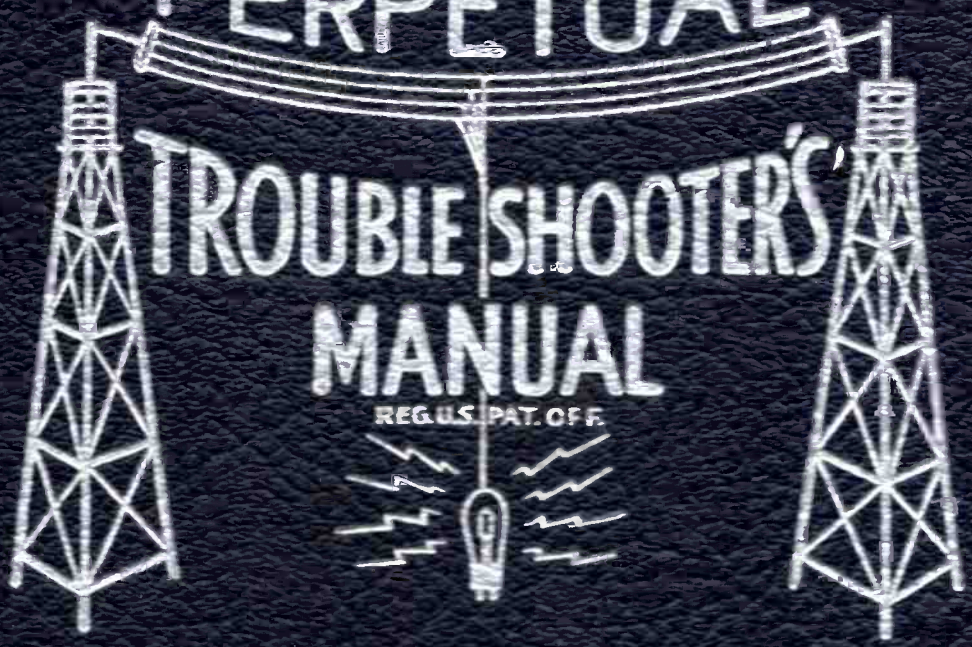
VOLUME XX

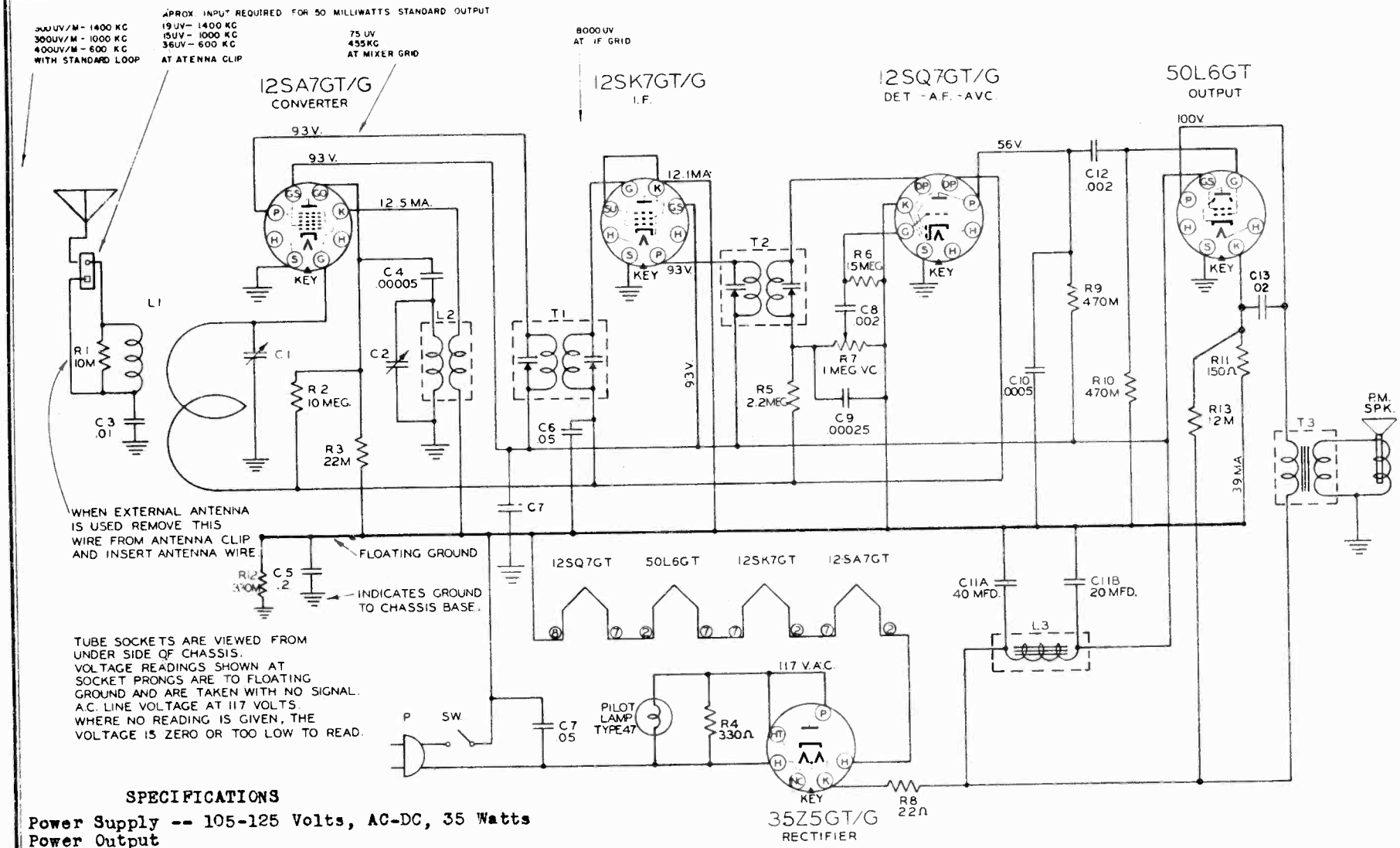
PERPETUAL TROUBLE SHOOTER'S MANUAL

REG. U.S. PAT. OFF.



JOHN F. RIDER

MODELS 6011, Ch. 132.816;
6012. Ch. 132.816A



SPECIFICATIONS

Power Supply -- 105-125 Volts, AC-DC, 35 Watts
Power Output
Undistorted 1.1 Watts, Maximum - 2.36 Watts
Tuning Range Broadcast Band 54-1600 Kc
Speaker
Voice Coil Impedance 3.2 Ohms

Note: On some sets C13, condenser was connected from the plate to the screen grid of the output tube instead of from plate to cathode.
Some sets do not have the B+ bypass condenser C7, (from the screen lug of the 12SA7 tube socket to chassis).

Difference between 6011 and 6012:

Model 6011 has a walnut cabinet. Model 6012 has an ivory cabinet.
Chassis 132.816 has walnut pushbuttons. Chassis 132.816A has ivory pushbuttons.

MODELS 6011, Ch. 132.816;
6012, Ch. 132.816A

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection ..... Across Speaker Voice Coil
Output meter reading to indicate 50 mw (Standard output)..... .4 Volt
Generator modulation..... 30% 400 Cycles
Position of volume control ..... Fully Clockwise
Position of dial pointer with variable condenser fully closed ..... *See Note Below

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN	TRIMMER FUNCTION
Open	455 Kc	.05 mfd.	Mixer grid	Floating ground	T2-T1	IF
1400 Kc	1400 Kc	200 mmf.	Ant. Clip	Floating ground	C-2, C-1	Osc. Ant.

IMPORTANT ALIGNMENT NOTES

1. *To Set Pointer: With variable condenser completely closed set pointer at right hand edge of rectangular notch cut in lower edge of dial backing plate near right hand end. The inverted v in lower edge of dial backing plate near left hand end is the 1400 Kc calibration mark.
2. Place set loop in the same position and at the same distance with respect to the back of the chassis as it would be when the set is mounted in the cabinet, during alignment of the RF stage. (1-1/16" from back of chassis to front of long loop strip).
3. If a standard test loop is used with the signal generator for alignment of the receiver the black wire will be left in the antenna clip. When the generator lead is connected to ant. clip the black wire is removed from the clip.
4. The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the A. V. C. action of the receiver ineffective.

