PHILCO SERVICE

PHILCO-TROPIC RADIO, MODEL 48-828

CIRCUIT DESCRIPTION

Philco Model 48-828 is a six-tube superheterodyne radio, providing reception on the standard broadcast band, 550-1600 kc., and three short-wave bands, 3—9.8 mc., 9.3—12 mc., and 11.8—22 mc. Manual tuning is employed for all bands.

A 100-foot (over-all) external aerial, such as Philco Outdoor Aerial, Part No. 45-1494, is recommended.

The converter stage employs a type 7J7E tube, the triode section operating as the oscillator, and the heptode section as the mixer. See figure 5. Oscillator r-f voltage is supplied to the mixer from the oscillator grid, which is connected, within the tube, to the injector grid of the mixer.

A type 7B7 tube is used in the i-f-amplifier stage. A 7C6 dual-diode, triode tube operates as second detector and first-audio amplifier; the a-v-c voltage is also developed in the diode circuit. The output circuit of the triode section is resistance-coupled to the push-pull output stage, which employs two 7B5E tubes in a phase-inverter circuit. In this phase-inverter circuit, the audio signal is applied to the control grid of one 7B5E tube. An audio voltage is developed across the voltage divider, R206 and R207, in the screen-grid circuit of this tube; this voltage, which is of opposite phase to that at the control grid, has suitable amplitude for application to the control grid (through condenser C204) of the other 7B5E tube.

The output circuit of the push-pull stage is transformer-coupled to the 5-inch, electrodynamic speaker.

Philco TROUBLE-SHOOTING *Procedure*

In this manual the circuit is divided into four sections, with individual chassis base layouts and a complete schematic showing test points for each section. The first step in each trouble-shooting chart is a master check, making it possible to determine whether trouble exists in that section without going through the entire test procedure. Failure to obtain "NORMAL INDICATION" in a given step indicates trouble, which should be located by voltage, resistance, or capacitance checks of the parts associated with the point under test, and remedied before testing further.

TP-1583

MODEL 48-828

SPECIFICATIONS

CABINET	Wood
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGES	
BROADCAST	550—1600 kc.
SHORT WAVE:	
S.W. 1	3—9.8 mc.
S.W. 2	9.3—12 mc.
S.W. 3	11.8—22 mc.
AUDIO OUTPUT	3 watts
OPERATING VOLTAGE	115/230 volts, a.c., 60 cycles
POWER CONSUMPTION	50 watts
AERIAL	Philco Outdoor Aerial, Part No. 45-1494
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (6)	7J7E, 7B7, 7C6, 7B5E (2), 6X5GT
PANEL LAMP,	6—8-volt, bayonet base, Part No. 34-2064

PRELIMINARY CHECKS

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

1. Inspect both 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 the 6X5GT rectifier tube) and the radio chassis. When the ohmmeter test leads are connected in proper polarity, the highest resistance reading will be obtained. If the reading is lower than 50,000 ohms, check condensers C100 and C101 for leakage or shorts.

