

PHILCO



SERVICE

HOME RADIO

PHILCO RADIO, MODEL 46-480

CIRCUIT DESCRIPTION

The Philco Model 46-480 is a seven-tube superheterodyne receiver providing reception on the standard broadcast band, 540-1720 kc., the short wave band, 9-15 mc., and the FM band, 88-108 mc.

A low-impedance loop within the cabinet provides adequate signal pickup on the broadcast and short-wave bands. Satisfactory FM reception usually requires the use of an outdoor dipole aerial (Philco Part Number 45-1462). In areas of high signal strength, however, the dipole built into the cabinet is sufficient for FM operation.

The converter stage of the 46-480 is built on a separate chassis to insure reliable performance at high frequencies. A 7F8 high-frequency double triode is employed in a circuit having high signal-to-noise ratio, plus high conversion efficiency. The FM tuning gang is constructed with copper plates to obtain the high Q required for proper selectivity.

Two transformer-coupled i-f stages are used. The transformers have two sets of windings; one set is tuned to 455 kc. for AM operation, the other to 9.1 mc. for FM operation. Switching of the windings is necessary only in the first transformer, to attenuate the undesired beat frequencies. The large difference in intermediate frequencies makes further switching unnecessary. Two 7H7 high-transconductance pentodes are used in the i-f stages.

A new type of discriminator circuit having good noise-reducing properties and a superior tuning characteristic is used for FM reception. Noise reduction on FM is achieved by preventing short-time amplitude variations across the secondary of the discriminator transformer Z302; this is the result of connecting the two diodes of a 6H6GT/G tube in series with the secondary, with a large condenser (5 mf) connected across the output circuit of the diodes. As a result of the high current which flows to this condenser whenever the diodes conduct in series, amplitude variations across the secondary are dissipated in the secondary windings and the diodes.

In AM reception, half-wave diode detection is used, one diode plate of the 6H6GT/G being biased to cutoff, and the operating-diode load resistance reduced to 27,000 ohms.

The high-mu-triode section of a 6SQ7GT/G tube is used in the first audio stage. Contact-potential bias is used on the grid; this bias is the small negative voltage (.7 to 1 volt) developed across the high grid resistance by electrons striking the grid. The first audio stage is resistance-coupled to the beam-pentode output tube 6V6GT/G, which is transformer-coupled to a twelve-inch electrodynamic speaker.

It should be noted that the filter choke (speaker field) is in the negative side of the filter circuit. The voltage drop across the choke is divided for biasing the output tube and also, in AM operation, the inactive diode plate of the 6H6GT/G tube.

PHILCO TROUBLE-SHOOTING PROCEDURE

In this manual, the circuit is divided into four sections which are shown both in schematic and chassis-base layouts, with test points for each section. A simplified trouble-shooting procedure is given in a chart for each section. The first step in each chart (except Section 4) makes it possible to determine whether trouble



MODEL 46-480

SPECIFICATIONS

CABINET:	Walnut-finish console
CIRCUIT:	Seven-tube superheterodyne
FREQUENCY RANGE:	Broadcast, 540 to 1720 kc. Short Wave, 9.3 to 15.5 mc. Frequency Modulation, 88 to 108 mc.
PUSH BUTTONS:	Six: 1 for on-off; 5 for broadcast stations
OPERATING VOLTAGE:	105 to 120 volts, 50-60 cycles, A.C. only
POWER CONSUMPTION:	70 watts
AERIALS:	Built-in cabinet loop, dipole, or external aerials
INTERMEDIATE FREQUENCIES:	Broadcast and short wave, 455 kc. Frequency Modulation, 9.1 mc.
PHILCO TUBES USED:	7F8, 7H7(2), 6H6GT/G, 6SQ7GT/G, 6V6GT/G, 724
PILOT LAMPS:	6 to 8-volt, Part No. 34-2040

exists in the section without going through the entire test procedure. Wherever trouble is indicated, by failure to get the "NORMAL INDICATION" in a given test, it should be located by voltage, resistance, or capacity checks of the parts associated with the point under test, and remedied before testing further.

All components in the receiver circuit are symbolized; the significance of the symbol in identifying the type and schematic location of a component may be understood by referring to the first page of the service manual for PHILCO RADIO, MODEL 46-350.

PRELIMINARY CHECKS

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

1. Before connecting the receiver to a source of power, inspect both sides of the chassis. Make sure that all tubes are secure in their sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (cathode terminal of 7Z4 rectifier tube) and the receiver chassis. When the ohmmeter test leads are connected in proper polarity, the highest resistance reading will be obtained. If this reading is lower than 50,000 ohms, check condensers C101, C104, and C308 for leakage or shorts.

CALIBRATING DIAL BACKPLATE

When the receiver chassis is removed from the cabinet, dial calibration and alignment points may be marked by small dots made with a pencil on the dial-backplate assembly below the pointer.

The method of measuring for these points is illustrated in Figure 1, which shows the relationship between dial marking and scale backplate.

Hold a ruler against the scale backplate in the position shown. Make dots at the proper points for the desired frequency settings.

When the ruler is correctly placed, the index point is $2 \frac{3}{16}$ inches from the reference point indicated in Figure 1.

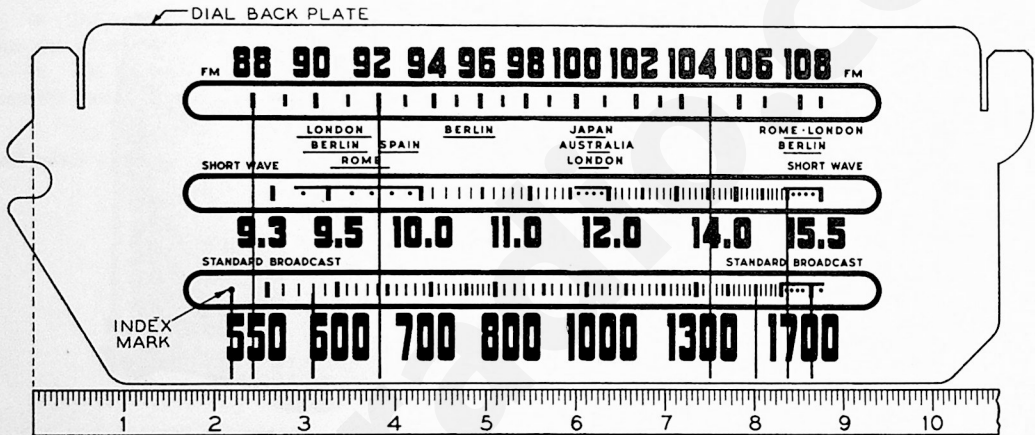


Figure 1. Dial-Backplate Calibration Measurements.

