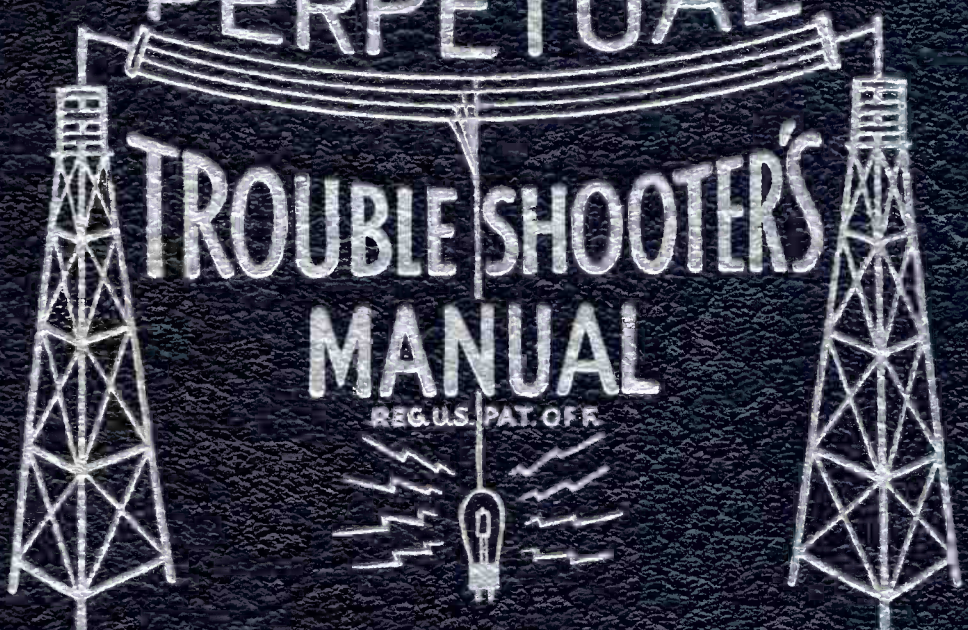
VOLUME XXI

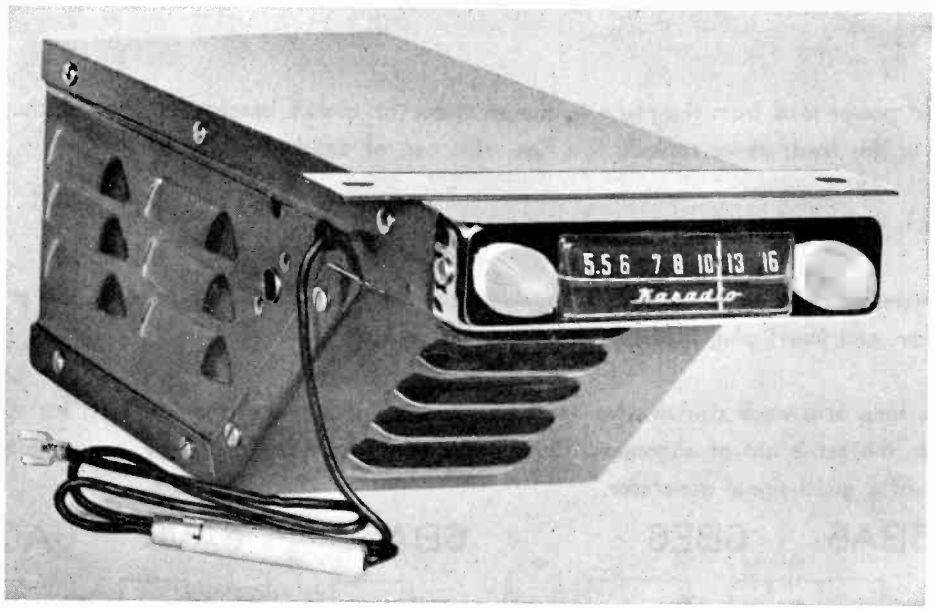
PERPETUAL TROUBLE SHOOTER'S MANUAL

REG. U.S. PAT. OFF.



JOHN F. RIDER

MODEL 1276



SPECIFICATIONS

Power Supply	6.3 volts DC
Frequency Range	540 KC to 1600 KC
Intermediate Frequency	257.5 KC
Antenna	Whip type
Tuning	Permeability
Speaker	4", P.M. voice coil impedance 3.2 ohms
Power Output	2.5 watts undistorted, 3.5 watts maximum
Sensitivity	1 uv for 500 milliwatts output
Selectivity	40 KC broad at 1000 times, signal at 1000 KC
Signal to Noise Ratio	10 to 1

Tubes used are as follows:

6BA6 R.F. Amplifier
6BE6 Oscillator-Converter
6BA6 I.F. Amplifier
6AV6 A.V.C., Detector, and Audio Amplifier
6AQ5 Power Output
6X4 Power Rectifier

UNPACK CAREFULLY, YOU WILL FIND:

Radio
1 Mounting bracket
1 Bag mounting parts:
Hardware, generator condenser, and distributor resistor.

MOUNTING

The chassis contains the complete radio, power supply, and speaker. This unit may be mounted to, and directly below, the instrument panel at any convenient location. Two holes must be drilled in the stiffening lip of the instrument panel about ¾ inch back from the front of the panel and spaced approximately 6 inches apart. These holes must be large enough to pass the two No. 8 machine screws provided in the bag of mounting parts for fastening the radio in place. After the holes are drilled, insert the mounting screws through the holes in the mounting plate of the radio and in the instrument panel lip, and place lock washers and nuts on screws. These nuts must be securely fastened. It is also very important that the paint be removed from the instrument panel lip directly under the nut so that a good ground connection is made.

Drill a hole to pass a No. 10 machine screw in the fire wall or some other convenient place, and bolt one end of the metal strap with series of holes to this place. Insert the 1/4-20 stud in tapped hole in the back of the radio, and fasten the mounting strap to the back of the radio by means of this stud, lock washer, and nut. This is the back support for the radio, and good ground connections must also be considered in this assembly.

MODEL 1276

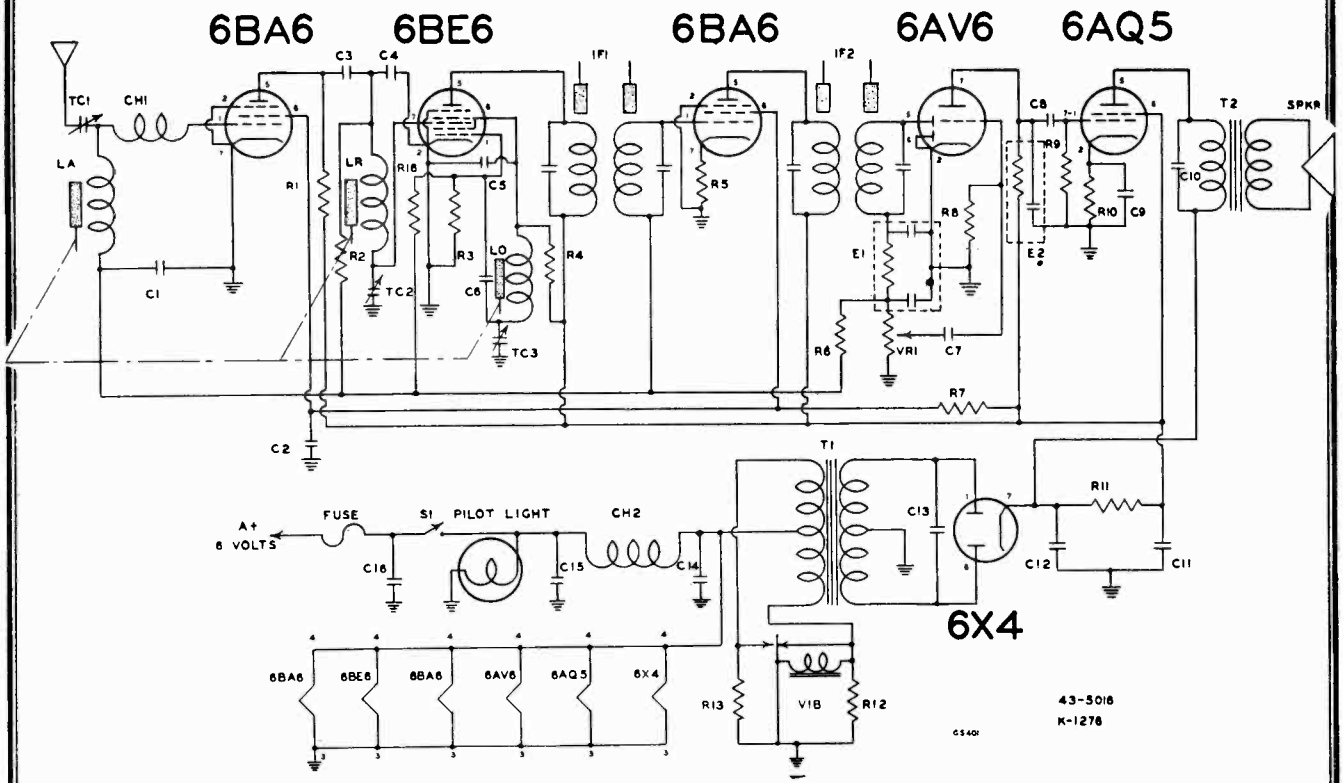
CONNECTIONS

Connect the fused power lead from the radio to the ammeter or circuit breaker of the vehicle. A 10 ampere fuse is provided in this lead; never replace this fuse with one of another value.

The antenna lead is plugged into the antenna jack.

If a second, or external, speaker is desired, a speaker socket is provided. Just connect the proper plug onto this second speaker, and insert plug in the external speaker socket.

After installation, tune in a weak station near 1600 KC, and adjust antenna trimmer, TC1, for maximum volume. If, for any reason, the set is out of alignment, these adjustments must be made by a competent service man and with the use of a good signal generator.



ALIGNMENT PROCEDURE

The following is for use only by competent service men having the proper equipment:

The alignment should be made with volume control fully on and the output voltage from the signal generator as low as possible to prevent A.V.C. action from interfering with the proper alignment. With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milliwatts is 0.4 volts using a signal which is modulated at 400 c.p.s.

Adjust all trimmers for maximum output. After adjusting IF1 and IF2, "rock" the tuner to make sure that the I.F. coils are not tuned to an image. Repeat the alignment procedure given below as a final check.

SIGNAL GENERATOR

Frequency	Dummy Antenna	Connection To Radio	Position Of Tuner	Adjust for Max. Output
257.5 KC	100 MMFD	6BE6 Grid Pin No. 7	Slugs Out	IF1 & IF2
1610 KC	100 MMFD	Ant. Jack	Slugs Out	TC3
1610 KC	100 MMFD	Ant. Jack	Slugs Out	TC2
1610 KC	100 MMFD	Ant. Jack	Slugs Out	TC1
1400 KC	100 MMFD	Ant. Jack	Tune in Signal Gen.	LA Slug & LR Slug

PARTS NUMBERS

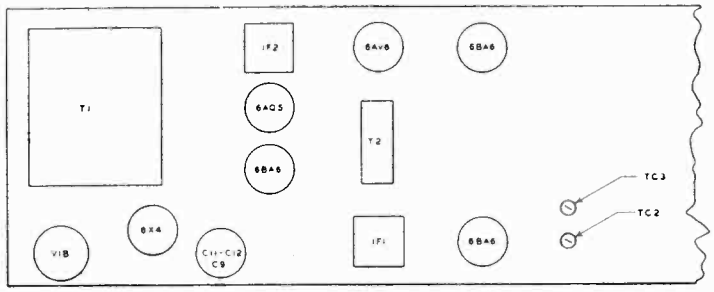
CIRCUIT COMPONENTS

SYMBOL	PART NO.	DESCRIPTION	VALUE	RATING
TC2-TC3	VC1276-2	Dual Trimmer		
TC1	VC1276-1	Trimmer		
C9, C11, C12	C-15-15-25-3.5-.25	Electrolytic	15-15-25 MFD	350-350-25 volts
	C5G	Generator, capacitor	.5 MFD	
C14, C15	C52	Capacitor, paper	.5 MFD	200 volts
C1	CO472	Capacitor, paper	.047 MFD	200 volts
C2	CO474	Capacitor, paper	.047 MFD	400 volts
C8	CO156	Capacitor, paper	.015 MFD	600 volts
C7, C10	CO16	Capacitor, paper	.01 MFD	600 volts
C13	COO5616	Capacitor, buffer	.0056 MFD	1600 volts
C5	C14205M	Capacitor, mica	1420 MMFD	500 volts
C4	C3005M	Capacitor, mica	300 MMFD	500 volts
C6	C505M	Capacitor, mica	50 MMFD	500 volts
C3	C105M	Capacitor, mica	10 MMFD	500 volts
C16	C2002OM	Capacitor, spark	200 MMFD	2000 volts
LA	1276LA	Antenna coil		
LR	1276LR	R.F. coil		
LO	1276LO	Oscillator coil		
	LV-1276	Permeability tuner, complete		
CH2	L16	A choke		
CH1	L47	Spark choke	4.7 MH	
T1	PT1276	Vibrator transformer		
T2	OT1276	Output transformer		
IF1, IF2	IF1276	I.F. transformer		
R12, R13	R680.5	Resistor	68 ohms	1/2 watt
R5	R122.5	Resistor	1200 ohms	1/2 watt
R1, R3	R223.5	Resistor	22K ohms	1/2 watt
R4	R333.5	Resistor	33K ohms	1/2 watt
R9	R474.5	Resistor	470K ohms	1/2 watt
R2	R185.5	Resistor	1.8 megohm	1/2 watt
R6	R225.5	Resistor	2.2 megohm	1/2 watt
R8	R106.5	Resistor	10 megohm	1/2 watt
R10	R4511	Resistor	450 ohms	1 watt
R11	R1021	Resistor	1000 ohms	1 watt
R7	R2731	Resistor	27K ohms	1 watt
	R103S	Resistor, suppressor	10K ohms	
VR1	VR1276	Volume control	1 megohm	
S1	VR1276	Switch SP.S.T. on volume control		
E2	CR2	Capristor	270K ohm/100 MMFD	
E1	CR1	Diode filter unit	100-100 MFD/47K ohm	
SPKR	SPK1276	Speaker		
VIB	E659	Vibrator		
Fuse		Fuse 10 ampere		
		Pilot light No. 47		

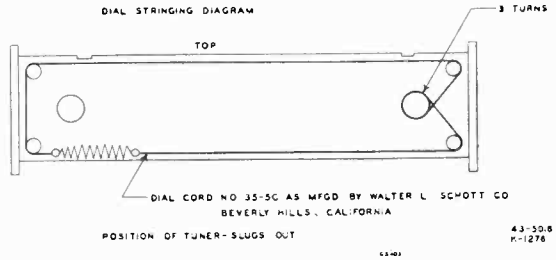
MECHANICAL PARTS

PART NO.	DESCRIPTION
M-1801	Chassis and wrapper
M-1802	Top cover
M-1803	Speaker cover
M-1804	Panel
M-1805	Dial plate
H-1801	I.F. Mounting clip
H-1802	Speed nut
H-1803	Eyelet
H-1804	Spade lug No. 10
P-1801	Dial scale
A-1801	Dial cord assembly
M-1806	Dial pointer

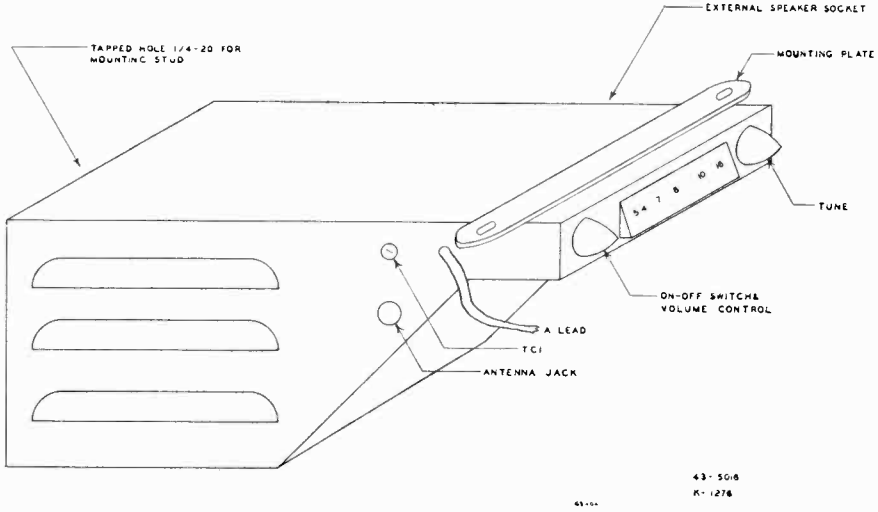
PART NO.	DESCRIPTION
H-81651	Dial rivet
P-1802	Knob
GR14	Rubber grommet
H-81644-5	Vibrator socket
H-81644-6	Miniature tube socket
H-81644-9	Pilot light socket
H-81644-6	Antenna jack
H-81644-7	Speaker socket
H-81644-8	Fuse holder
H-81641-8	Terminal board No. 8
H-81641-3	Terminal board No. 3
H-81641-27	Terminal board No. 27
H12754	Vibrator clamp



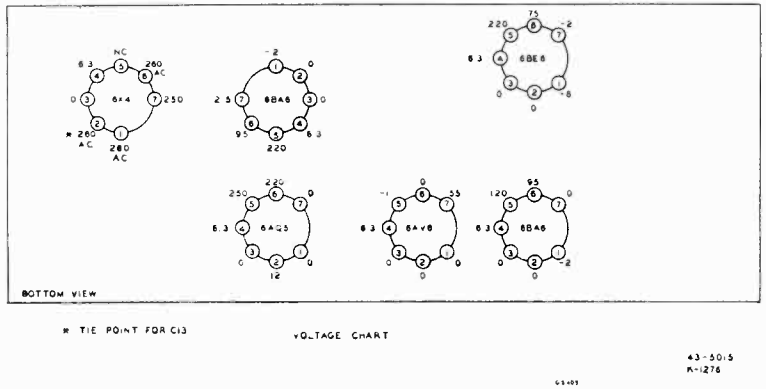
(Cut GS402, Chassis layout)



(Cut GS403, Dial stringing diagram)



(Cut GS404, Pictorial view)



(Cut GS405, Voltage chart)

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 onto 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 634B,
Ch. 120097B

MODEL 634B

DESCRIPTION

TYPE: Model 634B is a Single band superheterodyne receiver with a 3-speed automatic record changer.

FREQUENCY RANGE: 540-1620 kc.

TYPE OF TUBES:

Models 634B—chassis 120097B

1—12BE6, converter 1—12AT6, detector, a.v.c., a-f amplifier

1—12BA6, i-f amplifier 1—50B5, power output

1—35W4, rectifier

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

POWER CONSUMPTION—50 watts.

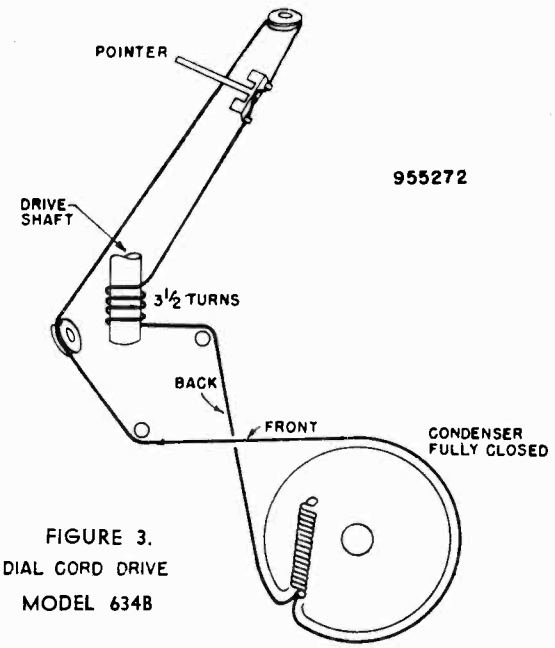


FIGURE 3.
DIAL CORD DRIVE
MODEL 634B

CABINET PARTS LIST (MODEL 634B)

Part No.	DESCRIPTION
140339	Cabinet Assembly (Automatic Changer)
819050-1	Record Changer (3-Speed)
505015	Pickup Plug
580108	Shielded Lead
450041S	Knob—Station Selector—On-Off
450064	Knob—Tone Control
450063	Knob—Radio Phono.
520115-1	Glass Dial
445008	Cork Gasket
410863	Dial Holder
700052	Loop Antenna

CHASSIS PARTS LIST (CHASSIS 120097B)

Symbol	Part No.	DESCRIPTION
C-1	900066	Variable Condenser—Tuning
C-2		Variable Condenser—Oscillator
C-3	Pt. of C-1	Trimmer
C-4	Pt. of C-2	Trimmer
C-5	Pt. of T-1	
C-6	Pt. of T-1	
C-7	Pt. of T-2	
C-8	Pt. of T-2	
C-9A	470310	220 MMF
C-9B		2000 MMF Multiple Condenser
C-9C		220 MMF
C-9D		5000 MMF
C-10	923104	.01 MF Paper 400V
C-11	920030	.05 MF Paper 400V
C-12	925163	50 MF Electrolytic 150V
C-13		50 MF Electrolytic 150V
C-14	923105	.05 MF Paper 400V
C-15	920030	.05 MF Paper 400V
C-16	920030	.05 MF Paper 400V
C-17	920040	.1 MF Paper 200V
C-18	Pt. of L-2	2.2 MMF Ceramic
L-1	716044	Oscillator Coil
L-2	700047	Loop
P-1	583028P	Line Cord & Plug
P-2	505015	Pickup Plug
R-1	351490	15 Meg. Carbon ½W ± 20%
R-2	340810	22,000 Ohm. Carbon ½W ± 10%
R-3	340270	120 Ohm. Carbon ½W ± 10%
R-4	351330	3.3 Meg. Carbon ½W ± 20%
R-5	510069-1	500,000 Ohm. Volume Control and Switch
R-6	351490	15 Meg. Carbon ½W ± 20%
R-7	351130	470,000 Ohm. Carbon ½W ± 20%
R-8	351130	470,000 Ohm. Carbon ½W ± 20%
R-9	340290	150 Ohm. Carbon ½W ± 10%
R-10	370490	1,000 Ohm. Carbon 1W ± 20%
R-11	370150	39 Ohm. Carbon 1W ± 20%
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	Vacuum Tube—12BE6
V-2	800524	Vacuum Tube—12BA6
V-3	800523	Vacuum Tube—12AT6
V-4	800527	Vacuum Tube—50B5
V-5	800526	Vacuum Tube—35W4
V-6	807000	Dial Light
X-1	585051	Cable & Socket Assy.—Motor
X-2	508003	Pickup Socket

MODEL 634B,
Ch. 120097B

ALIGNMENT INSTRUCTIONS — MODEL 634B

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 OUPLING	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.

950137

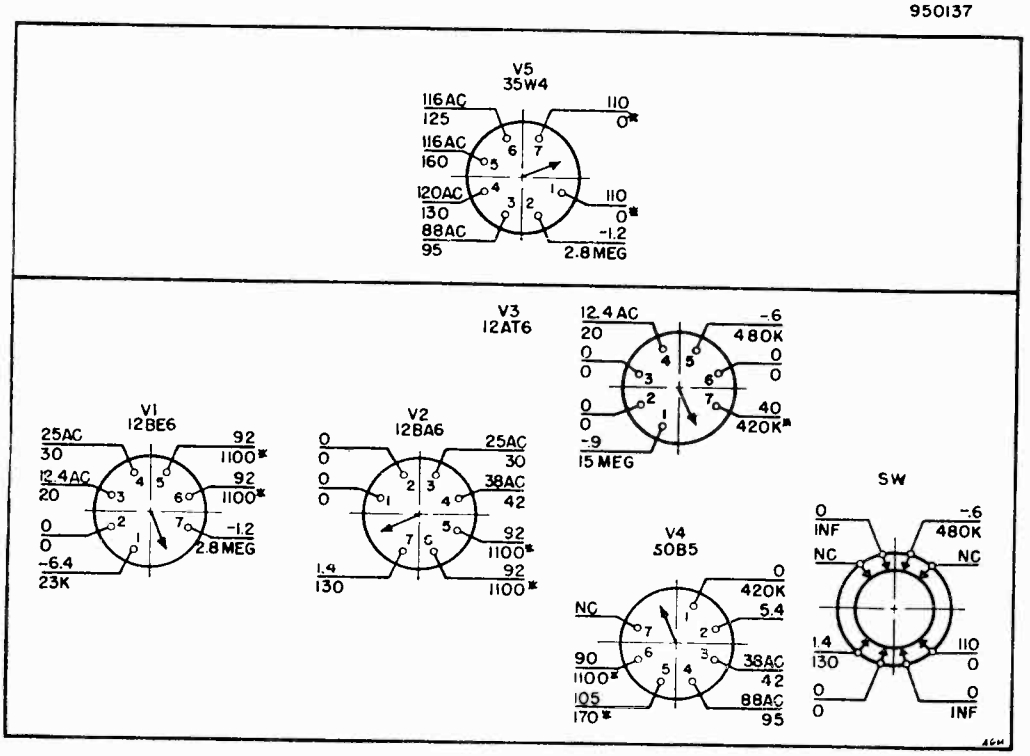


FIG. 2—VOLTAGE AND RESISTANCE CHECK CHART (CHASSIS 120097B)

CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages indicated are positive d.c., resistances are in ohms, unless otherwise indicated.
2. Measurements made with voltohmyst 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 634B measurements.
6. Nominal tolerance on component values makes possible a variation of ± 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+).

MODEL 634B,
Ch. 120097B

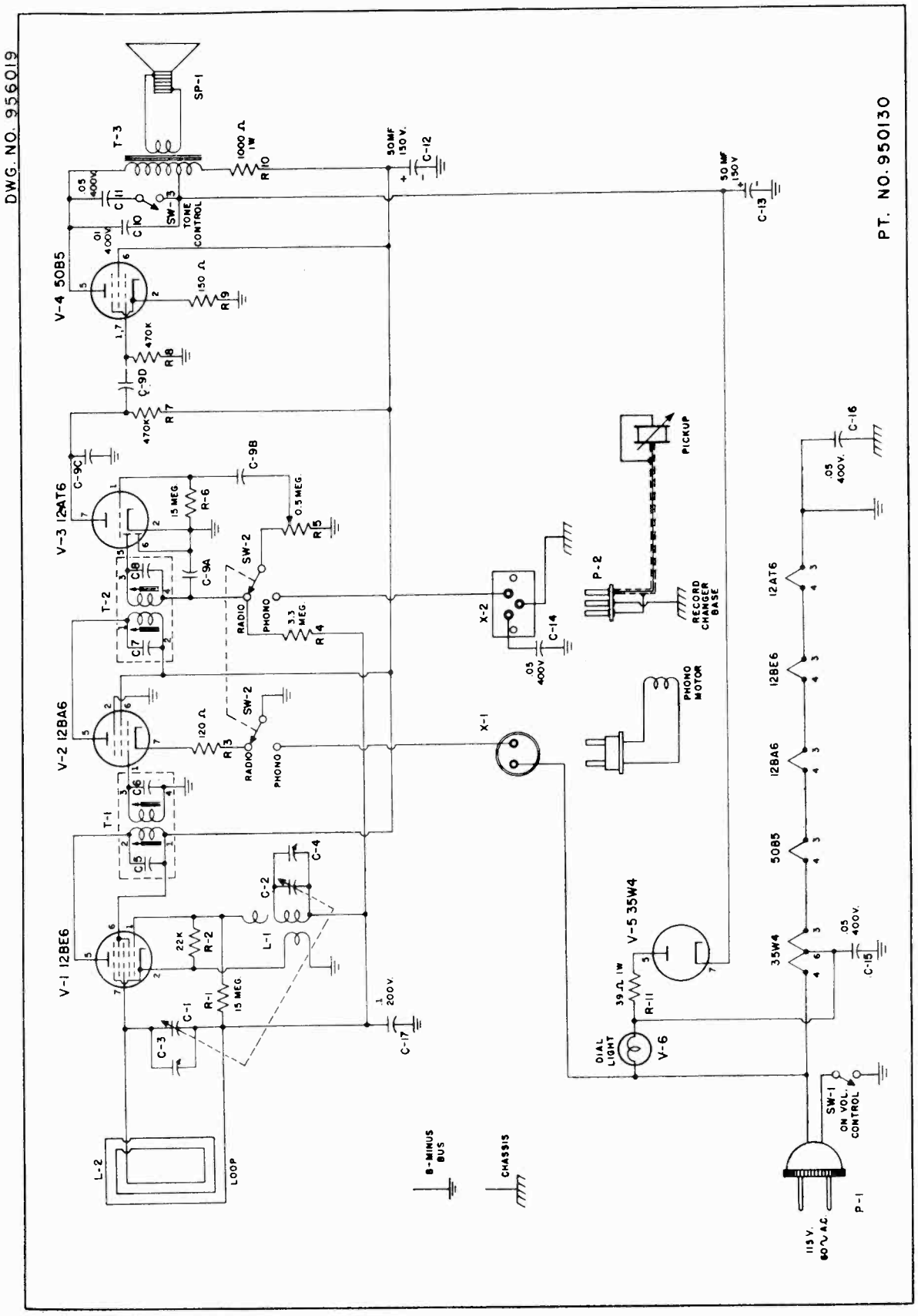
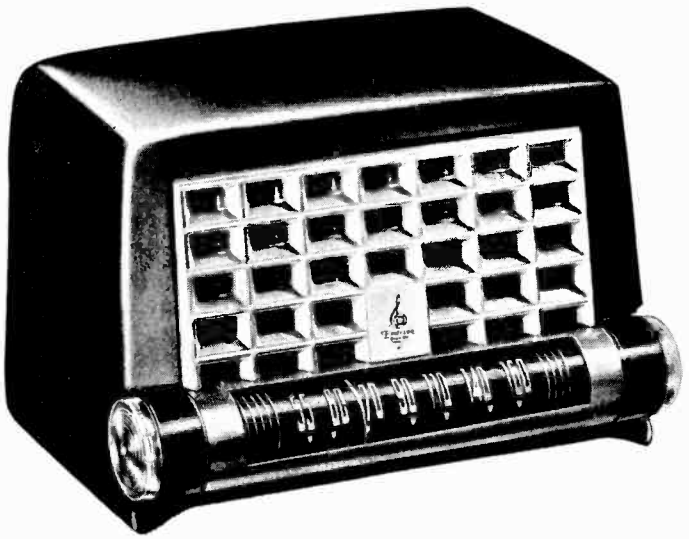


FIGURE 1 — SCHEMATIC DIAGRAM (CHASSIS 120097B)

MODEL 636,
Ch. 120106A



DESCRIPTION

TYPE: Single-band (AM) superheterodyne.

FREQUENCY RANGE: 540-1620 kc.

TYPE OF TUBES:

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: a.c. or d.c.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 30 watts.

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

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. In operating the receiver on d.c., it may be necessary to reverse the line plug for correct polarity.

3. All models have self-contained antennas and do not require additional antenna connections. For permanent home installation, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out at the rear, near the line cord. Use no ground connection.

4. The self-contained loop antenna operates at maximum efficiency when its position is at right angles to the broadcasting source. It is important, therefore, once the station is tuned in, to rotate the cabinet back and forth through a quarter of a circle (90 degrees), leaving it at the position where the station is received with maximum volume.

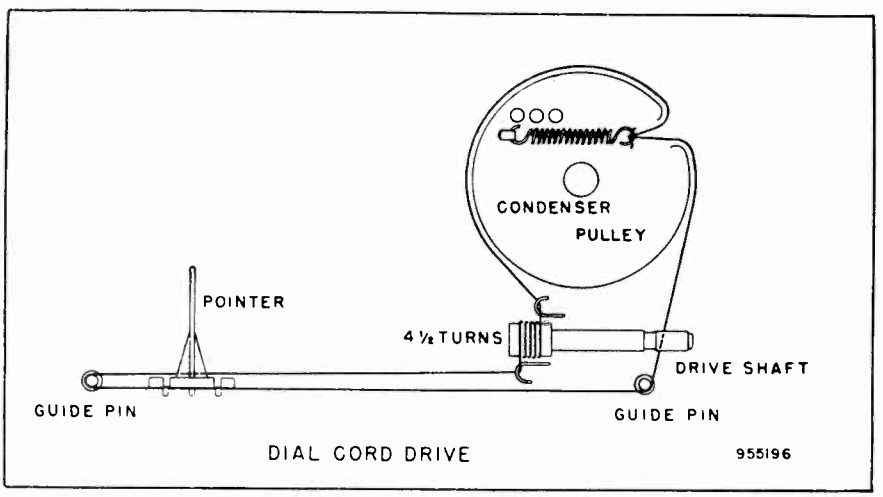


Fig. 2—Dial Cord Stringing, Model 636

MODEL 636,
Ch. 120106A

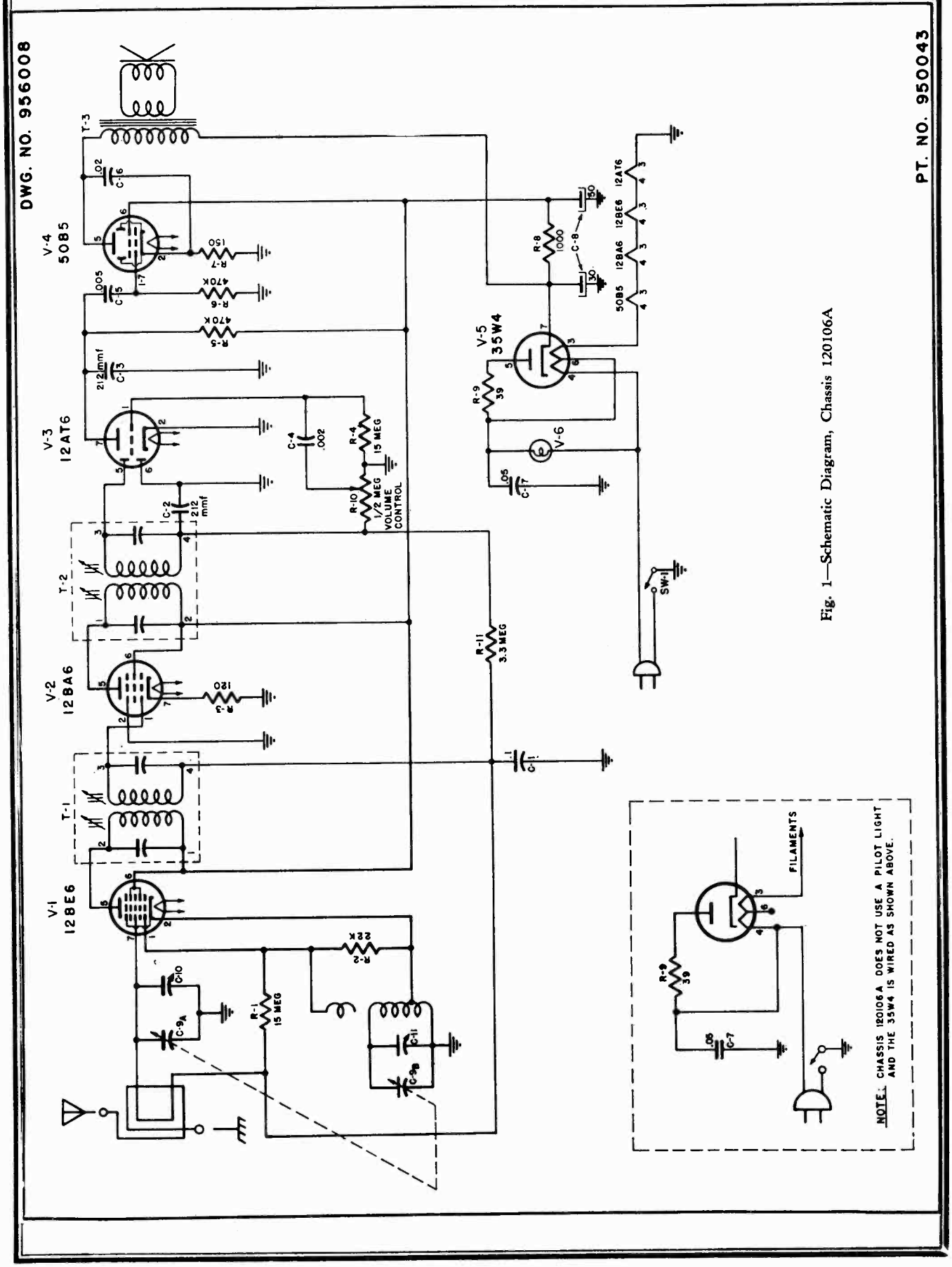


Fig. 1—Schematic Diagram, Chassis 120106A

MODEL 636,
Ch. 120106A

CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

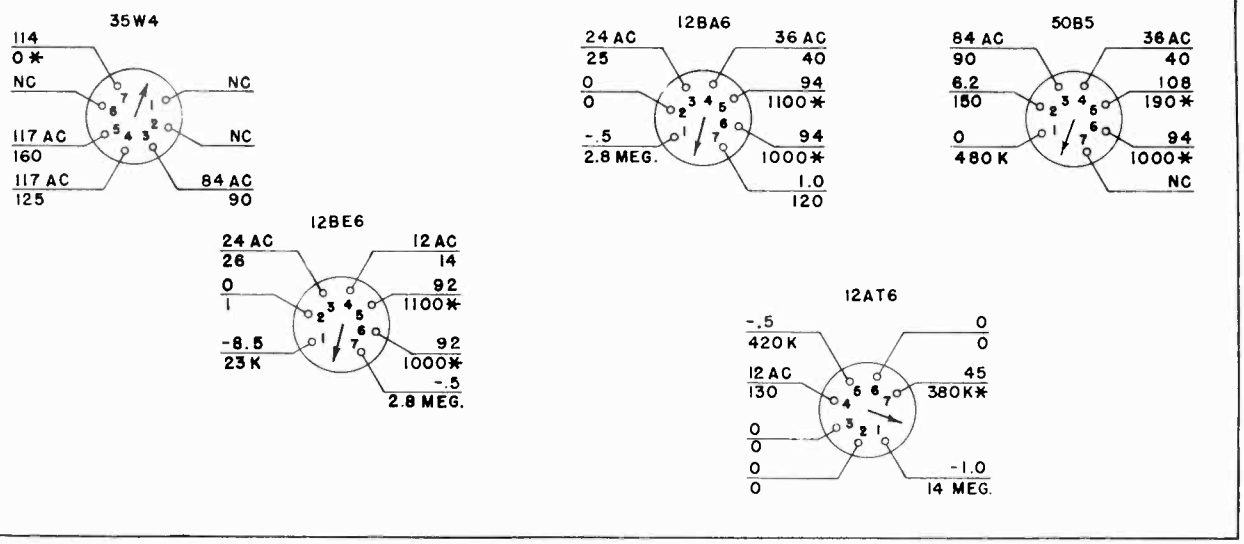
1. Voltages indicated are positive d.c., resistances are in ohms, unless otherwise indicated.
2. Measurements made with voltohmyst or equivalent.
3. Line voltage maintained at 117 volts a.c. for voltage measurements.
4. Socket connections are shown as bottom views, with measurements from pin to common negative.
5. Volume control at maximum; no signal applied for voltage measurements.
6. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
7. On the diagram, upper values are voltage; lower values are resistance. NC denotes no connection, K is kilohms, MEG is megohms. Resistances marked * are measured to pin 7 of rectifier (B+).

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 .1 mfd. condenser in series with low side of signal generator and B—.
3. Volume control should be at maximum 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 (A1, A2, A3, A4)	Adjust for maximum output. If isolation transformer is not used, reduce dummy ant. to .001 mfd. to reduce hum modulation.
2		Form loop of several turns and radiate signal into receiver.	1620 KC	"	Across voice coil.	Trimmer A5 (Osc.)	Adjust for maximum output.
3		"	1400 KC	Tune for maximum output.	Across voice coil.	Trimmer A6 (Ant.)	Adjust for maximum output.

955312



BOTTOM VIEW OF CHASSIS 120106A

Fig. 3—Voltage and Resistance Diagram, Chassis 120106A

MODEL 636,
Ch. 120106A

REPLACEMENT PARTS LIST

SYMBOL	PART NO.	DESCRIPTION	SYMBOL	PART NO.	DESCRIPTION
R-1	351490	15 meg, ½ watt, ±20%	C-7	920030	.05 mfd., 400 v.
R-2	Pt. of 716018	22,000 ohms, ½ w., ±10%	C-8	925061	Electrolytic, 30-50 mfd., 150 v.
R-3	340270	120 ohms, ½ w., ±10%	C-9 A & B	900023	Variable capacitor
R-4	351490	15 meg ohms, ½ w., ±20%	C-10 & C-11	Pt. of 900023	Trimmers
R-5	351130	470,000 ohms, ½ w., ±20%	L-1	700045	Ant. loop and back
R-6	351130	470,000 ohms, ½ w., ±20%	L-2	716018	Oscillator coil
R-7	340290	150 ohms, ½ w., ±10%			
R-8	370490	1,000 ohms, 1 w., ±10%	T-1	720021	1st I.F. transformer
R-9	370150	39 ohms, 1 w., ±10%	T-2	720021	2nd I.F. transformer
R-10	390062	½ meg ohms, volume control	T-3	734023	Output transformer
R-11	351330	3.3 meg ohms, ½ w., ±20%			
			SW-1	Pt. of 390062	On-off switch
C-1	920040	.1 mfd., 200 v.	V-1	800528	12BE6 tube
C-2	Pt. of 470310	212 mmf., ±20%, ceramic.	V-2	800528	12BA6 tube
C-3	Pt. of 470310	212 mmf., ±20%, ceramic.	V-3	800523	12AT6 tube
C-4	Pt. of 470310	.002 mfd., 400 v.	V-4	800527	50B5 tube
C-5	Pt. of 470310	.005 mfd., 400 v.	V-5	800526	35W4 tube
C-6	920020	.02 mfd., 400 v.			

CABINET AND DIAL PARTS

PART NO.	DESCRIPTION
140329	Cabinet, walnut
460078	Grille
575448	Baffle
460088	Knob
520104	Dial backplate
530002	Dial drive cord (31")
280055	Dial drive shaft
587040	Dial drive spring
525033	Pointer

MODEL 640,
Ch. 120112

VOLTAGE RATING:
"A" Battery—1.5 volts
"B" Battery—67.5 volts

CURRENT DRAIN:
"A" Battery—0.25 amp.
"B" Battery—0.0075 amp.

DESCRIPTION

TYPE: Pocket portable (battery operated) superheterodyne.

FREQUENCY RANGE: 540-1600 kc.

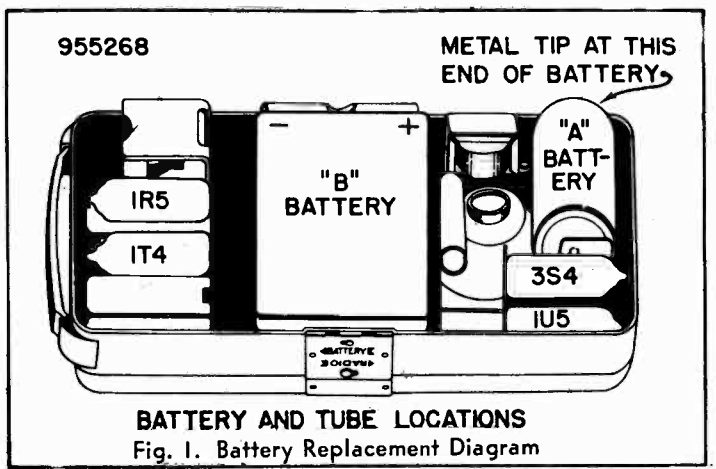
TYPE OF TUBES:
1—1R5, converter
1—1T4, i-f amplifier
1—1U5, detector, a.v.c., a-f amplifier
1—3S4, power output

POWER SUPPLY: "A" and "B" batteries.

GENERAL NOTES

1. If replacements are made in the r-f section of the circuit, the receiver should be carefully realigned.
2. The receiver has a self-contained antenna and does not require additional antenna or ground connections.
3. The self-contained loop antenna has directional properties. It is important, therefore, once the station is tuned in, to rotate the cabinet back and fourth through a quarter of a circle (90 degrees), leaving it at the position where the station is received with maximum volume.
4. The receiver is turned on when the lid is open and turned off when the lid is closed. Always close the lid when the set is not in use.
5. Remove batteries as soon as they are exhausted. The "A" battery will require more frequent replacement than the "B" battery.
6. Replace the 1.5 volt "A" battery with standard D-size flashlight cell (1—5/16" dia.). Replace 67.5 volt "B" battery with Eveready Minimax No. 467 or equivalent.

BATTERY REPLACEMENT



BATTERY AND TUBE LOCATIONS
Fig. 1. Battery Replacement Diagram

1. Slide the button on the release catch marked "Battery" in the direction of the arrow. This loosens the bottom shell and permits it to be swung open on the hinge, making the batteries accessible.
2. Insert the batteries as shown in the above diagram.
3. To reassemble, hold the chassis face down with the batteries in place. Close the bottom shelf over the chassis and press the rear shell so that it snaps into place.

MODEL 640,
Ch. 120112

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. Volume control should be at maximum; output of signal generator should be no higher than necessary to obtain an output reading.
3. Maintain loop in same position relative to chassis, if chassis is removed from cabinet.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to pin 6 (grid) of 1R5. Low side to chassis.	455 KC.	Tuning condenser fully open.	Across voice coil.	T2 and T1	Adjust for maximum output.
2		Loop	1620 KC.	"	"	C4 (osc. trimmer)	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3		"	1400 KC.	Tune for maximum output.	"	C3 (Ant. trimmer)	Adjust for maximum output.

REPLACEMENT PARTS LIST

Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
C1, C2	900068	Two gang variable condenser	R2	340470	820 ohms, ½ watt, ±10%
C3	Part of C1	Trimmer, antenna	R3	390117	1 megohm, volume control
C4	Part of C2	Trimmer, oscillator	R4	351450	10 megohms, ½ watt, ±20%
C5, C6	Part of T1	Trimmers	R5	351330	3.3 megohms, ½ watt, ±20%
C7, C8	Part of T2	Trimmers	R6	351130	470,000 ohms, ½ watt, ±20%
C9	928013	100 mmf., ceramic	R7	351330	3.3 megohms, ½ watt, ±20%
C10	920495	.001 mfd., 200 volt	R8	340730	10,000 ohms, ½ watt, ±10%
C11	920496	.005 mfd., 200 volt	R9	351330	3.3 megohms, ½ watt, ±20%
C12	928104	212 mmf., ceramic	SP1	180064	PM speaker
C13	920495	.001 mfd., 200 volt	T1	720111	I-F transformer
C14	928013	100 mmf., ceramic	T2	720111	I-F transformer
C15	920494	.05 mfd., 200 volt	T3	734056	Ouptut transformer
C16	920120	.02 mfd., 100 volt	T4	716047	Oscillator coil
C17	925164	16 mfd., 100 volt elect.	V1	800110	1R5, converter
C18	920485	.01 mfd., 100 volt	V2	800130	1T4, i-f amplifier
L1	700048	Loop antenna	V3	800019	1U5, det., a.v.c., a-f amp.
R1	350970	100,000 ohms, ½ watt. ±20%	V4	800170	3S4, power output

955309

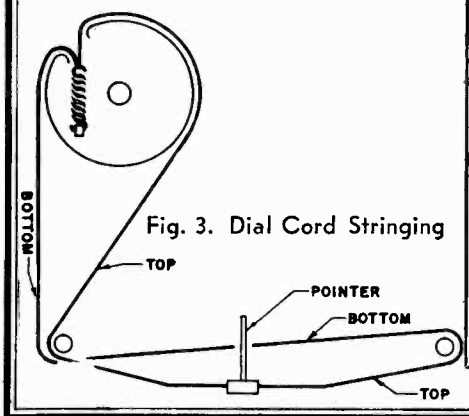


Fig. 3. Dial Cord Stringing

CABINET AND DIAL PARTS

†PART No.	DESCRIPTION	†PART No.	DESCRIPTION
140312	Case shell—saddle tan	460148	Handle
140313	Top cover—sand	410845	Snap latch—male
460144	Knob—sand	410850	Dual snap latch assembly
140314	Bottom cover—sand	587008	Spring
460147	Handle catch—saddle tan	700048	Loop
140336	Case shell—sand	630110	Loop cover
140337	Top cover—saddle tan	575528	Grille and baffle assembly
460145	Knob—saddle tan	520121	Dial crystal
140338	Bottom cover—saddle tan		
460149	Handle catch—sand		

†Specify part number when ordering.

MODEL 640,
Ch. 120112

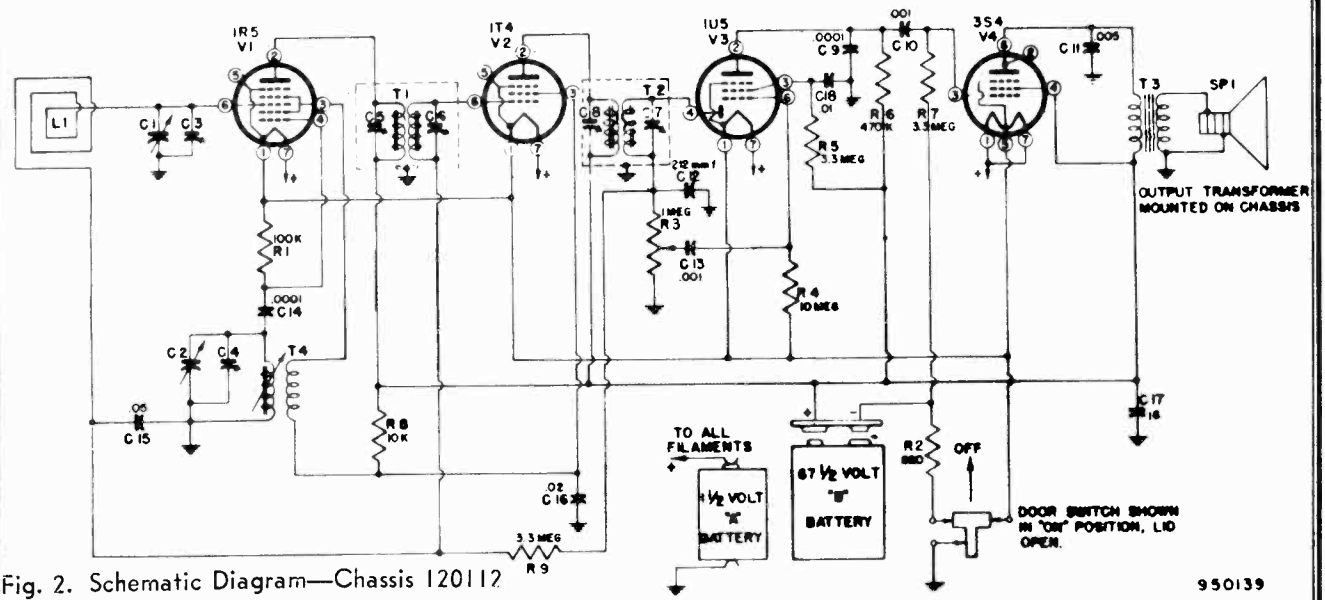


Fig. 2. Schematic Diagram—Chassis 120112

CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages indicated are positive d.c., resistances in ohms, unless otherwise noted.
2. Measurements made with voltohmyst or equivalent.
3. Socket connections are shown as bottom views, with measurements from pin to chassis.
4. Volume control at maximum, no signal applied, for voltage measurements.
5. Nominal tolerance in component valves makes possible a variation of ± 15% in readings.
6. On the diagram, upper valves are voltage, lower valves are resistance; K is Kilohms, MEG is megohms. Resistance marked * are measured to B+.

