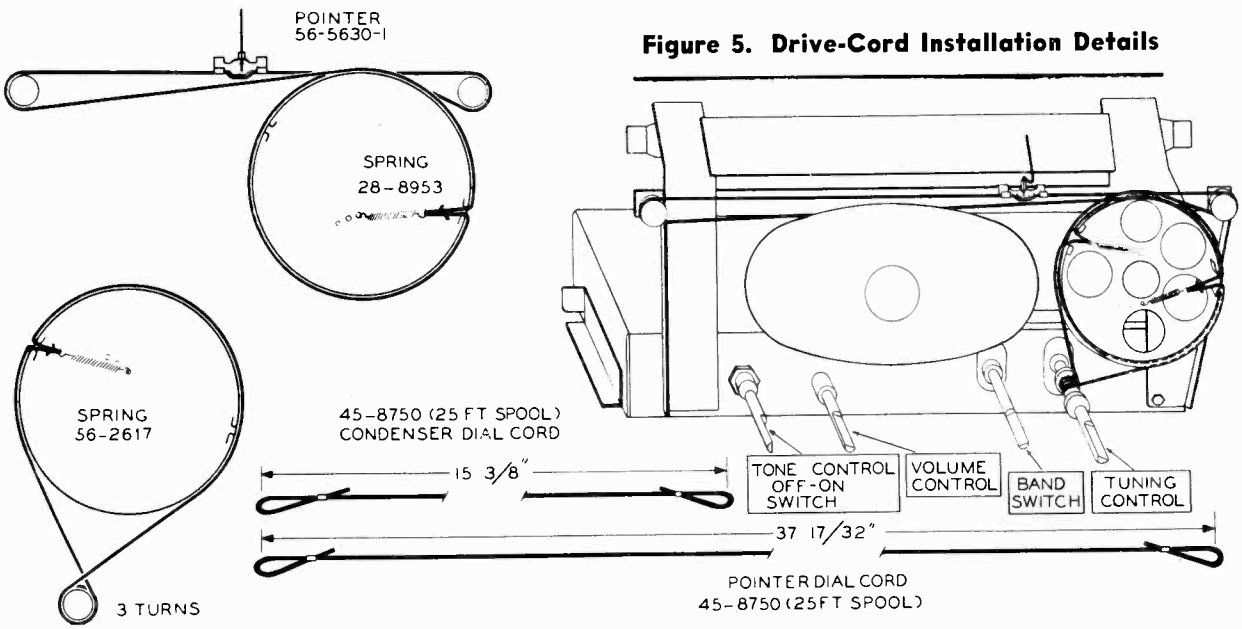


Figure 5. Drive-Cord Installation Details

ALIGNMENT OF AM CIRCUITS

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

DIAL POINTER—With tuning condenser fully meshed, adjust dial pointer to coincide with index mark at low-frequency end of dial. See "CALIBRATING DIAL BACKPLATE" for method of measuring backplate for index and calibration marks.

OUTPUT METER—Connect between terminal 3 (voice-coil connection) of aerial terminal panel TB400 and chassis.

AM SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

OUTPUT LEVEL—During alignment, signal-generator output must be attenuated to maintain radio output below 1.25 volts, as read on output meter.

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

ALIGNMENT OF FM CIRCUITS

Align the AM Circuits first

OUTPUT METER—Connect between terminal 3 (voice-coil connection) of aerial terminal panel TB400 and chassis.

ALIGNMENT INDICATOR—Connect negative lead of a 20,000-ohms-per-volt, d-c voltmeter to pin 2 of 19T8 tube; connect positive lead to B—, test point B in Section 2. Use 10-volt range.

AM SIGNAL GENERATOR—Generator must have sufficient output to give a reading of at least 8.5 volts on alignment indicator. Connect generator ground lead to B—, test point B; connect output lead as indicated in chart. Use modulated output.

CONTROLS—Same as for alignment of AM circuits, except set band switch to FM position. Allow radio and signal generator to warm up for at least 15 minutes before making alignment.

NOTE: Check resonance of coils L401, L402, and L403 by inserting each end of a powdered-iron tuning core, such as Philco Part No. 56-6100, in the coils. If the signal strength increases when the iron end is inserted, compress the turns slightly. If the signal strength increases when the threaded 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.

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial calibration and alignment points may 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 dial 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.

After installation of 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.

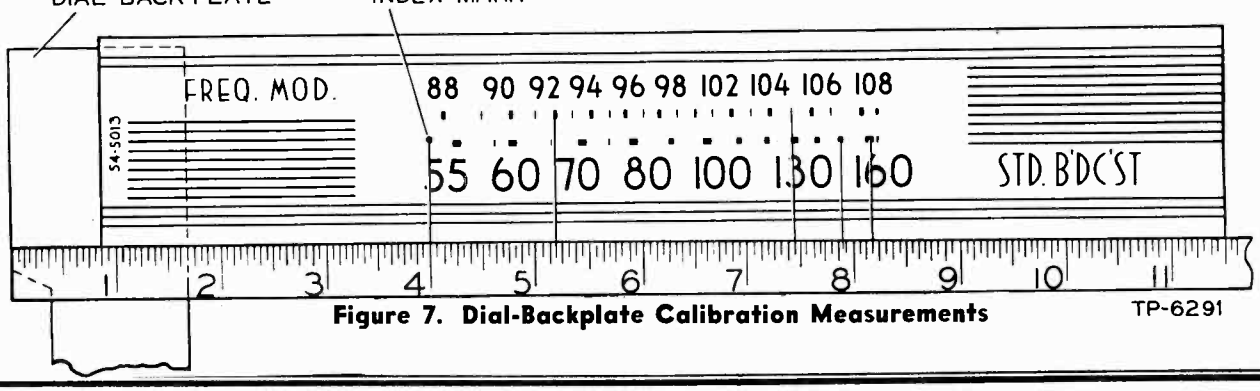
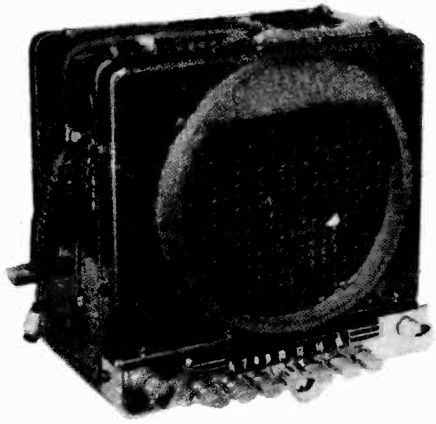


Figure 7. Dial-Backplate Calibration Measurements TP-6291



SPECIFICATIONS

CIRCUIT .....Eight-tube, superheterodyne
FREQUENCY RANGE .....540 to 1600 kc.
INTERMEDIATE FREQUENCY .....265 kc.
POWER INPUT .....6.3 volts, 8.8 amperes, d.c.
PHILCO TUBES .....7A7(2), 7B8, 7B6, 7A4, 7C5(2), 7Y4
AERIAL.....Retractable-tip, Philco Part No. 91-0227

IMPORTANT

The aerial and aerial lead-in form part of the r-f tuning circuit. When testing or aligning this receiver on the bench it is important that an aerial dummy load of equal capacity be used.

CIRCUIT DESCRIPTION

The circuit of the P4635 consists of a 7A7 r-f amplifier, a 7B8 converter, a 7A7 i-f amplifier, a 7B6 second detector–first audio, and an audio power amplifier using two 7C5's in push-pull, driven by a 7A4 phase inverter. The power supply is of the six-volt non-synchronous vibrator type, using a 7Y4 rectifier.

The aerial input circuit is designed for maximum interference elimination, without sacrifice of signal strength. Permeability tuning, controlled by a pantograph tuning unit, is used for both the r-f and oscillator stages. This method of tuning assures maximum sensitivity, selectivity, and stability for this type of receiver. A sensitivity control is provided (identified in figure 9, page 6), which consists of a variable resistor in the common cathode circuit of the converter and i-f stages. This should be adjusted for lower sensitivity in areas where most reception is from local stations, in order to minimize noise pickup.

The P4635 uses an intermediate frequency of 265 kc.

Two features of the audio system are the tone control, which is an inverse feed-back circuit built around the first audio amplifier, and the push-pull output stage, which delivers a full five watts of audio power to the dynamic speaker.

TROUBLE-SHOOTING PROCEDURE

This service manual provides a trouble-shooting procedure for the P4635, which will facilitate the isolation of most of the faults that may be encountered. The circuit is divided into four sections, with a schematic and chassis layout, showing test points for each section. The trouble-shooting procedure for each section is outlined in a chart. Tests indicated by a large asterisk (*) provide sectional master checks, making it possible to eliminate each section as a source of trouble without going through its entire test chart.

Wherever trouble is found (indicated by failure to get a "Normal Indication" on any test) it should be isolated by voltage and resistance checks of the parts associated with the point under test, and remedied before testing further.

PRELIMINARY CHECKS

The following preliminary checks are recommended:

1. Carefully inspect both sides of the chassis. Make sure that all the tubes are secure, and look for bad connections, burned resistors, or other mechanical faults.

2. Check the fuse, and connect the receiver to a source of power (6.3 volts, d.c.). Look for unlighted tube filaments, overheated resistors (smoke, sweating, etc.), and listen for the hum of the vibrator.

3. Check the tubes and the vibrator. WARNING: If the 7Y4 is defective, check C107 for shorts before inserting a new tube. If the vibrator is defective, check C106 for a short before inserting a new vibrator.

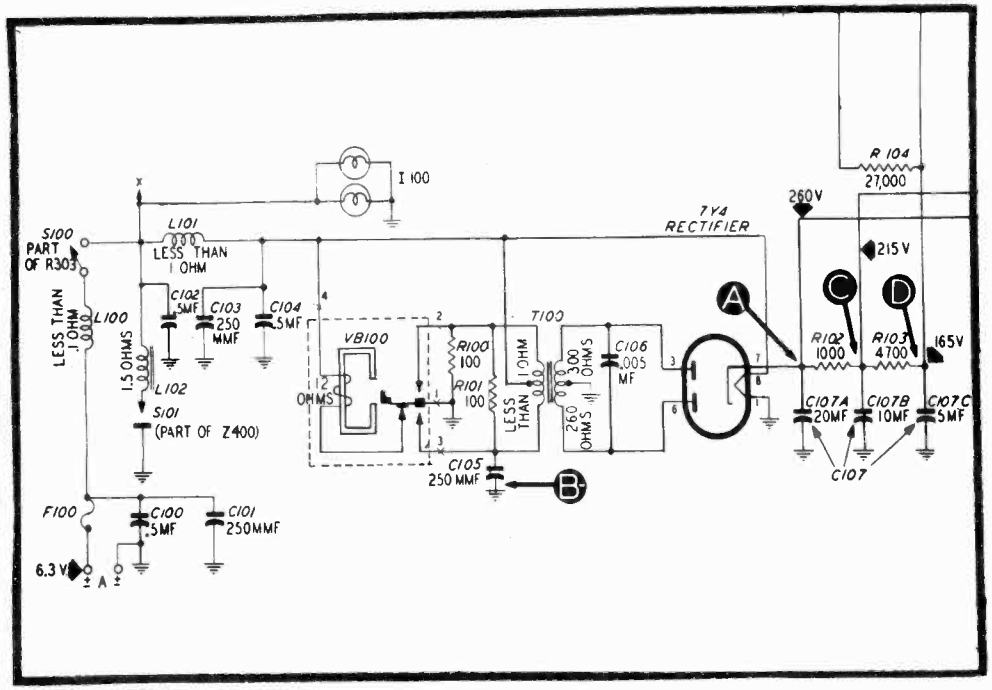
TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

MAKE TEST ✻ FIRST
If the "NORMAL INDICATION" is obtained, proceed to the next section. If not, isolate and remedy the trouble in this section.

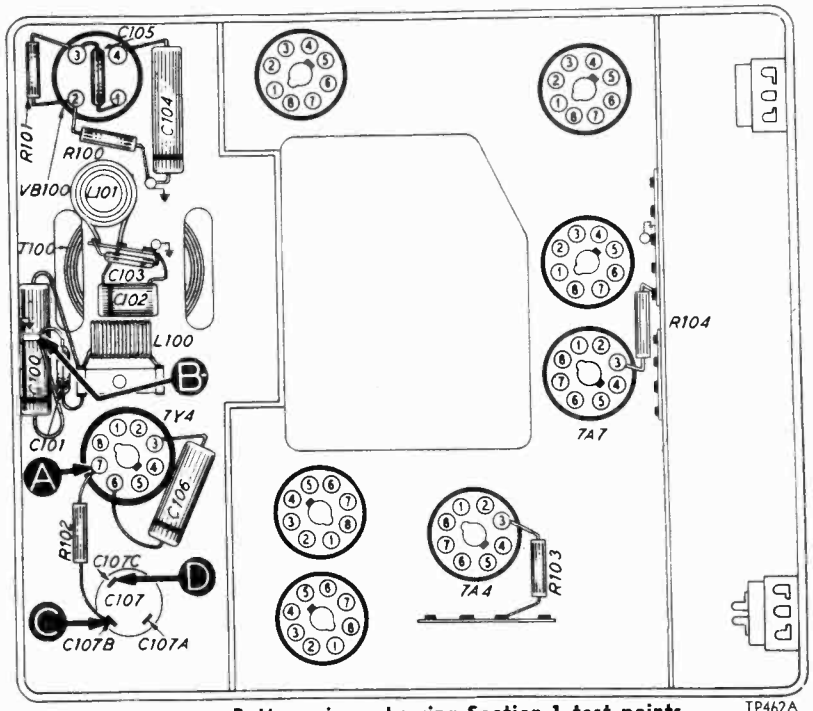
Make all measurements for this section with a volt-ohmmeter, using the applicable d-c range. All voltages given in this manual are average, and were taken with a 20,000 ohms-per-volt meter, with 6.3 volts d-c input; the volume control was set at minimum, and the tuning control at 540 kc.

WARNING: If the 7Y4 rectifier is found to be defective, check the main filter condenser, C107, for shorts before inserting a new tube. If the vibrator is found to be defective, check C106 for a short before inserting a new vibrator.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
D to B–	165 volts	Trouble within Section 1. Isolate by following tests.
A to B–	260 volts	Defective 7Y4, VB100, T100, C105, C106, C107A, or C107B.
C to B–	215 volts	Defective R102, C107B or C107C.
D to B–	165 volts	Defective R103, C107C or C407 (see Section 4 for location).



Section 1 schematic. TP462E



Bottom view, showing Section 1 test points. TP462A

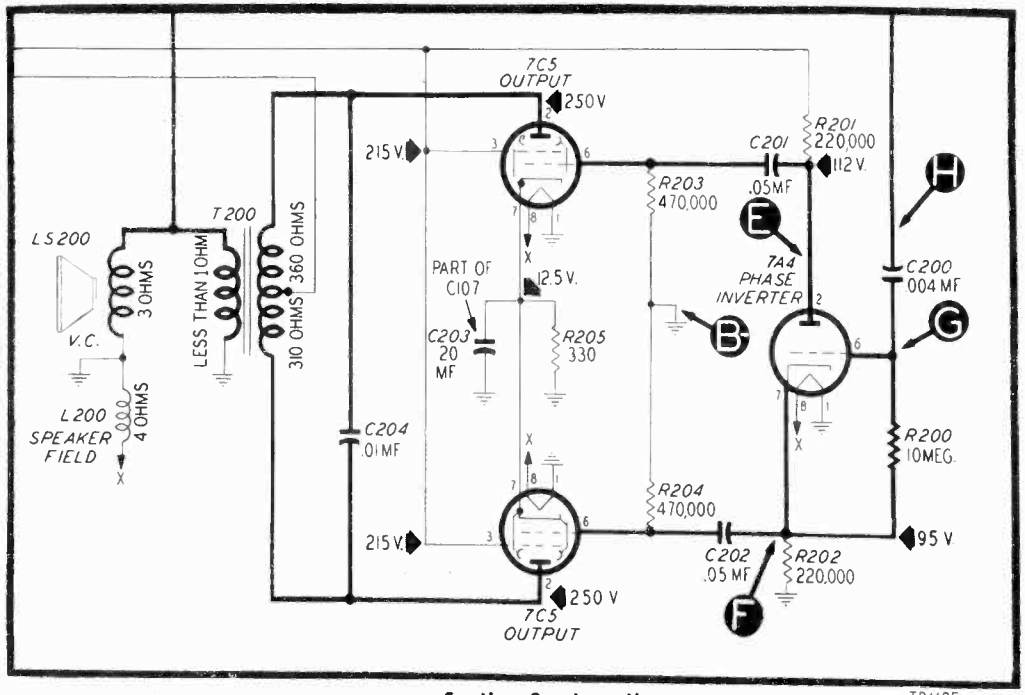
TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

MAKE TEST ✱ FIRST
If the "NORMAL INDICATION" is obtained, proceed to the next section. If not, isolate and remedy the trouble in this section.

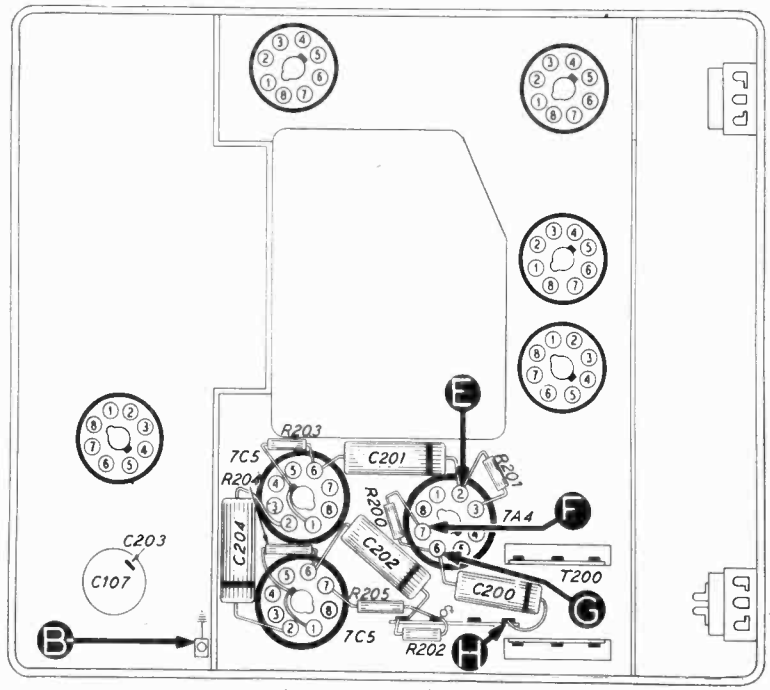
For all tests in this section, use an audio signal. Connect the generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis (B–).

Set the receiver volume control at maximum, and adjust the signal-generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
H to B–	Loud, clear signal.	Trouble within Section 2. Isolate by following tests.
E to B– (Remove 7A4)	Loud, clear signal.	Defective 7C5, T200, LS200, R203, R205, C201, C203, or C204.
F to B– (7A4 removed)	Loud, clear signal, same as preceding test.	Defective 7C5, T200, R204, or C202.
G to B– (Replace 7A4)	Clear signal, louder than preceding test.	Defective 7A4, R202, R201, R200, or C200.
H to B–	Loud, clear signal, same as preceding test.	Defective C200 or C308 (see Section 3 for location).



Section 2 schematic. TP462F



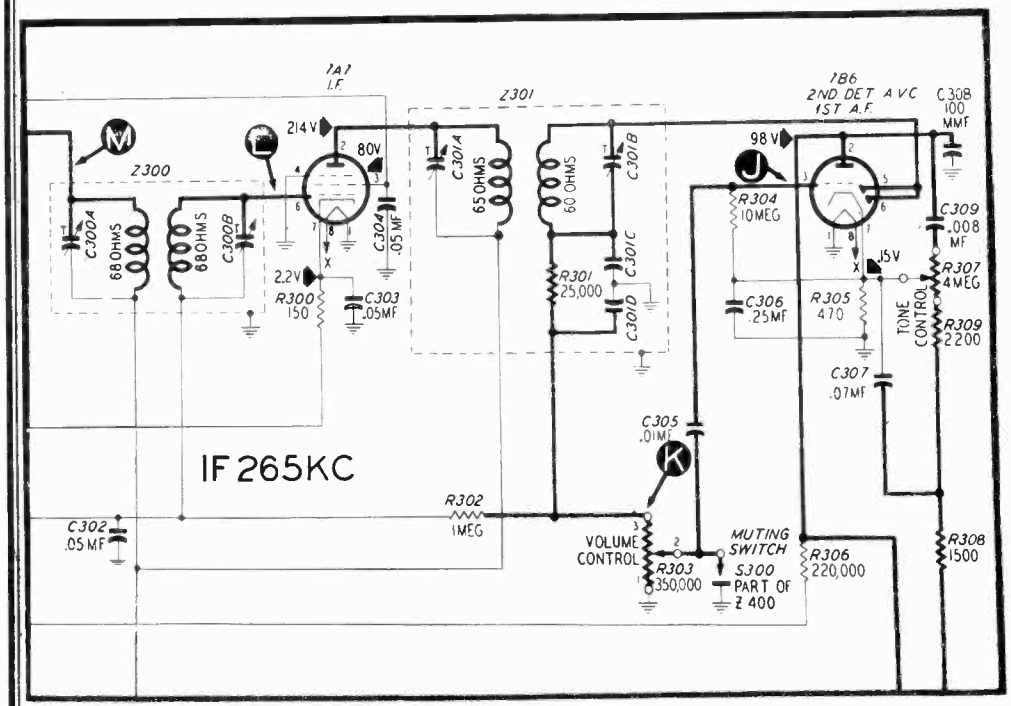
Bottom view, showing Section 2 test points.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

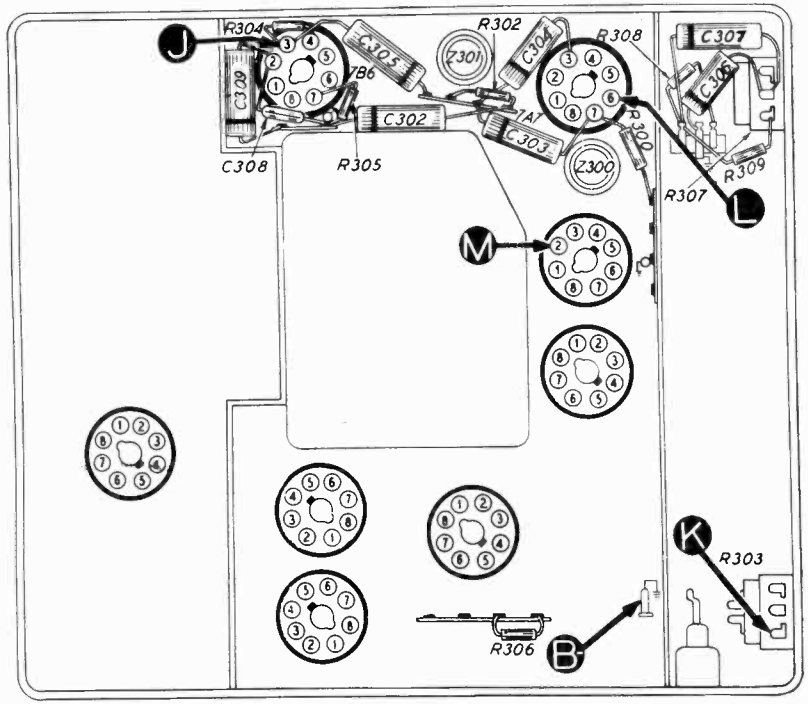
MAKE TEST ✳ FIRST
If the "NORMAL INDICATION" is obtained, proceed to the next section. If not, isolate and remedy the trouble in this section.

For the second and third tests in the chart for this section, use an audio signal. For the first, and the last two, use a modulated 265-kc. signal. Connect the signal-generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis (B–). Set the receiver volume control and sensitivity control at maximum, and adjust the signal-generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
M to B– (265-kc. signal)	Loud, clear signal.	Trouble within Section 3. Isolate by following tests.
J to B– (audio signal)	Loud, clear signal.	Defective 7B6, R306, R305, R304, C306, C308, or C309.
K to B– (audio signal)	Loud, clear signal.	Defective C305, S300, or R303 (rotate R303 through its entire range for complete check).
L to B– (265-kc. signal)	Loud, clear signal.	Defective 7A7, C303, C304, C406, R104, R300, R404, Z301; shorted C301C or C301D.
M to B– (265-kc. signal)	Loud, clear signal.	Defective R302 or Z300.



Section 3 schematic.



Bottom view, showing Section 3 test points.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 4

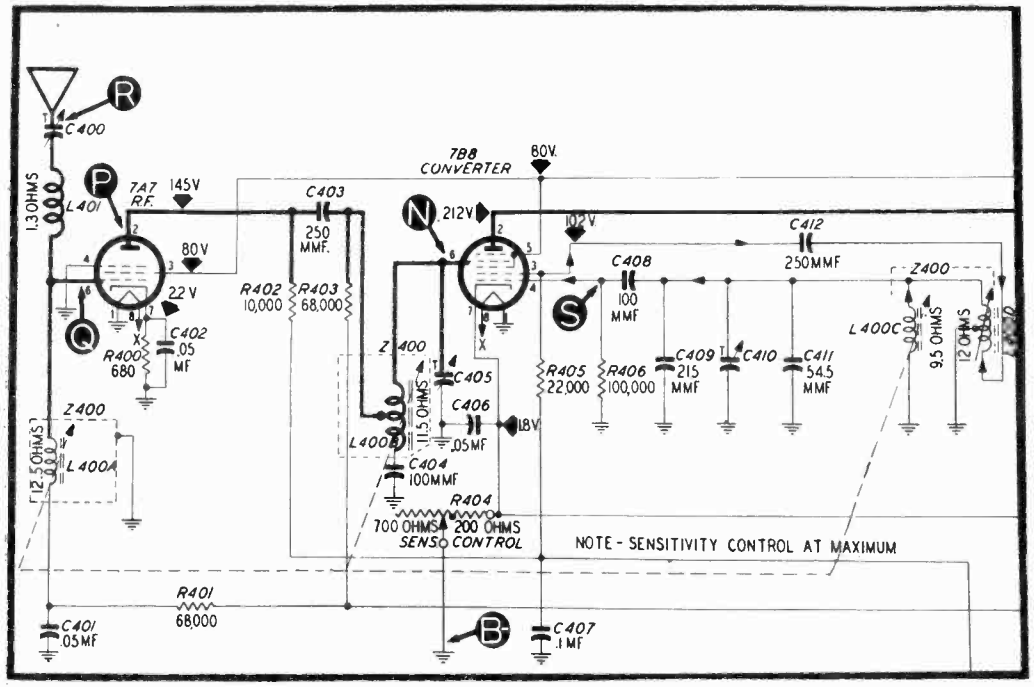
MAKE TEST ✱ FIRST

If the "NORMAL INDICATION" is not obtained, isolate and remedy the trouble in this section.

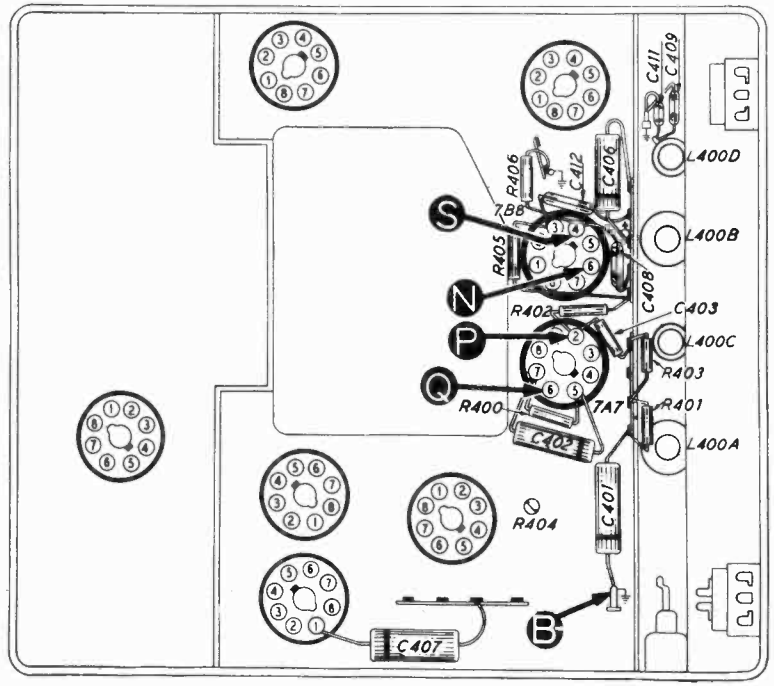
1. Attach the positive lead of a 20,000-ohms-per-volt meter (10-volt range) to the receiver chassis, and the prod end of the negative lead through 50,000 ohms to point S. Rotate the tuning control through its entire range; absence of voltage indicates that the oscillator is not functioning. If so, check the components listed in the second test below.

2. Connect the signal-generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis. Set the receiver volume control and sensitivity control at maximum, tune the signal generator and receiver to 1000 kc., and adjust the generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
R to B–	Loud, clear signal.	Trouble within Section 4. Isolate by following tests.
N to B–	Loud, clear signal.	Defective 7B8, L400C, L400D, R404, R405, R406, C408, C409, C410, C411, or C412.
P to B–	Loud, clear signal.	Defective C403, C404, C405, R403, or L400B.
Q to B–	Loud, clear signal.	Defective 7A7, L400A, R400, R402, or C402.
R to B–	Loud, clear signal.	Defective L401, C400, or C401.

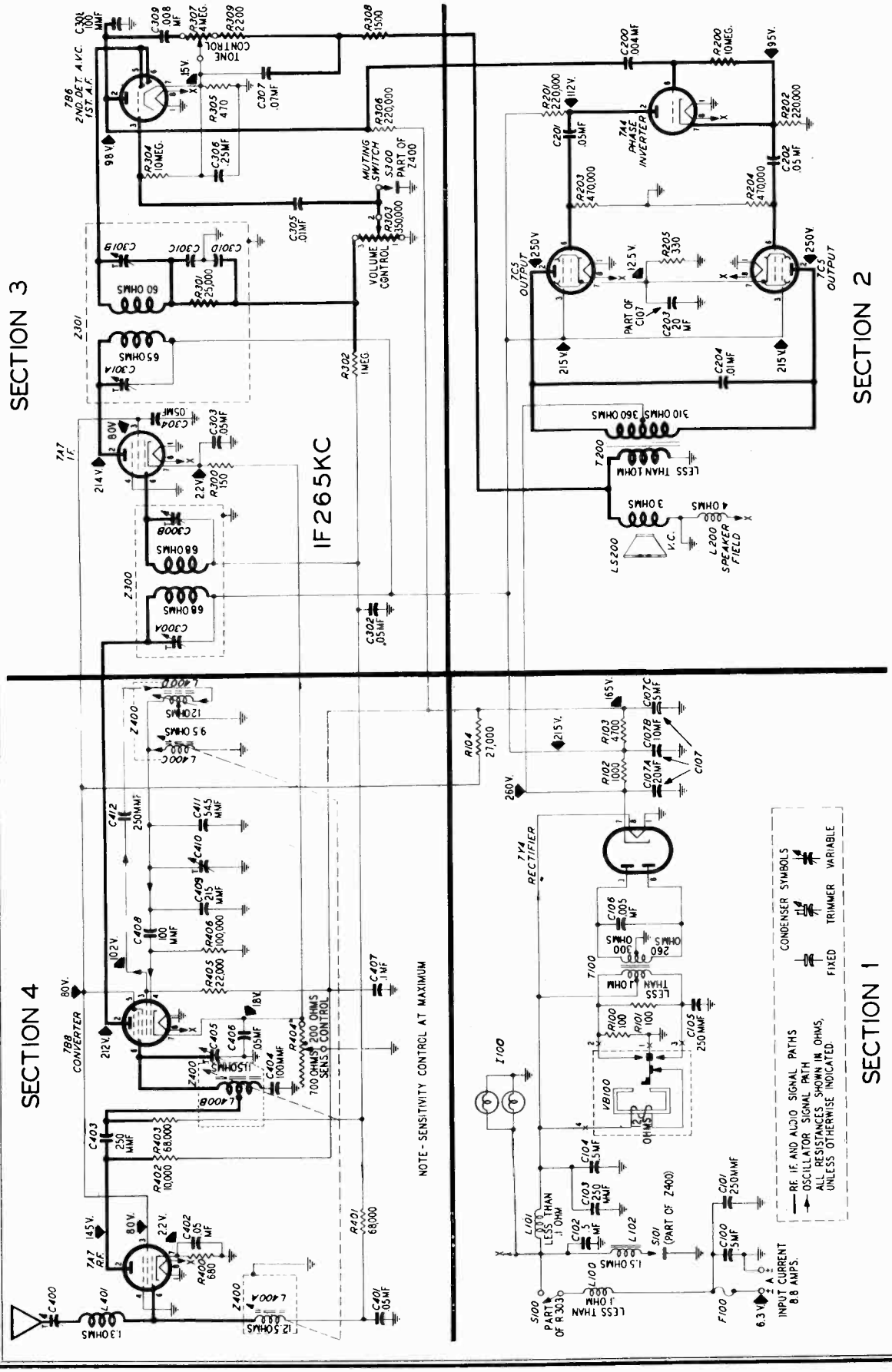


Section 4 schematic.



Bottom view, showing Section 4 test points.

MODEL P4635



NOTE: All voltage, capacity, and resistance values shown are average. The voltages were measured between the points indicated and the receiver chassis (B–), using a 20,000-ohms-per-volt meter, with 6.3 volts d-c input to the receiver power supply; the volume control was set at minimum, and the tuning control at 540 kc.

ALIGNMENT PROCEDURE

CONNECT THE SIGNAL-GENERATOR output lead as follows:

For the i-f alignment (the first step in the chart), connect through a .05-mf. condenser to the aerial connector.

For the r-f alignment (all steps after the first), inject the signal through a dummy aerial consisting of a 20-mmf. condenser in series with an aerial lead (Part No. 95-0181) plugged in to the antenna receptacle. If an aerial lead is not available, connect a 30-mmf. condenser from the antenna receptacle to ground, and inject the signal through the 20-mmf. condenser alone. **The foregoing instruction must be carefully followed if the receiver is to give its best performance after being reinstalled in the car.**

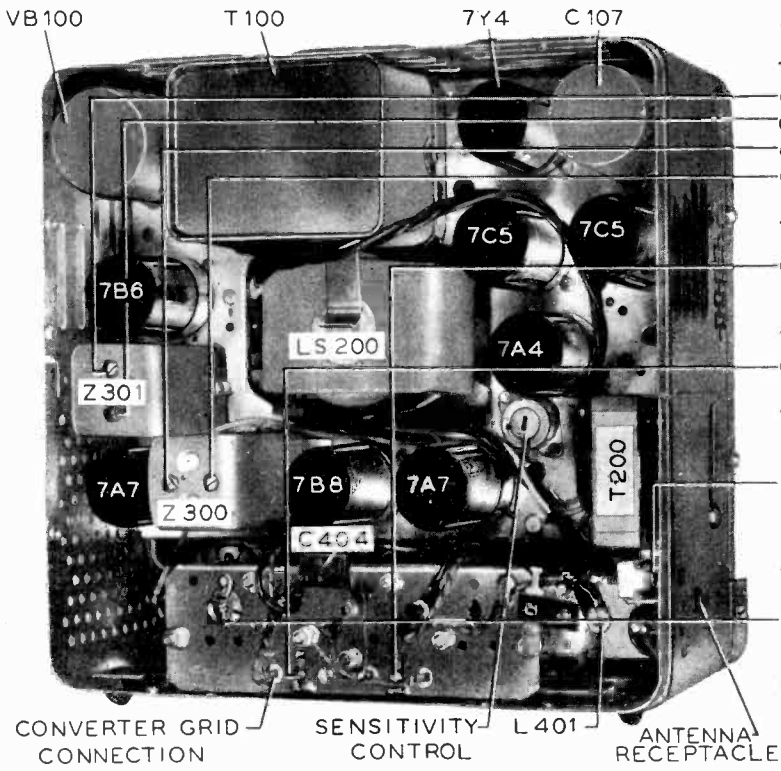
CONNECT THE OUTPUT METER between the voice-coil lug on the speaker and the receiver chassis.

ADJUST THE RECEIVER CONTROLS as follows:

Set the volume and sensitivity controls at maximum. Set the tone control for maximum signal output (approximately the center of its range).

ADJUST THE SIGNAL-GENERATOR OUTPUT as alignment progresses to keep the meter needle near center scale, using the lowest range on the output meter.

AFTER REINSTALLING THE RECEIVER in the car and connecting the aerial, make the following adjustments: Set the aerial trimmer for maximum signal strength on a weak station near 1400 kc. Set the sensitivity control for low sensitivity, if the receiver is to be used mainly for local-station reception, or higher sensitivity depending on the degree of distant-station reception desired. The lower the sensitivity can be set, the less will be the noise and interference pickup.



Chassis view, showing trimmer locations.

ADJUST IN ORDER	SPECIAL INSTRUCTIONS	DIAL SETTINGS SIG. GEN.	DIAL SETTINGS RECEIVER
C301B, C301A, C300B, C300A	Ground pin 4 of the 7B8. Adjust for maximum in order as numbered and then repeat procedure.	265 kc.	1600 kc.
C410	Remove the ground from pin 4 of the 7B8. Adjust for maximum.	1600 kc.	1600 kc.
C405	Adjust for maximum.	1400 kc.	1400 kc.
C400	Adjust for maximum. Final adjustment to be made after installation in car, with antenna connected.	1400 kc.	1400 kc.
L400D	Adjust for maximum while rocking tuning control back and forth across signal.	580 kc.	580 kc.
	Repeat all steps after the first.		

MODEL P4635

REPLACEMENT PARTS LIST

NOTE: Parts marked with an asterisk (*) are general replacement items, and the part numbers will not be identical with those used on factory assemblies. Use only the "Service Part No." shown in the parts list when ordering replacements.

SECTION 1

Reference No.	Description	Service Part No.
C100	Condenser, .5 mf.	61-0137*
C101	Condenser, 250 mmf.	60-10245307*
C102	Condenser, .5 mf.	61-0137*
C103	Condenser, 250 mmf.	60-10245307*
C104	Condenser, .5 mf.	61-0137*
C105	Condenser, 250 mmf.	60-10245307*
C106	Condenser, .005 mf.	61-0153*
C107	Condenser, electrolytic	61-0150*
	C107A: condenser, 20 mf.	Part of C107
	C107B: condenser, 10 mf.	Part of C107
	C107C: condenser, 5 mf.	Part of C107
F100	Fuse	45-2559*
I100	Lamp, pilot	34-2064
L100	Choke, "A"	32-1644
L101	Choke, vibrator	65-0151
L102	Coil, solenoid	65-0360
R100	Resistor, 100 ohms	66-1104340*
R101	Resistor, 100 ohms	66-1104340*
R102	Resistor, 1,000 ohms	66-2104340*
R103	Resistor, 4,700 ohms	66-2474340*
R104	Resistor, 27,000 ohms	66-3274340*
S100	Switch, off-on	Part of R303
S101	Switch, solenoid (muter)	Part of Z400
T100	Transformer, power	65-0358*
VB100	Vibrator	83-0026*

SECTION 2

C200	Condenser, .004 mf.	61-0129*
C201	Condenser, .05 mf.	61-0170*
C202	Condenser, .05 mf.	61-0170*
C203	Condenser, 20 mf.	Part of C107
C204	Condenser, .01 mf.	61-0124*
L200	Field, speaker	Part of LS200
LS200	Speaker	73-0066*
R200	Resistor, 10 megs.	66-6103340*
R201	Resistor, 220,000 ohms	66-4223340*
R202	Resistor, 220,000 ohms	66-4223340*
R203	Resistor, 470,000 ohms	66-4473340*
R204	Resistor, 470,000 ohms	66-4473340*
R205	Resistor, 330 ohms	66-1334340*
T200	Transformer, output	65-0409*

SECTION 3

C302	Condenser, .05 mf.	61-0122*
C303	Condenser, .05 mf.	61-0122*
C304	Condenser, .05 mf.	61-0122*
C305	Condenser, .01 mf.	61-0124*
C306	Condenser, .25 mf.	61-012 *
C307	Condenser, .07 mf.	61-0152*
C308	Condenser, 100 mmf.	60-10105407*
C309	Condenser, .008 mf.	61-0174*
R300	Resistor, 150 ohms	66-1153340*
R302	Resistor, 1 meg.	66-5103340*
R303	Control, volume, 350,000 ohms	67-0052*
R304	Resistor, 10 megs.	66-6103340*
R305	Resistor, 470 ohms	66-1473340*
R306	Resistor, 220,000 ohms	66-4223340*
R307	Control, tone, 4 megs.	67-0051*
R308	Resistor, 1,500 ohms	66-2153340*
R309	Resistor, 2,200 ohms	66-2223340*
S300	Switch, muting (solenoid)	Part of Z400
Z300	Transformer, 1st i-f	65-0352
	C300A: condenser, trimmer	Part of Z300
	C300B: condenser, trimmer	Part of Z300
Z301	Transformer, 2nd i-f	65-0410
	C301A: condenser, trimmer	Part of Z301
	C301B: condenser, trimmer	Part of Z301
	C301C: condenser	Part of Z301
	C301D: condenser	Part of Z301
	R301: resistor, 25,000 ohms	Part of Z301

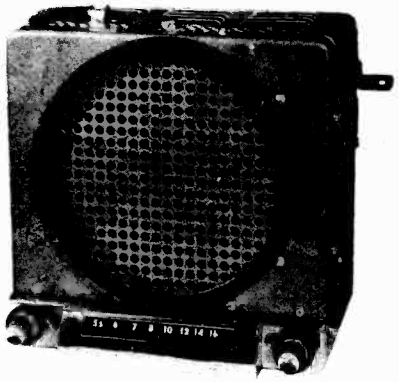
SECTION 4

Reference No.	Description	Service Part No.
C400	Condenser, trimmer	31-6472*
C401	Condenser, .05 mf.	61-0122*
C402	Condenser, .05 mf.	61-0122*
C403	Condenser, 250 mmf.	60-10245307*
C404	Condenser, 100 mmf.	60-10105407*
C405	Condenser, trimmer	Part of Z400*
C406	Condenser, .05 mf.	61-0122*
C407	Condenser, .1 mf.	61-0113*
C408	Condenser, 100 mmf.	60-10105407*
C409	Condenser, 215 mmf. (silver mica)	Part of Z400
C410	Condenser, trjmmer	Part of Z400
C411	Condenser, 54.5 mmf. (silver mica)	Part of Z400
C412	Condenser, 250 mmf.	60-10245307*
L401	Choke, antenna	65-0378
R400	Resistor, 680 ohms	66-1683340*
R401	Resistor, 68,000 ohms	66-3683340*
R402	Resistor, 10,000 ohms	66-3103340*
R403	Resistor, 68,000 ohms	66-3683340*
R404	Control, sensitivity	67-0036*
R405	Resistor, 22,000 ohms	66-3223340*
R406	Resistor, 100,000 ohms	66-4103340*
Z400	Pantograph tuning assembly	77-0891
	L400A: coil, r-f grid tuning (Part of Z400)	65-0378
	L400B: coil, converter grid tuning	Part of Z400
	L400C: coil, oscillator grid tuning	Part of Z400
	L400D: coil, oscillator tracking	Part of Z400

MISCELLANEOUS

Bezel assembly	
Bezel	57-2188FA8
Background plate, dial	57-2174FCP
Dial, lucite	55-1350
Felt, dial	55-1063
Nut, dial	1W56913FA1
Disc, tone color	55-1353
Retainer, color disc	57-1639FA3
Washer, color disc	57-1640FA3
"A" lead assembly (fuse-to-set)	77-0623
Bushing	27-4683
Cable and clamp assembly	77-0622
Cap, connector	28-5608
Contact	54-4344
Ferrule	28-5609
Grommet	27-4676
"A" lead assembly (fuse-to-ammeter)	77-0887
Housing, fuse	56-3595
Contact	54-4344
Spring	56-3593
Sleeve, insulating	54-7192
Washer, fibre	54-7191
Housing parts	
Housing and bracket assembly	77-0868FC51
Button, plug	2W15748FA8
Cover, tube side	57-1547FC51
Cover, wiring side	57-1548FC51
Connector, antenna	57-0591FA3
Knob kit	
Knob, volume and tone	77-0909
Manual knob assembly	77-0890
Retainer, manual knob	57-2223
Sleeve, manual knob	57-1623
Spacer, manual knob	57-1669
Spring, manual knob	57-1628FA1
Push-button knob assembly	76-2201
Pilot lamp assembly	
Bracket	27-2193FA3
Screen, color (tone control side)	55-1355
Screen, color (volume control side)	55-1354
Socket assembly	76-2261*
Shield	57-2208FA3
Set mounting kit	
Bolt, hook	57-2176FA3
Nut, gland	28-6558FA8
Nut, wing	1W23992
Socket, tube	27-6138*
Socket, vibrator	27-6153*
Speaker cable assembly	95-0161
Speaker Mounting Parts	
Gasket	55-1351
Nut	1W19988FA3
Screw	W1582FA26
Suppression parts	
Clip, ground	57-0617FA1
Condenser, generator	30-4475*
Condenser, ignition switch	30-4007*
Resistor, distributor	33-1196*

MODELS S4624, S4625



CIRCUIT DESCRIPTION

The circuit of the Model S4624 custom-built auto radio consists of a 7A7 r-f stage, a 7B8 converter, a 7A7 i-f stage, a 7B6 second detector and first audio, and a 7A5 beam-power audio amplifier. The power supply is of the 6-volt non-synchronous vibrator type, using a 7Y4 full-wave rectifier.

A high degree of selectivity, sensitivity, and stability is achieved by the use of permeability tuning in both the r-f and oscillator circuits.

An intermediate frequency of 455 kc. is generated in the converter stage, and is applied via a tuned transformer to the i-f amplifier. A second tuned transformer passes the amplified 455-kc. signal on to the second detector, (the diode section of the 7B6) where it is rectified and the audio-frequency modulation separated from it. Automatic volume control is provided by smoothing and filtering the rectified 455-kc. voltage, and applying it to the grids of the r-f amplifier and converter tubes.

The audio signal from the second detector is applied through the volume control to the first audio amplifier (the triode section of the 7B6). From the plate of the first audio, the signal is applied to the grid of the output power amplifier. The output transformer, which constitutes the plate load of the power amplifier, transmits the signal to the voice coil of the electro-dynamic speaker.

IMPORTANT

The aerial and aerial lead-in form part of the r-f tuning circuit. When testing or aligning this receiver on the bench it is important that an aerial dummy load of equal capacity be used.

TROUBLE-SHOOTING PROCEDURE

This service manual provides a logical trouble-shooting procedure for the S4624, which will facilitate the isolation of most of the faults that may be encountered. The circuit is divided into four sections, with a schematic and chassis layout, showing test points, for each section. The trouble-shooting procedure for each section is outlined in a chart. The first test in each chart is a sectional master check, making it possible to eliminate the section under test as a source of trouble without going through its entire chart procedure. The sections should be tested in their numerical order, as they are arranged in the manual.

The dial scale on the S-4625 is a fluorescent type to match the panel indicators of the 1947 cars. The dial pointer and cam assembly is different thus giving a new part number to the tuning assembly which otherwise is the same. The "A" lead is dressed to the left side of the radio case instead of the right side for convenience to the new position of the ignition switch. A clip is provided on the side of the case to hold the fuse holder and prevent it from rattling against the set. The receiver is mounted in the same position as in the 1946 car, but hook bolts of a new design are provided to fit the installation.

The suppression material is different and complete information on the suppression of ignition interference is given in the installation instructions with the radio.

PRELIMINARY CHECKS

Before starting the trouble-shooting procedure, the following steps are recommended:

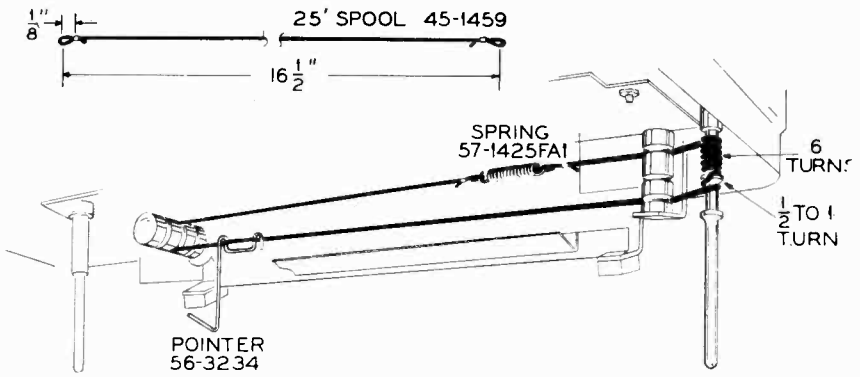
1. Carefully inspect both sides of the chassis. Make sure that all tubes are secure, and look for bad connections, burned resistors, or other mechanical faults.

2. Check the fuse, and connect the receiver to a source of power (6.3 volts, d.c.). Look for unlighted tube filaments, over-heated resistors (smoke, sweating, etc.), and listen for the hum of the vibrator.

3. Check the tubes and the vibrator. WARNING: If the 7Y4 is defective, check C105 for shorts before inserting a new tube. If the vibrator is defective, check C104 for a short before inserting a new vibrator.

SPECIFICATIONS

CIRCUIT	Six-tube, superheterodyne
FREQUENCY RANGE	540 to 1600 kc.
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES	7A7(2), 7B8, 7B6, 7A5, 7Y4
POWER INPUT	6.3 volts, 6 amps, d.c.
AERIAL	Retractable-tip, Philco Part No. 91-0230



Drive-cord installation details.

NOTE: Parts marked with an asterisk (*) are general replacement items, and the part numbers will not be identical with those used on factory assemblies. Use only the "Service Part No." shown in the parts list when ordering replacements.

MAKE TEST NO. 1 FIRST !

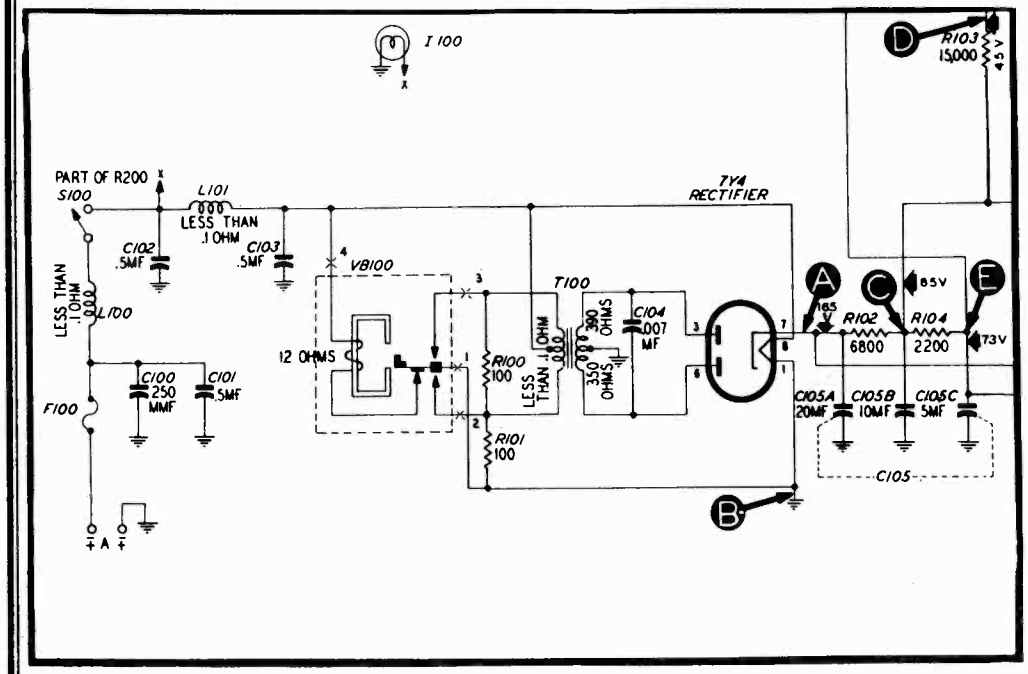
If the "NORMAL INDICATION" for this test is obtained, proceed to Test No. 1 in the next section. If not, continue through the chart to isolate and remedy the trouble in this section.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

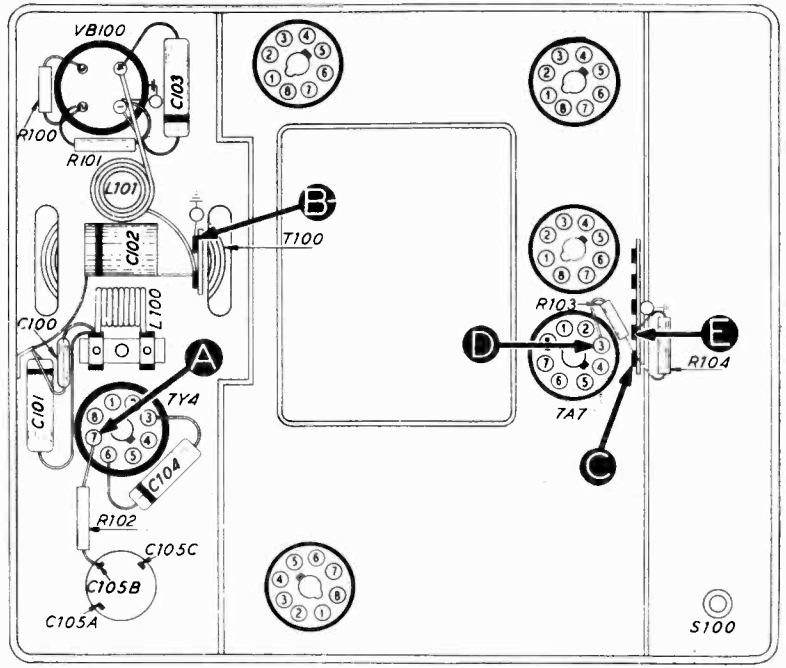
Make all measurements for this section with a volt-ohmmeter, using the applicable d-c range. All voltages given in this manual are average, and were taken with a 20,000 ohms-per-volt meter and with 6.3 volts d-c input; the volume control was set at minimum, and the tuning control at 540 kc.

WARNING: If the 7Y4 rectifier is found to be defective, check the main filter condenser, C105, for shorts before inserting a new tube. If the vibrator is found to be defective, check C104 for a short before inserting a new vibrator.

	TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1.	D to B–	45 volts	Trouble within Section 1. Isolate by following tests.
2.	A to B–	165 volts	Defective 7Y4, VB100, T100, C104, or C105A.
3.	C to B–	85 volts	Defective R102, C105B, C105C, or C406 (shown in Section 4).
4.	D to B–	45 volts	Defective R103 or C303 (shown in Section 3).
5.	E to B–	73 volts	Defective R104, C105C, or C406 (shown in Section 4).



Section 1 schematic.



Bottom view, showing Section 1 test points.

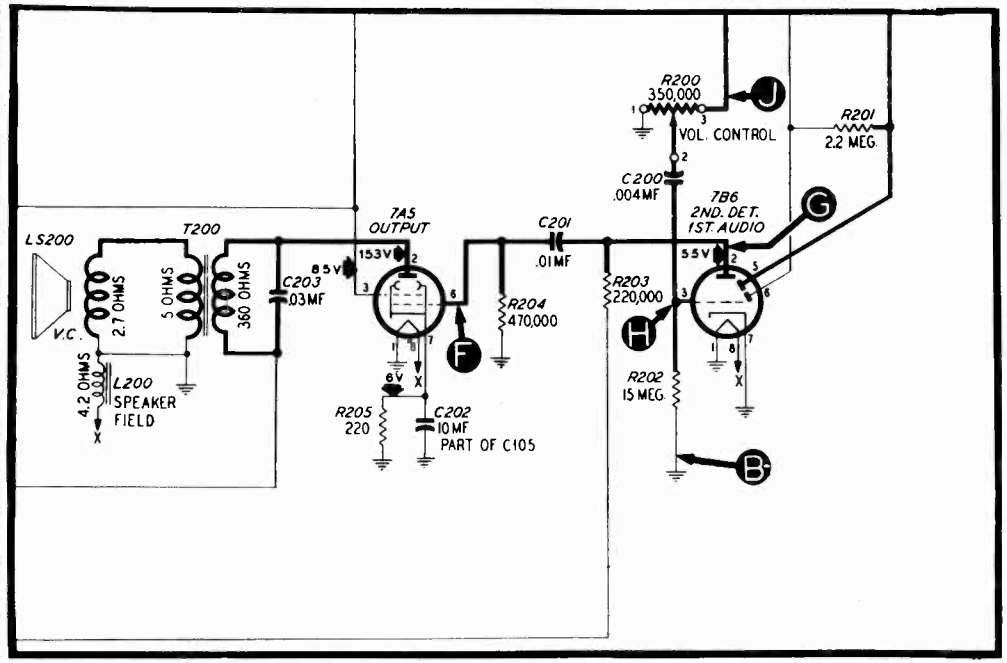
MAKE TEST NO. 1 FIRST !

If the "NORMAL INDICATION" for this test is obtained, proceed to Test No. 1 in the next section. If not, continue through the chart to isolate and remedy the trouble in this section.

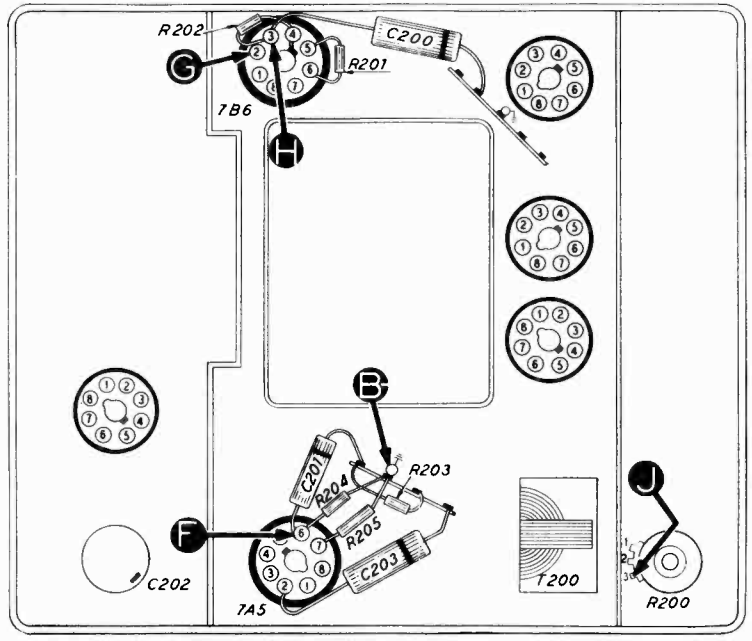
TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

For all tests in this section, use an audio signal. Connect the generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis (B–). Set the receiver volume control at maximum, and start with the signal generator adjusted for low output.

	TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1.	J to B–	Loud, clear signal.	Trouble within Section 2. Isolate by following tests.
2.	F to B–	Clear signal, using moderate generator output.	Defective 7A5, T200, LS200, R204, R205, C201, C202, or C203.
3.	G to B–	Same as above.	Open C201.
4.	H to B–	Clear signal, much louder than step 3.	Defective 7B6, R202, R203, C105C, or R104 (shown in Section 1).
5.	J to B–	Same as step 4.	Defective C200 or R200 (rotate R200 through its entire range for complete check).



Section 2 schematic.



Bottom view, showing Section 2 test points. TP461B

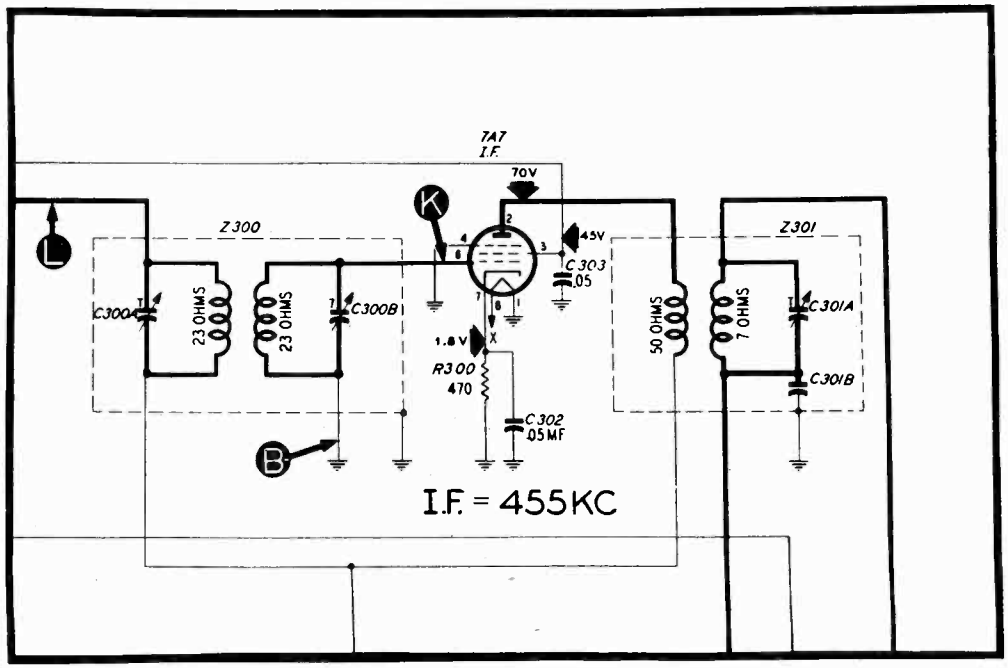
MAKE TEST NO. 1 FIRST !

If the "NORMAL INDICATION" for this test is obtained, proceed to Test No. 1 in the next section. If not, continue through the chart to isolate and remedy the trouble in this section.

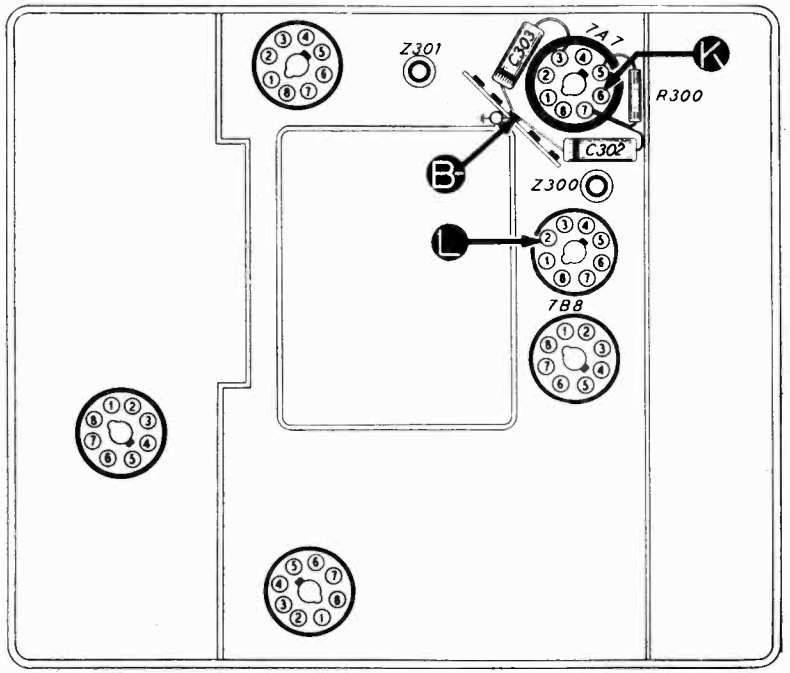
TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

For all tests in this section, use a modulated 455-kc. signal. Connect the signal-generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis (B–). Set the receiver volume control at maximum, and adjust the signal-generator output for a loud, clear signal.

	TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1.	L to B–	Loud, clear signal.	Trouble within Section 3. Isolate by following tests.
2.	K to B–	Loud, clear signal.	Defective 7A7, Z301, R300, C302, or C303.
3.	L to B–	Loud, clear signal.	Defective Z300.



Section 3 schematic.



Bottom view, showing Section 3 test points.

MAKE TEST NO. 1 FIRST !

If the "NORMAL INDICATION" for this test is not obtained, continue through the chart to isolate and remedy the trouble in this section.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 4

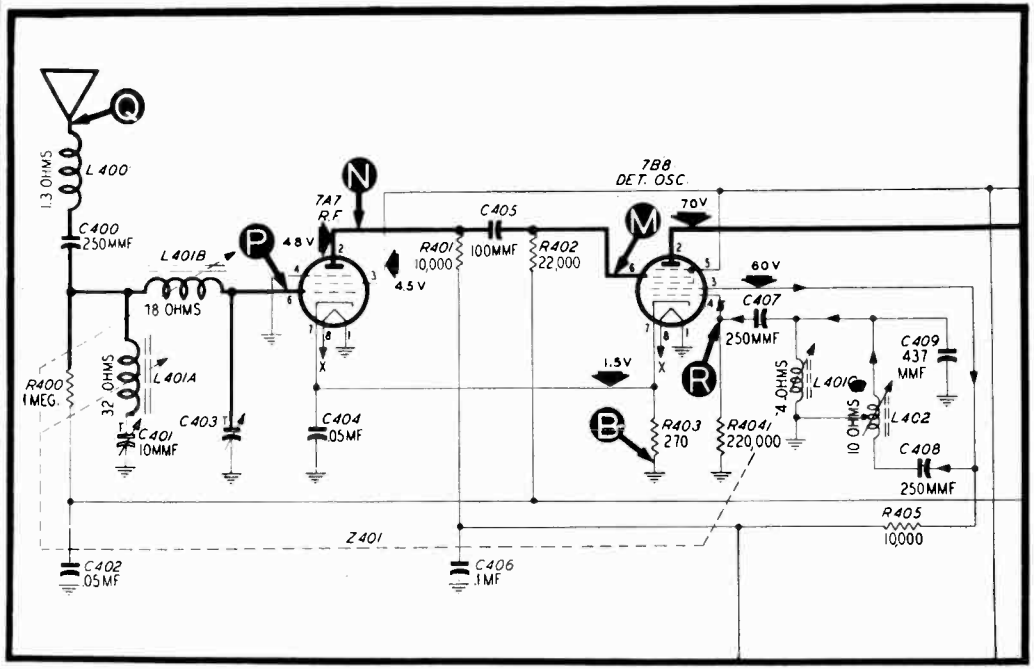
PRELIMINARY OSCILLATOR CHECK:

Attach the positive lead of a 20,000-ohms-per-volt meter (10-volt range) to the receiver chassis, and the prod end of the negative lead through 50,000 ohms to point R. Rotate the tuning control through its entire range; absence of voltage indicates that the oscillator is not functioning. If this is the case, check the components listed in the second test below.

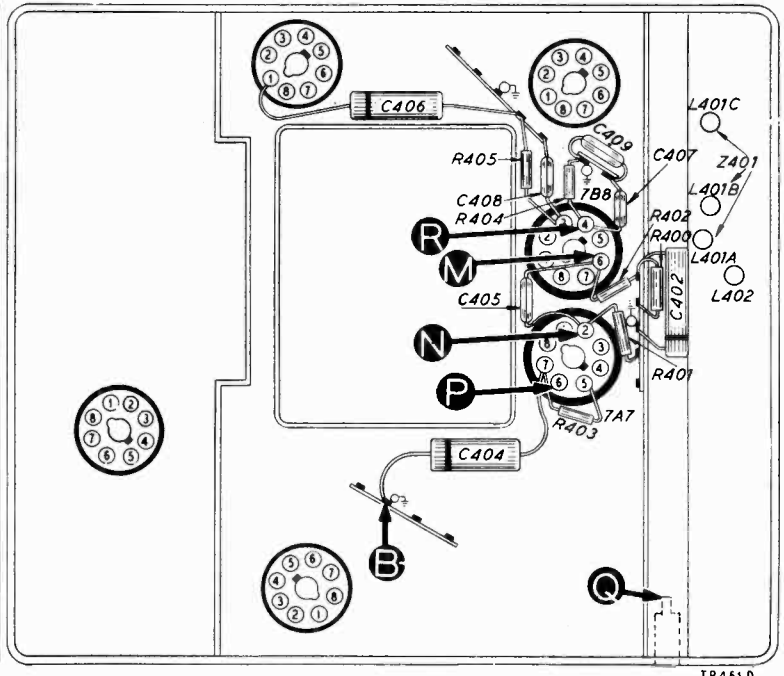
FOR CHART TESTS 1 - 5:

Connect the signal-generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis. Set the receiver volume control at maximum, tune the signal generator and receiver to 1000 kc., and start with the generator adjusted for low output.

	TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1.	Q to B—	Loud, clear signal.	Trouble within Section 4. Isolate by following tests.
2.	M to B—	Clear signal, with moderate generator output.	Defective 7B8, C404, C405, C406, C408, C409, R402, R403, R404, R405, L401C, or L402.
3.	N to B—	Same as above.	Open C405.
4.	P to B—	Clear signal, louder than step 3.	Defective 7A7, R400, R401, C401, C402, or C403.
5.	Q to B—	Same as step 4.	Defective L400, C400, L401A, or L401B.

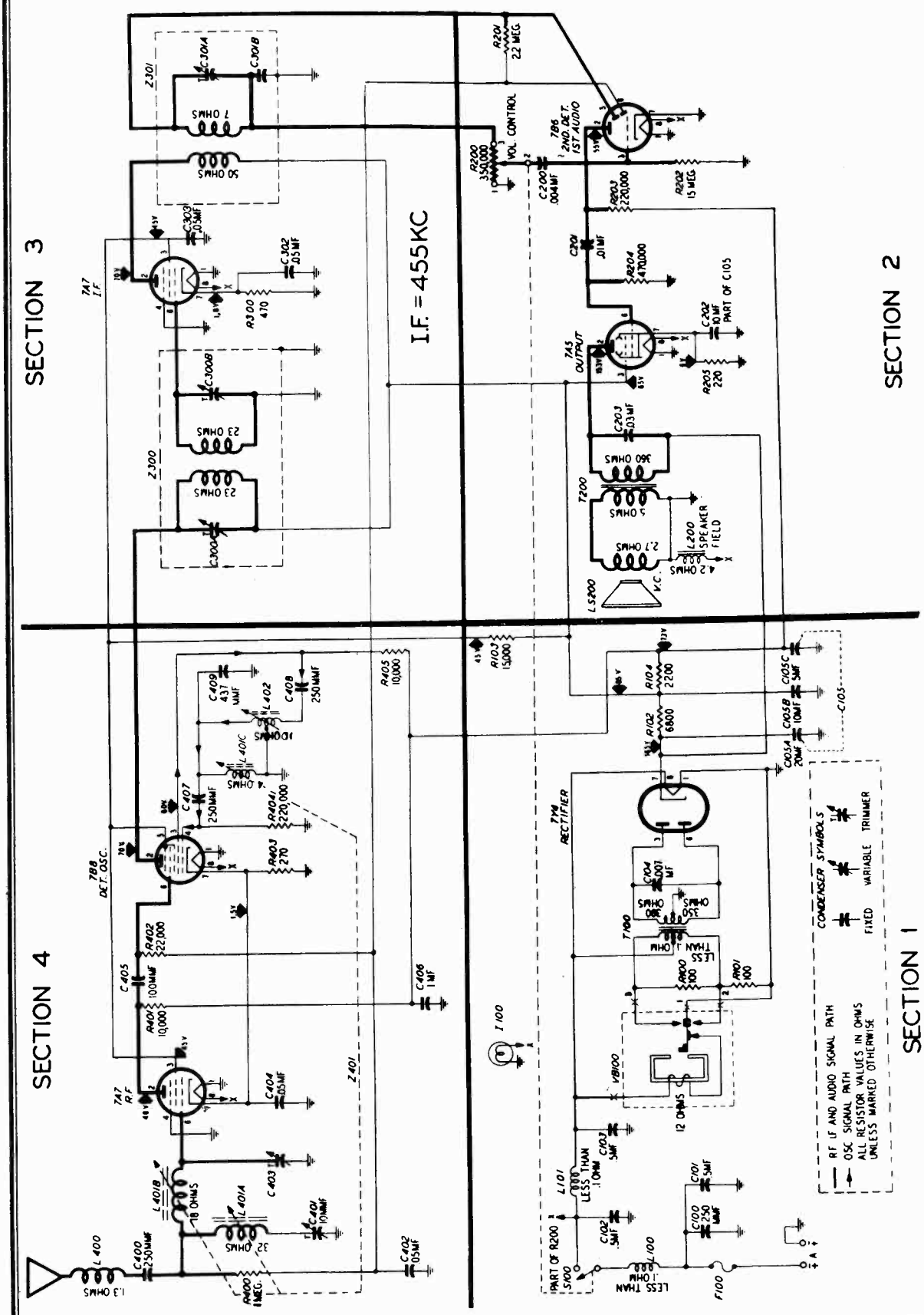


Section 4 schematic.



Bottom view, showing Section 4 test points.

MODELS S4624, S4625



NOTE: All voltage, capacity, and resistance values shown are average. The voltages were measured between the points indicated and the receiver chassis (B–), using a 20,000-ohms-per-volt meter, with 6.3 volts d-c input to the receiver power supply; the volume control was set at minimum, and the tuning control at 540 kc.

ALIGNMENT PROCEDURE

CONNECT THE SIGNAL-GENERATOR output lead as follows:

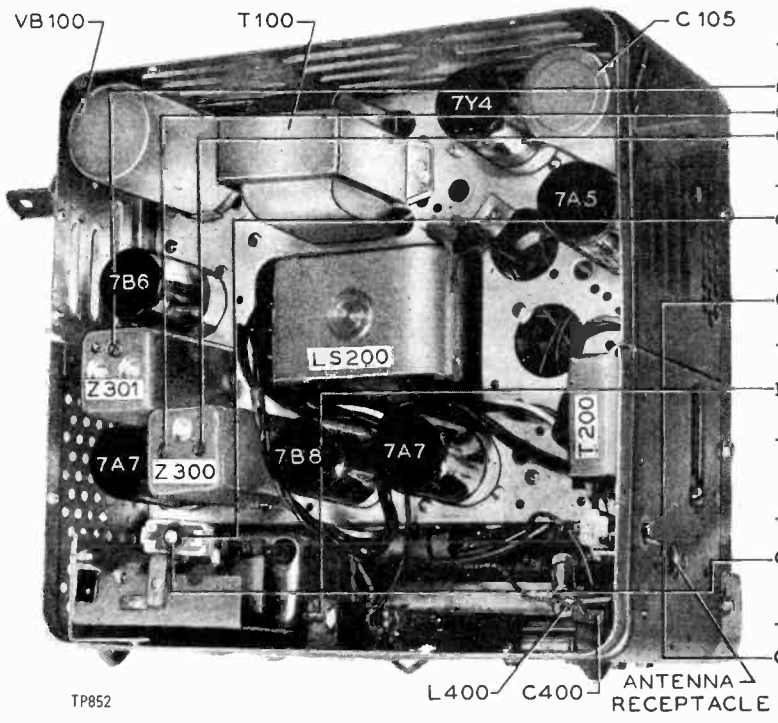
For the i-f alignment (the first step in the chart), connect through a .05-mf. condenser to the antenna receptacle.

For the r-f alignment (all steps after the first), connect through a dummy aerial consisting of a 20-mmf. condenser in series with an aerial lead (Part No. 95-0211) plugged into the antenna receptacle. If the aerial lead is not available, connect a 30-mmf. condenser from the aerial terminal to the receiver chassis, and inject the signal through the 20-mmf. condenser alone.

CONNECT THE OUTPUT METER across the speaker voice coil. Do not disconnect the speaker during alignment.

SET THE RECEIVER VOLUME CONTROL at maximum. Adjust the signal-generator output as alignment progresses to keep the meter needle near center scale, using the lowest range on the output meter.

AFTER REINSTALLING THE RECEIVER in the car, and connecting the antenna, adjust the antenna trimmer (C403) for maximum signal strength on a weak station near 1400 kc.



ADJUST IN ORDER	SPECIAL INSTRUCTIONS	DIAL SETTINGS SIG. GEN.	DIAL SETTINGS RECEIVER
C301A C300B C300A	1. Ground pin 4 of the 7B8 converter. Adjust the i-f trimmers for maximum in the order given, and then repeat the procedure.	455 kc.	1600 kc.
C401	2. Preset C401 to ½ turn from fully tight. Remove the ground from pin 4 of the 7B8.		
C403	3. Adjust for maximum.	1400 kc.	1400 kc.
L402	4. Adjust for maximum while rocking the tuning control.	580 kc.	580 kc.
	5. Tune in the 550-kc. signal with the receiver tuning control.	550 kc.	550 kc. (approx.)
C401	6. Adjust for minimum output.	1460 kc.	Do not alter from setting made in step 5.
C403	7. Adjust for maximum. Final adjustment to be made after the set has been reinstalled in the car, with the antenna connected.	1400 kc.	1400 kc.

MODELS S4624, S4625

SECTION 1

Reference No.	Description	Service Part No.
C100	Condenser, 250 mmf.	60-10245307*
C101	Condenser, .5 mf.	61-0137*
C102	Condenser, .5 mf.	61-0106*
C103	Condenser, .5 mf.	61-0137*
C104	Condenser, .007 mf.	61-0127*
C105	Condenser, electrolytic	61-0150*
	C105A: condenser, 20 mf.	Part of C105
	C105B: condenser, 10 mf.	Part of C105
	C105C: condenser, 5 mf.	Part of C105
F100	Fuse	45-2559
I100	Pilot lamp	34-2064*
L100	Choke, "A"	32-1644
L101	Choke, vibrator	65-0151
R100	Resistor, 100 ohms	66-1104340*
R101	Resistor, 100 ohms	66-1104340*
R102	Resistor, 6,800 ohms	66-2684340*
R103	Resistor, 15,000 ohms	66-3153340*
R104	Resistor, 2,200 ohms	66-2223340*
S100	Switch	Part of R200
T100	Transformer, power	65-0404*
VB100	Vibrator	83-0026*

SECTION 2

C200	Condenser, .004 mf.	61-0179*
C201	Condenser, .01 mf.	61-0120*
C202	Condenser, 10 mf.	Part of C105
C203	Condenser, .03 mf.	61-0119*
L200	Field, speaker	Part of LS200
LS200	Speaker	73-0068*
R200	Control, volume, 350,000 ohms	33-5540*
R201	Resistor, 2.2 mega.	66-5223340*
R202	Resistor, 15 megs.	66-6153340*
R203	Resistor, 220,000 ohms	66-4223340*
R204	Resistor, 470,000 ohms	66-4473340*
R205	Resistor, 220 ohms	66-1223340*
T200	Transformer, output	65-0395*

SECTION 3

C302	Condenser, .05	61-0111*
C303	Condenser, .05	61-0111*
R300	Resistor, 470 ohms	66-1473340*
Z300	Transformer, 1st i-f	65-0399
	C300A: condenser, trimmer	Part of Z300
	C300B: condenser, trimmer	Part of Z300
Z301	Transformer, 2nd i-f	65-0400
	C300A: condenser, trimmer	Part of Z301
	C301B: condenser, r-f filter	Part of Z301

SECTION 4

C400	Condenser, 250 mmf.	60-10245307*
C401	Condenser, image-suppressor trimmer (Part of Z401)	63-0071
C402	Condenser, .05 mf.	61-0111*
C403	Condenser, r-f trimmer	63-0064
C404	Condenser, .05 mf.	61-0101*
C405	Condenser, 100 mmf.	60-10105407*
C406	Condenser, .1 mf.	61-0104*
C407	Condenser, 250 mmf.	60-10245307*
C408	Condenser, 250 mmf.	60-10245307*
C409	Condenser, 437 mmf.	30-1220-22*
L400	Choke, antenna	65-0378
L402	Coil, oscillator tracking	65-0401
R400	Resistor, 1 meg.	66-5103340*
R401	Resistor, 10,000 ohms	66-3103340*
R402	Resistor, 22,000 ohms	66-3223340*
R403	Resistor, 270 ohms	66-1273340*
R404	Resistor, 220,000 ohms	66-4223340*
R405	Resistor, 10,000 ohms	66-3103340*
Z401	Manual: inductive tuning assembly	76-2197
	L401A: coil, image suppressor (Part of Z401)	65-0406
	L401B: coil, r-f grid tuning (Part of Z401)	65-0407
	L401C: coil, oscillator grid tuning (Part of Z401)	65-0405

New part numbers have been given to the following items and apply only to the Model S-4625.

Description	Service Part No.
Dial hardware	
Bezel and stud assembly	76-2155
Dial	27-5922
Pointer	76-2475
Knob, tone control and nut cover	76-2171
Knob, tuning and volume	77-1043
Pilot-lamp assembly	
Shield	76-2339-1
Set mounting hardware	
Bolt, hook	56-3740
Lock washer	1W35046FA1

The following additional parts are supplied with the Model S-4625:

Dial hardware	
Rubber pad	54-4314

MISCELLANEOUS

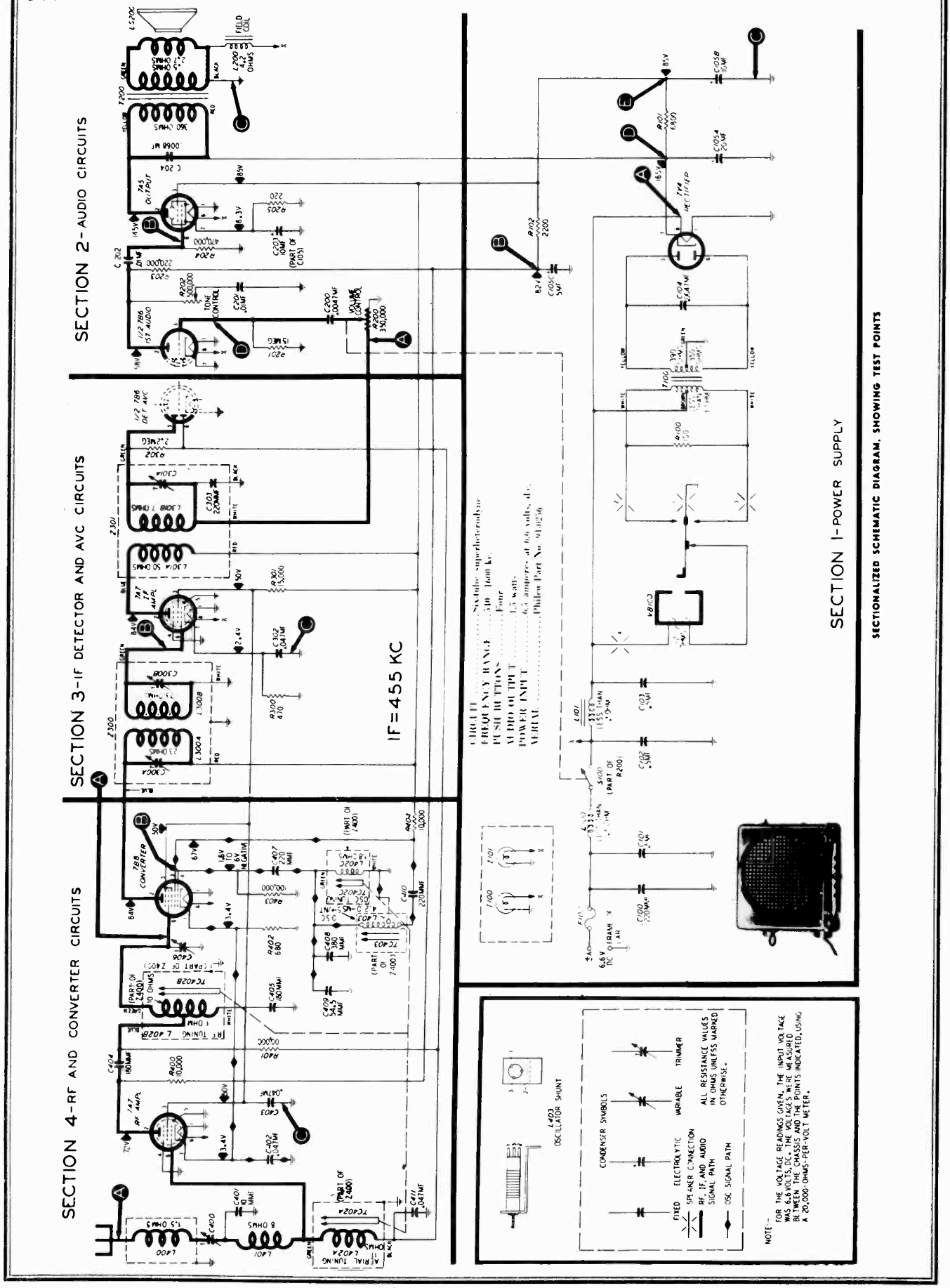
Description	Service Part No.
Dial hardware	
Background	55-1159
Bezel and stud assembly	76-2156
Bracket, stud, and screen assembly	76-2189
Cord, drive (25-foot spool)	45-1459
Dial	27-5900
Felt	54-4267
Pointer	56-3234
Spring, pointer	57-1425FA1
Spring, retaining	28-9007FA1
Housing parts	
Connector, antenna	57-0591FA3
Cover, tube side	57-1547FC59
Cover, wiring side	57-1548FC59
Gasket, speaker	55-1045
Housing assembly	77-1177FC59
Inductive tuning assembly	76-2197
Bracket (inductive tuning unit mounting)	57-1787FA3
Coil assembly, r-f	65-0407
Coil assembly, image trap	65-0406
Coil assembly, oscillator	65-0405
Condenser, image-suppressor trimmer	63-0071
Core, iron (r-f)	57-1702
Core, iron (oscillator)	57-1703
Core assembly, iron (image trap)	77-0677
Drive spiral assembly	76-2165
Nut, backlash	57-1706
Pin, hair	57-1868FA11
Shaft, core guide	57-1672FA3
Spring, retaining (phosphor bronze)	57-1398
Pilot lamp assembly	
Bracket	57-1404FA3
Shield	76-2339
Socket assembly	76-1679
Set mounting hardware	
Bolt, hook	97-0135FA3
Nut	97-0229FA3
Nut, wing	1W23750FA3
Socket, tube	27-6138*
Socket, vibrator	27-6153
Speaker-mounting hardware	
Bolt	W1582FA3
Lockwasher	1W24257FA1
Nut	1W19988FA3
Suppression parts	
Braid, copper (bonding)	95-0073
Condenser, generator	30-4632
Distributor choke assembly	77-0947
Ground strap	77-0336
Ground strap, fender	77-0966
Nipple, distributor suppressor	57-7159
Screw, ground strap	1W19828FA3
Suppressor, distributor (high-voltage)	33-1333
Washer, brass	2W54094

Description	Service Part No.
Speed nut	1W56913FE7
Moulding	56-3739
Speaker mounting hardware	
Gasket	55-1045
Suppression parts	
Bolt, heater-cable-clamp	1W10636FA3
Condenser, ignition-coil	30-4007-1
Ground strap, heater-cable	76-2505
Ground strap, battery-cable	76-2557
Ground strap, windshield-wiper-motor	76-2556
Nut, heater-cable-clamp	1W19988FA3

Suppression parts in the Model S-4624 list that are not used in Model S-4625 are:

Distributor filter assembly	77-0947
Ground strap, muffler	77-0336
Ground strap, fender	77-0966

MODEL S4824,
Studebaker



ALIGNMENT PROCEDURE

OUTPUT METER — Connect across voice-coil terminals.

SIGNAL GENERATOR — Connect ground lead to chassis; connect output lead as indicated in chart. Use modulated output.

RADIO CONTROLS — Set volume control to maximum, and tone control fully counterclockwise.

OUTPUT LEVEL — During alignment, adjust signal-generator output to maintain output-meter indication below 1 volt.

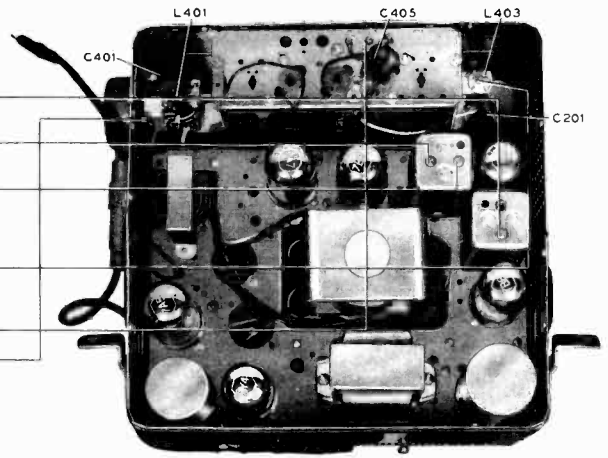
DUMMY AERIAL — For steps 2 and 3, connect generator output lead through 22-mmf. condenser to aerial receptacle; connect 30-mmf. condenser between receptacle and chassis.

IMPORTANT! The above instructions for the dummy aerial must be carefully followed if the radio is to perform at its best after being reinstalled in the car.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .05-mf. condenser to aerial receptacle.	455 kc.	1600 kc.	Adjust, in order given, for maximum output.	C301A — 2nd i-f sec. C300B — 1st i-f sec. C300A — 1st i-f pri.
2	Through dummy aerial.	580 kc.	580 kc.	Adjust for maximum while rocking tuning control. (See NOTE below.)	TC403 — Osc. padding
3	Same as step 2.	1400 kc.	1400 kc.	Adjust for maximum.	C406 — R.f. (shunt) C400 — Aerial (series)
4	Repeat steps 2 and 3 until no further improvement is obtained.				
5	After reinstalling radio in car, with aerial connected, adjust C400 for maximum output from weak station near 1400 kc.				

NOTE: If a satisfactory peak cannot be obtained, proceed to step 3

TOP VIEW, SHOWING TRIMMER AND TUNING-CORE LOCATIONS



SETTING PUSH BUTTONS

Any one of the four station push buttons may be set for any frequency within the broadcast band.

1. Turn on the power, and allow the radio to warm up for fifteen minutes.

2. Push the button in, and tune in the desired station by pulling out slightly on the knurled front end of the button and then turning; turning the knurled end causes the dial pointer to move, indicating the frequency to which the circuits are turned.

3. Repeat the adjustment for each button.

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 in 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 connecting the radio to a source of power.

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes and the vibrator are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, a blown fuse, or other obvious indications of trouble.

2. Measure the resistance between B+ (pin 7 of 7Y4 rectifier tube) and the chassis. 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 condenser C105A for leakage or short.

NOTE: The resistance value above, which is much lower than normal, does not represent a quality check of this condenser; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 (power supply) are performed.

3. If the fuse is blown, check the vibrator before installing a new fuse; if the vibrator is defective, check the buffer condenser, C104, before installing a new vibrator.

MODEL S4824,
Studebaker

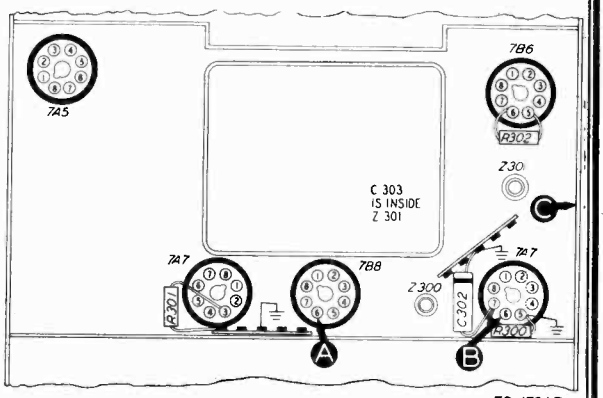
TROUBLE SHOOTING

Section 3 — I-F, DETECTOR, AND A-V-C CIRCUITS

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 the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully clockwise. Set the radio tuning control to the extreme low-frequency end of the dial.

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.



TP-4784C

BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS

Since the circuit location of test point A for this section is in Section 4, the effectiveness of step one as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal ...with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 7A7. Open: L301A, L301B, C301A, R300, R301. Shorted: C300B, L301A, L301B, C301A.
3	A	Same as step 1.	Defective: 7B8*. Open: C300A, C300B, L300A, L300B, R402*. Shorted: C300A, L300A, L300B, C404*, C406*.

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

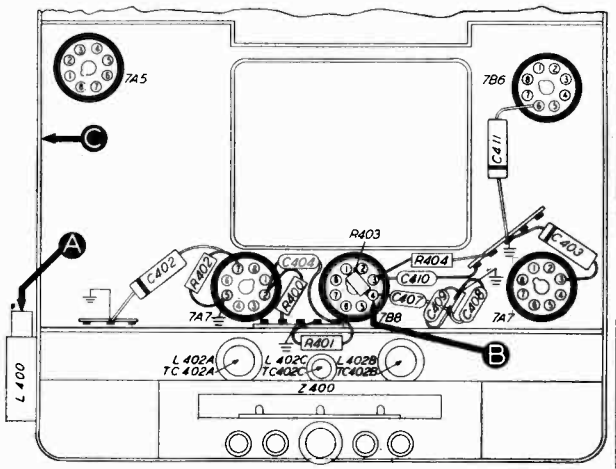
TROUBLE SHOOTING

Section 4 — R-F AND CONVERTER CIRCUITS

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 the chassis, test point C; 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 tone control fully clockwise. Set the radio tuning control and signal-generator frequency as indicated in the chart.

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



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BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS

STEP	TEST POINT	SIGNAL GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B (Osc. test; see note below.)			Negative 1.6 to 6 volts.	Defective: 7B8. Open: R403, C407, L402C, L403, C410, R404. Shorted: C407, C408, C409, C410, L402C, L403.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Defective: 7A7. Open: L400, C400, L401, L402A, R400, C404, L402B, C405. Shorted: C401.
Listening Test: Distortion may be caused by open R302, R401, or C411.					

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to the chassis; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 4) of the 7B8, test point B. Proper operation of the oscillator is indicated by negative voltages of approximately the values given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

MODEL S4824,
Studebaker

TROUBLE SHOOTING

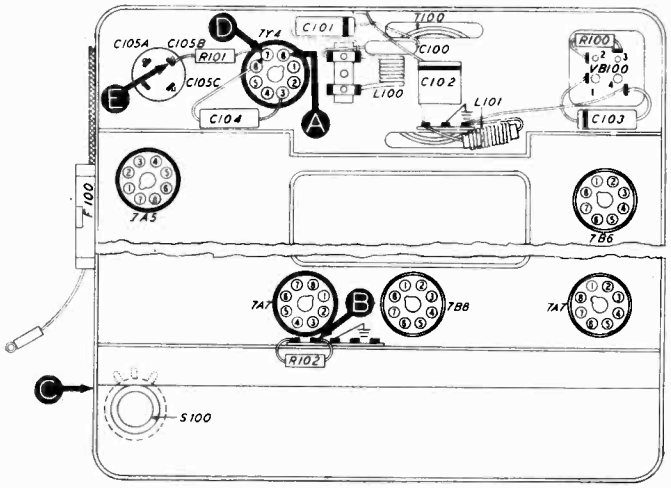
Section 1 — POWER SUPPLY

Make the tests for this section with a d-c voltmeter; connect the leads between the chassis, test point C, and the test points indicated in the chart.

The voltage readings given were taken with a 20,000-ohms-per-volt meter, with an input voltage of 6.6 volts, d.c.

Set the volume control to minimum, and the tone control fully clockwise.

Follow the steps in the order given. If the "NORMAL INDICATION" is obtained in step 1, (a) and (b), proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.



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BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a) 1 (b)	A B	6.6v 82v		Trouble in this section. Isolate by the following tests.
2	A	6.6v	No voltage Low voltage	Open: FS100, L100, S100, L101. Shorted: C100. C101. C102. C103. Leaky: C100, C101, C102, C103.
3	D	165v	No voltage Low voltage High voltage	Defective: 7Y4, VB100. Open: T100. Defective: 7Y4. Open: C105A. T100. Leaky: C105A. Shorted or leaky: C105B, C105C. Open: R101, R205*.
4	E	85v	No voltage Low voltage High voltage	Open: R101. Shorted: C105B. Leaky: C105B, C105C. Changed resistance: R101. Open: R102, R205*, T200*.
5	B	82v	No voltage Low voltage	Open: R102. Shorted: C105C. Leaky: C105C. Changed resistance: R102.
Listening Test: Abnormal hum may be caused by open C105B or C105C.				

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

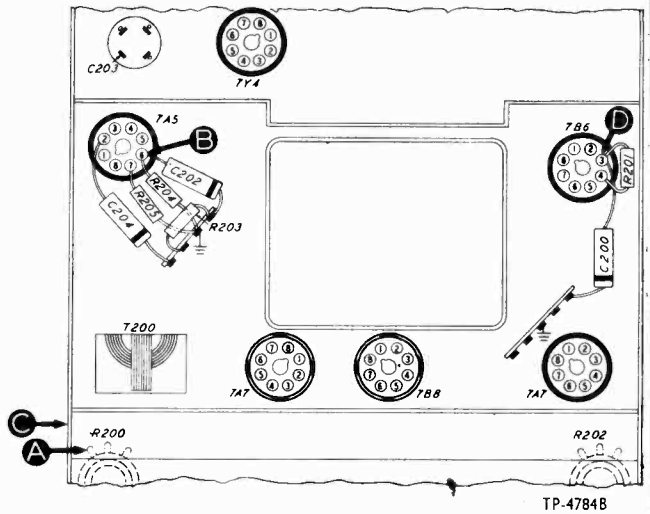
TROUBLE SHOOTING

Section 2 — AUDIO CIRCUITS

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully clockwise.

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.



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BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B	Clear signal with strong signal input.	Defective: 7A5, LS200. Open: R205, T200, L200. Shorted: C202, C204, C201 (rotate R202 through range).
3	D	Same as step 1.	Defective: 7B6. Open: C202, R203. Shorted: C303*.
4	A	Same as step 1.	Open: R200 (rotate through range), C200.
Listening Test: Distortion may be caused by open R201, R204, or by shorted or leaky C200, C202.			

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

MODEL S4824,
Studebaker

Circuit Description

Studebaker-Philco Model S4824, a custom-built auto radio, is a six-tube superheterodyne with self-contained speaker. Permeability tuning is used for all main circuits. Four push buttons provide mechanical automatic tuning by actuating the pantograph tuning mechanism.

The circuit includes a 7A7 r-f amplifier, a 7B8 converter, a 7A7 i-f amplifier, a 7B6 detector-a.v.c.-1st audio amplifier, and a 7A5 output amplifier. The power supply has a non-synchronous vibrator and a 7Y4 rectifier.

The lower section of L402B, together with C405 and incidental circuit constants, comprises a series-resonant circuit at image frequencies; since this circuit is directly across the output circuit of the r-f amplifier, the image-frequency component of the output is by-passed to ground. L402B as a whole, with its associated components, functions as an r-f autotransformer, of which the output side is resonant at signal frequencies.

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, r-f by-pass, 220 mmf.	62-122001001*
C101	Condenser, audio by-pass, .5 mf.	61-0137*
C102	Condenser, audio by-pass, .5 mf.	61-0137*
C103	Condenser, audio by-pass, .5 mf.	61-0137*
C104	Condenser, buffer, .0047 mf.	45-3500-7*
C105	Condenser, electrolytic, 4-section	61-0150
C105A	Condenser, filter, 20 mf., 350v	Part of C105
C105B	Condenser, filter, 10 mf., 350v	Part of C105
C105C	Condenser, filter, 5 mf., 300v	Part of C105
F100	Fuse, line, 14 amperes	45-2559
L100	Choke, "A"	32-1644
L101	Choke, hash filter	32-4170
R100	Resistor, damping, 100 ohms	66-1104340*
R101	Resistor, filter, 6800 ohms	66-2684340*
R102	Resistor, filter, 2200 ohms	66-2223340*
S100	Switch, on-off	Part of R200
T100	Transformer, power	65-0404
I100	Lamp, pilot	34-2064
I101	Lamp, pilot	34-2064
VB100	Vibrator	83-0026

SECTION 2
AUDIO CIRCUITS

C200	Condenser, d-c blocking, .0047 mf.	45-3502
C201	Condenser, tone control, .01 mf.	61-0120*
C202	Condenser, d-c blocking, .01 mf.	61-0120*
C203	Condenser, cathode by-pass, 10 mf., 25v.	Part of C105
C204	Condenser, tone compensation, .0068 mf.	45-3500-7*
R200	Volume control (with power switch) 350,000 ohms	33-5556-4
R201	Resistor, grid return, 15 megohms	66-5153340*
R202	Tone control, 500,000 ohms	33-5556-5
R203	Resistor, plate load, 220,000 ohms	66-4223340*
R204	Resistor, grid return, 470,000 ohms	66-4473340*
R205	Resistor, cathode bias, 220 ohms	66-1223340*
LS200	Speaker	36-1609-3
L200	Speaker field coil	Part of LS200
T200	Transformer, output	65-0395

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

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C302	Condenser, cathode by-pass, .047 mf.	61-0122*
C303	Condenser, i-f filter (part of Z301), 220 mmf.	62-122001001*
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
R300	Resistor, cathode bias, 470 ohms	66-1473340*
R301	Resistor, screen dropping, 15,000 ohms	66-3153340*
R302	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
Z300	Transformer, 1st i-f	65-0399
Z301	Transformer, 2nd i-f	65-0400

SECTION 4
R-F AND CONVERTER CIRCUITS

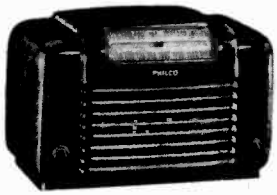
C400	Condenser, aerial trimmer	31-6472
C401	Condenser, aerial shunt, 10 mmf.	62-110009001*
C402	Condenser, cathode by-pass, .047 mf.	61-0122*
C403	Condenser, screen by-pass, .047 mf.	61-0122*

SECTION 4 (Continued)
R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C404	Condenser, d-c blocking, 180 mmf.	60-10205307*
C405	Condenser, image tracking, 180 mmf.	60-10205307*
C406	Condenser, r-f trimmer (part of Z400)	63-0053
C407	Condenser, d-c blocking, 220 mmf.	62-122001001*
C408	Condenser, osc. shunt, 380 mmf.	30-1220-37
C409	Condenser, osc. shunt, 54.5 mmf.	61-0149
C410	Condenser, d-c blocking, 220 mmf.	62-122001001*
C411	Condenser, a-v-c filter, .047 mf.	61-0122*
L400	Choke, aerial	65-0459
L401	Choke, aerial	65-0437
L402A	Coil, aerial tuning (part of Z400)	65-0443-10
L402B	Coil, r-f tuning (part of Z400)	65-0443-11
L402C	Coil, osc. tuning (part of Z400)	65-0443-12
L403	Coil, osc. shunt (part of Z400)	65-0229-1
R400	Resistor, plate load, 10,000 ohms	66-3103340*
R401	Resistor, grid return, 100,000 ohms	66-4103340*
R402	Resistor, cathode bias, 680 ohms	66-1683340*
R403	Resistor, osc. grid bias, 100,000 ohms	66-4103340*
R404	Resistor, osc. anode feed, 10,000 ohms	66-3103340*
TC402A	Tuning core, aerial (part of Z400)	56-3612-4
TC402B	Tuning core, r-f (part of Z400)	56-3612-4
TC402C	Tuning core, osc. (part of Z400)	56-3612-4
TC403	Tuning core, osc. shunt (part of L403)	57-0996
Z400	Pantograph tuning assembly	77-0588-3

MISCELLANEOUS

Description	Service Part No.
"A" Lead	
"A"-lead assembly (fuse to set)	76-2070-35
"A" lead	77-0638
Grommet, "A" lead	27-4676
Bezel Assembly	
Bezel-and-stud assembly	76-2156-1
Dial scale	27-5997
Spring, dial mounting	28-9007
Housing Parts	
Cover, tube side	57-1547FC59
Cover, wiring side	57-1548FC59
Gasket, speaker	55-1045
Housing assembly	77-1039FC59
Knobs	
Control-knob assembly (tone and volume)	77-1043
Nut-cover assembly	76-2171
Manual-tuning knob	57-2379
Manual-tuning-knob extension	56-3867
Push-button-knob assembly	76-1984
Spring, manual-tuning knob	57-1628
Spacer, manual-tuning knob	57-1669
Pilot-lamp assembly	
Pilot-lamp socket and light filter, l.h.	76-2496
Pilot-lamp socket and light filter, r.h.	76-2497
Set Mounting Parts	
Bolt, hook	56-374
Nut, wing	1W23750FA3
Socket, tube (loktal)	27-6138
Socket, vibrator	27-6153
Suppression Parts	
Braid, copper	97-0073
Distributor suppressor	33-4170
Nipple, distributor cable	54-7159
Strap, grounding (battery)	76-2557
Strap, grounding (windshield-wiper motor)	76-2556
Tuning-Unit Parts (Pantograph Tuning Assembly)	
Pointer assembly	76-2482
Push-button spring	57-1651
Latch-bar spring	57-1650
Tuning unit	77-0588-3



MODEL 46-131

SPECIFICATIONS

CABINET	Model 46-131 (Plastic, walnut finish)
CIRCUIT	Four-tube superheterodyne
FREQUENCY RANGE	540 to 1720 k.c.
POWER INPUT	90 volts at 6.5 to 7.5 milliamperes (plate supply) 1.5 volts at .2 ampere (filament supply) From battery pack—Type P-60B-6L
POWER CONSUMPTION	1 watt (total for both plate and filament supplies)
AERIAL	External, Philco Type 40-6383
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES USED	1LA6, 1LN5, 1LH4, 1A5GT/G

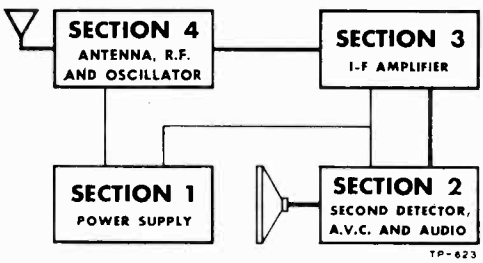


Figure 1. Block diagram (Heavy lines indicate signal path).

TROUBLE-SHOOTING PROCEDURE

In this manual, the receiver circuit is divided into four sections, as shown in figure 1. One test point is designated for each section, as shown in figure 2. Abnormal indications, secured when checking at these test points, localize trouble to the section under test. After localization, isolation of the faulty part is accomplished by testing in the order shown in the sectional test charts. A high-quality signal generator and volt-ohmmeter are required. Voltage readings shown were taken with a 20,000-ohms-per-volt meter. To localize trouble, proceed in the order given in the following chart. When applying a signal, connect the signal-generator output lead through a condenser (.01 to .25 mf.). Remedy any defect encountered before proceeding to the next check.

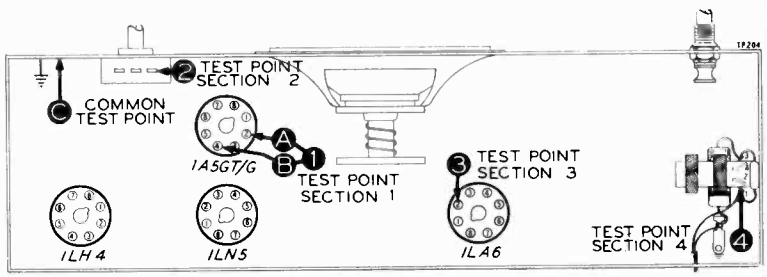


Figure 2. Bottom view, showing test points.

TESTS TO LOCALIZE TROUBLE TO ONE SECTION

SECTION	TEST	NORMAL RESULTS
Preliminary resistance check	Measure resistance between points 1B and C before connecting battery to receiver. If resistance is low, check condensers C100 and C203 for leakage or shorts.	100,000 ohms or higher
1	Measure voltage between points 1A and C (chassis). Measure voltage between points 1B and C.	1.2 to 1.4 volts 63 to 79 volts
2	Apply audio signal between points 2 and C.	Loud, clear signal
3	Apply weak, modulated signal (455 kc.) between points 3 and C.	Loud, clear signal
4	Apply weak, modulated signal (frequency to which set is tuned) between points 4 and C.	Loud, clear signal

MODEL 46-131

TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

Make all tests for this section with a volt-ohmmeter, using the 0-250v. d-c range. Voltages given were taken with the set operating and drawing normal current from battery. See figures 3 and 4 for location of test points.

Test Points	Normal Reading	Possible Cause of Abnormal Reading
B to C (chassis)	79 volts	No voltage indicates open battery cable, defective switch S100, open resistor R100, shorted condenser C100. Low voltage indicates nearly dead battery, defective resistor R100, leaky condenser C100, or excessive plate or screen current by one or more tubes.
A to C	1.4 volts	No voltage indicates open battery cable or defective switch S100.
D to C	6 volts	Deviation in this voltage indicates change in value of resistor R100, or abnormal current flow because of defective parts in sections 2, 3, or 4.

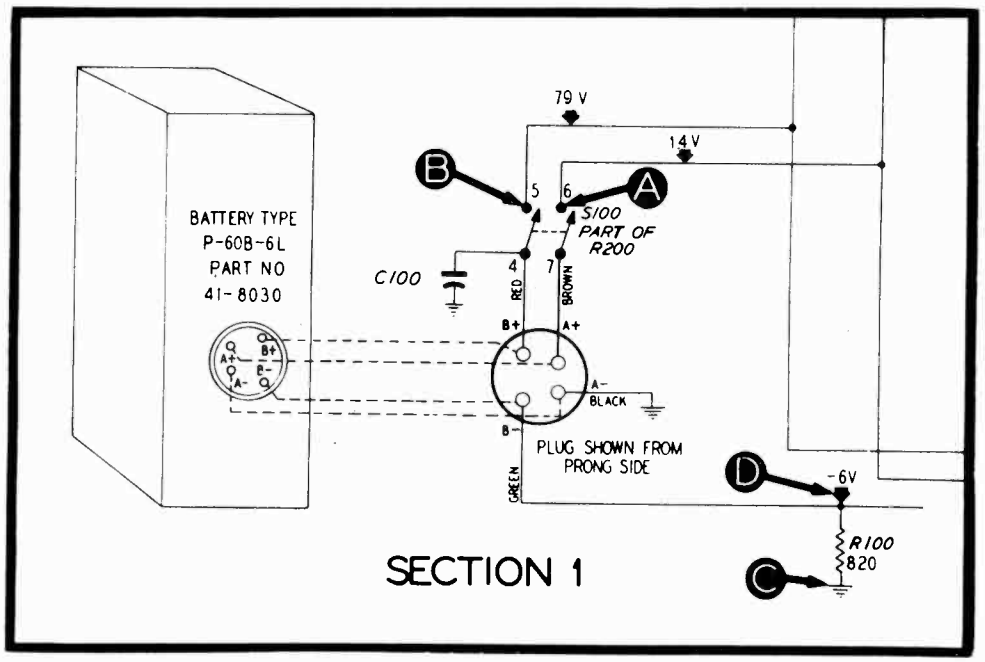


Figure 3. Section 1 schematic.

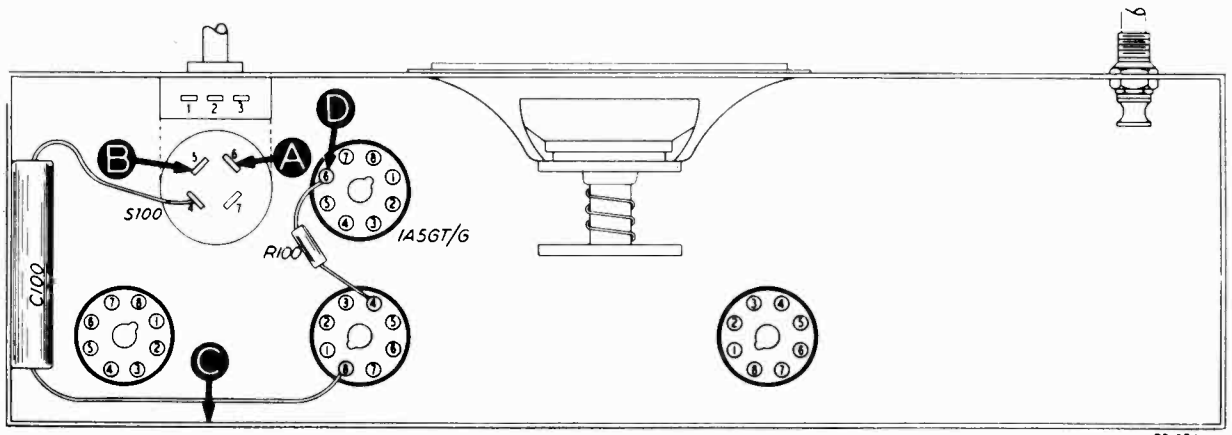


Figure 4. Bottom view, showing section 1 test points.

MODEL 46-131

TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

For all tests in this section use the audio range of the signal generator. Connect the generator output lead through a condenser (.01 to .25 mf.) to points indicated; connect the ground lead to receiver chassis. Adjust signal generator output for clear, audible signal.

Test Points	Normal Indication	Possible Cause of Abnormal Indication
E to C (chassis)	Clear, audible signal from speaker (receiver volume control at approximately three-fourths maximum).	No signal indicates defective 1A5GT/G, defective output transformer T200 or speaker LS200. Low and greatly distorted signal indicates leakage in condensers C202 or C203.
F to C	Clear, audible signal, same as preceding test.	No signal indicates open condenser C202, or shorted condenser C201; distortion indicates leakage in condenser C202, or open resistor R203.
G to C	Clear, audible signal with noticeable increase over that obtained in previous tests.	No signal indicates defective 1LH4, or open resistor R202. Distortion indicates defective 1LH4.
H to C	Clear, audible signal, same as preceding test.	No signal indicates open condenser C200; noisy or otherwise distorted signal indicates defective volume control R200. Rotate control through entire range for complete check.

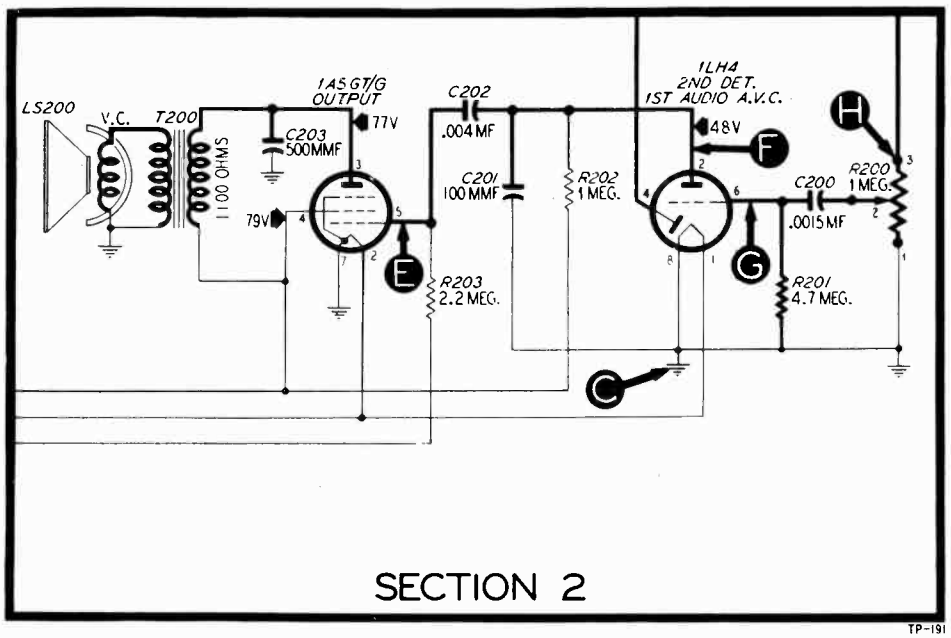


Figure 5. Section 2 schematic.

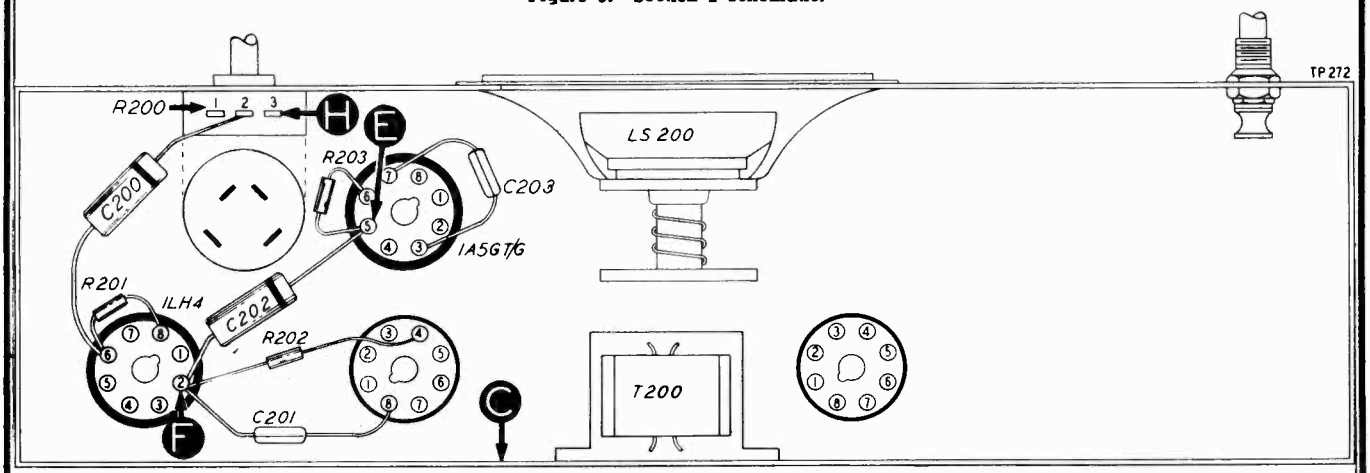


Figure 6. Bottom view, showing section 2 test points.

MODEL 46-131

TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

For all tests in this section, set the signal generator to 455 kc., modulation on. Connect the generator output lead through a condenser (.01 to .25 mf.) to the points indicated; connect the ground lead to receiver chassis. Adjust signal generator output for clear, audible signal.

Test Points	Normal Indication	Possible Cause of Abnormal Indication
J to C (chassis)	Audible signal from speaker.	No signal, or very weak signal, indicates defective 1LN5 tube, defective or misaligned i-f transformer assembly Z301, or defective diode section of 1LH4 tube.
K to C	Audible signal from speaker.	No signal indicates defective or misaligned i-f transformer assembly Z300.

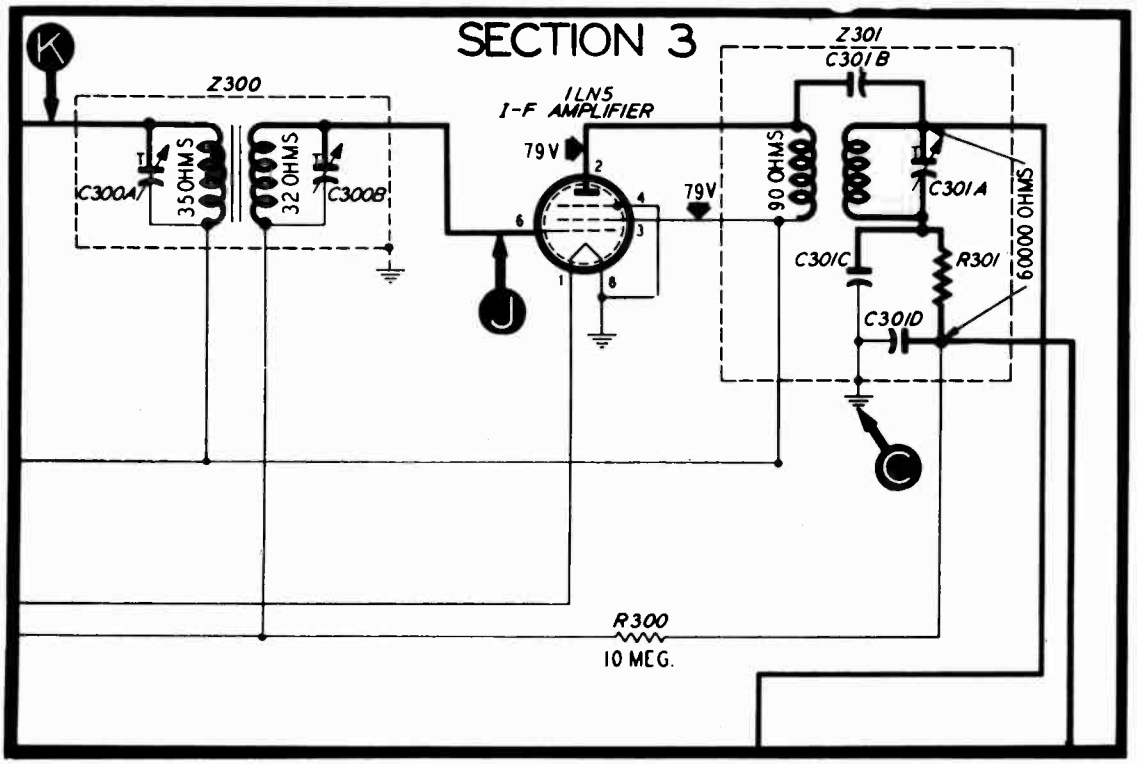


Figure 7. Section 3 schematic.

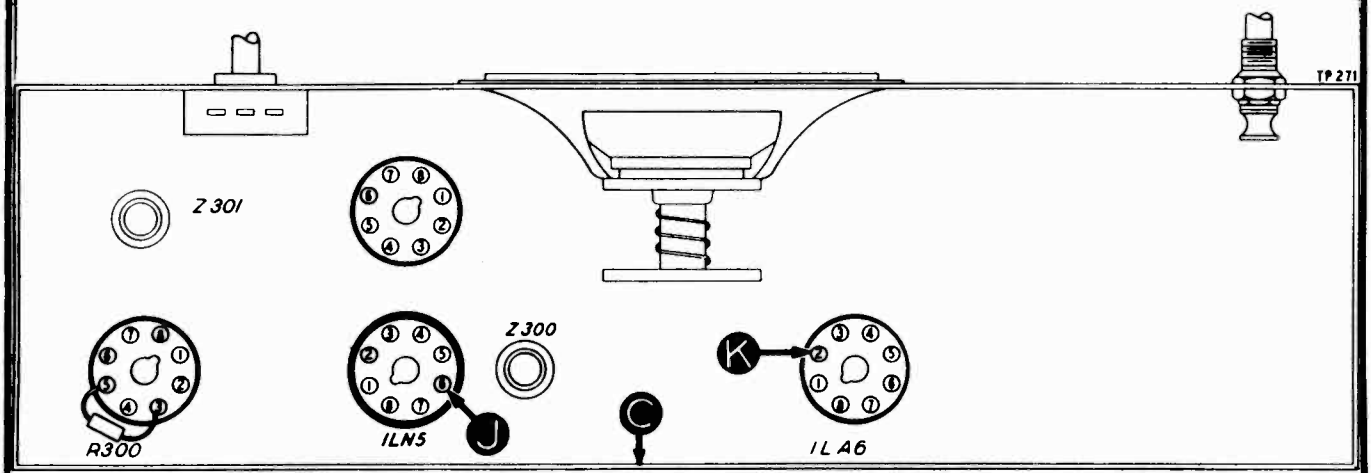


Figure 8. Bottom view, showing section 3 test points.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 4

IMPORTANT: Before applying a test signal to this section, make a preliminary check by rotating the tuning control through its entire range. Any scraping noise heard in the speaker indicates bent tuning condenser plates, dirty wiper contacts or dirt between the condenser plates. These conditions should be remedied before proceeding with the tests. Then connect the signal-generator output lead through a condenser (.01 to .25 mf.) to indicated test points and the generator ground lead to "C" (receiver chassis). For best results, check operation first at 540 kc. and then at 1700 kc.

Test Points	Normal Indication	Possible Cause of Abnormal Indication
L to C (chassis)	Audible signal from speaker.	No signal indicates defective 1LA6 tube, defective oscillator transformer T401, shorted plates in oscillator section of condenser C401, shorted condenser C405, or defective resistor R401 or R402.
M to C	Audible signal from speaker.	No signal indicates defective antenna transformer T400, or shorted plates in antenna section of condenser C401.

OSCILLATOR GRID BIAS VOLTAGE. Ground test point "L", connect a voltmeter (20,000-ohms-per-volt, 10-volt scale) between "N" (—) and "C" (+), and rotate the tuning control throughout its entire range. The voltage reading should not fall below 1.5 volts throughout. Insufficient voltage indicates malfunctioning, and the components listed in the first test in the above chart should be checked in the order given.

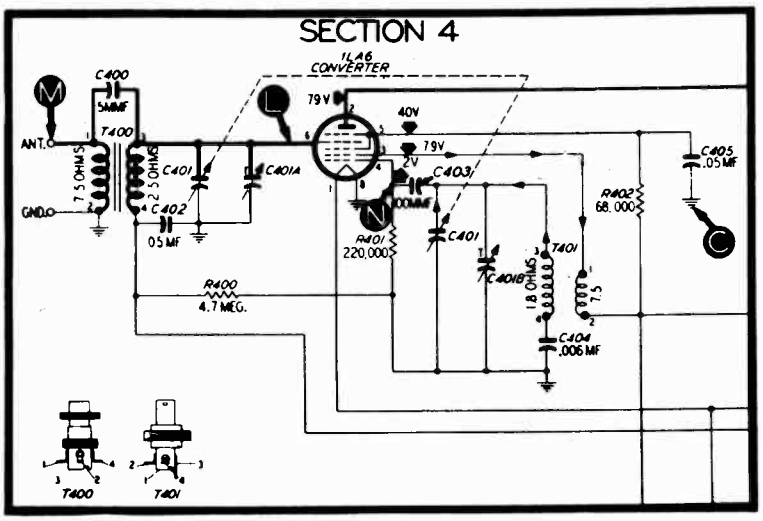


Figure 9. Section 4 schematic.

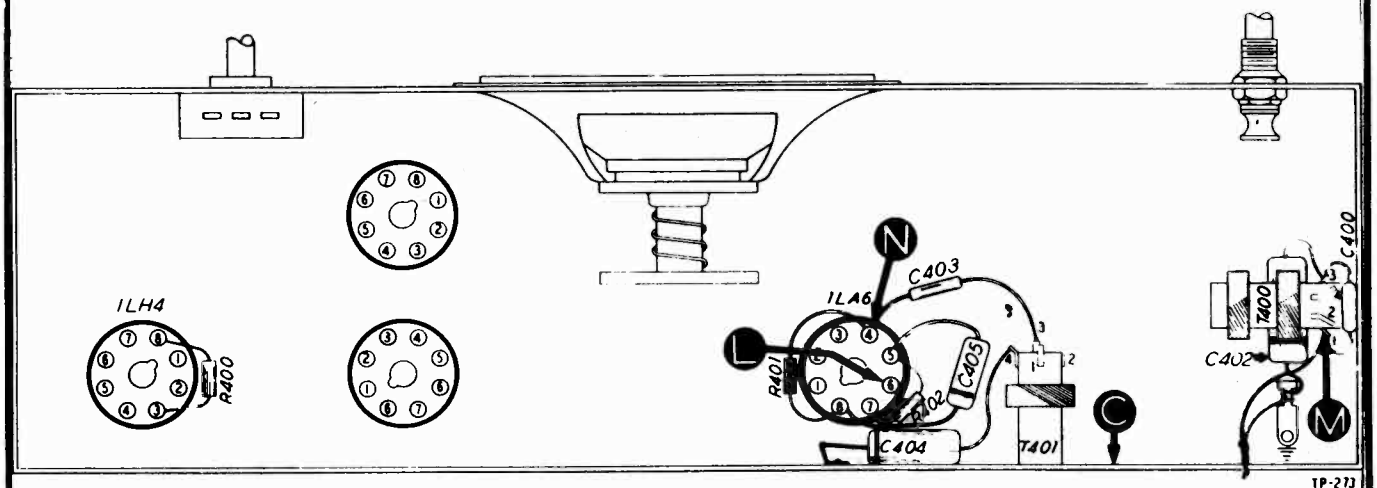


Figure 10. Bottom view, showing section 4 test points.

MODEL 46-131

CONNECTING ALIGNING EQUIPMENT

OUTPUT METER. Connect to voice coil lugs on rear of speaker, as shown in figure 11.

SIGNAL GENERATOR. Use a 100-mmf. condenser to couple the signal-generator output lead to the receiver. Adjust the output of the signal generator to give a signal strength sufficient to cause a readable deflection of the output meter, using the range on the meter which best indicates small variations in output. Reduce the output of the signal generator if the pointer of the output meter goes off scale as alignment progresses.

PROCEDURE. Turn receiver volume control to three-fourths maximum and adjust all trimmers, in the order listed, for maximum output.

ALIGNMENT CHART

SIGNAL GENERATOR		RECEIVER		
Connections to Receiver	Dial Setting (kc.)	Dial Setting (kc.)	Special Instructions	Adjust Trimmers in Given Order
Stator plate terminal, antenna section of tuning condenser, and chassis.	455	540	Turn C300B fully clockwise. Turn tuning condenser plates to fully meshed position. Make sure that dial pointer is set to the left index mark (the first small hole stamped 3¾ inches from left end of scale plate reflector). This setting corresponds to a dial setting of 540 kc.	C301A C300A C300B
Antenna lead and chassis.	1700	1700	Turn tuning condenser until dial pointer is on the first index mark (the first small hole 4⅛ inches from right end of the scale plate reflector).	C401B
Antenna lead and chassis.	1500	1500 (approx.)	Turn tuning condenser to position providing maximum reading on output meter.	C401A

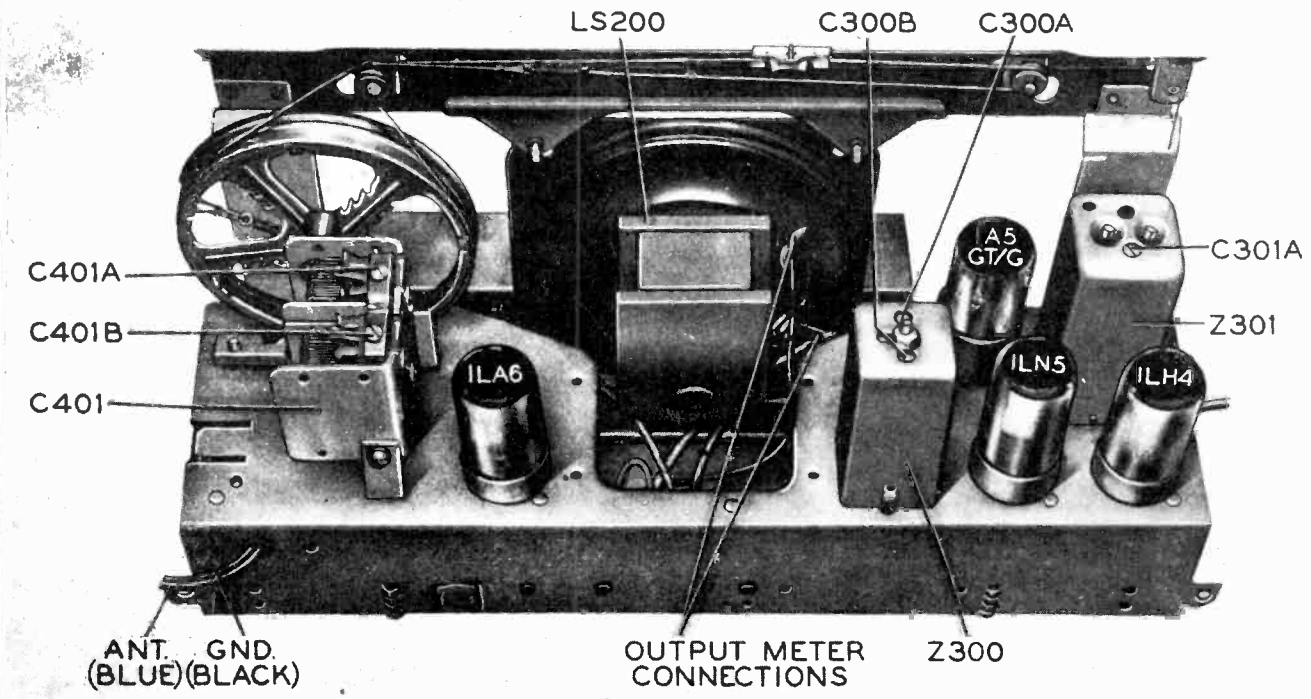


Figure 11. Top view, showing trimmer-condenser locations.

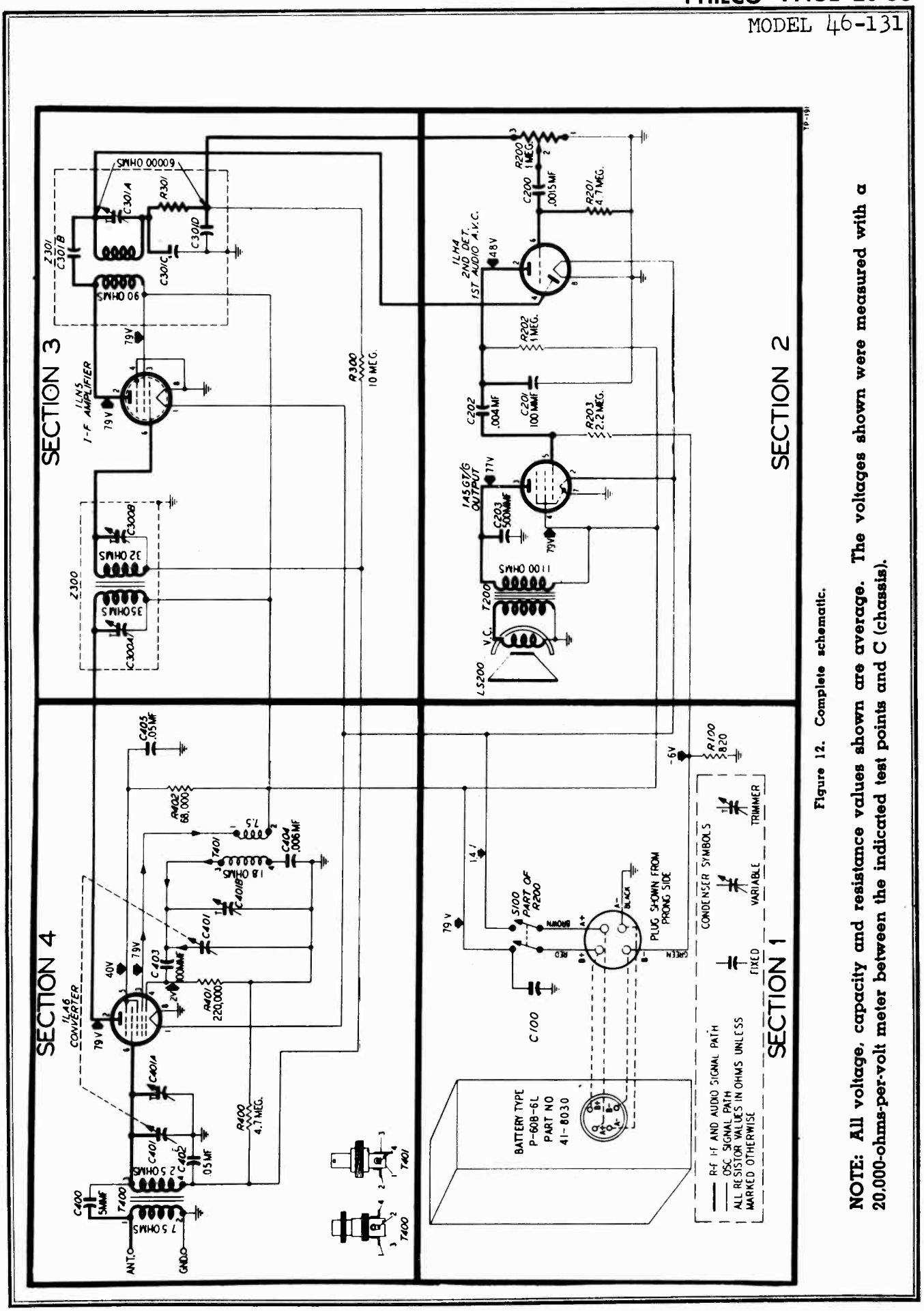


Figure 12. Complete schematic.

NOTE: All voltage, capacity and resistance values shown are average. The voltages shown were measured with a 20,000-ohms-per-volt meter between the indicated test points and C (chassis).

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Symbol designations used in the schematic and parts list are as follows:

C—condenser	S—switch
I—pilot lamp	T—transformer
LA—loop antenna	W—power cord
LS—loud speaker	and plug
R—resistor	Z—i-f transformer

NOTE: Parts marked with an asterisk (*) are general replacement items and will not be identical with those used on factory assemblies. Use only the "SERVICE PART NUMBER" shown in the parts list when ordering replacements.

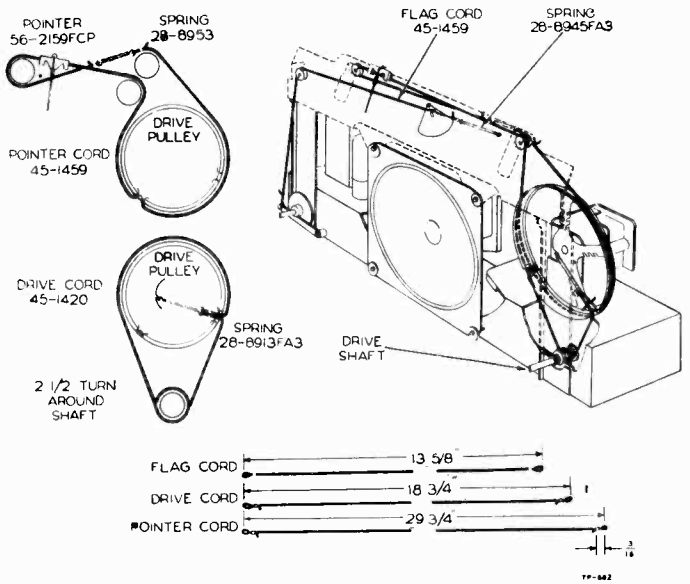


Figure 13. Drive cord installation details.

REPLACEABLE PARTS LIST

SECTION 1

Reference Number	Description	Service Part No.
C-100	Condenser, electrolytic, 10 mf.	30-2540*
PL-100	Battery cable assembly	41-3709
R-100	Resistor, 820 ohms	66-1823340*
	S-100: switch	Part of R-200

SECTION 2

C-200	Condenser, .0015 mf.	30-4621
C-201	Condenser, 100 mmf.	60-10105407*
C-202	Condenser, .004 mf.	30-4623
C-203	Condenser, 500 mmf.	60-90505007
LS-200	Speaker	36-1507
R-200	Volume control, 1 meg.	33-5493
R-201	Resistor, 4.7 megs.	66-5473340*
R-202	Resistor, 1 meg.	66-5103340*
R-203	Resistor, 2.2 megs.	66-5223340*
T-200	Transformer, output	32-8240

SECTION 3

R-300	Resistor, 10 megs.	66-6101330*
Z-300	Transformer, 1st i-f	32-3966
	C-300-A: condenser, trimmer	Part of Z-300
	C-300-B: condenser, trimmer	Part of Z-300
Z-301	Transformer, 2nd i-f	32-3897
	C-301-A: condenser	Part of Z-301
	C-301-B: condenser, trimmer	Part of Z-301
	C-301-C: condenser	Part of Z-301
	C-301-D: condenser	Part of Z-301
	R-301: resistor	Part of Z-301

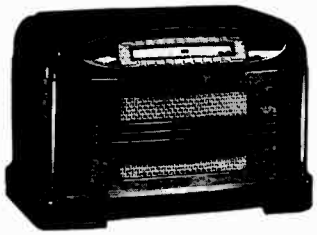
SECTION 4

C-400	Condenser, 5 mmf.	60-90505007
C-401	Condenser, tuning assembly	31-2641
	C-401-A: condenser, trimmer	Part of C-401
	C-401-B: condenser, trimmer	Part of C-401
C-402	Condenser, .05 mf.	30-4518*
C-403	Condenser, 100 mmf.	60-10105407*
C-404	Condenser, .006 mf.	30-4504*
C-405	Condenser, .05 mf.	30-4518*
R-400	Resistor, 4.7 megs.	66-5473340*
R-401	Resistor, 220,000 ohms	66-4223340*
R-402	Resistor, 68,000 ohms	66-3683340
T-400	Coil, antenna	32-3919
T-401	Coil, oscillator	32-4044

MISCELLANEOUS

Reference Number	Description	Service Part No.
	Antenna, ground cable	41-3699
	Cam assembly	76-1650
	Clamp, electrolytic condenser	56-1346
	Coil clip, {oscillator coil mounting / antenna coil mounting}	28-5002FE7
	Drive cord, flag drive (25-foot spool)	45-1459
	Drive cord, pointer drive (25-foot spool)	45-1459
	Drive cord, tuning condenser drive (25-foot spool)	45-1420
	Drive drum assembly	76-1651
	Grommet, tuning condenser mounting	27-4596
	Knob	54-4101
	Pointer	56-2159FCP
	Scale plate, flag and upright assembly	76-1652
	Screw, scale plate and upright assembly	1W19670FA3
	Screw and lockwasher, chassis mounting	1W32233FA3
	Socket, Loktal	27-6138*
	Socket, octal	27-6199*
	Spacer, speaker	26-2709
	Spacer, speaker mounting	1W29184
	Spacer, tuning condenser mounting	28-5665FA3
	Spring, flag drive	28-8945FA3
	Spring, spring wire	28-8953
	Spring, tuning condenser drive	28-8913FA3
	Stud, transfer lever mounting	1W29793
	Transfer lever assembly	76-1655
	Tuning shaft assembly	31-2640
	Washer, speaker mounting, steel	1W52237FA3
	Cabinet	10618
	Baffle and cloth assembly, 1/8" around speaker	40-6746
	Band, rubber	56-4025
	Cabinet, back	54-7100
	Grommet, scale bracket mounting	27-4596
	Pulleys	11W29740
	Scale, glass	27-5842
	Screw, chassis mounting	1W18676FA3
	Spacer, bracket-to-cabinet mounting	56-1307FA3
	Strap, right-hand	56-2672FA3
	Strap, left-hand	56-2671FA3
	Stud, back mounting	W2235-FA9
	Stud, baffle mounting	W2235-2FA9
	Washer, spring	56-1866

MODEL 46-132



MODEL 46-132

SPECIFICATIONS

CABINET	Model 46-132 (wood, walnut finish)
CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540 to 1720 kc.
POWER INPUT	90 volts at 8 to 10 milliamperes (plate supply) 1.5 volts at .25 ampere (filament supply) From battery pack—Type P-60D-11L
POWER CONSUMPTION	1.3 watts (total for both plate and filament supply)
AERIAL	External, Philco Type 40-6383
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES USED	1LA6, 1LN5, 1LH4, 1A5GT/G—(2)

PHILCO TROUBLE-SHOOTING PROCEDURE

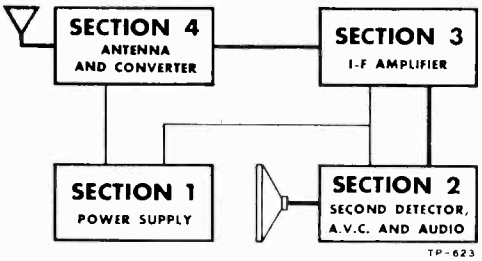


Figure 1. Block diagram (Heavy lines indicate signal path).

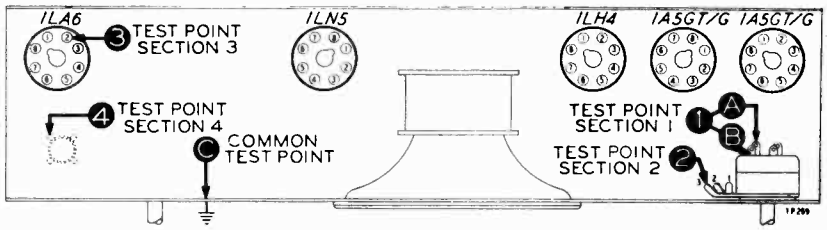


Figure 2. Bottom view showing test points.

In this manual, the receiver circuit is divided into four sections, as shown in figure 1. One test point is designated for each section, as shown in figure 2. Abnormal indications, secured when checking at these test points, localize trouble to the section under test. After localization, isolation of the faulty part is accomplished by testing in the order shown in the sectional test charts. A high-quality signal generator and a volt-ohmmeter are required. Voltage readings shown were ta en with a 20,000-ohms-per-volt meter. To localize trouble, turn receiver volume control full on; proceed in the order given in the following chart. When applying a signal, connect the signal-generator output lead through a condenser (.01 to .25 mf.). Remedy any defect encountered before proceeding to the next check.

TESTS TO LOCALIZE TROUBLE TO ONE SECTION

SECTION	TEST	NORMAL RESULTS
Preliminary resistance check	Measure resistance between points 1B and C with battery disconnected from receiver. If resistance is low, check condensers C302 and C202 for leakage or shorts.	100,000 ohms or higher
1	Measure voltage betwee point 1A and C (chassis) Measure voltage between point 1B and C (chassis)	1.2 to 1.4 volts 69 to 79 volts
2	Apply audio signal between point 2 and C (chassis)	Loud, clear signal
3	Apply weak, modulated signal (455 kc.) between point 3 and C (chassis)	Loud, clear signal
4	Apply weak, modulated signal (frequency to which set is tuned) between point 4 and C (chassis)	Loud, clear signal

MODEL 46-132

TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

NOTE: Make all tests for this section with a volt-ohmmeter, using the 0-250 V d-c range. Voltages given were taken with the set operating and drawing normal current from battery. See figures 3 and 4 for location of test points.

TEST POINTS	NORMAL READING	POSSIBLE CAUSE OF ABNORMAL READING
B to C (chassis)	79 volts	No voltage indicates open battery cable, defective switch S100, open resistor R100, shorted condenser C302 (see section 3). Low voltage indicates nearly dead battery, defective resistor R100, leaky condenser C302, or excessive plate or screen current by one or more tubes.
A to C	1.35 volts	No voltage indicates open battery cable or defective switch S100.
D to C	6 volts	Deviation in this voltage indicates change of value by resistor R100, or abnormal current flow because of defective parts in the sections 2, 3, or 4.