TP-1052

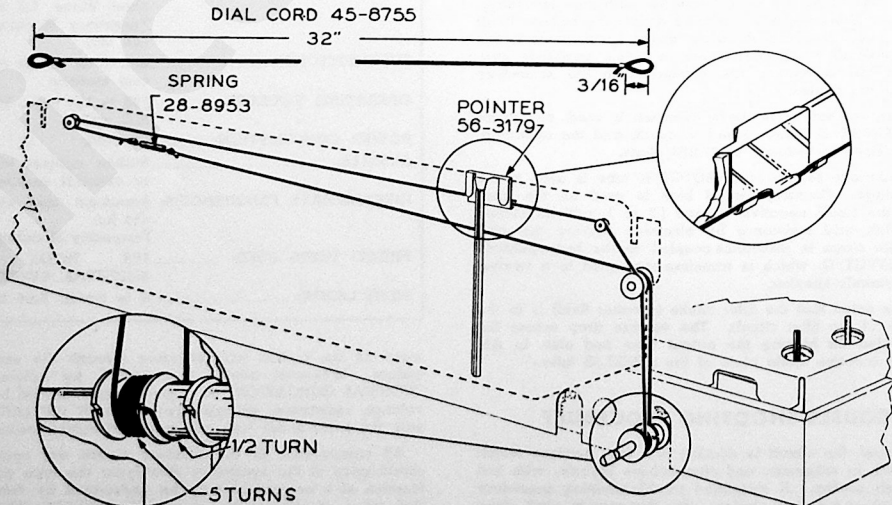


Figure 2. Pointer-Drive-Cord Installation Details.

TP-1380K

TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

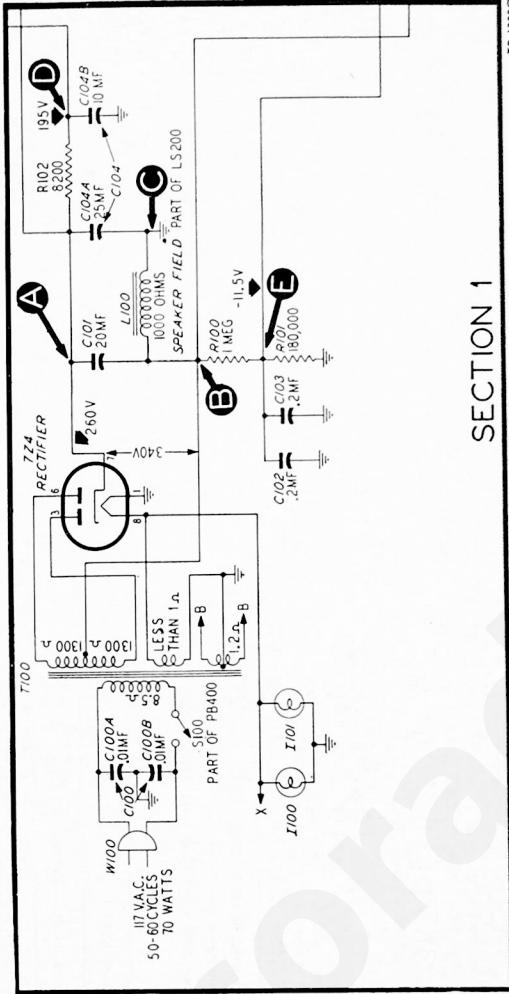


Figure 3. Section 1 Schematic.

CAUTION: Do not turn on receiver power with speaker disconnected, as this will cause damage to the set.

Make the tests for this section with a d-c voltmeter, connecting the leads to the test points indicated in the chart. The voltages given were taken with a 20,000-ohms-per-volt meter and a line voltage of 117 volts, a-c. Turn volume and tone controls fully counterclockwise, and set band switch to b oadcast (dial) position.

If the "NORMAL INDICATION" is obtained in the first step, proceed to tests for Section 2; if not, isolate and remedy the trouble within this section. A voltage may be considered normal if it measures within $\pm 10\%$ of the indicated value.

It will be noted that certain parts in other sections of the receiver are listed under "POSSIBLE CAUSE OF ABNORMAL INDICATION".

STEP	TEST POINTS	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	D to C B to C	195 volts Negative 75 volts	No voltage, or incorrect voltage.	Trouble within this section. Isolate by following tests.
2	A to B	340 volts	No voltage	Defective W100, S100, T100, 7Z4 tube, Shorted C101.
3	A to C	260 volts	Low voltage	Defective T100, 7Z4, Open C101.
4	D to C	195 volts	No voltage Low voltage	Shorted C104A or C308. Defective L100. Shorted or leaky C205, C206, C312 or C303.
5	B to C	Negative 75 volts	High voltage	Defective 6V6GT/G tube or T200. Open R101.
6	E to C	Negative 11.5 volts (Use 50-volt meter scale)	No voltage Low voltage	Open R102, Shorted C104B or C307. Leaky C104B or C307. Defective R102.
	Listening test: pick-up tuned in	Normal, clear reception.	Hum Audio howl Distorted signals	Open R101 or T200. Defective 6V6GT/G tube. Defective L100 (open), C308, C104A, C312, or C303. Open R100, Shorted C102 or C103. Leaky C102 or C103. Open R101. Defective C101, C102, C103, or C104. Open C104A. Open R100, R101. Shorted or leaky C102 or C103.

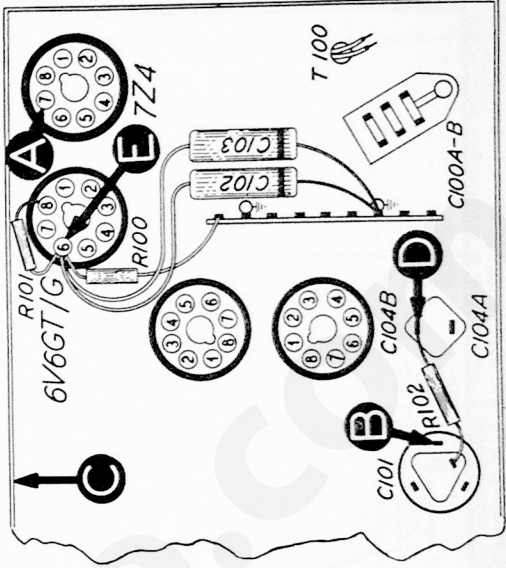


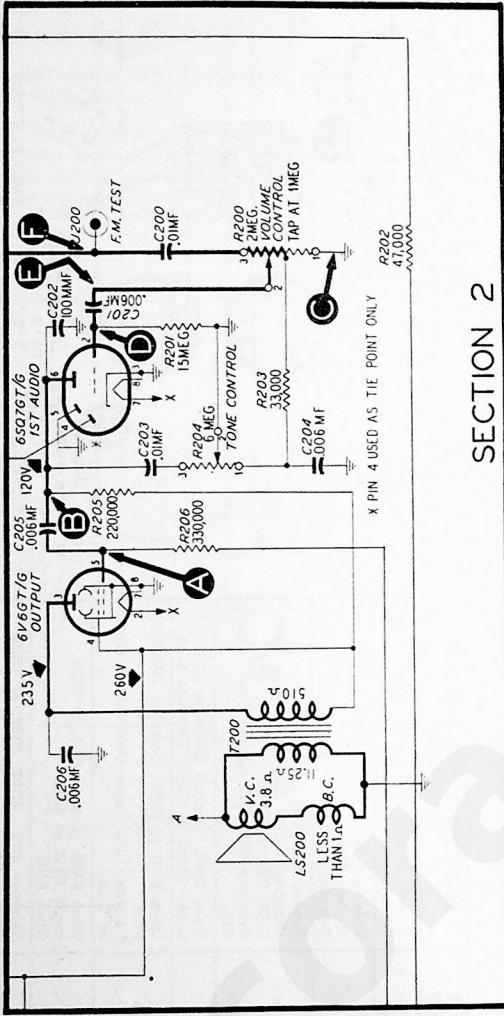
Figure 4. Bottom View, Showing Section 1 Test Points.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

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

Set the receiver volume control to maximum, band switch to broadcast (dial) position, and tone control fully counterclockwise.