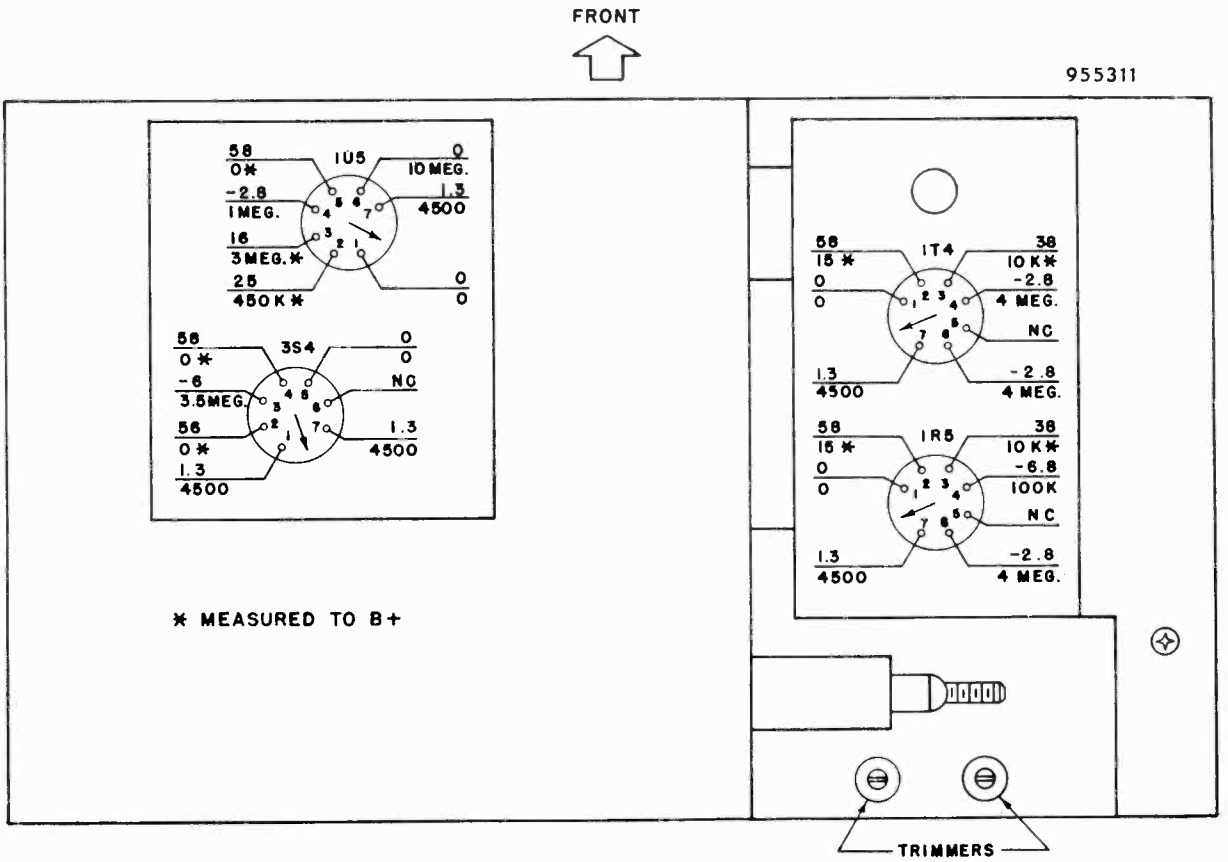
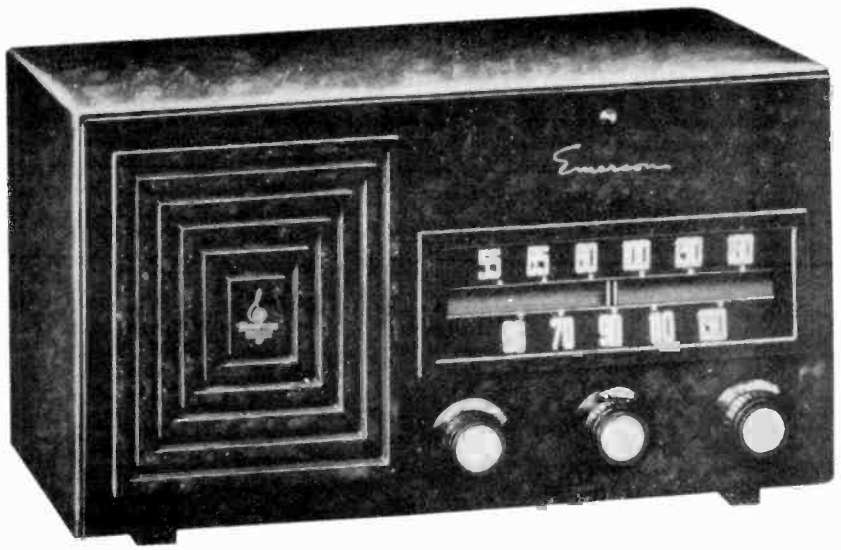


Fig. 4. Voltage and Resistance Diagrams, Chassis 120112

MODEL 641B,
Ch. 120125B



Model—641B
Chassis—120125B

DESCRIPTION

TYPE: Single band (AM) superheterodyne

FREQUENCY RANGE: 540-1620 KC.

TYPES OF TUBES:

- V-1-6BJ6 converter
- V-2-6BJ6 oscillator
- V-3-6BJ6 1st i.f. amplifier
- V-4-6BJ6 2nd i.f. amplifier
- V-5-12AT6 Detector, a.v.c., a-f amplifier
- V-6-50C5 Power output
- V-7-35W4 Rectifier

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

VOLTAGE RATING: 115 volts

POWER CONSUMPTION: 30 watts

CURRENT DRAIN: 0.26 amp. at 117 volts a.c.

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. In operating the receiver on d.c., it may be necessary to reverse the line plug for correct polarity.
3. The receiver has a self-contained antenna, and does not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out in the rear. Use no ground connection.
4. The self-contained loop antenna operates at maximum efficiency when its position is at right angles to the broadcasting source. It is important, therefore, once the station is tuned in, to rotate the cabinet back and forth through a quarter of a circle (90 degrees), leaving it at the position where the station is received with maximum volume.

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage readings are in d.c. volts and resistance readings in ohms unless otherwise specified.
2. A.C. and D.C. measurements are taken with a V.T.V.M.
3. Measured values are from socket pin to common negative (B—).
4. Line voltage maintained at 115V A.C. for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum with no signal applied, for voltage measurements.

VOLTAGE READINGS FOR CHASSIS 120125-B

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	6BJ6	-1.2 DC	1 DC	18 AC	12 AC	85 DC	35 DC	0
V-2	6BJ6	-9.2 DC	0	24 AC	18 AC	85 DC	85 DC	0
V-3	6BJ6	0	1.4 DC	30 AC	36 AC	68 DC	85 DC	0
V-4	6BJ6	-1.3 DC	.65 DC	30 AC	24 AC	85 DC	85 DC	0
V-5	12AT6	-.8 DC	0	0	12 AC	0	.65 DC	42 DC
V-6	50C5	5.4 DC	0	36 AC	80 AC	0	85 DC	100 DC
V-7	35W4	85 DC	NC	80 AC	115 AC	110 AC	110 AC	110 DC

RESISTANCE READINGS FOR CHASSIS 120125-B

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	6BJ6	4.2 meg.	1100	22	16	500,000	1 meg.	0
V-2	6BJ6	24,000	1	30	22	500,000	500,000	0
V-3	6BJ6	20	220	38	46	500,000	500,000	0
V-4	6BJ6	4.3 meg	120	38	30	500,000	500,000	0
V-5	12AT6	10 meg	0	0	16	0	550,000	1 meg.
V-6	50C5	150	400,000	46	100	400,000	500,000	500,000
V-7	35W4	500,000	NC	100	135	175	130	500,000

MODEL 641B,
Ch. 120125B

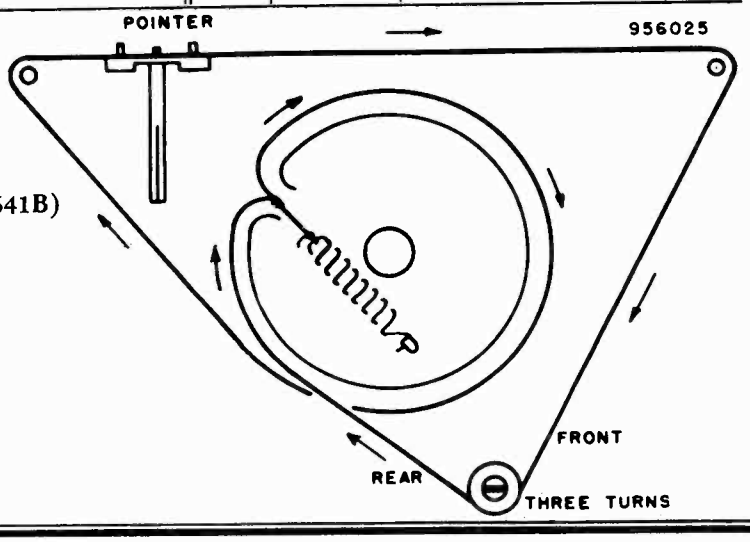
ALIGNMENT PROCEDURE

1. To set pointer, turn variable condenser fully closed and set pointer at mark near left 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 B minus bus.
3. Volume control should be at maximum position; output of signal generator should be not higher than necessary to obtain an output reading.
4. Use an insulated alignment screwdriver for adjusting.

STEPS	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	METER OUTPUT	ADJUST	REMARKS
1	0.1 mfd.	High side to pin 1 (grid) of 6BJ6 (V1). Low side to B minus Bus.	455 kc	Variable condenser fully open.	Across voice coil.	A1, A2 (2nd i-f trans. T2) A3, A4 (1st i-f trans. T1)	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to 0.001 mfd. to reduce hum modulation.
2	200 mmfd.	High side to external antenna lead. Low side to B minus Bus.	1620 kc	Variable condenser fully open.	Across voice coil.	A5 (Trimmer cond. C5).	Adjust for maximum output.
3	200 mmfd.	High side to external antenna lead. Low side to B minus Bus.	1400 kc	Tune for maximum output.	Across voice coil.	A6 (Trimmer cond. C2).	Adjust for maximum output.

CHASSIS PARTS LIST (Chassis 120125B)

Symbol	PART NO.	DESCRIPTION
C- 1	PT. OF L-1	2.2 mmf.
C- 2	PT. OF 900077	Trimer - r.f.
C- 3	PT. OF 900077	Variable capacitor - r.f. section
C- 4	920030	.05 mf paper 400v
C- 5	PT. OF 900077	Trimmer - osc.
C- 6	PT. OF 900077	Variable capacitor - osc. section
C- 7	920020	.02 mf paper 400v
C- 8	920020	.02 mf paper 400v
C- 9	928104	212 mmf ceramic
C-10	PT. OF T-2	100 mmf
C-11	PT. OF 470310	220 mmf } Multiple Capacitor
C-12	PT. OF 470310	.002 mf } Multiple Capacitor
C-13	PT. OF 470310	220 mmf } Multiple Capacitor
C-14	PT. OF 470310	.005 mf } Multiple Capacitor
C-15	920545	.002 mf paper 400v
C-16	920020	.02 mf paper 400v
C-17	920020	.05 mf paper 400v
C-18	PT. OF. 925187	80 mf electrolytic 150v
C-19	PT. OF. 925187	40 mf electrolytic 150v
C-20	920040	.1 mf paper 200v
L- 1	700054	LOOP ANTENNA
L- 2	716055	OSCILLATOR - COIL
R- 1	340492	1,000 ohm carbon ½w -10%
R- 2	PT. OF L-2	22,000 ohm
R- 3	341050	220,000 ohm carbon ½w -10%
R- 4	340332	220 ohm carbon ½w -10%
R- 5	340632	3,900 ohm carbon ½w -10%
R- 6	350970	100,000 ohm carbon ½w ±20%
R- 7	340272	120 ohm carbon ½w ±10%
R- 8	351330	3.3 megohm carbon ½w ±20%
R- 9	340890	47,000 ohm carbon ½w ±10%
R-10	390152	500,000 ohm volumn control
R-11	351450	10 megohm carbon ½w ±20%
R-12	351130	470,000 ohm carbon ½w ±20%
R-13	390157	400,000 ohm tone control
R-14	340292	150 ohm carbon ½w ±10%
R-15	370150	39 ohm carbon 1w ±10%
R-16	370490	1,000 ohm carbon 1w ±10%
SP-1	180074	Speaker - pm - 6"
SW-1	PT. of R-10	On-off switch
T-1	720033	1st i.f. transformer
T-2	720125	2nd i.f. transformer
T-3	734061	Output transformer
V-1	800023	Vacuum tube - 6BJ6
V-2	800023	Vacuum tube - 6BJ6
V-3	800023	Vacuum tube - 6BJ6
V-4	800023	Vacuum tube - 6BJ6
V-5	800523	Vacuum tube - 12AT6
V-6	800032	Vacuum tube - 50C5
V-7	800526	Vacuum tube - 35W4
V-8	807000	Pilot light



CABINET PARTS LIST (Model 641B)

Part No.	DESCRIPTION
140359	Cabinet
520133	Crystal
575649	Baffle and grill cloth
450068s	Knob
587011	Knob spring insert — ¼"

MODEL 641B,
Ch. 120125B

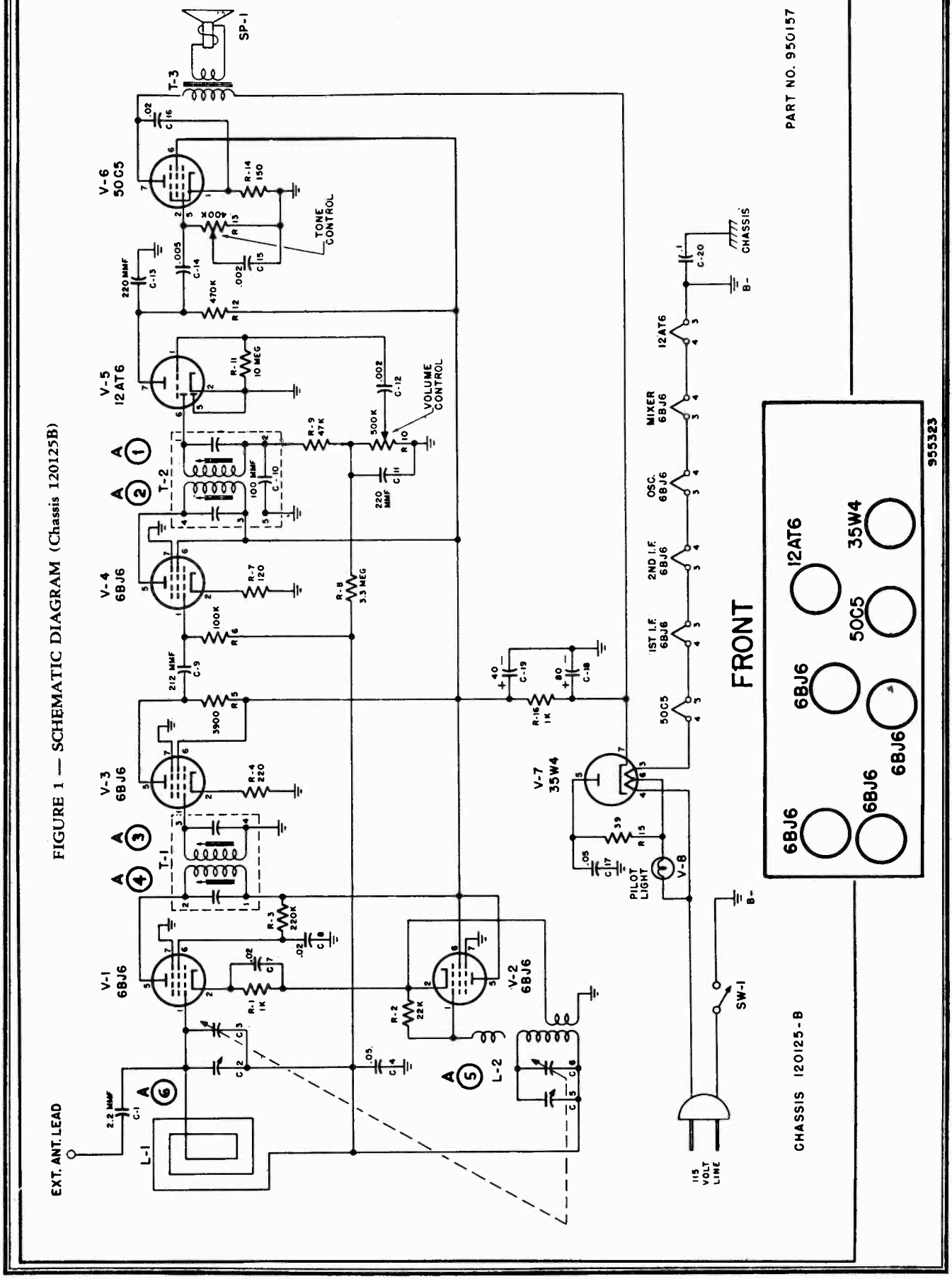


FIGURE 1 — SCHEMATIC DIAGRAM (Chassis 120125B)

MODELS 642, Ch. 120117A;
652, Ch. 120032B;
653, Ch. 120080B

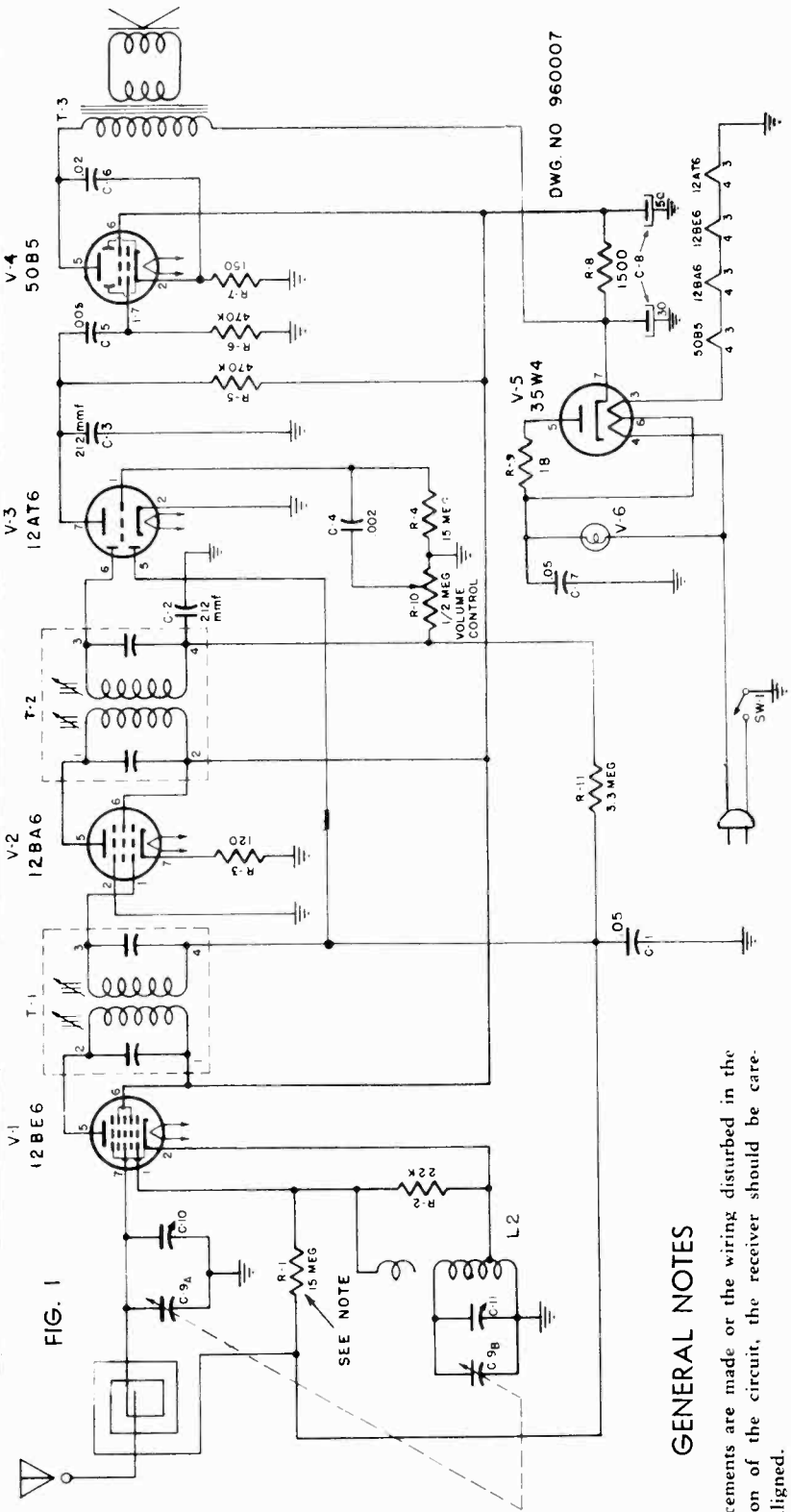
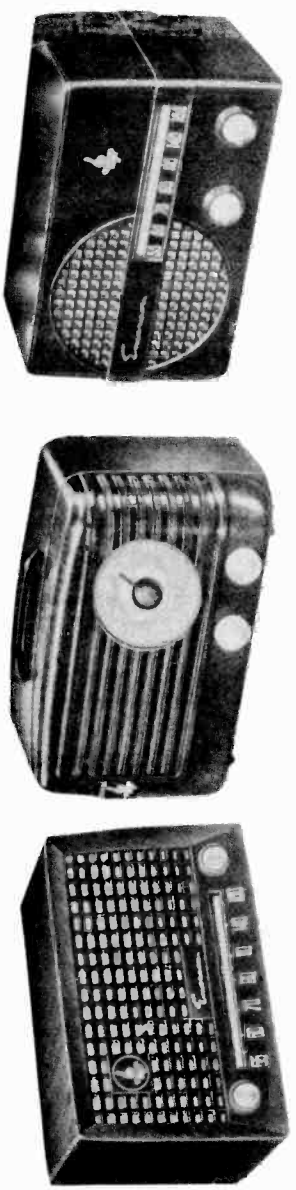


FIG. 1

SCHEMATIC FOR MODEL 642 USING CHASSIS 120117A.

NOTE: R-1 NOT IN LATER SETS.



MODEL 653
Chassis 120080B

MODEL 642
Chassis 120117A

MODEL 652
Chassis 120032B

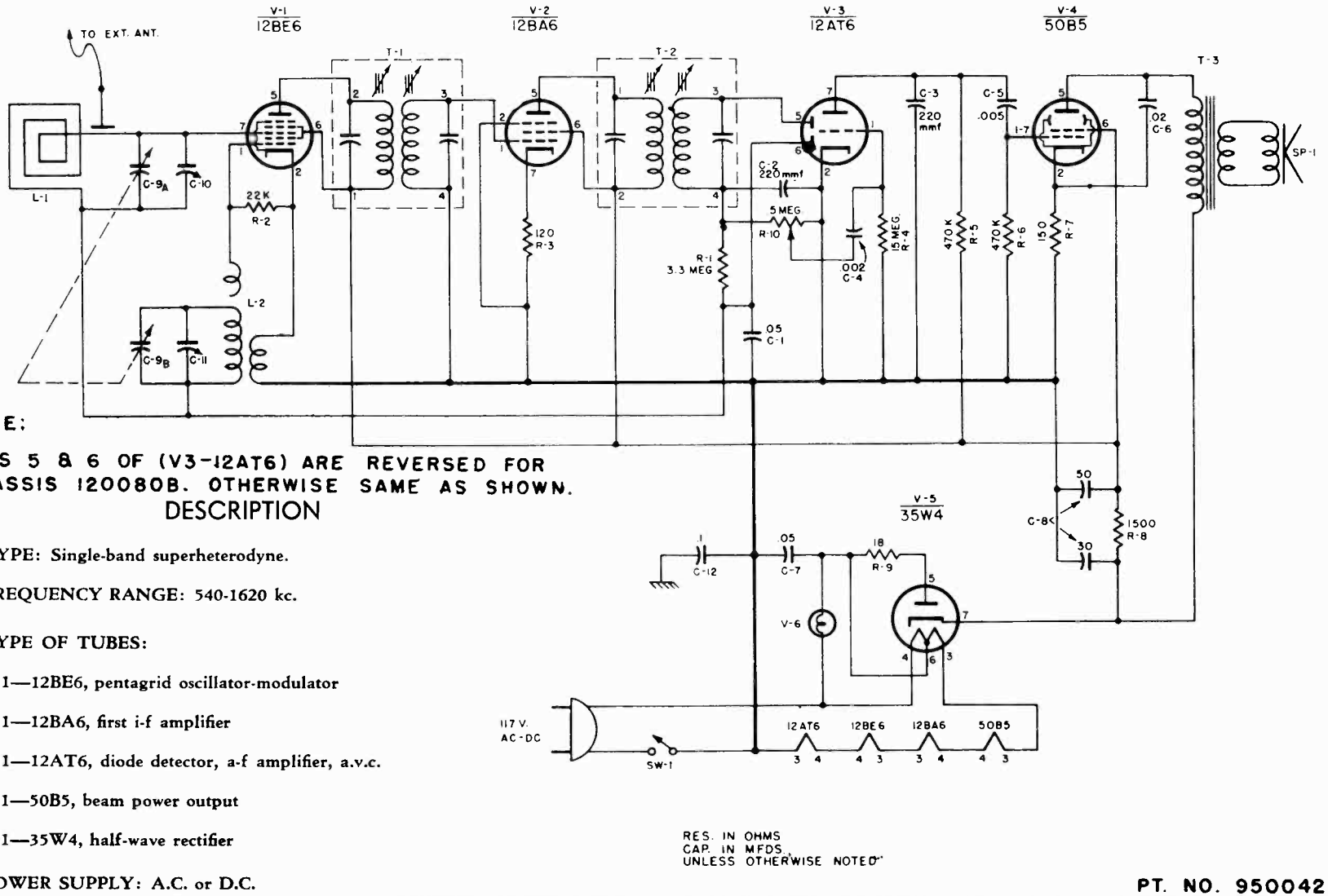
GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. In operating the receiver on d.c., it may be necessary to reverse the line plug for correct polarity.
3. All models have self-contained antennas and do not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out in the rear near the line cord. Use no ground connection.
4. The self-contained loop antenna operates at maximum efficiency when its position is at right angles to the broadcasting source. It is important, therefore, once the station is tuned in, to rotate the cabinet back and forth through a quarter of a circle (90 degrees), leaving it at the position where the station is received with maximum volume.

MODELS 642, Ch. 120117A; 652, Ch. 120032B; 653, Ch. 120080B

DWG. NO. 956009

FIG. 2 — SCHEMATIC DIAGRAM FOR MODELS 652 AND 653 USING CHASSIS 120032B AND 120080B



NOTE:

PINS 5 & 6 OF (V3-12AT6) ARE REVERSED FOR CHASSIS 120080B. OTHERWISE SAME AS SHOWN.

RES. IN OHMS
CAP. IN MFDS.
UNLESS OTHERWISE NOTED

PT. NO. 950042B

DESCRIPTION

TYPE: Single-band superheterodyne.

FREQUENCY RANGE: 540-1620 kc.

TYPE OF TUBES:

1—12BE6, pentagrid oscillator-modulator

1—12BA6, first i-f amplifier

1—12AT6, diode detector, a-f amplifier, a.v.c.

1—50B5, beam power output

1—35W4, half-wave 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.

MODELS 642, Ch. 120117A; 652, Ch. 120032B; 653, Ch. 120080B

CABINET AND DIAL PARTS LIST

DESCRIPTION	†PART NUMBER		
	Model 642	Model 652	Model 653
Cabinet (Bakelite)	140326	140346—Ebony 140353—Ivory	140345
Knobs	460151	460162S	460162S
Baffle and Grill Cloth	——	470609	470608
Back	575059	——	——
Baffle	——	575646	——
Handle (Black)	450000	——	——
Crystal	520034	——	——
Drive Pulley	531009	Pt. of 900072	Pt. of 900071
Drive Shaft	280024	280127	280126
Spring (Drive Cord)	587000	587040	587040
Dial Support Bracket (Right)	——	410907	——
Dial Support Bracket (Left)	——	410908	——
Dial Back Plate	520113	410909	410904
Pointer	525048	525054	525022-2
Loop and Back	——	700023 FH	700051
Loop	700033	——	——
Clip (Pointer)	541169	——	——
Bracket (Loop)	412481	410123	412481

†When Ordering Always Specify Part No.
*Prices Subject to Change Without Notice.

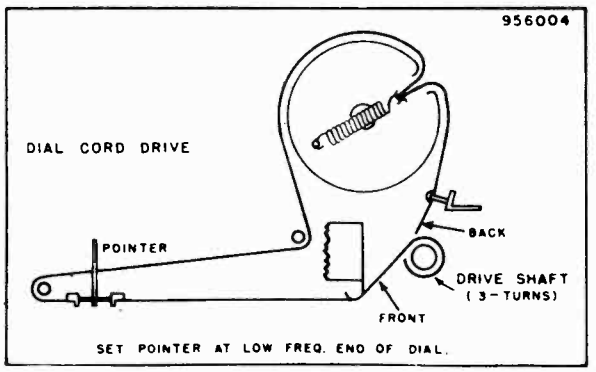
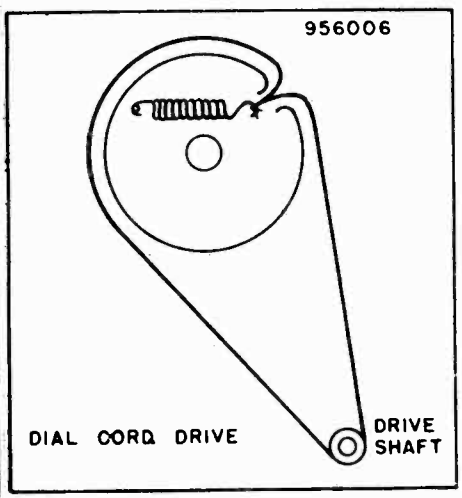
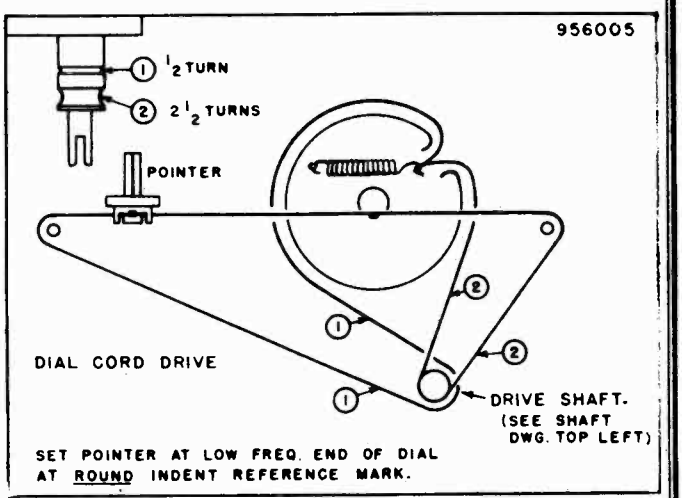


FIG. 5 — DIAL CORD DRIVE FOR CHASSIS 120080B



DIAL CORD DRIVE
FIG. 3 — FOR CHASSIS 120017B



DIAL CORD DRIVE
FIG. 4 — FOR CHASSIS 120032B

MODELS 642, Ch. 120117A; 652, Ch. 120032B; 653, Ch. 120080B

ALIGNMENT

To set pointer, turn variable condenser fully closed and set pointer at mark near left end of dial backplate. Use isolation transformer if available. If not, connect a 0.1 mfd. condenser in series with low side of signal generator and chassis. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading. 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 stator of rear section of tuning condenser. Low side to chassis.	455 kc	Variable condenser fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to 0.001 mfd. to reduce hum modulation.
2	200 mmfd.	High side to external antenna lead. Low side to external ground lead.	1620 kc	Variable condenser fully open.	Across voice coil.	A5	Adjust for maximum output.
3	200 mmfd.	High side to external antenna lead. Low side to external ground lead.	1400 kc	Tune for maximum output.	Across voice coil.	A6	Adjust for maximum output.

VOLTAGE READINGS FOR CHASSIS 120117A

Symbol	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V1	12BE6	—5.3 DC	0	11.2 AC	25 AC	90 DC	85 DC	—.45 DC
V2	12BA6	—.45 DC	0	25 AC	38 AC	90 DC	87 DC	1. DC
V3	12AT6	—0.6 DC	0	0	12 AC	—0.45 DC	—0.45 DC	45 DC
V4	50B5	0	5.5 DC	38 AC	85 AC	110 DC	85 DC	0
V5	35W4	0	0	85 AC	117 AC	110 AC	112 AC	120 DC

RESISTANCE READINGS FOR CHASSIS 120117A

Symbol	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V1	12BE6	2400	0.6	18	32	300,000	300,000	3 meg.
V2	12BA6	3 meg.	0	32	48	300,000	300,000	120
V3	12AT6	15 meg.	0	0	18	3 meg.	500,000	500,000
V4	50B5	400,000	150	48	80	300,000	300,000	400,000
V5	35W4	0	0	80	100	110	100	300,000

VOLTAGE READINGS FOR CHASSIS 120032B AND 120080B

Symbol	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V1	12BE6	—6.2 DC	0	24 AC	11.5 AC	85 DC	85 DC	—.05 DC
V2	12BA6	0	0	24 AC	37 AC	85 DC	85 DC	1.4 DC
V3	12AT6	—.4 DC	0	0	11.5 AC	*—.02 DC	*—.05 DC	50 DC
V4	50B5	0	5 DC	86 AC	37 AC	115 DC	85 DC	0
V5	35W4	0	0	86 AC	117 AC	110 AC	112 AC	120 DC

*12AT6, Pin 5 is —.05 in Chassis 120080B 12AT6, Pin 6 is —.02 in Chassis 120080B

RESISTANCE READINGS FOR CHASSIS 120032B AND 120080B

Symbol	TUBE	PIN 1	Pin 2	Pin 3	PIN 4	PIN 5	PIN 6	PIN 7
V1	12BE6	2400	0.6	25	13	300,000	300,000	3 meg.
V2	12BA6	20	0	25	38	300,000	300,000	120
V3	12AT6	15	0	0	13	*500,000	*3.5	700,000
V4	50B5	400,000	150	75	38	300,000	300,000	400,000
V5	35W4	Inf.	Inf.	75	100	110	95	300,000

*12AT6, Pin 5 is 3.5 in Chassis 120080B 12AT6, Pin 6 is 500,000 in Chassis 120080B

VOLTAGE AND RESISTANCE READING INSTRUCTIONS

1. Voltage readings are in volts and resistance readings in ohms unless otherwise specified.
2. D-C voltage measurements are at 20,000 ohms per volt; a-c voltage measured at 1,000 ohms per volt.
3. Socket connections are shown as bottom views.
4. Measured values are from socket pin to common negative.
5. Line voltage maintained at 117 volts for voltage readings.
6. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
7. Volume control at maximum, no signal applied for voltage measurements.

MODELS 642, Ch. 120117A; 652, Ch. 120032B; 653, Ch. 120080B

REPLACEMENT PARTS LIST FOR CHASSIS 120117A

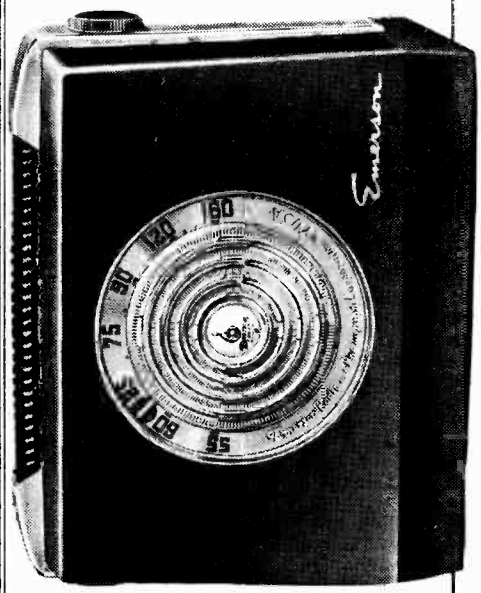
Schematic Symbol	†Part No. Model 642 Chassis 120117A	DESCRIPTION	Schematic Symbol	†Part No. Model 642 Chassis 120117A	DESCRIPTION
R1, 4	351490	Resistor—15 meg., ½ w., 20%	T1, T2	720021	1st and 2nd I. F. transformer
R2	Part of 716051	Resistor—22,000 ohms, ½ w., ±10%			
R3	340270	Resistor—120 ohm, ½ w., ±10%	T3	734057	Output transformer
R5, 6	351130	Resistor—470 k ohm, ½ w., ±20%			
R7	340290	Resistor—150 ohm, ½ w., ±10%	L2	716051	Oscillator coil
R8	380530	Resistor—1500 ohm, 1 w., ±20%			
R9	340070	Resistor—18 ohm, ½ w., ±10%			
R10	390015	Volume control	V1	800525	12BE6—Converter
R11	351330	Resistor——3.3 meg., ½ w., 20%	V2	800524	12BA6—I. F. amplifier
			V3	800523	12AT6—Detector—A. V. C. and A. F. amplifier
C1	920060	Capacitor—paper—.05 mfd., 200 v.	V4	800527	50B5—Audio output
C2, 3, 4, 5	470310	Capacitor assembly	V5	800526	35W4—Rectifier
C6	920020	Capacitor—.02 mfd., 400 v.	V6	807000	Pilot light
C7	920030	Capacitor—.05 mfd., 400 v.		530050	Drive cord (12") approx.
C8	925000	Capacitor—electrolytic—30-50 mfd., 150 v.		583029	Line Cord
				507090	Dial light socket
C9A, C9B	900052	Variable capacitor		180045	Speaker

†When Ordering Always Specify Part No.

REPLACEMENT PARTS LIST FOR CHASSIS 120032B AND 120080B

Schematic Symbol	†Part No. Model 652 Chassis 120032B	†Part No. Model 653 Chassis 120080B	DESCRIPTION
R1	351330	351330	Resistor—3.3 meg., ½ w., ±20%
R2	Part of L2	Part of L2	Resistor—22,000 ohms, ½ w., 10%
R3	340270	340270	Resistor—120 ohms, ½ w., ±10%
R4	351490	351490	Resistor—15 meg., ½ w., 20%
R5, 6	351130	351130	Resistor—470 k ohm, ½ w., ±20%
R7	340290	340290	Resistor—150 ohm, ½ w., ±10%
R8	380530	380530	Resistor—1500 ohm, 1 w., ±20%
R9	340070	340070	Resistor—18 ohm, ½ w., ±10%
R10	390146	390145	.5 meg volume control
C1	920060	920040	.05 mfd., 200 v.
C2	910000		220 mmf., mica, type "O"
C3	910000		220 mmf., mica, type "O"
C4	920515		.002 mfd., 400 v., paper
C5	920180		.005 mfd., 400 v., paper
C2, 3, 4, 5	470310	470310	Herlac coupling assembly
C6	920020	920540	.02 mfd., 400 v., paper
C7	920030	920539	.05 mfd., 400 v., paper
C8	925175	925000	30-50 mfd., 150 v., electrolytic
C-9A, B	900072	900071	Variable capacitor
C10, 11	Pt. of C9A, B	Pt. of C9A, B	Trimmers
C12	920040	920040	.1 mfd., 200 v.
T1, T2	720021	720021	1st and 2nd I. F. transformer
T3		734057	Output transformer
L1	700023FH	700051	Ant. loop and back
L2	716026-1	716026-2	Oscillator coil
SP-1	180071	180045	Speaker
SW-1	Pt. of R10	Pt. of R10	On-off switch
V1	800525	800525	12BE6—Mixer
V2	800524	800524	12BA6—I. F. amplifier
V3	800523	800523	12AT6—Detector—1st A. F. amplifier
V4	800527	800527	50B5—Audio output
V5	800526	800526	35W4—Rectifier
V6	807000	807000	Pilot light—15 amp., #47
		530002	Drive cord (30") approx.
	530002		Drive cord (27") approx.
	507005	507220	Dial light socket
	583030	583032	Line cord

MODEL 645,
Ch. 120115



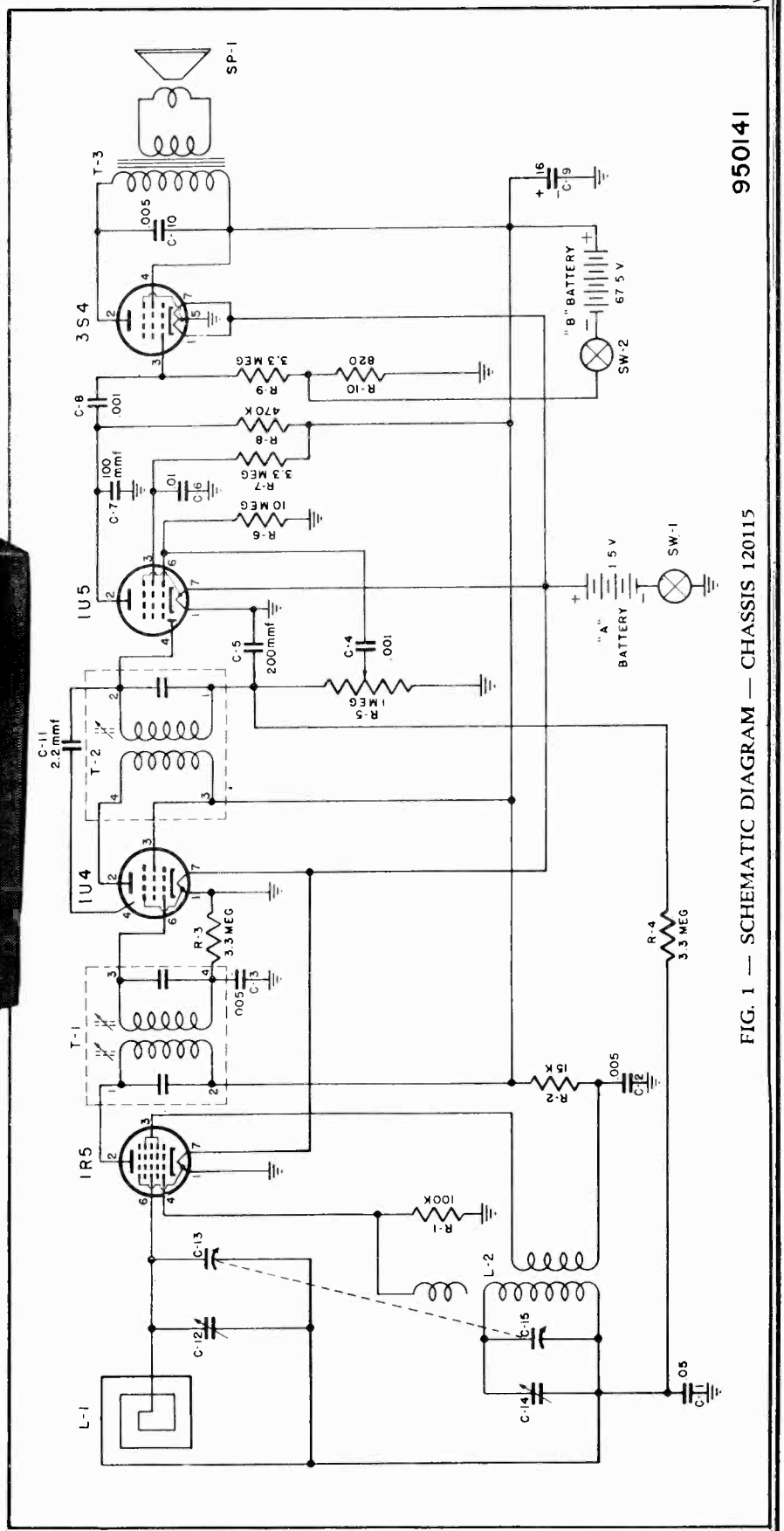


FIG. 1 — SCHEMATIC DIAGRAM — CHASSIS 120115

MODEL 645,
Ch. 120115

DESCRIPTION

TYPE: Battery operated 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—3S4, power output

POWER SUPPLY: "A" and "B" batteries

VOLTAGE RATING:

Battery operation—1½ volts "A" supply
67½ volts "B" supply

CURRENT CONSUMPTION:

"A" battery—.250 amp.
"B" battery—.009 amp.

GENERAL NOTES

1. Battery Complement: Replace "A" battery with Eveready 1½ volt No. 720 or equivalent. Replace "B" battery with 67½ volt Eveready No. 467 or equivalent.
2. The color coding of the battery is as follows:
   Red— B+ Yellow— A+
   White— B— Black— A—
3. If replacements are made in the r-f section of the circuit, carefully realign the receiver.
4. 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.
5. 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.

REPLACEMENT PARTS LIST

SYMBOL	†Part No.	DESCRIPTION	SYMBOL	†Part No.	DESCRIPTION
C-1	920060	.05 mfd., 200 v., paper	R-3	351330	3.3 megohms, ½ w., ± 20%
C-2	920180	.005 mfd., 400 v., paper	R-4	351330	3.3 megohms, ½ w., ± 20%
C-3	920180	.005 mfd., 400 v., paper	R-5	390066	1 megohm, Volume control
C-4	Pt. of 928034	.001 mfd., +100 —0%	R-6	351450	10 megohm, ½ w., ± 20%
C-5	Pt. of 928034	200 mmf., ± 50%	R-7	351330	3.3 megohms, ½ w., ± 20%
C-6	Pt. of 928034	.01 mfd., +200 —20%	R-8	351130	470,000 ohms, ½ w., ± 20%
C-7	Pt. of 928034	100 mmf., +100 —0%	R-9	351330	3.3 megohms, ½ w., ± 20%
C-8	Pt. of 928034	.001 mfd., +100 —0%	R-10	340470	820 ohms, ½ w., ± 10%
C-9	925066	16 mfd., 100 v., electrolytic	SP-1	180068	Speaker
C-10	920180	.005 mfd., 400 v., paper	SW-1	Pt. of 390066	On-off switch
C-11	915005	2.2 mfd., 400 v., ceramic	SW-2	Pt. of 390066	On-off switch
C-12	Pt. of 900057 or of 900047	R.f. trimmer	T-1	720062	1st i.f. transformer
C-13	Pt. of 900057 or of 900047	Variable cap.—R.f. section	T-2	720066A	2nd i.f. transformer
C-14	Pt. of 900057 or of 900047	Osc. trimmer	T-3	734053	Output transformer
C-15	Pt. of 900057 or of 900047	Variable cap.—Osc. section	V-1	1R5	Converter
L-1 or	700044	Loop ant.—Use with pt. 900057	V-2	1U4	I-F amplifier
L-1	700041	Loop ant.—Use with pt. 900047	V-3	1U5	Detector, a.v.c., a-f amplifier
L-2	716048A	Oscillator coil	V-4	354	Power output
R-1	350970	100,000 ohms, ½ w., ± 20%	——	——	1½ volt "A" battery, Eveready No. 720
R-2	340770	15,000 ohms, ½ w., ± 10%	——	——	67½ volt "B" battery, Eveready No. 467

†Specify part numbers when ordering.

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 645,
Ch. 120115

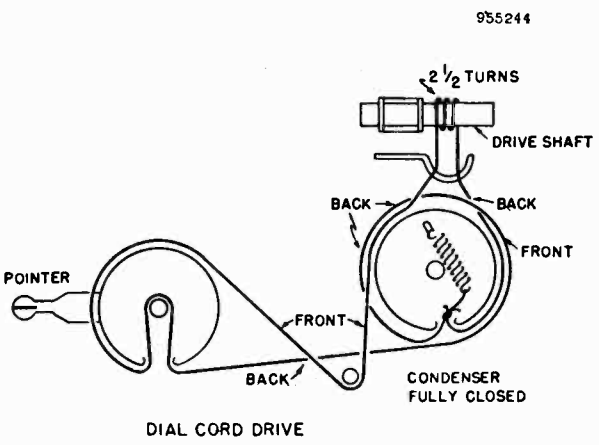


FIG. 2 — DIAL CORD STRINGING

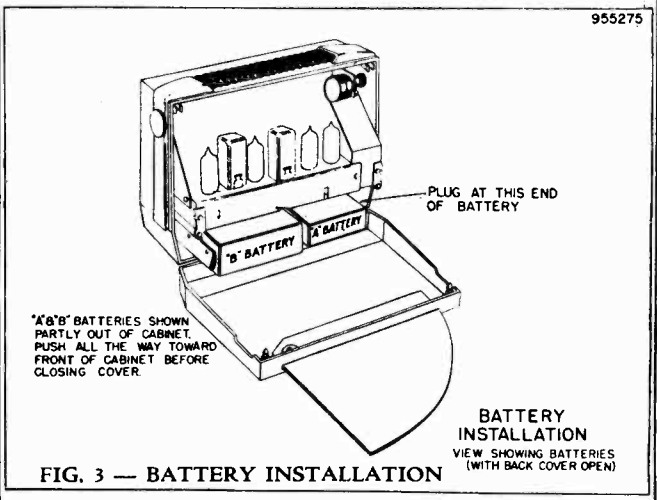


FIG. 3 — BATTERY INSTALLATION

ALIGNMENT PROCEDURE

1. To position pointer, turn variable condenser fully closed and set pointer to reference mark near low-frequency end of dial.
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, and oscillator slugs 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.
2	200 mmf.	High side to external antenna lead. Low side to chassis.	540 KC.	Variable condenser fully closed.	Across voice coil.	Oscillator slug in L-2.	Adjust for maximum output.
3	200 mmf.	"	1620 KC.	Variable condenser fully open.	Across voice coil.	Oscillator trimmer C-14.	Adjust for maximum output.
4	200 mmf.	"	1400 KC.	Tune for maximum output.	Across voice coil.	Antenna trimmer C-12.	Adjust for maximum output.

CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage readings are + dc. volts, resistance readings are ohms unless otherwise noted.
2. All measurements made with voltohmyst or equivalent.
3. Socket connections are shown as bottom views, with valves measured from socket pin to chassis.
4. No signal applied for voltage measurements.
5. Nominal tolerance on component valves makes possible a variation of ± 15% in readings.
6. On the voltage and resistance diagram, readings above line are voltage, valves below line indicate resistance. K= kilohms, MEG=megohms.
7. Valves marked * measured to pin 4 of V-4 (B+).

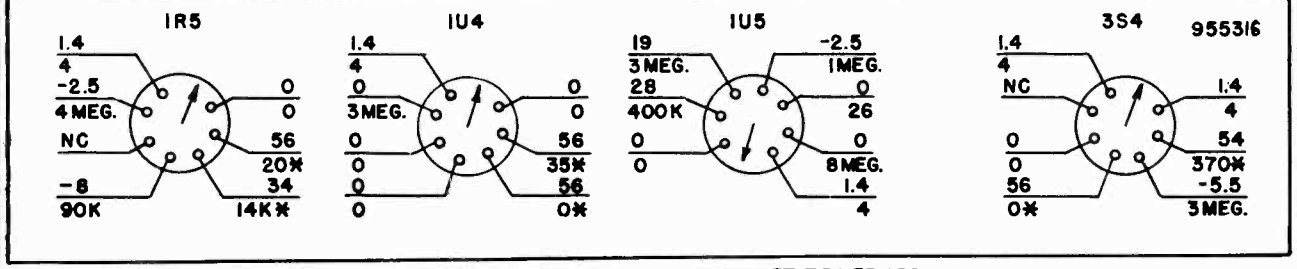


FIG 4. — VOLTAGE AND RESISANCE DIAGRAM

MODELS 646A, Ch. 120121A;
646B, Ch. 120121B

MODEL 646A, 646B
CHASSIS 120121A, 120121B

DESCRIPTION

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

FREQUENCY RANGE: 540-1620 kc.

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

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

VOLTAGE RATING:
Line operation—115 volts, a.c. or d.c.
Battery operation—"A" battery—4.5 volts
"B" battery—90 volts

POWER CONSUMPTION: 20 watts (line operation).

CURRENT DRAIN: "A" battery—.105 amp. at 4.5 volts
"B" battery—.012 amp. at 90.0 volts

Line operation—.170 amp. at 117 volts a.c.

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 rear of the chassis. 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 re-insert in the outlet to obtain proper polarity.

2. Battery Operation: Remove the line plug from the outlet and insert in the receptacle at the rear 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 alongside the "A" battery underneath the chassis. (See Fig. 5)

3. The color coding of the battery cables is as follows:

Red— A+	Yellow— A+
White— B−	Black— A−

4. If replacements are made in the r-f section of the circuit, carefully realign the receiver.

5. 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.

6. 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.

MODELS 646A, Ch. 120121A;
646B, Ch. 120121B

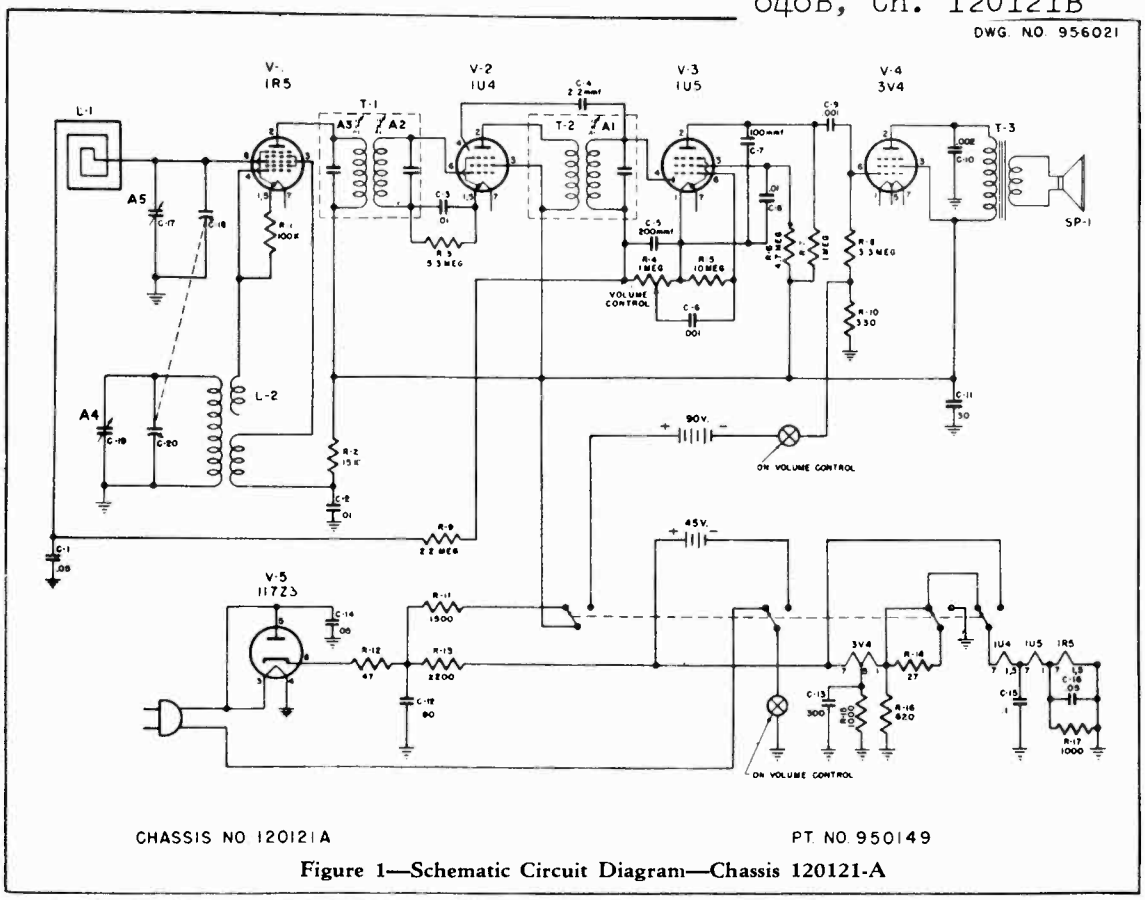


Figure 1—Schematic Circuit Diagram—Chassis 120121-A

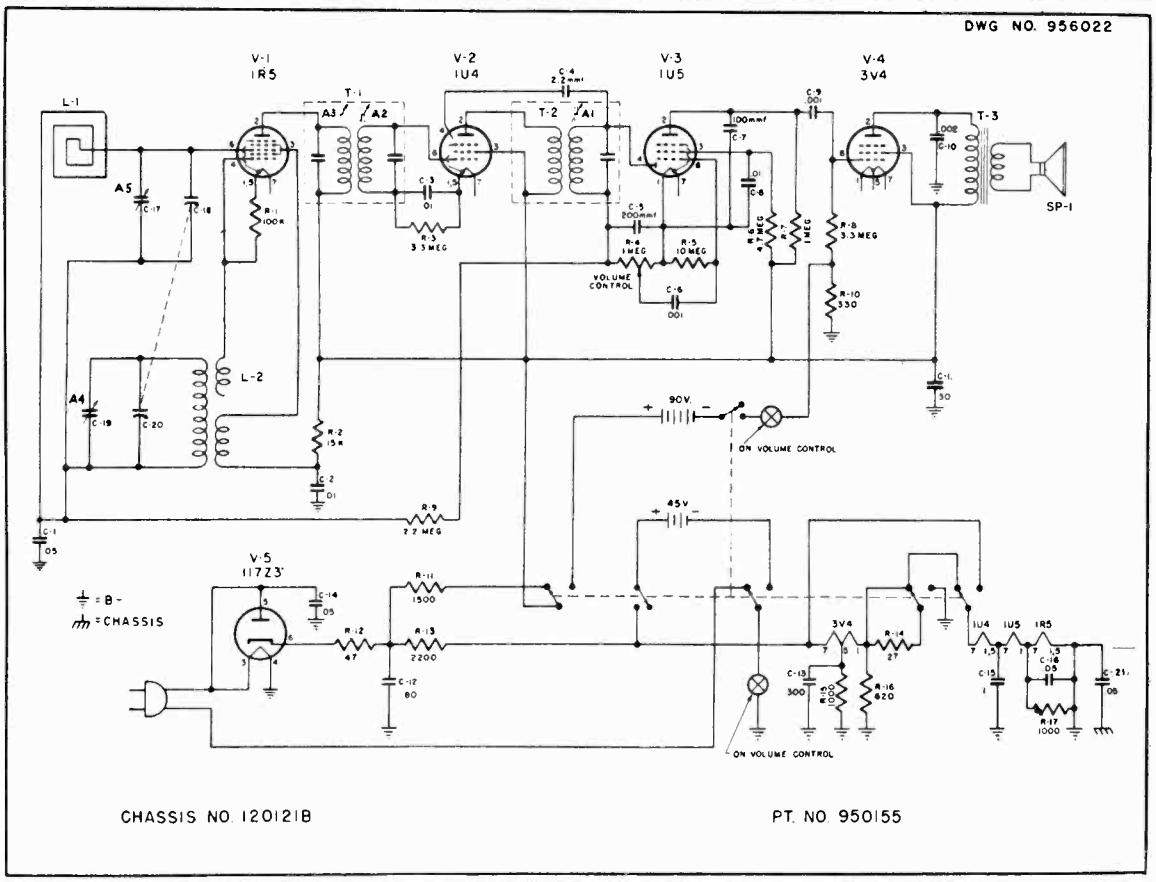


Figure 2—Schematic Circuit Diagram—Chassis 120121-B

MODELS 646A, Ch. 120121A;
646B, Ch. 120121B

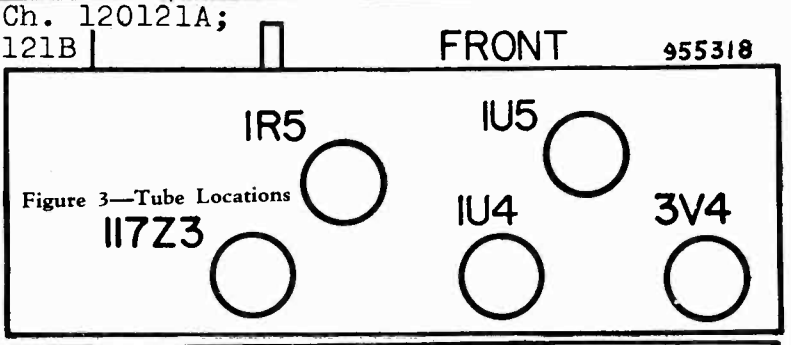


Figure 3—Tube Locations

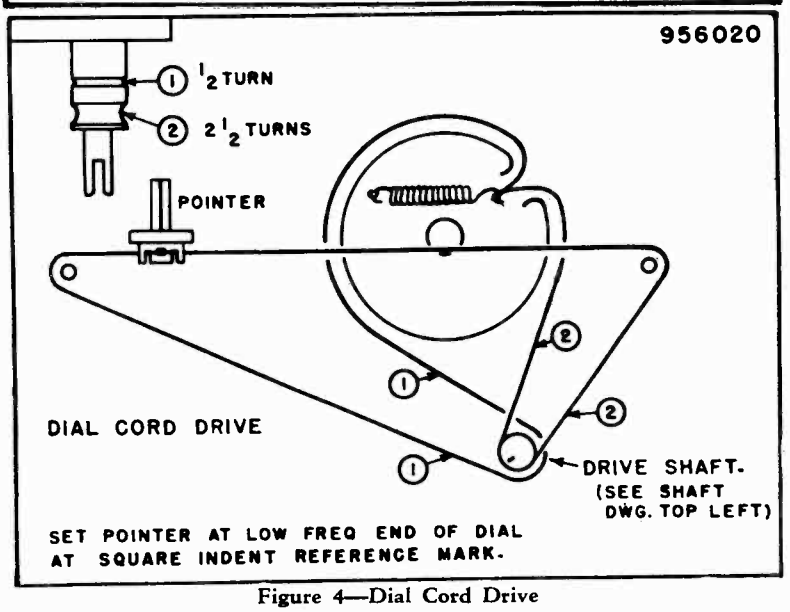


Figure 4—Dial Cord Drive

BATTERY REPLACEMENT TABLE

MODEL	CHASSIS	"A" BATTERY	"B" BATTERY
646A 646B	120121A 120121B	4½ volt. Eveready No. 726 or equivalent. (See Fig. 5)	90 volt. Eveready No. 490 Minimax or equivalent. (See Fig. 5)

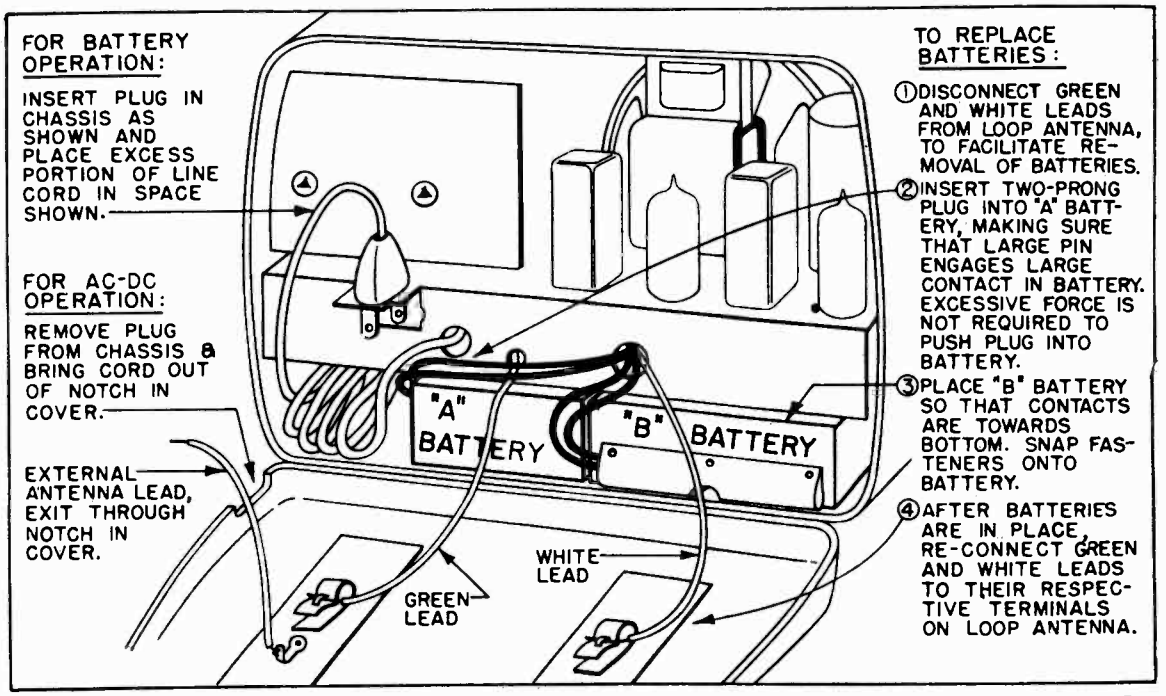


Figure 5—Battery Installation

955317

MODELS 646A, Ch. 120121A;
646B, Ch. 120121B

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.
3. Voltage readings are in d.c. volts and resistance readings in ohms, unless otherwise specified.
4. All meaurements made with voltohmyst.
5. For voltage measurements, set volume control at maximum; no signal applied.
6. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.

VOLTAGE READINGS

CHASSIS	SYMBOL	TUBE TYPE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
120121A	V1	1R5	0	95	60	−6.2	0	0	1.3
120121B	V2	1U4	2.8	95	95	0	2.8	.05	4.0
	V3	1U5	1.3	16	15	.05	.01	.01	2.5
	V4	3V4	4	95	95	0	5.2	0	6.5
	V5	117Z3	N.C.	115	115 AC	0	115 AC	116	115

RESISTANCE READINGS

CHASSIS	SYMBOL	TUBE TYPE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
120121A	V1	1R5	0	3800	20K	100K	0	3 Meg.	17
120121B	V2	1U4	30	3800	3800	Inf.	34	3.3 Meg.	38
	V3	1U5	17	1 Meg.	3 Meg.	1 Meg.	3 Meg.	10 Meg.	30
	V4	3V4	38	4000	3800	330	42	3.3 Meg.	54
	V5	117Z3	N.C.	2000	480	0	480	2000	2000

NC=no connection; Inf.=infinity; K=kilohms; Meg.=megohms

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.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST*	REMARKS
1	0.1 mfd.	High side to pin 6 (grid) of V1 (1R5). Low side to chassis	455 kc	Variable condenser fully open.	Across voice coil.	A1, (2nd i-f trans), A2, A3 (1st i-f trans.)	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 ant. lead. Low side to chassis	1620 kc	Variable condenser fully open.	Across voice coil.	A4 (trimmer cond. C4.)	Adjust for maximum output.
3	200 mmf.	"	1400 kc	Tune for maximum output.	Across voice coil.	A5 (trimmer cond. C2.)	Adjust for maximum output.

MODEL 646A,
Ch. 120121A

CHASSIS PARTS LIST—(CHASSIS 120121-A)

Symbol	Part No.	DESCRIPTION
R-1	Pt. of 716017-1	100,000 ohm, ½ w., ± 20%
R-2	340770	15,000 ohm, ½ w., ±10%
R-3	351330	3.3 meg., ½ w., ±20%
R-4	390051-1	1 meg., volume control
R-5	351450	10 meg., ½ w., ±20%
R-6	351370	4.7 meg., ½ w., ±20%
R-7	341210	1 meg., ½ w., ±10%
R-8	351330	3.3 meg., ½ w., ±20%
R-9	351290	2.2 meg., ½ w., ±20%
R-10	340370	330 ohm, ½ w., ±10%
R-11	340530	1,500 ohm, ½ w., ±10%
R-12	370170	47 ohm, 1 w., ±10%
R-13	394095	2,200 ohm, 10 w.
R-14	340110	27 ohm, ½ w., ±10%
R-15	340490	1,000 ohm, ½ w., ±10%
R-16	340470	820 ohm, ½ w., ±10%
R-17	340490	1,000 ohm, ½ w., ±10%
C-1	920060	.05, mfd., 200v.
C-2	920092	.01 mfd., 200v.
C-3	920092	.01 mfd., 200v.
C-4	915005	2.2 mmf.
C-5	Pt. of 928034	200 mmf., coupling plate
C-6	Pt. of 928034	.001 mfd., coupling plate
C-7	Pt. of 928034	100 mmf., coupling plate
C-8	Pt. of 928034	.01 mfd., coupling plate
C-9	Pt. of 928034	.001 mfd., coupling plate
C-10	920515	.002 mfd., 400v.
C-11	Pt. of 925167-1	30 mfd., 150v. electrolytic
C-12	Pt. of 925167-1	80 mfd., 150v. electrolytic
C-13	Pt. of 925167-1	300 mfd., 10v. electrolytic
C-14	920539	.05 mfd., 400v.
C-15	920040	.1 mfd., 200v.
C-16	920060	.05 mfd., 200v.
C-17	Pt. of 900160-1	R.F. trimmer
C-18	Pt. of 900160-1	Variable cap. — R.F. section
C-19	Pt. of 900160-1	Oscillator trimmer
C-20	Pt. of 900160-1	Variable cap. — Oscillator section
L-1	700027	Loop antenna
L-2	716017-1	Oscillator coil
T-1	720062	1st I.F. transformer
T-2	720066A	2nd I.F. transformer
T-3	734053	Output transformer
SW-1	510075	Transfer switch
SP-1	180068	Speaker
V-1	800110	1R5 tube
V-2	800017	1U4 tube
V-3	800019	1U5 tube
V-4	800018	3V4 tube
V-5	800013	117Z3 tube

CABINET PARTS LIST—(MODEL 646-A)

Part No.	DESCRIPTION
140352	Cabinet—maroon
140352-1	Cabinet back—maroon
140366	Cabinet—saddle tan
140366-A	Cabinet back—saddle tan
140364	Cabinet—green
140364-A	Cabinet back—green
140365	Cabinet—ivory
140365-A	Cabinet back—ivory
587007	Hinge spring—(for all above backs)
460162-S	Knob—black—gold center
525054	Pointer
808202	Fuse clip
541009	Tubular clip
530002	Drive cord (27")
410909	Dial back plate
583012P	Line cord
587040	Spring—drive cord
585008	Battery cable "A"
585029	Battery cable "B"

MODEL 646B,
Ch. 120121B

CHASSIS PARTS LIST—(CHASSIS 120121-B)

Symbol	Part No.	DESCRIPTION
R-1	350970	100,000 ohm, ½ w., ± 20%
R-2	340770	15,000 ohm, ½ w., ±10%
R-3	351330	3.3 meg., ½ w., ±20%
R-4	390051-1	1 meg., volume control
R-5	351450	10 meg., ½ w., ±20%
R-6	351370	4.7 meg., ½ w., ±20%
R-7	341210	1 meg., ½ w., ±10%
R-8	351330	3.3 meg., ½ w., ±20%
R-9	351290	2.2 meg., ½ w., ±20%
R-10	340372	330 ohm, ½ w., ±10%
R-11	340532	1,500 ohm, ½ w., ±10%
R-12	370172	47 ohm, 1 w., ±10%
R-13	394095	2,200 ohm, 10 w.
R-14	340112	27 ohm, ½ w., ±10%
R-15	340492	1,000 ohm, ½ w., ±10%
R-16	340472	820 ohm, ½ w., ±10%
R-17	340492	1,000 ohm, ½ w., ±10%
C-1	920060	.05 mfd., 200v.
C-2	920092	.01 mfd., 200v.
C-3	920092	.01 mfd., 200v.
C-4	915005	2.2 mmf.
C-5	Pt. of 928034	200 mmf., coupling plate
C-6	Pt. of 928034	.001 mfd., coupling plate
C-7	Pt. of 928034	100 mmf., coupling plate
C-8	Pt. of 928034	.01 mfd., coupling plate
C-9	Pt. of 928034	.001 mfd., coupling plate
C-10	920515	.002 mfd., 400v.
C-11	Pt. of 925186	30 mfd., 150v. electrolytic
C-12	Pt. of 925186	80 mfd., 150v. electrolytic
C-13	Pt. of 925186	300 mfd., 10v. electrolytic
C-14	920539	.05 mfd., 400v.
C-15	920040	.1 mfd., 200v.
C-16	920060	.05 mfd., 200v.
C-17	Pt. of 900160-1	R.F. trimmer
C-18	Pt. of 900160-1	Variable cap. — R.F. section
C-19	Pt. of 900160-1	Oscillator trimmer
C-20	Pt. of 900160-1	Variable cap. — Oscillator section
C-21	920539	.05 mfd., 400v.
L-1	700027	Loop antenna
L-2	716057	Oscillator coil
T-1	720062	1st I.F. transformer
T-2	720066A	2nd I.F. transformer
T-3	734053B	Output transformer
SW-1	510073	Transfer switch
SP-1	180068	Speaker
V-1	800110	1R5 tube
V-2	800017	1U4 tube
V-3	800019	1U5 tube
V-4	800018	3V4 tube
V-5	800013	117Z3 tube

CABINET PARTS LIST—(MODEL 646B)

Part No.	DESCRIPTION
140352	Cabinet—maroon
140352-1	Cabinet back—maroon
140366	Cabinet—saddle tan
140366-A	Cabinet back—saddle tan
140364	Cabinet—green
140364-A	Cabinet back—green
140365	Cabinet—ivory
140365-A	Cabinet back—ivory
587007	Hinge spring (for all above backs)
460162-S	Knob—black—gold center
700027	Loop antenna
525054	Pointer
808202	Fuse clip
541009	Tubular clip
530002	Drive cord (27")
410909	Dial back plate
583018	Line cord
587040	Spring—drive cord
585008	Battery cable "A"
585029	Battery cable "B"

MODELS 656B, 657B,
Ch. 120122B

MODEL 657B
CHASSIS 120122B

MODEL 656B
CHASSIS 120122B

DESCRIPTION

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

FREQUENCY RANGE: 540-1620 KC.

TYPE OF TUBES:
1—1U4, tuned 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—.014 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 halfway 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.

MODELS 656B, 657B,
Ch. 120122B

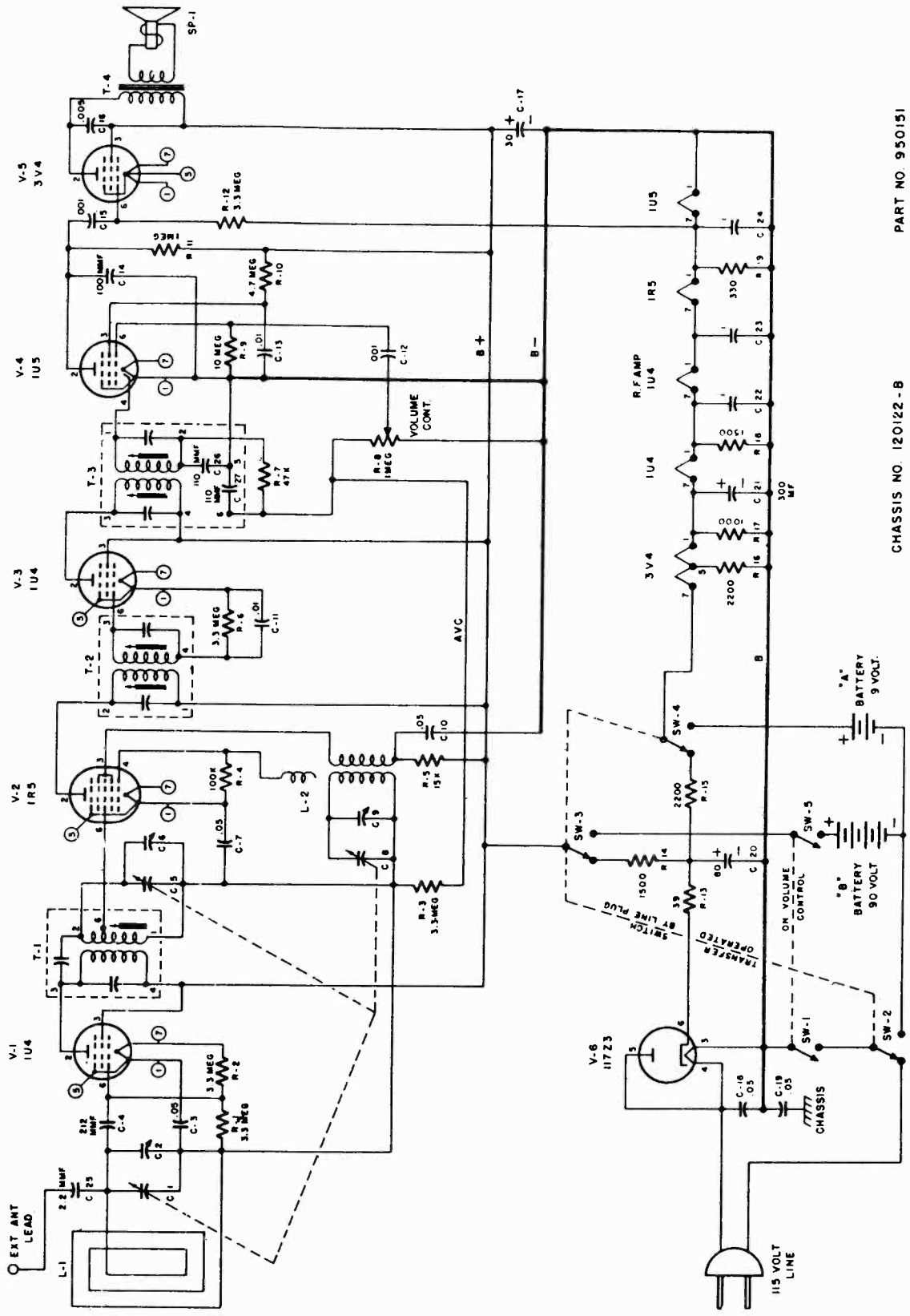


FIGURE 1—SCHEMATIC DIAGRAM, CHASSIS 120122B

MODELS 656B, 657B,
Ch. 120122B

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. Low side to B—.	455 KC	Variable condenser fully open	Across voice coil	T2, T3 top and bottom	Adjust for maximum output
2	Receiver Loop	Form loop of several turns and radiate signal into receiver	1620 KC	"	"	Trimmer condenser (C-9 osc.)	Bottom cover on chassis
3	"	"	1400 KC	Tunt for maximum output	"	Trimmer condenser (C-6 RF) and trimmer condenser (C-2 ant.)	"
4	"	"	600 KC	"	"	T1 top	"
5	Repeat steps 3 and 4						

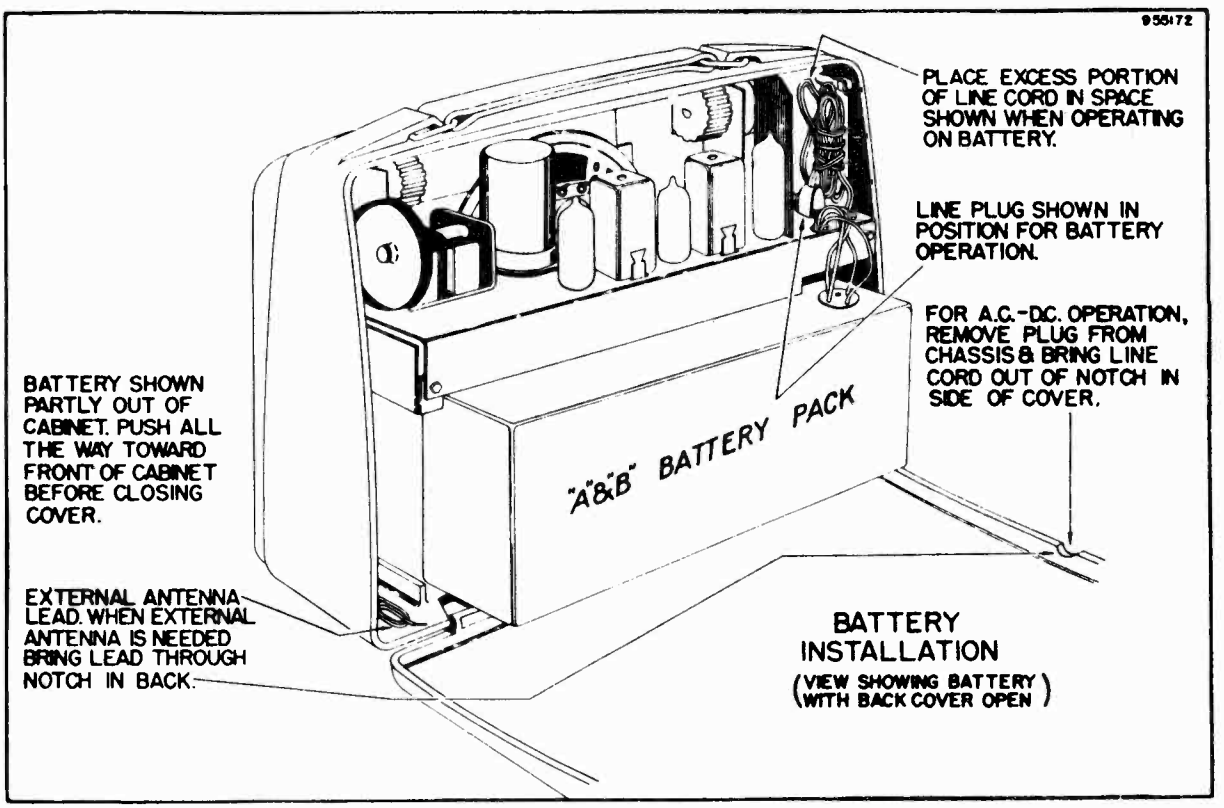


FIGURE 2 — BATTERY REPLACEMENT

CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages indicated are positive d.c., resistances are in ohms, unless otherwise indicated.
2. Measurements made with voltohmyst 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; no signal applied for voltage measurements.
6. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.

SYMBOL	TUBE	PIN NUMBER						
		Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	1U4	2.8 d.c.	92 d.c.	92 d.c.	N.C.	2.8 d.c.	1.8 d.c.	4.2 d.c.
V2	1R5	1.4 d.c.	92 d.c.	60 d.c.	—.10 d.c.	1.4 d.c.	.2 d.c.	2.8 d.c.
V3	1U4	4.2 d.c.	92 d.c.	92 d.c.	N.C.	4.2 d.c.	3.1 d.c.	5.8 d.c.
V4	1U5	0	26 d.c.	21 d.c.	—.5 V d.c.	—.5 V d.c.	0	1.4 V d.c.
V5	3V4	5.7 d.c.	88 d.c.	92 d.c.	0	7 d.c.	1.2 d.c.	8.5 d.c.
V6	117Z3	N.C.	120 d.c.	0	120 a.c.	120 a.c.	120 d.c.	0

VOLTAGE READINGS (MODELS 656B, 657B)

SYMBOL	TUBE	PIN NUMBER						
		Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	1U4	34	4.2 K	4.2 K	N.C.	36	2.2 meg.	48
V2	1R5	18	4.2 K	20 K	100 K	18	2.6 meg.	34
V3	1U4	48	4.2 K	4.2 K	N.C.	48	3.3 meg.	60
V4	1U5	0	1 meg.	4.7 meg.	1 meg.	1 meg.	10 meg.	18
V5	3V4	62	4.6 K	4.1 K	0	74	3.3 meg.	85
V6	117Z3	N.C.	2.4 K	0	500	500	2.4 K	Inf.

RESISTANCE READINGS (MODELS 656B, 657B)

MODELS 656B, 657B,
Ch. 120122B

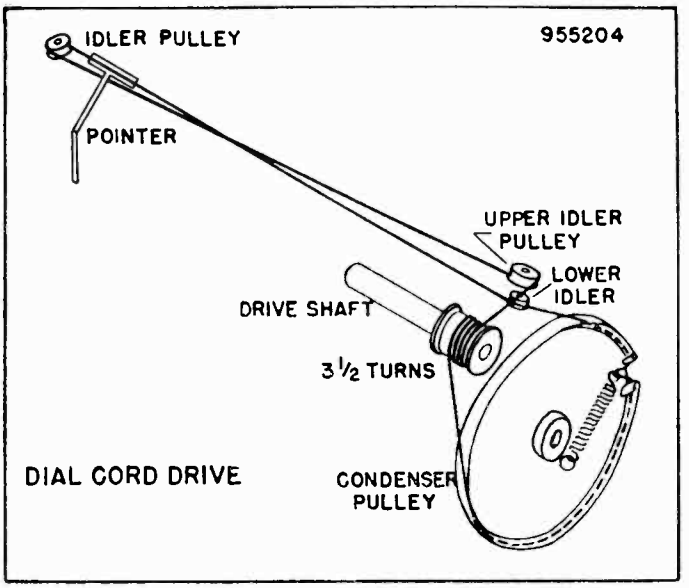


FIGURE 3 — DIAL CORD DRIVE

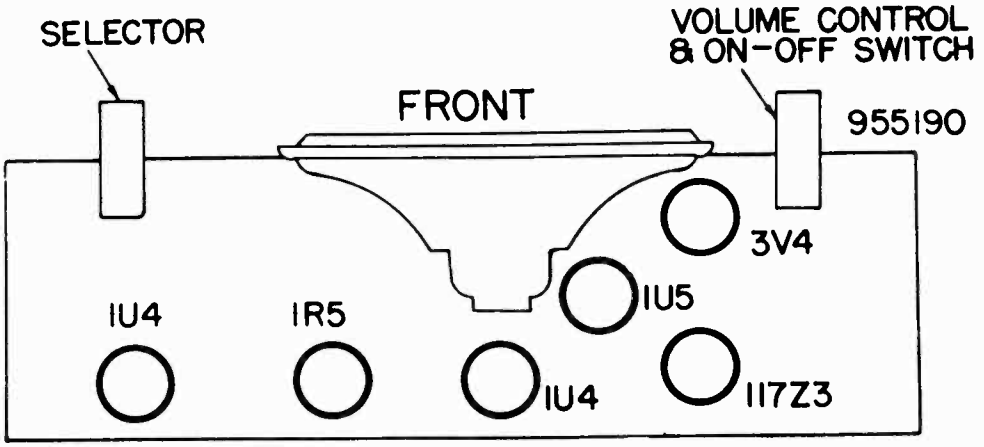


FIGURE 4 — TUBE LOCATIONS, CHASSIS 120122B

Part No. 656B	Part No. 657B	DESCRIPTION
140182-A		(Maroon) Cabinet with Grille
140183-S		Cabinet Back with Hinge (Maroon)
460082		Knobs
595006		Handle with Rings (Black)
140253-A		(Sand) Cabinet with Grille
140254		(Sand) Cabinet Back
460104		Knobs (Sand)
595007		Handle with Rings (Pigskin)
	140351	Cabinet and Back (Fabric Covered)
	460102	Grille (Sand)
	460104	Knobs (Sand)
520126	520126	Dial Crystal
808205		Fuse Clip
700042	700042	Loop Antenna
525041-1	525041-1	Pointer
180052	180052	Speaker
585033	585033	Battery Cable
583017-P	583017-P	Line Cord
530002	530002	Drive Cord
587040	587040	Spring — Drive Cord
520085	520085	Dial Back Plate

CABINET PARTS LIST (656B, 657B)

MODELS 656B, 657B,
Ch. 120122B

CHASSIS PARTS LIST (CHASSIS 120122B)

Symbol	Part No.	DESCRIPTION			
C-1	Pt. of 900076	Variable Capacitator — Antenna Section			
C-2	Pt. of 900076	Trimmer — Antenna			
C-3	920060	.05 MF	Paper		200V
C-4	928104	212 MMF	Ceramic	±20%	300V
C-5	Pt. of 900076	Variable Capacitator — R.F. Section			
C-6	Pt. of 900076	Trimmer — R.F.			
C-7	920060	.05 MF	Paper		200V
C-8	Pt. of 900076	Variable Capacitator — Oscillator Section			
C-9	Pt. of 900076	Trimmer — Oscillator			
C-10	920060	.05 MF	Paper		200V
C-11	920092	.01 MF	Paper		200V
C-12	Pt. of 923022	.001 MF			
C-13	Pt. of 923022	.01 MF			
C-14	Pt. of 923022	100 MMF	Multiple Condenser		
C-15	Pt. of 923022	.001 MF			
C-16	920180	.005 MF	Paper		400V
C-17	Pt. of 925183	30 MF	Electrolytic		150V
C-18	920539	.05 MF	Paper		400V
C-19	920539	.05 MF	Paper		400V
C-20	Pt. of 925183	80 MF	Electrolytic		150V
C-21	Pt. of 925183	300 MF	Electrolytic		15V
C-22	920040	.1 MF	Paper		200V
C-23	920040	.1 MF	Paper		200V
C-24	920040	.1 MF	Paper		200V
C-25	Pt. of L-1	2.2 MMF			
L-1	700042	Loop Antenna			
L-2	716056	Oscillator Coil			
R-1	351330	3.3 Megohm	Carbon	½W	±20%
R-2	351330	3.3 Megohm	Carbon	½W	±20%
R-3	351330	3.3 Megohm	Carbon	½W	±20%
R-4	350970	100,000 Ohm	Carbon	½W	±20%
R-5	340770	15,000 Ohm	Carbon	½W	±10%
R-6	351330	3.3 Megohm	Carbon	½W	±20%
R-7	340890	47,000 Ohm	Carbon	½W	±10%
R-8	390063	1 Megohm	Volume Control		
R-9	351450	10 Megohm	Carbon	½W	±20%
R-10	351370	4.7 Megohm	Carbon	½W	±20%
R-11	341210	1 Megohm	Carbon	½W	±10%
R-12	351330	3.3 Megohm	Carbon	½W	±20%
R-13	370152	39 Ohm	Carbon	1W	±10%
R-14	340532	1,500 Ohm	Carbon	½W	±10%
R-15	394099	2,200 Ohm	W.W.		± 5%
R-16	340572	2,200 Ohm	Carbon	½W	±10%
R-17	340492	1,000 Ohm	Carbon	½W	±10%
R-18	340532	1,000 Ohm	Carbon	½W	±10%
R-19	340372	330 Ohm	Carbon	½W	±10%
SP-1	180052	Speaker — PM			
SW-1	Pt. of R-8	On-Off Switch			
SW-2	Pt. of 510043				
SW-3	Pt. of 510043	Transfer Switch			
SW-4	Pt. of 510043				
SW-5	Pt. of R-8	On-Off Switch			
T-1	720122	R.F. Interstage Transformer			
T-2	720121	1st I.F. Transformer			
T-3	720123	2nd I.F. Transformer			
T-4	734039A	Output Transformer			
V-1	800017	Vacuum Tube — 1U4			
V-2	800110	Vacuum Tube — 1R5			
V-3	800017	Vacuum Tube — 1U4			
V-4	800019	Vacuum Tube — 1U5			
V-5	800018	Vacuum Tube — 3V4			
V-6	800013	Vacuum Tube — 117Z3			

MODEL 659B,
Ch. 120126-B

MODEL 659B
CHASSIS 120126-B

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.

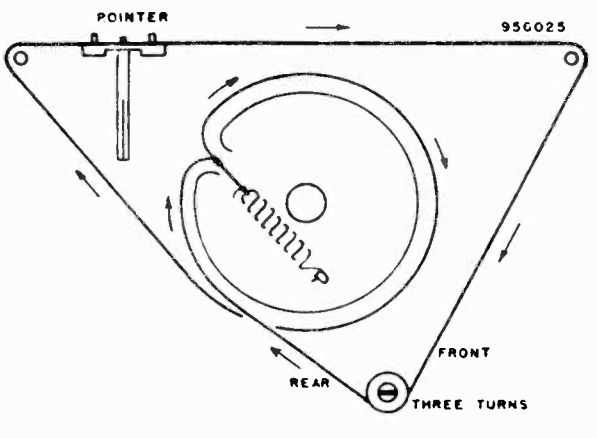
2. A self-contained loop antenna is provided for broadcast band reception. For permanent home installation, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. Connect the outdoor antenna to the screw on the loop terminal strip marked "AM".

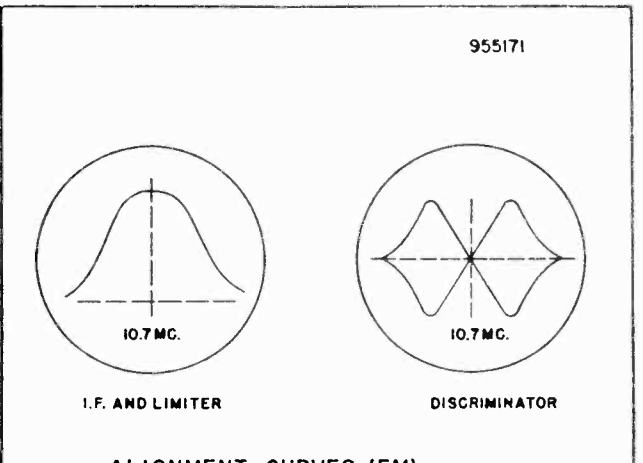
3. An internal power line antenna is provided for FM operation in relatively strong signal areas. An external dipole antenna is recommended for maximum FM operation. To connect the dipole, first remove the wire from the screw on the loop terminal strip marked "FM" and connect the dipole leads to the "FM" terminal and "G".

4. A ground connection is not required for AM and FM operation.

DESCRIPTION

TYPE: Amplitude modulation (AM) and frequency modulation (FM) superheterodyne.
FREQUENCY RANGE:
Broadcast band (AM)—540-1620 kilocycles
Frequency modulation band (FM)—88-108 megacycles
TYPE OF TUBES:
1—6BJ6 FM r-f amplifier
1—12AT7 FM converter
1—12BE6 AM converter
1—6BJ6 FM and AM i-f amplifier
1—6BJ6 2nd i-f FM amplifier
1—6BH6 FM limiter
1—19T8 FM discriminator, AM det., AVC and audio ampl.
1—50L6 power output
1—Selenium rectifier
POWER SUPPLY: 60 cycles
VOLTAGE RATING: 115v. a.c. and d.c.
POWER CONSUMPTION: 35 watts
CURRENT DRAIN: 0.30 amps. at 115 volts a.c.





ALIGNMENT CURVES (FM)

MODEL 659B,
Ch. 120126-B

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 law side of signal generator to chassis.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to Pin 7 (grid) of 12BE6. Low side to chasis.	455 KC.	Broadcast	Tuning condenser fully open.	Across voice coil.	A1, A2, (Trans. T4). A3, A4, (Trans. T2).	Adjust for maximum output. Reduce dummy antenna to .001 mfd. if isolation trans. is not used.
2		Loop	1620 KC.	Broadcast	Tuning condenser fully open.	Across voice coil.	A5, (Trimmer cond. C6).	Form loop of several turns of wire. Radiate signal into receiver loop. Adjust for maximum output.
3		Loop	1400 KC.	Broadcast	Tune for max. outpt.	Across voice coil.	A6, (Trimmer cond. C5).	Adjust for maximum output.

FM I-F and Disc. Alignment Using AM Signal Generator and VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	.01 mfd.	High side to Pin 1 (grid) of 6BJ6 2nd i-f (V5). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A7, (Trans. T5).	Adjust for maximum output.
2	.01 mfd.	High side to Pin 1 (grid) of 6BJ6 1st i-f (V3). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A8, A9, (Trans. T3).	Adjust for maximum output.
3	.01 mfd.	High side to Pin 7 of 12AT7 conv. (V2). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A10, A11, (Trans. T1).	Adjust for maximum output.
4	.01 mfd.	High side to Pin 1 (grid) of 6BJ6 2nd i-f (V5). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "B". Common to chassis.	A12, (Trans. T6).	Adjust for maximum output.
5	.01 mfd.	"	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "C". Common to chassis.	A13, (Trans. T6).	Adjust for zero output, Continue with FM r-f alignment.

FM I-F AND DISC. ALIGNMENT USING SWEEP SIGNAL GENERATOR AND OSCILLOSCOPE. Use frequency modulated signal, with 60 cycle modulation and 450 k sweep. Use 120 cycle sawtooth sweep voltage in oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT OSCILLOSCOPE	ADJUST	REMARKS
1	.01 mfd.	High side to Pin 1 (grid) of 6BJ6 1st i-f (V3). Low side of chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "A". Ground to chassis.	A7, A8, A9, (Trans. T5 and T3).	Adjust for maximum output (height) and symmetry as per i-f alignment curve shown (page 3).
2	.01 mfd.	High side to Pin 7 of 12AT7 of conv. (V2). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "A". Ground to chassis.	A10, A11, (Trans. T1)	Adjust for maximum output (height) and symmetry as per i-f alignment curve shown (page 3).
3	.01 mfd.	High side to Pin 1 (grid) of 6BJ6 2nd i-f (V5). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "C". Ground to chassis.	A12, A13, (Trans. T6).	Alternately adjust A12 for maximum amplitude and A13 for maximum straightness af cross-over lines, with cross-over occurring at center of pattern as per discriminator alignment curve (page 3). Continue with FM r-f alignment.

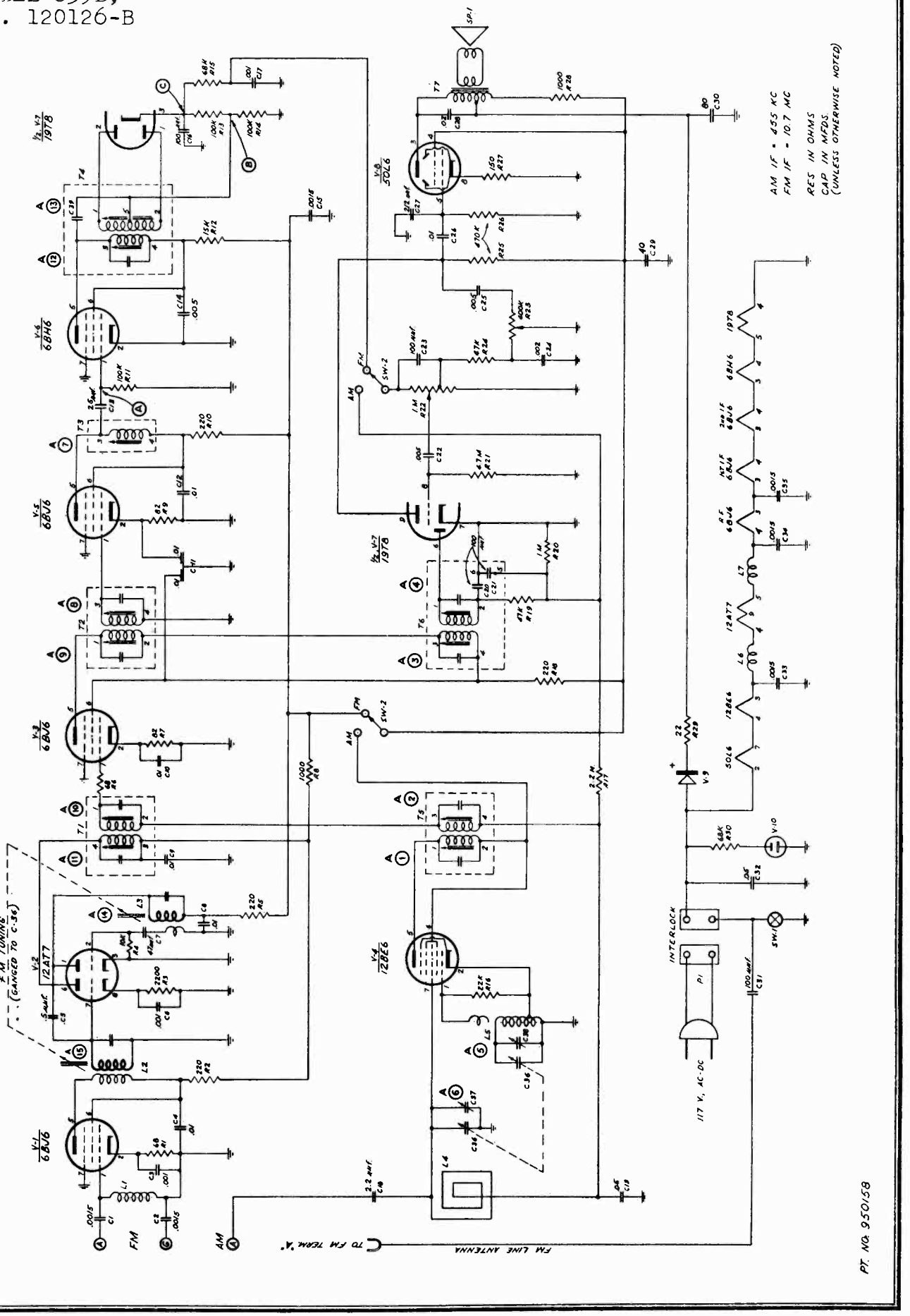
FM R-F ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	300 ohm resistor in series with gen. lead.	High side to FM ant. term. Low side to chassis.	109.0 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open	Connect d.c. probe to point "A". Common to chassis	A14 (Iron Core)	Adjust for maximum output.
2	"	"	106.0 mc.	Frequency modulation	Tune for maximum output.	"	A15 (Iron Core)	Adjust for maximum output.