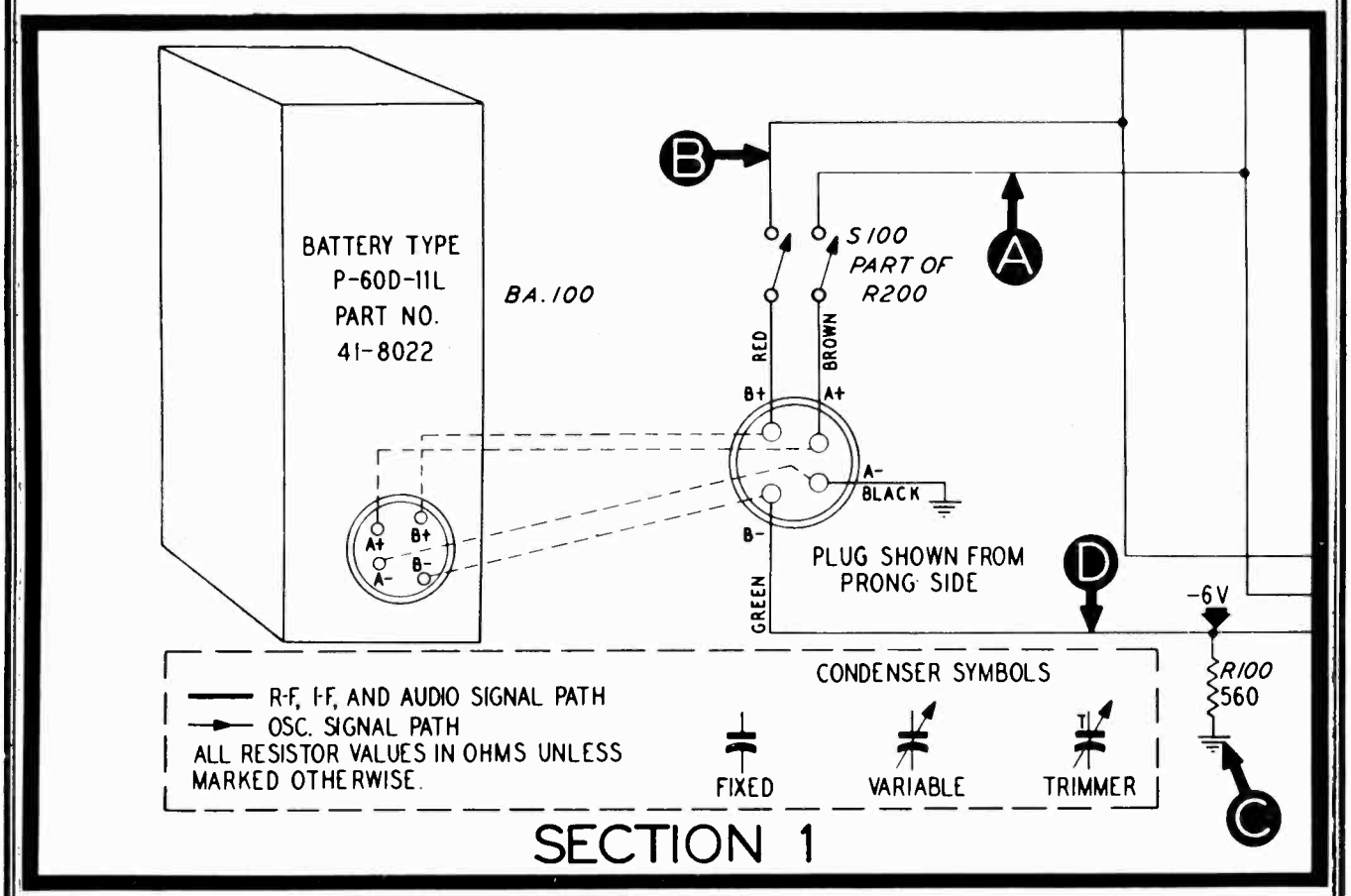
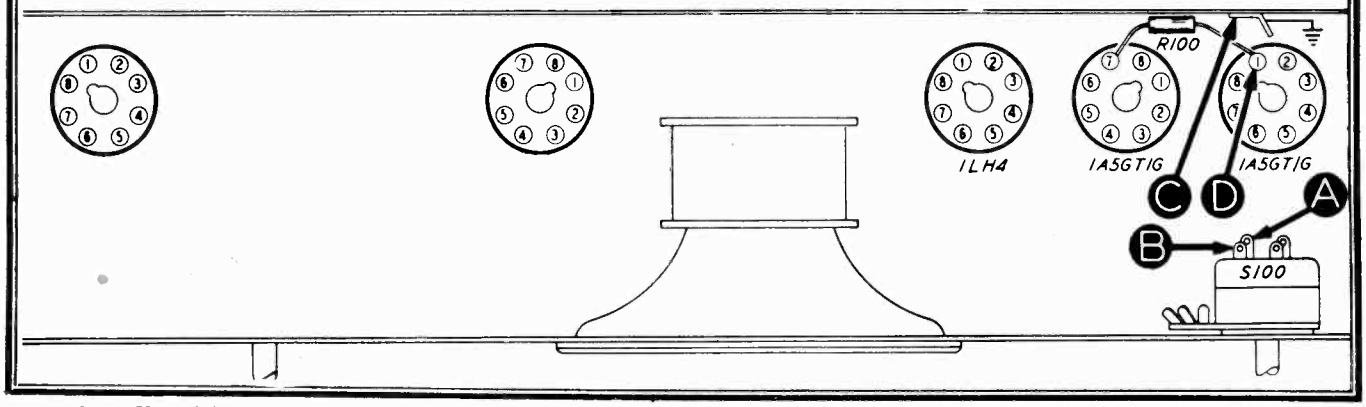


Figure 3. Section 1 schematic.



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TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

For all tests in this section, use the audio range of the signal generator. Connect the generator output lead through a condenser (.01 to .25 mf.) to points indicated, and connect the ground lead to receiver chassis. Adjust signal-generator output for clear audible signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
E to C (chassis)	Clear, audible signal from speaker (receiver volume control at approximately three-fourths maximum).	No signal indicates defective 1A5GT/G tube (into which the signal is fed), defective output transformer T200 or speaker LS200. Low and greatly distorted signal indicates leakage in condensers C203 or C204.
F to C	Clear, audible signal, as in preceding test.	No signal indicates open condenser C203 or shorted condenser C202; distortion indicates leakage in condenser C203.
G to C	Clear, audible signal with noticeable increase over that obtained in previous tests.	No signal indicates defective 1LH4 tube or open resistor R203. Distortion indicates defective 1LH4 tube.
H to C	Clear, audible signal, same as preceding test.	No signal indicates open condenser C201; noisy or otherwise distorted signal indicates defective volume control R200. Rotate control through entire range for complete check.

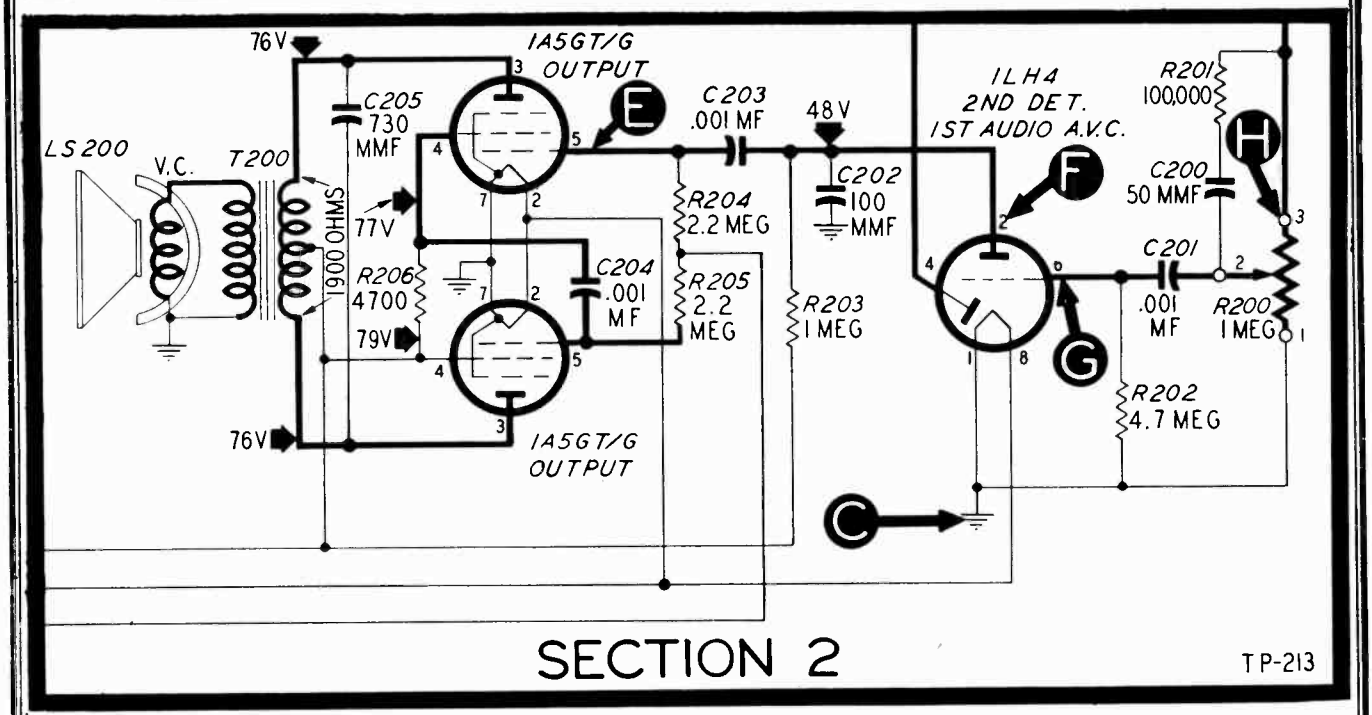
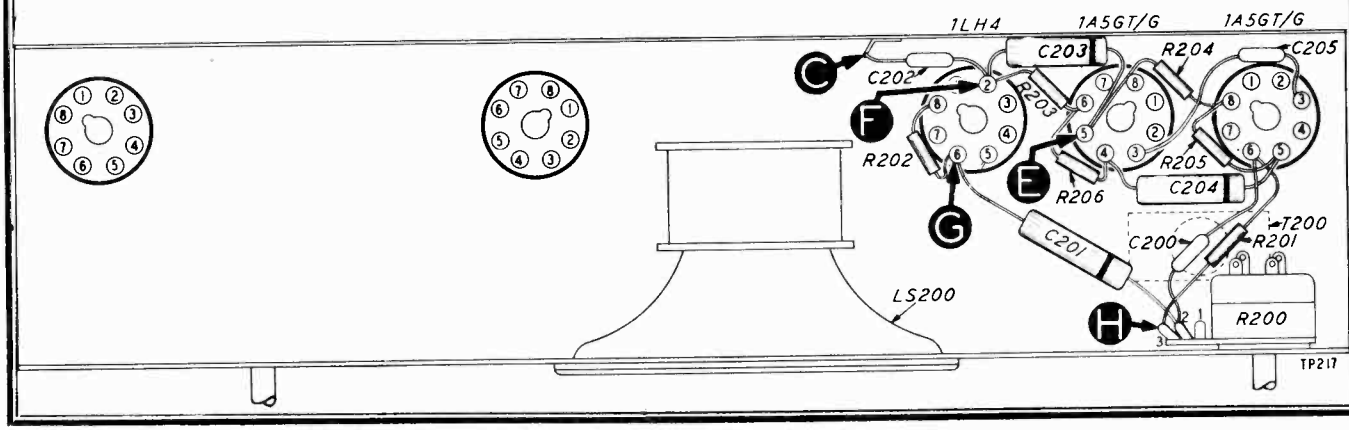


Figure 5. Section 2 schematic.



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TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

NOTE: For all tests in this section, set the signal generator to 455 kc., modulation ON. Connect generator output lead through a condenser (.01 to .25 mf.) to the points indicated, and connect the ground lead to receiver chassis. Adjust signal-genergtor output for clear, audible signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
J to C (chassis)	Audible signal from speaker.	No signal, or very weak signal, indicates defective 1LN5 tube, defective or misaligned i-f transformer assembly Z301, or defective diode section of 1LH4 tube.
K to C	Audible signal from speaker.	No signal indicates defective or misaligned i-f transformer assembly Z300.

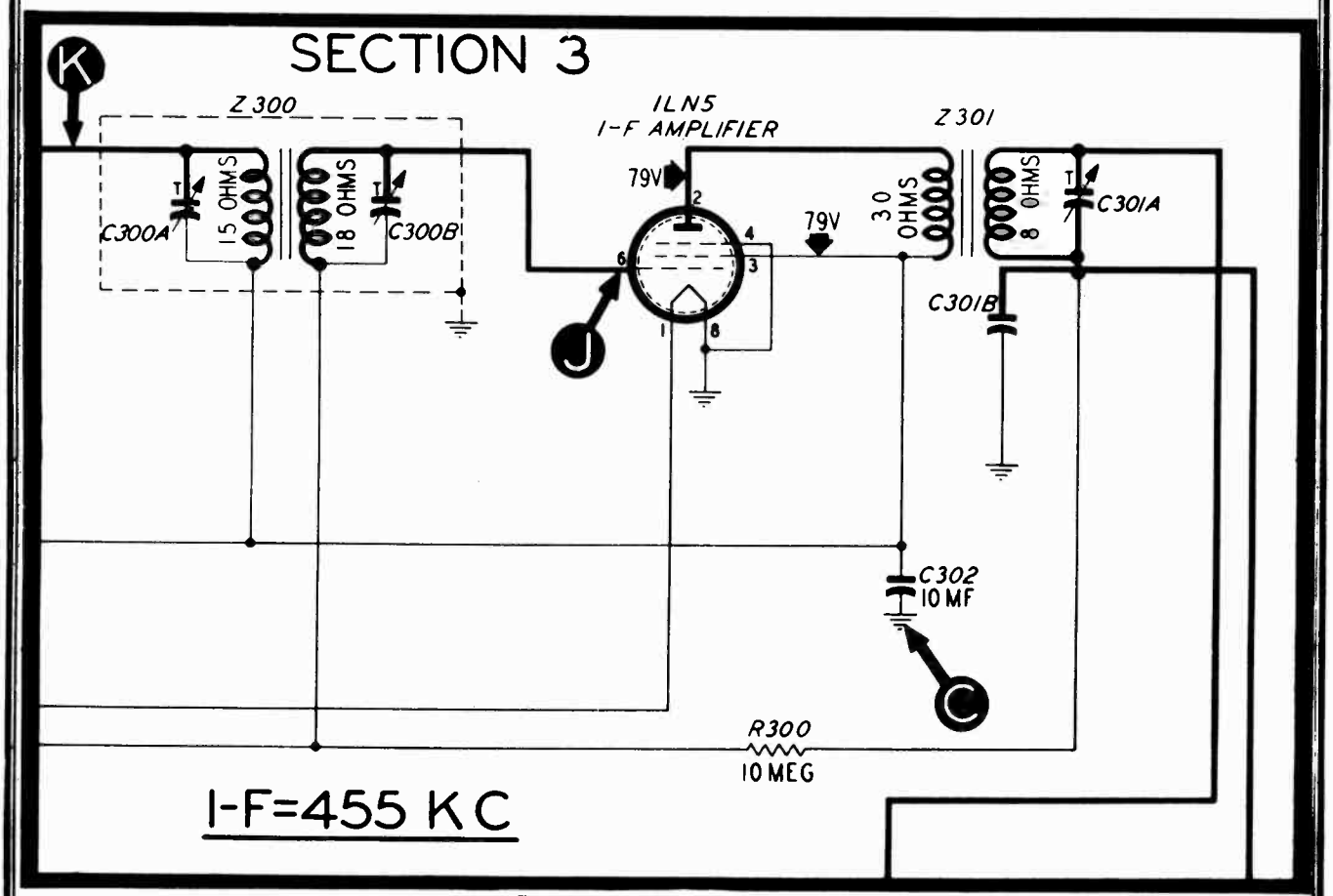
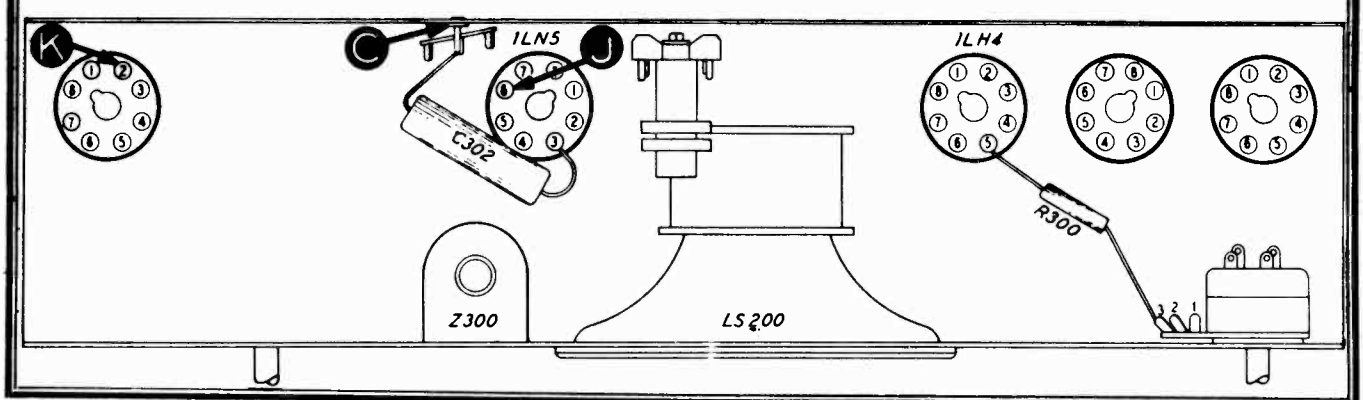


Figure 7. Section 3 schematic.



MODEL 46-132

TESTS TO ISOLATE TROUBLE WITHIN SECTION 4

IMPORTANT: Before applying a test signal to this section, make a preliminary check by rotating the tuning control throughout its entire range. Any scraping noise heard in the speaker indicates bent tuning condenser plates, dirty wiper contacts or dirt between the condenser plates, which conditions should be remedied before proceeding with the tests. Then connect the signal-generator output lead through a condenser (.01 to .25 mf.) to indicated test point and the generator ground lead to "C" (receiver chassis). For best results, check operation first at 540 kc. and then at 1700 kc.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE FOR ABNORMAL INDICATION
L to C (chassis)	Audible signal from speaker.	No signal indicates defective 1LA6 tube; defective oscillator transformer T401, shorted plates in oscillator section of condenser C401, shorted condenser C404 or defective resistor R401 or R402.
M to C	Audible signal from speaker.	No signal indicates defective antenna transformer T400, or shorted plates in antenna section of condenser C401.

OSCILLATOR GRID BIAS VOLTAGE. Ground test point "L"; connect a voltmeter (20,000 ohms-per-volt, 10-volt scale) through 50,000 ohm isolating resistor, between "N" (—) and "C" (+). Rotate the tuning control throughout its entire range. The voltage reading should not fall below 1.5 volts throughout. Insufficient voltage indicates malfunctioning, and the components listed in the first test in the above chart should be checked in the order given.

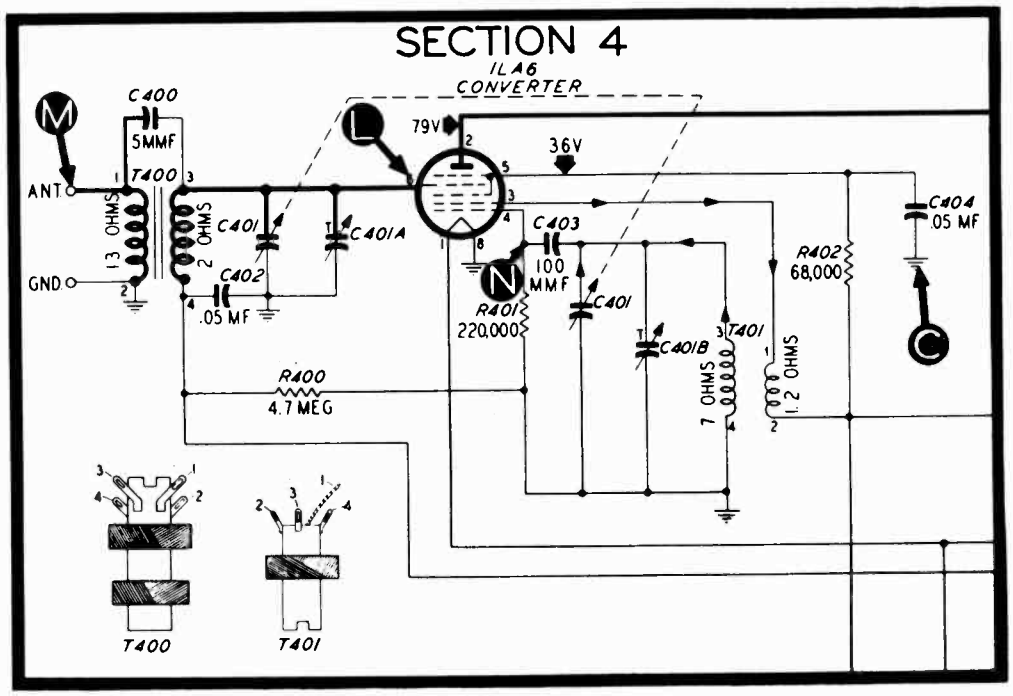
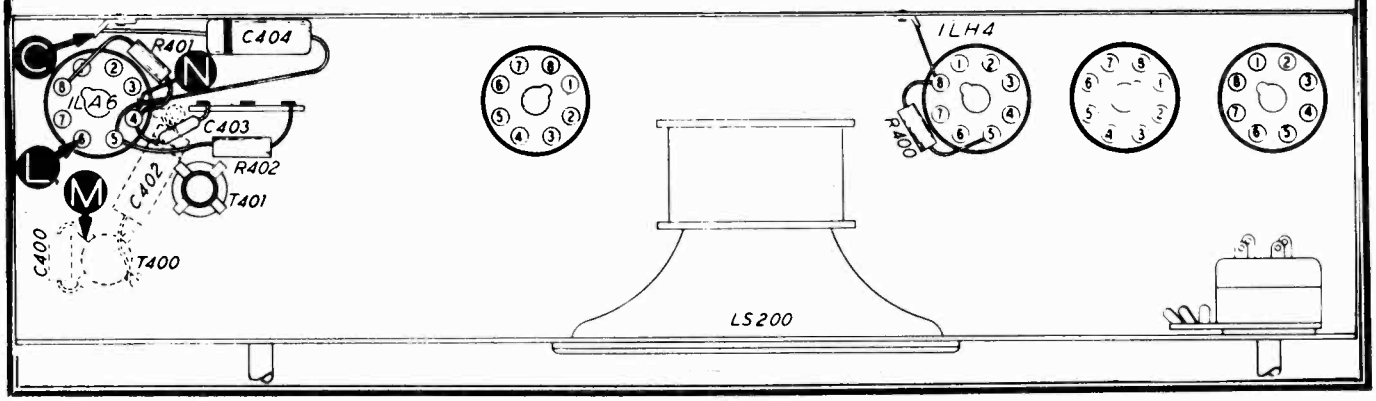


Figure 9. Section 4 schematic.



MODEL 46-132

CONNECTING ALIGNING EQUIPMENT

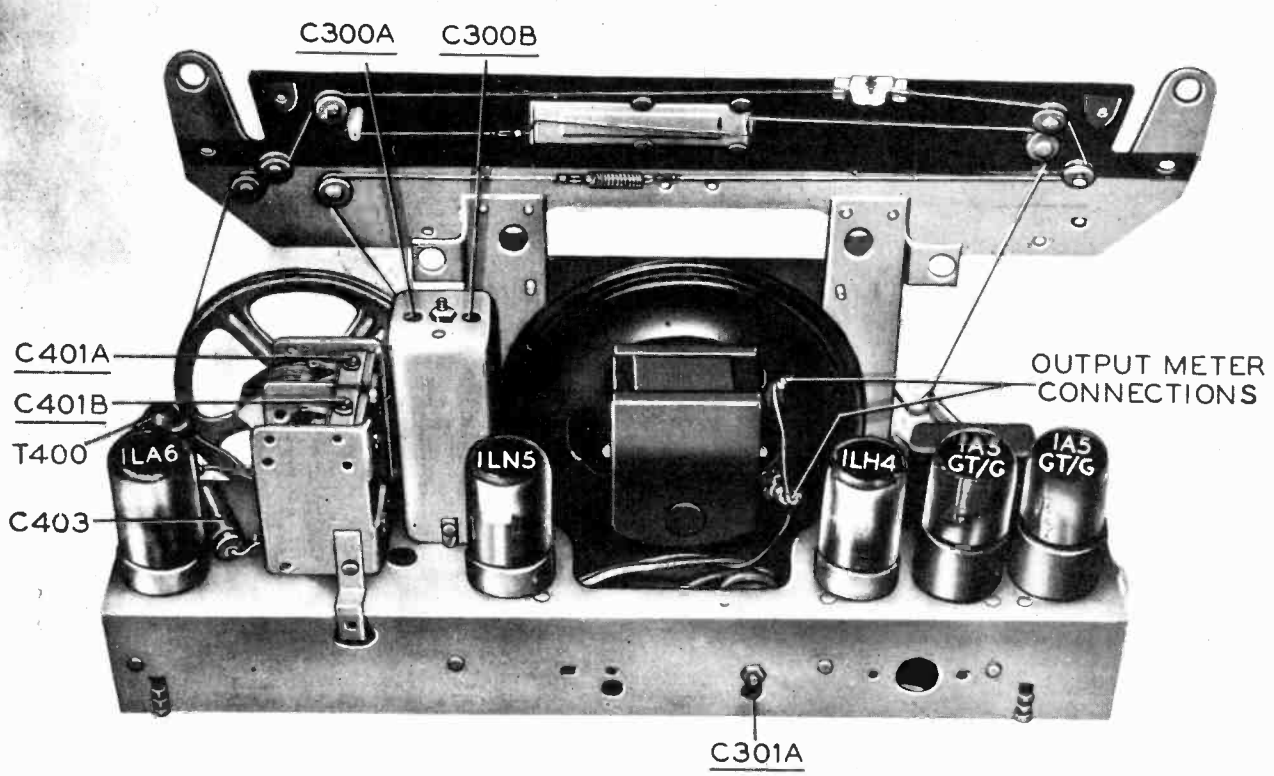
OUTPUT METER. Connect to voice coil of speaker, as shown in figure 11.

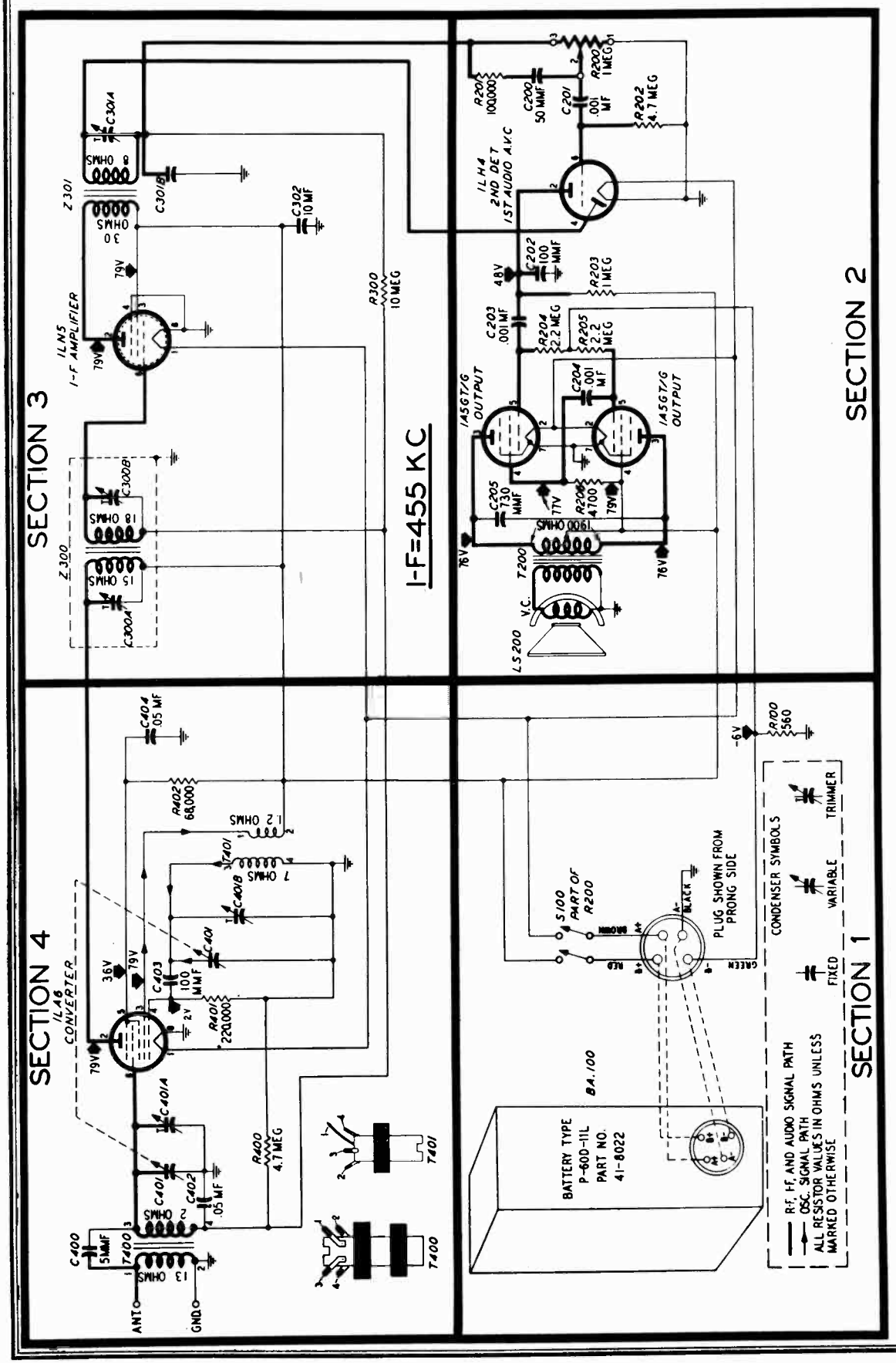
SIGNAL GENERATOR. Use a 100-mmf. condenser to couple the output lead to the receiver. Adjust the output of the signal generator to give a signal strength sufficient to cause a readable deflection of the output meter, using the range on the meter which best indicates small variations in output. Reduce the output of the signal generator if the pointer of the output meter goes off scale as alignment progresses.

PROCEDURE. Turn receiver volume control to maximum and adjust all trimmers in the order listed for maximum output.

ALIGNMENT CHART

SIGNAL GENERATOR		RECEIVER		
CONNECTIONS TO RECEIVER	DIAL SETTING (kc.)	DIAL SETTING (kc.)	SPECIAL INSTRUCTIONS	ADJUST TRIMMERS IN GIVEN ORDER
Stator plate terminal, antenna section of tuning condenser and chassis.	455	540	Turn C300B fully clockwise. Turn tuning condenser plates to full meshed position. Make sure that dial pointer is set to the left index mark (the first small hole stamped 3¾ inches from left end of scale plate reflector). This setting corresponds to a dial setting of 540 kc.	C301A C300A C300B IF
Aerial lead and chassis.	1700	1700	Turn tuning condenser until dial pointer is on the first index mark (the first small hole 4⅛ inches from right end of the scale plate reflector).	C401B
Aerial lead and chassis.	1500	1500 (approx.)	Turn tuning condenser to position providing maximum reading on output meter.	C401A





NOTE: All voltage, capacity and resistance values shown are average. The voltages shown were measured with a 20,000-ohms-per-volt meter between the indicated test points and C (chassis).

MODEL 46-132

Symbol designations used in the schematics and parts list are as follows:

C—condenser
I—pilot lamp
LA—loop antenna
LS—loudspeaker
R—resistor
S—switch
T—transformer
W—power cord and plug
Z—i-f transformer assembly

NOTE: Parts marked with an asterisk (*) are general replacement items and the numbers will not be identical with those used on factory assemblies. Use only the "SERVICE PART NO." shown below when ordering replacements.

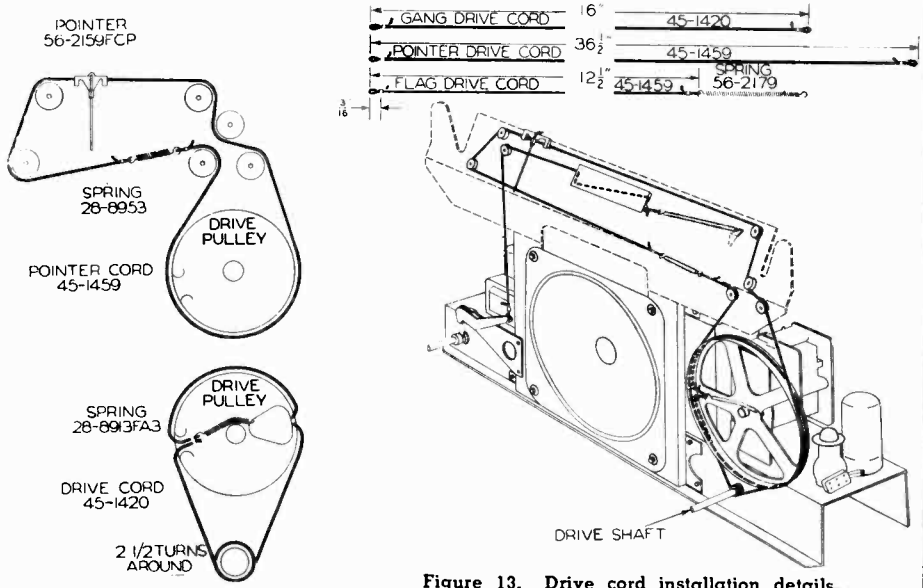


Figure 13. Drive cord installation details.

REPLACEMENT PARTS LIST

SECTION 1

Reference Number	Description	Service Part No.
S-100	Switch	Part of R-200
BA-100	Battery, type P-60D-11L	41-8022
	Battery cable assy.	41-3669
	Plug, battery cable	36-3399
R-100	Resistor, 560 ohms	66-1564360*

SECTION 2

C-200	Condenser, 50 mmf.	60-00513507*
C-201	Condenser, .001 mf.	30-4620
C-202	Condenser, 100 mmf.	60-10105407
C-203	Condenser, .001 mf.	30-4620
C-204	Condenser, .001 mf.	30-4620
C-205	Condenser, 730 mmf.	60-10755301*
R-200	Volume control, 1 meg.	33-5493
R-201	Resistor, 100,000 ohms	66-4103340*
R-202	Resistor, 4.7 megs.	66-5473340*
R-203	Resistor, 1 meg.	66-5103340*
R-204	Resistor, 2.2 megs.	66-5223340*
R-205	Resistor, 2.2 megs.	66-5223340*
R-206	Resistor, 4700 ohms	66-2473340
LS-200	Speaker	36-1507
T-200	Transformer, output	32-8152

SECTION 3

Z-300	Transformer, 1st I-F	32-3949
C-300-A	Condenser, trimmer	Part of Z-300
C-300-B	Condenser, trimmer	Part of Z-300
Z-301	Transformer, 2nd I-F	32-3963
C-301-A	Condenser, trimmer	Part of Z301
C-301-B	Condenser	Part of Z-301
C-302	Condenser, electrolytic, 10 mf.	30-2540
R-300	Resistor, 10 meg.	66-6103340*

SECTION 4

C-400	Condenser, 5 mmf.	60-90505007
C-401	Condenser, tuning	31-2708
C-401-A	Condenser, trimmer	Part of C-401
C-401-B	Condenser, trimmer	Part of C-401
C-402	Condenser, .05 mf.	30-4518*
C-403	Condenser, 100 mmf.	60-10105407*
C-404	Condenser, .05 mf.	30-4518*
R-400	Resistor, 4.7 meg.	66-5473340*
R-401	Resistor, 220,000 ohms	66-4223340*
R-402	Resistor, 68,000 ohms	66-3683340*
T-400	Transformer, antenna	32-3920
T-401	Transformer, oscillator	32-3184

MISCELLANEOUS

Description	Service Part No.
Coil clip, antenna oscillator mounting	28-5002FE7
Sleeve, tuning condenser mounting	28-5665FA3
Tuning shaft assy.	31-2554
Spring, tuning condenser	28-8913FA3
Spring, pointer drive	28-8953
Spring, flag	56-2179
Flag, operating arm assy.	76-1672
Flag	56-2180FCP
Pointer	56-2159FCP
Grommet, rubber, tuning condenser mounting, back	27-4610
Grommet, rubber, tuning condenser mounting, front	27-4596
Socket, octal	27-6199*
Socket, Loktal	27-6138*
Rivets	1W36671FA5
Knob assy.	54-4101
Cabinet, wood (includes scale and bezel)	10627
Drive drum assy.	76-1176FA3
Terminal panel assy.	12W45854
Screw, chassis mounting	1W19676FA9
Washer, chassis mounting	1W52353FA3
Drive cord, tuning condenser (25 ft. spool)	45-1420
Drive cord, flag and pointer (25 ft. spool)	45-1459
Scale plate and upright assy.	76-1579
Screws, speaker mounting	1W19670FA3
Washer, brass, speaker mounting	2W54094
Baffle and cloth assy.	40-6763
Scale strip	56-2068
Rubber bands, scale mounting	54-4168
Dial scale	27-5876
Felt feet	W2190
Pulley, drive cord	11W29740
Pulley stud	1W2918FA5
Transfer lever arm	56-2184FA3
Transfer lever arm, mounting bracket	56-2185FA3

Circuit Description

The Philco Models 47-204 and 47-205 are 5-tube, table-model superheterodyne radios, providing reception in the standard broadcast band. The two models are identical, except for cabinet and dial parts, as indicated in the parts list.

The high-impedance loop aerial normally provides adequate signal pick-up. An external aerial may be connected, if desired, by detaching the aerial lead (shown in figure 6) from the chassis, and connecting the lead to an external aerial lead-in. Do not use a ground.

The loop is coupled to the 7A8 converter tube. Variable-condenser tuning is employed, the oscillator rotor-section plates being shaped to obtain tracking, thus eliminating the necessity for a series padding condenser.

The 7A8 is transformer coupled to the 14A7 i-f amplifier, which is also transformer coupled to the diodes of the 14B6 second detector—first audio-frequency amplifier. A-v-c voltage is applied to the control grids of both the i-f and converter tubes.

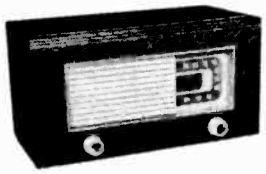
The triode section of the 14B6 is the first audio stage, and is resistance coupled to the 50L6GT output tube. The output tube is transformer coupled to a permanent-magnet dynamic speaker.

D-c operating voltages are obtained from a 35Y4 half-wave rectifier, the output of which is filtered by a two-section resistor—condenser filter.

The choke, part of C304, and the condenser C304 in Section 3, figure 3, form a series-tuned circuit, resonant at the intermediate frequency. This combination offers less impedance than a condenser alone, at this frequency, thus reducing any tendency toward oscillation. This choke—condenser combination acts as a condenser for audio frequencies. By-passing at broadcast frequencies is made adequate by connecting the tuning-condenser gang to the chassis.

The 150,000-ohm resistor, R100, in Section 1, prevents hum which might otherwise occur under conditions of high humidity.

MODEL 47-204



MODEL 47-205

SPECIFICATIONS

CABINET.....Wood composition, simulated leather
CIRCUIT.....Five-tube superheterodyne
FREQUENCY RANGE.....540 to 1,620 kc
OPERATING VOLTAGE..105 to 120 volts, a.c. or d.c.
POWER CONSUMPTION.....30 watts
AERIAL....Loop fastened to cabinet; terminal also provided for outside aerial
INTERMEDIATE FREQUENCY.....455 kc
PHILCO TUBES (5), 7A8, 14A7, 14B6, 50L6GT, 35Y4
PANEL LAMP, 6—8-volt, bayonet base, Part No. 34-2068

TP-2779A & TP-2780A

Philco TROUBLE-SHOOTING Procedure

In this manual, the schematic diagram is divided into four sections, with a chassis layout for each section, showing components and test points for each section. The test points are also indicated on the schematic diagram in the corresponding section. A simplified trouble-shooting procedure is given in a chart for each section. The first step in each chart is a master check, indicating whether trouble exists in that section. Failure to secure the "NORMAL INDICATION" in a given step indicates trouble, which should be located by voltage, resistance, or capacitance checks of parts indicated in the step, and remedied before testing further.

Preliminary Checks

The following preliminary checks are recommended before turning on the radio:

1. Carefully inspect both top and bottom of the chassis. Make sure that all tubes are secure in their proper sockets (see figure 6), and look for bad connections, burnt resistors, or other obvious sources of trouble.

2. Measure the resistance between B plus and B minus (test points C and B— in figure 1), using the ohmmeter polarity giving the highest resistance reading; if the reading is lower than 50,000 ohms, check C101A, C101B, and C101C, for leakage or shorts.

MODELS 47-204, 47-205

TROUBLE SHOOTING *Section 1*

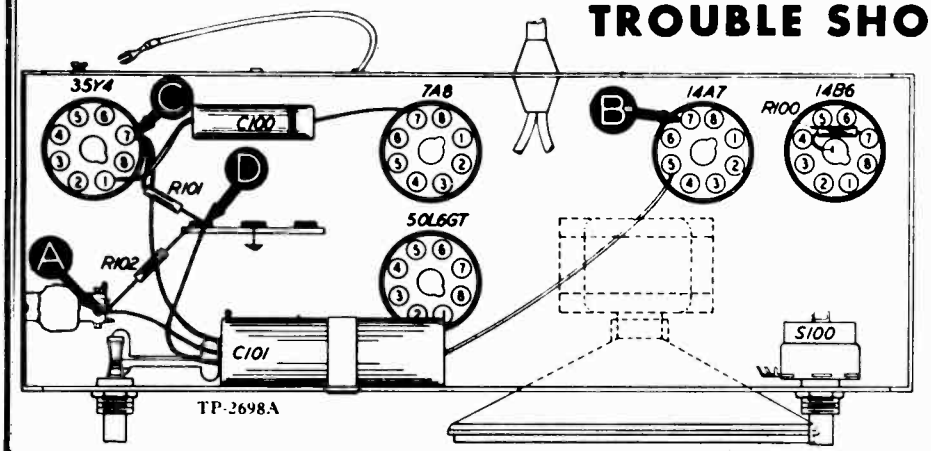


Figure 1. Bottom View, Showing Section 1 Test Points

Make the tests for this section with a d-c voltmeter, connecting the leads to the test points indicated in the chart. The voltages shown were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, 60 cycles.

Turn the volume control to minimum, and set the dial pointer at 540 kc.

Follow steps in sequence. If "NORMAL INDICATION" is obtained in step 1, proceed with tests for Section 2; if not, isolate and correct the trouble within this section.

STEP	TEST POINTS	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A to B—	90v		Trouble within this section; isolate by the following tests.
2	C to B—	115v	No voltage	Defective 35Y4 tube. Shorted C101A.
			Low voltage	Defective 35Y4 tube. Open C101A or 1100. Leaky C101A.
			High voltage	Open R101.
3	D to B—	105v	No voltage	Shorted C101B.
			Low voltage	Open C101B. Leaky C101B or C203.
			High voltage	Open R102, T200, or R204.
4	A to B—	90v	No voltage	Shorted C101C.
			Low voltage	Leaky C101C.
			High voltage	Open R204.

Listening Test: Abnormal hum may be caused by open C101A, C101B, or C101C.

TROUBLE SHOOTING *Section 2*

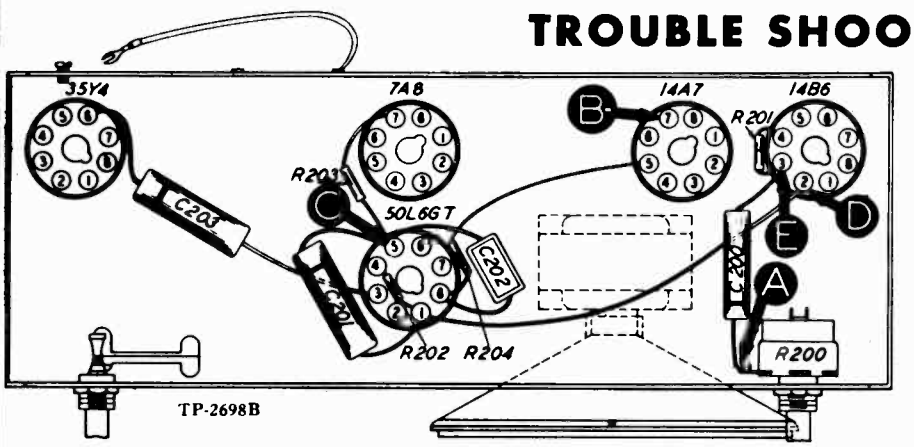


Figure 2. Bottom View, Showing Section 2 Test Points

Make tests for this section by using an audio signal. Connect ground lead of signal generator to B—; connect output lead through a .1-mf condenser to the test points indicated in the chart. Set the volume control at maximum. If "NORMAL INDICATION" is obtained in step 1, proceed with tests for Section 3; if not, isolate and correct the trouble within this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with low signal-generator output	Trouble within this section; isolate by the following tests.
2	C	Clear signal with high signal-generator output	No signal: Open or shorted LS200 or T200. Shorted C203. Open R204. Defective 50L6GT tube. Weak or distorted signal: Defective 50L6GT tube, or LS200. Leaky C202 or C201. Open R203. Shorted R204.
3	D	Same as step 2	No signal: Open C201. Weak or distorted signal: Leaky C201.
4	E	Same as step 1	No signal: Open R202. Defective 14B6 tube. Weak or distorted signal: Shorted C200. Open R201. Defective 14B6 tube.
5	A	Same as step 1 Note: Rotate R200 through range	No signal: Open C200. Shorted C300D. Weak or distorted signal: Defective R200.

MODELS 47-204, 47-205

TROUBLE SHOOTING — Section 3

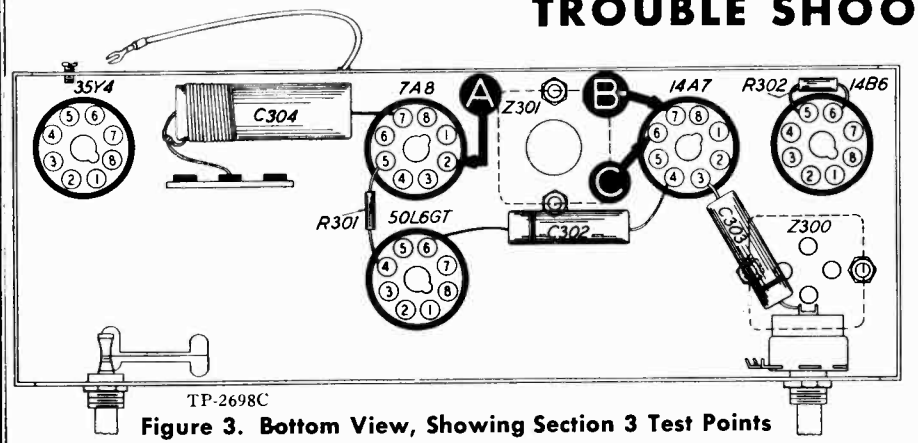


Figure 3. Bottom View, Showing Section 3 Test Points

Make tests for this section by using an r-f signal generator with modulated output. Set generator frequency to 455 kc. Connect ground lead of signal generator to B—; connect output lead through a .1-mf condenser to the test points indicated in the chart. Set the volume control at maximum. If "NORMAL INDICATION" is obtained in step 1, proceed with tests for Section 4; if not, isolate and correct the trouble within this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Clear signal with low signal-generator output	Trouble within this section; isolate by the following tests.
2	C	Same as step 1	No signal: Open or shorted Z300. Defective 14B6 or 14A7 tube. Open R301. Shorted C303. Weak or distorted signal: Leaky C303. Open C303 or C304. Defective 14B6 or 14A7 tube. Misaligned Z300. Leaky or open C302.
3	A	Same as step 1	No signal: Open or shorted Z301. Weak or distorted signal: Misaligned Z301.

TROUBLE SHOOTING — Section 4

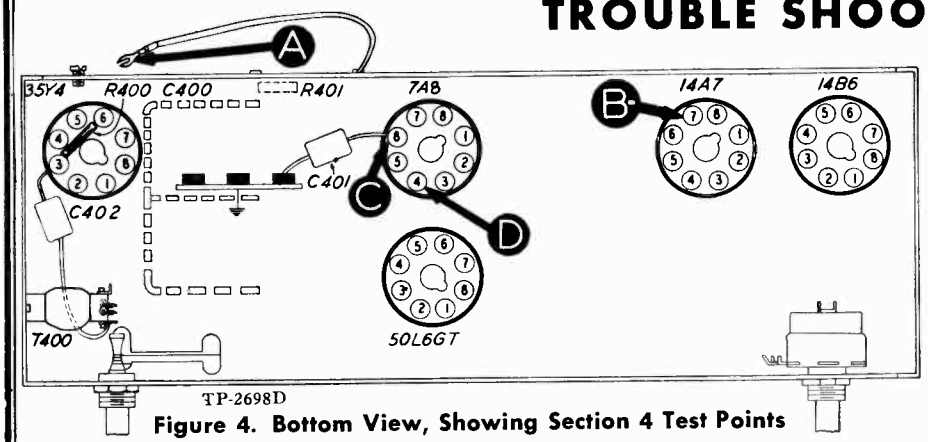


Figure 4. Bottom View, Showing Section 4 Test Points

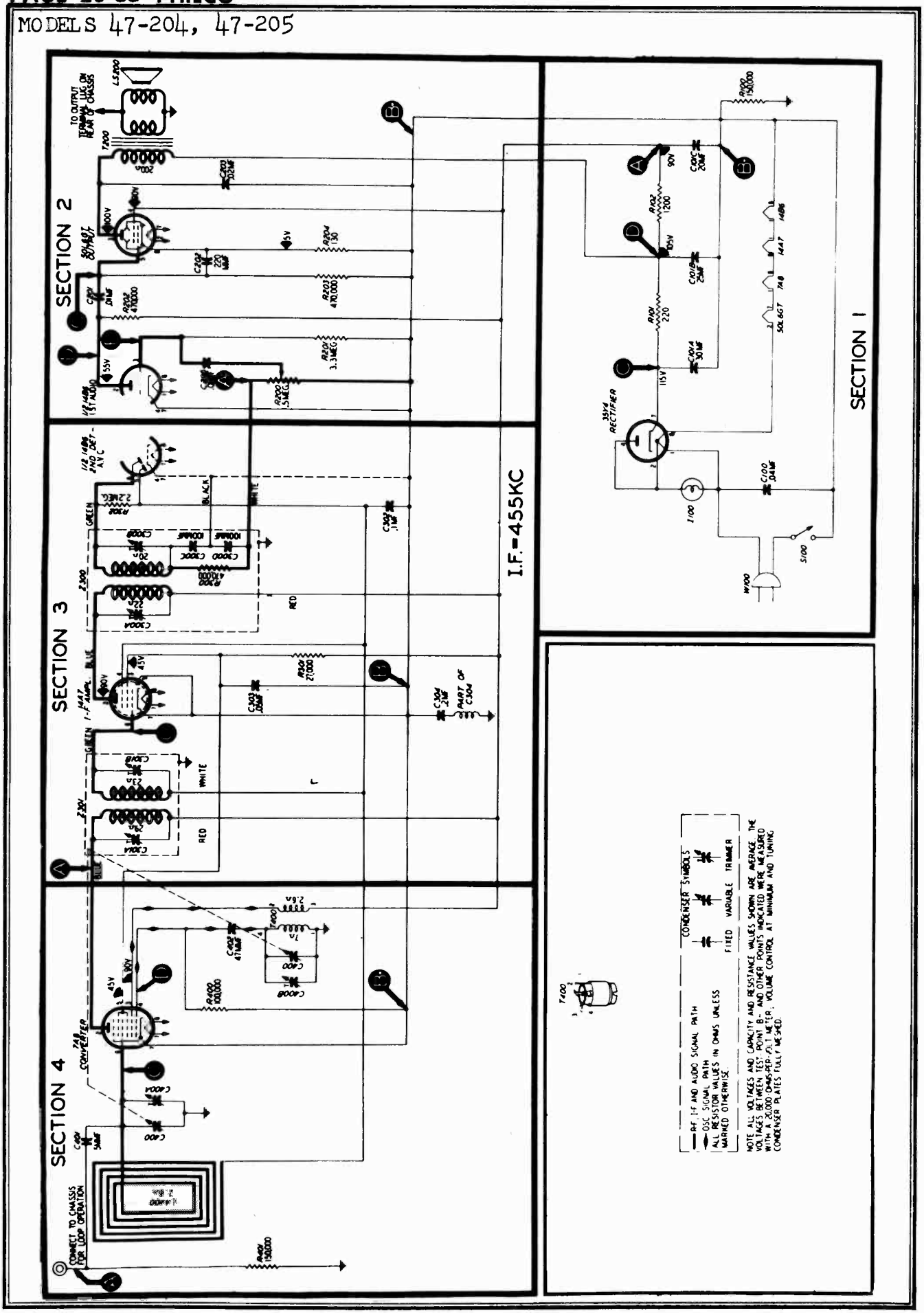
Make tests for this section by using an r-f signal generator with modulated output. Set frequency as noted in chart. Connect generator ground lead to B—; connect output lead through a .1-mf condenser to the test points indicated in the chart.

Inspect tuning condensers for bent plates, dirt, or poor wiper contacts; any or all of these will cause noise. If "NORMAL INDICATION" is not obtained in step 1, isolate trouble by following the remaining steps.

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc	540 kc	Clear signal with low signal-generator output	Trouble within this section; isolate by the following tests.
2	Osc. Test (see Note below)		540 to 1620 kc	Negative voltage	Open or shorted T400, C402, or R400. Shorted C400 or C400B. Defective 7A8 tube.
3	C	540 kc	540 kc	Same as step 1	No signal: Open or shorted Z301. Shorted C400 or C400A. Defective 7A8 tube. Weak or distorted signal: Shorted or open LA400. Defective 7A8 tube.
4	A	540 kc	540 kc	Same as step 1	Weak signal: Open C401.

NOTE: Oscillator test.—Connect positive lead of a 20,000-ohms-per-volt meter to B—; prod end of negative lead through a 100,000-ohm isolating resistor to test point D. Proper operation of oscillator is indicated by a negative voltage of 9 to 12 volts throughout range of tuning condenser.

MODELS 47-204, 47-205



ALIGNMENT PROCEDURE

TURN ON THE RADIO POWER, AND SET THE VOLUME CONTROL FULL ON

DIAL POINTER—Turn tuning condensers to full-mesh position. Set dial pointer to index dot, located to the left of "55."

OUTPUT METER—Connect to left (output) lug and center (chassis) lug of terminal panel, shown in figure 6.

SIGNAL GENERATOR—Connect ground lead to B—; connect output lead as indicated in the chart.

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

STEP	SIGNAL GENERATOR		RADIO		
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	ADJUST
1				Turn C301B (copper screw) down tight.	
2	Through .1-mf condenser to test-point C of Section 4	455 kc	540 kc	Adjust trimmers, in the order given, for maximum output.	C300A C300B C301A C301B
3	Through 100-mmf condenser to external aerial connector.	1600 kc	1600 kc	Disconnect external aerial lug from chassis. Adjust trimmer for maximum output.	C400B
4	Same	1500 kc	1500 kc	Adjust for maximum output.	C400A

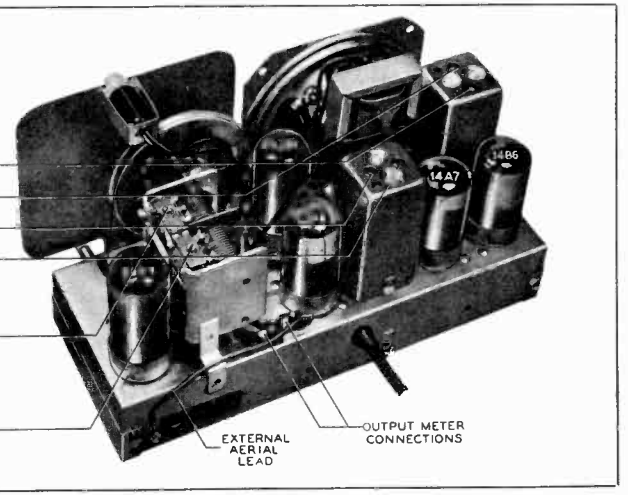


Figure 6. Chassis View, Showing Trimmer Locations

TP-312b

SYMBOLIZATION AND TERMINOLOGY

All components in the radio circuits are symbolized and located as follows:

C—condenser	LA—loop aerial	S—switch
I—pilot lamp	LS—loudspeaker	T—transformer
L—choke or coil	R—resistor	Z—electrical assembly

100-series components are in Section 1, the power supply.

200-series components are in Section 2, the second detector, a.v.c. and audio.

300-series components are in Section 3, the i-f amplifier.

400-series components are in Section 4, the aerial, r.f. and oscillator.

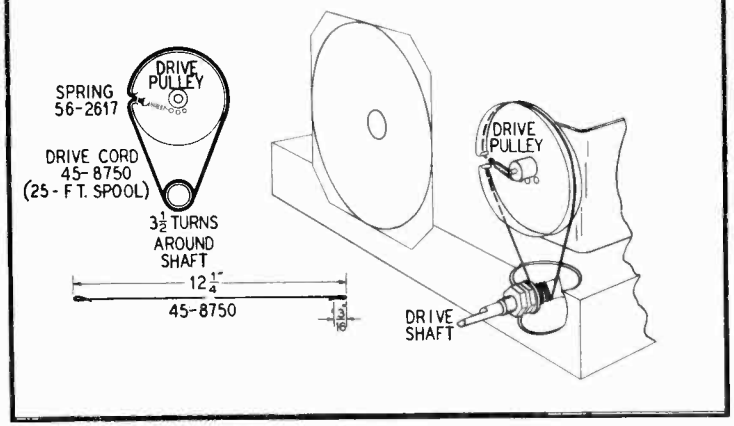


Figure 7. Drive-Cord Installation Details

MODELS 47-204, 47-205

REPLACEMENT PARTS LIST

NOTE: Parts marked with an asterisk (*) are general replacement items, and the numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items furnished may differ from the values indicated in the schematic and parts list. The values substituted in any case are so chosen that the operation of the instrument will be either unchanged or improved. When ordering replacements, use only the "Service Part No." in this parts list.

SECTION 1

Reference No.	Description	Service Part No.
C100	Condenser, line filter, .04 mf	45-3500-2*
C101	Condenser, electrolytic, 3-section filter	30-2573
C101A:	Condenser, electrolytic, 30 mf	Part of C101
C101B:	Condenser, electrolytic, 25 mf	Part of C101
C101C:	Condenser, electrolytic, 20 mf	Part of C101
R100	Resistor, leakage, 150,000 ohms	66-4153340*
R101	Resistor, filter, 220 ohms	66-1224340*
R102	Resistor, filter, 1200 ohms	66-2123340*
S100	Switch, power	Part of R200
W100	Power cord and plug	L3363
I100	Panel lamp	34-2068

SECTION 2

C200	Condenser, coupling, .01 mf	61-0120*
C201	Condenser, coupling, .01 mf	61-0120*
C202	Condenser, by-pass, 220 mmf	60-10205307*
C203	Condenser, by-pass, .02 mf	61-0108*
R200	Volume control (with power switch), 500,000 ohms	33-5429
R201	Resistor, grid load, 3.3 megohms	66-5333340*
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid load, 470,000 ohms	66-4473340*
R204	Resistor, bias, 130 ohms	66-1123340*
LS200	Speaker	36-1614
T200	Output transformer	Part of LS200

SECTION 3

C302	Condenser, a-v-c by-pass, .1 mf	61-0113*
C303	Condenser, screen by-pass, .05 mf	61-0122*
C304	Condenser and choke assembly, i-f by-pass, .2 mf	76-1161
R300	Resistor, diode load, 47,000 ohms	Part of Z300
R301	Resistor, screen, 27,000 ohms	66-3273340*
R302	Resistor, a-v-c, 2.2 megohms	66-5223340*
Z300	Transformer, 2nd i-f	32-3952
C300A:	Condenser, trimmer	Part of Z300
C300B:	Condenser, trimmer	Part of Z300
C300C:	Condenser, by-pass, 100 mmf	Part of Z300
C300D:	Condenser, by-pass, 100 mmf	Part of Z300
Z301	Transformer, 1st i-f	32-3967
C301A:	Condenser, trimmer	Part of Z301
C301B:	Condenser, trimmer	Part of Z301

SECTION 4

Reference No.	Description	Service Part No.
C400	Condenser, tuning, 2-section	31-2527-2
C400A:	Condenser, trimmer	Part of C400
C400B:	Condenser, trimmer	Part of C400
C401	Condenser, coupling, 5 mmf	60-90505007*
C402	Condenser, isolating, 47 mmf	60-00515307*
R400	Resistor, Osc., grid, 100,000 ohms	66-4103340*
R401	Resistor, aerial discharge, 150,000 ohms	66-4153340*
T400	Transformer, oscillator	32-3880
LA400	Loop aerial:	
	Model 47-204	32-4052-3
	Model 47-205	32-4052-1

MISCELLANEOUS

Description	Service Part No.
Cabinet	
Model 47-204	10674
Model 47-205	10673
Cabinet Hardware	
Back	54-7371
Baffle and cloth assembly	
Model 47-204	40-6906
Model 47-205	40-6905
Bezel	54-4152
Foot, felt	W2190
Grill (plastic), speaker	54-4458
Knob	
Model 47-204	54-4375
Model 47-205	54-4228
Window, acetate	27-5616
Clip, coil mounting	28-5002FA1
Dial-Scale Hardware	
Cord, drive (25-ft. spool)	45-8750
Pointer	54-4148-1
Scale, dial	
Model 47-204	27-5953
Model 47-205	27-5952
Screw, scale mounting	1W19674FA3
Spring, drive cord	56-2617
Washer, scale mounting	2W54094
Panel, terminal, loop aerial	76-2148
Panel, lamp assembly	76-1472
Shaft, drive assembly	31-2718
Socket, Loktal	27-6138*
Socket, octal	27-6174*

MODEL 48-1284

Circuit Description

Philco Model 48-1284 is a console-model radio-phonograph combination consisting of a seven-tube superheterodyne and a Philco Model M-8 Automatic Record Changer, operating on a.c. only. The tuning ranges are 540 to 1650 kc. and 9.3 to 15.7 mc. The built-in low-impedance loop normally provides adequate signal pickup; where greater pickup is required, an external aerial may be connected, using Philco Aerial Coupler Part No. 76-2353.

A 7AF7 dual triode is employed in a converter circuit designed for high signal-to-noise ratio and high conversion efficiency. A 7A7 pentode is used in the first i-f stage and the pentode section of a 7R7 dual-diode-pentode is used in the second i-f stage. The midget-type i-f transformers have permeability tuning for greater stability and efficiency. One diode section of the 7R7 is used as the detector, and the other is used to supply a-v-c voltage to the converter and the first i-f stage. A 7F7 dual triode functions as the first audio amplifier and phase inverter to drive two 6K6GT output tubes in push-pull.

More uniform frequency response and decreased harmonic distortion is obtained by the use of inverse feedback. Voltage from the secondary of the output transformer is fed back through a voltage divider, R209 and R210, over three stages to the first audio amplifier. Full control of bass and treble is made possible by a variable tone control, R201. Excellent frequency response at any volume level is provided by a 12-inch electrodynamic speaker.

Philco TROUBLE-SHOOTING Procedure

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

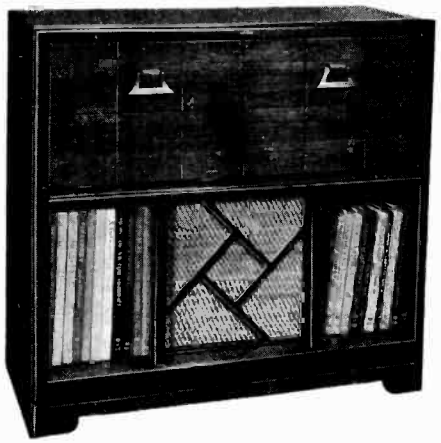
Section 1—the power supply
Section 2—the audio circuits
Section 3—the i-f, detector, and a-v-c circuits
Section 4—the r-f and converter circuits

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 test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. Any trouble revealed should be corrected before testing further.



MODEL 48-1284

SPECIFICATIONS

CABINET	Wood console, walnut finish
RADIO CIRCUIT	Seven-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1650 kc.
Short Wave	9.3—15.7 mc.
AUDIO OUTPUT	6 watts
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	
Radio	75 watts
Record Changer	20 watts
AERIAL	Built-in low-impedance loop; terminal provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (7)	7AF7, 7A7, 7R7, 7F7, 6K6GT (2), 7Z4
PHONOGRAPH	Philco Automatic Record Changer Model M-8 (for service information see manual PR-1478)

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 7 of 7Z4 rectifier) 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 3000 ohms, check condensers C102, C103B, C311, and C306 for leakage or shorts. This resistance value, 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 tests of Section 1 (power supply) are performed.

MODEL 48-1284

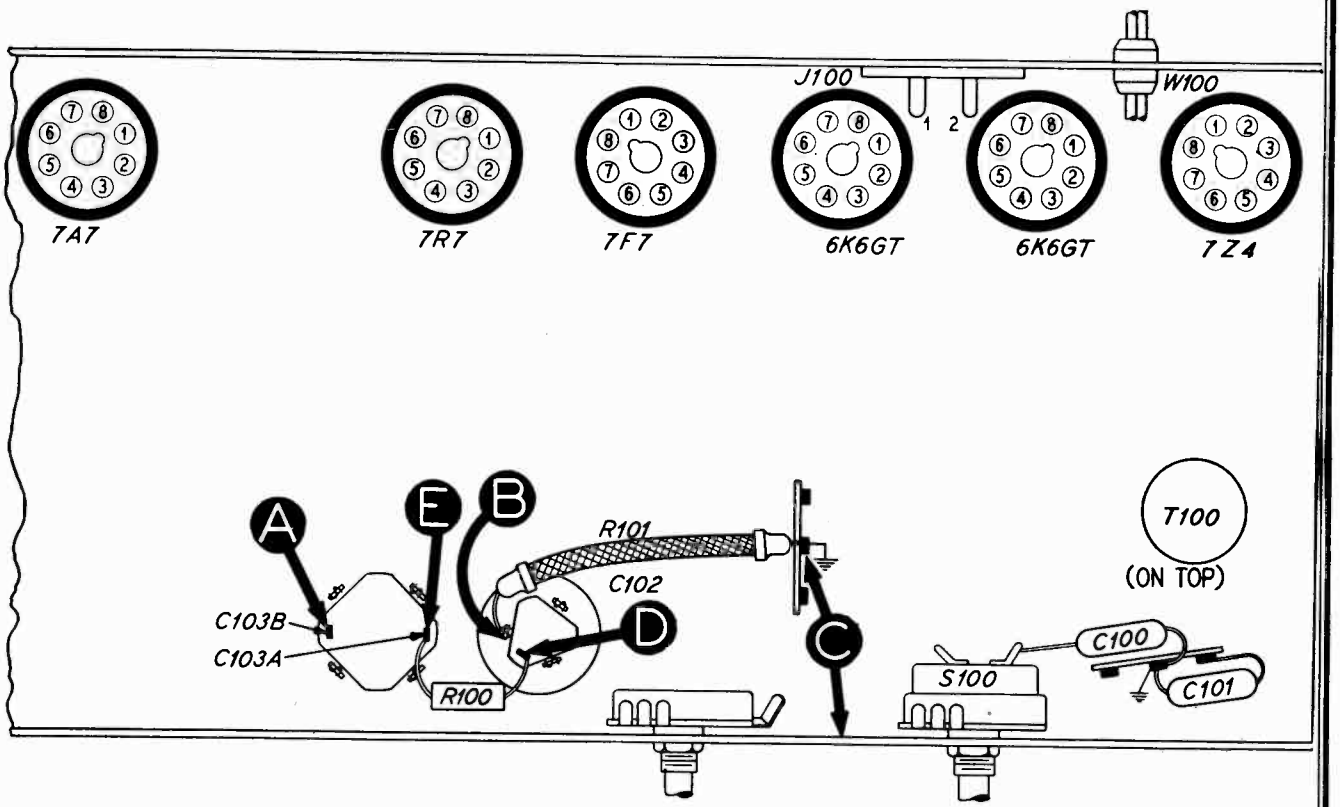


FIGURE 2. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS TP-5356-A

Section 1 TROUBLE SHOOTING

POWER SUPPLY

CAUTION: Do not turn on the power with the speaker disconnected, or the radio may be damaged.

Make the tests for this section with a d-c voltmeter; connect the leads between 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.

Set the band switch to the broadcast position. Set the volume control to minimum and turn the tone control fully clockwise.

Follow the steps in the order given. 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.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A to C	255v		Trouble in this section. Isolate by the following tests.
2	D to B	300v	No voltage Low voltage High voltage	Defective: 7Z4. Open: T100, S100, W100. Shorted: C102, T200. Leaky: C102. Shorted or leaky: C103A, C103B, C306*, C311*, C210*, C211*. Open: L100, R100, R101, T200*.
3	B to C	–17v	High voltage	Open: R101.
4	E to C	205v	No voltage Low voltage	Open: R100. Shorted: C103A. Leaky: C103A. Increased resistance: R100.
5	A to C	255v	No voltage Low voltage High voltage	Open: L100, R101. Shorted: C103B. Leaky: C103B. Shorted: C210*, C211*. Open: T200*.
Listening Test: Abnormal hum may be caused by open C102, C103A, C103B, C100, or C101.				

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

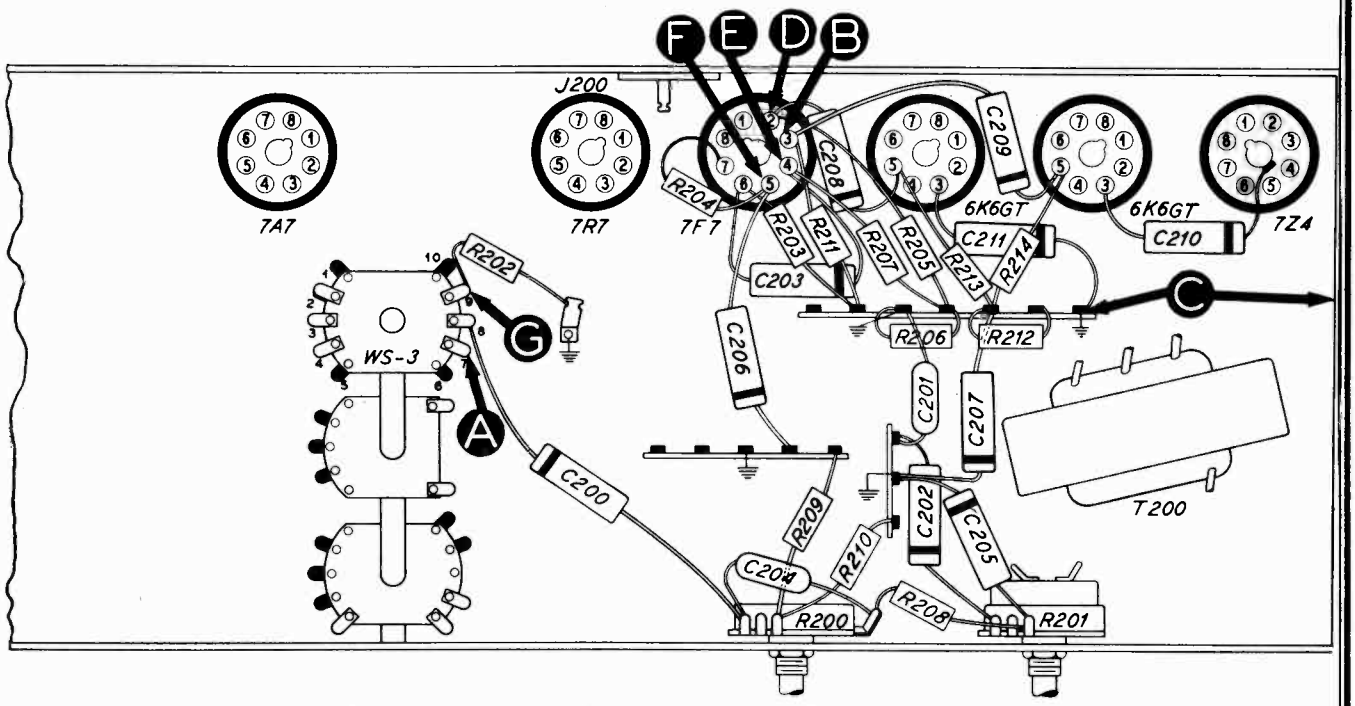


FIGURE 3. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS TP-5356-B

Section 2

TROUBLE SHOOTING

AUDIO CIRCUITS

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, turn the tone control fully clockwise, and set the band switch to the broadcast position for all of the steps except step 7.

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	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B (Remove 7F7.)	Clear signal with strong signal input.	Defective: 6K6GT, T200. Shorted: C210, C209. Open: R214, R212, C209.
3	D (7F7 removed.)	Same as step 2.	Defective: 6K6GT, T200. Shorted: C208, C211. Open: R213, C208.
4	E (Replace 7F7.)	Loud, clear signal with moderate signal input.	Defective: 7F7. Shorted: C203. Open: R205, R206, R207, R211.
5	F	Same as step 1.	Defective: 7F7. Shorted: C201, C202. Open: C203, R203, R204.
6	A	Same as step 1.	Defective: R200 (rotate through range). Open: C200, C206, WS-3 (R), R209. Shorted: C302D*, C312*.
7	G (Set band switch to phono.)	Same as step 1.	Open: WS-3 (R).
Listening Test: Distortion may be caused by shorted or leaky C200, C206, C203, C208, or C209. Poor low-frequency response may be caused by open or shorted C205 or open R208.			

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

MODEL 48-1284

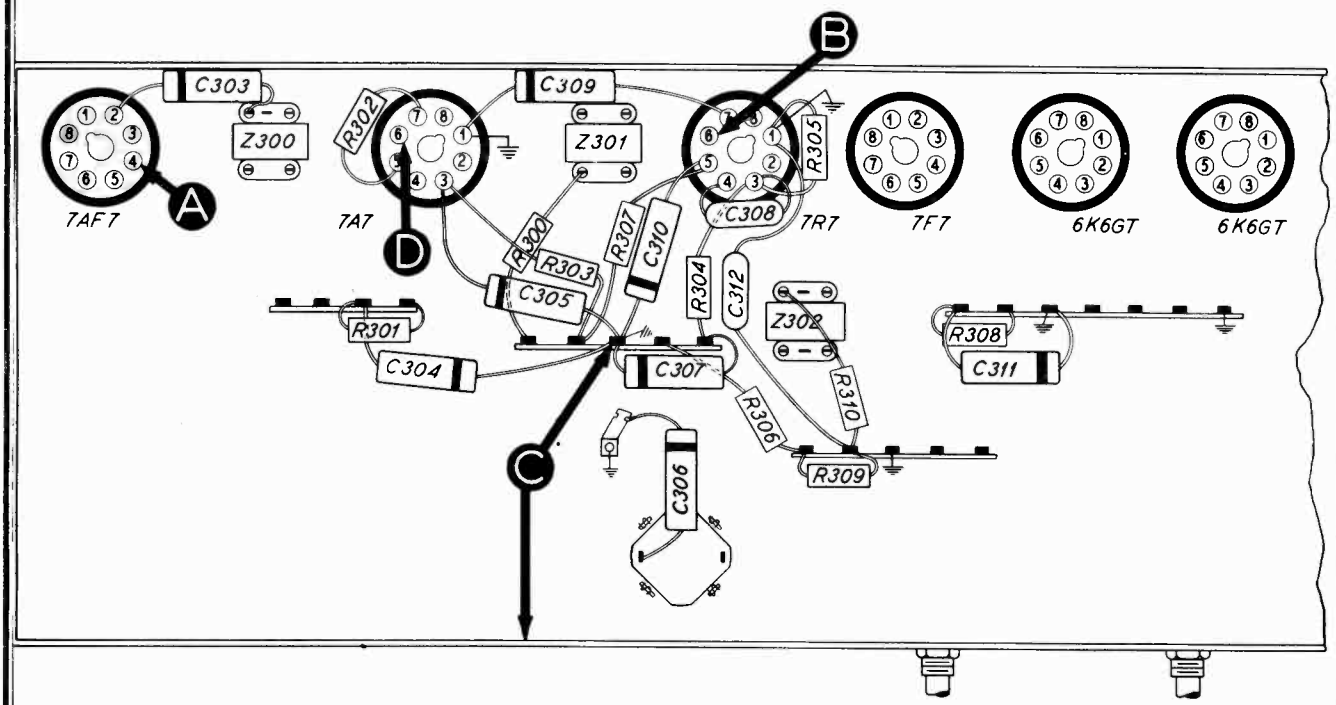


FIGURE 4. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS TP-5356-C

Section 3 TROUBLE SHOOTING

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

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 the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio-phono switch to the radio position and the band switch to the broadcast position. Set the volume control to maximum and turn the tone control fully clockwise. 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 "POSSIBLE CAUSE OF ABNORMAL INDICATION".

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 7R7. Open: L302A, L302B, R306, WS-2 (R), R309, R310, R308, R307, C302A, C302B. Shorted: L302A, L302B, C302A, C302B. Shorted or leaky: C310, C311, C302C. Misaligned: Z302.
3	D	Loud, clear signal with moderate signal input.	Defective: 7A7. Misaligned: Z301. Open: R302, R303, L301A, L301B, C301A, C301B. Shorted: C305, C301A, C301B, L301A, L301B.
4	A	Loud, clear signal with weak signal input.	Defective: 7AF7*. Misaligned: Z300. Open: R401*, R300, R301, L300A, L300B, L300C, C300A, C300B. Shorted: C303, C409*, C300A, C300B, L300A, L300B, L300C.

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

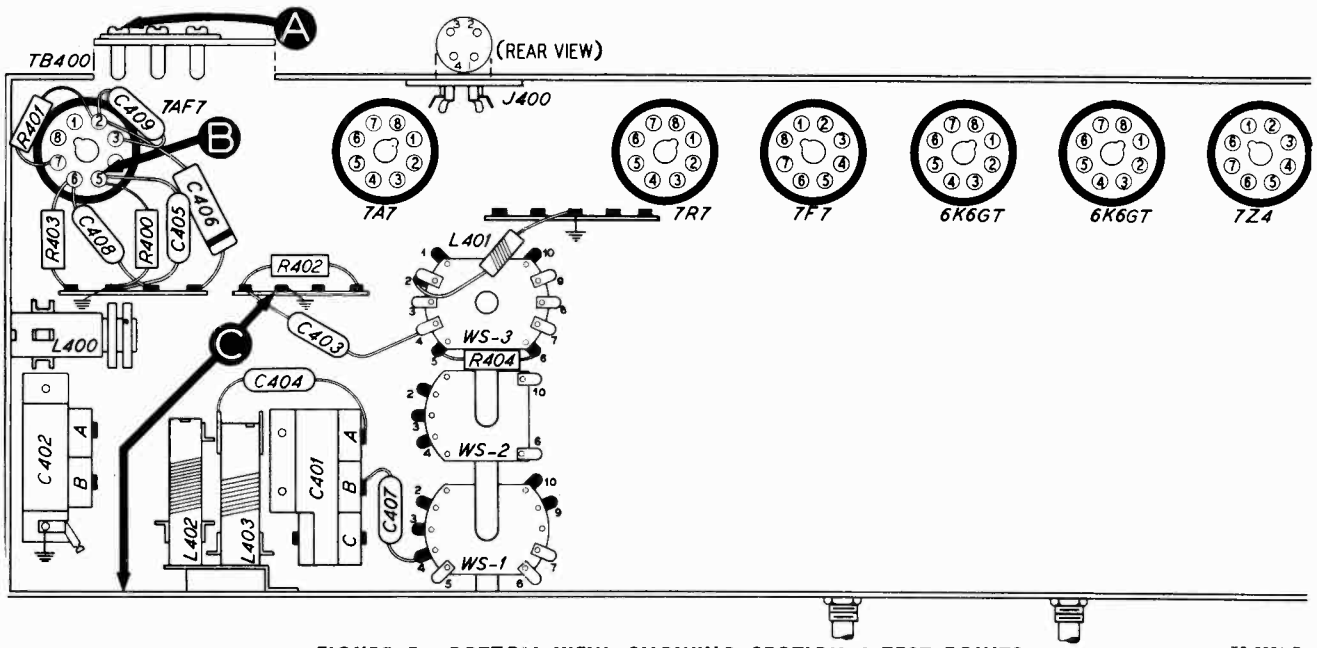


FIGURE 5. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS TP-5356-D

Section 4

TROUBLE SHOOTING

R-F AND CONVERTER CIRCUITS

For the tests in this section, with the exception of the oscillator tests, use an r-f signal generator with modulated output. Connect the generator ground lead to the chassis, test point C; 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 fully clockwise. Set the radio band switch, 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 this section. If the trouble is not revealed by the tests for this section, check the alignment.

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a)	A	1000 kc.	BC	1000 kc.	Loud, clear signal with weak signal input.	Trouble in broadcast band. Isolate by the tests in steps 2 and 3.
1 (b)	A	15 mc.	SW	15 mc.	Same as step 1 (a).	Trouble in short-wave band. Isolate by the tests in steps 4 and 5.
2	B (Osc. test; see note below.)		BC	Rotate through range.	Negative 1.5 to 2.0 volts.	Defective: 7AF7. Open: L402, WS-1 (F), WS-2 (F), WS-3 (F), R400, C408, R403, R404, C405. Shorted or leaky: C405, C408, C400A, C402B, C401C. Shorted: L402.
3	A	1000 kc.	BC	1000 kc.	Loud, clear signal with weak signal input.	Open: L400, WS-3 (F), WS-3 (R), C403, C406, R401. Shorted: C400B, C402A.
4	B (Osc. test; see note below.)		SW	Rotate through range.	Negative 1.5 to 2.0 volts.	Defective: 7AF7. Open: L403, WS-1 (F), WS-2 (F), WS-3 (F), C407. Shorted: C401B, C407.
5	A	15 mc.	SW	15 mc.	Loud, clear signal with weak signal input.	Open: WS-3 (F), WS-3 (R), L401. Shorted: C401A.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 5 of the 7AF7), test point B. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltages of approximately the values given in the chart (measured with a 20,000-ohms-per-volt meter) throughout the tuning range.

MODEL 48-1284

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 1. Hold a ruler against the scale 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 inches from the reference point indicated in figure 1.

With the tuning gang fully meshed, the pointer should be adjusted on the dial-drive cord to coincide with the index mark.

After installation of 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.

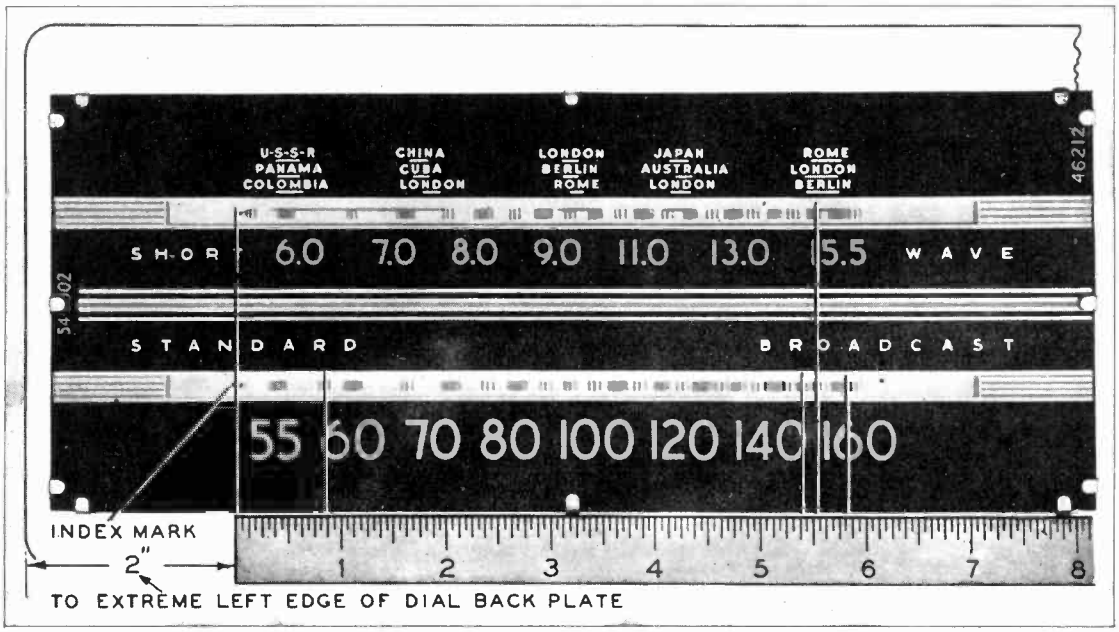


FIGURE 1. CALIBRATION MEASUREMENTS FOR DIAL BACKPLATE TP-5774

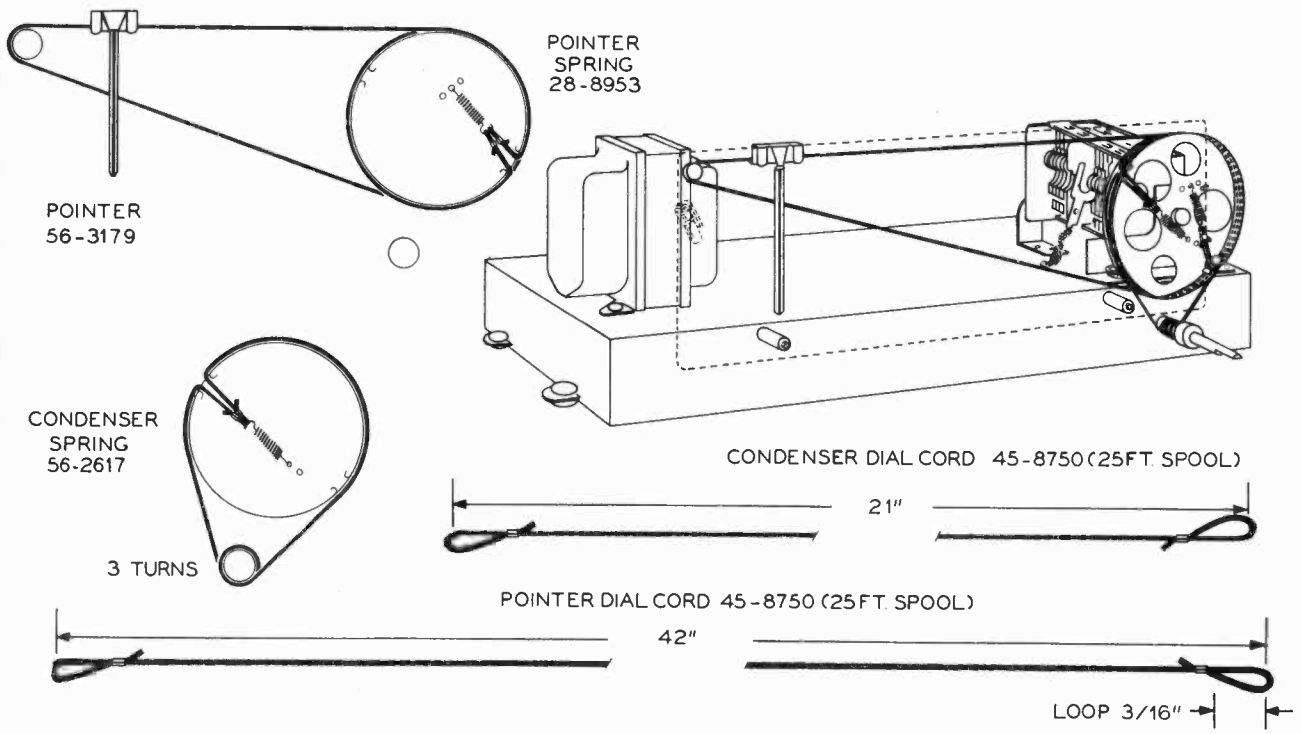
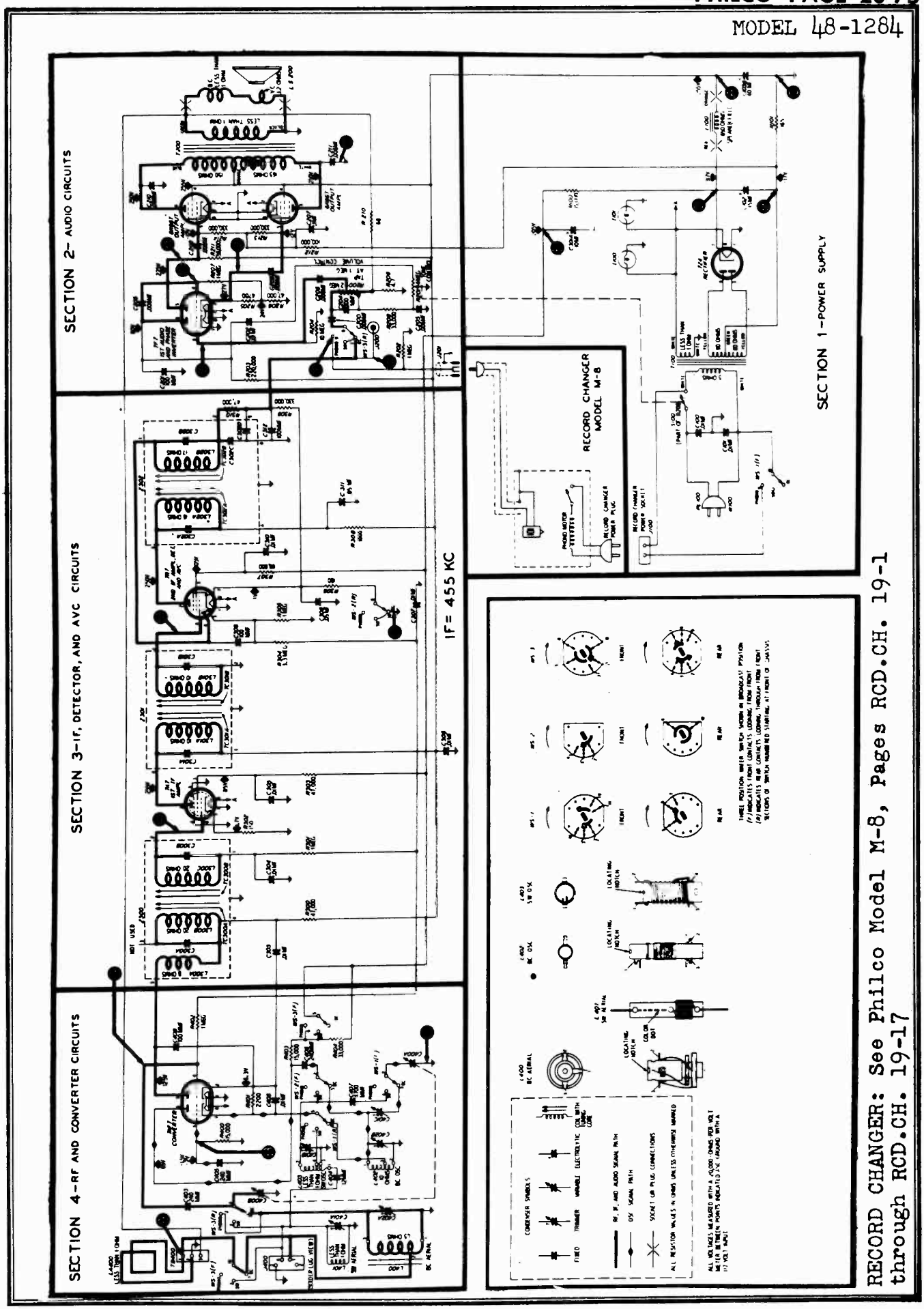


FIGURE 6. DRIVE-CORD INSTALLATION DETAILS

MODEL 48-1284



RECORD CHANGER: See Philco Model M-8, Pages RCD.CH. 19-1 through RCD.CH. 19-17

ALIGNMENT PROCEDURE

DIAL—Calibration and pointer-index measurements are shown in figure 1. With tuning condenser fully meshed, set pointer to index mark.

OUTPUT METER—Connect one lead to chassis, and other lead to terminal 3 of TB400.

SIGNAL GENERATOR—Connect generator ground lead to chassis; connect output lead as indicated in chart. Use modulated output.

RADIO CONTROLS—Set volume control to maximum and turn tone control fully counterclockwise.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1.5 volts.

STEP	SIGNAL GENERATOR		RADIO			ADJUST
	CONNECTION TO RADIO	DIAL SETTING	BAND SWITCH	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to terminal 1 of TB400.	455 kc.	BC	540 kc.	Adjust tuning cores, in order given, for maximum output.	TC302B—3rd i-f sec. TC302A—3rd i-f pri. 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).	580 kc.	BC	580 kc.	Adjust trimmer for maximum output.	C401C—BC osc. (series)
3	Same as step 2.	1600 kc.	BC	1600 kc.	Adjust trimmer for maximum output.	C402B—BC osc. (shunt)
4	Same as step 2.	1500 kc.	BC	1500 kc.	Adjust trimmer for maximum output.	C402A—BC aerial
5	Same as step 2.	580 kc.	BC	580 kc.	Adjust trimmer for maximum output while rocking tuning condenser.	C401C—BC osc. (series)
6	Repeat steps 3, 4, 5, 3, and 4 until no further improvement is noted.					
7	Same as step 2.	15 mc.	SW	15 mc.	Adjust trimmer for maximum output on first peak from loose position. Check for image at 14.1 mc.	C401B—SW osc.
8	Same as step 2.	15 mc.	SW	15 mc.	Adjust trimmer for maximum output while rocking tuning condenser.	C401A—SW aerial

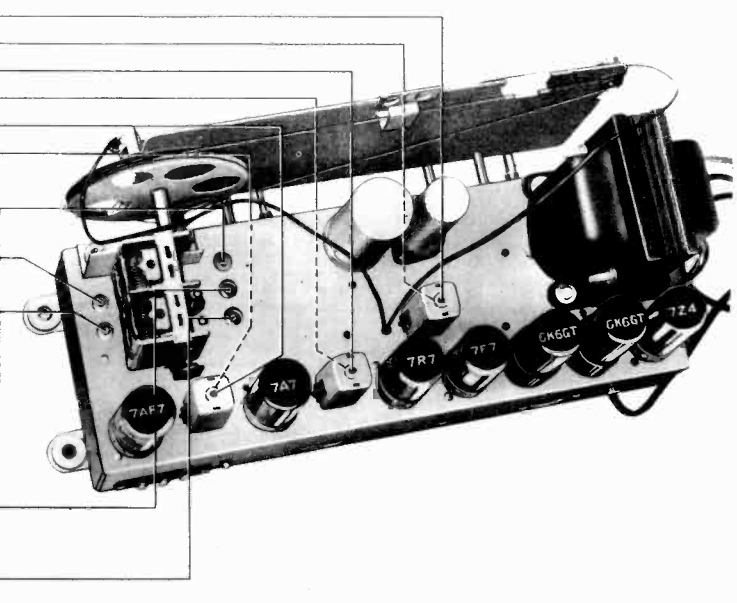


FIGURE 8. TOP VIEW, SHOWING TRIMMER LOCATIONS

RADIATING LOOP: Make up a 6—8-turn, 6-inch-diameter loop from insulated wire; connect to signal-generator leads and place near radio loop aerial. Make certain that radio loop aerial is connected to radio.

REPLACEMENT PARTS LIST

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 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, .01 mf.	61-0120*
C101	Condenser, line filter, .01 mf.	61-0120*
C102	Condenser, electrolytic, filter, 35 mf., 450v.	30-2570-25
C103	Condenser, electrolytic, 2-section	30-2570-24
C103A	Condenser, filter, 10 mf., 450v.	Part of C103
C103B	Condenser, filter, 40 mf., 450v.	Part of C103

REPLACEMENT PARTS LIST (Continued)

SECTION 1—POWER SUPPLY (Continued)

Reference Symbol	Description	Service Part No.
I100	Pilot lamp	34-2040
I101	Pilot lamp	34-2040
J100	Socket, record changer power	27-6200
L100	Speaker, field	Part of 36-1611-3
PL100	Plug, a-c power	Part of W100
R100	Resistor, filter, 15,000 ohms	66-3155340*
R101	Resistor, bias, 165 ohms	33-1334-3

SECTION 1—POWER SUPPLY (Continued)

Reference Symbol	Description	Service Part No.
S100	Switch, on-off	Part of 33-5538-29
T100	Transformer, power	32-8350
W100	Line-cord-and-plug assembly	L-2183*
WS-1 (F)	Switch-wafer section	Part of 42-1846

REPLACEMENT PARTS LIST (Continued)

SECTION 2—AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
C200	Condenser, d-c blocking, .006 mf.	45-3500-7*
C201	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C202	Condenser, tone control, .01 mf.	61-0120*
C203	Condenser, d-c blocking, .006 mf.	45-3500-7*
C204	Condenser, tone compensation, 100 mmf.	60-10105407*
C205	Condenser, tone compensation, .006 mf.	45-3500-7*
C206	Condenser, d-c blocking, .006 mf.	45-3500-7*
C207	Condenser, bias filter, .1 mf.	61-0113*
C208	Condenser, d-c blocking, .006 mf.	45-3500-7*
C209	Condenser, d-c blocking, .006 mf.	45-3500-7*
C210	Condenser, parasitic suppressor, .006 mf.	61-0153*
C211	Condenser, parasitic suppressor, .006 mf.	61-0153*
J200	Test socket	27-6180
J201	Cable and plug, phono input	41-3735-16
LS200	Loud-speaker	36-1611-3
R200	Volume control, 2 megohms	33-5535-16
R201	Tone control, 4 megohms	33-5538-29
R202	Resistor, crystal load, 1 megohm	66-5103340*
R203	Resistor, plate load, 220,000 ohms	66-4223340*
R204	Resistor, grid return, 10 megohms	66-6103340*
R205	Resistor, cathode bias, 4700 ohms	66-2473340*
R206	Resistor, cathode load, 47,000 ohms	66-3473340*
R207	Resistor, grid return, 1 megohm	66-5103340*
R208	Resistor, tone compensation, 33,000 ohms	66-3333340*
R209	Resistor, voltage divider (negative feedback), 4.7 ohms	66-9474360
R210	Resistor, voltage divider (negative feedback), 68 ohms	66-0683340*
R211	Resistor, plate load, 56,000 ohms	66-3563340*
R212	Resistor, bias filter, 100,000 ohms	66-4103340*
R213	Resistor, grid return, 330,000 ohms	66-4333340*
R214	Resistor, grid return, 330,000 ohms	66-4333340*
T200	Transformer, output	32-8274
WS-3 (R)	Switch-wafer section	Part of 42-1846

SECTION 3—I-F, DETECTOR, AND A-V-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
C302C	Condenser, r-f by-pass	Part of Z302
C302D	Condenser, r-f by-pass	Part of Z302
C303	Condenser, plate by-pass, .01 mf.	61-0120*
C304	Condenser, a-v-c by-pass, .01 mf.	61-0120*
C305	Condenser, screen by-pass, .01 mf.	61-0120*
C306	Condenser, r-f by-pass, .01 mf.	61-0120*
C307	Condenser, a-v-c by-pass, .01 mf.	61-0120*
C308	Condenser, d-c blocking, 100 mmf.	62-110009001*
C309	Condenser, cathode by-pass, .05 mf.	61-0122*
C310	Condenser, screen by-pass, .01 mf.	61-0120*
C311	Condenser, plate by-pass, .05 mf.	61-0122*
C312	Condenser, r-f by-pass, 100 mmf.	62-110009001*
L300A	Transformer primary, 1st i-f	Part of Z300
L300B	Transformer tertiary, 1st i-f	Part of Z300
L300C	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
L302A	Transformer primary, 3rd i-f	Part of Z302
L302B	Transformer secondary, 3rd i-f	Part of Z302
R300	Resistor, plate decoupling, 47,000 ohms	66-3473340*
R301	Resistor, a-v-c decoupling, 1 megohm	66-5103340*
R302	Resistor, cathode bias, 150 ohms	66-1153340*
R303	Resistor, screen dropping, 47,000 ohms	66-3473340*
R304	Resistor, a-v-c filter, 3.3 megohms	66-5333340*
R305	Resistor, a-v-c diode load, 1 megohm	66-5103340*
R306	Resistor, cathode bias, 180 ohms	66-1183340*
R307	Resistor, screen dropping, 68,000 ohms	66-3683340*
R308	Resistor, plate decoupling, 1000 ohms	66-2103340*
R309	Resistor, diode load, 330,000 ohms	66-4333340*

SECTION 3—I-F, DETECTOR, AND A-V-C CIRCUITS (Cont.)

Reference Symbol	Description	Service Part No.
R310	Resistor, r-f filter, 47,000 ohms	66-3473340*
WS-2 (R)	Switch-wafer section	Part of 42-1846
Z300	Transformer, 1st i-f	32-4258
Z301	Transformer, 2nd i-f	32-4160-3
Z302	Transformer, 3rd i-f	32-4240-2

SECTION 4—R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2728
C400A	Condenser, tuning (osc. section)	Part of C400
C400B	Condenser, tuning (aerial section)	Part of C400
C401	Condenser, trimmer, 3-section	31-6477-10
C401A	Condenser, trimmer, SW aerial	Part of C401
C401B	Condenser, trimmer, SW osc.	Part of C401
C401C	Condenser, trimmer, BC osc. (series)	Part of C401
C402	Condenser, trimmer, 2-section	31-6476-16
C402A	Condenser, trimmer, BC aerial	Part of C402
C402B	Condenser, trimmer, BC osc. (shunt)	Part of C402
C403	Condenser, d-c blocking, 240 mmf.	60-10245307*
C404	Condenser, stabilizing, 12 mmf.	30-1224-33
C405	Condenser, grid return, 240 mmf.	60-10245307*
C406	Condenser, cathode by-pass, .01 mf.	61-0120*
C407	Condenser, fixed padder (SW osc.), 4700 mmf.	60-20515304*
C408	Condenser, d-c blocking, 240 mmf.	60-10245307*
C409	Condenser, r-f by-pass, 100 mmf.	62-110009001*
J400	Socket, external aerial	27-6214-1
L400	Coil, BC aerial	32-4033-7
L401	Coil, SW aerial	32-4050-10
L402	Coil, BC osc.	32-4221-2
L403	Coil, SW osc.	32-4280
LA400	Loop aerial	76-3583-1
R400	Resistor, grid return, 15,000 ohms	66-3153340*
R401	Resistor, cathode bias, 2200 ohms	66-2223340*
R402	Resistor, grid return, 1 megohm	66-5103340*
R403	Resistor, plate load, 15,000 ohms	66-3153340*
R404	Resistor, plate load, 33,000 ohms	66-3333340*
TB400	Terminal panel, aerial	38-9942
WS-1 (F)	Switch-wafer section	Part of 42-1846
WS-2 (F)	Switch-wafer section	Part of 42-1846
WS-3 (F)	Switch-wafer section	Part of 42-1846

MISCELLANEOUS

Description	Service Part No.
Cabinet (less scale)	10705
Baffle and cloth	40-6998
Baffle, wood	219110
Bezel, metal	56-4878
Bin mechanism (L.H.)	76-3223-5
Bin mechanism (R.H.)	76-3223-6
Bullet catch	45-6002
Cabinet back, binder's board	54-7552
Cabinet back, Masonite	54-7555
Dial scale	76-3187-5
Dome	45-6190
Door pull	56-5272
Frame assembly	76-3222-1
Knife hinge (with stop arm)	56-4882
Knife hinge	56-5522
Scale strap	56-4916
Spring, changer mounting	56-3043FA15
Cable and plug, speaker	41-3734-8
Dial-backplate assembly	76-3716
Dial cord (25-ft. spool)	45-8750*
Dial pointer	56-3179
Spring (pointer drive cord)	28-8953
Spring (tuning-condenser drive cord)	56-2617
Tuning shaft	76-3820
Knob	54-4486
Shield, pilot lamp	56-2194FA3
Socket, Loktal	27-6138*
Socket, octal	27-6174
Socket assembly, pilot lamp	27-6233-16
Wafer, condenser mounting	27-9508

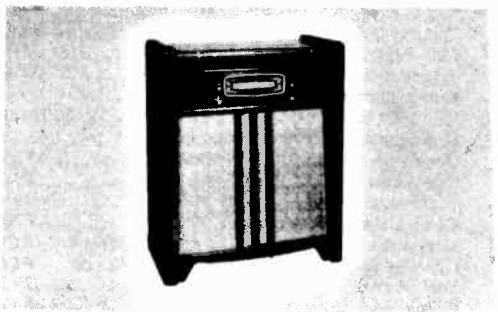
MODEL 49-1100

Circuit Description

Philco Radio Model 49-1100 is a six-tube superheterodyne, which provides reception in the standard-broadcast band. The circuit includes a 14AF7 converter, a 7B7 1st i-f amplifier, a 7B7 2nd i-f amplifier, a 7C6 detector, a.v.c., and 1st audio amplifier, and a 35L6GT output amplifier. The power supply employs a 50X6 rectifier in a voltage-doubling circuit.

A low-impedance loop aerial, located within the cabinet, normally provides adequate signal pickup. If greater signal pickup is required, the jumper should be disconnected from the terminal at the rear of the chassis and an external aerial connected to the terminal.

Two series-resonant circuits, consisting of condensers C302 and C303 together with the coils wound on these condensers, function as traps to prevent feedback of the intermediate frequency and the second harmonic of the intermediate frequency through the B– lead. One circuit is resonant at 455 kc., and the other at 910 kc. Each circuit offers a very low impedance to the resonant frequency, and, therefore, shunts it to the chassis.



SPECIFICATIONS

CABINET	Wood, mahogany
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
INTERMEDIATE FREQUENCY	455 kc.
AUDIO OUTPUT	2.5 watts
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	40 watts
AERIAL	Built-in low-impedance loop; provisions for external aerial.
PHILCO TUBES (6)	14AF7, 7B7(2), 7C6, 35L6GT, 50X6

TP-4525

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 test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before connecting the radio to a source of 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 7 of 50X6 rectifier) and B–. When the ohmmeter leads are connected in the proper polarity, the highest reading will be obtained. If the reading is lower than 3000 ohms, check condensers C101, C102, C103A, and C207 for leakage or shorts.

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

MODEL 49-1100

TROUBLE SHOOTING

Section 1—Power Supply

Make the tests for this section with a d-c voltmeter; connect the leads between B–, test point B, and 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.

Set the volume control to minimum, and the tone control fully clockwise.

Follow the steps in the order given. 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.

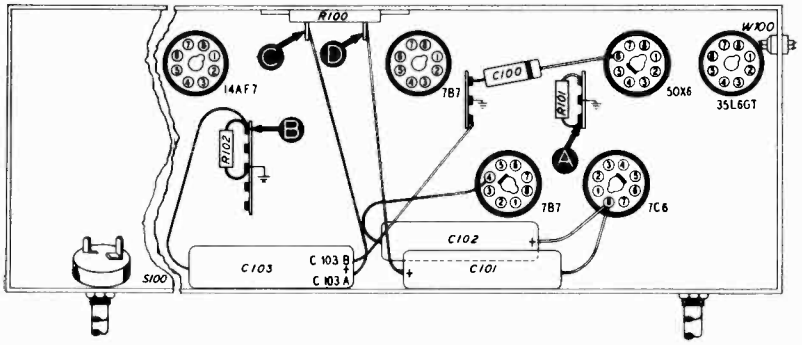


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	107v		Trouble in this section. Isolate by the following tests.
2	D	225v	No voltage Low voltage High voltage	Defective: 50X6, S100, W100, PL100. Shorted: C101 and C102. Defective: 50X6. Open: C101, C102. Leaky: C101, C102, C103A, C103B. Open: R100, R101.
3	C	190v	No voltage Low voltage High voltage	Shorted: C103A. Open: R100. Changed resistance: R100. Shorted: C207*, C103B. Leaky: C103A. Open: R101, T200*, R207*.
4	A	107v	No voltage Low voltage High voltage	Shorted: C103B. Open: R101. Leaky: C103B. Open: R207*, T200*.

Listening Test: Abnormal hum may be caused by open C100, C103A, C103B, or R102.

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

TROUBLE SHOOTING

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 volume control to maximum, and the tone control fully clockwise.

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.

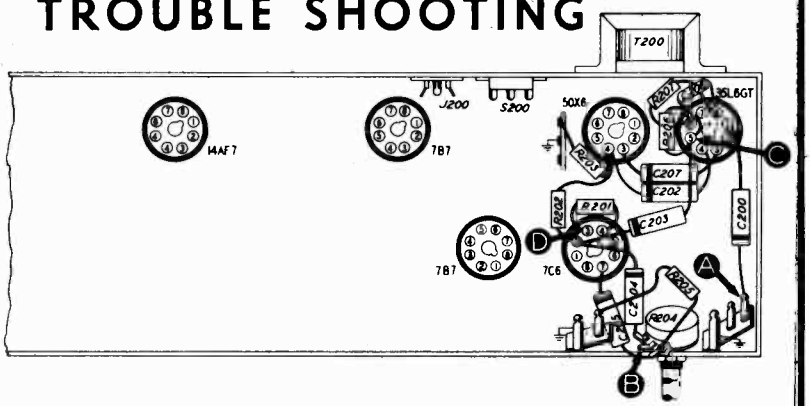


Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Open: T200, R207. Shorted: C203, C206, C207, C205. Leaky: C203. Defective: 35L6GT, LS200.
3	D	Same as step 1.	Open: R202, R203, C203. Shorted: C202, C204. Defective: 7C6 (triode section).
4	A	Same as step 1.	Open: C200, C201, R200 (rotate through range). Shorted: C307* C301D*.

Listening Test: Distortion may be caused by open R201 or R206, or by shorted or leaky C200 or C201.

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

MODEL 49-1100

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 volume control to maximum, and the tone control fully clockwise. 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.

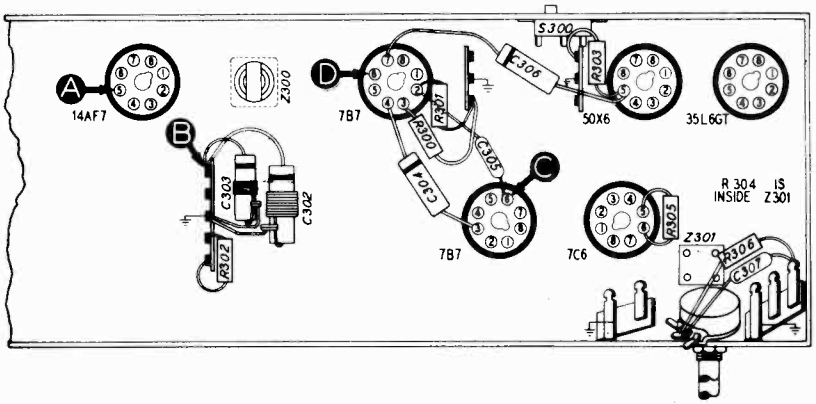


Figure 3. Bottom View, Showing Section 3 Test Points

Since the circuit location of test point A for this section is in Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear signal with moderate signal input.	Defective: 7B7 (2nd i-f amplifier), 7C6 (diode section). Open: L301A, L301B, R306, R304, R303, R300. Shorted: C305, C301A, C301B, C306, C304, C301C, L301A, L301B. Leaky: C305.
3	D	Same as step 1.	Defective: 7B7 (1st i-f amplifier). Open: C305, R301, R302. Shorted: C300B, L300B.
4	A	Same as step 1.	Defective: 14AF7. Open: R402*, L401*, L300A, C300A, L300B. Shorted: C300A, L300A.

NOTE: Voltage on the chassis may be caused by shorted C302 or C303. Oscillation may be caused by open C302 or C303.

* 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 volume control to maximum, and the tone control fully clockwise. Set the radio tuning control and signal-generator frequency as indicated in the chart.

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

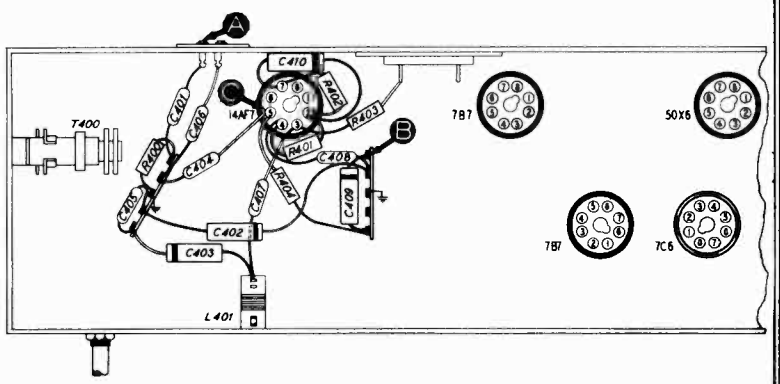


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C (Osc. test; see note below.)		Rotate through range.	Negative 3.5 to 5 volts.	Defective: 14AF7. Open C403, C407, C408, L401, R401. Shorted: C405, C400A, C400C, C408, C407. Leaky: C407, C408.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Open: C401, C404, T400. Shorted: C400B, C400D, C406.

Listening Test: Distortion and hum may be caused by open C409 or R404.

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 4 of the 14AF7), test point C. Proper operation of the oscillator is indicated by negative voltages of approximately the values given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

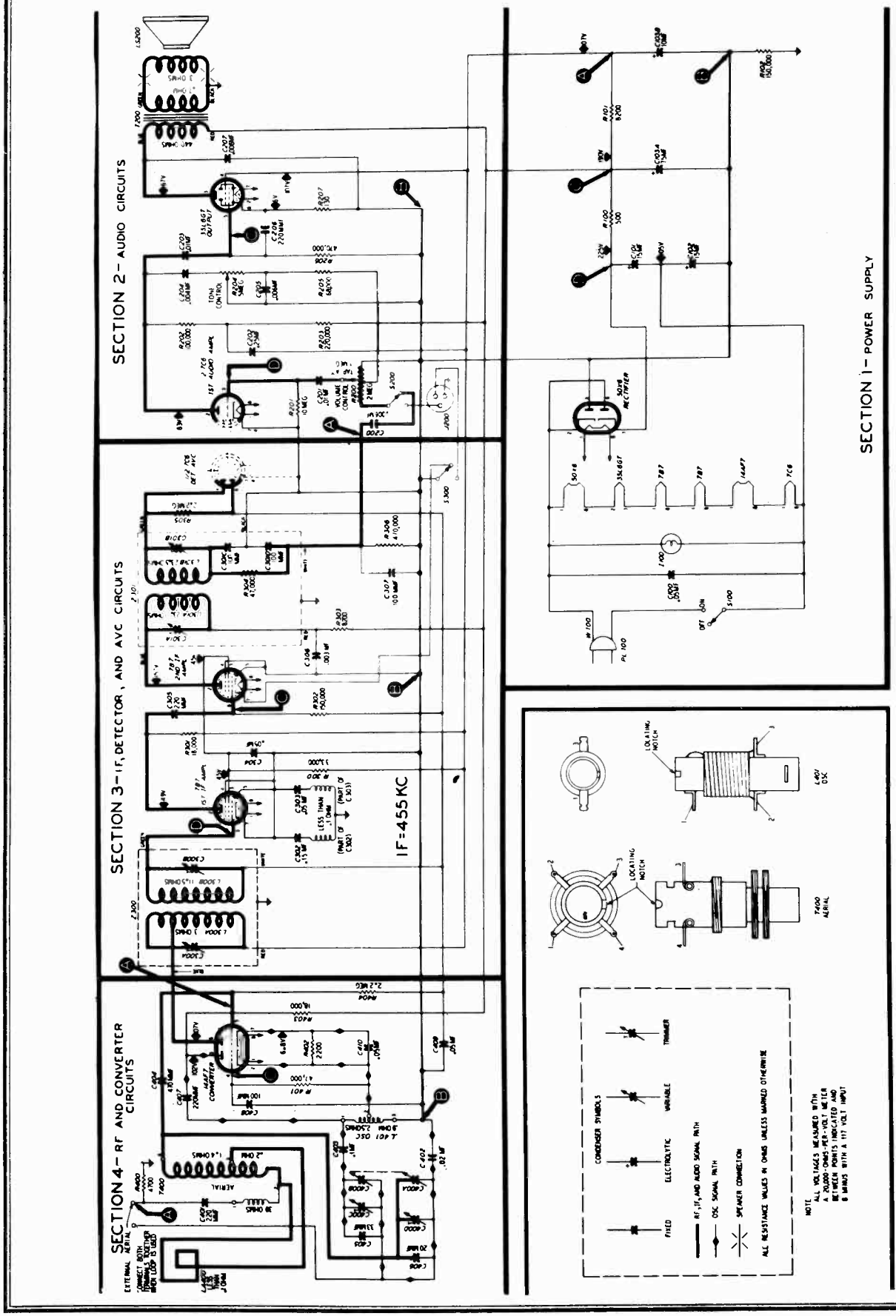


Figure 5. Philco Radio Model 49-1100, Sectionalized Schematic Diagram, Showing Test Points

ALIGNMENT PROCEDURE

DIAL—Calibration and pointer-index measurements are shown in figure 6. With tuning gang fully meshed, set pointer to index mark.

OUTPUT METER—Connect to voice-coil terminals.

SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

RADIO CONTROLS—Set volume control to maximum, and tone control fully counterclockwise.

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

STEP	SIGNAL GENERATOR		RADIO		
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	ADJUST
1				Turn trimmer fully tight.	C300B—1st i-f sec.
2	Through .1-mf. condenser to mixer grid (pin 5 of 14AF7).	455 kc.	Tuning gang fully meshed.	Adjust trimmers, in order given, for maximum output.	C301B—2nd i-f sec. C301A—2nd i-f pri. C300B—1st i-f sec. C300A—1st i-f pri.
3	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust trimmer for maximum output.	C400C—osc.
4	Same as step 3.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C400D—aerial.

RADIATING-LOOP NOTE: 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 certain that radio loop aerial is connected to radio.

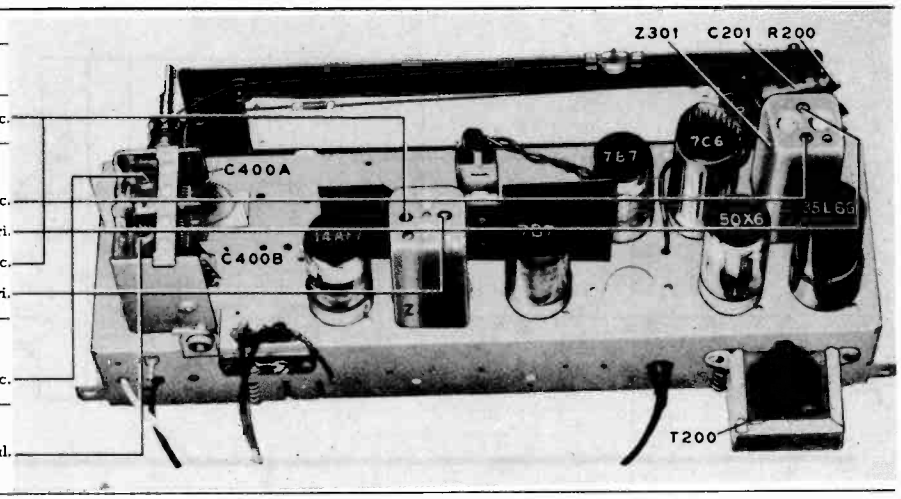


Figure 7. Top View, Showing Trimmer Locations

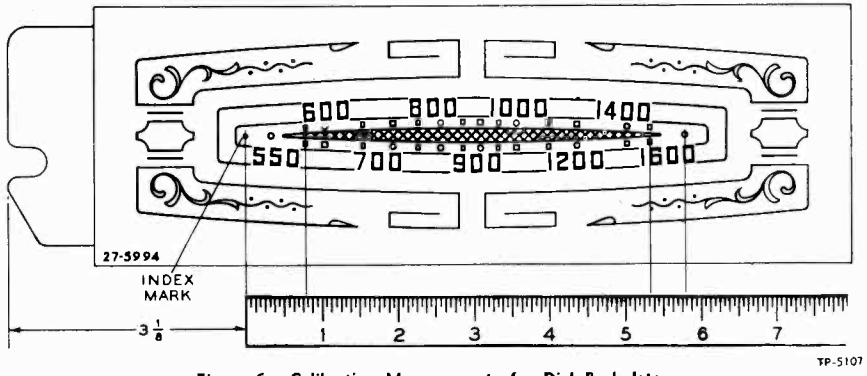


Figure 6. Calibration Measurements for Dial Backplate

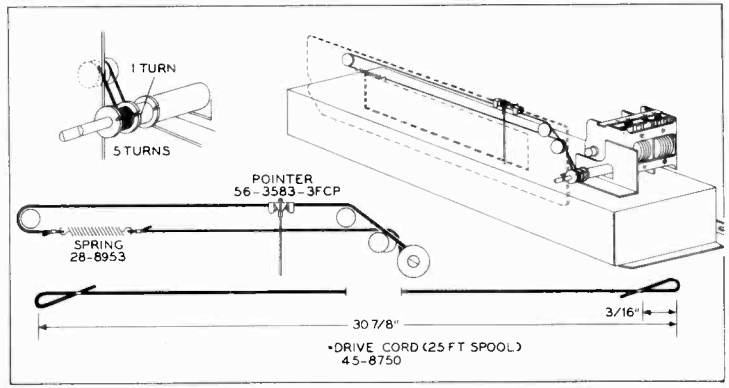


Figure 8. Drive-Cord Installation Details

MODEL 49-1100

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .05 mf.	61-0122*
C101	Condenser, filter, 15 mf., 200v	30-2575-11
C102	Condenser, filter, 15 mf., 200v	30-2575-11
C103	Condenser, electrolytic, 2-section	30-2575-17
C103A	Condenser, filter, 75 mf., 250v	Part of C103
C103B	Condenser, filter, 10 mf., 250v	Part of C103
I100	Pilot lamp	34-2477*
R100	Resistor, filter, 500 ohms	33-3435-3
R101	Resistor, filter, 8200 ohms	66-2824340
R102	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, on-off	42-1837
W100	Power cord	41-3755-13
PL100	A-c plug	Part of W100

SECTION 2
AUDIO CIRCUITS

C200	Condenser, d-c blocking, .006 mf.	30-4504*
C201	Condenser, d-c blocking, .01 mf.	61-0120*
C202	Condenser, plate decoupling, .25 mf.	61-0125*
C203	Condenser, d-c blocking, .01 mf.	61-0120*
C204	Condenser, tone control, .004 mf.	30-4623*
C205	Condenser, tone compensation, .006 mf.	30-1226-2*
C206	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C207	Condenser, tone compensation, .006 mf.	30-4504*
J200	Socket, accessory	27-6126
LS200	Speaker, 8" p-m	36-1626-1
R200	Volume control, 2 megohms (center-tapped)	33-5535-15
R201	Resistor, grid return, 10 megohms	66-6103340*
R202	Resistor, plate load, 100,000 ohms	66-4103340*
R203	Resistor, plate dropping, 220,000 ohms	66-4223340*
R204	Tone control, 5 megohms	33-5539-33
R205	Resistor, tone compensation, 68,000 ohms	66-3683340*
R206	Resistor, grid return, 470,000 ohms	66-4473340*
R207	Resistor, cathode bias, 130 ohms	66-1123340*
S200	Switch, accessory	42-1860
T200	Transformer, output	32-8242-3

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

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C301C	Condenser, a-v-c filter, 100 mmf.	Part of Z301
C301D	Condenser, a-v-c filter, 100 mmf.	Part of Z301
C302	Condenser-and-choke assembly, i-f filter, .15 mf.	38-9851-8
C303	Condenser-and-choke assembly, i-f filter, .05 mf.	38-9851-4
C304	Condenser, screen by-pass, .05 mf.	61-0122*
C305	Condenser, d-c blocking, 200 mmf.	60-10205307*
C306	Condenser, plate by-pass, .003 mf.	30-4582
C307	Condenser, r-f by-pass, 100 mmf.	60-10105407*
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

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

L301B	Transformer secondary, 2nd i-f	Part of Z301
R300	Resistor, screen dropping, 33,000 ohms	66-3333340*
R301	Resistor, plate load, 18,000 ohms	66-3183340*
R302	Resistor, grid return, 150,000 ohms	66-4153340*
R303	Resistor, plate decoupling, 8200 ohms	66-2823340*
R304	Resistor, i-f filter, 47,000 ohms	Part of Z301
R305	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R306	Resistor, diode load, 470,000 ohms	66-4473340*
S300	Switch, accessory	Part of 42-1860
Z300	Transformer, 1st i-f	32-4151-1
Z301	Transformer, 2nd i-f	32-3948-9

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2715-1
C400A	Condenser, oscillator tuning	Part of C400
C400B	Condenser, aerial tuning	Part of C400
C400C	Condenser, oscillator trimmer	Part of C400
C400D	Condenser, aerial trimmer	Part of C400
C401	Condenser, aerial isolating, 220 mmf.	60-10205307*
C402	Condenser, r-f by-pass, .02 mf.	61-0108*
C403	Condenser, isolating, .1 mf.	30-4527
C404	Condenser, d-c blocking, 470 mmf.	60-10515307*
C405	Condenser, shunt, 33 mmf.	60-00305307*
C406	Condenser, shunt, 20 mmf.	60-00205307*
C407	Condenser, d-c blocking, 220 mmf.	60-10205307*
C408	Condenser, osc. grid, 100 mmf.	60-10105407*
C409	Condenser, a-v-c filter, .05 mf.	61-0122*
C410	Condenser, cathode by-pass, .05 mf.	61-0122*
L401	Coil, oscillator	32-4019-6
LA400	Loop aerial	76-3583
R400	Resistor, aerial discharge, 4700 ohms	66-2473340*
R401	Resistor, grid return, 47,000 ohms	66-3473340*
R402	Resistor, cathode bias, 2200 ohms	66-2223340*
R403	Resistor, plate feed, 18,000 ohms	66-3183340*
R404	Resistor, grid return, 2.2 megohms	66-5223340*
T400	Transformer, aerial	32-4023-1

MISCELLANEOUS

Description	Service Part No.
Bracket-and-clip assembly, pilot lamp	76-3177
Cabinet (less scale)	10701
Baffle and cloth	40-6981
Baffle, wood	219102
Bezel	56-5287
Dial scale	27-5994
Dome	45-6190
Scale strap	56-4756
Dial-backplate assembly	76-3713
Cord, drive (25-ft. spool)	45-8750*
Pointer	56-3583-3FCP
Spring	28-8953
Knob	54-4486
Pilot-lamp-socket assembly	27-6233*
Socket, Loktal	27-6138*
Socket, octal	27-6174

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.

MODEL 49-1401

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.

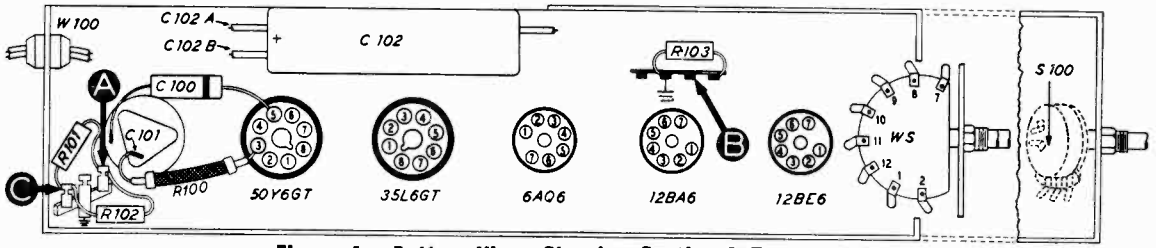


Figure 1. Bottom View, Showing Section 1 Test Points TP-5379A

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.

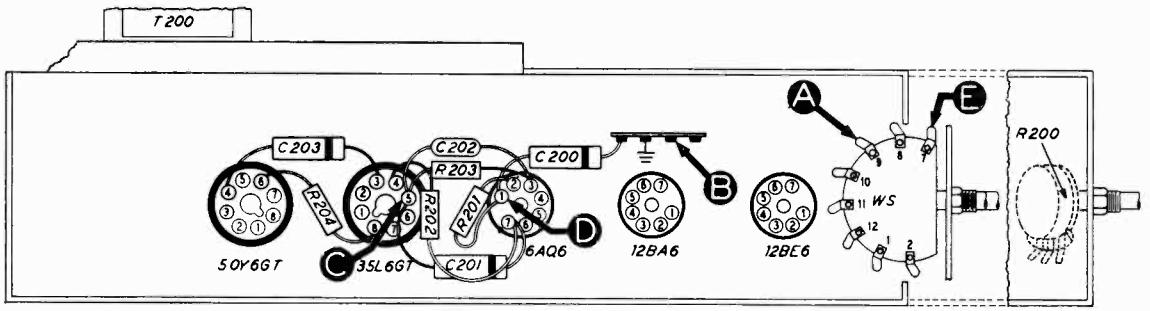


Figure 2. Bottom View, Showing Section 2 Test Points TP-5379B

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.				

MODEL 49-1401

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.

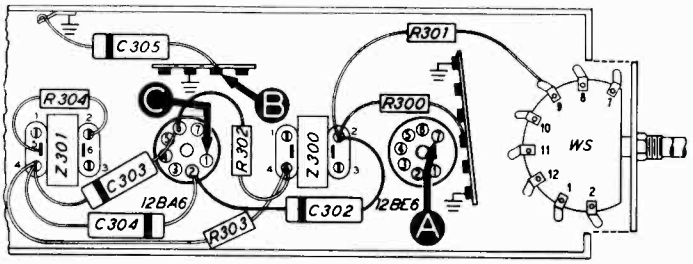


Figure 3. Bottom View, Showing Section 3 Test Points

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.

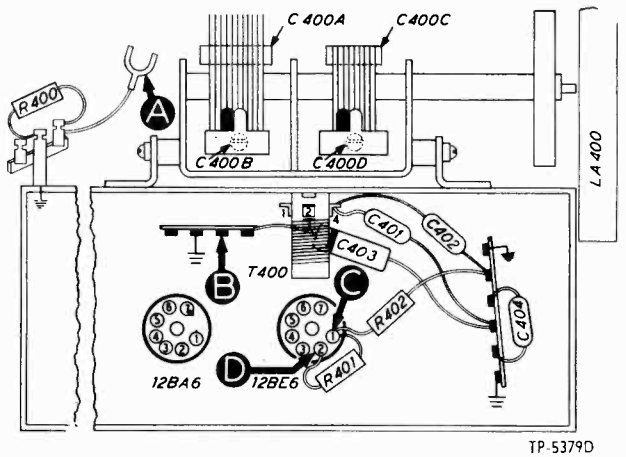


Figure 4. Bottom View, Showing Section 4 Test Points

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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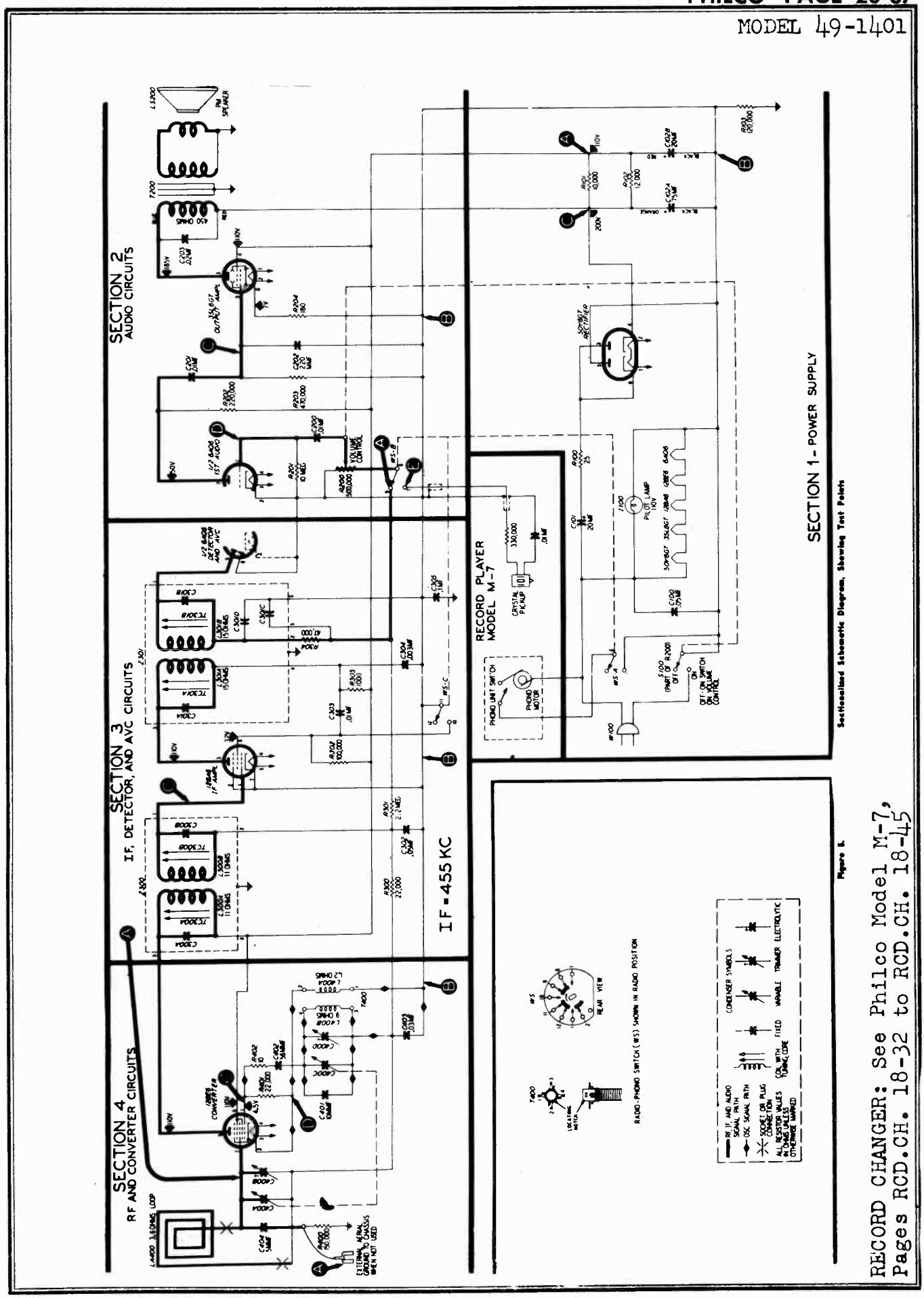


Figure 1. Schematic Diagram, Showing Test Points

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.

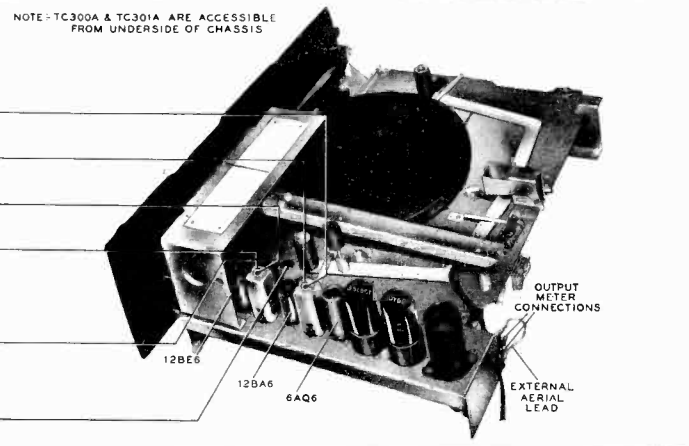


Figure 6. Top View, Showing Trimmer Locations

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.

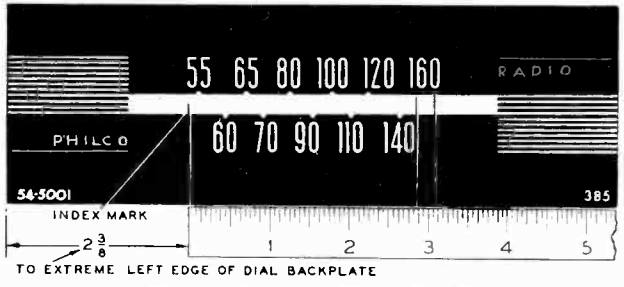


Figure 7. Dial-Backplate Calibration Measurements

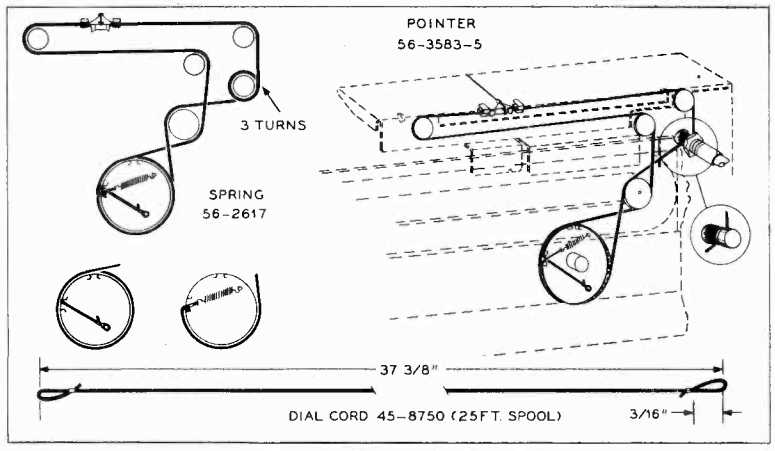


Figure 8. Drive-Cord Installation Details

MODEL 49-1401

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	27-6233-17

MODEL 49-1600

MODEL 49-1600

SPECIFICATIONS

CABINET	Modern classical, wood console, walnut finish.
CIRCUIT	Five-tube superhetrodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	3 watts
OPERATING VOLTAGE	117 volts, 60 cycles, a.c.
POWER CONSUMPTION	
Radio	35 watts
Phonograph	50 watts
AERIAL	High-impedance loop; also provision for external aerial.
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5)	14Q7, 12BA6, 7C6, 35L6GT, 50X6
RECORD PLAYER	Philco Automatic Record Changer Model M-9 (For service information refer to PR-1571.)

TP-5872

Circuit Description

Philco Model 49-1600 is a console radio-phonograph combination consisting of a five-tube superhetrodyne, which provides reception on the standard-broadcast band, and a Philco M9 Automatic Record Changer. The built-in loop aerial normally provides adequate signal pickup. However, provision has been made for connecting an external aerial, if required.

The loop works directly into a 14Q7 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 7C6. Both i-f transformers have permeability-tuned primary and secondary windings. The diode section of the 7C6 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 7C6, the first audio amplifier, is resistance-coupled to a 35L6GT beam-power-output amplifier, which supplies approximately three watts of audio power to a permanent-magnet dynamic speaker.

The d-c operating voltages are furnished by a voltage-doubler circuit employing a 50X6 rectifier and a resistor-condenser filter. Resistor R102 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, 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 hrough the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

Before connecting the radio to a source of power, the following steps are recommended:

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 2 of the 50X6 rectifier tube) 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 2700 ohms, check condensers C102A and C102B for leakage or shorts. The resistance value 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.

TROUBLE SHOOTING

Section 1 - Power Supply

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, set the volume control to minimum, and set the radio-phono switch to the radio position.

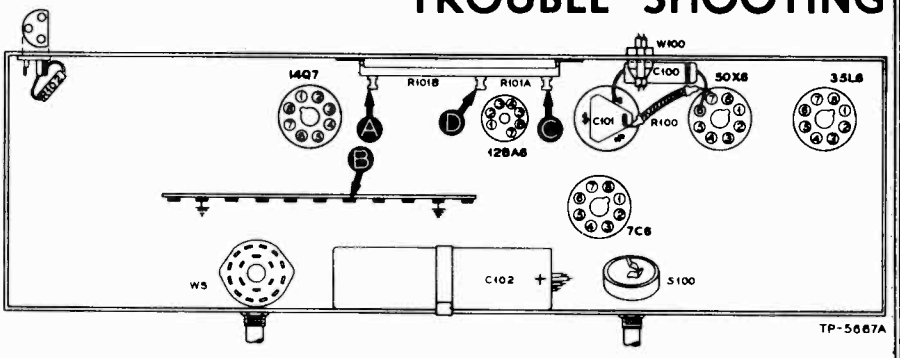


Figure 1. Bottom View, Showing Section 1 Test Points

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.

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	215v	No voltage	Defective: 50X6. Shorted: C100, C102A. Open: W100, S100, R100, C101.
			Low voltage	Defective: 50X6. Shorted: C101. Leaky: C101, C102A. Open: C102A.
3	D	205v	High voltage	Open: R101A.
			No voltage	Shorted: C102B. Open: R101A.
			Low voltage	Leaky: C102B. Open: C102B.
4	A	110v	High voltage	Open: R101B, T200*, R205*.
			No voltage	Open: R101B. Shorted: C102C.
			Low voltage	Leaky: C102C. Shorted: C303*.
Listening Test: Abnormal hum may be caused by open or leaky C102A, C102B, or C102C.				

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

TROUBLE SHOOTING

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 volume control to maximum.

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

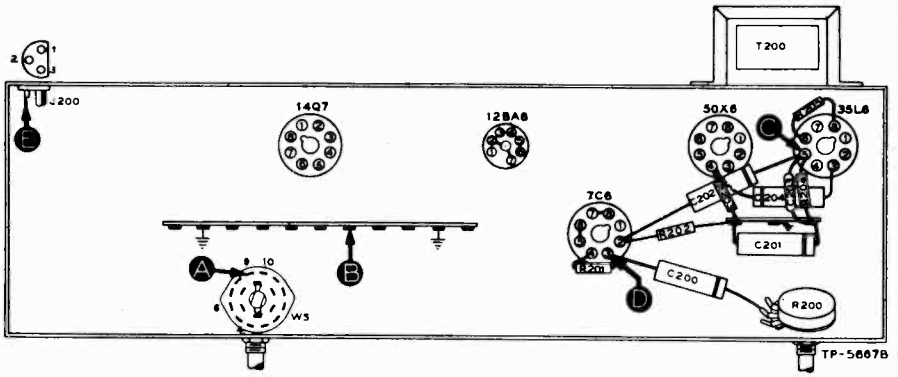


Figure 2. Bottom View, Showing Section 2 Test Points

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 moderate signal-generator input.	Trouble in this section. Isolate by the following tests.
2	C	Clear output with strong input.	Defective: 35L6GT, LS200. Shorted: T200, C202, C203, C204. Open: R204, R205, T200. Leaky: C204.
3	D	Loud, clear output with moderate input.	Defective: 7C6. Shorted: C200, C201. Open: C202, R201, R202, R203. Leaky: C202.
4	A	Same as step 1.	Open: R200 (rotate), C200, WS. Shorted: WS, C301*.
5	E	Same as step 1.	Open: WS. Shorted: WS.
Listening Test: Distortion may be caused by leaky C202. Distortion of strong signals may be caused by shorted or leaky C200.			

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

MODEL 49-1600

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 point indicated in the chart.

Set the volume control to maximum, and set the radio-phono switch to the radio position. 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.

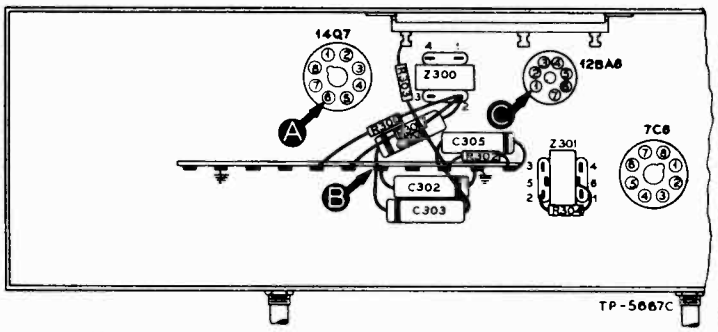


Figure 3. Bottom View, Showing Section 3 Test Points

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."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal-generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with moderate input.	Defective: 12BA6, 7C6. Shorted: C300B, C301A, C301B, C301C, C301D, C303, C305, L300B, L301A, L301B, WS-B. Open: C301A, C301B, L300B, L301A, L301B, R301, R302, R303, R304, WS-B. Leaky: C303, C305. Misaligned: Z301.
3	A	Loud, clear output with weak input.	Defective: 14Q7*. Shorted: C300A, L300A. Open: C300A, C300B, L300A, R300. 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 volume control to maximum, and set the radio-phono switch to the radio position. 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 this section. If the trouble is not revealed by the tests for this section, check the alignment.