INSTRUCTIONS FOR SETTING UP PUSH BUTTONS:

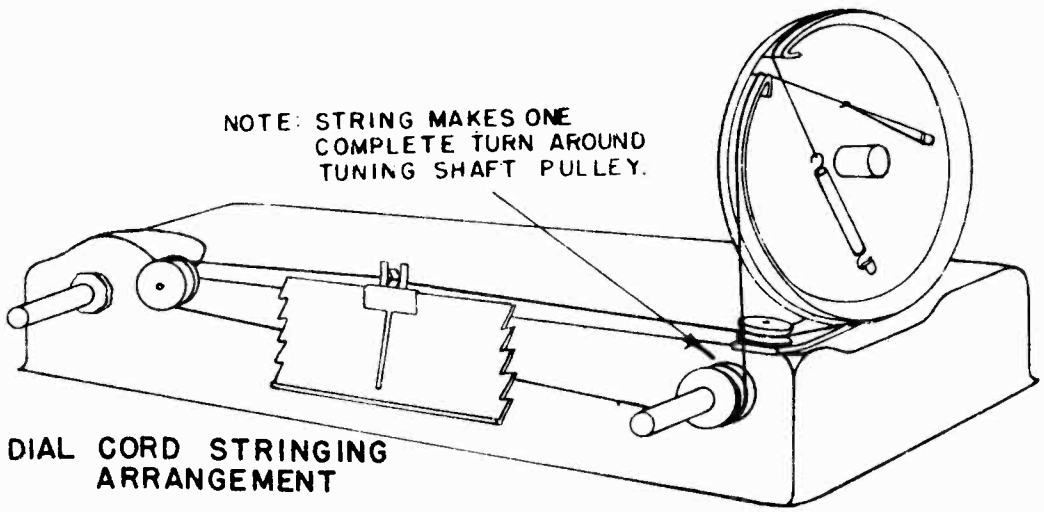
Allow the receiver to remain on for ten to fifteen minutes before making the push button adjustments. Each of the push buttons should be set to a desired station in the following manner:

1. Make a list of the four local stations for which push button tuning is desired and punch out the corresponding call letters from the call letter sheets.
2. Lift each button and insert a call letter tab into the slot at the side of the button, centering it in the front opening.
3. Lift a push button and insert a screw driver in the slotted screw head just below the button. Press down and loosen the locking screw by turning it to the left about two turns.
4. While holding the screw all the way down with the screw driver, tune in the desired station by hand with the tuning knob. Turning the tuning knob back and forth slightly either side of the station while holding the screw down will help to obtain a precise setting.
5. Tighten the screw, keeping it pushed all the way down while tightening it.
6. Check for accuracy by moving the pointer off the station about an inch and retuning it by depressing the push button set up for that station. If the setting is not accurate, repeat the foregoing procedure.
7. Follow the same procedure for each of the remaining buttons.
8. Should you desire to change your selection of stations, the old call letters can be removed from the buttons by pushing them out with a penknife, nail file or eraser on a pencil and repeating steps 3 to 8.

