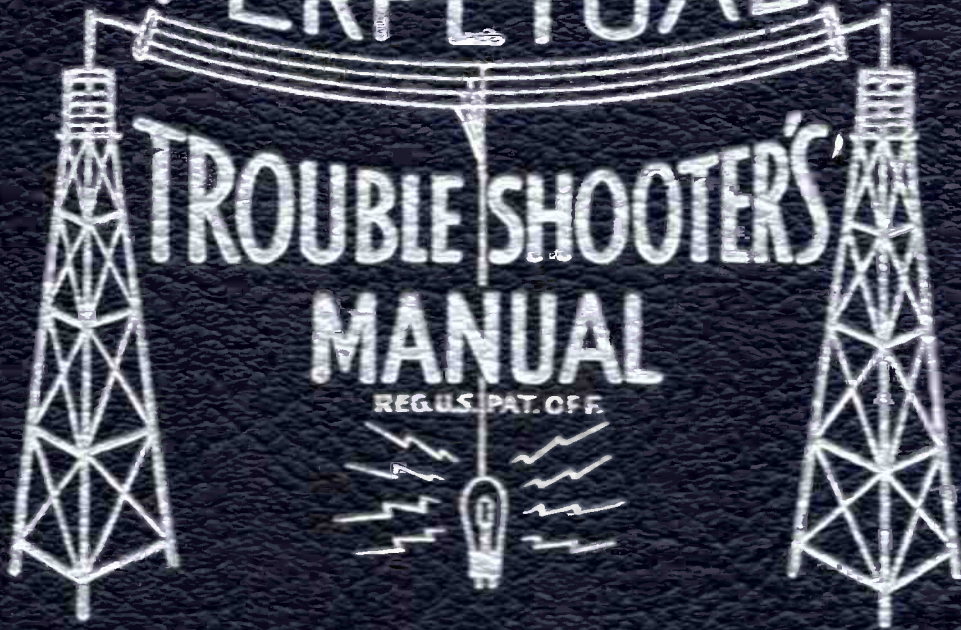


VOLUME XX

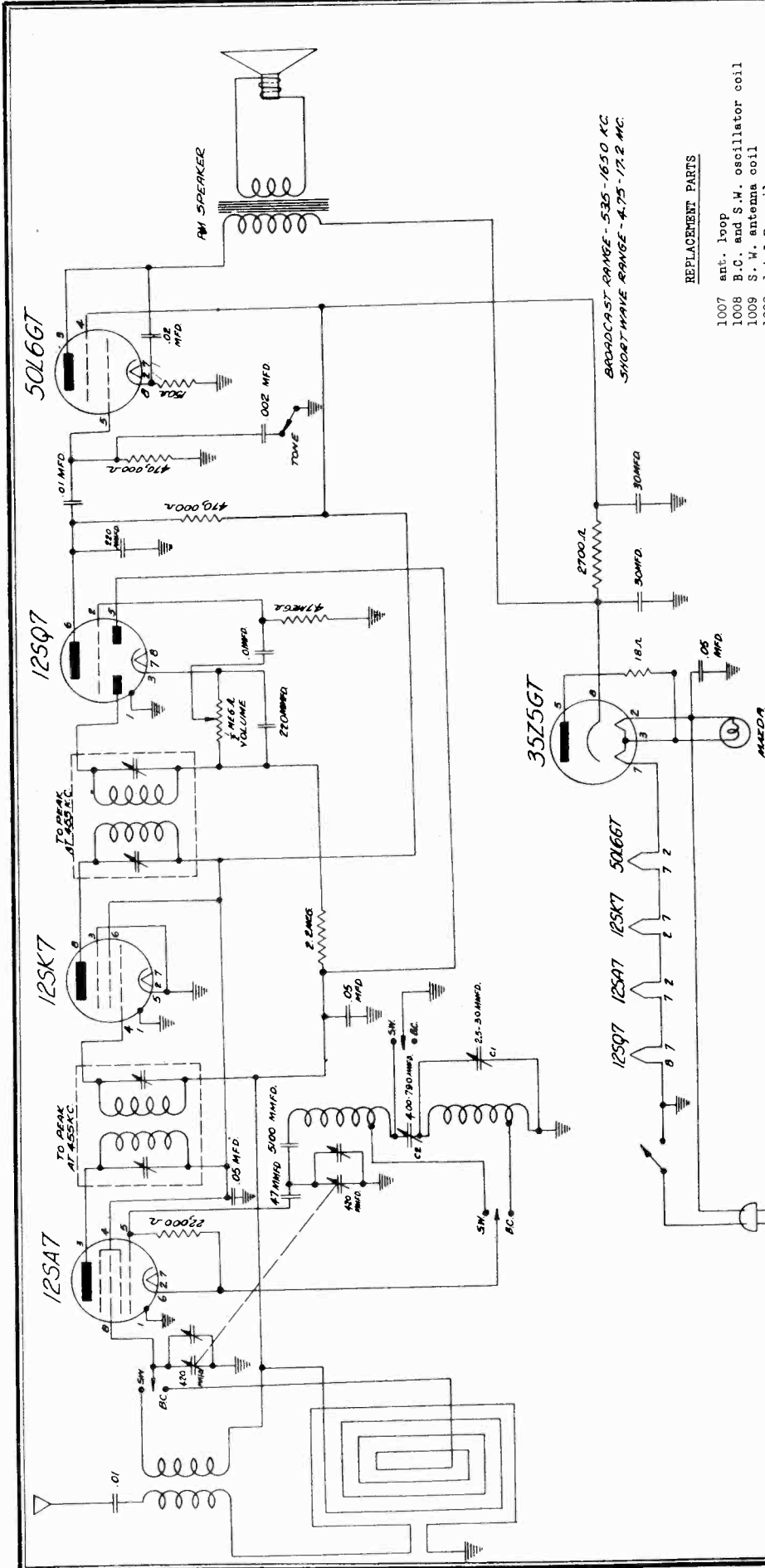
PERPETUAL

TROUBLE SHOOTER'S  
MANUAL

REG. U.S. PAT. OFF.



JOHN F. RIDER



REPLACEMENT PARTS

- |      |                               |
|------|-------------------------------|
| 1007 | ant. loop                     |
| 1008 | B.C. and S.W. oscillator coil |
| 1009 | S. W. antenna coil            |
| 1000 | 1st I.F. coil                 |
| 1002 | 2nd detector I.F.             |
| 2002 | var. condenser                |
| 2002 | comb. electrolytic            |
| 3002 | comb. vol. control            |
| 2000 | paper condenser               |
| 2001 | mica condenser                |
| 3000 | 1/4 W. resistor               |
| 3003 | 1/2 W. resistor               |
| 3004 | 2 W. resistor                 |
| 6004 | dial scale                    |
| 5016 | dial back plate               |
| 8012 | pilot lamp assembly           |
| #47  | pilot lamp                    |
| #20  | dial cord                     |
| 9762 | drive spring                  |
| 9818 | bushing                       |
| 9010 | shaft                         |
| 7001 | speaker                       |
| 8003 | tone cont. switch             |
| 8010 | wave band switch              |
| 5000 | line cord                     |
| 2008 | padding condenser             |

TUBES

- |   |        |       |
|---|--------|-------|
| 1 | 35Z5GT | A-505 |
| 1 | 50L6GT | 4012  |
| 1 | 12SA7  | 4017  |
| 1 | 12SK7  | 4027  |
| 1 | 12SQ7  |       |

TO 105-125V  
40-60~  
UNLESS OTHERWISE SPECIFIED.

These receivers will function from 105-125 volts, 40-60 cycles A.C. or D.C. power supply. A range of 535-1650 kilocycles and 4.75-17.2 megacycles, (17½-65M) is covered by these receivers.

To calibrate receiver connect the output of signal generator in series with a 200 MFD fixed condenser to the flexible antenna lead attached to the loop antenna. Connect the low side of signal generator through a 1/10 mfd. condenser to receiver chassis. The wave band switch should be in the broadcast position. Adjust signal generator to 455 Kilocycles and adjust both I.F. transformers for maximum signal. Open the receiver variable condenser for minimum capacity. Turn the band switch to short wave position. Set signal generator at 17.2 Megacycles. Peak oscillator section of receiver condenser for maximum signal. Next set signal generator at 16 Megacycles. Tune in this signal. Adjust R.F. section of receiver variable condenser for maximum signal strength. The low frequency end of the dial is automatically adjusted by a fixed padding condenser. Next turn band switch to broadcast position. Rotate drive shaft until maximum signal from generator is heard. Adjust signal generator to 1650 Kilocycles. Adjust the broadcast oscillator trimmer screw (C-1) until maximum signal from generator is heard. To adjust the low frequency, set the signal generator and receiver to 600 Kilocycles. Peak the broadcast pad-der (C-2) for maximum output. The variable condenser should be rocked during the operation. Keep the signal generator output as low as possible when making all of these measurements. It is extremely necessary in making the short wave adjustments, that the fundamental oscillator signal be tuned in and not the image frequency, which will fall below the fundamental.

## MODEL C-615

To calibrate receiver connect the output of signal generator in series with a 200 MMFD fixed condenser to the flexible antenna lead attached to the loop antenna. Connect the low side of signal generator through a 1/10 MFD. condenser to receiver chassis. The wave band switch should be in the broadcast position. Adjust signal generator to 455 Kilocycles and adjust both I. F. transformers for maximum signal. Open the receiver variable condenser for minimum capacity. Turn the band switch to short wave #1 position. Set signal generator at 24.2 Megacycles. Peak the short wave #1 oscillator trimmer screw (C5) for maximum signal. Next set signal generator at 23 Megacycles. Tune in this signal. Adjust short wave #1 R. F. trimmer screw (C2) for maximum signal strength. The low frequency end of the dial is automatically adjusted by a fixed padder condenser. Next turn band switch to short wave #2 position. Rotate drive shaft until variable condenser in minimum capacity position. Adjust signal generator to 8 Megacycles. Adjust the short wave #2 oscillator trimmer screw (C4) until maximum signal from generator is heard. Next set signal generator at 7 Megacycles. Tune in this signal. Adjust short wave #2 R. F. trimmer screw (C1) for maximum signal strength. The low frequency end of the dial is automatically adjusted by a fixed padder condenser. Next turn band switch to broadcast position. Adjust signal generator to 1500 Kilocycles. Tune in this signal. Adjust the broadcast oscillator trimmer screw (C3) until maximum signal from generator is heard. To adjust the low frequency, set the signal generator and receiver to 600 Kilocycles. Peak the broadcast padder (C7) for maximum output. The variable condenser should be rocked during the operation. Keep the signal generator output as low as possible when making all of these measurements. It is extremely necessary in making the short wave adjustments, that the fundamental oscillator signal be tuned in and not the image frequency, which will fall below the fundamental.

## REPLACEMENT PARTS

1092 Loop Ant.		2012 Ceramic Condenser		9818 Bushing
1093 B. C. Oscillator Coil		3001A-3 1 W. Resistor		9123-2 Shaft
1095-1 S. W. 1 Oscillator Coil		3003A 1/2 W. Resistor		7017 Speaker
1094-1 S. W. 1 Ant. Coil		3004-13 2 W. Resistor		8017B-4 Wave Band Switch
1095-2 S. W. 2 Osc. Coil		6022 Dial Scale		5008B-2 Line Cord
1094-2 S. W. 2 Ant. Coil		9139 Dial Back Plate.		2050 Padder Condenser
1091-1 1st I. F. Coil		8001-2 Pilot Lamp Assembly		8043 Tone Control Switch
1091-1 3rd I. F. Coil		#44 Pilot Lamp		3013-4 Comb. Volume Control
2014-4 Variable Condenser		9069-3 Drive Spring		
2049-1 Comb. Electrolytic	TUBES			
2000 Paper Condenser	6BA6		Cabinet Back 4095	
2048 Band Spread Cond.	6BA6		Cabinet 4093	
	6BE6		Knob 4055A-6	
	6AT6		Concentric Knob 4096	
	6AR5			
	6X4			

The model C-615 is a three band superheterodyne receiver, having one broadcast range and two short wave ranges. This receiver features Spread-A-Matic Tuning, a loop-tenna for broadcast, and automatic volume control. It has been designed to operate at 105-125 volts, 50-60 cycles A.C. or at 210-250 volts, 50-60 cycles A.C. as specified on tag attached to line cord. Instructions for tap changing are given on the reverse side.

B. C. Band	525-1680 Kilocycles	570-178 meters
S. W. 2 Band	2.5 M.C. to 8.0 M.C.	120 to 37.5 meters
S. W. 1 Band	7.5 M.C. to 24.2 M.C.	40 to 12.4 meters

**INSTALLATION:** Make certain that all tubes are in place and pressed down in their sockets. A label showing the location of each tube will be found underneath the cabinet. A loop-tenna is incorporated which makes the use of an antenna unnecessary, in most localities, for broadcast reception. If it is found that additional pick-up is desired on the standard band, an antenna may be connected to the red lead extending from the rear of the chassis, and the black lead connected to an external ground. On short wave reception an antenna and external ground should be used.

**VOLUME CONTROL AND POWER SWITCH:** The second knob from the left is the power switch and volume control. When the control is in the extreme counterclockwise position the power is "off". From this position, a slight clockwise rotation will turn the power "on", and by further rotation in this direction, volume may be increased to any degree until the full output of the receiver is obtained.

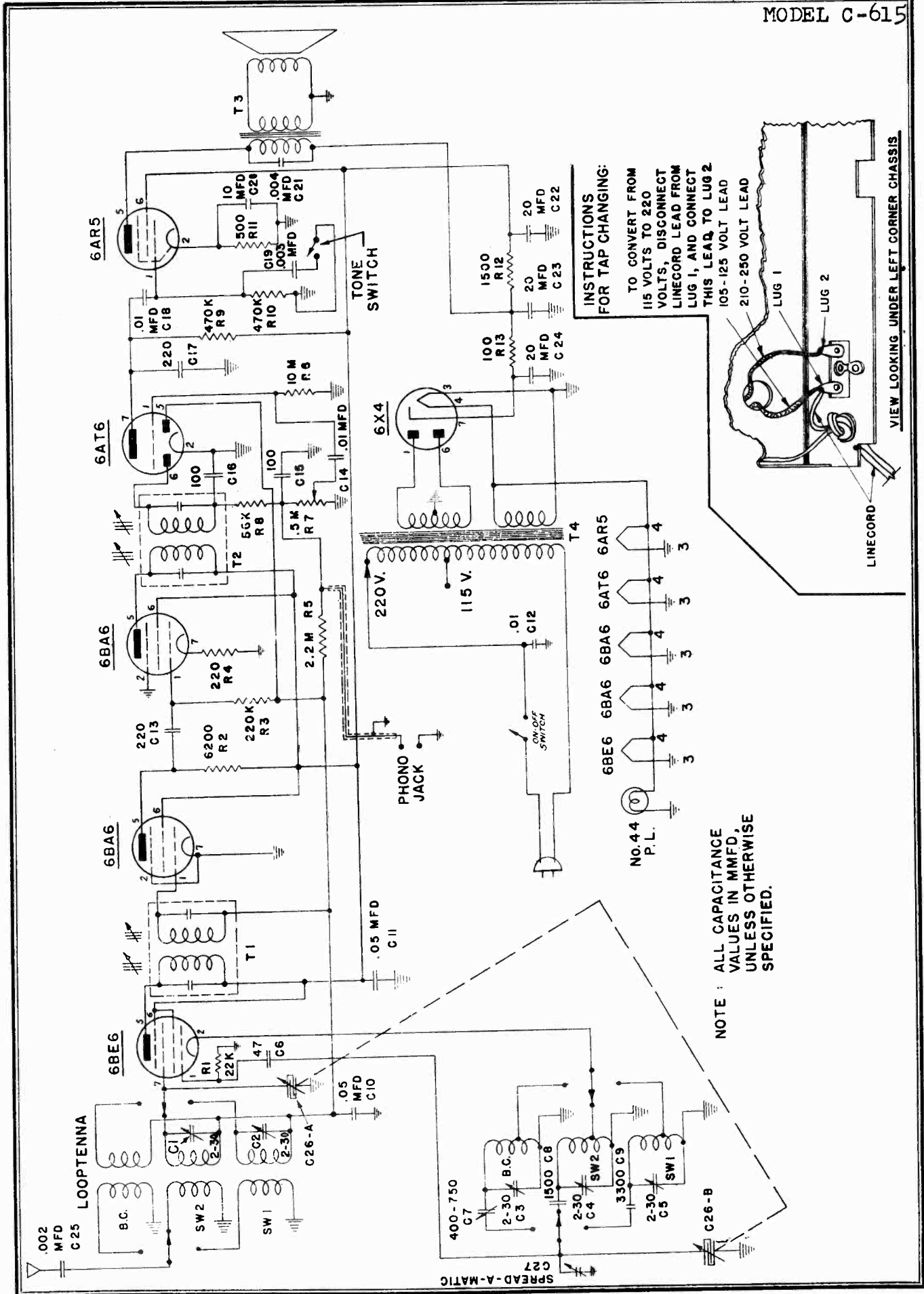
**TUNING CONTROL:** The knob on the right is the tuning control knob which operates the bottom pointer and tuning condenser through a reduction drive to insure ease and accuracy in the selection of stations.

**SPREAD-A-MATIC TUNING CONTROL:** There are two concentric knobs on the extreme left. The large knob operates the SPREAD-A-MATIC tuning. This is a special feature of this receiver, providing greater ease of tuning and better separation of stations on all three wave bands. To operate, turn the knob until the top pointer is set to "0", in the center of the SPREAD-A-MATIC scale. Tune in the desired station with the Tuning Control. By turning the SPREAD-A-MATIC control knob clockwise and counterclockwise the top pointer will move to the left and right of "0", and the station can be tuned in very accurately. When it is desired to change the station the SPREAD-A-MATIC pointer should first be set back to "0".

**WAVE BAND SWITCH:** The second knob from the right of the receiver is the wave band switch control. This knob has three positions. When the knob is in the extreme counterclockwise position, standard broadcast stations may be tuned in. When the knob is in the extreme clockwise position, short wave band #1 may be tuned in. The intermediate position is for tuning in short wave band #2.

**STONE CONTROL SWITCH:** The small concentric knob on the extreme left has two positions which allows the selection of two degrees of tone response.

**PHONOGRAPH OPERATION:** A terminal board marked "HIGH-LOW" is provided in the back of the chassis. For phonograph operation connect the Pick-Up to the terminals. Be sure the Tuning Control is off a station. If loud hum is heard when touching the Pick-Up arm reverse the leads to the terminals.



MODEL C-800

The DeWald Model C-800 is an AM-FM receiver. This receiver may be operated on either AC or DC, 105-125 volts, 50-60 cycles.

FM . . . . 88 to 108 MC.  
AM . . . . 540 to 1700 KC.

**Antenna Connections:**

Your DeWald C-800 is a sensitive receiver. It is equipped with built-in AM and FM antennae so that in primary listening areas an outside antenna is not necessary. **WHEN LISTENING TO FM BY USING THE BUILT-IN ANTENNA, KEEP THE ELECTRIC LINE CORD EXTENDED TO ITS FULL LENGTH.**

For weak or distant stations there are provisions made in the rear for antenna connections. A terminal strip with two screw connections for the lead-in wires from the FM antenna, also a wire coming out the back of the receiver for an external AM antenna.

When using the built-in antenna on FM, the lug coming out between the two screw connections on the terminal strip in the rear, must be connected to the screw connection marked "ANT." When using an external FM antenna disconnect this wire and connect external antenna lead-in wires to the two screw connections.

**Station Selector:**

The knob on the extreme right hand side of the cabinet operates the tuning condenser on both AM and FM and simultaneously moves the indicating pointer. Ease and accuracy in tuning is made possible due to a reduction drive.

**Band Switch:**

The second knob from the right is the AM-FM band switch. This is a two position switch. When the switch is in the counterclockwise position, AM (Standard Broadcast) stations may be tuned in. When the switch is in the clockwise position, FM (Frequency Modulation) stations may be tuned in.

**Volume Control and Power Switch:**

The third knob from the right is the volume control and power switch. When the control is in the extreme counterclockwise position the power is "OFF." From this position, a slight clockwise rotation will turn the power "ON." By further rotation in this direction volume may be increased to any degree until the full output of the receiver is obtained.

**Tone Switch:**

The fourth knob from the right is the tone switch. For normal operation the switch should be clockwise. For increased bass response turn switch fully counterclockwise.

**Notes:**

Since this receiver has a loop-tenna on AM which has a directional effect, it may be necessary at times to turn the receiver for best reception. This set will operate properly only after the tubes are sufficiently heated. This may take two minutes after the power switch is turned "ON." If the receiver is being operated on DC (Direct Current) and no signals are heard after two minutes, reverse the line cord plug in the power

outlet. Should noticeable hum be detected when operating on AC (Alternating Current), reverse the line cord plug in the power outlet.

**Servicing of the DeWald Model C-800**  
(For Use of Radio Technician):

Should your DeWald Model C-800 become inoperative for any reason, we suggest you contact your local DeWald Radio and Television Dealer for servicing. The following information is for the use by the radio serviceman.

Alignment of the receiver will, in most cases, be unnecessary unless an RF or IF transformer is replaced or the adjustment has been tampered with. The IF slugs are slotted for a small size fiber screwdriver. Do not put excessive pressure on the aligning tool or the threads in the coil-form will be stripped and adjustments will be impossible.

**IF Alignment:**

Set bandswitch to AM position. Connect the signal generator, modulated at 400 cycles, through a 0.01 Mfd condenser to the grid of the 12AT7 converter tube. Connect the low side of the generator through a 0.1 Mfd condenser to the receiver chassis. Adjust the signal generator to 455 KC. Tune primary and secondary slugs of T3 & T5, AM-IF Transformers, for maximum output.

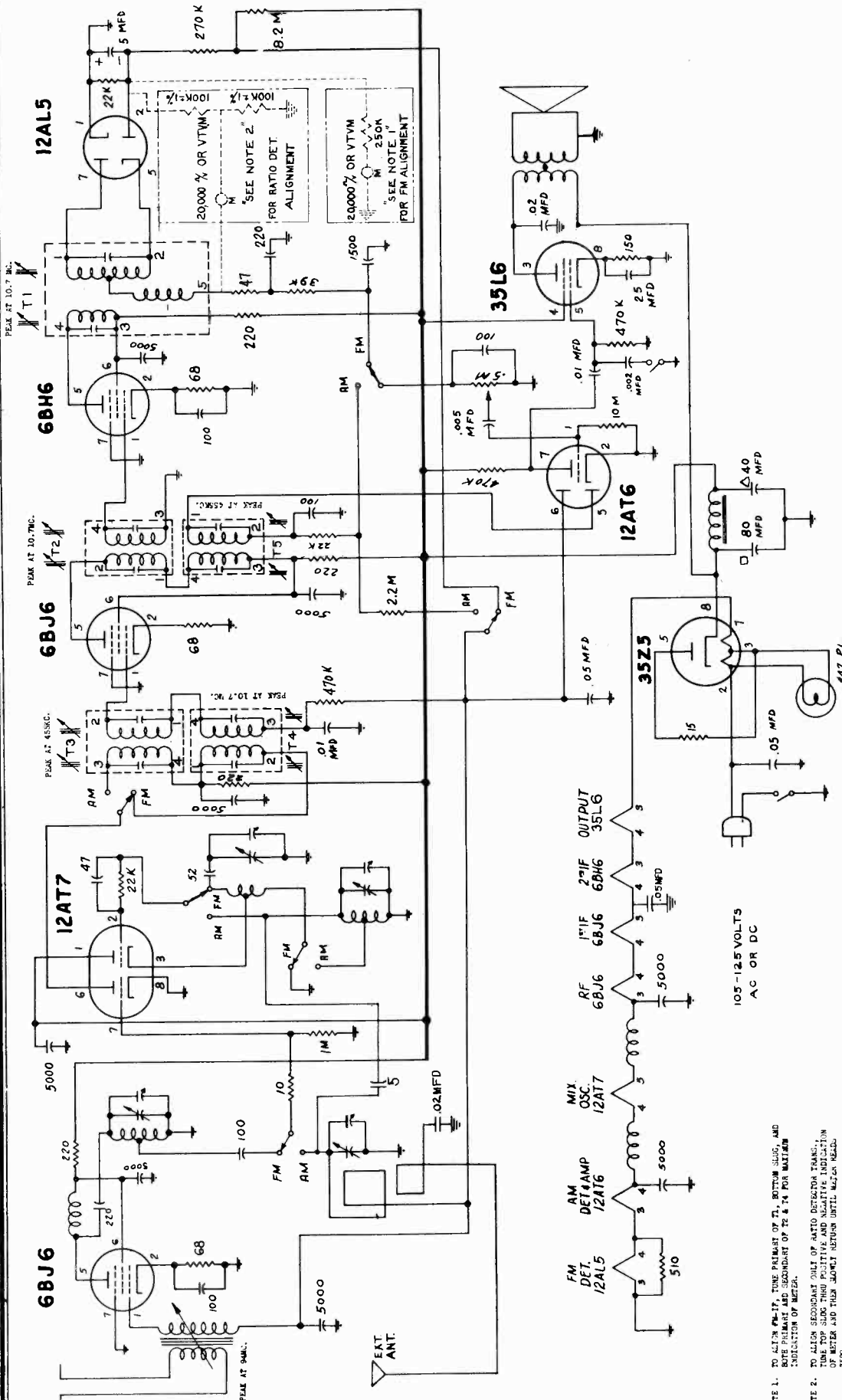
For FM alignment set bandswitch to FM position and leave generator connected to the grid of the 12AT7 converter tube. Adjust generator to 10.7 MC. Connect 20,000 ohm per volt or VTVM meter as in note "1" of schematic diagram. Tune primary of T1, bottom slug, and both primary and secondary of T2 & T4 for maximum indication on meter. To align secondary of Ratio Detector Transformer connect meter as in note "2" of schematic diagram. Tune top slug through positive and negative indication and then slowly return until meter reads zero. This is in the center of the "S" curve.

**RF Alignment:**

Set bandswitch to AM position. Connect signal generator, modulated at 400 cycles, to external antenna lead and to ground through a 0.1 Mfd condenser and adjust to 1700 KC. Set dial pointer to 1700 KC and tune signal for maximum output with oscillator trimmer. Next set generator to 1500 KC and tune in this signal on the receiver. Then adjust RF trimmer for maximum output.

Set bandswitch to FM position. Connect in series with each generator lead a carbon 150 ohm resistor and connect to rear antenna terminal board. Adjust generator and dial pointer to 108 MC. Peak oscillator trimmer for maximum signal output. Next set generator to 105 MC and tune in this signal on receiver. Then peak RF trimmer for maximum output. No adjustment is necessary at the low end because a special compensated fixed padder is used. Set the generator to 94 MC and tune the FM antenna coil for maximum.

In all the IF and RF adjustments it is important to keep the signal generator output as low as possible. It is extremely necessary in making the RF adjustments, that the fundamental oscillator signal be tuned in and not the image frequency. This can be checked by the use of a calibrated wavemeter.



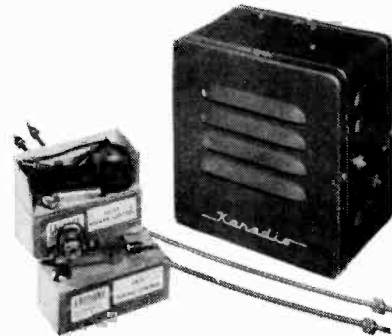
**NOTE 1.** TO ALIGN FM-IF, TUNE PRIMARY OF T1, BOTTOM SLUG, AND BOTE PRIMARY AND SECONDARY OF T2 & T4 FOR MAXIMUM INDICATION OF METER.

**NOTE 2.** TO ALIGN SECONDARY ONLY OF RATIO DETECTOR TRANS., TUNE TOP SLUG THRU POSITIVE AND NEGATIVE INDICATION OF METER AND THEN ADJUST RETURN UNTIL METER READS ZERO.

**NOTE:**  
 ALL CAPACITANCE VALUES IN MMFD EXCEPT WHERE OTHERWISE SPECIFIED.  
 ALL RESISTANCE VALUES IN OHMS EXCEPT WHERE OTHERWISE SPECIFIED.



## INSTALLATION AND OPERATING INSTRUCTIONS



### MOUNTING ●

The chassis contains the complete radio, power supply and speaker. This unit may be mounted in any convenient location on the bulkhead of the car. If possible it should be mounted on the left side or close to the center. This makes for an easier installation. This installation is made by drilling only one 5/16 inch hole in the bulkhead. Care must be taken to see that the mounting bolts on this unit as well as all others, such as the antenna and generator condenser, form a good ground connection. This can be accomplished by scraping the paint from the spot under the mounting nut and washer.

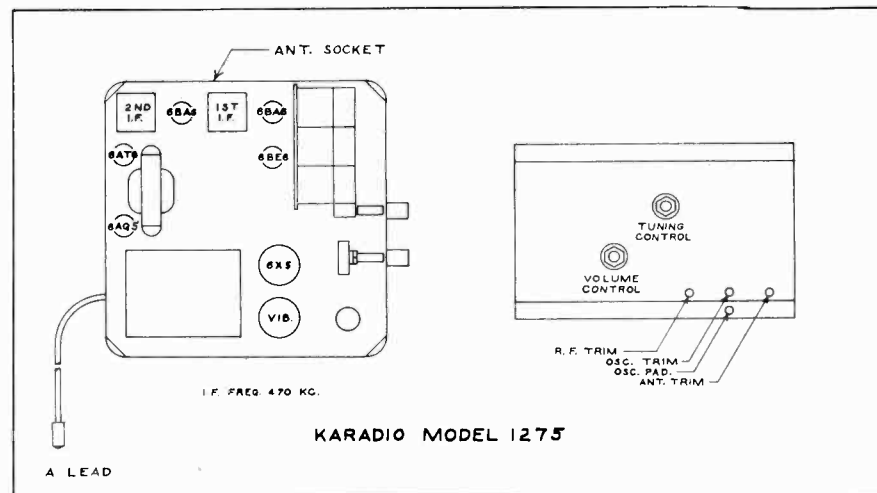


FIGURE 1

Install flexible cables in the proper place (see figure 1). The other end of cables go to the controls 716-T1 and 700-V2. These are installed in the panel kit (see instructions furnished with panel kit). The "A" lead of the radio connects to power socket on control 700-V2.

Antenna lead is plugged into the antenna socket (see figure 1).

After installation, tune in a weak station around 1400 K.C. and adjust antenna trimmer for maximum volume. DO NOT ADJUST OTHER TRIMMERS.



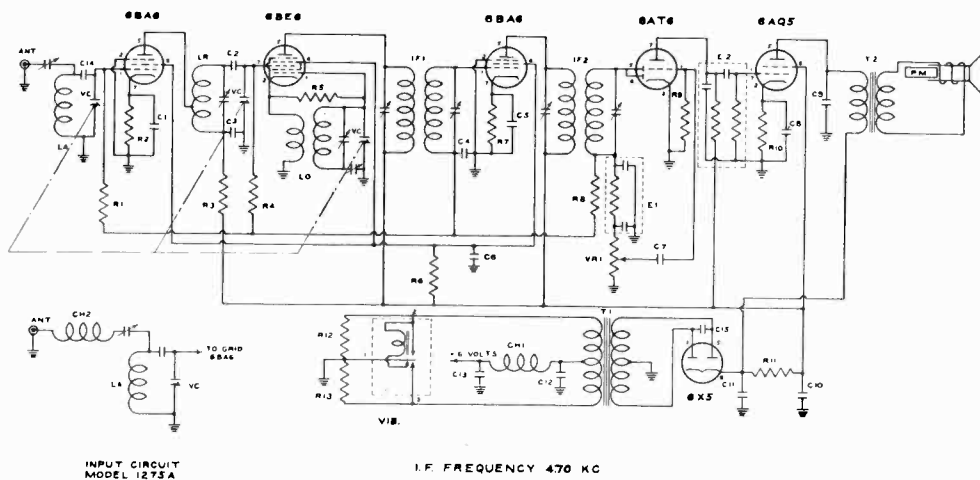


FIGURE 2

### ELIMINATION OF INTERFERENCE —

Remove the coil-to-distributor high-tension lead from the distributor. Cut the lead two inches from the end, and screw the distributor resistor onto the coil lead. Then screw the short length into the resistor, and plug the cable into the distributor cap.

One noise-filter condenser is furnished. Condenser must be connected to the output terminal of the generator (never to the field terminal). The generator-condenser bracket should be fastened to the generator housing, under the screw that holds the field.

In some particularly stubborn cases of motor interference, one or more of the following procedures may be necessary:

A condenser can often be used to advantage on the electrically operated oil gauge or gas gauge. Connect the condenser lead to the terminal of the gauge, and bolt the condenser case securely to the frame or some other grounded part of the car.

Bonding the steering column to the fire wall with a short braid may also be effective. Clean the paint from the steering column at the fire wall where the column enters the motor compartment, and solder on a short piece of braid. Ground the end of the braid to the fire wall.

In some cases it may be necessary to ground the tubes and rods coming through the fire wall in order to reduce the interference. Clean them with emery cloth and spot-solder the braid, fastening the end under a convenient screw.

In some cases it may be necessary to connect an additional condenser to the ammeter or to the ignition switch.

It may be necessary to use a condenser on the voltage regulator. The condenser case should be mounted under one of the voltage-regulator mounting screws, or at some other convenient location, and the lead connected to the battery terminal of the voltage regulator.

Interference from electric clocks can be eliminated by connecting a condenser to the ammeter terminal. The case of the condenser must be securely grounded.

If tire-static interference is noted in a particular installation, static collector springs should be obtained and installed in the front wheels of the car.

MODEL 575, Ch. 120068A,  
120068B



**DESCRIPTION**

**TYPE:** Three way (battery, a.c., d.c.) portable superheterodyne.

**FREQUENCY RANGE:** 540-1620 KC.

**TYPE OF TUBES:**

- 1—1U4 r-f amplifier
- 1—1R5, pentagrid converter
- 1—1U4, i-f amplifier
- 1—1U5, detector, a.v.c., a-f amplifier
- 1—3V4, power output
- 1—117Z3, rectifier

**POWER SUPPLY:** Battery powerpack, or a.c., or d.c.

**VOLTAGE RATING:**

- Line operation—105-125 volts, a.c. or d.c.
- Battery operation—9 volts "A" supply
- 90 volts "B" supply

**POWER CONSUMPTION:** Line operation 20 watts

**CURRENT CONSUMPTION:**

- "A" battery—.055 amp.
- "B" battery—.013 amp.
- 117 volts a.c.—.170 amp.

**GENERAL NOTES**

1. Line Operation: Open the rear cover which is held closed by the catch studs. Remove the line cord plug from its receptacle at the right side of the chassis (looking from the rear). Remove the line cord and insert the plug into

a suitable outlet. When the power supply is d.c. and the receiver remains inoperative, remove the plug, turn it half-way around and reinsert in the outlet to obtain proper polarity.

2. Battery Operation: Remove the line plug from the outlet and insert in the receptacle at the right side of the chassis. The receiver will not operate from batteries if the plug is out of the chassis receptacle. Coil the loose portion of the line cord and store it carefully in the compartment formed by the insulating paper.
3. Battery Complement: Replace the power pack unit with Eveready No. 753 or Rayovac No. AB994 batteries. These units supply both "A" and "B" voltages for battery operation.
4. The color coding of the battery cable is as follows:  
Red— B+, 90 volts      Yellow— A+, 9 volts  
White— B—              Black— A—
5. If replacements are made in the r-f section of the circuit, carefully realign the receiver.
6. The receiver has a self contained antenna and normally does not require an additional antenna connection. For installations in a location where reception is weak, connect an outside antenna to the colored lead connected to the loop at the left side of the cabinet (looking from the rear). Do not use a ground connection.
7. The self-contained loop antenna has directional properties. After a station is tuned in, it is important that the set be rotated through a quarter turn to obtain the position which results in the greatest volume.

**ALIGNMENT PROCEDURE**

1. Use battery power when available. When a.c. power is used, connect the line cord through an isolation transformer if available. Otherwise connect a 0.1 mfd. condenser in series with the low side of the signal generator and B—.
2. Set the volume control at maximum. The output of the signal generator should be no higher than that necessary to obtain an output reading. Attenuate the signal input as alignment proceeds. Use an insulated alignment tool.
3. Maintain the loop in the same position relative to the chassis as when the receiver is in the cabinet.

STEP	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	0.1 mfd.	High side to grid (pin 6) of V2 (1R5). Low side to chassis.	455 KC.	Variable condenser fully open.	Across voice coil	T-2, T-1 (Chassis 120101A) T-3, T-2 (Chassis 120101B)	Adjust for maximum output. If a.c. is used, without an isolation transformer, reduce dummy antenna to 200 mmf. to reduce hum modulation.
2	0.1 mfd.	High side to grid (pin 6) of V1 (1U4). Low side to chassis.	455 KC.	"	"	C-7 (Chassis 120101A) or T-1 (Chassis 120101B)	Adjust for minimum output.
3	200 mmf.	Form loop of several turns and radiate signal into receiver.	1620 KC.	"	"	Trimmer cond. C-4. (Osc.)	Adjust for maximum output.
4	200 mmf.	"	1400 KC.	Tune for maximum output.	"	Trimmer cond. C-3. (Ant.)	Adjust for maximum output.

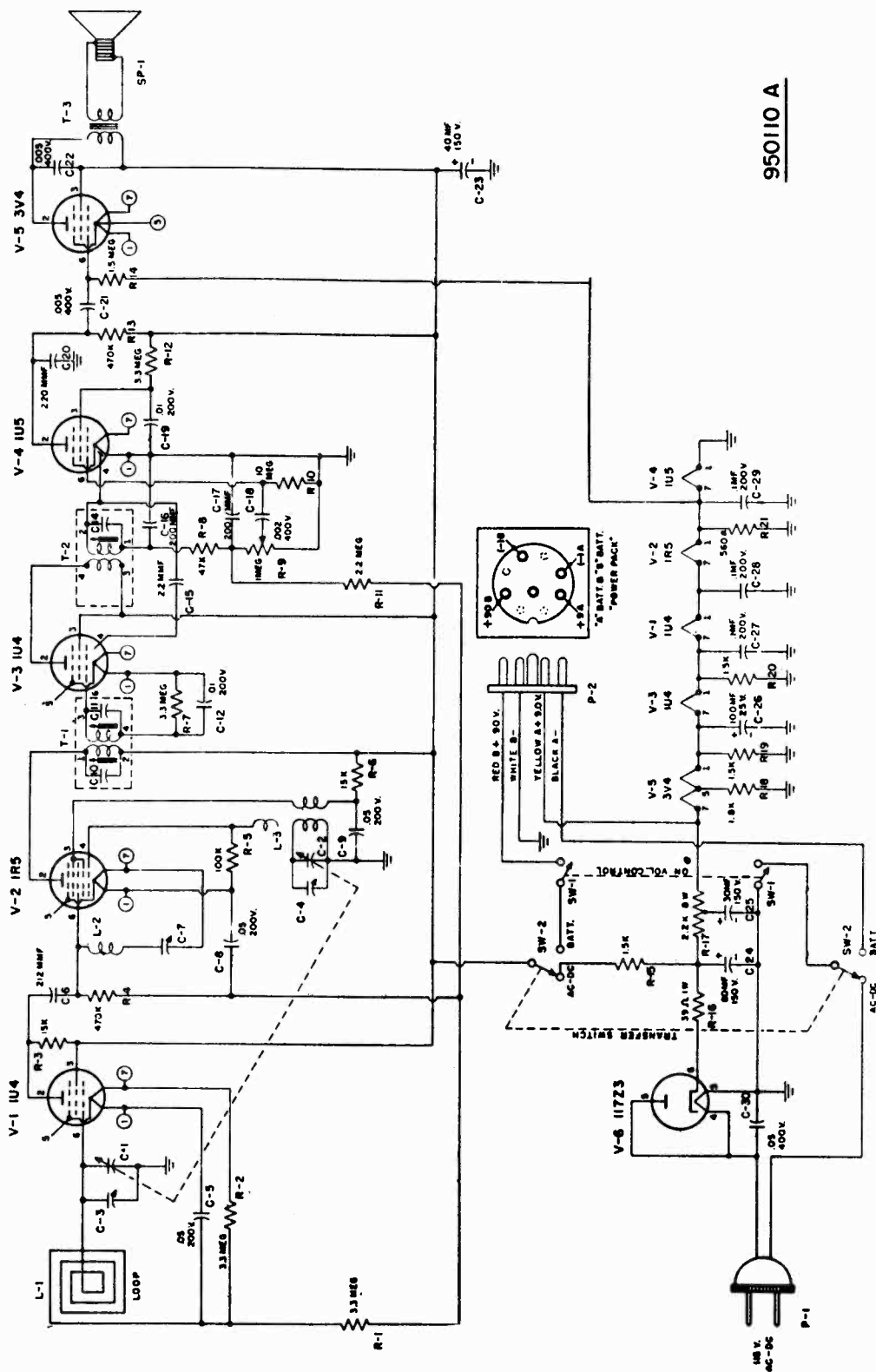


Fig. 1—Schematic Diagram, Chassis 120068A

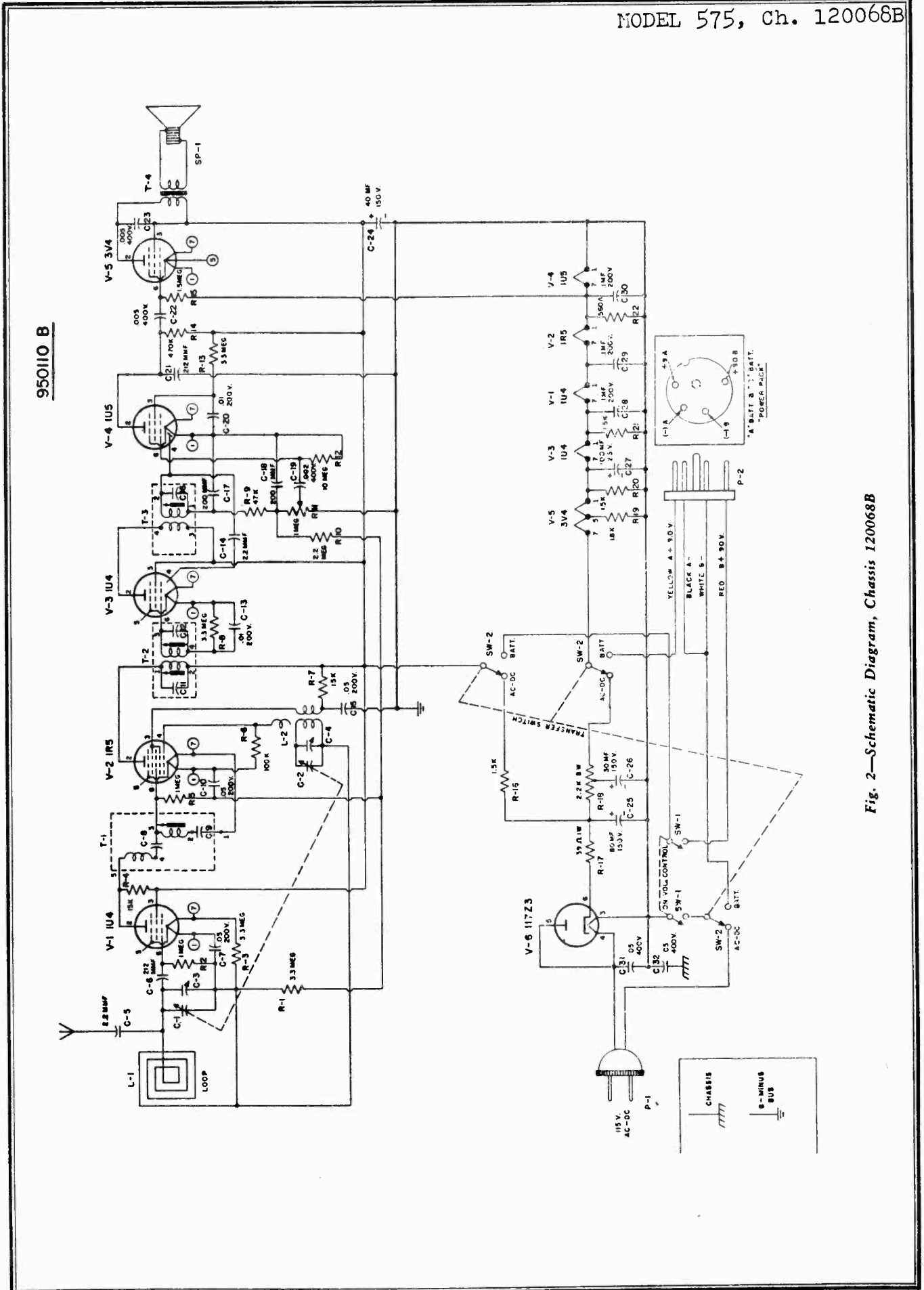


Fig. 2—Schematic Diagram, Chassis 120068B

MODEL 575, Ch. 120068A,  
120068B

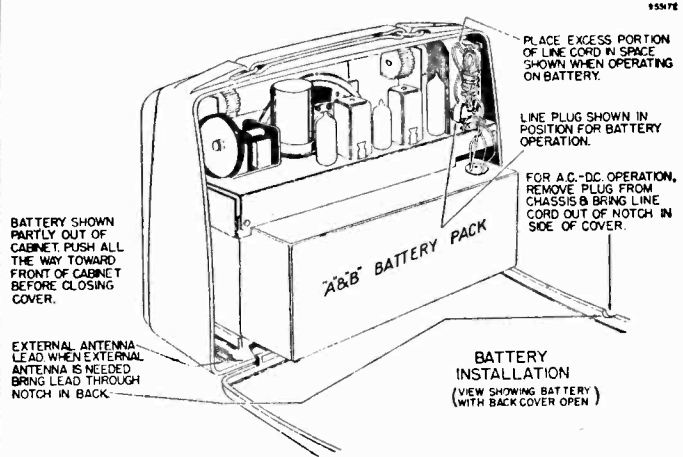
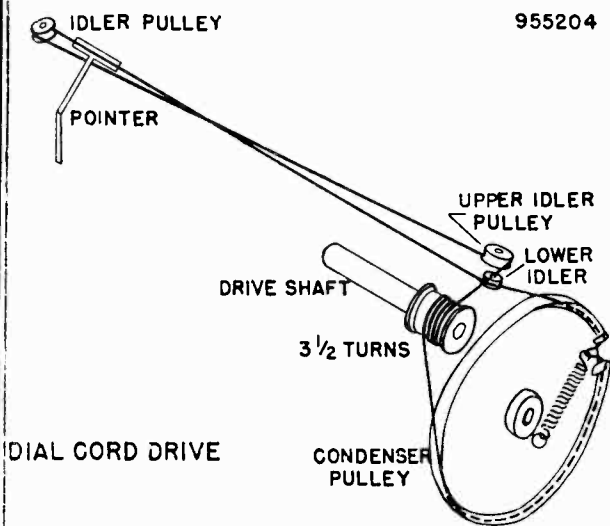


Fig. 3—Dial Cord Stringing

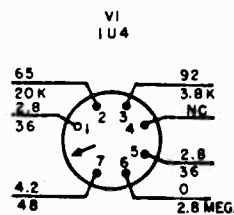
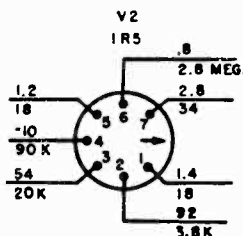
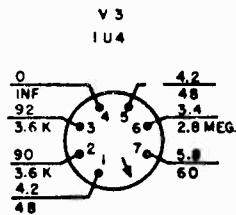
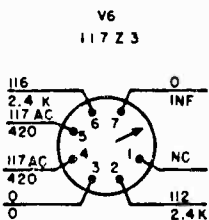
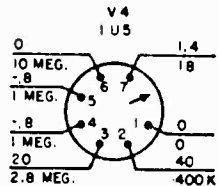
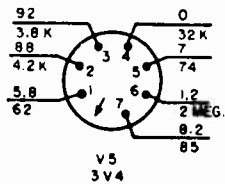
Fig. 4—Battery Replacement

CABINET AND DIAL PARTS

†PART No.	DESCRIPTION	†PART No.	DESCRIPTION
140182°	Cabinet	460082°	Knob
140183S°	Cabinet back, with hinge springs	808205	Cabinet catch clip
460081°	Speaker grille	280079	Cover catch stud
520092	Dial crystal	525041	Dial pointer
520085	Dial backplate	280070	Drive shaft
595006°	Handle, with rings	530002	Drive cord (30")
		587040	Drive cord spring

°Specify color when ordering

950136



CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Measurements made for 120 volt a.c. operation.
2. Voltages shown are + d.c. unless otherwise indicated.
3. All measurements made with voltohmyst or equivalent.
4. Upper values are voltage, lower values resistance on diagram. NC=no connection; K=kilohms; Meg.=meg-ohms; INF.=infinity.
5. Measurements made on Chassis 120068B.
6. Normal tolerance on components makes possible a variation of  $\pm 15\%$  from readings shown.

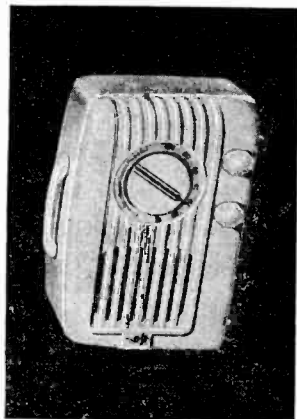
Fig. 5—Voltage and Resistance Readings—Model 575

## REPLACEMENT PARTS LIST

CHASSIS 120068A			CHASSIS 120068B		
Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
C-1}	900043	Variable Condenser—Antenna	C-1}	900043	Variable condenser—Antenna
C-2}		Variable Condenser—Oscillator	C-2}		Variable condenser—Oscillator
C-3	Pt. of C-1	Trimmer	C-3	Pt. of C-1	Trimmer
C-4	Pt. of C-2	Trimmer	C-4	Pt. of C-2	Trimmer
C-5	920060	.05 mf., paper, 200v,	C-5	Pt. of L-1	2.2 mmf.
C-6	928104 or	212 mmf., ceramic, 300v, ±20%	C-6	928104 or	212 mmf., ceramic, 300v, ±20%
	910000	220 mmf., mica, ±20%		910000	220 mmf., mica, ±20%
C-7	Pt. of L-2	Trimmer	C-7	920060	.05 mf., paper, 200v, ±25%
C-8	920060	.05 mf., paper, 200v	C-8	Pt. of T-1	
C-9	920060	.05 mf., paper, 200 v	C-9	Pt. of T-1	
C-10}			C-10	920060	.05 mf., paper, 200v, ±25%
C-11}	Pt. of T-1		C-11	Pt. of T-2	
C-12	920092	.01 mf., paper, 200 v	C-12	Pt. of T-2	
C-13}			C-13	920092	.01 mf., paper, 200v
C-14}	Pt. of T-2		C-14	915005	2.2 mmf., ceramic, ±20%
C-15	915005	2.2 mmf., Ceramic, ±20%	C-15	920060	.05 mf., paper, 200v
C-16}		200 mmf., {diode	C-16	Pt. of T-3	
C-17}	928032	200 mmf., {filter	C-17}	928032	200 mmf., {diode
C-18	920515	.002 mf., paper, 400v	C-18}		200 mmf., {filter
C-19	920092	.01 mf., paper, 200v	C-19	920515	.002 mf., paper, 400v
C-20	928104 or	212 mmf., ceramic, 300v ±20%	C-20	920092	.01 mf., paper, 200v
	910000	220 mmf., mica, ±20%	C-21	928104 or	212 mmf., ceramic, 300v, ±20%
C-21	920180	.005 mf., paper, 400v		910000	220 mmf., mica, ±20%
C-22	920180	.005 mf., paper, 400v	C-22	920180	.005 mf., paper, 400v
C-23		40 mf., 150v	C-23	920180	.005 mf., paper, 400v
C-24		80 mf., 150v	C-24		40 mf., 150v
C-25	925059	30 mf., 150v } electrolytic	C-25	925059-A	80 mf., 150v } electrolytic
C-26		100 mf., 25v	C-26		30 mf., 150v
C-27	920040	.1 mf., paper, 200v	C-27		100 mf., 25v
C-28	920040	.1 mf., paper, 200v	C-28	920040	.1 mf., paper, 200v
C-29	920040	.1 mf., paper, 200v	C-29	920040	.1 mf., paper, 200v
C-30	920539	.05 mf., paper, 400v	C-30	920040	.1 mf., paper, 200v
L-1	700039	Loop Antenna	C-31	920539	.05 mf., paper, 400v
L-2	708060	Wave trap	C-32	920539	.05 mf., paper, 400v
L-3	716029	Oscillator coil	L-1	700042	Loop antenna
P-1	583012P	Line cord and plug	L-2	716029	Oscillator coil
P-2	585033	Battery cable and plug assembly	P-1	583017-P	Line cord and plug
R-1	351330	3.3 megohm, carbon, ½w, ±20%	P-2	585033	Battery cable and plug assy.
R-2	351330	3.3 megohm, carbon, ½w, ±20%	R-1	351330	3.3 megohm, carbon, ½w, ±20%
R-3	340770	15,000 ohm, carbon, ½w, ±10%	R-2	351210	1 megohm, carbon, ½w, ±20%
R-4	351130	470,000 ohm, carbon, ½w, ±20%	R-3	351330	3.3 megohm, carbon, ½w, ±20%
R-5	350970	100,000 ohm, carbon, ½w, ±20%	R-4	340770	15,000 ohm, carbon, ½w, ±10%
R-6	340770	15,000 ohm, carbon, ½w, ±10%	R-5	351210	1 megohm, carbon, ½w, ±20%
R-7	351330	3.3 megohm carbon, ½w, ±20%	R-6	350970	100,000 ohm, carbon, ½w, ±20%
R-8	Pt. of C-16	47,000 ohm, carbon, ½w, ±10%	R-7	340770	15,000 ohm, carbon, ½w, ±10%
	and C-17		R-8	351330	3.3 megohm, carbon, ½w, ±20%
R-9	390063	1 megohm, Volume Control	R-9	Pt. of C-17	47,000 ohm, carbon, ½w, ±10%
R-10	351450	10 megohm, carbon, ½w, ±20%		and C-18	
R-11	351290	2.2 megohm, carbon, ½w, ±20%	R-10	351290	2.2 megohm, carbon, ½w, ±20%
R-12	351330	3.3 megohm, Carbon, ½w, ±20%	R-11	390063	1 megohm, volume control
R-13	351130	470,000 ohm, carbon, ½w, ±20%	R-12	351450	10 megohm, carbon, ½w, ±20%
R-14	351250	1.5 megohm, carbon, ½w, ±20%	R-13	351330	3.3 megohm, carbon, ½w, ±20%
R-15	340530	1,500 ohm, carbon, ½w, ±10%	R-14	351130	470,000 ohm, carbon, ½w, ±20%
R-16	370150	39 ohm, carbon, 1 w, ±10%	R-15	351250	1.5 megohm, carbon, ½w, ±20%
R-17	394041	2,200 ohm, w.w., 8w, ±5%	R-16	340530	1,500 ohm, carbon, ½w, ±10%
R-18	340550	1,800 ohm, carbon, ½w, ±10%	R-17	370150	39 ohm, carbon, 1w, ±10%
R-19	340530	1,500 ohm, carbon, ½w, ±10%	R-18	394041	2,200 ohm, w.w., 8w, ±5%
R-20	340530	1,500 ohm, carbon, ½w, ±10%	R-19	340550	1,800 ohm, carbon, ½w, ±10%
R-21	340430	560 ohm, carbon, ½w, ±10%	R-20	340530	1,500 ohm, carbon, ½w, ±10%
T-1	720525 or	1st. and 2nd. I-F transformer	R-21	340530	1,500 ohm, carbon, ½w, ±10%
	720062	I-F transformer	R-22	340430	560 ohm, carbon, ½w, ±10%
T-2	720066	Diode I-F single tuned trans- former	T-1	708029	Wave trap
T-3	734039	Output transformer	T-2	720525	1st. and 2nd. I-F transformer
SP-1	180052	PM Speaker—5"		(or 720062	1st. and 2nd. I-F transformer
SW-1	Pt. of R-9	On-off switch	T-3	720066	Diode I-F single tuned transformer
SW-2	510008	Transfer switch	T-4	734039-A	Output transformer
V-1	800017	R-F amplifier—1U4	SP-1	180052	PM Speaker—5"
V-2	800110	Converter—1R5	SW-1	Pt. of R-11	On-off switch
V-3	800017	I-F amplifier—1U4	SW-2	510043	Transfer switch
V-4	800019	Detector, a.v.c., a-f amp.—1U5	V-1	800017	R-F amplifier—1U4
V-5	800018	Power output—3V4	V-2	800110	Converter—1R5
V-6	800013	Rectifier—117Z3	V-3	800017	I-F amplifier—1U4
			V-4	800019	Detector, a.v.c., a-f amp.—1U5
			V-5	800018	Power output—3V4
			V-6	800013	Rectifier—117Z3

†Specify part number when ordering

MODELS 581, Ch. 120014A,  
120014B; 594, 595, Ch. 120071A



MODEL 581



MODEL 594



MODEL 595

REPLACEMENT PARTS LIST

Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
V1	12SA7GT	Converter	R3	351330	3.3 megohms, 1/2 watt
V2	12SK7GT	I-f amplifier	R4	390015	.5 megohm, volume cont.
V3	12SQ7GT	Detector, a.v.c., a-f amplifier	R6,7	351130	470 kilohms, 1/2 watt
V4	50L6GT	Power output	R8	340290	150 ohms, 1/2 watt
V5	35Z5GT	Rectifier	R9	370490	1000 ohms, 1 watt
C1	920040	.1 mfd., 200 volt, paper	R10	370150	39 ohms, 1 watt
C2	920010	.002 mfd., 600 volt, paper	R11	351050#	220 kilohms, 1/2 watt
C3, C4	910000	220 mmf., mica (alt. part 928104)	L1	700033	Loop antenna
C5	920180	.005 mfd., 400 volt, paper	L2	{716024	Oscillator coil
C6	920020	.02 mfd., 400 volt, paper	T1	{716026#	First i-f transformer
C7	925009	50-50 mfd., 150 volt, elect.	T2	720525	Second i-f transformer
C8	920030	.05 mfd., 400 volt, paper	T3	734031	Output transformer
C9	{920052	Two-gang, variable condenser	SP1	180045	P.M. speaker
	{900035*		SW1	Part of R4	Line Switch
C10	920050#	.2 mfd., 200 volt, paper	P.L.	807000	Dial light, 6-8v., .15 amp.
R1, R5	351490	15 megohms, 1/2 watt		507090	Dial light socket
R2	{340810#	22 kilohms, 1/2 watt		{583060	Line cord and plug
	{Part of L2			{583010P#	

† Specify part number when ordering. # Chassis 120014B only. \* Chassis 120071A only.