If the "NORMAL INDICATION" is obtained in the first test, proceed to the tests for Section 3; if not, isolate and remedy the trouble in this section.



SECTION 2

Figure 5. Section 2 Schematic.

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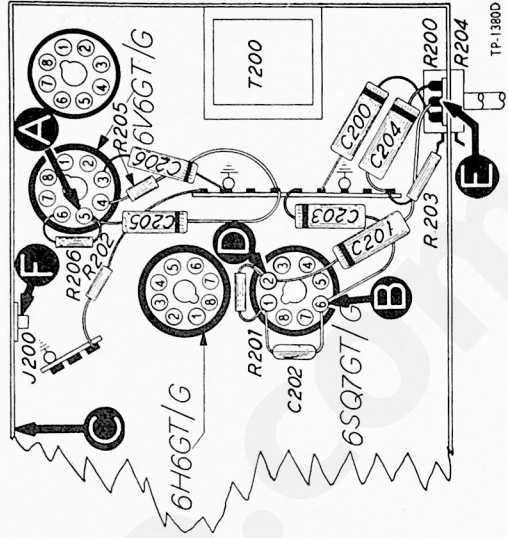


Figure 6. Bottom View, Showing Section 2 Test Points

TP-1380D

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	F	Loud, clear signal with low signal generator input	Trouble within this section. Isolate by following tests.
2	A	Normal, clear signal with moderate input	Defective 6S07GT/G tube, T200, or 6V6GT/G tube. Shorted or leaky C206.
3	B	Same as above	Shorted or leaky C202. Open C205.
4	D	Much louder than above. Reduce input to provide normal signal	Defective 6S07GT/G tube, C205. Open R205.
5	E	Same as above	Open C201.
6	F	Same as above	Open C200. Shorted C309.
	Listening test; station tuned in	Normal, clear reception	Distorted signal; leaky C202; open R206. Squelch, or shrill signals; open C202 or C206.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

AM TESTS

For the following tests, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the receiver chassis, test point "C", connect the output lead through a .1-mf condenser to the test points indicated.

Turn the receiver volume control to maximum, band switch to broadcast (dial) position, and tone control fully counterclockwise.

or If the "NORMAL INDICATION" is obtained in the first test, proceed to the FM tests, or to the tests in Section 4; if not, isolate and remedy the trouble in this section.

FM TESTS

Follow the instructions preliminary to the AM test chart, 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; set the receiver band switch to FM position.

The most satisfactory check on operation of the discriminator circuit is the ability to make proper alignment, as described on page 111.

AM TESTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	E	Loud, clear signal with low signal generator input	Trouble in this section. Isolate by following tests.
2	A	Normal signal with moderate input	Defective 7H7 tube, 6H6GT/G tube, Z302. Improperly aligned Z302. Defective C311, C307, C312, C308, C313, C309, R305, R306, R307, or R308. Open C302G.
3	B	Same as above	Defective or improperly aligned Z301. Shorted C310.
4	D	Much stronger signal than above; decrease input to obtain normal signal	Defective 7H7 tube. Shorted C306. Open R302 or R303.
5	E	Approx. same strength signal as above.	Defective or improperly aligned Z300. Shorted C303. Open C304.
	Listening test; attention tuned in	Normal, clear reception	Distorted signal with hum; defective R309 or S300B(F). Intense hum, or motorboating; open C308.

FM TESTS

1	A	Normal signal with moderate input	Defective or improperly aligned Z302. Defective S300B(F).
2	B	Same strength signal as above	Defective Z301.
3	D	Much stronger signal than above; decrease input to obtain normal signal.	Same parts listed in AM section, test point D.
4	E	Approx. same strength signal as above	Defective Z300, or any other part listed in AM section, test point E.

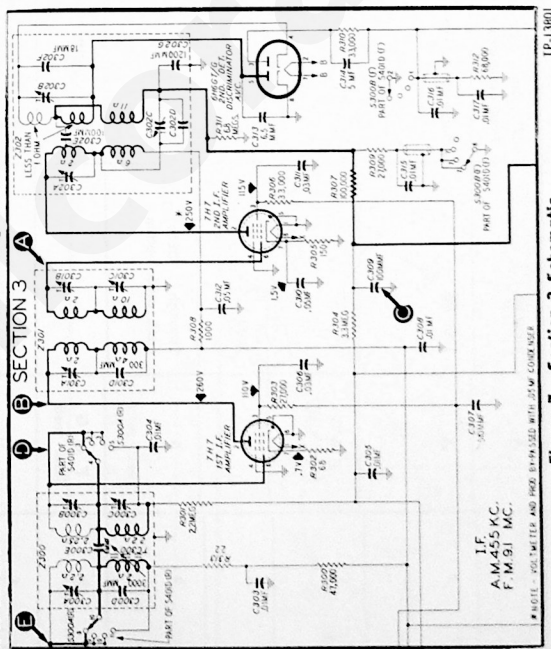


Figure 7. Section 3 Schematic.

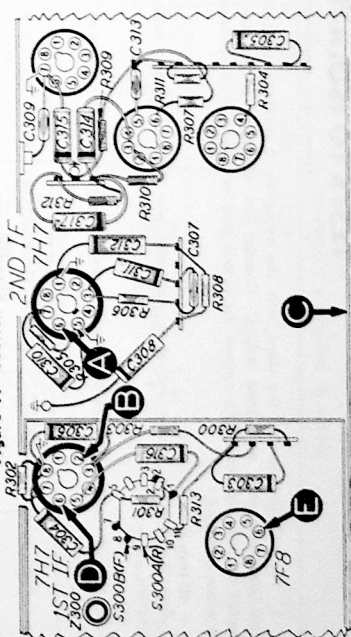


Figure 8. Bottom View, Showing Section 3 Test Points.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 4 AM TESTS

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

Turn the receiver volume control to maximum, and the tone control fully counter-clockwise.

Set the receiver band switch, tuning control, and signal-generator frequency as indicated

in the chart.

2. Oscillator Tests (AM test chart, steps 3, 6, and 8; FM chart, step 2).

Attach the positive lead of a high-resistance voltmeter to the 7F8 oscillator-cathode terminal, test point "G". Connect the negative lead through an isolating resistor (100,000 ohms) to the 7F8 oscillator grid, test point "F". Use a suitable meter range (0-10 to 0-50 volts).

Absence of negative grid voltage at any dial or band-switch position indicates that the oscillator is not functioning; check the parts listed in the chart for the oscillator tests.

