

PHILCO



SERVICE

HOME RADIO

PHILCO RADIO, MODEL 46-431

CIRCUIT DESCRIPTION

The Philco Model 46-431 is a six-tube superheterodyne radio, providing reception on the standard broadcast band, 540 to 1720 kilocycles, and on a short-wave band, 9.3 to 15.5 megacycles. Manual tuning is employed for both bands.

A low-impedance loop aerial, built into the cabinet, normally provides adequate signal pickup on both bands. Provision has been made for connecting an external aerial when required.

The converter stage employs a dual-triode tube, type 7AF7; one triode section operates as a mixer and the other section as a local oscillator. The oscillator signal voltage is applied to the mixer section of the tube by capacitive coupling between the cathodes of the two sections. On the short-wave band, interlocking between the aerial circuit and oscillator circuit adjustments (the cause of oscillator frequency shift) is greatly minimized by a reverse feedback circuit which neutralizes any oscillator signal voltage appearing at the grid of the mixer. This feedback is taken from a tap on the short-wave oscillator coil and injected into the mixer grid circuit through a 10-mmf condenser (C404).

The two i-f amplifier stages employ type 7H7 high-transconductance pentode tubes. The amplified i-f signal is applied to the diode section of a type 7C6 tube, the output of which develops the audio signal and the a-v-c voltage.

The audio signal from the diode section of the 7C6 tube is applied to the triode section of the same tube. The output from this amplifier is resistance coupled to the grid of the 6K6GT/G output tube.

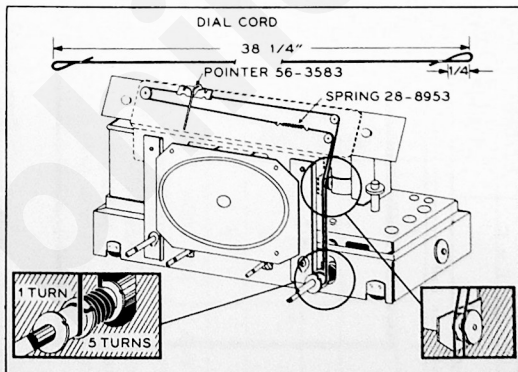
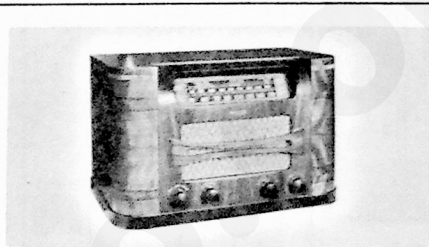


Figure 1. Dial-Cord Installation

TP-2186



Model 46-431

SPECIFICATIONS

CABINET	Wood, walnut finish
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGES	Broadcast: 540 to 1720 kc Short wave: 9.3 to 15.5 mc
INTERMEDIATE FREQUENCY	455 kc
AUDIO OUTPUT	1.5 watts
OPERATING VOLTAGE	115 volts, 60 cycles, a.c.
POWER CONSUMPTION	60 watts
AERIAL	Built-in low-impedance loop or external aerial
PHILCO TUBES	7AF7, 7H7 (2), 7C6, 6K6GT/G, 6X5GT/G
SPEAKER	4" x 6" oval electrodynamic

PHILCO TROUBLE-SHOOTING PROCEDURE

In this manual, the circuit is divided into four sections, with schematic and chassis layouts showing test points for each section. A simplified trouble-shooting procedure is given in a chart for each section. The first step in each chart (with the exception of Section 4) makes it possible to determine whether trouble exists in that 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 radio circuits are symbolized; the significance of the symbol in identifying the type and circuit locations of parts may be understood by referring to the front page of the service manual for PHILCO RADIO, MODEL 46-350.

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, and look for bad connections, burnt resistors, or other obvious sources of trouble.