CABINET AND DIAL PARTS

DESCRIPTION	Model 581 Chassis 120014A, 14B	Model 594 Chassis 120071A	Model 595 Chassis 120071A
Cabinet, ivory plastic	140267	140197	—
walnut plastic	—	140190	—
ebony plastic	—	140198	—
walnut wood	—	—	140195
Knob, ivory plastic	460151	—	—
clear plastic	—	460107	460107
Dial crystal	520034	{520074 or	{520077 or
		{520034	{520080
Dial pointer, ivory	525042	—	—
black	—	525036	525036
Dial backplate	520105	520050	520050
Drive shaft	280024	280024	280024
Drive cord	530050 (12")	530050 (10 1/2")	530050 (10 1/2")
Drive spring	587000	587000	587000
Cabinet back	575059	575059	575285
Handle	460151	—	—

MODELS 581, Ch. 120014A,  
120014B; 594, 595, Ch. 120071A

### INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage readings are in d.c. volts and resistance readings in ohms unless otherwise specified.
2. All measurements made with voltohmmvat.
3. Socket connections are shown as bottom views.
4. Measured values are from socket pin to common negative, unless otherwise specified.
5. Line voltage maintained at 117 volts for voltage readings.
6. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
7. Volume control at maximum with no signal applied, for voltage measurements.

### VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	12SA7GT	0	24 AC	95	95	-13	0	12 AC	-2
V2	12SK7GT	0	36 AC	0	-2	0	95	24 AC	95
V3	12SQ7GT	0	-1	0	-2	-5	55	0	12 AC
V4	50L6GT	NC	90 AC	110	95	0	NC	36 AC	6
V5	35Z5GT	NC	117 AC	112 AC	114	110 AC	NC	90 AC	114

### RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	12SA7GT	0	48	1K*	1K*	24K	0	32	3 Meg.
V2	12SK7GT	0	60	0	3 Meg.	0	1K*	48	1K*
V3	12SQ7GT	0	15 Meg.	0	3 Meg.	.5 Meg.	540K*	0	32
V4	50L6GT	NC	110	160*	900*	5 Meg.	NC	60	150
V5	35Z5GT	NC	148	145	0*	190	NC	110	0*

NC = no connection; K = kilohm; Meg. = megohm.

\* Readings taken to pin 8 of V5.

### ALIGNMENT PROCEDURE

1. Use isolation transformer if available. If not, connect a 0.1 mfd. condenser in series with low side of signal generator and chassis.
2. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading.
3. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	METER OUTPUT	ADJUST	REMARKS
1	0.1 mfd.	High side to pin 8 (grid) of 12SA7GT (V1). Low side to chassis.	455 kc	Variable condenser fully open.	Across voice coil.	T2, T1,	Adjust for maximum output. If isolation transformer is not used, reduce primary inductance to 0.001 mfd. to reduce hum modulation.
2	200 mmfd.	High side to external antenna lead. Low side to chassis.	1620 kc	Variable condenser fully open.	Across voice coil.	Trimmer condenser on oscillator section C9B.	Adjust for maximum output.
3	200 mmfd.	High side to external antenna lead. Low side to chassis.	1450 kc	Tune for maximum output.	Across voice coil.	Trimmer condenser on antenna section C9A.	Adjust for maximum output.

### DESCRIPTION

TYPE: Single band (AM) superheterodyne  
FREQUENCY RANGE: 540-1620 KC.

#### TYPES OF TUBES:

- 1—12SA7GT converter
- 1—12SK7GT i-f amplifier
- 1—12SQ7GT detector, a.v.c., a-f amplifier
- 1—50L6GT power output
- 1—35Z5GT rectifier

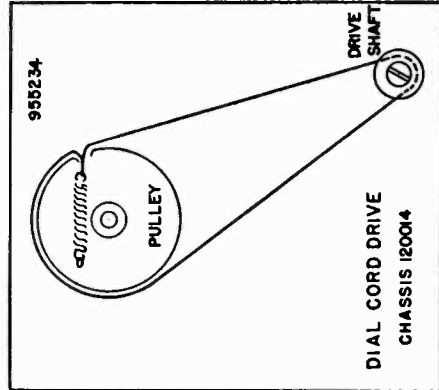
NOTE: Metal tubes, types 12SA7, 12SK7, and 12SQ7 may be used on same chassis.

POWER SUPPLY: A.c. or d.c.

VOLTAGE RATING: 105-125 volts

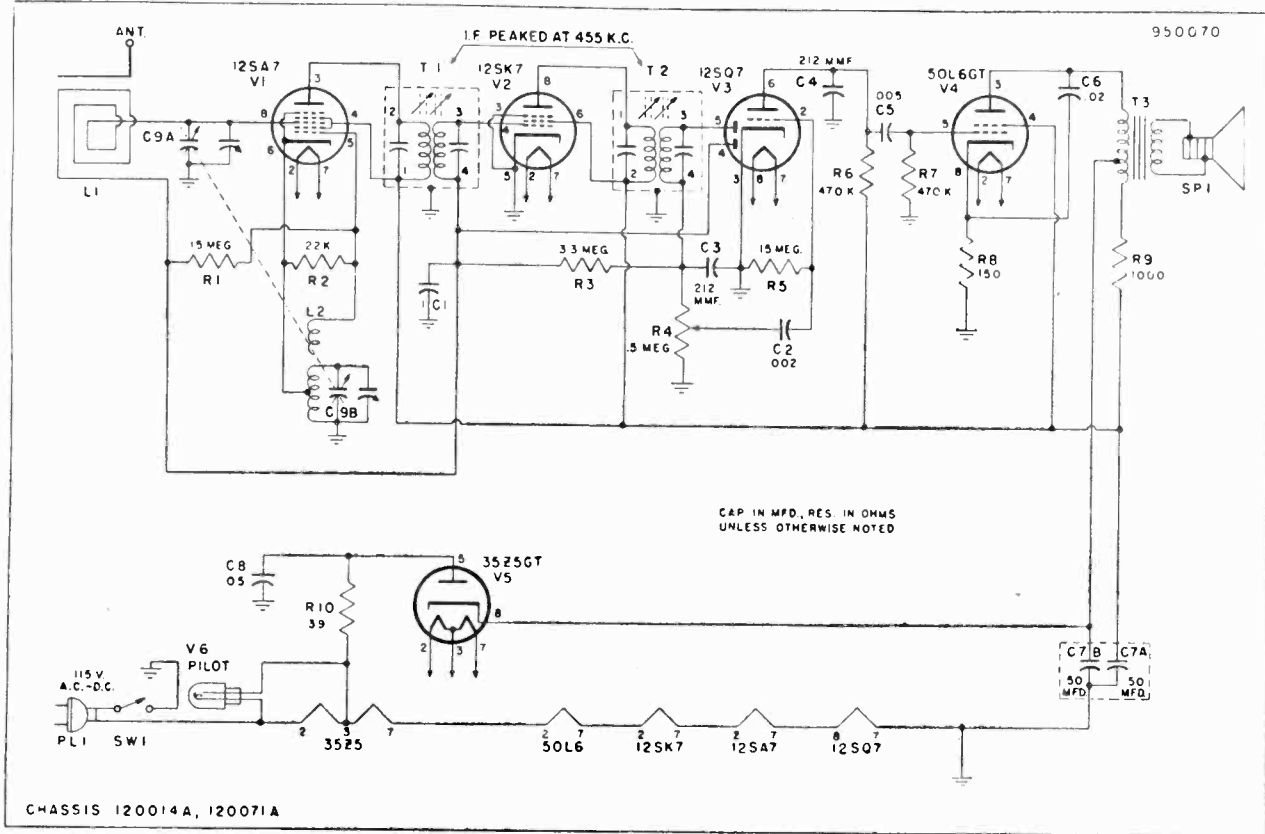
POWER CONSUMPTION: 30 watts

CURRENT DRAIN: 0.24 amp. at 117 volts a.c.

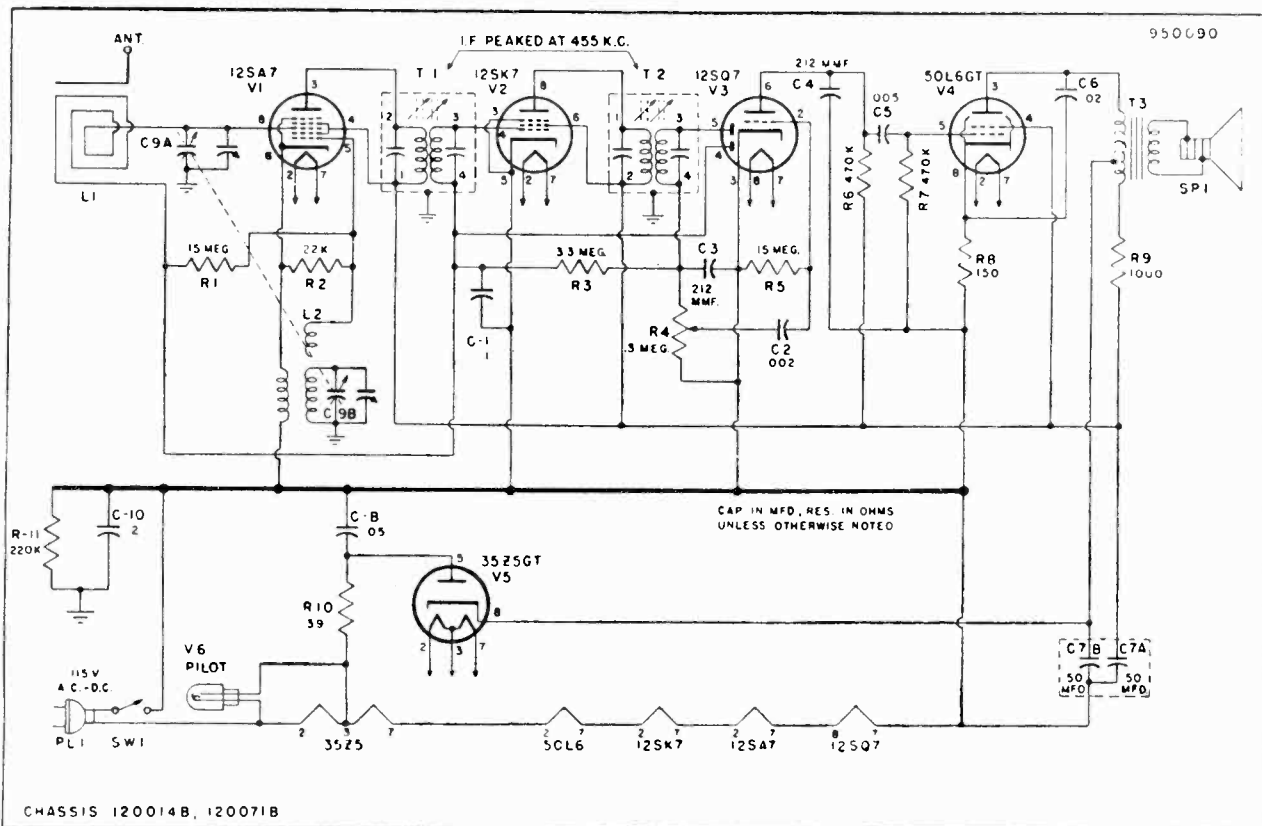




MODELS 581, Ch. 120014A,  
120014B; 594, 595, Ch. 120071A

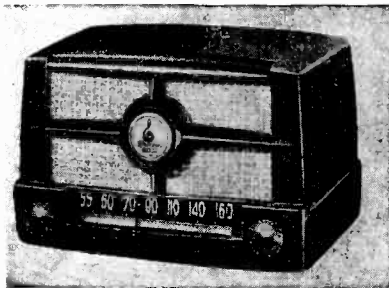


SCHMATIC CIRCUIT DIAGRAM — Chassis 120014A, Model 581  
Chassis 120071A, Models 594, 595

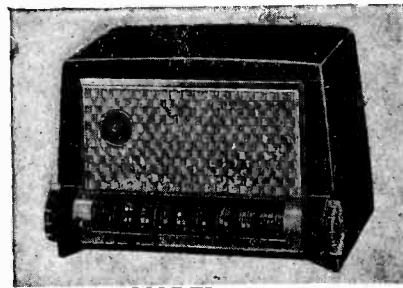


SCHMATIC CIRCUIT DIAGRAM — Chassis 120014B, Model 581

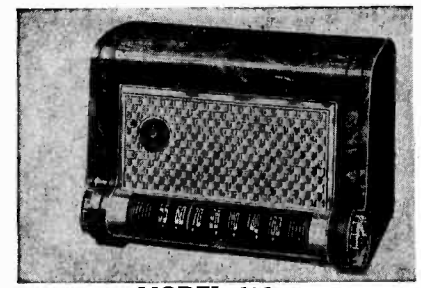
MODELS 587, Ch. 120033A,  
120033B; 610, 616, Ch. 120100A,  
120100B



MODEL 587



MODEL 610



MODEL 616

REPLACEMENT PARTS LIST

CHASSIS 120033A, 120100A			CHASSIS 120033B, 120100B		
Symbol	† Part No.	DESCRIPTION	Symbol	† Part No.	DESCRIPTION
V1	12SA7GT	Converter	V1	12SA7GT	Converter
V2	12SK7GT	I-f amplifier	V2	12SK7GT	I-f amplifier
V3	12SQ7GT	Detector, a.v.c., a-f amplifier	V3	12SQ7GT	Detector, a.v.c., a-f amplifier
V4	50L6GT	Power output	V4	50L6GT	Power output
V5	35Z5GT	Rectifier	V5	35Z5GT	Rectifier
C1, C2	900023	Two-gang, variable condenser	C1, C2	900023	Two-gang, variable condenser
C3	920040	.1 mfd., 200 volt, paper	C3, C9	920030	.05 mfd., 400 volt, paper
C4	920515	.002 mfd., 400 volt, paper	C4	920515	.002 mfd., 400 volt, paper
C5, C6	910000	220 mmf., mica (Alt. part 928104)	C5, C6	910000	220 mmf., mica (Alt. part 928104)
C7	920180	.005 mfd., 400 volt, paper	C7	920180	.005 mfd., 400 volt, paper
C8	920020	.02 mfd., 400 volt, paper	C8	923082	.02 mfd., 400 volt, paper
C9	920030	.05 mfd., 400 volt, paper	C10, C11	925061	30-50 mfd., 150 volt, electrolytic
C10, C11	925061	30-50 mfd., 150 volt, electrolytic	C12	920040	.1 mfd., 200 volt, paper
L1	700023FH	Loop antenna	L1	700023FH	Loop antenna
L2	716018	Oscillator coil	L2	716026	Oscillator coil
R1, R4	351490	15 megohms, 1/2 watt	R1, R4	351490	15 megohms, 1/2 watt
R2	Part of L2	22 kilohms, 1/2 watt	R2	340810	22 kilohms, 1/2 watt
R3	351330	3.3 megohms, 1/2 watt	R3	351330	3.3 megohms, 1/2 watt
R5, R6	351130	470 kilohms, 1/2 watt	R5, R6	351130	470 kilohms, 1/2 watt
R7	340290	150 ohms, 1/2 watt	R7	340290	150 ohms, 1/2 watt
R8	370490	1000 ohms, 1 watt	R8	370490	1000 ohms, 1 watt
R9	370150	39 ohms, 1 watt	R9	370150	39 ohms, 1 watt
R10	390024	.5 megohms, volume control (Alt. part 390062) #.	R10	390024	.5 megohm, volume control (Alt. part 390062) °
T1	720021	First i-f transformer	R11	351050	220 kilohms, 1/2 watt
T2	720021	Second i-f transformer	T1	720021	First i-f transformer
T3	734023	Output transformer	T2	720021	Second i-f transformer
SP1	180032H	P.M. speaker	T3	734024	Output transformer
SW1	Part of R10	Line switch	SP1	180032H	P.M. speaker
P.L.	807000	Dial light*	SW1	Part of R10	Line switch
	507003	Dial light socket*	P.L.	807000	Dial lightΔ
	583005	Line cord		507003	Dial light socketΔ
				583013P	Line cord

\* Chassis 120033A only; # Chassis 120100A only.

ΔChassis 120033B only; °Chassis 120100B only.

CABINET AND DIAL PARTS

DESCRIPTION	Model 587	Model 610	Model 616
Cabinet	140265 (Brown)	460097	140239A (Wood)
Grille	140275 (Ebony)	140168 (Plastic)	460097
Baffle	470454 (Grille & baffle)	575448	575448
Knob	450115	460088	460088
Drive shaft	280035	280055	280055
Dial drive cord	530002 (28")	530002 (31")	530002 (31")
Dial drive spring	587040	587040	587040
Dial backplate	520048	520104	520104
Pointer	525023	525033	525033

MODELS 587, Ch. 120033A, 120033B;  
610, 616, Ch. 120100A, 120100B

**DESCRIPTION**

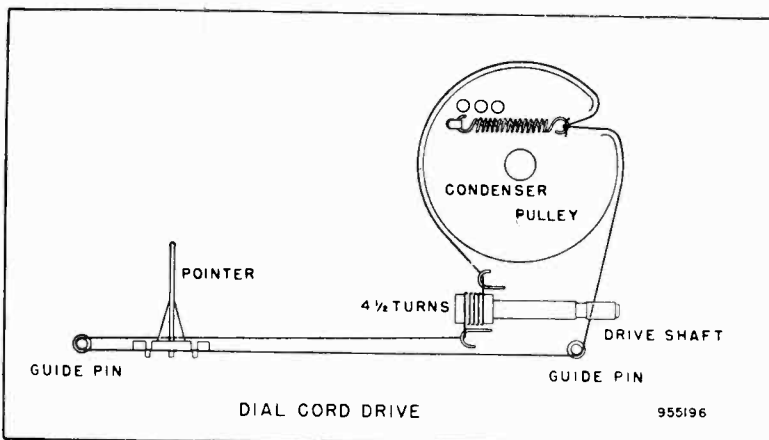
TYPE: Single-band (AM) superheterodyne.

FREQUENCY RANGE: 540-1620 kc.

**TYPE OF TUBES:**

- 1—12SA7GT, converter
- 1—12SK7GT i-f amplifier
- 1—12SQ7GT, detector, a.v.c., a-f amplifier
- 1—50L6GT, power output
- 1—35Z5GT, rectifier

POWER SUPPLY: A.c. or d.c.  
VOLTAGE RATING: 105-125 volts.  
POWER CONSUMPTION: 30 watts.  
CURRENT DRAIN: 0.24 amp. at 117 volts a.c.



**INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS**

1. Voltage readings are d.c. volts and resistance readings in ohms, unless otherwise specified.
2. All measurements made with voltohmmyst.
3. Socket connections are shown as bottom views.
4. Measured values are from socket pin to common negative, unless otherwise noted.
5. Line voltage maintained at 117 volts a.c. for voltage readings.
6. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
7. Volume control at maximum with no signal applied, for voltage measurements.

**VOLTAGE READINGS**

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	12SA7GT	0	25AC	92	92	-10	0	12AC	-1.0
V2	12SK7GT	0	36AC	0	-1.0	0	92	25AC	92
V3	12SQ7GT	0	-1.0	0	-8	0	60	0	12AC
V4	50L6GT	0	36AC	110	92	0	0	83AC	5.4
V5	35Z5GT	NC	117AC	NC	NC	115AC	0	83AC	116

**RESISTANCE READINGS**

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	12SA7GT	230K	32	880*	880*	24K	0	16	3 Meg.
V2	12SK7GT	230K	48	0	3 Meg.	0	880*	32	880*
V3	12SQ7GT	230K	14 Meg.	0	550K	0	450K*	0	16
V4	50L6GT	230K	48	220*	880*	500K	0	108	150
V5	35Z5GT	NC	150	NC	NC	190	0	108	0*

K=kilohms; Meg.=megohms; NC=no connection; \* Measured to pin 8 of V5, 35Z5GT.

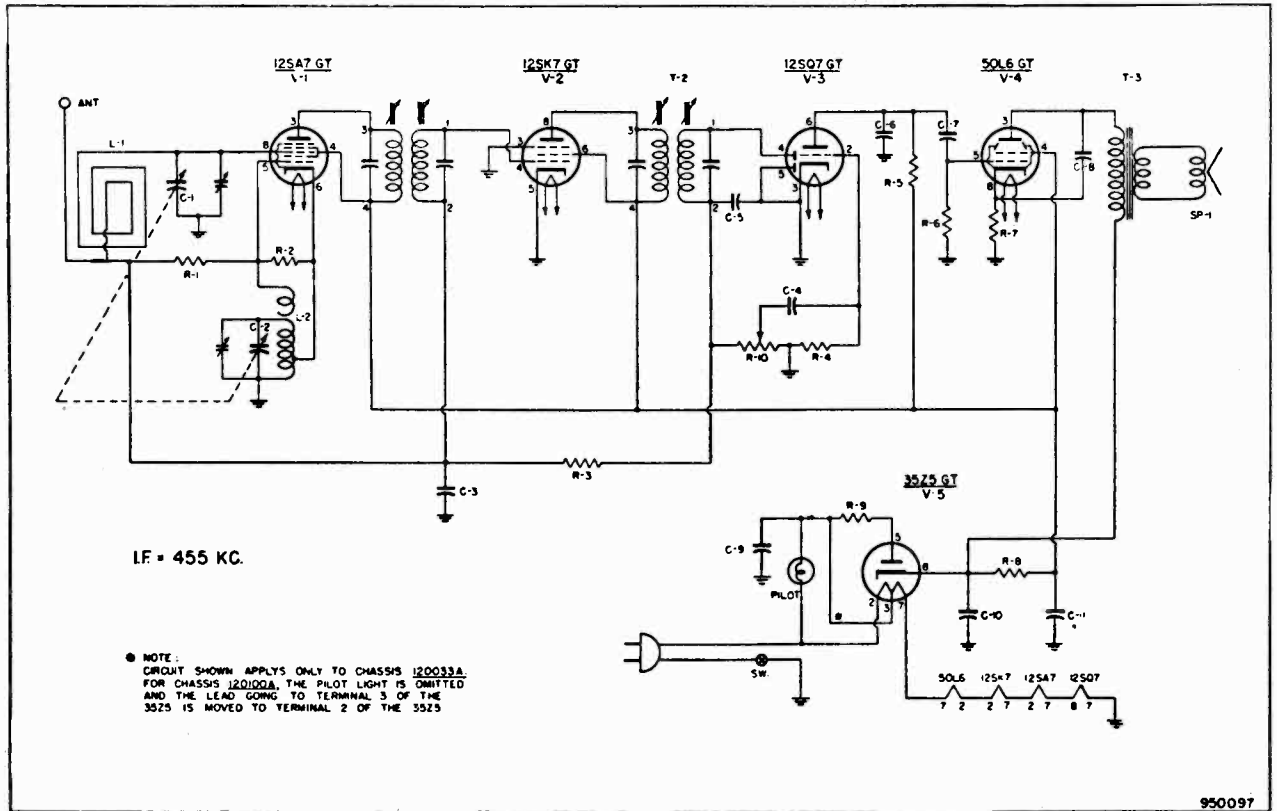
**ALIGNMENT INSTRUCTIONS**

1. To position pointer, turn variable condenser fully closed and set pointer to reference mark at low frequency end of dial backplate.
2. Use isolation transformer if available. If not, connect a 0.1 mfd. condenser in series with low side of signal generator and chassis.
3. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading.
4. Use an insulated alignment tool for all adjustments.

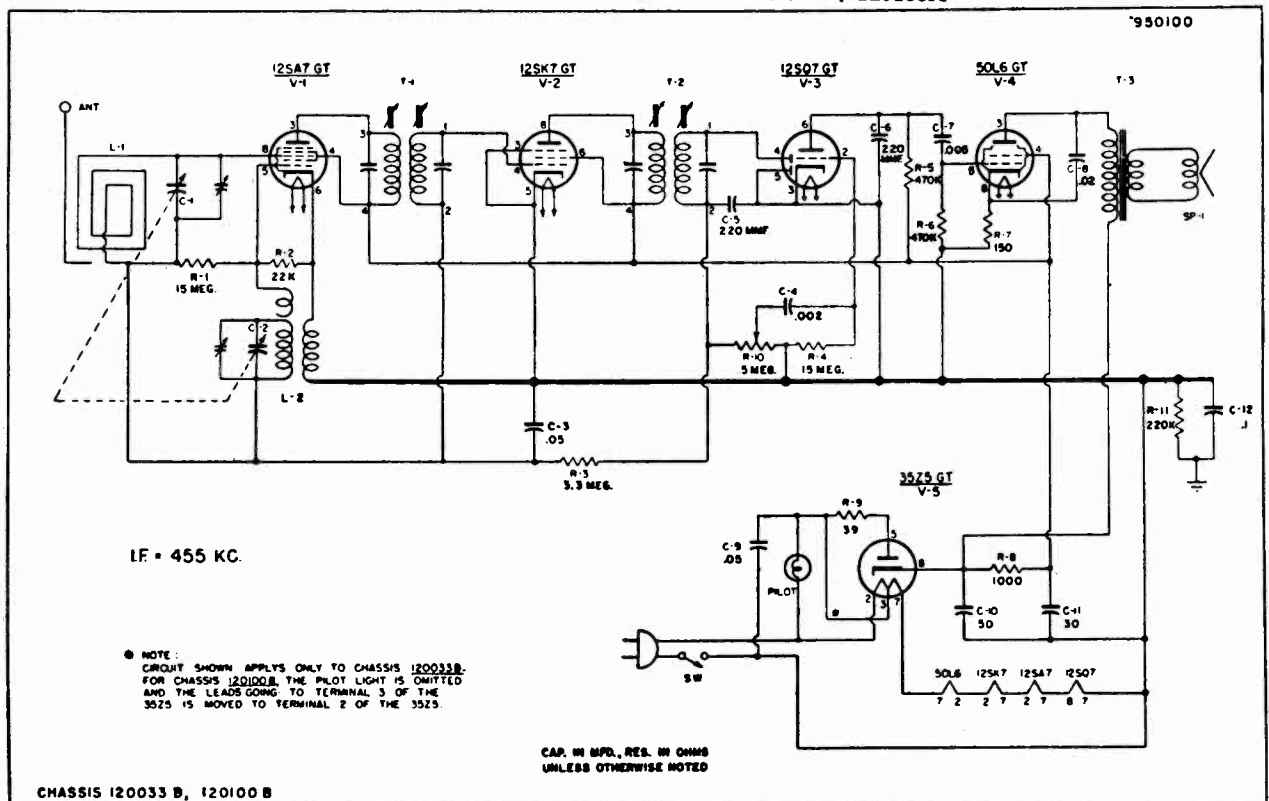
**ALIGNMENT PROCEDURE**

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	METER OUTPUT	ADJUST	REMARKS
1	0.1 mfd.	High side to grid (pin 8) of 12SA7GT(V1). Low side to chassis.	455 kc.	Variable condenser fully open.	Across voice coil.	Second i-f trans. T2 and first i-f trans. T1.	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001 mfd. to reduce hum modulation.
2	200 mmfd.	High side to external antenna lead. Low side to chassis.	1620 kc.	Variable condenser fully open.	Across voice coil.	Oscillator trimmer on C2.	Adjust for maximum output.
3	200 mmfd.	High side to external antenna lead. Low side to chassis.	1450 kc.	Tune for maximum output.	Across voice coil.	Antenna trimmer on C1.	Adjust for maximum output.

MODELS 587, Ch. 120033A, 120033B;  
610, 616, Ch. 120100A, 120100B

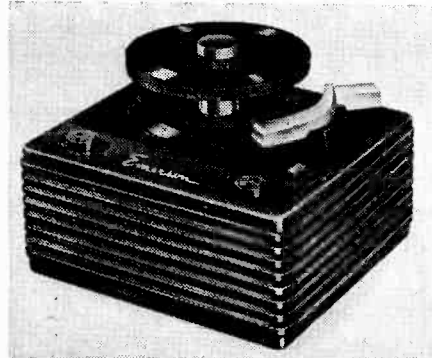
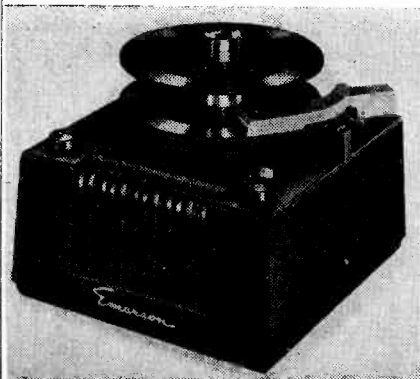


SCHMATIC DIAGRAM—CHASSIS 120033A, 120100A



SCHMATIC DIAGRAM—CHASSIS 120033B, 120100B

MODELS 590, 623, Ch. 120101A,  
120101B; 635, Ch. 120108B



MODEL 590

MODEL 623

MODEL 635

### GENERAL NOTES

1. All models are equipped with an automatic record changer that plays up to ten 7-inch, 45 rpm records only. A permanent type needle is supplied.
2. If replacements are made or the wiring disturbed in the r-f section of Model 635, the receiver should be carefully realigned.
3. Model 635 has a self-contained antenna and does not require an additional antenna. For permanent installations, however, if it desired to improve reception of weak stations, an additional outdoor antenna may be connected to the colored lead at the rear of the cabinet.
4. The self-contained loop antenna has directional properties. It is important, therefore, once a station is tuned in, that the cabinet be rotated back and forth through a quarter-turn and left at that position where maximum volume is obtained.

### DESCRIPTION

**TYPE:** Models 590, 623—Automatic phonograph, 45 rpm.  
Model 635—Single band superheterodyne with automatic record changer, 45 rpm.

**FREQUENCY RANGE:** 540-1620 kc.

**TYPE OF TUBES:**

Models 590, 623—Chassis 120101A or B.

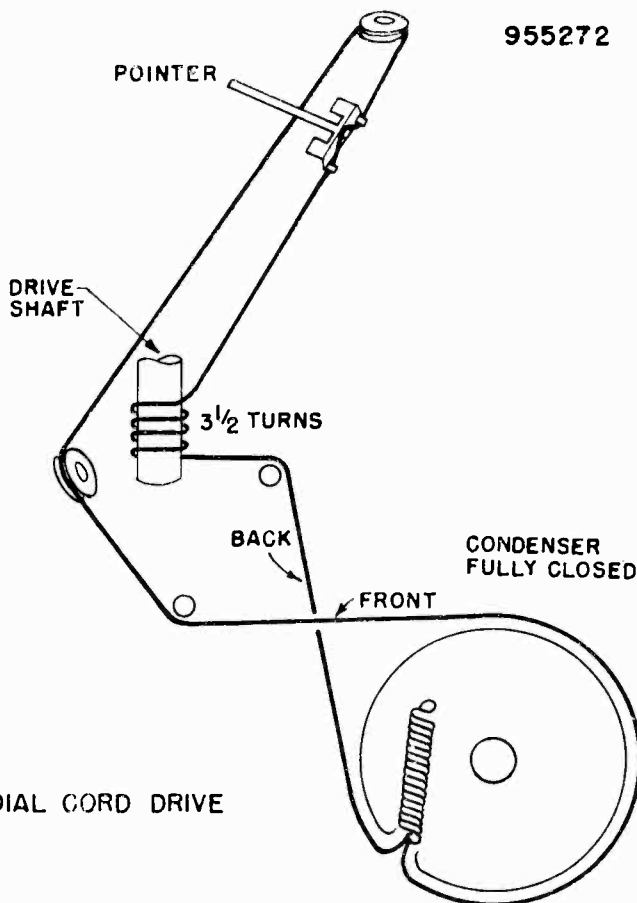
- 1—12AV6, audio amplifier
- 1—50C5, audio output
- 1—35W4, rectifier

Model 635—Chassis 120108B

- 1—12BE6, converter
- 1—12BA6, i-f amplifier
- 1—12AT6, detector, a.v.c., a-f amplifier
- 1—50B5, power output
- 1—35W4, rectifier

**POWER SUPPLY:** 105-125 volts, 60 cycles a.c. only

**POWER CONSUMPTION—**50 watts.



955272

DIAL CORD DRIVE

Dial Cord Stringing, Model 635

MODELS 590, 623, Ch. 120101A,  
120101B; 635, Ch. 120108B

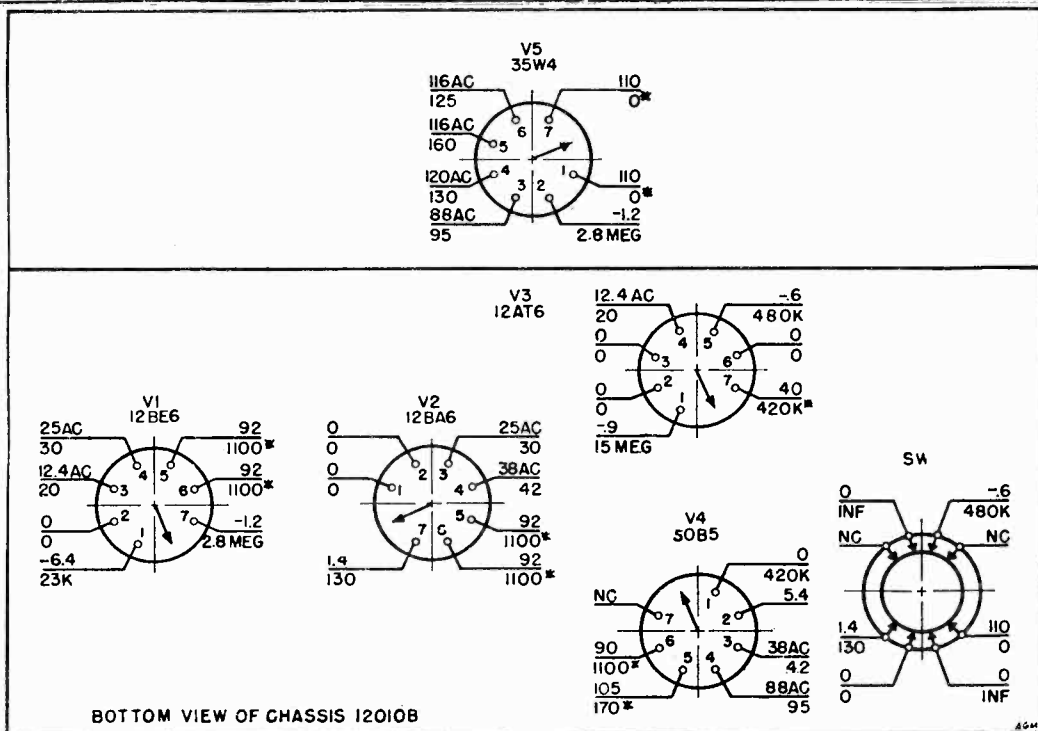
CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages indicated are positive d.c., resistances are in ohms, unless otherwise indicated.
2. Measurements made with voltohmmyst or equivalent.
3. Line voltage maintained at 120 volts a.c. for voltage measurements.
4. Socket connections are shown as bottom views, with measurements from pin to common negative.
5. Volume control at maximum; radio-phono switch in radio position; no signal applied for Model 635 measurements.
6. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
7. On the diagrams, upper values are voltage; lower values are resistance. NC denotes no connection, K is kilohms, MEG is megohms, INF. is infinity. Resistances marked \* are measured to pin 7 of rectifier (B+).

ALIGNMENT INSTRUCTIONS — MODEL 635

1. To position pointer, turn variable condenser fully closed and set pointer to reference mark at low-frequency end of dial backplate.
2. Use isolation transformer if available. If not, connect a .1 mfd. condenser in series with low side of signal generator and B-.
3. Volume control should be at maximum position; radio-phono switch in radio position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated screw driver for adjusting.

STEP	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to grid (pin 7) of V1 (12BE6). Low side to chassis.	455 KC	Variable condenser fully open.	Across voice coil.	T2, T1	Adjust for maximum output. If isolation transformer is not used, reduce dummy ant. to .001 mfd. to reduce hum modulation.
2	200 mmf.	Form loop of several turns and radiate signal into receiver.	1620 KC	"	Across voice coil.	Trimmer C-4. (Osc.)	Adjust for maximum output.
3	200 mmf.	"	1400 KC	Tune for maximum output.	Across voice coil.	Trimmer C-3. (Ant.)	Adjust for maximum output.

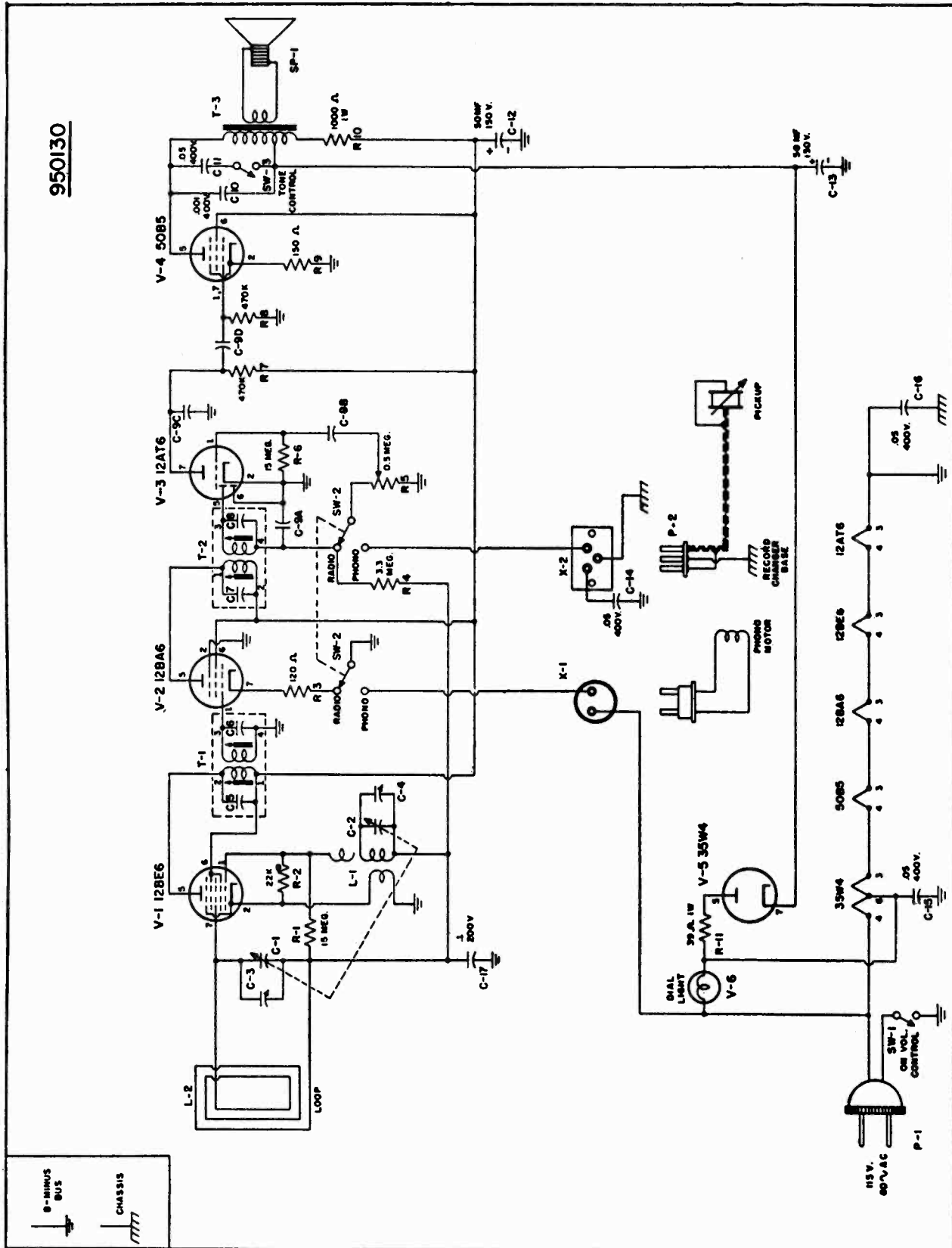


BOTTOM VIEW OF CHASSIS 120108B

Voltage and Resistance Analysis—Chassis 120108B

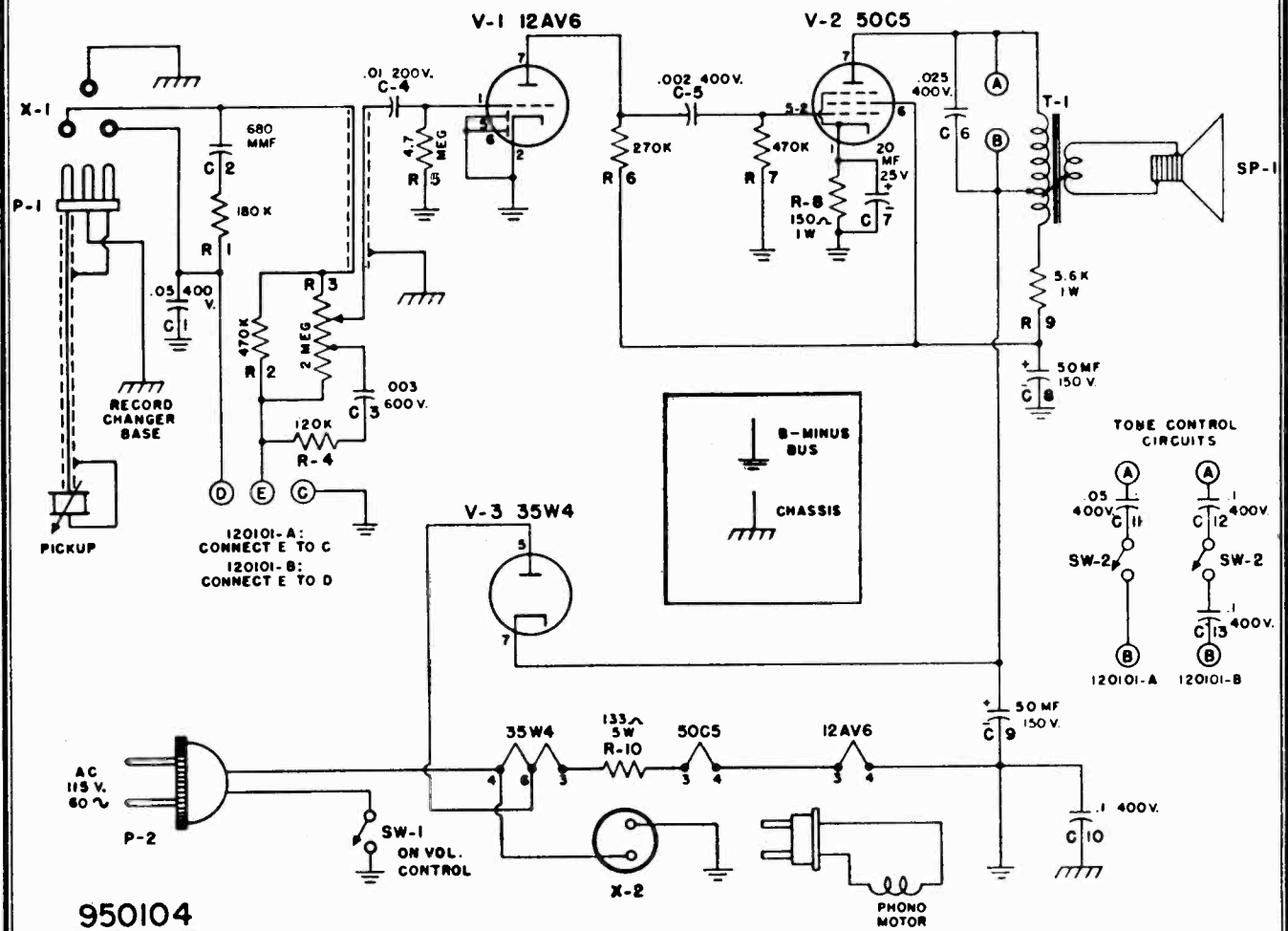
MODELS 590, 623, Ch. 120101A,  
120101B; 635, Ch. 120108B

950130



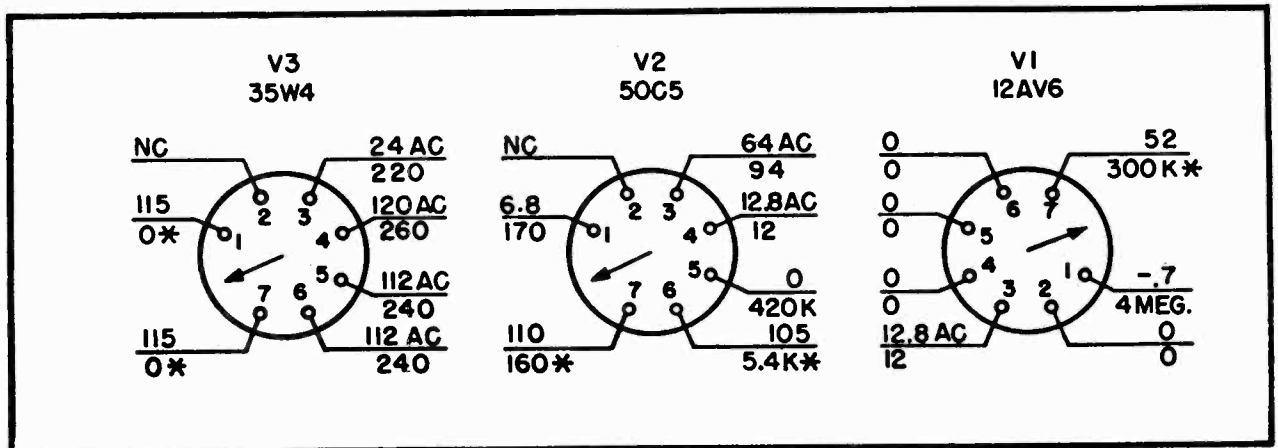
Schematic Diagram, Model 635—Chassis 120108B

MODELS 590, 623, Ch. 120101A,  
120101B; 635, Ch. 120108B



Schematic Diagram, Models 590, 623—Chassis 120101A, B

950138



BOTTOM VIEW - CHASSIS 120101  
Voltage and Resistance Analysis—Chassis 120101A, B



MODELS 590, 623, Ch. 120101A,  
120101B; 635, Ch. 120108B

REPLACEMENT PARTS LIST

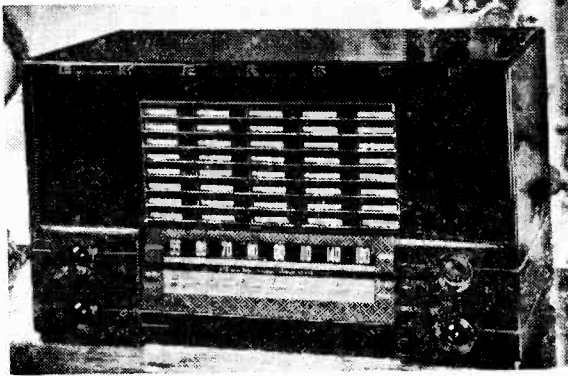
CHASSIS 120101A, 120101B			CHASSIS 120108B			
Symbol	†PART No.	DESCRIPTION	Symbol	†PART No.	DESCRIPTION	
C-1	920030	.05 mf., paper, 400v	C-1}	900066	Variable condenser—Antenna	
C-2	910009	680 mmf., mica	C-2}		Variable condenser—Oscillator	
C-3	920544	.003 mf., paper, 600v	C-3	Pt. of C-1	Trimmer	
C-4	920092	.01 mf., paper, 200v	C-4	Pt. of C-2	Trimmer	
C-5	920515	.002 mf., paper, 400v	C-5	Pt. of T-1		
C-6	920220	.025 mf., paper, 400v	C-6	Pt. of T-1		
C-7		20 mf., 20v	C-7	Pt. of T-2		
C-8	925152	50 mf., electrolytic, 150v	C-8	Pt. of T-2		
C-9		50 mf., 150v	C-9A		220 mmf.	
C-10	920250	.1 mf., paper, 400v	C-9B	470310	2000 mmf.	
C-11	920030	.05 mf., paper, 400v	C-9C		220 mmf.	
C-12	920250	.1 mf., paper, 400v	C-9D		5000 mf.	
C-13	920250	.1 mf., paper, 400v	C-10		} Multiple condenser	
P-1	505015	Pickup plug	C-11	923109		.001 mf., paper, 600v
P-2	583014	Line cord and plug	C-12}	920030		.05 mf., paper, 400v
R-1	341030	180,000 ohm, carbon, 1/2w, ±10%	C-13}	925163	50 mf., electrolytic, 150v	
R-2	351130	470,000 ohm, carbon, 1/2w, ±20%	C-14	923105	50 mf., electrolytic, 150v	
R-3	390083	2 megohm, volume control	C-15	920030	.05 mf., paper, 400v	
R-4	340990	120,000 ohm, carbon, 1/2w, ±10%	C-16	920030	.05 mf., paper, 400v	
R-5	351370	4.7 megohm, carbon, 1/2w, ±20%	C-17	920040	.1 mf., paper, 200v	
R-6	351070	270,000 ohm, carbon, 1/2w, ±20%	L-1	716044	Oscillator coil	
R-7	351130	470,000 ohm, carbon, 1/2w, ±20%	P-1	583023	Line cord and plug	
R-8	370290	150 ohm, carbon, 1w, ±10%	R-1	351490	15 megohm, carbon, 1/2w, ±20%	
R-9	370670	5,600 ohm, carbon, 1w, ±10%	R-2	340810	22,000 ohm, carbon, 1/2w, ±10%	
R-10	394160	133 ohm, w.w., 5w, ±5%	R-3	340270	120 ohm, carbon, 1/2w, ±10%	
SP-1	180052	PM Speaker—5"	R-4	351330	3.3 megohm, carbon 1/2w, ±20%	
SW-1	Pt. of R-3	On-off switch	R-5	510069	500,000 ohm, volume, control	
SW-2	510048	Tone control switch	R-6	351490	15 megohm, carbon, 1/2w, ±20%	
T-1	734049	Output transformer	R-7	351130	470,000 ohm, carbon, 1/2w, ±20%	
V-1	800034	Audio amplifier—12AV6	R-8	351130	470,000 ohm, carbon, 1/2w, ±20%	
V-2	800032	Audio output—50C5	R-9	340290	150 ohm, carbon, 1/2w, ±10%	
V-3	800526	Rectifier—35W4	R-10	370490	1,000 ohm, carbon, 1w, ±20%	
X-1	508003	Pickup socket	R-11	370150	39 ohm, carbon, 1w, ±20%	
X-2	585037	Socket and cable assembly	SP-1	180052	PM Speaker—5"	
			SW-1	Pt. of R-5	On-off switch	
			SW-2	Pt. of R-5	Radio-phono switch	
			SW-3	510068	Tone control switch	
			T-1	720055	1st. I.F. transformer	
			T-2	720055	2nd. I.F. transformer	
			T-3	734055	Output transformer	
			V-1	800525	Converter—12BE6	
			V-2	800524	I.F. amplifier—12BA6	
			V-3	800523	Detector, avc, a-f amp.—12AT6	
			V-4	800527	Power output—50B5	
			V-5	800526	Rectifier —35W4	
			V-6	807000	Dial light	
			X-1	585051	Cable and socket assembly	
			X-2	508003	Pickup socket	

†Specify part number when ordering.

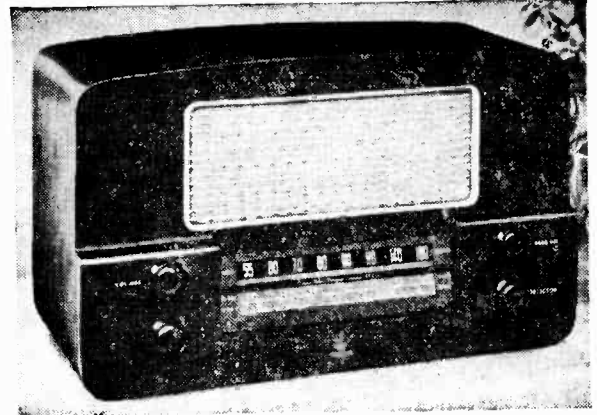
CABINET AND DIAL PARTS

MODELS 590, 623		MODEL 635	
†PART No.	DESCRIPTION	†PART No.	DESCRIPTION
140272	Cabinet—Model 590	140294	Cabinet body
140280	Cabinet—Model 623	140295	Cabinet lid
140274	Cabinet bottom—Model 590	140296	Cabinet bottom
620115	Cabinet bottom—Model 623	410849	Hinge
280104	Reject button—Model 590	575529	Baffle
587049	Lever spring—Model 590	819046	Record changer assembly
410650	Reject lever—Model 590	410802	Reject lever
819046	Record changer assembly —Model 590	450029	Reject button
820021	Pickup and arm assembly —Model 590	587077	Lever spring
470501	Record changer assembly —Model 623	450041S	Knob—tuning
460470S	Knob—Model 590	450064	Knob—tone control
460128	Knob—Model 623	450063	Knob—phono, radio
		520115	Dial crystal

MODELS 597, 607, Ch. 120073B,  
120074A



MODEL 597



MODEL 607

## DESCRIPTION

**TYPE:** Three band superheterodyne

### FREQUENCY RANGE:

Broadcast— 535-1620 kc.  
Short wave 1— 3.2-7.5 mc.  
Short wave 2— 9.0-22.0 mc.

### TYPE OF TUBES:

1—6SB7Y, converter  
1—6SG7, i-f amplifier  
1—6SQ7, detector, a.v.c., a-f amplifier  
1—6K6GT/G, power output  
1—5Y3GT, rectifier

**POWER SUPPLY:** 50-60 cycles a.c.

### VOLTAGE RATING:

Chassis 120073B—105-125 volts  
Chassis 120074A—105-125 volts or 210-240 volts  
**POWER CONSUMPTION:** 82 watts

**CURRENT DRAIN:** 0.7 amps. at 117 volts

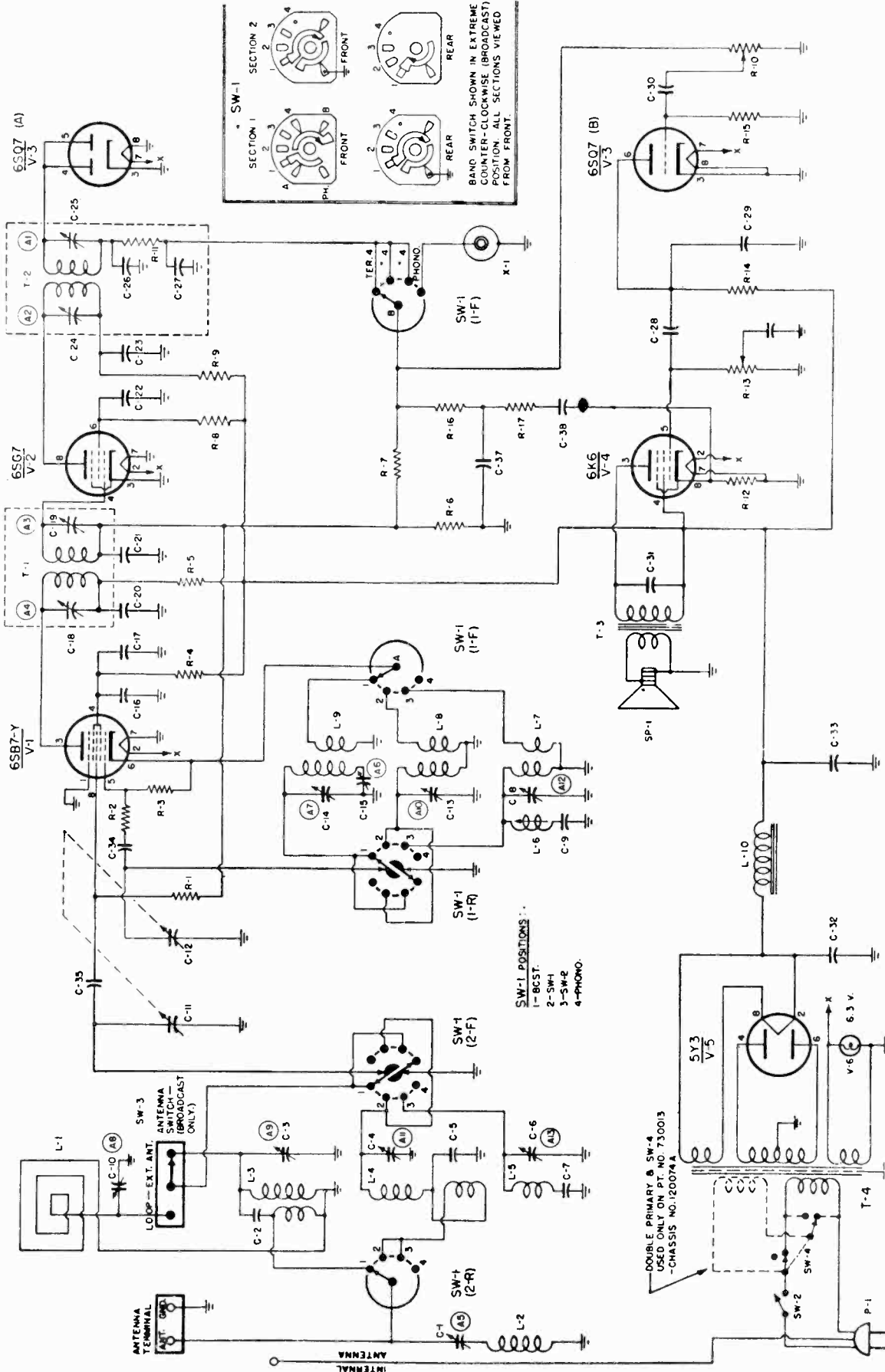
## GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.