STEP	TEST POINT	SIGNAL GENERATOR SETTING	BAND SWITCH AND TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	B	1000 kc.	BC. (dial) Tune to signal from generator	Loud, clear signal with low generator input	Trouble in this section. Isolate by the following tests.
2	A	1000 kc.	Same as above	Same as above	Defective 7F8 tube, Z300, C401, C303, C307, or C308. Open C404B, C408, R401, R403, R404, R408, R300, or R313. Trouble in oscillator section (step 3).
3	F to G (osc. test)		BC. Tune through range	Negative voltage approximately 2 volts	Defective 7F8 tube, S401CF, S401CR, I401C, I404, C409, C410, C404A, C408, or C401. Open R408.
4	B	1000 kc.	BC. (dial) Tune to signal from generator	Loud, clear signal with low generator input	Defective S401A(F), S401B(F), S401B(R), L402, or C402A. Open C405 or R400.
5	B	Through range of each push button	P.B. Operate each push button	Same as above	Defective S401A(F), S401B(F), S401B(R), L402, PB400A to PB400E. Shorted C402A. Defective or mistuned C400A to C400E.
6	F to G (osc. test)		P.B. Operate each push button	Negative voltage approximately 1 volt	Defective PB400A to PB400E, L400A to L400E, C412, C413, C414, R406, S401CF, or S401CR.
7	B	12 mc.	S.W. Tune to signal from generator	Loud, clear signal with low generator input	Defective S401A(F), S401B(F), S401B(R), C401, C402B, C404C, or C406. Open C411.
8	F to G		S.W. Tune through range	Negative voltage approximately 1 volt	Defective S401CF, S401CR, I405, C402B, C401, C411, C408, or C404C.
	Listening test				Oscillation or motorboating: Open R400 or R403.

FM TESTS

Make the tests indicated in the FM TEST CHART, following the procedure described in paragraphs 1 and 2 under AM TESTS.

STEP	TEST POINT	SIGNAL GENERATOR SETTING	BAND SWITCH AND TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	D	95 mc.	FM. Tune to signal from generator	Loud, clear signal with low generator input	Defective 7F8 tube, S401A(R), S401B(R), L401A, L401B, C401, C401A, or C401B.
2	F to G (osc. test)		FM Tune through range.	Negative voltage	Defective 7F8 tube, S401C(F), S401C(R), L401C, C401, or C401C. Open R405.

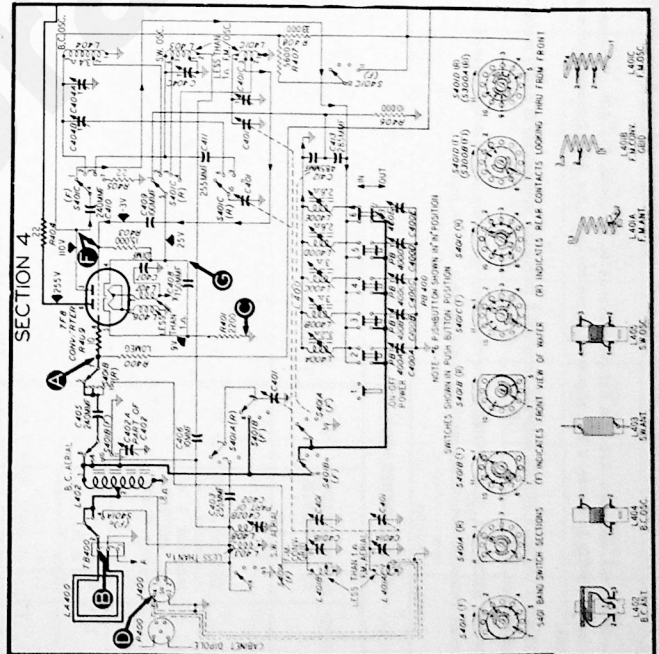


Figure 9. Section 4 Schematic.

TP-1360J

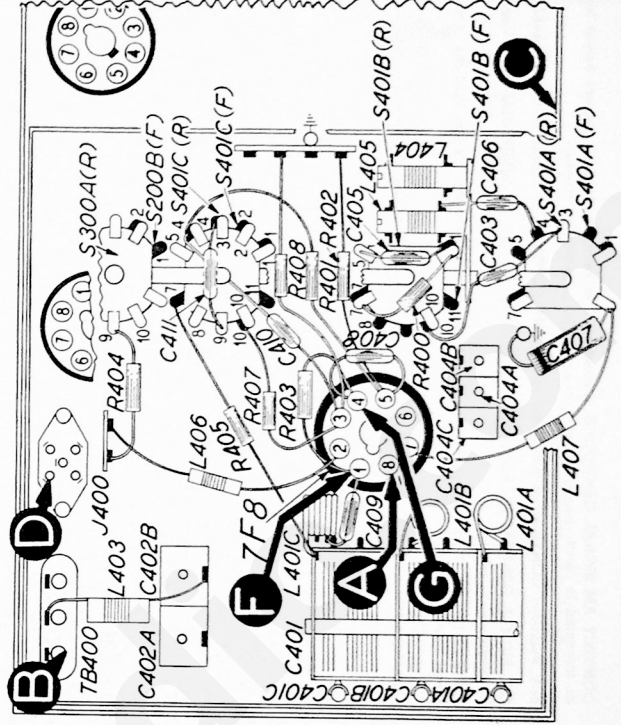


Figure 10. Bottom View, Showing Section 4 Test Points.

TP-1360F

AM ALIGNMENT PROCEDURE

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

CONNECT OUTPUT METER between terminal 3 (voice-coil connection) of aerial terminal strip and chassis.

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

SET VOLUME CONTROL at maximum, and TONE CONTROL at counterclockwise position. SET SIGNAL GENERATOR, RECEIVER BAND SWITCH, AND RECEIVER DIAL as indicated in chart.

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

SIGNAL GENERATOR			RECEIVER			
STEP	CONNECTIONS TO RECEIVER	DIAL	BAND SWITCH	DIAL	SPECIAL INSTRUCTIONS	ADJUST
1	Through .05-mi condenser to terminal 3 of ant. coil L402 (figures 9 and 11)	455 kc.	BC.	1700 kc.	Adjust trimmers for maximum output-meter reading—Align ONCE ONLY , in the order given.	C302C C301C C300C TC300
2	Loosely coupled to BC. loop (Note 1, page 112).	15 mc.	SW.	15 mc.	Start with loose trimmer screw and adjust for maximum on FIRST signal heard. Image should be heard with receiver tuned to 14.1 mc.	C404C
3	Same	15 mc.	SW.	15 mc.	Adjust for maximum while rocking tuning control.	C402B
4	Same		BC.		Preset C404B by tightening, then backing off $\frac{1}{4}$ turn.	C404B
5	Same	1700 kc.	BC.	1700 kc.	Adjust for maximum.	C404A
6	Same	1500 kc.	BC.	1500 kc.	Adjust for maximum.	C402A
7	Same	580 kc. approx.	BC.	580 kc.	Adjust for maximum while rocking tuning control.	C404B
8	Repeat steps 5, 6 and 7 until no further increase is noted.					