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages readings are in d.c. volts and resistance reading in ohms, unless otherwise specified.
2. D.c. voltage measurements are made at 20,000 ohms-per-volt and a.c. voltages are measured at 1000 ohms-per-volt.
3. Socket connections are shown as bottom views. Values are measured from socket pin to common negative.
4. Line voltage maintained at 115 volts a.c. for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in readings.
6. Volume control at maximum, with no signal applied and bandswitch in broadcast position (unless otherwise noted), for voltage measurements.

MODEL 659B,
Ch. 120126-B



MODEL 659B,
Ch. 120126-B

VOLTAGE READINGS (CHASSIS 120126-B)

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-1	6BJ6	0	.6*	35 AC	41 AC	78*	78*	0	—	—
V-2	12AT7	86*	-2.8*	0	53 AC	41 AC	80*	0	1.7*	NC
V-3	6BJ6	-.4	.8	35 AC	30 AC	100	100	0	—	—
V-4	12BE6	-7.6	0	53 AC	64 AC	100	100	-.4	—	—
V-5	6BJ6	0	.7*	30 AC	24 AC	86*	86*	0	—	—
V-6	6BH6	-.3	0	24 AC	18 AC	50*	50*	0	—	—
V-7	19T8	-.5*	-.6*	-.1*	0	18 AC	-.5	0	-.5	40
V-8	50L6	NC	115 AC	110	105	0	NC	64 AC	7.2	—

RESISTANCE READINGS (CHASSIS 120126-B)

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-1	6BJ6	0	68	42	50	200K*	200K*	0	—	—
V-2	12AT7	200K*	10K	0	62	50	200K*	0	2200	NC
V-3	6BJ6	3.2 meg.	82	42	35	200K*	200K*	0	—	—
V-4	12BE6	22K	.5	62	75	200K	200K	2.7 meg.	—	—
V-5	6BJ6	.6	82	35	28	200K*	200K*	0	—	—
V-6	6BH6	100K	0	28	20	200K*	200K*	0	—	—
V-7	19T8	100K	100K	175K*	0	20	500K	0	4.7 meg.	500K
V-8	50L6	NC	130	200K	200K	470K	NC	75	150	—

N.C. Denotes "No Connection."
*Denotes Bandswitch in FM Position Only.

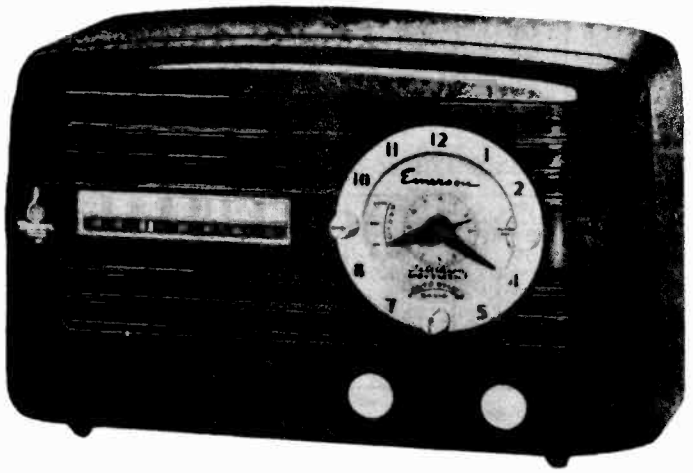
CHASSIS PARTS LIST (CHASSIS 120126-B)

Symbol	Part No.	DESCRIPTION
C1	928006	1,500 MMF Ceramic
C2	928006	1,500 MMF Ceramic
C3	928053	.001 MF Ceramic, Circular
C4	928027	.01 MF Ceramic, Circular
C5	915029	.5 MMF (Sim. Stackpole Type GA) 500V ±10%
C6	928053	.001 MF Ceramic, Circular
C7	928102	.50 MMF Ceramic
C8	928027	.01 MF Ceramic, Circular
C9	928027	.01 MF Ceramic, Circular
C10	928027	.01 MF Ceramic, Circular
C11	928055	.01 MF Dual, Ceramic, Shilded
C12	928027	.01 MF Ceramic, Circular
C13	928110	.25 MMF Ceramic
C14	928109	.005 MF Ceramic, Circular
C15	928006	1,500 MMF Ceramic
C16	928013	100 MMF Ceramic ±20%
C17	928053	.001 MF Ceramic, Circular
C18	(Part of Loop)	2.2 MMF Ceramic
C19	920060	.05 MF Paper 200V ±25%
C20, C21	Pt. of T6	100 MMF
C22	920180	.005 MF Paper 400V ±25%
C23	928013	100 MMF Ceramic ±20%
C24	920545	.002 MF Paper 400V ±25%
C25	920180	.005 MF Paper 400V ±25%
C26	920090	.01 MF Paper 400V ±25%
C27	928104	212 MMF Ceramic
C28	920020	.02 MF Paper 400V ±25%
C29	925187	40 MF Electrolytic } Dual 150V
C30	925187	80 MF Electrolytic }
C31	928013	100 MMF Ceramic ±20%
C32	920030	.05 MF Paper 400V ±25%
C33	928006	1,500 MMF Ceramic
C34	928006	1,500 MMF Ceramic
C35	928006	1,500 MMF Ceramic
C36	900078	AM Variable Cond. FM Tuning Assembly
C37	(Pt.ofC36)	AM RF Trimmer
C38	(Pt.ofC36)	AM Osc. Trimmer
C39	(Pt.ofT4)	
R1	340212	68 Ohms ½W ±10%
R2	340332	220 Ohms ½W ±10%
R3	340572	2,200 Ohms ½W ±10%
R4	340732	10,000 Ohms ½W ±10%
R5	340332	220 Ohms ½W ±10%
R6	340212	68 Ohms ½W ±10%
R7	340232	82 Ohms ½W ±10%
R8	340492	1,000 Ohms ½W ±10%
R9	340232	82 Ohms ½W ±10%
R10	340332	220 Ohms ½W ±10%
R11	340970	100,000 Ohms ½W ±10%
R12	340770	15,000 Ohms ½W ±10%
R13	340970	100,000 Ohms ½W ±10%
R14	340970	100,000 Ohms ½W ±10%
R15	340930	68,000 Ohms ½W ±10%
R16	(Pt.ofL5)	22,000 Ohms
R17	351290	2.2 Meghoms ½W ±20%
R18	340332	220 Ohms ½W ±10%
R19	340890	47,000 Ohms ½W ±10%
R20	341210	1 Megohm ½W ±10%
R21	351370	4.7 Meg. ½W ±20%
R22	390161	1.0 Meg. Vol. Control } Dual Pot.
R23	(PtofR22)	400,000 Ohms Tone Control } with Switch
R24	340890	47,000 Ohms ½W ±10%
R25	351130	470,000 Ohms ½W ±20%
R26	351130	470,000 Ohms ½W ±20%
R27	340292	150 Ohms ½W ±10%
R28	394042	1000 Ohms 3W ±10%
R29	394027	22 Ohms 2W ±10%
R30	340930	68,000 Ohms
L1	713026	FM Ant. Coil
L2	713027	FM R.F. Coil
L3	716059	FM Osc. Coil
L4	700055	AM Loop Ant.
L5	716058	AM Osc. Coil
L6	705002	Filament Choke
L7	705002	Filament Choke
P1	505014	Safety Interlock Plug
SP1	180074	PM Speaker
SW1	(Pt.ofR22)	On-Off Switch
SW2	510076	Band Switch
T1	720126	1st FM I.F. Transformer
T2	720067	2nd FM I.F. Transformer
T3	720077	3rd FM I.F.
T4	708062	FM Discriminator Transformer
T5	720075	1st AM I.F. Transformer
T6	720076	2nd AM I.F. Transformer
T7	734062	Output Transformer
V1	800023	6BJ6, FM RF Amplifier
V2	800047	12AT7, FM Osc.-Mixer
V3	800023	6BJ6, FM-AM 1st I.F. Amplifier
V4	800525	12BE6, AM Osc.-Mixer
V5	800023	6BJ6, FM 2nd IF Amplifier
V6	800054	6BH6, FM Limiter
V7	800029	19T8, FM Discriminator, AM Det., 1nt A.F. Ampl.
V8	800070	50L6, Power Output
V9	817102	Selenium Rectifier, 100 MA.
	817101	
V10	807030	Pilot Bulb—Neon NE51

CABINET PARTS LIST FOR MODEL 659B

Part No.	DESCRIPTION
140358	Cabinet
520133	Dial Crystal
575649	Baffle and Grill Cloth
450068S	Knob—Tuning and AM-FM
450099S	Knob—Volume
450064	Knob—Bass-Treble
587011	Spring Insert (¼" Knobs)
560153	Masonite Back
583206	Line Cord

MODEL 671B,
Ch. 120137-B



MODEL: 671B
CHASSIS: 120137-B

DESCRIPTION

TYPE: Single-band superheterodyne, with clock-timer.

FREQUENCY RANGE: 540-1620 kc.

TYPE OF TUBES:

V-1—12BE6, pentagrid oscillator-modulator

V-2—12BA6, first i-f amplifier

V-3—12AT6, diode detector, a-f amplifier, a.v.c.

V-4—50C5, beam power output

V-5—35W4, half-wave rectifier

POWER SUPPLY: A.C. 60 cycles only

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 32 watts.

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

CHASSIS PARTS LIST (Chassis 120137-B)

ITEM	PART NO.	DESCRIPTION
C1	920030	.05 mfd. Paper 400V
C2	470310	220 mmf. Coupling Assy.
C3		220 mmf.
C4		.002 mf.
C5		.005 mf.
C6	920540	.02 mf. Paper 400V
C7	922101	.05 mf. Paper Molded 400V
C8	925061	30 & 50 mf. Electrolytic 150V
C9A	900082	Var. Cap.-Ant. Sect.
C9B		Var. Cap.-Osc. Sect.
C10	Pt. of C9A	Trimmer-Ant. Section
C11	Pt. of C9B	Trimmer-Osc. Section
C12	920040	.1 mf. Paper 200V
L1	700057	Ant. Loop & Back
L2	716064	Oscillator Coil
M1	470653	Clock Movement
P1	585082	Plug—3 Prong—and Cable Ass'y.
P2	583014	Plug and Line Cord Ass'y.
R1	351330	3.3 megohm. Carbon ½W ±20%

ITEM	PART NO.	DESCRIPTION
R2	Pt. of L2	22,000 ohm. Carbon ½W ±10%
R3	340272	120 ohm. Carbon ½W ±10%
R4	351450	10 megohm. Carbon ½W ±20%
R5	351130	470,000 ohm. Carbon ½W ±20%
R6	351130	470,000 ohm. Carbon ½W ±20%
R7	340292	150 ohm. Carbon ½W ±10%
R8	380532	1,500 ohm. Carbon 1W ±20%
R9	340072	18 ohm. Carbon ½W ±10%
R10	390177	500,000 ohm. Volume Control
SP1	180079	Loudspeaker—PM—5"
T1	720033	1st I.F. Transformer
T2	720033	2nd I.F. Transformer
T3	734065	Output Transformer
V1	800525	12BE6, Osc.—Mixer
V2	800524	12BA6, I.F. Amplifier
V3	800523	12AT6, Det., 1st A.F. Amp
V4	800032	50C5, Power Output
V5	800526	35W4, Rectifier
X1	500027	Socket—3 Prong—Clock

CABINET PARTS LIST (Model 671B)

PART NO.	DESCRIPTION
140387	Cabinet (Bakelite)
520141	Crystal
470653	Clock Movement
411108	Housing (Clock)
585080	3-Prong Plug and Cable Assemb.
460162S	Knob

MODEL 671B,
Ch. 120137-B

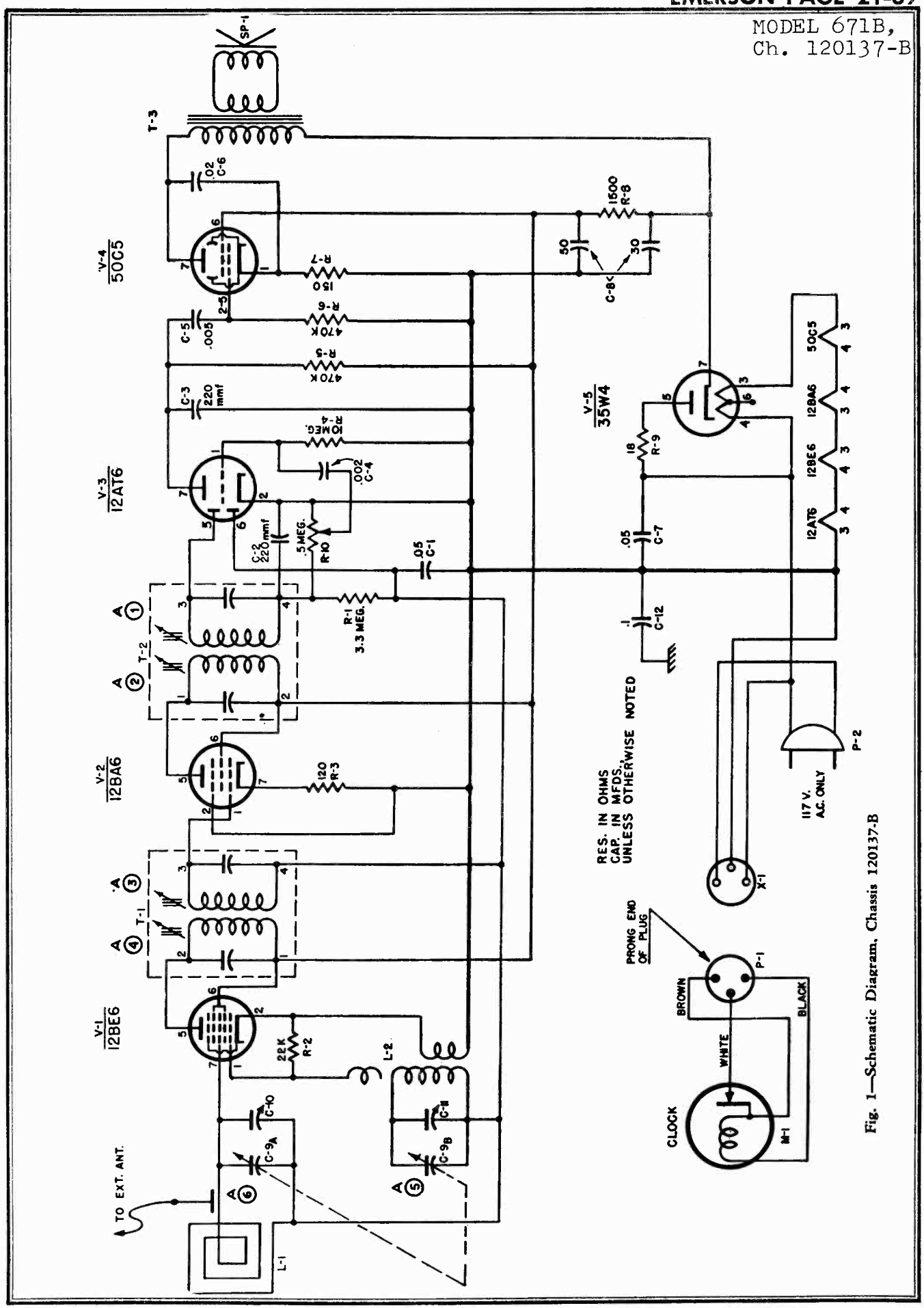


Fig. 1—Schematic Diagram, Chassis 120137-B

MODEL 671B,
Ch. 120137-B

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. This model has a self-contained antenna and does not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out in the rear. Use no ground connection.

3. The self-contained loop antenna operates at maximum efficiency when its position is at right angles to the broadcasting source. It is important, therefore, once the station is tuned in, to rotate the cabinet back and forth through a quarter of a circle (90 degrees), leaving it at the position where the station is received with maximum volume.

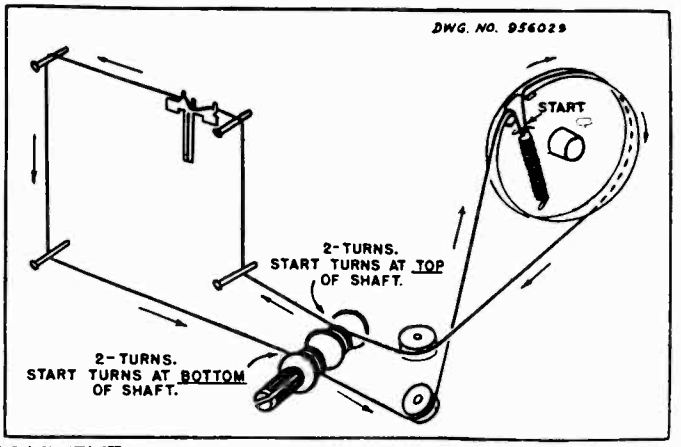


Fig. 2—Dial Cord Stringing, Model 671B

ALIGNMENT

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

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	METER OUTPUT	ADJUST	REMARKS
1	0.001 mfd.	High side to stator of rear section of tuning condenser. Low side to chassis.	455 kc	Variable condenser fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output.
2	200 mmfd.	High side to external antenna lead. Low side to external ground lead.	1620 kc	Variable condenser fully open.	Across voice coil.	A5	Adjust for maximum output.
3	200 mmfd.	High side to external antenna lead. Low side to external ground lead.	1400 kc	Tune for maximum output.	Across voice coil.	A6	Adjust for maximum output.

VOLTAGE READING FOR CHASSIS 120137B

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	12BE6	—6.3 DC	0	24 AC	12 AC	90 DC	90 DC	—.8 DC
V-2	12BA6	—.8 DC	0	24 AC	36 AC	90 DC	90 DC	1. DC
V-3	12AT6	—.9 DC	0	0	12 AC	—.7 DC	—.8 DC	38 DC
V-4	50C5	5.5 DC	0	80 AC	36 AC	0	90 DC	110 DC
V-5	35W4	0	0	80 AC	117 AC	115 AC	110 AC	120 DC

RESISTANCE READINGS FOR CHASSIS 120137B

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	12BE6	2,400	0.4	26	14	300,000	300,000	4 meg.
V-2	12BA6	4 meg.	0	26	38	300,000	300,000	120
V-3	12AT6	10 meg.	0	0	14	500,000	4 meg.	800,000
V-4	50C5	150	470,000	90	38	470,000	300,000	350,000
V-5	35W4	N.C.	N.C.	90	125	150	120	350,000

VOLTAGE AND RESISTANCE READING INSTRUCTIONS

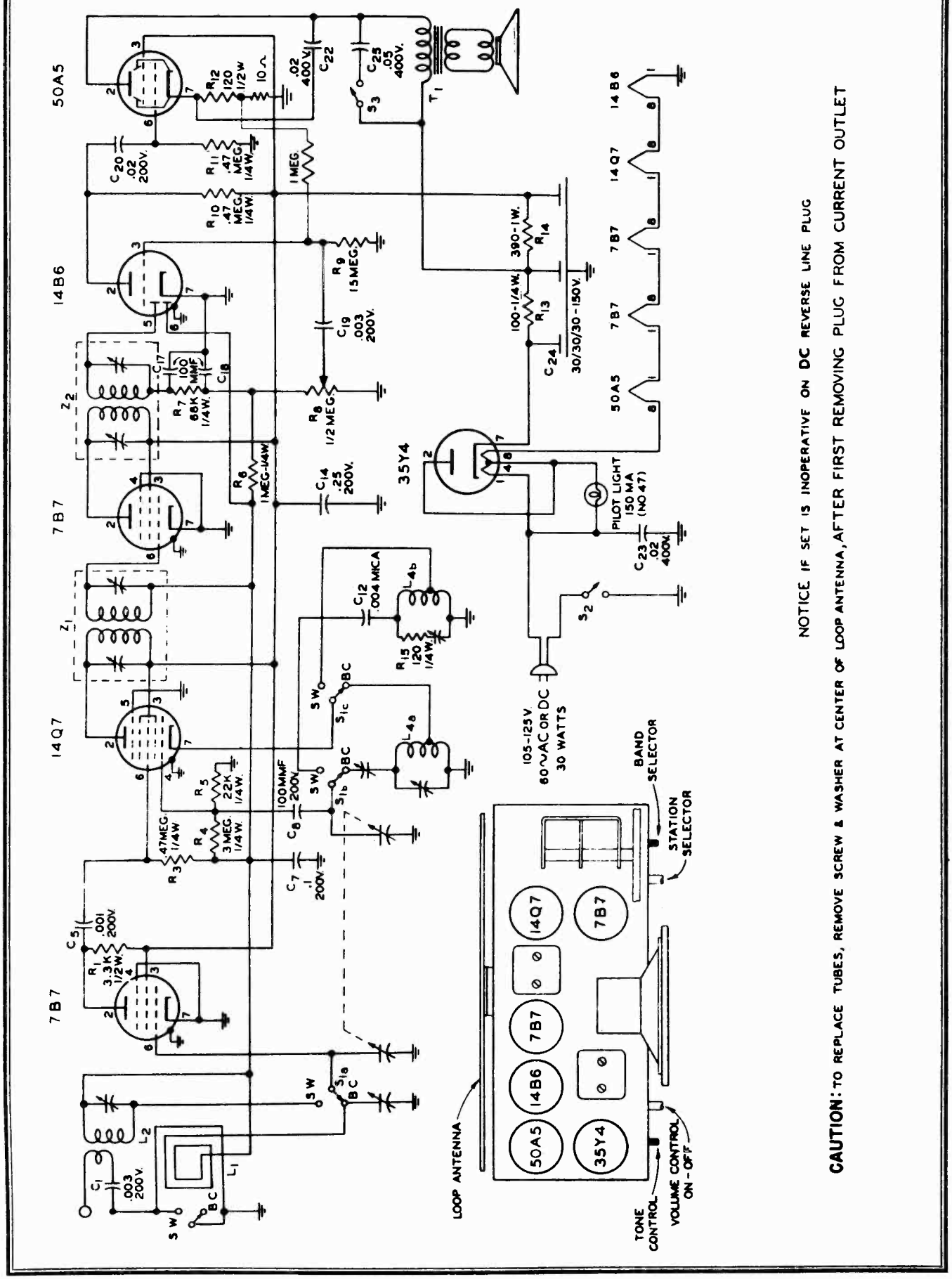
1. Voltage readings are in volts and resistance readings in ohms unless otherwise specified.
2. D-C voltage measurements are at 20,000 ohms per volt; a-c voltage measured at 1,000 ohms per volt.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts 60 cycle for voltage readings.
5. Normal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

NOTE: The radio and clock mechanism of Model 671B are covered by the Emerson warranty. If is should be necessary to have the clock mechanism repaired after the warranty has expired, it should be sent to the nearest authorized Telechron service station.

TO REMOVE THE CLOCK MECHANISM FROM THE CABINET THE FOLLOWING STEPS SHOULD BE TAKEN:

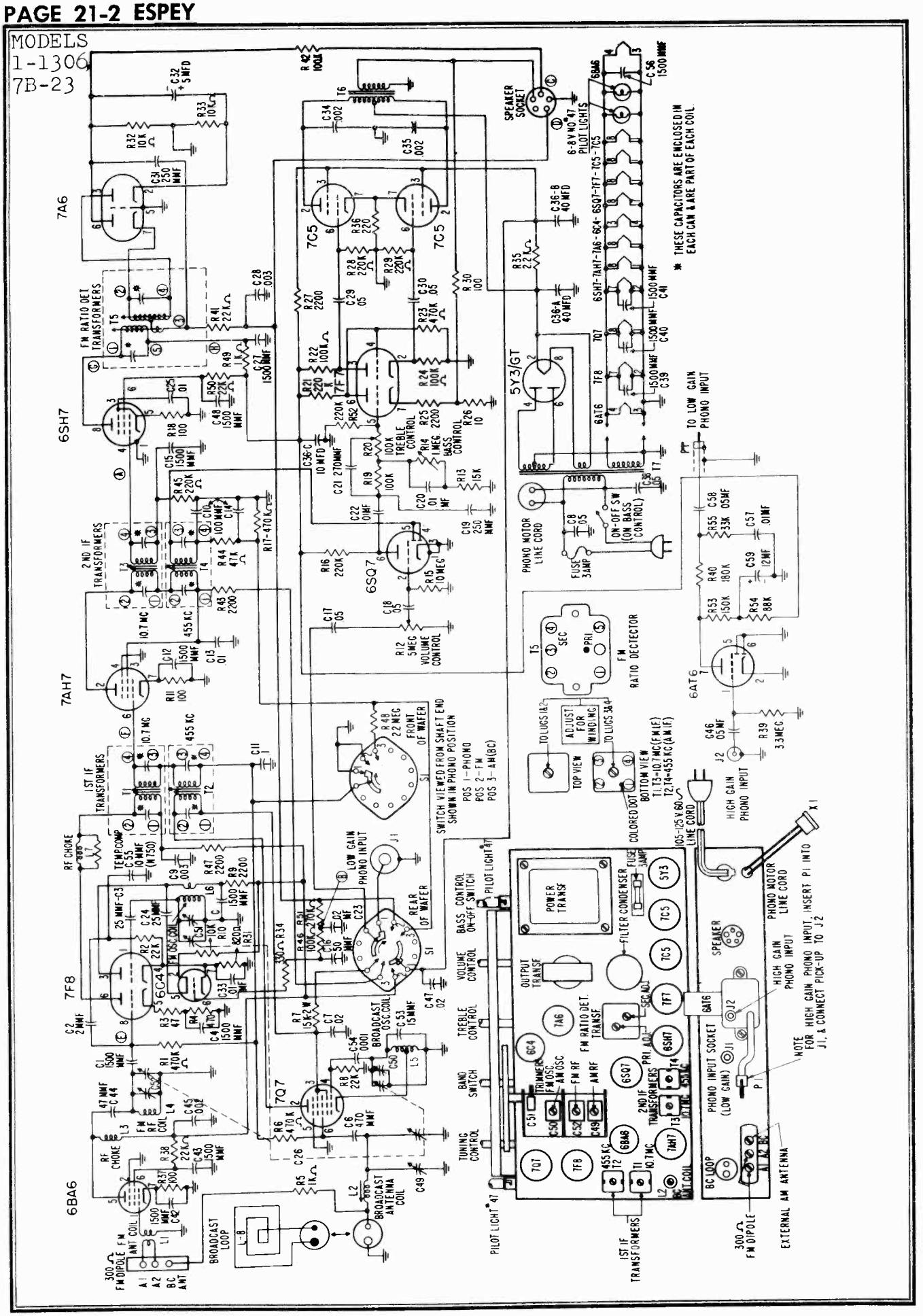
1. Remove radio chassis from cabinet.
2. Remove clock plug from chassis.
3. Remove three nuts located on back of clock and remove clock cover.
4. Carefully remove clock from *front* of cabinet.

MODEL RR13M

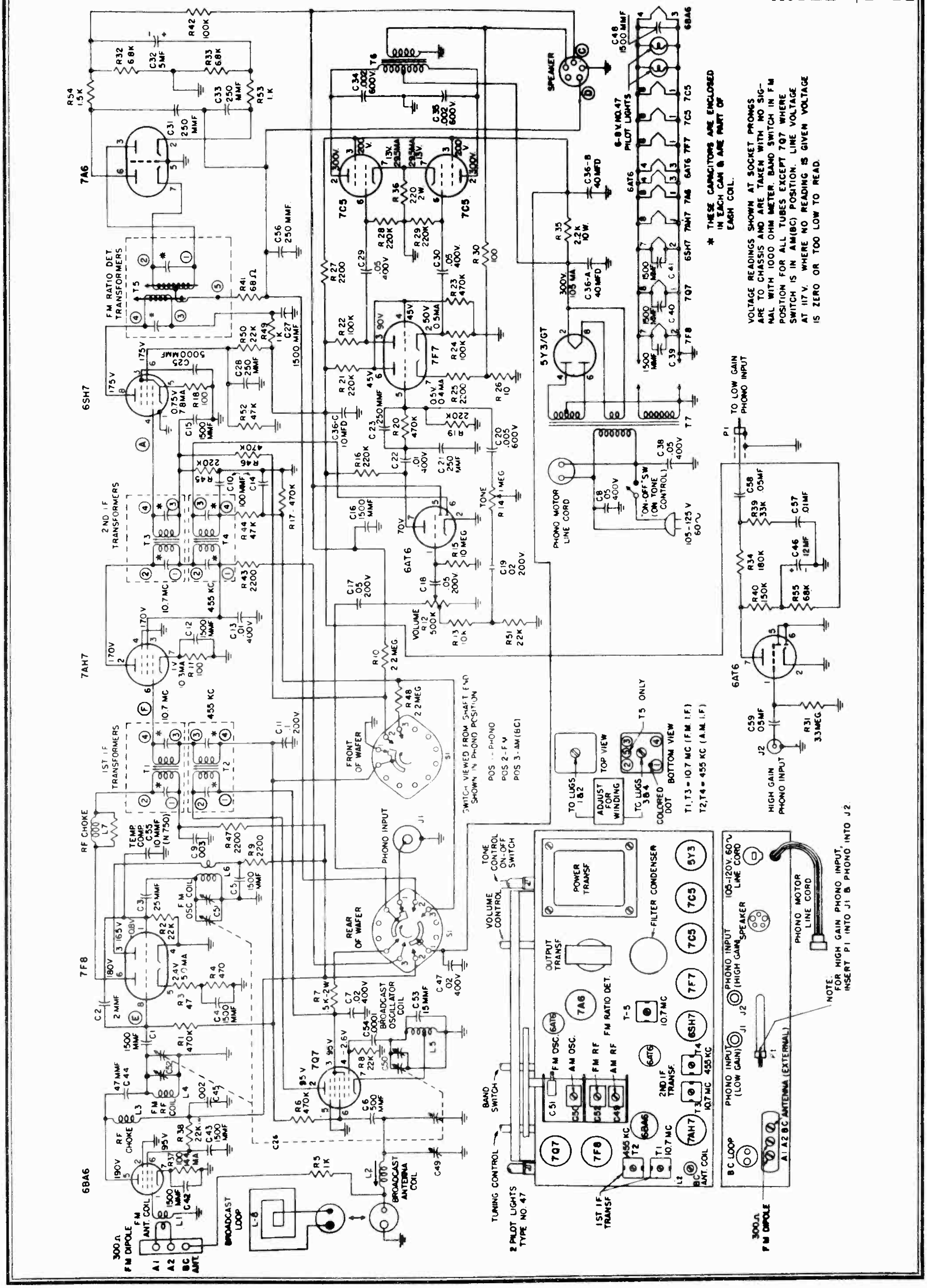


NOTICE IF SET IS INOPERATIVE ON DC REVERSE LINE PLUG

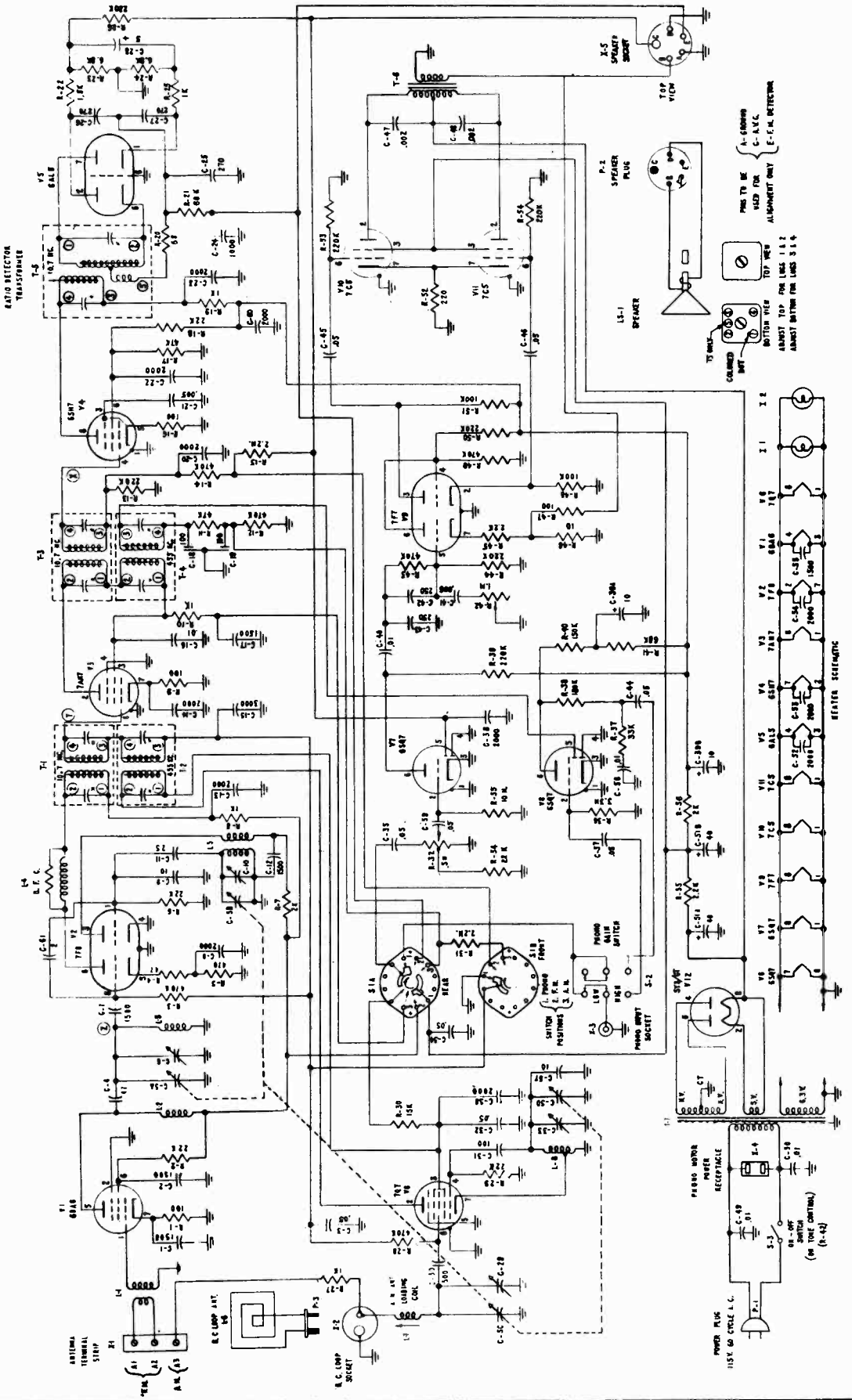
CAUTION: TO REPLACE TUBES, REMOVE SCREW & WASHER AT CENTER OF LOOP ANTENNA, AFTER FIRST REMOVING PLUG FROM CURRENT OUTLET



MODEL 7B-22



MODELS 11RP,
15RP



MODEL 4-A-70

CABINET DIMENSIONS	8" X 4-3/4" X 4-7/8"	LOUD SPEAKER	4 Inch P.M.
WEIGHT	2 Lbs. 10 Ozs.	VOICE COIL IMPEDANCE	3.2 Ohm at 400 Cycles
POWER SUPPLY	110 to 120 Volt AC-DC	POWER OUTPUT	Undistorted - 0.9Watts Maximum - 1.8Watts
TUNING RANGE	535 to 1620 KC	TUBE COMPLEMENT	12AU6 - Converter 12AV6 - Diode Audio 50C5 - Output 35W4 - Rectifier
INTERMEDIATE FREQ.	455 KC		

ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right, and make the adjustments marked (1) first, (2) next, (3) Third.

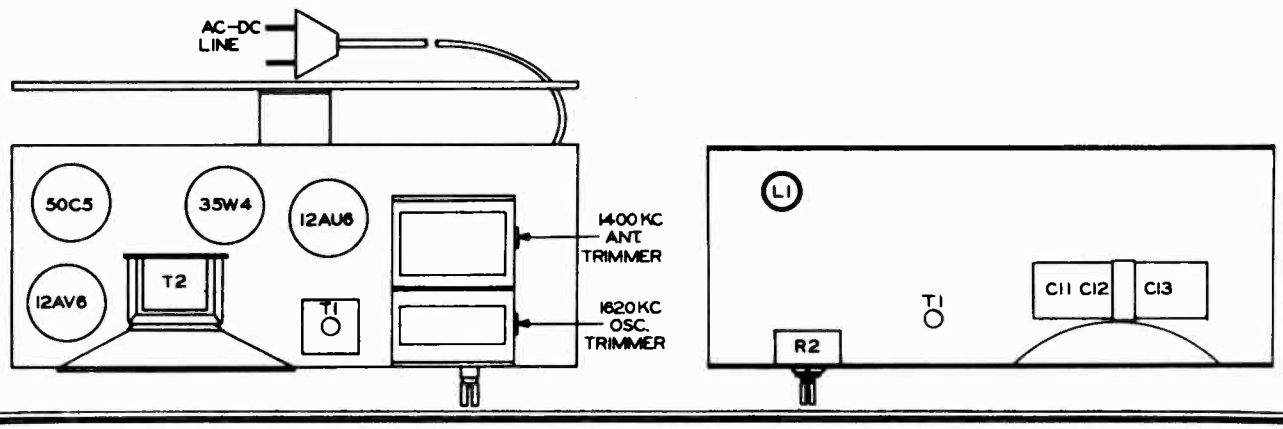
Before starting alignment

(A) Remove chassis and loop from cabinet. Leave loop in position on its mounting bracket. Turn tuning capacitor until plates are completely in mesh and replace tuning knob with indicator directly down.

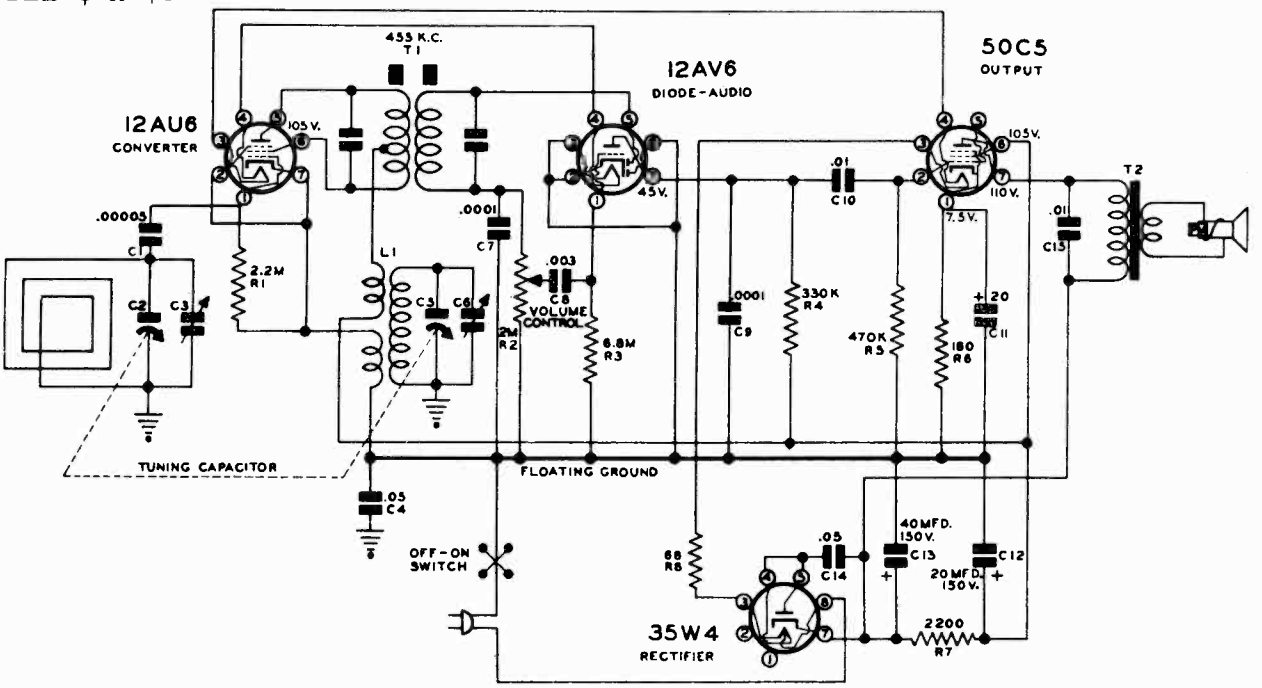
(B) Use an accurately calibrated test oscillator with some type of output measuring device.

(C) When aligning the 1400 KC Antenna Trimmer and the 1620 KC Oscillator Trimmer, couple test oscillator to receiver loop by; (1) make loop consisting of two turns of #22 size wire wound on a form of 6" in dia. (2) connect this loop across output of test oscillator; (3) place test oscillator loop approximately a foot from and in the same plane as the receiver loop. BE SURE THAT NEITHER LOOP MOVES WHILE ALIGNING.

Steps	Set Receiver dial to:	TEST OSCILLATOR		Refer to parts layout diagram for location of trimmers mentioned below:
		Adjust test oscillator frequency to:	Attach output of test oscillator to:	
1	ANY POINT WHERE NO INTERFERING SIGNAL IS RECEIVED, WITH TUNING CONDENSER NEAR CENTER	455 K.C.	HIGH SIDE TO REAR STATOR PLATES OF TUNING CONDENSER. LOW SIDE TO COMMON NEGATIVE THROUGH A .05 MFD BLOCKING CONDENSER	ADJUST SLUGS AT TOP AND BOTTOM OF I.F. CAN FOR MAXIMUM OUTPUT.
2	EXACTLY 1620 K.C.	EXACTLY 1620 K.C.	SEE PARAGRAPH "C" ABOVE	ADJUST 1620 K.C. OSCILLATOR TRIMMER FOR MAXIMUM OUTPUT.
3	APPROX. 1400 K.C.	APPROX. 1400 K.C.	SEE PARAGRAPH "C" ABOVE	ADJUST 1400 K.C. ANTENNA TRIMMER FOR MAXIMUM OUTPUT.

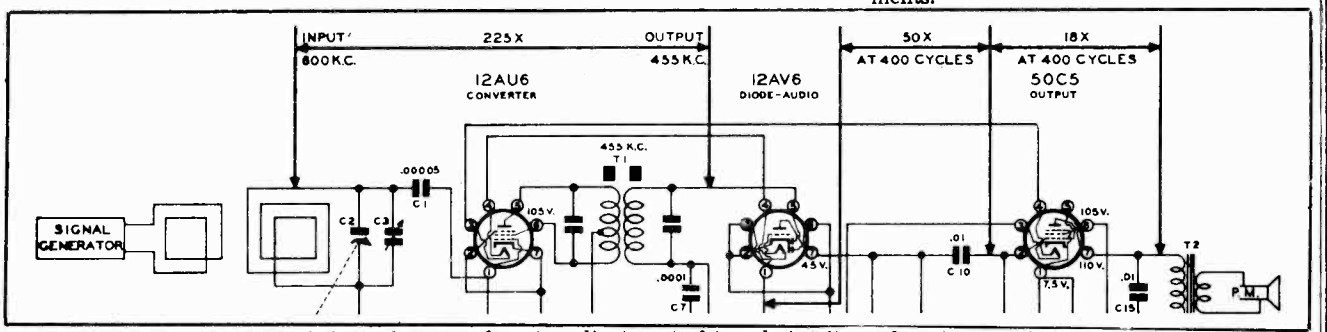


MODEL 4-A-70



Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel type instrument carefully tune it for maximum output at desired frequency before making measurements.

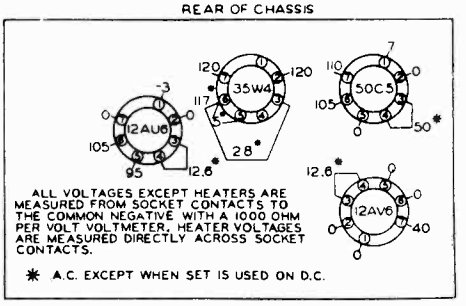


Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test exquipment. These factors may create considerable variation in gain measurements.

PARTS LIST

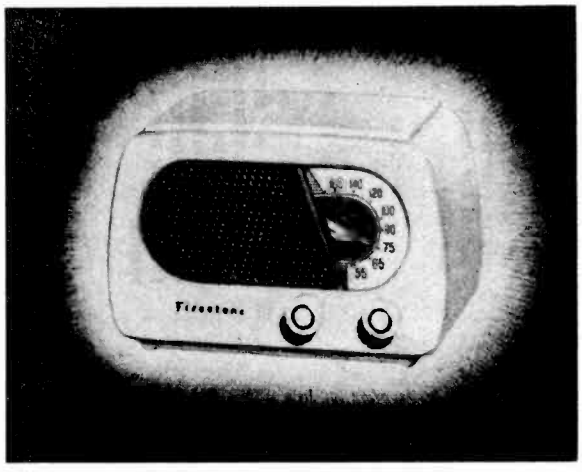
ILLUS. NO.	PART NUMBER	PART NAME	DESCRIPTION
C1	N-6385	Condenser	Ceramic 50 MMFD. 500 V.
C7,C9	N-6015	Condenser	Ceramic 100 MMFD. 500 V.
C4	N-1345	Condenser	Tubular .05 MFD. 200 V.
C8	N-2063	Condenser	Tubular .003 MFD. 600 V.
C10,C15	N-1344	Condenser	Tubular .01 MFD. 400 V.
C11)			(20 MFD. 15 V.)
C12)	N-7153	Condenser	Dry Electrolytic (20 MFD. 150 V.)
C13)			(40 MFD. 150 V.)
C14	N-1346	Condenser	Tubular .05 MFD. 400 V.
R1	N-4277	Resistor	Carbon 2.2 Megohm 1/2 W. 20%
R2	N-7142	Volume Control	2.0 Meghohm with Switch
R3	N-4028	Resistor	Carbon 6.8 Megohm 1/2 W. 20%
R4	N-4423	Resistor	Carbon 330,000 Ohm 1/2 W. 20%
R5	N-4027	Resistor	Carbon 470,000 Ohm 1/2 W. 20%
R6	N-4067	Resistor	Carbon 180 Ohm 1/2 W. 10%
R7	N-4896	Resistor	Carbon 2,200 Ohm 1/2 W. 10%
R8	N-6014	Resistor	Carbon 68 Ohm 2.0 W. 10%
T1	N-7694	Coil	I.F. Transformer
L1	N-7725	Coil	Oscillator
	N-7670	Antenna	Loop and Cabinet Back
	N-7141	Condenser	Two Gang, Tuning
	N-7824	Speaker	4" PM with Output Transformer
#299		Cabinet	Walnut Plastic (with Dial Scale and Carton)
	N-1090	Cord	6 Foot Rubber Line Cord
	N-1270	Knob	Station Selector
	N-7826	Knob	Volume

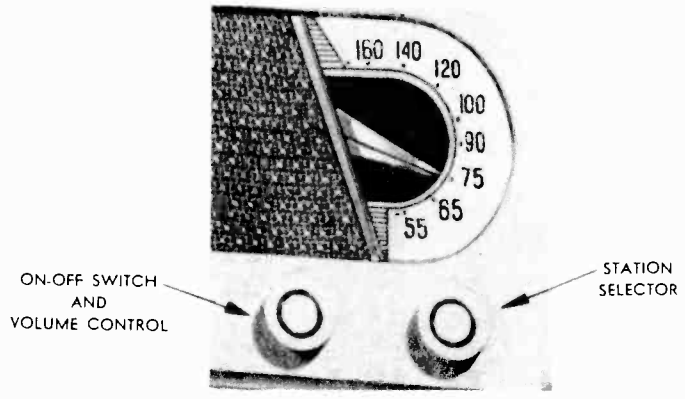
REAR OF CHASSIS



VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

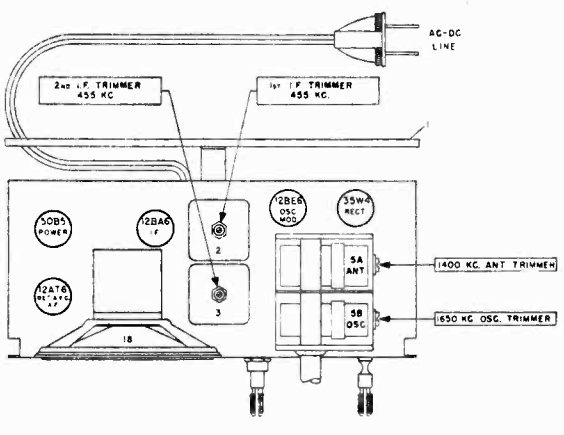
MODELS 4-A-78, 4-A-79

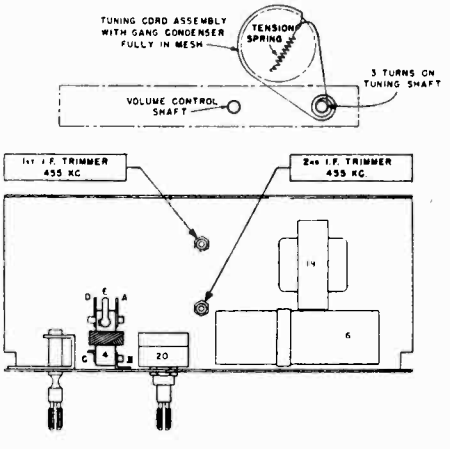




LOUD SPEAKER	3 Inch P.M.
VOICE COIL IMPEDANCE	3.2 OHM at 400 Cycles
POWER OUTPUT	Undistorted—0.9 Watts Maximum—1.5 Watts
TUBE COMPLEMENT	12BE6 Oscillator Modulator, 12BA6 IF, 12AT6 Det. AVC., 50B5 Power Output, 35W4 Rectifier

			of test to:	Refer to parts layout diagram for location of trimmers mentioned below:
			stator plates of Low side to through a .02 condenser.	Adjust each of the second I.F. transformer trimmers for maximum output—then adjust each of the first I.F. trimmers for maximum output.
			(C) above	Adjust 1650 K. C. oscillator trimmer for maximum output.
3	Approx. 1400 K. C.	Approx. 1400 K. C.	See paragraph (D) above	Adjust 1400 K. C. antenna trimmer for maximum output.





ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third.

Before starting alignment:

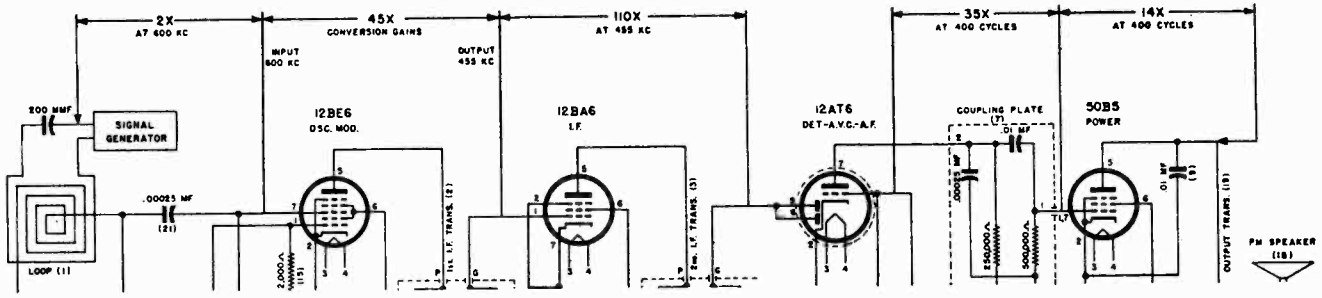
(A) Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move to correct position.