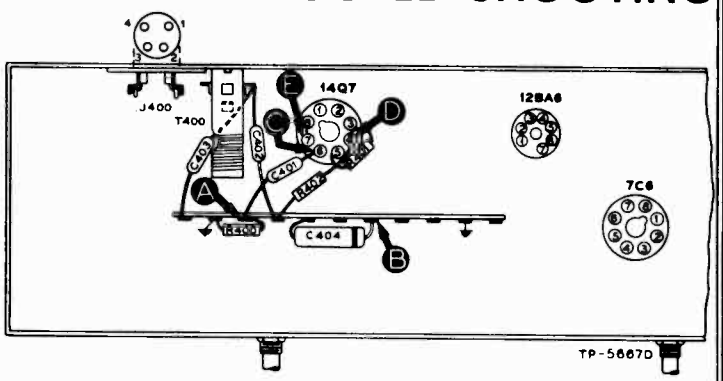


Figure 4. Bottom View, Showing Section 4 Test Points

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 signal-generator input.	Trouble in this section. Isolate by the following tests.
2	D—E (Osc. test; see note below.)		Rotate through range.	Negative 2 to 3 volts.	Defective: 14Q7. Shorted: C400 (osc. section), C400B, C402, C403, T400. Open: C402, R401, R402, T400.
3	C	1000 kc.	Tune to signal.	Same as step 1.	Defective: 14Q7. Shorted: C400 (aerial section), C400A, LA400. Open: LA400.
4	A	1000 kc.	Tune to signal.	Same as step 1.	Shorted: J400. Open: C401.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to the cathode of the 14Q7, test point E; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 4 of 14Q7), test point D. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by a negative voltage of approximately the volue given in the chart (measured with a 20,000 ohms-per-volt meter) throughout the tuning range

MODEL 49-1600

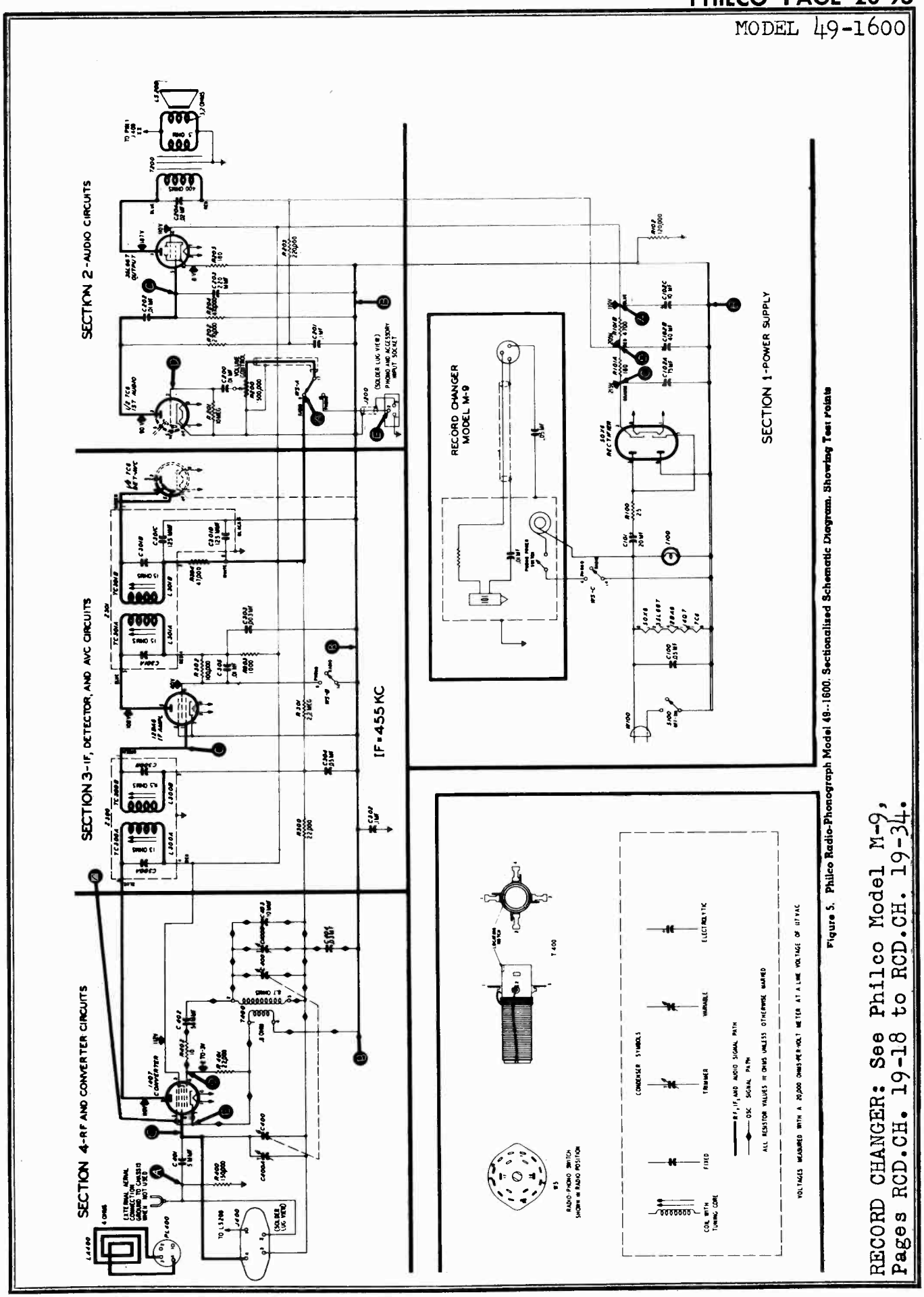


Figure 5. Philco Radio-Phonograph Model 49--1600. Sectionalized Schematic Diagram, Showing Test Points

RECORD CHANGER: See Philco Model M-9, Pages RCD.CH. 19-18 to RCD.CH. 19-34.

ALIGNMENT PROCEDURE

DIAL—Calibration and pointer-index measurements are shown in figure 7. With tuning condenser fully meshed, set pointer to index mark.

OUTPUT METER—Connect across voice coil.

SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

RADIO CONTROLS—Set volume control to maximum, and radio-phono switch to radio position.

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	Ground lead to B−; output lead through .1-mf. condenser to external-aerial lead (loop aerial must be connected).	455 kc.	Tuning condenser fully meshed.	Adjust tuning cores, 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 trimmer for maximum output.	C400B—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C400A—aerial

RADIATING LOOP: Make up a 6—8 turn, 6-inch-diameter loop from insulated wire; connect to signal-generator leads and place near radio loop aerial. The loop aerial must be connected.

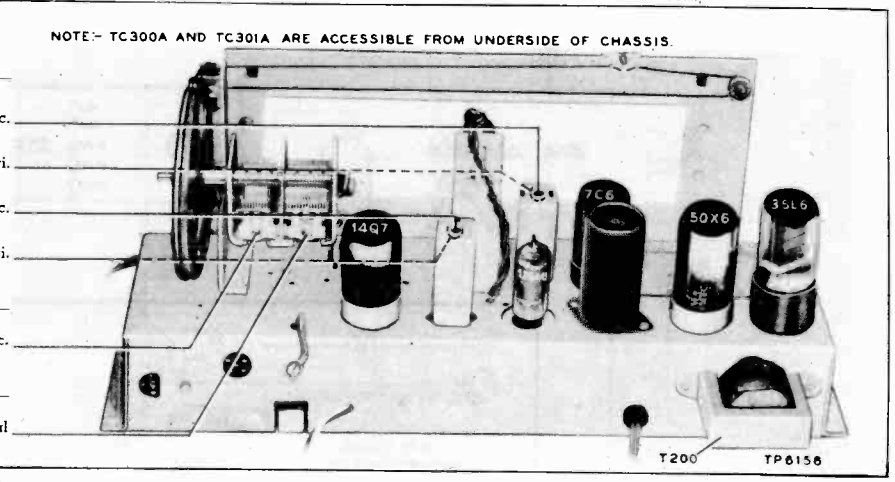


Figure 6. Top View, Showing Trimmer Locations

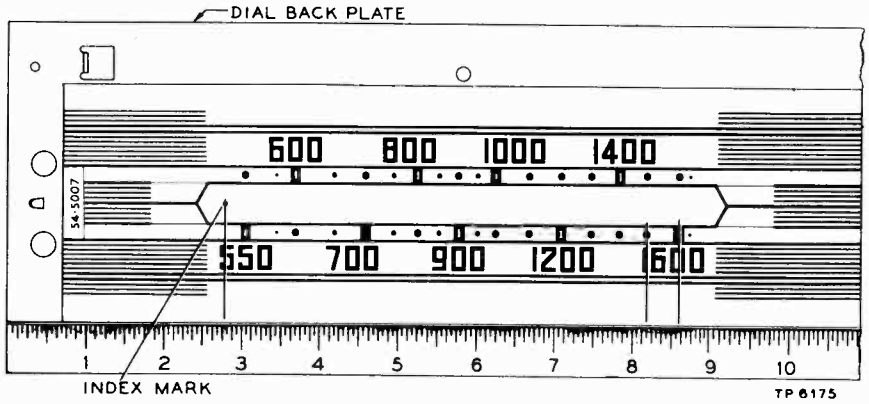


Figure 7. Calibration Measurements for Dial Backplate

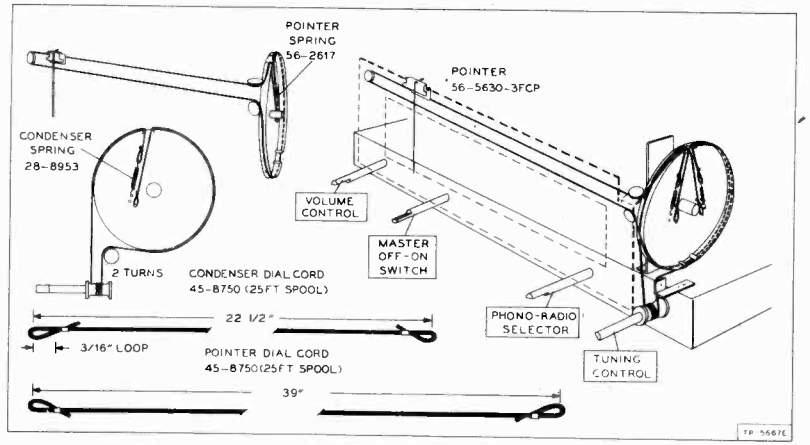


Figure 8. Drive-Cord Installation Details

MODEL 49-1600

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	TC—tuning core
I—pilot lamp	R—resistor	W—line-cord-and-plug assembly
L—choke or coil	S—switch	WS—Wafer switch
LA—loop aerial	T—transformer	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 powersupply.
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: 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."

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .05 mf.	61-0122*
C101	Condenser, electrolytic, doubler, 20 mf.	30-2568-22
C102	Condenser, electrolytic, filter, 3-section	30-2575-23
C102A	Condenser, electrolytic, filter, 75 mf., 250v	Part of C102
C102B	Condenser, electrolytic, filter, 40 mf., 250v	Part of C102
C102C	Condenser, electrolytic, filter, 10 mf., 250v	Part of C102
I100	Lamp, pilot, 110v	34-2605*
R100	Resistor, current limiting, 25 ohms	33-1334-5
R101	Resistor, filter, 2-section	33-3435-18
R101A	Resistor, filter, 180 ohms	Part of R101
R101B	Resistor, filter, 4700 ohms	Part of R101
R102	Resistor, leakage, 120,000 ohms	66-4123340*
S100	Switch, off-on power	42-1837-3
W100	Line-cord-and-plug assembly	L-2183*
WS-C	Wafer switch, radio-phono	Part of WS

SECTION 2
AUDIO CIRCUITS

C200	Condenser, blocking, .01 mf.	61-0120*
C201	Condenser, decoupling, .1 mf.	61-0113*
C202	Condenser, d-c blocking, .01 mf.	61-0120*
C203	Condenser, grid by-pass, ceramic, 220 mmf.	62-122001001*
C204	Condenser, parasitic suppressor, .02 mf.	61-0108*
J200	Jack, phono input	27-6126
LS200	Speaker, permanent magnet	36-1626-1
R200	Volume control, 500,000 ohms	45-5019*
R201	Resistor, grid return, 10 megohms	66-6103340*
R202	Resistor, plate load, 270,000 ohms	66-4273340*
R203	Resistor, plate filter, 220,000 ohms	66-4223340*
R204	Resistor, grid return, 470,000 ohms	66-4473340*
R205	Resistor, cathode bias, 180 ohms	66-1183340*
T200	Transformer, output	32-8242-3
WS	Wafer switch, radio-phono	42-1824-2
WS-A	Wafer switch, radio-phono	Part of WS

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

C300A	Condenser, fixed trimmer	Part of Z300
C300B	Condenser, fixed trimmer	Part of Z300
C301A	Condenser, fixed trimmer	Part of Z301
C301B	Condenser, fixed trimmer	Part of Z301
C301C	Condenser, i-f by-pass	Part of Z301
C301D	Condenser, i-f by-pass	Part of Z301
C302	Condenser, i-f by-pass, .1 mf.	61-0113*
C303	Condenser, decoupling, .003 mf.	61-0109*
C304	Condenser, a-v-c by-pass, .05 mf.	45-3500-2*
C305	Condenser, screen by-pass, .01 mf.	61-0120*
L300A	Primary, 1st i-f transformer	Part of Z300
L300B	Secondary, 1st i-f transformer	Part of Z300
L301A	Primary, 2nd i-f transformer	Part of Z301
L301B	Secondary, 2nd i-f transformer	Part of Z301
R300	Resistor, a-v-c filter, 22,000 ohms	66-3223340*

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

	Description	Service Part No.
R301	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R302	Resistor, screen dropping, 100,000 ohms	66-5103340*
R303	Resistor, plate dropping, 1,000 ohms	66-3103340*
R304	Resistor, diode load, 47,000 ohms	66-3473340*
TC300A	Tuning core	Part of Z300
TC300B	Tuning core	Part of Z300
TC301A	Tuning core	Part of Z301
TC301B	Tuning core	Part of Z301
WS-B	Switch, radio-phono	Part of WS
Z300	Transformer, 1st i-f	32-4160
Z301	Transformer, 2nd i-f	32-4240

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, variable, 2-section	31-2727-3
C400A	Condenser, trimmer, aerial	Part of C400
C400B	Condenser, trimmer, osc.	Part of C400
C401	Condenser, aerial coupling, mica, 5 mmf.	60-90505007*
C402	Condenser, blocking, mica, 56 mmf.	62-056409001*
C403	Condenser, fixed trimmer, ceramic, 10 mmf.	30-1224-26
C404	Condenser, a-v-c by-pass, .03 mf.	45-3500-1*
J400	Jack, aerial input	27-6214-1
LA400	Loop-aerial assembly	76-2127-8
PL400	Plug, loop aerial	Part of LA400
R400	Resistor, isolating, 150,000 ohms	66-4153340*
R401	Resistor, grid return, 22,000 ohms	66-3223340*
R402	Resistor, parasitic suppressor, 10 ohms	66-0103340*
T400	Transformer, oscillator	32-4190-2

MISCELLANEOUS

Description	Service Part No.
Bracket-and-clip assembly, pilot lamp	76-4004
Cable-and-plug assembly, phono input	41-3864-1
Cabinet (less scale)	10713
Bezel	56-5367
Cabinet back	54-7603
Dial scale	54-5007
Dial-Scale Hardware	
Dial-backplate assembly	76-4005
Diffusing panel	54-7606
Spring (2 required)	56-3841
Snap fastener	28-4342FA3
Drive cord (25-ft. spool)	45-8750*
Pointer	56-5630-3FCP
Spring	56-2617
Shaft-and-pulley assembly	76-3959
Spring, tuning-gang drive	28-8953
Knob (4 required)	54-4486
Socket assembly, pilot lamp	27-6233
Socket, Loktal	27-6138*
Socket, miniature	27-6226
Socket, octal	27-6138*

MODELS 49-1602, 49-1603, 49-1604, 49-1605

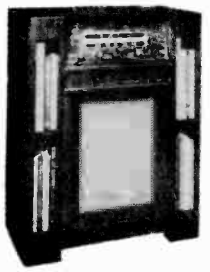
Circuit Description

Philco Radio-Phonograph Models 49-1602 and 49-1604 are identical electrically. Each model includes a Philco Automatic Record Changer Model M-9 and a six-tube superheterodyne which provides reception in the standard broadcast band.

A semi-high-impedance loop aerial normally gives adequate signal pickup; if greater signal pickup is required, an external aerial may be connected.

The loop aerial feeds into a 14AF7 converter. The aerial and oscillator circuits are tuned by ganged, variable tuning condensers. The two i-f stages employ 7B7 pentode amplifier tubes. The new Philco high-gain transformers are used for coupling in the r-f and i-f circuits, to provide additional amplification and to give better reproduction of the received r-f signal. The diode section of the 7C6 dual-diode-triode provides detection and a-v-c action. The triode section of this tube functions as the first audio amplifier, and is resistance-coupled to the 35L6GT output tube. The loudspeaker is a permanent-magnet, dynamic type. The power supply employs a 50X6 full-wave, voltage-doubler rectifier and a resistor-condenser filter network.

A 150,000-ohm resistor, R103, is connected between B– and the chassis to prevent hum under conditions of high humidity. The combination of C305 and its associated r-f choke is a series-resonant circuit at 455 kc., and functions as a low-impedance by-pass for the intermediate frequency.



MODEL 49-1602 MODEL 49-1604
MODEL 49-1603 MODEL 49-1605

SPECIFICATIONS

CABINET	
Model 49-1602	Wood console, walnut finish
Model 49-1604	Wood console, mahogany finish
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	3 watts
OPERATING VOLTAGE	105—120 volts, a.c.
POWER CONSUMPTION	
Radio	65 watts
Phonograph	30 watts
AERIAL	Built-in semi-high-impedance loop; also provision for connecting external aerial.
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (6)	7B7(2), 7C6, 14AF7, 35L6GT, 50X6
PHONOGRAPH	Philco Automatic Record Changer Model M-9

TP-5870 & TP-5819A

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 test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

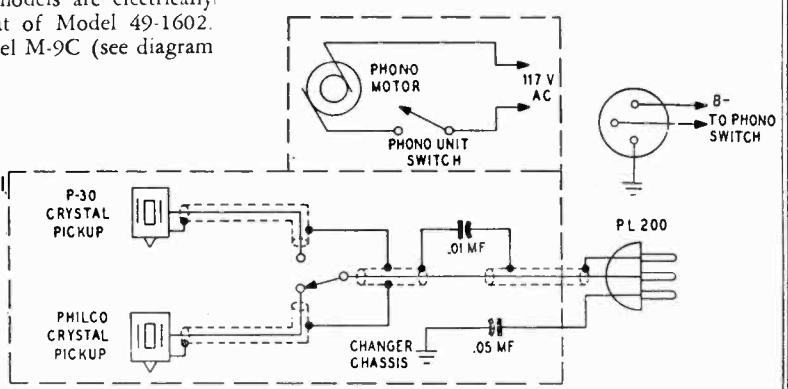
1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.
2. Measure the resistance between B+ (pin 7 of 50X6 rectifier) and B–, test point B. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 3000 ohms, check condensers C102A and C102B 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.

Model 49-1603 **GENERAL INFORMATION** Model 49-1605

The radio chassis of these two models are electrically and mechanically identical to that of Model 49-1602. The record changer used is a Model M-9C (see diagram below)

PHONO PICKUP PARTS

Description	Service Part No.
Crystal pickup cartridge, P-30	35-2671-1
Needle for P-30 crystal	35-2670
Crystal pickup cartridge, Philco Special	35-2682
Needle for Philco Special crystal	35-2678
Pickup-and-needle assembly	45-1609



Wiring Diagram of Model M-9C Automatic Record Changer

MODELS 49-1602, 49-1603, 49-1604, 49-1605

TROUBLE SHOOTING

Section 1 - Power Supply

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. Turn the tone control fully clockwise, and set the radio-phono switch to the radio position.

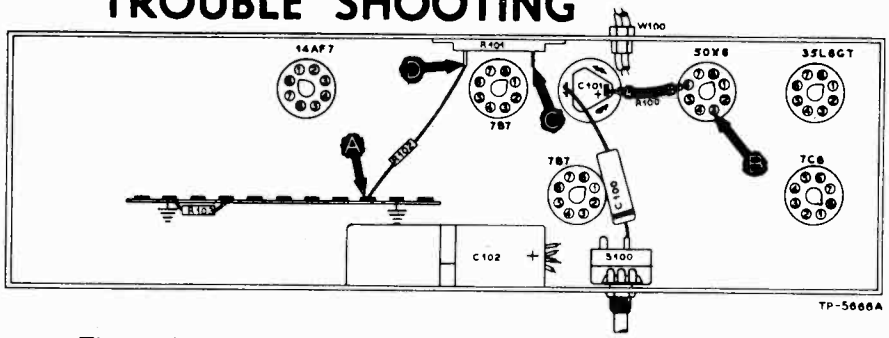


Figure 1. Bottom View, Showing Section 1 Test Points

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.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	80v		Trouble within this section. Isolate by the following tests.
2	C	225v	No voltage	Defective: 50X6. Open: C101, R100, S100, W100. Shorted: C102A.
			Low voltage	Defective: 50X6. Open: C102A, Leaky: C102A, 102B. Shorted: C102C.
			High voltage	Open: R101, R207*, T200*.
3	D	195v	No voltage	Shorted: C102B.
			Low voltage	Open: C102B. Leaky: C102B.
			High voltage	Open: R102.
4	A	80v	No voltage	Shorted: C102C. Open: R102.
			Low voltage	Leaky: C102C.
Listening Test: Abnormal hum may be caused by open C102A, C102B, or C102C.				

* 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 volume control to maximum, and turn the tone control fully counterclockwise. Set the radio-phono switch to the radio position for test points A, C, and D, and to the phono position for test point E.

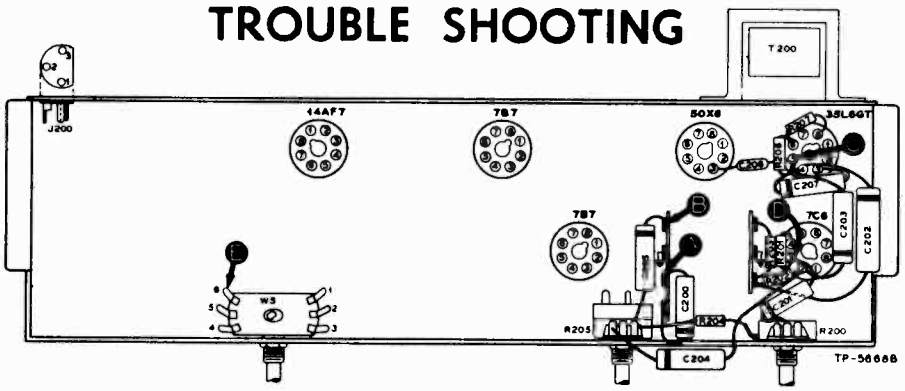


Figure 2. Bottom View, Showing Section 2 Test Points

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 moderate signal-generator input.	Trouble within this section. Isolate by the following tests.
2	C	Moderate, clear output with strong input.	Defective: 35L6GT, LS200. Open: R206, R207, T200. Shorted or leaky: C206, C207.
3	D	Loud, clear output with moderate input.	Defective: 7C6. Open: C203, R201, R202, R203. Shorted or leaky: C202, C203, C204.
4	A	Same as step 3.	Open: C200, C201, R200, WS. Shorted: C205 (rotate R200).
5	E	Same as step 3.	Open: WS.
Listening test: Distortion may be caused by shorted or leaky C200, C201, or C203.			

MODELS 49-1602, 49-1603,
49-1604, 49-1605

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 volume control to maximum, and turn the tone control fully counterclockwise. Set the radio-phono switch to the radio position, and rotate the tuning control until the tuning condenser is fully meshed.

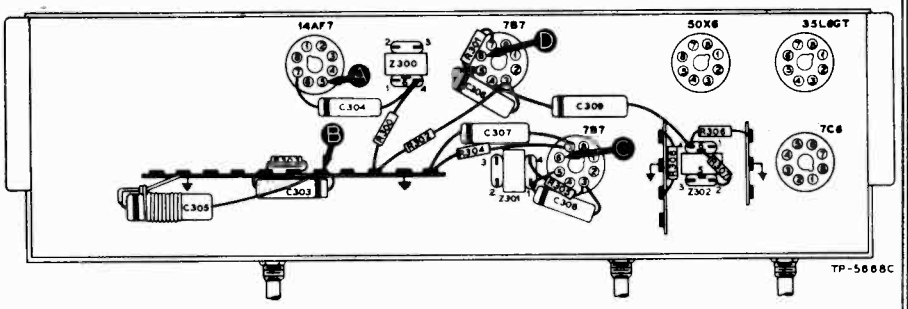


Figure 3. Bottom View, Showing Section 3 Test Points

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 the "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal-generator input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear output with moderate input.	Defective: 7B7 (2nd i-f amplifier). 7C6 (diode section). Misaligned: Z302. Open: L302A, L302B, L301B, C307, C308, C309, R304, R305, R306, R307, R308, WS. Shorted: L302A, L302B, C301B, C302A, C302B, C302C, C302D, C307, C308, C309.
3	D	Loud, clear output with weak input.	Defective: 7B7 (1st i-f amplifier). Misaligned: Z301. Open: L301A, L301B, L300C, C305, C306, R301, R302. Shorted: C300B, C301A, C301B, C306.
4	A	Same as step 3.	Defective: 14AF7*. Misaligned: Z300. Open: L300A, L300B, L300C, R300, R403*, R404*. Shorted: C300A, C300B, C304.

* 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 volume control to maximum, and turn the tone control fully counterclockwise. Set the radio-phono switch to the radio 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 this section. If the trouble is not revealed by the tests for this section, check the alignment.

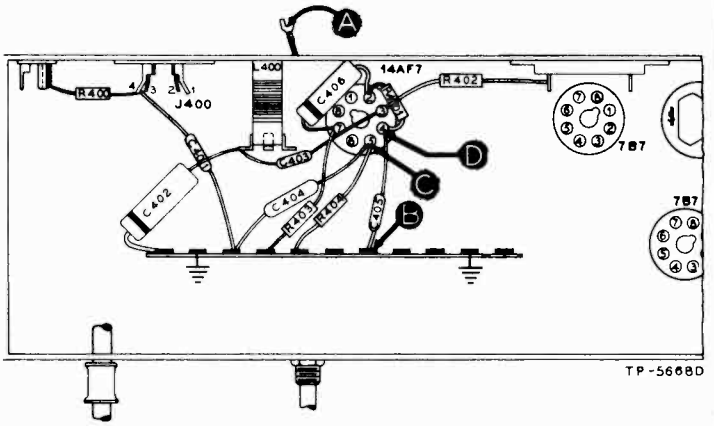


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Loud, clear speaker output with weak signal-generator input.	Trouble within this section. Isolate by the following tests.
2	C	1000 kc.	1000 kc.	Same as step 1.	Defective: 14AF7, osc. circuit. Open: C406, R403, R404. Shorted: C406.

MODELS 49-1602, 49-1603, 49-1604, 49-1605

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."

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line-filter, .05 mf.	61-0122*
C101	Condenser, electrolytic, doubler, 20 mf.	30-2568-22
C102	Condenser, electrolytic, 3-section	30-2575-24
C102A	Condenser, filter, 75 mf.	Part of C102
C102B	Condenser, filter, 40 mf.	Part of C102
C102C	Condenser, filter, 10 mf.	Part of C102
I100	Lamp, pilot, 110v	34-2605
R100	Resistor, current limiter, 25 ohms	33-1334-5
R101	Resistor, filter, 500 ohms	33-3435-3
R102	Resistor, filter, wire-wound, 8200 ohms, 2.5 watts	66-2825360
R103	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, off-on	Part of R205
W100	Line-cord-and-plug assembly	L-2183*

SECTION 2
AUDIO CIRCUITS

C200	Condenser, blocking, .006 mf.	45-3500-7*
C201	Condenser, blocking, .01 mf.	61-0120*
C202	Condenser, plate decoupling, .25 mf.	61-0125*
C203	Condenser, d-c blocking, .01 mf.	61-0120*
C204	Condenser, tone compensation, .004 mf.	61-0179*
C205	Condenser, bass compensation, .006 mf.	45-3500-7*
C206	Condenser, grid by-pass, 220 mmf.	62-122001001*
C207	Condenser, parasitic suppressor, .006 mf.	45-3500-7*
J200	Jack, phono input	27-6126
LS200	Speaker, permanent magnet	36-1626-1
R200	Volume control, 2 megohms (tap at 1 megohm)	45-5019*
R201	Resistor, grid return, 10 megohms	66-6103340*
R202	Resistor, plate load, 100,000 ohms	66-4103340*
R203	Resistor, plate filter, 220,000 ohms	66-4223340*
R204	Resistor, bass compensation, 68,000 ohms	66-3683340*
R205	Tone control (with off-on switch), 5 megohms	33-5538-38
R206	Resistor, grid return, 470,000 ohms	66-4473340*
R207	Resistor, cathode bias, 130 ohms	66-1133340*
T200	Transformer, output	32-8242-3
WS	Switch, radio-phono	45-1745-1

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

C300A	Condenser, fixed trimmer	Part of Z300
C300B	Condenser, fixed trimmer	Part of Z300
C301A	Condenser, fixed trimmer	Part of Z301
C301B	Condenser, fixed trimmer	Part of Z301
C302A	Condenser, fixed trimmer	Part of Z302
C302B	Condenser, fixed trimmer	Part of Z302
C302C	Condenser, i-f by-pass	Part of Z302
C302D	Condenser, i-f by-pass	Part of Z302
C303	Condenser, a-v-c by-pass, .05 mf.	61-0122*
C304	Condenser, decoupling, .01 mf.	61-0120*
C305	Condenser-and-choke assembly, .15 mf.	76-2361
C306	Condenser, screen by-pass, .01 mf.	61-0120*
C307	Condenser, cathode by-pass, .05 mf.	61-0122*
C308	Condenser, screen by-pass, .01 mf.	61-0120*
C309	Condenser, plate by-pass, .05 mf.	61-0122*
L300A	Primary, 1st i-f transformer	Part of Z300
L300B	Tertiary, 1st i-f transformer	Part of Z300
L300C	Secondary, 1st i-f transformer	Part of Z300
L301A	Primary, 2nd i-f transformer	Part of Z301
L301B	Secondary, 2nd i-f transformer	Part of Z301
L302A	Primary, 3rd i-f transformer	Part of Z302
L302B	Secondary, 3rd i-f transformer	Part of Z302
R300	Resistor, plate dropping, 10,000 ohms	66-3103340*
R301	Resistor, cathode bias, 100 ohms	66-1103340*
R302	Resistor, screen dropping, 1000 ohms	66-2103340*
R303	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R304	Resistor, cathode bias, 270 ohms	66-1273340*

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

Reference Symbol	Description	Service Part No.
R305	Resistor, screen dropping, 1000 ohms	66-2103340*
R306	Resistor, plate dropping, 8200 ohms	66-2823340*
R307	Resistor, diode load, 47,000 ohms	66-3473340*
R308	Resistor, a-v-c filter, 470,000 ohms	66-4473340*
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
WS	Switch, radio-phono	Part of WS
Z300	Transformer, 1st i-f	32-4258
Z301	Transformer, 2nd i-f	32-4160-3
Z302	Transformer, 3rd i-f	32-4240-2

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2727-3
C400A	Condenser, trimmer	Part of C400
C400B	Condenser, trimmer	Part of C400
C401	Condenser, series blocking, 5 mmf.	60-90505007*
C402	Condenser, isolating, .04 mf.	45-3500-2*
C403	Condenser, osc. plate 220 mmf.	62-122001001*
C404	Condenser, grid blocking, 470 mmf.	60-10475307*
C405	Condenser, osc. grid, 100 mmf.	60-10105017*
C406	Condenser, by-pass, .05 mf.	61-0122*
J400	Jack, aerial input	27-6214-1
L400	Coil, oscillator	32-4153
LA400	Loop aerial	32-4313
R400	Resistor, external aerial loading, 150,000 ohms	66-4153340*
R401	Resistor, osc. grid, 47,000 ohms	66-3473340*
R402	Resistor, plate dropping, 220,000 ohms	66-4223340*
R403	Resistor, cathode bias, 3900 ohms	66-2393340*
R404	Resistor, grid return, 2.2 megohms	66-5223340*
T400	Transformer, aerial	32-4033-9

MISCELLANEOUS

Description	Service Part No.
Antenna-lead assembly	76-1472-2
Bracket-and-clip assembly	76-4004
Cabinet and Cabinet Hardware	
Cabinet (less scale)	
Model 49-1602	10718
Model 49-1604(L)	10725A
Model 49-1604(W)	10725
Back	54-7638
Bezel	
Model 49-1602	56-5367FCP
Model 49-1604	56-5855FCP
Dial scale	
49-1602	54-5010
49-1604	54-5017
Knob (4)	54-4486
Cable, shielded, pickup	41-3754-16
Cable, speaker	41-3806-6
Cable, phono power	41-3747-17
Dial-backplate assembly	76-4005
Diffusing panel	54-7606
Drive cord (25-ft. spool)	45-8750*
Pointer	56-5630FCP
Spring (gang drive)	56-2617
Spring (diffusing panel) (2)	56-3841
Spring (pointer drive)	28-8953
Mounting bracket, rear (tuning condenser)	56-5647FA3
Rubber mount (3)	27-4771-1
Mounting clamp, electrolytic condenser	56-1346-1FA5
Mounting clips, aerial and osc. coil	28-5002FCP
Mounting clips, i-f transformer	56-4109
Shaft-and-pulley assembly	76-3959
Shield, light, fiber	54-7390
Socket assembly, pilot lamp	27-6233
Socket, Loktal	27-6138*
Socket, octal	27-6174

ALIGNMENT PROCEDURE

RADIO CONTROLS—Set volume control to maximum, turn tone control fully counterclockwise, and set radio-phono switch to radio position.

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

DIAL—Calibration and pointer-index measurements are shown in figure 7. With tuning condenser fully meshed, set pointer to index mark.

OUTPUT METER—Connect across voice coil.

SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

STEP	SIGNAL GENERATOR: CONNECTION TO RADIO	SIGNAL GENERATOR: DIAL SETTING	RADIO: DIAL SETTING	RADIO: SPECIAL INSTRUCTIONS	ADJUST
1	Ground lead to B−; output lead through .1-mf. condenser to mixer grid (pin 5 of 14AF7).	455 kc.	540 kc.	Adjust tuning cores, in order given, for maximum output.	TC302B—3rd i-f sec. TC302A—3rd i-f pri. TC301B—2nd i-f sec. TC301A—2nd i-f pri. TC300B—1st i-f sec. TC300A—1st i-f pri. T400
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust trimmer for maximum output.	C400B—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C400A—aerial

RADIATING LOOP: Make up a 6—8 turn, 6-inch diameter loop from insulated wire; connect to signal-generator leads and place near radio loop aerial. The loop aerial must be connected.

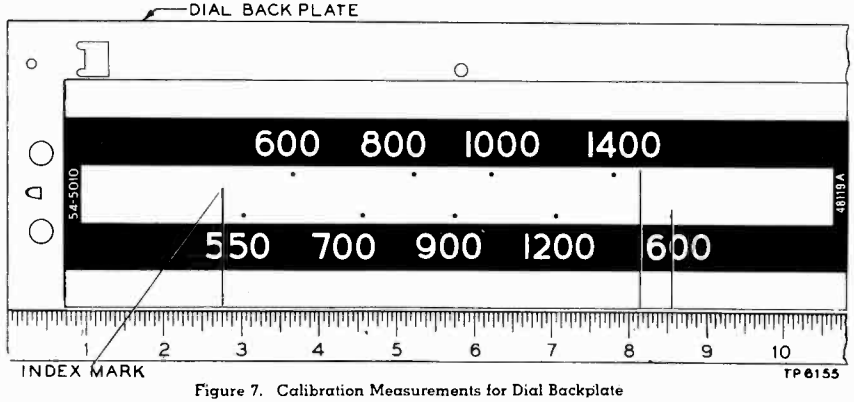


Figure 7. Calibration Measurements for Dial Backplate

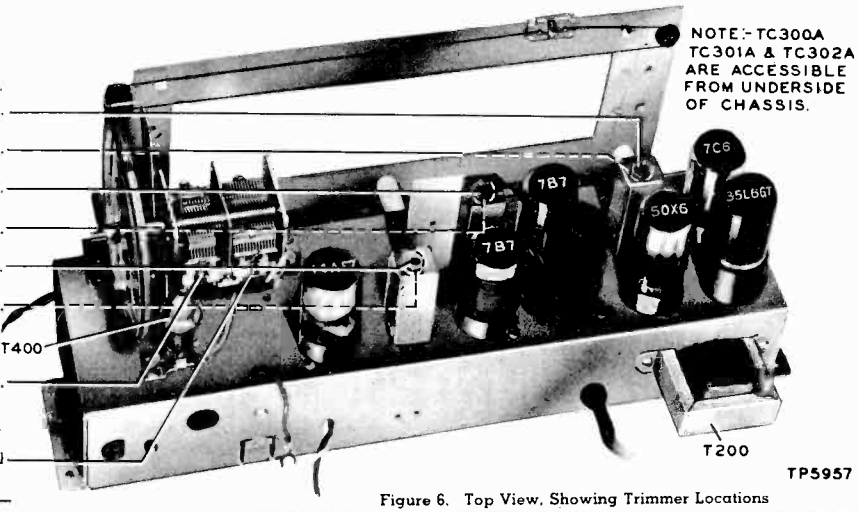


Figure 6. Top View, Showing Trimmer Locations

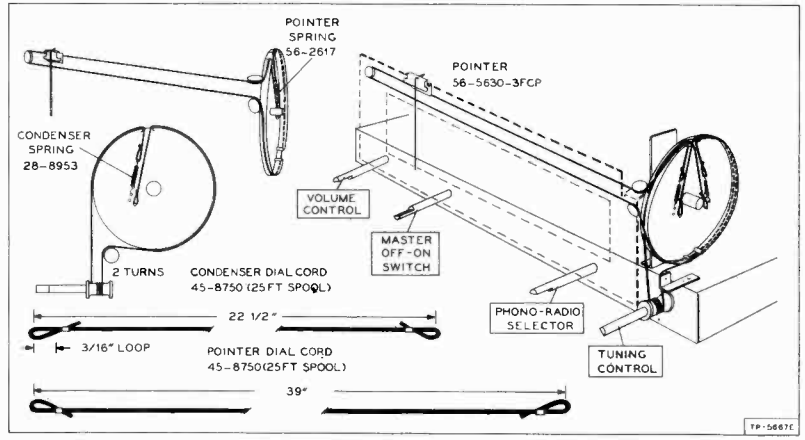
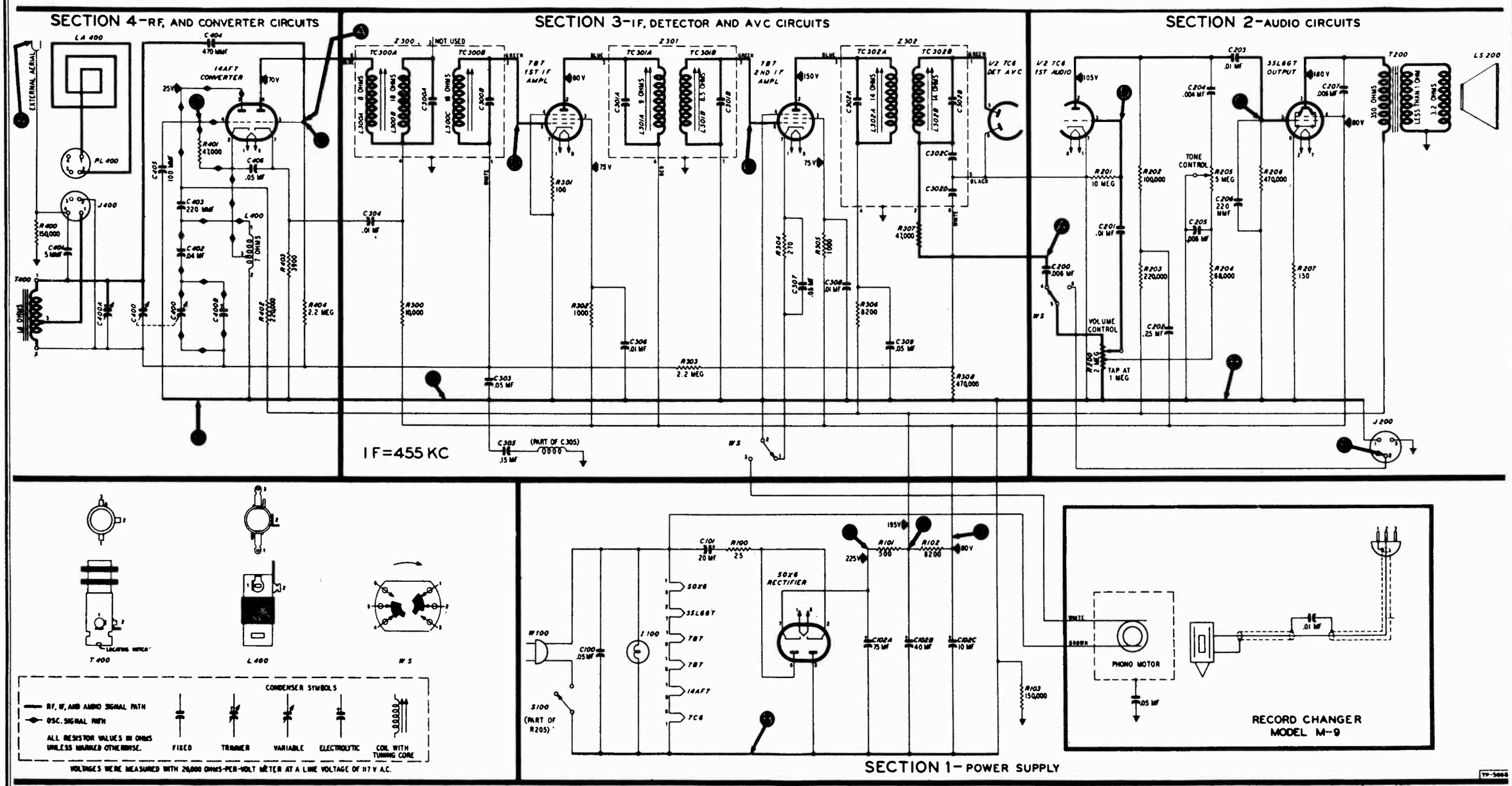


Figure 8. Drive-Cord Installation Details

MODELS 49-1602, 49-1603, 49-1604, 49-1605



RECORD CHANGER: See Philco Model M-9, Pages RCD.CH. 19-18 to RCD.CH. 19-34.

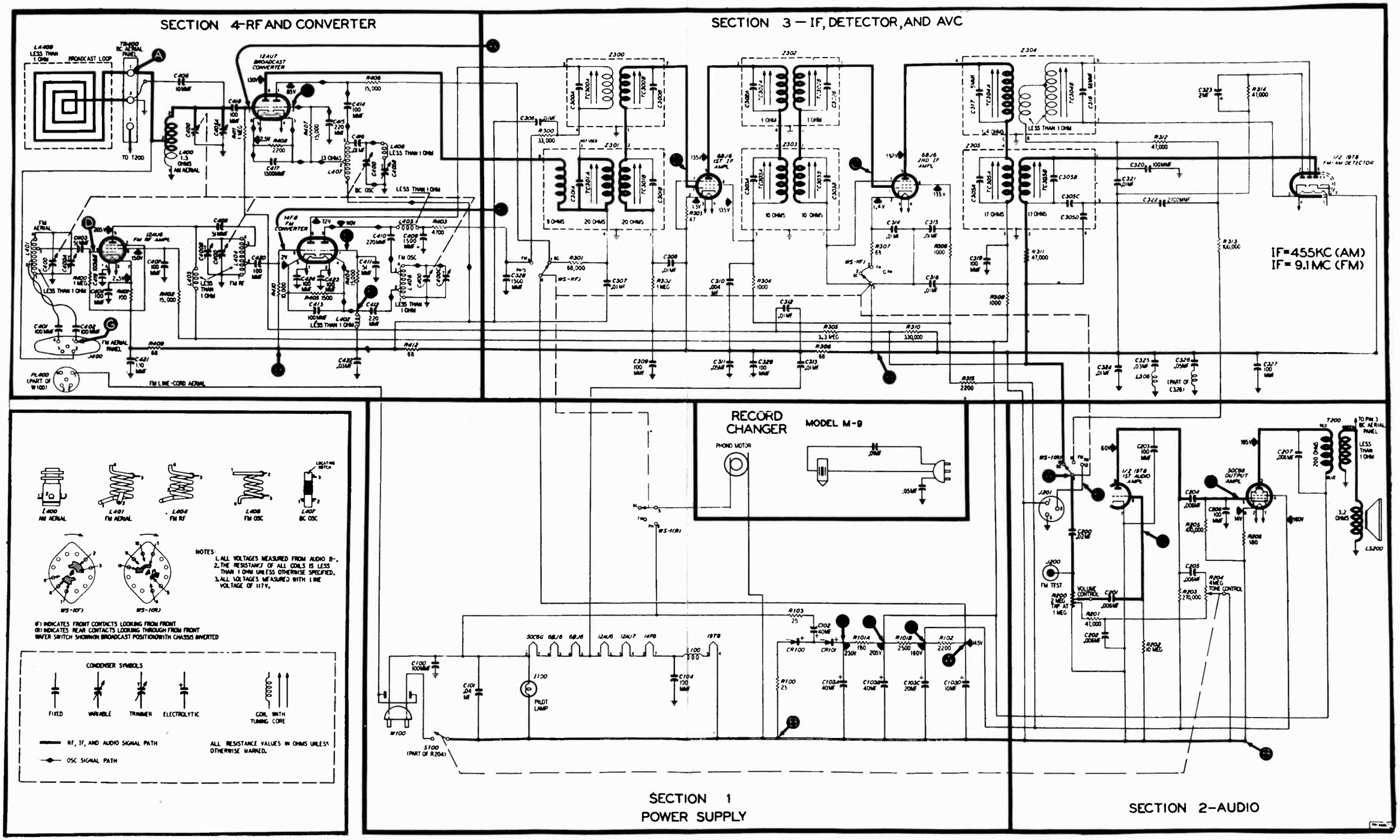
Figure 5. Philco Radio-Phonograph - - - - - - - - - - - - - - - - Sectionalized Schematic Diagram, Showing Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
3	D (Osc. test: see note below.)		Rotate through range.	Negative 1.5 to 2.5 volts.	Open: C402, C403, C405, R401, R402, L400. Shorted: C400, C400B, C402, C403, C405.
4	A	1000 kc.	1000 kc.	Same as step 1.	Open: LA400, C401, C404, T400. Shorted: C400, C400A, C404.

OSCILLATOR TESTS

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 4 of 14AF7), test point D. 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



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

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.

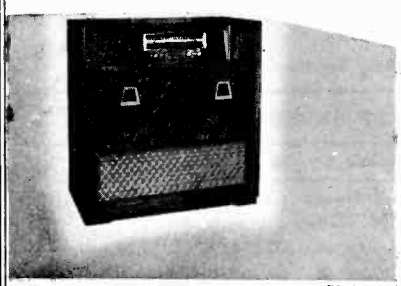
To eliminate complicated switching and to provide better stability and greater gain on both bands, separate converter tubes are used for broadcast and FM reception. A 12AU6 high-gain pentode is used in a tuned r-f amplifier on the FM band. The output of this tube is fed to the 14F8 dual triode, which 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.

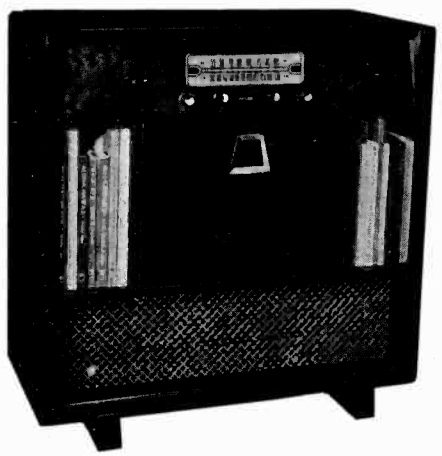
The triode section of the 19T8 functions as the first audio amplifier. The output of this stage is resistance-coupled to a 50C6G output tube, which is transformer-coupled to the permanent-magnet speaker.

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



MODEL 49-1611 TP-6233A

MODEL 49-1609 TP-6330A



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

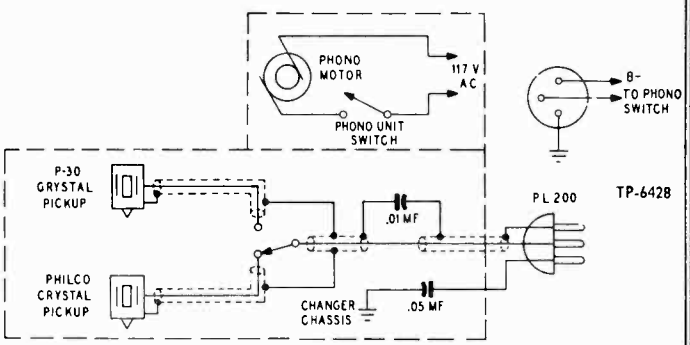
POWER CONSUMPTION:
Radio ..... 40 watts
Phonograph ..... 20 watts

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

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.



Wiring Diagram of Model M-9C Automatic Record Changer

Section 1 TROUBLE SHOOTING

POWER SUPPLY

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. Turn the tone control fully clockwise, and set the band switch to the broadcast 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.

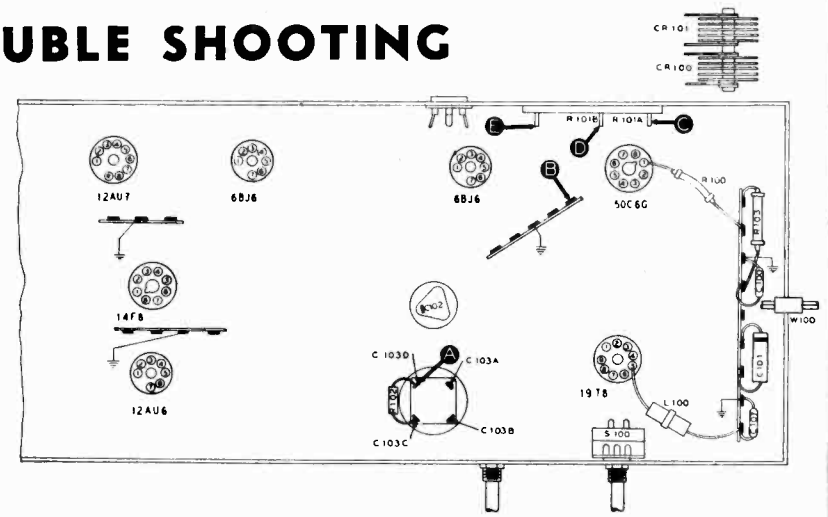


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	145v		Trouble in this section. Isolate by the following tests.
2	C	230v	No voltage.	Defective: CR100, CR101. Open: C102, W100, R103, S100. Shorted: C103A, C101, C104, C100.
			Low voltage.	Defective: CR100, CR101. Open: C103A, R100. Shorted or leaky: C103B.
			High voltage.	Open: R101A, R101B, R102.
3	D	205v	No voltage.	Open: R101A. Shorted: C103B.
			Low voltage.	Leaky: C103B. Shorted: C103C, C316*.
			High voltage.	Open: R101B, R102, R206*, T200*.
4	E	160v	No voltage.	Open: R101B. Shorted: C103C.
			Low voltage.	Leaky: C103C. Shorted: C103D, C310*, C315*.
			High voltage.	Open: R102, R315*.
5	A	145v	No voltage.	Open: R102. Shorted: C103D.
			Low voltage.	Leaky: C103C.
Listening Test: Abnormal hum may be caused by open C103A, C103B, C103C, or C103D.				

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

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.

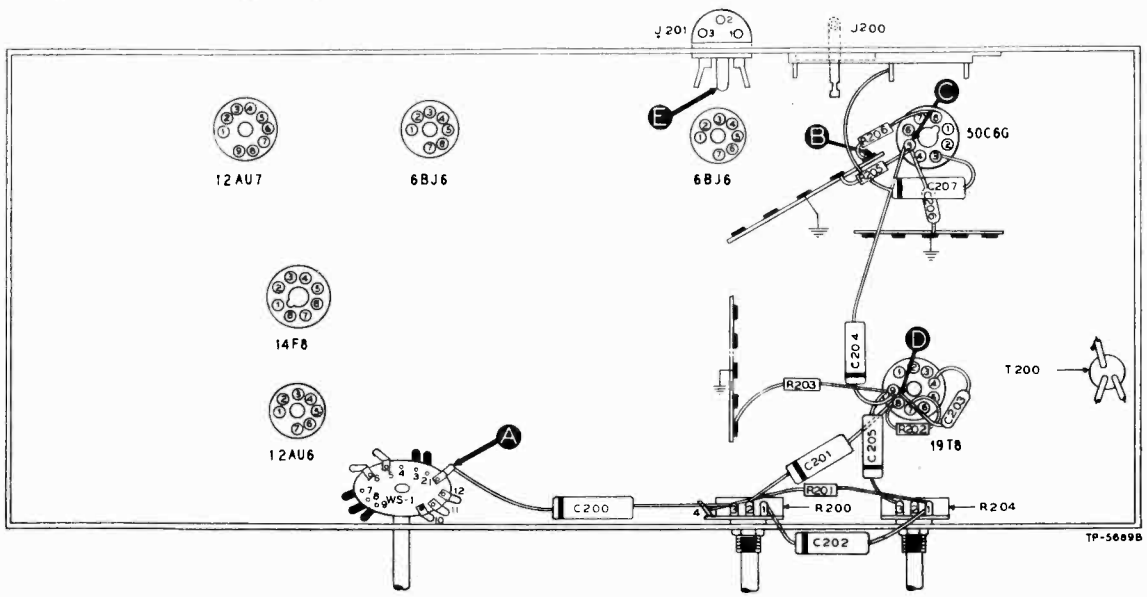


Figure 2. Bottom View, Showing Section 2 Test Points

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.

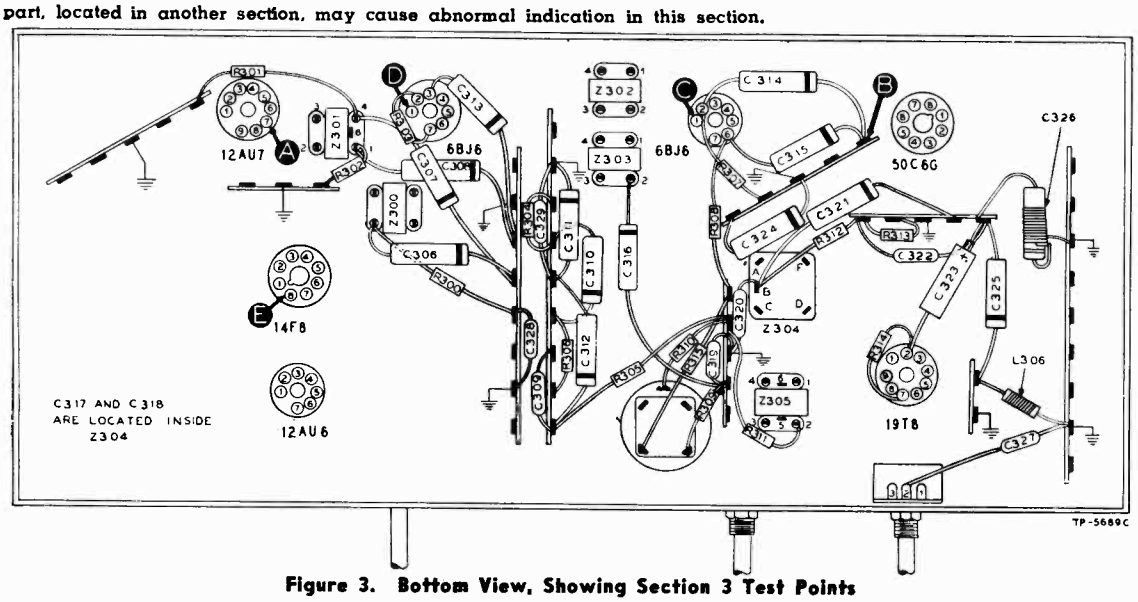


Figure 3. Bottom View, Showing Section 3 Test Points

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.

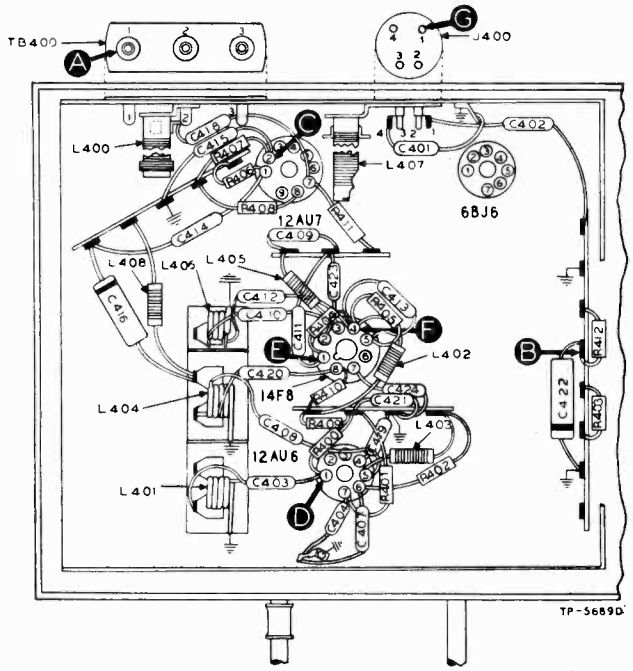


Figure 4. Bottom View, Showing Section 4 Test Points

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, R406.
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, L406, 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: C403, 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 Model 49-1611

Replacement parts are the same as those in Model 49-1606, with the exception of LA400 and the MISCELLANEOUS parts listed below.

Reference Symbol	Description	Service Part No.
LA400	Loop assembly:	
	Model 49-1609	76-3583-10
	Model 49-1611	76-3583-8

MISCELLANEOUS

Description	Service Part No.
Crystal pickup cartridge, P-30	35-2671-1
Needle for P-30 crystal	35-2670
Crystal pickup cartridge, Philco Special	35-2682
Needle for Philco Special crystal	35-2678

Model 49-1609

Description	Service Part No. Walnut-finish cabinet	Light cabinet
Cabinet (less scale)	10705B	10705C
Baffle-and-cloth assembly	40-7598	40-7598
Bezel	56-4878	56-4878
Dial scale	54-5040	54-5040
Dome (foot, 4)	45-6190	45-6190
Doors, matched set of 2	45-6434	45-6446
Door pull (2)	56-5272	56-5272-1
Hinge, knife, with stop (1)	56-5713-1	56-5713-5
Hinge, knife (3)	56-5713-3	56-5713-7
Knob (4)	54-4486	54-4486

Model 49-1611

Description	Service Part No. (Mahogany-finish cabinet)
Cabinet (less scale)	10724
Baffle-and-cloth assembly	40-7548
Bezel	56-5855
Dial scale	54-5024
Dome (foot, 4)	45-6190
Door pull (2)	56-5886
Door, record album | Door, phono | matched set	45-6466
Hinge, knife (2)	56-5522
Hinge (2)	45-6067
Instrument panel	45-6467
Knob (4)	54-4486

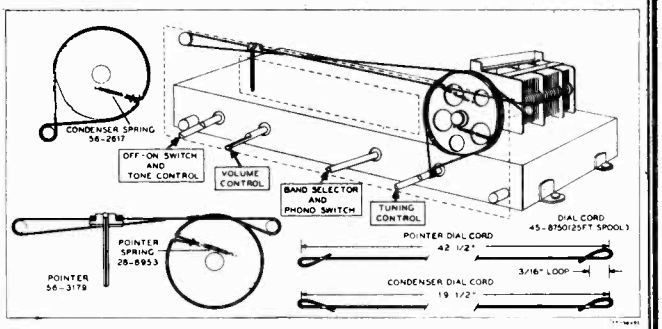


Figure 5. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

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."

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 C106
C103B	Condenser, filter, 40 mf., 250v	Part of C106
C103C	Condenser, filter, 20 mf., 250v	Part of C106
C103D	Condenser, filter, 10 mf., 250v	Part of C106
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
I100	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	L2183*
WS-1 (R)	Switch-wafer section	Part of 42-1874†

SECTION 2
AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
C200	Condenser, d-c blocking, .02 mf.	61-0108*
C201	Condenser, d-c blocking, .006 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*
J200	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	66-6103340*
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-V-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.	61-0120*
C307	Condenser, plate decoupling (AM), .01 mf.	61-0120*
C308	Condenser, a-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, a-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*
C320	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C321	Condenser, compensating, .01 mf.	61-0120*
C322	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.	61-0120*
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.	62-110009001*
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	27-6214-1
L400	Coil, AM aerial	32-4033-11
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	32-4159-1
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	76-3583-9
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	66-3103340*
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	45-6488
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)	56-3043FA15
Dial-backplate assembly	76-3918
Drive cord (25-ft. spool)	45-8750*
Fastener, snap (diffusing panel)	28-4342FA3
Panel, diffusing	54-7593
Pointer	56-5630-2
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	27-6233
Socket, minature (6BJ6)	27-6226
Socket, miniature (19T8)	27-6703-5
Socket, octal (50C6G)	27-6174-4

†42-1874 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	LS—loud-speaker	W—line cord
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.

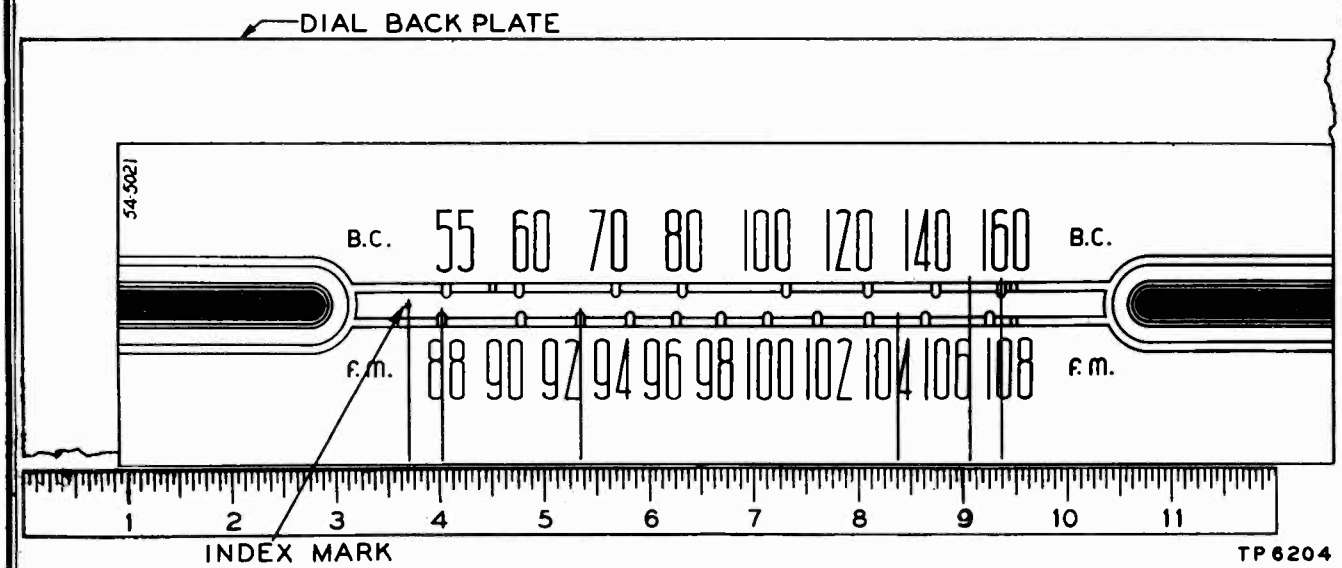


Figure 7. Dial-Backplate Calibration Measurements

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B−; output lead through .1-mf. condenser to terminal of TB400.	455 kc.	540 kc.	Adjust tuning cores once only, in order given, for maximum output.	TC305B—AM 3rd i-f sec. TC305A—AM 3rd i-f pri. — SEE NOTE TC303B—AM 2nd i-f sec. TC303A—AM 2nd i-f pri. — SEE NOTE TC301B—AM 1st i-f sec. TC301A—AM 1st i-f pri. — SEE NOTE
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust trimmer for maximum output.	C405B—AM osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C405A—AM aerial

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

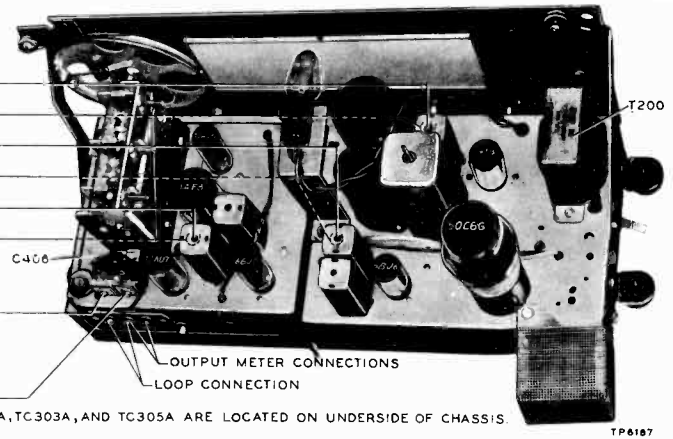


Figure 8. Top View, Showing AM Trimmer Locations

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B−; output lead through .1-mf. condenser to pin 1 of 6BJ6 (1st i-f amplifier).	9.1 mc.	88 mc.	Adjust tuning cores for maximum reading on alignment indicator. Attenuate signal generator to maintain 10-volt reading. Repeat until no further improvement is noted. After this step, do not touch any of these tuning cores except as directed in step 3.	TC304B—FM 3rd i-f sec. — SEE NOTE TC304A—FM 3rd i-f pri. — SEE NOTE TC302B—FM 2nd i-f sec. — SEE NOTE TC302A—FM 2nd i-f pri. — SEE NOTE
2	Output lead through .1-mf. condenser to pin 8 of 14F8.	9.1 mc.	88 mc.	Adjust tuning cores for maximum reading on alignment indicator. Attenuate signal generator to maintain 10-volt reading. Repeat until no further improvement is noted. After this step, do not touch these tuning cores.	TC300B—FM 1st i-f sec. — SEE NOTE TC300A—FM 1st i-f pri. — SEE NOTE
3	Same as step 2.	9.1 mc.	88 mc.	Adjust tuning core for minimum reading on output meter. This adjustment is critical; repeat to make sure it is correct.	TC304B—FM 3rd i-f sec. — SEE NOTE
4	Output lead to terminal 2 of J400.	105 mc.	105 mc.	Adjust trimmer for maximum reading on alignment indicator.	C400C—FM osc.
5	Same as step 4.	105 mc.	105 mc.	Adjust trimmer for maximum reading on alignment indicator while rocking tuning control.	C400B—FM r-f
6	Same as step 4.	105 mc.	105 mc.	Adjust trimmer for maximum reading on alignment indicator.	C400A—FM aerial
7	Same as step 4.	92 mc.	92 mc.	Adjust coil for maximum (see r-f coil note).	L406—FM osc. coil — LOCATED ON UNDERSIDE OF CHASSIS
8	Same as step 4.	92 mc.	92 mc.	Adjust coil for maximum (see r-f coil note).	L404—FM r-f coil — LOCATED ON UNDERSIDE OF CHASSIS
9	Same as step 4.	92 mc.	92 mc.	Adjust coil for maximum (see r-f coil note).	L401—FM aerial coil — LOCATED ON UNDERSIDE OF CHASSIS
10	Repeat steps 4 through 9 until no further increase is obtained.				

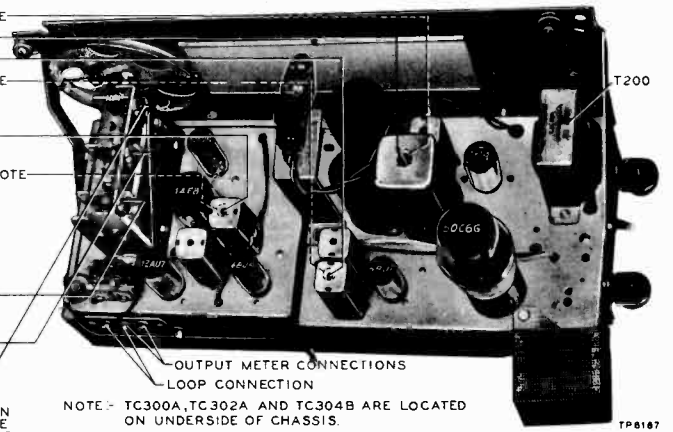


Figure 9. Top View, Showing FM Trimmer Locations

MODEL 50-520

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

1. Inspect both the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 8 of 35Z5GT), 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 1500 ohms, check condensers C101A, C101B, C101C, and C203 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.

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.

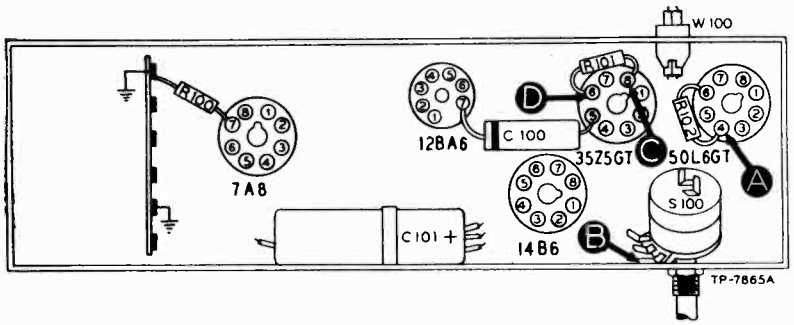


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	105 volts		Trouble in this section. Isolate by the following tests.
2	C	130 volts	No voltage	Defective: 35Z5GT. Open: W100, S100. Shorted: C100, C101A.
			Low voltage	Defective: 35Z5GT. Open: C101A. Leaky: C101A.
			High voltage	Open: R101.
3	D	118 volts	No voltage	Open: R101. Shorted: C101B.
			Low voltage	Open: C101B. Leaky: C101B. Shorted: C203*.
			High voltage	Open: R102, T200*, R204*.
4	A	105 volts	No voltage	Open: R102. Shorted: C101C.
			Low voltage	Open: C101C. Leaky: C101C.
			High voltage	Open: R204*.
Listening Test: Abnormal hum may be caused by open C101A, C101B, or C101C.				

* 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 generator. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-μf. condenser to the test points in the chart.

Set the volume control to maximum, and adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

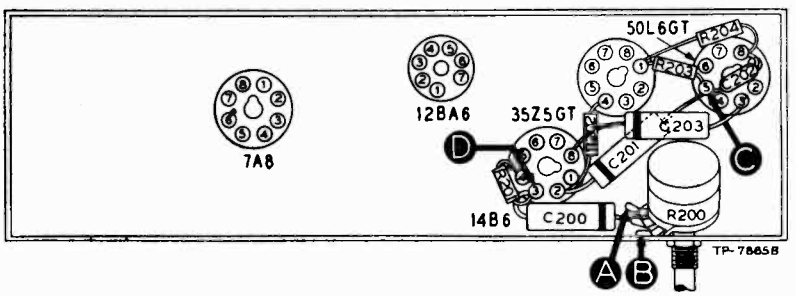


Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear output with moderate input.	Defective: 50L6GT, LS200. Open: R204, T200. Shorted: C202, C203.
3	D	Same as step 1.	Defective: 14B6 (triode section). Open: C201, R202, R203. Shorted: C201.
4	A	Same as step 1.	Open: R200 (rotate through range), C200, R201. Shorted: C301D*.

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

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-μf. condenser to the test points indicated in the chart.

Set the volume control to maximum, 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.

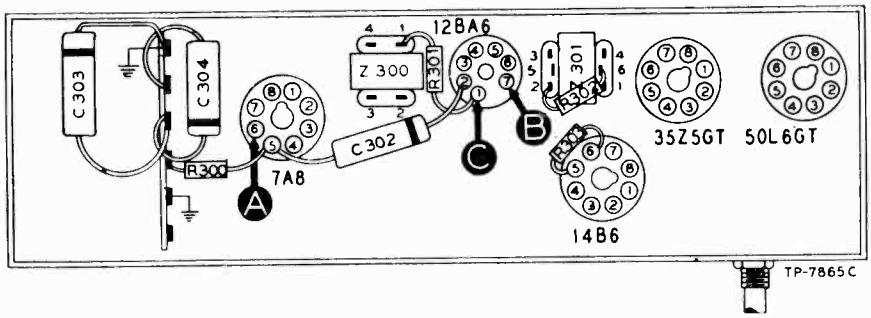


Figure 3. Bottom View, Showing Section 3 Test Points

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 dependant upon the condition of certain parts in the minor circuit. These parts are listed below under the "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with moderate input.	Defective: 12BA6, 14B6 (triode section). Misaligned: Z301. Open: C301A, C301B, L301A, L301B, R300, R302, R303. Shorted: C302, C300B, C301A, C301B, C301C.
3	A	Same as step 1.	Defective: 7A8*. Misaligned: Z300. Open: C300A, C300B, L300A, L300B, R301. Shorted: C300A, C400*, C400A*.

* 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-μf. condenser to the test points indicated in the chart.

Set the volume control to maximum, 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 this section. If the trouble is not revealed by the tests for this section, check the alignment.

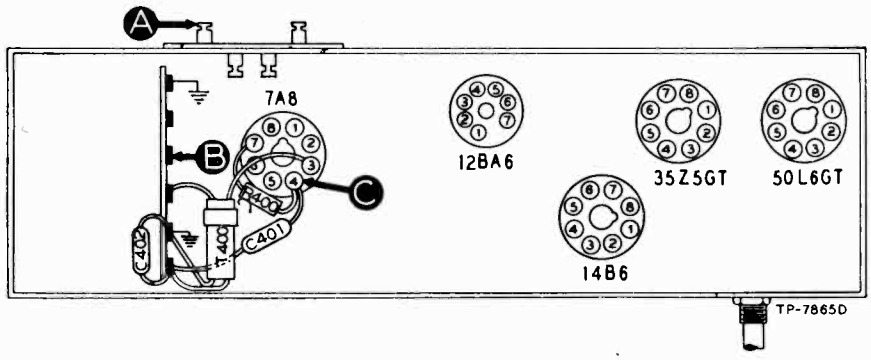


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Loud, clear speaker output with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C (Osc. test; see note below.)		Tune through range.	Negative 4.5 to 7.5 volts.	Defective: 7A8. Open: C401, T400, R400. Shorted: T400, C401, C400, C400B, C402.
3	A	1000 kc.	1000 kc.	Same as step 1.	Defective: 7A8. Open: LA400. Shorted: LA400, C400, C400A.

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 4 of 7A8), test point D. 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.

MODEL 50-520

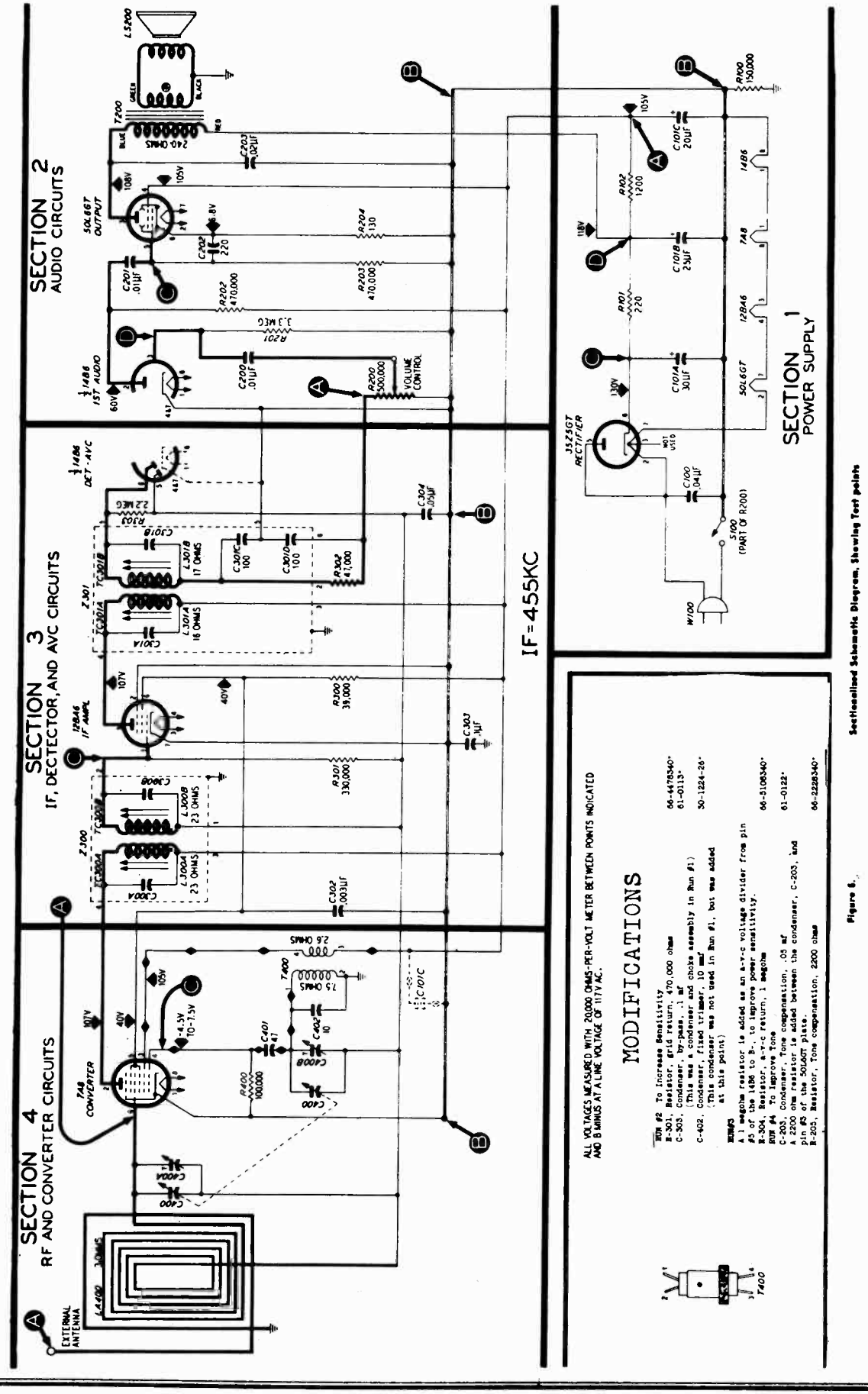


Figure 8. Sectionalized Schematic Diagram, Showing Test points

ALIGNMENT PROCEDURE

CONTROLS: Turn on radio and set volume control to maximum.

DIAL POINTER: Turn tuning condenser to full-mesh position. Set dial pointer to index mark, located to left of "55."

OUTPUT METER: Connect across voice-coil terminals.

SIGNAL GENERATOR: Connect as indicated in chart. Use modulated output.

OUTPUT LEVEL: During alignment, attenuate 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	Ground lead to B—; output lead through .1-μf. condenser to pin 6 of 7A8 converter.	455 kc.	540 kc. (gang fully meshed)	Adjust tuning cores, 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 trimmer for maximum output.	C400B—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C400A—aerial

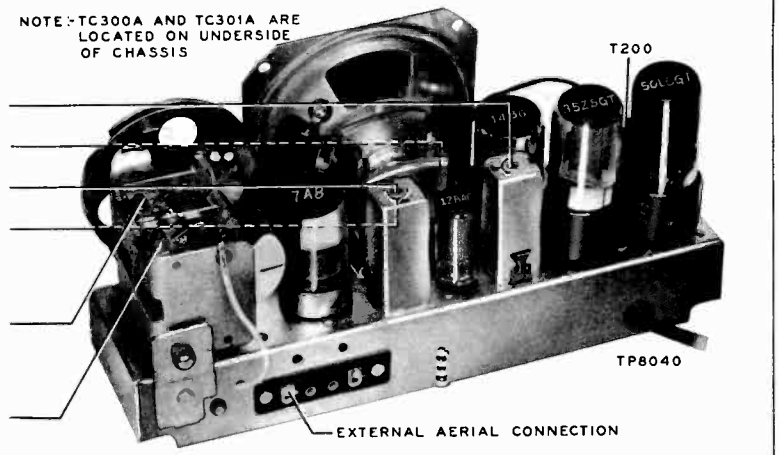


Figure 6. Top View, Showing Trimmer Locations

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

Circuit Description

Philco Radio Model 50-520 is a five-tube table-model superheterodyne, providing reception on the standard broadcast band. The high-impedance loop aerial normally provides adequate signal pickup. An external aerial may be connected, if desired, by attaching the lead to lug 4 on the rear of the chassis. Do not use a ground.

The loop is coupled to the 7A8 converter. Variable-condenser tuning is employed; the oscillator-rotor-section plates are shaped to obtain proper tracking, thus eliminating the necessity for a series padding condenser.

The 7A8 is transformer-coupled to the 12BA6 i-f amplifier, which is also transformer-coupled to the diodes of the 14B6, second detector and first audio amplifier. A-v-c voltage is applied to the control grids of both the i-f and converter tubes.

The triode section of the 14B6 is the first audio stage, and is resistance-coupled to the 50L6GT output tube. The output tube is transformer-coupled to a permanent-magnet speaker.

D-c operating voltages are obtained from a 35Z5GT half-wave rectifier, the output of which is filtered by a two-section, resistor-condenser filter. The 150,000-ohm resistor, R100, prevents hum which might otherwise occur under conditions of high humidity.

MODEL 50-520

SPECIFICATIONS

CABINET	
Model 50-520	Moulded plastic, mottled mahogany
Model 50-520I	Moulded plastic, ivory
CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	1.2 watts
OPERATING VOLTAGE	105—125 volts, a.c/d.c.
POWER CONSUMPTION	30 watts
AERIAL	High-impedance loop; provision for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5)	7A8, 12BA6, 14B6, 50L6GT, 35Z5GT

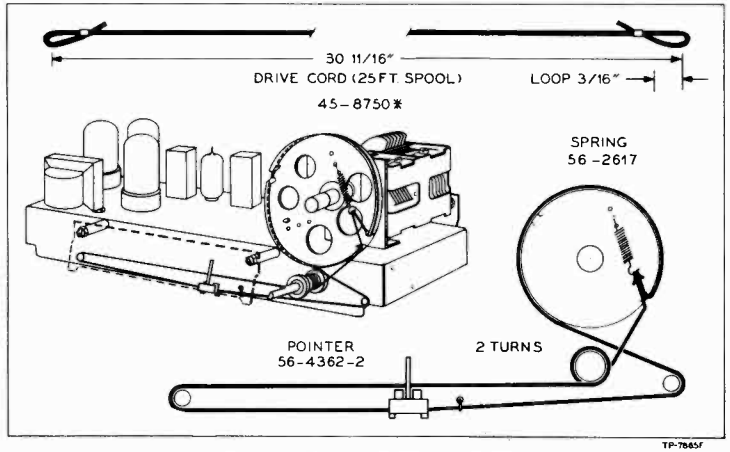


Figure 7. Drive-Cord Installation Details

MODEL 50-520

REPLACEMENT PARTS LIST

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.

SECTION 1

POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 μf.	45-3500-2*
C101	Condenser, electrolytic, 3-section	30-2573
C101A	Condenser, filter, 30 μf., 150 v.	Part of C101
C101B	Condenser, filter, 25 μf., 150 v.	Part of C101
C101C	Condenser, filter, 20 μf., 150 v.	Part of C101
R100	Resistor, leakage, 150,000 ohms	66-4158340*
R101	Resistor, filter, 220 ohms, 1 watt	66-1224340*
R102	Resistor, filter, 1200 ohms	66-2128340*
S100	Switch, off-on	Part of R200
W100	Line cord	L-2183*

SECTION 2

AUDIO CIRCUITS

C200	Condenser, d-c blocking, .01 μf.	61-0120*
C201	Condenser, d-c blocking, .01 μf.	61-0120*
C202	Condenser, by-pass, 220 μμf.	62-122001001*
C203	Condenser, tone compensation, .02 μf.	61-0108*
LS200	Speaker, p.m.	36-1627-5
R200	Volume control (with off-on switch), 500,000 ohms	33-5566-4
R201	Resistor, grid return, 3.3 megohms	66-5338340*
R202	Resistor, plate load, 470,000 ohms	66-4478340*
R203	Resistor, grid return, 470,000 ohms	66-4478340*
R204	Resistor, cathode bias, 130 ohms, 1 watt	66-1124340*
T200	Transformer, output	32-8384

SECTION 3

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

C300A	Condenser, fixed trimmer	Part of Z300
C300B	Condenser, fixed trimmer	Part of Z300
C301A	Condenser, fixed trimmer	Part of Z301
C301B	Condenser, fixed trimmer	Part of Z301
C301C	Condenser, i-f filter	Part of Z301
C301D	Condenser, i-f filter	Part of Z301
C302	Condenser, screen by-pass, .003 μf.	61-0109*
C303	Condenser, by-pass, .1 μf.	61-0113*
C304	Condenser, a-v-c by-pass, .05 μf.	61-0122*
L300A	Coil, primary, 1st i-f	Part of Z300
L300B	Coil, secondary, 1st i-f	Part of Z300

SECTION 3 *(Cont.)*

Reference Symbol	Description	Service Part No.
L301A	Coil, primary, 2nd i-f	Part of Z301
L301B	Coil, secondary, 2nd i-f	Part of Z301
R300	Resistor, screen dropping, 39,000 ohms	66-3398340*
R301	Resistor, grid return, 330,000 ohms	66-4338340*
R302	Resistor, i-f filter, 47,000 ohms	66-3478340*
R303	Resistor, diode load, 2.2 megohms	66-5228340*
TC300A	Tuning core	Part of Z300
TC300B	Tuning core	Part of Z300
TC301A	Tuning core	Part of Z301
TC301B	Tuning core	Part of Z301
Z300	Transformer, 1st i-f	32-4160-6A
Z301	Transformer, 2nd i-f	32-4240-A

SECTION 4

R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang, 2-section	31-2727-9
C400A	Condenser, trimmer, aerial	Part of C400
C400B	Condenser, trimmer, oscillator	Part of C400
C401	Condenser, d-c blocking, 47 μμf.	60-00515307*
C402	Condenser, fixed trimmer, 10 μμf.	30-1224-26*
LA400	Loop aerial	32-4052-33
R400	Resistor, grid return, 100,000 ohms	66-4108340*
T400	Transformer, oscillator	32-4263

MISCELLANEOUS

Description	Service Part No.
Cabinet, Model 50-520	10750
Cabinet, Model 50-520I	10750-1
Back	54-7777
Fastener (4)	W2235-2FA9
Knob	54-4527-11
Dial-backplate assembly	76-4658
Drive cord (25-ft. spool)	45-8750*
Drive-shaft-and-pulley assembly	76-3671-3
Pointer	56-4362-6
Spring	56-2617
Rubber mount, gang mounting (3)	27-4771-1
Socket, miniature (1)	27-6203
Socket, Loktal (2)	27-6138*
Socket, octal (2)	27-6174*

MODEL 49-1613

Circuit Description

Philco Radio-Phonograph Model 49-1613 contains an 11-tube superheterodyne and a Model M-12C Philco Automatic Record Changer.

A low-impedance loop aerial within the cabinet normally provides adequate signal pickup on the standard broadcast band. In most locations, the built-in FM dipole aerial provides satisfactory FM reception. In areas where FM signals are weak, an outdoor dipole aerial, such as Philco Part No. 45-1462, will provide additional pickup. To increase the pickup on both bands, use the Philco Aerial Coupler, Part No. 76-2353-1, with the outdoor dipole aerial. For increased pickup on the standard broadcast band only, the coupler may be used with an external aerial of the single-wire type, such as Philco Part No. 45-1494.

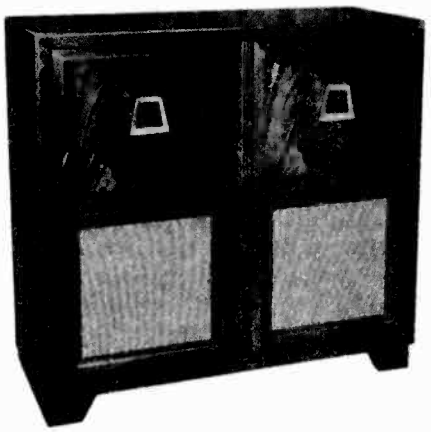
The r-f stage (FM only) and converter stage are mounted on a separate chassis, for improved performance at high frequencies. A 6AU6 high-frequency pentode is used in the r-f stage, and a 7F8 high-frequency double triode is employed as a converter.

Two transformer-coupler i-f stages are used. The transformers have two sets of windings; one set is tuned to 455 kc., for AM operation, and the other set is tuned to 9.1 mc., for FM operation. A 6BA6 high-frequency pentode is used in the first i-f stage. The pentode section of a 7R7 duo-diode, pentode functions as the second i-f amplifier; one diode of this tube is used for AM detection, while the other diode provides a.v.c.

The dual-diode section of a 7X7 is employed in the FM ratio-detector circuit; this circuit has good noise-reducing properties and an excellent tuning characteristic.

The triode section of the 7X7 functions as the first audio stage. A 6J5GT triode operates as a plate-and-cathode-loaded phase inverter, driving two 6K6GT output amplifiers, in push-pull operation. Tone fidelity is obtained by the use of inverse feedback in the audio system; feed-back voltage is taken from the secondary of the output transformer.

The Philco Electronic Scratch Eliminator, for phono operation, may be switched on or off, as required. The pentode section of a 7E7 functions as a variable shunt capacitance at the phono-input circuit; at low signal levels, a controlled portion of the higher audio frequencies is by-passed to ground. The grid bias of the reactance tube controls the effective capacitance, which



MODEL 49-1613

SPECIFICATIONS

CABINET	Wood, mahogany or light finish
CIRCUIT	11-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1720 kc.
FM	88—108 mc.
AUDIO OUTPUT	7 watts
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	
Radio	110 watts
Phonograph	125 watts
AERIALS	Built-in loop and FM cabinet dipole; external aerial also may be used
INTERMEDIATE FREQUENCIES	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES (11)	6AU6, 7F8, 6BA6, 7R7, 7X7, 6J5GT, 6K6GT (2), 7E7, 7F7, 5AZ4
PHONOGRAPH	Philco Automatic Record Changer, Model M-12C (for service information, refer to service manual PR-1600)

TP-5849

MODEL 49-1613

becomes maximum with low bias, and minimum with high bias. This control bias is developed by the audio signal itself; a proportionate amount of the signal is taken from the pickup output, amplified by each triode section of the 7F7, and rectified by the diode section of the 7E7.

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 connecting the radio to a source of power:

1. Inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance across condenser C102 (see figure 2). When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 3500 ohms, check condensers C102 and C103B for leakage or shorts.

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

Important!

To avoid altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical locations as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be changed.

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 1.

With the tuning gang fully meshed, the pointer should be adjusted on the dial-drive cord to coincide with the index mark.

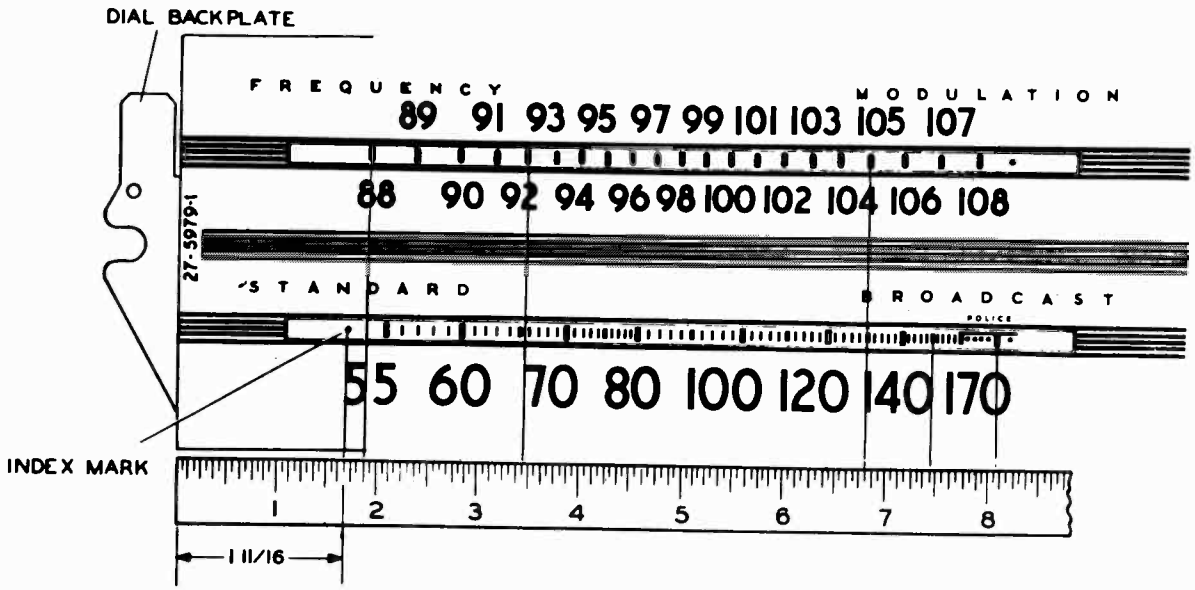


Figure 1. Dial-Backplate Calibration Measurements TP-6503

Section 1 TROUBLE SHOOTING

POWER SUPPLY

CAUTION: Do not turn on the power with the speaker disconnected, or the set may be damaged.

Make the tests for this section with a d-c voltmeter, connecting the leads between the chassis, test point C, and 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 tone control fully counterclockwise. Set the band selector-phono switch to the broadcast position.

Follow the steps in the order given. 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.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	195v		Trouble in this section. Isolate by the following tests.
2	B	300v	No voltage. Low voltage. High voltage.	Defective: 5AZ4. Open: S100, T100. Shorted: C102. Defective: 5AZ4. Shorted: C103B, C310*, C411*. Leaky: C102. Open: C102, L100. Shorted: L100. Open T200*.
3	A	195v	No voltage. Low voltage. High voltage.	Open: R100. Shorted: C103A, C311*. Leaky: C103A, C311*. Changed resistance: R100. Open: T200*
4	D	Negative 27v	No voltage. High voltage.	Open: R101. Open: R102.
Listening Test: Abnormal hum and instability may be caused by open C103A or C103B.				

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

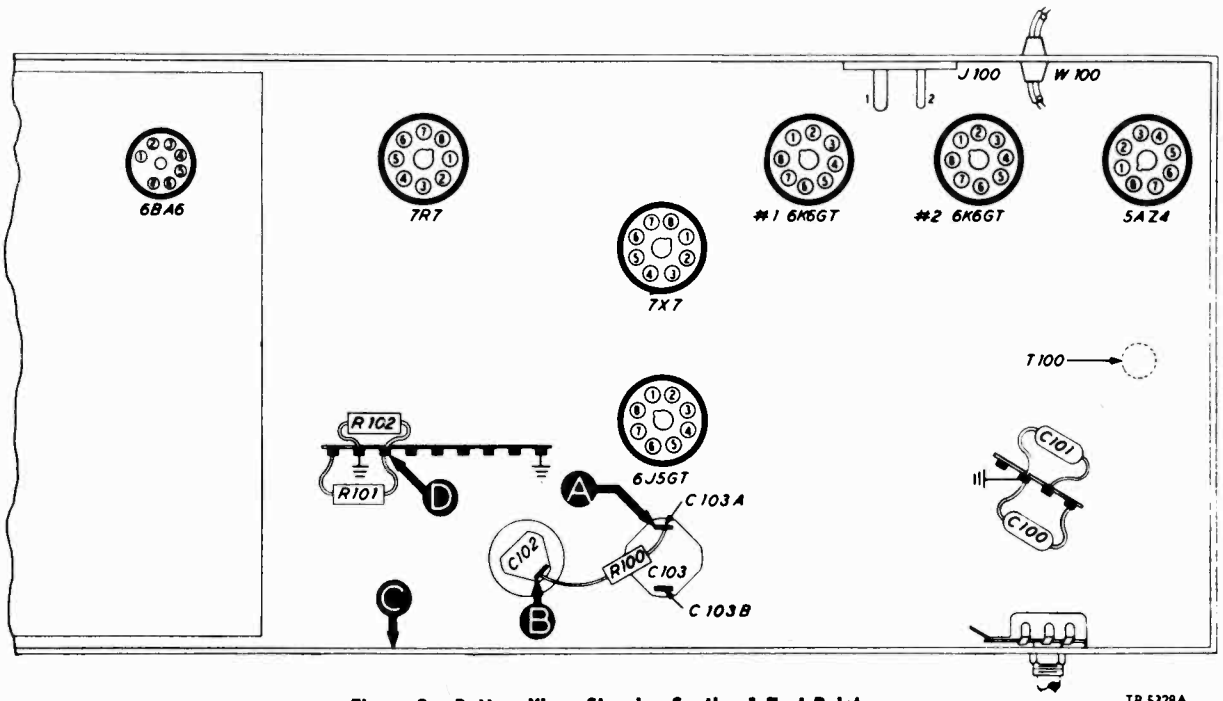


Figure 2. Bottom View, Showing Section 1 Test Points

TP-5328A

MODEL 49-1613

Section 2

TROUBLE SHOOTING

AUDIO-AMPLIFIER TESTS

AUDIO CIRCUITS

Use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully counterclockwise. Set the band (wafer) switch to the broadcast position. Make certain that the scratch-eliminator switch is turned off (two-position switch turned counterclockwise). If the "NORMAL INDICATION" is obtained in steps 1 and 6, proceed with the scratch-eliminator tests; if not, isolate and correct the trouble in the audio-amplifier circuits.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in audio-amplifier circuits. Isolate by the following tests.
2	B (Remove 6J5GT)	Clear signal with strong signal input.	Defective: 6K6GT(#1), LS200. Open: C206, R211, T200. Shorted or leaky: C206, C209.
3	D (6J5GT removed)	Same as step 2.	Defective: 6K6GT(#2). Open: C207, R212. Shorted or leaky: C207.
4	E (Replace 6J5GT)	Loud, clear signal with moderate signal input.	Defective: 6J5GT. Open: R208, R209, R207, R210. Shorted or leaky: C205, C204.
5	A	Same as step 1.	Defective: 7X7. Open: R200 (rotate through range), C202, R205, R206. Shorted: C203.
6*	F	Loud, clear signal with weak signal input.	Open: R230, WS-2(R).
Listening Test: Distortion may be caused by leaky C202, C205, C206, or C207; or by open R205, C207, C211, or C212.			

* For this step, set band (wafer) switch to phono.

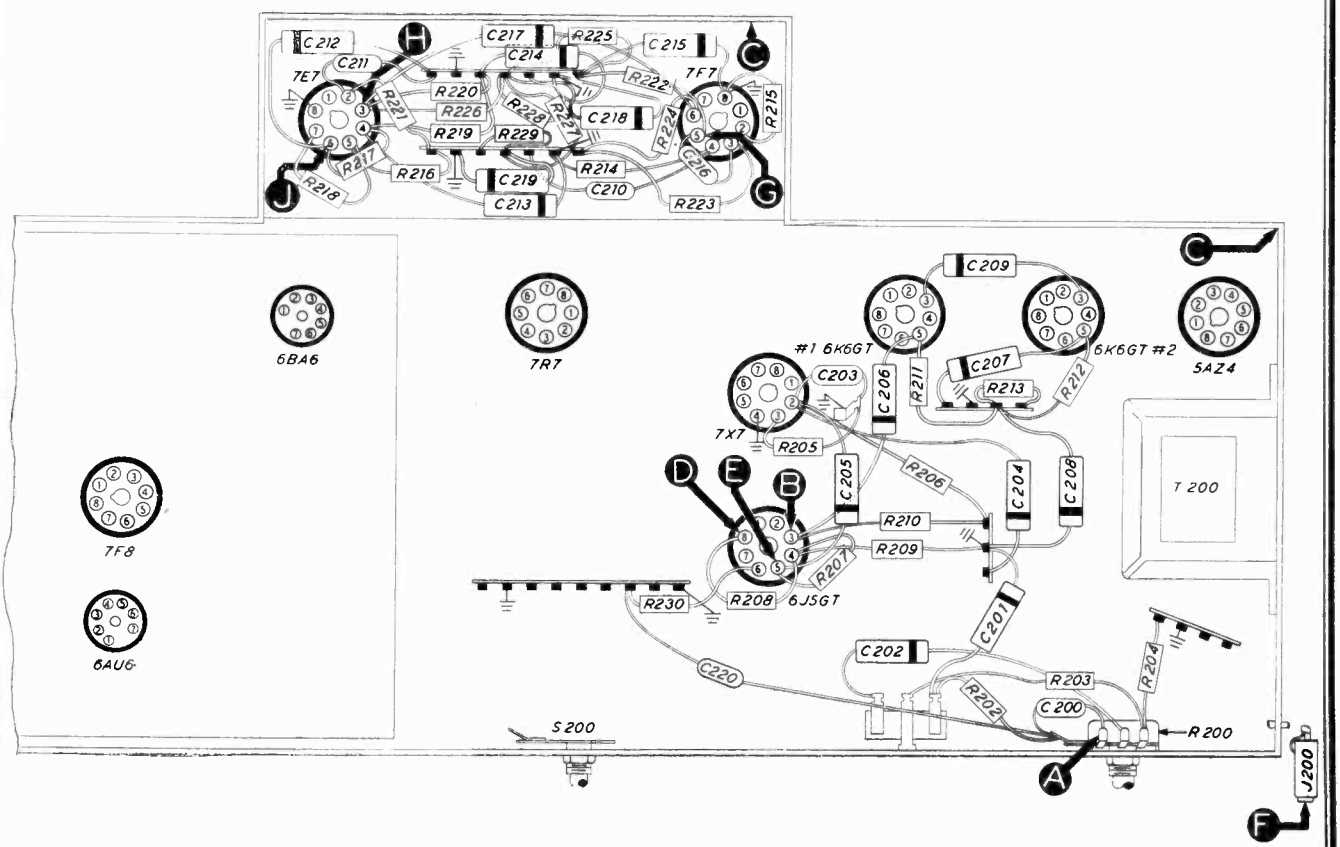


Figure 3. Bottom View, Showing Section 2 Test Points

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Section 2 (Cont.) TROUBLE SHOOTING

SCRATCH-ELIMINATOR TESTS

Set the tone control fully counterclockwise. Turn the band (wafer) switch to the phono position. For all steps except 1(b), set the volume control to maximum; for this step, adjust the volume control as directed in the chart.

Turn the scratch eliminator on or off as indicated in the chart. (The scratch eliminator is on when the two-position switch is turned clockwise.)

Connect an output meter across the *primary* of the output transformer, T200.

IMPORTANT! For all steps except step 4, use the 0—10-volt output-meter range; for step 4 only, use the 0—50-volt range. If the proper ranges are not used, erroneous readings will result.

Connect the ground lead of an audio signal generator to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the generator for 5000 cycles. Adjust the generator output as directed in the chart.

If normal operation is indicated by the tests in step 1, (a) and (b), proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in the scratch-eliminator circuits.

NOTE: For steps 2, 3, and 4, connect the positive lead of a 20,000-ohms-per-volt, d-c voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the "VOLTMETER" test points indicated in the chart.

STEP	TEST POINT	SIG. GEN. OUTPUT	VOLT-METER	SPECIAL INSTRUCTIONS	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a)	F	Adjust for 10v output-meter reading, with scratch-eliminator off.		Turn scratch eliminator on; output voltage should drop to 6.5v (approx.).	
1(b)	F	Same as for 1(a).		Reduce volume control to obtain output-meter reading of 1v. Increase generator output for output-meter reading of 10v. Turn scratch eliminator on; output voltage should not drop below 8.8v (approx.).	Trouble in scratch-eliminator circuits. Isolate by the following tests.
2	G	See SPECIAL INSTRUCTIONS.	H	With scratch eliminator on, increase generator output for voltmeter reading of 8.8v, negative; failure to obtain this value indicates trouble.	Defective: 7F7, 7E7 (diode section), WS-3(R). Open R224, R222, R226, R228, C217, S200.
3	G	Same setting which produced 8.8v reading in step 2, with scratch eliminator on.	J	With scratch eliminator on, voltage at point J should be 2v, negative.	Open: R220, R219, R217. Shorted: C213, C214, C212.
4	F	Same as step 2.	H	With scratch eliminator on, voltage at point H should be approx. 28v, negative.	Defective: 7F7. Open: C210, C216, R214, R215, R223. Shorted or leaky: C216.
5	F	Adjust for 10v output-meter reading, with scratch eliminator off.		Turn scratch eliminator on; output voltage should drop to 6.5v (approx.).	Defective: 7E7 (pentode section). Open: R221, R216, R218, C211, C212. Shorted: C211, C212.

MODEL 49-1613

Section 3

TROUBLE SHOOTING

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

AM CIRCUITS

Use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully counterclockwise. Set the band (wafer) switch to the broadcast position. Turn the tuning condensers to full-mesh position.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits, or the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in the AM circuits.

Since the circuit location of test point A for this section is in Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 7R7. Open: R309, R310, R312, L302A, L302C, L302D, R313, R314, R316, C325, C317, WS-3(R). Shorted: C317, C318, C321, C322, C323, C324, C320, C302B. Misaligned: Z302.
3	D	Loud, clear signal with moderate signal input.	Defective: 6BA6. Open: R302, R305, R308, R306, L301A, L301B, L301C, L301D, C301A, C301C, C301D. Shorted: C308, C301C, C301D, C309, C313, L301C, L301D, C300D. Misaligned: Z301.
4	A	Loud, clear signal with weak signal input.	Defective: 7F8*. Open: R406*, R405*, L406*, C300C, L300C, L300D, C300D, R300, WS-4(R), WS-4(F). Shorted: C300C, L300C, C303, C304, L300D. Misaligned: Z300.

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

FM CIRCUITS

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

Set the band (wafer) switch to the FM position, and follow the instructions preliminary to the tests for the AM circuits, with these exceptions: 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 14).

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.

Section 3 (Cont.) TROUBLE SHOOTING

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in FM circuits. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Open: L302B, C302A, C328, C329, R315, R318, C325, R317, WS-3(R). Shorted: L302A, C319, C302A, C328, L302E, C329, C330, C331, C332, C326.
3	D	Loud, clear signal with moderate signal input.	Defective: 6BA6. Open: R302, R305, C308, R306, L301A, L301B, L301C, L301D, C301A, C301C, C301D. Shorted: C308, C301C, C301D, C309, C313, L301C, L301D, C300D. Misaligned: Z301.
4	A	Loud, clear signal with weak signal input.	Open: WS-4(R), WS-4(F).

C300 IS LOCATED IN Z300

C319, C320, C328, C329 LOCATED IN Z302

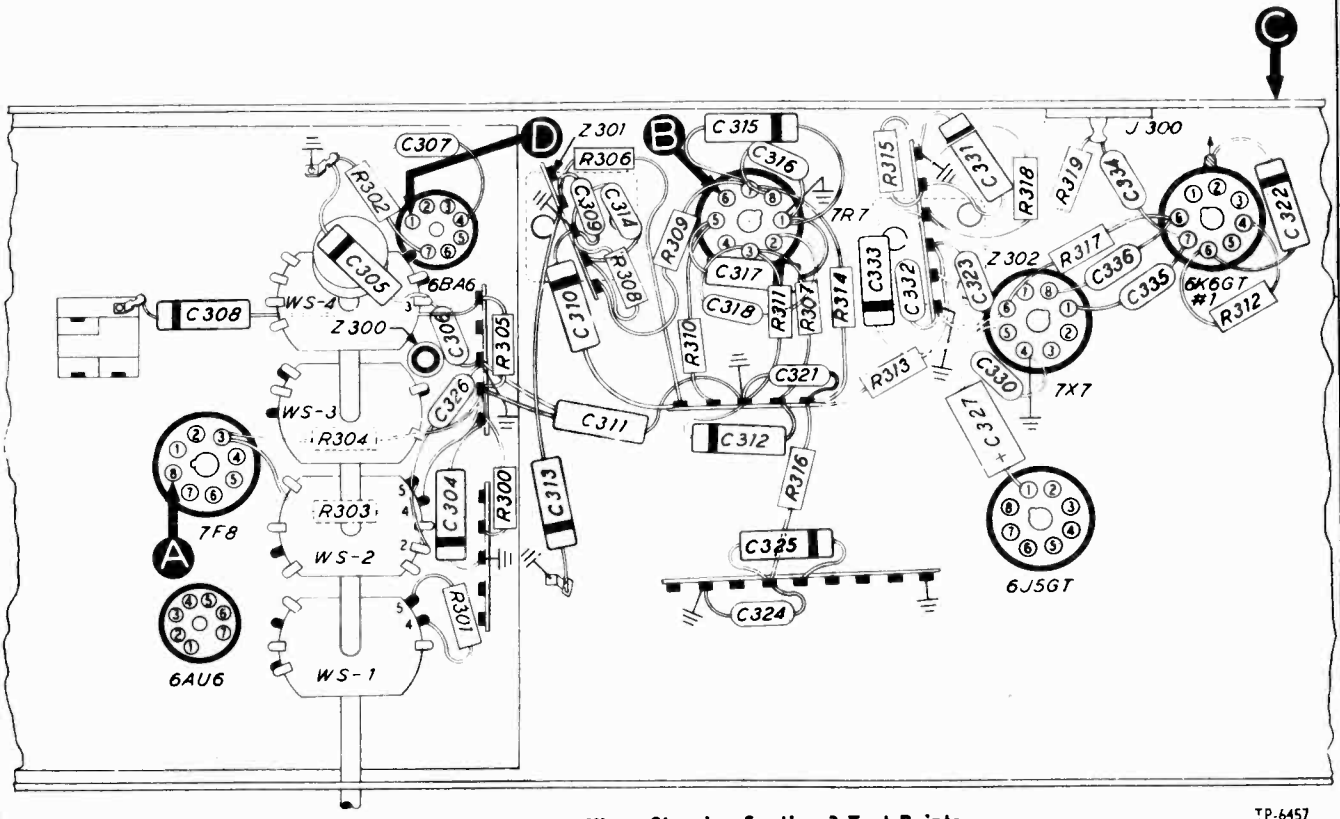

Figure 4. Bottom View, Showing Section 3 Test Points

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Section 4 TROUBLE SHOOTING

For the following tests, with the exception of the oscillator tests, use an AM r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C, and 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 tone control fully counterclockwise.

Set the band (wafer) switch, tuning control, and signal-generator frequency as indicated in the chart.

OSCILLATOR TESTS (AM AND FM CIRCUITS): Connect the positive lead of a high-resistance d-c voltmeter to the chassis, and connect the negative lead through a 100,000-ohm isolating resistor to the 7F8 oscillator grid (pin 1), test point B. Use a suitable range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltages of approximately the values given in the chart (measured with 20,000-ohms-per-volt meter), throughout the tuning range.

If the "NORMAL INDICATION" is not obtained in step 1 of both the AM and the FM test charts, isolate the trouble by following the remaining steps.

AM CIRCUITS

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Broadcast	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2 (Osc. test; see note above.)	B		Broadcast	Tune through range.	Negative 1.5v to 3.5v.	Defective: 7F8. Open: R304*, C405, C404B, C408, L404, R402, WS-2(F), WS-2(R), WS-1(F), WS-3(F), WS-3-(R). Shorted: C405, C404A, C400E, C404B, C408.
3	A	1000 kc.	Broadcast	Tune to signal.	Loud, clear signal with weak signal input.	Open: LA400, R401, L402, C402, C413, WS-1(R). Shorted: L402, C400D, C403.
Listening Test: Distortion may be caused by open R401 or R307*. Hum and instability may be caused by open C312* or R301*.						

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

FM CIRCUITS

Observe the instructions preliminary to the tests for the AM circuits, with the following exception: After tuning the signal generator and the radio to 95 mc., detune one or the other until a satisfactory test signal is obtained.

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	D	95 mc.	FM	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in FM circuits. Isolate by the following tests.

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Section 4 (Cont.) TROUBLE SHOOTING

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
2 (Osc. test: see note above.)	B		FM	Tune through range.	Negative 1v.	Defective: 7F8. Open: L403, WS-2(F), WS-2(R), WS-1(F), WS-3(F), WS-3-(R). Shorted: L403, C400C, C400H.
3	D	95 mc.	FM	Tune to signal.	Loud, clear signal with weak signal input.	Defective: 6AU6. Open: L400, L405, R400, R403, R404, C409, L401, WS-1-(R). Shorted: L400, C400A, C400F, C407, C409, C410, C411, L401, C400B, C400G.

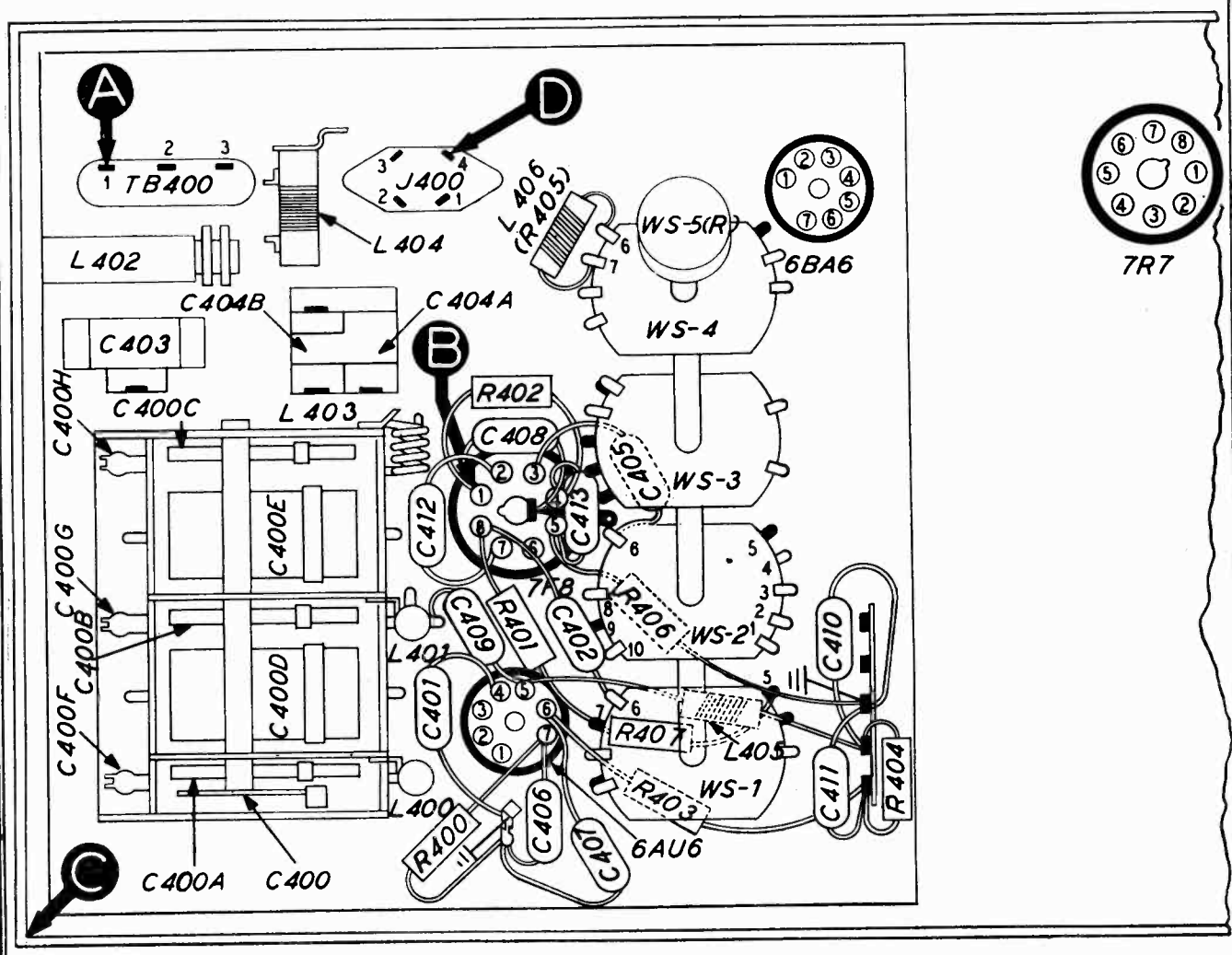


Figure 5. Bottom View, Showing Section 4 Test Points

TP-5328D

MODEL 49-1613

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 WS—wafer (band selector-phono) switch
I—pilot lamp LA—loop aerial R—resistor T—transformer Z—electrical assembly

The number of the symbol, except when the number is less than 100, designates the section in which the part is located, as follows:

100-series components are in Section 1 — the power supply
200-series components are in Section 2 — the audio circuits
300-series components are in Section 3 — the i-f amplifier, detector, and a-v-c circuits
400-series components are in Section 4 — the 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 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, .01 mf.	30-1226-1
C101	Condenser, line filter, .01 mf.	30-1226-1
C102	Condenser, electrolytic, input filter, 20 mf., 450v	30-2568-8
C103	Condenser, electrolytic, 2-section	30-2556
C103A	Condenser, filter, 10 mf., 450v	Part of C103
C103B	Condenser, filter, 25 mf., 450v	Part of C103
I100	Lamp, pilot	34-2064
I101	Lamp, pilot	34-2064
J100	Socket, phono power	27-6200
L100	Speaker, field	Part of LS200
R100	Resistor, filter, 15,000 ohms	66-3155340
R101	Resistor, bias divider, 680,000 ohms	66-4683340*
R102	Resistor, bias divider, 680,000 ohms	66-4683340*
S100	Switch, on-off	Part of R201
T100	Transformer, power	32-8248
W100	Power cord and plug	41-3755-20
WS-5 (R)	Switch-wafer section, phono power	Part of 42-1803-1†

SECTION 2
AUDIO CIRCUITS

C200	Condenser, tone compensation, 100 mmf.	60-10105407*
C201	Condenser, tone compensation, .006 mf.	45-3500-7*
C202	Condenser, d-c blocking, .006 mf.	45-3500-7*
C203	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C204	Condenser, tone control, .01 mf.	60-0120*
C205	Condenser, d-c blocking, .006 mf.	45-3500-7*
C206	Condenser, d-c blocking, .006 mf.	45-3500-7*
C207	Condenser, d-c blocking, .006 mf.	45-3500-7*
C208	Condenser, bias filter, .1 mf.	61-0113*
C209	Condenser, tone compensation, .003 mf.	61-0117*
C210	Condenser, high-pass filter, 150 mmf.	60-10155407*
C211	Condenser, reactance-feedback, 330 mmf.	60-10335407*
C212	Condenser, d-c blocking, .001 mf.	30-4620*
C213	Condenser, bias filter, .01 mf.	61-0120*
C214	Condenser, bias filter, .03 mf.	30-4517*
C215	Condenser, bias filter, .01 mf.	61-0120*
C216	Condenser, d-c blocking, 330 mmf.	60-10335407*
C217	Condenser, d-c blocking, .002 mf.	30-4622*
C218	Condenser, bias filter, .01 mf.	61-0108*
C219	Condenser, bias filter, .03 mf.	30-4517*
C220	Condenser, tone compensation, 150 mmf.	60-10155407*
J200	Phono cable and plug	41-3735-2
J201	Speaker cable and plug	41-3734-9
LS200	Speaker	36-1611-3
R200	Volume control, 2 megohms (tap at 1 megohm)	33-5535-1
R201	Tone control (with on-off switch), 6 megohms	33-5538-1
R202	Resistor, tone compensation, 33,000 ohms	66-3333340*
R203	Resistor, voltage divider, inverse feedback, 4.7 ohms	66-9473340*
R204	Resistor, voltage divider, inverse feedback, 68 ohms	66-0683340*
R205	Resistor, grid return, 10 megohms	66-6103340*
R206	Resistor, plate load, 220,000 ohms	66-4223340*
R207	Resistor, grid return, 1 megohm	66-5103340*
R208	Resistor, cathode bias, 4700 ohms	66-2473340*
R209	Resistor, cathode load, 47,000 ohms	66-3473340*

SECTION 2 (Continued)
AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
R210	Resistor, plate load, 56,000 ohms	66-3563340*
R211	Resistor, grid return, 330,000 ohms	66-4333340*
R212	Resistor, grid return, 330,000 ohms	66-4333340*
R213	Resistor, bias filter, 150,000 ohms	66-4153340*
R214	Resistor, grid return, 1 megohm	66-5103340*
R215	Resistor, cathode bias, 2200 ohms	66-2223340*
R216	Resistor, screen voltage divider, 33,000 ohms	66-3333340*
R217	Resistor, grid return, 1 megohm	66-5103340*
R218	Resistor, screen voltage divider, 33,000 ohms	66-3333340*
R219	Resistor, bias filter, 680,000 ohms	66-4683340*
R220	Resistor, bias filter, 220,000 ohms	66-4223340*
R221	Resistor, plate load, 18,000 ohms	66-3183540*
R222	Resistor, grid return, 560,000 ohms	66-4563340*
R223	Resistor, plate load, 220,000 ohms	66-4223340*
R224	Resistor, plate load, 100,000 ohms	66-4103340*
R225	Resistor, bias filter, 220,000 ohms	66-4223340*
R226	Resistor, diode load, 560,000 ohms	66-4563340*
R227	Resistor, bias filter, 1.5 megohms	66-5153340*
R228	Resistor, diode load, 220,000 ohms	66-4223340*
R229	Resistor, bias filter, 3.3 megohms	66-5333340*
R230	Resistor, low-pass filter, 47,000 ohms	66-3473340*
S200	Switch, on-off, scratch eliminator	42-1848
T200	Transformer, output	32-8274
WS-3 (F)	Switch-wafer section	Part of 42-1803-1†

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

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C300C	Condenser, shunt, 3000 mmf.	Part of Z300
C300D	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C301C	Condenser, shunt, 300 mmf.	Part of Z301
C301D	Condenser, trimmer	Part of Z301
C302A	Condenser, trimmer	Part of Z302
C302B	Condenser, trimmer	Part of Z302
C303	Condenser, d-c blocking, 6 mmf.	Part of Z300
C304	Condenser, plate by-pass, .01 mf.	61-0120*
C305	Condenser, r-f by-pass, .01 mf.	61-0120*
C306	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C307	Condenser, filament by-pass, 100 mmf.	62-110009001*
C308	Condenser, screen by-pass, .01 mf.	61-0120*
C309	Condenser, plate by-pass, 100 mmf.	62-110009001*
C310	Condenser, r-f by-pass, .01 mf.	61-0120*
C311	Condenser, r-f by-pass, .01 mf.	30-4641
C312	Condenser, a-v-c filter, .01 mf.	61-0120*
C313	Condenser, plate by-pass, .01 mf.	61-0120*
C314	Condenser, r-f by-pass, 250 mmf.	62-122001001*
C315	Condenser, cathode by-pass, .05 mf.	61-0122*
C316	Condenser, filament by-pass, 100 mmf.	62-110009001*
C317	Condenser, screen by-pass, .01 mf.	61-0120*
C318	Condenser, d-c blocking, 100 mmf.	60-10105407*
C319	Condenser, d-c blocking, 27 mmf.	Part of Z302
C320	Condenser, shunt, 470 mmf.	Part of Z302
C321	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C322	Condenser, plate by-pass, .05 mf.	61-0122*
C323	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C324	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C325	Condenser, d-c blocking, .006 mf.	45-3500-7*
C326	Condenser, r-f by-pass, 100 mmf.	62-110009001*

REPLACEMENT PARTS LIST (Continued)

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

Reference Symbol	Description	Service Part No.
C327	Condenser, electrolytic, noise suppressor (FM), 2 mf., 50v	30-2417-7
C328	Condenser, shunt, 25 mmf.	Part of Z302
C329	Condenser, shunt, 15 mmf.	Part of Z302
C330	Condenser, balancing, 7.5 mmf.	30-1224-8
C331	Condenser, tone compensation, .008 mf.	30-4112
C332	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C333	Condenser, d-c blocking, .006 mf.	45-3500-7*
C334	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C335	Condenser, filament by-pass, 100 mmf.	62-110009001*
C336	Condenser, filament by-pass, 100 mmf.	62-110009001*
J300	Test socket	27-6180
L300A	Transformer, primary (FM), 1st i-f	Part of Z300
L300B	Transformer, secondary (FM), 1st i-f	Part of Z300
L300C	Transformer, primary (AM), 1st i-f	Part of Z300
L300D	Transformer, secondary (AM), 1st i-f	Part of Z300
L301A	Transformer, primary (FM), 2nd i-f	Part of Z301
L301B	Transformer, secondary (FM), 2nd i-f	Part of Z301
L301C	Transformer, primary (AM), 2nd i-f	Part of Z301
L301D	Transformer, secondary (AM), 2nd i-f	Part of Z301
L302A	Transformer, primary (FM), 3rd i-f	Part of Z302
L302B	Transformer, secondary (FM), 3rd i-f	Part of Z302
L302C	Transformer, primary (AM), 3rd i-f	Part of Z302
L302D	Transformer, secondary (AM), 3rd i-f	Part of Z302
L302E	Transformer, winding, isolating, 3rd i-f	Part of Z302
R300	Resistor, plate dropping, 47,000 ohms	66-3473340*
R301	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R302	Resistor, cathode bias, 68 ohms	66-0683340*
R303	Resistor, plate dropping, 4700 ohms	66-2473340*
R304	Resistor, plate dropping, 33,000 ohms	66-3333340*
R305	Resistor, screen dropping, 27,000 ohms	66-3273340*
R306	Resistor, plate decoupling, 1000 ohms	66-2103340*
R307	Resistor, a-v-c filter, 3.3 megohms	66-5333340*
R308	Resistor, grid return, 2.2 megohms	66-5223340*
R309	Resistor, cathode bias, 150 ohms	66-1153340*
R310	Resistor, screen dropping, 68,000 ohms	66-3683340*
R311	Resistor, a-v-c load, 1 megohm	66-5103340*
R312	Resistor, plate decoupling, 1000 ohms	66-2103340*
R313	Resistor, i-f filter, 47,000 ohms	66-3473340*
R314	Resistor, diode load, 330,000 ohms	66-4333340*
R315	Resistor, FM detector load, 6.8 megohms	66-5683340*
R316	Resistor, isolating, 100,000 ohms	66-4103340*
R317	Resistor, noise suppressor (FM), 47,000 ohms	66-3473340*
R318	Resistor, isolating, 100,000 ohms	66-4103340*
R319	Resistor, isolating, 100,000 ohms	66-4103340*
TC300A	Tuning core	Part of Z300
TC302A	Tuning core	Part of Z302
WS-2 (F)	Switch-wafer section	Part of 42-1803-1†
WS-2 (R)	Switch-wafer section	Part of 42-1803-1†
WS-3 (R)	Switch-wafer section	Part of 42-1803-1†
WS-4 (F)	Switch-wafer section	Part of 42-1803-1†
WS-4 (R)	Switch-wafer section	Part of 42-1803-1†
Z300	Transformer, 1st i-f	32-4146
Z301	Transformer, 2nd i-f	32-4156
Z302	Transformer, 3rd i-f	32-4147

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang, 5-section	31-2703-2
C400A	Condenser, tuning, FM aerial	Part of C400
C400B	Condenser, tuning, FM r.f.	Part of C400
C400C	Condenser, tuning, FM osc.	Part of C400
C400D	Condenser, tuning, bc. aerial	Part of C400
C400E	Condenser, tuning, bc. osc.	Part of C400
C400F	Condenser, trimmer, FM aerial	Part of C400
C400G	Condenser, trimmer, FM r.f.	Part of C400
C400H	Condenser, trimmer, FM osc.	Part of C400
C401	Condenser, filament by-pass, 100 mmf.	62-110009001*
C402	Condenser, d-c blocking, 220 mmf.	62-122001001*
C403	Condenser, trimmer, bc. aerial	31-6473
C404	Condenser, trimmer assembly, 2-section	31-6476-5
C404A	Condenser, shunt trimmer, bc. osc.	Part of C404
C404B	Condenser, series padder, bc. osc.	Part of C404
C405	Condenser, d-c blocking, 220 mmf.	62-122001001*
C406	Condenser, cathode by-pass, 100 mmf.	62-110009001*
C407	Condenser, screen grid by-pass, 100 mmf.	62-110009001*
C408	Condenser, osc. grid, 100 mmf.	62-110009001*

SECTION 4 (Continued)
R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C409	Condenser, d-c blocking, 33 mmf.	30-1224*
C410	Condenser, r-f by-pass, 1500 mmf.	62-215001011
C411	Condenser, r-f by-pass, 1500 mmf.	62-215001011
C412	Condenser, filament by-pass, 100 mmf.	62-110009001*
C413	Condenser, d-c blocking, 750 mmf.	60-10755301*
J400	Socket, FM aerial	27-6214-1
L400	Coil, FM aerial	32-4158
L401	Coil, FM r.f.	32-4159
L402	Coil, bc. aerial	32-4049-3
L403	Coil, FM osc.	32-4018-2
L404	Coil, bc. osc.	32-4221
L405	Coil, r-f choke (plate of 6AU6)	32-4061-2
L406	Coil (including R405), parasitic suppressor, (plate of 7F8)	32-4157
LA400	Loop aerial assembly	76-3583-6
R400	Resistor, cathode bias, 82 ohms	66-0823340*
R401	Resistor, grid return, 2.2 megohms	66-5223340*
R402	Resistor, grid return, 15,000 ohms	66-3153340*
R403	Resistor, screen dropping, 33,000 ohms	66-3333340*
R404	Resistor, plate decoupling, 1000 ohms	66-2103340*
R405	Resistor (with coil L406), parasitic suppressor, 150 ohms	Part of L406
R406	Resistor, cathode bias, 1500 ohms	66-2153340*
R407	Resistor, a-v-c voltage divider (FM), 470,000 ohms	66-4473340*
TB400	Terminal panel, bc. aerial	38-9942
WS-1 (F)	Switch-wafer section	Part of 42-1803-1†
WS-1 (R)	Switch-wafer section	Part of 42-1803-1†
WS-2 (F)	Switch-wafer section	Part of 42-1803-1†
WS-2 (R)	Switch-wafer section	Part of 42-1803-1†
WS-3 (F)	Switch-wafer section	Part of 42-1803-1†
WS-3 (R)	Switch-wafer section	Part of 42-1803-1†
† 42-1803-1	5-section wafer switch (band selector-phono)	

MISCELLANEOUS

Description	Service Part No.
Cabinet and Cabinet Hardware	
Back, cabinet	54-7680
Baffle-and-Cloth Assembly	
For light cabinet, L.H.	40-7538-1
For light cabinet, R.H.	40-7592-1
For mahogany cabinet, L.H.	40-7538
For mahogany cabinet, R.H.	40-7592
Baffle, wood	219125
Bezel	56-4878
Bin mechanism, L.H.	76-3223-5
Bin mechanism, R.H.	76-3223-6
Bullet catch	45-6002-1
Dome (4)	45-6190
Door pull	56-4420-2
Frame assembly	76-4104
Hinge	
For light cabinet, L.H. (1)	56-5713-6
For light cabinet, R.H. (2)	56-5713-7
For light cabinet, R.H. (1)	56-5713-9
For mahogany cabinet, L.H. (1)	56-5713-8
For mahogany cabinet, R.H. (2)	56-5713-3
For mahogany cabinet, R.H. (1)	56-5713-2
Scale strap (2)	56-2234-1
Spring, bin mechanism (2)	56-4978
Strike plate	45-6003-1
Dial Scale and Scale Hardware	
Cord, drive (25-ft. spool)	45-8750*
Pointer	56-3179FCP
Scale	76-3187-1
Spring, pointer	28-8953
Escutcheon	56-5491FCP
Knob (4)	54-4486
Knob (1)	54-4338-2
Scale plate assembly	76-3187-6
Shield, pilot lamp	56-2194FA3
Socket, assembly, pilot lamp (2)	76-2109
Socket, Loktal	27-6177
Socket, Loktal (7F8)	27-6213
Socket, miniature (6BA6)	27-6226
Socket, octal	27-6174
Wafer-Switch Hardware	
Link assembly	76-2186-6
Shaft	56-3298FA11

MODEL 49-1613

ALIGNMENT PROCEDURE

When the complete AM and FM alignment is to be made, the AM alignment should be made FIRST; if AM alignment is not required, the FM alignment alone may be made.

ALIGNMENT OF AM CIRCUITS

DIAL POINTER: With tuning condensers fully meshed, dial pointer must coincide with index mark at low-frequency end of dial. (See "CALIBRATING DIAL BACKPLATE," page 2.)

OUTPUT METER: Connect between No. 3 terminal (voice-coil connection) of aerial terminal panel and chassis.

AM R-F SIGNAL GENERATOR: Connect ground lead to chassis, and output lead as indicated in chart. Use modulated output.

OUTPUT LEVEL: During alignment, signal-generator output must be attenuated to maintain radio output below 1.5 volts, as read on output meter.

CONTROLS: Set band switch to broadcast position. Set volume control to maximum, and tone control fully counterclockwise. Set signal-generator frequency and radio tuning dial as indicated in chart.

ALIGNMENT OF FM CIRCUITS

Make AM alignment (if required) first.

OUTPUT METER: Connect as for AM alignment (this meter is used only in step 3).

D-C METER: Connect 20,000-ohms-per-volt meter across 2-mf. condenser, C327, in FM-detector circuit—negative lead to pin 6 of 7X7 tube, and positive lead to chassis. Use 10-volt range.

AM R-F SIGNAL GENERATOR: Use modulated output for entire alignment. Generator must have sufficient output to give reading of approximately 9 volts on d-c meter, and signal should be attenuated during alignment to keep meter at this value. Connect generator ground lead to chassis, and output lead as indicated in chart.

VOLUME AND TONE CONTROLS: Same as for AM alignment.

RADIO BAND SWITCH, RADIO DIAL, AND SIGNAL-GENERATOR DIAL: Set as indicated in chart. Allow radio and generator to warm up for 15 minutes before starting alignment.

R-F COIL NOTE: When making the tracking adjustments, the resonance of the circuits using coils L400, L401, and L403 may be checked with a powdered-iron tuning core such as Part No. 56-6100. If the signal strength (meter reading) increases when the iron end is placed in, or near, the coil, compress the turns slightly. If the threaded brass end causes an increase in signal strength, spread the turns. Do not compress or spread the turns excessively; only a small change is required at these frequencies.

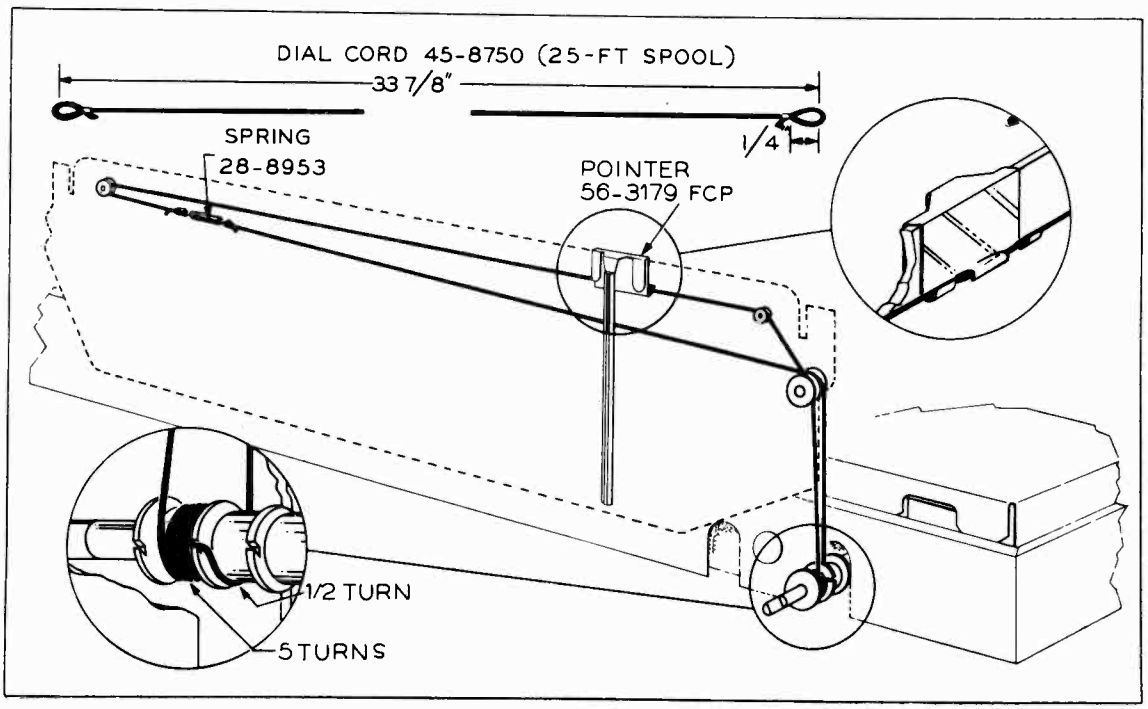


Figure 7. Drive-Cord Installation Details TP-4058E

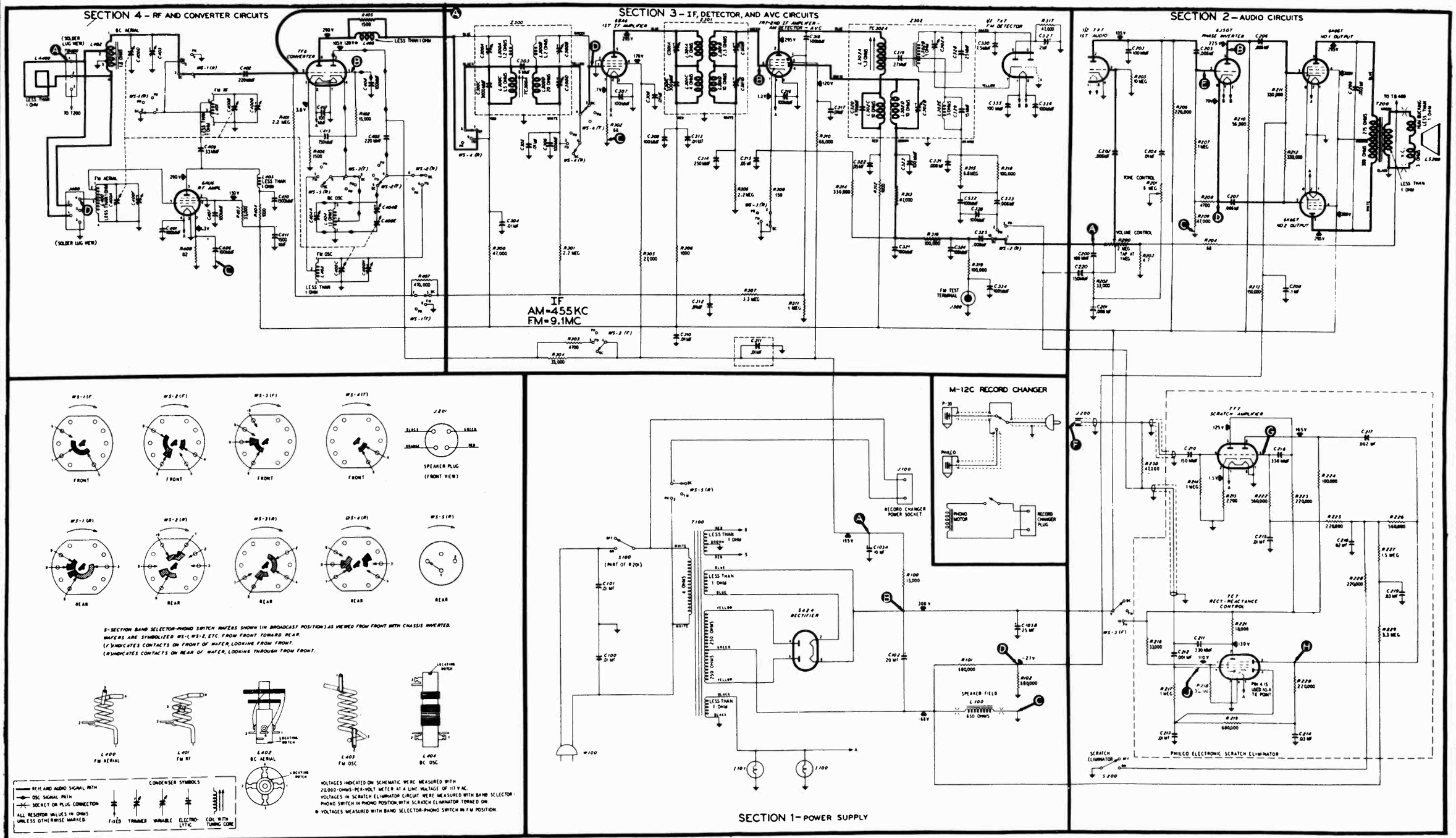


Figure 6. Philco Radio-Phonograph Model 49-1613, Sectionalized Schematic Diagram, Showing Test Points

TP-6455

RECORD CHANGER: See Philco Model M-12C, Pages RCD.CH. 19-55 to RCD.CH. 19-74.

MODEL 49-1613

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to terminal 1 of aerial terminal panel, TB400.	455 kc.	540 kc.	Adjust, in order given, for maximum output.	C302B—3rd i-f sec. C301D—2nd i-f sec. C300D—1st i-f sec. TC300A—1st i-f pri.
2	Radiating loop (see note below).	580 kc.	580 kc.	Adjust for maximum while rocking tuning control.	C404B—Osc. (series)
3	Same as step 2.	1700 kc.	1700 kc.	Adjust for maximum.	C404A—Osc. (shunt)
4	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C403—Aerial
5	Same as step 2.	580 kc.	580 kc.	Adjust for maximum while rocking tuning control.	C404B—Osc. (series)
6	Repeat steps 2, 3, and 4 until no further improvement is obtained.				

RADIATING LOOP: Make up a six-to-eight turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop.

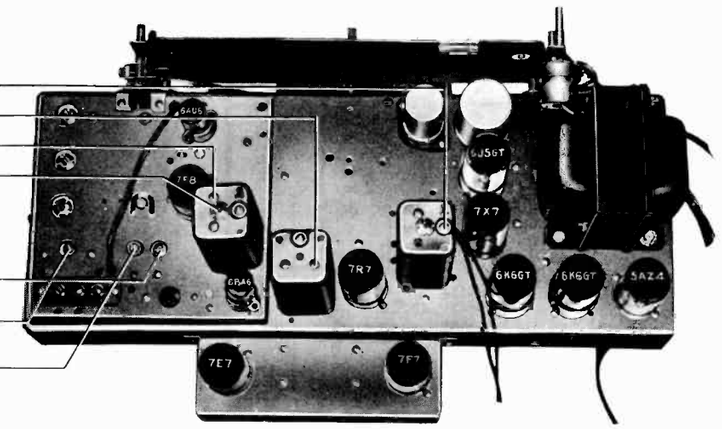


Figure 8. Top View, Showing AM Trimmer Locations

TP-5132-1

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to grid of 1st i-f ampl., 6BA6 (top plate of trimmer C300B*).	9.1 mc.	88 mc.	Adjust for maximum signal strength, as indicated by d-c voltmeter. Repeat until no further increase is obtained. After this step, do no disturb any of these settings except that of C302A, as directed in step 3.	C302A—Det. balance TC302A—Det. pri. C301B—2nd i-f sec. C301A—2nd i-f pri.
2	Through .1-mf. condenser to mixer grid (pin 8) of 7F8.	9.1 mc.	88 mc.	Adjust for maximum. After this step, do not disturb either of these settings.	C300B—1st i-f sec. C300A—1st i-f pri.
3	Same as step 2.	9.1 mc.	88 mc.	Double-check the adjustment of C302A to make certain that audio output is at minimum. Use output meter. The setting is critical; adjust carefully.	C302A—Det. balance
4	To FM aerial terminal (terminal 4 of J400).	105 mc.	105 mc.	Adjust for maximum.	C400H—Osc.
5	Same as step 4.	105 mc.	105 mc.	Adjust for maximum while rocking tuning control.	C400G—R.f.
6	Same as step 4.	105 mc.	105 mc.	Adjust for maximum.	C400F—Aerial
7	Same as step 4.	92 mc.	92 mc.	Adjust L403 for maximum (see R-F COIL NOTE above).	L403—(Osc. tracking)
8	Same as step 4.	92 mc.	92 mc.	Adjust L401 for maximum while rocking tuning control (see R-F COIL NOTE above).	L401—(R-f tracking)
9	Same as step 4.	92 mc.	92 mc.	Adjust L400 for maximum (see R-F COIL NOTE above).	L400—(Aerial tracking)
10	Repeat steps 4 through 9 until no further increase is obtained.				

FOR LOCATION SEE FIG. 5

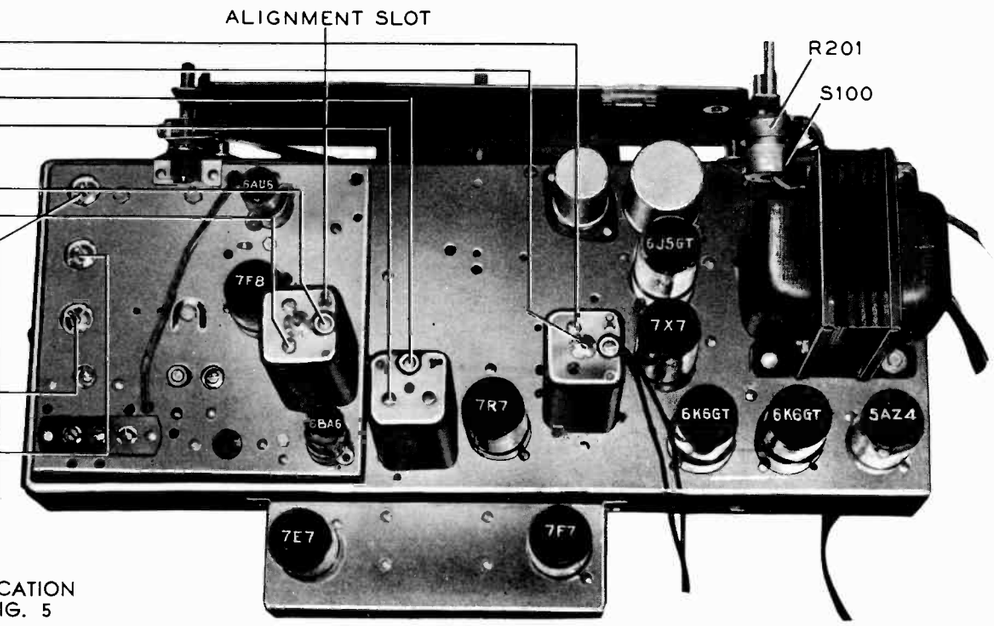


Figure 9. Top View, Showing FM Trimmer Locations

TP-5132-1

* Make this connection by sliding a piece of flattened wire solder down through alignment slot (see figure 9) in top of i-f transformer can.