TROUBLE SHOOTING

Section 1

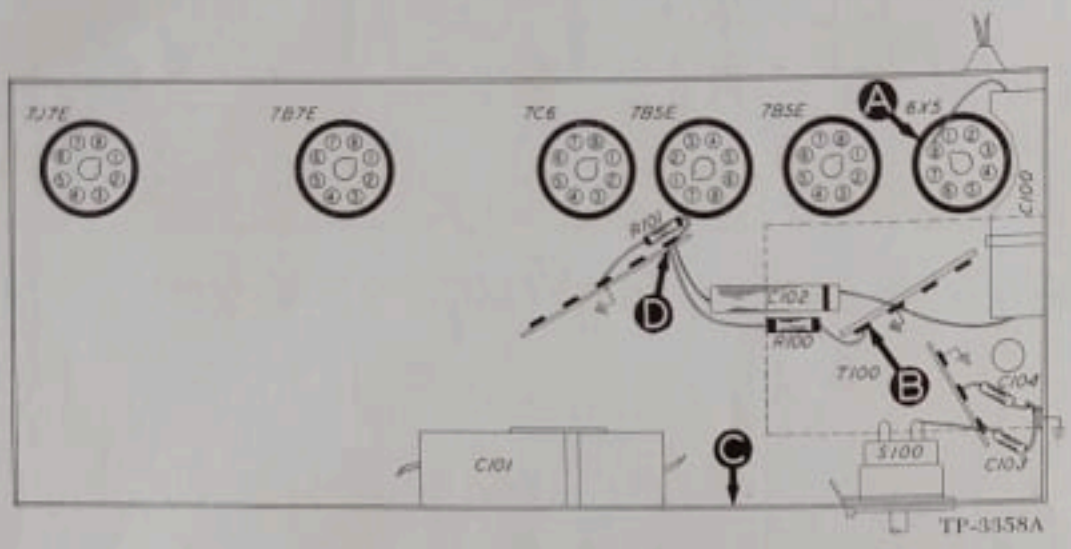

Figure 1. Bottom View, Showing Section 1 Test Points

Make the tests for this section with a d-c voltmeter; connect the test leads between chassis (test point C) and the test points indicated in the chart. The voltages 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 tone control fully counterclockwise, and the band switch in the broadcast position.

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

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	240 volts		Trouble within this section. Isolate by the following tests.
2	B	Negative 80 volts	No voltage Low voltage	Defective 6X5GT tube. Open L100.
3	D	Negative 14 volts	No voltage Low voltage	Defective 6X5GT tube. Open R100. Shorted C102. Open L100.
4	A	240 volts	No voltage Low voltage High voltage	Defective 6X5GT tube, or T100. Shorted C100. Open L100. Shorted or leaky C100, C101, C303, C302, or C202. Open T200.
Listening test: Abnormal hum may be caused by open C100 or C101.				

TROUBLE SHOOTING

Section 2

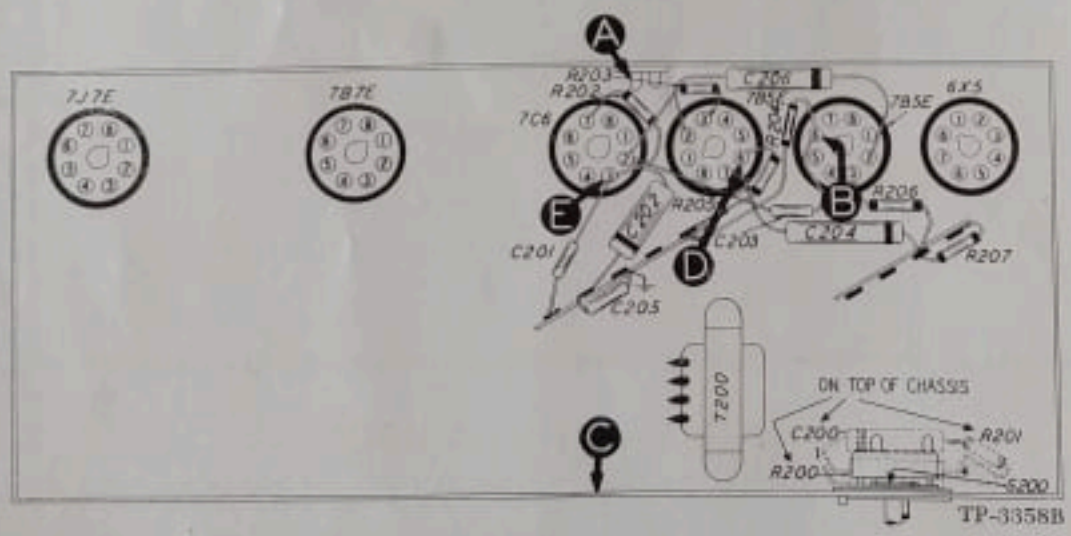

Figure 2. Bottom View, Showing Section 2 Test Points

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the radio 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.

If "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 3; if not, isolate and remedy 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 within this section. Isolate by the following tests.
2	B	Moderate, clear signal with strong signal input.	Defective 7B5E tube, T200, or LS200. Shorted C206 or C203. Open R206 or R207.
3	D	Same as step 2	Defective 7B5E tube, T200, or LS200. Shorted C206 or C204.
4	E	Same as step 1	Defective 7C6 tube. Open R203 or C203.
5	A	Same as step 1	Defective R209. Open C201.
Listening test: Distortion may be caused by leaky C203, C206, or C204.			