2. A self-contained loop antenna is provided for broadcast band reception. For maximum reception, rotate the receiver through a quarter of a circle after tuning in desired station, and leave at position resulting in greatest volume.
3. An internal power line antenna is provided for relatively strong short wave signals. The line cord must be completely uncoiled for effective operation of this antenna.
4. An external antenna is recommended for maximum short wave reception. To connect the external antenna, first disconnect the lead from the screw terminal on the loop marked "ANT." Connect the external antenna lead in its place.
5. To operate the set on the external antenna for broadcast band reception as well, loosen the terminal screw fastening the connecting link to "LOOP" on the broadcast antenna switch. Turn the link to "EXT. ANT." position and tighten the terminal screw to fasten the link in place.
6. A receptacle is provided at the rear of the chassis for connection of a phono pickup to the receiver. The range switch must be in the "PHONO" position for operation with a phonograph.
7. The band spread tuning control, located at the lower left section of the front panel, is effective only on short wave band 2.
8. Chassis 120073B operates on 105-125 volts, 50-60 cycles a.c. only; chassis 120074A is provided with a voltage changeover switch located on the power transformer at the rear of the set and may operate on 105-125 volts or 210-240 volts, 50-60 cycles a.c.

MODELS 597, 607, Ch. 120073B,  
120074A

950081-82



MODELS 597, 607, Ch. 120073B,  
120074A

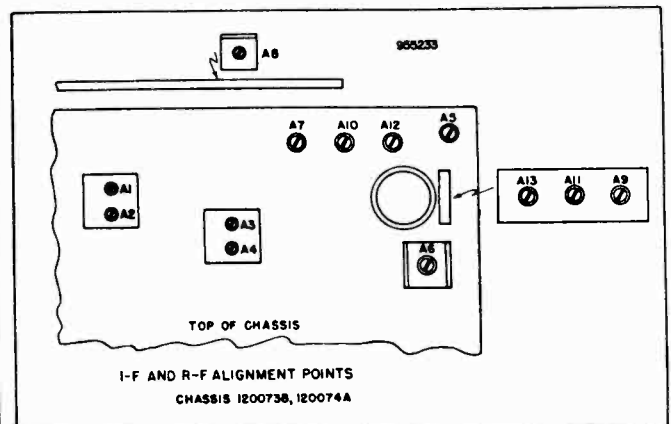
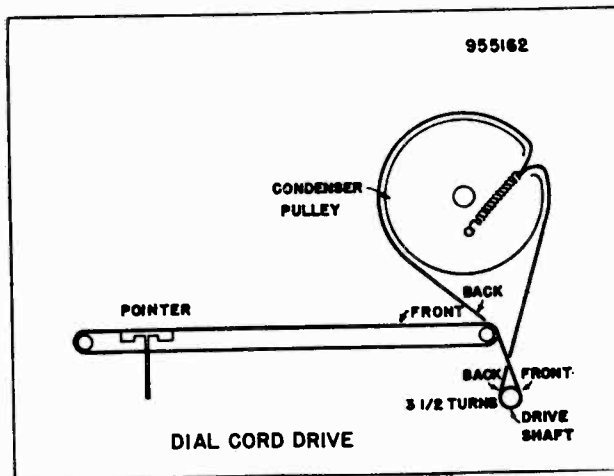
REPLACEMENT PARTS LIST

Symbol	† Part No.	DESCRIPTION	Symbol	† Part No.	DESCRIPTION
V1	6SB7Y	Converter	L1	700037	Antenna loop
V2	6SG7	I-f amplifier	L2	708015	Wave trap
V3	6SQ7	Detector, a.v.c., a-f amplifier	L3, L4,	710017	Antenna coil, three band
V4	6K6GT/G	Power output	L5		
V5	5Y3GT	Rectifier	L6	708014	Bandsread coil
C1	Part of L2	Trimmer, wave trap	L7, L8,	716027	Oscillator coil, three band
C2	Part of L3	2.2 mmf., mica	L9		
C3	Part of L3	Trimmer, broadcast ant. coil	L10	{ 737001* 737008#	Filter choke Filter choke
C4	Part of L4	Trimmer, S.W.-1 ant. coil	P1	583023	Line cord and plug, and int. ant.
C5	915009	2200 mmf., silver mica.	R1, R14,	351130	470 kilohms, 1/2 watt
C6	Part of L5	Trimmer, S.W.-2 ant. coil	R16, R17		
C7	915008	3500 mmf., silver mica	R2	350290	150 ohms, 1/2 watt
C8	Part of L7	Trimmer, S.W.22 osc. coil	R3	340810	22 kilohms, 1/2 watt
C9	910025	56 mmf., mica (Alt. part 928021)	R4	370730	10 kilohms, 1 watt
C10	Part of L1	Trimmer, loop antenna	R5, R9	350490	1000 ohms, 1/2 watt
C11, C12	900048	Two-gang, variable condenser	R6, R7	351330	3.3 megohms, 1/2 watt
C13	Part of L8	Trimmer, S.W.-1 osc. coil	R8	370830	27 kilohms, 1 watt
C14	Part of L9	Trimmer, broadcast osc. coil	R10	390058	.5 megohm, volume control
C15	900039	350-700 mmf., padder cond.	R11	Part of T2	47 kilohms, 1/2 watt
C16, C20,	920090	.01 mfd., 400 volt, paper	R12	370410	470 ohms, 1 watt
C22, C23			R13	390059	.4 megohm, tone control
C17	925114	8 mfd., 350 volt, electrolytic	R15	351490	15 megohms, 1/2 watt
C18, C19	Part of T1	Trimmer, i-f	SP1	180031P	P.M. speaker
C21, C38	920030	.05 mfd., 400 volt, paper	SW1	510036	Band-change switch
C24, C25	Part of T2	Trimmer, i-f	SW2	Part of R10	Line switch
C26, C27	Part of T2	110 mmf., mica	SW3	Part of L1	Loop-external antenna switch
C28	920210	.01 mfd., 600 volt, paper	SW4	Part of T4#	Primary voltage switch
C29, C35	910014	470 mmf., mica (Alt. part 928019)	T1	720064	First i-f transformer
C30	920010	.002 mfd., 600 volt, paper	T2	720065	Second i-f transformer
C31, C37	920180	.005 mfd., 400 volt, paper	T3	{ 734036* 734037#	Output transformer Output transformer
C32, C33	925113	20-30 mfd., 350 volt, electrolytic	T4	{ 730012* 730013#	Power transformer Power transformer
C34	910010	110 mmf., mica	X1	508010	Phono socket
C36	920545	.002 mfd., 400 volt, paper		807020	Dial light
				507006	Dial light socket

\* Chassis 120073B only; # Chassis 120074A only; † Specify part no. when ordering.

CABINET AND DIAL PARTS

† Part No.	DESCRIPTION	† Part No.	DESCRIPTION
140217	Cabinet, walnut plastic (Model 597)	520088	Dial crystal (Model 597)
140186	Cabinet, wood (Model 607)	520089	Dial crystal (Model 607)
575338	Cabinet back (Model 597)	410416	Dial backplate
575339	Cabinet back (Model 607)	280060	Drive shaft, tuning
520065	Escutcheon (Model 607)	280062	Drive shaft, bandsread
460470	Knob, black push-on	587070	Dial drive spring
460041	Knob, indicator (Model 597)	530002	Dial drive cord
460083	Knob, indicator (Model 607)	525017	Pointer



MODELS 597, 607, Ch. 120073B,  
120074A

### INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage readings are in d.c. volts and resistance readings in ohms, unless otherwise specified.
2. Measurements made with voltohmmyst.
3. Socket connections are shown as bottom views. Values are measured from socket pin to common negative, unless otherwise noted.
4. Line voltage maintained at 117 volts a.c. for voltage readings.
5. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in readings.
6. Volume control at maximum, with no signal applied and bandswitch in broadcast position, for voltage measurements.

#### VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	6SB7Y	0	6.3AC	254	105	-7.6	0	0	-.8
V2	6SG7	0	0	0	-2.2	0	145	6.3AC	250
V3	6SQ7	0	-1.2	0	-7	0	105	6.3AC	0
V4	6K6	-.6	0	245	258	0	-.6	6.3AC	5.8
V5	5Y3	117AC #	294	NC	290AC	NC	290AC	NC	290

#### RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	6SB7Y	0	.2	1.5K*	11K*	20K	.2	0	3 Meg.
V2	6SG7	0	0	0	3 Meg.	0	29K*	.2	1.5K*
V3	6SQ7	0	14 Meg.	0	500K	500K	450K*	.2	0
V4	6K6	800K	0	1K*	500*	380K	1 Meg.	.2	480
V5	5Y3	8 #	0*	NC	180	NC	180	NC	0*

# Measured to switch SW2  
K=kilohms

\* Measured to Pin 2 of V5, 5Y3.  
Meg=megohms

NC=no connection

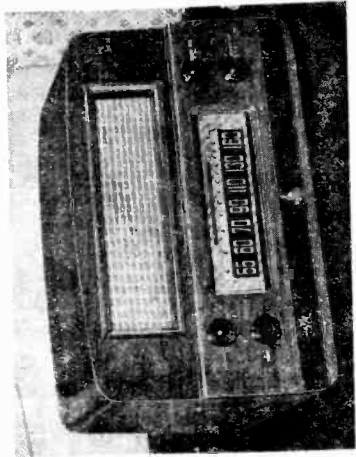
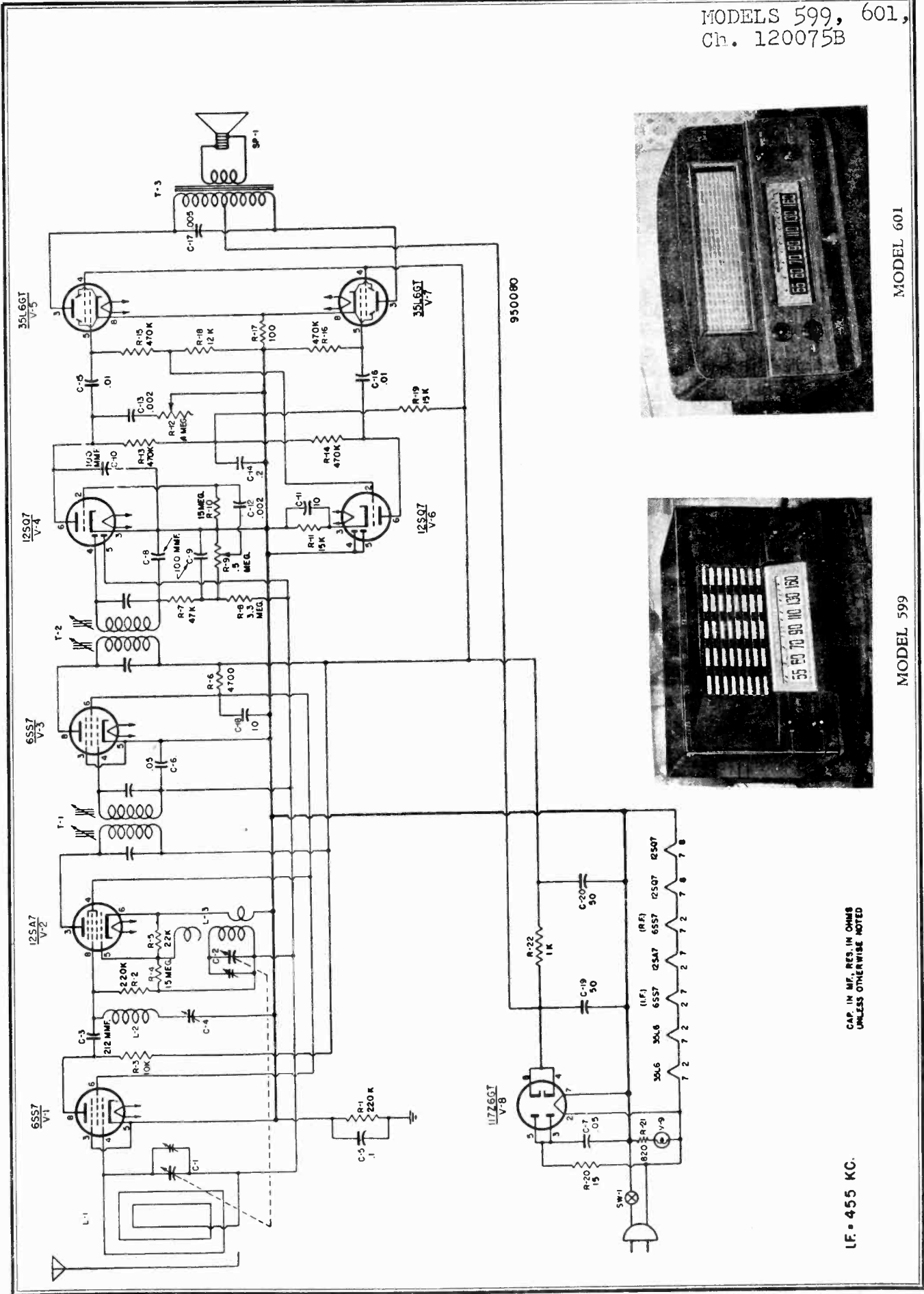
#### ALIGNMENT INSTRUCTIONS

1. To position pointer, turn variable condenser fully closed and set pointer to reference mark on dial backplate at the low frequency end of the dial.
2. Volume control should be set at maximum position. The output of the signal generator should be no higher than necessary to obtain an output reading. Attenuate the signal input as alignment proceeds. Use an insulated alignment tool for all adjustments.
3. Use isolation transformer if available; otherwise connect a .1 mfd. condenser in series with low side of signal generator to chassis.
4. Connect output meter across voice coil for all alignment steps.
5. Refer to illustration on page 3 for location of alignment points.

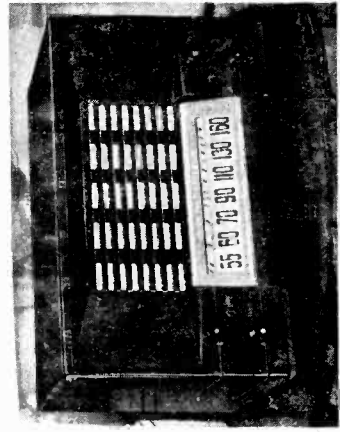
#### ALIGNMENT PROCEDURE

STEP	SIGNAL GENERATOR COUPLING	SIG. GEN. FREQ.	BANDSWITCH POSITION	DIAL SETTING	ADJUST	PROCEDURE
1	High side through .1 mfd., dummy antenna to grid (Pin 8) of 6SB7Y (V1). Low side to chassis.	455KC.	Broad-cast.	Tuning condenser fully open.	A1, A2 (Trans. T1), and A3, A4 (Trans. T2).	Adjust for maximum output. Reduce dummy antenna to 200 mmf., if isolation trans. is not used.
2	High side through 200 mmf. dummy antenna to "ANT." term. on antenna terminal strip. Low side to chassis.	455KC.	Broad-cast.	Tuning condenser fully open.	A5 (Trimmer C1, on wave trap).	Adjust for minimum output.
3	" Antenna switch (SW3) in "EXT. ANT." position.	1450KC.	Broad-cast.	Set pointer to 1450 kc. on dial.	A7 (Trimmer C14), A9 (Trimmer C3).	Adjust for maximum output (oscillator and ant. trimmers).
4	"	600KC.	Broad-cast.	Set pointer to 600 kc. on dial.	A6 (Padder C15).	Adjust for maximum output (oscillator padder).
5	"	1450KC.	Broad-cast.	Set pointer to 1450 kc. on dial.	A7 (Trimmer C14) only	Readjust for maximum output (oscillator trimmer), if necessary.
6	"	7.5MC	Short wave 1.	Set pointer to 7.5 mc. on dial.	A10 (Trimmer C13).	Adjust for maximum output.
7	"	6.5MC	Short wave 1.	Tune for max. output.	A11 (Trimmer C4).	Adjust for maximum output.
8	" Bandspread slug halfway out of L6.	22.5MC.	Short wave 2.	Set pointer to 22.5 mc. on dial.	A12 (Trimmer C8).	Adjust for maximum output.
9	"	21.5MC.	Short wave 2.	Tune for max. output.	A13 (Trimmer C6).	Adjust for maximum output.
10	Form loop of several turns and radiate signal into receiver broadcast loop. Move "ant. switch link to "loop" position.	1450KC.	Broad-cast	Tune for max. output.	A8 (Trimmer C10).	Adjust for maximum output.

MODELS 599, 601,  
Ch. 120075B



MODEL 601



MODEL 599

CAP. IN MF, RES. IN OHMS  
UNLESS OTHERWISE NOTED

LF = 455 KC.

MODELS 599, 601,  
Ch. 120075B

### INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage readings are d.c. volts and resistance readings in ohms, unless otherwise specified.
2. All measurements made with voltohmmyst.
3. Socket connections are shown as bottom views.
4. Measured values are from socket pin to common negative, unless otherwise noted.
5. Line voltage maintained at 117 volts a.c. for voltage readings.
6. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
7. Volume control at maximum with no signal applied, for voltage measurements.

#### VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	6SS7	0	24AC	0	-1.2	0	64	29AC	54
V2	12SA7	0	41AC	98	64	-5	0	29AC	-1.5
V3	6SS7	0	48AC	0	-1.2	0	64	41AC	.92
V4	12SQ7	0	-1	0	-4	0	58	0	12AC
V5	12SQ7	0	0	1.2	0	0	64	24AC	12AC
V6	35L6GT	0	48AC	120	100	0	96	83AC	7
V7	35L6GT	0	83AC	120	100	117AC	0	117AC	7
V8	117Z6GT	NC	117AC	117AC	125	NC	NC	0	125

#### RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	6SS7	0	22	0	3 Meg.	0	5.5K*	28	10K*
V2	12SA7	0	38	1K*	5.5K*	21K	0	28	3 Meg.
V3	6SS7	0	44	0	3 Meg.	0	5.5K*	38	1K*
V4	12SQ7	0	15 Meg.	0	600K	3 Meg.	500K*	0	11
V5	12SQ7	0	12K	15K	0	0	440K*	23	11
V6	35L6GT	0	44	100*	1K*	420K	18K	62	95
V7	35L6GT	0	62	100*	1K*	420K	NC	72	95
V8	117Z6GT	NC	72	88	0*	88	0	0	0*

K=kilohms;

Meg.=megohms;

NC=no connection;

\* Measured to pins 4, 8 of V8, 117Z6GT

#### ALIGNMENT INSTRUCTIONS

1. To position pointer, turn variable condenser fully closed and set pointer to reference mark at low frequency end of dial backplate.
2. Use isolation transformer if available. If not, connect a 0.1 mfd. condenser in series with low side of signal generator and chassis.
3. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading.
4. Use an insulated alignment tool for all adjustments.

#### ALIGNMENT PROCEDURE

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	0.1 mfd.	High side to pin 8 (grid) of 12SA7 (V2). Low side to chassis.	455 KC.	Variable condenser fully open.	Across voice coil.	Second i-f trans. T2 and first i-f trans. T1..	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001 mfd. to reduce hum modulation.
2	0.1 mfd.	High side to external antenna lead. Low side to chassis	455 KC.	Variable condenser fully open.	Across voice coil.	Trimmer cond. C4, on wave trap.	Adjust for minimum output.
3	200 mmf.	"	1620 KC.	Variable condenser fully open.	Across voice coil.	Trimmer cond. on C2.	Adjust for maximum output.
4	200 mmf.	"	1450 KC.	Tune for maximum output.	Across voice coil.	Trimmer cond. on C1.	Adjust for maximum output.

DESCRIPTION

TYPE: Single band (AM) superheterodyne

FREQUENCY RANGE: 540-1620 kc.

TYPE OF TUBES:

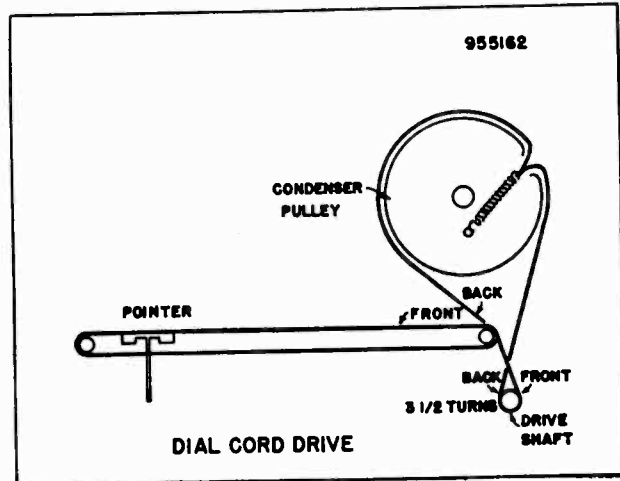
- 1—6SS7, r-f amplifier
- 1—12SA7, converter
- 1—6SS7, i-f amplifier
- 1—12SQ7, detector, a.v.c., audio amplifier
- 1—12SQ7, phase inverter
- 2—35L6GT, push-pull power output
- 1—117Z6GT, rectifier

POWER SUPPLY: A.c. or d.c.

VOLTAGE RATING: 105-125 volts

POWER CONSUMPTION: 40 watts

CURRENT DRIN: 0.34 amp. at 117 volts a.c.



REPLACEMENT PARTS LIST

Symbol	† Part No.	DESCRIPTION	Symbol	† Part No.	DESCRIPTION
V1	6SS7	R-f amplifier	L3	716023	Oscillator coil
V2	12SA7	Converter	R1, R2	351050	220 kilohms, 1/2 watt
V3	6SS7	I-f amplifier	R3	340730	10 kilohms, 1/2 watt
V4	12SQ7	Detector, a.v.c., a-f amplifier	R4, R10	351490	15 megohms, 1/2 watt
V5	12SQ7	Phase inverter	R5	340810	22 kilohms, 1/2 watt
V6	35L6GT	Power output	R6	340650	4700 ohms, 1/2 watt
V7	35L6GT	Power output	R7	340890	47 kilohms, 1/2 watt
V8	117Z6GT	Rectifier	R8	351330	3.3 megohms, 1/2 watt
C1, C2	900036	Two-gang, variable condenser	R9	390051	.5 megohm, volume control
	Part of C1, C2	Trimmers, ant. and osc.	R11, R19	340770	15 kilohms, 1/2 watt
C3	928104	212 mmf., ceramic	R12	390061	.4 megohm, tone control
C4	Part of L2	Trimmer, wave trap	R13, R14, R15, R16	351130	470 kilohms, 1/2 watt
C5	920040	.1 mfd., 200 volt, paper	R17	370250	100 ohms, 1 watt
C6	920060	.05 mfd., 200 volt, paper	R18	330750	12 kilohms, 1/2 watt
C7	920030	.05 mfd., 400 volt, paper	R20	340050	15 ohms, 1/2 watt
C10			R21	394038	820 ohms, 5 watt, w.w.
C8, C9,	928013	100 mmf., ceramic	R22	370490	1000 ohms, 1 watt
C11	925119	10 mfd., 25 volt, elect.	SP1	180041	P.M. speaker, 6"
C12, C13	920010	.002 mfd., 600 volt, paper	SW1	510031	Line switch
C14	920050	.2 mfd., 200 volt, paper	T1	720033	First i-f transformer
C15, C16	920090	.01 mfd., 400 volt, paper	T2	720033	Second i-f transformer
C17	920230	.005 mfd., 600 volt, paper	T3	734033	Output transformer
C18, C19,	925103	10-50-50 mfd., 150 volt, elect.	P.L.	807003	Dial light, 115 volt
C20				507009	Dial light socket
L1	700032	Loop antenna		583014	Line cord and plug
L2	708060	Wave trap			

CABINET AND DIAL PARTS

† Part No.	DESCRIPTION	† Part No.	DESCRIPTION
140216	Cabinet, walnut plastic (Model 599)	520091	Dial crystal (Model 601)
140221	Cabinet, wood (Model 601)	520091	Dial crystal (Model 601)
575288	Cabinet back (Model 599)	525037	Pointer
575319	Cabinet back (Model 601)	520083	Dial backplate
460470	Knob, black push-on	280058	Drive shaft
520065	Escutcheon (Model 601)	530002	Dial drive cord (56")
520075	Dial crystal (Model 599)	587070	Dial drive spring



MODEL 613, Ch. 120085A,  
120085B

## SERVICE NOTES

### MODEL: 613

CHASSIS MODELS 120085A, 120085B



### DESCRIPTION

**TYPE:** Three way (battery, a.c., d.c.) portable superheterodyne.

**FREQUENCY RANGE:** 540-1620 KC.

**TYPE OF TUBES:**

- 1—1R5, pentagrid converter
- 1—1U4, i-f amplifier
- 1—1U5, detector, a.v.c., a-f amplifier
- 1—3V4, or 3Q4, power output
- 1—Selenium rectifier

**POWER SUPPLY:** "A" and "B" batteries, or a.c., or d.c.

**VOLTAGE RATING:**

- Line operation—105-125 volts, a.c. or d.c.
- Battery operation—1½ volts "A" supply
- 67½ volts "B" supply

**POWER CONSUMPTION:** Line operation, 20 watts

**CURRENT CONSUMPTION:**

- "A" battery—.250 amp.
- "B" battery—.009 amp.
- 117 volts a.c.—.170 amp.

### GENERAL NOTES

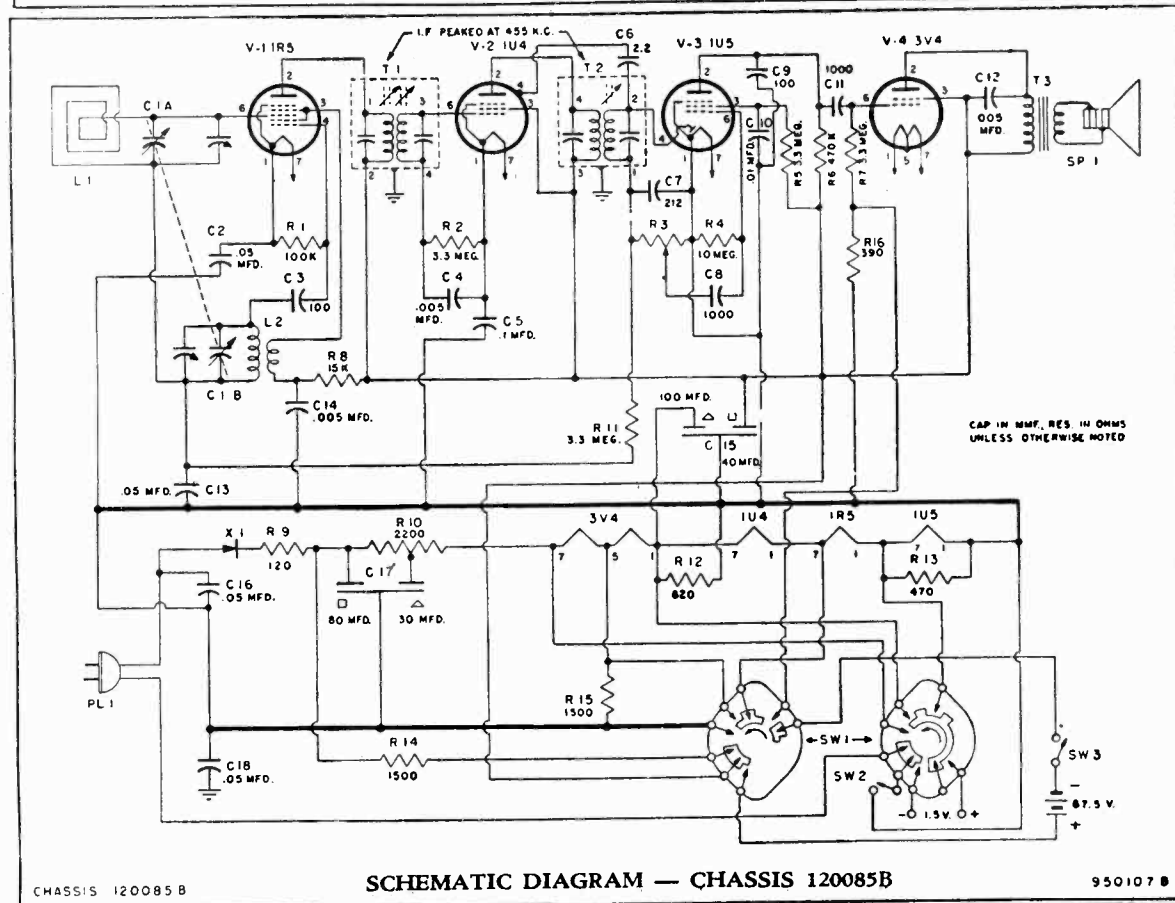
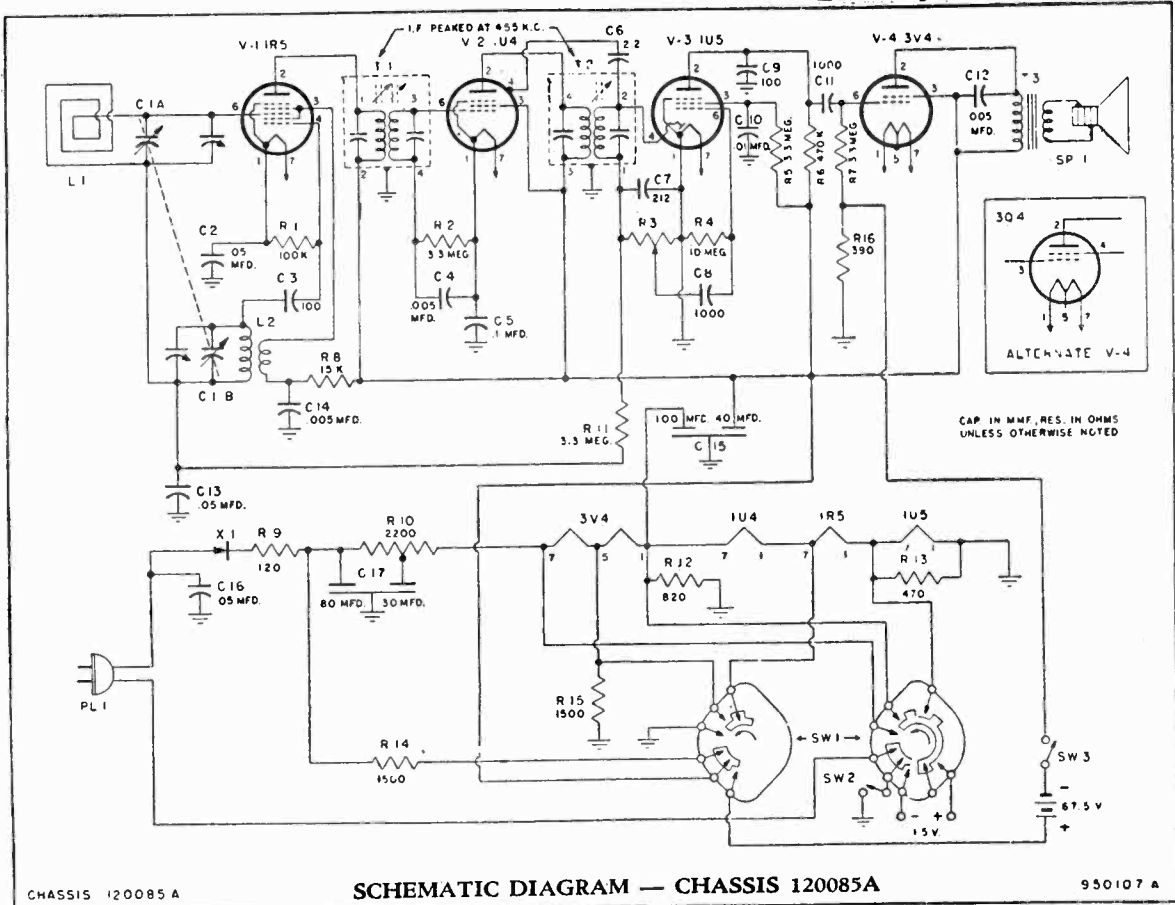
1. Line Operation: Open the rear cover which is held closed

by the catch studs. Remove the line cord plug from its receptacle at the right side of the chassis (looking from the rear). Remove the line cord and insert the plug into a suitable outlet. When the power supply is d.c. and the receiver remains inoperative, remove the plug, turn it half-way around and reinsert in the outlet to obtain proper polarity.

2. Battery operation: Remove the line plug from the outlet and insert in the receptacle at the side of the chassis. The receiver will not operate from batteries if the plug is out of the chassis receptacle. Coil the loose portion of the line cord and store it carefully in the space provided.
3. Battery Complement: Replace "A" battery with standard "D" flashlight cell. Replace "B" battery with 67½ volt Eveready No. 467 or equivalent.
4. The color coding of the battery cable is as follows:
 

Red—B+	Yellow—A+
White—B—	Black—A—
5. If replacements are made in the r-f section of the circuit, carefully realign the receiver.
6. The receiver has a self contained antenna and normally does not require an additional antenna connection. For installations in a location where reception is weak, connect an outside antenna to the colored lead at the rear of the cabinet. Do not use a ground connection.
7. The self-contained loop antenna has directional properties. After a station is tuned in, it is important that the set be rotated through a quarter turn to obtain the position which results in the greatest volume.

MODEL 613, Ch. 120085A,  
120085B



MODEL 613, Ch. 120085A,  
120085B

ALIGNMENT PROCEDURE

1. Use battery power when available. When a.c. power is used, connect the line cord through an isolation transformer if available. Otherwise connect a 0.1 mfd. condenser in series with the low side of the signal generator and B—.
2. Set the volume control at maximum. The output of the signal generator should be no higher than that necessary to obtain an output reading. Attenuate the signal input as alignment proceeds. Use an insulated alignment tool.
3. Maintain the loop in the same position relative to the chassis as when the receiver is in the cabinet.
4. Oscillator and antenna trimmers are reached from bottom of chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	0.1 mfd.	High side to grid (pin 6) of V1 (1R5). Low side to chassis.	455 KC.	Variable condenser fully open.	Across voice coil.	Primary and secondary of T2 and T1.	Adjust for maximum output. If a.c. is used, without an isolation transformer, reduce dummy antenna to 200 mmf., to reduce hum modulation.
2	200 mmf.	High side to external antenna lead. Low side to chassis.	1620 KC.	Variable condenser fully open.	Across voice coil.	Oscillator trimmer on C1B.	Adjust for maximum output.
3	200 mmf.	"	1400 KC.	Tune for maximum output.	Across voice coil.	Antenna trimmer on C1A.	Adjust for maximum output.

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage and resistance readings are measured for 117 volt a.c. line operation.
2. Socket connections are shown as bottom views. Measurements are taken from socket pin to chassis (chassis 120085A) or socket pin to common negative (chassis 120085B).
3. Voltages are in volts d.c. and resistances in ohms, unless otherwise indicated.
4. Measurements made with voltohmmyst.
5. For voltage measurements, set volume control at maximum, with no signal applied.
6. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.

VOLTAGE READINGS

SYMBOL	TUBE TYPE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V1	1R5	1.5	88	60	-3.2	1.5	0	2.8
V2	1U4	2.8	88	88	0	2.8	2.0	4.0
V3	1U5	0	43	18	.4	0	0	1.5
V4	3V4 or 3Q4	4.0	84	0	88	5.3	5.3	6.7

RESISTANCE READINGS

SYMBOL	TUBE TYPE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V1	1R5	24	3600	18K	110K	24	5 meg.	36
V2	1U4	36	3600	3600	Inf.	36	3.2 meg.	44
V3	1U5	0	480K	3.5 meg.	1.2 meg.	12 meg.	12 meg.	24
V4	3V4 or 3Q4	44	4100	4 meg.	3600	58	4100	70

K=kilohms; Meg.=megohms; Inf.=infinity.

MODEL 613, Ch. 120085A,  
120085B

REPLACEMENT PARTS LIST

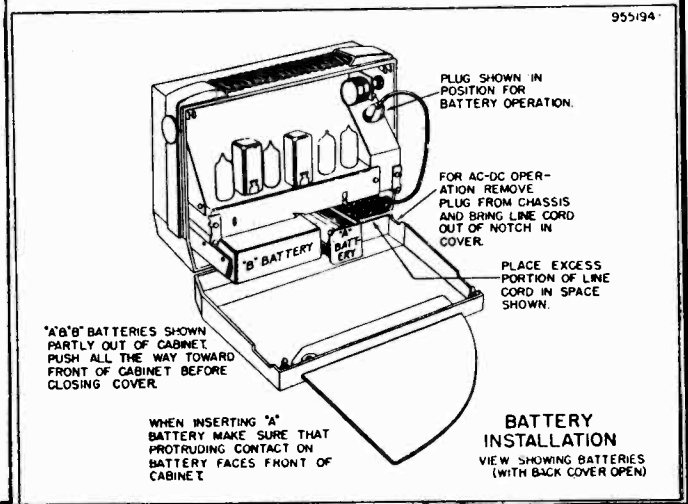
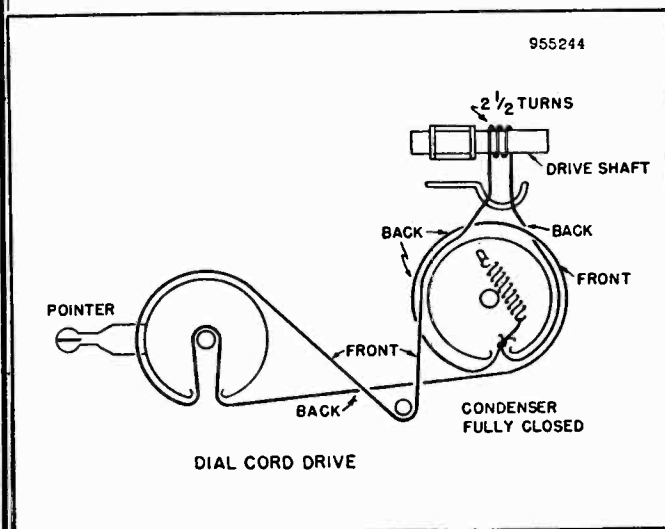
SYMBOL	†Part No.	DESCRIPTION	SYMBOL	†Part No.	DESCRIPTION
V1	1R5	Converter	R1	350970	100 kilohms, 1/2 watt
V2	1U4	I-f amplifier	R2	351330	3.3 megohms, 1/2 watt
V3	1U5	Detector, a.v.c., a-f amplifier	R3	390066	1 megohm, volume control
V4	3V4 or 3Q4	Power output	R4	351450	10 megohms, 1/2 watt
X1	817012	Selenium rectifier	R5	351330	3.3 megohms, 1/2 watt
C1A}	900057	Two-gang, variable condenser (used with loop ant. 700044). Alt. part 900047 (used with loop ant. 700041).	R6	351130	470 kilohms, 1/2 watt
C1B}			R7	351330	3.3 megohms, 1/2 watt
C2	920571	.05 mfd., 200 volt, paper	R8	340770	15 kilohms, 1/2 watt
C3	928013	100 mmf., ceramic	R9	394018	120 ohms, 3 watt
C4	920470	.005 mfd., 150 volt, paper	R10	394041	2200 ohms, wirewound
C5	920573	.1 mfd., 200 volt, paper	R11	351330	3.3 megohms, 1/2 watt
C6	915005	2.2 mmf., ceramic	R12	340470	820 ohms, 1/2 watt
C7	928104	212 mmf., ceramic	R13	340410	470 ohms, 1/2 watt
C8	928003	1000 mmf., ceramic	R14	340530	1500 ohms, 1/2 watt
C9	928013	100 mfd., ceramic	R15	340530	1500 ohms, 1/2 watt
C10	920570	.01 mfd., 150 volt, paper	R16	340390	390 ohms, 1/2 watt
C11	928003	1000 mmf., ceramic	SP1	{180060* {180060BΔ	P.M. speaker, 4"
C12	920470	.005 mfd., 150 volt, paper	SW1	{510044* {510053Δ	Power-transfer switch
C13	920571	.05 mfd., 200 volt, paper	SW2}	Part of R3	On-off switch
C14	928109	.005 mfd., ceramic	SW3}		
C15	{925155* {925136BΔ	40 mfd., 150 volt; 100 mfd., 25 volt, electrolytic	T1		
C16	920572	.05 mfd., 400 volt, paper	T2	720066	Second i-f trans.
C17	{Part of C15* {925135BΔ	80-30 mfd., 150 volt, electrolytic	T3	{734053* {734053BΔ	Output transformer
L1	700044	Loop antenna (Alt. part 700041)		{583025* {583026Δ	Line cord
L2	716031	Oscillator coil		585009	Battery cable, "B"
				470261	Battery contact assembly, "A"

†Specify part numbers when ordering.  
\*Chassis 120085A only.  
ΔChassis 120085B only.

NOTE: Condensers C7, C8, C10, and C11 may be combined in one ceramic unit, part number 928034.

CABINET AND DIAL PARTS

†Part No.	DESCRIPTION	†Part No.	DESCRIPTION
140236	Cabinet	530002	Drive cord (28")
140237	Cabinet back	587023	Drive cord spring
460091	Knob	410514	Dial backplate
520096	Dial and grille	525043	Pointer
460123	Handle	280084	Pointer shaft
280083	Drive shaft	531319	Pointer pulley



MODEL 643,  
Ch. 120111A

**DESCRIPTION**

TYPE: Three way, four band, portable superheterodyne

**FREQUENCY RANGE:**

- Broadcast - 535-1620 kc.
- Short Wave 1 - 2.75-5.6 mc.
- Short Wave 2 - 5.5-10.3 mc.
- Short Wave 3 - 10.0-18.5 mc.

**TYPE OF TUBES:**

- 1 - 1L6, converter
- 1 - 1U4, i-f amplifier
- 1 - 1U5, detector, a.v.c., a-f amplifier
- 1 - 3V4, a-f power output
- 1 - 11Z3, rectifier

POWER SUPPLY: A and B batteries, a.c., or d.c.

**VOLTAGE RATING:**

- Line operation - 115 or 230 volts a.c.
- 115 volts d.c.
- Battery operation - 9 volts A supply
- 90 volts B supply

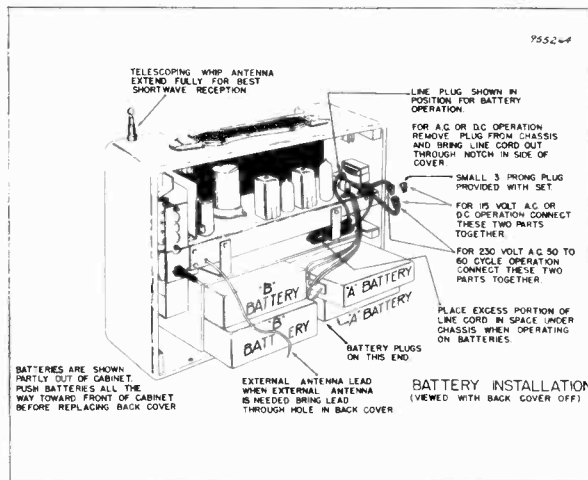
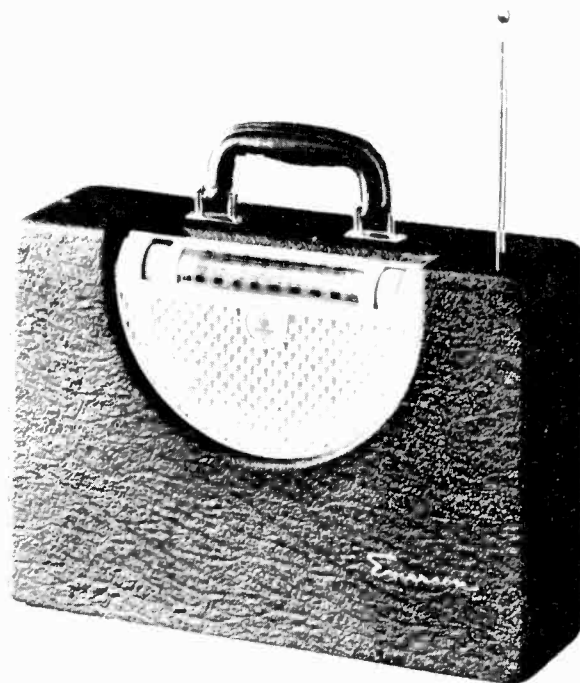
POWER CONSUMPTION: 115 volt a.c. line operation - 20 watts

**CURRENT CONSUMPTION:**

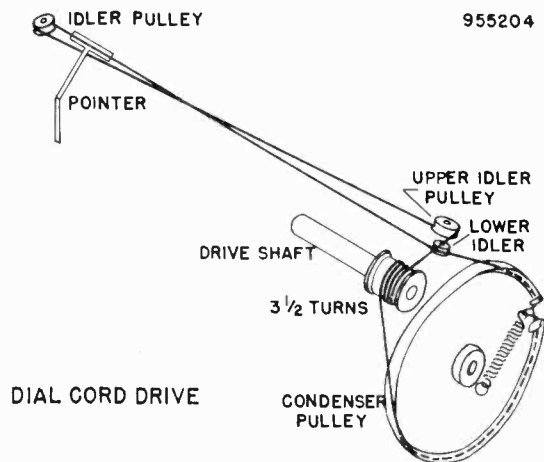
- A battery - 0.055 amp.
- B battery - 0.013 amp.
- 115 volts a.c. - 0.170 amp.

**GENERAL NOTES**

1. **LINE OPERATION:** Pry open the rear cover which is held closed by two catch studs. Remove the line cord plug from its receptacle at the right side of the chassis (looking from the rear). Bring the line cord out through the notch in the side of the cover.
  - a) 115 volt a.c. or d.c. operation - Insert the small, three-prong plug in the corresponding receptacle, adjacent to the line cord. Insert the line cord plug in a suitable outlet. When the power supply is d.c., reverse the plug if the receiver is inoperative, to obtain proper polarity.
  - b) 230 volt a.c., 50 to 60 cycle operation - Connect the small three-prong plug at the end of the line from the step-down transformer, to the receptacle adjacent to the line cord. Insert the line cord plug in a 230 volt a.c. only outlet.
2. **BATTERY OPERATION:** Remove the line cord plug from the outlet and insert in the receptacle at the right side of the chassis. Coil the loose portion of the line cord and store in the space provided under the chassis.
3. **BATTERY COMPLEMENT:** Replace the two 45 volt B batteries with Eveready No. 482 or equivalent. Replace the two 4½ volt A batteries with Eveready No. 746 or equivalent.
4. If components are replaced in the r-f section of the circuit, carefully realign the receiver.
5. The receiver has two self-contained antennas, for broadcast and short-wave reception, and normally does not require an additional antenna connection. For installations in a location where reception is poor, or where it is desired to improve reception, connect an external antenna to the colored lead at the left side of the chassis. Bring the lead through the hole provided in the back cover. The external antenna will function for all positions of the band switch.
6. The self-contained loop antenna operates only in the broadcast band and has directional properties. After a station is tuned in, it is important that the set be rotated through a quarter-turn, to obtain the position which results in greatest volume.
7. The telescoping antenna operates only for the short wave bands and must be fully extended for best reception.
8. To remove the chassis, first remove the telescoping antenna fastening screw at the bottom of the cabinet. Remove the chassis mounting screws and disconnect the broadcast loop leads. Note the color coding of the three leads and their clip connections. Remove the chassis and telescoping antenna. Loosen the clamp screw and slide off the connecting lead, together with the clamp.



BATTERY INSTALLATION DIAGRAM



DIAL STRINGING DIAGRAM

**CONDITIONS FOR VOLTAGE AND RESISTANCE ANALYSIS**

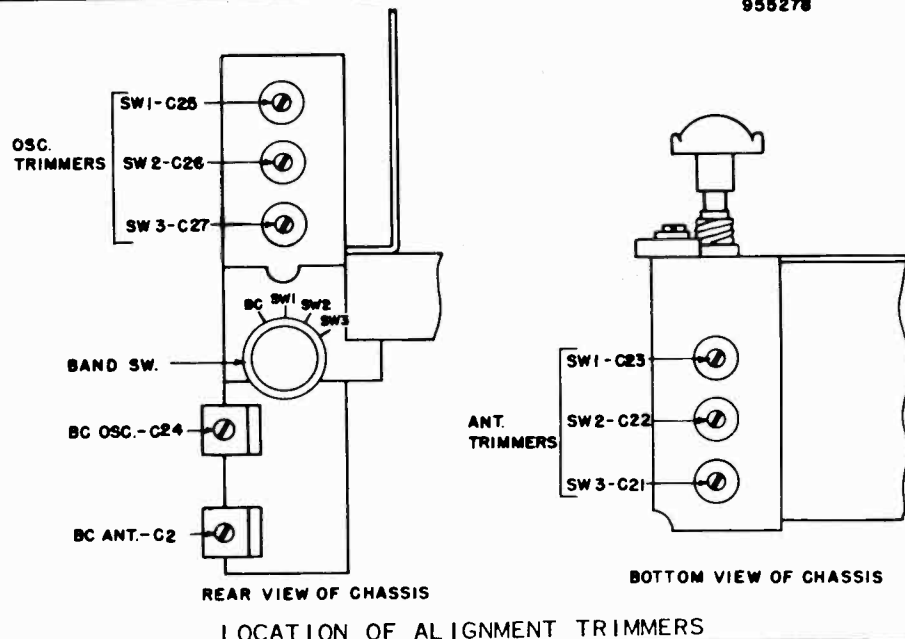
1. Voltage readings are d.c. volts, resistance readings are ohms, unless otherwise noted. values above line are voltage; values below line indicate resistance.
2. Voltage readings measured for 117 volt a.c. line operation.
3. All measurements made with voltohmmyst, or equivalent.
4. Socket connections are shown as bottom views, with values measured from socket pin to chassis.
5. No signal applied and band switch in BC position, for voltage and resistance measurements.
6. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in readings.
7. On the voltage and resistance diagram, fig. 2, K = kilohms, MEG = megohms, INF. = infinity.

**ALIGNMENT PROCEDURE**

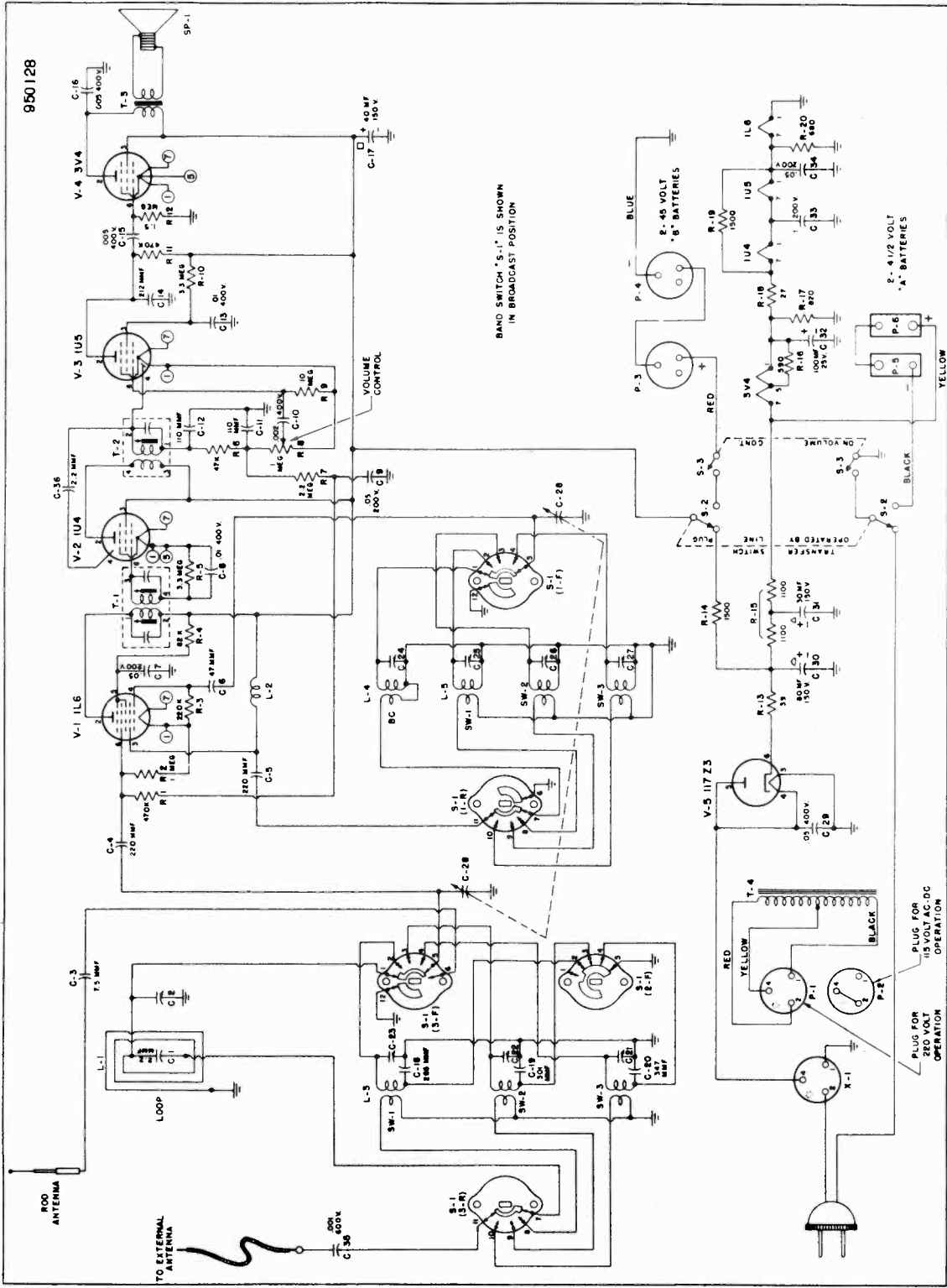
1. To position pointer, turn variable condenser fully closed and set pointer to reference mark on dial backplate at the low frequency end of the dial.
2. Volume control should be set at maximum position. The output of the signal generator should be no higher than necessary to obtain an output reading. Attenuate the signal input as alignment proceeds. Use an insulated alignment tool for all adjustments.
3. Use isolation transformer if available; otherwise connect a .1 mfd. condenser in series with low side of signal generator to chassis.
4. Connect output meter across voice coil for all alignment steps.
5. Refer to fig. 3 for location of alignment trimmers.
6. For BC alignment of the receiver, maintain the loop in the same position relative to the chassis as when the receiver is in the cabinet.
7. For SW alignment of the receiver, maintain the telescoping antenna closed.