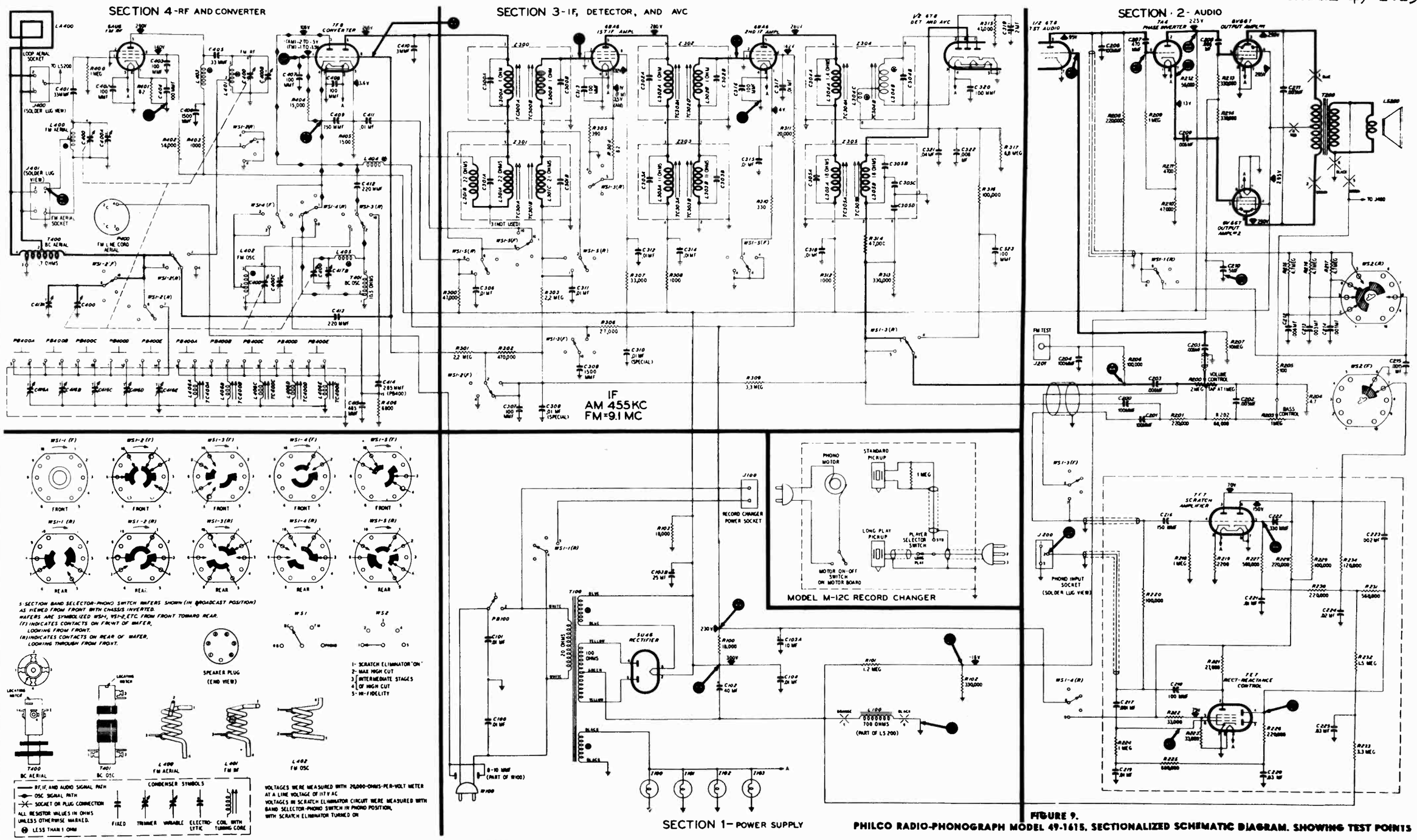


FIGURE 9.
PHILCO RADIO-PHONOGRAPH MODEL 49-1615, SECTIONALIZED SCHEMATIC DIAGRAM, SHOWING TEST POINTS

IMPORTANT!

To avoid altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical positions as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be changed.

SPECIFICATIONS

CABINET	Wood console, mahogany finish, Georgian style
CIRCUIT	11-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1620 kc.
FM	88—108 mc.
AUDIO OUTPUT	10 watts
PUSH BUTTONS	Six: Five for broadcast stations, one for power on-off
OPERATING VOLTAGE	105—125 volts, 60 cycles, a.c.
POWER CONSUMPTION	
Radio	110 watts
Phonograph	125 watts
AERIALS	Low-impedance broadcast loop; FM line-cord aerial; provision for external aerial
INTERMEDIATE FREQUENCIES	
AM	455 kc.
FM	9.1 mc.
PHONOGRAPH	Philco Automatic Record Changer and Record Player Combination, Model M-12C
PHILCO TUBES (11)	6AU6, 7F8, 6BA6(2), 6T8, 7A4, 6V6GT(2), 7E7, 7F7, 5U4G

The d-c resistance of the voice coil of LS200 is 10 ohms.

RECORD CHANGER: See Philco Model M-12C, Pages RCD.CH. 19-55 through RCD.CH. 19-74.

MODEL 49-1615

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to pin 8 of 7F8 tube.	455 kc.	Gang fully closed.	Adjust each trimmer, in order given, for maximum output. Do not repeat adjustments.	TC305B—3rd i-f sec. (SEE NOTE) TC305A—3rd i-f pri. TC303B—2nd i-f sec. TC303A—2nd i-f pri. (SEE NOTE) TC301B—1st i-f sec. TC301A—1st i-f pri. (SEE NOTE)
2	Loosely coupled with radiating loop. See note below.	1600 kc.	1600 kc.	Adjust for maximum output.	C417B—Osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output.	C417A—Aerial
4	Repeat steps 2 and 3 until no further increase in output is obtained.				

RADIATING LOOP: Make up a six-to-eight turn, 6-inch-diameter loop, using insulated wire; connect to signal generator leads and place near radio loop. Radio loop must be connected to set during alignment.

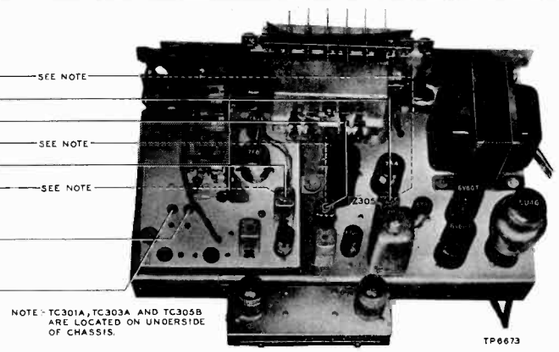


FIGURE 7. TOP VIEW, SHOWING AM TRIMMER LOCATIONS

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to pin 1 of 6BA6 2nd i-f ampl.	9.1 mc.	88 mc.	Adjust trimmers, in order given, for maximum output.	TC304B—3rd i-f sec. (SEE NOTE) TC304A—3rd i-f pri.
2	Through .1-mf. condenser to pin 1 of 6BA6 1st i-f ampl.	9.1 mc.	88 mc.	Same as step 1.	TC302B—2nd i-f sec. TC302A—2nd i-f pri. (SEE NOTE)
3	Through .1-mf. condenser to pin 8 of 7F8 converter.	9.1 mc.	88 mc.	Same as step 1.	TC300B—1st i-f sec. TC300A—1st i-f pri. (SEE NOTE)
4	To FM aerial terminal (terminal 4 of J401).	105 mc.	105 mc.	Adjust for maximum.	C400C—Osc.
5	Same as step 4.	92 mc.	92 mc.	Adjust L402 for maximum (see Note 1).	L402—Osc. tracking (SEE NOTE)
6	Same as step 4.	105 mc.	105 mc.	Adjust for maximum while rocking tuning control.	C400B—R.f.
7	Same as step 4.	105 mc.	105 mc.	Adjust for maximum.	C400A—Aerial
8	Dipole radiator (see Note 3).	92 mc.	92 mc.	Adjust L401 for maximum while rocking tuning control (see Note 1).	L401—R-f tracking
9	Same as step 8.	92 mc.	92 mc.	Adjust L400 for maximum (see Note 1).	L400—Aerial tracking
10	Repeat steps 5 through 10 until no further increase is obtained.				

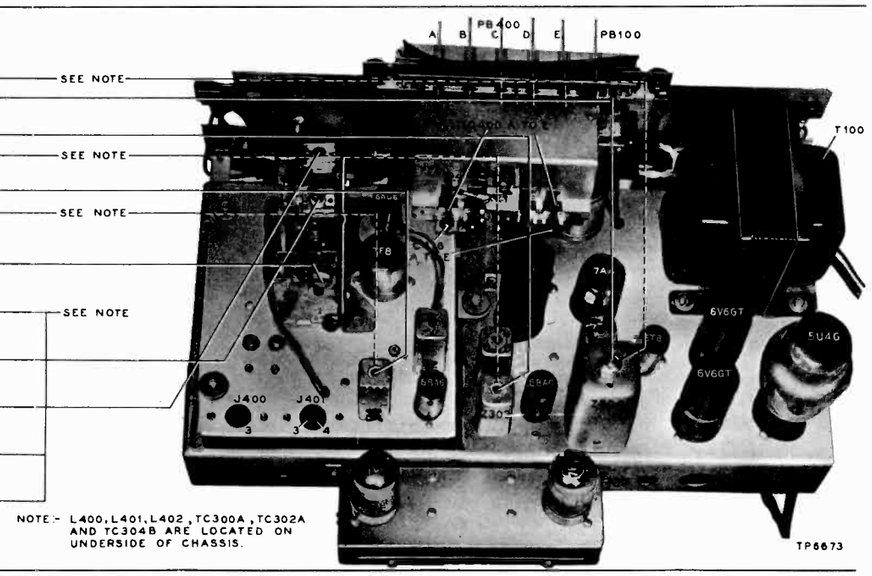


FIGURE 8. TOP VIEW, SHOWING FM TRIMMER LOCATIONS

MODEL 49-1615

CIRCUIT DESCRIPTION

Philco Radio-Phonograph Model 49-1615 consists of an 11-tube superheterodyne and a Model M-12C Philco Automatic Record Changer and Record Player (album length) Combination.

A low-impedance loop aerial within the cabinet normally provides adequate signal pickup on the standard broadcast band. In most localities, the built-in FM line-cord aerial provides satisfactory FM reception. In areas where FM signals are weak, an outdoor dipole aerial, such as Philco Part No. 45-1462, will provide additional pickup. To increase the pickup on both bands, use the Philco Aerial Coupler, Part No. 76-2353-1, with the outdoor dipole aerial. For increased signal pickup on the standard broadcast band only, use the coupler with an external aerial of the single-wire type, such as Philco Part No. 45-1494.

The r-f stage (FM only), the converter, and the 1st i-f amplifier are mounted on a separate chassis for improved operation at high frequencies. A 6AU6 high-frequency pentode is used as the FM r-f amplifier. A 7F8 high-frequency dual triode is employed as the converter. There are two transformer-coupled i-f stages using 6BA6 high-frequency pentodes. Each i-f stage has a double set of transformers; one is tuned to 9.1 mc., the FM intermediate frequency, and the other is tuned to 455 kc., the AM intermediate frequency. The use of individual transformers for FM and AM gives better stability and allows more complete shielding. In FM operation, the primary and secondary of the first AM i-f transformer are shorted out, to attenuate undesirable beat frequencies; switching of other windings is unnecessary.

The multi-purpose 6T8 provides AM and FM detection and functions as the first audio amplifier. Two diodes of this tube operate in a ratio detector circuit. The other diode acts as the AM detector and also supplies the a-v-c voltage. The triode section is the first audio amplifier for both radio and phono operation.

A 7A4 triode operates as a plate-and-cathode-loaded phase inverter, driving a pair of 6V6GT's in the push-pull output stage. Tone fidelity is obtained by the use of inverse feedback in the audio system. This feedback voltage is taken from the secondary of the output transformer and returned to the low side of the volume control.

Selective tone compensation is provided by a continuously variable bass booster and a five-step treble switch that ranges from Scratch Eliminator "on" through maximum high-cut to Hi Fidelity.

The Philco Electronic Scratch Eliminator, for phono operation, may be switched on or off, as required. In this circuit, the reactance tube (pentode section of a 7E7) functions as a variable shunt capacitance at the phono-input circuit; at low signal levels, this tube bypasses a controlled portion of the higher audio frequencies to ground. The grid bias of the reactance tube controls its effective capacitance, which becomes maximum with low bias and minimum with high bias. This control bias is developed by the audio signal itself; a proportionate amount of the signal is taken from the pickup output, amplified by each triode section of the 7F7, and rectified by the diode section of the 7E7.

MODEL 49-1615

TROUBLE SHOOTING

POWER SUPPLY

Section 1.

CAUTION: Do not turn on the power with the speaker disconnected, as this may cause damage to the set.

For the tests in this section, use a d-c voltmeter, connecting the leads between the chassis, test point C, and 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. Turn the bass control fully counterclockwise, and set the treble selector switch to the left-hand TREBLE position. Set the band switch to the broadcast 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.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	230v		Trouble in this section. Isolate by the following tests.
2	B	300v	No voltage	Defective: 5U4G. Open: T100, PB100, W100. Shorted: C100, C101.
			Low voltage	Defective: 5U4G. Open: C102, L100. Shorted: C103B, C311* C307*. Leaky: C102.
			High voltage	Open: T200*, R103. Shorted: L100.
3	A	230v	No voltage	Open: R100. Shorted: C103A, C303*.
			Low voltage	Leaky: C103A, C303*. Increased resistance: R100.
			High voltage	Open: T200*.
4	D	-16v	No voltage	Open: R101. Shorted: C210*.
			Low voltage	Leaky: C210*.
			High voltage	Open: R102.
Listening Test: Abnormal hum and instability may be caused by open C102, C103A, or C103B.				

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

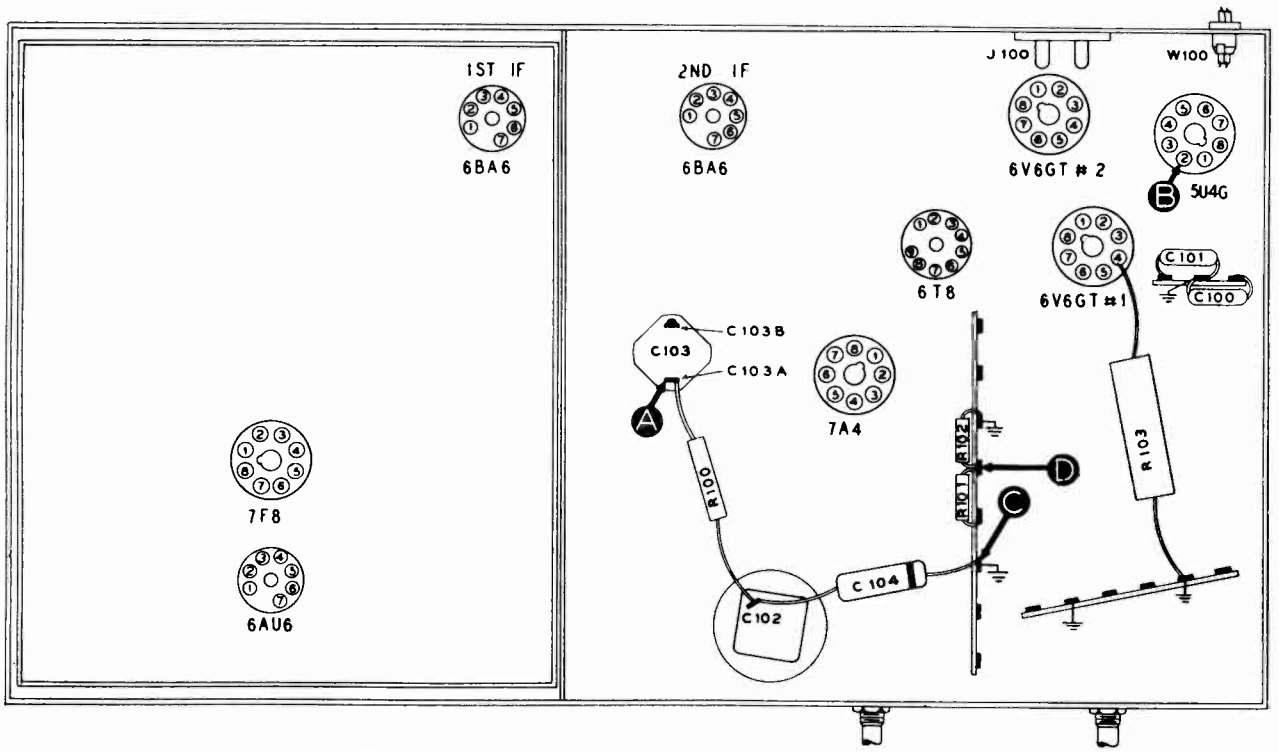


FIGURE 1. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS

MODEL 49-1615

TROUBLE SHOOTING

Section 2. AUDIO CIRCUITS

AUDIO-AMPLIFIER TESTS

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; 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 bass control fully counterclockwise. Set the treble selector switch to the second TREBLE position. Set the band switch to the broadcast position unless otherwise noted in the chart.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the scratch-eliminator circuits; if not, isolate and correct the trouble in the audio-amplifier circuits.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal input.	Trouble in audio-amplifier circuits. Isolate by the following tests.
2	B (Remove 7A4)	Clear output with strong input.	Defective: 6V6GT (#1), LS200. Open: C208, R213, T200. Shorted or leaky: C208, C210, C211,
3	D (7A4 removed)	Clear output with strong input.	Defective: 6V6GT (#2). Open: C209, R214. Shorted or leaky: C209.
4	E (Replace 7A4)	Loud, clear output with moderate input.	Defective: 7A4. Open: R209, R210, R211, R212. Shorted or leaky: C207.
5 (a)	F	Loud, clear output with weak input.	Defective: 6T8. Open: R208, C207, R207. Shorted or leaky: C206, C215, C320*.
5 (b)	F	Loud, clear output with weak input, for all 5 positions of treble selector switch.	Open: C212, C213, C214, C215, R215, R216, R217, WS2. Shorted or leaky: C212, C213, C214.
6 (a)	A	Loud, clear output with weak input.	Open: C203, C205, R204, R200 (rotate through range).
6 (b)	A	Loud, clear output with weak input, for any position of bass control.	Open: R203, R202, C202. Shorted: C202.
7	G (Band switch in Phono position)	Loud, clear output with weak input.	Open: WS1-3 (F), R220. Shorted: shielded cable.
Listening Test: Abnormal hum and distortion may be caused by leaky C207, C208, C209, or by open C206 or C210.			

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

SCRATCH-ELIMINATOR TESTS

Set the bass control fully counterclockwise. Turn the treble selector switch to the high-fidelity position, maximum clockwise. Set the band switch to the phono position. For all steps except 1(b), set the volume control to maximum; for this step, adjust the volume control as directed in the chart.

Turn the scratch eliminator on or off as indicated in the chart. (The scratch eliminator is on when the treble selector switch is in the counterclockwise position.)

Connect an output meter across the primary of the output transformer, T200.

IMPORTANT! For all steps except step 4, use the 0—10-volt output-meter range; for step 4 only, use the 0—50-volt range. If the proper ranges are not used, erroneous readings will result.

Connect the ground lead of an audio signal generator to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the generator for 5000 cycles. Adjust the generator output as directed in the chart.

If normal operation is indicated by the tests in step 1, (a) and (b), proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in the scratch-eliminator circuits.

NOTE: For steps 2, 3, and 4, connect the positive lead of a 20,000-ohms-per-volt, d-c voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the "VOLTMETER" test points indicated in the chart.

MODEL 49-1615

TROUBLE SHOOTING

AUDIO CIRCUITS (Cont.)

SCRATCH-ELIMINATOR TESTS

Section 2.

STEP	TEST POINT	SIGNAL GEN. OUTPUT	VOLT-METER	SPECIAL INSTRUCTIONS	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a)	G	Adjust for 10v output-meter reading, with scratch eliminator off.		Turn scratch eliminator on; output voltage should drop to 6.5v (approx.).	
1 (b)	G	Same as for 1 (a).		Reduce volume control to obtain output-meter reading of 1v. Increase generator output for output-meter reading of 10v. Turn scratch eliminator on; output voltage should not drop below 8.8v (approx.).	Trouble in scratch-eliminator circuits. Isolate by the following tests.
2	H	See SPECIAL INSTRUCTIONS.	J	With scratch eliminator on, increase generator output for voltmeter reading of 8.8v, negative; failure to obtain this value indicates trouble.	Defective: 7F7, 7E7 (diode section), WS1-4 (R). Open: R229, R227, R231, R234, C223, WS2 (F).
3	H	Same setting which produced 8.8v reading in step 2, with scratch eliminator on.	K	With scratch eliminator on, voltage at point K should be 2v, negative.	Open: R226, R225, R224. Shorted: C219, C220, C217.
4	G	Same as step 2.	J	With scratch eliminator on, voltage at point J should be approx. 28v negative.	Defective: 7F7. Open: C216, C222, R218, R219, R228. Shorted or leaky: C222.
5	G	Adjust for 10v output-meter reading, with scratch eliminator off.		Turn scratch eliminator on; output voltage should drop to 6.5v (approx.).	Defective: 7E7 (pentode section). Open: R221, R222, R223, C218, C217. Shorted: C218, C217.

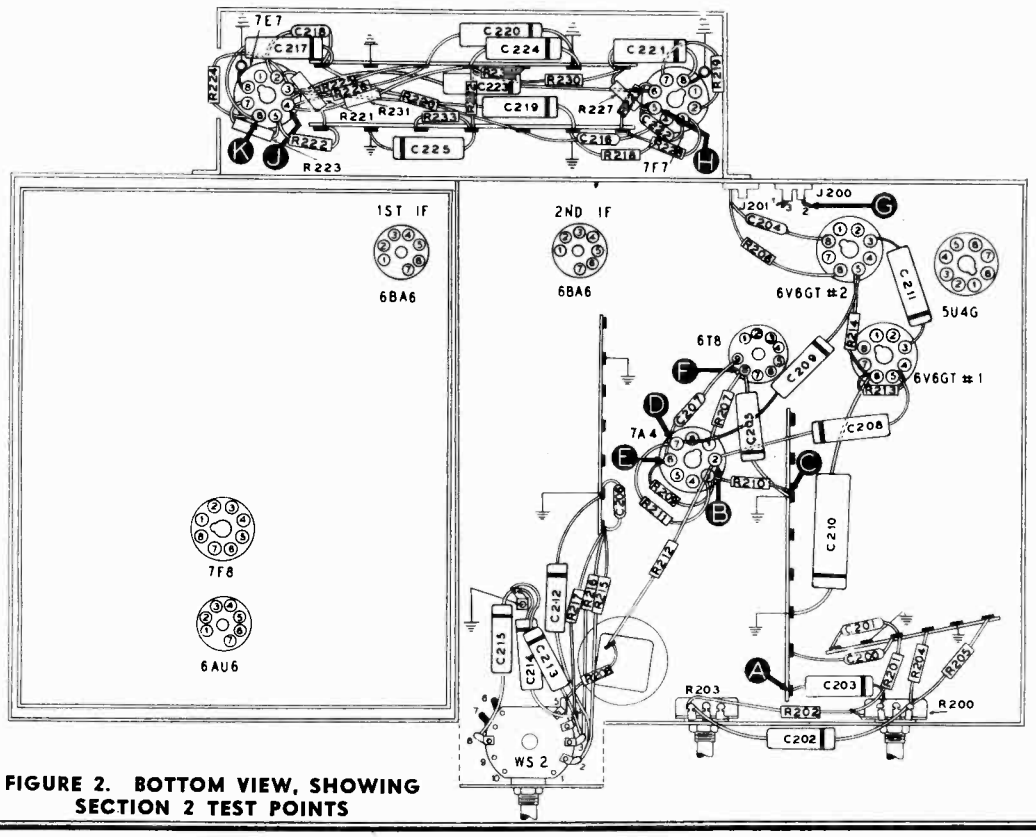


FIGURE 2. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS

TROUBLE SHOOTING

Section 3. I-F, DETECTOR, AND A-V-C CIRCUITS

AM TESTS

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 the chassis, test point C; 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 bass control fully counterclockwise. Set the treble selector switch to the second TREBLE position. Set the band switch to the broadcast 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 FM tests; if not, isolate and correct the trouble in the AM circuits.

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 signal input.	Trouble in AM i-f circuits. Isolate by the following tests.
2	B	Loud, clear output with strong input.	Defective: 6BA6 (2nd i-f ampl.), 6T8. Misaligned: Z305. Open: R310, R311, R312, R313, R314, L304A, L305B, L302B, L303B, WS1-5. Shorted: L303B, L305A, L305B. Shorted or leaky: C316, C315, C317, C318, C305A, C305B, C305C, C305D.
3	D	Loud, clear output with moderate input.	Defective: 6BA6 (1st i-f ampl.). Misaligned: Z303. Open: L300B, L301C, L302A, L302B, R303, R309, R305, R307, R308. Shorted: L303A. Shorted or leaky: C313, C312, C310, C314, C301B, C303A.
4	A	Loud, clear output with weak input.	Defective: 7F8*. Misaligned: Z301. Open: R405*, R300, R301, L300A, L301A, L301B. Shorted: L301A, L301B, L301C, WS1-5. Shorted or leaky: C410*, C411*, C409*, C301A, C301B, C306.
Listening Test: Abnormal hum may be caused by open: C306, C310, C312, C313, C314, C316, C317, C318.			

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

FM CIRCUITS

Set the band switch to FM position, and follow the instructions preliminary to the AM tests with these exceptions; 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 most satisfactory check on the operation of the discriminator circuit is the ability of the circuit to take proper alignment. See ALIGNMENT OF FM CIRCUITS.

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.

Usually, if a part is found to operate satisfactorily for AM it will also operate satisfactorily for FM.

MODEL 49-1615

TROUBLE SHOOTING

Section 3. I-F, DETECTOR, AND A-V-C CIRCUITS (Cont.)

FM TESTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal input.	Trouble in FM i-f circuits. Isolate by the following tests.
2	B	Loud, clear output with strong input.	Open: WS1-5, L304B, L304C, R315, C319, R316, R317, WS1-3. Shorted or leaky: C322, C323, C304A, C304B, C319, C321. Shorted: L304A, L304B. Misaligned: Z304.
3	D	Loud, clear output with moderate input.	Misaligned: Z302. Shorted: L302A, L302B, C302A, C302B. Open: R304, WS1-5.
4	A	Loud, clear output with weak input.	Misaligned: Z300. Shorted: L300A, L300B, C300A, C300B, C307, WS1-2. Open: WS1-2, WS1-5.

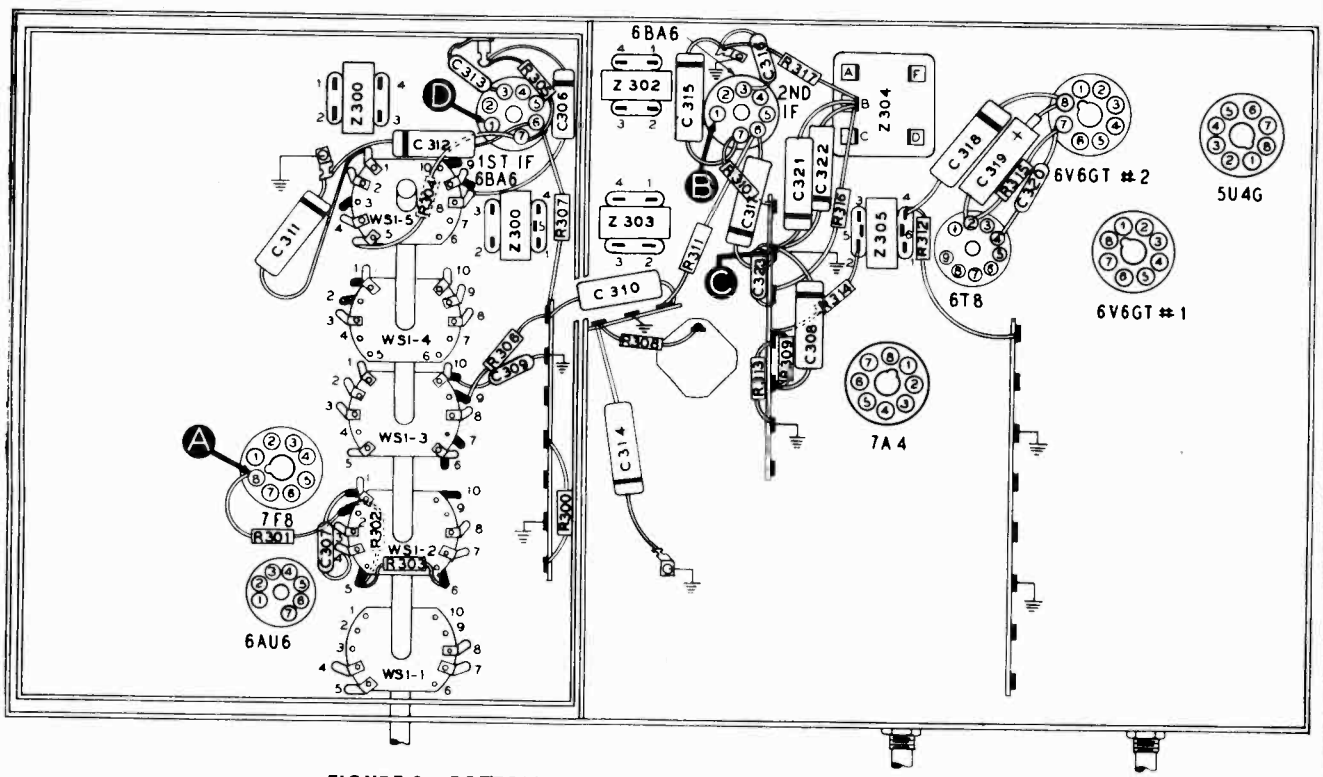


FIGURE 3. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS

TP-7673C

TROUBLE SHOOTING

Section 4. R-F AND CONVERTER CIRCUITS

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 the chassis, test point C; 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 bass control fully counterclockwise. Set the treble selector switch to the second TREBLE position. Set the band switch, tuning control, and signal-generator frequency as indicated in the chart.

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

OSCILLATOR TESTS: For the oscillator tests (steps 2 and 4 of the AM test chart, and step 2 of the FM test chart), connect the positive lead of a high-resistance voltmeter to the oscillator cathode, pin 4 of the 7F8 tube (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 the 7F8 tube (test point B). Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltages of approximately the values given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning ranges of the broadcast and FM bands.

AM TESTS

STEP	TEST POINT	SIGNAL GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a) 1 (b)	A A	1000 kc. Tune to frequency of each push-button.	BC Push-button	Tune to signal. Depress each button, in order.	Loud, clear speaker output with weak signal input.	Trouble in AM r-f circuits. Isolate by the following tests.
2 (Osc. Test.)	B to D		BC	Tune through range.	Negative 2—5 volts.	Defective: 7F8. Open: R404, T401, L405, C412, L404, R306*, WS1-3, WS1-4. Shorted: C412, C400, C417B, C407.
3	A	1000 kc.	BC	Tune to signal.	Loud, clear output with weak input.	Open: T400, WS1-2, C413. Shorted: C400, C417A.
4 (Osc. Test.)	B to D		Push-button	Depress each button, in order.	Negative 2—5 volts.	Open: L406, PB400, R406, WS1-3, WS1-4. Shorted: C414, C415.
5	A	Tune to frequency of each push-button.	Push-button	Depress each button, in order.	Loud, clear output with weak input.	Open: WS1-2, PB400. Shorted: C416.
Listening Test: Distortion may be caused by open R301*, R302*, or R309*. Hum and distortion may be caused by open C308* or C310*.						

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

FM TESTS

STEP	TEST POINT	SIGNAL GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	E	95 mc.	FM	Tune to signal.	Loud, clear speaker output with weak signal input.	Trouble in FM r-f circuits. Isolate by the following tests.
2 (Osc. Test.)	B to D		FM	Tune through range.	Negative 1—1.5 volts.	Defective: 7F8. Open: L402, WS1-3, WS1-4. Shorted: C400, C400C, C309*. Shorted or leaky: C407, C409.
3	E	95 mc.	FM	Tune to signal.	Loud, clear output with weak input.	Defective: 6AU6. Open: L400, C401, R400, R401, R402, R403, L403, C405, L401. Shorted: C400, C400A, L400, L401, WS1-2, C400B. Shorted or leaky: C402, C404, C403, C405, C406.
Listening Test: Hum and distortion may be caused by open C402, C406, C408, C409.						

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

MODEL 49-1615

TROUBLE SHOOTING

R-F AND CONVERTER CIRCUITS (Cont.)

SETTING THE PUSH BUTTONS

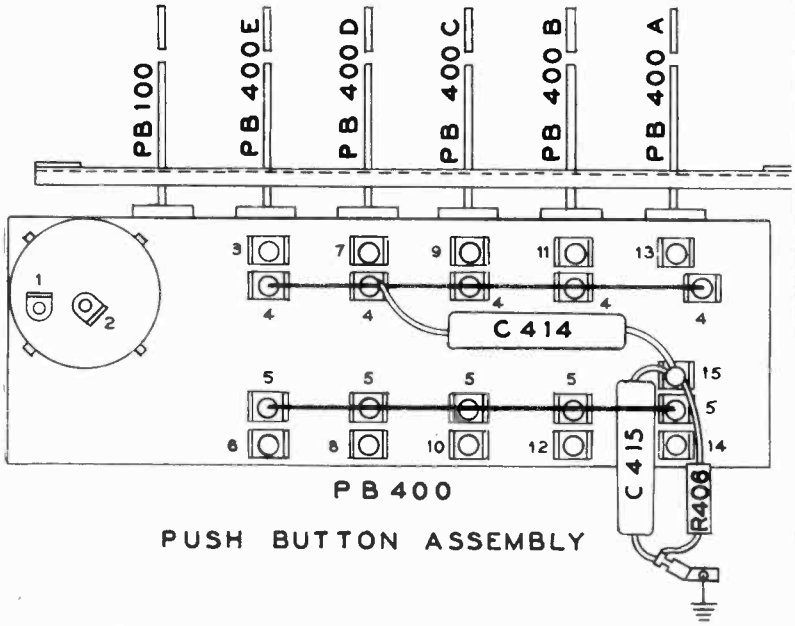
1. Connect the output meter between the No. 3 pin of the aerial input jack, J400, and the chassis. See figure 8.

2. Turn the volume control to maximum, and the bass control fully counterclockwise. Turn the treble selector switch fully clockwise. Set the band switch to the push-button position.

3. Couple the signal generator loosely to the loop aerial (see RADIATING LOOP note under AM ALIGNMENT CHART).

4. Turn on the power, and allow the radio to warm up for 15 minutes before starting the adjustments.

5. Starting with the lowest frequency desired, set the signal generator to the frequency (modulation on), push the station-selector push button, and adjust the associated oscillator tuning core and aerial trimmer condenser (marked on rear of chassis) for maximum indication on the output meter.



6. Reset the signal-generator frequency, and repeat the procedure for each remaining station-selector push button.

7. Turn off the signal generator, and make a final adjustment of all tuning cores and trimmer condensers while listening to the stations for which the adjustments are being made.

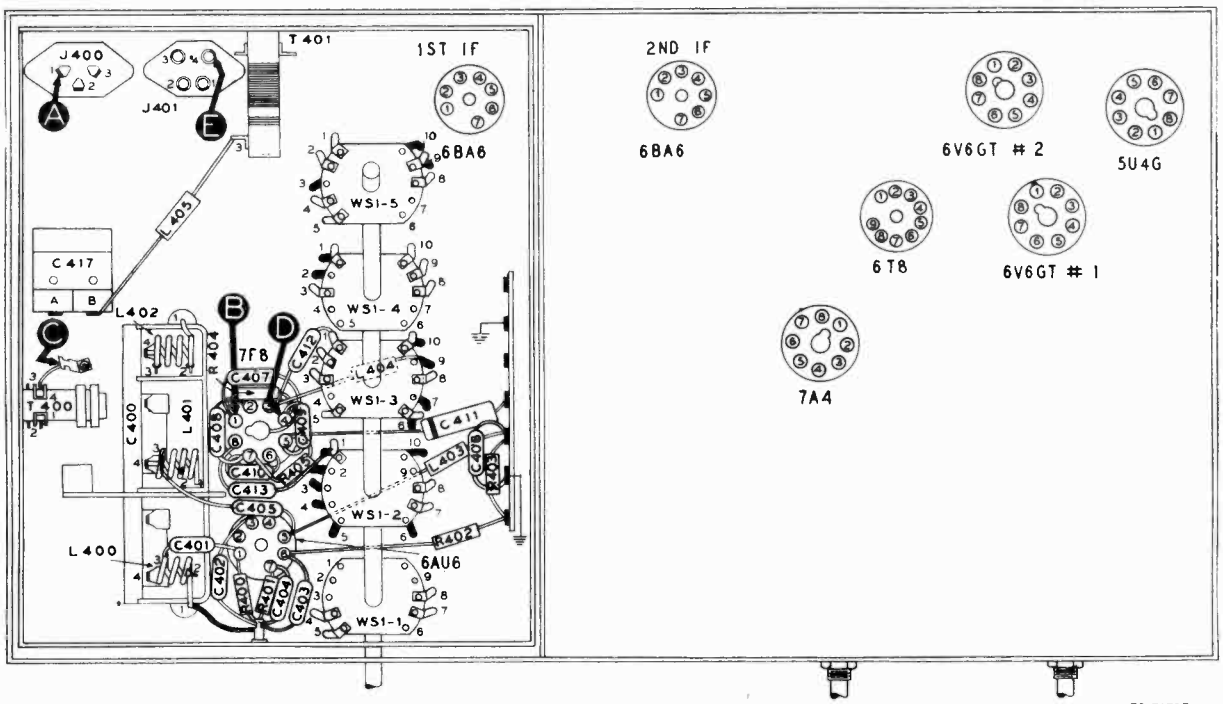


FIGURE 4. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS

MODEL 49-1615

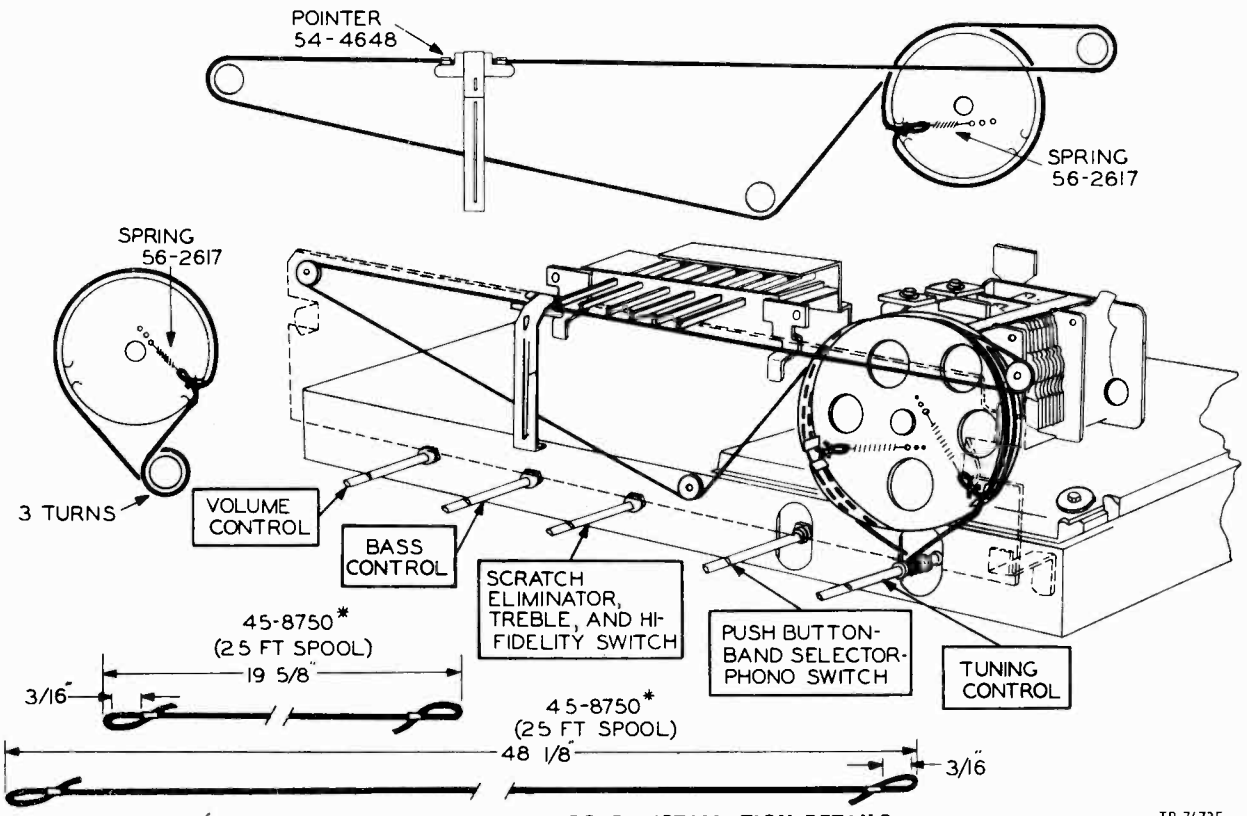


FIGURE 5. DRIVE-CORD INSTALLATION DETAILS

TP-7673F

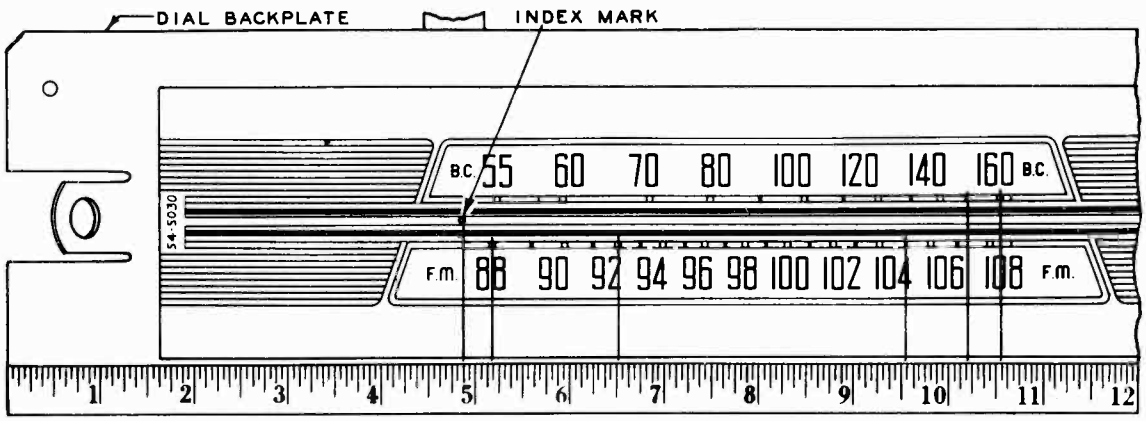


FIGURE 6. DIAL-BACKPLATE CALIBRATION MEASUREMENTS

TP-7088

CALIBRATING DIAL BACKPLATE

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

The method of measuring for these points is illustrated in figure 6. Hold a ruler against the scale backplate, with the start of the ruler at the left-hand edge of the backplate, and mark pencil dots at the proper points for the required frequency settings. When the ruler is correctly placed, the index mark is approximately 4-7/8" from the reference point indicated in figure 6.

With the tuning gang fully meshed, the pointer should be adjusted on the dial drive cord to coincide with the index mark.

After the chassis is installed in the cabinet, the tuning condenser should be fully meshed, and the dial pointer should be moved to coincide with the index mark on the dial.

MODEL 49-1615

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, .01 mf.	60-0120*
C101	Condenser, line filter, .01 mf.	60-0120*
C102	Condenser, electrolytic, filter, 40 mf., 450v	30-2568-20
C103	Condenser, electrolytic, 2-section	30-2556
C103A	Condenser, filter, 10 mf., 450v	Part of C103
C103B	Condenser, filter, 25 mf., 450v	Part of C103
C104	Condenser, filter, .01 mf.	61-0120*
L100	Field coil, filter choke	Part of LS200
I100	Lamp, bin light, 6.3-volt	34-2040
I101	Lamp, jewel light, 6.3-volt	34-2040
I102	Lamp, pilot light, 6.3-volt	34-2040
I103	Lamp, pilot light, 6.3-volt	34-2040
J100	Socket, phono power	27-6200
PB100	Switch, power off-on	Part of 42-1881†
R100	Resistor, filter, 18,000 ohms, 10w	33-1335-85
R101	Resistor, bias divider, 1.2 megohms	66-5123340*
R102	Resistor, bias divider, 330,000 ohms	66-4333340*
R103	Resistor, bleeder, 18,000 ohms, 10 watts	33-1335-85
T100	Transformer, power	32-8378
W100	Line cord and plug	L-2183*
WS1-1(R)	Switch-wafer section	Part of 42-1877‡

SECTION 2
AUDIO CIRCUITS

C200	Condenser, AM tone compensation, 100 mmf.	62-110009001
C201	Condenser, AM tone compensation, 100 mmf.	62-110009001
C202	Condenser, bass tone compensation, .003 mf.	61-0117*
C203	Condenser, d-c blocking, .006 mf.	45-3500-7*
C204	Condenser, r-f by-pass, 100 mmf.	62-110009001
C205	Condenser, d-c blocking, .006 mf.	45-3500-7*
C206	Condenser, r-f by-pass, 100 mmf.	62-110009001
C207	Condenser, d-c blocking, 470 mmf.	60-10515307*
C208	Condenser, d-c blocking, .006 mf.	45-3500-7*
C209	Condenser, d-c blocking, .006 mf.	45-3500-7*
C210	Condenser, bias filter, .5 mf.	45-3500-10*
C211	Condenser, tone compensation, .003 mf.	61-0117*
C212	Condenser, tone compensation, .006 mf.	45-3500-7*
C213	Condenser, tone compensation, .003 mf.	61-0117*
C214	Condenser, tone compensation, .001 mf.	45-3500-5*
C215	Condenser, tone compensation, .0015 mf.	45-3500-6*
C216	Condenser, high-pass filter, 150 mmf.	60-10155407*
C217	Condenser, d-c blocking, .001 mf.	45-3500-5*
C218	Condenser, reactance feedback, 100 mmf.	60-10105407*
C219	Condenser, bias filter, .01 mf.	61-0120*

†42-1881 Push-button switch assembly

SECTION 2 (Continued)
AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
C220	Condenser, bias filter, .03 mf.	45-3500-1*
C221	Condenser, bias filter, .01 mf.	61-0120*
C222	Condenser, d-c blocking, 330 mmf.	60-10335407*
C223	Condenser, d-c blocking, .002 mf.	61-0062*
C224	Condenser, bias filter, .02 mf.	61-0108*
C225	Condenser, bias filter, .03 mf.	45-3500-1*
J200	Socket, phono input	27-6126
J201	Socket, FM test	27-6180
LS200	Speaker, electrodynamic, 12" (including L100)	36-1630
R200	Volume control, 2 megohms, tap at 1 megohm	33-5535-19
R201	Resistor, bass boost, 220,000 ohms	66-4223340*
R202	Resistor, tone compensation, 68,000 ohms	66-3683340*
R203	Tone control, bass, 1 megohm	33-5539-52
R204	Resistor, voltage divider, inverse feedback, 4.7 ohms	66-9473340*
R205	Resistor, voltage divider, inverse feedback, 100 ohms	66-1103340*
R206	Resistor, isolating, 100,000 ohms	66-4103340*
R207	Resistor, grid return, 10 megohms	66-6103340*
R208	Resistor, plate load, 220,000 ohms	66-4223340*
R209	Resistor, grid return, 1 megohm	66-5103340*
R210	Resistor, cathode bias, 47,000 ohms	66-3473340*
R211	Resistor, cathode load, 4700 ohms	66-2473340*
R212	Resistor, plate load, 56,000 ohms	66-3563340*
R213	Resistor, grid return, 330,000 ohms	66-4333340*
R214	Resistor, grid return, 330,000 ohms	66-4333340*
R215	Resistor, tone compensation, 4.7 megohms	66-5473340*
R216	Resistor, tone compensation, 4.7 megohms	66-5473340*
R217	Resistor, tone compensation, 4.7 megohms	66-5473340*
R218	Resistor, grid return, 1 megohm	66-5103340*
R219	Resistor, cathode bias, 2200 ohms	66-2223340*
R220	Resistor, low-pass filter, 100,000 ohms	66-4103340*
R221	Resistor, plate load, 27,000 ohms	66-3273340*
R222	Resistor, screen voltage divider, 33,000 ohms	66-3333340*
R223	Resistor, screen voltage divider, 33,000 ohms	66-3333340*
R224	Resistor, grid return, 1 megohm	66-5103340*
R225	Resistor, bias filter, 680,000 ohms	66-4683340*
R226	Resistor, bias filter, 220,000 ohms	66-4223340*
R227	Resistor, grid return, 560,000 ohms	66-4563340*
R228	Resistor, plate load, 220,000 ohms	66-4223340*
R229	Resistor, plate load, 100,000 ohms	66-4103340*
R230	Resistor, bias filter, 220,000 ohms	66-4223340*
R231	Resistor, diode load, 560,000 ohms	66-4563340*

‡42-1877 Band switch, 5-section

MODEL 49-1615

REPLACEMENT PARTS LIST

SECTION 2 (Continued)
AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
R232	Resistor, bias filter, 1.5 megohms	66-5153340*
R233	Resistor, bias filter, 3.3 megohms	66-5333340*
R234	Resistor, diode load, 120,000 ohms	66-4123340*
T200	Transformer, output	32-8379
WS1-1(R)	Switch-wafer section	Part of 42-1877‡
WS1-3(F)	Switch-wafer section	Part of 42-1877‡
WS1-4(R)	Switch-wafer section	Part of 42-1877‡
WS2	Switch, wafer, scratch eliminator off-on and fidelity (treble selector) switch	42-1876

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

C300A	Condenser, fixed trimmer, pri., 1st FM i-f	Part of Z300
C300B	Condenser, fixed trimmer, sec., 1st FM i-f	Part of Z300
C301A	Condenser, fixed trimmer, pri., 1st AM i-f	Part of Z301
C301B	Condenser, fixed trimmer, sec., 1st AM i-f	Part of Z301
C302A	Condenser, fixed trimmer, pri., 2nd FM i-f	Part of Z302
C302B	Condenser, fixed trimmer, sec., 2nd FM i-f	Part of Z302
C303A	Condenser, fixed trimmer, pri., 2nd AM i-f	Part of Z303
C303B	Condenser, fixed trimmer, sec., 2nd AM i-f	Part of Z303
C304A	Condenser, fixed trimmer, pri., 3rd FM i-f	Part of Z304
C304B	Condenser, fixed trimmer, sec., 3rd FM i-f	Part of Z304
C305A	Condenser, fixed trimmer, pri., 3rd AM i-f	Part of Z305
C305B	Condenser, fixed trimmer, sec., 3rd AM i-f	Part of Z305
C305C	Condenser, r-f by-pass	Part of Z305
C305D	Condenser, r-f by-pass	Part of Z305
C306	Condenser, plate decoupling, .01 mf.	61-0120*
C307	Condenser, r-f by-pass, 100 mmf.	62-110009001
C308	Condenser (special), a-v-c filter, .01 mf.	30-4641
C309	Condenser, r-f by-pass, 1500 mmf.	62-215001011
C310	Condenser, (special), r-f by-pass, .01 mf.	30-4641
C311	Condenser, r-f by-pass, .01 mf.	61-0120*
C312	Condenser, screen by-pass, .01 mf.	61-0120*
C313	Condenser, filament by-pass, 100 mmf.	62-110009001
C314	Condenser, plate by-pass, .01 mf.	61-0120*
C315	Condenser, cathode by-pass, .01 mf.	61-0120*
C316	Condenser, filament by-pass, 100 mmf.	62-110009001
C317	Condenser, screen by-pass, .01 mf.	61-0120*
C318	Condenser, plate by-pass, .01 mf.	61-0120*
C319	Condenser, electrolytic, diode-load filter, 2 mf., 50v	30-2417-7
C320	Condenser, filament by-pass, 100 mmf.	62-110009001
C321	Condenser, de-emphasis, .04 mf.	45-3500-2
C322	Condenser, de-emphasis, .008 mf.	61-0174*
C323	Condenser, r-f by-pass, 100 mmf.	62-110009001
L300A	Coil, primary winding, 1st FM i-f	Part of Z300

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

Reference Symbol	Description	Service Part No.
L300B	Coil, secondary winding, 1st FM i-f	Part of Z300
L301A	Coil, primary winding, 1st AM i-f	Part of Z301
L301B	Coil, tertiary winding, 1st AM i-f	Part of Z301
L301C	Coil, secondary winding, 1st AM i-f	Part of Z301
L302A	Coil, primary winding, 2nd FM i-f	Part of Z302
L302B	Coil, secondary winding, 2nd FM i-f	Part of Z302
L303A	Coil, primary winding, 2nd AM i-f	Part of Z303
L303B	Coil, secondary winding, 2nd AM i-f	Part of Z303
L304A	Coil, primary winding, 3rd FM i-f	Part of Z304
L304B	Coil, secondary winding, 3rd FM i-f	Part of Z304
L304C	Coil, tertiary winding, 3rd FM i-f	Part of Z304
L305A	Coil, primary winding, 3rd AM i-f	Part of Z305
L305B	Coil, secondary winding, 3rd AM i-f	Part of Z305
R300	Resistor, plate dropping, 47,000 ohms	66-3473340*
R301	Resistor, grid return, 2.2 megohms	66-5223340*
R302	Resistor, a-v-c voltage divider, 470,000 ohms	66-4473340*
R303	Resistor, grid return, 2.2 megohms	66-5223340*
R304	Resistor, cathode bias (FM), 82 ohms	66-0823340*
R305	Resistor, cathode bias, 390 ohms	66-1393340*
R306	Resistor, plate dropping, 27,000 ohms	66-3273340*
R307	Resistor, screen dropping, 33,000 ohms	66-3333340*
R308	Resistor, plate decoupling, 1000 ohms	66-2103340*
R309	Resistor, a-v-c filter, 3.3 megohms	66-5333340*
R310	Resistor, cathode bias, 330 ohms	66-1333340*
R311	Resistor, screen dropping, 20,000 ohms	66-3203340*
R312	Resistor, plate decoupling, 1000 ohms	66-2103340*
R313	Resistor, diode load, 330,000 ohms	66-4333340*
R314	Resistor, i-f filter, 47,000 ohms	66-3473340*
R315	Resistor, FM diode load, 47,000 ohms	66-3473340*
R316	Resistor, isolating, 100,000 ohms	66-4103340*
R317	Resistor, FM detector load, 6.8 megohms	66-5683340*
TC300A	Tuning core, pri., 1st FM i-f	Part of Z300
TC300B	Tuning core, sec., 1st FM i-f	Part of Z300
TC301A	Tuning core, pri., 1st AM i-f	Part of Z301
TC301B	Tuning core, sec., 1st AM i-f	Part of Z301
TC302A	Tuning core, pri., 2nd FM i-f	Part of Z302
TC302B	Tuning core, sec., 2nd FM i-f	Part of Z302
TC303A	Tuning core, pri., 2nd AM i-f	Part of Z303
TC303B	Tuning core, sec., 2nd AM i-f	Part of Z303
TC304A	Tuning core, pri., 3rd FM i-f	Part of Z304
TC304B	Tuning core, sec., 3rd FM i-f	Part of Z304
TC305A	Tuning core, pri., 3rd AM i-f	Part of Z305
TC305B	Tuning core, sec., 3rd AM i-f	Part of Z305
WS1-2(F)	Switch-wafer section	Part of 42-1877‡
WS1-3(F)	Switch-wafer section	Part of 42-1877‡
WS1-3(R)	Switch-wafer section	Part of 42-1877‡
WS1-5(F)	Switch-wafer section	Part of 42-1877‡
WS1-5(R)	Switch-wafer section	Part of 42-1877‡
Z300	Transformer, 1st FM i-f	32-4257
Z301	Transformer, 1st AM i-f	32-4258
Z302	Transformer, 2nd FM i-f	32-4257-1
Z303	Transformer, 2nd AM i-f	32-4160-3
Z304	Transformer, 3rd FM i-f	32-4261-1
Z305	Transformer, 3rd AM i-f	32-4240-2

‡42-1877 Band switch, 5-section

MODEL 49-1615

REPLACEMENT PARTS LIST

SECTION 4
R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C400	Condenser, tuning gang (AM, 2-section; FM, 3-section)	31-2724-6
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, d-c blocking, 33 mmf.	30-1224
C402	Condenser, filament by-pass, 100 mmf.	62-110009001
C403	Condenser, screen by-pass, 100 mmf.	62-110009001
C404	Condenser, cathode by-pass, 100 mmf.	62-110009001
C405	Condenser, d-c blocking, 33 mmf.	30-1224
C406	Condenser, r-f by-pass, 1500 mmf.	62-215001011
C407	Condenser, oscillator grid, 100 mmf.	62-110009001
C408	Condenser, filament by-pass, 100 mmf.	62-110009001
C409	Condenser, d-c blocking, 750 mmf.	60-10755301
C410	Condenser, plate by-pass, 3 mmf.	30-1221
C411	Condenser, r-f by-pass, .01 mf.	61-0120*
C412	Condenser, d-c blocking, 220 mmf.	62-122001001
C413	Condenser, d-c blocking, 220 mmf.	62-122001001
C414	Condenser, ceramic, r-f voltage divider, 285 mmf.	30-1224-14
C415	Condenser, ceramic, r-f voltage divider, 485 mmf.	30-1224-15
C416	Condenser, aerial trimmer assembly, push-button (including C416A to C416E)	31-6479-3
C417	Condenser, trimmer assembly, 2-section	31-6476-8
C417A	Condenser, trimmer, Bc. aerial	Part of C417
C417B	Condenser, trimmer, Bc. oscillator	Part of C417
J400	Socket, loop aerial	27-6214-6
J401	Socket, FM dipole	27-6214-1
LA400	Loop aerial, Bc.	76-4337-1
L400	Coil, FM aerial	32-4158-1
L401	Coil, FM r-f	32-4159-1
L402	Coil, FM oscillator	32-4018-5
L403	Coil, r-f choke, FM plate load	32-4061-2
L404	Coil, r-f choke	32-4061-2
L405	Coil, r-f choke	32-4061-2
L406	Coil, oscillator assembly, push-button	
L406A	Coil, oscillator, 900—1600 kc.	32-3779
L406B	Coil, oscillator, 850—1500 kc.	32-3779
L406C	Coil, oscillator, 650—1300 kc.	32-4059-2
L406D	Coil, oscillator, 600—1200 kc.	32-4059-2
L406E	Coil, oscillator, 540—1000 kc.	32-4059-2
P400	Plug, wire, and lug assembly, FM aerial	41-3791-1
PB400A to PB400E	Push-button switch assembly	42-1881
R400	Resistor, grid return, 1 megohm	66-5103340*
R401	Resistor, cathode bias, 82 ohms	66-0823340*
R402	Resistor, screen dropping, 56,000 ohms	66-3563340*
R403	Resistor, plate decoupling, 1000 ohms	66-2103340*
R404	Resistor, grid return, 15,000 ohms	66-3153340*
R405	Resistor, cathode bias, 1500 ohms	66-2153340*
R406	Resistor, cathode bias, 6800 ohms	66-2683340*
T400	Transformer, Bc. aerial	32-4049-3
T401	Transformer, Bc. oscillator	32-4221-3
TC400A to TC400E	Tuning cores, push-button oscillator	Part of Z400

‡42-1877 Band switch, 5-section

SECTION 4 (Continued)
R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
WS1-2(F)	Switch-wafer section	Part of 42-1877‡
WS1-2(R)	Switch-wafer section	Part of 42-1877‡
WS1-3(R)	Switch-wafer section	Part of 42-1877‡
WS1-4(F)	Switch-wafer section	Part of 42-1877‡
WS1-4(R)	Switch-wafer section	Part of 42-1877‡

MISCELLANEOUS

Description	Service Part No.
Cabinet and Cabinet Hardware	
Back assembly, wood	76-4344
Back, cabinet, masonite	54-7702
Baffle (cardboard) and cloth assembly	40-7575-1
Baffle, speaker	219138
Bezel	56-6375FCP
Bin mechanism, R.H.	76-3223-6
Bin mechanism, L.H.	76-3223-5
Spring (2) bin mechanism, phono mtg.	56-4978
Bullet catch (2)	45-6002
Strike plate (2), bullet catch	45-6003
Cabinet	10731
Door, record album	45-6473
Doors, matched set	45-6472
Door pull (2)	56-5398-1
Frame assembly, changer mounting	76-4104
Grommet (3) changer mtg.	54-4313
Spring (6) changer mtg.	56-3043FA15
Hinge, phono door	56-5713-3
Hinge, phono door	56-5713-4
Hinge, knife (stop), top, radio door	56-5713
Hinge, knife (stop), bottom, radio door	56-5713-2
Hinge, knife, R.H., top, record door	45-6449
Hinge, knife, L.H., bottom, record door	45-6449-1
Instrument panel	45-6474
Metal grille (2)	56-6370
Cable-and-plug assembly, speaker	41-3734-11
Dial Scale Parts and Hardware	
Cord, drive (25-ft. spool)	45-8750
Dial backplate-and-pulley assembly	76-4309
Knob (5)	54-4486
Pointer	54-4648
Carriage, pointer	56-6408
Spring (2), gang and pointer	56-2617
Push-button knob (6)	54-4292
Cap, plastic (6), push-button knob	54-4294
Tab kit	40-7583
Scale-and-backplate assembly	76-4298
Scale strap (2), end, scale mounting	56-2234-2
Scale strap, middle, scale mtg.	56-4756FE11
Jewel-and-bin-lamp assembly	41-3896
Pilot-lamp-socket assembly, L.H.	27-6233-22
Pilot-lamp-socket assembly, R.H.	27-6233-25
Shaft assembly, tuning	76-4245
Socket, Loktal, 7A4	27-6177
Socket, Loktal, 7F8 (r-f section, mica-filled bakelite)	27-6213
Socket, Loktal, 7E7, 7F7	27-6138
Socket, miniature, 6BA6 (2)	27-6226
Socket, miniature, 6AU6 (r-f section, mica-filled bakelite)	27-6203-1
Socket, miniature 6T8	27-6203-5
Socket, octal (3)	27-6174
Jewel, telltale	54-4304

MODEL 49-1615

ALIGNMENT PROCEDURE

CAUTION: Do not turn on the power with the speaker disconnected, or the radio may be damaged.

ALIGNMENT OF AM CIRCUITS

When the complete AM and FM alignment is to be made, the AM alignment should be made first; however, if AM alignment is not required, the FM alignment alone may be made.

DIAL POINTER: With the tuning condensers fully meshed, the dial pointer must coincide with the index mark at the low-frequency end of the dial. See "CALIBRATING DIAL BACKPLATE" for the method of measuring the backplate for index and calibration points.

CONTROLS: Set the volume control to maximum, and the bass control fully counterclockwise. Set the treble selector switch fully clockwise. Set the band switch to the broadcast position. Set the signal-generator dial and radio dial as indicated in the chart.

OUTPUT METER: Connect between the No. 3 terminal (voice-coil connection) of the loop aerial socket, J400, and the chassis. See figure 8.

AM SIGNAL GENERATOR: Connect the ground lead to the chassis, and the output lead as indicated in the chart. Use modulated output.

OUTPUT LEVEL: During alignment, the signal-generator output must be attenuated to hold the radio output below 1.5 volts, as read on the output meter.

ALIGNMENT OF FM CIRCUITS

BEFORE STARTING ALIGNMENT, ALLOW THE RADIO AND SIGNAL GENERATOR TO WARM UP FOR 15 MINUTES.

CONTROLS: Set the volume control to maximum, and the bass control fully counterclockwise. Set the treble selector switch fully clockwise. Set the band switch to the FM position. Set the signal-generator dial and radio dial as indicated in the chart.

OUTPUT METER: Connect between the No. 3 terminal (voice-coil connection) of the loop aerial socket, J400, and the chassis. See figure 8.

AM SIGNAL GENERATOR: Connect the ground lead to the chassis; connect the output lead through a .1-mf. condenser to the points specified in the chart. Use modulated output.

OUTPUT LEVEL: During alignment, the signal-generator output must be attenuated to hold the radio output below 1.5 volts, as read on the output meter.

LOCATIONS OF COILS: For the locations of coils L400, L401, and L402 (steps 8, 9, and 10), refer to figure 4.

Note 1. Check the tracking of oscillator and r-f circuits with a tuning wand. If placing the brass end in or near the coil increases the output-meter reading, spread the turns; if the powdered-iron end increases the output reading, compress the turns. If both ends cause a decrease in the output, the coil is correctly tuned. Do not change the coils excessively, since only a small adjustment is required at these frequencies.

Note 2. Make two simple dipole aerials to feed the signals from the signal generator to the radio. Each dipole aerial may consist of two 30-inch lengths of rubber-covered wire. Connect one dipole aerial to terminals 3 and 4 on the FM aerial socket, J401, of the radio. See figure 8. Connect the other dipole aerial to the output leads of the signal generator. Place the two dipoles several feet apart.

Note 3. The use of a signal generator for steps 5 through 11 is recommended only if the available generator is sufficiently accurate to insure correct frequency settings. Otherwise, an alternative procedure employing FM broadcast-station signals is recommended. For the adjustments at the high-frequency end of the band, use the station nearest 105 mc.; for the adjustments at the low-frequency end of the band, use the station nearest 88 mc. or 92 mc., as indicated. If the radio is greatly misaligned, it may be necessary to adjust the trimmers and coils for maximum noise at each end of the band before station signals can be heard.

MODEL 49-1615

Production Change Supplement

PRE-PRODUCTION CHANGES

The following parts were deleted:

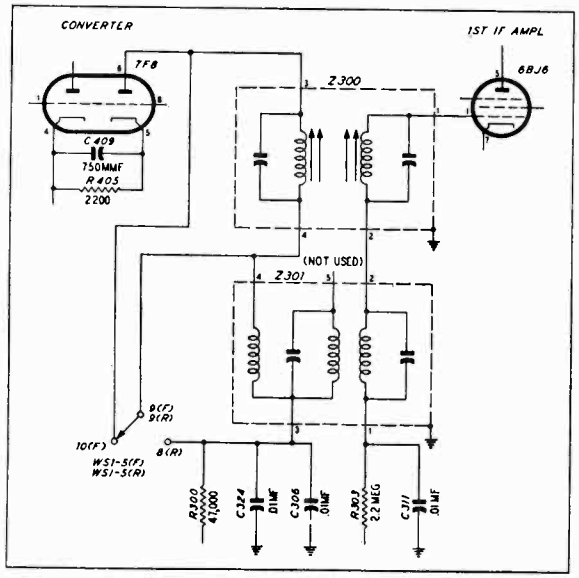
Reference Symbol	Description	Service Part No.
C104	Condenser, filter, .01 mf.	61-0120*
C410	Condenser, plate by-pass, 3 mmf.	30-1221
C411	Condenser, r-f by-pass, .01 mf.	61-0120*

The following parts were changed:

Reference Symbol	New Description	New Service Part No.
C202	Condenser, bass compensation, .006 mf.	45-3500-7*
C312	Condenser, screen by-pass, .003 mf.	61-0109*
C315	Condenser, cathode by-pass, .05 mf.	61-0122*
C317	Condenser, screen by-pass, .003 mf.	61-0109*
R100	Resistor, filter, 10,000 ohms, 2 watts	66-3103340*
R304	Resistor, cathode bias (FM), 100 ohms	66-1108340*
R310	Resistor, cathode bias, 82 ohms	66-0828340*
R311	Resistor, screen dropping, 33,000 ohms	66-3338340*
R405	Resistor, cathode bias, 2200 ohms (R405 was disconnected from ground and connected to the oscillator cathode, pin 4 of the 7F8.)	66-2228340*
R406	Resistor, cathode bias, 1000 ohms The 1st and 2nd i-f amplifier tubes were changed to type 6BJ6.	66-2108340*

The following parts were added:

Reference Symbol	Description	Service Part No.
C324	Condenser, plate by-pass, .01 mf. (Connected from lug 3 of Z301 to ground, as shown in figure 1.)	61-0120*
L407	Coil, r-f choke (Connected in the lead from C417A to the BC aerial section of C400.)	32-4061-2



TP-8462

Figure 1.

The following circuit changes were made:
C314 was disconnected from ground, and connected to the 1st i-f amplifier screen, pin 6 of the first 6BJ6. In its new connection, C314 provides screen neutralization. C318 was disconnected from ground, and connected to the 2nd i-f amplifier screen, pin 6 of the second 6BJ6. In its new connection, C318 provides screen neutralization. The switching of the primaries of Z300 and Z301 was revised as shown in figure 1.

RUN 2 CHANGES (MAIN CHASSIS)

To eliminate inverse-feedback oscillation, the following part was changed:

Reference Symbol	New Description	New Service Part No.
R205	Resistor, volt[illegible] divider, inverse feedback, 12[illegible]	66-1128340*

RUN 2 CHANGES (SCRATCH-ELIMINATOR CHASSIS)

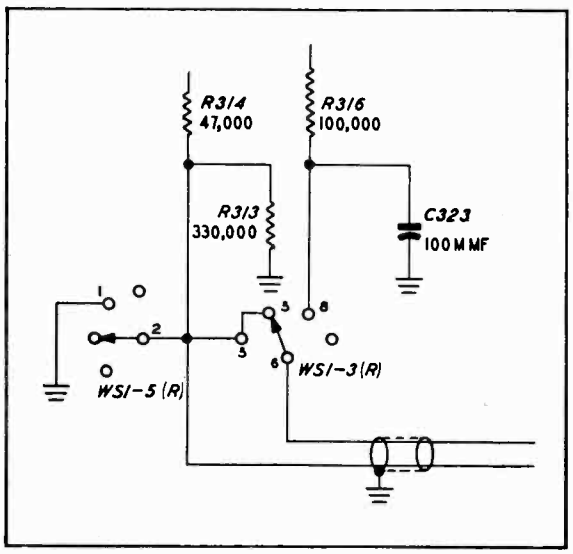
To improve phono-noise suppression, the following parts were changed:

Reference Symbol	New Description	New Service Part No.
C218	Condenser, d-c blocking, reactance feedback, 220 mmf.	62-122001001*
R229	Resistor, plate load, 33,000 ohms	66-3338340*

RUN 3 CHANGES

To prevent AM noise-pulse interference on FM, the following circuit changes were made:

The switching was removed from the secondary of Z301. C311 is now connected directly to lug 1 of Z301. The removed switch section is now used to ground the AM audio lead when in the FM position. Lug 2 of WS1-5(R) is tied to lug 5 of WS1-3(R), and lug 1 of WS1-5(R) is grounded. See figure 2.



TP-8463

Figure 2.

MODELS 50-522,
50-522-I, 50-524

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

1. Inspect both the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance between B+ (test point C) and B— (test point B). See figure 1. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C101A, C101B, C101C, and C203 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.

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.

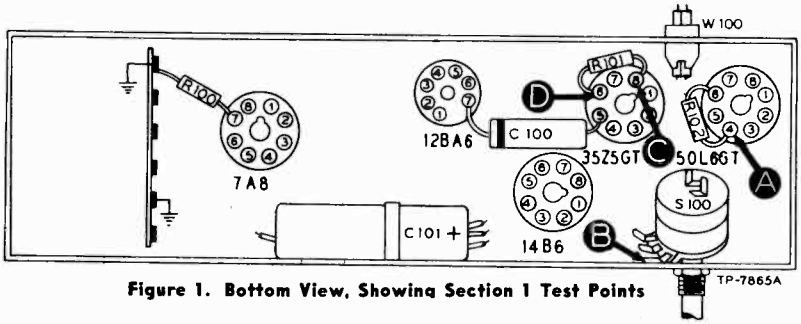


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	105 volts		Trouble in this section. Isolate by the following tests.
2	C	130 volts	No voltage	Defective: 35Z5GT. Open: W100, S100. Shorted: C100, C101A.
			Low voltage	Defective: 35Z5GT. Open: C101A. Leaky: C101A.
			High voltage	Open: R101.
3	D	118 volts	No voltage	Open: R101. Shorted: C101B.
			Low voltage	Open: C101B. Shorted: C203*. Leaky: C101B.
			High voltage	Open: R102, T200*, R204*.
4	A	105 volts	No voltage	Shorted: C101C. Open: R102.
			Low voltage	Leaky: C101C. Open: C101C.
			High voltage	Open: R204*.
Listening Test: Abnormal hum may be caused by open C101A, C101B, or C101C.				

* 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-μf. condenser to the test points indicated in the chart.

Set the volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Sections 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

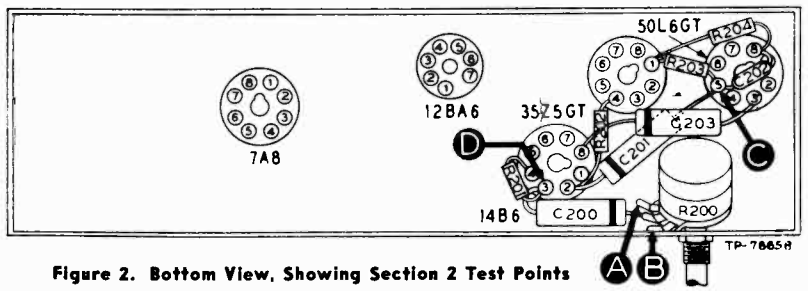


Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear output with moderate signal input.	Defective: 50L6GT, LS200. Open: R204, T200. Shorted: C202, C203.
3	D	Same as step 1.	Defective: 14B6 (triode section). Open: C201, R202, R203. Shorted: C201.
4	A	Same as step 1.	Open: R200 (rotate through range), C200, R201. Shorted: C301D*.

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

MODELS 50-522,
50-522-I, 50-524

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-μf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and turn 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.

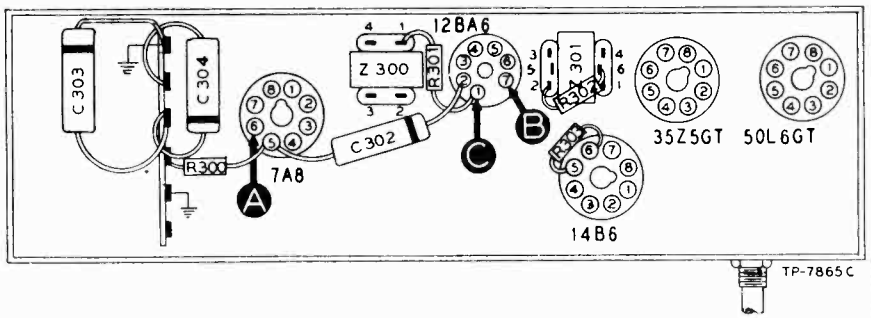


Figure 3. Bottom View, Showing Section 3 Test Points

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 signal input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with moderate input.	Defective: 12BA6, 14B6, (diode section). Misaligned: Z301. Open: R300, C301A, C301B, L301A, L301B, R302, R303. Shorted: C302, C300B, C301A, C301B, C301C.
3	A	Same as step 1.	Defective: 7A8*. Misaligned: Z300. Open: L300A, L300B, R301, C300A, C300B. Shorted: C300A, C400, C400A.

* 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-μf. condenser to the test points indicated in the chart.

Set the volume control to maximum. 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 this section. If the trouble is not revealed by the tests for this section, check the alignment.

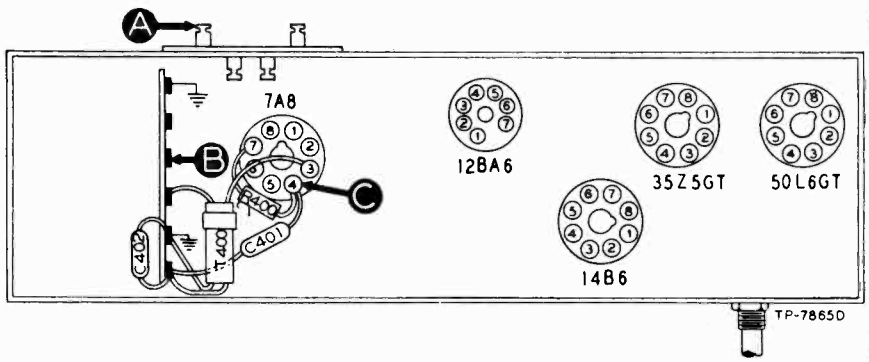


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Loud, clear speaker output with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C Osc. test; see note below.		Tune through range.	Negative 4.5 to 7.5 volts.	Defective: 7A8. Open: C401, T400, R400. Shorted: T400, C401, C400, C400B, C402.
3	A	1000 kc.	1000 kc.	Same as step 1.	Defective: 7A8. Open: LA400. Shorted: C400, C400A, LA400.

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 7A8 oscillator grid (pin 4), test point D. 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.

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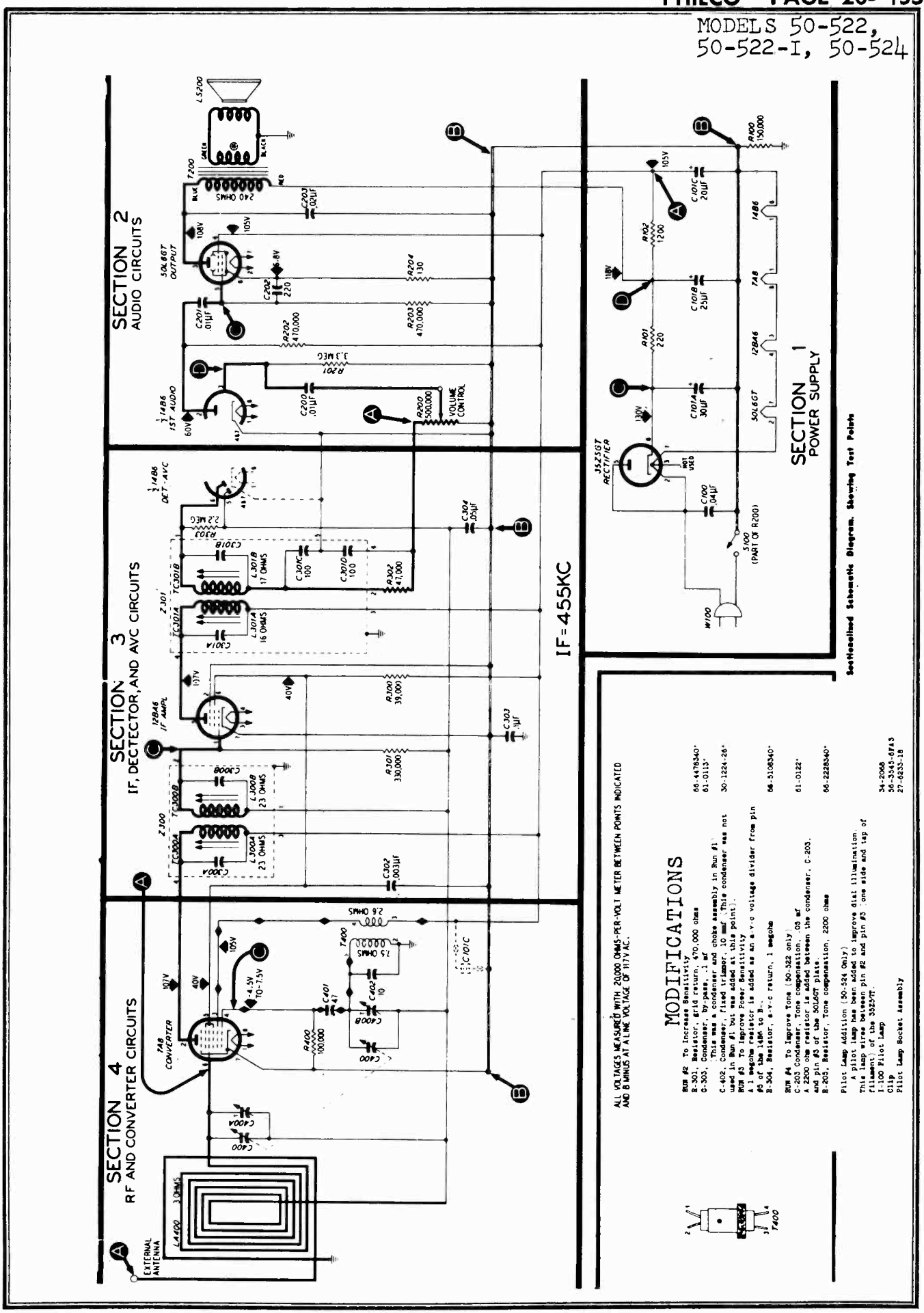
50-522-I, 50-524



ALIGNMENT PROCEDURE

CONTROLS: Turn on the radio, and set the volume control to maximum.

DIAL POINTER: Turn the tuning condenser to the full-mesh position. Set the dial pointer to the index mark, located to the left of "55."

OUTPUT METER: Connect across the voice-coil terminals.

SIGNAL GENERATOR: Connect as indicated in the chart.

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

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B—; output lead through .1-μf. condenser to pin 6 of 7A8 tube.	455 kc.	540 kc. (gang fully meshed).	Adjust tuning cores, 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.	C400B—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C400A—aerial

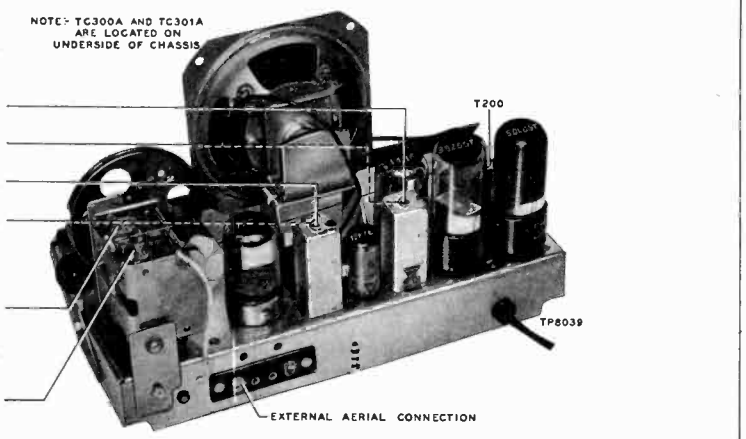


Figure 6. Top View, Showing Trimmer Locations

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

MODEL 50-522
MODEL 50-522-I

MODEL 50-524

SPECIFICATIONS

CABINET	
Model 50-522	Molded plastic, mottled mahogany
Model 50-522-I	Molded plastic, ivory
Model 50-524	Wood, mahogany finish
CIRCUIT	5-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	1.2 watts
OPERATING VOLTAGE	105—125 volts, a.c. or d.c.
POWER CONSUMPTION	30 watts
AERIAL	High-impedance loop; connector for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5)	7A8, 12BA6, 14B6, 50L6GT, 35Z5GT

Circuit Description

Philco Models 50-522, 50-522-I, and 50-524 are 5-tube, table-model superheterodyne radios, providing reception in the standard broadcast band. These three models are identical except for the cabinets and certain cabinet parts, as indicated in the Replacement Parts List.

The high-impedance loop aerial normally provides adequate signal pickup. An external aerial may be connected if desired, by attaching the lead to lug No. 4 (shown in figure 6) on the rear of the chassis. Do not use a ground.

The converter employs a 7A8 tube. Variable-condenser tuning is used; the rotor plates of the oscillator section are specially shaped to obtain tracking, thus eliminating the necessity for a series padding condenser.

The 7A8 is transformer-coupled to the 12BA6 i-f amplifier, which is, in turn, transformer-coupled to the diodes of the 14B6 detector-first audio amplifier. A-v-c voltage is applied to the control grids of the i-f and converter tubes.

The triode section of the 14B6 is the first audio amplifier, and is resistance-coupled to the 50L6GT output tube, which works into a permanent-magnet speaker.

D-c operating voltages are obtained from a 35Z5GT half-wave rectifier, the output of which is filtered by a two-section resistance-capacitance filter.

Resistor R100, 150,000 ohms (in Section 1), prevents hum which might otherwise occur under conditions of high humidity.

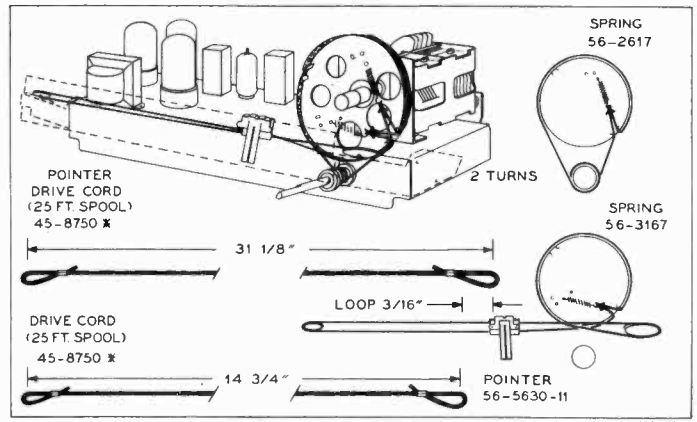


Figure 7. Drive-Cord-Installation Details

MODELS 50-522, 50-522-I, 50-524

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.

SECTION 1

POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 μf	45-3500-2*
C101	Condenser, electrolytic, 3-section filter	30-2573
C101A	Condenser, filter, 30 μf., 150 v.	Part of C101
C101B	Condenser, filter, 25 μf., 150 v.	Part of C101
C101C	Condenser, filter, 20 μf., 150 v.	Part of C101
R100	Resistor, leakage, 150,000 ohms	66-4158340*
R101	Resistor, filter, 220 ohms, 1 watt	66-1224340*
R102	Resistor, filter, 1200 ohms	66-2128340*
S100	Switch, off-on	Part of R200
W100	Line cord and plug	L-2183*

SECTION 2

AUDIO CIRCUITS

C200	Condenser, d-c blocking, .01 μf	61-0120*
C201	Condenser, d-c blocking, .01 μf	61-0120*
C202	Condenser, by-pass, 220 μμf	62-122001001*
C203	Condenser, tone compensation, .02 μf	61-0108*
LS200	Speaker, p-m, 4"	36-1627-5
R200	Volume control (with off-on switch), 500,000 ohms	33-5566-4
R201	Resistor, grid return, 3.3 megohms	66-5338340*
R202	Resistor, plate load, 470,000 ohms	66-4478340*
R203	Resistor, grid return, 470,000 ohms	66-4478340*
R204	Resistor, cathode bias, 130 ohms, 1 watt	66-1124340*
T200	Transformer, output	32-8384

SECTION 3

I-F, DET, AND A-V-C CIRCUITS

C300A	Condenser, fixed trimmer	Part of Z300
C300B	Condenser, fixed trimmer	Part of Z300
C301A	Condenser, fixed trimmer	Part of Z301
C301B	Condenser, fixed trimmer	Part of Z301
C301C	Condenser, i-f filter	Part of Z301
C301D	Condenser, i-f filter	Part of Z301
C302	Condenser, screen by-pass, .003 μf	61-0109*
C303	Condenser, by-pass, .1 μf	61-0113*
C304	Condenser, a-v-c by-pass, .05 μf	61-0122*
L300A	Coil, 1st i-f primary	Part of Z300
L300B	Coil, 1st i-f secondary	Part of Z300
L301A	Coil, 2nd i-f primary	Part of Z301
L301B	Coil, 2nd i-f secondary	Part of Z301
R300	Resistor, screen dropping, 39,000 ohms	66-3398340*
R301	Resistor, grid return, 330,000 ohms	66-4338340*
R302	Resistor, i-f filter, 47,000 ohms	66-3478340*
R303	Resistor, diode load, 2.2 megohms	66-5228340*
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
Z300	Transformer, 1st i-f	32-4160-6A
Z301	Transformer, 2nd i-f	32-4240-A

SECTION 4

R-F AND CONVERTER

C400	Condenser, tuning gang, 2-section	31-2727-2
C400A	Condenser, trimmer, aerial	Part of C400
C400B	Condenser, trimmer, oscillator	Part of C400
C401	Condenser, d-c blocking, 47 μμf	60-00515307*
C402	Condenser, fixed trimmer, 10 μμf	30-1224-26*
LA400	Loop aerial	
	Model 50-522, 50-522-I	32-4052-31
	Model 50-524	32-4052-34
R400	Resistor, grid return, 100,000 ohms	66-4108340*
T400	Transformer, oscillator	32-4263

MISCELLANEOUS

Description	Service Part No.
Cabinet	
Model 50-522	10747
Model 50-522-I	10747-1
Model 50-524	10754
Back	
Model 50-522, 50-522-I	54-7767
Model 50-524	54-7810
Fastener, cabinet back (4), 50-522, 50-522-I	W2235-2FA9
Dial scale, Model 50-524	54-5060-1
Scale strap (2)	56-7021-FA3
Knob	
Model 50-522	54-4674
Model 50-522-I	54-4674-1
Model 50-524	54-4527-3
Dial-backplate assembly	76-4570
Drive cord (25-ft. spool)	45-8750*
Spring, drive cord	56-2617
Drive-shaft-and-pulley assembly	76-3671-2
Pointer	56-5630-11
Spring, pointer	56-3167
Rubber mounts, gang mounting (3)	27-4771-1
Socket, Loktal (2)	27-6138*
Socket, miniature (1)	27-6203
Socket, octal (2)	27-6174*

MODEL 50-527,
50-527-I

Section 1 TROUBLE SHOOTING

POWER SUPPLY

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.

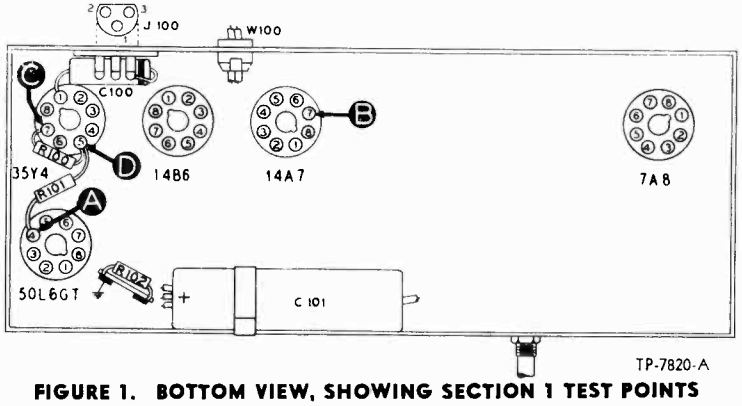


FIGURE 1. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	95v		Trouble within this section. Isolate by the following tests.
2	C	108v	No voltage Low voltage High voltage	Defective: 35Y4. Shorted: C101A. Open: S100, W100, J100. Defective: 35Y4. Open: C101A. Leaky: C101A. Open: R100.
3	D	120v	No voltage Low voltage High voltage	Shorted: C101B. Open: R100. Open: C101B. Leaky: C101B, C203*. Open: R101, T200*, R203*.
4	A	95v	No voltage Low voltage	Shorted: C101C. Open: R101. Leaky: C101C.
Listening Test: Abnormal hum may be caused by open C101A, C101B, or C101C.				

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

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.

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.

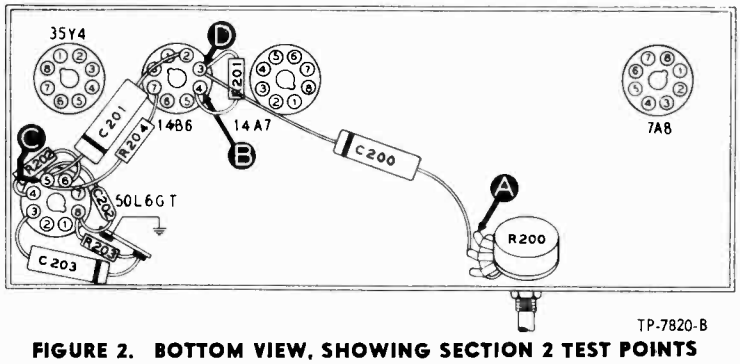


FIGURE 2. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal-generator input.	Trouble within this section. Isolate by the following tests.
2	C	Clear output with strong input.	Defective: 50L6GT, LS200. Shorted: C202, C203. Open: R203, T200.
3	D	Clear output with moderate input.	Defective: 14B6. Shorted: C201. Open: C201, R202, R204.
4	A	Same as step 1.	Shorted: C301D*. Open: R200, R201, C200.
Listening Test: Distortion may be caused by shorted or leaky C201.			

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

MODELS 50-527,
50-527-I

Section 3 TROUBLE SHOOTING

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

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 volume control to maximum, 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.

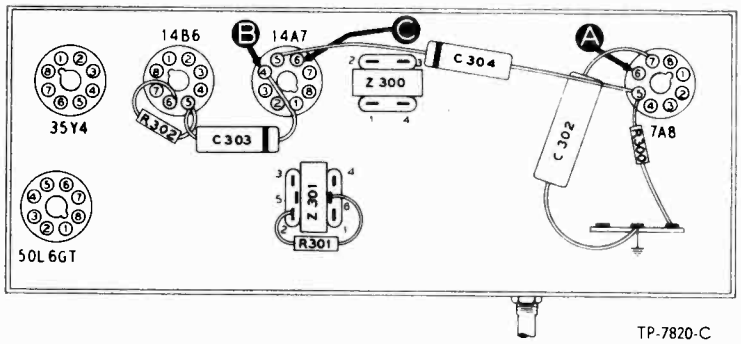


FIGURE 3. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS

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 signal-generator input.	Trouble within this section. Isolate by the following tests.
2	C	Same as step 1.	Defective: 14A7, 14B6 (diode section). Shorted: L300B, C300B, L301A, C301A, L301B, C301B, C301C, C301D. Open: L301A, L301B, C301A, C301B, R300, R301, C304. Misaligned: Z301.
3	A	Same as step 1.	Defective: 7A8*. Shorted: C400*, C400A*, L300A, C300A. Open: L300A, L300B, C300A, C300B. Misaligned: Z300.
Listening Test: Hum and instability may be caused by open C302, C303.			

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

Section 4 TROUBLE SHOOTING

R-F AND CONVERTER CIRCUITS

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 volume control to maximum, 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 this section. If the trouble is not revealed by the tests for this section, check the alignment.

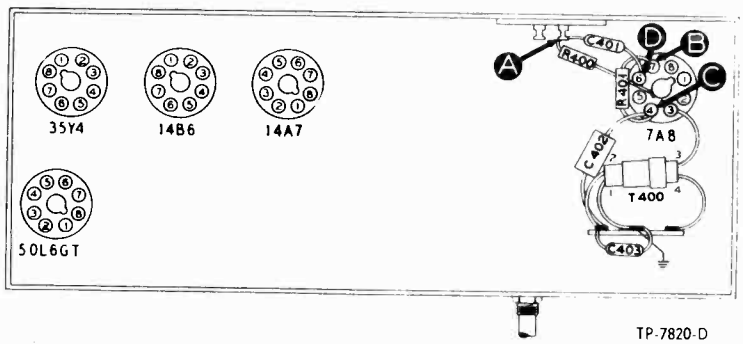
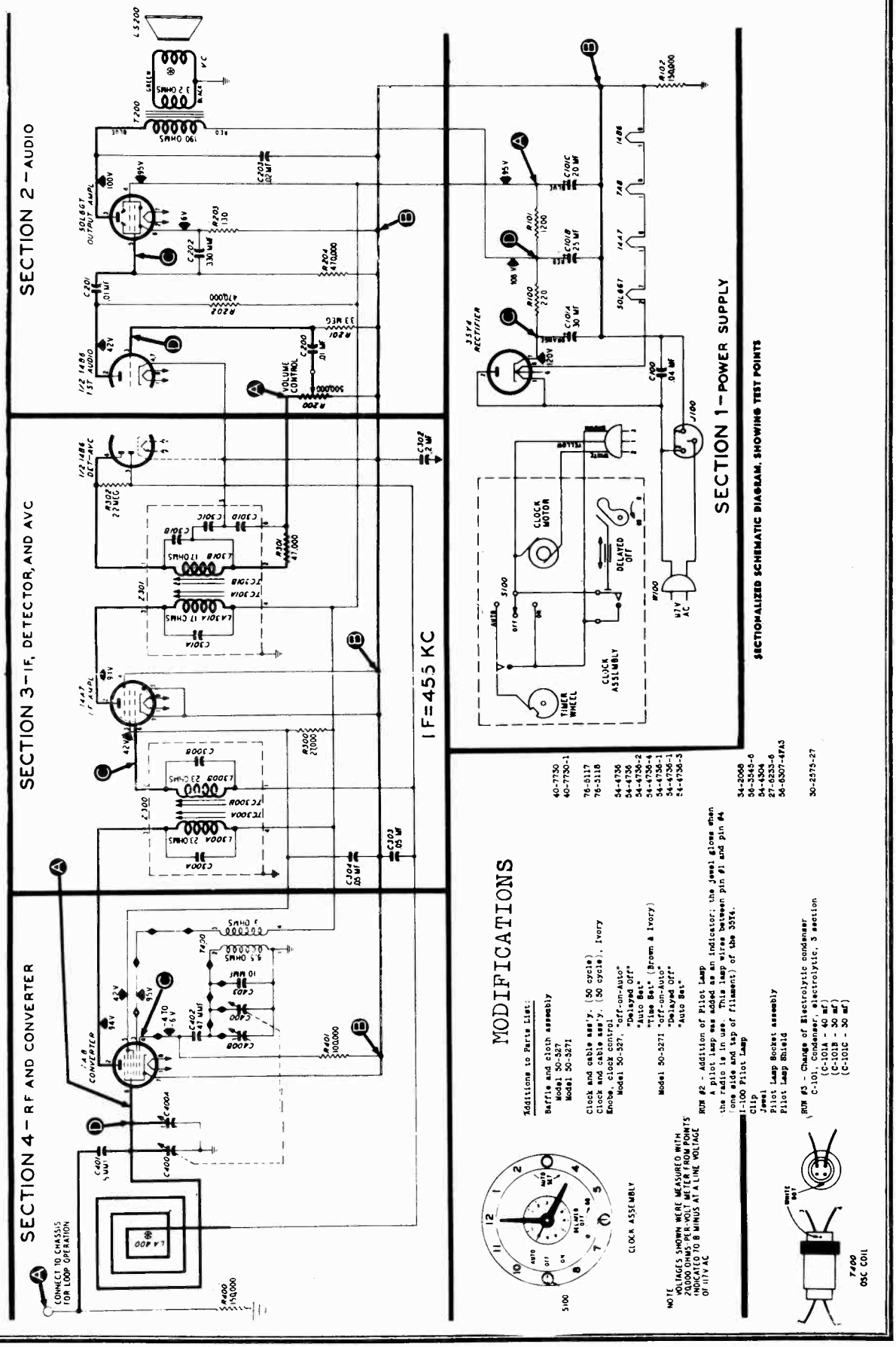


FIGURE 4. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS

STEP	TEST POINT	SIG. GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Clear speaker output with weak signal-generator input.	Trouble within this section. Isolate by the following tests.
2	C (Osc. test; see note below.)		Rotate through range.	Negative 4v to 6v.	Defective: 7A8. Open: C402, R401, T402. Shorted: T400, C400, C400B, C403.
3	D	1000 kc.	1000 kc.	Same as step 1.	Defective: 7A8. Open: LA400. Shorted: C400, C400A, LA400.
4	A	1000 kc.	1000 kc.	Same as step 1.	Open: C401.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to the B–, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the 7A8 oscillator grid (pin 4), 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.

MODELS 50-527,
50-527-I



MODIFICATIONS

Additions to Parts List:

Baffle and cloth assembly	40-7730
Model 50-527	40-7730-1
Model 50-527I	
Clock and cable ass'y. (50 cycle)	76-0117
Clock and cable ass'y. (50 cycle), Ivory	76-0118
Knobs, clock control	54-4736
Model 50-527, "off-on-Auto"	54-4736
"Delayed Off"	54-4736-2
"Auto Bat"	54-4736-4
"Time Bat" (Brown & Ivory)	54-4736-5
Model 50-527I "off-on-Auto"	54-4736-1
"Delayed Off"	54-4736-3
"Auto Bat"	

RUN #2 - Addition of Pilot Lamp
A pilot lamp was added as an indicator; the jewel glows when the radio is turned on. The lamp wires between pin #1 and pin #4 (one side and top of filament) of the 35Y4.

I-100 Pilot Lamp	34-2068
Clip	56-3545-6
Jewel	54-4304
Pilot Lamp Socket assembly	27-6233-6
Pilot Lamp Shield	56-6307-4PA3

RUN #3 - Change of Electrolytic condenser
C-101, Condenser, electrolytic, 3 section 30-2575-27
(C-101A - 40 mf)
(C-101B - 30 mf)
(C-101C - 30 mf)

NOTE
VOLTAGES SHOWN WERE MEASURED WITH 20,000 OHMS PER-VOLT METER FROM POINTS INDICATED TO B MINUS AT A LINE VOLTAGE OF 117V AC

CLOCK ASSEMBLY

T400 OSC COIL

ALIGNMENT PROCEDURE

RADIO CONTROLS — Set volume control to maximum. Set tuning control as indicated in chart.

OUTPUT METER — connect across voice-coil terminals.

SIGNAL GENERATOR — Connect generator and set frequency as indicated in chart. Use modulated output.

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

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Connect ground lead to B–; output lead through .1-mf. condenser to grid (pin 6) of 7A8.	455 kc.	Tuning condenser fully meshed.	Adjust tuning cores, 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 trimmer for maximum output.	C400B—Osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C400A—Aerial

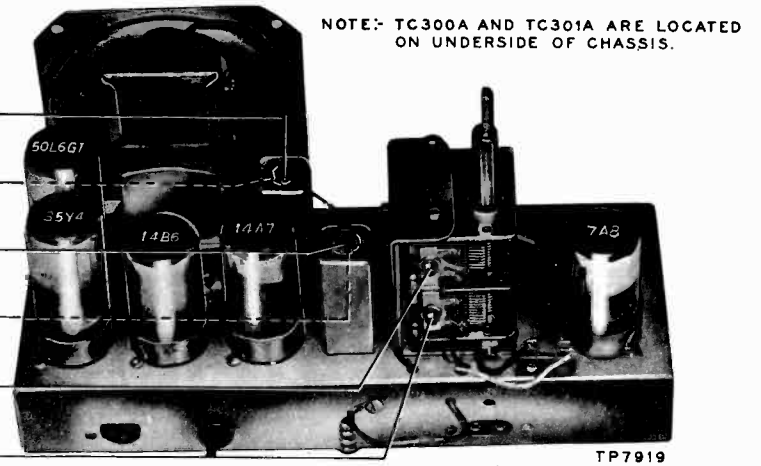


FIGURE 6. TOP VIEW, SHOWING TRIMMER LOCATION

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

SPECIFICATIONS

CABINET	
Model 50-527	Molded Phenolic, brown
Model 50-527-I	Molded Phenolic, Ivory
FREQUENCY RANGE	540—1600 kc.
AUDIO OUTPUT	1 watt
OPERATING VOLTAGE	117 volts, a.c.
POWER CONSUMPTION	30 watts
AERIAL	High-impedance loop; connector for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5)	7A8, 14A7, 14B6, 50L6GT, 35Y4

TP-7964

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

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 7 of the 35Y4) 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 1500 ohms, check condensers C101A, C101B, C101C, and C203 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.

Circuit Discription

Philco Radio-Clock Models 50-527 and 50-527-I are 5-tube table-model superheterodynes, providing reception in the standard broadcast band and the functions of an electric alarm clock.

A high-impedance loop aerial normally provides adequate signal pickup. An external aerial may be connected, if desired, by detaching the aerial lead from the chassis and connecting it to the external aerial leadin. Do not use a ground.

The loop aerial is coupled to the 7A8 converter. The aerial and oscillator circuits are tuned by ganged variable condensers, and the oscillator rotor-section plates are properly shaped to obtain tracking, thus eliminating the necessity for a series padding condenser.

The 7A8 converter is transformer-coupled to the 14A7 i-f amplifier, which is also transformer-coupled to the diodes of the 14B6 second detector — first audio amplifier. A-v-c voltage is applied to the control grids of both the i-f amplifier and converter tubes. The triode section of the 14B6 is the first audio stage, and is resistance-coupled to the 50L6GT output tube. The output tube works into a permanent-magnet speaker.

D-c operating voltages are supplied from a 35Y4 half-wave rectifier, and filtered by a three-section resistor-condenser network.

R102, a 150,000-ohm resistor, prevents hum which might otherwise occur under conditions of high humidity.

In addition to the normal features of a table-model radio and an electric clock, a radio alarm is included, which turns the radio on at any preset time; there is also a "delayed off" feature that automatically shuts the set off after any desired period up to an hour. These functions are available by the following control settings: For alarm action, the AUTO-OFF-ON switch is set to the AUTO position, and the alarm is set to the desired time. When the delayed off action is required, as when retiring, the DELAYED OFF switch is turned to the right, and the AUTO-OFF-ON switch is set to the AUTO position. The two actions may be combined, i.e., before retiring, the alarm may be set for the morning time, and the DELAYED OFF switch also set. The radio then plays for an hour, shuts itself off, and comes on again in the morning. When the AUTO-OFF-ON switch is set to the ON position, the radio operates independently of the clock. When the switch is set to the OFF position, the radio is turned off, and is not under the control of the clock.

MODELS 50-527,
50-527-I

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.

SECTION 1

POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf.	45-3500*
C101	Condenser, electrolytic, 3-section	30-2573
C101A	Condenser, filter, 30 mf., 150v	Part of C101
C101B	Condenser, filter, 25 mf., 150v	Part of C101
C101C	Condenser, filter, 20 mf., 150v	Part of C101
J100	Socket, clock motor and switch	27-6126
R100	Resistor, filter, 220 ohms, 1 watt	66-1224340*
R101	Resistor, filter, 1200 ohms	66-2128340*
R102	Resistor, leakage, 150,000 ohms	66-4158340*
S100	Switch, AUTO-OFF-ON	Part of clock assembly
W100	Line cord and plug	L-2183*

SECTION 2

AUDIO CIRCUITS

C200	Condenser, d-c blocking, .01 mf.	61-0120*
C201	Condenser, d-c blocking, .01 mf.	61-0120*
C202	Condenser, parasitic suppressor, 330 mmf.	60-10335407*
C203	Condenser, tone compensation, .02 mf.	61-0109*
LS200	Speaker, p-m	36-1627
R200	Volume control, 500,000 ohms	33-5565-6
R201	Resistor, grid return, 3.3 megohms	66-5338340*
R202	Resistor, plate dropping, 470,000 ohms	66-4478340*
R203	Resistor, cathode bias, 130 ohms	66-1138340*
R204	Resistor, grid return, 470,000 ohms	66-4478340*
T200	Transformer, output	Part of LS200

SECTION 3

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

C300A	Condenser, fixed trimmer	Part of Z300
C300B	Condenser, fixed trimmer	Part of Z300
C301A	Condenser, fixed trimmer	Part of Z301
C301B	Condenser, fixed trimmer	Part of Z301
C301C	Condenser, fixed trimmer	Part of Z301
C301D	Condenser, fixed trimmer	Part of Z301
C302	Condenser, by-pass, .2 mf.	45-3500-3
C303	Condenser, a-v-c filter, .05 mf.	61-0122*
C304	Condenser, screen by-pass, .05 mf.	61-0122*
L300A	Coil, primary, 1st i-f	Part of Z300
L300B	Coil, secondary, 1st i-f	Part of Z300
L301A	Coil, primary, 2nd i-f	Part of Z301
L301B	Coil, secondary, 2nd i-f	Part of Z301

SECTION 3 (Cont.)

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

Reference Symbol	Description	Service Part No.
R300	Resistor, screen dropping, 27,000 ohms	66-3278340*
R301	Resistor, diode load, 47,000 ohms	66-3478340*
R302	Resistor, a-v-c filter, 2.2 megohms	66-5228340*
TC300A	Tuning core, primary, 1st i-f	Part of Z300
TC300B	Tuning core, secondary, 1st i-f	Part of Z300
TC301A	Tuning core, primary, 2nd i-f	Part of Z301
TC301B	Tuning core, secondary, 2nd i-f	Part of Z301
Z300	Transformer, 1st i-f	32-4160-6
Z301	Transformer, 2nd i-f	32-4240

SECTION 4

R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang, 2-section	31-2731-1
C400A	Condenser, trimmer, aerial	Part of C400
C400B	Condenser, trimmer, osc.	Part of C400
C401	Condenser, aerial coupling, 5 mmf.	30-1224-5*
C402	Condenser, d-c blocking, 47 mmf.	60-00515307**
C403	Condenser, ceramic, oscillator compensator, 10 mmf.	30-1224-26
LA400	Loop aerial	32-4052-32
R400	Resistor, isolating, 150,000 ohms	66-4158340*
R401	Resistor, grid return, 100,000 ohms	66-4108340*
T400	Transformer, oscillator	32-4263

MISCELLANEOUS

Description	Service Part No.
Back	54-7631
Cabinet	
Model 50-527	10745
Model 50-527-I	10745-1
Clock, with cable assembly	
Model 50-527	76-4640
Model 50-527-I	76-4840
Clock cover	
Model 50-527	56-6710
Model 50-527-I	"
Dial, tuning	54-5055
Knob, volume control	
Model 50-527	27-4820
Model 50-527-I	54-4118
Socket, Loktal	27-6177

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.

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

TP-4523

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.

MODEL 50-620

TROUBLE SHOOTING

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.

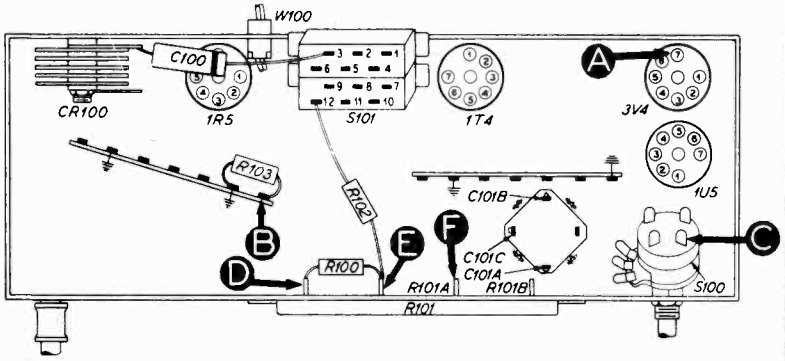


Figure 1. Bottom View, Showing Section 1 Test Points TP-5355A-1

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.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a) 1(b)	A C	7.5v 90v		Trouble in this section. Isolate by the following tests.
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.

TROUBLE SHOOTING

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.

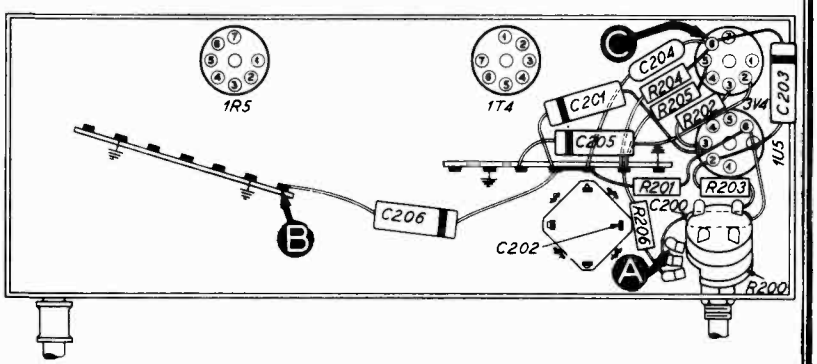


Figure 2. Bottom View, Showing Section 2 Test Points TP-5355B-1

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 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.

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.

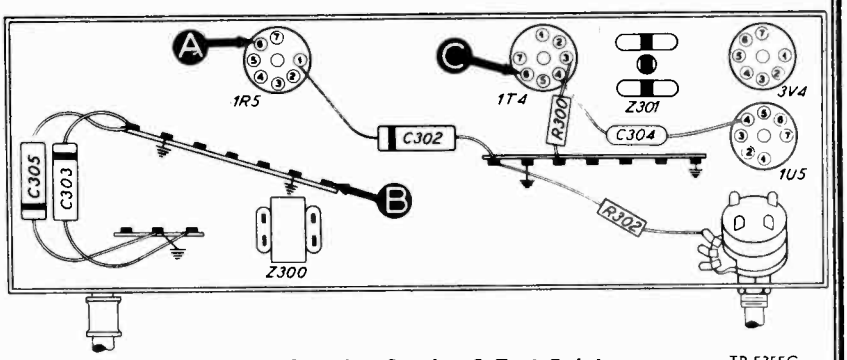


Figure 3. Bottom View, Showing Section 3 Test Points TP-5355C

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 moderate input.	Defective: 1T4, 1U5 (diode section). Misaligned: Z301. Open: R300, C303, L301A, R301, L301B, C301A. Shorted: C300B, C303, L301A, L301B, C301A, C301B.
3	A	Same as step 1.	Defective: 1R5*. Misaligned: Z300. Open: C300A, L300A, L300B, C300B, T400*. Shorted: C400A*, C400B*, C300A, L300A, L300B, C300B.

*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. 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.

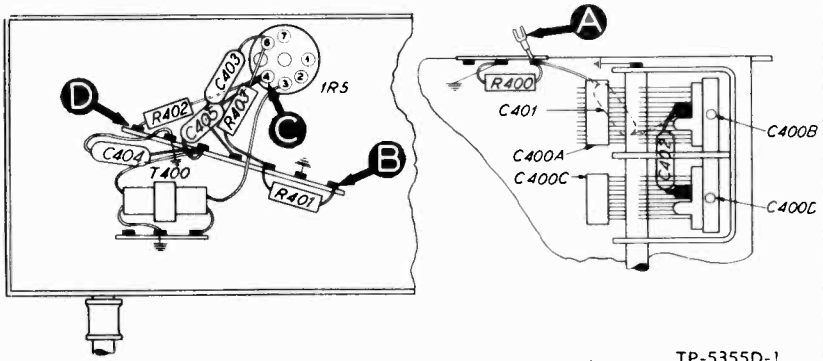


Figure 4. Bottom View, Showing Section 4 Test Points TP-5355D-1

STEP	TEST POINT	SIGNAL GEN. FREQUENCY	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 to D (Osc. test; see note below.)		Rotate through range.	Negative 5 to 10 volts.	Defective: 1R5. Open: R402, T400, C405. Shorted: C402, C400C, C400D.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Open: C401, C403, R401, R403, LA400.

MODEL 50-620

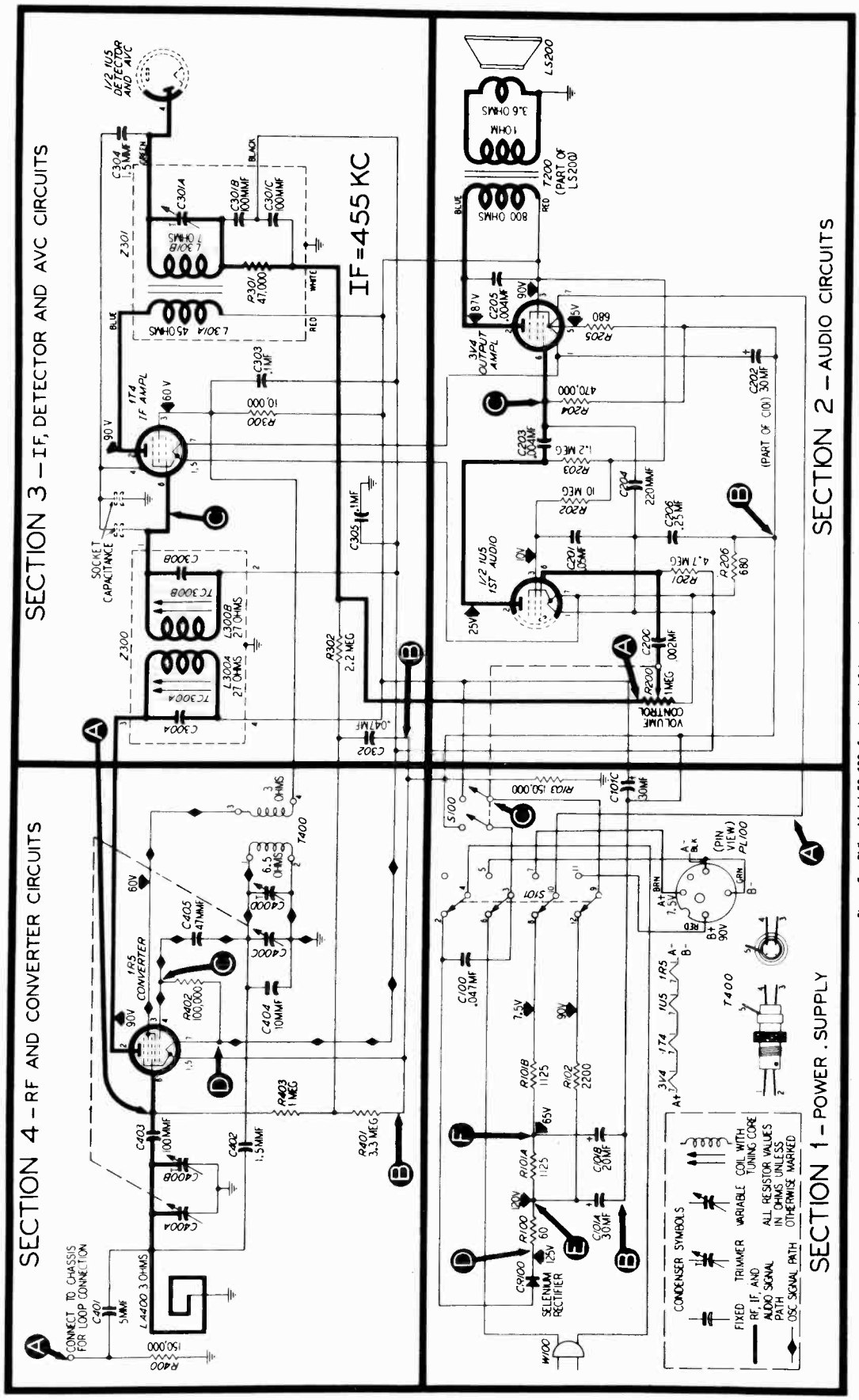


Figure 5. Philco Model 50-620, Sectionalized Schematic Diagram, Showing Test Points TP-5335-1

OSCILLATOR TEST. Connect the positive lead of a high-resistance voltmeter to test point D, connect the probe end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 5 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

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.

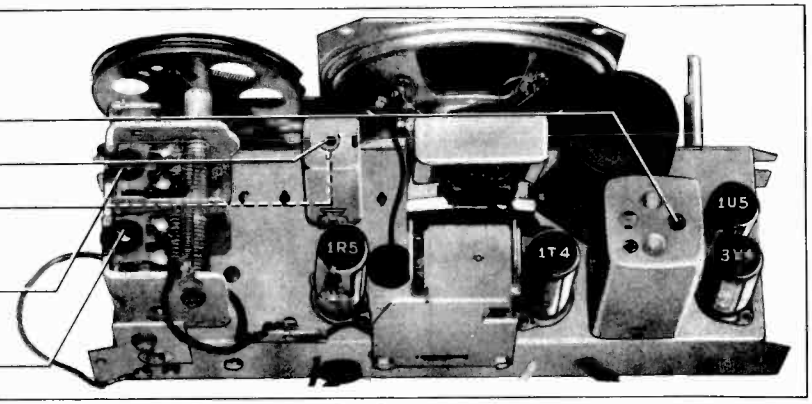


Figure 6. Top View, Showing Trimmer Locations TP-5283

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.

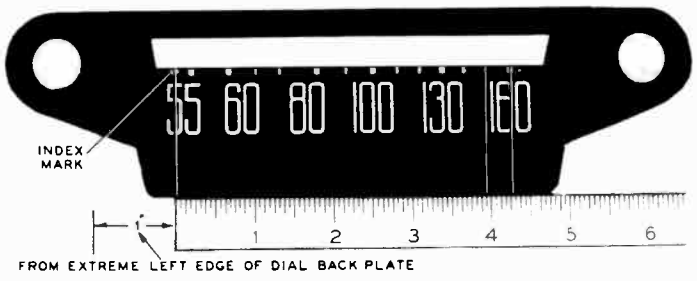


Figure 7. Dial-Backplate Calibration Measurements TP-5776

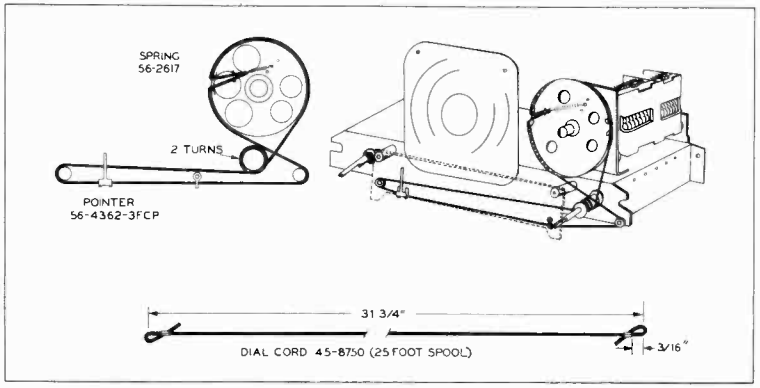


Figure 8. Drive-Cord Installation Details TP-5354E-1

MODEL 50-620

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
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 33-5538-28
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

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

Reference Symbol	Description	Service Part No.
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
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

SPECIFICATIONS

CABINET	Molded plastic, brown
CIRCUIT	Five-tube (plus rectifier) superheterodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	160 milliwatts
OPERATING VOLTAGES	117 volts, a.c. or d.c.; or 9-volt "A" battery and 90-volt "B" battery
POWER CONSUMPTION	
A-C or D-C Operation	15 watts
Battery Operation	55 ma. at 9 volts and 13 ma. at 90 volts
INTERMEDIATE FREQUENCY	265 kc.
PHILCO TUBES (5)	1T4, 1R5, 1U4, 1U5, 3V4
BATTERY TYPE	Philco P-363

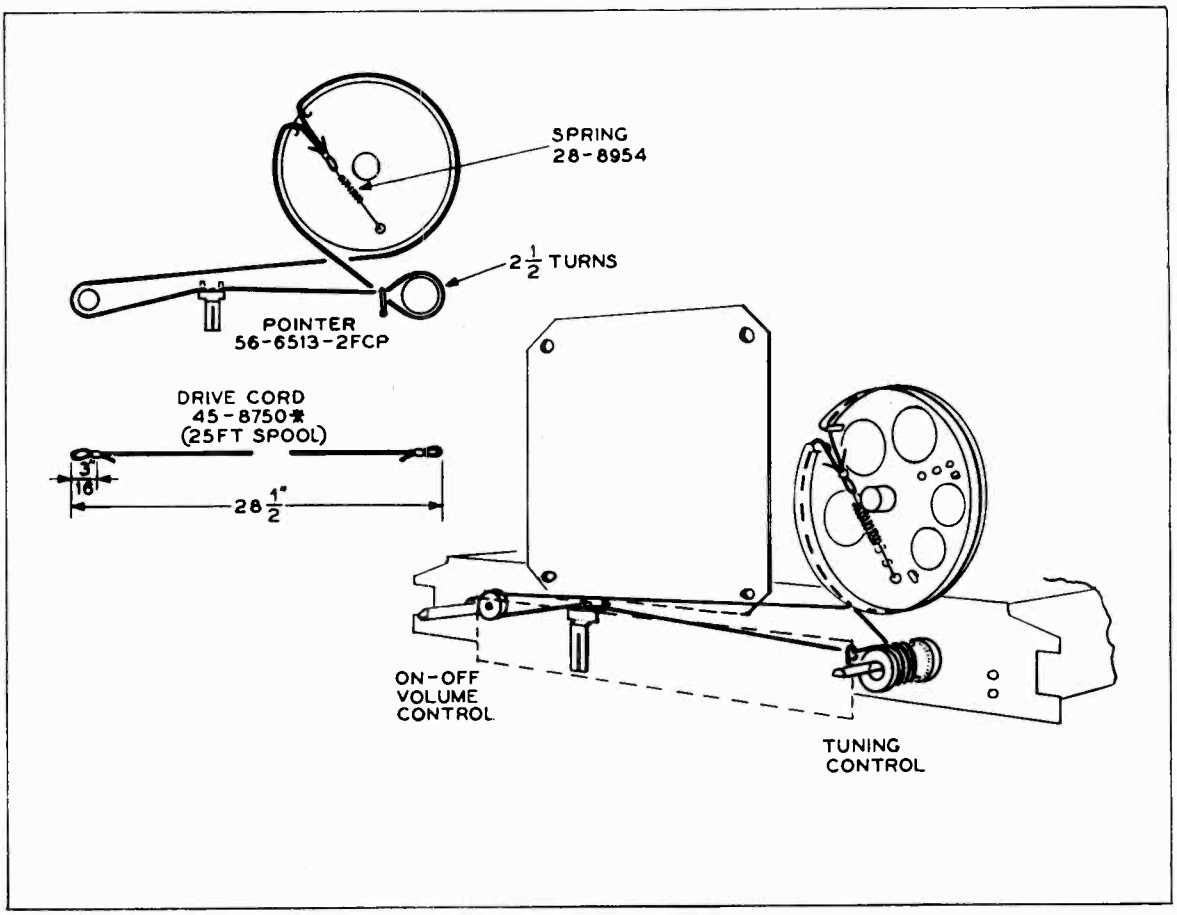


Figure 1. Drive-Cord Installation Details

TP9-513

MODEL 50-621

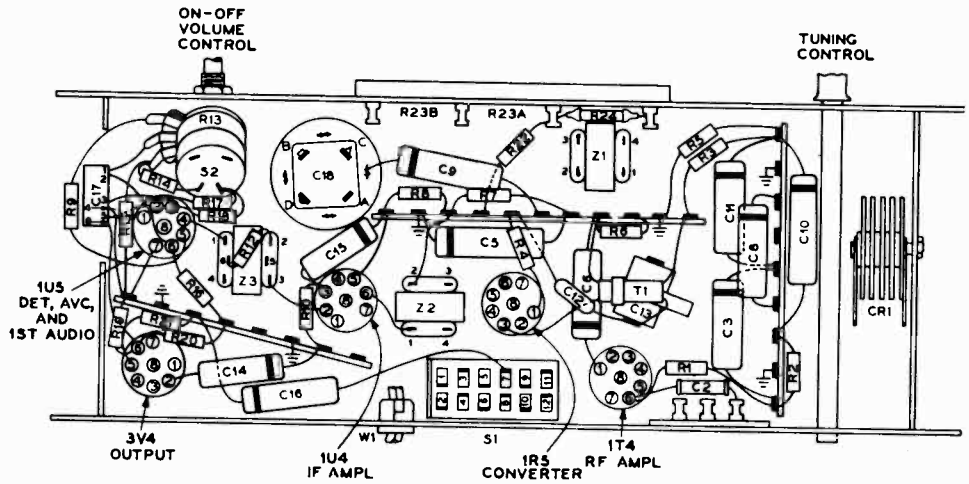


Figure 2. Bottom View, Showing Location of Parts

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 $\mu\mu f$.	62-110009001*
C3	Condenser, bias filter, .05 μf.	61-0122*
C4	Condenser, d-c blocking, 10 $\mu\mu f$.	Part of Z1
C5	Condenser, filament by-pass, .05 μf.	61-0122*
C6	Condenser, screen by-pass, .05 μf.	61-0122*
C7	Condenser, neutralization, 1.5 $\mu\mu f$.	30-1221-3
C8	Condenser, a-v-c filter, .05 μf.	61-0122*
C9	Condenser, filament by-pass, .1 μf.	61-0113*
C10	Condenser, filament by-pass, .1 μf.	61-0113*
C11	Condenser, filament by-pass, .05 μf.	61-0122*
C12	Condenser, d-c blocking, 47 $\mu\mu f$.	30-1224-2*
C13	Condenser, series padder, oscillator	31-6473-16
C14	Condenser, tone compensation, .004 μf.	61-0179*
C15	Condenser, screen neutralizing, .003 μf.	61-0109*
C16	Condenser, line by-pass, .04 μf.	45-3500-2*
C17	Condenser, ceramic, 4-section	30-1237
C17A	Condenser, screen by-pass, .01 μf.	Part of C17
C17B	Condenser, by-pass, 200 $\mu\mu f$.	Part of C17
C17C	Condenser, d-c blocking, .002 μf.	Part of C17
C17D	Condenser, d-c blocking, .001 μf.	Part of C17
C18	Condenser, electrolytic, 4-section	30-2568-26
C18A	Condenser, filament by-pass, 60 μf.	Part of C18
C18B	Condenser, filter, 30 μf.	Part of C18
C18C	Condenser, filter, 10 μf.	Part of C18
C18D	Condenser, filter, 60 μf.	Part of C18
CR1	Selenium rectifier	34-8300*
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*
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	10761-3
Back	54-4712-1
Baffle	54-7857
Front	54-4711
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
Base, shield	56-5628FA3
Socket, tube, miniature	27-6203

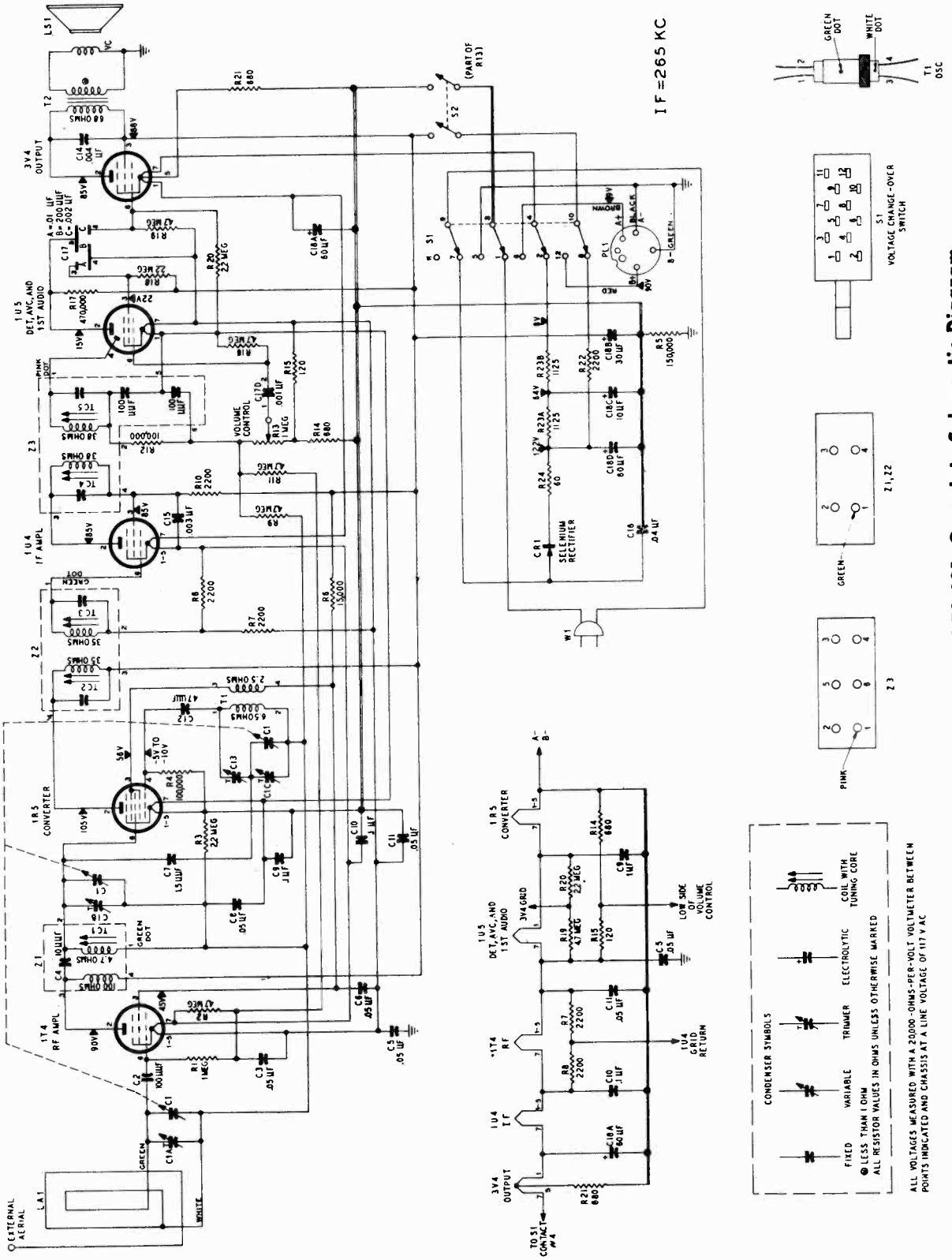


Figure 3. Philco Portable Radio Model 50-621, Complete Schematic Diagram

MODEL 50-621

ALIGNMENT PROCEDURE

POINTER—Set pointer to coincide with first index mark from left side of dial backplate (looking at backplate).

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 and battery is critical for correct tracking. During alignment, with the cabinet back (containing the loop) lying flat on the bench, the chassis should be laid on its back in approximately its normal relation to the loop, with a 1/4"-thick wooden board separating the loop and chassis. The battery should also be placed as close as possible to its normal position with respect to the chassis and loop.

CRITICAL LEAD DRESS—To secure proper padding capacity, the green lead from pin 6 of the 1R5 tube to Z1 must be dressed over wiring panel, away from chassis, and the green lead from Z1 to the tuning condenser must be dressed away from chassis.

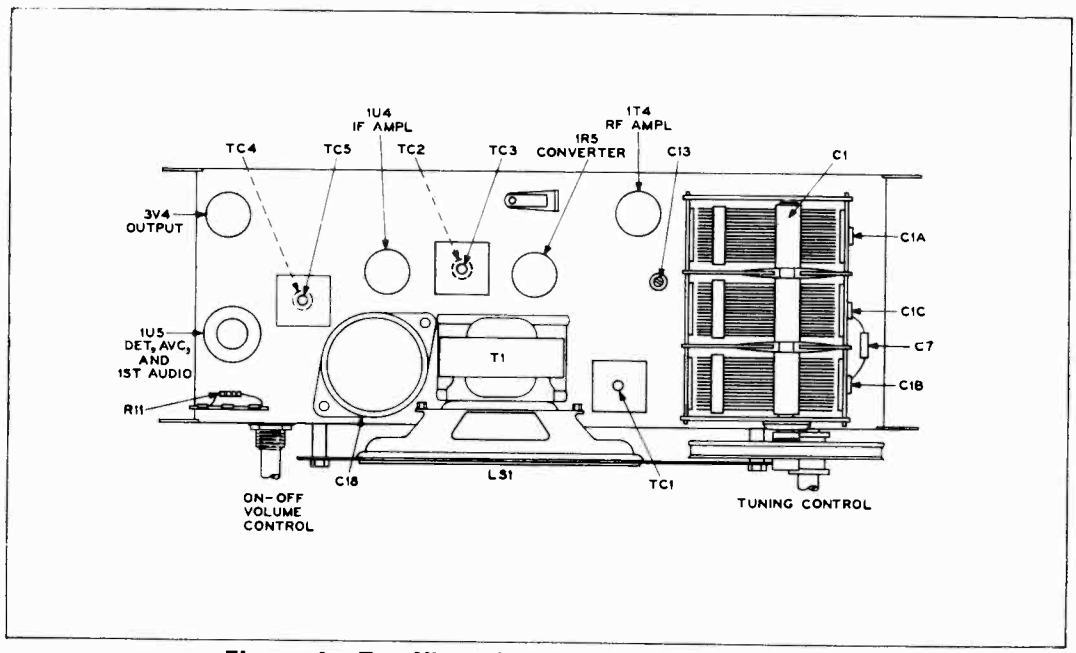


Figure 4. Top View, Showing Trimmer Locations TP9-516

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through a .1-μf. condenser to pin 6 of the 1R5 converter.	265 kc.	540 kc. (gang fully meshed)	Adjust, in order given, for maximum output.	TC5—2nd i-f sec. TC4—2nd i-f pri. TC2—1st i-f pri. TC3—1st i-f sec.
2	Radiating loop. See note below.	1620 kc.	1620 kc. (gang fully open)	Adjust for maximum output. If low-frequency dial tracking is far off, make adjustments in steps 3 and 4 before making this adjustment.	C1C—osc. shunt
3	Same as step 2.	580 kc.	580 kc.	Adjust for maximum output while rocking tuning control.	C13—osc. series
4	Same as step 2.	580 kc.	580 kc.	Adjust for maximum output. This adjustment should not be made unless dial tracking is off, or sensitivity is low at low-frequency end (580 kc.).	TC1—r-f sec.
5	Same as step 2.	1500 kc.	1500 kc. (index mark at right)	Adjust, in order given, for maximum output.	C1B—r-f trimmer C1A—aerial trimmer
6	Repeat steps 3 and 5 until no further improvement is obtained.				

RADIATING LOOP: Make up a six-to-eight-turn, 6-inch-diameter loop using insulated wire; connect to signal-generator leads and place near radio loop.

MODEL 50-925

Circuit Description

Philco Radio Model 50-925 is a superheterodyne employing six tubes plus a selenium rectifier. Reception is provided in the standard-broadcast and FM bands. A built-in high-impedance loop is used as the aerial for the broadcast band, and the line cord is used as the aerial for the FM band. These aerials normally provide adequate signal pickup; if additional pickup is required on the FM band, Philco Dipole Aerial Part No. 45-1462 may be used. If it is desired to use the FM dipole aerial to provide additional AM as well as FM pickup, Aerial Coupler Part No. 45-1598 and Aerial Coupler Cable Part No. 45-1652 should be used in conjunction with the dipole aerial. The purpose of the cable is to permit the isolation of the coupler from the chassis, since the coupler must not be connected directly to the "hot" chassis.

A 12BA6 pentode is used as an r-f amplifier, for FM only. This stage is capacity-coupled to a 12BA7, which is employed as a mixer and oscillator for both bands, by switching the mixer grid and common cathode to the proper circuits.

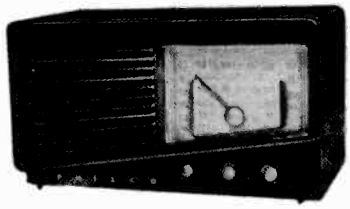
For broadcast reception, the i-f signal is transformer-coupled to a 12BA6 i-f amplifier. The output of this stage is transformer-coupled to a diode section of the 19T8, which provides detection and a-v-c action.

For FM reception, an additional i-f amplifier stage, which employs another 12BA6, is used to provide adequate gain and stability. The 12BA6 is transformer-coupled to two diode sections of the 19T8, in a ratio-detector circuit. The proper detector for AM or FM is selected by the band switch at the detector output circuits.

In the i-f circuits, two sets of i-f transformers are used. One set is tuned to 455 kc., for standard broadcast, and the other set is tuned to 9.1 mc., for FM. The use of two sets of transformers makes better shielding possible, so that undesirable beat signals and interaction between transformers are eliminated. In switching bands, the band switch shorts the primary of the 1st i-f transformer for the undesired band.

The triode section of the 19T8 is employed as the first audio amplifier; this section is resistance-coupled to the 50C5 output tube, which supplies an audio output of approximately one watt to the permanent-magnet speaker.

The power supply utilizes a selenium rectifier in a half-wave-rectifier circuit, and operates from a line voltage of 105—120 volts, a.c. or d.c.



MODEL 50-925

SPECIFICATIONS

CABINET	Plastic, brown finish
CIRCUIT	6-tube superheterodyne, plus selenium rectifier
FREQUENCY RANGES	
Broadcast	540—1620 kc.
FM	88—108 mc.
AUDIO OUTPUT	1 watt
OPERATING VOLTAGE	105—120 volts, a.c. or d.c.
POWER CONSUMPTION	35 watts
AERIALS	Built-in high-impedance loop for AM, line cord for FM; also connector for external aerial
INTERMEDIATE FREQUENCIES	
Broadcast	455 kc.
FM	9.1 mc.
PHILCO TUBES (6)	12BA6(3), 12BA7, 19T8, 50C5

TP-8091

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 test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

MODEL 50-925

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

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+ (test point B) and the chassis (test point C). When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C102A, C102B, C102C, and C309 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.

Section 1 TROUBLE SHOOTING

POWER SUPPLY

CAUTION—One side of the power line is connected directly to the chassis. Do not connect chassis to ground. Use all precautions to avoid shock.

For the tests in this section, use a d-c voltmeter. Connect the negative lead to the chassis, test point C; 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. Set the band switch for broadcast reception.

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.

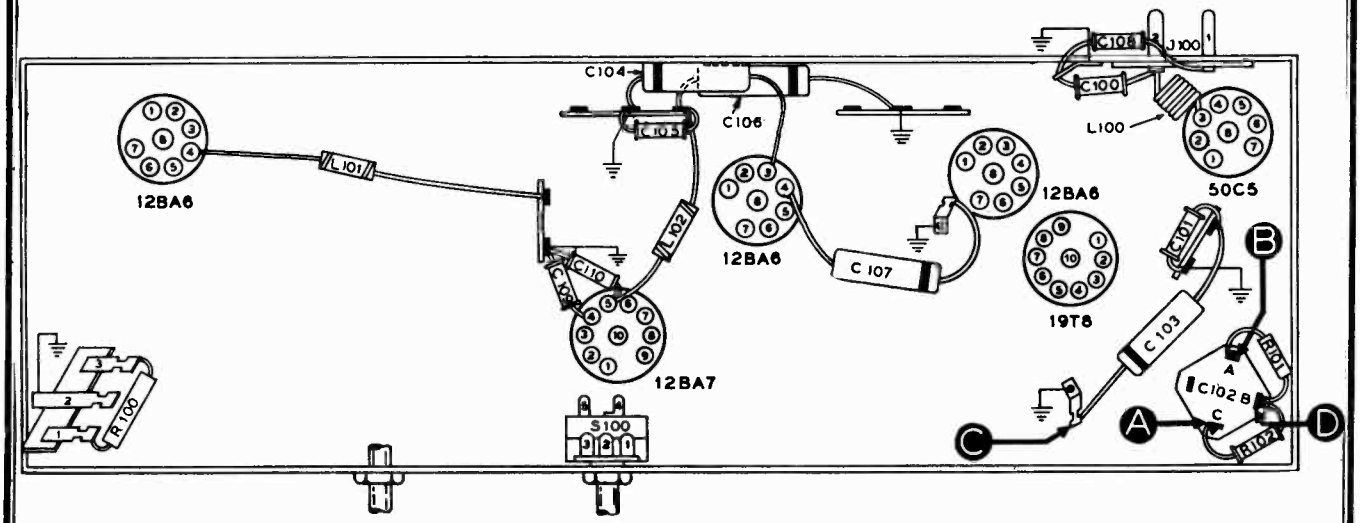


Figure 1. Bottom View, Showing Section 1 Test Points TP-8455A

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	100v		Trouble in this section. Isolate by the following tests.
2	B	135v	No voltage Low voltage High voltage	Defective: CR100. Open: R100. Shorted: C102A. Defective: CR100. Shorted: C102A, C102B, C102C, C309*, C310*. Open: R101.
3	D	120v	No voltage Low voltage High voltage	Shorted: C102B. Open: R101. Leaky: C102B. Shorted: C102A, C102C. Open: R102, T200* (primary), R204*.
4	A	100v	No voltage Low voltage	Open: R102. Shorted: C102C. Shorted: C102B. Leaky: C102C.
Listening Test: Abnormal hum may be caused by open C102A, C102B, or C102C.				

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

Section 2

TROUBLE SHOOTING

AUDIO CIRCUITS

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

With the band switch set for broadcast reception (except for test point E), set the 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.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A E (Band switch in FM position)	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	B	Loud, clear output with strong input.	Defective: 50C5. Open: R204, R203, C207, T200. Shorted: C205, C206, C207, C208. Leaky: C205, C206, C208.
3	D	Same as step 1.	Defective: 19T8 (triode section). Open: R201, R202, C205. Shorted or leaky: C204, C205.
4	A	Same as step 1.	Open: WS-1(F), R200, C203. Shorted: C202, C307*.
5	E (Band switch in FM position)	Same as step 1.	Open: C200, WS-1(F). Shorted: C201, C202.
Listening Test: Distortion may be caused by shorted or leaky C205 or by shorted, leaky, or open C207.			

