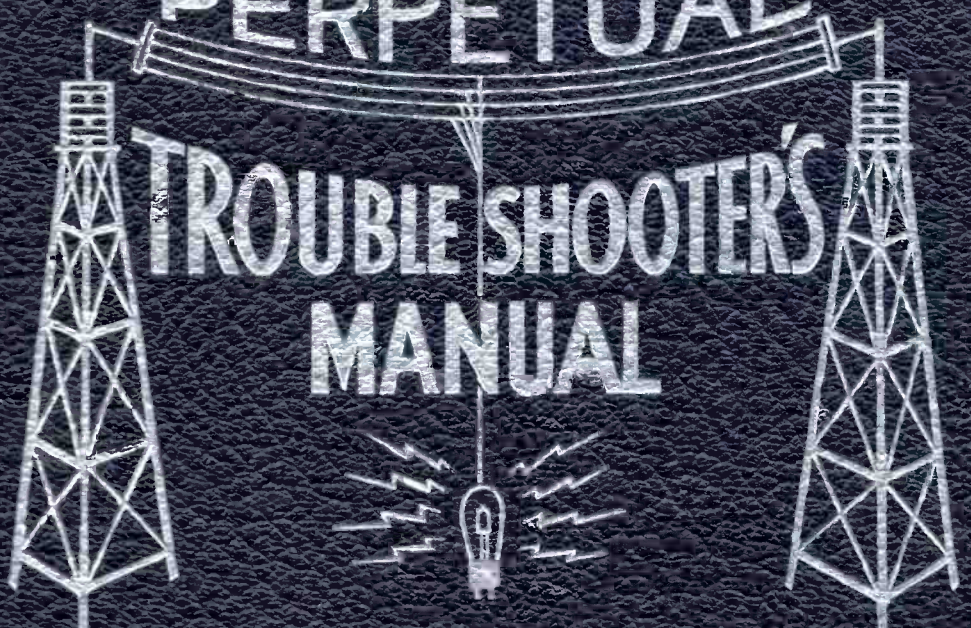
VOLUME V

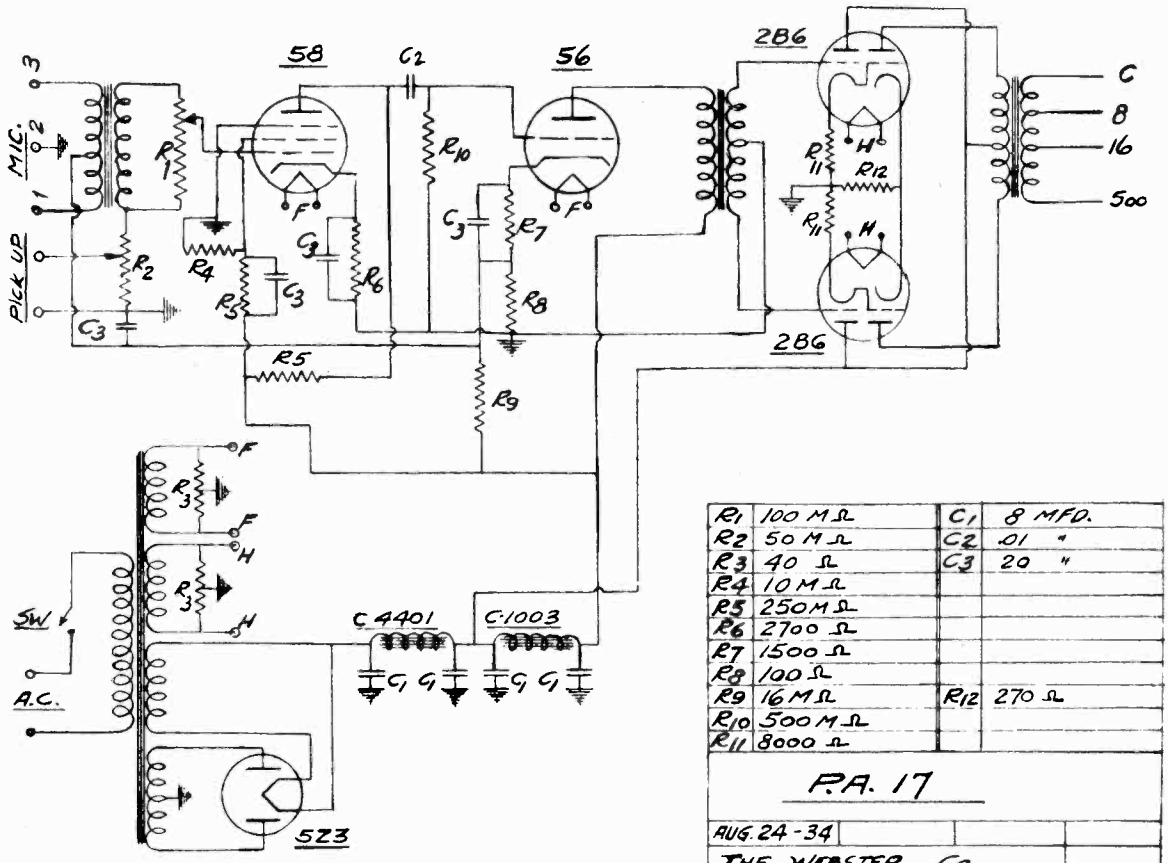
PERPETUAL TROUBLE SHOOTER'S MANUAL



JOHN F. RIDER

WEBSTER CO.

MODEL PA-17
MODEL PA-42
Schematic

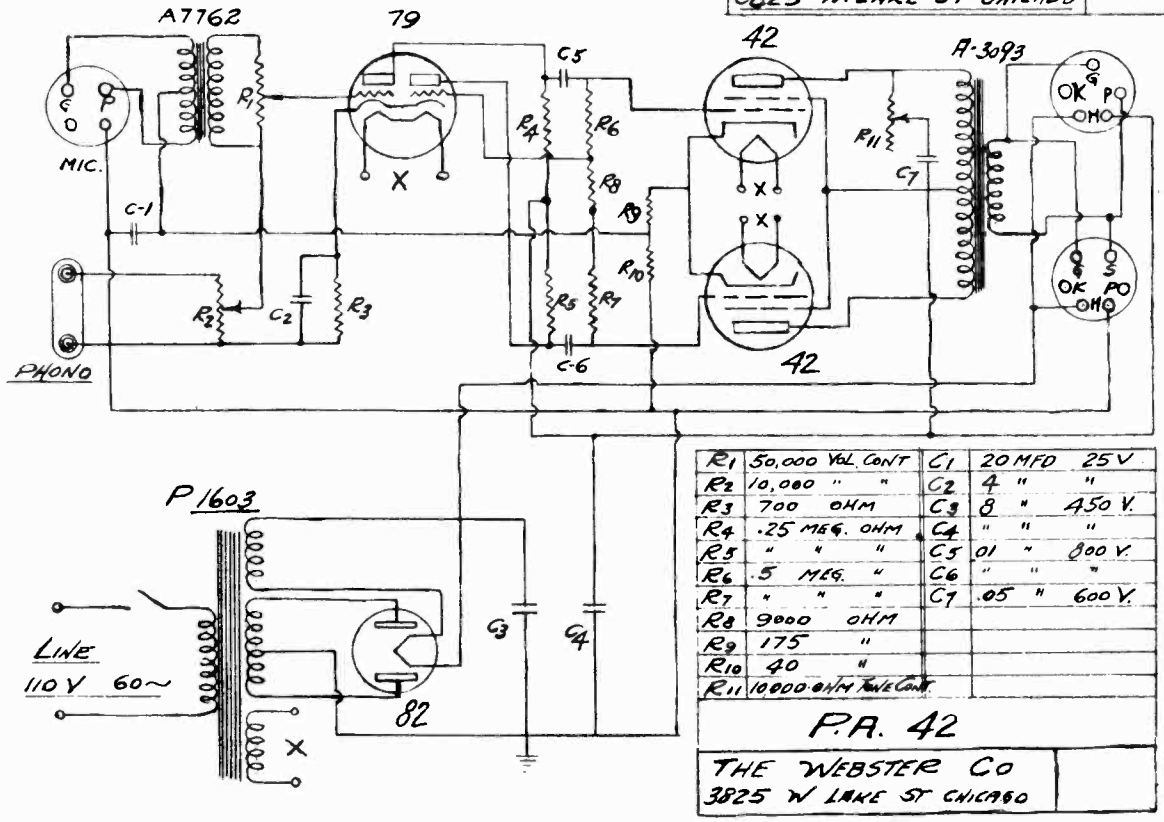


R_1	100 MΩ	C_1	8 MFD.
R_2	50 MΩ	C_2	.01 "
R_3	40 Ω	C_3	20 "
R_4	10 MΩ		
R_5	250 MΩ		
R_6	2700 Ω		
R_7	1500 Ω		
R_8	100 Ω		
R_9	16 MΩ	R_{12}	270 Ω
R_{10}	500 MΩ		
R_{11}	8000 Ω		

P.A. 17

AUG. 24-34

THE WEBSTER CO
3825 W. LAKE ST CHICAGO



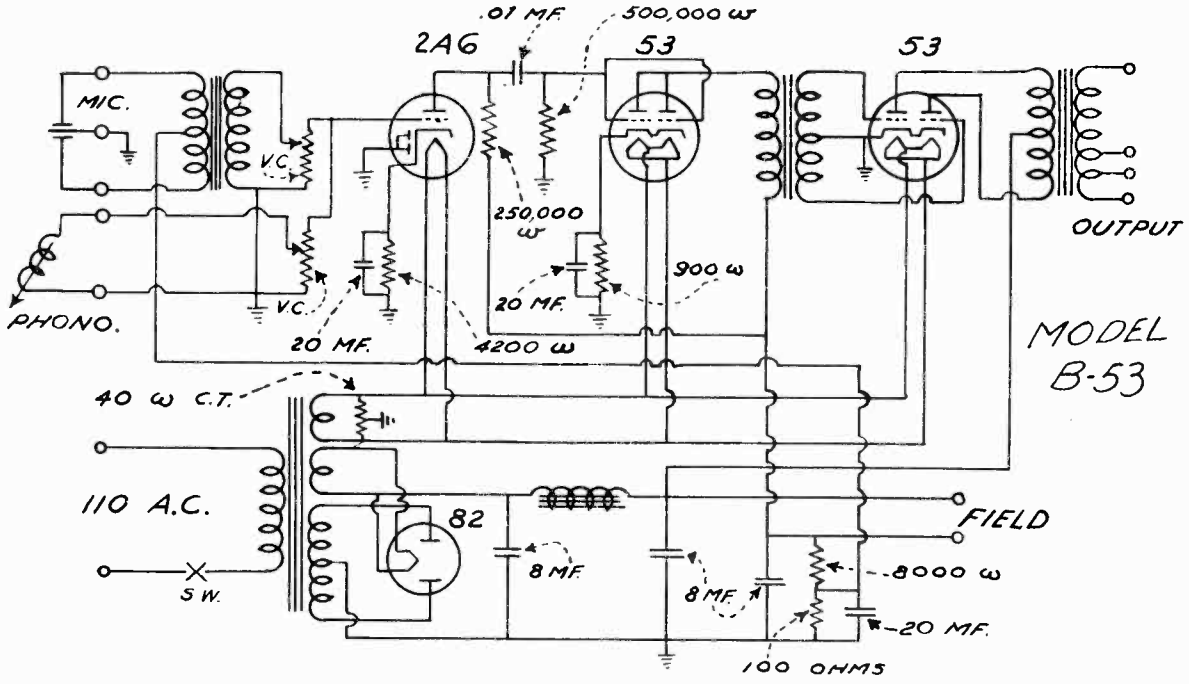
R_1	50,000 VOL. CONT	C_1	20 MFD 25 V
R_2	10,000 " "	C_2	4 " "
R_3	700 OHM	C_3	8 " 450 V.
R_4	.25 MEG. OHM	C_4	" " "
R_5	" " "	C_5	.01 " 800 V.
R_6	.5 MEG. "	C_6	" " "
R_7	" " "	C_7	.05 " 600 V.
R_8	9000 OHM		
R_9	175 "		
R_{10}	40 "		
R_{11}	10000 OHM TONE CONT.		

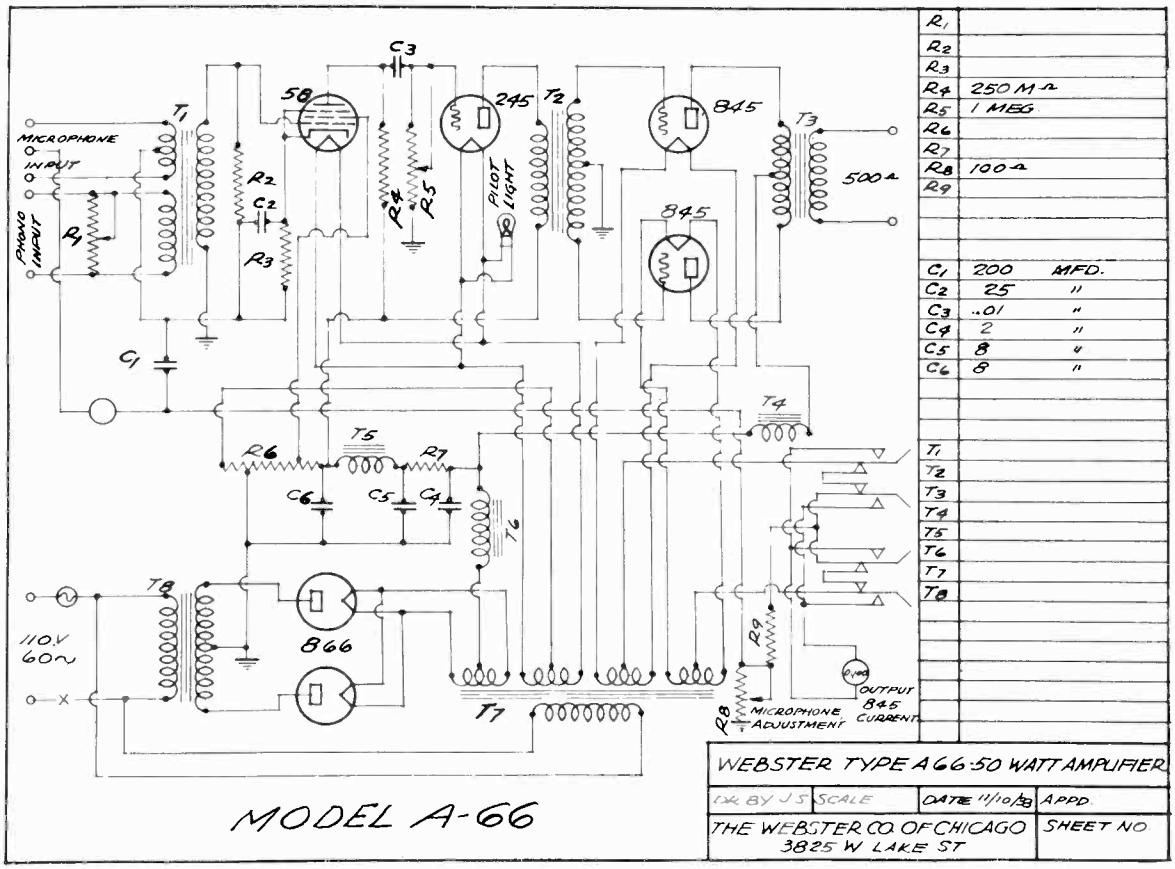
P.A. 42

THE WEBSTER CO
3825 W LAKE ST CHICAGO

MODEL A-66
MODEL B-53
Schematic

WEBSTER CO.





R1		
R2		
R3		
R4	250 M Δ	
R5	1 MEG	
R6		
R7		
R8	100 Δ	
R9		
C1	200	MFD.
C2	25	"
C3	.01	"
C4	2	"
C5	8	"
C6	8	"
T1		
T2		
T3		
T4		
T5		
T6		
T7		
T8		

WEBSTER TYPE A66 50 WATT AMPLIFIER

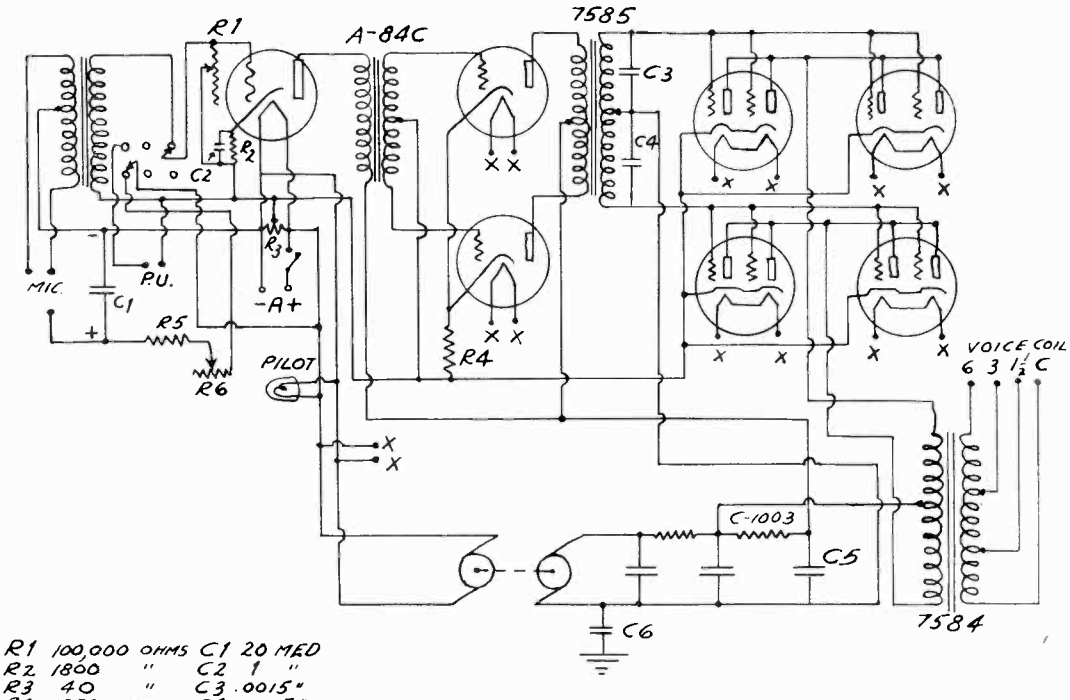
DR. BY J.S. | SCALE | DATE 11/10/38 | APPD.

THE WEBSTER CO. OF CHICAGO
3825 W LAKE ST

SHEET NO.

WEBSTER CO.

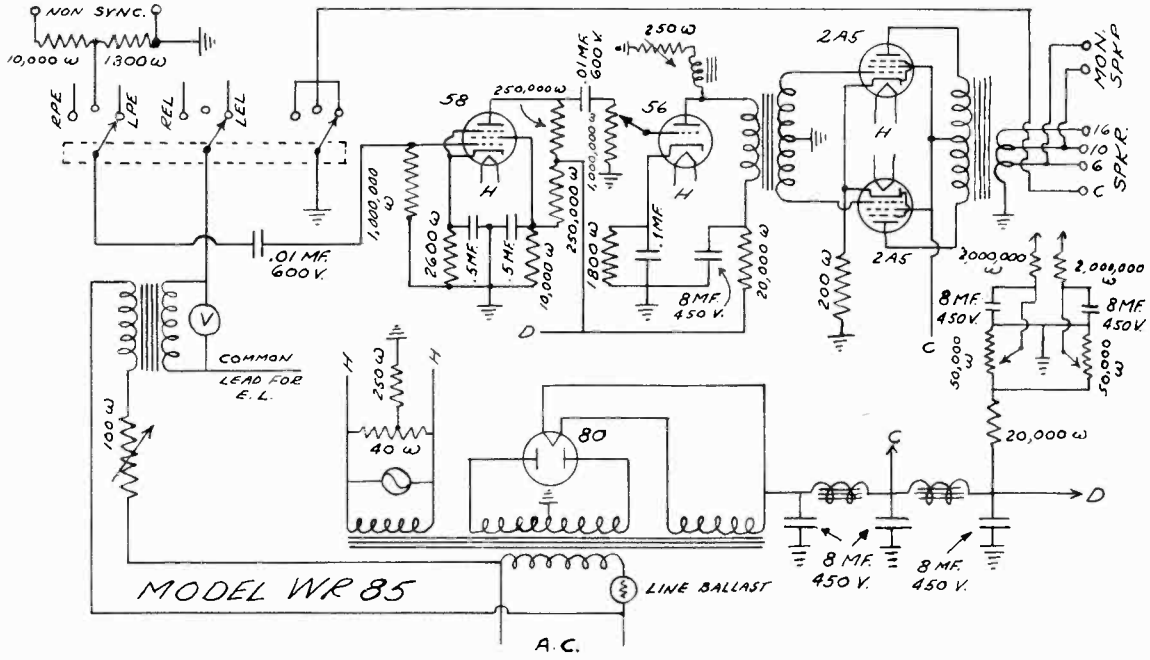
MODEL B-79
MODEL WR-85
Schematic



R1	100,000	OHMS	C1	20	MFD
R2	1800	"	C2	1	"
R3	40	"	C3	.0015	"
R4	1350	"	C4	.0015	"
R5	150	"	C5	8	"
R6	200	"	C6	1	"

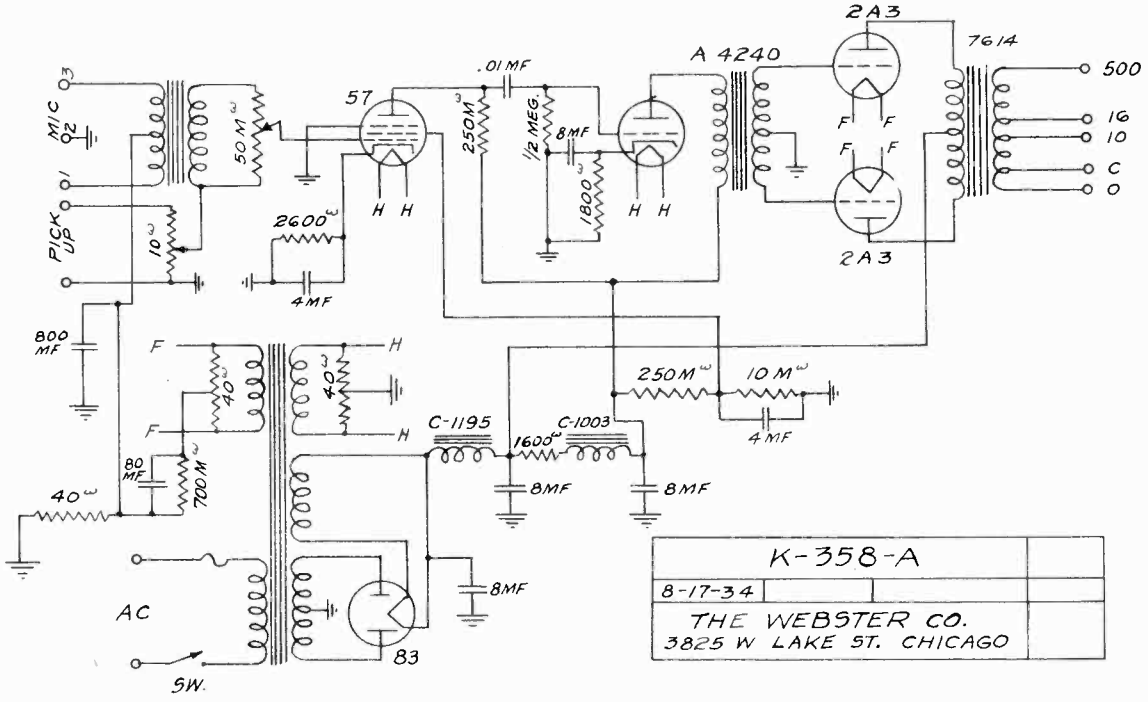
B-79 MOBILE SYSTEM

THE WEBSTER Co.
3825 W LAKE ST. CHICAGO

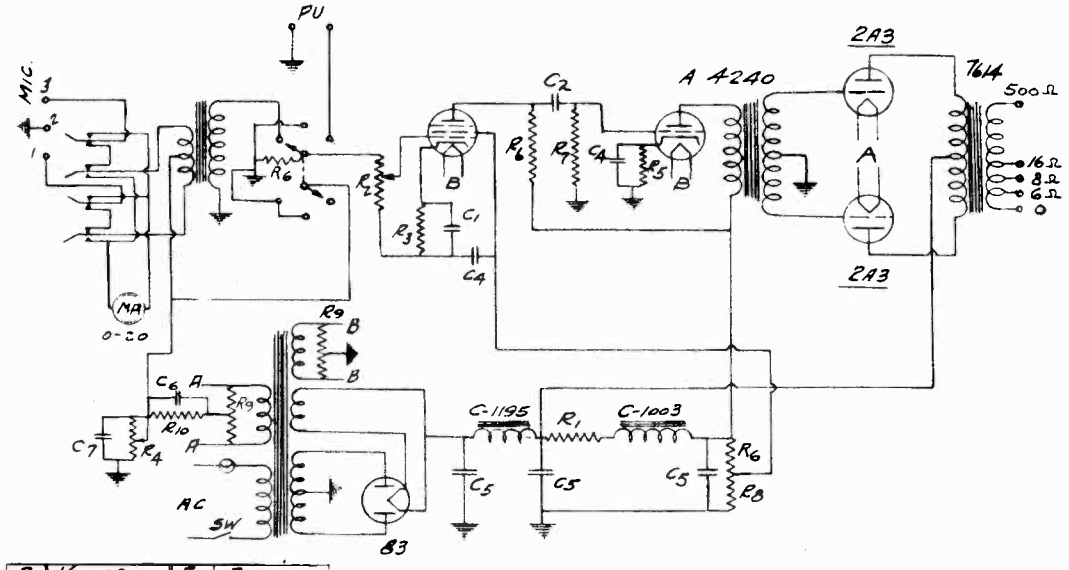


MODEL K-358-A
MODEL K-359-A
Schematic

WEBSTER CO.



K-358-A	
8-17-34	
THE WEBSTER CO. 3825 W LAKE ST. CHICAGO	



R_1	16000 Ω	R_{10}	700 Ω
R_2	50 M Ω		
R_3	2700 Ω	C_1	4 MFD
R_4	100 Ω	C_2	.01 "
R_5	1800 Ω	C_3	
R_6	250 M Ω	C_4	4 MFD
R_7	½ MEG	C_5	8 "
R_8	10 M Ω	C_6	80 MFD
R_9	40 Ω	C_7	800 "

K-359 A	
8-18-34	
THE WEBSTER Co 3825 W LAKE ST CHICAGO	

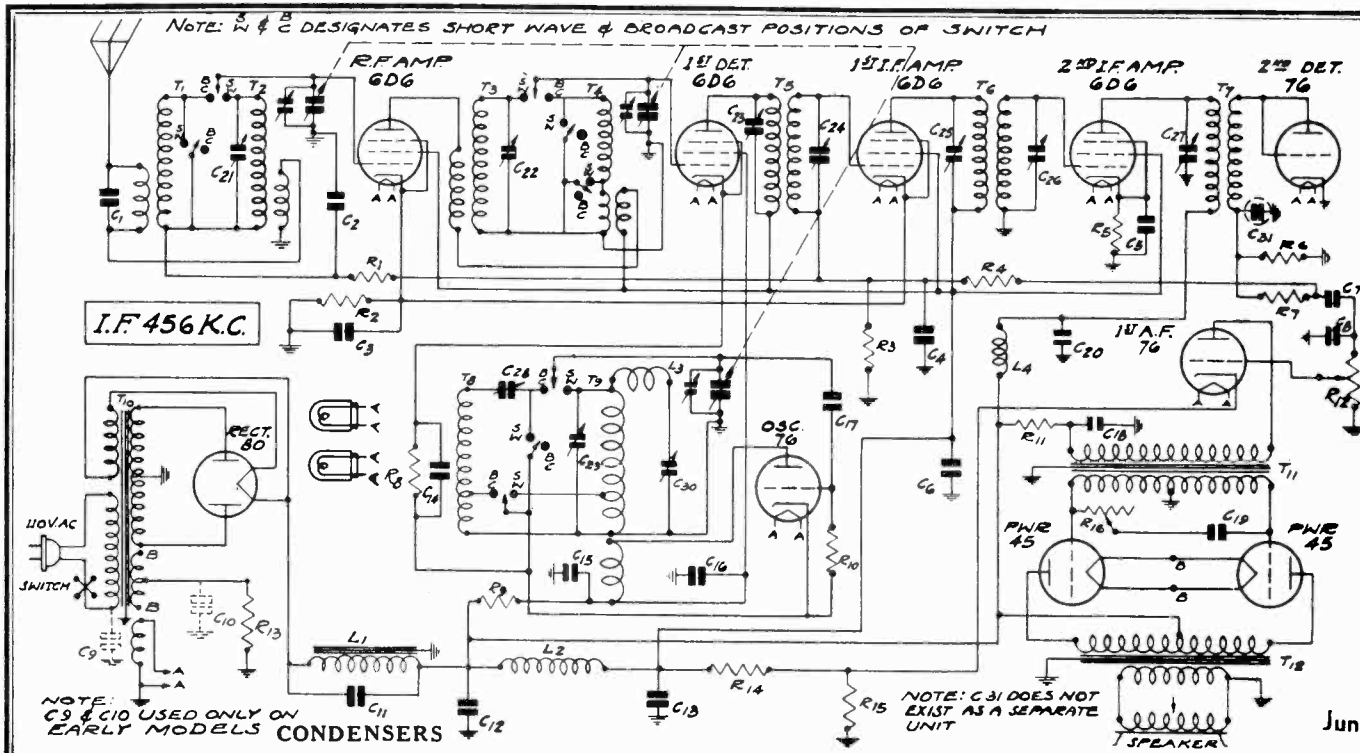


Fig. 1—Schematic Circuit Diagram

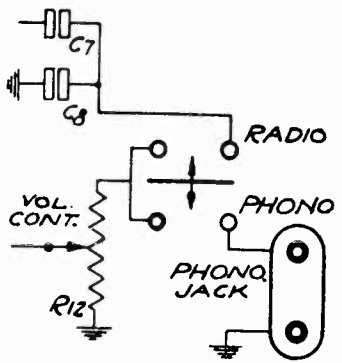


Fig. 5—Phonograph Connections

June, 1934

CONDENSERS

Part No.	Code	Capacity	Volts	Type
P-80919	C1	250 mmfd.		Moulded
P-80862	C2	.05 mfd.	200V.	Tubular
P-80888	C3	.25 mfd.	200V.	Tubular
P-80862	C4	.05 mfd.	200V.	Tubular
P-80862	C5	.05 mfd.	200V.	Tubular
P-80888	C6	.25 mfd.	200V.	Tubular
P-80862	C7	.05 mfd.	200V.	Tubular
P-81005	C8	35 mmfd.	600V.	Moulded
*P-80997	C9	.01 mfd.	600V.	Condenser in metal can
*P-80888	C10	.25 mfd.	200V.	Tubular
P-80985	C11	.15 mfd.	200V.	Tubular
P-81039	C12	16.0 mfd.	400V.	Wet Electrolytic
P-81018	C13	6.0 mfd.	150V.	Dry Electrolytic
	C16	2.0 mfd.	300V.	
	C18	2.0 mfd.	300V.	
P-80862	C14	.05 mfd.	200V.	Tubular
P-80864	C15	.10 mfd.	200V.	Tubular
P-81005	C17	35 mmfd.	600V.	Moulded
P-80863	C19	.004 mfd.	600V.	Tubular
P-81041	C20	.10 mfd.	400V.	Tubular
P-2102	C21	3-40 mmfd.		Ant. S.W. Trimmer
P-2102	C22	3-40 mmfd.		1st Det. S.W. Trimmer
P-2103	C23	200+ 50 mmfd.		Dual Trimmer
	C24	200+ 50 mmfd.		Part of I.F. Assem.
P-2103	C25	200+ 50 mmfd.		Dual Trimmer
	C26	200+ 50 mmfd.		Part of I.F. Assem.
P-1685	C27	70+ 30 mmfd.		3rd I.F. Coil Trimmer
P-2112	C28	300-500 mmfd.		600 K.C. Trimmer
P 2102	C29	3-40 mmfd.		Osc. S.W. Trimmer
P-1685	C30	70+ 30 mmfd.		6000 K.C. Trimmer
P-81027		Three Gang Condenser		

RESISTORS

Part No.	Code	Resistance	Watts	Type
P-A95204	R1	200,000 ohm	.2	Carbon
P-98023	R2	150 ohm	.5	Flex. Wire Wound
P-A95105	R3	1 megohm	.2	Carbon
P-A95205	R4	2 megohm	.2	Carbon
P-98024	R5	400 ohm	.5	Flex. Wire Wound
P-A94504	R6	300,000 ohm	.2	Carbon
P-A95104	R7	100,000 ohm	.2	Carbon
P-A94252	R8	2,500 ohm	.2	Carbon
P-98022	R9	30,000 ohm	2.0	Carbon
P-A95104	R10	100,000 ohm	.2	Carbon
P-C94303	R11	30,000 ohm	1.0	Carbon
P-96005	R12	2 megohm		Volume Control and Switch
P-98006	R13	780 ohm	3.0	Armored Wire Wound
	R14	6000 ohm	1.4	
	R15	460 ohm	.2	
P-97003	R16	3 megohm		Tone Control

*Used in Early Models only.

Part No.	Item
P-50638	Power Transformer 115V. 60 cycles T 10
P-50639	Power Transformer 115V. 25 cycles T 10
P-50640	Power Transformer 115-230V. 40-60 cycles T 10
P-50641	Power Choke L 1
P-50642	Audio Output Transformer T 12
P-50643	Audio Input Transformer T 11
P-5176	Antenna R.F. Trans. T 1 and T 2 less can
P-5177	Interstage R.F. Trans. T3 and T4 less can
P-5178	Oscillator Coil Assembly T8 and T9 less can
P-5186	3rd I. F. Coil T7 less can
P-40433	Cans for the above coils
P-5184	1st I.F. Coil & Can Assembly T5
P-5185	2nd I.F. Coil & Can Assembly T6
P-5190	H. F. Oscillator Tracking Coil L3
P-5151	I.F. Plate Isolating Reactor L4
P-70702	A.C. Cord & Plug
P-1421	Single Insulated Terminal Strip
P-1441	Double Insulated Terminal Strip
P-2060	Small Knob
P-2062	Large Knob
P-30342A	Grid Cap only
P-30456	Small Pointer
P-20912	Large Double End Pointer
P-2012	Pilot Light Bulb
P-10272	Rubber Mounting Feet
P-10320	Glass Crystal
P-20875	Crystal Retaining Ring
P-2152	8" Dynamic Speaker Mantel L2
P-1968	10" Dynamic Speaker Console L2
P-2101	Three Position Band Change Switch
P-20905	Condenser Shield
	8" Black Drive Cord (V.C. or T.C. Ind.)
	29" Black Drive Cord (Cond. Drive)
P-2126	Pilot Lamp Socket & Clip Assembly
P-20911	Bottom Shield
P-1011A	Phono-Radio Switch
P-1193	Phono Jack
P-2025	No. 80 Socket
P-1643	No. 45 Socket
P-2022	No. 76 Socket
P-1885	No. 6D6 Socket
P-1637	Speaker Socket
P-40434	Tube Shield—Aluminum (for earlier models)
P-40424	Tube Shield Base—Aluminum (for earlier models)

Replacing Drive Cord

Remove chassis from cabinet.

Take off the pilot light assembly by lifting off the two sockets and spring clips.

Detach the large pointer by removing the screw at the center of the dial.

Loosen the dial assembly by taking out the two screws which secure the bottom of this assembly to the chassis.

Then lay the complete dial assembly face downward in front of the chassis. It is not necessary to remove the volume control and tone control collars which hold the indicator cords of these two controls in position.

Turn the drive drum until the opening in this drum is approximately vertical and with the hole at the top as shown in Fig. 4.

Remove the tension spring and the old drive cord.

See that the eyelet is in the hole in the drive drum as shown in Fig. 4. Insert one end of the drive cord from the outside through the hole in the eyelet in the drive drum.

Tie the end of the cord which has been inserted in the hole to one end of the tension spring.

Wrap the cord in a clockwise direction (facing front of chassis) around the drive drum approximately one-half turn.

Then tilt the chassis up on its back panel and bring the cord mentioned in the previous paragraph down to the drive shaft. Wrap it two and one-half times around the drive shaft as shown in Fig. 4.

Then bring this cord up from the drive shaft and wrap it around the drive drum approximately one and one fifth turns in a clockwise direction until it is up to the hole in this drum as illustrated.

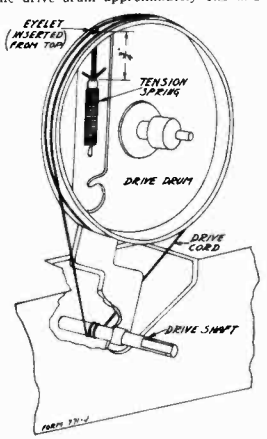


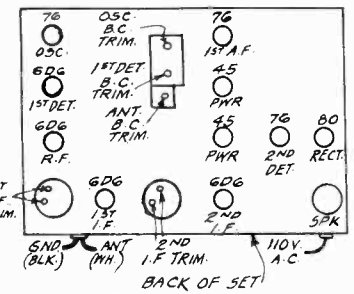
Fig. 4—Drive Cord Replacement

Insert the free end of the cord through the hole in the eyelet and tie it to the end of the tension spring. The end of the spring, when hanging free, should be approximately ¼" from the flange of the drum as shown in Fig. 4. Cut off the surplus length of cord after it is knotted.

Then secure the other end of the tension spring over the spur on the drive drum.

Replace the dial assembly and pointer.

Replace the pilot light assembly after which the chassis may be reinstalled in the cabinet.



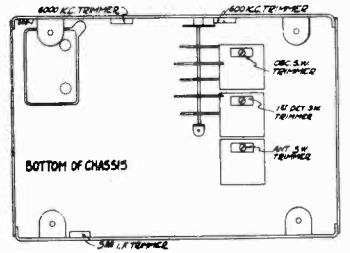


Fig. 2—Tube Arrangement & Location of Trimmers

Voltages at Sockets

LINE VOLTAGE — 115

ANTENNA SHORTED TO GROUND

Type of Tube	Function	Across Fila. or Heater	Plate to Cath.	Screen to Cath.	Cath. to Ground	Normal Plate M. A.
6D6	R. F.	6.3	95	95	2.8	7.0
6D6	1st Det.	6.3	88	95	9.2	2.9
76	Osc.	6.3	110	—	—	5.0
6D6	1st I. F.	6.3	95	95	2.8	7.0
6D6	2nd I. F.	6.3	300	95	3.3	6.0
76	2nd Det.	6.3	—	—	—	—
76	1st Audio	6.3	160	—	9.0	4.0
45	Output	2.5	245	—	48.0	30.0
80	Rectifier	5.0	890 V. A. C. pl. to pl.			58.0 per plate

Phono Connections

Phonograph connections can be made as shown in Fig. 5. A single pole double throw switch and double pin jack are required. These should be mounted on the back panel of the chassis close to the 2nd detector. The connections are made by opening the diode circuit at the point shown in the illustration and completing the connections to the switch and pin jacks as indicated. A high impedance pick-up should be used. If a low impedance pick-up is used a step-up transformer will be required for sufficient volume. The volume control of the set will regulate the phono volume.

Change in Early Models

In the early models of this receiver the side of the trimmer condenser C27 which is shown in Fig. 1 as connected to ground was connected to the B+ side of the 3rd I. F. coil primary.

Condenser Alignment

Correct alignment is extremely important in connection with all wave receivers. The receivers are all properly aligned at the factory with precision instruments and re-alignment 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 of 456 K. C. and accurately calibrated signals over the broadcast and short wave bands, 530-1740 K. C. and 5.8-18.3 M. C., is required. An output indicating meter is also necessary. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

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

Intermediate Frequency Adjustment

Set the signal generator for 456 K. C. Connect the antenna lead of the signal generator to the grid of the 1st detector through a .05 mfd. condenser. Turn the tuning condenser rotor until the plates are completely out. The ground lead from the signal generator goes to the ground lead of the receiver. The volume control should be at the maximum position. Reduce the signal so that A. V. C. action is not obtained.

Then adjust the five I. F. trimmer condensers until maximum output is obtained. The adjusting screws for the 1st and 2nd trimmer condensers are reached from the top of the chassis and are in the round I. F. cans - See Fig. 2. The openings to these trimmer condensers are covered over by small cover plates which are held in position by screws. Loosen these screws until the cover plates can be swung around. **CAUTION - Use an insulated screwdriver for adjusting trimmers to prevent short circuiting to ground.** In the 3rd I. F. coil, only the primary has a variable trimmer condenser. This condenser is mounted on the back panel of the chassis as shown in Fig. 2 and the adjustment screw is reached through a hole in the back panel.

Broadcast Band Adjustment

The broadcast short wave switch should be in the broadcast position. Set the signal generator for 1740 K. C. Turn the rotor to the full open position. The antenna lead from the signal generator is in this instance connected to the antenna lead of the receiver. Reduce the signal so that A. V. C. action is not obtained. Adjust the oscillator broadcast trimmer until maximum output is obtained. This trimmer is on the tuning condenser and its location is shown in Fig. 2.

Then set the signal generator for 1500 K. C. Turn the rotor until maximum output is obtained. Loosen the set screw in the pointer hub and set the pointer at the 1500 K. C. mark on the broadcast band scale. Retighten the hub set screw. Then adjust the antenna and 1st detector broadcast trimmers until maximum output is obtained.

Next set the signal generator for 600 K. C. and adjust the 600 K. C. trimmer. The adjusting screw is reached through a hole in the front panel of the chassis as shown in Fig. 2. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting at the same time adjusting the 600 K. C. trimmer screw until the highest output is obtained.

Short Wave Band Adjustment

CAUTION—After the broadcast band alignment as described above has been made, do not change the adjustment of any of the broadcast band trimmers.

In aligning the short wave band of the receiver, it will be noted that the signal will be heard with the signal generator set at two points 912 K. C. apart. That is, if the receiver is tuned to 15,000 K. C. a signal will be heard when the signal generator is set at 15,000 K. C. and again at approximately 15,912 K. C. This is due to image reception or the fact that a 456 K. C. beat is obtained when the signal is 456 K. C. lower than the receiver oscillator and also when the signal is 456 K. C. higher than the receiver oscillator. Care should be taken to see that the receiver is tracked with the signal generator adjusted to the lower of the two frequencies at which a signal is heard, in order that the oscillator in the receiver will be 456 K.C. higher in frequency than the signal.

Turn the broadcast short wave switch to the short wave position. Turn the rotor to the full open position. As explained above, the volume control should be at the maximum position and the signal should be reduced to prevent A. V. C. action. Set the signal generator for 18,300 K. C. Then adjust the oscillator short wave trimmer for maximum output. This trimmer is reached from under the chassis and its position is shown in Fig. 2. If a maximum output peak cannot be reached, it may be due to the fact that the antenna and 1st detector short wave trimmers are screwed down too far. Back off these two trimmer screws two or three turns and then adjust the oscillator short wave trimmer for maximum output.

Next set the signal generator for 15,000 K. C. Turn the rotor until maximum output is obtained. Then adjust the antenna and 1st detector short wave trimmers for maximum output.

Next set the signal generator for 6000 K. C. and adjust the 6000 K. C. trimmer. This condenser is mounted on the front panel of the chassis as shown in Fig. 2 and is reached through a hole in the front panel. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 6000 K. C. trimmer screw until the highest output is obtained.

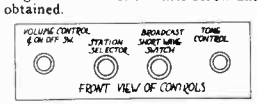


Fig. 3—Arrangement of Controls

D. C. Resistance of Windings

Following are the D.C. resistances of the various windings in the chassis.

Part No.	Item	Code		D.C. Resistance in Ohms
P-5176	S.W. and B.C. Antenna R.F. Transformer Primaries (in series)	T1	T2	27.9
	B.C. Antenna R.F. Transformer Secondary	T1		5.0
	S.W. Antenna R.F. Transformer Secondary	T2		Small
P-5177	S.W. and B.C. Interstage R.F. Transformer Primaries (in series)	T3	T4	2.7
	B.C. Interstage R.F. Transformer Secondary	T4		4.4
	S.W. Interstage R.F. Transformer Secondary	T3		Small
P-5178	S.W. Oscillator Grid Coil	T9		Small
	S.W. Oscillator Plate Coil	T9		.25
	B.C. Oscillator Grid Coil	T8		3.5
P-5190	S.W. Oscillator Tracking Coil	L3		1.27
P-5184	1st I.F. Coil Primary	T5		5.0
	1st I.F. Coil Secondary	T5		5.0
P-5185	2nd I.F. Coil Primary	T6		5.0
	2nd I.F. Coil Secondary	T6		5.0
P-5186	3rd I.F. Coil Primary	T7		9.3
	3rd I.F. Coil Secondary	T7		26.3
P-50643	Audio Input Transformer Primary	T11		2300.
	Audio Input Transformer Secondary Center Tap to Outside	T11		2600.
	Audio Input Transformer Secondary Center Tap to Inside	T11		2300.
P-50642	Audio Output Transformer Primary Center Tap to Outside	T12		360.
	Audio Output Transformer Primary Center Tap to Inside	T12		320.
	Audio Output Transformer Secondary	T12		.44
P-1968	Speaker Voice Coil			3.0
	Speaker Field Coil	1,2		5000.
P-50641	Filter Choke	1,f		150.
P-50638	Power Transformer 115V. 60 Cycles Pri.	T10		5.3
	Power Transformer 115V. 60 Cycles H.T. Sec. Center Tap to Outside	T10		120.
	Power Transformer 115V. 60 Cycles H.T. Sec. Center Tap to Inside	T10		110.
	Power Transformer 115V. 60 Cycles Sec. (80 Fil.)	T10		Small
	Power Transformer 115V. 60 Cycles Sec. (AA Fil.)	T10		Small
	Power Transformer 115V. 60 Cycles Sec. (BB Fil.)	T10		Small

WELLS-GARDNER & CO., INC.

MODEL 5-E Series
Schematic, Socket
Parts List

July, 1934

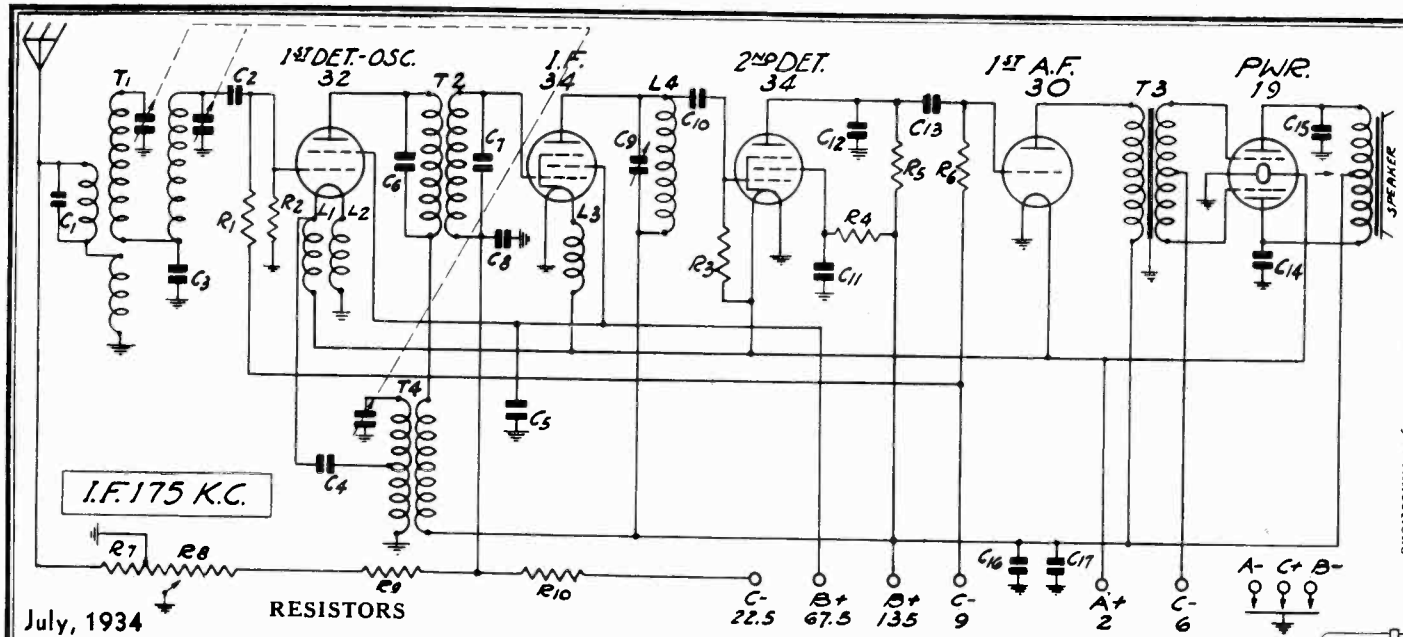


Fig. 1—Schematic Circuit Diagram.

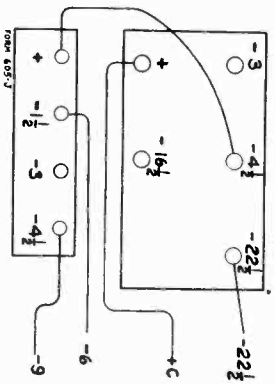


Fig. 3—Optional "C" Battery Connections

Part No.	Code	Resistance	Wattage	Type
P-A94505	R1	5 Megohm	0.2	Carbon
P-A94105	R2	1 Megohm	0.2	Carbon
P A94205	R3	2 Megohm	0.2	Carbon
P-B94104	R4	100,000 Ohm	0.5	Carbon
P-B94403	R5	40,000 Ohm	0.5	Carbon
P-A95105	R6	1 Megohm	0.2	Carbon
P-96001	R7	3,000 Ohm		Volume Control
	R8	60,000 Ohm		
P-A94901ww	R9	900 Ohm	0.2	Wire Wound
P-A94652	R10	6,500 Ohm	0.2	Carbon
*P-A94106	R1	10 Megohm	0.2	Carbon
*P-A94205	R2	2 Megohm	0.2	Carbon

*These resistors were used on first models.

CONDENSERS

Part No.	Code	Capacity	Voltage	Type
P-81812	C1	200 mmf		Wire—Part of Ant. Assem
P-81801	C2	35 mmf		Wire—Part of Ant. Assem.
P-80862	C3	0.05 mf	200V	Tubular
P-80862	C4	0.05 mf	200V	Tubular
P-80862	C5	0.05 mf	200V	Tubular
P-81806	C6	70 mmf		Wire
P-81804	C7	45 mmf		Wire
P-80862	C8	0.05 mf	200V	Tubular
P-1685	C9	70+ 30 mmf		I. F. Trimmer
P-81800	C10	50 mmf		Wire
P-81045	C11	0.25 mf	200V	Tubular
P-80863	C12	0.004 mf	600V	Tubular
P-80898	C13	0.006 mf	600V	Tubular
P-80969	C14	0.01 mf	400V	Dual Tubular
	C15	0.01 mf	400V	
P-80864	C16	0.1 mf	200V	Tubular
P-80968	C17	4.0 mf	150V	Electrolytic
P-81036	3 Gang Condenser			

MISCELLANEOUS

Part No.	ITEM
P-2131	No. 32 Socket
P-1645	No. 34 Socket
P-1644	No. 30 Socket
P-1833	No. 19 Socket
P-1640	Speaker Socket
P-20406-A	Tube Shield for 34 and 32 Tubes
P-20786	Tube Shield Base
P-50586-D	Audio Input Transformer T3
P-5168	Double Tuned Ant. Trans. Assem. Comp. with resistors and condensers T1 less can
P-40432	Can for above Assem.
P-5199	1st I.F. Coil and Can Assem. T2
P-5187	Oscillator Coil and Can Assem. T4
P-5188	2nd I.F. Coil and Can Assem. L4
P-5172	Double Filament Reactor L1, L2
P-5189	Single Filament Reactor L3
P-30342-A	Grid Cap Only
P-2060	Knob, plain
P-2122	Knob, Arrow Indicator
P-1441-A	Double Insulated Terminal Strip
P-1786	Five Lug Terminal Strip
P-1831	On-Off Switch
P-20711	Gang Condenser Shield
P-10272	Rubber Chassis Cushions
P-70703	Antenna and Ground Wire
P-70749	"B" Battery Wire Assem.
P-70771	"A" Battery Wire Assem.
P-70772	"C" Battery Wire Assem.
P-2124	Speaker 6"
P-2125	Speaker 8"

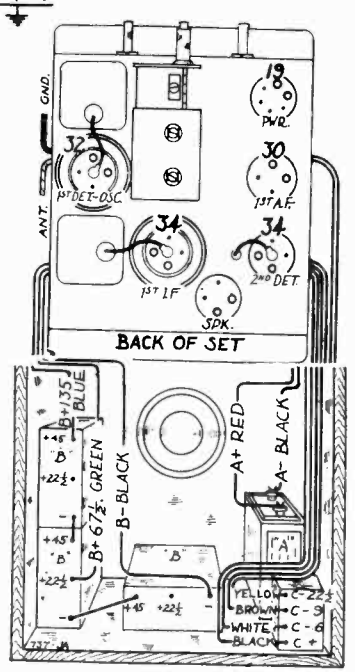


Fig. 2—Tube Arrangement and Battery Connections.

MODEL 5-E Series
Voltage
Alignment Data

WELLS-GARDNER & CO., INC.

Circuit

This receiver is designed to operate from a battery power supply the values of which are shown in Fig. 1. All of the tubes used are of the 2 volt type. The receiver is designed to operate at a very low current drain from the batteries and still have a very satisfactory quality of output.

The circuit has a preselector stage incorporating 2 tuned circuits for image rejection. This couples into the type 32 first detector-oscillator tube through a combination of inductive coupling in T1 and capacitive coupling through C3. In Fig. 1 the two coils to the right of the 32 1st detector tube are the primary and secondary of the 1st I. F. transformer while below this tube are the oscillator coils. The oscillating circuit is tuned by the oscillator section of the gang condenser and is always resonant at a frequency of 175 K. C. above the frequency to which the R. F. circuit is tuned.

One stage of I. F. amplification is employed using a 34 tube. Fixed condensers tune the primary and secondary of the first I. F. transformer. A second I. F. unit of the impedance coupled type is provided in which the inductance L4 is tuned by a trimmer condenser C9. The volume control is of the variable antenna input and I. F. bias type. Referring to Fig 1 it will be noted that one end of the volume control strip is connected to the antenna and the other end is connected to resistor R9. Also note that the volume control strip is tapped. Bias voltage for the 34 I. F. tube is obtained from a potentiometer consisting of resistors R9, R10 and the 60,000 ohm section of the volume control R8 which resistors are connected across the 22½ volt "C" battery.

As the slider of the volume control is moved away from the antenna end, the signal input to the antenna stage is increased. The bias voltage of the I. F. tube is not affected until the tap is reached. As the slider moves from this point to the end of the strip the I. F. bias is decreased, thus increasing the sensitivity. When this happens the plate current goes up and more battery current is used.

A 34 tube is used as the 2nd detector or demodulator. Demodulation takes place in the grid circuit of this tube.

Resistance coupling is used between the 2nd detector and the 1st audio stage which uses a 30 tube. The 1st audio stage is transformer coupled to the output stage. Class "B" amplification is employed in the output stage which uses a type 19 tube. This consists of two output tubes in one envelope. A magnetic reproducer is used.

A 3 pole switch controls all three sources of battery supply.

Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself as broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all 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 accurately calibrated signals over the broadcast band and at the intermediate frequency, and an output meter are required for indicating the effect of adjustments.

First set the signal generator to a frequency of 175 K. C. Connect the antenna lead of the signal generator to the grid of the 1st detector thru a .05 mfd. condenser. The ground lead from the signal generator goes to the ground lead of the receiver. Adjust trimmer condenser C9 on the back panel of the chassis until maximum output is obtained. **A non-metallic screw driver should be used in making this adjustment as the I. F. trimmer is at B+ potential.**

Next set the signal generator for 1730 K. C. Turn the rotor to the full open position. The antenna lead from the signal generator is in this instance connected to the antenna lead of the receiver. Adjust the trimmer of the oscillator section of the 3 gang condenser until maximum output is obtained. The oscillator section is the one with the cut plate rotor.

Then set the signal generator for 1400 K. C. and turn the rotor until maximum output is obtained. Adjust the other two trimmers on the gang condenser for maximum output.

To obtain dial scale calibration tune in an 800 K. C. signal and set the dial pointer at that mark on the dial scale. When calibrated in this manner, the setting will be approximately correct at both ends of the scale.

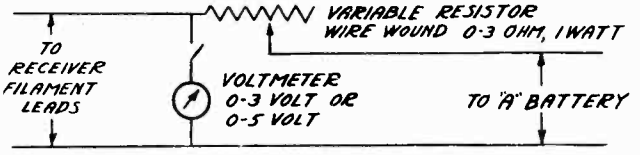


Fig. 4—Using Voltage Regulator with 3 Volt "A" Battery

The use of the cut plate type of condenser eliminates the necessity of a 600 K. C. padder and no adjustment at this frequency, therefore, is required.

D. C. Resistance of Windings

Following are the D.C. resistances of the various windings in the chassis.

Part No.	Item	Code	D. C. Resistance in Ohms
P-5168	Double Tuned Ant. Coil Pri.	T1	19.2
	Double Tuned Ant. Coil Sec. (Preselector)	T1	3.2
	Double Tuned Ant. Coil Sec. (1st Det.)	T1	3.2
P-5199	1st I.F. Coil Pri.	T2	90.0
	1st I.F. Coil Sec.	T2	116.0
P-50586-D	Audio Input Trans. Pri.	T3	1010.
	Audio Input Trans. Sec. Cent. Tap to outside end	T3	648.
	Audio Input Trans. Sec. Cent. Tap to inside end	T3	588.
P-5187	Oscillator Coil, Grid Winding	T4	4.1
	Oscillator Coil, Plate Winding	T4	10.4
P-5172	Double Filament Reactor Assem.	L1	.61
	Double Filament Reactor Assem.	L2	.61
P-5189	Single Filament Reactor Assem.	L3	.61
P-5188	2nd I.F. Reactor Coil	L4	52.1
P-2124	6" Magnetic Speaker, Center Tap to outside end		272.
	6" Magnetic Speaker, Center Tap to inside end		225.
P-2125	8" Magnetic Speaker (same as P-2124)		

VOLTAGES AT SOCKETS

Volume Control at Maximum—Antenna Shorted to Ground
B+135 Volts
Voltages to Chassis

Type of Tube	Function	Across Filament	Plate to Cath.	Screen to Gath	Grid to Cath.	Normal Plate M. A.
32	1st Det. & Osc.	2.0	135	67.5	7.5(1)(2)	2.5
34	I. F.	2.0	135	67.5	2.5(3)	2.8
34	2nd Det.	2.0	50	40(1)	0	1.8
30	1st Audio	2.0	135		9(4)	3.0
19	Output	2.0	135		6	1.8
						Total

(1) With 250,000 ohm meter.
(2) Subject to variation due to oscillatory current.
(3) With 25,000 ohm meter.
(4) As read at "C" battery.