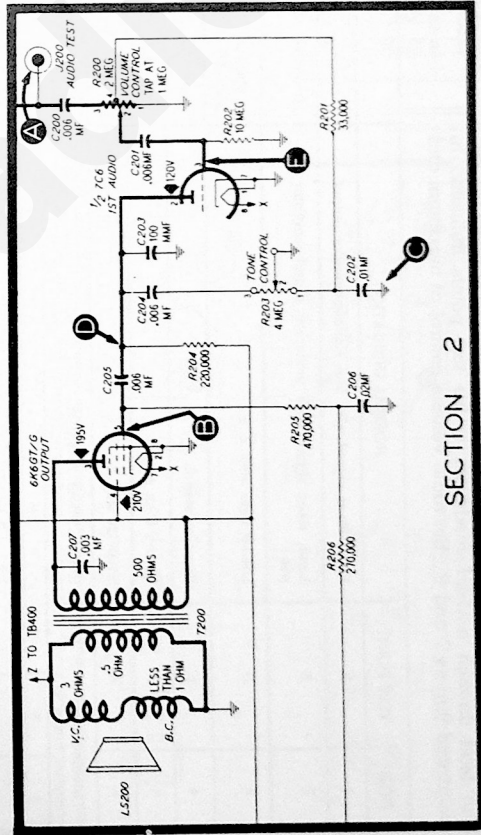
2. Measure the resistance between B+ (pin 8 of 6X5GT/G tube) and chassis, with the ohmmeter polarity such that it gives the highest resistance reading; if the reading is lower than 50,000 ohms, check condensers C101, C102 (A and B), C207, C310 and C309, for leakage or shorts.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

For all tests in this section, use an audio signal. Connect the signal-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 chart and figures 5 and 6. Set the radio volume control at maximum

and tone control fully counterclockwise. If the "NORMAL INDICATION" is obtained in step 1, proceed with 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 low signal-generator output.	Trouble within this section. Isolate by the following tests.
2	B	Normal, clear signal with moderate signal-generator output.	Defective 6K6GT/G tube, T200 or LS200. Shorted or leaky C207.
3	D	Same as above.	Shorted or leaky C203. Open C205.
4	E	Much louder than above. Reduce signal-generator output to provide normal signal.	Defective 7C6 tube. Open R204.
5	A	Same as above.	Open C201. C200. Defective R200.
Listening test		Normal, clear reception.	Distortion may be caused by leaky C203, C205, C207, or C206; open R205. Hum will result if C206 is open.



TP-1999D

Figure 5. Section 2 Schematic

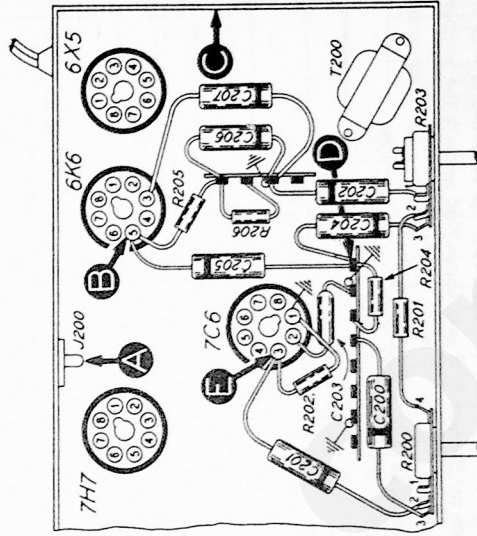


Figure 6. Bottom View, Showing Section 2 Test Points

TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

For all tests in this section, use an r-f signal generator with modulated output; set the generator frequency to 455 kc. 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 chart and figures 7 and 8. Set radio volume control at maximum and

tone control fully counterclockwise; adjust signal-generator output as indicated in chart. If "NORMAL INDICATION" is obtained in step 1, proceed with 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 low signal-generator output.	Trouble in this section. Isolate by the following tests.
2	B	Loud, clear signal with moderate signal-generator output.	Defective 7C6 tube, Z302 or C309. Shorted C312. Open R308 or R309.
3	D	Louder than step 2.	Defective 7H7 tube, C307 or Z301. Shorted C311. Open R305, R306 or R307. Improperly aligned Z302.
4	E	Same as step 3.	Defective Z301 or C310.
5	F	Louder than step 4.	Defective 7H7 tube, C306 or Z300. Open R302 or R303. Improperly aligned Z301.
6	A	Same as step 5.	Defective Z300, C304 or R301. Shorted C303.
Listening test; station tuned in			Motorboating may be caused by open C306 or C311.

