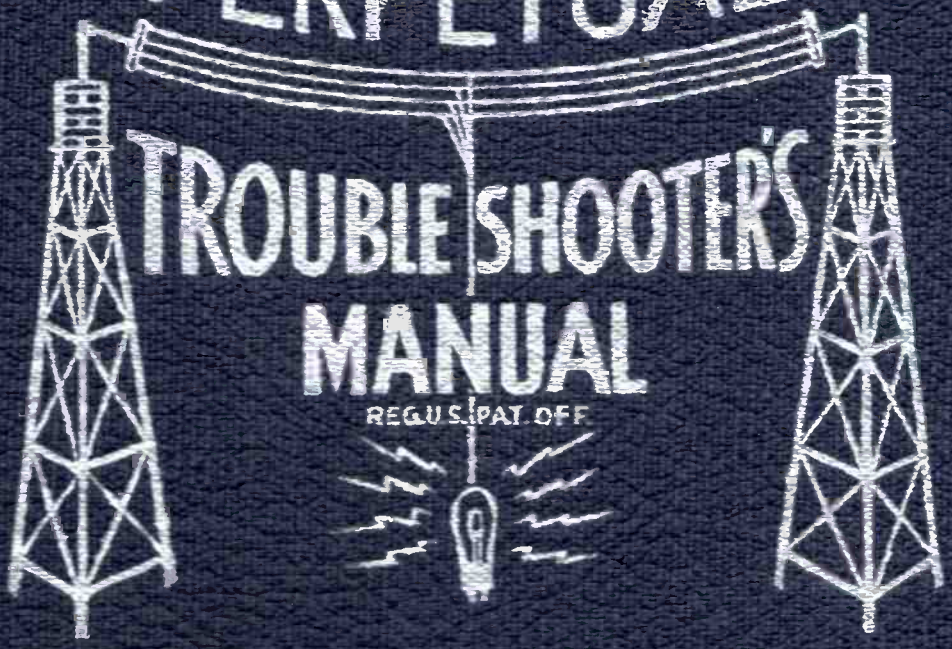
VOLUME XIV

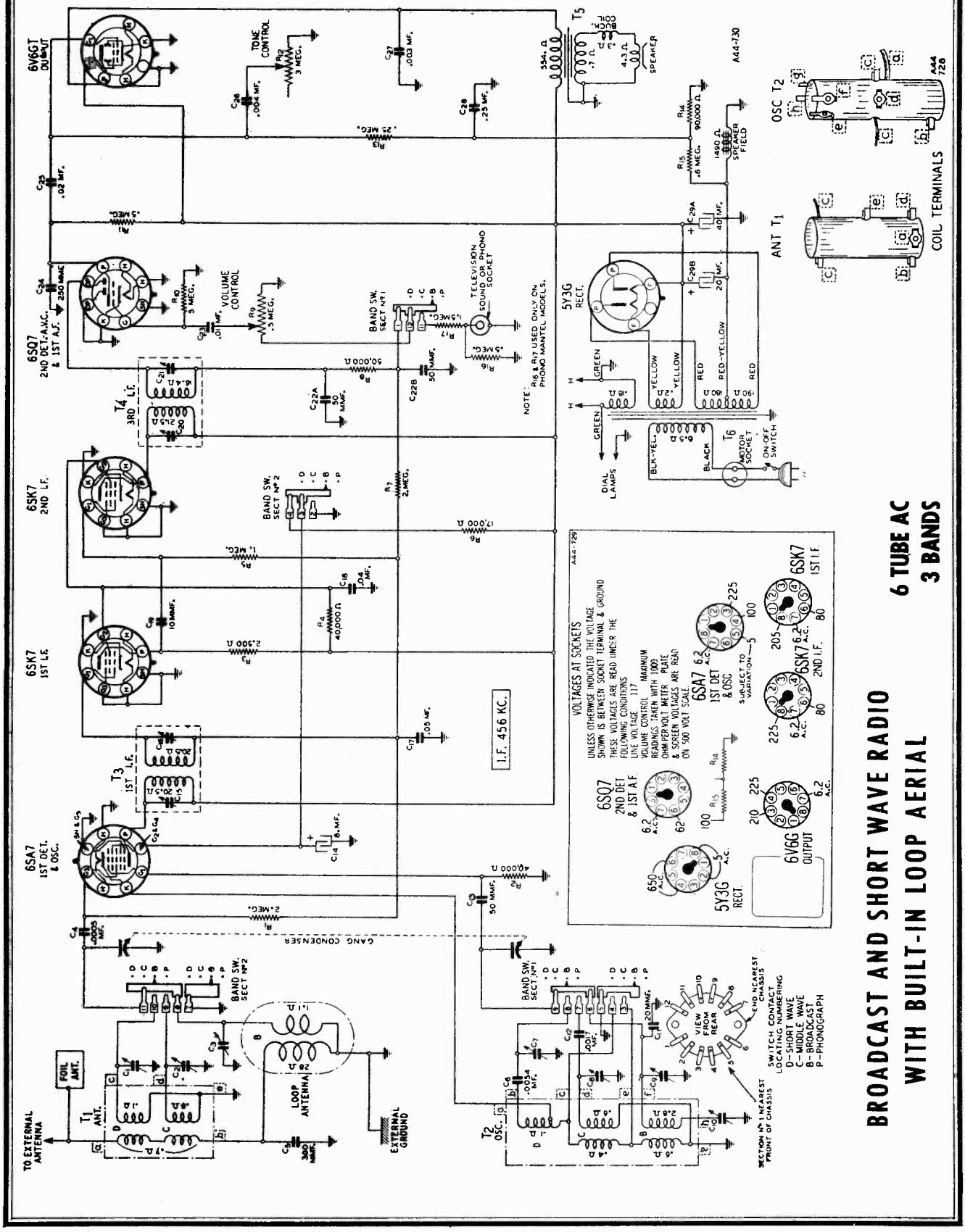
PERPETUAL TROUBLE SHOOTER'S MANUAL



JOHN F. RIDER

MODEL 6A44

WELLS-GARDNER & CO.



MODEL 6A44

WELLS-GARDNER & CO.

SPECIFICATIONS

Power Consumption 60 Watts (At 117 volts 60 cycles)

Power Output..... 2.5 Watts Undistorted
3.5 Watts Maximum

Selectivity.....40 KC Broad at 1000 times Signal

Intermediate Frequency.....456 KC

Speaker.....6" or 8" Electro-Dynamic

Tuning Frequency Range

B Range ..... 528 to 1600 KC
C Range .....2200 to 7000 KC
D Range .....7000 to 22000 KC

Sensitivity—External Antenna—(For 0.5 Watt output)

B Range ..... 7 Microvolts Average
C Range ..... 7 Microvolts Average
D Range .....15 Microvolts Average

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

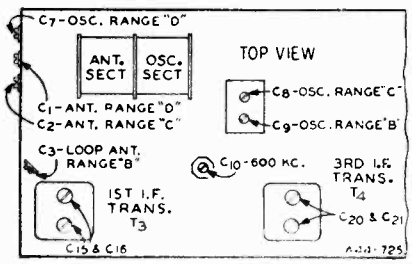
The following equipment is required for aligning:

An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver.

Dummy Antennas—.1 mf., 100 mmf., and 400 ohms.

SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I.F.					
456 KC	Grid Terminal No. 8 of 1st Det.	.1 mf.	B Range	Turn Rotor to Full Open	1st I.F. (C15) & (C16) 3rd I.F. (C20) & (C21)
RANGE B					
1600 KC	External Antenna Clip or Lead	100 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C9)
1400 KC	External Antenna Clip or Lead	100 mmf.	B Range	Turn Rotor to Max. Output Set Indicator to 1400 KC— See Note A	Ant. Range B (C3)
600 KC	External Antenna Clip or Lead See Note B	100 mmf.	B Range	Turn Rotor to Max. Output	600 KC (C10) Rock Rotor—See Note C
RANGE C					
7000 KC	External Antenna Clip or Lead	400 Ohm	C Range	Turn Rotor to Full Open	Oscillator Range C (C8)
6000 KC	External Antenna Clip or Lead	400 Ohm	C Range	Turn Rotor to Max. Output	Antenna Range C (C2)
RANGE D					
22,000 KC	External Antenna Clip or Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C7)
21,000 KC	External Antenna Clip or Lead	400 Ohm	D Range	Turn Rotor to Max. Output	Ant. Range D (C1) Rock Rotor—See Note C
LOOP RANGE B					
1400 KC	External Antenna Clip or Lead See Note D	100 mmf.	B Range	Turn Rotor to Max. Output	Ant. Range B (C3)



Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

After each range is completed, repeat the procedure as a final check.

NOTE A—If the pointer is not at 1400 KC on the dial, remove pointer from drive cord. Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

NOTE B—(Table Model) By means of wooden blocks, stand the loop aerial assembly the same distance from the back of the chassis that it is normally when the chassis is assembled in the cabinet.

NOTE C—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

NOTE D—Re-assemble chassis in cabinet. Replace back on cabinet (Table Model). Connect ground post of signal generator to external ground clip on loop antenna (Table Model) or ground screw on chassis (Console Model).

CAUTION—When aligning the short wave bands, be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000 less 912 KC, or 14,088 KC on the dial. It may be necessary to increase the input signal to hear the image.

DRIVE CORD REPLACEMENT

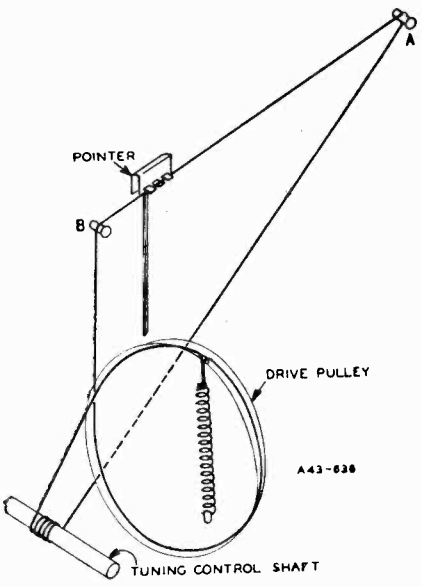
Turn gang condenser to full open position—See illustration. Use a new drive cord 42 inches in length.

Tie one end of cord to tension spring. Pass other end of cord up through hole in groove of drive pulley. Pull cord through hole until spring is flush against inside of pulley rim.

Wind cord 1/4 turn counter-clockwise (from pulley side of chassis) around drive pulley. Then wind 4 1/2 turns clockwise (from front of chassis) around tuning control shaft. These turns should progress toward chassis. Pass cord over idler studs A and B as shown, then wind cord 3/4 turn counter-clockwise (from pulley side of chassis) around drive pulley. This turn should be on left side (from front of chassis) of pulley groove.

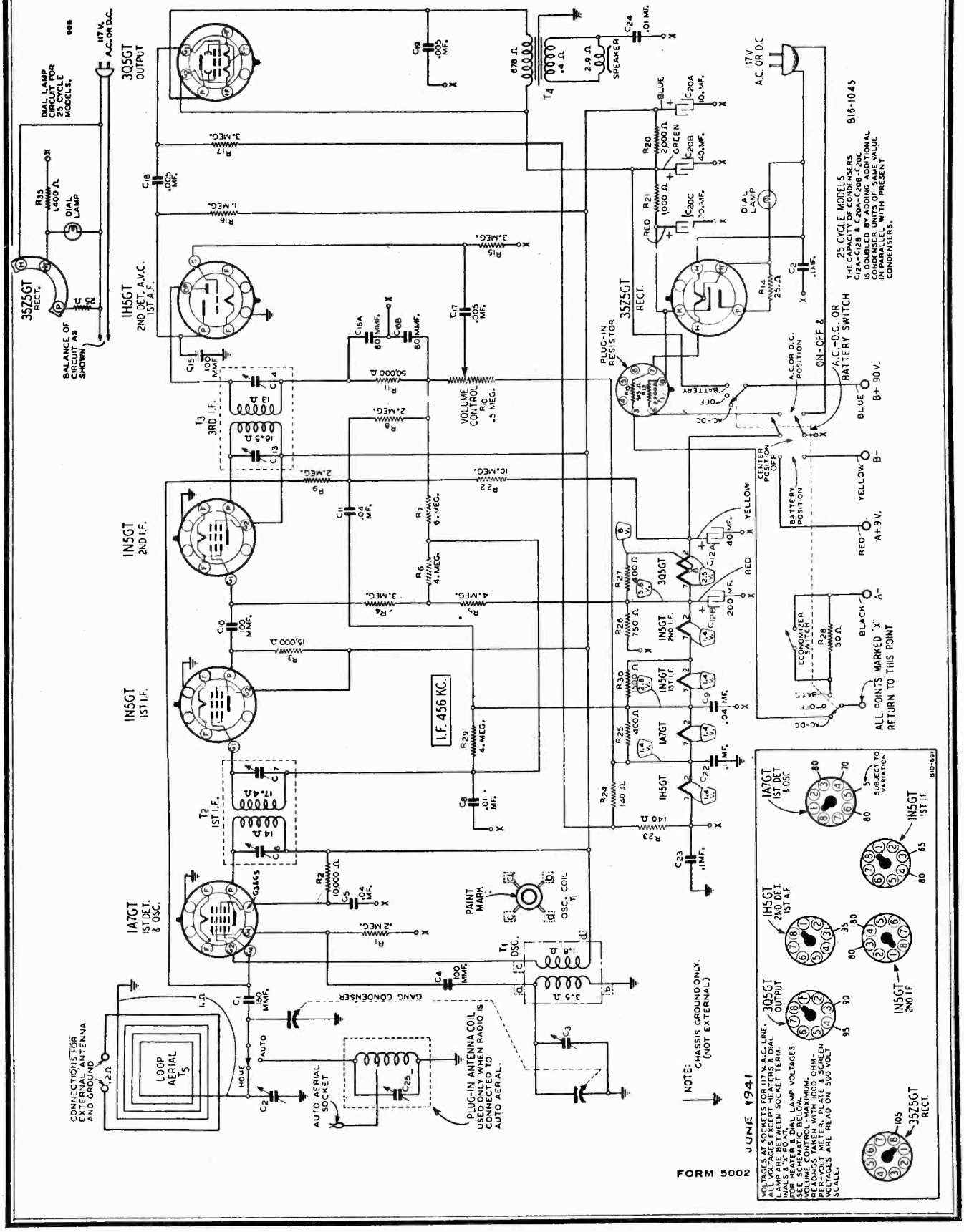
Pass cord through hole in groove of drive pulley. Tie cord to tension spring. Fasten other end of spring to hook on drive pulley.

DIAL POINTER ATTACHMENT—Tune in a signal of known frequency. Set pointer at this frequency mark on dial scale. Fasten pointer to drive cord—See illustration.



MODEL 6B16

WELLS-GARDNER & CO.



MODEL 6B16

WELLS-GARDNER & CO.

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The equipment in column at right is required for aligning:

A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver.

Dummy Antennas—.1 mf., 50 mmf.

SIGNAL GENERATOR FREQUENCY SETTING	ANTENNA CONNECTION	GROUND CONNECTION	DUMMY ANTENNA	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration below)
456 KC	External Antenna Clip on Loop	External Ground Clip on Loop	.1 mf.	Turn Rotor to full open	1st I.F. (C6) & (C7) 3rd I.F. (C13) & (C14)
1600 KC	External Antenna Clip	External Ground Clip	.1 mf.	Turn Rotor to full open	Oscillator (C3)
1400 KC	External Antenna Clip See Note A	External Ground Clip	50 mmf.	Turn Rotor to max. output	Antenna (C2)

If radio is equipped with special antenna coil for use in car, make the following additional adjustment after the radio is installed in the car and the car antenna is connected.

Car Antenna Adjustment—Tune in weak signal near 1400 KC—Adjust Car Antenna Trimmer C25 for maximum output. This trimmer is in special antenna coil can at left side of chassis (See illustration in Auto Installation Sheet).

SPECIFICATIONS

Input Voltages and Currents—Battery Operation
"A" Battery .....9 Volts—50 Ma.
"B" Battery .....90 Volts—11.5 Ma.

Power Consumption
(At 117 volts AC Supply) .....28 Watts

Power Output
Battery Operation - - - 150 Mw. Undistorted, 350 Mw. Maximum
AC Operation - - - - 200 Mw. Undistorted, 400 Mw. Maximum

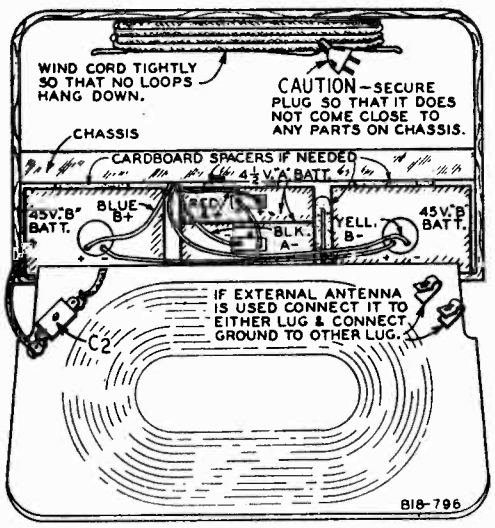
Selectivity - 50 KC Broad at 1000 Times Signal

Intermediate Frequency - - - - - - 456 KC

Speaker - - - - - - - - 6" P.M. Dynamic

Tuning Frequency Range - - - 540 to 1600 KC

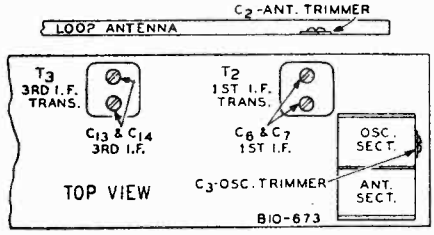
Sensitivity (For .05 Watt Output)
External Antenna - - 10 Microvolts Average

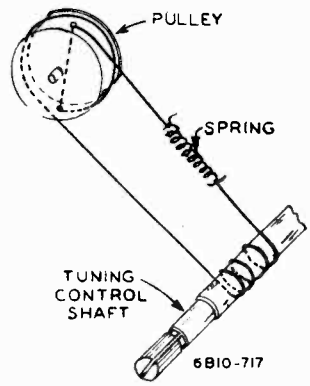


NOTE A—Reassemble chassis in cabinet. Close back on cabinet.

CALIBRATION—To obtain dial scale calibration, tune in an 800 KC signal. The pointer should be at the 800 KC mark on the dial. If it is not, set the pointer at the 800 KC mark. Retighten set screw.

REMOVING CHASSIS FROM CABINET—Pull off the 3 control knobs. Take out the 4 screws, 2 at each side on the outside of the cabinet. Then pull the chassis out of the cabinet.





GANG CONDENSER IN CLOSED POSITION

REPLACEMENT PARTS LIST

NOTICE: There is a chassis number label on the chassis. The chassis number identifies the radio as to chassis, dial, and issue letter. When ordering parts or writing, be sure to mention the chassis number.

No. 3 DIAL—Black Calibration Numbers on Gold Background

No. 4 DIAL—Blue Calibration Numbers on Gold Background

Part No.	Description	List Price
12A358	6" P.M. Dynamic Speaker complete with Output Transformer	$6.10⊗
	Cone and Voice Coil (Specify part number and letters stamped on Speaker)	1.20⊗
	Output Transformer (Specify part number and letters stamped on Speaker)	1.50
14X295	Screen for above Speaker (Dial No. 3)	.25
14X297	Screen for above Speaker (Dial No. 4)	.40
14X296	Grille Cloth (Dial No. 3)	.10
14X298	Grille Cloth (Dial No. 4)	.10
10A421	Knob (Off Switch—AC-DC—Battery Switch)	.10
10A419	Knob (Tuning or Volume Control)	.10
3A303	Tube or Resistor Sockets—Octal (8 Prong) Molded Ea.	.10
3A309	4 Prong Socket for Antenna Transformer Assembly	.10
30X44	Grid Clips Doz.	.10
52X174	Tube Shields Ea.	.10
13X418	"A" Battery Cable and Plug Assembly	.20
13X419	"B" Battery Cable and Plug Assembly	.20
13X328	Line Cord and Plug Assembly	.40
2A193	Off-Switch—AC-DC—Battery Switch	.65
28A284	Home-Auto Switch and Mounting Spring Assembly	.40
4X621	Escutcheon for Home-Auto Switch	.25
2A175	Economizer Switch	.15
26X265	Phosphor Bronze Ground Plate (For 3rd I.F. Can)	.10

TRANSFORMERS AND COILS

9A1396	T1	Oscillator Coil Assembly	$1.25
9A1372	T2	1st I.F. Transformer and Can Assembly	1.05
9A1373	T3	3rd I.F. Transformer and Can Assembly	1.00
	T4	Output Transformer (See "Miscellaneous")	
9A1404	T5	Loop Aerial Assembly less Trimmer Condenser	1.05
		Antenna Transformer Assembly (See "Auto Installation Parts")	

CONDENSERS

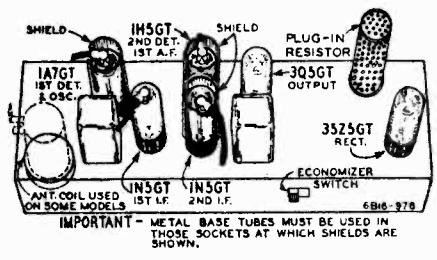
47X142	C1	150 mmf.		Molded	$0.10
17A118	C2	2.5-23 mmf.	Loop Aerial Trimmer— Part of Gang Condenser		.15
	C3				
47X87	C4,C10,G15	100 mmf.		Molded	.10
B66403	C5,C9,C11	.04 mf.	200 V.	Tubular	.10
	(C8)		Part of 1st I.F. Can Assembly		
	(C7)				
B66103	C8	.01 mf.	200 V.	Tubular	.10
	(C12A	40 mf.	35 V.)	Dry	
45X301	(C12B	200 mf.	35 V.)	Electrolytic	.80
	(C13)		Part of 3rd I.F. Can Assembly		
	(C14)				
	(C16A	60 mmf.)		Dual Mica	.15
47X172	(C16B	60 mmf.)			
B66502	C17,C18	.005 mf.	200 V.	Tubular	.10
D66502	C19	.005 mf.	400 V.	Tubular	.10
	(C20A	10 mf.	150 V.)	Dry	
45X297	(C20B	40 mf.	150 V.)	Electrolytic	.70
	(C20C	20 mf.	150 V.)		
D66104	C21,C22,C23	.10 mf.	400 V.	Tubular	.15
D66103	C24	.01 mf.	400 V.	Tubular	.10
17A115	C25	2.5-35 mmf. (See "Auto Installation Parts")			
		(40 mf.	150 V.)	Dry	
45X283		(10 mf.	150 V.)	Electrolytic	.75
		(20 mf.	150 V.)	(USED ON 25 CYCLE MODELS ONLY)	
		(200 mf.	35 V.)	Dry	
45X284		(40 mf.	35 V.)	Electrolytic (USED ON 25 CYCLE MODELS ONLY)	.60
14A154		2 Section Gang Condenser			3.00

RESISTORS

B95204	R1	200,000 Ohm	0.5 W.	Carbon	$0.10
B95103	R2	10,000 Ohm	0.5 W.	Carbon	.10
B95153	R3	15,000 Ohm	0.5 W.	Carbon	.10
B95303	R4,R15,R17	3.0 Megohm	0.5 W.	Carbon	.10
B95405	R5,R6,R29	4.0 Megohm	0.5 W.	Carbon	.10
B85605	R7	6.0 Megohm	0.5 W.	Carbon	.10
B95205	R8,R9	2.0 Megohm	0.5 W.	Carbon	.10
36X299	R10	500,000 Ohm	Volume	Control	.50
B95503	R11	50,000 Ohm	0.5 W.	Carbon	.10
	(R12	2200 Ohm	5 W.)	Plug-In	
48X114	(R13	515 Ohm	12 W.)	Resistor	1.15
B95250	R14	25 Ohm	0.5 W.	Carbon	.10
B95105	R16	1.0 Megohm	0.5 W.	Carbon	.10
B95202	R20	2000 Ohm	0.5 W.	Carbon	.10
B95102	R21	1000 Ohm	0.5 W.	Carbon	.10
B95106	R22	10.0 Megohm	0.5 W.	Carbon	.10
B94141	R23,R24	140 Ohm	0.5 W.	Carbon	.15
B94401	R25,R27	400 Ohm	0.5 W.	Carbon	.15
B94751	R26	750 Ohm	0.5 W.	Carbon	.15
B94300	R28	30 Ohm	0.5 W.	Carbon	.15
B94152	R30	1500 Ohm	0.5 W.	Carbon	.15
43X104	R35	1400 Ohm	12 W.	Wire Wound— (USED ON 25 CYCLE MODELS ONLY)	.60

DIAL AND DRIVE ASSEMBLY

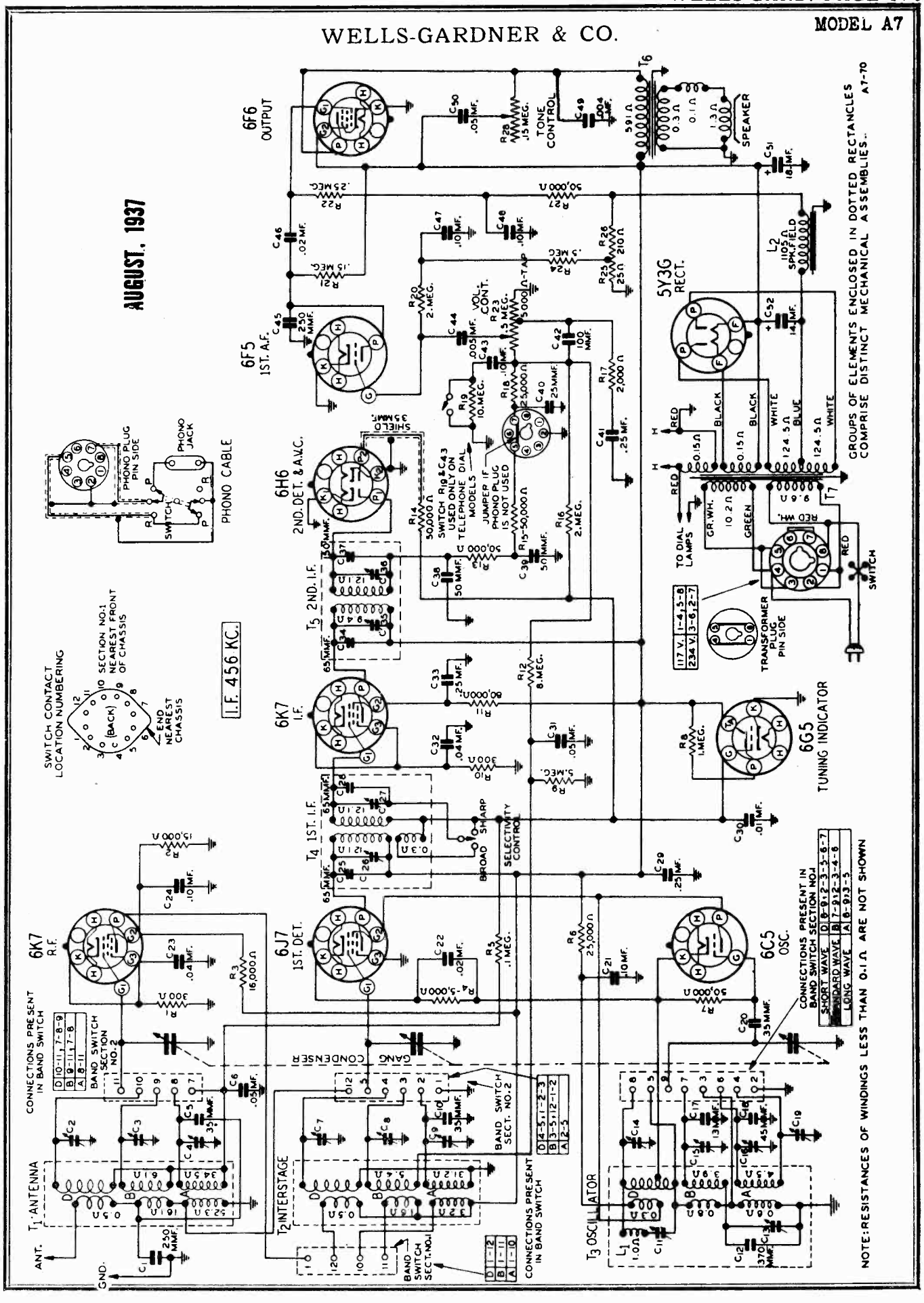
26A294	Dial Mounting Plate Assembly complete with Drive Cord Pulley and Bracket, less Dial Scale and Celluloid Crystal	$0.40
17X66	Celluloid Crystal	.20
	Dial Scale (Specify Name and Chassis Number of Radio)	*
15X161	Pointer for Dial Scale—Black (No. 3 Dial)	.10
15X197	Pointer for Dial Scale—White (No. 4 Dial)	.10
28X56	Clamp Buttons (to hold Dial Scale and Celluloid Crystal to Mounting Plate) Doz.	.10
	14" Drive Cord (12 Lb. Test)	.05
28X206	Tension Spring for Drive Cord Doz.	.30



IMPORTANT - METAL BASE TUBES MUST BE USED IN THOSE SOCKETS AT WHICH SHIELDS ARE SHOWN.

Use only GENUINE factory tested parts to insure service jobs you can depend on and to obtain original set performance.

Prices Subject to Change Without Notice.



ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Selectivity Control—Sharp Position All Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator With a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

The following equipment is required for aligning:
An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antennas — .1 mf., 200 mmf., and 400 ohms.

STEP (Follow Order as Given)	BAND SWITCH SETTING	DUMMY ANTENNA	SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	TRIMMERS ADJUSTED See Illustration	PROCEDURE INITIAL STEPS	PROCEDURE ADJUSTMENT
I.F.							
2nd I.F. Adj.	Range B	.1 mf.	456 KC	Grid of I.F. Tube	2nd I.F. (C35) & (C36)	Turn Rotor to Full Open	Adjust to Maximum Output
1st I.F. Adj.	Range B	.1 mf.	456 KC	Grid of 1st Det.	1st I.F. (C26) & (C27)	Turn Rotor to Full Open	Adjust to Maximum Output
RANGE A							
380 KC	Range A	200 mmf.	380 KC	Antenna Lead	Oscillator Range A (C16)	Turn Rotor to Full Open	Adjust to Maximum Output
350 KC	Range A	200 mmf.	350 KC	Antenna Lead	Int. Range A (C9) Antenna Range A (C4)	Turn Rotor to Max. Output	Adjust to Maximum Output
165 KC	Range A	200 mmf.	165 KC	Antenna Lead	165 KC (C19)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B
RANGE B							
1830 KC	Range B	200 mmf.	1830 KC	Antenna Lead	Oscillator Range B (C15)	Turn Rotor to Full Open	Adjust to Maximum Output
1500 KC	Range B	200 mmf.	1500 KC	Antenna Lead	Ant. Range B (C3) Int. Range B (C8)	Turn Rotor to Max. Output Set Indicator to 1500 KC— See Note A	Adjust to Maximum Output
600 KC	Range B	200 mmf.	600 KC	Antenna Lead	600 KC (C13)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B
RANGE D							
19,800 KC	Range D	400 Ohm	19,800 KC	Antenna Lead	Oscillator Range D (C14)	Turn Rotor to Full Open	Adjust to Maximum Output
16,000 KC	Range D	400 Ohm	16,000 KC	Antenna Lead	Ant. Range D (C2) Int. Range D (C7)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B
6000 KC	Range D	400 Ohm	6000 KC	Antenna Lead	6000 KC (C11)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

After each range is completed, repeat the procedure as a final check.

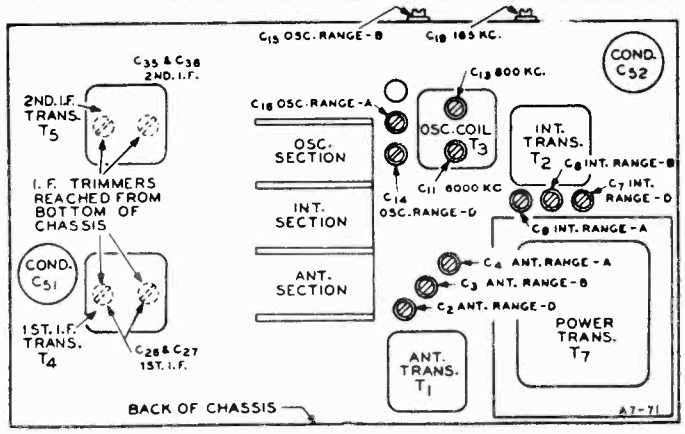
NOTE A—In sets using the telephone dial tuning, there will be seen inside the telephone dial button ring an escutcheon plate held in place by four screws. Loosen the 2 screws nearest the pointer. An extension of the pointer will be seen protruding over the edge of this escutcheon plate. Move the pointer to the 1500 KC mark on the dial and then tighten the 2 escutcheon screws. (Do not tighten these screws too much.)

In sets using a pointer or any other type of dial mechanism, it will be necessary to adjust the position of the indicator until it is at the 1500 KC mark.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

CAUTION—When aligning the short wave band be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000 less 912 KC, or 14,088 KC on the dial. It may be necessary to increase the input signal to hear the image.

NOTICE—Re-alignment is necessary if glass tubes are replaced by their equivalent in metal tubes, or vice versa, in the R.F. and I.F. stages.



WELLS-GARDNER & CO.

MODEL A7

CONDENSERS

TUBULAR

Part No.	Code	Capacitance	Voltage
46X80	C6	.05 mf.	180
46X105	C21	.10 mf.	360
46X187	C22	.02 mf.	180
46X211	C23	.04 mf.	180
46X181	C24	.10 mf.	240
46X121	C29	.25 mf.	360
46X124	C30	.01 mf.	180
46X80	C31	.05 mf.	180
46X211	C32	.04 mf.	180
46X121	C33	.25 mf.	360
46X197	C41	.25 mf.	180
46X98	C43	.10 mf.	180
46X147	C44	.005 mf.	360
46X202	C46	.02 mf.	360
46X98	C47	.10 mf.	180
46X98	C48	.10 mf.	180
46X114	C49	.004 mf.	600
46X108	C50	.05 mf.	600

MOLDED

Part No.	Code	Capacitance
47X69	C1	250 mmf.
47X93	C5	35 mmf.
47X93	C10	35 mmf.
47X94	C18	45 mmf.
47X56	C38	50 mmf.
47X56	C39	50 mmf.
47X72	C40	25 mmf.
47X57	C42	100 mmf.
47X65	C45	250 mmf.

ELECTROLYTIC

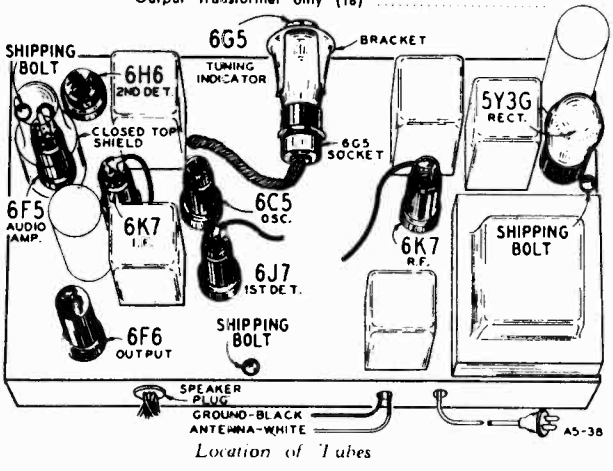
44X11	C51	18 mf.	300
44X10	C52	14 mf.	400

SPEAKERS

When ordering parts for speakers, specify part number of speaker, and letter preceding part number stamped on the speaker.

12A290 10" Dynamic Speaker Complete with Output Trans. (T6)
Cone and Voice Coil for above Speaker
Output Transformer only (T6)

12A285 8" Dynamic Speaker Complete with Output Trans. (T6)
Cone and Voice Coil for above Speaker
Output Transformer only (T6)



Location of Tubes

TRIMMER

17A73	C2	2-25 mmf.	Antenna Range "D"
	C3	2-25 mmf.	Antenna Range "B"
	C4	2-25 mmf.	Antenna Range "A"
17A73	C7	2-25 mmf.	Interstage Range "D"
	C8	2-25 mmf.	Interstage Range "B"
	C9	2-25 mmf.	Interstage Range "A"
17A69	C11	40-100 mmf.	Oscillator 6000 KC
	C13	40-120 mmf.	Oscillator 600 KC
17A76	C14	2-25 mmf.	Oscillator Range "D"
	C16	2-25 mmf.	Oscillator Range "A"
17A68	C15	1-12 mmf.	Oscillator Range "B"
17A66	C19	100-200 mmf.	165 KC Padder
17A70	C26	15-55 mmf.	1st I.F. Trimmers
	C27	15-55 mmf.	
17A70	C35	15-55 mmf.	2nd I.F. Trimmers
	C36	15-55 mmf.	

MISCELLANEOUS

47X89	C12	370 mmf.	Iron Clad
47X80	C17	13 mmf.	Compensating Capacitor
47X81	C20	35 mmf.	Iron Clad
47X91	C25	65 mmf.	Iron Clad
47X91	C28	65 mmf.	Iron Clad
47X91	C34	65 mmf.	Iron Clad
47X83	C37	150 mmf.	Iron Clad
14A70	3 Section Gang Condenser less Dial and Drive Assembly		

RESISTORS

CARBON

Part No.	Code	Resistance	Wattage
A94301	R1	300 Ohm	0.2
C94153	R2	15,000 Ohm	1.0
D94163	R3	16,000 Ohm	2.0
A94502	R4	5,000 Ohm	0.2
A95104	R5	100,000 Ohm	0.2
C94253	R6	25,000 Ohm	1.0
A94503	R7	50,000 Ohm	0.2
A95105	R8	1 Megohm	0.2
A94505	R9	5 Megohm	0.2
A94301	R10	300 Ohm	0.2
895803	R11	80,000 Ohm	0.5
A94805	R12	8 Megohm	0.2
A95503	R13	50,000 Ohm	0.2
A95503	R14	50,000 Ohm	0.2
A95503	R15	50,000 Ohm	0.2
A95205	R16	2 Megohm	0.2
A94202	R17	2,000 Ohm	0.2
A95253	R18	25,000 Ohm	0.2
A95106	R19	10 Megohm	0.2
A95205	R20	2 Megohm	0.2
A95154	R21	150,000 Ohm	0.2
A95254	R22	250,000 Ohm	0.2
A95504	R24	500,000 Ohm	0.2
A95503	R27	50,000 Ohm	0.2

WIRE WOUND

43X83	R25	25 Ohm	0.25
	R26	210 Ohm	2.0

VARIABLE

36X236	R23	.5 Megohm Volume Control and On-Off Switch
40X223	R28	.15 Megohm Tone Control

TRANSFORMERS AND COILS

Part No.	Code	Description
9A863	T1	Antenna Transformer and Can Assembly
9A864	T2	Interstage Transformer and Can Assembly
9A865	T3	Oscillator Coil and Can Assembly
9A782	T4	1st I.F. Transformer and Can Assembly
9A777	T5	2nd I.F. Transformer and Can Assembly
	T6	Output Transformer only (See "Speakers")
53X161	T7	117-234 Volt, 40-60 Cycle, Universal Power Trans.
53X160	T7	117 Volt, 25 Cycle Power Transformer.
53X159	T7	117 Volt, 60 Cycle Power Transformer

VOLTAGES AT SOCKETS

Line Voltage: 117—Volume Control: Maximum — Antenna Shorted to Ground

Readings taken with 1000 Ohm-per-volt meter — Position of Band Switch: Standard Wave

TUBE	FUNCTION	VOLTAGE BETWEEN SOCKET PRONG AND GROUND (Unless otherwise indicated)							
		Prong No. 1	Prong No. 2	Prong No. 3	Prong No. 4	Prong No. 5	Prong No. 6	Prong No. 7	Prong No. 8
6K7	R.F.	0	6.2(1)	245	110	2.5		6.2(1)	2.5
6J7	1st Det.	0	6.2(1)	245	114	0		6.2(1)	6.2
6C5	Osc.	0	6.2(1)	114				6.2(1)	0
6K7	I.F.	0	6.2(1)	245	118	2.5		6.2(1)	2.5
6H6	2nd Det.	0	6.2(1)		0			6.2(1)	0
6F5	1st A.F.	0	6.2(1)		155			6.2(1)	0(2)
6F6	Power	0	6.2(1)	230	245	16(3)		6.2(1)	0
5Y3G	Rectifier	0	5.0(4)		680(5)		680(5)		5.0(4)
6G5	Tuning Indicator	Plate to Ground 20		Target to Ground 245		Cathode to Ground 0		Across Heater 6.2	

(1) A.C. voltage as read across heater terminals 2 and 7.
(2) Bias (1.5 volts) as read across resistor R25.
(3) Bias (16 volts) as read across resistors R25 and 26.
(4) A.C. voltage as read across filament terminals 2 and 8.
(5) A.C. voltage as read across terminals 4 and 6.

MODEL 7P

WELLS-GARDNER & CO.

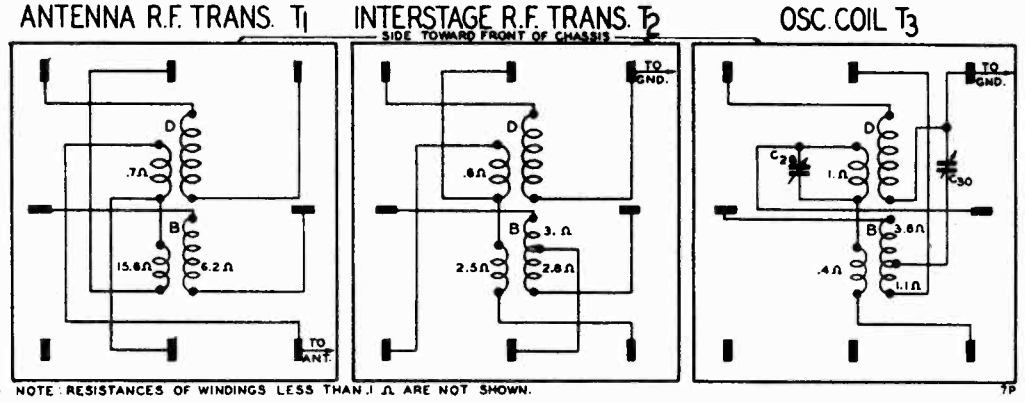


Fig. 4—R.F. and Oscillator Coil Base Terminal Arrangement and D.C. Resistance of Windings

32 Volt Power Supply

This radio is designed for use on farms and in those places where the power supply consists of a 32 volt direct current generating plant.

Polarity of Power Supply

There is a red mark on the plug at the end of the power supply cord of the radio. The prong of the plug at which the red mark is placed must be plugged into the positive side of the line.

Use a receptacle on the 32 volt line from which the plug will not have to be removed after it has once been inserted correctly.

If the polarity of the line is not known, that is, if it is not known which side of the line is positive, a meter may be used to indicate the polarity. A voltmeter of 50 volt range or up is used. Connect the meter across the line. If the pointer deflects correctly, then the positive post of the meter is connected to the positive side of the line.

If the polarity of the line is not known and there is no way of determining it, insert the power supply plug, turn on the set, advance the volume control and proceed to tune the radio. If no sounds are heard from the speaker after the plug has been in two minutes, withdraw the plug, turn it around and re-insert it. This time sounds should be heard after the tubes have been heated.

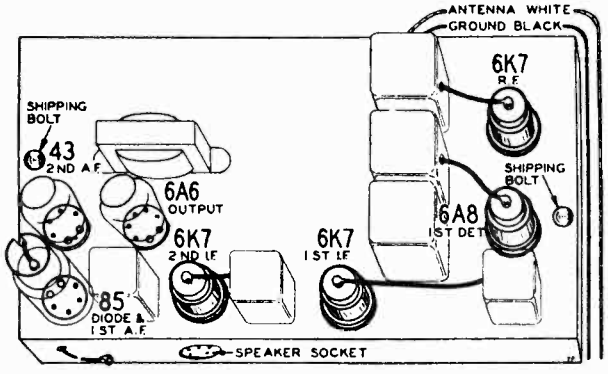


Fig. 6—Tube Arrangement

Caution

If used on any other type of power supply than 32 volt DC, severe damage may be done to the receiver.

Do not turn the radio on unless all of the tubes and the dial lamps are in the proper sockets. Use only No. 51 bayonet pin base lamps.

Do not leave the plug inserted for more than five minutes if it is found that the radio does not operate.

Line Voltage Range

The radio will operate satisfactorily within a line voltage range of 25 to 42 volts.

Series Resistor

If the line voltage is higher than 42, it will be necessary to use a series resistor to cut it down. If the voltage varies, a variable resistor may be required.

Starting Current

When first turned on, the drain for a few seconds is slightly higher than normal until the tubes heat up. Some automatic plants are adjusted to start under a load of 200 to 300 watts. If a number of devices such as lights or motors are being used and the radio set is turned on the total drain may be sufficient to start the plant.

Dial Lamps

For the dial lamps, No. 51 bayonet pin base lamps must be used. These lamps are part of one section of the tube heater circuit (See Fig. 7) and any other lamps having a different current drain would upset the voltage system of this section.

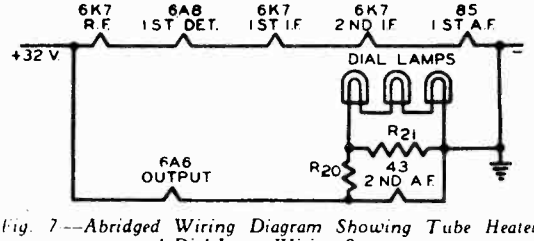
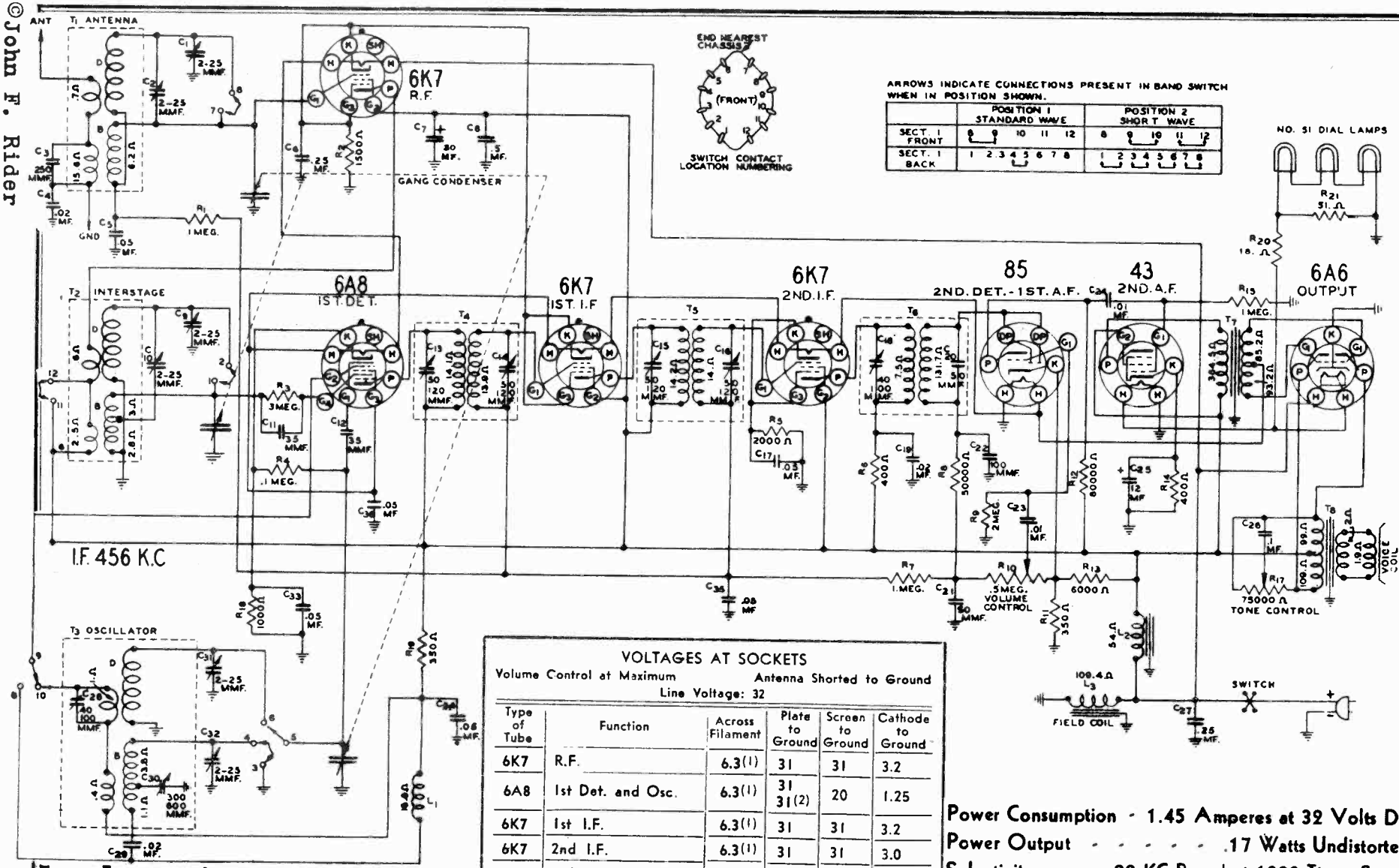


Fig. 7—Abridged Wiring Diagram Showing Tube Heater and Dial Lamp Wiring System



VOLTAGES AT SOCKETS

Volume Control at Maximum — Antenna Shorted to Ground
Line Voltage: 32

Type of Tube	Function	Across Filament	Plate to Ground	Screen to Ground	Cathode to Ground
6K7	R.F.	6.3(1)	31	31	3.2
6A8	1st Det. and Osc.	6.3(1)	31 31(2)	20	1.25
6K7	1st I.F.	6.3(1)	31	31	3.2
6K7	2nd I.F.	6.3(1)	31	31	3.0
85	2nd Det. and 1st A.F.	6.3(1)	10		1.5
43	2nd A.F.	26.0(1)	28.2	31	3.2
6A6	Output	6.0(1)	31		6.4(3)

(1) Subject to Variation
(2) Anode Grid to Ground
(3) Center Tap of Output Transformer to Ground

Tuning Frequency Range

B Range ..... 528 to 1730 KC
D Range ..... 5650 to 16000 KC

Sensitivity

B Range ..... 4 Microvolts Absolute
D Range ..... 6 Microvolts Absolute

Power Consumption - 1.45 Amperes at 32 Volts DC
Power Output - - - - - - .17 Watts Undistorted
Selectivity - - 22 KC Broad at 1000 Times Signal
Intermediate Frequency - - - - - - - - 456 KC
Speaker - - - - - - - - - - 8 inch Dynamic

WELLS-GARDNER & CO.

MODEL 7P

MODEL 7P

WELLS-GARDNER & CO.

I. F. Adjustment

Set the signal generator for a signal of 456 KC.

Connect the output of the signal generator through a .1 mf. condenser to the grid of the 1st detector (G_4).

Connect the ground lead of the radio to the ground post of the signal generator.

Turn the band switch to the Range B position (standard wave band).

Turn the volume control to the maximum position.

Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.

Then adjust the five I.F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis, and the location is shown in Fig. 3.

Range B Alignment

After the procedure for the alignment of each range, as explained below, is completed, it is advisable to repeat the procedure as a final check.

1730 KC Adjustment

Set the signal generator for 1730 KC.

Turn the rotor of the tuning condenser to the full open position.

Keep the band switch in the standard wave position.

Connect the antenna lead of the radio through a 200 mmf. condenser to the output of the signal generator.

For this and **all** subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.

Adjust the oscillator Range B trimmer (C32) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

1500 KC Adjustment

Set the signal generator for 1500 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Loosen the pointer screw and set the pointer at the 1500 KC mark on the standard wave band scale. Retighten the screw.

Adjust the interstage Range B trimmer (C10) and antenna Range B trimmer (C2) to maximum.

Do not change the setting of the oscillator Range B trimmer.

600 KC Adjustment

Set the signal generator for 600 KC.

Turn the tuning condenser rotor until maximum output is obtained.

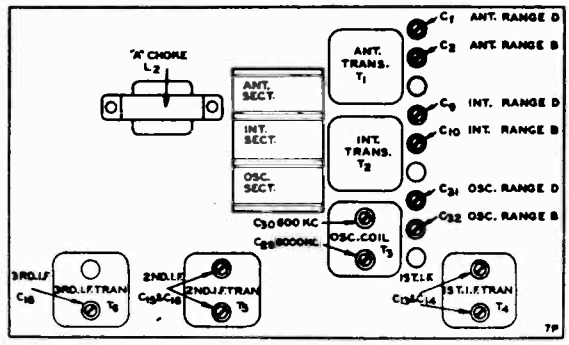


Fig. 3—Location of Trimmers

Turn the rotor slowly back and forth at the same time adjusting the 600 KC trimmer (C30) until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Range D Alignment

CAUTION—When aligning the short wave band be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000 less 912 KC, or 14,088 KC. It may be necessary to increase the input signal to hear the image.

16,000 KC Adjustment

Set the signal generator for 16,000 KC.

Connect the antenna lead of the radio through a 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range D position (short wave band).

Adjust the oscillator Range D trimmer (C31) until maximum output is obtained. See Fig. 3 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage Range D trimmer (C9) and antenna Range D trimmer (C1) to maximum. When adjusting these trimmers, it will be necessary at the same time to turn the tuning condenser rotor slowly back and forth until the peak of greatest intensity is obtained.

Do not change the setting of the oscillator Range D trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC.

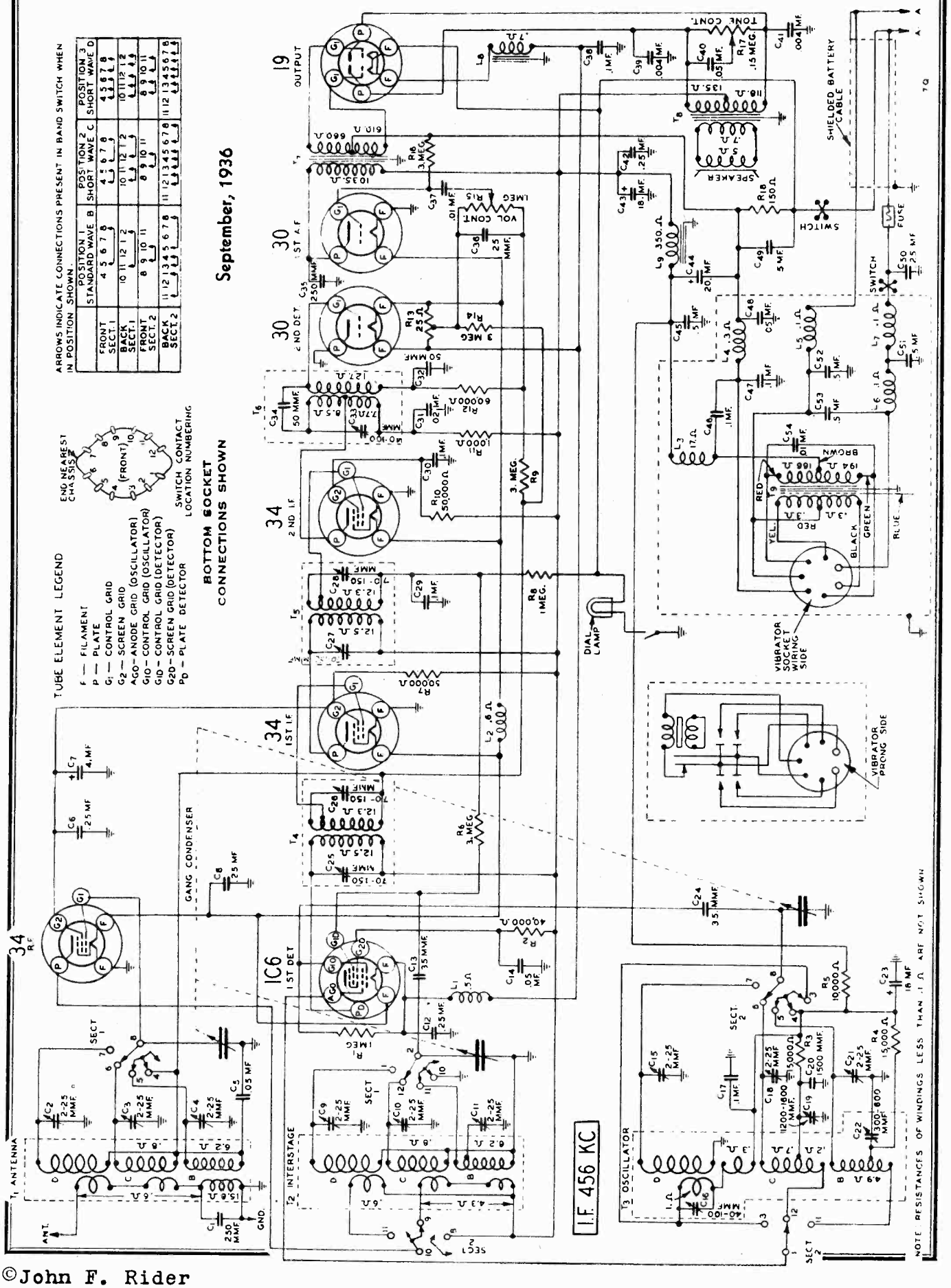
Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 6000 KC (C28) trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

WELLS-GARDNER & CO.

MODEL 7Q

September, 1936



MODEL 7Q

WELLS-GARDNER & CO.

Voltages

Check the voltages at the sockets to see if correct values are being delivered to the tubes. The antenna and ground should be disconnected and the antenna and ground leads from the set connected together. The volume control should be turned to the right or maximum position.

The voltage chart gives the voltages with all tubes in, the speaker connected and the set in operating condition. These voltages are typical of the sets but will vary slightly with variations in individual radios, tubes, test equipment used and battery voltage.

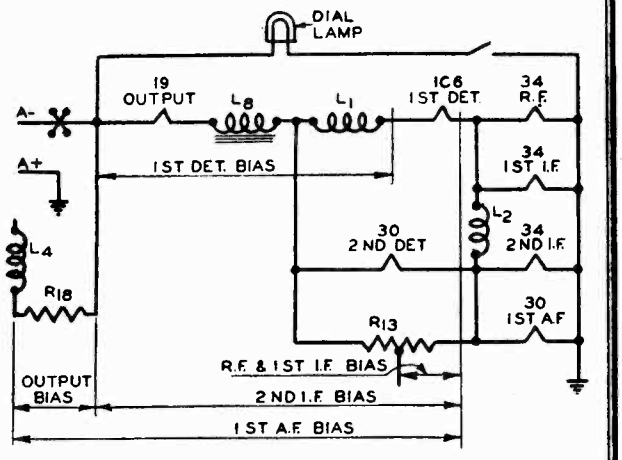


Fig. 5—Abridged wiring diagram showing filament wiring system and points at which no-signal bias voltages are obtained.

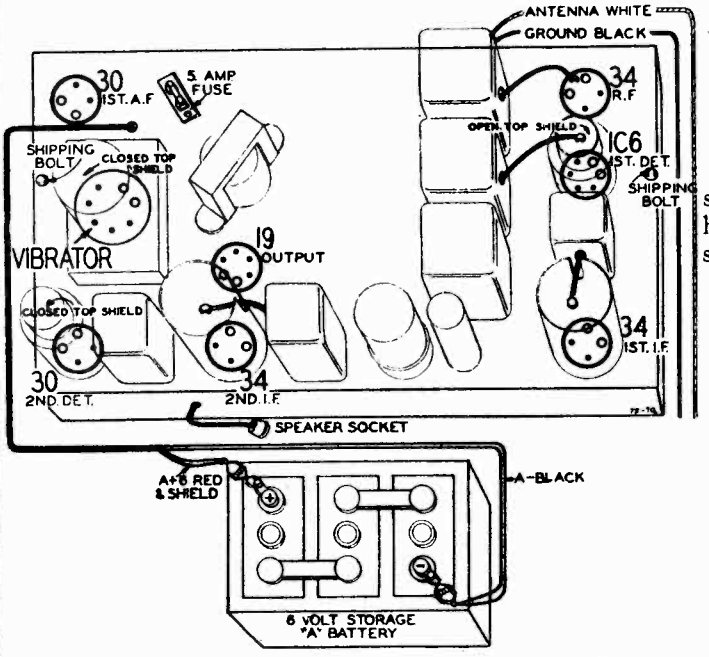


Fig. 4—Tube Arrangement and Battery Connections

Tubes

The tubes used in this radio are of the 2 volt series. All of them are of the filament or directly heated types. The filaments are connected in the series–parallel arrangement shown in Fig. 5.

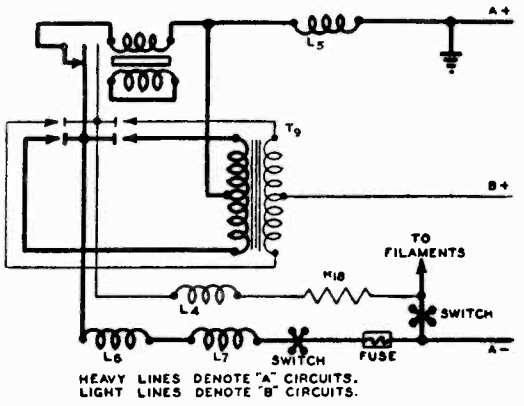


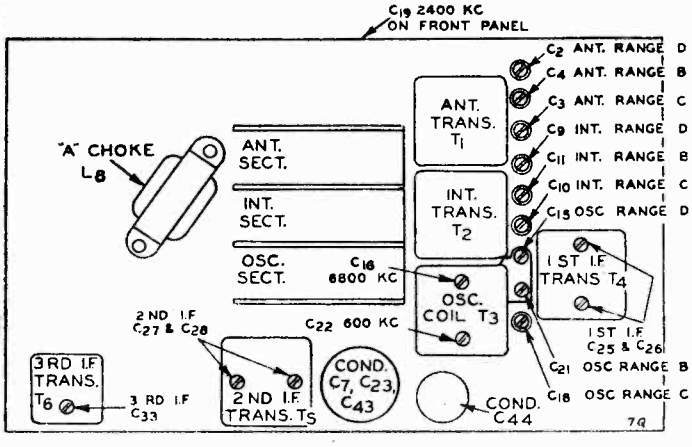
Fig. 6—Abridged wiring diagram showing action of synchronous vibrator

VOLTAGES AT SOCKETS

Volume Control at Maximum — Antenna Shorted to Ground
Battery - 6 Volts — Band Switch in Standard Wave Position

Type of Tube	Function	Across Filament	Plate to Ground	Screen to Ground	Bias Voltage See Notes
34	R.F.	2.0	145	55	1.0(1)
IC6	1st Det.-Osc.	2.0	145 90(2)	60	2 (3)
34	1st I.F.	2.0	145	55	1.0(1)
34	2nd I.F.	2.0	140	90	4.0(3)
30	2nd Det.	2.0			
30	1st A.F.	2.0	140		9 (4)
19	Power	2.0	140		5 (5)

(1) As read from negative filament leg to tap of resistor R13.
(2) Anode grid to ground.
(3) As read from negative filament leg to A—.
(4) Total voltage drop from negative filament leg to low potential end of resistor R18.
(5) As read across resistor R18.



Location of Trimmers

WELLS-GARDNER & CO.

Series 7Q

7 Tube - 3 Band
6 Volt Synchronous Vibrator Radio

Alignment and Calibration

The radios are properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment.

A signal generator that will provide an accurately calibrated signal at 456, 1730, 1500, 600, 6700, 6000, 2400, 18,400, 15,000 and 6800 KC and an output indicating meter are required. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

I. F. Adjustment

Set the signal generator for a signal of 456 KC.

Connect the output of the signal generator through a .1 mf. condenser to the grid of the 1st detector G_{1D}.

Connect the ground lead of the receiver to the ground post of the signal generator.

Turn the band switch to the Range B position (standard wave band).

Turn the volume control to the maximum position.

Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.

Then adjust the five I.F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis and the location is shown in Fig. 3.

Range B Alignment

After the procedure for the alignment of each range, as explained below, is completed, it is advisable to repeat the procedure as a final check.

1730 KC Adjustment

Set the signal generator for 1730 KC.

Turn the rotor of the tuning condenser to the full open position.

Keep the band switch in the standard wave position.

Connect the antenna lead of the receiver through a 200 mmf. condenser to the output of the signal generator.

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.

Adjust the oscillator Range B trimmer (C21) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

1500 KC Adjustment

Set the signal generator for 1500 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Loosen the pointer screw and set the pointer at the 1500 KC mark on the standard wave band scale. Retighten the screw.

Adjust the interstage Range B trimmer (C11) and antenna Range B trimmer (C4) to maximum.

Do not change the setting of the oscillator Range B trimmer.

600 KC Adjustment

Set the signal generator for 600 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 600 KC trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Range C Alignment

CAUTION—When aligning the short wave bands be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 5000 KC. The signal will then be heard at 5000 KC on the dial of the radio. The image signal, which is much weaker, will be heard at 5000 less 912 KC, or 4088 KC. It may be necessary to increase the input signal to hear the image.

6700 KC Adjustment

Set the signal generator for 6700 KC.

Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range C position (first short wave band).

Adjust the oscillator Range C trimmer (C18) until maximum output is obtained. See Fig. 3 for location of this trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage Range C trimmer (C10) and antenna Range C trimmer (C3) to maximum.

Do not change the setting of the oscillator Range C trimmer.

2400 KC Adjustment

Set the signal generator for 2400 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 2400 KC trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Range D Alignment

18,400 KC Adjustment

Set the signal generator for 18,400 KC.

Keep the antenna lead of the receiver connected through the 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range D position (second short wave band).

Adjust the oscillator Range D trimmer (C15) until maximum output is obtained. See Fig. 3 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage Range D trimmer (C9) and antenna Range D trimmer (C2) to maximum.

When adjusting the interstage and antenna Range D trimmers, it will be necessary at the same time to turn the tuning condenser rotor slowly back and forth until the peak of greatest intensity is obtained.

Do not change the setting of the oscillator Range D trimmer.

6800 KC Adjustment

Set the signal generator for 6800 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 6800 KC trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

General Service Data

Planetary Drive Assembly

The planetary assembly is the unit that is integral with the tuning shaft.

If the nut on the back end of this assembly is too tight, the drive will be jerky and will turn hard in high speed. If this condition exists, back off this nut one or two turns and note the effect.

If this nut is too loose, the drive will slip in slow speed. The remedy in this case, of course, is to tighten the nut.

Should the condenser drive cord slip when the planetary pulley is turning, inspect the tuning condenser, drive drum and gears to see that they are turning properly and that they are not being obstructed in some way.

If the drive turns unevenly (rough in spots), this may mean that the planetary assembly is defective or damaged internally and a new unit will be required.

Trimmer Replacement

If one trimmer of the gang trimmer strip should become defective, it is not necessary to replace the entire strip. A single trimmer P-17A36, as shown in the replacement parts list, may be used. Disconnect the lead from the coil side (side not grounded) of the defective trimmer in the strip. This connection is then made to the single trimmer. Connect it to the side of the trimmer not in contact with the adjusting screw. The other side of the single trimmer is then connected to a good ground, using a piece of heavy wire in order to support the trimmer adequately. In replacing a trimmer, be sure to keep both leads as short as possible and keep the ungrounded lead as far from ground as possible.

Circuit

This radio is designed to operate from a 6 volt storage battery and uses a synchronous vibrator and a transformer to provide the required high voltage. The tubes used are of the 2 volt type and are connected in a series parallel arrangement across the 6 volt battery.

Three bands are covered with a tuning range in each band as shown in the specifications above. Three band coverage is accomplished by means of three sets of R.F. and oscillator coils and a two section triple throw switch.

Referring to the schematic circuit diagram, Fig. 2, T1 and T2 are the antenna and interstage R.F. transformer assemblies and T3 is the oscillator coil assembly. The standard wave, 1st and 2nd short wave coils in each assembly are indicated by the letters B, C and D respectively. The band switch sections are designated as section one and section two.

The band switch completes connections to the coils in use. It short circuits the R.F. transformer secondaries and oscillator grid coils of lower frequency not in use. It also short circuits the interstage R.F. transformer Range B and C primaries when in the Range D position. The Range D oscillator plate coil is short circuited by the band switch when it is in Range B and C positions.

The antenna transformer with tuned secondary feeds into a type 34 R.F. amplifier tube. The output of this tube is fed through the interstage R.F. transformer with tuned secondary into the control grid circuit of a 1C6 pentagrid converter tube which functions as the oscillator and 1st detector.

The oscillator potential on the oscillator control grid of this tube modulates the electron stream from the cathode in such a manner as to impress on it the oscillator frequency which is always 456 KC above the frequency to which the R.F. amplifier is tuned. The electron stream is also modulated at the signal frequency by the detector control grid. As a result of the beating of the two frequencies, the intermediate or beat frequency of 456 KC is present in the plate circuit of this tube.

Two stages of I.F. amplification are employed using type 34 tubes. The primaries and secondaries of the first and second I.F. transformers and the primary of the 3rd I.F. transformer are tuned by small trimmer condensers.

A type 30 tube functions as a diode second detector and as the automatic volume control tube. AVC voltage is applied to the R.F. and 1st I.F. tubes.

The audio voltage developed across the volume control resistor R15 is applied to the control grid of the type 30 1st A.F. tube.

The output stage employs a type 19 tube. This tube is a Class "B" power amplifier and combines 2 triodes in one envelope. A P.M. dynamic reproducer is used.

Filament Wiring—Fig. 5 is an abridged wiring diagram which shows the tube filament and dial lamp wiring system and also indicates the points at which the no-signal bias voltages are obtained.

Synchronous Vibrator—The action of the synchronous vibrator used in the power unit is shown in the abridged wiring diagram Fig. 6. When the switch is closed, the armature is drawn over as a result of the current through the vibrator coil. When this occurs, the two contacts at the lower right side of the armature are closed and the circuit through the vibrator coil is broken. The spring action then causes the armature to spring back and the two contacts at the lower left side are closed. The circuit through the vibrator coil again is completed and the armature is drawn over to start the next cycle.

The "A" current (heavy lines, Fig. 6) flows first through one side of the power transformer primary and then through the other side in the opposite direction. An AC voltage is induced in the secondary as a result. That portion of the armature shown in light lines rectifies the current in the secondary circuit.

MODEL 7Q

WELLS-GARDNER & CO.

SPECIFICATIONS

Power Consumption - 1.4 Amperes at 6.3 Volts
Power Output - - - - - 1.1 Watt Undistorted
Selectivity - - 24 KC Broad at 1000 times Signal
Intermediate Frequency - - - - - - - 456 KC.
Speaker - - - - 6 inch P.M. Dynamic—Mantel Models
8 inch P.M. Dynamic—Console Models

Tuning Frequency Range
B Range ..... 528 to 1730 KC.
C Range ..... 2300 to 6700 KC.
D Range ..... 6500 to 18400 KC.

Sensitivity
B Range Average ..... 2.0 Microvolts Absolute
C Range Average ..... 4.0 Microvolts Absolute
D Range Average ..... 8.0 Microvolts Absolute

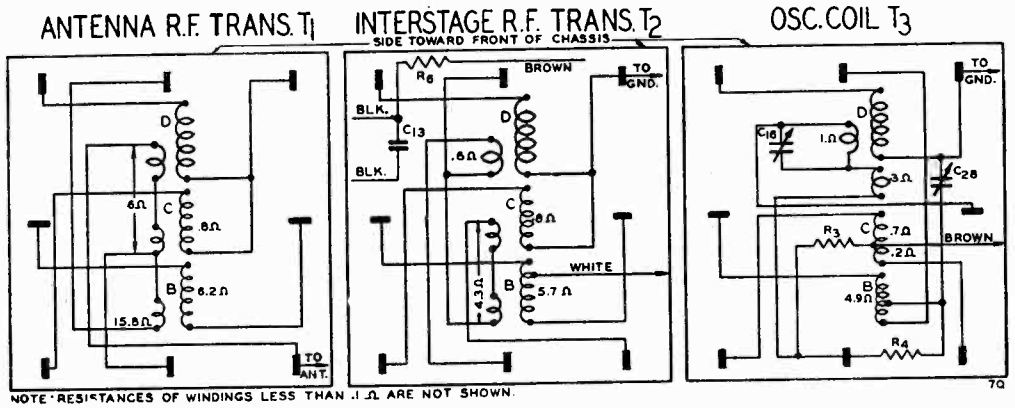


Fig. 7—R.F. and Oscillator Coil Base Terminal Arrangement and D. C. Resistance of Windings

Switch Contact Location Numbering

A standard arrangement for switch contact location numbering has been adopted. This numbering is illustrated in Fig. 2. In contact locations not used, the number applying to that particular location is not employed.

Servicing Power Unit

The power unit is that portion of the chassis assembly contained within the large rectangular shield can and the circuit for which is shown within the dotted lines at the lower right side of the schematic diagram, Fig. 2.

Continuity Resistance Check—The power transformer, choke coil circuits and condenser shorts may be checked by utilizing the vibrator socket terminals and various points on the "A" or "B" lines, without removal of the shield can. For example: when checking the continuity or resistance of the upper half of the transformer secondary, contact may be made with the test prods at the proper vibrator socket terminal, as shown on the circuit diagram, and at the positive terminal of the 20 mf. electrolytic condenser. C44.

Removing Transformer and Vibrator Socket Assembly—Take off the filter unit shield can by removing the four self tapping screws at the right side (from front) of the chassis base and the five hex nuts from the bolts at the top of the chassis.

Unsolder the ground connections from the two lugs on the inside of the chassis base (right side from front). Unsolder the black and white coded wire from the terminal strip lug nearest the front of the chassis. This terminal strip is mounted on the transformer cover. Now unsolder the bracket holding the terminal strip to the transformer cover.

Remove the four nuts from the bolts holding the transformer assembly to the chassis. Do not remove these bolts from the transformer core. Then lift the assembly to free it from the chassis so that all parts of the assembly are readily accessible.

Proceed with replacement of the power transformer or with any other necessary service or replacements and then reassemble.

Replacement of Buffer Condenser C54—This condenser is located in the top of the transformer and vibrator assembly just underneath the vibrator socket. To replace, remove the assembly as explained in the preceding article.

In addition, the two screws holding the vibrator socket to the transformer cover assembly should be taken out. The condenser is then easily replaced.

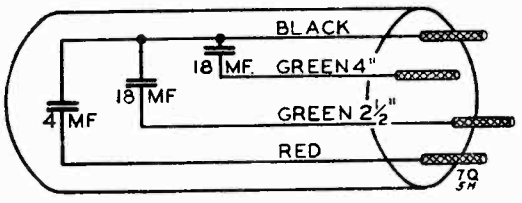


Fig. 8—Electrolytic Condenser Internal Connections

WELLS-GARDNER & CO.

MODEL Federal Recorder and Record Changer

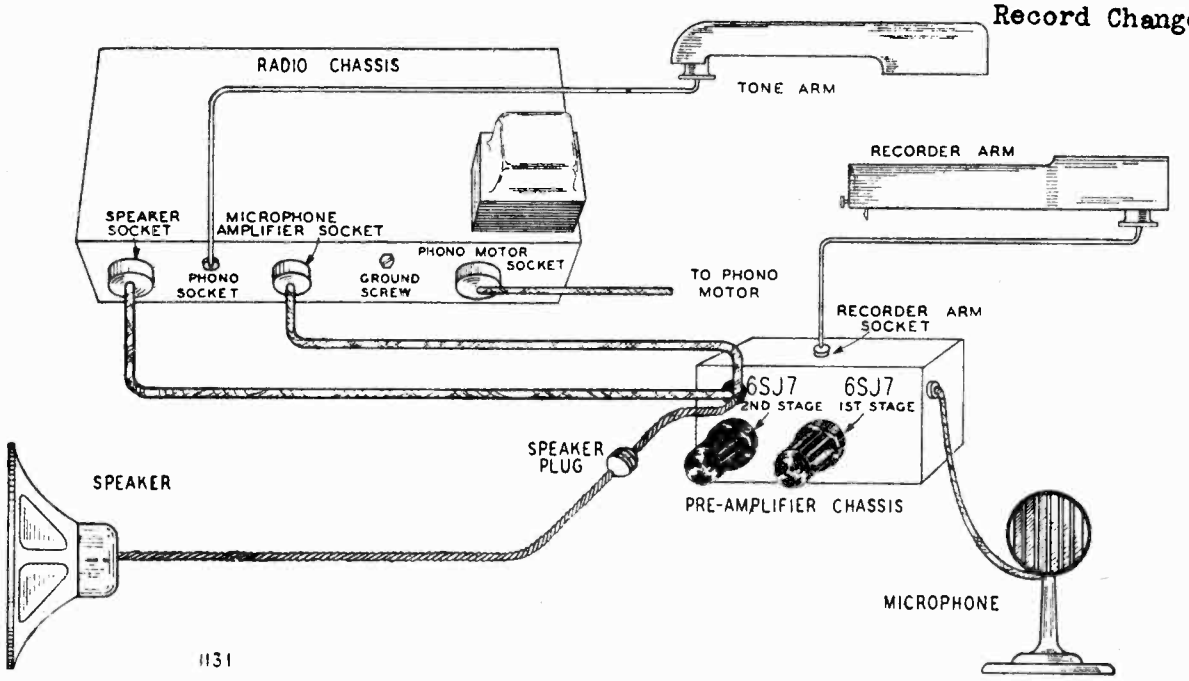


Fig. 4—Cable Connections

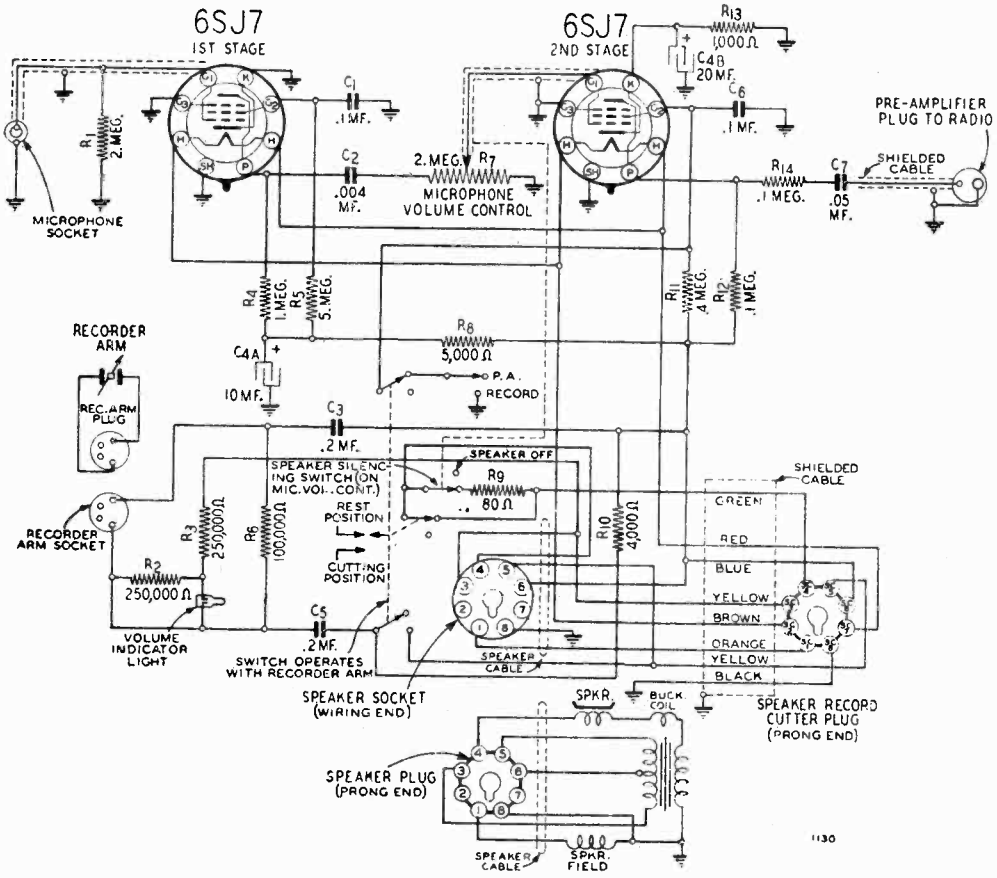


Fig. 5—Schematic Circuit Diagram

OPERATING THE RECORD MAKER

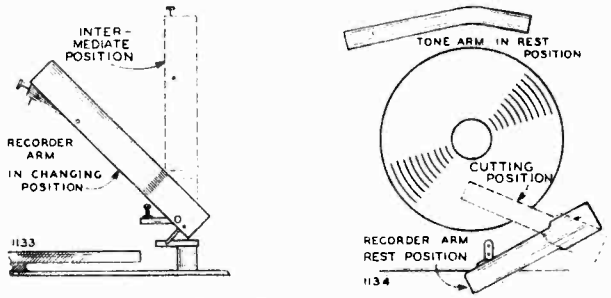


Fig. 1—Positions of Recorder Arm

1. TO MAKE A RECORD FROM A RADIO PROGRAM

A—Lift up hook on front support post and move indicator to Manual position.