TROUBLE SHOOTING

Section 3

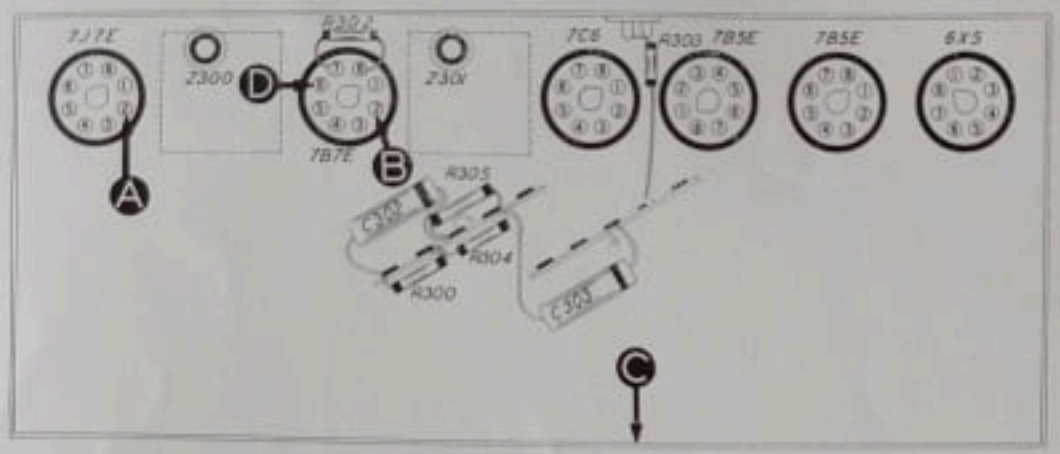

Figure 3. Bottom View, Showing Section 3 Test Points

For the tests in this section, use an r-f signal generator with frequency set at 455 kc. (modulated output). Connect the generator ground lead to the radio 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.

If "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 4; if not, isolate and remedy 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 within this section. Isolate by the following tests.
2	B	Moderate, clear signal with strong signal input.	Defective 7C6 tube. Defective or misaligned Z301. Shorted C303, C301C, or C301D.
3	D	Same as step 1	Defective or misaligned Z300 or Z301. Open R302 or R303.
4	A	Same as step 1	Defective or misaligned Z300. Shorted C302. Open R300.

TROUBLE SHOOTING

Section 4

For the tests in this section, with the exception of 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 generator frequency and the radio band switch as indicated in the chart.

Figure 4. Bottom View, Showing Section 4 Test Points

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

Inspect the tuning condensers; dirty or bent plates or poor bearing contacts will cause noise.

For the oscillator tests, steps 3, 4, 5, and 6, connect the positive lead of a 20,000-ohms-per-volt meter to the cathode of the 7J7E tube (pin 7, test point E); connect the prod end of the negative lead through a 100,000-ohm isolating resistor to test point D (osc. grid, pin 4 of 7J7E tube). Use 50-volt or similar range.

Absence of negative voltage at any position of the tuning dial indicates that the oscillator is not operating properly; check the parts listed in the chart for the oscillator tests.

STEP	TEST POINT	SIG. GEN. FREQUENCY	BAND SWITCH	TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc. 6 mc. 11 mc. 16 mc.	B.C. S.W. 1 S.W. 2 S.W. 3	1000 kc. 6 mc. 11 mc. 16 mc.	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.