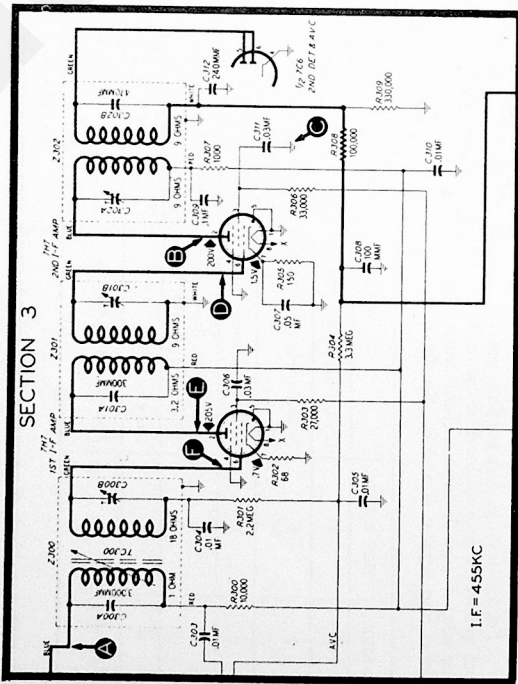


Figure 7. Section 3 Schematic

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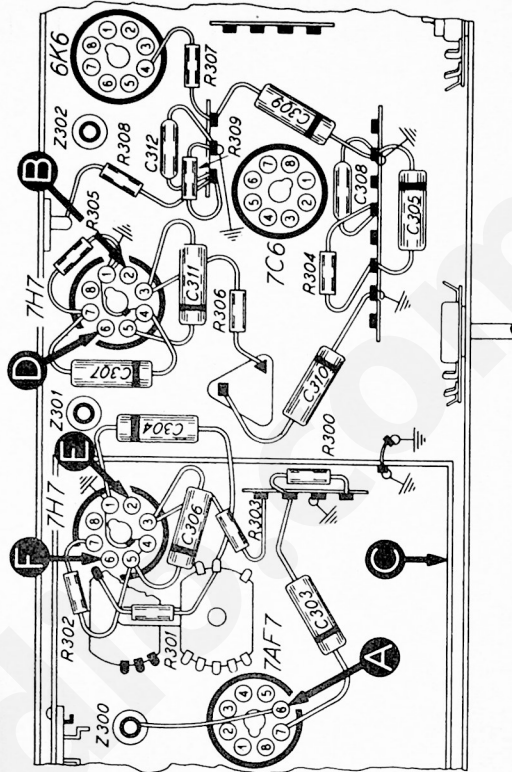


Figure 8. Bottom View, Showing Section 3 Test Points

TP-1999G

TESTS TO ISOLATE WITHIN SECTION 4

Connect ground lead of r-f signal generator to test point "C" (chassis); connect output lead through a .1mf condenser to test points indicated in chart and figures 9 and 10. Set radio volume control at maximum, set tuning control, band switch, and signal generator as indicated.

Oscillator check: Attach positive lead of a 20,000-ohms-per-volt meter (10-volt or similar range) to chassis, and prod end of the negative lead through a 100,000-ohm

isolating resistor to test point "D." Negative voltage over entire tuning range indicates oscillator is operating. Steps 3 and 4 indicate possible cause of oscillator trouble. Inspect tuning condenser; dirty or bent plates, or poor bearing contacts will cause noise. If "NORMAL INDICATION" is not obtained in step 1, isolate trouble by following remaining steps.

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc 12 mc	B'DC/ST SW	1000 kc 12 mc	Loud, clear signal with low signal-generator output.	Trouble within this section. Isolate by the following tests.
2	B	1000 kc	B'DC/ST	1000 kc	Same.	Defective 7AF7 tube or R400. Open R401. Defective or misaligned Z300.
3	D (See osc. check)	Not used	B'DC/ST	Rotate 540-1720 kc	Negative, 3½ to 5 volts.	Defective 7AF7 tube, S400C(F), S400D(R), L402, C303, R402, C308, C409 or C407. Shorted C402B. Open C402A.
4	D (See osc. check)	Not used	SW	Rotate 9.3-15 mc	Negative, 1 to 2 volts.	Defective 7AF7 tube, S400C(F), S400D(R), C407, C402C, L403, R401, R402, C408 or C409.
5	A	1000 kc	B'DC/ST	1000 kc	Loud, clear signal with low signal-generator output.	Defective L400, C401A, S400A(F), S400B(R), S400D(R) or C403. Shorted C404.
6	A	12 mc	SW	12 mc	Same.	Defective L401, C401B, S100A(F), S400B(R), S400D(R) or C403. Shorted C404.