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

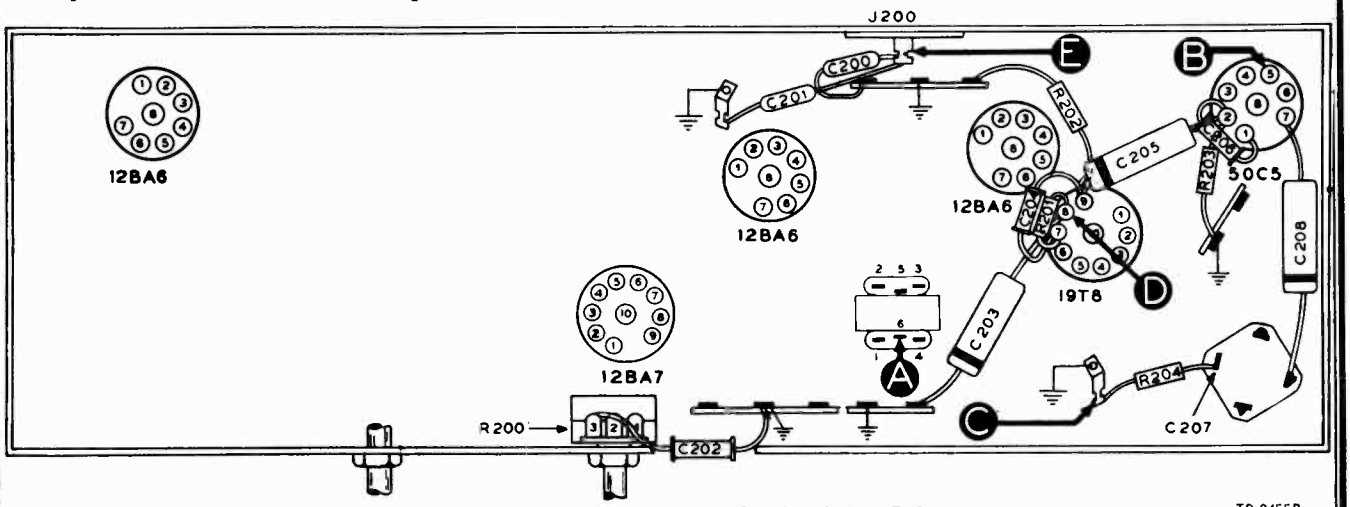


Figure 2. Bottom View, Showing Section 2 Test Points

TP-8455B

Section 3

TROUBLE SHOOTING

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

AM Circuits

For the AM tests in this section, use an AM r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

With the volume control set to maximum, and the band switch set for broadcast reception, rotate the tuning control until the tuning condenser is fully meshed.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the FM tests: if not, isolate and correct the trouble in the AM circuits.

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 on next page under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

MODEL 50-925

Section 3 (Cont.) TROUBLE SHOOTING

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	B	Loud, clear output with moderate input.	Defective: 12BA6, 19T8. Open: R301, R303, R305, R102*, R302. Shorted: C305, C303C, C303D. Misaligned or open: Z303.
3	A	Same as step 1.	Defective: 12BA7. Open: Z301, R404*, R300, WS-1(F), R402*, R307, L404. Shorted: C304, C408*, C409*. Misaligned: Z301.

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

FM Circuits

For the FM tests in this section, follow the preliminary instructions for the AM tests, with the following exceptions:

Set the band switch for FM reception, set the signal generator to 9.1 mc., and detune to one side or the other until a satisfactory test signal is obtained.

The most satisfactory check on the operation of the discriminator circuit is the ability to make proper alignment as described under "ALIGNMENT PROCEDURE."

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.

FM Chart

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in FM circuits. Isolate by the following tests.
2	D	Loud, clear output with strong input.	Defective: 12BA6, 19T8 (diode sections). Open: R304, R308, R102*, R309, R310, Z304, C314, Z303. Shorted: C311, C312, C313, C314, C200*, C201*, Z304. Misaligned: Z304.
3	B	Loud, clear output with moderate input.	Open: Z302, R302, R306, R307, R301, R303. Shorted: C305, C309, C310. Misaligned: Z302.
4	A	Same as step 1.	Open: WS-1(F), R404*, Z300, Z301, R300, R102*, WS-2(R). Shorted: C408*, C409*, C304. Misaligned: Z300.

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

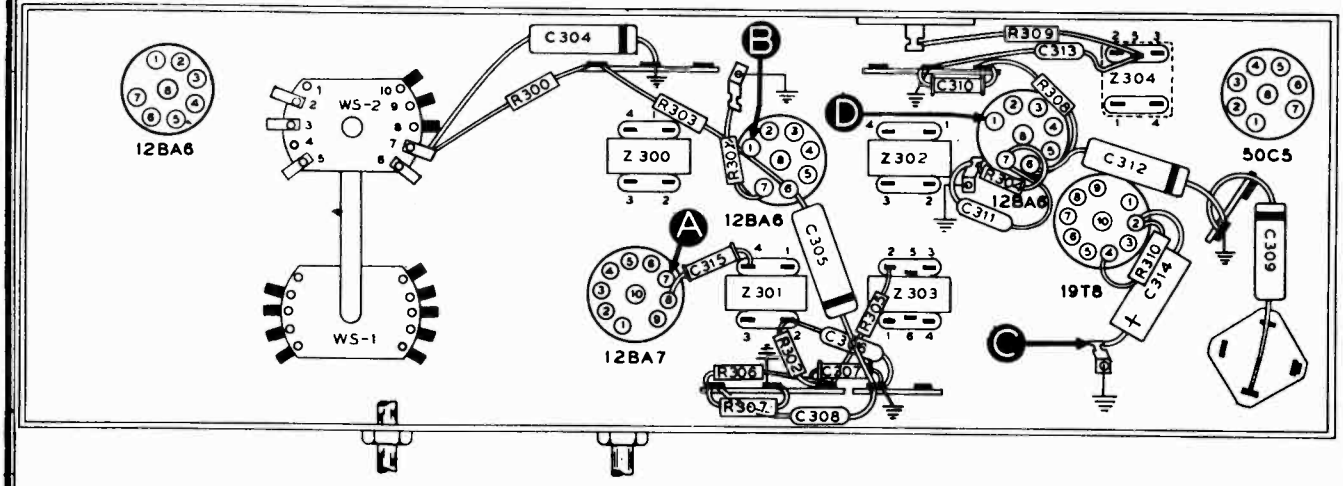


Figure 3. Bottom View, Showing Section 3 Test Points TP-8455C

Section 4

TROUBLE SHOOTING

R-F AND CONVERTER CIRCUITS

AM Circuits

For the AM 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 the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

With the volume control set to maximum, set the band switch for broadcast reception, and set the tuning control and signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits; if not, isolate and correct the trouble in the AM circuits.

FM Circuits

For the FM tests in this section, follow the preliminary instructions for the AM tests, except set the band switch for FM reception.

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 corrected by the tests for this section, check the alignment.

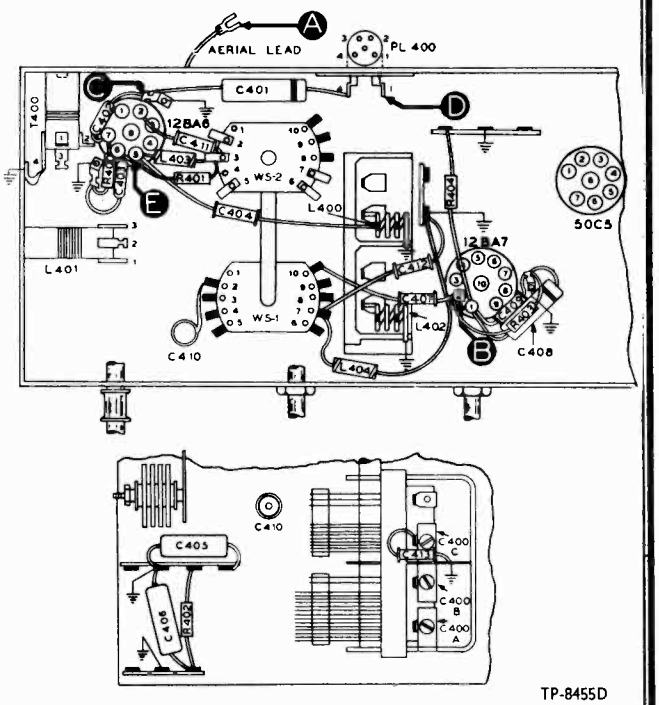


Figure 4. Bottom View, Showing Section 4 Test Points

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	B (Osc. test: see note below.)		Tune through range.	Negative .8 to 2.4 volts.	Open: WS-1(F), L401, C407, R403, R404, C408, C409. Shorted: C400C, C407, C304*, C408, C409. Defective: 12BA7 (osc. section). Misaligned: L401.
3	A	1000 kc.	Tune to signal	Same as step 1.	Open: T401, WS-2(F), R404, R300*, WS-1(F), R402. Shorted: C406, C408, C409.

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

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 2) of the 12BA7, test point B. 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	D	100 mc.	Tune to signal	Loud, clear speaker output with weak generator input.	Trouble in FM circuits. Isolate by the following tests.
2	B (Osc. test: see note above.)		Tune through range.	Negative .4 to 1.5 volts.	Defective: 12BA7 (osc. section). Open: WS-1(F), C407, R403, C410, R404, R300*. Shorted: C410, C407, C408, C409, C304*. Misaligned: L402.
3	E	100 mc.	Tune to signal	Loud, clear output with moderate input.	Defective: 12BA7. Open: C404, L400, WS-2(F). Shorted: C404, C400. Misaligned: L400.
4	D	100 mc.	Tune to signal	Loud, clear output with very weak input.	Defective: 12BA6. Open: T400, C401, C402, R400, R401, L403. Shorted: C402, C403, C309*, C310*.

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

MODEL 50-925

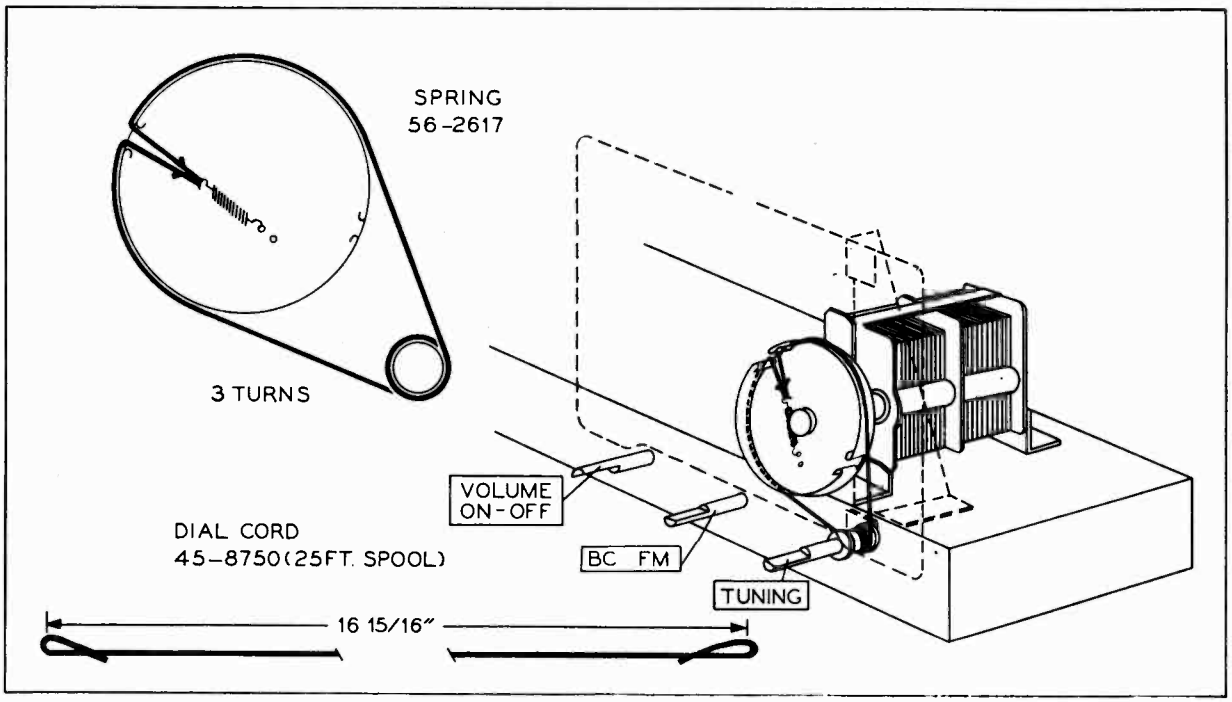


Figure 5. Drive-Cord Installation Details TP-5686E-1

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."

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, 100 $\mu\mu f$	62-110009001*
C101	Condenser, line filter, 100 $\mu\mu f$	62-110009001*
C102	Condenser, electrolytic, 4 sections	30-2570-43
C102A	Condenser, filter, 40 mf., 150v	Part of C102
C102B	Condenser, filter, 70 mf., 150v	Part of C102
C102C	Condenser, filter, 40 mf., 150v	Part of C102
C103	Condenser, line by-pass, .04 μf	45-3500-2*
C104	Condenser, line by-pass, .01 μf	61-0120*
C105	Condenser, line by-pass, 100 $\mu\mu f$	62-110009001*
C106	Condenser, line by-pass, .01 μf	61-0120*
C107	Condenser, line by-pass, .01 μf	61-0120*
C108	Condenser, r-f by-pass, 100 $\mu\mu f$	62-110009001*
C109	Condenser, r-f by-pass, 100 $\mu\mu f$	62-110009001*
C110	Condenser, r-f by-pass, 100 $\mu\mu f$	62-110009001*
CR100	Selenium rectifier	34-8003-1
J100	Jack, male, a-c	27-4785-7
L100	Choke, line filter	32-4089-3
L101	Choke, filament	32-4061-2
L102	Choke, filament	32-4061-2
PL100	Plug, a-c	27-6200-1
R100	Resistor, current limiting, 20 ohms	33-1345
R101	Resistor, filter, 150 ohms	66-1154340*

SECTION 1 (Continued)
POWER SUPPLY

Reference Symbol	Description	Service Part No.
R102	Resistor, filter, 470 ohms	66-1474340*
S100	Switch, a-c, on-off	Part of R200
W100	Line cord	L-2183

SECTION 2
AUDIO CIRCUITS

C200	Condenser, FM coupling, .01 μf	61-0120*
C201	Condenser, de-emphasis, 2200 $\mu\mu f$	60-20225014
C202	Condenser, r-f by-pass, 100 $\mu\mu f$	62-110009001*
C203	Condenser, d-c blocking, .02 μf	61-0108*
C204	Condenser, parasitic suppressor, 680 $\mu\mu f$	62-168001001
C205	Condenser, audio coupling, .006 μf	45-3500-7*
C206	Condenser, r-f by-pass, 100 $\mu\mu f$	62-110009001*
C207	Condenser, electrolytic, cathode by-pass, 25 μf, 25v	Part of C102
C208	Condenser, tone compensating, .006 μf	45-3500-7*
J200	Jack, FM test	27-6180
LS200	Speaker, permanent-magnet	36-1614
R200	Volume control (with off-on switch) 500,000 ohms	33-5566-8
R201	Resistor, grid return, 10 megohms	66-6108340*

REPLACEMENT PARTS LIST (Continued)

SECTION 2 (Continued)

AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
R202	Resistor, plate load, 470,000 ohms	66-4478340*
R203	Resistor, grid return, 470,000 ohms	66-4478340*
R204	Resistor, cathode bias, 150 ohms	66-1158340*
T200	Transformer, output	Part of LS200
WS-1(F)†	Switch-wafer section	Part of 42-1896

SECTION 3

I-F, DET., AND A-V-C CIRCUITS

C300A	Condenser, fixed trimmer	Part of Z300
C300B	Condenser, fixed trimmer	Part of Z300
C301A	Condenser, fixed trimmer	Part of Z301
C301B	Condenser, fixed trimmer	Part of Z301
C302A	Condenser, fixed trimmer	Part of Z302
C302B	Condenser, fixed trimmer	Part of Z302
C303A	Condenser, fixed trimmer	Part of Z303
C303B	Condenser, fixed trimmer	Part of Z303
C303C	Condenser, i-f by-pass	Part of Z303
C303D	Condenser, i-f by-pass	Part of Z303
C304	Condenser, screen by-pass, .01 μf	61-0120*
C305	Condenser, screen by-pass, .003 μf	30-4582
C306	Condenser, a-v-c filter, .01 μf	61-0120*
C307	Condenser, r-f by-pass, 100 $\mu\mu f$	62-110009001*
C308	Condenser, a-v-c filter, .01 μf	61-0120*
C309	Condenser, i-f by-pass, .01 μf	61-0120*
C310	Condenser, r-f by-pass, 100 $\mu\mu f$	62-110009001*
C311	Condenser, cathode by-pass, .01 μf	61-0120*
C312	Condenser, screen by-pass, .002 μf	61-0062*
C313	Condenser, i-f by-pass, .01 μf	61-0120*
C314	Condenser, electrolytic filter, 2 μf, 50v	30-2417-7
C315	Condenser, r-f by-pass, 100 $\mu\mu f$	62-110009001*
L300A	Coil, 1st FM i-f primary	Part of Z300
L300B	Coil, 1st FM i-f secondary	Part of Z300
L301A	Coil, 1st AM i-f primary	Part of Z301
L301B	Coil, 1st AM i-f secondary	Part of Z301
L302A	Coil, 2nd FM i-f primary	Part of Z302
L302B	Coil, 2nd FM i-f secondary	Part of Z302
L303A	Coil, 2nd AM i-f primary	Part of Z303
L303B	Coil, 2nd AM i-f secondary	Part of Z303
L304A	Coil, FM discriminator transformer primary	Part of Z304
L304B	Coil, FM discriminator transformer secondary	Part of Z304
L304C	Coil, FM discriminator transformer tertiary	Part of Z304
R300	Resistor, plate load, 1000 ohms	66-2108340*
R301	Resistor, cathode bias, 47 ohms	66-0478340*
R302	Resistor, a-v-c filter, 1 megohm	66-5108340*
R303	Resistor, plate load, 1000 ohms	66-2108340*
R304	Resistor, cathode bias, 68 ohms	66-0688340*
R305	Resistor, r-f filter, 47,000 ohms	66-3478340*
R306	Resistor, a-v-c filter, 1 megohm	66-5108340*
R307	Resistor, isolating, 470,000 ohms	66-4478340*
R308	Resistor, plate load, 470 ohms	66-1478340*
R309	Resistor, isolating, 47,000 ohms	66-3478340*
R310	Resistor, FM detector load, 47,000 ohms	66-3478340*
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
WS-2(R)†	Switch-wafer section	Part of 42-1896
Z300	Transformer, 1st FM i-f	32-4372A
Z301	Transformer, 1st AM i-f	32-4160A

SECTION 3 (Continued)

I-F, DET., AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
Z302	Transformer, 2nd FM i-f	32-4372-1A
Z303	Transformer, 2nd AM i-f	32-4240A
Z304	Transformer, 3rd FM i-f	32-4310

SECTION 4

R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2733-1
C400A	Condenser, trimmer, aerial	Part of C400
C400B	Condenser, trimmer, FM r-f	Part of C400
C400C	Condenser, trimmer, AM osc.	Part of C400
C401	Condenser, aerial isolating, .01 μf	61-0120*
C402	Condenser, cathode by-pass, 100 $\mu\mu f$	62-110009001*
C403	Condenser, screen by-pass, 1500 $\mu\mu f$	62-215001011*
C404	Condenser, d-c blocking, 220 $\mu\mu f$	62-122001001
C405	Condenser, aerial isolating, .01 μf	61-0120*
C406	Condenser, r-f by-pass, .05 μf	61-0122*
C407	Condenser, d-c blocking, 22 $\mu\mu f$	62-022009001*
C408	Condenser, AM i-f by-pass, .01 μf	61-0120*
C409	Condenser, FM i-f by-pass, 100 $\mu\mu f$	62-110009001*
C410	Condenser, FM osc. trimmer	31-6495-3
C411	Condenser, r-f by-pass, 100 $\mu\mu f$	62-110009001*
C412	Condenser, r-f by-pass, 6.5 $\mu\mu f$	30-1224-6*
C413	Condenser, fixed trimmer, 13 $\mu\mu f$	62-015200001*
J400	Jack, FM aerial	27-6214-8
L400	Coil, FM r-f	32-4392
L401	Coil, AM osc.	32-4153-3
L402	Coil, FM osc.	32-4391
L403	Coil, r-f choke	32-4061-2
L404	Coil, r-f choke	32-4111
LA400	Loop aerial	30-4052-35
PL400	Plug, wire-and-lug assembly, FM line-cord aerial (part of W100)	41-3791-1
R400	Resistor, cathode bias, 47 ohms	66-0478340*
R401	Resistor, screen dropping, 1000 ohms	66-2108340*
R402	Resistor, a-v-c voltage dropping, 33,000 ohms	66-3338340*
R403	Resistor, grid return, 22,000 ohms	66-3228340*
R404	Resistor, screen dropping, 1000 ohms	66-2108340*
T400	Transformer, FM aerial	32-4390
WS-2(F)†	Switch-wafer section	Part of 42-1896
WS-1(F)†	Switch-wafer section	Part of 42-1896

†Wafer switch, 2 sections (band switch) 42-1896

MISCELLANEOUS

Description	Service Part No.
Cabinet	10714-2
Back	54-7819
Baffle-and-cloth assembly	40-7535-1
Window, acetate	54-4595
Dial Scale	54-5011-1
Drive cord, 25-foot spool	45-8750*
Spring, gang drive	56-2617
Pointer	54-4704
Drive Shaft	76-4034
Bushing	27-9437
Spring, retaining (2)	57-1468FA1
Insulator, volume-control shaft	54-7818
Knob, "TUNING"	54-4527-1
Knob, "FM-AM"	54-4527-21
Knob, "VOLUME-ON-OFF"	54-4527
Shield, rectifier	54-7818
Shield, tube base	56-3978-1FA3
Socket, 7-pin miniature (3)	27-6203
Socket, 7-pin miniature, 12BA6 r-f amp.	27-6203-1
Socket, 9-pin miniature, 19T8	27-6203-6
Socket, 9-pin miniature, 12BA7	27-6203-5

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 — With tuning-condenser plates fully meshed, adjust pointer to coincide with index mark at low-frequency end of scale.

RADIO CONTROLS — Set volume control to maximum, set band switch for broadcast reception, and set tuning control a, indicated in chart.

OUTPUT METER — Connect across voice-coil terminals.

SIGNAL GENERATOR — Use AM r-f signal generator, with modulated output. Connect generator and set frequency as indicated in chart.

OUTPUT LEVEL — During alignment, signal-generator output must be attenuated to hold output-meter reading below 1.25 volts.

FM ALIGNMENT PROCEDURE

Make AM alignment first.

RADIO CONTROLS — Set volume control to maximum, set band switch for FM reception, and set tuning control as indicated in chart.

OUTPUT METER — Connect across voice-coil terminals. (This meter is used only for step 3.)

D-C VOLTMETER — Connect negative lead of d-c voltmeter (resistance of at least 20,000 ohms per volt) to pin 2 of 19T8 tube, and positive lead to chassis. Use 0—10-volt range.

SIGNAL GENERATOR — Use AM r-f signal generator, with modulated output. Connect ground lead to chassis. Connect output lead and set frequency as indicated in chart. Generator must have sufficient output to give reading of approximately 8.5 volts on d-c voltmeter; during alignment, generator output must be attenuated to hold meter reading at this value.

NOTE: Before starting FM alignment, allow radio and signal generator to warm up for 15 minutes.

MODIFICATIONS

MODEL 50-925 - Service Replacement
When replacing C-206, use the following:
C-206, Condenser, tone compensation, .0068mf 30-4650-91

PRE-PRODUCTION CHANGES - To Increase Undistorted Output:
R-204, Resistor, cathode bias, 100 ohms 66-1106340*

FOUR ADDITIONS TO IMPROVE F-M
1. A .01 mf condenser, C-111, has been added from the filament, pin #5, of the 12BA7 to ground in parallel with C-110.
C-111 Condenser, filament by-pass, .01 mf 61-0120*
2. A 100 mmf condenser, C-414, has been added from pin #4 of J-400 to ground, making the low side of the primary of the F-M antenna coil ground at r-f potential. This is to prevent the F-M r-f stage from oscillating when the antenna is disconnected.
C-414, Condenser, r-f by-pass, 100 mmf 62-110009001*

(3) A tube shield has been added to the 12BA6, 1st I-F amplifier.
Shield 56-3979FA5
Shield Base 56-3978FA5
(4) A special lead shield assembly has been added to the 12BA7 converter tube to reduce microphonics in the F-M band.
Socket, 12BA7 27-6249
Tube shield and Lead Weight assembly 76-5124
C-406, Condenser, r-f by-pass, .047 mf 30-4650-45
A pilot lamp, I-100, has been added to improve dial lighting. It is wired from the junction of L-100 and R-100 to ground.
I-100, Pilot Lamp 110-125V., intermediate base 34-2605*
Pilot Lamp Socket 27-6233-34
Pilot Lamp Shield 56-6331FA2
Spring Clip, Pilot Lamp socket mtg. 28-2488FA1

RUN #2 - To Improve Conversion Gain
L-401 Coil, AM oscillator 32-4153-5*

RUN #3 - Prevention of Selenium Rectifier Burnouts
CR-100, has been changed to one of higher current rating.
RUN #2R and #3 are identical.
CR-100 Selenium Rectifier, 150 ma 34-8300-2

RUN #4 - Also to prevent rectifier burnout and to reduce ripple current in the electrolytic condenser, C-102, and additional 20 ohm current limiting resistor, R-103, has been added between L-100 and R-100. This resistor wires between pin #3 of the 5Q5 socket and the ungrounded lug of the 2 lug terminal panel, the junction of C-101, C-103 and the white wire to R-100.

R-103 Resistor, current limiting, 20 ohms 33-1345

Part Number Changes:-

C-305 Condenser, screen by-pass .003 mf 61-0109*
L-400 Coil, F-M r-f 32-4392-1
L-402 Coil, F-M osc. 32-4391-1
LA400, Loop Aerial 32-4052-35
Pointer 54-4599
Window, acetate 54-4595-1

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST TRIMMER
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to chassis. Output lead through a .1-mf. condenser to mixer grid (pin 7) of 12BA7.	455 kc.	540 kc. (gang fully meshed)	Adjust for maximum output.	TC303B—2nd AM i-f sec. TC303A—2nd AM i-f pri. TC301B—1st AM i-f sec. TC301A—1st AM i-f pri.
2	Radiating loop. (See note below.)	1600 kc.	1600 kc.	Adjust for maximum output.	C400C—osc. trimmer
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output.	C400A—aerial trimmer

RADIATING LOOP: Make up a six-to-eight-turn, 6-inch-diameter loop from insulated wire; connect to generator terminals, and place near radio loop aerial. Radio loop aerial must be connected.

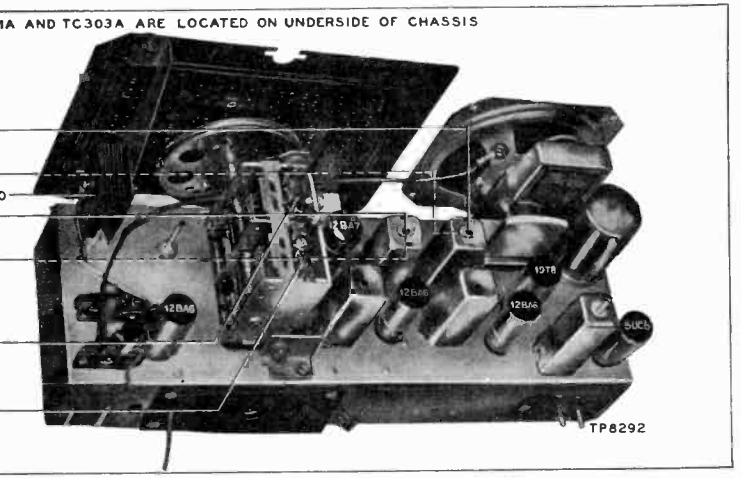


Figure 7. Top View, Showing AM Trimmer Locations

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST TRIMMER
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through a .1-mf. condenser to control grid (pin 1) of 12BA6 1st i-f amp.	9.1 mc.	88 mc.	Adjust tuning cores for maximum reading on d-c voltmeter. Attenuate signal generator to maintain a reading of approximately 10 volts. Repeat adjustments until no further improvement is noted. After this step, do not disturb these tuning cores except as directed in step 3.	TC304B—discriminator sec. TC304A—discriminator pri. TC302B—FM 2nd i-f sec. TC302A—FM 2nd i-f pri.
2	Through .1-mf. condenser to pin 7 of 12BA7.	9.1 mc.	88 mc.	Adjust tuning cores for maximum reading on d-c voltmeter. Repeat adjustments until no further improvement is noted. Do not disturb these tuning cores after this step.	TC300B—FM 1st i-f sec. TC300A—FM 1st i-f pri.
3	Same as step 1.	9.1 mc.	88 mc.	Adjust tuning core for minimum reading on output meter. This adjustment is critical; repeat to make certain it is correct.	TC304B—discriminator sec.
4	To terminal 1 of J400.	105 mc.	105 mc.	Adjust trimmer for maximum reading on d-c voltmeter.	C410—FM osc.
5	Same as step 4.	105 mc.	105 mc.	Same as step 4.	C400B—FM r-f
6	Same as step 4.	92 mc.	92 mc.	Adjust coil for maximum reading on d-c voltmeter.	L402—FM osc. (tracking)
7	Same as step 4.	92 mc.	92 mc.	Same as step 6.	L400—FM r-f (tracking)
8	Same as step 4.	105 mc.	105 mc.	Same as step 4.	C410—FM osc.
9	Repeat steps 4 through 8 until no further improvement is noted.				

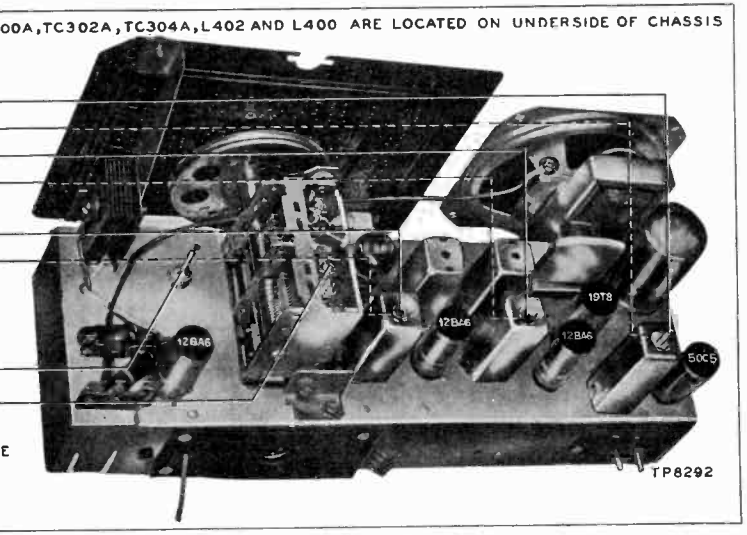


Figure 8. Top View, Showing FM Trimmer Locations

PR-1681

MODEL 50-925

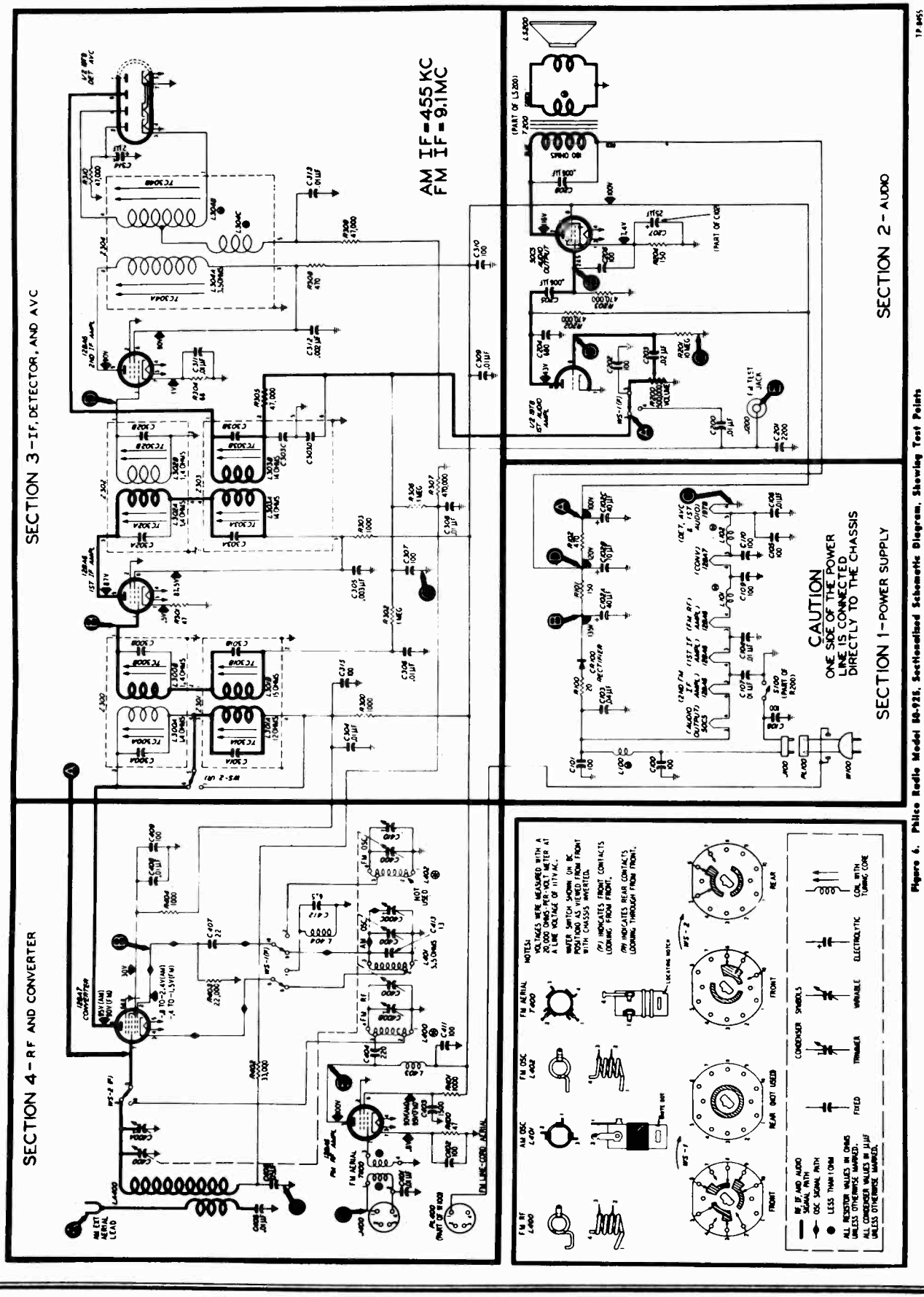


Figure 6. Philco Radio Model 50-925, Sectionalized Schematic Diagram, Showing Test Points

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.

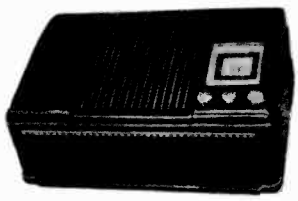
The loop works directly into a 12BE6 converter; no series padder is required for the oscillator, as the tuning-condenser plates are shaped for tracking.

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.



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)

TP-6527

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.

MODEL 50-1420

Section 1—Power Supply

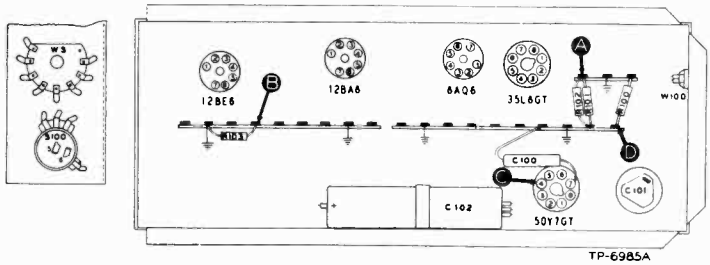
TROUBLE SHOOTING

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

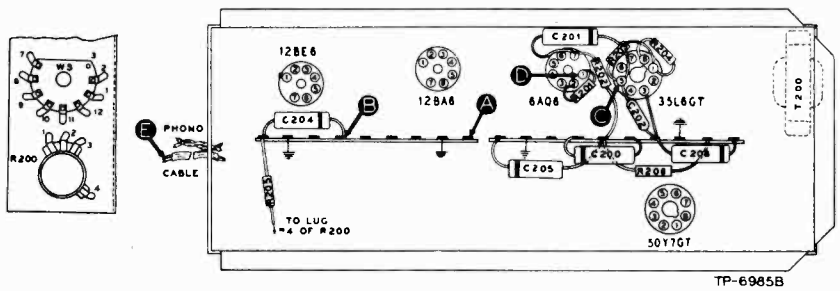
TROUBLE SHOOTING

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.

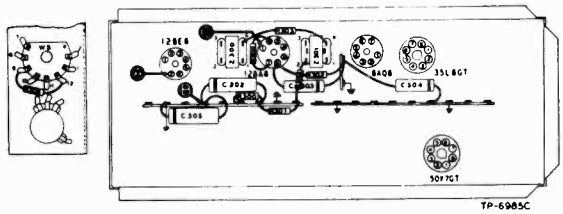


Figure 3. Bottom View, Showing Section 3 Test Points

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.

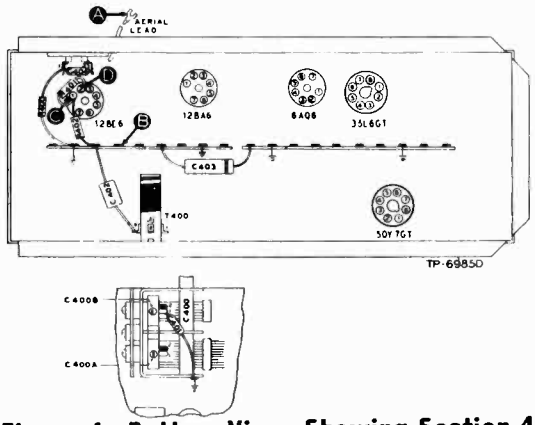


Figure 4. Bottom View, Showing Section 4 Test Points

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.

MODEL 50-1420

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.	61-0107*
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.	66-122001001*
C203	Condenser, tone compensation, .004 mf.	30-4623*
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*

SECTION 3 (Cont.)

Reference Symbol	Description	Service Part No.
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
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	32-4160
Z301	Transformer, 2nd i-f	32-4240

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.	76-4225
Scale	54-5047
Shaft assy., drive	76-4477
Spring, gang drive	56-2617
Pilot-lamp-socket assy.	76-1179-1
Reflector, pilot light	56-6037-1FA3
Shield, tube	56-3979PA5
Socket, octal (2)	27-6174
Socket, miniature (3)	27-6226
Socket, test	27-6114-1
Speed nut, changer mtg. (3)	1W60083FE7
Spring, changer mtg. (6)	56-3043PA15

MODEL 50-1420

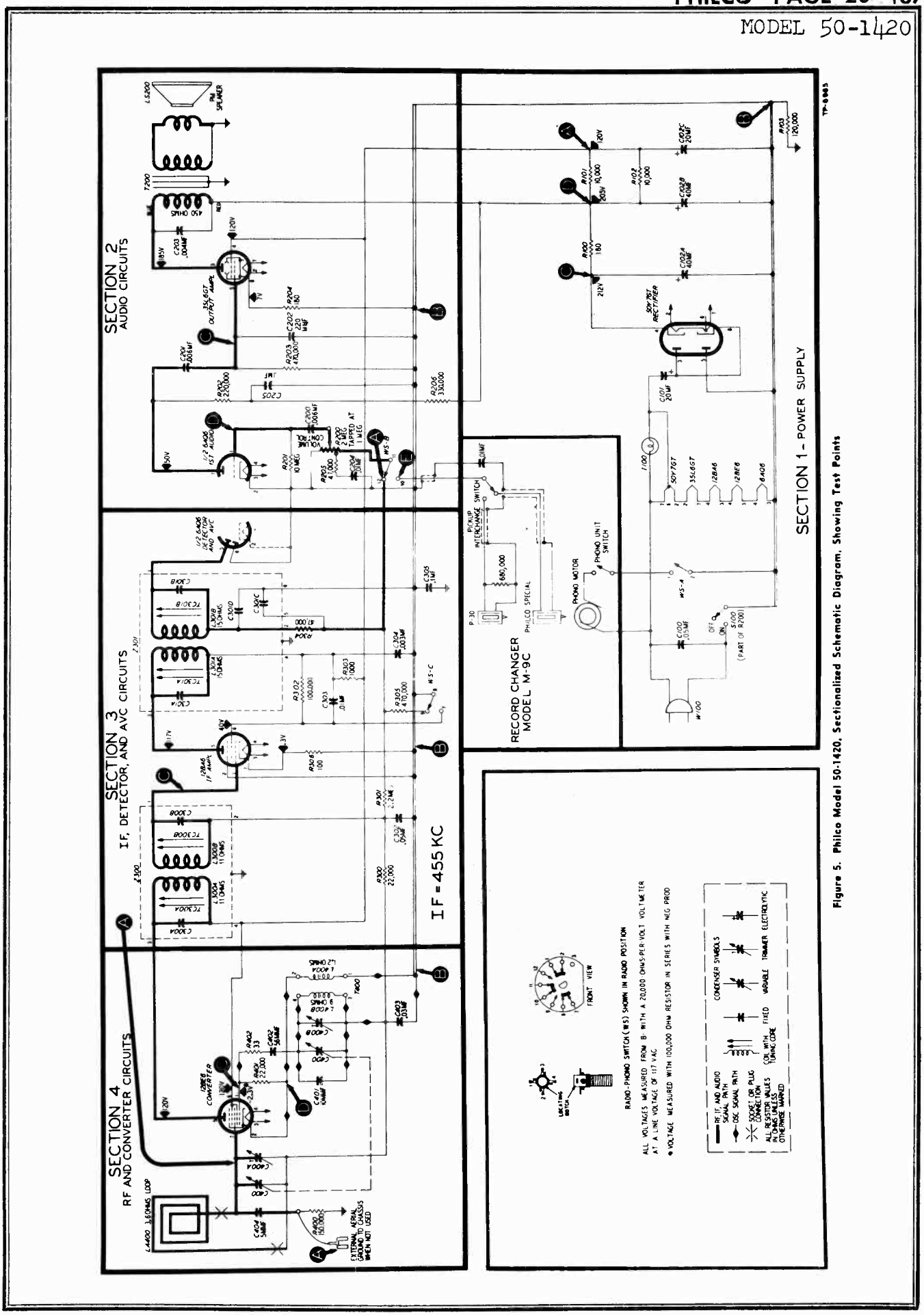


Figure 5. Philco Model 50-1420, Sectionalized Schematic Diagram, Showing Test Points

MODEL 50-1420

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.

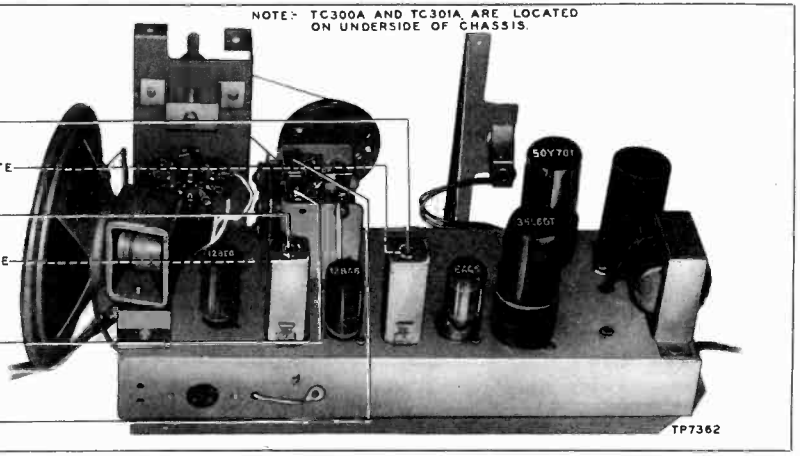


Figure 6. Top View, Showing Trimmer Locations

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

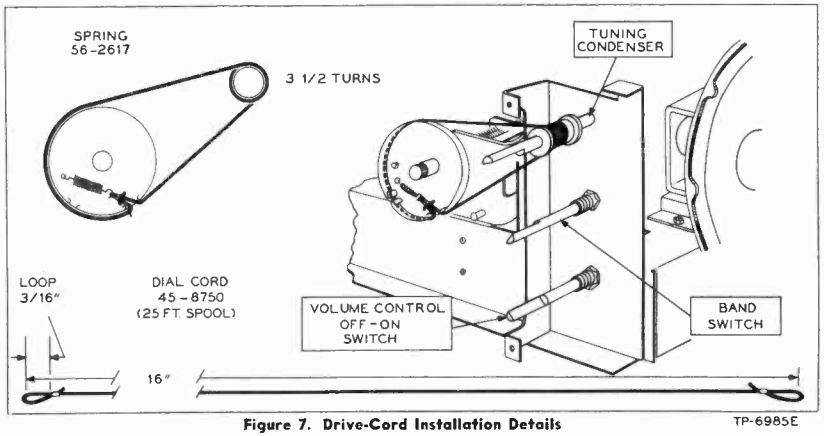


Figure 7. Drive-Cord Installation Details

MODEL 50-1725

Circuit Description

Philco Model 50-1725 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.

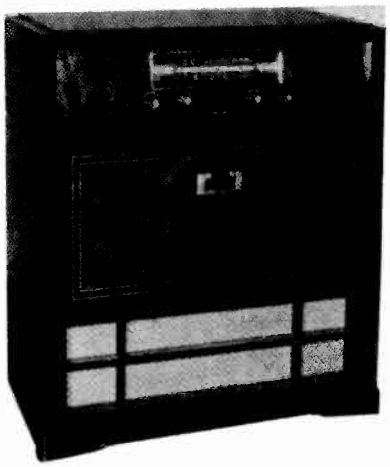
Two diode sections of a 19T8 triple-diode are used in a ratio-detector circuit, for detection of FM signals. The other diode section is used in a half-wave rectifier circuit, for detection of AM (broadcast) signals and to provide a-v-c action.

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.

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.



MODEL 50-1725

SPECIFICATIONS

CABINET	Wood console, mahogany finish
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, semi-high-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)

MODEL 50-1725

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

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

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+, 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.

Important!

To avoid altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical positions as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be altered.

Section 1 TROUBLE SHOOTING

POWER SUPPLY

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. Turn the tone control fully clockwise, and set the band switch to the broadcast 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.

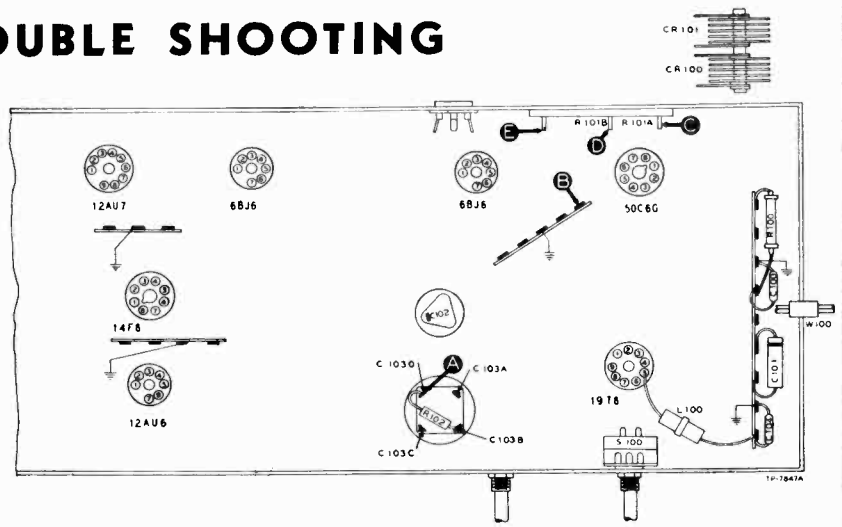


Fig. 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	145v		Trouble in this section. Isolate by the following tests.
2	C	230v	No voltage.	Defective: CR100, CR101. Open: C102, W100, R100, S100. Shorted: C103A, C101, C104, C100, C313*, C330*.
			Low voltage.	Defective: CR100, CR101. Open: C103A. Shorted or leaky: C103B.
			High voltage.	Open: R101A, R101B, R102.
3	D	205v	No voltage.	Open: R101A. Shorted: C103B.
			Low voltage.	Leaky: C103B. Shorted: C103C, C316*.
			High voltage.	Open: R101B, R102, R206*, T200*.
4	E	160v	No voltage.	Open: R101B. Shorted: C103C.
			Low voltage.	Leaky: C103C. Shorted: C103D, C310*, C315*.
			High voltage.	Open: R102, R315*.
5	A	145v	No voltage.	Open: R102. Shorted: C103D.
			Low voltage.	Leaky: C103C.

Listening Test: Abnormal hum may be caused by open C103A, C103B, C103C, or C103D.

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

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, C209.
3	D	Same as step 1.	Defective: 19T8. Open: C204, R202, R203. Shorted: C203, C205 (rotate R204), C204, C208.
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.

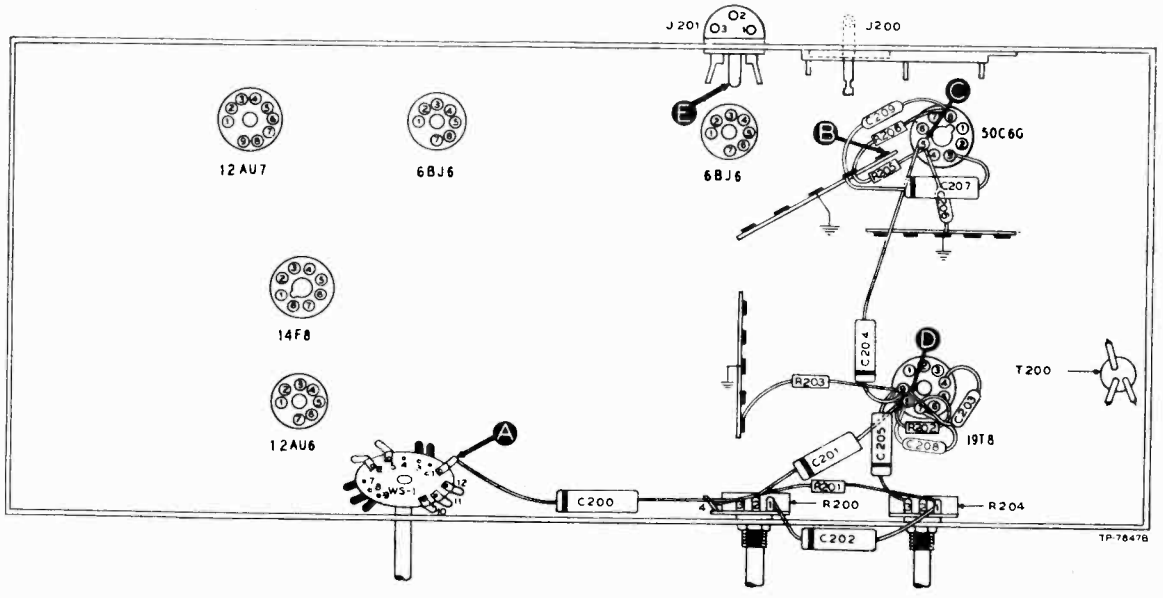


Fig. 2. Bottom View, Showing Section 2 Test Points

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."

MODEL 50-1725

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, C332, 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*, L407*, 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.

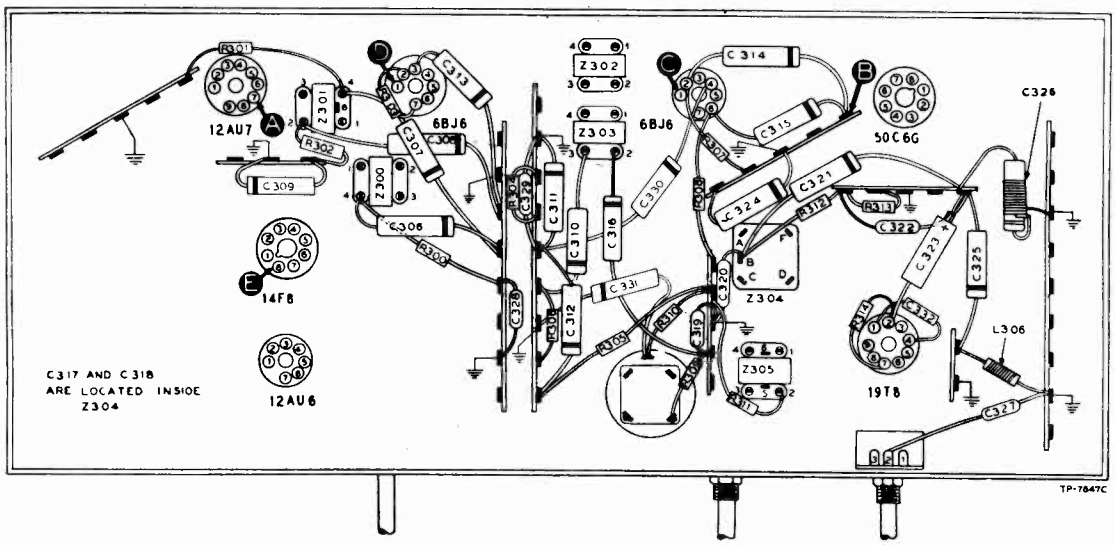


Fig. 3. Bottom View, Showing Section 3 Test Points

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.

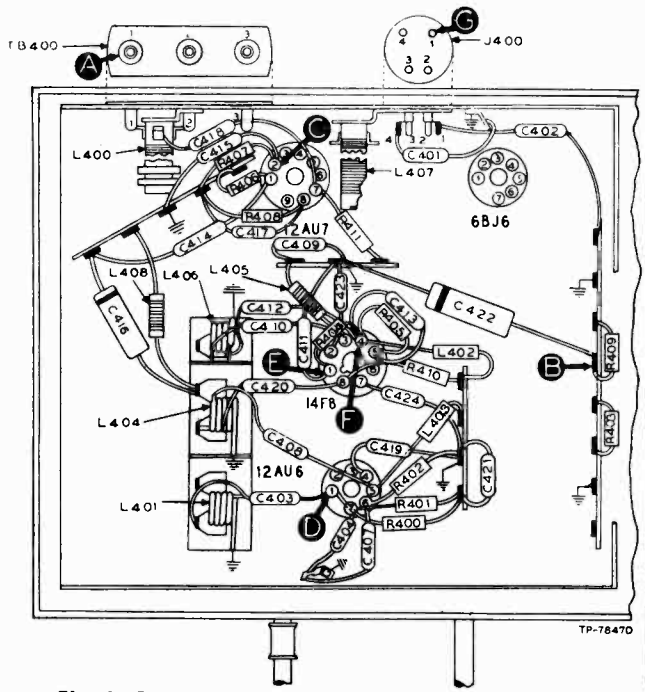


Fig. 4. Bottom View, Showing Section 4 Test Points

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, R406.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Defective: 12AU7 (mixer section). Open: L400, L409, 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: R409, L402, L406, L405, C412, R404, C410, R403. Shorted: C400, C400C, L406, C411, C412, C423, C424, C410, C409.
3	D	100 mc.	Tune to signal.	Same as step 1.	Defective: 12AU6. Open: L403, R402, R401, R400, C408, L404, C420, R410, R405, C413. Shorted: C403, 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.

MODEL 50-1725

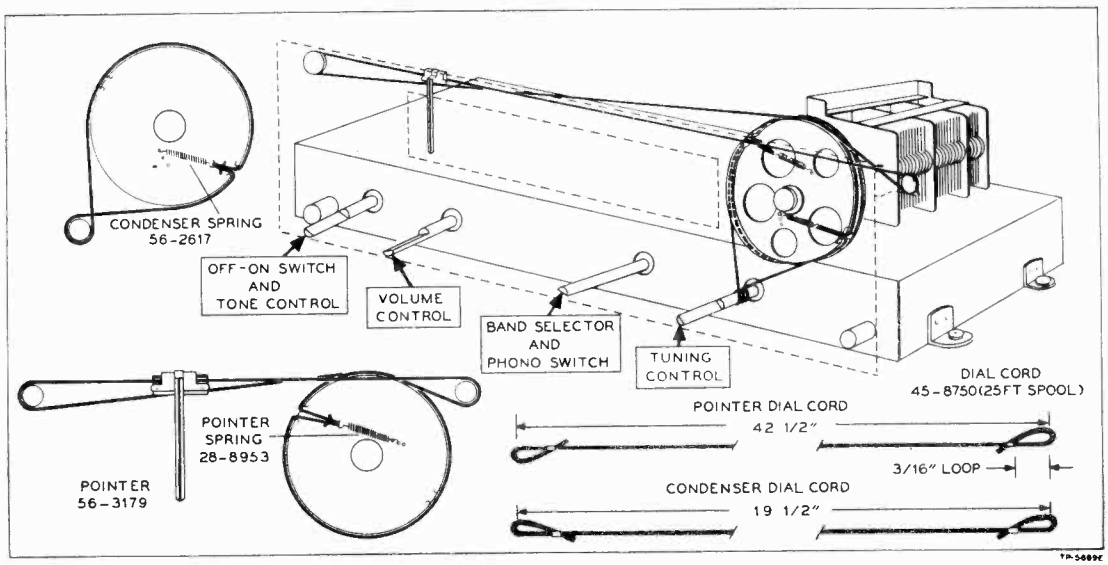


Figure 5. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

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."

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., 200 v.	30-2568-28
C103	Condenser, electrolytic, 4-section	30-2568-24
C103A	Condenser, filter, 40 mf., 250 v.	Part of C106
C103B	Condenser, filter, 40 mf., 250 v.	Part of C106
C103C	Condenser, filter, 20 mf., 250 v.	Part of C106
C103D	Condenser, filter, 10 mf., 250 v.	Part of C106
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
I100	Lamp, pilot	34-2605*
L100	Choke, filament, 100 microhenries	32-4143-4
R100	Resistor, current limiting, 50 ohms	33-1334
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
S100	Switch, on-off	Part of R204
W100	Line cord and plug	L2183*
WS-1 (R)	Switch-wafer section	Part of 42-1874†

SECTION 2
AUDIO CIRCUITS

C200	Condenser, d-c blocking, .02 mf.	61-0108*
C201	Condenser, d-c blocking, .006 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*
C208	Condenser, 51 mmf.	30-1224-2*
C209	Condenser, cathode by-pass, 220 mmf.	62-122001001*
J200	Socket, FM test	27-6180
J201	Socket, phono input	27-6126
LS200	Speaker	36-1610-2
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	66-6103340*
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, 220 ohms	66-1225340*
T200	Transformer, audio output	32-8367
WS-1 (R)	Switch-wafer section	Part of 42-1874†

SECTION 3
I-F, DETECTOR, AND A-V-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.	61-0120*
C307	Condenser, plate decoupling (AM), .01 mf.	61-0120*
C308	Condenser, a-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, a-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*
C320	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C321	Condenser, compensating, .01 mf.	61-0120*
C322	Condenser, decoupling, 2700 mmf.	60-20275404*
C323	Condenser, electrolytic, FM-detector filter, 2 mf., 50 v.	30-2417-7

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

Reference Symbol	Description	Service Part No.
C324	Condenser, r-f by-pass, .01 mf.	61-0120*
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*
C330	Condenser, filament by-pass, .01 mf.	61-0120*
C331	Condenser, r-f by-pass, .01 mf.	61-0120*
C332	Condenser, neutralization, 2.2 mmf.	30-1221-6
L306	Coil, tuned i-f by-pass	32-4061-2
R300	Resistor, plate decoupling, 10,000 ohms	66-3103340*
R301	Resistor, plate decoupling, 10,000 ohms	66-3103340*
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, 10,000 ohms	66-3103340*
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*
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.	62-110009001*
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, 220 mmf.	62-122001001*

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, .02 mf.	61-0108*
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	27-6214-1
L400	Coil, AM aerial	32-4033-11
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	32-4159-1
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
L409	Coil, r-f isolating	32-4061-2
LA400	Loop aerial	76-3583-12
PL400	Plug, wire and lug assembly, FM line-cord aerial	41-3791-1
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, 10,000 ohms	66-3103340*
R404	Resistor, grid return, 15,000 ohms	66-3153340*
R405	Resistor, cathode bias, 1500 ohms	66-2153340*
R406	Resistor, plate load, 33,000 ohms	66-3333340*
R407	Resistor, grid return, 15,000 ohms	66-3153340*
R408	Resistor, cathode bias, 1500 ohms	66-2153340*
R409	Resistor, isolating, 68 ohms	66-0683340*
R410	Resistor, grid return, 10,000 ohms	66-3103340*
R411	Resistor, grid return, 1 megohm	66-5103340*
TB400	Terminal board, aerial	38-9942

MISCELLANEOUS

Description	Service Part No.
Bracket-and-clip assembly, pilot lamp	76-3919
Cabinet (less scale)	10751
Back	54-7814
Baffle, speaker	219-166
Baffle-and-cloth assembly	40-7674
Bezel	56-5855FCP
Bin mechanism (L.H.)	76-3223-5
Bin mechanism (R.H.)	76-3223-6
Dome (4 required)	45-6190
Door pull	56-6493
Frame, changer mounting	76-4104
Grommet, changer mounting	54-4313
Hinge (pair)	45-6036
Knob (4 required)	54-4376
Scale	54-5024
Scale strap (2 required)	56-2234-2
Scale strap, short	56-4756FE11
Spring, bin mechanism (2 required)	56-4978
Spring, changer mounting (6 required)	56-3043FA15
Dial-backplate assembly	76-3918
Drive cord (25-ft. spool)	45-8750*
Fastener, snap (diffusing panel)	28-4342FA3
Panel, diffusing	54-7593
Pointer	56-5630-2
Spring, diffusing panel (2 required)	56-3841
Spring, gang	56-2617
Spring, pointer	28-8953
Phono parts	
Condenser, blocking, .01 mf.	61-0120*
Condenser, blocking, .05 mf.	61-0122*
Crystal-pickup-cartridge-and-needle assembly, Philco special	45-1609
Crystal-pickup cartridge, P-30	35-2671-1
Needle, for P-30 crystal	45-1597
Shaft, drive (radio)	76-3479-1
Bushing (2 required)	54-7512
Socket assembly, pilot lamp	27-6233
Socket, miniature (6BJ6)	27-6226
Socket, miniature (19T8)	27-6703-5
Socket, octal (50C6G)	27-6174-4
Washer, fiber, speaker mounting (4 required)	27-7467

† 42-1874 is a single-section wafer switch (band switch).

MODEL 50-1725

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.

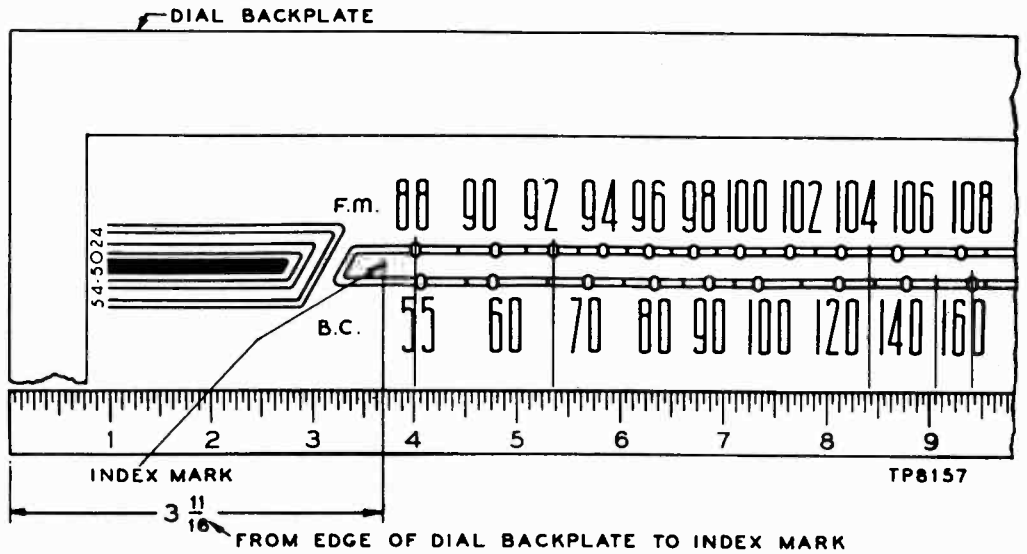
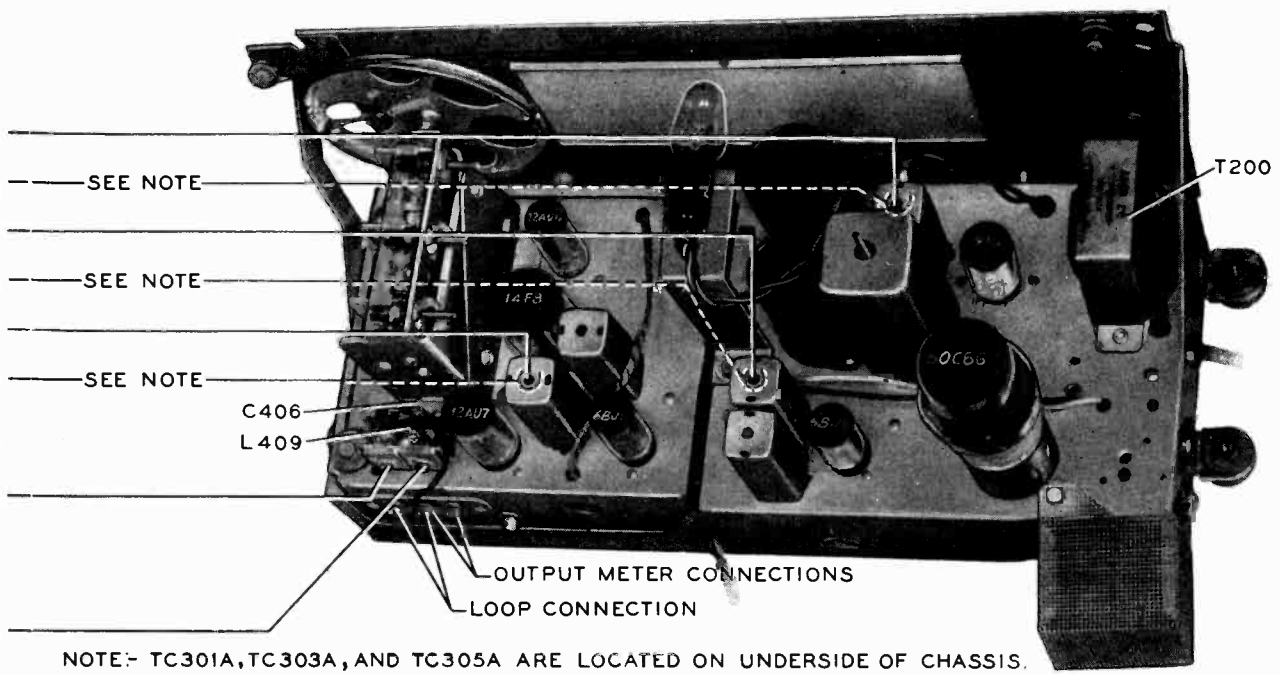


Figure 7. Dial-Backplate Calibration Measurements

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B–; output lead through .1-mf. condenser to terminal of TB400.	455 kc.	540 kc.	Adjust tuning cores once only, in order given, for Maximum output.	TC305B—AM 3rd i-f sec. TC305A—AM 3rd i-f pri. — SEE NOTE TC303B—AM 2nd i-f sec. TC303A—AM 2nd i-f pri. — SEE NOTE TC301B—AM 1st i-f sec. TC301A—AM 1st i-f pri. — SEE NOTE
2	Radiating loop (see loop below).	1600 kc.	1600 kc.	Adjust trimmer for maximum output.	C405B—AM osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C405A—AM aerial



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

Figure 8. Top View, Showing AM Trimmer Locations

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B–; output lead through .1-mf. condenser to pin 1 of 6BJ6 (1st i-f amplifier).	9.1 mc.	88 mc.	Adjust tuning cores for maximum reading on alignment indicator. Attenuate signal generator to maintain 10-volt reading. Repeat until further improvement is noted. After this step, do not touch any of these tuning cores except as directed in step 3.	TC304B—FM 3rd i-f sec. — SEE NOTE TC304A—FM 3rd i-f pri. TC302B—FM 2nd i-f sec. — SEE NOTE TC302A—FM 2nd i-f pri.
2	Output lead through .1-mf. condenser to pin 8 of 14F8.	9.1 mc.	88 mc.	Adjust tuning cores for maximum reading on alignment indicator. Attenuate signal generator to maintain 10-volt reading. Repeat until no further improvement is noted. After this step, do not touch these tuning cores.	TC300B—FM 1st i-f sec. TC300A—FM 1st i-f pri. — SEE NOTE
3	Same as step 2.	9.1 mc.	88 mc.	Adjust tuning core for minimum reading on output meter. This adjustment is critical; repeat to make sure it is correct.	TC304B—FM 3rd i-f sec.
4	Output lead to terminal 2 of J400.	105 mc.	105 mc.	Adjust trimmer for maximum reading on alignment indicator.	C400C—FM osc.
5	Same as step 4.	105 mc.	105 mc.	Adjust trimmer for maximum reading on alignment indicator while rocking tuning control.	C400B—FM r-f
6	Same as step 4.	105 mc.	105 mc.	Adjust trimmer for maximum reading on alignment indicator.	C400A—FM aerial
7	Same as step 4.	92 mc.	92 mc.	Adjust coil for maximum (see r-f coil note).	L406—FM osc. coil — LOCATED ON UNDERSIDE OF CHASSIS
8	Same as step 4.	92 mc.	92 mc.	Adjust coil for maximum (see r-f coil note).	L404—FM r-f coil — LOCATED ON UNDERSIDE OF CHASSIS
9	Same as step 4.	92 mc.	92 mc.	Adjust coil for maximum (see r-f coil note).	L401—FM aerial coil — LOCATED ON UNDERSIDE OF CHASSIS
10	Repeat steps 4 through 9 until no further increase is obtained.				

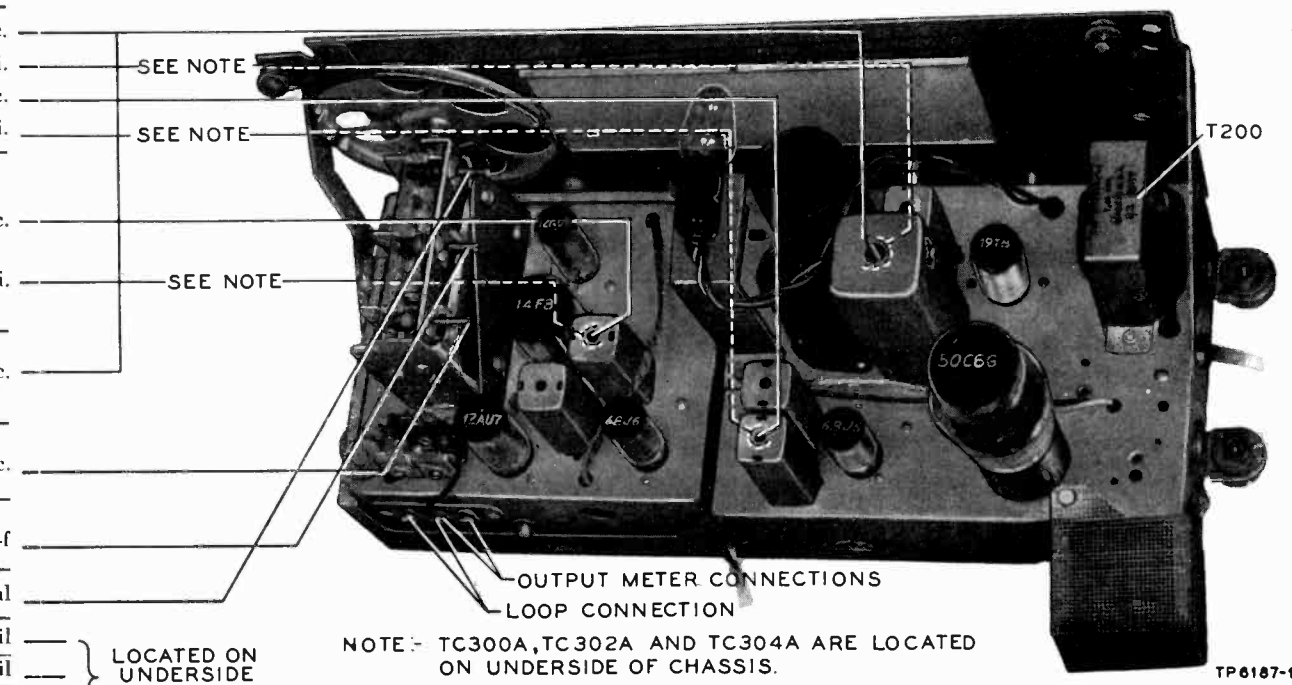


Figure 9. Top View, Showing FM Trimmer Locations

MODEL 50-1725

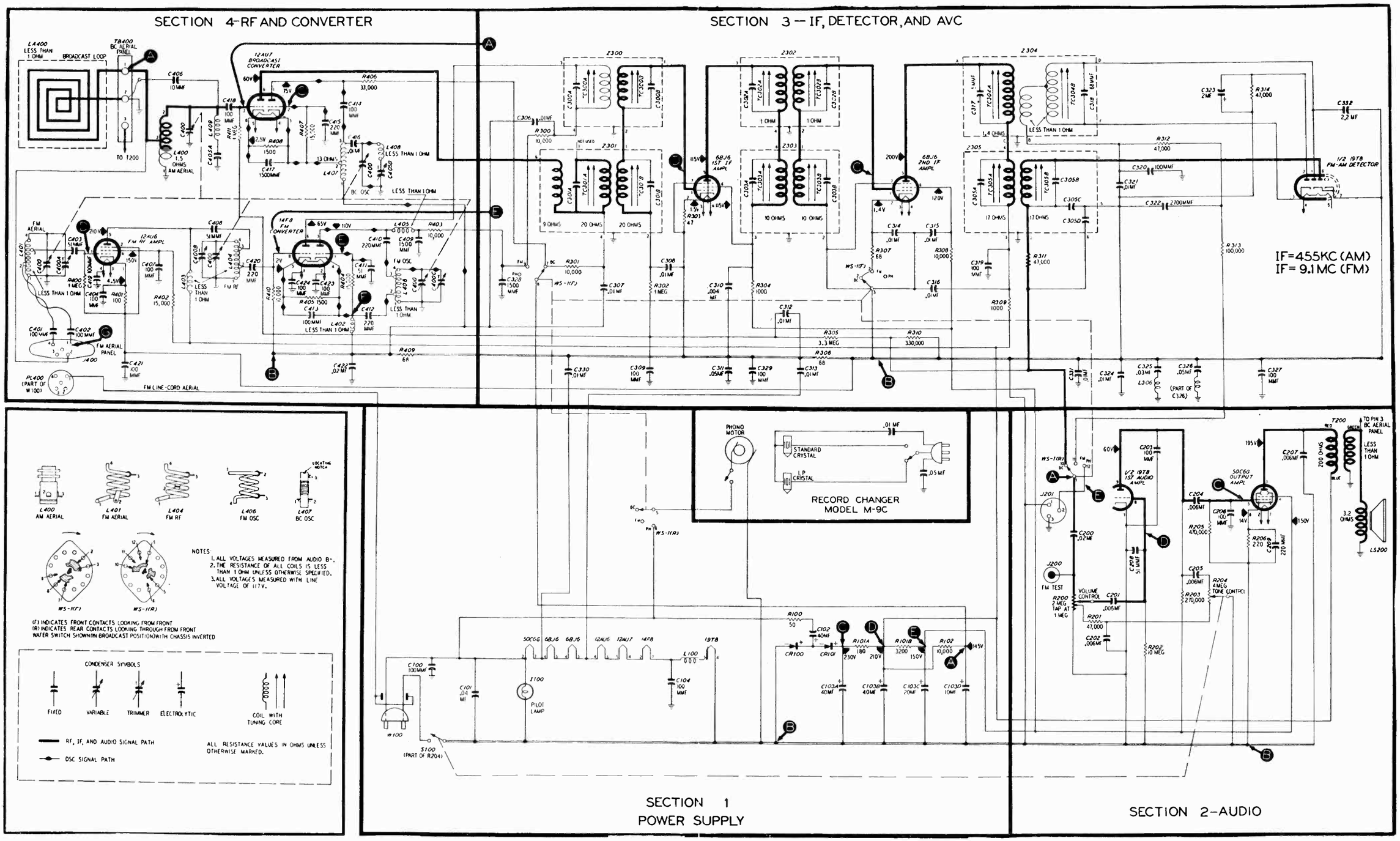
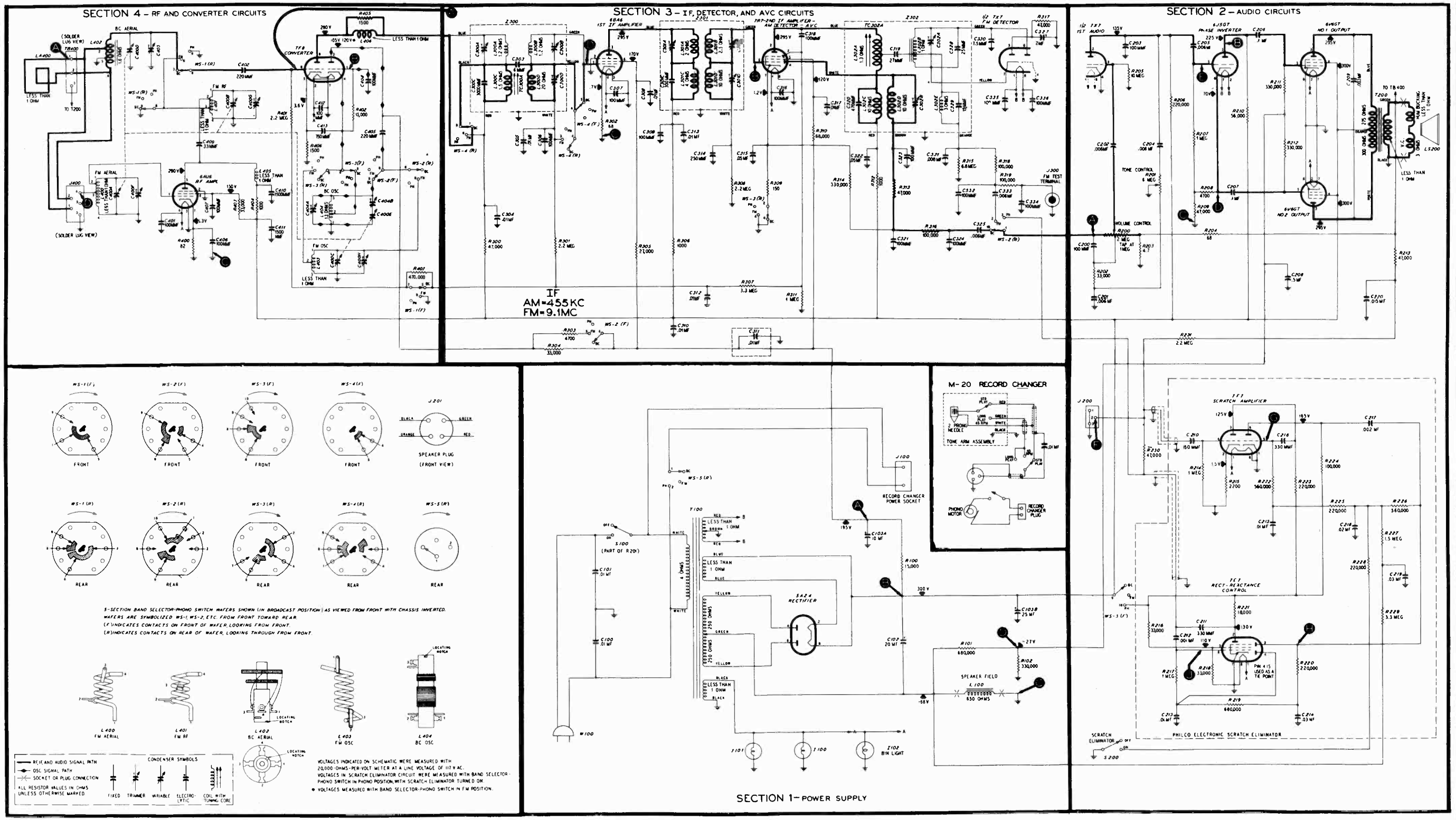


Figure 6. **Sectionalized Schematic Diagram, Showing Test Points**

RECORD CHANGER: See Philco Model M-9C, Pages RCD.CH. 19-35 through RCD.CH. 19-54



5-SECTION BAND SELECTOR-PHONO SWITCH WAFERS SHOWN IN BROADCAST POSITION AS VIEWED FROM FRONT WITH CHASSIS INVERTED.
WAFERS ARE SYMBOLIZED WS-1, WS-2, ETC. FROM FRONT TOWARD REAR.
(F) INDICATES CONTACTS ON FRONT OF WAFER, LOOKING FROM FRONT.
(R) INDICATES CONTACTS ON REAR OF WAFER, LOOKING THROUGH FROM FRONT.

Figure 6. Philco Radio-Phonograph Model 50-1726, Sectionalized Schematic Diagram, Showing Test Points

TP-6455-1

RECORD CHANGER: See Philco Model M-20, Page RCD.CH. 20-1

MODEL 50-1726

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to terminal 1 of aerial terminal panel, TB400.	455 kc.	540 kc.	Adjust, in order given, for maximum output.	C302B—3rd i-f sec. C301D—2nd i-f sec. C300D—1st i-f sec. TC300A—1st i-f pri.
2	Radiating loop (see note below).	580 kc.	580 kc.	Adjust for maximum while rocking tuning control.	C404B—Osc. (series)
3	Same as step 2.	1700 kc.	1700 kc.	Adjust for maximum.	C404A—Osc. (shunt)
4	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C403—Aerial
5	Same as step 2.	580 kc.	580 kc.	Adjust for maximum while rocking tuning control.	C404B—Osc. (series)
6	Repeat steps 2, 3, and 4 until no further improvement is obtained.				

RADIATING LOOP: Make up a six-to-eight turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop.

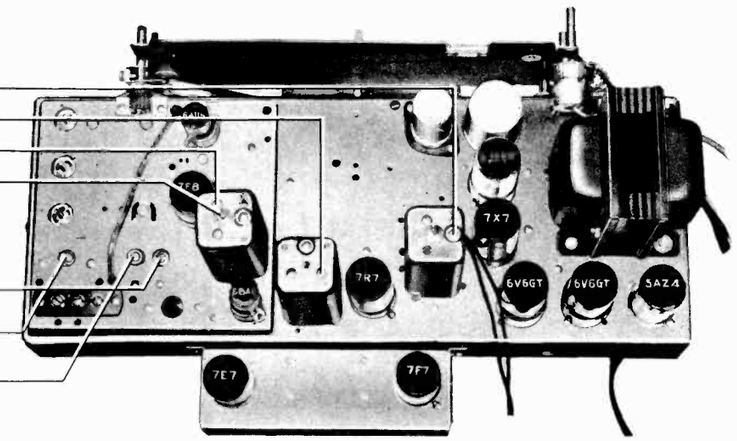


Figure 8. Top View, Showing AM Trimmer Locations

TP-5132-2

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to grid of 1st i-f ampl., 6BA6 (top plate of trimmer C300B*).	9.1 mc.	88 mc.	Adjust for maximum signal strength, as indicated by d-c voltmeter. Repeat until no further increase is obtained. After this step, do no disturb any of these settings except that of C302A, as directed in step 3.	C302A—Det. balance TC302A—Det. pri. C301B—2nd i-f sec. C301A—2nd i-f pri.
2	Through .1-mf. condenser to mixer grid (pin 8) of 7F8.	9.1 mc.	88 mc.	Adjust for maximum. After this step, do not disturb either of these settings.	C300B—1st i-f sec. C300A—1st i f pri.
3	Same as step 2.	9.1 mc.	88 mc.	Double-check the adjustment of C302A to make certain that audio output is at minimum. Use output meter. The setting is critical; adjust carefully.	C302A—Det. balance
4	To FM aerial terminal (terminal 4 of J400).	105 mc.	105 mc.	Adjust for maximum.	C400H—Osc.
5	Same as step 4.	105 mc.	105 mc.	Adjust for maximum while rocking tuning control.	C400G—R.f.
6	Same as step 4.	105 mc.	105 mc.	Adjust for maximum.	C400F—Aerial
7	Same as step 4.	92 mc.	92 mc.	Adjust L403 for maximum (see R-F COIL NOTE above).	L403—(Osc. tracking)
8	Same as step 4.	92 mc.	92 mc.	Adjust L401 for maximum while rocking tuning control (see R-F COIL NOTE above).	L401—(R-f tracking)
9	Same as step 4.	92 mc.	92 mc.	Adjust L400 for maximum (see R-F COIL NOTE above).	L400—(Aerial tracking)
10	Repeat steps 4 through 9 until no further increase is obtained.				

FOR LOCATION SEE FIG. 5

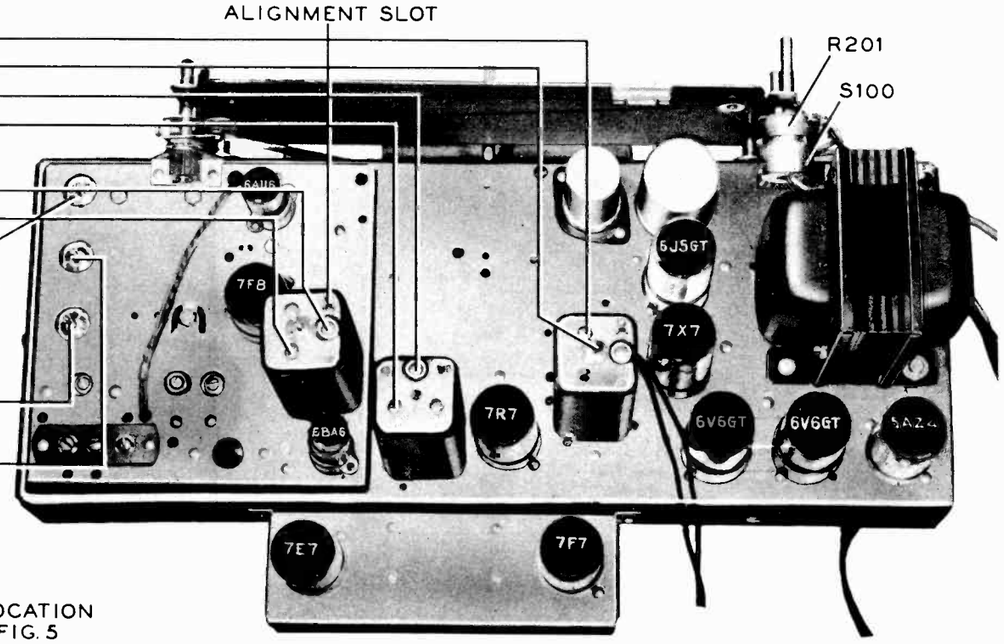


Figure 9. Top View, Showing FM Trimmer Locations

TP-5132-2

* Make this connection by sliding a piece of flattened wire solder down through alignment slot (see figure 9) in top of i-f transformer can.

ALIGNMENT PROCEDURE

When the complete AM and FM alignment is to be made, the AM alignment should be made FIRST; if AM alignment is not required, the FM alignment alone may be made.

ALIGNMENT OF AM CIRCUITS

DIAL POINTER: With tuning condensers fully meshed, dial pointer must coincide with index mark at low-frequency end of dial. (See "CALIBRATING DIAL BACKPLATE," page 2.)

OUTPUT METER: Connect between No. 3 terminal (voice-coil connection) of aerial terminal panel and chassis.

AM R-F SIGNAL GENERATOR: Connect ground lead to chassis, and output lead as indicated in chart. Use modulated output.

OUTPUT LEVEL: During alignment, signal-generator output must be attenuated to maintain radio output below 1.5 volts, as read on output meter.

CONTROLS: Set band switch to broadcast position. Set volume control to maximum, and tone control fully counterclockwise. Set signal-generator frequency and radio tuning dial as indicated in chart.

ALIGNMENT OF FM CIRCUITS

Make AM alignment (if required) first.

OUTPUT METER: Connect as for AM alignment (this meter is used only in step 3).

D-C METER: Connect 20,000-ohms-per-volt meter across 2-mf. condenser, C327, in FM-detector circuit—negative lead to pin 6 of 7X7 tube, and positive lead to chassis. Use 10-volt range.

AM R-F SIGNAL GENERATOR: Use modulated output for entire alignment. Generator must have sufficient output to give reading of approximately 9 volts on d-c meter, and signal should be attenuated during alignment to keep meter at this value. Connect generator ground lead to chassis, and output lead as indicated in chart.

VOLUME AND TONE CONTROLS: Same as for AM alignment.

RADIO BAND SWITCH, RADIO DIAL, AND SIGNAL-GENERATOR DIAL: Set as indicated in chart. Allow radio and generator to warm up for 15 minutes before starting alignment.

R-F COIL NOTE: When making the tracking adjustments, the resonance of the circuits using coils L400, L401, and L403 may be checked with a powdered-iron tuning core such as Part No. 56-6100. If the signal strength (meter reading) increases when the iron end is placed in, or near, the coil, compress the turns slightly. If the threaded brass end causes an increase in signal strength, spread the turns. Do not compress or spread the turns excessively; only a small change is required at these frequencies.

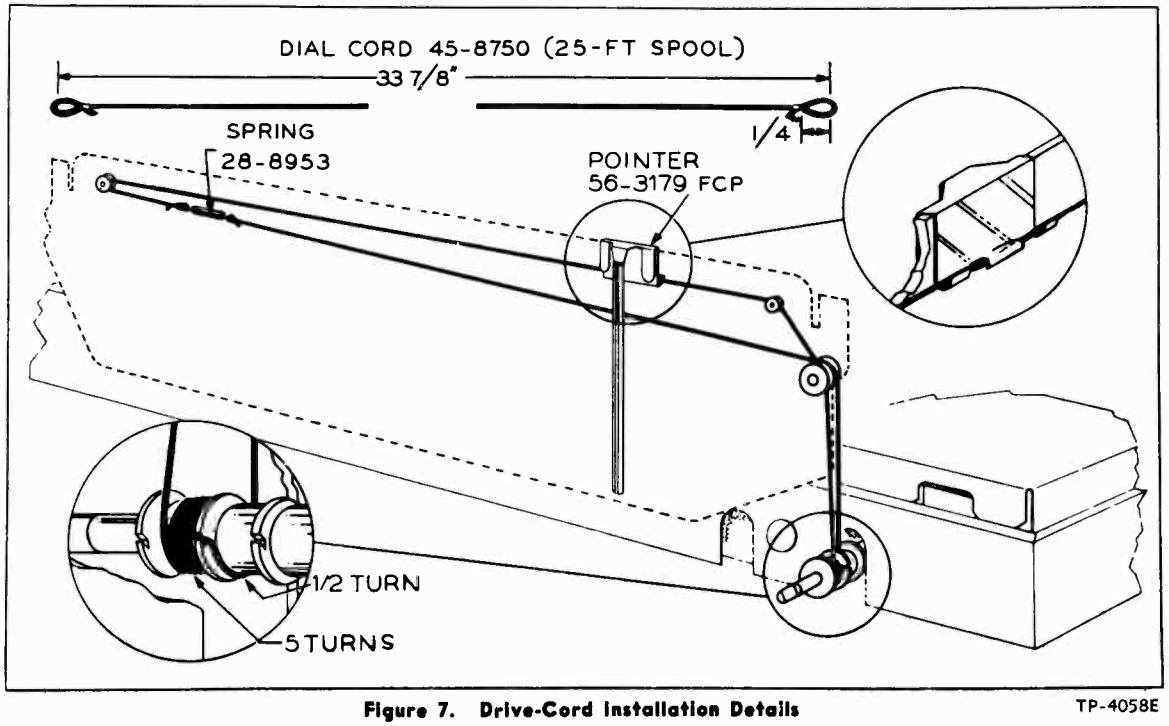


Figure 7. Drive-Cord Installation Details TP-4058E

MODEL 50-1726

Circuit Description

Philco Radio-Phonograph Model 50-1726 contains an 11-tube superheterodyne and a Model M-20 Philco Automatic Record Changer.

A low-impedance loop aerial within the cabinet normally provides adequate signal pickup on the standard broadcast band. In most locations, the built-in FM dipole aerial provides satisfactory FM reception. In areas where FM signals are weak, an outdoor dipole aerial, such as Philco Part No. 45-1462, will provide additional pickup. To increase the pickup on both bands, use the Philco Aerial Coupler, Part No. 76-2353-1, with the outdoor dipole aerial. For increased pickup on the standard broadcast band only, the coupler may be used with an external aerial of the single-wire type, such as Philco Part No. 45-1494.

The r-f stage (FM only) and converter stage are mounted on a separate chassis, for improved performance at high frequencies. A 6AU6 high-frequency pentode is used in the r-f stage, and a 7F8 high-frequency double triode is employed as a converter.

Two transformer-coupler i-f stages are used. The transformers have two sets of windings; one set is tuned to 455 kc., for AM operation, and the other set is tuned to 9.1 mc., for FM operation. A 6BA6 high-frequency pentode is used in the first i-f stage. The pentode section of a 7R7 duo-diode, pentode functions as the second i-f amplifier; one diode of this tube is used for AM detection, while the other diode provides a.v.c.

The dual-diode section of a 7X7 is employed in the FM ratio-detector circuit; this circuit has good noise-reducing properties and an excellent tuning characteristic.

The triode section of the 7X7 functions as the first audio stage. A 6J5GT triode operates as a plate-and-cathode-loaded phase inverter, driving two 6V6GT output amplifiers, in push-pull operation. Tone fidelity is obtained by the use of inverse feedback in the audio system; feed-back voltage is taken from the secondary of the output transformer.

The Philco Electronic Scratch Eliminator, for phono operation, may be switched on or off, as required. The pentode section of a 7E7 functions as a variable shunt capacitance at the phono-input circuit; at low signal levels, a controlled portion of the higher audio frequencies is by-passed to ground. The grid bias of the reactance tube controls the effective capacitance, which

MODEL 50-1726

SPECIFICATIONS

CABINET	Wood, mahogany or light finish
CIRCUIT	11-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1720 kc.
FM	88—108 mc.
AUDIO OUTPUT	7 watts
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	
Radio	110 watts
Phonograph	125 watts
AERIALS	Built-in loop and FM cabinet dipole; external aerial also may be used
INTERMEDIATE FREQUENCIES	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES (11)	6AU6, 7F8, 6BA6, 7R7, 7X7, 6J5GT, 6V6GT (2), 7E7, 7F7, 5AZ4
PHONOGRAPH	Philco Automatic Record Changer, Model M-20 (for service information, refer to service manual PR-1731)

TP-5849

becomes maximum with low bias, and minimum with high bias. This control bias is developed by the audio signal itself; a proportionate amount of the signal is taken from the pickup output, amplified by each triode section of the 7F7, and rectified by the diode section of the 7E7.

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 connecting the radio to a source of power:

1. Inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance across condenser C102 (see figure 2). When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 3500 ohms, check condensers C102 and C103B for leakage or shorts.

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

Important!

To avoid altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical locations as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be changed.

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 1.

With the tuning gang fully meshed, the pointer should be adjusted on the dial-drive cord to coincide with the index mark.

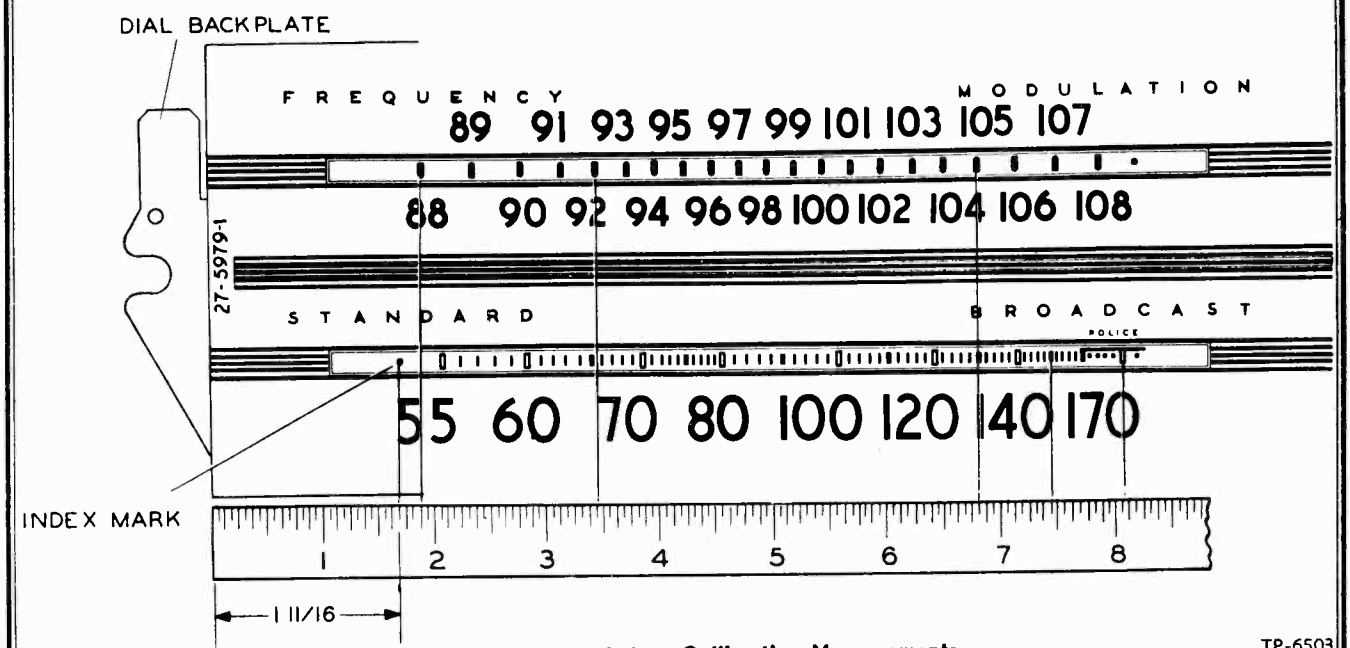


Figure 1. Dial-Backplate Calibration Measurements

TP-6503

MODEL 50-1726

Section 1 TROUBLE SHOOTING

POWER SUPPLY

CAUTION: Do not turn on the power with the speaker disconnected, or the set may be damaged.

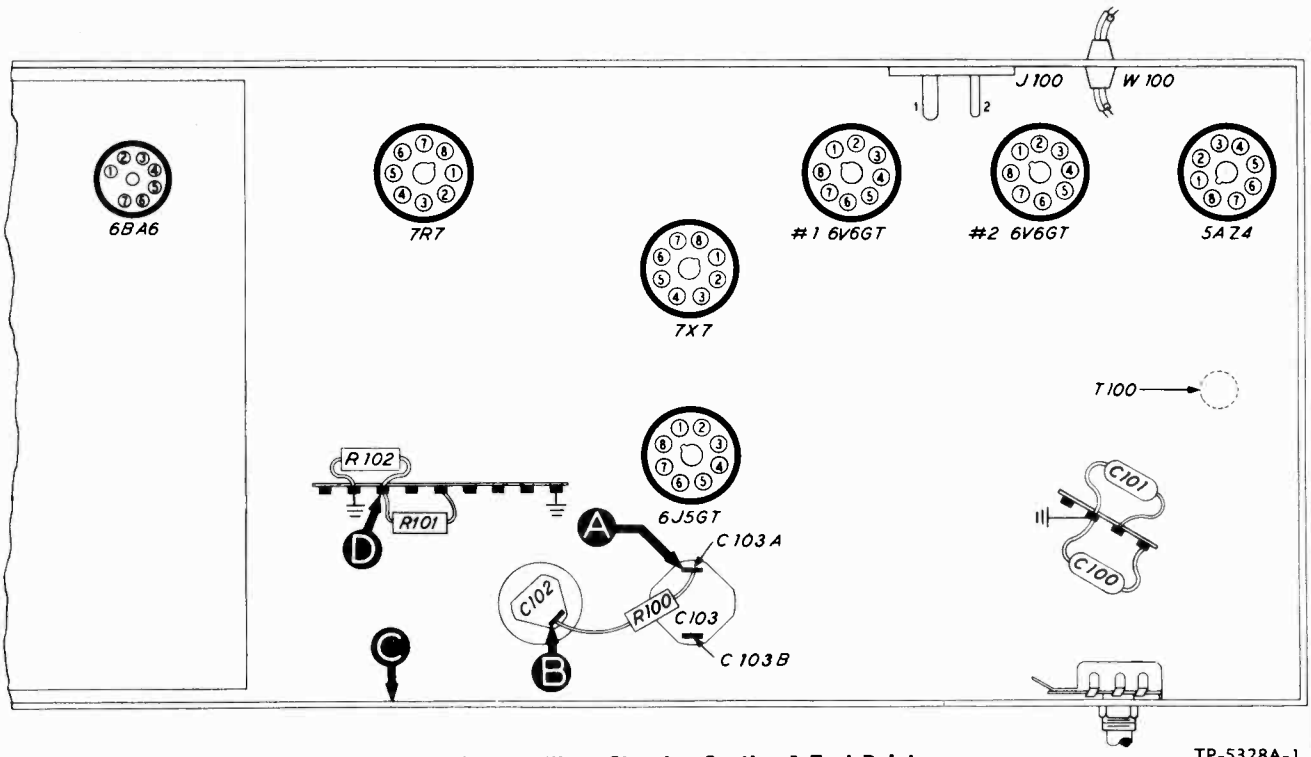
Make the tests for this section with a d-c voltmeter, connecting the leads between the chassis, test point C, and the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Set the volume control to minimum, and the tone control fully counterclockwise. Set the band selector-phono switch to the broadcast position.

Follow the steps in the order given. 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.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	195v		Trouble in this section. Isolate by the following tests.
2	B	300v	No voltage. Low voltage. High voltage.	Defective: 5AZ4. Open: S100, T100. Shorted: C102. Defective: 5AZ4. Shorted: C103B, C310*, C411*. Leaky: C102. Open: C102, L100. Shorted: L100. Open T200*.
3	A	195v	No voltage. Low voltage. High voltage.	Open: R100. Shorted: C103A, C311*. Leaky: C103A, C311*. Changed resistance: R100. Open: T200*.
4	D	Negative 27v	No voltage. High voltage.	Open: R101. Open: R102.
Listening Test: Abnormal hum and instability may be caused by open C103A or C103B.				

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



TP-5328A-1

Figure 2. Bottom View, Showing Section 1 Test Points

MODEL 50-1726

Section 2

TROUBLE SHOOTING

AUDIO-AMPLIFIER TESTS

AUDIO CIRCUITS

Use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully counterclockwise. Set the band (wafer) switch to the broadcast position. Make certain that the scratch-eliminator switch is turned off (two-position switch turned counterclockwise). If the "NORMAL INDICATION" is obtained in steps 1 and 6, proceed with the scratch-eliminator tests; if not, isolate and correct the trouble in the audio-amplifier circuits.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in audio-amplifier circuits. Isolate by the following tests.
2	B (Remove 6J5GT)	Clear signal with strong signal input.	Defective: 6V6GT(#1), LS200. Open: C206, R211, T200. Shorted or leaky: C206, C209.
3	D (6J5GT removed)	Same as step 2.	Defective: 6V6GT(#2). Open: C207, R212. Shorted or leaky: C207.
4	E (Replace 6J5GT)	Loud, clear signal with moderate signal input.	Defective: 6J5GT. Open: R208, R209, R207, R210. Shorted or leaky: C205, C204.
5	A	Same as step 1.	Defective: 7X7. Open: R200 (rotate through range), C202, R205, R206. Shorted: C203.
6*	F	Loud, clear signal with weak signal input.	Open: R230, WS-2(R).
Listening Test: Distortion may be caused by leaky C202, C205, C206, or C207; or by open R205, C207, C211, or C212.			

* For this step, set band (wafer) switch to phono.

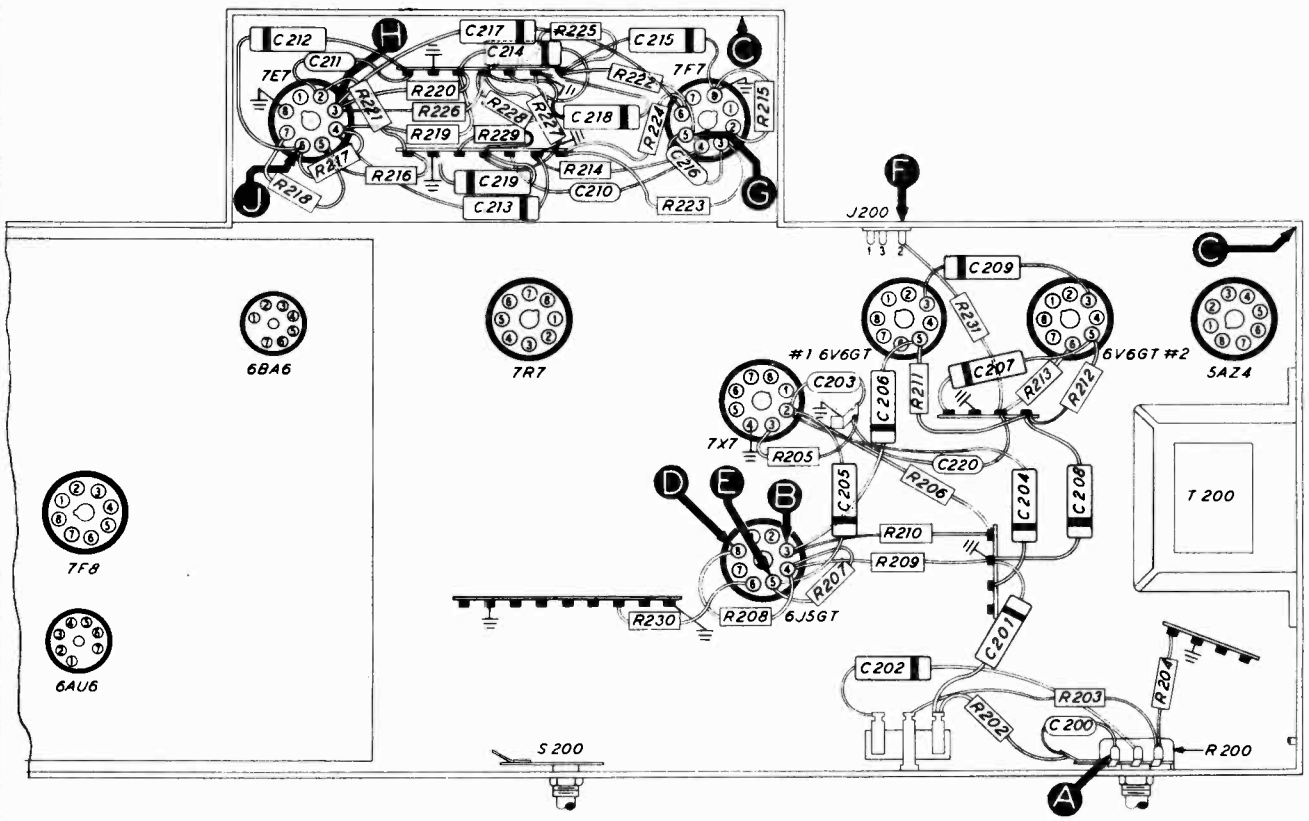


Figure 3. Bottom View, Showing Section 2 Test Points TP-6456-1

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Section 2 (Cont.) TROUBLE SHOOTING

SCRATCH-ELIMINATOR TESTS

Set the tone control fully counterclockwise. Turn the band (wafer) switch to the phono position. For all steps except 1(b), set the volume control to maximum; for this step, adjust the volume control as directed in the chart.

Turn the scratch eliminator on or off as indicated in the chart. (The scratch eliminator is on when the two-position switch is turned clockwise.)

Connect an output meter across the *primary* of the output transformer, T200.

IMPORTANT! For all steps except step 4, use the 0—10-volt output-meter range; for step 4 only, use the 0—50-volt range. If the proper ranges are not used, erroneous readings will result.

Connect the ground lead of an audio signal generator to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the generator for 5000 cycles. Adjust the generator output as directed in the chart.

If normal operation is indicated by the tests in step 1, (a) and (b), proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in the scratch-eliminator circuits.

NOTE: For steps 2, 3, and 4, connect the positive lead of a 20,000-ohms-per-volt, d-c voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the "VOLTMETER" test points indicated in the chart.

STEP	TEST POINT	SIG. GEN. OUTPUT	VOLT-METER	SPECIAL INSTRUCTIONS	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a)	F	Adjust for 10v output-meter reading, with scratch-eliminator off.		Turn scratch eliminator on; output voltage should drop to 6.5v (approx.).	
1(b)	F	Same as for 1(a).		Reduce volume control to obtain output-meter reading of 1v. Increase generator output for output-meter reading of 10v. Turn scratch eliminator on; output voltage should not drop below 8.8v (approx.).	Trouble in scratch-eliminator circuits. Isolate by the following tests.
2	G	See SPECIAL INSTRUCTIONS.	H	With scratch eliminator on, increase generator output for voltmeter reading of 8.8v, negative; failure to obtain this value indicates trouble.	Defective: 7F7, 7E7 (diode section), WS-3(R). Open R224, R222, R226, R228, C217, S200.
3	G	Same setting which produced 8.8v reading in step 2, with scratch eliminator on.	J	With scratch eliminator on, voltage at point J should be 2v, negative.	Open: R220, R219, R217. Shorted: C213, C214, C212.
4	F	Same as step 2.	H	With scratch eliminator on, voltage at point H should be approx. 28v, negative.	Defective: 7F7. Open: C210, C216, R214, R215, R223. Shorted or leaky: C216.
5	F	Adjust for 10v output-meter reading, with scratch eliminator off.		Turn scratch eliminator on; output voltage should drop to 6.5v (approx.).	Defective: 7E7 (pentode section). Open: R221, R216, R218, C211, C212. Shorted: C211, C212.

Section 3

TROUBLE SHOOTING

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

AM CIRCUITS

Use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully counterclockwise. Set the band (wafer) switch to the broadcast position. Turn the tuning condensers to full-mesh position.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits, or the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in the AM circuits.

Since the circuit location of test point A for this section is in Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 7R7. Open: R309, R310, R312, L302A, L302C, L302D, R313, R314, R316, C325, C317, WS-3(R). Shorted: C317, C318, C321, C322, C323, C324, C320, C302B. Misaligned: Z302.
3	D	Loud, clear signal with moderate signal input.	Defective: 6BA6. Open: R302, R305, R308, R306, L301A, L301B, L301C, L301D, C301A, C301C, C301D. Shorted: C308, C301C, C301D, C309, C313, L301C, L301D, C300D. Misaligned: Z301.
4	A	Loud, clear signal with weak signal input.	Defective: 7F8*. Open: R406*, R405*, L406*, C300C, L300C, L300D, C300D, R300, WS-4(R), WS-4(F). Shorted: C300C, L300C, C303, C304, L300D. Misaligned: Z300.

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

FM CIRCUITS

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

Set the band (wafer) switch to the FM position, and follow the instructions preliminary to the tests for the AM circuits, with these exceptions: 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 14).

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.

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Section 3 (Cont.) TROUBLE SHOOTING

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in FM circuits. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Open: L302B, C302A, C328, C329, R315, R318, C325, R317, WS-3(R). Shorted: L302A, C319, C302A, C328, L302E, C329, C330, C331, C332.
3	D	Loud, clear signal with moderate signal input.	Defective: 6BA6. Open: R302, R305, C308, R306, L301A, L301B, L301C, L301D, C301A, C301C, C301D. Shorted: C308, C301C, C301D, C309, C313, L301C, L301D, C300D. Misaligned: Z301.
4	A	Loud, clear signal with weak signal input.	Open: WS-4(R), WS-4(F).

C300 IS LOCATED IN Z300

C319, C320, C328, C329 LOCATED IN Z302

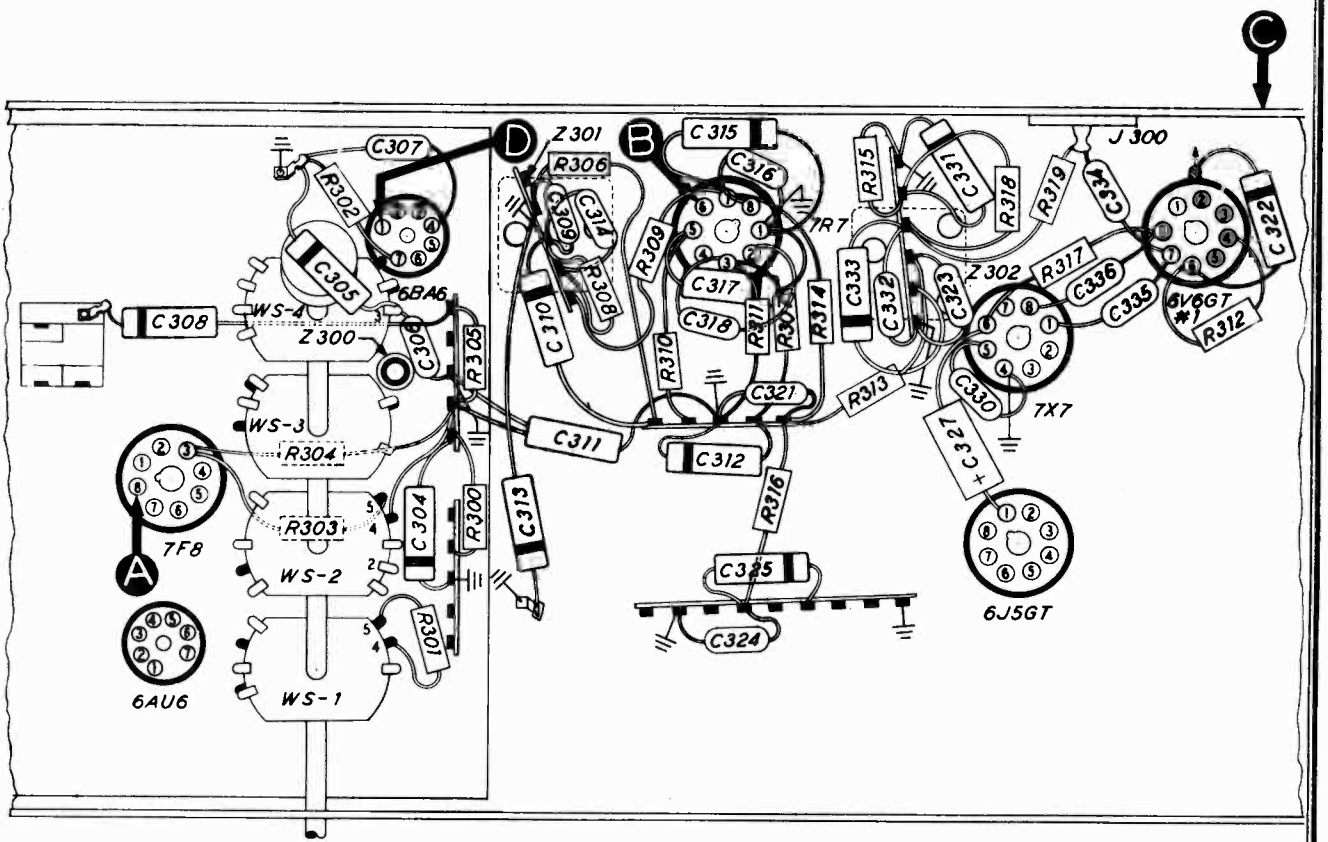


Figure 4. Bottom View, Showing Section 3 Test Points TP-6457-1

Section 4 TROUBLE SHOOTING

For the following tests, with the exception of the oscillator tests, use an AM r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C, and 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 tone control fully counterclockwise.

Set the band (wafer) switch, tuning control, and signal-generator frequency as indicated in the chart.

OSCILLATOR TESTS (AM AND FM CIRCUITS): Connect the positive lead of a high-resistance d-c voltmeter to the chassis, and connect the negative lead through a 100,000-ohm isolating resistor to the 7F8 oscillator grid (pin 1), test point B. Use a suitable range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltages of approximately the values given in the chart (measured with 20,000-ohms-per-volt meter), throughout the tuning range.

If the "NORMAL INDICATION" is not obtained in step 1 of both the AM and the FM test charts, isolate the trouble by following the remaining steps.

AM CIRCUITS

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Broadcast	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2 (Osc. test; see note above.)	B		Broadcast	Tune through range.	Negative 1.5v to 3.5v.	Defective: 7F8. Open: R304*, C405, C404B, C408, L404, R402, WS-2(F), WS-2(R), WS-1(F), WS-3(F), WS-3(R). Shorted: C405, C404A, C400E, C404B, C408.
3	A	1000 kc.	Broadcast	Tune to signal.	Loud, clear signal with weak signal input.	Open: LA400, R401, L402, C402, C413, WS-1(R). Shorted: L402, C400D, C403.
Listening Test: Distortion may be caused by open R401 or R307*. Hum and instability may be caused by open C312* or R301*.						

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

FM CIRCUITS

Observe the instructions preliminary to the tests for the AM circuits, with the following exception: After tuning the signal generator and the radio to 95 mc., detune one or the other until a satisfactory test signal is obtained.

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	D	95 mc.	FM	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in FM circuits. Isolate by the following tests.

MODEL 50-1726

Section 4 (Cont.) TROUBLE SHOOTING

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
2 (Osc. test; see note above.)	B		FM	Tune through range.	Negative 1v.	Defective: 7F8. Open: L403, WS-2(F), WS-2(R), WS-1(F), WS-3(F), WS-3-(R). Shorted: L403, C400C, C400H.
3	D	95 mc.	FM	Tune to signal.	Loud, clear signal with weak signal input.	Defective: 6AU6. Open: L400, L405, R400, R403, R404, C409, L401, WS-1-(R). Shorted: L400, C400A, C400F, C407, C409, C410, C411, L401, C400B, C400G.

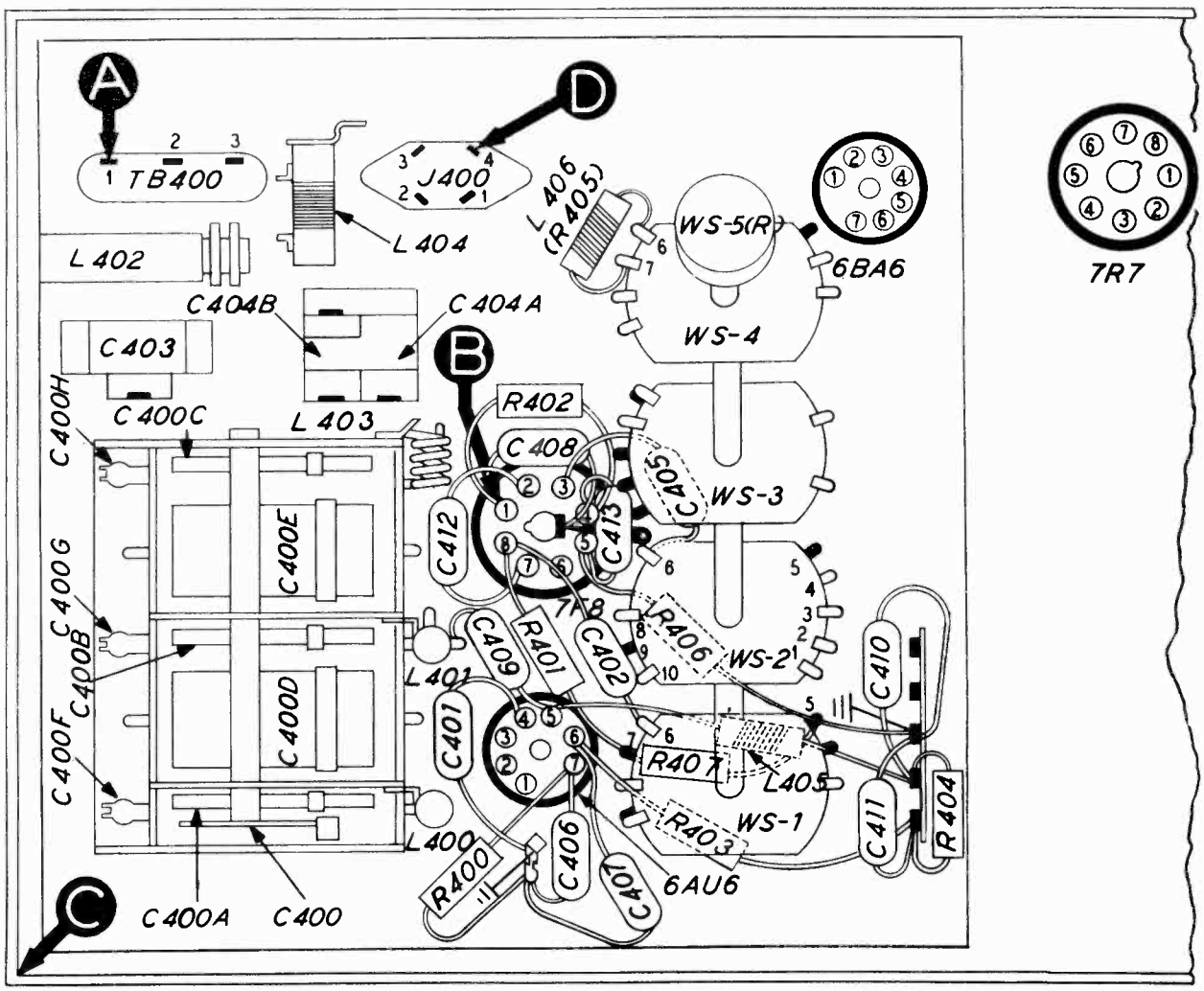


Figure 5. Bottom View, Showing Section 4 Test Points

TP-5328D

SYMBOLIZATION

MODEL 50-1726

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 WS—wafer (band selector-phono) switch
I—pilot lamp LA—loop aerial R—resistor T—transformer Z—electrical assembly

The number of the symbol, except when the number is less than 100, designates the section in which the part is located, as follows:

100-series components are in Section 1 — the power supply
200-series components are in Section 2 — the audio circuits
300-series components are in Section 3 — the i-f amplifier, detector, and a-v-c circuits
400-series components are in Section 4 — the 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 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, .01 mf.	30-1226-1
C101	Condenser, line filter, .01 mf.	30-1226-1
C102	Condenser, electrolytic, input filter, 20 mf., 450v	30-2568-8
C103	Condenser, electrolytic, 2-section	30-2556
C103A	Condenser, filter, 10 mf., 450v	Part of C103
C103B	Condenser, filter, 25 mf., 450v	Part of C103
I100	Lamp, pilot	34-2064
I101 & I102	Lamp, pilot	34-2064
J100	Socket, phono power	27-6200
L100	Speaker, field	Part of LS200
R100	Resistor, filter, 15,000 ohms	66-3155340
R101	Resistor, bias divider, 680,000 ohms	66-4683340*
R102	Resistor, bias divider, 330,000 ohms	66-4333340*
S100	Switch, on-off	Part of R201
T100	Transformer, power	32-8248
W100	Power cord and plug	41-3755-20
WS-5 (R)	Switch-wafer section, phono power	Part of 42-1803-2†

SECTION 2
AUDIO CIRCUITS

C200	Condenser, tone compensation, 100 mmf.	60-10105407*
C201	Condenser, tone compensation, .006 mf.	45-3500-7*
C202	Condenser, d-c blocking, .006 mf.	45-3500-7*
C203	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C204	Condenser, tone control, .006 mf.	45-3500-7*
C205	Condenser, d-c blocking, .006 mf.	45-3500-7*
C206	Condenser, d-c blocking, .1 mf.	45-3500-8*
C207	Condenser, d-c blocking, .1 mf.	45-3500-8*
C208	Condenser, bias filter, .5 mf.	61-0133*
C209	Condenser, tone compensation, .003 mf.	61-0117*
C210	Condenser, high-pass filter, 150 mmf.	60-10155407*
C211	Condenser, reactance-feedback, 330 mmf.	60-10335407*
C212	Condenser, d-c blocking, .001 mf.	30-4620*
C213	Condenser, bias filter, .01 mf.	61-0120*
C214	Condenser, bias filter, .03 mf.	30-4517*
C215	Condenser, bias filter, .01 mf.	61-0120*
C216	Condenser, d-c blocking, 330 mmf.	60-10335407*
C217	Condenser, d-c blocking, .002 mf.	30-4622*
C218	Condenser, bias filter, .01 mf.	61-0108*
C219	Condenser, bias filter, .03 mf.	30-4517*
C220	Condenser, feedback filter, .015 mf.	45-3505-59
J200	Phono socket	27-6126
J201	Speaker cable and plug	41-3734-9
LS200	Speaker	36-1611-3
R200	Volume control, 2 megohms (tap at 1 megohm)	33-5535-1
R201	Tone control (with on-off switch), 6 megohms	33-5538-1
R202	Resistor, tone compensation, 33,000 ohms	66-3333340*
R203	Resistor, voltage divider, inverse feedback, 4.7 ohms	66-9473340*
R204	Resistor, voltage divider, inverse feedback, 68 ohms	66-0683340*
R205	Resistor, grid return, 10 megohms	66-6103340*
R206	Resistor, plate load, 220,000 ohms	66-4223340*
R207	Resistor, grid return, 1 megohm	66-5103340*
R208	Resistor, cathode bias, 4700 ohms	66-2473340*
R209	Resistor, cathode load, 47,000 ohms	66-3473340*
R210	Resistor, plate load, 56,000 ohms	66-3563340*
R211	Resistor, grid return, 330,000 ohms	66-4333340*
R212	Resistor, grid return, 330,000 ohms	66-4333340*

SECTION 2 (Continued)
AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
R213	Resistor, feedback, 47,000 ohms	66-3478340*
R214	Resistor, grid return, 1 megohm	66-5103340*
R215	Resistor, cathode bias, 2200 ohms	66-2223340*
R216	Resistor, screen voltage divider, 33,000 ohms	66-3333340*
R217	Resistor, grid return, 1 megohm	66-5103340*
R218	Resistor, screen voltage divider, 33,000 ohms	66-3333340*
R219	Resistor, bias filter, 680,000 ohms	66-4683340*
R220	Resistor, bias filter, 220,000 ohms	66-4223340*
R221	Resistor, plate load, 18,000 ohms	66-3185340*
R222	Resistor, grid return, 560,000 ohms	66-4563340*
R223	Resistor, plate load, 220,000 ohms	66-4223340*
R224	Resistor, plate load, 100,000 ohms	66-4103340*
R225	Resistor, bias filter, 220,000 ohms	66-4223340*
R226	Resistor, diode load, 560,000 ohms	66-4563340*
R227	Resistor, bias filter, 1.5 megohms	66-5153340*
R228	Resistor, diode load, 220,000 ohms	66-4223340*
R229	Resistor, bias filter, 3.3 megohms	66-5333340*
R230	Resistor, low-pass filter, 47,000 ohms	66-3473340*
R231	Resistor, phono feedback, 2.2 megohms	66-5228340*
S200	Switch, on-off, scratch eliminator	42-1848-1
T200	Transformer, output	32-8274
WS-3 (F)	Switch-wafer section	Part of 42-1803-2†

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

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C300C	Condenser, shunt, 3000 mmf.	Part of Z300
C300D	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C301C	Condenser, shunt, 300 mmf.	Part of Z301
C301D	Condenser, trimmer	Part of Z301
C302A	Condenser, trimmer	Part of Z302
C302B	Condenser, trimmer	Part of Z302
C303	Condenser, d-c blocking, 6 mmf.	Part of Z300
C304	Condenser, plate by-pass, .01 mf.	61-0120*
C305	Condenser, r-f by-pass, .01 mf.	61-0120*
C306	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C307	Condenser, filament by-pass, 100 mmf.	62-110009001*
C308	Condenser, screen by-pass, .01 mf.	61-0120*
C309	Condenser, plate by-pass, 100 mmf.	62-110009001*
C310	Condenser, r-f by-pass, .01 mf.	61-0120*
C311	Condenser, r-f by-pass, .01 mf.	30-4641
C312	Condenser, a-v-c filter, .01 mf.	61-0120*
C313	Condenser, plate by-pass, .01 mf.	61-0120*
C314	Condenser, r-f by-pass, 250 mmf.	62-122001001*
C315	Condenser, cathode by-pass, .05 mf.	61-0122*
C316	Condenser, filament by-pass, 100 mmf.	62-110009001*
C317	Condenser, screen by-pass, .01 mf.	61-0120*
C318	Condenser, d-c blocking, 100 mmf.	60-10105407*
C319	Condenser, d-c blocking, 27 mmf.	Part of Z302
C320	Condenser, shunt, 470 mmf.	Part of Z302
C321	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C322	Condenser, plate by-pass, .05 mf.	61-0122*
C323	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C324	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C325	Condenser, d-c blocking, .006 mf.	45-3500-7*
C327	Condenser, electrolytic, noise suppressor (FM). 2 mf., 50v	30-2417-7
C328	Condenser, shunt, 25 mmf.	Part of Z302
C329	Condenser, shunt, 15 mmf.	Part of Z302
C330	Condenser, balancing, 7.5 mmf.	30-1224-8
C331	Condenser, tone compensation, .008 mf.	30-4112

MODEL 50-1726

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

Reference Symbol	Description	Service Part No.
C332	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C333	Condenser, d-c blocking, .006 mf.	45-3500-7*
C334	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C335	Condenser, filament by-pass, 100 mmf.	62-110009001*
C336	Condenser, filament by-pass, 100 mmf.	62-110009001*
J300	Test socket	27-6180
L300A	Transformer, primary (FM), 1st i-f	Part of Z300
L300B	Transformer, secondary (FM), 1st i-f	Part of Z300
L300C	Transformer, primary (AM), 1st i-f	Part of Z300
L300D	Transformer, secondary (AM), 1st i-f	Part of Z300
L301A	Transformer, primary (FM), 2nd i-f	Part of Z301
L301B	Transformer, secondary (FM), 2nd i-f	Part of Z301
L301C	Transformer, primary (AM), 2nd i-f	Part of Z301
L301D	Transformer, secondary (AM), 2nd i-f	Part of Z301
L302A	Transformer, primary (FM), 3rd i-f	Part of Z302
L302B	Transformer, secondary (FM), 3rd i-f	Part of Z302
L302C	Transformer, primary (AM), 3rd i-f	Part of Z302
L302D	Transformer, secondary (AM), 3rd i-f	Part of Z302
L302E	Transformer, winding, isolating, 3rd i-f	Part of Z302
R300	Resistor, plate dropping, 47,000 ohms	66-3473340*
R301	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R302	Resistor, cathode bias, 68 ohms	66-0683340*
R303	Resistor, plate dropping, 4700 ohms	66-2473340*
R304	Resistor, plate dropping, 33,000 ohms	66-3333340*
R305	Resistor, screen dropping, 27,000 ohms	66-3273340*
R306	Resistor, plate decoupling, 1000 ohms	66-2103340*
R307	Resistor, a-v-c filter, 3.3 megohms	66-5333340*
R308	Resistor, grid return, 2.2 megohms	66-5223340*
R309	Resistor, cathode bias, 150 ohms	66-1153340*
R310	Resistor, screen dropping, 68,000 ohms	66-3683340*
R311	Resistor, a-v-c load, 1 megohm	66-5103340*
R312	Resistor, plate decoupling, 1000 ohms	66-2103340*
R313	Resistor, i-f filter, 47,000 ohms	66-3473340*
R314	Resistor, diode load, 330,000 ohms	66-4333340*
R315	Resistor, FM detector load, 6.8 megohms	66-5683340*
R316	Resistor, isolating, 100,000 ohms	66-4103340*
R317	Resistor, noise suppressor (FM), 47,000 ohms	66-3473340*
R318	Resistor, isolating, 100,000 ohms	66-4103340*
R319	Resistor, isolating, 100,000 ohms	66-4103340*
TC300A	Tuning core	Part of Z300
TC302A	Tuning core	Part of Z302
WS-2 (F)	Switch-wafer section	Part of 42-1803-2†
WS-2 (R)	Switch-wafer section	Part of 42-1803-2†
WS-3 (R)	Switch-wafer section	Part of 42-1803-2†
WS-4 (F)	Switch-wafer section	Part of 42-1803-2†
WS-4 (R)	Switch-wafer section	Part of 42-1803-2†
Z300	Transformer, 1st i-f	32-4146
Z301	Transformer, 2nd i-f	32-4156
Z302	Transformer, 3rd i-f	32-4147

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang, 5-section	31-2703-6
C400A	Condenser, tuning, FM aerial	Part of C400
C400B	Condenser, tuning, FM r.f.	Part of C400
C400C	Condenser, tuning, FM osc.	Part of C400
C400D	Condenser, tuning, bc. aerial	Part of C400
C400E	Condenser, tuning, bc. osc.	Part of C400
C400F	Condenser, trimmer, FM aerial	Part of C400
C400G	Condenser, trimmer, FM r.f.	Part of C400
C400H	Condenser, trimmer, FM osc.	Part of C400
C401	Condenser, filament by-pass, 100 mmf.	62-110009001*
C402	Condenser, d-c blocking, 220 mmf.	62-122001001*
C403	Condenser, trimmer, bc. aerial	31-6473
C404	Condenser, trimmer assembly, 2-section	31-6476-5
C404A	Condenser, shunt trimmer, bc. osc.	Part of C404
C404B	Condenser, series padder, bc. osc.	Part of C404
C405	Condenser, d-c blocking, 220 mmf.	62-122001001*
C406	Condenser, cathode by-pass, 100 mmf.	62-110009001*
C407	Condenser, screen grid by-pass, 100 mmf.	62-110009001*
C408	Condenser, osc. grid, 100 mmf.	62-110009001*
C409	Condenser, d-c blocking, 33 mmf.	30-1224*
C410	Condenser, r-f by-pass, 1500 mmf.	62-215001011
C411	Condenser, r-f by-pass, 1500 mmf.	62-215001011
C412	Condenser, filament by-pass, 100 mmf.	62-110009001*
C413	Condenser, d-c blocking, 750 mmf.	60-10755301*
J400	Socket, FM aerial	27-6214-1
L400	Coil, FM aerial	32-4158
L401	Coil, FM r.f.	32-4159
L402	Coil, bc. aerial	32-4049-3

SECTION 4 (Continued)
R-F AND CONVERTER CIRCUITS

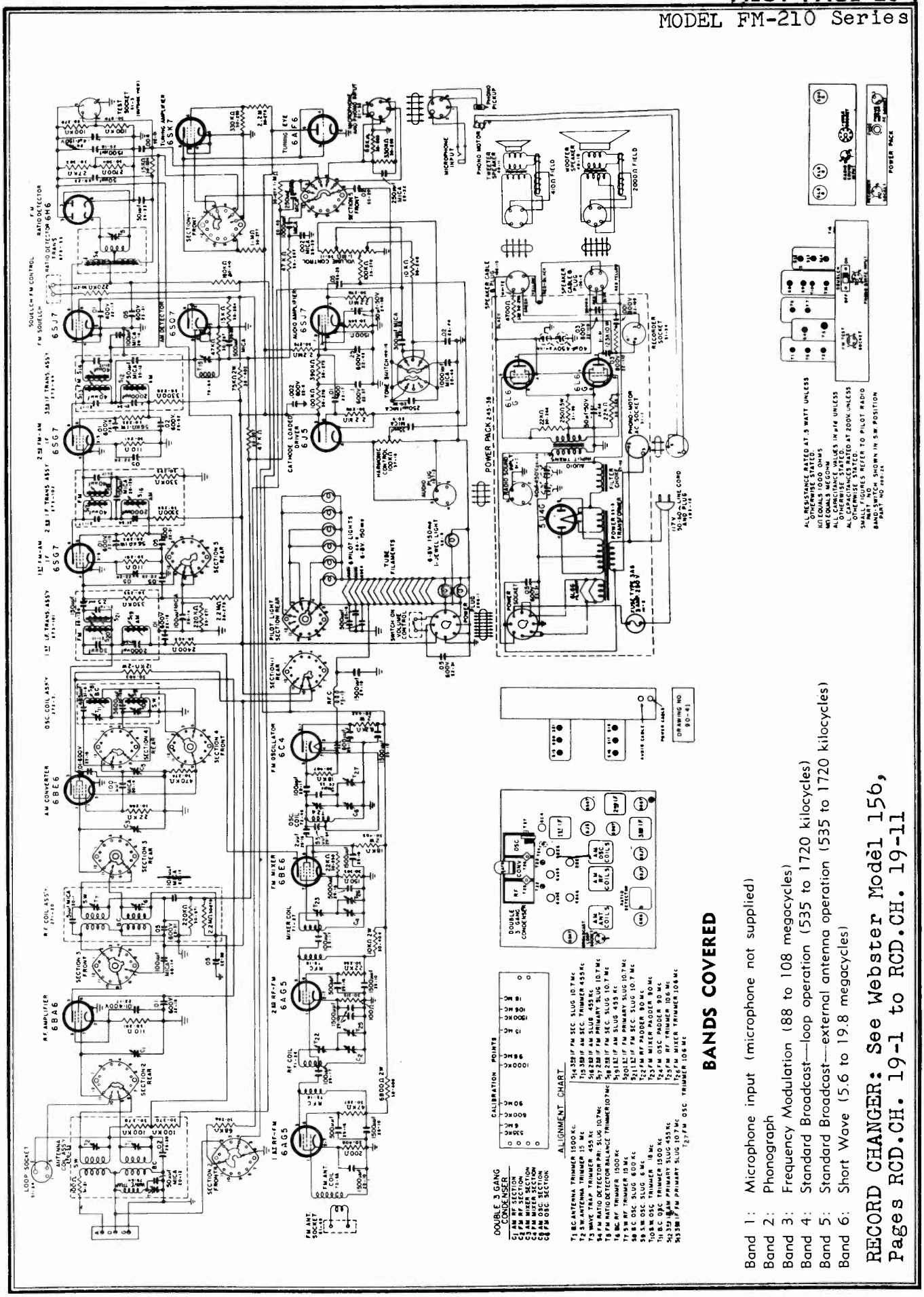
Reference Symbol	Description	Service Part No.
L403	Coil, FM osc.	32-4018-2
L404	Coil, bc. osc.	32-4221
L405	Coil, r-f choke (plate of 6AU6)	32-4061-2
L406	Coil (including R405), parasitic suppressor, (plate of 7F8)	32-4157
LA400	Loop aerial assembly	76-3583-6
R400	Resistor, cathode bias, 82 ohms	66-0823340*
R401	Resistor, grid return, 2.2 megohms	66-5223340*
R402	Resistor, grid return, 15,000 ohms	66-3153340*
R403	Resistor, screen dropping, 33,000 ohms	66-3333340*
R404	Resistor, plate decoupling, 1000 ohms	66-2103340*
R405	Resistor (with coil L406), parasitic suppresor, 1500 ohms	Part of L406
R406	Resistor, cathode bias, 1500 ohms	66-2153340*
R407	Resistor, a-v-c voltage divider (FM), 470,000 ohms	66-4473340*
TB-400	Terminal panel, bc. aerial	38-9942
WS-1 (F)	Switch-wafer section	Part of 42-1803-2†
WS-1 (R)	Switch-wafer section	Part of 42-1803-2†
WS-2 (F)	Switch-wafer section	Part of 42-1803-2†
WS-2 (R)	Switch-wafer section	Part of 42-1803-2†
WS-3 (F)	Switch-wafer section	Part of 42-1803-2†
WS-3 (R)	Switch-wafer section	Part of 42-1803-2†

† 42-1803-2 5-section wafer switch (band selector-phono)

MISCELLANEOUS

Description	Service Part No.
Cabinet and Cabinet Hardware	
Back, cabinet	54-7680
Backplate	76-2005-3
Baffle-and-Cloth Assembly	
For light cabinet, L.H. (speaker)	40-7538-1
For light cabinet, R.H. (dummy)	40-7592-1
For mahogany cabinet, L.H. (speaker)	40-7538
For mahogany cabinet, R.H. (dummy)	40-7592
Baffle, wood	219125
Bezel	56-4878
Bin mechanism, L.H.	76-3223-5
Bin mechanism, L.H.	76-3223-6
Bullet catch (light)	45-6002-1
Bullet catch (mahogany)	45-6002
Cabinet, mahogany	10721B
Cabinet, light	10721C
Dome (4)	45-6190
Door pull (light)	56-4420-2
Door pull (mahogany)	56-4420
Frame assembly	76-4104
Hinge	
For light cabinet, L.H. (1)	56-5713-6
For light cabinet, R.H. (2)	56-5713-7
For light cabinet, R.H. (1)	56-5713-9
For mahogany cabinet, L.H. (1)	56-5713-8
For mahogany cabinet, R.H. (2)	56-5713-3
For mahogany cabinet, R.H. (1)	56-5713-2
Scale strap (2)	56-2234-1
Spring, bin mechanism (2)	56-4978
Strike plate (light)	45-6003-1
Dial Scale and Scale Hardware	
Cord, drive (25-ft. spool)	45-8750*
Pointer	56-3179
Scale	76-3187-6
Spring, pointer	28-8953
Escutcheon	56-5491FCP
Knob (4)	54-4486
Knob (1)	54-4338-1
Light shield	56-6307-6FA3
Scale plate assembly	76-3187-6
Shield, pilot lamp	56-2194FA3
Socket, assembly, pilot lamp (2)	76-2109
Socket, assembly, binlight	27-6233-50
Socket, Loktal	27-6138
Socket, Loktal (7F8)	27-6213
Socket, miniature (6BA6)	27-6226
Socket, octal	27-6174
Spring, changer mounting	56-7059FA9
Spring, changer mounting	56-7059-1FJ47
Strike plate, mahogany	45-6003
Wafer-Switch Hardware	
Link assembly	76-2186-6
Shaft	56-3298FA11

MODEL FM-210 Series



BANDS COVERED

Band 1: Microphone input (microphone not supplied)
Band 2: Phonograph
Band 3: Frequency Modulation (88 to 108 megacycles)
Band 4: Standard Broadcast—loop operation (535 to 1720 kilocycles)
Band 5: Standard Broadcast—external antenna operation (535 to 1720 kilocycles)
Band 6: Short Wave (5.6 to 19.8 megacycles)

RECORD CHANGER: See Webster Model 156, Pages RCD.CH. 19-1 to RCD.CH. 19-11

ALIGNMENT CHART

STEP	CIRCUIT ALIGNED	RECEIVER		SIGNAL GENERATOR		METER		TRIMMER OR SLUG ADJUST	PROCEDURE
		BAND SWITCH	DIAL POINTER	FREQUENCY	CONNECTIONS	TYPE (See Notes)	CONNECTIONS		
1	AM IF	BC ANT.	55	455 kc	Through .1 mfd. to center gang large stator	A	Across speaker voice coil	15, 12, 16, 19	Adjust for maximum output
2	FM IF	FM	88	10.7 mc	Through .1 mfd. to center gang small stator	B	FM Test Socket, #4 cold (+), #5 high (—)	4, 13, 14, 17, 18, 20, 21	Adjust for maximum negative DC voltage
3	Ratio Detector	FM	88	10.7 mc	Through .1 mfd. to center gang small stator	B	FM Test Socket, #2 cold #1 high	5	Check VTVM zero set. Turn trimmer slowly through point where DC polarity reverses. Carefully set for zero DC at reversal point
4	AM IF Trap	BC ANT	55	455 kc	Through 200 mmf to "A" and "G" posts of AM antenna strip	A	Across speaker voice coil	3	Adjust for minimum output
5	BC RF	BC ANT	150	1500 kc	Through 200 mmf to "A" and "G" posts of AM antenna strip	A	Across speaker voice coil	11, 6, 1	Adjust for maximum output
6			60	600 kc	Through 200 mmf to "A" and "G" posts of AM antenna strip	A	Across speaker voice coil	8	Adjust for maximum output while rocking gang
7			Repeat Steps 5 and 6						
8	SW RF	SW	18	18 mc	Through 400 ohms to "A" and "G" posts of AM antenna strip	A	Across speaker voice coil	10	Adjust osc. trimmer for maximum output. (osc. on high side of signal)
9			15	15 mc	Through 400 ohms to "A" and "G" posts of AM antenna strip	A	Across speaker voice coil	7, 2	Adjust for maximum output
10			6	6.0 mc	Through 400 ohms to "A" and "G" posts of AM antenna strip	A	Across speaker voice coil	9	Adjust for maximum output while rocking gang
11			Repeat Steps 8, 9 and 10						
12	FM RF	FM	90	90 mc	To dipole terminals FM antenna strip	B	FM Test Socket, #4 low (+), #5 high (—)	24, 23, 22	Adjust for maximum negative DC voltage
13			106	106 mc	To dipole terminals FM antenna strip	B	FM Test Socket, #4 low (+), #5 high (—)	27, 26, 25	Adjust for maximum negative DC voltage
14			Repeat Steps 12 and 13 as required						

ALIGNMENT NOTES

See Alignment chart (next Page) and layout diagram showing trimmers.

The following notes are intended for the use of an expert radio technician:

Alignment should be attempted only if the proper meters and a signal generator are at your disposal. Insulated alignment tools are necessary. Output meters should include:

A) a low range AC Voltmeter

B) a 0-20 volt DC vacuum tube Voltmeter

The signal generator must cover the frequencies of 455 kc, 600 kc, 1500 kc, 6 mc, 10.7 mc, 15 mc, 18 mc, 90 mc and 106 mc.

During alignment the line voltage feeding the receiver power supply should be kept at approximately 117 volts.

The receiver should be allowed to warm up for at least 30 minutes before making any adjustments.

The location of adjustment screws are indicated clearly on the schematic diagrom. Alignment adjustments should be made only in the sequence given in the chart.

SETTING THE PUSHBUTTONS

The Model FM-210 Series is equipped with 8 pushbuttons which mechanically operate the dual three-gang tuning condenser. It is permissible for some of these buttons to be used for tuning into FM stations (preferably those toward the left of the dial), but for best FM reception the tuning knob should be adjusted slightly after the pushbutton has located the approximate setting of the FM station. For the broadcast band, however, pushbutton tuning will be sufficient, and no further adjustment will be necessary.

The initial adjustment of the pushbuttons is as follows:

1. Remove the bakelite cap
2. Loosen the locking screw behind the cap
3. Tune into the desired station carefully by turning the manual tuning knob until the opening in the tuning indicator eye is at a minimum
4. Depress the exposed pushbutton shoft as far as possible and tighten the locking screw
5. Ploce the station identification tab in the bakelite button and cover with celluloid tab.
6. Replace the button on the shaft

TUNING RANGE

Broadcast Band—535 to 1720 kc or 174 to 561 meters.