B—Recorder arm in rest position—See Fig. 2.

C—Tone arm in rest position—See Fig. 1.

D—Microphone Volume Control in OFF position—See Fig. 2.

E—P.A.-Record Switch in RECORD position—See Fig. 2.

F—Phono-Radio Knob (On radio panel) in RADIO position.

G—Tune in the desired radio program carefully to room volume.

H—Place a blank record disc on the turntable with the small pin in the turntable extending through the hole in the disc.

I—The Tone Control on the radio panel should, for most recordings, be in the TREBLE position.

J—Lift up the cutting end of the recorder arm at the same time turning in a clock-wise direction about 1 inch, to vertical or intermediate position and leave it in this position. See that the cutting needle is properly in place (See article "Recording Needles," page 5). The volume of the radio program will be reduced. Bring the volume up with the Radio Volume Control until the red indicator light, at left of Microphone Volume Control, just flashes on loud passages. Then back the volume down a *slight* amount so that the red indicator light does not flicker.

K—Push the Motor Switch to the ON position (Fig. 2) and allow the turntable to come up to full speed.

L—Grasp and rotate recorder arm towards turntable and *carefully* let it down with the needle point on the blank record about ¼ inch from the outside edge of the blank record.

M—Watch the volume indicator light as the recording is being made. It is not necessary to continuously adjust the position of the Radio Volume Control—merely make sure that the red light does not flicker. A slight flicker on very loud passages only will not be harmful.

N—The thread which forms at the cutting needle may be pushed gently toward the center with a soft brush while the record is being cut. Considerable care must be taken that the operator does not tangle this thread around the cutting needle or that he does not slow up the turntable by touching it with his hands, as either condition will cause poor recordings. After the recording is completed, remove the thread from the record.

O—The record can be cut until the cutting needle is about 1½ inches from the center of the record or until a short distance before the paper label is reached. Shortly before the needle reaches its final position, reduce the volume to zero with the Radio Volume Control (without turning the knob to the OFF position) and cut 3 to 5 blank grooves on the record. Then return the recorder arm to the rest position by lifting to an angle of about 50° (Fig. 1). Rotate it counterclockwise as far as it will go and then let it down gently on the post. Push the Motor Switch Knob to the OFF position.

2. TO MAKE A RECORD USING THE MICROPHONE

Voice or music that can be picked up by the microphone with sufficient volume can be recorded. Keep the room quiet, as all extraneous noises picked up by the microphone will be on the record.

A—Set indicator to Manual position.

B—Recorder arm in rest position—See Fig. 1.

C—Tone arm in rest position—See Fig. 1.

D—Microphone Volume Control in OFF position—See Fig. 2.

E—P.A.-Record Switch in RECORD position—See Fig. 2.

F—Phono-Radio Knob (On radio panel) in PHONO position.

G—Insert the plug on the end of the microphone cord in the microphone socket (Fig. 2) on the motor panel and push this plug all the way down.

H—Turn the radio On-Off Switch (On the radio panel) to the ON position.

I—Place a blank record disc on the turntable with the small pin in the turntable extending through the hole in the disc.

J—The Tone Control on the radio panel should, for most recordings, be in the TREBLE position.

K—Keep the microphone at least one yard away from the radio loudspeaker at all times. If the recording is to be speech, keep the lips about 6 inches (for cutting) away from the microphone. If the recording is to be music or other sound, place the microphone near the sound source, moving it closer or farther away as the volume requires.

L—Lift up the cutting end of the recorder arm, at the same time turning in a clockwise direction about 1 inch, to vertical or intermediate position and leave in this position. See that the cutting needle is properly in place (See article "Recording Needles," Page 5).

Turn the Microphone Volume Control past the point at which the speaker silencing switch is felt to operate. This switch is at about the halfway mark on the control. Speak or start the music or sound into the microphone.

After the Microphone Volume Control knob has been turned past the point at which the switch is thrown, the sound can no longer be heard through the radio speaker but the sound intensity will be shown by the red indicator light. Turn the Microphone Volume Control until the speech or sound picked up by the microphone causes the red indicator light to flicker. Then turn the Microphone Volume Control down slowly until the red light just disappears.

If in reducing the microphone volume, the knob is turned below the point at which the switch is felt to operate, the sound will again be heard through the radio speaker. The recording continues and no harm will result if the microphone is kept at least one yard from the radio speaker. If brought closer, a howl may occur.

M—Push the Motor Switch to the ON position (Fig. 2) and allow the turntable to come up to full speed.

N—Rotate the recorder arm and *carefully* let it down with the needle point on the blank record about ¼ inch from the outside edge of the blank record.

O—After 1 or 2 blank grooves have been cut in the record, start the speech, music, or sound into the microphone. Watch the volume indicator light as the recording is being made. It is not necessary to continuously adjust the position of the Microphone Volume Control—merely make sure that the red light does not flicker. A slight flicker on very loud passages only, will not be harmful.

P—Remove thread as explained in Article 1, Step N.

Q—The record can be cut until the cutting needle is about 1½ inches from the center of the record or until a short distance before the paper label is reached. Shortly before the needle reaches its final position, reduce the volume to zero with the Microphone Volume Control and cut 3 to 5 blank grooves on the record. Then return the recorder arm to the rest position by lifting to an angle of about 50° (Fig. 1). Rotate it counterclockwise as far as it will go and then let it down gently on the post. Push the Motor Switch to the OFF position.

3. TO PLAY BACK THE HOME RECORDING; TO PLAY ORDINARY PHONOGRAPH RECORDS

The record made in Articles 1 and 2 may be played back immediately.

Also, ordinary commercial records may be played in the following manner:

A—Recorder arm in rest position—See Fig. 1.

B—Turn Phono-Radio Knob on radio panel to PHONO position.

C—Push Motor Switch to ON position.

D—Lift tone arm and set arm down gently with needle in outside groove of record.

E—Adjust volume by means of Radio Volume Control to desired intensity.

F—Adjust tone by means of Radio Tone Control to desired quality.

G—Lift up tone arm at end of recording, set it in its rest position, and push Motor Switch to OFF position.

4. TO USE MICROPHONE AND RADIO AS A PUBLIC ADDRESS SYSTEM

A—Recorder arm in rest position—See Fig. 1.

B—Tone arm in rest position—See Fig. 1.

C—Microphone Volume Control in OFF position—See Fig 2.

D—P.A.-Record Switch in P.A. Position.

E—Phono-Radio Knob (On radio panel) in PHONO position.

F—Insert the plug on the end of the microphone cord in the microphone socket (Fig. 2) on the motor panel and push this plug all the way down.

G—Turn the Radio On-Off Switch (On the radio panel) to the ON position.

H—Turn the Microphone Volume Control to about the half-way mark. The speaker silencing switch at about the mid-point of the Microphone Volume Control is not effective when the recorder arm is in the rest position.
Keep the microphone at least one yard away from the radio speaker at all times. The lips should be about 2 inches (for public address) away from the microphone.

I—Speak into the microphone and adjust the volume by means of the Microphone Volume Control to the proper intensity. If this control is turned too high, a howl may result. Should this happen, turn down the microphone volume slightly, move the lips closer to the microphone, and move the microphone farther away from the radio speaker.

5. TO USE THE MICROPHONE FOR MAKING ANNOUNCEMENTS WHEN PLAYING THE RADIO OR PHONOGRAPH

Follow all the steps as given in Article 4 except that for radio reception the Phono-Radio Knob is in RADIO position.

Reduce the radio or phonograph volume by means of the Radio Volume Control when making an announcement.

6. TO USE THE MICROPHONE FOR SUPERIMPOSING AN ANNOUNCEMENT OR ACCOMPANYING THE PROGRAM WHEN MAKING A RECORD OF A RADIO PROGRAM

The microphone can be used for superimposing an announcement on the record at any time when making a record of a radio program.

A musical instrument or a singing voice may be used to accompany a radio program while recording it.

A—Instructions for cutting the record are given in Article 1. Be sure P.A.-Record Switch is in RECORD position.

B—Insert the plug on the end of the microphone cord in the microphone socket (Fig. 2) on the motor panel and push this plug all the way down.

C—Keep the microphone at least one yard away from the radio speaker at all times. The lips should be about 6 inches away from the microphone.

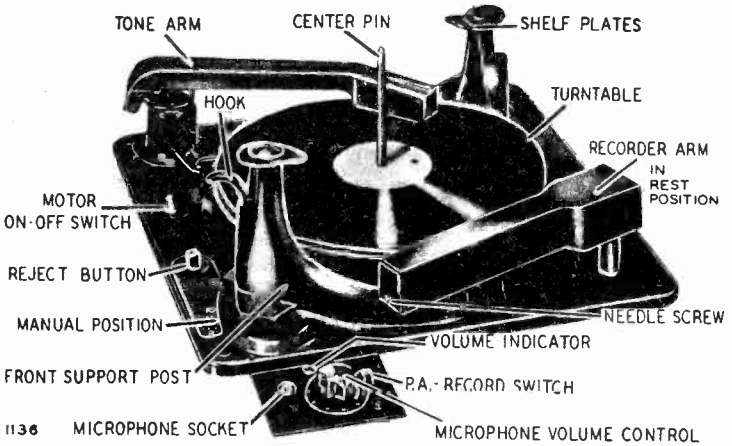


Fig. 2—Phonograph and Recorder Unit

D—If an announcement or title is to be inserted, reduce the volume of the radio program with the Radio Volume Control to any desired level, just before the announcement is to be made or the title is to be put in.

If a musical instrument or singing voice is to be used to accompany the radio program, the latter may be reduced with the Radio Volume Control or may be left at normal volume.

E—Turn the Microphone Volume Control up to just below the point at which the speaker silencing switch is felt to operate. This switch is at about the half-way mark on the control. (Continuing to turn this knob in a clockwise direction would throw the switch, and the sound could no longer be heard through the radio speaker but the recording would continue.

F—Speak, or start the sound into the microphone and observe the indicator light. To increase volume, speak louder and get closer to the microphone. To decrease volume, of course, reverse these procedures and turn down the Microphone Volume Control. Keep volume just below point at which red indicator light flickers.

G—When the announcement or accompaniment is completed, turn the Microphone Volume Control to the OFF position and if additional radio program recording is wanted, turn up the Radio Volume Control to just below the point at which the red indicator light flickers.

7. TO MAKE A RECORD FROM ANOTHER RECORD

WITH AN ELECTRIC RECORD PLAYER CONNECTED TO RADIO

If you have an electric record player, play the record to be copied on this record player.

Remove the phono-pickup plug from the back of radio chassis and insert plug from electric record player into phono socket. (See Fig. 4)

Follow all the instructions as given in Article 1, except that radio-phono switch on the radio should be in the PHONO position.

WITH A MICROPHONE AND SEPARATE ELECTRIC PHONOGRAPH

If you have a small phonograph of the electric type, play the record to be copied on this phonograph. Place the recorder microphone about 12 inches away, then proceed to make the new record in the usual manner with the microphone—See Article 2.

This method, however, will result in poorer reproductions than those obtained using an electric record player connected to the radio.

RECORDING TECHNIQUE

Making records has been likened to popular photography. It takes time to master the essentials of the art and learn how to do a real good job. The Federal Record-Maker has been so simplified that any one can start making satisfactory records right away, but to make the best, it is necessary to learn more of the technique of the art.

Follow the step-by-step instructions as given in this booklet, slowly and carefully.

ADDITIONAL INFORMATION

RECORDING NEEDLES

IMPORTANT—Use only long-shank recording needles.

Handle recording needles carefully. They are very sharp and can be easily damaged. Every precaution must be taken to protect the cutting point at all times; in cutting, the arm should be lowered *gently* on the blank with the turntable *running*.

Note that these needles have a long "flat" on one side of the shank. To install a recording needle, first loosen the needle screw—See Fig 2. Place the recording needle all the way in the hole on the underside of recorder arm, with the flat portion of the needle shank toward the needle screw. Tighten the needle screw firmly. If the needle is in backward or at a wrong angle, it will not cut properly, and will damage the record and the needle.

A recording needle is considered worn when the background hiss becomes objectionable or when the thread becomes ragged. In general, the ordinary steel recording needle will have a satisfactory life of from ½ to 1½ hours, depending upon the original quality of the needle and the type of blank used.

Important: After a recording needle has been used for a short time, it may become loose in the cutting head; it is good practice to retighten after each recording.

TIMING YOUR RECORDS

The following is the approximate maximum time for each record:

6" size...Each side 1½ min.
8" size...Each side 3 min.
10" size...Each side 4½ min.

For best results, you should rehearse your selection and time it for recording. This will permit you to space your selection nicely on the record and also insure against using up the record before your selection is finished. After your selection is finished, do not lift the needle at once but allow it to cut several extra grooves while you remain silent.

ADJUSTING THICKNESS OF THREAD (PRESSURE ADJUSTMENT)

The pressure on the cutting needle can be varied by the adjusting knob located inside the cutting arm, shown in Fig. 3. This pressure determines the thickness of the thread cut from the blank record.

All recorders are adjusted at the factory to cut grooves approximately .0015 inches deep. When cut at this depth, the thread will be approximately as thick as a human hair.

You can get a fairly good idea of the depth of the cut by examining the record with a magnifying glass. The width of the groove should be about equal to the space between grooves if the cutting needle is sharp and the cutting head is correctly adjusted.

The thickness of the thread is increased by rotating the pressure adjusting knob in a clockwise direction, while looking down on arm, See Fig. 3. Turning this counter-clockwise will decrease the thickness of the thread. Before making any pressure adjustment, be sure that a good cutting needle is used and that it is properly inserted.

ADJUSTING HEIGHT OF RECORDER ARM

In Fig. 3 is shown the screw and locking nut for adjusting the height of the recorder arm above the turntable. This height is adjusted at the factory and ordinarily does not require readjustment.

To check for proper height, grasp the needle screw and lift it until the cartridge assembly is felt to touch the recorder arm. The needle point will then be approximately ⅛ inch above the record surface.

If, due to variations in recording needle length, the height must be adjusted, loosen the locking nut, adjust the screw to the proper height and retighten the nut.

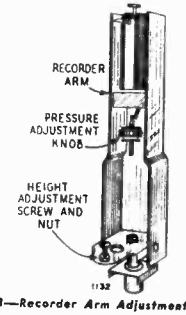


Fig. 3—Recorder Arm Adjustments

MAINTENANCE

The Federal Record Maker normally requires little attention. However, after a number of records have been cut the turntable should be removed and any cutting threads found wrapped around the shafts of the rubber drive wheel and turntable must be cleared away. Both the shaft for the turntable and rubber drive wheel should be lubricated occasionally, depending on amount of use, with a good machine oil.

CAUTION—Do not allow oil to come in contact with rubber surface of drive wheel.

REPLACEMENT PARTS LIST

MISCELLANEOUS

Part No.	Description
7A119	Neon Lamp for Red Volume Indicator
15X175	Red Celluloid Indicator
3A303	Tube Sockets—Octal (8 prong)
3A305	Microphone Socket—Single Pin Tip
3A308	Cutter Socket
7A173	P. A.—Record Switch
2A213	Record Cutter Changeover Switch
17X194	Trip Arm and Hub Assembly for Changeover Switch
28X141	Stop Collar on Changeover Switch
10A314	Knob for Microphone Volume Control

CONDENSERS

D65104	C1, C6	.10 mf.	400 Volt	Tubular
B66402	C2	.004 mf.	200 Volt	Tubular
D66264	C3, C5	.20 mf.	400 Volt	Tubular
45X287	C4A	10 mf.	450 Volt	Dry Electrolytic
	C4B	20 mf.	25 Volt	
D66303	C7	.05 mf.	400 Volt	Tubular

RESISTORS

B93203	R1	2 Megohm	0.5 Watt	Carbon
B63254	R2, R3	250,000 Ohm	0.5 Watt	Carbon
B64105	R4	1 Megohm	0.5 Watt	Carbon
B64503	R5	3 Megohm	0.5 Watt	Carbon
B54104	R6, R14	100,000 Ohm	0.5 Watt	Carbon
36X292	R7	2 Megohm	Microphone Volume Control and Switch	
B95502	R8	5,000 Ohm	0.5 Watt	Carbon
B95609	R9	50 Ohm	0.5 Watt	Carbon
D94402	R10	4,900 Ohm	2.5 Watt	Carbon
B64404	R11	400,000 Ohm	0.5 Watt	Carbon
B95104	R12	100,000 Ohm	0.5 Watt	Carbon
B94102	R13	1000 Ohm	0.5 Watt	Carbon

MICROPHONE AND CABLES

28A94	Recording Microphone Complete with Stand and Cable
13X408	Recorder Cable Complete with Molded Octal Plug
13X419	Pre-Amplifier Cable Complete with 5 Prong Plug
15X484	Speaker Socket and Cable Assembly

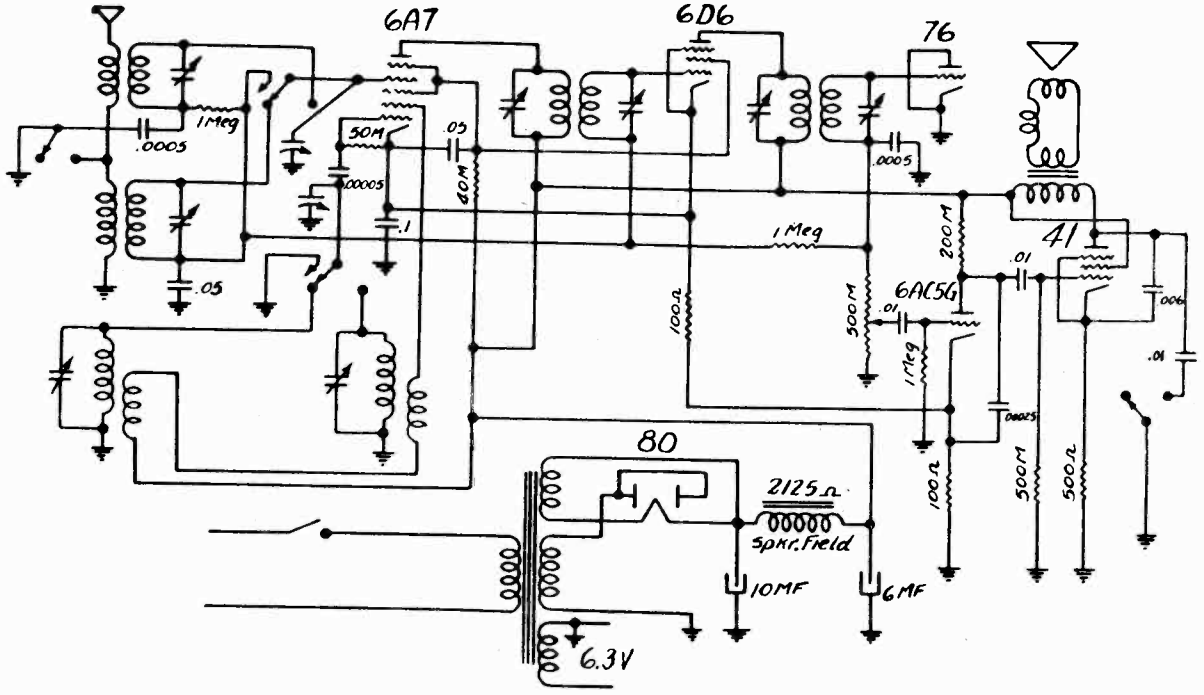
WESTERN AUTO SUPPLY CO.

MODEL D721 Early
MODEL D909

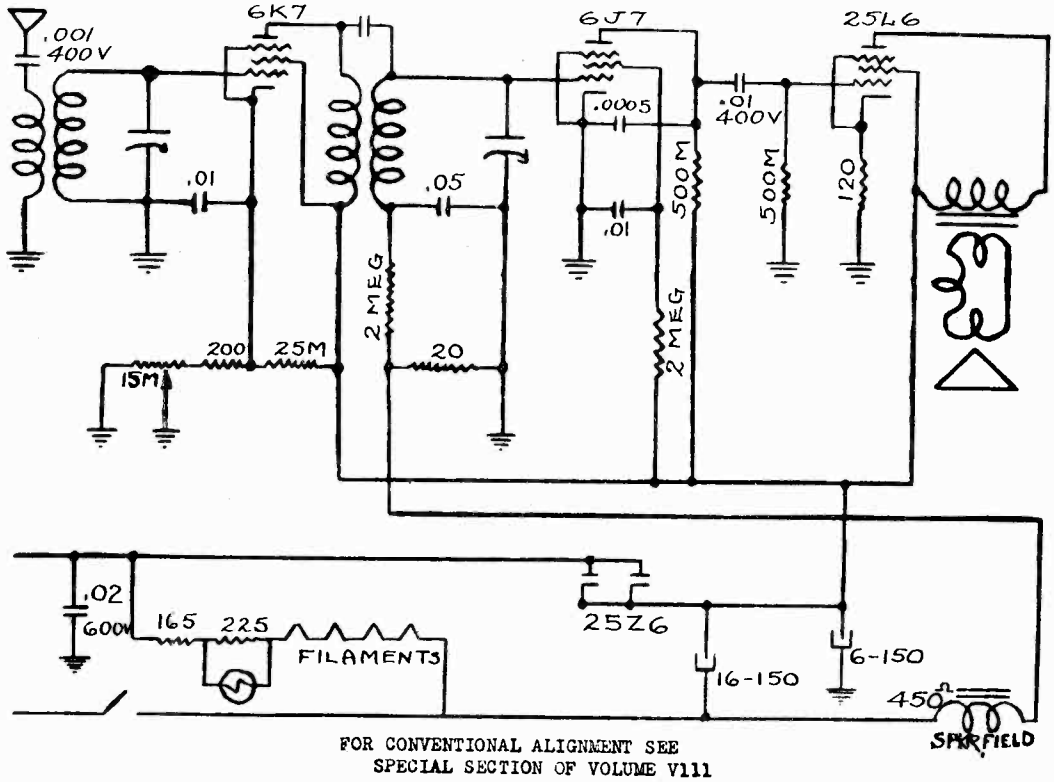
I.F. 456 K.C.

FOR CONVENTIONAL ALIGNMENT SEE
SPECIAL SECTION OF VOLUME V111

MODEL D721



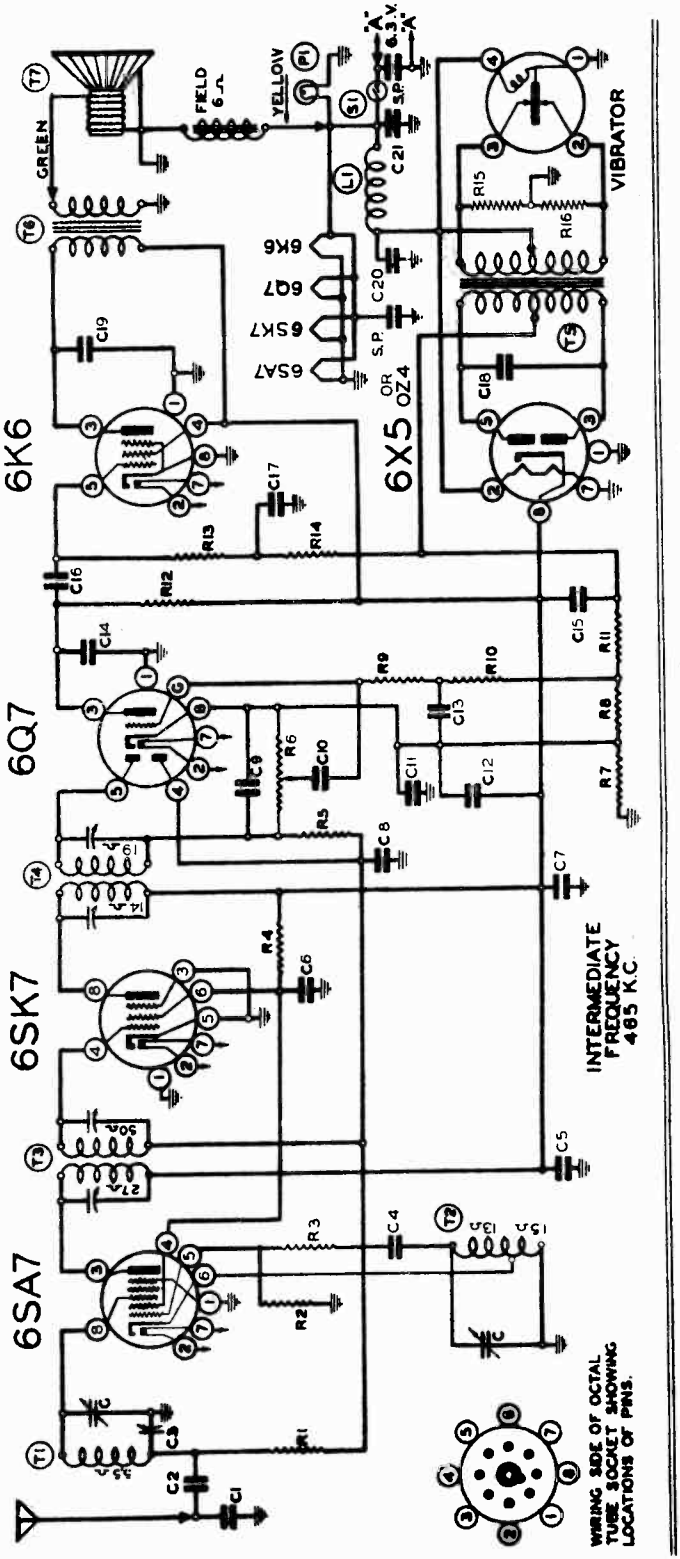
MODEL D909

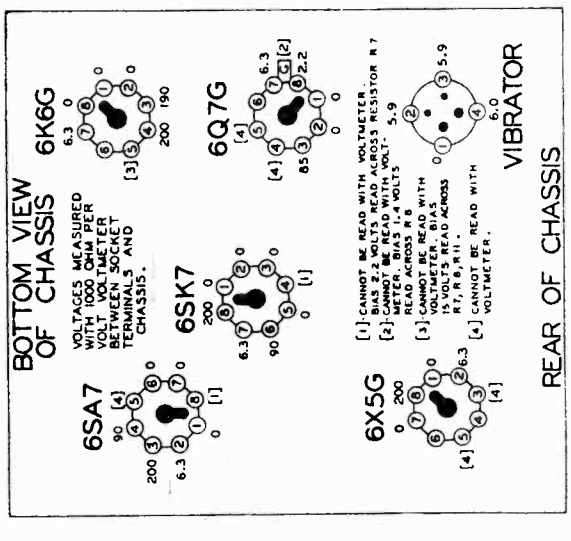


FOR CONVENTIONAL ALIGNMENT SEE
SPECIAL SECTION OF VOLUME V111

MODEL D746
3rd Production

WESTERN AUTO SUPPLY CO.

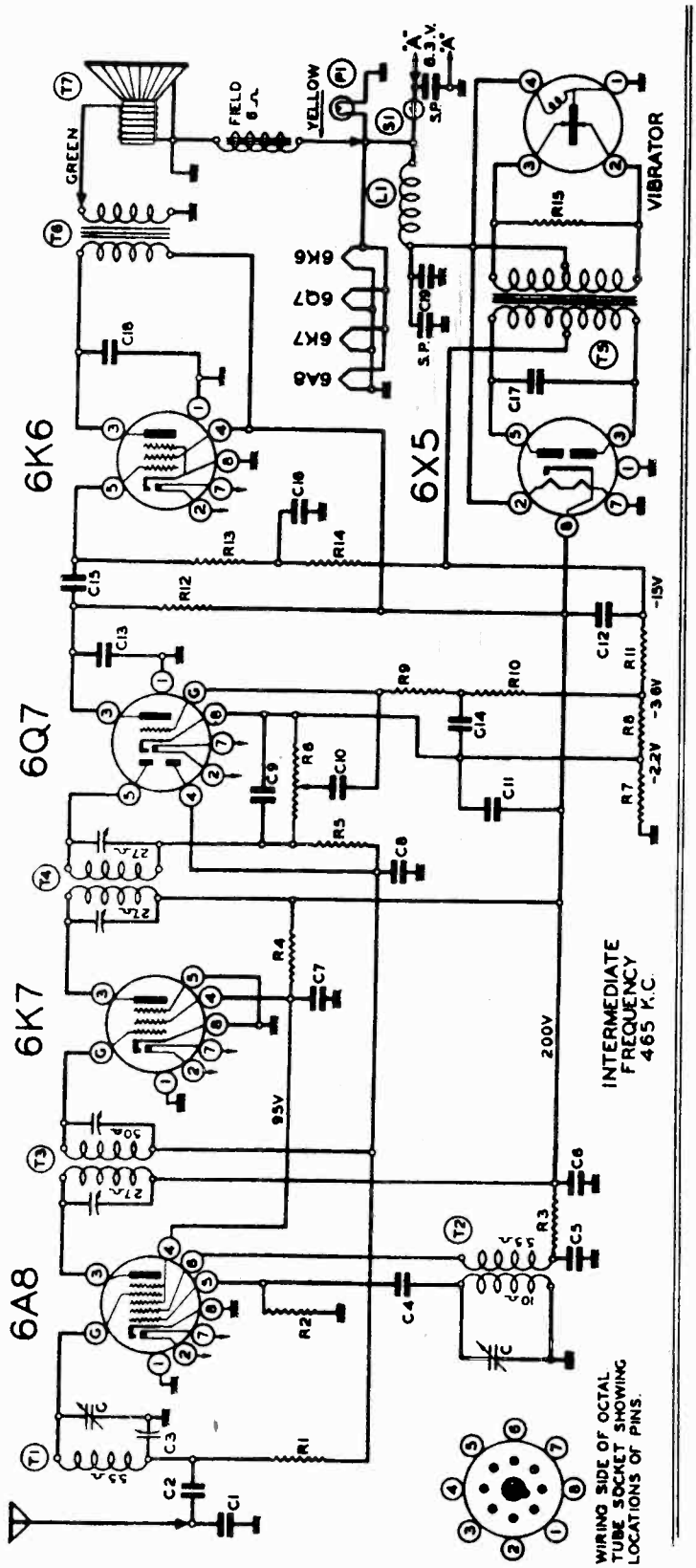




Code No.	Part No.	Description
		RESISTORS
R1	13011	250M ohm - ½ w. 20%
R2	130176	20M ohm - ½ w. 10%
R3	130272	10 ohm - ½ w. 10%
R4	130245	10M ohm - 1 w. 10%
R5	1304	3 megohm - ½ w. 20%
R6	101110	1 megohm volume control
R7	130174	50 ohm - ½ w. 10%
R8	130211	30 ohm - ½ w. 10%
R9	130209	2 megohm - ½ w. 20%
R10	130210	1 megohm - ½ w. 20%
R11	130212	250 ohm - 1 watt 10%
R12	13011	250M ohm - ½ w. 20%
R13	13011	250M ohm - ½ w. 20%
R14	13011	250M ohm - ½ w. 20%
R15	13060	100 ohm - ½ w. 10%
R16	13060	100 ohm - ½ w. 10%
		CONDENSERS
C	10269	2 gang variable condenser
C1	1293	.00002 Mica 20%
C2	10055	.01 x 400 v. 25%
C3	12434	Antenna Trimmer
C4	12912	.00025 Mica 20%
C5	1001	.1 x 400 v. 25%
C6	10020	.1 x 200 v. 25%
C7	1295	.0001 Mica
C8	1009	.05 x 200 v. 25%
C9	1295	.0001 Mica 20%
C10	10078	.01 x 200 v. 25%
C11	10020	.1 x 200 v.
C12	11950	8 mfd. lytic
C13	10078	.01 x 200 v.
C14	1292	.0005 Mica
C15	11950	8 mfd. lytic
C16	10055	.01 x 400 v. 25%
C17	10019	.006 x 600 v.
C18	10034	.005 x 1200 v.
C19	10087	.01 x 600 v.
C20	10031	.5 x 120 v. + 50-10%
C21	10031	.5 x 120 v. + 50-10% C12 and C15 in same unit.
		PARTS
T1	11195B	Antenna coil complete
T2	110107	Oscillator coil complete
T3	108139	Input I.F. 465 kc. - complete
T4	108121	Output I.F. 465 kc. - complete
T5	104131	Power Transformer
T6	10567	Output Transformer
T7	114114	5" Dynamic Speaker
L1	10568	"A" Filter Choke
P1	10797	6.8 v. pilot light
S1		Off-on Switch on Volume Control
SP		Spark Plates

MODEL D746
2nd Production

WESTERN AUTO SUPPLY CO.

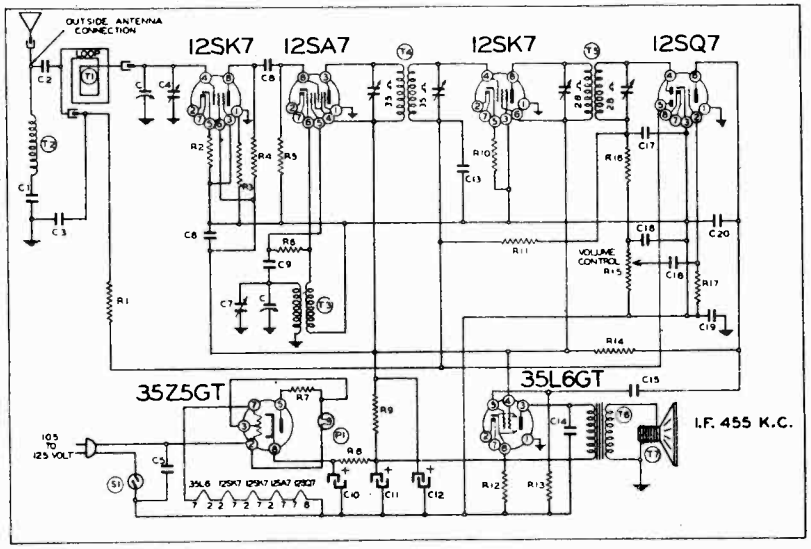


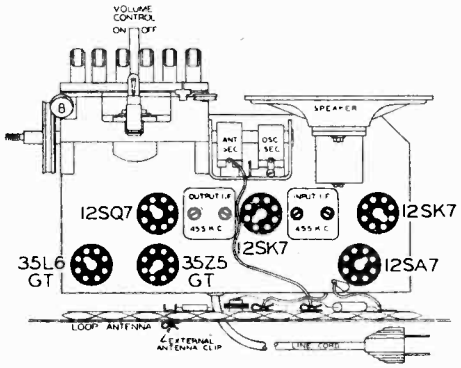
Code No.	Part No.	Description
		RESISTORS
R1	130-186	250M ohm - 1/10 w. 20%
R2	130-117	50M ohm - 1/10 w. 20%
R3	130-164	30M ohm - ½ w. 20%
R4	130-213	25M ohm - 1 watt 10%
R5	130-126	3 megohm - 1/10 w. 20%
R6	101-110	1 megohm volume control
R7	130-174	50 ohm - ½ w. 10%
R8	130 211	30 ohm - ½ w. 10%
R9	130-209	2 megohm - ½ w. 20%
R10	130-210	1 megohm - ½ w. 20%
R11	130-212	250 ohm - 1 watt 10%
R12	130-186	250M ohm - 1/10 w. 20%
R13	130-186	250M ohm - 1/10 w. 20%
R14	130-186	250M ohm - 1/10 w. 20%
R15	130-84	200 ohm - ½ w. 20%

		CONDENSERS	
C	102-69	2 gang variable condenser	
C1	129-3	.00002 Mica 20%	
C2	100-55	.01 x 400 v. 25%	
C3	124-34	Antenna Trimmer	
C4	129-12	.0025 Mica 20%	
C5	100-20	.1 x 200 v. 25%	
C6	100-85	.05 x 400 v. 25%	
C7	100-20	.1 x 200 v. 25%	
C8	100-9	.05 x 200 v. 25%	
C9	129-5	.0001 Mica 20%	
C10	100-78	.01 x 200 v. 25%	
C11	119-50	8. mfd. lytic	
C12	119-50	8. mfd. lytic	
C13	129-2	.0005 Mica 20%	
C14	100-78	.01 x 200 v. 25%	
C15	100-55	.01 x 400 v. 25%	
C16	100-19	.006 x 600 v. 25%	
C17	100-34	.005 x 1200 v. 10%	
C18	100-87	.01 x 600 v. 25%	
C19	100-31	.5 x 120 v. 50-10%	
		C11 and C12 in same unit	
		PARTS	
T1	111-95	Antenna coil complete	
T2	110-76	Oscillator coil complete	
T3	108-96D	Input I.F. 465 kc. - complete	
T4	108-95C	Output I.F. 465 kc. - complete	
T5	104-131	Power Transformer	
T6	105-67	Output Transformer	
T7	114-114	5" Dynamic Speaker	
L1	105-19	"A" Filter Choke	
P1	107-97	6.8 v. pilot light	
S1		Off-on Switch on Volume Control	
SP		Spark Plates	

MODELS D1011, D2015; D1012, D2016

WESTERN AUTO SUPPLY CO.

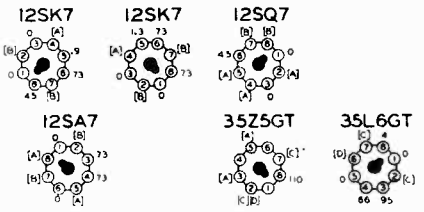




BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOLTMETER BETWEEN SOCKET TERMINALS AND B— WITH A LINE VOLTAGE OF 117 VOLTS.

[A] CANNOT BE READ WITH VOLTMETER.
[B] 12 VOLTS A.C. BETWEEN PINS 8 & B.
[C] 32 VOLTS A.C. BETWEEN PINS 2 & 7.
[D] 117 VOLTS A.C. BETWEEN PINS 9 & D.



REAR OF CHASSIS

R1	130100	150M ohms—½ w.	
R2	130168	100 ohms—½ w.	
R3	130100	150M ohms—½ w.	
R4	130218	5M ohms—½ w.	
R5	13020	100M ohms—½ w.	
R6	13094	50M ohms—½ w.	
R7	130215	25 ohms—½ w.	
R8	130296	200 ohms—1 watt	
R9	130287	1200 ohms—1 watt	
R10	130166	150 ohm—½ w.	
R11	1304	3 megohm—½ w.	
R12	130166	150 ohm—½ w.	
R13	1303	500M ohm—½ w.	
R14	1309	200M ohm—½ w.	
R15	101211	1 megohm—volume control and switch	
R16	13012	50M ohm—½ w.	
R17	130257	5 megohm—½ w.	
C	102116	Two gang variable condenser	
C1	10011	.01 x 400 v.	
C2	129132	.000125 mica	
C3	10026	.02 x 400 v.	
C4		B.C. Antenna Trimmer	
C5	1001	.1 x 400 v.	
C6	1006	.25 x 200 v.	
C7		B.C. Oscillator Trimmer	
C8	1295	.0001 mica	
C9	1295	.0001 mica	
C10	11994	40 ufd.—150 w.v. lytic	
C11	11994	20 ufd.—150 w.v. lytic	
C12	11994	20 ufd.—150 w.v. lytic	
C13	1009	.05 x 200 v.	
C14	10026	.02 x 400 v.	
C15	100106	.004 x 600 v.	
C16	12939	.00005 mica	
C17	1295	.0001 mica	
C18	10025	.002 x 600 v.	
C19	100110	.2 x 400 v.	
C20	1295	.0001 mica	
		C10, C11, C12 are in same unit	

ALIGNMENT PROCEDURE

IMPORTANT:—See alignment instructions

- Volume control—Maximum all adjustments.
- Connect B - of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 Mfd.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Four Trimmers on Top	Output and Input I.F.	Adjust to maximum output
BROAD-CAST BAND	1650 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Trimmer bottom of rear section of gang. (See bottom of radio)	Broadcast Oscillator	Adjust to maximum output
	1400 Kc.	See Note "A"		Set dial at 1400 Kc.	Trimmer bottom of front section of gang. (See bottom of radio)	Broadcast Antenna	Adjust to maximum output

NOTE "A" Lay the output lead from the generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the generator.

FREQUENCY RANGE
530 to 1650 K.C.

Power Consumption.....35 Watts
Power Output.....1 Watt Undistorted, 1.7 Watts Maximum
Intermediate Frequency.....455 K.C.

ALIGNING INSTRUCTIONS:

CAUTION:—No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltage, defective tubes, condensers and resistors. In order to properly align this radio, the chassis should be removed from the cabinet.

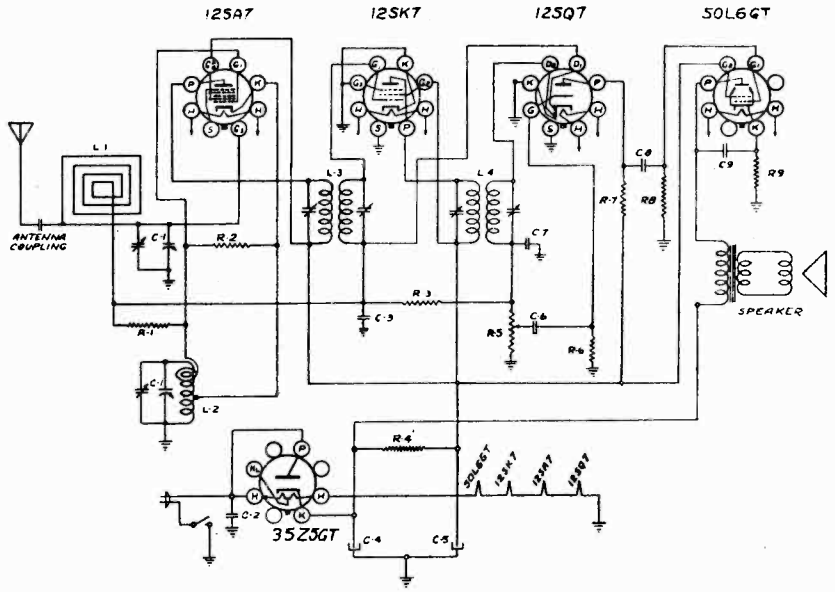
It is important during alignment that the same distance between the loop antenna and the chassis be maintained as when the chassis is installed in the cabinet.

Slight adjustments to the oscillator and antenna circuits can be made without removing the chassis from the cabinet through two holes which are provided on the bottom of the cabinet.

The two adjustments on the variable gang condenser can be reached with a long insulated type screw driver through these two holes.

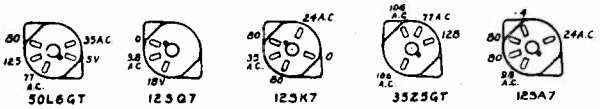
MODELS D1109, D2106

WESTERN AUTO SUPPLY CO.

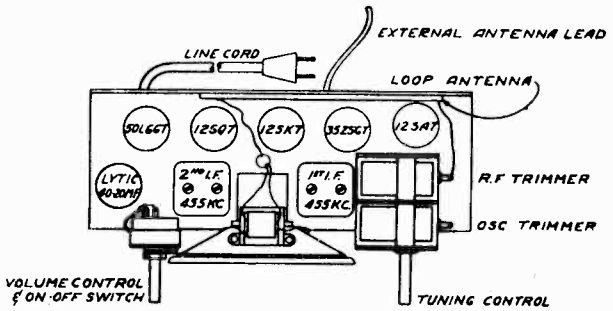


BOTTOM VIEW OF CHASSIS

VOLTAGES MARKED AT SOCKET TERMINALS ARE MEASURED WITH 1000 OHM PER VOLT METER, ON 117 VOLT LINE WITH NO SIGNAL (ANTENNA LEAD SHORTED TO CHASSIS)



REAR OF CHASSIS



GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TRIMMERS TO TUNE	REMARKS
IF 455 KC	12SA7 GRID	.1 mfd.	H. F. End	IF Transformers	Tune to
1620 KC	Antenna	200 mmf.	H. F. End	4 Trimmers	Max.
1400 KC	"	"	1400	Oscillator Trimmer	Set Limit Of Band
				Antenna Trimmer	Tune to Max.

Repeat above Alignment Procedure at least once more.

PARTS LIST AND PRICES

Part No.	Circuit Diagram Reference	Description	List Price Each
9019		Book—Instruction	$0.20
9003		Cabinet	2.50
2163		Cable—Drive	.10
8013	L2	Coil—Oscillator	.80
9007	L1	Coil—Loop Antenna Assembly with Back	1.25
9008	R5	Control—Volume and Switch	1.00
9009	C1	Condenser—Variable	2.00
8948	C4, C5	Condenser—Elect. 40 mfd—20 mfd. 150V	1.00
824	C6	Condenser—Paper .002 mfd.—600V	.20
563	C2	Condenser—Paper .05 mfd.—400 V	.20
576	C8, C9	Condenser—Paper .02 mfd—400V	.20
580	C3	Condenser—Paper .05 mfd.—200V	.20
1286	C7	Condenser—Mica 250 mmf	.20
8036		Cord—AC Line	.25
9020		Crystal—Dial	.20
9005		Indicator	.25
9021		Knob	.15
9024		Pointer	.20
8039	R1, R6	Resistor 1/3 W—15 Meg.	.15
6997	R3	Resistor 1/3 W—2 Meg.	.15
8060	R7, R8	Resistor 1/3 W—500 M	.15
8061	R2	Resistor 1/3 W—20 M	.15
8326	R9	Resistor 1/2 W—150 M	.20
8393	R4	Resistor—1 W—2 M	.20
2908		Spring—Pointer Drive	.10
9015	L3	Transformer 1st I.F.	1.75
9016	L4	Transformer 2nd I.F.	1.75
9017		Speaker—4" P. M.	2.50
9018		Carton	.60

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

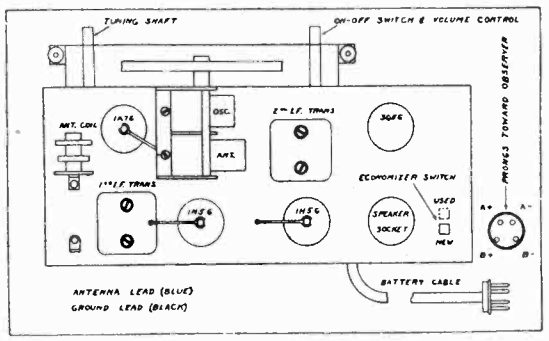


Fig. 1—Top View

VOLTAGE CHART

All voltages measured with a 1,000 ohm per volt meter on 150 volt scale. For the following voltages the "B" battery section of the power pack should read 94½ volts under load.

1A7 TUBE	Volts
Plate—P—to ground	86½
Screen—G3 & G5—to ground	31
Grid—G1—to ground	—3
Grid—G2—to ground	86½

1N5G	
Plate—P—to ground	86½
Screen—G2—to ground	86½

1H5G	
Plate—P—to ground	24

3Q5G	
Plate—P—to ground	84
Screen—G2—to ground	86½
Grid—G—to ground	—2½

Speaker (Part No. P4919) 5" PM Type.

D.C. voice coil resistance.....3.1 ohms
Voice coil impedance at 400 cycles.....3.5 ohms

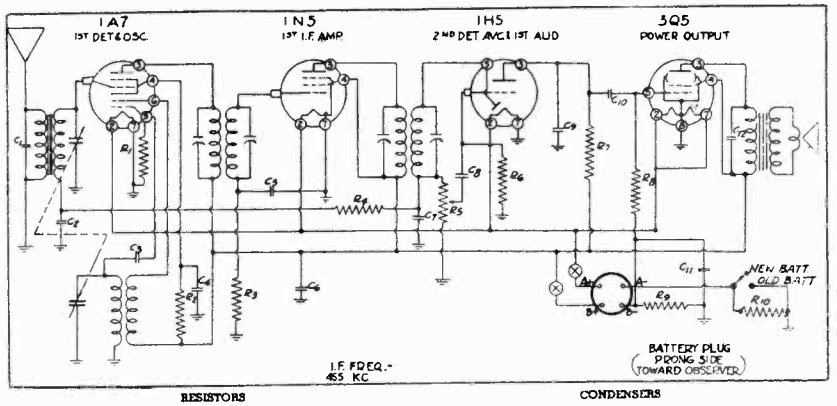
Antenna Coil (Part No. G-5724).

Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, AVC; No. 2, grid; No. 3, Ant.; No. 4, ground. No. 4 is grounded to the mounting bracket.

Primary—No. 3 and No. 4—Resistance 24.6 ohms.

Secondary—No. 1 and No. 2—Resistance 2.2 ohms.

A gimmik coil of 5.5 mmfd. connects to terminals No. 2 and No. 3.



RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	200,000	½	R6	5 Meg.	¼
R2	30,000	½	R7	1 Meg.	¼
R3	5 Meg.	¼	R8	1 Meg.	¼
R4	1 Meg.	¼	R9	440 10%	¼
R5	500,000	V.C.	R10	¾	½

CONDENSERS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)	Volts
C1	.00005	Mica	C7	.00025	Mica
C2	.05	200	C8	.01	400
C3	.00005	Mica	C9	.00025	Mica
C4	.1	200	C10	.01	400
C5	.002	400	C11	20 (Elect.)	25
C6	.1	200	C12	.005	400

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide as accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 mf., 200 mmf.

BAND	SIGNAL GENERATOR Frequency Setting	SIGNAL GENERATOR Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 KC.	.1 MFD.	Grid of 1N5G tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Output I.F.	Adjust to maximum output
	455 KC.	.1 MFD.	Grid of 1A7G tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Input I.F.	Adjust to maximum output
BROAD-CAST	1730 KC.	200 mmf.	Antenna lead	Rotor full open (Plates out of mesh)	Trimmer—Top of front section of gang (See Fig. 1)	Oscillator	Adjust to maximum output
	1400 KC.	200 mmf.	Antenna lead	Set dial at 1400 KC.	Trimmer—Top of rear section of gang (See Fig. 1)	Antenna	Adjust to maximum output

This is all that is necessary for the alignment unless the plates of the gang have been bent out of shape. In case of bent plates, set the signal generator and receiver to 600KC and bend the plates into the position for maximum output.

Attenuate the signal from the signal generator to prevent the leveling off-action of the AVC. After each band is completed, repeat the procedure as a final check.

Frequency Range

535 to 1730 K.C.

Power output .27 watt undistorted—.35 watt maximum

Intermediate Frequency 455 K.C.

Oscillator Coil (Part No. 2412) (Red Dot).

Looking at the connection end (with dot) starting at the chassis in a clockwise direction the terminals are: No. 1, grid; No. 2, plate; No. 3, B+; No. 4, ground.

Primary—No. 2 and No. 3—Resistance 2.2 ohms.

Secondary—No. 4 and No. 1—Resistance 5.3 ohms.

First I.F. Transformer (Part No. P3048)

Primary—Blue white, plate; red white B+—Resistance 12.1 ohms.

Secondary—White, grid; black white, AVC—Resistance 24.9 ohms.

Second I.F. Transformer (Part No. P2606)

Primary—Blue white, plate; red white B+—Resistance 15.1 ohms.

Secondary—White, grid; black white, AVC—Resistance 11.8 ohms.

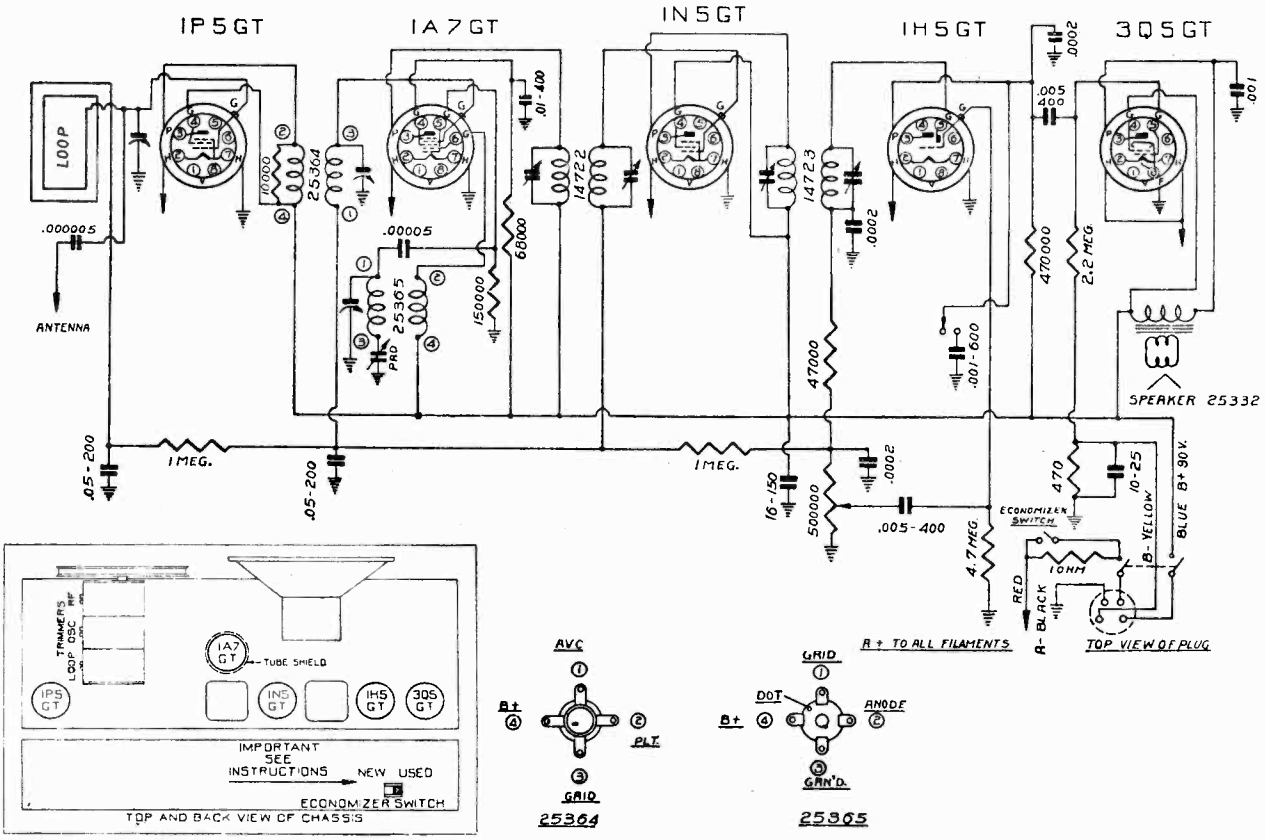
MODELS D1126, D1144

WESTERN AUTO SUPPLY CO.

MODELS D1125, D2121

ALIGNMENT DATA
MODELS D-1125 and D-2121

To properly align, first align the I. F. transformers in the conventional manner applying a test oscillator adjusted to 456 kc through a .1 MFD condenser to the grid of 1A7 with tuning condenser at minimum capacity. For the balance of alignments it is advisable to remove chassis from cabinet and suspend the loop above the chassis by means of a cord maintaining same relative position it would normally occupy in the cabinet. The test oscillator is coupled very loosely to the loop, one means is to drape the lead from oscillator over the loop so that it is near the loop winding but not necessarily touching. The trimmer of oscillator (center section) is then adjusted to 1650 kc with the plates completely out of mesh. The antenna and R. F. sections are trimmed at 1500 kc. The padder is adjusted to 600 kc. The tuning condenser is rocked while the padder is being adjusted for maximum output.



ALIGNMENT CHART FOR MODELS D1126 D1144

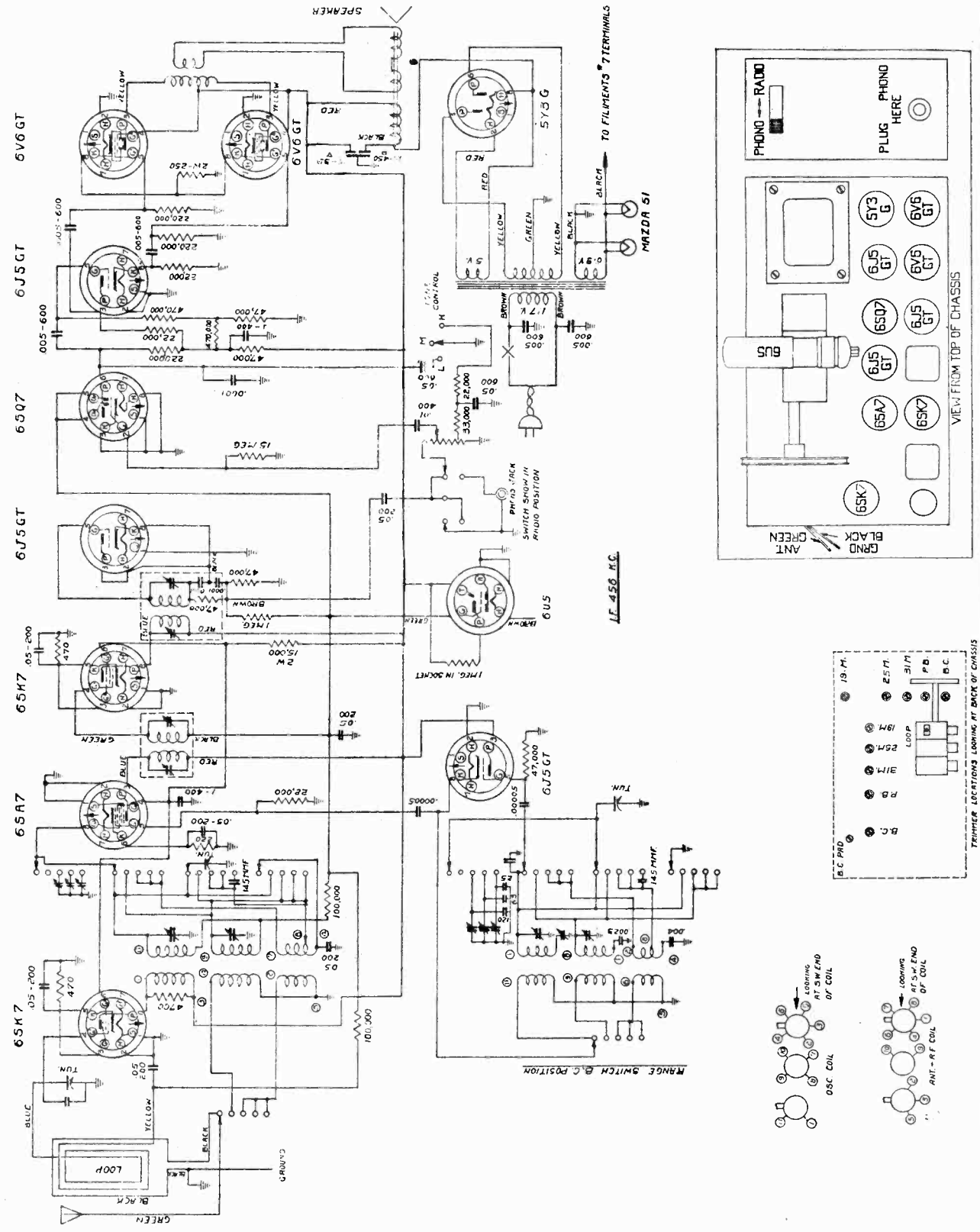
Generator	Connection at Radio	Dummy Antenna	Range Switch	Dial	Trimmers to Tune	Sensitivity	Remarks
I. F. 456 K.C.	Center Stator of Variable	.1 MFD.	A	H. F. End	I. F. Transformers	65—70MV.	Tune to Max.
B. C. 1725 K.C.	Antenna	200 MMF.	A	H. F. Limit of Travel	B. C. Oscillator		Set Band Limit
1400 K.C.	Antenna	200 MMF.	A	1400	B. C. R. F. and Loop	3-5 MV.	See Note A
600 K.C.	Antenna	200 MMF.	A	Rock Rotor	Padder	3-5 MV.	
P. B. 6.0 M.C.	Antenna	400 Ohm	B	6.0 M. C.	P. B. Osc. P. B. Ant.	25 MV.	See Note B
2.2 M. C.	Antenna	400 Ohm	B	2.2 M. C.	Check	40 MV.	See Note B
31M. 9.6 M.C.	Antenna	400 Ohm	C	9.6 M. C.	31M. Ant. 31M. Osc.	25 MV.	See Note B
25M. 11.6 M.C.	Antenna	400 Ohm	D	11.6 M. C.	25M. Ant. 25M. Osc.	30 MV.	See Note B
19M. 15.2 M.C.	Antenna	400 Ohm	E	15.2 M. C.	19M Ant. 19M. Osc.	40 MV.	See Note B

Note "A" — If the pointer is not at 1400 KC with a 1400 KC signal it may be loosened from the dial cord and moved to correct the calibration. This should be checked across the band to arrive at the optimum condition.

Note "B" — Care should be taken not to align on the image frequency. This may be checked by rotating the dial of the signal generator. Another signal should be heard at dial frequency plus 912 KC. This signal should be checked carefully on all short wave bands, making sure the lowest frequency signal agrees with the dial setting in frequency and that it is the strongest of the two.

MODELS D1126,
D1144

WESTERN AUTO SUPPLY CO.



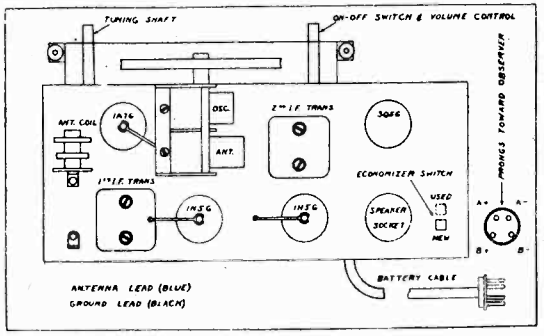


Fig. 1—Top View

VOLTAGE CHART

All voltages measured with a 1,000 ohm per volt meter on 150 volt scale. For the following voltages the "B" battery section of the power pack should read 94½ volts under load.

1A7 TUBE	Volts
Plate—P—to ground	86½
Screen—G3 & G5—to ground	31
Grid—G1—to ground	—3
Grid—G2—to ground	86½

1N5G	
Plate—P—to ground	86½
Screen—G2—to ground	86½

1H5G	
Plate—P—to ground	24

3Q5G	
Plate—P—to ground	84
Screen—G2—to ground	86½
Grid—G—to ground	—2½

Speaker (Part No. P4572) 6" PM Type.

D.C. voice coil resistance.....7.3 ohms
Voice coil impedance at 400 cycles.....8.0 ohms

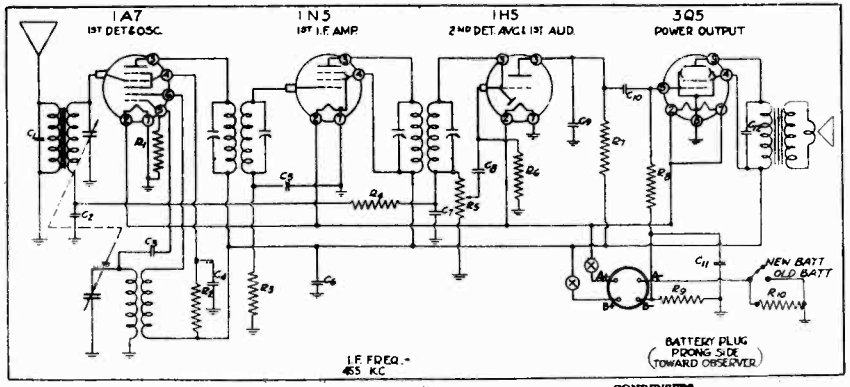
Antenna Coil (Part No. G-5724).

Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, AVC; No. 2, grid; No. 3, Ant.; No. 4, ground. No. 4 is grounded to the mounting bracket.

Primary—No. 3 and No. 4—Resistance 24.6 ohms.

Secondary—No. 1 and No. 2—Resistance 2.2 ohms.

A gimmik coil of 5.5 mmfd. connects to terminals No. 2 and No. 3.



RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	200,000	½	R6	5 Meg.	½
R2	30,000	½	R7	1 Meg.	¼
R3	5 Meg.	½	R8	1 Meg.	¼
R4	1 Meg.	½	R9	440 10%	¼
R5	500,000	V.C.	R10	¾	½

CONDENSERS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)	Volts
C1	.00005	Mica	C7	.00025	Mica
C2	.05	200	C8	.01	400
C3	.00005	Mica	C9	.00025	Mica
C4	.1	200	C10	.01	400
C5	.002	400	C11	20 (Elect.)	25
C6	.1	200	C12	.005	400

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 mf., 200 mmf.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 KC.	.1 MFD.	Grid of 1N5G tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Output I.F.	Adjust to maximum output
	455 KC.	.1 MFD.	Grid of 1A7G tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Input I.F.	Adjust to maximum output
BROAD-CAST	1730 KC.	200 mmf.	Antenna lead	Rotor full open (Plates out of mesh)	Trimmer—Top of front section of gang (See Fig. 1)	Oscillator	Adjust to maximum output
	1400 KC.	200 mmf.	Antenna lead	Set dial at 1400 KC.	Trimmer—Top of rear section of gang (See Fig. 1)	Antenna	Adjust to maximum output

This is all that is necessary for the alignment unless the plates of the gang have been bent out of shape. In case of bent plates, set the signal generator and receiver to 600KC and bend the plates into the position for maximum output.

Attenuate the signal from the signal generator to prevent the leveling off-action of the AVC. After each band is completed, repeat the procedure as a final check.

Frequency Range

535 to 1730 K.C.

Power output .27 watt undistorted—.35 watt maximum

Intermediate Frequency 455 K.C.

Oscillator Coil (Part No. 2412) (Red Dot).

Looking at the connection end (with dot) starting at the chassis in a clockwise direction the terminals are: No. 1, grid; No. 2, plate; No. 3, B+; No. 4, ground.

Primary—No. 2 and No. 3—Resistance 2.2 ohms.

Secondary—No. 4 and No. 1—Resistance 5.3 ohms.

First I.F. Transformer (Part No. P3048)

Primary—Blue white, plate; red white B+—Resistance 12.1 ohms.

Secondary—White, grid; black white, AVC—Resistance 24.9 ohms.

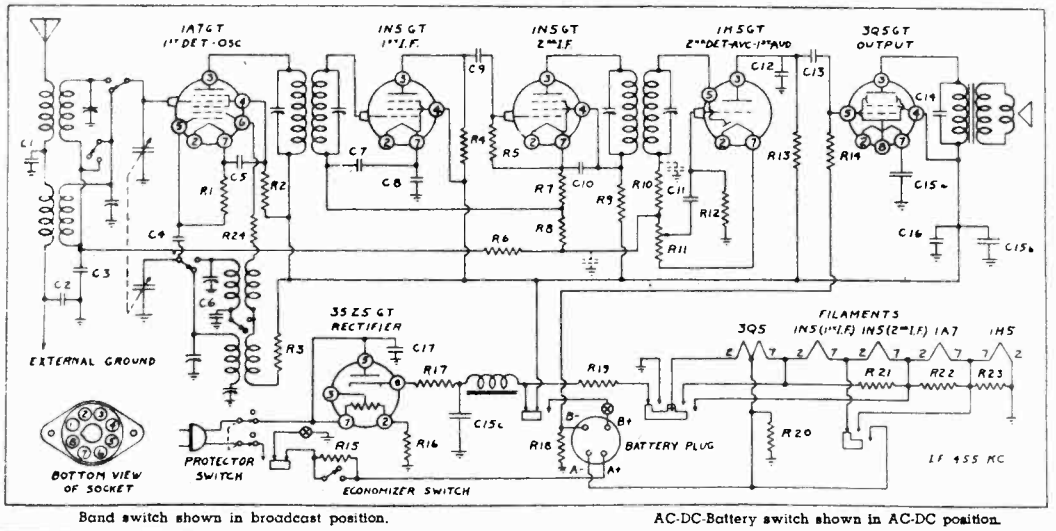
Second I.F. Transformer (Part No. P2606)

Primary—Blue white, plate; red white B+—Resistance 15.1 ohms.

Secondary—White, grid; black white, AVC—Resistance 11.8 ohms.

MODELS D1136, D1169

WESTERN AUTO SUPPLY CO.



Band switch shown in broadcast position. AC-DC-Battery switch shown in AC-DC position.

RESISTORS

No.	Ohms	Watts
R1	200,000	½
R2	50,000	½
R3	150	½
R4	20,000	½
R5	1,000,000	½
R6	2,000,000	½
R7	5,000,000	½
R8	5,000,000	½
R9	5,000	½
R10	70,000	½
R11	1,000,000	V.C.
R12	10,000,000	½
R13	1,000,000	½
R14	2,000,000	½
R15	0.5	½
R16	550	15
R17	30	½
R18	500	½
R19	1,950	5
R20	3,000	½
R21	500	½
R22	200	½
R23	110	½
R24	100	½

CONDENSERS

No.	Capacity (Mfd.)	Volts
C1	.0001	Mica
C2	.01	400
C3	.05	200
C4	.0001	Mica
C5	.01	400
C6	.004	Mica
C7	.01	400
C8	.25	200
C9	.0001	Mica
C10	.01	400
C11	.01	400
C12	.0001	Mica
C13	.01	400
C14	.002	600
C15a	40.	25
C15b	30.	150
C15c	30.	150
C16	.05	400
C17	.05	400

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 KC.	.1 Mfd.	Grid of 1N5GT I.F. tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Output I. F.	Adjust to maximum output
	455 KC.	.1 Mfd.	Grid of 1A7GT tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Input I. F.	Adjust to maximum output
SHORT WAVE	18,100 KC.	400 ohms	Antenna lead	Rotor full open (Plates out of mesh)	Trimmer—Upper left, front of chassis	Short Wave Oscillator	Adjust to receive signal
	16,100 KC.	400 ohms	Antenna lead	Tune Signal	Trimmer—Center, front of chassis	Short Wave Antenna	Adjust to maximum output
BROAD-CAST	1730 KC.	200 Mmf.	Antenna lead	Rotor full open (Plates out of mesh)	Trimmer—Lower left, front of chassis	Broadcast Oscillator	Adjust to maximum output
	1400 KC.	200 Mmf.	Antenna lead	Set dial at 1400 KC.	Trimmer—Right, front of chassis	Broadcast Antenna	Adjust to maximum output
	600 KC.	200 Mmf.	Antenna lead	Set dial at 600 KC.	Trimmer—Top of chassis (See Fig. 1)	Oscillator Series Pad	Adjust to maximum rock dial See Note 'A'

When removing the chassis it is first necessary to remove the "Protector Switch" located on the left side of the cabinet. When checking the chassis on AC or DC it is necessary to insert a piece of metal, similar to the one on the cardboard back, into the "Protector Switch" to close the line circuit.

Speaker (Part No. P5001) 8" PM Type.

D.C. voice coil resistance ..... 5.3 ohms
Voice coil impedance at 400 cycles ..... 6.0 ohms

B.C. and S.W. Oscillator Coil (Part No. P-4566)

In a clockwise direction starting at the mounting lug on same side as single lug on other end, the connections are: No. 1, plate; No. 2, grid; No. 3, S.W. pad; No. 4, B.C. pad; No. 5, grid, No. 6, switch; other end, No. 7, B+.

S.W. Primary—No. 1 and No. 6—Resistance ..... .8 ohm
B.C. Primary—No. 7 and No. 6—Resistance ..... 3.8 ohms
S.W. Secondary—No. 2 and No. 3—Resistance ..... .05 ohm
B.C. Secondary—No. 5 and No. 4—Resistance ..... 4.5 ohms

First I.F. Transformer (Part No. P-4569)
Primary—Blue white, plate; red white B+—Resistance 12.1 ohms.
Secondary—White, grid; black white, AVC—Resistance 24.9 ohms.

Second I.F. Transformer (Part No. P-4420)
Primary—Blue white, plate; red white B+—Resistance 15.1 ohms.
Secondary—White, grid; black white, AVC—Resistance 11.8 ohms.

B.C. and S.W. Antenna Coil (Part No. P4582)

Starting with the lug that is connected to ground lead in a clockwise direction, the terminals are: No. 1, ground; No. 2, cond.; No. 3, pad; No. 4, grid; No. 5, grid; No. 6, ant.

S.W. Primary—No. 6 and No. 2—Resistance ..... .35 ohm
B.C. Primary—No. 1 and No. 2—Resistance ..... 24.1 ohms
S.W. Secondary—No. 3 and No. 4—Resistance ..... .07 ohm
B.C. Secondary—No. 3 and No. 5—Resistance ..... 2.9 ohms

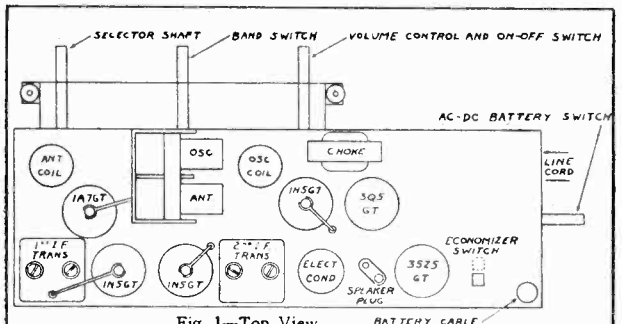


Fig. 1—Top View

VOLTAGE CHART

1A7GT TUBE

	Volts
Plate (3) to ground	98
Screen (4) to ground	60
Grid (6) to ground	99

1N5GT (1st I.F.) TUBE

Plate (3) to ground	76
Screen (4) to ground	100

1N5GT (2nd I.F.) TUBE

Plate (3) to ground	91
Screen (4) to ground	93

3Q5GT TUBE

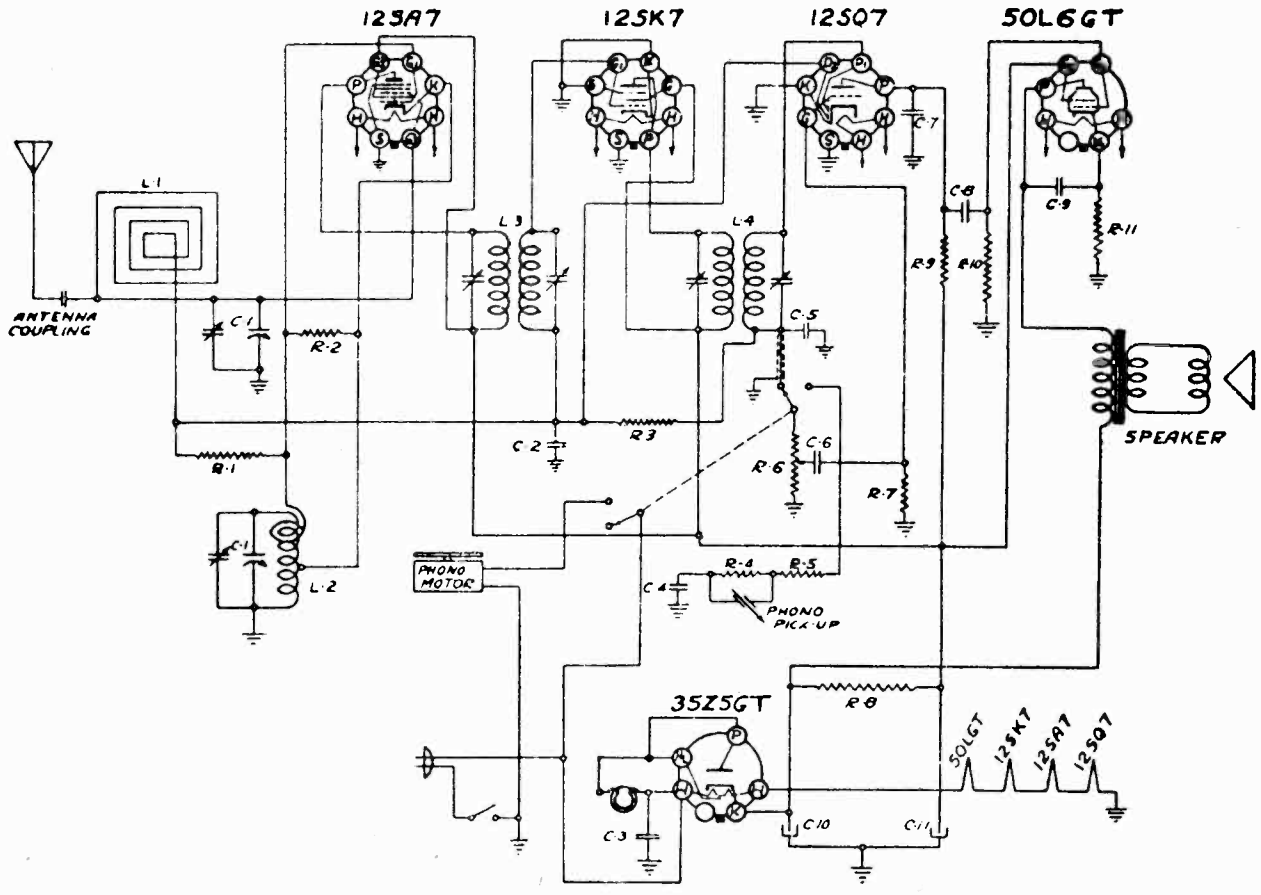
Plate (3) to ground	97
Screen (4) to ground	100

35Z5GT TUBE

Plate (5) to ground	117 (AC)
Cathode (8) to ground	120

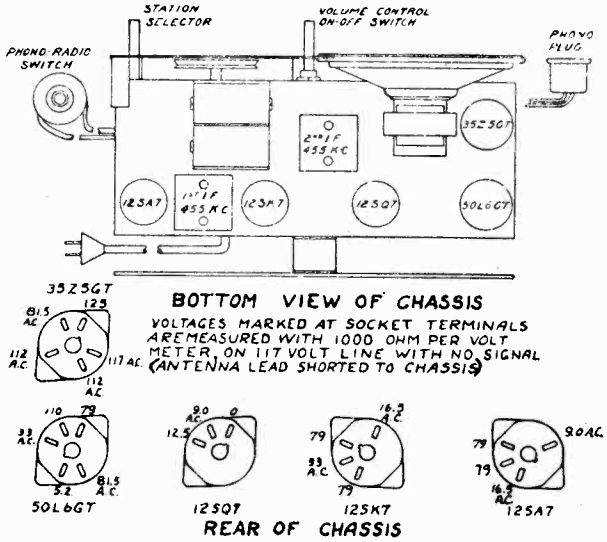
MODELS D1170, D2142

WESTERN AUTO SUPPLY CO.



PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Part No.	Circuit Diagram Reference	Description	List Price Each
9032	L-1	Coil-Loop Antenna Assembly	1.00
8031	L-2	Coil-Oscillator	.80
9051	R-6	Control-Volume and Switch	1.00
9033	C-1	Condenser-Variable	2.00
8525	C10, C11	Condenser-Elect. - 40 mf. - 20 mf. - 150V.	1.00
824	C-6	Condenser-Paper .002 mfd.—600V.	.20
563	C--3	Condenser-Paper .05 mfd. —400V.	.20
576	C-8 C-9	Condenser-Paper .02 mfd.—400V.	.20
580	C-2	Condenser-Paper .05 mfd.—200V.	.20
572	C-4	Condenser-Paper .1 mfd.—200V.	.20
1286	C-5, C-7	Condenser-Mica 250 mmf.	.20
8039	R-1, R-7	Resistor 1/3 W-15 Meg.	.15
8062	R-3	Resistor 1/3 W-3 Meg.	.15
6722	R-9, R-10	Resistor 1/3 W-½ Meg.	.15
7121	R12	Resistor 1/3 W-20M	.15
8393	R-8	Resistor 1 W-2 M.	.20
7326	R-11	Resistor ½ W-150 ohm	.15
6721	R-4, R-5	Resistor 1/3 W-200 M.	.15



BOTTOM VIEW OF CHASSIS

VOLTAGES MARKED AT SOCKET TERMINALS ARE MEASURED WITH 1000 OHM PER VOLT METER, ON 117 VOLT LINE WITH NO SIGNAL (ANTENNA LEAD SHORTED TO CHASSIS)

GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TRIMMERS TO TUNE	REMARKS
1F 455 KC	12SA7 GRID	.1 mfd.	H. F. End	IF Transformers 4 Trimmers	Tune to Max.
1620 KC	Antenna	200 mmf.	H. F. End	Oscillator Trimmer	Set Limit Of Band
1400 KC	"	"	1400	Antenna Trimmer	Tune to Max.

Repeat above Alignment Procedure at least once more.

VOLTAGE CHART

All voltages measured with a 1,000 ohm per volt meter on the 150 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in. Power consumption 30 watts, radio only, with changer 48 watts.

	Volts
12SA7 TUBE	
Plate (3) to ground	93
Screen (4) to ground	95
12SK7 TUBE	
Plate (8) to ground	93
Screen (6) to ground	95
50L6 TUBE	
Plate (3) to ground	118
Screen (4) to ground	95
Cathode (8) to ground	5.5
35Z5 TUBE	
Filament (8) to ground	122

Speaker (Part No. P4792) 5" PM Type.
D.C. voice coil resistance.....3.5 ohms

Voice coil impedance at 400 cycles.....3.8 ohms

Oscillator Coil (Part No. P4780)

Looking at the connection end in a clockwise direction starting at the chassis the terminals are No. 1, end of winding; No. 2, start of winding; No. 3, tap.

No. 2 and No. 1—Resistance 4.9 ohms.

No. 3 and No. 1—Resistance 4.3 ohms.

First I.F. Transformer (Part No. P3923)
Primary—Blue, plate; red, B+ Resistance.....20.4 ohms

Secondary—White, grid; Black, AVC Resistance.....20.3 ohms

Second I.F. Transformer (Part No. P3924)
Primary—Blue, plate; red B+ Resistance.....22.2 ohms

Secondary—White, diode; black; AVC Resistance.....22.1 ohms

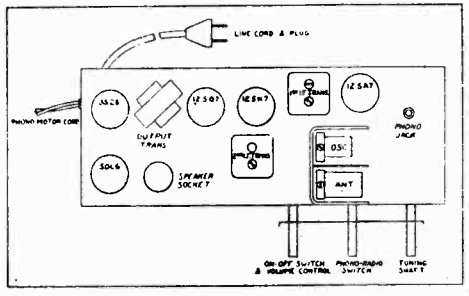
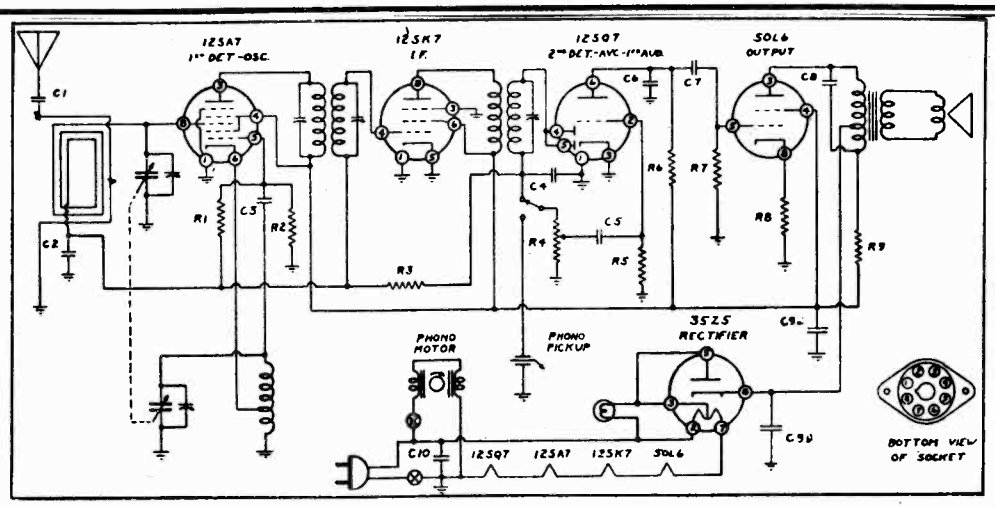


Fig. 1—Top View

FOR RADIO PRODUCTS RC-50 RECORD CHANGER - SEE RIDER'S BOOK, "AUTOMATIC RECORD CHANGERS AND RECORDERS"



RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	10,000,000	¼	R6	250,000	¼
R2	25,000	¼	R7	500,000	¼
R3	2,000,000	¼	R8	150—10%	¼
R4	500,000	V.C.	R9	1,000	½
R5	5,000,000	¼			

CONDENSERS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)		Volts
C1	.001	600	C7	.01		400
C2	.05	200	C8	.02		400
C3	.00005	Mica	C9a	50.	Elec.	150
C4	.00025	Mica	C9b	30.	Elec.	150
C5	.005	600	C10	.05		400
C6	.0005	Mica				

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 mfd., 200 mmf.

BAND	*SIGNAL GENERATOR Frequency Setting*	*Dummy Antenna*	*Connection to Radio*	*Variable Condenser Setting*	*Trimmers Adjusted (In Order Shown)*	*Trimmer Function*	*Adjustment*
I. F.	455 KC.	.1 Mfd.	Grid of 12SK7 I.F. tube	Rotor full open (Plates out of mesh)	One trimmer on top (See Fig. 1)	Output I. F.	Adjust to maximum output
	455 KC.	.1 Mfd.	Grid of 12SA7 tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Input I. F.	Adjust to maximum output
BROAD-CAST	1,630 KC.	200 Mmf.	Antenna lead	Rotor full open (Plates out of mesh)	Trimmer—Top of gang	Oscillator	Adjust to maximum output
	1,400 KC.	200 Mmf.	Antenna lead	Set dial at 1400 KC.	Trimmer—Top of gang	Broadcast Antenna	Adjust to maximum output

Frequency Range—535 to 1630 K.C.

Attenuate the signal from the signal generator to prevent the leveling-off action of the A.V.C.

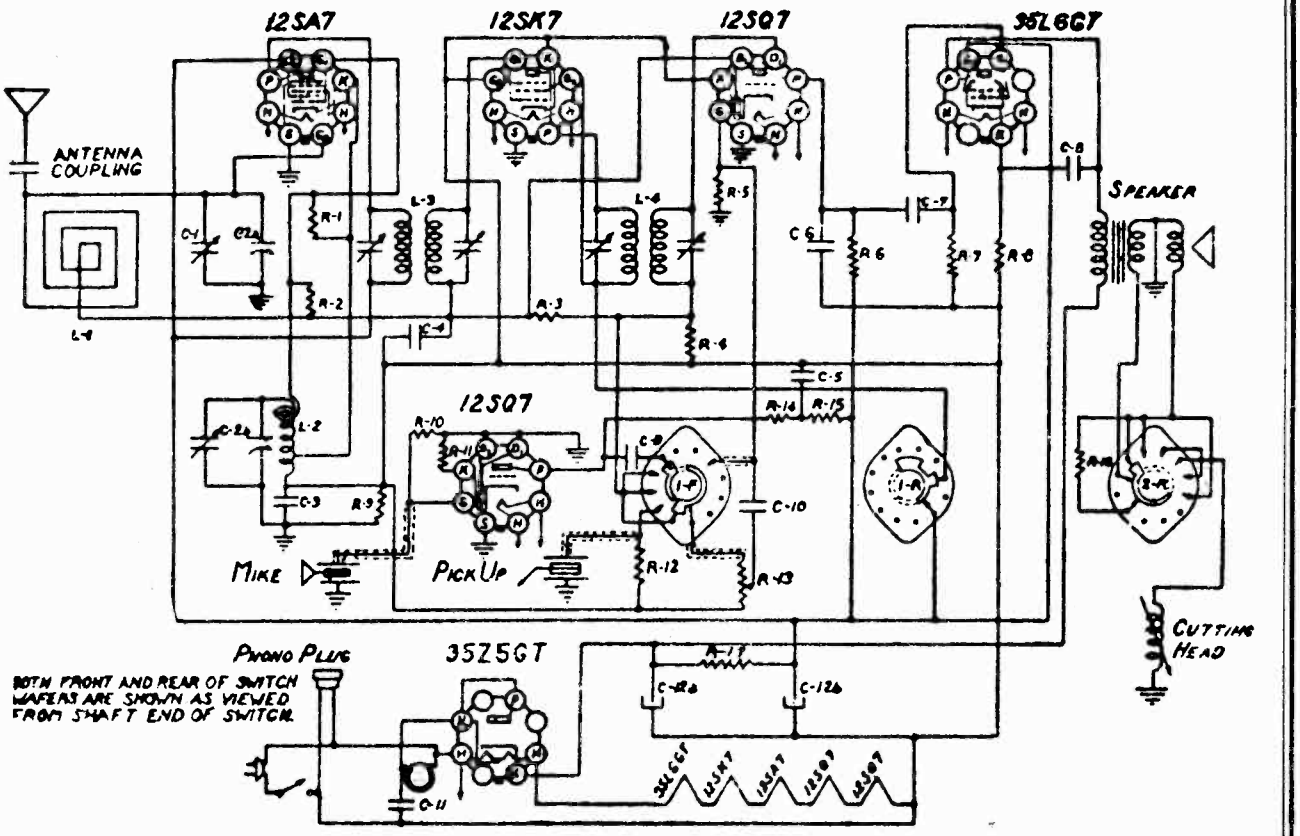
Power output 1.3 watts undistorted—2.0 watts maximum.

Intermediate Frequency 455 K.C.

Total Power Consumption—48 watts.

WESTERN AUTO SUPPLY CO.

MODELS D1173, D2155



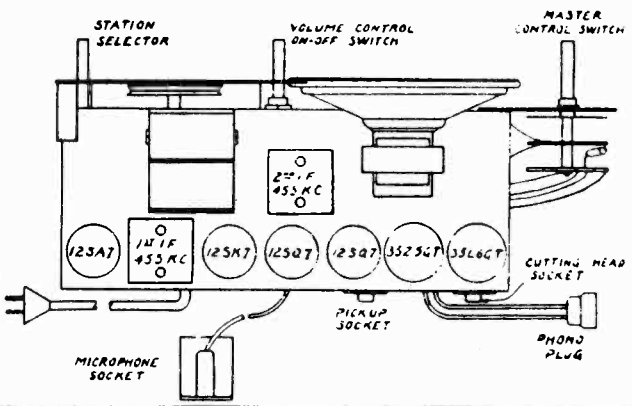
FOR PARTS LIST SEE INDEX

TUBES

1-12SA7 CONVERTER (OSCILLATOR AND FIRST DETECTOR)
1-12SK7 I.F. AMPLIFIER
1-12SQ7 SECOND DETECTOR AND FIRST AUDIO
1-12SQ7 MICROPHONE PRE-AMPLIFIER
1-35L6GT POWER OUTPUT
1-35Z5GT RECTIFIER

BOTTOM VIEW OF CHASSIS

VOLTAGES MARKED AT SOCKET TERMINALS ARE MEASURED WITH 1000 OHM PER VOLT METER, ON A 117 VOLT LINE WITH NO SIGNAL. (ANTENNA LEAD IS SHORTED TO THE CHASSIS) VOLTAGES MEASURED FROM "B-" TO LUGS



ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this chassis:

1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output Meter.
3. A non-metallic screw driver.
4. Dummy Antenna—.1 mfd., 200 mmf.

GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TRIMMERS TO TUNE	REMARKS
IF 455 KC.	12SA7 Grid	.1 mfd.	H. F. End	IF Transformers 4 Trimmers	Tune to Max.
1620 KC.	Antenna	200 mmf.	H. F. End	Oscillator Trimmer	Set Limit of Band
1400 KC.	Antenna	200 mmf.	1400	Antenna Trimmer	Tune to Max.

Repeat above Alignment Procedure at least once

TRUETONE MODEL D2155

FORMERLY MODEL D1173

PARTS LIST AND PRICES

Part No.	Circuit Diagram Reference	Description	List Price Each
9231		Back	$ .25
9232		Book—Instruction	.20
8462		Bushing-Stem—Motor Mounting	.03
9234		Cabinet	12.00
2163		Cable—Drive	.15
9076	L1	Coil—Loop Antenna Assembly	1.00
8031	L2	Coil—Oscillator	.80
9221	R13	Control—Volume and Switch	1.00
8036		Cord—AC Line	.25
5562	C1	Condenser—Antenna Trimmer	.20
9223	C2a, b	Condenser—Variable	2.00
8525	C12a,b	Condenser—Electrolytic 40-20-150 V	1.00
3352	C3	Condenser—Paper .2-400 V	.20
563	C11	Condenser—Paper .05-400 V	.20
576	C7, C8	Condenser—Paper .02-400 V	.20
3137	C9	Condenser—Paper .001-400 V	.20
824	C10	Condenser—Paper .002-600 V	.20
572	C5	Condenser—Paper .1-200 V	.20
580	C4	Condenser—Paper .05-200 V	.20
1286	C6	Condenser—Mica 250 mmfd	.20
8941		Connector—Microphone—with bracket and lead	.40
9043		Crystal—Dial	.20
981		Grommet—Condenser Mounting	.02
9029		Indicator	.40
9031		Indicator—Back Plate	.30
3247		Knob—Master Control	.15
2750		Knob—Motor Switch	.15
9246		Knob—Tuning	.15
9248		Knob—Volume	.15
6158		Lamp—Pilot No. 47 Mazda	.15
8285		Microphone No. X-20	6.00
9275		Needles—Cutting (Furnished by W. A.)	
9276		Needles—Playing (Furnished by W. A.)	
9236		Plate—Instruction	.20
8477		Plate—Motor on-off	.15
8287		Plug—1 Prong Large (Play)	.15
8288		Plug—1 Prong Small (Cut)	.15
8493		Plug—Phono Motor	.15
9036		Pointer	.20
9013		Pulley—Drive	.20
9086		Pulley—Idler	.10
9277		Records—Blank (Furnished by W.A.)	
8929		Recorder Unit—Complete	25.00
7326	R8	Resistor—150 ohm 1/2 W	.20
3807	R16	Resistor—35 ohm 1/2 W Flexohm	.20
9093	R17	Resistor—1500 ohm 1 W	.20
9325	R11	Resistor—2 M 1/3 W	.15
8580	R12	Resistor—100M 1/3 W	.15
7122	R9	Resistor—200M 1/3 W	.15
6722	R14	Resistor—500M 1/3 W	.15
6721	R6,7,15	Resistor—50M 1/3 W	.15
8970	R4	Resistor—2 Meg 1/3 W	.15
8062	R3,10	Resistor—3 Meg. 1/3 W	.15
8039	R2,5	Resistor—15 Meg. 1/3 W	.15
7121	R1	Resistor—20 M 1/3 W	.15
9228		Shaft—Drive	.20
9030		Speaker—5" P.M.	3.00
2908		Spring—Pointer Drive	.06
8430		Socket—Phono Motor	.20
6267		Socket—1 Prong—Large (Playing)	.10
8266		Socket—1 Prong—Small (Cutting)	.10
7573		Socket—Dial Lamp	.15
9226		Switch—Master Control	1.25
8454		Switch—Motor	.75
8042	L3	Transformer—1st I.F.	1.75
8043	L4	Transformer—2nd I.F.	1.75

RECORDER UNIT PARTS

86943	Hex Nut for Pivot Post	.15	
86947	Motor Mounting Screw	.02	
86948	Adjusting Screw (Follower Arm)	.02	
869413	Turntable Shaft Locking Screw	.02	
869417	Recorder Arm Rest	.60	
869418	Follower Arm Complete	1.00	
869424	Pickup Cartridge	5.00	
869426	Tone Arm, Complete	6.00	
869428	Cutter Head Tension Spring	.25	
869434	Recorder Arm, Complete	11.00	
869438	Pivot Post Return Spring	.15	
869449	Tone Arm Post	1.25	
869450	10" One-Piece Turntable	3.00	
869456	Turntable Drive Disc Stud Clip	.03	
869458	Lead Screw & Pinion Assembly	1.80	
869463	Turntable Drive Disc Tension Spring	.06	
869464	Turntable Shaft	1.30	
869465	Auxiliary Shaft Housing, Complete	4.00	
869466	Turntable Drive Disc	1.00	
869467	Turntable Drive Disc Mounting Bracket Assembly	.30	
869469	Retractable Pin Spring	.06	
869470	Retractable Pin	.15	
869472	Rotor Shaft Pulley 9	.30	
869474	Rotor Shaft Pulley Set Screw	.05	
869481	Motor—60 Cycle	11.00	
869482	Motor—50 Cycle	12.00	
869484	Magnetic Cutter Head with Leads	9.00	
869485	Cutter Head Set Screw (Large)	.20	
869486	Tone Arm Cartridge Set Screw	.20	

TRUETONE MODEL DW2090

FORMERLY MODEL DE3002

PARTS LIST AND PRICES

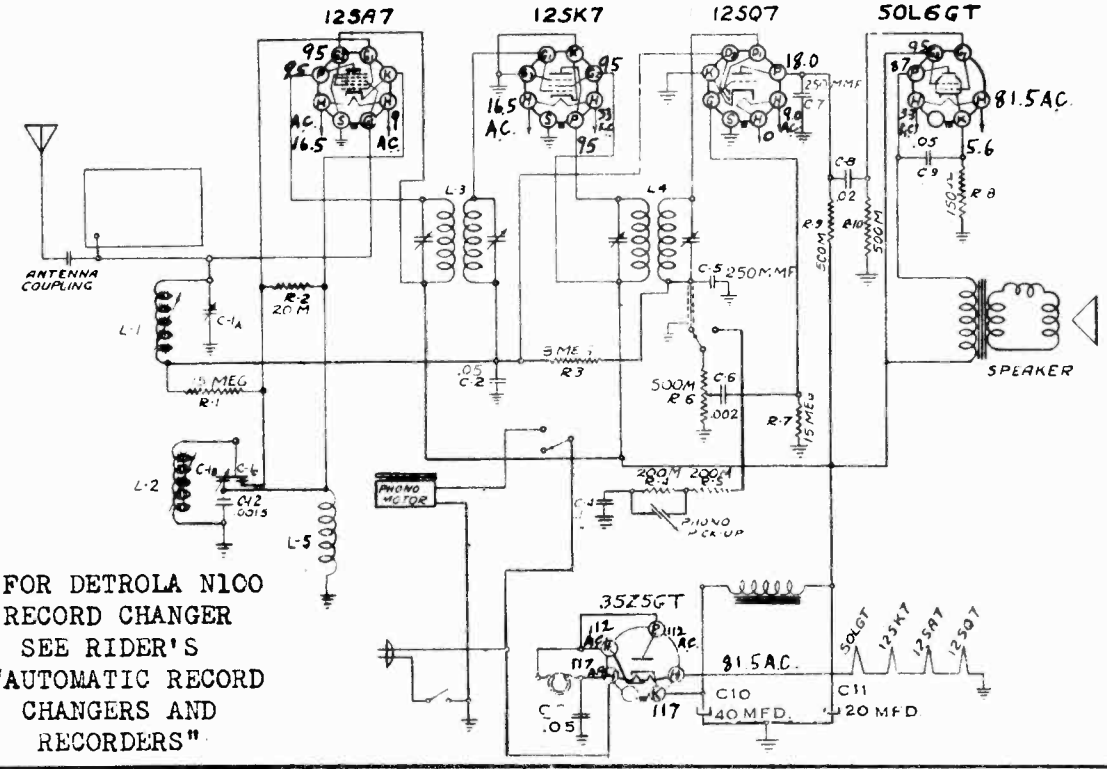
Part No.	Circuit Diagram Reference	Description	List Price Each
9353		Arm—Tone—with Crystal	$ 6.00
		Battery Pack ("A" and "B") Wizard D235	
9159		Book — Instruction	.20
5344		Bracket—Chassis Mounting	.15
9141		Bracket—Condenser and Indicator Mounting	.45
9158		Cabinet	12.00
9262		Cable — Battery Pack	.25
2163		Cable—Drive—30"	.15
4874	L1	Coil— Antenna	.90
6256	L2	Coil — Oscillator	.80
9145	C1a,b	Condenser—Variable—With Pulley	2.25
3137	C7	Condenser—Paper .001 mfd.—400 V	.20
568	C8,C9	Condenser—Paper .01 mfd.—400 V	.20
3547	C10	Condenser—Paper .002 mfd—400 V	.20
580	C2,C4	Condenser—Paper .05 mfd.—200 V	.20
2780	C11	Condenser—Mica 50 mmf	.20
1285	C3	Condenser—Mica 100 mmf	.20
1286	C6	Condenser—Mica 250 mmf	.20
9146	C5	Condenser—Electrolytic 10 mfd.—150 V	.50
9143	R4	Control—Volume and Switch	1.00
8683		Cup—Needle	.30
9147		Dial Lamp Mounting Assembly	.20
9161		Escutcheon and Crystal	.80
7209		Grommet—Variable Condenser	.03
9148		Indicator	.45
9021		Knob	.15
9149		Lamp—Dial G. E. 1/8 W. Neon	.15
9162		Phonograph Unit—Complete with Turntable, Crank, and Mounting Hardware	8.00
8288		Plug—Phono Pickup	.15
9150		Pointer	.20
6244		Pulley—Idler	.10
6890	R10	Resistor—300 ohm, 1/3 W	.15
8580	R1	Resistor—50M, 1/3 W	.15
7122	R2,R11	Resistor—100M, 1/3 W	.15
6721	R5,R6	Resistor—200M, 1/3 W	.15
6723	R8	Resistor—1 Meg. 1/3 W	.15
8970	R9	Resistor—2 Meg. 1/3 W	.15
8062	R3	Resistor—3 Meg. 1/3 W	.15
6562	R7	Resistor—10 Meg. 1/3 W	.15
1207		Retainer—"C" Washer	.01
8427		Shaft—Drive	.20
9157		Speaker—6 1/2" P. M.	4.00
8648		Spring—Pointer Drive	.06
9152		Switch—Phono—Radio	.75
9151		Switch—Tone Control	.70
9155	L3	Transformer—1st I. F.	1.75
9156	L4	Transformer—2nd I. F.	1.75
9268		Vellum for Translucent Window	.02

TUBES

1-1A7 CONVERTER (OSCILLATOR AND FIRST DETECTOR
1-1N5 I.F. AMPLIFIER
1-H5 SECOND DETECTOR AND FIRST AUDIO
2-3Q5 POWER OUTPUT

WESTERN AUTO SUPPLY CO.

MODELS D1174, D2245

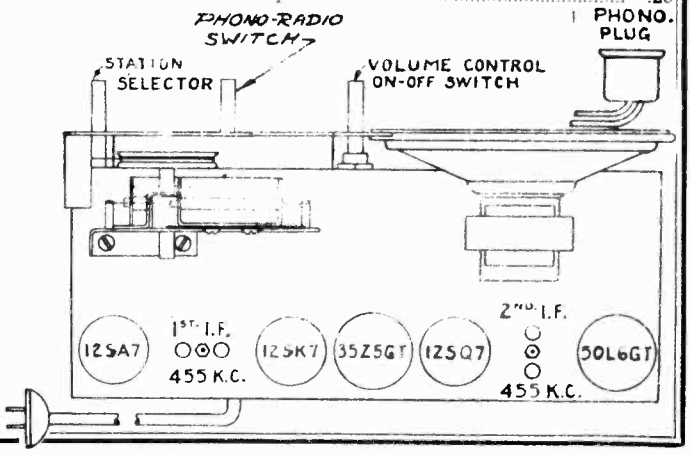


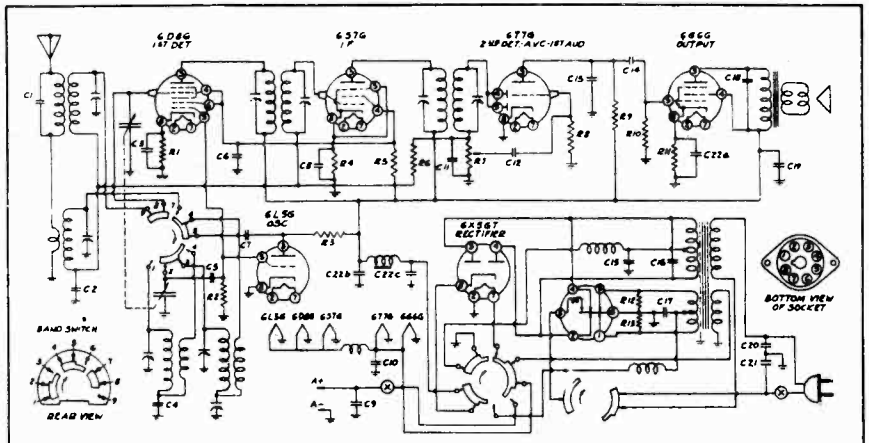
FOR DETROLA N100 RECORD CHANGER SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS"

GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TRIMMERS TO TUNE	REMARKS
IF 455 KC	12SA7 GRID	.1 mfd.	H. F. End	IF Transformers	Tune to
1720 KC	Antenna	200 mmf.	H. F. End	4 Trimmers	Max.
1400 KC	"	"	1400	Oscillator Trimmer	Set Limit Of Band
				Antenna Trimmer	Tune to Max.

PARTS LIST AND PRICES

Part No.	Circuit Diagram Reference	Description	List Price Each
N-200		Record Changer—Complete	
9575		Capacity Plate Assembly	.65
9736		Book—Instruction	.20
9031		Bracket-Indicator Back Plate	.30
9490	L1,L2	Tuner—Permeability with Pulley	2.20
9737		Cabinet	18.00
2163		Cable-Drive	.15
9722	L5	Coil—Cathode Choke	.40
9051	R6	Control—Volume and Switch	1.00
9510	C1a, b	Condenser—Dual Trimmer	.50
9363	C10, C11	Condenser—Elect.—40 mf.—20 mf.—150V	1.00
9672	C12	Condenser—Paper .0015 mfd.—400V	.20
824	C6	Condenser—Paper .002 mfd.—600V	.20
563	C3	Condenser—Paper .05 mfd.—400V	.20
576	C8, C9	Condenser—Paper .02 mfd.—400V	.20
580	C2	Condenser—Paper .05 mfd.—200V	.20
572	C4	Condenser—Paper .1 mfd.—200V	.20
1286	C5, C7	Condenser—Mica—250 mmf.	.20
1285	C1c	Condenser—Mica—100 mmf.	.20
8036		Cord—AC Line	.25
9732		Indicator	.40
9021		Knob	.15
6158		Lamp—Pilot—Mazda #47	$ .15
242		Plug—Phono Motor	.15
9150		Pointer	.20
9086		Pulley—Idler	.10
8039	R1, R7	Resistor 1/3 W—15 Meg.	.15
8062	R3	Resistor 1/3 W—3 Meg.	.15
6722	R9, R10	Resistor 1/3 W—1/2 Meg.	.15
7121	R2	Resistor 1/3 W—20 M.	.15
7326	R8	Resistor 1/2 W—150 ohm	.15
6721	R4, R5	Resistor 1/3 W—200 M.	.15
1207		Retainer—Shaft	.01
9734		Switch—Phono-Radio	.75
9038		Shaft—Drive	.20
7477		Spring—Pointer Drive	.08
9472	L3	Transformer—1st I. F.	1.75
9473	L4	Transformer—2nd I. F.	1.75
9594		Speaker—5" Dynamic	3.50
9739		Cloth	1.20
9738		Dial Crystal	.20





Band switch shown in broadcast position in schematic and in short wave position in pictorial view in lower left corner.

RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	800	½	R8	15,000,000	½
R2	60,000	½	R9	250,000	½
R3	15,000	½	R10	500,000	½
R4	1,000	½	R11	500	½
R5	20,000	½	R12	100	½
R6	1,000,000	½	R13	100	½
R7	500,000	V.C.			

CONDENSERS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)	Volts
C1	.0001	Mica	C13	.00025	Mica
C2	.05	200	C14	.01	400
C3	.05	200	C15	.1	400
C4	.004—5%	Mica	C16	.015	1000
C5	.0001	Mica	C17	.5	150
C6	.1	400	C18	.005	600
C7	.0005	Mica	C19	.1	400
C8	.05	200	C20	.05	400
C9	.5	10	C21	.05	400
C10	.0006	Mica	C22a	20.	25
C11	.0001	Mica	C22b	20.	250
C12	.01	400	C22c	20.	250

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 mfd., 200 mmfd., 400 ohms.

BAND	SIGNAL GENERATOR Frequency Setting	SIGNAL GENERATOR Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 KC.	.1 Mfd.	Grid of 6S7G I.F.	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Output I. F.	Adjust to maximum output
	455 KC.	.1 Mfd.	Grid of 6D8G tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Input I. F.	Adjust to maximum output
SHORT WAVE	18,100 KC.	400 ohms	Antenna lead	Rotor full open (Plates out of mesh)	Trimmer—Top of chassis (See Fig. 1)	Short Wave Oscillator	Adjust to receive signal
	16,000 KC.	400 ohms	Antenna lead	Tune Signal	Trimmer—Top of chassis (See Fig. 1)	Short Wave Antenna	Adjust to maximum output
BROADCAST	1730 KC	200 Mmf.	Antenna lead	Rotor full open (Plates out of mesh)	Trimmer—Top of chassis (See Fig. 1)	Broadcast Oscillator	Adjust to maximum output
	1400 KC	200 Mmf.	Antenna lead	Set dial at 1400 KC.	Trimmer—Top of chassis (See Fig. 1)	Broadcast Antenna	Adjust to maximum output
	600 KC.	200 Mmf.	Antenna lead	Set dial at 600 KC.	Trimmer—Top of chassis (See Fig. 1)	Oscillator Series Pad	Adjust to maximum rock dial See Note 'A'

Note "A"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of intensity is obtained.

Attenuate the signal from the signal generator to prevent the leveling-off action of the A.V.C.

Do not bend variable condenser to correct tracking.

Frequency Range—535 to 1730 and 5.750 to 18,100 K.C.

Power output .6 watt undistorted—1.1 watt maximum.

Intermediate Frequency 455 K.C.

Speaker (Part No. P-4233) 6" PM Type.

D. C. voice coil resistance ..... 5.1 ohms
Voice coil impedance at 400 cycles ..... 5.5 ohms

B.C. and S.W. Oscillator Coil (Part No. P-4226)

Looking at the mounting bracket end in a clockwise direction starting at the chassis, the connections are: No. 1, pad; No. 2, open. Looking at the other end in a clockwise direction starting at the chassis the connections are: No. 3, plate; No. 4, plate; No. 5, pad; No. 6, grid; No. 7, grid.

S.W. Primary—No. 4 and No. 5—Resistance .44 ohm.
B.C. Primary—No. 1 and No. 3—Resistance 1.3 ohms.
S.W. Secondary—No. 5 and No. 6—Resistance .09 ohm.
B.C. Secondary—No. 1 and No. 7—Resistance 5.8 ohms.

B.C. and S.W. Antenna Coil (Part No. P-4225)

Starting with the lug that is connected direct to ground in a clockwise direction, the terminals are: No. 1, ground; No. 2, open; No. 3, pad; No. 4, grid; No. 5, grid; No. 6, ant.

S.W. Primary—No. 6 and No. 2—Resistance .35 ohm.
B.C. Primary—No. 1 and No. 2—Resistance 24.1 ohms.
S.W. Secondary—No. 3 and No. 4—Resistance .07 ohm
B.C. Secondary—No. 3 and No. 5—Resistance 2.9 ohms.

First I.F. Transformer (Part No. P-4245)

Primary—Blue, plate; red, B+—Resistance 26.2 ohms
Secondary—White, grid; black, AVC—Resistance 26.6 ohms

Second I.F. Transformer (Part No. P-4244)

Primary—Blue, plate; red, B+—Resistance 15.1 ohms.
Secondary—White, grid; black, AVC—Resistance 11.8 ohms.

VOLTAGE CHART

All voltages measured with a 1000 ohm per volt meter on 250 volt scale. Volume control maximum and no signal tuned in.

	117 V.A.C.	6.3 V. Bat.
6D8G TUBE		
Plate (3) to ground	160	146
Screen (4) to ground	82	76
Cathode (8) to ground	4.3	3.3
6S7G TUBE		
Plate (3) to ground	160	146
Screen (4) to ground	82	76
Cathode (8) to ground	4.1	3.2
6Q6G TUBE		
Plate (3) to ground	152	139
Screen (4) to ground	163	148
Cathode (8) to ground	7.5	6.9
6X5GT TUBE		
Cathode (8) to ground	169	154

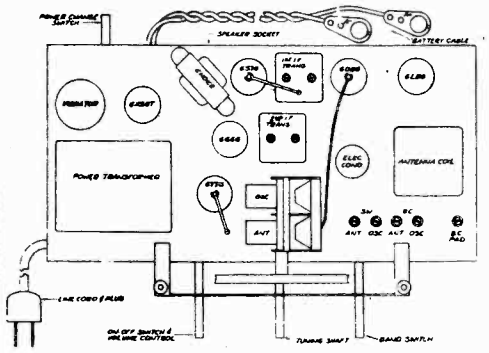
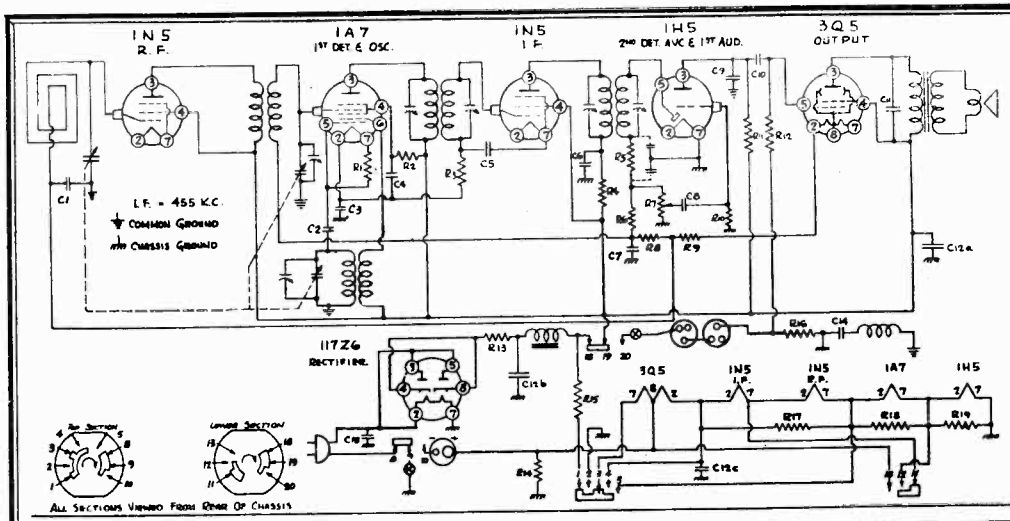


Fig. 1—Top View

Part No.	Circuit Reference	Description
		PAPER CONDENSERS
P1322	C16	.005 mfd. 600 volt
P184	C12, C14	.01 mfd 400 volt
P2134	C16	.015 mfd. 1000 volt (oil filled)
P148	C2, C3, C8	.05 mfd. 200 volt
P334	C20, C21	.05 mfd. 400 volt
P278	C6, C15, C19	.1 mfd. 400 volt
P395	C9	.5 mfd. 10 volt
P2133	C17	.5 mfd 120 volt
		MOULDED MICA CONDENSERS
P480	C1, C5, C11	.0001 mfd.
P617	C13	.00025 mfd.
P236	C7, C10	.0005 mfd.
P1683	C4	.004 mfd. 5%
		VARIABLE CONDENSERS
P4222		Gang condenser
P3484		Trimmer strip
P4132		Padding condenser
		ELECTROLYTIC CONDENSERS
P4224	C22a C22b C22c	20 mfd 25 volt 20 mfd. 250 volt 20 mfd. 250 volt

		RESISTORS
P3800	R12, R13	100 ohm ½ watt
P3820	R11	500 ohm ½ watt
P3825	R1	800 ohm ½ watt
P3828	R4	1,000 ohm ½ watt
P3836	R3	5,000 ohm ½ watt
P3844	R5	20,000 ohm ½ watt
P3855	R2	60,000 ohm ½ watt
P3868	R9	250,000 ohm ½ watt
P3876	R10	500,000 ohm ½ watt
P3882	R6	1,000,000 ohm ½ watt
P3891	R8	15,000,000 ohm ½ watt
		VARIABLE RESISTORS
P4231	R7	Volume control and switch
		TRANSFORMERS AND COILS
P4225		B.C. and S.W. antenna coil
P4226		B.C. and S.W. oscillator coil
P4245		1st I.F. transformer
P4244		2nd I.F. transformer
P4220		Power transformer
		MISCELLANEOUS
P3005		Tube socket
P945		Speaker socket
P824		Vibrator socket
P4138		Electrolytic mounting base
P929		Line cord
P4042		Glass dial
P3893		Tenite escutcheon
P3090		Escutcheon screw
P4119		Dial background
P1585		Snap buttons, for dial background
P4032		Pointer
P4214		Drive shaft
P1399		Horseshoe washer
G5581		Dial drum and hub
P2078		Cord tension spring
P4228		Iron core filter choke
G5612		Hash choke
G5130		Filament choke
G5126		"B" choke
P4230		Power change switch
P4229		Band sw itch



BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 KC.	.1 MFD.	Grid of 1N5GT I.F. tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Output I.F.	Adjust to maximum output
See Note "A"	455 KC.	.1 MFD.	Grid of 1A7GT tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Input I.F.	Adjust to maximum output
BROAD-CAST	1600 KC.	.05 MFD.	Grid of 1N5GT R.F. tube	Rotor full open (Plates out of mesh)	Trimmer—Side of gang-rear	Oscillator	Adjust to maximum output
See Note "B"	1400 KC.	.05 MFD.	Grid of 1N5GT R.F. tube	Set dial at 1400 KC.	Trimmer—Side of gang-center	R.F.	Adjust to maximum output

This is all that is necessary for the alignment unless the plates of the gang have been bent out of shape. In case of bent plates, set the signal generator and receiver to 600 KC and bend the plates into the position for maximum output.

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC. After each band is completed, repeat the procedure as a final check.

NOTE "A"—Use battery operation for all adjustments.

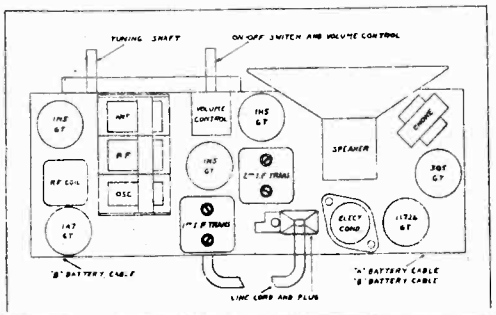
NOTE "B"—The oscillator trimmer is reached thru the hole in the R.F. coil can.

Frequency Range
540 to 1600 K.C.

Power output (on batteries) .27 watt undistorted—.35 watt maximum.

Power output (AC-DC) .27 watt undistorted — .35 watt maximum.

Intermediate Frequency 455 K.C. Power consumption 25 watts.



RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	200,000	½	R11	1,000,000	½
R2	50,000	½	R12	2,000,000	½
R3	5,000,000	½	R13	30—10%	½
R4	5,000	½	R14	1,000	½
R5	70,000	½	R15	2,150—10%	5
R6	3,000,000	¼	R16	400—10%	½
R7	1,000,000	V.C.	R17	500—10%	½
R8	5,000,000	½	R18	200—10%	½
R9	10,000,000	¼	R19	110—10%	½
R10	15,000,000	½			

CONDENSERS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)	Volts
C1	.05	200	C9	.00025	Mica
C2	.00005	Mica	C10	.001	600
C3	.25	200	C11	.002	600
C4	.01	400	C12a	50. Elect.	150
C5	.001	600	C12b	30. Elect.	150
C6	.05	400	C12c	100. Elect.	25
C7	.05	200	C13	.05	400
C8	.001	600	C14	.2	200

Speaker (Part No. P4795) 5" PM Type
D.C. voice coil resistance.....2.4 ohms
Voice coil impedance at 400 cycles.....2.7 ohms

R. F. Coil (Part No. P4853)

Primary—Red; green—Resistance .....112.8 ohms
Secondary—Black; white—Resistance ..... 5.9 ohms

Oscillator Coil (Part No. P3967)

Looking at the connection end (with dot) in a clockwise direction starting at the chassis the terminals are No. 1 grid; No. 2, plate; No. 3, B+; No. 4, ground.
Primary—No. 2 and No. 3—Resistance 2.2 ohms.
Secondary—No. 4 and No. 1—Resistance 4.9 ohms.

First I.F. Transformer (Part No. P4818)

Primary—Red, B+; blue, plate—Resistance 11.8 ohms
Secondary—White, grid; black, AVC—Resistance 23.9 ohms

Second I.F. Transformer (Part No. P4819)

Primary—Blue, plate; red, B+ — Resistance 15.1 ohms
Secondary—White, grid; other end inside can—Resistance 11.8 ohms

Power Change Switch

The power change switch connects the tube filaments in series (9 volt) on AC-DC operation and parallel (1½ volt) on battery operation.

VOLTAGE CHART

All voltages measured with a 1,000 ohm per volt meter on the 150 volt scale. Line voltage 117½ volts A.C. Volume control maximum and no signal tuned in.

1N5 (RF) TUBE

	Volts
Plate (3) to common ground	94
Screen (4) to common ground	102
Filament (2) to (7)	1.4

1A7 TUBE

Plate (3) to common ground	100
Screen (4) to common ground	62
Anode grid (6) to common ground	100
Filament (2) to (7)	1.4

1N5 (IF) TUBE

Plate (3) to common ground	95
Screen (4) to common ground	102
Filament (2) to (7)	1.38

117Z6 TUBE

Plate (3) or (5) to common ground	117.5 (AC)
Cathode (4) or (8) to common ground	128
Filament (2) to (7)	117.5 (AC)

1H5 TUBE

Plate (3) to common ground	38
Filament (2) to (7)	1.4

3Q5 TUBE

Plate (3) to common ground	98
Screen (4) to common ground	102
Filament (7) to (8)	1.38
Filament (2) to (8)	1.33

MODELS D1281,D3230
MODEL D2269

WESTERN AUTO SUPPLY CO.

MODEL D 2269

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.

Dummy antenna—.1 mf., .05 mf., .200 mmfd.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 KC.	.1 MFD.	Grid of 1N5GT I.F. tube	Rotor full open (Plates out of mesh)	C, D (See Fig. 1)	Output I.F.	Adjust to maximum output
See Note "A"	455 KC.	.1 MFD.	Grid of 1A7GT tube	Rotor full open (Plates out of mesh)	A, B (See Fig. 1)	Input I.F.	Adjust to maximum output
BROAD-CAST	1600 KC.	.05 MFD.	Grid of 1N5GT R.F. tube	Rotor full open (Plates out of mesh)	E gang-rear	Oscillator	Adjust to maximum output
	1400 KC.	.05 MFD.	Grid of 1N5GT R.F. tube	Set dial at 1400 KC.	F	R.F.	Adjust to maximum output
	1400 KC.	200 MMFD.	ANT. LEAD	Set dial at 1400 KC.	G	Antenna	Adjust to maximum output

This is all that is necessary for the alignment unless the plates of the gang have been bent out of shape. In case of bent plates, set the signal generator and receiver to 600 KC and bend the plates into the position for maximum output.

Attenuate the signal fro the signal generator to prevent the leveling-off action of he AVC. After each band is completed, repeat the procedure as a final check.

NOTE "A"—Use battery operation for all adjustments.

Frequency Range 540 to 1600 K.C.

Power output (on batteries) .27 watt undistorted—.35 watt maximum.

Power output (AC-DC) .27 watt undistorted — .35 watt maximum.

Intermediate Frequency 455 K.C. Power consumption 25 watts.

D 3230

FORMERLY MODEL D 1281

PLEASE NOTE THAT ALTHOUGH OUR D3230(FORMERLY D1281) AND OUR D3130(FORMERLY D1181) USE THE SAME FACTORY MODEL NUMBER THEY DIFFER IN THAT THE D3230 USES A PERMEABILITY TUNED R.F. COIL.

ALIGNMENT PROCEDURE

- Volume control - Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.

Dummy antennas—.1 mf., .05 mf.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 KC.	.1 MFD.	Grid of 1N5GT I.F. tube	Rotor full open (Plates out of mesh)	C, D (See Fig. 1)	Output I.F.	Adjust to maximum output
See Note "A"	455 KC.	.1 MFD.	Grid of 1A7GT tube	Rotor full open (Plates out of mesh)	A, B (See Fig. 1)	Input I.F.	Adjust to maximum output
BROAD-CAST	1600 KC.	.05 MFD.	Grid of 1N5GT R.F. tube	Rotor full open (Plates out of mesh)	E gang-rear	Oscillator	Adjust to maximum output
	1400 KC.	.05 MFD.	Grid of 1N5GT R.F. tube	Set dial at 1400 KC.	F	R.F.	Adjust to maximum output
See Note "B"	1400 KC.	Loop Radiator	No connection to radio	Set dial at 1400 KC.	G	Antenna	Adjust to maximum output

This is all that is necessary for the alignment unless the plates of the gang have been bent out of shape. In case of bent plates, set the signal generator and receiver to 600 KC and bend the plates into the position for maximum output.

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC. After each band is completed, repeat the procedure as a final check.

NOTE "A"—Use battery operation for all adjustments.

NOTE "B"—Use three turn loop, in series with 400 ohm resistor, connected to signal generator output.

Frequency Range 540 to 1600 K.C.

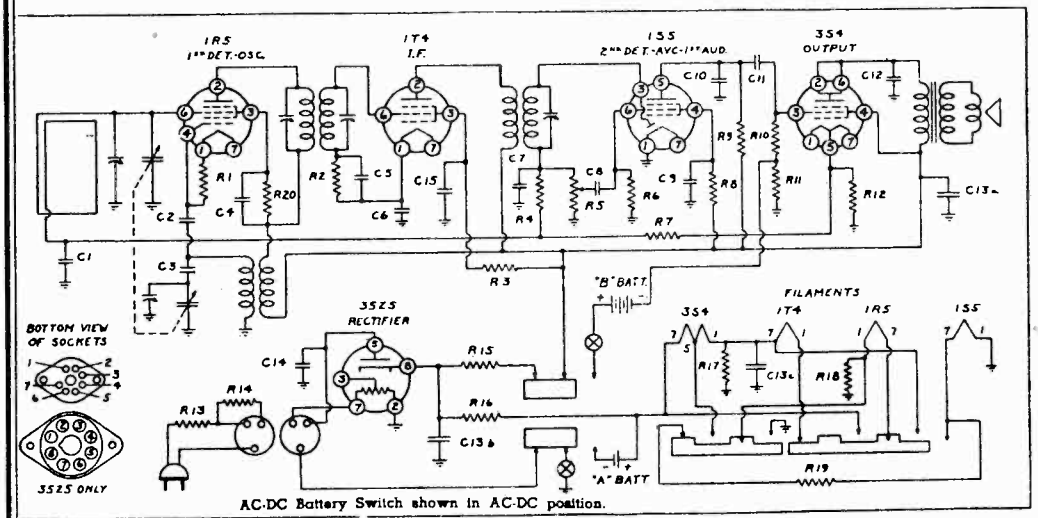
Power output (on batteries) .27 watt undistorted—.35 watt maximum.

Power output (AC-DC) .27 watt undistorted — .35 watt maximum.

Intermediate Frequency 455 K.C. Power consumption 25 watts.

MODELS D1183, D3123

WESTERN AUTO SUPPLY CO.



AC-DC Battery Switch shown in AC-DC position.

RESISTORS

No.	Ohms	Watts
R1	100,000	¼
R2	5,000,000	½
R3	25,000—10%	½
R4	5,000,000—10%	½
R5	1,000,000	V.C.
R6	10,000,000	¼
R7	10,000,000—10%	½
R8	4,000,000	¼
R9	1,000,000	½
R10	2,000,000	½
R11	750—10%	¼
R12	3,000—10%	¼
R13	80 } part of	
R14	350 } line cord	
R15	2,000—10%	½
R16	1,750—10%	4
R17	1,700—10%	¼
R18	1,000—10%	¼
R19	55—10% (wire wound)	½
R20	10,000	¼

CONDENSERS

No.	Capacity (Mfd.)	Volts
C1	.05	200
C2	.0001	Mica
C3	.000410-2%	Mica
C4	.01	120
C5	.01	120
C6	.1	120
C7	.00025	Mica
C8	.01	200
C9	.05	200
C10	.00005	Mica
C11	.005	200
C12	.01	200
C13a	20.	150
C13b	30.	150
C13c	100.	12
C14	.05	400
C15	.01	120

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 KC.	.1 MFD.	Grid of 1T4 I.F. tube	Rotor full open (Plates out of mesh)	One Trimmer on End of Chassis	Output I.F.	Adjust to maximum output
See Note "A"	455 KC.	.1 MFD.	Grid of 1R5 tube	Rotor full open (Plates out of mesh)	Two Trimmers on Side of Chassis	Input I.F.	Adjust to maximum output
BROAD-CAST	1630 KC.		Inductive Coupled	Rotor full open (Plates out of mesh)	Upper Section, Side of Gang	Oscillator	Adjust to maximum output
See Note "B"	1400 KC.		Inductive Coupled	Set dial at 1400 KC.	Lower Section, Side of Gang	Antenna	Adjust to maximum output

NOTE "A"—Use battery operation for all adjustments.

NOTE "B"—Align broadcast band with chassis in cabinet and loop antenna connected.

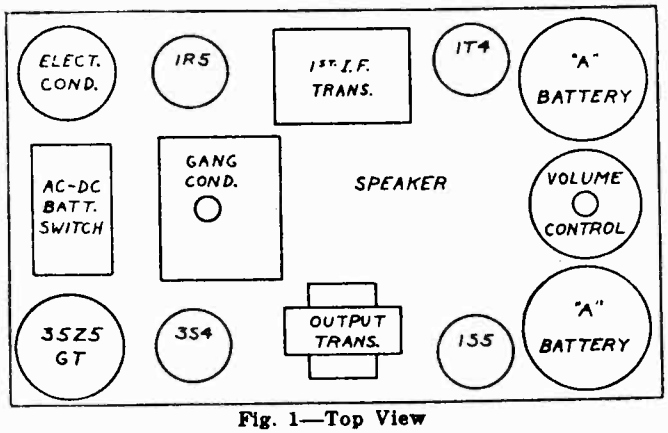


Fig. 1—Top View

VOLTAGE CHART

	Volts
1R5 TUBE	
Plate (2) to ground	66
Screen (3) to ground	45
Filament (7) to (1)	1.4
1T4 TUBE	
Plate (2) to ground	66
Screen (3) to ground	45
Filament (7) to (1)	1.3
1S5 TUBE	
Filament (7) to (1)	1.3
3S4 TUBE	
Plate (2) or (6) to ground	66
Screen (4) to ground	67.5
Filament (1) to (5)	1.3
Filament (7) to (5)	1.3
35Z5 TUBE	
Cathode (8) to ground	90
Filament (7) to ground	37.5 (AC)

SERVICE INFORMATION

Speaker (Part No. P4620A) 3" PM Type

D.C. voice coil resistance.....2.8 ohms
Voice coil impedance at 400 cycles.....3.0 ohms

Oscillator Coil (Part No. P4722)

Looking at the connection end in a clockwise direction starting at the mounting bracket the terminals are: No. 1, ground (direct to mounting bracket). No. 2, plate; No. 3, B+; No. 4, grid.

Primary—No. 2 and No. 3—Resistance.....3.4 ohms
Secondary—No. 1 and No. 4—Resistance....2.6 ohms

First I.F. Transformer (Part No. P4610)

The primary leads are on one end (opposite sides) and the secondary leads on the other end. The red dots indicate the end of the windings. The primary and secondary windings are identical.

Resistance (primary or secondary).....16.7 ohms

Second I.F. Transformer (Part No. P4712)

Looking at the coil starting at the lug nearest the red dot in a clockwise direction, the terminals are: No. 1, start of pri.; No. 2, start of sec.; No. 3, end of sec.; No. 4, end of pri.

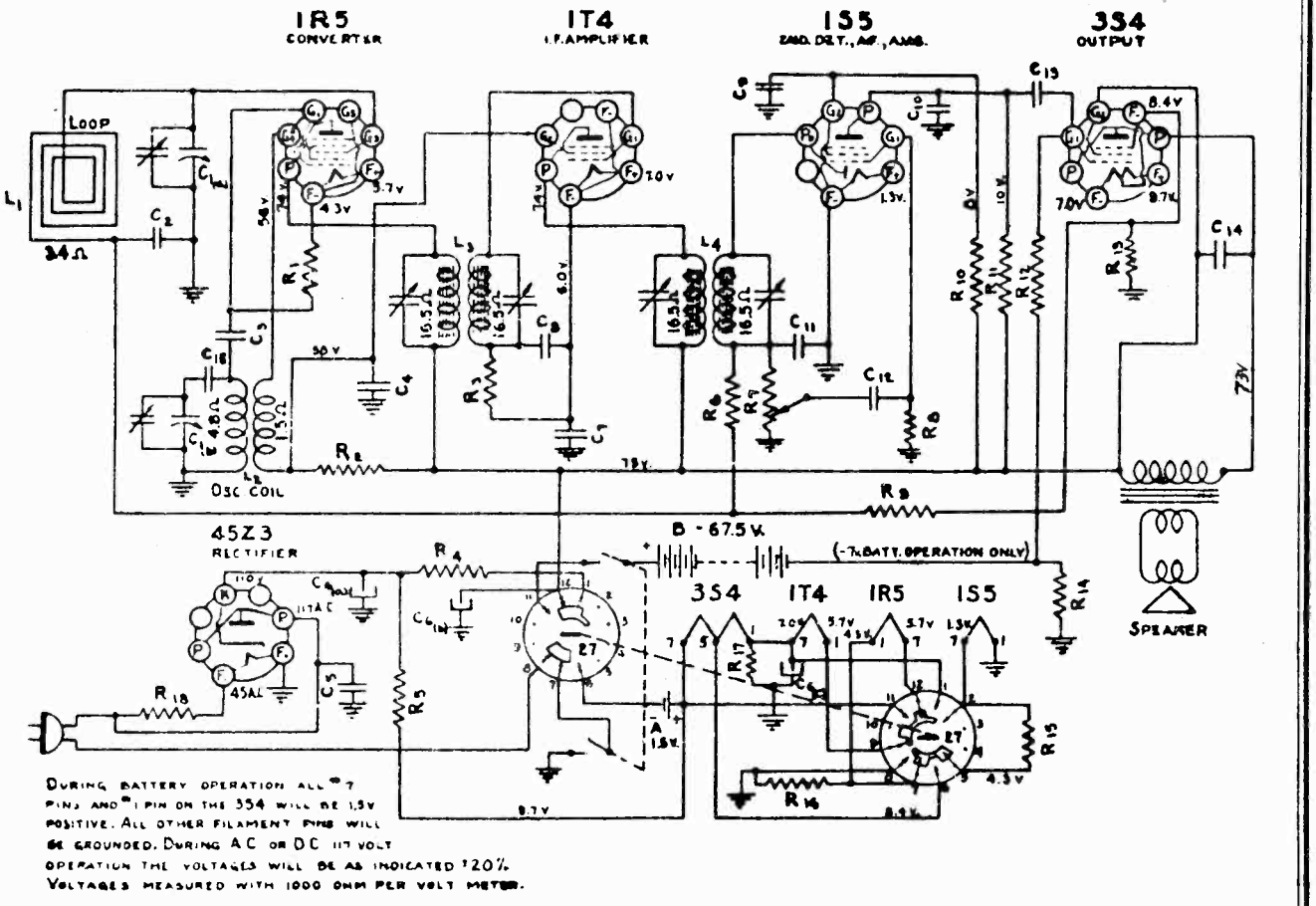
Primary—No. 1 and No. 4—Resistance.....43.3 ohms
Secondary—No. 2 and No. 3—Resistance....34.2 ohms

Power Change Switch

The power change switch connects the tube filaments in series (7½ volt) on AC-DC operation and parallel (1½ volt) on battery operation.

MODELS D1184, D3124

WESTERN AUTO SUPPLY CO.



Chassis Parts

L2	Coil, Oscillator
R18	Cord Line with Plug, 960 OHM @ .075 AMP
	Cam—Latch
R7	Control—Volume
R1	Resistor—100M 1/3 Watt
R11	Resistor—1 MEG 1/3 Watt
R12	Resistor—2 MEG 1/3 Watt
R6, R10	Resistor—4 MEG 1/3 Watt
R3	Resistor—5 MEG 1/3 Watt
R8	Resistor—10 MEG 1/3 Watt
R9	Resistor—6 MEG 1/3 Watt
R15	Resistor—55 Ohm, ½ Watt
R14	Resistor—700 Ohm, 1/3 Watt
R5	Resistor—2200 Ohm, Wire Wound
R16	Resistor—1M 1/3 Watt
R17	Resistor—1700 Ohm, 1/3 Watt
R13	Resistor—3M 1/3 Watt
R4	Resistor—3M 1 Watt
R2	Resistor—5M 1/3 Watt
C1	Condenser—Variable
C6,A,B,C	Condenser—Elect 30 Mfd-150V, 20 Mfd-150V, 100 Mfd- 12V
C4, C8	Condenser—Paper— .01-120V
C7	Condenser—Paper— .25- .75V
C13	Condenser—Paper—.005-600V
C2, C9	Condenser—Paper— .05-200V
C14	Condenser—Paper— .01-400V
C5	Condenser—Paper— .05-400V
C12	Condenser—Paper—.001-600V
C11	Condenser—Mica 250 MMF
C10	Condenser—Mica 50 MMF
C3	Condenser—Mica 100 MMF
C15	Condenser—Mica 485±2% MMF.
	Insulation—Bottom Shield
	Insulation—I. F. Transformers
	Latch

ALIGNMENT PROCEDURE

GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TRIMMERS TO TUNE	REMARKS
IF 455 K. C.	1R 5 Grid	.1 Mfd	H. F. End	IF Transformers 4 Trimmers	Tune to Max.
1600 KC	1R 5 Grid		H. F. End (1600)	Oscillator Trimmer	Set limit of band
1400 K. C.	Standard Loop or single turn from generator loosely coupled		1400	Antenna Trimmer	Tune to Max.

Repeat above Alignment Procedure at least once more.

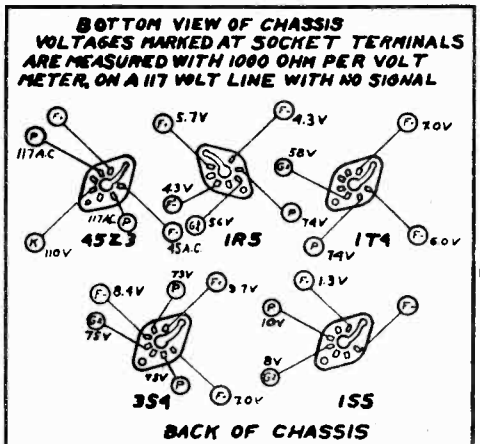


Figure 3

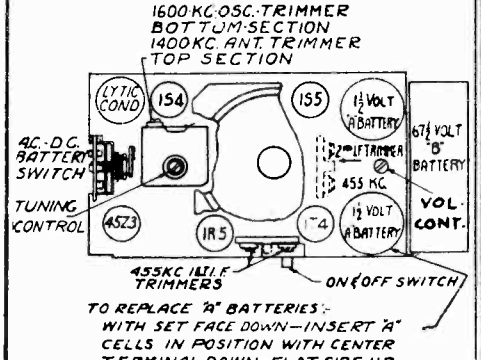
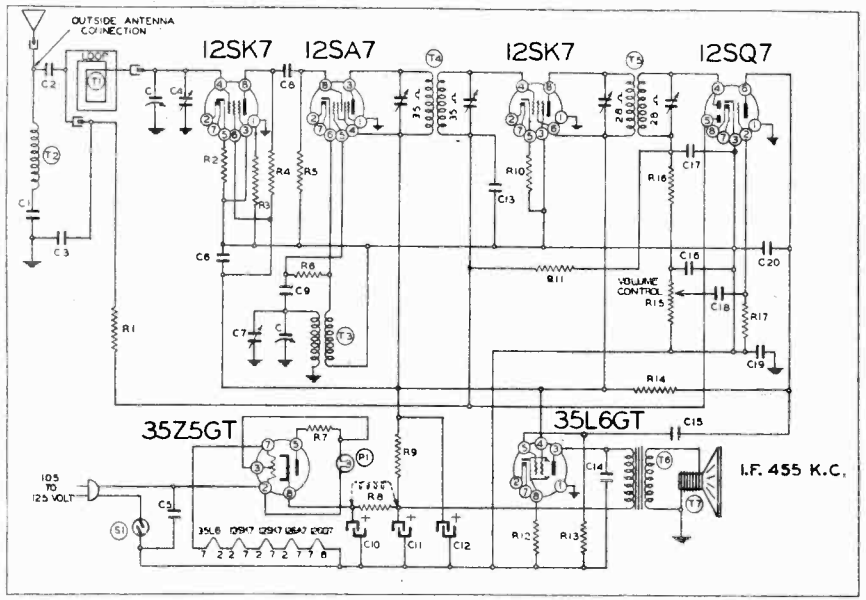


Figure 1



NOTE: On some sets R8 is replaced by a speaker field; R9 is also eliminated and C11 and C12 are connected in parallel.

Part No.	Circuit Diagram Reference	Description	List Price Each
		CONDENSERS	
1001	C5	.1 x 400 Volt Tubular Condenser	.25
1006	C6	.25 x 200 Volt Tubular Condenser	.25
1009	C13	.05 x 200 Volt Tubular Condenser	.25
10011	C1	.01 x 400 Volt Tubular Condenser	.25
10025	C18	.002 x 600 Volt Tubular Condenser	.25
10026	C3, C14	.02 x 400 Volt Tubular Condenser	.25
100106	C15	.004 x 600 Volt Tubular Condenser	.25
100110	C19	.2 x 400 Volt Tubular Condenser	.25
11994	C10, C11, C12	40 Mfd.—20 Mfd.—20 Mfd.—Electrolytic Condenser (For 60 Cycles)	1.50
11995	C10, C11, C12	60 Mfd.—40 Mfd.—40 Mfd.—Electrolytic Condenser (For 25 Cycles)	2.00
NOTE: 11995 not needed for 25 cycles when set uses electrodynamic speaker.			
1295	C8, C9, C17, C20	.0001 Mica Type Condenser—20%	.25
12939	C16	.00005 Mica Type Condenser—20%	.25
129132	C2	.000125 Mica Type Condenser—5%	.25

		RESISTORS	
1303	R13	500M Ohm—½ Watt Resistor—20%	.20
1304	R11	3 Megohm—½ Watt Resistor—20%	.20
1309	R14	200M Ohm—½ Watt Resistor—20%	.20
13012	R16	50M Ohm—½ Watt Resistor—20%	.20
13020	R5	100M Ohm—½ Watt Resistor—20%	.20
13094	R6	50M Ohm—½ Watt Resistor—10%	.20
130100	R1, R3	150M Ohm—½ Watt Resistor—20%	.20
130166	R10, R12	150 Ohm—½ Watt Resistor—10%	.20
130168	R2	100 Ohm—½ Watt Resistor—10%	.20
130215	R7	25 Ohm—½ Watt Resistor—10%	.20
130218	R4	5M Ohm—½ Watt Resistor—10%	.20
130257	R17	5 Megohm—½ Watt Resistor—25%	.20
130287	R9	1200 Ohm—1 Watt Resistor—10%	.20
130296	R8	200 Ohm—1 Watt Resistor—10%	.20
1012f1	R15, S1	1 megohm—volume control and switch	1.00

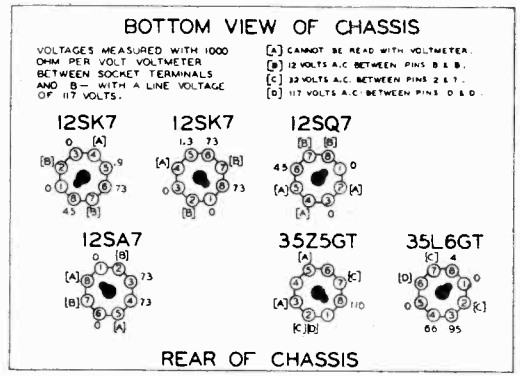


FIG. 1

ALIGNMENT PROCEDURE

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Four Trimmers on Top (See Fig. 1)	Output and Input I. F.	Adjust to maximum output
BROADCAST BAND	1650 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Trimmer bottom of rear section of gang. (See bottom of radio)	Broadcast Oscillator	Adjust to maximum output
	1400 Kc.	See Note "A"		Set dial at 1400 Kc.	Trimmer bottom of front section of gang. (See bottom of radio)	Broadcast Antenna	Adjust to maximum output

NOTE "A" Lay the output lead from the generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the generator.

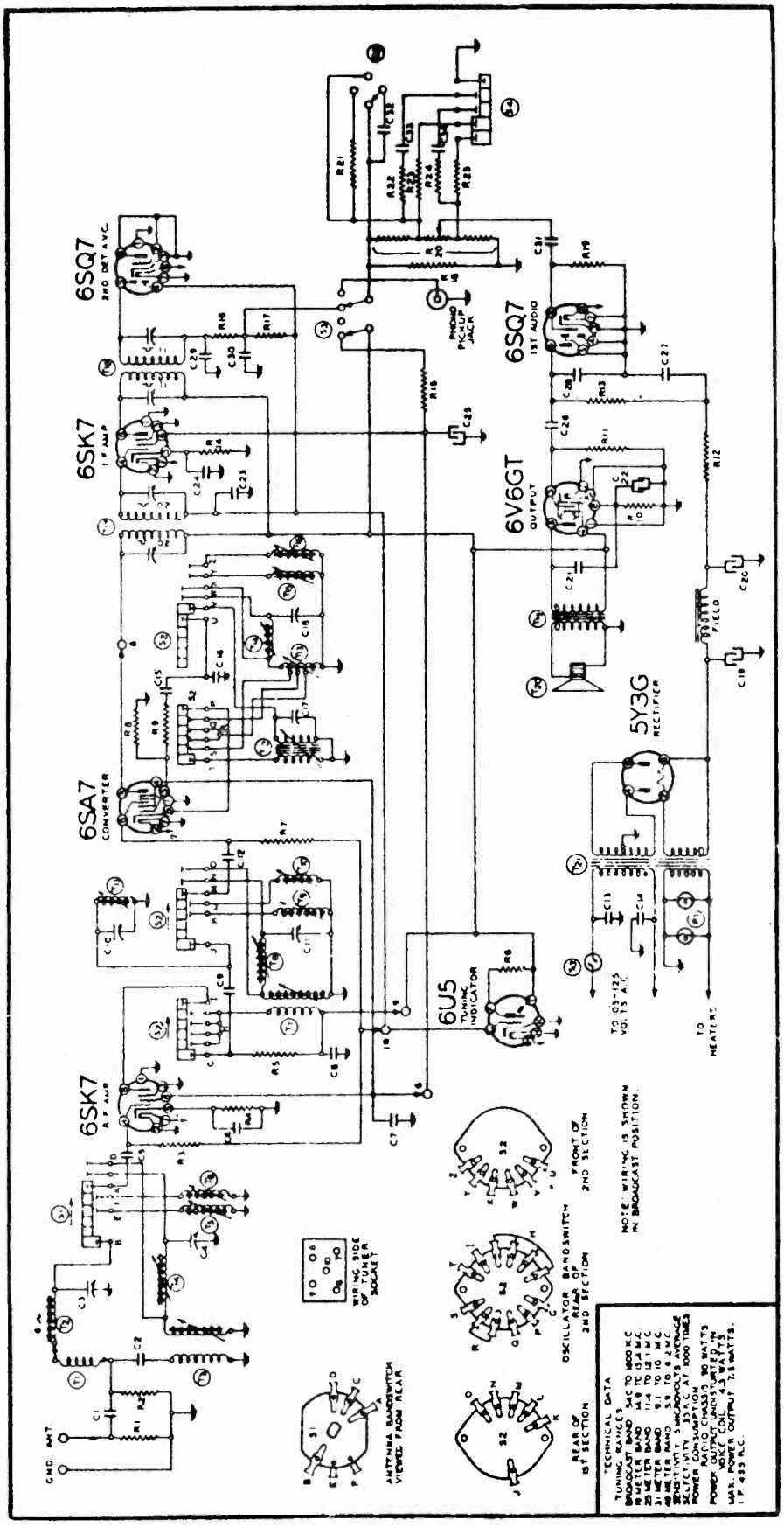
● Connect B— of radio chassis to ground post of signal generator through .1 Mfd. condenser.

FREQUENCY RANGE
530 to 1650 K.C.

Power Consumption ..... 35 Watts
Power Output ..... .1 Watt Undistorted, 1.7 Watts Maximum
Intermediate Frequency ..... 455 K.C.

MODEL D1210

WESTERN AUTO SUPPLY CO



MODEL D1210

WESTERN AUTO SUPPLY CO.

MAIN CHASSIS PARTS LIST

CONDENSERS

Part No.	Schematic Diagram Reference	Description	No. Used In Set	Selling Price Each
10019	C31	.006 x 600 V. Tubular Condenser	1	.25
10013	C26	.05 x 400 V. Tubular Condenser	1	.25
10065	C21	.015 x 600 V. Tubular Condenser	1	.25
10026	C23	.02 x 400 V. Tubular Condenser	1	.25
10020	C24	.1 x 200 V. Tubular Condenser	1	.25
10061	C13, C1	.02 x 600 V. Bakelite Condenser	2	.35
1002	C33	.0003 x 600 V. Tubular Condenser	1	.25
100139	C34	.0015 x 200 V. Tubular Condenser	1	.25
1001	C27	.1 x 400 V. Tubular Condenser	1	.25
11991B	C22	Electrolytic Filter Condenser—40 Mfd. x 25 Volts	1	.50
119109	C19, C20, C25	Electrolytic Filter Condenser—15 Mfd. x 450 V.; 15 Mfd. x 450 V.; 10 Mfd. x 350 V.	1	1.50
		or		
119109B	C19, C20, C25	Electrolytic Filter Condenser—15 Mfd. x 450 V.; 15 Mfd. x 450 V.; 10 Mfd. x 350 V.	1	1.50
12951	C32	.000125 Mica Type Condenser	1	.25
1295	C28	.0001 Mica Type Condenser	1	.25
1292	C1	.0005 Mica Type Condenser	1	.25
129165	C29, C30	.00005 Dual Mica Condenser	1	.25

RESISTORS

101277	R20	Volume Control—Less Shaft—(2.8 Megohm)	1	1.00
115829		Shaft for Volume Control	1	.05
13070	R14	500 Ohm—½	1	.20
13012	R12, R16	50M Ohm—½	2	.20
1304	R17	3 Megohm—½	1	.20
130227	R10	250 Ohm—1	1	.20
1303	R11, R18, R25	500M Ohm—½	3	.20
13011	R13	250M Ohm—½	1	.20
130257	R19	5 Megohm—½	1	.20
130191	R21	1.5 Megohm—½	1	.20
130351	R22	80M Ohm—½	1	.20
1307	R24	40M Ohm—½	1	.20
130352	R23	150M Ohm—½	1	.20
1301	R1, R2	25M Ohm—½	2	.20
10662	R15	Resistor Strip, 12,500 Ohms—3 Watts	1	.35

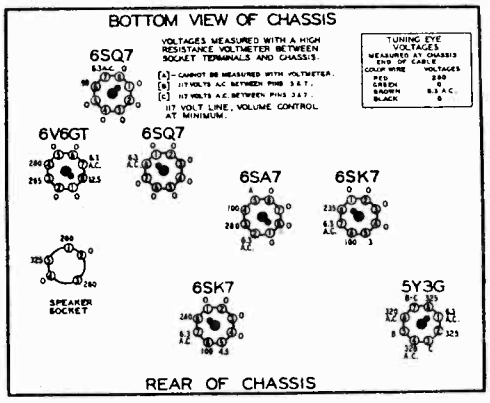
TUNER CHASSIS PARTS LIST

CONDENSERS

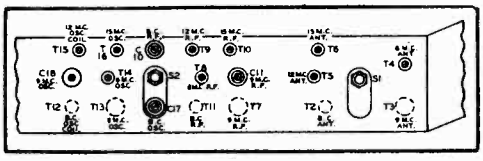
10020	C6	.1 x 200 Volt Tubular Condenser	1	.25
10047	C2	.002 x 600 Volt Tubular Condenser	1	.25
10074	C7, C8	.1 x 400 Volt Tubular Condenser	2	.35
124138	C11	9 Mc., R.F. Adjustable Trimmer Condenser	1	.20
124139	C10	B.C., R.F. Adjustable Trimmer Condenser	1	.25
124143	C3, C4	B.C., and 9 Mc. Dual Adjustable Antenna Trimmer Condenser	1	.30
124144	C17	B.C. Oscillator Adjustable Trimmer Condenser	1	.20
124145	C18	9 Mc. Oscillator Adjustable Trimmer Condenser	1	.35
1292	C5, C12	.0005 Mica Type Condenser—20%	1	.25
12938	C15	.00005 Mica Type Condenser—10%	1	.25
129168	C9	.00001 Mica Type Condenser—20%	1	.25
129167	C16	.0002 Silver Mica Type Condenser—3%	1	.35

RESISTORS

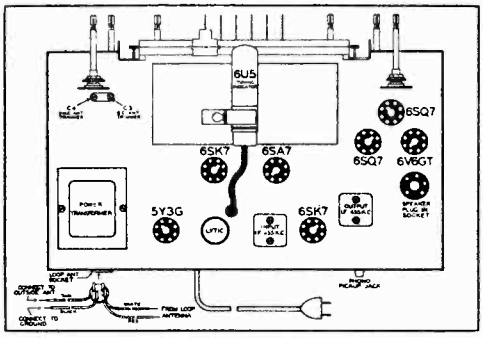
13019	R3, R7	1 Megohm—½ Watt Resistor—20%	1	.20
130218	R5	5M Ohm—½ Watt Resistor—10%	1	.20
130232	R8	25M Ohm—½ Watt Resistor—10%	1	.20
130239	R4	250 Ohm—½ Watt Resistor—10%	1	.20
	R6	1 Megohm—In Tuning Eye Cable	1	.20
130174	R9	50 Ohm—½ Watt Resistor	1	.20



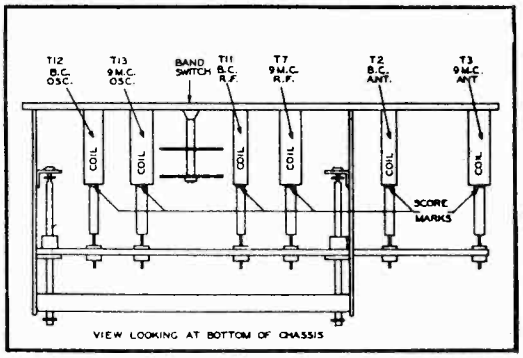
VOLTAGE CHART



TRIMMER VIEW



CHASSIS VIEW



IRON CORE ADJUSTMENT VIEW

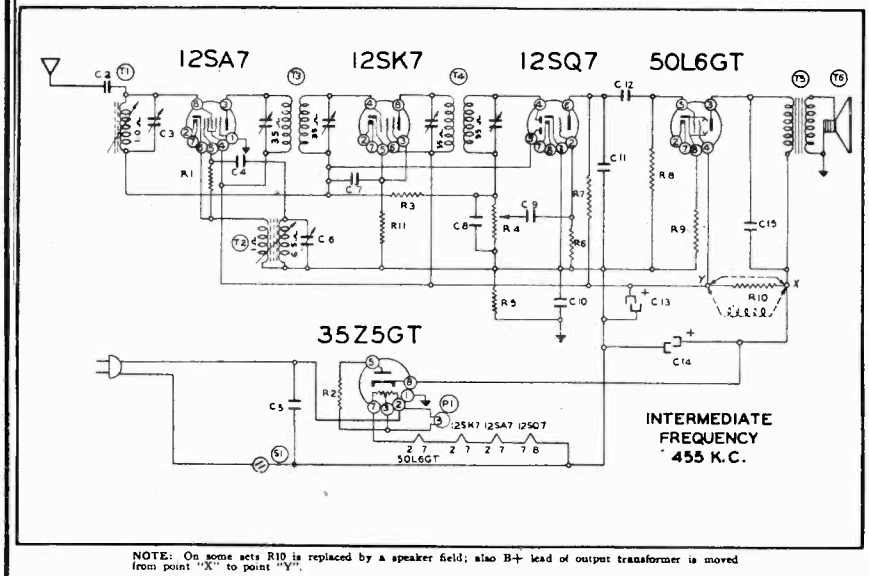
ALIGNMENT PROCEDURE

- Tone control—Treble.
- Volume control—Maximum all adjustments.
- Use an all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.