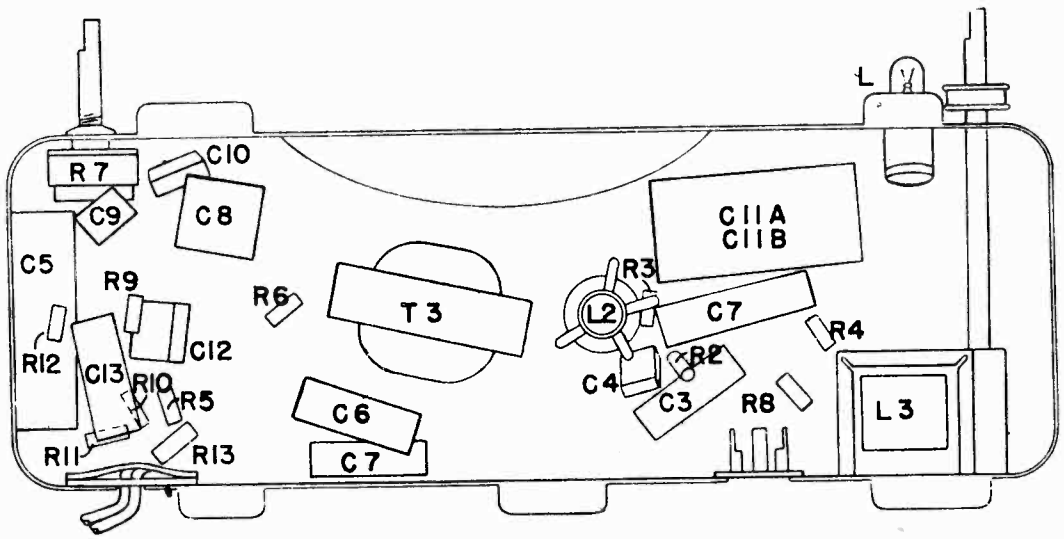
PARTS LIST

Schematic Location	Part No.	Description
R1		Resistor, 10,000 ohm, ½ watt
R2		Resistor, 10 megohm, ½ watt
R3		Resistor, 22,000 ohm, ½ watt
R4		Resistor, 330, ohm, ½ watt
R5		Resistor, 2.2 megohm, ½ watt
R6		Resistor, 15 megohm, ½ watt
R7	N19390	Volume Control and Switch (1 megohm)
R8		Resistor, 22 ohm, ½ watt
R9,R10		Resistor, 470,000 ohm, ½ watt
R11		Resistor, 150 ohm, ½ watt
R12		Resistor, 330,000 ohm, ½ watt
R13		Resistor, 12,000 ohm, 1 watt
C1,C2	N19359	Condenser, variable
C3		Condenser, .01 mfd., 400 V.
C4		Condenser, .00005 mfd., 500 V. Mica
C5		Condenser, .2 mfd., 400 V.
C6		Condenser, .05 mfd., 200 V.
C7		Condenser, .05 mfd., 400 V.
C8,C12		Condenser, .002 mfd., 400 V.
C9		Condenser, .00025 mfd., 500 V. Mica
C10		Condenser, .0005 mfd., 500 V. Mica
C11A-11B	N19360	Condenser, Electrolytic, 40-20 mfd., 150 V.
C13		Condenser, .02 mfd., 400 V.
T1	N19355	Transformer, 1st I. F.
T2	N19356	Transformer, 2nd I. F.
T3	N19358	Transformer, Output
L1	N19353	Antenna Loop Assembly
	N19234	Socket, Antenna Loop
	N19350	Socket Assy., Dial Light
L2	N19354	Coil, oscillator
L3	N19357	Choke, Iron Core "B"
Spk.	N19403	Speaker, 4" P. M.
L		Dial Light - Mazda 47
	N20084-3	Line Cord and Plug Assembly
	N19988	Cabinet Assembly, Walnut (Cat. No. 6011)
	N19989	Cabinet Assembly, Ivory (Cat. No. 6012)
	N19495	Handle Assembly
	N19266	Knob, Tuning or Volume, Walnut (Cat. No. 6011)
	N19267	Knob, Tuning or Volume, Ivory (Cat. No. 6012)
	N19276	Push Button, Walnut (Cat. No. 6011)
	N19275	Push Button, Ivory (Cat. No. 6012)
	N19341	Scale, Dial
	N19410	Retainer, Antenna Loop
	N19374	Instruction Sheet
	N19348	Call Letter Sheets, Set
	N19221	Tuning Shaft Ass'y
	N19344-2	Pulley, Wood, ¾" Dia.
	N19343-3	Pulley, Wood, 11/16" Dia.
	N19407	Pointer, Dial
	N19347	Baffle Board
	N20149-2	Spring, Dial Cord
	N19361	Clip, Hairpin
	N19132	Cord, Dial Drive