STEP	SIGNAL GENERATOR		BAND SWITCH POSITION	DIAL SETTING	ADJUST	PROCEDURE
	COUPLING	FREQUENCY				
1	High side through 0.1 mfd. to grid (pin 6) of V-1 (1L6). Low side to chassis.	455 KC.	BC	Tuning condenser fully open.	T-2, T-1	Peak for maximum output. Reduce coupling condenser to 200 mmf. if isolation transformer is not used.
2	High side through 200 mmf. to external antenna lead. Low side to chassis.	1620 KC.	BC	Tuning condenser fully open.	C-24 (BC osc.)	Peak for maximum output.
3	"	1420 KC.	BC	Tune for maximum output.	C-2 (BC ant.)	"
4	"	5.4 MC.	SW1	Set pointer to 5.4 MC.	C-25 (SW1 osc.)	"
5	"	5.0 MC.	SW1	Tune for maximum output.	C-23 (SW1 ant.)	"
6	"	10.0 MC.	SW2	Set pointer to 10.0 MC.	C-26 (SW2 osc.)	"
7	"	9.5 MC.	SW2	Tune for maximum output.	C-22 (SW2 ant.)	"
8	"	18.0 MC.	SW3	Set pointer to 18.0 MC.	C-27 (SW3 osc.)	"
9	"	17.0 MC.	SW3	Tune for maximum output.	C-21 (SW3 ant.)	"

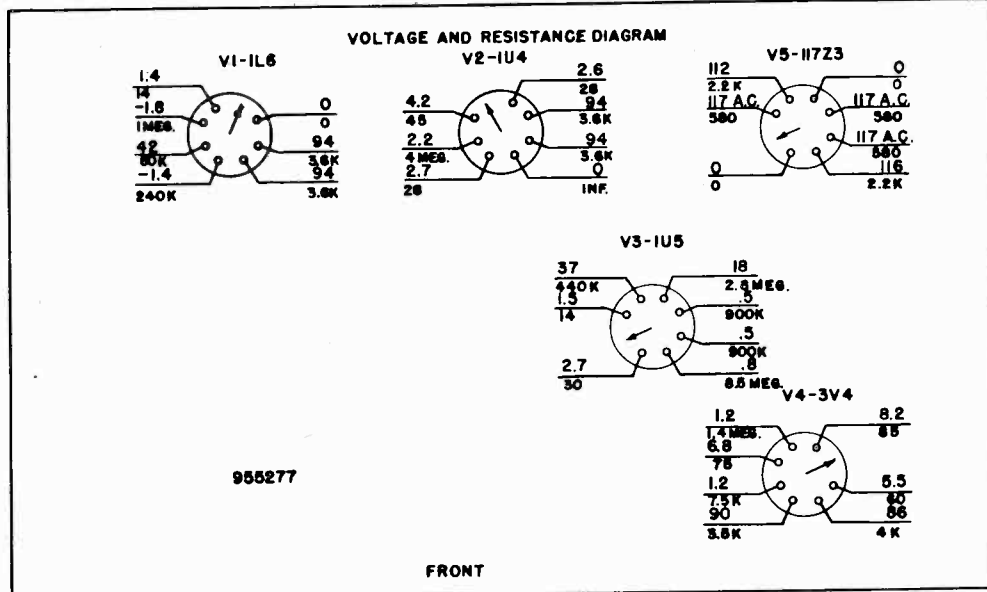
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MODEL 643,  
Ch. 120111A



SCHEMATIC DIAGRAM - MODEL 643, CHASSIS 120111A



BOTTOM VIEW OF CHASSIS  
VOLTAGE AND RESISTANCE DIAGRAM  
REPLACEMENT PARTS LIST

SYMBOL	PART NO.	DESCRIPTION	SYMBOL	PART NO.	DESCRIPTION
C-1	915005	2.2 mfm., Ceramic (Pt. of loop assy)	R-8	390063	1 megohm, Volume Control
C-2	900031	Loop trimmer	R-9	351450	10 megohm, Carbon $\pm 20\%$
C-3	928105A	7.5 mfm., Ceramic $\pm 10\%$	R-10	351330	3.3 megohm, Carbon $\pm 20\%$
C-4	910000	220 mfm., Mica $\pm 20\%$	R-11	351130	470,000 ohm, Carbon $\pm 20\%$
C-5	910000	220 mfm., Mica $\pm 20\%$	R-12	351250	1.5 megohm, Carbon $\pm 20\%$
C-6	928038	47 mfm., Ceramic $\pm 10\%$	R-13	370150	39 ohm, Carbon $\pm 10\%$
C-7	920060	.05 mfm., Paper 200V	R-14	340530	1,500 ohm, Carbon $\pm 10\%$
C-8	920090	.01 mfm., Paper 400V	R-15	394041	2,200 ohm, W.W., C.T., Metal Clad $\pm 5\%$
C-9	920060	.05 mfm., Paper 200V	R-16	370390	390 ohm, Carbon $\pm 10\%$
C-10	920515	.002 mfm., Paper 400V	R-17	340470	820 ohm, Carbon $\pm 10\%$
C-11	928032	110 mfm. (Combined with R-6)	R-18	340110	27 ohm, Carbon $\pm 10\%$
C-12		110 mfm. (Combined with R-6)	R-19	340530	1,500 ohm, Carbon $\pm 10\%$
C-13	920090	.01 mfm., Paper 400V	R-20	340450	680 ohm, Carbon $\pm 10\%$
C-14	928104	212 mfm., Ceramic $\pm 20\%$	L-1	700042	Loop Antenna
C-15	920180	.005 mfm., Paper 400V	L-2	708095	R.F. Choke
C-16	920180	.005 mfm., Paper 400V	L-3	710027	Three-band Ant. Coil
C-17	925059	40 mfd., Elect. 150V	L-4	716045	Broadcast-band Osc. Coil
C-18	915021	265 mfm., Silver Mica $\pm 2\%$	L-5	716046	Three-band Osc. Coil
C-19	915019	301 mfm., Silver Mica $\pm 2\%$	T-1	720525 or 720062	1st I.F. Transformer
C-20	915022	347 mfm., Silver Mica $\pm 2\%$	T-2	720066A	1st I.F. Transformer
C-21	Pt. of L-3	Trimmer	T-3	734039	2nd I.F. Transformer
C-22	Pt. of L-3	Trimmer	T-4	720021	Output Transformer
C-23	Pt. of L-3	Trimmer			230 V. Conversion Transformer
C-24	900100	Broadcast osc. trimmer (Pt. of L-4)	V-1	800043	Converter - 1L6
C-25	Pt. of L-5	Trimmer	V-2	800017	I.F. Amplifier - 1U4
C-26	Pt. of L-5	Trimmer	V-3	800019	Det., A.V.C., A.F. Amp. - 1U5
C-27	Pt. of L-5	Trimmer	V-4	800018	Audio Output - 3V4
C-28	900067	Two gang variable capacitor	V-5	800013	Rectifier - 117Z3
C-29	920539	.05 mfm., Paper 400V	S-1	510066	Band Switch
C-30	Pt. of C-17	80 mfm., Elect. 150V	S-2	510008	Transfer Switch
C-31	Pt. of C-17	30 mfm., Elect. 150V	S-3	Pt. of R-8	On-off Switch
C-32	Pt. of C-17	100 mfm., Elect. 25V	P-1	505055	Plug - Conversion Transformer
C-33	920040	.1 mfm., Paper 200V	P-2	585314	Plug - Shorting
C-34	920060	.05 mfm., Paper 200V	P-3	585049	Battery Cable Assembly
C-35	920170	.001 mfm., Paper 600V	P-4		
C-36	915005	2.2 mfm., Ceramic $\pm 20\%$	P-5		
			P-6		
R-1	351130	470,000 ohm, Carbon $\pm 20\%$	X-1	505054	Female Line Plug
R-2	351210	1 megohm, Carbon $\pm 20\%$	SP-1	180052	Speaker - 5"
R-3	351050	220,000 ohm, Carbon $\pm 20\%$			
R-4	340950	82,000 ohm, Carbon $\pm 10\%$			
R-5	351330	3.3 megohm, Carbon $\pm 20\%$			
R-6		47,000 ohm, (Pt. of C-11 & C-12)			
R-7	351290	2.2 megohm, Carbon $\pm 20\%$			

CABINET AND DIAL PARTS

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
140316	Cabinet	410836	Escutcheon plate
140317	Cabinet back	410837	Telescoping antenna
460102	Speaker grille	505056	Adaptor
410835	Grille bracket	525041	Pointer
460104	Knob, tuning and volume	530002	Dial cord (30")
520116	Dial crystal	587040	Dial cord spring
450117	Knob, band switch		

† Specify part number when ordering.







Power Supply: 105-125 V., 40-60 cycles AC  
 Same Voltage DC—Power Consumption 10 Watts  
 Battery Operation: 1—67½ V B — 3—1½ V D Cells in parallel  
 Frequency Range: 1640 — 530 KC  
 I.F. Circuits: 456 KC

Tubes: 1R5 Osc. Converter      1S5 Det. AVC A.F.  
           1T4 I.F. Amplifier      3S4 Power Output

Rectifier, Selenium  
 Speaker 4" P.M. 1 oz. Alnico V Magnet.  
 Speaker Transformer 5500 ohms - 400 cycles  
 Speaker Voice Coil 3.2 ohms.

### PARTS LIST

Part No.	Description		
12.11	Tubular Condenser .05 mf 200 V	47.23	Battery—Electric Switch
12.12	Tubular Condenser .05 mf 400 V	52.54	Volume Control with on-off switch
12.14	Tubular Condenser .1 mf 200 V	62.175	A-Battery Retainer
12.65	Tubular Condenser .002 mf 200 V	72.35	Power Cord
17.7	Ceramic Condenser 200 mmf ± 20%	92.280	B Battery Connector
17.18	Ceramic Condenser 50 mmf ± 20%	97.190	Cabinet (specify color)
17.21	Ceramic Condenser 100 mmf ± 20%	97.261	Loop Cover (specify color)
22.5	Electrolytic Condenser 100 mf 15 V	107.42	4" Speaker 1 oz. with Transformer
22.13	Electrolytic Condenser 150 mmf 15 V	112.18	Rectifier Selenium
22.64	Electrolytic Condenser 40-40 mf 150 V	117.15	W. W. Resistor
27.36	Variable Condenser 2 gang	132.10	Padder Condenser
37.184	Oscillator Coil	142.7	Knob-Pointer (specify color)
37.188	Input & Diode I.F. Transformer	142.68	Knob-Tuning (specify color)
37.189	Loop	142.69	Knob-Volume (specify color)

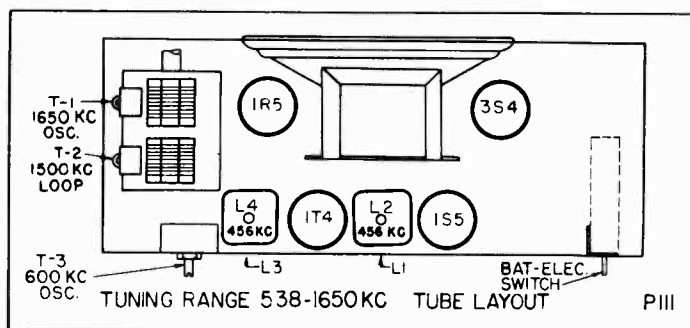
MODEL P111

### ALIGNMENT PROCEDURE

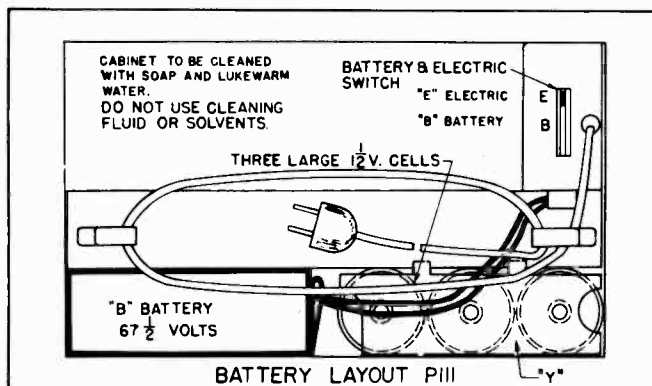
No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

- Disconnect Loop leads--Remove Chassis from Cabinet.
- Volume Control full on.
- Low range A.C. meter connected across voice coil to indicate output.
- Keep signal generator attenuated so as to maintain 1/2 scale reading on output meter.
- Use battery power when available.

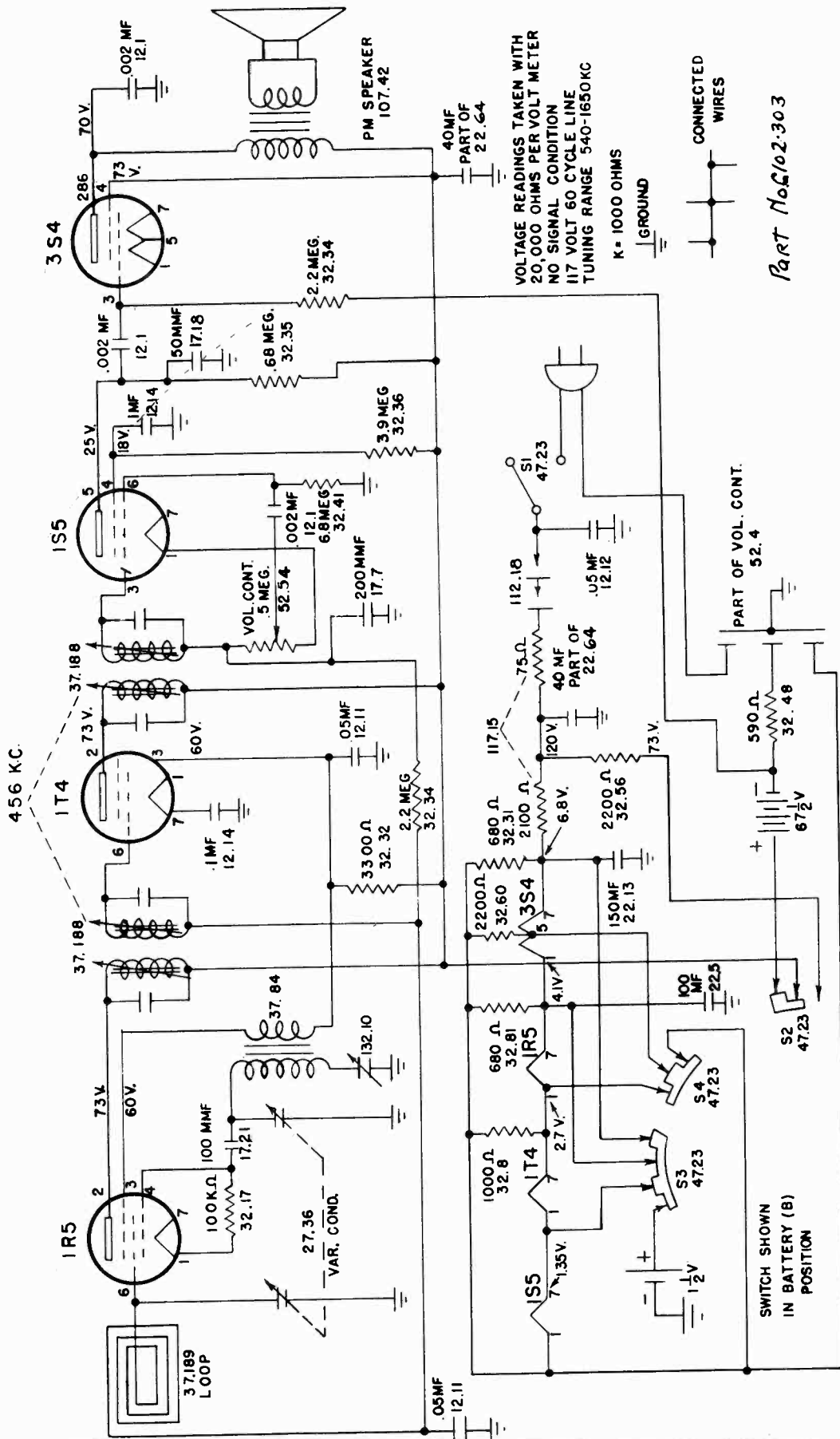
Receiver Condenser at:	Signal Generator	Dummy Antenna	Connect Signal Generator to:	Refer to Chassis Layout for Location of Trimmers
1 Fully closed	Exactly 456 KC	.1 MF	Chassis Ground and Control Grid 1R5 Rear Section Var. Cond.	Adjust for maximum output L1, L2, L3 and L4.
2 Fully closed	Approx. 538 KC	.1 MF		Adjust for maximum output T3
3 Fully open	Exactly 1650 KC	.1 MF		Adjust for maximum output T1
Repeat Operations 2 and 3. The next two operations are performed with the chassis in the cabinet, the loop connected and tuning indicator in position.				
4 Approx. 1500 KC	Approx. 1500 KC		Radiating Loop 20" from Receiver	Adjust T2 for maximum output.
5 Approx. 600 KC	Approx. 600 KC		Radiating Loop 20" from Receiver	Adjust T3 for max. while rocking variable cond.



Part No. 102-2071



A 102-207-2



MODEL 830



### PARTS LIST

Part No.	Description	
12.4	Tubular Condenser .005 mf 600 V	
12.6	Tubular Condenser .01 mf 400 V	
12.9	Tubular Condenser .03 mf 400 V	
12.11	Tubular Condenser .05 mf 200 V	
12.12	Tubular Condenser .05 mf 400 V	
17.21	Ceramic Condenser, 100 mmf, $\pm 20\%$	
17.22	Ceramic Condenser, 250 mmf, $\pm 20\%$	
22.38	3 Sec. Electrolytic Condenser, 30-40-20 mf 150 W.V.	
27.31	Variable Condenser	
37.57	Oscillator Coil	
37.157	Loop Antenna & Back	Power supply: 40-60 cycles, 105-125V AC
37.80	Output I.F. Transformer, complete	Same Voltage DC
37.81	Input I.F. Transformer, complete	Power consumption: 30 Watts
52.31	Volume Control with Switch	Frequency Range: 530-1680 KC
72.1	Power Cord (Approved)	I.F. Circuits: 456 KC
77.133	Dial Scale (Calibrated)	Tubes: Osc.-Converter 12BE6
77.145	Dial Pointer	I.F. Amplifier 12BA6
77.146	Reflector paper	Det. Avc. A.F. 12AT6
77.5	Dial plate cord	Power Output 50B5
77.134	Drive	Rectifier 35W4
97.139	Cabinet, State color	Speaker: 4" P.M. 1 oz. "Alnico V" Magnet
142.26	Cabinet Knobs, State color	Speaker Transformer: 2500 ohms—400 cycles
107.32	4" P.M. Speaker	Speaker Voice Coil: 3.2 ohms
42.40	Speaker Transformer for above	
117.1	30 ohm 1 W. Resistor	

### ALIGNMENT PROCEDURE

The chassis may be removed from the cabinet by pulling off the knobs, removing the back and the two screws on the back of the chassis.

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary.

Then proceed as follows:

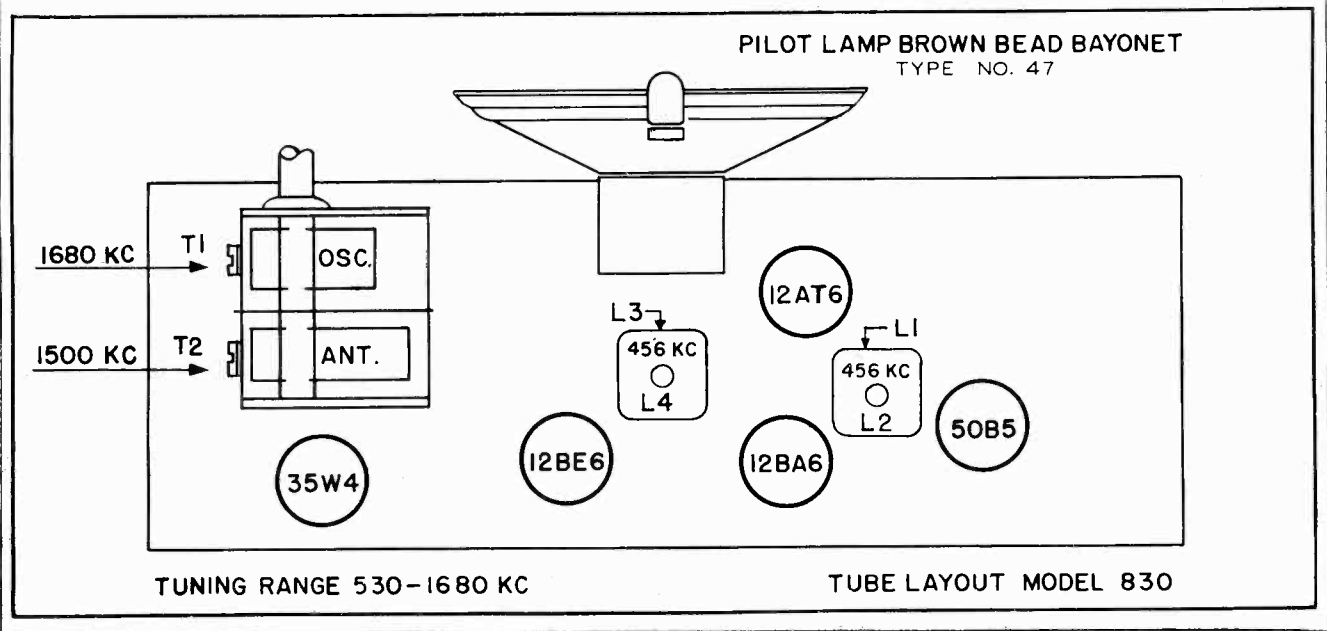
Volume Control full on.

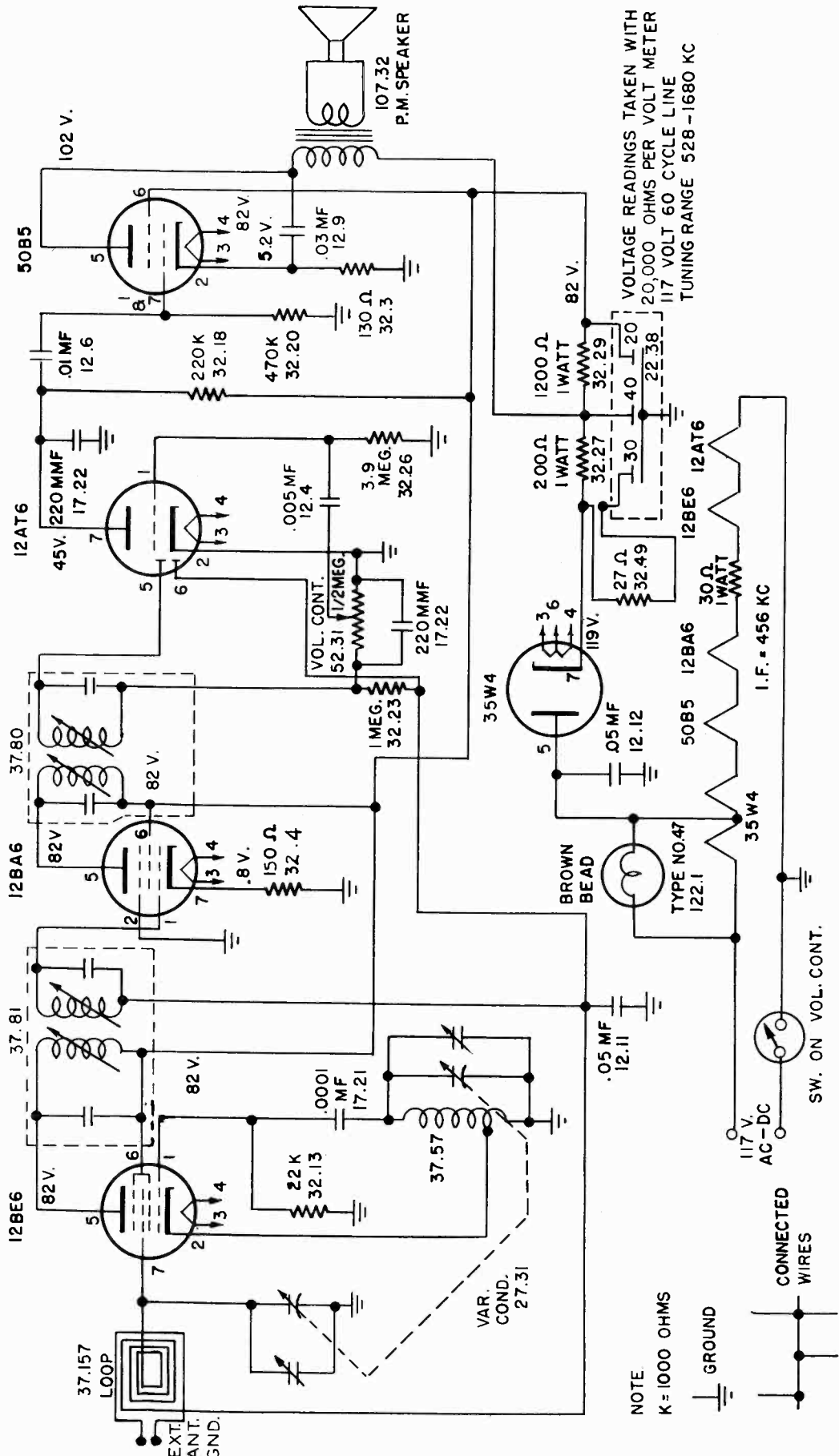
Low range A.C. meter connected across voice coil to indicate output.

Keep signal generator attenuated so as to maintain 1/2 scale reading on output meter. Make certain that dial pointer is exactly on index line (top left side of dial plate) when variable condenser is fully meshed.

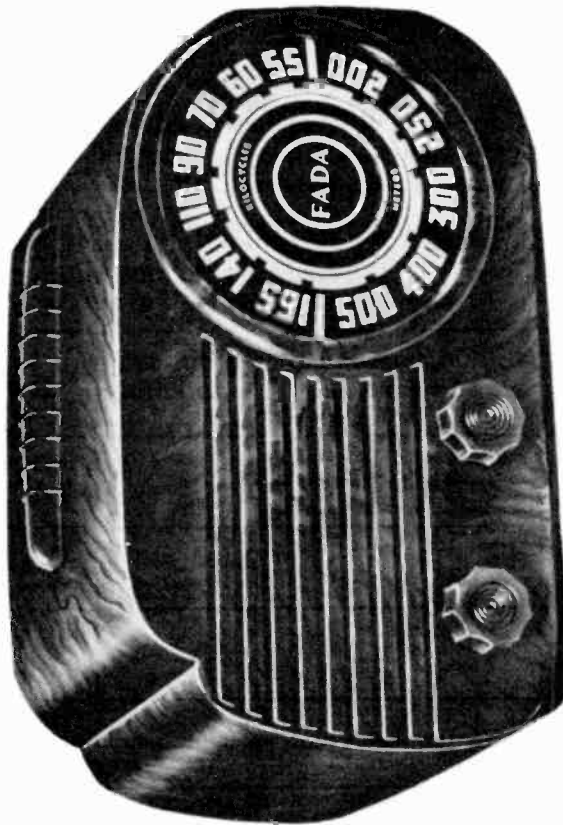
Use only mild soap and water to clean cabinet and knobs. **Never use cleaning fluids.**

Receiver Dial at:	Signal Generator	Dummy Antenna	Connect Signal Generator to:	Refer to Chassis Layout for Location of Trimmers
Full Open	Exactly 456 KC	.1 MF	Control Grid 12BE6 Tube Rear Section Variable Condenser	Adjust for Maximum Output L1, L2, L3 & L4
Full Open	Exactly 1680 KC		Radiating Loop (1/2 meter) 20" from Receiver Loop	Adjust for Maximum Output T1
Approx. 1500 KC	Approx. 1500 KC		Radiating Loop (1/2 meter) 20" from Receiver Loop	Adjust for Maximum Output T2
Approx. 600 KC	Approx. 600 KC		Radiating Loop (1/2 meter) 20" from Receiver Loop	Check tracking and bend slotted end plate (rear section) of variable, if necessary.





**PARTS LIST**



Part No.	Description	
12.19	Tubular Condenser, .005 mf, 400 V	
12.6	Tubular Condenser, .01 mf, 400 V	
12.9	Tubular Condenser, .03 mf, 400 V	
12.11	Tubular Condenser, .05 mf, 200 V	
12.12	Tubular Condenser, .05 mf, 400 V	
17.18	Ceramic Condenser, 50 mmf, ±20%	
17.21	Ceramic Condenser, 100 mmf, ±20%	
17.22	Ceramic Condenser, 220 mmf, ±20%	
22.19	3 Section Electrolytic Condenser, 30-40-20 mf, 150 W.V.	
27.18	Variable Condenser	
37.57	Oscillator Coil	
37.64	Loop Antenna	
37.61	Input I.F. Transformer, complete	
37.33	Output I.F. Transformer, complete	
37.66	I.F. Trap	
52.16	Volume Control with Switch	
72.1	Power Cord	
77.167	Dial Pointer	
77.165	Dial Scale (Calibrated)	
97.216	Cabinet — state color	
142.26	Cabinet Knobs — state color	
97.80	Cabinet Handle — state color	
107.20	4" P.M. Speaker less Transformer	
42.2	Speaker Transformer for Above	
117.1	30 ohm 1 W. Resistor	

Power supply (40-60 cycles AC)	105-125V AC-DC
Power consumption:	30 Watts
Frequency Range:	1680-530 KC
I.F. Circuits:	456 KC
Tubes:	R.F. Amplifier 12BA6
	Osc. Converter 12BE6
	I.F. Amplifier 12BA6
	Det. Avc. A.F. 12AT6
	Power Output 35B5
	Rectifier 35W4
Speaker:	4" P.M. 1 oz. "Alnico V" Magnet
Speaker Transformer:	2500 ohms—400 cycles
Speaker Voice Coil:	3.2 ohms



MODEL 845

### ALIGNMENT PROCEDURE

The chassis may be removed from the cabinet by pulling off the knobs, removing the four screws on the bottom, and raising the handle.

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

Volume Control full on.

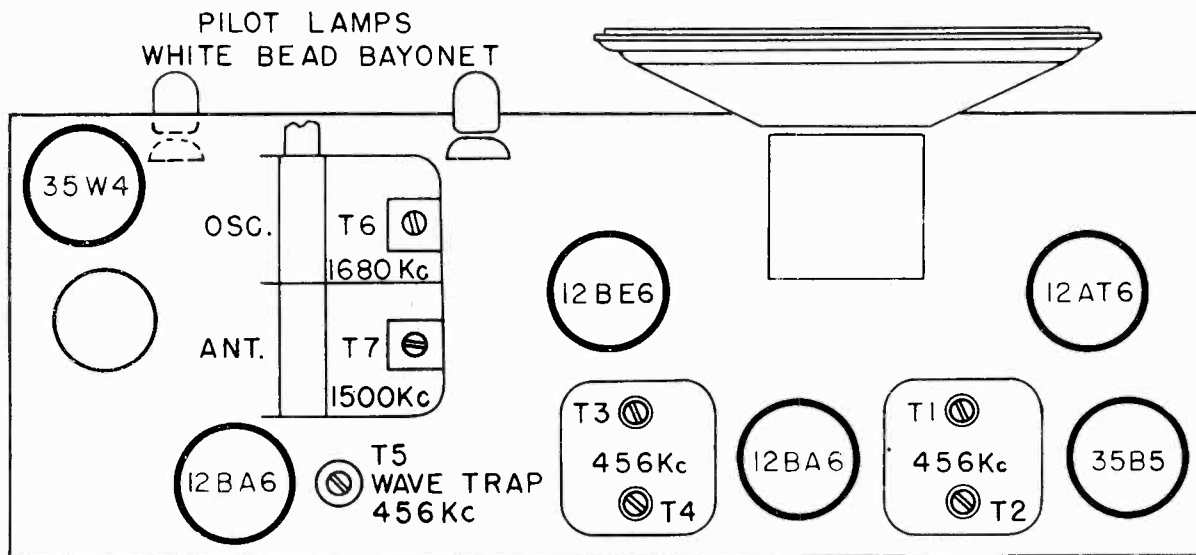
Low range A.C. meter connected across voice coil to indicate output.

Keep signal generator attenuated so as to maintain 1/2 scale reading on output meter.

Make certain that dial pointer is exactly horizontal when variable condenser is fully meshed.

Use only mild soap and water to clean cabinet. Never use cleaning fluids.

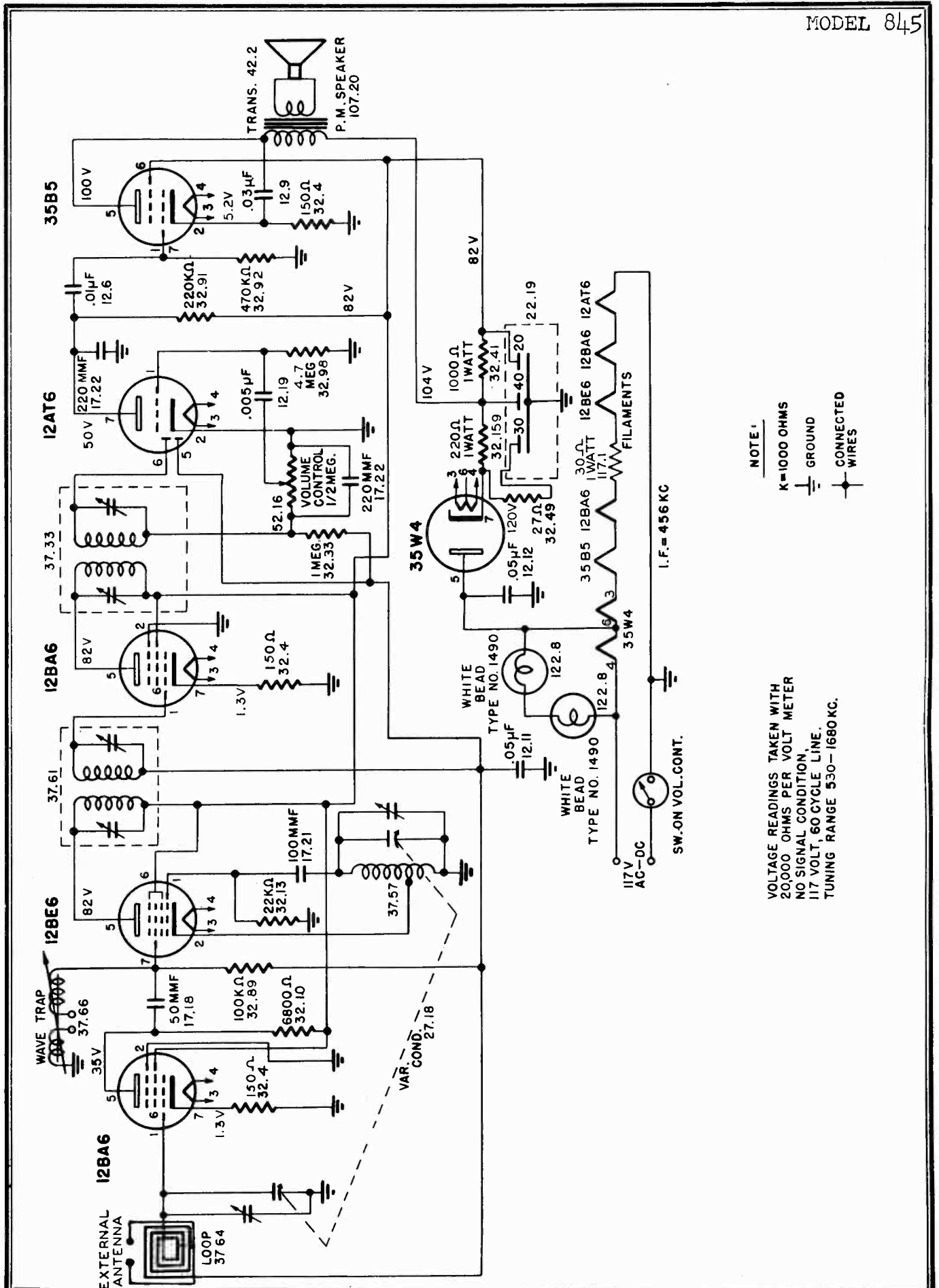
Receiver Dial at:	Signal Generator	Dummy Antenna	Connect Signal Generator to:	Refer to Chassis Layout for Location of Trimmers
Full Open	Exactly 456 KC	.1 MF	Control Grid 12BA6 Tube (R.F.) (Top) Rear Section Variable Condenser	Adjust for Maximum Output T1, T2, T3 & T4
Full Open	Exactly 456 KC	.1 MF	Control Grid 12BA6 Tube (R.F.) (Top) Rear Section Variable Condenser	Adjust for Minimum Output T5
Full Open	Exactly 1680 KC	200 MMF	Leads at Rear for Ext. Ant. and Gnd.	Adjust for Maximum Output T6
Approx. 1500 KC	Approx. 1500 KC	200 MMF	Leads at Rear for Ext. Ant. and Gnd.	Adjust for Maximum Output T7
Approx. 600 KC	Approx. 600 KC	200 MMF	Leads at Rear for Ext. Ant. and Gnd.	Check tracking and bend slotted end plate (rear section) of variable, if necessary.



TUNING RANGE 530 - 1680 Kc

TUBE LAYOUT

845



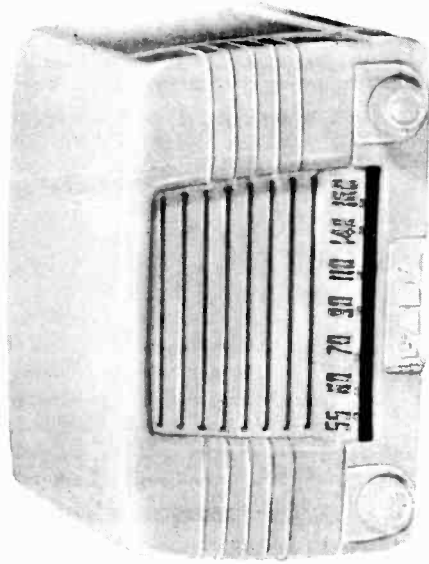
NOTE:

- K=1000 OHMS
- ⊥ GROUND
- + CONNECTED WIRES

VOLTAGE READINGS TAKEN WITH  
 20000 OHMS PER VOLT METER  
 NO SIGNAL CONDITION,  
 117 VOLT, 60 CYCLE LINE,  
 TUNING RANGE 530-1680 KC.

MODEL 855

## PARTS LIST



Part No.	Description
12.19	Tubular Condenser, .005 mf, 400 V
12.6	Tubular Condenser, .01 mf, 400 V
12.9	Tubular Condenser, .03 mf, 400 V
12.11	Tubular Condenser, .05 mf, 200 V
12.12	Tubular Condenser, .05 mf, 400 V
17.22	Ceramic Condenser, 220 mmf, $\pm 20\%$
22.45	2 Section Electrolytic Condenser, 30-30 mf, 150 W.V.
27.33	Variable Condenser
37.153	Oscillator Coil
37.146	Loop Antenna
37.80	Input or Output I.F. Transformer, complete
52.32	Volume Control with Switch
72.1	Power Cord
77.150	Dial Slide
77.151	Dial Pointer
97.184W	Cabinet, Polystyrene - Walnut
97.184V	Cabinet, Polystyrene - Ivory
97.184M	Cabinet, Polystyrene - Maroon
142.25W	Knobs—Walnut
142.25V	Knobs—Ivory
142.25M	Knobs—Maroon
107.35	4" P.M. Speaker with Transformer

Power supply: 40-60 cycles, 105-125V AC  
Same Voltage DC

Power consumption: 30 Watts

Frequency Range: 530-1680 KC

I.F. Circuits: 456 KC

Tubes: Osc.-Converter 12BE6

I.F. Amplifier 12BA6

Det. Avc. A.F. 12AT6

Power Output 50B5

Rectifier 35W4

Speaker: 4" P.M. .68 oz. "Alnico V" Magnet

Speaker Transformer: 2500 ohms—400 cycles

Speaker Voice Coil: 3.2 ohms

### ALIGNMENT PROCEDURE

The chassis may be removed from the cabinet by pulling off the knobs and removing the two screws on the bottom.

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

Volume Control full on.

Low range A.C. meter connected across voice coil to indicate output.

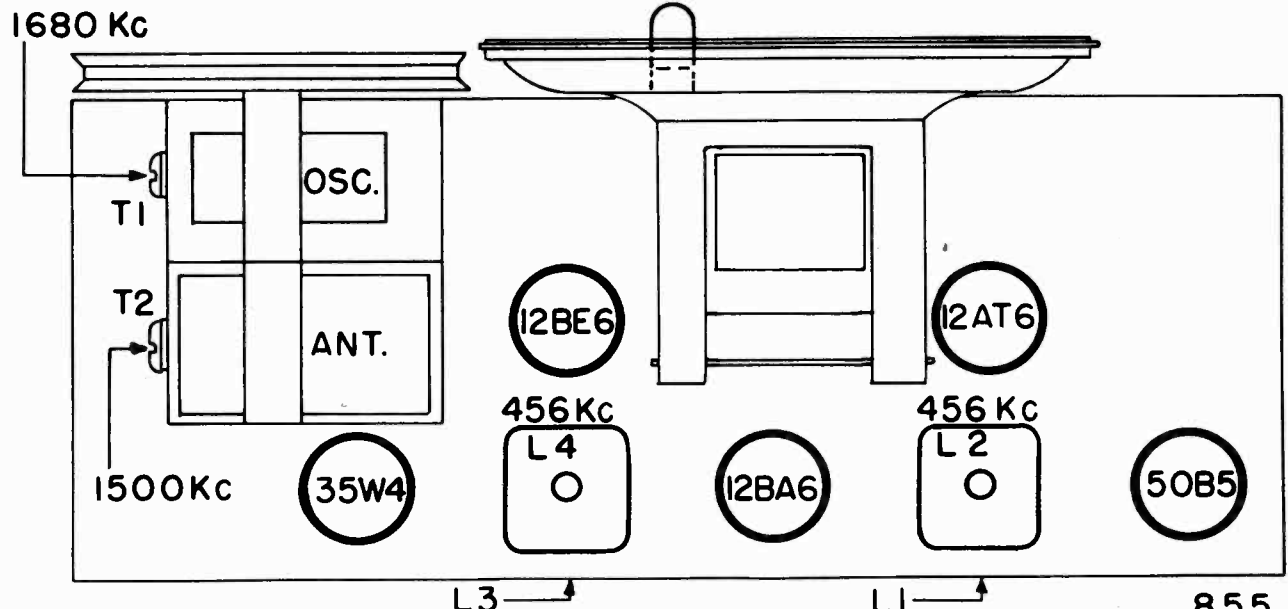
Keep signal generator attenuated so as to maintain 1/2 scale reading on output meter.

Make certain that dial pointer is at inside edge of left leg of track when variable condenser is fully meshed.

Use only mild soap and water to clean cabinet. Never use cleaning fluids.

Receiver Dial at:	Signal Generator	Dummy Antenna	Connect Signal Generator to:	Refer to Chassis Layout for Location of Trimmers
Full Open	Exactly 456 KC	1 MF	Control Grid 12BE6 Tube (Top) Rear Section Variable Condenser	Adjust for Maximum Output L1, L2, L3 & L4
Full Open	Exactly 1680 KC	200 MMF	Leads at Rear for Ext. Ant. and Gnd.	Adjust for Maximum Output T1
Approx. 1500 KC	Approx. 1500 KC	200 MMF	Leads at Rear for Ext. Ant. and Gnd.	Adjust for Maximum Output T2
Approx. 600 KC	Approx. 600 KC	200 MMF	Leads at Rear for Ext. Ant. and Gnd.	Check tracking and bend slotted end plate (rear section) of variable, if necessary.

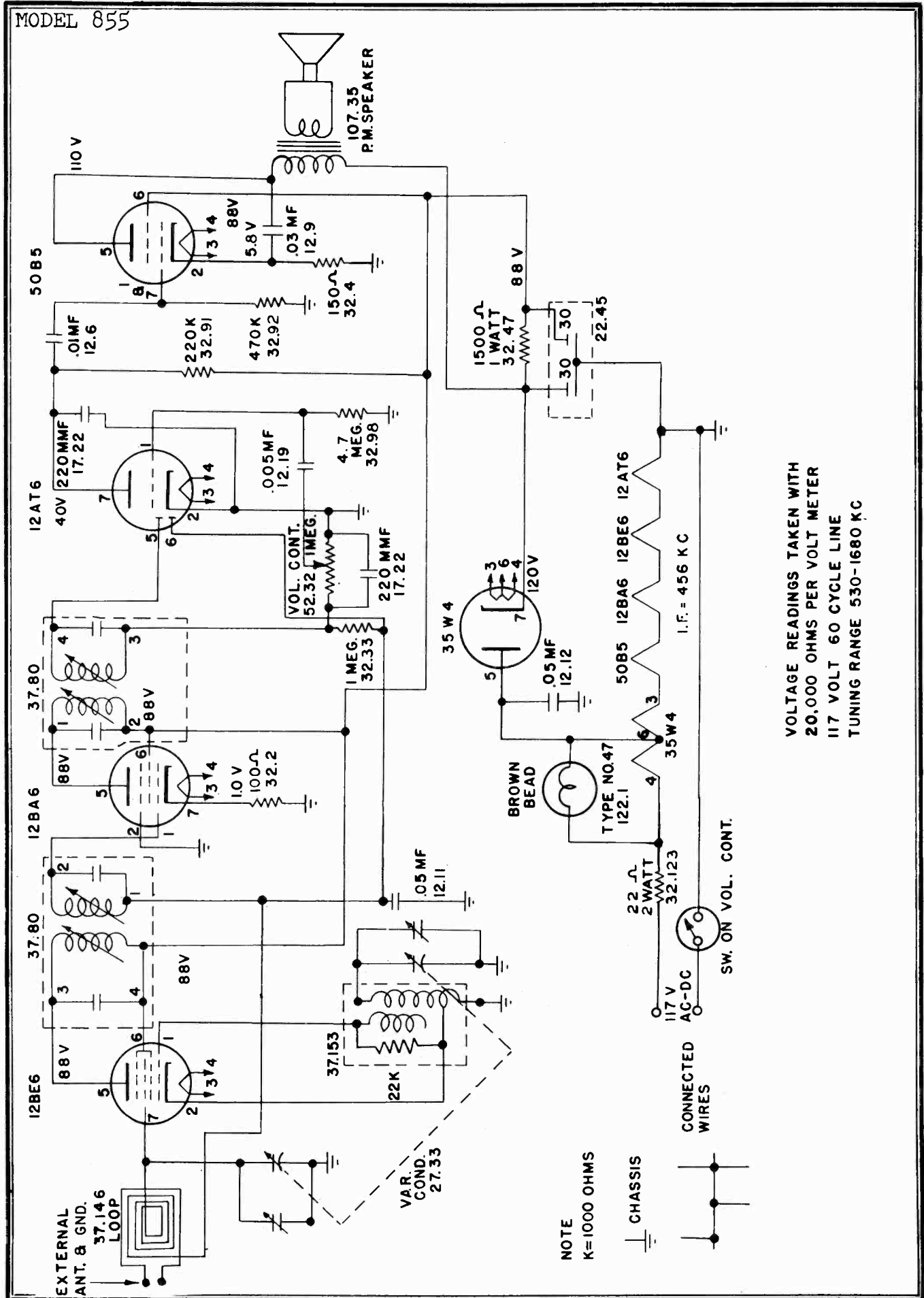
PILOT LAMP BROWN BEAD BAYONET NO.47



TUNING RANGE 530-1680 Kc

TUBE LAYOUT

MODEL 855



VOLTAGE READINGS TAKEN WITH  
 20,000 OHMS PER VOLT METER  
 117 VOLT 60 CYCLE LINE  
 TUNING RANGE 530-1680 KC

NOTE  
 K=1000 OHMS  
 CHASSIS  
 CONNECTED WIRES

GENERAL DESCRIPTION

NOTE: While the descriptions and illustrations in this manual refer specifically to the Model PR-12 portable Federal Recorder, they apply to all models - console as well as portable.

**Two-Piece Carrying Case**  
The Federal recorder type PR-12 is built into a two-piece carrying case. The lower section houses the recorder proper with the amplifier, driving mechanism and controls. The upper section of the lid contains the loud speaker and cable bracket. In setting up for operation the case is placed so that the speaker protective grill is on the top side. Inside the lid of the case is mounted an 8-inch electro-dynamic speaker with a bracket for wrapping the speaker cable and line cord. The lid or cover of the case acts as the baffle board for the speaker.

The lid is removed from the body part of the case by unfastening the two front latches, raising as one does the lid of a suit case. After the lid is raised past the vertical position it may be unhooked from its hinges and set alongside the recorder proper or at cable length from it.

Panel Controls

All the recorder controls are located on the front panel. Referring to Figure 1, the switch marked (1) on the left-hand side of the front panel turns the amplifier on or off. This switch, however, does not control the amplifier until the speaker cable (19) is plugged into the socket (20) on the rear left-hand corner of the top panel.

The switch just below marked (2) turns the driving motor on or off. The motor may be started by this switch whether the speaker plug is in or out. The turntable (21) is engaged to the motor by the action of the control lever (14) and the holding knob (15) in a manner described in a later section.

The tone knob (3) is used to control the tone only when a record is played back. There is no provision for controlling the tone while recording. Within the frequency range of the recorder the sound is recorded exactly as it is. If it were possible to control tone while recording it could cause, at the discretion of the operator, an unnatural recording to be made.

The speaker switch (4) controls the connection of the speaker and the cutting head (27) to the amplifier output, when this switch is turned to "ON" position the loud speaker is connected to the output of the amplifier. (No recording can be made until this switch is thrown to "OFF" position.) With this switch in the "OFF" position the cutting head is connected across the output of the amplifier, the monitoring meter (12) is connected to the amplifier to give a visual indication of the recording level. The loud speaker is also faintly connected to give an audible monitoring of the program or material being recorded.

The gain control (5) is a fader type of volume control. When the bar type knob is turned to the left of the "center mark" under the word GAIN the volume for the radio is turned is increased. If the right-hand switch (9) is thrown to the RADIO position the gain control acts to control radio volume. If it is thrown to PICKUP position the gain control acts to control the volume on play back. When the gain control knob is turned to the right of the "center mark" it acts to control the volume of the amplifier when microphone is used. The jack marked WYE (6) is used to receive the microphone plug (7) whenever a recording is to be made with microphone. This jack will accommodate any high impedance type of microphone except those requiring a polarizing voltage. The microphone used should have for best results a sensitivity falling within the range of -56 to -72 decibels.

The switch at the right-hand side of the panel marked (9) connects either the radio tuner or the pickup to the amplifier, depending upon whether it is in the RADIO or the PICKUP position. With this switch in the RADIO position, the amplifier switch on, and the speaker plug in its socket, the "Station Selector" dial (11) should be turned to a half minute or so for the radio tuner tubes to heat up after switching the radio on. The Station Selector dial is calibrated in kilocycles, thereby enabling easy selection of the radio stations. Stations are tuned in by the tuning knob (13).

The radio volume knob (8) is used to control the volume of the radio tuner. This acts to control the radio tuner volume before it is fed into the amplifier. The center gain control, when turned to RADIO side, acts to control the radio volume after the tuner is fed into the amplifier. The use of these two controls for regulating the volume of the radio to proper monitoring level is explained in a later section.

**Drive Between Motor and Turntable**  
The power from the motor is transmitted to the inner rim of the turntable by a rubber pulley beneath the turntable. This rubber pulley is shown in Figure 2 marked (38). It is mounted on the pulley lever (14). When the pulley lever is pushed toward the rear it engages the rubber pulley between the motor shaft (39) and the inside rim of the turntable thus enabling the motor to drive the turntable. The inside rim of the turntable is marked (40) on Figure 2. The knob (15) fastens the pulley lever into position. Pulling the lever forward draws the rubber pulley away from between the motor pulley and the turntable rim, thus disengaging the turntable from the driving motor. Do not push lever so hard as to put excess friction between turntable and motor.

When the recorder is not in use the motor must be left disengaged from the turntable. This relieves the pressure on the rubber pulley, thereby preventing the formation of a deformed spot

in the rubber pulley which in time might develop a thump.

**Drive Between Turntable and Cutting Head**  
The turntable is set on a tapered spindle (14) of Figure 2. It is normally held on this spindle by the spindle thumb nut (22) of Figure 1. During recording and playback this center thumb screw is unnecessary, since the weight of the turntable holds it sufficiently solid to the tapered spindle. This spindle runs in ball bearings inside the cast gear housing (42) see Figure 7. On this spindle and inside the gear housing is a worm gear which drives a fibre gear. This fibre gear drives the shaft (43) which in turn engages with the precision ground lead screw (45) through the medium of a small worm gear and a fibre gear (44).

The lead screw finger (47) becomes engaged with the threads of the lead screw when the cutting head is lowered on to a record in the cutting position, thereby carrying the head slowly across the record while it is turning. Whenever the cutting head is raised from the record it disengages the lead screw finger from the threads of the lead screw.

HOW TO MAKE RECORDINGS WITH MICROPHONE

1. Remove the lid of case which contains speaker and set it a few feet away from recorder. (See Figure 1.)

2. Plug speaker cable plug (19) into socket (20) located on the rear left-hand side of panel. This plug fits in only one position.

3. Plug power cord (18) into A. C. outlet only (100 to 117 volt 60 cycle). Converter must be used for D. C. current.

4. Put cutting needle all the way into the cutting head (27) so that flat part of the needle rests against the set screw. If a sapphire is used it is necessary to push weight adjustment (31) forward a few notches to get proper depth of cut.

5. Unscrew turntable holding thumb nut (22). This nut is left-hand thread and turns to right to unscrew. Place record on turntable (21) and on top of felt pad (24) so that the driving pin (23) engages in one of the driving holes of the record. It is not necessary to fasten the record down with the center thumb nut.

6. Set the turntable properly engaged in gear so that when you are ready to make recording you will lose no time. Do this as follows: Loosen knob (15) and push the lever (14) toward rear until you feel it engaging. Hold lever in this position and switch motor switch (2) to ON position. The turntable will start turning. Adjust the lever so that turntable is running full speed without slipping. Now tighten the lever knob (15). (A quick test for determining whether the turntable lever is adjusted properly is to press the thumb against the outside rim of the turntable gently, yet with sufficient pressure to determine that it would not slip while cutting a record.) Motor switch may be left on while making the next few operations or you can turn it off.

7. Plug microphone plug (7) into panel jack marked WYE (6).

8. Throw speaker switch (4) to OFF position.

9. Turn amplifier on by switching WIP-ON switch (1) to ON position. The green pilot lamp (13) will light up. Allow about thirty seconds for amplifier to warm up. Note: (It is impossible to turn amplifier on unless the speaker plug has been plugged in as described in direction 2 above. The motor can operate the turntable whether the speaker plug is in or out.)

10. Switch right-hand switch (9) marked RADIO PICKUP to pickup side. This operation is not strictly essential, but it allows the radio portion of the recorder to be turned off while recording with microphone.

11. Have subject speak a few words or play a few notes in front of the microphone and turn the center gain control (5) to the right of the center mark (the side marked WYE) until the monitoring meter (12) swings and averages around the red line. Occasional audio peaks or high notes will make the needle swing full scale but the proper level is obtained when the average is around the red line.

A trial or two will enable you easily to recognize and obtain proper level. For a person talking, a good distance away from microphone is 8 to 12 inches; for singing, 12 inches to 1 feet; for instrument recording, 2 feet to 20 feet, depending upon loudness of instrument.

12. Have turntable running. Holding the cutting head (27) in right hand and cutting arm (34) in left hand bring cutting head over desired starting point on disc. Lower the cutting arm easily so as to engage it into the drive mechanism and then gently lower the cutter head on to the record. (The cutting head is adjusted at the factory to cut the proper depth on acetate record.)

13. When recording is completed, even if only a part of the record is used, lift the cutting head from the record and replace it on the armrest (35).

14. While the turntable is still running, remove the shavings from the record by working them toward the center with the finger tips, or a moderately stiff brush. Note: (These shavings are highly inflammable.)

HOW TO FLAY P.A.C.H

1. Turn the center gain control slightly to the left of the center mark (the side marked RADIO-PICKUP).
2. Throw speaker switch (4) to IN position.
3. Put a pickup needle all the way into the head of the pickup. (Do not turn this thumbscrew with force.)

MODEL PR-12

**PROTECTION OF MONITORING METER**

The volume required for proper recording is considerably less than the normal output of the amplifier. With this in mind the following precaution must be observed for the protection of the monitoring meter: Never have radio or microphone gain turned up high when switching the speaker switch to the OUT position for making a recording. Always start with a low gain and raise it to the required level.

**ADJUSTING CUTTING HEAD USE OF CUTTING DEPTH GAUGE**

The cutting head is adjusted to the proper cutting angle at the factory and ordinarily need never be changed. The pressure of the cutting needle on the record determines the depth of the cut into the acetate coating. If the cut is too light, the groove will not be deep enough for the pickup needle to follow on playback. The pickup will either jump out of the groove or else act to straighten out the groove and destroy the wavy track representing the recorded material. If the cut is too deep the cutting head must labor, in order to impress the vibrations of the cutting needle into the coating, so that some of the original frequencies will not be recorded. This means an unnatural recording and produces what is sometimes called an echo.

The position of the counter balance weight (31) on the slide rod (30) controls the depth of the cut.

The proper position of the counter balance weight is determined with the aid of the Depth Gauge (16 of Figure 6) which is furnished with each Federal Recorder.

The depth gauge consists of a piece of spring material fastened into a small block. Near the tip end of the spring is a small round dent. The gauge is held on the surface of the record with the finger so that the point of the cutting needle sets in the small dent on the spring. The proper adjustment of the balance weight is obtained when the tip of the spring is caused just to touch the surface of the record, with the cutting arm fully engaged into the lead screw.

**NOTES:** In order to make sure that the cutting arm is in the proper cutting position and fully engaged in the lead screw gear it is well to allow the turntable to turn a few rounds with only the cutting head lifted slightly off the record. The adjustments of the balance weight must be done with the felt pad between the turntable and the record.

**CARE TO BE TAKEN WHEN CARRETTING**

After completing a recording and just before closing it up to move to another position make sure that the center thumb nut (22 of Figure 1) is tightened. This holds the turntable fast on the spindle, preventing it from falling off and doing damage to the rest of the machine.

It is advisable to remove the needle from the head of the pickup since any bump against it can cause damage to the crystal located in the head of the pickup. Make sure the pickup is rigidly held in its support.