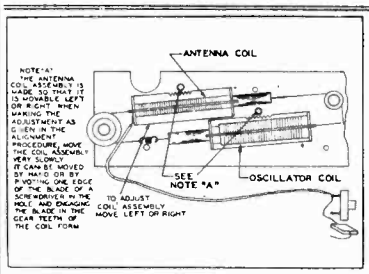
BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Band Switch	Dial Pointer Setting	Trimmers Adjusted To Maximum
I. F.	455 Kc.	.1 MFD.	Grid of 6SK7 (I.F.)	Broadcast	Set Dial at 1600 Kc.	On Top of Output I.F.
	455 Kc.	.1 MFD.	Grid of 6SA7	Broadcast	Set Dial at 1600 Kc.	On Top of Input I.F.
31 METER BAND	9.6 Mc.	400 ohms	Antenna lead	31M	Set Dial at 9.6 Mc.	(See Trimmer View) C18—Osc. (See Trimmer View) C11—R.F. (See Chassis View) C4—Ant.
49 METER BAND	6.1 Mc.	400 ohms	Antenna lead	49M	Set Dial at 6.1 Mc.	(See Trimmer View) T14—Osc. (See Trimmer View) T8—R.F. (See Trimmer View) T4—Ant.
25 METER BAND	11.8 Mc.	400 ohms	Antenna lead	25M	Set Dial at 11.8 Mc.	(See Trimmer View) T15—Osc. (See Trimmer View T9—R.F. (See Trimmer View) T5—Ant.
19 METER BAND	15.2 Mc.	400 ohms	Antenna lead	19M	Set Dial at 15.2 Mc.	(See Trimmer View) T16—Osc. (See Trimmer View) T10—R.F. (See Trimmer View) T6—Ant.
BROAD-CAST BAND	1600 Kc.	200 mmf.	Antenna lead	Broadcast	Set Dial at 1600 Kc.	(See Trimmer View) C17—Osc. (See Trimmer View) C10—R.F. (See Chassis View) C3—Ant.
	1400 Kc.	200 mmf.	Antenna lead	Broadcast	Set Dial at 1400 Kc.	Rotate Core T11—R.F. Rotate Core T2—Ant. (See Iron Core Adjustment View)

MODELS D1215,
D2210

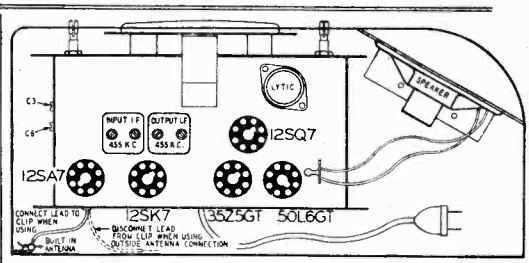
WESTERN AUTO SUPPLY CO.



NOTE: On some sets R10 is replaced by a speaker field; also B+ lead of output transformer is moved from point "X" to point "Y".

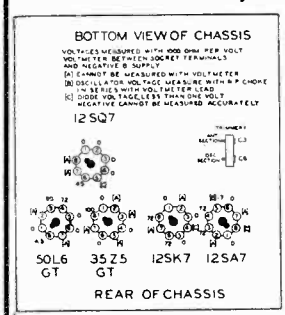


COIL ASSEMBLY VIEW



CHASSIS VIEW

Note: When using an outside aerial disconnect lead wire from clip and connect to outside aerial as shown above.



PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Replacement Parts List

Part No.	Schematic Diagram Reference	Description	No. Selling Used In Set	Price Each
		CONDENSERS		
1001	C5	.1 x 400 Volt Tubular Condenser	1	.25
1009	C7	.05 x 200 Volt Tubular Condenser	1	.25
10011	C15	.01 x 400 Volt Tubular Condenser	1	.25
10025	C9	.002 x 600 Volt Tubular Condenser	1	.25
10091	C10	.15 x 400 Volt Tubular Conednser	1	.25
10078	C12	.01 x. 200 Volt Tubular Condenser	1	.25
11992	C13, C14	Electrolytic Filter Condenser 20 Mfd. x 150 Volts; 40 Mfd. x 150 Volts	1	1.50
134150	C3, C6	Antenna and Oscillator Dual Trimmer Condenser	1	.35
12912	C8	.00025 Mica Type Condenser—20%	1	.25
17938	C4	.00005 Mica Type Condenser—10%	1	.25
129160	C11	.0004 Mica Type Condenser—20%	1	.35
129187	C2	.000025 Mica Type Condenser—20%	1	.25
		RESISTORS		
1305	R8	300M Ohm—½ Watt Resistor—20%	1	.20
13080	R5, R7	150M Ohm—½ Watt Resistor—10%	2	.20
130166	R9	150 Ohm—½ Watt Resistor—10%	1	.20
130170	R8	3 Megohm—½ Watt Resistor—25%	1	.20
130199	R10	1500 Ohm—1 Watt Resistor—10%	1	.20
130232	R1	25M Ohm—½ Watt Resistor—10%	1	.20
130257	R6	5 Megohm—½ Watt Resistor—25%	1	.20
130284	R2	25 Ohm—½ Watt Resistor—20%	1	.20
130168	R11	100 Ohm—½ Watt Resistor—20%	1	.20
		SOCKETS		
131318		Eight Prong Molded Octal Socket	5	.15
121216		Bakelite Socket Base for Filter Cond.	1	.10
		SPEAKER		
114213	T6	Four Inch Permanent Magnet Dynamic Speaker (Less Output Transformer)	1	2.75
		or		
114266		Four Inch Electrodynamic Speaker. (Less Output Transformer)	1	2.75
105117	T5	Output Transformer for Speaker	1	1.00
		COILS		
108157J	T2	Input I. F. Coil Complete in Can	1	1.00
108157K	T4	Output I. F. Coil Complete in Can	1	1.00
112827	T1, T3	Complete Tuning Assembly (Consisting of Antenna and Osc. Coils)	1	3.50
		MISCELLANEOUS		
10798		Line Cord and Plug	1	.50
101230	R4, S1	Volume Control and Switch (500M Ohm)	1	1.00
107249	P1	6-8 Volt Pilot Lite Bulb—Type T-47	1	.10
107344		Socket Assembly for Pilot Lite	1	.10
107205		Insulating Shield for Pilot Lite Socket	1	.02
128523-4		Knob—Mahogany	2	.10
		DIAL PARTS		
112822		Dial Scale	1	1.00
112824		Crystal for Dial Scale	1	.30
131211		Snap-in Rivets	7	.01
112825		Pointer	1	.15
120184		Coiled Tension Spring for Dial String	1	.05
128214		Silk Line Dial String	.15	Yd.
117809		Shaft for Pointer	1	.10
115647		Bracket for Dial	1	.30
115648		Support for Dial Bracket	1	.10
117808		Drive Shaft	1	.15
115594		Drive Bracket	1	.15

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect B— of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning.

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 Mfd., and 200 Mmf.

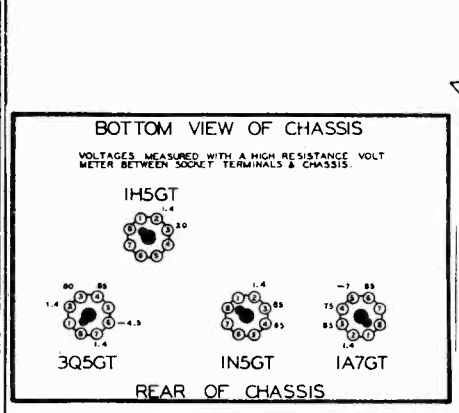
BAND	SIGNAL GENERATOR Frequency Setting	SIGNAL GENERATOR Dummy Antenna	Connection to Radio	Position of Iron Cores (Dial Setting)	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	455 Kc.	.1 MFD.	Connect to Grid of 12SA7	Iron Cores All the way out	Two trimmers on top of output I. F. can	Output I. F.	Adjust to maximum output
	455 Kc.	.1 MFD.	Connect to Grid of 12SA7	Iron Cores All the way out	Two trimmers on top of input I. F. can	Input I. F.	Adjust to maximum output
BROAD-CAST BAND	1720 Kc.	.1 MFD.	Connect to Grid of 12SA7	Iron Cores All the way out	Trimmer (C6) (See chassis view)	Oscillator	Adjust to maximum output
	1720 Kc.	200 MMF.	Connect to Outside Antenna Lead	Iron Cores All the way out	Trimmer (C3) (See chassis view)	Antenna	Adjust to maximum output
	1400 Kc.	200 MMF.	Connect to Outside Antenna Lead	Turn Dial to 1400 Kc.	Adjust position of antenna coil (See coil assembly view)	Antenna Coil Adjustment	Adjust to maximum output (See Note "A")
	1720 Kc.	200 MMF.	Connect to Outside Antenna Lead	Turn Dial to 1720 Kc.	Adjust trimmer (C3) (See chassis view)	Antenna	Check for tracking (See Note "B")

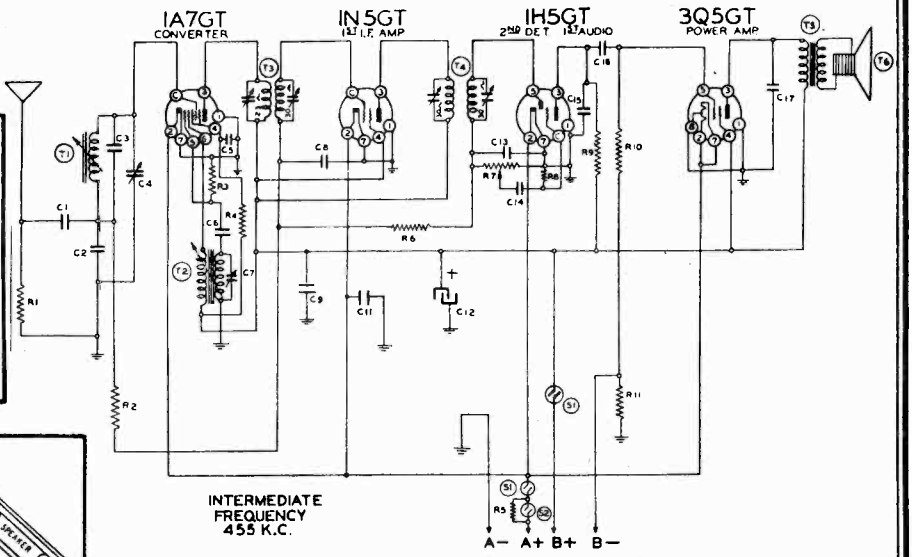
NOTE "A"—The antenna coil assembly is made so that it is movable. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

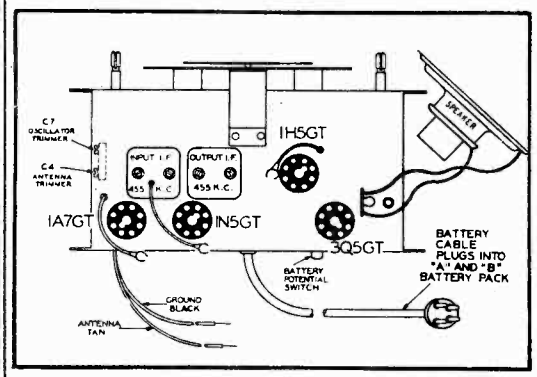
NOTE "B"—After the antenna coil has been tracked at 1400 Kc, it is necessary to check the antenna trimmer (C3) adjustment again at 1720 Kc. If no appreciable change in trimmer adjustment is made the coil is in track. If the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1720 Kc.

WESTERN AUTO SUPPLY CO.

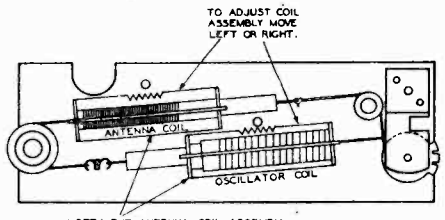
MODELS D1224, D2261







CHASSIS VIEW



NOTE: THE ANTENNA COIL ASSEMBLY IS MADE SO THAT IT IS MOVABLE LEFT OR RIGHT. WHEN MAKING THE ADJUSTMENT AS GIVEN IN THE ALIGNMENT PROCEDURE MOVE COIL ASSEMBLY VERY SLOWLY

COIL ASSEMBLY VIEW

ALIGNMENT PROCEDURE

The following equipment is required for aligning.

- Dummy antenna .1 mfd. and 200 mmf.
- Volume control—Maximum all adjustments.
- Connect ground lead of radio chassis to ground post of signal generator.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Iron Cores (Dial Setting)	Trimmers Adjusted (in Order Shown)	Trimmer Function	Ajustment
455 Kc. I. F.	455 Kc.	.1 MFD.	Connect to Grid of 1A7	Iron Cores All the way out	Two trimmers on top of output I. F. can	Output I. F.	maximum output
	455 Kc.	.1 MFD.	Connect to Grid of 1A7	Iron Cores All the way out	Two trimmers on top of input I. F. can	Input I. F.	maximum output
BROAD-CAST BAND	1700 Kc.	.1 MFD.	Connect to Grid of 1A7	Iron Cores All the way out	Trimmer (C7) (See chassis view)	Oscillator	maximum output
	1700 Kc.	200 MMF.	Connect to Antenna	Iron Cores All the way out	Trimmer (C4) (See chassis view)	Antenna	maximum output
	1400 Kc.	200 MMF.	Connect to Antenna	Turn Dial to 1400 Kc.	Adjust position of antenna coil (See coil assembly view)	Antenna Coil Adjustment	maximum output (See Note "A")
	1700 Kc.	200 MMF.	Connect to Antenna	Turn Dial to 1700 Kc.	Adjust Trimmer (C4) (See chassis view)	Antenna	Check for tracking (See Note "B")

NOTE "A"—The antenna coil assembly is made so that it is movable. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

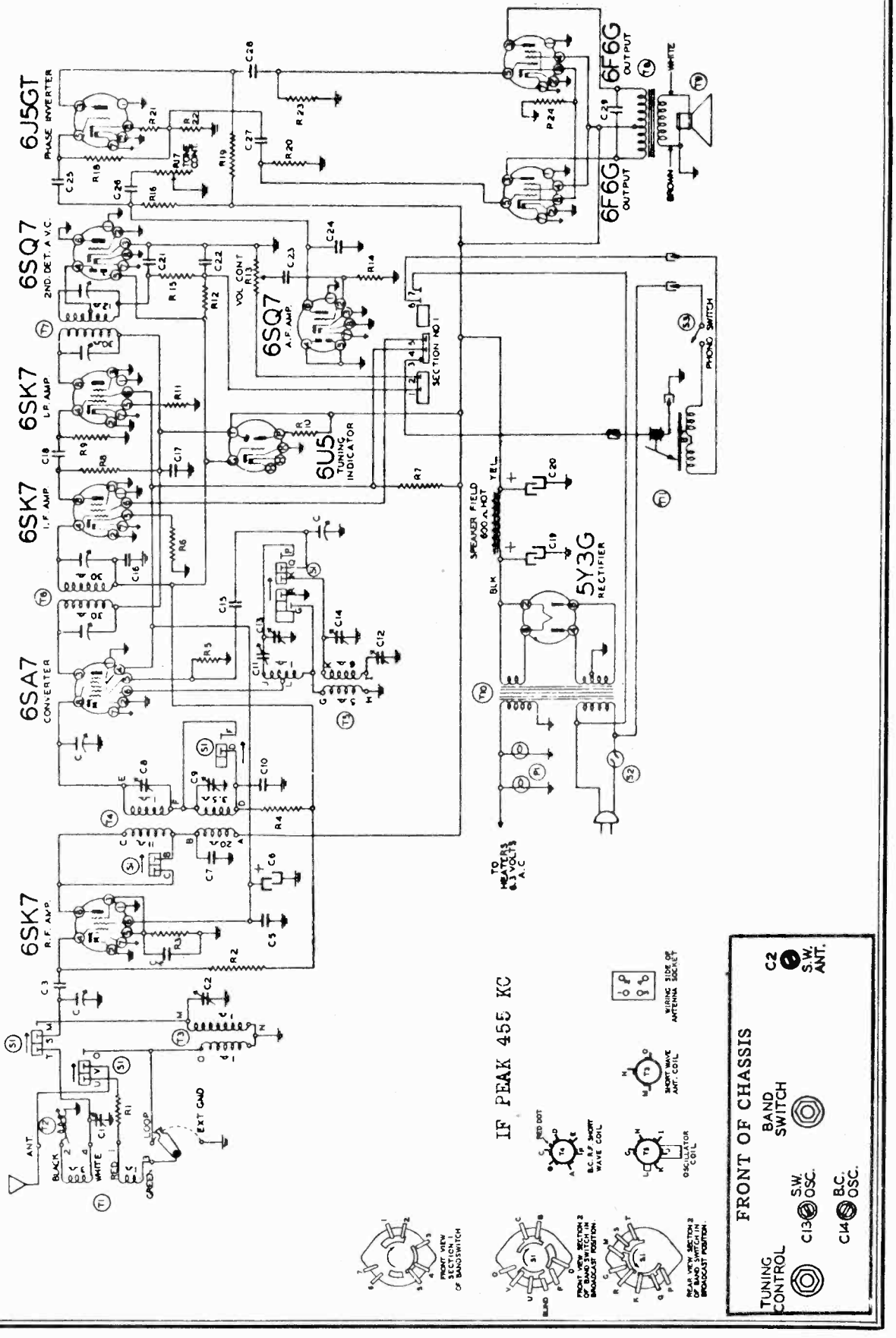
NOTE "B"—After the antenna coil has been tracked at 1400 Kc. it is necessary to check the antenna trimmer (C4) adjustment again at 1700 Kc. If no appreciable change in trimmer adjustment is made the coil is in track, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1700 Kc.

Part No.	Schematic Reference	Description	No. Used	Price Each
		CONDENSERS		
1007	C17	.005 Mfd. x 600 Volt Tubular Condenser	1	.25
1006	C9	.25 Mfd. x 200 Volt Tubular Condenser	1	.25
10012	C14	.003 Mfd. x 600 Volt Tubular Condenser	1	.25
10017	C11	.5 Mfd. x 120 Volt Tubular Condenser	1	.35
10022	C5, C8	.05 Mfd. x 200 Volt Tubular Condenser	2	.25
10026	C16	.02 Mfd. x 400 Volt Tubular Condenser	1	.25
100112	C2	.001 Mfd. x 200 Volt Tubular Condenser	1	.25
119117	C12	Electrolytic Filter Condenser—10 Mfd. x 150 Volts	1	.40
124165	C4, C7	Dual Trimmer Condenser. Ant. and Oscillator	1	.25
12912	C6	.00025 Mica Type Condenser—20%	1	.25
12940	C13, C15	.0001 Mica Type Condenser—10%	2	.25
129114	C1	.0003 Mica Type Condenser—20%	1	.25
129177	C3	.000045 Ceramicon Condenser—5%	1	.35
		RESISTORS		
1304	R2, R6	3 Megohm—½ Watt Resistor—20%	2	.20
1309	R3	200M Ohm—½ Watt Resistor—20%	1	.20
13068	R9	1 Megohm—½ Watt Resistor—10%	1	.20
13079	R11	400 Ohm—½ Watt Resistor—10%	1	.20
13082	R1	10M Ohm—½ Watt Resistor—10%	1	.20
130194	R4	35M Ohm—½ Watt Resistor—10%	1	.20
130257	R8	5 Megohm—½ Watt Resistor—25%	1	.20
130346	R5	.56 Ohm—½ Watt Wire Wound Resistor—5%	1	.20
130146	R10	2 Megohm—½ Watt Resistor—10%	1	.20

Part No.	Schematic Reference	Description	No. Used	Price Each
		SOCKETS		
121210		Eight Prong Molded Octal Socket	4	.15
		COILS		
13613	T1, T2	Permeability Tuning Unit Complete with Antenna and Oscillator Coils	1	3.50
108202B	T3	Input I.F. Coil Complete in Can	1	1.25
108153C	T4	Output I.F. Coil Complete in Can	1	1.25
		SPEAKER		
114213	T6	Four Inch P.M. Dynamic Speaker—Less Output Transformer	1	2.00
10591C	T5	Output Transformer for Speaker	1	.75
		DIAL PARTS		
112924		Dial Scale	1	1.00
112824		Crystal for Dial	1	.30
131211		Snap-in Rivets for Dial	6	.01
112825		Pointer	1	.15
1209		String for Dial	1'	Yd. .15
120184		Coiled Tension Spring for Dial String	1	.05
115647		Bracket and Support for Dial	1	.30
		MISCELLANEOUS		
101210	R7, S1	Volume Control and Switch	1	1.00
107364	S2	Battery Cable Assembly	1	.50
12988B		Battery Potential Switch	1	.25
128775		Metal Cabinet (Walnut)	1	
128790B		Back for Cabinet	1	
128523-14		Knob—Without Dot	1	.10
128523C-14		Knob—With Dot	1	.10

MODELS D1250

WESTERN AUTO SUPPLY CO.



MODELS D1250

WESTERN AUTO SUPPLY CO.

Part No.	Schematic Diagram Reference	Description	No. Used In Set	Price Each
CONDENSERS				
102129B	C	Three Gang Variable Condenser	1	4.00
'0020	C4	.1 x 200 Volt Tubular Condenser	1	.25
10026	C10, C16, C25	.02 x 400 Volt Tubular Condenser	3	.25
10025	C23	.002 x 600 Volt Tubular Condenser	1	.25
1009	C27	.05 x 200 Volt Tubular Condenser	1	.25
10013	C28	.05 x 400 Volt Tubular Condenser	1	.25
10011	C26	.01 x 400 Volt Tubular Condenser	1	.25
10071	C29	.004 x 600 Volt Tubular Condenser	1	.25
100117	C5, C17	.25 x 400 Volt Tubular Condenser	2	.35
119124	C6, C19, C20	Electrolytic Filter Condenser—10 Mfd. x 350 V.; 25 Mfd. x 450 V.; 25 Mfd. x 450 V.	1	1.50
124117	C2	S.W. Antenna Trimmer	1	.20
124131	C8,C9	S.W. and B.C. R.F. Trimmer—Dual	1	.35
124130	C13, C14	S.W. and B.C. Osc. Trimmer—Dual	1	.35
124132	C1	B.C. Antenna Trimmer	1	.20
129157	C12	.000525 Compression Cond.—B.C. Pad	1	.35
1292	C3, C18	.0005 Mica Type Condenser—20%	2	.25
129160	C7	.0004 Mica Type Condenser—20%	1	.35
12939	C15	.00005 Mica Type Condenser—20%	1	.25
1295	C21, C22	.0001 Mica Type Condenser—2%	2	.25
129156	C11	.0024 Compression Mica Condenser	1	.50
12912	C24	.00025 Mica Type Condenser—20%	1	.25
TRANSFORMERS				
10554B	T8	Output Transformer for Speaker	1	1.50
104202C	T10	Power Transformer, 50 to 60 Cycles 105-125 Volt Primary	1	4.50
104203C		Power Transformer 25 to 60 Cycles 105-125 Volt Primary		
RECORD CHANGER COMPARTMENT				
104297	S2	Automatic Record Changer Complete (N-200) 115 Volts A.C. 60 Cycles L-26 Cartridge	1	
10794	P2	Indicator Light Bulb	1	.10
107388		Socket Assembly for Pilot Lite	1	.35

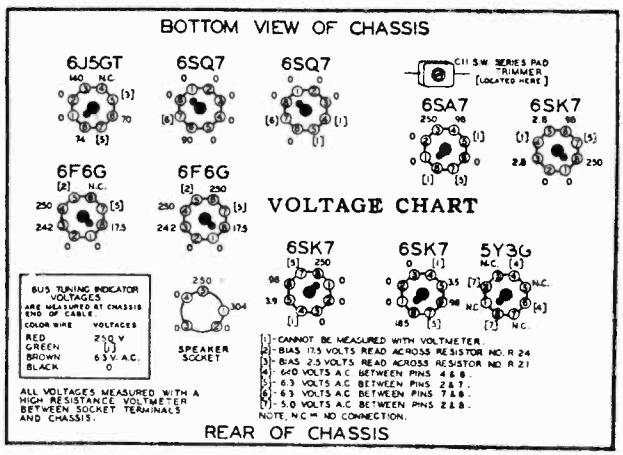
Part No.	Schematic Diagram Reference	Description	No. Used In Set	Price Each
SPEAKER				
114275	T9	Ten Inch Electrodynamic Speaker (Less Output Transformer)	1	6.00
RESISTORS				
101278	R13, S2	Volume Control and Switch (500M Ohms) Less Shaft	1	1.25
101279	R17	Tone Control (1 Megohm) Less Shaft	1	.90
115834		Shaft Only For Volume and Tone Controls	2	.05
13019	R2, R18	1 Megohm—½ Watt Resistor—20%	2	.20
1305	R4	300M Ohm—½ Watt Resistor—20%	1	.20
130208	R5	40M Ohm—½ Watt Resistor—20%	1	.20
13054	R6, R11	500 Ohm—½ Watt Resistor—20%	2	.20
130263	R8	12M Ohm—½ Watt Resistor—20%	1	.20
13020	R9, R19, R22	100M Ohm—½ Watt Resistor—20%	3	.20
130304	R7	12M Ohm—2 Watt Resistor—10%	1	.20
13012	R15	50M Ohm—½ Watt Resistor—20%	1	.20
130170	R12	3 Megohm—½ Watt Resistor—25%	1	.20
130257	R14	5 Megohm—½ Watt Resistor—30%	1	.20
13043	R21	2500 Ohm—½ Watt Resistor—20%	1	.20
1303	R20, R23	500M Ohm—½ Watt Resistor—20%	2	.20
13011	R16	250M Ohm—½ Watt Resistor—20%	1	.20
130311	R24	300 Ohm—1 Watt Resistor—20%	1	.20
13099	R3	300 Ohm—½ Watt Resistor—20%	1	.20
13024	R1	400 Ohm—½ Watt Resistor—20%	1	.20
	R10	1 Megohm—In Eye Socket	1	.20
COILS				
108169K	T6	Input I. F. Coil Complete in Can	1	1.00
108130G	T7	Output I.F. Coil Complete in Can	1	1.25
10957	T4	B.C.—S.W. R.F. Coil Complete in Can	1	1.25
110149	T5	B.C.—S.W. Oscillator Coil	1	.75
111176	T3	S.W. Antenna Coil	1	.50
111153	T2	Loop Adjusting Coil With Iron Slug	1	.50
111257B	T1	Loop Antenna Assembly	1	2.00

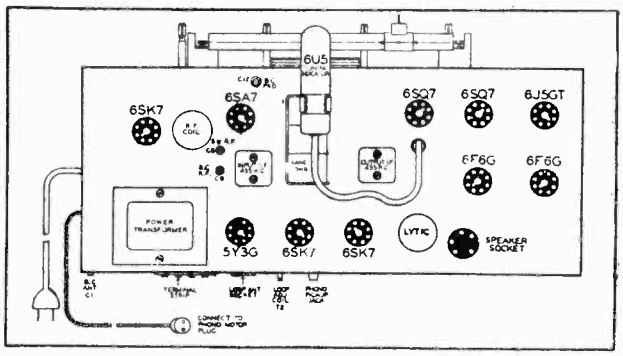
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Alignment Procedure

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Band Switch	Variable Condenser Setting	Trimmers Adjusted to Max mum (in Order Shown)
I. F.	455 Kc.	.1 MFD.	Grid of 6SK7 I. F.	Broadcast	Rotor full open (Plates out of mesh)	Two trimmers on top Output I. F.
	155 Kc.	.1 MFD.	Grid of 6SA7 Mixer	Broadcast	Rotor full open (Plates out of mesh)	Two trimmers on top Input I. F.
SHORT WAVE BAND	17 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 17 Mc.	C13, S.W. Osc.
	17 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 17 Mc.	C8, S.W. R.F., C2 S.W. Antenna
	6 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 6 Mc.	C11 S.W. Osc. Series Pad See Note "A"
BROAD-CAST BAND	1580 Kc.	200 mmf.	Grid of 6SK7 R. F. Tube	Broadcast	Rotor full open (Plates out of mesh)	C14 B.C. Osc.
	540 Kc.	200 mmf.	Grid of 6SK7 R. F. Tube	Broadcast	Set Dial at 540 Kc. (Plates in Mesh)	C12 B.C. Osc. Series Pad
	1400 Kc.	200 mmf.	Grid of 6SK7 R. F. Tube	Broadcast	Set Dial at 1400 Kc.	C9 B.C. R.F.
LOOP ALIGN-MENT	1400 Kc.	200 mmf.	External Antenna and Ground	Broadcast	Set Dial at 1400 Kc.	C1 B.C. Ant.
	600 Kc.	200 mmf.	External Antenna and Ground	Broadcast	Set Dial at 600 Kc.	T2 fron Core Tracking Coil

NOTE "A"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.





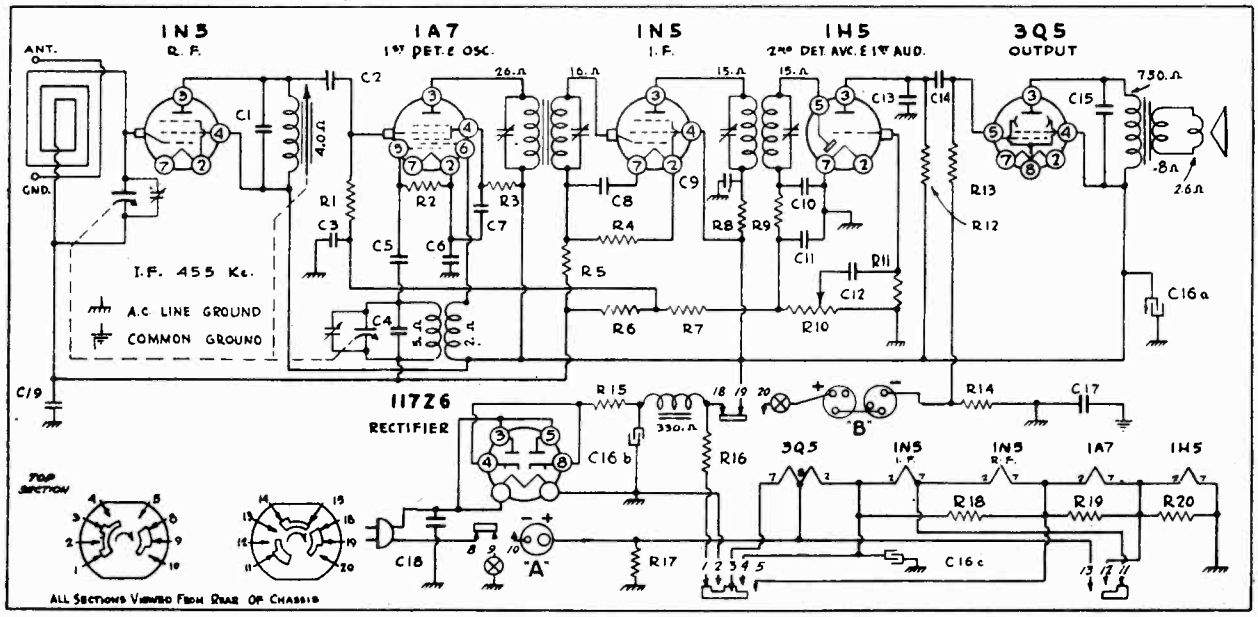
CHASSIS VIEW

This radio uses Detrola Model N100 record changer. Replacement parts should be ordered from the Detrola Corp.

FOR RECORD CHANGER DATA, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".

MODELS D1281,
D3230

WESTERN AUTO SUPPLY CO.



RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	100,000	½	R11	15,000,000	½
R2	200,000	½	R12	1,000,000	½
R3	50,000	½	R13	2,000,000	½
R4	5,000,000	½	R14	400	½
R5	5,000,000	½	R15	22	½
R6	5,000,000	½	R16	2,150	5
R7	3,000,000	½	R17	3,000	½
R8	5,000	½	R18	500	½
R9	70,000	½	R19	200	½
R10	1,000,000	V.C.	R20	110	½

CONDENSERS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)	Volts
C1	.000367	Silver Mica	C11	.0001	Mica
C2	.00025	Mica	C12	.01	400
C3	.01	400	C13	.00025	Mica
C4	.000015	Mica	C14	.01	400
C5	.00005	Mica	C15	.002	600
C6	.25	200	C16a	40.	150
C7	.01	400	C16b	30.	150
C8	.01	400	C16c	100.	25
C9	.05	400	C17	.1	400
C10	.00005	In I.F. Can	C18	.05	400
			C19	.05	200

SERVICE DATA FOR PROFESSIONAL SERVICEMEN

SERVICE NOTES

Voltages taken from the different points of the circuit to chassis are measured with volume control in maximum position, all tubes in their sockets and with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the voltage chart.

All voltages should be measured with 117.5 volts AC input to receiver. Resistance and actual connections of coils and transformers and speaker data are given under Service Information.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good until the defective unit is located.

ALIGNING INSTRUCTIONS

All of the adjustments have been very carefully set with signal generators at the factory and require no further adjustment, unless it becomes necessary to replace a coil or transformer, or if the adjustments have been tampered with in the field. Under no circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been checked and found to be normal. To properly re-align this receiver, a signal generator as well as an output meter, must be used.

SEE INDEX FOR ALIGNMENT

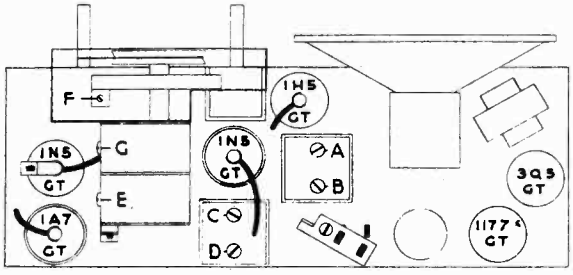


FIG. 1 TOP VIEW

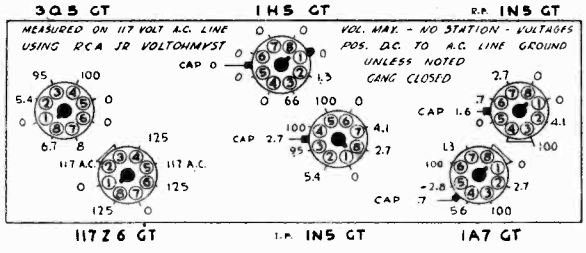
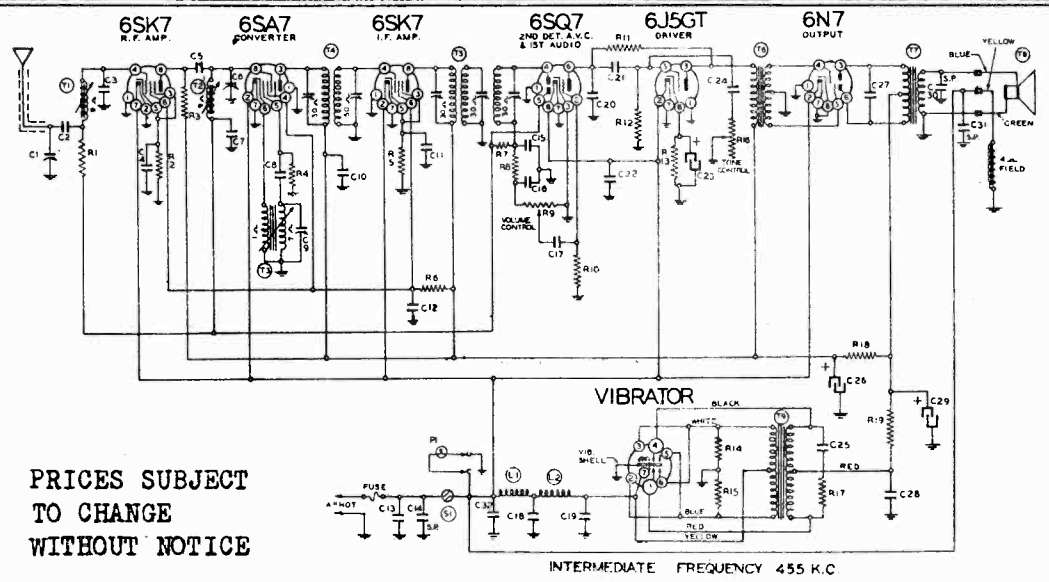
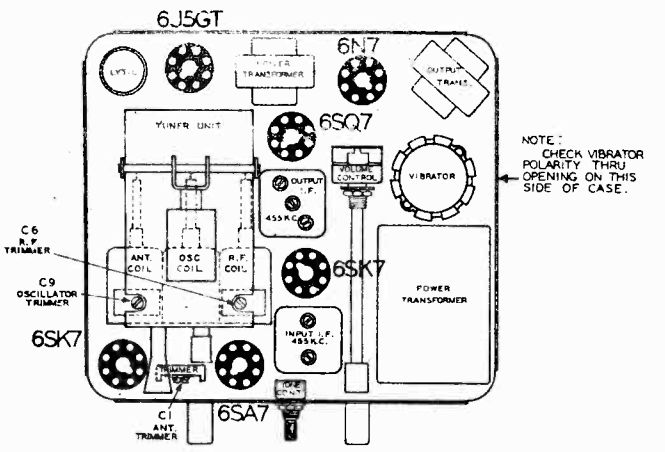


FIG. 2 VOLTAGE CHART



PRICES SUBJECT TO CHANGE WITHOUT NOTICE



CHASSIS VIEW
SHOWING TRIMMER POSITIONS

ALIGNMENT PROCEDURE

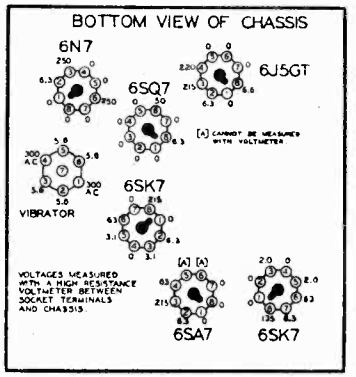
- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas [illegible] mmf.

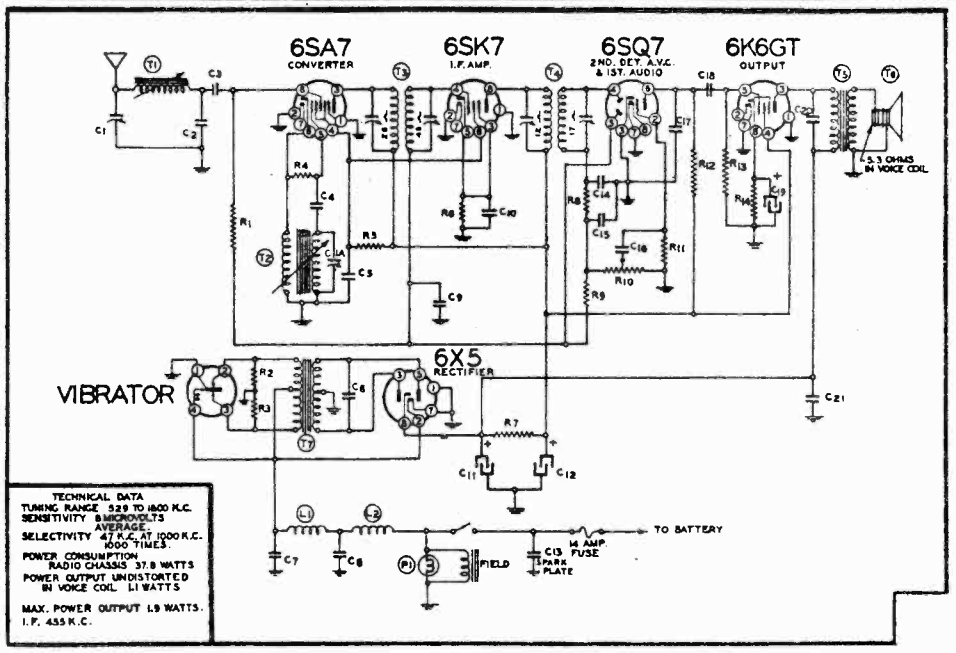
BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Remote Tuner Dial Setting	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
I. F.	455 Kc.	.1 MFD.	Grid of 6SK7 I. F. Tube	Set dial at 1400 Kc.	See Chassis View	Output I. F.	Adjust to maximum output
	455 Kc.	.1 MFD.	Grid of 6SA7 I. F. Tube	Set dial at 1400 Kc.	See Chassis View	Input I. F.	Adjust to maximum output
BROAD-CAST BAND	1600 Kc.	35 mmf.	Antenna lead	Set dial at 1600 Kc.	Trimmer C6, C9, C1 Chassis View	Oscillator R. F. antenna	Adjust to maximum output
	1400 Kc.	35 mmf.	Antenna lead	Set dial at 1400 Kc.	Rotate cores of antenna and R. F. coils	Antenna and R. F.	Adjust to maximum output

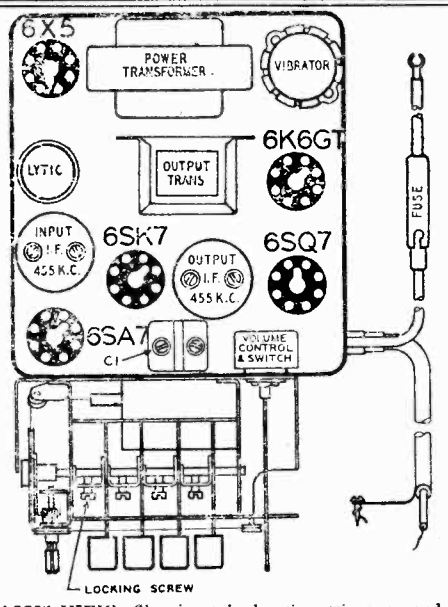
Part No.	Schematic Diagram Reference	Description	No. Used In Set	Selling Price Each
		CONDENSERS		
1001	C10, C28	.1 x 400 Volt Tubular Condenser	2	.25
10011	C24	.01 x 400 Volt Tubular Condenser	1	.25
10053	C12	.25 x 400 Volt Tubular Condenser	1	.35
10031	C13, C18, C19	.5 x 120 Volt Oval Type Condenser	3	.60
100126	C27	.006 x 800 Volt Tubular Condenser	1	.25
100127	C2, C17	.01 x 120 Volt Tubular Condenser	2	.25
100128	C4, C11	.05 x 120 Volt Tubular Condenser	2	.25
100129	C7	.02 x 120 Volt Tubular Condenser	1	.25
10098	C25	.005 x 1600 Volt Tubular Condenser	1	.25
10026	C21	.02 x 400 Volt Condenser	1	.25
10081		.5 Mfd. Generator Condenser	1	.50
10082		.5 Mfd. Ammeter Condenser	1	.40
119118	C23, C26, C29	Electrolytic Filter Condenser 20 Mfd. x 25 V.; 20 Mfd. x 400 V.; 20 Mfd. x 400 V.	1	1.50
124157	C1	Antenna Trimmer Condenser	1	.30
124158	C9	Oscillator Trimmer Condenser	1	.25
124159	C6	R.F. Trimmer Condenser	1	.20
1292	C22	.0005 Mica Type Condenser—20%	1	.25
129145	C5	.00001 Ceramicon Zero Coefficient Condenser—1%	1	.25
129165B	C15, C16	.00005 Dual Mica Condenser	1	.25
129172	C3, C8	.0001 Ceramicon Negative Coefficient Condenser—5%	2	.25
12912	C20, C32	.00025 Mica Type Condenser	2	.25
		RESISTORS		
13016	R5	900 Ohm—⅓ Watt Resistor—10%	1	.20
13019	R7	1 Megohm—⅓ Watt Resistor—20%	1	.20
13092	R13, R17	1000 Ohm—⅓ Watt Resistor—10%	2	.20
130102	R11, R12	500M Ohm—⅓ Watt Resistor—10%	2	.20
130168	R14, R15	100 Ohm—⅓ Watt Resistor—10%	2	.20
130196	R6	30M Ohm—1 Watt Resistor—10%	1	.20
130199	R18	1500 Ohm—1 Watt Resistor—10%	1	.20
130257	R10	5 Megohm—⅓ Watt Resistor—25%	1	.20
130328	R19	75 Ohm—⅓ Watt Resistor—20%	1	.20
130329	R4, R8	47M Ohm—⅓ Watt Resistor—20%	2	.20
130330	R1	220M Ohm—⅓ Watt Resistor—20%	1	.20
130331	R3	15M Ohm—⅓ Watt Resistor—10%	1	.20
130332	R2	250 Ohm—⅓ Watt Resistor—10%	1	.20
130202		Distributor Suppressor	1	.30



MODELS D1296, P4220

WESTERN AUTO SUPPLY CO.





CHASSIS VIEW--Showing tube location, trimmers, and the pushbutton locking-screws.

CONDENSERS

10026	C18	.02 x 400 Volt Tubular Condenser	1	.25
10087	C20	.01 x 600 Volt Tubular Condenser	1	.25
10013	C5	.05 x 400 Volt Tubular Condenser	1	.25
10020	C10	.1 x 200 Volt Tubular Condenser	1	.25
1009	C9	.05 x 200 Volt Tubular Condenser	1	.25
100125	C6	.0035 x 1600 Volt Tubular Condenser	1	.35
10025	C16	.002 x 600 Volt Tubular Condenser	1	.25
10031	C7, C8	.5 x 120 Volt Oval Condenser	2	.60
10081		.5 Mfd. Generator Condenser	1	.50
10082		.5 Mfd. Ammeter Condenser	1	.40
119105	C11, C12, C19	Electrolytic Filter Condenser—15 Mfd. x 350 V.; 15 Mfd. x 350 V.; 25 Mfd. x 25 V.;	1	1.50
124187	C1, C1A	Ant. and Oscillator Dual Trimmer	1	.35
1292	C3, C17	.0005 Mica Type Condenser—20%	2	.25
129188	C2	.00008 Mica Type Condenser—3%	2	.25
12921	C4	.0002 Mica Type Condenser—20%	1	.25
12912	C21	.00025 Mica Type Condenser—20%	1	.25
129161	C14, C15	.0001 Dual Mica Condenser—10%	1	.25
11719-B	C13	Spark Plate	1	.05

RESISTORS

101276	R10	Volume Control and Switch (500M Ohms) (Less Shaft)	1	1.00
130257	R11	5 Megohm—½ Watt Resistor—25%	1	.20
13011	R12	250M Ohm—½ Watt Resistor—20%	1	.20
1303	R13	500M Ohm—½ Watt Resistor—20%	1	.20
130101	R14	600 Ohm—½ Watt Resistor—10%	1	.20
1304	R9	3 Megohm—½ Watt Resistor—20%	1	.20
13012	R8	50M Ohm—½ Watt Resistor—20%	1	.20
13083	R6	300 Ohm—½ Watt Resistor—10%	1	.20
13019	R1	1 Megohm—½ Watt Resistor—20%	1	.20
13076	R4	30M Ohm—½ Watt Resistor—20%	1	.20
130307	R5	15M Ohm—1 Watt Resistor—10%	1	.20
130199	R7	1500 Ohm—1 Watt Resistor—10%	1	.20
130168	R2, R3	100 Ohm—½ Watt Resistor—10%	2	.20
130202		Distributor Suppressor	1	.30

COILS

108139-B	T3	Input I. F. Coil	1	1.25
108211	T4	Output I. F. Coil	1	1.25
13620	T1, T2	Permeability Tuning Unit Complete with Ant. and Osc. Coils	1	3.75
10566	L2	"A" Choke No. 16 Wire	1	.15
10568	L1	"A" Choke No. 18 Wire	1	.15

TRANSFORMERS

104295	T7	Power Transformer	1	3.00
105142	T5	Output Transformer for Speaker	1	1.25

SPEAKER

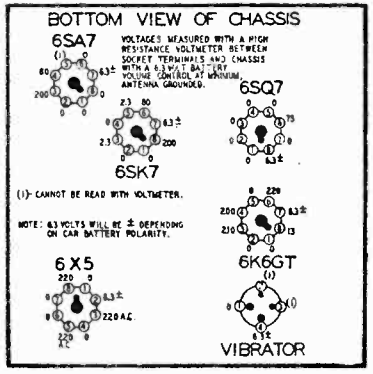
114273	T6	Five Inch Electrodynamic Speaker. Less Output Transformer	1	3.50

VIBRATOR UNIT

12629		Plug-in Vibrator Unit	1	2.50

DIAL AND TUNER PARTS

1121028		Dial Scale	1	.25
1121025-45		Escutcheon	1	1.00
1121029		Set of Station Call Letters	1	.20
128773-45		Knob—For Tuning and Volume	2	.10
115860		Shaft for Volume Control	1	.05
128766-45		Pushbuttons	4	.10
1121027		Pointer	1	.10
120214		String for Pointer	15	Yd.
120442		Tension Spring for Pointer String	1	.05
1121026		Diffuser for Dial	1	.10
131211		Snap-in Rivet to Fasten Diffuser	2	.01
107400		Socket Assembly for Pilot Lite	1	.10
10797	P1	6-8 Volt Pilot Lite, Type T-51	1	.10
115807		Pushrod—For Pushbuttons	4	.40
115799		"U" Cam—With Set Screw	4	.20
120445		Return Spring—For Pushrods	4	.05
117924		Tuning Shaft	1	.15
117311		Pinion Gear—Drives Crown Gear	1	.05
13623		Drum Assembly Complete with 115800 Crown Gear	1	.35
120441		Tension Spring for Slug String	1	.05



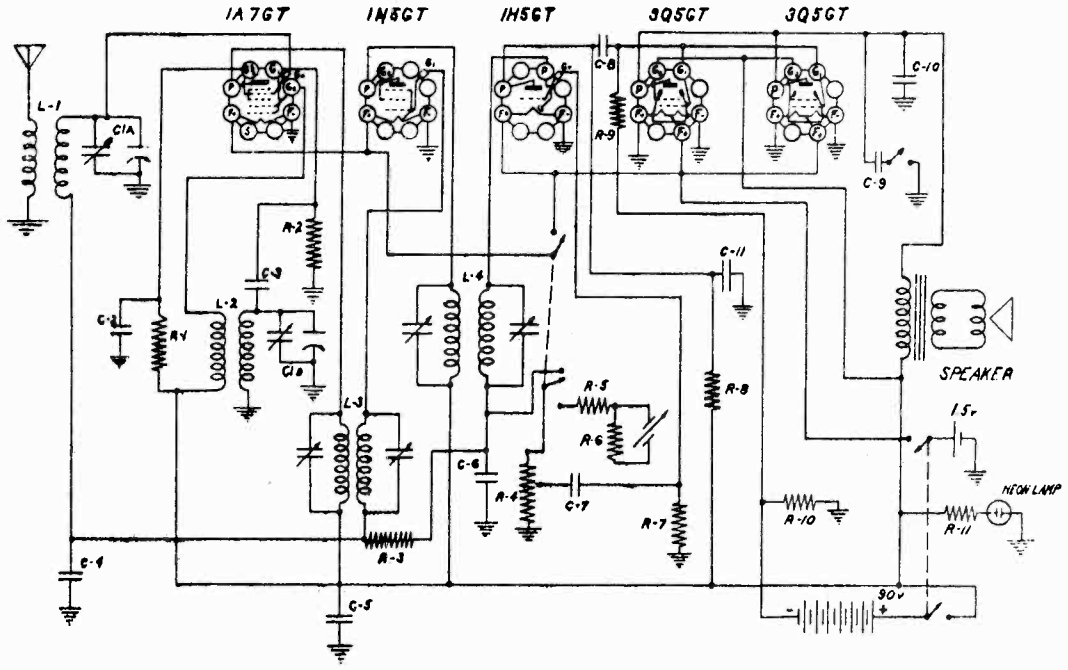
VOLTAGE CHART

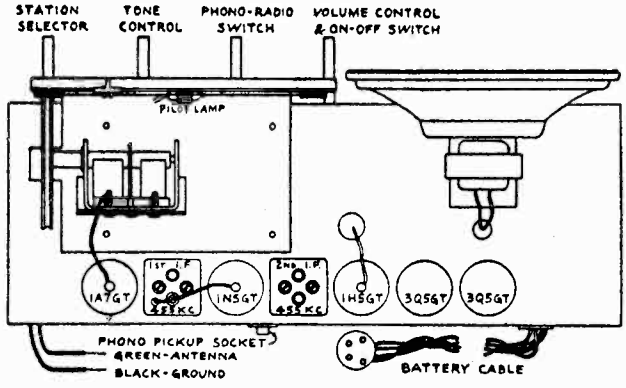
ALIGNMENT PROCEDURE

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Dial Setting	Trimmers Adjusted to Maximum
I. F.	455 Kc.	.1 MFD.	Grid of 6SK7 I. F. Tube	Set dial at 1400 Kc.	Output I. F.
	455 Kc.	.1 MFD.	Grid of 6SA7 I. F. Tube	Set dial at 1400 Kc.	Input I. F.
BROAD-CAST BAND	1600 Kc.	100 mmf.	Antenna lead	Set dial at 1600 K	Trimmer C1A Oscillator C1 Antenna
	1400 Kc.	100 mmf.	Antenna lead	Set dial at 1400 Kc.	Rotate cores of Antenna coils

MODELS DW2090, DE3002

WESTERN AUTO SUPPLY CO.





SEE INDEX FOR PARTS LIST

BOTTOM VIEW OF CHASSIS

VOLTAGES MARKED AT SOCKET TERMINALS ARE MEASURED WITH 1000 OHM PER VOLT METER, ON A 90 VOLT BATTERY WITH NO SIGNAL. (ANTENNA LEAD IS SHORTED TO THE CHASSIS) VOLTAGE FROM CHASSIS TO B- OF BATTERY IS 4.4V

ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this chassis:

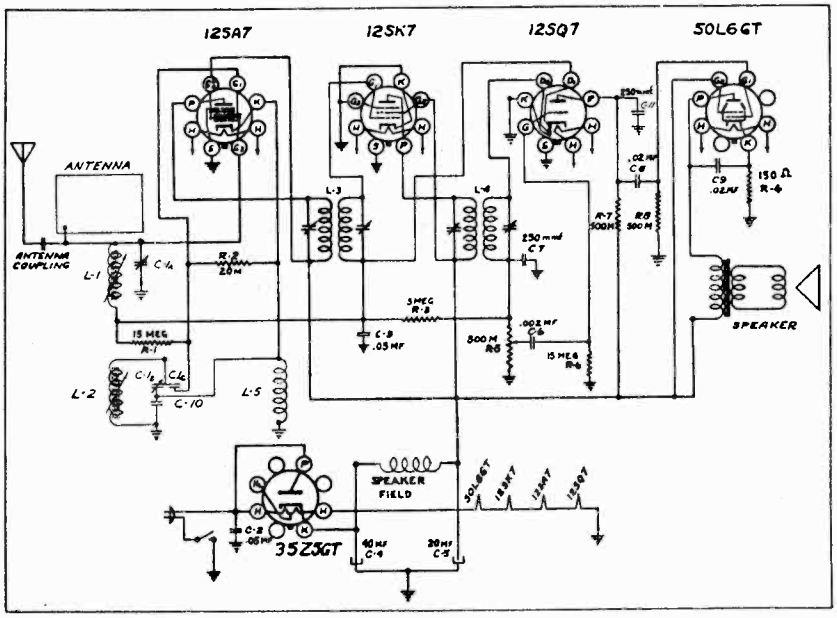
1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output Meter.
3. A non-metaillic screw driver.
4. Dummy antenna—.1 mfd., 200 mmf.

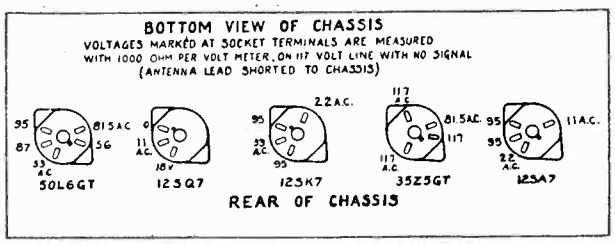
GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TRIMMERS TO TUNE	REMARKS
IF 455 KC.	1A7 GRID	.1 mfd.	H. F. End	IF Transfomer 4 Trimmers	Tune to Max.
1620 KC.	Antenna	200 mmf.	H. F. End	Oscillator Trimmer	Set Limit of Band
1400 KC.	Antenna	200 mmf.	1400	Antenna Trimmer	Tune to Max.

Repeat above Alignment Procedure at least once more.

MODEL D2206

WESTERN AUTO SUPPLY CO.





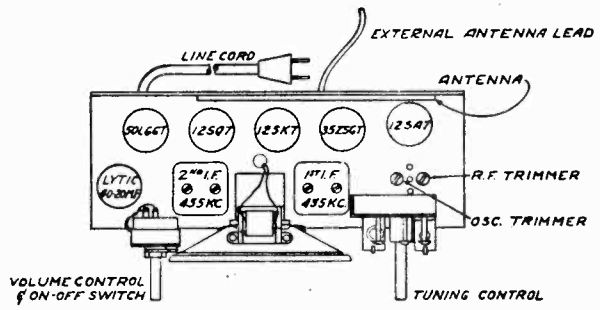


Figure 1

ALIGNMENT PROCEDURE

GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TRIMMERS TO TUNE	REMARKS
IF 455 KC	12SA7 GRID	.1 mfd.	H. F. End	IF Transformers 4 Trimmers	Tune to Max.
1720 KC	Antenna	200 mmf.	H. F. End (1720)	Oscillator Trimmer	Set Limit Of Band
1400 KC	"	"	1400	Antenna Trimmer	Tune to Max.

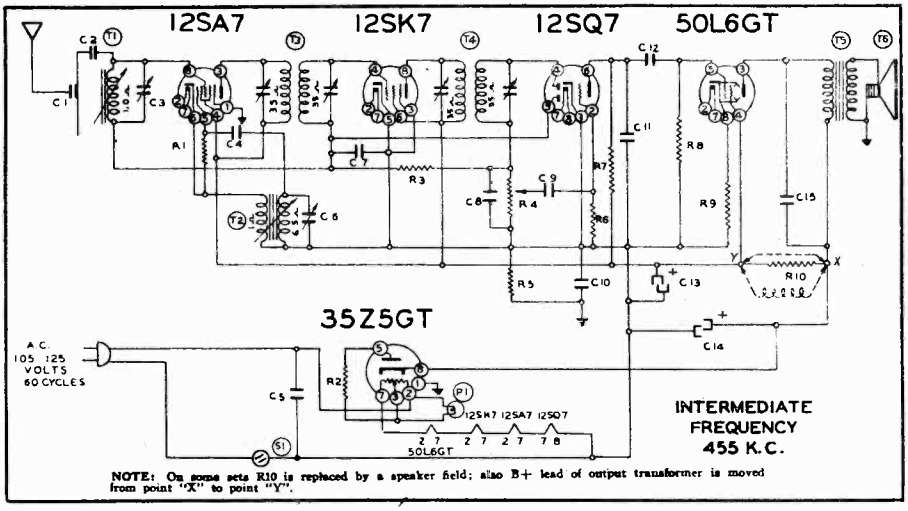
Repeat above Alignment Procedure at least once

Part No.	Circuit Diagram Reference	Description	List Price Each
9914		Book—Instruction	$0.20
9897		Cabinet	2.50
2163		Cable—Drive	.10
9458	L5	Coil—Cathode	.40
9513	L1, L2	Tuner-Permeability	2.00
9913		Antenna Capacity Plate Assembly	.55
9008	R5	Control—Volume and Switch	1.00
9510	C1a, b	Condenser—Trimmer	.40
1285	C1c	Condenser—Mica 100 mmf.	.20
8948	C4, C5	Condenser—Elect. 40 mfd.—20 mfd. 150V.	1.00
824	C6	Condenser—Paper .002 mfd.—600V.	.20
563	C2	Condenser—Paper .05 mfd.—400V.	.20
576	C8, C9	Condenser—Paper .02 mfd.—400V.	.20
580	C3	Condenser—Paper .05 mfd.—200V.	.20
1286	C7, C11	Condenser—Mica 250 mmf.	.20
8036		Cord—AC Line	.25
9899		Crystal—Dial	.20
9511-1		Indicator	.25
9021		Knob	.15
9024		Pointer	.20
8039	R1, R6	Resistor 1/3 W—15 Meg.	.15
6997	R3	Resistor 1/3 W—2 Meg.	.15
8060	R7, R8	Resistor 1/3 W—500 M.	.15
8061	R2	Resistor 1/3 W—20 M.	.15
7326	R4	Resistor 1/2 W—150 ohm	.20
8648		Spring—Pointer Drive	.10
9015	L3	Transformer 1st I.F.	1.75
9016	L4	Transformer 2nd I.F.	1.75
9744		Speaker—4" Dynamic	3.50
9915		Carton	.60

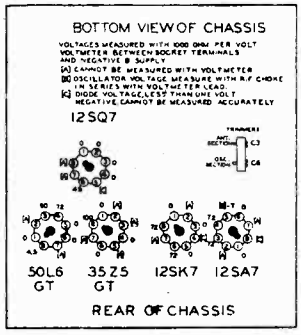
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

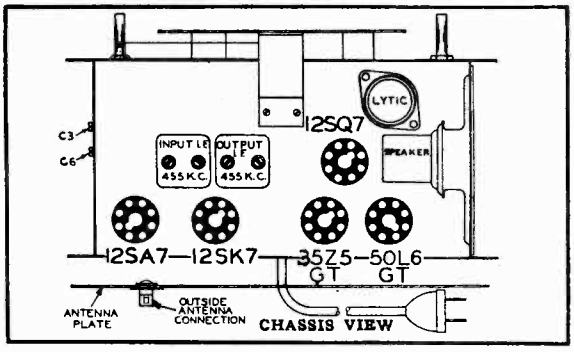
MODEL D2211

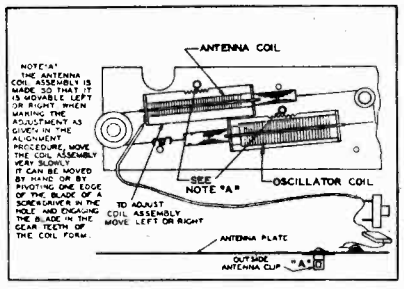
WESTERN AUTO SUPPLY CO.



NOTE: On some sets R10 is replaced by a speaker field; also B+ lead of output transformer is moved from point "X" to point "Y".







COIL ASSEMBLY VIEW

Part No.	Schematic Diagram Reference	Description	No. Selling Used In Set	Price Each
		RESISTORS		
1305	R8	300M Ohm—½ Watt Resistor—20%	1	.20
13080	R5	150M Ohm—½ Watt Resistor—10%	1	.20
130166	R9	150 Ohm—½ Watt Resistor—10%	1	.20
130170	R8	3 Megohm—½ Watt Resistor—25%	1	.20
130199	R10	1500 Ohm—1 Watt Resistor—10%	1	.20
130232	R1	25M Ohm—½ Watt Resistor—10%	1	.20
130257	R6	5 Megohm—½ Watt Resistor—25%	1	.20
130284	R2	25 Ohm—½ Watt Resistor—20%	1	.20
		CONDENSERS		
1001	C5	.1 x 400 Volt Tubular Condenser	1	.25
1009	C7	.05 x 200 Volt Tubular Condenser	1	.25
10011	C15	.01 x 400 Volt Tubular Condenser	1	.25
10025	C9	.002 x 600 Volt Tubular Condenser	1	.25
10091	C10	.15 x 400 Volt Tubular Conednser	1	.25
10078	C12	.01 x 200 Volt Tubular Condenser	1	.25
11992	C13, C14	Electrolytic Filter Condenser 20 Mfd. x 150 Volts; 40 Mfd. x 150 Volts	1	1.50
124150	C3, C6	Antenna and Oscillator Dual Trimmer Condenser	1	.35
12912	C2, C8	.00025 Mica Type Condenser—20%	2	.25
12938	C4	.00005 Mica Type Condenser—10%	1	.25
129160	C11	.0004 Mica Type Condenser—20%	1	.35

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect B— of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning.

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 Mfd., and 200 Mmf.

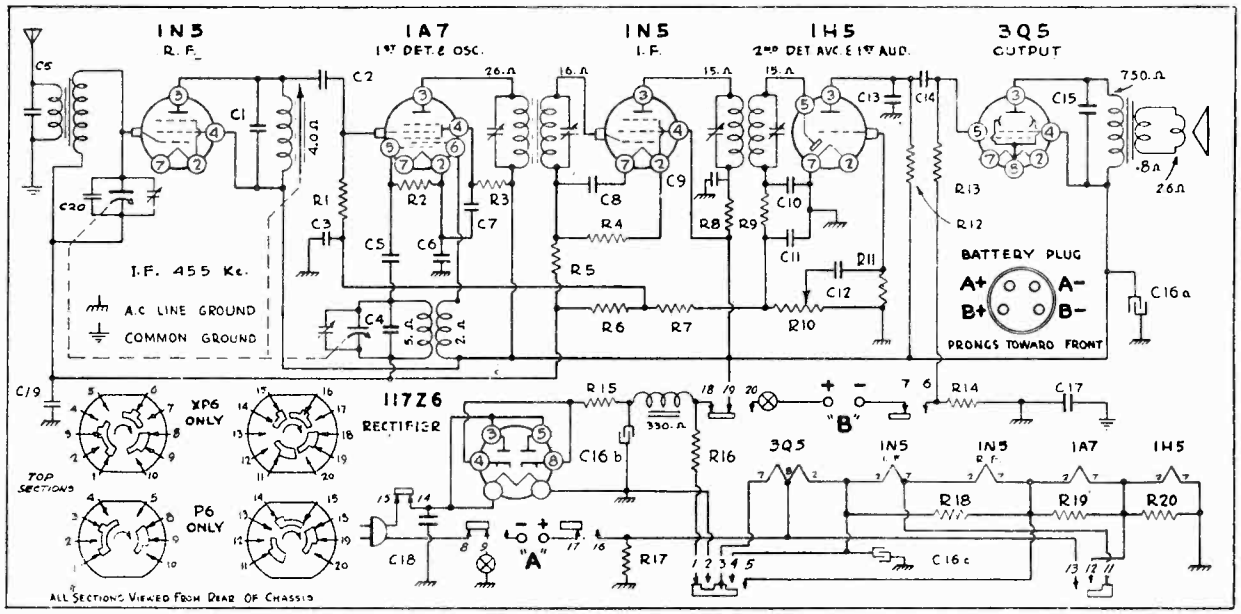
BAND	SIGNAL GENERATOR Frequency Setting	SIGNAL GENERATOR Dummy Antenna	Connection to Radio	Position of Iron Cores (Dial Setting)	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
I. F.	455 Kc.	.1 MFD.	Connect to Grid of 12SA7	Iron Cores All the way out	Two trimmers on top of output I. F. can	Output I. F.	Adjust to maximum output
	455 Kc.	.1 MFD.	Connect to Grid of 12SA7	Iron Cores All the way out	Two trimmers on top of input I. F. can	Input I. F.	Adjust to maximum output
BROAD-CAST BAND	1720 Kc.	.1 MFD.	Connect to Grid of 12SA7	Iron Cores All the way out	Trimmer (C6) (See chassis view)	Oscillator	Adjust to maximum output
	1720 Kc.	200 MMF.	Connect to Outside Antenna Clip	Iron Cores All the way out	Trimmer (C3) (See chassis view)	Antenna	Adjust to maximum output
	1400 Kc.	200 MMF.	Connect to Outside Antenna Clip	Turn Dial to 1400 Kc.	Adjust position of antenna coil (See coil assembly view)	Antenna Coil Adjustment	Adjust to maximum output (See Note "A")
	1720 Kc.	200 MMF.	Connect to Outside Antenna Clip	Turn Dial to 1720 Kc.	Adjust trimmer (C3) (See chassis view)	Antenna	Check for tracking (See Note "B")

NOTE "A"—The antenna coil assembly is made so that it is movable. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

NOTE "B"—After the antenna coil has been tracked at 1400 Kc. it is necessary to check the antenna trimmer (C3) adjustment again at 1720 Kc. If no appreciable change in trimmer adjustment is made the coil is in track. If the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1720 Kc.

MODEL D2269

WESTERN AUTO SUPPLY CO.



In model P6 only, switch points 6, 7, 16, and 17 are not used. Power switch in line position. Common ground is chassis ground.

RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	100,000	½	R11	15,000,000	½
R2	200,000	½	R12	1,000,000	½
R3	50,000	½	R13	2,000,000	½
R4	5,000,000	½	R14	400	½
R5	5,000,000	½	R15	22	½
R6	5,000,000	½	R16	2,150	5
R7	3,000,000	½	R17	3,000	½
R8	5,000	½	R18	500	½
R9	70,000	½	R19	200	½
R10	1,000,000	V.C.	R20	110	½

CONDENSERS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)	Volts
C1	.000367	Silver Mica	C12	.01	400
C2	.00025	Mica	C13	.00025	Mica
C3	.01	400	C14	.01	400
C4	.000015	Mica	C15	.002	400
C5	.00005	Mica	C16a	40.	150
C6	.25	200	C16b	30.	150
C7	.01	400	C16c	100.	25
C8	.01	400	C17	.1	400
C9	.05	400	C18	.05	400
C10	.00005	In I.F. Can	C19	.05	200
C11	.0001	Mica	C20	.00002	Mica

IF PEAK 455 KC

SERVICE NOTES

Voltages taken from the different points of the circuit to chassis are measured with volume control in maximum position, all tubes in their sockets and with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the voltage chart.

All voltages should be measured with 117.5 volts AC input to receiver. Resistance and actual connections of coils and transformers and speaker data are given under Service Information.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good until the defective unit is located.

ALIGNING INSTRUCTIONS

All of the adjustments have been very carefully set with signal generators at the factory and require no further adjustment, unless it becomes necessary to replace a coil or transformer, or if the adjustments have been tampered with in the field. Under no circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been checked and found to be normal. To properly re-align this receiver, a signal generator as well as an output meter, must be used.

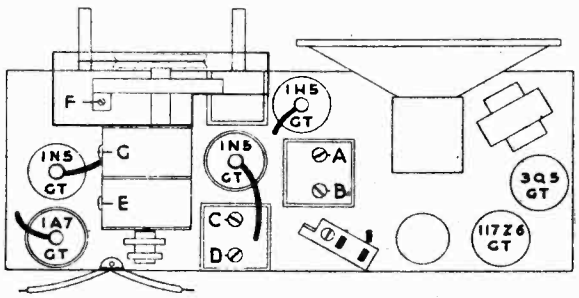


FIG. 1 TOP VIEW

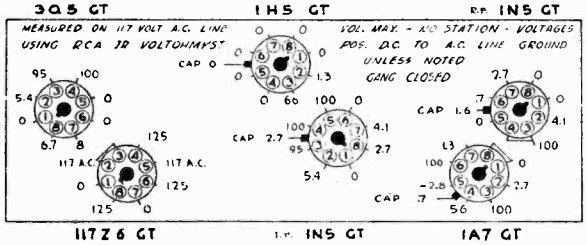


FIG. 2 VOLTAGE CHART

MODEL WR-12X4

WESTINGHOUSE ELECTRIC SUPPLY CO.

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, through a .01 mfd. capacitor, and keep the output as low as possible.

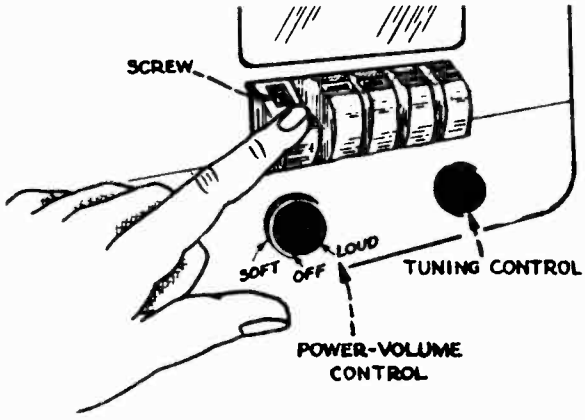
Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	I-F grid in series with .01 mfd.	455 kc	Quiet point 1,700 kc end of dial	C8 and C9 2nd I-F Transformer
2	1st Det. grid in series with .01 mfd.			C6 and C7 1st I-F Transformer
3	Ant. terminal in series with 200 mmfd.	1,720 kc	Gang at minimum	C3 (osc.)
4	Radiation loop consisting of two turns of wire 18 inches in diameter located 4 to 6 feet from receiver	1,300 kc	Signal Frequency	C1 (ant.)
5	Repeat steps 3 and 4.			

Adjustments for Push Button Tuning

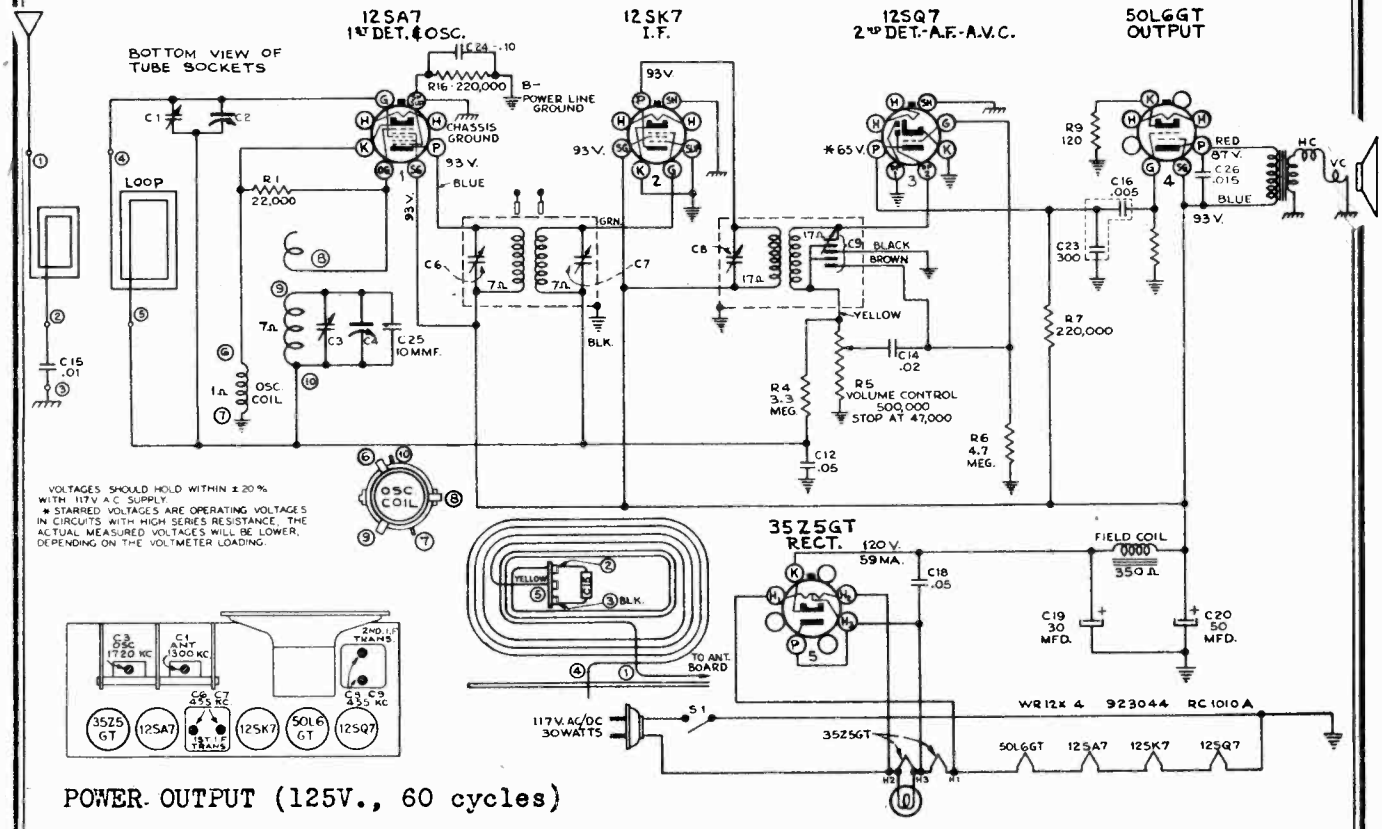
The push buttons should be adjusted for five favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Cut out the tabs for your five favorite stations and arrange them in order of frequency in the recesses on the push buttons.
2. Press down on the first push button and hold it down. The screw in back of the push button is now accessible and should be loosened one or two turns with a screwdriver.
3. While still holding down the push button, tune in the first station represented by the station tab with the tuning knob, by Dial Tuning. When the station is heard at its best, tighten up the screw in back of the push button. Now let go of the push button, turn the tuning knob in order to detune and again press down the button and let go. The station should be heard again. If not, repeat the above adjustment process until reception is satisfactory.
4. Proceed to set up the other four push buttons in a similar manner.