Short Wave Band—5.67 to 24.0 mc or 12.5 to 53.6 meters.

ALIGNMENT NOTES

Alignment should be attempted only if a low range A.C. meter, a signal generator, and insulated alignment tools are at your disposal. The A.C. meter is used as an outputmeter. The signal generator must cover a frequency range from 450 kc to 24 mc.

It is essential that the signal generator be connected to the points indicated in the alignment chart through the proper dummy antenna.

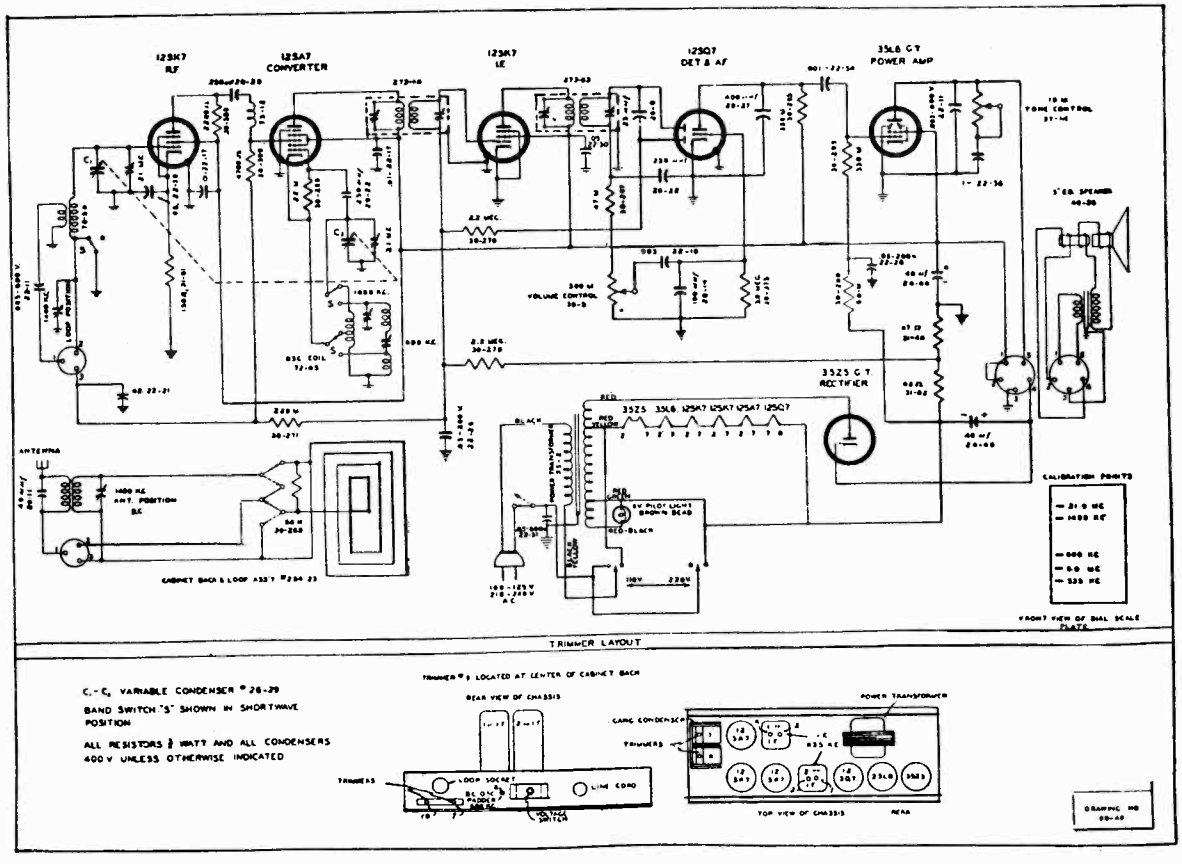
A good ground connection, secured between the groundpost of the signal generator and the chassis, is necessary.

The output of the signal generator must always be kept at its lowest possible value. This is to prevent the automatic volume control of the receiver from interfering with accurate alignment.

During alignment, the line voltage feeding the receiver power supply should be kept at approximately 230 volts.

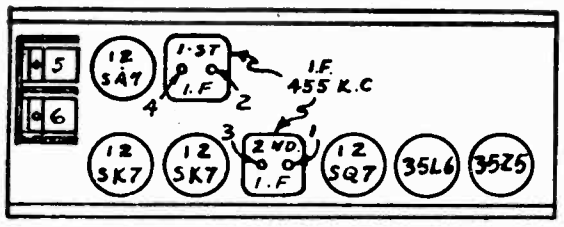
The locations of adjustment screws are indicated clearly on the schematic diagram. Alignment adjustments should be made only in the sequence given in the chart.

For all alignments, connect the outputmeter across the voice coil. With the volume control turned fully clockwise, tune for a maximum reading.

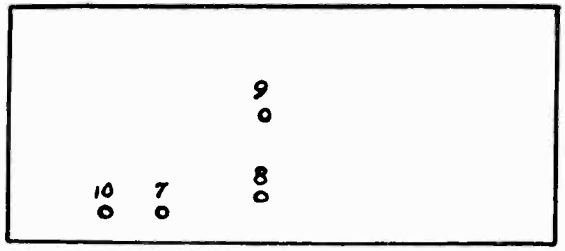


ALIGNMENT CHART

STEP	CIRCUIT ALIGNED	RECEIVER		SIGNAL GENERATOR		DUMMY ANTENNA	ADJUSTMENTS (All maximum output)
		BAND SWITCH	DIAL POINTER	FREQUENCY	CONNECTION		
1	IF	BC	Low end of dial	455 KC	Grid of 12SK7 RF	0.1 mfd.	#1, 2, 3, 4
2	SW	SW	E	21 MC	Antenna Post	400 ohm carbon resistor	First #5 Then #6
3	BC	BC	D	1400 KC	Antenna Post	200 mmfd. mica capacitor	#7
4	BC	BC	C	600 KC	Antenna Post	200 mmfd. mica capacitor	#8
5	Repeat steps 3 and 4						
6	BC	BC	Set for broadcast station near 1400 KC			——	#9 and #10



TOP



BACK

E — 21.0 MC
D — 1400 KC
C — 600 KC
B — 6.0 MC
A — 535 KC

This Pilot superheterodyne receiver has FIVE tubes and one selenium rectifier. The set operates on either alternating or direct current power supply (105 to 125 volts) or on self-contained batteries. Since it features a selenium rectifier, it will play immediately after being turned on, on either battery or house current power supply.

TUNING RANGE

Broadcast Band—535 to 1605 kc or 187 to 561 meters.

Short Wave Band—5.63 to 16.56 mc or 18.2 to 53.2 meters.

ALIGNMENT NOTES

. Alignment should be attempted only if a low range A.C. meter, a signal generator, and insulated alignment tools are at your disposal. The A.C. meter is used as an output-meter. The signal generator must cover a frequency range from 262 kc to 16 mc.

It is essential that the signal generator be connected to the points indicated in the alignment chart through the proper dummy antenna.

A good connection between the groundpost of the signal generator and the chassis, is necessary. DO NOT connect chassis or generator to an external ground.

The output of the signal generator must always be kept at its lowest possible value. This is to prevent the automatic volume control of the receiver from interfering with accurate alignment.

During alignment, the line voltage feeding the receiver power supply should be kept at approximately 117 volts.

The locations of adjustment screws are indicated clearly on the schematic diagram. Alignment adjustments should be made only in the sequence given in the chart.

For all alignments, connect the outputmeter across the voice coil. With the volume control turned fully clockwise tune for a maximum reading.

BATTERIES

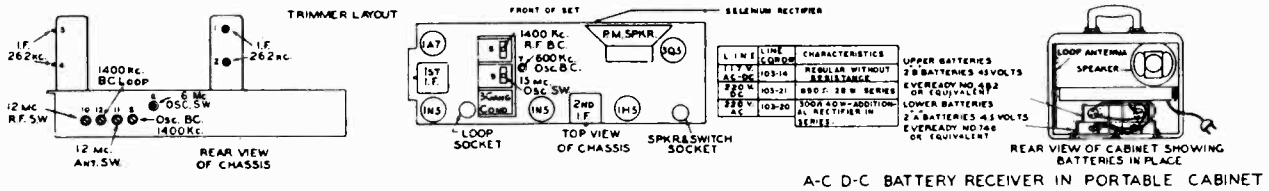
The battery portion of this receiver contains two Eveready No. 746 "A" batteries of 4½ volts, and two Eveready No. 482 "B" batteries of 45 volts each. The set is so designed that these batteries will all last the same length of time.

It is a good idea to take the receiver to your dealer when purchasing replacement batteries. He will connect the batteries correctly. If you do it yourself, first MAKE SURE THAT THE POWER SWITCH IS COMPLETELY TURNED OFF.

When removing the batteries, first unscrew clamps, and then remove battery plugs. Be sure not to pull on the cables, but on the plugs themselves.

Place the new "A" and "B" batteries in position shown on diagram below and replace clamps.

The blue and white cable, coming from the chassis, has 2-prong plugs which are then plugged into the "A" batteries. The red and black cable has two 3-prong plugs, both of which are plugged into the "B" batteries.

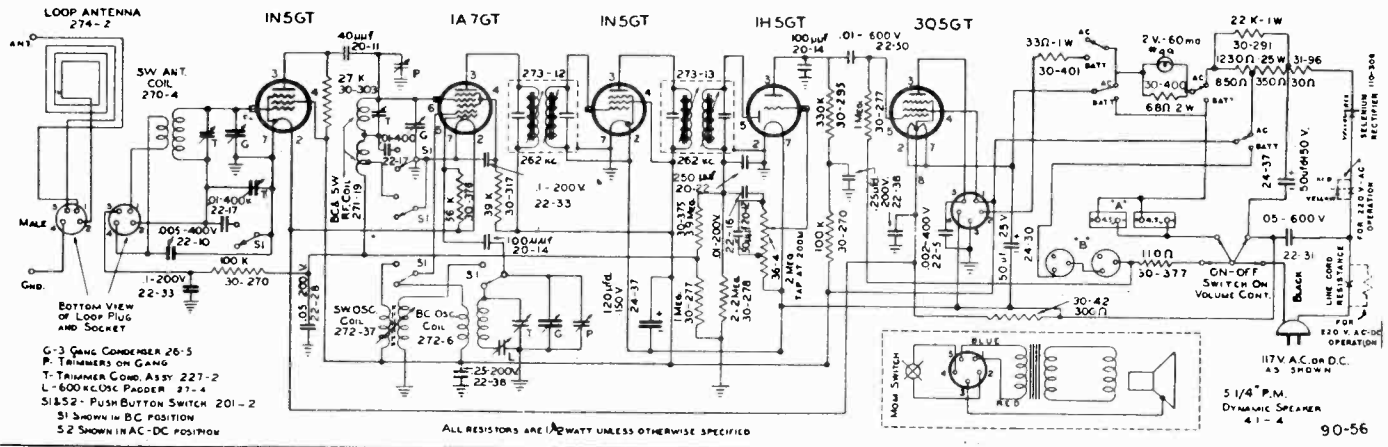


A-C D-C BATTERY RECEIVER IN PORTABLE CABINET

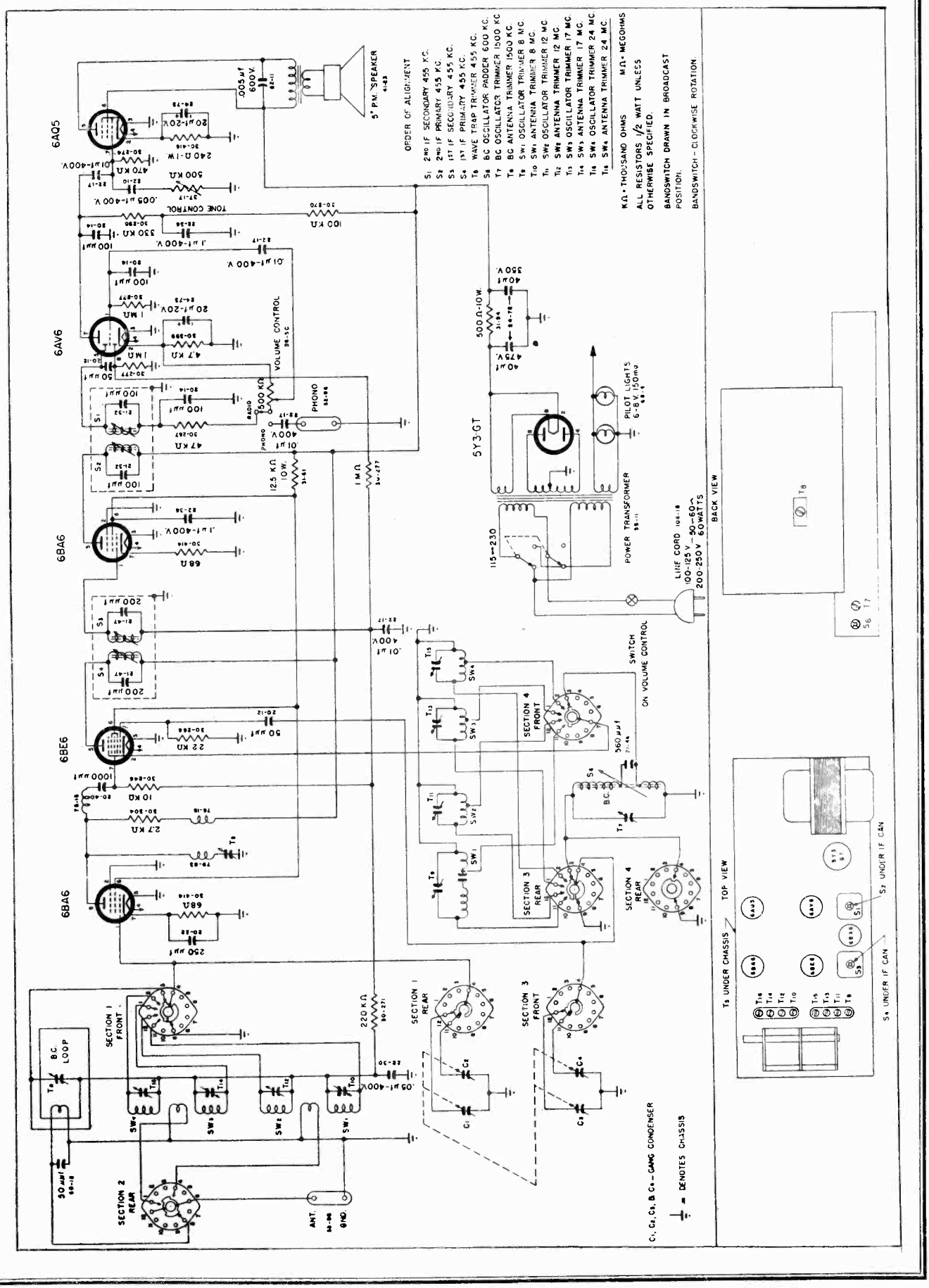
ALIGNMENT CHART

STEP	CIRCUIT ALIGNED	RECEIVER		SIGNAL GENERATOR		DUMMY ANTENNA	ADJUSTMENTS (All maximum output)
		BAND SWITCH	DIAL POINTER	FREQUENCY	CONNECTION		
1	IF	BC	Low end of dial	262 KC	Grid of 1A7GT conv.	0.1 mfd.	#1, 2, 3, 4
2	BC	BC	1400 KC	1400 KC	Antenna Post	200 mmfd. mica cap.	First #5 Then #6
3	BC	BC	600 KC	600 KC	Antenna Post	200 mmfd. mica cap.	#7
4	Repeat steps 2 and 3						
5	SW	SW	6 MC	6 MC	Antenna Post	400 ohm carbon resistor	#8
6	SW	SW	15 MC	15 MC	Antenna Post	400 ohm carbon resistor	#9
7	SW	SW	Tune in generator	12 MC	Antenna Post	400 ohm carbon resistor	First #10, while rocking Then #11
8	Repeat step 5 while rocking for maximum output.						
9	Repeat steps 6 and 7.						
10	Repeat step 2, trimmer #5 only.						
11	BC	BC	Tune in broadcast station near 1400 KC				#12

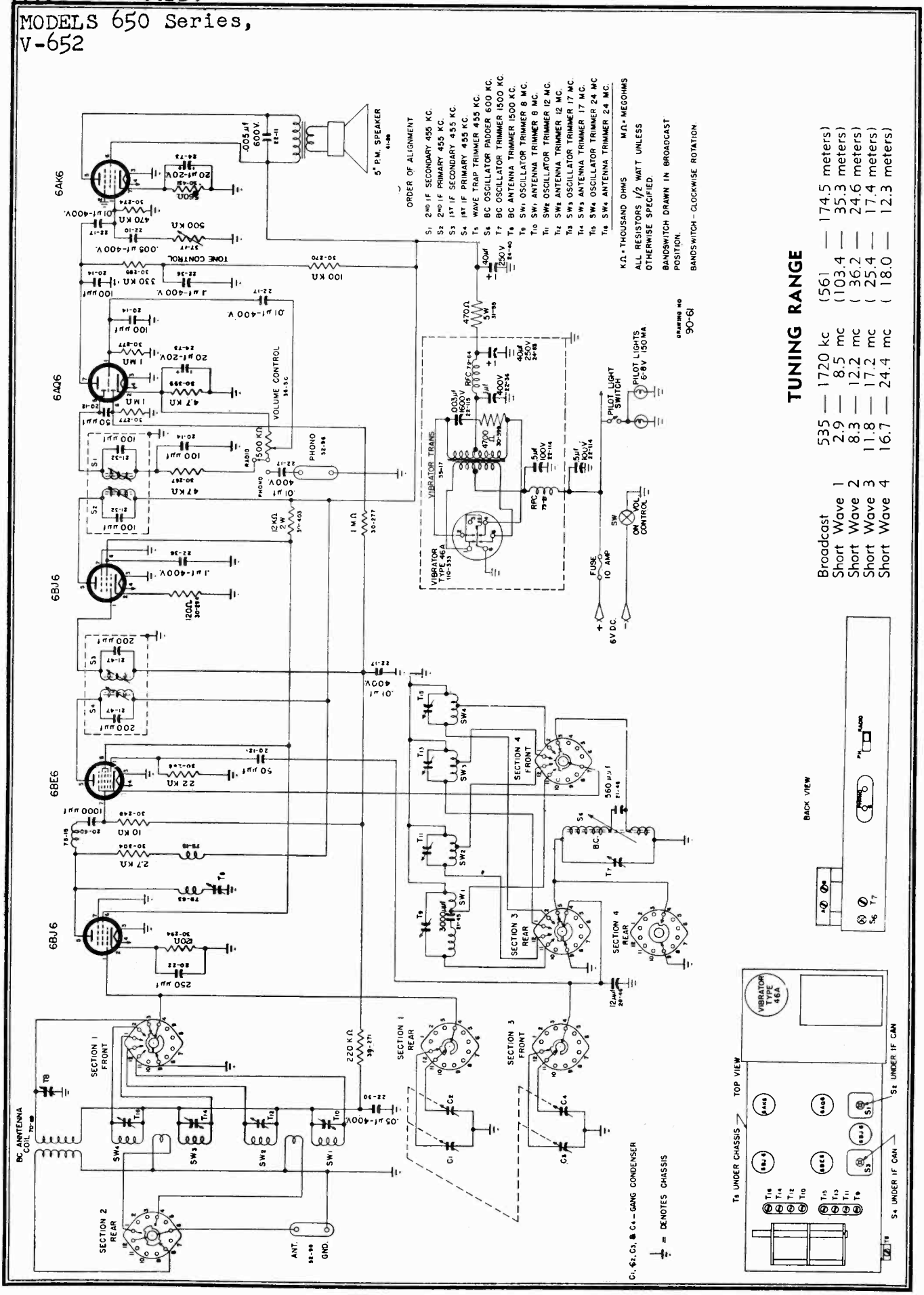
NOTE: Align step 1 to 10 with chassis out of cabinet, but loop plugged in. Step 11 must be taken with set properly placed in cabinet, and batteries and loop in the normal position.



MODEL T-612



MODELS 650 Series,
V-652



ALIGNMENT CHART

STEP	CIRCUIT ALIGNED	RECEIVER		SIGNAL GENERATOR		TRIMMER OR IRON CORE TO BE ADJUSTED	PROCEDURE
		BAND SWITCH	DIAL POINTER	FREQUENCY	CONNECTION		
1	I.F.	B'dc'st.	At low frequency end of dial	455 kc	Thru 0.1 mfd. condenser to front section of gang	S1, S2 S3, S4	Adjust for maximum output
2	I.F. Trap.	B'dc'st.	At low frequency end of dial	455 kc	Thru 200 mmf. condenser to Ant. Terminal "A"	T5	Adjust for minimum output
3	B'dc'st. R.F.	B'dc'st.	150 on dial	1500 kc	Thru 200 mmf. condenser to Ant. Terminal "A"	1. T7 (osc) 2. T8 (ant)	Adjust for maximum output
4	B'dc'st. R.F.	B'dc'st.	60 on dial	600 kc	Thru 200 mmf. condenser to Ant. Terminal "A"	S6 (padder)	Adjust for maximum output while rocking var. cond.
5	B'dc'st. R.F.	B'dc'st.	Repeat steps 3, 4 and 3				
6	S.W. 1	S.W. 1	8 mc on dial	8.0 mc	Thru 400 ohm resistor to "A" terminal	1. T9 (osc) 2. T10 (ant)	Adjust for maximum output
7	S.W. 2	S.W. 2	12 mc on dial	12 mc	Thru 400 ohm resistor to "A" terminal	1. T11 (osc) 2. T12 (ant)	Adjust for maximum output
8	S.W. 3	S.W. 3	17 mc on dial	17 mc	Thru 400 ohm resistor to "A" terminal	1. T13 (osc) 2. T14 (ant)	Adjust for maximum output
9	S.W. 4	S.W. 4	24 mc on dial	24 mc	Thru 400 ohm resistor to "A" terminal	1. T15 (osc) 2. T16 (ant)	Adjust for maximum output

ALIGNMENT NOTES

Alignment should be attempted only if a low range A.C. meter, a signal generator, and insulated alignment tools are at your disposal. The A.C. meter is used as an output meter. The signal generator must cover a frequency range from 450 kc to 24 mc.

It is essential that the signal generator be connected to the points indicated in the alignment chart through the proper dummy antenna.

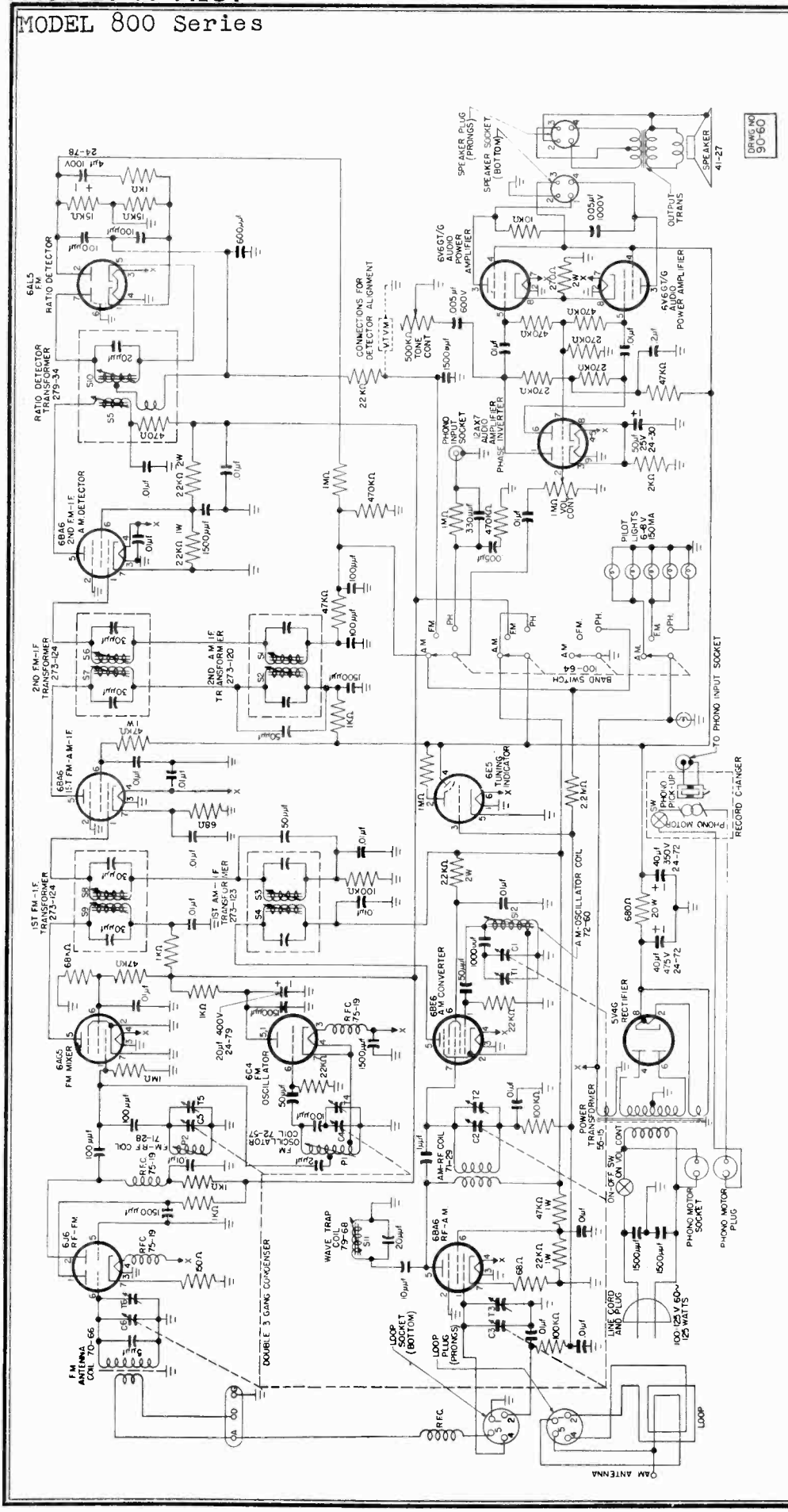
A good ground connection, secured between the groundpost of the signal generator and the chassis, is necessary.

The output of the signal generator must always be kept at its lowest possible value. This is to prevent the automatic volume control of the receiver from interfering with accurate alignment.

The locations of adjustment screws are indicated clearly on the schematic diagram Alignment adjustments should be made only in the sequence given in the chart.

For all alignments, connect the output meter across the voice coil. With the volume control turned fully clockwise, tune for a maximum reading.

MODEL 800 Series



USAGE

Standard Broadcast (AM)—Built-in loop or external antenna operation—540 to 1720 kc

Frequency Modulation (FM)—Built-in or external dipole antenna operation—88 to 108 mc

Automatic Phonograph—Webster "156" changer

RECORD CHANGER: See Webster Model 156, Pages RCD.CH. 19-1 to RCD.CH. 19-11

ALIGNMENT CHART

STEP	CIRCUIT ALIGNED	RECEIVER		SIGNAL GENERATOR		OUTPUT METER		TRIMMER OR SLUG ADJUST	PROCEDURE
		BAND SWITCH	DIAL POINTER	FREQUENCY	CONNECTIONS	TYPE	CONNECTIONS		
1	AM-I.F.	AM	55	455KC	Through .1 mf to mixer gang—large stator	A	Across Speaker Voice Coil	S1, S2, S3, S4	Adjust for maximum output
2	FM-I.F.	FM	88	10.7MC	Through .1 mf to mixer gang—small stator	B	Pin# 2—FM ratio detector & ground	S5, S6, S7, S8, S9	Adjust for maximum negative DC voltage
3	Rat.o Detector	FM	88	10.7MC	SAME	B	From audio output of ratio detector to ground (See Circuit Diagram)	S10	Check VTVM zero set. Turn slug slowly through point where DC polarity reverses. Carefully set for zero DC at reversal point.
4	B.C. Wave Trap	AM	55	455KC	Through 200 mmf to "A" & "G" terminals of antenna strip	A	Across Speaker Voice Coil	S11	Adjust for minimum output
5	B.C. R.F.	AM	150	1500KC	Through 200 mmf to "A" & "G" terminals of antenna strip	A	Across Speaker Voice Coil	T1, T2, T3	Adjust for maximum output
6			60	600KC	SAME	A	Across Speaker Voice Coil	S12	Adjust for maximum output while rocking gang
7			Repeat Steps 5 and 6 as required						
8	FM R.F.	FM	90	90MC	To "A" & "D" terminals Antenna strip	B	Pin #2 — F.M. Ratio Detector & Ground	P1, P2,	Adjust for maximum negative DC voltage.
9			106	106MC	SAME	B	SAME	T4, T5, T6	Adjust for maximum negative DC voltage
10			Repeat Steps 8 and 9 as required						

ALIGNMENT NOTES

Alignment should be attempted only if the proper meters and a signal generator are at your disposal. Insulated alignment tools are necessary. Output meters should include:

(A) a low range AC Voltmeter

(B) a 0-20 volt DC vacuum tube Voltmeter

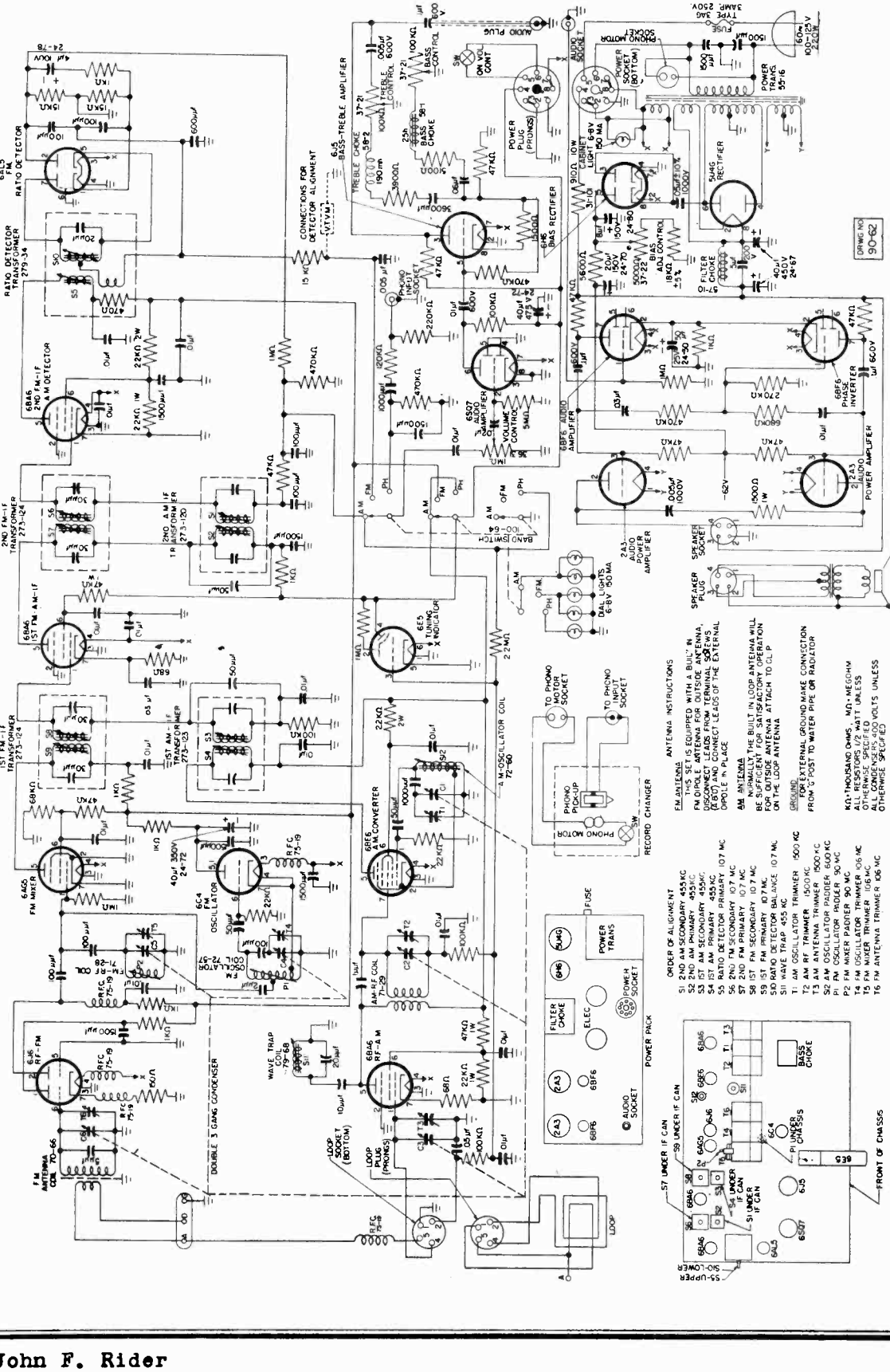
The signal generator must cover the frequencies of 455 kc, 600 kc, 1500 kc, 10.7 mc, 90 mc and 106 mc.

During alignment the line voltage feeding the receiver power supply should be kept at approximately 117 volts.

The receiver should be allowed to warm up for at least 30 minutes before making any adjustments.

The location of adjustment screws are indicated clearly on the schematic diagram. Alignment adjustments should be made only in the sequence given in the chart.

MODEL 810 Series



RECORD CHANGER: See Webster Model 156, Pages RCD.CH. 19-1 to RCD.CH. 19-11.

USAGE

Standard Broadcast (Amplitude Modulation—AM)—Built-in loop or external antenna operation—540 to 1720 kc

Frequency Modulation (FM)—Built-in or external dipole antenna operation—88 to 108 mc

Automatic Phonograph—Webster "156" changer

ALIGNMENT NOTES

Alignment should be attempted only if the proper meters and a signal generator are at your disposal. Insulated alignment tools are necessary. Output meters should include:

(A) a low range AC Voltmeter

(B) a 0-20 volt DC vacuum tube Voltmeter

The signal generator must cover the frequencies of 455 kc, 600 kc, 1500 kc, 107 mc, 90 mc and 106 mc.

During alignment the line voltage feeding the receiver power supply should be kept at approximately 117 volts.

The receiver should be allowed to warm up for at least 30 minutes before making any adjustments.

The location of adjustment screws are indicated clearly on the schematic diagram. Alignment adjustments should be made only in the sequence given in the chart.

BIAS ADJUSTMENT

This adjustment is made at the factory and will normally not require adjustment in the field. However, if for any reason it does require adjustment, proceed as follows:

(1) Connect a 20,000 ohm per volt or a vacuum tube voltmeter between the junction of the two 47,000 ohm 2A3 grid resistors and ground (positive side of meter to ground).

(2) Adjust bias control (screwdriver adjustment inside of power supply chassis) until meter reads exactly—62 volts.

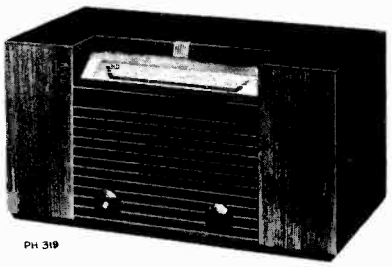
Improper adjustment of this control will impair the tone quality of the receiver and may shorten the lives of the 2A3 tubes.

ALIGNMENT CHART

(Follow Sequence as Indicated)

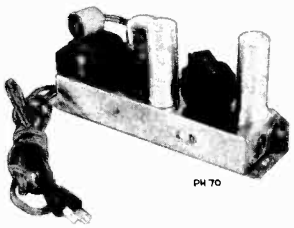
STEP	CIRCUIT ALIGNED	RECEIVER		SIGNAL GENERATOR		OUTPUT METER		TRIMMER OR SLUG ADJUST	PROCEDURE
		BAND SWITCH	DIAL POINTER	FREQUENCY	CONNECTIONS	TYPE	CONNECTIONS		
1	AM-I.F.	AM	55	455KC	Through .1 mf to mixer gang—large stator	A	Across Speaker Voice Coil	S1, S2, S3, S4	Adjust for maximum output
2	FM-I.F.	FM	88	10.7MC	Through .1 mf to mixer gang—small stator	B	Pin# 2—FM ratio detector & ground	S5, S6, S7, S8, S9	Adjust for maximum negative DC voltage
3	Ratio Detector	FM	88	10.7MC	SAME	B	From audio output of ratio detector to ground (See Circuit Diagram)	S10	Check VTVM zero set. Turn slug slowly through point where DC polarity reverses. Carefully set for zero DC at reversal point.
4	B.C. Wave Trap	AM	55	455KC	Through 200 mmf to "A" & "G" terminals of antenna strip	A	Across Speaker Voice Coil	S11	Adjust for minimum output
5	B.C. R.F.	AM	150	1500KC	Through 200 mmf to "A" & "G" terminals of antenna strip	A	Across Speaker Voice Coil	T1, T2, T3	Adjust for maximum output
6			60	600KC	SAME	A	Across Speaker Voice Coil	S12	Adjust for maximum output while rocking gang
7			Repeat Steps 5 and 6 as required						
8	FM R.F.	FM	90	90MC	To "A" & "D" terminals Antenna strip	B	Pin #2 — F.M. Ratio Detector & Ground	P1, P2,	Adjust for maximum negative DC voltage.
9			106	106MC	SAME	B	SAME	T4, T5, T6	Adjust for maximum negative DC voltage
10			Repeat Steps 8 and 9 as required						

MODELS 8F43, Ch. RC 1037B;
CV-45, Ch. RS-1001



Model 8F43

CV-45 Electrifier →



Specifications

Tuning Range ..... 540 KC.—1600KC.
Intermediate Frequency ..... 455 KC.

Tube Complement

(1) RCA—1A7 GT ..... Converter
(2) RCA—1N5 GT ..... 1F Amplifier
(3) RCA—1H5 GT .2nd Det., A.V.C., and A-F Amplifier
(4) RCA—3Q5 GT ..... Output
RCA—6X5 GT .....(in CV-45)..... Rectifier

Power Output Rating

Undistorted ..... 160 MW.
Maximum ..... 270 MW.

Loudspeaker

Type 922258-2 ..... 4 x 6 inch PM
V.C. impedance at 400 cycles ..... 3.4 ohms

Power Supply

(1) RCA Battery Pack—VS022.
"A" Battery, 1½ volts, Drain—0.24 amperes.
"B" Battery, 90 volts, Drain—10.5 ma.
(2) Electrifier—(CV-45)
105 to 125 volts, 60 cycles, AC.

Cabinet Dimensions

Height ....$9^{7}/_{16}$ in. Width ....17½ in. Depth ....$9^{1}/_{2}$ in.

Replacement Parts

Stock No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1037B
*73884	Capacitor—Variable tuning capacitor (C11, C11a, C12, C12a)
*73901	Capacitor—Ceramic, 51 mmf. (C10)
39630	Capacitor—Mica, 120 mmf. (C8, C9)
72571	Capacitor—Mica, 330 mmf. (C4)
70622	Capacitor—Tubular, .002 mfd., 600 volts (C3)
70606	Capacitor—Tubular, .005 mfd., 400 volts (C5, C6)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C2)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C1)
38593	Capacitor—Electrolytic, 10 mfd., 90 volts (C7)
71404	Coil—Antenna coil complete with adjustable core and stud (L1, L2)
71401	Coil—Oscillator coil complete with adjustable core and stud (L3, L4)
71168	Control—Volume control and power switch (R9, S1)
†72953	Cord—Drive cord. (approx. 52" overall length required)
72283	Grommet—Rubber grommet to mount tuning condenser (3 required)
*73886	Indicator—Station selector indicator
*73885	Plate—Dial back plate complete with pulleys, less dial
71162	Plug—Battery shorting plug—3 prong male
30550	Plug—4 prong male plug for battery cable
	Resistor—Fixed, composition, 470 ohms, ±20%, ½ watt (R4)
	Resistor—Fixed, composition, 68,000 ohms, ±20%, ½ watt (R2)
	Resistor—Fixed, composition, 220,000 ohms, ±20%, ½ watt (R1)
	Resistor—Fixed, composition, 1 megohm, ±20%, ½ watt (R5)
	Resistor—Fixed, composition, 2.2 megohm, ±20%, ½ watt (R6)
	Resistor—Fixed, composition, 3.3 megohm, ±20%, ½ watt (R3)
	Resistor—Fixed, composition, 10 megohm, ±20%, ½ watt (R7, R8)
*73887	Shaft—Tuning knob shaft
70377	Shield—Shield for 1A7GT tube
71163	Socket—Battery shorting socket—3 contact female
37605	Socket—Tube socket
70390	Spring—Drive cord spring
71403	Transformer—First I.F. transformer (T1)
71400	Transformer—Second I.F. transformer (T2)
71047	Transformer—Output transformer (T3)
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLIES 922258-2
71058	Speaker—4" x 6" elliptical P.M. speaker complete with cone and voice coil
	MISCELLANEOUS
70398	Clamp—Dial clamp (2 required)
X1660	Cloth—Grille cloth
*73888	Dial—Glass dial scale
39002	Foot—Rubber foot (4 required)
70473	Knob—Tuning knob
71164	Knob—Volume control knob
72649	Motif—Decorative motif
38458	Nut—Speed nut to fasten motif
30900	Spring—Retaining spring for knobs
	CV-45 ELECTRIFIER RS-1001
71840	Capacitor—Electrolytic, dual, 2,000 mfd., 6 volts (C3, C4)
71844	Capacitor—Electrolytic, dual, 20 mfd., 150 volts (C1, C2)
35069	Fastener—Push fastener for bottom cover
71838	Reactor—Filter reactor
71839	Rectifier—Rectifier complete with mounting bracket
72787	Resistor—1.2 ohms, ½ watt (R3)
12453	Resistor—27 ohms, ¼ watt (R1)
30788	Resistor—4,700 ohms, 1 watt (R2)
71841	Socket—3 contact female socket
31027	Socket—4 contact female socket for battery cable
37605	Socket—Tube socket
71837	Transformer—Power transformer, 117 volt, 60 cycle (T1)

*This is the first time this Stock No. has appeared in Service Data.
†Stock No. 72953 is a reel containing 250 ft. of cord.

MODELS 8F43, Ch. RC 1037B;
CV-45, Ch. RS-1001

Alignment Procedure

Output Meter Alignment.—Connect the meter across the voice coil and turn the receiver volume control to maximum.

Test Oscillator.—Connect the low side of the test oscillator to the receiver chassis, and keep the output low to avoid AVC action.

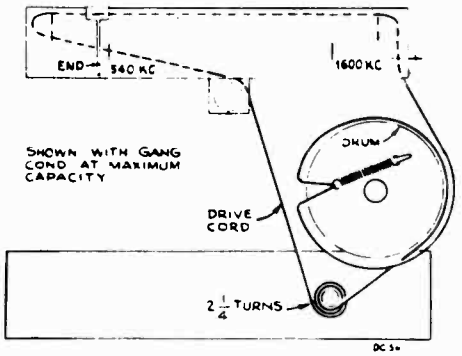
Pre-Setting Dial.—With gang condenser in full mesh, the pointer should be set at the left-hand end dial calibration mark.

Steps	Connect high side of test oscillator to—	Tune test oscillator to—	Turn radio dial to—	Adjust for maximum output
1	1N5GT grid in series with .1 mfd.	455 kc.	Quiet point near 600 kc.	T-2 2nd I.F. trans.
2	1A7GT grid in series with .1 mfd.			T-1* 1st I.F. trans.
3	Antenna lead in series with 220 mmfd.	1600 kc.	1600 kc. mark	C12A
4		540 kc.	540 kc. mark	L3
5		Repeat Steps 3 and 4.		
6		1400 kc.	1400 kc. signal	C11A
7		600 kc.	600 kc. signal	L2
8		Repeat Steps 6 and 7.		

*Do not readjust T-2.

Critical Lead Dress

1. Keep output plate capacitor dressed close to the chassis.
2. Keep lead from lug A of second IF transformer down and dressed close around the 1H5GT tube socket.
3. Dress 1N5GT plate lead close to chassis.
4. Dress C1 down and away from the antenna coil.
5. Dress C3 and C5 away from each other.
6. Dress the lead from 2nd. IF transformer to the volume control clear of other components.

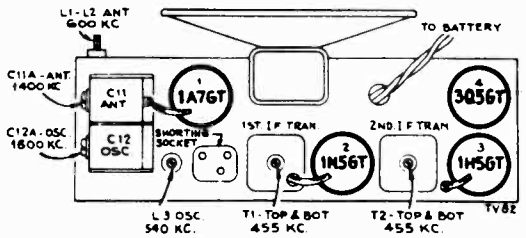


Dial Indicator and Drive Mechanism Showing Alignment Check Points

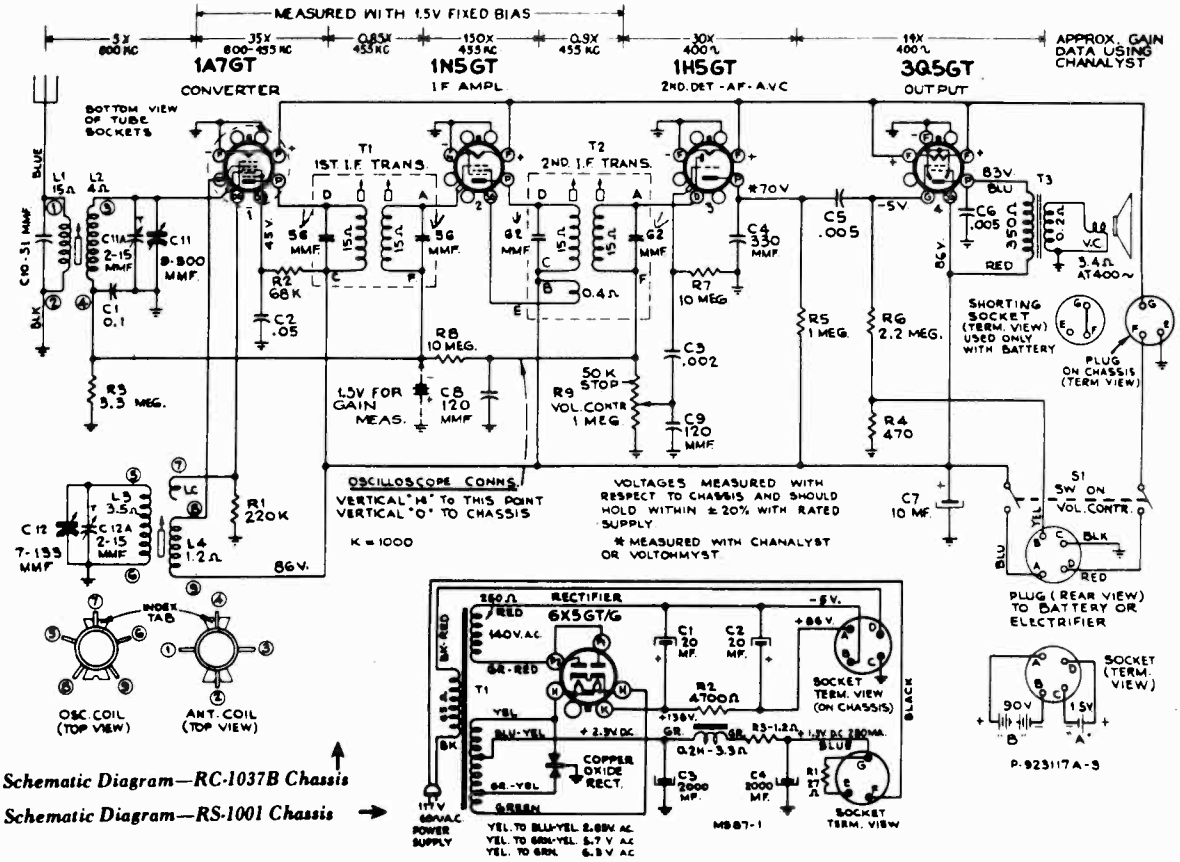
NOTE:—

When using the electrifier, remove the shorting plug on the chassis (adjacent to the 1A7GT tube) and replace it with a similar plug, attached to the electrifier. Also connect the remaining plug attached to the electrifier, in place of the normal battery plug. The receiver will operate in the normal manner, using the same control for turning the set on and off.

Do not plug electrifier into a DC outlet.



Tube and Trimmer Locations



Schematic Diagram—RC-1037B Chassis

Schematic Diagram—RS-1001 Chassis →

MODEL 9BX5,
Ch. RC-1059B, RC-1059C

PH 380

Specifications

Tuning Range ..... 540-1600 kc.

Intermediate Frequency ..... 455 kc.

Tube Complement

(1) RCA 1R5 ..... Converter
(2) RCA 1U4 ..... I. F. Amplifier
(3) RCA 1U5 ..... Det.-A. V. C.-A. F. Amp.
(4) RCA 3V4 ..... Output
(5) RCA 117Z3 ..... Rectifier

Power Supply Rating

Power Line Operation

115 volts, d. c. or 50 to 60 cycles a. c. ..... 18 watts

or

Battery Operated ..... VS 050 Battery

(Average life—100 hrs. intermittent service)

Loudspeaker (92577-1)

Size and type ..... 4 in. PM dynamic
Voice coil impedance ..... 3.4 ohms at 400 cycles

Power Output

Undistorted—150 milliwatts Maximum—250 milliwatts

(Output is slightly lower on battery operation)

Cabinet Dimensions

Height 9½ in. Width 11 in. Depth 5 in.

Weight

5 lb. less battery 8 lb. 2 oz. with battery

AC-DC Operation

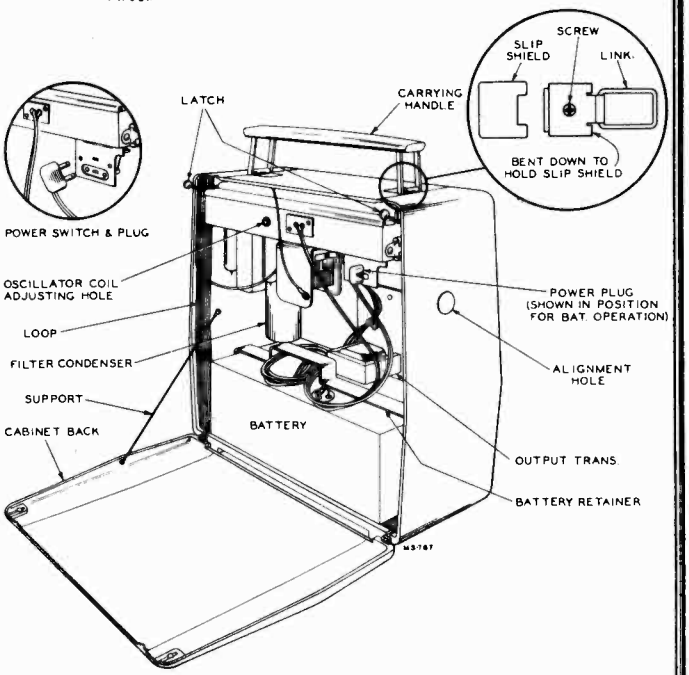
This receiver will operate on 115 volts, d. c. or 50 to 60 cycles a. c.

A power cord is stored inside the cabinet. To open the cabinet, push upward on the two metal ball catches at the top rear of the cabinet. Remove the plug of the power cord from its socket on the chassis and insert the plug into a convenient electrical outlet. A slot in the bottom of the back cover allows the back to be closed with the cord passing through.

Note: If reception is not obtained on d. c., reverse plug in outlet receptacle. This may also reduce hum on a. c. operation.

When returning to battery operation replace the plug in the socket provided on the chassis, roll up the cord and place under the raised portion of the battery holder bracket.

Note: Make certain that the plug is fully inserted (base of plug touching chassis) to assure proper operation of the Batt-Line switch.



Cabinet Hinges

The cabinet hinges may be readily removed, they are secured to the cabinet and back by force fit. To remove back from cabinet—pull straight outward on both hinges at the same time.

To Remove Chassis

1. Pull off the volume control knob
2. Close tuning condenser (dial at 54) to prevent possible damage to tuning condenser.
3. Unsolder the loop leads.
4. Remove the plug from the battery.
5. Remove the two screws holding the bottom edge of the speaker and the screw holding dial back-plate to cabinet.
6. Remove the two slip shields beneath the handle. They may be removed by pushing straight toward the top center of the case. The chassis mounting screws are then accessible.
7. Remove the two screws at the top of the cabinet while supporting the chassis with one hand.

Note: When re-installing, replace speaker holding screws first but do not securely tighten until the two screws at the top of the cabinet have been tightened.

MODEL 9BX5,
Ch. RC-1059B, RC-1059C

Alignment Procedure

Cathode Ray Alignment is the preferable method. Connections for the oscilloscope are shown on the schematic diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

Test Oscillator.—For all alignment operations, connect the low side of the test oscillator to the receiver chassis and keep the oscillator output as low as possible to avoid AVC action.

Battery operation of the receiver is preferable during alignment; on a. c. operation an isolation transformer (117v./117v.) may be necessary for the receiver if the test oscillator is also a. c. operated.

Note: Battery or substitute must be in place for ant. alignment (step 5).

Alignment Tabulation

Step	Connect high side of test oscillator to—	Test oscillator output—	Turn receiver dial to—	Adjust for maximum peak output
1	Disconnect loop—remove chassis—remove bottom plate, connect a 10,000 ohm resistor from C1 stator terminal to tuning condenser frame.			
2	Stator terminal of C1 thru 01 mf. capacitor	455 kc	55	*Top and bottom T2 (2nd. I-F. trans.) *Top and bottom T1 (1st. I-F trans.)
3	Remove the 10,000 ohm resistor. Replace bottom cover and install chassis in cabinet. Re-connect loop.			
4	Short wire placed near receiver (for radiated signal)	1600 kc	160	†C5 (osc.)
5		1400 kc	140	†C2 (ant.)
6		600 kc	60	*L2 (osc.) while rocking gang
7		Repeat steps 4, 5 and 6		

NOTES:

*The magnetite cores of L2 and T2 and T1 do not have visible adjusting screws. The cores have screw driver slots to permit adjustment (use non-metallic screwdriver).

†Adjustable thru hole in side of case.

CAUTION.—

Do not remove any tubes from the chassis with the set operating and the plug connected to the power line. Damage to tubes may result.

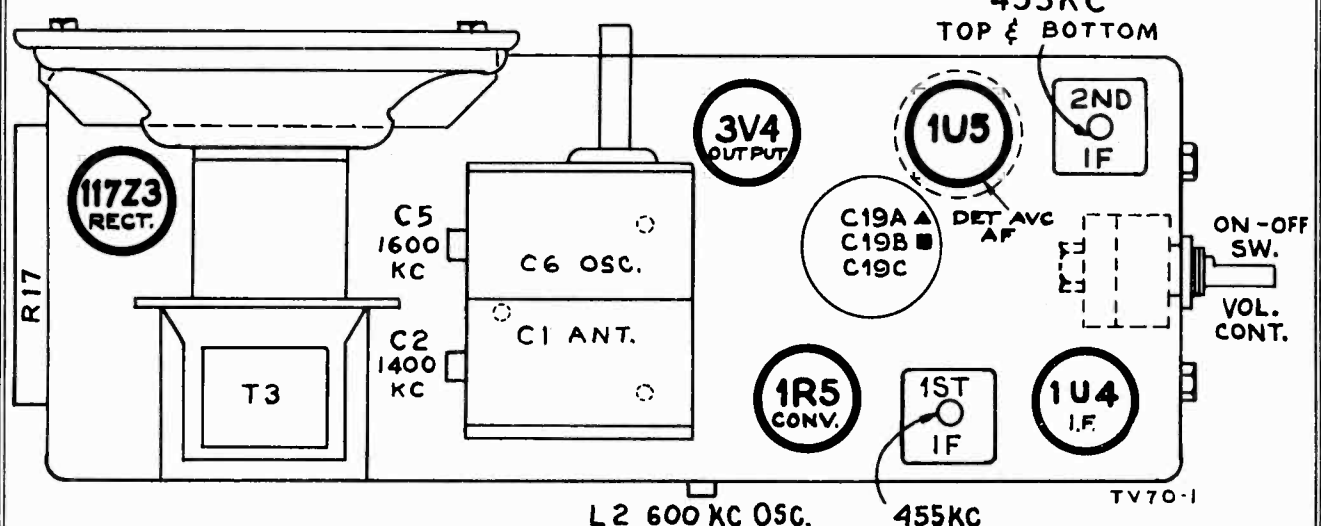
Critical Lead Dress

1. Dress output plate bypass C20 capacitor against chassis.
2. Dress output plate lead to output transformer against chassis.
3. Dress audio coupling capacitor C14 (volume control to grid of 1U5) away from chassis, away from audio limiting resistor R8 and to permit adjustment of second I.F. Transformer.
4. Dress all exposed leads away from each other, and away from chassis to prevent short circuits.
5. Dress all filament and ground leads against chassis.
6. Dress filament bypass capacitor C23 and accompanying compensating resistor R15 (volume control to 1U4) against volume control.
7. Dress power line cord away from line-battery switch mechanism.
8. Dress all capacitors and wiring away from oscillator coil.
9. Dress 4 mmf. neutralizing capacitor C7 against A.V.C. bypass capacitor C8 (1U4 filament to first I.F. trans.).

Note: These instruments are designed to be operated with a battery in position inside the cabinet. Reception will be below normal unless the battery is in its normal location.

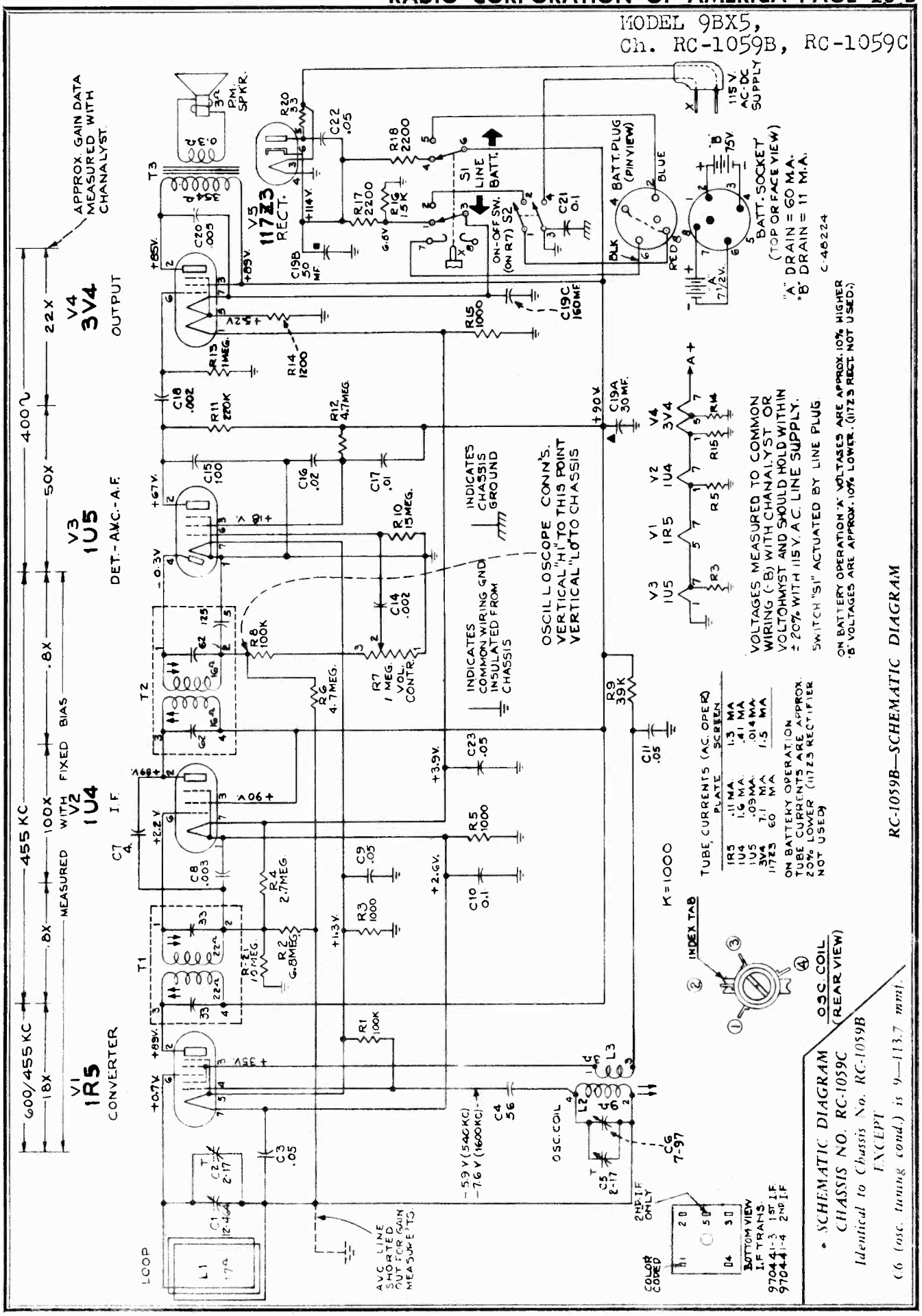
The position of the battery pack affects the loop inductance. Therefore, when the battery is removed, the loop inductance will change (increase) and the sensitivity will be slightly worse because of improper electrical tracking of the loop circuit with the heterodyne oscillator.

Where a battery is temporarily unavailable, a sheet of aluminum 8½" long x 3⅝" wide and from .020 to .050" thick may be placed in the cabinet in the position occupied by the battery so that it is lying flat down on the bottom. This sheet of aluminum has an effect on the loop inductance similar to the effect caused by the battery and will, therefore, return the performance of the loop to approximately the same as obtained when a battery is installed. If aluminum is not available, brass may be substituted with approximately the same performance. DO NOT USE STEEL OR IRON since the performance will be adversely affected. If desired, the sheet of aluminum may be waxed to the inside bottom of the case. DO NOT PLACE ANY WAX, CEMENT OR OTHER MATERIAL ON THE LOOP WINDINGS.



Tube and Trimmer Locations

MODEL 9BX5,
Ch. RC-1059B, RC-1059C



RC-1059B—SCHEMATIC DIAGRAM

• SCHEMATIC DIAGRAM
CHASSIS NO. RC-1059C
Identical to Chassis No. RC-1059B
EXCEPT
C6 (osc. tuning cond.) is 9—113.7 mmf.

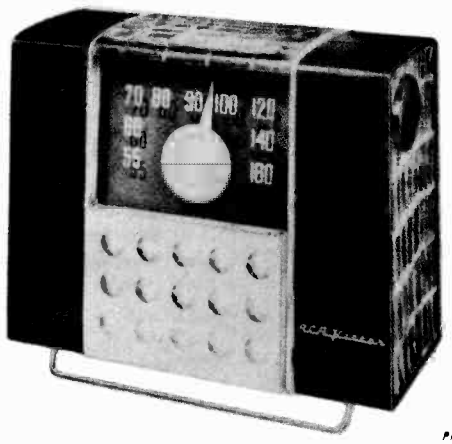
MODEL 9BX5,
Ch. RC-1059B, RC-1059C

Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES
	RC 1059B and RC 1059C
*74286	Capacitor—Variable tuning capacitor for RC 1059B (C1, C2, C5, C6)
*74406	Capacitor—Variable tuning capacitor for RC 1059C (C1, C2, C5, C6)
73153	Capacitor—Ceramic, 4 mmf. (C7)
71924	Capacitor—Ceramic, 56 mmf. (C4)
73152	Capacitor—Ceramic, 100 mmf. (C15)
73750	Capacitor—Tubular, .002 mfd., 200 volts (C14, C18)
73961	Capacitor—Tubular, .003 mfd., 200 volts (C8)
72791	Capacitor—Tubular, .005 mfd., 400 volts (C20)
71923	Capacitor—Tubular, .01 mfd., 200 volts (C17)
71928	Capacitor—Tubular, .02 mfd., 200 volts (C16)
72596	Capacitor—Tubular, .05 mfd., 200 volts (C9, C23)
73553	Capacitor—Tubular, .05 mfd., 400 volts (C3, C11, C22)
73784	Capacitor—Tubular, 0.1 mfd., 200 volts (C10)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C21)
73127	Capacitor—Electrolytic, comprising 1 section of 50 mfd., 150 volts, 1 section of 30 mfd., 150 volts and 1 section of 160 mfd., 25 volts (C19A, C19B, C19C)
73935	Clip—Mounting clip for I-F transformer (2 required)
73114	Coil—Oscillator coil complete with adjustable core for RC 1059B (L2, L3)
*74405	Coil—Oscillator coil complete with adjustable core for RC 1059C (L2, L3)
*74285	Control—Volume control and power switch (R7, S2)
70022	Cord—Power cord and plug
*74282	Dial—Dial scale and back plate assembly less cushions
72283	Grommet—Rubber grommet to mount tuning condenser (3 required)
*74284	Knob—Tuning knob complete with indicator window
28452	Plate—Mounting plate for electrolytic capacitor
73275	Plug—5 prong male plug for battery cable
73237	Resistor—Wire wound, 33 ohms, 150 MA (R20)
	Resistor—Fixed, composition, 1000 ohms, ±10%, ½ watt (R3, R5, R15)
	Resistor—Fixed, composition, 1200 ohms, ±10%, ½ watt (R14)
	Resistor—Fixed, composition, 2200 ohms, ±10%, ½ watt (R18)
73132	Resistor—Wire wound, 2200 ohms, 7 watts (R17)
	Resistor—Fixed, composition, 15,000 ohms, ±10%, ½ watt (R16)
	Resistor—Fixed, composition, 39,000 ohms, ±10%, ½ watt (R9)
	Resistor—Fixed, composition, 100,000 ohms, ±20%, ½ watt (R1)
	Resistor—Fixed, composition, 100,000 ohms, ±10%, ½ watt (R8)
	Resistor—Fixed, composition, 220,000 ohms, ±20%, ½ watt (R11)
	Resistor—Fixed, composition, 1 megohm, ±20%, ½ watt (R13)
	Resistor—Fixed, composition, 2.7 megohms, ±10%, ½ watt (R4)
	Resistor—Fixed, composition, 4.7 megohms, ±20%, ½ watt (R12)
	Resistor—Fixed, composition, 4.7 megohms, ±10%, ½ watt (R6)
	Resistor—Fixed, composition, 6.8 megohms, ±10%, ½ watt (R2)
	Resistor—Fixed, composition, 10 megohms, ±10%, ½ watt (R21)
	Resistor—Fixed, composition, 15 megohms, ±20%, ½ watt (R10)
73103	Shield—Tube shield for 1U5 tube
73117	Socket—Tube socket
14270	Spring—Retaining spring for tuning knob
71039	Switch—"Line-Battery" switch (S1)
73129	Transformer—First I-F transformer (T1)
73130	Transformer—Second I-F transformer (T2)
71047	Transformer—Output transformer (T3)
	SPEAKER ASSEMBLIES
	92577-1
73123	Speaker—4" P.M. speaker complete with cone and voice coil
	MISCELLANEOUS
*74287	Back—Case back—less hinges
73147	Ball—Metal ball with groove for back cover latching mechanism (2 required)
*74292	Button—Plug button for L.H. case side
Y2099	Case—Case complete with loop, metal front, decorative ring, and emblem—less latch mechanism, hinges, handle, handle mounting plate and case back (L1)
*74302	Channel—Carrying handle under channel
*74457	Cushion—Rubber cushion for under-side of carrying handle
70425	Clip—Spring clip for volume control knob
73549	Emblem—"RCA Victor" emblem
*74293	Front—Decorative metal front for case
*74288	Handle—Carrying handle less links and under channel
74180	Hinge—Cabinet hinge (2 required)
*74290	Knob—Volume control knob—less spring clip
*74303	Link—Carrying handle link (2 required)
73141	Loop—Antenna loop (L1)
73145	Nut—Hex nut with groove for back cover latching mechanism (2 required)
*74289	Plate—Carrying handle mounting plate (2 required)
*74294	Ring—Decorative ring for front of case
*74291	Screw—#4-40 x 3/8" flat head cross recessed machine screw for mounting flexible drop support (2 required)
*74295	Screw—#4-40 x 7/16" flat head cross recessed machine screw for mounting latch mechanism to case side
*74304	Screw—#4 x 5/16" flat head thread cutting screw for handle (2 required)
*74301	Screw—8 x 3/8" pan head cross recessed thread cutting screw for holding speaker (2 required) or dial plate to case
*74364	Shield—Slip shield for handle mounting plate (2 required)
73148	Spring Extension spring for back cover latching mechanism—L.H.
73146	Spring—Extension spring for back cover latching mechanism—R.H.
73483	Support—Flexible drop support for back cover

*This is the first time that this Stock No. has appeared in Service Data.

MODEL 9BX56,
Ch. RC-1068



Specifications

Tuning Range ..... 540-1600 kc.
Intermediate Frequency ..... 455 kc.

Tube Complement

(1) RCA 1R5 ..... Converter
(2) RCA 1U4 ..... I.F. Amplifier
(3) RCA 1U5 ..... Det.—A.V.C.—A.F. Amp.
(4) RCA 3V4 ..... Output
(A selenium rectifier is used)

Power Supply Rating

Power Line Operation
115 volts d.c. or 50 to 60 cycles a.c. ..... 17 watts
or
Battery Operation
1 RCA VS 065 "A" Battery ..... 7.5 v., 60 ma.
1 RCA VS 016 "B" Battery ..... 67.5 v., 10 ma.
(Battery life—approx. 40 hrs. intermittent service)

Power Output

A.C. operation ..... 150 mw. undistorted, 250 mw. max.
Batt. operation ..... 70 mw. undistorted, 180 mw. max.

Loudspeaker (92584-1)

Size and type ..... 4 in. PM dynamic
Voice coil impedance ..... 3.2 ohms @ 400 cycles

Dial Drive Ratio ..... 6:1 (3 turns of knob)

Cabinet Dimensions

Height $8\frac{3}{8}$ in. Width $10\frac{1}{2}$ in. Depth 5 in.

Weight $5\frac{1}{2}$ lbs. (less batteries) $6\frac{1}{4}$ lbs. (with batteries)

To Open Cabinet:

The back is secured to the cabinet with two clip catches at the top and two hinges at the bottom. To open—while facing the front of the receiver, with the handle in the upright position grip the sides of the cabinet with both hands and push the top of the back to the rear with both thumbs.

To Remove Back:

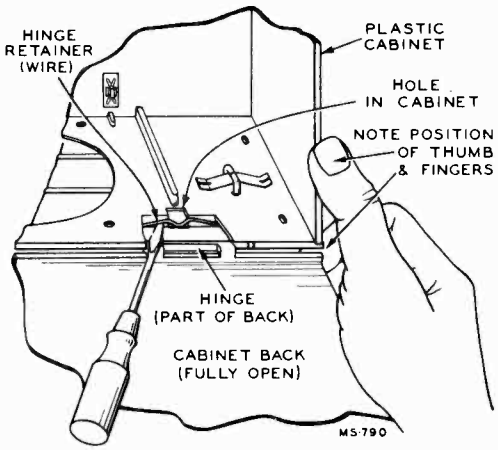
Open the cabinet as explained above. With the back fully open, grip the cabinet as illustrated. Insert a screwdriver under one hinge retainer and pry the center of the retainer out of the opening in the cabinet while maintaining pressure on the back with the fingers and on the cabinet with the thumb. Repeat this procedure with the other hinge retainer. Pull straight to the rear.

To Remove Cabinet Foot:

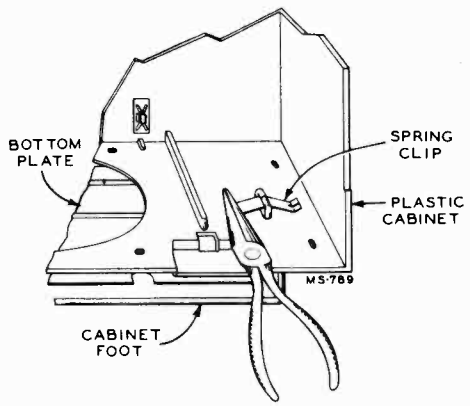
Open the cabinet. Grip the end of the spring clip with long nose pliers as illustrated and pull toward the center of the cabinet. Repeat this procedure with the other clip.

To Remove Chassis:

1. Remove knobs (pull off).
2. Open cabinet.
3. Unsolder loop leads.
4. Disconnect batteries and speaker.
5. Remove the two screws which hold the dial back plate to the cabinet.
6. Remove the TWO SCREWS AT THE BOTTOM EDGE OF THE REAR CHASSIS APRON.
7. Pull chassis to rear.



Removal of Cabinet Back



Removal of Cabinet Foot

MODEL 9BX56, Ch. RC-1068

Alignment Procedure

Cathode Ray Alignment is the preferable method. Connections for the oscilloscope are shown on the schematic diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

Test Oscillator.—For all alignment operations, connect the low side of the test oscillator to the receiver chassis and keep the oscillator output as low as possible to avoid AVC action.

Battery operation of the receiver is preferable during alignment; on a.c. operation an isolation transformer (117v./117v.) may be necessary for the receiver if the test oscillator is also a.c. operated.

Dial Pointer Position. There are two score marks on the dial back plate with the tuning condenser fully meshed (closed) the pointer should be set to the LEFT HAND MARK.

The RIGHT HAND MARK is for 1600 kc.

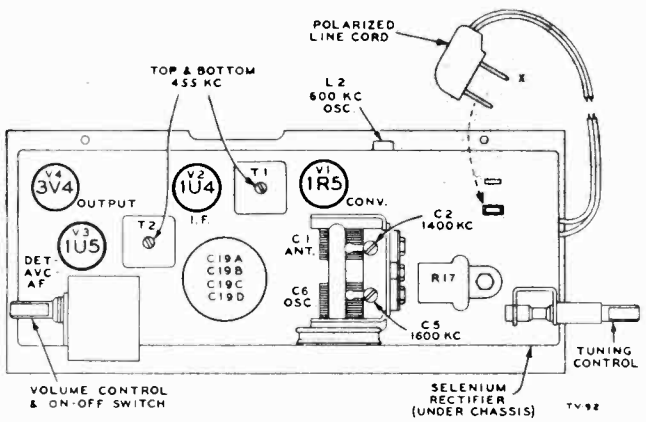
The dial is not easily removed. A reproduction of the dial is illustrated on another page. It is suggested that a tracing be made of it for use in alignment.

Step	Connect high side of test oscillator to—	Test oscillator output—	Turn receiver dial to—	Adjust for maximum peak output
1	Disconnect loop—remove chassis—connect a 1000 ohm resistor from C1 stator terminal to tuning condenser frame.			
2	Stator terminal of C1 through a 39 mmf. capacitor	455 kc.	Quiet point near 160	*Top and bottom T2 (2nd I-F trans.) *Top and bottom T1 (1st I-F trans.)
3	Remove the 1000 ohm resistor. Replace but do not fasten chassis in cabinet. Re-connect loop.			
4	Short wire placed near receiver (for radiated signal)	1630 kc.	Max. clockwise	†C5 (osc.)
5		1400 kc.	140	†C2 (ant.)
6		600 kc.	60	*L2 (osc.) while rocking gang
7		Repeat steps 4, 5 and 6		
8	Fasten chassis to cabinet.			

NOTES:

* The magnetite cores of L2, T2 and T1 do not have visible adjusting screws. The cores have screw driver slots to permit adjustment (use non-metallic screwdriver).

† C5 and C2 are more readily accessible if the chassis is not fully inserted into the cabinet. However the chassis should be near its proper position because its position affects the inductance of the loop.



Tube and Trimmer Locations

Power Line Operation:

A power cord is stored inside the cabinet. Open the cabinet and remove the plug of the power cord from its socket on the chassis and insert the plug into a convenient electrical outlet. A slot in the right-hand end of the cabinet allows the back to be closed with the cord passing through.

NOTE: If reception is not obtained on DC, reverse plug in outlet receptacle. On AC operation this may reduce hum.

When returning to battery operation replace the plug in the socket provided on the chassis, with the cord extending toward the back.

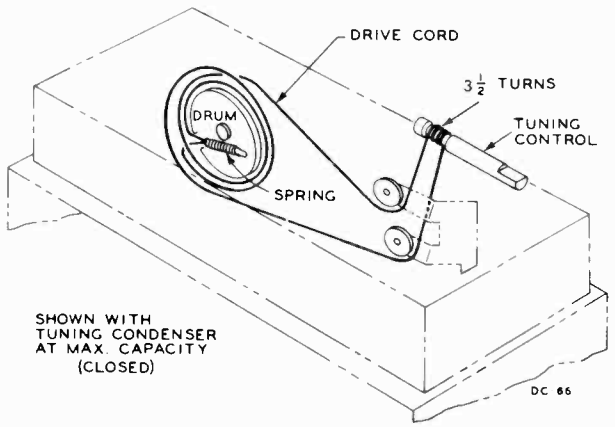
NOTE: Make certain that the plug is fully inserted (base of plug touching chassis) to assure proper operation of the Batt-Line switch.

CAUTION.—

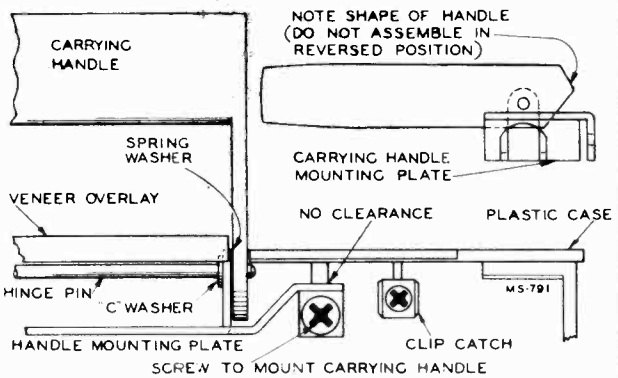
Do not remove any tubes from the chassis with the set operating and the plug connected to the power line. Damage to tubes may result.

Critical Lead Dress

1. Dress 1R5 plate lead and 1U4 grid lead down against chassis.
2. Dress all filament and ground leads against chassis.
3. Dress the 4 mmf. neutralizing capacitor C7 against the 1U4 tube socket with short lead at the plate end.
4. Dress .002 mf. capacitor C14 down against chassis and away from other wiring.
5. Dress .05 mf. capacitor C9 down over top of C14.
6. Dress capacitors C10 and C22 away from oscillator coil so that pressure is not exerted on the side of the coil.
7. Dress all wiring away from the selenium rectifier.
8. Dress .003 mf. capacitor C8 as near chassis as possible.

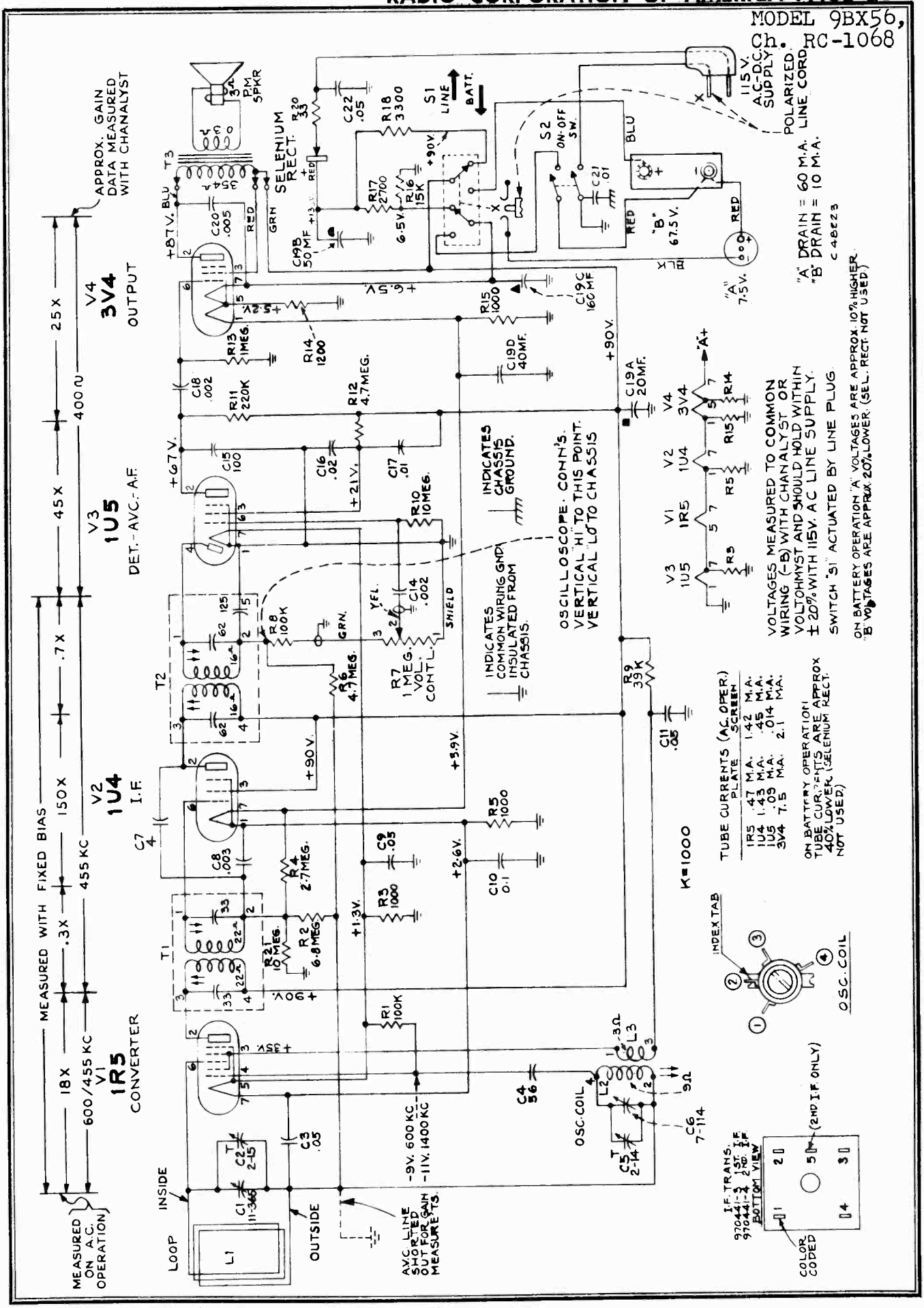


Dial Drive Cord

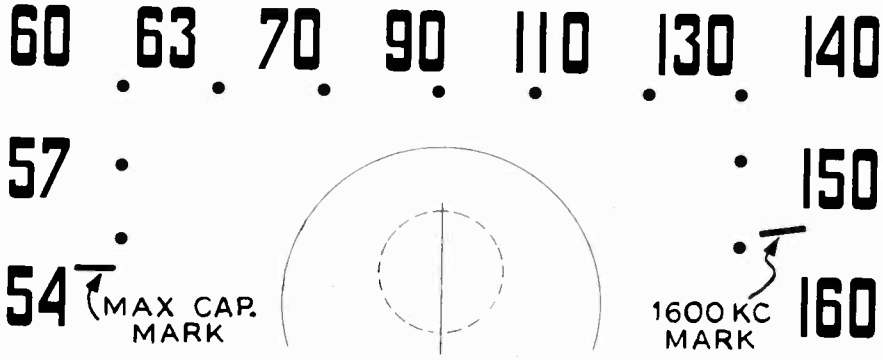


Carrying Handle Assembly

MODEL 9BX56,
Ch. RC-1068



MODEL 9BX56,
Ch. RC-1068



Dial Scale 933722

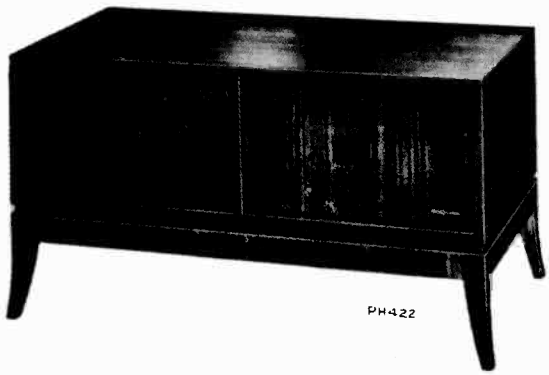
The dial scale drawing shown is a full size reproduction. It can be used as a reference in alignment procedure.

Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES
	RC 1068
*74318	Bracket—Drive cord pulley bracket complete with two (2) pulleys
*74323	Capacitor—Variable tuning capacitor (C1, C2, C5, C6)
73153	Capacitor—Ceramic, 4 mmf. (C7)
71924	Capacitor—Ceramic, 56 mmf. (C4)
73152	Capacitor—Ceramic, 100 mmf. (C15)
73750	Capacitor—Tubular, .002 mfd., 200 volts (C14, C18)
73961	Capacitor—Tubular, .003 mfd., 200 volts (C8)
72791	Capacitor—Tubular, .005 mfd., 400 volts (C20)
71923	Capacitor—Tubular, .01 mfd., 200 volts (C17)
71928	Capacitor—Tubular, .02 mfd., 200 volts (C16)
71551	Capacitor—Tubular, .05 mfd., 200 volts (C9)
54859	Capacitor—Tubular, .05 mfd., 400 volts (C11)
73553	Capacitor—Tubular, .05 mfd., 400 volts (C3, C22)
73784	Capacitor—Tubular 0.1 mfd., 200 volts (C10)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C21)
73113	Capacitor—Electrolytic, comprising 1 section of 50 mfd., 150 volts, 1 section of 20 mfd., 150 volts, 1 section of 160 mfd., 25 volts and 1 section of 40 mfd., 25 volts (C19A, C19B, C19C, C19D)
73935	Clip—I-F transformer mounting clip (2 required)
73114	Coil—Oscillator coil (L2, L3)
*74315	Connector—"B" Battery connector—less cable
73125	Control—Volume control and power switch (R7, S2)
†72953	Cord—Drive cord (approx. 19" length required)
70022	Cord—Power cord and plug
72283	Grommet—Rubber grommet to mount tuning capacitor (3 required)
*74321	Indicator—Station selector indicator
18469	Plate—Bakelite mounting plate for electrolytic capacitor
*74317	Plate—Dial back plate—less dial
31572	Plug—3 contact female plug for speaker cable
*74324	Plug—3 prong male plug for battery cable
*74322	Rectifier—Selenium rectifier
73237	Resistor—Wire wound, 33 ohms, 150 MA (R20)
	Resistor—Fixed, composition, 1000 ohms, ±10%, ½ watt (R3, R5, R15)
	Resistor—Fixed, composition, 1200 ohms, ±10%, ½ watt (R14)
*74319	Resistor—Wire wound, 2700 ohms, 7 watts (R17)
	Resistor—Fixed, composition, 3300 ohms, ±10%, ½ watt (R18)
	Resistor—Fixed, composition, 15,000 ohms, ±10%, ½ watt (R16)
	Resistor—Fixed, composition, 39,000 ohms, ±10%, ½ watt (R9)
	Resistor—Fixed, composition, 100,000 ohms, ±20%, ½ watt (R1)
	Resistor—Fixed, composition, 100,000 ohms, ±10%, ½ watt (R8)
	Resistor—Fixed, composition, 220,000 ohms, ±20%, ½ watt (R11)
	Resistor—Fixed, composition, 1 megohm, ±20%, ½ watt (R13)
	Resistor—Fixed, composition, 2.7 megohms, ±10%, ½ watt (R4)
	Resistor—Fixed, composition, 4.7 megohms, ±20%, ½ watt (R12)
	Resistor—Fixed, composition, 4.7 megohms, ±10%, ½ watt (R6)
	Resistor—Fixed, composition, 6.8 megohms, ±10%, ½ watt (R2)
	Resistor—Fixed, composition, 10 megohms, ±20%, ½ watt (R10)
	Resistor—Fixed, composition, 10 megohms, ±10%, ½ watt (R21)
*74320	Shaft—Tuning knob shaft
38904	Socket—2 contact socket for power cord
73117	Socket—Tube socket
72540	Spring—Drive cord spring
71039	Switch—"Line-Battery" change switch (S1)
73129	Transformer—First I-F transformer (T1)
73130	Transformer—Second I-F transformer (T2)
35969	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLIES
	92584-1
	RL 108 B5
*74415	Connector—3 contact male connector for speaker
*74411	Speaker—4" P.M. speaker complete with cone and voice coil—less output transformer and connector
71047	Transformer—Output transformer (T3)
	MISCELLANEOUS
*74328	Back—Cabinet back complete with two hinges, two top retainers and two hinge retainers
*74327	Board—Antenna loop lead terminal board complete with retaining clip
*74346	Button—Dial drop door release button
Y2108	Cabinet—Cabinet including veneer overlay with drop door catch, loop and loop supports—less drop door, handle, foot, trim strips, dial, clip catches, protective bottom plate and back (L1)
*74339	Catch—Cabinet back clip catch (fastens to cabinet) (2 required)
*74345	Catch—Drop door catch assembly
*74338	Clip—Spring clip for holding cabinet foot (2 required)
*74334	Dial—Polystyrene dial scale
*74330	Door—Drop door for front of cabinet
73549	Emblem—"RCA Victor" emblem
*74331	Foot—Cabinet mounting foot—less protective plate
*74349	Handle—Carrying handle—less mounting plate and hinge pin
73490	Knob—Volume control knob or tuning knob
*74326	Loop—Antenna loop (L1)
*74412	Nut—Speed nut for speaker mounting (4 required)
*74337	Nut—Speed nut for mounting dial (4 required)
*74340	Nut—Speed nut for mounting veneer overlay (4 required)
*74336	Nut—Spring nut to fasten cabinet trim strip (2 required for each strip)
*74329	Overlay—Veneer overlay for top of cabinet including drop door catch and release button
*74351	Pin—Carrying handle hinge pin
*74344	Plate—Protective bottom plate for cabinet—less foot
*74350	Plate—Mounting plate for carrying handle
*74325	Screen—Speaker screen
*74348	Screw—#4 x 3/16" self tapping round head screw (cross-recessed) for mounting drop door catch (2 required)
*74341	Screw—#4 x 5/16" self tapping round head (cross-recessed) screw for cabinet back clip catch
*74342	Screw—#8 x 7/16" self tapping round head (cross-recessed) screw for carrying handle mounting plate (2 required)
*74335	Spring—Drop door release spring for front of cabinet (2 required)
14270	Spring—Retaining spring for knobs
*74347	Spring—Coil spring for drop door release button
*74332	Strip—Trim strp—R.H.
*74333	Strip—Trim strip—L.H.
*74353	Washer—"C" washer for carrying handle hinge pin
*74352	Washer—Spring washer for carrying handle hinge pin (2 required)
*74343	Washer—Spring washer for dial drop door (2 required)

* This is the first time that this Stock No. has appeared in Service Data.
† Stock No. 72953 is a reel containing 250 feet of cord.

MODEL 9W102,
Ch. RC-618D



FOR RECORD CHANGER INFORMATION REFER TO RP 168 SERIES SERVICE DATA

Specifications

Tuning Range
Standard Broadcast (AM) ..... 540-1600 kc.
Frequency Modulation (FM) ..... 88-108 mc.
Intermediate Frequencies ..... AM—455 kc., FM—10.7 mc.

Tube Complement
(1) RCA 6J6 ..... Mixer and Oscillator
(2) RCA 6BA6 ..... I-F Amplifier
(3) RCA 6AU6 ..... Driver
(4) RCA 6AL5 ..... Ratio Detector
(5) RCA 6AV6 ..... A-F Amplifier
(6) RCA 6V6GT ..... Output
(7) RCA 6AV6 ..... AM Det.—AVC—Ph. Inv.
(8) RCA 6V6GT ..... Output
(9) RCA 6X5GT ..... Rectifier
(10) RCA 6BF6 ..... Phono Pre-amplifier
Dial Lamps (2) ..... Type No. 51, 6-8 volts, 0.2 amp.
Jewel Lamp ..... Type No. 51, 6-8 volts, 0.2 amp.

Tuning Drive Ratio ..... 18:1 (9 turns of knob)

Power Supply Rating ..... 115 volts, 60 cycles, 90 watts

Loudspeaker (92569-5W)
Size and type ..... 12 in. PM
Voice coil impedance ..... 3.2 ohms at 400 cycles

Power Output
Undistorted 6 watts ..... Maximum 7 watts

Cabinet Dimensions
Height 19⅞" Width 38¾" Depth 20"

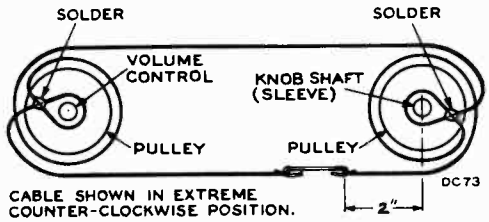
Weight ..... 71 lbs.

Record Changer (RP-168A-1)
Turntable speed ..... 45 r.p.m.
Record capacity ..... Up to 10 RCA 7 in. fine groove
Pickup ..... Crystal (medium output)

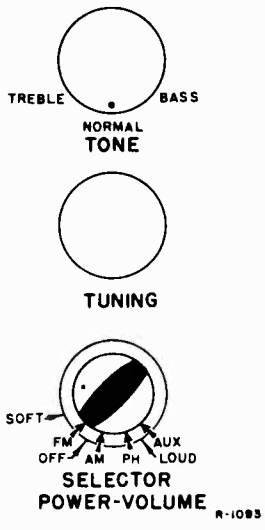
Description

Model 9W102 is identical electrically with Models 9W101 and 9W103. It uses a vertical type of dial. The chassis differs mechanically from that used in 9W101 and 9W103 in that the volume control and range switch shafts are combined as a dual knob control (a drive cord couples the volume control to the volume control knob shaft). The second I-F transformer is stamped 970435-6 and is identical to that used in 9W101 and 9W103 except for having a copper plated shield can to reduce feedback to the loop. **Refer to Service Data on Models 9W101, 9W103, 9W105 for additional information.**

(Supplementary Information on 9W101, 9W103 and 9W105 contained in this publication.)

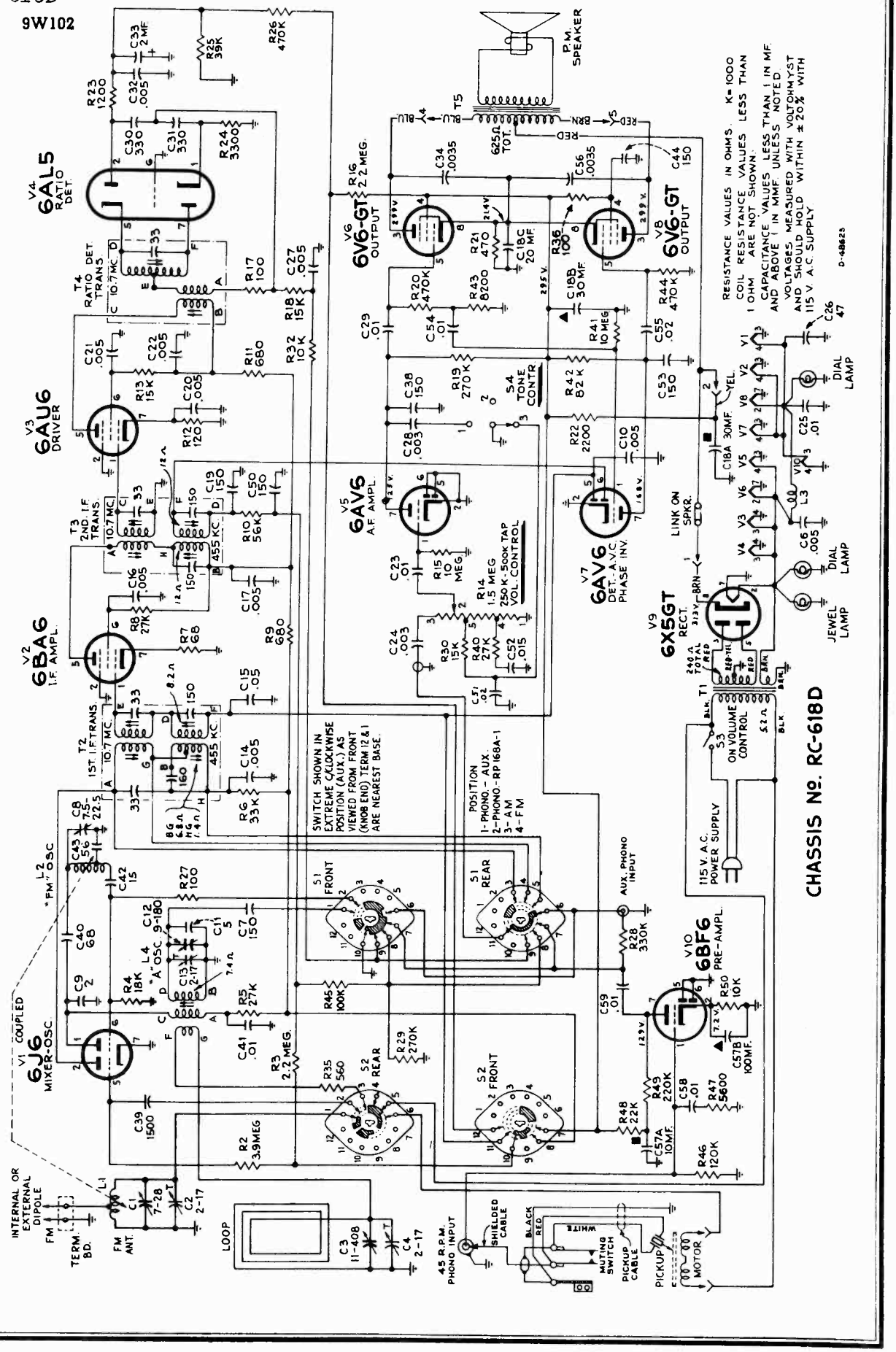


Volume Control Flexible Cable



Controls

MODEL 9W102,
Ch. RC-618D



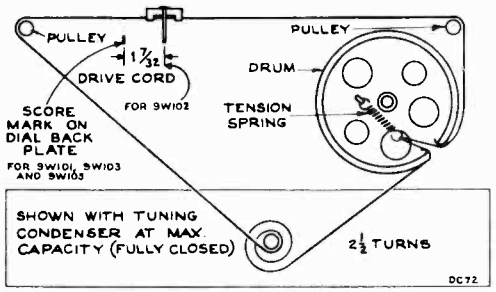
MODELS 9W102, Ch. RC-618D;
9W101, 9W103, Ch. RC-618B, Rev;
9W105, Ch. RC-618C, Rev.

Alignment Procedure

Identical to that given in 9W101, 9W103, 9W105 Service Data
Except

After the chassis is installed in the cabinet, recheck the adjustment of C4 (AM Ant.) at 1400 kc. and L4 (AM Osc.) at 600 kc. Two holes in the right hand side of the radio compartment drawer permit access to these adjustments.

The dial indicator should be set to the SPECIFIED POSITION on the dial back plate with the tuning condenser at max. capacity.



Dial Indicator and Drive Mechanism

9W101, 9W103, 9W105 (RC-618B, RC-618C) SUPPLEMENTARY INFORMATION

Added Capacitor:

A capacitor (150 mmf.—C44) has been added between the screen grid terminal of V8 (6V6GT) socket and chassis as shown in the illustration below. This was done to eliminate spurious audio oscillation.

Correction to Simplified Schematics:

The simplified schematic diagrams (phono position) on page 7 of 9W101, 9W103, 9W105 Service Data show C34 and C56 connected to ground. They should be shown connected to the cathodes of the 6V6GT tubes as shown in the illustration below.

Change in Wiring:

To improve FM stability one dial lamp is now connected to pin #2 of V9 (6X5GT). Previously both were connected to pin #2 of V8 (6V6GT).

Substitute Speaker:

Speakers stamped 92569-1WX have been used as a substitute for 92569-5W speakers in Model 9W101; 92569-1WX speakers have a 2.2 ohm voice coil; 92569-5W speakers have a 3.2 ohm voice coil.

Changes in Parts List:

CHASSIS ASSEMBLIES

Add:

48125 Capacitor—Ceramic, 150 mmf. (C44) [same as C7, C19, C38, C50, C53]

SPEAKER ASSEMBLY
92569-1WX
(Used on Model 9W101)

13867 Cap—Dust cap
36145 Cone—Cone and voice coil assembly
5039 Plug—4 prong male plug for speaker
71145 Suspension—Metal cone suspension
37899 Transformer—Output transformer (T3)

NOTE: When replacing complete speaker order Stock No. 73635 (92569-5W).

MISCELLANEOUS

Add:

37396 Grommet—Rubber grommet for mounting speaker (3 required)—for Model 9W103

Correction:

73896 Loop—Loop antenna complete for Models 9W101 and 9W103 (previously listed for 9W101 and 9W105)

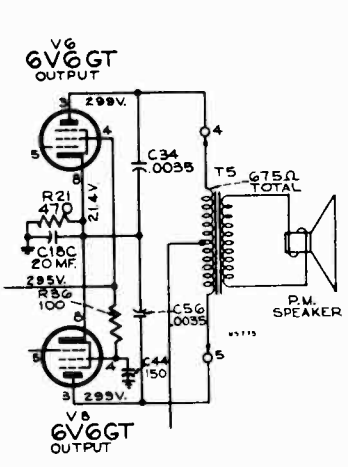
Pickup Arm Cable:

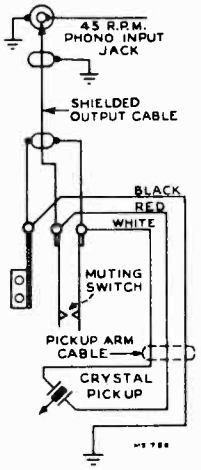
The RP-168A-1 record changer pickup arm cable now being used is a three wire cable (RED-WHITE-BLACK). In some instruments the black wire is omitted or a shielded wire may be used as shown in 9W101, 9W103, 9W105 Service Data. The latest connection diagram is given below.

I.F. Transformer Substitution:

In some chassis I.F. transformers stamped 970435-2 have been used as a substitute for 2nd. I.F. transformers stamped 970435-5.

The 455 Kc. windings of 970435-2 transformers use resonating capacitors of 235 mmf. each, the d.c. resistance of each winding is 8.2 ohm, the transformer indicated in the schematic diagram is stamped 970435-5.





Output Tubes Circuit Pickup Arm Cable
Models 9W101, 9W103, 9W105

Incorrect Color Code on Capacitor:

Some ceramic capacitors C11 (5 mmf.) have been used which have a color code of BLACK-GREEN-BLACK. The capacitor is correct, but the color code is incorrect. The normal color code of this capacitor is GREEN-BLACK-WHITE.

Record Changer Mounting Screws:

The original mounting screws used a cover which screwed into the top of the mounting screw. The screws now being used have a plug-in type of cover.

Change in Parts List:

MISCELLANEOUS

Change:

74209 Cover—Mounting screw cover (threaded type) for RP 168-A-1 record changer (3 required) (used with RCA 74424 screw).

74424 Screw—#8-32 x 1¾" special screw (tapped hole) for RP 168-A-1 record changer (3 required) (used with RCA 74209 cover).

Add:

74579 Bumper—Rubber bumper (black) for front panel of record changer drawer—walnut or mahogany instruments—Models 9W101 and 9W103 (2 required)

74580 Bumper—Rubber bumper (white) for front panel of record changer drawer—blond or limed oak instruments—Models 9W101 and 9W103 (2 required)

74581 Cover—Mounting screw cover (plug-in type) for RP 168-A-1 record changer (3 required) (used with RCA 74582 screw).

74582 Screw—#8-32 x 1¾" special screw (non-tapped hole) for RP 168-A-1 record changer (3 required) (used with RCA 74581 cover).

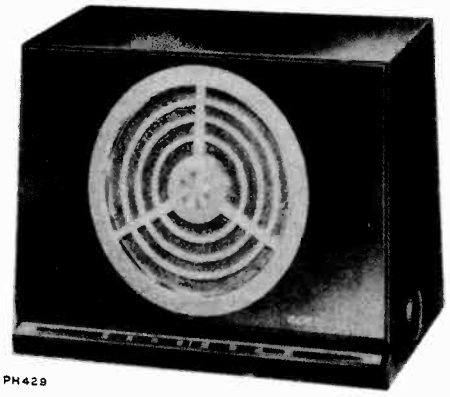
MODEL 9W102,
Ch. RC-618D

Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES
	RC 618D
73893	Board—"F. M." terminal board
74641	Cable—Flexible cable to operate volume control
73889	Capacitor—Variable tuning capacitor C1, C2, C3, C4, C8, C12, C13
73866	Capacitor—Ceramic, 2 mmf. C9
93056	Capacitor—Ceramic, 5 mmf. C11
39044	Capacitor—Ceramic, 15 mmf. C42
39042	Capacitor—Ceramic, 47 mmf. C26
73867	Capacitor—Ceramic, 56 mmf. C43
33379	Capacitor—Ceramic, 68 mmf. C40
48125	Capacitor—Ceramic, 150 mmf..... C7, C19, C38, C44, C50, C53
39640	Capacitor—Mica, 330 mmf. C30, C31
73748	Capacitor—Ceramic, 1500 mmf. C39
73473	Capacitor—Ceramic, 5000 mmf. C6, C10
73659	Capacitor—Tubular, .003 mfd., 200 volts C24
72573	Capacitor—Tubular, .003 mfd., 400 volts C28
70646	Capacitor—Tubular, .0035 mfd., 1000 volts C34, C56
71926	Capacitor—Tubular, .005 mfd., 200 volts C20, C27, C32
71553	Capacitor—Tubular, .005 mfd., 400 volts C14, C16, C17, C21, C22
71923	Capacitor—Tubular, .01 mfd., 200 volts C23, C25
71925	Capacitor—Tubular, .01 mfd., 400 volts C29, C41, C54
73561	Capacitor—Tubular, .01 mfd., 400 volts C58, C59
72120	Capacitor—Tubular, .015 mfd., 200 volts C52
71928	Capacitor—Tubular, .02 mfd., 200 volts C51
73638	Capacitor—Tubular, .02 mfd., 400 volts C55
71551	Capacitor—Tubular, .05 mfd., 200 volts C15
73747	Capacitor—Electrolytic, 2 mfd., 50 volts C33
74200	Capacitor—Electrolytic, comprising 1 section of 10 mfd., 300 volts and 1 section of 100 mfd., 10 volts..... C57A, C57B
73372	Capacitor—Electrolytic, comprising 1 section of 30 mfd., 350 volts, 1 section of 30 mfd., 300 volts and 1 section of 20 mfd., 25 volts C18A, C18B, C18C
73744	Coil—Oscillator coil—A.M. L4
73918	Coil—Antenna coil—F.M. L1
73916	Coil—Oscillator coil—F.M. L2
71942	Coil—Filament choke coil L3
33514	Connector—Phono input connection socket (dual)
5040	Connector—4-contact female connecting socket for speaker cable
30868	Connector—2-contact female connecting socket for record changer motor cable
*74639	Control—Volume control and power switch (R14, S3)
†72953	Cord—Drive cord (approximately 48" overall length required)
73690	Cord—Power cord and plug
16058	Grommet—Rubber grommet to mount R-F shelf (4 required)
72069	Grommet—Rubber grommet for rear mounting feet (2 required)
73895	Indicator—Station selector indicator
*74645	Nut—#8-32 hex retainer nut between R-F shelf and volume control knob shaft
74297	Plate—Dial back plate assembly complete with two (2) drive cord pulleys
*74640	Pulley—Pulley and hub for volume control shaft
	Resistors—Fixed composition resistors:
	68 ohms, ±10%, ½ watt R7
	100 ohms, ±10%, ½ watt R17, R27, R36
	120 ohms, ±10%, ½ watt R12
	470 ohms, ±10%, 2 watts R21
	560 ohms, ±10%, ½ watt R35
	680 ohms, ±20%, ½ watt R9, R11
	1200 ohms, ±5%, ½ watt R23
73637	Resistor—Wire wound, 2200 ohms, 5 watts R22
	Resistors—Fixed composition resistors:
	3300 ohms, ±5%, ½ watt R24
	5600 ohms, ±10%, ½ watt R47
	8200 ohms, ±10%, ½ watt R43
	10,000 ohms, ±10%, ½ watt R32, R50
	15,000 ohms, ±10%, ½ watt R13, R18, R30
	18,000 ohms, ±10%, ½ watt R4
	22,000 ohms, ±10%, ½ watt R48
	27,000 ohms, ±10%, ½ watt R8, R40
	27,000 ohms, ±10%, 1 watt R5
	33,000 ohms, ±10%, ½ watt R6
	39,000 ohms, ±10%, ½ watt R25
	56,000 ohms, ±10%, 1 watt R10
	82,000 ohms, ±10%, ½ watt R42
	100,000 ohms, ±10%, ½ watt R45
	120,000 ohms, ±10%, ½ watt R46
	220,000 ohms, ±10%, ½ watt R49
	270,000 ohms, ±10%, ½ watt R19, R29
	330,000 ohms, ±10%, ½ watt R28
	470,000 ohms, ±10%, ½ watt R20, R26, R44
	2.2 megohms, ±20%, ½ watt R3
	3.9 megohms, ±10%, ½ watt R2
	10 megohms, ±20%, ½ watt R15, R41
	22 megohms, ±20%, ½ watt R16

STOCK No.	DESCRIPTION
73894	Shaft—Tuning knob shaft
73632	Shield—Tube shield—for V2, V5
*74646	Sleeve—Sleeve and pulley assembly (for volume control knob shaft)
72516	Socket—Tube socket, miniature—for V4, V5, V7
73606	Socket—Tube socket, miniature—for V1, V2, V3
31251	Socket—Tube socket, octal, wafer—for V6, V8, V9
73117	Socket—Tube socket, miniature—for V10
31364	Socket—Dial lamp or pilot lamp socket
74038	Spring—Tension spring for drive cord
74202	Support—Polystyrene support for F.M. oscillator coil complete with mounting bracket
73891	Switch—Tone control switch (S4)
*74644	Switch—Selector switch (S1, S2)
73743	Transformer—Ratio detector transformer (T4)
73745	Transformer—First I.F. transformer—dual (T2)
*74642	Transformer—Second I.F. transformer—dual (T3)
*74643	Transformer—Power transformer, 115 volt, 60 cycle (T1)
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLIES
	Stamped 92569-5W
	RL 103B5
13867	Cap—Dust cap
73934	Cone—Cone and voice coil assembly
5039	Plug—4-prong male plug for speaker
73635	Speaker—12" PM speaker complete with cone and voice coil—less output transformer and plug
71145	Suspension—Metal cone suspension
73636	Transformer—Output transformer (T5)
	Note: If stamping on speaker does not agree with above number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
*74649	Antenna—F.M. antenna
74205	Bezel—Dial scale bezel less dial
74054	Bracket—Pilot lamp bracket
71105	Cable—Shielded pickup cable for record changer, complete with pin plug
13103	Cap—Pilot lamp cap
71892	Catch—Door strike and catch
74298	Clamp—Dial clamp (2 required)
X3038	Cloth—Grille cloth (2 required) for mahogany or walnut instruments
X3039	Cloth—Grille cloth (2 required) for oak instruments
30868	Connector—2-contact female connecting socket for motor cable
30870	Connector—2-contact male connecting plug for motor cable
74581	Cover—Mounting screw cover (plug-in type) for mounting record changer (3 required)
*74737	Decal—Control panel function decal for mahogany or walnut instruments
*74738	Decal—Control panel function decal for oak instruments
74273	Decal—Trade mark decal ("Victrola")
*74647	Dial—Glass dial scale
73549	Emblem—"RCA Victor" emblem (metal)
11889	Grommet—Rubber grommet for front apron of chassis (2 required)
73735	Hinge—Drop door hinge (2 required)
71821	Knob—Tuning knob—maroon—for mahogany or walnut instruments
72824	Knob—Tuning knob—brown—for oak instruments
73998	Knob—Volume control knob—maroon—for mahogany or walnut cabinets
73995	Knob—Volume control knob—brown—for oak instruments
73230	Knob—Function switch knob—maroon—for mahogany or walnut instruments
73231	Knob—Function switch knob—brown—for oak instruments
*74845	Knob—Tone control switch knob—maroon—for mahogany or walnut instruments
*74846	Knob—Tone control switch knob—brown—for oak instruments
11765	Lamp—Dial lamp—Mazda 51
*74648	Loop—Antenna loop
74208	Nut—Tee nut for mounting record changer (3 required)
74582	Screw—#8-32 x 1¾" special screw for mounting record changer (3 required)
*74736	Slide—Record changer tray slide
74421	Spring—Conical spring for mounting record changer—upper—RH side (1 required)
74422	Spring—Conical spring for mounting record changer—upper—LH side (2 required)
74423	Spring—Conical spring for mounting record changer—lower (3 required)
30900	Spring—Retaining spring for knobs 71821 and 72824
72845	Spring—Retaining spring for knobs 73995 and 73998
14270	Spring—Retaining spring for knobs 73230 and 73231
73412	Support—Drop door fall support

MODELS 9X561, Ch. RC-1079B;
9X562, Ch. RC-1079C



PH428

9X561
Maroon

9X562
Ivory

Specifications

Tuning Range ..... 540-1600 kc

Intermediate Frequency ..... 455 kc

Tube Complement

(1) RCA 12SA7 ..... Converter
(2) RCA 12SK7 ..... I-F Amplifier
(3) RCA 12SQ7 ..... Det.—A.V.C.—A-F Amp.
(4) RCA 50L6GT ..... Output
(5) RCA 35Z5GT ..... Rectifier

Power Supply Rating

115 volts a.c., 50 to 60 cycles or d.c. ..... 30 watts

Power Output

Undistorted ..... .85 watts
Maximum ..... 1.1 watts

Dial Lamps (2) ..... Mazda type 1490, 3.2 volts, .16 amp.

Loudspeaker (92586-4)

Size and Type ..... 8 in. PM
Voice Coil Impedance ..... 3.2 ohms at 400 cycles

Cabinet Dimensions

Height... 9¾" Width... 12½" Depth... 8⅜"

Weight ..... 9 lbs.

Tuning Drive Ratio ..... 9 to 1 (4½ turns of knob)

POWER SUPPLY POLARITY. — For operation on d.c., the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a.c., reversal of the plug may reduce hum.

Replacement Parts

Stock No.	DESCRIPTION
	CHASSIS ASSEMBLIES **RC 1079B—9X561** **RC 1079C—9X562**
74655	Back—Cabinet back (maroon) and loop assembly for Model 9X561 ..... L1
*74656	Back—Cabinet back (ivory) and loop assembly for Model 9X562 ..... L1
74653	Capacitor—Variable tuning capacitor .. C1, C2, C3, C4
71924	Capacitor—Ceramic, 56 mmf C5
*74661	Capacitor—Ceramic, 470 mmf C14
74662	Capacitor—Electrolytic, comprising 1 section of 80 mfd., 150 volts and 1 section of 50 mfd. 150 volts C16A, C16B
73186	Capacitor—Tubular, .001 mfd., 400 volts C9
71927	Capacitor—Tubular, .002 mfd., 400 volts C15
71923	Capacitor—Tubular, .01 mfd., 200 volts C12
72827	Capacitor—Tubular, .01 mfd., 400 volts C17
71928	Capacitor—Tubular, .02 mfd., 200 volts C13
73553	Capacitor—Tubular, .05 mfd., 400 volts C8, C18
70617	Capacitor—Tubular, 0.1 mfd., 400 volts C19, C6
73935	Clip—Mounting clip for I.F. transformers
74448	Coil—Oscillator coil L2, L3
35787	Connector—Phono input connector (socket)
74133	Control—Volume control and power switch .. R10, S1
†72953	Cord—Drive cord (approx. 43" overall length required)
73693	Grommet—Power cord strain relief (1 set)
72283	Grommet—Rubber grommet for mounting tuning capacitor (3 required)
74658	Indicator—Station selector indicator (ivory) for Model 9X561
74657	Indicator—Station selector indicator (red) for Model 9X562
71116	Lamp—Dial lamp—Mazda 1490
74651	Plate—Dial back plate (maroon) complete with three (3) pulleys for Model 9X561
74652	Plate—Dial back plate (ivory) complete with three (3) pulleys for Model 9X562
74660	Resistor—Wire wound, 15 ohms, ½ watt R16
	Resistors—Fixed composition resistors:
	82 ohms, ±10%, ½ watt R17
	150 ohms, ±10%, ½ watt R14
	1,000 ohms, ±10%, 1 watt R15
	22,000 ohms, ±10%, ½ watt R2
	33,000 ohms, ±10%, ½ watt R9
	56,000 ohms, ±10%, ½ watt R4
	220,000 ohms, ±10%, ½ watt R12, R18
	330,000 ohms, ±10%, ½ watt R6
	470,000 ohms, ±10%, ½ watt R13
	3.3 megohm, ±10%, ½ watt R5
	10 megohm, ±10%, ½ watt R11
74659	Shaft—Tuning knob shaft and pulley
31251	Socket—Tube socket, octal
74663	Socket—Dial lamp socket
74038	Spring—Tension spring for drive cord
33634	Switch—Phono switch S2
*74654	Transformer—Output transformer T3
73036	Transformer—First I.F. transformer T1
73037	Transformer—Second I.F. transformer T2
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLIES **STAMPED 92586-4**
*74759	Cone—Cone and voice coil assembly
*74664	Speaker—8" P.M. speaker complete with cone and voice coil NOTE: If stamping on speaker does not agree with above number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
*74665	Bezel—Round bezel for cabinet—polystyrene
Y2131	Cabinet—Plastic cabinet—maroon—for Model 9X561
Y2132	Cabinet—Plastic cabinet — ivory — for Model 9X562
74904	Clamp—Dial clamp
74671	Clip—Dial clip (1 set)
*74675	Cloth—Grille cloth for Model 9X561
*74756	Cloth—Grille cloth for Model 9X562
74668	Dial—Dial scale
74674	Emblem—"RCA Victor" emblem
74666	Knob—Control knob—maroon—for Model 9X561
*74667	Knob—Control knob—ivory—for Model 9X562
*74673	Nut—Speed nut to fasten bezel
*74669	Screw—No. 8 x ⅝" pan head cross-recessed screw to fasten speaker (4 required)
*74670	Screw—No. 8 x 7/16" pan head cross-recessed screw to fasten dial clamps (2 required)
74734	Spring—Spring clip for knob

MODELS 9X561, Ch. RC-1079B; 9X562, Ch. RC-1079C

Lead Dress

1. Dress all heater leads down to chassis and away from all audio grid and plate wiring.
2. Dress power cord down to chassis base and corner.
3. Dress capacitor C18 against back apron.
4. Dress capacitor C13 down to base alongside of shielded lead.
5. Dress output transformer leads down to chassis.
6. Dress capacitors C9 and C15 as direct as possible.
7. Dress dial lamp leads on top of chassis between 12SQ7 and 50L6GT tubes; below chassis, as short as possible to rectifier socket.
8. Dress excess loop leads away from tubes and clear of tuning condenser.

Alignment Procedure

Test-Oscillator. — For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

On AC operation an isolation transformer (115 v./115 v.) may be necessary for the receiver if the test oscillator is also AC operated.

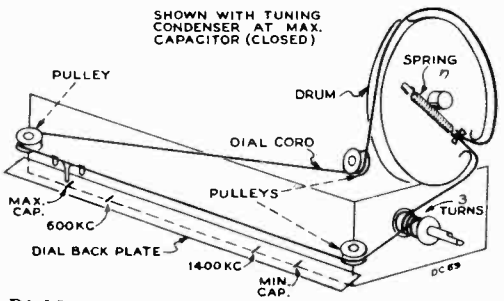
Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. output
1	12SK7 I-F grid through 0.1 mfd. capacitor	455 kc	Quiet-point 1600 kc end of dial	T2 (top and bottom) 2nd I-F trans.
2	Stator of C1 through 0.1 mfd.			*T1 (top and bottom) 1st I-F trans.
3	Short wire placed near loop to radiate signal	1620 kc	Min. cap.	C4 (osc.)
4		1400 kc	1400 kc	†C2 (ant.)
5		600 kc	600 kc	L3 (osc.) Rock gang
6		Repeat steps 3, 4 and 5.		

*Do not readjust T2 when test oscillator is connected to C1.

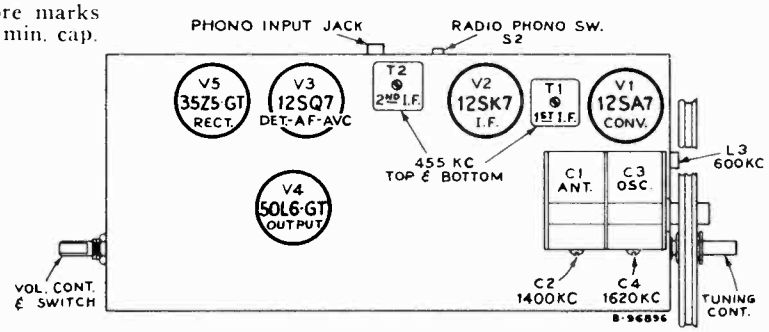
†When adjusting C2 (ant. trimmer) it is necessary to have the loop in the same position and spacing as it will have when assembled in the cabinet.

Dial Calibration

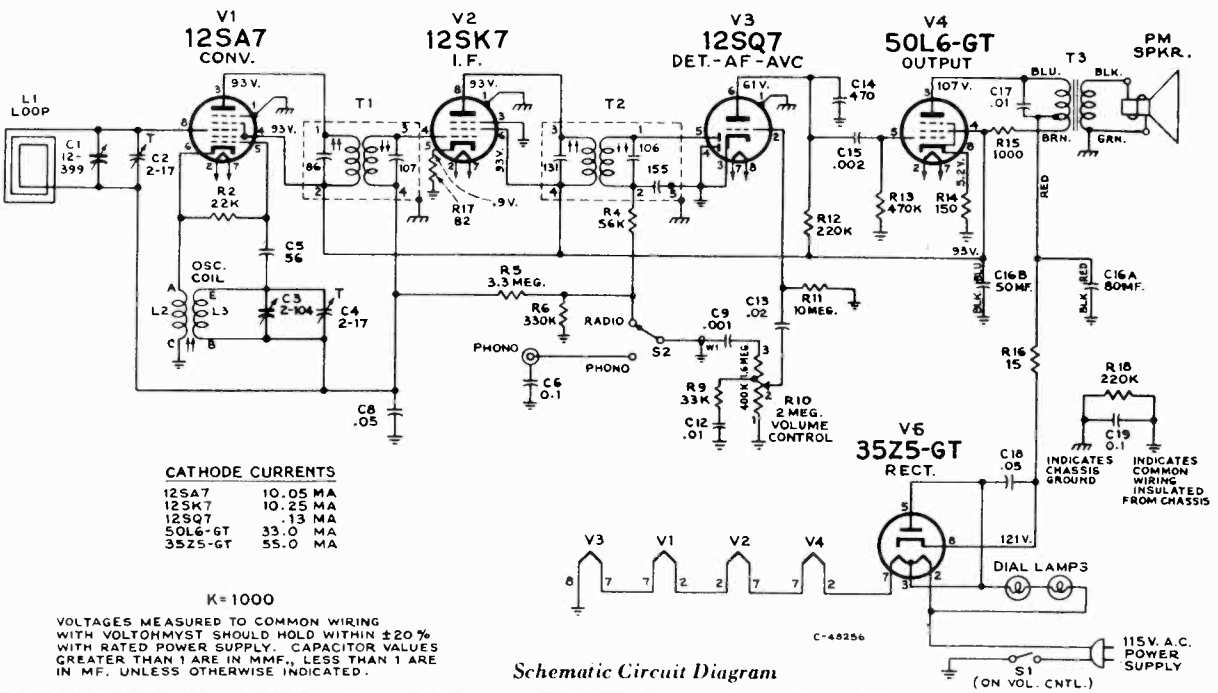
With the tuning condenser fully meshed, the dial pointer should be set to the first score mark at the left-hand end of the dial back plate. The four score marks represent: Max. cap. 600 kc 1400 kc min. cap.



Dial Indicator and Drive Cord



Tube and Trimmer Locations



Schematic Circuit Diagram

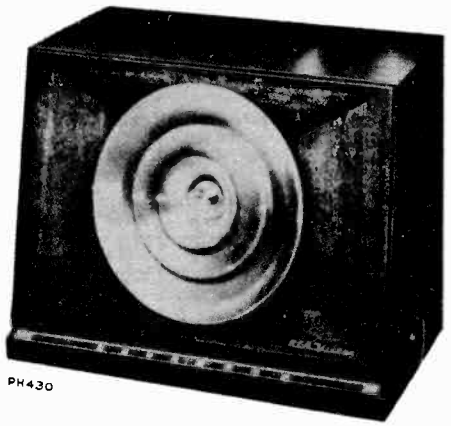
CATHODE CURRENTS

12SA7	10.05 MA
12SK7	10.25 MA
12SQ7	.13 MA
50L6-GT	33.0 MA
35Z5-GT	55.0 MA

K=1000

VOLTAGES MEASURED TO COMMON WIRING WITH VOLTOHMYST SHOULD HOLD WITHIN ±20% WITH RATED POWER SUPPLY. CAPACITOR VALUES GREATER THAN 1 ARE IN MMF., LESS THAN 1 ARE IN MF. UNLESS OTHERWISE INDICATED.

MODELS 9X571, Ch. RC-1079;
9X572, Ch. RC-1079A



9X571
Maroon

9X572
Ivory

Specifications

Tuning Range ..... 540-1600 kc
Intermediate Frequency ..... 455 kc
Tube Complement
(1) RCA 12SA7 ..... Converter
(2) RCA 12SK7 ..... I-F Amplifier
(3) RCA 12SQ7 ..... Det.—A.V.C.—A-F Amp.
(4) RCA 50L6GT ..... Output
(5) RCA 35Z5GT ..... Rectifier
Power Supply Rating
115 volts a.c., 50 to 60 cycles or d.c. ..... 30 watts
Power Output
Undistorted ..... 1.1 watts
Maximum ..... 1.75 watts

Dial Lamps (2) ..... Mazda type 1490, 3.2 volts, .16 amp.
Loudspeaker (92586-2W)
Size and Type ..... 8 in. PM
Voice Coil Impedance ..... 3.2 ohms at 400 cycles
Cabinet Dimensions
Height... 9 11/16" Width... 12½" Depth... 8 5/16"
Weight ..... 10 lbs.
Tuning Drive Ratio ..... 9 to 1 (4½ turns of knob)

POWER SUPPLY POLARITY.— For operation on d.c., the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a.c., reversal of the plug may reduce hum.

Replacement Parts

Stock No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1079 Model 9X571 RC 1079A Model 9X572
*74655	Back—Cabinet back (tan) and loop assembly ... L1
*74653	Capacitor—Variable tuning capacitor ... C1, C2, C3, C4
71924	Capacitor—Ceramic, 56 mmf. ... C5
71514	Capacitor—Ceramic, 82 mmf. ... C11
73501	Capacitor—Ceramic, 150 mmf. ... C7, C14
*74678	Capacitor—Electrolytic, comprising 2 sections of 120 mfd., 150 volts and 1 section of 40 mfd., 25 volts ... C16A, C16B, C16C
73186	Capacitor—Tubular, .001 mfd., 400 volts ... C9
73961	Capacitor—Tubular, .003 mfd., 200 volts ... C10
71923	Capacitor—Tubular, .01 mfd., 200 volts ... C12
72827	Capacitor—Tubular, .01 mfd., 400 volts ... C15, C17
71928	Capacitor—Tubular, .02 mfd., 200 volts ... C13, C20
73553	Capacitor—Tubular, .05 mfd., 400 volts ... C8, C18
70617	Capacitor—Tubular, 0.1 mfd., 400 volts ... C19, C6
73935	Clip—Mounting clip for I.F. transformer
74448	Coil—Oscillator coil ... L2, L3
35787	Connector—Phono input connector (socket)
71596	Control—Volume control ... R10
†72953	Cord—Dial drive cord (approx. 43" overall length required)
73693	Grommet—Power cord strain relief (1 set)
72283	Grommet—Rubber grommet for mounting tuning capacitor (3 required)
*74658	Indicator—Station selector indicator (ivory) for Model 9X571
*74657	Indicator—Station selector indicator (red) for Model 9X572
71116	Lamp—Dial lamp—Mazda 1490
*74651	Plate—Dial back plate (maroon) complete with three (3) pulleys for Model 9X571
*74652	Plate—Dial back plate (ivory) complete with three (3) pulleys for Model 9X572
18469	Plate—Bakelite mounting plate for electrolytic capacitor
72313	Resistor—Fuse type, 33 ohms ... R16
	Resistors—Fixed composition resistors
	82 ohms, ±10%, ½ watt ... R17
	150 ohms, ±10%, ½ watt ... R14
	1,000 ohms, ±10%, 1 watt ... R15
	18,000 ohms, ±10%, ½ watt ... R19
	22,000 ohms, ±10%, ½ watt ... R2
	27,000 ohms, ±10%, ½ watt ... R9
	56,000 ohms, ±10%, ½ watt ... R4
	220,000 ohms, ±10%, ½ watt ... R6, R7, R12, R18
	470,000 ohms, ±10%, ½ watt ... R13
	1 megohm, ±10%, ½ watt ... R8
	3.3 megohms, ±10%, ½ watt ... R5
	10 megohm, ±10%, ½ watt ... R11

Stock No.	DESCRIPTION
*74659	Shaft—Tuning knob shaft and pulley
31251	Socket—Tube socket, octal
*74663	Socket—Dial lamp sockets and lead assembly
74038	Spring—Tension spring for drive cord
*74676	Switch—Function switch ... S1
73036	Transformer—First I.F. transformer ... T1
73037	Transformer—Second I.F. transformer ... T2
*74677	Transformer—Output transformer ... T3
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLIES 92586-2W RL 105C2
*74758	Cone—Cone and voice coil assembly
*74679	Speaker—8" P.M. speaker complete with cone and voice coil NOTE.—If stamping on speaker does not agree with above number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
*74683	Base—Grille base for diffuser rings
*74687	Button—Diffuser decorative button
Y2133	Cabinet—Plastic cabinet—maroon—less diffuser rings and dial—Model 9X571
Y2134	Cabinet—Plastic cabinet—ivory—less diffuser rings and dial—Model 9X572
74904	Clamp—Dial clamp
*74671	Clip—Dial clip (1 set)
*74689	Cushion—Rubber cushion between cabinet and grille base
*74682	Decal—Function switch decal
*74668	Dial—Dial scale
*74674	Emblem—"RCA Victor" emblem
*74680	Knob—Function switch knob—light tan—for Model 9X572
*74681	Knob—Function switch knob—maroon—for Model 9X571
*74666	Knob—Volume control or tuning knob—maroon—for Model 9X571
*74806	Knob—Volume control or tuning knob—light tan—for Model 9X572
74340	Nut—Speed nut to hold decorative button
*74688	Nut—Speed nut to hold diffuser rings (18 required)
*74684	Ring—Outer diffuser ring (7" diameter)
*74685	Ring—Middle diffuser ring (4 15/32" diameter)
*74686	Ring—Inner diffuser ring (2 21/32" diameter)
74301	Screw—No. 8 x ⅜" pan head, cross-recessed screw for mounting grille base (6 required)
*74734	Spring—Retaining spring for knobs

MODELS 9X571, Ch. RC-1079; 9X572, Ch. RC-1079A

Critical Lead Dress

1. Dress all heater leads down to chassis and away from all audio grid and plate wiring.
2. Dress power cord to back apron and away from phono jack.
3. Dress capacitor C18 against back apron.
4. Connect shielded capacitor C13 direct and with a minimum of exposed leads.
5. Dress dial lamp leads on top of chassis around electrolytic capacitor and between 12SQ7 and 50L6GT tubes.
6. Dress output transformer leads down to chassis.
7. Dress excess loop leads away from tubes and clear of tuning condenser.

Test-Oscillator. — For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

On AC operation an isolation transformer (115 v./115 v.) may be necessary for the receiver if the test oscillator is also AC operated.

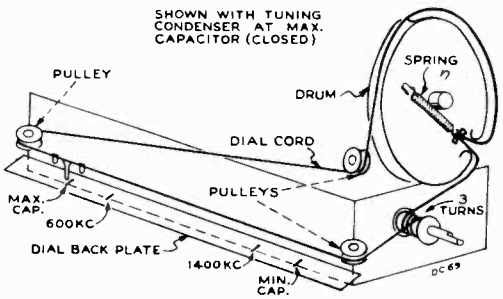
Dial Calibration

With the tuning condenser fully meshed, the dial pointer should be set to the first score mark at the left-hand end of the dial back plate. The four score marks represent: Max. cap. 600 kc 1400 kc min. cap.

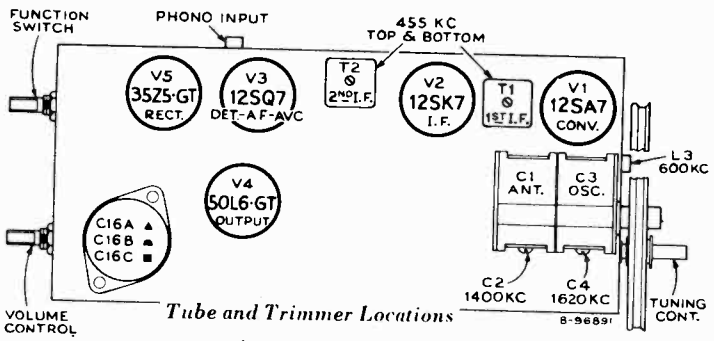
Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. output
1	*12SK7 I-F grid through 0.1 mfd. capacitor	455 kc	Quiet-point 1600 kc end of dial	T2 (top and bottom) 2nd I-F trans.
2	Stator of C1 through 0.1 mfd.			*T1 (top and bottom) 1st I-F trans.
3	Short wire placed near loop to radiate signal	1620 kc	Min. cap.	C4 (osc.)
4		1400 kc	1400 kc	†C2 (ant.)
5		600 kc	600 kc	L3 (osc.) Rock gang
6		Repeat steps 3, 4 and 5.		

*Do not readjust T2 when test oscillator is connected to C1.

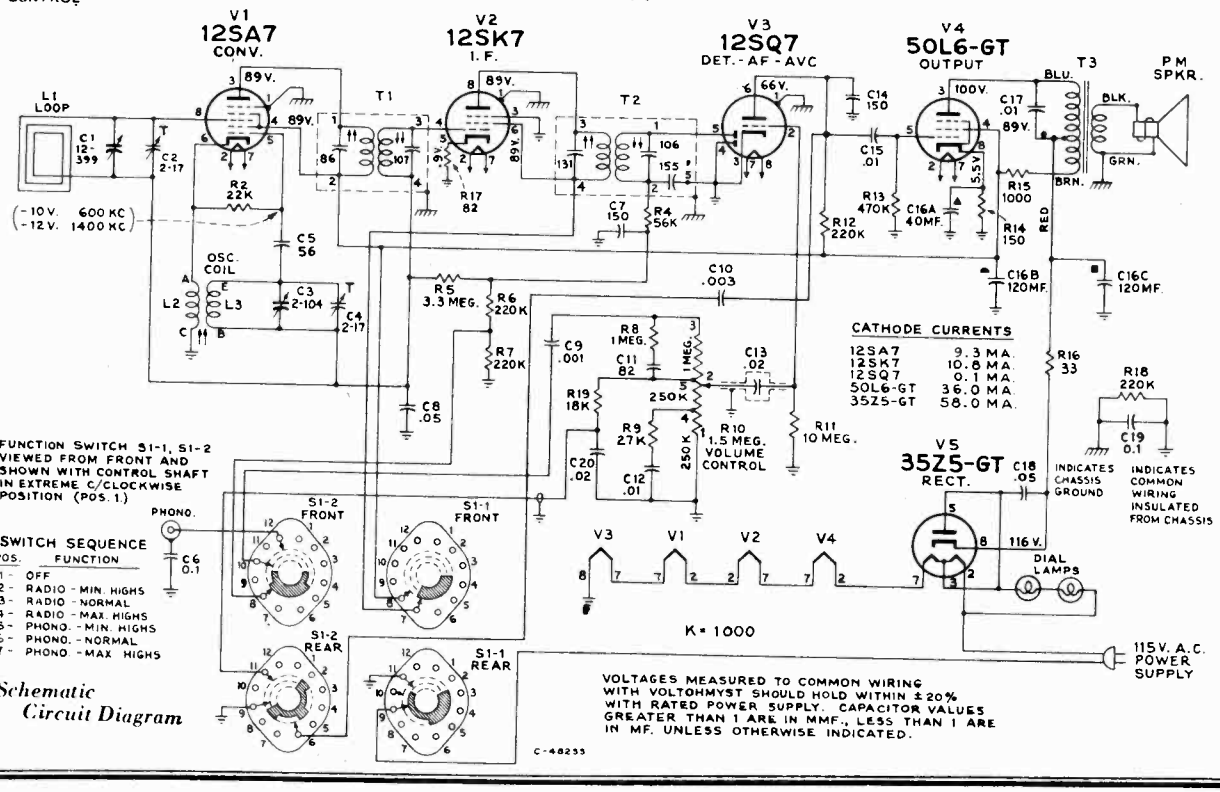
†When adjusting C2 (ant. trimmer) it is necessary to have the loop in the same position and spacing as it will have when assembled in the cabinet.



Dial Indicator and Drive Cord

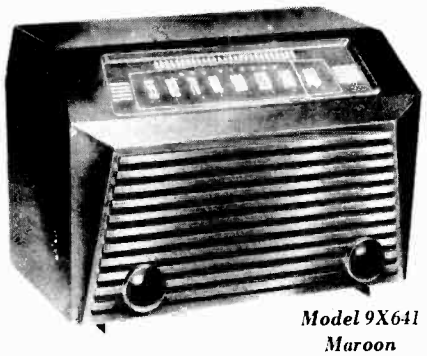


Tube and Trimmer Locations



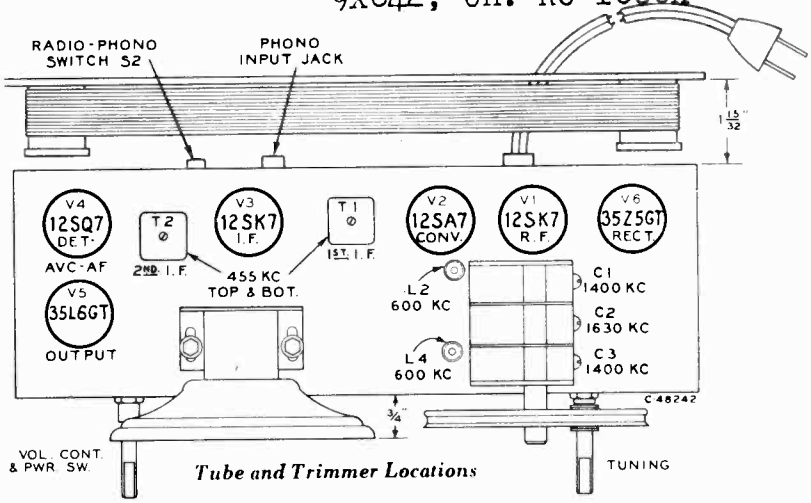
Schematic Circuit Diagram

MODELS 9X641, Ch. RC-1080;
9X642, Ch. RC-1080A



Model 9X641
Maroon

Model 9X642
Ivory



Tube and Trimmer Locations

SPECIFICATIONS

Tuning Range ..... 540—1600 kc

Intermediate Frequency ..... 455 kc

Tube Complement

(1) RCA 12SK7 ..... R.F. Amplifier
(2) RCA 12SA7 ..... Converter
(3) RCA 12SK7 ..... I.F. Amplifier
(4) RCA 12SQ7 ..... Det.-A.V.C.-A.F. Amp.
(5) RCA 35L6GT ..... Output
(6) RCA 35Z5GT ..... Rectifier

Power Supply Rating

115 volts d. c. or 50 to 60 cycles a. c. ..... 32 watts

Dial Lamp ..... Mazda type 51, 6-8 volts, 0.2 amp.

Loudspeaker (92572-4)

Size and type ..... 5-in. P.M.
Voice coil impedance ..... 3.2 ohms at 400 cycles

Power Output

Undistorted ..... 0.75 watt
Maximum ..... 1.25 watts

Tuning Drive Ratio ..... 10 to 1 (5 turns of knob)

Weight ..... 8¾ lbs.

Cabinet Dimensions

Height ..... 8½" Width ..... 12⅜" Depth ..... 7½"

REPLACEMENT PARTS

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES **RC 1080—9X641 RC 1080A—9X642**
*74694	Back—Cabinet back and loop assembly—maroon—for Model 9X641
*74695	Back—Cabinet back and loop assembly—ivory—for Model 9X642
*74692	Capacitor—Variable tuning capacitor (C1, C2, C3, C4, C5, C6)
39042	Capacitor—Ceramic, 47 mmf. (C8)
71924	Capacitor—Ceramic, 56 mmf. (C9)
73501	Capacitor—Ceramic, 150 mmf. (C12, C13)
*74662	Capacitor—Electrolytic, comprising 1 section of 80 mfd. 150 volts and 1 section of 50 mfd. 150 volts (C19A, C19B)
72315	Capacitor—Tubular, .002 mfd. 200 volts (C14)
70572	Capacitor—Tubular, .015 mfd. 400 volts (C16)
71928	Capacitor—Tubular, .02 mfd. 200 volts (C15)
73553	Capacitor—Tubular, .05 mfd. 400 volts (C17, C18)
70617	Capacitor—Tubular, .1 mfd. 400 volts (C10, C11)
73935	Clip—Mounting clip for I.F. transformer
73677	Coil—R.F. coil (L1, L2)
*74693	Coil—Oscillator coil (L3, L4)
35787	Connector—Phono input connector (socket)
38410	Control—Volume control and power switch (R14, S1)
70392	Cord—Power cord and plug
†72953	Cord—Dial drive cord (approx. 52" overall length required)
72283	Grommet—Rubber grommet to mount variable tuning capacitor (3 required)
73693	Grommet—Power cord strain relief (1 set)
*74696	Indicator—Station selector indicator
*74690	Plate—Dial back plate complete with four (4) drive cord pulleys, less dial
*74660	Resistor—Wire wound, 15 ohms, ½ watt (R13)
	Resistor—Fixed, composition, 68 ohms, ±10%, ½ watt (R1, R4)
	Resistor—Fixed, composition, 120 ohms, ±10%, ½ watt (R11)
	Resistor—Fixed, composition, 1,200 ohms, ±10%, 1 watt (R12)
	Resistor—Fixed, composition, 12,000 ohms, ±10%, ½ watt (R2)
	Resistor—Fixed, composition, 22,000 ohms, ±10%, ½ watt (R3)
	Resistor—Fixed, composition, 56,000 ohms, ±10%, ½ watt (R7)
	Resistor—Fixed, composition, 220,000 ohms, ±10%, ½ watt (R5, R6)
	Resistor—Fixed, composition, 470,000 ohms, ±10%, ½ watt (R10)
	Resistor—Fixed, composition, 2.2 megohm, ±10%, ½ watt (R8)
	Resistor—Fixed, composition, 4.7 megohm, ±10%, ½ watt (R9)
*74691	Shaft—Tuning knob shaft and pulley
54414	Socket—Tube socket
*74697	Socket—Dial lamp socket and lead
74038	Spring—Tension spring for drive cord
33634	Switch—Radio-Phono switch (S2)
73036	Transformer—First I.F. transformer (T1)
73037	Transformer—Second I.F. transformer (T2)
73976	Transformer—Output transformer (T3)
35969	Washer—"C" washer for tuning shaft
	SPEAKER ASSEMBLIES **Stamped 92572-4**
73900	Speaker—5" P.M. speaker complete with cone and voice coil NOTE.—If stamping of speaker does not agree with above number, order replacement by referring to model number of instrument and number stamped on speaker.
	MISCELLANEOUS
Y2135	Cabinet—Plastic cabinet—maroon—for Model 9X641
Y2136	Cabinet—Plastic cabinet—ivory—for Model 9X642
*74699	Clamp—Dial clamp (1 set)
*74698	Dial—Dial scale
71821	Knob—Control knob—maroon—for Model 9X641
72645	Knob—Control knob—ivory—for Model 9X642
11765	Lamp—Dial lamp—Mazda 51
30900	Spring—Retaining spring for knobs

† Stock No. 72953 is a reel containing 250 feet of cord.
* THIS IS THE FIRST TIME THIS STOCK NUMBER HAS APPEARED

MODELS 9X641, Ch. RC-1080; 9X642, Ch. RC-1080A

ALIGNMENT PROCEDURE

Cathode Ray Alignment is the preferable method. Connections for the oscilloscope are shown on the schematic diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

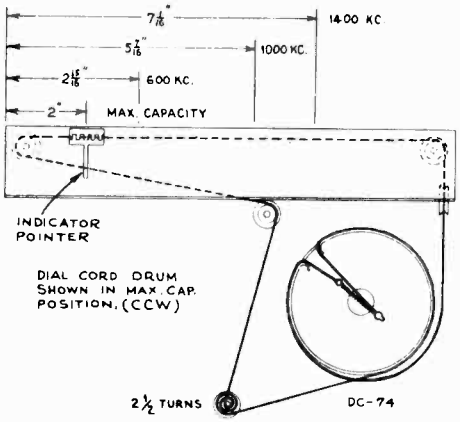
Test Oscillator.—Connect low side of test oscillator to common wiring in series with a .1 mf. capacitor. If the test oscillator is a.c. operated it may be necessary to use an isolation transformer for the receiver during alignment and the low side of the test oscillator connected directly to common wiring at the electrolytic capacitor. Keep the oscillator output low to prevent a-v-c action.