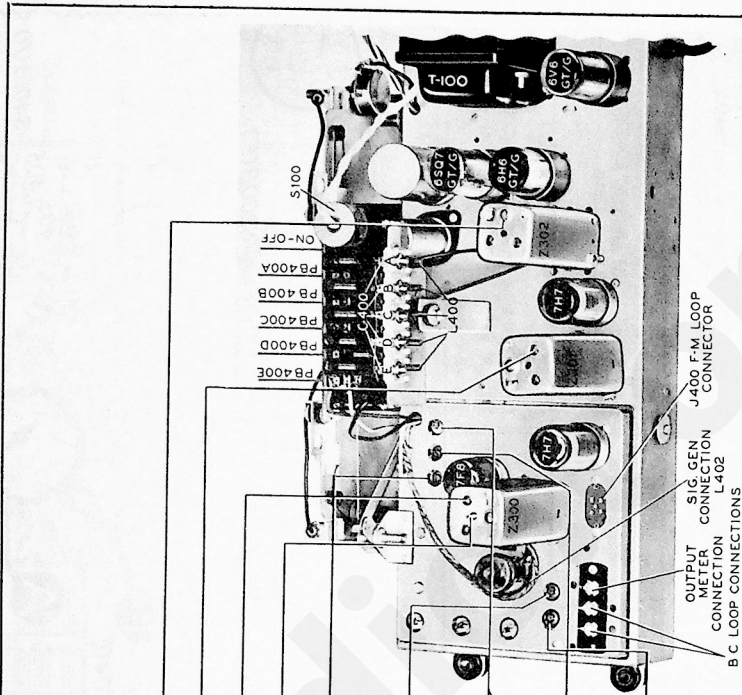


Figure 11. Chassis View, Showing AM Trimmer Locations.

TP-1380A

FM ALIGNMENT PROCEDURE

Note: Make AM alignment first.

Connect a 20,000-ohms-per-volt, d-c meter across the 5-mf condenser, C314, in the discriminator circuit (see Figure 13). Use 50-volt meter range.

Use an r-f signal generator with UNMODULATED output for the entire alignment. The generator must have sufficient output to give a meter reading greater than 20 volts

in step 6 below. Connect the generator ground lead to the receiver chassis; connect the output lead as indicated in the chart.

Set the receiver band switch to FM position.

Allow the receiver and generator to warm up for 15 minutes before starting the alignment.

STEP	SIGNAL-GENERATOR Connections to Receiver	DIAL SETTINGS		SPECIAL INSTRUCTIONS	ADJUST
		SIGNAL GEN.	REC.		
1	Through .05 mf. condenser to 1st 1/4 transformer secondary (Figure 12). Insert insulated wire to fixed plate of C300B.	9.1 mc.	88 mc.	Set trimmer screw tight.	C302B
2		9.1 mc.	88 mc.	Maximum meter reading. Attenuate signal to keep meter on scale.	C302A
3		9.1 mc.	88 mc.	Maximum meter reading.	C301B C301A
4	To tuning-coil (T C 3 0 0) shank, first 1/4 transformer Z300.	9.1 mc.	88 mc.	Maximum meter reading.	C300B C300A
5		9.1 mc.	88 mc.	Readjust C302A, C301B, and C301A. IMPORTANT! Set input for greater than 20-volt reading while adjusting.	
6	Same.	9.1 mc.	88 mc.	Adjust input for 25-volt meter reading (approx.).	
7	Same.	9.1 mc.	88 mc.	Carefully turn counterclockwise, recording MINIMUM location and MAXIMUM meter reading; readjust for average of this value. Example: max. 30 volts; min., 20 volts; average—25 volts.	C302B (location indicated in step 1)
8	Through 70-ohm coaxial line to terminal 4, J400.	105 mc.	105 mc.	Maximum meter reading. This is the oscillator high-frequency paddler adjustment.	C401C
9		105 mc.	105 mc.	Max.—rock tuning control.	C401B C401A
10	Same.	105 mc.	105 mc.	Maximum meter reading.	
11	Same.	92 mc.	92 mc.	Adjust L401C (note 2, page 112).	
12	Same	92 mc.	92 mc.	Adjust L401B (note 2, page 112).	
13	Same	92 mc.	92 mc.	Adjust L401A (note 2, page 112).	
14	Repeat steps 8 through 13 until no further increase is obtained.				

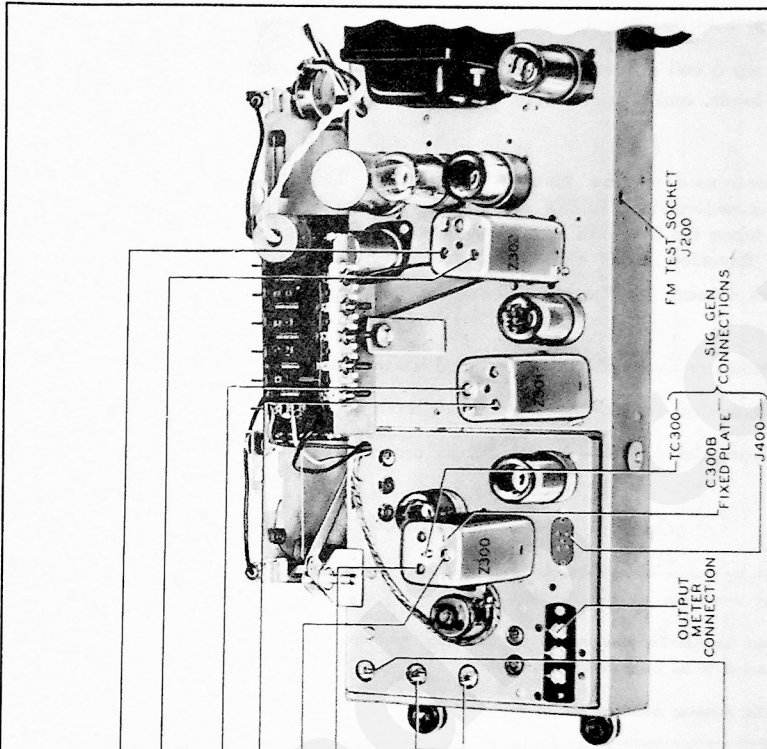


Figure 12. Chassis View, Showing FM Trimmer Locations.

ALIGNMENT NOTES

Note 1

Make up a coil of insulated wire, using 6 or 8 turns, about 6 inches in diameter; connect to the signal-generator leads, and suspend near the receiver broadcast loop.

Note 2

The resonance of the circuits using coils L401C, L401B, and L401A may be checked by the use of a powdered-iron tuning core, such as Part No. 56-6100. If the signal strength (meter reading) increases when the iron end is inserted in the coil, compress the turns slightly. If the signal increases when the threaded brass end is inserted, spread the turns.

Do not spread or compress turns excessively, since only a small change is required at these frequencies.

- a. Oscillator Coil L401C.—Adjust coil for maximum meter reading.
- b. Mixer Coil L401B.—Adjust coil for maximum meter reading while rocking tuning control.
- c. Aerial Coil L401A.—Adjust coil for maximum meter reading.

PUSH-BUTTON ALIGNMENT

- 1 Connect the output meter between terminal #3 on aerial terminal panel and receiver chassis.
- 2 Turn the receiver volume control to maximum, and the tone control to its counterclockwise position.
- 3 Turn the receiver band switch to push-button position.
- 4 Couple the signal generator loosely through a coil of wire to the receiver loop aerial (see Note 1 above).
- 5 Turn on the power, and allow the receiver to warm up for 15 minutes before starting the adjustments.
- 6 Starting with the lowest frequency desired, set the signal-generator frequency, push the button, and adjust the associated oscillator tuning core and aerial trimmer condenser (see figure 11) for maximum indication on the output meter. Reset the signal-generator frequency, and repeat the procedure for each remaining 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.