A station may be changed at any time by following the above information.



Push Button Adjustments



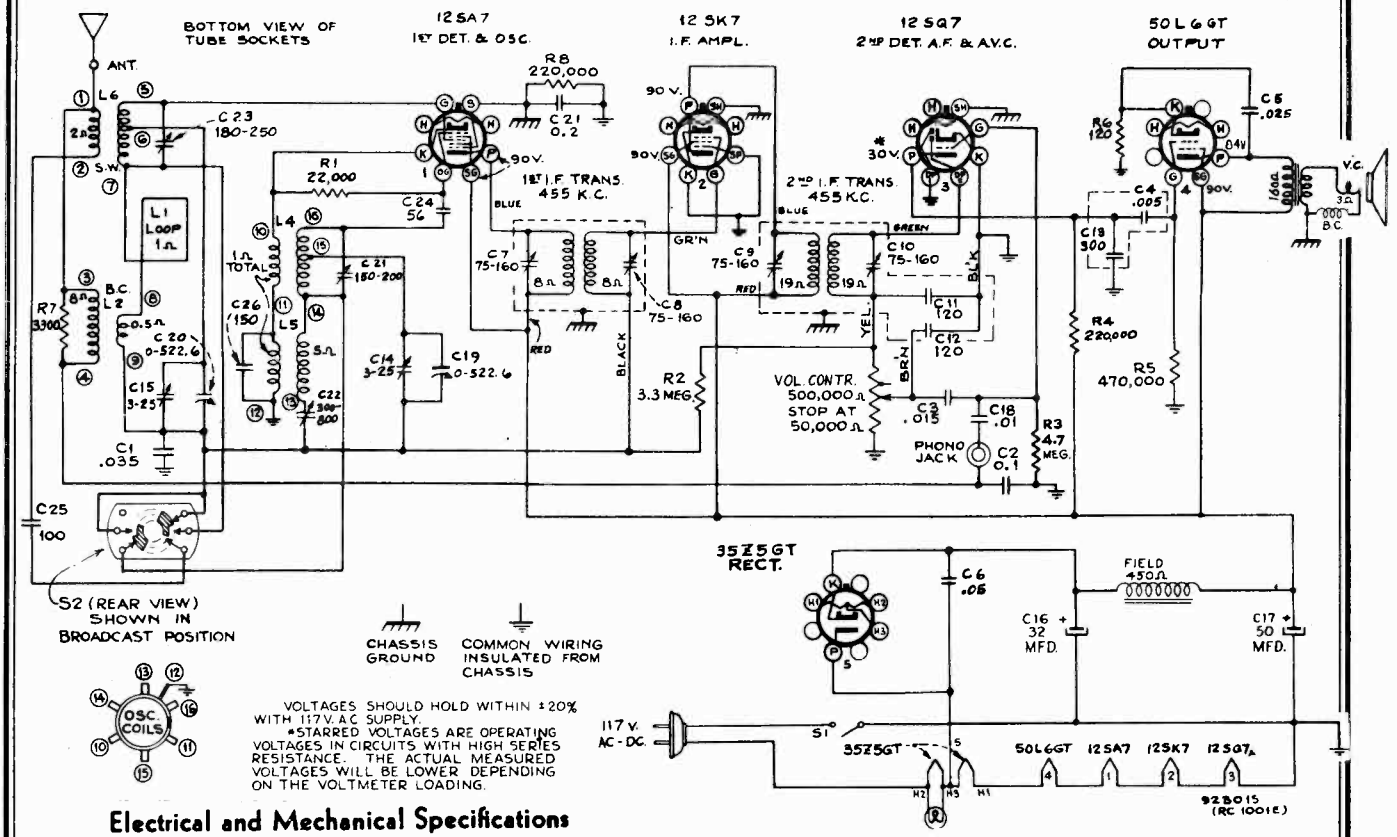
POWER OUTPUT (125V., 60 cycles)

Undistorted	.09 watts
Maximum	1.4 watts

INTERMEDIATE FREQUENCY PEAK 455 KC

MODEL WR-13X8

WESTINGHOUSE ELECTRIC SUPPLY CO.



VOLTAGES SHOULD HOLD WITHIN ±20% WITH 117 V. A.C SUPPLY.
*STARRED VOLTAGES ARE OPERATING VOLTAGES IN CIRCUITS WITH HIGH SERIES RESISTANCE. THE ACTUAL MEASURED VOLTAGES WILL BE LOWER DEPENDING ON THE VOLTMETER LOADING.

Electrical and Mechanical Specifications

Frequency Range
Broadcast Band ..... 540-1,720 kc
Short Wave Band ..... 9 mc to 12 mc.

Intermediate Frequency ..... 455 kc

Pilot Lamp ..... Mazda No. 51, 6-8 volts, 0.2 amp.

Power Output
Undistorted ..... .9 watts
Maximum ..... 1.3 watts

Loudspeaker
Type ..... 5-inch Electrodynamic
V.C. Impedance ..... 3.3 ohms at 400 cycles

Power Supply Rating
105-125 volts, AC 50 or 60 cycles, or DC ..... 30 watts

Precautionary Lead Dress.—

1. Dress the power cable to switch on the volume control close to the chassis and away from all grid and diode leads and condensers.
2. Dress capacitors in the 12SQ7 grid circuit away from all wiring.
3. Green and black phono wires should be twisted and dressed away from other parts and leads.
4. 50L6-GT filament wires should be dressed to rear of chassis and away from the second I-F transformer leads.
5. Dress brown lead from second I-F transformer to 12SQ7 away from power cable.
6. Dress wire to No. 1 grid of the 12SA7 away from pilot lamp leads.
7. Dress wire from loop to variable condenser away from chassis.
8. Dress all capacitors, leads, etc. which come close to oscillator coil rigidly and as far as possible from it.

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.

Alignment Procedure

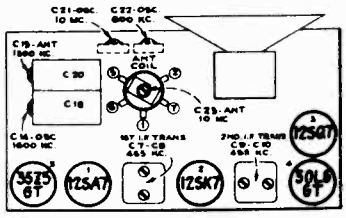
Output Meter Alignment.—If this method is used connect the meter across the voice coil and turn the receiver volume control to maximum.

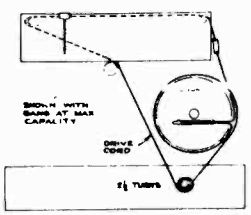
Test Oscillator.—Connect the low side of the test oscillator to the receiver chassis through a .01 mfd. capacitor. With the output meter alignment method the test oscillator output should be kept as low as possible.

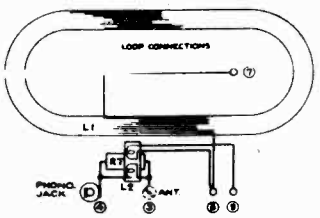
Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the dial backing plate for quick reference during alignment.

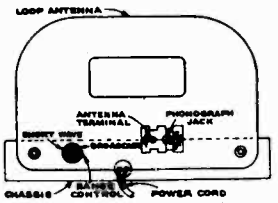
Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	12SK7 grid in series with 0.1 mfd.	455 kc	Quiet Point at 1,600 kc and of dial	C10, C9 2nd I-F Transformer
2	12SA7 grid in series with 0.1 mfd.			C8, C7 1st I-F Transformer
3	Antenna term. in series with 47 mmf.	10 mc*	10 mc	C21 (osc.)** C23 (ant.)
4	Antenna term. in series with 200 mmfd.	1,600 kc	1,600 kc	C14 (osc.)
5	Radiation Loop	1,300 kc	Resonance on Signal	C15 (ant.)
6	Radiation Loop	600 kc	600 kc	C22 Osc. Rock in

* It is recommended that this step be repeated using a received station of known frequency.
** Use minimum capacity if two peaks can be obtained.



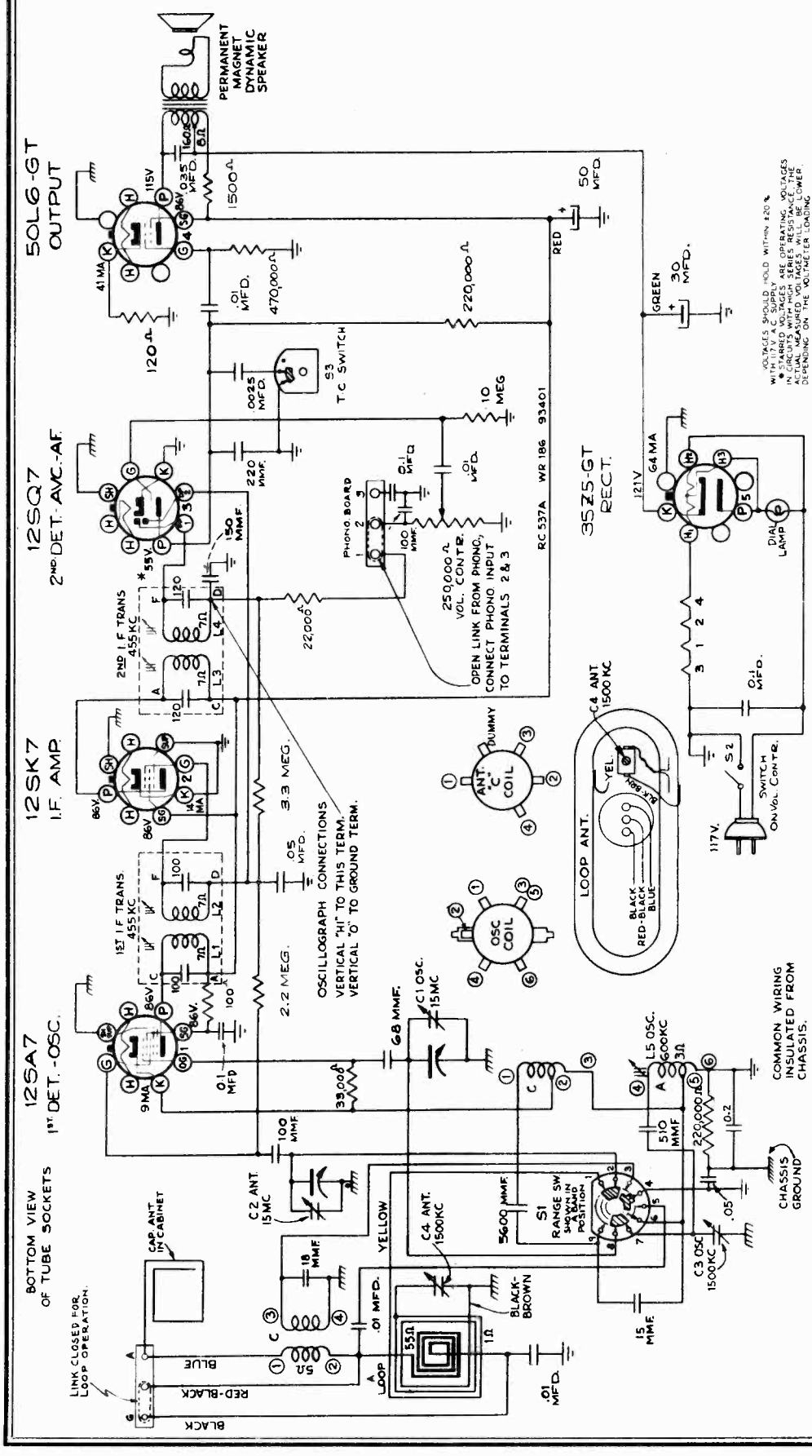






MODELS WR-12X7, WR-186

WESTINGHOUSE ELECTRIC SUPPLY CO.



ADJUSTMENTS FOR PUSH BUTTON TUNING.

1. Cut out tabs for six stations, arrange them in order of freq.
2. Press down on first P.B. and hold it down. The screw in back of P.B. is now accessible and should be loosened 1 or 2 turns.
3. While still holding down P.B., tune in first station represented by station tab with tuning knob, by Dial Tuning. When station is heard at its best, tighten screw in back of push button. Let go of P.B., turn tuning knob in order to detune and again press down button and let go. Station should be heard again. If not, repeat above adjustment until reception is satisfactory.
4. Proceed to set up other five push buttons in similar manner.

POWER SUPPLY RATINGS
A-C Rating.....105-125 V. 50-60 ~, 30 W.
D-C Rating .....105-125 V. d.c., 30 W.

POWER OUTPUT
Undistorted ..... 1.1 watts
Maximum ..... 1.4 watts
LOUDSPEAKER (permanent-magnet dynamic)5"
V.C. Impedance at 400 cycles 3.4 ohms
INTERMEDIATE FREQUENCY 455 kc
RANGE: (A) 540-1,600kc; (C) 5,8 - 18 mc

MODELS WR-12X7, WR-186

WESTINGHOUSE ELECTRIC SUPPLY CO.

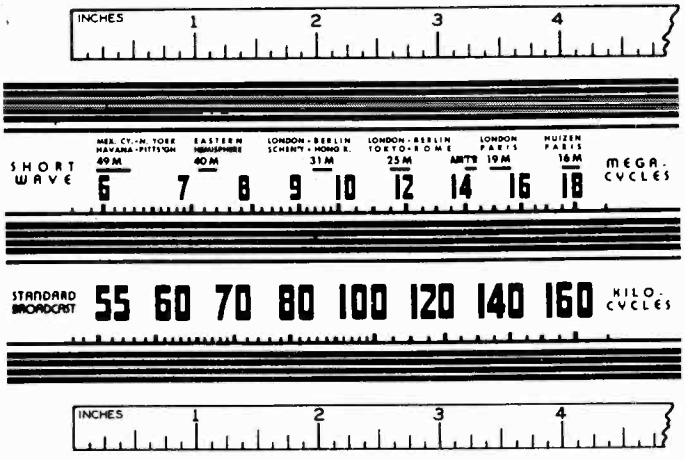
Alignment Procedure

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 ground, and keep the output as low as possible.

Precautionary Lead Dress

1. Dress 1st I-F plate and grid leads against chassis and away from each other. Dress plate lead from 12SK7 close to chassis.
2. Dress leads from terminal board on loop support away from loop.



Calibration Scale

Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. Or, if necessary, the calibration scale printed in this service note can be used in conjunction with an ordinary 12-inch ruler as an accurate and convenient substitute for the regular dial.

Using Calibration Scale.—

1. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.

2. Place a flat 6-inch ruler on the dial backing plate so the left-end of ruler is at the reference mark at left-end of backing plate. Temporarily fasten the ruler with scotch tape to the backing plate.

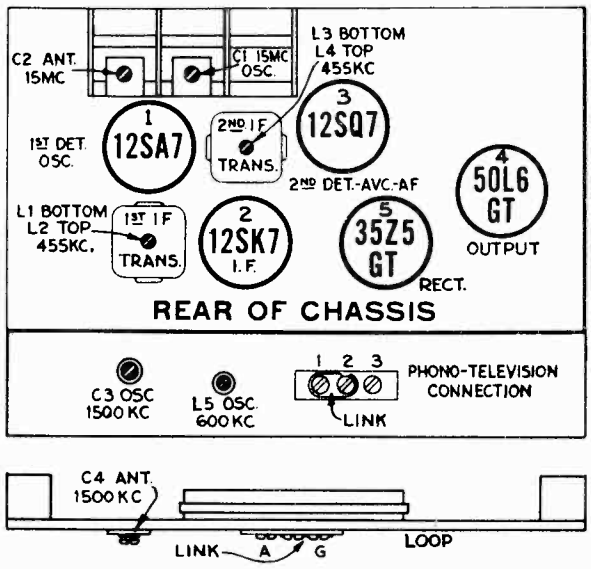
3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch-scale drawn at the bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale. For example 1,500 kc is approximately 3¼ inches from the reference mark.

Dial-Pointer Adjustment.—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

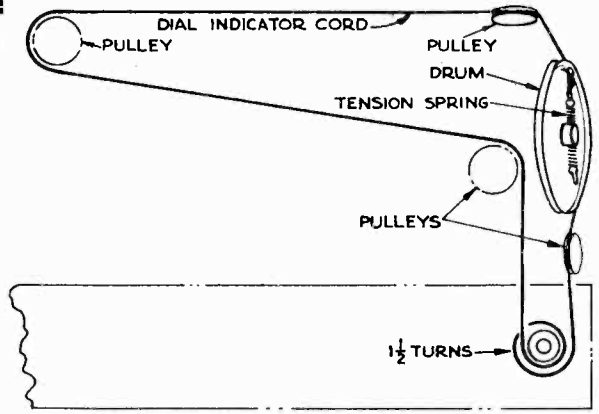
Antenna.—The set is equipped with a built-in loop antenna. If an outdoor antenna is used, it may be connected to the "ANT." terminal on rear of cabinet. It should not be longer than 100 feet, including lead-in. If it is longer, connect a 100 to 200 mmf. capacitor in series with the lead-in.

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.

Loudspeaker.—To center the loudspeaker voice coil, first remove the front dust cover, then loosen the screws, holding the spider assembly. Insert three narrow feelers into the air gap, and tighten the spider screws. Remove the feelers and fasten a dust cover in place with loudspeaker cement.



Tube and Trimmer Location



Dial-Indicator and Drive Mechanism

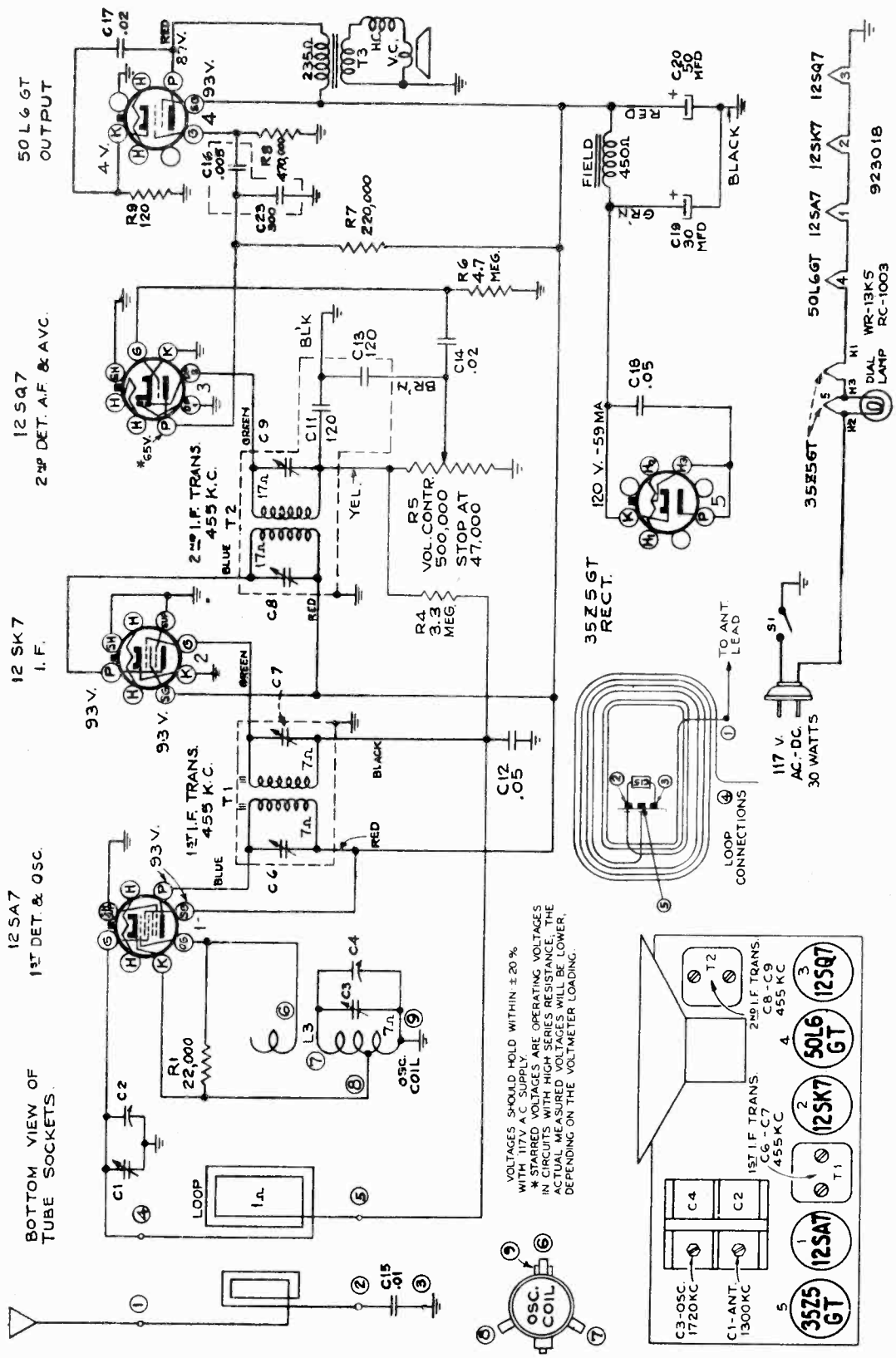
Steps	Connect test-osc. output to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	1-F grid through 0.1 mfd. capacitor and ground	455 kc	Quiet point between 550-750 kc	L-3 and L-4 (2nd I-F trans.)
2	1st det. grid through 0.1 mfd. capacitor and ground	455 kc		L-1 and L-2 (1st I-F trans.)
3	Antenna terminal (open link between "A" and "G") in series with 47 mmfd.	15 mc	15 mc "C" band	C-1 oscillator*
4		15 mc	Rock at 15 mc	C-2 antenna† while rocking
5	Antenna terminal (open link between "A" and "G") in series with 200 mmfd.	1,500 kc	1,500 kc "A" band	C-3 oscillator C-4 antenna
6		600 kc	Rock at 600 kc "A" band	L-5 oscillator while rocking
7		1,500 kc	1,500 kc "A" band	C-3 oscillator C-4 antenna

* Oscillator should track on high frequency side of signal. If two peaks are obtained use high frequency (minimum capacity) peak.

† If two peaks can be obtained use low frequency (maximum capacity) peak.

MODEL WR-13K5

WESTINGHOUSE ELECTRIC SUPPLY CO.



Schematic Circuit Diagram

MODEL WR-13K5
MODELS WR-177, WR-179 WESTINGHOUSE ELECTRIC SUPPLY CO.
MODELS WR-178, WR-180

Model WR-13K5

Electrical and Mechanical Specifications

FREQUENCY RANGE ..... 540-1,720 kc

INTERMEDIATE FREQUENCY ..... 455 kc

TUBE COMPLEMENT
(1) RCA-12SA7 ..... 1st Detector—Oscillator
(2) RCA-12SK7 ..... I-F Amplifier
(3) RCA-12SQ7 ..... 2nd Detector, 1st A-F, and A.V.C.
(4) RCA-50L6GT ..... Power Output
(5) RCA-35Z5GT ..... Half-Wave Rectifier

DIAL LAMP ..... Mazda 51, 7.5 volts, 0.2 amp.

POWER SUPPLY RATINGS
A-C Rating ..... 105-125 volts, 50-60 cycles, 30 watts
D-C Rating ..... 105-125 volts, direct current, 30 watts

POWER OUTPUT (125 volts, 60 cycle supply)
Undistorted ..... 0.8 watts
Maximum ..... 1.2 watts

LOUDSPEAKER
Type ..... 5-inch Electrodynamic

	Height	Width	Depth
Over-all Dimensions	7¼ inches	11⅛ inches	6 3/16 inches

Weight ..... 10 pounds (shipping)

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, through a 0.1 mfd. capacitor, and keep the output as low as possible.

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	I-F grid, in series with .01 mfd.	455 kc	Quiet point 1,700 kc end of dial	C8 and C9 2nd I-F Transformer
2	1st Det. grid in series with .01 mfd.			C6 and C7 1st I-F Transformer
3	Ant. terminal in series with 200 mmfd.	1,720 kc	Gang at minimum	C3 (osc.)
4	Radiation loop consisting of two turns of wire 18 inches in diameter located 4 to 6 feet from receiver	1,300 kc	Signal Frequency	C1 (ant.)
5	Repeat steps 3 and 4			

Antenna.—The set is equipped with a built-in loop antenna. If an out-door antenna is used, it may be connected to the "ANT." (blue) lead on rear of cabinet. It should not be longer than 100 feet, including lead-in. If it is longer, connect a 100 to 200 mmf. capacitor in series with the lead-in.

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.

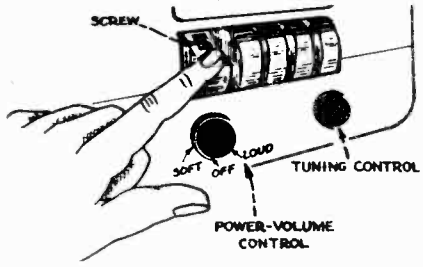
Precautionary Lead Dress:
1. Dress 1st I-F plate and grid leads against chassis and away from each other. Dress plate lead from 12SK7 close to chassis.
2. Dress leads from terminal board on loop support away from loop.

WR-177, WR-178, WR-179, WR-180 Adjustments for Push Button Tuning

The push buttons should be adjusted for five favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Cut out the tabs for your five favorite stations and arrange them in order of frequency in the recesses on the push buttons.
2. Press down on the first push button and hold it down. The screw in back of the push button is now accessible and should be loosened one or two turns with a screwdriver.
3. While still holding down the push button, tune in the first station represented by the station tab with the tuning knob, by Dial Tuning. When the station is heard at its best, tighten up the screw in back of the push button. Now let go of the push button, turn the tuning knob in order to detune and again press down the button and let go. The station should be heard again. If not, repeat the above adjustment process until reception is satisfactory.
4. Proceed to set up the other four push buttons in a similar manner.

A station may be changed at any time by following the above information.



Push Button Adjustments

Antenna.—The set is equipped with a built-in loop antenna. If an outdoor antenna is used, it may be connected to the "ANT." terminal on rear of cabinet. It should not be longer than 100 feet, including lead-in. If it is longer, connect a 100 to 200 mmf. capacitor in series with the lead-in.

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.

Alignment Procedure WR-177, WR-178, WR-179, WR-180

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, through a .01 mfd capacitor, and keep the output as low as possible.

Precautionary Lead Dress

1. Dress 1st I-F plate and grid leads against chassis and away from each other. Dress plate lead from 12SK7 close to chassis.
2. Dress leads from terminal board on loop support away from loop.

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	Tuning condenser stator (osc.) in series with .01 mfd.	455 kc	Quiet point at 1,600 kc end of dial	C1, C2, C3, C4 (1st and 2nd I-F transformers)
2	Antenna term. of ant. loop in series with 100 mmfd.	1,600 kc	Full clockwise (out of mesh)	C5 (oscillator)
3		1,500 kc	Resonance on 1,500 kc signal	C6 (antenna)

Electrical and Mechanical Specifications

Frequency Range ..... 540-1,600 kc

Intermediate Frequency ..... 455 kc

Loudspeaker
Type ..... 5-inch Electrodynamic

Power Supply Ratings
A-C Rating ..... 105-125 volts, 50-60 cycles, 30 watts
D-C Rating ..... 105-125 volts, direct current, 30 watts

Power Output (125 volts, 60 cycle supply)
Undistorted ..... 0.8 watts
Maximum ..... 1.2 watts

MODEL WR-42K11

WESTINGHOUSE ELECTRIC SUPPLY CO.

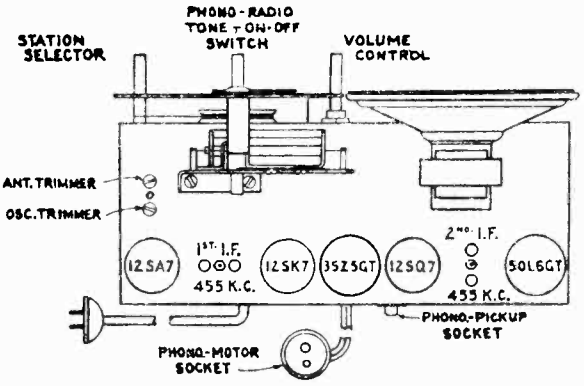
WR 42K11

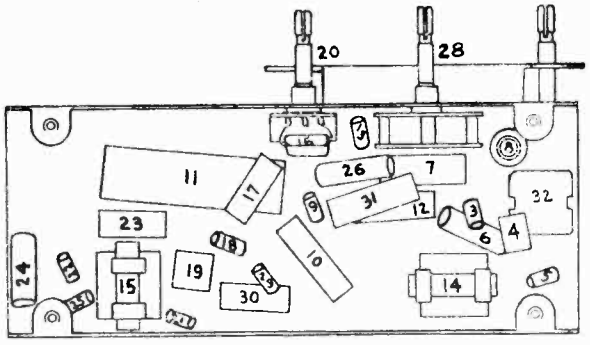
ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this chassis:

1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output meter.
3. A non-metallic screw driver
4. Dummy antennae—.1 mfd., 200 mmf.

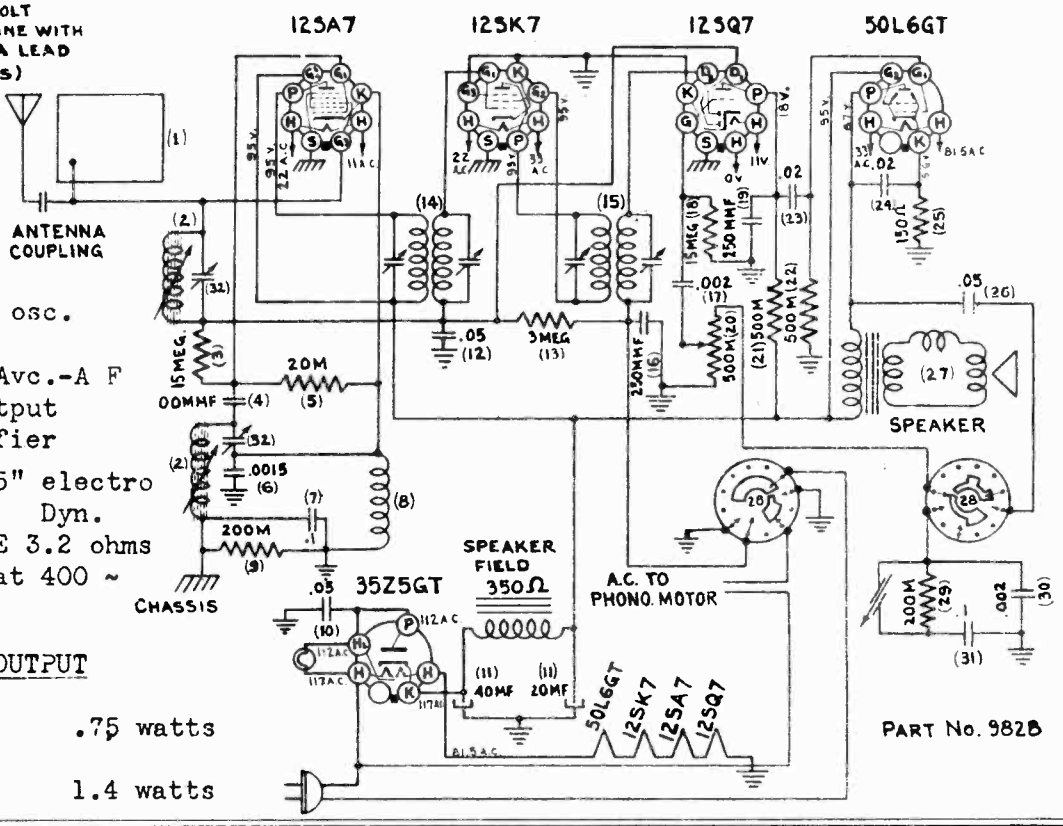
GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TRIMMER TO TUNE	REMARKS
I.F. 455 kc	12SA7 Grid	.1 mfd.	H.F. End	I.F. Transformers	Tune to Max.
1720 kc	Ext. Ant. Wire	200 mmf.	H.F. End	Oscillator Trimmer	Set limit of band
1400 kc	Ext. Ant. Wire	200 mmf.	1400	Antenna Trimmer	Tune to Max.





PART No. 9839

VOLTAGES ARE MEASURED WITH 1000 OHM PER VOLT METER, ON 117 VOLT LINE WITH NO SIGNAL. (ANTENNA LEAD SHORTED TO CHASSIS)



PART No. 9828

TUBES

12SA7 - Conv. osc.
12SK7 - I.F.
12SQ7 - Det. Avc.-A F
50L6GT - BP output
35Z5GT - Rectifier

LOUDSPEAKER 5" electro Dyn.
V.C. IMPEDANCE 3.2 ohms at 400 ~

POWER OUTPUT

Undistorted	.75 watts
Maximum	1.4 watts

MODEL WR-42X2

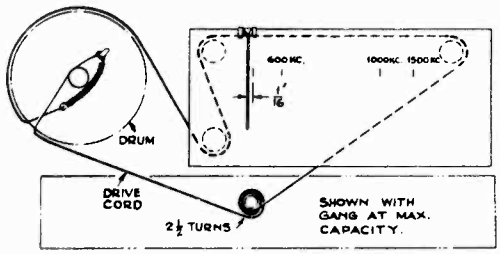
WESTINGHOUSE ELECTRIC SUPPLY CO.

Alignment Procedure

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 common negative, and keep the output as low as possible to avoid a-v-c action.

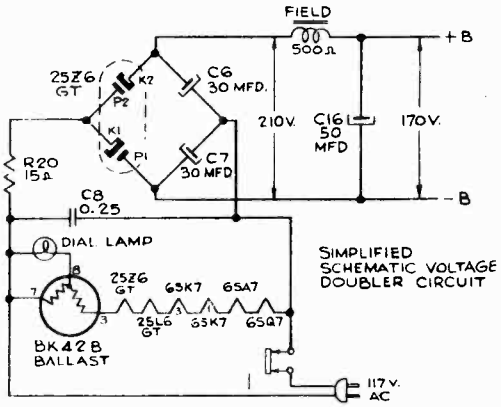
Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output
1	I-F grid, in series with .01 mfd.	455 kc	Quiet point 1,600 kc end of dial	L9 and L10 2nd I-F transformer
2	1st Det. grid in series with .01 mfd.			L6 and L7 1st I-F transformer
3	Ant. terminal in series with 200 mmfd.	1,720 kc	Gang at minimum	C10 (osc.)
4	Radiated signal 1,500 kc		Signal Frequency	C1 (ant.)
5	Radiated signal near 600 kc		Signal Frequency	L5 (osc.) (Rock gang)
6	Repeat steps 3, 4 and 5.			

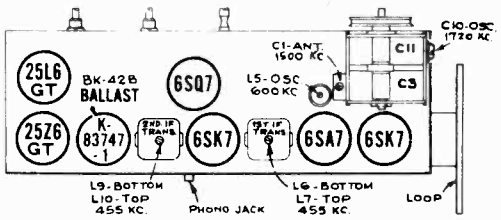


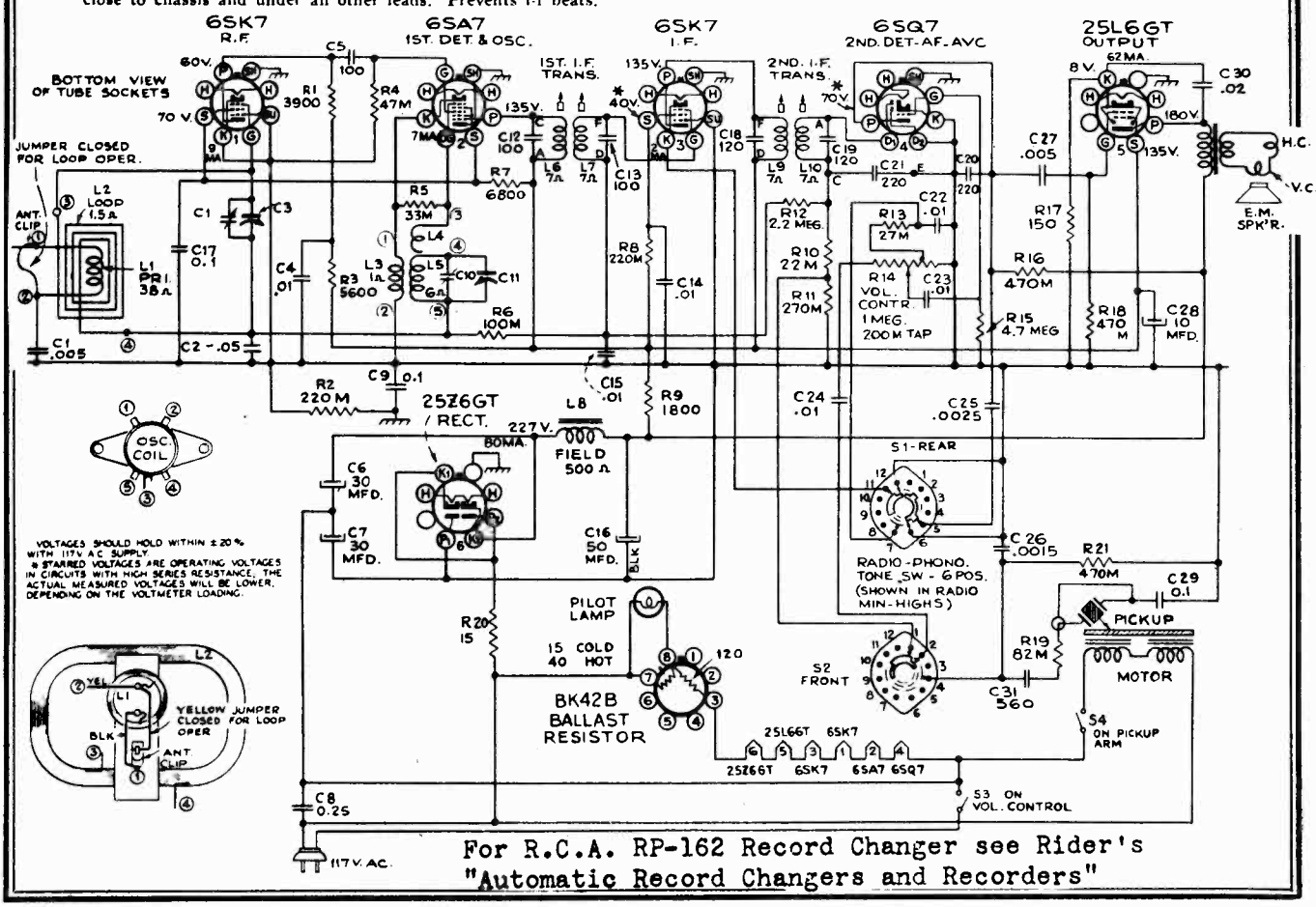
Critical Lead Dress:

1. Lead from 6SK7 i-f plate to last i-f transformer to be dressed close to chassis and under all other leads. Prevents i-f beats.
2. First audio grid coupling capacitor C23 and C24 to be dressed close to chassis and away from heater wiring. Prevents hum.

Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. In the event that only the chassis is returned for service, and the cabinet with its tuning dial is left in the customer's home, the scale printed in this service note can be used as an accurate and convenient substitute for the regular dial. With gang in full mesh, move the dial pointer to a point 1/16 inch to left of reference mark at left hand end of the dial backing plate. Place the dial under the pointer so that the extreme left scale graduation coincides with the pointer. Use scotch tape to hold the dial in place.



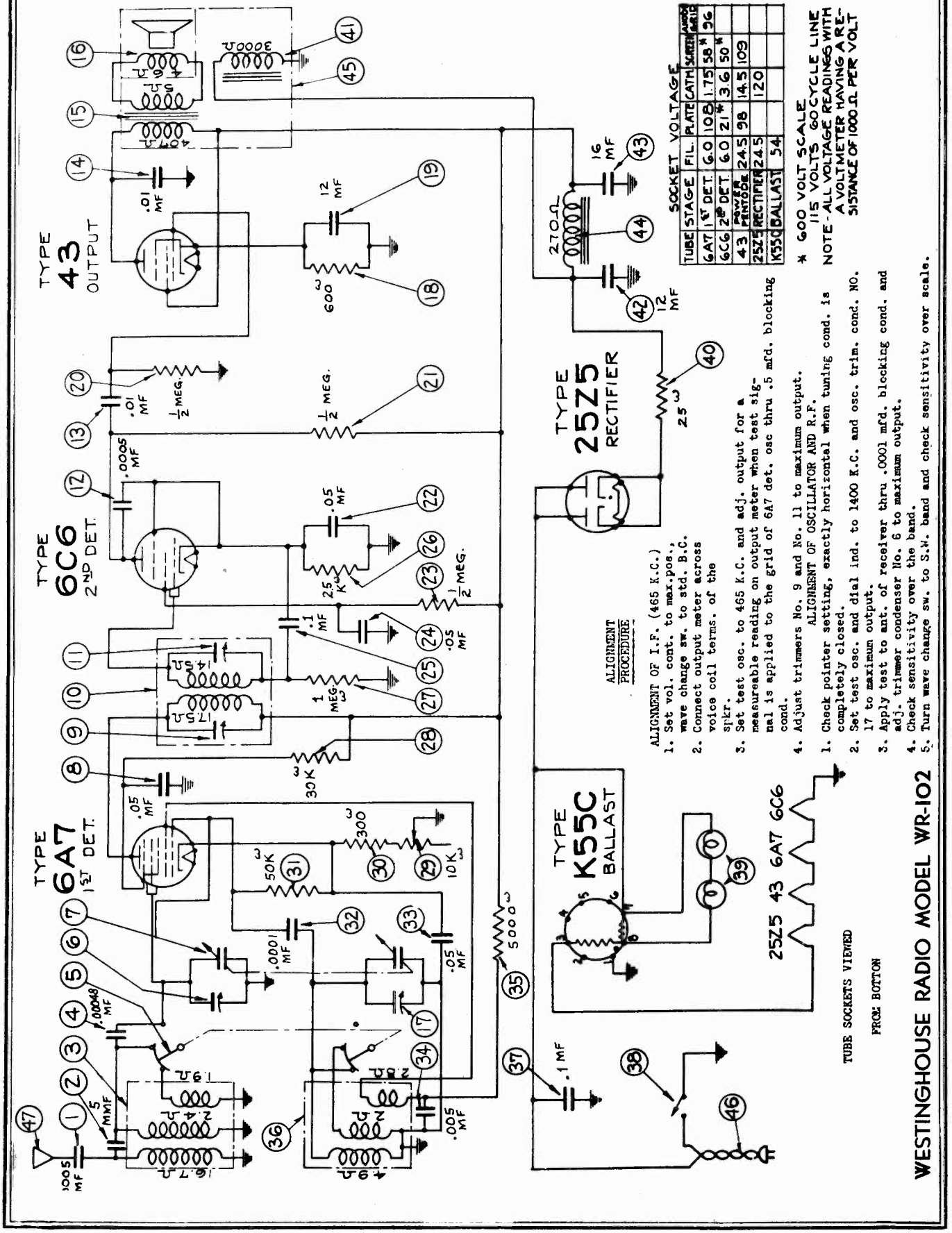




For R.C.A. RP-162 Record Changer see Rider's "Automatic Record Changers and Recorders"

MODEL WR-102

WESTINGHOUSE ELECTRIC SUPPLY CO.

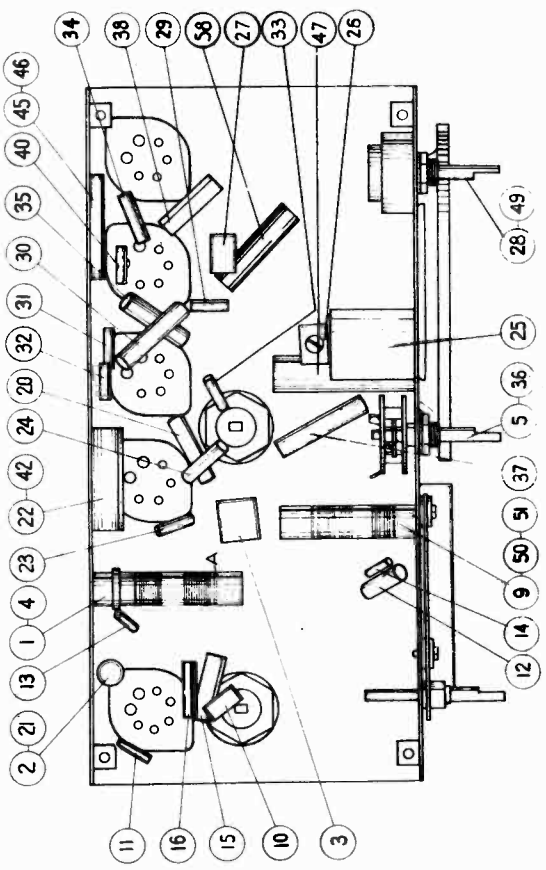


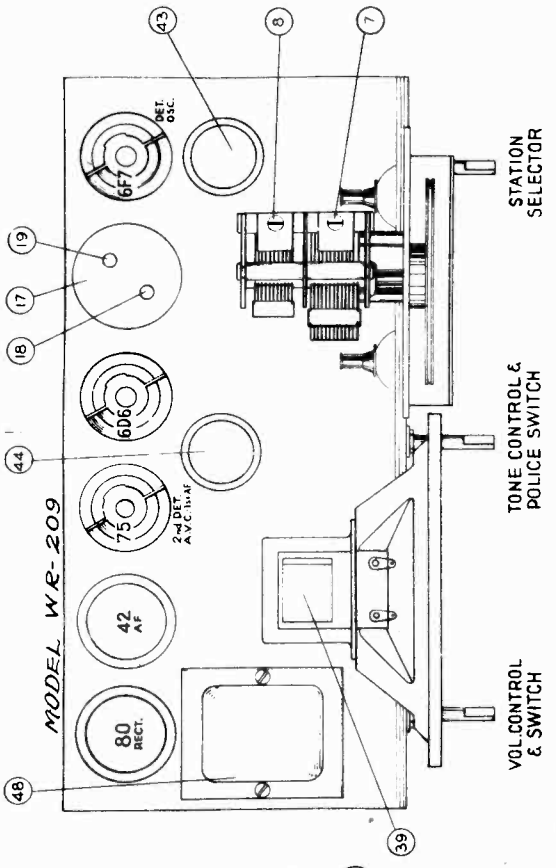
TUBE	STAGE	FIL.	PLATE	CATH	SCREEN	ANODE GRID
6A7	1ST DET.	6.0	108	1.75	58*	2.6
6C6	2ND DET.	6.0	21*	3.6	50*	
43	POWER PENTODE	24.5	98	14.5	109	
25Z5	RECTIFIER	24.5		120		
K55C	BALLAST	54				

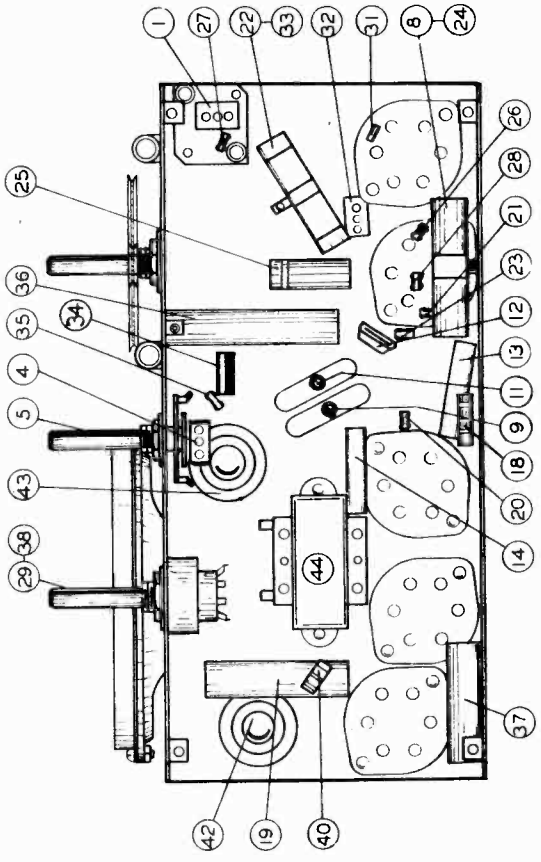
WESTINGHOUSE RADIO MODEL WR-102

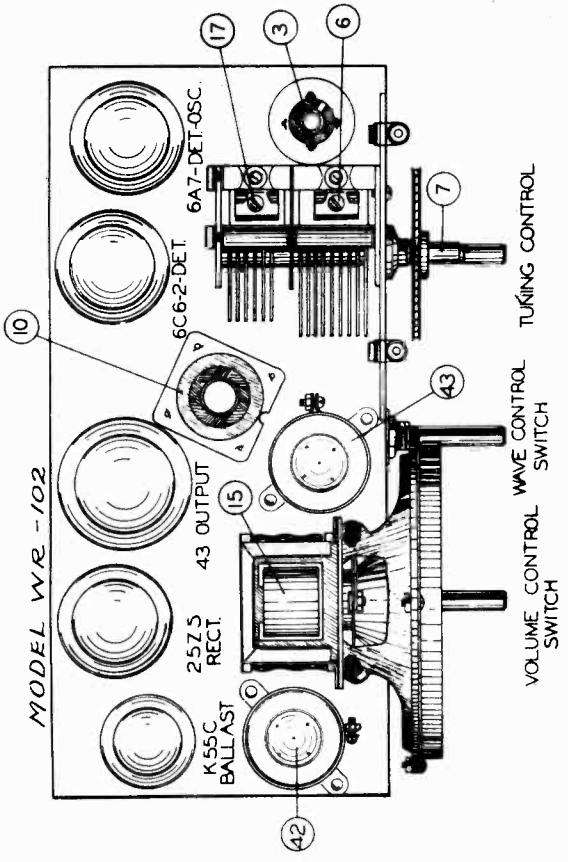
MODEL WR-102
MODEL WR-209

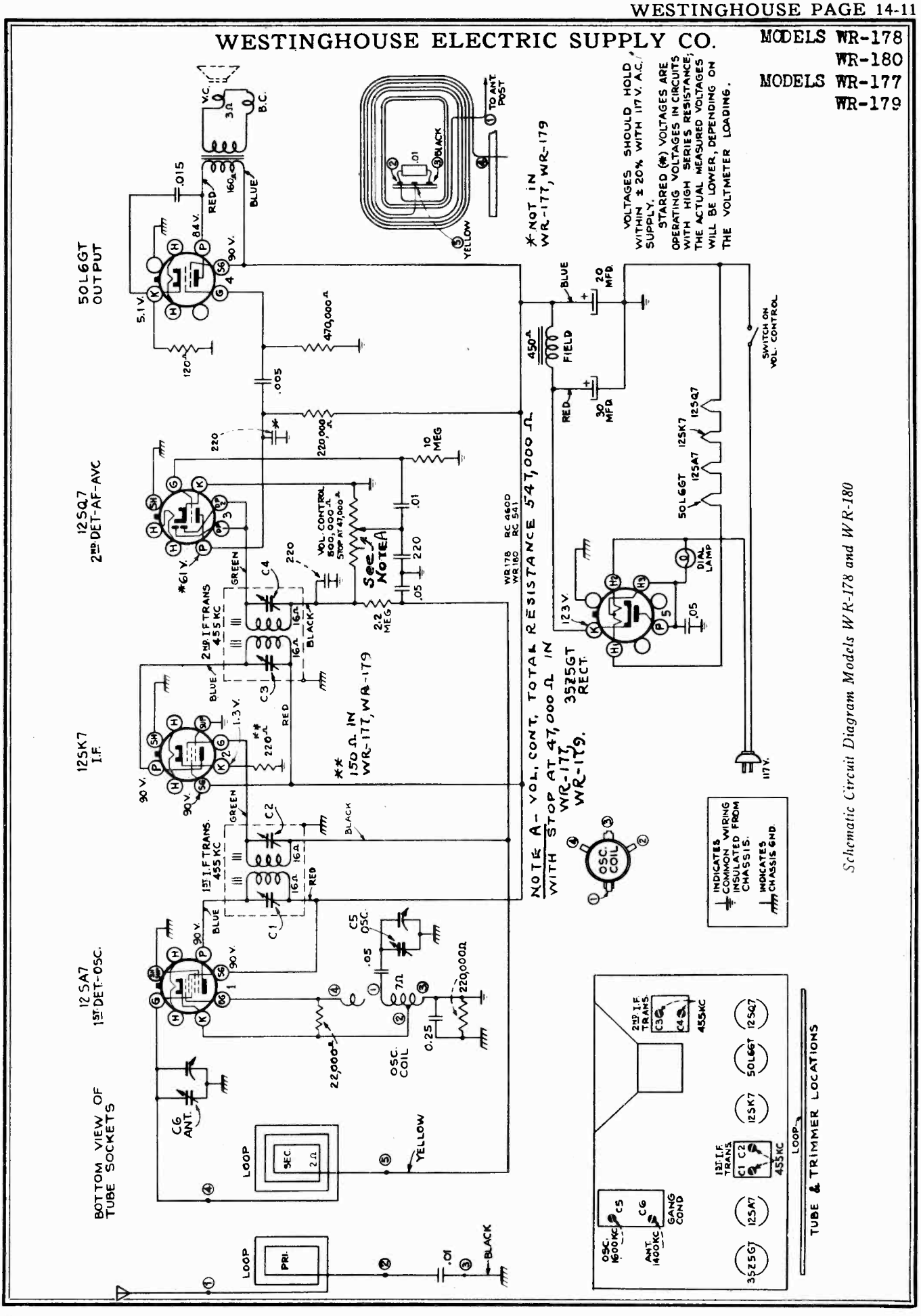
WESTINGHOUSE ELECTRIC SUPPLY CO.











MODEL WR-182
MODEL WR-182A

WESTINGHOUSE ELECTRIC SUPPLY CO.

Alignment Procedure

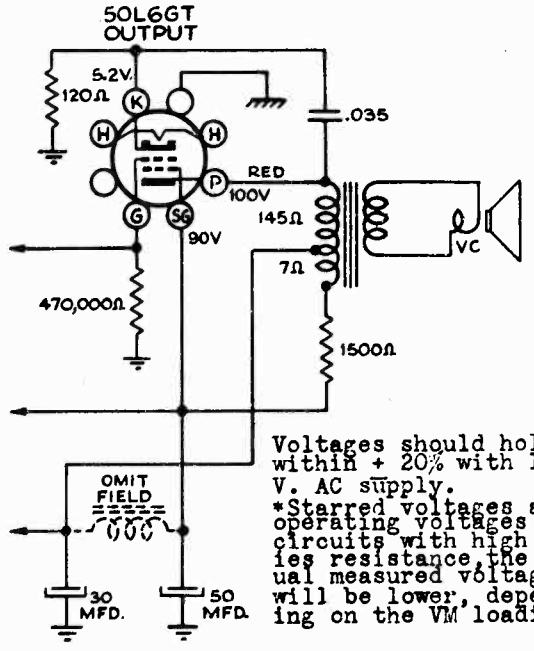
Output Meter Alignment.—Connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—Connect the low side of test-oscillator to the receiver chassis through a .01 mfd. capacitor, and keep the output as low as possible.

Pre-Setting Pointer.—With gang condenser in full mesh, the pointer should be adjusted to a horizontal position.

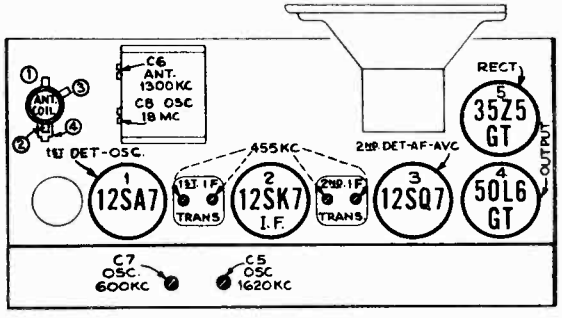
Step	Connect high side of test oscillator to—	Tune test oscillator to—	Turn radio dial to—	Adjust following for max. output—
1	Grid 12SK7 in series with 0.01 mfd.	455 kc	"A" Band Quiet Point at 1,550 kc end of dial	C3 and C4 (2nd I-F Trans.)
2	Grid 12SA7 in series with 0.01 mfd.			C1 and C2 (1st I-F Trans.)
3	Antenna in series with 300 ohms	18 mc	"C" Band 18 mc	C8 (osc.)*
4	Antenna in series with 200 mmfd.	600 kc	"A" Band 600 kc	C7 (osc.)
5		1,620 kc	"A" Band Full Clockwise	C5 (osc.)
6		1,300 kc	Resonance on 1,300 kc "A" Band	C6 (ant.)
7	Repeat steps 4 (rock in), 5 and 6.			

* Use minimum capacity peak if two can be obtained.
Note: Oscillator tracks above signal on both bands.

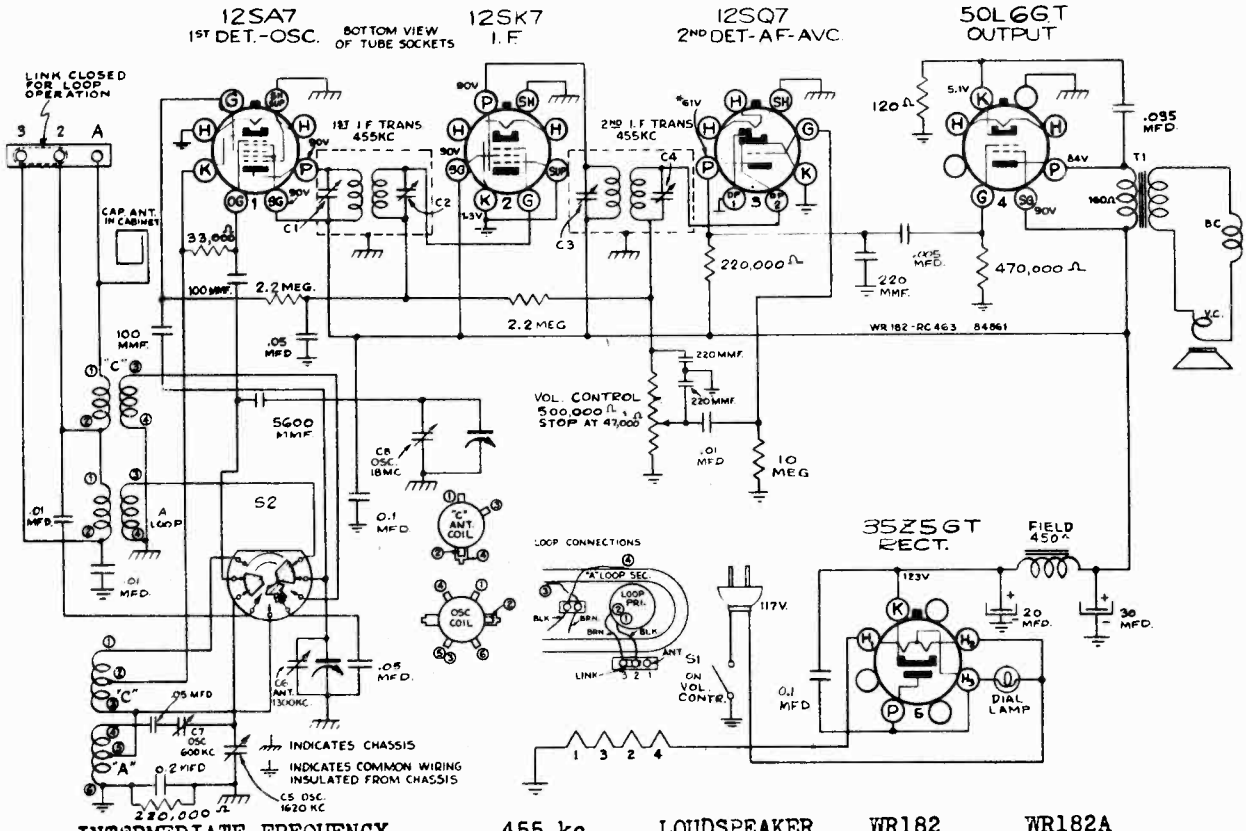


Voltages should hold within + 20% with 117 V. AC supply.
*Starred voltages are operating voltages in circuits with high series resistance, the actual measured voltages will be lower, depending on the VM loading.

Schematic Circuit Diagram for the Model WR182A is the same as that for WR182 except connections and parts as shown above



Tube and Trimmer Locations



INTERMEDIATE FREQUENCY	455 kc
POWER OUTPUT(125 V., 60 ~ Supply)	
Undistorted	0.65 watts
Maximum	1.23 watts

LOUDSPEAKER	WR182	WR182A
Type	5" Electro-dyn.	5"PM Dyn.

POWER SUPPLY RATINGS
A-C Rating 105-125V. 50-60~, 30 W.
D-C Rating 105-125 V. d.c.30 W.

MODEL WR-184

WESTINGHOUSE ELECTRIC SUPPLY CO.

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 ground, and keep the output as low as possible.

Precautionary Lead Dress

1. Dress 1st I-F plate and grid leads against chassis and away from each other. Dress plate lead from 12SK7 close to chassis.
2. Dress leads from terminal board on loop support away from loop.

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	Tuning condenser stator (osc.) in series with .01 mfd.	455 kc	Quiet point at 1,600 kc end of dial	L1, L2, L3, L4 (1st and 2nd I-F transformers)
2	Antenna term. of ant. loop in series with 100 mmfd.	1,500 kc	1,500 kc	C1 (oscillator) C2 (antenna)
3		600 kc	600 kc	L5 (oscillator)
4	Repeat steps 2 and 3.			

Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. Or, if necessary, the calibration scale printed in this service note can be used in conjunction with an ordinary 12-inch ruler as an accurate and convenient substitute for the regular dial.

Receiver Dial Scale and Corresponding Calibration Scale

Using Calibration Scale.—

1. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
2. Place a flat 12-inch ruler on the dial backing plate so the left-end of ruler is at the reference mark at left-end of backing plate. Temporarily fasten the ruler with scotch tape to the backing plate.
3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch-scale drawn at the bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale. For example 1,500 kc is approximately 3¼ inches from the reference mark.

Adjustments for Push Button Tuning

The push buttons should be adjusted for six favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Cut out the tabs for your six favorite stations and arrange them in order of frequency in the recesses on the push buttons.
2. Press down on the first push button and hold it down. The screw in back of the push button is now accessible and should be loosened one or two turns with a screwdriver.
3. While still holding down the push button, tune in the first station represented by the station tab with the tuning knob, by Dial Tuning. When the station is heard at its best, tighten up the screw in back of the push button. Now let go of the push button, turn the tuning knob in order to detune and again press down the button and let go. The station should be heard again. If not, repeat the above adjustment process until reception is satisfactory.
4. Proceed to set up the other five push buttons in a similar manner.

A station may be changed at any time by following the above information.

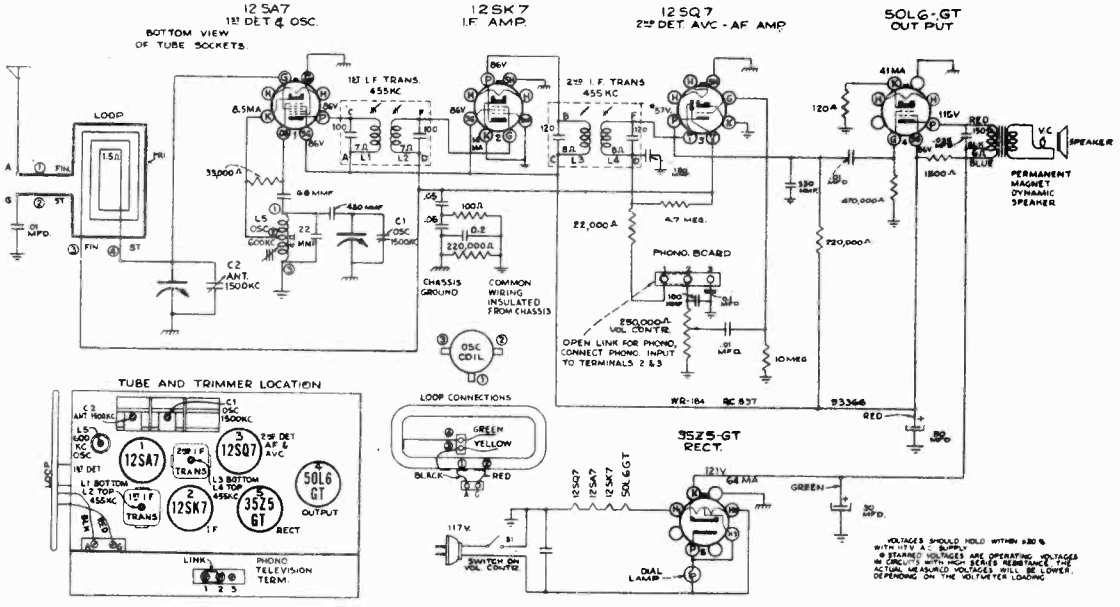
Dial-Pointer Adjustment.—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

INTERMEDIATE FREQUENCY 455 kc

POWER SUPPLY RATINGS
A-C Rating .... 105-125 V. 50-60 ~, 30 W.
D-C Rating ..... 105-125 V., d.c. 30 W.

POWER OUTPUT (125 Volts, 60 cycle supply)
Undistorted 1.1 watts
Maximum 1.4 watts

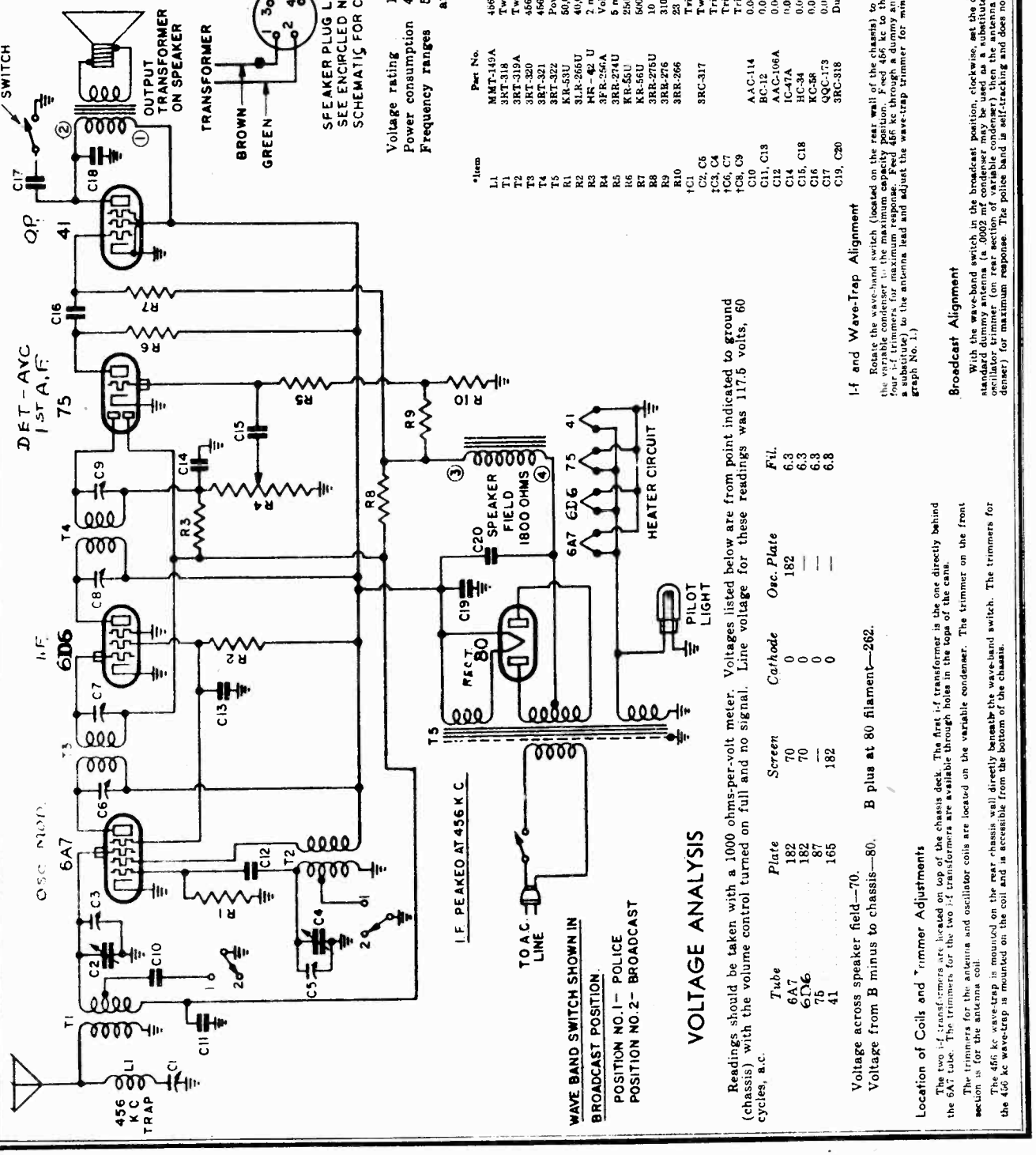
LOUDSPEAKER
Type 5-inch Permanent Magnet



Schematic Circuit Diagram

MODEL WR-217

WESTINGHOUSE ELECTRIC SUPPLY CO.



Voltage rating 105-125 volts a.c.
Power consumption 45 watts
Frequency ranges 540 to 1580 kc. and 1580 to 4200 kc.

*Item	Part No.	DESCRIPTION
L1	MMT-149A	456 kc wave-trap
T1	3RT-318	Two-band antenna coil
T2	3RT-319A	Two-band oscillator coil
T3	3RT-320	456 kc first i-f transformer
T4	3RT-321	456 kc second i-f transformer
T5	3RT-322	Power transformer
R1	KR-53U	50,000 ohm ¼ watt carbon resistor
R2	3LR-266U	40,000 ohm ½ watt carbon resistor
R3	HR-42 U	2 megohm ¼ watt carbon resistor
R4	3FR-256A	Volume control with switch—500,000 ohms
R5	3RR-274U	5 megohm ¼ watt carbon resistor
R6	KR-55U	250,000 ohm ¼ watt carbon resistor
R7	KR-56U	600,000 ohm ¼ watt carbon resistor
R8	3RR-276U	10 megohm ¼ watt carbon resistor
R9	3RR-276	310 ohm ½ watt wire-wound resistor
R10	3RR-266	23 ohm ½ watt wire-wound resistor
†C1		Trimmer, part of 456 kc wave-trap assembly.
C2, C6	3RC-317	Two-gang variable condenser
‡C3, C4		Trimmers, part of variable condenser.
†C6, C7		Trimmers, part of first i-f transformer assembly.
†C8, C9		Trimmers, part of second i-f transformer assembly.
C10	AAC-114	0.001 mf mica condenser
C11, C13	BC-12	0.05 mf, 200 volt tubular condenser
C12	AAC-106A	0.00005 mf mica condenser
C14	IC-47A	0.0005 mf mica condenser
C15, C18	HC-34	0.006 mf, 600 volt tubular condenser
C16	KC-58	0.01 mf, 400 volt tubular condenser
C17	QQC-173	0.015 mf, 600 volt tubular condenser
C19, C20	3RC-318	Dual 6 mf, 300 volt dry electrolytic condenser

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c.

Tube	*Plate*	*Screen*	*Cathode*	*Osc. Plate*	*Fil.*
6A7	182	70	0	182	6.3
6D6	182	70	0	—	6.3
75	87	—	0	—	6.3
41	165	182	0		6.8

Voltage across speaker field—70.
Voltage from B minus to chassis—80. B plus at 80 filament—262.

Location of Coils and Trimmer Adjustments

The two i-f transformers are located on top of the chassis deck. The first i-f transformer is the one directly behind the 6A7 tube. The trimmers for the two i-f transformers are available through holes in the top of the cans.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the antenna coil.

The 456 kc wave-trap is mounted on the rear chassis wall directly beneath the wave-band switch. The trimmers for the 456 kc wave-trap is mounted on the coil and is accessible from the bottom of the chassis.

I-f and Wave-Trap Alignment

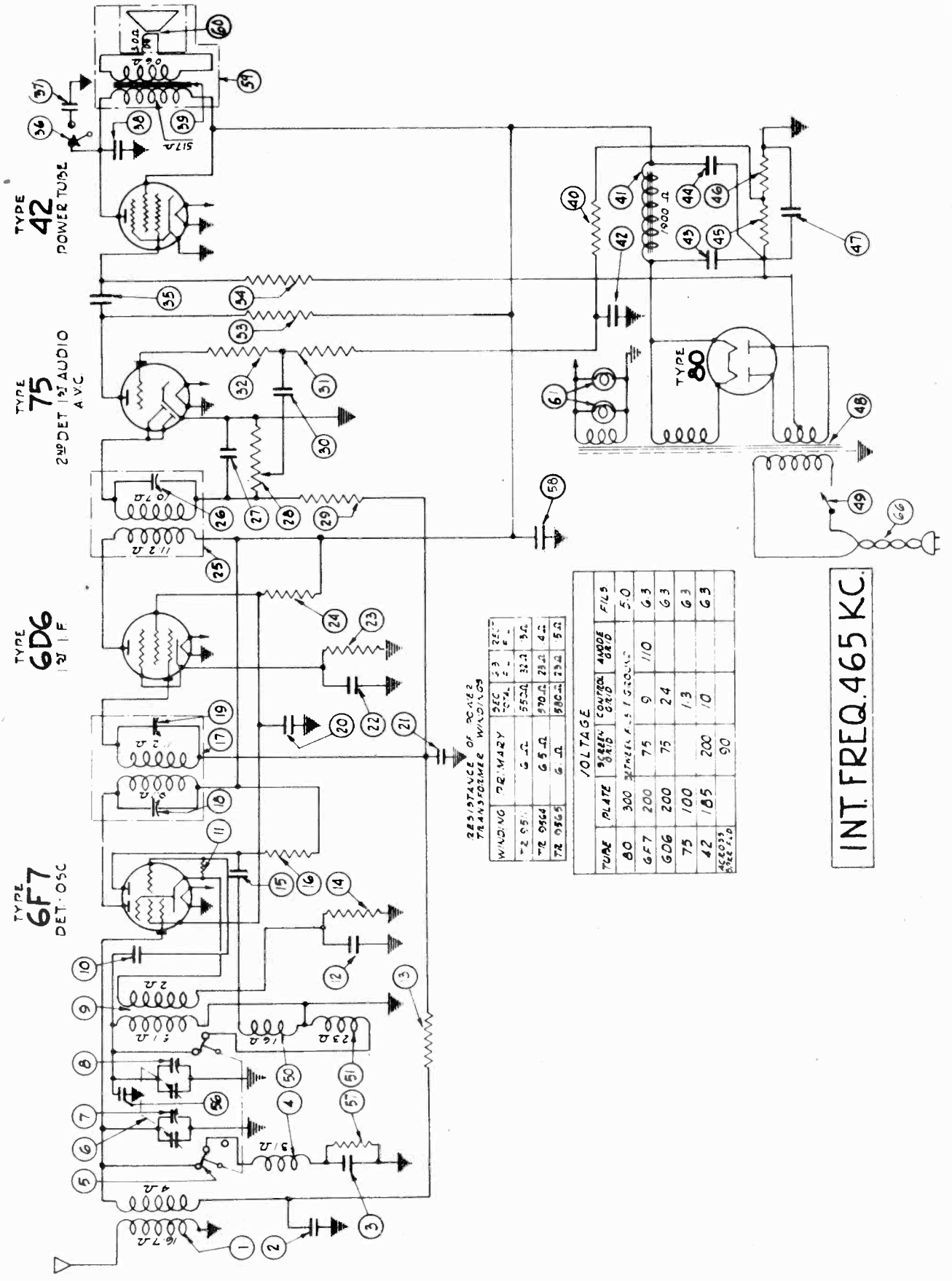
Rotate the wave-band switch (located on the rear wall of the chassis) to the broadcast position, clockwise, and swing the variable condenser to the maximum capacity position. Feed 456 kc to the grid cap of the 6A7, and adjust the four i-f trimmers for maximum response. Feed 456 kc through a dummy antenna (a .0002 mf condenser may be used as a substitute) to the antenna lead and adjust the wave-trap trimmer for minimum response. (See General Notes, paragraph No. 1.)

Broadcast Alignment

With the wave-band switch in the broadcast position, clockwise, set the dial pointer at 140. Feed 1400 kc. through a standard dummy antenna (a .0002 mf condenser may be used as a substitute) to the antenna lead and adjust that oscillator trimmer (on rear section of variable condenser) for maximum response. Then set the dial pointer at 600 and adjust the antenna trimmer (on front section of variable condenser) for maximum response. The police band is self-tracking and does not require any adjustment.

MODEL WR-209

WESTINGHOUSE ELECTRIC SUPPLY CO.



WESTINGHOUSE RADIO MODEL WR-209

ELECTRICAL SPECIFICATIONS

Type and Number of Tubes ---------- 1 #6F7, 1 #6D6, 1 #75, 1 #42, 1 #80 - Total 5
Power Supply ---------- 105 to 125 volts, 50 to 60 cycles A.C.
Power Consumption ---------- 46 Watts
Tuning Ranges ---------- 540 to 1500 K.C. and 1500 to 3200 K.C.
Maximum Undistorted Output ---------- 1.5 Watts
Maximum Output ---------- 2.8 Watts
Line-Up Frequencies ---------- I.F. 465 K.C., 1400 K.C.

GENERAL DESCRIPTION

This model is a five-tube, A.C., two-band superheterodyne receiver whose circuit comprises a combined first detector-oscillator an intermediate frequency amplifier, a combined second detector, A.V.C. and first audio amplifier, a power pentode output stage and a rectifier with its associated filter circuit and power transformer.