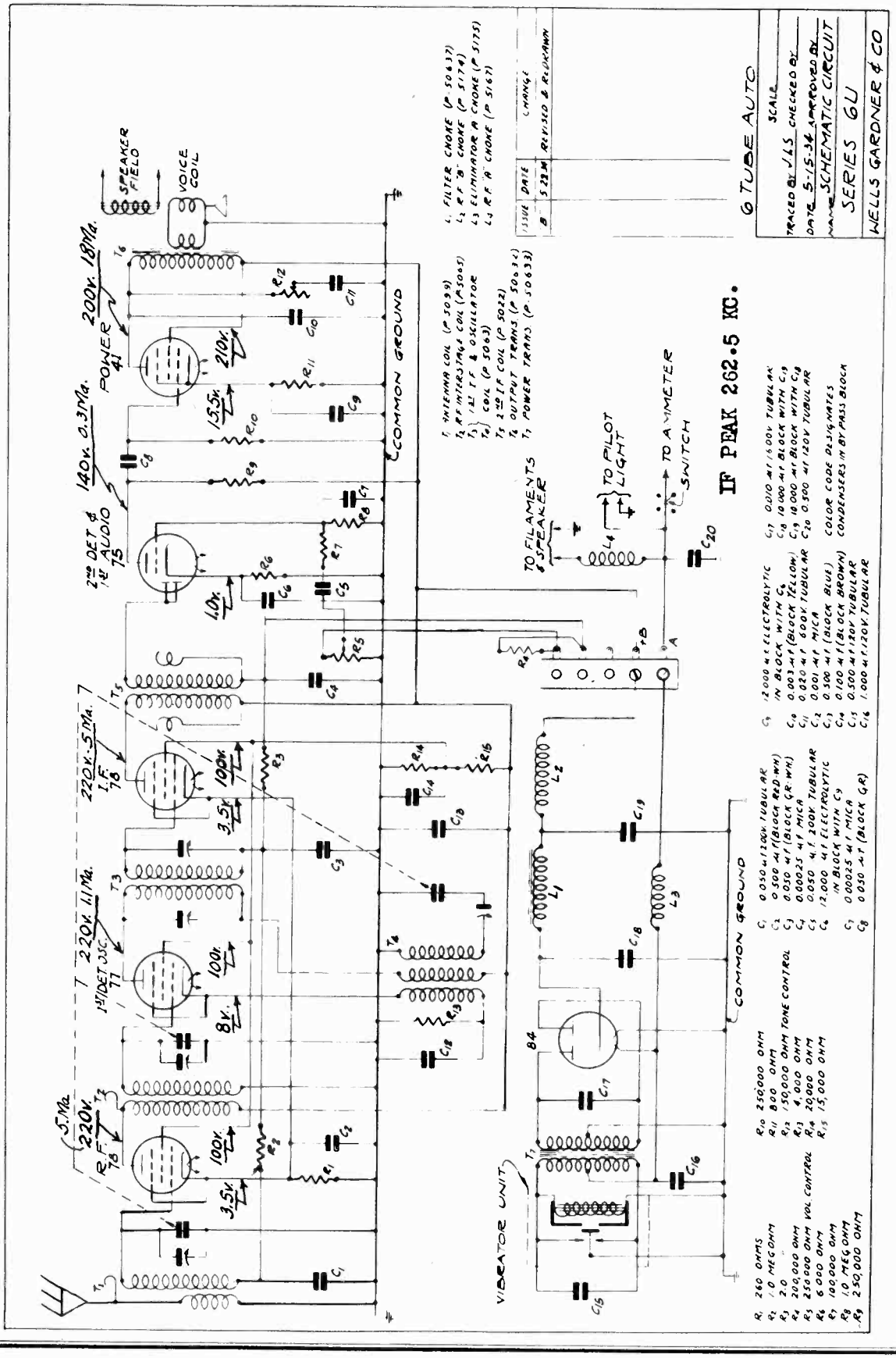
Voltages

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 receivers, tubes, test equipment used and battery voltages.

MODEL 6-U Series
Schematic

WELLS-GARDNER & CO., INC.



Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all 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 accurately calibrated signals over the broadcast band and accurately calibrated signals at and around 262.5 K. C., the intermediate frequency and an output indicating meter are desirable.

Do not take the chassis out of the box. First set the signal generator at approximately 262.5 K. C. Connect the antenna lead from the generator to the control grid of the I. F. 78 tube, through a .05 mfd. condenser. The ground lead of the generator goes to the ground of the receiver. Turn the rotor plates of the tuning condenser completely out and keep the signal weak enough to prevent A. V. C. action. Note from Fig. 1 that the second I. F. transformer is self tuned and cannot be adjusted. Adjust the frequency of the signal generator until the output meter shows maximum output. The intermediate frequency setting of the generator is then correct, although it may be a very small percentage higher or lower than 262.5 K. C.

Next connect the signal lead from the signal generator to the grid of the 1st detector tube through a .05 mfd. condenser. Do not change the signal generator setting. Then adjust the 1st I. F. trimmer condenser screws for maximum output. There are 2 holes at one end of the chassis box. The 2 trimmer screws can be reached through these holes. CAUTION—use an insulated screwdriver to prevent short circuiting to ground.

Now disconnect the signal generator and adjust it to exactly 1400 K. C. The antenna lead from the generator is then connected to the antenna lead of the receiver. Connect the tuning condenser flexible drive shaft to the chassis if it has been disconnected. Turn the station selector knob until the rotor plates are completely in mesh. Then with a screwdriver turn the calibration screw on the back of the control unit, until the pointer is at the lowest frequency mark. This is the large point, 5 points below the 55 mark. Then turn the station selector knob until the pointer on the dial scale is at 1400 K. C.

Then adjust the oscillator R. F. and antenna trimmer condensers on the gang tuning condenser for maximum output, adjusting the oscillator section first. See Fig. 2.

Next, set the signal generator for a signal of 600 K. C. and adjust the oscillator 600 K. C. trimmer. This condenser is mounted on the end of the gang condenser. See Fig. 2.

A non-metallic screwdriver is necessary for this adjustment. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 600 K. C. trimmer screw until the highest output is obtained.

Then set the signal generator again for a signal of 1400 K. C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

If the control unit or flexible shaft is moved after the set has been aligned, the setting of the dial pointer may change. This can be adjusted by turning the control unit calibration screw until the pointer is at the correct setting.

Completing the Wiring Connections

Battery Cable

The battery connection is made at the ammeter. In the case of vibrator equipped sets no attention need be paid to polarity. The connection at the end of this cable is secured to one of the posts at the back of the ammeter in the instrument panel. This cable should preferably be connected to the post which will not show the discharge caused by the receiver.

The battery cable is made up in two pieces which are joined together by the fuse receptacle. The latter houses the fuse and fuse shield. The two parts of the cable are connected together by a bayonet pin connection.

Dynamotor "B" Unit Sets

In sets equipped with Dynamotor "B" Units there is a connection which may have to be changed depending on which side of the car battery is grounded. This unit is shipped from the factory correctly wired up for cars that have the positive side of the battery grounded, as shown in Fig. 9. If the negative side of the car battery is grounded, the connections to the terminal strip on the Dynamotor unit must be reversed, as shown in the same illustration.

Sensitivity Control Jumper

Referring to Figs. 8 and 9 it will be noted that there is a terminal strip in the chassis with terminals marked Nos. 1, 2 and 3 as shown. The receiver is shipped from the factory with a wire jumper in terminals Nos. 2 and 3. When connected in this manner, the sensitivity of the receiver is correct for ordinary conditions of reception as met with in a city or at reasonable proximity to the broadcasting stations. If the receiver is used in the country or at a great distance from the broadcasting stations, this jumper should be inserted in terminals Nos. 1 and 2. This connection increases the sensitivity of the receiver, providing for better reception of distant stations. However, at the same time the receiver will appear to be somewhat noisier owing to the fact that the pickup of noise signals will also be increased.

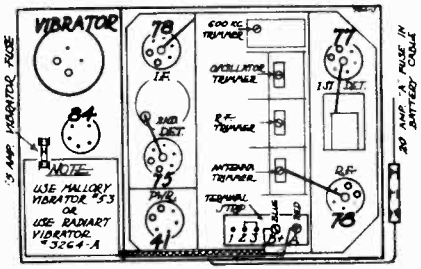


Fig. 8—Location of Tubes—Vibrator Sets

After the wiring has all been completed and the chassis and cables are permanently installed try out the set and adjust the antenna trimmer. The location and types of the tubes are shown in Figs. 8 and 9. The types of vibrators in vibrator equipped sets are also shown.

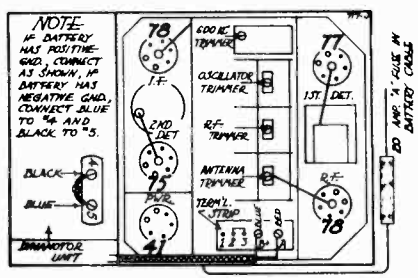


Fig. 9—Location of Tubes—Dynamotor Sets

Adjusting Antenna Trimmer

To adjust the antenna trimmer, tune in a weak signal between 1200 and 1400 K.C. with the volume control about three-fourths on. Remove the cover of the chassis box. The antenna trimmer is the trimmer condenser closest to the terminal strip—see Figs. 8 and 9. Turn the adjusting screw of this condenser up or down until maximum output is obtained. CAUTION—Do not turn any of the other trimmer adjusting screws as these have all been properly set at the factory with precision instruments.

Calibrating the Receiver

To calibrate the receiver, tune in a station of known frequency. At the back of the control unit is the calibration screw—see Fig. 5. Insert a screw driver and turn this screw until the pointer on the dial scale is at the frequency of the station being received.

WELLS-GARDNER & CO., INC.

MODEL 6-U Series
Installation Data

Mounting the Chassis

The chassis is mounted in back of the dash as shown in Figs. 1 and 2. The first step is to inspect the dash to determine at which point there is space available. Lift the chassis box up and temporarily hold it in the proposed position. In Figs. 1 and 2 is shown the position at which the chassis is generally mounted. However, there are many other possible locations, depending on the considerations as mentioned below and the space available.

In general, the chassis will be mounted in the vertical position, that is, with the long dimension vertical as illustrated and as mentioned above, since this method of mounting is the most convenient. It may, however, be mounted horizontally. If mounted in this manner, the speaker must face downward. *Never install a chassis with the speaker facing upward due to the fact that dirt and water may get in and ruin the speaker.*

Other points to consider in choosing the chassis location are as follows: Mount the chassis box in such a way that the cover may be readily removed for inspection of tubes. Mount the chassis box as high as possible to avoid interference with the feet of the people in the front compartment. If mounted at the extreme left or right of the dash, the speaker should face inward for acoustical reasons. Mount the chassis box in such a way as to avoid interference with the car controls, including pedals, gear shift lever, cowl ventilator, etc. If there is a great deal of room available on the dash, consideration should also be given to the length and position of the flexible shafts.

Next secure the dash mounting plate to the chassis box by means of the four screws provided. Note that there are six tapped holes on the chassis box for this purpose. For vertical mounting use the four tapped holes which permit the slot at the bottom of the mounting plate to extend below the chassis box—see Figs. 3 and 4. For horizontal mounting the mounting plate may be secured to the right hand set of four tapped mounting holes or the left hand set of four, whichever is the most convenient. As indicated in Fig. 3, for vertical mounting, holes "A" in dash mounting plate shall be used, and for horizontal mounting, holes "B" shall be used.

Now place the chassis box, with plate attached, in position on the dash and with a center punch locate the lower mounting hole at approximately the position in the slot as shown in Fig. 3. Then remove the box and by means of the template provided, or by using the dimensions shown in Fig. 3, locate the two upper mounting holes. Next drill the three ¼" holes required.

Three 4" square head mounting bolts are supplied. Take two of these, which will be used for the upper part of the mounting plate and screw on nut "A" (see Fig. 4). The nut should be just

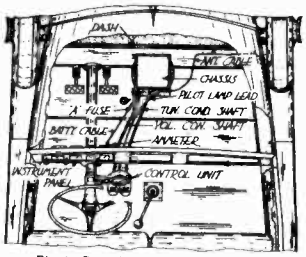


Fig. 1—General Installation—Top View

far enough away from the head of the bolt to permit the bracket of the mounting plate to slip down as shown in the illustration. Then put on nut "B" and the washer, after which the two bolts can be put through the dash, with the shanks extending into the engine compartment, as shown in Fig. 4. A washer, lockwasher, and nut are then put on these bolts from the front of the dash to hold them in place.

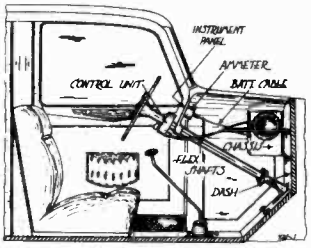


Fig. 2—General Installation—Side View

The distance "X" between nuts "A" and "B" determines how far out the chassis is mounted from the dash. When there is a lot of apparatus in back of the dash, such as wires, tubing, etc., the chassis will have to set out far enough to clear it. However, in most cars, there is no interfering apparatus and therefore the distance "X" will be zero.

Then put a washer on the third mounting bolt and put this bolt through the lower mounting hole *with the head on the engine side of the dash*, as shown in the illustration. Put on a washer, lockwasher, and nut "D" and tighten it up. Then put on nut "E" with a washer as shown. Nut "E" should be screwed down until it is up against nut "D," when distance "X," as explained above, is zero.

All tubes and the vibrator (vibrator equipped sets) should be in the sockets and the flexible drive shaft brackets should be attached to the chassis box before the chassis is mounted—see article on Attachment of Flexible Shafts.

The dash mounting plate with chassis attached is slipped over the three mounting bolts. The two upper brackets on the plate slip down in back of nut "A" as shown in Fig. 4 and the slot at the bottom of the plate slips over the shank of the lower mounting bolt in back of nut "E." The plate will then hang with the bottom farther away from the dash than the top. A washer, lockwasher, and nut "F" are then put on the lower mounting bolt. Nut "F" is screwed on until the mounting plate is tight up against the washer in back of nut "E." In this position, the bracket at the top of the mounting plate should butt up against nut "A" and be tight. Also the mounting plate will be approximately parallel with the dash.

Mounting the Control Unit

The control unit is mounted on the steering column under the steering wheel as shown in Figs. 1 and 2. It is generally mounted in the right hand position as shown in Figs. 1 and 2. It may also be mounted in the left hand or top position at the preference of the customer, see Fig. 5 (A).

For right hand mounting the supporting arm is screwed to the back of the control unit as shown in Fig. 5 (C). For left hand and top mountings use the correct tapped hole as indicated in the same illustration.

To attach the control unit, first remove the supporting arm by taking out the supporting arm screw—see Fig. 5 (C). Now note that there are several holes in the strap. These are for different sizes of steering columns. Wrap the strap around the column and put the strap screw through the strap nut as shown in Fig. 5 (C). Do not tighten up the screw until the flexible shafts are attached.

Next attach the two flexible shafts to the control unit as explained in the next article. Then reattach the supporting arm to the control unit proper.

Attaching the Flexible Drive Shafts

After the chassis is mounted and the control unit is temporarily mounted, the flexible drive shafts may be attached. Two 30" shafts are supplied unless otherwise specified. These shafts may also be had in 14" and 20" lengths. *These shafts are provided with special ends and cannot be cut to length.*

The flexible drive shafts should always be installed with a minimum amount of bending. Always keep the radius of the bend as large as possible. The larger the radius of the bend, the easier the shaft will turn.

If the shafts are not already secured to the control unit proceed as follows. First loosen the set screw in the volume control shaft housing at the back of the control unit. The volume control shaft may be identified by a brass fitting at both ends. The longer of these two fittings has a key slot and is inserted into the control unit as shown in Fig. 5 (B). Insert the shaft far enough so that the key knob engages and may be inserted all the way. The set screw in the housing at the back of the control unit is then tightened down on the shaft casing.

To insert the tuning condenser shaft in the control unit, first remove the station selector knob. Then loosen the two set screws on the shank extending from the front of the control unit. Also loosen the set screw in the tuning shaft housing at the back of the control unit. Then insert the end of the flexible shaft with no fitting into the tuning condenser shaft housing until the end of this shaft is flush with the end of the shank and tighten the two set screws. The knob may then be replaced, the set screw tightened down and the set screw in the housing tightened down on the shaft casing.

To secure the flexible shafts to the chassis, first attach the two brackets to the chassis box by means of the screws furnished and as shown in Fig. 6. Before tightening up the bracket screws, center the opening through the clamp with the opening for the spade end of the shaft in the chassis. Then tighten the screws.

Both shafts are provided with spade ends which are readily inserted into the slotted receptacles provided in the chassis—see Fig. 6. Before inserting the flexible shafts, slip the rubber dust caps with ¼" holes over the shaft casings. After the shafts are inserted the clamps are tightened down on the shaft casings by means of the clamp screws as shown in the illustration.

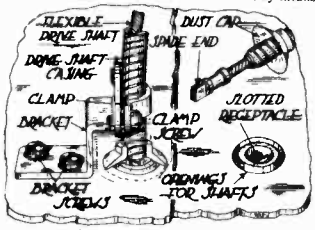


Fig. 6—Details of Flexible Shaft Attachment

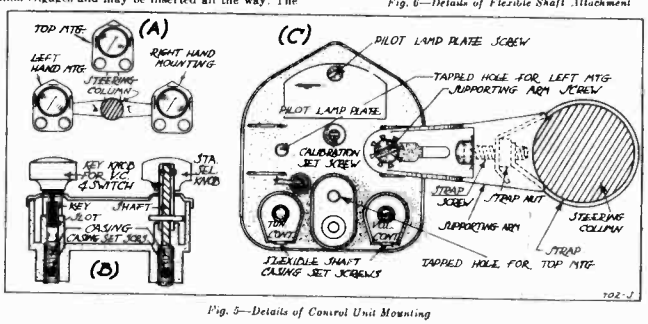


Fig. 5—Details of Control Unit Mounting

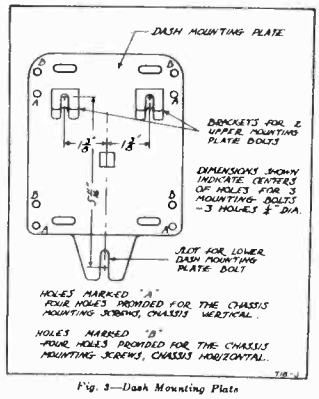


Fig. 3—Dash Mounting Plate

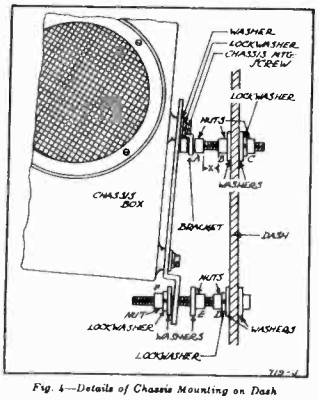
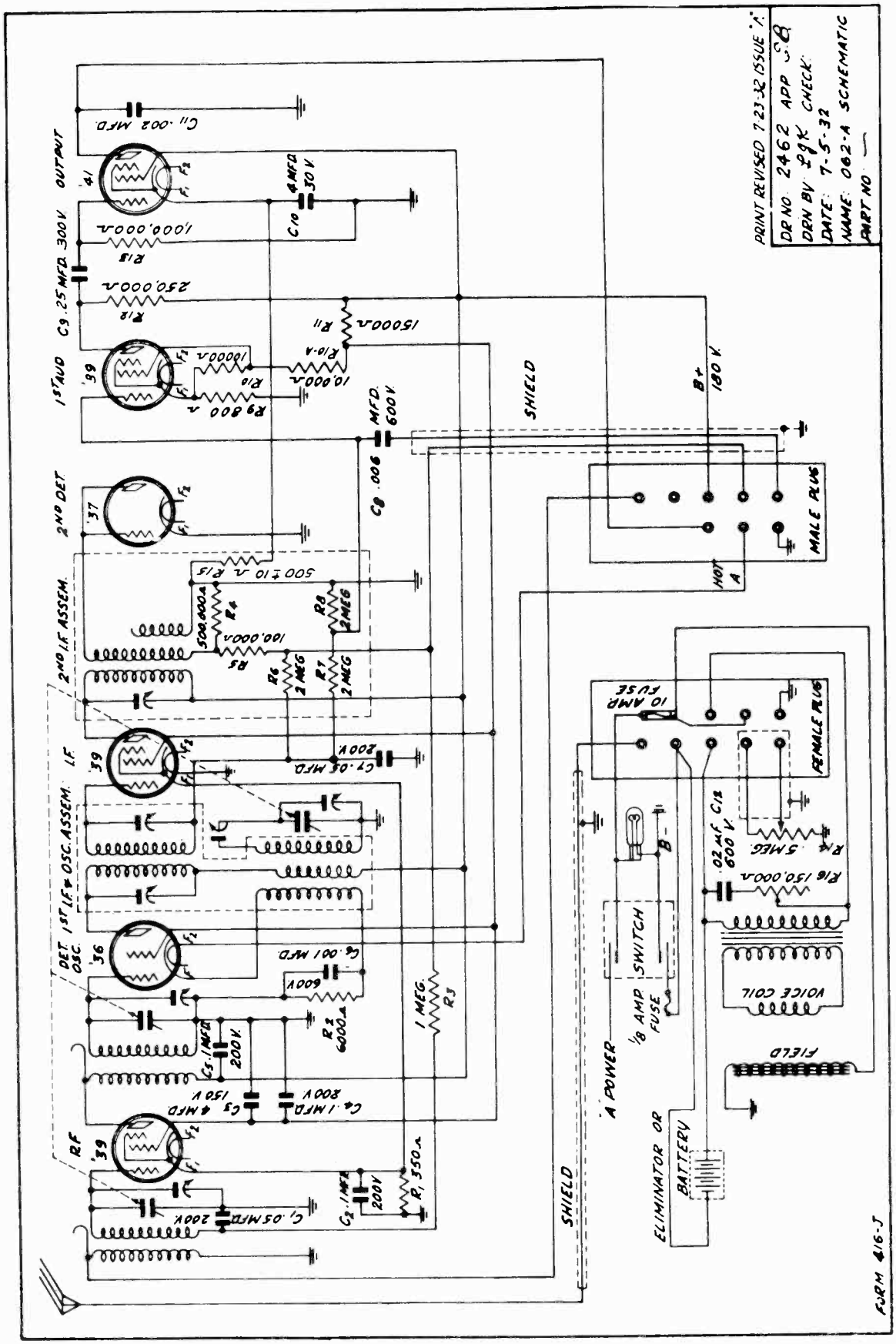


Fig. 4—Details of Chassis Mounting on Dash

MODEL 062-A
Schematic

WELLS-GARDNER & CO., INC.



WELLS-GARDNER & CO., INC.

MODEL 7-D Series
Schematic
Socket, Alignment

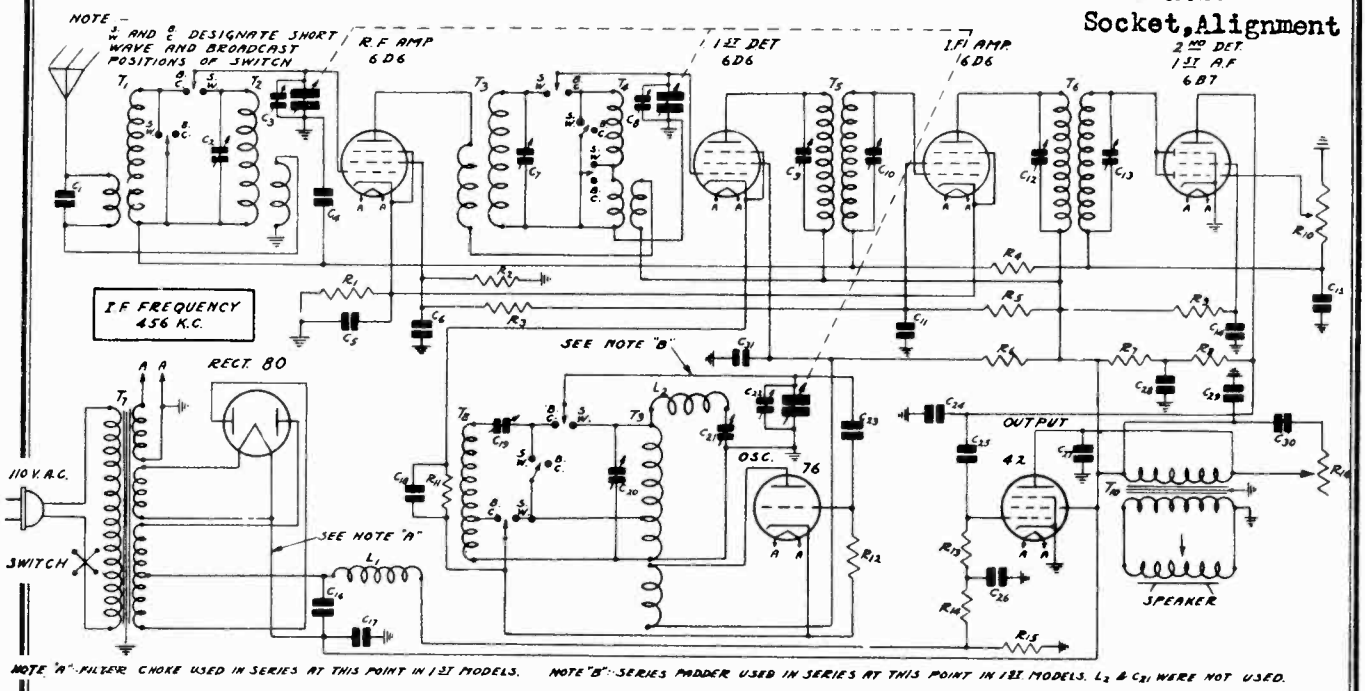


Fig. 1—Schematic Circuit Diagram

Condenser Alignment

Correct alignment is extremely important in connection with all wave receivers. The receivers are all 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 of 456 K. C. and accurately calibrated signals over the broadcast and short wave bands. 530-1740 K. C. and 5.8-18.3 M. C., is required. An output indicating meter is also necessary. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

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

Intermediate Frequency Adjustment

Set the signal generator for 456 K. C. Connect the antenna lead of the signal generator to the grid of the 1st detector through a .05 mfd. condenser. Turn the tuning condenser rotor until the plates are completely out. The ground lead from the signal generator goes to the ground lead of the receiver. The volume control should be at the maximum position. Attenuate the signal so that A. V. C. action is not obtained.

Then adjust the four I. F. trimmer condensers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis and are in the round I. F. cans—See Fig. 2. The openings to the trimmer condensers are covered over by a small cover plate which is held in position by a screw. Loosen these screws until the cover plates can be swung around.

Broadcast Band Adjustment

The broadcast short wave switch should be in the broadcast position. Set the signal generator for 1740 K. C. Turn the rotor to the full open position. The antenna lead from the signal generator is in this instance connected to the antenna lead of the receiver. Attenuate the signal so that A. V. C. action is not obtained. Adjust the oscillator broadcast trimmer until maximum output is obtained. This trimmer is on the tuning condenser and its location is shown in Fig. 2.

Then set the signal generator for 1500 K. C. Turn the rotor until maximum output is obtained. Loosen the pointer screw and set the pointer at the 1500 K. C. mark on broadcast band scale. Retighten pointer screw. Then adjust the antenna and 1st detector broadcast trimmers until maximum output is obtained.

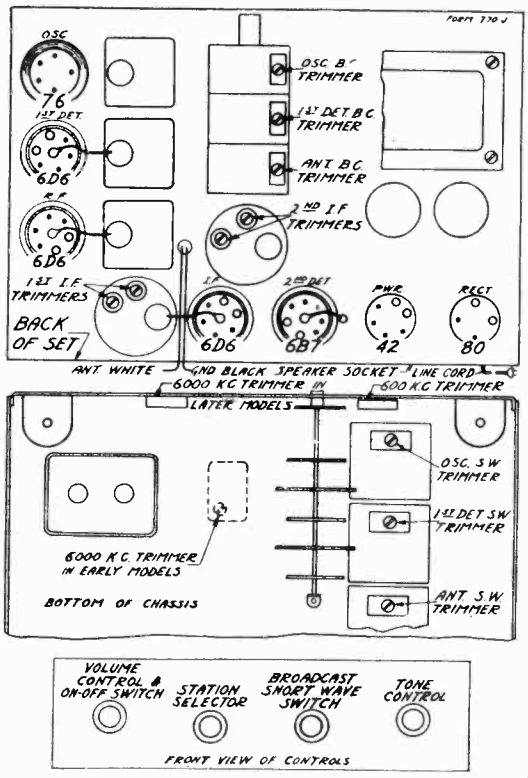


Fig. 2—Tube Arrangement and Location of Trimmers

Next set the signal generator for 600 K. C. and adjust the 600 K. C. trimmer. The adjusting screw is reached through a hole in the front panel of the chassis as shown in Fig. 2. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over

this setting at the same time adjusting the 600 K. C. trimmer screw until the highest output is obtained.

Short Wave Band Adjustment

CAUTION—After the broadcast band alignment as described above has been made, do not change the adjustment of any of the broadcast band trimmers.

Turn the broadcast short wave switch to the short wave position. Turn the rotor to the full open position. As explained above, the volume control should be at the maximum position and the signal should be attenuated to prevent A. V. C. action. Set the signal generator for 18,300 K. C. Then adjust the oscillator short wave trimmer for maximum output. This trimmer is reached from under the chassis and its position is shown in Fig. 2.

Next set the signal generator for 15,000 K. C. Turn the rotor until the dial pointer is at the 15,000 K. C. mark on the short wave portion of the dial scale. Then adjust the antenna and 1st detector short wave trimmers until maximum output is obtained.

In aligning the short wave band of the receiver, it will be noted that the signal will be heard with the signal generator set at two points 912 K. C. apart. That is, if the receiver is tuned to 15,000 K. C. a signal will be heard when the signal generator is set at 15,000 K. C. and again at approximately 15,912 K. C. This is due to image reception or the fact that a 456 K. C. beat is obtained when the signal is 456 K. C. lower than the receiver oscillator and also when the signal is 456 K. C. higher than the receiver oscillator. Care should be taken to see that the receiver is tracked with the signal generator adjusted to the lower of the two frequencies at which a signal is heard, in order that the oscillator in the receiver will be 456 K.C. higher in frequency than the signal.

Next set the signal generator for 6000 K. C. and adjust the 6000 K. C. trimmer. In the first models of this receiver, this condenser was located at the point shown in Fig. 2 in dashed lines. In the later models it is reached through a hole in the front panel of the chassis as shown in the same illustration. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 6000 K. C. trimmer screw until the highest output is obtained. In the early models this adjustment is broad while in the later models it is more critical.

Caution

The can of electrolytic condenser C16 is not at ground potential. Therefore in any work on the chassis, care should be taken not to touch this can and any other grounded point such as the other electrolytic condenser can.

Replacing Drive Cord

Remove chassis from cabinet.

Take off the pilot light assembly by lifting off the two sockets and spring clips.

Detach the large pointer by removing the screw at the center of the dial.

Loosen the dial assembly by taking out the two screws which secure the bottom of this assembly to the chassis.

Then lay the complete dial assembly face downward in front of the chassis. It is not necessary to remove the volume control and tone control collars which hold the indicator cords of these two controls in position.

Turn the drive drum until the opening in this drum is approximately vertical and with the hole at the top as shown in Fig. 3.

Remove the tension spring and the old drive cord.

See that the eyelet is in the hole in the drive drum as shown in Fig. 3. Insert one end of the drive cord from the outside through the hole in the eyelet in the drive drum.

Voltages at Sockets
LINE VOLTAGE — 115
ANTENNA SHORTED TO GROUND

Type of Tube	Function	Across Fila. or Heater	Plate to Cath.	Screen to Cath.	Control Grid to Cath.	Normal Plate M. A.
6D6	R. F.	6.3	246	100	3.6(1)	5.3
6D6	1st Det.	6.3	237	97	8.0(2)	3.4
76	Osc.	6.3	115		0	4.8
6D6	I. F.	6.3	246	130	3.6(1)	8.3
6B7	2nd Det.	6.3	50(3)	40(3)	0	2.7
42	Power	6.3	230	245	17.0(4)	33.0
80	Rectifier	5.0				37.0 per plate

(1) Cathode to ground
(2) Subject to variation
(3) Read with 1,000,000 ohm meter
(4) As read across R15

Tie the end of the cord which has been inserted in the hole to one end of the tension spring.

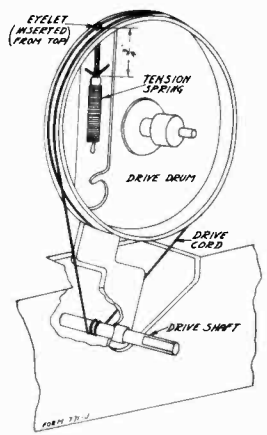


Fig. 3—Drive Cord Replacement

Wrap the cord in a clockwise direction (facing front of chassis) around the drive drum approximately one-half turn.

Then tilt the chassis up on its back panel and bring the cord mentioned in the previous paragraph down to the drive shaft. Wrap it two and one-half times around the drive shaft as shown in Fig. 3.

Then bring this cord up from the drive shaft and wrap it around the drive drum approximately one and one fifth turns in a clockwise direction until it is up to the hole in this drum as illustrated.

Insert the free end of the cord through the hole in the eyelet and tie it to the end of the tension spring. The end of the spring, when hanging free, should be approximately ¾" from the flange of the drum as shown in Fig. 3. Cut off the surplus length of cord after it is knotted.

Then secure the other end of the tension spring over the spur on the drive drum.

Replace the dial assembly and pointer.

Replace the pilot light assembly after which the chassis may be reinstalled in the cabinet.

Changes in Early Models

There are two points at which the early models of this receiver differ from the present models. These points are indicated in Fig. 1 and described below.

Power Unit

In the early models a separate filter choke was used in series at the point indicated in note A in Fig. 1. The values of the two filter condensers C16 and C17 were less than as used at present. The values of the old and new condensers are shown in the parts list. A different power transformer was also used with the early filter system and this is likewise shown in the parts list.

The two power transformers are not interchangeable and care must be taken in ordering for replacement purposes to order the correct one. The original chassis can be identified by the separate filter choke.

Short Wave Oscillator

Referring to Fig. 1 it will be noted that there is a tracking coil L2 and a trimmer condenser C21 connected in series between the short wave oscillator coil and ground. In the first models of this receiver these two units, which are required for tracking the short wave oscillator, are not used. Instead a series padding condenser was used at the point in the circuit indicated by note B in Fig. 1.

At the time this change was made a change was also made in the oscillator assembly and care must be taken in ordering for replacement purposes to order the correct one. Early models with the original oscillator assembly have no spot of paint or a green spot of paint on the 80 socket rivet. Later models with the new oscillator assembly and new tracking system have a red spot of paint on the 80 socket rivet.

Twenty-five Cycle Receivers

The twenty-five cycle receiver differs from the sixty-cycle receiver only in the fact that a different power transformer is used. The correct power transformer is shown in the parts list.

The twenty-five cycle chassis can be operated satisfactorily from a sixty-cycle power supply. However, the reverse is not true, the sixty-cycle receiver cannot be operated from a twenty-five cycle power supply.

A 110-220 Volt, 40-60 cycle Power Transformer is also available for this model.

REPAIR PARTS LIST FOR 7 TUBE BROADCAST AND SHORT WAVE RECEIVER

When ordering parts be sure and give the part number. Also give the series number which will be found in the License Notice label. If there is a spot of paint on the chassis, give this color.

Part No.	Item	List Price
P-1441	Double Mounting Strip	.10
P-1421	Single Mounting Strip	.10
P-2060	Knob Small	.20
P-2062	Knob Large	.20
P-10332	Small Tone & Volume Control Disc	.10
P-20912	Pointer, Large	.20
P-2012	Pilot Light Bulb 6-8 volt	.15
P-10272	Rubber Mounting Feet	.10
P-10470	Glass Crystal	.15
P-20835	Crystal Retainer Ring	.10
P-2090	6" Speaker Mantel Sets L1 - 1250 ohm	6.00
P-2091	8" Speaker Console Sets L1 - 1250 ohm	6.75
	8" Black Drive Cord (V. C. or T. C. Ind.)	.05
	29" Black Drive Cord (Cond. Drive)	.10
P-2136	Pilot Lamp Socket & Clip Assembly	.10
P-2101	Broadcast-Short Wave Switch	1.88
P-1885	No. 6D6 Socket	$ .15
P-2022	No. 76 Socket	.15
P-1944	No. 6B7 Socket	.15
P-1884	No. 42 Socket	.15
P-2025	No. 80 Socket	.15
P-1635	Speaker Socket	.10
P-40445	Tube Shield for 6D6 & 6B7 Tubes	.15
P-40444	Tube Shield for 76 Tube	.15
P-40443	Tube Shield Bases	.10
*P-50634	Power Transformer 115 Volts, 60 Cycles	3.00
*P-50635	Power Transformer 115 Volts 25 Cycles	4.50
*P-50636	Power Transformer 115-230 Volts, 40-60 Cycles	3.25
†P-50646	Power Transformer 115 Volts, 40 Cycles	3.25
†P-50647	Power Transformer 115 Volts, 25 Cycles	4.50
†P-50648	Power Transformer 115-230 Volts, 40-60 Cycles	3.75
*P-50637	Filter Reactor	.85
P-50599-A	Output Transformer T 10	1.15
P-5176	Antenna R.F. Trans. less can T1 & T2	1.80
P-5177	Inter-Stage R. F. Trans. less can T3 & T4	1.75
*P-5178	Oscillator Coil Assembly Less can T8 & T9	1.70
†P-5103	Oscillator Coil Assembly Less can T8 & T9	1.70
P-40433	Cans for the above Assemblies	.15
†P-5180	High Frequency Oscillator Tracking Coil L2	.35
P-5179	1st I. F. Assembly Complete with Can T5	2.15
P-5180	2nd I. F. Assembly Complete with Can T6	1.75
P-30342-A	Grid Cap Only	.10
P-76702	AC Cord & Plug	.70
P-1504	8 Terminal Mounting Strip	.10

Part No.	Code	Resistance	Watts	Type	List Price
P-98016	R1	200 ohm	.2	Flex. Wire Wound	$ .15
P-B93303	R2	30,000 ohm	.5	Carbon	.20
P-B94602	R3	6,000 ohm	.5	Carbon	.15
P-A95205	R4	2.0 megohm	.2	Carbon	.15
P-98020	R5 16,000 ohm 1.5 / R6 25,000 ohm 1.0			Armored wire wound	.65
P-A94203	R7	20,000 ohm	.2	Carbon	.15
P-B94603	R8	60,000 ohm	.5	Carbon	.15
P-B94954	R9	250,000 ohm	.5	Carbon	.15
P-96014	R10	500,000 ohm		Vol. Control & Switch	1.05
P-A94252	R11	2,500 ohm	.2	Carbon	.15
P-A94104	R12	100,000 ohm	.2	Carbon	.15
P-A95504	R13	500,000 ohm	.2	Carbon	.20
P-A94104	R14	100,000 ohm	.2	Carbon	.15
P-98015	R15	235 ohm	2.0	Flex. Wire Wound	.15
P-97011	R16	150,000 ohm		Tone Control	.75

Part No.	Code	Capacity	Volts	Type	List Price
P-80919	C1	.00025 mfd.		Moulded	$ .20
P-2102	C2	3-40 mmfd.		Ant. S.W. Trimmer	.15
	C3	(See 3 Gang Cond.)		Gang Trimmer	
P-80862	C4	.05 mfd.	200V.	Tubular	.15
P-80888	C5	.25 mfd.	200V.	Tubular	.25
P-80890	C6	.05 mfd.	400V.	Tubular	.20
P-2102	C7	3-40 mmfd.		1st Det.S.W. Trim	.15
	C8	(See 3 Gang Cond.)		Gang Trimmer	
P-1386-B	C9 90±30 mmfd. / C10 90±30 mmfd.			Dual Trimmer Part of I. F. Assem.	
P-81034	C11	.25 mfd.	300V.	Tubular	.30
P-1386-B	C12 90±30 mmfd. / C13 90±30 mmfd.			Dual Trimmer Part of I. F. Assem.	
P-81040	C14	.25 mfd.	400V.	Tubular	.35
P-80977	C15	.0001 mfd.		Moulded	.20
†P-81063	C16	18.0 mfd.	300V.	Electrolytic Wet	1.30
*P-80916	C16	8.0 mfd.	450V.	Electrolytic Wet	1.25
*P-81032	C17	8.0 mfd.	500V.	Electrolytic Wet	1.30
†P-81042	C17	14.0 mfd.	400V.	Electrolytic Wet	1.45
P-80862	C18	.05 mfd.	200V.	Tubular	.15
P-2112	C19	300-500 mmfd.		600 K.C. Trimmer	.45
P-2102	C20	3-40 mmfd.		Osc. S.W. Trimmer	.15
†P-1685	C21	70±30 mmfd.		6000 K.C. Trimmer	.35
	C22	(See 3 Gang Cond.)		Gang Trimmer	
P-81005	C23	.000035 mfd.		Moulded	.15
P-80914	C24	.002 mfd.	600V.	Tubular	.20
P-80981	C25	.01 mfd.	400V.	Tubular	.20
P-81044	C26	.03 mfd.	400V.	Tubular	.15
P-80914	C27	.002 mfd.	600V.	Tubular	.20
P-81033	C28	.25 mfd.	400V.	Tubular	.35
P-80887	C29	.1 mfd.	400V.	Tubular	.20
P-80890	C30	.05 mfd.	400V.	Tubular	.20
P-80887	C31	.1 mfd.	400V.	Tubular	.20
P-81027-B	3 Gang Condenser				3.35
*P-2113		600-1200 mmfd.		6000 K.C. Trimmer	.61

* Used in early Models. See Article on changes in this Manual
† Used in Later Models. See Article on changes in this Manual

WELLS-GARDNER & CO., INC.

MODEL 9-B Series

Schematic, Socket

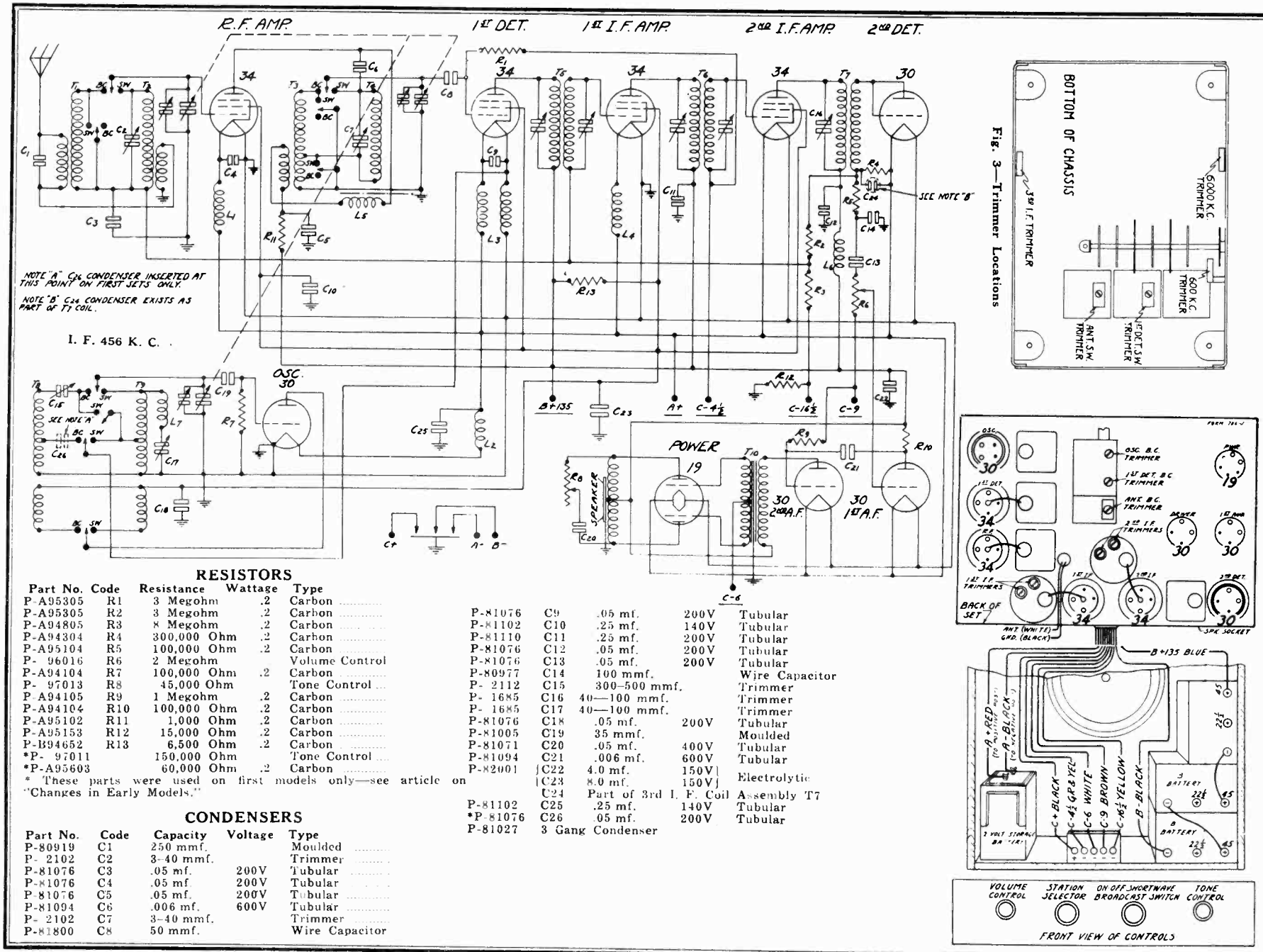


Fig. 3—Trimmer Locations

RESISTORS

Part No.	Code	Resistance	Wattage	Type
P-A95305	R1	3 Megohm	.2	Carbon
P-A95305	R2	3 Megohm	.2	Carbon
P-A94805	R3	8 Megohm	.2	Carbon
P-A94304	R4	300,000 Ohm	.2	Carbon
P-A95104	R5	100,000 Ohm	.2	Carbon
P- 96016	R6	2 Megohm		Volume Control
P-A94104	R7	100,000 Ohm	.2	Carbon
P- 97013	R8	45,000 Ohm		Tone Control
P-A94105	R9	1 Megohm	.2	Carbon
P-A94104	R10	100,000 Ohm	.2	Carbon
P-A95102	R11	1,000 Ohm	.2	Carbon
P-A95153	R12	15,000 Ohm	.2	Carbon
P-B94652	R13	6,500 Ohm	.2	Carbon
*P- 97011		150,000 Ohm		Tone Control
*P-A95603		60,000 Ohm	.2	Carbon

* These parts were used on first models only—see article on "Changes in Early Models."

CONDENSERS

Part No.	Code	Capacity	Voltage	Type
P-80919	C1	250 mmf.		Moulded
P- 2102	C2	3-40 mmf.		Trimmer
P-81076	C3	.05 mf.	200V	Tubular
P-81076	C4	.05 mf	200V	Tubular
P-81076	C5	.05 mf.	200V	Tubular
P-81094	C6	.006 mf.	600V	Tubular
P- 2102	C7	3-40 mmf.		Trimmer
P-81800	C8	50 mmf.		Wire Capacitor
P-81076	C9	.05 mf.	200V	Tubular
P-81102	C10	.25 mf.	140V	Tubular
P-81110	C11	.25 mf.	200V	Tubular
P-81076	C12	.05 mf.	200V	Tubular
P-81076	C13	.05 mf.	200V	Tubular
P-80977	C14	100 mmf.		Wire Capacitor
P- 2112	C15	300-500 mmf.		Trimmer
P- 1685	C16	40—100 mmf.		Trimmer
P- 1685	C17	40—100 mmf.		Trimmer
P-81076	C18	.05 mf.	200V	Tubular
P-81005	C19	35 mmf.		Moulded
P-81071	C20	.05 mf.	400V	Tubular
P-81094	C21	.006 mf.	600V	Tubular
P-82001	C22	4.0 mf.	150V	Electrolytic
	C23	8.0 mf.	150V	Electrolytic
	C24	Part of 3rd I. F. Coil		Assembly T7
P-81102	C25	.25 mf.	140V	Tubular
*P-81076	C26	.05 mf.	200V	Tubular
P-81027		3 Gang Condenser		

MODEL 9-B Series
Service Notes, Parts

WELLS-GARDNER & CO., INC.

Replacing Drive Cord

Lift off the pilot light assembly.

Detach the large pointer by removing the center screw.

Loosen the dial assembly by taking out the two screws which secure the bottom of this assembly to the chassis.

Then lay the complete dial assembly face downward in front of the chassis. It is not necessary to remove the volume control and tone control collars which hold the indicator cords of these two controls in position.

Turn the drive drum until the opening in this drum is approximately vertical and with the hole at the top as shown in Fig. 6.

Remove the tension spring and the old drive cord.

See that the eyelet is in the hole in the drive drum as shown in Fig. 6. Insert one end of the drive cord from the outside through the hole in the eyelet in the drive drum.

Tie the end of the cord which has been inserted in the hole to one end of the tension spring.

Wrap the cord in a clockwise direction (facing front of chassis) around the drive drum approximately one-half turn.

Then tilt the chassis up on its back panel and bring the cord mentioned in the previous paragraph down to the drive shaft. Wrap it two and one-half times around the drive shaft as shown in Fig. 6.

Then bring this cord up from the drive shaft and wrap it around the drive drum approximately one and one fifth turns in a clockwise direction until it is up to the hole in this drum as illustrated.

Insert the free end of the cord through the hole in the eyelet and tie it to the end of the tension spring. The end of the spring, when hanging free, should be approximately ¾" from the flange of the drum as shown in Fig. 6. Cut off the surplus length of cord after it is knotted.

Then secure the other end of the tension spring over the spur on the drive drum.

Replace the dial assembly and pointer.

Replace the pilot light assembly.

Changes in Early Models

The condenser, C26 was used only on the early models of this receiver. Another change was in the tone control circuit. In the early models R8 was a 150,000 ohm resistor paralleled by a 60,000 ohm resistor. However, in the later models this arrangement was replaced by a single 45,000 ohm resistor to provide greater sensitivity in tone control.

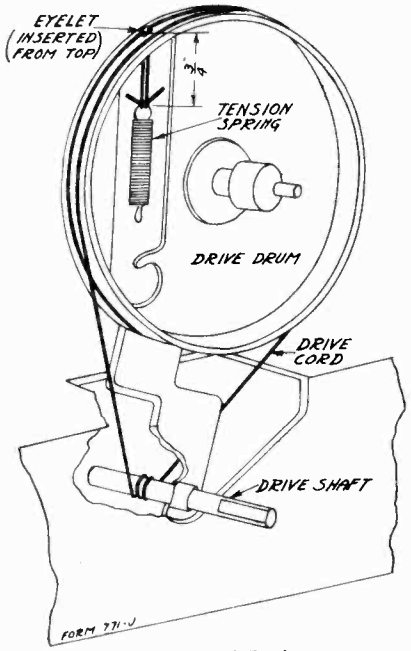


Fig. 6—Drive Cord Replacement

Circuit

This model is a broadcast and short wave receiver with a coverage of 530 to 1730 K. C. on the broadcast band and 5.8 to 16.0 M. C. on the short wave band. Dual band coverage is accomplished by means of dual sets of R. F. and oscillator coils and a 4 section three position selector switch. The various circuits made and broken, as this switch is thrown, are indicated in the schematic circuit diagram Fig. 1.

Referring to the antenna transformer in Fig. 1, T1 is the broadcast transformer and T2 the short wave transformer. The two primaries are connected in series. With the switch in the short wave position, the short wave secondary is connected to the grid circuit of the 34 R. F. amplifier tube and the broadcast secondary is short circuited. When the switch is in the broadcast position, the short wave secondary circuit is opened up and the broadcast secondary is connected to the grid circuit of the tube. The secondary being used is tuned by the R. F. section of the three gang condenser. A separate variable trimmer condenser C2 is used for the short wave secondary.

Bias voltage for the 34 R. F. and 1st I. F. tubes is obtained from a high resistance potentiometer composed of resistors R2, R3 and R4, which are connected across the 16½ volt "C" battery and the 2 volt "A" source. See Fig. 1. The grid circuit of this tube is connected between resistors R2 and R3.

The output of the R. F. 34 tube is fed through another R. F. transformer with tuned secondary into a second 34 tube which functions as the first detector. The first detector section of the three gang condenser is used for tuning this circuit. This interstage R. F. transformer consists of two portions shown as T3 and T4 on the diagram T4 is the short wave coupling coil and T3 is the broadcast transformer.

The short wave coupling coil is connected to the plate circuit of the 34 R. F. amplifier thru an interstage plate reactor, L5, in conjunction with a by-pass condenser, C6. The standard wave transformer, T3, functions as a simple R. F. coupling the same as that of T1. A separate trimmer condenser C7 is used for the short wave coil.

A type 30 tube is employed in a separate oscillator circuit. Referring to the diagram, T8 is the broadcast oscillator coil and T9 is the short wave oscillator coil. The coil being used is tuned by the oscillator section of the three gang condenser and these circuits are always resonant at 456 K. C. above the frequency to which the R. F. amplifier is tuned. When the switch is in the broadcast position, the connections are completed to the broadcast oscillator coil and the short wave oscillator coil is opened up. When the switch is in the short wave position, the connections are completed to the short wave coil and the broadcast coil is connected between ground and the short tap in order to render it ineffective. A 600 K. C. padding condenser C15 is used in conjunction with the broadcast oscillator and a 6,000 K. C. padder C17 is used for the short wave oscillator circuit.

REPAIR PARTS LIST FOR 9 TUBE BATTERY OPERATED BROADCAST AND SHORT WAVE SUPERHETERODYNE RECEIVER

When ordering parts be sure and give the part number. Also give the series number which will be found in the License Notice label. If there is a spot of paint on the chassis, give this color.

MISCELLANEOUS

Part No.	ITEM
P-5176	Antenna R. F. Trans. T1, T2 less can
P-5236	Interstage R. F. Trans. T3, T4 less can
P-5224	Oscillator Coil T8, T9 less can
P-5186	3rd I. F. Assembly T7
P-40433	Cans for the above assemblies
P-5179A	1st I. F. Coil and Can Assembly T5
P-5185	2nd I. F. Coil and Can Assembly T6
P-5189	Filament Reactor L1
P-5189	Filament Reactor L2
P-5235	Double Filament Reactor L3
P-5189	Filament Reactor L4
P-5228	S. W. R. F. Interstage Plate Reactor L5

WELLS-GARDNER & CO., INC.

MODEL 9-B Series
Voltage Alignment Data

Condenser Alignment

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

Intermediate Frequency Adjustment

Set the signal generator for 456 K. C. Connect the antenna lead of the signal generator to the grid of the 1st detector through a .05 mfd. condenser. Turn the tuning condenser rotor until the plates are completely out. The ground lead from the signal generator goes to the ground lead of the receiver. The volume control should be at the maximum position. Reduce the signal so that A. V. C. action is not obtained.

Then adjust the five I. F. trimmer condensers until maximum output is obtained. The adjusting screws for the 1st and 2nd trimmer condensers are reached from the top of the chassis and are in the round I. F. cans—See Fig. 2. The openings of these trimmer condensers are covered over by small cover plates which are held in position by screws. Loosen these screws until the cover plates can be swung around. **CAUTION—Use an insulated screwdriver for adjusting trimmers to prevent short circuiting to ground.** In the 3rd I. F. coil, only the primary has a variable trimmer condenser. This condenser is mounted on the back panel of the chassis as shown in Fig. 3 and the adjustment screw is reached through a hole in the back panel.

Broadcast Band Adjustment

The broadcast short wave switch should be in the broadcast position. Set the signal generator for 1730 K. C. Turn the rotor to the full open position. The antenna lead from the signal generator is in this instance connected to the antenna lead of the receiver. Reduce the signal so that A. V. C. action is not obtained. Adjust the oscillator broadcast trimmer until maximum output is obtained. This trimmer is on the tuning condenser and its location is shown in Fig. 2.

Then set the signal generator for 1500 K. C. Turn the rotor until maximum output is obtained. Loosen the set screw in the pointer hub and set the pointer at the 1500 K. C. mark on the broadcast band scale. Retighten the hub set screw. Then adjust the antenna and 1st detector broadcast trimmers until maximum output is obtained.

Next set the signal generator for 600 K. C. and adjust the 600 K. C. trimmer. The adjusting screw is reached through a hole in the front panel of the chassis as shown in Fig. 3. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting at the same time adjusting the 600 K. C. trimmer screw until the highest output is obtained.

Short Wave Band Adjustment

CAUTION—After the broadcast band alignment as described above has been made, do not change the adjustment of any of the broadcast band trimmers.

In aligning the short wave band of the receiver, it will be noted that the signal will be heard with the signal generator set at two points 912 K. C. apart. That is, if the receiver is tuned to 15,000 K. C. a signal will be heard when the signal generator is set at 15,000 K. C. and again at approximately 15,912 K. C. This is due to image reception or the fact that a 456 K. C. beat is obtained when the signal is 456 K. C. lower than the receiver oscillator and also when the signal is 456 K. C. higher than the receiver oscillator. Care should be taken to see that the receiver is tracked with the signal generator adjusted to the lower of the two frequencies at which a signal is heard, in order that the oscillator in the receiver will be 456 K. C. higher in frequency than the signal.

Turn the broadcast short wave switch to the short wave position. As explained above, the volume control should be at the maximum position and the signal should be reduced to prevent A. V. C. action.

Next set the signal generator for 15,000 K. C. Turn the rotor until maximum output is obtained. Then adjust the antenna and 1st detector short wave trimmers for maximum output.

Next set the signal generator for 6000 K. C. and adjust the 6000 K. C. trimmer. This condenser is mounted on the front panel of the chassis as shown in Fig. 3 and is reached through a hole in the front panel. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 6000 K. C. trimmer screw until the highest output is obtained.

Voltages at Sockets

Antenna Shorted to Ground
Batteries Up to Rated Voltages. See Fig. 1
Voltages Read from Negative Filament Terminal

Type of Tube	Function	Across Filament	Plate to Gnd.	Control Grid to Ground	Screen to Gnd.	Normal Plate M. A.
34	R. F.	2.0	135	4.5(1)	80	2.8
34	1st Det.	2.0	135	4.5(1)	80	3.0
30	Osc.	2.0	80			2.8
34	1st I. F.	2.0	135	4.5(1)	80	2.8
34	2nd I. F.	2.0	135	4.5	80	2.8
30	2nd Det.	2.0				
30	1st Audio	2.0	95	9.0(2)		0.35
30	2nd Audio	2.0	135	9.0(3)		3.0
19	Output	2.0	135	6.0		1.3

(1) Computed figure—cannot be read because of high resistance cir.
(2) Volume Control at minimum.
(3) As read at battery.

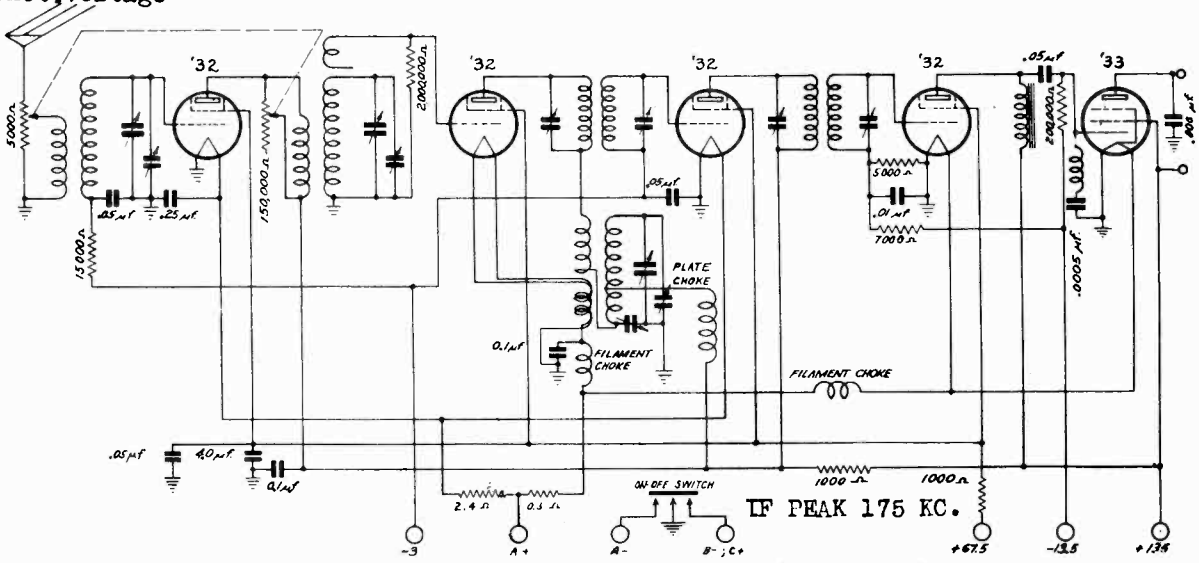
D. C. Resistance of Windings

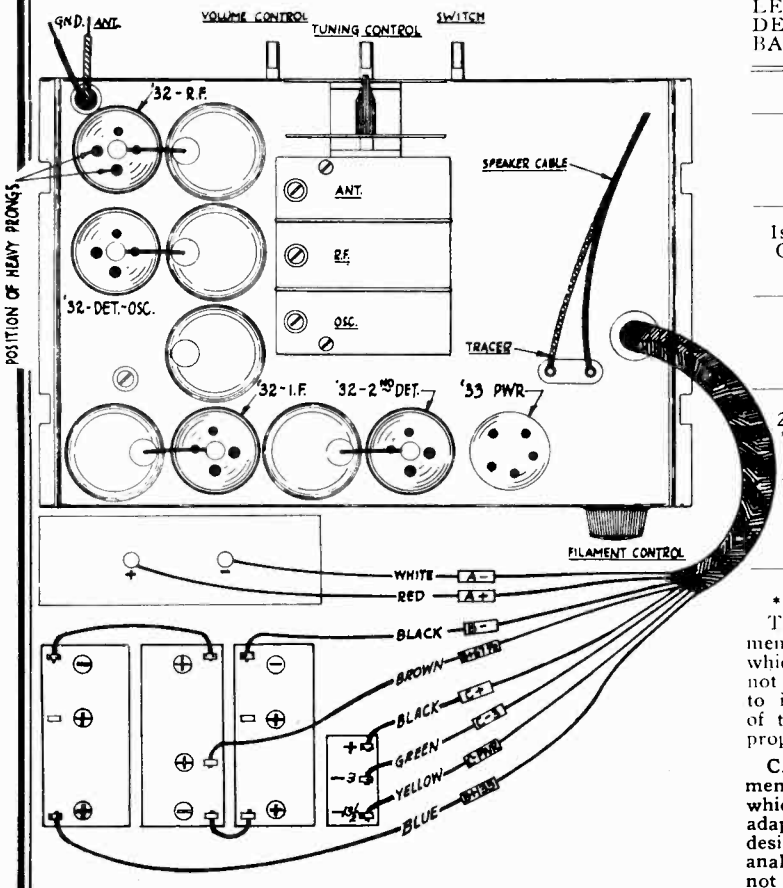
Following are the D. C. resistances of the various windings in the chassis. The values given below will vary slightly in different sets.