(B) Use an accurately calibrated test oscillator with some type of output measuring device.

(C) WHEN ADJUSTING THE 1650 KC OSCILLATOR TRIMMER, remove chassis from cabinet and disconnect the loop connection wires from the loop. Attach a 1 megohm resistor across these connections and feed output of test oscillator across the 1 megohm resistor.

(D) THE 1400 KC LOOP ANTENNA TRIMMER should be adjusted only after all other adjustments have been made. PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET—APPROXIMATELY ⅝" SPACE BETWEEN LOOP AND CHASSIS.

When aligning the 1400 KC Antenna Trimmer, couple test oscillator to receiver loop by: (1) make loop consisting of five to ten turns of No. 20 to No. 30 size wire, wound on a 2" or 3" form; (2) connect this loop across output of test oscillator; (3) place test oscillator loop near radio loop. BE SURE THAT NEITHER LOOP MOVES WHILE ALIGNING.



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)

2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)

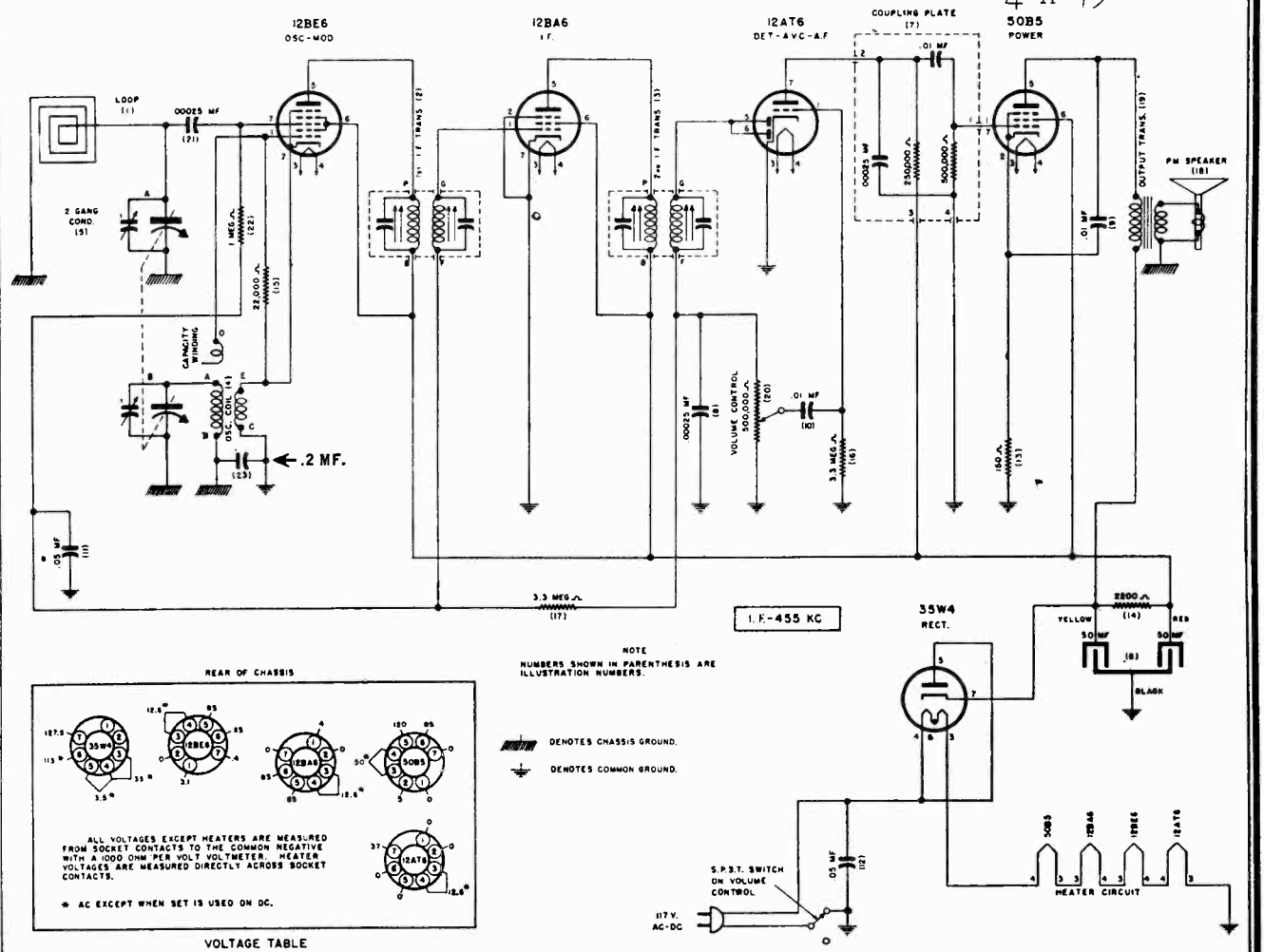
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

ORDERING PARTS

Order parts from your nearest Firestone Tire and Auto Supply Warehouse. When ordering parts, it is important that the correct code number, stock number, and serial number be given with the correct part name and part number as shown in the parts list. You will find the stock number and code number stamped on the chassis pan.

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

MODELS 4-A-78, 4-A-79



VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

PARTS LIST

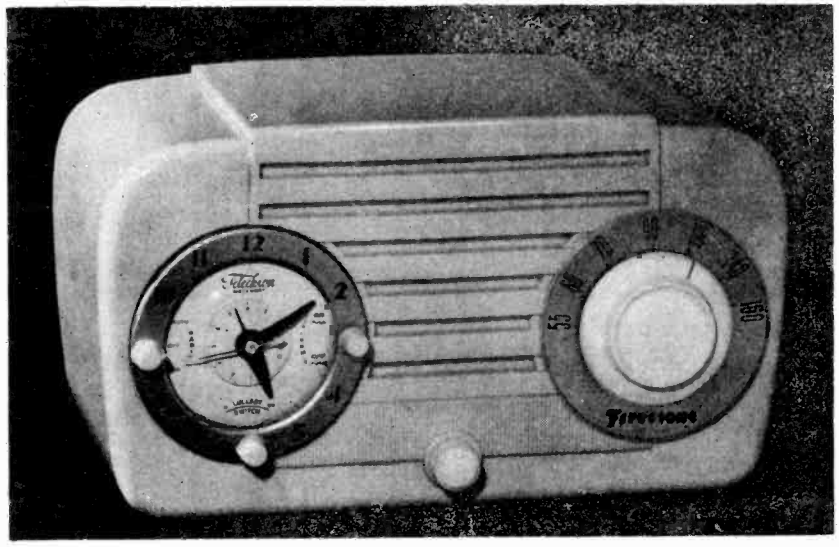
Illus. No.	Part No.	Part Name	Description
1	64E27	Antenna	Loop and cabinet back
2	20E378	Coil	1st I. F. Transformer
	OR		
2	20E402	Coil	1st I. F. Transformer
3	20E378	Coil	2nd I. F. Transformer
	OR		
3	20E402	Coil	2nd I. F. Transformer
4	20E346	Coil	Oscillator
5	24E45	Condenser	Two Gang, Tuning
6	**25E24**	**Condenser**	**Dry Electrolytic, 50-50 Mfd. 150 Volt**
7	23E2023	Condenser	Ceramic, Coupling Plate
8	23E42	Condenser	Mica, .00025 Mfd. 500 V.
	OR		
8	23E2027	Condenser	Ceramic, .00025 Mfd. 500 V.
9	23E411	Condenser	Tubular, .01 Mfd. 400 V.
10	23E211	Condenser	Tubular, .01 Mfd. 200 V.
11	23E216	Condenser	Tubular, .05 Mfd. 200 V.
12	23E416	Condenser	Tubular, .05 Mfd. 400 V.
13	27E151	Resistor	Carbon, 150 Ohm, 1/3 W.
14	27E222-3	Resistor	Carbon, 2200 Ohm, 1 W.
15	27E223	Resistor	Carbon, 22,000 Ohm, 1/3 W.
16	27E335	Resistor	Carbon, 3.3 Megohm, 1/3 W.
17	27E335	Resistor	Carbon, 3.3 Megohm, 1/3 W.
18	1E32	Speaker	3" P.M.
19	22E49	Transformer	Output
20	**28E27**	**Vol. Control**	**500,000 Ohm, with Switch**
21	23E2027	Condenser	Ceramic, .00025 Mfd. 500 V.
22	27E105	Resistor	Carbon, 1 Megohm 1/3 W.
23	23E2021	Condenser	Tubular, .2 Mfd. 400 V.

MISCELLANEOUS PARTS

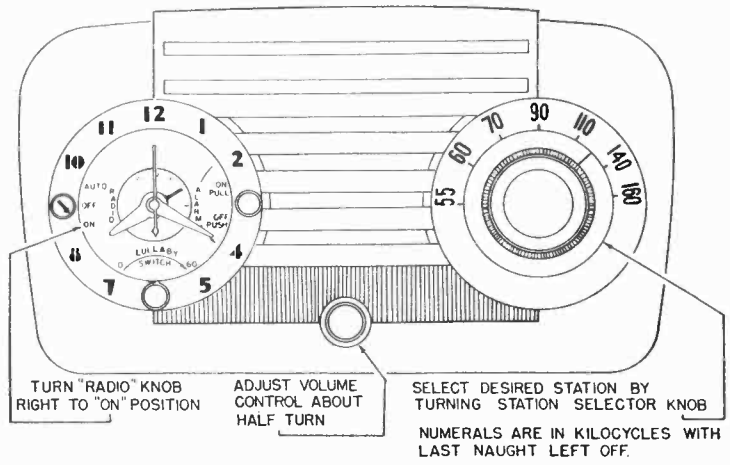
Part No.	Part Name	Description
7E196-22	**Cabinet**	**Walnut Plastic for 4A78**
7E196-29	**Cabinet**	**Ivory Plastic for 4A79**
41E14	Cord	5 Ft. Rubber Line Cord
20E253-25	Dial Cord	Dial Drive Cord
36E50	Dial Scale	Calibrated Dial Scale
20E348-3	Dial Shaft Assy.	Dial Drive Shaft with Bracket
35E27-2	Dial Pointer	Dial Indicator
65E2	Dial Spring	Tension Spring for Dial Cord
37E52-12	Knob	For Walnut Cabinet 4A78
37E52-14	Knob	For Ivory Cabinet 4A79

MOUNTING HARDWARE

Part No.	Part Name	Description
19E27	Nut	Slotted head, holds chassis in cabinet.
10E42	Stud	Trimount Stud for loop and back
10E43	Stud	Trimount Stud for baffle and dial scale.
10E41	Stud	Trimount stud for dial scale



(2) TO TURN RADIO ON MANUALLY



Instructions for Using Your RADIO-ALARM CLOCK

This skillfully designed and carefully constructed combination will give you long and enjoyable service. This Receiver can perform the following services for the user:

1. Provide accurate time.
2. Receive broadcast programs being transmitted and within range—at any time.
3. Turn off radio program at will of user up to 60-minute interval or less.
4. Turn on radio program for awakening.
5. Turn buzzer alarm on 10 minutes after radio starts playing.
6. Turn on buzzer alarm for awakening — with radio silenced.

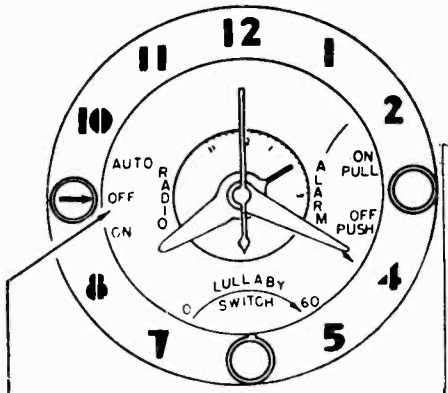
INSTALLATION—Check the voltage and cycles of the electric power supplied to your home. This combination will operate ONLY on 60 cycle alternating current (ac), from 105 to 125 volts. THIS SET WILL NOT OPERATE ON ANY OTHER TYPE OF CURRENT OR CYCLES. Your electric company will help you make certain that you have the correct kind of power.

This combination includes a sensitive five multi-purpose tube super-heterodyne radio including a rectifier tube. Your radio has a self contained duro-loop antenna capable of supplying sufficient volume in areas of normal reception. If you live in an area where radio reception is poor, you can improve the performance by connecting an outside antenna to the screw marked EXT. ANT. which you will find on the right hand side of the rear of the cabinet.

(1) TO SET THE CLOCK

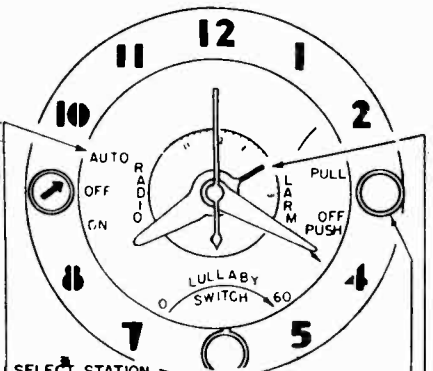
Your self-starting TELECHRON movement will begin operating when the set is plugged into the proper outlet and your sweep second hand begins to rotate. Set the correct time by means of the small knob at the right REAR of the cabinet. Turn ONLY in the direction shown on the back cover.

(3) TO TURN OFF RADIO MANUALLY



TURN "RADIO" KNOB LEFT TO "OFF" POSITION.

(4) TO AWAKEN TO MUSIC

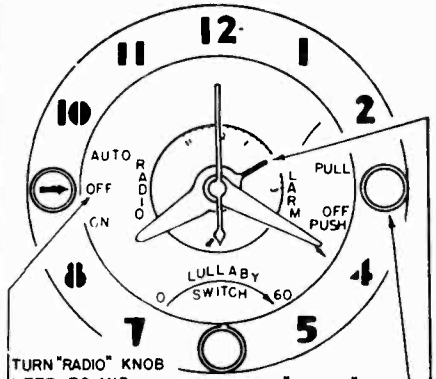


SELECT STATION AND ADJUST VOLUME TO LEVEL SUFFICIENT TO AWAKEN YOU. (AS INDICATED IN ILLUSTRATION 2.)

TURN "RADIO" KNOB LEFT TO "AUTO" POSITION.

PULL OUT "ALARM" KNOB AND TURN IN COUNTER CLOCKWISE (ARROW) DIRECTION UNTIL POINTER IS OVER HOUR FIGURE AND MINUTE MARKS DESIRED FOR AWAKENING. THIS TIME SETTING MAY BE 11 HOURS IN ADVANCE OR LESS. AFTER HAVING SET AWAKENING HOUR PUSH IN "ALARM" KNOB.

(5) TO AWAKEN TO BUZZER ALARM

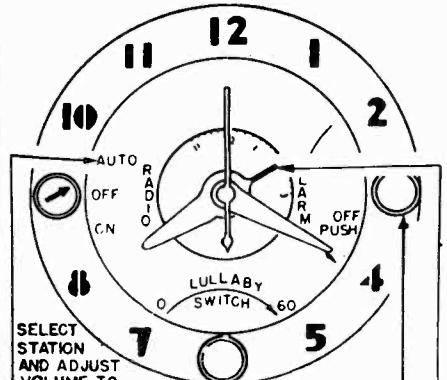


TURN "RADIO" KNOB LEFT TO MID "OFF" POSITION

PULL OUT "ALARM" KNOB AND TURN IN COUNTER CLOCKWISE (ARROW) DIRECTION UNTIL POINTER IS SET TEN MINUTES AHEAD OF HOUR FIGURE AND MINUTE MARKS DESIRED FOR AWAKENING. THIS TIME SETTING MAY BE 11 HOURS IN ADVANCE OR LESS.

FOR EXAMPLE :- SHOULD YOU DESIRE TO AWAKEN AT 7, SET ALARM POINTER TO 6:50 (TO SHUT OFF BUZZER PUSH IN "ALARM" KNOB.)

(6) TO AWAKEN TO MUSIC AND BUZZER ALARM



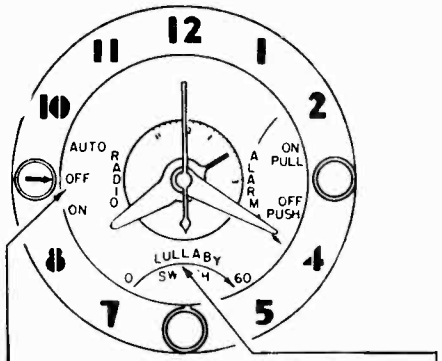
SELECT STATION AND ADJUST VOLUME TO LEVEL SUFFICIENT TO AWAKEN YOU (AS INDICATED IN ILLUSTRATION 2).

TURN "RADIO" KNOB LEFT TO "AUTO" POSITION.

PULL OUT "ALARM" KNOB AND TURN IN COUNTER CLOCKWISE (ARROW) DIRECTION UNTIL POINTER IS OVER HOUR FIGURE AND MINUTE MARKS DESIRED FOR AWAKENING. THIS TIME SETTING MAY BE 11 HOURS IN ADVANCE OR LESS.

BUZZER SOUNDS AS A REMINDER APPROXIMATELY 10 MINUTES AFTER RADIO COMES ON TO SHUT OFF BUZZER PUSH IN "ALARM" KNOB.

(7) TO TURN RADIO OFF AUTOMATICALLY WHEN RETIRING



TURN "RADIO" KNOB TO MID "OFF" POSITION

TURN LULLABY KNOB CLOCKWISE (TO RIGHT) FOR PLAYING TIME DESIRED. ESTIMATE TIME BETWEEN 0 AND 60 MARKS ALONG ARROW

(8)—To Turn Radio Off Automatically When Retiring and Awaken to Music

Set Controls as in Illustration 4.

Set "Lullaby" Knob as in Illustration 7.

(9)—To Turn Radio Off Automatically When Retiring and Awaken to Buzzer Alarm

Set Controls as in Illustration 5.

Set "Lullaby" Knob as in Illustration 7.

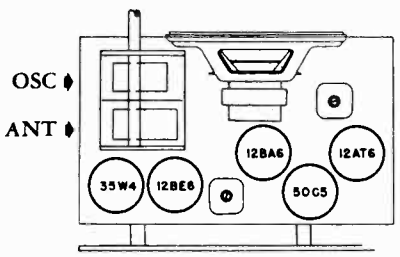
(10)—To Turn Radio Off Automatically When Retiring, Awaken to Music and Buzzer Alarm

Set Controls as in Illustration 6.

Set "Lullaby" Knob as in Illustration 7.

MODEL 4-A-83, Slumbertone

MODEL 4-A-83,
Slumbertone



TUBE COMPLEMENT

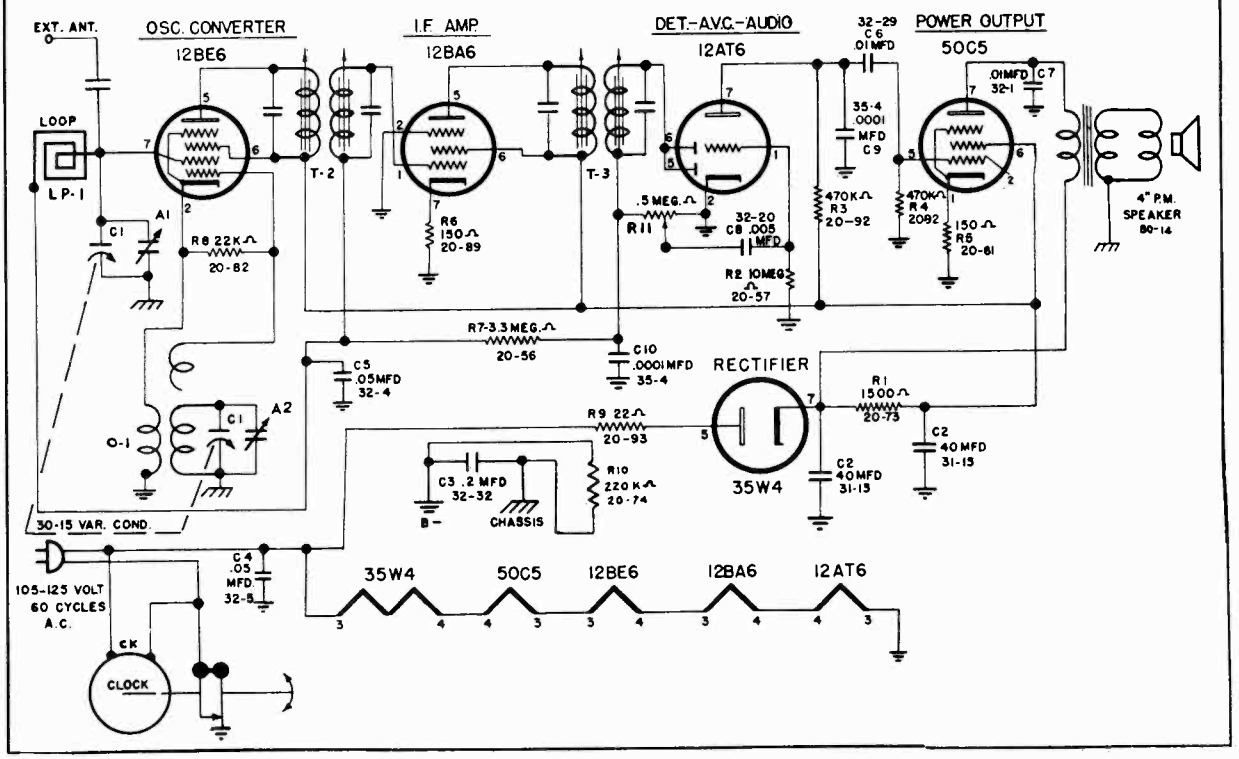
12BE6 Converter
12BA6 I.F. Amplifier
12AT6 Det. AVC-AUDIO
50C5 Power Output
35W4 Rectifier

SERVICE DATA

ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				*TUNER SETTING*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Capacitor*	*Connections to Receiver*	*Ground Connection*		
455 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc	Antenna trimmer A1



MODEL 4-A-83, Slumbertone

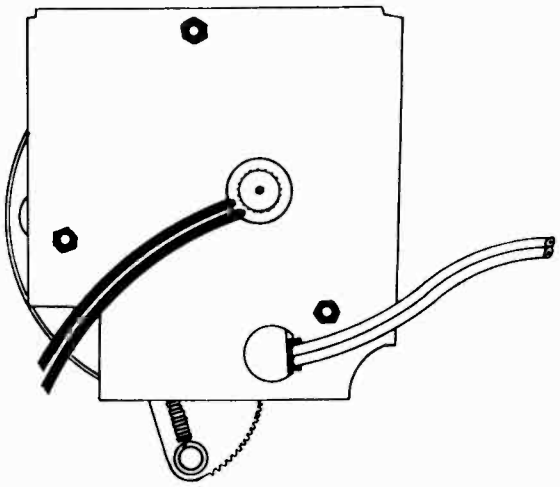


FIGURE A

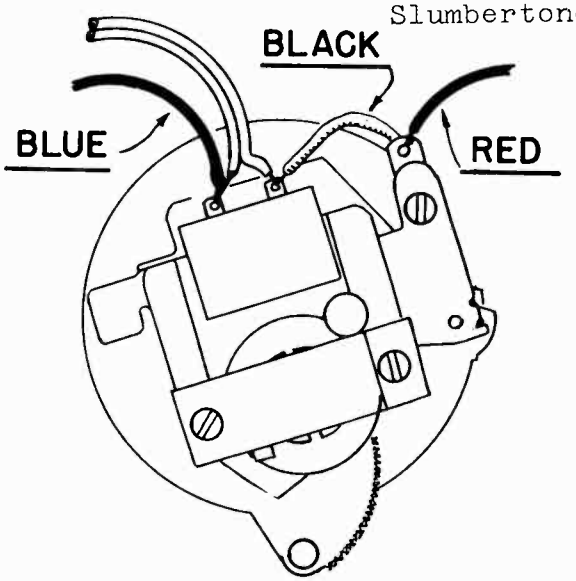


FIGURE B

To take clock movement out of cabinet proceed as follows:

Remove the following:

A—Line cord from power line.

B—Tuning knob, volume control knob, and chassis from cabinet.

C—3 nuts holding clock clamping shield shown in Figure A above.

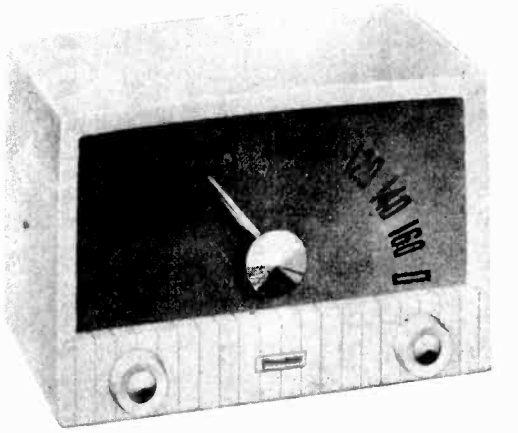
D—As this shield is sufficiently pulled back unsolder red and blue wires and power cord shown in Figure B above.

E—Before movement can be withdrawn from cabinet, it is necessary to have the lullaby time switch in the full 60-minute position. With this switch in this position, the clock can be withdrawn by turning the rim clockwise approximately 5 to 10 degrees so that movement parts can pass openings in cabinet.

F—In shipping a movement to a service station, be certain that it is suitably packed to withstand transportation. Care should be taken with the glass crystal so that it is not subject to strain during shipment.

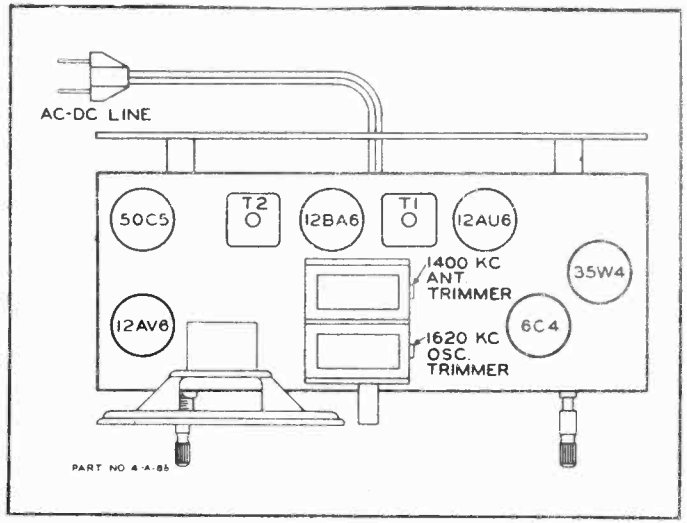
REPLACEMENT PARTS LIST

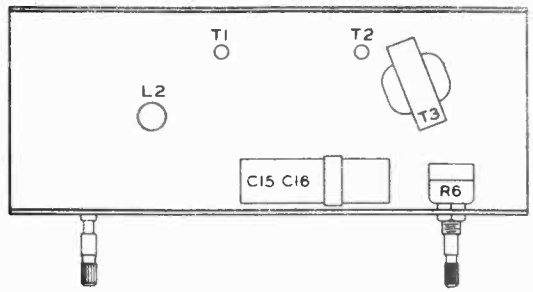
Ref. No.	*Part No.*	*DESCRIPTION*
		CAPACITORS
C1	30-15	Variable Condenser, 2 gang
C2	31-13	40 mfd.—40 mfd., 150 volt dual electrolytic condenser
C3	32-32	.2 mfd., 200 volt, paper
C4	32-5	.05 mfd., 400 volt, paper
C5	32-4	.05 mfd., 200 volt, paper
C6	32-1	.01 mfd., 400 volt, paper
C7	32-1	.01 mfd., 400 volt, paper
C8	32-20	.005 mfd., 600 volt, paper
C9	35-4	.0001 mfd., 500 volt, mica
C10	35-4	.0001 mfd., 500 volt, mica
		RESISTORS
R1	20-73	1500 ohm, 1 watt 20%
R2	20-57	10 megohm, ¼ watt 20%
R3	20-92	470,000 ohm, ¼ watt 20%
R4	20-92	470,000 ohm, ¼ watt 20%
R5	20-81	150 ohm, ½ watt 20%
R6	20-89	150 ohm, ¼ watt 20%
R7	20-56	3.3 megohm, ¼ watt 20%
R8	20-82	22,000 ohm, ¼ watt 20%
R9	20-93	22 ohm, ½ watt 20%
R10	20-74	220,000 ohm, ¼ watt 20%
R11	50-15B	½ meg. volume control
		COILS AND TRANSFORMERS
O-1	60-9	Oscillator coil
T-2	61-11	Input IF transformer
T-3	61-11	Output IF transformer
LP-1	A125-32	Loop antenna
		MISCELLANEOUS
80-14	80-14	4 inch P.M. speaker with output transformer
	122-19	Selector knob
	122-15	Volume knob
	120-33Y	Cabinet—ivory (in carton)
CK	140-6	Clock



ON-OFF SWITCH AND VOLUME CONTROL

STATION SELECTOR





Cabinet Dimensions	-10-5/8"x5-3/4"x7-3/32"	Power Output	- Undistorted- 1.0 Watts
Weight	-7-1/2 Lbs.		Maximum - 1.9 Watts
Power Supply	-110 to 120 Volt AC-DC	Tube Complement	- 12AU6 - Converter
Tuning Range	-535 to 1620 KC		12BA6 - I.F. Amplifier
Intermediate Freq.	-455 KC		12AV6 - Diode-Audio
Loud Speaker	-5 Inch P.M.		6C4 - Oscillator
Voice Coil Impedance	-3.2 Ohm at 400 Cycles		50C5 - Output
			35W4 - Rectifier

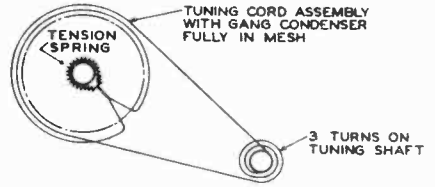
ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right and make the adjustments marked (1) first, (2) next, (3) third.

Before starting alignment:

(A) Remove the chassis and loop antenna from the cabinet at the same time. To accomplish this, remove the two fasteners holding the top of the back to the cabinet and remove the two screws on the rear apron of the chassis which fasten the chassis to the cabinet.

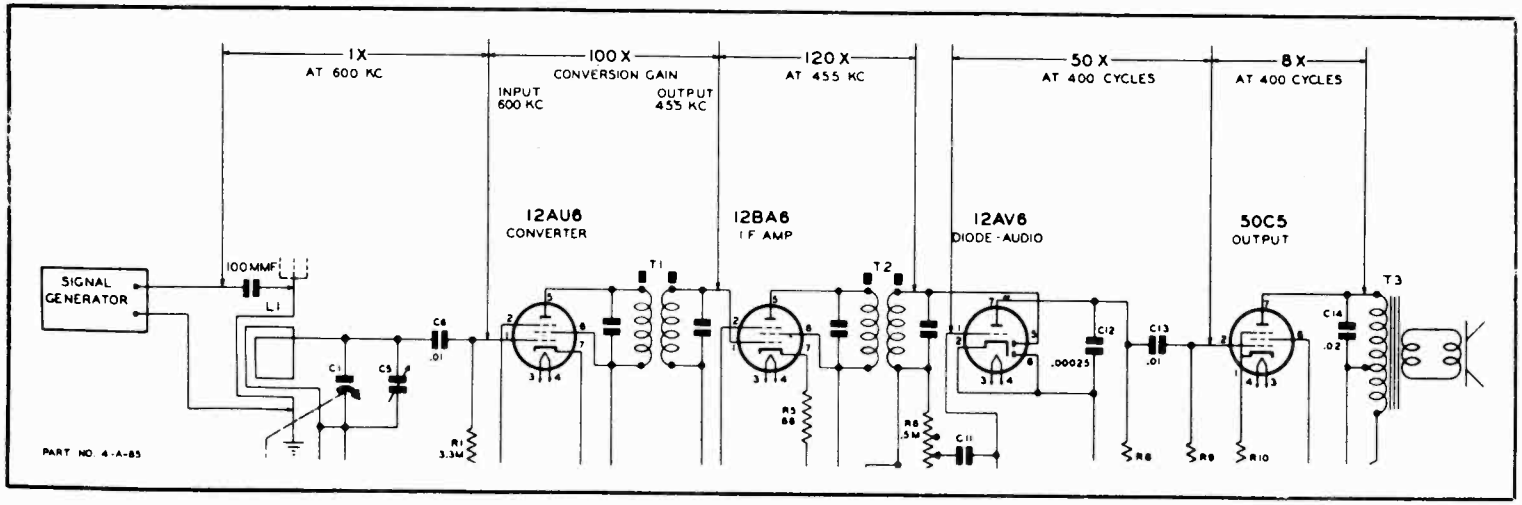
(B) Use an accurately calibrated test oscillator with some type of output measuring device.



Steps	Set Receiver dial to:	TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Attach output of test oscillator to:	DUMMY ANTENNA	Refer to parts layout diagram for location of trimmers mentioned below:
1	Any point where no interfering signal is received.	EXACTLY 455 KC	High side to grid of 12AU6 Tube. Low side to common negative.	.05 MFD. CONDENSER.	Adjust slugs at top and bottom of 2nd I.F. (T2) and then each of the slugs of the 1st I.F. (T1) for max. output.
2	Exactly 1620 KC	Exactly 1620 KC	External Antenna blue lead on loop.	100 MMFD CONDENSR	Adjust 1620 KC oscillator trimmer for maximum output.
3	Approx. 1400 KC	Approx. 1400 KC	External Antenna blue lead on loop.	100 MMFD CONDENSR	Adjust 1400 KC antenna trimmer for maximum output.

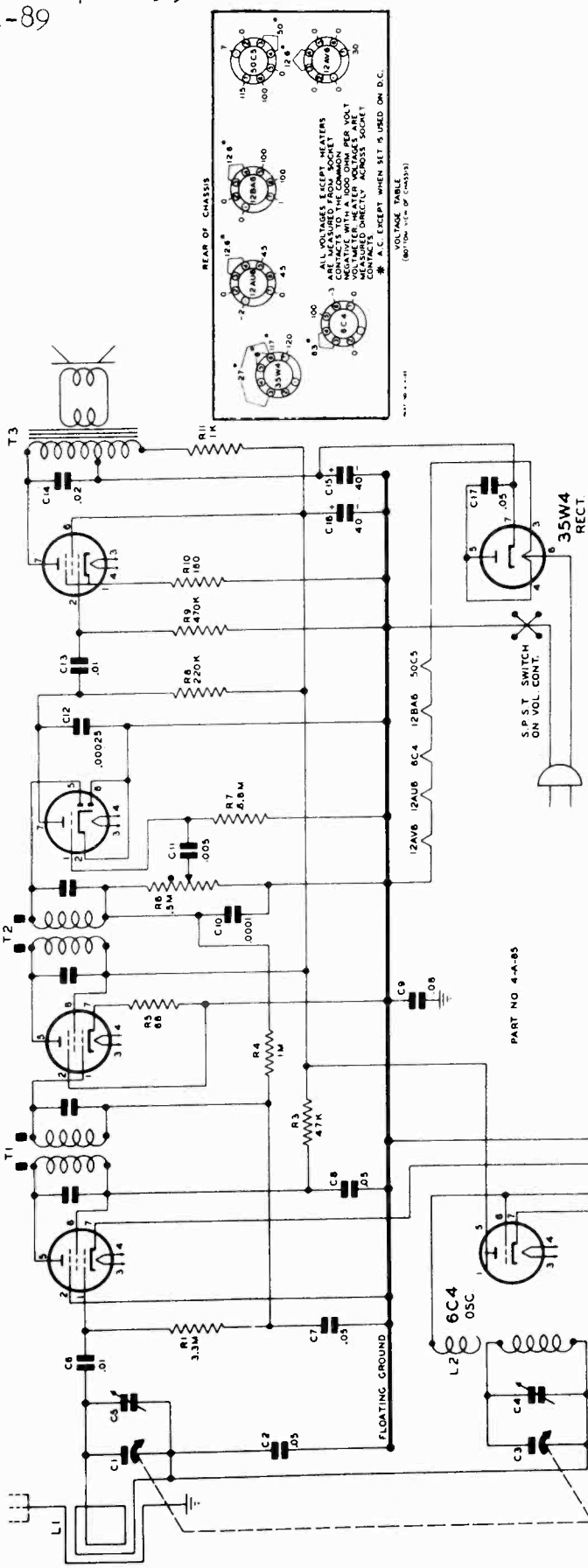
Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel type instrument carefully tune it for maximum output at desired frequency before making measurements.



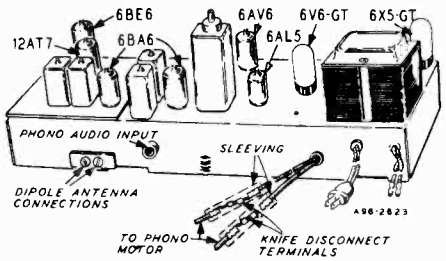
Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in us your test exquipment. These factors may create considerable variation in gain measurements.

MODELS 4-A-85,
4-A-89



ILLUS. NO.	PART NUMBER	PART NAME	DESCRIPTION
C2,C7,C8	N-1345	Condenser	Paper .05 MFD. 200 V.
C6, C13	N-1344	Condenser	Paper .01 MFD. 400 V
C9	N-1351	Condenser	Paper .1 MFD. 200 V
C10	N-6015	Condenser	Ceramic 100 MMFD. 500 V. 20%
C11	N-4894	Condenser	Paper .005 MFD. 600 V.
C12	N-6488	Condenser	Ceramic 250 MMFD. 500 V. 20%
C14	N-1376	Condenser	Paper .02 MFD. 400V.
C15)	N-5051	Condenser	Dry Electrolytic (40 MFD. 150 V.
C16)			(40 MFD. 150 V.
C17	N-1346	Condenser	Paper .05 MFD. 400 V.
R1	N-4062	Resistor	Carbon 3.3 Megohm 1/2 W. 20%
R2, R3	N-4063	Resistor	Carbon 47,000 Ohm 1/2 W. 20%
R4	N-1262	Resistor	Carbon 1.0 Megohm 1/2 W. 20%
R5	N-6485	Resistor	Carbon 68 Ohm 1/2 W. 10%
R6	N-7984	Volume Control	500,000 Ohm with Switch
R7	N-4028	Resistor	Carbon 6.8 Megohm 1/2 W. 20%
R8	N-4026	Resistor	Carbon 220,000 Ohm 1/2 W. 20%
R9	N-4027	Resistor	Carbon 470,000 Ohm 1/2 W. 20%
R10	N-4067	Resistor	Carbon 180 Ohm 1/2 W. 10%
R11	N-3341	Resistor	Carbon 1,000 Ohm 1/2 W. 10%
L1	N-7964	Coil	Loop Antenna and Cabinet Back
L2	N-7982	Coil	Oscillator
T1, T2	N-7981	Coil	1st and 2nd I.F. Transformer
T3	N-8001	Transformer	Output
	N-7980	Speaker	5 inch P.M.
	N-8045	Assembly	Variable Gang Condenser & Pulley
	N-7992	Screen	Flocked Dial) For Stock No.
	N-7990	Knobs	Walnut Plastic) 4-A-85 Only
	# 313	Cabinet	Walnut Plastic)
	N-7991	Screen	Flocked Dial) For Stock No.
	N-7989	Knobs	White Plastic) 4-A-89
	# 312	Cabinet	White Plastic)
	N-7994	Pointer	Dial Indicator
	N-1090	Line Cord	6 Ft. Rubber

MODEL 4-A-86,
Westmoreland



TUBE LAYOUT

ELECTRICAL SPECIFICATIONS

Power Supply .....105-125 volts AC 60 cycles, 40 watts. 60 watts with record changer.

Frequency Ranges ....Broadcast 540-1600 KC
Frequency Modulation 88-108 MC

Intermediate Frequency AM—455 KC
FM—10.7 MC

Selectivity .....AM—45 KC broad at 1000 times signal, measured at 1000 KC
I.F. FM—200 KC broad at 2 times down
I.F. FM—950 KC broad at 200 times down

AM Sensitivity .....(For .5 watt output with external antenna) 25 microvolts average

FM Sensitivity .....(For .5 watt output)
25 microvolts average

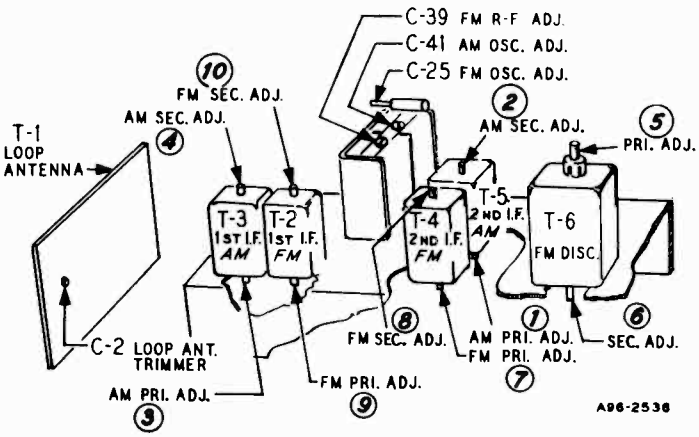
Power Output .....1.9 watts maximum
0.8 watts 10% distortion

Loud Speaker .....10" PM Dynamic

Voice Coil Impedance..3.2 ohms 400 cycles

Record Changer .....See Manual No. 199

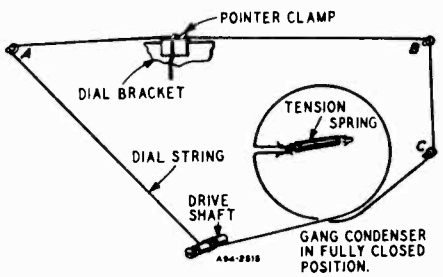
Tube and Dial Lamp Complement
1 6BE6 AM Converter & FM Osc.
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 6X5GT Rectifier
1 12AT7 R-F Amplifier & Mixer
2 No. 47 Dial Lamps



TRIMMER POSITIONS

DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.



MODEL 4-A-86,
Westmoreland

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50mmf.

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.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rator Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as abave	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Maximum Deflection
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltoge	Ant. C-39	Maximum Deflection

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

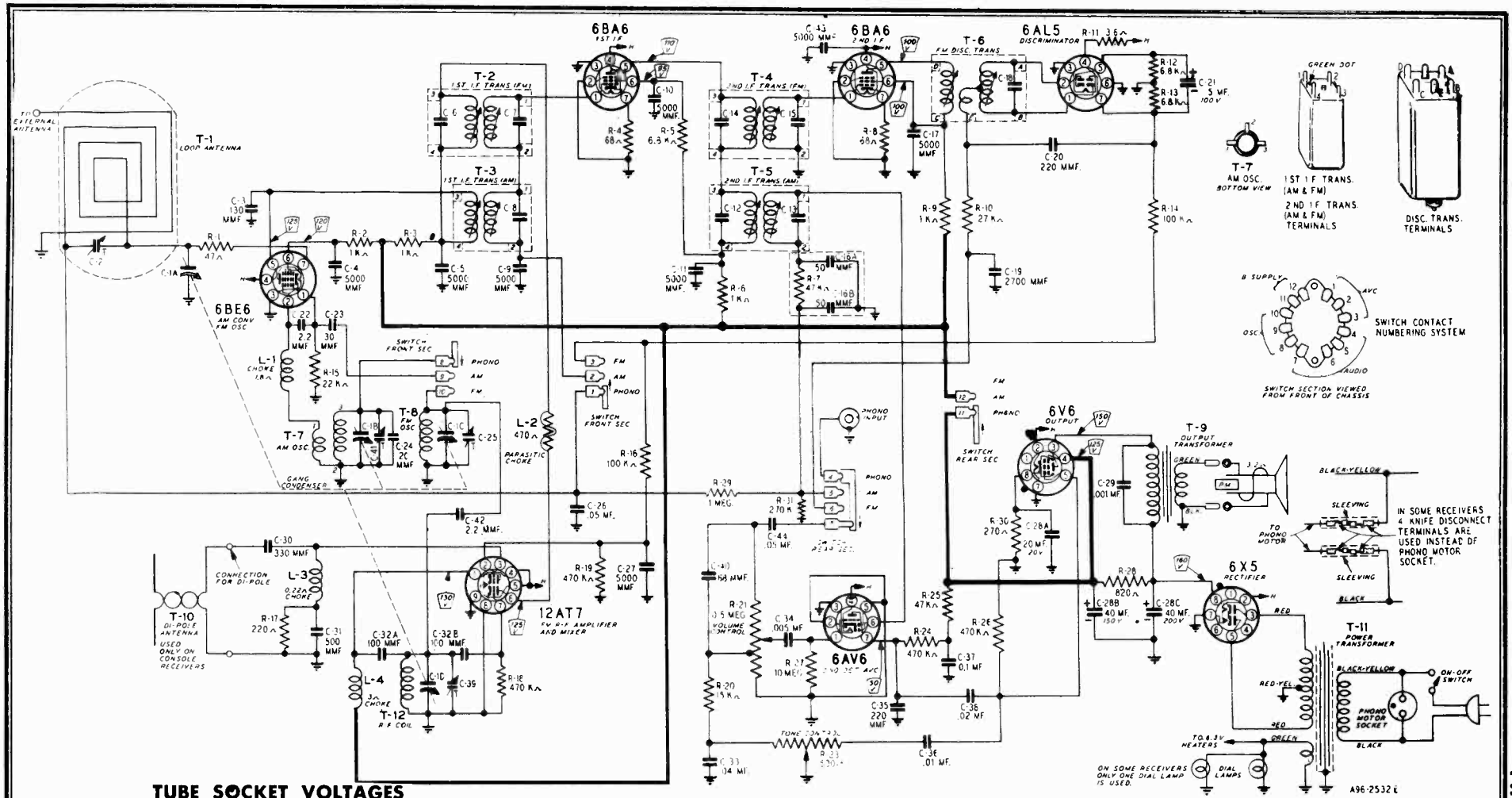
FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.



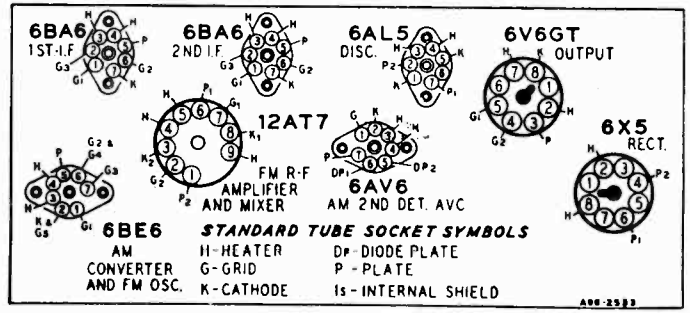
TUBE SOCKET VOLTAGES

Socket voltages are shown on the Schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC

Signal Input .....None

A Variation of ±10% is usually permissible.