This model is designed to work over two bands, the broadcast band extending from 540 to 1500 K.C. and a police band which extends from 1400 to 3200 K.C.

LINE-UP CAPACITOR ADJUSTMENTS

To align the circuits of this receiver it is essential to use a high grade modulated test oscillator, the output of which can be continuously varied with absence from overload when the individual circuits of the receiver are brought into alignment.

A conventional output meter can be connected across the terminals of the speaker voice coil to indicate when the circuits are aligned. The sensitivity of the output meter must be sufficient to give satisfactory reading with a low input signal.

Before attempting to align the receiver, the service man should familiarize himself with the general layout of the chassis, location of the tubes and various alignment condensers. Top and bottom views of the chassis are shown in Fig. #1 and #2 and should be carefully studied before the actual work is started.

ADJUSTMENT OF I.F. (465 K.C.)

1. Set volume control on full, turn tone control knob to the right hand position. Set wave-change switch on the broadcast position and the dial indicator at approximately 600 K.C.
2. Connect output meter across voice coil of speaker.
3. Set test oscillator to 465 K.C. and adjust its output to produce a measurable reading on output meter when test signal is applied to the grid of the 6D6 I.F. tube thru a .5 mfd. blocking condenser.
4. Adjust #26 (see Fig. #2) to maximum output reducing output of test oscillator as required.
5. Apply test signal to grid of 6F7 first detector-oscillator tube and adjust #18 and #19 (Fig. #1) to maximum output.
6. With test signal still on the grid of 6F7 tube, repeat the above adjustments for greatest sensitivity.

ADJUSTMENT OF BROADCAST BAND

1. Leave test signal on grid of 6F7 tube and set the test oscillator to1400 K.C.
2. Turn the gang condenser to its maximum position. Adjust dial indicator until either end is directly over the long horizontal lines on the dial scale. Then set dial indicator to 1400 K.C.
3. Adjust trimmer #8 to maximum output.
4. Apply test signal to antenna of set thru a .0002 mfd. condenser and adjust trimmer #7 to maximum output.

ADJUSTMENT OF POLICE BAND

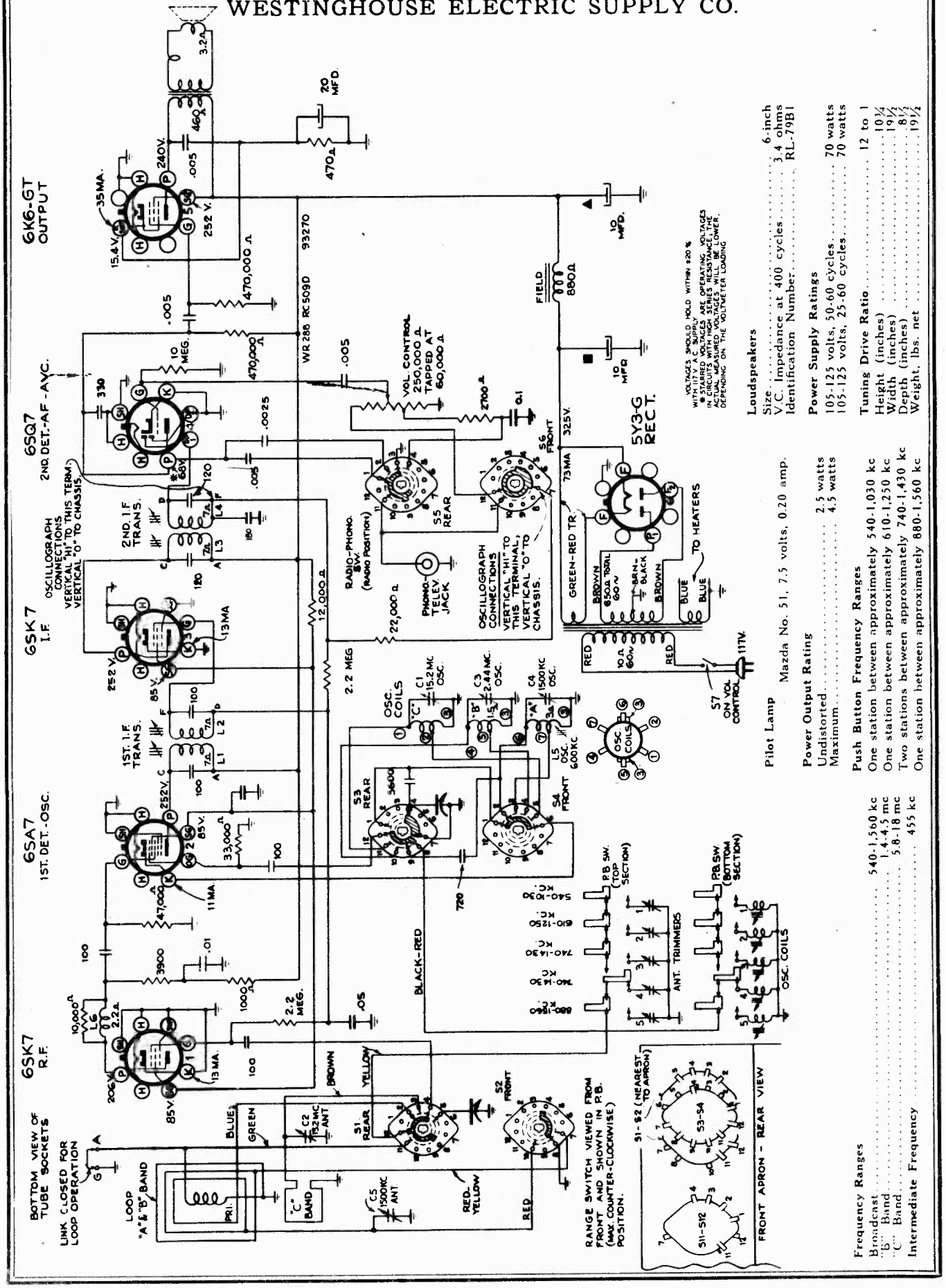
When adjustments as outlined under the broadcast band are completed, the police band requires no adjustment unless the coil had been changed. In this event, set test oscillator and station indicator to 1700 K.C. and apply test signal to antenna lead. The police band winding is indicated by "A" in Fig. #2. Adjust the position of this winding by sliding it back and forth on the core until maximum output is indicated on the output meter. This winding should then be secured in place by applying a thin coat of coil cement.

SERVICE PARTS LIST

Dia. #	Part #	Description of Parts	List Price
1	RC 9588	Antenna coil assembly	$ 1.10
2		.05 mfd., 200 V. condenser - part of SA 105327 (dual).	.30
3	CM 958	400 mmfd. mica condenser	.20
4		Police pre-selector coil - part of RC 9588	
5	SW 9519	Switch assembly	.85
6	CG 9522	Variable gang condenser	2.45
7		Trimmer condenser - part of CG 9522	
8		Trimmer condenser - part of CG 9522	
9	RC 9589	Oscillator coil assembly	.95
10	SA 106417	100 mmfd. mica condenser	.20
11	SA 105276	50,000 ohm, 1/4 W. resistor	.15
12	CW 2-05	.05 mfd., 200 V. condenser	.15
13	SA 105279	250,000 ohm, 1/4 W. resistor	.15
14	SA 105269	1800 ohm, 1/4 W. resistor	.15
15	CW 4-01	.01 mfd., 400 V. condenser	.15
16	SA 100197	25,000 ohm, 1/2 W. resistor	.15
17	IC 9532	1st I.F. transformer (465 KC.)	1.75
18		I.F. trimmer condenser - part of IC 9532	
19		I.F. trimmer condenser - part of IC 9532	
20	CW 4-10	.1 mfd., 400 V. condenser	.15
21		.05 mfd., 200 V. condenser - part of SA 105327 (dual).	.30
22		.05 mfd., 200 V. condenser - part of SA 105327 (dual).	.30
23	SA 105264	500 ohm, 1/4 W. resistor	.15
24	SA 101163	75,000 ohm, 1/2 W. resistor	.15
25	IC 9533	2nd I.F. transformer (465 KC.)	1.10
26		I.F. trimmer condenser - part of IC 9533	
27	SA 106417	100 mmfd. mica condenser	.20
28	VR 957	Volume control and line switch - (500,000 ohm)	1.25
29	SA 105281	1 meg., 1/4 W. resistor	.15
30	CW 4-02	.02 mfd. 400 V. condenser	.15
31	SA 105281	1 meg., 1/4 W. resistor	.15
32	SA 105278	100,000 ohm, 1/4 W. resistor	.15
33	SA 105279	250,000 ohm, 1/4 W. resistor	.15
34	SA 100195	250,000 ohm, 1/2 W. resistor	.15
35	CW 4-02	.02 mfd. 400 V. condenser	.15
36	SW 9519	Tone control switch	.85
37	CW 4-02	.02 mfd. 400 V. condenser	.15
38	CW 4-005	.005 mfd. 400 V. condenser	.15
39	SA 107357	Speaker output transformer	1.25
40	SA 105276	50,000 ohm, 1/4 W. resistor	.15
41	SA 107358	Speaker field coil - (1900 ohm)	1.75
42		.05 mfd. 200 V. condenser - part of 105327 (dual)	.30
43	CE 9512	12 mfd. electrolytic condenser (450 V.)	1.25
44	CE 9511	8 mfd. electrolytic condenser (300 V.)	.85
45	RE 9513	320 ohm resistor	.25
46		30 ohm resistor - part of RE 9513	
47	CE 958	10 mfd. electrolytic condenser	.65
48	PR 9511	Power transformer 105-125 V., 50-60 cycles	3.50
49		Line switch - part of VR 957	
50		Oscillator feed back coil - part of RC 9589	
51		Police oscillator coil - part of RC 9589	
56	SA 108043	.00001 mfd. mica condenser	.20
57	SA 105272	10,000 ohm, 1/4 W. resistor	.15
58	CW 4-05	.05 mfd., 400 V. condenser	.15
59	SK 9536	Speaker	6.00
60	SA 106617	Diaphragm and voice coil	1.15
61	LP 951	Dial lamp	.20
66	*CB 9512	Line cable and plug	.50

MODEL WR-288

WESTINGHOUSE ELECTRIC SUPPLY CO.



Loudspeakers

Size	6-inch
V.C. Impedance at 400 cycles	3.4 ohms
Identification Number	RL-79B1

Power Supply Ratings

105-125 volts, 50-60 cycles	70 watts
105-125 volts, 25-60 cycles	70 watts

Tuning Drive Ratio ..... 12 to 1

Height (inches)	10¾
Width (inches)	19½
Depth (inches)	8½
Weight, lbs. net	19½

Pilot Lamp ..... Mazda No. 51, 7.5 volts, 0.20 amp.

Power Output Rating

Undistorted	2.5 watts
Maximum	4.5 watts

Push Button Frequency Ranges

One station between approximately	540-1,030 kc
One station between approximately	610-1,250 kc
Two stations between approximately	740-1,430 kc
One station between approximately	880-1,560 kc

Frequency Ranges

Broadcast	540-1,560 kc
"B" Band	1.4-4.5 mc
"C" Band	5.8-18 mc
Intermediate Frequency	455 kc

MODEL WR-288

WESTINGHOUSE ELECTRIC SUPPLY CO.

Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic diagrams.

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 output as low as possible to avoid a-v-c action.

Calibration Scale.—The glass tuning dial my be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. Or, if necessary, the calibration scale printed in this service note can be used in conjunction with an ordinary 12-inch ruler as an accurate and convenient substitute for the regular dial.

Each method is described below.

Using Tuning Dial.—

1. Slide out the flat spring clamp at each end of the dial, and remove the glass dial from the cabinet.

2. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.

3. Place the glass dial under the pointer so that the extreme left scale graduations coincide with the pointer. Use scotch tape to hold the glass dial in this position.

4. After completion of the alignment, replace the glass dial in cabinet, taking care that the fibre light shields are in correct position at ends of dial.

Using Calibration Scale.—

1. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.

2. Place a flat 12-inch ruler on the dial backing plate so the left-end of ruler is at the reference mark at left-end of backing plate. Temporarily fasten the ruler with scotch tape to the backing plate.

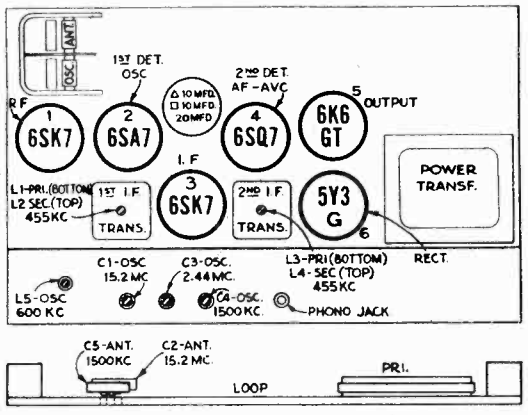
To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale. For example, 1,500 kc is approximately 4 inches from the reference mark.

Dial-Pointer Adjustment.—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

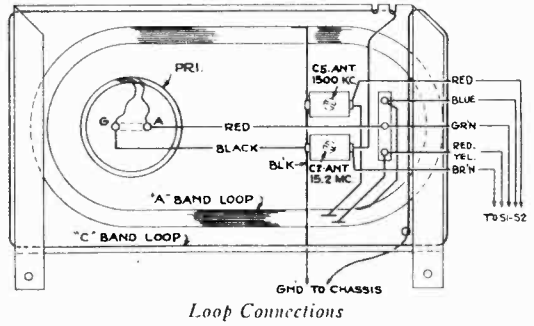
Steps	Connect the high side of the test-osc. to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for maximum peak output—
1	I.F grid, in series with .01	455 kc	"A" band, Quiet point at 1,500 kc end of dial	L3 and L4 (2nd I.F. Trans.)
2	1st-Det. grid, in series with .01			L1 and L2 (1st I.F. Trans.)
3	Antenna terminal, in series with 300 ohms (link open)	15.2 mc	15.2 mc "C" band	C1 (osc.)* C2 (ant.)
4		2.44 mc	2.44 mc "B" band	C3 (osc.) Rock in
5	Antenna terminal, in series with 200 mmfd. (link open)	1,500 kc	1,500 kc "A" band	C4 (osc.) C5 (ant.)
6		600 kc	600 kc "A" band	L5 Rock in
7	Repeat steps 5 and 6.			

* Use minimum capacity peak if two peaks can be obtained. Check to determine that the correct peak has been used, by tuning receiver to 14.29 mc, where a weaker signal should be received.

Note: Oscillator tracks above signal on all bands.



Tube and Trimmer Locations



Loop Connections

Push Button Adjustment

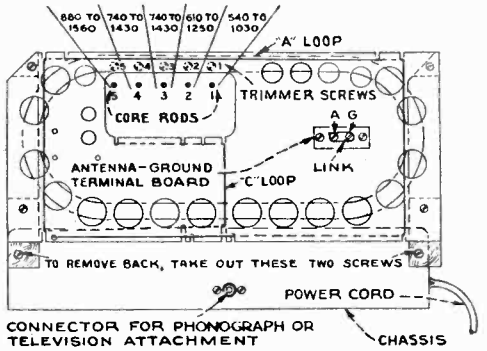
The push buttons connect to separate magnetite-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool. Allow at least five minutes warm-up period before making adjustments.

In the event that the receiver is to be used with an external antenna use one or two feet of wire (as an antenna) to ensure sharp peaking during the final adjustment procedure. For loop operation, the link should be strapped across "A" and "G" terminals on back of set. In either case the procedure is as follows:

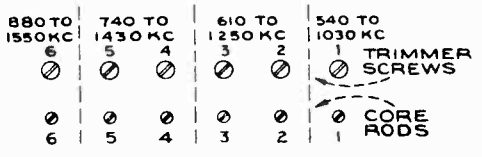
1. Make a list of the desired stations, arranged in order from low to high frequencies.
2. Turn the range selector to "A" band, and manually tune in the first station on the list.
3. Turn Range Control knob to "PB" and press push button No. 1 and adjust No. 1 oscillator core to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until station is received.
4. Adjust No. 1 antenna trimmer for maximum output on this station.

   Owing to the relatively high R-F gain, it may be found that there are several settings of each push-button magnetite core that will bring in any particular station. In such cases it is advisable to unscrew the push button antenna trimmers to minimum capacity before adjusting the oscillator cores.

   Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.
5. Adjust for each of the remaining stations in the same manner.
6. After all stations are tuned-in on the buttons, make a fina careful adjustment of all core rods until best reception is obtained for each. Outdoor antenna should now be reconnected if used.

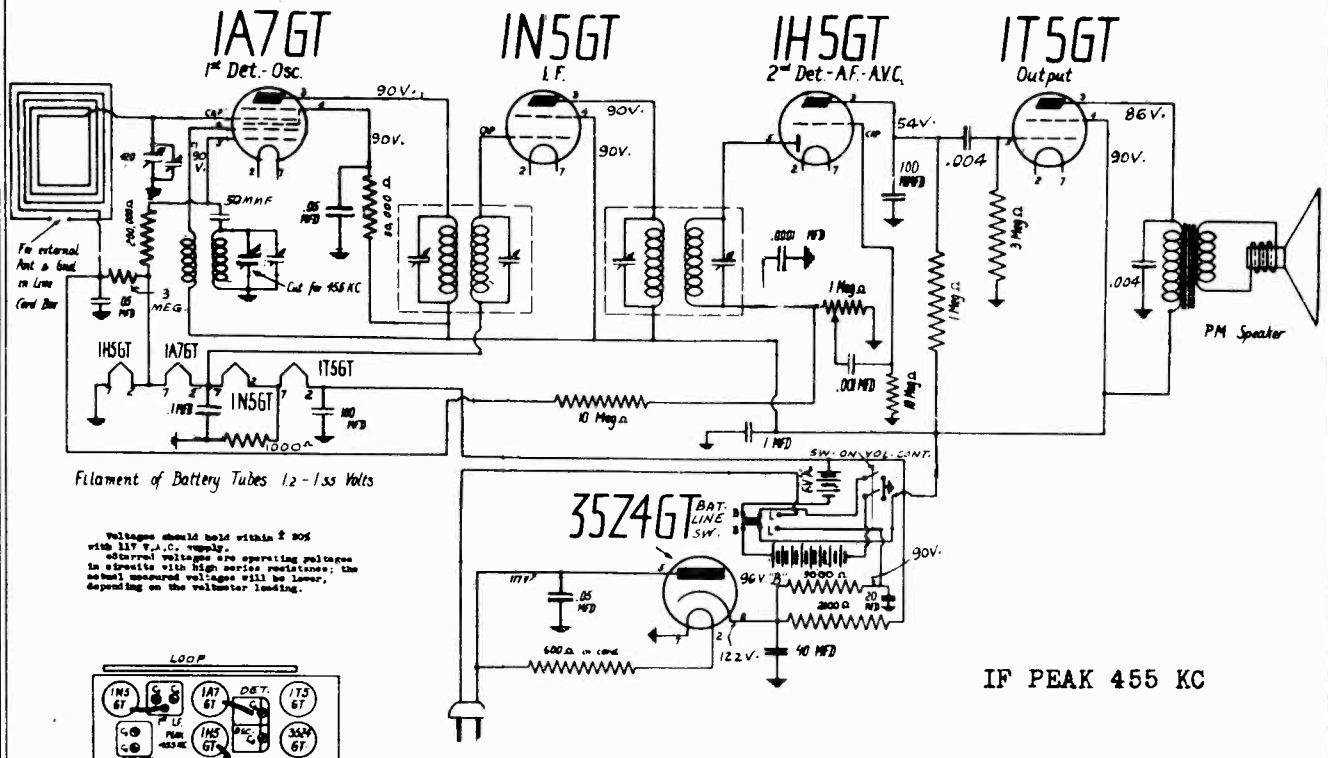


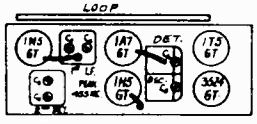
Back of Chassis



Push Button Adjustments

WESTINGHOUSE ELECTRIC SUPPLY CO.





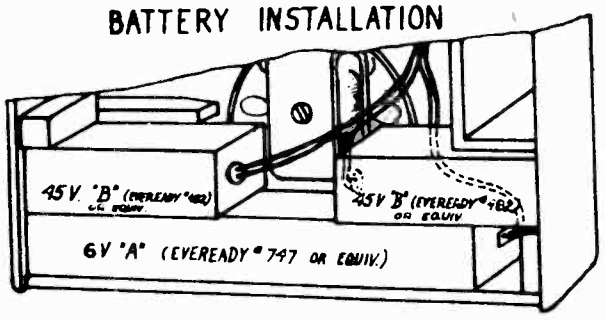
Alignment Procedure

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, keep the output as low as possible to avoid a-v-c action. Connect the high side of the test-oscillator to one of the antenna loop primary leads. Connect the low side of the test-oscillator to the other antenna loop primary lead.

Steps	Tune test-osc. to—	Turn Radio dial to—	Adjust the following for max. peak output—
1	455 kc	Quiet point at 1700 kc end of dial	C1, C2, C3, C4 (1st and 2nd I-F transformers)
2	1700 kc	1700 kc	C5 osc.
3	1500 kc	1500 kc	C6

BATTERY INSTALLATION



MODEL WR-678
WR-679

Frequency Range ..... 540-1700 kc
Intermediate Frequency ..... 455 kc

RCA TUBE COMPLEMENT
(1) RCA-1A7-GT ..... 1st.-Det—Osc.
(2) RCA-1N5-GT ..... I-F Amplifier
(3) RCA-1H5-GT ..... 2nd-Det., A-F, and A.V.C.
(4) RCA-1T5-GT ..... output
(5) RCA-35Z4-GT ..... Rectifier

LINE CURRENT SUPPLY
110 to 125 volts, AC 40 to 60 cycles, or DC ..... 20 watts

BATTERIES REQUIRED
"A" one 6 volt dry plug-in type (Eveready No. 747 or equivalent)
"B" two 45 volt dry plug-in type (Eveready No. 482 or equivalent)

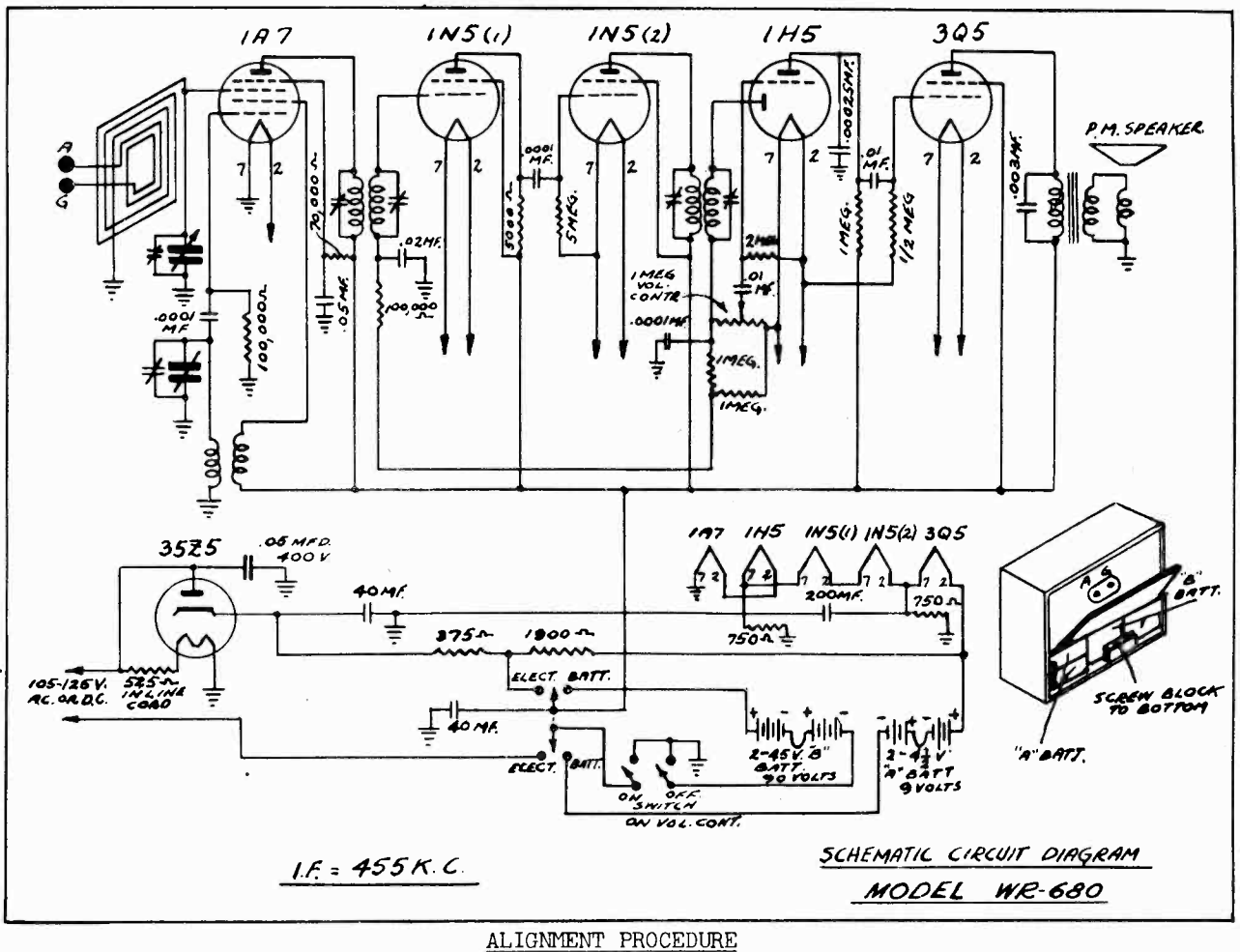
CURRENT CONSUMPTION
"A," 0.05 ampere—"B," 10.5 milliamperes full power,

POWER OUTPUT
Undistorted ..... 0.10 watt
Maximum ..... 0.19 watt

LOUDSPEAKER
Type ..... 5-inch permanent-magnet dynamic
Voice-coil Impedance ..... 3.5 ohms at 400 cycles

MODELS WR-680, WR-681

WESTINGHOUSE ELECTRIC SUPPLY CO.



ALIGNMENT PROCEDURE

A Signal Generator and Output Meter are necessary for proper alignment of this receiver.

Before proceeding with any re-alignment, see that the pointer is in a horizontal position when the plates are fully meshed. Be sure that the grid leads to the 1N5 tubes are not too close together, and move the lead from the loop antenna away from the 1F grid.

THE INTERMEDIATE FREQUENCY is 455 KC. Connect the high side of the Signal Generator to the 1A7 grid with the grid cap removed and the low side to chassis. Set the Generator to this frequency. Adjust for maximum output as indicated on the output meter, which is connected across the Speaker Voice Coil. The I.F. trimmers are in the tops of the shield cans.

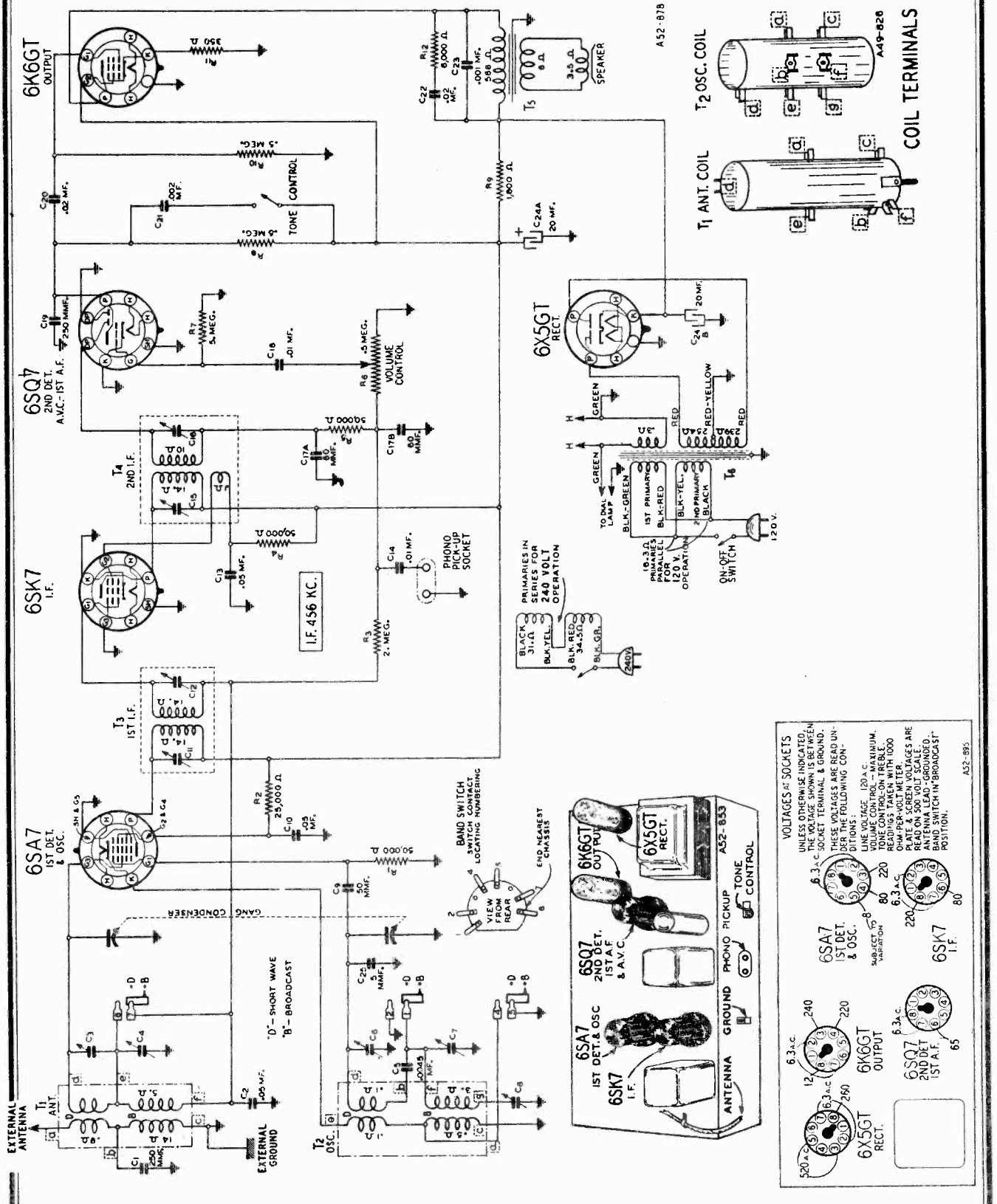
Replace the 1A7 grid cap. Couple the signal generator to the receiver by connecting to the A and G terminals on the back of the case. Turn the Signal Generator to 1400 KC, rotate the tuning knob to indicate this frequency and tune in the signal by means of the oscillator trimmer which is located on the right side (rear) of the variable condenser. Now adjust the antenna trimmer (front section of the variable condenser) for maximum output.

No further adjustments are required.

TUBES:	1A7GT - Det.-Osc.	POWER OUTPUT:	
	1N5GT - 1st I.F.		
	1N5GT - 2nd I.F.	Undistorted	.17 watt
	1H5GT - Det. avc. and A.F.		
	3Q5GT - Output	Maximum	.250 watt
	35Z5GT - Rectifier		

MODEL M-102

WESTINGHOUSE ELEC. INTERNATIONAL CO.



MODEL M-102

WESTINGHOUSE ELEC. INTERNATIONAL CO.

SPECIFICATIONS

Power Consumption 45 Watts (At 120 volts 60 cycles)
Power Output .....1.5 Watts Undistorted
3.0 Watts Maximum
Selectivity.....37 KC Broad at 1000 times Signal
Intermediate Frequency .....456 KC
Speaker Voice Coil Impedance at
400 cycles .....3½ Ohms

Tuning Frequency Range
Broadcast Range ..... 540 to 1600 KC
Shortwave Range .....4700 to 18000 KC

Sensitivity—(For 0.5 Watt output)
Broadcast Range.....20 Microvolts Average
Shortwave Range.....60 Microvolts Average

120 OR 240 VOLT POWER TRANSFORMER CONNECTIONS

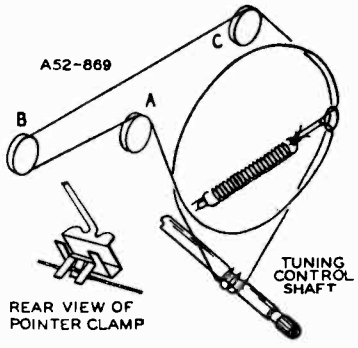
All radios except those for use on 25 cycles are equipped with a dual voltage power transformer which may be connected for 120 volts or 240 volts operation on 50-60 cycles. See diagram on page 3.

DRIVE CORD REPLACEMENT

Turn gang condenser to completely closed position. Using a new drive cord 45" in length, tie one end to tension spring. Pass other end through hole in rim of drive pulley. Pull spring flush against inside of pulley rim. Wind cord around drive pulley and pass over idler pulleys "A," "B," and "C"—See illustration.

Continue cord around drive pulley to tuning control shaft. Cord should be on right side of pulley groove (from gang condenser end of chassis). Wind drive cord 2 turns around section of tuning control shaft directly below drive pulley—See illustration.

Continue cord around drive pulley. Pass cord through hole in pulley rim. Tie cord to tension spring. Stretch tension spring and secure free end to hook on pulley.



ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning:
An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter—Small Screwdriver.
Dummy Antennas—.1 mf., 200 mmf., and 400 ohm carbon resistor.

SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	RANGE SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
It is not necessary to remove chassis from cabinet if a short screwdriver is used for the I.F. adjustments. CAUTION—Align S.W. (Range D) *before* aligning Broadcast (Range B).					
I.F.					
456 KC	Antenna Lead	.1 mf.	Broadcast (to left)	Turn Rotor to Full Open	1st I.F. (C11) & (C12) 2nd I.F. (C15) & (C16)
S.W. (RANGE D)					
18,000 KC	Antenna Lead	400 Ohm	Shortwave (to right)	Turn Rotor to Full Open	Oscillator Shortwave (C6)
17,000 KC	Antenna Lead	400 Ohm	Shortwave (to right)	Turn Rotor to Max. Output	Ant. Shortwave (C3) Rock Rotor—See Note B
BROADCAST (RANGE B)					
1600 KC	Antenna Lead	200 mmf.	Broadcast (to left)	Turn Rotor to Full Open	Oscillator Broadcast (C7)
1400 KC	Antenna Lead	200 mmf.	Broadcast (to left)	Turn Rotor to Max. Output Set Pointer to 1400 KC— See Note A	Ant. Broadcast (C4)
600 KC	Antenna Lead	200 mmf.	Broadcast (to left)	Turn Rotor to Max. Output	600 KC (C8) Rock Rotor—See Note B

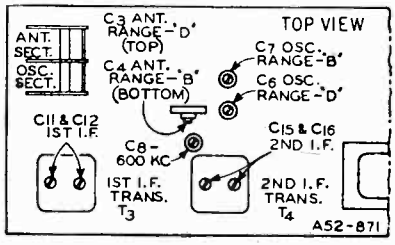
Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

After each range is completed, repeat the procedure as a final check.

NOTE A—If the pointer is not at 1400 KC on the dial when maximum output is obtained, move the pointer to the 1400 KC mark on the dial scale.

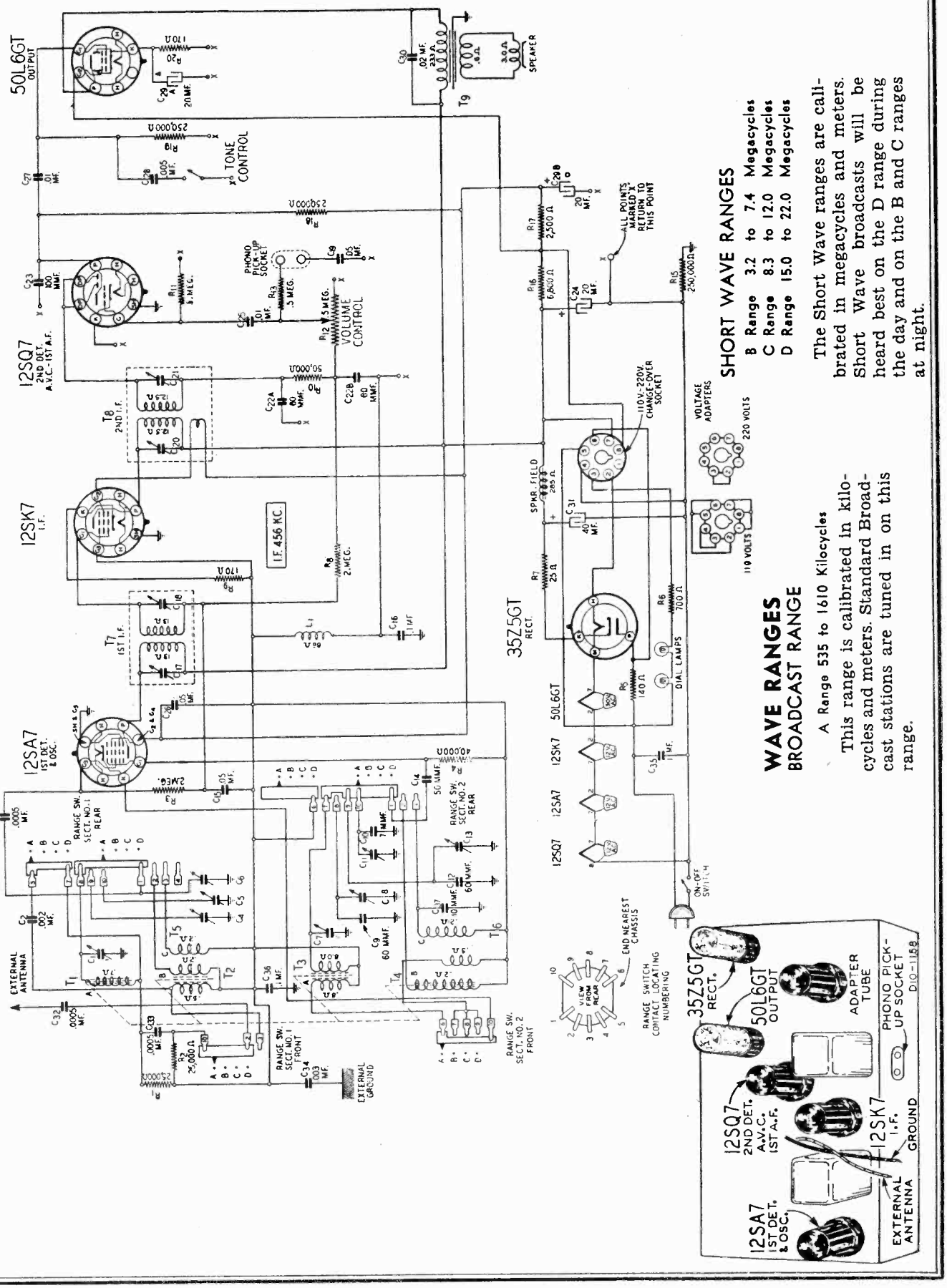
NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

CAUTION—When aligning the short wave bands, be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal should be heard at 15,000 less 912 KC, or 14,088 KC on the dial. It may be necessary to increase the input signal to hear the image.



MODELS M-104, N-204

WESTINGHOUSE ELEC. INTERNATIONAL CO.



WAVE RANGES
BROADCAST RANGE

A Range 535 to 1610 Kilocycles

This range is calibrated in kilocycles and meters. Standard Broadcast stations are tuned in on this range.

SHORT WAVE RANGES

B Range 3.2 to 7.4 Megacycles
C Range 8.3 to 12.0 Megacycles
D Range 15.0 to 22.0 Megacycles

The Short Wave ranges are calibrated in megacycles and meters. Short Wave broadcasts will be heard best on the D range during the day and on the B and C ranges at night.

MODELS M-104, N-204

WESTINGHOUSE ELEC. INTERNATIONAL CO.

100-120 Volts DC or 40-60 Cycle AC Operation

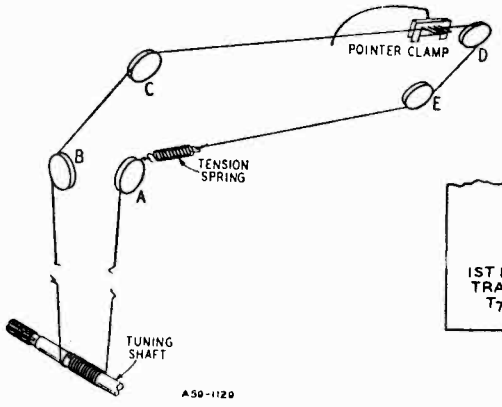
To adjust this receiver for operation on a 100-120 volt DC or 40-60 cycle power supply, the 220 volt Voltage Adapter tube (Part No. 6A250) must be replaced with a 110 volt Voltage Adapter tube (Part No. 6A251).

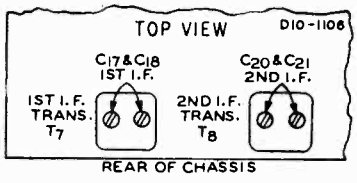
SPECIFICATIONS

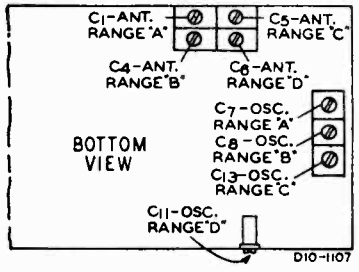
	120 Volt Operation AC or DC	240 Volt Operation AC or DC
Power Consumption	45 Watts	60 Watts
Power Output	2 Watts Undistorted 3 Watts Maximum	4.5 Watts Undistorted 6 Watts Maximum
Sensitivity	(For .05 Watt Output) 20 Microvolts Av. All Ranges	(For 0.5 Watt Output) 20 Microvolts Av. All Ranges
Selectivity	37 KC Broad at 1000 Times Signal	
Intermediate Frequency	456 KC	
Speaker	6" Electro-Dynamic	

Tuning Frequency Range

A Range	535 to 1610 KC
B Range	3.2 to 7.4 MC
C Range	8.3 to 12.0 MC
D Range	15.0 to 22.0 MC







Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

After each range is completed, repeat the procedure as a final check.

CAUTION—When aligning the short wave ranges, be sure NOT to adjust at the image frequency. This can be checked as follows: let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000 less 912 KC, or 14,088 KC on the dial. It will be necessary to increase the input signal to hear the image. The image frequency must always be 912 KC LESS than the frequency at which the set is aligned. This is true of all the short wave ranges.

It is very important that the bandspread ranges (B, C and D) be aligned at the precise frequencies given. If the accuracy of the signal generator is not known, it is always best to first calibrate the signal generator by using a receiver that is in good condition. First tune in a station of known frequency close to 12.0 MC. Then tune the signal generator until it "beats" with the station, carefully marking the setting of the generator. Proceed in the same manner for all the other alignment frequencies.

NOTE A—Turn tuner back and forth and adjust trimmer until peak of greatest intensity is reached.

ALIGNMENT PROCEDURE

Before aligning make certain that dial pointer is adjusted properly as instructed under "Drive Cord Replacement" on page 5.
Volume Control—Maximum All Adjustments.
Connect Radio Ground Lead to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning:
An All Wave Signal Generator which will provide an **accurately calibrated** signal at the test frequencies as listed.
Output Indicating Meter—Non-Metallic Screwdriver.
Dummy Antennas—.1 mf., 200 mmf., and 400 ohms. (Connect in series with Antenna lead.)

	SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	POINTER SETTING	ADJUST TRIMMERS TO MAXIMUM
I.F.	456 KC	Antenna Lead	.1 mf.	A Range	Turn Tuning Knob until Extreme High Frequency Position is Reached	2nd I.F. (C20) & (C21) 1st I.F. (C17) & (C18)
RANGE D	21.8 MC	Antenna Lead	400 Ohm	D Range	Same as Above	Oscillator Range D (C11)
	Reset to 20.0 MC	Antenna Lead	400 Ohm	D Range	Turn Tuner to Max. Output	Antenna Range D (C6) Rock Tuner—See Note A
RANGE C	12.0 MC	Antenna Lead	400 Ohm	C Range	Extreme High Frequency Position	Oscillator Range C (C13)
	Reset to 11.5 MC	Antenna Lead	400 Ohm	C Range	Turn Tuner to Max. Output	Antenna Range C (C5) Rock Tuner—See Note A
RANGE B	7.4 MC	Antenna Lead	400 Ohm	B Range	Extreme High Frequency Position	Oscillator Range B (C8)
	Reset to 7.0 MC	Antenna Lead	400 Ohm	B Range	Turn Tuner to Max. Output	Antenna Range B (C4) Rock Tuner—See Note A
RANGE A	1610 KC	Antenna Lead	200 mmf.	A Range	Extreme High Frequency Position	Oscillator Range A (C7) Antenna Range A (C1)

PHONOGRAPH CONNECTIONS

Phonograph records may be reproduced through this radio by using a record-player.

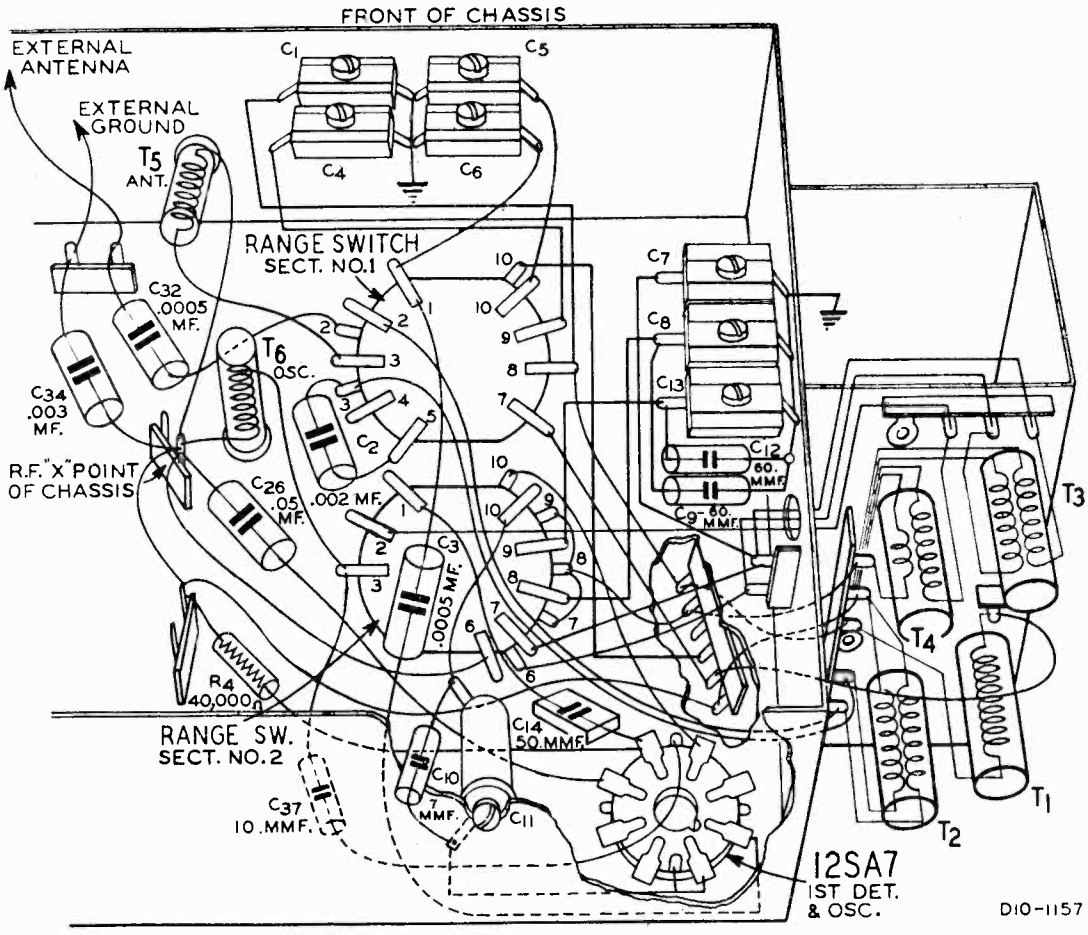
On the back of the chassis base is a double pin tip socket to which a phono pickup of the high-impedance type may be connected. Always try reversing the position of the pickup pin tips in the socket if excessive hum is noticed.

POWER SUPPLY.

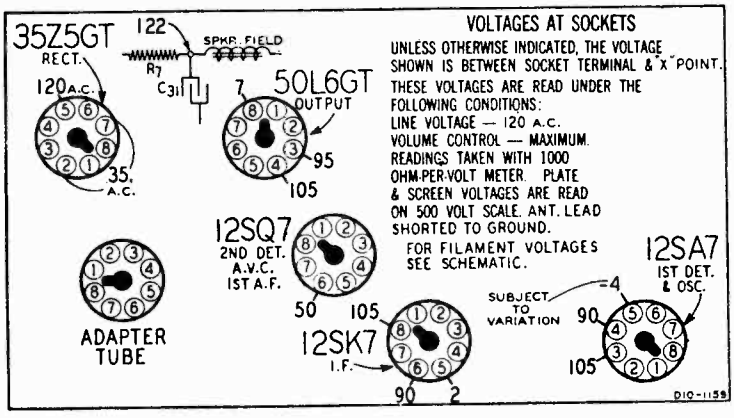
Radio shipped from factory for operation on a power supply of 200 to 240 volts D.C. or 40 to 60 cycles A.C. An adjustment can be made for operation on a line voltage of 100 to 120 volts D.C. or 40 to 60 cycles A.C.

MODELS M-104, N-204

WESTINGHOUSE ELEC. INTERNATIONAL CO.



Wiring Diagram for Coil System



DRIVE CORD REPLACEMENT

Turn drive shaft until cores are entirely within coil form. Pass cord through hole in tuning shaft and bring two ends together evenly. CAUTION—Cord must remain centered on shaft. Wind one part of cord two turns on tuning shaft in a counterclockwise direction (from front of chassis). These turns should progress away from chassis. Hold both parts of cord and withdraw cores from within coils slowly by turning the tuning shaft. One part of cord should progress towards chassis and the other away from the chassis. Unwind the inside cord from shaft. Then wind this cord two turns in a clockwise direction (from front of chassis). These turns should progress towards rear of chassis.

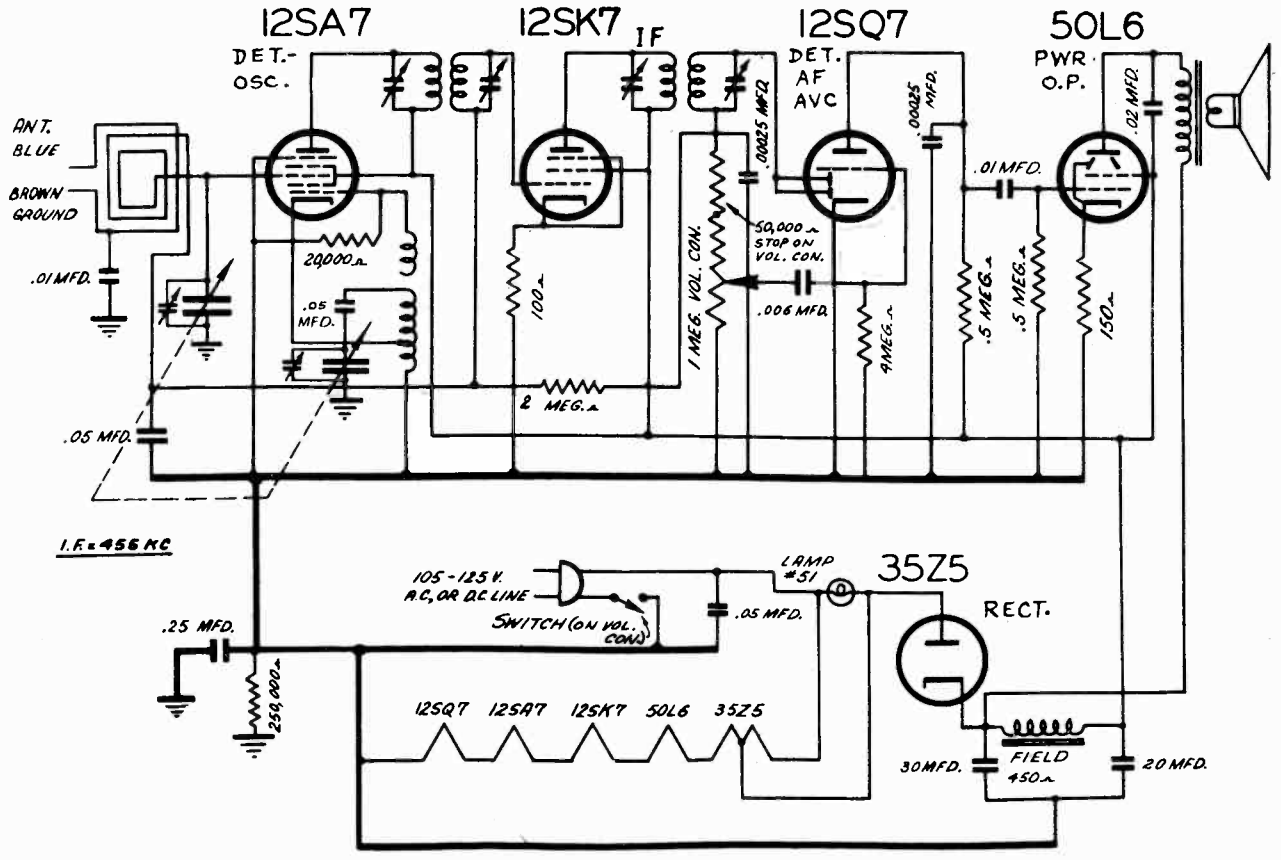
Pass this cord over idler pulley A—see illustration. Pass outer cord on tuning shaft over idler pulleys B, C, D and E, attaching it to tension spring. Secure other end of cord to opposite end of tension spring. This spring should be slightly stretched for tension.

ATTACHING DIAL POINTER

Turn tuning knob clockwise until extreme high frequency position is reached. (Cores completely out of coils.) Slip the pointer on the dial cord and move to high frequency end of dial scale. Carefully align pointer with end of printed scales and clamp securely into position.

MODEL M-115

WESTINGHOUSE ELEC. INTERNATIONAL CO.



Frequency Range----------545 to 1630 K.C.
Intermediate Frequency----------455 K.C.

Power Supply Ratings
Alternating Current----------105-125 volts, 50-60 cycles, 30 watts
Direct Current----------105-125 volts----------30 watts

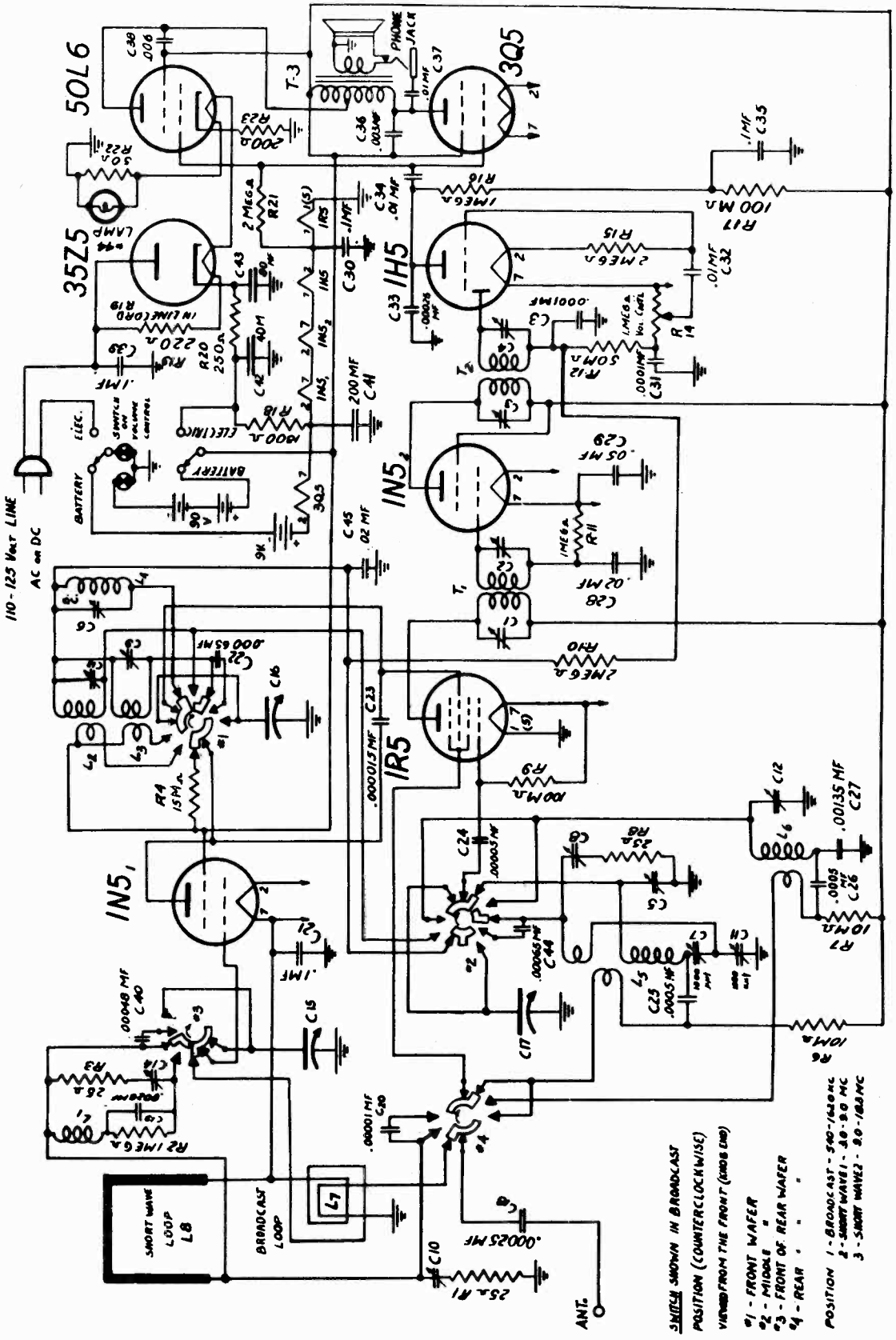
Alignment Procedure

A test oscillator or signal generator is required together with an output meter. Connect the output meter across the voice coil. For I.F. alignment connect the low side of the signal generator or test oscillator to the Negative bus. (This connection maybe made at the line switch) The high side is then connected to the stator of the antenna section (rear) thru a .01 mfd condenser. Then align the I.F. trimmers for maximum as indicated on the output meter. Should any station interfere while this adjustment is being made, turn the variable condenser to a quiet point on the dial.

Connect the test oscillator to antenna and ground leads of the receiver. Now open the variable condenser with the plates entirely out of mesh. Set the test oscillator to 1630 K.C. and adjust the oscillator trimmer (front section of the variable condenser) to this frequency. Now change to a clear spot on the dial at about 1400 K.C., set the test oscillator to this frequency and align the antenna trimmer (rear section) for maximum. No other adjustments are required.

MODEL M-106

WESTINGHOUSE ELEC. INTERNATIONAL CO.



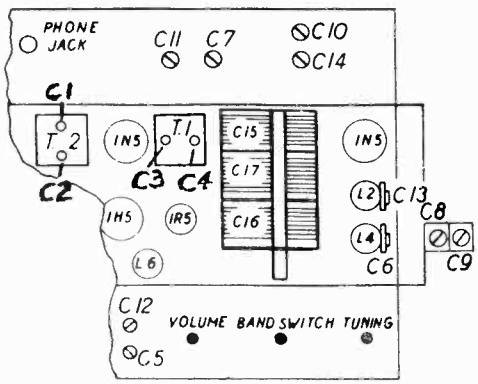
MODEL M-106

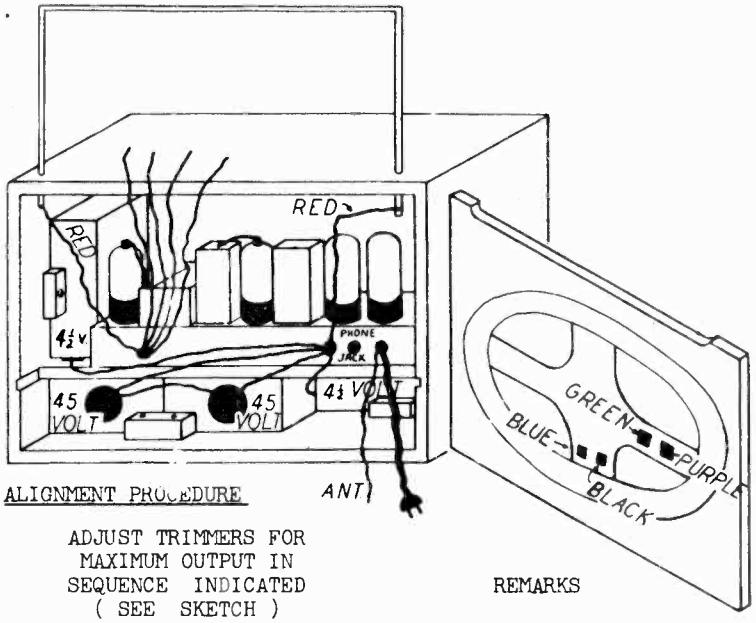
WESTINGHOUSE ELEC. INTERNATIONAL CO.

During the alignment procedure all adjustments should be made under the following conditions:

(1) Line Voltage as indicated elsewhere in these instructions (or a fresh set of batteries)
(2) Volume control at maximum.
(3) Minimum input from the Signal Generator to give a good readable signal on the output meter.

If this procedure is not adhered to, all adjustments will appear very broad due to the action of the automatic volume control.





ALIGNMENT PROCEDURE

	SIGNAL GENERATOR FREQUENCY	BAND	ADJUST TRIMMERS FOR MAXIMUM OUTPUT IN SEQUENCE INDICATED (SEE SKETCH)	REMARKS
A	455 MC	I.F.	1--2--3--4	I. F. Trimmers
B	1500 KC	B.C.	5--6	Set dial to 1500 KC
C	600 KC	B.C.	7	Recheck adjustment "B"
D	17 MC	S.W.2	8--9--10	Set dial to 17 MC (rock condenser slightly)
E	9.5 MC	S.W.2	11	Recheck adjustment "D"
F	8.5 MC	S.W.1	12--13--14	

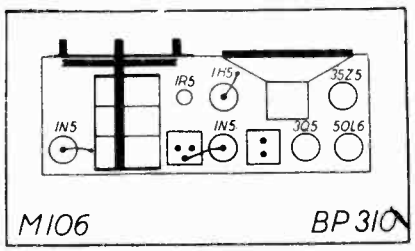
POWER CONSUMPTION (On 117 Volts AC) 20 Watts

BATTERIES 2--45 Volt "B" and 2--4½ Volt "A"

BATTERY DRAIN "A"--300 Milliamperes
"B"--12 Milliamperes

POWER OUTPUT BATTERY OPERATION - 100 Milliwatts undistorted
200 Milliwatts maximum

A.C. OPERATION - 500 Milliwatts undistorted
1.5 Watts maximum



INTERMEDIATE FREQUENCY 455 KC

SPEAKER 5 inch P.M. dynamic

FREQUENCY RANGE BROADCAST 540--1630 KC
SHORT WAVE #1 3--9 MC
SHORT WAVE #2 9--18 MC

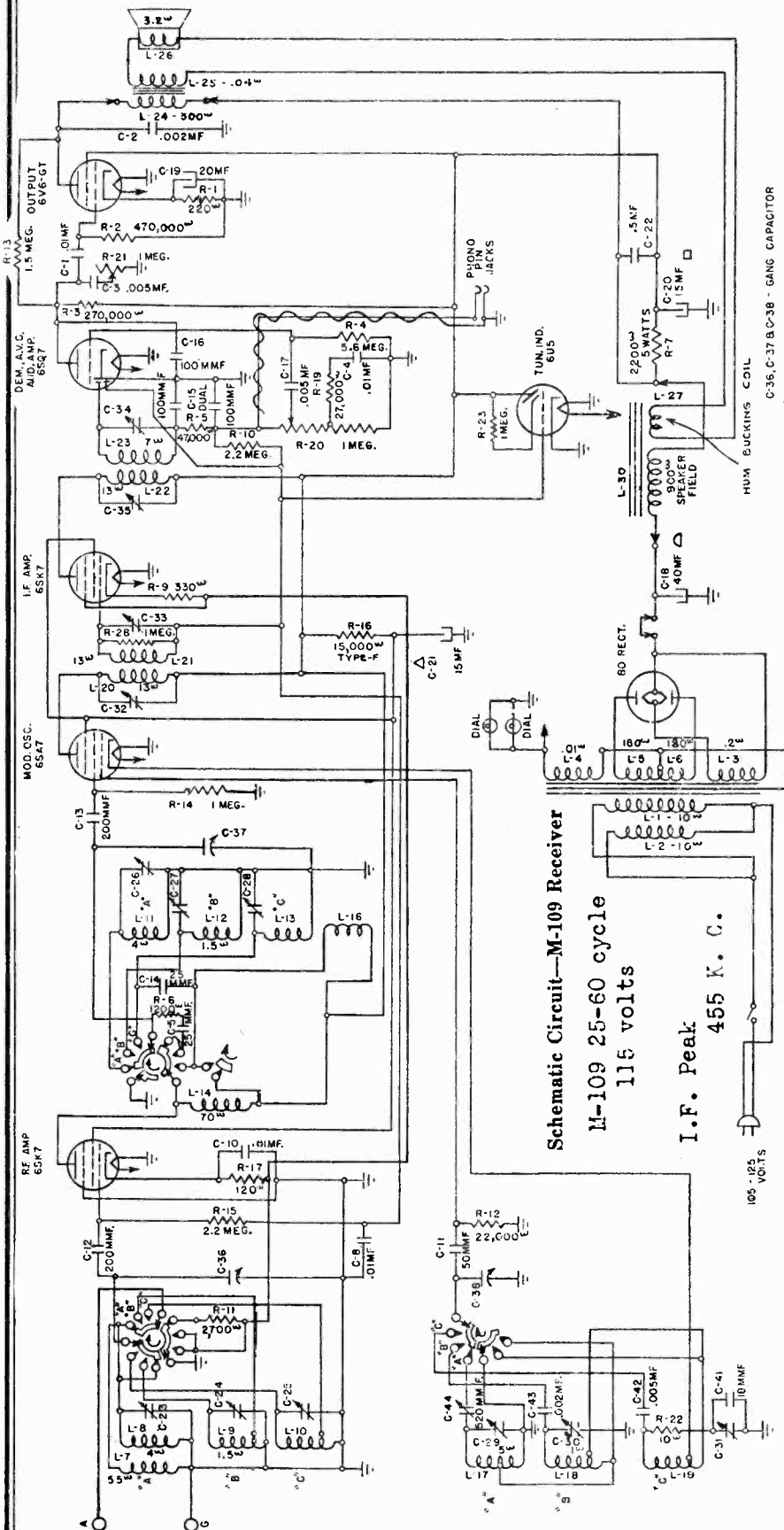
TUBE COMPLEMENT

1N5GT Tuned R.F. Amplifier
1R5 1st. detector and oscillator
1N5GT I.F. amplifier
1H5GT 2nd detector, A.V.C. and 1st Audio
3Q5GT Output (for Battery Operation)
50L6G7 Output (for Electric Operation)
35Z5GT Rectifier (for Electric Operation)

SENSITIVITY BROADCAST-LOOP OPERATION-75 MICROVOLTS PER METER (AVERAGE) FOR 50 MW OUTPUT
ANTENNA - 5 MICROVOLTS (AVERAGE)
SHORT WAVE-LOOP OPERATION 100 MICROVOLTS PER METER (AVERAGE)

MODELS M-109, M-109B, M-109C

WESTINGHOUSE ELEC. INTERNATIONAL CO.



Models M-109 and M-113 series

VOLTAGE NOTES:

1. Take all readings with receiver operating and tuned to approx. 1000 Kc.-no Sig.
2. Use a line voltage of 120V. (240 V. for "C" models),or make or allow for any slight variation.
3. Use a good high res.voltmeter having a res. of at least 1000 Ohms per volt.
4. Take all D.C. readings on the 500 V. scale except when an asterisk appears.
5. Read from indicated terminals to chassis base.
6. A.C. voltages are indicated by italics.

NORMAL VOLTAGE READINGS

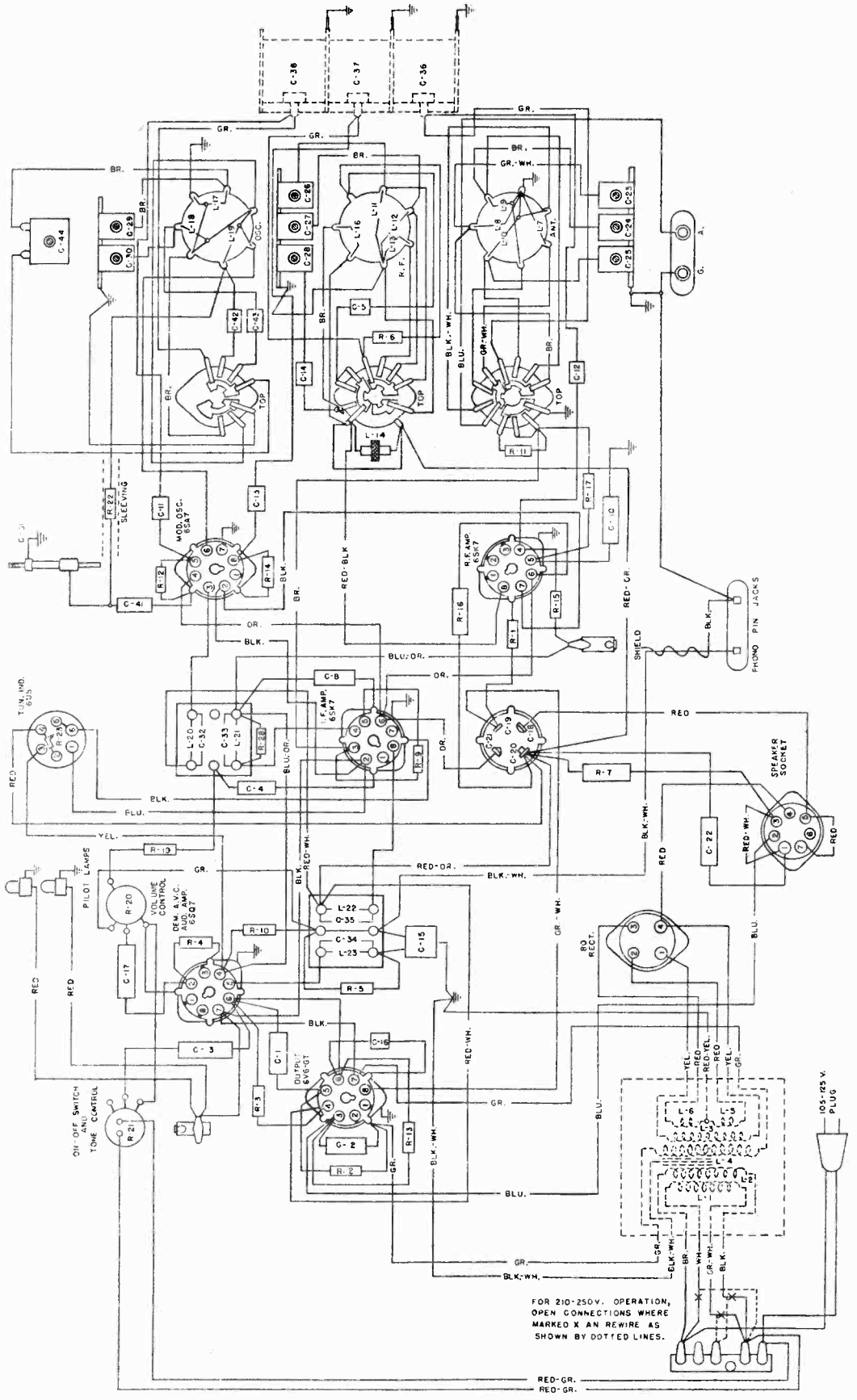
TERMINALS OF SOCKETS

Tube	*Circuit*	1	2	3	4	5	6	7	8
6SK7	R. F. Amp.	0	0	0	0	+9*	+110	*6.0*	+265
6SA7	Mod. and Osc.	0	*6.0*	+265	+110	—6*	0	0	0
6SK7	I. F. Amp.	0	*6.0*	+9*	0	+9*	+110	0	+265
6SQ7	Demod., A. V. C. Audio Ampl.	0	0	0	0	0	+100	*6.0*	0
6V6G	Output	0	0	+310	+265	0	+100	*6.0*	+12*
80†	Rectifier	+410	*300*	*300*	+410	—	—	—	—
6U5	Tuning Indicator	0	+25	0	+265	0	*6.0*	—	—
	Speaker Socket	+320	+310	+320	+410	+410	0	+410	—

*Read on lowest possible scale of voltmeter.
†Between terminals 1 and 4 of rectifier socket: 4.5 volts A. C.

MODELS M-109, M-109B, M-109C

WESTINGHOUSE ELEC. INTERNATIONAL CO.

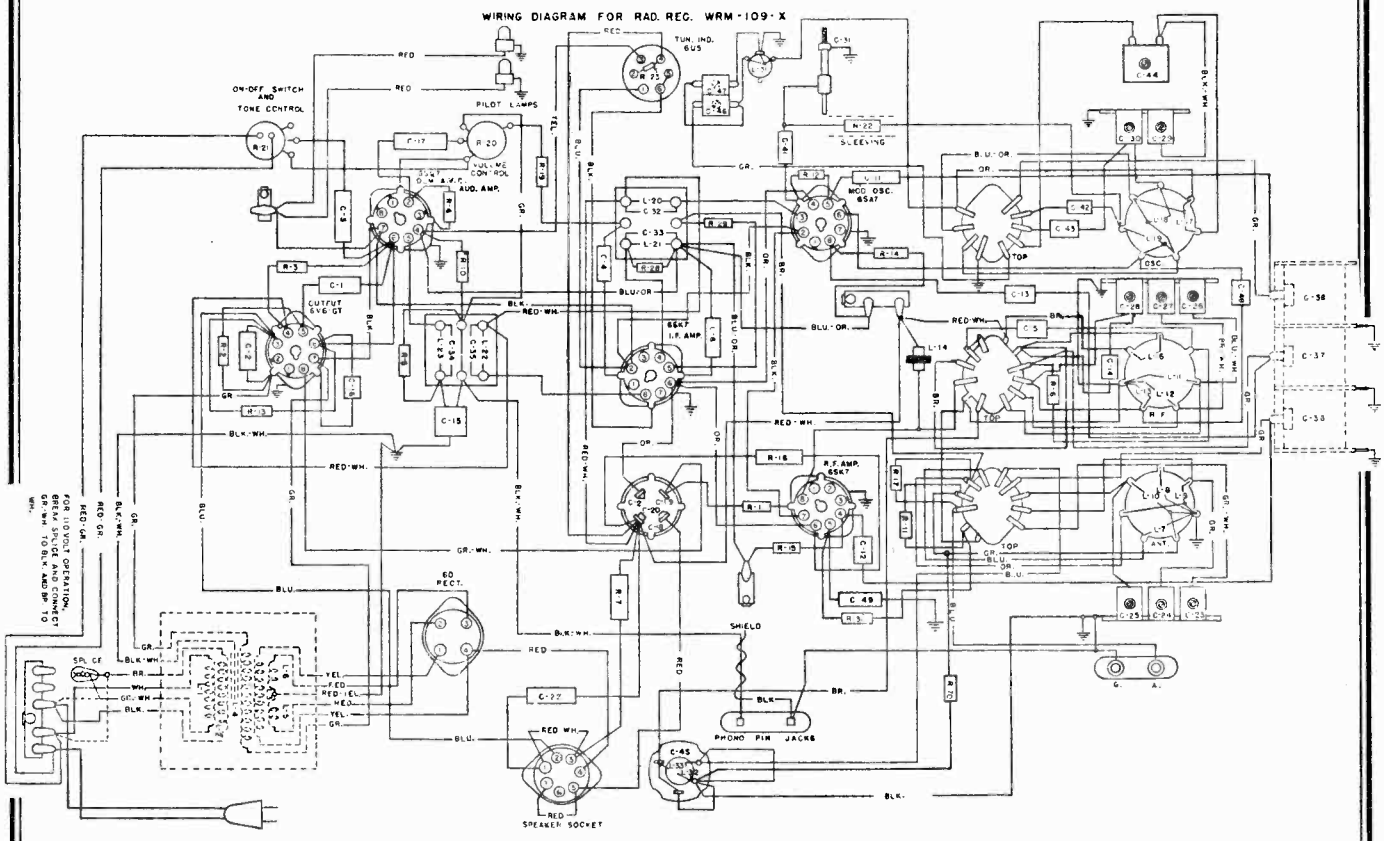


Wiring Diagram—M-109 Receiver

Tuning Range: A - .54 to 1.6 MC.; B - 2.3 to 7.6 MC.; C - 7.6 to 23 MC.
Input Power Rating..... 80 watts I. F. Peak ..... 455 KC.
Speaker Voice Coil Impedance at 400 cycles ..... Approximately 3.2 ohms
Speaker Field Coil Resistance ..... Approximately 900 ohms

WESTINGHOUSE ELEC. INTERNATIONAL CO. MODEL M-109X

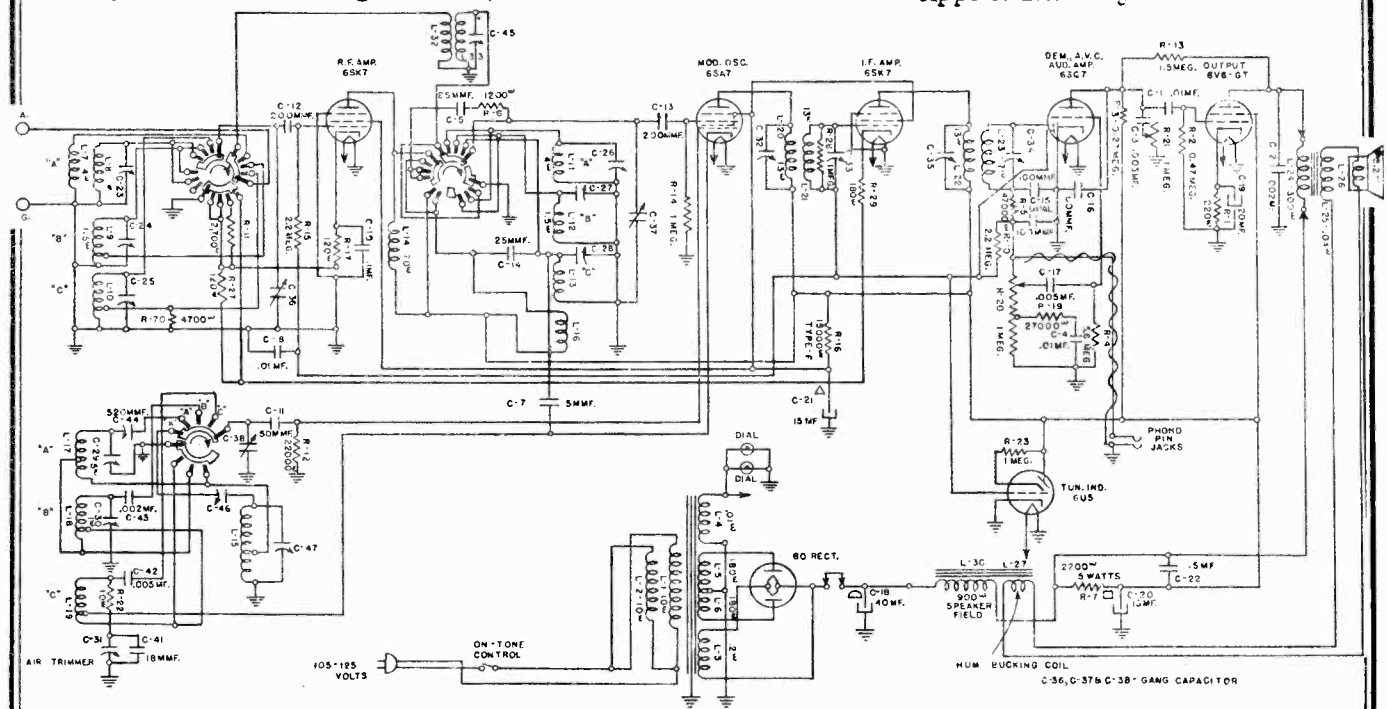
Wiring Diagram—M-109-X Receiver



Tuning Ranges, Model M-109-X
X-150 to 400 Kc.; A-0.54 to 1.6 Mc.
B-2.3 to 7.6 Mc.; C-7.6 to 23 Mc.