Fasten the cutting head securely with the thumb nut on the cutting head rest (35). Make sure that the speaker cable and power cord are wrapped so that the plug ends of the cord do not flop around into the speaker cone or the other parts on the top panel.

**CLEANING DRIVE MECHANISM**

It is necessary often to remove the turntable and clean bits of shavings and dirt away from the rubber drive pulley (38 of Figure 2). Particular care must be taken to see that the driving face of the rubber pulley is kept free from grit and shavings. A small bit of shavings stuck on the pulley will cause a thumping noise which may be recorded into the record with the program, or distort the recording.

The driving face of the rubber pulley can be cleaned with alcohol or Carbona (Never gasoline).

It is often necessary to wipe out the inner rim of the turntable, especially the track where the rubber pulley runs. Sometimes it is necessary to remove grease or dirt films from the motor pulley (39 of Figure 2).

The lead screw (15 of Figure 7) must be kept free of dirt, shavings and especially any small gritty particles. Every few months the threads of this screw should be cleaned with a brush and alcohol, and then greased, (see section under LUBRICATION).

**LUBRICATION**

Following is a list of the places to be lubricated, showing the kind of lubricant and how often it should be used.

1. The rubber pulley bearing (38A of Figure 2): To lubricate the rubber pulley unscrew the round head screw holding it in place and remove it from its shaft. After cleaning put a small bit of automobile chassis lubricant or ordinary vaseline inside and on the lower shoulder of the fibre bushing in the rubber pulley. Replace pulley and fasten with holding screw and washer.
2. This pulley should be greased every few days, depending upon amount of use. The cutting head pivot screws (33 of Figure 6) should be oiled with a drop of light machine oil every two or three weeks, depending upon amount of use. The cutting head should always be free to turn on these two pivot screws in order that the cutting head can follow any up and down movement while it is cutting.
3. The lead screw pivot points (18 of Figure 7) occasionally require a small amount of chassis grease.
4. The lead screw threads should be kept greased with a little chassis grease or vaseline.

4. Remove the pickup from its holder and place very gently on to the revolving record at the beginning of the cut.
5. Adjust the volume to desired value with the center gain control, turning it to the left of the center mark or to the side marked RADIO PICKUP.
6. The tone control (3) may be used to obtain the desired tone. This tone control is effective only on playback; it cannot be used to control the tone of the radio or when recording.
7. Commercial record may be placed by unscrewing the driving pin from the turntable. It is not necessary to fasten record down with center thumb nut when playing.

**HOW TO RECORD RADIO PROGRAMS**

1. To make a good radio recording it is essential first to properly tune in the station, using the loud speaker as indicator. Since the radio tuner is of the tuned radio frequency type to insure high fidelity it is essential to take a little care in properly tuning and adjusting volume of radio before starting to record.
2. Connect the antenna (approximately 30 feet long) to the antenna binding post (25). A ground connection is not required for the Federal Recorder.
3. The first six directions under HOW TO OPERATE RECORDING WITH MICROPHONE apply also to making a radio recording.
4. Throw the right-hand switch (9) to RADIO. This should illuminate the station selector dial.

5. Throw the speaker switch to IN position.
6. Set the center gain control about 1/8 of a turn to the left of the center mark.
7. Set the radio volume control (8) about half way between minimum and maximum.
8. Tune in the station and program to be recorded. Do this tuning carefully, making sure that there are no interfering stations or noises. (See paragraph HOW TO USE AS HOME RADIO for additional pointers on operating radio.)

9. The proper volume for recording is obtained by using both the radio control and the center gain control. By a trial the proper setting of each control can be determined. If the radio volume control (8) is turned low and the center gain control turned high a slight distortion may be introduced. Most distortion is apt to be introduced if the radio volume control is turned high and the center gain control set near minimum. Best results will be obtained by placing the center gain control middle way between maximum and minimum and then adjusting to proper volume with the radio volume control.

10. Throw the speaker switch to OUT position but before doing so make sure the radio volume is turned near minimum; otherwise the volume may be too great for the monitoring meter.

11. Raise the radio volume with the radio volume control until monitoring meter averages around the red line.

12. Proceed with recording as in directions 12-13-14 under HOW TO OPERATE RECORDING WITH MICROPHONE.

13. It is possible to cut into any "off the air" recording and make a personal comment. This is done by inserting the microphone plug into the "mike" jack and turning the center gain control from its radio position to the mike position - that is, from left to right. This feeds the radio program out and brings the microphone into play. When comment has been made into microphone you may get back to the radio recording by turning the center gain control back to where it originally was set.

**HOW TO USE AS PUBLIC ADDRESS SYSTEM**

1. Plug microphone into jack on panel marked MIKE.
2. Have radio turned off. This is done by having the right-hand toggle switch to PICKUP position.

3. Turn amplifier switch to ON position.

4. Throw speaker switch to IN position. Turn center gain control to right, on "mike" side of the center mark, until desired volume is obtained.

When using the Federal Recorder as a Public Address system it is necessary to have the loud speaker and the microphone removed from one another by considerable distance in order to eliminate the howling due to acoustic feedback between speaker and mike. Speaker should be placed of microphone and microphone turned at 180 degrees from speaker. Best results may be obtained by using an extension cable and having the microphone isolated from speaker. The extension cable can be obtained from the Federal Recorder Company.

**HOW TO USE AS A HOME RADIO**

Although it is not one of the major intents of the Federal Recorder machine, it can be used as an ordinary home radio set.

Since the radio tuner and amplifier are of the high fidelity type for the express purpose of making true radio recording, it cannot be used with the same flexibility and type of control as a commercial type home radio. The tuner does not have as good sensitivity or selectivity as the 9 or 10-tube superheterodyne commercial receivers nor will it control with the same ease. However, with the station properly tuned in, the fidelity will greatly surpass the commercial receiver. The radio tuner is purposely built this way to insure exact reproduction of the radio program, even though a little care is required to retune the station properly.

An antenna about thirty feet long will give satisfactory results. Connect to antenna binding post (25) in Figure 1. No ground is necessary.

Set the center gain control about mid way to left and control volume with radio volume control.

This may be applied with the tip of the finger through the opening in lead screw cover (45 of Figure 7).

5. The cutting arm guide rod (49 of Figure 2) must be kept oiled throughout its length with a light grade of machine oil.
6. This rod should be oiled whenever it is seen to be getting dry or when the cutting head arm ceases to move freely from inside of record to outside or inside in when moved by hand.
7. The grease retaining cup which houses the lead screw ball-bearing gear should be kept filled with an automobile chassis lubricant. Some lubrication may be required every three or four months (50 of Figure 7).
8. The driving motor (51 of Figure 7) has two small oil holes close to the rubber mounting rings (53) which require a couple of drops of very light oil every few months depending upon amount of use.

**HINTS FOR ACETATE RECORDING**

The shaft of the SAFEROID needle has a flat portion along its length and the needle should be inserted so that the set screw tightens up against this flat. The v-w shape needle has no flat portion but has an indentation just above the point. This indentation faces you when held in front of the cutting head. Insert needle all the way into the cutting head. It is of great advantage to use a sharp needle, as this will minimize surface noise. We suggest setting aside one record for test purposes. Then test each needle by cutting a few lines on this record. If the needle cuts quietly, reproduction will be quiet. If the needle is dull, it will hiss and squeak loudly, resulting in noisy reproduction. A simple way to check is to put one's ear as close as possible to the needle and listen to the cutting. Under proper conditions, the needle noise should be barely audible. All Federal Recorders come adjusted with the proper needle angle. This angle, when facing the cutter, is 95°. If necessary, the angle may be changed by adjusting the screws in back of the cutter head as shown in Figure 6. In cutting, the shavings should be kept away from the cutting needle. If your machine is made to cut from the "inside-out" the shavings will automatically take care of themselves. Occasionally, in starting the thread may catch at the needle. If this occurs, push it away toward the center. When cutting from the "outside-in" both cutter and shavings are travelling in the same direction and more care must be taken to see that these shavings are clear of the cutting needle. This can be done by using a soft brush or by using the finger-tips lightly. Do not press fingers or brush on record while cutting as this tends to slow down record and produce "wows" in the recording that are noticeable when playing back.

**NOTES:** A few drops of high grade machine oil, when spread over the surface of an acetate record before recordings, will result in a smoother and more quiet cut. This procedure is especially beneficial when using discs which are either cold or have hardened due to age.

**HINTS FOR USE OF MICROPHONE**

A few trial recordings with the microphone will enable one to become familiar with a few of the "tricks" in recording to obtain best results. For voice recordings, where the level is at a natural conversation, the microphone should be held from about eight inches to two feet from the mouth. For singing, a distance of from two to eight feet will be found most suitable. For recording piano, a distance of from six to fifteen feet gives the best results. When recording a piano, place the microphone on the high side of the keyboard so that the high notes will come through better. These distances are somewhat governed by the surroundings and the type of room. Where the recording of an orchestra is to be made, the highest toned instruments should be closest to the microphone. For recording an orchestra in a room where sound reflection from the ceiling may cause reverberation it is best to place a cloth over the microphone when it is tilted face up.

If the microphone is tilted with the face up it is essentially non-directional and will give best recording where sounds all around the microphone are to be recorded.

**TROUBLES AND REMEDIES**

Excessive Needle Scratch  
Needle scratch is caused by a defective needle, a faulty or chilled record, or recording at too low level.

A poor grade acetate record blank often has grit or hard spots. This will cause excessive scratch. Use only good grade acetate records. The Federal Recorder "Ferra Disc" is one of the quietest records known and in general runs very consistent as to softness. When recording is at too low level excessive amplification is required on playback. This brings out scratch and background noises. Cut all records so that the monitor averages around the red line.

Cutting Needle Runs in Single Groove  
If the cutting needle runs in single groove the lead screw finger is not engaging in the lead screw.

Cutting Through Coating Into Aluminum Disc  
If the cutting needle cuts through into the aluminum disc the cutting depth is too great. To correct this follow the instructions for the use of the depth gauge in one of the preceding sections.

The failure of the playback needle to track may be caused by either a dull playback needle or too light a cut on the record. If the playback needle is very blunt it may be too large to fit into the groove in the record. The only remedy in this case is to replace the needle.

If the cut is not deep enough the playback needle cannot follow in the groove. To correct this adjust to proper cutting depth. A properly cut groove gives a black and shiny shaving about the thickness of ordinary human hair.

Cutting Head Not Free to Move Up and Down  
This is due to the cutting head pivot screws (33 of Figure 6) being too tight or requiring a bit of oil. The cutting head should be free enough to follow any up and down movement of turntable.

Playback Needle Repeats in Single Groove  
This may be due to over cutting or because of shavings becoming tangled in cutting needle while recording. When shavings become entangled about the cutting needle they may pull on the needle or lift it from the record and set it into the next groove. In cutting, the shavings should be kept clear from the needle. See the notes under HINTS FOR ACETATE RECORDING.

Greater than normal level, causing the cutting needle to make a cut in the space intended for the adjacent groove. This is sometimes called "cutting into next groove". The only remedy in this case is to lower the recording level. Record so that the average swing of the monitor is around the "red line."

**Turntable Growls**

This may be caused by shavings getting under the turntable and getting caught into the rubber drive pulley. See notes under CLEANING.

**Chatter of Cutting Head**

Chatter is caused usually by one of four things:

1. Needle may not be inserted tightly into cutting head.
2. Loose pivot screws.
3. Improper angle of needle on record.
4. Dirt between the finger and the lead screw. The proper cutting angle is made at the factory and ordinarily need not be corrected. This angle can be changed by the adjusting screw on the back side of the cutting head bracket. For correct cutting angle see illustration of Figure 7.

**Wows or Wavering**

A wow is described as a noticeable and unnatural change of pitch in a musical note. This effect is most noticeable on long sustained notes. This change of pitch is caused by a change of speed in the turntable while cutting. This is caused by slippage or a momentary loss of inertia in the turntable while recording, too deep a cut or a chilled record.

Any slippage in the drive mechanism while recording will cause a wow. This may be caused by dirt or grease on the motor shaft or rubber pulley. Improper adjustment of the pulley lever (44 of Figure 2) will cause slippage.

A hard spot on the record will act to slow the turntable down while recording which will cause a wow on play back.

A cold record is a very common cause of wows. When the temperature is low the acetate coating becomes hard, making it difficult to cut properly.

**Radio Whistles when Tuning Station**

This is caused by the radio tuner being out of line or improperly trimmed up. A proper alignment of the radio tuner stages will correct this whistle. Often the tuner may be only partly out of trim causing whistle when radio volume is turned up full. In such case it is usually satisfactory to keep the radio volume control turned below this point.

This can be caused by either a bad tube in the radio tuner or by the tuner being considerably out of trim.

**Amplifier Troubles**

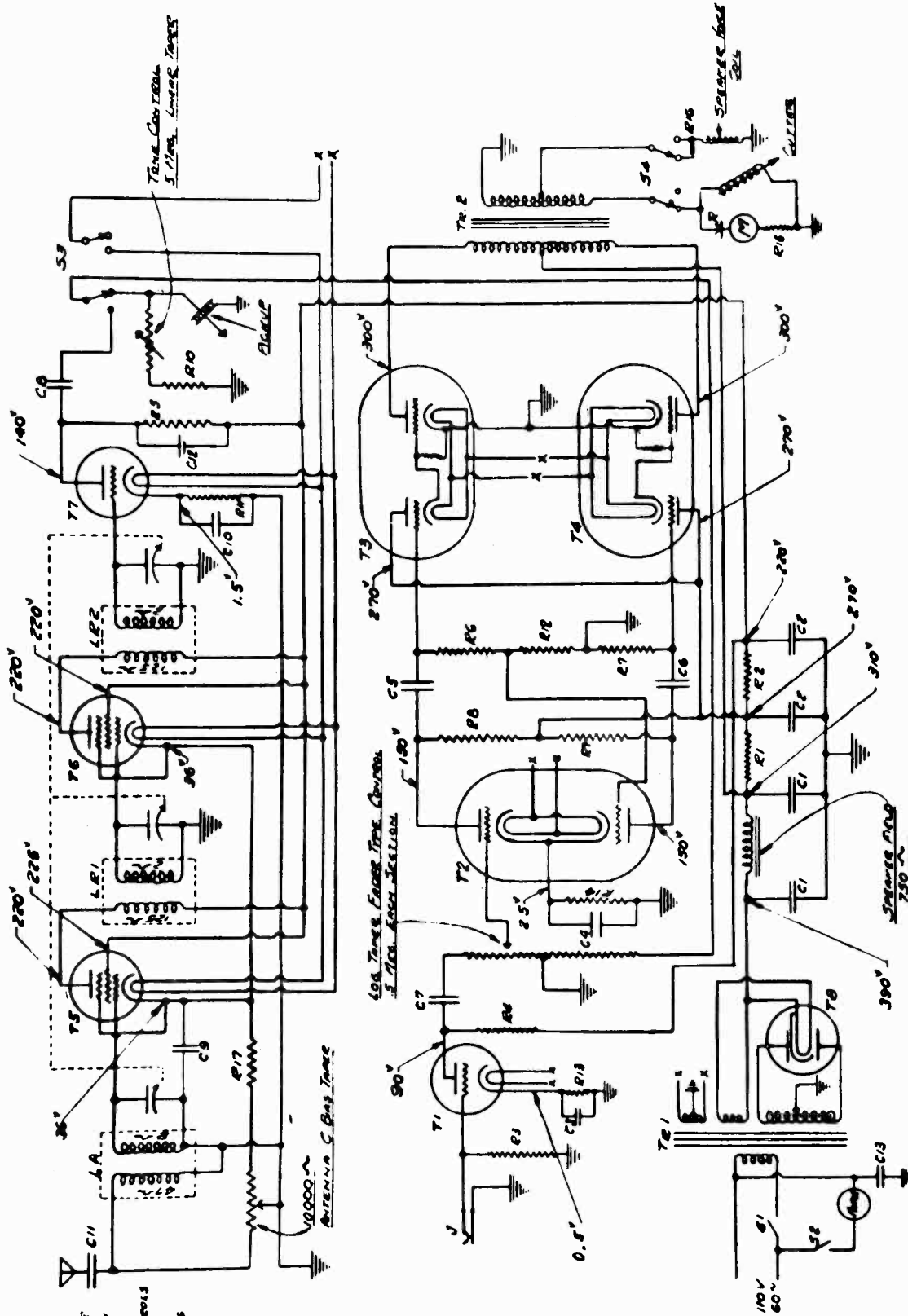
Troubles and remedies in the radio and amplifier cannot be outlined in such a manner as to be beneficial to the average Recorder owner. All such troubles should be taken up only by a reliable service man or authorized service station.

**CARE OF RECORDS**

The acetate material used for coating records is unstable chemically because of the use of volatile materials to give the coating plasticity. Open storage, cold, or heat acts to make the coating brittle or harder. This in turn tends to make noisy recordings.

NOTE: The records themselves are not highly inflammable because of the metal base. The shavings, however, are highly inflammable and should not be disposed of in a careless manner.





Voltages Measured  
With 1000 Ohm P.E.  
Not Metered On  
Scale Supplied.  
All Voltage Outputs  
At ZERO Time  
Power = .115 WATTS

60g. Tubes, Ensign Time, General  
1/2 Amp. 1000 Ohm, 1000 Ohm

Tone Control  
5.7/100 Linear Tubes

Speaker Load  
20Ω

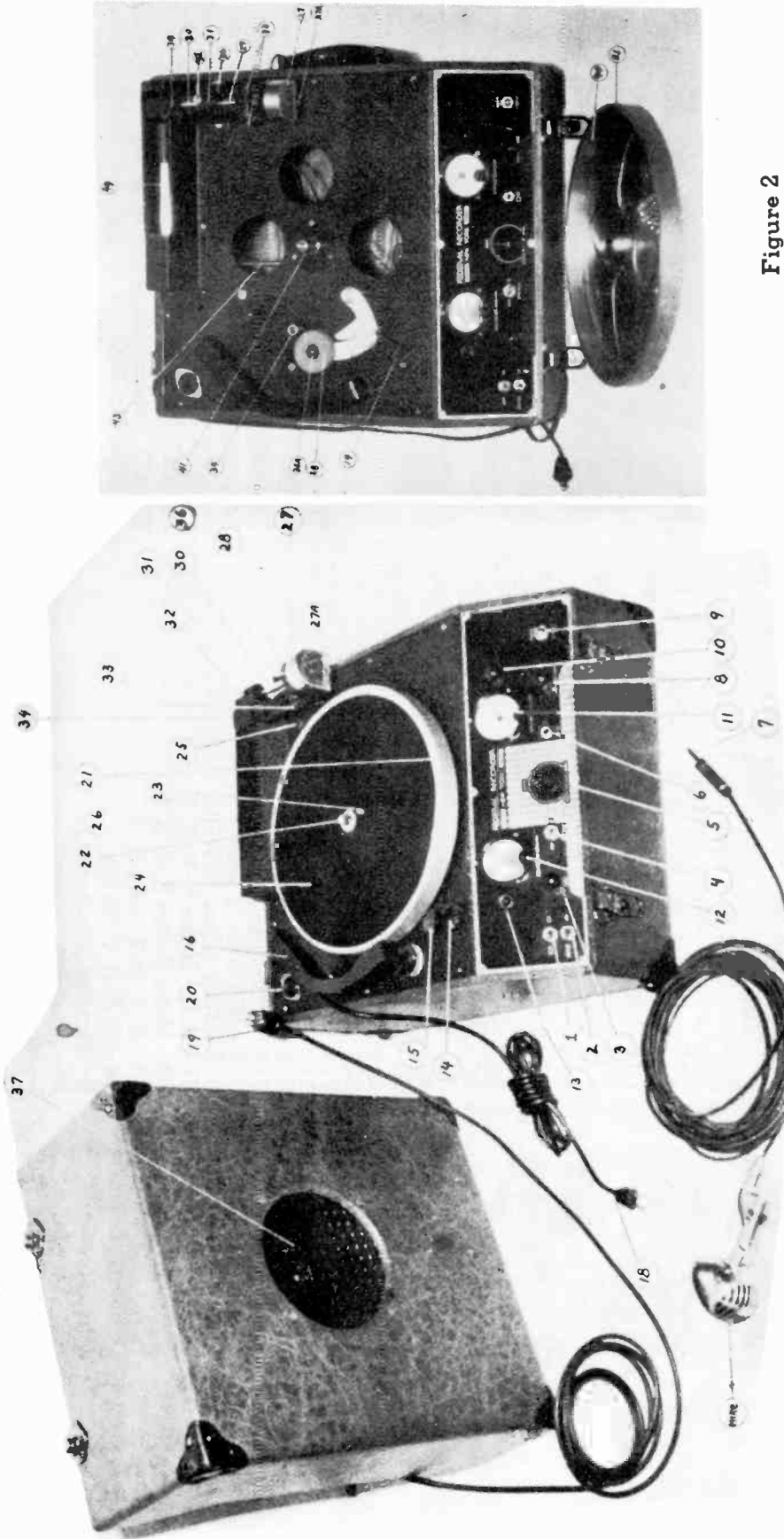


Figure 1

- 1—Switch "Amp"—"ON".
- 2—Switch "Motor"—"ON".
- 3—Tone Control.
- 4—Speaker Switch "OUT"—"IN".
- 5—Gain Control.
- 6—Mike Jack.
- 7—Mike Plug.
- 8—Radio Volume.
- 9—Switch "Radio"—"Pickup".
- 10—Station Selector Tuning Knob.
- 11—Station Selector Dial.
- 12—Monitoring Meter.
- 13—Pilot Lamp.
- 14—Pulley Lever.
- 15—Pulley Lever Knob.
- 16—Pickup.
- 18—A. C. Line Cord and Plug.

- 19—Speaker Cable and Plug.
- 20—Speaker Socket.
- 21—Turntable.
- 22—Center Thumb Nut.
- 23—Drive Pin.
- 24—Felt Pad.
- 25—Antenna Binding Post.
- 26—Lead Screw Cover.
- 27—Cutting Head.
- 27A—Cutting Head Needle Thumb Screw.
- 28—Cutting Head Bracket.
- 30—Balance Rod.
- 31—Balance Weight.
- 32—Balance Weight Thumb Screw.
- 33—Cutting Head Pivot Screw.
- 34—Cutting Head Arm.
- 36—Cutting Head Rest Thumb Screw.
- 37—Speaker Protective Grill.

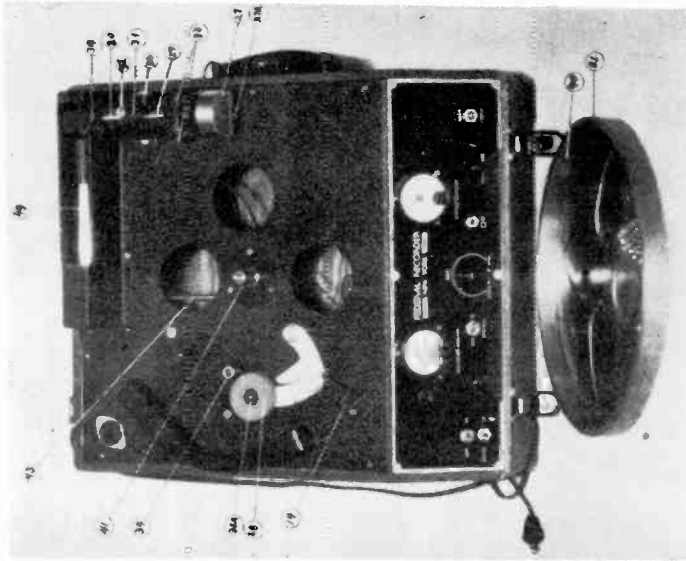


Figure 2

- 14—Pulley Lever.
- 21—Turntable.
- 27—Cutting Head.
- 27A—Cutting Head Needle Thumb Screw.
- 29—Cutting Head Adjusting Spring.
- 30—Balance Rod.
- 31—Balance Weight.
- 32—Balance Weight Thumb Screw.
- 33—Cutting Head Pivot Screw.
- 34—Cutting Head Arm.
- 36—Cutting Head Rest Thumb Screw.
- 38—Rubber Pulley.
- 38A—Rubber Pulley Bearing.
- 39—Motor Shaft Pulley.
- 40—Inner Race of Spindle.
- 41—Spindle (beveled part).
- 43—Shaft Out of Gear Box.
- 49—Cutting Arm Guide Rod.

MODEL PR-12

# Circuit Diagram Legend

- LA—Antenna Transformer.
- LR1—First R. F. Coil.
- LR2—Second R. F. Coil.
- C1—8-8 Mfd First Section Filter.
- C2—8-8 Mfd Second Section Filter.
- C3—5 Mfd 25 Volt Cathode By-Pass Condenser (Mike Amp.).
- C4—5 Mfd 25 Volt Cathode By-Pass Condenser (6N7).
- C5—1—600 Volt Coupling (To Grid of T3).
- C6—1—600 Volt Coupling (To Grid of T4).
- C7—.01—400 Volt Coupling (Mike Amp. to Grid).
- C8—.01—400 Volt Coupling (Det. to Amp.).
- C9—.1—200 Volt By-Pass (R. F. Coil).
- C10—.1—200 Volt By-Pass (Det. Coil).
- C11—.001—600 Volt Antenna Series Condenser.
- C12—.0005—400 Volt Det. Plate Condenser.
- C13—.1—400 Volt A. C. Line to Ground By-Pass.
- R1—2000 Ohms 5 Watts.
- R2—15000 Ohms 2 Watts.
- R3—5 Meg 1/4 Watt.
- R4—5 Meg 1/4 Watt.
- R5—.5 Meg 1/4 Watt.
- R6—.25 Meg 1/4 Watt.
- R7—.25 Meg 1/4 Watt.
- R8—.1 Meg 1/4 Watt.
- R9—.1 Meg 1/4 Watt.
- R10—.1 Meg 1/4 Watt.
- R11—50,000 Ohms 1/4 Watt.
- R12—15,000 Ohms 1/4 Watt.
- R13—1500 Ohms 1/4 Watt.
- R14—1500 Ohms 1/4 Watt.
- R15—100 Ohms 1/4 Watt.
- R16—60 Ohms 1/4 Watt.
- R17—3500 Ohms 1/4 Watt.
- S1—Amp. Switch S. P. S. T.
- S2—Motor Switch S. P. S. T.
- S3—D. P. D. T. Switch.
- S4—D. P. D. T. Switch.
- R—Rectifier (Monitoring).
- M—Monitoring Meter.
- J—Mike Jack.

- TR1—Power Transformer, General Transformer 7F37.
- TR2—Output Transformer, Kenyon S.
- T1—First Audio.
- T2—Second Audio.
- T3—Power Output.
- T4—Power Output.
- T5—First R. F.
- T6—Second R. F.
- T7—Detector.
- T8—Rectifier.

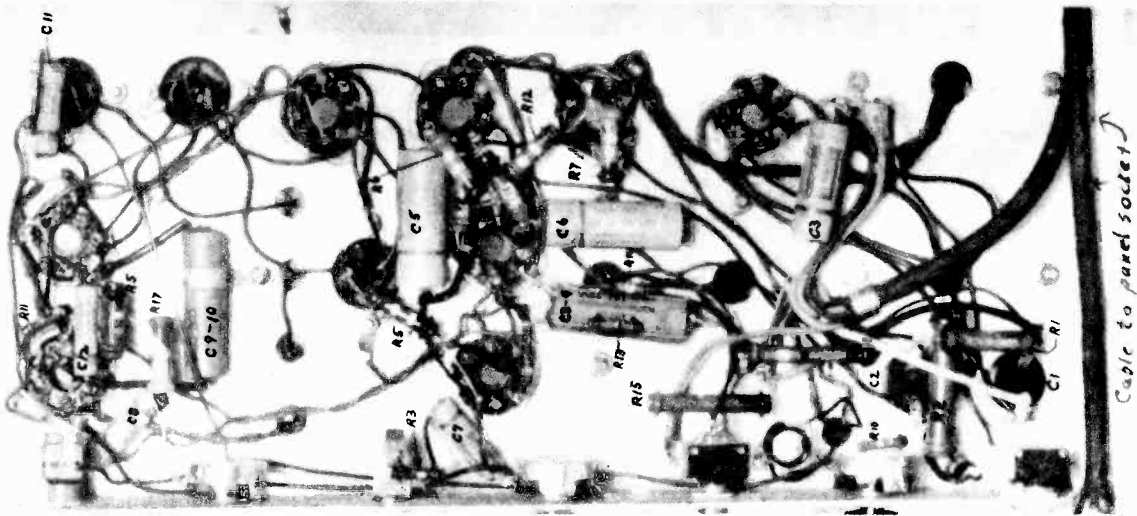


Figure 4



Figure 5

## TUBES

- T1—6F5 Microphone amplifier stage or pre-amplifier.
- T2—6N7 Second amplifier stage.
- T3—6N6G Power stage.
- T4—6N6G Power stage.
- T5—6K7 R. F. Amplifier.
- T6—6K7 R. F. Amplifier.
- T7—6J7 Detector stage (up to serial No. 800) 6F5 after No. 800.
- T8—5V4G Rectifier.
- 56—Power Transformer.
- 57—Tuning Condenser.

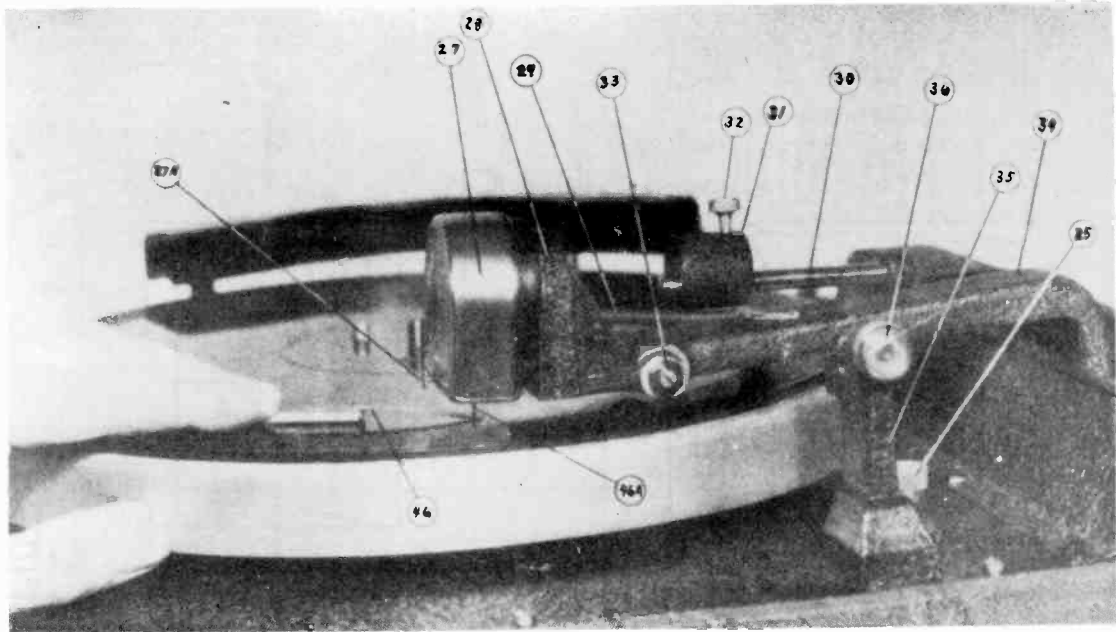


Figure 6

- |                                      |                                   |
|--------------------------------------|-----------------------------------|
| 27—Cutting Head.                     | 32—Balance Weight Thumb Screw.    |
| 27A—Cutting Head Needle Thumb Screw. | 33—Cutting Head Pivot Screw.      |
| 28—Cutting Head Bracket.             | 34—Cutting Head Arm.              |
| 29—Cutting Head Adjusting Spring.    | 35—Cutting Head Rest.             |
| 30—Balance Rod.                      | 36—Cutting Head Rest Thumb Screw. |
| 31—Balance Weight.                   | 46—Depth Gauge.                   |
|                                      | 46A—Cutting Needle.               |

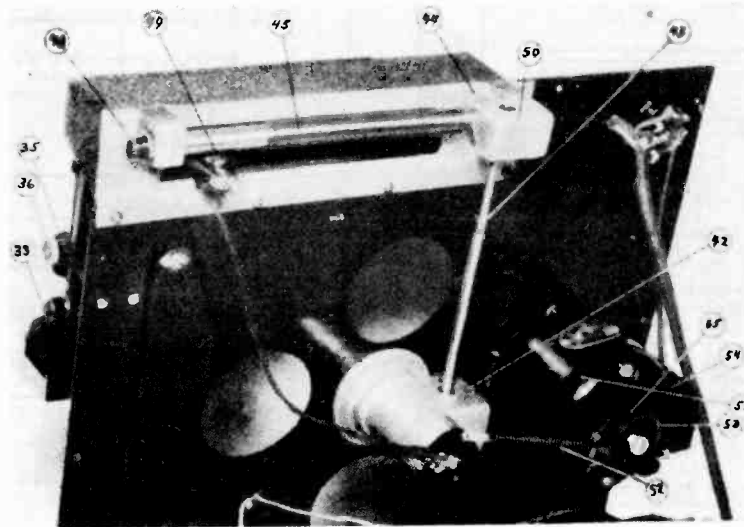
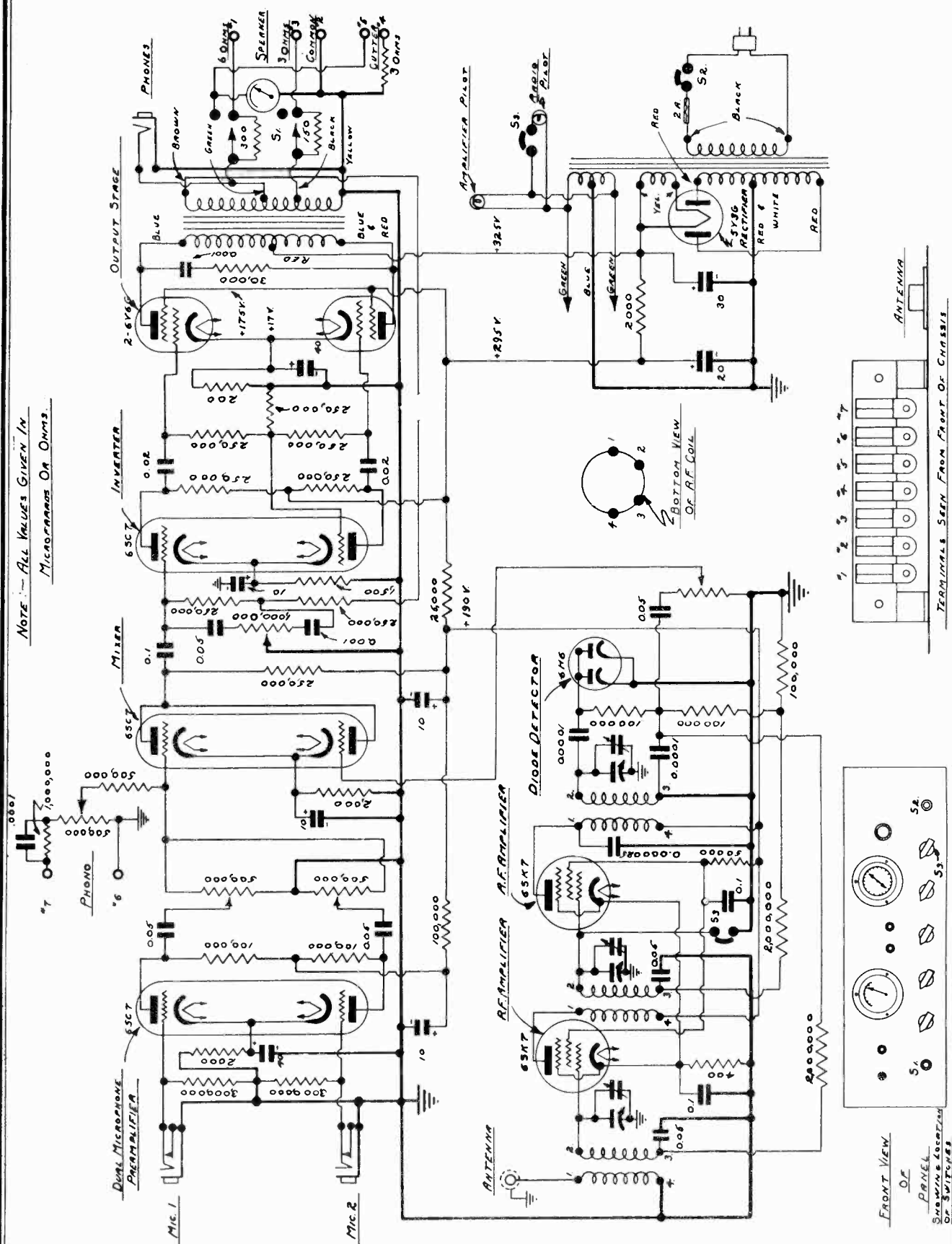


Figure 7

- |                                   |                             |
|-----------------------------------|-----------------------------|
| 33—Cutting Head Pivot Screw.      | 47—Lead Screw Finger.       |
| 35—Cutting Head Rest.             | 48—Lead Screw Pivot Points. |
| 36—Cutting Head Rest Thumb Screw. | 50—Grease Retaining Cup.    |
| 42—Gear Housing.                  | 51—Motor.                   |
| 43—Shaft Out of Gear Box.         | 52—Motor Supporting Spring. |
| 44—Fibre Gear.                    | 53—Motor Rubber Mounts.     |
| 45—Lead Screw.                    | 54—Motor Mounting Bracket.  |
|                                   | 55—Motor Clamping Rings.    |

MODEL 12LP,  
Little Pro

NOTE: - ALL VALUES GIVEN IN  
MICROGRAMS OR OHMS.



IMPORTANT INSTRUCTIONS

Regular phonograph speed of 78 RPM is obtained when rubber motor pulley is in standard position with the larger diameter at top. For 33-1/3 RPM, remove the little spring at top, lift up pulley, and replace with small diameter at top. Pointer lever can then be moved to "33" as marked on plate. Be sure to replace spring before starting motor. Always lock roller arm so that it will not move when machine is in operation

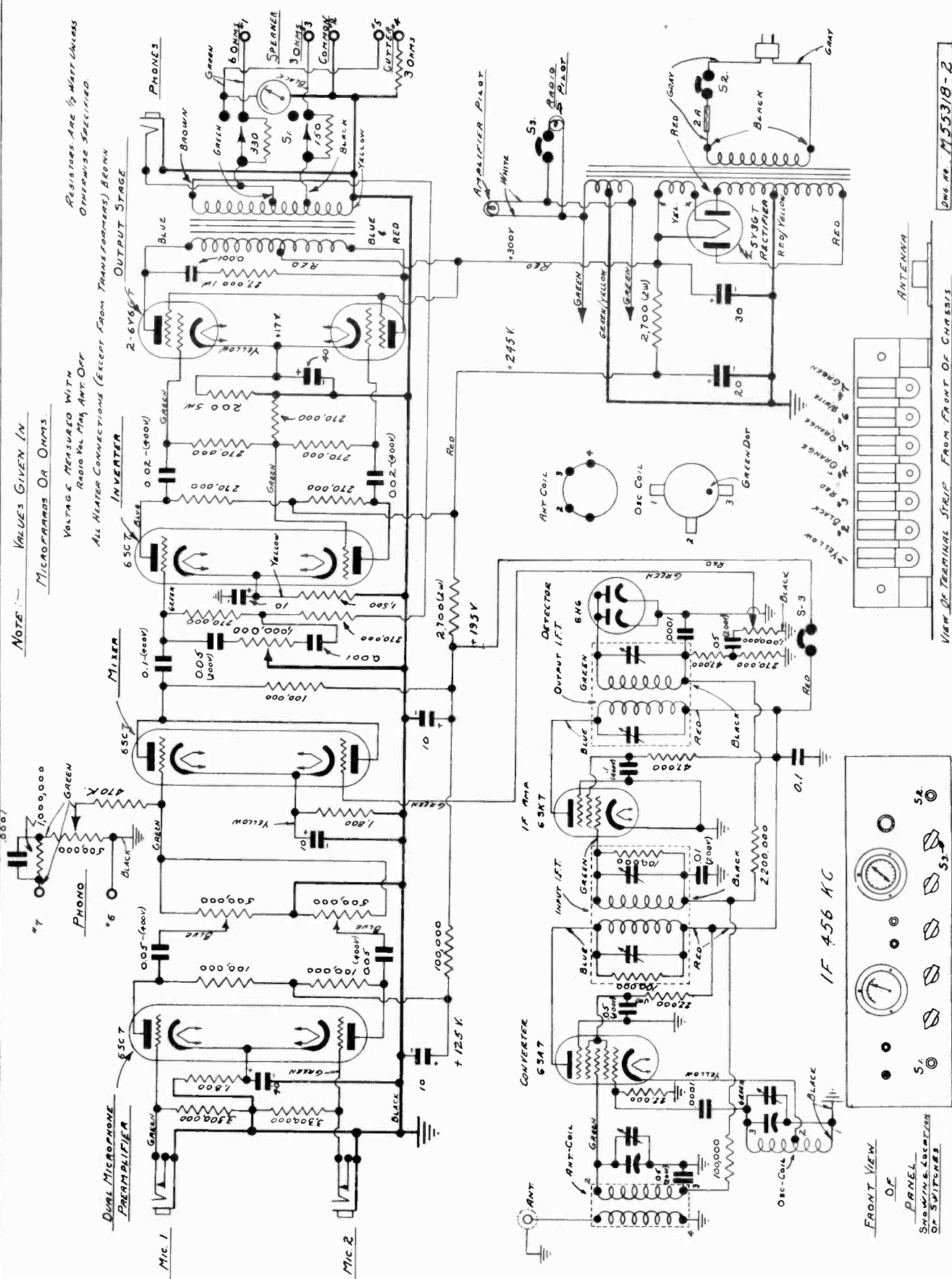
In playing commercial records, it is not necessary to remove the extra pin on the turntable. Simply place the record in position and the pin will be depressed into the turntable. Be sure when placing a blank disk on the turntable for recording that one of the three holes fits over this extra pin. This prevents the disk from slipping.

Be sure to start the turntable revolving when you engage the rubber motor pulley. This special alloy steel 17-lb. turntable is made extra heavy so that its flywheel action improves the quality of recordings. Starting it by hand prevents excessive wear on the rubber pulley.

REPLACEMENT PARTS FOR NEW "LITTLE PRO" FEDERAL RECORDER

<u>Part No.</u>	<u>Description</u>
28943	..Speaker Unit (10" Jenssen).....
28841	..Pick-up Arm.....
29311	..Drive Pulley, Complete Assembly.....
29310	..Drive Pulley Shaft.....
29303	..Drive Pulley Link.....
28867	..Hair Spring Fastener.....
28881	..Motor Switch.....
29198	..Cast Iron Turntable, Complete Assembly....
29302	..Turntable Shaft.....
28896	..Record Drive Button.....
28945	..Spring for Record Drive Button.....
28836	..Overhead Drive, Complete Assembly.....
28837	..Tie Bar.....
28857	..Drive Shaft.....
28846	..Worm.....
28812	..Worm Spindle Cap.....
28983	..Lead Screw (L.H. Thread) Complete Assembly
28875	..Collar.....
28890	..Stop Ring for Cutting Head.....
55076	..Cutting Head (Webster R-84).....
28845	..Worm Gear.....
28879	..Pivot Screw, Cone Point, Slotted.....
28884	..Black Bakelite Knob.....
28806	..Cutting Head Mounting Bracket.....
28808	..Cutting Head Hinge Plate.....
28947	..Carriage Stop Stud.....
28986	..Tension Device, Complete Assembly.....
28877	..Tension Screw.....
28840	..Spring Extension.....
28861	..Tension Spring.....
28959	..Electrical Connection Socket.....
28957	..Electrical Connection Plug.....
29333	..Microphone (Shure 98-13B)..... and Base
50948	..Microphone Plug.....
56003	..25-foot Speaker Extension Cord Assembly
55018	..Rectifier Tube - 5Y3G - (1 used).....
55019	..Output Tube - 6V6GT - (2 used).....
28172	..Amplifier Tube - 6SK7 - (2 used).....
29175	..Amplifier Tube - 6SC7 - (3 used).....
55020	..Detector Tube - 6H6 - (1 used).....

MODEL 12LP,  
Revised



ONE NO. M55318-2

VIEW OF TERMINAL STRIP FROM FRONT OF CHASSIS

FRONT VIEW OF PANEL SHOWING LOCATION OF SWITCHES

Cutter angle

The cutter head may be adjusted by loosening screw 6 in Fig. 1 and moving recording head until stylus is in a position to produce a reflection from a blank record as shown in Fig. 4. For 90°, adjustment to angles of 87° to 89° may perform better with some stylii.

Depth of cut

This is the most important single item that will mean the difference between good and bad recordings. The depth of cut can be adjusted by turning tension screw 1 in Fig. 3. clockwise to decrease depth, counterclockwise to increase depth. This adjustment can then be locked by turning screw 2. Fig. 3. clockwise. The depth should be such that the width of the space between grooves is the same as the width of the groove as shown in Fig. 5. It is very important that this relationship be maintained. If the walls are narrower than the groove, there is danger of either cutting into adjacent grooves, or deforming the wall between grooves, resulting in echoes and other spurious responses. If the groove is not deep enough, that is, the walls are wider than the groove, there is danger that the pickup will not stay in the groove.

The depth of cut may be observed with a magnifying glass or small microscope.

Alignment of recorder mechanism with respect to record surface

The recorder mechanism should be almost parallel to record surface. For best results the end nearest the outside of record should be approximately 1/64" closer to record than at the center. The object of doing this is to maintain the depth of cut at the outside and the inside of record approximately the same.

Before proceeding with alignment of the mechanism, make sure that turntable is level with edge of idler pulley as shown in Fig. 2. If this is not so, loosen screws 1, 2, and 3, (Fig. 7) and then adjust screw 4 until turntable is at proper level. Screws 1, 2, and 3 should now be tightened. Spindle 3 (Fig. 3 and 6) should fit in its socket without wobbling. As this pin wears, the fit should be checked and adjusted by raising or lowering the spindle by means of screw 5 and locked by screw 6, (Fig. 7).

Place a blank record on the turntable and then place recorder mechanism on center pin of turntable, turning knob 4 (Fig. 3) until mechanism rests on the record. The cutter should be in raised or non-recording position. Referring to Fig. 6, mounting bracket 4 should be centered in end bracket 5 and should turn freely without binding. This can be adjusted by means of nuts 1 and screws 2. Loosen set screw 6 and raise or lower mechanism by turning set screw 7 clockwise or counterclockwise until the distance between the guide rod and the record near the outside of the turntable is 1/64" greater than the distance near the center. The turntable should now be set in motion and the set screw wrench inserted in hole 8 in spindle 3, and spindle turned until the recorder mechanism can be lifted from and lowered on center pin of turntable freely or until all signs of mechanical noise or vibration such as knocking disappear. Set screw 6 should now be tightened.

Center pin

The center pin in the turntable may be pressed out and replaced. Replacement may be desirable after considerable use due to wear caused by slipping records on and off. A snug fit is necessary for recording and re-



MODEL 12LP,

Revised

producing records without "wow". The pin furnished is 0.2800  $\pm$  .0001 inch diameter. It may be replaced by a pin 0.2835  $\pm$  .0005 inch diameter if a snug fit is wanted in reproducing commercial shellac records.

#### Lubrication and maintenance

Points 7, 8, and 9 (Fig. 1) should be lubricated with a light high grade oil occasionally.

The worm gear and worm wheel on recorder mechanism should be lubricated every two or three months with a light grease such as Vaseline. Pivot bearings 9 and 10 (Fig. 6) should be lubricated with a drop of light machine oil every two or three weeks.

The motor should be lubricated every two or three months by dropping a few drops of light high grade oil in hole 7 (Fig. 7).

The lead screw and guide shaft should be cleaned with Carbona. This should be done quite frequently since dust and dirt will accumulate on these parts and hinder operation of machine. If the amplifier becomes noisy, the tubes and all plug connections should be checked. The idler pulley and rim of turntable should be kept clean and free of oil and grease.

Caution - Never replace fuse with another of higher rating.

#### TECHNICAL DATA - Electrical

Power supply rating (complete recorder): 105-125 V, 60 c.p.s.

Power supply rating: 105-125 V  
50-60 c.p.s.  
82 watts

Fuse: Two amperes located under chassis.

Tubes:	Converter	RCA 6SA7
	I.F.	" 6SK7
	Detector	" 6H6
	Mic. Amplifier	" 6SC7
	Mixer	" 6SC7
	Inverter	" 6SC7
	Power Output	" 2-6V6-GT/G
	Rectifier	" 5Y3-GT/G

Pilot lamps: 2 Mazda #46  
6.3 V, 0.25 A.

Radio: Superheterodyne

Frequency range: 540-1670KC

Intermediate frequency: 456KC

Gain amplifier: Mic. 1) -- 3900  
Mic. 2)

Phono -- 10.3

Frequency response: 50-10,000 c.p.s.

Frequency compensation (equalizer):

High freq. boost +13.5 db at 9000 c.p.s.

" " cut -25 db at 9000 c.p.s.

Input impedances: Mic. 1 3 meg

Mic. 2 3 meg

Phono has built-in  
equalizer for crystal pickup.

Radio built in.

Maximum input levels:

Mic. 1 and 2 - 10db\* }  
Phono + 16db\* } 1000 c.p.s.

Output impedances: 3 and 6 ohms

Power output: 9 watts undistorted  
11 watts maximum

Speaker: 10" pm dynamic  
Voice coil imp.  
6 ohms at 400 c.p.s.

Cutter Head: Magnetic  
Impedance 2.5 ohms  
at 400 c.p.s.  
3 ohm series equalizer  
built into amp. re-  
quires 3.5 V. r.m.s.

Pickup: Crystal 1 1/8 oz. pressure

Microphone: Crystal

\* 0.001 W-Zero level

TECHNICAL DATA - Mechanical

Dimensions: 18 1/2 x 17-1/8 x 14"

Net Weight: 64.5 lbs.

Turntable: size 12" diameter. Special alloy steel wt. 14 lbs.

Motor: Constant speed induction 1550 r.p.m., Power Output, 12 watts.

Speed: 78 or 33-1/3 r.p.m.

Recording lines: 100 per inch

Direction of feed: Std. outside in. Available on order inside out.

Center Pin: 0.280 +.000 inch diameter (removable.)  
-.001

REPLACEMENT PARTS LIST

<u>Name and Description</u>	<u>Part No.</u>
Jack, microphone input	55052
Jack, monitor	55053
Knob, radio dial	55054
Knob, bar	55055
Sockets, tube	48034
Sockets, antenna	55059
Plug, antenna	55060
Fuseholder	55056
Fuse, 2 ampere	48294
Plug, amplifier and motor power	29323
Shell, amplifier and motor power plug	29324
Resistor, variable 500 K, microphone and phonograph volume control	55015
Resistor, variable, 1 megohm, equalizer control	55017
Resistor, variable, 1 megohm with switch, radio volume control	55129
Resistor, 1 watt 3.3. megohm	45227
" " 2.2 "	45225
" " 1.0 "	50891
" " .47 "	45228
" " .27 "	45224

PAGE 20-14 FEDERAL RECORDER

MODEL 12LP,  
Revised

"	1/2"	"	.10	"		55034
"	1/2"	"	47,000	ohm		45223
"	1"	"	27,000	"		45234
"	1"	"	22,000	"		45226
"	1/2"	"	22,000	"		45232
"	1/2"	"	2,700	"		45233
"	1/2"	"	1,800	"		45229
"	1/2"	"	1,500	"		55037
"	1/2"	"	330	"		45230
"	1/2"	"	200	"		55042
"	1/2"	"	150	"		55067
"	1"	"	3	"		55074
<u>Capacitor</u>						
"	0.01		mfd	200 volt paper		56313
"	0.05		"	" " "		56309
"	0.02		"	400 " "		43535
"	0.05		"	" " "		43591
"	0.1		"	" " "		43660
"	0.0001		"	500 " mica		55010
"	0.001		"	500 " "		55011
"	30-20-10-40		"	electrolytic		55012
"	10-20-20		"	" "		55013
"	50		"	25 volt "		47760
"	variable gang, tuning					55130
Transformer, power						
"						55022
" , output						
"						55021
Switch, amplifier, SBST toggle						
"						55024
" output, DPDT "						
"						55025
Meter, recording						
"						55320
Lamp, radio and amplifier pilot, 6.3 V. #46						
"						55026
Coil, antenna						
"						55131
" oscillator						
"						55132
" input IF						
"						55133
" output IF						
"						55134
Switch, motor						
"						28881
Motor						
"						28843
Pulley, motor, 60 cycle						
"						56021
"			50	"		55118
"			60	RPM		55470
Screw, set, motor pulley						
"						28871
Spring, motor mounting						
"						28982
Idler pulley						
"						29311
Shaft, idler pulley						
"						45020
Nut, idler pulley						
"						55472
Lead screw assembly - outside - inside						
"						55338
Shaft assembly, overhead drive - outside - inside						
"						56031
"					inside - outside	55436
Lead screw and collar assembly - inside - outside						
"						55437
Spring, cutting head tension						
"						28861
Cutting head assembly						
"						55100
Pickup arm assembly						
"						45237
Center pin 0.2800 $\pm$ .000						
"					-.001 diameter	29199
Center pin 0.2835 $\pm$ .0005 inch diameter						
"						55577

MODEL 12LP,  
Revised

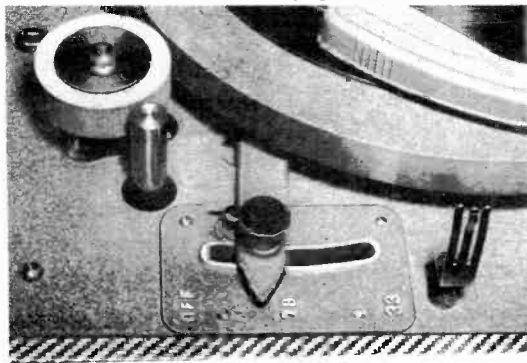
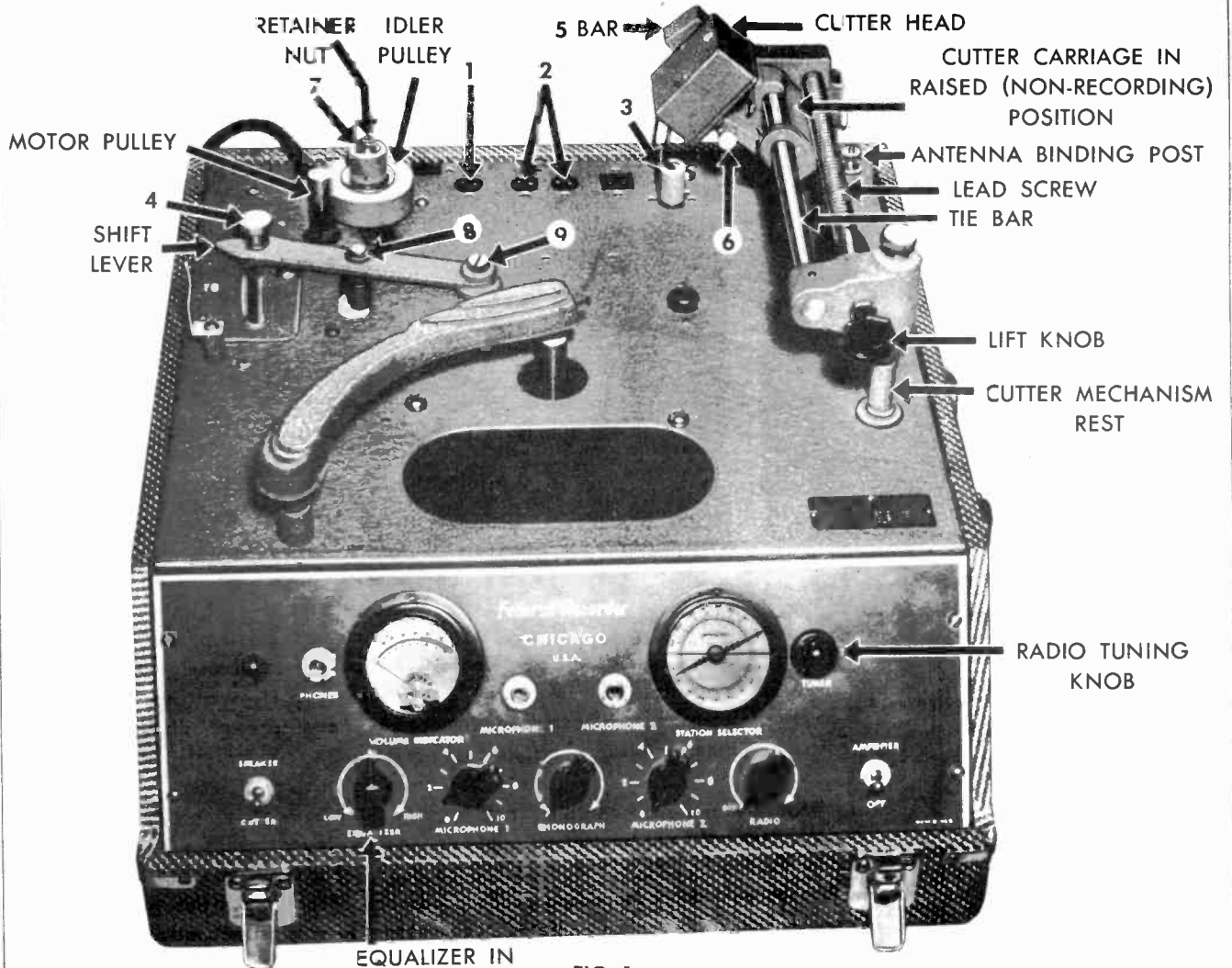


FIG. 2 - 78 R.P.M.