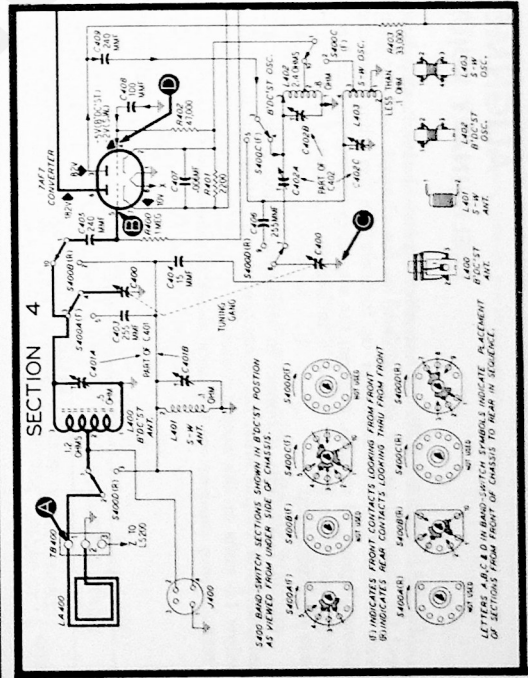


Figure 9. Section 4 Schematic

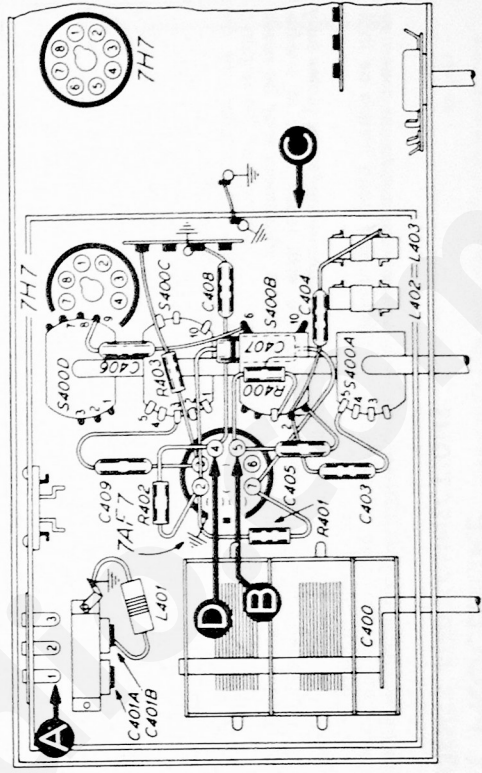


Figure 10. Bottom View, Showing Section 4 Test Points

ALIGNMENT PROCEDURE PRELIMINARY ADJUSTMENTS AND CONNECTIONS

SIGNAL GENERATOR: When aligning the i-f circuit, step 1, connect the signal-generator ground lead to the chassis, and the output lead through a .1-mf condenser as indicated in the alignment chart. When aligning r-f circuits, connect the signal generator to a coil of insulated wire (6 to 8 turns, about 6 inches in diameter). Suspend coil near the radio loop.*

OUTPUT METER: Connect to terminals 2 and 3 on TB400. Signal-generator output must be attenuated to maintain the radio output below 1.5 volts on the output meter.

* NOTE: During alignment, the loop aerial should be connected to the radio.

CONTROL SETTINGS: Set volume control to maximum, tone control to maximum counterclockwise position and band switch as indicated in chart below.

DIAL-POINTER ADJUSTMENT: With tuning-condenser plates fully meshed, adjust dial pointer to coincide with index mark at low-frequency end of the dial scale. This pointer adjustment may be made after the chassis has been removed from the cabinet and the required index and calibration points marked on the dial backplate as described in "CALIBRATING DIAL BACKPLATE," page 86.

ALIGNMENT CHART

SIGNAL GENERATOR			RADIO			
STEP	CONNECTIONS TO RADIO	DIAL SETTING	BAND SWITCH POSITION	DIAL SETTING	SPECIAL INSTRUCTIONS	ADJUST
1	Terminal 1 TB400	455 kc	B'DCST	540 kc	Adjust for maximum once only in order.	C302A C302B C300B TC300
2	6" coil, suspended near loop	580 kc	B'DCST	580 kc	Adjust for maximum.	C402A
3	Same	1700 kc	B'DCST	1700 kc	Adjust for maximum.	C402B
4	Same	1500 kc	B'DCST	1500 kc	Adjust for maximum.	C401A
5	Same	580 kc	B'DCST	580 kc (approx.)	Rock tuning condenser while adjusting for maximum.	C402A
6	Repeat steps 3, 4, 5 and 4 in order, until no improvement results.					
7	Same	15 mc	SW	15 mc	Adjust for maximum on first peak from loose position. Image should be heard at 14.1 mc.	C402C
8	Same	15 mc	SW	15 mc	Adjust for maximum.	C401B