Input Power Rating (M-109) 80 watts

Intermediate Frequency ..... 455 Kc.
Spkr. V.C. Impedance at 400 cycles
Approximately 3.2 ohms
Spkr. Field Coil Resistance
Approximately 900 ohms



Schematic Circuit—M-109-X Receiver

MODELS M-109, M-109B, M-109C, M-109X WESTINGHOUSE ELEC. INTERNATIONAL CO. MODELS M-113, M-113C

ALIGNING INFORMATION

Never Align Unless Absolutely Necessary

Use a good modulated signal generator (test oscillator) with variable output voltage and connect a sensitive output meter across the voice coil of the speaker.

Always align using the smallest possible signal from the signal generator. A strong signal makes adjustments inaccurate.

Always have receiver volume control full on.

See location chart for location of all the aligning adjusfment screws.

Aligning procedure (follow this order exactly)

I. Dial pointer adjustment.

Make sure that the dial drive cord is in position on all pulleys, otherwise it will not be possible to correctly set the dial pointer. To correct the position of the dial pointer, first free the pointer ends from the drive cord, then with the gang capacitor fully engaged, set the pointer directly behind the horizontal line at the top of the dial. Carefully retighten the pointer ends to the drive cord.

II. Intermediate frequency adjustments.

1. Set the range switch to the medium wave position ("A").
2. Tune set to extreme low frequency end of the dial.
3. Connect the ground terminal of the signal generator to the ground terminal of the chassis.
4. Introduce a modulated signal of 455 Kilocycles to the stator terminal (top) of the center section of the gang capacitor, using a 0.1 microfarad capacitor in series with the output lead of the signal generator.
5. Adjust the I. F. Aligners for maximum signal in the following order:
   - A. Secondary of second I. F. transformer.
   - B. Primary of second I. F. transformer.
   - C. Secondary of first I. F. transformer.
   - D. Primary of first I. F. transformer.

III. Radio frequency adjustments.

Short Wave Range, Scale "C".

1. Replace the 0.1 microfarad capacitor in series with the output lead of the signal generator with a 400 ohm carbon type resistor, and connect it to the antenna terminal of the chassis.
2. Set the range switch to the "C" short-wave position.
3. Set the signal generator frequency and the receiver tuning dial to 20 megacycles.
4. Adjust the "OSC. 20 MC." (air trimmer) aligner by loosening the lock nut and moving the plunger in or out until maximum signal is obtained. If two positions are found at which maximum signal occurs, always use the minimum capacitance position (most outward position of plunger). Always be sure to tighten the lock nut after the aligning adjustment has been completed. An S. D. 76 aligning tool is recommended for alignment of air trimmer capacitors of the plunger type.
5. Adjust the "20 MC." R. F. and ANTenna aligning capacitors for maximum signal.

Short Wave Range, Scale "B".

(Leave the receiver connected to the signal generator in the same manner as above.)

1. Set the range switch to the "B" short-wave position.
2. Set the signal generator frequency and the receiver tuning dial to 7 Mc.
3. Adjust the "7 MC." OSCillator aligning capacitor for maximum signal. If two positions are found at which maximum signal occurs, always use the minimum capacitance position (most counter-clockwise position).
4. Adjust the "7 MC." R. F. and ANTenna aligning capacitors for maximum signal.

Medium Wave Range, Scale "A".

1. Replace the 400 ohm carbon type resistor is series with the output lead from the signal generator with a 200 micro-microfarad capacitor.
2. Set the range switch to the medium wave position, "A".
3. Set the signal generator frequency and the receiver tuning dial to 1.5 Mc.
4. Adjust the "1.5 MC." OSCillator R. F. and ANTenna aligners (iron cores) for maximum signal.
5. Set the signal generator frequency and the receiver tuning dial to 0.6 Mc.
6. Adjust the "0.6 MC." OSCillator aligning capacitor for maximum signal.
7. Repeat operations 3 and 4.

Alignment Procedure, WRM-109-X only

Long Wave Range, Scale "X".

1. Connect signal generator to antenna connection of receiver with a 200 MMF Capacitor in series with the high side of the signal generator lead. Connect the ground side to the ground connection of the receiver.
2. Set signal generator and receiver dial to 800 meters (375 Kc.).
3. Turn range switch to "X" range position (extreme left).
4. With a screwdriver, adjust the long wave shunt aligner until the 800 meter signal is brought to exact resonance. (The series and shunt oscillator aligners are located on the front of the chassis directly under the dial. The aligners are accessible through two holes side by side in which the left hand adjustment is the series aligner and the right, the shunt aligner.)
5. Adjust the antenna aligner for maximum output. (This aligner is located on the rear of the chassis, to the right of the antenna-ground terminal block, and is accessible through a hole provided.)
6. Turn the dial of the receiver to 2000 meters (150 Kc.).
7. Set the signal generator to 2000 meters (150 Kc.).
8. Rock tuning control, at the same time adjusting the oscillator series aligner (see paragraph 4 above for location) until maximum signal output is obtained.
9. Repeat operations 2, 4 and 5.
10. Repeat operations 7 and 8.

POWER TRANSFORMER CONNECTIONS

Models M-109, 109-C, 109-X, 113 and 113-C have a double primary power transformer which when connected in parallel will operate between 105 and 130 volts A. C. and when connected in series (M-109-C and M-113-C) will operate between 210 and 250 volts A. C. If it is desired to change the operating voltage of these sets, see the wiring diagrams on Pages 6, 8 or 9 for the correct connections. These connections are located underneath the chassis and must be soldered. On Phonograph Models (M-113 and M-113-C) it is also necessary when changing the operating voltage to insert the proper plug on the phonograph motor. The plug having a double jumper wire is for 105 to 130 volts operation of the phonograph motor. The plug having a single jumper wire provides 200 to 250 volts A. C. operation of the phonograph motor.

PHONO MOTOR CONNECTIONS

The phonograph motor for the M-113-C should be inspected to see that the small plug having a single jumper wire is in place for operation on a line voltage of 200 to 250 volts A. C.

The phonograph motor for the M-113 should be inspected to see that the small plug having a double jumper wire is in place for operation on a line voltage of 100 to 130 volts.

To obtain correct turntable speed when operating the phonograph on a 50 cycle power supply, remove the drive pulley from the motor shaft and replace it with the pulley enclosed in envelope stapled to cabinet.

INSTRUCTIONS FOR ADJUSTING PHONOGRAPH MECHANISM USED IN M-113 RECEIVERS

A. Adjusting Landing Position of Needle on Record

If needle comes down too far from the edge of the record so that record does not start at the beginning, **turn adjusting screw "A" very slightly counter-clockwise.**

If needle comes down too close to the edge of the record so that it slips off, **turn adjusting screw clockwise.**

B. Adjusting Tripping Mechanism

If trip mechanism fails to trip or operates during playing of record, adjust screw "B" to position where proper tripping is obtained. When this adjustment cannot be accomplished by means of screw "B" loosen adjusting nuts "D-D", make necessary adjustments with these nuts, then retighten.

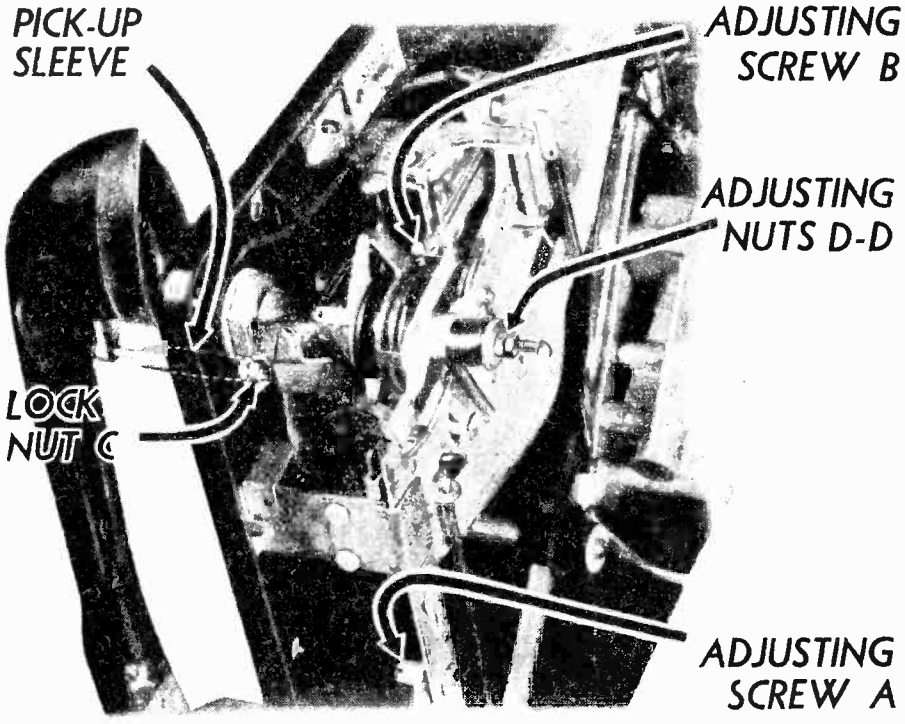
C. Adjusting Height to Which Pick-up Arm Rises

The arm should rise during the change cycle so that it clears the record above it by only ⅛". To make this adjustment, loosen the locknut "C" on pick-up sleeve and turn sleeve to lengthen or shorten the plunger. **Be sure to tighten locknut again after adjustment.**

No adjustment of the record separating knives is required as they are arranged to compensate for slight differences in record thickness automatically.

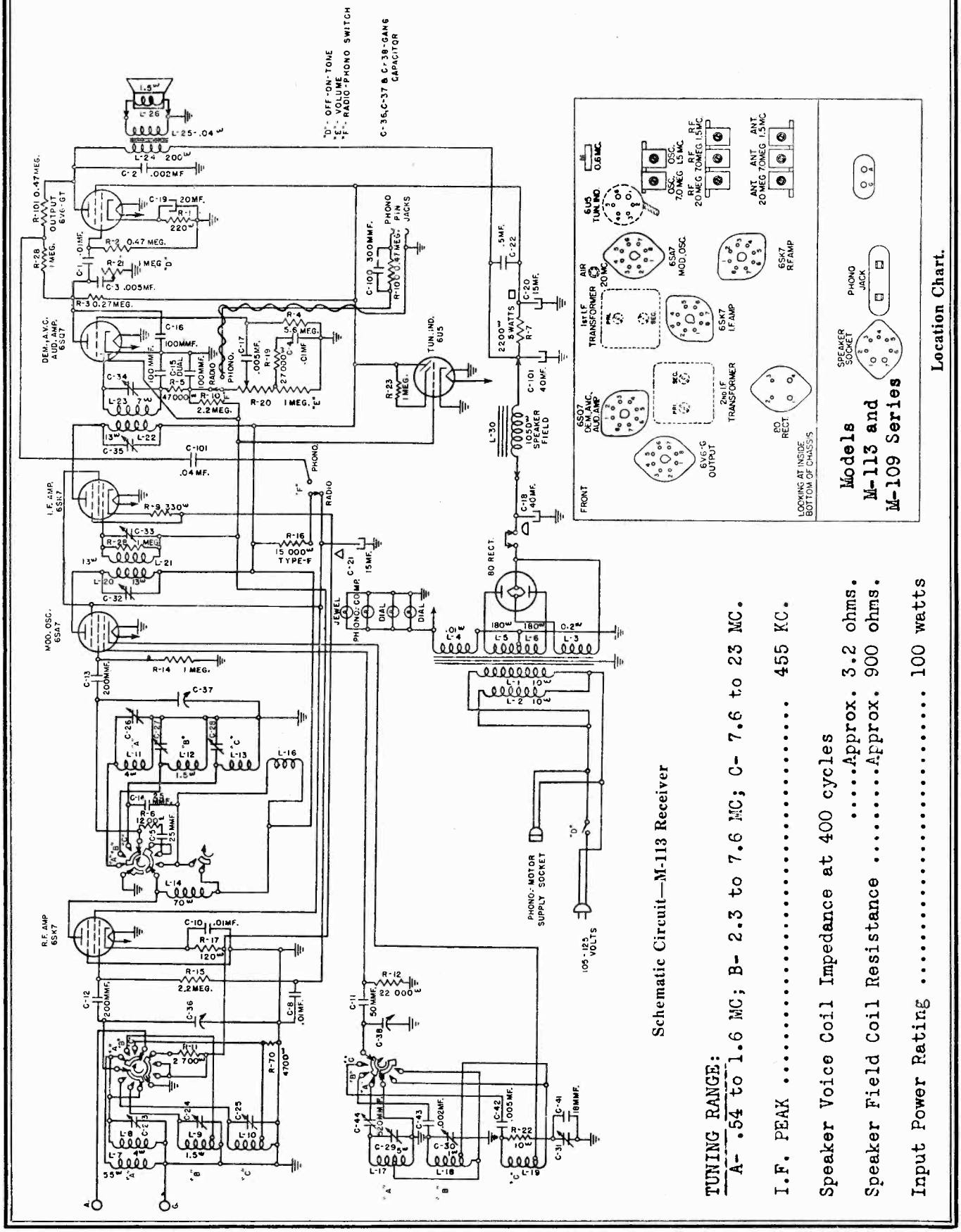
Handle the mechanism with care.

Do not lift it by the record holding knives.



MODELS M-113, M-113C

WESTINGHOUSE ELEC. INTERNATIONAL CO.



Schematic Circuit—M-113 Receiver

TUNING RANGE:
A- .54 to 1.6 MC; B- 2.3 to 7.6 MC; C- 7.6 to 23 MC.

I.F. PEAK ..... 455 KC.

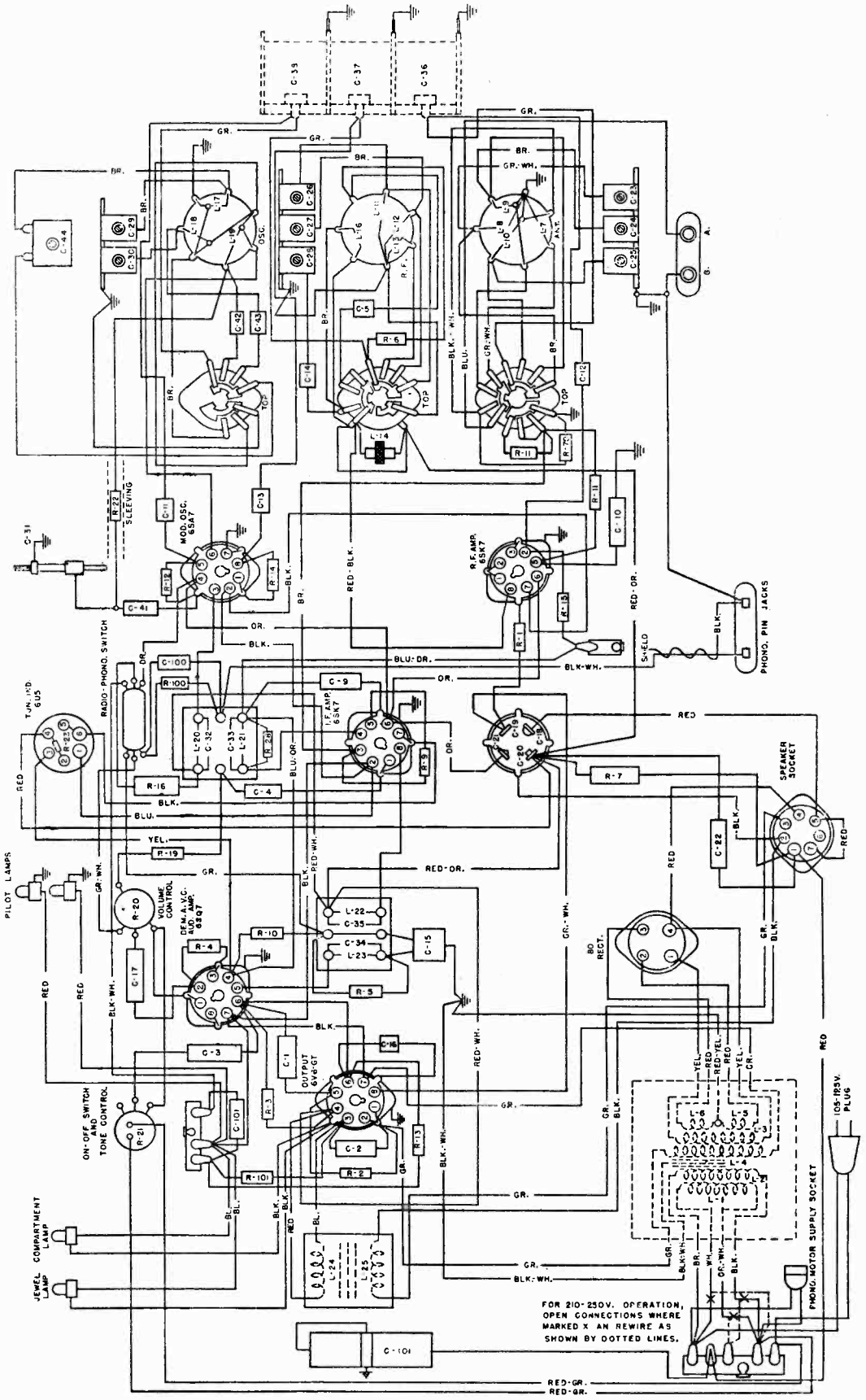
Speaker Voice Coil Impedance at 400 cycles
.....Approx. 3.2 ohms.

Speaker Field Coil Resistance .....Approx. 900 ohms.

Input Power Rating ..... 100 watts

MODELS M-113,
M-113-C

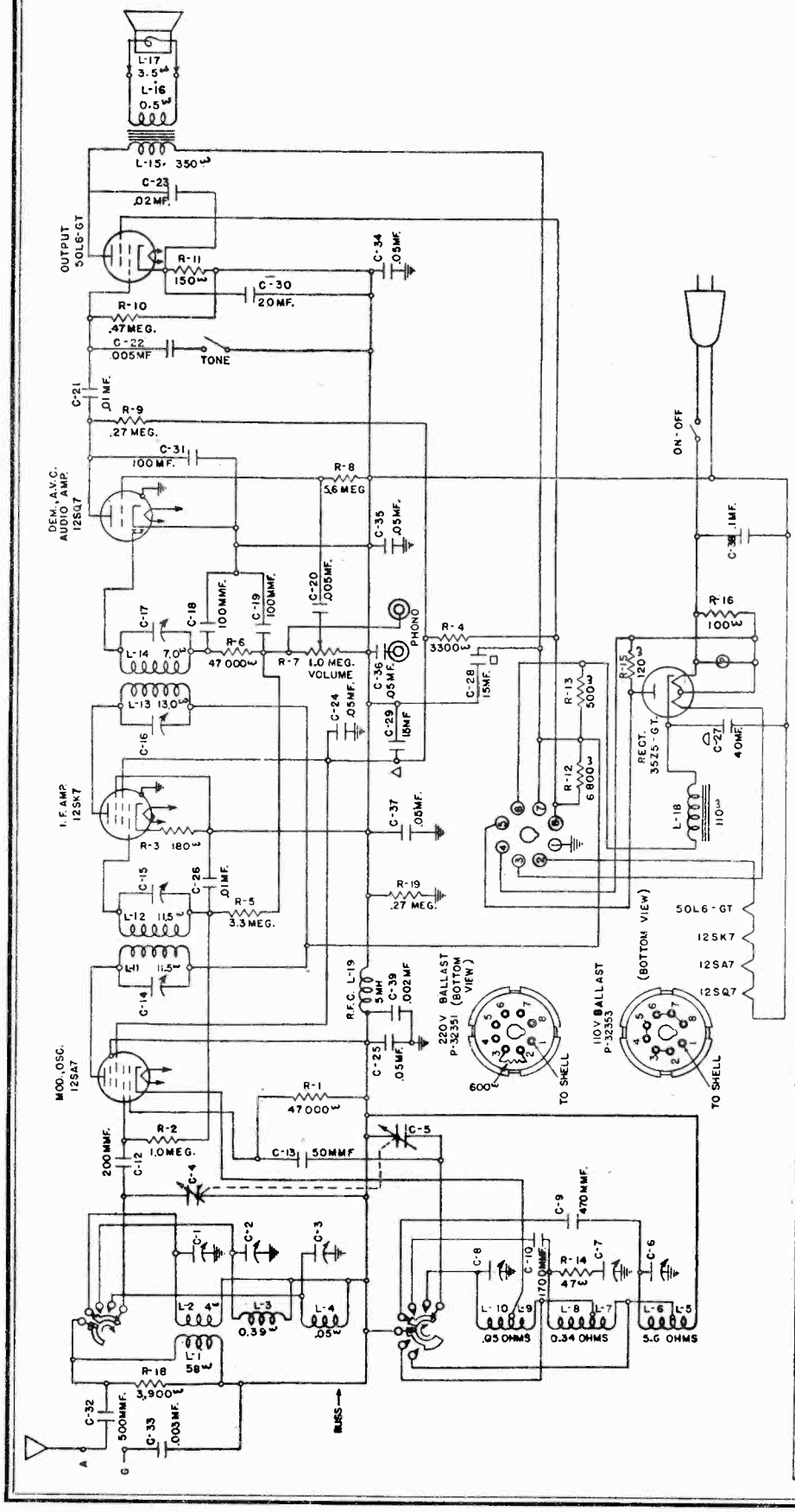
WESTINGHOUSE ELEC. INTERNATIONAL CO.



Wiring Diagram—M-113 Receiver

MODEL WRL-165

WESTINGHOUSE ELEC. INTERNATIONAL CO.



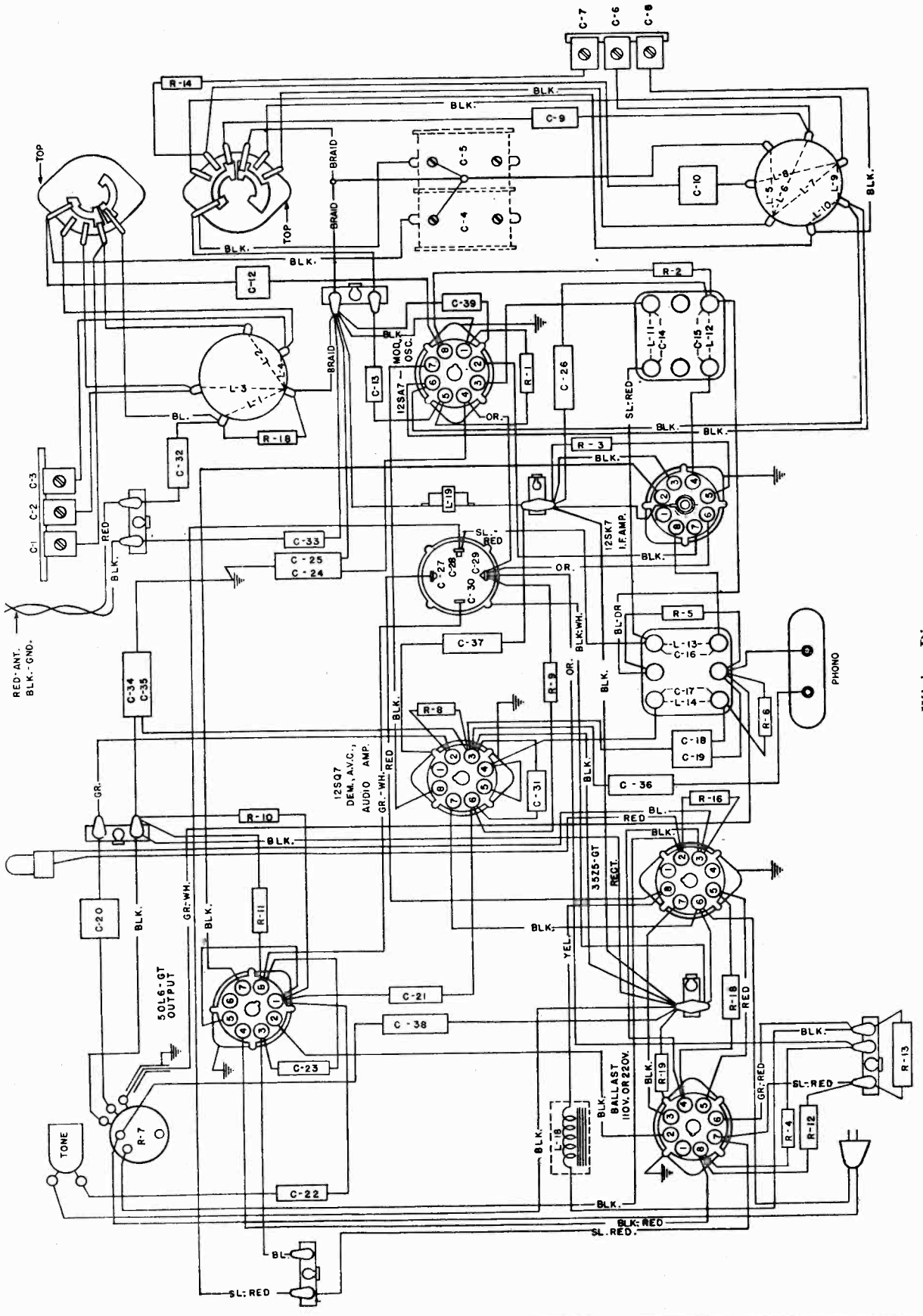
Schematic Diagram

Location Chart

Voltage Rating	105 to 125 Volts with W-32353 Ballast Resistor 200 to 240 Volts with W-32351 Ballast Resistor
Type of Circuit	Superheterodyne
Tuning Ranges	"A"—0.54 to 1.68 Mc.; "B"—2.3 to 7.6 Mc.; "C"—7.6 to 23 Mc.
Input Power Rating	30 Watts with a line voltage of 110 Volts 60 Watts with a line voltage of 220 Volts
Intermediate Frequency	455 Kilocycles
Speaker Voice Coil Impedance at 400 Cycles	Approximately 3.5 Ohms

MODEL WRL-165

WESTINGHOUSE ELEC. INTERNATIONAL CO.



NORMAL VOLTAGE READINGS FOR 120 VOLTS OPERATION

These voltage readings are obtained by measuring from the single terminal block (located between the 12SK7 I. F. tube and the electrolytic capacitor) and the various tube socket contacts with the tubes in their respective sockets. See Location Chart on Page 3. Voltages are given for a line voltage of 120 volts, using the W-32353 Ballast Resistor. Allowance should be made for the difference when the line voltage is slightly higher or lower.

Use a good high resistance voltmeter having a resistance of at least 1,000 ohms per volt. Take all D. C. readings on the 500 volt scale except when an asterisk appears.

When the receiver is being operated from an alternating current power supply circuit it will be necessary to have a high resistance A. C. voltmeter for checking the A. C. voltages. A large paper capacitor (2 microfarads or larger) should be used in series with the A. C. voltmeter to prevent the D. C. component from affecting the readings.

		TERMINALS OF SOCKETS							
Tube	*Circuit*	1	2	3	4	5	6	7	8
12SA7	Mod. and Osc.	+0.5*	*26*	+107	+93	−1*	0	*15*	0
12 SK7	I. F. Amp.	0	39	0	0	1.8*	+92	*26*	+107
12SQ7	Demod., A. V. C., and Audio	0	0	0	0	0	+42	0	*15*
50L6GT	Output	0	*90*	+103	+107	0	0	*89*	+8*
35Z5GT	Rectifier	—	*120*	*115*	—	*115*	0	*90*	+123
W32353	Ballast	—	*90*	*90*	*115*	*115*	+107	+107	+107

*Read on the lowest possible scale of voltmeter.

A. C. voltages are indicated by italics; when the receiver is operated from a D. C. power supply, D. C. voltages will be obtained in place of the A. C. voltages shown. Receiver tuned to 1000 K. C. no signal.

NORMAL VOLTAGE READINGS FOR 240 VOLTS OPERATION

These readings are obtained by measuring from the single terminal block (located between the 12SK7 I. F. tube and the electrolytic capacitor) and the various tube socket contacts with the tubes in their respective sockets. See Location Chart on Page 3. Voltages are given for a line voltage of 240 volts, using the W-32351 Ballast Resistor. Allowance should be made for the difference when the line voltage is slightly lower.

Use a good high resistance voltmeter having a resistance of at least 1,000 ohms per volt. Take all D. C. readings on the 500 volt scale except when an asterisk appears.

When the receiver is being operated from an alternating current power supply circuit, it will be necessary to have a high resistance A. C. voltmeter for checking the A. C. voltages. A large paper capacitor (2 microfarads or larger) should be used in series with the A. C. voltmeter to prevent the D. C. component from affecting the readings.

		TERMINALS OF SOCKETS							
Tube	*Circuit*	1	2	3	4	5	6	7	8
12SA7	Mod. and Osc.	+0.5*	*27*	+195	+100	−1.5*	0	*13.5*	0
12SK7	I. F. Amp.	0	*40*	0	0	+2*	+100	*27*	+195
12SQ7	Demod., A. V. C., and Audio	0	0	0	0	0	+52	0	*13.5*
50L6GT	Output	0	*100*	+180	+130	0	0	*40*	+8.5*
35Z5GT	Rectifier	0	*240*	*235*	0	*225*	0	*205*	+240
W32351	Ballast	0	*100*	*205*	*235*	*225*	+230	+195	+130

*Read on the lowest possible scale of voltmeter.

A. C. voltages are indicated by italics; when the receiver is operated from a D. C. power supply, D. C. voltages will be obtained in place of the A. C. voltages shown. Receiver tuned to 1000 K. C. no signal.

ALIGNING INFORMATION

Never Align Unless Absolutely Necessary

Use a good modulated signal generator (test oscillator) with variable output voltage and connect a sensitive output meter across the voice coil of the speaker.

Always align using the smallest possible signal from the signal generator. A strong signal makes adjustments inaccurate.

Always have receiver volume control full on. See Location Chart above for location of all the aligning adjustment screws.

Aligning procedure (follow this order exactly)

I. Dial pointer adjustment.

Make sure that the dial drive cord is in position on all pulleys, otherwise it will not be possible to correctly set the dial pointer. To correct the position of the dial pointer, first free the pointer ends from the drive cord, then, with the gang capacitor fully engaged, set the pointer directly on the index marks nearest to the letters "A" and "C" on the dial. Carefully re-tighten the pointer ends to the drive cord.

II. Intermediate frequency adjustments.

1. Set the range switch to the medium wave position ("A").
2. Tune set to extreme low frequency end of the dial.
3. Connect the ground terminal of the signal generator to the ground lead of the chassis.
4. Introduce a modulated signal of 455 Kilocycles to the grid of the 12SA7 Tube (Terminal No. 8), using a 0.1 microfarad capacitor in series with the output lead of the signal generator.
5. Adjust the I. F. Aligners for maximum output in the following order:

a. Secondary of second I. F. transformer.

b. Primary of second I. F. transformer.

c. Secondary of first I. F. transformer.

d. Primary of first I. F. transformer.

III. Radio frequency adjustments.

Short Wave Range, Scale "C".

1. Replace the 0.1 microfarad capacitor in series with the output lead of the signal generator, with a 400 ohm carbon type resistor, and connect it to the antenna lead of the chassis.
2. Set the range switch to the "C" short wave position.
3. Set the signal generator frequency and the receiver tuning dial to 20 megacycles.
4. Adjust the "OSC. 20 Mc." aligning capacitor for maximum signal. Two positions will be found at which maximum signal occurs. Always use the minimum capacitance (most counter-clockwise) position.
5. Adjust the "ANT. 20 Mc." aligning capacitor for maximum signal. Two positions may be found at which maximum signal occurs. Always use the maximum capacitance (most clockwise) position.

Short Wave Range, Scale "B".

(Leave the receiver connected to the signal generator in the same manner as above.)

1. Set the range switch to the "B" short wave position.
2. Set the signal generator frequency and the receiver tuning dial to 7 megacycles.
3. Adjust the "OSC. 7 Mc." and the "ANT. 7 Mc." aligning capacitors for maximum signal.

Medium Wave Range, Scale "A".

1. Replace the 400 ohm carbon type resistor in series with the output lead from the signal generator with a 200 micro-microfarad capacitor.
2. Set the range switch to the medium wave position ("A").
3. Set the signal generator frequency and the receiver tuning dial to 1.5 Mc.
4. Adjust the "OSC. 1.5 Mc." and the "ANT. 1.5 Mc." aligning capacitors for maximum signal.

Note: The calibration at the low frequency end of each range should be checked after the alignment of each range is completed. If the calibration is too inaccurate, repeat the aligning procedure, changing the dial setting slightly at the high-frequency end of the dial to compensate for the low frequency dial error.

MODEL WR217

Listed by Underwriters Laboratories

Voltage rating	105-125 volts, 60 cycles, a.c.	Frequency ranges	540 to 1580 kc. and 1580 to 4200 kc.
Power consumption	45 watts	Power output	2.25 watts undistorted, 3 watts total

Tube Complement—*One* 6A7 pentagrid oscillator-modulator, *one* 6D6 i-f amplifier, *one* 75 diode detector, a-f amplifier, a.v.c., *one* 41 pentode power output, and *one* 80 full-wave rectifier.

GENERAL NOTES

1. The wave-trap in the receiver has been adjusted for maximum signal rejection at 456 kc. If, however, persistent interference is experienced from some particular telegraphic station, readjust the wave-trap trimmer until the response from the interfering station is at a minimum.
2. The receiver should never be turned on with either the speaker plug or the 41 tube out of their sockets, since the rapid rise in rectifier voltage would damage the electrolytic condensers.
3. The pilot light may be replaced by removing the snap-on socket from the dial and unscrewing the bulb. It is not necessary to remove either the dial or chassis from the cabinet.
4. The color coding of the leads of the i-f transformers, is as follows:
   Grid—green — Plate—blue
   Grid return—black — B plus—red
5. The color coding of the power transformer leads is as follows:
   Primary—two green leads — 6.3 v. sec.—two heavy blue leads
   High voltage sec.—two black leads — 5 v. sec.—two heavy red leads
   High voltage sec. center tap—yellow
6. With a few exceptions, the color coding of the general wiring is as follows:
   Plate—blue — A.v.c. and cathode—white or yellow
   B plus—red — Grid—green
   Screen—brown — Filament and ground—black

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c.

Tube	*Plate*	*Screen*	*Cathode*	*Osc. Plate*	*Fil.*
6A7	182	70	0	182	6.3
6D6	182	70	0	—	6.3
75	87	—	0	—	6.3
41	165	182	0	—	6.3

Voltage across speaker field—70.
Voltage from B minus to chassis—80.
B plus at 80 tube filament—262.

ADJUSTMENTS

1. An oscillator with frequencies of 456 and 1400 kc is required.
2. An output meter should be used across the voice coil or output transformer for observing maximum response.
3. Always use as weak a test signal as possible when aligning the receiver.

LOCATION OF COILS AND TRIMMER ADJUSTMENTS

1. The two i-f transformers are located on top of the chassis deck. The first i-f transformer is the one directly behind the 6A7 tube. The trimmers for the two i-f transformers are available through holes in the tops of the cans.
2. The trimmers for the antenna and osc. coils are located on the variable cond. The trimmer on the front section is for the antenna coil.
3. The 456 kc wave-trap is mounted on the rear chassis wall directly beneath the wave-band switch. The trimmer for the 456 kc wave-trap is mounted on the coil and is accessible from the bottom of the chassis.

I-F AND WAVE-TRAP ALIGNMENT

Rotate the wave-band switch(located on the rear wall of the chassis) to the broadcast position, clockwise, and swing the variable cond. to the minimum capacity position. Feed 456 kc to the grid-cap of the 6A7 tube and adjust the four i-f trimmers for maximum response. Feed 456 kc through a dummy antenna (a .0002 mf condenser may be used as a substitute) to the antenna lead and adjust the wave-trap trimmer for minimum response.

R-F ALIGNMENT

With the wave-band switch in the broadcast position, clockwise, set the dial pointer at 1400. Feed 1400 kc. through a standard dummy antenna (a .0002 mf condenser may be used as a substitute) to the antenna lead and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response. The police band is self-tracking and does not require any adjustment.

WRL-250 RADIO RECEIVER

FEATURES. This is a five-tube superheterodyne receiver designed for operation on either a direct (continuous) or alternating current power supply of 105 to 130 volts. Provision has also been made so that this set may be readily converted for operation on a power supply of 200 to 225 volts. (See below.) An automatic volume control circuit is provided in this receiver and a step tone control is included.

ADAPTING RECEIVER TO 200-225 VOLTS OPERATION. A W-31826 Resistor must be installed inside of the chassis and connected according to the wiring diagram on page 3. Mounting holes for this resistor are provided on the rear of the chassis base.

ADJUSTING DIAL LAMP. To adjust the dial lamp simply push the pilot lamp and socket forward until maximum illumination of the dial is obtained.

ALIGNING INFORMATION. **Never realign unless absolutely necessary.**

Use a good modulated signal generator (test oscillator) with variable output voltage and a sensitive output meter across the voice coil of the speaker. Always align using the smallest possible input from the signal generator. A strong signal makes adjustments inaccurate.

Always have the volume control "full on".

Important: **Be sure the metal plate is fastened in place on the bottom of the chassis before alignment is attempted.**

ALIGNING PROCEDURE. See location chart on page 2 and proceed as follows:

I. Dial Pointer Adjustment.

With the plates of the gang tuning capacitor fully engaged, set the dial pointer in a vertical position directly on the calibration marks located at the top and bottom of the dial scale.

II. Intermediate Frequency Adjustments.

1. Tune the set to the extreme low frequency position. (Variable capacitor plates fully engaged.)
2. Connect the ground terminal of the signal generator to the chassis base.
3. Introduce a modulated signal of 455 kilocycles using a .01 mf. capacitor in series with the lead from the signal generator to the rear stator (green wire) of the variable capacitor.
4. Adjust the I. F. aligners for maximum output in the following order:
   A. Secondary of second I. F. Transformer.
   B. Primary of second I. F. Transformer.
   C. Secondary of first I. F. Transformer.
   D. Primary of first I. F. Transformer.

III. Radio Frequency Adjustments.

1. Replace the .01 mf. capacitor in series with the output lead of the signal generator with a 200 mmf. capacitor and connect it to the antenna lead (blue) of the chassis.
2. Set the signal generator frequency and the receiver tuning dial to 1.4 megacycles.
3. Adjust the oscillator and antenna aligning capacitors for maximum signal.
4. Set both the signal generator frequency and the receiver tuning dial to 0.6 megacycles and check calibration.

   NOTE: If the calibration is too far off at 0.6 megacycles, Operations 2 and 3 may be repeated, varying the 1.4 Mc. dial setting slightly until the best results are obtained.

REPLACEMENT PARTS

Capacitors

Piece Number		Part	List Price
W-24405	C-26	.04 mf. Capacitor	$ .20
W-25150	C-4	.02 mf. Capacitor	.20
W-27009	C-23	500 mmf. Capacitor	.15
W-27108	C-13, 16	Dual .05 Capacitor	.25
W-27305	C-24	50 mmf. Capacitor	.15
W-27538	C-25	.005 mf. Capacitor	.35
W-27998	C-5	200 mmf. Capacitor	.15
W-28568	C-7	100 mmf. Capacitor	.15
W-29973	C-29	.25 mf. Capacitor	.25
W-30322	C-6	.005 mf. Capacitor	.15
W-31466	C-17	25 mmf. Capacitor	.20
W-31481	C-8	.01 mf. Capacitor	.10
W-31682	C-1, 2, 3	Electrolytic Capacitor, 2—40 mfs., 150 volts; 1—15 mf., 150 volts	.95
W-31698	C-18, 19, 21, 22	Variable Capacitor and Pulley	2.10

Coils, Transformers and Speaker

W-31684	L-10, 11	Antenna Coil	.75
W-31685	L-8, 9	Oscillator Coil	.60
W-31686	L-6, 7 C-14, 15	1st I. F. Transformer	1.60
W-31690	L-4, 5 C-9, 10, 11, 12 R-8, 9	2nd I. F. Transformer	1.55
SD-244	L-1, 2	Output Transformer	.95
SD-267	L-3	Speaker Cone Assembly	1.50
W-31696	L-1, 2, 3	Speaker less Output Transformer	3.50

Controls and Knobs

W-31260		Knob	.10
W-31694	R-7	Off-On Switch and Volume Control	.70
W-31695		Tone Control Switch	.35
W-31801		Dial Drive Shaft	.10
W-31803		Rubber Pulley for Dial Drive; per doz.	.20
W-31367		"C" Washer for Dial Drive; per doz.	.20
W-31824		Dial Drive Cord and Spring	.15

Resistors

Piece Number		Part	List Price
W-26323	R-3	150 Ohm Resistor	$ .10
W-26341	R-20	4,700 Ohm Resistor (see note below)	.10
W-26349	R-10	22,000 Ohm Resistor	.10
W-26353	R-8	47,000 Ohm Resistor	.10
W-26362	R-5, 11	.27 Megohm Resistor	.10
W-26369	R-4, 12	1 Megohm Resistor	.10
W-26378	R-9	5.6 Megohm Resistor	.10
W-26381	R-6	10 Megohm Resistor	.10
W-31813	R-1	220 Ohm Resistor, 1 Watt	.10
W-31215	R-2	470 Ohm Resistor, 1 Watt	.10
W-31826	R-14	440 Ohm Resistor (Used for adapting WRL-250 for 200-225 Volts Operation), 25 Watts	.55

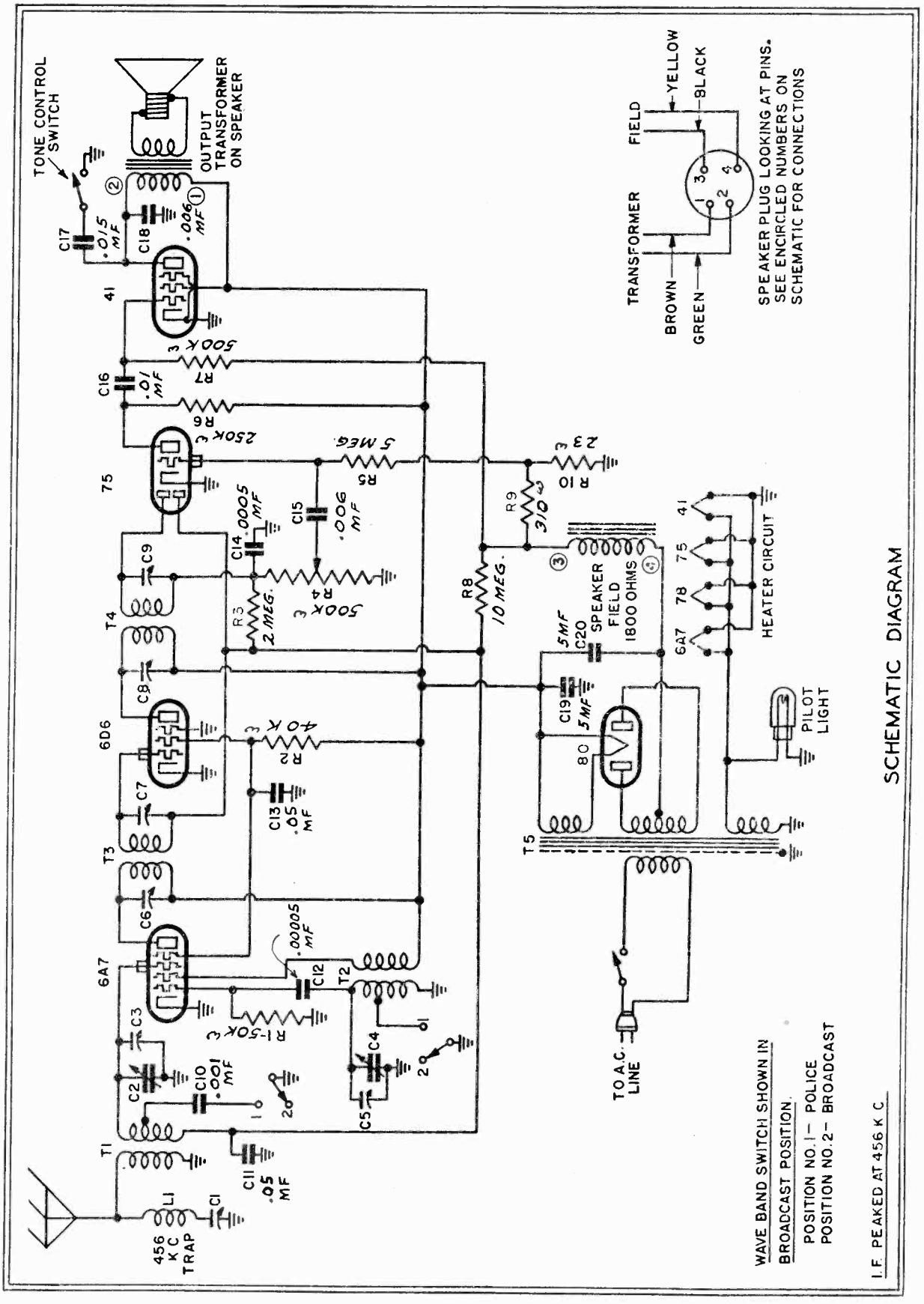
Note: R-20 is not shown on diagrams but is connected in parallel with L-10.

Miscellaneous

SD-272		Screws for Cabinet Back Panel; per doz.	.15
SD-273		Chassis Mounting Screws; per doz.	.20
W-28652		Power Supply Cord	.50
W-29379		Palnut for Control Shafts; per doz.	.15
W-30933		Pilot Lamp (Mazda No. 51)	.15
W-30947		Pilot Lamp Socket Assembly	.25
W-31680		8-prong Tube Socket	.10
W-31805		Dial Pointer	.35
W-31821		Speaker Baffle	.10
W-31822		Dial Lens	.25
W-31831		Cabinet less accessories	4.00
W-31992		Dial Assembly complete with Bracket Plate and Dial	.50
W-32032		Back Panel for Cabinet	.15
W-32036		Grille Cloth	.20
W-24608		Aligning Tool	.70

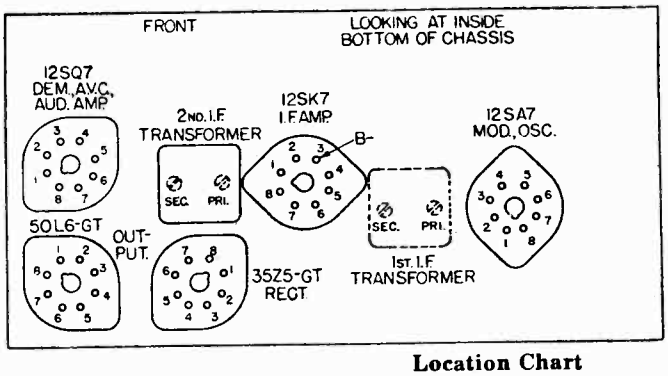
MODEL WRL-217

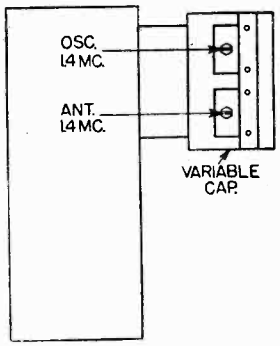
WESTINGHOUSE ELEC. INTERNATIONAL CO.



MODEL WRL-250

WESTINGHOUSE ELEC. INTERNATIONAL CO.





Location Chart

CONTINUITY TEST

Caution: Disconnect the receiver from the power supply and remove all tubes before making continuity test.

Use a good ohmmeter capable of measuring accurately up to several megohms.

The resistances given are often approximate owing to electrolytic capacitors in the circuit. When this is the case, be sure to reverse the test leads and read the highest resistance.

Read from indicated terminals to chassis base except when an asterisk appears. See location chart above for position and numbering of terminals.

		TERMINALS OF SOCKETS							
Tube	*Circuit*	1	2	3	4	5	6	7	8
12SA7	Mod. and Osc.	S	O	*690¶	*650¶	290000¶	270000¶	O	8M
12SK7	I. F. Amp.	S	O	270000¶	7M	270000¶	*650¶	O	*690¶
12SQ7	Demod.—A. V. C. Audio Amp.	S	10M	270000¶	1.3M	1.3M	*270000¶	O	270000¶
50L6GT	Output	S	O	*450¶	*650¶	1.2M	O	O	270000¶
35Z5GT	Rectifier	S	O	O	O	O	7M	O	400000¶ or Greater

Symbols used on chart are as follows: ¶—Ohms; M—Megohms; S—Short; O—Open.

***These readings should be made from indicated terminals to Terminal No. 8 of the rectifier socket (Type 35Z5GT Tube).**

Other tests not shown on chart:

Antenna Terminal to Chassis Base—"Open"

Ground Terminal to Chassis Base—"Open"

Between Antenna and Ground Terminals—50 Ohms

Terminals of Power Cord Plug to Chassis Base:

One Terminal should read 270,000 Ohms and the other Terminal should read "Open"

Between Terminals of Power Cord Plug—"Open"

NORMAL VOLTAGE READINGS

These voltage readings are obtained by measuring between the various tube socket contacts and the negative "B" supply (Terminal No. 3 of the 12SK7 Socket) with the tubes in their respective sockets. The receiver is, therefore, in operation when the measurements are made. (See location chart above for the terminal layout of sockets with their proper terminal numbers.)

Voltages are given for a line voltage of 120 volts A. C. Allowance should be made when the line voltage is slightly higher or lower.

If the receiver is operated from a direct current power supply circuit, the various voltages measured will be slightly lower than those listed in the table.

Use a high resistance voltmeter having a resistance of at least 1000 ohms per volt. Take all D. C. readings on the 500 volt scale, except when an asterisk appears.

When the receiver is being operated from an alternating current power supply circuit, it will be necessary to have a high resistance A.C. voltmeter for checking the A.C. voltages.

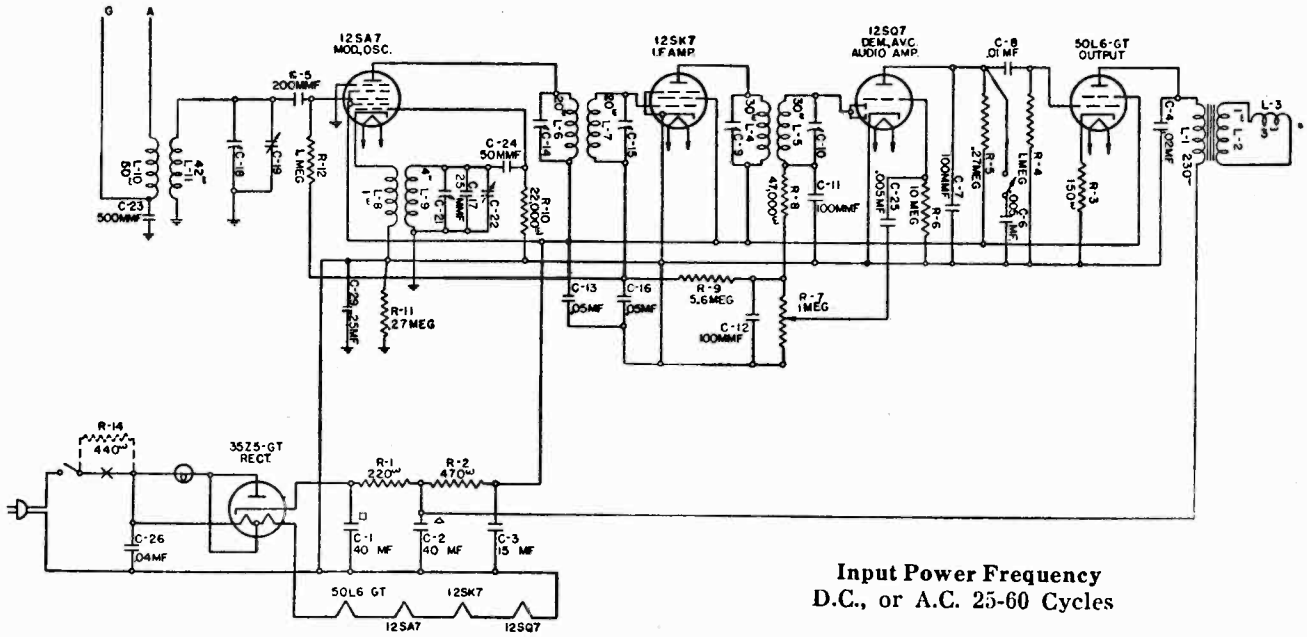
		TERMINALS OF SOCKETS							
Tube	*Circuit*	1	2	3	4	5	6	7	8
12SA7	Modulator and Oscillator	0	*25*	+95	+95	−10*	0	*37*	0
12SK7	I. F. Amp.	0	*25*	0	0	0	+95	*12*	+95
12SQ7	Demod., A. V. C., Audio Amp.	0	0	0	0	0	+50	*12*	0
50L6GT	Output	0	*88*	+105	+95	0	—	*37*	+6*
35Z5GT	Rectifier	0	*120*	*115*	—	*115*	0	*88*	+120

A.C. voltages are indicated by italics; when the receiver is operated from a D.C. power supply, all voltages will be D.C. Receiver tuned to 1000 kc., no signal.

***Read on lowest possible scale of Voltmeter.**

MODEL WRL-250

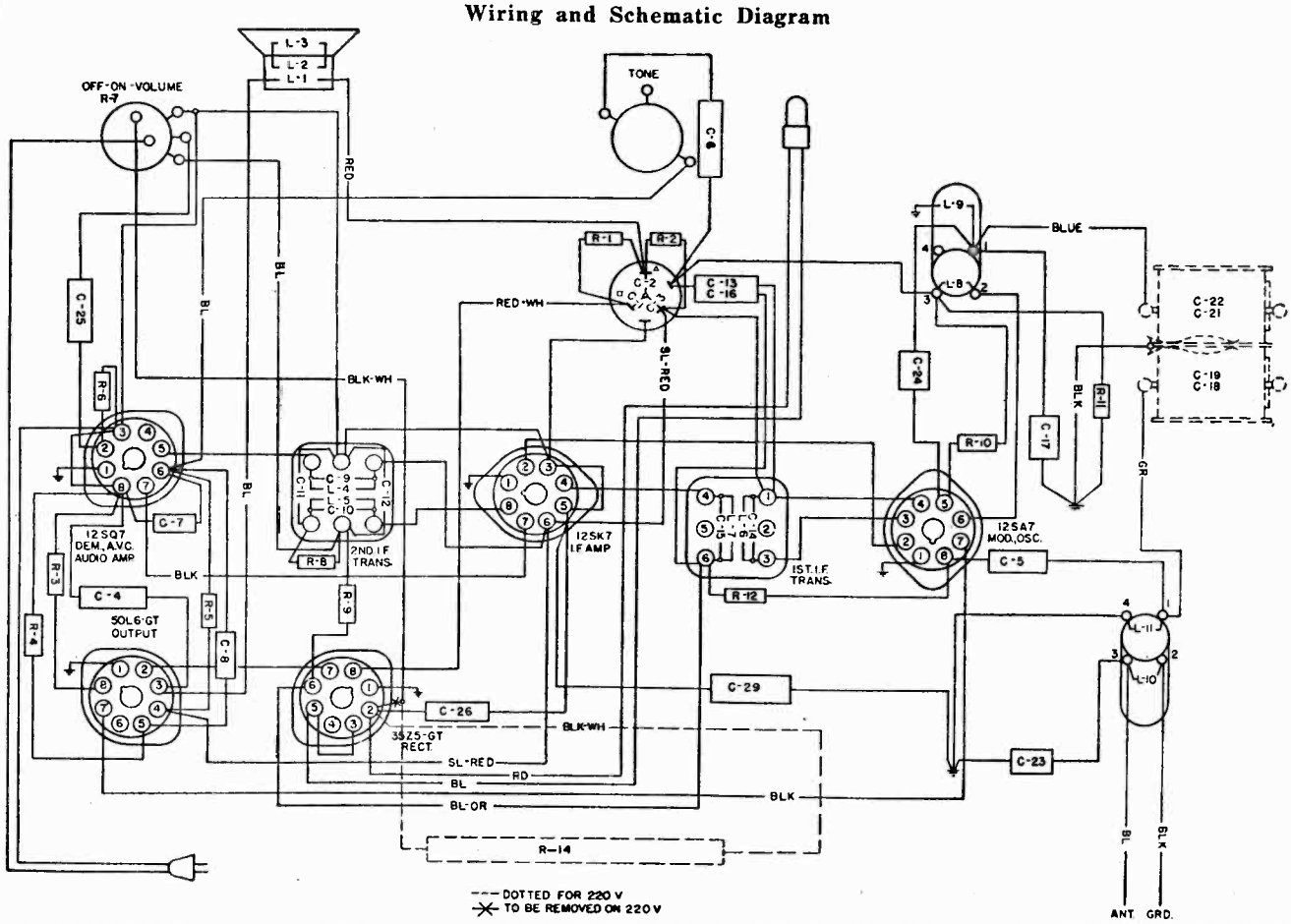
WESTINGHOUSE ELEC. INTERNATIONAL CO.



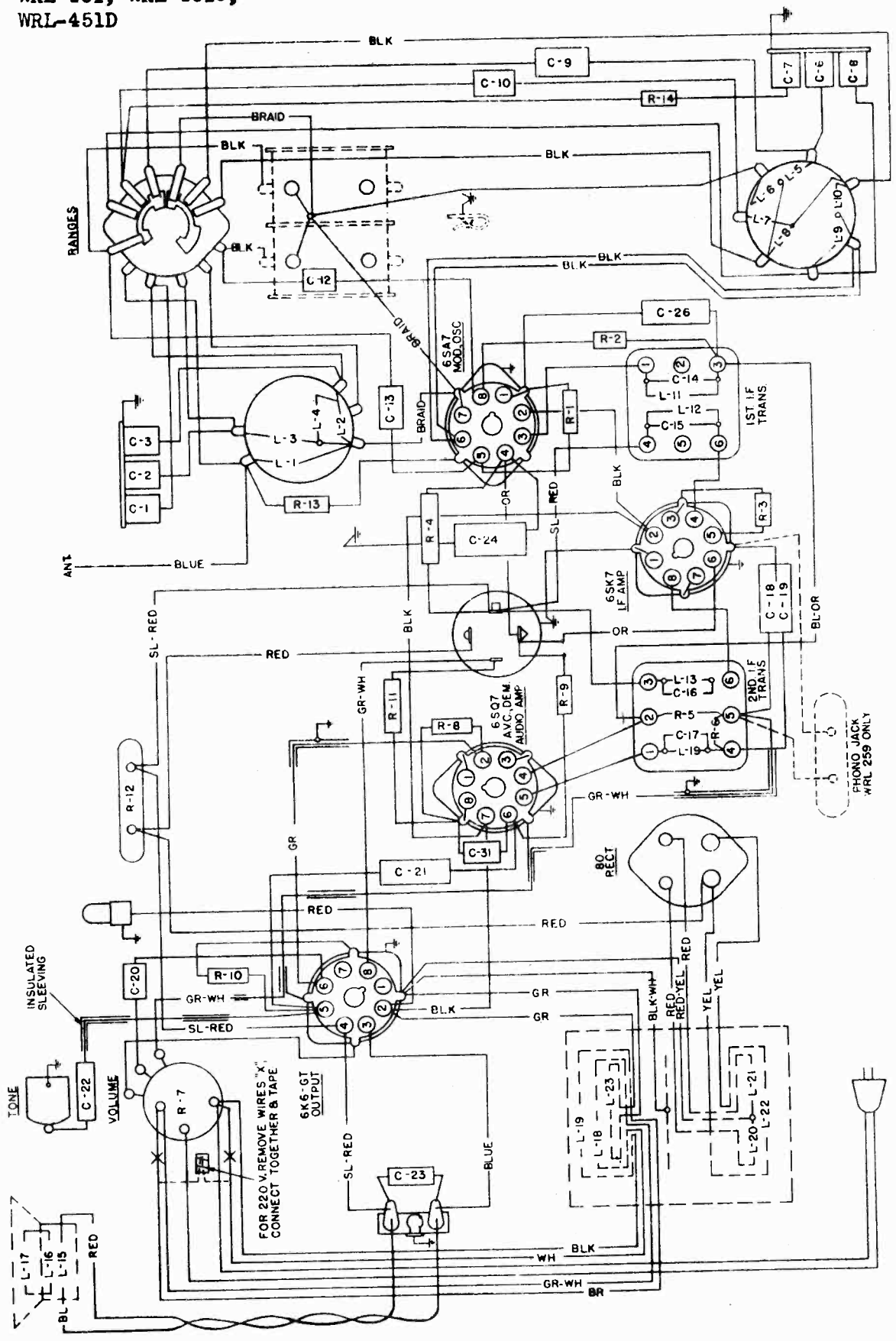
Input Power Frequency
D.C., or A.C. 25-60 Cycles

Voltage Rating ..... 105-130 Volts; (See Adapting Receiver to 200-225 Volts Operation)
Type of Circuit ..... Superheterodyne
Tuning Range ..... 0.54 to 1.65 Megacycles (182 to 550 Meters)
Input Power Rating at 130 Volts; 60 Cycles ..... 30 Watts
Intermediate Frequency ..... 455 Kilocycles
Speaker Voice Coil Impedance at 400 Cycles ..... Approximately 3.5 Ohms

Wiring and Schematic Diagram



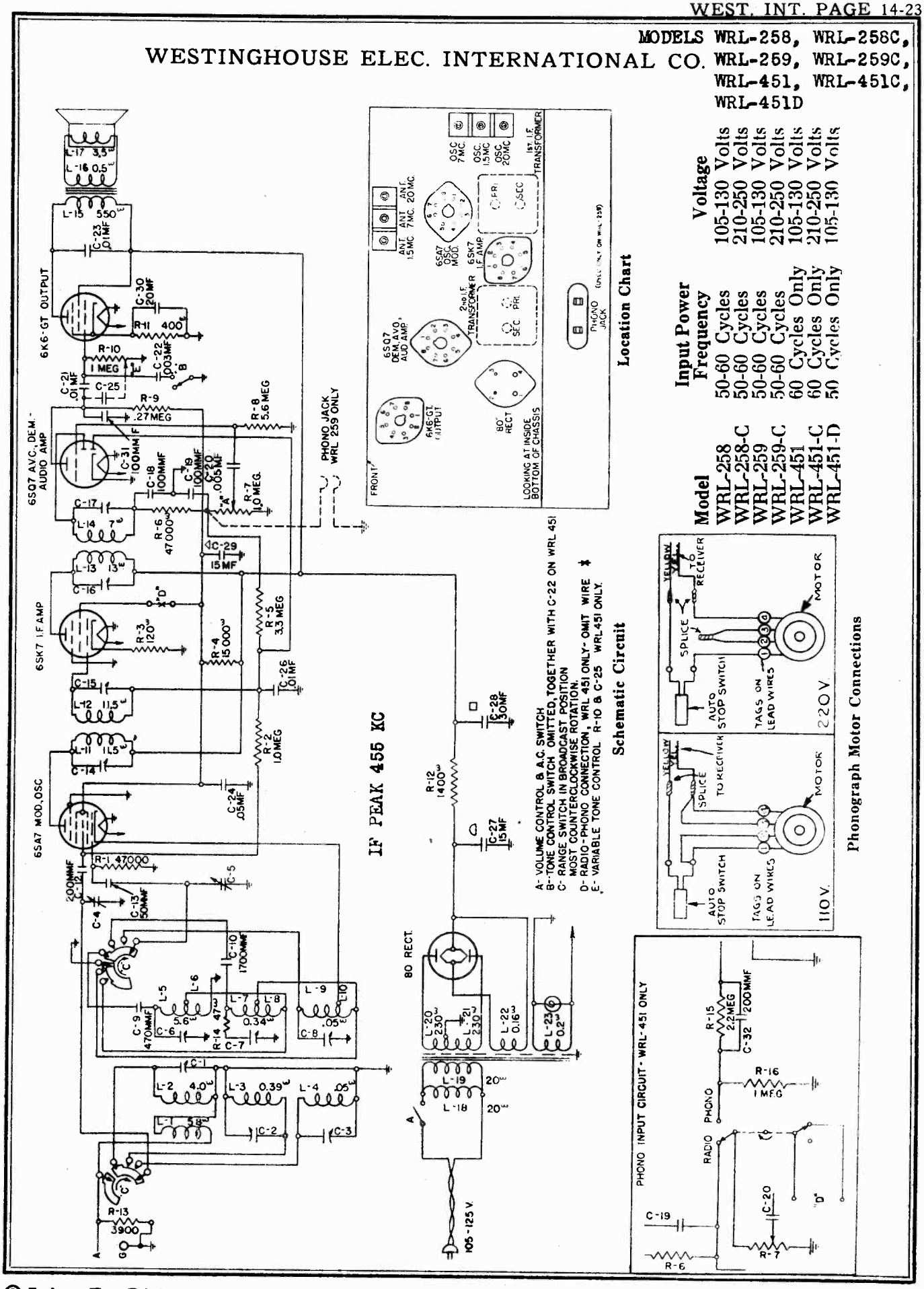
MODEL WRL-258, WRL-258C,
WRL-259, WRL-259C, WESTINGHOUSE ELEC. INTERNATIONAL CO.
WRL-451, WRL-451C,
WRL-451D



Wiring Diagram

WESTINGHOUSE ELEC. INTERNATIONAL CO.

MODELS WRL-258, WRL-258C, WRL-259, WRL-259C, WRL-451, WRL-451C, WRL-451D



Model	Input Power Frequency	Voltage
WRL-258	50-60 Cycles	105-130 Volts
WRL-258-C	50-60 Cycles	210-250 Volts
WRL-259	50-60 Cycles	105-130 Volts
WRL-259-C	50-60 Cycles	210-250 Volts
WRL-451	60 Cycles Only	105-130 Volts
WRL-451-C	60 Cycles Only	210-250 Volts
WRL-451-D	50 Cycles Only	105-130 Volts

SPECIFICATIONS

Tuning Ranges ..... A—0.54 to 1.68 Mc; B—2.25 to 7.5 Mc; C—7.5 to 23 Mc

Number of Tubes 5
- 1—6SA7 Modulator and Oscillator
- 1—6SK7 I. F. Amplifier
- 1—6SQ7 Demodulator, A. V. C. and Audio Ampl.
- 1—6K6G Power Amplifier
- 1—80 Rectifier

Input Power Ratings
- WRL-258, WRL-259 ..... 50 Watts
- WRL-451 ..... 70 Watts

Intermediate Frequency ..... 455 Kilocycles

Speaker Voice-Coil Impedance at 400 Cycles ..... Approximately 3.5 Ohms

POWER TRANSFORMER CONNECTIONS

Models WRL-258, WRL-258-C, WRL-259 and WRL-259-C Receivers have a double primary power transformer which, when connected in parallel (WRL-258 and WRL-259) will operate between 105 and 130 volts A. C., and when connected in series (WRL-258-C and WRL-259-C) will operate between 210 and 250 volts A.C.

If it is desired to change the operating voltage of a WRL-258, WRL-259, WRL-258-C and WRL-259-C, see the wiring diagram for the correct connections. These connections are located underneath the chassis and must be soldered.

All WRL-451 Models can be changed from one voltage to another in the same manner as above, but it will also be necessary to change the phonograph motor connections as shown
It should be remembered that the WRL-451 and WRL-451-C are for 60 cycles only while the WRL-451-D is for 50 cycles only, and a change in voltage connections does not change the frequency.

ALIGNING INFORMATION

Never Align Unless Absolutely Necessary

Use a good modulated signal generator (test oscillator) with variable output voltage and connect a sensitive output meter across the voice coil of the speaker.

Always align using the smallest possible output from the signal generator. A strong signal makes adjustments inaccurate.

Always have receiver volume control full on. See Location Chart below for location of all the aligning adjustment screws.

Aligning procedure (follow this order exactly)

I. Dial pointer adjustment.

Make sure that the dial drive cord is in position on all pulleys, otherwise it will not be possible to correctly set the dial pointer. To correct the position of the dial pointer, first free the pointer ends from the drive cord, then, with the gang capacitor fully engaged, set the pointer directly on the index marks nearest to the letters "A" and "C" on the dial. Carefully re-tighten the pointer ends to the drive cord.

II. Intermediate frequency adjustments.

1. Set the range switch to the medium wave position ("A").
2. Tune set to extreme low frequency end of the dial.
3. Connect the ground terminal of the signal generator to the ground terminal of the chassis.
4. Introduce a modulated signal of 455 Kilocycles to the grid of the 6SA7 Tube (Terminal No. 8), using a 0.1 microfarad capacitor in series with the output lead of the signal generator.
5. Adjust the I. F. Aligners for maximum output in the following order:
   a. Secondary of second I. F. transformer.
   b. Primary of second I. F. transformer.
   c. Secondary of first I. F. transformer.
   d. Primary of first I. F. transformer.

III. Radio frequency adjustments.

Short Wave Range, Scale "C".

1. Replace the 0.1 microfarad capacitor in series with the output lead of the signal generator, with a 400 ohm carbon type resistor, and connect it to the antenna lead of the chassis.
2. Set the range switch to the "C" short wave position.
3. Set the signal generator frequency and the receiver tuning dial to 20 megacycles.
4. Adjust the "OSC. 20 Mc." aligning capacitor for maximum signal. Two positions will be found at which maximum signal occurs. Always use the minimum capacitance (most counter-clockwise) position.
5. Adjust the "ANT. 20 Mc." aligning capacitor for maximum signal. Two positions may be found at which maximum signal occurs. Always use the maximum capacitance (most clockwise) position.

Short Wave Range, Scale "B".

(Leave the receiver connected to the signal generator in the same manner as above.)

1. Set the range switch to the "B" short wave position.
2. Set the signal generator frequency and the receiver tuning dial to 7 megacycles.
3. Adjust the "OSC. 7 MC." and the "ANT. 7 MC." aligning capacitors for maximum signal.

Medium Wave Range, Scale "A".

1. Replace the 400 ohm carbon type resistor in series with the output lead from the signal generator with a 200 micro-microfarad capacitor.
2. Set the range switch to the medium wave position ("A").
3. Set the signal generator frequency and the receiver tuning dial to 1.5 MC.
4. Adjust the "OSC. 1.5 MC." and the "ANT. 1.5 MC." aligning capacitors for maximum signal.

Note: The calibration at the low frequency end of each range should be checked after the alignment of each range is completed. If the calibration is too inaccurate, repeat the aligning procedure, changing the dial setting slightly at the high-frequency end of the dial to compensate for the low frequency dial error.

NORMAL VOLTAGE READINGS

Take all readings with chassis operating and tuned to approximately 1000 Kc.—no signal. Use a line voltage of 120 volts (240 volts for "C" models), or make allowance for any slight variation.

Use a good high resistance voltmeter having a resistance of at least 1000 ohms per volt. Take all D.C. readings on the 500 volt scale except when an asterisk appears.

Read from indicated terminals to chassis base. See location chart on page 3 for position of terminals.

A.C. voltages are indicated by *italics*.

		TERMINALS OF SOCKETS							
Tube	*Circuit*	1	2	3	4	5	6	7	8
6SA7	Mod. and Osc.	—	*6.0*	+250	+100	−5*	0	—	0
6SK7	I. F. Amp.	—	*6.0*	—	0	+2*	+100	—	+250
6SQ7	Demod., A. V. C., Audio Amp.	—	0	0	0	0	+60*	*6.0*	—
6K6G	Output	—	*6.0*	+240	+250	0	0	—	+15*
80†	Rectifier	+340	*310*	*310*	+340	—	—	—	—

*Read on lowest possible scale of voltmeter
†Between terminals 1 and 4 of rectifier socket: 4.5 volts A. C.

CONTINUITY TEST

CAUTION: Remove all tubes and disconnect the receiver from the power supply before making continuity test. The speaker should remain connected.

Use a good ohmmeter capable of measuring accurately up to several megohms.

The resistances given are often approximate, owing to electrolytic capacitors in the circuit. When this is the case, be sure to reverse the test leads and read the highest resistance.

Read from indicated terminals (see Location Chart, page 3) to chassis base unless otherwise specified.

		TERMINALS OF SOCKETS							
Tube	*Circuit*	1	2	3	4	5	6	7	8
6SA7	Mod. and Osc.	S	S	*1400¶	*1600¶	47000¶	R	S	5M
6SK7	I. F. Amp.	S	S	S	4M	120¶	*16000¶	S	*14000¶
6SQ7	Demod., A. V. C., Audio Amp.	S	5.6M	S	4.3M	1M	280000¶	S	S
6K6G	Output	100000¶	S	*1950¶	*1400¶	100000¶	5M	S	400¶
80	Rectifier	200000¶ or Greater	240¶	240¶	200000¶ or Greater	—	—	—	—

Symbols used are as follows: ¶—ohms; M—megohms; S—short; O—open.
*These readings should be taken from indicated terminal to terminal No. 1 of the rectifier socket (type 80 tube).
R—Range Switch in position: A = 1 ohm; B = "short"; C = "short".

Other Tests Not Shown on Chart

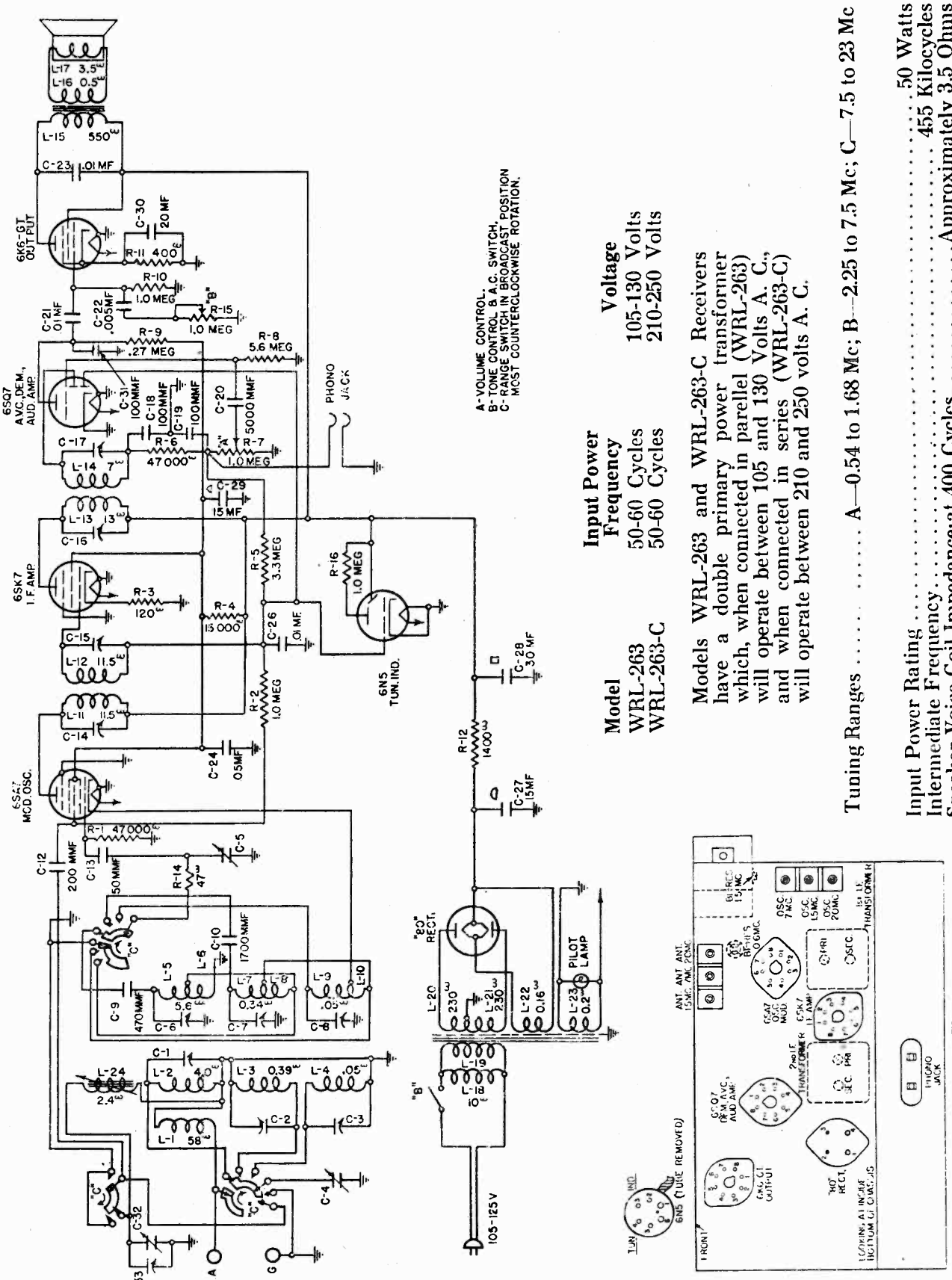
Antenna lead to Chassis Base:
- Range switch in "A", medium wave position ..... 60 Ohms
- Range switch in "B", short wave position ..... 4 Ohms
- Range switch in "C", short wave position ..... 0.5 Ohm

Between Terminals of A.C. Plug:
- A.C. switch closed (WRL-258, WRL-259, and WRL-451) ..... 10 Ohms
- A.C. switch closed (WRL-258-C WRL-259-C, and WRL-451-C) .. 40 Ohms

Terminals of A.C. plug to chassis base .. "Open"

MODELS WRL-263, WRL-263C

WESTINGHOUSE ELEC. INTERNATIONAL CO.