PUSH-BUTTON (Left to right from front)	FREQUENCY RANGE	OSC. TUNING CORE	AERIAL TRIMMER
Power ON-OFF			
PB400A	540—1000 KC.	L400A	C400A
PB400B	600—1200 KC.	L400B	C400B
PB400C	650—1300 KC.	L400C	C400C
PB400D	850—1500 KC.	L400D	C400D
PB400E	900—1600 KC.	L400E	C400E

REPLACEMENT PARTS LIST — Model 46-480

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

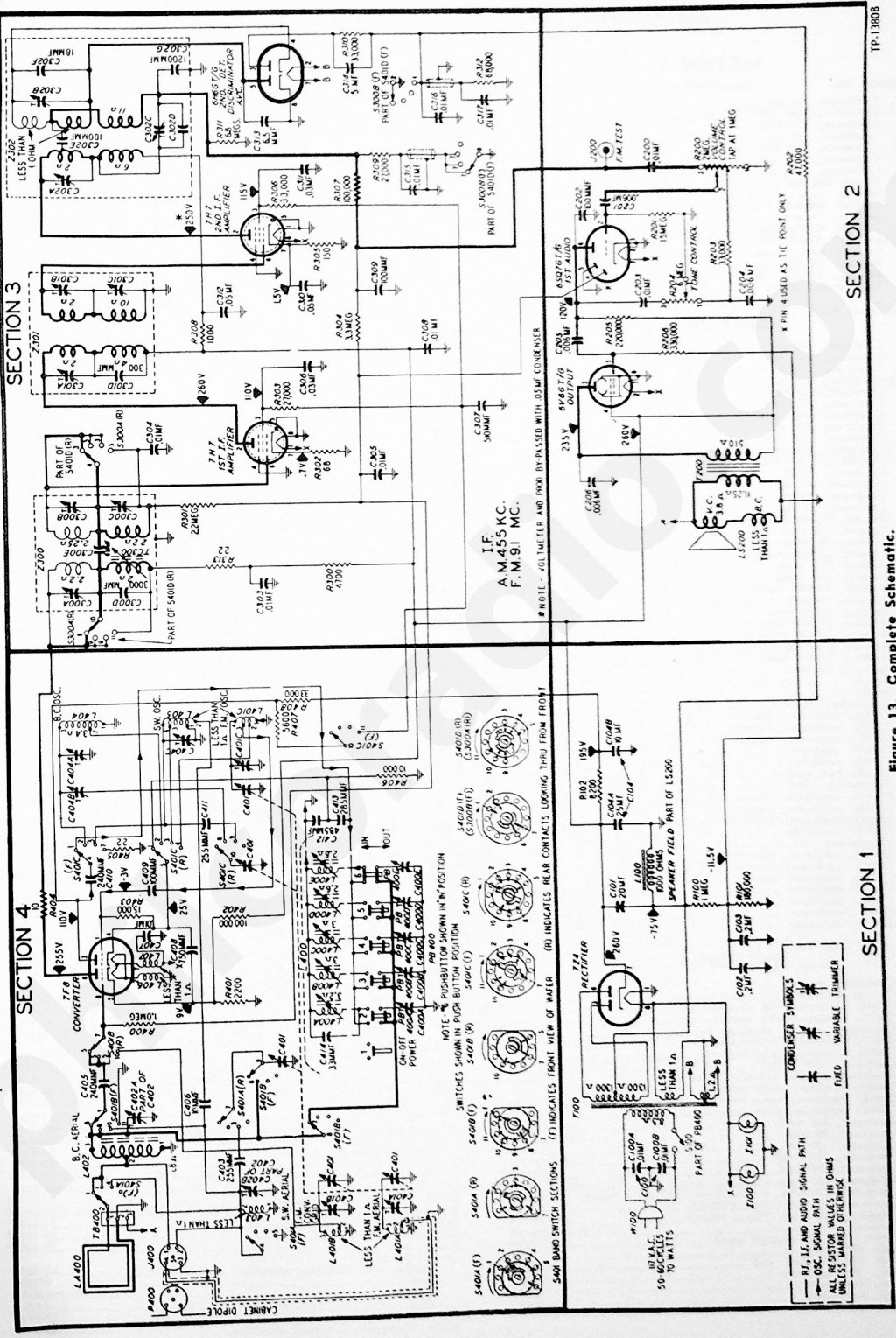
SECTION 1

Reference No.	Description	Service Part No.
C100	Condenser, line filter	3903-ODG
C100A	condenser, .01 mf.	Part of C100
C100B	condenser, .01 mf.	Part of C100
†C101	Condenser, electrolytic, 20 mf.	30-2568-8*
†C102	Condenser, .2 mf.	45-3500-3*
†C103	Condenser, .2 mf.	45-3500-3*

SECTION 1 (continued)

Reference No.	Description	Service Part No.
C104	Condenser, electrolytic	30-2556*
	C104A: condenser, 25 mf.	Part of C103
	C104B: condenser, 10 mf.	Part of C103
I100	Lamp, pilot	34-2040*
I101	Lamp, pilot	34-2040*
L100	Field, speaker	Part of LS200
R100	Resistor, 1 meg.	66-5103340*
R101	Resistor, 180,000 ohms	66-4183340*
R102	Resistor, 8,200 ohms	66-282340*
S100	Switch, power	Part of PB400
T100	Transformer, power	32-8223*
W100	Cord, a-c	13199

CONTINUED ON PAGE 114



SECTION 2

SECTION 1

SECTION 3

SECTION 4

Figure 13. Complete Schematic.

NOTE: ALL VOLTAGE, CAPACITY, AND RESISTANCE VALUES SHOWN ARE AVERAGE. THE VOLTAGES WERE MEASURED BETWEEN THE POINTS INDICATED AND THE RECEIVER CHASSIS (C). USING A 20,000-OHMS-PER-VOLT METER, WITH 117-VOLT, 60-CYCLE INPUT TO THE RECEIVER POWER SUPPLY; THE VOLUME AND TONE CONTROLS WERE SET TO COUNTERCLOCKWISE POSITIONS, AND THE BAND SWITCH WAS SET TO PUSH-BUTTON POSITION. THE OSCILLATOR GRID VOLTAGE WAS TAKEN BETWEEN PINS 1 AND 4 OF THE 7F8 TUBE, USING A 100,000-OHM ISOLATING RESISTOR IN SERIES WITH NEGATIVE GRID OF VOLUME LEAD.