Part No.	Item	Code	D. C. Resistance in Ohms
P-5176	B. C. Antenna R. F. Transformer, Primary	T1	28.0
	B. C. Antenna R. F. Transformer, Secondary	T1	5.0
	S. W. Antenna R. F. Transformer, Primary	T2	0.25
	S. W. Antenna R. F. Transformer, Secondary	T2	Small
P-5236	B. C. Interstage R. F. Transformer, Primary	T3	5.25
	B. C. Interstage R. F. Transformer, Secondary	T3	5.0
	S. W. Interstage R. F. Transformer, Secondary	T4	Small
P-5224	B. C. Oscillator Grid Coil	T8	2.4
	B. C. Oscillator Plate Coil	T8	3.5
	S. W. Oscillator Grid Coil	T9	1.0
	S. W. Oscillator Plate Coil	T9	Small
P-5179-A	1st I. F. Coil Primary	T5	12.0
	1st I. F. Coil Secondary	T5	13.0
P-5185	2nd I. F. Coil Primary	T6	5.5
	2nd I. F. Coil Secondary	T6	5.5
P-5186	3rd I. F. Coil Primary	T7	12.0
	3rd I. F. Coil Secondary	T7	30.0
P-50586-B	Audio Transformer Primary	T10	910.0
	Audio Transformer Secondary, Center tap to outside	T10	590.0
	Audio Transformer Secondary, Center tap to inside	T10	530.0
P-5189	Filament Reactor	L1	0.65
P-5189	Filament Reactor	L2	0.65
P-5235	Double Filament Reactor (each)	L3	0.3
P-5189	Filament Reactor	L4	0.65
P-5228	S. W. R. F. Interstage Plate Reactor	L5	28.0
P-5227	I. F. Isolating Reactor	L6	1.6
P-2179	Speaker Voice Coil, Center tap to outside		300.0
	Speaker Voice Coil, Center top to inside		250.0

MODEL 92,93
Schematic
Socket, Voltage

WELLS - GARDNER & CO.





The .006 mfd. condenser connected from the plate of the pentode tube to ground is there for two reasons,—one, to prevent any I.F. or harmonic of the intermediate frequency from getting into the speaker and possibly coupling back into the antenna to cause a squeal; two, to put the proper amount of capacity across the speaker winding to produce a pleasing tone quality. This condenser may be varied to any value from .002 mfd. to .006 mfd. without losing its effectiveness in preventing the I.F. from getting into the speaker.

TURN THE VOLUME CONTROL ALL THE WAY ON, CONNECT THE ANTENNA AND GROUND LEADS TOGETHER AND TURN THE GANG CONDENSER PLATES ALL THE WAY OUT. CHECK BATTERY VOLTAGES.

TUBE	CIRCUIT	VOLTAGE
R.F. '32	Filament	2.
	Screen Grid	65.
	Plate	127.
	Control Grid	1.4
1st. Det. & Oscillator '32	Filament	2.
	Screen Grid	65.
	Plate	85.
	Control Grid	No Reading
I.F. '32	Filament	2.
	Screen Grid	65.
	Plate	125.
	Control Grid	5. *
2nd Det '32	Filament	2.
	Screen Grid	67.
	Plate	127.5
	Control Grid	3.2
Audio '33	Filament	2.
	Screen Grid	132.5
	Plate	117.5
	Control Grid	7.5 **

*This includes filament voltage.
**250 v. Scale.

The measurement of grid bias voltages is not recommended as this causes an abnormal rise in plate current which is injurious to the tube. When the receiver does not function properly and the trouble is apparently due to incorrect grid bias on any tube or tubes, the cause of the incorrect bias may be determined by applying the proper continuity test.

CAUTION: Do not attempt to take voltage measurements or test the '33 pentode tube with a set analyzer which is not designed to test that type of tube. A special adaptor is necessary. The latest type analyzers only are designed to test pentode tubes. The UY socket in an analyzer which is used to test '24, '35, and '27 tubes cannot be used to test '33 pentode tubes. A break-in adaptor and the external binding posts of the set analyzer may be used to take voltage measurements when an adaptor is not available.

Comparison of the voltage measurements taken and those shown in the chart below will show any irregularities. The cause of any variation may be determined by applying the proper continuity test. REMEMBER—Voltage measurements will vary slightly with different sets of tubes, and also with different chassis. Unless the voltages are radically different than normal, they may be considered satisfactory.

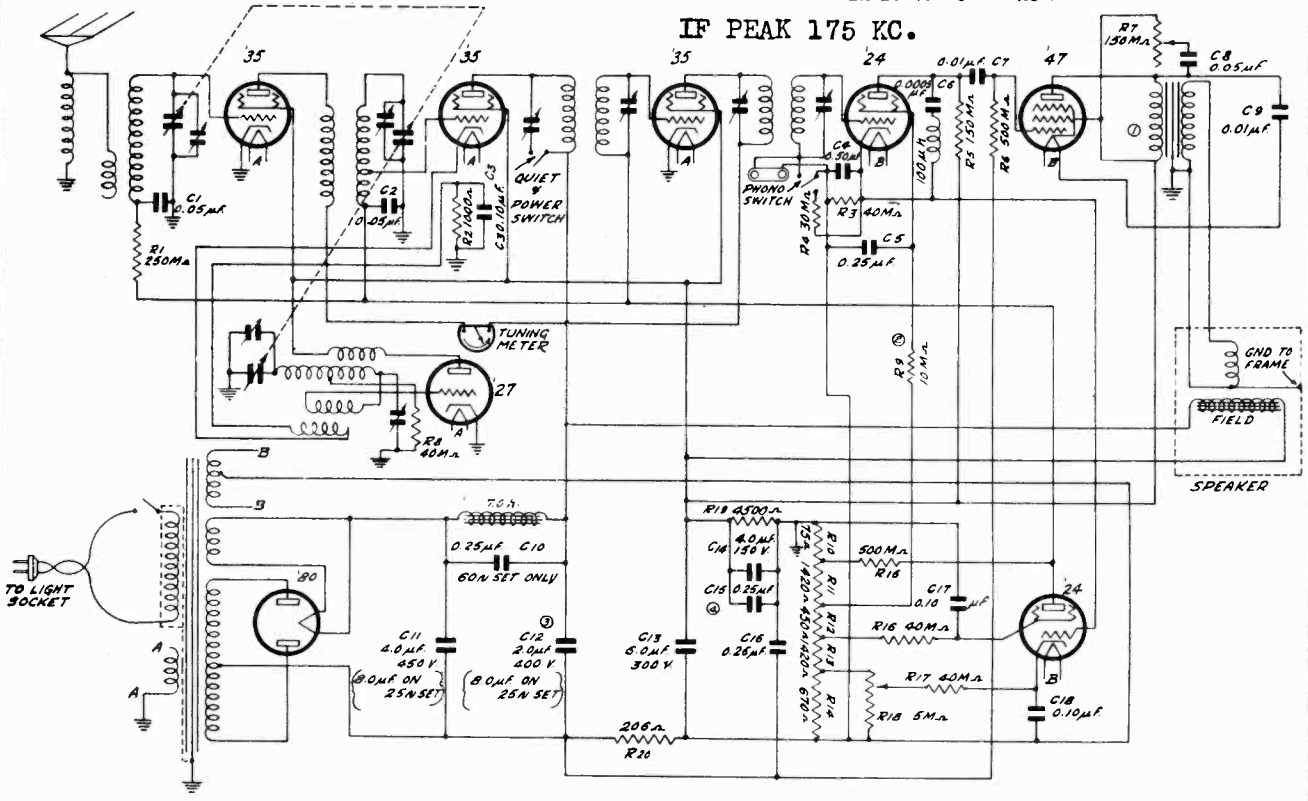
The voltages shown in the chart were taken with a 1000 ohm per volt voltmeter; voltage measurements taken with a voltmeter having a different resistance will, of course, differ from those shown.

WELLS - GARDNER & CO.

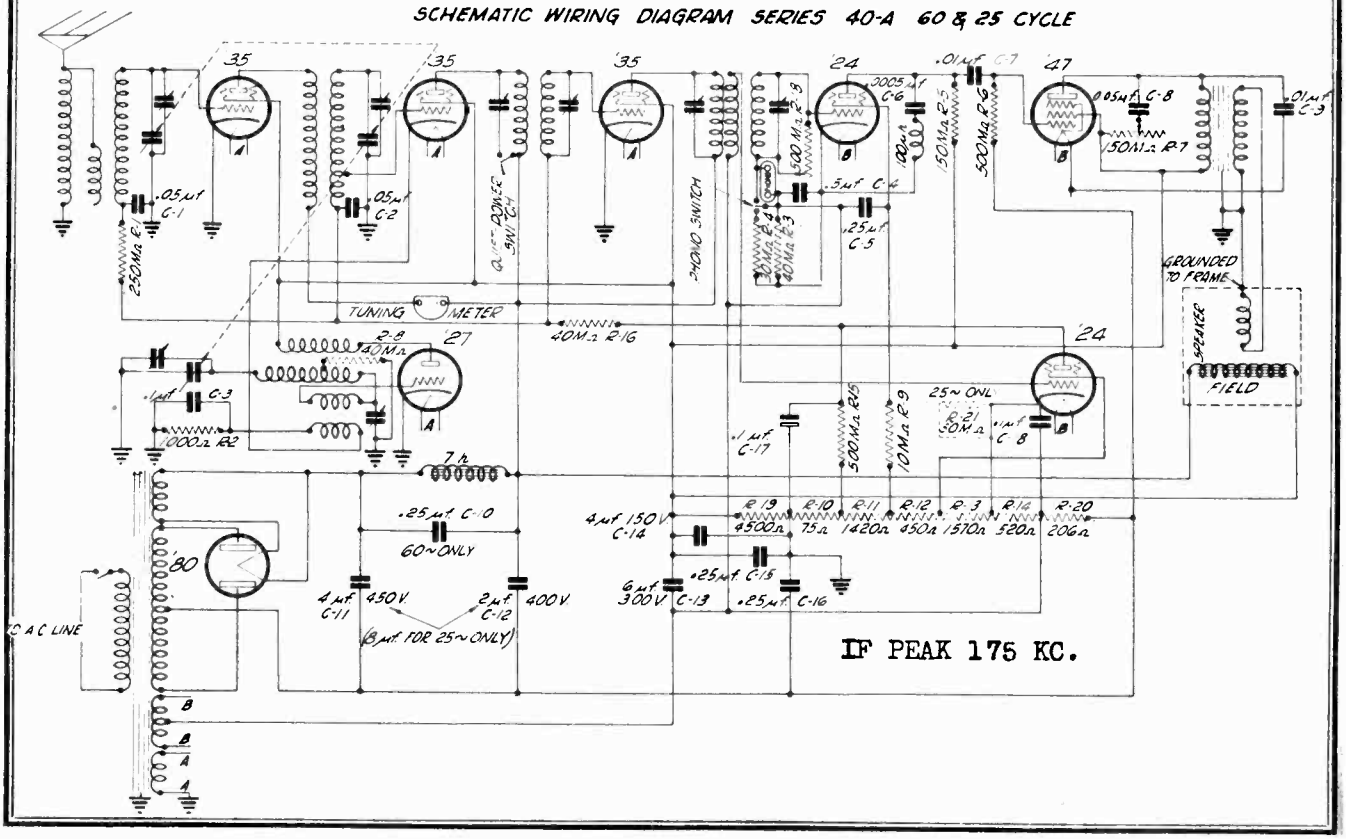
MODEL 40,40-A
Schematics

SCHEMATIC WIRING DIAGRAM SERIES 40 - 60 ~ & 25 ~

IF PEAK 175 KC.



SCHEMATIC WIRING DIAGRAM SERIES 40-A 60 & 25 CYCLE



IF PEAK 175 KC.

MODEL 40,40-A
Alignment Data
Socket,Voltage

WELLS - GARDNER & CO.

A modulated test oscillator and an output meter MUST be used when aligning this receiver to insure accurate alignment. It is important that the oscillator deliver a signal at exactly 175 K.C. in addition to frequencies in the broadcast band.

The adjustable condensers which tune the primaries and secondaries of the I.F. transformers are adjusted by inserting a screw driver through the holes in the chassis base directly below the I.F. transformer assemblies.

A trimmer condenser is mounted over each section in the gang and is adjusted by turning the screw located under the hole in the top of the gang shield.

The oscillator 600 K.C. tracking condenser is on the back of the chassis near the "QUIET-POWER" switch.

Make each adjustment in the order given below or the receiver may be thrown further out of alignment and it will then be a difficult task to align it properly.

The receiver and test oscillator must be well grounded and the output kept within the range of the output meter at all times.

All shields must be in place when making the adjustments.

INTERMEDIATE CIRCUITS.—Tune the test oscillator to exactly 175 K.C., and connect its output to the grid of the first detector tube after removing the clip on the tip of the tube. Connect the output meter across the secondary of the speaker coupling transformer and then adjust all four condensers which tune the intermediate transformers, for the greatest deflection on the output meter. Check the settings of all four condensers to make certain the maximum output has been obtained.

When the above instructions have been followed remove the test oscillator coupling and replace the grid clip on the tip of the first detector tube.

GANG CONDENSERS.—Turn the gang condenser plates all the way in and see that the dial pointer is on the first dial division point below 550 K.C.

Tune the test oscillator to 1,400 K.C., turn the dial to read 1,400 K.C., and then adjust each gang condenser trimmer for maximum output.

OSCILLATOR.—Tune the test oscillator to 600 K.C., and tune the receiver to the signal. Disconnect the output meter and then rotate the adjusting screw on the oscillator 600 K.C. tracking condenser. Rock the gang condenser back and forth across the signal at the same time, and listen closely until the maximum volume is obtained. The tracking condenser is then properly adjusted and remains fixed thereafter.

The gang condenser trimmers only must then be adjusted again at 1,400 K.C. for maximum output.

The receiver should be accurately aligned if the above instructions have been followed and no further adjustments need be made.

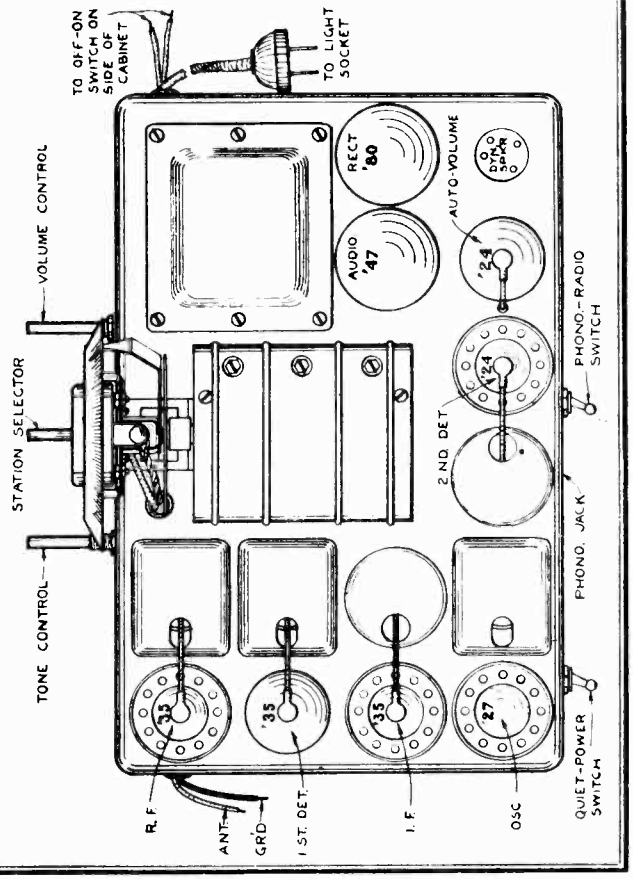
The blue lead on the filter block is common for condensers C4, C5, and C18, and the black lead is common for condensers C3, C15, C16, and C17. The second detector plate filter choke is also contained in the block and is connected by two yellow leads, C8, (white-red leads) and C10 (red leads) are connected as shown in Fig. 1 schematic wiring diagram.

Voltages at Sockets

The voltages shown in the chart were taken with a 1,000 ohm per volt voltmeter; voltage measurements taken with a voltmeter having a different resistance will, of course, differ from those shown.

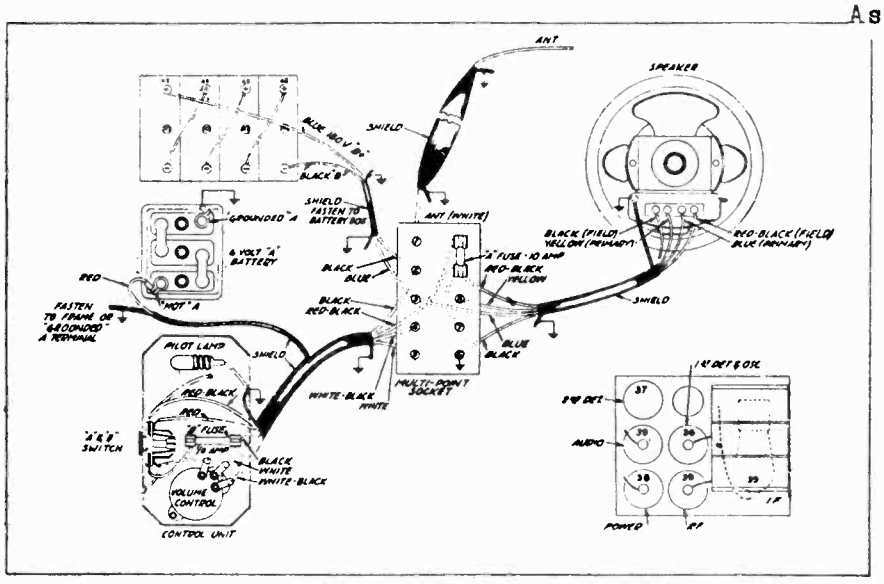
Turn the volume control all the way on, connect the antenna and ground leads together and turn the gang condenser plates all the way out. Check the line voltage.

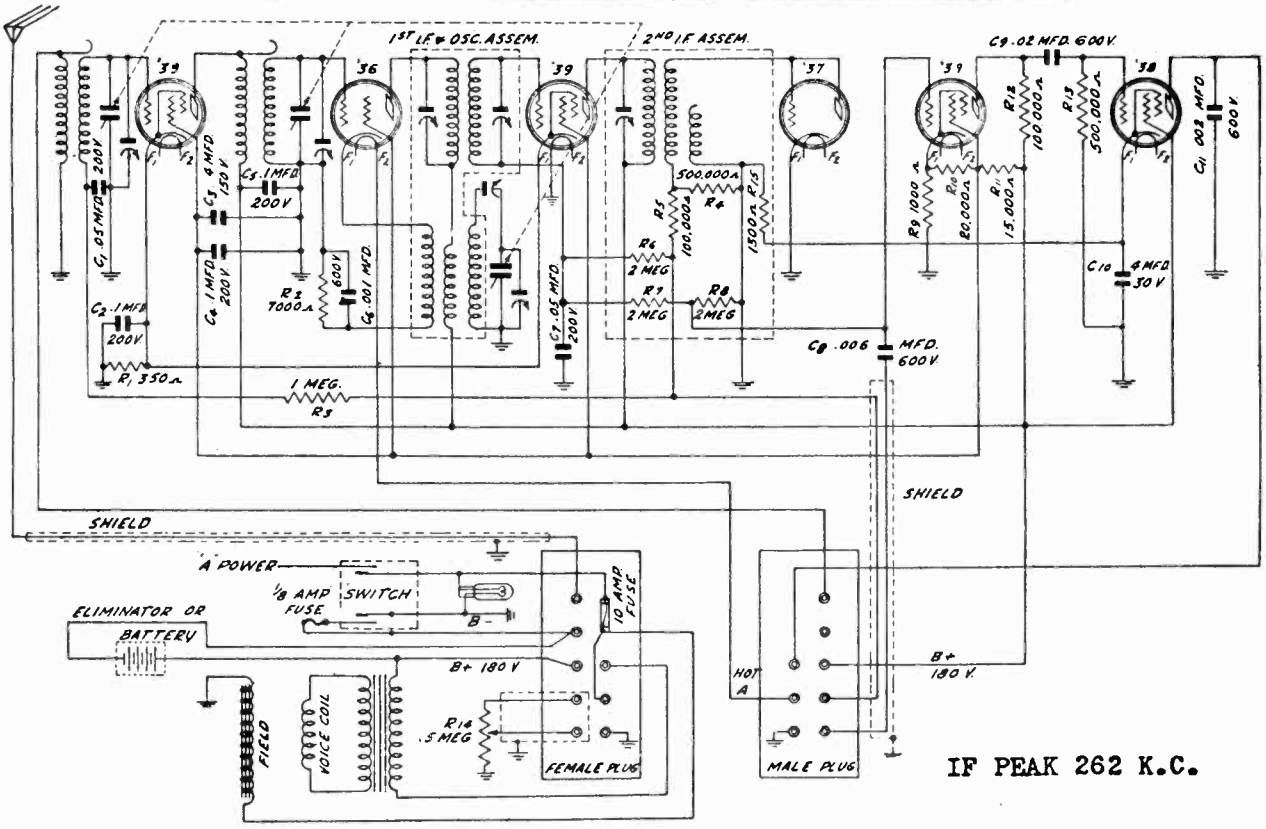
Tube	Circuit	LINE VOLTAGE 90 V.	100 V.	110 V.	120 V.	130 V.
R. F. '35	Screen-Grid	70	78	85	92	100
	Plate	143	159	175	191	207
1st Det. '35	Screen-Grid	70	78	85	92	100
	Plate	143	159	175	191	207
I. F. '35	Screen-Grid	70	78	85	92	100
	Plate	143	159	175	191	207
Oscillator '27	Plate	70	78	85	92	100
2nd Det. '24	Screen-Grid	66	73	80	87	94
	Plate	127	134	141	148	155
A. V. C. '24	Grid	14	15.5	17	18.5	20
	Screen-Grid	24	26	28	30	32
Audio '47	Accelerating-Grid	199	221	244	267	289
	Plate	171	190	210	230	250
Rectifier '80	Current (both plates)	67 MA	75 MA	82 MA	89 MA	96 MA
	Plate to Plate Volt.	512	569	625	682	739



WESTERN AUTO SUPPLY CO.

MODEL 062
Schematic
Voltage
Assembly Wiring





IF PEAK 262 K.C.

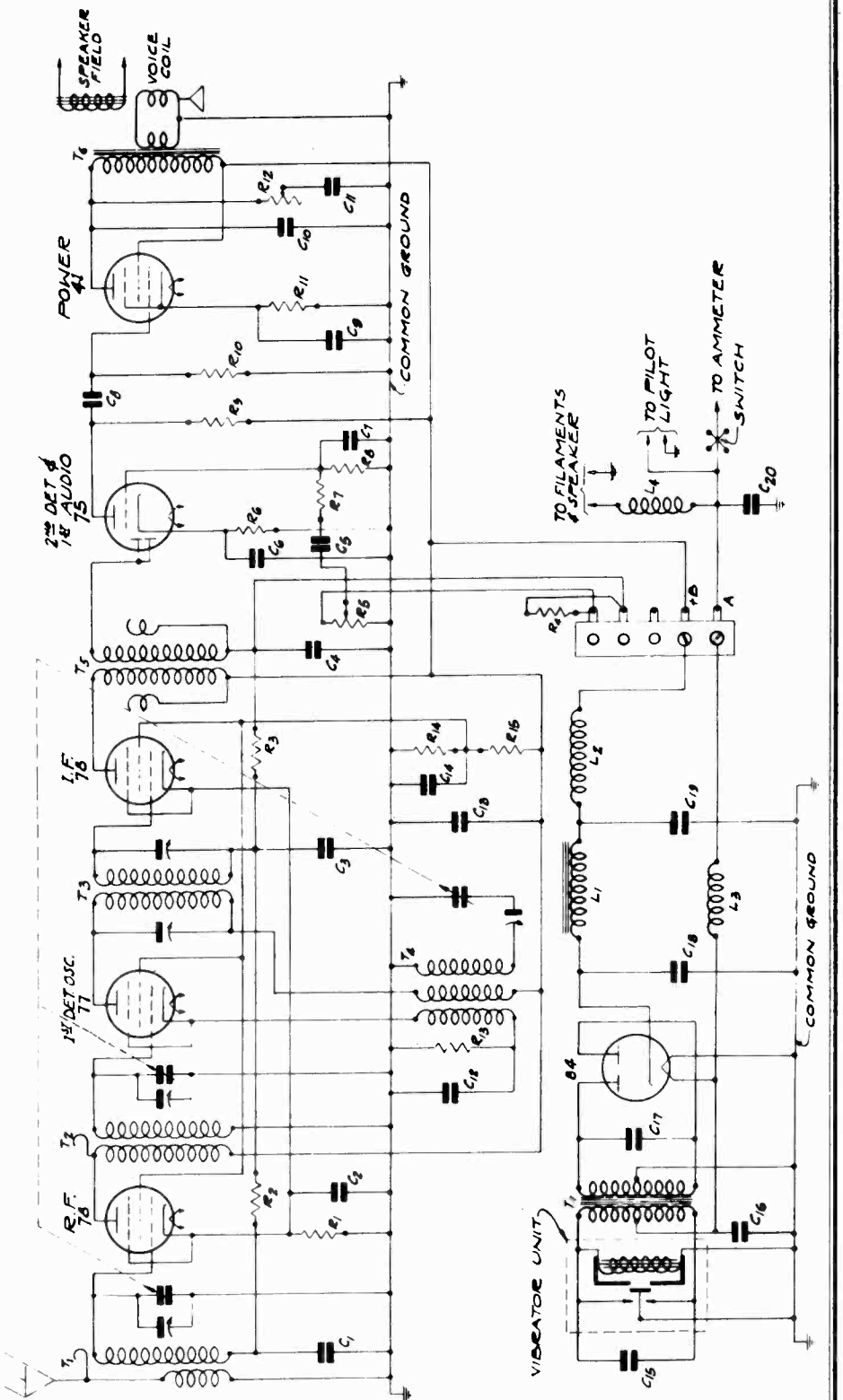
VOLTAGE DATA

Tube	*Plate*	*Screen*	*Grid*	*Plate MA.*
R-F.	177	80	3	3.6
1st Det.	173	76	7*	.9*
I-F.	177	80	3	3.6
2nd Det.	0	0	0	0
1st A-F.	54	77	6	1.2
Output	159	165	15.5	10.0

* Will vary with dial setting.

MODEL 6-U
Schematic

WESTERN AUTO SUPPLY CO.



IF PEAK 262.5 KC.

T, ANTENNA COIL (P-5039)
T2 R.F. INTERSTAGE COIL (P-5045)
T3 1ST I.F. & OSCILLATOR COIL (P-5063)
T4 2ND I.F. COIL (P-5022)
T5 OUTPUT TRANS. (P-50632)
T6 POWER TRANS. (P-50633)

L, FILTER CHOKE (P-50637)
L2 R.F. "B-" CHOKE (P-5174)
L3 ELIMINATOR "A" CHOKE (P-5175)
L4 R.F. "A" CHOKE (P-5167)

R, 260 OHMS
R1 1.0 MEGOHM
R2 2.0 "
R3 200,000 OHM
R4 250,000 OHM VOL. CONTROL
R5 6,000 OHM
R6 100,000 OHM
R7 1.0 MEG OHM
R8 250,000 OHM
R10 250000 OHM
R11 800 OHM
R12 150,000 OHM TONE CONTROL
R13 4,000 OHM
R14 20,000 OHM
R15 15,000 OHM

C,	0.050 MF 1200V TUBULAR	C9	12,000 MF ELECTROLYTIC IN BLOCK WITH C5
C2	0.500 MF (BLOCK RED-WH)	C10	0.003 MF (BLOCK YELLOW)
C3	0.050 MF (BLOCK GR-WH)	C11	0.020 MF 600V TUBULAR
C4	0.00025 MF MICA	C12	0.001 MF MICA
C5	0.050 MF 200V TUBULAR	C13	0.500 MF (BLOCK BLUE)
C6	12,000 MF ELECTROLYTIC IN BLOCK WITH C9	C14	0.100 MF (BLOCK BROWN)
C7	0.00025 MF MICA	C15	0.500 MF 120V TUBULAR
C8	0.030 MF (BLOCK GR)	C16	1.000 MF 120V TUBULAR
		C17	0.010 MF 1600V TUBULAR
		C18	18,000 MF BLOCK WITH C19
		C19	18,000 MF BLOCK WITH C18
		C20	0.500 MF 120V TUBULAR

COLOR CODE DESIGNATES CONDENSERS IN BY PASS BLOCK

Circuit

The circuit consists of an antenna stage, a 78 R.F. stage, a 77 1st detector-oscillator stage, a 78 I.F. stage, a 75 dual diode-triode tube, which functions as a diode 2nd-detector and triode 1st audio stage, and a single 41 output stage. An 84 full wave rectifier is used in the power unit. The intermediate frequency is 262 K.C. The diode current establishes a drop across a resistor which is used as additional bias voltage for the R.F. and I.F. tubes giving automatic volume control action. Noise suppression between stations is obtained by the resistor in the cathode circuit of the 75 tube, the drop across which must be overcome before rectification in this tube begins. The manual volume control varies the audio voltage applied to the grid of the 75 tube.

A vibrator interrupts the current through the primary of the power transformer in the power unit. This, together with the turns ratio in this transformer, results in the high voltage AC being present in the secondary of the transformer. The full wave rectifier tube, filter choke, and filter condensers convert this high voltage AC into high voltage DC for the plate and screen circuits.

Current for the receiver is obtained from the car storage battery. In Fig. 11 is shown the condenser block internal wiring.

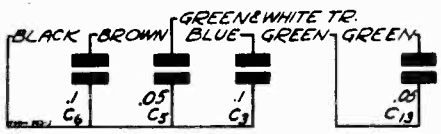


Fig. 11—Condenser Block—Internal Wiring

Voltages at Sockets

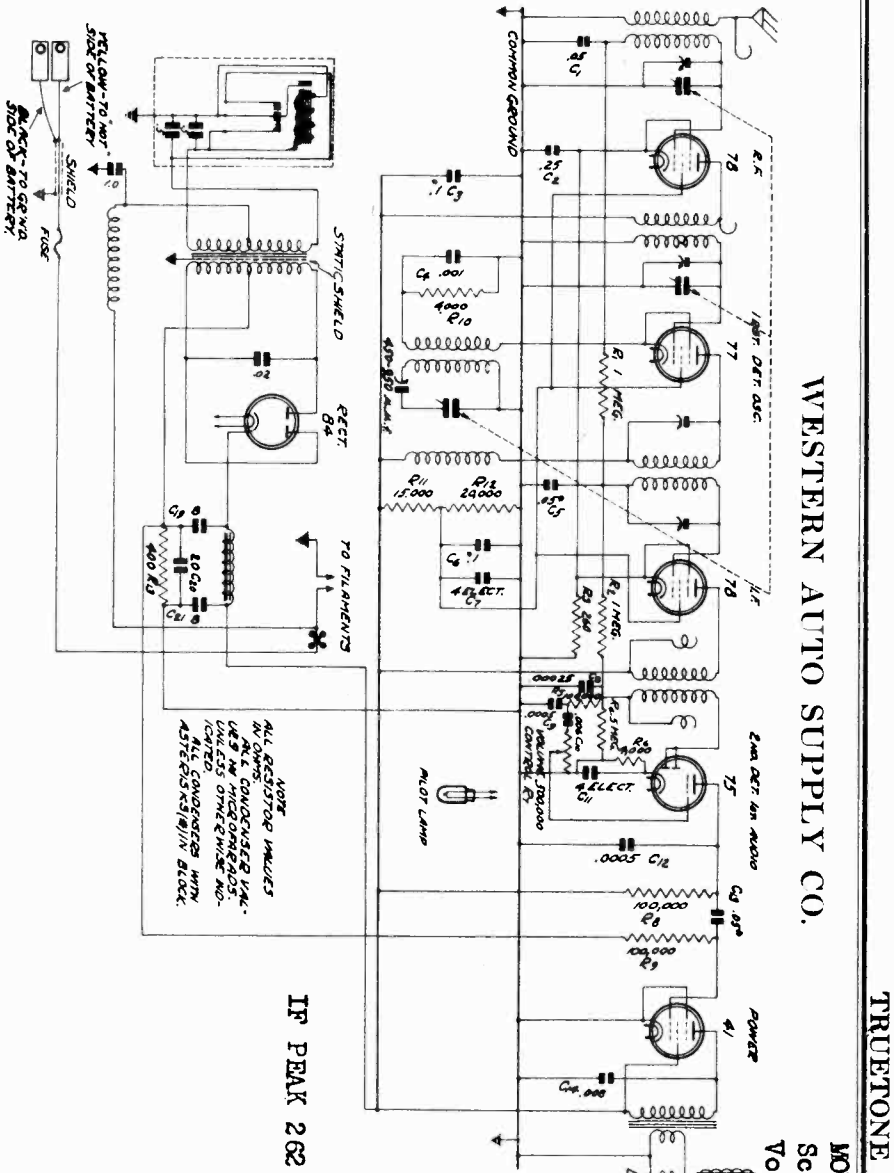
In the following chart are given the voltages at the sockets with all the tubes in, all units connected, and the set in operating condition, but with no signal being received. The antenna should be grounded.

A thousand ohm-per-volt meter of 0-250 volt range is required for the plate and screen voltages. Lower ranges will be necessary for the grid and heater voltages. It is not absolutely necessary to have a high resistance meter for the heater or "A" battery reading.

These voltages will vary with variations in receivers, tubes, test equipment used, and "B" eliminator output voltage.

Type of Tube	*Function*	*Across Heater*	*Plate to Cathode*	*Screen to Cathode*	*Grid to Cathode*	*Normal Plate MA*
78	R. F.	6.1	182	80	3.(1)	7.0
77	1st Det. and Osc.	6.1	178	77	5.(2)	1.3(2)
78	I. F.	6.1	182	80	3.(1)	7.0
75	2nd Det. 1st Audio	6.1	70(3)		1.4(1)	.35
41	Output	6.1	172.5	176.5	12.5(4)	16.0
84	Rect.	6.1	205			17.5 per plate

(1) Cathode to Ground
(2) Subject to Variation
(3) Triode Plate to Cathode
(4) Read Across 400-Ohm Resistor, R13



Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all 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 accurately calibrated signals over the broadcast band and accurately calibrated signals at and around 262 K.C., the intermediate frequency and an output indicating meter are desirable.

First set the signal generator at approximately 262 K.C. Connect the antenna lead from the generator to the control grid of the I.F. 78 tube, through a .05 mfd. condenser. The ground lead of the generator goes to the ground of the receiver. Turn the rotor plates of the tuning condenser completely out and keep the signal weak enough to prevent A.V.C. action. Note from Fig. 10 that the second I.F. transformer is self tuned and cannot be adjusted. Adjust the frequency of the signal generator until the output meter shows maximum output. The intermediate frequency setting of the generator is then correct, although it may be a very small percentage higher or lower than 262 K.C.

Next connect the signal lead from the signal generator to the grid of the 1st detector tube through a .05 mfd. condenser. Then adjust the two intermediate frequency condensers for maximum output. One of the I.F. condenser screws is reached through the hole on the top of the 1st I.F. assembly can. The other I.F. condenser screw is reached from the bottom of the sub-panel through a hole at the bottom of this assembly.

Now set the signal generator for a signal of exactly 1400 K.C. The antenna lead from the generator is, in this instance, connected to the antenna lead of the receiver. Connect the flexible drive shaft to the chassis if it has been disconnected. As explained previously, the dial scale should be at the low frequency end stop when the rotor is completely in mesh. Then turn the station selector knob until the dial scale is at 1400 K.C.

Then adjust the three trimmer condensers on the gang tuning condenser for maximum output, adjusting the oscillator section first.

Next, set the signal generator for a signal of 600 K.C. and adjust the oscillator 600 K.C. trimmer. The adjusting screw for this condenser is reached through a hole in the back wall of the sub-panel.

A non-metallic screwdriver is necessary for this adjustment. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 600 K.C. trimmer screw until the highest output is obtained.

Then set the signal generator again for a signal of 1400 K.C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

Rattle

If rattle is experienced when a signal is being received, it is, in practically all cases, due to mechanical vibration at some point in the chassis. Inspect the chassis and look for a loose tube shield or a loose part at some point which can rattle against another part. When the vibrating part is found, secure it in place in some manner. This can generally be done with a wedge made of a piece of paper, cardboard or wood. Rattle may, in some instances, be due to a loose cover. If this is the case, remove the cover and bend the edge of the chassis box outward between the screw holes so that the cover will fit tightly when it is put on.

If the Receiver Fails to Operate

"A" Fuse—Check the "A" line fuse in the cable.

"A" Line Open—See if power is being supplied to the speaker, tube heaters, and "B" eliminator.

"B" Eliminator Not Working—See if the "B" eliminator is in proper working order by checking the high voltage points at the tube plate terminals (see Fig. 10).

Antenna and Lead—See if antenna is properly connected to lead-in wire and antenna lead from set. Be sure antenna system is not grounded at any point.

All Tubes Not Inserted—See if all tubes are inserted as per Fig. 8.

Defective Tubes—Try out a new set of tested tubes.

Grid Caps Not Connected—See if all grid caps are properly connected to top of top grid connection tubes.

Variable Condenser Plates Shorted—Check condenser sections in chassis carefully for foreign particles or rotor stator rubbing.

CHASSIS PARTS

Part No.	Description	List Price
P-1780	No. 75 Tube Socket	$0.10
P-1761	No. 77 Tube Socket	.10
P-1762	No. 78 Tube Socket	.10
P-1665	No. 41 Tube Socket	.10
P-1803	No. 84 Tube Socket	.10
P-1805	Single Pin Jack	.10
P-1799	Tube Shield Assembly	.25
P-20656	Chassis Box	4.00
P-20657	Chassis Box Cover	1.10
P-70740	Shielded Antenna Lead	.40
P-70744	Shielded "A" Battery Lead	1.15
P-1926	Interrupter with Condensers in Rubber Boot and Metal Case	6.35
P-10260	Cardboard Baffle	.20
P-1924	15 Amp. Fuse	.10
P-1774	Electrodynamic Speaker	3.75
P-20585	Cond. Drive Gear	.25
P-1801	Volume Control and Drive Bracket	.30
P-20635	Cond. Drive Pinion	.15
P-20677	Pinion Adjustment Plate	.10
P-20614	Lock Lever	.10
P-20658	Tension Spring	.10
P-30419	Entry Plate Assembly	.10
P-1830	Dial Gear and Strip Assembly	.40
P-1816	Celluloid Dial Strip only	.15
P-1810	Pilot Lamp Socket and Spring Clip	.10
P-1563	6-8 Volt Pilot Lamp	.25
P-10263	Rubber Tube Bumper—Square	.10
P-10210	Rubber Tube Bumper—Round	.10
P-10213	Rubber Band for Tube	.10
P-50569	Filter Choke Assembly	1.60
P-50595	Power Trans. Assembly	2.90
P-5099	Antenna R. F. Transformer—Less Can	1.20
P-5065	Interstage R. F. Transformer—Less Can	1.00
P-5105	Second I. F. Transformer and Can Assembly	.95
P-5096	First I. F. and Oscillator Transformer and Can Assembly	2.70
P-5097	Single Solenoid "A" Choke	.25
P-40431	Antenna R. F. Can	.15
P-1826	Interstage R. F. Can	.10

Resistors

Part No.	Code No.	Resistance	Type	List Price
P-A95105	R-1	1 Megohm	Carbon	$0.25
P-A95105	R-2	1 Megohm	Carbon	.25
P-B94261	R-3	260 ohm	Carbon	.35
P-A95504	R-4	.5 Megohm	Carbon	.25
P-A95104	R-5	100,000 ohm	Carbon	.25
P-A94402	R-6	4,000 ohm	Carbon	.20
P-91066	R-7	0 500,00 ohm	Volume Control and Switch	$1.15
P-A95104	R-8	100,000 ohm	Carbon	.25
P-A95104	R-9	100,000 ohm	Carbon	.25
P-A94402	R-10	4,000 ohm	Carbon	.20
P-B94153	R-11	15,000 ohm	Carbon	.25
P-B94203	R-12	20,000 ohm	Carbon	.25
P-C94401	R-13	400 ohm	Carbon	.20

Condensers

Part No.	Code No.	Capacity	Voltage	Type	List Price
P-80862	C-1	.05 mfd.	200 V.	Tubular	$0.30
P-80888	C-2	.25 mfd.	200 V.	Tubular	.35
P-80821-B	C-4	.001 mfd.	600 V.	Molded	.25
P-80937	C-7	4.0 mfd.		Electrolytic Block in can	1.25
	C-11	4.0 mfd.			
P-80919	C-8	.00025 mfd.	600 V.	Molded	.20
P-80945	C-9	.0005 mfd.	600 V.	Molded	.15
P-80898	C-10	.006 mfd.	600 V.	Tubular	.15
P-80945	C-12	.0005 mfd.	600 V.	Molded	.15
P-80966	C-14	.008 mfd.	600 V.	Tubular	.20
P-80962A	.02 mfd.	800 V.	Tubular Condenser		.25
P-80978A	1. mfd.	120 V.	Tubular Condenser		.45
P-80976A	Dual .5 mfd.	120 V.	Tubular Condenser In Paper Box		.80
P-80956	C-19	8.0 mfd.	225 V.	Electrolytic Block in Can	2.25
	C-20	20.0 mfd.	25 V.		
	C-21	8.0 mfd.	225 V.		
P-80955	C-3	.1 mfd.	300 V.	Bypass Block in Can	1.35
	C-5	.05 mfd.	200 V.		
	C-6	.1 mfd.	200 V.		
	C-13	.05 mfd.	300 V.		
P-1539	600 K. C. Trimmer Condenser				.45
P-80957	Three-Gang Variable Condenser				3.00

CONTROL UNIT PARTS

(When Separate Control Unit Is Used)

Part No.	Description	List Price
P-1816	Celluloid Dial Strip	$0.15
P-1825	Dial Gear and Strip Assembly	.40
P-20509B	Control Unit Swivel	.15
P-20510A	Steering Post Apron	.30
P-20511	Steering Post Clamp	.15
P-20693	Control Box Cover	.35
P-20635	Cond. Drive Pinion	.15
P-70746	Pilot Lamp Cable only	.40
P-1415A	Pilot Lamp Socket and Clip	.15
P-1563A	6-8 Volt Pilot Lamp	.25
P-30426	Ornamental Plug	.10
P-30414	Key	.15

WESTINGHOUSE ELEC. SUPPLY CO.

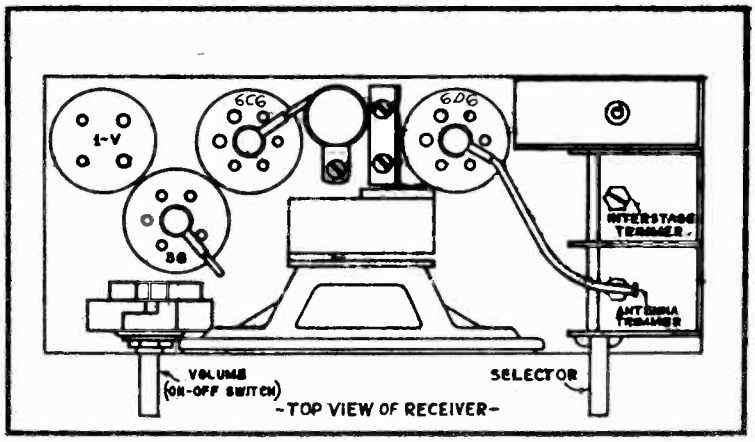
MODEL WR-20
Schematic
Socket
Voltage

Universal Compact

Operates on either AC or DC

110-120 Volts 25-60 Cycles

Adaptable for 220-Volt Current with use of 220 Volt Resistor



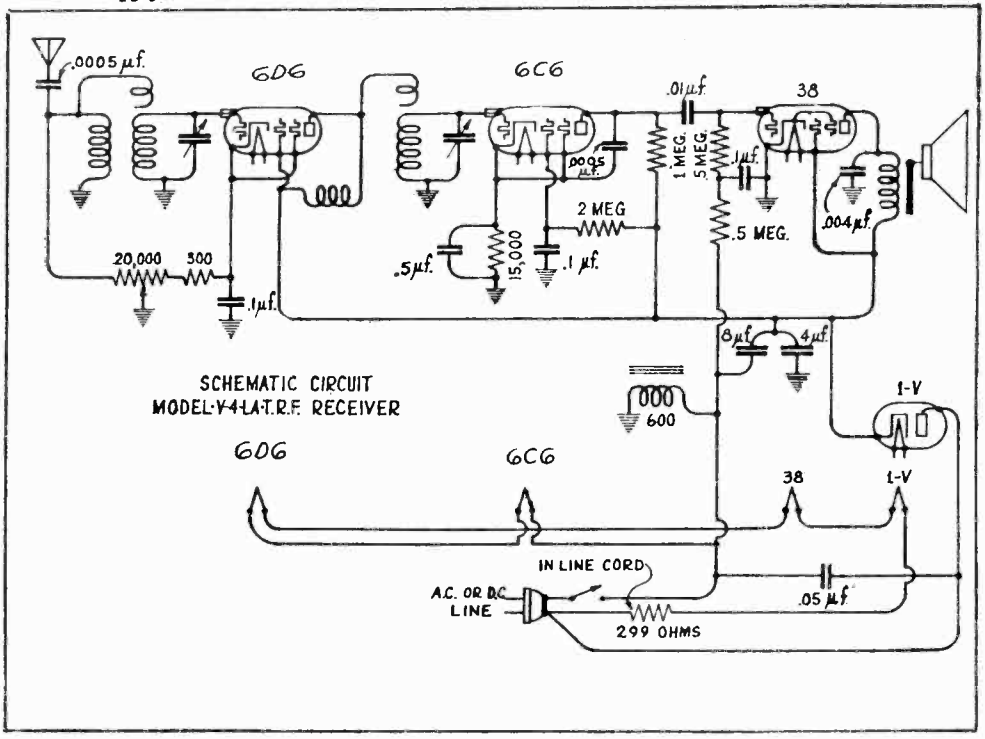
Voltage Readings:

Readings should be taken with Volume Control fully on, Tuning Control set for 550 KC., and antenna outside of set. Use a D. C. voltmeter having a resistance of 1000 ohms per volt.

Chassis	*To— Plate*	*Screen*	*Cathode*
77—Detector	10- 15	9- 12	1- 2
78—R.F. Amplifier	105-115	105-115	2- 3
38—Output Pentode	105-115	105-115	——

Voltage across filter choke is "C" bias for 38 Tube=10v.

Readings will not change materially regardless of type of power supply.



Circuit Wiring Diagram

MODEL WR-21
Schematic
Socket, Voltage

WESTINGHOUSE ELEC. SUPPLY CO.

Voltage Readings:

Readings should be taken with Volume Control fully on. Tuning control set for 550 K.C., and antenna outside the set. Use a D.C. Voltmeter having a resistance of 1000 ohms per volt.

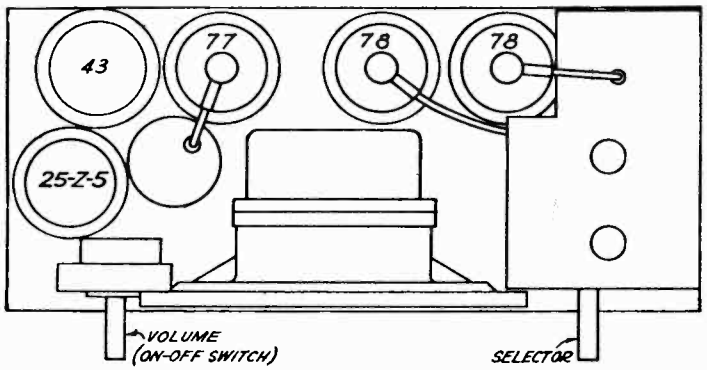
Using	300-volt scale Plate to Ground	300-volt scale Screen to Ground	30-volt scale Cathode to Ground
78—Detector Oscillator ..	98	98	1.6
78—I. F. Amplifier.....	98	98	2.8
77—2nd Detector	35	25	1.5
43—Power Amplifier	92	98	..
25Z5—Rectifier	..	..	98

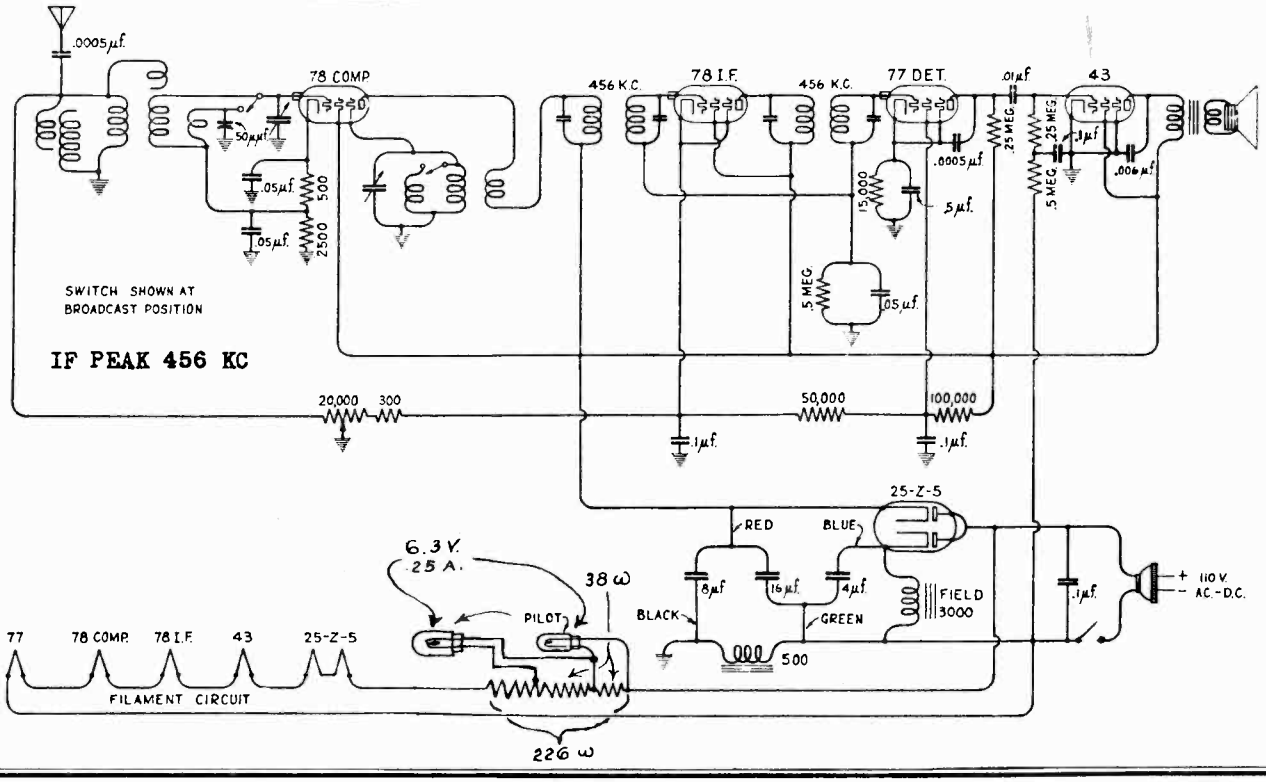
A.C.-D.C. . . 100-135 Volts . . 25-70 Cycles
Also Available for 220 Volts.

Broadcast	Short Wave
540—1500 Kilocycles	1500—3000 Kilocycles
550— 200 Meters	200— 100 Meters

Voltage across speaker field 100 volt.

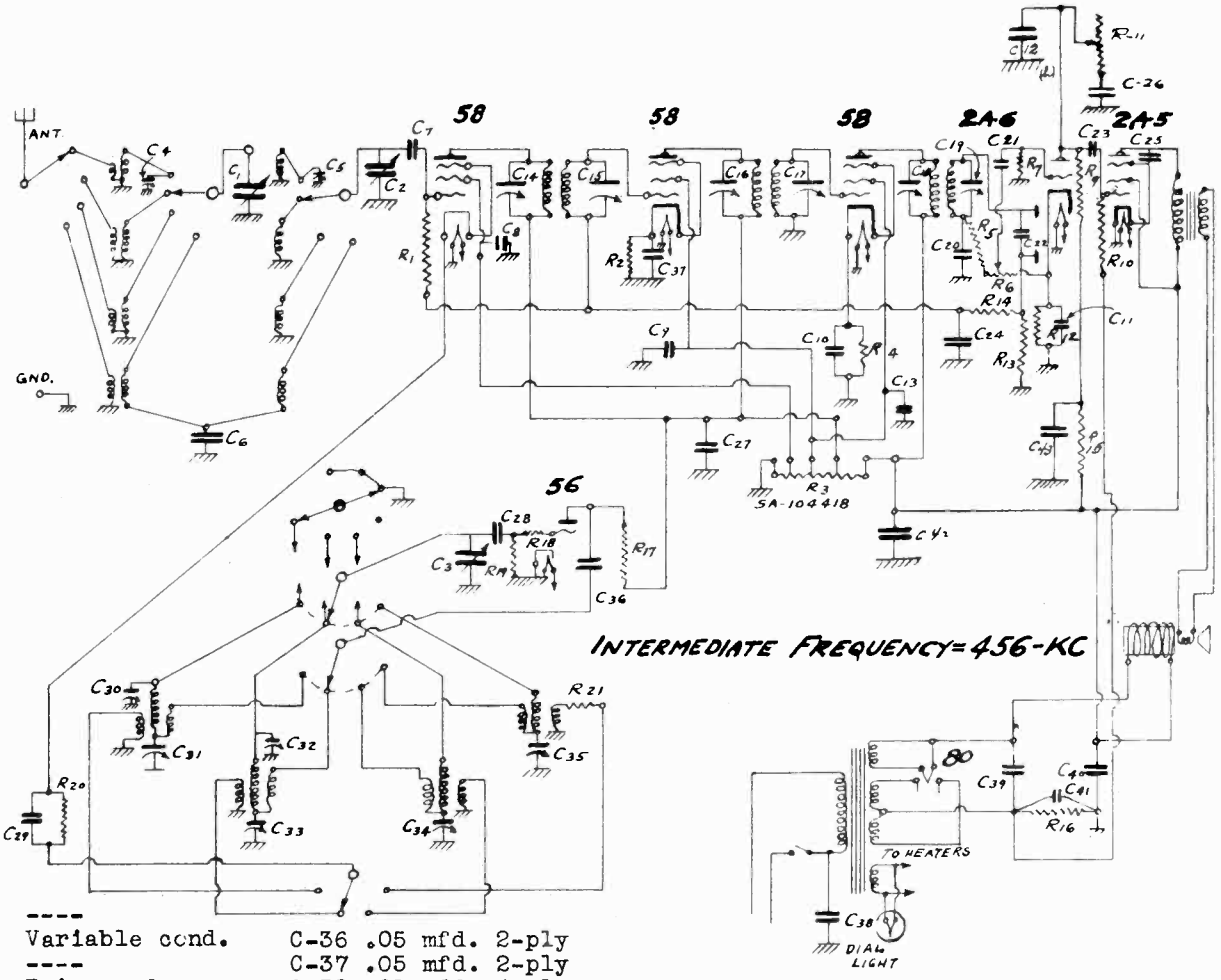
Bias for 43 tube is measured across filter choke and should be 15 to 18 volts.





WESTINGHOUSE ELEC. SUPPLY CO.

MODEL WR-23.WR-24
Schematic



C-1 ----
C-2 Variable cond.
C-3 ----
C-4 Trim condenser
C-5 Trim condenser
C-6 .05 mfd. 2-ply
C-7 100 mmf mica
C-8 .05 mfd. 2-ply
C-9 .05 mfd. 2-ply
C-10 .05 mfd. 2-ply
C-11 .5 mfd. 2-ply
C-12 .001 mica
C-13 .05 mfd. 2-ply
C-14 30 - 100 mmf mica
C-15 30 - 100 mmf mica
C-16 30 - 100 mmf mica
C-17 30 - 100 mmf mica
C-18 30 - 100 mmf mica
C-19 30 - 100 mmf mica
C-20 100 mmf mica
C-21 .005 mfd. 3-ply
C-22 100 mmf mica
C-23 .005 mfd. 3-ply
C-24 .05 mfd. 2-ply
C-25 .005 mfd. 3-ply
C-26 .01 3-ply
C-27 .05 mfd. 3-ply
C-28 100 mmf mica
C-29 .05 mfd. 2-ply
C-30 7 - 70 mmf
C-31 300 mmf variable
C-32 7 - 70 mmf
C-33 1200 mmf variable
C-34 2000 mmf variable
C-35 2000 mmf variable
C-36 .05 mfd. 2-ply
C-37 .05 mfd. 2-ply
C-38 .01 mfd. 4-ply
C-39 8 mfd. electro
C-40 4 mfd. electro
C-41 20 mfd. electro
C-42 .05 mfd. 3-ply
C-43 .1 mfd. 3-ply

R-1 1/2 meg. 1/4 watt
R-2 1000 ohms 1/4 watt
R-3 Multiple
R-4 1000 ohms 1/4 watt
R-5 50,000 ohms 1/4 watt
R-6 500,000 ohms vol.
R-7 1 meg. 1/4 watt
R-9 250,000 ohms 1/4 watt
R-10 250,000 ohms 1/4 watt
R-11 Variable
R-12 5000 ohms 1/4 watt
R-13 1 meg. 1/4 watt
R-14 1/2 meg. 1/4 watt
R-15 50,000 ohms 1/4 watt
R-16 400 ohms 1 watt
R-17 25,000 ohms 1/2 watt
R-18 50 ohms 1/2 watt
R-19 20,000 ohms 1/4 watt
R-20 2000 ohms 1/4 watt
R-21 200 ohms 1/4 watt

STANDARD RESISTOR COLOR CODE

BODY	TIP	DOT
0-BLACK	0-BLACK	.0-BLACK
1-BROWN	1-BROWN	0-BROWN
2-RED	2-RED	00-RED
3-ORANGE	3-ORANGE	000-ORANGE
4-YELLOW	4-YELLOW	0000-YELLOW
5-GREEN	5-GREEN	00000-GREEN
6-BLUE	6-BLUE	000000-BLUE
7-PURPLE	7-PURPLE	
8-GREY	8-GREY	
9-WHITE	9-WHITE	

SERVICE TECHNICAL DATA

SOCKET VOLTAGES

Stage	Tube	Fil.	Plate	Screen	Cathode	Grid
1st Det.	58	2.65	220	40	2.8	--
1st IF	58	2.65	220	95	2.0	--
2nd IF	58	2.65	240	95	2.7	--
Osc.	56	2.65	75	--	0	25
2nd Det.	2A6	2.65	90	--	1.4	--
Output	2A5	2.65	235	240	0	--
Rectifier	80	4.8	---	---	-	--

Bias on 2A5 (across 400 ohms) - 22 volts
Output of rectifier 360 volts

Line volts - 115
Power 60 watts

Note: These values are readings of a high resistance voltmeter from each socket terminal to ground, with the exception of the filament voltages. The values are only approximate and will vary with the line voltage and the type of meter employed.

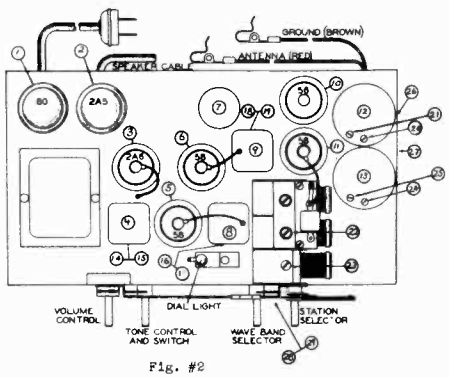


Fig. #2

#1 type 80 rectifier
#2 type 2A5 output pentode
#3 type 2A6 2nd det. A.V.C. and 1st A. F.
#4 3rd I. F. coil
#5 type 58 1. F. tube
#6 type 58 I. F. tube
#7 Filter condenser
#8 2nd I. F. coil
#9 1st I. F. coil
#10 type 56 osc. tube
#11 type 58 1st det. tube
#12 broadcast osc. coil
#13 2nd band osc. coil
#14 3rd I. F. trim cond.
#15 3rd I. F. trim cond.
#16 2nd I. F. trim cond.
#17 2nd I. F trim cond.
#18 #19 1st I. F. trim cond.
#20 Broadcast osc. trim cond.
#21 Broadcast osc. lag. cond.
#22 #23 Presector trim cond.
#24 2nd band trim. cond.
#25 2nd band lag. cond.
#26 3rd band lag. cond.
#27 4th band lag cond.
#28) 4th ban selector trim cond.
#29) underneath chassis

ALIGNING THE CHASSIS

To properly align the Model WR-23 and 24 chassis, it is essential to use a high grade modulated oscillator and a sensitive output meter. The R. F. signal fed into the receiver must be very weak or it will cause the A.V.C. to function making correct alignment impossible. The sensitivity of the output meter must be sufficient to give satisfactory reading with a low signal.