Model	Input Power Frequency	Voltage
WRL-263	50-60 Cycles	105-130 Volts
WRL-263-C	50-60 Cycles	210-250 Volts

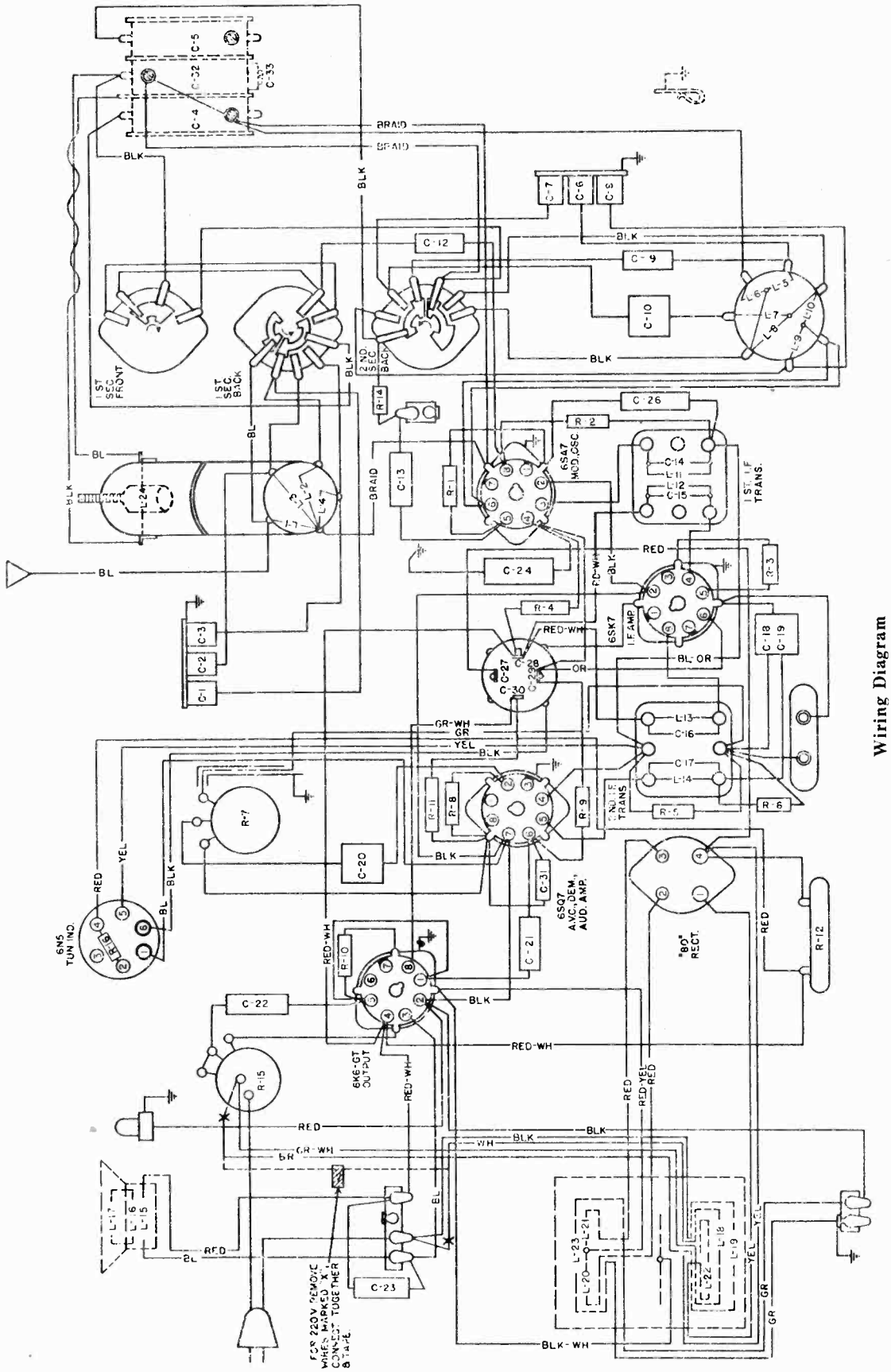
Models WRL-263 and WRL-263-C Receivers have a double primary power transformer which, when connected in parellel (WRL-263) will operate between 105 and 130 Volts A. C., and when connected in series (WRL-263-C) will operate between 210 and 250 volts A. C.

Tuning Ranges ..... A—0.54 to 1.68 Mc; B—2.25 to 7.5 Mc; C—7.5 to 23 Mc

Input Power Rating ..... 50 Watts
Intermediate Frequency ..... 455 Kilocycles
Speaker Voice-Coil Impedance at 400 Cycles ..... Approximately 3.5 Ohms

MODELS WRL-263,
WRL-263C

WESTINGHOUSE ELEC. INTERNATIONAL CO.



Wiring Diagram

ALIGNING INFORMATION

Never Align Unless Absolutely Necessary

I. Dial pointer adjustment.

Make sure that the dial drive cord i in position on all pulleys, otherwise it will not be possible to correctly set the dial pointer. To correct the position of the dial pointer, first free the pointer ends from the drive cord, then, with the gang capacitor fully engaged, set the pointer directly on the index marks nearest to the letters "A" and "C" on the dial. Carefully re-tighten the pointer ends to the drive cord.

II. Intermediate frequency adjustments.

1. Set the range switch to the medium wave position ("A").
2. Tune set to extreme low frequency end of the dial.
3. Connect the ground terminal of the signal generator to the ground terminal of the chassis.
4. Introduce a modulated signal of 455 Kilocycles to the stator terminal of the center section of the gang capacitor, using a 0.1 microfarad capacitor in series with the output lead of the signal generator.
5. Adjust the I. F. Aligners for maximum output in the following order:
   a. Secondary of second I. F. transformer.
   b. Primary of second I. F. transformer.
   c. Secondary of first I. F. transformer.
   d. Primary of first I. F. transformer.

III. Radio frequency adjustments.

Short Wave Range, Scale "C".

1. Replace the 0.1 microfarad capacitor in series with the output lead of the signal generator, with a 400 ohm carbon type resistor, and connect it to the antenna lead of the chassis.
2. Set the range switch to the "C" short wave position.
3. Set the signal generator frequency and the receiver tuning dial to 20 megacycles.
4. Adjust the "OSC. 20 Mc." aligning capacitor for maximum signal. Two positions will be found at which maximum signal occurs. Always use the minimum capacitance (most counter-clockwise) position.
5. Adjust the "ANT. 20 Mc." aligning capacitor for maximum signal. Two positions may be found at which maximum signal occurs. Always use the maximum capacitance (most clockwise) position.

Short Wave Range, Scale "B".

(Leave the receiver connected to the signal generator in the same manner as above.)

1. Set the range switch to the "B" short wave position.
2. Set the signal generator frequency and the receiver tuning dial to 7 megacycles.
3. Adjust the "OSC. 7 MC." and the "ANT. 7 MC." aligning capacitors for maximum signal.

Medium Wave Range, Scale "A".

1. Replace the 400 ohm carbon type resistor in series with the output lead from the signal generator with a 200 micro-microfarad capacitor.
2. Set the range switch to the medium wave position ("A").
3. Set the signal generator frequency and the receiver tuning dial to 1.5 MC.
4. Adjust the "OSC.", "BI-RESONATOR" and "ANT." Aligning Capacitors for maximum signal (the "Bi-Resonator" Aligning Capacitor is located on the side of the variable gang capacitor).
5. Set the signal generator frequency and the receiver tuning dial to 0.6 megacycles.
6. Adjust the 0.6 megacycle "Bi-Resonator" (iron core) for maximum signal.
7. Repeat operations 3 and 4.

Note: The calibration at the low frequency end of each range should be checked after the alignment of each range is completed. If the calibration is too inaccurate, repeat the aligning procedure, changing the dial setting slightly at the high-frequency end of the dial to compensate for the low frequency dial error.

NORMAL VOLTAGE READINGS

Take all readings with chassis operating and tuned to approximately 1000 Kc. no signal. Use a good high resistance voltmeter having a resistance of at least 1000 ohms per volt. Take all D. C. readings on the 500 volt scale except when an asterisk appears.

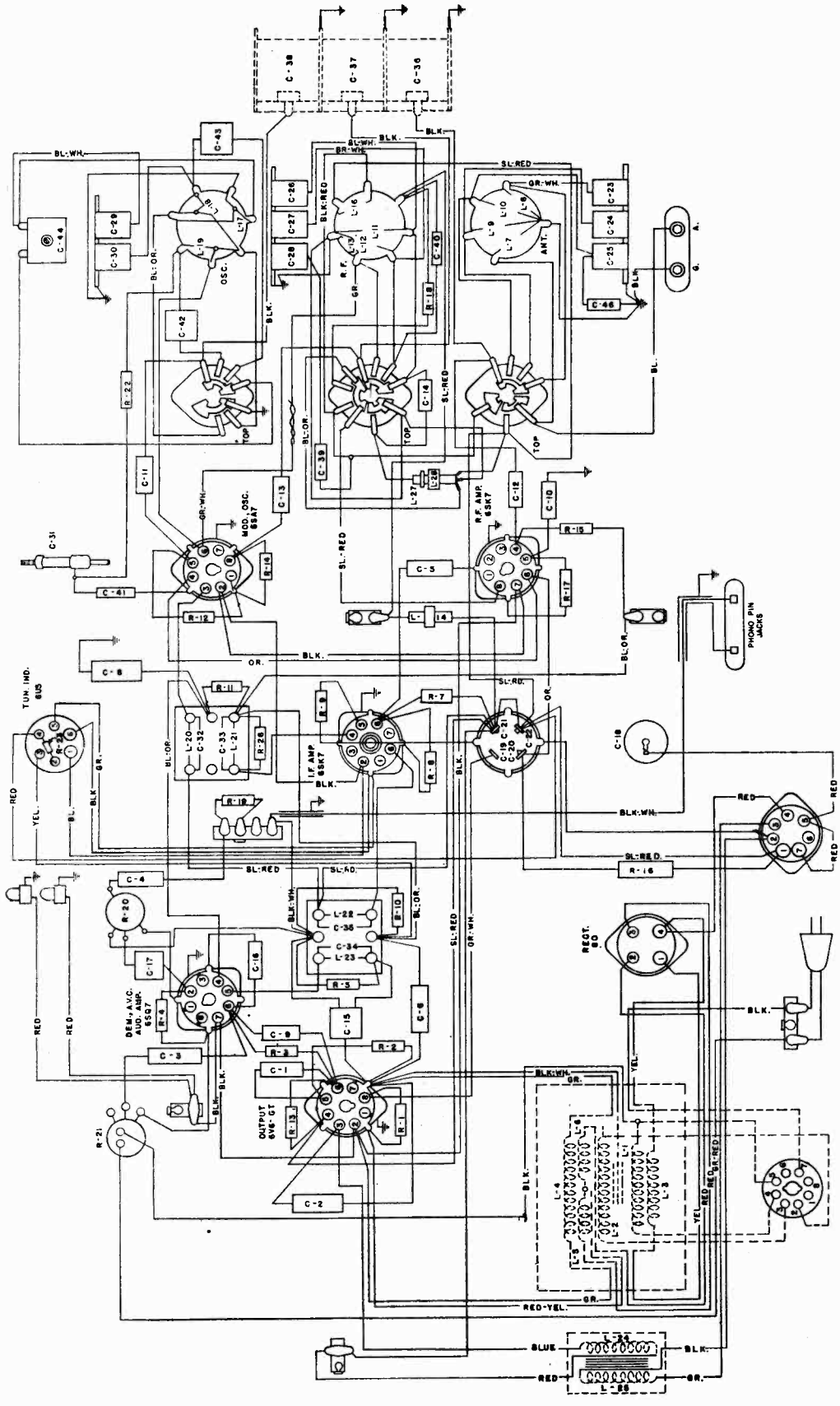
		TERMINALS OF SOCKETS							
Tube	*Circuit*	1	2	3	4	5	6	7	8
6SA7	Mod. and Osc.	—	*6.0*	+250	+100	−5*	0	—	0
6SK7	I. F. Amp.	—	*6.0*	—	0	+2*	+100	—	+250
6SQ7	Demod., A. V. C., Audio Amp.	—	0	0	0	0	+60*	*6.0*	—
6K6G	Output	—	*6.0*	+240	+250	0	0	—	+15*
6N5	Tuning Ind.	*6.0*	+25	0	+250	0	0	—	—
80†	Rectifier	+340	*310*	*310*	+340	—	—	—	—

*Read on lowest possible scale of voltmeter.
†Between terminals 1 and 4 of rectifier socket: 4.5 volts A. C.

A. C. voltages are indicated by *italics*.

MODELS WRL-277,
WRL-277B

WESTINGHOUSE ELEC. INTERNATIONAL CO.



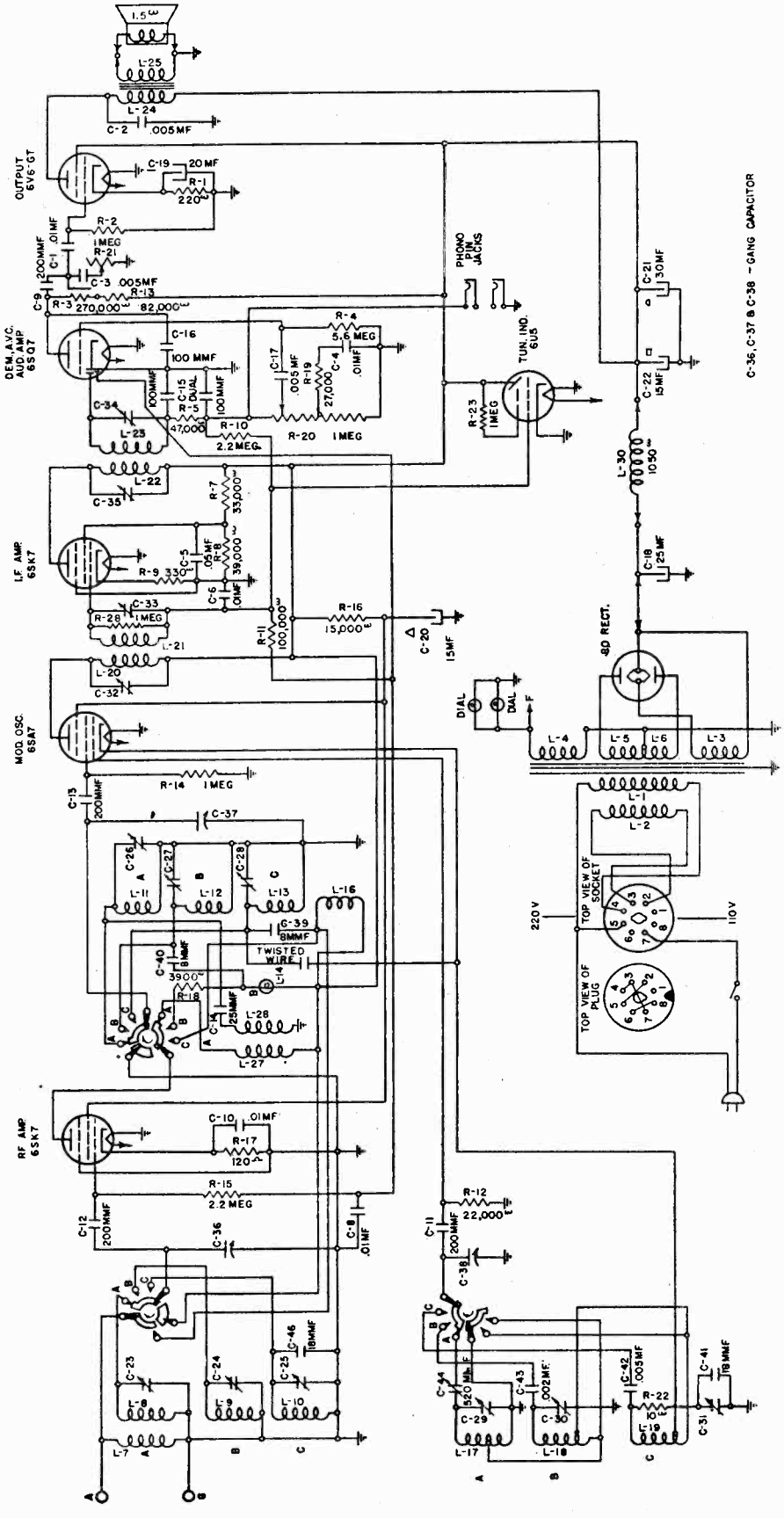
Wiring Diagram—WRL-277 Receiver

Number of Tubes..... 7

- 1—6SK7 R. F. Amplifier
- 1—6SA7 Modulator and Oscillator
- 1—6SK7 I. F. Amplifier
- 1—6SQ7 Demodulator, A. V. C. and Audio Amplifier
- 1—6V6G Output
- 1—80 Rectifier
- 1—6U5 Tuning Indicator

MODELS WRL-277, WRL-277B

WESTINGHOUSE ELEC. INTERNATIONAL CO.

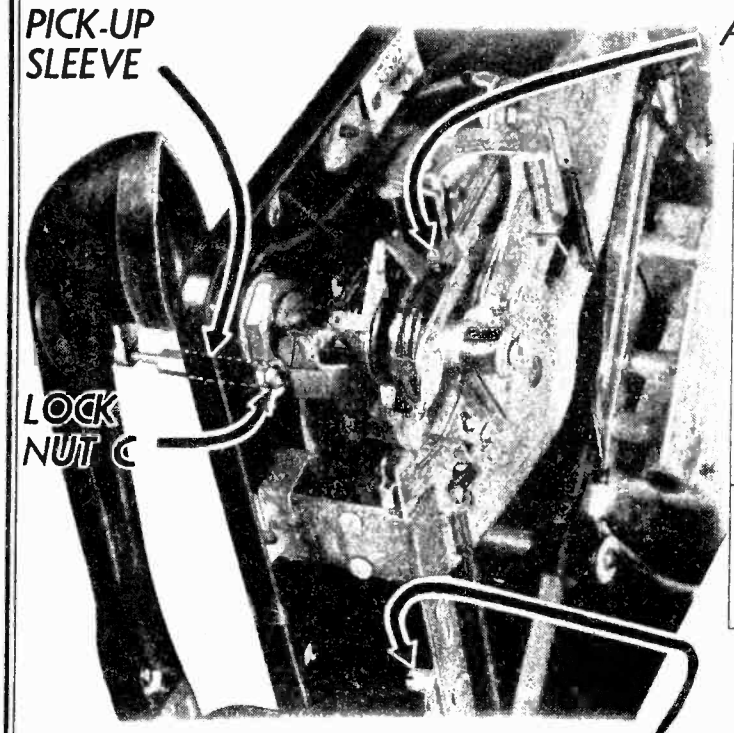


Schematic Circuit—WRL-277 Receiver

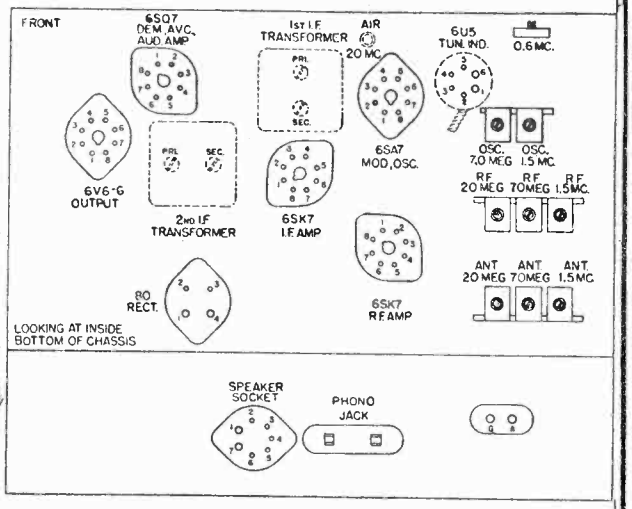
Voltage Rating	Adjustable for 100 to 120 or 200 to 240 Volts A. C. (See "Adjustment of Receiver to various line voltages")
Type of Circuit	Superheterodyne
Tuning Ranges	A—0.54 to 1.6 Mc.; B—2.3 to 7.6 Mc.; C—7.6 to 23 Mc.
Input Power Rating WRL-277 and WRL-371	80 Watts
Input Power Rating WRL-471	100 Watts
Intermediate Frequency	455 Kilocycles
Speaker Voice Coil Impedance at 400 cycles	Approximately 1.5 Ohms
Speaker Field Coil Resistance	Approximately 1050 Ohms

MODELS WRL-277, WRL-277B, WRL-371, WRL-471, WRL-471D

WESTINGHOUSE ELEC. INTERNATIONAL CO.



Model WRL-471 Receiver
Phonograph Mechanism



Location Chart

Model	Input Power Frequency
WRL-277	40-60 Cycles
WRL-277-B	25-60 Cycles (115 Volts only)
WRL-371	40-60 Cycles
WRL-471	60 Cycles only
WRL-471-D	50 Cycles only

NORMAL VOLTAGE READINGS

Take all readings with receiver operating and tuned to approximately 1000 Kc.—no signal.

Use a line voltage of 120 volts, or make allowance for any slight variation.

Use a good high resistance voltmeter having a resistance of at least 1000 ohms per volt.

Take all D. C. readings on the 500 volt scale except when an asterisk appears.

Read from indicated terminals to chassis base.

See location chart above for position of terminals.

A. C. voltages are indicated by *italics*.

		TERMINALS OF SOCKETS							
Tube	*Circuit*	1	2	3	4	5	6	7	8
6SK7	R. F. Amp.	0	0	0	0	+2*	+105	*6.0*	+265
6SA7	Mod. and Osc.	0	0	+265	+105	—5*	0	*6.0*	0
6SK7	I. F. Amp.	0	0	—	0	+3*	+105	*6.0*	+265
6SQ7	Demod., A. V. C., Audio Ampl.	0	0	0	0	0	+90	*6.0*	—
6V6G	Output	0	0	+250	+265	0	0	*6.0*	+12*
80†	Rectifier	+380	*370*	*370*	+380	—	—	—	—
6U5	Tuning Ind.	0	+25	0	+265	0	*6.0*	—	—
	Speaker Socket	+265	0	0	+380	+380	0	+380	—

***Read on lowest possible scale of voltmeter.**
†Between terminals 1 and 4 of rectifier socket: 4.5 volts A. C.

SERVICE NOTES
WESTINGHOUSE WRL-277, WRL-371 AND WRL-471 RADIO RECEIVERS

ALIGNING INFORMATION

Never Align Unless Absolutely Necessary

Use a good modulated signal generator (test oscillator) with variable output voltage and connect a sensitive output meter across the voice coil of the speaker.

Always align using the smallest possible signal from the signal generator. A strong signal makes adjustments inaccurate.

Always have receiver volume control full on.

See location chart on Page 4 for location of all the aligning adjustment screws.

Aligning procedure (follow this order exactly)

I. Dial pointer adjustment.

Make sure that the dial drive cord is in position on all pulleys, otherwise it will not be possible to correctly set the dial pointer. To correct the position of the dial pointer, first free the pointer ends from the drive cord, then with the gang capacitor fully engaged, set the pointer directly behind the horizontal line at the top of the dial. Carefully retighten the pointer ends to the drive cord.

II. Intermediate frequency adjustments.

1. Set the range switch to the medium wave position ("A").
2. Tune set to extreme low frequency end of the dial.
3. Connect the ground terminal of the signal generator to the ground terminal of the chassis.
4. Introduce a modulated signal of 455 Kilocycles to the stator terminal (top) of the center section of the gang capacitor, using a 0.1 microfarad capacitor in series with the output lead of the signal generator.
5. Adjust the I. F. Aligners for maximum signal in the following order:
   - A. Secondary of second I. F. transformer.
   - B. Primary of second I. F. transformer.
   - C. Secondary of first I. F. transformer.
   - D. Primary of first I. F. transformer.

III. Radio frequency adjustments.

Short Wave Range, Scale "C".

1. Replace the 0.1 microfarad capacitor in series with the output lead of the signal generator with a 400 ohm carbon type resistor, and connect it to the antenna terminal of the chassis.
2. Set the range switch to the "C" short-wave position.
3. Set the signal generator frequency and the receiver tuning dial to 20 megacycles.
4. Adjust the "OSC. 20 MC." (air trimmer) aligner by loosening the lock nut and moving the plunger in or out until maximum signal is obtained. If two positions are found at which maximum signal occurs, always use the minimum capacitance position (most outward position of plunger). Always be sure to tighten the lock nut after the aligning adjustment has been completed. An S. D. 76 aligning tool is recommended for alignment of air trimmer capacitors of the plunger type.
5. Adjust the "20 MC." R. F. and ANTenna aligning capacitors for maximum signal.

Short Wave Range, Scale "B".

(Leave the receiver connected to the signal generator in the same manner as above.)

1. Set the range switch to the "B" short-wave position.
2. Set the signal generator frequency and the receiver tuning dial to 7 Mc.
3. Adjust the "7 MC." OSCillator aligning capacitor for maximum signal. If two positions are found at which maximum signal occurs, always use the minimum capacitance position (most counter-clockwise position).
4. Adjust the "7 MC." R. F. and ANTenna aligning capacitors for maximum signal.

Medium Wave Range, Scale "A".

1. Replace the 400 ohm carbon type resistor is series with the output lead from the signal generator with a 200 micro-microfarad capacitor.
2. Set the range switch to the medium wave position, "A".
3. Set the signal generator frequency and the receiver tuning dial to 1.5 Mc.
4. Adjust the "1.5 MC." OSCillator, R. F. and ANTenna aligners (iron cores) for maximum signal.
5. Set the signal generator frequency and the receiver tuning dial to 0.6 Mc.
6. Adjust the "0.6 MC." OSCillator aligning capacitor for maximum signal.
7. Repeat operations 3 and 4.

ADJUSTMENT OF RECEIVER TO VARIOUS LINE VOLTAGES

The power transformer used in these receivers is adjustable for operation on 100 to 120 Volts, 40-60 Cycles, or 200 to 240 Volts, 40-60 Cycles. Provision is also made for operation on 120 to 130 Volts, 40-60 Cycles, or 130 to 150 Volts, 40-60 Cycles, by using the proper "Plug-in Resistor".

To correctly adjust the receiver to any of the line voltages given below, an accurate A. C. voltmeter should be used to measure the line voltage at the location where the receiver is to be installed.

CAUTION: Never make any adjustments of the power transformer without first removing the receiver's power supply cord from its power supply receptacle.

Operation on Line Voltage of 200 to 240 Volts, 40-60 Cycles

When shipped from the factory, these receivers are adjusted for a line voltage of 200 to 240 volts.

Care should be taken to see that the white dot on the voltage changer plug indicates the "220 V" marking on top of the power transformer.

The phonograph motor of Model WRL-471 should also be inspected to see that the small plug having a **single jumper wire** is in place.

To Adjust the Receiver for a Line Voltage of 100 to 120 Volts, 40-60 Cycles

Loosen the screw and bracket so that the voltage changer plug may be removed from its socket on top of the power transformer.

Replace the voltage changer plug in its socket with the white dot set to the "110 V" marking. Screw the bracket in place.

With Model WRL-471 it is also necessary to remove the single jumper plug from the socket of the phonograph motor and insert the **double jumper** plug, which will be found attached to the inside of the cabinet.

To Adjust the Receiver for a Line Voltage of 120 to 130 Volts, 40-60 Cycles

Loosen the screw and bracket so that the voltage changer plug can be removed from its socket on top of the power transformer.

Remove the voltage changer plug and insert a W-32486 Plug-in Resistor into the socket on top of the power transformer.

With Model WRL-471 it is also necessary to remove the single jumper plug from the socket of the phonograph motor and insert the **double jumper** plug, which will be found attached to the inside of the cabinet.

To Adjust the Receiver for a Line Voltag. of 130 to 150 Volts, 40-60 Cycles

Loosen the screw and bracket so that the voltage changer plug can be removed from its socket on top of the power transformer.

Remove the voltage changer plug and insert a W-32487 Plug-in Resistor into the socket on top of the power transformer.

With Model WRL-471 it is also necessary to remove the single jumper plug from the socket of the phonograph motor and insert the **double jumper** plug, which will be found attached to the inside of the cabinet. In addition, a W-32485 Resistor must be inserted between the phonograph power cord and the radio chassis.

Playing Records

Any record player equipped with a high impedance pick-up can be attached to the WRL-277 and WRL-371 receivers.

Connect the pick-up directly to the two receptacles (jacks) provided in the back of the chassis.

When operating a record player with the WRL-277 Receiver tune the receiver to a quiet place on either of the short wave ranges and proceed to operate. Model WRL-371 has a phonograph position incorporated on the range switch; when operating a record player in conjunction with this receiver this control should be set so the arrow points to the star.

A shielded cable of the low-capacity type should be used to connect the pick-up to the receiver. The shield must be connected to the ground terminal of the receiver.

The volume may be controlled with the volume control at the receiver, or (if such is provided) with the volume control on the record player.

A low impedance phonograph pick-up may also be used, but a matching transformer must be placed between the pick-up and the phono receptacles (jacks) on the back of the chassis.

Model WRL-471 is equipped with an automatic record changer using a crystal pick-up. This record player shifts and plays the standard 10 or 12 inch records.

Care of the Cabinet

The finish of Westinghouse Radio cabinets should be protected by using a good cabinet polish regularly. It is available in pint cans, designated as W-28601.

Nicks and scratches of most kinds can be repaired quickly and easily by proper use of the W-26962 Touch-up Kit. Complete instructions are provided with each kit.

INSTRUCTIONS FOR ADJUSTING PHONOGRAPH MECHANISM USED IN WRL-471 RECEIVER

A. Adjusting Landing Position of Needle on Record

If needle comes down too far from the edge of the record so that record does not start at the beginning, **turn adjusting screw "A" very slightly counter-clockwise.**

If needle comes down too close to the edge of the record so that it slips off, **turn adjusting screw clockwise.**

B. Adjusting Tripping Mechanism

If trip mechanism fails to trip or operates during playing of record, adjust screw "B" to position where proper tripping is obtained.

C. Adjusting Height to Which Pick-up Arm Rises

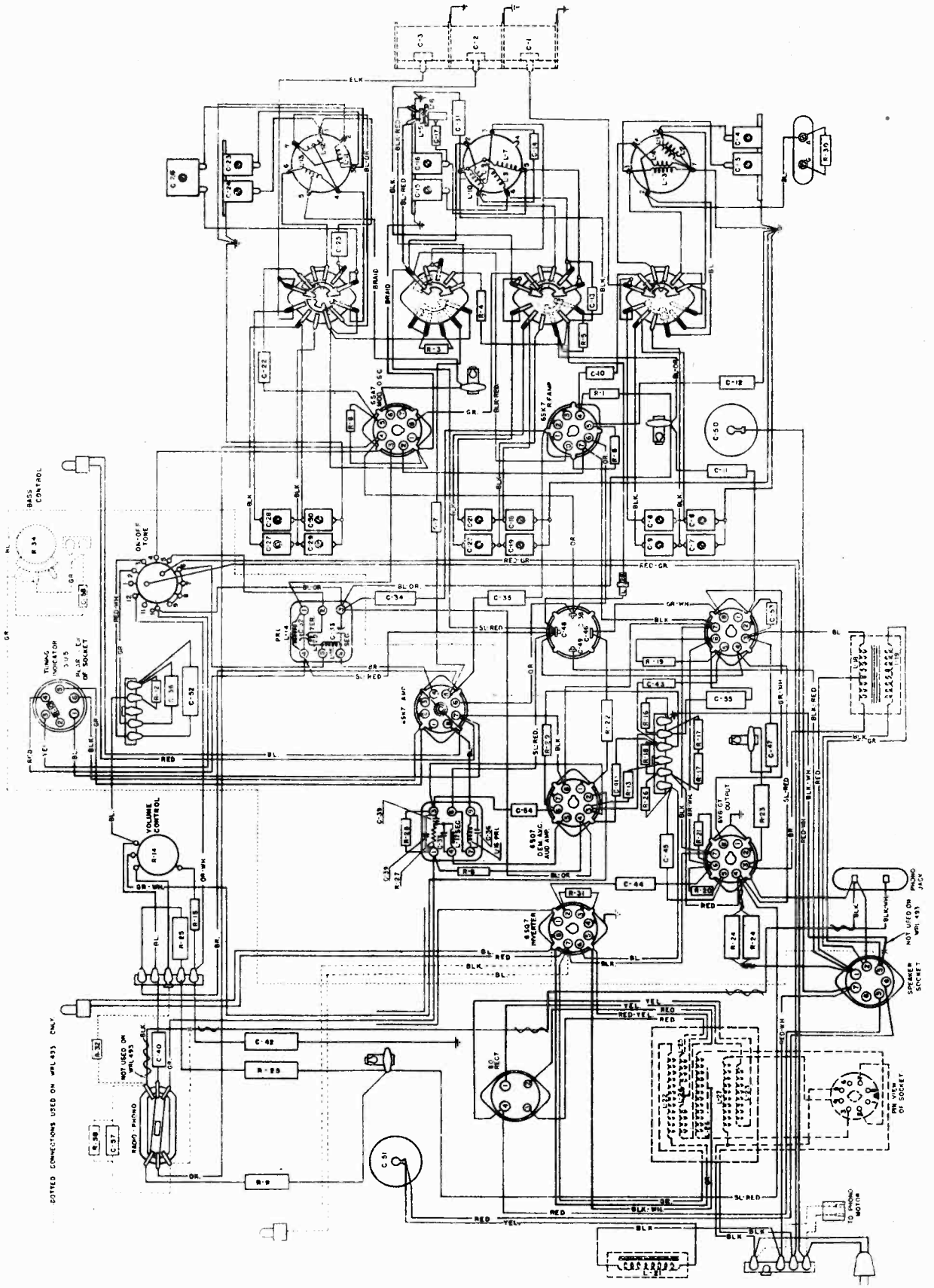
The arm should rise during the change cycle so that it clears the record above it by only ⅛". To make this adjustment, loosen the locknut "C" on pick-up sleeve and turn sleeve to lengthen or shorten the plunger. **Be sure to tighten locknut again after adjustment.**

No adjustment of the record separating knives is required as they are arranged to compensate for slight differences in record thickness automatically.

Handle the mechanism with care.

Do not lift it by the record holding knives.

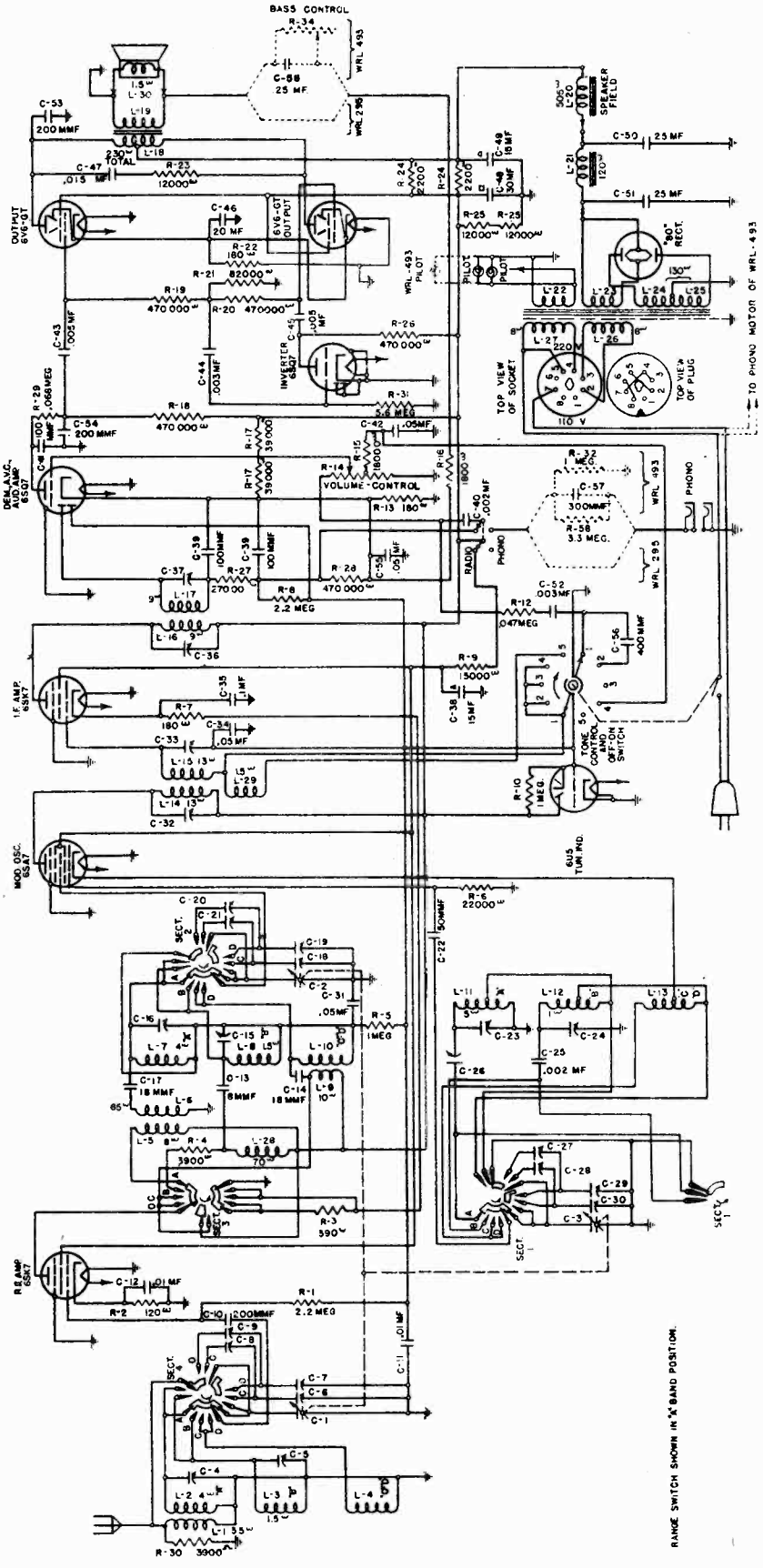
MODELS WRL-295, WRL-295B,
WRL-493, WRL-493D WESTINGHOUSE ELEC. INTERNATIONAL CO.



Wiring Diagram

WESTINGHOUSE ELEC. INTERNATIONAL CO.

MODELS WRL-295, WRL-295B, WRL-493, WRL-493D



Schematic Circuit

SPECIFICATIONS

Voltage Rating ..... { Adjustable for 100 to 120 or 200 to 240 Volts A. C. See "Adjustment of Receiver to Various Line Voltages" }

Type of Circuit ..... Superheterodyne

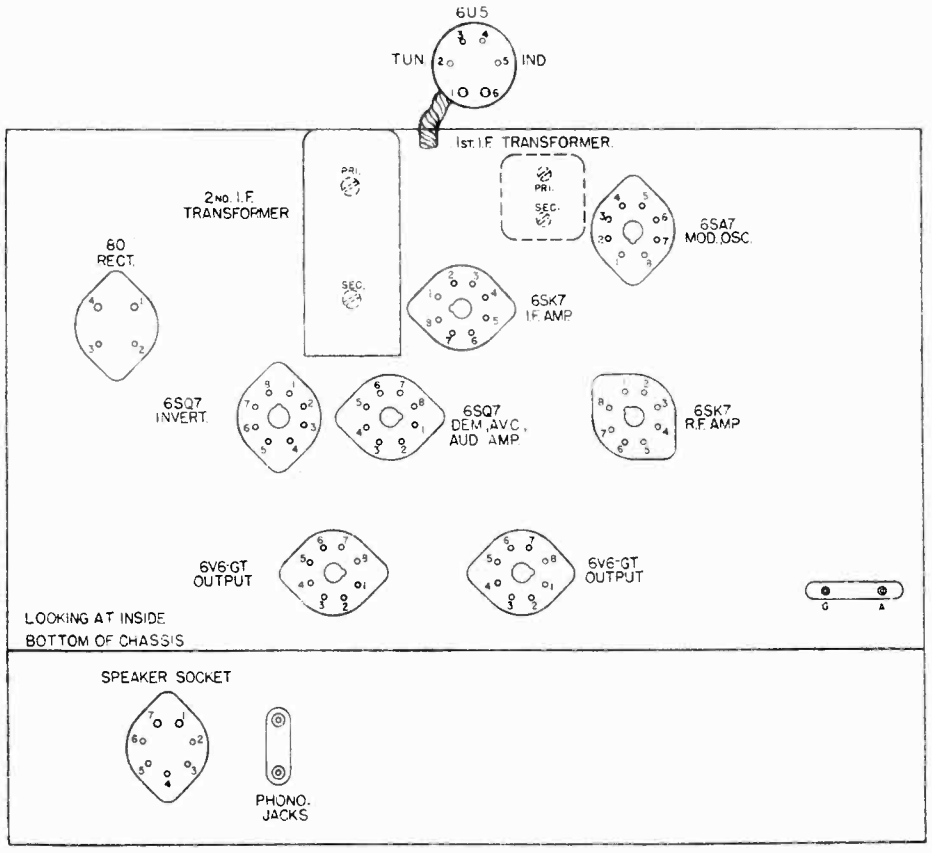
Tuning Ranges ..... A—0.54 to 1.62 Mc.; B—2.3 to 7.2 Mc.; C—8.6 to 12.1 Mc.; D—14.7 to 18.2 Mc.

Input Power Rating { WRL-295 ..... 105 Watts WRL-493 ..... 135 Watts

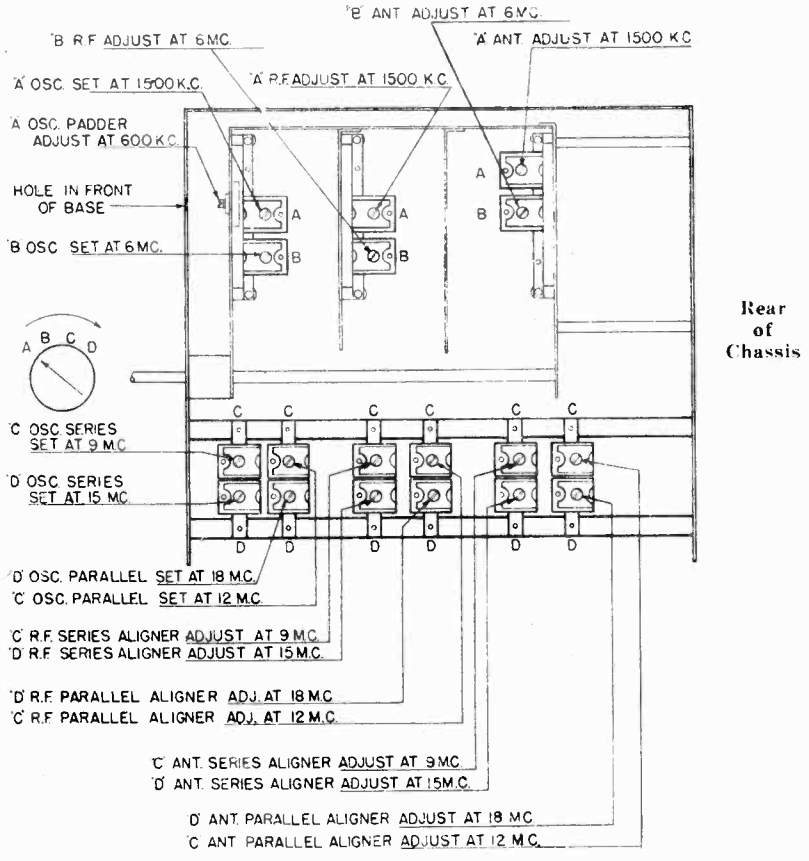
Intermediate Frequency ..... 455 Kilocycles

Speaker Voice Coil Impedance at 400 cycles ..... Approximately 1.5 Ohms

Speaker Field Coil Resistance ..... Approximately 505 Ohms



Location and I. F. Aligning Chart



R. F. Aligning Chart

Model	Input Power Frequency	Chassis	Cabinet	Speaker	Phono Equipment
WRL-295	40-60 Cycles	32922	33128	33135	—
WRL-295-B	25-60 Cycles (115 Volts only)	32856	33128	33135	—
WRL-493	60 Cycles only	33183	33185	27504	32777
WRL-493-D	50 Cycles only	33183	33185	27504	32834

ALIGNING INFORMATION—WRL-295

Never Align Unless Absolutely Necessary

Use a good modulated signal generator (test oscillator) with variable output voltage and connect a sensitive output meter across the voice coil of the speaker.

It is essential that the **exact** frequencies of 18, 15, 12 and 9 Megacycles be obtained from the signal generator in order to insure proper calibration of the D and C scales. The accuracy of the signal generator may be checked by "beating" with known short-wave stations using any receiver that is in good operating condition.

Always align using the smallest possible signal from the signal generator. A strong signal makes adjustments inaccurate.

Always have receiver volume control full on and the tone control must **not** be set to the high fidelity (most clockwise) position.

See location chart on Page 3 for location of all the aligning adjustment screws.

Aligning procedure (follow this order exactly)

I. Dial pointer adjustment.

Make sure that the dial drive cord is in position on all pulleys. To correct the position of the dial pointer, first set the gang capacitor so that it is fully engaged, and remove the two clips which hold the dial cord and the drive cord together. Then, without disturbing the drive cord, move the **dial cord** so that the pointer is directly behind the two diamond-shaped index marks at the low frequency end of the dial scales. Now fasten the dial cord and drive cord together at the extreme left (when viewed from the rear of the cabinet) by means of the two small clips.

II. Intermediate frequency adjustments.

1. Set the range switch to the medium wave position ("A").
2. Tune set to extreme low frequency end of the dial.
3. Connect the ground terminal of the signal generator to the ground terminal of the chassis.
4. Introduce a modulated signal of 455 Kilocycles to the stator terminal (top) of the center section of the gang capacitor, using a 0.1 microfarad capacitor in series with the output lead of the signal generator.
5. Adjust the I. F. Aligners for maximum signal in the following order:
   a. Secondary of second I. F. transformer.
   b. Primary of second I. F. transformer.
   c. Secondary of first I. F. transformer.
   d. Primary of first I. F. transformer.

III. Radio frequency adjustments. (See R. F. Aligning Chart for position of alignment adjusting screws.)

Short Wave Range, Scale "D"

1. Replace the 0.1 mf. capacitor in series with the output lead of the signal generator with a 400 ohm carbon type resistor and connect it to the antenna terminal of the chassis.
2. Set the range switch to the "D" short-wave position.
3. Set the signal generator frequency and the receiver tuning dial to 18 megacycles.
4. Adjust the "D" OSC. PARALLEL 18 MC. aligner for maximum signal. Two positions will be found at which maximum signal occurs. Be sure to use the **minimum** capacitance position (most counter-clockwise position of screw).
5. Adjust the "D" R. F. PARALLEL 18 MC. and the "D" ANT. PARALLEL 18 MC. aligners for maximum signal. Two positions may be found at which maximum signal occurs. Be sure to use the **maximum** capacitance position (most clockwise position of screw).
6. Set the signal generator frequency and the receiver tuning dial to 15 megacycles.
7. Adjust the "D" OSC. SERIES 15 MC. aligner for maximum signal. Two positions will be found at which maximum signal occurs. Be sure to use the **minimum** capacitance position (most counter-clockwise position of screw).
8. Adjust the "D" R. F. SERIES 15 MC. and the "D" ANT. SERIES 15 MC. aligners for maximum signal. Two positions will be found at which maximum signal occurs. Be sure to use the **maximum** capacitance position (most clockwise position of screw).
9. Repeat operations 3, 4, 5, 6, 7 and 8 until no further improvement results.

Short Wave Range, Scale "C".

(Leave the receiver connected to the signal generator in the same manner as above.)

1. Set the range switch to the "C" short-wave position.
2. Set the signal generator frequency and the receiver tuning dial to 12 megacycles.
3. Adjust the "C" OSC. PARALLEL 12 MC. aligner for maximum signal. Two positions will be found at which maximum signal occurs. Be sure to use the **minimum** capacitance position (most counter-clockwise of screw).
4. Adjust the "C" R. F. PARALLEL 12 MC. and the "C" ANT. PARALLEL 12 MC. aligners for maximum signal. Two positions will be found at which maximum signal occurs. Be sure to use the **maximum** capacitance position (most clockwise position of screw).
5. Set the signal generator frequency and the receiver tuning dial to 9 megacycles.
6. Adjust the "C" OSC. SERIES 9 MC. aligner for maximum signal. Two positions will be found at which maximum signal occurs. Be sure to use the **minimum** capacitance position (most counter-clockwise of screw).
7. Adjust the "C" R. F. SERIES 9 MC. and the "C" ANT. SERIES 9 MC. aligner for maximum signal. Two positions will be found at which maximum signal occurs. Be sure to use the **maximum** capacitance position (most clockwise of screw).
8. Repeat operations 2, 3, 4, 5, 6 and 7 until no further improvement results.

Short Wave Range, Scale "B".

(Leave the receiver connected to the signal generator in the same manner as above.)

1. Set the range switch to the "B" short-wave position.
2. Set the signal generator frequency and the receiver tuning dial to 6 Mc.
3. Adjust the "B" OSCillator "6 MC." aligning capacitor for maximum signal. If two positions are found at which maximum signal occurs, always use the minimum capacitance position (most counter-clockwise position).
4. Adjust the "B" R. F. and ANTenna "6 MC." aligning capacitors for maximum signal.

Medium Wave Range, Scale "A".

1. Replace the 400 ohm carbon type resistor in series with the output lead from the signal generator with a 200 micro-microfarad capacitor.
2. Set the range switch to the medium wave position, "A".
3. Set the signal generator frequency and the receiver tuning dial to 1500 Kc.
4. Adjust the "A" OSCillator, R. F. and ANTenna "1500 KC." aligners for maximum signal.
5. Set the signal generator frequency and the receiver tuning dial to 600 Kc.
6. Adjust the "A" OSCillator padder "600 KC." aligner for maximum signal.
7. Repeat operations 3 and 4.

ALIGNING INFORMATION WRL-493

In order to align the WRL-493, the chassis must be removed from the cabinet. Therefore, it is necessary to use the auxiliary scale (on the back of the large pulley) in place of the tuning dial. This auxiliary scale is calibrated in degrees and a temporary indicator can be provided by soldering a short piece of bare copper wire (approx. No. 22 B.S.) to the upright dial drive support. This wire should be so located that it indicates 180° when the gang tuning capacitor is fully engaged.

Alignment procedure is exactly the same as given for the WRL-295 except that the following positions in degrees must be used in place of the tuning dial settings.

"D" range	18 Mc.	use	166	degrees.
"D" range	15 Mc.	use	27	degrees.
"C" range	12 Mc.	use	162	degrees.
"C" range	9 Mc.	use	39	degrees.
"B" range	6 Mc.	use	148.5	degrees.
"A" range	1500 Kc.	use	157	degrees.
"A" range	600 Kc.	use	30	degrees.

ADJUSTMENT OF RECEIVER TO VARIOUS LINE VOLTAGES

The power transformer used in these receivers is adjustable for operation on 100 to 120 Volts, 40-60 Cycles, or 200 to 240 Volts, 40-60 Cycles. Provision is also made for operation on 120 to 130 Volts, 40-60 Cycles, or 130 to 150 Volts, 40-60 Cycles, by using the proper "Plug-in Resistor".

To correctly adjust the receiver to any of the line voltages given below, an accurate A. C. voltmeter should be used to measure the line voltage at the location where the receiver is to be installed.

CAUTION: Never make any adjustments of the power transformer without first removing the receiver's power supply cord from its power supply receptacle.

Operation on Line Voltage of 200 to 240 Volts

When shipped from the factory, these receivers are adjusted for a line voltage of 200 to 240 volts.

Care should be taken to see that the white dot on the voltage changer plug indicates the "220 V" marking on top of the power transformer.

The phonograph motor of Model WRL-493 should also be inspected to see that the small plug having a **single jumper wire** is in place.

To Adjust the Receiver for a Line Voltage of 100 to 120 Volts

Loosen the screw and bracket so that the voltage changer plug may be removed from its socket on top of the power transformer.

Replace the voltage changer plug in its socket with the white dot set to the "110 V" marking. Screw the bracket in place.

With Model WRL-493 it is also necessary to remove the single jumper plug from the socket of the phonograph motor and insert the **double jumper** plug, which will be found attached to the inside of the cabinet.

To Adjust the Receiver for a Line Voltage of 120 to 130 Volts

Loosen the screw and bracket so that the voltage changer plug can be removed from its socket on top of the power transformer.

Remove the voltage changer plug and insert a W-30971 (32188) Plug-in Resistor into the socket on top of the power transformer.

With Model WRL-493 it is also necessary to remove the single jumper plug from the socket of the phonograph motor and insert the **double jumper** plug, which will be found attached to the inside of the cabinet.

To Adjust the Receiver for a Line Voltage of 130 to 150 Volts

Loosen the screw and bracket so that the voltage changer plug can be removed from its socket on top of the power transformer.

Remove the voltage changer plug and insert a W-30972 (32489) Plug-in Resistor into the socket on top of the power transformer.

With Model WRL-493 it is also necessary to remove the single jumper plug from the socket of the phonograph motor and insert the **double jumper** plug, which will be found attached to the inside of the cabinet. In addition, a W-32485 Resistor must be inserted between the phonograph power cord and the radio chassis.

Playing Records

Any record player equipped with a high impedance pick-up can be attached to the WRL-295 receiver.

Model WRL-295 has a Radio-Phono switch; when operating a record player in conjunction with this receiver this control should be set so the arrow points to "Phono".

A shielded cable of the low-capacity type should be used to connect the pick-up to the receiver. The shield must be connected to the ground terminal of the receiver.

The volume may be controlled with the volume control at the receiver, or (if such is provided) with the volume control on the record player.

A low impedance phonograph pick-up may also be used, but a matching transformer must be placed between the pick-up and the phono receptacles (jacks) on the back of the chassis.

Model WRL-493 is equipped with an automatic record changer using a crystal pick-up. This record player shifts and plays the standard 10 or 12 inch records.

Care of the Cabinet

The finish of Westinghouse Radio cabinets should be protected by using a good cabinet polish regularly. It is available in pint cans, designated as W-28601.

Nicks and scratches of most kinds can be repaired quickly and easily by proper use of the W-26962 Touch-up Kit. Complete instructions are provided with each kit.

MODELS WRL-295, WRL-295B, WRL-493, WRL-493B

WESTINGHOUSE ELEC. INTERNATIONAL CO.

INSTRUCTIONS FOR ADJUSTING PHONOGRAPH MECHANISM USED IN WRL-493 RECEIVER

A. Adjusting Landing Position of Needle on Record

If needle comes down too far from the edge of the record so that record does not start at the beginning, **turn adjusting screw "A" very slightly counter-clockwise.**

If needle comes down too close to the edge of the record so that it slips off, **turn adjusting screw clockwise.**

B. Adjusting Tripping Mechanism

If trip mechanism fails to trip or operates during playing of record, adjust screw "B" to position where proper tripping is obtained.

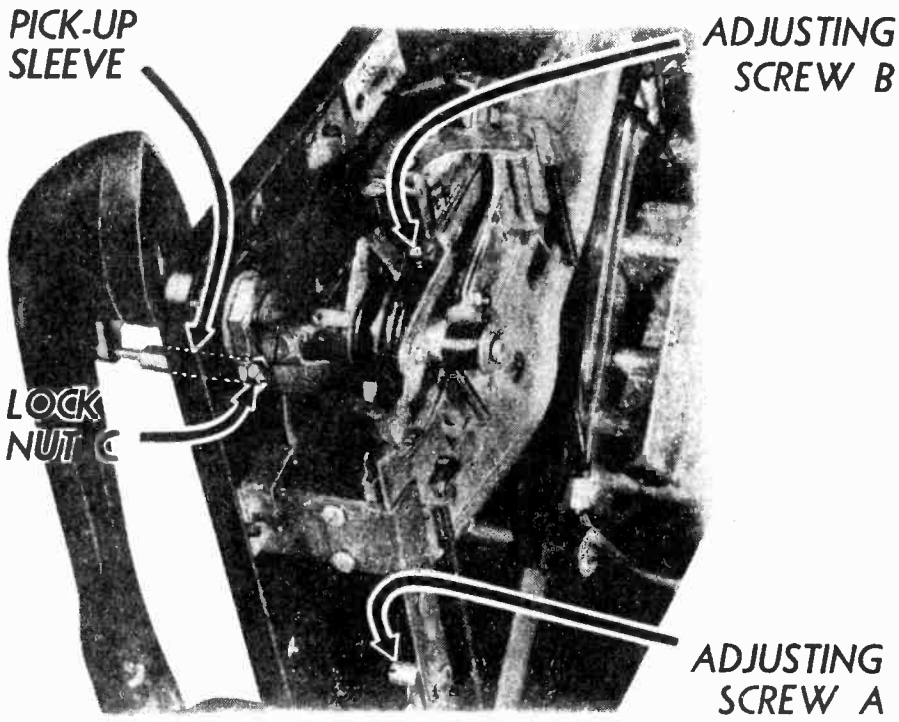
C. Adjusting Height to Which Pick-up Arm Rises

The arm should rise during the change cycle so that it clears the record above it by only ⅛". To make this adjustment, loosen the locknut "C" on pick-up sleeve and turn sleeve to lengthen or shorten the plunger. **Be sure to tighten locknut again after adjustment.**

No adjustment of the record separating knives is required as they are arranged to compensate for slight differences in record thickness automatically.

Handle the mechanism with care.

Do not lift it by the record holding knives.



NORMAL VOLTAGE READINGS

Take all readings with receiver operating and tuned to approximately 1000 Kc.—no signal.
Use a line voltage of 120 volts, or make allowance for any slight variation.
Use a good high resistance voltmeter having a resistance of at least 1000 ohms per volt.

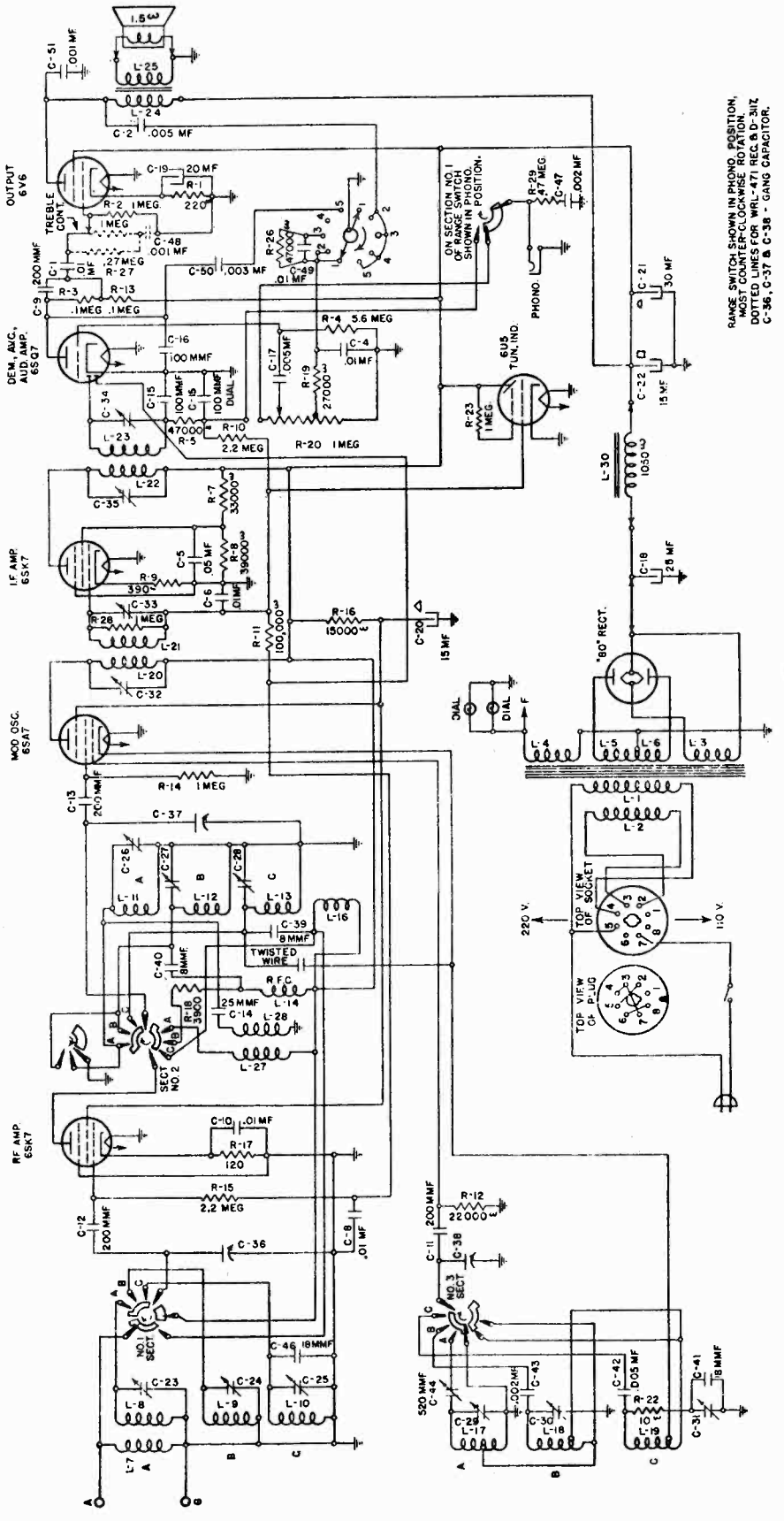
Take all D. C. readings on the 500 volt scale except when an asterisk appears.
Read from indicated terminals to chassis base. See location chart on Page 3 for position of terminals.
A. C. voltages are indicated by *italics*.

		TERMINALS OF SOCKETS							
Tube	*Circuit*	1	2	3	4	5	6	7	8
6SK7	R. F. Amp.	0	0	0	0	+1.5*	+100	*6.0*	+270
6SA7	Mod. and Osc.	0	*6.0*	+270	+100	−4*	0	0	0
6SK7	I. F. Amp.	0	0	0	0	+8*	+100	*6.0*	+270
6SQ7	Demod., A. V. C. Audio Ampl.	0	0	0	0	0	+60	0	*6.0*
6SQ7	Inverter	0	0	0	0	0	+70	*6.0*	0
6V6GT (both)	Output	0	0	+315	+270	0	0	*6.0*	+15*
80†	Rectifier	+390	*380*	*380*	+390	—	—	—	—
6U5	Tuning Ind.	*6.0*	+25	0	+270	0	0	—	—
—	Speaker Socket	+330	0	0	+380	+390	0	+380	—

*** Read on lowest possible scale of voltmeter.** **† Between terminals 1 and 4 of rectifier socket: 5 volts A. C.**

MODELS WRL-371, WRL-471, WRL-471-D

WESTINGHOUSE ELEC. INTERNATIONAL CO.



Schematic Circuit—WRL-371 and WRL-471 Receivers

Voltage Rating ..... Adjustable for 100 to 120 or 200 to 240 Volts A. C.
(See "Adjustment of Receiver to various line voltages")

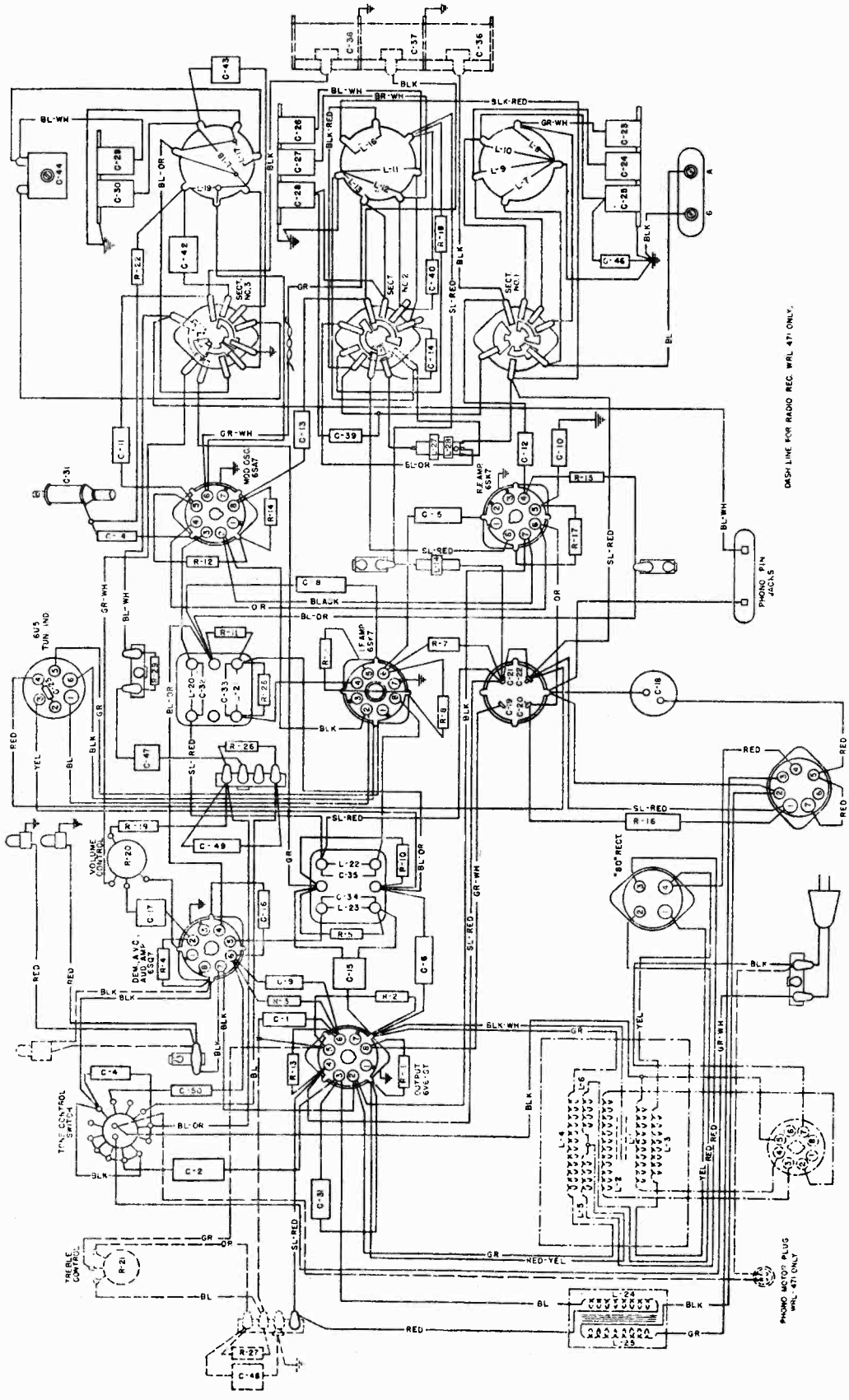
Type of Circuit..... Superheterodyne
Tuning Ranges ..... A-0.54 to 1.6 Mc.; B-2.3 to 7.6.; C-7.6 to 23 Mc.

Input Power Rating WRL-277 and WRL-371 ..... 80 Watts
WRL-471..... 100 Watts

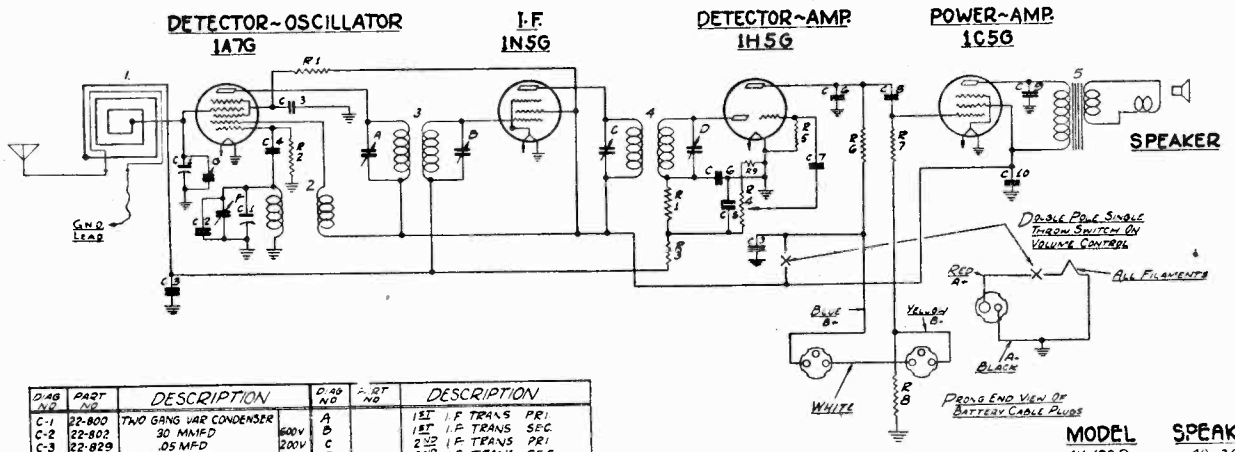
Intermediate Frequency ..... 455 Kilocycles
Speaker Voice Coil Impedance at 400 cycles..... Approximately 1.5 ohms
Speaker Field Coil Resistance..... Approximately 1050 ohms

MODELS WRL-371, WRL-471,
WRL-471D

WESTINGHOUSE ELEC. INTERNATIONAL CO.



Wiring Diagram—WRL-371 and WRL-471 Receivers



DIAG NO	PART NO	DESCRIPTION		DIAG NO	PART NO	DESCRIPTION
C-1	22-800	TWO GANG VAR CONDENSER		A		1ST I.F. TRANS. PRI.
C-2	22-802	30 MMFD	600V	B		1ST I.F. TRANS. SEC.
C-3	22-829	.05 MFD	200V	C		2ND I.F. TRANS. PRI.
C-4	22-182	.00025 MFD	400V	D		2ND I.F. TRANS. SEC.
C-5	22-828	.05 MFD	400V	E		BROADCAST OSC. (ON GANG)
C-6	22-162	.0001 MFD	600V	S		ANTENNA BROAD. (ON GANG)
C-7	22-826	.01 MFD	200V			
C-8	22-243	.01 MFD	400V			
C-9	22-448	.004 MFD	600V	1	56885	LOOP ASSEMBLY
C-10	22-684	8MFD ELECTROLYTIC	150V	2	56869	OSCILLATOR COIL ASSM.
				3	95-593	1ST I.F. TRANSFORMER
				4	95-594	2ND I.F. TRANSFORMER
R-1	63-593	47M OHMS	1/4W	5		SPEAKER TRANSF'MR.
R-2	63-654	180M OHMS	1/4W			
R-3	63-669	3.9 MEGOHMS	1/4W			
R-4	63-1026	VOLUME CONTROL				
R-5	63-604	10 MEGOHMS	1/4W			
R-6	63-271	1 MEGOHM	1/4W			
R-7	63-600	2.2 MEGOHMS	1/4W			
R-8	63-238	1000 OHMS	1/2W			
R-9	63-387	4700 OHMS	1/4W			

MODEL	SPEAKER
4K400D	49-294
4K400L	49-294
4K400M	49-294
4K400S	49-294

I.F. FREQUENCY 455 K.C.

4 TUBE BATTERY SUPERHETERODYNE

CHASSIS No. 5416

ZENITH RADIO CORPORATION

CHICAGO, ILLINOIS

NOTE:

All measurements with 1000 ohms per voltmeter — loop antenna not connected — volume at minimum — All readings made with fresh Zenith (part No. Z-59) battery pack with speaker in circuit.

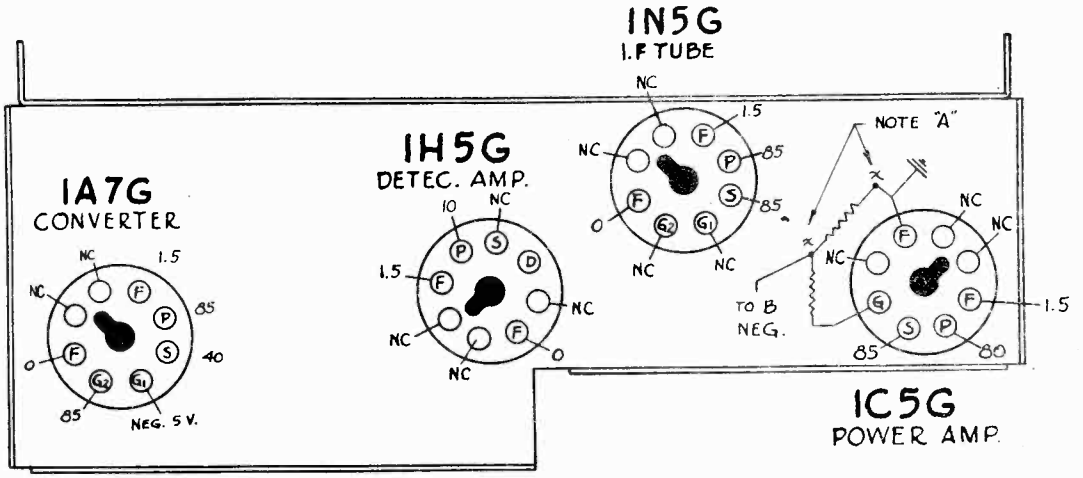
NOTE: "A"

Bias for 1C5 measured across 1000 ohm resistor at points marked X—X.

Bias is neg. 10 volts.

LEGEND

F — FILAMENT
P — PLATE
S — SCREEN
G — GRID
D — DIODE
NC — NO CONNECTION

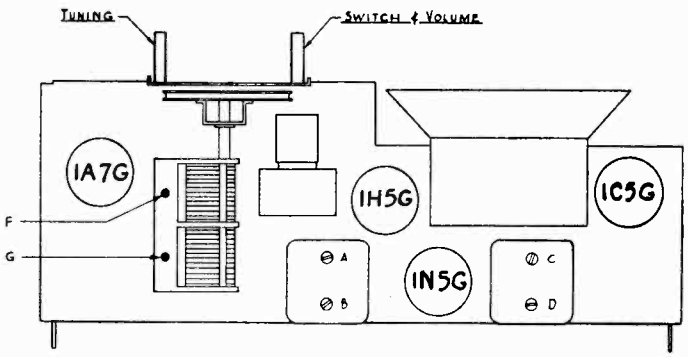


FRONT OF CHASSIS

MODELS 4K400D, 4K400L,
4K400M, 4K400S
Chassis 5416

ZENITH RADIO CORP.

MODELS 4K400D, 4K400S, 4K400L, 4K400M
Chassis 5416



ALIGNMENT PROCEDURE

Operation	Connect Test Oscillator to	Dummy Antenna	Set Test Osc. to	Band	Set Dial At	Adjust Trimmers	Purpose
1	1st Det. Grid	1/2 Mfd.	455	Br'dc't	600	ABCD	I. F. Alignment
2	Separate 3 foot antenna		1500	"	1500	F	Set Osc. to Scale
3	Separate 3 foot antenna		1500	"	1500	G	Al'gment of Ant.

PARTS LIST

Chassis 5416

MODELS 4K400D, 4K400S, 4K400L, 4K400M

Dial Assembly

26-220	Dial scale	$ .20
59-75	Dial pointer	.10
76-278	Dial drive shaft	.10
80-69	Dial cord tension spring	.02
93-371	Dial spacer bakelite washer	.25
192-38	Dial crystal	.15
MS-418	Pulley and bracket assembly	.10
S-6870	Indicator disc and bushing	.15
S-6893	Dial cord and eyelet assembly	.15

Coils

95-593	1st I. F. Transformer	1.00
95-594	2nd I. F. Transformer	1.00
S-6869	Oscillator coil assembly	.60
S-6888	Loop antenna assembly	1.35

Condensers

22-162	.0001 mfd. .... 600 volt	.15
22-182	.00025 mfd. .. 600 volt	.15
22-243	.01 mfd. ..... 400 volt	.15
22-448	.004 mfd. .... 600 volt	.18
22-684	8. mfd. ..... 150 volt Dry Electrolytic	.45
22-800	Two gang variable	2.00
22-802	30 mmfd. .... 600 volt	1.00
22-826	.01 mfd. ..... 200 volt	.12
22-828	.05 mfd. ..... 400 volt	.15
22-829	.05 mfd. ..... 200 volt	.12

Resistors

63-238	1000 ohm .... ¼ watt	.07
63-271	1 megohm .... ¼ watt	.07
63-593	47 M ohm .... ¼ watt	.07
63-600	2.2 megohm .. ¼ watt	.07
63-604	10 megohm ... ¼ watt	.07
63-654	180 M ohm ... ¼ watt	.07
63-669	3.9 megohm .. ¼ watt	.07
63-1026	Volume control and switch	1.50

Miscellaneous

46-273	Tuning control knob	.10
49-294	Speaker—5½" PM—all models	6.25
	208-294 cone and voice coil	1.50
	206-294 output transformer	1.25
78-208	Speaker plug socket	.10
78-246	Socket 1A7G tube	.10
78-247	Socket 1N5G tube	.10
78-248	Socket 1H5G tube	.10
78-249	Socket 1C5G tube	.10
83-658	Pin jack terminal strip	.06
126-297	Tube shield	.10
S-6872	Battery cable and plugs	.45

ALL PRICES LIST SUBJECT TO REGULAR PARTS DISCOUNT
AND CHANGE WITHOUT NOTICE

APRIL 4, 1939