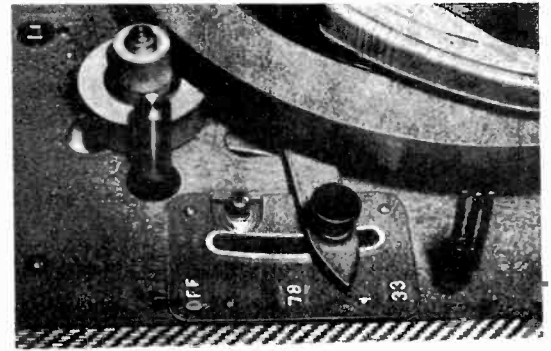
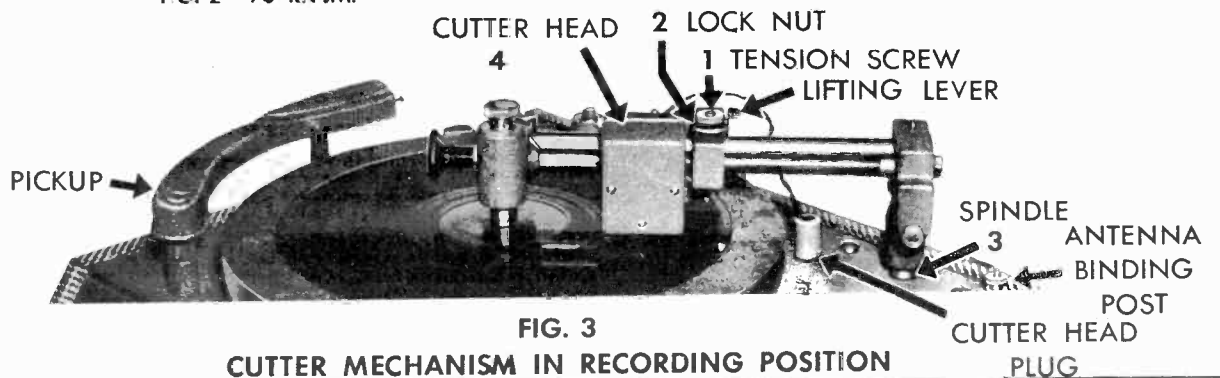


FIG. 3 - 33 1/3 R.P.M.



MODEL 12LP,  
Revised

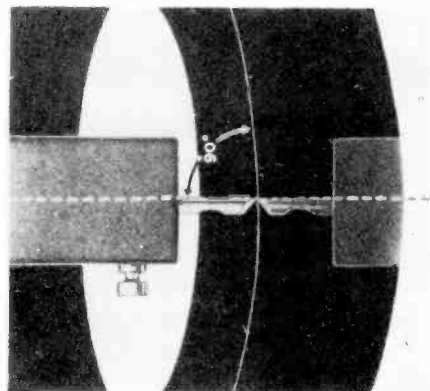


FIG. 4  
CORRECT POSITION OF STYLUS

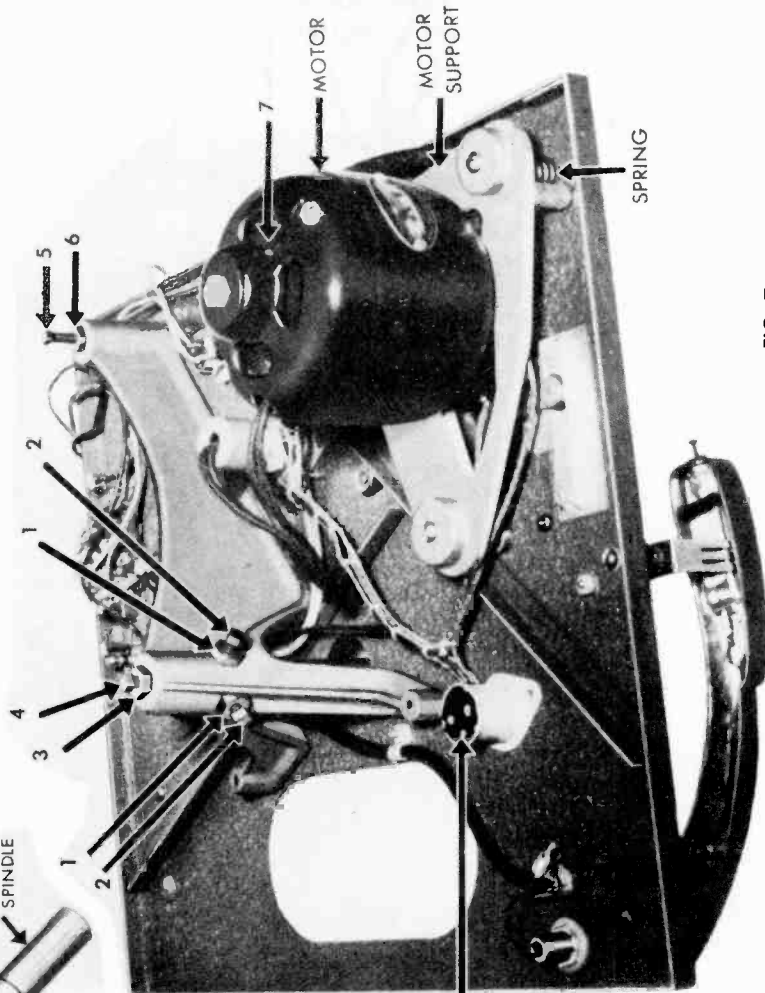


FIG. 7

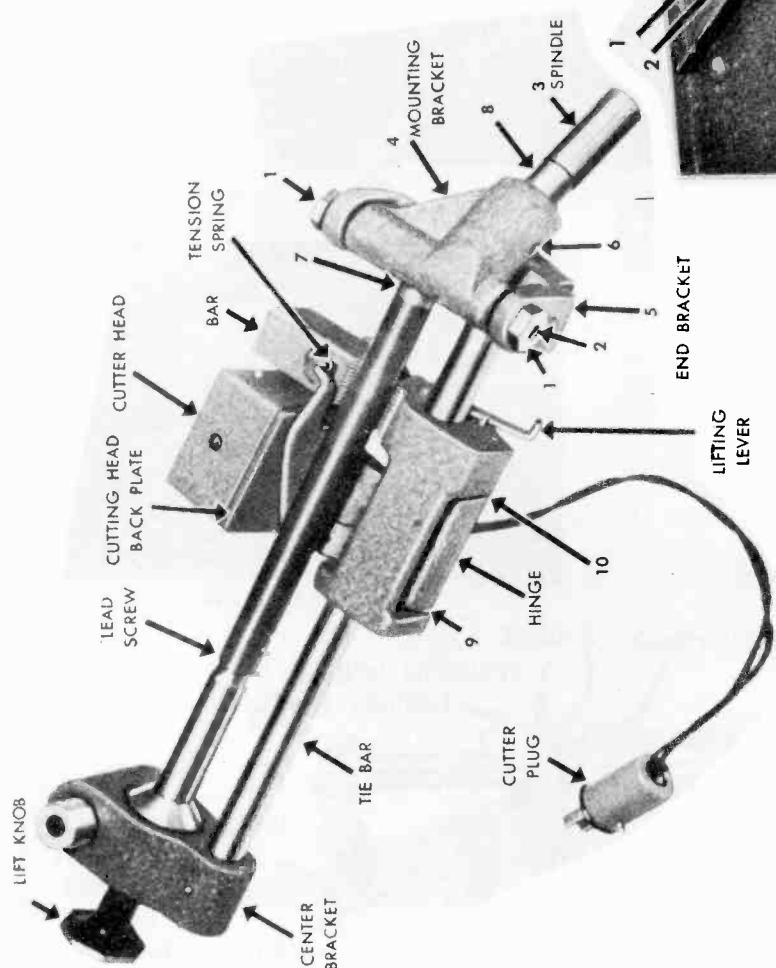
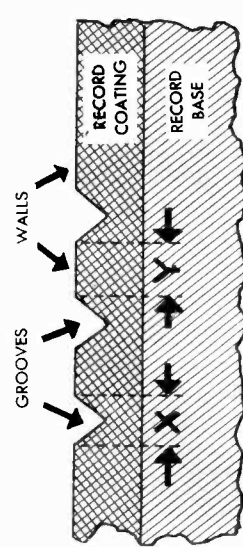


FIG. 6  
RECORDER MECHANISM



X SHOULD BE LESS THAN OR  
EQUAL TO Y

FIG. 5

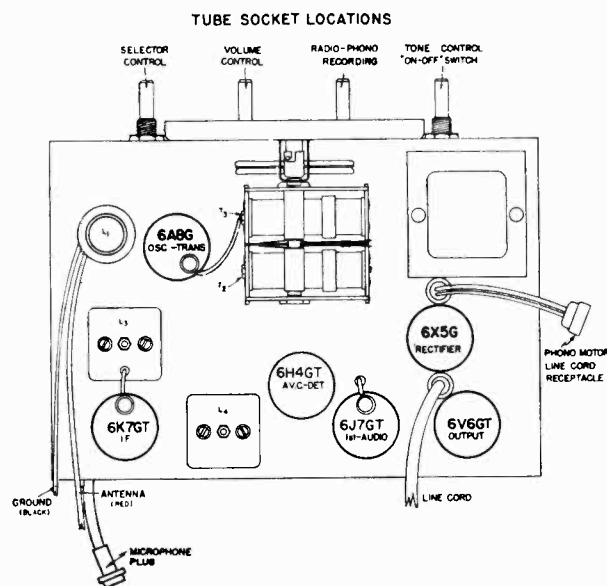
## Instructions for Installation and Operation

### For Model 101 — Radio, Phonograph and Recorder Combination

This receiver consists of a six-tube superheterodyne phono-radio and recorder combination. An improved filter circuit, automatic volume control, a beam power output tube and oversized electro-dynamic speaker are incorporated for improved performance. The frequency range covered is standard broadcast, 530 to 1700 kilocycles. This range covers all of the standard American broadcast stations and some of the low-frequency police transmitters.

#### TUBES:

6A8G, 6K7GT, 6H4GT, 6J7GT, 6V6GT, 6X5G.



#### ANTENNA AND GROUND CONNECTIONS:

The leadin (wire running from outside antenna to radio) should be spliced to the antenna lead (red wire) at the rear of the cabinet.

A good ground connection is of real importance. Firmly secure a wire to a water or steam radiator pipe, by means of a "Ground Clamp" designed for the purpose. The pipe must be thoroughly scraped so that the clamp makes contact with bright metal. If no such ground is available, a wire clamped to a piece of galvanized pipe which has been driven a few feet into moist earth will serve. The ground wire should be spliced to the black lead at rear of cabinet.

#### PHONO - RADIO AND RECORDING SWITCH:

The knob of this switch is marked with the numbers from one to five.

To receive radio programs set the number 5 opposite the small brass marker above the knob.

To play phonograph records or home recordings set the number 4 opposite the brass marker.

To make a record of a radio program set the number 3 opposite the brass marker.

To make a record of speech or music picked up on the microphone furnished with the instrument set the number 2 opposite the brass marker.

To use the equipment as a public address system set the number 1 opposite the marker.

MODEL 101

## IMPORTANT INSTRUCTIONS FOR HOME RECORDING

### INSTRUCTIONS FOR HOME RECORDING:

First place a recording needle in the head of the recorder arm. To do this loosen set-screw projecting from end and insert needle in hole on underside of recorder arm. Make sure that the set-screw is tight so that the needle is firmly held in place. Be sure that flat side of needle point faces towards the rear of cabinet. Place a blank disc on the turntable, making sure that the small pin on the turntable projects through one of the three small holes near the center of the disc. This is absolutely necessary to prevent the disc from slipping and ruining the recording.

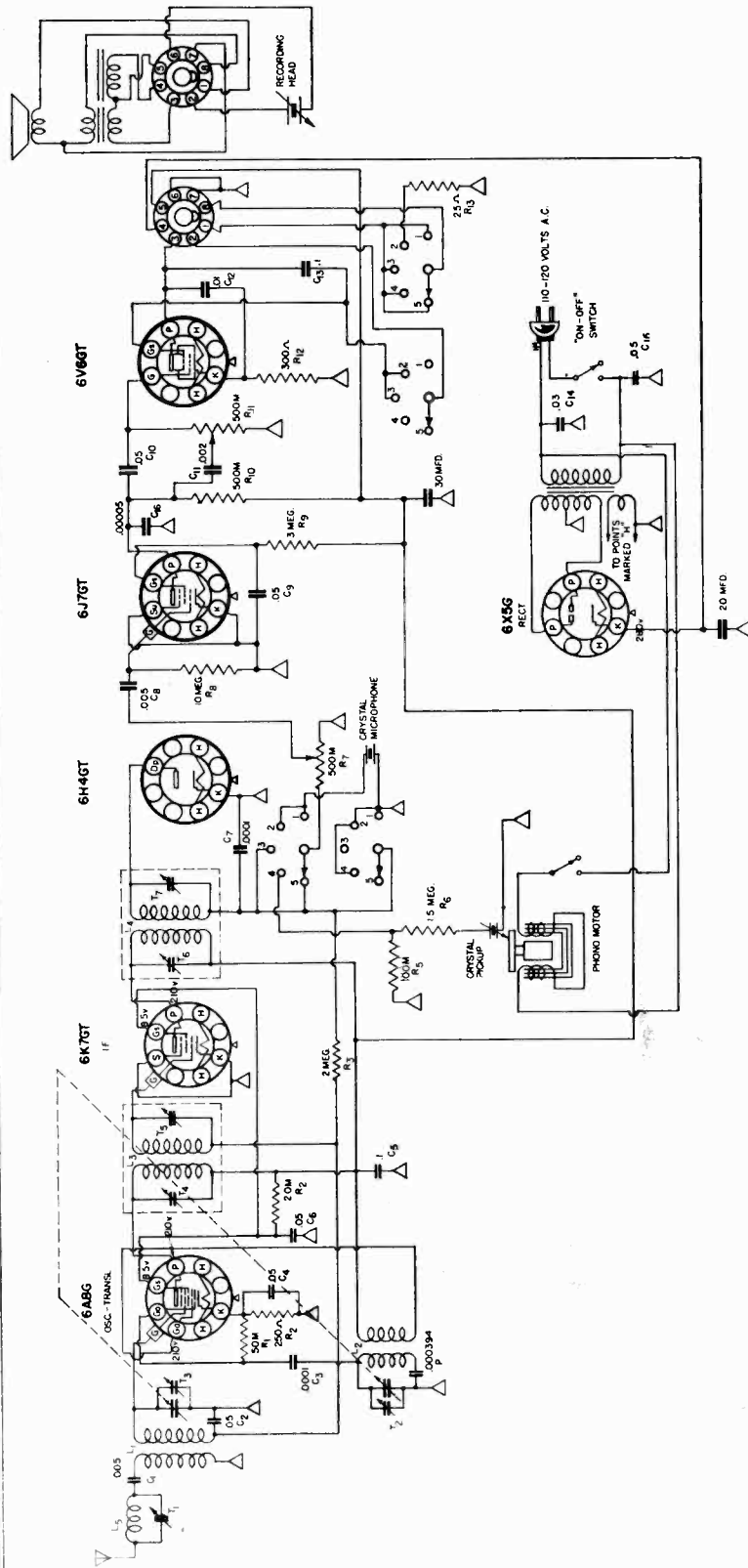
If you wish to record a radio program set the "Phono-Radio Record" switch so that the number "5" is opposite the brass marker above the knob. Tune in the desired radio program and advance the volume control so that the program is heard loudly, but so that it is not rough or distorted. Remember the record will sound the same as the program. Noise or static if present will be recorded along with the music. Having adjusted the radio controls, set the "Phono-Radio Record" switch knob so that the number "3" is opposite the marker. The program will still be heard, but now the recording head is operating and the recording needle is vibrating in unison with the sound coming from the speaker. Raise the recorder arm and move it over the record, then lower the arm until the needle point almost touches the record. If the point is about one-quarter inch from the edge of the record lower the arm slowly and release it. If the position is not correct at the first trial, remember that the arm must be RAISED before the needle point can be relocated.

You are now recording the radio program on the record blank and the recorder will continue to operate without further attention until the needle reaches the label at the inside of the disc. When this point is reached, lift the recorder arm and return to its rest. Failure to do this will result in the needle cutting through the coating and digging into the disc, with possible injury to the recorder. During the time the recording is being made you will note a fine thread which piles up into a heap about  $\frac{1}{2}$  inch from the point at which the recording needle touches the record. This thread should be brushed lightly toward the center of the disc with a handkerchief or soft brush, and not allowed to collect under recording needle.

To play the record you have just made set the "Phono-Radio Record" switch knob so that the number "4" is opposite the marker, and proceed to play the same as any phonograph record.

**CAUTION—NEVER** play home recordings with a needle that has been used to play regular records. To do so may ruin the recording.

To record from microphone, insert microphone plug into connector as shown in drawing. Set "Phono-Radio Record" switch so the number "1" is opposite the marker. Speak into microphone and advance volume control until speech is reproduced from the loud speaker in the set. This is simply a test to indicate that the microphone is operating properly. Next set "Phono-Radio Record" switch so that the number "2" is opposite the marker. Turn volume control to right as far as possible. The recording head is now functioning and you proceed to make a recording of voice or music from the microphone in exactly the same manner as the radio recording was made. In recording speech keep microphone at least six inches from your mouth and speak in a normal tone of voice.



PARTS LIST

PART No.	DESCRIPTION	SCHEMATIC LOCATION
104518	Cabinet—walnut table	
104117	Clip—grid	
102854	Coil—antenna	L1
102866	Coil—oscillator	L2
103313	Coil—i.f. input transformer	L3
103514	Coil—i.f. output transformer	L4
103161	Coil—wave-trap	L5
101642	Condenser—variable	V
102048	Condenser—electrolytic dry, 20 mf, 450 volts	E1
102047	Condenser—electrolytic dry, 30 mf, 350 volts	E2
101910	Condenser—paper, fixed	P
101916	Condenser—.005, 400 volts	C1, C8
101917	Condenser—.05, 400 volts	C2, C4, C6, C9, C10
101921	Condenser—.0001, mica	C3, C7
101925	Condenser—.1, 400 volts	C5, C13
101919	Condenser—.002, 400 volts	C11
101936	Condenser—.01, 800 volts	C12
101927	Condenser—.05, 600 volts	C14
101928	Condenser—.03, 600 volts	C15
101821	Connector—microphone, female	
102444	Control—volume	R7
102444	Control—tone, with switch	R11
105574	Cord—power	
104040	Dial—scale	
104568	Dial—drum	
104220	Dial—escutcheon	
104518	Dial—cable and spring	
104117	Dial—pointer	
103969	Knob—volume control	
103967	Knob—phono radio-recording	
103968	Knob—on-off, tone	
103933	Knob—tuning	
104924	Lamp—pilot, No. 51	
105994	Leaflet—instruction	
105413	Needle cup	
102327	Resistor—50,000 ohms, 1/4 watt	R1
102323	Resistor—250 ohms, 1/4 watt	R2
102337	Resistor—2 megohms, 1/4 watt	R3
102336	Resistor—20,000 ohms, 1/4 watt	R4
102338	Resistor—100,000 ohms, 1/4 watt	R5
102329	Resistor—5 megohms, 1/4 watt	R6
102335	Resistor—10 megohms, 1/4 watt	R8
102326	Resistor—3 megohms, 1/4 watt	R7
102313	Resistor—1/2 megohm, 1/4 watt	R10
102316	Resistor—20 ohms, 1/2 watt, wire wound	R12
102333	Resistor—25 ohms, 2 watt, wire wound	R13
101881	Socket—pilot light	
101881	Socket—octal	
105932	Speaker—6", dynamic	
103730	Switch—radio-phonograph, recording	
103812	Switch—on-off, toggle	
101011	Transformer—power, 50-60 cycles	
101012	Transformer—power, 25 cycles	



MODELS 111, 116

ALIGNMENT PROCEDURE

GENERAL DATA

The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400 and 1720 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE

The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the Broadcast band should be aligned.

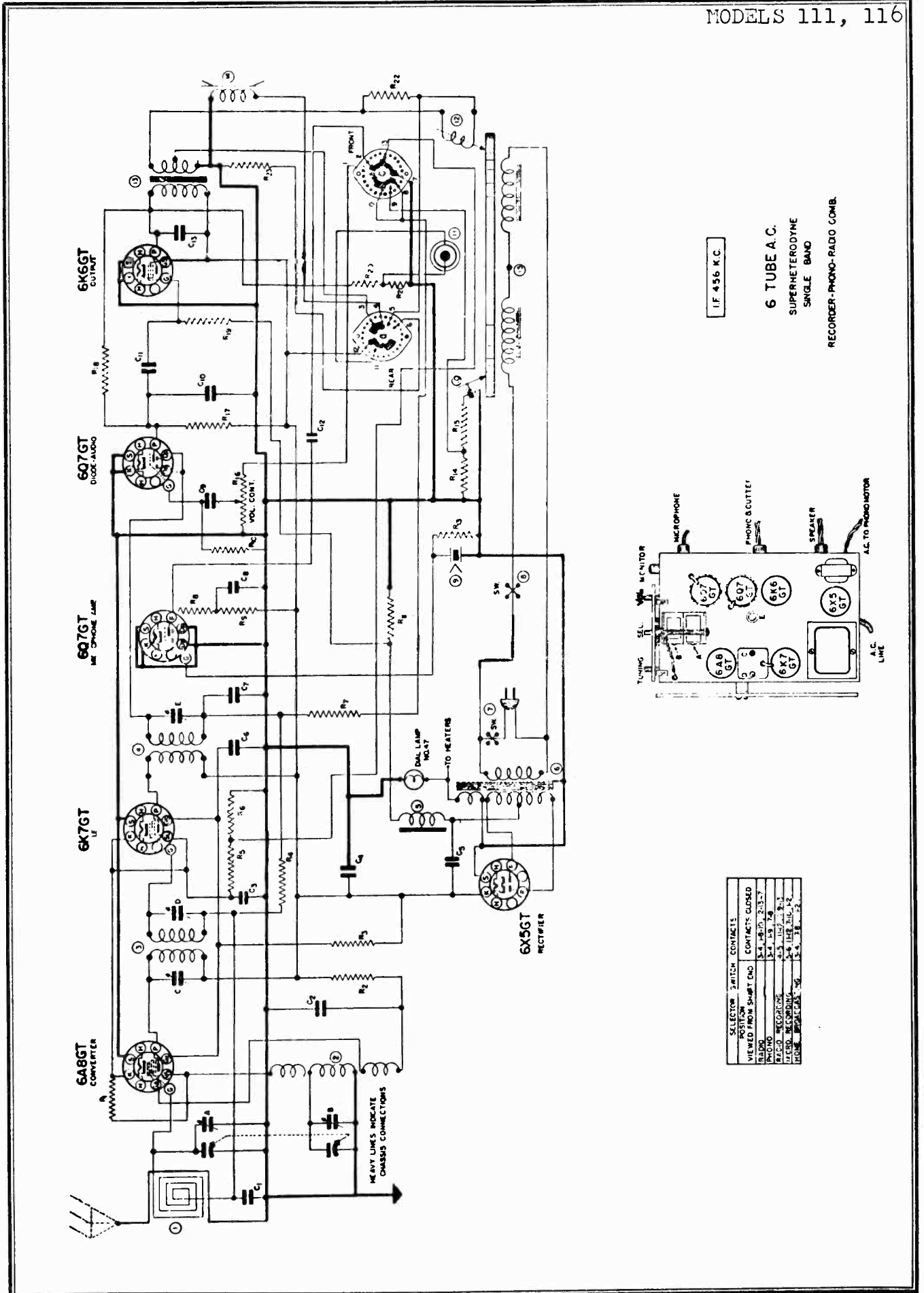
I.F. ALIGNMENT

With the gang condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (6A8GT) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis base. Align all three I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Connect the antenna to the generator through a 200 MMF dummy and the ground of the set (Black wire) to the generator ground. Set the dial and generator at 1720 KC. Align the BC oscillator trimmer for maximum output. Set the generator at 1400 KC and tune-in signal with the dial. Adjust antenna trimmer for maximum output. Next set the generator at 600 KC and tune in the signal with the dial to check if the gang condenser or coils have been damaged. This receiver requires no adjustment at this point as it employs a cut section gang.

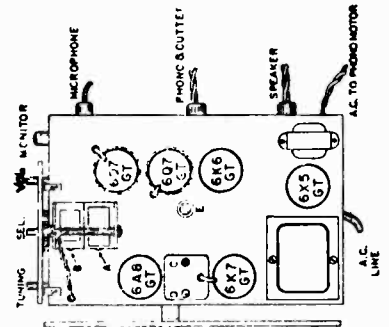
DIAG NO	PART NO	DESCRIPTION	DIAG NO	PART NO	DESCRIPTION	DIAG NO	PART NO	DESCRIPTION
R1	N-1260	50,000 OHM .5W 20%	C1	N-1345	.05 MFD. 200V	1	N-3464	LOOP ANTENNA COIL
R2	N-1127	20,000 OHM .5W 20%	C2	N-1345	.05 MFD. 200V	2	N-1452	OSCILLATOR COIL
R3	N-1474	25,000 OHM .5W 20%	C3	N-1479	.25 MFD. 200V	3	N-1598	1ST I.F. TRANSFORMER
R4	N-1262	1 MEGOHM .5W 20%	C4	N-3440	.15 MFD. 300V	4	N-3464	2ND I.F. TRANSFORMER
R5	N-1265	100 OHM .5W 10%	C5	N-3440	.15 MFD. 300V	5		SPEAKER FIELD (200 OHMS)
R6	N-1237	2,000 OHM .5W 20%	C6	N-1351	.1 MFD. 200V	6	N-3426	POWER TRANSFORMER
R7	N-1474	25,000 OHM .5W 20%	C7	N-1374	100 MMFD.	7		SWITCH ON VOLUME CONTROL
R8	N-1779	150,000 OHM .5W 20%	C8	N-1479	.25 MFD. 200V	8	N-820	PHONO MOTOR SWITCH
R9	N-1264	250,000 OHM .5W 20%	C9	N-1344	.01 MFD. 400V	9	N-3456	MICROPHONE
R10	N-1419	4 MEGOHM .5W 20%	C10	N-3454	.75 MMFD.	10		PICK-UP (ON N-3443)
R11	N-1263	250 OHM 1W 10%	C11	N-1344	.01 MFD. 400V	11	N-3389	NEEDLE MONITOR (G.E. N-7)
R12	N-1263	250 OHM .5W 20%	C12	N-1344	.01 MFD. 400V	12		CUTTING HEAD (ON N-3443)
R13	N-2189	4 MEGOHM .5W 20%	C13	N-3455	.004 MFD. 600V	13	N-3437	OUTPUT TRANSFORMER
R14	N-1779	150,000 OHM .5W 20%				14	N-3438	5" DYNAMIC SPEAKER
R15	N-1263	300,000 OHM .5W 20%				15	N-3443	PHONO MOTOR AND TURNTABLE
R16	N-3085	300,000 OHM VOL. CONT.						
R17	N-1377	200,000 OHM .5W 20%						
R18	N-1268	4 MEGOHM .5W 20%						
R19	N-1264	300,000 OHM .5W 20%						
R20	N-1779	150,000 OHM .5W 20%						
R21	N-3460	15 MEGOHM .5W 20%						
R22	N-3452	5 OHM .5W 10%						
R23	N-3454	4.5 OHM .5W 10%						



IF 456 K.C.

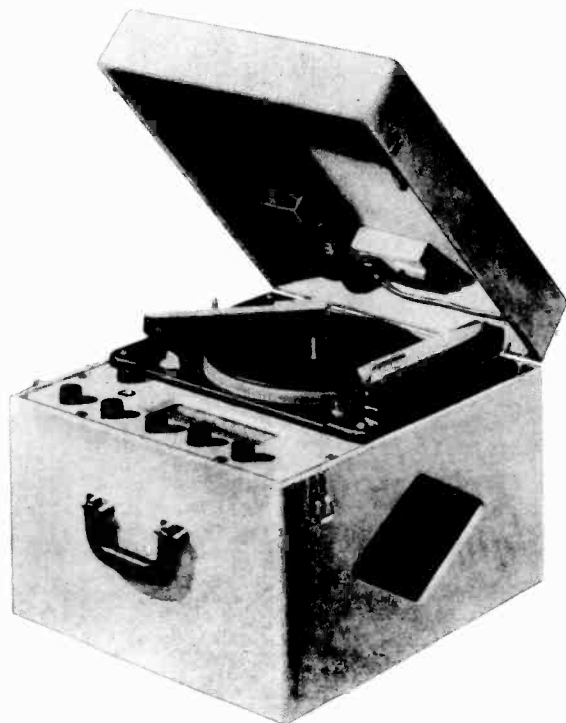
6 TUBE A.C.  
SUPERHETERODYNE  
SINGLE BAND

RECORDER-PHONO-RADIO COMB.

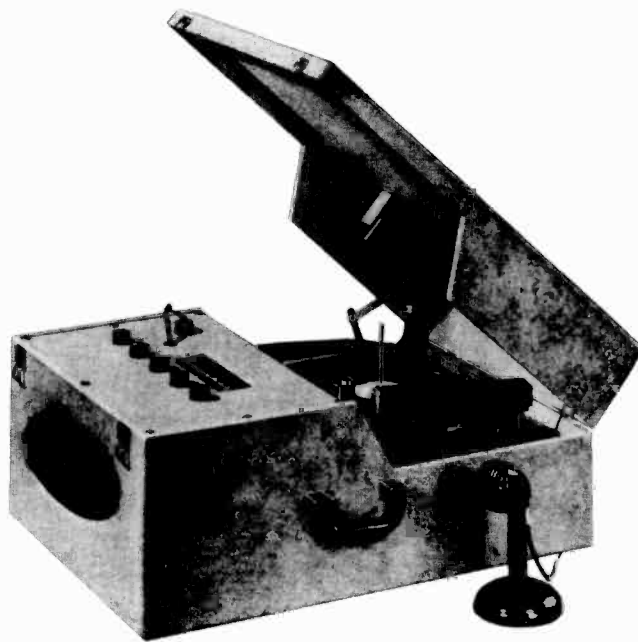


SELECTOR SWITCH	CONTACTS
VIEWED FROM SHIRT END	CONTACTS CLOSED
RECORD	3-4, 4-5, 5-6, 2-3-7
PHONO	3-4, 5-6, 7-8
RECORDING	3-4, 5-6, 7-8, 9
RECORDING	3-4, 5-6, 7-8, 9, 10
RECORDING	3-4, 5-6, 7-8, 9, 10, 11

MODELS 118, 119



*Federal Recording Radio  
No. 118 Dual Speed Portable*



*Federal Recording Radio  
No. 119 Portable with Record Changer*

## POWER SOURCES

This instrument will operate on 110 to 125 volt—60 cycle current only. Never plug into a higher voltage line or the parts will be seriously damaged. Never use current of any other frequency

than 60 cycles, as the motor in this instrument is made for 60 cycle operation only. If you are in doubt about your home current, you should consult your local power company.

## ADJUSTMENTS

If it is necessary to adjust the cutting arm proceed as follows:

1. With the turntable stopped, lower the cutting arm over the turntable so that the stylus rests on the disc. Measure the distance between the disc and the bottom edge of the arm. This distance should be  $\frac{1}{4}$  of an inch. The cutting head will extend slightly below the bottom of the cutting arm, but the distance should be measured from the bottom of the cutting arm. The 'best spot' to make this measurement is at the end of the arm, just below the opening from which protrudes the knurled thumb screw which locks the stylus into the cutting head. When properly adjusted, the thumb screw will be approximately in, or

slightly above, the center of the opening in the end of the arm. If the arm is lower than  $\frac{1}{4}$  of an inch, raise the arm to a vertical position. Loosen the lock nut on screw 'A' (see fig. No. 2) and turn the screw to the left. Lower the arm again onto the disc and make your measurement. Do this until the proper distance is set. Then retighten the lock nut to hold the screw into place.

If the arm is higher than  $\frac{1}{4}$  of an inch, turn screw 'A' to the right until the proper setting is made.

After the correct adjustments have been made on screw 'A', it is only necessary to turn the screw 'B' (see fig. No. 2) to the right to increase the width of the groove or to the left to decrease the width.

## ALIGNMENT PROCEDURE

Remove the chassis from the cabinet before attempting to align this receiver. To do this, proceed as follows:

Loosen and remove the four screws from the four corners of the motor plate. Next, loosen and remove the four wood screws in the control panel.

Remove the control knobs by pulling straight up on the knobs. Raise up the motor plate and lift out the control panel. Pull out the plugs connecting the motor plate to the chassis. Loosen and remove the four screws in the front end of the cabinet and lift out the chassis.

A signal generator having the following frequencies is necessary: 456KC, 600KC, 1400KC, 6MC, 16MC, 18.3MC. An output meter of some kind should be connected across the speaker leads at the output tube.

When aligning this receiver, always keep the volume control turned full on and the generator output as low as possible. See Fig. No. 3 for location of adjustments.

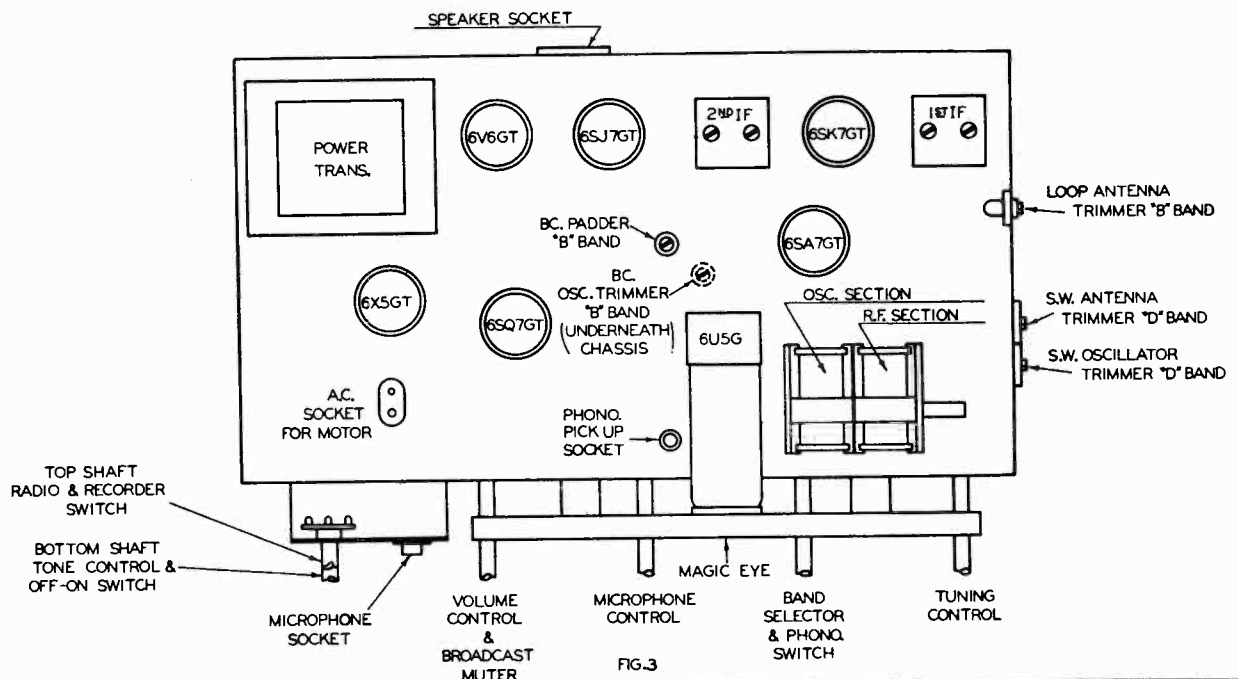
**I. F. ALIGNMENT:** Connect the leads from generator to the stator plates of the 'RF' section of the gang condenser, through a .05 condenser. Make sure that the ground lead from the generator is connected to some point on the chassis. Adjust the generator to 456KC. Adjust the four trimmer screws in the I.F. cans until a maximum reading is noted on the output meter. The gang condenser should be turned all the way out during these adjustments.

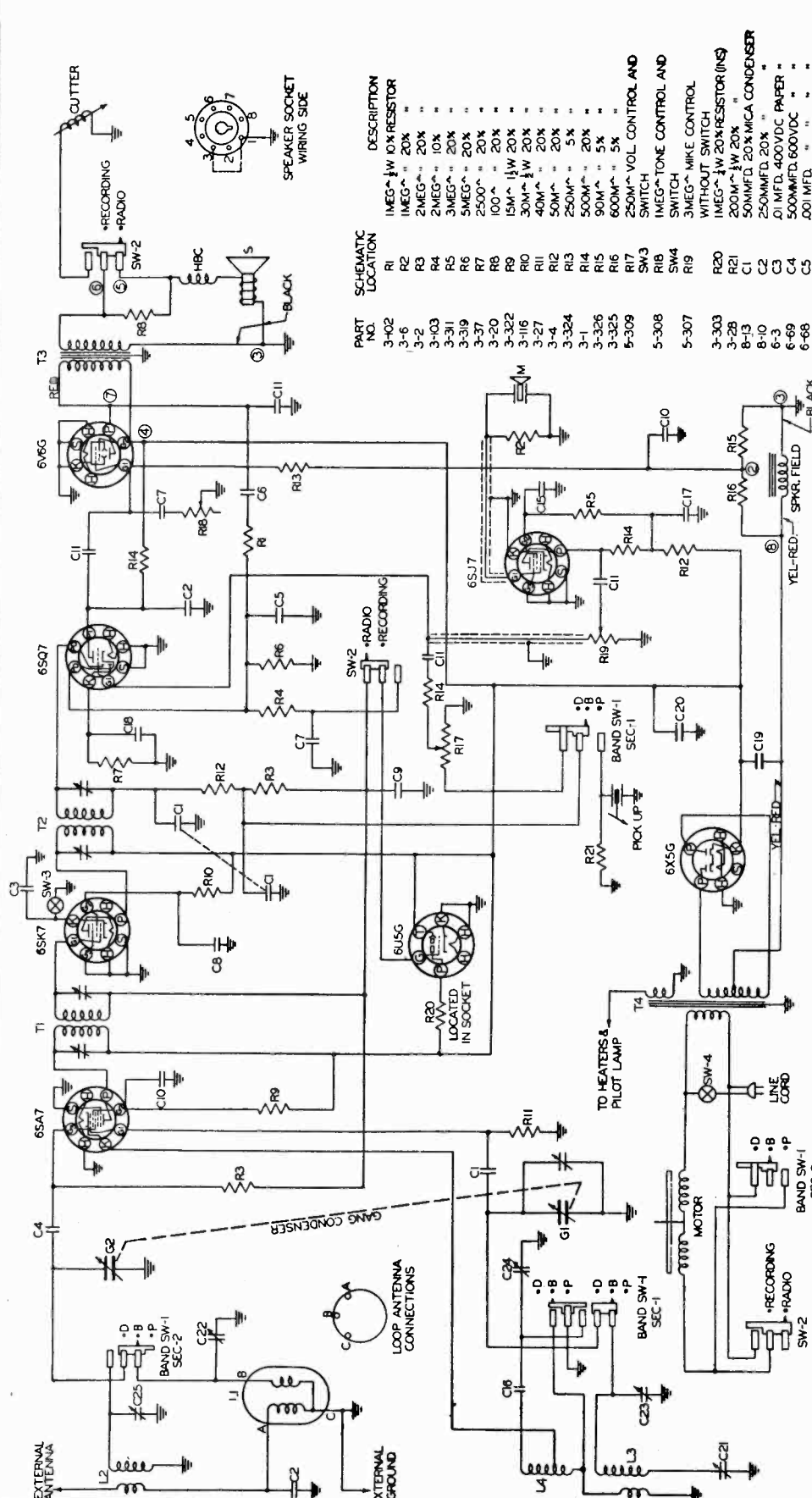
**'B' BAND ALIGNMENT:** Connect the generator leads to the 'Ant' and 'Gnd' leads of the chassis through a .0002 condenser. Set the generator to 1400KC and turn the tuning control until the pointer is directly over 140 on the 'B' band scale. If necessary, adjust the 'B' band oscillator trimmer, (which is located underneath the chassis) until the 1400KC signal from the generator is heard. Next set the generator to 600KC and tune the receiver until the 600KC signal is tuned in. Turn the 'B' band padding condenser very slowly to the right or left and at the same time rock the tun-

ing control back and forth until a maximum reading is noted on the output meter. Next reset the generator to 1400KC and tune the receiver to 140 on the scale. If the signal has shifted, then re-adjust the 'B' band osc. trimmer. Place the loop antenna so that it is in approximately the same relative position as it would be in the cabinet. With the generator still at 1400KC and the receiver still tuned to 140 on the scale, adjust the 'B' band loop antenna trimmer till the output meter shows a maximum reading.

**"D" BAND ALIGNMENT:** Connect the generator leads to the "Ant." and "Gnd" leads of the receiver through a 400 ohm resistor. Turn the tuning control so that the pointer is at the extreme right end of the 'D' Band scale. Set the generator to 18.3MC and adjust the 'D' band osc. trimmer, till the signal is heard. Make sure that you hear the fundamental frequency and not the image. This may be checked by tuning the receiver to approximately 17.4MC while the generator is still at 18.3MC. At this point, you should hear a weaker signal which indicates that it is the image frequency. Next set the generator to 16MC and tune the receiver to 16MC. Tune the signal in carefully. Adjust the 'D' band antenna trimmer and at the same time rock the tuning control back and forth till a maximum reading is noted on the output meter. Next set the generator to 6MC and tune the receiver to that signal. No adjustment should be necessary at 6MC. A fixed oscillator padding condenser is used for this frequency.

TUBE AND TRIMMER LOCATION  
110-125 VOLTS 60 CYCLE A.C.





PART NO.	SCHEMATIC LOCATION	DESCRIPTION
3-02	R1	1MEG-1/4W 10% RESISTOR
3-6	R2	2MEG-1/4W 20% "
3-2	R3	2MEG-1/4W 20% "
3-103	R4	3MEG-1/4W 10% "
3-311	R5	3MEG-1/4W 20% "
3-319	R6	5MEG-1/4W 20% "
3-37	R7	2500M-1/4W 20% "
3-20	R8	100M-1/4W 20% "
3-322	R9	15M-1/4W 20% "
3-116	R10	30M-1/4W 20% "
3-27	R11	40M-1/4W 20% "
3-4	R12	50M-1/4W 20% "
3-324	R13	2500M-1/4W 5% "
3-1	R14	5000M-1/4W 20% "
3-326	R15	90M-1/4W 5% "
3-325	R16	600M-1/4W 5% "
5-309	R17	250M-1/4W VOL CONTROL AND SWITCH
5-308	R18	1MEG-1/4W TONE CONTROL AND SWITCH
5-307	R19	3MEG-1/4W MIKE CONTROL WITHOUT SWITCH
3-303	R20	1MEG-1/4W 20% RESISTOR (MS)
3-28	C1	200M-1/4W 20% "
8-10	C2	50MMFD. 20% MICA CONDENSER
6-3	C3	250MMFD. 20% "
6-69	C4	.01 MFD. 400VDC PAPER "
6-68	C5	500MMFD. 600VDC "
6-17	C6	.001 MFD. "
6-309	C7	.002 MFD. "
6-12	C8	.05 MFD. 200 "
6-32	C9	.25 MFD. 400 "
6-306	C10	.005 MFD. 600 "
6-20	C11	.005 MFD. 400 "
6-300	C12	.01 MFD. 400 "
7-310	C13	.00475 MFD. 180WV 5% POLYSTYRENE CONDENSER
7-308	C14	4MFD 100WV ELECTROLYTIC COND.
7-309	C15	20MFD 35WV "
7-309	C16	40MFD 400WV "
9-302	C17	BC PADDER CONDENSER
9-303	C18	HALF PLATE TRIMMER CONDENSER
9-47	C19	FULL "
9-304	C20	TRIMMER COND. TRIMMER
10-305	G1	OSC. SECTION STRIP
6-30	G2	RF SECTION GANG
6-30	C21	.04 MFD. 400VDC PAPER CONDENSER
15-320	L1	LOOP SW ANTENNA LOOP
15-318	L2	BC OSCILLATOR COIL
15-319	L3	SW
16-302	T1	INPUT IF TRANSFORMER
16-303	T2	OUTPUT IF " (ON SPKR)
11-304	T3	POWER " 117V. 60-
14-306	SW1	BAND SWITCH
14-307	SW2	CHANGE OVER SWITCH
43-309	S	ELECTRO DYNAMIC SPEAKER
20-303	PL	PILOT LAMP
54-303	M	MICROPHONE
55-305	HBC	HUM BUCKING COIL (ON SPKR)
40-307	6SA7GT	CONVERTER
	6SK7GT	IF AMPLIFIER
	6SQ7GT	2ND DETECTOR & 1ST AUDIO
	6V6GT	AUDIO OUTPUT
	6U5G	TUNING INDICATOR
	6SJ7GT	MIKE AMPLIFIER
	6X5GT	RECTIFIER

B - BROADCAST  
D - SHORT WAVE  
P - PHONOGRAPH

JAN. 21, 1942

## INSTALLATION

**POWER SUPPLY.** This receiver is designed for operation on a power supply of 110 to 120 volts, 60 cycle, alternating current. Before inserting power plug, be sure that your house is wired for the correct voltage and current for which this set is designed. If you are in doubt, call up your local power company for the necessary information. Never plug into a direct current (DC) outlet.

**ANTENNA AND GROUND CONNECTIONS.** This receiver has a built-in loop antenna and ordinarily will require no external antenna. The excellent design of this loop is such as to give maximum pickup from stations having wide variations in signal strength. In poor localities for reception, such as locations in metal buildings, near iron ore deposits, steel structures, or in localities remote from broadcasting stations, reception can be improved by using an outside antenna with a length of from 50 to 100 feet including lead-in. This lead-in is connected to the blue lead extending from the chassis. The loop antenna will also work

on the short wave band, but to obtain maximum reception on the short waves it is advisable to use an outside antenna.

A good ground connection is necessary to secure maximum performance on both radio and recorder. Connect the **black** ground wire to a water pipe or steam radiator by means of a ground clamp. The pipe should be thoroughly cleaned so that this clamp makes a positive contact with the metal. If no ground is available, one can be made by driving a piece of pipe into moist earth.

**LOCATION OF CABINET.** If the cabinet is placed close to a flat wall it is necessary to allow a minimum space of 3 inches between the rear of the cabinet and the wall. This is necessary to secure proper tone quality and ventilation for the radio. The cabinet should stand firmly on its four feet. If the cabinet wobbles, fold up a piece of paper and place under the leg which does not rest securely on the floor.

## ALIGNMENT DATA AND SERVICING

Lack of sensitivity and poor tone quality may be due to **any one or a combination of causes** such as **weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc.** Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

**NOTE:** IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED, OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

## ALIGNMENT PROCEDURE

**GENERAL DATA.** The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400, 1720, 6000, 15000 and 18300 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

**CORRECT ALIGNMENT PROCEDURE.** The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the Broadcast and Short Wave bands in the order given, should be aligned.

**I.F. ALIGNMENT.** With the wave switch in the Broadcast Band and the gang condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (6A8GT) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis buss. Align all four I.F. trimmers to peak or maximum reading on the output meter.

**BROADCAST BAND ALIGNMENT.** With the switch turned to the broadcast position, connect the antenna to the generator

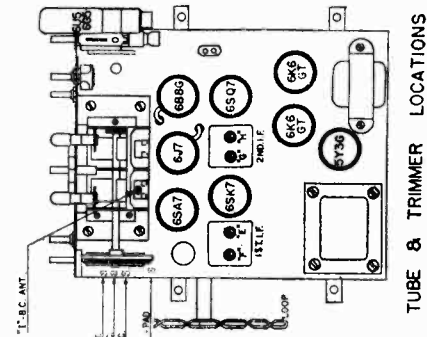
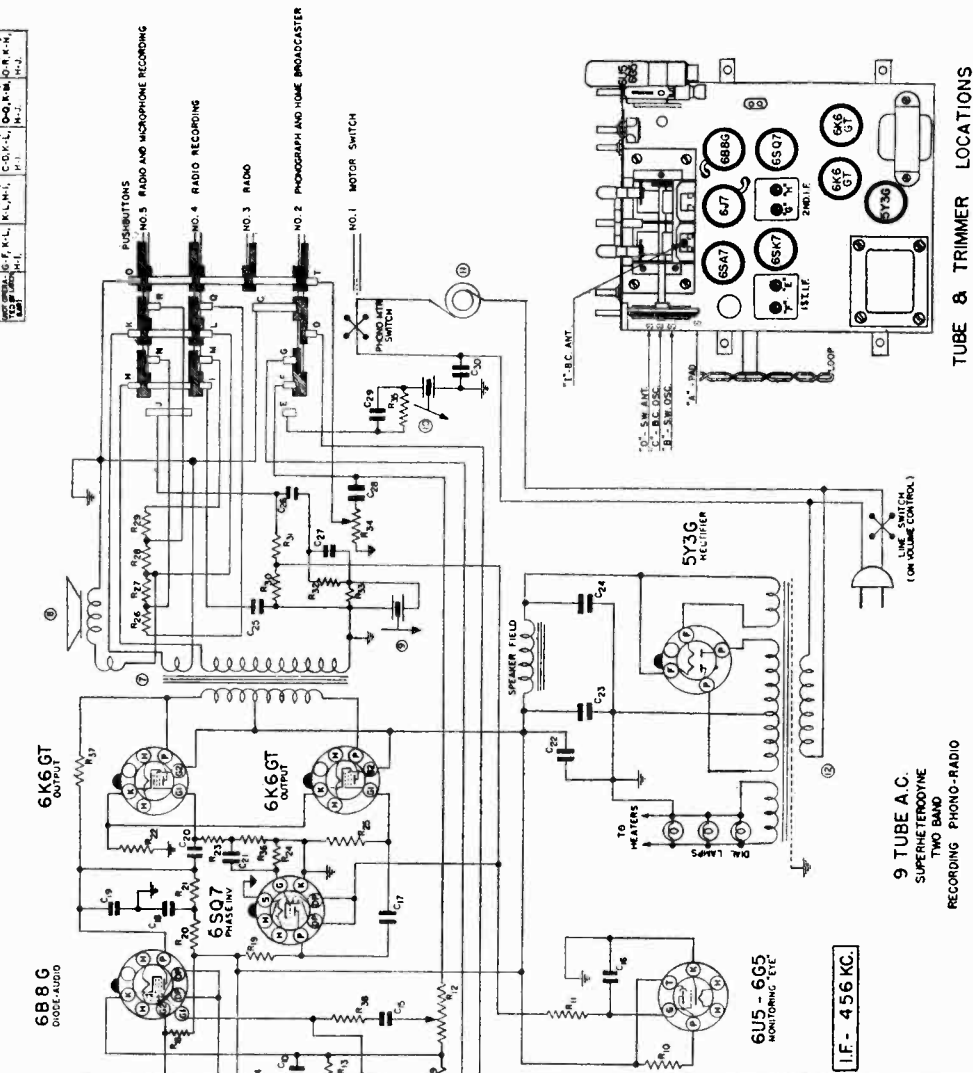
through a 200 MMF dummy and the ground of the set (Black wire) to the generator ground. Set the dial and generator at 1720 KC. Align the BC oscillator trimmer for maximum output. Set the generator at 1400 KC and tune-in signal with the dial. Adjust antenna trimmer for maximum output. Next set the generator at 600 KC and tune in the signal with the dial. Adjust the BC pad by rocking the gang back and forth while adjusting the pad until maximum output is attained. Recheck the adjustment at 1400 KC as the pad adjustment may have caused misalignment.

**SHORT WAVE BAND ALIGNMENT.** With the band switch turned to the S. W. position, connect the generator to the antenna with a 400 ohm dummy and the ground of the set (Black wire) to the generator ground. Adjust the S. W. oscillator to give a maximum output with the dial at 18300 KC (extreme end). Set the generator at 15000 KC and tune-in the signal with the dial. Adjust the antenna trimmer for maximum output. With a strong signal input turn the dial to approximately 1 M. C. lower in frequency and pick up the image frequency. If the image is not received, it will be necessary to return the dial to 18300 KC to reduce the capacity in the oscillator trimmer until a second signal is received. Proceed as before with the alignment of the antenna and recheck for image frequency. Check the sensitivity at 6000 KC to determine if the coils and mica pad are not defective.

MODEL 201

PUSHBUTTON SWITCH CONTACTS

NO. 1	NO. 2	NO. 3	NO. 4	NO. 5
AC SWITCH	T.C.E.F.	T.C.C.F.	C.D.C.F.	C.D.C.F.
AC SWITCH	G.P.K.L.	K.L.H.I.	C.D.K.L.	C.D.K.L.
AC SWITCH	T.C.E.F.	T.C.C.F.	C.D.C.F.	C.D.C.F.
AC SWITCH	G.P.K.L.	K.L.H.I.	C.D.K.L.	C.D.K.L.



TUBE & TRIMMER LOCATIONS

9 TUBE A.C. SUPERHETERODYNE TWO BAND RECORDING PHONO-RADIO

I.F. - 456 KC.

PART NO.	QTY.	DESCRIPTION	QTY.	DESCRIPTION	QTY.	DESCRIPTION
C1	M-2827	0.00025 MFD.	1	M-2827	1	SKERTWAIVE ANTENNA COIL
C2	M-2843	105 MFD.	20%	M-2824	1	ANTENNA LOOP COIL
C3	M-2843	105 MFD.	20%	M-2824	1	OSCILLATOR COIL
C4	M-2843	0.00025 MFD.	1	M-2825	1	5T I.F. TRANSFORMER
C5	M-2843	0.00025 MFD.	1	M-2826	1	NO I.F. TRANSFORMER
C6	M-2843	0.00025 MFD.	1	M-2827	1	OUTPUT TRANSFORMER
C7	M-2843	0.00025 MFD.	1	M-2828	1	2" DYNAMIC SPEAKER
C8	M-2843	0.00025 MFD.	1	M-2829	1	PHONO CUTTING HEAD
C9	M-2843	0.00025 MFD.	1	M-2830	1	PHONO MOTOR & TURNABLE
C10	M-2843	0.00025 MFD.	1	M-2831	1	POWER TRANSFORMER
C11	M-2843	0.00025 MFD.	1	M-2832	1	PADDER CONDENSER
C12	M-2843	0.00025 MFD.	1	M-2833	1	OSCILLATOR TRIMMER CONDENSER
C13	M-2843	0.00025 MFD.	1	M-2834	1	BC OSCILLATOR TRIMMER CONDENSER
C14	M-2843	0.00025 MFD.	1	M-2835	1	5W ANTENNA TRIMMER CONDENSER
C15	M-2843	0.00025 MFD.	1	M-2836	1	2 GANG CONDENSER WITH 4 BUTTON TUNING UNIT
C16	M-2843	0.00025 MFD.	1	M-2837	1	5W ANTENNA TRIMMER CONDENSER
C17	M-2843	0.00025 MFD.	1	M-2838	1	3 PUSHBUTTON SWITCH
C18	M-2843	0.00025 MFD.	1	M-2839	1	
C19	M-2843	0.00025 MFD.	1	M-2840	1	
C20	M-2843	0.00025 MFD.	1	M-2841	1	
C21	M-2843	0.00025 MFD.	1	M-2842	1	
C22	M-2843	0.00025 MFD.	1	M-2843	1	
C23	M-2843	0.00025 MFD.	1	M-2844	1	
C24	M-2843	0.00025 MFD.	1	M-2845	1	
C25	M-2843	0.00025 MFD.	1	M-2846	1	
C26	M-2843	0.00025 MFD.	1	M-2847	1	
C27	M-2843	0.00025 MFD.	1	M-2848	1	
C28	M-2843	0.00025 MFD.	1	M-2849	1	
C29	M-2843	0.00025 MFD.	1	M-2850	1	
C30	M-2843	0.00025 MFD.	1	M-2851	1	
R1	M-2827	20,000 OHM.	3W.	20%		
R2	M-2827	15,000 OHM.	3W.	20%		
R3	M-2827	10,000 OHM.	3W.	20%		
R4	M-2827	5,000 OHM.	3W.	20%		
R5	M-2827	1,000 OHM.	3W.	20%		

## ALIGNMENT DATA AND SERVICING

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

**NOTE:** IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED. OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

### ALIGNMENT PROCEDURE

**GENERAL DATA.** The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400, and 1720 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

**CORRECT ALIGNMENT PROCEDURE.** The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the Broadcast band should be aligned.

**I.F. ALIGNMENT.** With the gang condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the

first detector tube (6SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis base. Align all four I.F. trimmers to peak or maximum reading on the output meter.