REPLACEMENT PARTS LIST (continued from page 112)

SECTION 2

Reference No.	Description	Service Part No.
C200	Condenser, .01 mf.	61-0120*
C201	Condenser, .006 mf.	45-3500-7*
C202	Condenser, 100 mmf.	60-10105407*
C203	Condenser, .01 mf.	61-0120*
C204	Condenser, .006 mf.	45-3500-7*
C205	Condenser, .006 mf.	45-3500-7*
†C206	Condenser, .006 mf.	45-3500-7*
J200	Socket, FM test	27-6180*
LS200	Speaker	45-006-1
R200	Control, volume, 2 meg.	33-5535-1*
R201	Resistor, 15 meg.	66-6153340*
R202	Resistor, 47,000 ohms	66-3473340*
R203	Resistor, 33,000 ohms	66-3333340*
R204	Control, tone, 6 meg.	33-5539-1*
R205	Resistor, 220,000 ohms	66-4223340*
R206	Resistor, 350,000 ohms	66-4333340*
T200	Transformer, output	32-8249*

SECTION 3

C303	Condenser, .01 mf.	61-0120*
C304	Condenser, .01 mf.	61-0120*
C305	Condenser, .01 mf.	61-0120*
C306	Condenser, .03 mf.	45-3500-1*
C307	Condenser, 510 mmf.	60-10515307*
C308	Condenser, .01 mf.	61-0120*
C309	Condenser, 100 mmf.	60-10105407*
C310	Condenser, .05 mf.	61-0122*
C311	Condenser, .03 mf.	45-3500-1*
C312	Condenser, .05 mf.	61-0122*
C313	Condenser, 6.5 mmf.	30-1224-6*
C314	Condenser, 5 mf.	30-2417*
C315	Condenser, .01 mf.	61-0120*
†C316	Condenser, .01 mf.	61-0120*
C317	Condenser, .01 mf.	61-0120*
†R300	Resistor, 47,000 ohms	66-3473340*
R301	Resistor, 2.2 meg.	66-5223340*
R302	Resistor, 68 ohms	66-0683340*
R303	Resistor, 27,000 ohms	66-3273340*
R304	Resistor, 3.3 meg.	66-5333340*
R305	Resistor, 150 ohms	66-1153340*
R306	Resistor, 33,000 ohms	66-3333340*
R307	Resistor, 100,000 ohms	66-4103340*
R308	Resistor, 1,000 ohms	66-2103340*
R309	Resistor, 27,000 ohms	66-3273340*
R310	Resistor, 33,000 ohms	66-3333340*
R311	Resistor, 6.8 meg.	66-5683340*
†R312	Resistor, 68,000 ohms	66-3683340*
R313	Resistor, 22 ohms	66-0223340*
S300A(R)	Switch	Part of S401
S300B(F)	Switch	Part of S401
Z300	Transformer, 1st i-f	32-4020
C300A:	condenser, trimmer	Part of Z300
C300B:	condenser, trimmer	Part of Z300
C300C:	condenser, trimmer	Part of Z300
C300D:	condenser	Part of Z300
C300E:	condenser	Part of Z300
TC300:	core, tuning	Part of Z300
Z301	Transformer, 2nd i-f	32-4022
C301A:	condenser, trimmer	Part of Z301
C301B:	condenser, trimmer	Part of Z301
C301C:	condenser, trimmer	Part of Z301
C301D:	condenser	Part of Z301
Z302	Transformer, 3rd i-f	32-4074
C302A:	condenser, trimmer	Part of Z302
C302B:	condenser, trimmer	Part of Z302
C302C:	condenser, trimmer	Part of Z302
C302D:	condenser	Part of Z302
C302E:	condenser	Part of Z302
C302F:	condenser	Part of Z302
C302G:	condenser	Part of Z302

SECTION 4

C401	Condenser, tuning	31-2703-2
C401A:	condenser, FM aerial trimmer	Part of C401
C401B:	condenser, FM converter grid trimmer	Part of C401
C401C:	condenser, FM oscillator trimmer	Part of C401
C402	Condenser, trimmer assembly, two section	31-6476
C402A:	Condenser, b-c trimmer	Part of C402
C402B:	Condenser, s-w trimmer	Part of C402
C403	Condenser, 255 mmf.	30-1220-24*
C404	Condenser, trimmer assembly, three section	31-6464
C404A:	condenser, shunt trimmer, bc osc.	Part of C404
C404B:	condenser, series trimmer, bc osc.	Part of C404
C404C:	condenser, shunt trimmer, s-w osc.	Part of C404
C405	Condenser, 240 mmf.	60-10245307*
C406	Condenser, 10 mmf.	60-00105407*
C407	Condenser, .01 mf.	61-0120*
C408	Condenser, 750 mmf.	60-1075301*
C409	Condenser, 100 mmf.	30-1225-2*
C410	Condenser, 240 mmf.	60-10245307*
C411	Condenser, 255 mmf., s-w oscillator fixed series padder	30-1220-24*
†C412	Condenser, 485 mmf. (Part of PB400)	30-1224-15
†C413	Condenser, 285 mmf. (Part of PB400)	30-1224-14
†C414	Condenser, 33 mmf. (Part of PB400)	Part of PB400
J400	Socket, 5-prong, external aerial	27-6214*
L401A	Coil, FM aerial	32-4016
L401B	Coil, FM converter grid	32-4017
L401C	Coil, FM oscillator	32-4018
L402	Coil, b-c aerial	32-4033-1
L403	Coil, s-w	32-4050-4
L404	Coil, b-c oscillator	32-4019-2

SECTION 4 (Continued)

Reference No.	Description	Service Part No.
L405	Coil, s-w oscillator	32-3996-1
†L406	Choke, filament	32-4061-1
†L407	Choke, filament	32-4061-1
LA400	Loop assembly, broadcast	76-1989
PB400	Push-button switch, coil and padder assembly	31-6479-1
	Push-button switch strip assembly	Part of PB400
	C400A: condenser	Part of PB400
	C400B: condenser	Part of PB400
	C400C: condenser	Part of PB400
	C400D: condenser	Part of PB400
	C400E: condenser	Part of PB400
	Switch, push-button assembly (Part of PB400)	42-1786-1*
L400:	Push-button coils assembly	
	L400A: coil, push-button (Part of L400)	32-4059-2
	L400B: coil, push-button (Part of L400)	32-4059-2
	L400C: coil, push-button (Part of L400)	32-4059-2
	L400D: coil, push-button (Part of L400)	32-3779
	L400E: coil, push-button (Part of L400)	32-3779
R400	Resistor, 1 meg.	66-5103340*
R401	Resistor, 2,200 ohms	66-2223340*
†R402	Resistor, 100,000 ohms	66-4103340*
R403	Resistor, 15,000 ohms	66-3133340*
R404	Resistor, 10 ohms	66-010340*
†R405	Resistor, 22 ohms	66-0223340*
R406	Resistor, 10,000 ohms	66-3103340*
R407	Resistor, 5,600 ohms	66-2563340*
R408	Resistor, 33,000 ohms	66-3333340*
S401	Switch, band	
	†S401A: switch, band (section)	Part of S401
	†S401B: switch, band (section)	Part of S401
	†S401C: switch, band (section)	Part of S401