Before attempting to align a receiver, the service man should familiarize himself with the general layout of the chassis, the location of the tubes and the various alignment condensers. A top view of the chassis is shown in Fig. 2 and should be carefully studied before the actual work is started.

(A) ALIGNING THE I. F. (456 K. C.)

1. Set test oscillator to 456 K. C.
2. Connect test oscillator to grid of second I. F. tube #5 and adjust #14 and #15 to maximum output, reducing test oscillator as required.
3. Connect test oscillator to grid of first I. F. amplifier #9 and adjust #16 and #17 to maximum output.
4. Connect test oscillator to grid of first detector #11 and adjust #18 and #19 to maximum output.
5. Recheck the above four operations for accuracy.

(B) ALIGNING THE R. F.

1. Set test oscillator to 1500 KC and connect to grid of first detector #11. Place pointer of radio to 1.5 mark on dial. Adjust #20 until signal is tuned in. This adjusting screw is usually designated by a red color dot. Having obtained tune at this point set test oscillator to 600 KC and tune station selector to .6 mark on dial. Adjust #21 until the signal is tuned in. Now return to 1500 KC point with set and test oscillator and make the resetting of #20 to obtain accurate adjustment to scale reading.
2. Connect test oscillator to antenna lead, making sure the equivalent (200 mmf) is in the circuit.
3. Continue setting of 1500 KC. Adjust #22 and #23 for maximum output. Check sensitivity and calibration at several points on dial. Set should come correctly to kilocycle settings of important broadcasting stations.

(C) ALIGNING THE 2ND BAND

1. Set test oscillator to 3600 KC and indicator of radio at 3.6 mark on dial.
2. Adjust #24 until signal is tuned in. This trim condenser is usually marked with a red color dot. Set test oscillator at 1600 KC and tune set to 1.6 mark. Adjust #25 to maximum output. Return to 3600 KC and repeat adjustment. In adjusting the 3600 KC point it is possible to obtain two settings for different position of the trim condenser. This denotes merely the plus and minus frequency between oscillator and test oscillator which will give the correct I. F. frequency. The correct setting of the trim condenser is the one wherein the screw is turned furthest out. In any event, an incorrect setting will always be denoted by lack of sensitivity when the set and test oscillator are tuned to 2500 KC (mid-band).

(D) ALIGNING THE 3RD BAND

1. Set test oscillator to 8000 KC marking and tune receiver in region of 8.0 on dial scale. Note when signal is received. Next set test oscillator to 4000 KC setting and tune set to 4.0 on dial scale. Adjust #26 on right side of chassis until signal is heard.
2. Retune set and test oscillator to 8000 KC and observe pointer setting and sensitivity. Slight deviations from calibration can be compensated by manipulating the stiff wires connecting the oscillator coil to switch.

(E) ALIGNING THE 4TH BAND

1. Set test oscillator to 20,000 KC or if this is not available, then adjust to highest possible frequency, which preferably should be at least 15,000 KC. Tune set to this frequency and note where set oscillator is received on dial scale. Then place test oscillator on 10,000 KC and adjust #27 on right of chassis until test oscillator is tuned at 10. on dial scale. Now return both test oscillator and radio set to high frequency. Located underneath the base and adjacent to the switch and high frequency selector coils are two trim condensers #28 and #29 which are used for correct adjustment at this high frequency.

Increase setting of test oscillator until signal generator can be tuned in at two points on dial (say 20 and 19). Then with pointer of set at 20 adjust #28 and #29 for maximum output decreasing test signal as signal becomes better tuned. At correct adjustment a very loud signal will be obtained at 20 on dial while a feeble signal or none at all is observed at 19. This is a practical illustration of the effectiveness of preselection as outlined in the first part of this description.

SERVICE PARTS LIST

PART NUMBER	DESCRIPTION
	MAIN ASSEMBLIES
WR-07200	Chassis assembly
WR-07361	Cabinet assy. (Mod. WR-23)
WR-07364	Cabinet assy. (Mod. WR-24)
WR-05750	Speaker assembly (large)
WR-05575	Speaker assembly (small)
WR-06781	Power transformer
	COILS
WR-05695	1st and 2nd IF coil
WR-05696	3rd IF coil
WR-05684	Oscillator coil (black)
WR-05683	Oscillator coil (green)
WR-05689	Oscillator coil (red)
WR-05687	Oscillator coil (blue)
WR-05690	Preselector coil (black-antenna)
WR-05691	Preselector coil (black-input)
WR-05685	Preselector coil (green)
WR-05686	Preselector coil (red)
WR-05688	Preselector coil (blue)
WR-01868	Field coil
WR-02561	Output transformer
	CONDENSERS
WR-05705	Trimmer condenser
WR-02493	.05 mfd. 2-ply
WR-01143	100 mmf. mica
WR-02499	.5 mfd. 2-ply
WR-06403	.001 mfd. mica
WR-03659	.005 mfd. 3-ply
WR-06277	.01 mfd. 3-ply
WR-02492	.05 mfd. 3-ply
WR-05931	.01 mfd. 4-ply
WR-02494	.1 mfd. 3-ply
WR-06665	Filter condenser

MISCELLANEOUS PARTS

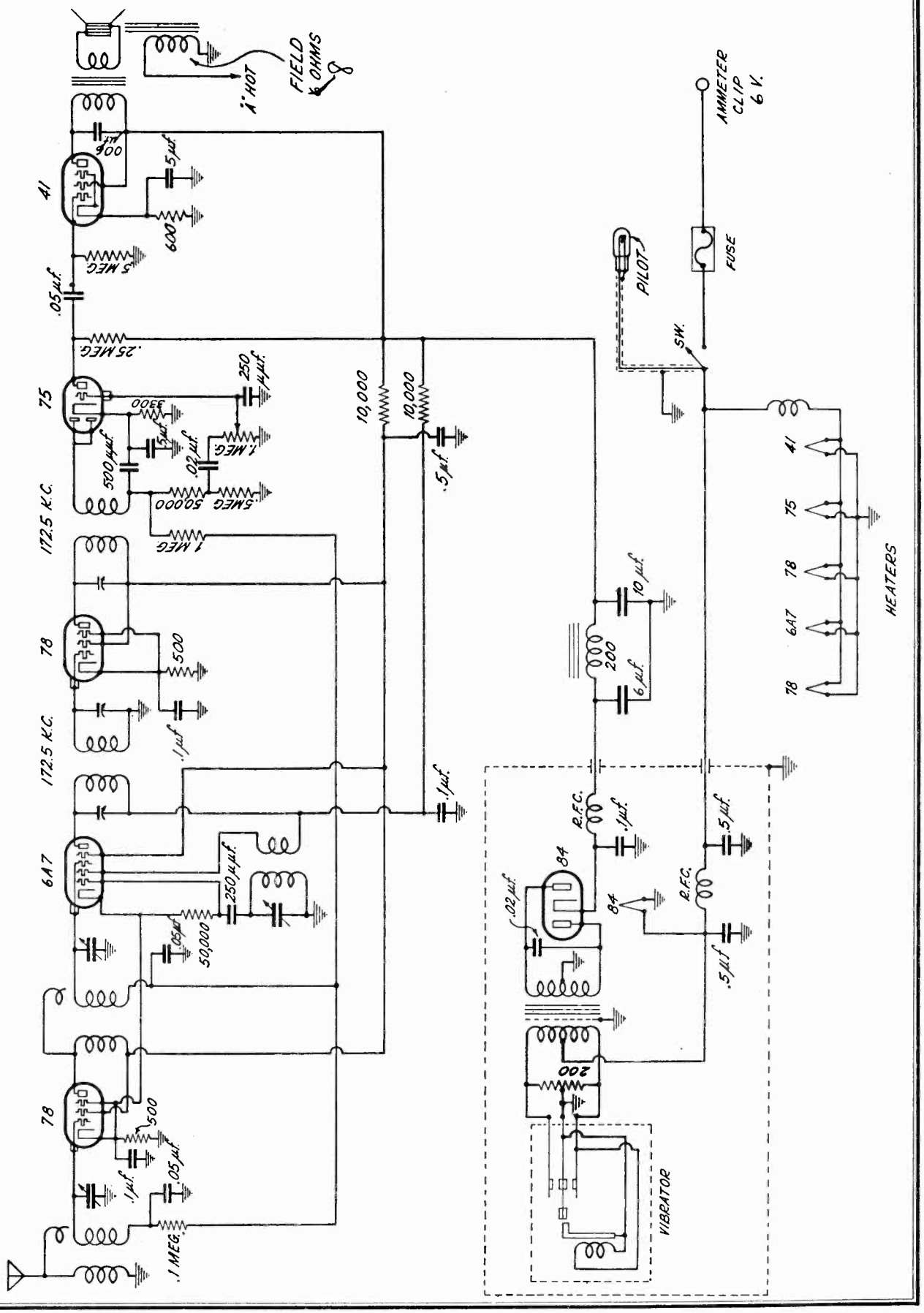
WR-02282	Diaphragm assembly (small)
WR-02283	Diaphragm assembly (large)
WR-98713	Dial lamp
WR-07195	Dial scale
WR-07136	Dial plate
WR-07228	Knobs
WR-05561	Tone control
WR-05562	Volume control
WR-05707	Wave change switch
WR-05118	Dial gear assembly
WR-07072	Variable cond. gang assembly
WR-03424	Long tube shield
WR-06355	Condenser drive disc assembly
WR-07062	Condenser drive arm assembly
WR-06364	Condenser drive spring
WR-06943	Condenser drive bracket assy.
WR-06946	Cond. drive gear and shaft assy.
WR-07066	Dial indicator link
WR-07063	Indicator
WR-07062	Lever assembly
WR-03199	Dial light bracket assembly
WR-01711	Line cable and plug

	RESISTORS
WR-05246	.5 meg. 1/4 W
WR-05267	10,000 1/4 W
WR-04418	Multiple
WR-05267	1000 1/4 W
WR-05276	50000 1/4 W
WR-05281	1 meg. 1/4 W
WR-05279	1/4 meg. 1/4 W
WR-05249	5000 1/4 W
WR-03062	400 1 W
WR-00197	25000 1/2 W
WR-00814	50 1/2 W
WR-05274	20000 1/4 W
WR-05245	2000 1/4 W
WR-05258	200 1/4 W

	SOCKETS
WR-03513	6-prong socket
WR-03686	4-prong socket
WR-03514	5-prong socket

WESTINGHOUSE ELEC. SUPPLY CO.

MODEL WR-25
Schematic



MODEL WR-25
Alignment
Voltage, Parts List

WESTINGHOUSE ELEC. SUPPLY CO.

ADJUSTMENTS

The receiver was carefully adjusted and tested by experts at the factory, and should reach the customer in perfect condition. Under no circumstances should these adjustments be disturbed unless it is absolutely necessary as in the repairing of a damaged set. This should be done by an experienced Auto Radio Service man only.

Intermediate Transformers

To align the intermediate frequency transformers, use a good modulated oscillator set for 172½ k.c. Set the volume control for maximum volume and turn the dial to a point where little or no signal is received; then ground the antenna.

Connect the oscillator output between the grid of the 6A7 tube and ground. Connect an output meter across the primary of the speaker transformer or across the voice coil. Using the smallest output from the test oscillator that will give a small reading on the meter, adjust the two I.F. transformers for the largest reading obtainable. Use a non-metallic screw driver if possible.

Radio Frequency and Oscillator

To align the R.F. and oscillator sections, couple the oscillator through a standard dummy antenna to the antenna lead and ground of the receiver. Set the test oscillator to some frequency between 1350-1450 k.c. Set the dial to the frequency selected. Adjust trimmers on the variable condenser beginning with the oscillator trimmer. Reduce the output of the test oscillator and repeat. In the absence of an oscillator, the R.F. sections may be aligned on broadcast.

Tune in a weak station between 1350 and 1450 k.c. and align as before. If an output meter is not available, adjust for maximum volume, then reduce the input and repeat.

Voltage Analysis:

Note: All "B" and "C" voltages should be measured on a high resistance voltmeter of 1000 ohms per volt or over.

The voltages are measured to ground from the points named. Ground the antenna to its shield when taking readings.

Battery volts—6. Volts across heaters—6 scant. Volts across speaker field—6 scant.

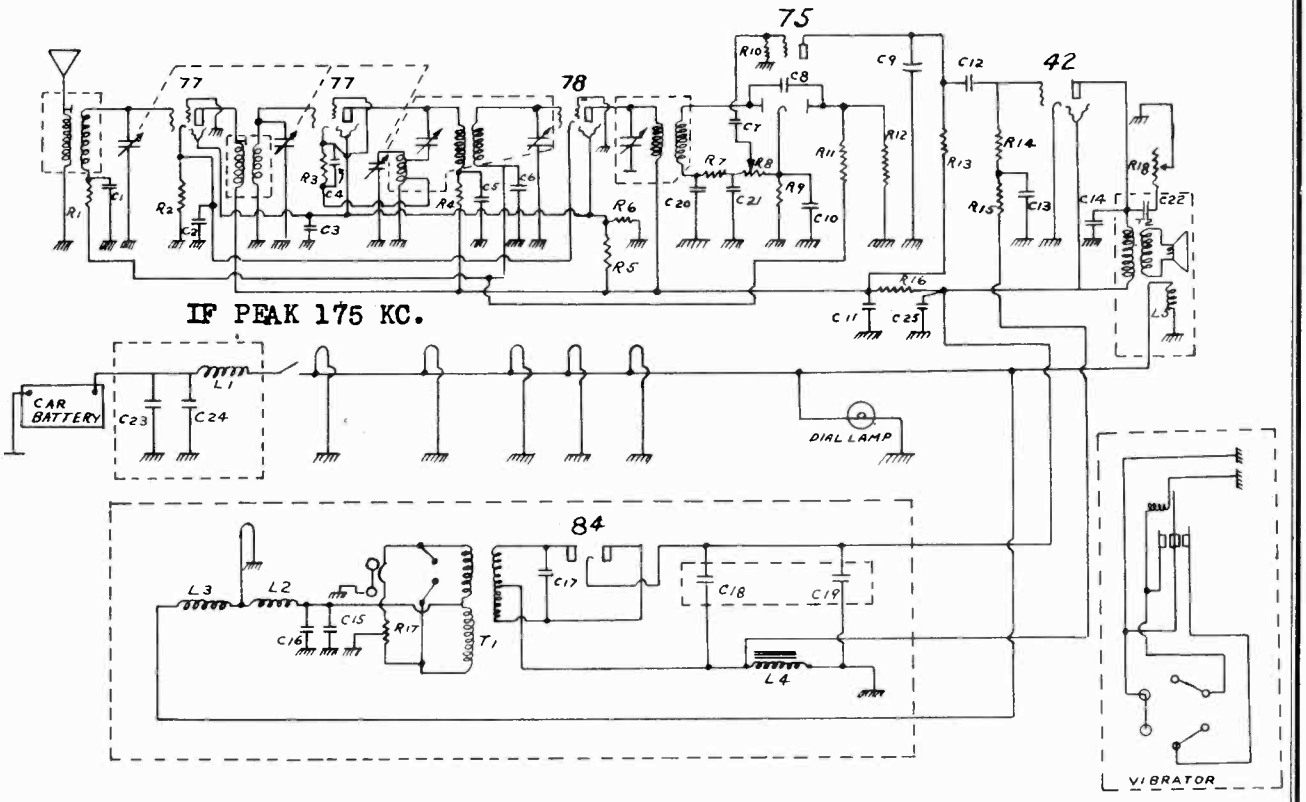
Tube	*Plate*	*Screen*	*Cathode*	*Suppressor*	*Osc. plate*
78	110	110	6	6	—
6A7	170	110	6	—	170
75	110	—	1.3	—	—
78	110	110	3.5	3.5	—
41	210	220	15	—	—

Part No.	*Description*
ZT-92	Antenna Coil
ZT-93	Interstage Coil
ZT-94	Composite I.F. and Oscillator Coil
ZT-95	Output I.F. Coil
ZT-99	Power Transformer
ZT-96	"B" Filter Choke
NT-53	"B" R.F. Choke
ZT-98-A	"A" R.F. Choke, multiple layer
ZC-123	Filter Condenser, 10 x 6 mfd.
IC-43	5 Mfd. Electrolytic Condenser
EC-19	.5 Mfd. Tubular Condenser
ZR-104	10,000 Ohm 2 Watt Wire Wound Resistor
	Any Carbon Resistor
	Any Mica Condenser
	Any Socket
KL-6	Pilot Light Bulb
WR-92	Volume control, complete with switch
ZV-3	Vibrator
ZS-66	Speaker
NZ-54	Spark Plug Suppressor
NZ-54-A	Distributor Suppressor
NZ-55	Generator Condenser

MODEL WR-26
Schematic
Voltage

WESTINGHOUSE ELEC. SUPPLY CO.

SERVICE INSTRUCTIONS
WESTINGHOUSE MOTOR CAR RADIO
MODEL WR-26



ELECTRICAL VALUES

C1	.05 mfd. 2 ply	C14	.005 mfd. 3 ply	R1	100,000 ohms 1/4 W.	R14	250,000 ohms 1/4 W.
C2	.25 mfd. 2 ply	C15	.5 mfd. 2 ply	R2	500 ohms 1/4 W.	R15	250,000 ohms 1/4 W.
C3	.25 mfd 2 ply	C16	.5 mfd. 2 ply	R3	7500 ohms 1/4 W.	R16	4,000 ohms 1 W.
C4	.002 mfd. 4 ply	C17	.02 mfd. 4 ply	R4	2000 ohms 1/4 W.	R17	200 Center tapped
C5	.05 mfd. 3 ply	C18	6. mfd.	R5	40,000 ohms 1/4 W.	R18	1/2 meg. Tone Control
C6	.05 mfd. 2 ply	C19	10. mfd.	R6	75,000 ohms 1/4 W.	T1	Power Trans.
C7	.005 mfd. 3 ply	C20	10 mmfd. mica	R7	50,000 ohms 1/4 W.	T2	Output Trans.
C8	100 mmfd. mica	C21	100mmfd. mica	R8	1/2 meg. Vol. Control	L1	Filter Choke
C9	.002 mfd. 4 ply	C22	.05 mfd. 3 ply	R9	5000 ohms 1/4 W.	L2	Filter Choke
C10	.5 mfd. 2 ply	C23	.001 mica	R10	1 meg. 1/4 W.	L3	Filter Choke
C12	.005 mfd. 3 ply	C24	.5 mfd. 2 ply	R12	1/2 meg. 1/4 W.	L4	Power Choke
C13	.1 mfd. 2 ply	C25	.001 mica	R13	100,000 ohms 1/4 W.	L5	Field Coil

MODEL WR-26 SOCKET VOLTAGES
(Car Battery 6 Volts Under Load)

Tube	Use	Fil.	Plate	Screen	Cathode	Bias
77	RF	5.3	179	79	2.9	
77	Det. Osc.	5.3	178	79	4.3 to 8.4	
78	IF	5.3	179	79	2.9	
75	2nd Det. AVC	5.3	113			
42	AF	5.3	201	217	1.2	13.0

The above readings were taken from ground or metal of chassis to socket terminals and will vary slightly with different types of voltmeters used.

MODEL WR-26
Socket, Parts List

WESTINGHOUSE ELEC. SUPPLY CO.

Alignment Data

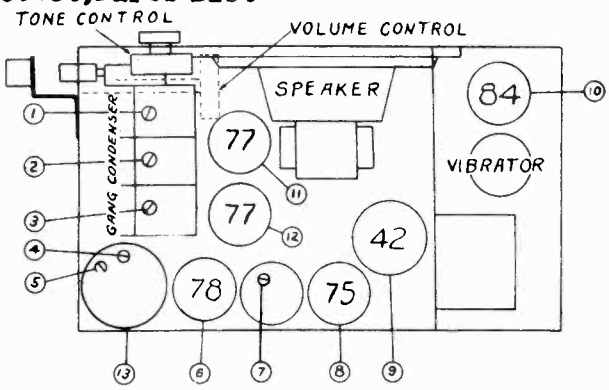


Fig. #2

#1 RF Trimmer Condenser
#2 1st Det. Trimmer Cond.
#3 Osc. Trimmer Condenser
#4) 1st IF Trimmer Cond.
#5)
#6 IF Amplifier
#7 2nd IF Trimmer Cond.
#8 2nd Det. AVC & AF Amplifier
#9 Power Output
#10 Rectifier
#11 RF Amplifier
#12 Det. and Osc.
#13 1st IF & Osc.Coil

All of the adjustable condensers commonly called trimmer condensers, are very accurately adjusted at the factory and will not need any further adjustments unless a coil or I. F. transformer is changed or the adjustments have been tampered with in the field. Therefore, DO NOT attempt to change the setting of any of the trimmer condensers unless it is definitely known that adjustment is necessary, and a high-grade test oscillator and output meter is available, then proceed as follows:

1. Connect output meter across voice coil of speaker.
2. Set volume control on full.
3. Set tone control to bass position.
4. Connect dial light.

(A) I. F. Adjustment

1. Connect a .1 mfd. condenser in series with antenna lead of test oscillator.
2. Set test oscillator to 175 K. C.
3. Connect test oscillator to grid of 1st I. F. tube #6 (see Fig. #2) and adjust #7 to maximum output.
4. Connect test oscillator to grid of 1st Det. #12 and adjust condensers #4 and 5 to maximum output.
5. Repeat the above adjustments for accuracy.

(B) Oscillator Adjustment

1 Set test oscillator to 1500 K. C.
2. Connect test oscillator leads to grid of 1st Det. #12.
3. Set gang condenser to 1500 K. C. as follows:
   (a) Open gang to fullest extent.
   (b) Close slowly to the thickness of a thin cardboard strip or approximately .015".
4. Peak oscillator condenser #3 on end of gang.

(C) R. F. Adjustment

1. Set test oscillator to 1400 K. C.
2. Change antenna condenser in oscillator lead from .1 mfd. to .0002 mfd., and connect test oscillator to antenna lead of set.
3. Set condenser gang at 1400 K. C.
4. Peak condensers #1 and 2 on gang.
5. Do not touch oscillator trimmer #3 at 1400 K. C. setting of gang.

SERVICE PARTS LIST WR-26 MOTOR CAR RADIO

RESISTORS

	Ohms	Body	Tip	Dot
WR-05277	75,000	Purple	Green	Orange
WR-05251	40,000	Yellow	Black	Orange
WR-05245	2,000	Red	Black	Red
WR-05247	7,500	Purple	Green	Red
WR-05279	250,000	Red	Green	Yellow
WR-05249	5,000	Green	Black	Green
WR-05281	1 meg.	Brown	Black	Green
WR-05278	100,000	Brown	Black	Yellow
WR-05276	50,000	Green	Black	Orange
WR-05246	500,000	Green	Black	Yellow
WR-05264	500	Green	Black	Brown
WR-06531	4,000	Yellow	Black	Red
WR-06527	Resistor strip assembly			
WR-06537	Mid tap resistor			

CONDENSERS

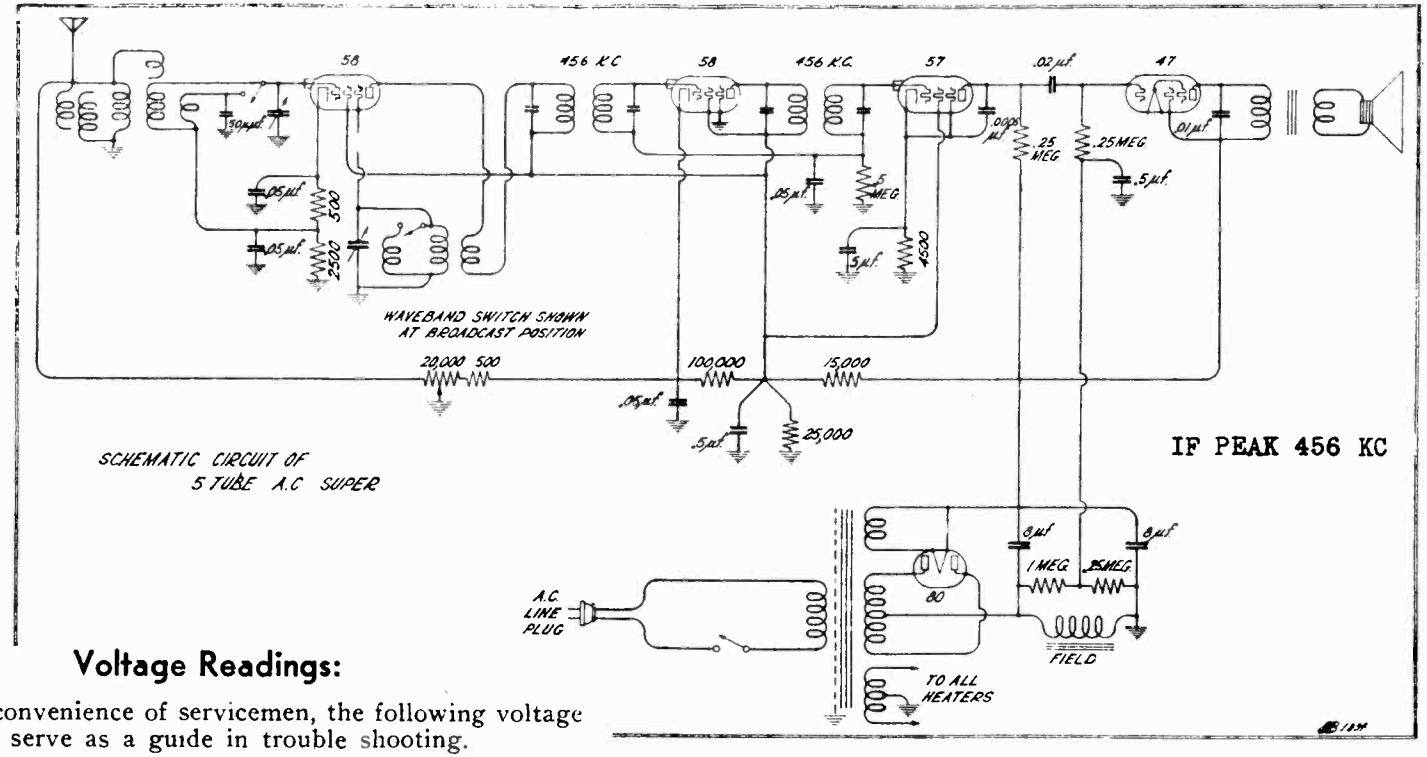
Part No.	Description of Parts
WR-06558	Electrolytic cond.-power pack.
WR-06680	Variable condenser assembly...
WR-06536	Condenser- power pack base ...
WR-06526	Condenser assembly block .....
WR-06560	Condenser in can .....
WR-06600	Condenser & choke assembly ...
WR-02493	Condenser .05 - 2 ply .....
WR-06417	Condenser .0001 mfd. mica ....
WR-99650	Condenser .001 mfd. mica .....
WR-03659	Condenser .005 - 3 ply .....
WR-03852	Condenser .002 4 ply .....
WR-02497	Condenser .25 2 ply .....
WR-02499	Condenser .5 2 ply .....
WR-02496	Condenser .25 3 ply .....
WR-02495	Condenser .1 2 ply .....
WR-03775	Condenser .001 mica .....
WR-02492	Condenser .05 3 ply- speaker .
WR-06560	Condenser- power pack base ...
WR-03864	Condenser .002 4 ply .....
WR-03660	Condenser .005 3 ply .....
WR-02303	Condenser .05 3 ply .....
WR-02508	Condenser .1 3 ply .....
WR-01883	Condenser .25 2 ply .....
WR-02322	Condenser .5 2 ply .....
WR-02386	Condenser .25 3 ply .....

COILS

WR-05824	Choke coil- power pack .....
WR-05452	R.F. choke coil - power pack..
WR-06523	Oscillator coil assembly .....
WR-04580	I. F. coil assembly-chassis ..
WR-06519	Antenna coil assembly .....
WR-06518	R.F. coil assembly .....
WR-06713	Speaker field coil .....

TRANSFORMERS

WR-06535	Transformer- power pack .....
WR-06618	Output transformer .....
WR-07053	Iron core filter choke .....



SCHEMATIC CIRCUIT OF 5 TUBE A.C. SUPER

Voltage Readings:

For the convenience of servicemen, the following voltage readings will serve as a guide in trouble shooting.

Readings are to be taken with all the tubes in their places, volume control turned on full and antenna wire grounded to chassis.

The D.C. Voltmeter used should be 1000 ohms per volt, or over. Line volts 117 A.C.

	Fil.	Ground to Plate	Ground to Screen	Ground to Cathode	Ground to Suppressor
58 Osc. 1st Det.	2.4 A.C.	80 D.C.	80 D.C.	2. D.C.	.....
58 Osc. I. F. Amplifier	2.4 A.C.	80 D.C.	80 D.C.	11. D.C.	.....
57 2nd Det.	2.4 A.C.	75 D.C.	80 D.C.	4.5 D.C.	4.5 D.C.
47 Output	2.4 A.C.	245 D.C.	255 D.C.	.....	.....
80 Rectifier	5 0				

Voltage across speaker field, 90.

Above voltages were taken with a high resistance voltmeter of 1000 ohms per volt and may vary somewhat with different sets and with the resistance of the voltmeter.

FIVE-TUBE BROADCAST AND SHORT-WAVE SUPERHETERODYNE

110-120 Volts . . A.C. . . 60 Cycles

Broadcast	Short Wave
540—1500 Kilocycles	1500—3000 Kilocycles
550— 200 Meters	200— 100 Meters

MODEL WR-27
Schematic
Voltage

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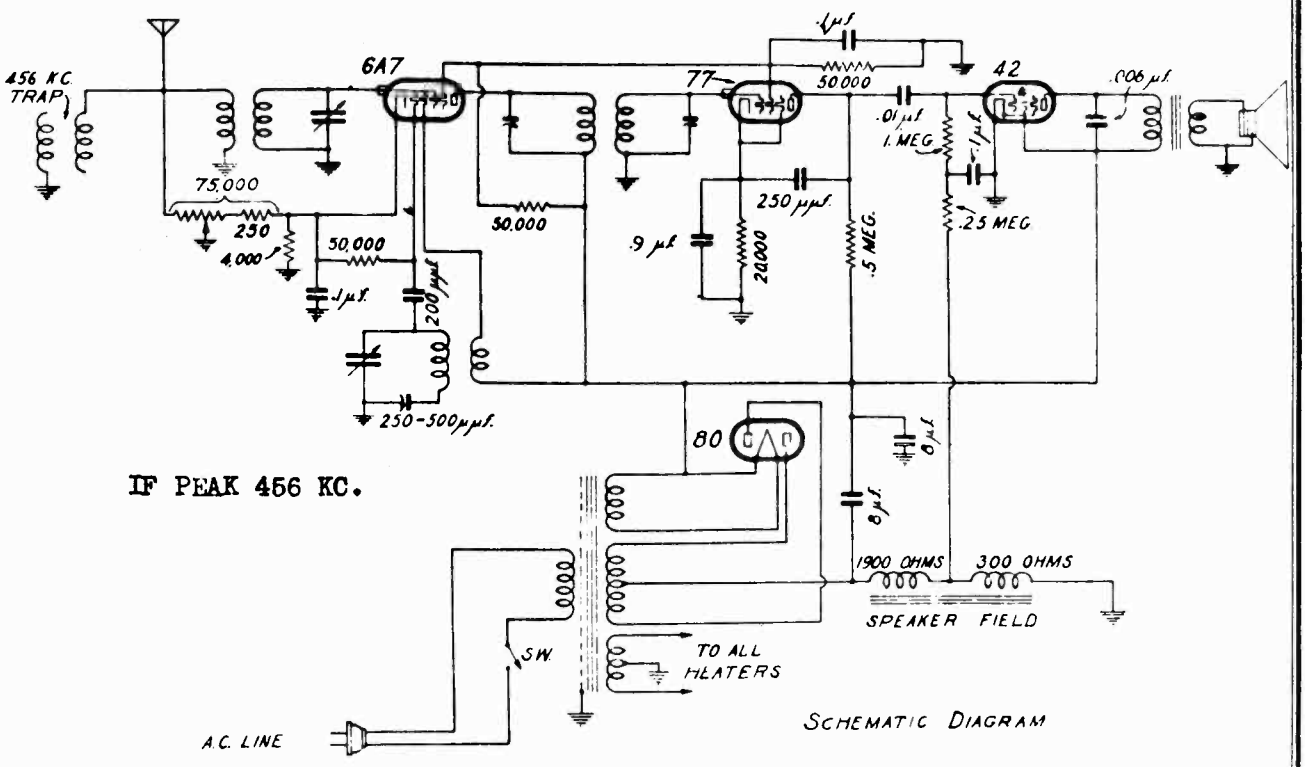


VOLTAGE READINGS

Readings of voltages should be taken with the Volume Control turned on fully (all the way to the right). D-C, measurements must be read with a high resistance voltmeter (1000 ohms per volt) and an A-C. voltmeter must be used on the a-c. circuit readings.

The d-c. voltages are measured from the points indicated to ground.

TUBE	PLATE	ANODE GRID	CONTROL GRID	SCREEN GRID	SUPPR. GRID	CATHODE
6A7	214	214	-	62	-	2
77	70	-	-	62	4	4
42	194	-	-13*	215	-	-
80	-	-	-	-	-	-

* Measured from ground to tap on speaker field winding

Voltage across field, 100 volts d-c.
Voltage across '80 filament, 5 volts a-c.
Voltage across all other heaters or filaments, 6.2 volts a-c.
The above voltages, with minor variations, should be obtained with an a-c. line input of 117.5 volts.

WESTINGHOUSE ELEC. SUPPLY CO.

MODEL WR-28,WR-29
Voltage, Socket
Alignment Data

SERVICE TECHNICAL DATA

SOCKET VOLTAGES

Stage	Tube	Filament	Plate	Screen	Cathode
Rectifier	80	4.85	382		
Power Output	42	6.1	234	245	18
2nd Detector	75	6.1	126		0.87
1st I.F.	6D6	6.1	245	99	5.6
2nd I.F.	6D6	6.1	245	96	5.6
Oscillator	6A7	6.1	236-136	87	4.7

Note: These values are readings of a high resistance voltmeter from each socket terminal to ground, with the exception of the filament voltages. The values are only approximate and will vary with the line voltage and the type of meter employed. Line voltage - 112.

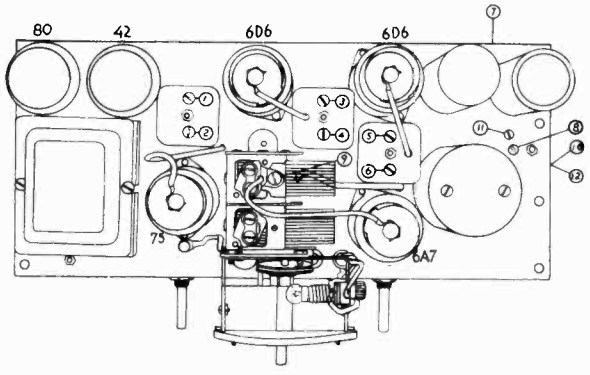


Figure #1

#1 I. F. trimmer condenser
#2 I. F. trimmer condenser
#3 I. F. trimmer condenser
#4 I. F. trimmer condenser
#5 I. F. trimmer condenser
#6 I. F. trimmer condenser
#7 Wave trap tuning condenser
#8 B. B. oscillator trim condenser
#9 Selector trim condenser
#10 B. B. oscillator lag. condenser -top screw
#11 S. W. B. oscillator trim condenser
#12 S. W. B. oscillator lag. condenser (bottom screw)

CIRCUIT DESCRIPTION

The Models WR-28-29 are six tube, dual wave-band receivers, designed to operate over the frequency ranges from 1570 to 540 kilocycles and 15,500 to 5,700 kilocycles. The circuits comprise an R. F. selector circuit, a combination first detector oscillator, two stages of intermediate frequency amplification (456 KC) with double tuned circuits coupling each stage, a combination second detector, A.V.C. and first audio stage, a power output stage and a rectifier tube.

The wave change switch serves to change the electrical circuits to the wave band desired and in addition operates to illuminate the particular dial scale in use.

ALIGNING THE CHASSIS

To properly align the Models WR-28-29 chassis, it is essential to use a high grade modulated oscillator and a sensitive output meter. The R. F. signal fed into the receiver must be very weak or it will cause the A. V. C. to function making correct alignment impossible. The sensitivity of the output meter must be sufficient to give satisfactory reading with a low signal.

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

A- I. F. ADJUSTMENT

1. Set test oscillator to 456 K. C.

2. Connect A. C. voltmeter (output meter) across voice coil of speaker.

3. Connect test oscillator to grid of 2nd I.F. tube (6D6 in rear of condenser gang) and frame of chassis.

4. Adjust #1 and #2 to maximum output on output meter.

5. Connect test oscillator to grid of 1st I.F. tube (6D6 - rear right hand tube).

6. Adjust #3 and #4 to maximum output.

7. Connect test oscillator to grid of 1st detector (6A7).

8. Adjust #5 and #6 to maximum output.

This completes the I. F. adjustment.

B - R. F. ADJUSTMENT
(Broadcast Band)

1. Connect test oscillator to antenna and ground leads. Set wave change switch to broadcast band position as indicated by the dial light. Set station selector to 540 K. C.

2. With test oscillator still adjusted to 456 K. C., increase signal strength of test oscillator until signal is heard in loud speaker.

3. Adjust #7 (through small hole in right hand rear panel of chassis) until signal disappears or goes through a null. If signal disappears, increase signal output from test oscillator and readjust #7 until a definite minimum is obtained. The purpose of this adjustment is to correctly adjust a wave trap installed to block direct transmission of 456 K. C. (usually ship telegraph signals) from antenna to first detector.

4. Set test oscillator and station selector to 1400 K. C.

MODEL WR-28,WR-29
Schematic
Alignment,Part 2

WESTINGHOUSE ELEC. SUPPLY CO.

5. Adjust #8 to maximum output.

6. Adjust #9 to maximum output.

7. Set test oscillator and station selector to 600 K. C.

8. Adjust #10 to maximum output (top screw)

9. Set test oscillator and station selector to 1400 K. C. and readjust #8 and #9 for correct calibration.

C - R. F. ADJUSTMENT
(Short Wave Band)

1. Set wave change switch to short wave band position.

2. Set test oscillator and station selector to 15,000 K. C.

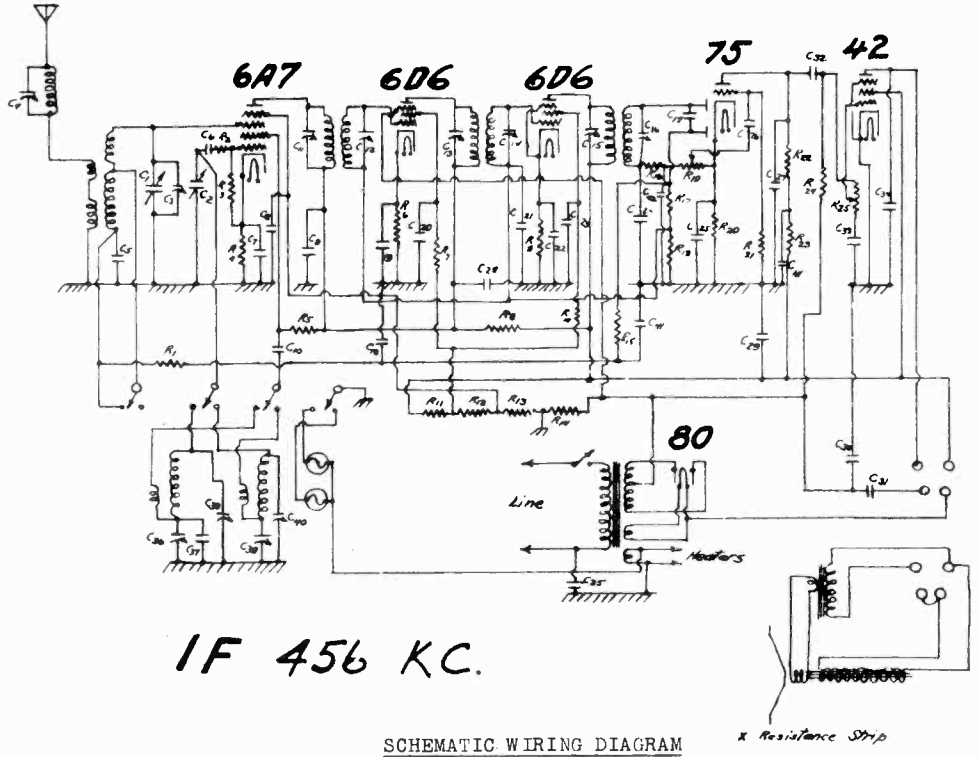
3. Adjust #11 until signal is tuned in.

4. Adjust R. F. trimmer condenser (mounted underneath chassis on R. F. coil) to maximum output.

5. Set test oscillator and station selector to 6000 K. C.

6. Adjust #12 to maximum output (bottom screw)

7. Set test oscillator and station selector to 15,000 K. C. and readjust #11 and R. F. trimmer underneath chassis for correct calibration. This completes the lining up process.



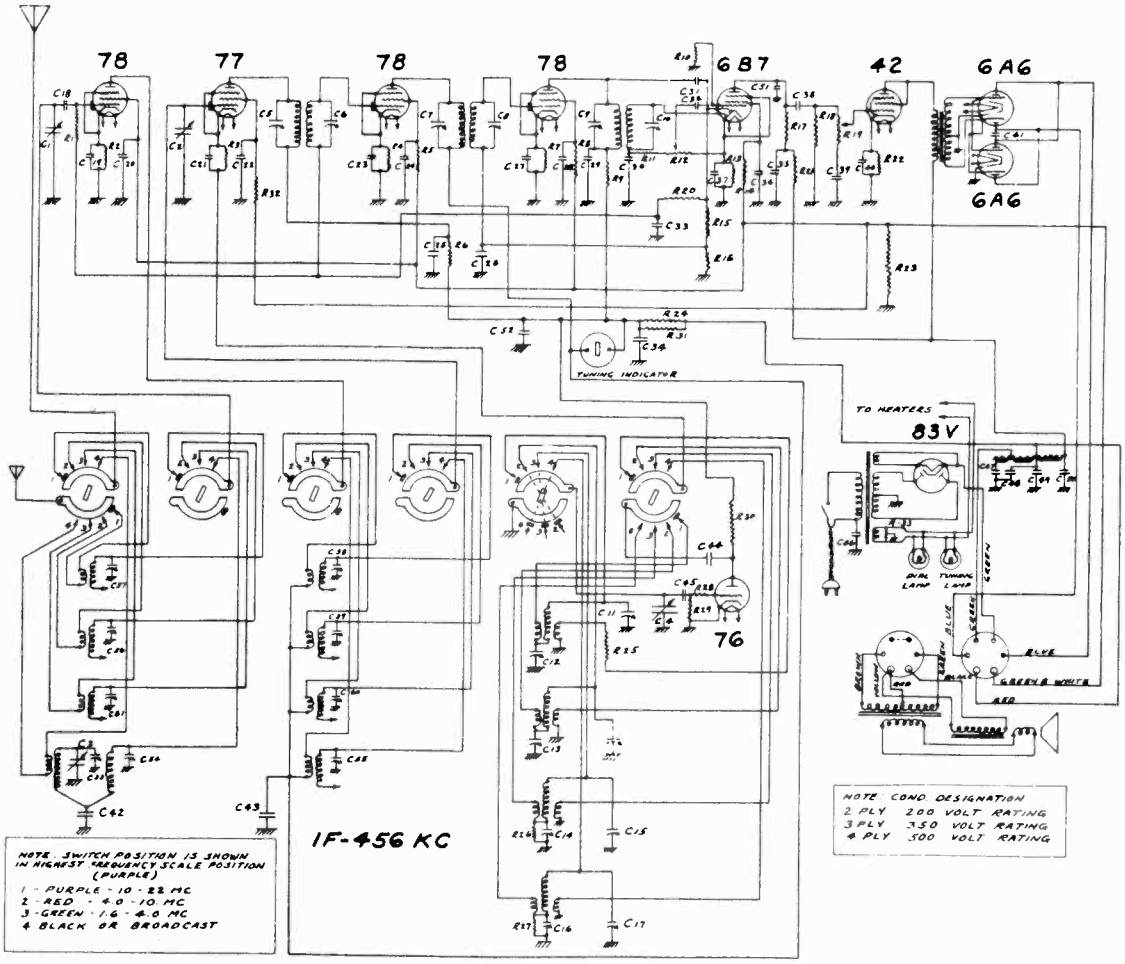
SCHEMATIC WIRING DIAGRAM

ELECTRICAL VALUES

C-1 Var. gang with trimmer
C-2 Var. gang with trimmer
C-3 Var. gang with trimmer
C-4 600 mmf. variable
C-5 .05 mf - 2 ply
C-6 .0001 mica
C-7 .05 - 2 ply
C-8 .05 - 2 ply
C-9 .05 - 3 ply
C-10 .02 - 3 ply
C-11 I.F. coil
C-12 I.F. coil
C-13 I.F. coil
C-14 I.F. coil
C-15 I.F. coil
C-16 I.F. coil
C-17 .0001 mica
C-18 .05 - 2 ply
C-19 .05 - 2 ply
C-20 .05 - 2 ply
C-22 .05 - 2 ply
C-23 .05 - 2 ply
C-24 .0001 mica
C-25 .5 - 2 ply
C-26 .005 - 3 ply
C-27 .001 - 4 ply
C-28 8 - electrolytic
C-29 4 - electrolytic
C-30 20- electrolytic
C-31 8 - electrolytic
C-32 .005 - 3 ply
C-33 .001 - 4 ply
C-34 .01 - 4 ply
C-35 .01 - 4 ply
C-36 425 mmf. variable
C-37 1500 mmf. mica
C-38 Trimmer condenser
C-39 425 mmf. variable
C-40 Trimmer condenser
C-41 .05 - 3 ply
C-42 .0001 - mica
C-43 .05 - 3 ply
C-44 4-40 mmf. variable
R-1 .1 meg. 1/4 watt
R-2 50 ohms 1/4 watt
R-3 50,000 ohms 1/4 watt
R-4 500 ohms 1/4 watt
R-5 20,000 ohms 1/2 watt
R-6 1,000 ohms 1/4 watt
R-7 5,000 ohms 1/4 watt
R-8 1,000 ohms 1/4 watt
R-9 1,000 ohms 1/4 watt
R-10 5,000 ohms 1/4 watt
R-11 11,200 ohms
R-12 1,800 ohms
R-13 12,000 ohms
R-14 300 ohms
R-15 1 meg - 1/4 watt
R-16 50,000 ohms - 1/4 watt
R-17 1 meg - 1/4 watt
R-19 .5 meg. variable
R-20 2,000 ohms 1/4 watt
R-21 1 meg. 1/4 watt
R-22 75,000 ohms - 1/4 watt
R-23 50,000 ohms - 1/4 watt
R-24 .25 meg. 1/4 watt
R-25 .25 meg. variable

WESTINGHOUSE ELEC. SUPPLY CO.

MODEL WR-30
Schematic



SCHEMATIC WIRING DIAGRAM

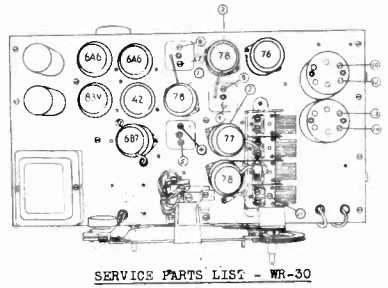
ELECTRICAL VALUES

C-1 Variable condenser
C-2 Variable condenser
C-3 Variable condenser
C-4 Variable condenser
C-5 I.F. coil
C-6 I.F. coil
C-7 I.F. coil
C-8 I.F. coil
C-9 I.F. coil
C-10 I.F. coil
C-11 7-70 mmf.
C-12 1000-2000 mmf.
C-13 500-1000 mmf.
C-14 400-800 mmf.
C-15 3-40 mmf.
C-16 270-600 mmf.
C-17 7-70 mmf.
C-18 100 mmf. mica
C-19 .05 - 2 ply
C-20 .05 - 2 ply
C-21 .05 - 2 ply
C-22 .05 - 2 ply
C-23 .05 - 2 ply
C-24 .05 - 3 ply
C-25 .005 - 3 ply
C-26 .05 - 2 ply
C-27 .05 - 2 ply
C-28 .05 - 3 ply
C-29 .005 - 3 ply
C-30 100 mmf. mica
C-31 100 mmf. mica
C-32 .005 - 3 ply
C-33 .05 - 2 ply
C-34 4 mfd. electrolytic
C-35 4 mfd. electrolytic
C-36 .5 - 2 ply
C-37 .5 - 2 ply
C-38 .005 - 3 ply
C-39 .001 - 4 ply
C-40 20 mfd. 25 V.
C-41 .005 - 3 ply
C-42 .05 - 2 ply
C-43 .02 - 3 ply
C-44 .02 - 3 ply
C-45 100 mmf. mica
C-46 .01 - 4 ply
C-47 8 mfd. electrolytic
C-48 4 mfd. electrolytic
C-49 4 mfd. electrolytic
C-50 8 mfd. electrolytic
C-51 .001 - 4 ply
C-52 .1 - 3 ply
C-53 Variable condenser gang
C-54 4-25 mmf.
C-55 4-25 mmf.
C-56 4-25 mmf.
C-57 7-70 mmf.
C-58 7-70 mmf.
C-59 4-25 mmf.
C-60 4-25 mmf.
C-61 4-25 mmf.
R-1 1/2 meg. 1/4 watt
R-2 300 ohms 1/4 watt
R-3 5,000 ohms 1/4 watt
R-4 1,000 ohms 1/4 watt
R-5 5,000 ohms 1/4 watt
R-6 1,000 ohms 1/4 watt
R-7 1,000 ohms 1/4 watt
R-8 5,000 ohms 1/4 watt
R-9 1,000 ohms 1/4 watt
R-10 1 meg. 1/4 watt
R-11 50,000 ohms 1/4 watt
R-12 1/2 meg. volume control
R-13 2,000 ohms 1/4 watt
R-14 50,000 ohms 1/4 watt
R-15 1 meg. 1/4 watt
R-16 250,000 ohms 1/4 watt
R-17 50,000 ohms 1/4 watt
R-18 250,000 ohms 1/4 watt
R-19 1/4 meg. tone control
R-20 1 meg. 1/4 watt
R-21 100,000 ohms 1/4 watt
R-22 2,500 ohms 1/2 watt
R-23 1,800 ohms 30 watt
R-24 5,000 ohms 1 watt
R-25 100 ohms 1/4 watt
R-26 5,000 ohms 1/4 watt
R-27 2,000 ohms 1/4 watt
R-28 50 ohms 1/4 watt
R-29 20,000 ohms 1/4 watt
R-30 20,000 ohms 1 watt
R-31 5,000 ohms 1 watt
R-32 5,000 ohms 1/4 watt
R-33 Mid tap resistor

SERVICE TECHNICAL DATA

Stage	Tube	Filament	Plate	Screen	Cathode
Rectifier	83V	5.0			340
Audio power output	6A6	6.0	305		
Audio power output	6A6	6.0	305		
Audio driver	42	6.0	280	280	30
2nd Det., AVC, 1st audio	6B7	6.0	12	55	3.8
I.F. amplifier	78	6.0	240	100	4.5
I.F. amplifier	78	6.0	230	100	4.5
R.F. amplifier	78	6.0	240	100	2.5
1st Detector	77	6.0	240	100	4.5
Oscillator	76	6.0	95		

Note: These values are readings of a high resistance voltmeter from each socket terminal to ground, with the exception of the filament voltages. The values are only approximate and will vary with the line voltage and the type of meter employed. Line voltage - 115.



#1 2nd I.F. tube
#2 1st I.F. tube
#3 1st detector tube
#4 I.F. trimmer condenser
#5 I.F. trimmer condenser
#6 I.F. trimmer condenser
#7 I.F. trimmer condenser
#8 I.F. trimmer condenser
#9 I.F. trimmer condenser
#10 B.B. oscillator trim. condenser (Red code)
#11 B.B. preselector trim. condenser
#12 B.B. oscillator lag. condenser
#13 2nd band oscillator trim. condenser (Green code)
#14 2nd band oscillator lag. condenser

SERVICE PARTS LIST - WR-30

Part No.	Description
	MAIN ASSEMBLIES
WR-07685	Chassis assembly
WR-07594	Speaker
WR-07698	Cabinet
	COILS
WR-07494	I.F. coil assembly #1
WR-07495	I.F. coil assembly #2
WR-07496	I.F. coil assembly #3
WR-07504	Choke coil assembly
WR-03554	Choke coil assembly
WR-07481	Oscillator coil assembly (Broadcast)
WR-07482	Oscillator coil assembly (Green band)
WR-07483	Oscillator coil assembly (Red band)
WR-07484	Oscillator coil assembly (Blue band)
	CONDENSERS
WR-07682	Variable condenser assembly
WR-07510	Condenser assembly - electrolytic
WR-07516	Condenser assembly - electrolytic
WR-07530	Trimmer condenser assembly
WR-03800	Trimmer condenser assembly
WR-07529	Trimmer condenser assembly
WR-07615	Condenser assembly - buffer
WR-06386	Condenser .05 - 2 ply
WR-02499	Condenser .05 - 2 ply
WR-06417	Condenser .0001 mica
WR-06403	Condenser .01 - 3 ply
WR-03659	Condenser .005 - 2 ply
WR-02504	Condenser .02 - 3 ply
WR-02494	Condenser .1 - 3 ply

RESISTOR

	Ohms	Body	Tip	Dot
WR-07508	Resistor strip assembly			
WR-07509	Resistor strip assembly			
WR-05278	10,000	Brown	Black	Orange
WR-05276	50,000	Green	Black	Orange
WR-05267	1,000	Black	Black	Red
WR-05249	5,000	Green	Black	Red
WR-05281	1 meg.	Brown	Black	Green
WR-05245	2,000	Red	Black	Red
WR-07572	5,000	Green	Black	Red
WR-05260	300	Orange	Black	Brown
WR-07614	100	Brown	Black	Brown
WR-05277	20,000	Red	Black	Orange
WR-02345	20,000	Red	Black	Orange
WR-07726	50	Green	Black	Black
WR-01423	2,500	Red	Green	Red
WR-05279	250,000	Red	Green	Yellow

	TUBE SOCKETS & TUBE SHIELD
WR-03514	Tube socket - 5 prong
WR-03513	Tube socket - 6 prong
WR-05694	Tube socket - 7 prong
WR-03686	Tube socket - 4 prong
WR-03424	Tube shield - long
WR-03257	Tube shield - short
WR-05624	Tube socket - 7 prong
	MISCELLANEOUS PARTS
WR-07105	Power transformer
WR-07584	Tone control
WR-07585	Volume control
WR-07506	Switch assembly (wave change)
WR-07708	Dial lamp bracket assembly
WR-05809	Dial lamp
WR-07640	Knob - tone control switch
WR-07643	Knob - large for variable condenser
WR-07641	Knob - small for variable condenser
WR-07642	Knob - volume control
WR-05952	Antenna cable assembly
WR-01711	Cable assembly - line
WR-07564	Input transformer
WR-07583	Resistance
WR-07636	Dial scale assembly
WR-07630	Indicator dial scale
WR-07627	Guide - dial scale
WR-07136	Dial plate
WR-07647	Indicator plate
WR-07683	Tuning indicator

A - ALIGNING THE I.F. (456 KC)

1. Set test oscillator to 456 KC.

2. Connect output meter across voice coil of speaker.

3. Connect test oscillator to grid of 2nd I.F. tube (#1).

4. Adjust #4 and #5 to maximum output as indicated on output meter.

5. Connect test oscillator to grid of 1st I. F. tube (#2).

6. Adjust #6 and #7 to maximum output.

7. Connect test oscillator to grid of 1st detector tube (#3).

8. Adjust #8 and #9 to maximum output.

B - ADJUSTMENT OF BROADCAST OR 1st BAND

Note: Because of set sensitivity it is difficult to make an accurate R.F. adjustment unless the set sensitivity is reduced. This is easily accomplished by cutting out the amplification of an I. F. stage. To do this, remove grid clip on tube #1, and connect to this tube the grid clip previously connected to tube #2. Remove tube #2 from its socket.

1. Set test oscillator and station selector to 1400 KC.

2. Connect test oscillator to grid of 1st detector tube (#3).

3. Adjust #10 (Red color coded) until signal is tuned in.

4. Connect test oscillator to antenna and ground leads of chassis.

5. Adjust #11 and the two alignment condensers underneath the chassis located directly in front of the small shield containers housing the broadcast selector coils, until signal is correctly tuned in.

6. Set test oscillator and station selector to 600 KC.

7. Adjust #12 to maximum output.

8. Return to 1400 KC setting and readjust #10 for correct calibration.

C - ADJUSTMENT OF 2nd BAND

1. Adjust wave change switch to 2nd band position and set station selector to 3600 KC.

2. Set test oscillator to 3600 KC.

3. Adjust #13 (Green color coded) until signal is tuned in.

4. Adjust trim condensers, located underneath chassis and mounted on the small coils at the extreme right end, to maximum output.

5. Set test oscillator and station selector to 1800 KC.

6. Rotate #14 until signal is at maximum.

7. Return test oscillator and station selector to 3600 KC setting and readjust #13 for correct calibration.

D - ADJUSTMENT OF 3rd BAND

1. Set wave change switch to 3rd band position and set test oscillator and station selector to 9000 KC. On bottom of chassis fastened to the back plate is the 3rd band oscillator coil in its shield container. This coil is directly in back of the wave change switch. A Green wire twisted around a Green and White wire will be noticed. This twist serves to make the slight adjustment necessary to bring this band to correct calibration. If set is not on calibration, an increase or decrease of the twist will serve to readjust the calibration. This adjustment will serve for about one-half a scale division either way. If set is initially off more than this, it indicates a serious fault in the oscillator circuit such as poor or incorrect connections, open resistor, defective oscillator tube or other major fault.

Assuming that the correction can be made, the set is now placed on its proper marking and adjustment is made of the preselector trim condensers for this wave band. These condensers are two in number and are mounted integral with the preselector coils. The coils are part of the main switch assembly and are located between the 2nd band (furthest left or under side) and the highest frequency selector coils which are located under the isolantite trim condensers.

2. Adjust test oscillator and station selector to 5000 KC setting.

3. Adjust 3rd band lagging condenser to maximum output. This condenser is located on the back plate to the right of the 3rd band oscillator coil mentioned above.

4. Return to 9000 KC setting and check the previous setting.

E - ADJUSTMENT OF 4th BAND

1. Set wave change switch to the 4th band position and adjust test oscillator and station selector to 20,000 KC.

2. Adjust oscillator trim condenser (lower left hand unit on back of chassis) for maximum output.

3. Then adjust trim condensers for further maximum output. These condensers are two isolantite base units mounted integral with the switch assembly.