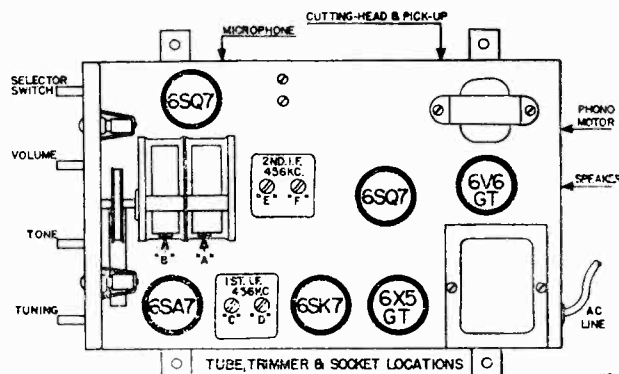
**BROADCAST BAND ALIGNMENT.** Connect the antenna to the generator through a 200 MMF dummy and the ground of the set (Black wire) to the generator ground. Set the dial and generator at 1720 KC. Align the BC oscillator trimmer for maximum output. Set the generator at 1400 KC and tune-in signal with the dial. Adjust antenna trimmer for maximum output. Next set the generator at 600 KC and tune in the signal with the dial to check if the gang condenser or coils have been damaged. This receiver requires no adjustment at this point as it employs a cut section gang.

DIAG NO.	PART NO.	DESCRIPTION	DIAG NO.	PART NO.	DESCRIPTION	DIAG NO.	PART NO.	DESCRIPTION
R1	N-1778	100,000 OHM .5W. 20%	C1	N-1345	.05 MFD. 200 V.	1	N-3209	LOOP ANTENNA COIL
R2	N-1779	150,000 OHM .5W. 20%	C2	N-2880	.01 MFD. 800 V.	2	N-3210	OSCILLATOR COIL
R3	N-1627	20,000 OHM .5W. 20%	C3	N-1834	.002 MFD. 800 V.	3		CUTTING HEAD
R4	N-2716	15,000 OHM 2 W. 10%	C4	N-1623	.1 MFD. 400 V.	4	N-2993	PHONO MOTOR & TURNABLE
R5	N-1482	250 OHM .5W. 20%	C5	N-1347	.006 MFD. 600 V.	5		PICK-UP
R6	N-1260	50,000 OHM .5W. 20%	C6	N-1351	.1 MFD. 200 V.	6	N-3211	1ST. I.F. TRANSFORMER
R7	N-1262	1 MEGOHM .5W. 20%	C7	N-1346	.05 MFD. 400 V.	7	N-3212	2ND. I.F. TRANSFORMER
R8	N-2571	250,000 OHM .5W. 10%	C8	N-1374	100 MMFD (MICA)	8	N-3232	MICROPHONE
R9	N-1696	400,000 OHM .5W. 20%	C9	N-1376	.02 MFD. 400 V.	9	N-3205	OUTPUT TRANSFORMER
R10	N-3250	125,000 OHM .5W. 20%	C10	N-1347	.006 MFD. 600 V.	10	N-3204	8" DYNAMIC SPEAKER
R11	N-2572	300,000 OHM .5W. 10%	C11	N-1343	250 MMFD (MICA)	11	N-3206	POWER TRANSFORMER
R12	N-1419	6 MEGOHM .5W. 20%	C12	N-1973	.02 MFD. 600 V.	12	N-3256	6" DYNAMIC SPEAKER
R13	N-3213	5 MEGOHM VOLUME CONTROL	C13	N-1347	.006 MFD. 600 V.			
R14	N-1419	6 MEGOHM .5W. 20%	C14	N-1623	.1 MFD. 400 V.			
R15	N-1778	100,000 OHM .5W. 20%	C15	N-3234	.001 MFD. 1000 V.			
R16	N-1778	100,000 OHM .5W. 20%	C16		20 MFD. 350V. ELECTROLYTIC			
R17	N-3214	25 MEGOHM TONE CONTROL	C17	N-3216				
R18	N-3225	280 OHM 1W. 10%	C18		20 MFD. 25V.		N-3207	7" GANG CONDENSER
R19	N-1627	20,000 OHM .5W. 20%	C19		6 MFD. 200V.		N-3215	SELECTOR SWITCH
R20	N-3236	4.5 OHM 3W. 10%	C20	N-1470	D1 MFD. 600 V.		N-1930	PHONO MOTOR SWITCH
R21	N-1262	1 MEGOHM .5W. 20%						

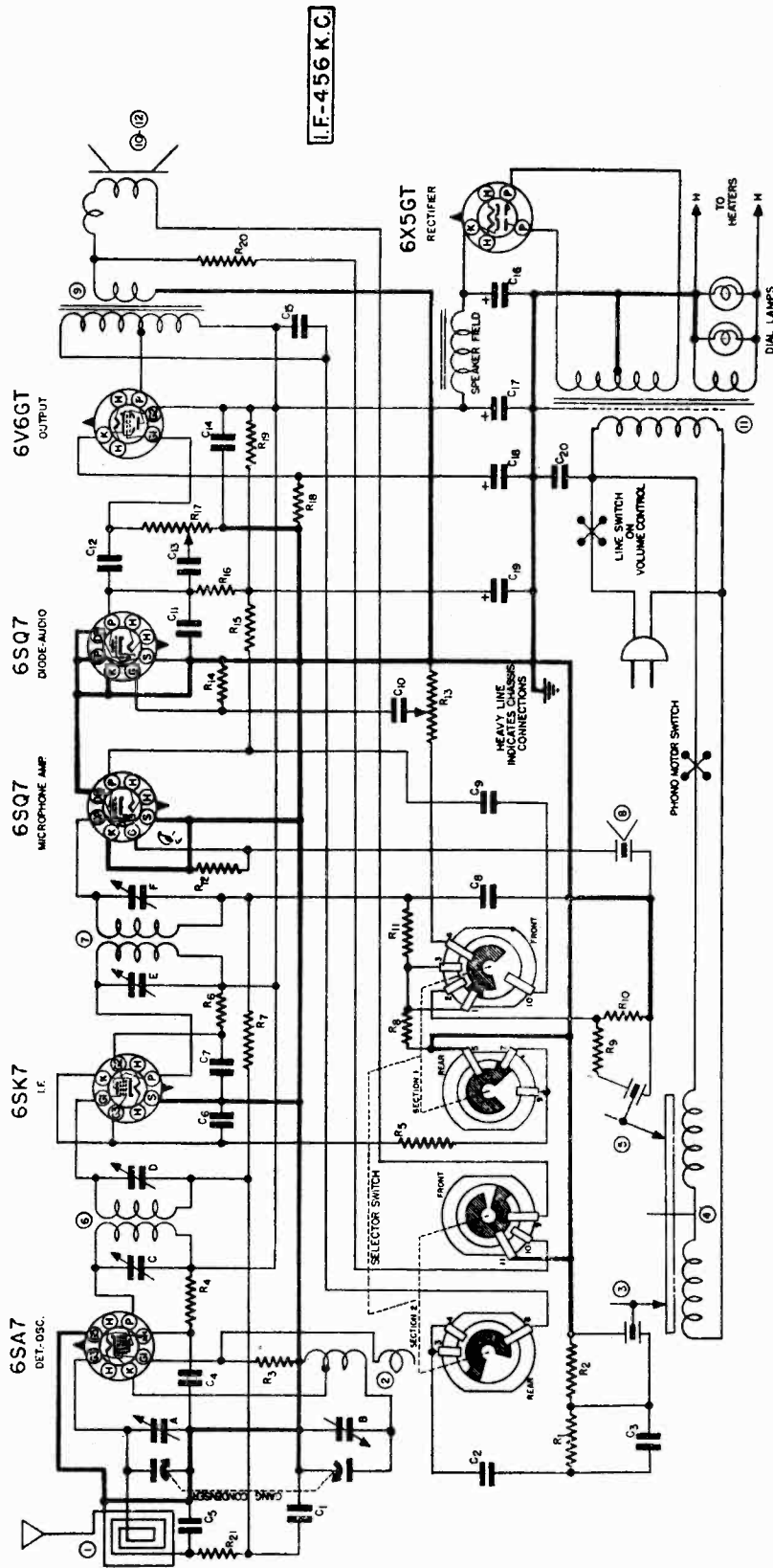
8" SPKR. USED ON CONSOLE MODEL  
6" SPKR. USED ON TABLE MODEL

SELECTOR SWITCH CONTACTS			
POSITION	SECTION 1		SECTION 2
(VIEWED FROM SHAFT END)	FRONT	REAR	FRONT/REAR
1-KC (1) RADIO	1-4	5-7	8-11
2- PHONOGRAPH	2-4		9-11
3- RADIO RECORDING	3-4	5-8	9-11 3-8
4- MICROPHONE RECORDING	4-10		10-11 4-8
5-KC (1) HOME BROADCASTING	4-10		9-11

6 TUBE—A.C.  
SUPERHETERODYNE  
SINGLE BAND  
RECORDER-PHONO-RADIO







## ALIGNMENT DATA AND SERVICING

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

**NOTE:** IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED, OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

**GENERAL DATA.** The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400, and 1720 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

**CORRECT ALIGNMENT PROCEDURE.** The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the Broadcast band should be aligned.

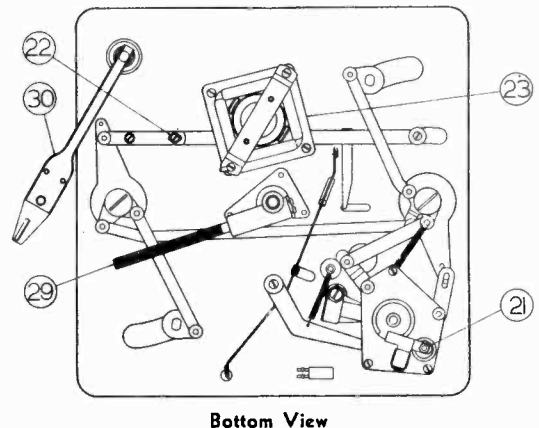
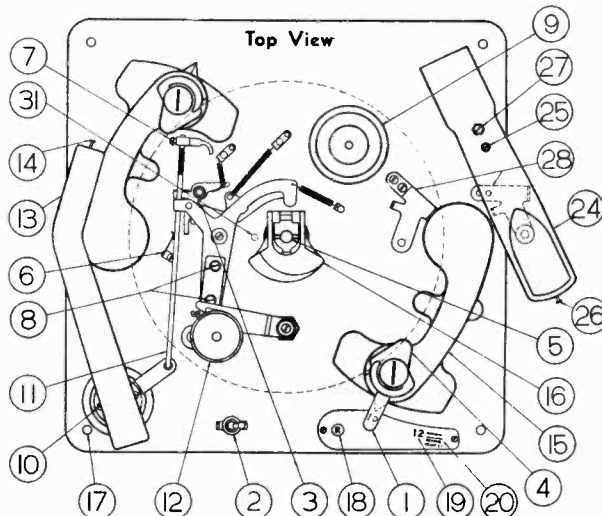
**I.F. ALIGNMENT.** With the gang condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the

first detector tube (6SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis base. Align all four I.F. trimmers to peak or maximum reading on the output meter.

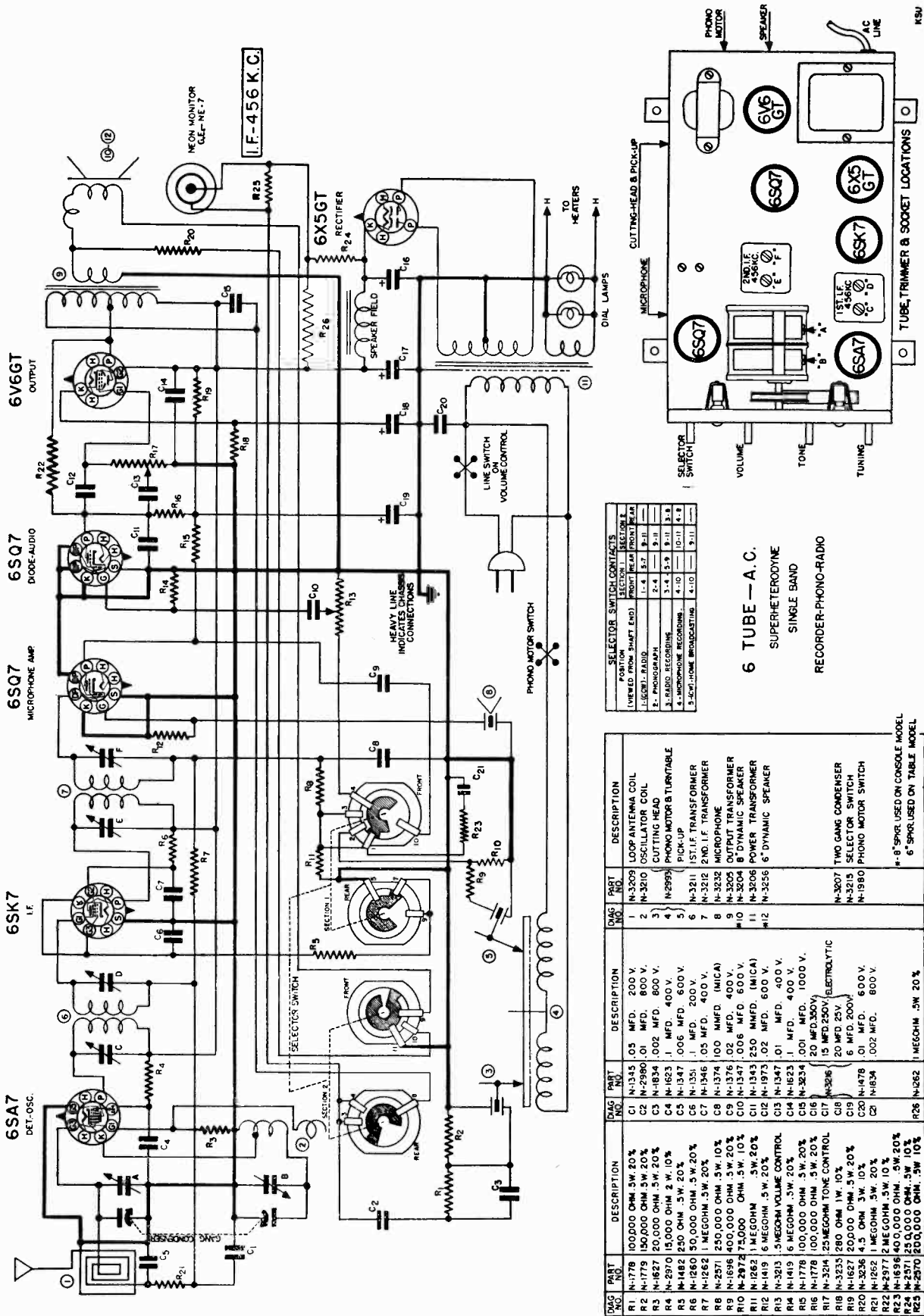
**BROADCAST BAND ALIGNMENT.** Connect the antenna to the generator through a 200 MMF dummy and the ground of the set (Black wire) to the generator ground. Set the dial and generator at 1720 KC. Align the BC oscillator trimmer for maximum output. Set the generator at 1400 KC and tune-in signal with the dial. Adjust antenna trimmer for maximum output. Next set the generator at 600 KC and tune in the signal with the dial to check if the gang condenser or coils have been damaged. This receiver requires no adjustment at this point as it employs a cut section gang.

## RECORD CHANGER SERVICING

- (1) Lever for setting to play 10-inch or 12-inch records, Manual playing or Remove records. Mechanism as shown is set for playing 10-inch records.
- (2) "On" and "Off" switch for operating the record playing mechanism. Not used on some models.
- (3) Trip mechanism designed to handle automatically records with either spiral run-in or oscillating grooves.
- (4) Record Support Fingers.
- (5) Turntable Shaft.
- (6) Trip Rod Tension Spring.
- (7) Adjustment for run-in or spiral-grooved records.
- (8) Adjusting lock screws for controlling position of power take off wheel (12).
- (9) Rubber-tired Drive Wheel. By means of a spring, this wheel contacts the steel pulley on the motor and the inside flange of the turntable; driving the table in clockwise rotation.
- (10) Adjusting screws for locking tone arm in position so that needle will rest properly on edge of record.
- (11) Trip rod.
- (12) Rubber-tired power take-off wheel. Through the trip mechanism, this wheel contacts the inside flange of the turntable during the change cycle from one record to the next, but does not operate during the playing of a record.
- (13) Pickup Arm.
- (14) Needle Set Screw.
- (15) Record Support Arm.
- (16) Master Trip Cam.
- (17) Mounting Holes. Rubber washers or springs should be used when bolting changer in cabinet to absorb possible vibration.
- (18) Reject Button. By pressing this button, changing mechanism operates immediately regardless of needle position on the record. Also by pressing this button, the first record will drop on turntable.
- (19) Position for Lever (1) when playing 12-inch records.
- (20) Position for Lever (1) for Manual playing, Removing records or Cutting records.
- (21) Adjusting screw for setting vertical movement of tone arm. If properly set, no further adjustment will be necessary.
- (22) Adjustable Tie Bar used for positioning record support arms. The adjustment of this bar properly made should require no further attention.
- (23) Rim Drive Electric Motor. Be sure Voltage and Cycles are correct for your Power Line.
- (24) Cutter Arm. At all times except when actually recording, cutter arm is placed on cutter arm support rest (28).
- (25) Adjusting Screw by which the tension on the cutter head equalizing spring may be varied for different types of records.
- (26) Cutting Stylus clamp screw.
- (27) Adjusting screw and lock nut for proper spacing between cutter arm and record.
- (28) Cutter arm support rest. Prevents interference with reproduction and also removes all strain on cutter-head equalizing spring. Full lines show shipping position—dotted, Installation Position.
- (29) Lead Screw.
- (30) Follower Arm and Spring Cam. This arm and cam mesh with lead screw (29) to provide lateral motion of cutter arm during recording.
- (31) Depressible Pin in turntable for driving home recording disc.



MODEL 301



POSITION	SECTION 1	SECTION 2
(VIEWED FROM SHAFT END)	PROT. MEAL	FRONT
1. LOOP ANTENNA	1-4	5-7
2. PHONO MOTOR	2-4	9-11
3. RADIO RECORDING	3-4	5-9
4. MICROPHONE RECORDING	4-10	10-11
5. 5-W/10 HOME BROADCASTING	4-10	9-11

6 TUBE - A. C.  
SUPERHETERODYNE  
SINGLE BAND  
RECORDER-PHONO-RADIO

DIAG. PART NO.	DESCRIPTION	DIAG. PART NO.	DESCRIPTION	DIAG. PART NO.	DESCRIPTION
R1	100,000 OHM .5W 20%	C1	N-1345 .05 MFD. 200 V.	1	N-3209 LOOP ANTENNA COIL
R2	N-1779 150,000 OHM .5W 20%	C2	N-2980 .01 MFD. 800 V.	2	N-3210 OSCILLATOR COIL
R3	N-1627 20,000 OHM .5W 20%	C3	N-1834 .002 MFD. 800 V.	3	N-3210 CUTTING HEAD
R4	N-2970 15,000 OHM 2 W. 10%	C4	N-1623 .1 MFD. 400 V.	4	N-2998 PICK-UP
R5	N-1482 250 OHM .5W 20%	C5	N-1347 .006 MFD. 600 V.	5	N-3211 1ST. I.F. TRANSFORMER
R6	N-1260 50,000 OHM .5W 20%	C6	N-1351 .1 MFD. 200 V.	6	N-3212 2ND. I.F. TRANSFORMER
R7	N-1262 1 MEGOHM .5W 20%	C7	N-1346 .05 MFD. 400 V.	7	N-3232 MICROPHONE
R8	N-2571 250,000 OHM .5W 10%	C8	N-1374 100 MFD. (MICA)	8	N-3205 OUTPUT TRANSFORMER
R9	N-1696 400,000 OHM .5W 20%	C9	N-1376 .02 MFD. 400 V.	9	N-3204 B DYNAMIC SPEAKER
R10	N-2974 75,000 OHM .5W 10%	C10	N-1343 250 MFD. (MICA)	10	N-3206 POWER TRANSFORMER
R11	N-1262 1 MEGOHM .5W 20%	C11	N-1973 .02 MFD. 600 V.	11	N-3256 6" DYNAMIC SPEAKER
R12	N-1419 6 MEGOHM .5W 20%	C12	N-1347 .01 MFD. 400 V.	12	
R13	N-3213 .5 MEGOHM VOLUME CONTROL	C13	N-1347 .01 MFD. 400 V.		
R14	N-1419 6 MEGOHM .5W 20%	C14	N-1623 .1 MFD. 400 V.		
R15	N-1778 100,000 OHM .5W 20%	C15	N-3234 .001 MFD. 1000 V.		
R16	N-1778 100,000 OHM .5W 20%	C16	(20 MFD. 300V)		
R17	N-3235 280 OHM 1W 10%	C17	15 MFD. 250V ELECTROLYTIC		
R18	N-1627 20,000 OHM .5W 20%	C18	20 MFD. 250V		
R19	N-3236 4.5 OHM 3W 10%	C19	6 MFD. 200V		
R20	N-1262 1 MEGOHM .5W 20%	C20	N-1478 .01 MFD. 600 V.		
R21	N-1262 1 MEGOHM .5W 20%	C21	N-1634 .002 MFD. 800 V.		
R22	N-1656 400,000 OHM .5W 20%				
R23	N-2571 250,000 OHM .5W 10%				
R24	N-2570 200,000 OHM .5W 10%				
R25	N-2570 200,000 OHM .5W 10%				

\* 8" SPKR. USED ON CONSOLE MODEL  
6" SPKR. USED ON TABLE MODEL

### ALIGNMENT DATA AND SERVICING

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

**NOTE:** IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED, OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

#### ALIGNMENT PROCEDURE

**GENERAL DATA.** The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400, 1720, 6000, 15000 and 18300 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

**CORRECT ALIGNMENT PROCEDURE.** The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the Broadcast and Short Wave bands in the order given, should be aligned.

**I.F. ALIGNMENT.** With the wave switch in the Broadcast Band and the gang condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (6SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis ground. Align all four I.F. trimmers to peak or maximum reading on the output meter.

**BROADCAST BAND ALIGNMENT.** With the switch turned to the broadcast position, connect the antenna to the generator

through a 200 MMF dummy and the ground of the set (Black wire) to the generator ground. Set the dial and generator at 1720 KC.

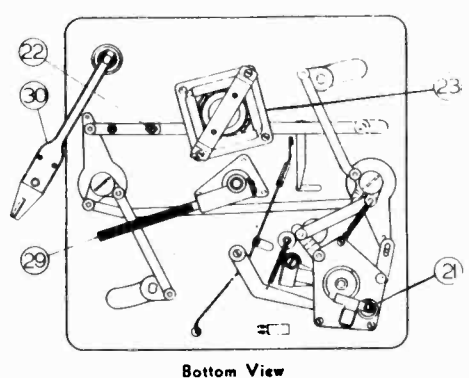
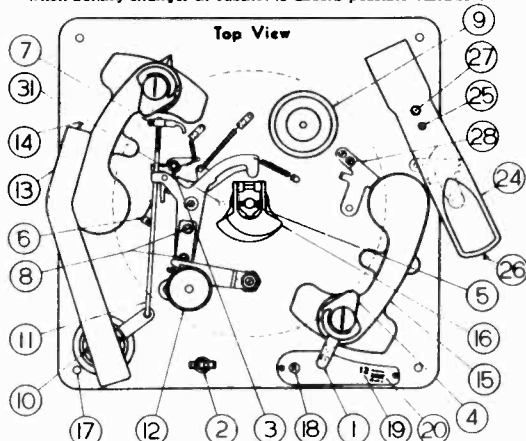
Align the BC oscillator trimmer for maximum output. Set the generator at 1400 KC and tune-in signal with the dial. Adjust antenna trimmer for maximum output. Next set the generator at 600 KC and tune in the signal with the dial. Adjust the BC pad by rocking the gang back and forth while adjusting the pad until maximum output is attained. Recheck the adjustment at 1400 KC as the pad adjustment may have caused misalignment.

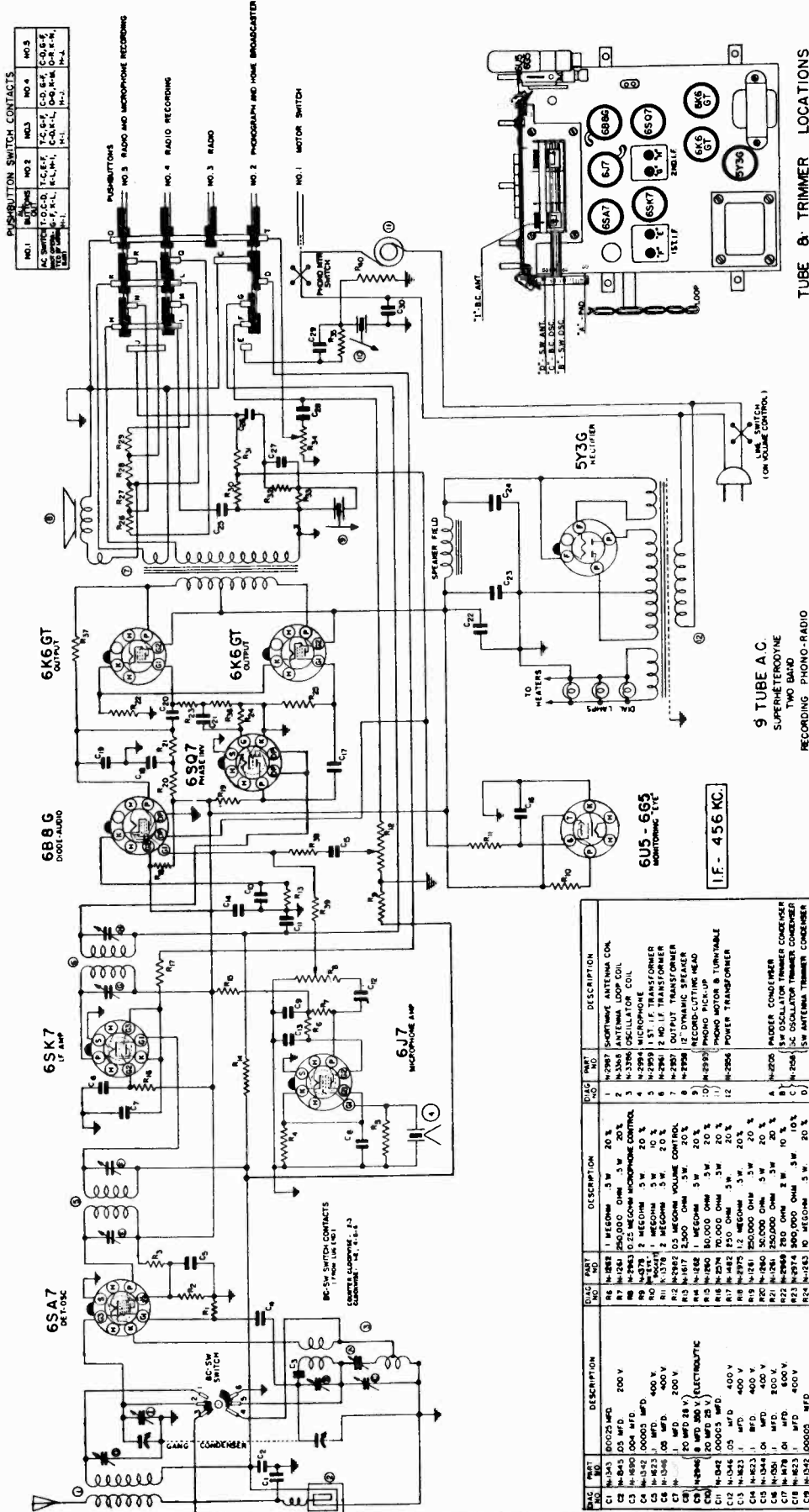
**SHORT WAVE BAND ALIGNMENT.** With the band switch turned to the S. W. position, connect the generator to the antenna with a 400 ohm dummy and the ground of the set (Black wire) to the generator ground. Adjust the S. W. oscillator to give a maximum output with the dial at 18300 KC (extreme end). Set the generator at 15000 KC and tune-in the signal with the dial. Adjust the antenna trimmer for maximum output. With a strong signal input turn the dial to approximately 1 M. C. lower in frequency and pick up the image frequency. If the image is not received, it will be necessary to return the dial to 18300 KC to reduce the capacity in the oscillator trimmer until a second signal is received. Proceed as before with the alignment of the antenna and recheck for image frequency. Check the sensitivity at 6000 KC to determine if the coils and mica pad are not defective.

#### RECORD CHANGER SERVICING

- (1) Lever for setting to play 10-inch or 12-inch records, Manual playing or Remove records. Mechanism as shown is set for playing 10-inch records.
- (2) "On" and "Off" switch for operating the record playing mechanism. Not used on some models.
- (3) Trip mechanism designed to handle automatically records with either spiral run-in or oscillating grooves.
- (4) Record Support Fingers.
- (5) Turntable Shaft.
- (6) Trip Rod Tension Spring.
- (7) Adjustment for run-in or spiral grooved records.
- (8) Adjusting lock screws for controlling position of power take off wheel (12).
- (9) Rubber-tired Drive Wheel. By means of a spring, this wheel contacts the steel pulley on the motor and the inside flange of the turntable; driving the table in clockwise rotation.
- (10) Adjusting screws for locking tone arm in position so that needle will rest properly on edge of record.
- (11) Trip rod.
- (12) Rubber-tired power take-off wheel. Through the trip mechanism, this wheel contacts the inside flange of the turntable during the change cycle from one record to the next, but does not operate during the play of a record.
- (13) Pickup Arm.
- (14) Needle Set Screw.
- (15) Record Support Arm.
- (16) Master Trip Cam.
- (17) Mounting Holes. Rubber washers or springs should be used when bolting changer in cabinet to absorb possible vibration.

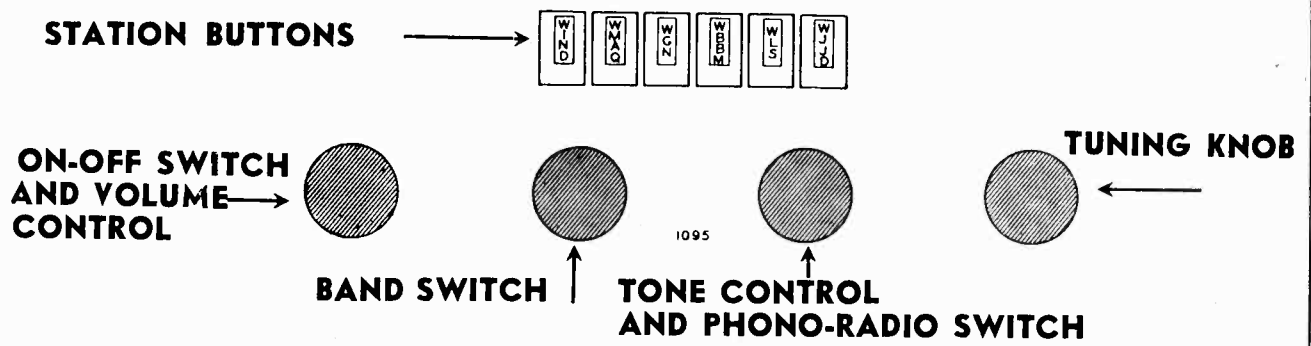
- (18) Reject Button. By pressing this button, changing mechanism operates immediately regardless of needle position on the record. Also by pressing this button, the first record will drop on turntable.
- (19) Position for Lever (1) when playing 12-inch records.
- (20) Position for Lever (1) for Manual playing, Removing records or Cutting records.
- (21) Adjusting screw for setting vertical movement of tone arm. If properly set, no further adjustment will be necessary.
- (22) Adjustable Tie Bar used for positioning record support arms. The adjustment of this bar properly made should require no further attention.
- (23) Rim Drive Electric Motor. Be sure Voltage and Cycles are correct for your Power Line.
- (24) Cutter Arm. At all times except when actually recording, cutter arm is placed on cutter arm support rest (28).
- (25) Adjusting Screw by which the tension on the cutter head equalizing spring may be varied for different types of records.
- (26) Cutting Stylus clamp screw.
- (27) Adjusting screw and lock nut for proper spacing between cutter arm and record.
- (28) Cutter arm support rest. Prevents interference with reproduction and also removes all strain on cutter-head equalizing spring. Full lines show shipping position—dotted, Installation Position.
- (29) Lead Screw.
- (30) Follower Arm and Spring Cam. This arm and cam mesh with lead screw (29) to provide lateral motion of cutter arm during recording.
- (31) Depressible Pin in turntable for driving home recording disc.





QTY	PART NO.	DESCRIPTION
1	M-2387	12-000000 3W 20%
1	M-2388	12-000000 3W 20%
1	M-2389	12-000000 3W 20%
1	M-2390	12-000000 3W 20%
1	M-2391	12-000000 3W 20%
1	M-2392	12-000000 3W 20%
1	M-2393	12-000000 3W 20%
1	M-2394	12-000000 3W 20%
1	M-2395	12-000000 3W 20%
1	M-2396	12-000000 3W 20%
1	M-2397	12-000000 3W 20%
1	M-2398	12-000000 3W 20%
1	M-2399	12-000000 3W 20%
1	M-2400	12-000000 3W 20%
1	M-2401	12-000000 3W 20%
1	M-2402	12-000000 3W 20%
1	M-2403	12-000000 3W 20%
1	M-2404	12-000000 3W 20%
1	M-2405	12-000000 3W 20%
1	M-2406	12-000000 3W 20%
1	M-2407	12-000000 3W 20%
1	M-2408	12-000000 3W 20%
1	M-2409	12-000000 3W 20%
1	M-2410	12-000000 3W 20%
1	M-2411	12-000000 3W 20%
1	M-2412	12-000000 3W 20%
1	M-2413	12-000000 3W 20%
1	M-2414	12-000000 3W 20%
1	M-2415	12-000000 3W 20%
1	M-2416	12-000000 3W 20%
1	M-2417	12-000000 3W 20%
1	M-2418	12-000000 3W 20%
1	M-2419	12-000000 3W 20%
1	M-2420	12-000000 3W 20%
1	M-2421	12-000000 3W 20%
1	M-2422	12-000000 3W 20%
1	M-2423	12-000000 3W 20%
1	M-2424	12-000000 3W 20%
1	M-2425	12-000000 3W 20%
1	M-2426	12-000000 3W 20%
1	M-2427	12-000000 3W 20%
1	M-2428	12-000000 3W 20%
1	M-2429	12-000000 3W 20%
1	M-2430	12-000000 3W 20%
1	M-2431	12-000000 3W 20%
1	M-2432	12-000000 3W 20%
1	M-2433	12-000000 3W 20%
1	M-2434	12-000000 3W 20%
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1	M-2436	12-000000 3W 20%
1	M-2437	12-000000 3W 20%
1	M-2438	12-000000 3W 20%
1	M-2439	12-000000 3W 20%
1	M-2440	12-000000 3W 20%
1	M-2441	12-000000 3W 20%
1	M-2442	12-000000 3W 20%
1	M-2443	12-000000 3W 20%
1	M-2444	12-000000 3W 20%
1	M-2445	12-000000 3W 20%
1	M-2446	12-000000 3W 20%
1	M-2447	12-000000 3W 20%
1	M-2448	12-000000 3W 20%
1	M-2449	12-000000 3W 20%
1	M-2450	12-000000 3W 20%
1	M-2451	12-000000 3W 20%
1	M-2452	12-000000 3W 20%
1	M-2453	12-000000 3W 20%
1	M-2454	12-000000 3W 20%
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1	M-2456	12-000000 3W 20%
1	M-2457	12-000000 3W 20%
1	M-2458	12-000000 3W 20%
1	M-2459	12-000000 3W 20%
1	M-2460	12-000000 3W 20%
1	M-2461	12-000000 3W 20%
1	M-2462	12-000000 3W 20%
1	M-2463	12-000000 3W 20%
1	M-2464	12-000000 3W 20%
1	M-2465	12-000000 3W 20%
1	M-2466	12-000000 3W 20%
1	M-2467	12-000000 3W 20%
1	M-2468	12-000000 3W 20%
1	M-2469	12-000000 3W 20%
1	M-2470	12-000000 3W 20%
1	M-2471	12-000000 3W 20%
1	M-2472	12-000000 3W 20%
1	M-2473	12-000000 3W 20%
1	M-2474	12-000000 3W 20%
1	M-2475	12-000000 3W 20%
1	M-2476	12-000000 3W 20%
1	M-2477	12-000000 3W 20%
1	M-2478	12-000000 3W 20%
1	M-2479	12-000000 3W 20%
1	M-2480	12-000000 3W 20%
1	M-2481	12-000000 3W 20%
1	M-2482	12-000000 3W 20%
1	M-2483	12-000000 3W 20%
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1	M-2489	12-000000 3W 20%
1	M-2490	12-000000 3W 20%
1	M-2491	12-000000 3W 20%
1	M-2492	12-000000 3W 20%
1	M-2493	12-000000 3W 20%
1	M-2494	12-000000 3W 20%
1	M-2495	12-000000 3W 20%
1	M-2496	12-000000 3W 20%
1	M-2497	12-000000 3W 20%
1	M-2498	12-000000 3W 20%
1	M-2499	12-000000 3W 20%
1	M-2500	12-000000 3W 20%

MODELS 401, 402, 403,  
404, 405, 406, 407



## PROCEDURE FOR SETTING THE STATION BUTTONS

Make a list of your six favorite stations, those which you tune in regularly. It is better to list the station with the lowest kilocycle number first, the station with the next higher kilocycle number next, and so on.

Grasp the left-hand button at the sides (depress the adjacent button) and pull it out as far as it will go. A click will be heard. If it is impossible to depress the button which is adjacent to the button you are setting, rotate the tuning knob a few turns.

Select the first station from the list you have prepared. *Carefully* tune in this station by means of the manual tuning knob until the dark sector in the tuning eye is narrowest.

Now lock the mechanism by pushing the button all the way in until it is felt to lock into place.

Proceed in the same manner to set stations on any of the remaining buttons. Any button may be used for any station you can receive, although it will be more convenient to set the stations so that the kilo-

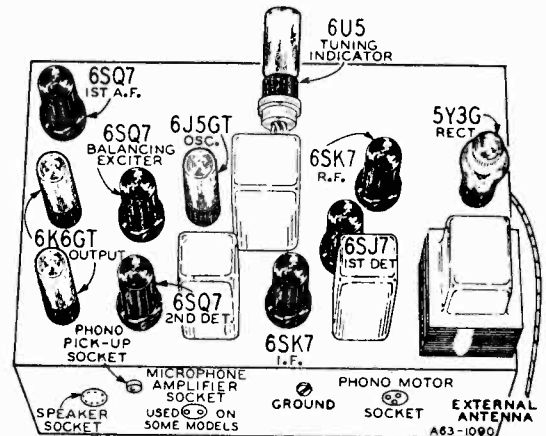
cycle numbers increase from left to right.

Remove the correct station call letter tab from the sheets supplied by bending the sheet back and forth at the score mark until the tab can be broken off. Press the tab all the way to the bottom of the space provided in the button. Cover the call letter tab with a celluloid tab, pressing this in until it snaps into place.

Changing the setting of one button will not affect the setting of any of the other buttons.

### SPECIFICATIONS

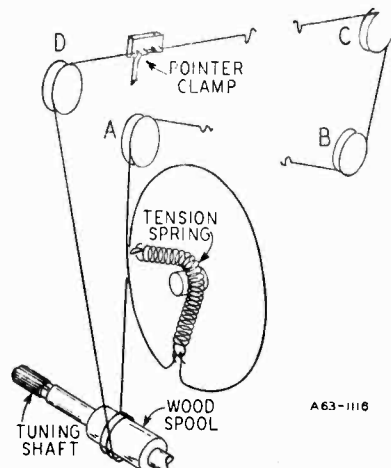
Power Consumption	- - - - - 90 Watts (At 117 volts 60 cycles) 122 Watts (Motor Operating)
Power Output	- - - - - 4 Watts Undistorted 5.5 Watts Maximum
Selectivity	- - - - - 35 KC Broad at 1000 Times Signal
Intermediate Frequency	- - - - - 456 KC
Speaker	- - - - - 12" Electro-Dynamic
Tuning Frequency Range	
B Range	- - - - - 535 to 1610 KC
D Range	- - - - - 5.35 to 18.3 MC
Sensitivity—External Antennas—(For 0.5 Watt output)	
B Range	- - - - - 2.0 Microvolts Average
D Range	- - - - - 4.0 Microvolts Average



### DRIVE CORD REPLACEMENT

Turn gang condenser to open position. Use new drive cord 55" in length.

Secure one end of tension spring to hook on drive pulley. Bend spring around drive pulley shaft—see illustration. Pass cord through slot in pulley rim. Wind cord 1/4 turn clockwise (from drive pulley end of chassis) around drive pulley. Pass cord around idler pulleys A, B, C and D as in illustration. Then wind cord 2 1/2 turns clockwise (from front of chassis) around tuning shaft spool. These turns should progress away from chassis. Pass cord over top of drive pulley for 1/4 turn clockwise (from drive pulley end of chassis) and through slot in pulley rim. Fasten cord to tension spring—see illustration.



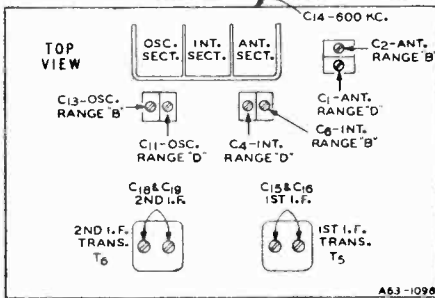
MODELS 401, 402, 403,  
404, 405, 406, 407

### ALIGNMENT PROCEDURE

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

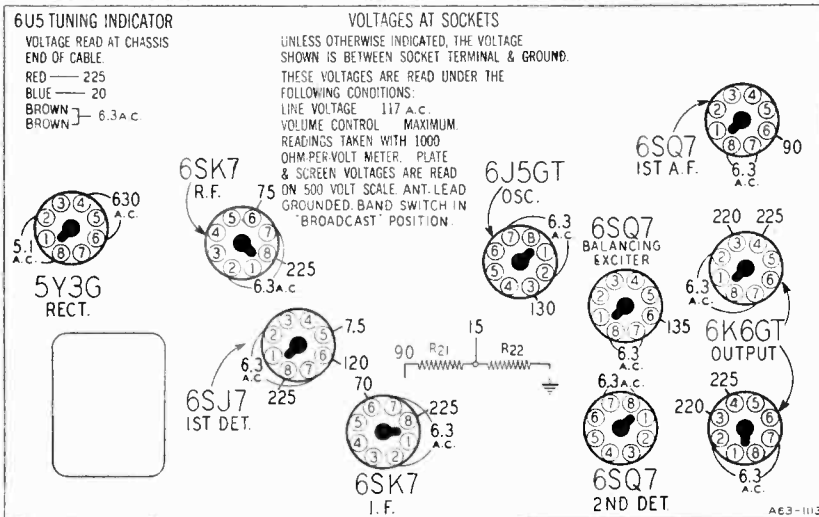
The following equipment is required for aligning:  
An all Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.  
Output Indicating Meter—Non-Metallic Screw driver.  
Dummy Antennas—1 mf., 100 mmf., and 400 ohms.

SIGNAL GENERATOR		CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
FREQUENCY SETTING						
I.F.	456 KC	Signal Grid of 1st Det.	.1 mf.	B Range	Turn Rotor to Full Open	1st I.F. (C15) & (C16) 2nd I.F. (C18) & (C19)
RANGE D	18,300 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C11)
	17,000 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Max. Output	Ant. Range D (C1) Int. Range D (C4) Rock Rotor—See Note B
RANGE B	1610 KC	Antenna Lead	100 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C13)
	1400 KC	Antenna Lead	100 mmf.	B Range	Turn Rotor to Max. Output Set Indicator to 1400 KC— See Note A	Ant. Range B (C2) Int. Range B (C6)
	600 KC	Antenna Lead	100 mmf.	B Range	Turn Rotor to Max. Output	600 KC (C14) Rock Rotor—See Note B
LOOP RANGE B	1400 KC	Antenna Lead	100 mmf.	B Range	Turn Rotor to Max. Output	Ant. Range B (C2)



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

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



### REPLACEMENT PARTS LIST

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

#### MISCELLANEOUS

Part No.	Description
12A422	12" Electro-Dynamic Speaker complete with Output Transformer
3A304	Phono Motor Socket
3A305	Single Pin Tip Socket (Phono)
3A307	Pre-Amplifier Socket
13X448	Tuning Eye Tube Socket and Cable Assembly complete with 1 Megohm Resistor
13X328	Line Cord and Plug Assembly
2A222	Band Change Switch
10A433	Knob (Band Change Switch)
10A430	Knob (Tone Control)
10A431	Knob (Tuning)
10A432	Knob (Volume Control and On-Off Switch)
26A231	Foil Aerial Assembly

#### TRANSFORMERS AND COILS

Part No.	Description
9A1545	T1 Antenna Transformer Assembly—"B" and "D" Range
9A1564	T2 Loop Aerial Assembly—"B" Range
9A1543	T3 Interstage Transformer Assembly—"B" and "D" Range
9A1542	T4 Oscillator Coil Assembly—"B" and "D" Range
9A1534	T5 1st I.F. Transformer and Can Assembly
9A1535	T6 2nd I.F. Transformer and Can Assembly
T7	Output Transformer (See "Miscellaneous")
53X185	T8 117 Volt, 60 Cycle Standard Power Transformer

#### CONDENSERS

Part No.	Value	Description
17A182	C1	1.9-15 mmf. / Trimmer
066501	C2	1.9-15 mmf. / 400 Volt Tubular
17A182	C4	1.9-15 mmf. / Trimmer
47X70	C6	1.9-15 mmf. / Molded
47X57	C7	100 mmf. / Molded
B66203	C8, C10, C30	.02 mf. / 200 Volt Tubular
46X340	C9	.0037 mf. / 1800 Volt Tubular
17A182	C11	1.9-15 mmf. / Trimmer
47X53	C12	35 mmf. / Molded
17A175	C14	300-600 mmf. / 600 K.C. Padder
17A136	C15	50-120 mmf. / 1st I.F. Trimmer
B66503	C17	50-120 mmf. / 200 Volt Tubular
17A137	C18	50-120 mmf. / 2nd I.F. Trimmer
	C19	85-185 mmf. / 200 Volt Tubular
	C20A	60 mmf. / Dual Mica
	C20B	60 mmf. / Dual Mica
B66103	C21	.01 mf. / 200 Volt Tubular
47X65	C22	.250 mf. / Molded
D66203	C23, C24, C26	.02 mf. / 400 Volt Tubular
B66254	C25	.25 mf. / 200 Volt Tubular
F66202	C27, C28	.002 mf. / 400 Volt Tubular
45X322	C29A	20 mf. / 450 Volt / Dry Electrolytic
	C29B	40 mf. / 450 Volt / Dry Electrolytic
D66104	C31	10 mf. / 400 Volt Tubular
47X150	C32	300 mmf. / Molded
14A157	C3	3 Gang Condenser Complete with Drive Pulley

#### RESISTORS

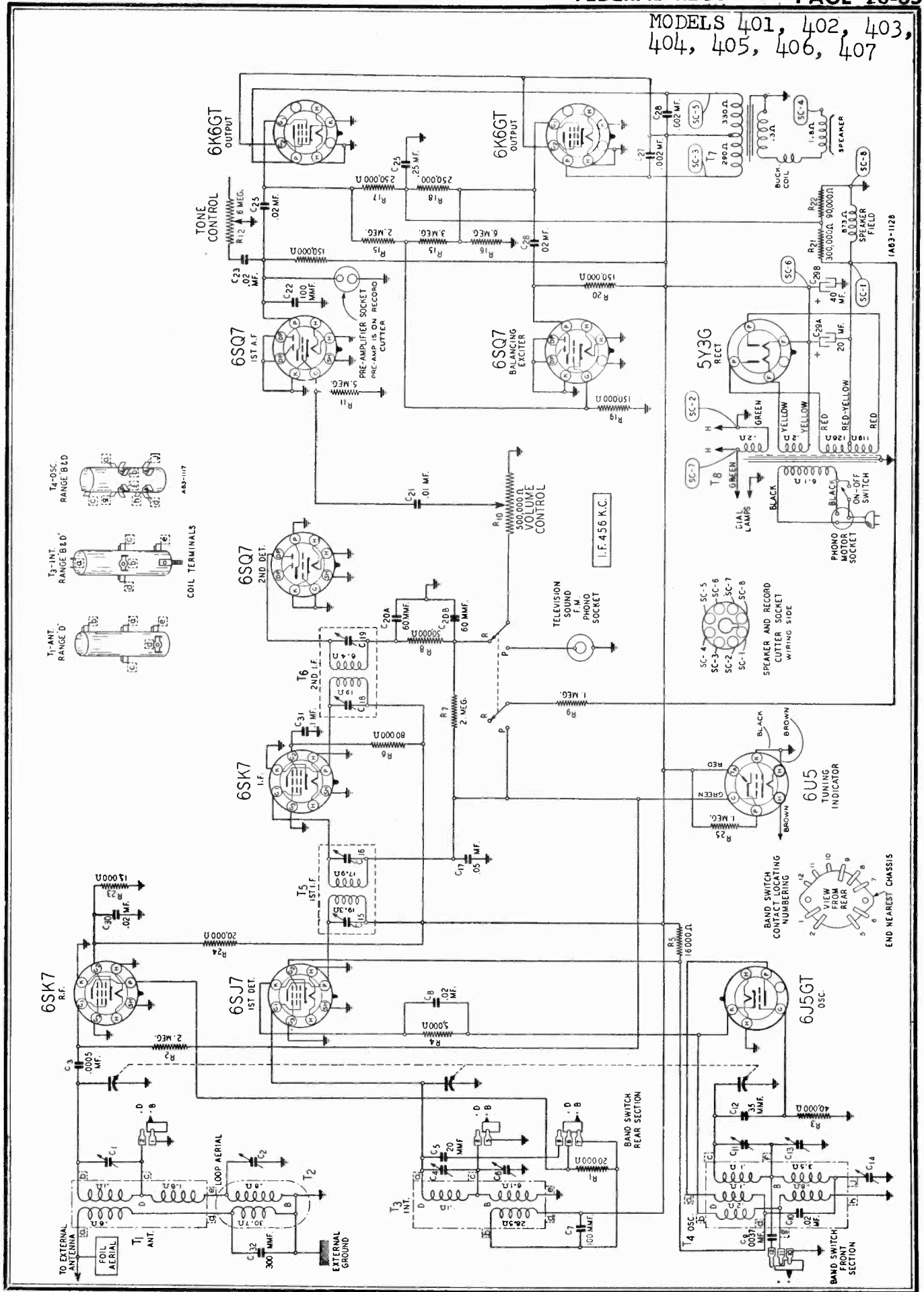
Part No.	Value	Description
C95203	R1	20,000 Ohm / 1.0 Watt / Carbon
B95205	R2, R7	2 Megohm / 0.5 Watt / Carbon
B95403	R3	40,000 Ohm / 0.5 Watt / Carbon
B9-4502	R4	5,000 Ohm / 0.5 Watt / Carbon
D94163	R5	16,000 Ohm / 2.0 Watt / Carbon
B95-03	R6	80,000 Ohm / 0.5 Watt / Carbon
B95503	R8	50,000 Ohm / 0.5 Watt / Carbon
B95105	R9	1 Megohm / 0.5 Watt / Carbon

Part No.	Value	Description
35X320	R10	500,000 Ohm / Volume Control and On-Off Switch
B95505	R11	5 Megohm / 0.5 Watt / Carbon
40X270	R12	6 Megohm / 0.5 Watt / Carbon
B95154	H13, R20	150,000 Ohm / 0.5 Watt / Carbon
B93205	R14	2 Megohm / 0.5 Watt / Carbon
B94305	R15	3 Megohm / 0.5 Watt / Carbon
B95605	R16	6 Megohm / 0.5 Watt / Carbon
B95254	R17, R18	250,000 Ohm / 0.5 Watt / Carbon
B93154	H19	150,000 Ohm / 0.5 Watt / Carbon
B93304	R21	300,000 Ohm / 0.5 Watt / Carbon
B93903	R22	90,000 Ohm / 0.5 Watt / Carbon
C94153	R23	15,000 Ohm / 1.0 Watt / Carbon
C94203	R24	20,000 Ohm / 1.0 Watt / Carbon
	R25	1 Megohm (Part of Tuning Eye Tube Socket and Cable Assembly)

#### AUTOMATIC TUNING AND DIAL ASSEMBLY

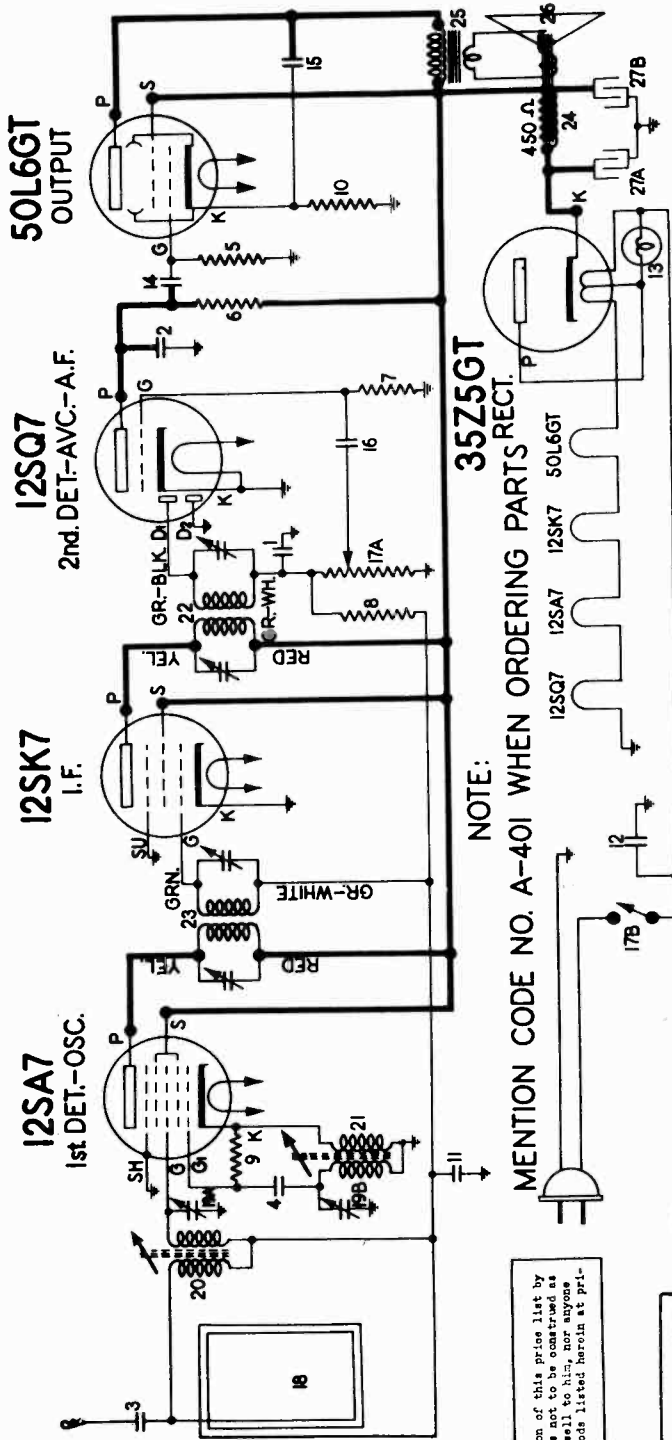
Part No.	Description
20A90	Automatic Tuning Assembly complete with 3 Section Gang Condenser and Drive Pulley
26A353	Dial Mounting Plate Assembly complete with Idler Pulleys, Cardboard Dial Scale and Clear Glass Crystal
17X58	Clear Glass Crystal
41X26	Clamp for Glass Crystal
58X560	Cardboard Dial Scale
15X163	Pointer for Dial Scale
	55" Drive Cord (30 Lb. Test)
28X137	Tension Spring for Drive Cord
26X360	Tuning Shaft
23X560	Bracket for Tuning Shaft
24X452	Wooden Spool for Tuning Shaft
19X204	"C" Washers for Tuning Shaft
7A126	Dial Lamp Socket and Cable Assembly
7A32	Dial Lamp (No. 51)
4X655	Escutcheon for Dial
	Escutcheon Screws No. 2x3/4" Ph. Fr. Oval Hd. Wood Screws Stat. Bronze
9A495	Statin Buttons
26A315	Set of Call Letter Sheets and Celluloid Tabs
58X640	Celluloid Tabs only (Sheet of 8)

MODELS 401, 402, 403,  
404, 405, 406, 407

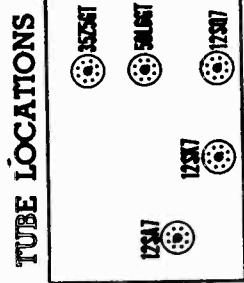




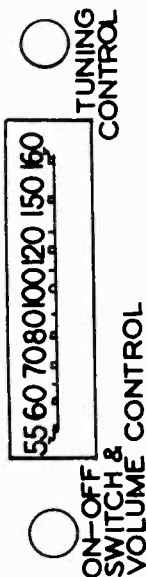




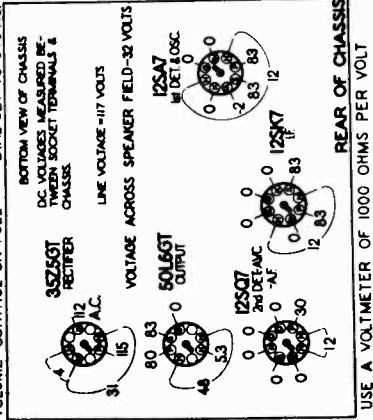
NOTE:  
MENTION CODE NO. A-40I WHEN ORDERING PARTS RECT.