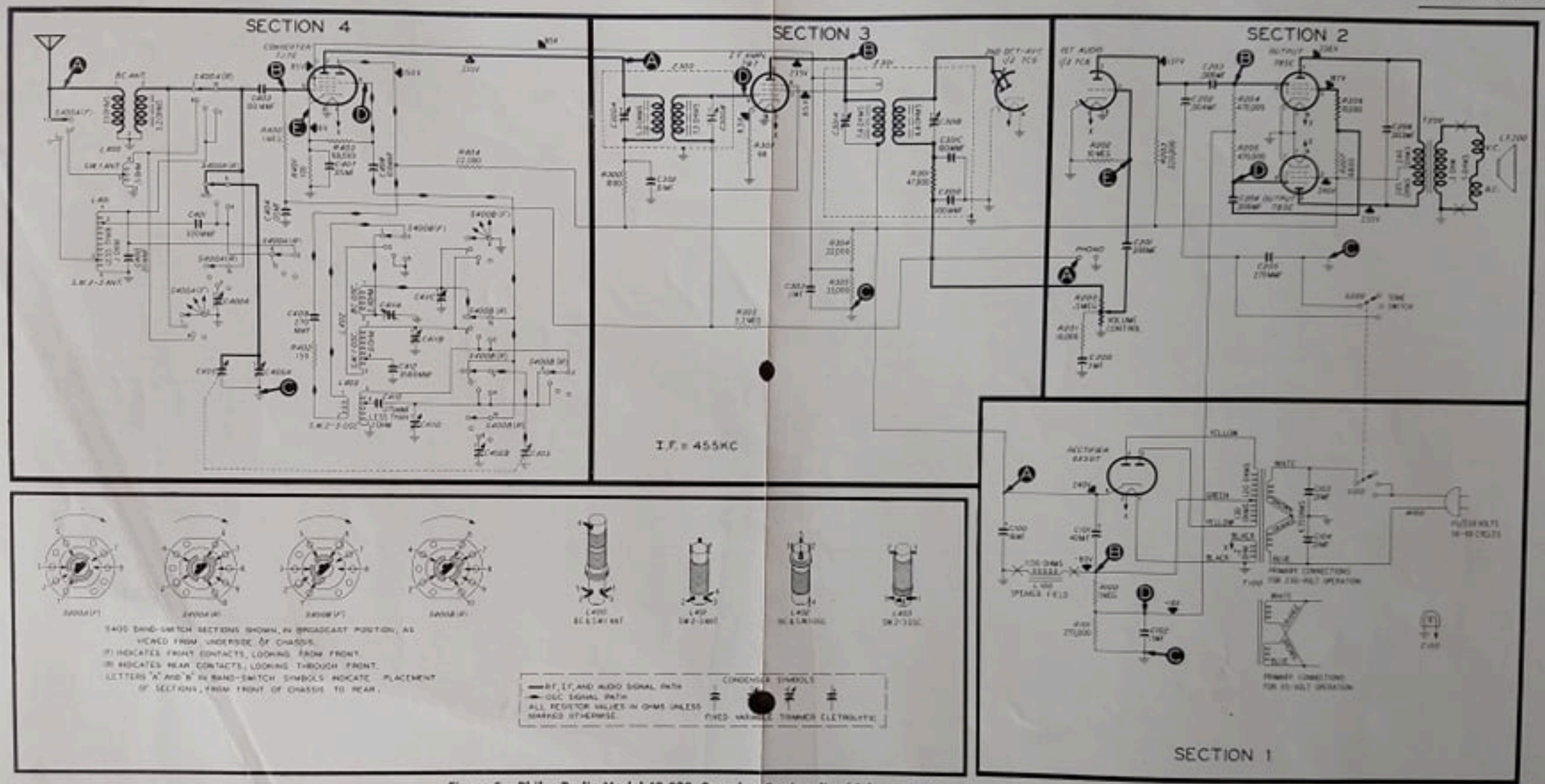

Figure 5. Philco Radio Model 48-828, Complete Sectionalized Schematic, Showing All Test Points

TF-3158

STEP	TEST POINT	SIG. GEN. FREQUENCY	BAND SWITCH	TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
2	B	1000 kc.	B.C.	1000 kc.	Moderate, clear signal with weak signal input.	Defective Z300, or 7J7E tube. Open R400 or R401.
3	D (Osc. test)		B.C.	Tune through entire range.	Negative voltage.	Defective 7J7E tube, S400B(F), S400B(R), L401B, C411A, or C411B. Shorted or leaky C408 or C409. Open C408, C409, R402, R403, or R404.
4	D (Osc. test)		S.W. 1	Tune through entire range.	Negative voltage.	Defective 7J7E tube, S400B(F), S400B(R), L401A, or C411B. Open C412, R402, R403, or R404.
5	D (Osc. test)		S.W. 2	Tune through entire range.	Negative voltage.	Defective 7J7E tube, S400B(F), S400B(R), T401, or C402B. Open R402, R403, or R404. Open or shorted C410.
6	D (Osc. test)		S.W. 3	Tune through entire range.	Negative voltage.	Defective 7J7E tube, S400B(F), S400B(R), T401, or C411D. Open R402, R403, or R404.
7	A	1000 kc.	B.C.	1000 kc.	Loud, clear signal with weak signal input.	Defective 7J7E tube, T400, S400A(R), S400A(F), or C405A. Open R400 or C403.
8	A	6 mc.	S.W. 1	6 mc.	Loud, clear signal with weak signal input.	Defective 7J7E tube, T400, S400A(R), or S400A(F). Open R400.
9	A	11 mc.	S.W. 2	11 mc.	Loud, clear signal with weak signal input.	Defective 7J7E tube, L400, S400A(R), S400A(F), or C402A. Open R400 or C400. Open or shorted C401.
10	A	16 mc.	S.W. 3	16 mc.	Loud, clear signal with weak signal input.	Defective L400, S400A(R), or S400A(F).