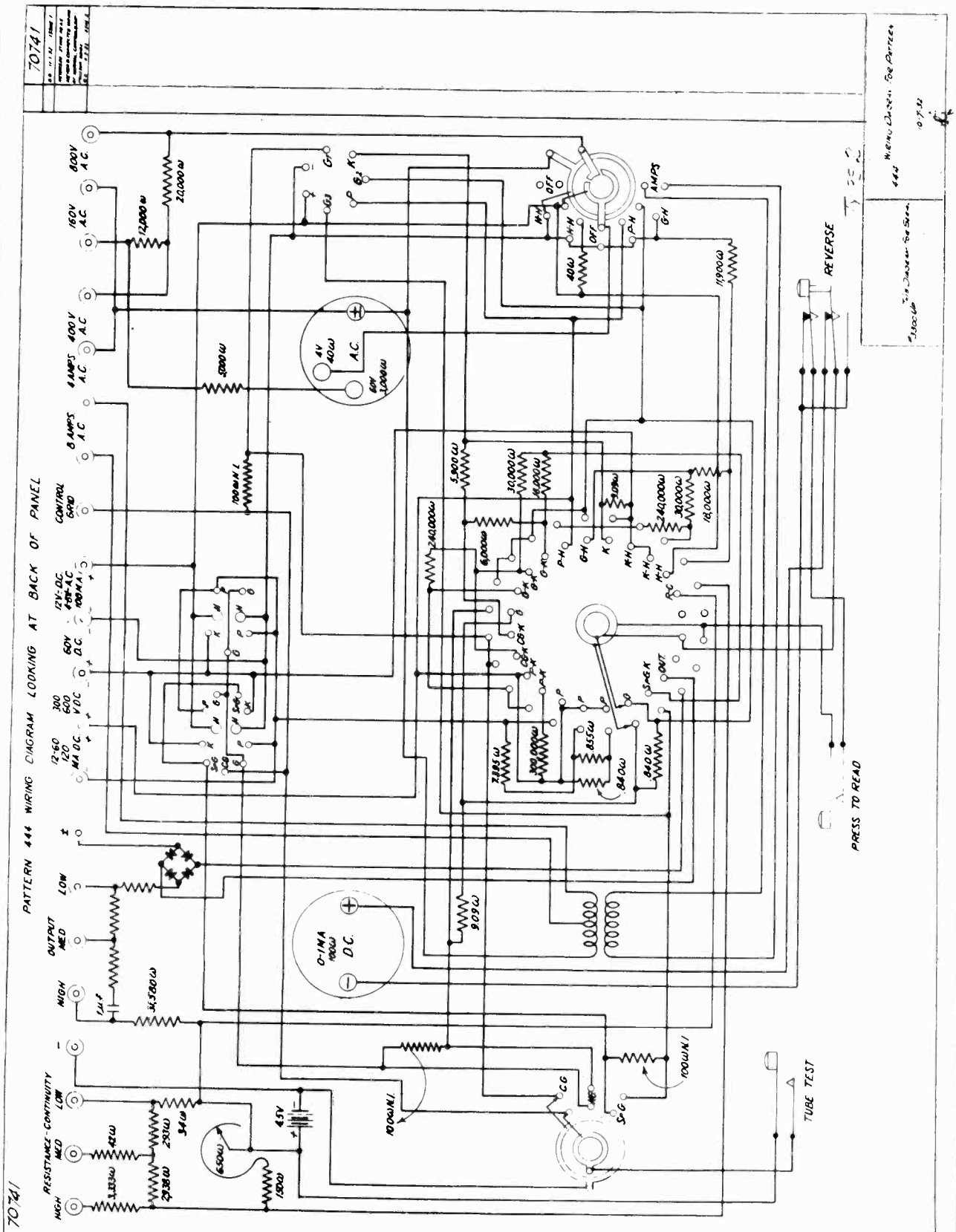
4. Set test oscillator and station selector to 12,000 KC.

5. Adjust oscillator lag condenser (upper left hand corner of rear plate) until signal is tuned in.

6. Return test oscillator and station selector to 30,000 KC and check setting.

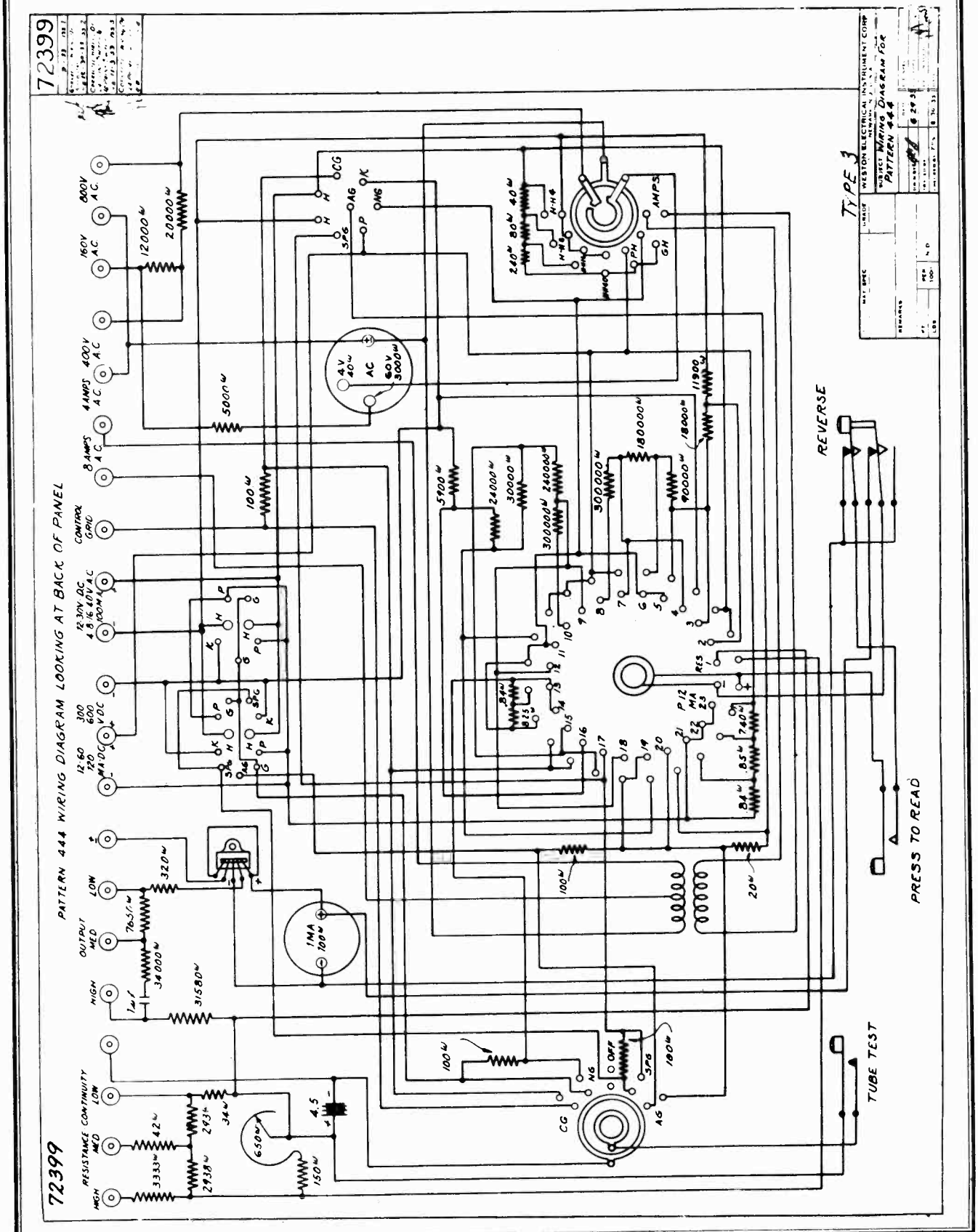
WESTON ELECTRICAL INSTRUM'T CORP.

MODEL 444
Type 2
Schematic



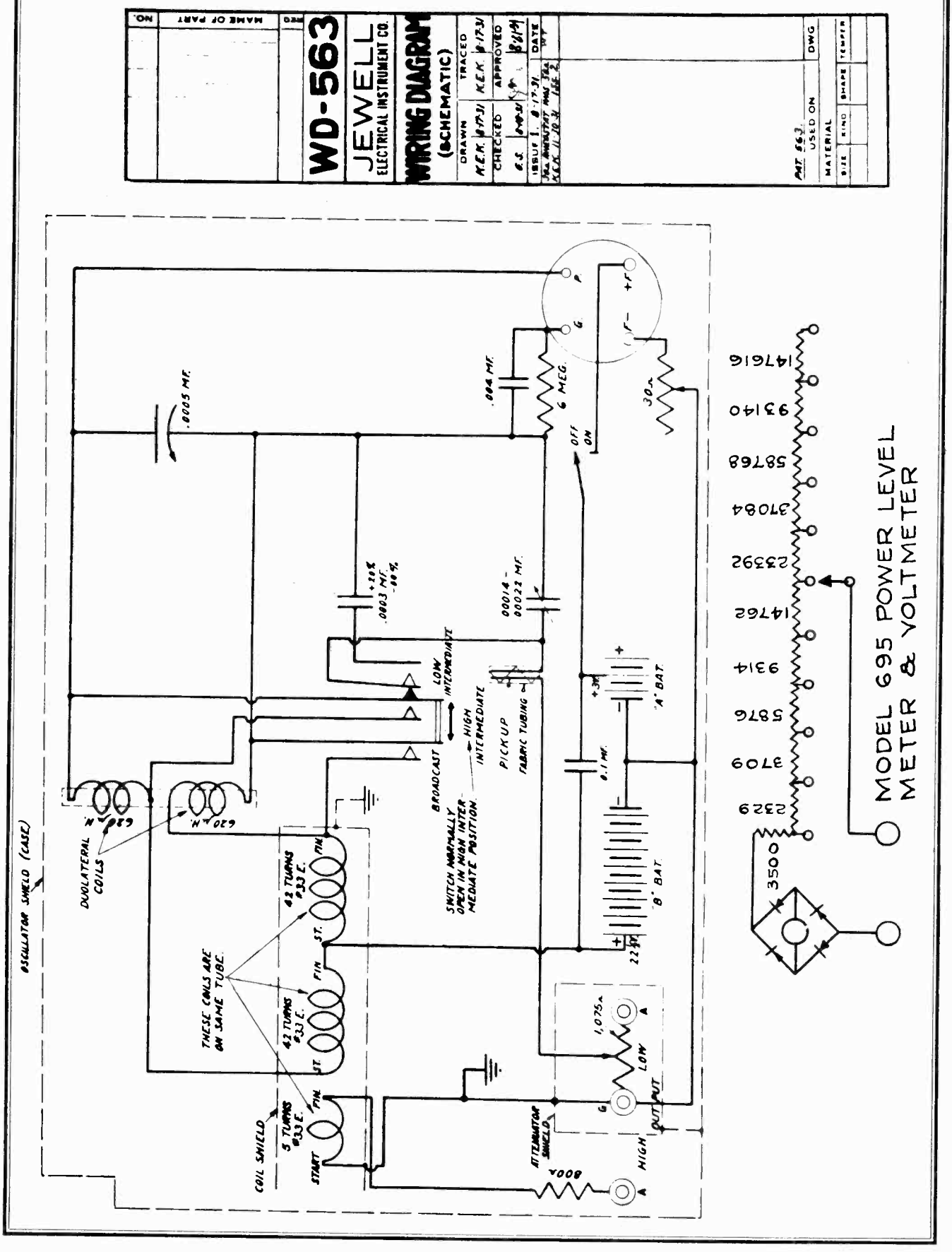
MODEL 444
Type 3
Schematic

WESTON ELECTRICAL INSTRUM'T CORP.



WESTON ELECTRICAL INSTRUM'T CORP.

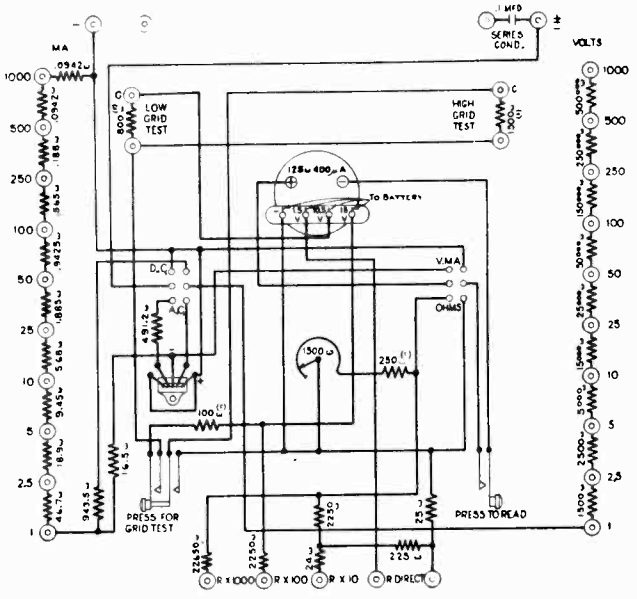
MODEL 563 (Type 2)
MODEL 695
Schematics

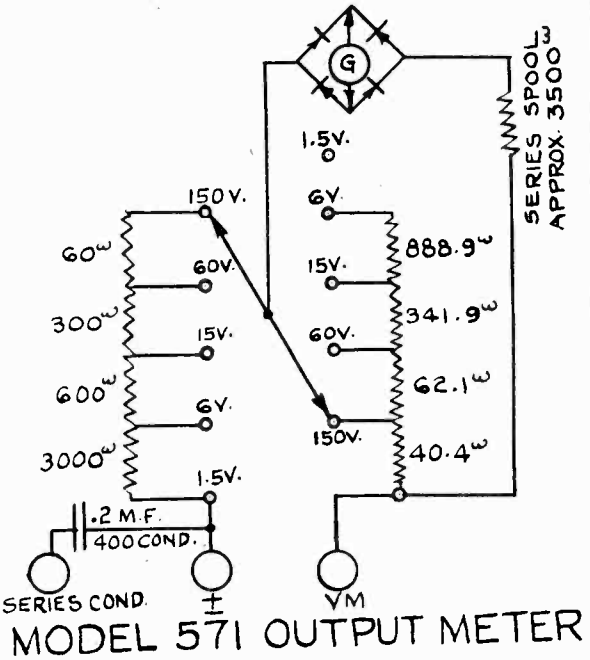


MODEL 571
MODEL 665
Schematics

WESTON ELECTRICAL INSTRUMENT CORP.

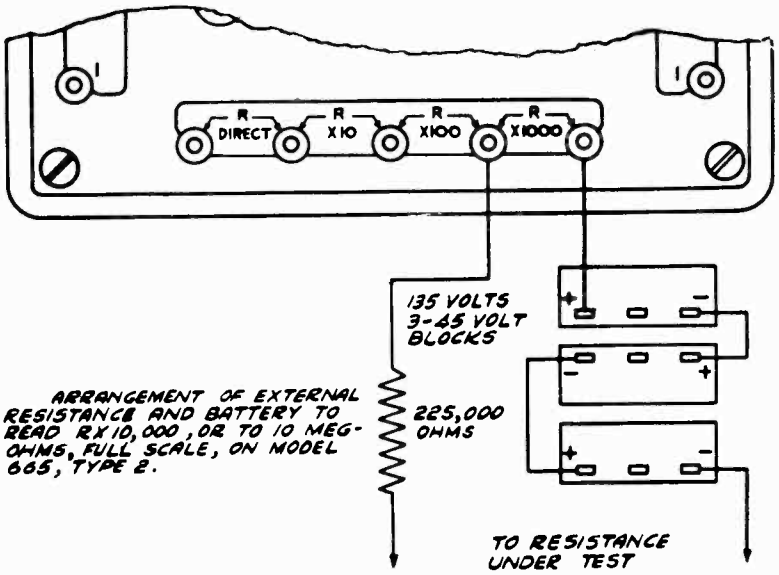
INTERNAL CONNECTION DIAGRAM
OF
MODEL 665 TYPE 2 SELECTIVE ANALYZER





MODEL 571 OUTPUT METER

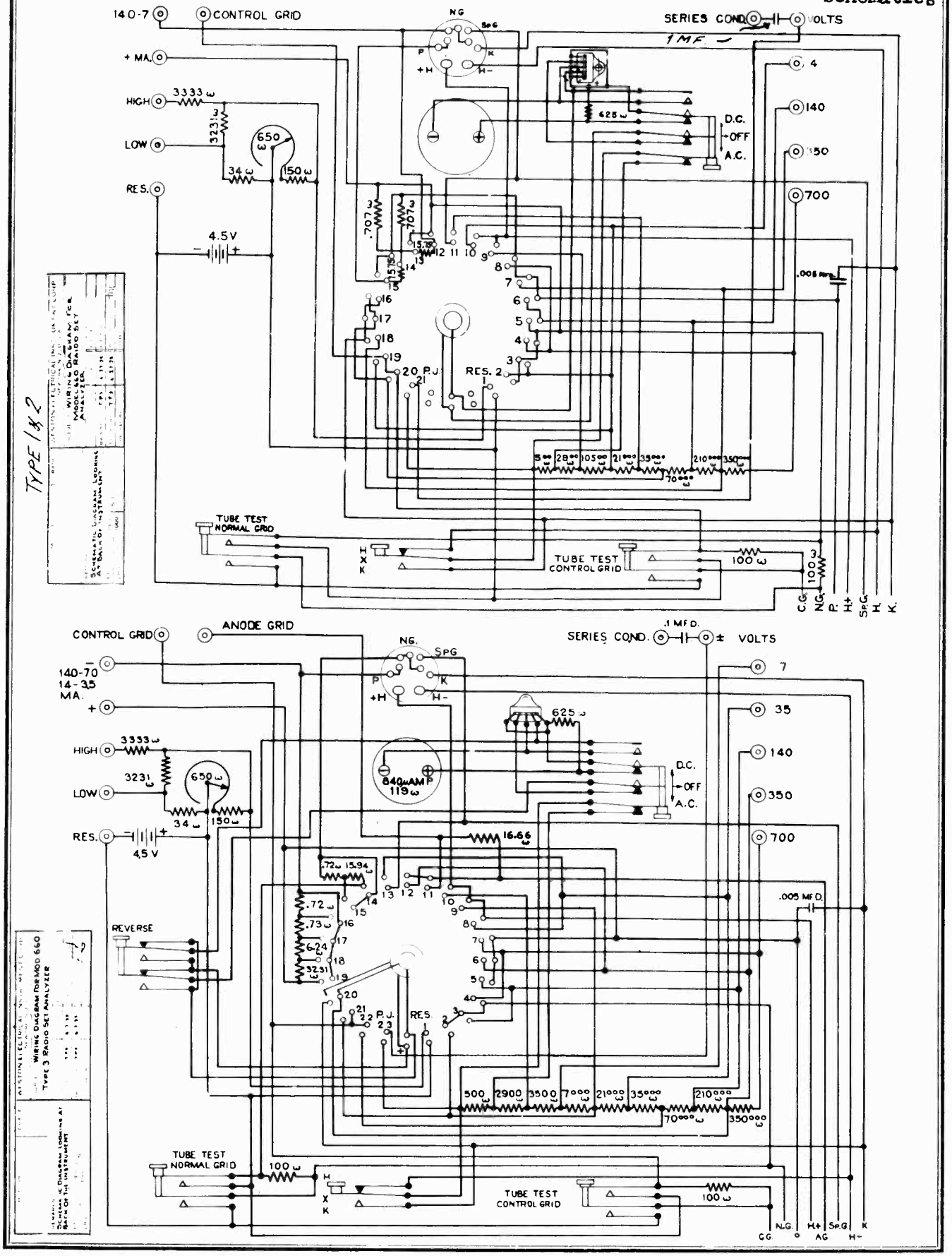
PROCEDURE FOR INCREASING RESISTANCE RANGE TO 10 MEGOHMS



ARRANGEMENT OF EXTERNAL RESISTANCE AND BATTERY TO READ RX10,000, OR TO 10 MEGOHMS, FULL SCALE, ON MODEL 665, TYPE 2.

WESTON ELECTRICAL INSTRUM'T CORP.

MODEL 660
Type 3
Schematics

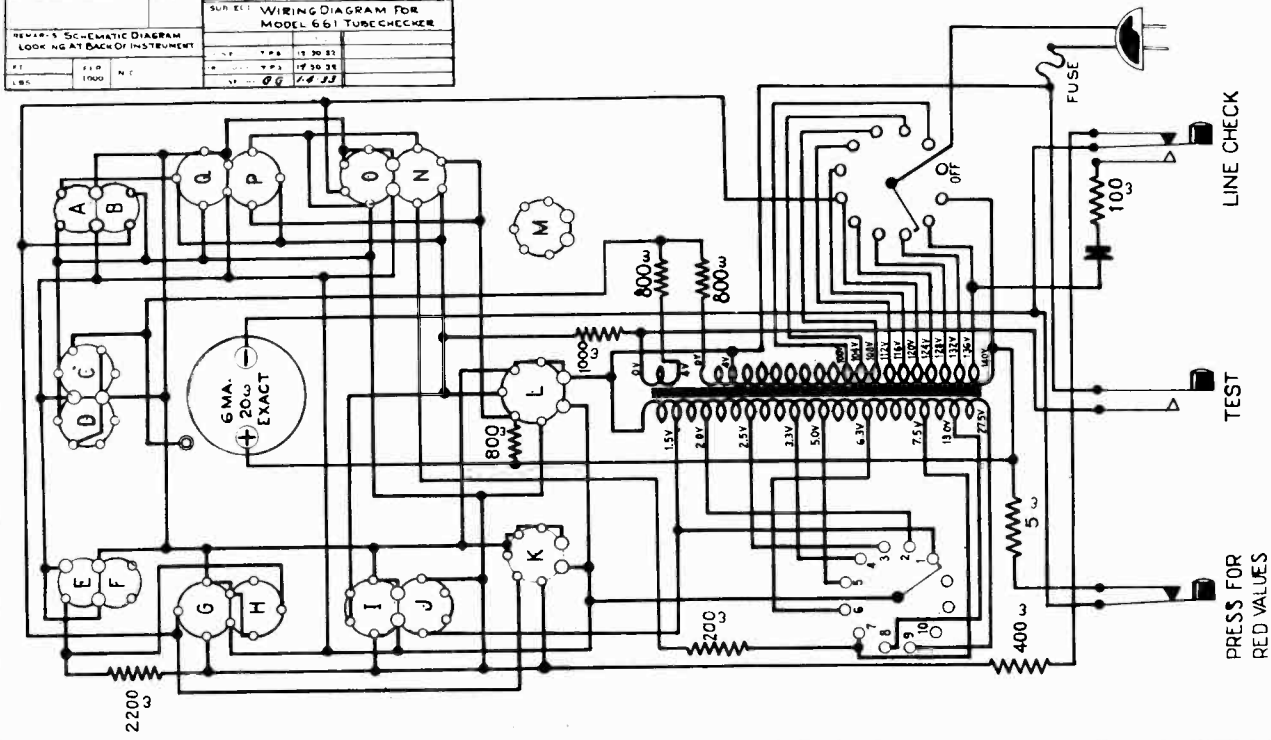


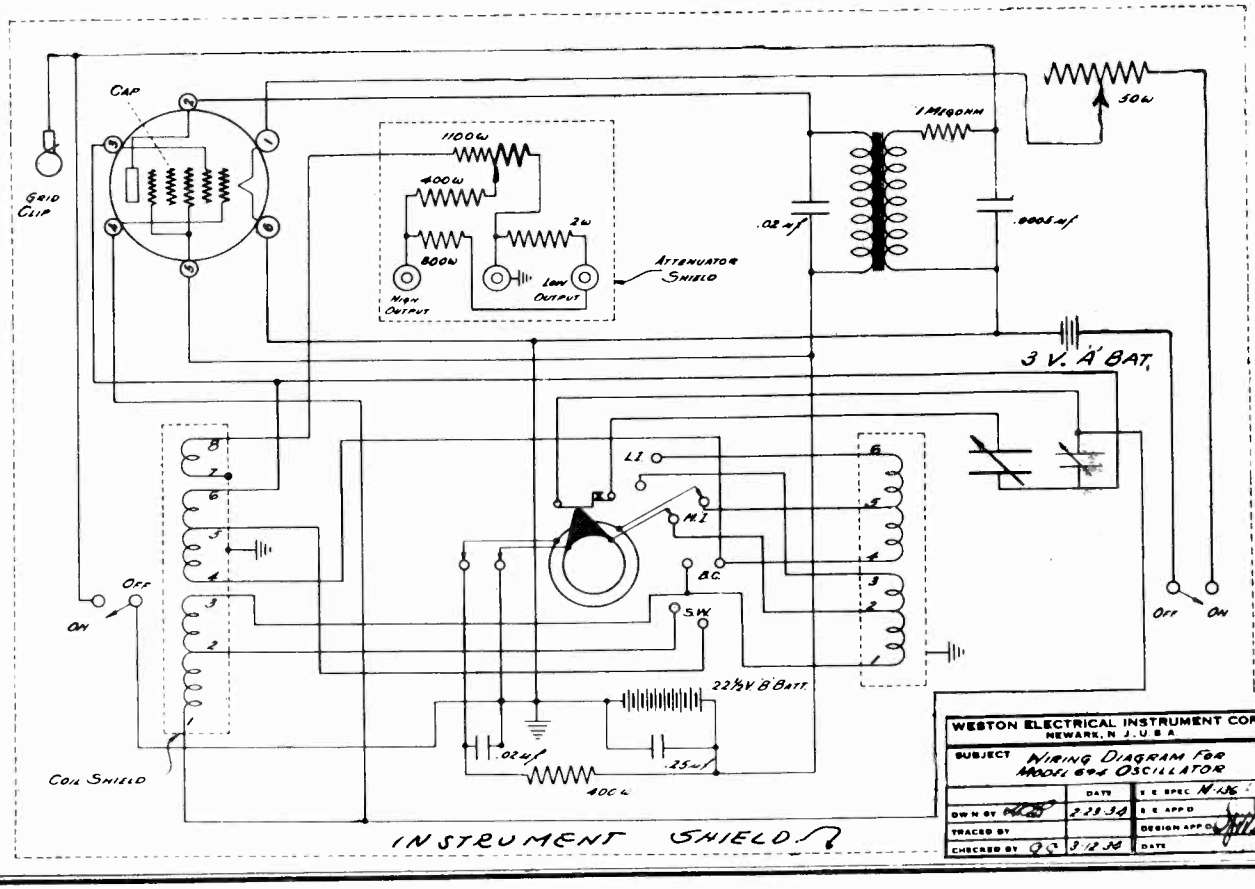
MODEL 661, 673
MODEL 694
Schematics

WESTON ELECTRICAL INSTRUM'T CORP.

ALSO MODEL 673

WESTON ELECTRICAL INSTRUMENT CORP.
SUBJECT: WIRING DIAGRAM FOR MODEL 661 TUBECHECKER
NEWARK'S SCHEMATIC DIAGRAM LOOKING AT BACK OF INSTRUMENT

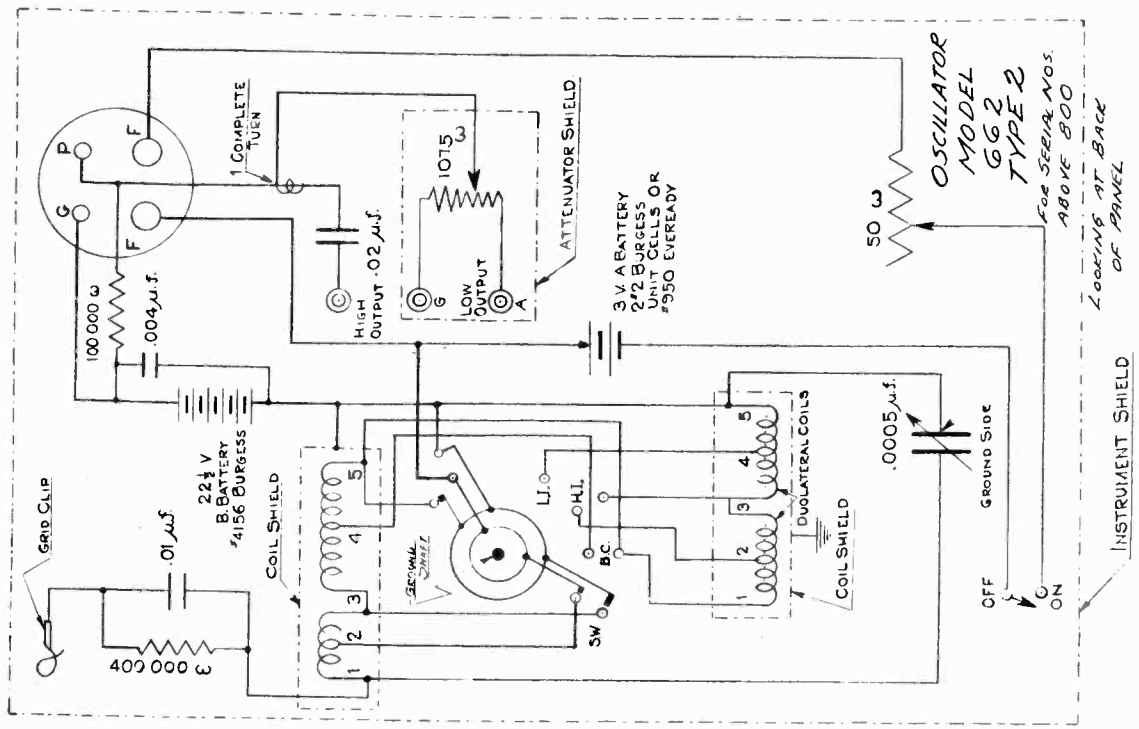


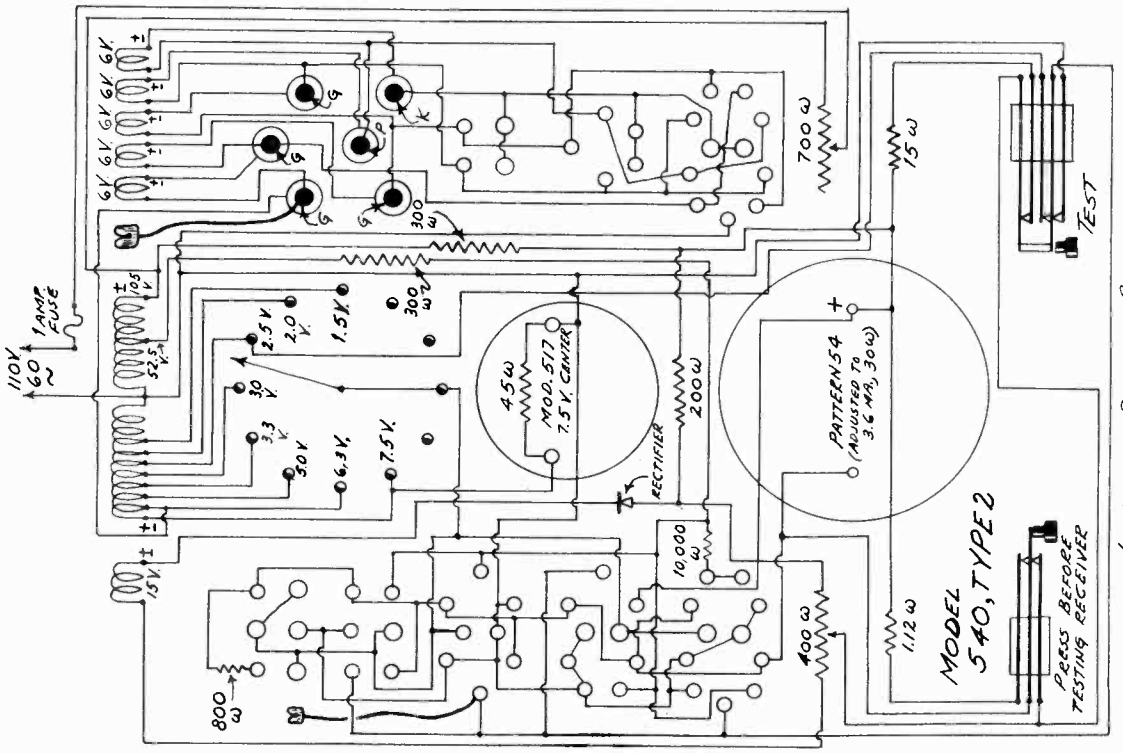


WESTON ELECTRICAL INSTRUMENT CORP.
NEWARK, N.J., U.S.A.
SUBJECT: WIRING DIAGRAM FOR MODEL 694 OSCILLATOR
DWN BY: 2-23-38
CHECKED BY: 3-12-38
W.E. SPEC. NO. 136
W.E. APP'D
DESIGN APP'D
DATE

WESTON ELECTRICAL INSTRUM'T CORP.

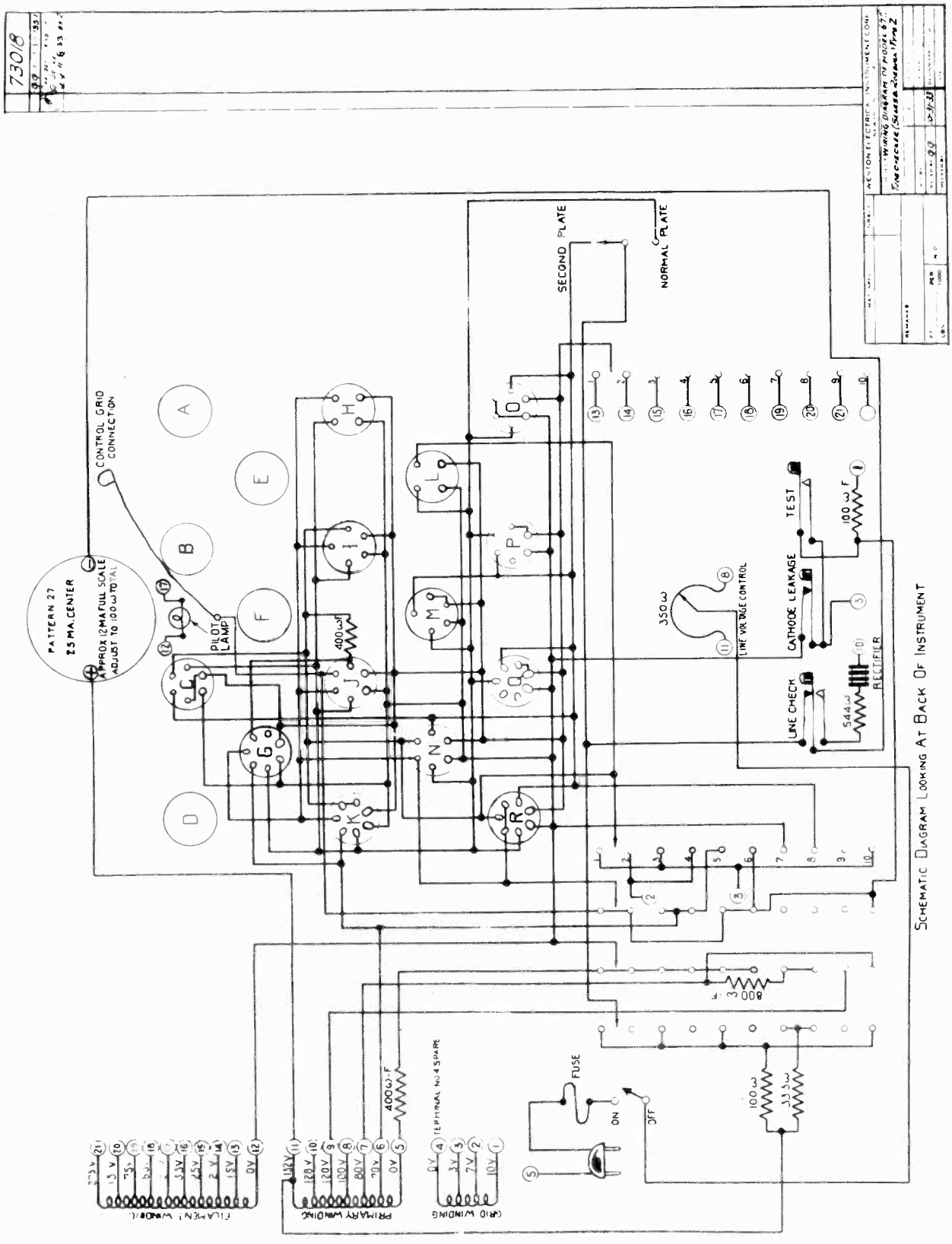
MODEL 540, Type 2
MODEL 662, Type 2
Schematics





MODEL 672, Type 2
Schematic

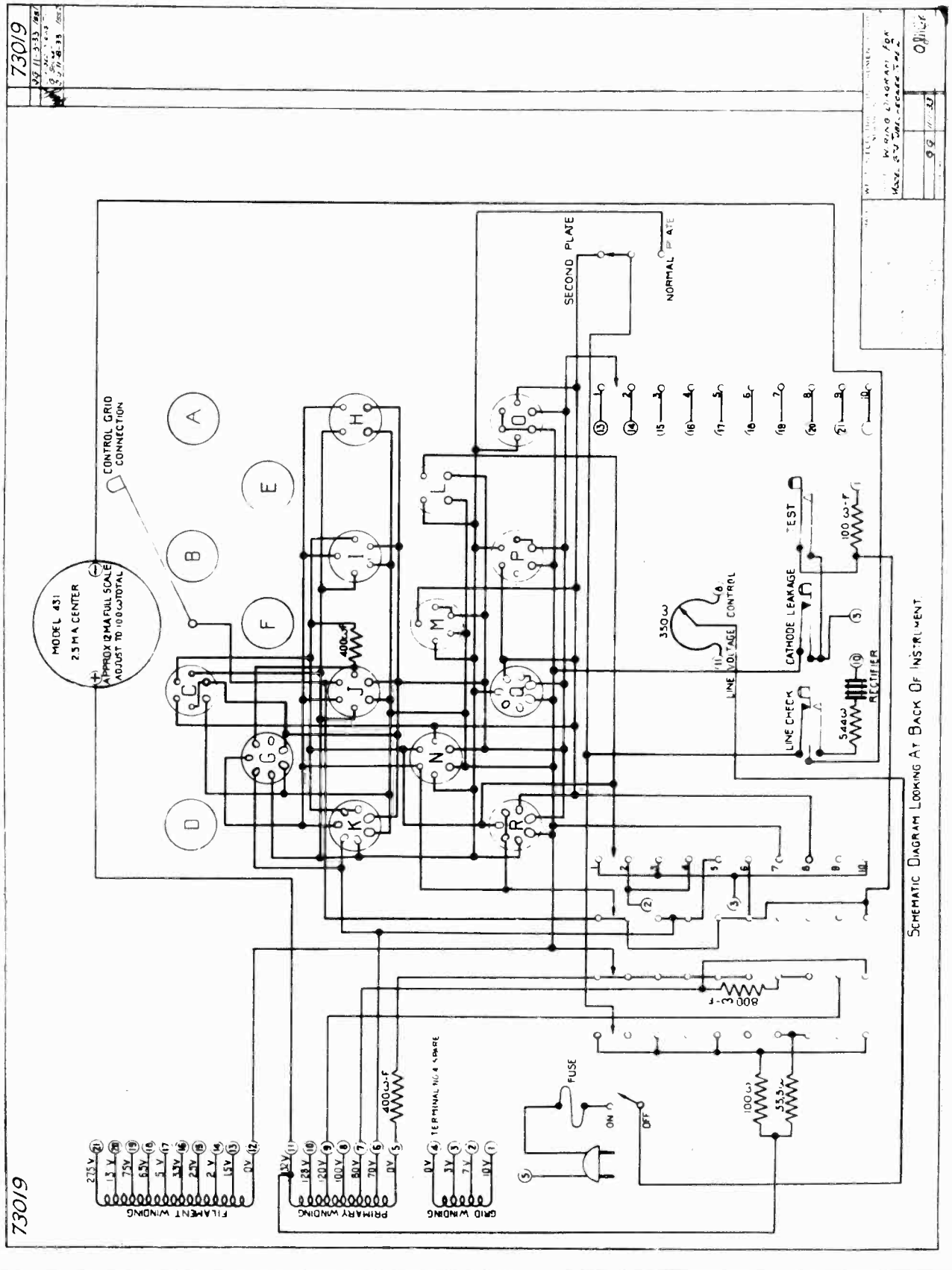
WESTON ELECTRICAL INSTRUM'T CORP.



SCHEMATIC DIAGRAM LOOKING AT BACK OF INSTRUMENT

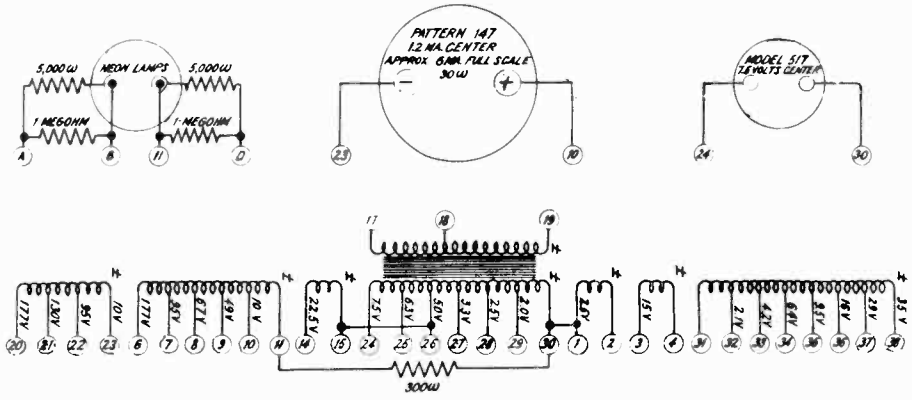
MODEL 674, Type 2

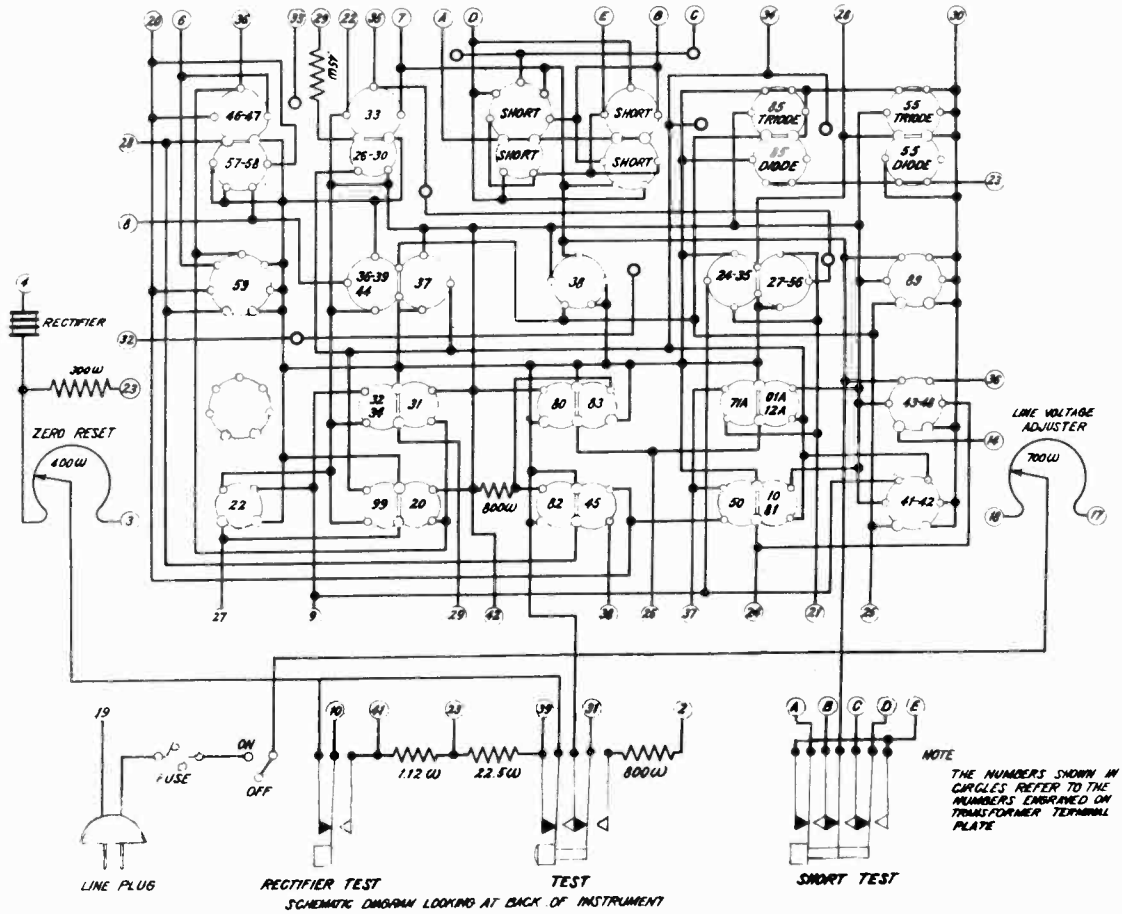
WESTON ELECTRICAL INSTRUMENT CORP. Schematic



MODEL 676
Schematic

WESTON ELECTRICAL INSTRUM'T CORP.





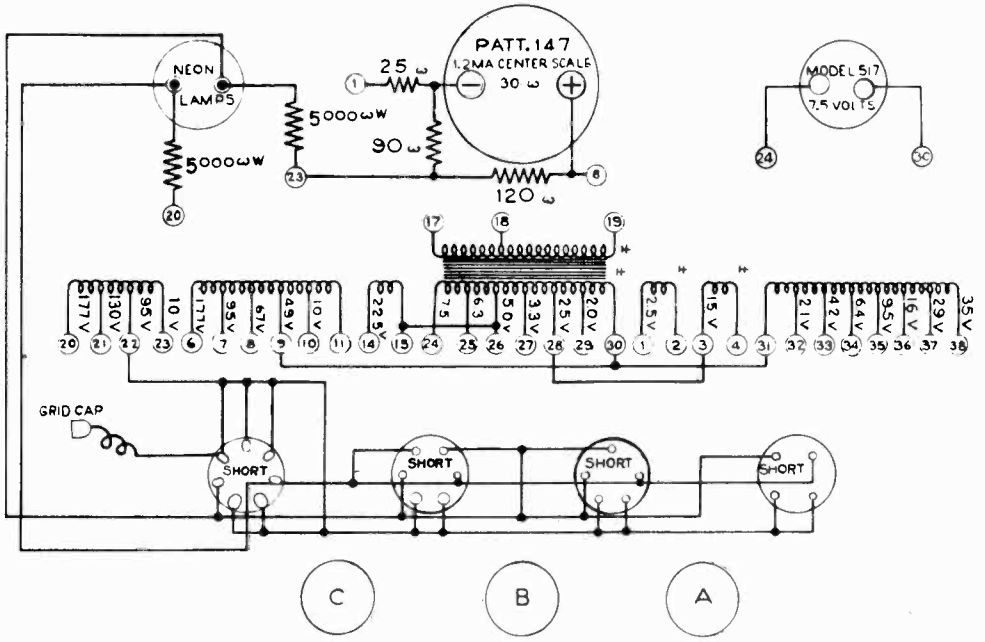
SCHEMATIC DIAGRAM LOOKING AT BACK OF INSTRUMENT

Wiring Diagram For Mod. 676
10-24-32
11-28-32

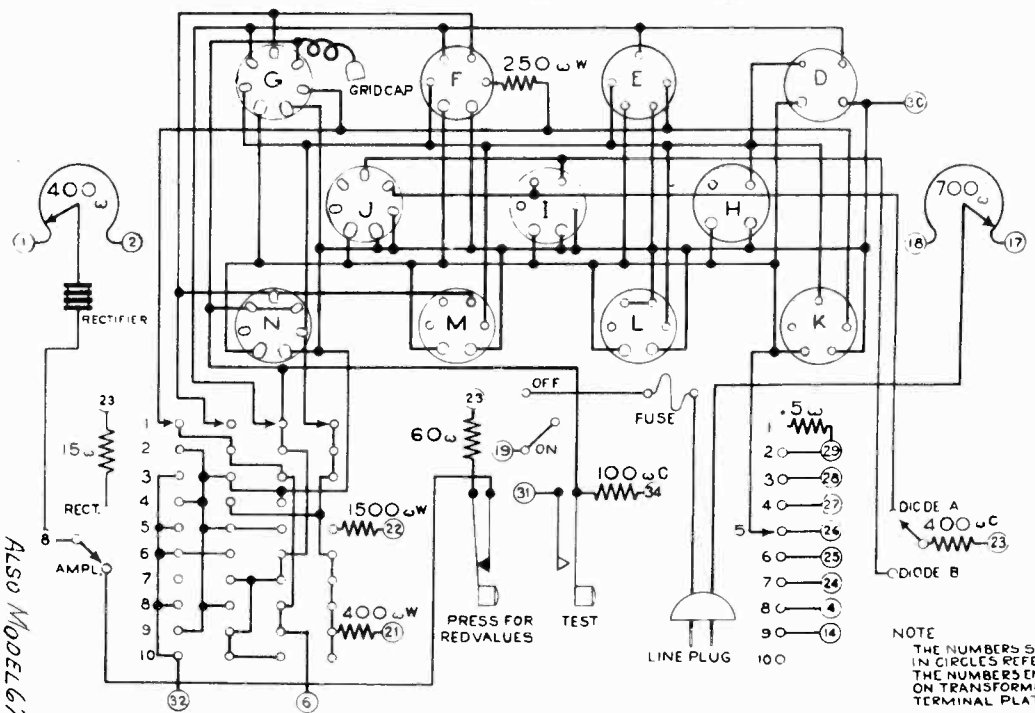
WESTON ELECTRICAL INSTRUM'T CORP.

MODEL 676-R, 677-R, 678-R
Schematic

72368



C B A



NOTE
THE NUMBERS SHOWN IN CIRCLES REFER TO THE NUMBERS ENGRAVED ON TRANSFORMER TERMINAL PLATE

SCHEMATIC DIAGRAM LOOKING AT BACK OF INSTRUMENT

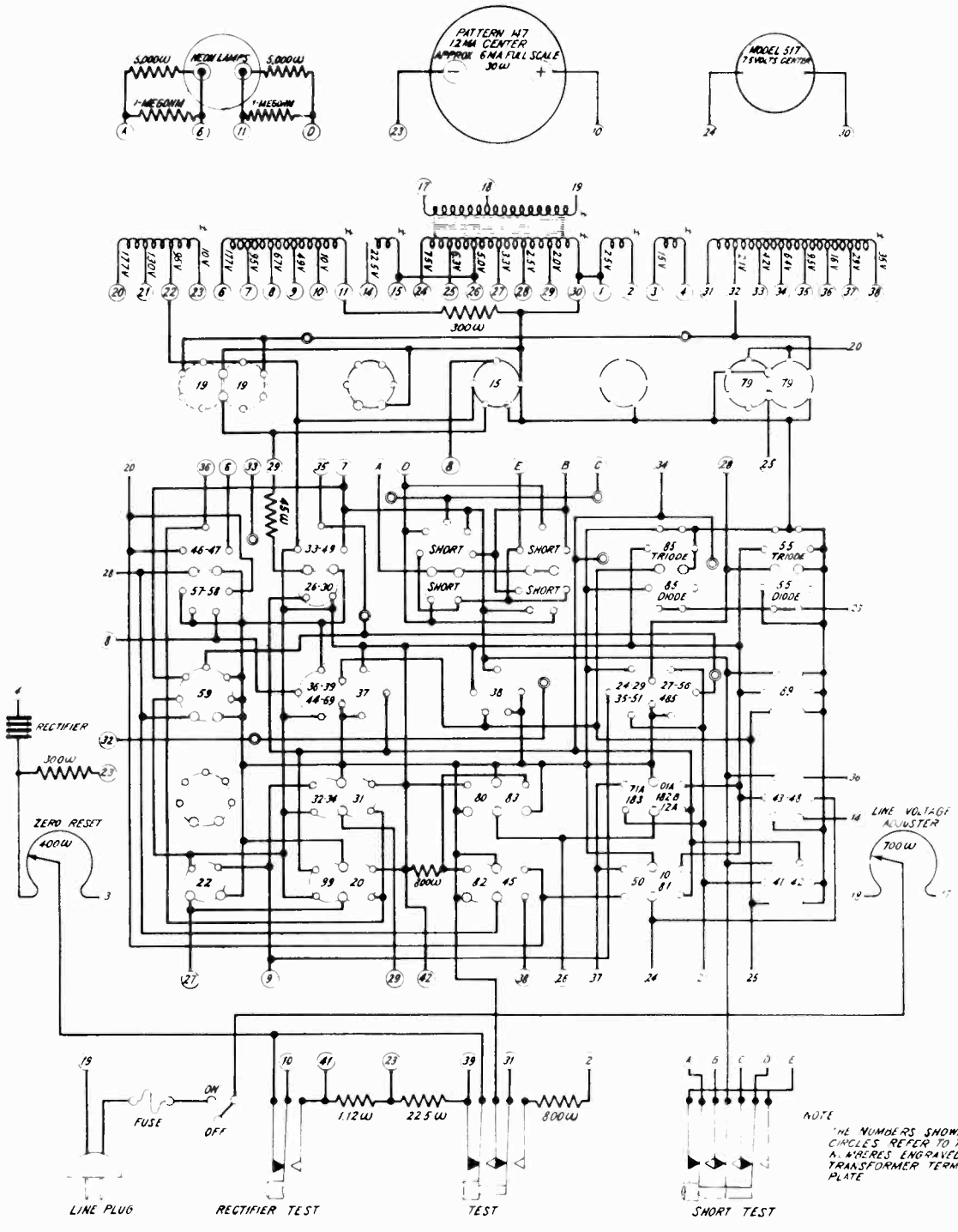
ALSO MODEL 677R-678R

WIRING DIAGRAM FOR MODEL 676 R

72368

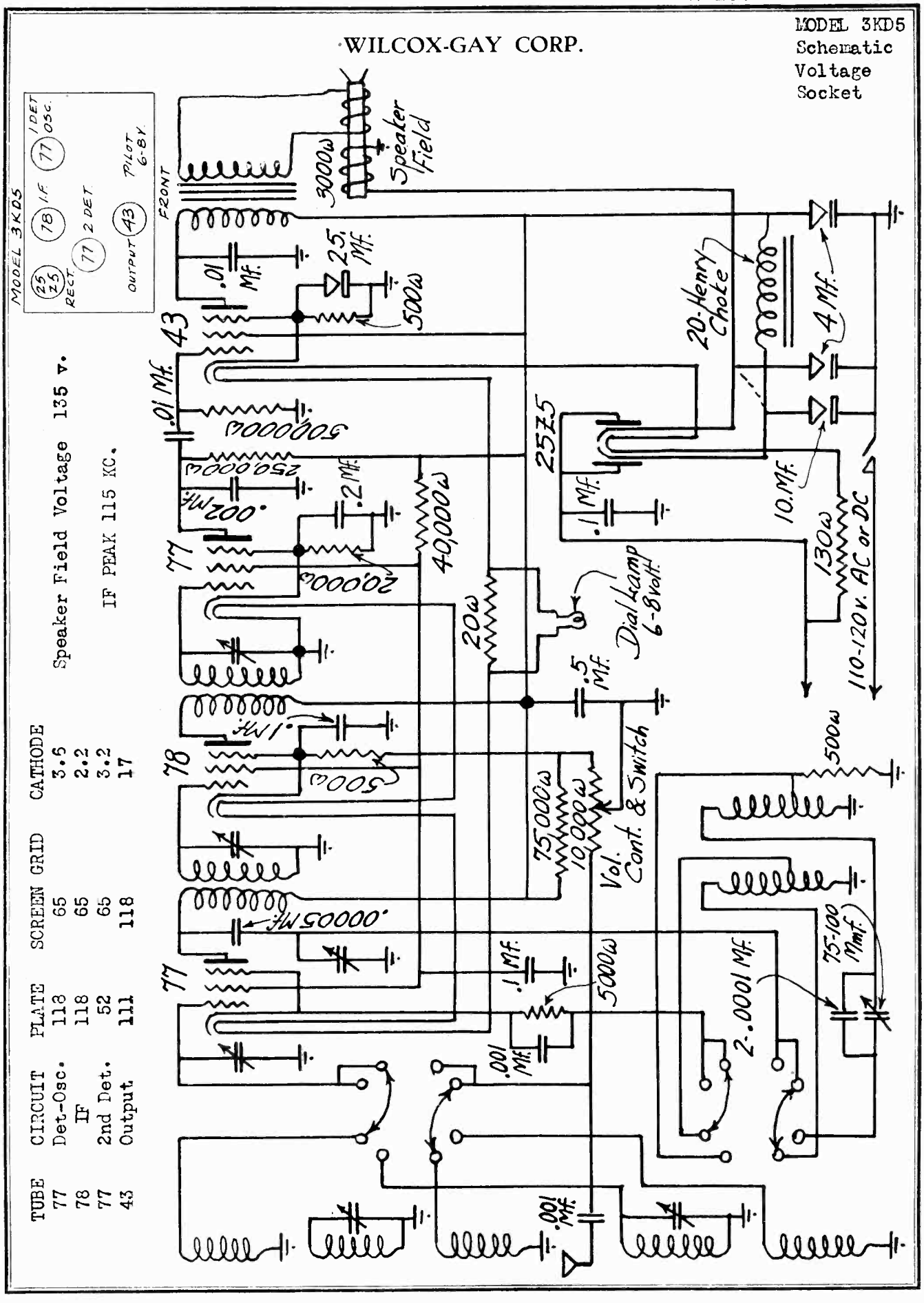
MODEL 677,678
Schematic

WESTON ELECTRICAL INSTRUM'T CORP.



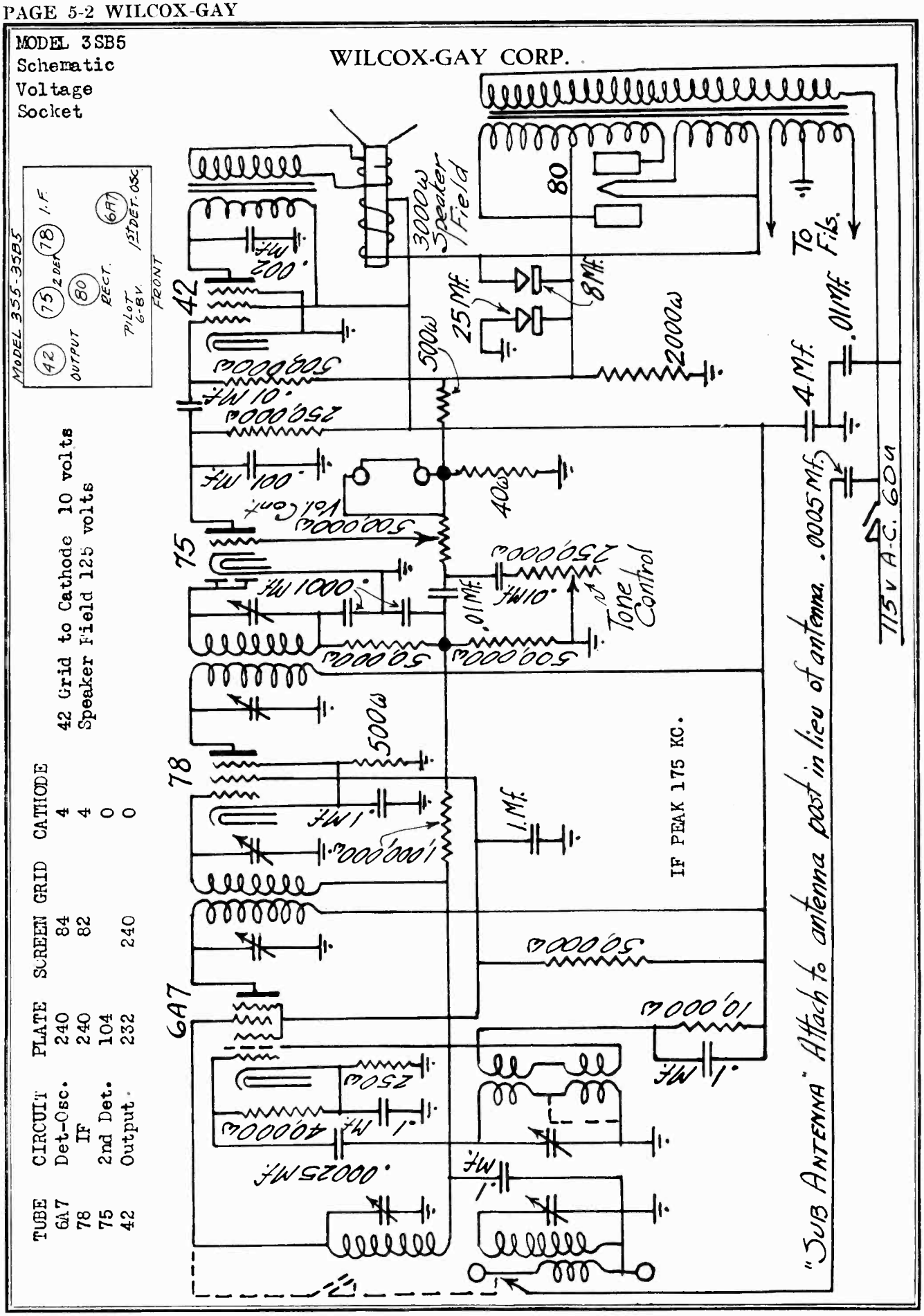
NOTE
THE NUMBERS SHOWN IN CIRCLES REFER TO THE NUMBERS ENGRAVED ON TRANSFORMER TERMINAL PLATE

SCHEMATIC DIAGRAM LOOKING AT BACK OF INSTRUMENT



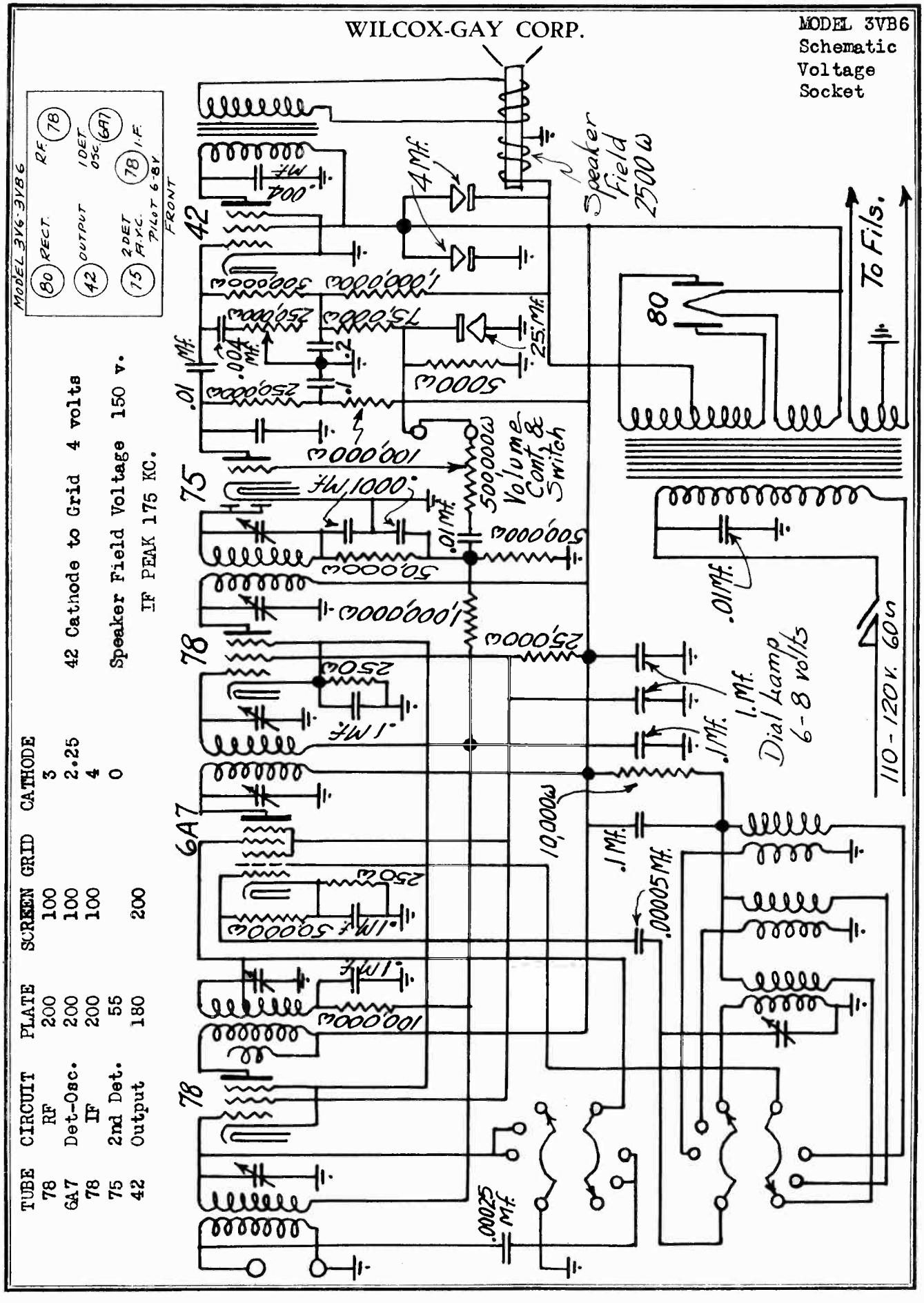
MODEL 3SB5
Schematic
Voltage
Socket

WILCOX-GAY CORP.