MISCELLANEOUS

Band-switch hardware	
Palnut	1W29084FA3
Shaft, band-switch	56-3271FA11
Switch link assembly, band	76-2186
Washer, shaft ("C")	1W42535FA3
Bracket assembly, band-switch shaft	76-2187FA3
Cabinet hardware	
Cabinet complete	10631
Baffle, wood	219024
Bezel, wood	16601
Cloth, baffle and grille	40-6754
Dome, gilder	45-6042
Cable assembly, shielded, 7-inch length	41-3754-5
Cable assembly, shielded, 9-inch length	41-3754-6
Cable assembly, shielded, 8 1/2-inch length	41-3754-10
Chassis mounting hardware	
Clip, grounding, r-f unit	57-1335
Grommet (3), r-f unit mtg.	54-4295
Screw	1W17326FA22
Screw (3), r-f unit mtg.	1W19674FA3
Spacer (3), r-f unit mtg.	1W29155FA3
Washer (3), r-f unit mtg.	1W52224FA3
Washer	1W52540FA3
Clip, aerial	28-5002FA1
Clip, b-c oscillator (short-wave oscillator)	56-2927E7
Core, push-button tuning	56-6100
Spring strip, tuning-core stabilizer	56-2249
Dial scale hardware	
Band, rubber (2)	54-4234
Cord, pointer drive (25-foot spool)	45-8755*
Pointer	56-3179
Scale and plate assembly	76-2226
Scale backplate and pulley assembly	76-2005
Screw	1W24894FE11
Screw	1W25349FA3
Spacer, scale backplate (2)	1W29184FA3
Spacer, scale plate assembly	1W29184FA3
Spring, pointer	28-8953
Washer, scale plate assembly	1W52116FA3
Loop and loop hardware	
Loop assembly, b-c	76-1989
Loop assembly, FM	76-2029-4
Plug, FM loop	27-4788
Washer, b-c loop	1W52267FA3
Palnut, Volume and Tone control mtg.	1W29091FA3
Panel, aerial-terminal	38-9942
Pilot lamp socket assembly	76-1985
Push-button assembly hardware	
Cover assembly, a-c push-button switch	76-1343
Cover, tab	27-5737
Grommet, push-button switch mounting	27-4596
Knob assembly	54-4217
Knob, control	54-4245
Screw, drive	1W2054FA3
Screw, push-button switch and padder assembly	1W19674FA3
Sleeve, push-button switch mounting	28-5665FA3
Tab, on-off	54-4325
Tab kit assembly	40-6766
Washer, push-button switch and padder assembly	1W52237FA3
Shield (616)	56-3358
Socket, 5-prong, external aerial	27-6214*
Socket, FM test	27-6180*
Socket, Loktal	27-6138*
Socket, Loktal (7F8)	27-6213*
Socket, octal	27-6199*
Speaker hardware	
Speaker cable and plug assembly	41-3679
Bolt	W1695
Nut	1W19988FA3
Plug	27-4419-2
Washer (speaker mounting)	27-7467
Waler, electrolytic condenser mounting	45-6239

PRODUCTION CHANGES FOR MODEL 46-480

CODE 121 (MAIN CHASSIS)

RUN 2

To correct hum, condensers C102 and C103, each .2 mf., Part No. 45-3500-3*, were replaced by a single .5-mf. condenser, Part No. 61-0133.

RUN 3

Physical wiring changes were made.

RUN 4

To improve the high-frequency audio response, a 100-mmf. condenser, Part No. 60-10105407*, was added, between the "high-potential" end and the 1-megohm tap of the volume control.

RUN 5

To prevent oscillation in FM operation, a 240-mmf. condenser, Part No. 60-10245307*, was added, in parallel with C316.

RUN 6

Electrolytic condenser C101, 20 mf., Part No. 30-2555, was changed to Part No. 30-2568-8, to conform to Underwriters' requirements.

RUN 7

Condenser C206, .006 mf., 400 volts, Part No. 45-3500-7*, was changed to a 1000-volt condenser, Part No. 61-0105*.

RUN 8

Condenser C414, 33 mmf. (in parallel with coil L400A), was removed.

CODE 121 (R-F CHASSIS)

NOTE: The information in the manual applies to runs 1 through 9 of the r-f chassis.

RUN 1

No production.

RUN 2

- a. Cable assembly, shielded, 8½" in length, was changed from Part No. 41-3751 to Part No. 41-3754-10.
- b. Resistor R405, 10 ohms, was changed to 22 ohms, Part No. 66-0223340*.
- c. Condenser C303A, .01 mf., Part No. 61-0120*, was added.
- d. Resistor R313A, 22 ohms, Part No. 66-0223340*, was added.

RUN 3

- a. Two filament chokes (L406 and L407), Part No. 32-4061-1, were added to the 7F8 filament circuit.
- b. Condenser C407A, .01 mf., Part No. 61-0120, was added.

RUNS 4 and 5

Physical wiring changes were made.

RUN 6

- a. Condenser C415, 3.3 mmf., Part No. 30-1221, was added, between terminal 7 of S401B(F) and ground.
- b. Resistor R409, 10 ohms, Part No. 66-0103340*, was added, in series with the mixer grid.

RUN 7

- a. Condenser C415 (added in Run 6) was removed.
- b. Terminal 7 of S401A(F) was wired to ground; this change was made to ground the push-button trimmers in FM operation, thus reducing any reaction from the push-button assembly at FM frequencies.

RUN 8

- a. Condenser C316, .01 mf., Part No. 61-0120*, was removed.
- b. Physical wiring changes were made.

RUN 9

Choke L408, Part No. 32-4111, was added in series with C402B; this change was made to prevent resonance of this padder circuit at FM frequencies.

GENERAL INFORMATION ON MODEL 46-480

REDUCING FREQUENCY DRIFT (CODE 121)

Frequency drift may be reduced, and operation of the mixer improved, by making the following changes:

1. Remove the 100,000-ohm resistor, R402, connected between the mixer cathode (pin 5 of 7F8 tube) and the B+.
2. Change the mixer plate dropping resistor, R300, from 4700 ohms to 47,000 ohms, Part No. 66-3473340*.

REDUCING FREQUENCY DRIFT IN PUSH-BUTTON OPERATION (CODE 121)

Frequency drift in push-button operation may be reduced by making the following changes:

1. Replace the 485-mmfd. silver-mica condenser, C412, with a 485-mmfd. insulated-ceramic condenser, Part No. 30-1224-15.
2. Replace the 285-mmfd. silver-mica condenser, C413, with a 285-mmfd. insulated-ceramic condenser, Part No. 30-1224-14.

NOTE: These condensers are located above the radio chassis, on the push-button assembly.

DISTORTION ON STRONG BROADCAST SIGNALS

Distorted reception of strong broadcast signals may be caused by conduction of the 6H6 diode section (pins 3 and 4) which is not used for AM reception; conduction can occur when the signal strength overcomes the bias on the associated cathode. The effect may be eliminated by replacing the 68,000-ohm resistor, R312, with a resistor of 150,000 ohms, Part No. 66-4153340*.

CRITICAL LEAD DRESS FOR MODEL 46-480

1. The green lead of the 3rd i-f transformer, Z302, should be dressed close to the chassis. The yellow lead should be dressed away from the chassis. The orange, blue, and red leads should be dressed close to the chassis (make certain that these leads come through the original holes).

2. The blue lead of the 2nd i-f transformer should be dressed as closely as possible to the chassis where the lead enters the r-f unit.

3. The red, black, and blue leads of the 1st i-f transformer, Z300, should be dressed away from the FM oscillator coil, L401C.