MODEL 4-A-86,
Westmoreland

REPLACEMENT PARTS LIST

MISCELLANEOUS

12A480	10" P.M. Speaker	
4X1082	Escutcheon	
10A759	Knob	
13X546	Line Cord & Plug Assembly	
2A393	Band Change Switch	
3A435	Molded Octal Tube Socket	
3A305	Phono Socket	
3A426	Tube Socket (1st 6BA6)	
3A443	Tube Socket (12AT7)	
3A427	Tube Socket (6BE6)	
3A439	Tube Socket (Miniature)	

CAPACITORS

C-1	14A209	Gang Condenser Assembly		
C-2	17A256	2-24 mmf		Trimmer
C-3	47X559	130 mmf		Ceramic
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	47X507	5000 mmf		Ceramic
C-6, C-7	Part of T-2 (1st I-F Trans. FM)			
C-8	Part of T-3 (1st I-F Trans. AM)			
C-12, C-13	Part of T-5 (2nd I-F Trans. AM)			
C-14, C-15	Part of T-4 (2nd I-F Trans. FM)			
C-16A, C-16B	47X112	50-50 mmf		Dual Mica
C-18	Part of T-6 (Discriminator Trans.)			
C-19	47X492	2700 mmf		Molded Mica
C-20, C-35	47X468	220 mmf		Ceramic
C-21	45X361	5 mf	100 V	Dry Electrolytic
C-22, C-42	47X557	2.2 mmf		Ceramic
C-23	47X558	30 mmf		Ceramic
C-24	47X516	20 mmf		Ceramic
C-25	17A255	1 8 mmf		Trimmer
C-26, C-44	B66503	.05 mf	200 V	Tubular
C-28A		20 mf	20 V	
C-28B	45X360	40 mf	150 V	Dry Electrolytic
C-28C		40 mf	200 V	
C-29	H66102	.001 mf	800 V	Tubular
C-30	47X470	330 mmf		Molded Mica
C-31	47X508	500 mmf		Ceramic
C-32A, C-32B	76X4	100 mmf		Dual Ceramic
C-33	B66403	.04 mf	200 V	Tubular
C-34	D66502	.005 mf	400 V	Tubular
C-36	B66103	.01 mf	200 V	Tubular
C-37	D66104	.1 mf	400 V	Tubular
C-38	D66203	.02 mf	400 V	Tubular
C-39, C-41	Part of C-1 (Gang Condenser)			
C-40	47X471	68 mmf		Ceramic

RESISTORS

		Ohms	Watts	
R-1	B85470	47	0.5	Carbon
R-2, R-3, R-6, R-9	B85102	1000	0.5	Carbon
R-4, R-8	B84680	68	0.5	Carbon
R-5, R-12, R-13	B84682	6800	0.5	Carbon
R-7, R-25	B85473	47 K	0.5	Carbon
R-10	B85273	27 K	0.5	Carbon
R-11	43X233	3.6	0.5	Wirewound
R-14, R-16	B85104	100 K	0.5	Carbon
R-15	B85223	22 K	0.5	Carbon
R-17	B84221	220	0.5	Carbon
R-18, R-19, R-24, R-26	B85474	470 K	0.5	Carbon
R-20	B85153	15 K	0.5	Carbon
R-21	36X372	.5 meg.		Volume Control
R-23	40X310	.5 meg.		Tone Control
R-27	B85106	10 meg.	0.5	Carbon
R-28	D84821	820	2.0	Carbon
R-29	B85105	1 meg.	0.5	Carbon
R-30	B84271	270	0.5	Carbon
R-31	B84274	270 K	0.5	Carbon

TRANSFORMERS AND COILS

L-1	35A5	Insulated Choke
L-2	9A2103	Parasitic Choke
L-3	35A9	Insulated Choke
L-4	35A8	Insulated Choke
T-1	9A2146	"B" Range Loop Antenna
T-2	9A2060	1st I-F Trans. (FM)
T-3	9A2062	1st I-F Trans. (AM)
T-4	9A2061	2nd I-F Trans. (FM)
T-5	9A2063	2nd I-F Trans. (AM)
T-6	9A2064	Discriminator Transformer
T-7	9A2065	Oscillator Coil (AM)
T-8	9A2067	Oscillator Coil (FM)
T-9	51X134	Output Transformer
T-10	9A2004	Dipole Antenna
T-11	53X291	Power Transformer
T-12	9A2066	Antenna Coil (FM)

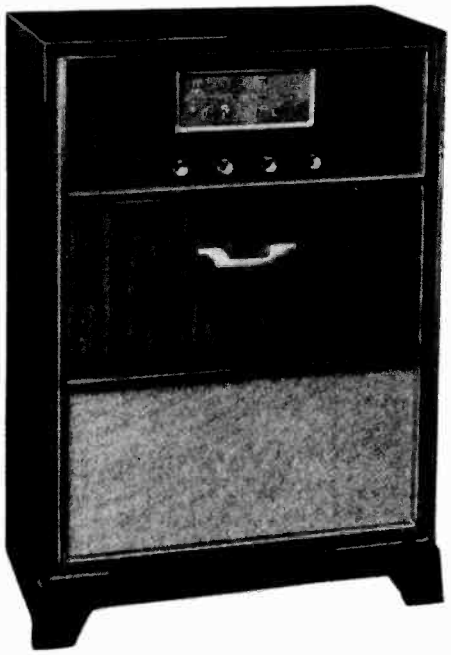
DIAL AND DRIVE ASSEMBLY

58X739	Dial Glass
15X251	Pointer
19X192	"C" Washer (Mtg. Drive Shaft)
6X66	Rubber Grommet
25X1616	Dial Bracket
28X113	Drive Cord Tension Spring
7A103	No. 47 Pilot Light
7A199	Pilot Light Socket Assembly
10X38	Drive Cord Assembly
26X486	Drive Shaft

VM No. 950 RECORD CHANGER PARTS

P-81	Crystal Cartridge with Unipoint Needle
85-35	Unipoint Needle
P-77	Crystal Cartridge with Needles
85-18	Needle, Microgroove (Red)
85-16	Needle, Regular

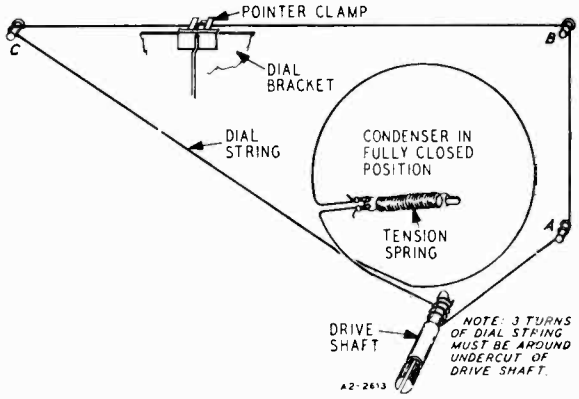
MODEL 4-A-87,
Waverly



DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new S-10X77 drive cord assembly or a new length of cord 48 inches long for the installation. Install the cord as shown in the illustration, winding three turns counterclockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



ELECTRICAL SPECIFICATIONS

6 Tube Superheterodyne, including Rectifier Tube.
Tuning Frequency Range.....540 to 1600 KC
Power Consumption....(Radio) 35 watts (At 117 volts AC)
(Phono) 20 watts, 60 cycles only
Power Output 2.0 watt maximum, 1.1 watt (10% distortion)
Intermediate Frequency .....455 KC
Sensitivity .....10 Microvolts Average
Selectivity .....45 KC Wide at 1000 Times Signal
Speaker .....(3.2 ohm Voice Coil) 8" PM Dynamic

Tube and Dial Lamp Complement
1 6BA6 R-F Amplifier
1 6BE6 Converter
1 6BA6 I-F Amplifier
1 6AV6 Det. & 1st Audio
1 6AQ5 Output
1 6X4 Rectifier
1 No. 47 Dial Lamp

ALIGNMENT PROCEDURE

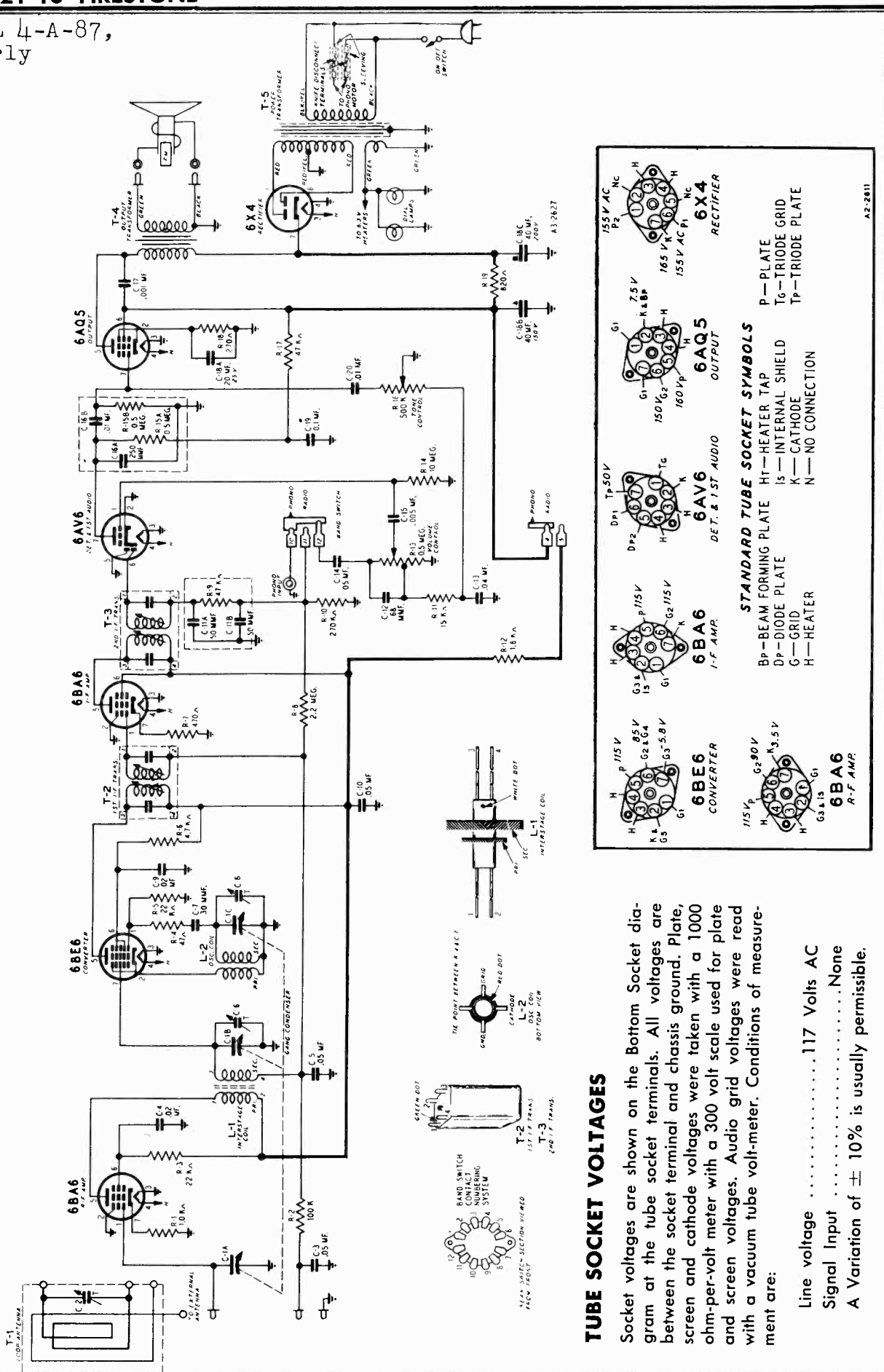
The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas, — .1 mf, and 50 mmf.

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.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid I-F 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (4) and Sec. (3)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-8	Maximum Output
1400 KC	Control Grid R-F 6BA6 Pin No. 1	.1 mf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Interstage C-6 See Note B	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2 See Note B	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.
NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

MODEL 4-A-87,
Waverly

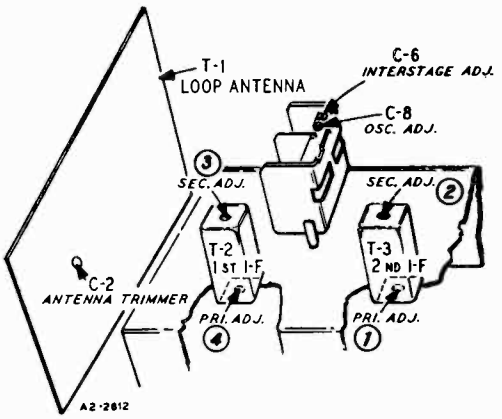


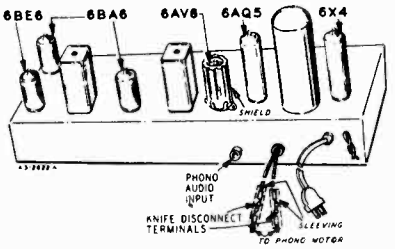
TUBE SOCKET VOLTAGES

Socket voltages are shown on the Bottom Socket diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None
A Variation of ± 10% is usually permissible.

MODEL 4-A-87,
Waverly





REPLACEMENT PARTS LIST

MISCELLANEOUS

12A477	8" P.M. Speaker	
10A759	Knobs	
4X1082	Escutcheon	
2A405	Radio-Phono Switch	
13X546	Line Cord & Plug Assembly	
3A458	Tube Socket (6AV6)	
3A426	Tube Socket (miniature)	
30X560	Line Cord Clamp	
3A305	Phono Socket	
32X403	Tube Shield (6AV6)	
76X1	Capacitor-Resistor Combination	
76X5	Capacitor-Resistor Combination	

CAPACITORS

C-1A, C-1B, C-1C	14A213	Gang Condenser Assembly		
C-2	17A235	2-24 mmf		Trimmer
C-3, C-5, C-10	B66503	.05 mf	200 V	Tubular
C-4, C-9	B66203	.02 mf	200 V	Tubular
C-6, C-8	Part of Gang Condenser Assembly			
C-7	47X558	30 mmf		Ceramic
C-11A, C-11B	Part of 76X1 Assembly (See Miscellaneous)			
C-12	47X471	68 mmf		Ceramic
C-13	B66403	.04 mf	200 V	Tubular
C-14	B65503	.05 mf	200 V	Tubular
C-15	D66502	.005 mf	400 V	Tubular
C-16A, C-16B	Part of 76X5 Assembly (See Miscellaneous)			
C-17	F66102	.001 mf	600 V	Tubular
C-18A	45X381	20 mf	25 V	Dry Electrolytic
C-18B		40 mf	150 V	
C-18C		40 mf	200 V	
C-19	B66104	.1 mf	200 V	Tubular
C-20	B66103	.01 mf	200 V	Tubular

RESISTORS

		Ohms	Watts	
R-1	B84102	1K	0.5	Carbon
R-2	B85104	100K	0.5	Carbon
R-3, R-5	B85223	22K	0.5	Carbon
R-4	B85470	47	0.5	Carbon
R-6	B84472	4.7K	0.5	Carbon
R-7	B84471	470	0.5	Carbon
R-8	B85225	2.2 meg.	0.5	Carbon
R-9	Part of 76X1 Assembly (See Miscellaneous)			
R-10	B84274	270K	0.5	Carbon
R-11	B84153	15K	0.5	Carbon
R-12	C84182	1.8K	1.0	Carbon
R-13	36X372	.5 meg.		Volume Control
R-14	B85106	10 meg.	0.5	Carbon
R-15A, R-15B	Part of 76X5 Assembly (See Miscellaneous)			
R-16	40X310	.5 meg.		Tone Control
R-17	B85473	47K	0.5	Carbon
R-18	B84271	270	0.5	Carbon
R-19	D84821	820	2.0	Carbon

TRANSFORMERS AND COILS

L-1	9A2117	Interstage Coil
L-2	9A2113	Oscillator Coil
T-1	9A2152	Loop Antenna
T-2	9A2112	1st I-F Trans.
T-3	9A2063	2nd I-F Trans.
T-4	51X134	Output Trans.
T-5	53X291	Power Trans.

DIAL AND DRIVE ASSEMBLY

S-10X77	Drive Cord Assemb'y
15X251	Pointer
25X1616	Dial Bracket
58X740	Dial Glass
26X515	Drive Shaft
7A199	Pilot Light Socket Assembly
28X113	Drive Cord Tension Spring
41X88	Dial Light Reflector
7A103	No. 47 Dial Light
19X192	"C" Washer (Mtg. Drive Shaft)

VM No. 950 RECORD CHANGER PARTS

P-81	Crystal Cartridge with Unipoint Needle
85-35	Unipoint Needle
P-77	Crystal Cartridge with Needles
85-18	Needle, Microgroove (Red)
85-16	Needle, Regular

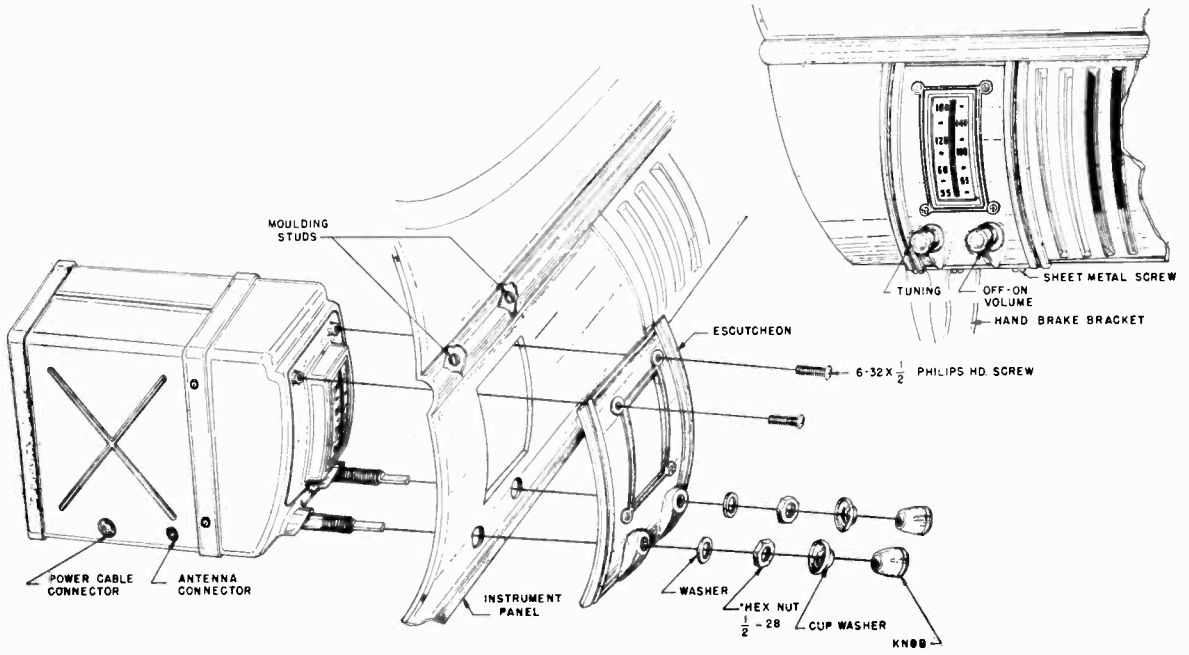
MODEL 4-B-57,
Chevrolet, 1949-1950

DESCRIPTION

Your new Automobile Receiver is a 6-tube (including rectifier) superhetrodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It features a novel two-piece construction and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver.

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. For best results we recommend Firestone Disappearing Fenderwell Aerial Stock No. 4-B-21. The unit is simple to install and requires no electrical adjustment after installation.

INSTALLATION



R.F. TUNING UNIT DETAIL MOUNTING ASSEMBLY

Fig. 1

R. F. TUNING UNIT

1. Loosen nuts on the two moulding studs located behind the instrument panel cover plate.
2. Remove sheet metal screw from the lower edge of the instrument panel cover plate and the two screws and washers attaching the hand brake to the instrument panel. Keep these parts.
3. Remove instrument panel cover plate and discard.
4. Tighten nuts on the two moulding studs located behind the instrument panel cover plate.
5. Drop vent controls by removing screws, lockwashers, and flat washers securing these controls to the instrument panel. This will facilitate installation of both receiver units. Save parts removed.
6. Install R.F. Tuning Unit behind instrument panel so that mounting bushings and tuning shafts protrude through the instrument panel.
7. Slide plastic escutcheon over mounting bushings and secure with flat washers, nuts, cup washers, and knobs as shown in Fig. 1
8. Secure top part of plastic escutcheon to R.F. Tuning Unit with two No. 6-32 x ½" long Philips Head screws.

POWER SUPPLY UNIT

1. Insert a thin blade screwdriver or a flat strip of metal through the Radio Grille and slit fiberboard Radio Grille screen. Reach in back of Radio Grille and remove screen by grasping slit edge. Discard fiberboard screen.
2. Remove 10-32 nuts and washers from the moulding studs behind the Radio Grille.
3. Remove 10-32 nuts. screws, and washers securing the lower tabs of the Radio Grille to the instrument panel.
4. Install Power Supply Unit behind Radio Grille and position into place so that holes in top of unit slide over moulding studs as shown in Fig. 2.

NOTE: It may be more convenient, in car models with air conditioner heaters, to remove the vibrator before installing this unit. The vibrator can be replaced after the power unit is mounted.

MODEL 4-B-57,
Chevrolet, 1949-1950

5. Replace 10-32 nuts and washers on moulding studs.
6. Replace lower grille tab 10-32 mounting screws, nuts, and washers so that screws secure the lower grille tabs and Power Supply Unit to the instrument panel.
7. Connect cable from Power Supply Unit to R.F. Tuning Unit.
8. Secure Power Supply Cable under clamp on R.F. Tuning Unit.
9. Replace vent controls.
10. Replace screws and washers securing hand brake.

Connect battery lead to terminal on Ignition Switch.

Plug Antenna cable into receiver.

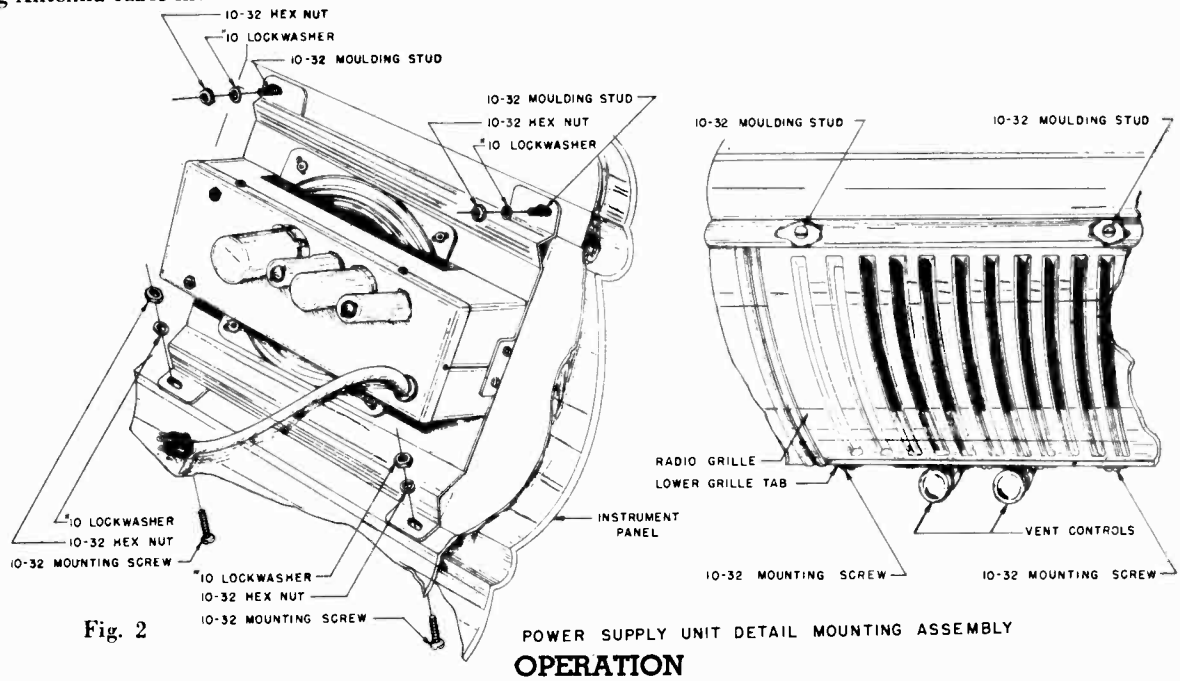


Fig. 2 POWER SUPPLY UNIT DETAIL MOUNTING ASSEMBLY

OPERATION

VOLUME CONTROL KNOB

This knob is located on the right side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to the desired level. The volume should never be reduced by detuning the station selector knob.

STATION SELECTOR KNOB

This knob is located on the left side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

SUPPRESSION KIT MOTOR NOISE ELIMINATION

A suppression kit is shipped with this receiver. It contains the following parts:

1 Generator Condenser.
1 Distributor Suppressor.

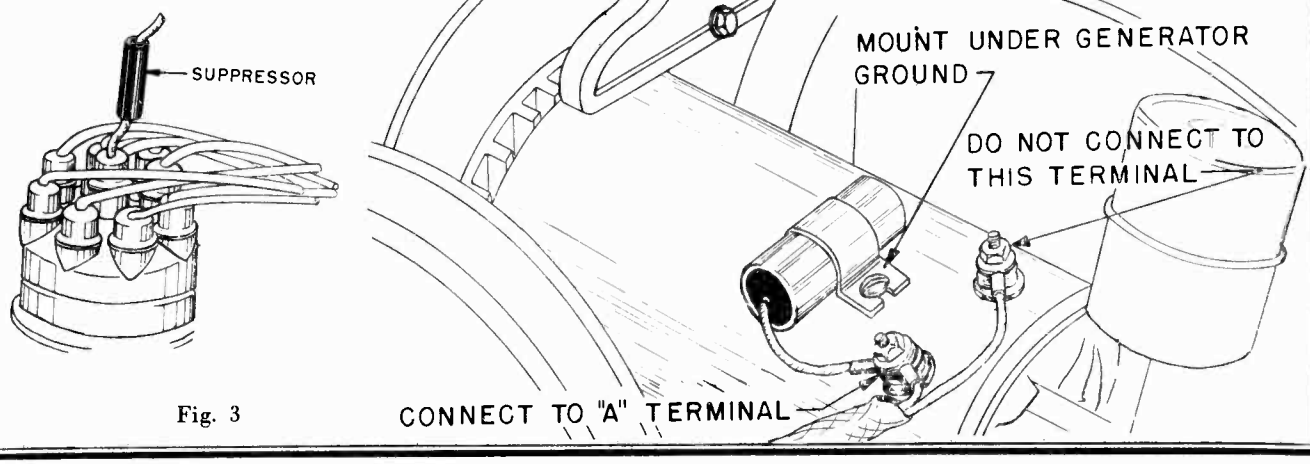


Fig. 3

MODEL 4-B-57,
Chevrolet, 1949-1950

DISTRIBUTOR SUPPRESSOR

Disconnect the center lead in the distributor head of the motor. Cut lead approximately 2 inches back from metal tip end. Screw suppressor into cut end of long lead. Screw cut end of short lead into suppressor. Plug lead, with attached suppressor, back into distributor head.

The generator condenser and distributor suppressor will normally eliminate all objectionable motor noise. If the motor noise persists, a .5 MFD by-pass condenser may be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

SERVICE DATA

ELECTRICAL SPECIFICATIONS

Power Supply	6.3 Volts DC
Current	5.5 Amp. average
Frequency Range	538-1600 KC
Speaker	5¼" PM
Power Output	2 watts, undistorted
	3 watts, maximum
Sensitivity	2-3 microvolts average for 1 watt output
Selectivity	40 KC broad at 1000 times signal, at 1000 KC

This receiver contains the following:
1—6BA6—RF Amplifier
1—6BE6—Converter
1—6BA6—1. F. Amplifier
1—6AT6—Detector—AVC—1st Audio
1—6AQ5—Power Output
1—6X4—Rectifier

SERVICE NOTES

Voltage taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a volt meter having a resistance of 20,000 Ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 5).
All voltages should be measured with an input voltage of 6.3 volts DC.
To check for open by-pass condensers, shunt each condenser with another one having the same capacity and voltage rating which is known to be good until the defective unit is located.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components such as tubes, condensers, resistors, etc. are normal before proceeding with realignment.

If realignment is necessary follow the instructions given under the heading "Alignment Procedure". After realignment has been completed repeat the procedure as final check.

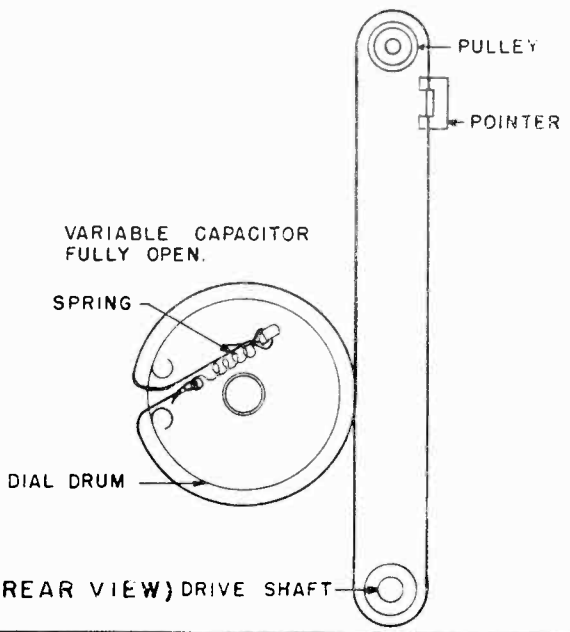


Fig. 4 DIAL CORD DRIVE (REAR VIEW)

ALIGNMENT PROCEDURE

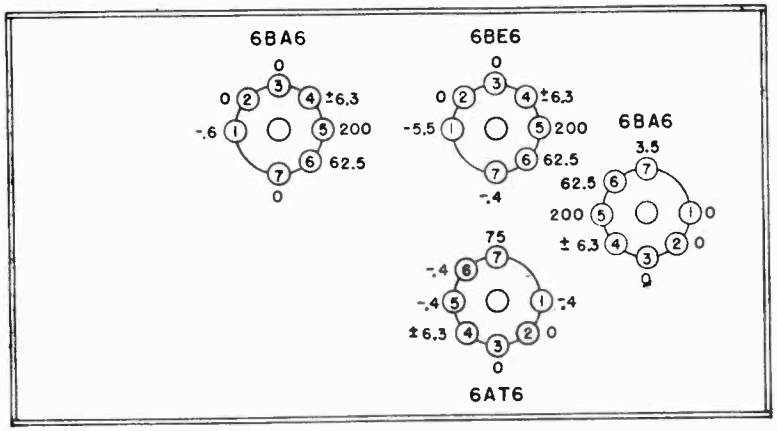
Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to Schematic Diagram.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connection*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T2 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T1 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L3	Maximum	RF Stage
7) Tune in Signal from generator	600 KC	100 MMFD	Ant. lead	L2	Maximum	Antenna

8) Repeat steps 4 and 5

BOTTOM VIEW OF CHASSIS



BOTTOM VIEW OF POWER PACK

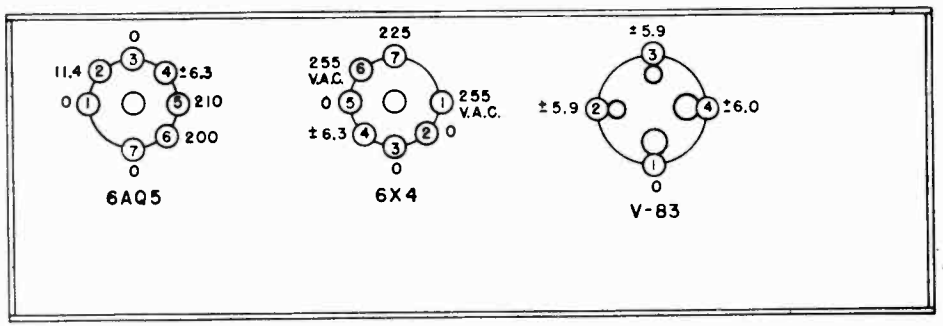
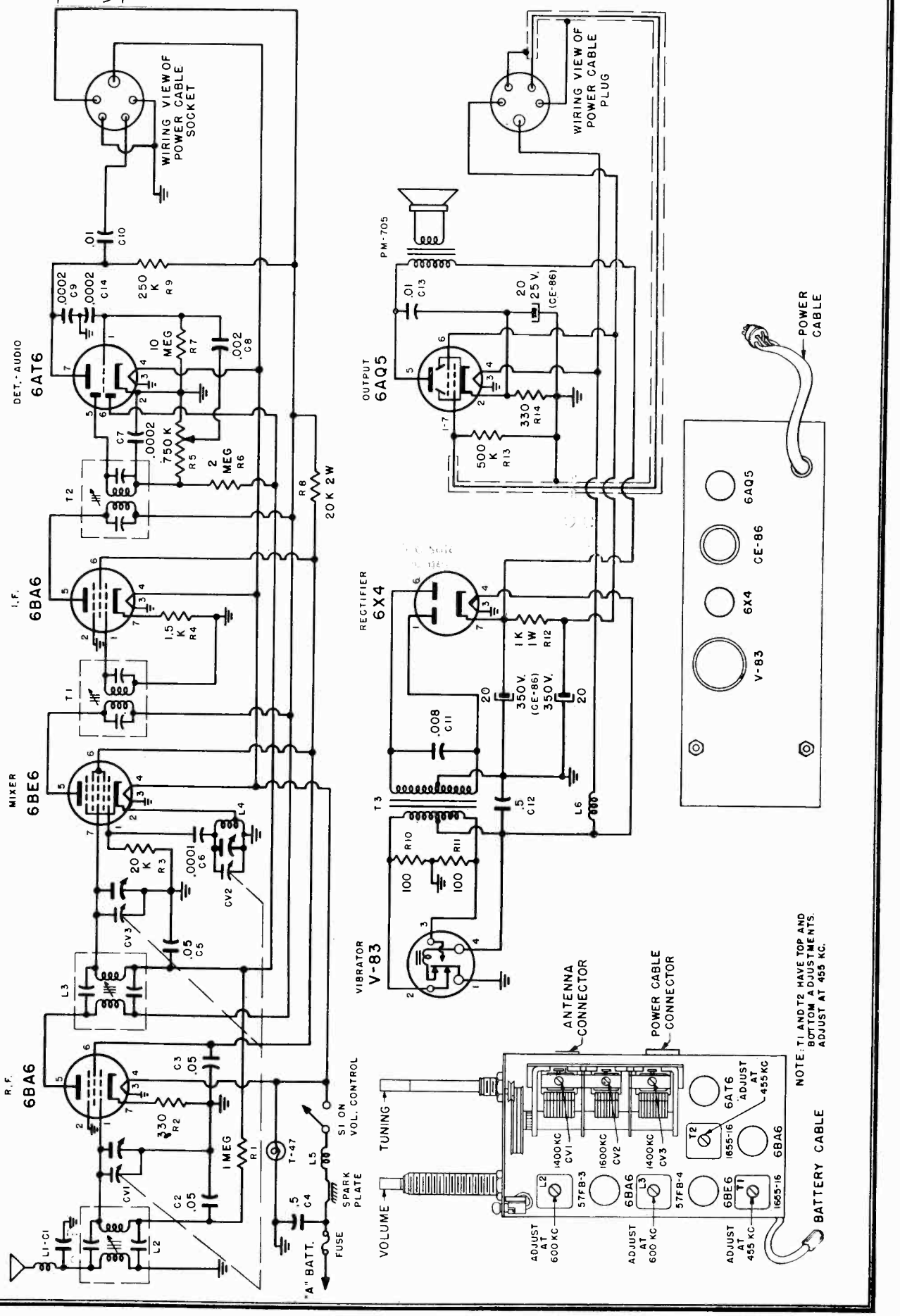


Fig. 5

SOCKET VOLTAGES

MODEL 4-B-57



MODEL 4-B-57,
Chevrolet, 1949-1950

PARTS AND PRICE LIST

CONDENSERS

Schematic Diagram Reference	Part No.	Description
C2, C3, C5	C207	.05 MFD 200 Volt Condenser
C4, C12	C209	.5 MFD 100 Volt Condenser
C6	CC200	100 MMFD Ceramic Condenser
C7, C9, C14	CC201	200 MMFD Ceramic Condenser
C8	C203	.002 MFD 400 Volt Condenser
C10, C13	C206	.01 MFD 600 Volt Condenser
C11	C205	.008 MFD 1600 Volt Condenser
CE-86	CE-86	20 MFD 350 Volt Electrolytic Condenser 20 MFD 350 Volt Electrolytic Condenser 20 MFD 25 Volt Electrolytic Condenser
CV1-CV2-CV3	CV-300	3 Section Variable Tuning

RESISTORS

R1	R309	1 megohm 1/2 Watt 20% Resistor
R2, R14	R303	330 Ohm 1/2 Watt 20% Resistor
R3	R306	20K Ohm 1/2 Watt 20% Resistor
R4	R314	1.5K Ohm 1/2 Watt 20% Resistor
R5	RV300	Volume Control 3/4 megohm with switch
R6	R310	2 megohm 1/2 Watt 20% Resistor
R7	R311	10 megohm 1/2 Watt 20% Resistor
R8	R313	20K Ohm 2 Watt 20% Resistor
R9	R307	250K Ohm 1/2 Watt 20% Resistor
R10, R11	R301	100 Ohm 1/2 Watt 20% Resistor
R12	R312	1K Ohm 1 Watt 20% Resistor
R13	R308	500K Ohm 1/2 Watt 20% Resistor

COILS AND TRANSFORMERS

L1-C1	L200	Motor noise elimination unit
L2	15053 or 57FB-3	Antenna coil
L3	15054 or 57FB-4	R.F. coil
L4	L201	R.F. oscillator coil
L5	L203	Choke, "A" line
L6	L202	Choke, vibrator hash
T1	14977 or 1655-16	1st IF transformer
T2	14977 or 1655-16	2nd IF transformer
T3	TV-100	Vibrator transformer
T4		Output transformer (Part of speaker not furnished separately)

MISCELLANEOUS

A300	"A" lead assembly
H301	Case, less covers for Power Supply Unit
H300	Case, complete with covers for R.F. tuning unit
H207	Clip, Anti-rattle
H208	Clip, coil mounting
H302	Cover, power supply unit mounting (with speaker louvres)
A201	Fuse 15 Amp.
504PC-300	Power Cable Assembly (complete with plug)
H212	Receptacle, Antenna cable
504-FC	Socket, power cable
PM-705	Speaker, 5 1/4" PM (includes output transformer)
V-83	Vibrator
H310	Knob
H311	Cup washer
H312	Plastic Escutcheon
H313	1/2 x 28 hex nut
C100	.5 MFD Generator Condenser
R100	Distributor Suppressor

DIAL PARTS

D300	Dial Scale
PS300	Dial Pointer
DS300	Drive Shaft Assembly
H201	Grommet, rubber drive
T51	Pilot Light
H214	Pilot Light Socket
H203	Pulley, idler
H204	Spring, Dial drive String Tension
H215	String, dial drive

MODEL 4-B-58, Dodge, Plymouth, 1949-1950

DESCRIPTION

Your new Automobile Receiver is a 6-tube (including rectifier) superhetrodyne, designed to operate from the 6-volt storage battery in your car. It is custom-built to mount behind the instrument panel in the place provided for a radio by the automobile manufacturer. It has a self-contained PM speaker and covers the frequency range 538 to 1600 KC. Two simple controls are provided for operating the receiver. (See Fig. 1.)

This receiver has been designed with a tuned RF stage and a 3-gang tuning condenser thereby insuring the finest in sensitivity and selectivity. For best results we recommend Firestone disappearing fender-well aerial stock No. 4-B-21. The unit is simple to install and requires no electrical adjustment after installation.

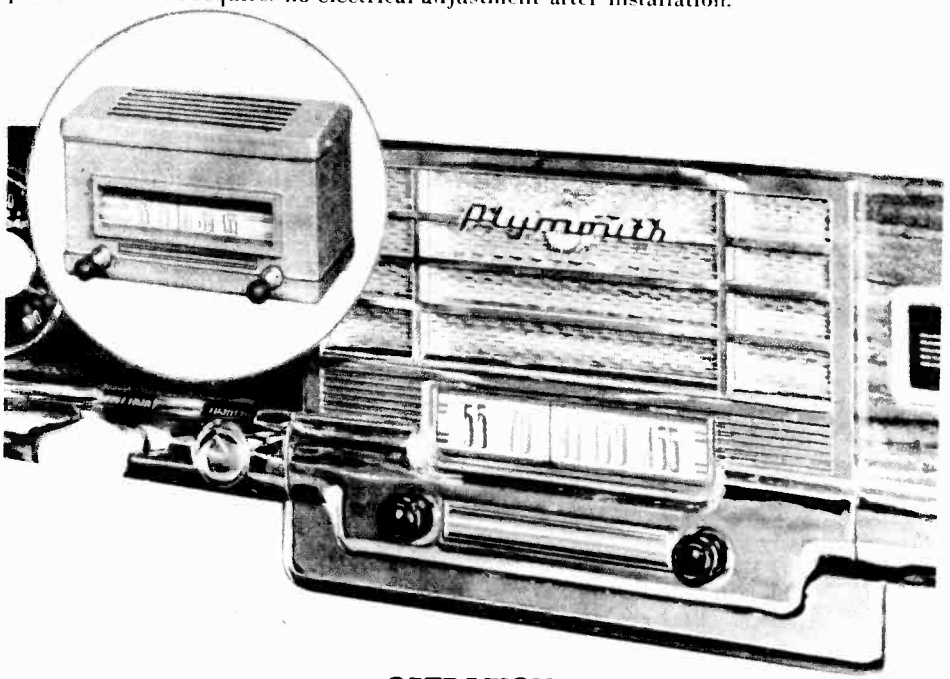


Fig. 1

OPERATION

VOLUME CONTROL KNOB

This knob is located on the left side of the radio. Turning this knob slightly to the right until a slight click is heard will put the radio into operation. Turning this knob further to the right will increase the volume and turning it to the left will decrease the volume. After a station has been selected, the volume control should be adjusted to desired level. The volume should never be reduced by detuning the station selector knob.

STATION SELECTOR KNOB

This knob is located on the right side of the radio. This knob should be turned until a desired station has been selected. Adjust this knob very carefully until the station comes in with the most natural tone.

INSTALLATION
PLYMOUTH P18 SPECIAL DELUXE

1. Remove six screws securing Radio Grille in place and remove Radio Grille.
2. Remove dummy plates covering radio dial and control openings.
3. Remove knobs, cup washers, hex nuts and washers from control shafts and mounting bushings.
4. Secure two mounting brackets to Radio Grille with $\frac{3}{8}$ inch long 10-32 self-tapping screws, lockwashers, and cup washers as shown in detail assembly drawing, Fig. 2.
5. Place radio control cover plate over mounting bushings.
6. Position receiver behind Radio Grille so that mounting bushings and shafts protrude through the grille.
7. Attach receiver by replacing washers and hex nuts on mounting bushings.
8. Replace cup washers and knobs over shafts.
9. Secure receiver to mounting brackets with two No. 8 self-tapping thumb screws.
10. Insert radio with attached grille through front opening on instrument panel.
11. Replace grille mounting screws.
12. Connect battery lead to terminal marked "ACC" on ignition switch.
13. Plug antenna cable into receiver.

PLYMOUTH P17, P18 4-DOOR DELUXE AND P18 CLUB COUPE DELUXE DODGE "WAYFARER" AND "MEADOWBROOK"

These models are not equipped by the car manufacturers with a radio grille.

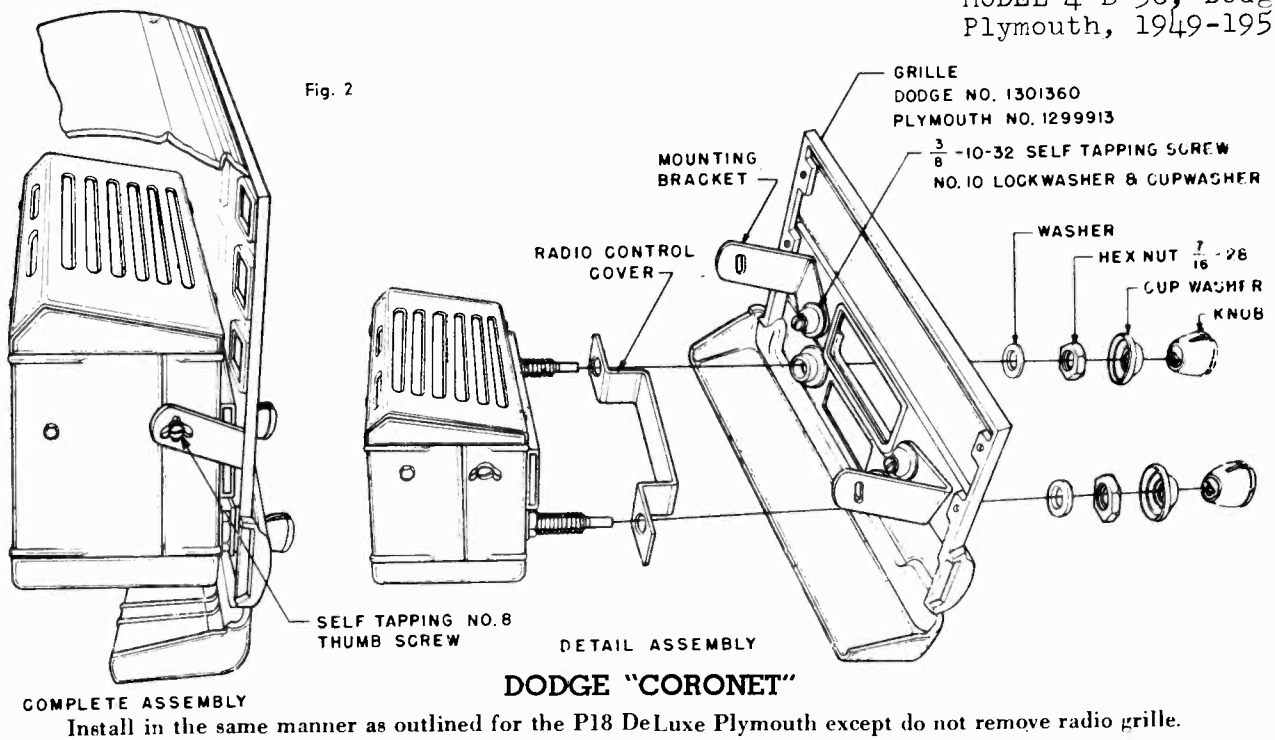
The following parts must be obtained from any authorized Plymouth or Dodge dealer before an installation can be made in any of these cars.

Plymouth P17, P18 4-Door DeLuxe, P18 Club Coupe DeLuxe
Radio Grille No. 1299913

Dodge "Meadowbrook" or "Wayfarer"
Radio Grille No. 1301360

MODEL 4-B-58, Dodge, Plymouth, 1949-1950

Fig. 2



DODGE "CORONET"

Install in the same manner as outlined for the P18 DeLuxe Plymouth except do not remove radio grille.

ACCESSORIES FURNISHED FOR INSTALLATION

MOUNTING PARTS KIT

The following mounting hardware parts are shipped attached to the receiver. (See detail assembly drawing FIG. 2)

2 Washers
2 7/16-28 hex nuts
2 Cup washers
2 Knobs
2 Mounting Brackets
2 No. 8 self-tapping thumb screws
1 Radio control cover

An envelope containing additional mounting hardware is supplied with this receiver. It contains the following parts:

2 3/8 10-32 self-tapping screws
2 Cup washers
2 No. 10 lockwashers

SUPPRESSION KIT

1 Distributor Suppressor
1 .5 MFD Generator Condenser

MOTOR NOISE ELIMINATION

SUPPRESSION KIT

A suppression kit is shipped with this receiver. It contains the following parts:

1 Generator Condenser.
1 Distributor Suppressor.

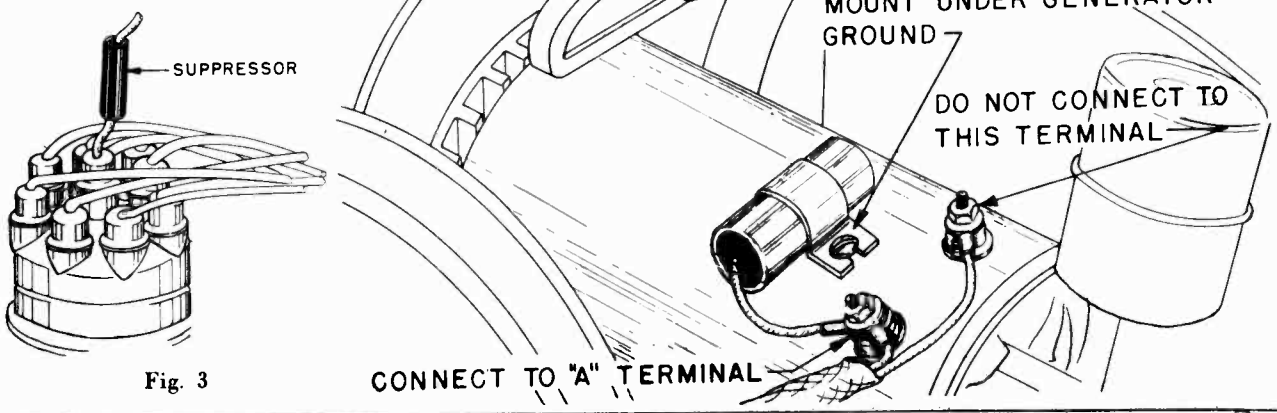


Fig. 3

MODEL 4-B-58, Dodge, Plymouth, 1949-1950

DISTRIBUTOR SUPPRESSOR

Disconnect the center lead in the distributor head of the motor. Cut lead approximately 2 inches back from metal tip end. Screw suppressor into cut end of long lead. Screw cut end of short lead into suppressor. Plug lead, with attached suppressor, back into distributor head.

The generator condenser and distributor suppressor will normally eliminate all objectionable motor noise. If the motor noise persists, a .5 MFD by-pass condenser may be connected to either side of the ammeter with the ground lug fastened to a good ground nearby.

WHEEL STATIC

Wheel static is a form of interference caused by the rotation of the front wheels of the car, and it is, of course, only noticed when the car is in motion. If this form of interference is present, it can be eliminated by installing wheel static collector springs between the inner hub cap and the spindle shaft.

ELECTRICAL ACCESSORIES

In some cases, it may be found that car accessories such as electric heaters, lighters, automatic relays or gauges, may cause interference while in operation. Proper procedure in such cases is to connect a .5 MFD by-pass condenser from ground to the suspected accessory until the source of interference is found. The condenser then should be permanently mounted in this location.

SERVICE DATA

ELECTRICAL SPECIFICATIONS

Power Supply	6.3 Volts DC
Current	5.5 Amp. average
Frequency Range	538-1600 KC
Speaker	5" PM
Power Output	2 watts, undistorted
	3 watts, maximum
ensitivity	2-3 microvolts average for 1 watt output
Selectivity	40 KC broad at 1000 times signal, at 1000 KC

This receiver contains the following:
1—6BA6—RF Amplifier
1—6BE6—Converter
1—6BA6—I. F. Amplifier
1—6AT6—Detector—AVC—1st Audio
1—6AQ5—Power Output
1—6X4—Rectifier

SERVICE NOTES

Voltage taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a volt meter having a resistance of 20,000 Ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 4).
All voltages should be measured with an input voltage of 6.3 volts DC.
To check for open by-pass condensers, shunt each condenser with another one having the same capacity and voltage rating which is known to be good until the defective unit is located.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.
If realignment is necessary follow the instructions given under the heading "Alignment Procedure". After realignment has been completed repeat the procedure as final check.

INSTRUCTIONS FOR SERVICING RECEIVER COMPONENTS

The novel design of this receiver permits servicing all components without removing the chasis from the case. The top cover (the one with the speaker louvres) can be removed by removing the four (4) screws securing it to the case. This exposes all tube sockets, connections, resistors and condensers for observation and service.
Removing the bottom cover makes it possible to service tubes, vibrator, and volume control.