ALIGNMENT PROCEDURE

CONNECT OUTPUT METER across speaker voice coil.

ADJUST RADIO DIAL POINTER, with tuning-condenser plates fully meshed, to make pointer coincide with index mark at low-frequency end of dial.

CONNECT SIGNAL GENERATOR ground lead to radio chassis; connect output lead as indicated in chart.

SET SIGNAL-GENERATOR FREQUENCY, RADIO BAND SWITCH, and **RADIO DIAL** as indicated in chart.

SET VOLUME CONTROL to maximum.

OUTPUT LEVEL: During alignment, the input signal must be attenuated to hold the output-meter reading below 1.5 volts.

SET TONE CONTROL fully counterclockwise.

SIGNAL GENERATOR			RADIO			
STEP	CONNECTIONS TO RADIO	FREQUENCY	BAND SWITCH	FREQUENCY	SPECIAL INSTRUCTIONS	ADJUST
1	Through .1-mf. condenser to aerial lead.	455 kc.	B.C.	550 kc.	Adjust trimmers for maximum output-meter reading. Align ONCE ONLY, in the order given.	C301B C301A C300B C300A
2	Through 400-ohm resistor to aerial lead.	20 mc.	S.W.3	20 mc.	Adjust for maximum (for C405A, rock tuning control).	C411D C405A
3	Same.	11.5 mc.	S.W.2	11.5 mc.	Adjust for maximum (for C402A, rock tuning control).	C402B C402A
4	Same.	9 mc.	S.W.1	9 mc.	Adjust for maximum.	C411B
5	Same.	580 kc.	B.C.	580 kc.	Adjust for maximum while rocking tuning control.	C411A
6	Through 200-mmf. condenser to aerial lead.	1400 kc.	B.C.	1400 kc.	Adjust for maximum while rocking tuning control.	C411C
7	Repeat steps 5 and 6 until no further increase is noted.					

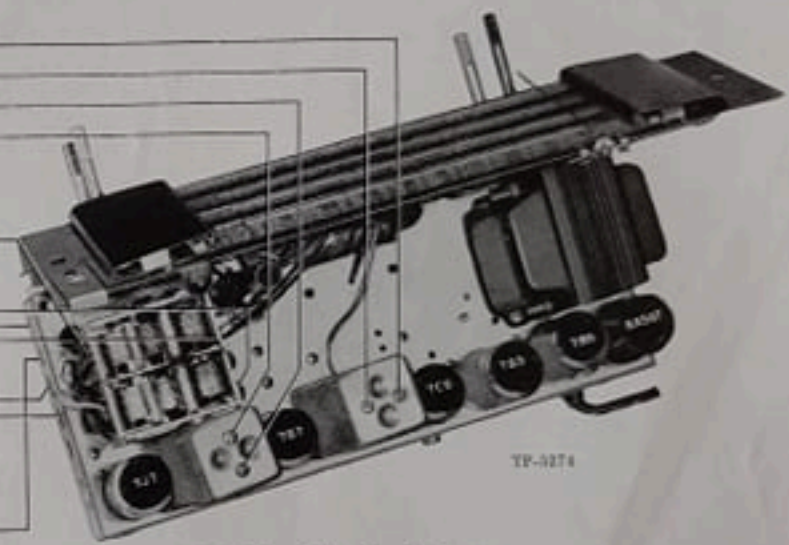

Figure 6. Top View, Showing Trimmer Locations

SYMBOLIZATION AND TERMINOLOGY

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

C—condenser	LA—loop aerial	S—switch
I—pilot lamp	LS—loud-speaker	T—transformer
L—choke or coil	R—resistor	Z—electrical ass'y

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

200-series components are in Section 2—the audio amplifier.