Step	Connect high side of sig. gen. to—	Sig. gen. output	Turn radio dial to—	Adjust for peak output
1	Pin No. 8 of 12SA7 tube	455 kc	Quiet point near 600 kc	Top and bottom cores of T1
2				Top and bottom cores of T2
3	"External Antenna" terminal through 100 mmf. capacitor	1,400 kc	1,400 kc	C6 Osc. C5 R.F. C4 Ant.
4		Shunt C5 with 22,000 ohm resistor		
		600 kc	600 kc	L4 Osc. (Rock gang)
5		Remove 22,000 ohm resistor from C5		
		600 kc	600 kc	L2 R.F.
6		Repeat steps 3, 4 and 5		

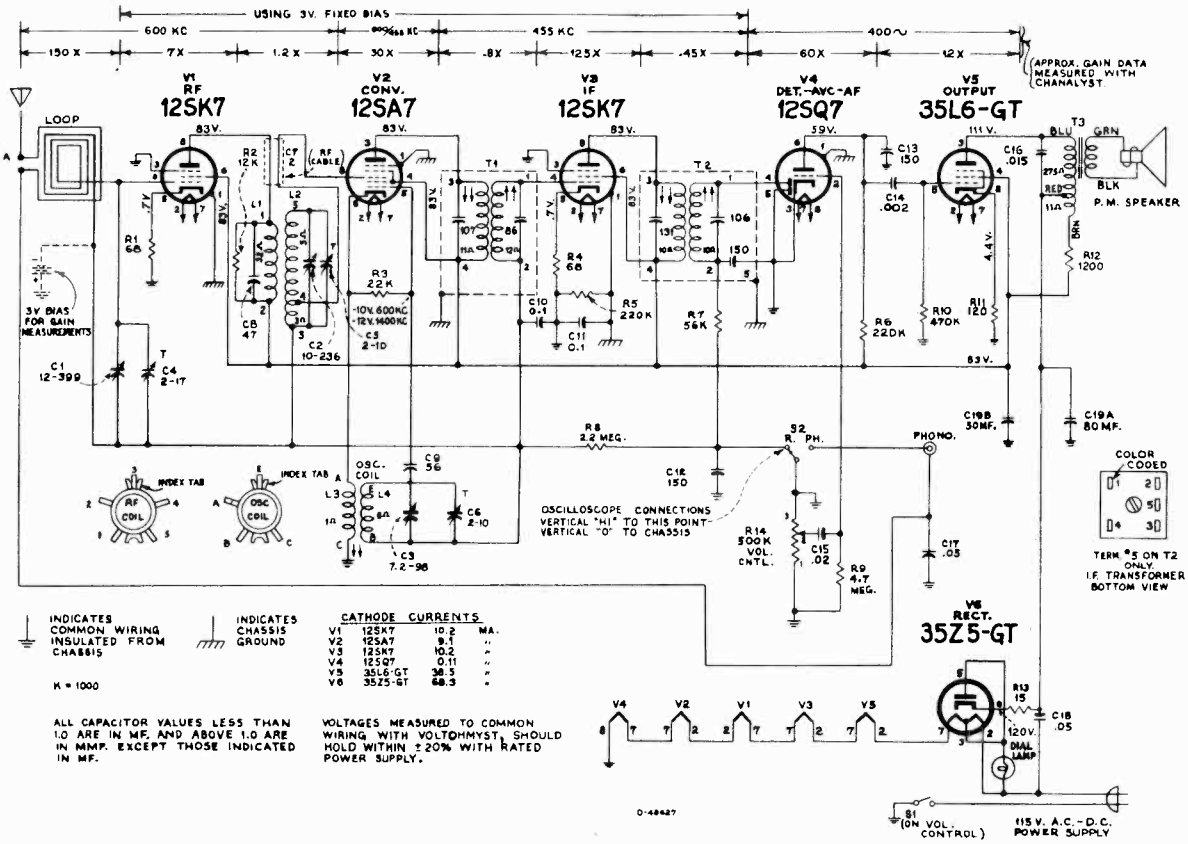
The position of the loop antenna in relation to the chassis affects adjustment of C4. The correct position is indicated on the illustration "Tube and Trimmer Locations."

NOTE.—If reception is not obtained on d.c. operation, reverse plug in outlet receptacle. On a.c. operation this may reduce hum.

The position of the speaker is adjustable; the correct position is indicated on the illustration "Tube and Trimmer Locations."



Dial Indicator and Drive Mechanism

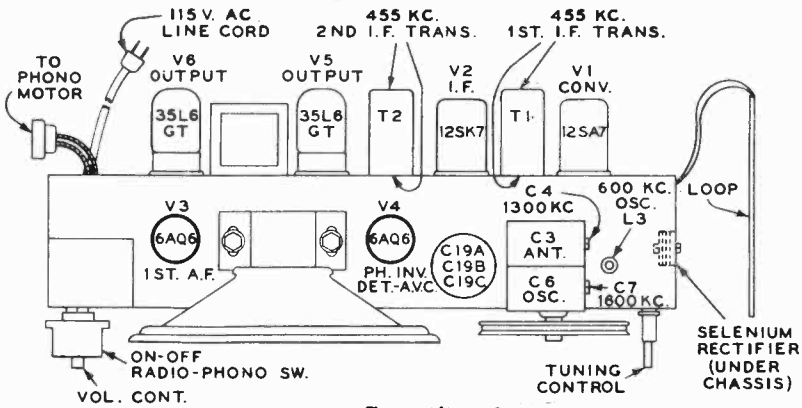


Schematic Diagram

In some chassis an alternate filter capacitor is used which has three sections. The low voltage section (20 mf. 25 volts) is not used. The alternate capacitor is mounted on top of the chassis and is available as Stock No. 73975.

MODEL 9Y7, Ch. RC-1057B

Tube and Trimmer Locations



Alignment Procedure

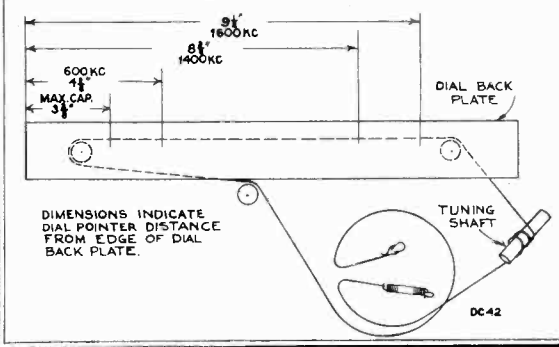
Output Meter.—Connect meter across speaker voice coil. Turn volume control to maximum.

Test Oscillator.—Connect low side of test oscillator to common wiring in series with a .1 mf. capacitor. If the test oscillator is a.c. operated it may be necessary to use an isolation transformer for the receiver during alignment and the low side of the test oscillator connected directly to common wiring at the electrolytic capacitor. Keep the oscillator output low to prevent a-v-c action.

Dial Pointer Adjustment.—Rotate tuning condenser fully counterclockwise (plates fully meshed). Adjust indicator pointer so that it is 3⅜" from the left hand edge of the dial back plate.

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. output
1	I.F. grid, in series with .1 mfd.	455 kc	Quiet point 1,600 kc end of dial	Pri. & Sec. 2nd I.F. transformer
2	Converter grid in series with .1 mfd.			Pri. & Sec. 1st I.F. transformer
NOTE.—ANTENNA LOOP AND RECORD CHANGER MUST BE IN CABINET FOR THE FOLLOWING				
3	Short wire placed near loop for radiated signal	1,620 kc	Extreme R. H. end (gang open)	C7 (osc.)
4		1,400 kc	1,400 kc	C4 (ant.)
5		600 kc	600 kc	Osc. Coil L3 Rock gang
6	Repeat steps 3, 4, & 5 if necessary			

Dial Indicator and Drive Mechanism



Specifications

Tuning Range ..... 540-1600 kc
Intermediate Frequency ..... 455 kc
Tube Complement

1. RCA-12SA7 ..... Converter
2. RCA-12SK7 ..... I-F Amplifier
3. RCA-6AQ6 ..... A-F Amplifier
4. RCA-6AQ6 ..... 2nd Det.-Ph. Inv.
5. RCA-35L6GT } Push-Pull Output
6. RCA-35L6GT

A selenium rectifier is used.

Power Supply Rating 115 volts, 60 cycles a.c., 60 watts.
Dial Lamps (2) ..... Mazda type 51, 6-8 volts, 0.2 amp.
Loudspeaker (92573-1K)
Size and type ..... 5" x 7" P.M.
Voice coil impedance ..... 3.4 ohms at 400 cycles
Power Output
Undistorted ..... 2.2 watts
Maximum ..... 3.0 watts
Cabinet Dimensions
Height 9 13/16" Width 16¼" Depth 14⅜"
Tuning Drive Ratio ..... 10½:1 (5¼ turns of knob)
Record Changer (RP-168A-1)
Turntable speed ..... 45 r.p.m
Records used ..... Long playing—7 in.
Record capacity ..... 8 records
Pickup ..... Crystal (medium output)

Service Hints

The two 6AQ6 tubes and the dial lamps are accessible by removing the sloping panel in the front of the record changer compartment.

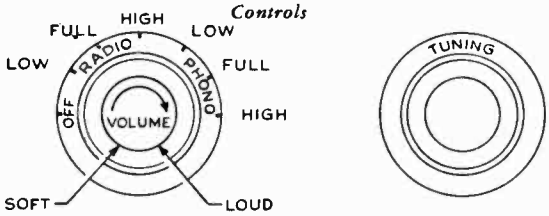
When re-installing the chassis in the cabinet the dial lamps should be positioned to give maximum illumination of the dial without direct light of the lamps being visible from the front of the cabinet.

The chassis mounting board should be flush against the front of the cabinet.

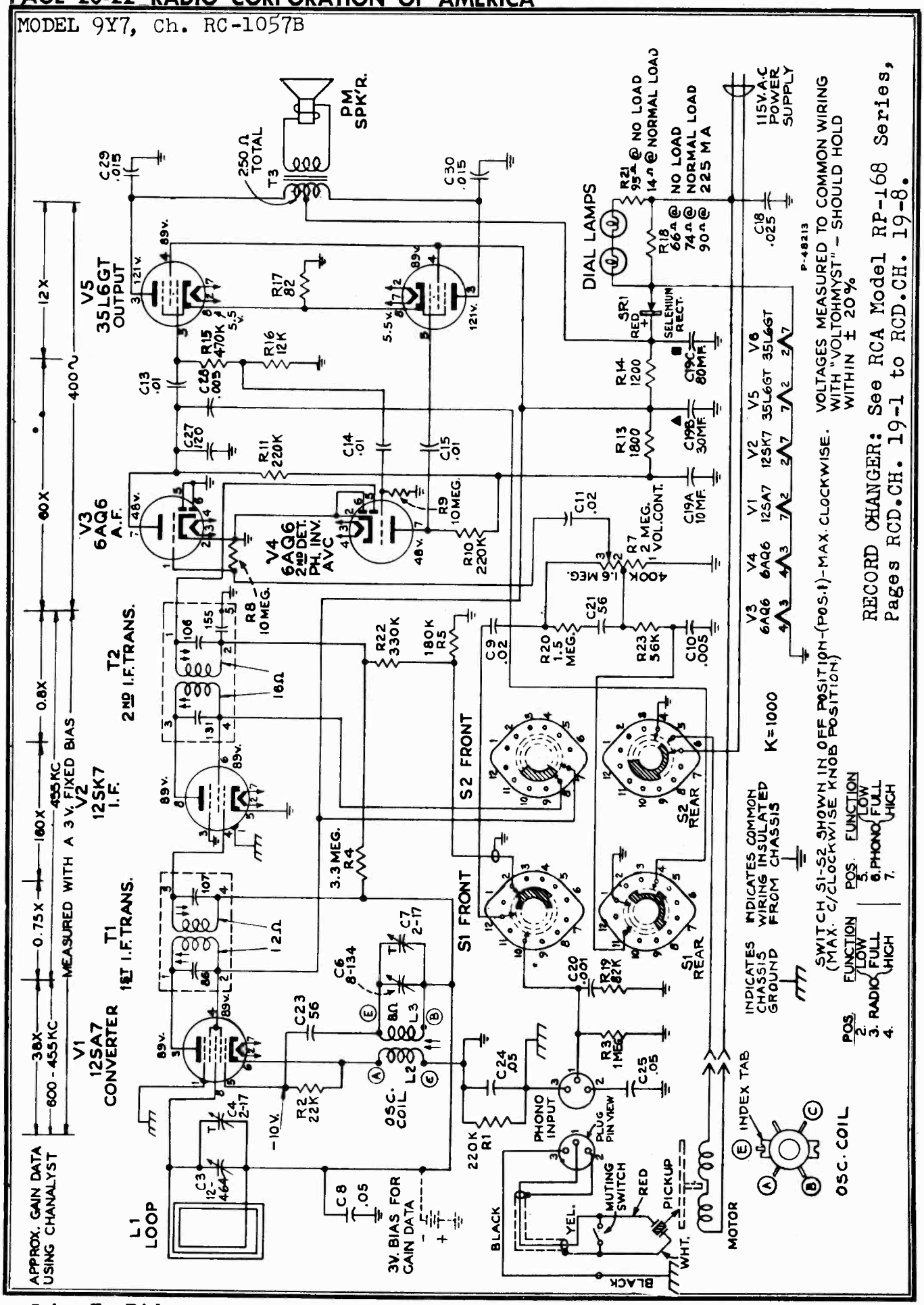
The position of the speaker is adjustable. When correctly positioned, it should set firmly against the front of the cabinet but with no undue strain on the speaker.

CAUTION.—CLOSE TUNING CONDENSER PLATES COMPLETELY (C-C-W) BEFORE REMOVING OR RE-INSTALLING CHASSIS.

Controls



MODEL 9Y7, Ch. RC-1057B



MODEL 9Y7, Ch. RC-1057B

Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1057B
71042	Button—Plug button to cover holes for I.F. transformers' adjustment (2 required)
*74246	Capacitor—Variable tuning capacitor (C3, C6, C7)
*74270	Capacitor—Mica trimmer, 3-30 mmf. (C26)
39622	Capacitor—Mica, 56 mmf. (C21)
73499	Capacitor—Ceramic, 56 mmf. (C23)
39630	Capacitor—Mica, 120 mmf. (C27)
70600	Capacitor—Tubular, .001 mfd., 400 volts (C20)
70603	Capacitor—Tubular, .003 mfd., 400 volts (C28)
72791	Capacitor—Tubular, .005 mfd., 400 volts (C10)
70612	Capacitor—Tubular, .025 mfd., 400 volts (C18)
73561	Capacitor—Tubular, .01 mfd., 400 volts (C13, C14, C15)
70572	Capacitor—Tubular, .015 mfd., 400 volts (C29, C30)
73638	Capacitor—Tubular, .02 mfd., 400 volts (C9)
70611	Capacitor—Tubular, .02 mfd., 400 volts (C11)
73553	Capacitor—Tubular, .05 mfd., 400 volts (C8, C25)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C24)
73013	Capacitor—Electrolytic, comprising 1 section of 80 mfd., 150 volts, 1 section of 30 mfd., 150 volts and 1 section of 10 mfd., 150 volts (C19A, C19B, C19C)
73935	Clip—Mounting clip for I.F. transformers (2 required)
73048	Coil—Oscillator coil (L2, L3)
38403	Control—Volume control (R7)
†72953	Cord—Drive cord (approx. 50" length required)
70392	Cord—Power cord and plug
70397	Gear—Power, radio and phono switch gear
73014	Gear—Volume control gear—less spring
72283	Grommet—Rubber grommet to mount tuning capacitor (3 required)
73886	Indicator—Station selector indicator
*74248	Loop—Antenna loop (L1)
*74216	Plate—Dial back plate complete with three (3) drive cord pulleys, less dial
30868	Plug—2 contact female plug for motor cable
73009	Rectifier—Selenium rectifier (SR1)
73038	Resistor—Normal value, 66 ohms with positive temperature coefficient (R18)
	Resistor—Fixed, composition, 82 ohms, ±10%, 1 watt (R17)
73072	Resistor—Normal value, 95 ohms with negative temperature coefficient (R21)
	Resistor—Fixed, composition, 1200 ohms, ±10%, 1 watt (R14)
	Resistor—Fixed, composition, 1800 ohms, ±10%, ½ watt (R13)
	Resistor—Fixed, composition, 12,000 ohms, ±10%, ½ watt (R16)
	Resistor—Fixed, composition, 22,000 ohms, ±20%, ½ watt (R2)
	Resistor—Fixed, composition, 56,000 ohms, ±10%, ½ watt (R23)
	Resistor—Fixed, composition, 82,000 ohms, ±10%, ½ watt (R19)
	Resistor—Fixed, composition, 180,000 ohms, ±10%, ½ watt (R5)
	Resistor—Fixed, composition, 220,000 ohms, ±20%, ½ watt (R1, R10, R11)
	Resistor—Fixed, composition, 330,000 ohms, ±10%, ½ watt (R22)
	Resistor—Fixed, composition, 470,000 ohms, ±10%, ½ watt (R15)
	Resistor—Fixed, composition, 470,000 ohms, ±20%, ½ watt (R12)
	Resistor—Fixed, composition, 1 megohm, ±10%, ½ watt (R3)
	Resistor—Fixed, composition, 1.5 megohms, ±10%, ½ watt (R20)
	Resistor—Fixed, composition, 3.3 megohms, ±20%, ½ watt (R4)
	Resistor—Fixed, composition, 10 megohms, ±20%, ½ watt (R8, R9)
73012	Shaft—Tuning knob shaft
73103	Shield—Tube shield for miniature tubes (2 required)
72998	Socket—Dial lamp socket and lead assembly
36422	Socket—Phono input socket, 3 contact
9914	Socket—Tube socket, miniature, for V3
72516	Socket—Tube socket, miniature, for V4
37605	Socket—Tube socket, octal
74038	Spring—Drive cord spring
70396	Spring—Volume control gear tension spring
73011	Switch—Power, radio and phono switch (S1, S2)
73036	Transformer—First I.F. transformer (T1)
73037	Transformer—Second I.F. transformer (T2)
73008	Transformer—Output transformer (T3)
33726	Washer—"C" washer for tuning knob shaft
*74029	Washer—Fibre washer for tuning knob shaft
70406	Washer—Spring washer for volume control
34457	Washer—Spring washer for tuning knob shaft
	SPEAKER ASSEMBLIES 92573-1K
72728	Cone—Cone and voice coil assembly
74454	Gasket—Rubber gasket for speaker
72727	Speaker—5" x 7" P.M. speaker complete with cone and voice coil
	MISCELLANEOUS
74225	Bezel—Dial scale bezel less dial
*74209	Cover—Cover for record changer mounting screw (3 required)
*74273	Decal—Trademark decal (Victrola)
*74224	Dial—Polystyrene dial scale
*74237	Escutcheon—Tuning control escutcheon for blonde instruments
*74236	Escutcheon—Tuning control escutcheon for mahogany or walnut instruments
*74235	Escutcheon—Power—radio—phono switch escutcheon for blonde instruments
*74234	Escutcheon—Power—radio—phono switch escutcheon for mahogany or walnut instruments
72894	Foot—Rubber foot (4 required)
72692	Hinge—Cabinet lid hinge (2 required)
*74223	Knob—Power, radio and phono switch knob—tan—for blonde instruments
*74222	Knob—Power, radio and phono switch knob—maroon—for walnut or mahogany finish instruments
*74221	Knob—tuning knob—tan—for blonde instruments
*74220	Knob—Tuning knob—maroon—for walnut or mahogany finish instruments
*74219	Knob—Volume control knob—tan—for blonde instruments
*74218	Knob—Volume control knob—maroon—for walnut or mahogany finish instruments
11765	Lamp—Dial lamp
*74208	Nut—Tee nut for mounting record changer (3 required)
71095	Nut—Speed nut for dial scale bezel (8 required)
74192	Plug—3 prong male plug for shielded pickup cable
74424	Screw—#8-32 x 1¾" special head screw for mounting record changer (3 required)
74421	Spring—Conical spring for mounting record changer —upper—R. H. side (1 required)
74422	Spring—Conical spring for mounting record changer —upper—L. H. side (2 required)
74423	Spring—Conical spring for mounting record changer —lower (3 required)
14270	Spring—Retaining spring for knobs
71824	Stud—Stud and screw to mount lid hinge (1 set)
30688	Support—Cabinet lid support

† Stock No. 72953 is a reel containing 250 feet of cord.

* THIS IS THE FIRST TIME THIS STOCK NUMBER HAS APPEARED IN SERVICE DATA.

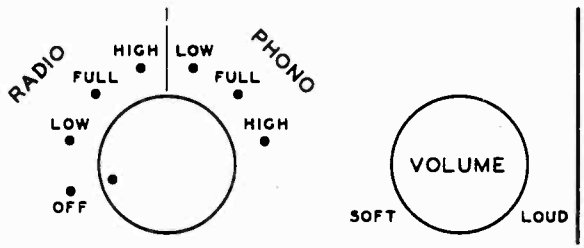
Specifications

Tuning Range ..... 540-1600 kc
Intermediate Frequency ..... 455 kc

Tube Complement
(1) RCA 12SA7 ..... Converter
(2) RCA 12SK7 ..... I-F Amplifier
(3) RCA 12SQ7 ..... Det.—A.V.C.—A-F Amplifier
(4) RCA 50L6GT ..... Output
(5) RCA 35Z5GT ..... Rectifier

Power Supply Rating
115 volts a.c., 60 cycles ..... 45 watts total

Power Output
Undistorted ..... 1.1 watts
Maximum ..... 1.75 watts



Controls

Dial Lamps (2) ..... Mazda type 1490, 3.2 volts, .16 amp.

Loudspeaker (92586-2W)
Size and Type ..... 8 in. PM
Voice Coil Impedance ..... 3.2 ohms at 400 cycles

Cabinet Dimensions
Height .... 28" Width .... 18½" Depth .... 14¼"

Weight ..... 36 lbs.

Tuning Drive Ratio ..... 9 to 1 (4½ turns of knob)

Record Changer RP168A-1

Power Supply

Although this model employs an AC-DC receiver chassis, the instrument is not suitable for use on DC, as this would damage the motor in the record changer.

Replacement Parts

Stock No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1079 D
74655	Back—Chassis back and loop assembly (L1)
74653	Capacitor—Variable tuning capacitor (C1, C2, C3, C4)
71924	Capacitor—Ceramic, 56 mmf. (C5)
71614	Capacitor—Ceramic, 120 mmf. (C11)
73501	Capacitor—Ceramic, 150 mmf. (C14, C7)
74678	Capacitor—Electrolytic comprising 2 sections of 120 mfd, 150 volts and 1 section of 40 mfd, 25 volts (C16A, C16B, C16C)
73186	Capacitor—Tubular, paper, .001 mfd, 400 volts (C9)
73961	Capacitor—Tubular, paper, .003 mfd, 200 volts (C10)
72573	Capacitor—Tubular, paper, .003 mfd, 400 volts (C21)
72791	Capacitor—Tubular, paper, .005 mfd, 400 volts (C17)
71923	Capacitor—Tubular, paper, .01 mfd, 200 volts (C12)
72827	Capacitor—Tubular, paper, .01 mfd, 400 volts (C15)
71928	Capacitor—Tubular, paper, .02 mfd, 200 volts (C13, C20)
73553	Capacitor—Tubular, paper, .05 mfd, 400 volts (C8, C18, C6, C19)
73935	Clip—Mounting clip for I.F. transformer
74448	Coil—Oscillator coil (L2, L3)
36422	Connector—3 contact female connector for pickup cable (J1)
30868	Connector—2 contact female connector for motor cable (P3)
*74827	Control—Volume control (R10)
†72953	Cord—Drive cord (approx. 43" overall)
73893	Grommet—Power cord strain relief (1 set)
72283	Grommet—Rubber grommet for mounting tuning capacitor (3 required)
74658	Indicator—Station selector indicator
71116	Lamp—Dial lamp—Mazda 1490
74651	Plate—Dial back plate complete with three (3) pulleys
18469	Plate—Bakelite mounting plate for electrolytic
72313	Resistor—Fuse type, 33 ohms (R16)
	Resistors—Fixed composition:
	82 ohms, ±10%, ½ watt (R17)
	150 ohms, ±10%, ½ watt (R14)
	1,000 ohms, ±10%, 1 watt (R15)
	18,000 ohms, ±10%, ½ watt (R19)
	22,000 ohms, ±10%, ½ watt (R2)
	27,000 ohms, ±10%, ½ watt (R9)
	56,000 ohms, ±10%, ½ watt (R4)
	120,000 ohms, ±10%, ½ watt (R3)
	220,000 ohms, ±10%, ½ watt (R6, R7, R12, R18)
	470,000 ohms, ±10%, ½ watt (R13)
	680,000 ohms, ±10%, ½ watt (R8)
	1 megohm, ±10%, ½ watt (R1)
	3.3 megohm, ±10%, ½ watt (R5)
	10 megohm, ±10%, ½ watt (R11)
*74825	Shaft—Tuning knob shaft and pulley
31251	Socket—Tube socket, octal
74663	Socket—Dial lamp socket assembly complete with two (2) sockets (miniature bases) and leads
74038	Spring—Tension spring for drive cord
*74826	Switch—Function switch (S1)
73036	Transformer—First I.F. transformer (T1)
73037	Transformer—Second I.F. transformer (T2)
74677	Transformer—Output transformer (T3)
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLIES 92586-2W RL 105 C2
74758	Cone—Cone and voice coil assembly
74679	Speaker—8" P.M. speaker complete with cone and voice coil NOTE: If stamping on speaker does not agree with above speaker number, order replacement parts by referring to model number of instrument and full description of part required.
	MISCELLANEOUS
*74832	Bottom—Bottom cover for record changer compartment (2 required)
*74833	Bracket—Lamp bracket (2 required)
*74830	Clamp—Dial clamp (2 required)
X1758	Cloth—Grille cloth
74192	Connector—3 contact male connector for pickup cable (P1)
74581	Cover—Plug-in cover for record changer mounting screws (3 required)
*74831	Cushion—Rubber cushion for dial clamp
74682	Decal—Function switch decal for mahogany or walnut instruments
*74835	Decal—Function switch decal for oak instruments
74273	Decal—Trade mark decal
*74829	Dial—Dial scale
74674	Emblem—"RCA Victor" emblem
74828	Knob—Function switch knob—tan—for oak instruments
74681	Knob—Function switch knob—maroon—for mahogany or walnut instruments
74686	Knob—Volume control or tuning knob—maroon—for mahogany or walnut instruments
74247	Knob—Volume control or tuning knob—tan—for oak instruments
74208	Nut—Tee nut for mounting record changer
73770	Pull—Drawer pull
74582	Screw—No. 8-32 x 1¾" special head screw for mounting record changer (3 required)
74835	Slide—Slide mechanism assembly for record changer drawer
74422	Spring—Conical spring for mounting record changer (upper LH) (2 required)
74421	Spring—Conical spring for mounting record changer (upper RH) (1 required)
74423	Spring—Conical spring for mounting record changer (lower) (3 required)

†Stock No. 72953 is a reel containing 250 feet of cord.
*This is the first time that this Stock No. has appeared in Service Data.

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS

Alignment Procedure

Critical Lead Dress

1. Dress all heater leads down to chassis and away from all audio grid and plate wiring.
2. Dress power cord to back apron and away from phono jack.
3. Dress capacitor C18 against back apron.
4. Connect shielded capacitor C13 direct and with a minimum of exposed leads.
5. Dress dial lamp leads on top of chassis around electrolytic capacitor and between 12SQ7 and 50L6GT tubes.
6. Dress output transformer leads down to chassis.
7. Dress excess loop leads away from tubes and clear of tuning condenser.

Test-Oscillator. — For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

An isolation transformer (115 v./115 v.) may be necessary for the receiver if the test oscillator is also AC operated.

Dial Calibration

With the tuning condenser fully meshed, the dial pointer should be set to the first score mark at the left-hand end of the dial back plate. The four score marks represent: Max. cap., 600 kc, 1400 kc and min. cap.

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. output
1	12SK7 I-F grid through 0.1 mfd. capacitor	455 kc	Quiet-point 1600 kc end of dial	T2 (top and bottom) 2nd I-F trans.
2	Stator of C1 through 0.1 mfd.			*T1 (top and bottom) 1st I-F trans.
3	Short wire placed near loop to radiate signal	1630 kc	Min. cap.	C4 (osc.)
4		1400 kc	1400 kc	†C2 (ant.)
5		600 kc	600 kc	L3 (osc.) Rock gang
6	Repeat steps 3, 4 and 5.			

*Do not readjust T2 when test oscillator is connected to C1.

†When adjusting C2 (ant. trimmer) it is necessary to have the loop in the same position and spacing as it will have when assembled in the cabinet.

Care of Sapphire

The record changer sapphire is protected by a permanent metal guard. LINT MAY COLLECT TO CLOG THE OPENING IN THE GUARD AT THE SAPPHIRE POINT AND CAUSE POOR RECORD REPRODUCTION. This may require occasional cleaning of the guard opening — clean by carefully brushing with a small soft brush.

Record Separators

In the out of cycle position the record separator knives or discs are normally concealed inside the center post. During service, the position of the star wheel on the underside of the record changer may be accidentally shifted; this may cause the separator knives to be extended when they should be concealed.

If the separator knives are thus extended — turn the power on so that the turntable is revolving, gently press fingers against the extended knives until they disappear inside the center post — **DO THIS ONLY WHILE MECHANISM IS OUT OF CYCLE.**

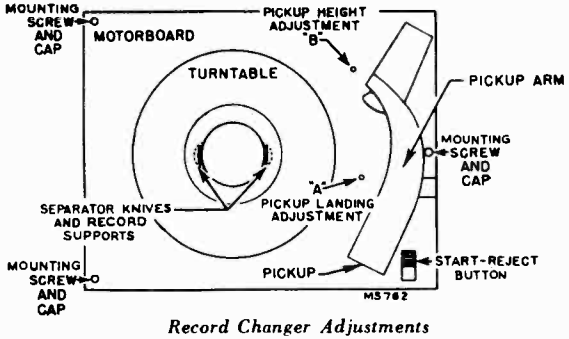
Landing Adjustment "A"

If the pickup lands inside the starting grooves — turn screw "A" slightly clockwise. If pickup lands outside the starting grooves — turn screw "A" slightly counterclockwise.

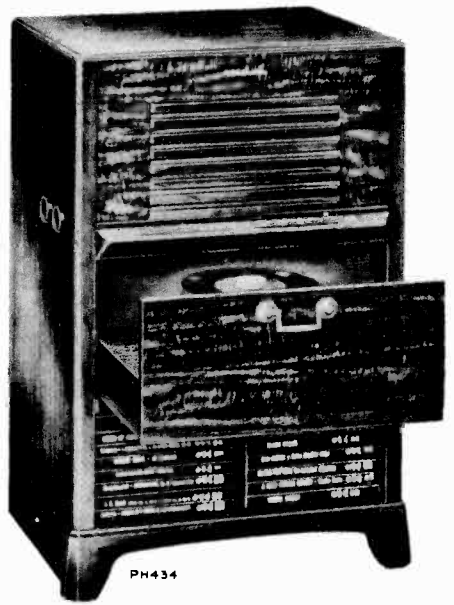
Pickup Height Adjustment "B"

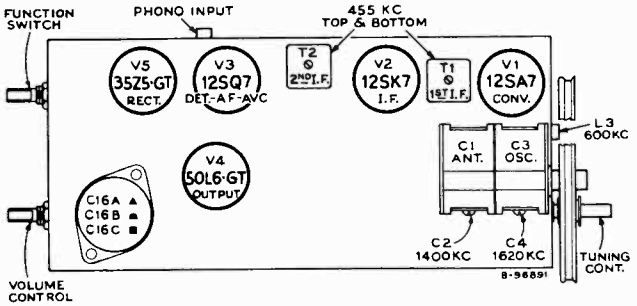
During cycle the pickup arm must rise high enough to clear a stack of eight records on the turntable, but not high enough to cause the top of the arm to touch records resting on the record supports.

If pickup does not clear a stack of eight records — or if pickup arm touches records on record supports — turn screw "B" slightly.

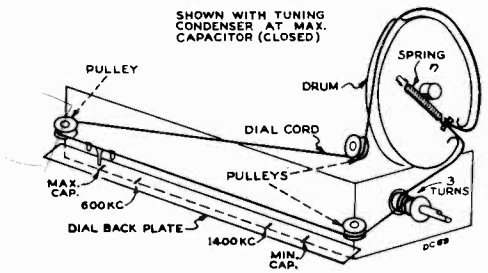


Record Changer Adjustments

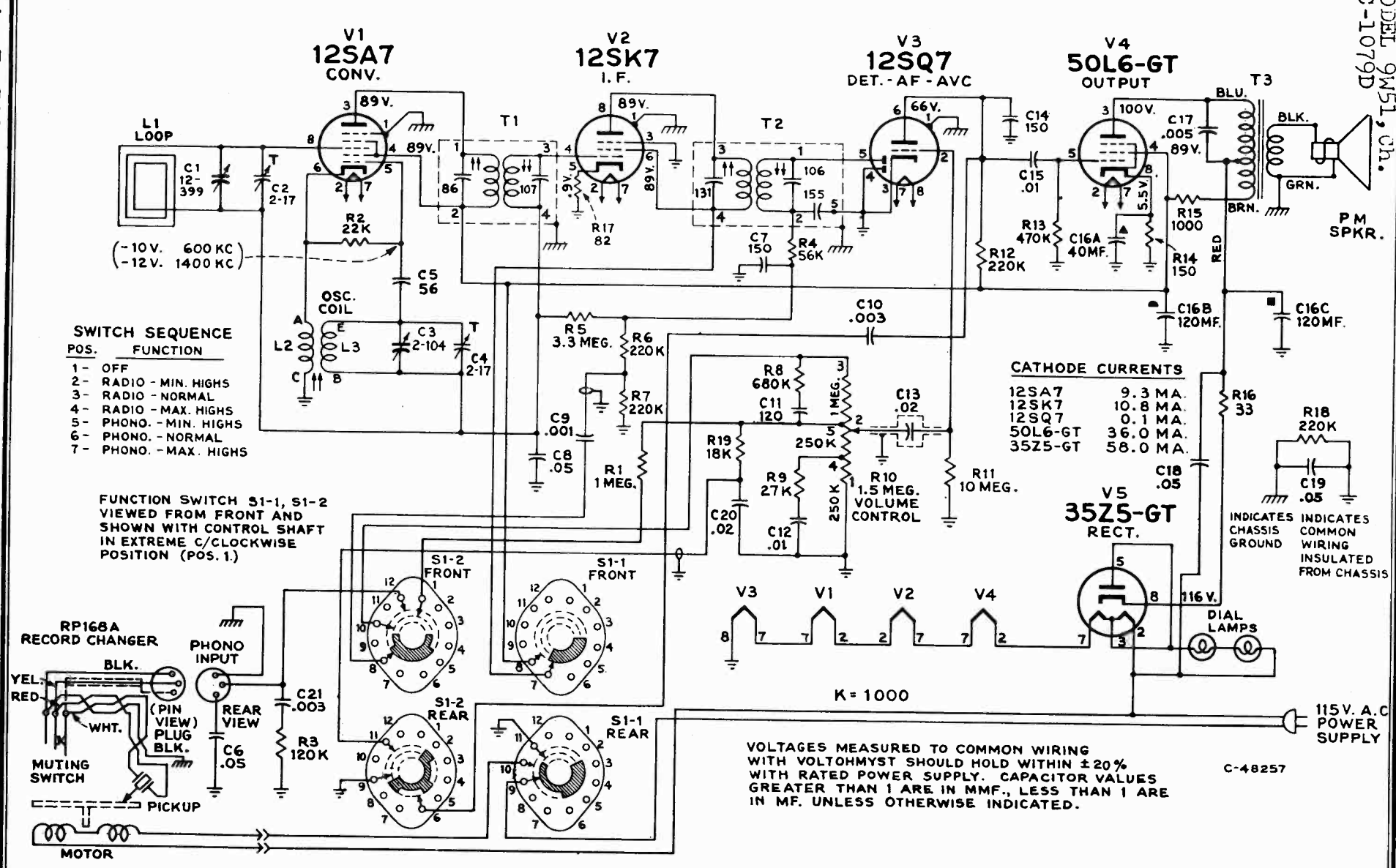




Tube and Trimmer Locations



Dial Indicator and Drive Cord



RECORD CHANGER: Model RP-168A-1, see RCA Model RP-168 Series, Pages RCD.CH. 19-1 to RCD.CH. 19-8

MODEL 9Y51,
Ch. RC-1077

Specifications

Tuning Range ..... 540-1600 kc

Intermediate Frequency ..... 455 kc

Tube Complement

1. RCA-12BE6 ..... Converter
2. RCA-12BA6 ..... I-F Amplifier
3. RCA-12AV6 ..... Det., AVC., A-F Amplifier
4. RCA-50L6GT ..... } Output Rectifier
5. RCA-35W4 ..... }

Power Supply Rating ..... 115 volts, 60 cycles a.c., 60 watts

Dial Lamps (2) ..... Mazda type 1490, 3.2 volts, 0.16 amp.

Loudspeaker (92585-1)

Size and type ..... 5" x 7" P.M.
Voice coil impedance ..... 3.2 ohms at 400 cycles

Power Output

Undistorted ..... 1 watt
Maximum ..... 1.5 watts

Cabinet Dimensions

Height 7¾" Width 12⅜" Depth 14¼"

Tuning Drive Ratio ..... 7½:1 (3¾ turns of knob)

Record Changer (RP-168-1 modified or RP-168B-1)

Turntable speed ..... 45 r.p.m.
Records used ..... Long playing—7 in.
Record capacity ..... Up to 10 records
Pickup ..... Crystal (medium output)
Pickup arm assembly RMP129-2

Service Hints

The tubes and the dial lamps are accessible by removing the panel in the front of the record changer compartment.

The chassis metal mounting plate should be flush against the front of the cabinet.

The position of the speaker is adjustable. When correctly positioned, it should set firmly against the front of the cabinet but with no undue strain on the speaker.

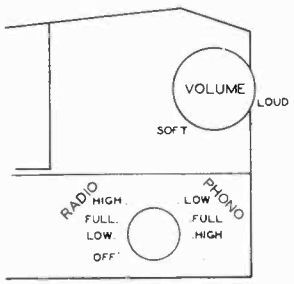
Care of Sapphire

The record changer sapphire is protected by a permanent metal guard. LINT MAY COLLECT TO CLOG THE OPENING IN THE GUARD AT THE SAPPHIRE POINT AND CAUSE POOR RECORD REPRODUCTION. This may require occasional cleaning of the guard opening—clean by carefully brushing with a small soft brush.

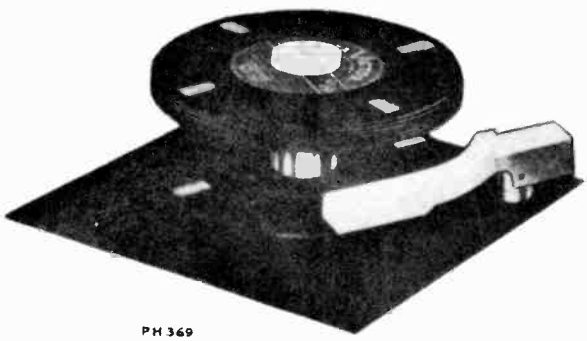
Record Separators

In the out of cycle position the record separator knives or discs are normally concealed inside the center post. During service, the position of the star wheel on the underside of the record changer may be accidently shifted; this may cause the separator knives to be extended when they should be concealed.

If the separator knives are thus extended—turn the power on so that the turntable is revolving, gently press fingers against the extended knives until they disappear inside the center post—**DO THIS ONLY WHILE MECHANISM IS OUT OF CYCLE.**



Controls



This instrument incorporates either a RP168-1 (modified) or a RP-168B-1 record changer and a RMP129-2 pickup arm assembly. Refer to Service Data RP-168 Series, 3rd edition, for information on record player.

Alignment Procedure

Output Meter.—Connect meter across speaker voice coil. Turn volume control to maximum.

Test Oscillator.—Connect low side of test oscillator to common wiring in series with a .1 mf. capacitor. If the test oscillator is a.c. operated it may be necessary to use an isolation transformer for the receiver during alignment and the low side of the test oscillator connected directly to common wiring at the electrolytic capacitor. Keep the oscillator output low to prevent a-v-c action.

Dial Pointer Adjustment.—Rotate tuning condenser until the plates are fully open. Adjust indicator pointer to 1630 kc (extreme high frequency end of the scale).

MODEL 9Y51,
Ch. RC-1077

LEAD DRESS

1. Dress all heater leads and pilot light leads down to chassis and as far as possible from all audio grid and plate wiring.
2. Dress all exposed leads away from each other and away from chassis to prevent short circuits.
3. Dress lead from R.F. section of gang to V1 pin 7 direct but away from chassis base to reduce capacity, also away from fuse resistor.
4. Dress lead from oscillator section of gang to oscillator coil direct but away from chassis base to reduce capacity.
5. Connect capacitor C20 with short leads between gang frame and mounting bracket.
6. Dress output transformer leads down to base.
7. Dress loop antenna leads away from gang plates and tubes.
8. Dress 33-ohm limiting resistor away from chassis.

Pickup Landing Adjustment "A"

The pickup point should land half-way between the outer edge of the record and the first music groove.

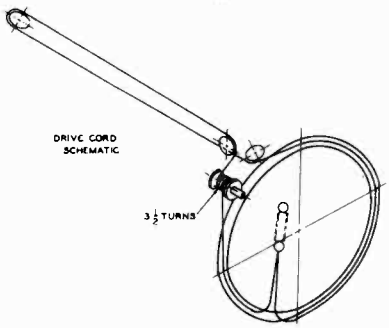
If the pickup lands inside the starting grooves—turn screw "A" slightly clockwise. If pickup lands outside the starting grooves—turn screw "A."

Pickup Height Adjustment "B"

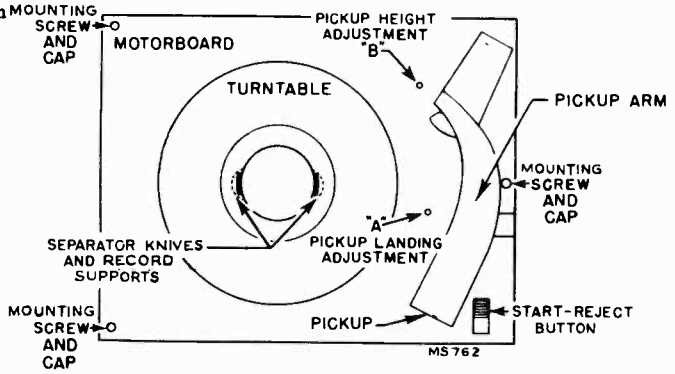
During cycle the pickup arm must rise high enough to clear a stack of eight records on the turntable, but not high enough to cause the top of the arm to touch records resting on the record supports.

If pickup does not clear a stack of eight records—turn screw "B" slightly clockwise. If pickup arm touches records on record supports—turn screw "B."

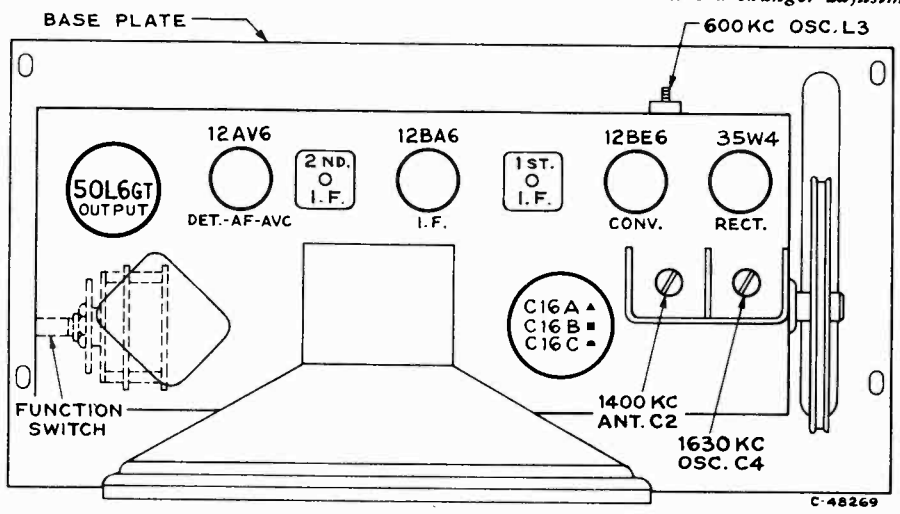
Steps	Connect the high side of test to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. output
1	I.F. grid, in series with .1 mfd.	455 kc	Quiet point 1,600 kc end of dial	Pri. & Sec. 2nd I.F. transformer
2	Converter grid in series with .1 mfd.			Pri. & Sec. 1st I.F. transformer
NOTE.—ANTENNA LOOP AND RECORD CHANGER MUST BE IN CABINET FOR THE FOLLOWING				
3	Short wire placed near loop for radiated signal	1,630 kc	Extreme R. H. end (gang open)	C4 (osc.)
4		1,400 kc	1,400 kc	C2 (ant.)
5		600 kc	600 kc	Osc. Coil L3 Rock gang
6	Repeat steps 3, 4, & 5 if necessary			



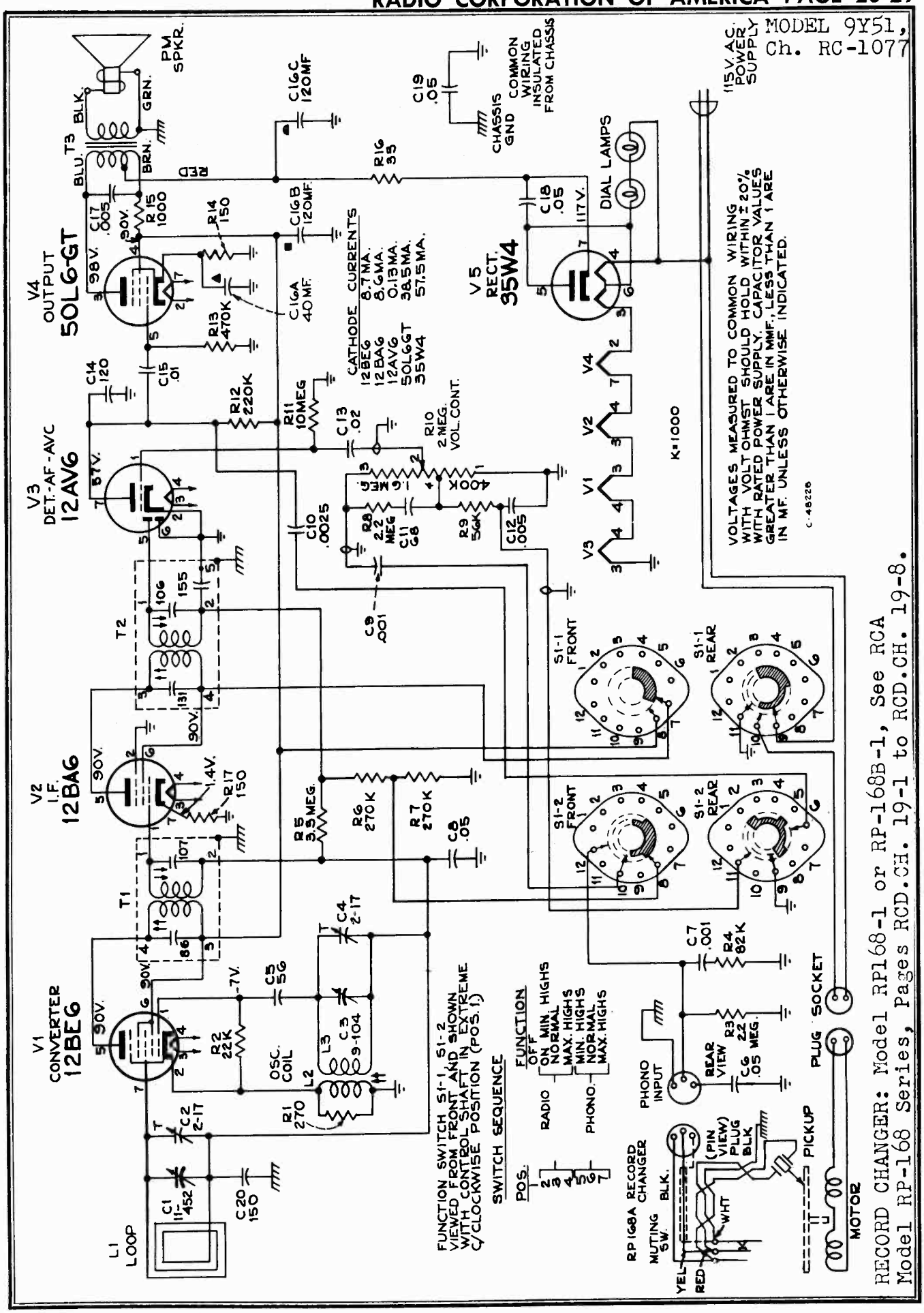
Dial drive mechanism



Record changer adjustments



Tube and trimmer location



RECORD CHANGER: Model RP168-1 or RP-168B-1, See RCA Model RP-168 Series, Pages RCD.CH. 19-1 to RCD.CH. 19-8.

MODEL 9Y51,
Ch. RC-1077

Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1077
*74700	Bracket—Drive cord pulley bracket (L. H.) complete with one (1) pulley and one (1) terminal board.
*74705	Bracket—Drive cord pulley bracket (R. H.) complete with two (2) pulleys less long bracket.
*74704	Capacitor—Variable tuning capacitor—less bracket..C1, C2, C3, C4
71924	Capacitor—Ceramic, 56 mmf. C5
74884	Capacitor—Ceramic, 68 mmf. C11
39630	Capacitor—Mica, 120 mmf. C14
39632	Capacitor—Mica, 150 mmf. C20
74678	Capacitor—Electrolytic, comprising 2 sections of 120 mfd., 150 volts and 1 section of 40 mfd., 25 volts C16A, C16B, C16C
72792	Capacitor—Tubular, .001 mfd., 200 volts C7
73186	Capacitor—Tubular, .001 mfd., 400 volts C9
71926	Capacitor—Tubular, .005 mfd., 200 volts C12
72791	Capacitor—Tubular, .005 mfd., 400 volts C17
70602	Capacitor—Tubular, .0025 mfd., 400 volts C10
72827	Capacitor—Tubular, .01 mfd., 400 volts C15
71928	Capacitor—Tubular, .02 mfd., 200 volts C13
73553	Capacitor—Tubular, .05 mfd., 400 volts C6, C8, C18, C19
73935	Clip—Mounting clip for 1. F. transformer
74448	Coil—Oscillator coil L2, L3
36422	Connector—3 contact female connector (phono input socket) J1
30868	Connector—2 contact female connector for motor cable....P3
*74702	Control—Volume control R10
†72953	Cord—Drive cord (approx. 49" overall length required)
74454	Gasket—Rubber gasket for between speaker and cabinet
73693	Grommet—Power cord strain relief (1 set)
72283	Grommet—Rubber grommet to mount variable capacitor (3 required)
*74703	Loop—Antenna loop L1
18469	Plate—Bakelite mounting plate for electrolytic capacitor
72313	Resistor—Fuse type, 33 ohms R16
	Resistor—Fixed composition resistors:
	150 ohms, ±10%, ½ watt R14, R17
	270 ohms, ±10%, ½ watt R1
	1,000 ohms, ±10%, 1 watt R15
	22,000 ohms, ±10%, ½ watt R2
	56,000 ohms, ±10%, ½ watt R9
	82,000 ohms, ±10%, ½ watt R4
	220,000 ohms, ±10%, ½ watt R12
	270,000 ohms, ±10%, ½ watt R6, R7
	470,000 ohms, ±10%, ½ watt R13
	2.2 megohm, ±10%, ½ watt R3, R8
	3.3 megohm, ±10%, ½ watt R5
	10 megohm, ±10%, ½ watt R11
*74701	Shaft—Tuning knob shaft and pulley
73584	Shield—Tube shield for 12AV6
70827	Socket—Tube socket, octal, wafer
73117	Socket—Tube socket
72998	Socket—Dial lamp socket and lead
74038	Spring—Drive cord spring
*74676	Switch—Function switch S1
74677	Transformer—Output transformer T3
73488	Transformer——First I.F. transformer T1
73037	Transformer—Second I.F. transformer T2
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLIES Stamped 92585-1
*74706	Speaker 5" x 7" elliptical P. M. speaker **Note:** If stamping on speaker does not agree with above number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
Y2137	Cabinet—Plastic cabinet—maroon
*74713	Clamp—Dial clamp (2 required)
73508	Clip—Spring clip for knob
*74719	Clip—Spring clip for radio compartment back panel (2 required)
74192	Connector—3 contact male connector for shielded pickup cable
74682	Decal—Function switch decal
74273	Decal——Trade mark decal
74722	Dial—Dial scale
74674	Emblem—"RCA Victor" emblem
72894	Foot—Rubber foot (4 required)
*74707	Grille—Metal grille
74210	Knob—Reject knob
*74710	Knob—Volume control or tuning knob
*74711	Knob—Function switch knob
72692	Hinge—Cabinet lid hinge (2 required)
74709	Indicator—Station selector indicator
71116	Lamp—Dial lamp
*74940	Lever—"Start-Reject" actuating lever
*74720	Lid—Cabinet lid
*74717	Mask—End mask for dial (2 required)
*74708	Motif—Decorative motif for front of cabinet
*74623	Mounting—One set of hardware consisting of 3 rubber grommets, 3 flat washers, and 3 eyelets to mount record changer
*74715	Panel—Radio compartment back panel
*74721	Plate—Dial back plate, less dial
74212	Nut—Speed nut for reject knob
*74712	Nut—Speed nut for "Start-Reject" actuating lever
72765	Nut—Speed nut to fasten motif (1 required) or to fasten dial (2 required)
73728	Screen—Ventilation screen (2 7/16" x 1¼") (2 required)
*74716	Screw—#6-32 x ¼" cross-recessed oval head machine screw for lid support (4 required) or radio compartment back panel (3 required)
14270	Spring—Retaining spring for function switch knob
*74718	Spring—Return spring for "Start-Reject" actuating lever
71824	Stud—Stud and screw to mount lid hinge (1 set) (2 required)
*74714	Support—Lid support

† Stock No. 72953 is a reel containing 250 feet of cord.

* This is the first time this stock number has appeared in Service Data.

REL MODELS 646B, 647B AND 648B FM BROADCAST RECEIVERS 88 TO 108 MC.

These receivers are single superheterodyne units of orthodox circuit and design. As with all VHF receiving equipment, performance is dependent on correct installation, particularly the associated antenna and lead-in system.

The nominal impedance at the antenna terminals (marked A - A) is 150 ohms. Both 70 and 300 ohm lines may be used here without serious mismatch consequences. Whether or not the ground terminal (marked G) is used depends on local conditions. Because of uncertainties in this connection and because the input circuit coupling is fairly tight, the latter is not precisely tracked at the factory. For very weak signals or for technical use at any one frequency, this circuit may be trimmed by adjusting C1. This is accessible at the top of the chassis and is located as shown in the tube layout sketch.

For convenience in tuning and rough measuring the circuits are adjusted so that one small division of the TUNE meter corresponds to a frequency shift of about 20 kilocycles, and so that the steps of the RF GAIN control are roughly ten to one each. Indications on the SIGNAL meter are approximately linear. Both these meters may be supplemented externally by use of the connections on the rear terminal board. The TUNE meter is 25-0-25 microamperes, and the SIGNAL is 0-1 milliampere.

To use external meters, remove the strap between terminals 4 and 5 and the ground bus from terminal 5, then connect the TUNE meter between terminals 5 and 1 (ground) and the SIGNAL meter between terminal 4 and 1. If only one of these meters are connected externally, the terminal for the second meter must be connected to terminal 1.

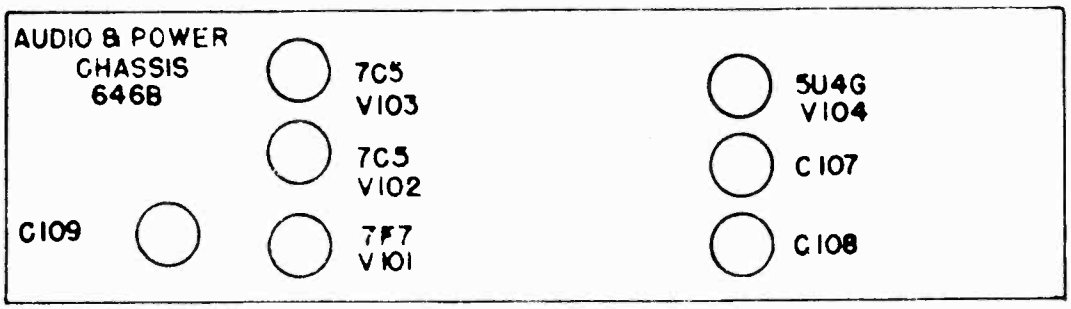
Terminals are provided for connecting an external signal to the audio amplifier input and selecting this signal by means of the switch on the front panel. Terminal 2 is high and terminal 1 is ground. These terminals represent an AC impedance of about one megohm and 30 micro-microfarads. For the 646B about 2V. RMS input is required for full audio amplifier output.

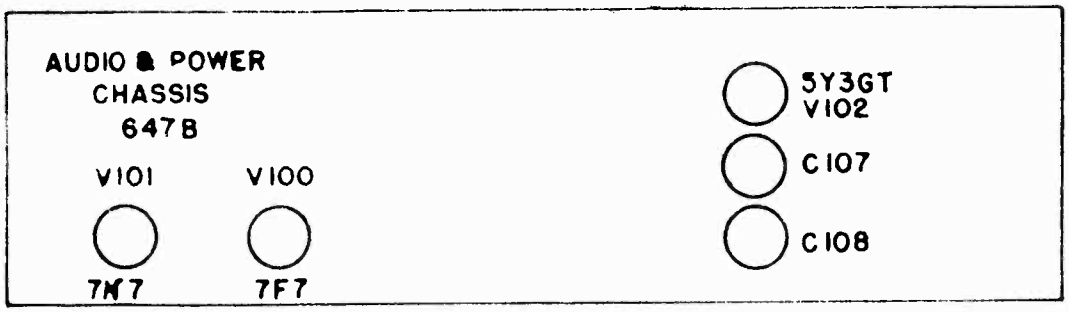
The 646B and 647B receivers are designed for operation at 115 volts. They should not be operated permanently on lines higher than 125 volts. The 648 receiver requires at least 5.8 volts DC at the indicated terminals. They are connected for negative ground. If the vehicle has a positive ground system the vibrators must be reoriented according to the legend on the top of the Vibrapacks.

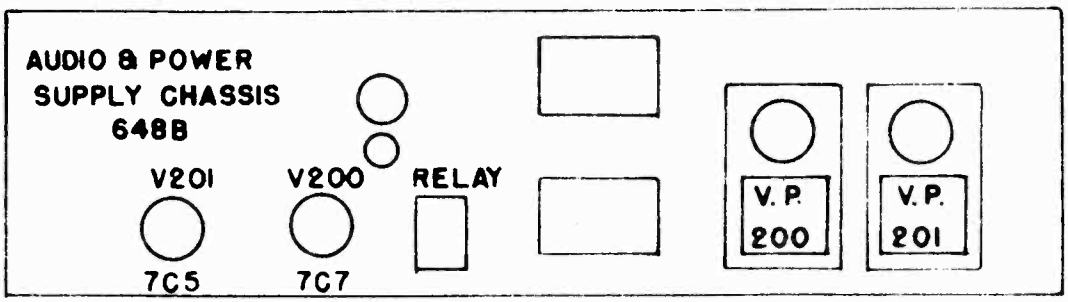
The maximum audio output of the 646B receiver is ten watts into either 500 or 8 ohms (mismatch up to 2 to 1 here is not generally aurally serious). The maximum output of the 647B receiver is + 18 DBM into 600 or 150 ohms. This receiver is connected for 600 ohm load; to use with 150 ohm load the output transformer should be restrapped by replacing strap from 5 to 6 by a strap from 4 to 6 and another from 5 to 7. The maximum audio output of the 648B receiver is 4 watts into 6 ohms.

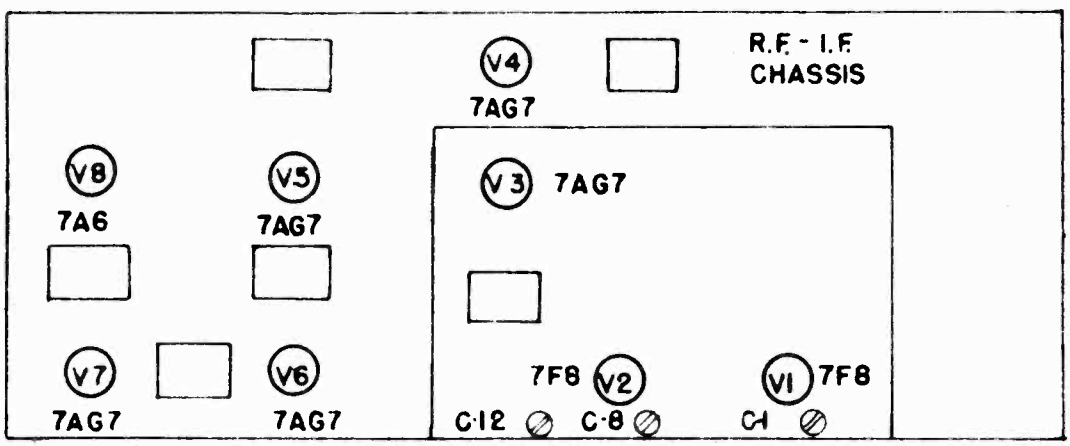
MODELS 646B,
647B, 648B

CHASSIS TUBE AND TRIMMER LAYOUT

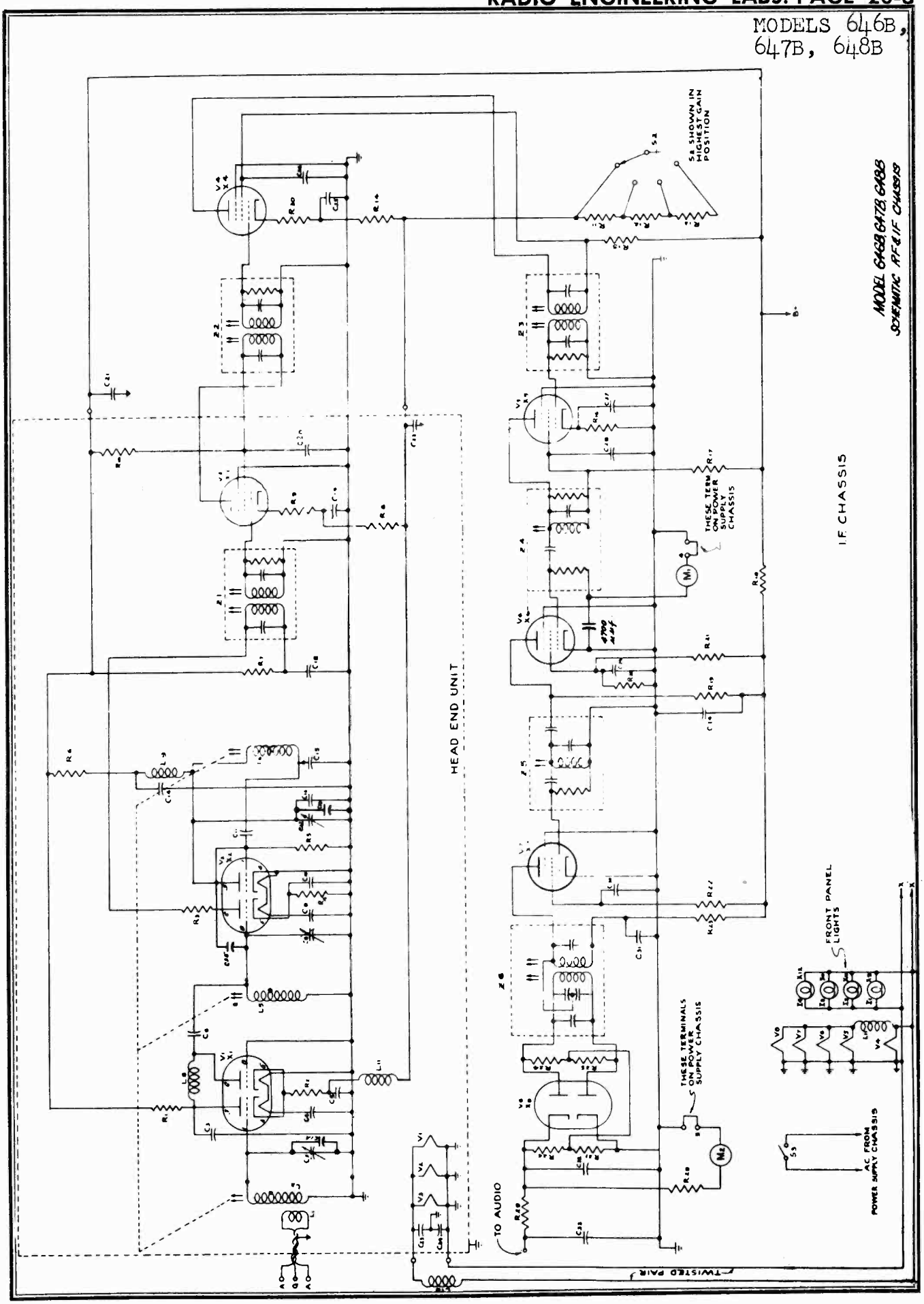




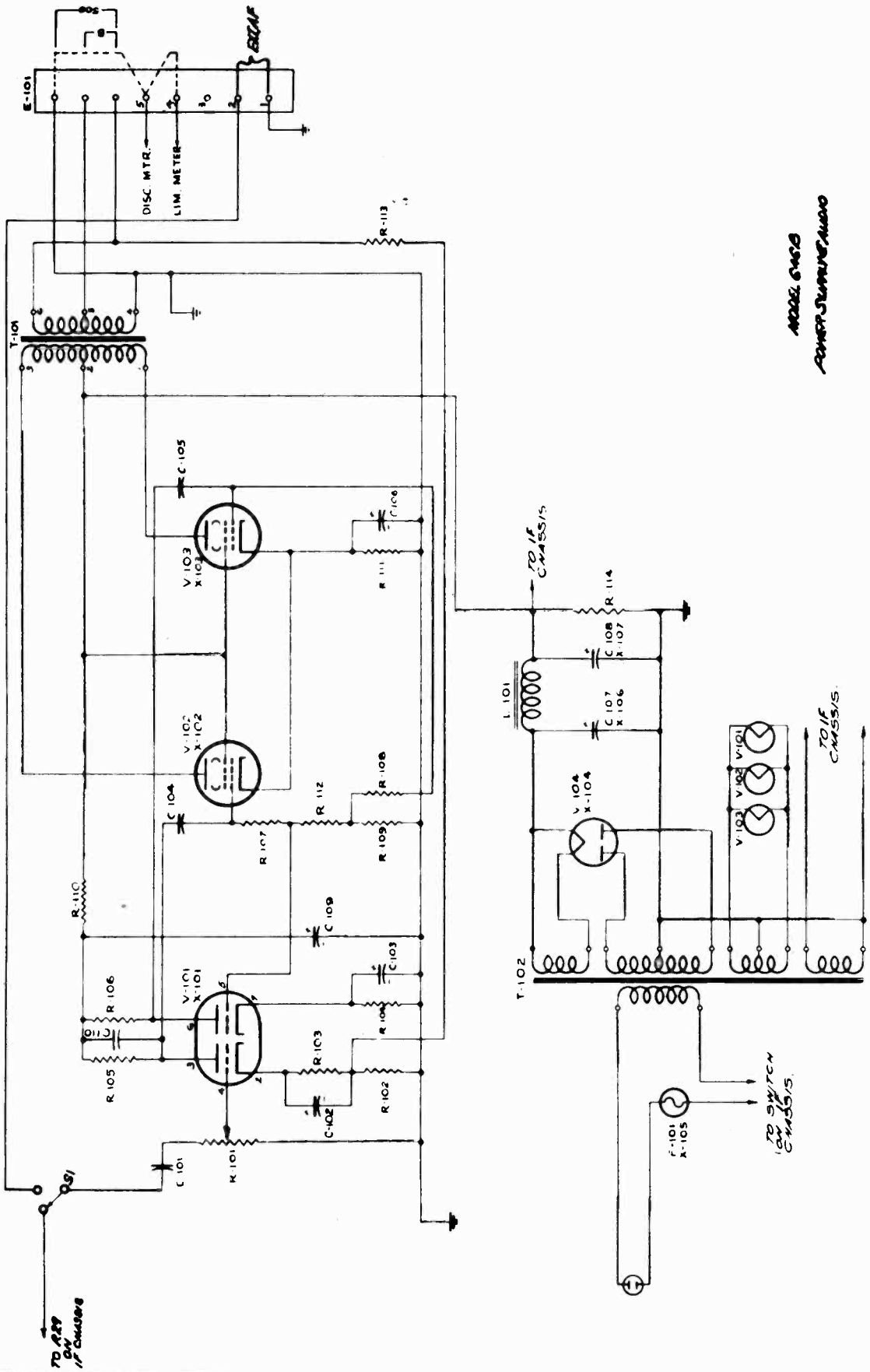




MODELS 646B, 647B, 648B



MODEL 646B



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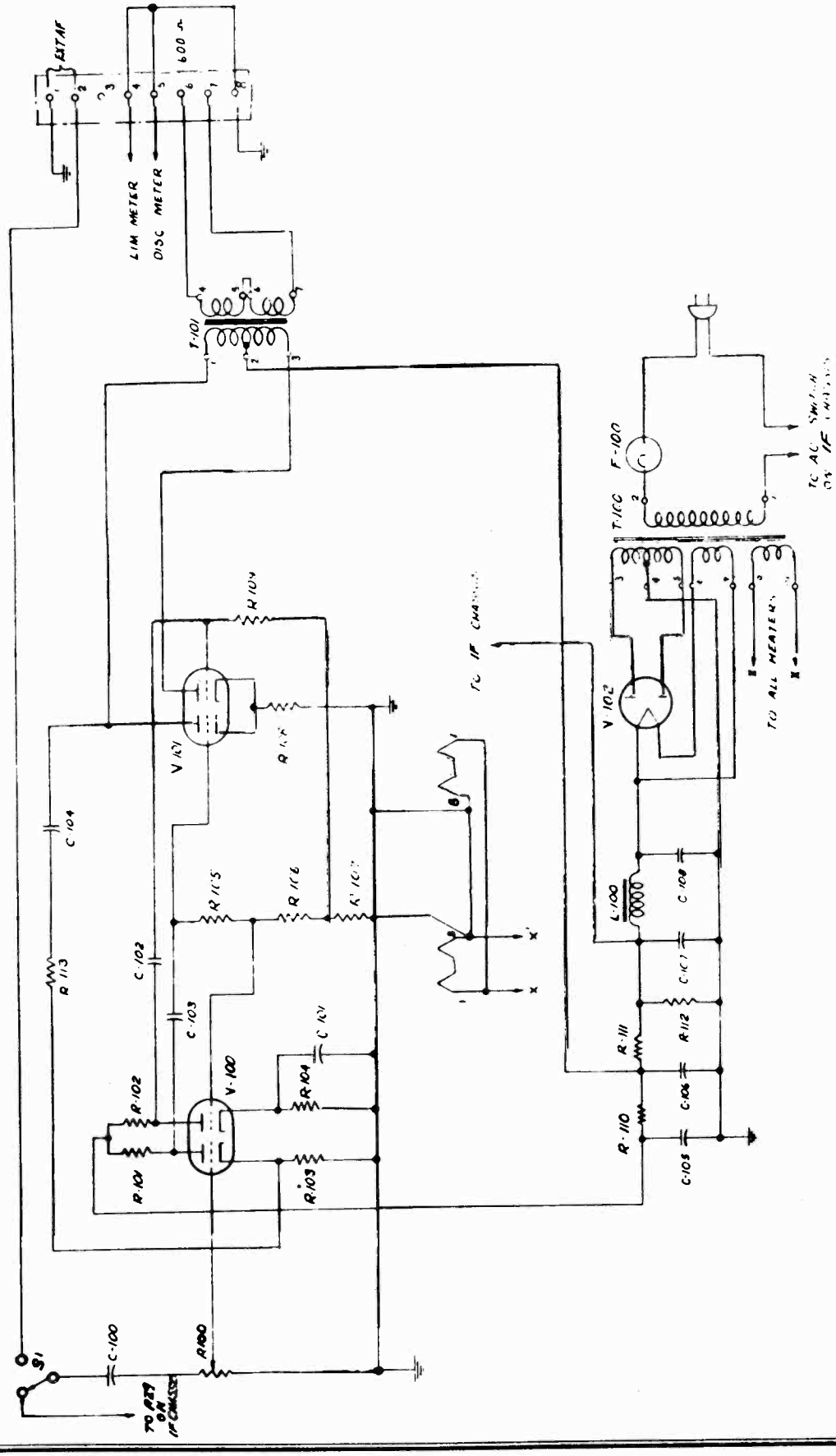
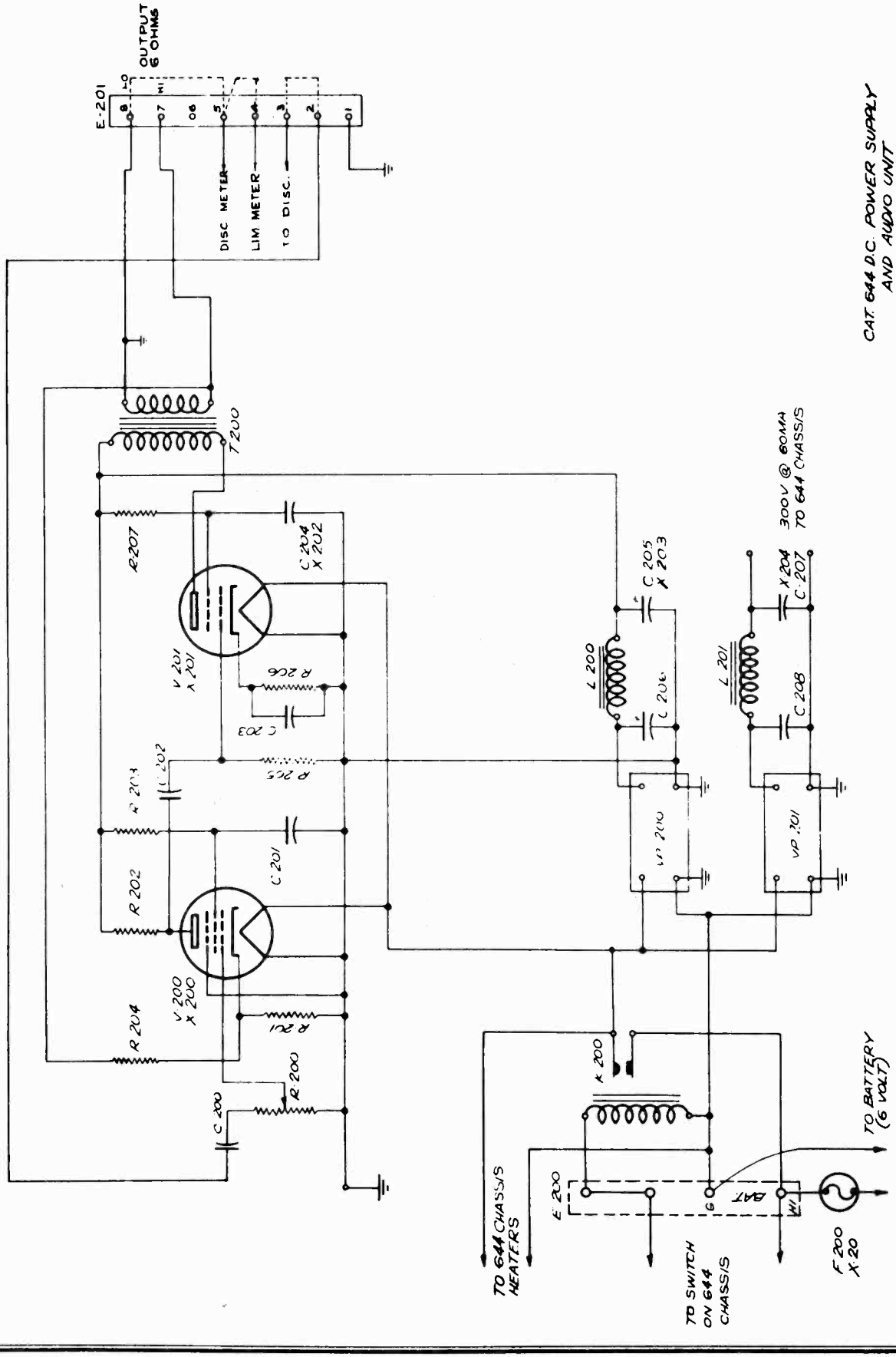


MODEL 648B



MODEL 646B, 647B and 648B FM RECEIVER PARTS LIST FOR RF AND IF CHASSIS

SYMBOL REF.	DESCRIPTION
C1	Capacitor, glass, variable 1-12 mmfd., 500 VDCW
C1A	Capacitor, ceramic, 4.7 mmfd.
C2	Not used
C2A	Not used
C3	Capacitor, 500 mmfd., ±20%, 500 VDCW
C4	Capacitor, 1200 mmfd., ±20%, 300 VDCW
C5	Same as C4
C6	Capacitor, 47 mmfd., ±10%, 500 VDCW
C7	Not used
C7A	Not used
C8	Same as C1
C9	Same as C4
C10	Same as C4
C11	Capacitor, 22 mmfd., ±10%, 500 VDCW
C12	Same as C1
C13	Capacitor, 20 mmfd., ±10%, 500 VDCW, N375
C14	Same as C3
C15	Same as C11
C16	Capacitor, 22 mmfd., ±5%, 500 VDCW
C17	Not used
C18	Capacitor, 4700 mmfd., 600 VDCW
C19) C20) C21)	Same As C18
C21A	Capacitor, 500 mmfd.
C22) C23) C24)	Same as C4
C25) C26) C27) C28) C29) C30) C31)	Same as C18
C32	Same as C6
C33	Capacitor, 470 mmfd. ±10%, 500 VDCW
C34	Same as C18
C35	Capacitor, 1.0 mmfd. ±20%

SYMBOL REF.	DESCRIPTION
I1	Pilot light, miniature bayonet base, 6-8 volts, .15 amps.
I2) I3) I4)	Same as I1
L1)	Antenna and first grid
L2)	Coil assembly
L3	Not used
L4	Not used
L5	Mixer grid coil
L6	Oscillator coil
L7	Not used
L8	Choke, 3 Microhenries, ±25%
L9) L10) L11)	Same as L8
M1	Signal strength meter, 0-1 ma.
M2	Tuning meter, 25-0-25 microamps.
R1	Resistor, 4700 ohms, ±10%, 1 watt
R2	Resistor, 270 ohms, ±10%, 1/2 watt
R3	Resistor, 100 ohms, ±10%, 1/2 watt
R4	Resistor, 1500 ohms, ±10%, 1/2 watt
R5	Resistor, 15,000 ohms, ±10%, 1/2 watt
R6	Resistor, 39,000 ohms, ±10%, 1 watt
R7	Resistor, 220,000 ohms, ±10%, 1/2 watt
R8	Resistor, 150 ohms ±10%, 1/2 watt
R9	Resistor, 47 ohms, ±10%, 1/2 watt
R10	Resistor, 1000 ohms, ±20%, 1/2 watt
R11	Resistor, 330 ohms, ±10%, 1/2 watt
R12	Resistor, 560 ohms, ±10%, 1/2 watt
R13	Resistor, 820 ohms, ±10%, 1/2 watt
R14	Same as R8

MODELS 646B, 647B, 648B

MODEL 646B, 647B and 648B FM RCVR PARTS LIST FOR RF AND IF CHASSIS(CONT'D)

SYMBOL REF.	DESCRIPTION
R15	Same as R10
R16	Resistor, 100,000 ohms, ±10%, 1/2 watt
R17	Same as R10
R18	Same as R10
R19	Resistor, 100,000 ohms, ±10%, 1 watt
R20	Resistor, 47,000 ohms ±10%, 1 watt
R21	Same as R20
R22	Resistor, 47,000 ohms, ±10%, 1/2 watt
R23	Resistor, 68,000 ohms, ±10%, 1 watt
R24	Resistor, 10,000 ohms, ±10%, 1/2 watt
R25	Same as R24
R26	Resistor, 33,000 ohms, ±10%, 1/2 watt
R27	Same as R26
R28	Resistor, 470,000 ohms, ±10%, 1/2 watt
R29	Resistor, 150,000 ohms, ±10%, 1/2 watt
R30	Same as R9
S1	Not used
S2	Switch, tap, 3 pole, 4 position
S3	Switch, single pole, single throw, rotary
V1	Type 7F8 tube
V2	Same as V1
V3	Type 7AG7 tube
V4) V5) V6) V7)	Same as V3
V8	Type 7A6 tube
X1	Socket, octal, mica filled Bakelite
X2) X3) X4) X5) X6) X7) X8)	Same as X1
X9	Miniature, bayonet type socket
X10) X11) X12)	Same as X9
Z1	Interstage coupling unit, 10.7 mc.
Z2	Interstage coupling unit, 10.7 mc.
Z3	Same as Z1
Z4	Interstage coupling unit, D. 10.7 mc.
Z5	Interstage coupling unit, 10.7 mc.
Z6	Discriminator assembly unit, 10.7 mc.

MODEL 646B COMBINED AUDIO & POWER SUPPLY CHASSIS

SYMBOL REF.	DESCRIPTION
C101	Capacitor, fixed, paper, tubular, .05 mfd., 600 VDCW, ±20%.
C102	Capacitor, fixed, dry electrolytic, 25 mfd., 25 VDCW
C103	Same as C102
C104	Same as C101
C105	Same as C101
C106	Capacitor, fixed, dry electrolytic, 25 mfd., 50 VDCW
C107	Capacitor, fixed, electrolytic, 20 mfd., 475 VDCW
C108	Capacitor, fixed, electrolytic, 40 mfd., 475 VDCW
C109	Capacitor, fixed, electrolytic, 10 mfd., 475 VDCW
C110	Capacitor, fixed, mica 300 mmfd., ±20%, 500 VDCW

MODEL 646B COMBINED AUDIO & POWER SUPPLY CHASSIS (CONT'D)

SYMBOL REF.	DESCRIPTION
F101	Fuse, 2 ampere, 250 volts
L101	Choke, 10 henries, 0.160 amps
R101	Resistor, variable, composition, 1 megohm, Z taper standard shaft
R102	Resistor, 220 ohms, 1/2 watt, ±10%
R103	Resistor, 2700 ohms, 1/2 watt, ±10%
R104	Same as R103
R105	Resistor, 18,000 ohms, 1/2 watt, ±10%
R106	Same as R105
R107	Resistor, 330,000 ohms, 1/2 watt, ±10%
R108	Same as R107
R109	Resistor, 100,000 ohms, 1/2 watt, ±10%
R110	Resistor, 4700 ohms, 1 watt, ±10%
R111	Resistor, 220 ohms, 10 watts, ±5%
R112	Same as R110
R113	Resistor, 10,000 ohms 1 watt, ±10%
R114	Resistor, 150,000 ohms, 2 watts, ±10%
S101	Switch, rotary, SPDT
T101	Transformer, output, Pri. 10,000 ohms CT, 12 Ma. DC unbalance, push-pull windings, balanced at high audio frequencies, Sec. 8/500 ohms, Max operation level 10 watts
T102	Transformer, power, Prl, 115 volts, 50/60 cycles, single phase, Sec. #1. 320-0-320 volts RMS at 0.160 amp. Sec. #2, 5 volts at 3 amps., Sec. #3. 6.3 volts, Sec. #4, 6.3 volts CT at 1.5 amp.
V101	Tube, type 7F7
V102	Tube type 7C5
V103	Same as V102
V104	Tube type 5U4G
X101	Socket, loctal, mica-filled bakelite
X102	Same as X101
X103	Same as X101
X104	Socket, octal, mica-filled bakelite
X105	Fuse holder, molded black bakelite, finger operated

MODEL 647B COMBINED AUDIO & POWER SUPPLY CHASSIS

SYMBOL REF.	DESCRIPTION
C100	Capacitor, .05 mfd., 600 VDCW
C101	Capacitor, electrolytic, 50 mfd., 25 VDCW
C102	Same as C100
C103	Same as C100
C104	Capacitor, 125 mfd., 600 VDCW
C105	Capacitor, electrolytic, dual 20 mfd., 450 VDCW
C106	Part of C105
C107	Capacitor, electrolytic, 40 mfd., 475 VDCW
C108	Capacitor, electrolytic, 20 mfd., 475 VDCW
F100	Fuse, glass, 1 amp., 250 volts
L100	Choke, 10 henries at 0.100 amp.
R100	Resistor, variable, 1 megohm, ±10%, 1/2 watt, "Z" taper, clarostat 37
R101	Resistor, 100,000 ohms, ±10% 1/2 watt
R102	Same as R101
R103	Resistor, 2200 ohms, ±10%, 1/2 watt
R104	Same as R103
R105	Resistor, 330,000 ohms, ±10%, 1/2 watt
R106	Resistor, 4,700 ohms, ±10%, 1/2 watt
R107	Same as R101
R108	Resistor, 680 ohms, ±10%, 1/2 watt
R109	Same as R105
R110	Resistor, 27,000 ohms, ±10%, 1/2 watt
R111	Resistor, 1500 ohms, ±10%, 1 watt

MODELS 647B, 648B

MODEL 647B COMBINED AUDIO & POWER SUPPLY CHASSIS (CONT'D)

SYMBOL REF.	DESCRIPTION
R112	Resistor, 100,000 ohms, ±10%, 2 watts
R113	Resistor, 68,000 ohms, ±10%, 1/2 watt
S100	Switch, rotary, SPDT
T100	Transformer, power, Pri, 115 volts, 50/60 cycles, single phase, Sec. #1, 310-0-310 volts RMS at 0.1 amp., Sec. #2, 5 volts at 2.0 amp., Sec. #3, 6.3 volts at 2.5 amps.
T101	Transformer, output, Pri. 16,000 ohms, CT: 6 Ma. DC unbalance, push-pull windings balanced for high audio frequencies, Sec. 600/150 ohms Max. operation level +26 d b m
V100	Tube type 7F7
V101	Tube type 7N7
V102	Tube type 5Y3GT
X100	Socket, loctal, mica-filled bakelite
X101	Same as X100
X102	Socket, loctal, mica-filled bakelite
X105	Fuse holder, molded black bakelite, finger operated

MODEL 648B COMBINED AUDIO AND POWER SUPPLY CHASSIS

SYMBOL REF.	DESCRIPTION
C200	Capacitor, .05 mfd., 600 VDCW, ±20%
C201	Capacitor, 0.1 mfd., 600 VDCW, ±20%
C202	Capacitor - Same as C200
C203	Capacitor, 50 mfd., 50 VDCW
C204	Capacitor, 3 section, 10-10-10 mfd., 450 VDCW
C205	Capacitor, dual, 40-40 mfd., 450 VDCW
C206	Capacitor - Part of C204 (10 mfd. section)
C207	Capacitor - Part of C205 (40 mfd. section)
C208	Capacitor - Part of C204 (10 mfd. section)
F200	Fuse, 20 amp. *Littlefuse type 4AG
K200	Relay, filament-single pole, normally open, DC operation
L200	Choke, filter, smooth, 10 henries
L201	Same as L1
R200	Resistor, variable, .5 megohms, 20% accuracy, 1/2 watt
R201	Resistor, 560 ohms 1/2 watt, ±10%
R202	Resistor, 100,000 ohms, 1 watt, ±10%
R203	Resistor, 680,000 ohms, 1/2 watt, ±10%
R204	Resistor, 1000 ohms, 1/2 watt, ±10%
R205	Resistor, 390,000 ohms, 1/2 watt, ±10%
R206	Resistor, 330 ohms, 1 watt, ±10%
R207	Resistor, 15,000 ohms, 1 watt, ±10%
T200	Transformer, output, single 7C5 to loudspeaker
V201	Tube type 7C5
VP200	Vibrapack, audio supply
VP201	Vibrapack - (receiver supply) - Same as VP200
X200	Socket, loctal, mica-filled bakelite
X201	Socket - Same as X200
X202	Fuse holder

ALIGNMENT PROCEDURE

The following alignment procedure is for use only by competent service men having the proper equipment. Re-alignment is very seldom needed and is usually only required after some major part has been replaced because of damage to the receiver.

The equipment required for re-aligning this receiver is an output meter and a modulated source of radio frequency (a signal generator or microvolter). This source of radio frequency must be accurately calibrated in frequency and must have a method of varying the output.

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while still giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a .5 M.F. condenser and a resistance of such a value as to make the total meter resistance approximately 10,000 ohms, to the two small pins of the speaker plug. The output meter remains connected during the entire alignment procedure.

Connect the signal generator to the grid cap of the 6A7 tube through a .1 M.F. condenser. Connect the ground of the generator to the ground lead of the receiver. With the wave switch on broadcast position and the dial set to about 1000 K.C., feed in a 456 K.C. signal. Adjust the trimmers on top of the first and second I.F. transformers until the maximum output is obtained. This aligns the I.F.

Leaving the signal generator connected to the grid cap of the 6A7, turn the wave switch to the right hand (short wave) position. Set the dial and the signal generator to 15.0 M.C. Tune in the signal by adjusting the 15.0 M.C. oscillator trimmer. The signal will he heard at two different settings of the trimmer. The proper setting is the one where the signal is heard when the trimmer is the loosest. Also when the dial of the receiver is turned the signal will be heard again at about 14.0 M.C. If the signal is heard at about 16.0 M.C. on the dial instead of 14.0 M.C. the wrong setting has been used and should be corrected.

Set the wave switch on broadcast position and turn the dial to the extreme high frequency end. Feed a 1680 K.C. signal to the receiver antenna post through a .00025 M.F. mica condenser. Adjust the 1680 K.C. broadcast oscillator trimmer for maximum output. Set the generator to 1500 K.C. and tune in this signal on the receiver. Then adjust the 1500 K.C. broadcast antenna trimmer and the 1500 K.C.broadcast preselector trimmer for maximum output. Set the generator to 600 K.C. and adjust the 600 K.C. broadcast oscillator pad to maximum output **while tuning the receiver back and forth across the signal** from the generator. This completes the alignment of the broadcast band.

The police band is aligned by feeding a 4.0 M.C. signal to the receiver antenna lead through the .00025 condenser. Turn the wave switch to the center position and tune the receiver to this signal. Adjust the 4.0 M.C. police antenna trimmer for best output.

The short wave band is aligned in the same way using a 15 M.C. signal and adjusting the 15 M.C. short wave antenna trimmer after having turned the wave switch to the right hand position.

DESCRIPTION

This receiver is an 8 tube alternating current operated superheterodyne.

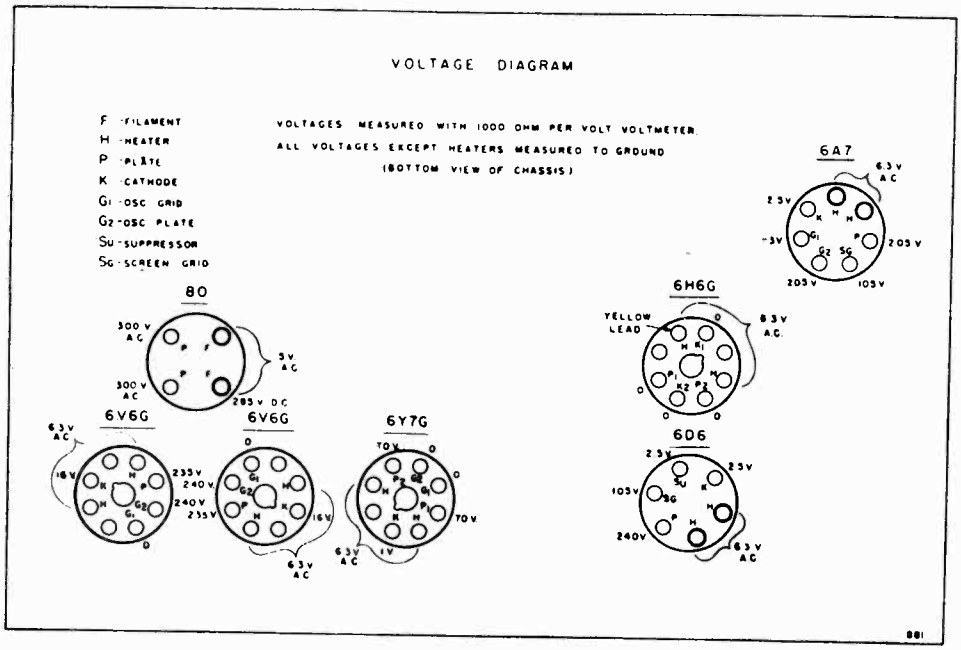
The tubes used are a 6A7 as oscillator modulator, a 6D6 as I.F. amplifier, a 6H6G as A.V.C. and audio rectifier, a 6Y7G as audio voltage amplifier, an 80 as a power rectifier, a 6G5 as tuning indicator and two type 6V6G tubes as push pull audio power amplifiers.

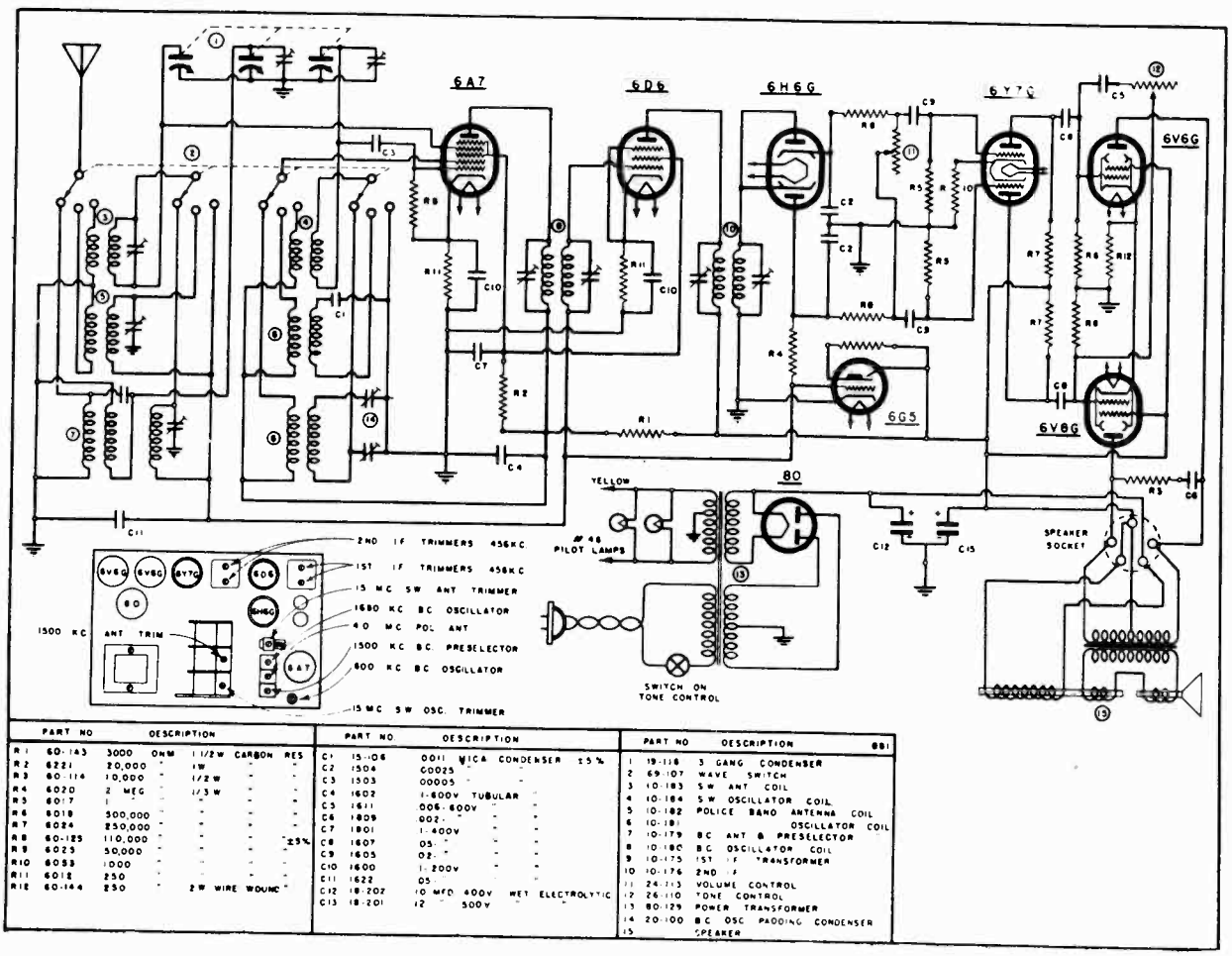
This receiver is made to cover 3 tuning bands, the standard broadcast band which ranges from 1680 K.C. to 535 K.C., the middle or police band which has a frequency range of from 5.4 M.C. to 1.7 M.C. and high frequency or foreign band which is from 19 M.C. to 5.0 M.C.

PARTS LIST

Part No.	Description
19-116	3 Gang Variable Condenser
69-107	Wave Switch
10-175	1st I.F. Transformer
10-176	2nd I.F. Transformer
10-183	S.W. Antenna Coil
10-184	S.W. Oscillator Coil
10-180	B.C. Oscillator Coil
10-182	Police Band Antenna Coil
10-181	Police Band Oscillator Coil
10-179	B.C. Ant. & Preselector Coil
80-129	Power Transformer (115 V. 50-60 Cycle)
18-201	12 M.F.D. Wet Electrolytic Condenser
18-202	10 M.F.D. Wet Electrolytic Condenser
24-113	Volume Control
26-110	Tone Control with Switch
20-100	B.C. Oscillator Padding Condenser
20-101	3 Gang Trimmer
79-231	6 inch Dynamic Speaker
79-224	12 inch Dynamic Speaker

MODELS D50,
D51, D53, D54



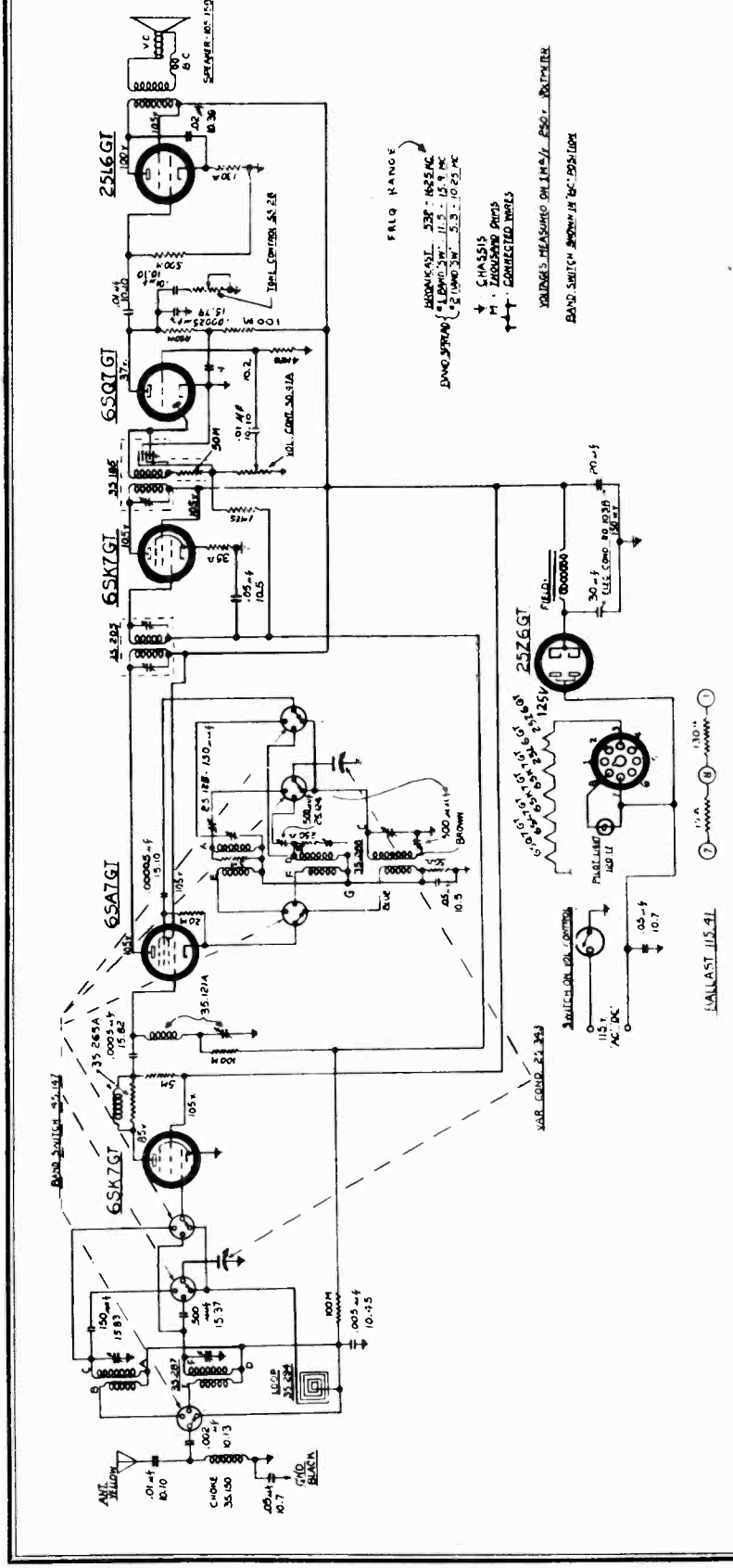


PART NO	DESCRIPTION
R1 60-143	3000 OHM 1 1/2W CARBON RES
R2 6221	20,000 " 1W " "
R3 60-114	10,000 " 1/2W " "
R4 6020	2 MEG " 1/3W " "
R5 6017	1 " " " "
R6 6018	500,000 " " " "
R7 6024	250,000 " " " "
R8 60-125	110,000 " " " ±5%
R9 6023	50,000 " " " "
R10 6033	1000 " " " "
R11 6018	250 " " " "
R12 60-144	250 " 2W WIRE WOUND "

PART NO	DESCRIPTION
C1 15-106	0011 MICA CONDENSER ±5%
C2 1504	00025 " "
C3 1503	00005 " "
C4 1602	1-600V TUBULAR "
C5 1611	006-600V " "
C6 1609	002- " " "
C7 1801	1-400V " "
C8 1607	05- " " "
C9 1605	02- " " "
C10 1600	1-200V " "
C11 1622	05- " " "
C12 18-202	10 MFD 400V WET ELECTROLYTIC
C13 18-201	12 " 500V " "

PART NO	DESCRIPTION 881
1 19-118	3 GANG CONDENSER
2 69-107	WAVE SWITCH
3 10-183	S.W. ANT. COIL
4 10-184	S.W. OSCILLATOR COIL
5 10-182	POLICE BAND ANTENNA COIL
6 10-181	OSCILLATOR COIL
7 10-179	B.C. ANT. & PRESELECTOR
8 10-180	B.C. OSCILLATOR COIL
9 10-175	1ST I.F. TRANSFORMER
10 10-176	2ND I.F. "
11 24-113	VOLUME CONTROL
12 26-110	TONE CONTROL
13 80-129	POWER TRANSFORMER
14 20-100	B.C. OSC. PADDING CONDENSER
15	SPEAKER

MODELS JS-188,
JS-189, JS-190



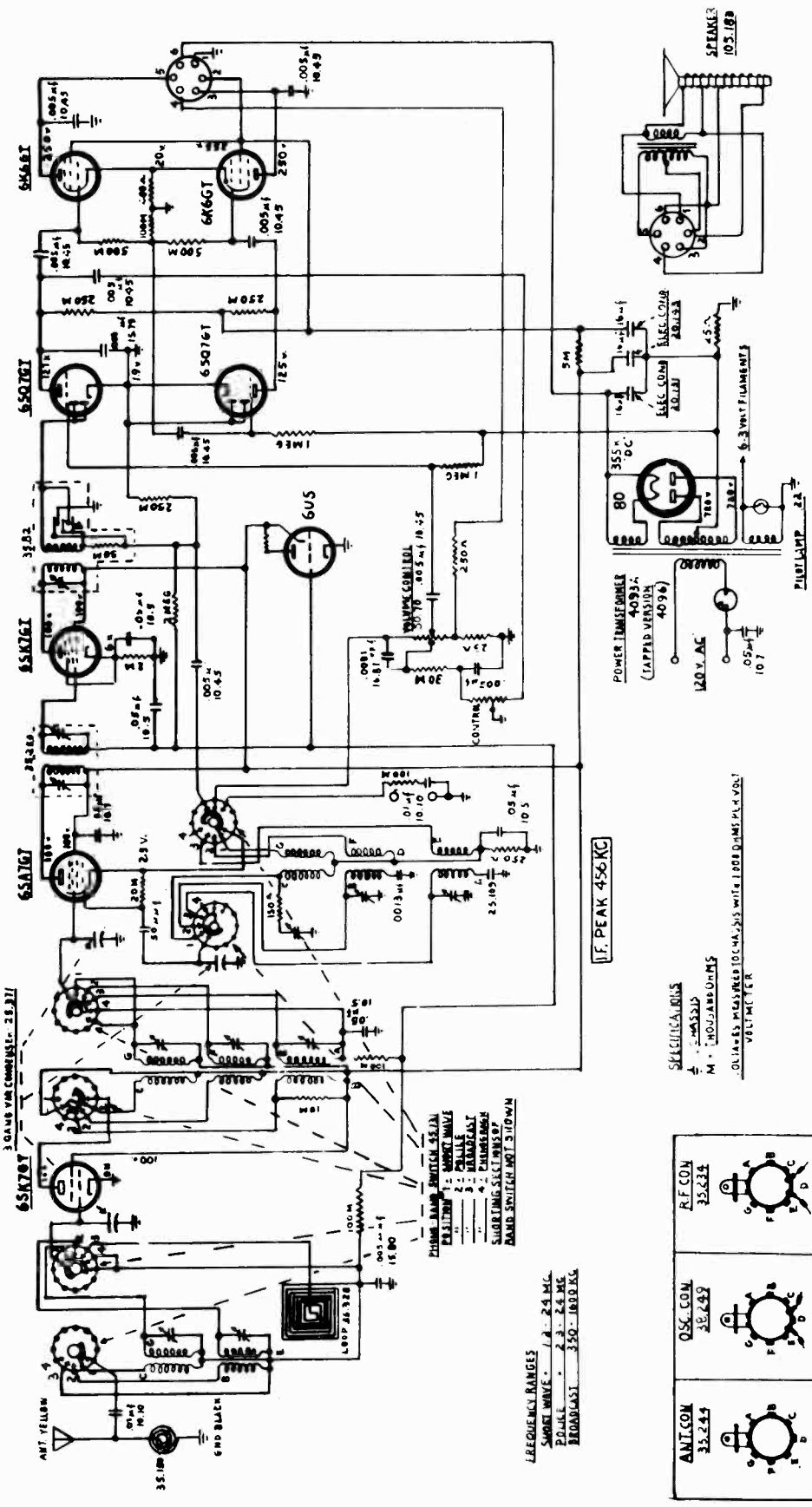
TUNING RANGE: 538 to 1625KC; 5.3 to 10.25MC; and 11.5 to 15.9MC covers regular American Broadcast stations, the high fidelity broadcast experimental stations, Amateurs, Aircraft and all regular International Short Wave Stations.

BAND SPREAD TUNING

Band Spread Tuning which is the feature of this series, allows ease of tuning on IMPORTANT International Short Wave Stations, particularly the 19-20 and 25 meter bands and 31-40 and 49 meter bands.

DIAL LAMP: Chassis uses one 6-8 Volt, 150M.A. Lamp. When replacing Dial Lamp use only similar Lamp or damage will result.

MODELS JS-191, JS-300



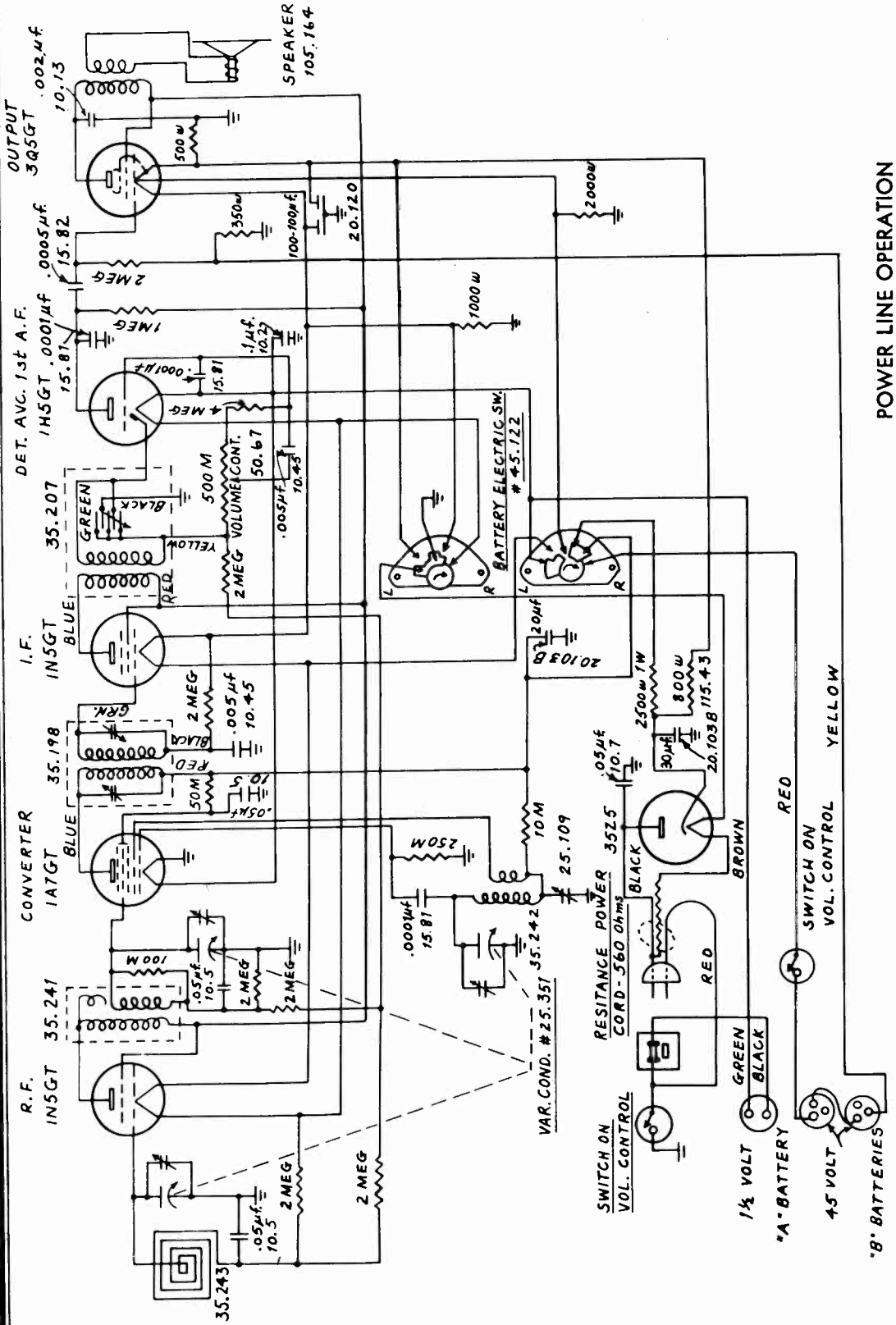
This model is a 9 tube (including tuning eye) three wave band Superheterodyne Receiver designed to operate on 105-125 Volts, 50-60 cycles Alternating Current (AC) only.

TUNING RANGE: 550 to 1600 kilocycles (KC) (Domestic Broadcast), 2.3 to 7.0MC (Megacycles) (Police Call Band), 7.5 to 24.MC (Megacycles) (International Short Wave).

DIAL LAMP: This model uses a 6-8 Volt, 250 M.A. dial lamp. When replacing this lamp use similar type or damage will result.

CAUTON: When Dial Lamp burns out, REPLACE AT ONCE.

MODELS JS-193, JS-256



POWER LINE OPERATION

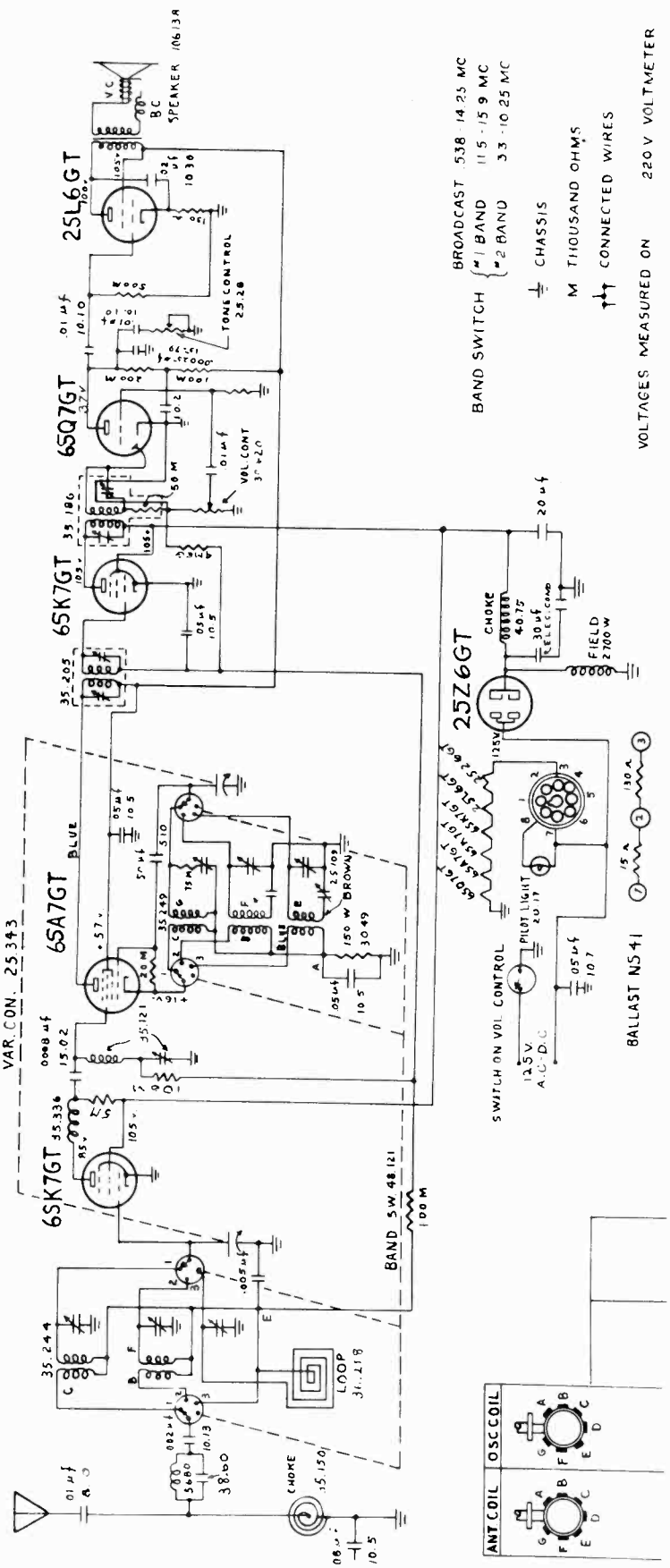
Release catch at top and drop rear cover of case. Remove Power Cord Plug from receptacle (automatically disconnecting batteries), uncoil Power Cord to its full length and close cover, allowing Cord to pass through notch in case. Insert Power Cord Plug into electric outlet and operate receiver as described above.

Allow 20 seconds for tubes to heat. If receiver fails to operate on D.C., or hums slightly on A.C., reverse Power Cord Plug.

This Six-tube Receiver is designed to operate on self-contained Battery Power Unit or 115 volts, 40 to 60 cycles, Alternating Current (AC) or 115 volts Direct Current (DC)

The tuning range, 540 to 1600 Kilocycles (555 to 187 meters) covers the regular broadcast and experimental high-fidelity broadcast stations.

MODEL JS-242



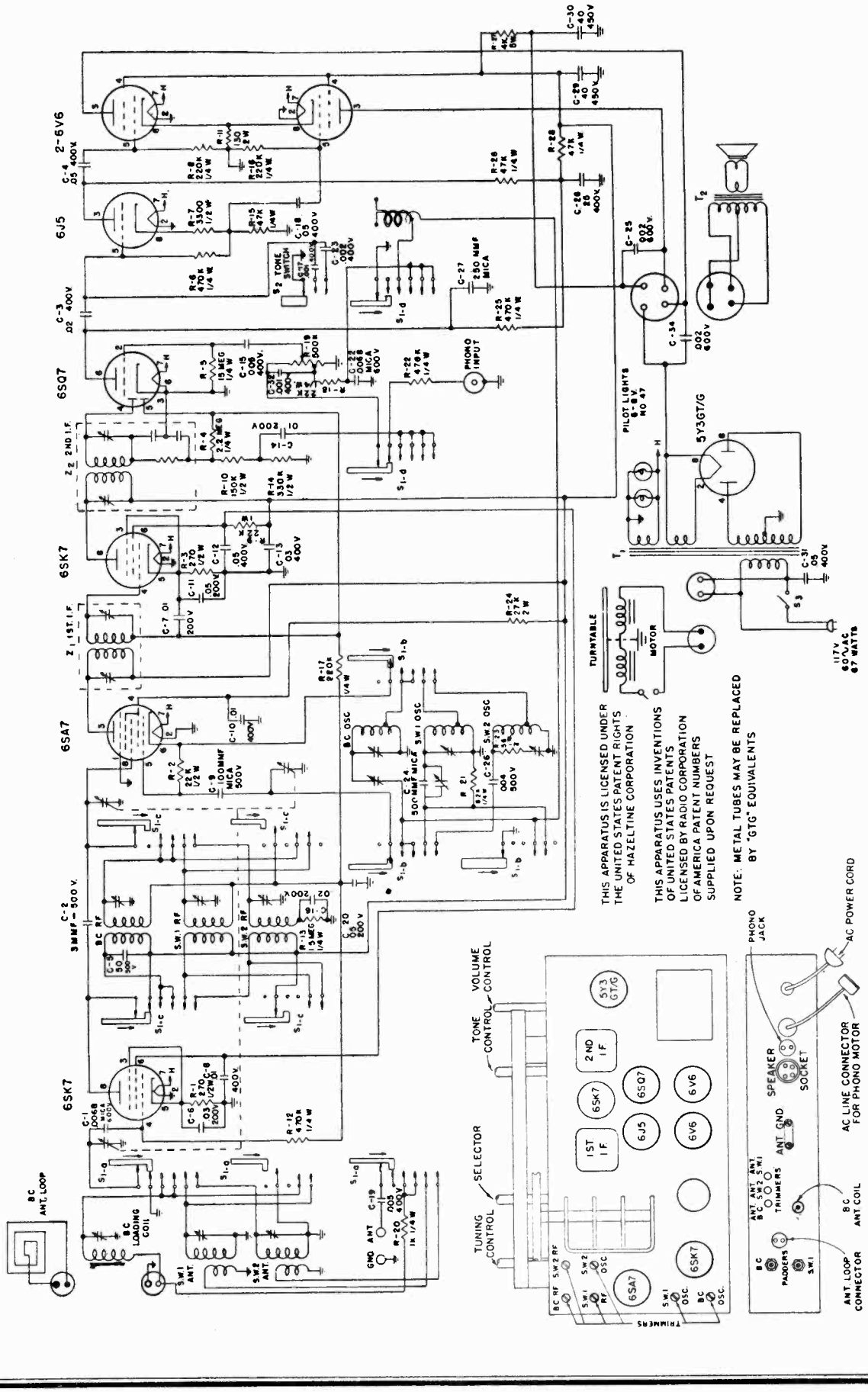
This is a 6 tube Plus Ballast AC-DC, 3 Wave Band Receiver.

TUNING RANGE: 538 to 1625KC; 5.3 to 10.25MC; and 11.5 to 15.9MG covers regular American Broadcast stations, the high fidelity broadcast experimental stations, Amateurs, Aircraft and all regular International Short Wave Stations.

SHORT WAVE RECEPTION: An external aerial is absolutely necessary for good reception on all Short Wave Bands. In installing an Antenna to be used with this receiver, every precaution should be observed to keep interfering noises at the minimum.

For connection to the Antenna, a YELLOW wire is brought out from the rear of the receiver.

MODEL M8



POWER SOURCE:

This receiver may be operated from either an AC or DC line, between 105 and 125 volts. On AC lines the frequency must be 50 to 60 cycles.

TUBE COMPLEMENT:

1 12BE6 — AM converter.
1 12BA6 — AM intermediate frequency amplifier.
1 12AT6 — AM demodulator and AVC; AM-FM 1st audio amplifier.
1 14F8 — FM oscillator-mixer-Super Regenerative I.F. amp.
1 35B5 — Audio output amplifier.
1 35W4 — Power rectifier.

INSTALLATION:

1. Antenna Connection.

AM—A self contained loop antenna is provided, which will give satisfactory reception on the standard broadcast band without requiring any additional external antenna. However, if stronger signals are desired from weak or distant stations an external antenna may be connected to the wire extending from the loop.

FM—A self contained line antenna system is provided for reception of stations appearing in the FM band. To use this line antenna a short wire jumper should be connected between the two outside screw terminals of the FM antenna panel, which is mounted on the broadcast loop antenna form. Should poor reception conditions make it necessary, an FM dipole antenna may be connected to the left hand and center screw terminals of the FM antenna panel. In such a case, the line antenna link should be disconnected.

2. Ground.

This set has been designed to operate without an external ground, and the use of any ground connection is not recommended.

3. Power Connection.

After making certain that the power circuit is rated between 105 and 125 volts extend the line cord to its full length and insert the plug into the nearest convenient outlet. If the supply is DC, and the set fails to operate, it may be necessary to reverse the plug connection to secure operation of the set.

SERVICE ADJUSTMENTS:

Alignment or adjustment of the various circuits of this receiver can only be made by a skilled radio technician with the proper equipment.

NOTE: Points A, B, C, D, E, and F are noted on the circuit diagram.

AM Equipment:

Equipment Required:
a) Broadcast Band Signal Generator.
b) Output Meter.

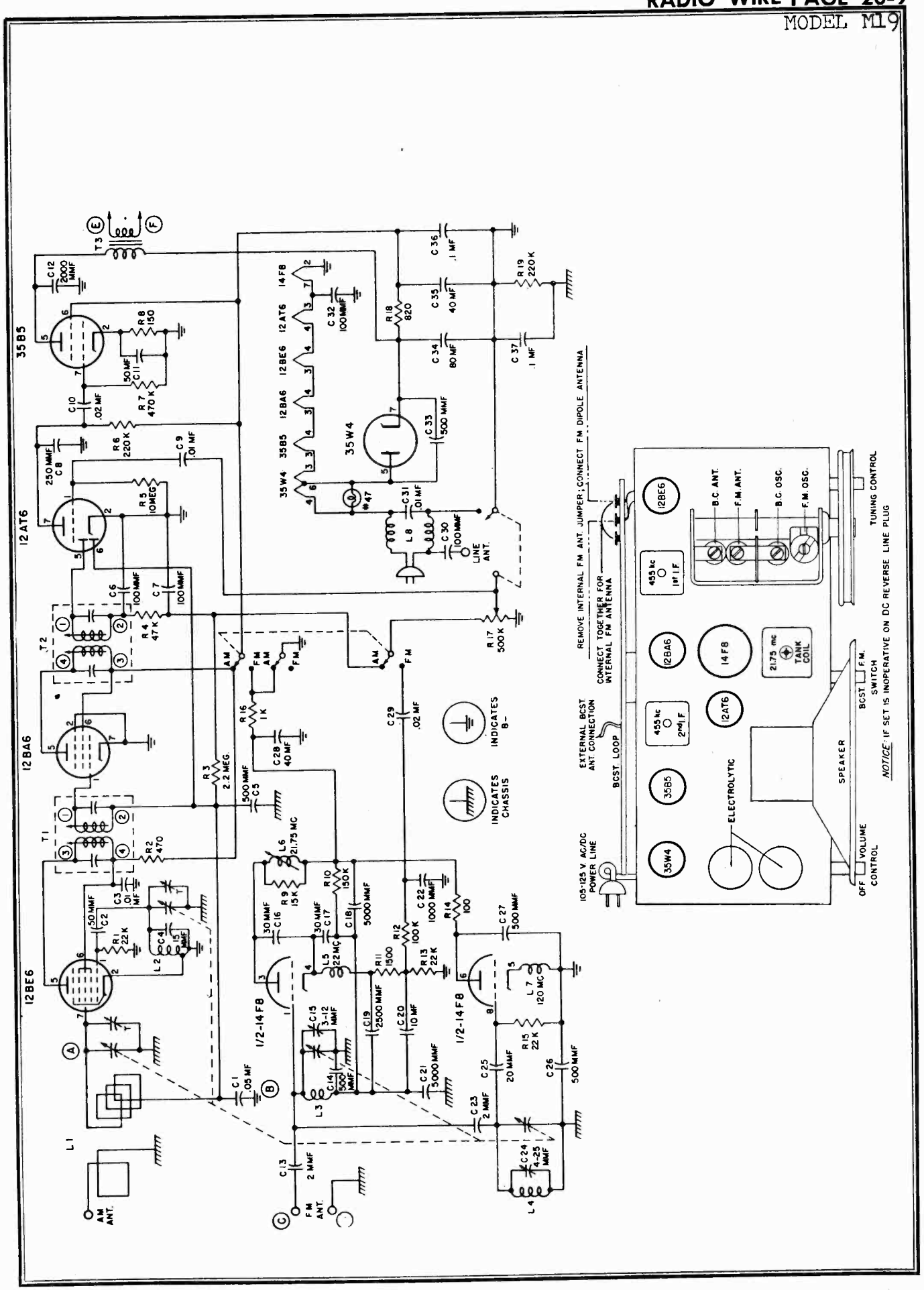
1. Set band switch at AM. Advance volume control to full volume setting.
2. Connect output meter across voice control at points "E" and "F".
3. Connect the "high" side of the Signal Generator to point "A" through a .01 mfd condenser. Connect the "ground" side to point "B". Adjust the Signal Generator to 455 kc and with the receiver switched on, adjust the first and second I.F. transformers for peak output as shown on the output meter. The signal injected into the receiver should be as small in magnitude as possible, consistent with a useful deflection on the output meter.
4. Connect the "high" side of the Generator to the antenna terminal with a 200 mmf condenser inserted in series. Connect the "ground" side of the Generator to point "B".
5. Tune receiver to 150 on the dial. Adjust Signal Generator to 1500 kc. Adjust BC oscillator and BC antenna trimmers for maximum output. Use a weak signal for final adjustment.

FM Equipment:

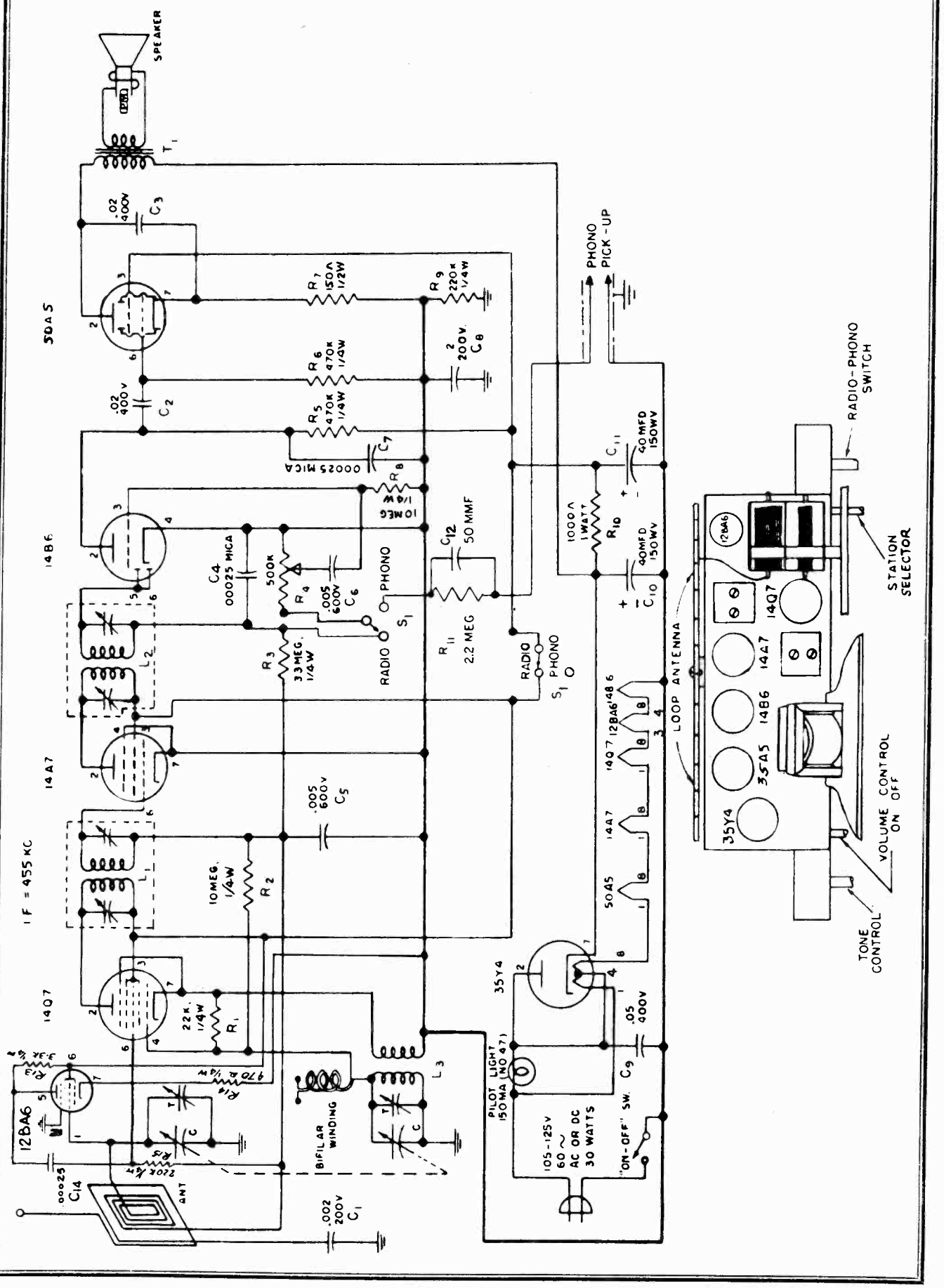
Equipment Required:
a) 21.75 kc oscillator.
b) FM Signal Generator for 88 to 108 megacycle range.
c) Output meter.

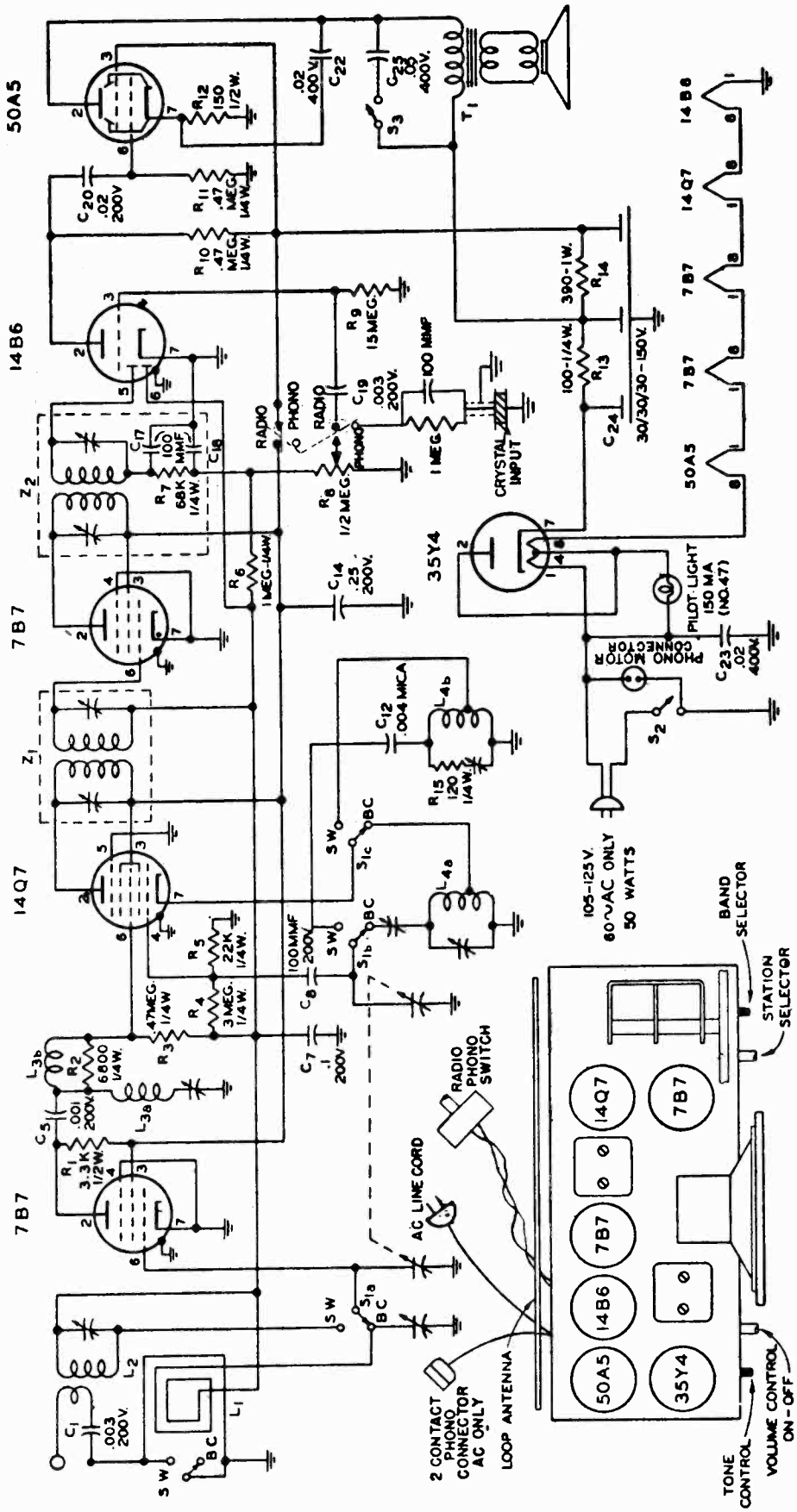
1. Connect output meter across points "E" and "F".
2. With set switched on and volume control at maximum, feed modulated 21.75 mc signal into terminals "C" and "D".
3. Adjust tank coil for maximum response on output meter.
4. Disconnect 21.75 kc oscillator and connect FM signal generator to points "C" and "D".
5. Set receiver dial to 88 megacycles and adjust Signal Generator for same frequency. Adjust spacing of FM oscillator coil for maximum signal response.
6. Tune receiver to 108 megacycles and adjust Signal Generator to same frequency. Adjust FM oscillator trimmer for maximum signal response.
7. Repeat operation 5 and 6.
8. Tune receiver to 90 megacycles and adjust Signal Generator for same frequency. Adjust spacing of the FM antenna coil for maximum signal response with minimum background noise. Slowly rock tuning control while performing this adjustment.
10. Repeat operations 8 and 9.

MODEL M19



MODEL M61





CAUTION: TO REPLACE TUBES, REMOVE SCREWS ON SLOPING BOARD IN CABINET & TILT BOARD BACK, AFTER FIRST REMOVING PLUG FROM CURRENT OUTLET

ALIGNMENT PROCEDURE

Correct alignment is of extreme importance in all-wave receivers. The receivers are properly aligned at the factory with precision equipment and realignment should not be attempted by the service technician until all other causes of faulty operation are corrected.

In order to properly realign the receiver the following equipment is necessary:

1. A signal generator which will provide an accurately calibrated signal at any frequency from 456 kilocycles to 18 megacycles. The generator should have adjustable signal output.

2. An output audio voltmeter of the low voltage type to be connected across the moving coil of the speaker. This should be capable of providing a readable deflection for relatively low output levels to avoid the effects of overload.

3. An insulated or non-metallic screw driver for the adjustment of trimmers.

I F ALIGNMENT 456 KC

1. Connect the output meter (low scale) across the loud speaker voice coil. Turn the wave band switch to broadcast position. Turn the volume control to its maximum position..

2. Connect the test oscillator ground to chassis and the "hot" lead from the test oscillator to the grid of the 6L7 converter tube through a series .1 Mfd. condenser. Set test oscillator to 456 KC.

3. Adjust I F alignment screws of second I F transformer adjacent to 6F6 power tube to maximum output, reducing output of test oscillator to keep the meter reading on scale as alignment proceeds.

4. Adjust alignment of first I F transformer, (directly behind tuning condenser) to maximum output as described above.

5. Readjust these trimmers for accurate alignment. Always use the lowest possible output from the test oscillator to preclude the possibility of automatic volume control action confusing proper adjustment.

NOTE: Since coils are used in series it is absolutely necessary to align the high frequency bands first, in the order indicated.

FOREIGN BAND 5.7 TO 18.5 MEGACYCLES

1. With test oscillator connected to the antenna and ground terminals through a 400 ohm resistor set oscillator at 16 megacycles.

2. Set the dial scale to 16 megacycles and adjust the oscillator trimmer condenser (C 4) to a resonance using the counterclockwise or low capacity point.

3. Adjust input circuit trimmer (C 5) to maximum response, rocking the gang condenser back and forth a degree or two to obtain proper maximum.

POLICE OR MIDDLE BAND 1.75 TO 5.8 MEGACYCLES

1. With the test oscillator connected as above set the oscillator and dial to 5.5 megacycles.

2. Adjust oscillator trimmer condenser (C 6) for maximum response using the counterclockwise or low capacity point.

3. Adjust input circuit trimmer (C 7) to maximum response rocking the gang condenser as described above.

BROADCAST BAND 535 TO 1800 KC

1. With test oscillator connected to antenna and ground through a 200 Mfd. condenser set oscillator and receiver dial to 1600 kilocycles.

2. Adjust broadcast oscillator trimmer (C 8) to obtain maximum response.

3. Adjust antenna circuit trimmer (C 9) for maximum output.

4. Adjust preselector trimmer (C 10) for maximum output.

5. Set test oscillator and dial to 600 kilocycles and tune in the signal, then adjust broadcast band padding condenser (C 11) for maximum output This padder is mounted on the aluminum coil deck near the panel and is adjusted through a hole provided in the back of the chassis pan. Rock the condenser back and forth a degree or two in order to obtain proper maximum.