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.
No signal applied to antenna.
Power input—6.3 volts.
Connect dummy antenna in series with output lead of signal generator.
Connect ground lead of signal generator to chassis.
Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, modulated 400 cycles, 30%.
Non-metallic screwdriver.
Output meter. (1.8 volt for 1 watt output.)
Dummy antennas—.1 MFD., 100 MMFD.
For alignment points refer to Schematic Diagram.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connection*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
1) Fully open	455 KC	.1 MFD	6BE6 Grid	T2 Top & bottom	Maximum	Output I.F.
2) Fully open	455 KC	.1 MFD	6BE6 Grid	T1 Top & bottom	Maximum	Input I.F.
3) Fully open	1600 KC	100 MMFD	Ant. lead	CV2	Maximum	Oscillator
4) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV3	Maximum	RF Stage
5) Tune in signal from generator	1400 KC	100 MMFD	Ant. lead	CV1	Maximum	Antenna
6) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L3	Maximum	RF Stage
7) Tune in signal from generator	600 KC	100 MMFD	Ant. lead	L2	Maximum	Antenna
8) Repeat steps 4 and 5						

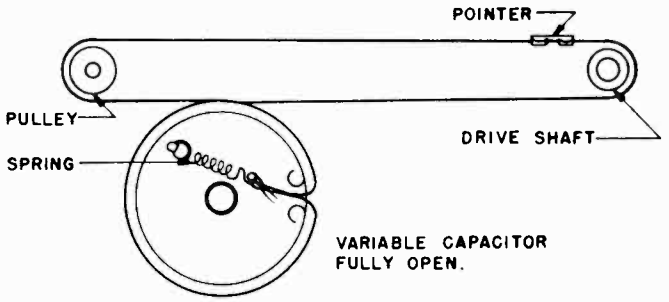


Fig. 5

DIAL CORD DRIVE

BOTTOM VIEW OF CHASSIS

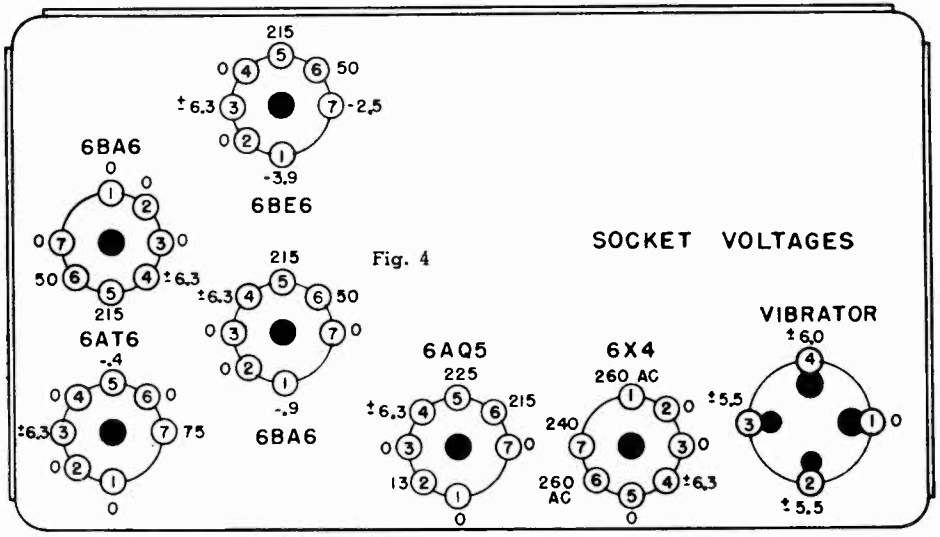


Fig. 4

FIRESTONE PAGE 21-29
MODEL 4-B-58, Dodge, Plymouth, 1949-1950

MODEL 4-B-58. Dodge, Plymouth, 1949-1950

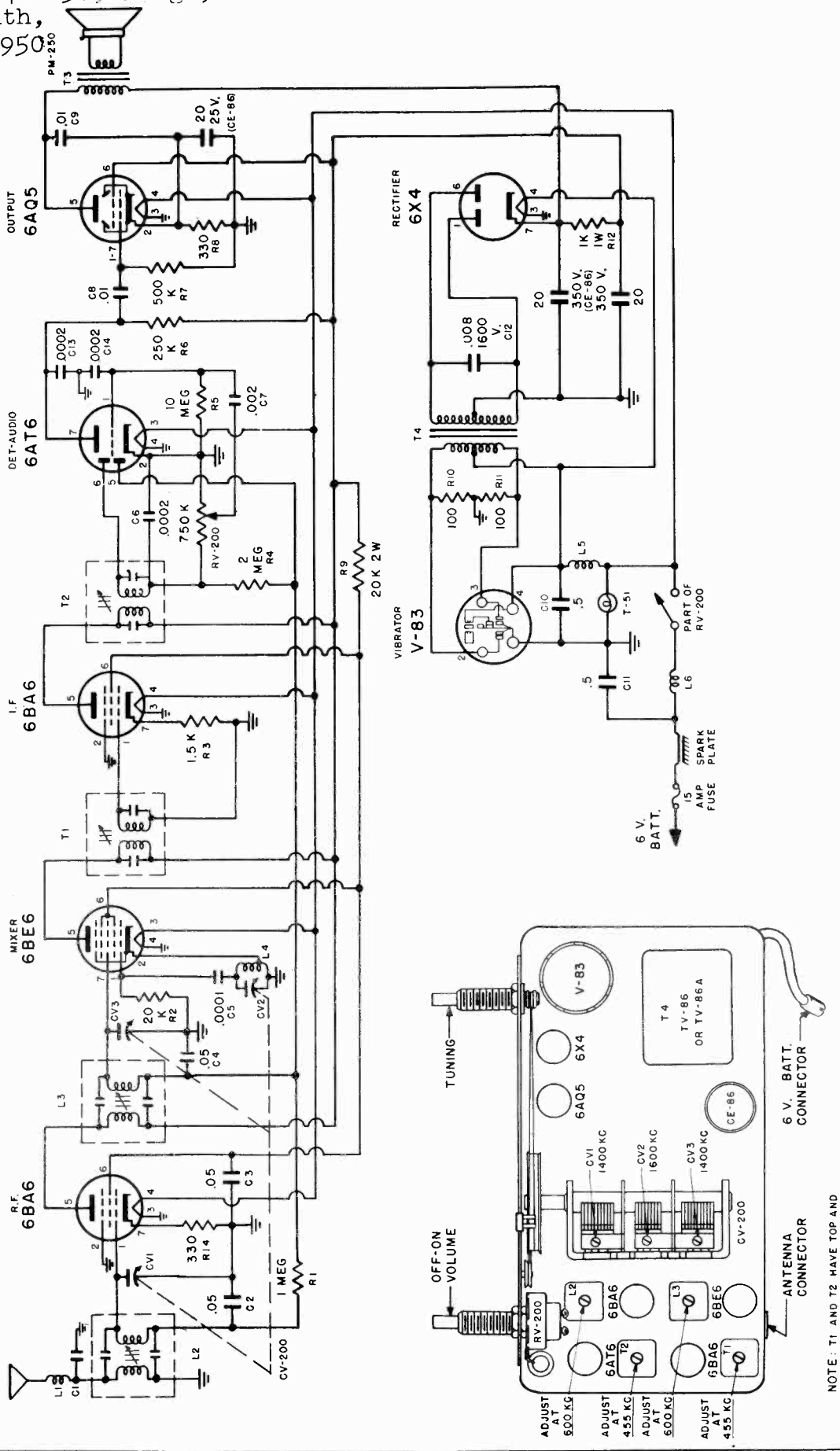


Fig. 6

MODEL 4-B-58, Dodge, Plymouth, 1949-1950

PARTS AND PRICE LIST

CONDENSERS

Schematic Diagram Reference	Part No.	Description
C2, C3, C4	C207	.05 MFD 200 volt condenser
C5	CC200	100 MMFD ceramic condenser
C6, C13, C14	CC201	200 MMFD ceramic condenser
C7	C203	.002 MFD 400 volt condenser
C8, C9	C206	.01 MFD 600 volt condenser
C10, C11	C209	.5 MFD 100 volt condenser
C12	C205	.008 MFD 1600 volt condenser
CE-86	CE-86	20 MFD 350 volt electrolytic condenser 20 MFD 350 volt electrolytic condenser 20 MFD 25 volt electrolytic condenser
CV-200	CV-200	3 section variable tuning condenser

RESISTORS

R1	R309	1 megohm 1/2 watt 20% resistor
R2	R306	20K ohm 1/2 watt 20% resistor
R3	R314	1.5K ohm 1/2 watt 20% resistor
R4	R310	2 megohm 1/2 watt 20% resistor
R5	R311	10 megohm 1/2 watt 20% resistor
R6	R307	250K ohm 1/2 watt 20% resistor
R7	R308	500K ohm 1/2 watt 20% resistor
R8, R13	R303	330 ohm 1/2 watt 20% resistor
R9	R313	20K ohm 2 watt 20% resistor
R10, R11	R301	100 ohm 1/2 watt 20% resistor
R12	R312	1K ohm 1 watt 20% resistor
RV-200	RV-200	Volume control 3/4 megohm with switch

COILS AND TRANSFORMERS

L1-C1	L200	Motor noise elimination unit
L2	57FB-3	Antenna Coil
L3	57FB-4	RF coil
L4	L201	RF Oscillator coil
L5	L202	Choke, vibrator hash
L6	L203	Choke, "A" line
T1	1655-16	1st IF transformer
T2	1655-16	2nd IF transformer
T3		Output transformer (Part of speaker not furnished separately)
T4	TV-86 or TV-86A	Vibrator transformer

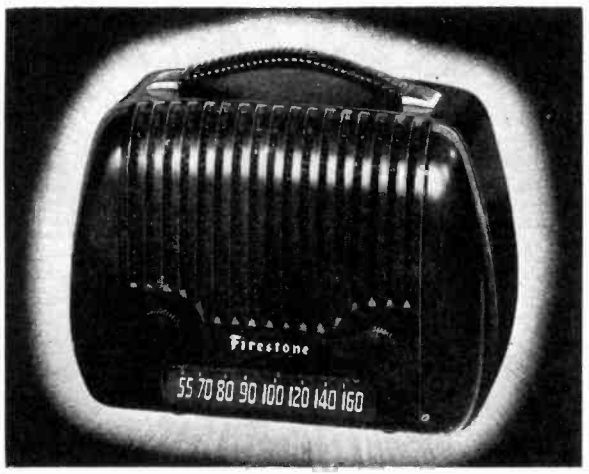
MISCELLANEOUS

A200	"A" lead assembly
H216	Bracket, mounting
H206	Case, (less covers)
H207	Clip, anti-rattle
H208	Clip, coil mounting
H209	Cover, bottom case
H218	Cover, radio control
H210	Cover, top case (with speaker louvres)
H311	Cup washers, shaft
A201	Fuse, 15 amp
H211	Grommet, rubber, gang mounting
H310	Knob
H217	Nuts, mounting
H212	Receptacle, antenna cable
PM-250	Speaker, 5" PM includes output transformer
V-83 or V-94	Vibrator
H113	7/8-28 Hex nut
C100	.5 MFD Generator condenser
R100	Distributor suppressor

DIAL PARTS

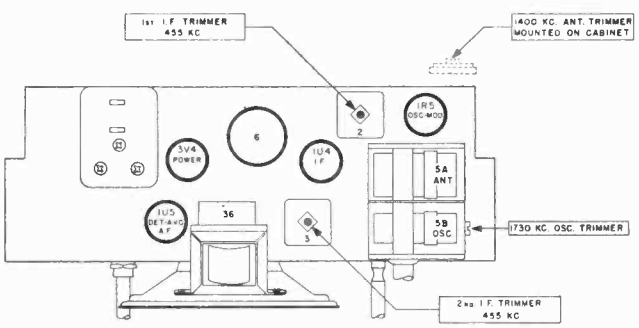
D200	Dial Scale
PS200	Dial Pointer
DS200	Drive shaft assembly
H201	Grommet, rubber drive
T51	Pilot light
H202	Pilot light socket
H203	Pulley, idler
H204	Spring, Dial Drive String Tension
H205	String, Dial Drive

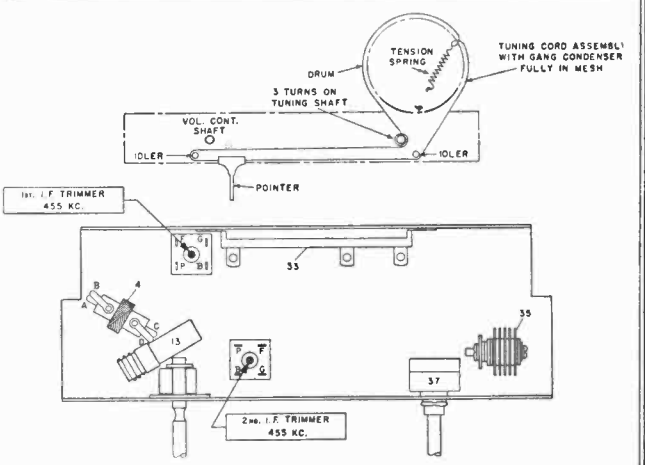
MODELS 4-C-16, 4-C-17



TUNING RANGE	535 to 1730 KC
INTERMEDIATE FREQUENCY	455 KC
LOUD SPEAKER	4 Inch P.M.
VOICE COIL IMPEDANCE	3.2 OHM at 400 Cycles
POWER OUTPUT	Undistorted—110 Milliwatts Maximum—240 Milliwatts
TUBE COMPLEMENT	1R5 Modulator-Oscillator 1U4 I.F. Amplifier 1U5 Det., AVC, 1st Audio 3V4 Power Output
CABINET DIMENSIONS	9-9/16" x 5" x 7"
WEIGHT	4¼ lbs. less batteries
POWER SUPPLY	110-120 Volt AC-DC and battery
BATTERY SPECIFICATIONS	One 4½ Volt "A", Firestone Stock No. 4-D-86 One 90 Volt "B" Firestone Stock No. 4-D-88 Or One 67½ Volt "B" Firestone Stock No. 4-D-84

Steps	Set receiver dial to:	TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Attach output of test oscillator to	Refer to parts layout diagram for location of trimmers mentioned below:
1	Any point where no interfering signal is received	Exactly 455 K. C.	High side to grid of 1R5 tube. Low side to common negative through a .02 Mfd. Blocking Condenser.	Adjust each of the 2nd I.F. transformer trimmer adjustment screws for maximum output, then adjust each of the 1st I.F. transformer trimmer adjustment screws for maximum output.
2	Rotate gang condenser to minimum capacity	Exactly 1730 K. C.	See paragraph (C) above	Adjust 1730 K. C. oscillator trimmer for maximum output.
3	Approximately 1400 K. C.	Approx. 1400 K. C.	See paragraph (D) above	Adjust 1400 K. C. antenna trimmer for maximum output.





ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure, read tabulations from left to right. Make the adjustment marked (1) first, (2) next, (3) third.

BE SURE TO HAVE METAL BASE PLATE MOUNTED ON CHASSIS DURING ALIGNMENT AT 1730 KC AND 1400 KC STEPS 2 AND 3 OF ALIGNMENT TABLE.

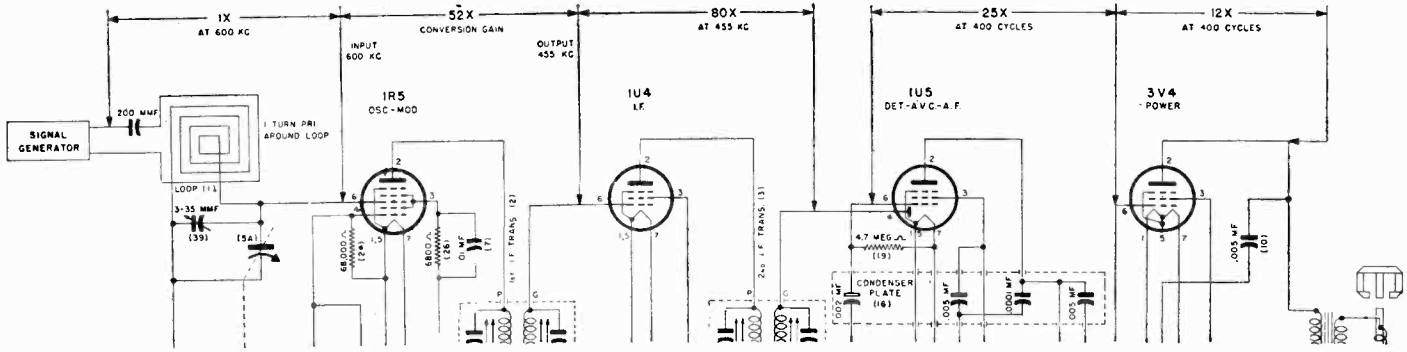
Before starting alignment:

(A) Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial indicator must be exactly even with the outside edge of the first 5 in the 55 calibration number at the low frequency end of the dial scale. If dial indicator does not point exactly to the outside edge, move pointer to correct position.

(B) Use an accurately calibrated test oscillator with some type of output measuring device.

(C) WHEN ADJUSTING THE 1730 KC OSCILLATOR TRIMMER, remove chassis from cabinet and disconnect the loop connection wires from the loop terminal strip. Attach a 1 megohm resistor across these connections and feed output of te oscillator across the 1 megohm resistor.

(D) THE 1400 KC LOOP ANTENNA TRIMMER should be adjusted only after all other adjustments have been made and with the set mounted in the cabinet. When aligning the 1400 KC Antenna Trimmer, couple test oscillator to receiver loop by: (1) make loop consisting of five to ten turns of No. 20 to No. 30 size wire, wound on a 2" or 3" form; (2) connect this loop across output of test oscillator; (3) place test oscillator loop near radio loop. BE SURE THAT NEITHER LOOP MOVES WHILE ALIGNING.



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)

2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)

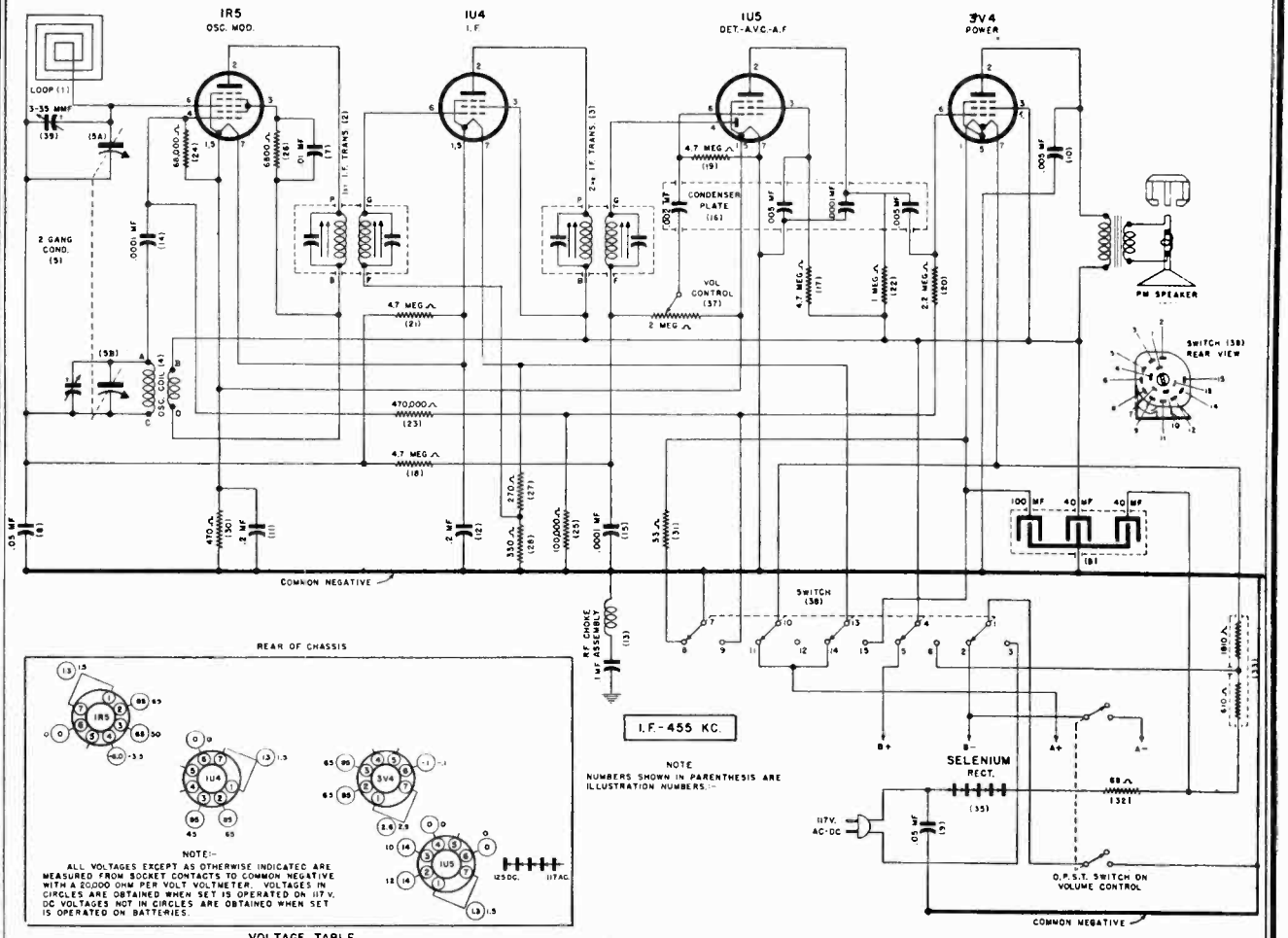
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

ORDERING PARTS

Order parts from your nearest Firestone Tire and Auto Supply Warehouse. When ordering parts, it is important that the correct code number, and stock number be given with the correct part name and part number as shown in the parts list. You will find the stock number and code number stamped on the chassis pan.

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

MODELS 4-C-16, 4-C-17



VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

PARTS LIST

Illus. No.	Part No.	Part Name	Description
1	64E18	Antenna	Loop
2	20E463	Coil	1st I.F. Transformer
3	20E463	Coil	2nd I.F. Transformer
4	20E338	Coil	Oscillator
5	24E40	Condenser	Tuning, Two Gang
*6	25E29	Condenser	Dry Electrolytic, 40-40 Mfd. 150 V. & 100 Mfd. 10 V.
7	23E211	Condenser	Tubular, .01 Mfd. 200 V.
8	23E216	Condenser	Tubular, .05 Mfd. 200 V.
9	23E416	Condenser	Tubular, .05 Mfd. 400 V.
10	23E408	Condenser	Tubular, .005 Mfd. 400 V.
11	23E220	Condenser	Tubular, .2 Mfd. 200 V.
12	23E220	Condenser	Tubular, .2 Mfd. 200 V.
13	20E407	Choke	R. F.
14	23E24	Condenser	Ceramic, .0001 Mfd.
15	23E24	Condenser	Ceramic, .0001 Mfd.
16	23E2024	Condenser	Ceramic Condenser Plate
17	27E475	Resistor	Carbon, 4.7 Megohm, 1/3 W.
18	27E475	Resistor	Carbon, 4.7 Megohm, 1/3 W.
19	27E475	Resistor	Carbon, 4.7 Megohm, 1/3 W.
20	27E225	Resistor	Carbon, 2.2 Megohm, 1/3 W.
21	27E475	Resistor	Carbon, 4.7 Megohm, 1/3 W.
22	27E105	Resistor	Carbon, 1 Megohm, 1/3 W.
23	27E474	Resistor	Carbon, 470,000 Ohm, 1/3 W.
24	27E683	Resistor	Carbon, 68,000 Ohm, 1/3 W.
25	27E104	Resistor	Carbon, 100,000 Ohm, 1/3 W.
26	27E682	Resistor	Carbon, 6,800 Ohm, 1/3 W.
27	27E271	Resistor	Carbon, 270 Ohm, 1/3 W.
28	27E331	Resistor	Carbon, 330 Ohm, 1/3 W.
30	27E471	Resistor	Carbon, 470 Ohm, 1/3 W.
31	27E330-2	Resistor	Carbon, 33 Ohm, 1/2 W.
32	27E680-3	Resistor	Carbon, 68 Ohm, 1 W.
33	27E1005	Resistor	Wire Wound, 1810 and 610 Ohms, 8 W.
*35	57E1-4	Rectifier	Selenium
	OR		
*35	57E1-5	Rectifier	Selenium
36	1E29	Speaker	4" P.M.
*37	28E30	Volume Control	With D.P.S.T. Switch, 2 Megohm
38	29E20	Switch	Spring Return Type
39	24E33	Condenser	Trimmer 3-35 MMF. Working Range

IMPORTANT: When ordering complete cabinet, or cabinet parts, BE SURE TO MENTION REQUIRED COLOR in addition to proper part number.

MISCELLANEOUS PARTS

Part No.	Part Name	Description
*20E343-8	Cabinet	Complete Cabt. Assembly with Handle, Baffle, Loop and Cabt. Back, Ivory.
*20E343-7	Cabinet	Complete Cabt. Assembly with Handle, Baffle, Loop and Cabt. Back, Tan.
20E344-8	Cabinet, less Back	Cabinet Assembly, less Back, but with Handle, Baffle and Loop, Ivory.
20E344-7	Cabinet, less Back	Cabinet Assembly, less Back, but with Handle, Baffle and Loop, Tan.
*7E165-9	Cabinet Back	Back for Cabinet with 65E27 Spring Hinge, Maroon
*7E165-8	Cabinet Back	Back for Cabinet with 65E27 Spring Hinge, Tan
20E253-19	Dial Cord	Dial Drive Cord
65E2	Dial Spring	Dial Cord Tension Spring
20E348	Dial Shaft	Drive Shaft Assembly
5E32	Backplate	Dial Backplate
35E8-8	Dial Pointer	Dial Indicator
20E249	Batt. Connector	B— Battery Connector Assembly
20E249-2	Batt. Connector	B+ Battery Connector Assembly
20E340	"A" Batt. Cable	"A" Battery Cable with Plug
55E21-1	Handle Bracket	Bracket for Mounting Handle
52E31-5	Handle Cover	Plastic Cover, Ivory
52E31-2	Handle Cover	Plastic Cover, Tan
55E39	Handle Strap	Clock Spring Steel
65E27	Hinge	Spring Hinge for Cabinet Back
37E17-9	Knob	Ivory
37E17-6	Knob	Tan
41E14	Line Cord	Line Cord and Plug
17E3-2	Plug	"A" Battery Plug
20E345	Speaker Baffle	Baffle Assembly with Grille Cloth, Tan
20E345-2	Speaker Baffle	Baffle Assembly with Grille Cloth, Ivory

MOUNTING HARDWARE

Part No.	Part Name	Description
13E103-9	Clip	Holds Back to Cabinet
82E37-F10	Screw	6-20x3/8—Holds 13E103-9 Clip to Cabt.
82E37-F10	Screw	6-20x3/8—For Mounting Chassis
10E43	Stud	Trimount, for Mounting Speaker Baffle to Cabinet

SPECIFICATIONS

STOCK NO. 4-C-18

Cabinet Dimensions
11 5/8" x 9 1/4" x 6 5/16"

Weight
7 lbs. 4 oz., less battery

Power Supply
105-125 volt 60 cycle AC-DC or
Self-Contained battery

Tuning Range
545 to 1610 KC

I. F. Frequency
455 KC

Loud Speaker
5 inch P.M.

Voice Coil Impedance
3.2 ohms at 400 cycles

Power Output
Maximum 300 milliwatts

CODE NO. 332-0-186193

Tube Complement
1L4—R. F. Amplifier
1R5—Oscillator Converter
1L4—I. F. Amplifier
1U5—AVC, Detector, 1st Audio
3V4—Power Output

Battery
1 combination A-B battery pack,
9 volt "A", 90 volt "B",
Firestone Stock No. 4-D-130

ALIGNMENT PROCEDURE

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent A.V.C. action from interfering with correct alignment.

For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third, (4) fourth.

Before starting alignment:

(a) Check position of dial pointer. With variable condenser set for maximum capacity (plates completely in mesh) the pointer should be aligned with the extreme left dot on dial backing plate. Adjust pointer to correct position, if necessary.

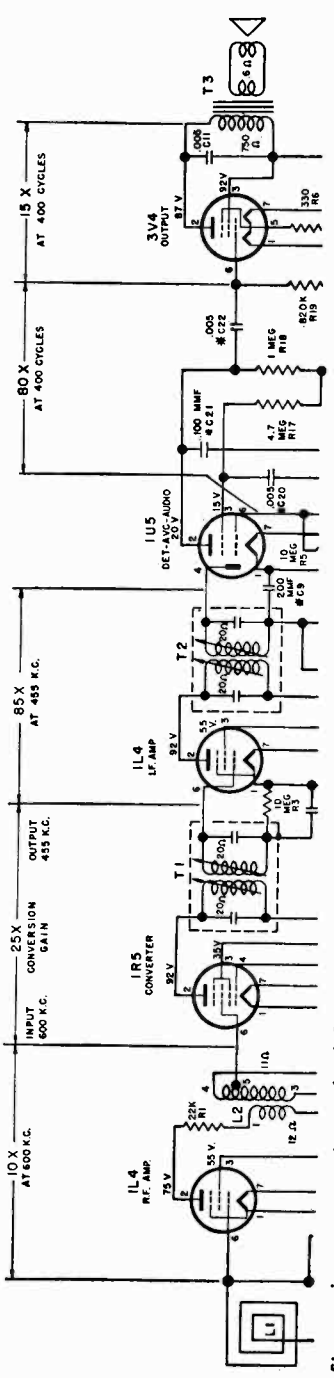
(b) Use an accurately calibrated test oscillator with some type of output measuring device.

Steps	Set receiver dial to:	TEST OSCILLATOR			Refer to parts layout diagram for location of trimmers mentioned below:
		Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to:	
1	Minimum capacity (fully open)	455 K.C.	.1 MFD. condenser	High side to grid of 1R5 tube. Low side to common negative. (through .25 MFD. Cond.)	Adjust each trimmer on the second I. F. transformer for maximum output—then adjust each trimmer on the first I. F. transformer for maximum output.
2	Minimum capacity (fully open)	Exactly 1610 K.C.	.1 MFD. condenser	High side to grid of 1R5 tube. Low side to common negative.	Adjust C6 oscillator trimmer for maximum output.
3	Approx. 1400 K.C.	Approx. 1400 K.C.	.1 MFD. condenser	High side to grid of 1L4, RF Low side to common negative.	Adjust C5, R.F. trimmer for maximum output.
4	Approx. 1400 K.C.	Approx. 1400 K.C.		Loosely coupled to Loop Antenna	Adjust C4 antenna trimmer for maximum output.

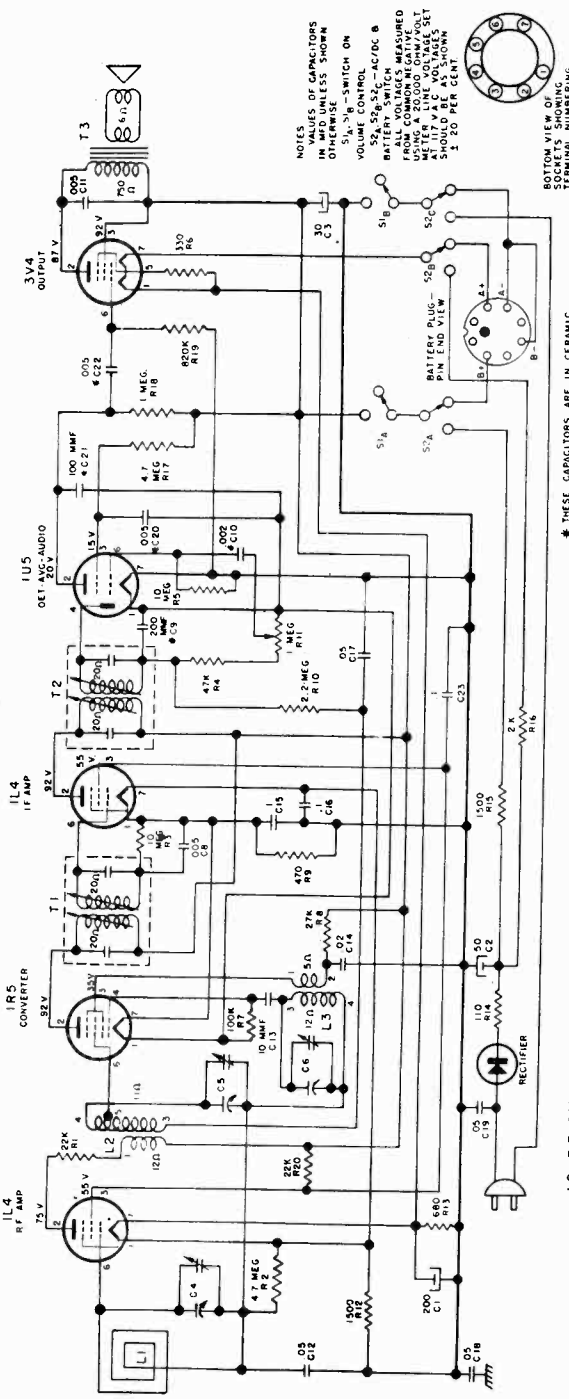
MODEL 4-C-18, Vacationer

Before proceeding with stage measurements be sure the receiver is properly aligned. R.F. gains can be measured by a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe the following precautions:

1. **For gain measurements connect the high side of the signal generator through a .1 MFD condenser to the appropriate point as indicated on the diagram below. The ground of the signal generator should be connected to common negative. The RF and IF measurements are made using 30% 400 cycle modulation.**
2. **Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning).**
3. **When using a "channel" type instrument carefuly tune it for maximum output at desired frequency before making measurements.**



Stage gain measurements can be influenced by the normal manufacturers tolerances allowed in parts, differences in individual tube characteristics, the adjustment of the tuned circuits and variations in line voltage. Careful tuning of the receiver as well as experience in using your test equipment will determine the accuracy of the measurements taken. Due to all of these factors, the stage gains shown in the above diagram are approximate values rather than absolute as it is possible to introduce many variations in these measurements.



MODEL 4-C-18,
Vacationer

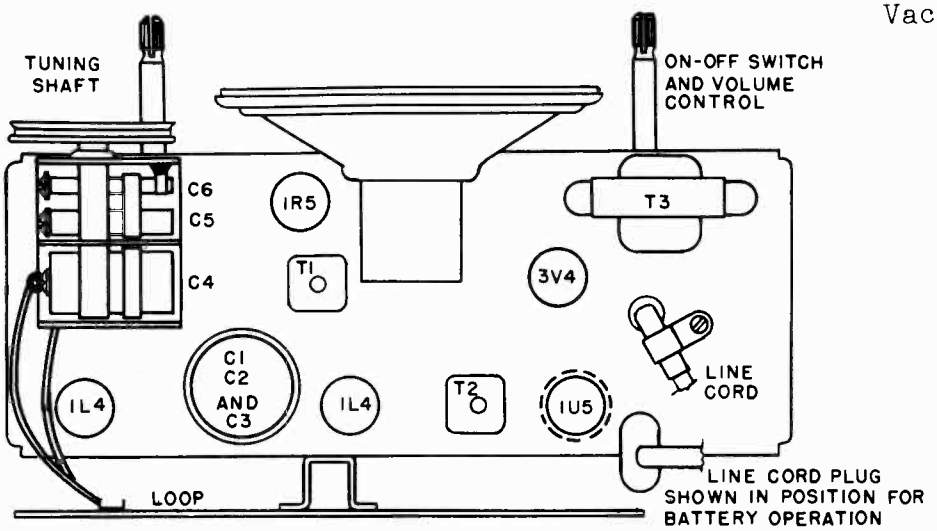


Fig. 2. Chassis—top view

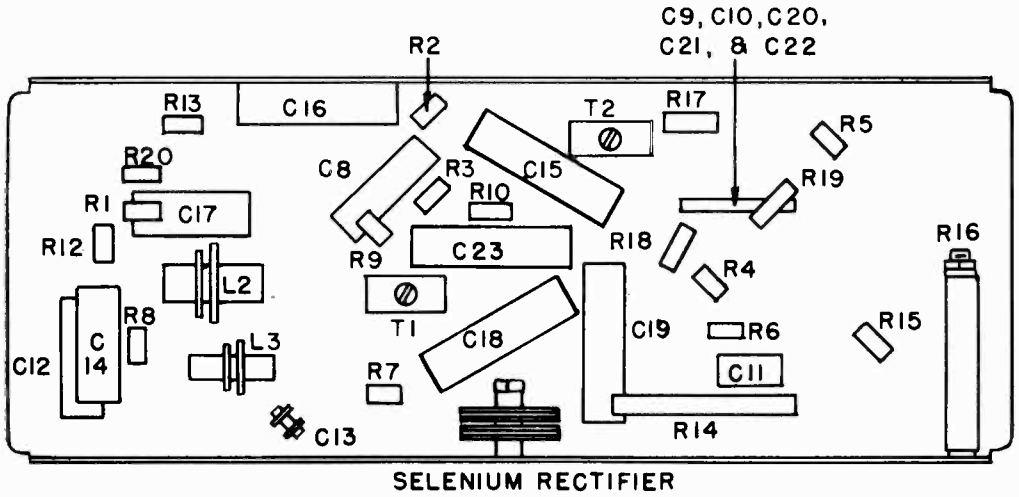


Fig. 3. Chassis—bottom view

PARTS LIST

Circuit Diagram Reference	Part Number	Description
		CONDENSERS
C1, C2, C3	18-296	Capacitor, electrolytic
C4, C5, C6	19-208	Capacitor, variable (3 gang)
C8, C11	16-153	Capacitor, .005 mfd. 600 volt
C9, C10, C20, C21, C22	17-103	Capacitor, ceramic unit
C12, C17	16-152	Capacitor, .05 mfd. 200 volt
C13	15-186	Capacitor, 10 mmfd. mica
C14	16-150	Capacitor, .02 mfd. 400 volt
C15, C16, C23	16-157	Capacitor, .1 mfd. 200 volt
C18, C19	16-179	Capacitor, .05 mfd. 400 volt
		RESISTORS
R1, R20	60-744	Resistor, 22,000 ohm, ½ watt, 10%
R2, R17	60-669	Resistor, 4.7 megohm, ½ watt
R3, R5	60-728	Resistor, 10 megohm, ½ watt
R4	60-730	Resistor, 47,000 ohm, ½ watt
R6	60-704	Resistor, 330 ohm, ½ watt, 10%
R7	60-727	Resistor, 100,000 ohm, ½ watt
R8	60-745	Resistor, 27,000 ohm, ½ watt
R9	60-770	Resistor, 470 ohm, ½ watt, 10%
R10, R19	60-725	Resistor, 2.2 megohm, ½ watt
R12, R15	60-729	Resistor, 1500 ohm, ½ watt, 10%
R13	60-708	Resistor, 680 ohm, ½ watt, 10%
R14	60-796	Resistor, 110 ohm, 3 watt, 10%
R16	60-757	Resistor, 2000 ohm, 10 watt, 5%
R18	60-668	Resistor, 1 megohm, ½ watt
		COILS AND TRANSFORMERS
L1	82-66	Loop, antenna
L2	10-535	R.F. coil
L3	10-553	Oscillator coil
T1, T2	10-508	Transformer, 1st and 2nd I.F.
T3	80-228	Transformer, output
		MISCELLANEOUS
	84-391	Cable, assembly, battery
	83-421	Clip, I.F. transformer mounting
R11, S1	24-186	Control, volume with switch
	23-151	Cord, power, AC/DC
	51-105	Cord, pointer travel, 29"
	47-108	Grommet, variable condenser
	76-13	Insulator, electrolytic
	11-416	Pointer rail bracket
	58-82	Pointer
	83-642	Rectifier, selenium
	75-69	Shaft, tuning
	68-39	Socket, miniature, wafer
	79-384	Speaker, 5" P.M.
	70-122	Spring, dial cord
	69-186	Switch, AC/DC/Battery
	86-51	Washer, "C", tuning shaft
	86-80	Washer, compression, tuning shaft
		CABINET
	44-14	Baffle
	42-469	Cabinet
	31-162	Dial plate
	67-557	Dial scale
	40-162	Escutcheon
	22-161	Fastener, Escutcheon
	98-16	Grille cloth
	52-310	Knob

MODELS 24, 37, 46, Ch. 100, 110

MODEL 37

INPUT 105-125 Volts, 60 Cycle

TUNER CHASSIS CH-110

POWER SUPPLY & AMPLIFIER CHASSIS PS #4

BASS SPEAKER QSD-A6

TREBLE SPEAKER QSD-A4

RECORD CHANGER RC-60

SPECIFICATIONS

POWER CONSUMPTION 250 Watts

TUNING RANGES
(Frequency Modulation.....88 to 108 Megacycles
(Short Wave Band #2.....6.2 to 9.9 Megacycles
(Short Wave Band #1.....12 to 17.5 Megacycles
(Standard Broadcast Band.540 to 1600 Kilocycles

POWER OUTPUT 20 Watts Undistorted

TUBE COMPLEMENT

Quantity	Type	Description
1	6SK7	R. F. Amplifier (AM)
1	6SA7	Oscillator & Converter (AM)
1	6SK7	I. F. Amplifier (AM)
1	6SL7-GT	2nd Det. (AM) First Audio
1	6J5	Bass Boost Amplifier
1	6J5	Audio Amplifier & Phase Inverter
2	6L6-G	Push Pull Power Output
2	5U4-G	Rectifier
1	6AG5	R. F. Amplifier (FM)
1	6AG5	First Detector (FM)
1	6AG5	H. F. Oscillator (FM)
1	6SA7	6.4 Mc. Osc. & 2nd Conv. (FM)
2	6SG7	I. F. Amplifiers (FM)
2	6SH7	Limiters (FM)
1	6H6	Discriminator (FM)
1	6J5-GT	Interstation Noise Suppressor (FM)
1	6U5	Tuning Indicator (FM-AM)

MODELS 24, 37, 46, Ch. 100, 110

Speaker Field Resistance..... 350 Ohms (Bass)

Voice Coil Impedance at 400 cycles..... 8 Ohms (Bass)
3.3 Ohms (Treble)

Intermediate Frequencies..... 455 KC (AM)
10.7 MC (FM)
4.3 MC (FM)

SENSITIVITY

Frequency Modulation..... 10 Microvolts (approximately) to produce complete limiting.
Standard Broadcast Band..... 10 Microvolts (approximately)
Short Wave Band #1..... 10 Microvolts (approximately)
Short Wave Band #2..... 10 Microvolts (approximately)

NOTE: By definition, the sensitivity is equal to the smallest signal input that will produce a standard test output of 0.5 watt in a matched load resistor across the secondary of the output transformer.

SPECIAL FEATURES

FREQUENCY MODULATION

1. A separate gang condenser and completely independent F.M. section is incorporated. Its advantages are extremely good stability and ease in servicing, both electrically and mechanically.

2. A special type of double conversion circuit is used which makes possible the exceptionally good sensitivity and stability of this receiver.

3. Temperature-compensated capacitors are used to insure stability in tuning.

4. Dual limiters are incorporated to insure adequate limiting action and freedom from impulse noises.

5. A special interstation noise silencer circuit is incorporated, which serves to eliminate tube "hiss" or "rush" ordinarily heard on F.M. receivers when there is no F.M. signal present.

6. Provision is made for an indoor or outdoor Dipole antenna. The receiver is furnished with an indoor Dipole antenna fastened to the back of the cabinet.

AMPLITUDE MODULATION

1. Adjustable iron cores are used in the broadcast tuning coils to provide greater accuracy of alignment.

2. Ceramic trimming capacitors are used with the short wave tuning coils for accuracy and stability.

3. Provision is made for 3 types of AM antennae. A loop is mounted in the cabinet for local broadcast reception and binding posts are provided for either a short or long outside antenna.

4. A special bass boost amplifier is incorporated to insure adequate bass compensation.

5. Inverse feedback is used to reduce total harmonic distortion to an extremely low value and to provide high fidelity response.

6. A special high fidelity dual speaker combination is used.

7. The power transformer has been designed to operate at a maximum rise of 50°C above ambient temperature. This feature permits the transformer to run at an appreciably lower temperature than the average commercial transformer.

RECORD CHANGER

Detailed service information will be found in the special record changer instruction book, which is supplied to Freed-Eisemann dealers.

ALIGNMENT INSTRUCTIONS

CAUTION:

This receiver has been carefully aligned at the factory with special equipment designed for aligning frequency modulation receivers operating in the new band, 88 to 108 megacycles. Due to the fact that the proper equipment, such as a wide band frequency modulated signal generator and a wide band oscilloscope, etc., is not yet generally available, it is advisable not to attempt realigning this receiver unless it is absolutely necessary.

If it is necessary to align this receiver in the field, it is imperative that the following instructions be followed exactly.

IMPORTANT

The following equipment must be available before alignment is attempted:

1. Accurately Calibrated SIGNAL GENERATORS, one of which must cover the new FM band 88 to 108 megacycles.

2. ACCURATE Vacuum Tube Voltmeter which has an extremely high input resistance (approximately 10 megohms).

3. A zero center microammeter (100 microampere range each side of center).

4. An insulated low loss high frequency alignment screw driver.

DIAL POINTER ADJUSTMENT

Rotate both gang condensers to the fully closed position and set the dial pointers to the index mark at the low ends of the scales. If adjustment is necessary, make sure to cement the pointer carriage to the dial cord.

ALIGNMENT OF FREQUENCY MODULATED SECTION

CAUTION: Make certain that the signal generator is accurately calibrated and is warmed up for at least a half hour before alignment is attempted.

INTERMEDIATE FREQUENCY (FM)

1. Set the Band Switch to the FM Position.

2. Rotate the gang condenser to its fully open position.

3. Remove 6J5 squelch tube.

4. Connect an extremely high input resistance VTVM across R22 in the grid return circuit of the 1st Limiter Tube (see Schematic Diagram Fig. 1). An alternative method would be to connect the VTVM to the test socket on the back of the chassis. (See test socket on Schematic Diagram, Fig. 1) Use a DC range of approximately 30 volts.

5. Connect the ground terminal on the signal generator output cable to the ground lug on the 6SG7 2nd I.F. tube socket. (See location diagram, Fig. 6)

6. Connect the high side of the signal generator output cable to the grid terminal (Pin #4) of the 6SG7 2nd I.F. tube socket using a 0.1 microfarad capacitor in series with it.

7. Feed in an unmodulated signal at 4.3 megacycles and align the primary and secondary trimmers of the 3rd I.F. transformer for peak reading on VTVM.

   NOTE: In the following steps, keep the reading on the VTVM below 10 volts by adjusting the signal generator output attenuator.

8. Move the signal generator output lead and the 0.1 microfarad capacitor in series with it to the grid terminal (pin No. 4) of the 6SG7 1st I.F. tube socket. Move the ground terminal on the output cable to this tube socket.

9. Align the primary and secondary trimmers of the 2nd I.F. transformer for peak reading on the VTVM.

NOTE: DO NOT REPEAK ANY OF THE I.F. TRANSFORMERS ALREADY ALIGNED.

10. Move the signal generator output lead and the 0.1 microfarad capacitor in series with it to input grid (Pin No. 8) of the 6SA7 2nd converter tube socket.

11. Align the primary and secondary trimmers of the 1st I.F. transformer in the same manner.

12. Connect a zero center microammeter (100 microampere range each side of center) with a 0.5 megohm resistor in series with it across R30 in the discriminator load (from the junction of R28, R30 to ground).

13. Align the primary of the discriminator transformer by adjusting the primary trimmer for maximum reading on the zero center microammeter. (See location diagram, Fig. 7).

14. Remove the zero center microammeter from R30 and connect it across the entire discriminator load (Pin No. 4) of the 6H6 discriminator tube socket to ground. Use a 0.5 megohm resistor in series with high side of microammeter.

15. Align the secondary of the discriminator (See location diagram, Fig. 7) for zero reading on the zero center microammeter.

16. Vary the frequency of the signal generator by an equal amount on each side of resonance (approximately 75 KC) and make sure that the zero center microammeter reads the same value each side of center. If the same readings are not obtained on each side of center, it indicates that the discriminator transformer is not in perfect alignment and the primary and secondary should be realigned.

17. Move the signal generator output lead and the 0.1 microfarad capacitor in series with it to input grid (Pin No. 1) of the 6AG5 first converter tube. This can be accomplished by connecting the signal generator across C-7 (See location diagram, Fig. 7).

18. Introduce an unmodulated signal at 10.7 megacycles.

19. Adjust the iron core of the 6.4 mc. oscillator for peak reading (See location diagram, Fig. 6).

20. Align the primary and secondary iron cores of the 10.7 megacycle I.F. transformer for peak reading on the VTVM. (See location diagram, Fig. 6 and Fig. 7).

NOTE: Make certain that the peak reading on the VTVM occurs when the zero center microammeter reads zero.

RADIO FREQUENCY (FM)

1. Leave the high input resistance VTVM across R22 and the zero center microammeter across the discriminator load. Connect the high frequency signal generator to the FM antenna binding posts using a 150 ohm resistor in series with the high side of the signal generator output cable.

MODELS 24, 37, 46, Ch. 100, 110

2. Set the receiver tuning dial to 92 megacycles.

3. Introduce an unmodulated signal at 92 megacycles.

CAUTION: The high frequency signal generator must be accurately calibrated and warmed up for at least a half hour.

4. Align the high frequency oscillator coil adjustable iron core for maximum reading on the VTVM. (See location diagram, Fig. 7).

NOTE: Make certain that the peak reading on the VTVM occurs when the zero center microammeter reads zero. This can be done by rocking the receiver tuning control slightly until zero is obtained on the microammeter. Keep the reading on the VTVM below 10 volts by reducing the signal generator input.

5. Introduce an unmodulated signal at 106 megacycles and set the FM dial pointer to 106 megacycles.

6. Align the high frequency oscillator trimmer capacitor C13 for peak reading on the VTVM. (See location diagram, Fig. 7). Make certain that the zero center microammeter reads zero when the receiver is tuned to the signal generator frequency.

7. Repeat steps 3 to 7, inclusive.

8. Align the R.F. trimmer capacitor C7 for peak reading on the VTVM in the same manner.

9. Align the antenna trimmer capacitor C1 for peak reading on the VTVM in the same manner. The peak reading on the VTVM should coincide with zero reading on the microammeter.

10. Replace 6J5 squelch tube.

ALIGNMENT OF AMPLITUDE MODULATED SECTION

INTERMEDIATE FREQUENCY (AM)

1. Set the band switch to the STANDARD BROADCAST POSITION.

2. Connect an output meter across the voice coil.

3. Rotate the gang condenser to its fully open position.

4. Rotate the volume control to its maximum clockwise position.

5. Rotate the bass control to its minimum position.

6. Connect the ground terminal on the standard signal generator to the ground lug on the 6SK7 I.F. tube socket.

7. Connect the high side of the signal generator output cable to the grid terminal (Pin No. 4) of the 6SK7 I.F. tube socket. Use a 0.1 microfarad capacitor in series.

8. Introduce a 455 KC signal modulated 30% at 400 cycles.

9. Align the secondary and primary trimmers of the output I.F. transformer for peak reading on the output meter.

NOTE: IN THE FOLLOWING STEPS KEEP THE OUTPUT METER READING BELOW 3 VOLTS BY ADJUSTING SIGNAL GENERATOR OUTPUT ATTENUATOR.

10. Move the signal generator output cable and the 0.1 microfarad capacitor in series with the high side to Pin No. 8 of the 6SA7 converter tube socket. This can be accomplished by connecting the signal generator output cable to the stator of the center section on the tuning condenser.

11. Align secondary and primary trimmers of the input I.F. transformer for peak reading on the output meter.

CAUTION: DO NOT REPEAK ANY OF THE I.F. TRANSFORMERS ALREADY ALIGNED.

RADIO FREQUENCY (STANDARD BROADCAST)

1. Set the ANT-LOOP Switch to the OUTSIDE ANT. position. (See location drawing).

2. Set the dial pointer to 1000 KC.

3. Connect the signal generator output cable to the AM antenna binding posts using a 200 mmfd. capacitor in series with the high side.

4. Introduce a 1000 KC signal modulated 30% at 400 cycles.

5. Align the oscillator coil adjustable iron core (See location diagram, Fig. 7) for peak reading on the output meter.

6. Set the dial pointer to 600 KC.

7. Introduce a 600 KC signal modulated 30% at 400 cycles.

8. Align the low end of the oscillator range by adjusting the padding capacitor, C54, for peak reading on output meter. (See location diagram, Fig. 7).

9. Align the ANTENNA and R.F. coils by adjusting the iron cores for peak reading.

10. Now rotate the gang condenser until the dial pointer reads "1500 KC".

11. Introduce a 1500 KC signal modulated 30% at 400 cycles.

12. Align the high end of the broadcast oscillator range by adjusting the oscillator trimmer C53 for peak reading on the output meter. (C53 is mounted on the gang condenser, see Fig. 7).

13. Align the ANTENNA and R.F. trimmer capacitors for peak reading. The R.F. trimmer capacitor C47 is mounted on the gang condenser. The antenna trimmer capacitor C38 is mounted under the chassis. (See location diagram, Fig. 6).