300-series components are in Section 3—the i-f amplifier, second detector, and a.v.c.

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

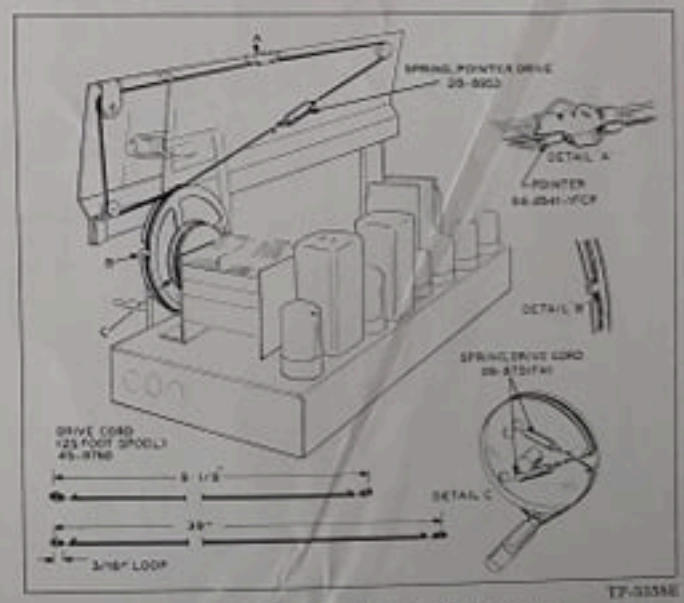

Figure 7. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

NOTE: Parts marked with an asterisk (*) are general replacement items, and the numbers listed 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 radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No." in this parts list.

SECTION 1

Symbol	Description	Service Part No.
C100	Condenser, electrolytic, 16 mf., power-supply filter	45-3016*
C101	Condenser, electrolytic, 40 mf., power-supply filter	30-2520
C102	Condenser, .1 mf., bias filter	61-0113*
C103	Condenser, .01 mf., line filter	30-1226-1
C104	Condenser, .01 mf., line filter	30-1226-1
I100	Panel lamp, 6—8-volt, bayonet base	34-2064
L100	Speaker field	Part of LS200
R100	Resistor, 1 megohm, bias filter	66-5103340
R101	Resistor, 270,000 ohms, bias bleeder	66-4273340
S100	Switch, a-c power	Part of S200
T100	Transformer, power	32-8269
W100	Line cord	L-3246

SECTION 2

C200	Condenser, .1 mf., tone compensation	61-0113*
C201	Condenser, .006 mf., coupling	30-1226-2
C202	Condenser, .004 mf., tone compensation	61-0179*
C203	Condenser, .006 mf., coupling	30-1226-2
C204	Condenser, .006 mf., coupling	30-1226-2
C205	Condenser, 270 mmf., tone compensation	60-10245307*
C206	Condenser, .003 mf., high-frequency (audio) by-pass	61-0109*
R200	Volume control, 500,000 ohms	33-5510
R201	Resistor, 10,000 ohms, tone compensation	66-3103340
R202	Resistor, 10 megohms, grid load	66-6103340*
R203	Resistor, 220,000 ohms, plate load	66-4223340*
R204	Resistor, 470,000 ohms, grid load	66-4473340*
R205	Resistor, 470,000 ohms, grid load	66-4473340*
R206	Resistor, 10,000 ohms, voltage divider	66-3103340
R207	Resistor, 6800 ohms, voltage divider	66-2683340
T200	Transformer, output	32-8189
LS200	Loud-speaker	36-1551
S200	Switch, tone control and a-c power	42-1753