6. Repeat the 1600 KC adjustments described above for greater accuracy.

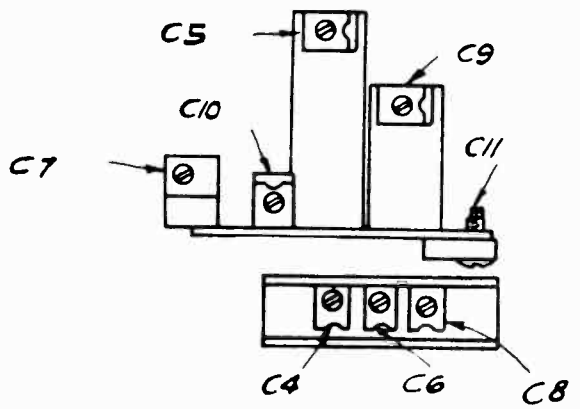
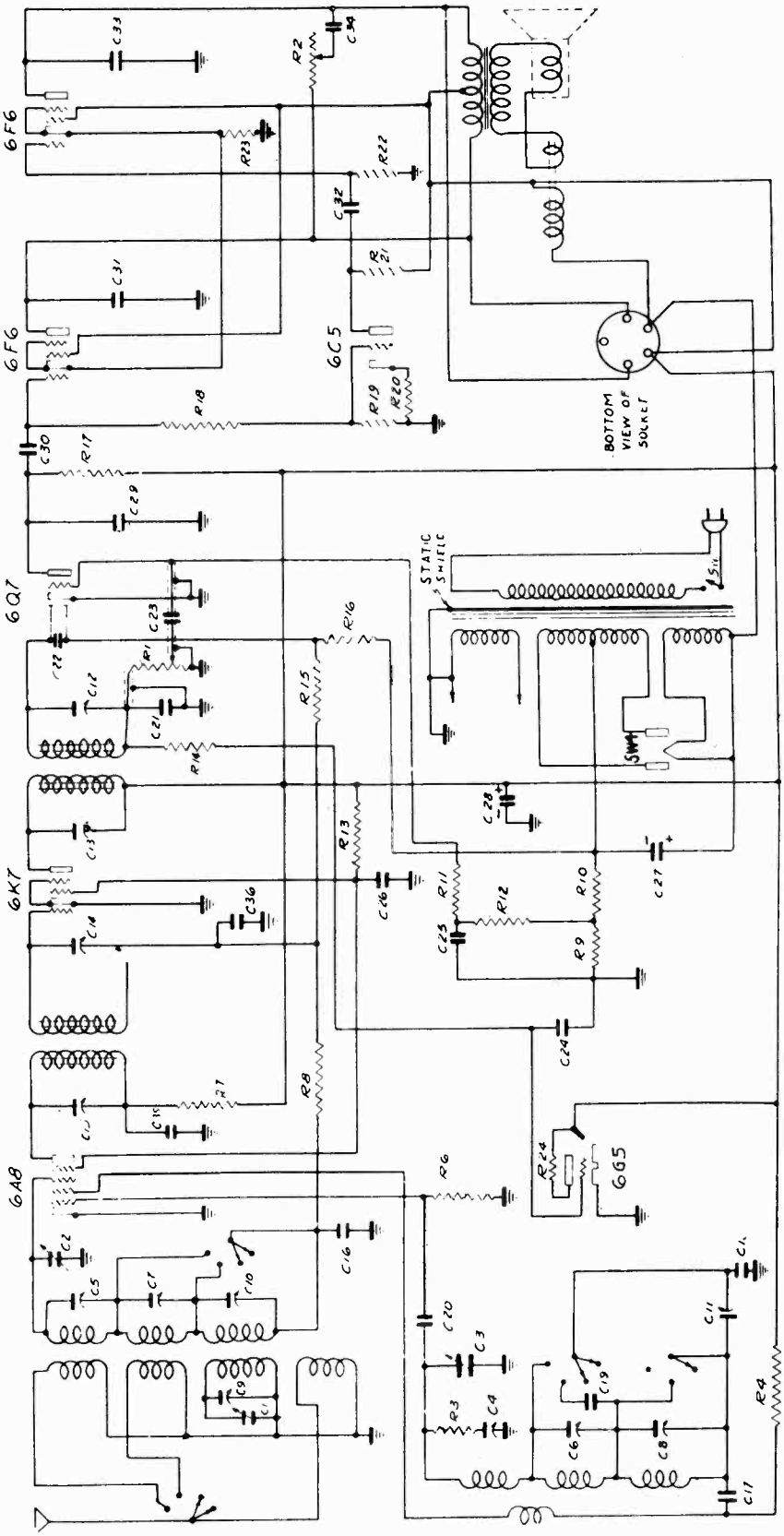


Fig. 2 Location of Trimmers

SCHEMATIC WIRING DIAGRAM



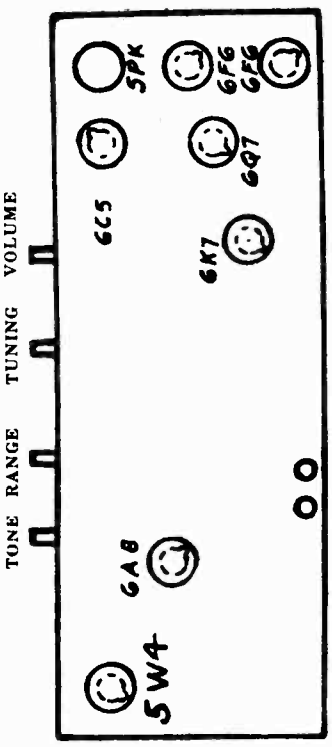


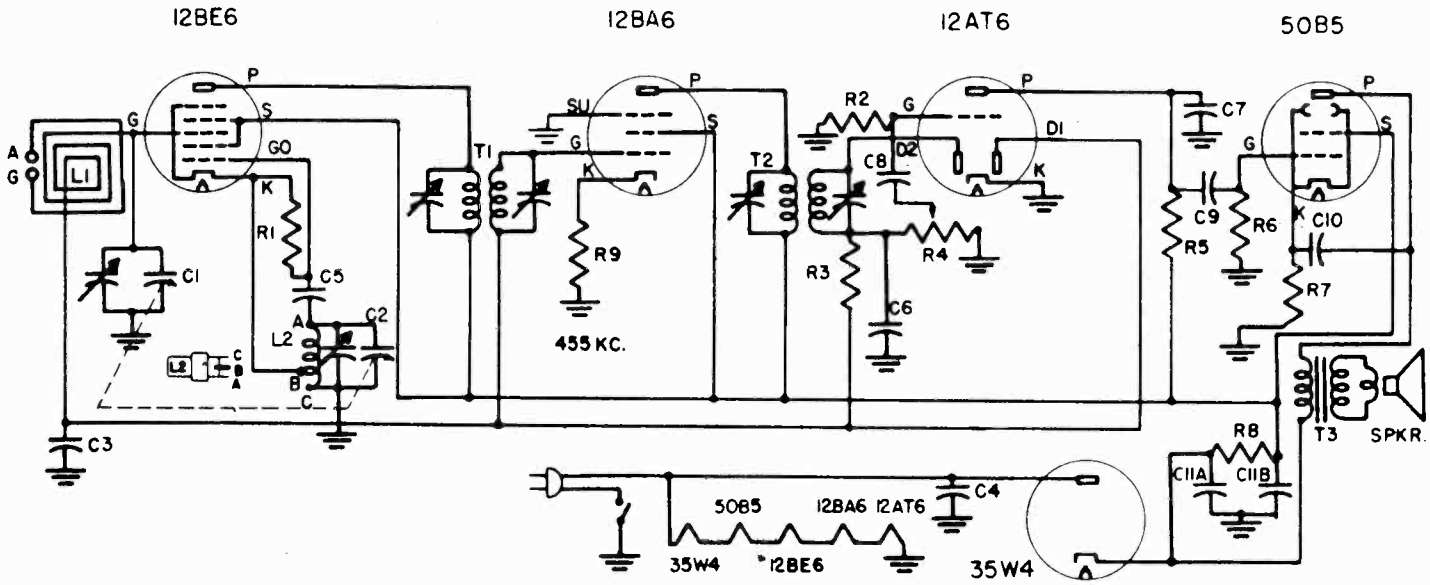
Fig. 1 Tuning Controls and Tube Position

MODELS MB3, MB3A

SCHEMATIC LOCATION	PART No.	DESCRIPTION
	15089	Bulb pilot light (edgelight)
	B-15045	Bezel
C1 C2 C3	C-16830	Condenser, variable gang model MB3—MB3A
C11	A-16472	Condenser, padder 340 uuf 960 uuf
C4 C6 C8	A-16473	Condenser, trimmer 3-30 uuf (triple strip)
C7	A-15246-2	Condenser, trimmer 3-30 uuf (bakelite base)
C5 C9 C10	A-16474	Condenser, trimmer 3-30 uuf (ceramic base)
C27	A-15236-3	Condenser, wet electrolytic 25 Mfd. 400 volts
C28	A-15237-2	Condenser, wet electrolytic 10 Mfd. 300 volts
C29	15918	Condenser, mica 100 Mfd. +—20% type O
C21	15928	Condenser, mica 250 Mfd. +—20% type O
C20 C22	15929	Condenser, mica 50 Mmfd. +—20% type O
C17	15930	Condenser, mica 2000 Mmfd. +—20% type W
C18	15931	Condenser, mica 4300 Mmfd. +—5% type W
C19	15932	Condenser, mica 1750 Mmfd. +—5% type W
C16 C36	15752	Condenser, tubular .05 Mfd. 200 volts
C31 C33	15753	Condenser, tubular .002 Mfd. 600 volts
C23 C30 C32	15754	Condenser, tubular .01 Mfd. 400 volts
C35	15757	Condenser, tubular .1 Mfd. 400 volts
C24	15763	Condenser, tubular .01 Mfd. 200 volts
C34	15764	Condenser, tubular .03 Mfd. 400 volts
C25	15770	Condenser, tubular .2 Mfd. 200 volts
C26	15773	Condenser, tubular .2 Mfd. 400 volts
R2	B-16832	Control, tone
R1	B-16831	Control, volume
	16938	Coil and mounting assembly
	B-15044	Glass convex
	A-15039	Knob
	B-15041	Retaining spring for Bezel
	B-15043	Retaining ring for Glass
R13	15501	Resistor, carbon 25,000 +—20% 1 watt
R12	15511	Resistor, carbon 50,000 +—20% ¼ watt
R17	15512	Resistor, carbon 250,000 +—20% ¼ watt
R8	15515	Resistor, carbon 100,000 +—20% ¼ watt
R14 R15 R16 R24	15517	Resistor, carbon 1 meg. +—20% ¼ watt
R7	15542	Resistor, carbon 1,000 +—20% ¼ watt
R22	15554	Resistor, carbon 500,000 +—10% ¼ watt
R4	15558	Resistor, carbon 10,000 +—20% ½ watt
R11	15559	Resistor, carbon 3 meg. +—20% ¼ watt
R3	3320	No. 38 D. C. C. Manganin wire 2 ohms
R18	15604	Resistor, carbon 435,000 +—10% ¼ watt
R19	15605	Resistor, carbon 100,000 +—10% ¼ watt
R20	15606	Resistor, carbon 5,000 +—10% ½ watt
R23	15607	Resistor, carbon 250 +—10% 2 watt
R12	15608	Resistor, carbon 50,000 +—10% ¼ watt
R6	15552	Resistor, carbon 30,000 +—20% ¼ watt
R9 R10	A-16564	Resistor, candohm 27.5 and 15 ohms .245 watts
	A-16829	Socket speaker
	15066	Socket 6 K7
	15083	Socket 6 C5
	15084	Socket 6 F6
	16470	Socket 5 W4
	16469	Socket 6 Q7
	16537	Socket 6 A8
	B-16635	Socket 6 G5 with leads
	A-15054	Socket pilot light (edgelight) R. H.
	A-15053	Socket pilot light (edgelight) L. H.
	C-16852	Speaker
	A-16818	Transformer 1st, I. F.
	A-16819	Transformer 2nd I. F.
	C-16544-5	Transformer, Power 110 volt 50-60 cycles
	C-16806	Transformer, Power Universal Tap
	A-1950	Washer Felt
	16941	Dial and Paper Strip Assembly
	A-15023	Pointer (Minute)
	A-15024	Pointer (Tuning)
	B-16813	Paper Dial Backing

VOLTAGE CHART

POSITION	TUBE	Ef	Ek	Eg SCREEN	Ep SUPPRESSOR	Ep TRIODE	Ep PENTODE
Converter	6 A8	6.3	3.0	110.0			225.0
T. F. Amplifier	6 K7	6.3	3.0	110.0			230.0
Detector—AVC	6 Q7	6.3	2.0			95.0	
Phase Inverter	6 C5	6.3	7.0			150.0	
Power Output	6 F6	6.3	14 0	230 0			225
Power Output	6 F6	6.3	14.0	230.0			225
Rectifier	5 W4	5 0					

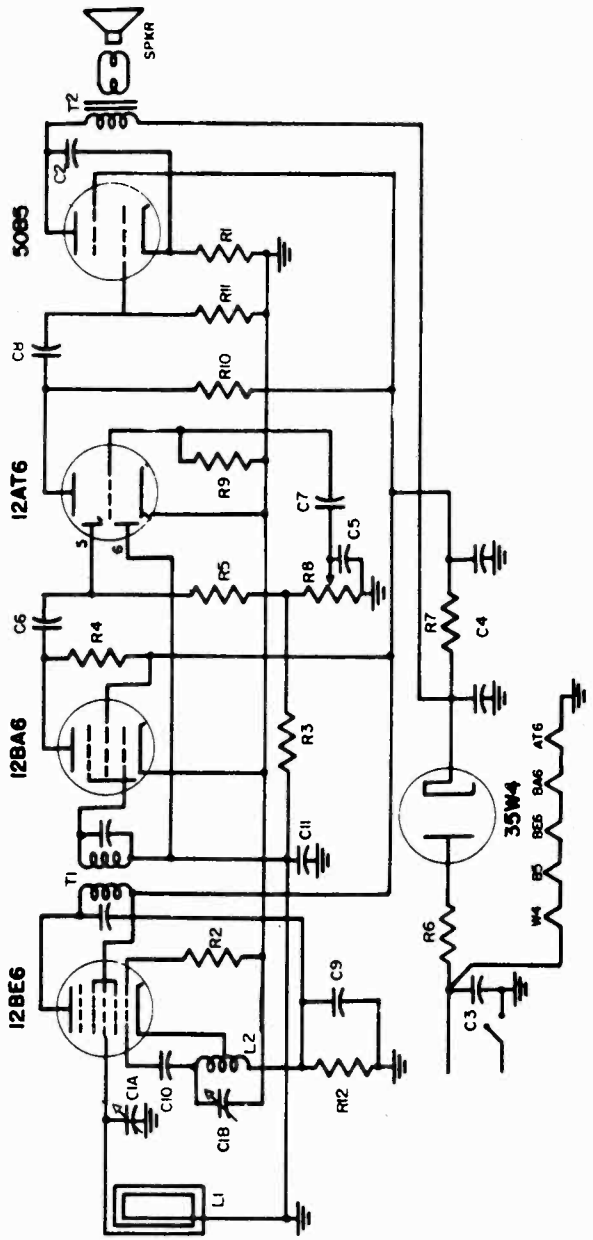


I.F. 455KC.

Part No.	Circ. Sym.	Description
CV-10002-E	C1,C2	CONDENSER - VARIABLE TUNING WITH DRUM
CP-14503	C3,C4	CONDENSER - .05 MFD. 400 VOLT.
CM-15500	C5	CONDENSER - .00005 MFD. MICA
CM-15251	C6,C7	CONDENSER - .00025 MFD. MICA
CP-14103	C8,C9	CONDENSER - .01 MFD. 400 VOLT.
CP-14503	C10	CONDENSER - .05 MFD. 400 VOLT.
CL-10001	C11A,C11B	CONDENSER - 20/20 MFD. 150 VOLT ELECT
RC-32002	R1	RESISTOR - CARBON 20,000 OHMS 1/2 WATT
RC-31005	R2	RESISTOR - CARBON 10 MEG. 1/2 WATT
RC-32004	R3	RESISTOR - CARBON 2 MEG. 1/2 WATT
VC-10105	R4	VOLUME CONTROL - 1 MEG. (WITH SWITCH).

Part No.	Circ. Sym.	Description
RC-32503	R5	RESISTOR - CARBON 250,000 OHMS 1/2 WATT
RC-35003	R6	RESISTOR - CARBON 500,000 OHMS 1/2 WATT
RC-31500	R7	RESISTOR - CARBON 150 OHMS 1/2 WATT
RC-32000	R8	RESISTOR - CARBON 200 OHMS 1/2 WATT
RC-31001	R9	RESISTOR - CARBON 68 OHMS 1/2 WATT
AL-10004	L1	LOOP ANTENNA
TRC-10000-D	L2	COIL, OSCILLATOR
TS-10000	T1	TRANSFORMER 1ST. I.F.
TS-10001	T2	TRANSFORMER 2ND. I.F.
TO-10000	T3	TRANSFORMER - OUTPUT FOR SPEAKER
SR-10000	SPKR	SPEAKER, 4" P.M.

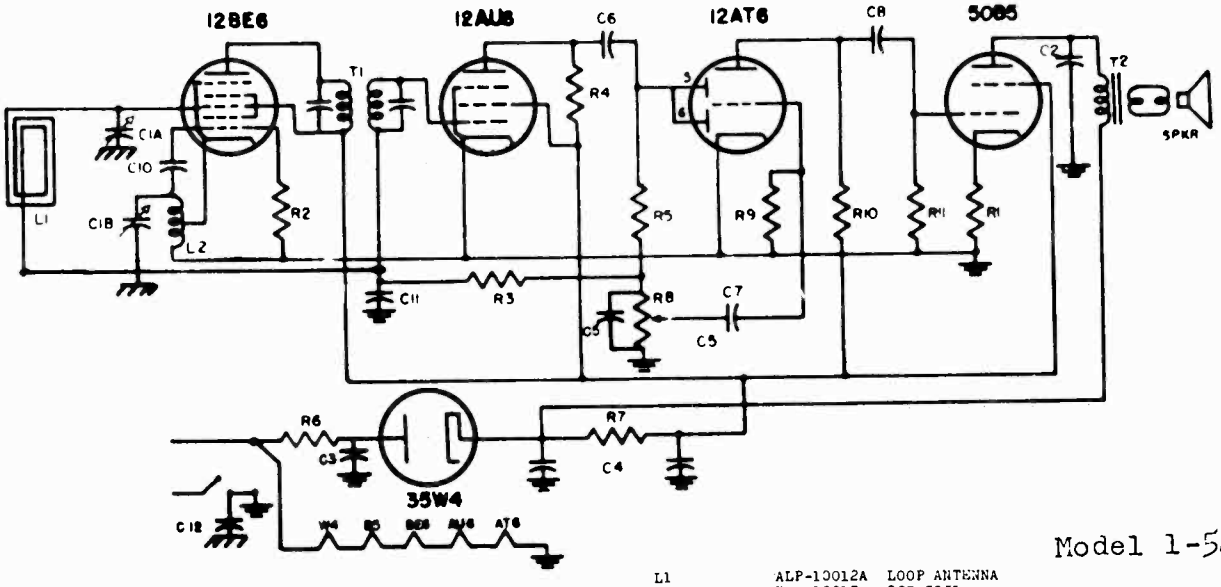
MODEL MC-16



Part No.	Circuit Symbol	Description
CV-10008	C1	Variable condenser for Model 5A7
CPP-14203	C2	Condenser paper tub .02 mfd-400V
CPP-14503	C3	Condenser paper tub .05 mfd-400V
CLP-10007	C4	Condenser electrolytic 50-30 mfd-150V
CMP-15251	C5, C6	Condenser mica 250 mmf-500V
CPP-12103	C7, C8	Condenser paper tub .01 mfd-200V
CPP-11103	C9	Condenser paper tub .01 mfd-150V
CMP-15500	C10	Condenser mica 50 mmf-500V
CPP-12203	C11	Condenser paper .02 mfd-200V
RCP-31500	R1, R12	Resistor carbon 150 ohm ½ watt
RCP-31002	R2	Resistor carbon 10,000 ohm ½ watt
RCP-32204	R3	Resistor carbon 2.2 megohm ½ watt
RCP-36801	R4	Resistor carbon 6800 ohm ½ watt
RCP-31003	R5	Resistor carbon 100,000 ohm ½ watt

Part No.	Circuit Symbol	Description
RCP-30220	R6	Resistor carbon 22 ohm ½ watt
RCP-41001	R7	Resistor carbon 1000 ohm 1 watt
VCP-10105	R8	Volume control 1 megohm and switch
VCP-12105	R8	Volume control for Model 5A7- 1 megohm
RCP-31005	R9	Resistor carbon 10 megohm ½ watt
RCP-32203	R10	Resistor carbon 220,000 ohm ½ watt
RCP-34703	R11	Resistor carbon 470,000 ohm ½ watt
ALP-10013	L1	Loop antenna
TRCP-10000-D	L2	Oscillator coil
TSP-10002	T1	I.F. Transformer
TOP-10000	T2	Output transformer
SRP-10005	SPKR	Speaker P.M. 3" round for Model 5A7

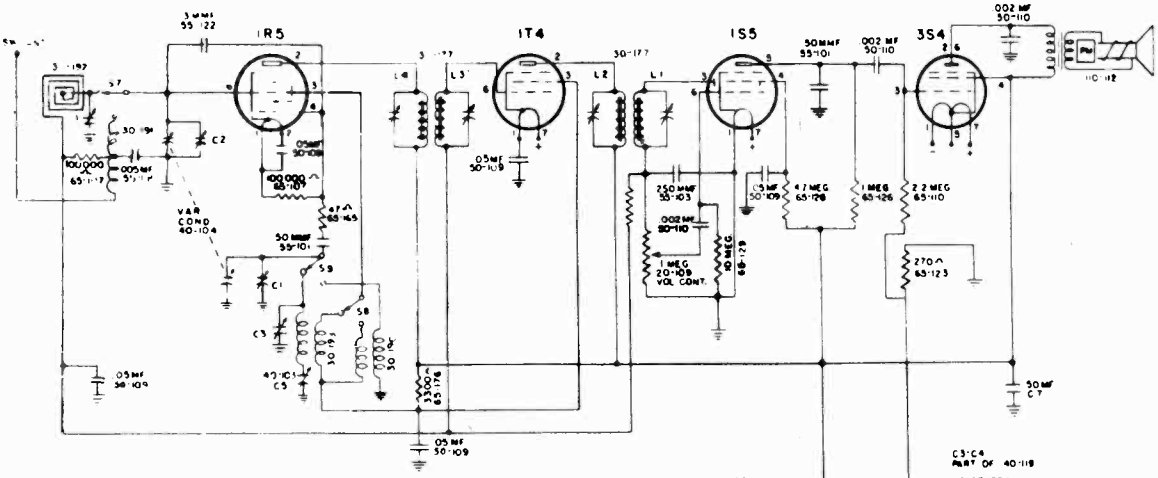
MODELS 1-421, 1-542



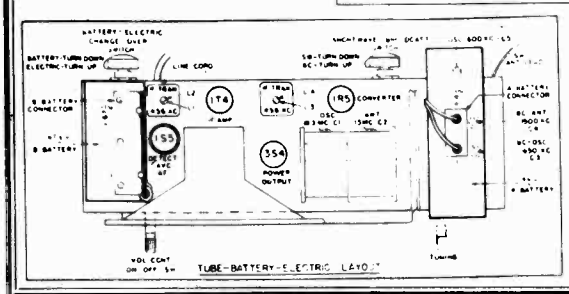
Model 1-542

CIRCUIT SYMBOL	PART NO	DESCRIPTION
C1 A B	CV-10010	CONDENSER VARIABLE
C2	CP-14103	" PAPER TUBE .01 mfd 400v
C3	CP-14203	" " " .02 " "
C4	CL-10017	" ELECTROLYTIC 30-20 mfd.150v
C5	CM-15251	" MICA 250 mmf. 500v
C6	CM-15500	" " 50 " "
C7	CP-12202	" PAPER TUBE .002mfd.200v.
C8	CP-12502	" " " .005 " "
C10		PART OF L2
C11	CP-12103	CONDENSER PAPER .01 " "
C12	CP-12203	" " .02 " "

L1	ALP-10012A	LOOP ANTENNA
L2	TRC-10017	OSC.COIL
R1	RC-31500	RESISTOR CARBON 150 ohms 1/2 watt
R2	RC-31502	" " 15,000 " "
R3	RC-32204	" " 2.2 meg "
R4	RC-31002	" " 10,000 " "
R5	RC-31503	" " 150,000" "
R6	RC-30220	" " 22 " "
R7	RC-42001	" " 2000 " "
R8	VC-12106	VOLUME CONTROL 1 MEG WITH SWITCH
R9	RC-31005	RESISTOR CARBON 10 MEG 1/2 watt
R10	RC-32203	" " 220,000 ohms 1/2 watt
R11	RC-34703	" " 470,000 " "
T1	TO-10000	OUTPUT TRANS
T2	TS-10039	I.F. TRANS. 455 KC



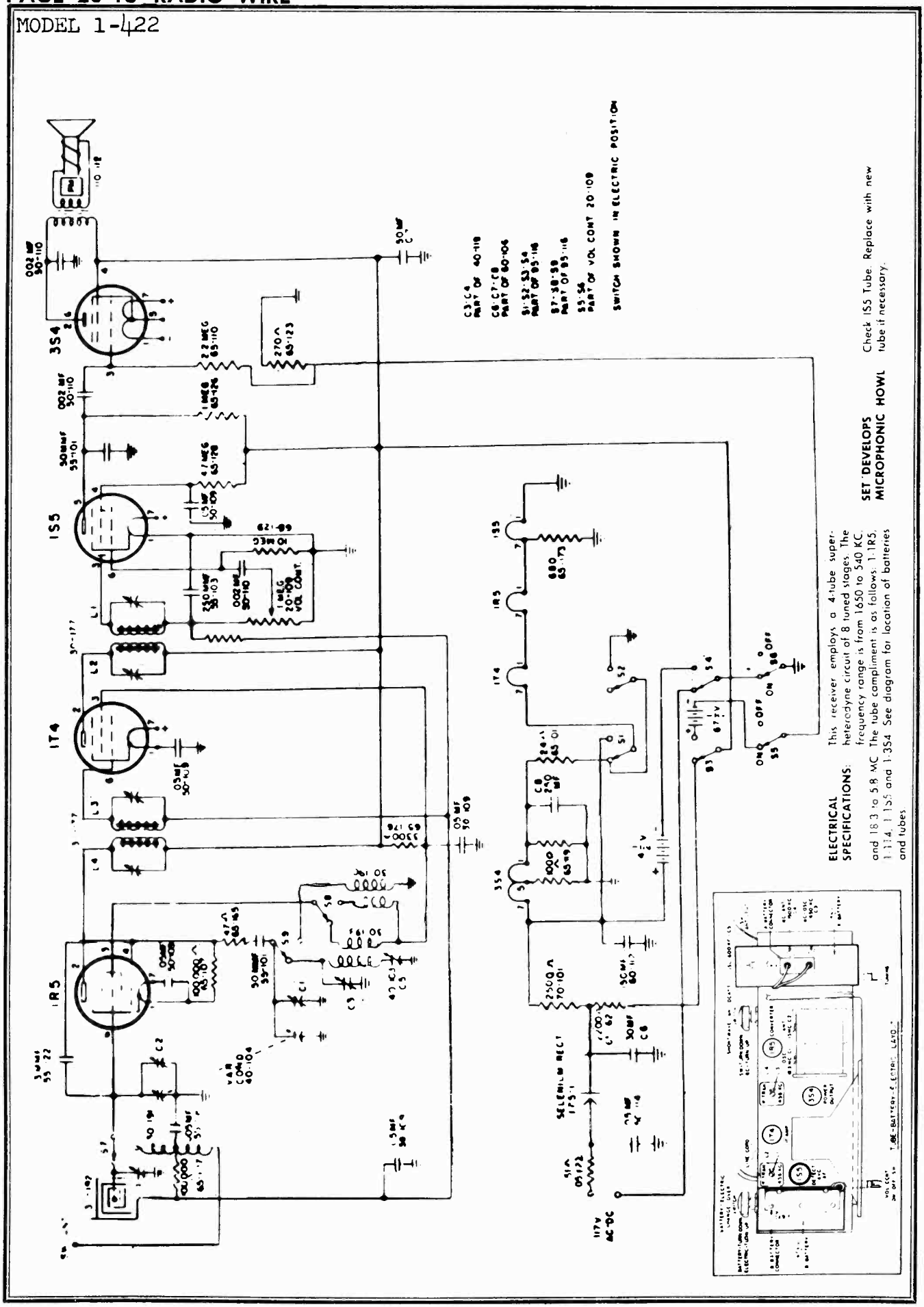
Model 1-421



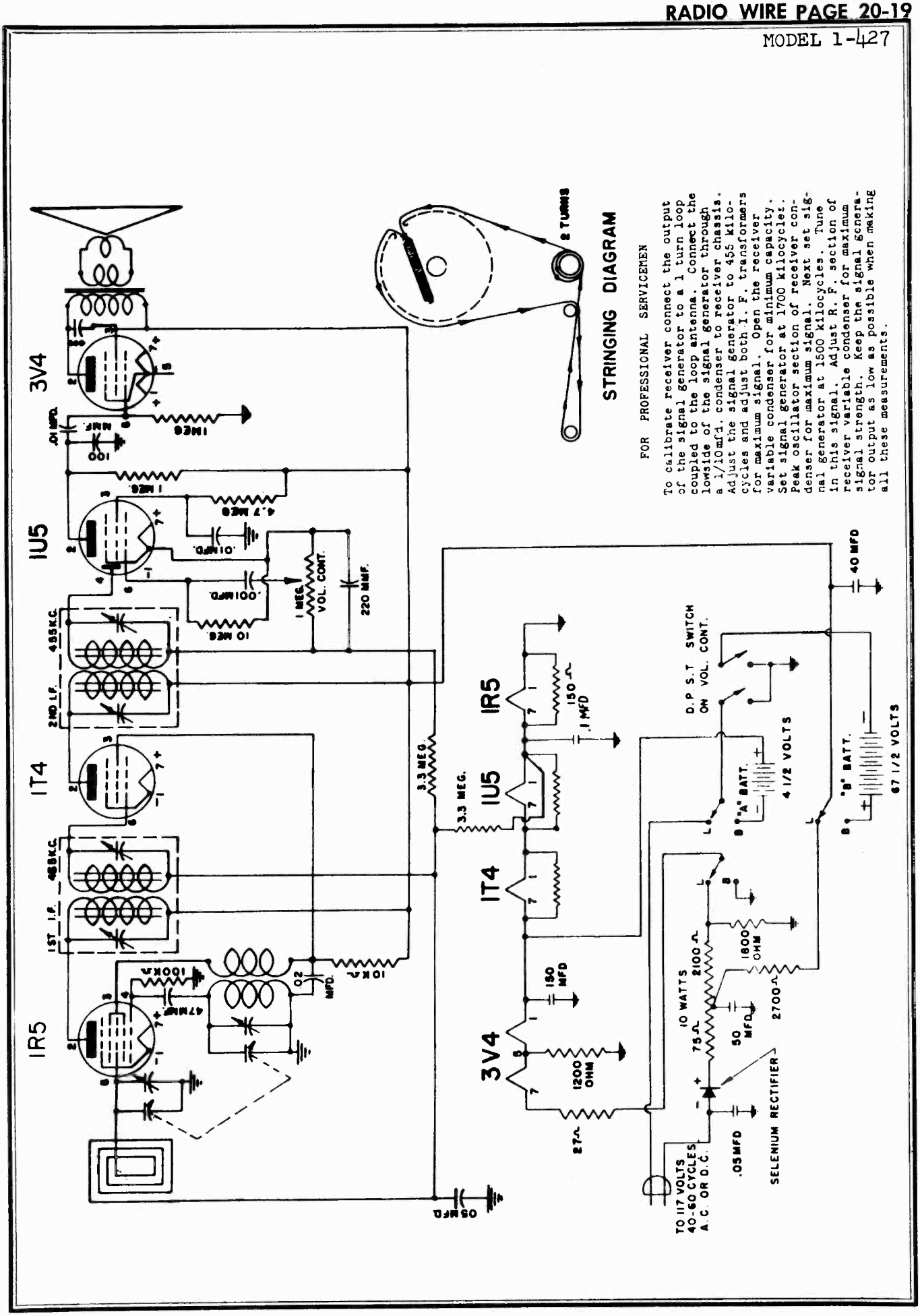
ELECTRICAL SPECIFICATIONS: This receiver employs a 4-tube superheterodyne circuit of 8 tuned stages. The frequency range is from 1650 to 540 KC, and 18.3 to 5.8 MC. The tube compliment is as follows: 1-1R5, 1-1T4, 1-1S5 and 1-3S4. See diagram for location of batteries and tubes.

SET DEVELOPS MICROPHONIC HOWL Check 1S5 Tube. Replace with new tube if necessary.

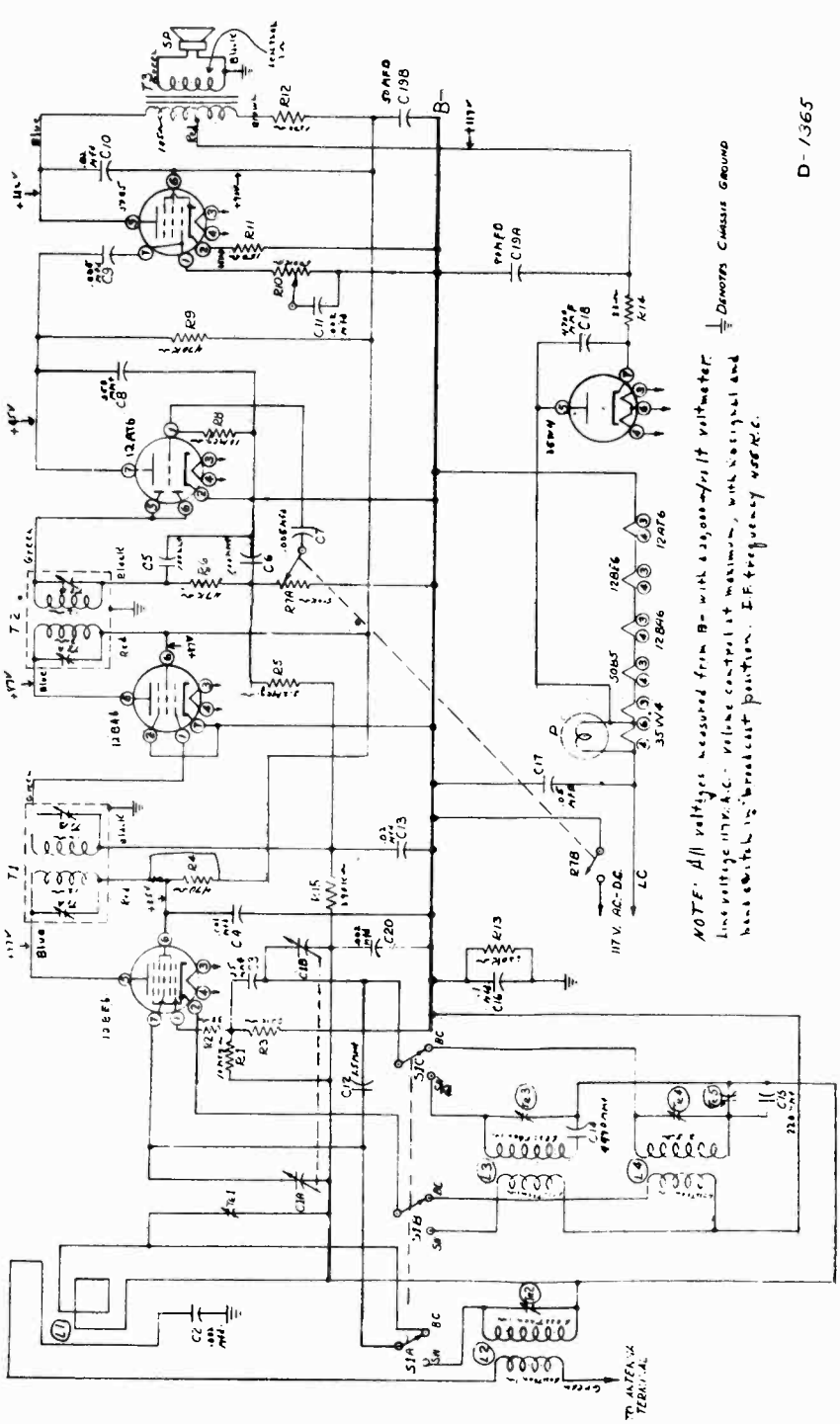
MODEL 1-422



MODEL 1-427



MODEL 1-524



D-1365

L1	1	LOOP ANTENNA ASSY	C-1372
L2	1	SHORT WAVE ANTENNA COIL	B-1318
L3	1	SHORT WAVE OSCILLATOR COIL	B-1357
L4	1	BROADCAST OSCILLATOR COIL	B-1339
T1	1	INPUT I.F. TRANSFORMER ASSY	B-1038-1
T2	1	OUTPUT I.F. TRANSFORMER ASSY	B-1067-1
T3	1	OUTPUT TRANSFORMER	S-1021
SP	1	SPEAKER 5" P.M.	S-1391
S1A S1B S1C	1	WAVE BAND SWITCH	S-1354
P	1	PILOT BULB #47 MAZDA	S-1233
LC	1	6' Line cord with Male Plug UL Approved	S-330-1
V1	1	TUBE 12BE6	S-150-12-16
V2	1	TUBE 12BA6	S-150-12-26
V3	1	TUBE 12AT6	S-136-12-36
V4	1	TUBE 50B5	S-250-50-16
V5	1	TUBE 35W4	S-136-35-16

Ref. No.	Qty.	Description	Part No.
R1, R4	2	Resistor, 4-70 meg.	S-1363
R2, R3	2	Resistor, 1.6-18 meg.	
R5	1	Resistor, 110-560 meg.	
R1 R8	2	RESISTOR 10 MEG ½W ±20%	S-450-145-20
R2	1	RESISTOR 330 Ω ½W ±20%	S-451-13-20
R3	1	RESISTOR 22 KΩ ½W ±20%	S-450-81-20
R4	1	RESISTOR 470 Ω ½W ±20%	S-450-41-20
R5	1	RESISTOR 22 MEG ½W ±20%	S-450-129-20
R6	1	RESISTOR 47 KΩ ½W ±20%	S-450-89-20
R7A R7B	1	VOLUME CONTROL .5 MEG 20% WITH SWITCH	S-1064-3
R9	1	RESISTOR .47 MEG. ½ W ±20%	S-450-145-20
R10	1	TONE CONTROL .5 MEG ±20%	S-1017-3
R11	1	RESISTOR .150 Ω ½ W ±10%	S-451-13-10
R12	1	RESISTOR 5000 Ω 2W ±10%	S-453-53-10
R13	1	RESISTOR .22 MEG ½W ±20%	S-450-105-20
R14	1	RESISTOR 33 Ω ½ W ±20%	S-451-13-20
R15	1	RESISTOR 390 K Ω ½ W ±20%	S-450-111-20

Item No.	Qty.	Description	Part No.
C1, C12	2	.2 MFD PAPER CONDENSER	S-1374
C2, C11	2	CONDENSER, PAPER, .25 MFD, 400 V.	S-4032-25-6
C3	1	CONDENSER, CERAMIC, 25 MMF, 500 V.	S-4114-1-1
C4	1	CONDENSER, PAPER TUBULAR, .001 MFD, 600 V.	S-4000-4-6
C5, C6	2	CONDENSER, MICA, .100 MMF, 500 V.	S-4034-21-1
C7, C9	2	CONDENSER, PAPER TUBULAR, .005 MFD, 600 V.	S-4000-5-6
C8	1	CONDENSER, MICA, .250 MMF, 500 V. ±20%	S-4034-27-1
C10	1	CONDENSER, PAPER TUBULAR, .02 MFD, 400 V.	S-4000A-15-4
C12	1	CONDENSER, CERAMIC, 1000 MMF, 500 V. ±20%	S-412-2-1
C13	1	CONDENSER, PAPER TUBULAR, .05 MFD, 400 V.	S-4000-52
C14	1	CONDENSER, MICA, 680 MMF, 500 V. ±5%	S-1373
C15	1	CONDENSER, MICA, 220 MMF, 500 V. ±20%	S-4034-26-1
C16	1	CONDENSER, PAPER TUBULAR, .1 MFD, 400 V. ±10%	S-400B-22-4
C17	1	CONDENSER, PAPER TUBULAR, .05 MFD, 400 V. ±10%	S-400A-18-4
C18	1	CONDENSER, MICA, 4700 MMF, 500 V. ±20%	S-4034-17-1
C19A, B	1	80 MFD CONDENSER, DRY ELECTROLYTIC, 150 V.	S-1339
C19C	1	30 MFD CONDENSER, DRY ELECTROLYTIC, 150 V.	S-400B-5-6
C20	1	CONDENSER, PAPER TUB. .002 MFD 600 V.	S-4000-5-6

BILL OF MATERIALS

Model 1-819

The Lafayette Model 1-819 is an AM-FM receiver. This receiver may be operated on either AC or DC, 105-125 volts, 50-60 cycles.

FM . . . . 88 to 108 MC.
AM . . . . 540 to 1700 KC.

Antenna Connections:

Your Lafayette 1-819 is a sensitive receiver. It is equipped with built-in AM and FM antennae so that in primary listening areas an outside antenna is not necessary. WHEN LISTENING TO FM BY USING THE BUILT-IN ANTENNA, KEEP THE ELECTRIC LINE CORD EXTENDED TO ITS FULL LENGTH.

For weak or distant stations there are provisions made in the rear for antenna connections. A terminal strip with two screw connections for the lead-in wires from the FM antenna, also a wire coming out the back of the receiver for an external AM antenna.

When using the built-in antenna on FM, the lug coming out between the two screw connections on the terminal strip in the rear, must be connected to the screw connection marked "ANT." When using an external FM antenna disconnect this wire and connect external antenna lead-in wires to the two screw connections.

Station Selector:

The knob on the extreme right hand side of the cabinet operates the tuning condenser on both AM and FM and simultaneously moves the indicating pointer. Ease and accuracy in tuning is made possible due to a reduction drive.

Band Switch:

The second knob from the right is the AM-FM band switch. This is a two position switch. When the switch is in the counterclockwise position, AM (Standard Broadcast) stations may be tuned in. When the switch is in the clockwise position, FM (Frequency Modulation) stations may be tuned in.

Volume Control and Power Switch:

The third knob from the right is the volume control and power switch. When the control is in the extreme counterclockwise position the power is "OFF." From this position, a slight clockwise rotation will turn the power "ON." By further rotation in this direction volume may be increased to any degree until the full output of the receiver is obtained.

Tone Switch:

The fourth knob from the right is the tone switch. For normal operation the switch should be clockwise. For increased bass response turn switch fully counterclockwise.

Notes:

Since this receiver has a loop-tenna on AM which has a directional effect, it may be necessary at times to turn the receiver for best reception. This set will operate properly only after the tubes are sufficiently heated. This may take two minutes after the power switch is turned "ON." If the receiver is being operated on DC (Direct Current) and no signals are heard after two minutes, reverse the line cord plug in the power outlet. Should noticeable hum be detected when operating on AC (Alternating Current), reverse the line cord plug in the power outlet.

Servicing of the Lafayette Model 1-819
(For Use of Radio Technician):

Should your Lafayette Model 1-819 become inoperative for any reason, we suggest you contact your local Lafayette Radio and Television Dealer for servicing. The following information is for the use by the radio serviceman.

Alignment of the receiver will, in most cases, be unnecessary unless an RF or IF transformer is replaced or the adjustment has been tampered with. The IF slugs are slotted for a small size fiber screwdriver. Do not put excessive pressure on the aligning tool or the threads in the coil-form will be stripped and adjustments will be impossible.

IF Alignment:

Set bandswitch to AM position. Connect the signal generator, modulated at 400 cycles, through a 0.01 Mfd condenser to the grid of the 12AT7 converter tube. Connect the low side of the generator through a 0.1 Mfd condenser to the receiver chassis. Adjust the signal generator to 455 KC. Tune primary and secondary slugs of T3 & T5, AM-IF Transformers, for maximum output.

For FM alignment set bandswitch to FM position and leave generator connected to the grid of the 12AT7 converter tube. Adjust generator to 10.7 MC. Connect 20,000 ohm per volt or VTVM meter as in note "1" of schematic diagram. Tune primary of T1, bottom slug, and both primary and secondary of T2 & T4 for maximum indication on meter. To align secondary of Ratio Detector Transformer connect meter as in note "2" of schematic diagram. Tune top slug through positive and negative indication and then slowly return until meter reads zero. This is in the center of the "S" curve.

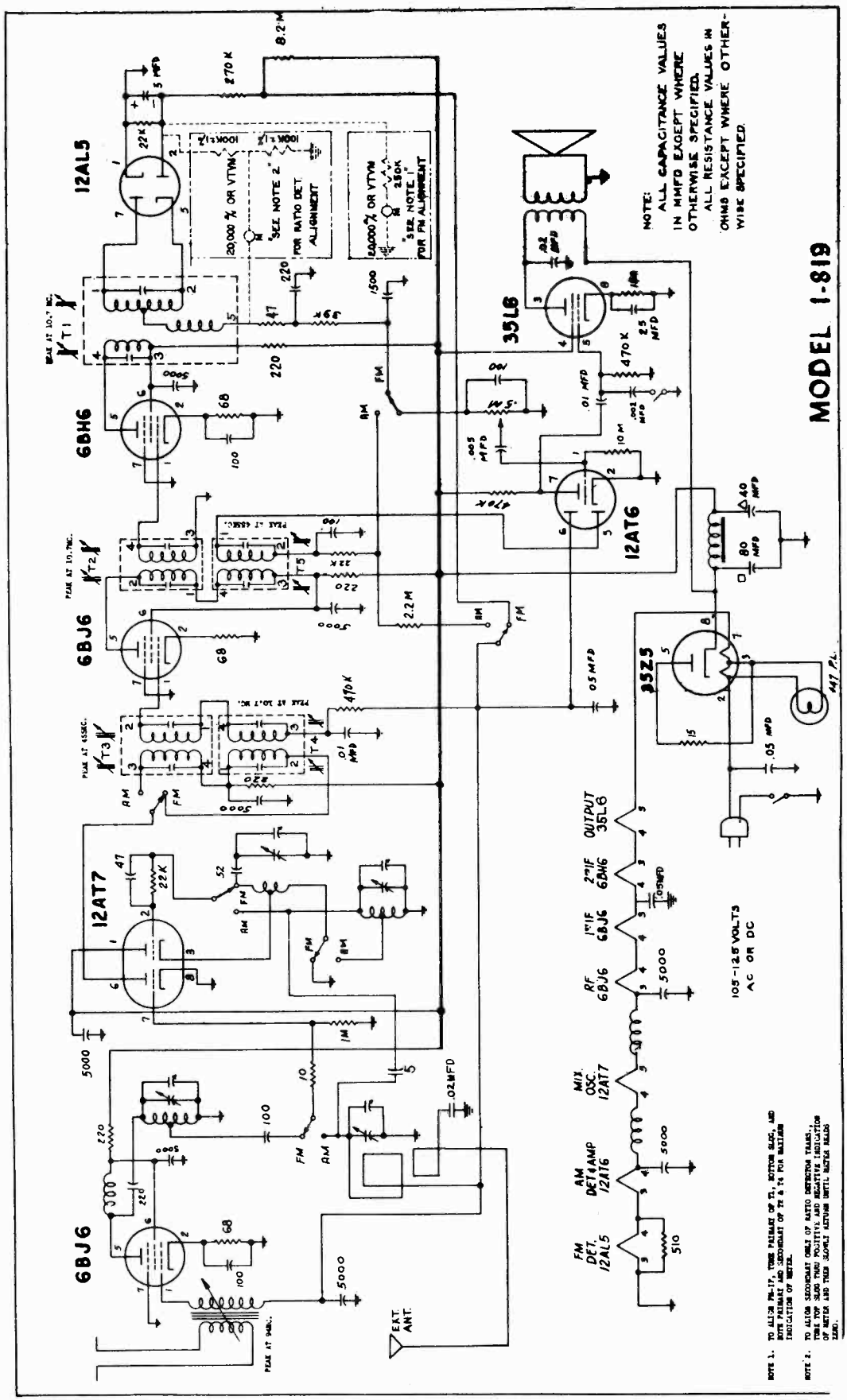
RF Alignment:

Set bandswitch to AM position. Connect signal generator, modulated at 400 cycles, to external antenna lead and to ground through a 0.1 Mfd condenser and adjust to 1700 KC. Set dial pointer to 1700 KC and tune signal for maximum output with oscillator trimmer. Next set generator to 1500 KC and tune in this signal on the receiver. Then adjust RF trimmer for maximum output.

Set bandswitch to FM position. Connect in series with each generator lead a carbon 150 ohm resistor and connect to rear antenna terminal board. Adjust generator and dial pointer to 108 MC. Peak oscillator trimmer for maximum signal output. Next set generator to 105 MC and tune in this signal on receiver. Then peak RF trimmer for maximum output. No adjustment is necessary at the low end because a special compensated fixed padder is used. Set the generator to 94 MC and tune the FM antenna coil for maximum.

In all the IF and RF adjustments it is important to keep the signal generator output as low as possible. It is extremely necessary in making the RF adjustments, that the fundamental oscillator signal be tuned in and not the image frequency. This can be checked by the use of a calibrated wavemeter.

MODEL 1-819



This Receiver features the latest in A. M. - F. M., Receiver Design. Eleven (11) tubes plus a Rectifier are used in the A. M. — F. M. superheterodyne circuit. separate antennas are supplied for A. M. and F. M. An automatic frequency control tube is used to stabilize the F. M. and simplify tuning.

TUBE COMPLEMENT:

1 Type 6BA6 — F. M. R F. Amplifier
1 Type 7F8 — F. M. Converter
1 Type 7Q7 — A. M. Converter
1 Type 6C4 — Automatic Frequency Control
1 Type 7AH7 — I. F. Amplifier
1 Type 6SH7 — Detector Driver (F.M.)
1 Type 6SQ7 -- 1st Audio Amplifier, A. M. Detector
1 Type 7A6 — Ratio Detector
1 Type 7F7 — 2nd Audio Amplifier and phase inverter
2 Type 7C5 — Beam power output.
1 Type 5Y3/GT — Rectifier.

1. OPERATING CONTROLS:

1) The "ON-OFF" power switch and Tone Control is the knob at the extreme left of the set. Turn this control in a clockwise direction until the switch clicks and the dial becomes illuminated. Turning this control further in the same direction will change the tone.

2) The Volume Control is the second knob from the left. Turning this control in a clockwise direction will increase the volume.

3) The Band Switch is the third knob from the left. The extreme counterclockwise position of this knob is for phonograph operation. The center position is for F.M. reception. The extreme clockwise position is for A. M. reception.

4) The Tuning Control is the extreme right hand knob. Turning this knob in either direction will move the dial pointer and select the stations on the A. M. or F. M. Bands.

2. ANTENNAS:

In most cases it will not be necessary to use external antennas, since the receiver is equipped with a loop antenna for AM reception and an indoor type folded dipole antenna for FM reception.

When inadequate reception is obtained from a desired station, it may be necessary to reposition the antennas to favor that station. On AM, the loop should be turned so that the edge faces toward the station desired. On FM, the entire cabinet should be positioned so that the back is broadside to the direction from which the signals are transmitted.

For the reception of weak or distant stations, or for the operation of the receiver in unfavorable locations, provisions are made for the use of external antennas. The folded dipole should be disconnected when an external FM antenna is employed.

Do not disconnect the AM loop when an external antenna is used on standard broadcast.

3. SERVICE NOTES:

Failure of the Receiver to operate may be due to:

1) All tubes not firmly in sockets.
2) No current at power socket.
3) Band Switch in wrong position.
4) Speaker not plugged in.
5) Antennas not attached.
6) Defective fuse in Receiver.

4. ALIGNMENT PROCEDURE FOR A. M.:

Equipment Required:

a) Broadcast Band Signal Generator.
b) Output Meter.

1. Set band switch to AM, advance volume control to full volume setting.

2. Connect output meter across voice coil.

3. Connect the Signal Generator across the broadcast band antenna (Rear) section of the variable condenser. The "high" side of the Generator should connect to the stator section and the "ground" side to the chassis. Adjust the Signal Generator to 455 kc and with the receiver switched on, adjust the first and second I. F. transformers for peak output as shown on the output meter. The signal injected into the receiver should be as small in magnitude as possible, consistent with a useful deflection on the output meter.

4. Connect the "high" side of the Generator to the antenna terminal with a 200mmf condenser inserted in series. Connect the "ground" side of the Generator to the chassis. Tune receiver to 60 on the dial, adjust Signal Generator to 600kc. Adjust the BC antenna coil for maximum deflection on the output meter. Use a weak signal.

MODEL 1-1205

5. Tune receiver to 160 on the dial. Adjust Signal Generator to 1600kc. Adjust BC oscillator and BC antenna trimmers for maximum output.

6. Repeat operations 4 and 5.

5. *ALIGNMENT PROCEDURE FOR F. M.:*

NOTE: *Points A. B. C. D. E. F. G. and H are noted on circuit diagram. Points C, and D have been brought out to the unused contacts of the speaker socket at the rear of the chassis.*

Equipment Required:

a) High frequency Signal Generator with 88-108 Mc tuning range.

b) Signal Generator capable of delivering .1 Volt at 10.7mc.

c) Audio output meter.

d) D. C. vacuum tube voltmeter with zero center scale.

e) Tuning wand.

Disable A.F.C. during alignment of F.M. circuits by short circuiting point "B" to chassis.

A. Ratio Detector Alignment:

1. Connect V.T.V.M. across point "C" and ground, (Detector Voltage).

2. Feed 10.7mc unmodulated R.F. Signal into 6SH7 grid (point A) through .01 ufd. condenser. This signal should be .1 volt.

3. Adjust primary of Ratio Detector (T-5) for maximum voltage indication on V. T. V. M.

4. Connect zero centered V. T. V. M. across point "D" and ground.

5. Adjust secondary of Ratio Detector (T-5) for zero indication.

6. Tune 10.7mc Signal Generator higher in frequency (about 200kc) until maximum voltage reading is obtained on V. T. V. M.; note this voltage, then tune signal generator lower in frequency until maximum voltage of the opposite polarity is obtained. Note this voltage, then if necessary re-adjust primary of the Det. (T-5) until the voltages are about equal on either the high or low side of 10.7 mc.

B. 10.7 I. F. ALIGNMENT:

1. Shunt a 1,000-ohm carbon resistor across the primary of the detector (T-5) (Points G and H).

2. Connect output meter across speaker voice coil.

3. Volume and tone controls at maximum clockwise position.

4. Connect 10.7mc (modulated 30%) signal generator through .01ufd. condenser across point "F" and ground.

5. Adjust secondary, then primary of (T-3) for maximum audio output. (Reduce input signal to maintain output at .5-watt level.)

6. Connect 10.7mc 30% modulated signal generator across point "E" and ground.

7. Adjust secondary, then primary of (T-1) for maximum audio output. (Reduce input signal to maintain output at .5-watt level.)

8. Remove 1000-ohm shunting resistor from across primary of (T-5).

C. OSCILLATOR AND R. F. ALIGNMENT:

1. Connect V. T. V. M. across point "C" and ground, (detector voltage).

2. Connect 108mc signal generator to FM antenna terminals. If generator impedance is low, put one 150-ohm carbon resistor in series with each of the generator leads. Tune receiver dial to 108 mc.

3. Adjust FM oscillator trimmer (C-51) for maximum V. T. V. M. reading.

4. Adjust FM R.F. trimmer (C-52) for maximum V. T. V. M. reading. During alignment reduce input signal to maintain Detector voltage at 2.V.

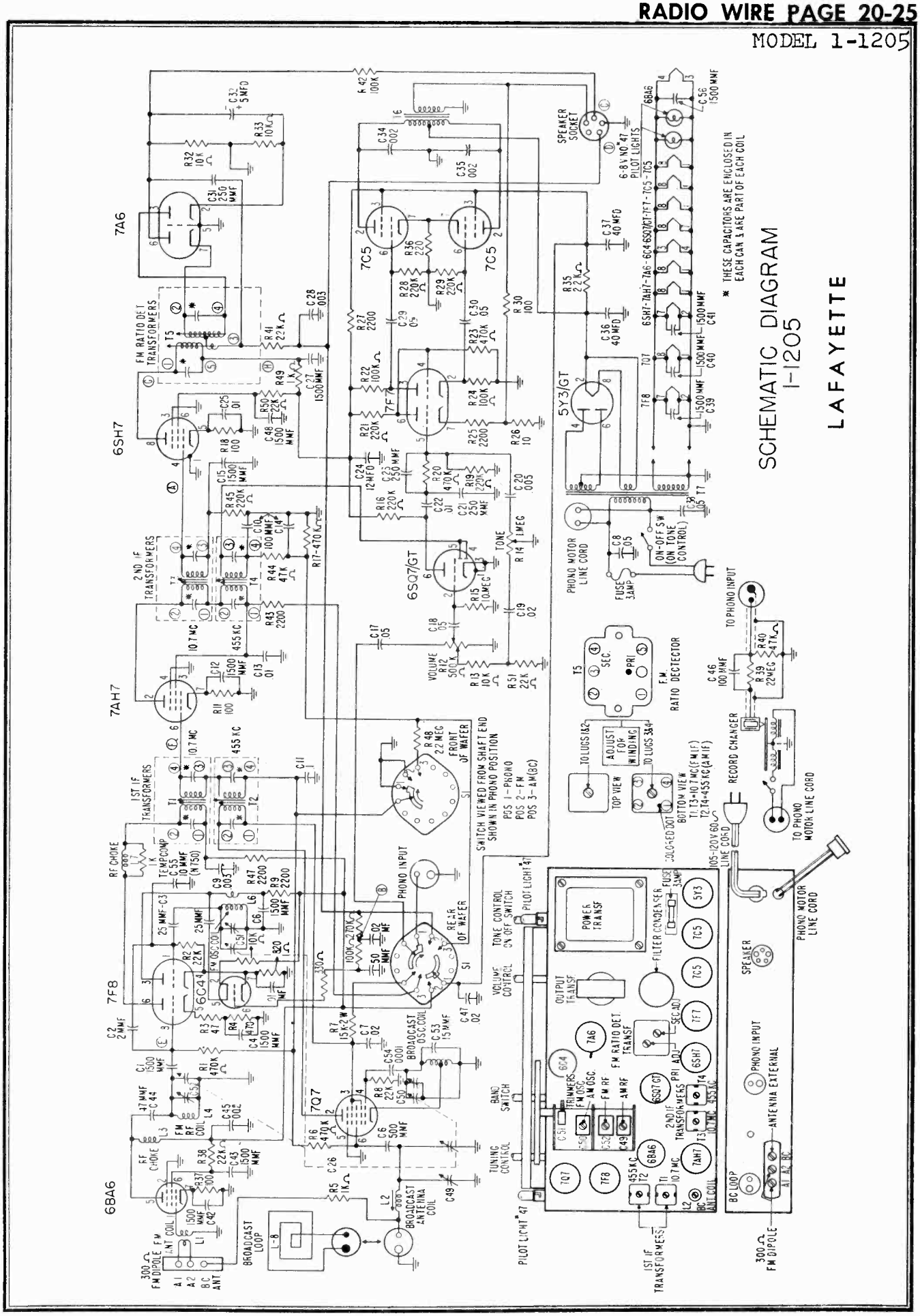
5. Repeat steps 3 and 4.

6. Feed a 90mc signal into antenna terminals (as in C-2), tune receiver dial to signal.

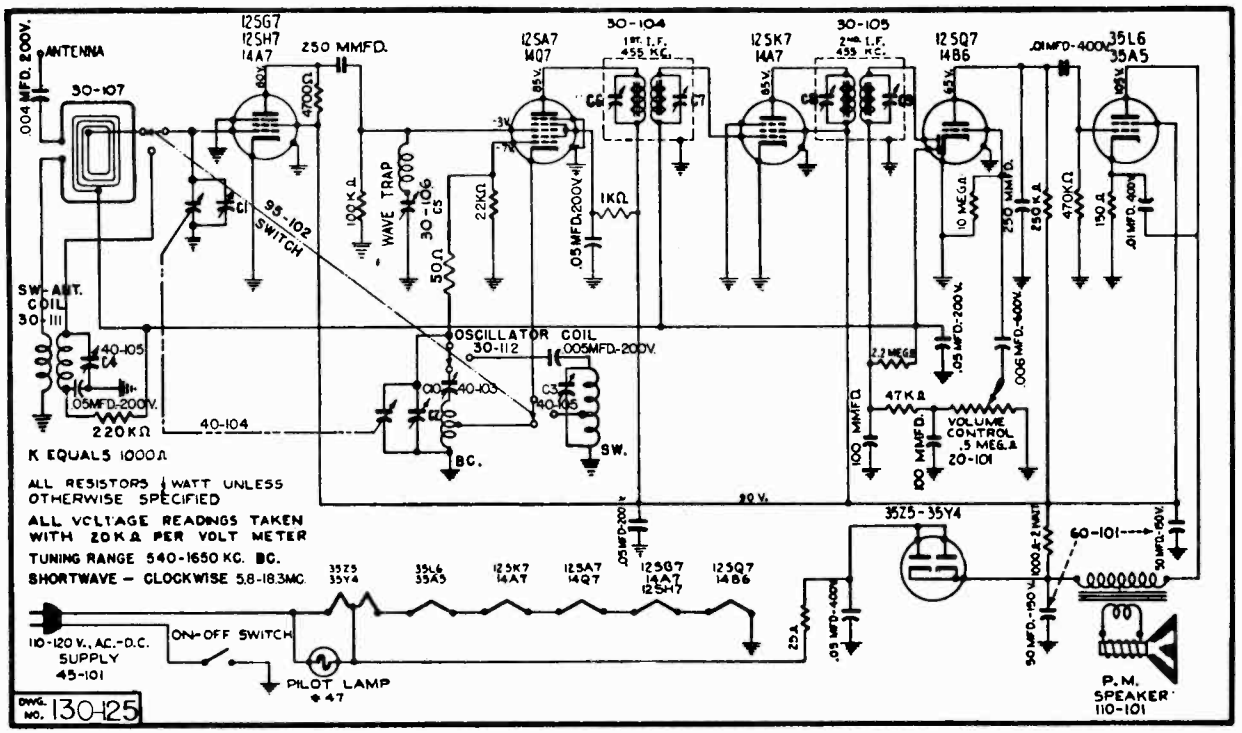
7. Test R. F. coil with tuning wand and if necessary adjust spacing of FM R.F. coil (L-4) for maximum V.T.-V.M. reading at 90mc. During alignment reduce input signal to maintain Detector voltage at 2.V.

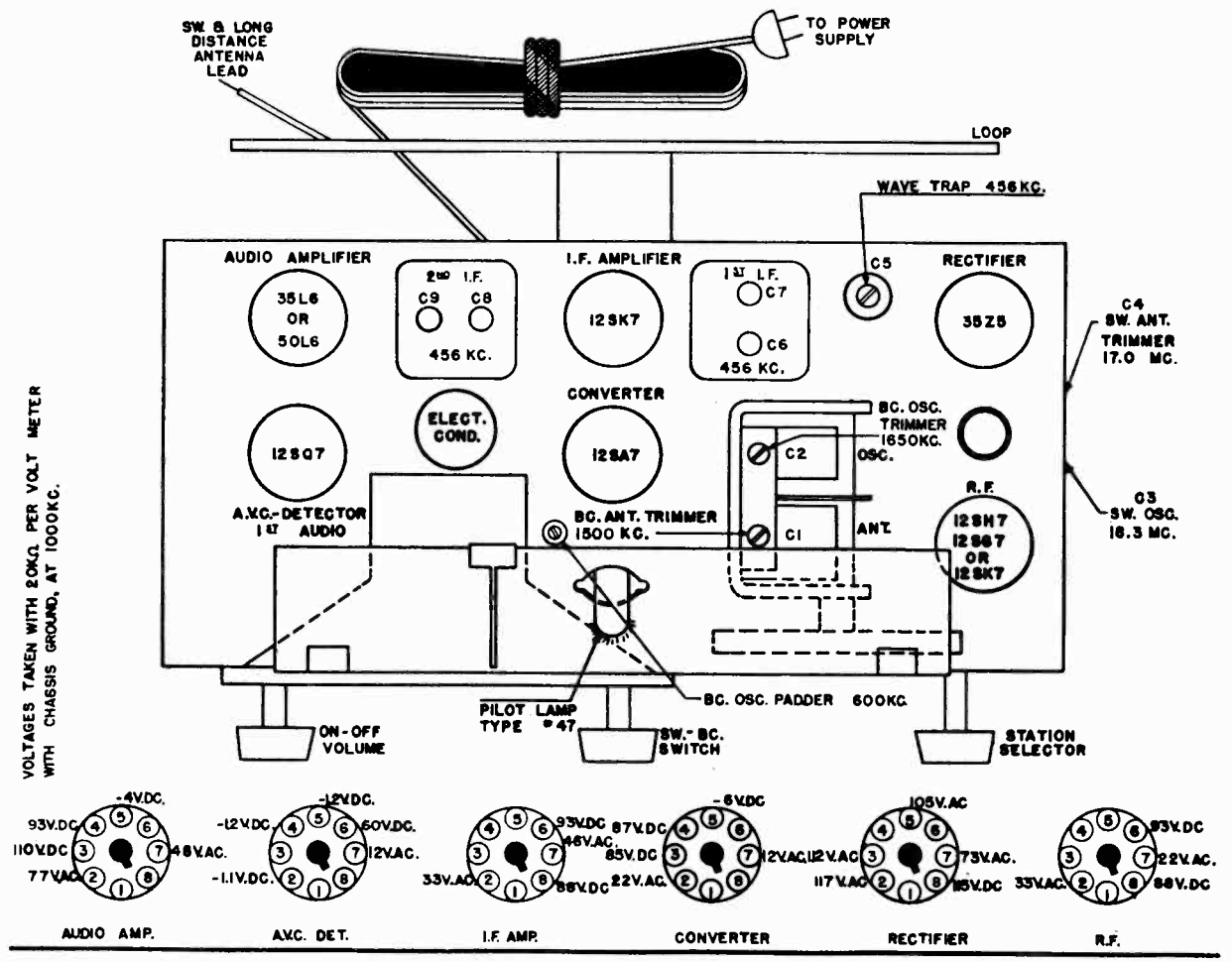
8. Repeat steps 2 and 4 if necessary.

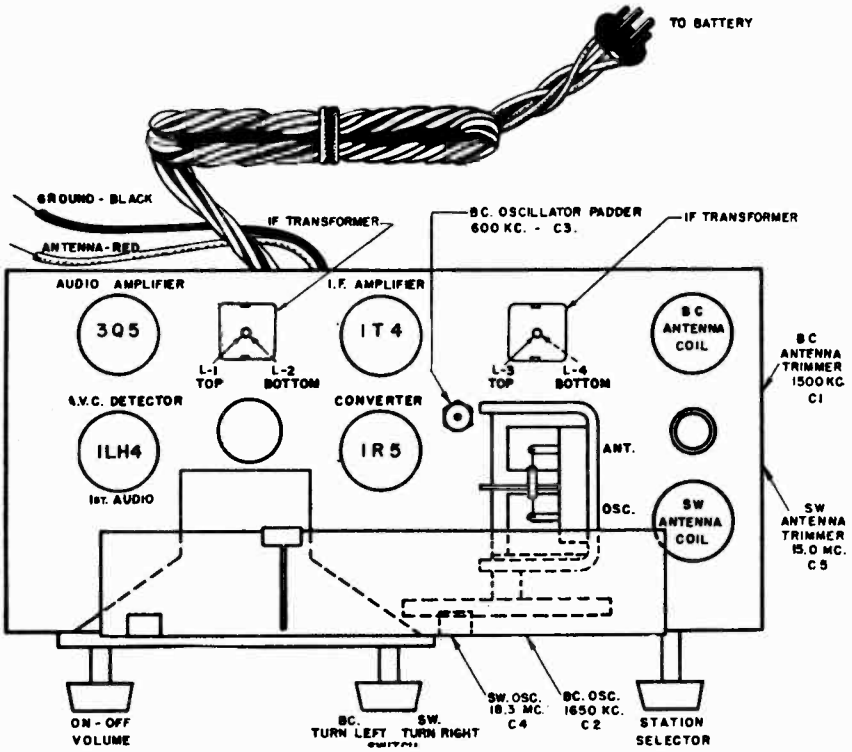
9. Remove A.F.C. shorting jumper.

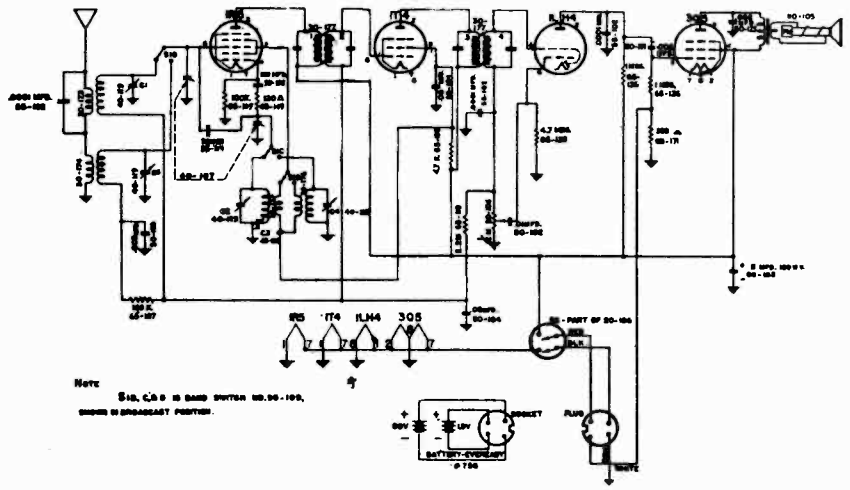


MODELS 617, 618









DWG. 130-178

ALIGNMENT INSTRUCTIONS

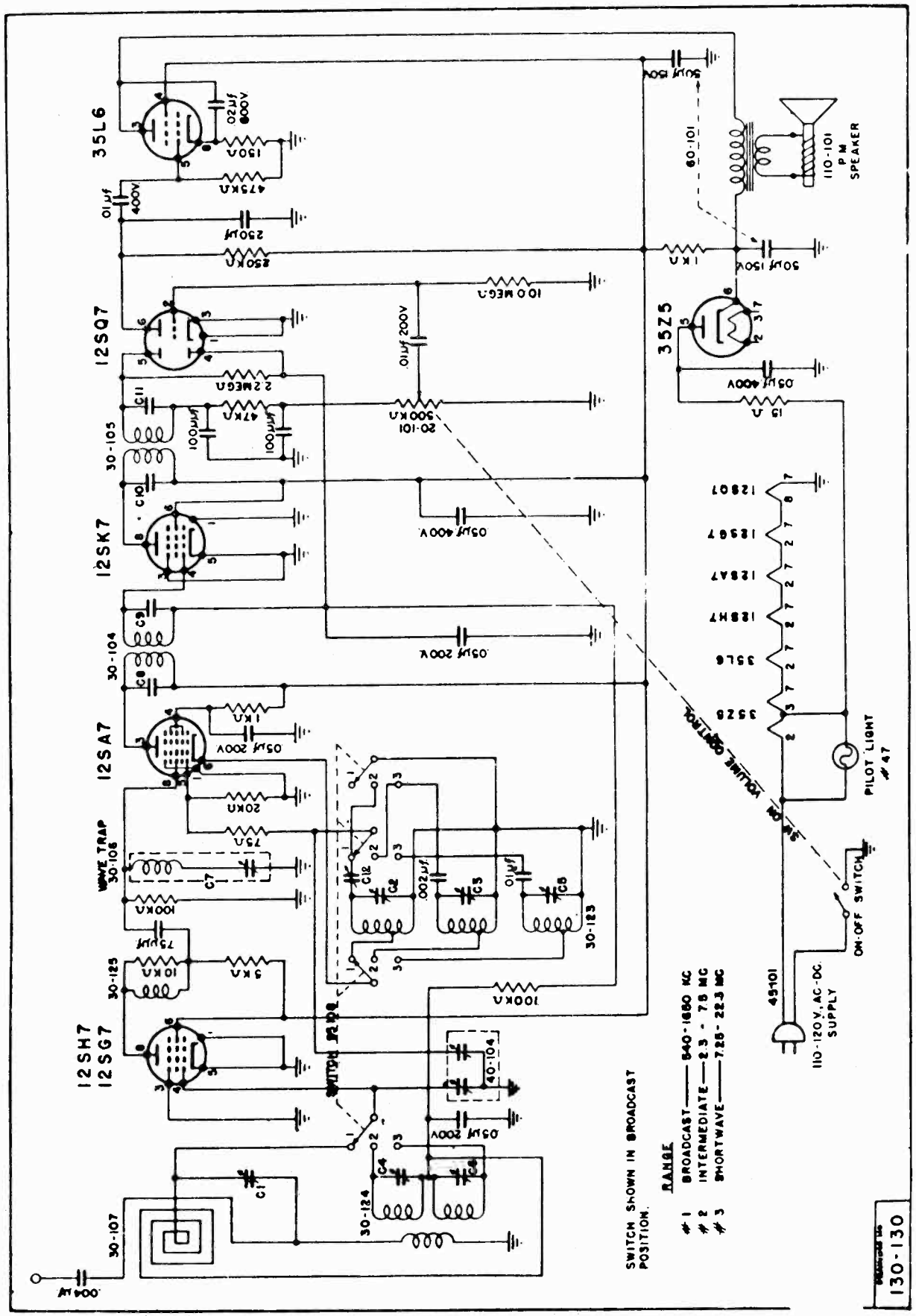
SET VOLUME CONTROL AT MAXIMUM VOLUME AND OUTPUT FROM SIGNAL GENERATOR NO HIGHER THAN IS NECESSARY TO OBTAIN OUTPUT READING.

TUNING RANGE

BROADCAST :- 540 - 1650 KC. SHORTWAVE :- 5.8 - 18.3 MC.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	BAND SWITCH POSITION	SIGNAL GEN'R FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
.05 MFD	R.F. SECTION OF VARIABLE CONDENSER	B C EXTREME LEFT	455 KC	1650 KC.	ACROSS VOICE COIL	L1, L2, L3, L4.	ADJUST FOR MAXIMUM
100 MMFD.	ANTENNA LEAD	B C	1650 KC	1650 KC.	" "	C1	" " "
100 MMFD.	" "	B C	1500 KC	1500 KC.	" "	C2	" " "
100 MMFD.	" "	B C	600 KC	600 KC.	" "	C3	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT. RECHECK C1 & C2 ADJUSTMENTS AS GIVEN
400 Ω	" "	S W EXTREME RIGHT	18.3 MC.	18.3 MC.	" "	* C4	ADJUST FOR MAXIMUM
400 Ω	" "	S W	15 MC	15 MC.	" "	X C5	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT.

MODELS 621, 622



ALIGNMENT INSTRUCTIONS

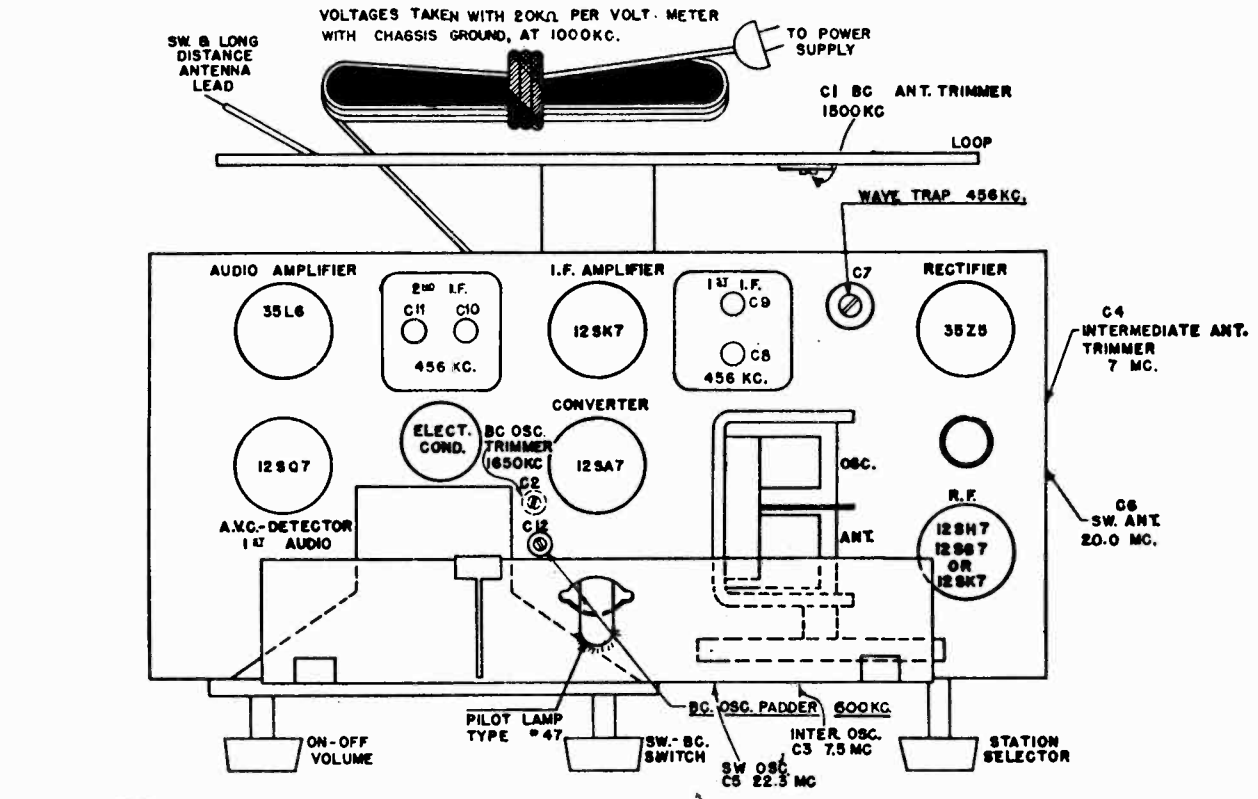
SET VOLUME CONTROL AT MAXIMUM VOLUME AND OUTPUT FROM SIGNAL GENERATOR NO HIGHER THAN IS NECESSARY TO OBTAIN OUTPUT READING

TUNING RANGE BROADCAST 540 - 1650 INTERMEDIATE 2.25 - 7.5 SHORTWAVE 7.25 - 22.3

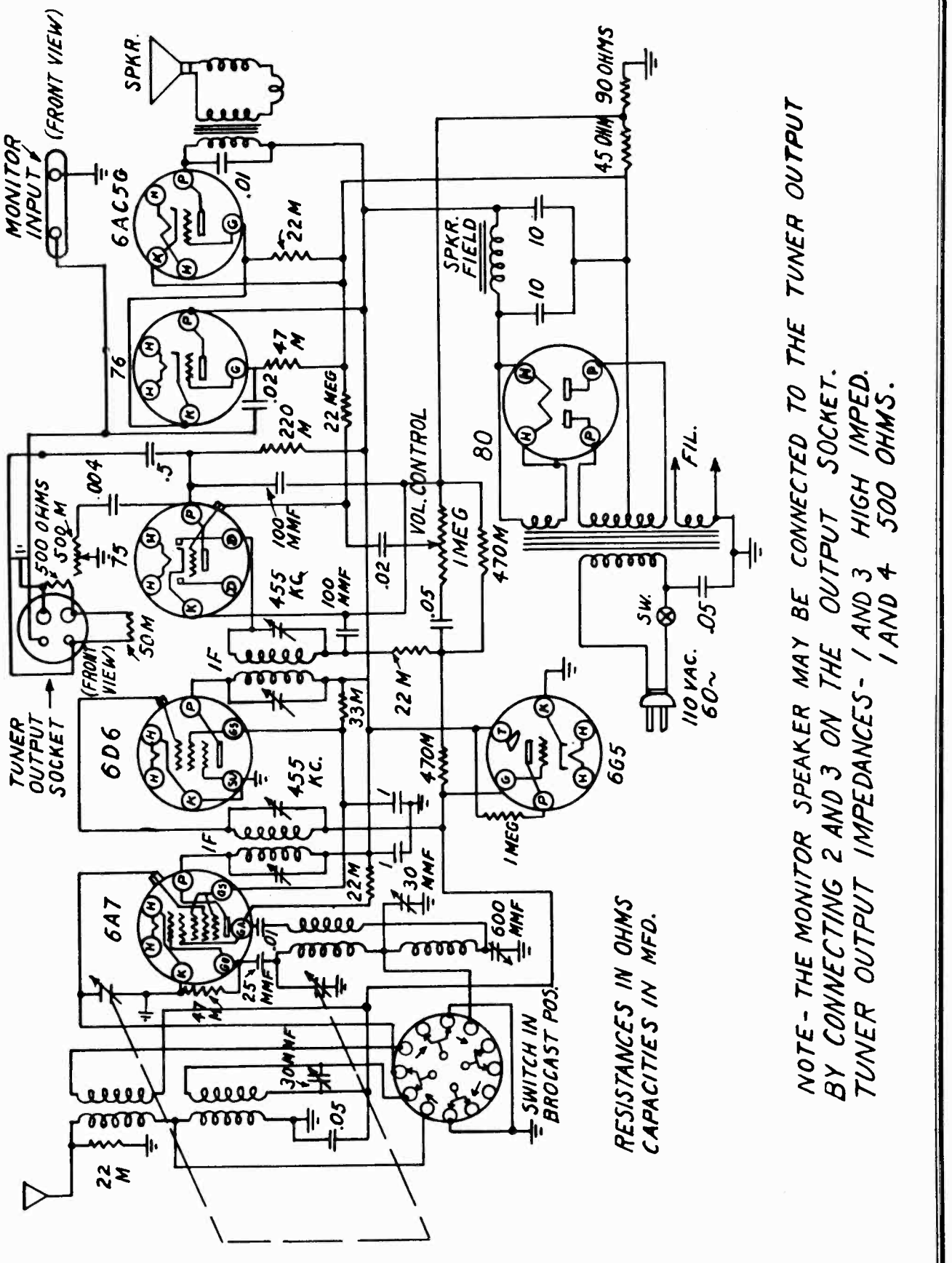
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	BAND SWITCH POSITION	SIGNAL GEN FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1 MFD	RF SECTION OF VARIABLE CONDENSER	BC	455 KC	1650 KC	ACROSS VOICE COIL	C8 , C9 C10 , C11	ADJUST FOR MAXIMUM
1 MFD	" "	BC	455 KC	600 KC	" "	C7	" " MINIMUM
200 MMFD	ANTENNA LEAD	BC	1650 KC	1650 KC	" "	C2	" " MAXIMUM TRIMMER UNDER CHASSIS
200 MMFD	" "	BC	1500 KC	1500 KC	" "	C1	" " "
200 MMFD	" "	BC	600 KC	600 KC	" "	C12	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT RECHECK C1 & C2 ADJUSTMENTS AS GIVEN
400 Ω	" "	INTERMEDIATE	7.5 MC	7.5 MC	" "	C3	ADJUST FOR MAXIMUM
400 Ω	" "	INTERMEDIATE	7.0 MC	7 MC	" "	C4	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT
400 Ω	" "	SW	22.3 MC	22.3 MC	" "	C5	ADJUST FOR MAXIMUM
400 Ω	" "	SW	20 MC	20 MC	" "	C6	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT

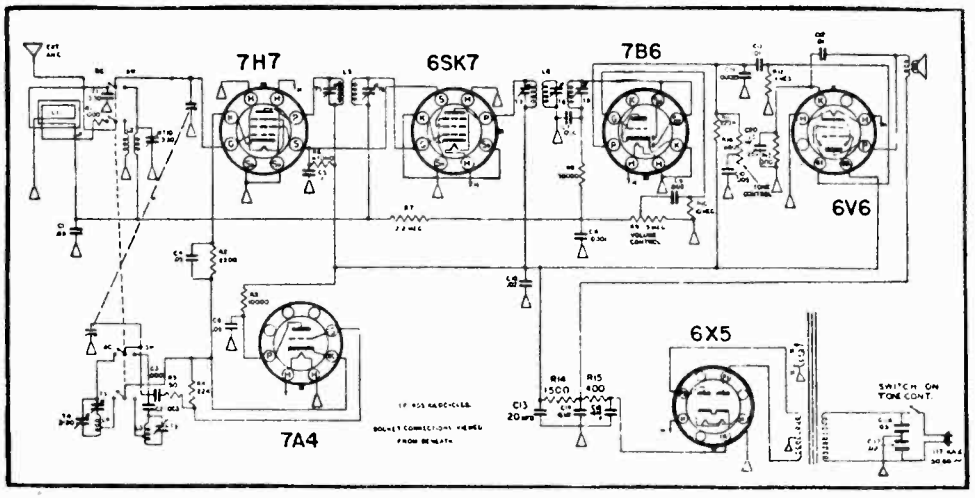
130-135

IF TWO PEAKS CAN BE OBTAINED USE ONE WITH TRIMMER SCREW FURTHER OUT



MODEL 1030TP





ALIGNMENT PROCEDURE

Output meter connection.....Across voice coil

Output meter reading to indicate ½ watt.....1.25V for 3.2 Ohm voice coil

Connection of generator ground.....Receiver chassis

Generator modulation.....Approximately 30% @ 400 cycles

Position of volume control.....Fully clockwise

Position of tone control.....High position

WAVE BAND SW.	POSITION OF DIAL POINTER	GEN. FREQ.	GEN. CONN.	DUMMY ANT.	TRIMMERS ADJ. IN ORDER SHOW	TRIMMER FUNC'S
B. C.	540 kc	455 kc	7H7 Grid	.1 mfd	T9-T7-T8-T6-T5	I. F.
	1500 kc	1500 kc	* note		T4-T1	Osc. - Ant.
	600 kc	600 kc	* note		T3-Rock Var. Cond.	Osc. - Padder
	1500 kc	1500 kc	* note		Readjust T4	Osc.
S. W.	18 mc	18 mc	Ant. Post	RMA Standard All Wave	T2 **	Osc.
	16 mc	16 mc	Ant. Post	RMA Standard All Wave	T10	Ant.

PARTS LIST

Schematic Location	Part No.	Description
	457	Cabinet
	62172	Cover — back
L1	28135	Coil, loop
L2	28137	Coil, SW — Ant.
L3	28138	Coil, SW osc with trimmer
L4	28136	Coil, BC osc with padder
C1, C4, C6, C16		Condenser, .05 mfd, 400 volts
C5		Condenser, .1 mfd, 400 volts
C9		Condenser, .002 mfd, 400 volts
C19		Condenser, .005 mfd, 400 volts
C11		Condenser, .01 mfd, 400 volts
C12		Condenser, .01 mfd, 800 volts
C18, C17		Condenser, .02 mfd, 400 volts
C3, C8, C7		Condenser, Mica, .0001 mfd, 400 volts
C19		Condenser, Mica, .00025 — 400 volts
C2		Condenser, Mica, .003 — 400 volts
C	1655	Variable condenser
C13, C14, C15	20102	Condensers, electrolytic, 20 mfd, 16 mfd, 16 mfd, 350 vplts
C20	20105	Condensers, electrolytic, 25 mf, 25 volts
T1, T10, T4	1725	Condenser, trimmers on bracket (3) 3-30 mmfd
R7	2470	Control, volume, .5 megohm
R14	2521	Control, tone, .25 megohm with switch
	8581	Cord, power
	4579	Dial cord
	40109	Dial scale
	4140	Dial pointer
	4633	Dial spring
	39138	Knob, tone, off-on
	39139	Knob, SW - BC
	39140	Knob, tuning
	39141	Knob, volume
	4911	Lamp, dial, #47 (2)
R1		1000 ohm, ½ watt
R2		2200 ohm, ½ watt
R3		47 ohm, ½ watt
R4		22,000 ohm, ½ watt
R5		10,000 ohm, ½ watt
R7		2.2 megohm, ½ watt
R6, R8		47,000 ohm, ½ watt
R11		220,000 ohm, ½ watt
R13		300 ohm, 1 watt, wire wound
R14		1500 ohm, 1 watt, wire wound
R15		400 ohm, 1 watt, wire wound
R10		10 megohm, ½ watt
R12		.5 megohm, ½ watt
	8107	Socket, pilot lamp (2)
	3784	Switch, band, BC - SW
	5866	Speaker, 5" output transformer
	1089	Transformer, power **
L5	3323	Transformer, I.F. Input
L6	3523	Transformer, I.F. Output

TUBES

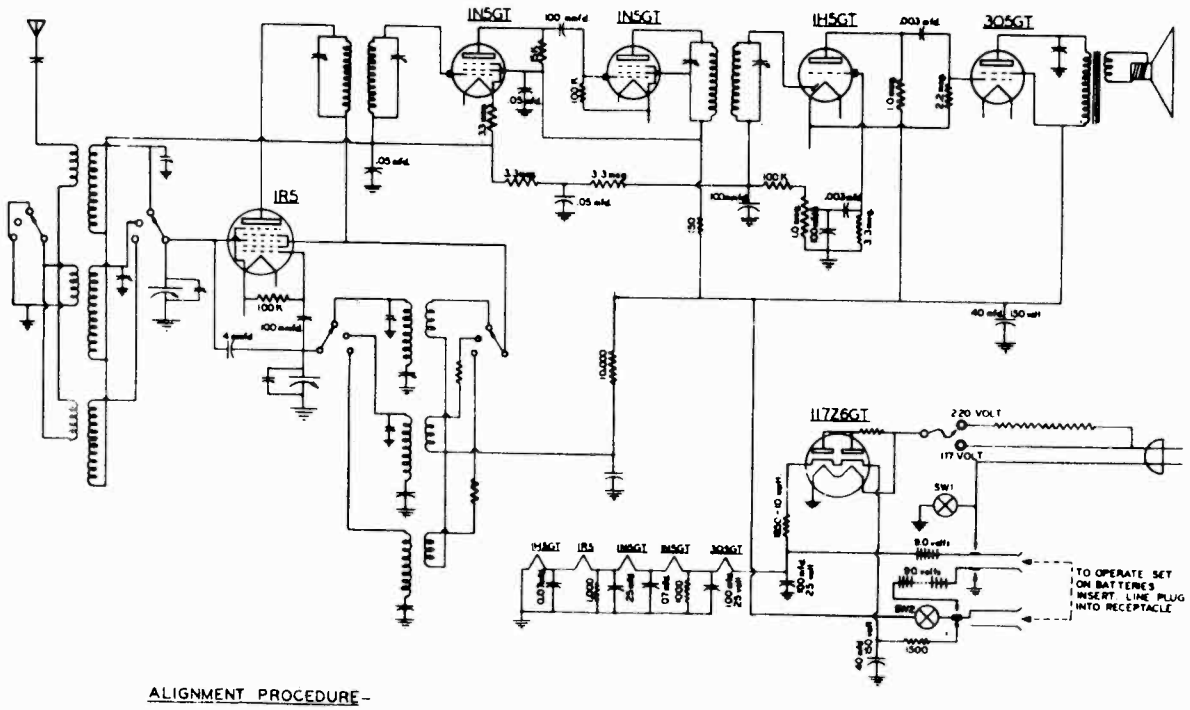
1—6V6	1—6X5	1—6SK7
1—7H7	1—7A4	1—7B6

** For 115 - 230 volt operation use transformer #1090

POWER SUPPLY:

This receiver is designed for operation on A. C. (Alternating Current) only. 105-125 volts, 50-60 cycles. If in doubt as to the voltage and frequency supplied to your home, telephone your local Power Company.

MODELS 651, 653



ALIGNMENT PROCEDURE-

Note: Use isolating condenser in feeding signals from the signal generator

Step	Set Gen at	Connect Gen to	Set Bandswitch	Set dial at	Vary	For	Check For
#1	455KC	R.F. Sec of Variable	BC	Min cap	I.F. Trimmer	Max. response	Max senstivity
#2	18MC	Antenna terminal	SW (6-18MC)	18MC	Variable osc trimmer	gen sig.	to make sure not image frequency (image should appear in frequency)
#3	16MC	"	"	16MC	Variable RF trimmer	Max. response	Check entire band for good sentivity
#4	6MC	"	P.B (2-6MC)	6MC	P.B. osc trimmer	Gen. signal	To make sure not on image frequency
#5	5MC	"	"	5MC	P.B. Ant trimmer	Max. resp.	Check entire band for good sentivity
#6	1600KC	"	B.C.	1600KC	BC Ant trimmer	Gen. signal	
#7	1600KC	"	"	"	BC Ant trimmer	Max response	
#8	600KC	"	"	600KC	BC Padder	Gen Signal	
#9		Recheck all steps					

TO REPLACE BATTERIES

Unscrew the two bolts holding the loop to the chassis and loosen the metal bar holding the "B" batteries in place. Pull the battery plugs out and replace new batteries in the same relative position. Use 2 Eveready #746 (or equivalent) and 2 Eveready #402 (or equivalent).

Batteries are considered to be poor or defective when they measure 1/3 less terminal voltage than the normal value thus the 90 volt "B" batteries should read better than 60 volts and the 9 volts "A" batteries should read better than 6 volts. These voltage measurements are to be taken after the set has been playing in the battery position for approximately one quarter hour. Use a voltmeter with low drain to read voltages (a 1000 ohm per volt meter or better)

TO OPERATE THIS SET ON A 120 VOLT POWER LINE.

Disconnect the set from the power line. Take voltage selector plug (behind loop under loop mounting bracket) and insert into the 120 volt jack (black).

TO OPERATE THIS SET ON A 220 VOLT POWER LINE

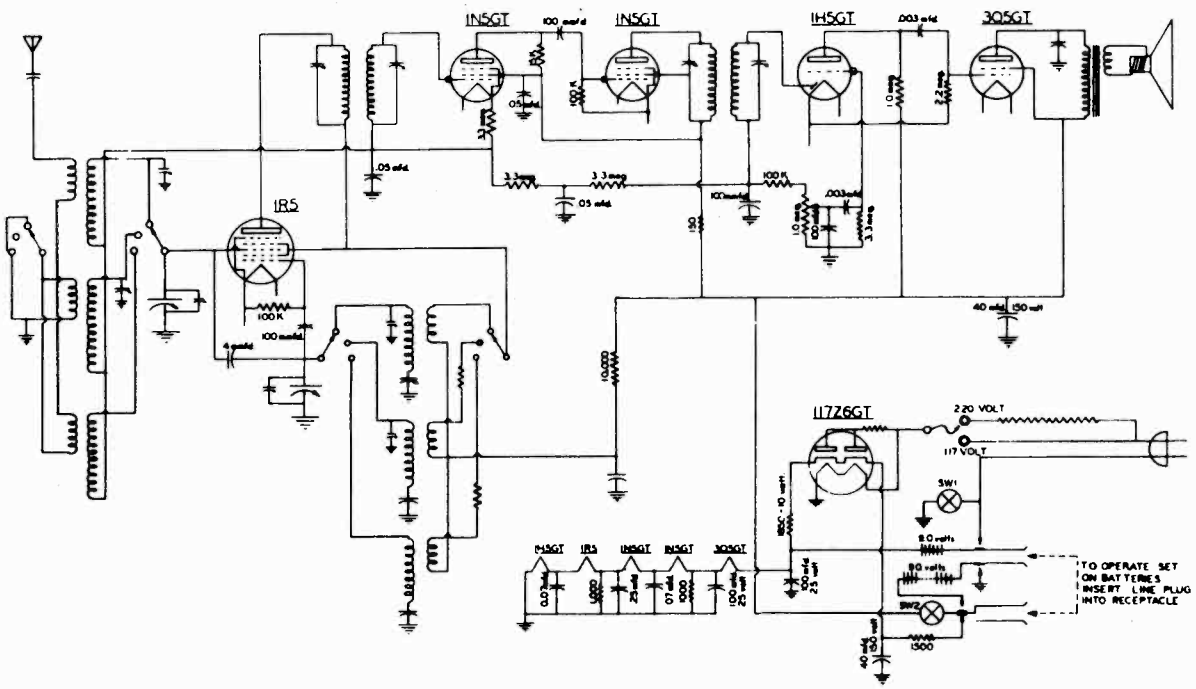
Disconnect the set from the power line. Take voltage selector plug (behind loop under loop mounting bracket) and insert it into the 220 volt jack (red).

CAUTION:

NEVER PLUG THIS SET INTO A 220 VOLT POWER LINE WHEN THE VOLTAGE SELECTOR PLUG IS IN THE 120 VOLT POSITION (BLACK JACK) OTHERWISE PERMANENT DAMAGE WILL RESULT. DO NOT CUT THE LINE CORD OR OTHERWISE CHANGE IT'S CHARACTERISTICS OR DAMAGE WILL OCCUR.

DO NOT CHANGE TUBES WHILE THE SET IS TURNED ON SINCE DAMAGE CAN BE CAUSED BY SO DOING.

MODEL 655



ALIGNMENT PROCEDURE-

Note: Use isolating condenser in feeding signals from the signal generator

Step	Set Gen at	Connect Gen to	Set Bandswitch	Set dial at	Vary	For	Check For
#1	455KC	R.F. Sec of Variable	BC	Min cap	I.F. Trimmer	Max. response	Max sensitivity
#2	18MC	Antenna terminal	SW (6-18MC)	18MC	Variable osc trimmer	gen sig.	to make sure not image frequency (image should appear in frequency)
#3	16MC	"	"	16MC	Variable RF trimmer	Max. response	Check entire band for good sentivity
#4	400KC	"	LW	400	LW osc trimmer	Gen. signal	To make sure not on image frequency
#5	350KC	"	"	350	LW Ant trimmer	Max. resp.	Check entire band for good sentivity
#6	1600KC	"	B.C.	1600KC	BC Ant trimmer	Gen. signal	
#7	1600KC	"	"	"	BC Ant trimmer	Max response	
#8	600KC	"	"	600KC	BC Padder	Gen Signal	
#9		Recheck all steps					

TO REPLACE BATTERIES

Unscrew the two bolts holding the loop to the chassis and loosen the metal bar holding the "B" batteries in place. Pull the battery plugs out and replace new batteries in the same relative position. Use 2 Eveready # 746 (or equivalent) and 2 Eveready #482 (or equivalent).

Batteries are considered to be poor or defective when they measure 1/3 less terminal voltage than the normal value thus the 90 volt "B" batteries should read better than 60 volts and the 9 volts "A" batteries should read better than 6 volts. These voltage measurements are to be taken after the set has been playing in the battery position for approximately one quarter hour. Use a voltmeter with low drain to read voltages (a 1000 ohm per volt meter or better)

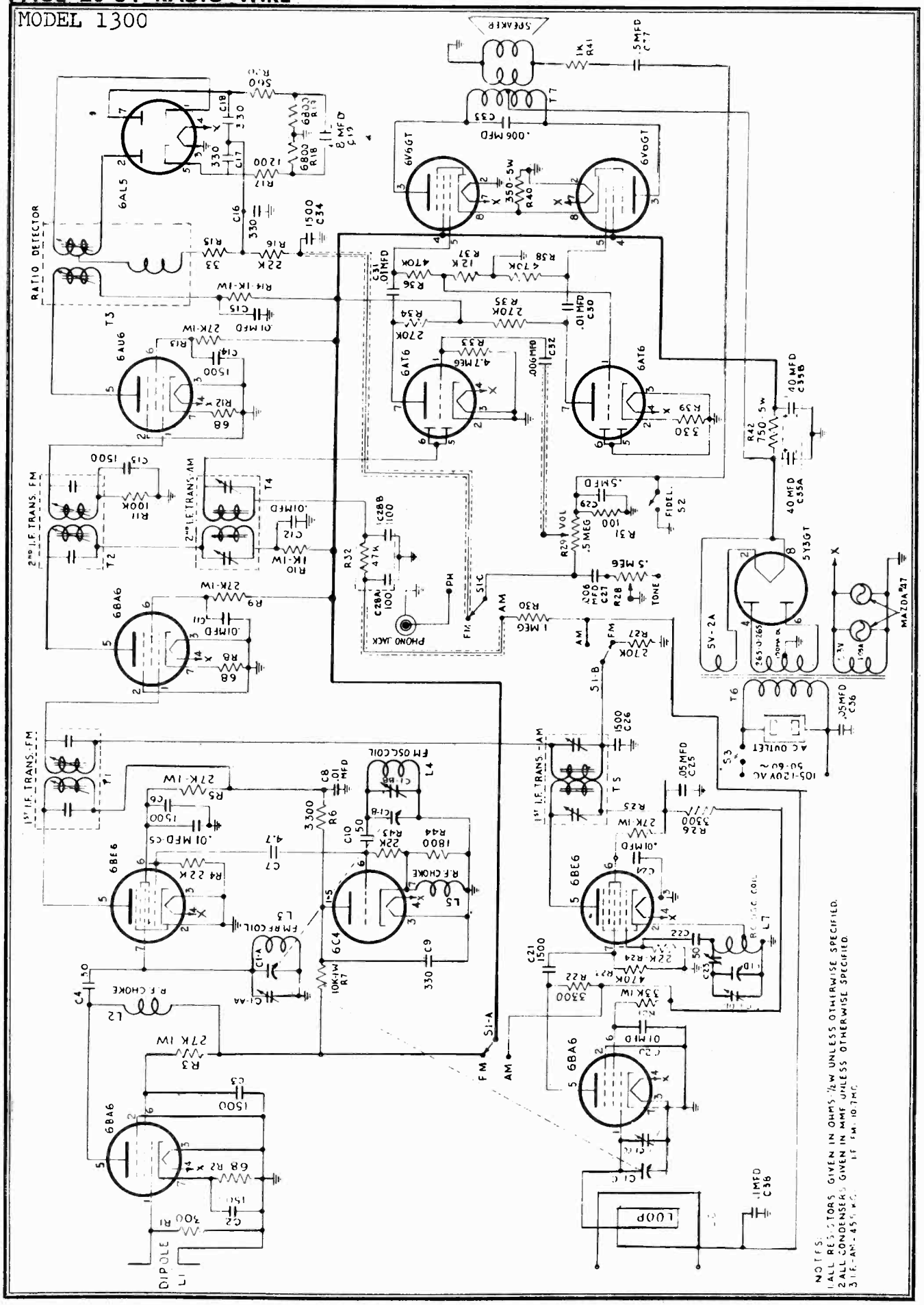
TO OPERATE THIS SET ON A 120 VOLT POWER LINE.

Disconnect the set from the power line. Take voltage selector plug (behind loop under loop mounting bracket) and insert into the 120 volt jack (red).

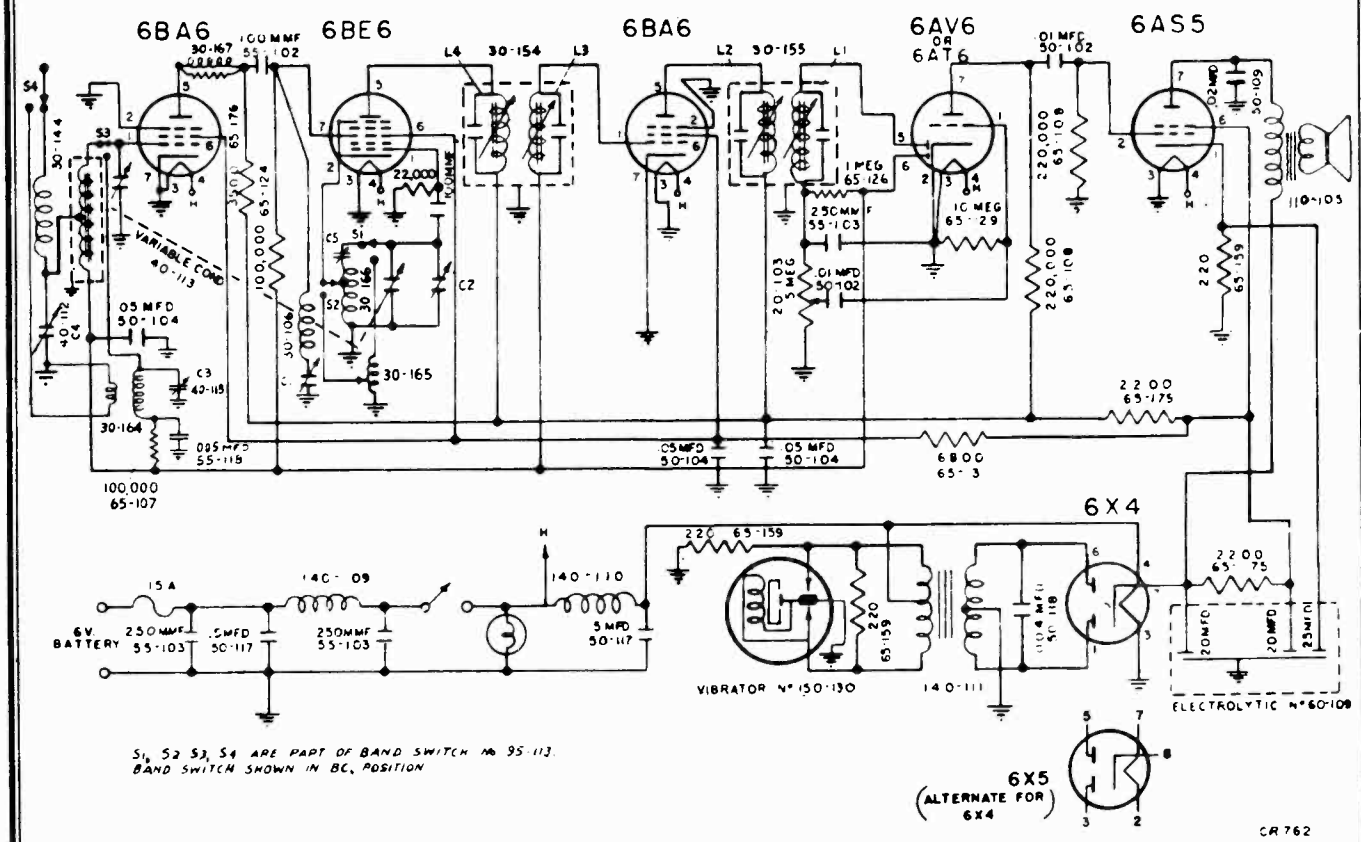
TO OPERATE THIS SET ON A 220 VOLT POWER LINE

Disconnect the set from the power line. Take voltage selector plug (behind loop under loop mounting bracket) and insert it into the 220 volt jack (red).
CAUTION:
NEVER PLUG THIS SET INTO A 220 VOLT POWER LINE WHEN THE VOLTAGE SELECTOR PLUG IS IN THE 120 VOLT POSITION (BLACK JACK) OTHERWISE PERMANENT DAMAGE WILL RESULT. DO NOT CUT THE LINE CORD OR OTHERWISE CHANGE IT'S CHARACTERISTICS OR DAMAGE WILL OCCUR.
DO NOT CHANGE TUBES WHILE THE SET IS TURNED ON SINCE DAMAGE CAN BE CAUSED BY SO DOING.

MODEL 1300



MODEL CR762



ALIGNMENT INSTRUCTIONS

SET VOLUME CONTROL AT MAXIMUM VOLUME AND OUTPUT FROM SIGNAL GENERATOR NO HIGHER THAN IS NECESSARY TO OBTAIN OUTPUT READING.

TUNING RANGE

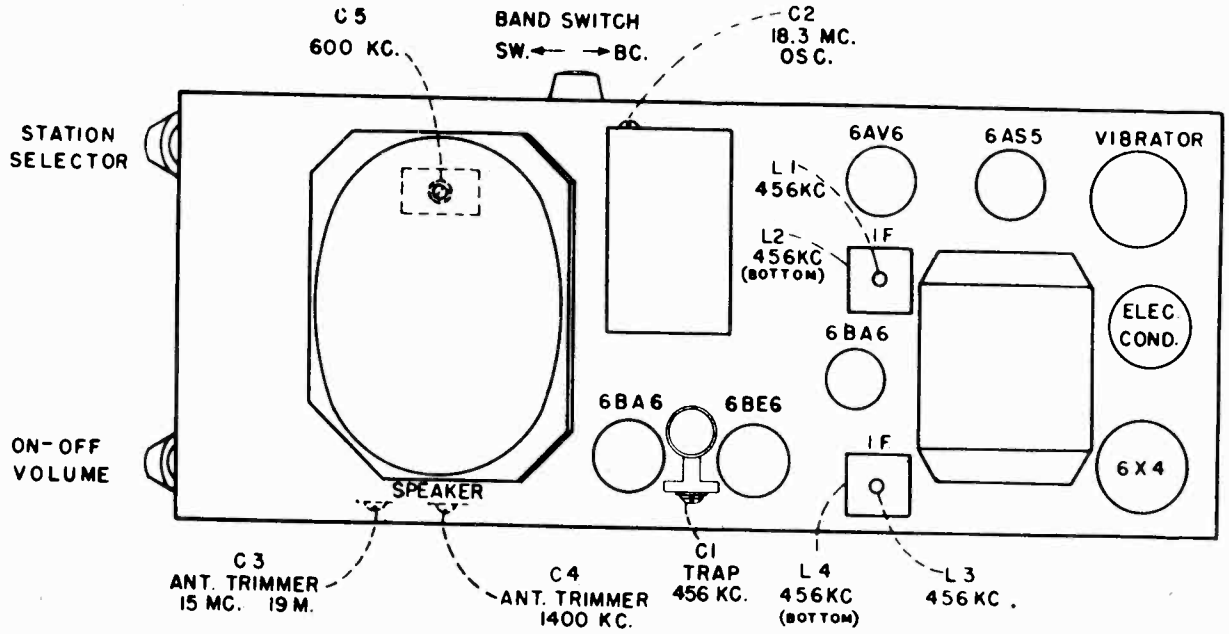
BROADCAST :- 540 - 1650 KC. SHORTWAVE :- 5.8 - 18.3 MC.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING TO	BAND SWITCH POSITION	SIGNAL GEN'R FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
.1 MFD	PIN 7 ON 6BE6 SOCKET	B C	456 KC.	FULL OPEN	ACROSS VOICE COIL	L1, L2, L3, L4.	ADJUST FOR MAXIMUM OUTPUT
.1 MFD	PIN 1 ON 6BA6 (RF)	B C	456 KC.	" "	" "	C1	" " " MINIMUM
200 OHMS	ANTENNA SOCKET	S W	18.3 MC.	" "	" "	* C2	" " " MAXIMUM
200 OHMS	" "	S W	15 MC.	APPROX. 19 METERS	" "	C 3	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT. C3 ADJUSTMENT
30 MMFD.	" "	B C	1400 KC.	APPROX. 1400 KC.	" "	C 4	ADJUST FOR MAXIMUM OUTPUT
30 MMFD.	" "	B C	600 KC.	600 KC.	" "	C 5	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT.

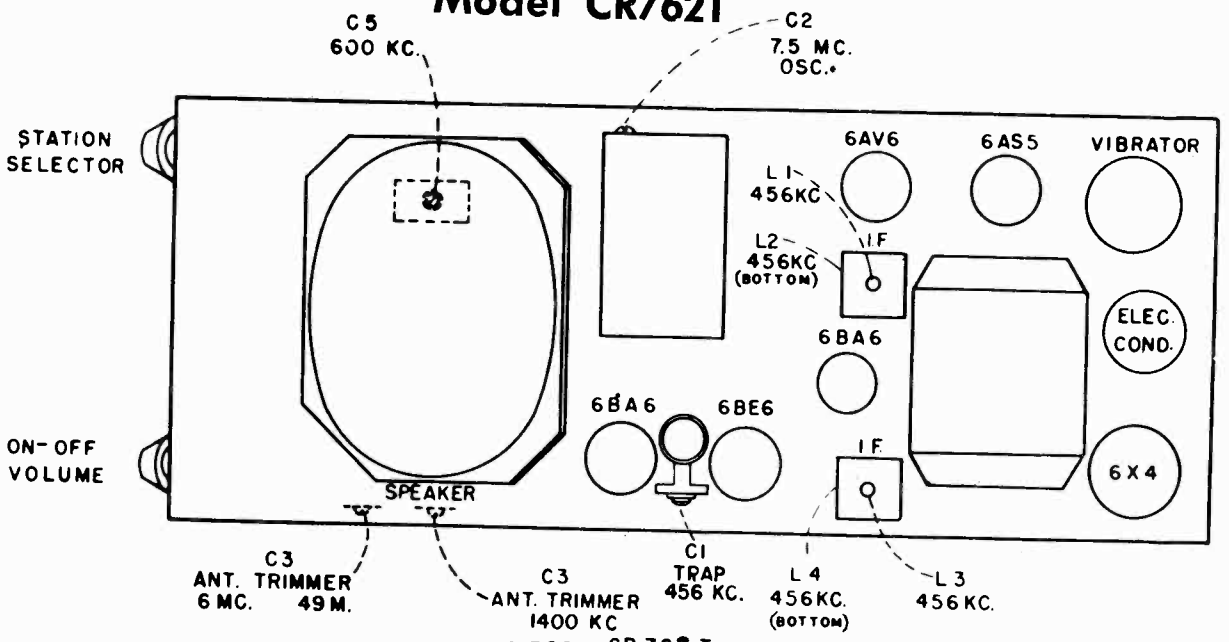
* IF TWO PEAKS CAN BE OBTAINED, USE ONE WITH TRIMMER SCREW FURTHER IN.

MODELS CR762, CR762T

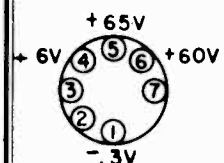
Model CR762



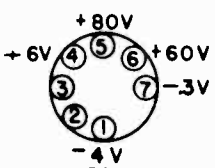
Model CR762T



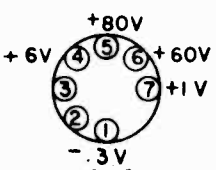
CR 762 CR 762 T



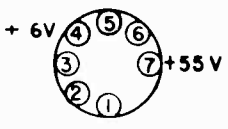
6BA6
RF



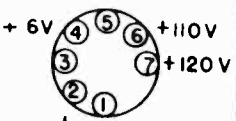
6BE6
CONV



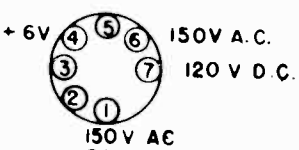
6BA6
IF



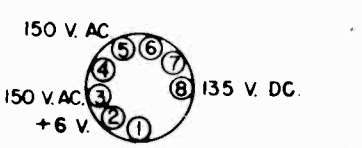
6AT6
6AV6
DET-AVC-AF



6AS5
PWR.

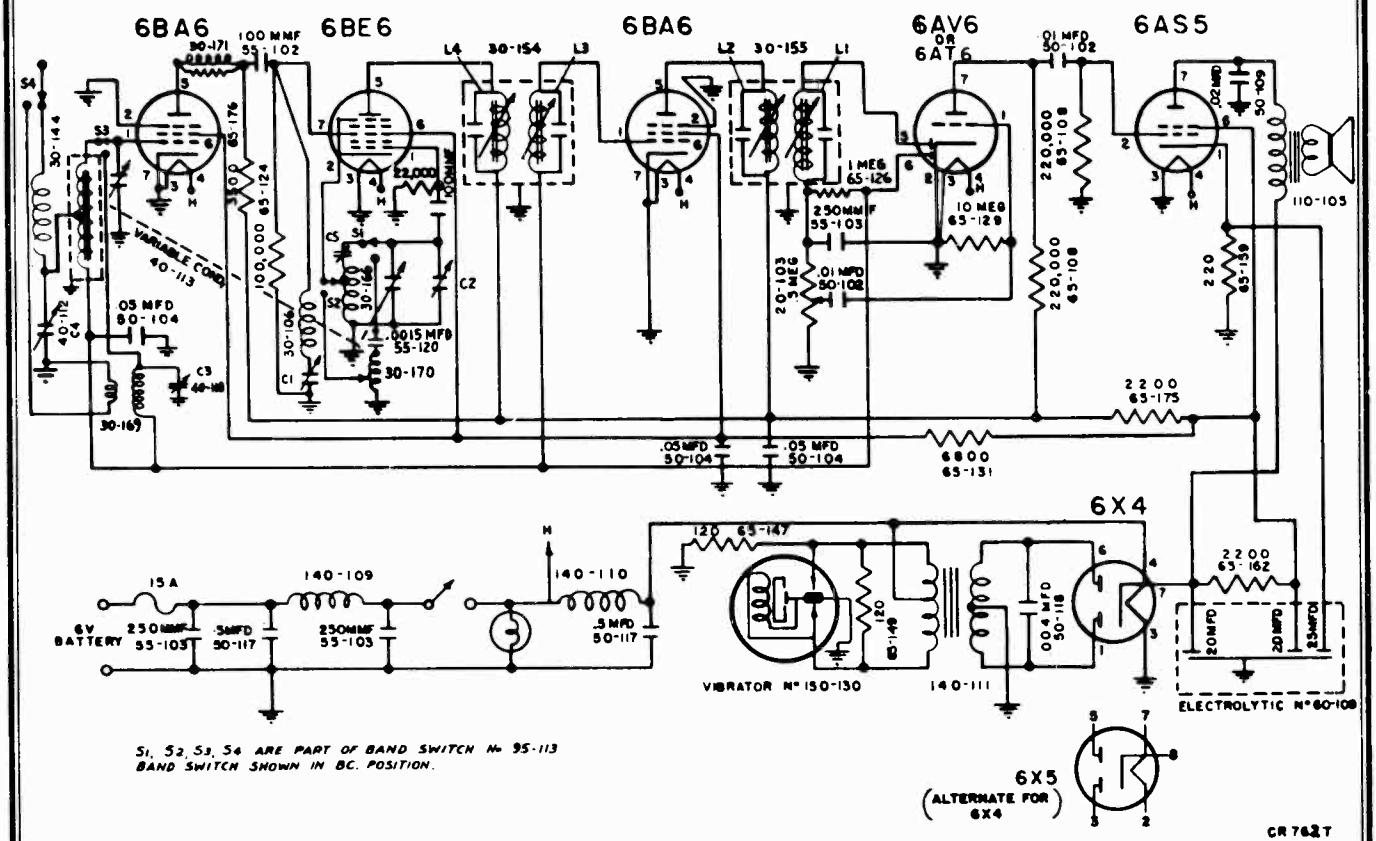


150 V AC
6X4
RECT.



6X5 (ALTERNATE FOR 6X4)
RECT.

MODEL CR762T



ALIGNMENT INSTRUCTIONS

SET VOLUME CONTROL AT MAXIMUM VOLUME AND OUTPUT FROM SIGNAL GENERATOR NO HIGHER THAN IS NECESSARY TO OBTAIN OUTPUT READING

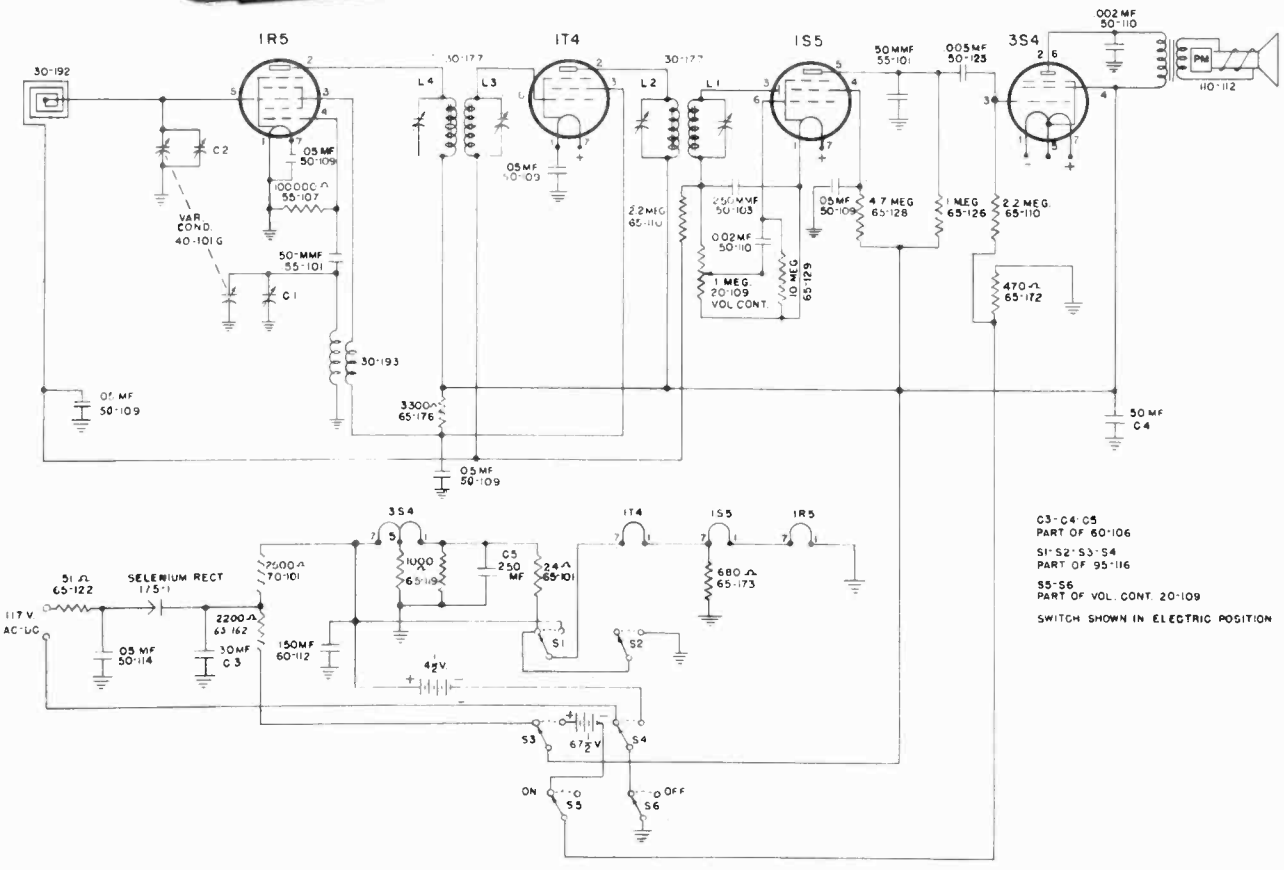
TUNING RANGE

BROADCAST :- 540 - 1650 KC SHORTWAVE - 2.3 - 7.5 MC.

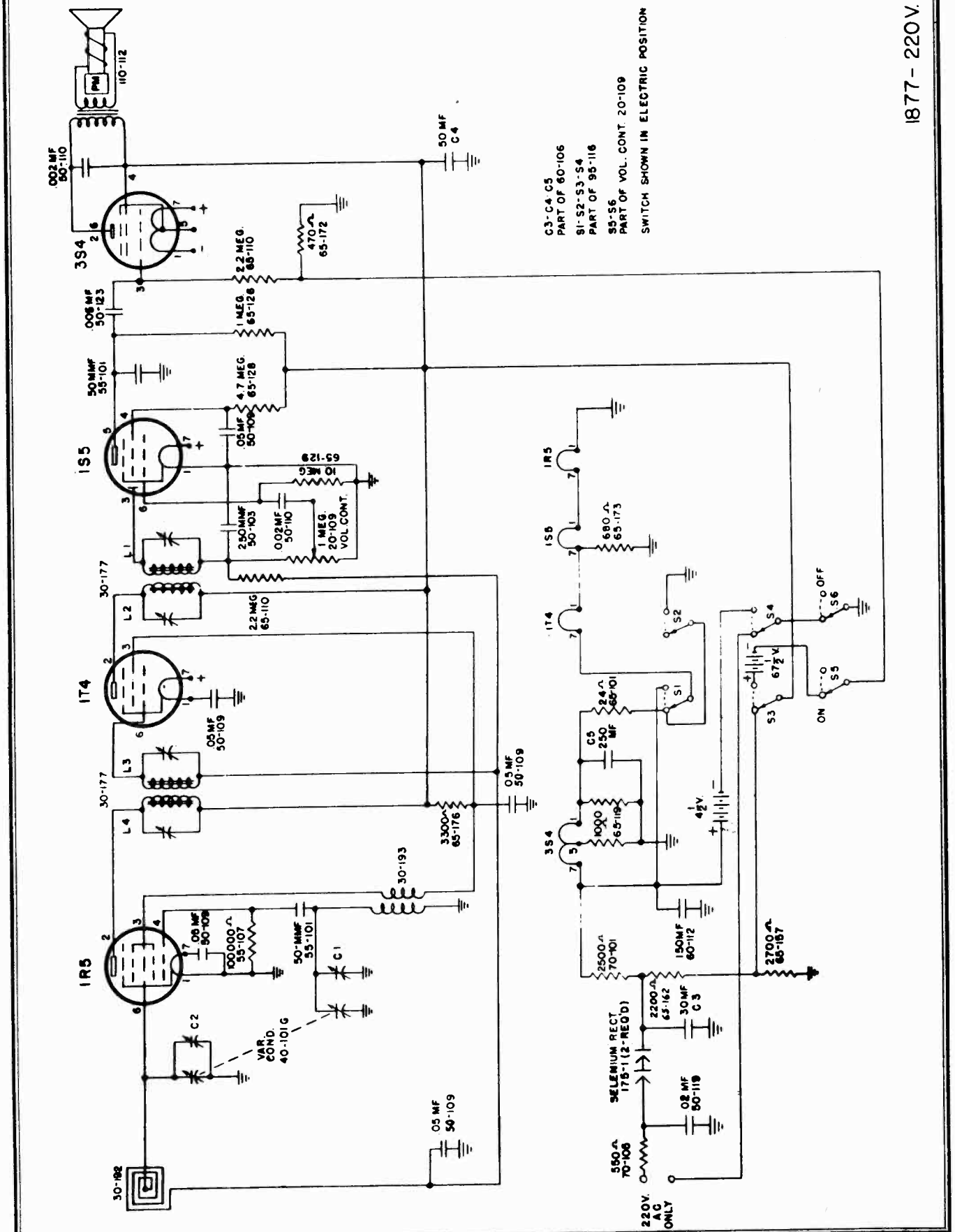
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING ON	BAND SWITCH POSITION	SIGNAL GEN'R FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
.1 MFD	PIN* 7 ON 6BE6 SOCKET	B C	456 KC	FULL OPEN	ACROSS VOICE COIL	L1, L2, L3, L4	ADJUST FOR MAXIMUM OUTPUT
.1 MFD.	PIN* 1 ON 6BA6 (RF) "	B C	456 KC	" "	" "	C1	" " MINIMUM "
200 OHMS	ANTENNA SOCKET	S W	7.5 MC.	" "	" "	* C2	" " MAXIMUM "
200 OHMS	" "	S W	6 MC.	APPROX. 49 METERS	" "	C 3	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT. C3 ADJUSTMENT
30 MMFD.	" "	B C	1400 KC.	APPROX. 1400 KC.	" "	C 4	ADJUST FOR MAXIMUM OUTPUT
30 MMFD.	" "	B C	600 KC.	600 KC.	" "	C 5	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT.

* IF TWO PEAKS CAN BE OBTAINED, USE ONE WITH TRIMMER SCREW FURTHER OUT.

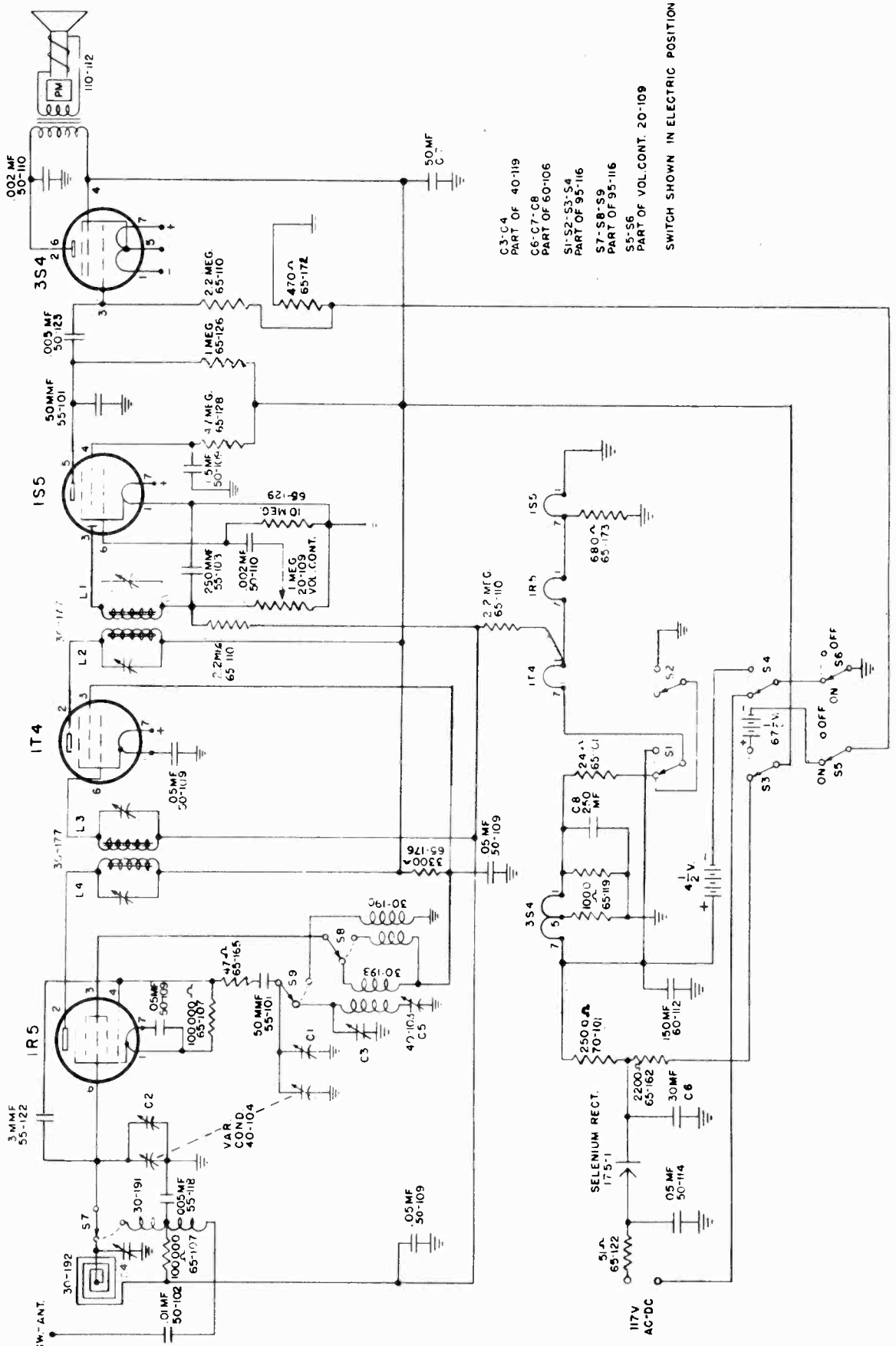
MODEL 1877



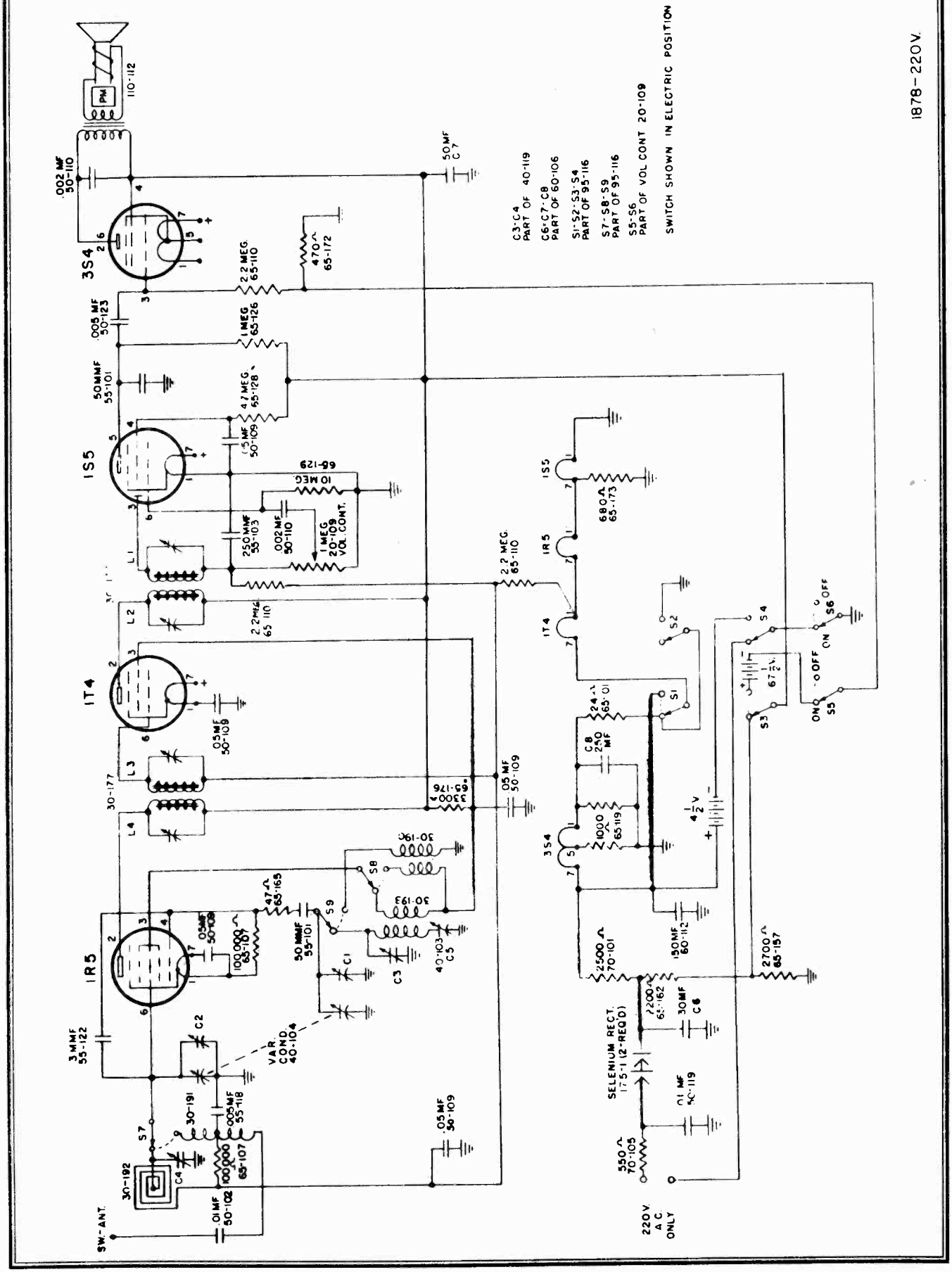
MODEL 1877-220V.



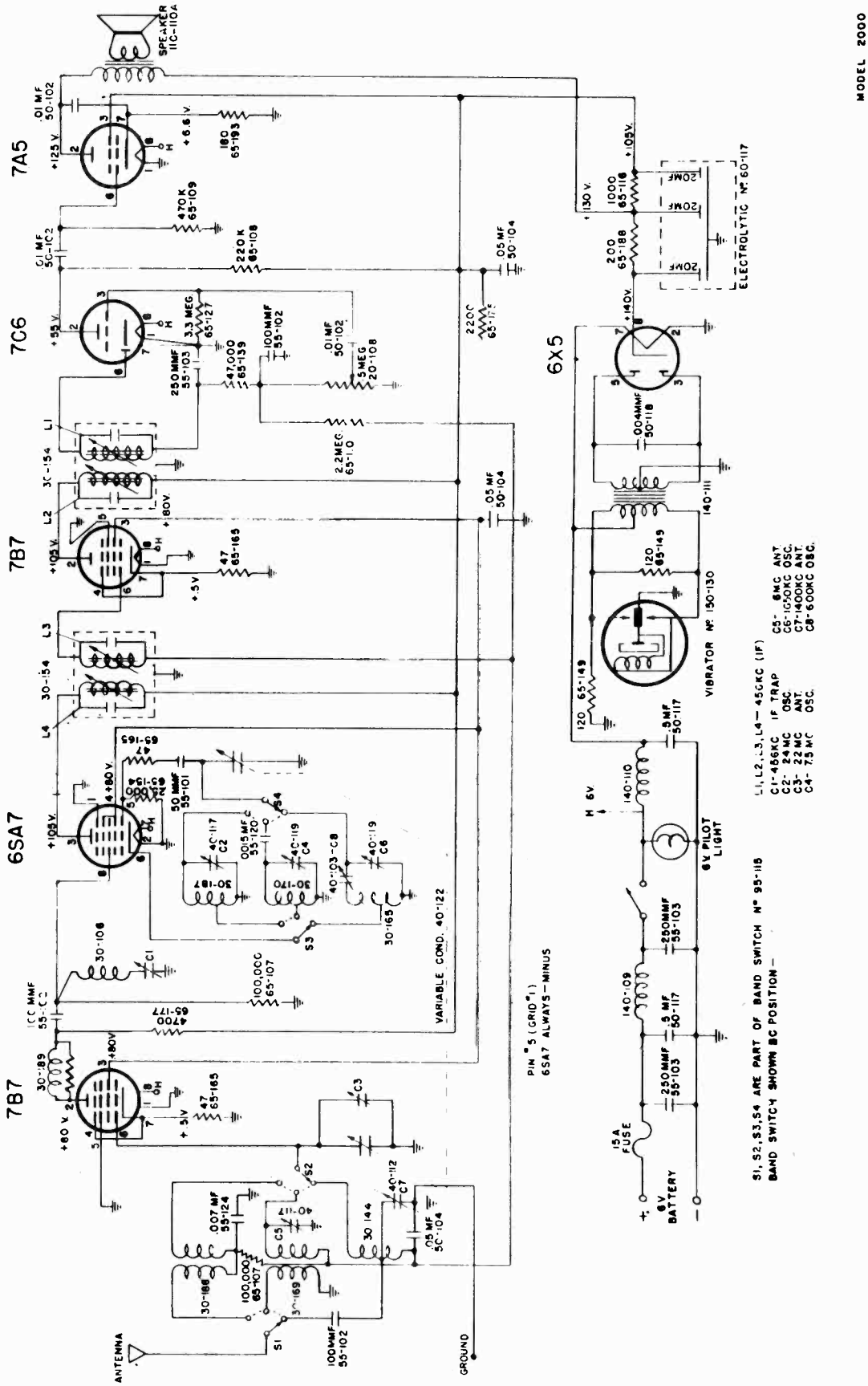
MODEL 1878



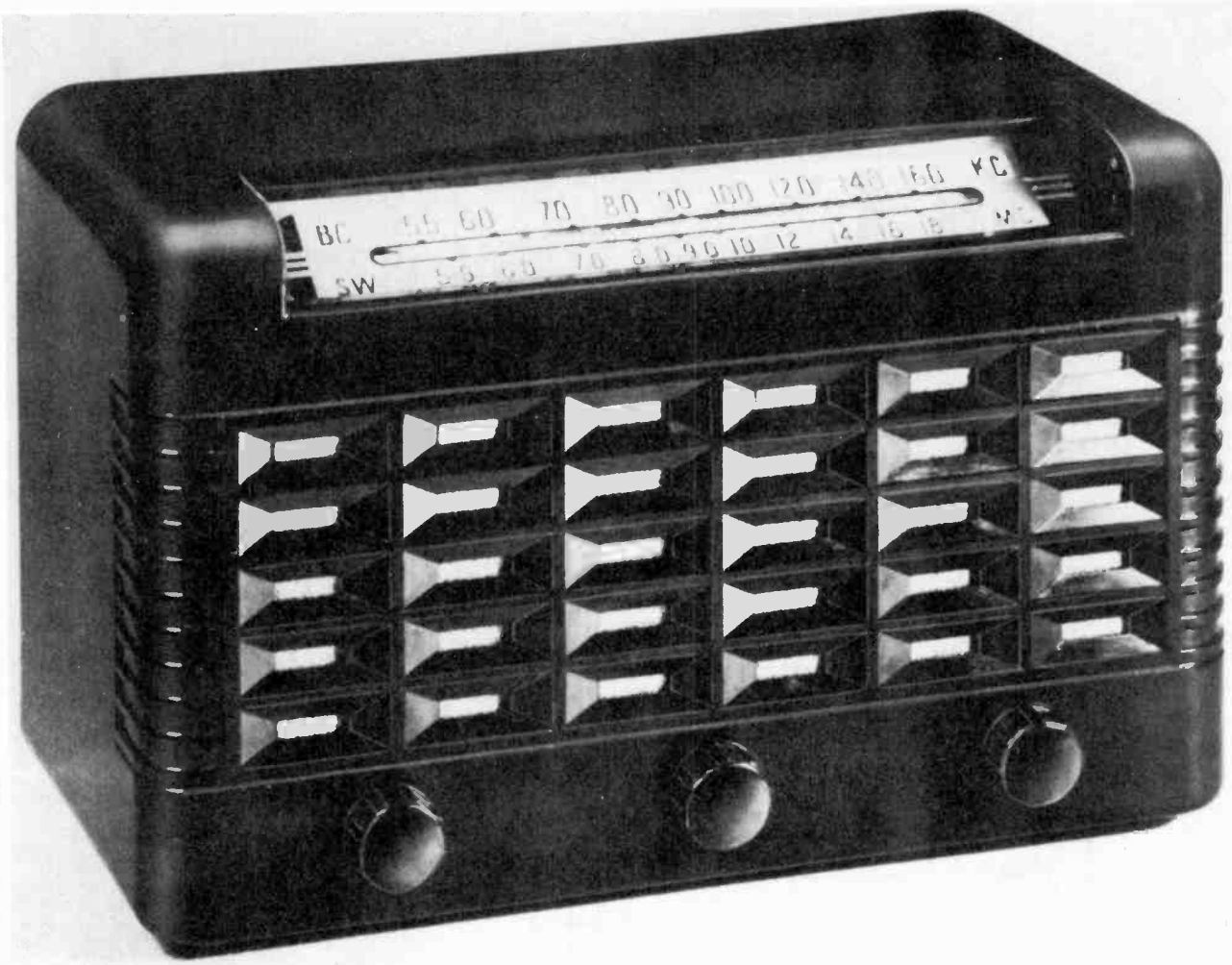
MODEL 1878-220V.



MODEL 2000



MODELS 2000, 4963



ALIGNMENT INSTRUCTIONS

SET VOLUME CONTROL AT MAXIMUM VOLUME AND OUTPUT FROM SIGNAL GENERATOR NO HIGHER THAN IS NECESSARY TO OBTAIN OUTPUT READING

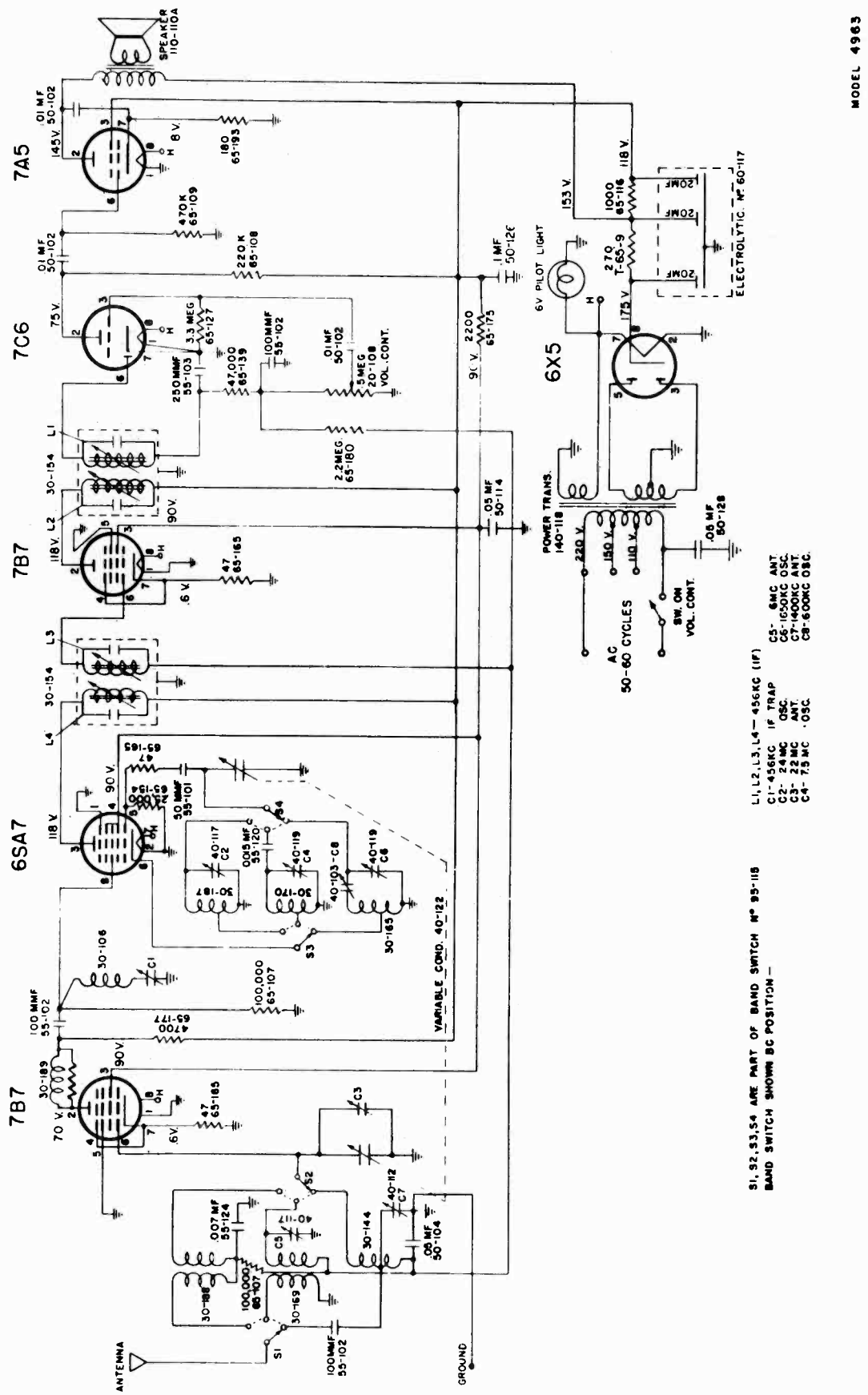
TUNING RANGE

BROADCAST 540-1650 KC , INTERNATIONAL - 7-24 MC , TROPIC 2.3-7.4 MC

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING ON	BAND SWITCH POSITION	SIGNAL GEN'R FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 MFD	PIN *6 ON 787 (RF) SOCKET	B C	456 KC	FULL OPEN	ACROSS VOICE COIL	L1, L2, L3, L4,	ADJUST FOR MAXIMUM OUTPUT
2	.1 MFD	PIN *6 ON 787 (RF) SOCKET	B C	456 KC	FULL OPEN	ACROSS VOICE COIL	C1	ADJUST FOR MINIMUM OUTPUT
3	200 OHMS	ANTENNA LEAD	INTERNATIONAL	24MC	FULL OPEN	ACROSS VOICE COIL	* C2	AJUST FOR MAXIMUM OUTPUT
4	200 OHMS	ANTENNA LEAD	INTERNATIONAL	20 MC	APPROX. 20 MC	ACROSS VOICE COIL	C 3	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT C3 ADJUSTMENT
5	200 OHMS	ANTENNA LEAD	TROPIC	7.4 MC	FULL OPEN	ACROSS VOICE COIL	+ C 4	ADJUST FOR MAXIMUM OUTPUT
6	200 OHMS	ANTENNA LEAD	TROPIC	6 MC	APPROX. 6 MC	ACROSS VOICE COIL	C 5	ADJUST FOR MAXIMUM OUTPUT
7	50 MMFD	ANTENNA LEAD	B C	1650 KC	FULL OPEN	ACROSS VOICE COIL	C6	ADJUST FOR MAXIMUM OUTPUT
8	50 MMFD	ANTENNA LEAD	B C	1400 KC	APPROX 1400 KC	ACROSS* VOICE COIL	C7	ADJUST FOR MAXIMUM OUTPUT
9	50 MMFD	ANTENNA LEAD	B C	600 KC	600 KC	ACROSS VOICE COIL	C 8	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT

* IF TWO PEAKS CAN BE OBTAINED, USE ONE WITH TRIMMER SCREW FURTHER IN.
+ IF TWO PEAKS CAN BE OBTAINED, USE ONE WITH TRIMMER SCREW FURTHER OUT.

MODEL 4963



ALIGNMENT INSTRUCTIONS

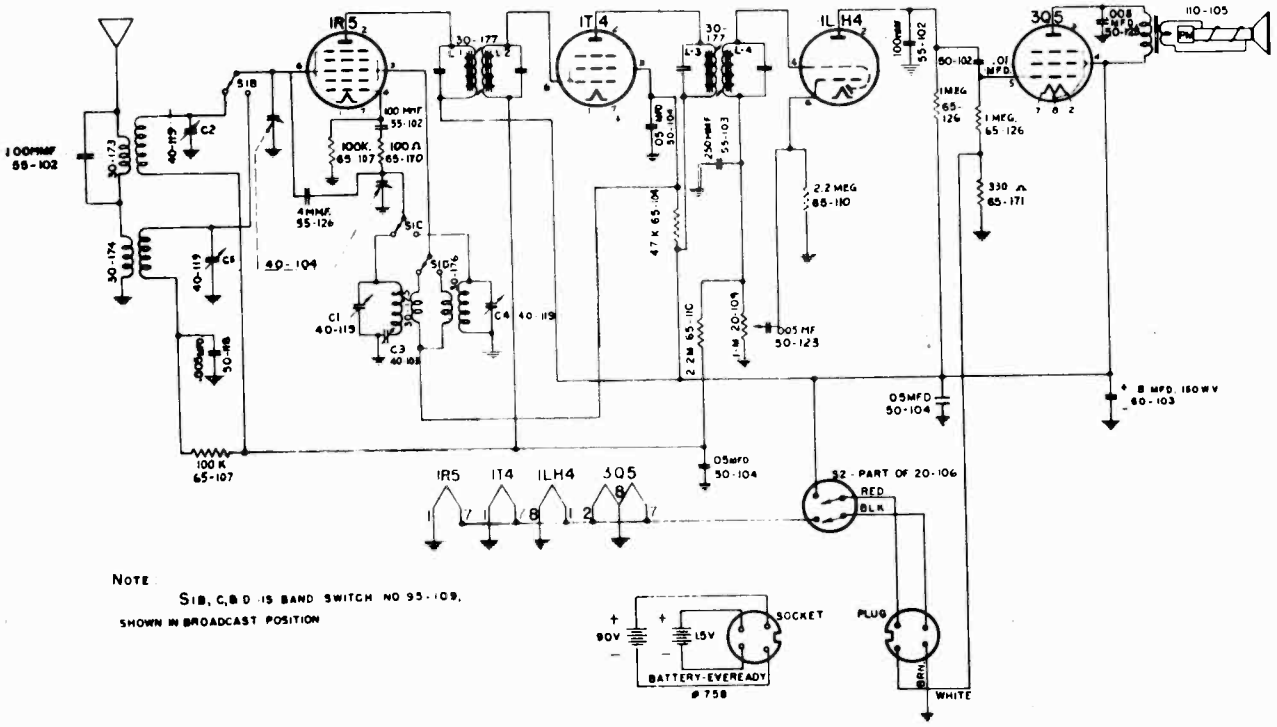
SET VOLUME CONTROL AT MAXIMUM VOLUME AND OUTPUT FROM SIGNAL GENERATOR NO HIGHER THAN IS NECESSARY TO OBTAIN OUTPUT READING.

TUNING RANGE

BROADCAST :- 540 - 1650 KC. SHORTWAVE :- 5.8 - 18.3 MC.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	BAND SWITCH POSITION	SIGNAL GEN'R FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
.05 MFD	R.F. SECTION OF VARIABLE CONDENSER	B C EXTREME LEFT	455 KC.	1650 KC.	ACROSS VOICE COIL	L1, L2, L3, L4.	ADJUST FOR MAXIMUM
100 MMFD.	ANTENNA LEAD	B C	1650 KC.	1650 KC.	" "	C 1	" " "
100 MMFD.	" "	B C	1500 KC.	1500 KC.	" "	C 2	" " "
100 MMFD.	" "	B C	600 KC.	600 KC.	" "	C 3	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT. RECHECK C1 & C2 ADJUSTMENTS AS GIVEN.
400 Ω	" "	S W EXTREME RIGHT	18.3 MC.	18.3 MC.	" "	* C 4	ADJUST FOR MAXIMUM.
400 Ω	" "	S W	15 MC.	15 MC.	" "	X C 5	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT.

* IF TWO PEAKS CAN BE OBTAINED, USE ONE WITH TRIMMER SCREW FURTHER IN.
X IMAGE FREQUENCY SHOULD APPEAR AT 15.9 MC. AND BE CONSIDERABLY WEAKER.



NOTE
S1B, C, & D IS BAND SWITCH NO 95-109, SHOWN IN BROADCAST POSITION

DWG. 130-178