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46, Ch. 100, 110

NOTE: It may be necessary, if the receiver is far out of alignment, to repeat steps 2 to 13 inclusive, since each of the adjustments is affected by the others.

14. Set the ANT-LOOP switch to LOOP position and align loop trimmer for peak reading on output meter. Use a broadcast station at approximately 1400 KC as a signal source.

SHORT WAVE (BAND #2)

1. Set the band switch to Short Wave Band #2.
2. Set the ANT-LOOP switch to the OUTSIDE ANTENNA position.
3. Set the dial pointer to 9.9 megacycles.
4. Turn chassis bottom side up.
5. Introduce a 9.9 megacycle signal modulated 30% at 400 cycles using a 400 ohm resistor in series with the signal generator output lead.
6. Align the S.W. #2 oscillator trimmer C51 for peak reading on the output meter. (See location diagram, Fig. 8).
7. Align the S.W. #2 antenna and R.F. trimmers for peak reading on the output meter.

SHORT WAVE (BAND #1)

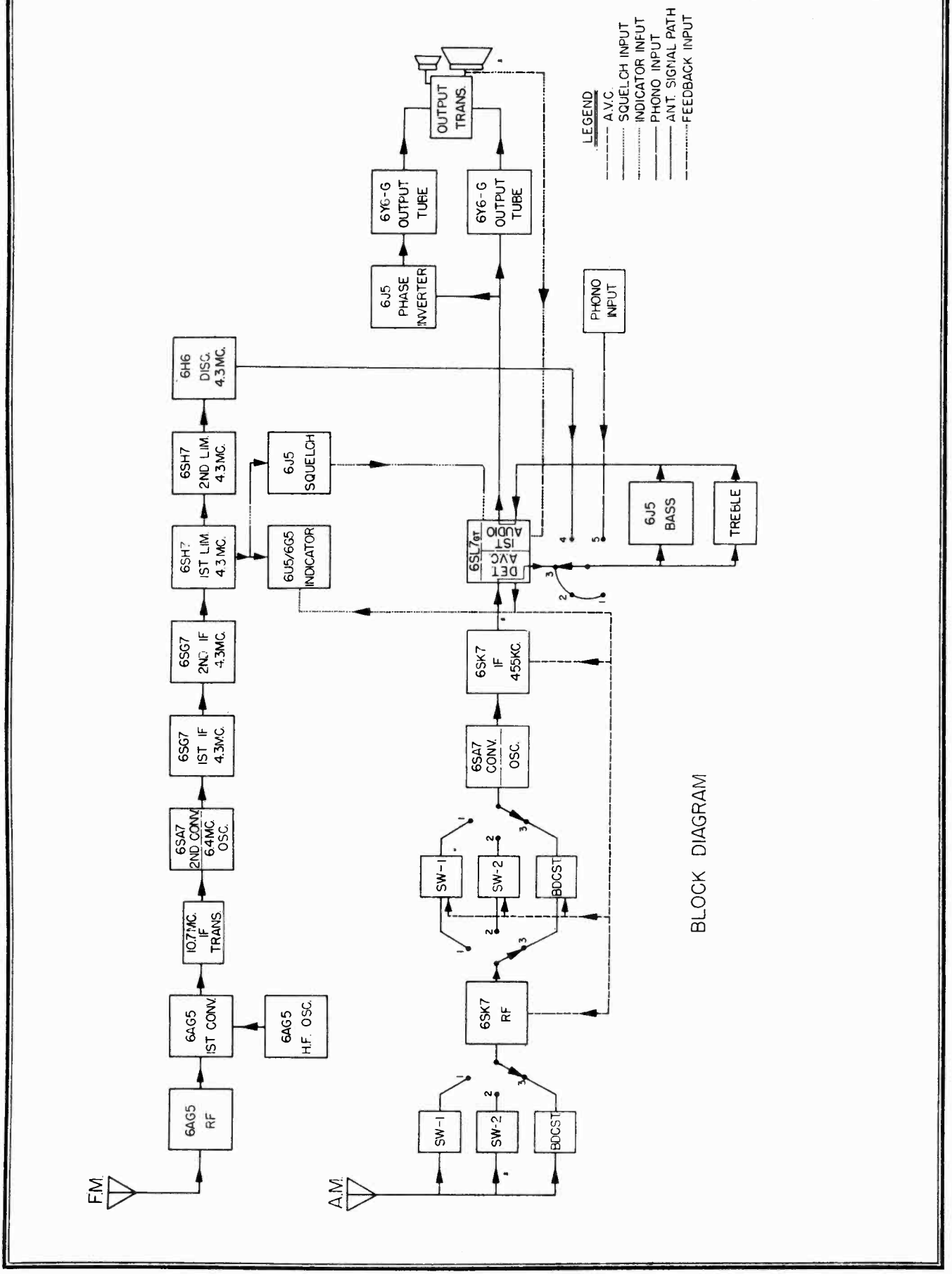
1. Set the band switch to short wave band #1.
2. Set the dial pointer to 17.5 megacycles.
3. Introduce a 17.5 megacycle signal modulated 30% at 400 cycles.
4. Align the S.W. #1 oscillator trimmer C50 for peak reading on the output meter.
5. Align the S.W. #1 antenna and R.F. trimmers for peak reading on the output meter. (See location diagram, Fig. 8).

WAVE TRAP ALIGNMENT

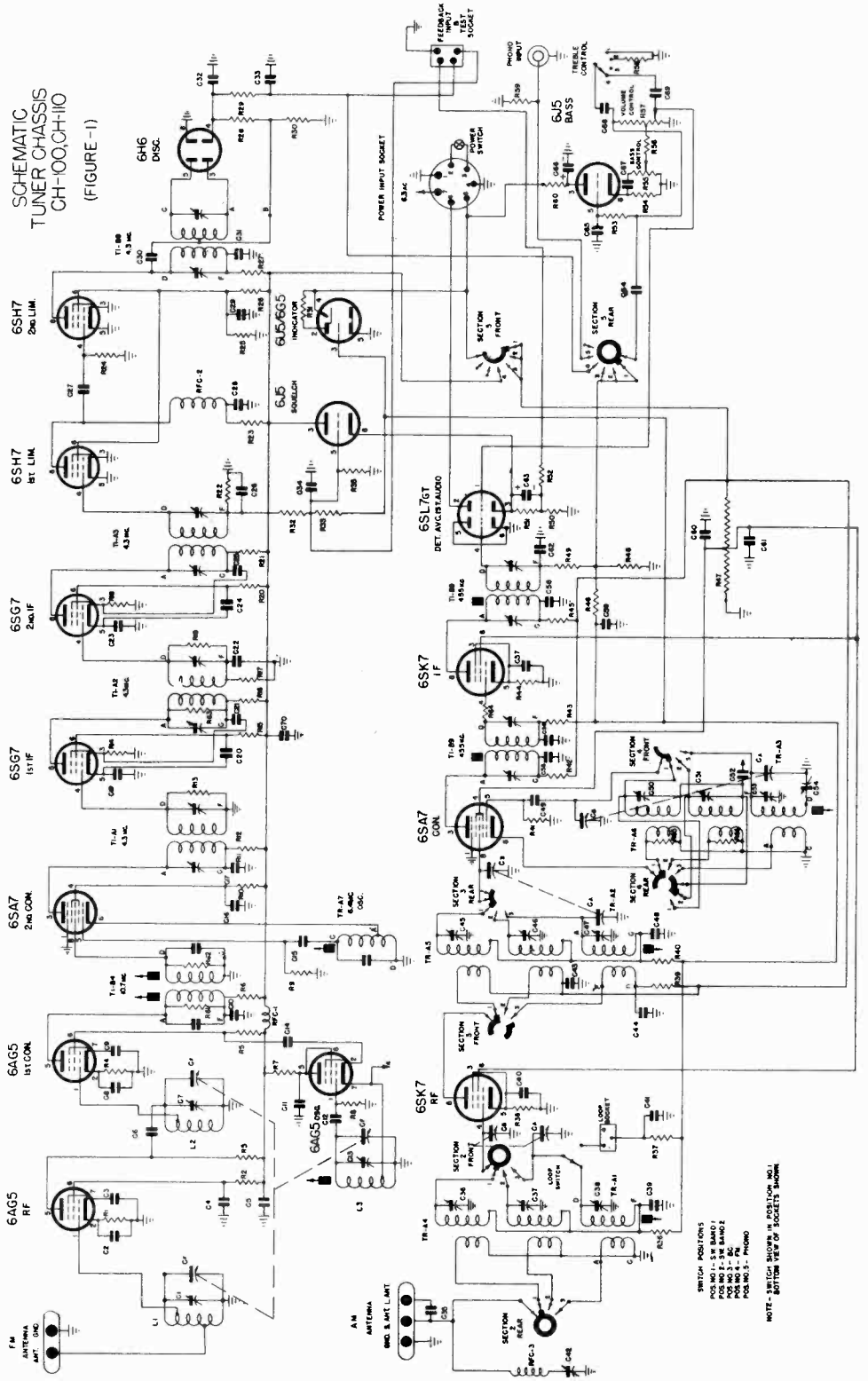
1. Set the band switch to the standard broadcast position.
2. Set the dial pointer to 1000 kilocycles.
3. Introduce a strong 455 KC signal modulated 30% at 400 cycles into the antenna binding posts.
4. Adjust the wave trap trimmer C42 for MINIMUM reading on the output meter. (See location diagram, Fig. 8).
5. Set the ANT-LOOP switch back to LOOP position. Remove signal generator and output meter leads.

NOTE: The ANT-LOOP switch should be set in that position required for either OUTSIDE ANTENNA or LOOP depending upon which the customer is using.

MODELS 24, 37, 46, Ch. 100, 110



MODELS 24, 37,
46, Ch. 100, 110



MODELS 24, 37, 46, Ch. 100, 110

RESISTANCE VALUES
FOR
CH-100-110 SCHEMATIC

SYMBOL	VALUE	SYMBOL	VALUE	SYMBOL	VALUE
R-1	200 OHM	R-22	51 K	R-43	100 K
R-2	68 K	R-23	100 K	R-44	1000 OHM
R-3	10 K	R-24	24 K	R-45	3600 OHM
R-4	1000 OHM	R-25	22 K	R-46	1 Meg.
R-5	270 K	R-26	39 K, 1 W.	R-47	10 K, W.W.TAP. 5 K
R-6	1000 OHM	R-27	100 K	R-48	270 K
R-7	30 K	R-28	100 K	R-49	51 K
R-8	39 K	R-29	75 K	R-50	20 OHM
R-9	22 K	R-30	100 K	R-51	3600 OHM
R-10	15 K, 2 W.	R-31	1 Meg.	R-52	1500 OHM
R-11	3600 OHM	R-32	510 K	R-53	220 K
R-13	50 K	R-33	2.2 meg.	R-54	5100 OHM
R-14	200 OHM	R-35	1 Meg.	R-55	10 K, BASS
R-15	39 K	R-36	100 K	R-56	51 K
R-16	3600 OHM	R-37	100 K	R-57	500 K, VOL.
R-17	100 K	R-38	390 OHM	R-58	68 K
R-18	50 K	R-39	5100 OHM	R-59	1 Meg.
R-19	390 OHM	R-40	100 K	R-60	10 K
R-20	39 K	R-41	22 K	R-61	51 K
R-21	3600 OHM	R-42	3600 OHM	R-62	51 K
				R-63	51 K
				R-64	1000 OHM
				R-65	510 OHM
				R-66	200 OHM

NOTE:- ALL 1/2 WATT UNLESS OTHERWISE NOTED.

FIG. 2

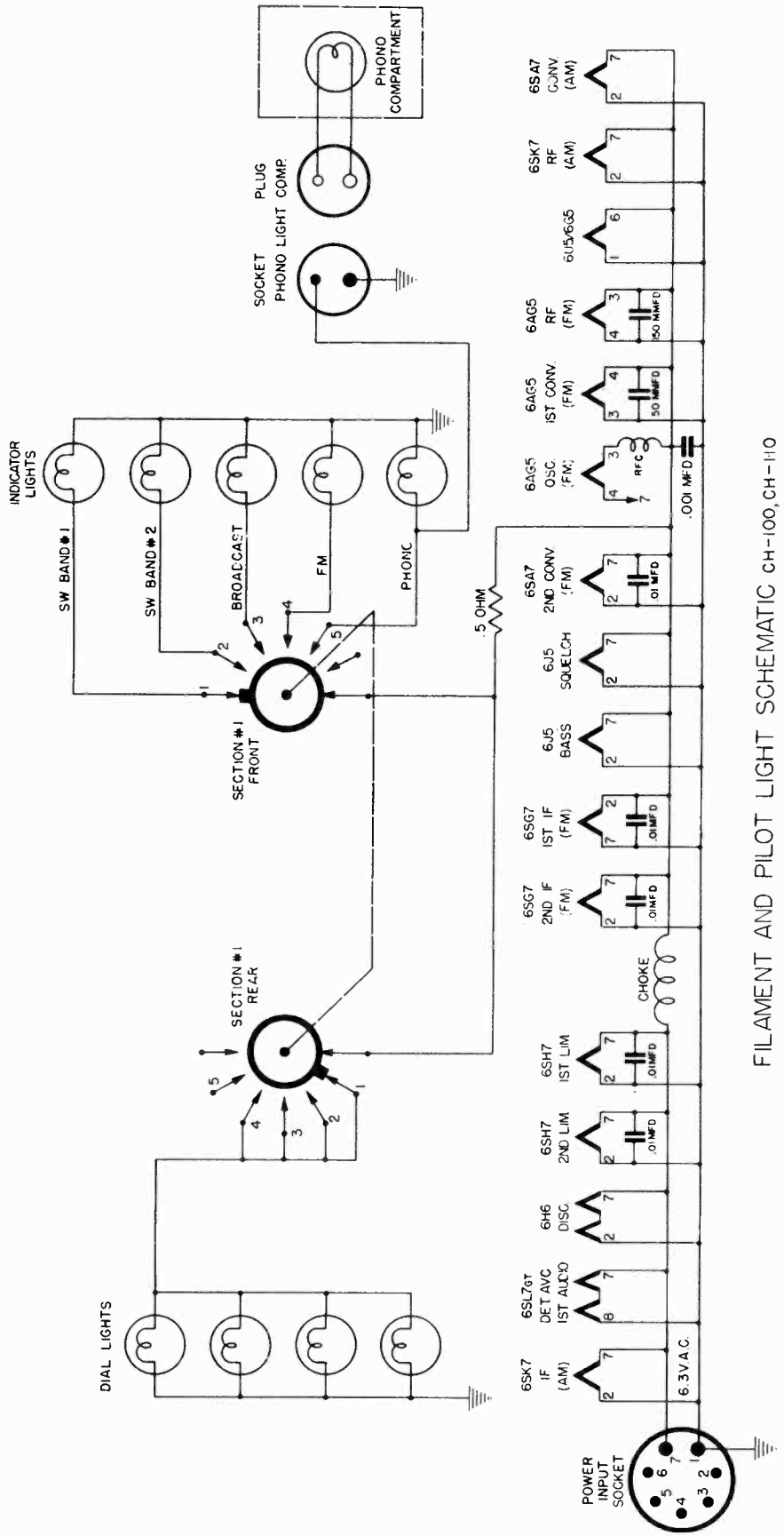
MODELS 24, 37, 46, Ch. 100, 110

CAPACITOR VALUES
FOR
CH-100-110 SCHEMATIC

SYMBOL	VALUE	SYMBOL	VALUE	SYMBOL	VALUE
C-1	1.5 to 7 mmfd Ceramic	C-24	.01 mfd Mica	C-47	4 - 30 mmfd Ceramic
C-2	510 mmfd Mica	C-25	.01 mfd Mica	C-48	.05 mfd, 400 V.
C-3	510 mmfd Mica	C-26	51 mmfd Ceramic	C-49	62 mmfd, Ceramic
C-4	.001 mfd Mica	C-27	51 mmfd Ceramic	C-50	4 - 30 mmfd Ceramic
C-5	.001 mfd Mica	C-28	.01 mfd Mica	C-51	4 - 30 mmfd Ceramic
C-6	51 mmfd Ceramic	C-29	.01 mfd Mica	C-52	.001 mfd Mica
C-7	1.5 to 7 mmfd Ceramic	C-30	100 mmfd Mica	C-53	4 - 30 mmfd Ceramic
C-8	.001 mfd Mica	C-31	.01 mfd Mica	C-54	200-600 mmfd Padder
C-9	.001 mfd Mica	C-32	100 mmfd Mica	C-55	.05 mfd, 400 V.
C-10	.01 mfd Mica	C-33	.001 mfd Mica	C-56	.05 mfd, 400 V.
C-11	.001 mfd Mica	C-34	.01 mfd Mica	C-57	.05 mfd, 400 V.
C-12	24 mmfd Ceramic	C-35	24 mmfd Ceramic	C-58	.05 mfd, 400 V.
C-13	1.5 to 7 mmfd Ceramic	C-36	4 - 30 mmfd Ceramic	C-59	.05 mfd, 400 V.
C-14	.001 mfd Mica	C-37	4 - 30 mmfd Ceramic	C-60	.05 mfd, 400 V.
C-15	51 mmfd Ceramic	C-38	4 - 30 mmfd Ceramic	C-61	.05 mfd, 400 V.
C-16	.01 mfd Mica	C-39	.05 mfd, 400 V.	C-62	100 mmfd Mica
C-17	.01 mfd Mica	C-40	.05 mfd, 400 V.	C-63	25 mfd, 50 Volt
C-19	.01 mfd Mica	C-41	.05 mfd, 400 V.	C-64	.05 mfd, 400 V.
C-20	.01 mfd Mica	C-42	10 - 80 mmfd, Trimmer	C-65	.005 mfd, 400 V.
C-21	.01 mfd Mica	C-43	.01 mfd, 400 V.	C-66	8 mfd, 450 V.
C-22	.01 mfd Mica	C-44	.05 mfd, 400 V.	C-67	.5 mfd, 400 V.
C-23	.01 mfd Mica	C-45	4 - 30 mmfd, Ceramic	C-68	.005 mfd, 400 V.
		C-46	4 - 30 mmfd, Ceramic	C-69	62 mmfd Ceramic
				C-70	.01 mfd Mica

FIG. 3

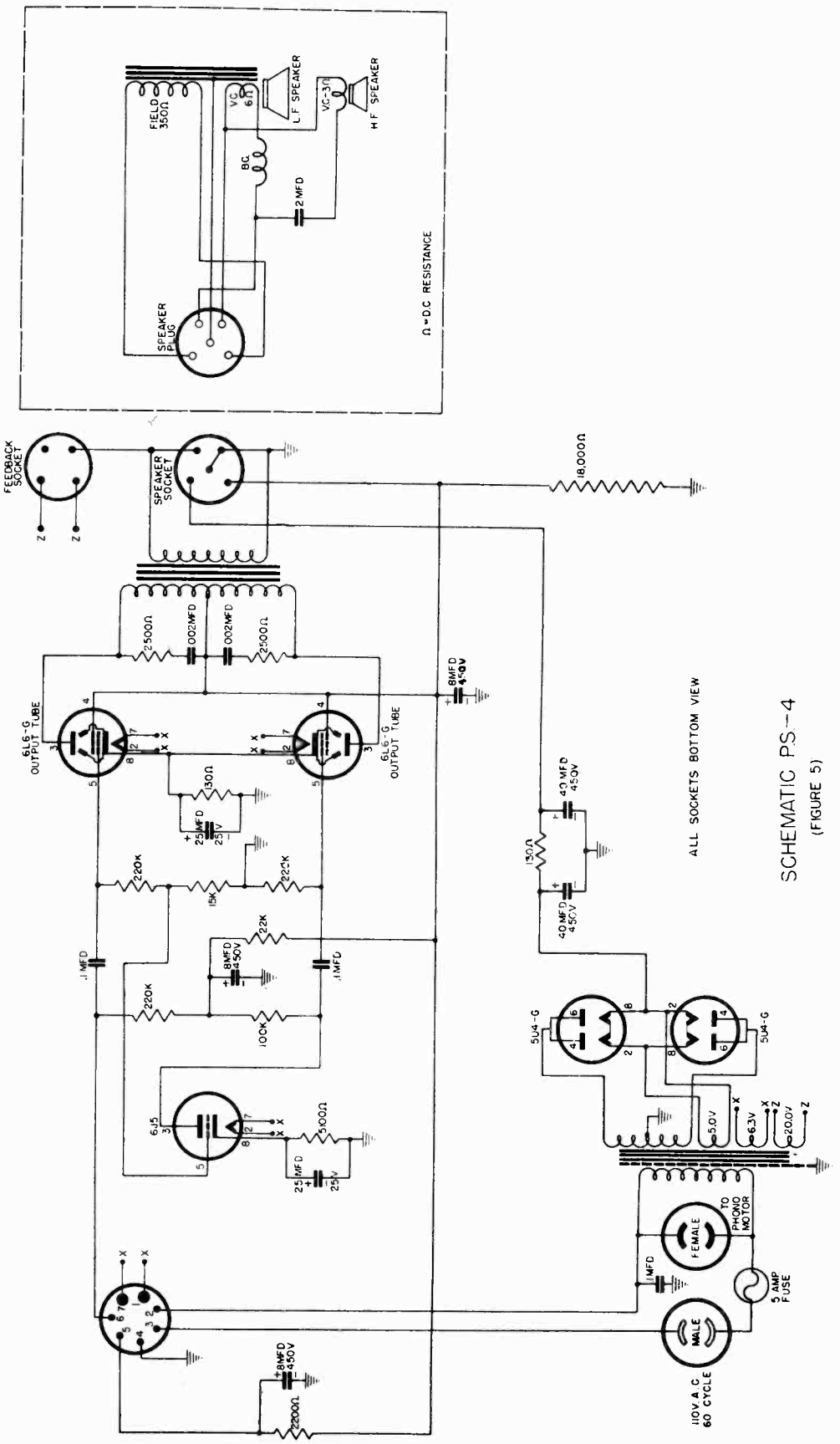
MODELS 24, 37, 46, Ch. 100, 110



FILAMENT AND PILOT LIGHT SCHEMATIC CH-100, CH-110

(FIGURE 4)

MODELS 24, 37, 46, Ch. 100, 110



MODELS 24, 37, 46, Ch. 100, 110

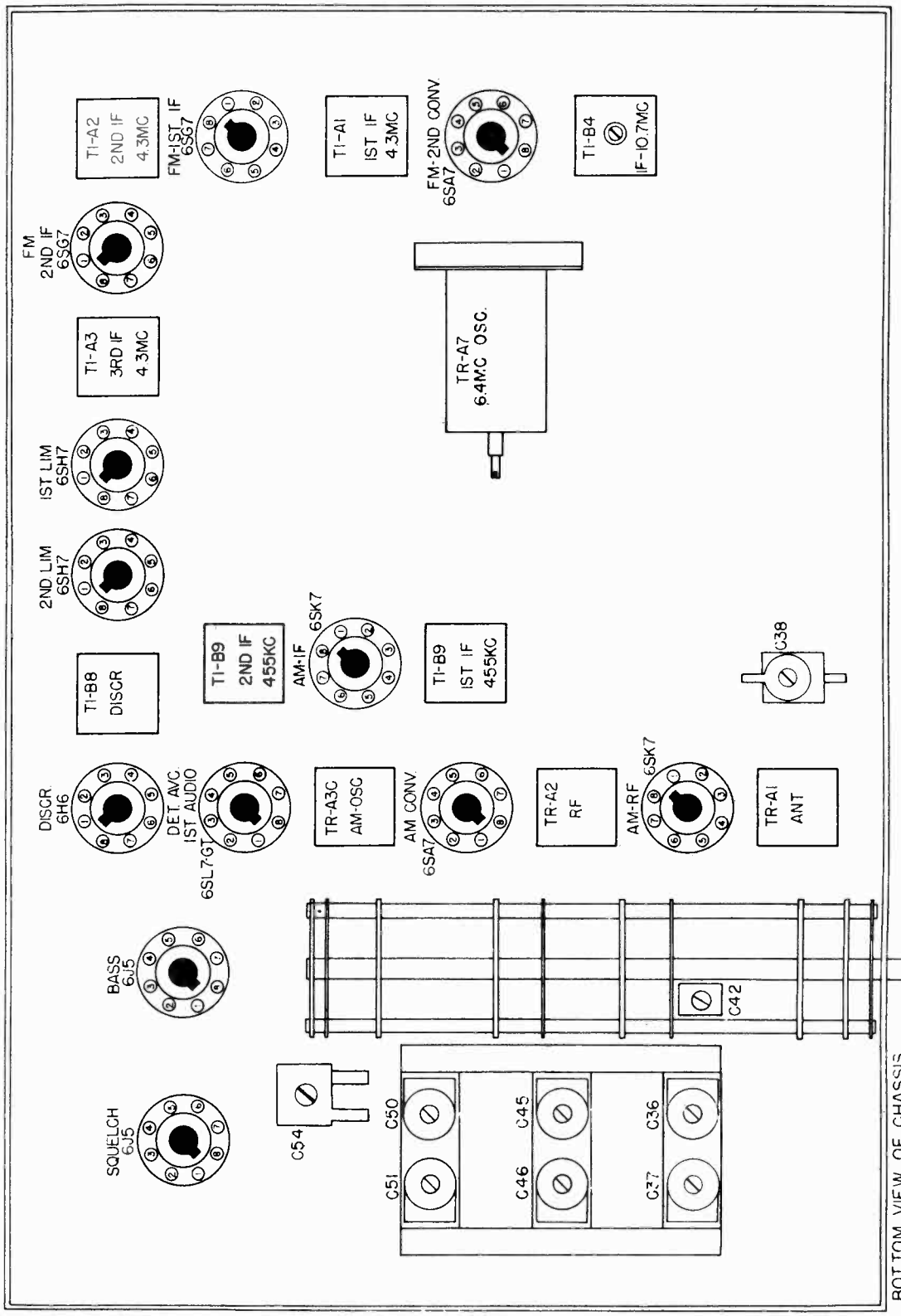
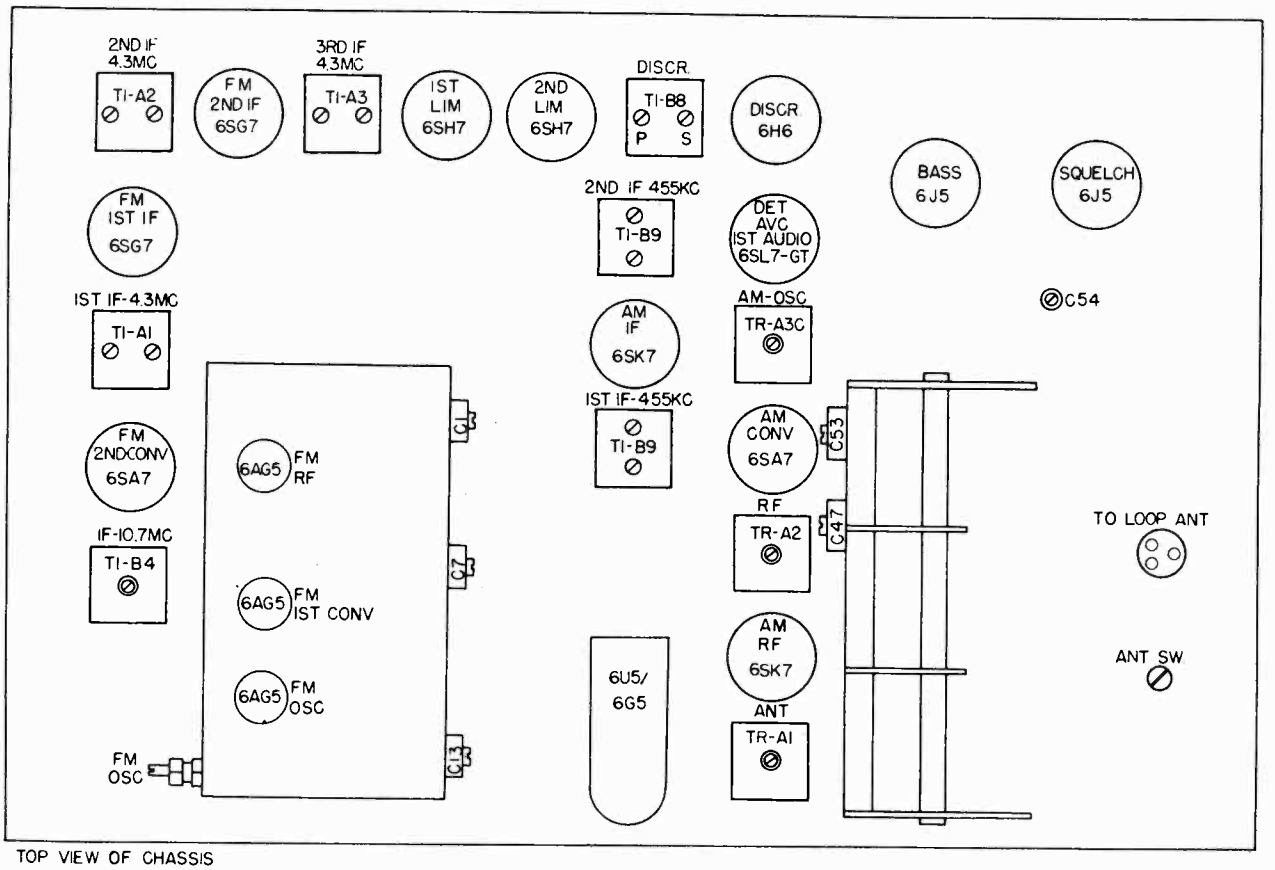
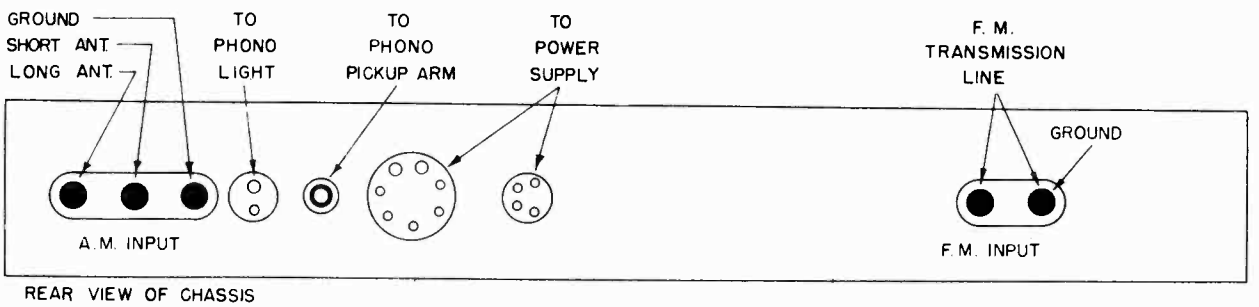


FIG. 6-PARTS LOCATION

MODELS 24, 37,
46, Ch. 100, 110



TOP VIEW OF CHASSIS



REAR VIEW OF CHASSIS

FIG.-7-PARTS LOCATION

MODELS 24, 37, 46, Ch. 100, 110

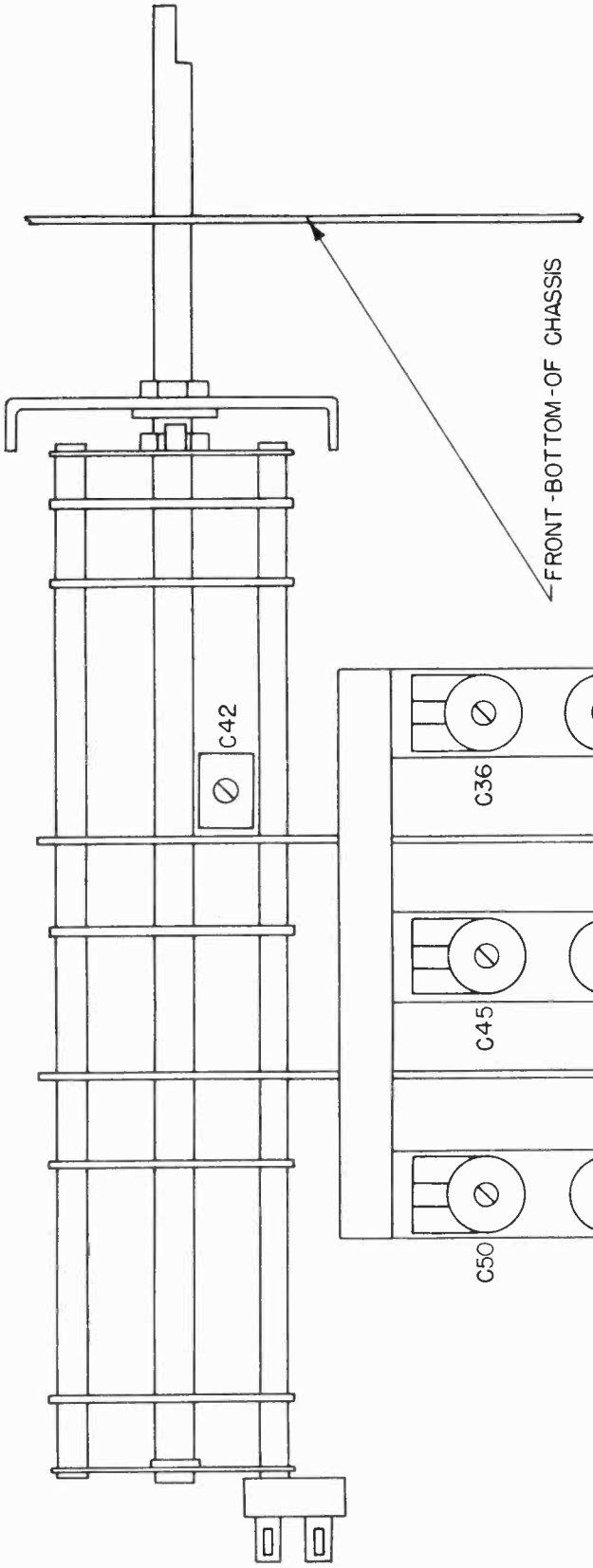


FIG. 8-PARTS LOCATION

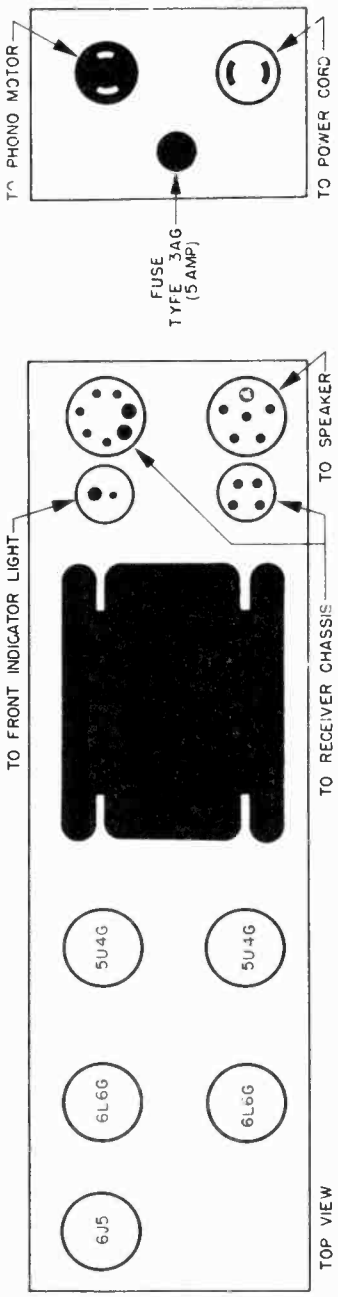


FIG. 9-PARTS LOCATION P.S.-4

MODELS 24, 37, 46, Ch. 100, 110

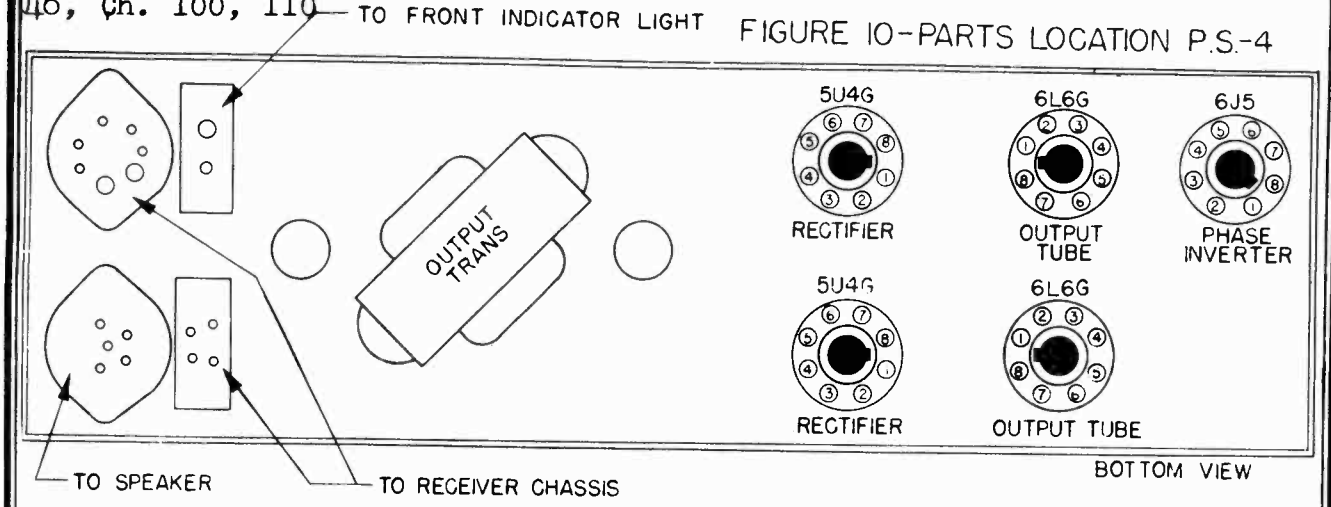


FIGURE 10-PARTS LOCATION P.S.-4

TABLE OF RESISTANCE MEASUREMENTS-TUNER CHASSIS CH-110

FIGURE 11

TUBE	FUNCTION	PLATE TO GROUND	SCREEN TO GROUND	CONTROL GRID TO GROUND	CATHODE TO GROUND
6SK7	AM-R.F.	9,000	4,000	1 MEG.	400
6SA7	AM-CONV.	9,000	4,000	1 MEG.	0
6SK7	AM-I.F.	9,000	4,000	1 MEG.	1,000
6SL7-GT	AM-DET. 1st AUDIO	0 250,000	--- ---	300,000 370,000	0 3,600
6J5	BASS AMP.	15,000	---	550,000	5,100
6AG5	FM-R.F.	20,000	75,000	0	200
6AG5	FM-1st CONV:	10,000	270,000	0	1,000
6AG5	FM-H.F.O.	40,000	---	40,000	0
6SA7	FM-2nd CONV.	12,000	22,000	0	0
6SG7	FM-1st I.F.	13,500	49,000	100,000	200
6SG7	FM-2nd I.F.	13,500	49,000	100,000	390
6SH7	1st LIMITER	110,000	15,000	51,000	0
6SH7	2nd LIMITER	110,000	15,000	24,000	0
6H6	DISCRIMINATOR	100,000	100,000	---	200,000
6J5-GT	INTERSTATION NOISE SUPPR.	10,000	---	300,000	3,600
6U5	TUNING INDICATOR	1 meg.	---	1 MEG.	0

MODELS 24, 37, 46, Ch. 100, 110

TABLE OF RESISTANCE MEASUREMENTS - P.S. #4 — FIGURE 12

TUBE	FUNCTION	PLATE TO GROUND	SCREEN TO GROUND	CONTROL GRID TO GROUND	CATHODE TO GROUND
6J5-GT	PHASE INV.	120,000	----	17,000	5,100
6L6-G	OUTPUT	7,000	7,000	220,000	130
6L6-G	OUTPUT	7,000	7,000	220,000	130
5U4-G	RECTIFIER	300	----	----	7,500
5U4-G	RECTIFIER	300	----	----	7,500

TABLE OF VOLTAGE MEASUREMENTS-TUNER CHASSIS CH-110 — FIGURE 13

TUBE	FUNCTION	PLATE TO GROUND	SCREEN TO GROUND	CONTROL GRID TO GROUND	CATHODE TO GROUND	
6SK7	AM-R.F.	190	80	---	2.0	BAND SWITCH IN BROADCAST POSITION
6SA7	AM-CONV.	190	80	6.0 *	---	
6SK7	AM-I.F.	190	80	---	3.5	
6SL7-GT	1st AUDIO	100	---	---	1.4	
6J5	BASS AMP.	180	---	---	8.5	
6AG5	FM-R.F.	150	100	---	1.0	BAND SWITCH IN F. M. POSITION
6AG5	FM-1st CONV.	190	85	---	2.0	
6AG5	FM-H.F.O.	90	---	4.0 *	---	
6SA7	FM-2nd CONV.	180	85	12.0 *	---	
6SG7	FM-1st I.F.	170	105	---	1.75	
6SG7	FM-2nd I.F.	170	115	---	3.0	
6SH7	1st LIMITER	13	45	---	---	
6SH7	2nd LIMITER	45	45	---	---	
6H6	DISCRIMINATOR	---	---	---	---	
6J5-GT	INTERSTATION NOISE SUPPR.	190	---	---	6.5	
6U5	TUNING IND.	SUPPLY 190	---	---	---	

NOTE: Above values are measured with a 20,000 ohm per voltmeter and with no signal applied.

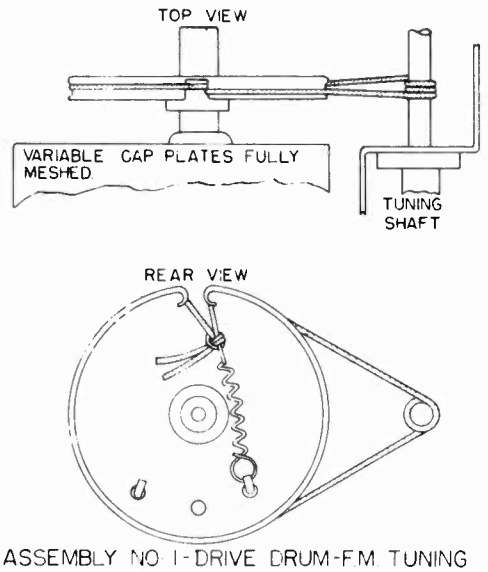
Measured with vacuum tube voltmeter and 1 megohm resistor in series with test prod.

MODELS 24, 37, 45, Ch. 100, 110

FIGURE 14

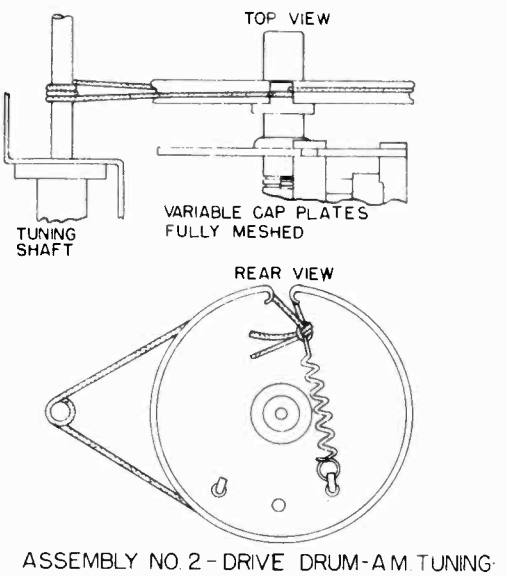
TABLE OF VOLTAGE MEASUREMENTS - P.S. #4

TUBE	FUNCTION	PLATE TO GROUND	SCREEN TO GROUND	CONTROL GRID TO GROUND	CATHODE TO GROUND
6J5-GT	PHASE INV.	160	----	----	6.5
6L6-G	OUTPUT	300	300	----	20
6L6-G	OUTPUT	300	300	----	20
5U4-G	RECTIFIER	360 AC	----	----	400
5U4-G	RECTIFIER	360 AC	----	----	400



ASSEMBLY NO. 1 - DRIVE DRUM - F.M. TUNING

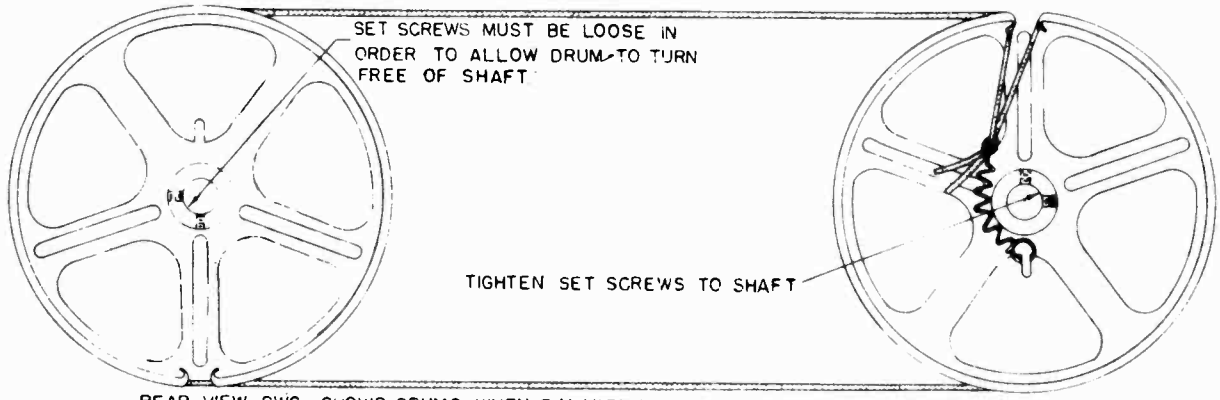
FIGURE 15A



ASSEMBLY NO. 2 - DRIVE DRUM - A.M. TUNING

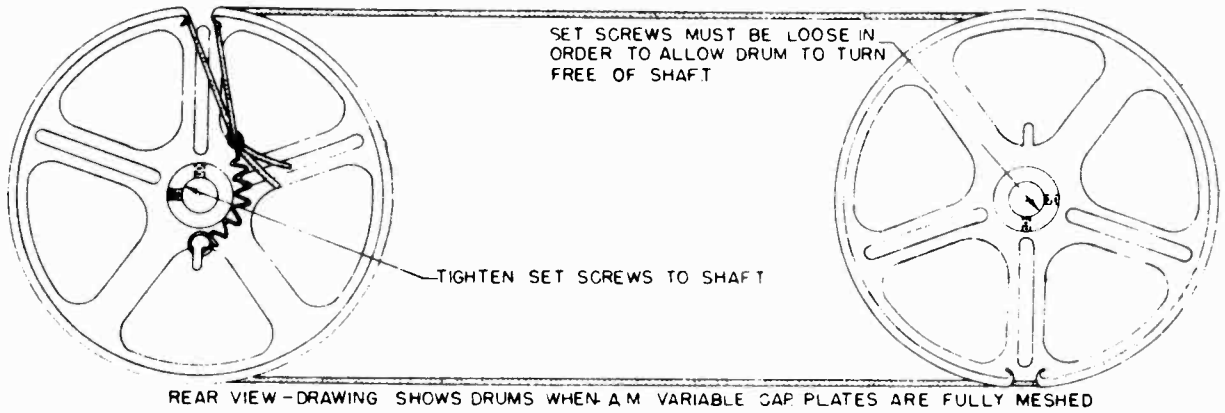
FIGURE 15B

MODELS 24, 37, 46, Ch. 100, 110



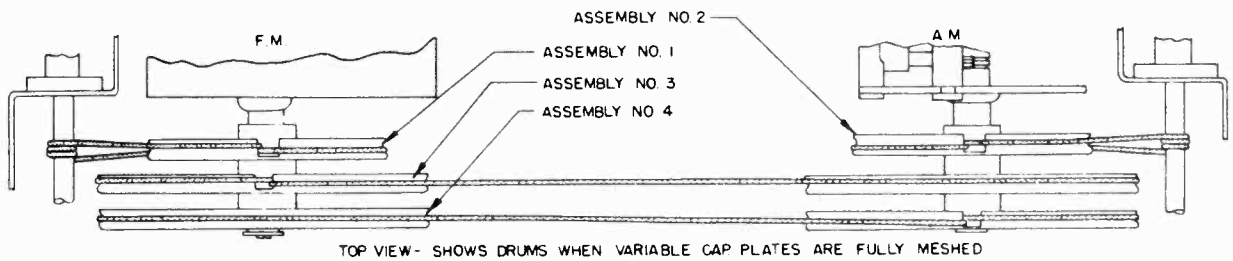
ASSEMBLY NO. 3- DIAL DRUM-F.M. TUNING

FIGURE 15C



ASSEMBLY NO 4- DIAL DRUM-A.M TUNING

FIGURE 15D



NOTE
SEE ASSEMBLY DETAIL DRAWINGS FOR PROPER ASSEMBLY SEQUENCE

DIAL CABLE ASSEMBLY

FIGURE 15E

MODELS 24, 37,
46, Ch. 100, 110

FIGURE 16

REPLACEMENT PARTS LIST
CH-110 Tuner

PART NO.	DESCRIPTION
A-A11	Pointer, AM
A-A45	Pointer, FM
LC-B1	Loop, AM
LC-A2	Choke, R.F., 1 Mh.
ND-D4	Dial, Glass
OK-A1	Knob
PL-A1	Plug for Phono Motor
PL-A2	Plug for Line Cord
RVC-A1	Volume Control
RVC-A2	Bass Control
RW-A1	Resistor, Wire Wound
SR-B1	Switch, Wave Band
SR-A2	Switch, Treble Control
SR-A3	Switch, Ant-Loop
TI-A1	Transformer, I.F., 4.3 Mc., Input
TI-A2	Transformer, I.F., 4.3 Mc., Interstage
TI-A3	Transformer, I.F., 4.3 Mc., Output
TI-B4	Transformer, I.F., 10.7 Mc.
TI-B8	Discriminator, FM, 4.3 mc.
TI-B9	Transformer, I.F., 455 KC.
TR-A1	Coil, Antenna, AM
TR-A2	Coil, R.F., AM
TR-A3	Coil, Oscillator, AM
TR-A4	Coil, Antenna, Short Wave
TR-A5	Coil, R.F., Short Wave
TR-A6	Coil, Oscillator, Short Wave
TR-A7	Coil, Oscillator, FM
W-A6	Cable, 7-wire Power Supply

Power Supply #4

PART NO.	DESCRIPTION
CE-A2	Capacitor, Electrolytic
QSD-A6	Speaker, 12"
QSD-A4	Speaker, 5"
RW-A2	Resistor, Wire Wound, 2200 Ohms
RW-A3	Resistor, Wire Wound, Bleeder
RW-A4	Resistor, Wire Wound, 130 Ohms
TP-C1	Transformer, Power

NOTE: SPECIAL REPLACEMENT ITEMS LISTED. PARTS NOT LISTED MAY BE OBTAINED FROM FREED RADIO CORPORATION.