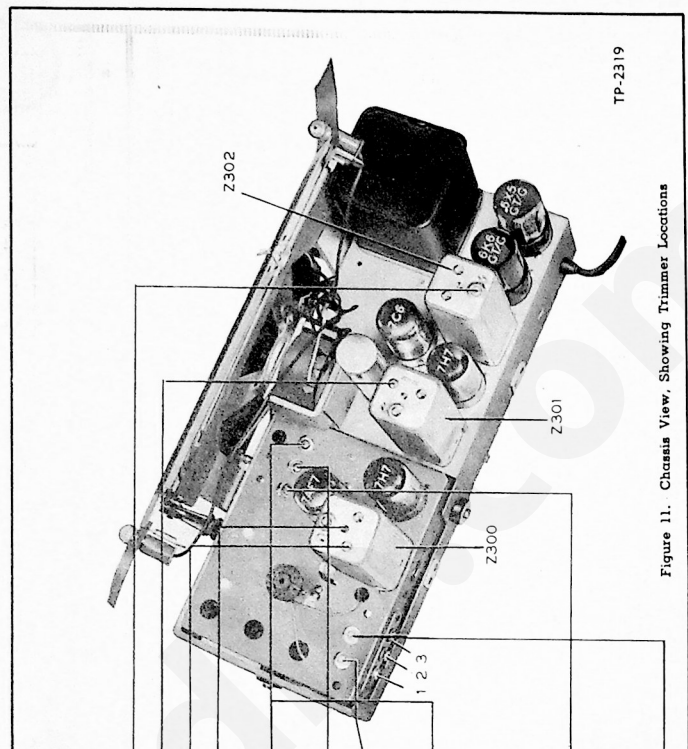


Figure 11. Chassis View, Showing Trimmer Locations

REPLACEMENT PARTS LIST

MODEL 46-431

NOTE: Parts marked with an asterisk (*) are general replacement items, and the numbers may not be identical with those used on factory assemblies. When ordering replacements, use only the "SERVICE PART NUMBER" given in the parts list.

SECTION 1

Reference No.	Description	Service Part No.
C100	Condenser, line filter, 2-section	39030DG
	C100A: condenser, .01 mf	Part of C100
	C100B: condenser, .01 mf	Part of C100
C101	Condenser, electrolytic, 15 mf	30-2568*
C102	Condenser, electrolytic, 2-section	30-2550*
	C102A: condenser, electrolytic, 25 mf	Part of C102
	C102B: condenser, electrolytic, 10 mf	Part of C102
I100	Lamp, pilot	34-2040*
I101	Lamp, pilot	34-2040*
L100	Field, speaker	Part of LS200
R100	Resistor, 240 ohms	66-1244340*
R101	Resistor, 15,000 ohms	66-3154340*
S100	Switch, power on-off	Part of R203
T100	Transformer, power	32-8220*
W100	Cord, line	L3199

SECTION 2

C200	Condenser, .006 mf	45-3500-7*
C201	Condenser, .006 mf	45-3500-7*
C202	Condenser, .01 mf	61-0120*
C203	Condenser, 100 mmf	60-10105407*
C204	Condenser, .006 mf	45-3500-7*
C205	Condenser, .006 mf	45-3500-7*
C206	Condenser, .02 mf	61-0108*
C207	Condenser, .003 mf	61-0109*
J200	Socket, audio-test	27-6180*
LS200	Speaker	36-1604*
R200	Control, volume, 2 meg	33-5535*
R201	Resistor, 33,000 ohms	66-3333340*
R202	Resistor, 10 meg	66-6103340*
R203	Control, tone, 4 meg	33-5538*
R204	Resistor, 220,000 ohms	66-4223340*
R205	Resistor, 470,000 ohms	66-4473340*
R206	Resistor, 270,000 ohms	66-4243340*
T200	Transformer, output	32-8278*

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, .05 mf	61-0122*
C308	Condenser, 100 mmf	60-10105407*
C309	Condenser, .1 mf	61-0113*
C310	Condenser, .01 mf	61-0120*
C311	Condenser, .03 mf	45-3500-1*
C312	Condenser, 240 mmf	60-10245307*
R300	Resistor, 10,000 ohms	66-3103340*
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, 1000 ohms	66-2103340*
R308	Resistor, 100,000 ohms	66-4103340*
R309	Resistor, 330,000 ohms	66-4333340*
Z300	Transformer, 1st i-f	32-4106*
	C300A: condenser, 3000 mmf	Part of Z300
	C300B: condenser, trimmer	Part of Z300
	TC300: tuning core	Part of Z300