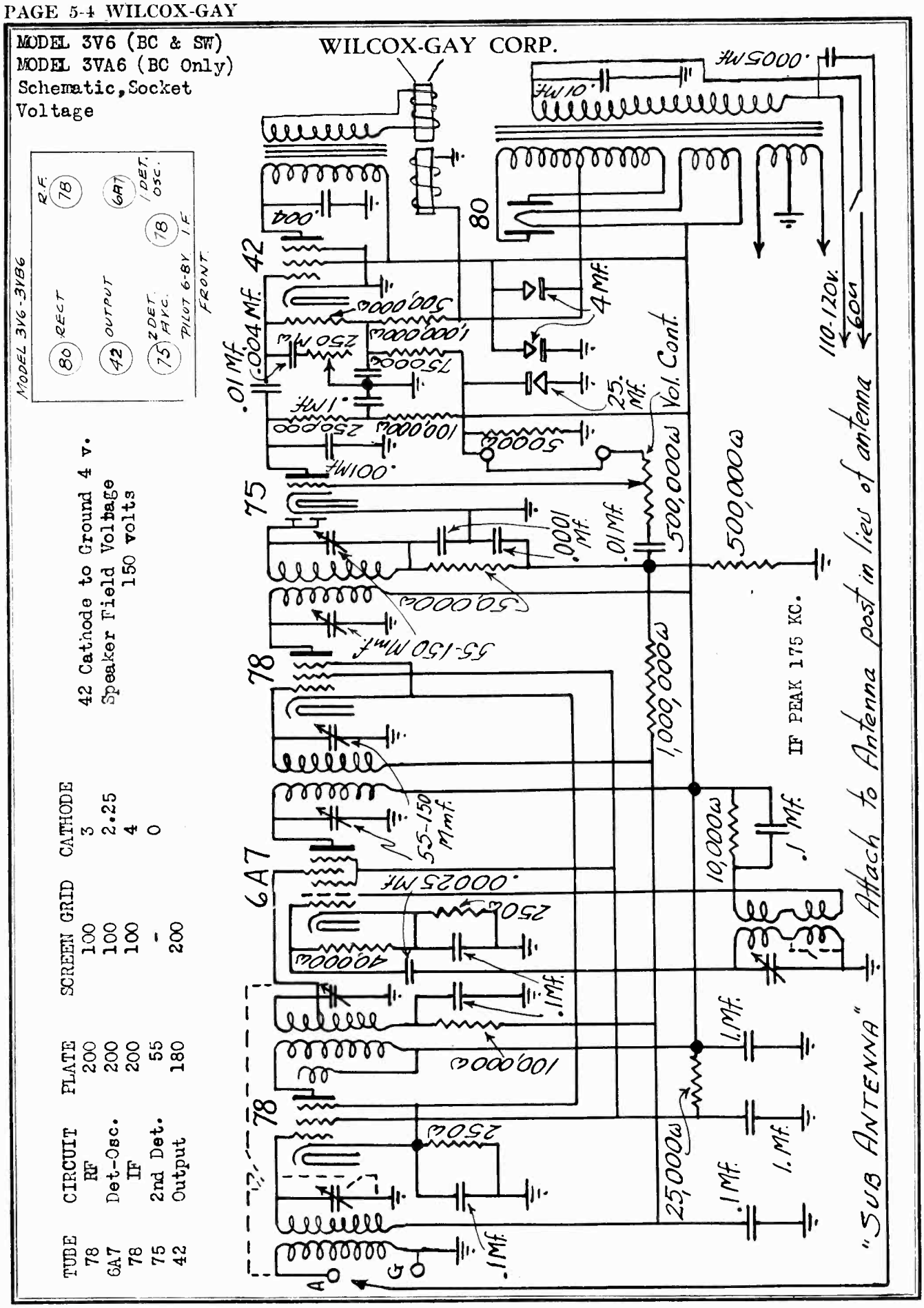
TUBE	CIRCUIT	PLATE	SCREEN GRID	CATHODE
6A7	Det-Osc.	240	84	4
78	IF	240	82	4
75	2nd Det.	104		0
42	Output	232	240	0

42 Grid to Cathode 10 volts
Speaker Field 125 volts



TUBE	CIRCUIT	PLATE	SCREEN GRID	CATHODE
78	RF	200	100	3
6A7	Det-Osc.	200	100	2.25
78	IF	200	100	4
75	2nd Det.	55		0
42	Output	180	200	

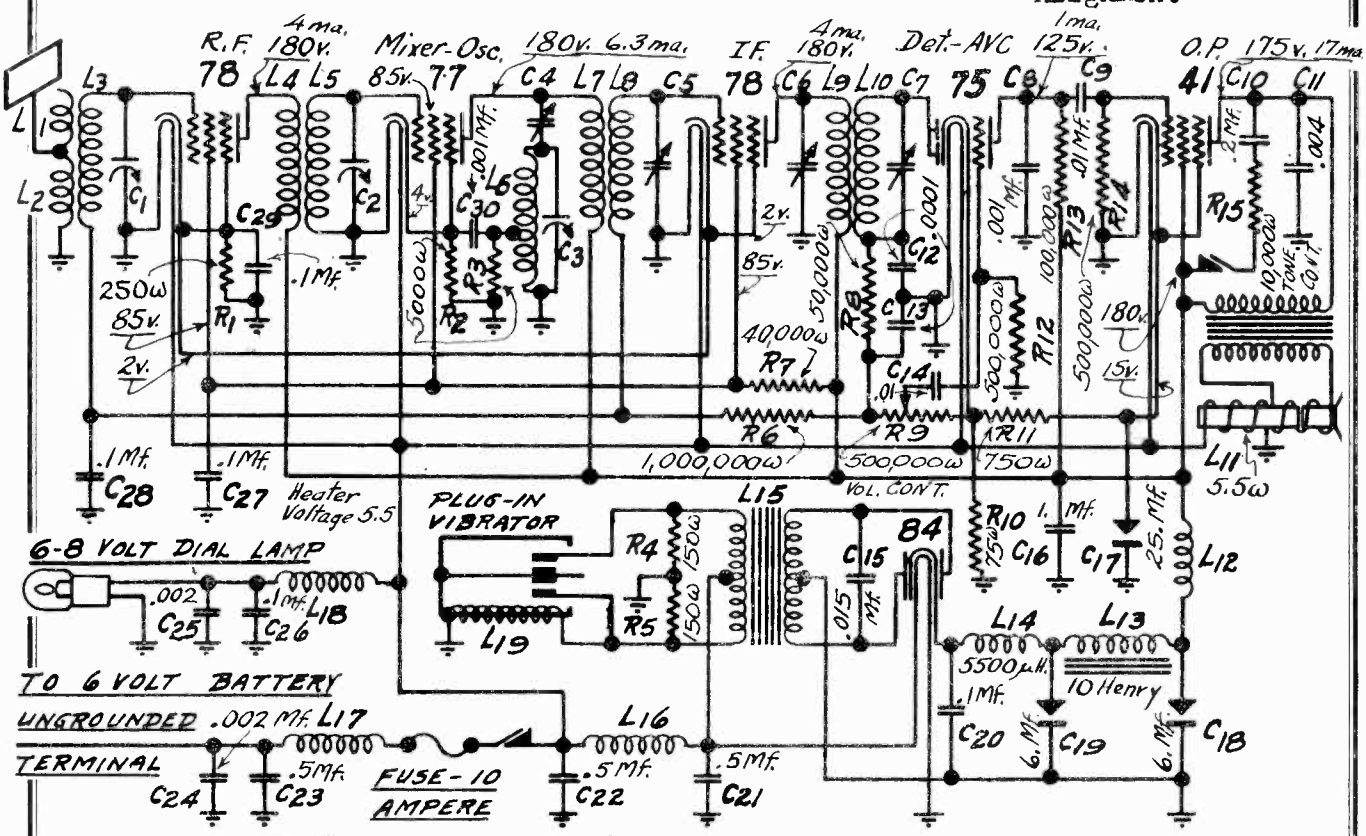
MODEL 3V6 (BC & SW)
MODEL 3VA6 (BC Only)
Schematic, Socket
Voltage



TUBE	CIRCUIT	PLATE	SCREEN GRID	CATHODE
78	RF	200	100	3
6A7	Det-Osc.	200	100	2.25
78	IF	200	100	4
75	2nd Det.	55	-	0
42	Output	180	200	

WILCOX-GAY CORP.

MODEL 4B6, Road Mate
Schematic, Voltage
Alignment



The three R. F. trimming condensers are adjusted at 1400 K. C.. Proceed as follows:
Procure a modulated oscillator giving a signal at 1400 K.C..

Remove the chassis from case, couple the output of the oscillator from antenna to ground, set the dial at 1400 and the oscillator at 1400 K.C..

Place the oscillator and receiver in operation and adjust the oscillator output so that a weak signal is heard in the loudspeaker when the volume control is at its maximum position.

Then adjust the trimming condensers starting with C 3, C 2 and then C 1 until maximum output is obtained. Readjust a second time as there is a slight interlocking of adjustments.

A more accurate adjustment can be made with an output meter.

I. F. Adjustment:

The four I. F. trimming condensers are adjusted at 175 K.C.. Proceed as follows:
Procure a modulated oscillator giving a signal at 175 K.C., a non-metallic screw driver and an output meter.

Connect the oscillator output between the first detector grid and ground. Connect output meter.

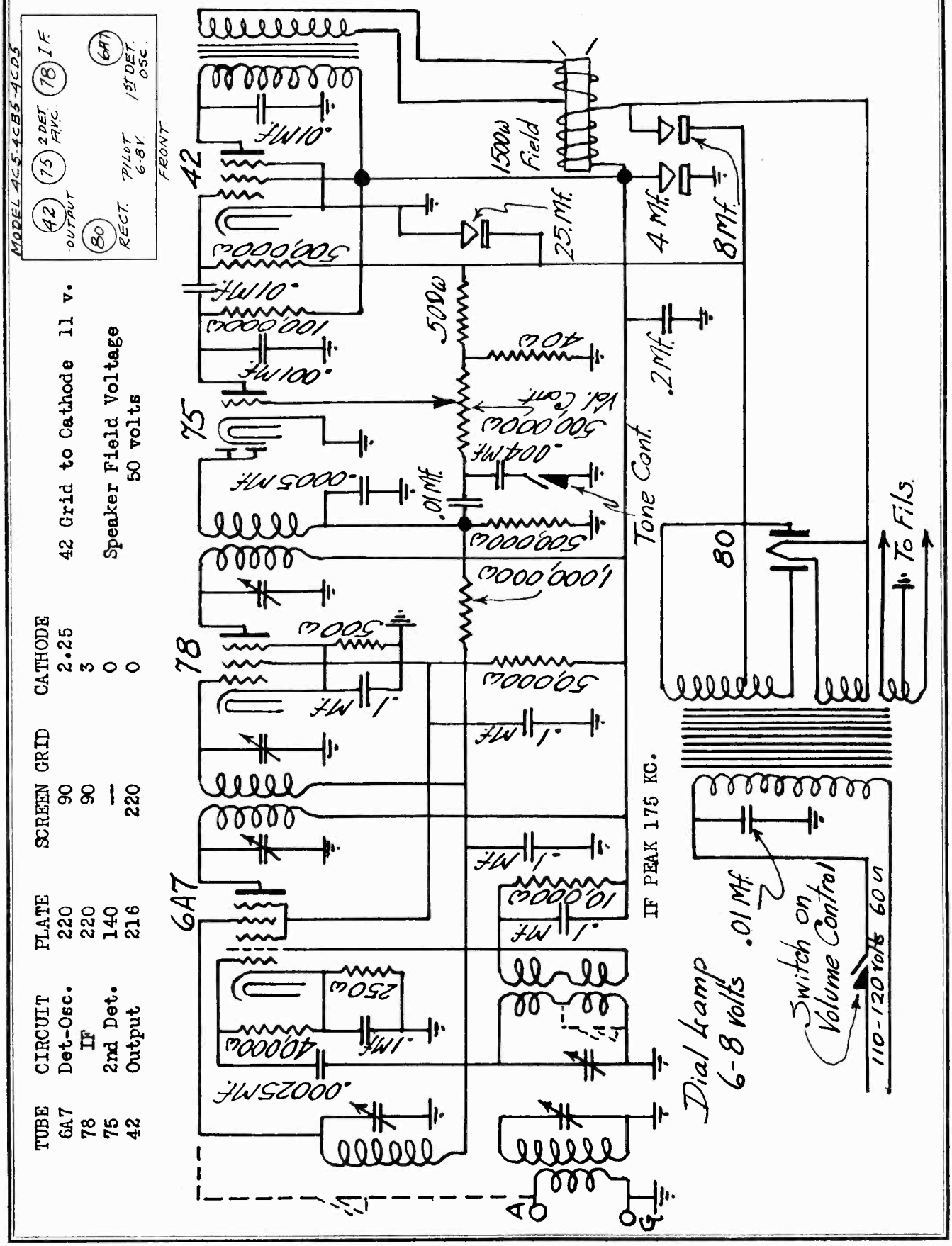
IF PEAK 175 KC.

Adjust the tuning condenser so that no signal except the I. F. oscilletor is heard at maximum volume. With the volume control at maximum, reduce the oscillator output until a small deflection is obtained. Unless this is done the action of the AVC will make it impossible to obtain correct adjustments.

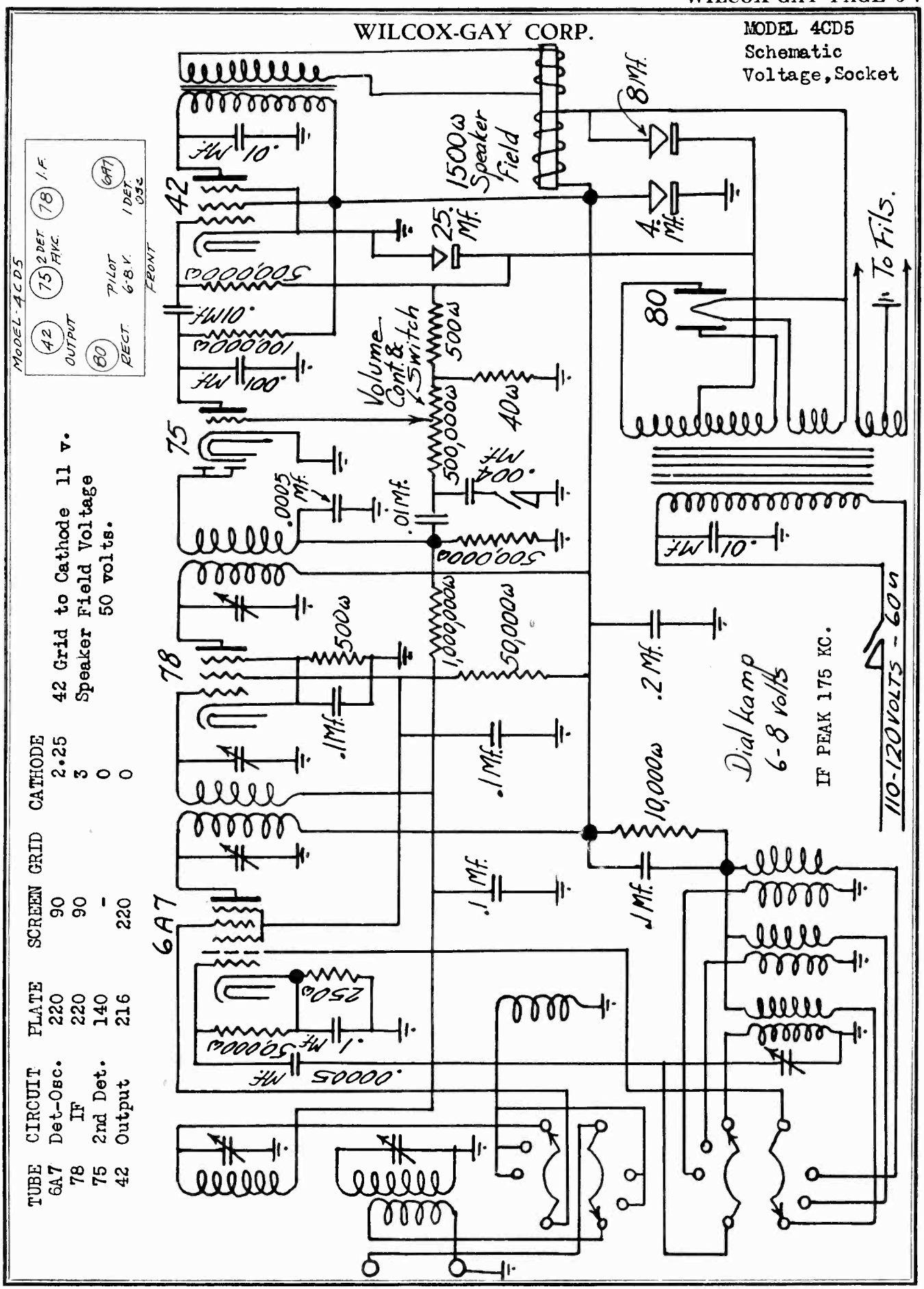
Trim in order C 4, C 5, C 6 and C 7, repeat adjustments and then follow with the R. F. adjustments.

MODEL 4C5,4CB5 (BC & SW)
MODEL 4CA5 (BC Only)
Schematic, Voltage, Socket

WILCOX-GAY CORP.



TUBE	CIRCUIT	PLATE	SCREEN GRID	CATHODE
6A7	Det-Osc.	220	90	2.25
78	IF	220	90	3
75	2nd Det.	140	--	0
42	Output	216	220	0

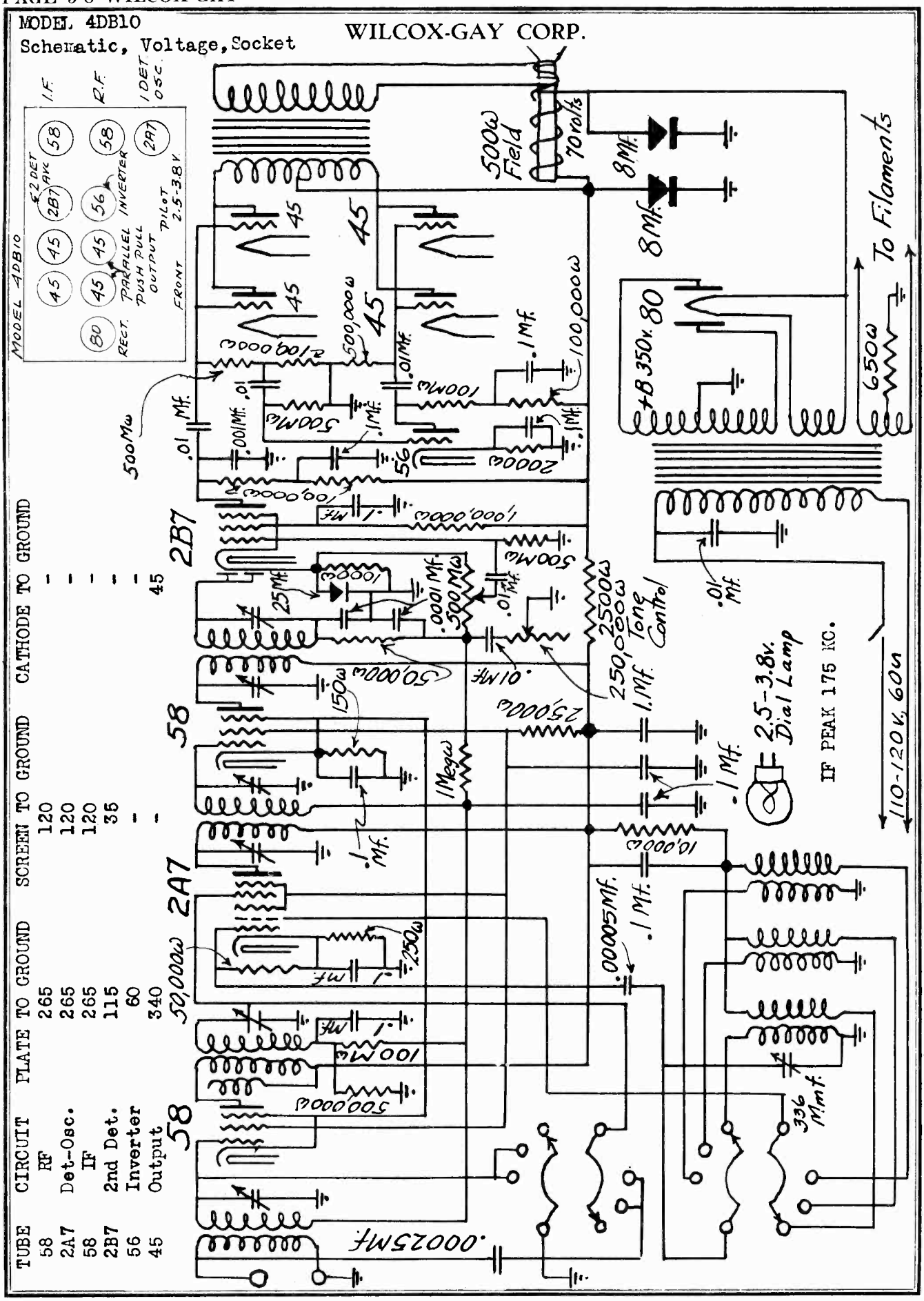


TUBE	CIRCUIT	PLATE	SCREEN GRID	CATHODE	
6A7	Det-Osc.	220	90	2.25	42 Grid to Cathode 11 v.
78	IF	220	90	3	Speaker Field Voltage
75	2nd Det.	140	-	0	50 volts.
42	Output	216	220	0	

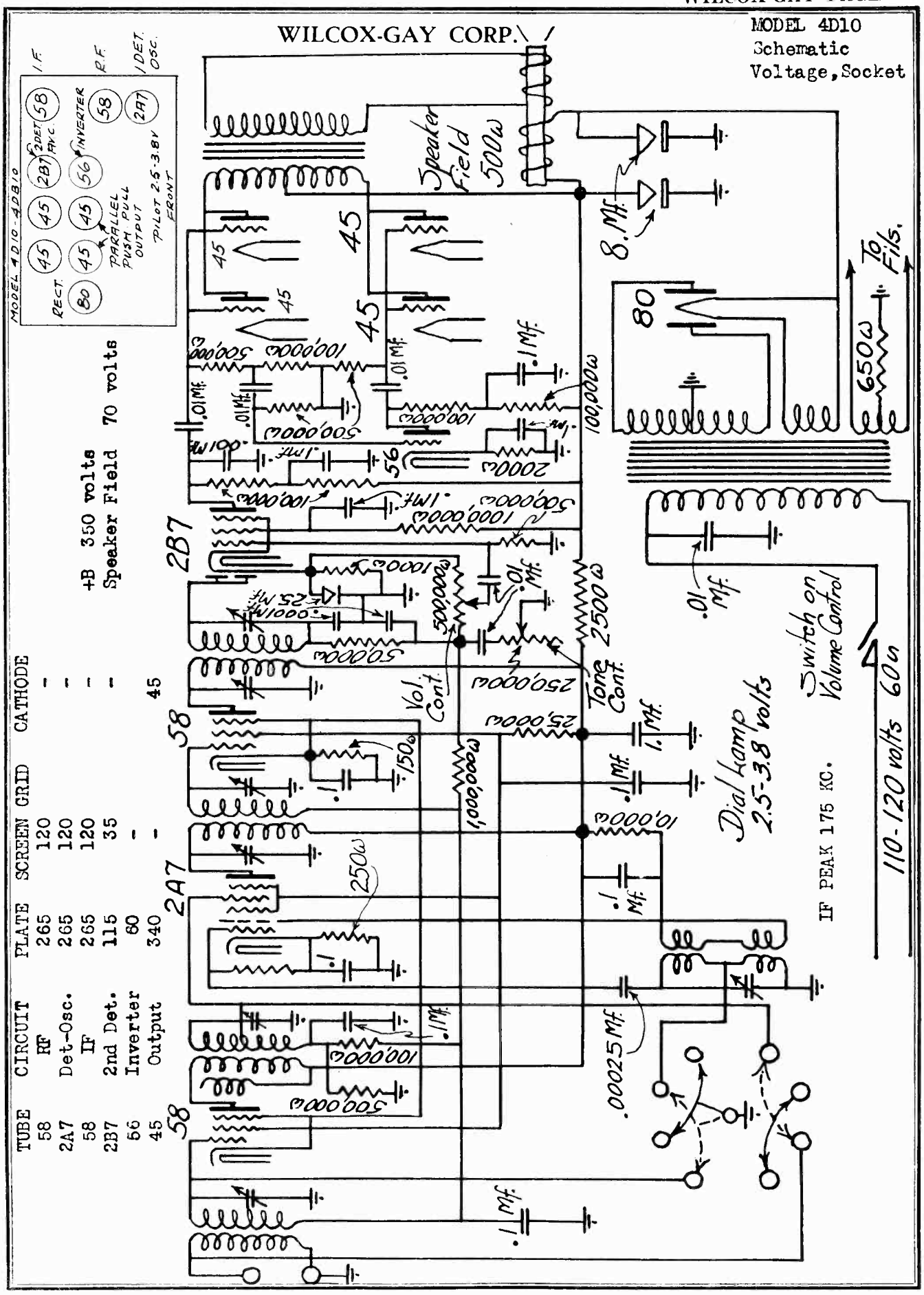
MODEL 4DB10

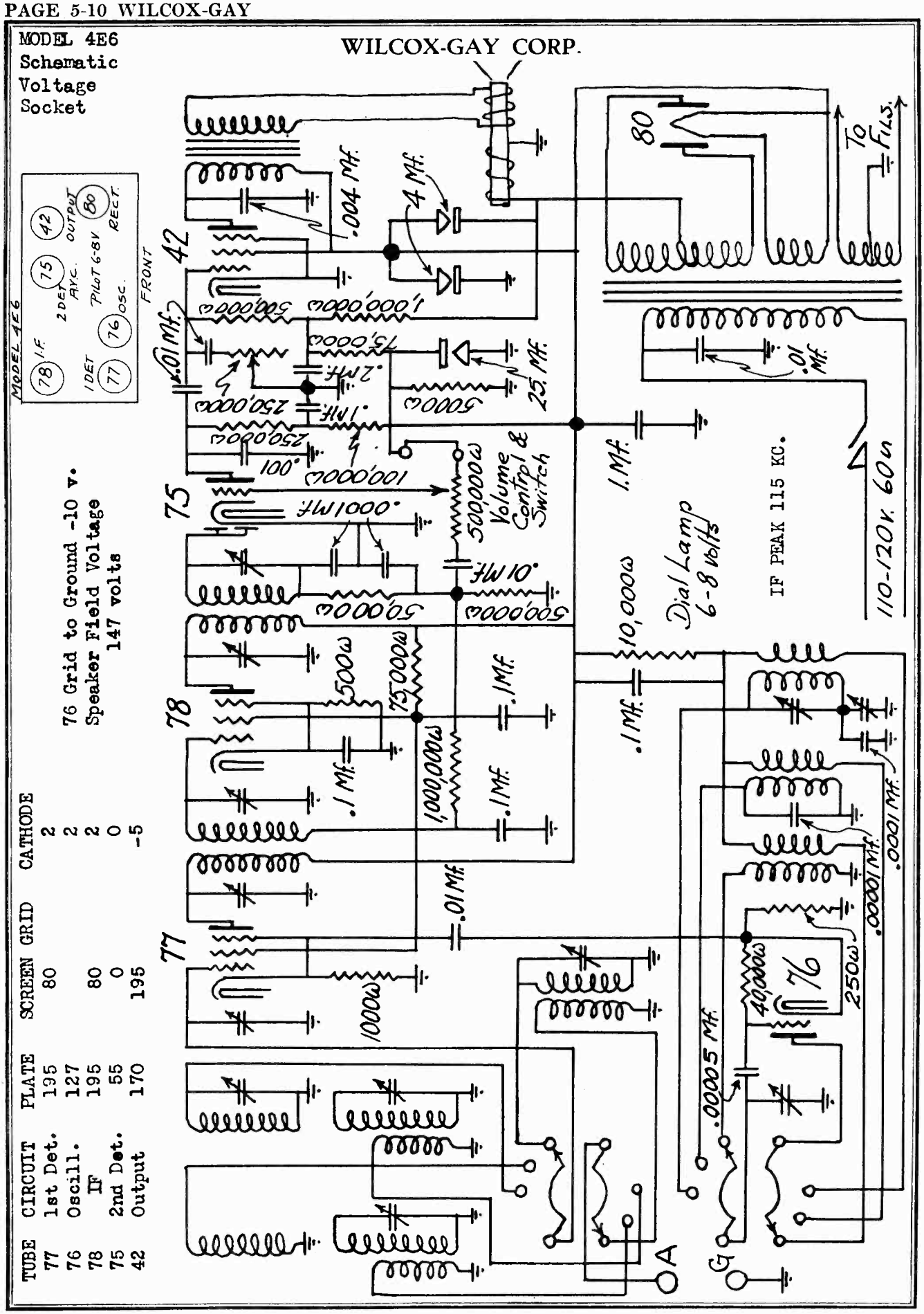
Schematic, Voltage, Socket

WILCOX-GAY CORP.

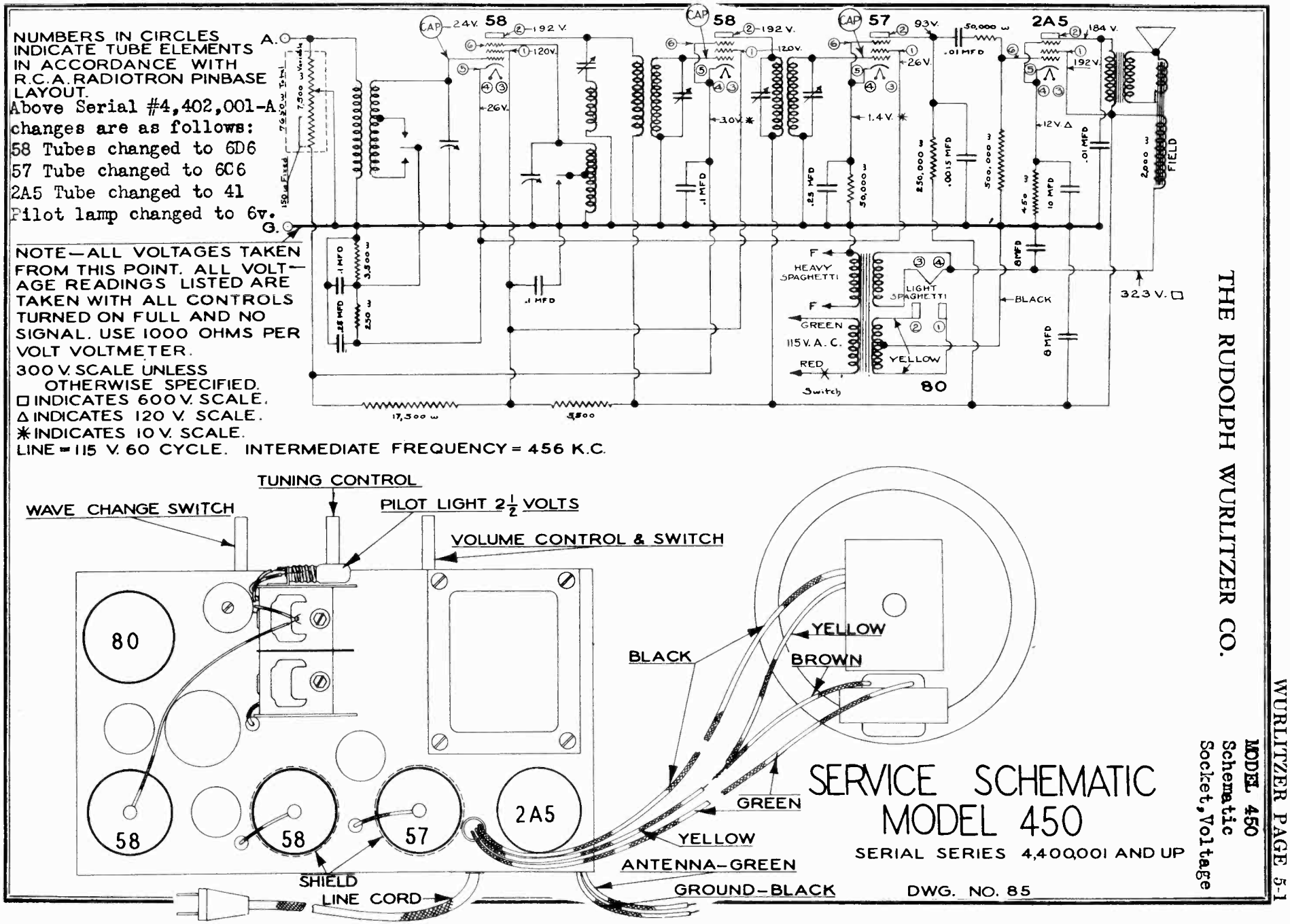


TUBE	CIRCUIT	PLATE TO GROUND	SCREEN TO GROUND	CATHODE TO GROUND
58	RF	265	120	-
2A7	Det.-Osc.	265	120	-
58	IF	265	120	-
2B7	2nd Det.	115	35	-
56	Inverter	60	-	-
45	Output	340	-	45





TUBE	CIRCUIT	PLATE	SCREEN GRID	CATHODE
77	1st Det.	195	80	2
76	Oscill.	127		2
78	IF	195	80	2
75	2nd Det.	55	0	0
42	Output	170	195	-5



SERVICE SCHEMATIC MODEL 450

SERIAL SERIES 4,400,001 AND UP

DWG. NO. 85

THE RUDOLPH WURLITZER CO.

MODEL 450
Schematic
Socket, Voltage

The Model 450 is a five tube dual band superheterodyne covering the broadcast band and an additional short-wave band of from 1440 to 3500 kc. The circuit used embodies a 58 oscillator-modulator, a 58 I. F. amplifier operating at 456 kc., a 57 plate circuit second detector, and a 2A5 output audio stage. The volume control functions to increase the bias on the I. F. 58 and decrease the signal from the antenna to effect a decrease in volume. In all ganging operations this control must be advanced to its maximum position (clockwise), and THE WEAKEST SIGNAL THAT WILL GIVE A SATISFACTORY INDICATION ON THE OUTPUT METER must be used.

The I.F. trimmer adjustments are carefully made at the factory and should not be tampered with unless a thorough investigation definitely proves the I.F. amplifier to be at fault. In that event:-

(a) Attach the output meter from screen to plate of the 2A5 tube.

(b) Attach the local oscillator tuned to 456 kc. to the antenna lead of the receiver and,

(c) Adjust the I.F. trimmers (screw adjustments, accessible when the name plate is removed) for maximum indication on the output meter.

There are no adjustments to be made on the short-wave band.

TO CALIBRATE THE 450

With the band switch in the broadcast position (clockwise), set the dial to the position where a station (or oscillator) of known frequency, about 1400 kc., should come in.

(a) Adjust oscillator trimmer (screw adjustment, top-rear of gang condenser) until desired signal is received.

The calibration will fall within reasonable limits over the balance of the tuning range with no further adjustments.

TO ALIGN THE 450

With the band switch in the broadcast position (clockwise), set the dial to approximately 1400 kc.

(a) Attach the output meter from screen to plate of the 2A5 tube.

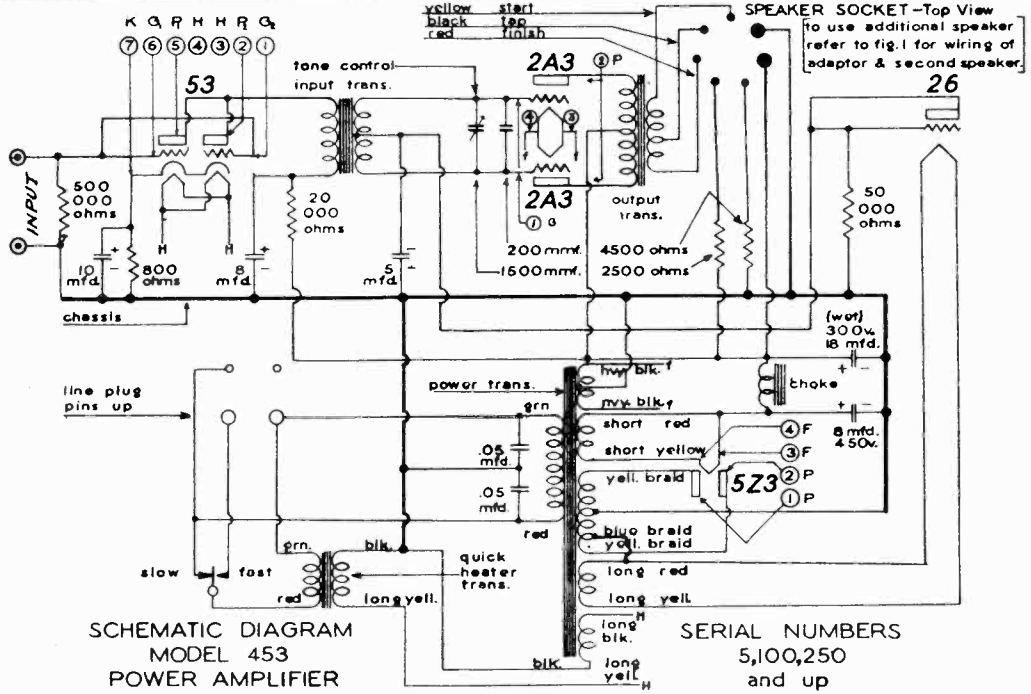
(b) Attach the local oscillator tuned to the set to the green antenna lead and,

(c) Adjust the R. F. trimmer (screw adjustment, top, front of gang condenser) for maximum indication on output meter.

The alignment will fall within reasonable limits over the balance of the tuning range with no further adjustments.

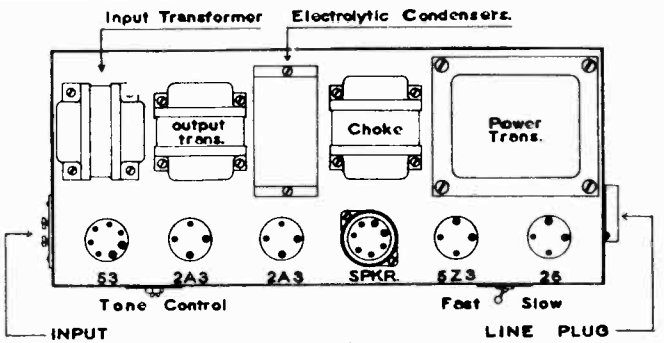
44-4176 Coil, Antenna Assembly (1)
44-4177 Coil, Oscillator Assembly (1)
44-4164 Coil, I. F. Assembly (2)
44-3715 Condenser, 8 & 8 & 10 Mfd. (1)
44-3344 Condenser .1 & .25 Mfd. 200 Volt (2)
44-3820 Condenser .1 Mfd. 200 Volt (1)
44-3838 Condenser .01 Mfd. 600 Volt (1)
44-4233 Condenser .01 Mfd. 600 Volt (1)
44-4234 Condenser .0015 Mfd. 600 Volt (1)
44-4179 Condenser I. F. Tuning Assembly (1)
44-4162 Condenser 4 Gang & Dial Assembly (1)
44-4237 Dial Scale & Hub Assembly (1)
44-4167 Control, Volume & Line Switch (1)
44-4186 Lamp Bracket & Socket Assembly (1)
44-767 Dial Lamp (1)
44-2238 Line Cord (1)
44-4190 Resistor (1) Voltage Divider
44-4187 Resistor 450 Ohm 1 Watt (1)

44-4182 Resistor ½ Meg Ohm ¼ Watt (1)
44-4183 Resistor ¼ Meg Ohm ¼ Watt (1)
44-4184 Resistor 50,000 Ohm ¼ Watt (1)
44-3751 Socket 4 Prong (1)
44-3866 Socket 6 Prong (4)
44-4166 Switch, Short Wave (1)
44-2663 Speaker Assembly, Jensen (1)
44-3835 Field Coil (1)
44-3834 Output Transformer (1)
44-3836 Cone & Voice Coil Assembly (1)
Above Speaker for Table Model
44-4285 Speaker Assembly, Magnavox (1)
44-4157 Field Coil (1)
44-4155 Output Transformer (1)
44-4158 Cone & Voice Coil Assembly (1)
Above Speaker for Console Model
44-4168 Transformer, Power 60 Cy. 110 Volt (1)
44-4280 Transformer, Power 25 Cy. 110 Volt (1)
44-4170 Transformer, Power 60 Cy. 230 Volt (1)

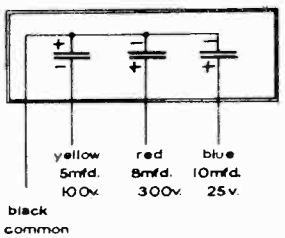


SCHEMATIC DIAGRAM
MODEL 453
POWER AMPLIFIER

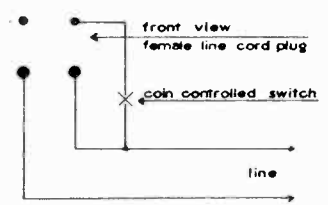
SERIAL NUMBERS
5,100,250
and up



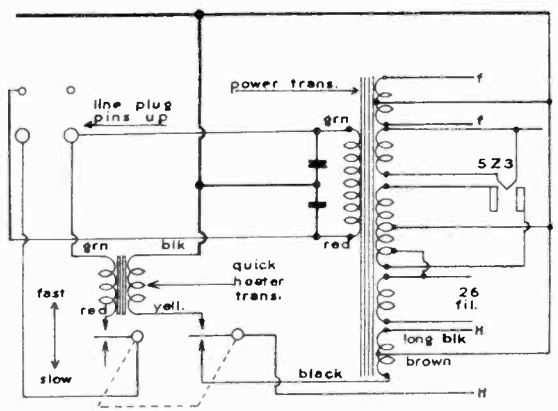
TOP VIEW — MODEL 453



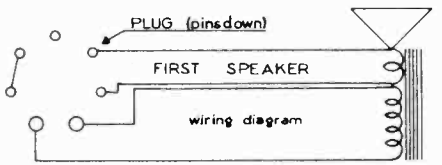
Detail of 4681 Electrolytic Cond.

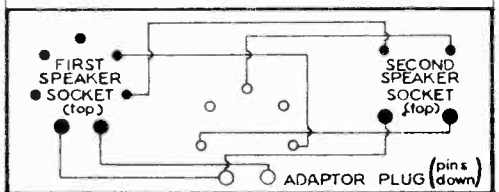


Detail of Line Cord Plug Connections.



QUICK HEATER TRANSFORMER CIRCUIT
SERIAL NUMBERS 5,100,001
to 5,100,249





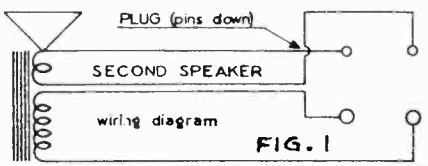


FIG. 1

NOTES

Measure all D.C. voltages from chassis with a 1000 ohm per volt meter, with the line at 120volts 60cycle.

Numbers in circles indicate tube elements in accordance with RCA-Cunningham Pinbase Layouts.

Average A.C. Voltages.		Average D.C. Voltages	
5Z3 filament	5.0	2A3 plates	300
2A3 filament	2.7	2A3 grids	-57
26 filament	1.4	53 plates	200
53 heater	2.5	53 cathode	4.2

Amplifier Power Consumption *130 watts.*

SERVICE SCHEMATIC

SIMPLEX POWER AMPLIFIER

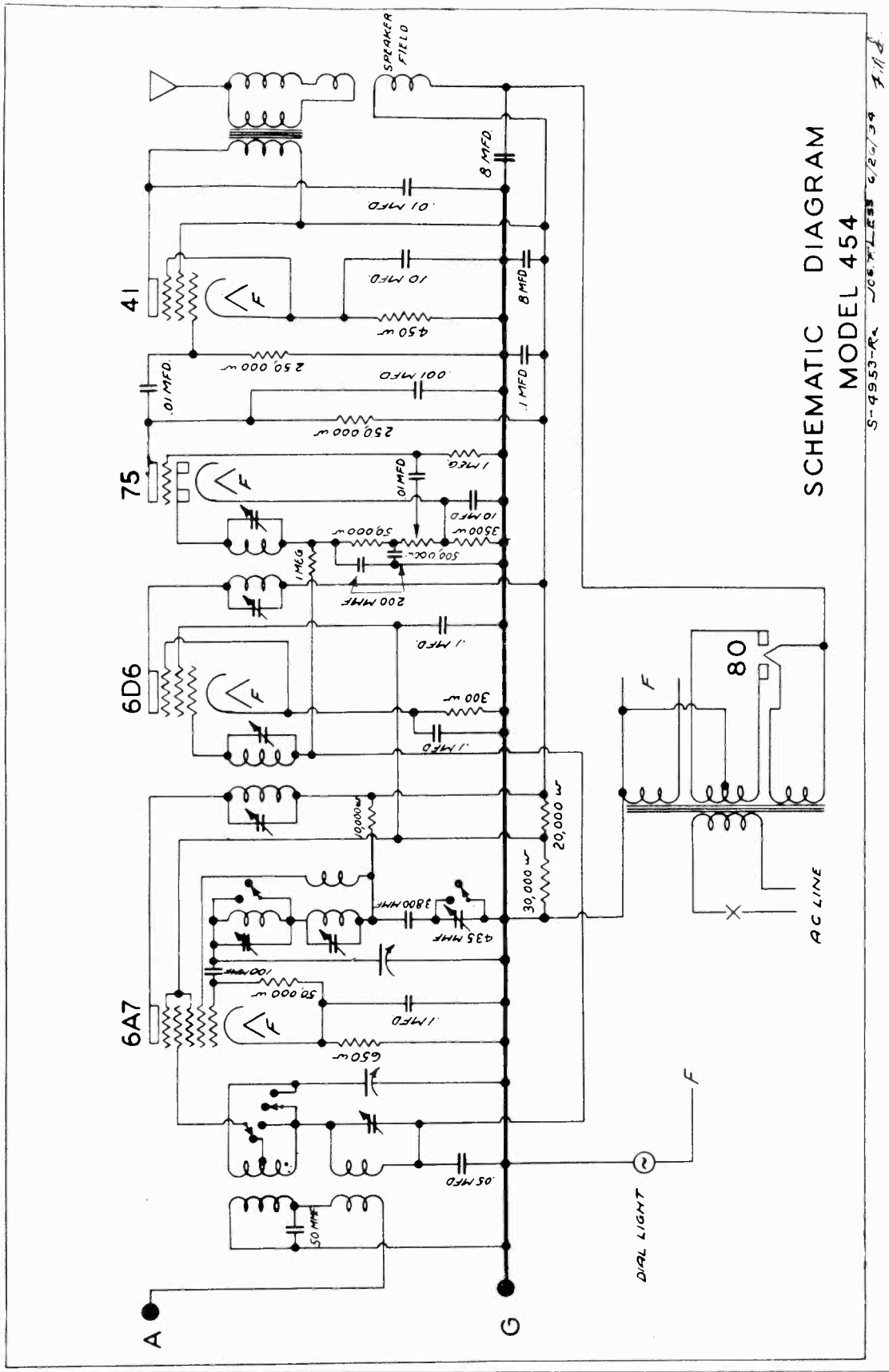
7-16-34 MODEL 453 W.A.HAYES

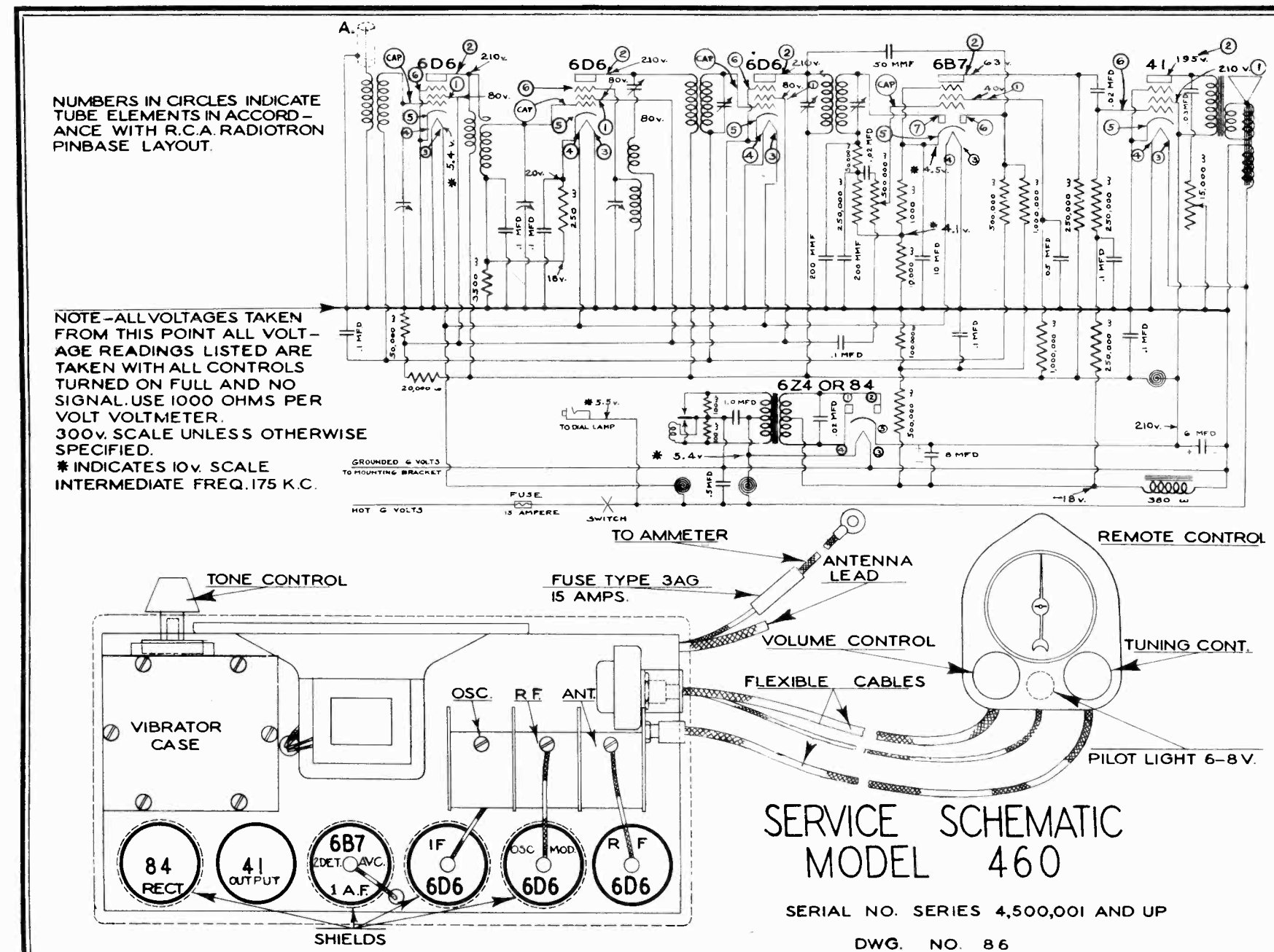
THE RUDOLPH WURLITZER CO.

MODEL 453 Amplifier
Schematic, Socket
Circuit Details

MODEL 454
Schematic

THE RUDOLPH WURLITZER CO.





SERVICE SCHEMATIC MODEL 460

SERIAL NO. SERIES 4,500,001 AND UP

DWG. NO. 86

THE RUDOLPH WURLITZER CO.

MODEL 460
Schematic
Socket
Voltage

The Model 460 is a 6 tube superheterodyne, completely self-contained, for operation from a 6 volt d.c. source. A cable drive remote control head is used, one cable operating the volume control and switch and the other cable operating the tuning condenser.

The circuit comprises a stage of R.F. amplification, an oscillator-modulator, and a stage of I.F. amplification at 175 kc., each using a 6D6 tube. A 6B7 is used as a diode second detector-A.V.C. and first audio stage and a 41 is used in the audio output stage. The power supply,an integral part of the chassis, uses an 85 or a 6Z4 as a full wave rectifier for the B supply. The filter choke is in the negative side of the B supply, and the voltage drop across it, after being filtered, furnished the C supply for the set.

The pentode section of the 6B7 is used as the first audio stage, resistance coupled into the 41. One of the diode plates of the 6B7 is used for the diode second detector and the other diode plate is used in the diode A.V.C. circuit. An inspection of Drawing #86 will indicate that under no-signal conditions, the cathode of the 6B7 is considerably more positive than the A.V.C. diode plate. As a result no current will flow through the A.V.C. diode until the signal applied to this diode plate is greater than the bias on the 6B7 cathode. The advantage of the circuit is two--fold, greater volume on weak signals and more uniform volume on all signals than straight diode A.V.C. provides.

IN ALL GANGING OPERATIONS USE THE WEAKEST SIGNAL THAT WILL GIVE A SATISFACTORY INDICATION ON THE OUTPUT METER and turn both the volume and tone controls to their maximum positions (clock-wise).

TO ALIGN (or gang) THE I.F. CIRCUITS

(1) Attach the output meter from screen to plate of the 41 tube.
(2) Feed the signal from the local oscillator tuned to exactly 175 kc. into the receiver at the control grid of the oscillator-modulator 6D6.
(3) Adjust the I.F. trimmers for maximum indication on the output meter, ALWAYS KEEPING THE SIGNAL INPUT LOW.
(a) The first I.F. trimmers are mounted in the end of the first I.F. transformer located between the gang condenser and the chassis pan. The nut adjusts the primary trimmer.
(b) The second I.F. trimmers are mounted in the end of the second I.F. transformer, located under the chassis pan directly below the speaker field. The nut adjusts the primary trimmer.

TO CALIBRATE THE OSCILLATOR

(1) Set the dial pointer to 53 with the plates entirely enmeshed.
(2) Set the dial pointer to the position where a station or (oscillator) of known frequency, about 1500 kc., should be received and adjust oscillator trimmer (screw adjustment, top of gang condenser, inside end) until the desired signal is heard.
(3) Set the dial pointer to the position where a station(or oscillator) of known frequency, about 1100 kc., should be received and correct calibration (if necessary) by bending the rotor plates of the inside gang condenser section.
(4) Repeat operation 3 at, or near, 850 kc.
(5) Repeat operation 3 at, or near, 700 kc.
(6) Repeat operation 3 at, or near, 580 kc.

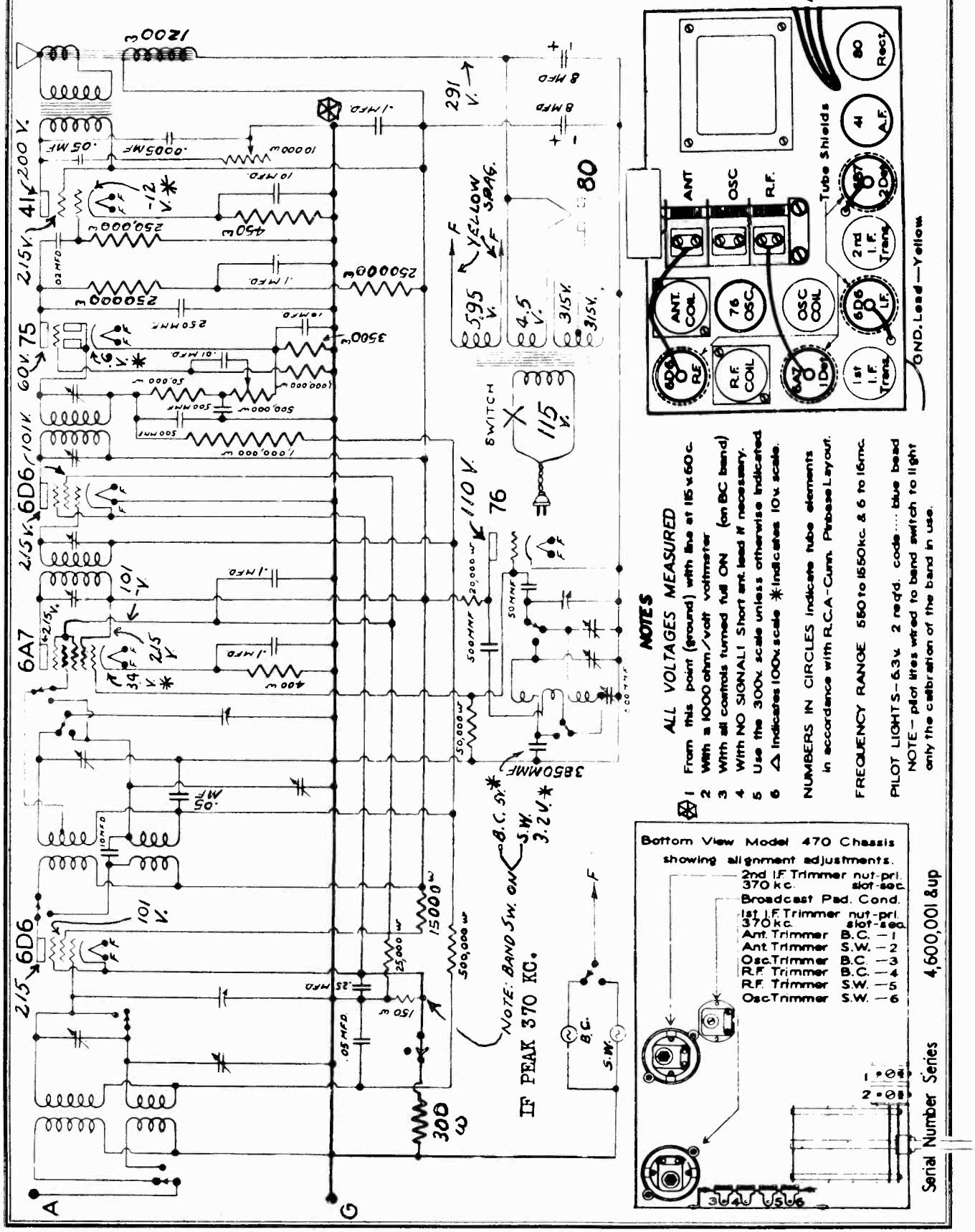
TO ALIGN (or gang) THE R.F. CIRCUITS

(1) Attach the output meter from screen to plate of the 41 tube.
(2) Attach the local oscillator to the antenna lead and KEEP THE SIGNAL INPUT LOW.
(3) With the receiver and oscillator tuned to resonance at, or near, 1500 kc. adjust the antenna and R.F trimmers(screw adjustments, top of gang condenser, outside and middle sections) until maximum output is obtained.
(4) With the receiver and oscillator tuned to resonance at, or near, 1100 kc. bend the rotor plates of the outside and middle gang condenser sections to obtain maximum output.
(5) Repeat operation 4 at, or near, 850 kc.
(6) Repeat operation 4 at, or near, 700 kc.
(7) Repeat operation 4 at, or near, 580 kc.