SECTION 3

C302	Condenser, .01 mf., r-f by-pass	61-0120*
C303	Condenser, .1 mf., r-f by-pass	61-0113*
R300	Resistor, 1,000 ohms, plate load	66-2103340
R301	Not used	
R302	Resistor, 68 ohms, cathode (degeneration)	66-0683340*
R303	Resistor, 2.2 megohms, a-v-c filter	66-5223340*
R304	Resistor, 22,000 ohms, screen voltage divider	66-3224340
R305	Resistor, 33,000 ohms, screen voltage divider	66-3333340
Z300	Transformer, 1st i-f	32-3898
C300A:	Condenser, primary trimmer	Part of Z300
C300B:	Condenser, secondary trimmer	Part of Z300
Z301	Transformer, 2nd i-f	32-3909
C301A:	Condenser, primary trimmer	Part of Z301
C301B:	Condenser, secondary trimmer	Part of Z301
C301C:	Condenser, 100 mmf., r-f by-pass	Part of Z301
C301D:	Condenser, 100 mmf., r-f by-pass	Part of Z301
R301:	Resistor, 47,000 ohms, diode load	Part of Z301

SECTION 4

C400	Condenser, 20 mmf., shunt, S. W. 2-3 aerial coil	Part of L401
C401	Condenser, 320 mmf., band spread, S. W. 2-3 aerial coil	30-1220-12
C402	Condenser, trimmer and padder assembly, 2-section	31-6416

SECTION 4 (Cont.)

Symbol	Description	Service Part No.
C402A:	Condenser, aerial trimmer, S. W. 2	Part of C402
C402B:	Condenser, osc. trimmer, S. W. 2	Part of C402
C403	Condenser, 100 mmf., coupling	60-10105407*
C404	Condenser, .05 mf., a-v-c filter	30-1226
C405	Condenser, main tuning	31-2690
C405A:	Condenser, aerial trimmer, S. W. 3	Part of C405
C407	Condenser, .05 mf., cathode by-pass	61-0122*
C408	Condenser, 100 mmf., oscillator feedback	60-10105407*
C409	Condenser, 270 mmf., blocking	60-10245307*
C410	Condenser, 275 mmf., band spread, S. W. 2-3 osc.	30-1220-7
C411	Condenser, trimmer, and padder assembly, 4-section	36-6411
C411A:	Condenser, series padder, broadcast osc.	Part of C411
C411B:	Condenser, shunt trimmer, S. W. 1 osc.	Part of C411
C411C:	Condenser, shunt trimmer, broadcast osc.	Part of C411
C411D:	Condenser, shunt trimmer, S. W. 3 osc.	Part of C411
C412	Condenser, 3500 mmf., r-f by-pass	60-20335404*
R400	Resistor, 1 megohm, grid load	66-5103340*
R401	Resistor, 100 ohms, cathode bias	66-1103340
R402	Resistor, 150 ohms, oscillator damping	66-1153340*
R403	Resistor, 68,000 ohms, grid leak	66-3683340*
R404	Resistor, 22,000 ohms, plate load	66-3223340*
S400	Band switch	42-1752
S400A:	Band-switch wafer	Part of S400
S400B:	Band-switch wafer	Part of S400
L400	Coil, aerial, B. C. and S. W. 1	32-3655
L401	Coil, aerial, S. W. 2—3 (with C400 attached)	32-3652
L402	Coil, oscillator, B. C. and S. W. 2	32-3656
L403	Coil, oscillator, S. W. 2—3	32-3651

MISCELLANEOUS

Description	Service Part No.
Back, cabinet	54-7105
Baffle, wood	219022
Grille, wood	16612
Cabinet, less scale	10624A
Clamp, dial scale (2)	56-3236FA1
Cord, drive (25-foot spool)	45-8760
Dial plate assembly	76-1915
Dial indicator lever and link assembly	76-1522
Dial scale, B. C.	27-5901
Dial scale, S. W. 1	27-5901-1
Dial scale, S. W. 2	27-5901-2
Dial scale, S. W. 3	27-5901-3
Dial channel (3)	54-4303
Drive drum assembly	38-9883FA33
Drive shaft	56-2907FA3
Escutcheon (2)	56-3237FA21
Knob (4)	54-4376
Panel-lamp socket	76-2169
Pointer	56-2541-1FCP
Screw, scale mtg. (2)	1W-25328FA3
Socket, Loktal	27-6138*
Socket, octal	27-6174
Socket, phono	27-6189*
Spring, drive cord (2)	28-8751FA1
Spring, pointer drive	28-8953
Speaker cable	41-3713
Speaker plug (for cable)	27-4419-2
Window, glass	54-7158

PR-1425

Printed in U. S. A.