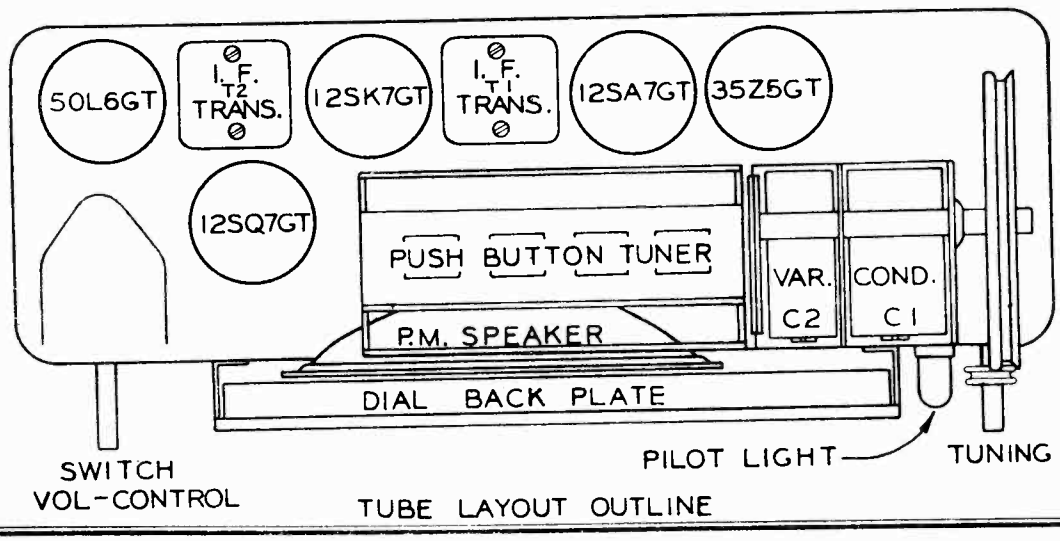
MODELS 6011, Ch. 132.816;
6012, Ch. 132.816A