NOTE--RE OPERATION 2, CALIBRATION PROCEDURE: If more than one position of the oscillator trimmer enables the desired signal to be received REDUCE THE INPUT TO THE RECEIVER until one, and only one position of the oscillator trimmer will enable the desired signal to be received.

THE RUDOLPH WURLITZER CO.

MODEL 470
Schematic
Socket
Voltage



NOTES

ALL VOLTAGES MEASURED

1. From this point (ground) with the set 115 v 60 c.
2. With a 1000 ohm/volt voltmeter
3. With all controls turned full ON (on BC band)
4. With NO SIGNAL! Short ant. lead if necessary.
5. Use the 300 v. scale unless otherwise indicated.
6. △ Indicates 100 v. scale ✱ Indicates 10 v. scale.

NUMBERS IN CIRCLES indicate tube elements in accordance with R.C.A.-Cunn. Phase Layout.

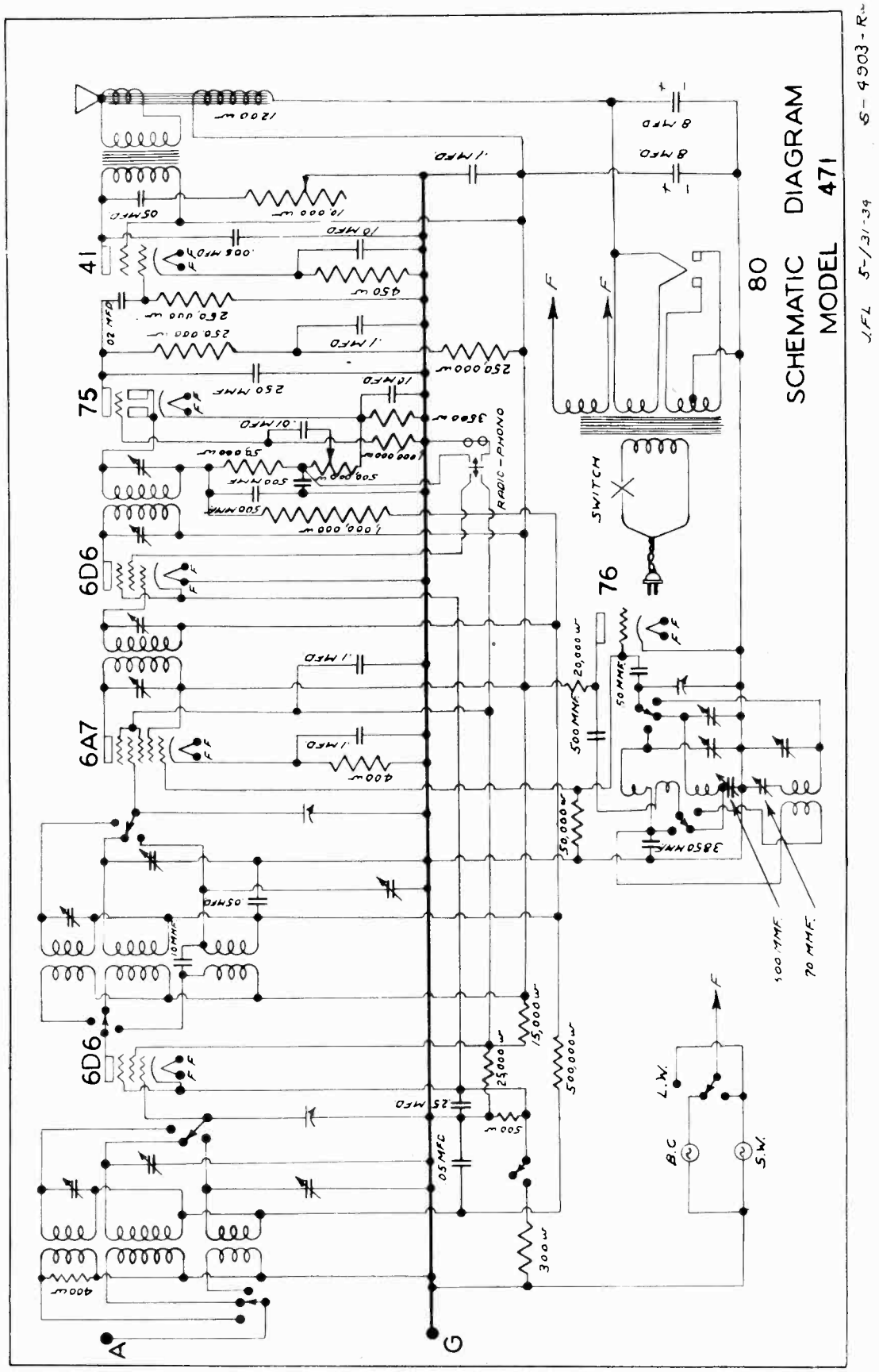
FREQUENCY RANGE 550 to 1550 kc. & 6 to 16 mc.

PILOT LIGHTS—6.3 v. 2 req'd. code ..... blue bead
NOTE—pilot lites wired to band switch to light only the calibration of the band in use.

Serial Number Series 4,600,001 &up

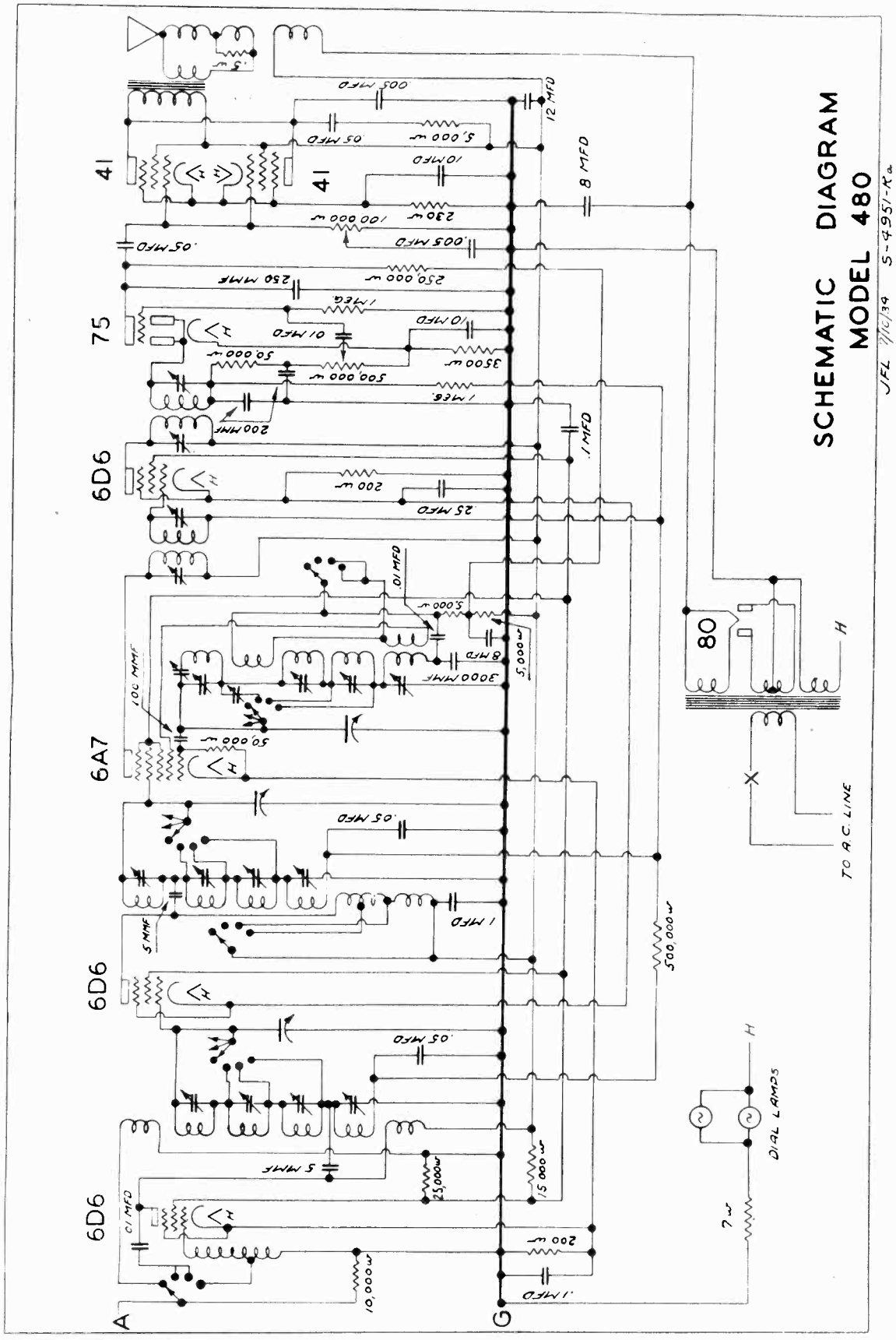
MODEL 471
Schematic

THE RUDOLPH WURLITZER CO.



THE RUDOLPH WURLITZER CO.

MODEL 480
Schematic



The only difference between the Lyric Models C-4 and M-4 is the placement of the volume control and gang condenser. On the Model C-4 the volume control is mounted on a bracket at the left, and the gang condenser on the right. On the Model M-4 the volume control is mounted below the gang condenser on the right. Hereinafter these models are referred to indiscriminately as Model C/M-4. The early Model C/M-4 is a single (broadcast) band receiver. The later models have an additional short wave band, approximately 1500 to 4000 kc., which is selected by a toggle switch at the right rear of the chassis pan. There are no calibration or alignment adjustments to make on this band. For short wave reception the switch must be thrown toward the end of the chassis pan. For Broadcast reception, toward the center of the chassis pan.

Connect the output meter (when used) from screen to plate of 43 tube.

Advance the volume control to its maximum position (clockwise).

In all ganging operations USE THE WEAKEST SIGNAL THAT WILL GIVE A SATISFACTORY INDICATION ON THE OUTPUT METER. Do this by reducing the input, NOT BY RETARDING THE VOLUME CONTROL.

The C/M-4 uses the 6B7 as a reflexed I.F.--A.F. amplifier, and the I.F. trimmer adjustments are very critical. For this reason, and because these adjustments are carefully made at the factory, the alignment of the I.F. trimmers is not recommended. If, however, the I.F. amplifier is definitely at fault--the following procedure should be followed:-

(1) Attach the output meter from screen to plate of 43 tube.

(2) Attach antenna lead to local oscillator tuned to 456 kc.

(3) KEEPING THE INPUT FROM THE LOCAL OSCILLATOR AS LOW AS POSSIBLE, adjust the I.F. trimmers for maximum reading on the output meter.

(A) The first I.F. trimmer is located under the chassis pan, adjustable through a hole in the chassis pan, near right center, directly in front of the first I.F. transformer. The slot adjustment is the primary trimmer. The nut ($\frac{1}{4}$" hex) adjustment is the secondary trimmer.

(B) The second I.F. trimmer is located under the chassis pan, adjustable through a hole in the chassis pan, left center, near volume control.

TO CALIBRATE THE C/M-4

(1) Throw the toggle switch (if any) to the broadcast position.

(2) Set the gang condenser to the position where a station (or oscillator) of known frequency, about 1500 kc., should be received.

(3) Adjust the oscillator trimmer (screw adjustment, top of gang condenser, front end) until desired signal is heard. The calibration of the rest of the dial will fall within reasonable limits without further adjustment.

TO ALIGN (or gang) THE C/M-4

(1) Throw the toggle switch (if any) to the broadcast position.

(2) Connect the output meter from screen to plate of the 43 tube.

(3) Turn condenser to approximately 1400 kc., connect antenna lead to local oscillator tuned to set, and check setting of volume control.

(4) Adjust R. F. trimmer (screw adjustment, rear end, top of gang condenser) until output meter indicates maximum output. KEEP SIGNAL INPUT LOW. The alignment of the balance of the tuning range will fall within reasonable limits with no further adjustments.

ALIGNMENT PROCEDURE FOR LYRIC C-4 & M-4

The Lyric Model P-5 is a five tube superheterodyne of the universal type with the heaters of the tubes connected in series. A 456 kc. I. F. amplifier is used and a series (acceptor) wave trap is shunted across the primary of the antenna coil to minimize the pick-up of stations operating at, or very near, the I. F.

The circuit used includes, a 6A7 electron coupled oscillator-first detector, and a 75 duplex diode hi-mu triode in the second detector-first A. F. circuit. Diode type A. V. C. is employed.

The first I. F. transformer is fitted with an adjustable tickler to control the sensitivity of the receiver. This tickler is mounted on a small wooden dowel protruding from the center, bottom, of the transformer and is connected between the cathode and suppressor of the 78 I. F. tube. To increase the sensitivity of this receiver, pull out on the dowel. To decrease the sensitivity of, (or to stabalize), this receiver, push the dowel in.

A socket is provided at which the autodaptor may be connected, thus enabling the P-5 to be operated from a 6 volt D. C. source.

IN ALL GANGING OPERATIONS USE THE WEAKEST SIGNAL THAT WILL GIVE A SATISFACTORY INDICATION ON THE OUTPUT METER. DO THIS BY REDUCING THE INPUT, NOT BY RETARDING THE VOLUME CONTROL.

The I. F. trimmer adjustments are carefully made at the factory and should not be tampered with unless a thorough investigation definitely proves the I. F. amplifier to be at fault. In that event:-

(1) Attach the output meter from screen to plate of the 43 tube.

(2) Attach the local oscillator, tuned to 456 kc., to the antenna lead.

(3) Adjust the I. F. trimmers for maximum indication on the output meter.

(A) The first I. F. trimmer is a dual unit, located on the rear of the chassis pan. The nut adjustment is the secondary trimmer.

(B) The second I. F. trimmer is a dual unit located on the top of the chassis pan near the volume control. The nut adjustment is the primary trimmer.

(4) Adjust the wave trap trimmer for MINIMUM indication (dip) on the output meter.

(A) This trimmer is a single unit at the extreme left end, on the rear of the chassis pan.

TO CALIBRATE THE P-5

(1) Set the condenser to the point where a station (or oscillator) of known frequency, about 1400 kc., should be received.

(2) Adjust the oscillator trimmer (screw adjustment top, front of gang condenser) until desired signal is heard. The calibration will then fall within reasonable limits with no further adjustment.

TO ALIGN (or gang) THE R. F. CIRCUIT

(1) Attach output meter from screen to plate of the 43 tube.

(2) Turn condenser to 1400 kc.

(3) Attach antenna lead to local oscillator tuned to resonance with receiver,.

(4) Adjust R. F. trimmer (screw adjustment top, rear of gang condenser) for maximum indication on the output meter. The alignment of the R. F. stage will fall within reasonable limits with no further adjustments.

ALIGNMENT PROCEDURE FOR MODEL P-5

MODEL SA-5
Alignment Data

THE RUDOLPH WURLITZER CO.

The Model SA-5 is a 5 tube superheterodyne covering the broadcast band and utilizing a band pass filter between the antenna and the first detector, a 2A7 electron coupled oscillator-first detector circuit, a 175 kc., I. F. amplifier, and a 2A6 duplex diode hi-mu triode second detector-first A. F. circuit. Diode type A.V.C. is employed.

IN ALL GANGING OPERATIONS USE THE WEAKEST SIGNAL THAT WILL GIVE A SATISFACTORY INDICATION ON THE OUTPUT METER. DO THIS BY REDUCING THE INPUT, NOT BY RETARDING THE VOLUME CONTROL.

The I. F. trimmers are carefully adjusted at the factory and should not be tampered with unless a thorough investigation definitely proves the I. F. amplifier to be at fault. In that event:-

(1) Attach the output meter from screen to plate of the 2A5 tube.

(2) Attach local oscillator tuned to exactly 175 kc. to the control grid of the 2A7, providing a D. C. from this point to ground.

(3) Adjust the I. F. trimmers for maximum indication on the output meter. These I. F. trimmers are mounted on a strip extending from near the 2A7 socket toward the center of the chassis pan. A recheck of each trimmer adjustment, to insure perfect alignment of the I. F. stages, is recommended.

TO CALIBRATE THE SA-5

(1) Set the dial to the point where a station (or oscillator) of known frequency, about 1400 kc, should be received. Adjust the oscillator trimmer (screw adjustment, top center of gang condenser) until desired signal is heard.

(2) Set the dial to the point where a station (or oscillator) of known frequency, about 1000 kc., should be received and bend the rotor plates, when necessary, to correct the calibration.

(3) Repeat operation 2 at, or near, 800 kc.

(4) Repeat operation 2 at, or near, 600 kc.

TO ALIGN (or gang) THE R. F. CIRCUITS

(1) Set the dial to 1400 kc.

(A) Attach the output meter from screen to plate of the 2A5 tube.

(B) Attach local oscillator and tune to resonance with receiver.

(C) Adjust antenna trimmer (screw adjustment top, rear of gang condenser) for maximum indication on output meter.

(D) Adjust R. F. trimmer (screw adjustment top, front of gang condenser) for maximum indication on output meter.

(2) Set dial to 1000 kc.

(A) Adjust local oscillator to resonance with receiver.

(B) Bend rotor plates (front and rear gang condenser sections) for maximum indication on output meter.

(3) Repeat operation 2 at 800 kc.

(4) Repeat operation 2 at 600 kc.

THE RUDOLPH WURLITZER CO.

In all ganging operations USE THE WEAKEST SIGNAL THAT WILL GIVE A SATISFACTORY INDICATION ON THE OUTPUT METER. Do this by reducing the input, NOT BY RETARDING THE VOLUME CONTROL.

The I. F. trimmer adjustments are carefully made at the factory and should not be tampered with unless a thorough investigation definitely proves the I. F. amplifier to be at fault. In that event:-

1. Feed the signal from the local oscillator tuned to exactly 175 kc. into the set at the control grid 2A7, using some type of coupling device that will provide D. C. path from control grid to ground.

2. Attach the output meter from screen to plate of the 2A5 tube.

3. KEEPING THE SIGNAL AS LOW AS POSSIBLE, adjust the I. F. trimmers to give a maximum indication on the output meter. These I. F. trimmers will be found under the chassis pan, mounted on a strip extending from near the 2A7 socket to the center of the chassis pan. After having carefully adjusted these trimmers for maximun output, a final check should be made by going over each adjustment a second time to insure perfect alignment.

TO CALIBRATE THE SA-6

1. Set the dial to the point where a station (or oscillator) of known frequency, about 1400 kc., should come in. Adjust oscillator trimmer (screw adjustment top rear of gang condenser) until the desired signal is heard.

2. Set the dial to the point where a station (or oscillator) of known frequency, about 1000 kc. should come in. Then bend the rotor segments (about half engaged with the stator plates at this dial setting) to correct the calibration. If the dial reading is higher than the actual frequency, bend the segments away from the stator, and vica-versa,

3. Repeat operation two at, or near, 800 kc.

4. Repeat operation two at, or near, 600 kc.

This completes the calibration procedure.

TO ALIGN (or gang) THE R. F. CIRCUIT

1. Set dial to 1400 kc.

(A) Attach the output meter from screen to plate of the 2A5 tube.

(B) Attach the lead from local oscillator to the antenna post of the receiver, and adjust the oscillator to resonance with the receiver.

(C) KEEPING THE SIGNAL AS LOW AS POSSIBLE, adjust the antenna trimmer (screw adjustment, top of gang condenser, front end) for maximum indication on the output meter. Then-adjust the R. F. trimmer (screw adjustment, top center of gang condenser) for maximum indication on output meter.

2. Set dial to 1000 kc.

(A) Adjust the local oscillator for resonance with the receiver.

(B) Bend the segments of the rotor plates on the front and center sections of the gang condenser to give maximum indication on the output meter.

3. Repeat operation two at 800 kc.

4. Repeat operation two at 600 kc.

This completes the alignment procedure.

MODEL SA-91-A
Alignment Data

THE RUDOLPH WURLITZER CO.

BALANCING

Caution: When balancing radio frequency or IF circuits, be sure that the volume control is turned to the full "On" position and the output of the test oscillator adjusted to give a very weak signal. This is necessary to minimize the automatic volume control action and to permit the most accurate adjustment.

INTERMEDIATE FREQUENCY CIRCUITS

The intermediate frequency amplifier of this receiver operates at 175 kc. and an accurately calibrated test oscillator generating this frequency is necessary for ganging.

Current from the test oscillator should be fed into the set by removing the control grid cap on the type 57 detector modulator tube, and connecting the oscillator output terminals between the chassis pan and the control grid cap of this tube.

The IF transformers are tuned by adjusting the screws under the removable name plate on the rear of the chassis.

To align the RF circuits the test oscillator should first be set to some known frequency between 1400 and 1500 kc. and the set tuned so that the dial pointer indicates this frequency. The trimmer condenser of the oscillator section of the variable condenser (front section) should then be tuned until the test signal is received with greatest output.

There are two possible adjustments on the trimmer condensers at which this signal may be received; the proper adjustment is that at which the trimmer is set to minimum capacity; that is, the adjustment at which the trimmer plate is farthest out. When this has been done the trimmer condensers of the second and third variable condensers are to be set to give maximun output.

The set should next be balanced at approximately 1250, 950, 700 and 550 kc. in the order mentioned as follows:

The test oscillator is set to some known frequency, approximately that recommended above, and the set adjusted for maximum output by bending the adjustable sections of the rotor end plates of the variable condensers. In doing this, the plates or the oscillator section should be bent first and those of the remaining sections bent after the oscillator is adjusted.

AUTOMATIC VOLUME CONTROL

The detector and automatic gain control functions are performed by the diode section of the type 55 tube which rectifies the energy sent to it by the intermediate frequency amplifier. The DC component of this energy passes through a net work of high resistances and by-pass condensers to the control grids of the RF and IF tubes to control the amount of amplification in these stages.

An increase in signal strength results in an opposite action decreasing the amount of RF and IF amplification. The audio component of the signal rectified by the diode, is passed through the manual volume control which also serves as a part of the diode resistance net work. The adjustment of this control sets the amount of energy passed on to the audio amplifier for further amplification.

The Model SU-5 is a dual wave superheterodyne receiver covering the broadcast band (550 to 1500 kc.), and a short wave band of from 1580 to 3700 kc.
Connect the line cord lead marked with a red dot to the grounded side of the line. Connect the output meter from screen to plate of the 43 tube.
Advance the tone and volume controls to their maximum positions (clockwise).
In all ganging operations USE THE WEAKEST SIGNAL THAT WILL GIVE A SATISFACTORY INDICATION ON THE OUTPUT METER, do this by reducing the input, NOT BY RETARDING THE VOLUME CONTROL.
The I. F. trimmer adjustments are carefully made at the factory and should not be tampered with unless a thorough investigation definitely proves the I. F. amplifier is at fault, in that event:-
(1) Attach the output meter to the 43 tube.
(2) Attach antenna lead to a local oscillator tuned to 456 KC.
(3) KEEPING THE SIGNAL INPUT AS LOW AS POSSIBLE, adjust the two I. F. trimmers to give maximum indication on output meter.
(A) The first I. F. trimmer is on the rear of the chassis directly under the first I. F. transformer, between the 6A7 and 78 tubes. The slot adjustment is the primary trimmer. The hex nut adjustment is the secondary trimmer.
(B) The second I. F. trimmer is located on the top of the chassis pan, left end, near the volume control. The adjustments are the same as on the first I. F. trimmer.
UNDER NO CIRCUMSTANCES SHALL THE SINGLE TRIMMER AT THE EXTREME RIGHT REAR OF THE CHASSIS (usually marked with red) BE ADJUSTED.

TO CALIBRATE BROADCAST BAND:-

(1) Turn the band switch to the broadcast position (clockwise).
(2) Set the dial pointer to the position where a station (or oscillator) of known frequency, about 1400 kc., should come in.
(3) Adjust oscillator trimmer (screw adjustment, top of gang condenser, front-dial-end) until desired signal is heard.
The calibration of the rest of the dial will fall within reasonable limits with no further adjustment.

TO ALIGN (or gang) THE BROADCAST BAND:-

(1) Connect the output meter to the 43 tube.
(2) Set dial to approximately 1400 kc., connect antenna lead to local oscillator tuned to set, and check settings of volume and tone controls.
(3) Adjust R. F. trimmer (screw adjustment, top of gang condenser, rear end) until output meter indicates maximum output. KEEP SIGNAL INPUT LOW! The alignment over the balance of the tuning range will fall within reasonable limits without further adjustment.

TO CALIBRATE THE SHORT WAVE BAND:-

(1) Turn the band switch to the short wave position (counter-clockwise).
(2) Set the dial pointer to the position where a station (or oscillator) of known frequency about 3700 kc., should come in.
(3)Adjust the short wave oscillator trimmer (screw adjustment, under chassis pan-adjustable through hole in chassis pan top front, right corner near gang condenser) until desired signal is heard. The calibration of the rest of the dial will fall within reasonable limits without further adjustment.

TO ALIGN (or gang) THE SHORT WAVE BAND:-

(1) Connect the output meter to 43 tube.
(2) Set dial to approximately 3600 kc. (3.6 MC.), connect antenna lead to local oscillator tuned to set and check settings of tone and volume controls.
(3) Adjust short wave R. F. trimmer (screw adjustment, rear of antenna coil mounting bracket, between 6A7 and 78 tubes) until the output meter indicates maximum output. KEEP THE SIGNAL INPUT LOW! The alignment over the balance of the tuning range will fall within reasonable limits without further adjustment.

ALIGNMENT PROCEDURE FOR LYRIC SU-5

The Model SW-88 is an eight tube superheterodyne designed to receive modulated signals whose carrier frequency is between 550 and 22,000 kc. This tuning range is divided into four bands.

1st.	Scale	550	1500	kc.	546	200 m.	Broadcast.
2nd.	Scale	1450	3700	kc.	207	81.1 m.	Police Calls.
3rd.	Scale	3500	9000	kc.	85.7	33.3 m.	Domestic S.W.
4th.	Scale	8500	22000	kc.	35.3	13.6 m.	Foreign S.W.

The desired band is selected by a four position wave change switch mounted directly below the tuning control. This switch knob also controls the sliding mask behind the dial scale, allowing only the calibration of the band in use to be illuminated.

The Model SW-88 uses a 57 first detector, a 56 oscillator whose output is inductively coupled into the cathode circuit of the first detector, two stages of I.F. amplification(at 485 kc.) using 58 tubes, a 56 diode second detector and A.V.C. tube, a 57 first audio, and a 2A5 in the audio output stage.

IN ALL GANGING OPERATIONS USE THE WEAKEST SIGNAL THAT WILL GIVE A SATISFACTORY INDICATION ON THE OUTPUT METER, AND TURN THE VOLUME & TONE CONTROLS TO THEIR MAXIMUM POSITIONS (clockwise).

The I.F. trimmer adjustments are carefully made at the factory and should not be tampered with unless a thorough investigation definitely proves the I.F. amplifier to be at fault,in that event:-

(1) Attach the output meter from plate to screen of 2A5 tube.
(2) Feed the signal from the local oscillator tuned to exactly 485 kc. into the receiver at the control grid of the first detector, providing a D.C. path from the point to ground.
(3) Adjust the I.F. trimmers to give maximum indication on the output meter. There are three I.F. transformers, each with two screw adjustments. On the early models these adjustments are on the bottom of the transformers, accessible from the under side of the chassis. On the later models these adjustments are on the top of the transformers.
(4) NEXT-feed the 485 kc. signal in at the antenna post,replace the first detector grid cap, and adjust the wave trap condenser for MINIMUM indication on the output meter. This adjustment is a $\frac{1}{4}$" hex nut on a two plate trimmer under the chassis,below the gang condenser, near the band switch.

TO CALIBRATE THE SW-88

(1) Set the dial to the point where a station (or oscillator) of known frequency, about 1400 kc.,should come in.
(A) Set Band switch to band 1 (top scale).
(B) Adjust oscillator trimmer (screw adjustment, top-rear of gang condenser) until desired signal is heard. There will be two peaks in adjusting this trimmer. The peak obtained with the loosest trimmer setting is correct.
(2) Repeat operation 1 at,or near,550 kc., using band 1.
(A) Adjust oscillator pad (fourth adjustment from right, on rear of chassis pan) until desired signal is heard.
(3) Repeat operation 1 at, or near,1450 kc.,using band 2.
(A) Adjust oscillator pad (third adjustment from right on rear of chassis pan) until the desired signal is heard.
(4) Repeat operation 1 at, or near, 3500 kc.,using band 3.
(A) Adjust oscillator pad (second adjustment from right on rear of chassis pan) until the desired signal is heard.
(5) Repeat operation 1 at, or near, 8500 kc.,using band 4.
(A) Adjust oscillator pad (extreme right adjustment on rear of chassis pan) until the desired signal is heard.

TO ALIGN (or gang) THE R.F. CIRCUITS

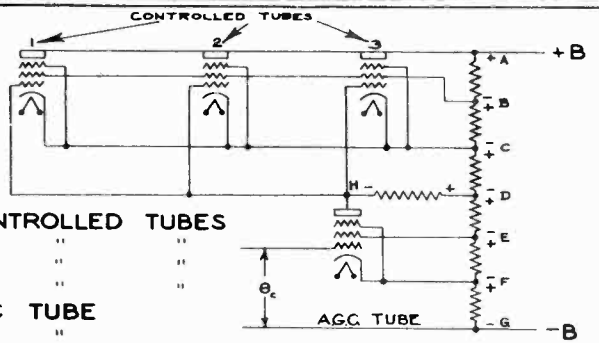
(1) Set the dial to 1400 kc., using band 1.
(A) Attach oscillator, tuned to set, to antenna post.
(B) Attach output meter from screen to plate of 2A5 tube.
(C) Adjust R. F. trimmer (screw adjustment, top-front-of gang condenser) for maximum output. KEEP SIGNAL INPUT LOW!
(2) Set the dial to 3700 kc., using band 2.
(A) Tune the oscillator to the receiver and adjust R.F. trimmer (extreme left adjustment on rear of chassis pan) for maximum output. KEEP SIGNAL INPUT LOW!
(3) Set the dial to 9000 kc., using band 3.
(A) Tune the oscillator to the receiver and adjust R.F. trimmer (second adjustment from left on rear of chassis pan)

Note 1-In case the local oscillator will not reach the higher alignment frequencies, harmonics of lower frequencies may be used.

CORRECTION--The 9000 kc. R.F. trimmer is erroneously shown connected to switch point 4 in the Model SW-88 Service Schematic, Drawing No. 83. This trimmer should be wired to point 3, and point 4 should be left open.

ALIGNMENT PROCEDURE FOR MODEL SW-88

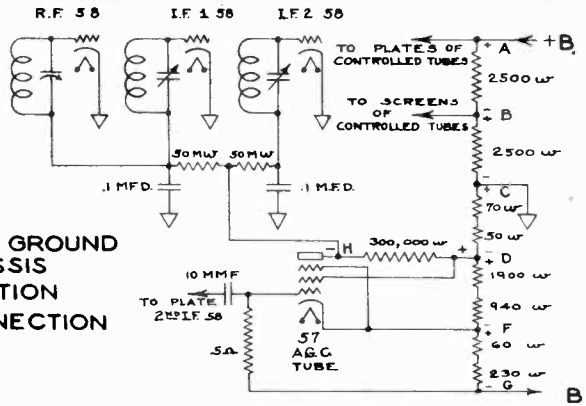
FIG. 1



C-A E_f CONTROLLED TUBES
C-B E_s " "
C-D E_a " "
D-H AVC E_a " "
F-D E_f AGC TUBE
F-E E_s " "
F-G E_a " "
e_c CONTROL VOLTAGE FOR AGC TUBE

FUNCTIONAL SCHEMATIC
THERMIONIC VOLTMETER TYPE
AUTOMATIC GAIN CONTROL (H)

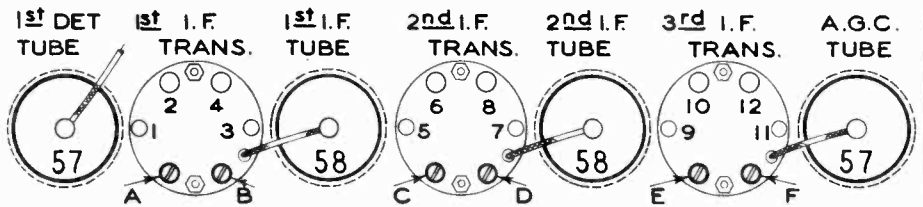
FIG. 2



LEGEND
INDICATES GROUND TO CHASSIS
CONNECTION
NO CONNECTION
MEGOHM
MΩ KILOHM
Ω OHM

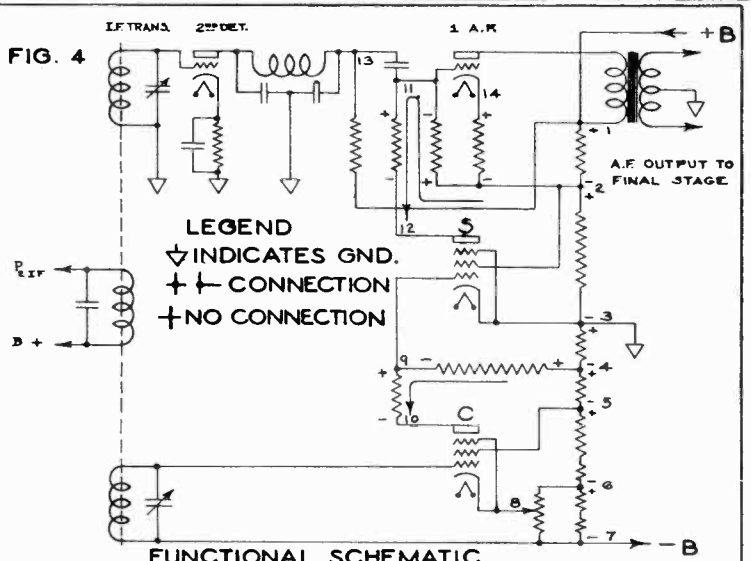
A.V.C. CIRCUITS MODEL SA-133

FIG. 3



I.F. AMPLIFIER SECTION MODEL SA—133

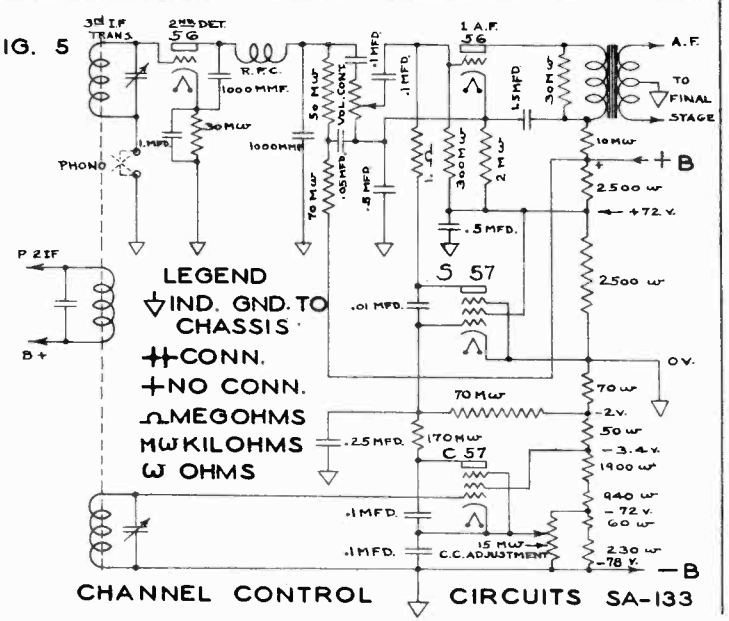
FIG. 4



LEGEND
INDICATES GND.
CONNECTION
NO CONNECTION

FUNCTIONAL SCHEMATIC
CHANNEL CONTROL SYSTEM

FIG. 5



CHANNEL CONTROL CIRCUITS SA-133

The difficulty in correctly aligning the I.F. stages is a result of the design of the I. F. transformers. In order to obtain a high degree of selectivity without sacrificing tone quality these transformers have been designed to provide a very narrow resonance curve with an essentially flat top. This is accomplished by over-coupling these transformers enough to get "double-bumps" the correct distance apart. With these transformers over-coupled it is impossible to correctly align them, therefore, it is necessary to decouple each I. F. transformer while it is being aligned. This is accomplished by shunting one winding with a 20,000 ohm resistor and aligning the other winding.

In the event that the I.F. stages require realignment the following procedure should be followed.

(1) Attach the output meter from plate to plate of the 2A5 tubes.
(2) Remove the silencing tube of the channel control circuit
(3) Attach the local oscillator tuned to exactly 175 kc. to the control grid of the first detector, using some type of coupling device that provides a d.c. path to ground. IN ALL GANGING OPERATIONS USE THE WEAKEST SIGNAL THAT WILL GIVE A SATISFACTORY INDICATION ON THE OUTPUT METER.
(4) Attach a resistor across the secondary of the first I.F. transformer (by inserting the leads in holes 3 & 4--See Figure 3, Drawing #82-B) and adjust screw A for MAXIMUM indication on the output meter.
(5) Remove the resistor from the secondary of the first I.F. transformer and place it across the primary (holes 1 & 2) and adjust screw (B) for MAXIMUM indication on the output meter. LEAVE THIS RESISTOR WHERE IT IS FOR THE BALANCE OF THE ALIGNMENT PROCEDURE.
(6) With a second resistor repeat operation 4, (holes 7 & 8, screw (C).
(7) With this second resistor repeat operation 5, (holes 5 & 6, screw (D).
(8) With a third resistor repeat operation 4,(holes 11 & 12, screw (E).
(9) With this third resistor repeat operation 5, (holes 9 & 10, screw (F).
(10) Adjust the channel control pad (screw adjusting trimmer under chassis pan near third I.F. transformer, (adjustable through hole in chassis pan bottom cover) for MINIMUM (dip) indication on the output meter. This dip is not very pronounced, and unless extreme care is exercised it may be passed over without being noticed. Note--Be sure the resistor leads make good contact when inserted in holes in transformers.

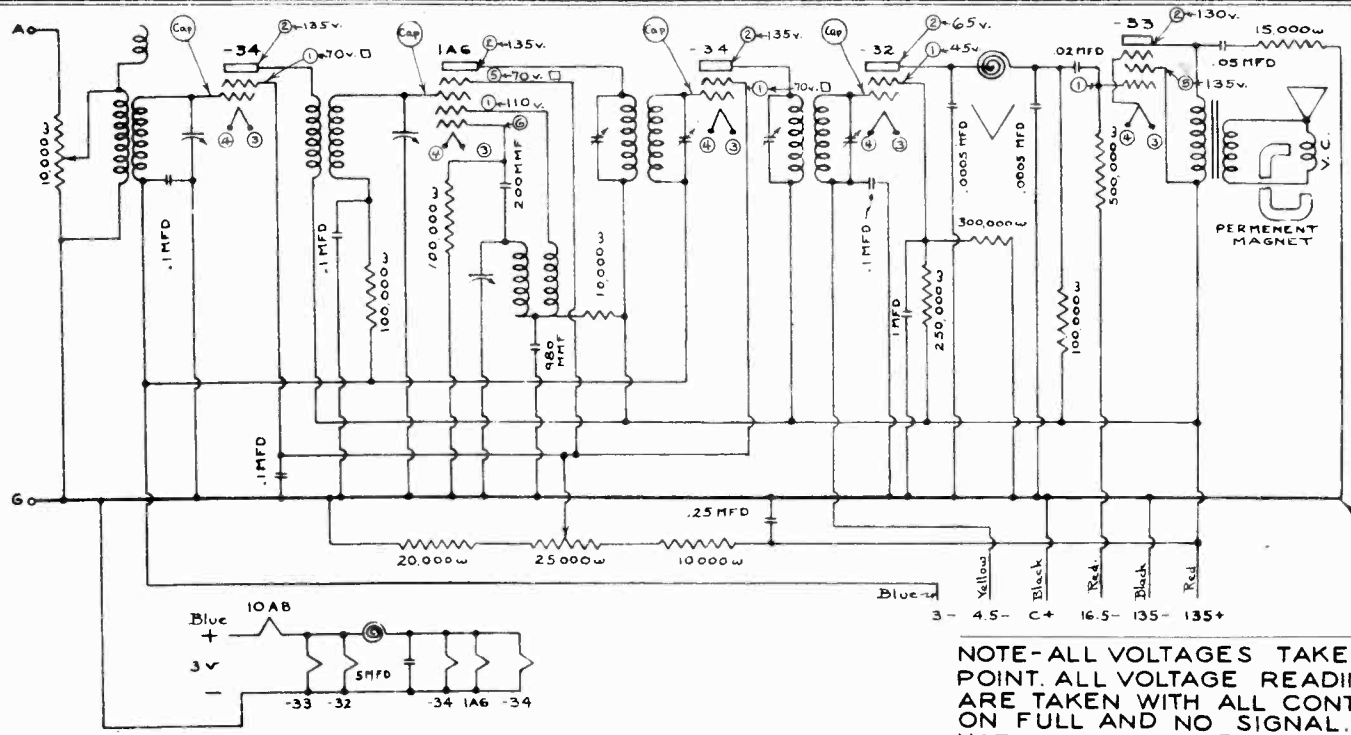
TO CALIBRATE THE SA-133

(1) Adjust the dial mechanism (if necessary) so that with the plates entirely enmeshed the dial will indicate 525 kc.
(2) Set the dial to the point where a station(or oscillator) of known frequency, about 600 kc., should be received and adjust the oscillator pad (screw adjustment under hole in chassis pan between oscillator section on gang condenser shields) until desired signal is heard.
(3) Set the dial to the point where a station(or oscillator) of known frequency, about 1400 kc., should be received and adjust the oscillator trimmer (screw adjustment, top of gang condenser, third from front) until desired signal is heard.
(4) Re-check operations 2 & 3.
(5) Check the calibration at, or near, 1200 kc. and correct (if necessary) by bending outer oscillator section rotor plates.
(6) Repeat operation 5 at, or near, 950 kc.
(7) Repeat operation 5 at, or near, 650 kc.
(8) A thorough re-check of the foregoing 7 operations to insure perfect calibration is recommended. If the alignment procedure to this point has been performed correctly the calibration will be accurate to within 2kc. at all points on the dial.

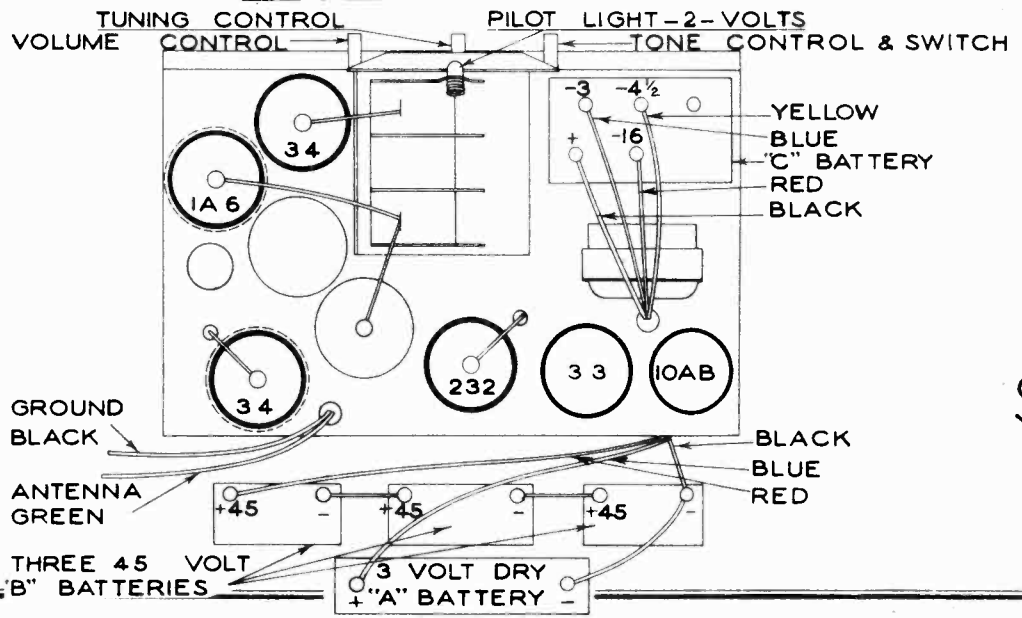
TO ALIGN THE R. F. CIRCUITS OF THE SA-133

(1) Attach the output meter from plate to plate of the 2A5 tubes.
(2) Attach the local oscillator to the antenna and tune to to set at each test frequency.
(3) At 1400 kc., adjust the antenna, link, and R.F trimmers (screw adjustments, top of gang condenser--see Drawing #82) for maximum indication on the output meter USING THE WEAKEST SIGNAL THAT WILL GIVE A SATISFACTORY INDICATION.
(4) At 1200 kc. bend the plates of the antenna, link and R.F rotors to give maximum indication on the output meter.
(5) Repeat operation 4 at 950 kc.
(6) Repeat operation 4 at 650 kc.
(7) Repeat operation 4 at 570 kc.
(8) Re-check operations 3-8 inclusive to insure perfect alignment.
(9) REMOVE RESISTORS FROM THE I.F. TRANSFORMERS.
(10) Remove the output meter and local oscillator, attach antenna, set dial to a point where no signal is being received and turn channel control counter-clockwise just far enough to silence the static and other inter-station noises.

The Model SA-133 is now ready for operation.



NOTE - ALL VOLTAGES TAKEN FROM THIS POINT. ALL VOLTAGE READINGS LISTED ARE TAKEN WITH ALL CONTROLS TURNED ON FULL AND NO SIGNAL.
USE 1000 OHMS PER VOLT VOLTMETER.
USE 300v. SCALE UNLESS OTHERWISE SPECIFIED.
□ INDICATES 35 VOLTS WITH VOLUME CONTROL OFF.
INTERMEDIATE FREQUENCY 175 K C



SERVICE SCHEMATIC MODEL B-6

SERIAL NO SERIES 4200001 & UP

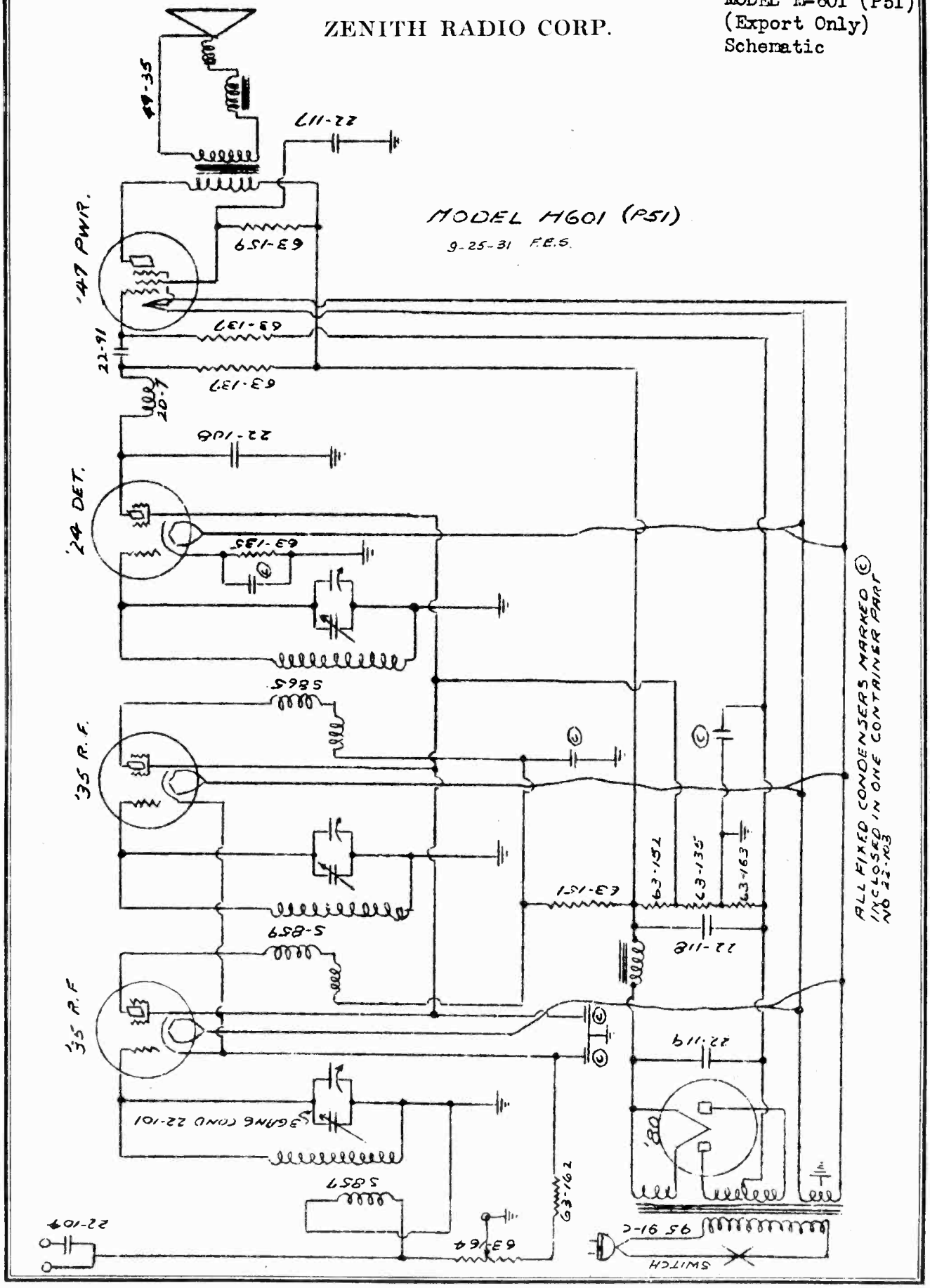
DWG. NO. 81

THE RUDOLPH WURLITZER CO.

MODEL B-6
Schematic
Socket
Voltage

MODEL M-601 (P51)
(Export Only)
Schematic

ZENITH RADIO CORP.



MODEL M-601 (P51)
Parts List

ZENITH RADIO CORP.

Variable Condenser Assembly

22-101	Three gang condenser
S-861	Dial drum assembly
S-769	Pilot lamp bracket and socket
100-18	2½ volt lamp
11-2	Pulley string
80-69	Dial string tension spring

Fixed Condensers

22-91	.03 mfd. condenser	(audio coupling)
S-392	Antenna series condenser	
22-103	Five section bypass condenser	
22-108	.002 mfd. condenser	(bypass)
22-117	.5 " "	"
22-118	6. " "	(electrolytic low voltage)
22-119	6. " "	(" high ")

Resistors

63-135	25M ohm resistor	(Red, Green end, Or ange Dot)
63-137	250M " "	(" " " Yellow ")
63-151	15M " "	(Brown " " Orange ")
63-152	43M " "	(Yellow Orange " ")
63-159	4M " "	(" Black end Red ")
63-162	100 " "	(Flat wire wound black ")
63-163	320 " "	" " " Red ")
63-164	Volume control	

Coils

S-857	1st R.F.coil (antenna)	(Coil Only)
S-859	2nd " " " (intermediate)	(" ")
S-865	3rd " " " (detector)	(" ")
20-8	R.F.choke	

Shields

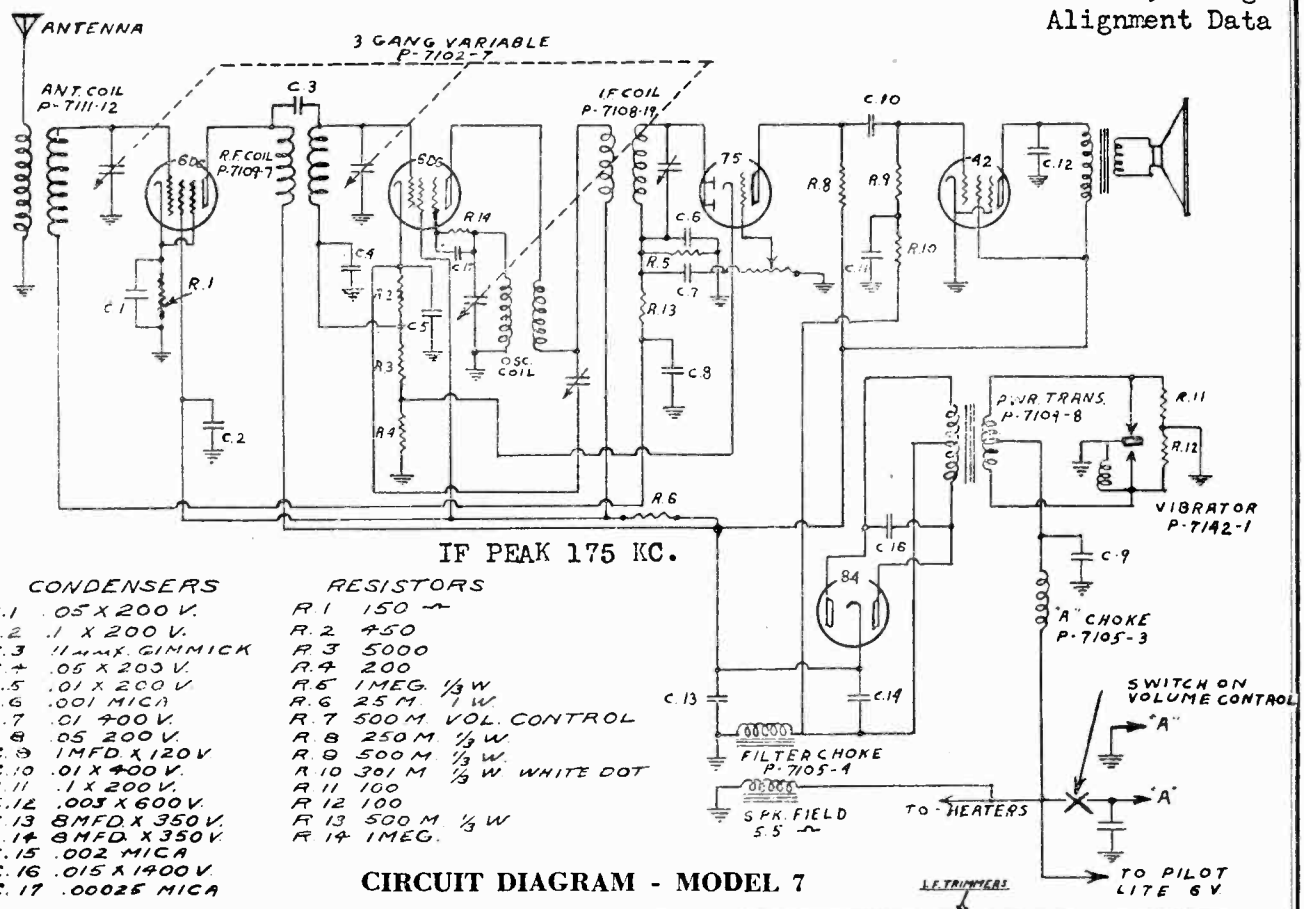
126-59	R.F. coil shield can
126-68	Condenser shield
MS-163	Tube shield
S-771	Coil mounting base

Miscellaneous

26-20	Calibrated dial strip	
46-50	Knobs for switch & volume control	
46-51	Knob for dial	
49-34	Dynamic speaker	
57-269	Escutcheon plate	
78-34	Four prong socket	
78-35	Five " "	
78-39	" " Pentode socket	
83-226	Speaker terminal strip	
85-29	Off & On switch	
95-91	Power transformer	(60 cycle)
95-92	" "	(25 ")

ZENITH RADIO CORP.

MODEL 7
Schematic
Socket, Voltage
Alignment Data

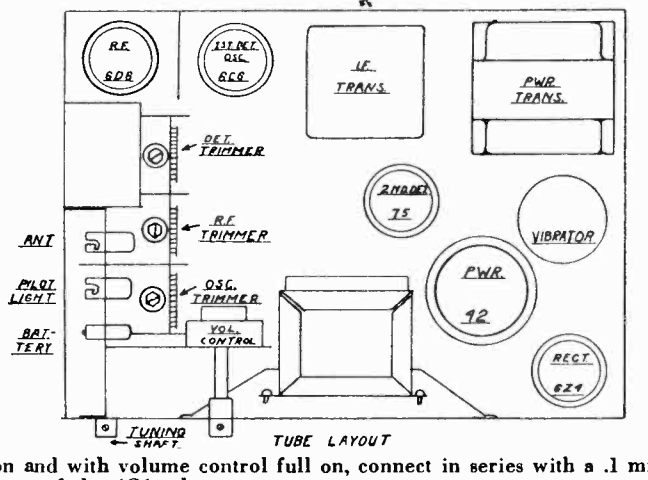


IF PEAK 175 KC.

CONDENSERS		RESISTORS	
C.1	.05 X 200 V.	R.1	150 ~
C.2	.1 X 200 V.	R.2	450
C.3	11mmf. GIMMICK	R.3	5000
C.4	.05 X 200 V.	R.4	200
C.5	.01 X 200 V.	R.5	1MEG. 1/3 W
C.6	.001 MICA	R.6	25 M 1 W.
C.7	.01 400 V.	R.7	500 M VOL. CONTROL
C.8	.05 200 V.	R.8	250 M 1/3 W.
C.9	1MFD X 120 V	R.9	500 M 1/3 W.
C.10	.01 X 400 V.	R.10	301 M 1/3 W WHITE DOT
C.11	.1 X 200 V.	R.11	100
C.12	.003 X 600 V.	R.12	100
C.13	8MFD X 350 V.	R.13	500 M 1/3 W
C.14	8MFD X 350 V.	R.14	1MEG.
C.15	.002 MICA		
C.16	.015 X 1400 V.		
C.17	.00025 MICA		

CIRCUIT DIAGRAM - MODEL 7

NOTE:
C.1, C.2, C.4, C.5 IN ONE UNIT. PART 7145-4
C.13, C.14 IN ONE UNIT PART 7119-4
R.1, R.2, R.3, R.4 IN ONE UNIT. PART 7106-14
R.11, R.12 IN ONE UNIT. PART 7106-6



TUBE LAYOUT

TUBE	POSITION	Ef	Ek	Eg¹	Eg²	Eg³	Ep
6D6	R.F.	5.9	1.5	0.	98	1.5	240
6C6	DET.-OSC.	5.9	17.	15.	98	—.5	98
75	1st AUD.	5.9	.5	0	—	—	80
42	PWR.	5.9	0	—5	240	0	220
84	RECT.	5.9	240	—	—	—	—

I. F. ALIGNMENT:

1. With variable condenser at its maximum capacity position and with volume control full on, connect in series with a .1 mfd. condenser, an oscillator set at 175 kilocycles to the grid cap of the 6C6 tube.
2. Adjust trimming condensers I. F. transformer, part number 7108-19 (see top view of chassis) to resonance with oscillator, as indicated on an output meter connected across the primary terminals of the speaker input transformer. Maximum deflection on the meter indicates resonance.

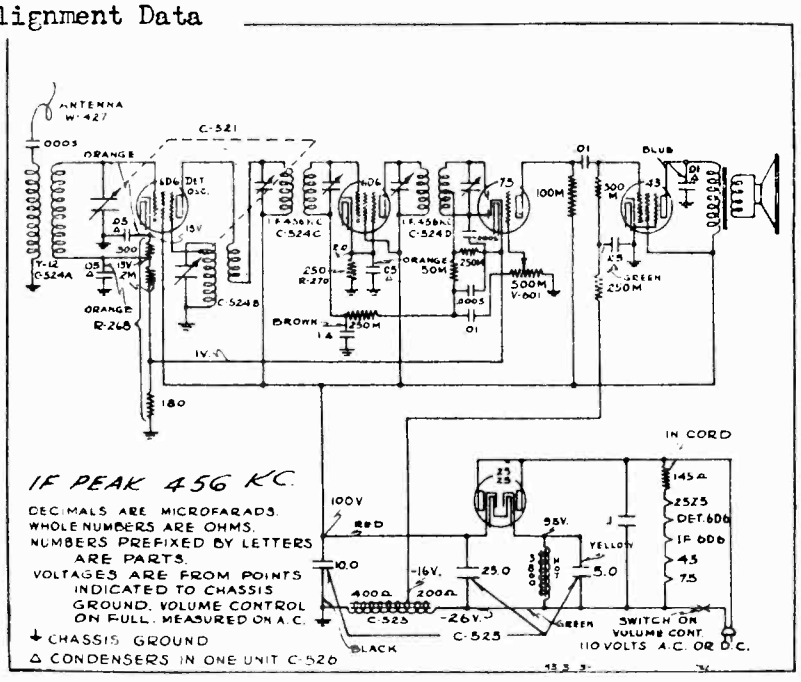
Note: The I. F. transformer has two trimmers, both of which are adjustable through the rear of the case.