NOTE  
The possession of this price list by any person is not to be construed as an offer to sell to him, nor anyone else, the goods listed herein at prices stated.



**SOCKET VOLTAGES**



**MISCELLANEOUS PARTS**

PART NUMBER	DESCRIPTION
501996	Cabinet back only
114955	Clamp - for drive cord
112764	Clip - coil mounting
116946	Cord - tuning mech. drive (6 ft. length)
117057	Cord - dial drive (3 ft. length)
502005	Dial Scale
501140	Drive - drum & bushing
501136	Drive - shaft & disc
501370	Escutcheon
501995	Knob - tuning or volume
500218	Pointer
81145	Retaining ring - for tuning shaft
85827	Set Screw - 8/32 square head
160026	Socket - condenser mtg. (used with alum. can only)
116690	Socket - octal base
500499	Socket - pilot lamp (with leads)
161364	Spring - dial cord tension
501145	Spring - tension for tuning mech.
500216	Tuning shaft
111972	Washer - extruded & tapped (mtg.)
111456	Washer - spring washer for tuning shaft
500219	Window - dial

**ELECTRICAL PARTS**

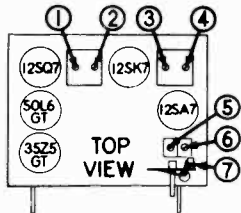
DIAGRAM NUMBER	PART NUMBER	DESCRIPTION
1-2	83539	Condenser - mica 260 mmfd.
3	85081	Condenser - mica 51 mmfd.
4	88686	Condenser - mica 200 mmfd.
5	112971	Resistor - insulated, 470,000 ohm 1/2 watt
6	112987	Resistor - insulated, 220,000 ohm 1/2 watt
7	116050	Resistor - insulated, 10 meg. 1/2 watt
8	116056	Resistor - insulated, 2.2 meg. 1/2 watt
9	116059	Resistor - insulated, 22,000 ohm 1/2 watt
10	116092	Resistor - insulated, 1.40 ohm, 1 watt-wire wound
11-12	116819	Condenser .05 mfd. 600 volt
13	118921	Lamp-Dial (Mazda #47)
14-15	119193	Condenser .01 mfd. 600 volt
16	119875	Condenser .002 mfd. 600 volt
17A-17B	500223	Volume Control - 1 meg. (with switch)
18	501150	Loop Antenna
19A-19B	501223	Condenser - trimmer (2 sections) (A-35 mmfd.) (B-238 mmfd.)
20	501157	Coil - antenna (with slug)
21	501158	Coil - oscillator (with slug)
22	501166	Transformer - 2nd I.F.
23	501233	Transformer - 1st I.F.
24	R-500916	Speaker - dynamic (4")
25	R-500916	Transformer - output for R-500916 Spkr.
26	R-501163	Transformer - output for R-500916 Spkr.
27A-27B	501213	Electrolytic Capacitor (A-40 mfd. - 150 volt) (B-20 mfd. - 150 volt)

MODEL S-7402-8

## ALIGNMENT PROCEDURE

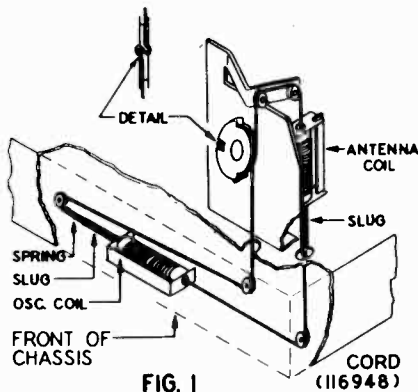
1. Connect output meter across voice coil or from 50L6GT plate through a .1 mfd. condenser to chassis.
2. Set Volume Control in maximum position.
3. Connect signal generator ground through a .1 mfd. condenser to chassis.
4. Set dial pointer to 160 with slugs all the way out.

Dummy Ant. in Series with Sig. Gen.	Connection Sig. Gen. Output to Receiver	Sig. Gen. Freq.	Receiver Dial Setting	Trimmer No.	Trimmer Description	Type of Adjustment
200 Mmfd. Mica Condenser	Grid of 12SA7 Tube	455 KC	Any place where it does not affect signal	1-2 3-4	2nd I.F. 1st I.F.	Adjust screws on top of I.F. cans for maximum output
200 Mmfd. Mica Condenser	Antenna Terminal	1600 KC	1600 KC	5	B.C. Osc.	Adjust for maximum output
200 Mmfd. Mica Condenser	Antenna Terminal	1600 KC	Tune to 1600 KC Gen. Sig.	6	B.C. Ant.	Adjust for maximum output
200 Mmfd. Mica Condenser	Antenna Terminal	1400 KC	Tune to 1400 KC Gen. Signal	7	B.C. Ant. Coil	Adjust moveable Antenna Coil for maximum output



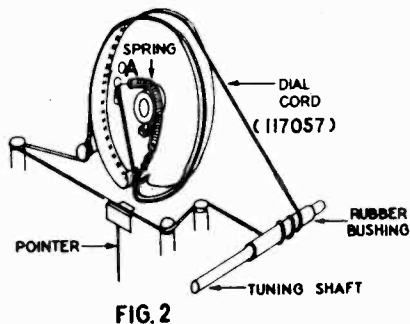
NOTE: After completing adjustment No. 7 return slugs to maximum out position and check trimmer No. 6. If no appreciable change in trimmer adjustment is necessary for maximum output, the antenna circuit is tracking. If the trimmer No. 6 requires considerable change it will be necessary to repeat adjustment No. 7 again. These two adjustments (Nos. 6 & 7) should be made several times until no change in trimmer adjustment for maximum output is necessary at either point.

### TO RESTRING TUNING MECHANISM



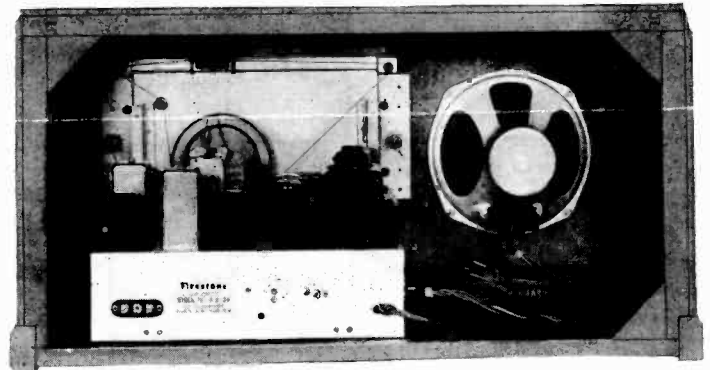
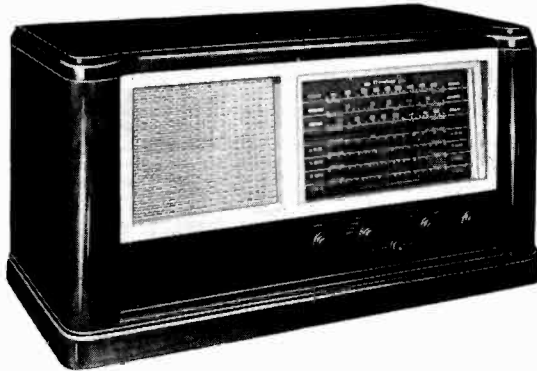
1. Form a loop in one end of the cord and attach it to the hook nearest to the dot on the slug marked with a yellow dot. Form another loop through the hook farthest from the dot on the slug with the white dot and adjust the length so that the distance from the iron end of one slug to the iron end of the other is 2 15/16 inches.
2. Attach another length of cord to the other end of the yellow dot slug and drop the assembly through the hole in the top of the antenna coil leaving the newly added length of cord on the top end.
3. Pass the lower slug through the hole in the chassis, around the lower pulley and through the oscillator coil.
4. Now pass the cord from the top end over the two pulleys at the top of the mounting bracket, around the rear side of the small irregularly shaped pulley (see Fig. 1) threading it through the slots as shown in the "Detail" drawing and across the front down through the second hole in the chassis. Pass the cord under the upper pulley and around the top of the left hand pulley.
5. Form a loop and attach to spring (part no. 501145). Attach spring to slug in oscillator coil and adjust loop in cord to give normal tension.
6. The iron slug in the oscillator coil should project 1/2" from the end of the coil when the drive pulley is in its maximum counter-clockwise position. This may be adjusted by sliding the cord in the slots shown in the "Detail" drawing.
7. If the procedure outlined in the steps above has been carefully followed, the colored dot ends of the slugs will enter the coil last when the slugs are fully entered in the coils.
8. After restringing tuning mechanism, perform the alignment indicated under "Alignment Procedure" above.

DRUM SHOWN WITH SLUGS IN FULL OUT POSITION



### TO RESTRING DIAL CORD

1. Set drum to position shown in Figure 2 with slugs in full out position (shown in Fig. 1).
2. Attach one end of the dial cord to point A on the drum.
3. Pass the cord through the opening at the bottom of the drum around the rear of the left side over the top and make two and one half turns around the rubber bushing on the tuning shaft as shown in Fig. 2.
4. Pass the cord around the guides as shown and over the front edge of the drum around and up through the opening at the bottom of the drum.
5. Attach spring to point A and bring it over hub of drum.
6. Form a loop in the cord and adjust for normal tension on the spring. (See Fig. 2).
7. Set the pointer to 1600 KC on the dial scale with the drum in the maximum counter-clockwise position.



**FREQUENCY RANGES:**

Standard Broadcast Band } 540-1725 KC.

Intermediate Band } 1.8-5.8 MC.

Short Wave Band } 5.8-15.5 MC.

16-13 Meter Spread Band } 17.1-22.2 MC.

19 Meter Spread Band } 14.5-17.1 MC.

25 Meter Spread Band } 11.17-12.2 MC.

31 Meter Spread Band } 9.28-9.8 MC.

**TUNING CONDENSER:**

3 section gang;  
Double rotor, Double stator;  
shock resistant mounting

**TUBE COMPLEMENT:**

6SK7—R.F. Amplifier  
6K8—Oscillator—1st Detector  
6SK7—I.F. Amplifier  
6SQ7—2nd Detector—A.V.C.—Phase Inverter  
6SQ7—1st Audio  
6K6GT } Power Output  
6K6GT } (Push-pull)  
5Y3GT—Rectifier

**POWER OUTPUT:**

Undistorted—4.5 watts  
Maximum—7.0 watts

**I.F. FREQUENCY:**

455 KC.

**SPEAKER:**

8 inch P.M. Dynamic  
Voice coil impedance—4.4 ohms

**POWER SUPPLY:**

110, 125, 150, 200, 225 or 245 volts  
50-60 cycles A.C.  
70 watts (at 125 volts)

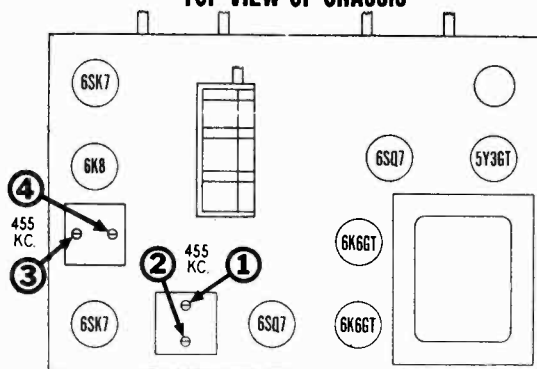
**AUDIO OSCILLATION**

The audio system of this receiver utilizes a two stage type of inverse feed-back arrangement and should it ever be necessary to replace the speaker or output transformer it is important to maintain a definite phase relationship in the feed-back circuit. If the connections to the output transformer are reversed or if the feed-back connection is made to the wrong side of the output transformer secondary, the system will become regenerative instead of degenerative. Under those conditions audio oscillation may result. If that occurs, oscillation may be prevented by reversing the connections to the primary of the output transformer.

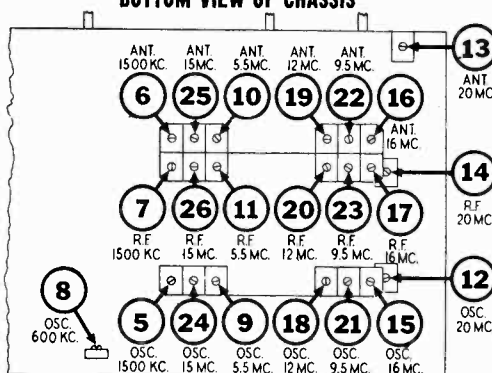
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	9.5 MC	31 Meter (*Position 7)	9.5 Mc.	21	31 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by setting the signal generator to 8.6 Mc. and then tune radio in vicinity of 9.5 Mc. If image signal is not heard, realign at 9.5 Mc. with trimmer screw farther in. Recheck image.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	9.5 MC	31 Meter (*Position 7)	Tune to 9.5 Mc. generator signal.	22	31 Meter Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					23	31 Meter R.F.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	15 MC	S.W. (*Position 3)	15 Mc.	24	S.W. Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 14.1 MC. If image does not appear, realign at 15 MC. with trimmer screw farther out. Recheck image.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	15 MC	S.W. (*Position 3)	Tune to 15 Mc. generator signal.	25	S.W. Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					26	S.W. R.F.	

\* Position 1 corresponds to extreme counter-clockwise setting of band switch. Succeeding positions are numbered in ascending order as switch is rotated clockwise.

TOP VIEW OF CHASSIS



BOTTOM VIEW OF CHASSIS



STAGE GAIN MEASUREMENT PROCEDURE

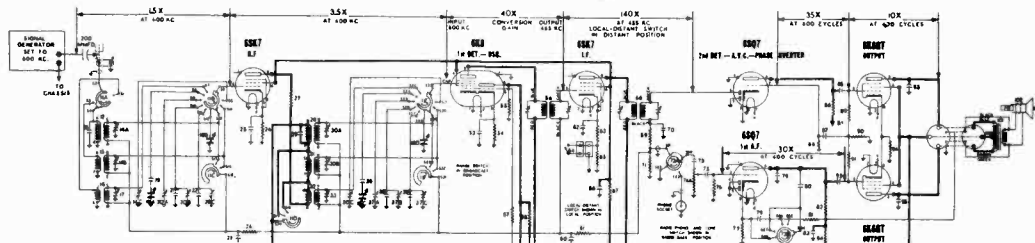
**REQUIRED INSTRUMENTS:** The amount of amplification or "gain" of each of the stages of this receiver may be measured with an A.C. Vacuum Tube Voltmeter or a "channel" type instrument containing a tuned and calibrated amplifier.

**PROCEDURE:** It is exceedingly important to adhere to the procedure outlined below since the accuracy of these measurements will be affected to a considerable extent by the failure to establish proper operating conditions.

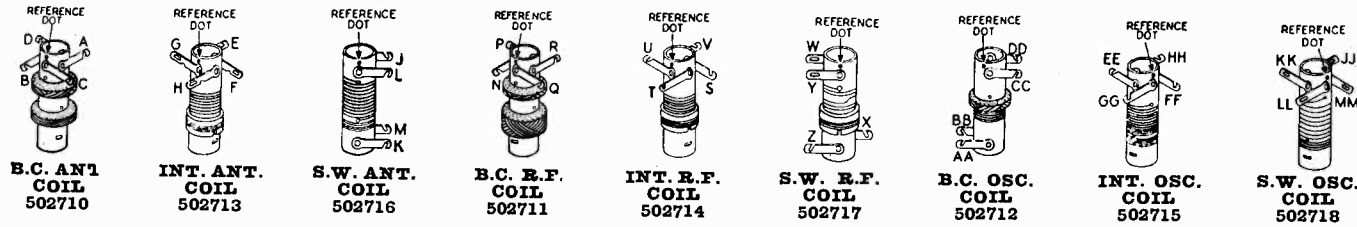
1. Be sure that R.F. and I.F. stages are carefully and accurately aligned by utilizing the alignment procedure given above.
2. Connect Signal Generator as shown below.
3. The values of stage gain which are given here were measured with a fixed bias of 3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to A.V.C. at the

black lead of the 1st I.F. transformer and connect the positive battery lead to the receiver chassis.

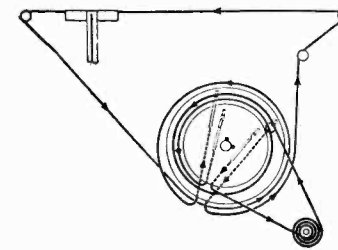
4. Set Signal Generator for operation at 600 Kc with 400 cycle modulation and carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
5. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.
6. When using a "channel" type instrument, carefully tune it for maximum output at desired frequency before making measurements.



**DIFFERENCES** in tube characteristics, tolerance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown above.



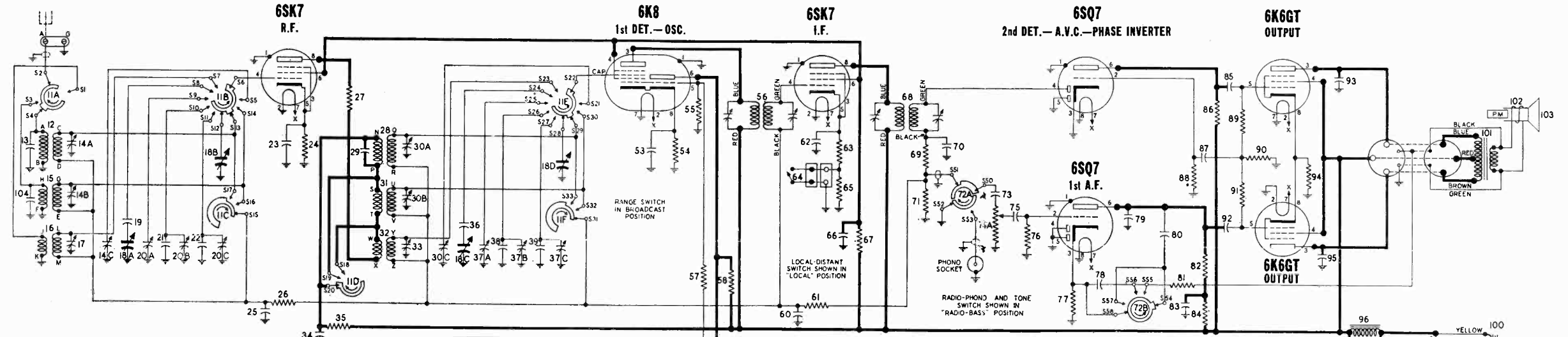
Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.



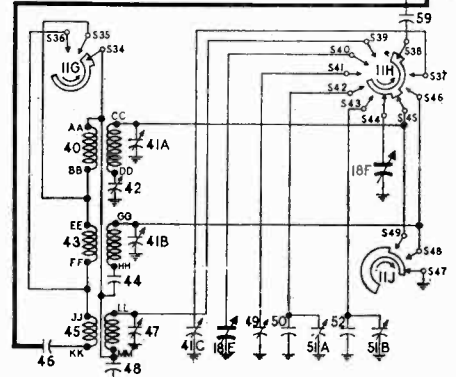
**DIAL AND POINTER DRIVE CORD ARRANGEMENT**

To string dial cord, set gang condenser to fully meshed position and use following parts:

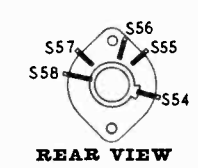
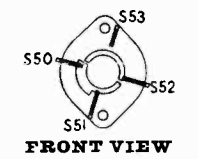
- 113177 Tension Spring
- 114955 Clip on end of cord
- 119087 Ring
- 502773 Cord (8 feet)
- 4 1/2 ft. for pointer drive
- 3 1/2 ft. for tuning drive



**I. F. 455 KC.**



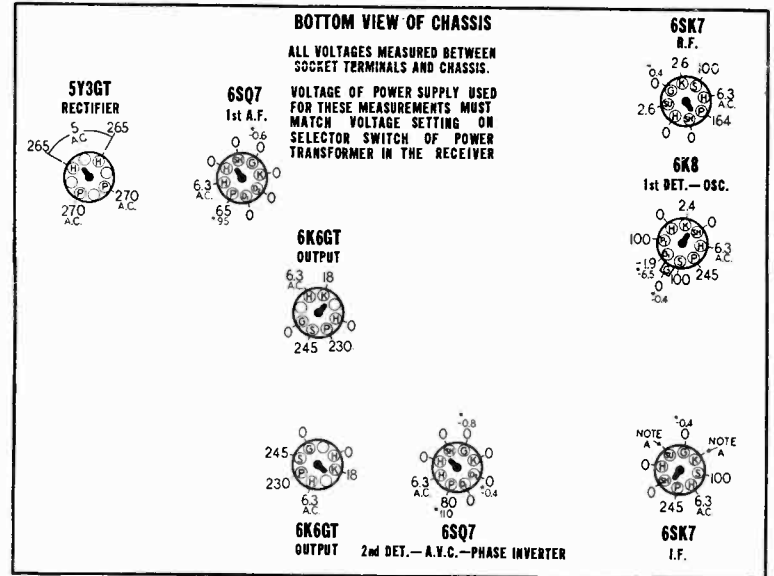
**RADIO-PHONO & TONE SWITCH 502719**



**SOCKET VOLTAGES**

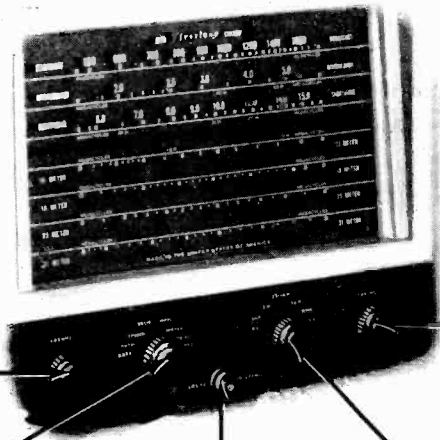
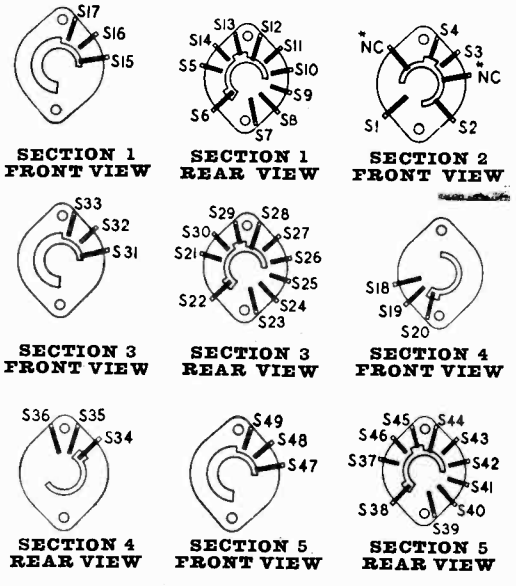
Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (\*). The (\*) symbol designates a vacuum tube voltmeter measurement.

**BE SURE THAT SWITCH ON POWER TRANSFORMER IS SET TO POSITION WHICH MOST NEARLY MATCHES LINE VOLTAGE**  
**RADIO-PHONO AND TONE SWITCH IN "RADIO-BASS" POSITION**  
**VOLUME ON FULL WITH NO SIGNAL**  
**DIAL TUNED TO 540 KC**  
**BAND SWITCH IN BROADCAST POSITION**



**REAR OF CHASSIS**

**BAND SWITCH 502748**



**ON-OFF SWITCH AND VOLUME CONTROL**  
 Turn this knob clockwise to turn set on. Continuing clockwise will increase volume.  
**MARCHA - VOLUMEN**  
 Para usar el radio volteé esta perilla a la derecha y luego para aumentar el volumen hágalo a la izquierda.

**TUNING CONTROL**  
 Use this control to tune receiver to the desired station.  
**SINTONIZACION**  
 Voltee esta perilla a la derecha o izquierda, hasta dar con la estación deseada.

**TONE AND RADIO-PHONO SWITCH**  
 Use to select most pleasing tone and also to switch from radio to phonograph operation when using a separate record player. Starting at extreme counter-clockwise setting and turning clockwise, first 3 positions are for radio and next 3 are for phonograph.  
**CAMBIADOR DE TONO Y RADIO-FONO**  
 Use éste para escoger el tono más agradable y también para el fonógrafo cuando se hace uso de un tocadiscos separado. Empezando al extremo derecho voltee a la izquierda y luego a la derecha parando según convenza. Las tres primeras posiciones son para el radio y las tres siguientes para el fonógrafo.

**LOCAL-DISTANT SWITCH**  
 Use the "DISTANT" position when tuning for weak stations. The "LOCAL" position is used to reduce inter-station noise when tuning for strong stations.  
**CAMBIADOR DE POSICIONES**  
 Use la posición DISTANT para sintonizar estaciones débiles o de poca potencia y la posición LOCAL para reducir ruidos producidos por estaciones débiles que están entre estaciones de mayor potencia.

**BAND SWITCH**  
 Use to select desired tuning range. Title of each position corresponds with marking at side of dial scale for that range.  
**CAMBIADOR DE BANDA**  
 Use éste para sintonizar teniendo en cuenta que cada posición está rotulada para corresponder con la rotulación al lado de la escala para tal banda o alcance.

Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.

NOTE A: The voltage at the cathode or suppressor terminals of this tube is 13 volts when Local-Distant switch is in "Local" position and 2.4 volts when switch is set to "Distant" position.

\* Not used; may serve as wiring junction point.

**ALIGNMENT PROCEDURE**

1. When gang condenser is fully meshed, dial pointer should be in the position indicated by the last division below 550 on the dial. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.
2. Connect an output meter across the speaker voice coil or from the plate of the 6K6GT tube to chassis through a 0.1 Mfd. condenser.
3. Connect the ground lead of the signal generator to the receiver chassis.
4. Set volume control to maximum volume position and use a weak signal from the signal generator.
5. Set Radio-Phono and Tone switch to "Radio-Bass" position.
6. Set Local-Distant switch to "Distant" position.

**IMPORTANT:** Align this receiver in exactly the order shown below. The 13-16 Meter band must be aligned before any of the other short wave bands.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT	
200 MMFD. Mica Condenser	Cap of 6K8	455 KC	Broadcast (*Position 1)	Any point where it does not affect the signal.	1-2 3-4	2nd I.F. 1st I.F.	Adjust for maximum output. Then repeat adjustment.	
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	1500 KC	Broadcast (*Position 1)	1500 Kc.	5	Broadcast Oscillator (Shunt)	Adjust for maximum output.	
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	1500 KC	Broadcast (*Position 1)	Tune to 1500 Kc. generator signal.	6 7	Broadcast Antenna Broadcast R.F.	Adjust for maximum output.	
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	600 KC	Broadcast (*Position 1)	Tune to 600 Kc. generator signal.	8	Broadcast Oscillator (Series Pad)	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.	
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	Repeat adjustment of trimmers 5, 6, and 7 at 1500 Kc. Then re-check adjustment of trimmer 8 at 600 Kc.						
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	5.5 MC	Intermediate (*Position 2)	5.5 Mc.	9	Intermediate Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 4.6 MC. If image does not appear, realign at 5.5 MC. with trimmer screw farther out. Recheck image.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	5.5 MC	Intermediate (*Position 2)	Tune to 5.5 Mc. generator signal.	10 11	Intermediate Antenna Intermediate R.F.	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	20 MC	13-16 Meter (*Position 4)	20 Mc.	12	13-16 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 20.9 MC. If image does not appear, realign at 20 MC. with trimmer screw in a different position. Recheck image.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	20 MC	13-16 Meter (*Position 4)	Tune to 20 Mc. generator signal.	13 14	13-16 Meter Antenna 13-16 Meter R.F.	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	16 MC	19 Meter (*Position 5)	16 Mc.	15	19 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 16.9 MC. If image does not appear, realign at 16 MC. with trimmer screw in a different position. Recheck image.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	16 MC	19 Meter (*Position 5)	Tune to 16 Mc. generator signal.	16 17	19 Meter Antenna 19 Meter R.F.	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	12 MC	25 Meter (*Position 6)	12 Mc.	18	25 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by setting the signal generator to 11.1 Mc. and then tune radio in vicinity of 12 Mc. If image signal is not heard, realign at 12 Mc. with trimmer screw farther in. Recheck image.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	12 MC	25 Meter (*Position 6)	Tune to 12 Mc. generator signal.	19 20	25 Meter Antenna 25 Meter R.F.	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.	

(Continued on next page)

\* Position 1 corresponds to extreme counter-clockwise setting of band switch. Succeeding positions are numbered in ascending order as switch is rotated clockwise.

**PARTS LIST**

DIA-GRAM NO.	PART NO.	DESCRIPTION
<b>CONDENSERS</b>		
13	502787	Condenser—mica 100 Mmfd. 500 volt.
14A, B, C	502753	Condenser—trimmer assembly A—1.6 to 18 Mmfd. B—1.6 to 18 Mmfd. C—3 to 35 Mmfd.
17	502758	Condenser—trimmer; 1.6 to 18 Mmfd.
18A to E	502749	Condenser—variable gang
19	502778	Condenser—ceramic 200 Mmfd. 500 volt
20A, B, C	502754	Condenser—trimmer assembly A—3 to 35 Mmfd. B—3 to 35 Mmfd. C—1.6 to 18 Mmfd.
21	502779	Condenser—ceramic 56 Mmfd. 500 volt.
22	502884	Condenser—mica 120 Mmfd. 500 Volt.
23	502806	Condenser—.05 Mfd. 200 volt.
25	502806	Condenser—.05 Mfd. 200 volt.
29	502787	Condenser—mica 100 Mmfd. 500 volt.
30A, B, C	502753	Condenser—trimmer assembly A—1.6 to 18 Mmfd. B—1.6 to 18 Mmfd. C—3 to 35 Mmfd.
33	502758	Condenser—trimmer; 1.6 to 18 Mmfd.
34	502807	Condenser—.05 Mfd. 400 volt.
36	502778	Condenser—ceramic 200 Mmfd. 500 volt.
37A, B, C	502754	Condenser—trimmer assembly A—3 to 35 Mmfd. B—3 to 35 Mmfd. C—1.6 to 18 Mmfd.
38	502779	Condenser—ceramic 56 Mmfd. 500 volt.
39	502884	Condenser—mica 120 Mmfd. 500 Volt.
41A, B, C	502753	Condenser—trimmer assembly A—1.6 to 18 Mmfd. B—1.6 to 18 Mmfd. C—3 to 35 Mmfd.
42	502922	Condenser—trimmer; 300 to 600 Mmfd.
44	502791	Condenser—mica 1600 Mmfd. 500 volt.
46	502792	Condenser—mica 4000 Mmfd. 500 volt.
47	502756	Condenser—trimmer; 2 to 6 Mmfd.
48	502793	Condenser—mica 5600 Mmfd. 500 volt.
49	502757	Condenser—trimmer; 6.5 to 35 Mmfd.
50	502167	Condenser—ceramic 68 Mmfd. 500 volt.
51A, B	502755	Condenser—trimmer assembly A—3 to 35 Mmfd. B—1.6 to 18 Mmfd.
52	502789	Condenser—mica 160 Mmfd. 500 volt.
53	502806	Condenser—.05 Mfd. 200 volt.
59	502787	Condenser—mica 100 Mmfd. 500 volt.
60	502806	Condenser—.05 Mfd. 200 volt.
62	502806	Condenser—.05 Mfd. 200 volt.
66	502807	Condenser—.05 Mfd. 400 volt.
70	502787	Condenser—mica 100 Mmfd. 500 volt.
73	502802	Condenser—.004 Mfd. 600 volt.
75	502802	Condenser—.004 Mfd. 600 volt.
78	502808	Condenser—.25 Mfd. 200 volt.
79	502787	Condenser—mica 100 Mmfd. 500 volt.
80	502803	Condenser—.006 Mfd. 600 volt.
83	502809	Condenser—.25 Mfd. 400 volt.
85	502805	Condenser—.02 Mfd. 400 volt.
87	502804	Condenser—.01 Mfd. 400 volt.
92	502805	Condenser—.02 Mfd. 400 volt.
93	502802	Condenser—.004 Mfd. 600 volt.
95	502802	Condenser—.004 Mfd. 600 volt.
97A, B	502720	Condenser—electrolytic A—15 Mfd. 400 volt B—20 Mfd. 400 volt
104	502788	Condenser—mica 130 Mmfd. 500 volt.

**DIA-GRAM NO. PART NO. DESCRIPTION**

DIA-GRAM NO.	PART NO.	DESCRIPTION
<b>RESISTORS</b>		
24	502125	Resistor—carbon 220 ohms 1/4 watt.
26	502134	Resistor—carbon 470,000 ohms 1/4 watt.
27	502478	Resistor—carbon 1000 ohms 1/4 watt.
35	502795	Resistor—carbon 4700 ohms 1/2 watt.
54	502125	Resistor—carbon 220 ohms 1/4 watt.
55	502131	Resistor—carbon 47,000 ohms 1/4 watt.
57	502794	Resistor—carbon 68 ohms 1/4 watt.
58	502801	Resistor—carbon 39,000 ohms 1/2 watt.
61	502135	Resistor—carbon 2.2 Meg. 1/4 watt.
63	502125	Resistor—carbon 220 ohms 1/4 watt.
55	502796	Resistor—carbon 8200 ohms 1/4 watt.
67	502981	Resistor—carbon 15,000 ohms 2 watt.
69	502131	Resistor—carbon 47,000 ohms 1/4 watt.
71	502134	Resistor—carbon 470,000 ohms 1/4 watt.
74A, B	502750	Volume control—with switch; 2 meg.
76	502136	Resistor—carbon 10 meg. 1/4 watt.
77	502794	Resistor—carbon 68 ohms 1/4 watt.
81	502126	Resistor—carbon 470 ohms 1/4 watt.
82	502133	Resistor—carbon 220,000 ohms 1/4 watt.
84	502132	Resistor—carbon 100,000 ohms 1/4 watt.
86	502133	Resistor—carbon 220,000 ohms 1/4 watt.
88	502136	Resistor—carbon 10 meg. 1/4 watt.
89	502133	Resistor—carbon 220,000 ohms 1/4 watt.
90, 91	502133	Resistor—carbon 220,000 ohms 1/4 watt.
94	502813	Resistor—wire wound 300 ohms 2 watt.

**COILS AND TRANSFORMERS**

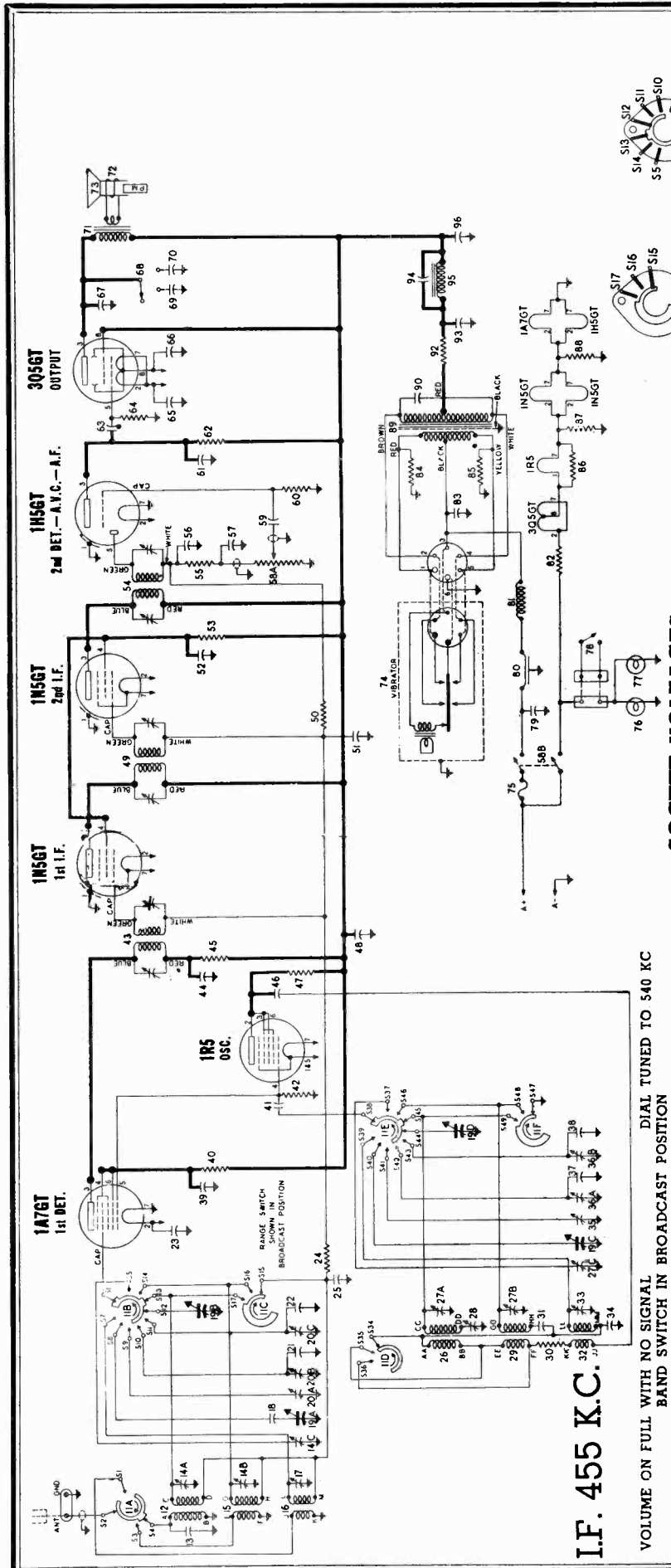
12	502710	Coil—BC. antenna
15	502713	Coil—Int. antenna
16	502716	Coil—S.W. antenna
28	502711	Coil—BC. R.F.
31	502714	Coil—Int. R.F.
32	502717	Coil—S.W.R.F.
40	502712	Coil—BC. oscillator
43	502715	Coil—Int. oscillator
45	502718	Coil—S.W. oscillator
56	502725	Transformer—1st I.F.
68	502726	Transformer—2nd I.F.
96	502751	Coil—filter choke
100	502747	Transformer—power
101	502776	Transformer—output for M-502775 spkr.

**OTHER ELECTRICAL PARTS**

11A to J	502748	Switch—band
64	502916	Switch—local-distant
72A, B	502719	Switch—tone control
98, 99	110629	Lamp—dial (Mazda No. 44) 6.3V 0.25 Amps
102	502775	Speaker—P.M. dynamic (8 inch)
103	502777	Cone & voice coil for M-502775 speaker.

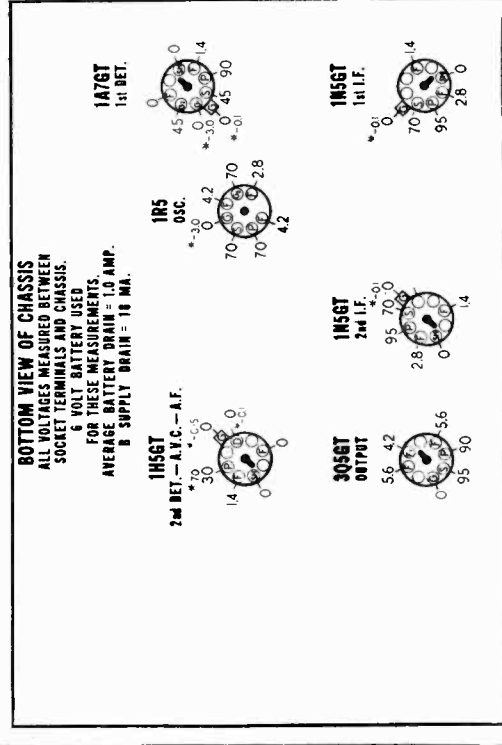
**MISCELLANEOUS**

502724	Background for dial.
160026	Base for mtg. electrolytic condenser.
504566	Cabinet
500420	Clamp—for dial glass.
112745	Clip—coil mtg.
114955	Clip—retainer on end of dial cord.
502773	Cord—dial drive (8 ft. required) Per ft.
504344	Dial scale—glass
117029	Drum—for dial drive
502705	Knob—tone or band switch
502704	Knob—volume or tuning
502762	Plug—for Local-Distant switch
502984	Plug—Speaker
502772	Pointer
81145	Retaining ring for tuning shaft
119087	Ring for dial cord.
113463	Rubber pad for mtg. chassis
116584	Rubber spacer for mtg. dial scale
85827	Screw—No. 8-32 for dial drum
112874	Screw—No. 10 x 1/8 for mtg. chassis
118606	Shaft—tuning control
502770	Socket—for dial lamp
502761	Socket—for Local-Distant switch
502769	Socket—for speaker
114876	Socket—octal base
160039	Socket—phono. plug
113177	Spring—dial cord tension
502767	Terminal strip—"A G"
119886	Washer—felt for knobs



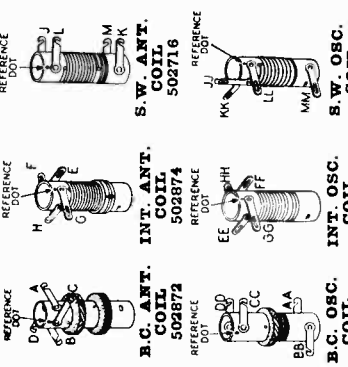
I.F. 455 K.C.

VOLUME ON FULL WITH NO SIGNAL  
BAND SWITCH IN BROADCAST POSITION  
DIAL TUNED TO 540 KC



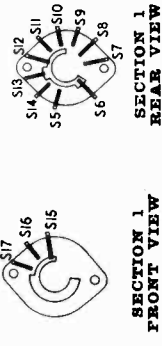
**SOCKET VOLTAGES**

Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (\*). The (\*) symbol designates a vacuum tube voltmeter measurement.



**DIAL AND POINTER DRIVE CORD ARRANGEMENT**

To string dial cord, set gong condenser to fully meshed position and use following parts:  
 113177 Tension Spring  
 114955 Clip on end of cord  
 119087 Ring  
 502773 Cord (8 feet)  
 4 1/2 ft. for pointer drive  
 3 1/2 ft. for tuning drive



\*Not used; may serve as wiring junction point.  
**BAND SWITCH**  
 502855



### ALIGNMENT PROCEDURE

1. When gang condenser is fully meshed, dial pointer should be in the position indicated by the last division below 550 on the dial. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.
2. Connect an output meter across the speaker voice coil or from the plate of the 3Q5GT tube to chassis through a 0.1 Mfd. condenser.
3. Connect the ground lead of the signal generator to the receiver chassis.
4. Set volume control to maximum volume position and use a weak signal from the signal generator.

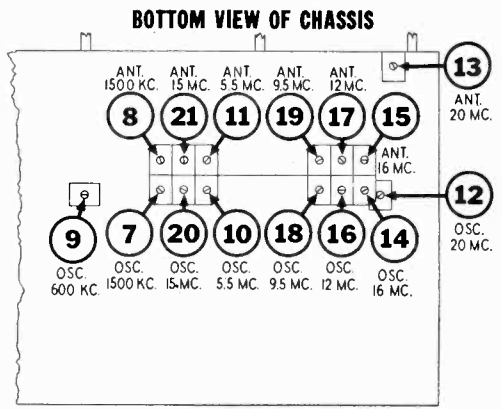
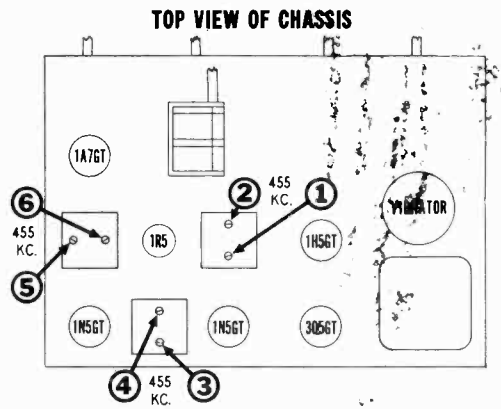
**IMPORTANT:** Align this receiver in exactly the order shown below. The 13-16 Meter band must be aligned before any of the other short wave bands.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Cap of 1A7GT	455 KC	Broadcast (*Position 1)	Any point where it does not affect the signal.	1-2	3rd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	2nd I.F.	
					5-6	1st I.F.	
200 MMFD. Mica Condenser	"ANT" terminal at rear of chassis.	1500 KC	Broadcast (*Position 1)	1500 Kc.	7	Broadcast Oscillator (Shunt)	Adjust for maximum output.
200 MMFD. Mica Condenser	"ANT" terminal at rear of chassis.	1500 KC	Broadcast (*Position 1)	Tune to 1500 Kc. generator signal.	8	Broadcast Antenna	Adjust for maximum output.
200 MMFD. Mica Condenser	"ANT" terminal at rear of chassis.	600 KC	Broadcast (*Position 1)	Tune to 600 Kc. generator signal.	9	Broadcast Oscillator (Series Pad)	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
200 MMFD. Mica Condenser	"ANT" terminal at rear of chassis.	Repeat adjustment of trimmers 7 and 8 at 1500 Kc. Then recheck adjustment of trimmer 9 at 600 Kc.					
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	5.5 MC	Intermediate (*Position 2)	5.5 Mc.	10	Intermediate Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 4.6 MC. If image does not appear, realign at 5.5 MC. with trimmer screw farther out. Recheck image.
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	5.5 MC	Intermediate (*Position 2)	Tune to 5.5 Mc. generator signal.	11	Intermediate Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	20 MC	13-16 Meter (*Position 4)	20 Mc.	12	13-16 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 20.9 MC. If image does not appear, realign at 20 MC. with trimmer screw in a different position. Recheck image.
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	20 MC	13-16 Meter (*Position 4)	Tune to 20 Mc. generator signal.	13	13-16 Meter Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	16 MC	19 Meter (*Position 5)	16 Mc.	14	19 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 16.9 MC. If image does not appear, realign at 16 MC. with trimmer screw in a different position. Recheck image.
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	16 MC	19 Meter (*Position 5)	Tune to 16 Mc. generator signal.	15	19 Meter Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	12 MC	25 Meter (*Position 6)	12 Mc.	16	25 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by setting the signal generator to 11.1 Mc. and then tune radio in vicinity of 12 Mc. If image signal is not heard, realign at 12 Mc. with trimmer screw further in. Recheck image.
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	12 MC	25 Meter (*Position 6)	Tune to 12 Mc. generator signal.	17	25 Meter Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.

\*Position 1 corresponds to extreme counter-clockwise setting of band switch. Succeeding positions are numbered in ascending order as switch is rotated clockwise.

400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	9.5 MC	31 Meter (*Position 7)	9.5 Mc.	18	31 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by setting the signal generator to 8.6 Mc. and then tune radio in vicinity of 9.5 Mc. If image signal is not heard, realign at 9.5 Mc. with trimmer screw further in. Recheck image.
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	9.5 MC	31 Meter (*Position 7)	Tune to 9.5 Mc. generator signal.	19	31 Meter Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	15 MC	S.W. (*Position 3)	15 Mc.	20	S.W. Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 14.1 MC. If image does not appear, realign at 15 MC, with trimmer screw further out. Recheck image.
400 OHM Carbon Resistor	"ANT" terminal at rear of chassis.	15 MC	S.W. (*Position 3)	Tune to 15 Mc. generator signal.	21	S.W. Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.

\*Position 1 corresponds to extreme counter-clockwise setting of band switch. Succeeding positions are numbered in ascending order as switch is rotated clockwise.



### STAGE GAIN MEASUREMENT PROCEDURE

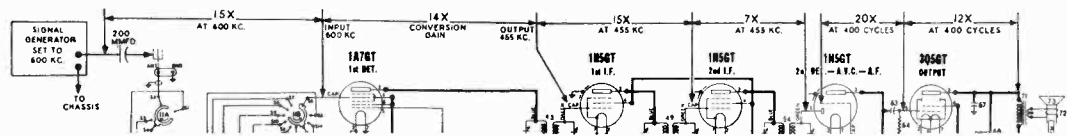
**REQUIRED INSTRUMENTS:** The amount of amplification or "gain" of each of the stages of this receiver may be measured with an A.C. Vacuum Tube Voltmeter or a "channel" type instrument containing a tuned and calibrated amplifier.

**PROCEDURE:** It is exceedingly important to adhere to the procedure outlined below since the accuracy of these measurements will be affected to a considerable extent by the failure to establish proper operating conditions.

1. Be sure that R.F. and I.F. stages are carefully and accurately aligned by utilizing the alignment procedure given above.
2. Connect Signal Generator as shown below.
3. The values of stage gain which are given here were measured with a fixed bias of 1½ volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 1½ volt battery to A.V.C. at

the white lead of the 2nd I.F. transformer and connect the positive battery lead to the receiver chassis.

4. Set Signal Generator for operation at 600 Kc with 400 cycle modulation and carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
5. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.
6. When using a "channel" type instrument, carefully tune it for maximum output at desired frequency before making measurements.



**DIFFERENCES** in tube characteristics, tolerance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown above.

MODEL 4-A-40

# PARTS LIST

DIA-GRAM NO.	PART NO.	DESCRIPTION	DIA-GRAM NO.	PART NO.	DESCRIPTION
64	502134	Resistor—carbon 470,000 Ohms 1/4 watt	13	502787	Condenser—mica 100 Mmfd. 500 volt
82	502893	Resistor—wire wound 4.3 Ohms 1 watt	14A, B, C	502753	Condenser—trimmer assembly A—1.6 to 18 Mmfd. B—1.6 to 18 Mmfd. C—3 to 35 Mmfd.
84, 85	502894	Resistor—carbon 100 Ohms 1/4 watt	17	502758	Condenser—trimmer; 1.6 to 18 Mmfd.
86	502895	Resistor—carbon 22 Ohms 1/4 watt	18	502778	Condenser—ceramic 200 Mmfd. 500 volt.
87	502897	Resistor—carbon 220 Ohms 1/4 watt	19A, 19B	502868	Condenser—variable gang
88	502898	Resistor—carbon 1200 Ohms 1/4 watt	19C, 19D		
92	502895	Resistor—carbop 1200 Ohms 1 watt	20A, B, C	502862	Condenser—trimmer assembly A—3 to 35 Mmfd. B—3 to 35 Mmfd. C—3 to 35 Mmfd.
<b>COILS AND TRANSFORMERS</b>			21	502779	Condenser—ceramic 56 Mmfd. 500 volt.
12	502872	Coil—BC. antenna	22	502884	Condenser—mica 120 Mmfd. 500 volt.
15	502874	Coil—Int. antenna	23	502808	Condenser—.25 Mfd. 200 volt.
16	502716	Coil—S.W. antenna	25	502806	Condenser—.05 Mfd. 200 volt.
26	502873	Coil—BC. oscillator	27A, B, C	502753	Condenser—trimmer assembly A—1.6 to 18 Mmfd. B—1.6 to 18 Mmfd. C—3 to 35 Mmfd.
29	502875	Coil—Int. oscillator	28	502922	Condenser—trimmer 300 to 600 Mmfd.
32	502876	Coil—S.W. oscillator	31	502893	Condenser—mica 1800 Mmfd. 500 volt.
43	502869	Transformer—1st I.F.	33	502756	Condenser—trimmer; 2 to 6 Mmfd.
43	502870	Transformer—2nd I.F.	34	502793	Condenser—mica 5600 Mmfd. 500 volt.
54	502871	Transformer—3rd I.F.	35	502757	Condenser—trimmer; 6.5 to 35 Mmfd.
71	502919	Transformer—output for M-502918 spkr.	36A, B	502863	Condenser—trimmer assembly A—3 to 35 Mmfd. B—3 to 35 Mmfd.
81	502861	Coil—choke in "A" supply lead	37	502167	Condenser—ceramic 68 Mmfd. 500 volt.
89	502900	Transformer—power	38	502789	Condenser—mica 160 Mmfd. 500 volt.
95	502898	Coil—filter choke	39	502890	Condenser—1 Mfd. 400 volt.
<b>OTHER ELECTRICAL PARTS</b>			41	502787	Condenser—mica 100 Mmfd. 500 volt.
11A to F	502855	Switch—band	44	502805	Condenser—.02 Mfd. 400 volt.
68	117025	Switch—tone control	46	502792	Condenser—mica 4000 Mmfd. 500 volt.
72	502918	Speaker—P.M. dynamic (8 inch) with output transformer	48	502880	Condenser—1 Mfd. 400 volt.
73	502920	Cone & voice coil for M-502918 speaker.	51	502806	Condenser—.05 Mfd. 200 volt.
74	110800	Vibrator	52	502807	Condenser—.05 Mfd. 400 volt.
75	110895	Fuse—3 amp. 250 volt.	56, 57	502882	Condenser—220 Mmfd. 500 volt.
76, 77	118921	Lamp—dial (Mazda No. 47) 6-8 volt, 150 Ma.	59	502803	Condenser—.006 Mfd. 600 volt.
78	502943	Switch—dial lamp	61	502882	Condenser—220 Mmfd. 500 volt.
<b>MISCELLANEOUS PARTS</b>			63	502804	Condenser—.01 Mfd. 400 volt.
502724		Background for dial	65	502878	Condenser—.5 Mfd. 200 volt.
504568		Cabinet	66	502865	Condenser—electrolytic 100 Mfd. 8 volt.
500420		Clamp—for dial glass	67	502881	Condenser—.002 Mfd. 400 volt.
502859		Clip—battery	69	502802	Condenser—.004 Mfd. 600 volt.
112745		Clip—coil mtg.	70	502804	Condenser—.01 Mfd. 400 volt.
114955		Clip—retainer on end of dial cord	79	502878	Condenser—.5 Mfd. 200 volt.
502773		Cord—dial drive (8 ft. required) per ft.	80	502860	Drain Plate—260 Mmfd. 100 volt.
504344		Dial scale—glass	83	502878	Condenser—.5 Mfd. 200 volt.
117029		Drum—for dial drive	90	502879	Condenser—.01 Mfd. 1000 volt.
502864		Fuse retainer and "A" supply lead	93	502866	Condenser—electrolytic 20 Mfd. 200 volt.
502705		Knob—tone or band switch	94	502880	Condenser—1 Mfd. 400 volt.
502704		Knob—volume or tuning	96	502867	Condenser—electrolytic 10 Mfd. 200 volt.
502762		Plug for dial lamp connection	<b>RESISTORS</b>		
502772		Pointer	24	502134	Resistor—carbon 470,000 Ohms 1/4 watt
81145		Retaining ring for tuning shaft	30	502886	Resistor—carbon 33 Ohms 1/4 watt
119087		Ring for dial cord	40	502889	Resistor—carbon 22,000 Ohms 1/4 watt
113463		Rubber pad for mtg. chassis	42	502131	Resistor—carbon 47,000 Ohms 1/4 watt
116584		Rubber Spacer for mtg. Dial Scale	45	502231	Resistor—carbon 4,700 Ohms 1/4 watt
85827		Screw—No. 8-32 for dial drum	47	502459	Resistor—carbon 6,800 Ohms 1/4 watt
112874		Screw—No. 10 x 1 1/8 for mtg. chassis	50	502268	Resistor—carbon 1 Meg. 1/4 watt
118606		Shaft—tuning control	53	502890	Resistor—carbon 56,000 Ohms 1/4 watt
502856		Shield cup clips—for retaining vibrator shield	55	502131	Resistor—carbon 47,000 Ohms 1/4 watt
117716		Shield—tube	58A, B	119357	Vol. Control—with switch 250,000 Ohms
502899		Socket for dial lamp	60	502136	Resistor—carbon 10 Meg. 1/4 watt
502761		Socket for dial lamp connection	62	502892	Resistor—carbon 330,000 Ohms 1/4 watt
114876		Socket—ctal base			
502982		Socket—miniature type 7 prong			
502858		Socket—vibrator			
113177		Spring—dial cord tension			
502767		Terminal strip "GND ANT"			
119886		Washer—felt for knobs			

## SPECIFICATIONS

### FREQUENCY RANGES:

Standard Broadcast Band	540-1725 KC.
Intermediate Band	1.8-5.8 MC.
Short Wave Band	5.8-15.5 MC.
16-13 Meter Spread Band	17.1-22.2 MC.
19 Meter Spread Band	14.5-17.1 MC.
25 Meter Spread Band	11.17-12.2 MC.
31 Meter Spread Band	9.28-9.8 MC.

### I.F. FREQUENCY:

455 KC.

### POWER OUTPUT:

Undistorted—.2 watt  
Maximum—.35 watts

### TUBE COMPLEMENT:

1A7GT—1st Detector  
1R5—Oscillator  
1N5GT—1st I.F. Amplifier  
1N5GT—2nd I.F. Amplifier  
1H5GT—2nd Detector—A.V.C.—1st Audio  
3Q5GT—Output

### TUNING CONDENSER:

2 Section gang;  
Double rotor, Double stator;  
Shock resistant mounting

### SPEAKER:

8 inch P.M. Dynamic  
Voice coil impedance—3.5 ohms

### POWER SUPPLY:

6 Volt Battery  
(Synchronous Vibrator Type)  
1 Amp. Average Battery Drain