SECTION 3 (Continued)

Reference No.	Description	Service Part No.
Z301	Transformer, 2nd i-f	32-4107*
	C301A: condenser, 300 mmf	Part of Z301
	C301B: condenser, trimmer	Part of Z301
Z302	Transformer, 3rd i-f	32-4108*
	C302A: condenser, trimmer	Part of Z302
	C302B: condenser, 470 mmf	Part of Z302

SECTION 4

C400	Condenser, gang-tuning	31-2719-2
C401	Padder strip, 2-section	31-6476
	C401A: condenser, b'dc'st aerial trimmer	Part of C401
	C401B: condenser, s-w aerial trimmer	Part of C401
C402	Padder strip, 3-section	31-6464
	C402A: condenser, b'dc'st osc. series trimmer	Part of C402
	C402B: condenser, b'dc'st osc. shunt trimmer	Part of C402
	C402C: condenser, s-w osc. shunt trimmer	Part of C402
C403	Condenser, 255 mmf	30-1220-24*
C404	Condenser, 15 mmf	60-00155407*
C405	Condenser, 240 mmf	60-10245307*
C406	Condenser, 255 mmf	30-1220-24*
C407	Condenser, .006 mf	45-3500-7*
C408	Condenser, 100 mmf	60-10105407*
C409	Condenser, 240 mmf	60-10245307*
J400	Socket, 4-prong, external aerial	27-6214-1*
L400	Coil, aerial, b'dc'st	32-4043
L401	Coil, aerial, s-w	32-4050-6
L402	Coil, oscillator, b'dc'st	32-4019-3
L403	Coil, oscillator, s-w	32-4113
LA400	Aerial, loop, b'dc'st	76-2236
R400	Resistor, 1 meg	66-5103340*
R401	Resistor, 2200 ohms	66-2223340*
R402	Resistor, 47,000 ohms	66-3473340*
R403	Resistor, 33,000 ohms	66-3333340*
S400	Switch, band	42-1780*
	S400A: section, band switch	Part of S400
	S400B: section, band switch	Part of S400
	S400C: section, band switch	Part of S400
	S400D: section, band switch	Part of S400
TB400	Panel, aerial terminal	38-9942

MISCELLANEOUS

Description	Service Part No.
Cabinet Hardware	
Baffle and cloth assembly	40-6817
Cabinet, complete	10632C
Dial scale	27-5940
Scale mounting screws	1W24894
Scale strap, dial-scale mtg.	56-2898
Clip, b'dc'st aerial coil	28-5002FA1
Clip, b'dc'st oscillator coil	56-2927FE7
Dial-Scale Hardware	
Cord, pointer-drive (25-foot spool)	45-8750*
Pointer	56-3583
Scale, backplate and pulley assembly	76-2151
Spring, pointer-drive-cord	28-8953
Knob (4)	54-4101*
Pinnut, volume and tone-control mtg.	1W29091FA3
R-F Unit Mounting Hardware	
Grommet (3)	54-4295
Spacer (3)	1W29155FA3
Screw (3)	1W19673FA3
Washer (3)	1W52224FA3
Shield, pilot-lamp (2)	54-7150
Socket assembly, pilot-lamp (right)	76-2154
Socket assembly, pilot-lamp (left)	76-2153
Socket, Loktal (7AF7)	27-6213*
Socket, Loktal (3)	27-6138*
Socket, octal (2)	27-6199*
Speaker Hardware	
Screw and lock-washer combination (2)	1W48188FA3

PRODUCTION CHANGES FOR MODEL 46-431

CODE 121

RUN 2

A physical change in wiring was made; this change does not affect the schematic diagram.

RUN 3

A 22-mmf. condenser, Part No. 60-00205307*, was connected from the grid (pin 6) of the 7H7 first i-f tube to the chassis, to eliminate spurious oscillations.

RUN 4

C102, 25-10mf., Part No. 30-2550*, was changed to Part No. 30-2570.

CRITICAL LEAD DRESS AND PARTS PLACEMENT FOR MODEL 46-431

1. L401 (s-w aerial coil) should be parallel to the end plate of the tuning-condenser gang, C400.
2. The L400 (broadcast aerial coil) lead connected to C401A should be dressed upward from the chassis.
3. The lead from C401A to the band-switch, S400, should be dressed upward from the chassis and away from the tuning-condenser gang, C400.