FREQUENCY ALIGNMENT:

1. Attach oscillator connected in series with a 200 mmfd. condenser to the antenna lead and with the variable condenser at its minimum capacity position (extreme right of its rotation) and with an oscillator set at 1550 kilocycles, adjust concondenser trimmer of oscillator section (shaft end) to resonance.
2. Re-set oscillator to 1400 kilocycles, rotate variable condenser to pick up signal, adjust antenna and R. F. trimmers to resonance.
3. Check alignment at 1200-1000-800-600-530 kilocycles by setting oscillator to these frequencies and picking up signal by rotating condenser.
4. Bend slotted plates of antenna and R. F. sections only if necessary. UNDER NO CIRCUMSTANCES BEND PLATES OF OSCILLATOR SECTION.

MODEL 701
MODEL 702
Schematic, Socket
Alignment Data

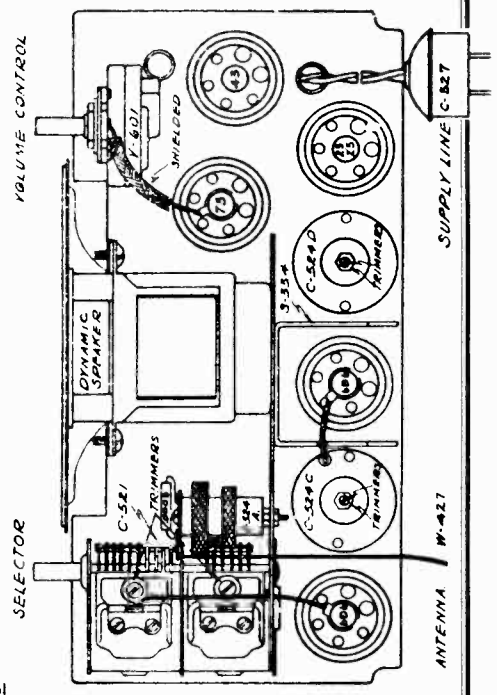
ZENITH RADIO CORP.



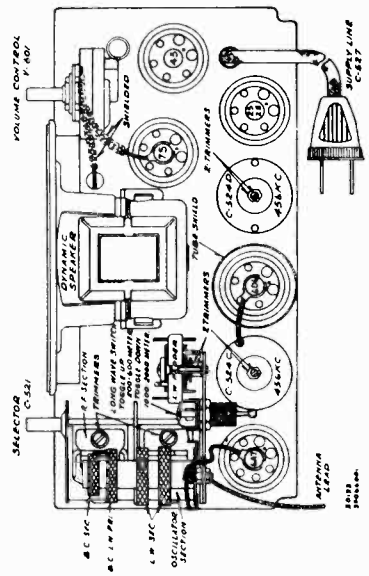
Schematic circuit diagram Model 701 AC-DC Superheterodyne, with automatic volume control

Should it be necessary, at any time, to rebalance this set the procedure is as follows: Attach a 456 kilocycle oscillator to the grid of the 6D6 tube in back of the variable condenser and adjust the trimming condensers of the I. F. transformers to maximum deflection on an output meter connected across the primary of the speaker input transformer. While adjusting these trimmers, the variable condenser should be at the maximum capacity position—at the extreme right of its rotation.

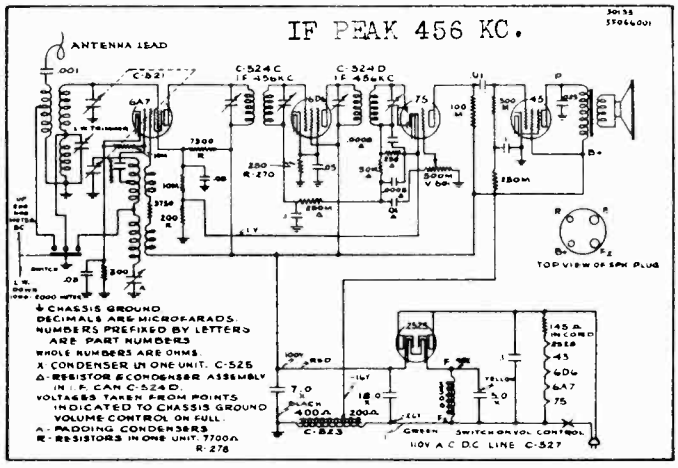
Next disconnect the antenna wire and connect an oscillator in series with a 75 mmf. condenser to the antenna coil. Rotate the condenser plates to the minimum capacity position—extreme left turn, and adjust the trimmer condenser of the rear section of the variable condenser to resonance with an oscillator set at 1725 kilocycles, then adjust the condenser of the front section of the variable condenser to resonance. Align at 1400—1200—1000—800—600—530 kilocycles, bend slotted plates of variable condenser if necessary.



MODEL 701



MODEL 702



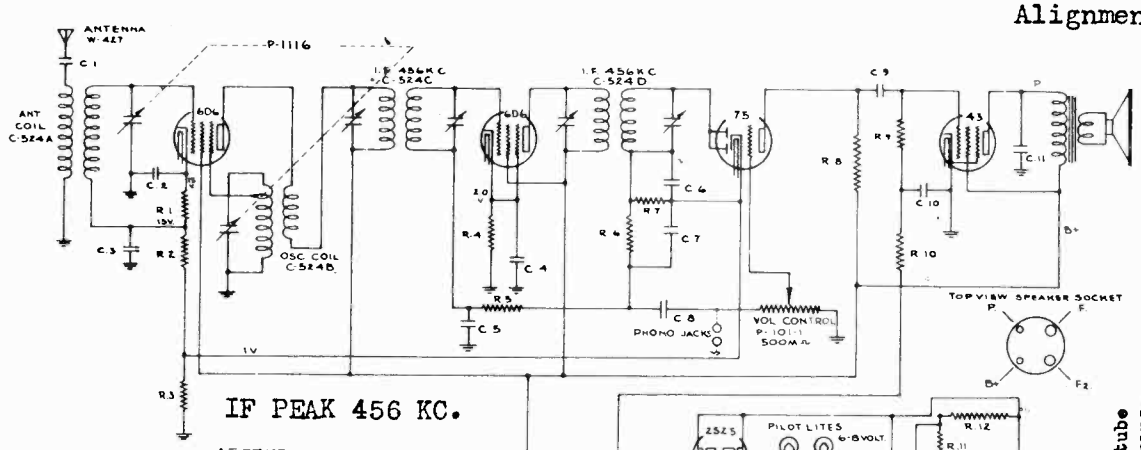
Schematic Circuit Diagram and Aligning Instructions Model 702 AC-DC Superheterodyne
200-600 Meters: 1000-2000 Meters

Should it be necessary, at any time, to rebalance this set the procedure is as follows: Attach a 456 kilocycle oscillator to the grid of the 6A7 tube in back of the variable condenser and adjust the trimming condensers of the I. F. transformers to maximum deflection on an output meter connected across the primary of the speaker input transformer. While adjusting these trimmers, the variable condenser should be at the maximum capacity position—at the extreme right of its rotation.

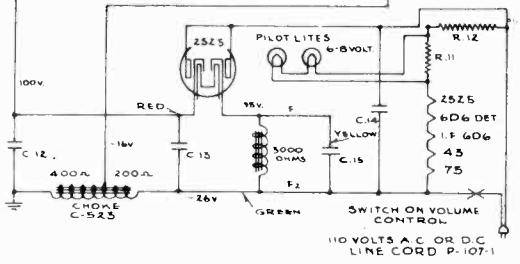
With switch lever up in 200-600 meter position, disconnect the antenna wire and connect an oscillator in series with a 250 mfd. condenser to the antenna coil, rotate the condenser plates to the minimum capacity position, extreme left turn, and adjust trimmer condenser of the oscillator and rear section of the variable to resonance with the oscillator set at 200 meters, adjust the front section to resonance at 215 meters, align at 250—300—400—500 meters and bend slotted plates of variable condenser if necessary. To adjust long wave, 1000-2000 meters, with switch lever down, set variable at maximum capacity, extreme right turn, and tune generator to maximum output, then peak long wave padder (hexagon nut of L. W. Padder), at the same time tuning oscillator until maximum output is attained. Attach oscillator leads to grid of 6A7 ground, set variable condenser at minimum capacity, extreme left turn, and adjust oscillator to resonance with set. Remove oscillator lead from grid of 6A7 and attach to antenna lead, then adjust long wave R.F. trimmer to maximum output (set screw adjustment of L. W. Padder). Do not disturb either oscillator or variable condenser while making this adjustment.

ZENITH RADIO CORP.

MODEL 801
Schematic, Socket
Alignment Data



IF PEAK 456 KC.



LEGEND

RESISTORS

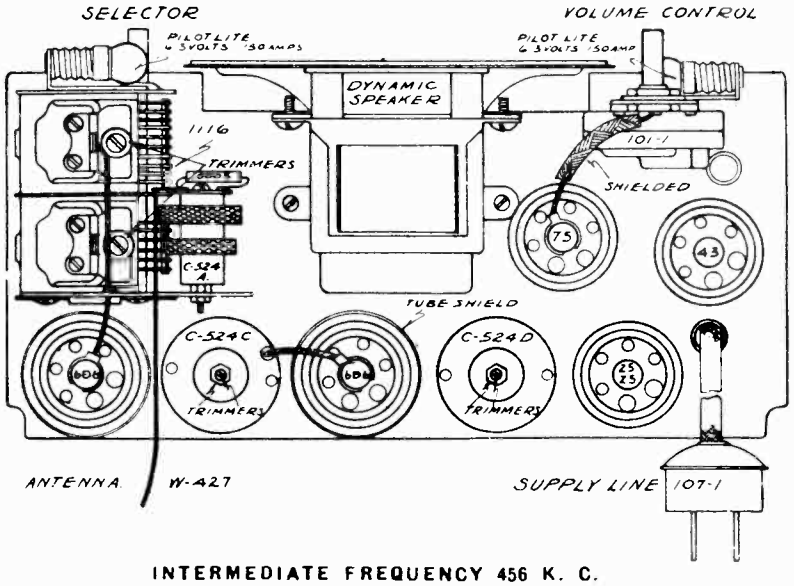
No	VALUE	
R 1	300	*
R 2	2M	*
R 3	180	*
R 4	250 R-270	
R 5	250M	
R 6	50M	
R 7	250M	
R 8	100M	
R 9	300M	
R 10	250M	
R 11	40A-300M.A. 0.36W R-106-1	
R 12	126 IN CORD P-107-1	

CONDENSERS

No	VALUE	
C 1	.0005	MICA
C 2	.05	200V
C 3	.05	200V
C 4	.05	200V
C 5	.1	200V
C 6	.0005	MICA
C 7	.0005	MICA
C 8	.01	400V
C 9	.01	400V
C 10	.1	200V
C 11	.025	300
C 12	5.0MFD. C-525D	
C 13	25.0MFD.	*
C 14	.1	400V
C 15	5.0MFD	*

NOTE:
*R 1, R 2 & R 3 IN ONE UNIT PART NUMBER R-268.
*C 13 AND C 15 IN ONE UNIT PART NUMBER C-525 C
NUMBERS PREFIXED BY LETTERS ARE PARTS.
VOLTAGES TAKEN FROM POINTS INDICATED TO CHASSIS GROUND. VOLUME CONTROL ON FULL. MEASURED ON A.C. CURRENT

MODEL 801



INTERMEDIATE FREQUENCY 456 K. C.

I.F. ALIGNMENT

1. To peak I.F. transformers, connect oscillator set at 456 kilocycles to the grid of the 6D6 tube directly in back of the variable condenser and adjust the trimming condensers of the I.F. transformers to resonance (Maximum deflection on an output meter connected across the primary of the speaker input transformer).

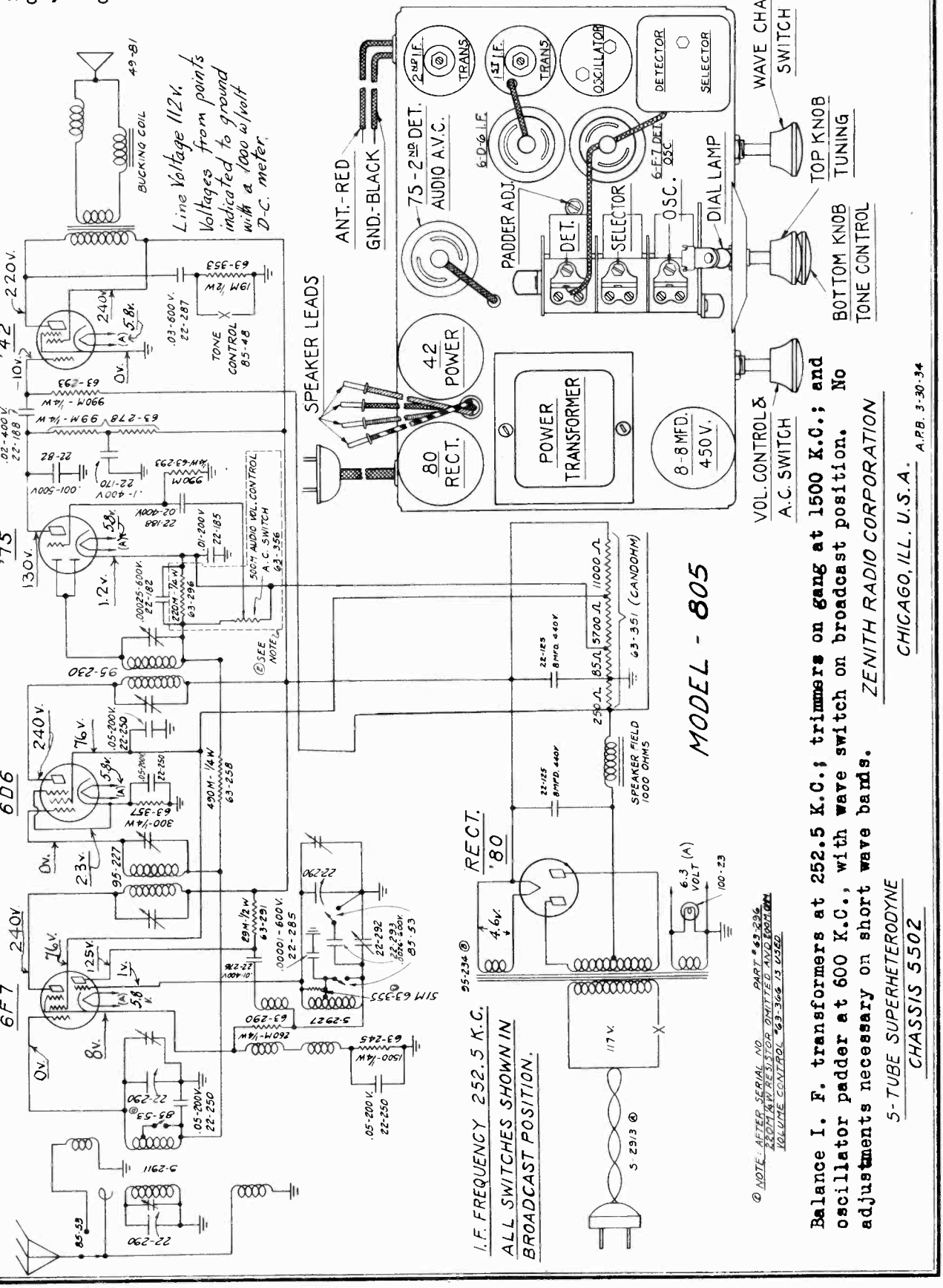
Each I.F. trimmer has two adjustments, one nut and one screw, both of which are adjustable from the top.

BROADCAST BAND ALIGNMENT

1. Disconnect antenna wire and connect oscillator in series with a 75 mmfd. condenser to the antenna coil. With the variable condenser set at its minimum capacity position, at the extreme right of its rotation, and with an oscillator output adjusted to 1720 kilocycles, adjust trimmer of oscillator section of variable condenser (rear section) to resonance (maximum deflection on an output meter connected across the primary of the speaker input transformer). Next adjust the trimmer condenser of the front section of the variable condenser to resonance.
2. Check alignment at 1400-1200-1000-800-600-530 kilocycles, bending the slotted plates of the front section of the variable condenser only if absolutely necessary.

MODEL 805,845
Schematic
Socket Layout
Voltage, Alignment

ZENITH RADIO CORP.



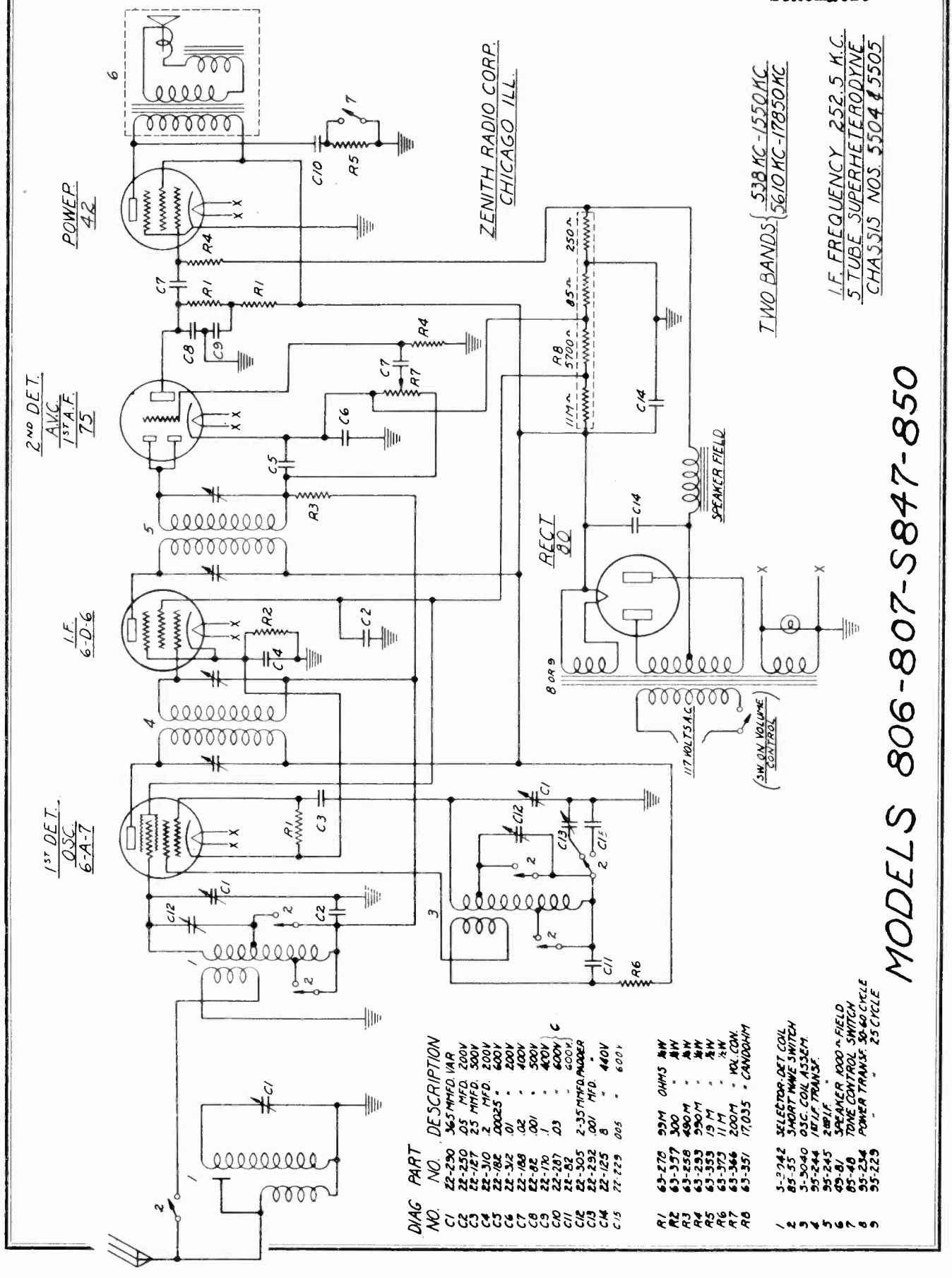
Balance I. F. transformers at 252.5 K.C.; trimmers on gang at 1500 K.C.; and oscillator padder at 600 K.C., with wave switch on broadcast position. No adjustments necessary on short wave bands.

ZENITH RADIO CORPORATION
CHICAGO, ILL. U.S.A.
A.P.B. 3-30-34

5-TUBE SUPERHETERODYNE
CHASSIS 5502

ZENITH RADIO CORP.

MODELS 806,807, S847,850
Schematic



DIAG NO.	PART NO.	DESCRIPTION
C1	22-230	365 MMFD VAR
C2	22-250	.05 MFD. 200V
C3	22-187	.25 MFD. 300V
C4	22-310	.2 MFD. 200V
C5	22-182	.0025 " 600V
C6	22-312	.01 " 200V
C7	22-188	.02 " 400V
C8	22-82	.001 " 500V
C9	22-170	.1 " 400V } C
C10	22-281	.03 " 600V
C11	22-82	" 600V
C12	22-305	2-35 MMFD PADDER
C13	22-292	.001 MFD "
C14	22-125	.8 " 440V
C15	22 229	.005 " 600V
R1	63-270	22M OHMS ½W
R2	63-357	300 " ½W
R3	63-258	490M " ½W
R4	63-233	950M " ½W
R5	63-353	19 M " ½W
R6	63-373	11 M " ½W
R7	63-366	2000M " VOL CON.
R8	63-351	17035 " CANOHM
1	5-2242	SELECTOR-ANT. COIL
2	85-55	SHORT WAVE SWITCH
3	5-3040	OSC. COIL ASSEM.
4	95-244	1ST I.F. TRANS.
5	95-245	2ND I.F. "
6	45-81	SPEAKER 1000 Ω FIELD
7	85-49	TONE CONTROL SWITCH
8	95-234	POWER TRANS. 50-60 CYCLE
9	95-223	" 25 CYCLE

MODELS 806,807,
S847,850
Voltage, Socket
Alignment Data

ZENITH RADIO CORP.

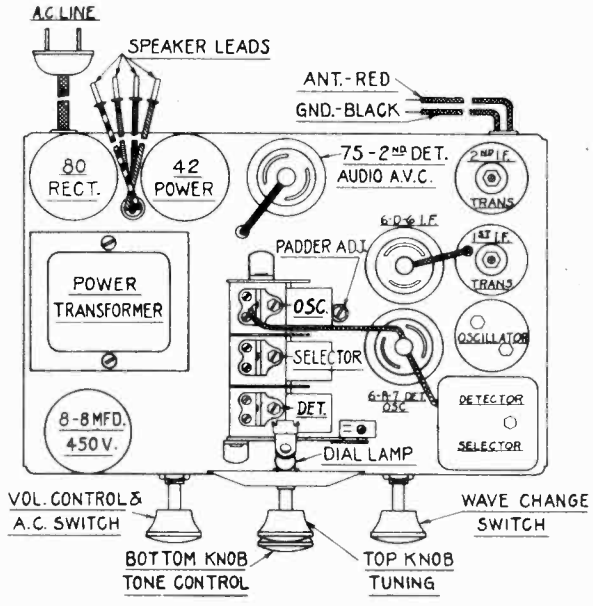
TUBE	POSITION	Ef	Ek	Eg1	Eg2	Eg3	Ep
6A7	1st Det.	5.8	5.2	0	80	-	260
	Osc.			.6	-	-	210
6D6	I.F.	5.8	5.2	0	80	5.2	260
75	2nd Det.	5.8	1.5	0	-	-	135
42	PWR.	5.8	0	-.7	260	-	245
80	RECT.	4.8	-	-	-	-	-

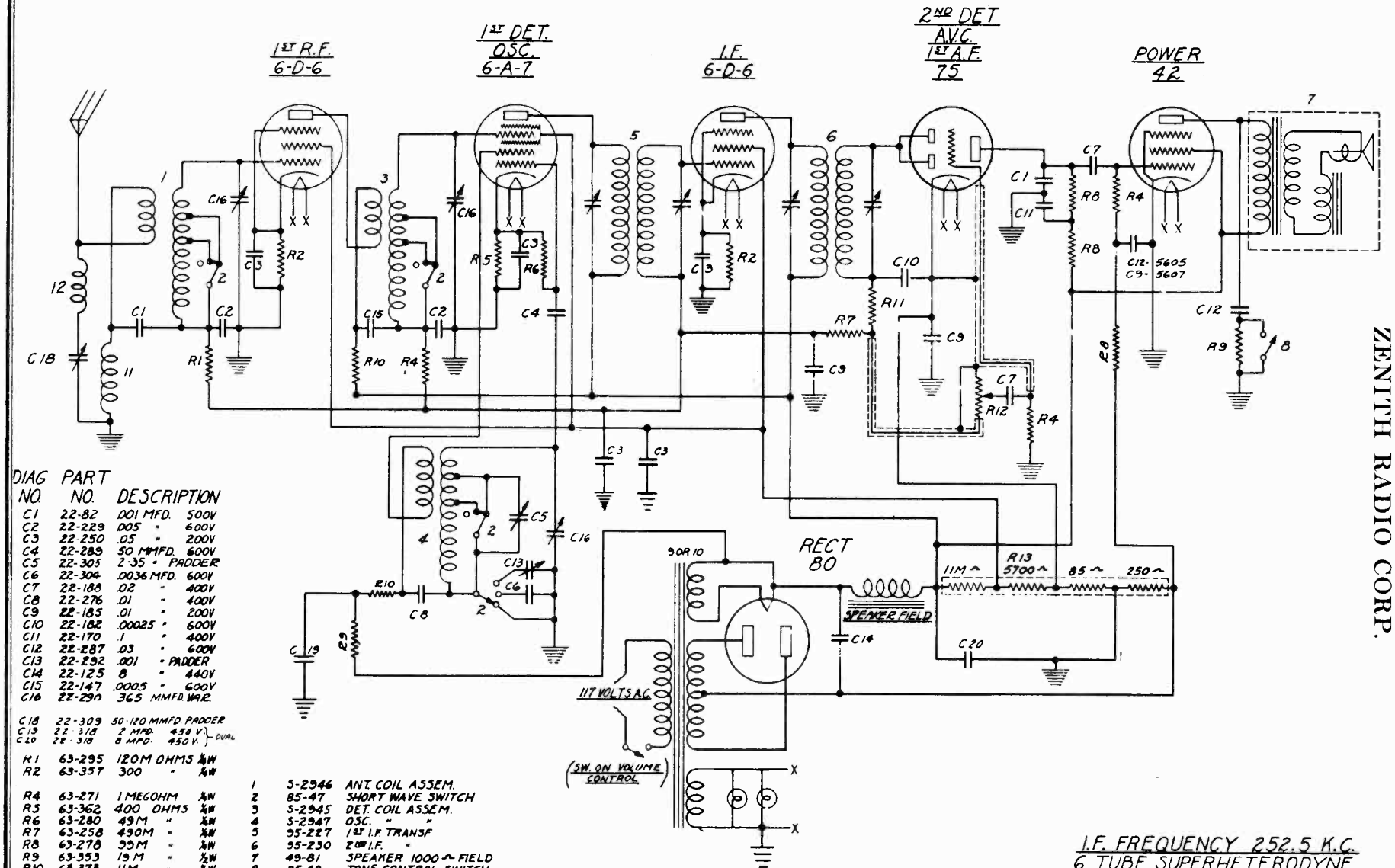
Line Voltage 112 Antenna and Ground Disconnected

All measurements taken from point indicated to ground, using a 1000 ohm per volt D.C. meter (except filaments).
F - Filament; K - Cathode; g1 - Control Grid; g2 - Screen Grid; g3 - Suppressor Grid; p - Plate.

Alignment

1. Balance I.F. transformers at 252.5 K.C. with test oscillator connected to control grid of 6A7 and ground.
2. Connect test oscillator to antenna and ground leads.
3. Adjust broadcast padder (located nest to gang on top of chassis) for correct dial reading at 600 K.C.
4. Adjust trimmer on oscillator section of gang for correct dial reading at 15 M.C. Adjust detector trimmers (located between gang and coil shield on top of chassis) for maximum signal.
5. Adjust oscillator trimmer (located on right side underneath chassis) for correct dial reading at 1400 K.C. - also adjust preselector and detector trimmers on gang for maximum signal.
6. Readjust broadcast padder for correct dial setting.





DIAG NO.	PART NO.	DESCRIPTION
C1	22-82	.001 MFD. 500V
C2	22-229	.005 " 600V
C3	22-250	.05 " 200V
C4	22-289	50 MMFD. 600V
C5	22-305	2-35 " PADDER
C6	22-304	.0036 MFD. 600V
C7	22-188	.02 " 400V
C8	22-276	.01 " 400V
C9	22-185	.01 " 200V
C10	22-182	.00025 " 600V
C11	22-170	.1 " 400V
C12	22-287	.03 " 600V
C13	22-292	.001 " PADDER
C14	22-125	8 " 440V
C15	22-147	.0005 " 600V
C16	22-290	365 MMFD. VAR.
C18	22-309	50-120 MMFD PADDER
C19	22-318	2 MFD. 450 V. } DUAL
C20	22-318	8 MFD. 450 V. } DUAL
R1	63-295	120M OHMS ½W
R2	63-357	300 " ½W
R4	63-271	1 MEGOHM ½W
R5	63-362	400 OHMS ½W
R6	63-280	49M " ½W
R7	63-258	490M " ½W
R8	63-278	99M " ½W
R9	63-353	19M " ½W
R10	63-373	11M " ½W
R11	63-355	51M " ½W
R12	63-366	200M VOL. CON.
R13	63-351	17,035 CANDOHM

1	S-2946	ANT. COIL ASSEM.
2	85-47	SHORT WAVE SWITCH
3	S-2945	DET. COIL ASSEM.
4	S-2947	OSC. " "
5	95-227	1ST I.F. TRANSF
6	95-230	2ND I.F. "
7	49-81	SPEAKER 1000 ~ FIELD
8	85-48	TONE CONTROL SWITCH
9	95-234	POWER TRANSF. 50-60 CYCLE
10	95-229	" " 25 CYCLE
11	20-71	ANT. CHOKE
12	20-75	WAVE TRAP CHOKE

MODELS - 808-809-860-861

I.F. FREQUENCY 252.5 K.C.
6 TUBE SUPERHETERODYNE
CHASSIS NOS. 5605 AND 5607

ZENITH RADIO CORP.
CHICAGO ILL.

ZENITH RADIO CORP.

ZENITH PAGE 5-9
MODELS 808, 809, 860, 861

MODELS 808,809,
860,861
Voltage, Socket
Alignment Data

ZENITH RADIO CORP.

5605

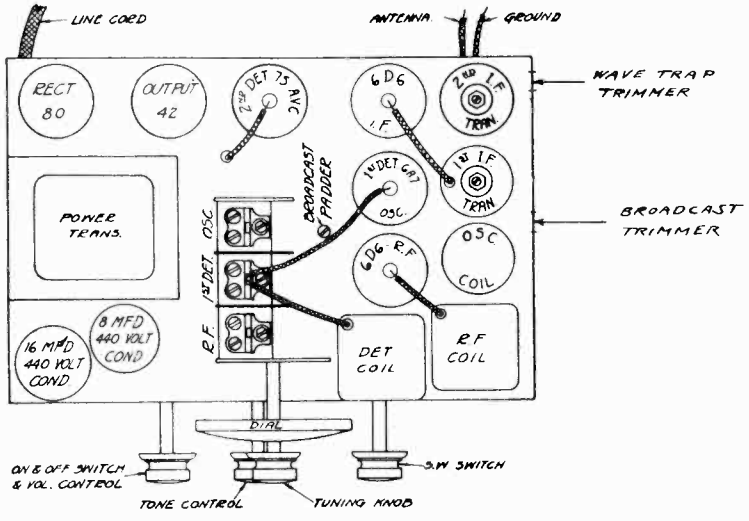
TUBE	POSITION	Ef	Ek	Eg1	Eg2	Eg3	Ep
6D6	R.F.	5.6	2.4	0	70	2.4	200
6A7	1St. Det.	5.6	3	0	70	-	250
	Osc.			3.6	-	-	230
6D6	I.F.	5.6	2.6	0	70	2.6	250
75	2nd. Det. 1st Audio	5.6	1.4	0	-	-	148
42	PWR.	5.6	0	-.6	250	-	250
80	RECT.	4.6	-	-	-	-	300

Line Voltage 112 Antenna and Ground Disconnected

All measurements taken from point indicated to ground, using a 1000 ohm per volt D.C. meter (except heaters).
F - Filament; K - Cathode; g1 - Control Grid; g2 - Screen Grid; g3 - Suppressor Grid; p - Plate.

Alignment

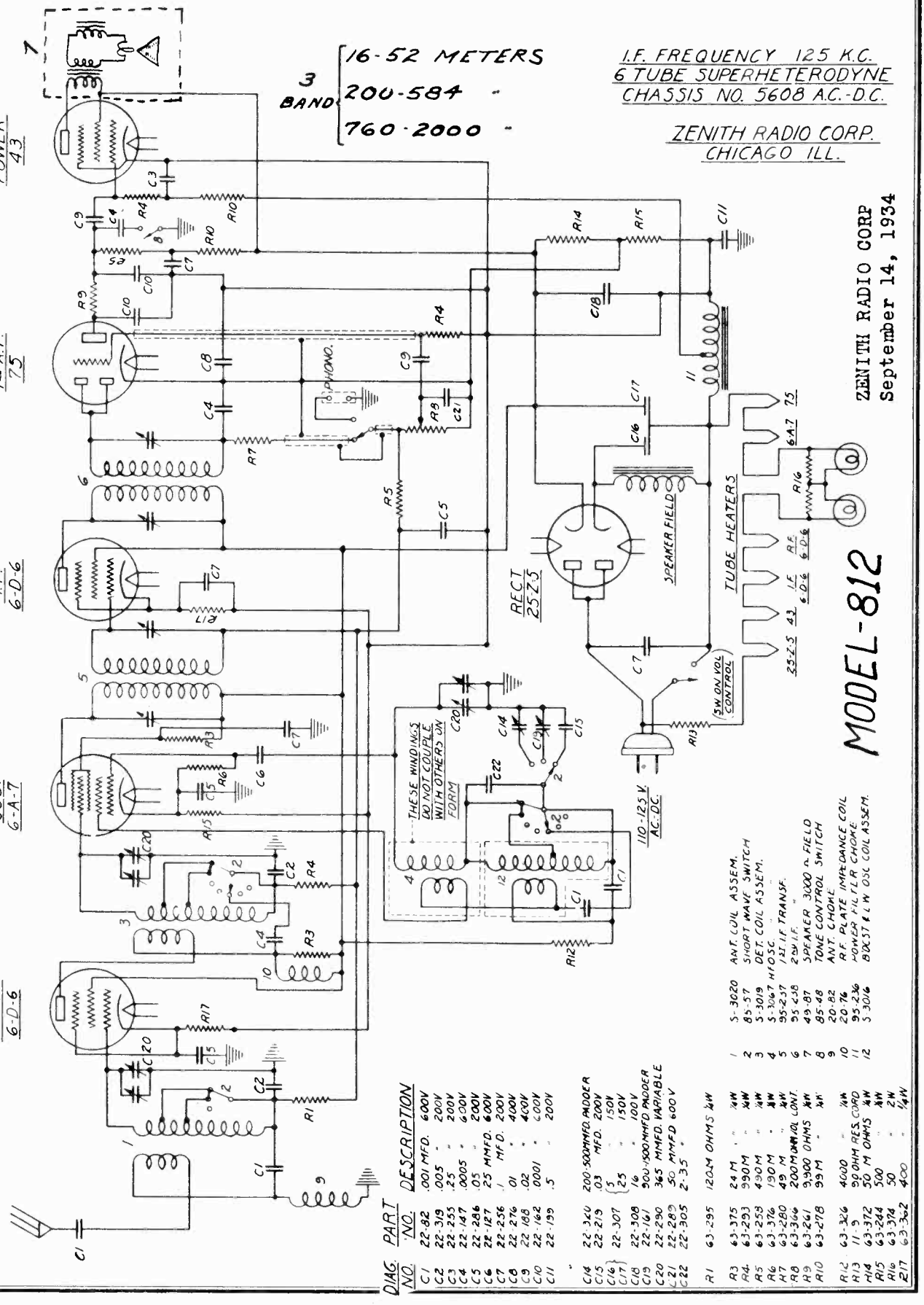
1. Balance intermediate transformers at 252.5 K.C. with oscillator connected to grid of first detector and ground.
2. Adjust wave trap padder (located underneath chassis at rear right side) for weakest signal with 252.5 K.C. oscillator connected to aerial and ground.
3. Turn wave band switch clockwise to the highest frequency band. Connect 15,000 K.C. oscillator to aerial and ground. Balance oscillator trimmer on three-gang condenser for correct dial reading at this frequency.
4. Turn wave band switch counter-clockwise to standard broadcast position. Adjust broadcast oscillator trimmer (located underneath chassis at right center) for correct dial reading at 1400 K.C. and balance R. F. and 1st detector trimmers on three-gang condenser for loudest signal.
5. Adjust oscillator standard broadcast padder through hole in top center of chassis for correct dial reading at 600 K.C.



TUBE-POSITION

ZENITH RADIO CORP.

MODEL 812
Schematic



DIAG. NO.	PART NO.	DESCRIPTION		
C1	22-182	.001 MFD. 600V		
C2	22-319	.005 " 200V		
C3	22-255	.25 " 200V		
C4	22-147	.005 " 600V		
C5	22-286	.05 " 200V		
C6	22-127	25 MMFD. 600V		
C7	22-256	.1 MFD. 200V		
C8	22-276	.01 " 400V		
C9	22-188	.02 " 400V		
C10	22-162	.0001 " 600V		
C11	22-199	.5 " 200V		
C14	22-320	200-500MMFD. PADDER		
C15	22-219	.03 MFD. 200V		
C16	22-307	.5 " 150V		
C17		.25 " 150V		
C18	22-308	.16 " 100V		
C19	22-161	900-500MMFD PADDER		
C20	22-290	365 MMFD. VARIABLE		
C21	22-289	50 MMFD 600V		
C22	22-305	2-35 "		
R1	63-295	120M OHMS ½W	1	5-3020 ANT. COIL ASSEM.
R3	63-275	2M " ½W	2	85-57 SHORT WAVE SWITCH
R4	63-293	990M " ½W	3	5-3019 DET. COIL ASSEM.
R5	63-253	490M " ½W	4	5-3067 1ST OSC. "
R6	63-276	190M " ½W	5	95-237 1ST I.F. TRANSF.
R7	63-280	49 M " ½W	6	95-238 2ND I.F. "
R8	63-266	2000 OHMS VOL CONT.	7	49-87 SPEAKER 3000 Ω FIELD
R9	63-261	9,900 OHMS ½W	8	85-48 TONE CONTROL SWITCH
R10	63-278	99M " ½W	9	20-82 ANT. CHOKE "
R12	63-326	4000 " 1W	10	20-76 R.F. PLATE IMPEDANCE COIL
R13	11-9	90 OHM RES. CORD	11	95-236 POWER FILTER CHOKE
R14	63-272	50 M OHMS ½W	12	5-3016 BOOST-L-W OSC COIL ASSEM.
R15	63-244	500 " 1W		
R16	63-274	50 " 2W		
217	63-362	400 " ½W		

MODEL 812
Voltage, Socket
Alignment Data

ZENITH RADIO CORP.

TUBE	POSITION	Ef	Ek	Eg1	Eg2	Eg3	Ep
6D6	R.F.	5.7	4.2	5	96	5	98
6A7	1st Det.	5.7	2.3	2	50	-	96
	Osc.			0	-	-	96
6D6	I. F.	5.7	4.1	5	96	5	96
75	2nd Det.	5.7	1.1	5	-	-	25
43	PWR.	24	0	-5	96	-	90
25Z5	RECT.	24	Spkr. Fld. 80	-	-	-	-

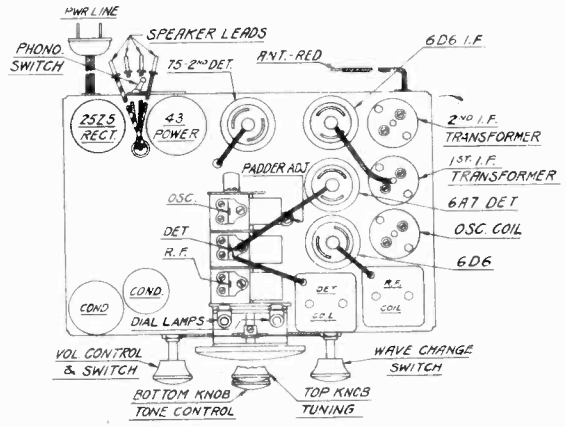
Line Voltage 112 Antenna and Ground Disconnected

All voltages measured from B-(negative side of C18) using a 1000 ohm per volt D.C. meter (except heaters).
F - Filament; K - Cathode; g1 - Control Grid; g2 - Screen Grid; g3 - Suppressor Grid; p - Plate.

Alignment

1. Balance intermediate transformers at 125 K.C. with service oscillator connected to grid of first detector and chassis.
2. Rotate wave-band switch clockwise to the short-wave position. Connect service oscillator to antenna and ground leads and set for 18750 K.C. Balance oscillator trimmer on gang for correct dial reading at 16 meters.
3. Turn wave-band switch to center or standard broadcast position. Adjust padder condenser (located on top center of chassis next to gang) for correct dial reading at 500 meters (600 K.C.).
4. Balance oscillator trimmer (located underneath chassis at right center) for correct dial reading at 210 meters (1440 K.C.). Balance R.F. and 1st detector trimmers on gang to resonance
5. Turn switch counter-clockwise to long-wave position. Adjust oscillator padder (located underneath chassis at rear right side) for correct dial reading at 2000 meters (150 K.C.).

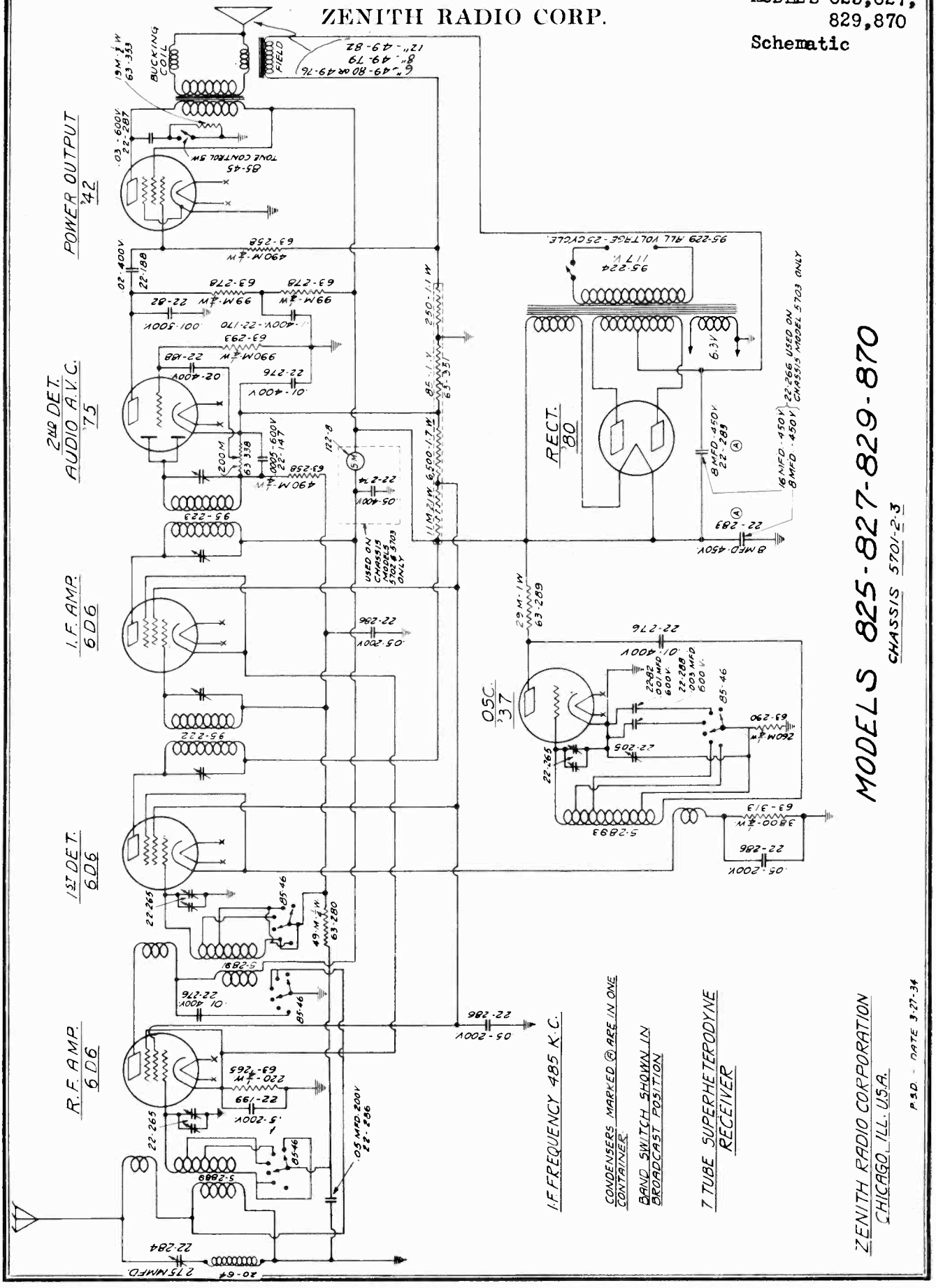
NOTE: If howls are encountered on short-wave band the oscillator trimmer on gang is too tight.



MODEL 812
Chassis 5608

Tube Position

MODELS 825,827, 829,870
Schematic



MODELS 825,827, 829,870
Voltage, Socket Alignment Data

ZENITH RADIO CORP.

SOCKET VOLTAGES — 5701 - 2 - 3 CHASSIS

TYPE	POSITION	Ef	Ek	Eg1	Eg2	Eg3	Ep
6D6	R.F.	5.4	2.8	0	2.8	74	230
6D6	1st. Det.	5.4	7.8	0	7.8	74	230
37	Osc.	5.4	0	38	-	-	130
6D6	I.F.	5.4	2.8	0	2.8	74	230
74	2nd. Det.	5.4	1	0	-	-	125
42	PWR.	5.4	0	4	0	230	215
80	Rect.	4.2	-	-	-	-	235

Line Voltage 112 V. Aerial and Ground disconnected.

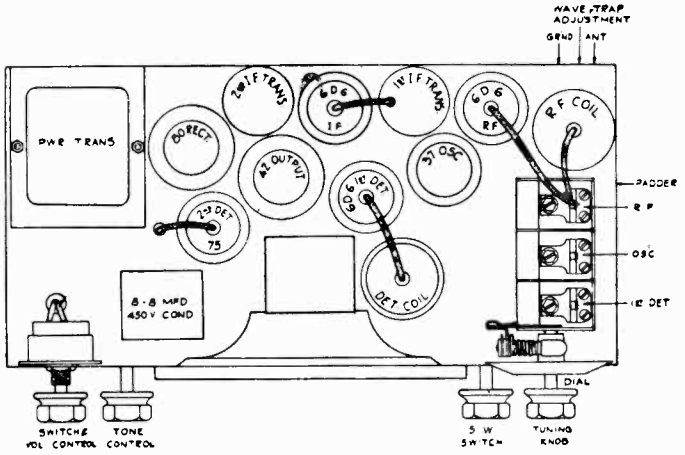
F - Filament K - Cathode G1 - Control Grid

G2 Suppressor Grid G3 - Screen Grid P - Plate

All measurements taken from points indicated to ground with 1000 ohms per volt D.C. meter (except filaments).

Balance I.F. transformers at 485 K.C., trimmers on condenser gang at 1500 K.C. and oscillator padder at 600 K.C.

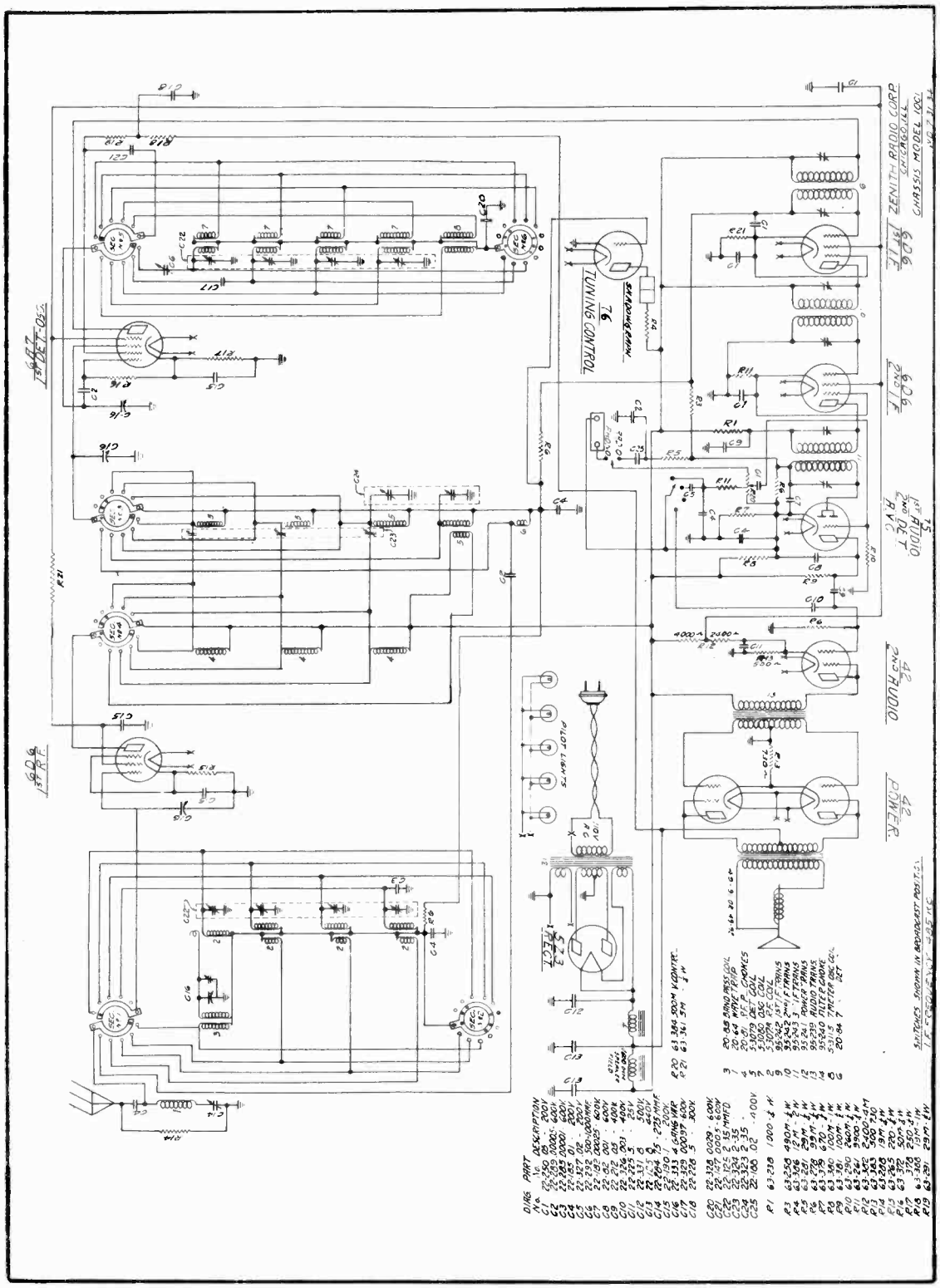
The screw adjustment at the right hand rear of chassis is a wave trap for the elimination of code interference at the I.F. frequency. Connect 485 K.C. oscillator on antenna and adjust for weakest signal.



Tube Layout

ZENITH RADIO CORP.

MODELS 835,880
Chassis 1001,1001-A
Schematic



MODELS 835,880
Chassis 1001,1001-A
Voltage, Socket,
Alignment, Notes

ZENITH RADIO CORP.

Service Bulletin

MODELS 835 · 880 — CHASSIS 1001-1001A

SERVICE NOTES

Dial Slips or Binds. Tighten lugs on planetary drive. See that both pointers are free. Make sure gang is squarely lined up with dial.

Off Calibration. Check for loose set screws on dial assembly to condenser shaft. Black pointer may be loose on shaft. Check alignment as outlined in Alignment Procedure.

Poor Tone. Defective tubes in audio. One side of push-pull circuit faulty. Check audio and output transformers. See A.V.C. blocking.

Insensitive. Out of alignment, weak tubes or defective by-pass condenser.

Shadowgraph Inoperative. weak 76 tube, burnt out shadowgraph, open resistor in 76 plate circuit.

Distortion at Medium Volume. Defective 75 tube, defective volume control. Separate green volume control-lead and speaker-lead close to grid of 42 tube.

Insensitive on Any Short Wave Band. Check alignment, make sure R.F.circuit is not aligned to image frequency Change 6A7 tube. Change position of fixed condensers adjacent to rear section of wave change switch. Location of these condensers in relation to each other and their distance from the chassis will effect dial calibration and sensitivity, especially on the Blue Band.

Stops Oscillating Around 9 M.C. Change 6A7 tube, leakage in 50 mmfd. or .0029 mfd. condenser.

A.V.C. Blocks. Shorted resistor on antenna choke. C-14 padder shorted. Grounded R.F. grid circuit.

Oscillates on Broadcast. Check alignment. Push brown wire away from 6A7 socket. Grounded cathode on 1st I.F or grounded to 600 K.C. padder. Check for open by-pass condenser.

Noisy. Shorting plates in gang condenser. Poor contact in band switch. Loose shields or shield bases. Static shields may be touching leads under gang condenser.

Overheats. Check pilot light and heater circuits for partial short or ground.

Flutters. Rearrange leads under chassis especially around 6A7.

Oscillates on Short Wave Bands. Make sure brown R.F. grid return lead is pushed away from 6A7 socket. Check for ground on any A.V.C. lead. Open by-pass condenser.

Tone Control Inoperative. Resin joint or poor contact on tone control switch. Defective condensers in tone control circuits.

Continuous Audio Whistle. Rearrange leads in audio circuit.

Alignment

Separate coils are used for each band. Mounted on the coils are individual trimmers that align each band, independent of the other bands.

Connect 485 K.C. service oscillator to grid of 6A7 and chassis ground. Adjust I.F. trimmers on rear of I.F. transformers for strongest signal.

Connect 485 K.C. service oscillator to antenna and ground. Turn dial to 540 K.C. on broadcast band and adjust wave trap trimmer on right rear side of chassis for weakest signal.

Broadcast - Black Band

Set service oscillator at 1400 K.C., remaining attached to antenna ground posts. Turn dial to same point and adjust #1 trimmer (top one on oscillator coil) to resonance. Adjust #1 R.F. trimmer (top one on R.F. coil); #1 detector trimmer (through hole in chassis base) and band pass trimmer (top front section of gang) all to resonance.

Set service oscillator at 600 K.C. Adjust padder (located in center rear of chassis) for correct dial reading.

Recheck 1400 K.C. alignment.

Orange Band

Set service oscillator at 4 M.C.(still attached to antenna and ground) and adjust trimmer #2 (2nd from top) on oscillator coil for correct dial reading. Adjust #2 R.F. trimmer (2nd from top on R.F. coil) and #2 detector trimmer (center hole through chassis) to resonance.

Brown Band

Loosen #3 detector trimmer (top one on detector coil). Set service oscillator at 10.5 M.C. Adjust #3 oscillator trimmer (third from top on oscillator coil) for correct dial reading. Adjust #3 R.F. trimmer (third from top of R.F.coil) and #3 detector trimmer (rear one through hole in top of chassis). Adjust #3 detector trimmer on coil to resonance.

Blue Band

Tighten #4 detector trimmer (bottom one on detector coil). Set service oscillator at 21 M.C. Adjust #4 oscillator trimmer (bottom one on oscillator coil) for correct dial reading. Adjust #4 R.F. trimmer (lower one on R.F. coil) and #4 detector trimmer (lower one on detector coil) to resonance.

It is very easy to mistake the image frequency for the fundamental on this band. Rotate dial and if shadowmeter narrows at any point, especially at 15 M.C., the band should be rebalanced.

Green Band

There are no adjustments to be made on this band.

Parts and Prices

Chassis 1001 — MODELS 835, 880, 881 and 1101

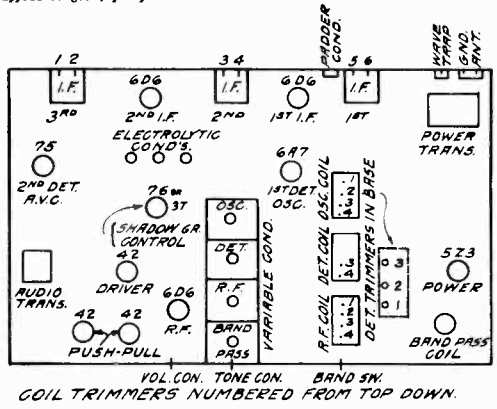
	Dial Assembly	
26-66	Complete Dial and Drive Assembly	$7.50
26-67	Dial Scale only	.75
33-57	Dial Retaining Frame	.35
59-28	Large Z Pointer	.10
59-29	Split Second Pointer	.10
192-4	Dial Glass	.20
93-217	Dial Glass Cushion Washer	.10
76-151	Planetary Drive Assembly	2.00
32-3	Pulley Drive Belt	.15
	Coils & Chokes	
20-64	Wave Trap	.35
20-81	R. F. Plate Choke	.65
20-84	7-Meter Detector Coil Assembly	.10
20-85	Band Pass Coil Assembly	.60
95-242	1st and 2nd I. F. Coil Assembly	1.50
95-243	3rd I. F. Coil Assembly	1.50
S-3078	R. F. Coil Assembly	2.75
S-3079	Detector Coil Assembly	2.50
S-3080	Oscillator Coil Assembly	2.75
S-3115	7-Meter Oscillator Coil Assembly	.40
	Miscellaneous	
44-7	Phono Connector Jack (Export Models Only)	.15
46-94	Band Selector Switch Knob	.25
46-95	Tone and Volume Knobs	.25
46-96	Tuning Knob - Large	.25
46-97	Tuning Knob - Small	.20
49-91	10" Dynamic Speaker (Model 835)	10.00
	Cone and Voice Coil for 49-91	3.00
	Output Transformer for 49-91	2.00
	Field Coil for 49-91	2.00
49-92	12" Dynamic Speaker (Models 880, 881)	14.50
	Cone and Voice Coil for 49-92	3.25
	Output Transformer for 49-92	2.50
	Field Coil for 49-92	2.50
57-455	Dial Escutcheon Plate for Models 880, 881	.75
78-100	Tube Socket - 6D6	.10
78-101	" " 76	.10
78-102	" " 42	.10
78-106	" " 6A7	.10
78-109	" " 75	.10
78-110	" " 523	.10
85-56	Phono Switch	.35
85-58	Band Selector Switch	4.00
85-60	4-position Tone Switch	.60
95-239	Push Pull Input Transformer	2.00
95-240	Power Filter Choke	2.00

SOCKET VOLTAGES

TUBE	POSITION	Ef	Ek	Eg1	Eg2	Eg3	Ep
6D6	R. F.	5.9	1.7	0	85	1.7	235
6A7	1st. Det.	5.9	2.5	0	95	-	235
	OSC.			-1	-	-	165
6D6	1st. I. F.	5.9	8	0	95	8	235
6D6	2nd. I. F.	5.9	8	0	95	8	230
75	Rnd. Det. 1st. Aud.	5.9	1.5	0	-	-	155
37 or 76	Shadow-Met. Amp.	5.9	0	-1	-	-	98
42	2nd. Aud.	5.9	21	0	-	-	230
42	P-P.	5.9	33	0	-	-	340
42	P-P.	5.9	33	0	-	-	340
523	Rect.	4.5	-	-	-	-	-

Line Voltage 112 Volts — Antenna and Ground Disconnected.

f - filament; k - cathode; g1 - control grid; g 2 - screen grid; g3 - suppressor grid; p - plate.



COIL TRIMMERS NUMBERED FROM TOP DOWN.