DIAL CORD STRINGING ARRANGEMENT

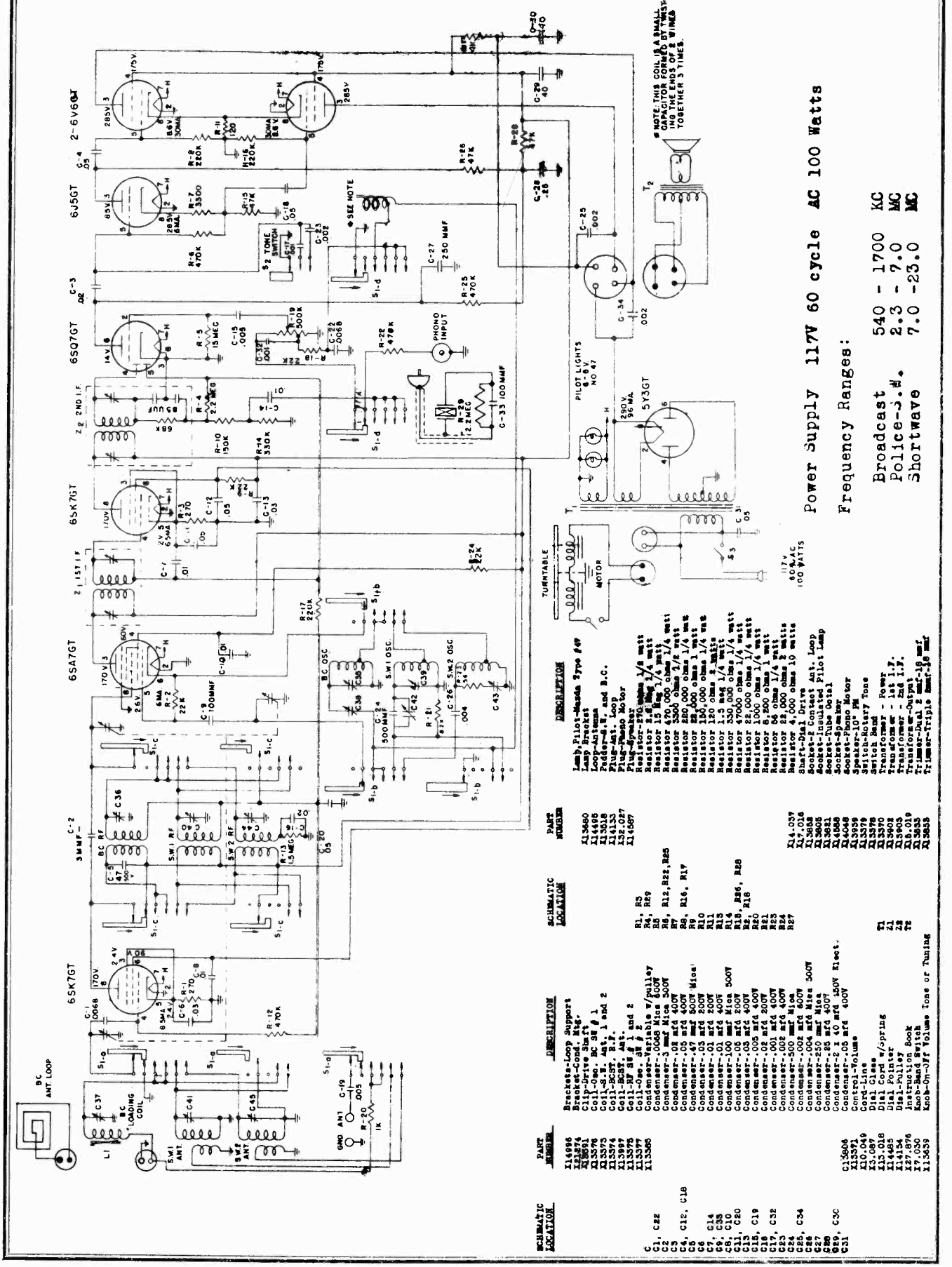


LOCATION OF PARTS UNDER CHASSIS



TUBE LAYOUT OUTLINE

MODEL 7111,
Ch. 434.140



SCHEMATIC LOCATION	DESCRIPTION	PART NUMBER
	Brackets-Loop Support	X14996
	Bracket-Cond. Mtg.	X14874
	Clip-Drive Shaft	X13691
	Coil-Osc. BC SW # 1	X13576
	Coil-BC SW. Ant. 1 and 2	X13575
	Coil-BC SW. Ant.	X13574
	Coil-RF SW # 1 and 2	X13999
	Coil-Osc. SW # 2	X13577
	Condenser-Variable w/Pulley	X13585
C1, C22	Condenser-.0068 Mica 600V	
C2	Condenser-3 mmf Mica 500V	
C3	Condenser-.01 mfd 400V	
C4, C12, C18	Condenser-.05 mfd 400V	
C5	Condenser-47 mmf 500V Mica	
C6	Condenser-.03 mfd 200V	
C7, C14	Condenser-.01 mfd 400V	
C8, C35	Condenser-.01 mfd 400V	
C9, C10	Condenser-100 mmf Mica 500V	
C11, C20	Condenser-.05 mfd 200V	
C13	Condenser-.05 mfd 400V	
C15, C19	Condenser-.005 mfd 400V	
C16	Condenser-.02 mfd 200V	
C17, C32	Condenser-.001 mfd 400V	
C23	Condenser-.002 mfd 400V	
C24	Condenser-500 mmf Mica	
C25, C34	Condenser-.002 mfd 500V	
C26	Condenser-250 mmf Mica 500V	
C27	Condenser-.004 mfd Mica	
C28	Condenser-.25 mfd 400V	
C29, C30	Condenser-2 x 40 mfd 450V Elect.	
C31	Condenser-.05 mfd 400V	C13606
	Control-Volume	X13571
	Cord-Line	X10.049
	Dial Glass	X3.087
	Dial Cord w/spring	X13.018
	Dial Pointer	X14485
	Dial-Pulley	X14154
	Instruction Book	X27.0876
	Knob-Band Switch	X27.0900
	Knob-On-Off Volume Tone or Tuning	X13639

SCHEMATIC LOCATION	DESCRIPTION	PART NUMBER
	Lamp, Pilot-Dials Type #47	X13660
	Lamp Bracket	X14496
	Loop-Antenna	X13518
	Holder-R.F. and B.C.	X13573
	Plug-Ant. Loop	X13578
	Plug-Phono Motor	X13577
	Plug-Speaker	X14.027
	Resistor-270 ohms 1/2 watt	X14497
R1, R3	Resistor 1.5 Meg 1/4 watt	
R4, R29	Resistor 470,000 ohms 1/4 watt	
R5	Resistor 5300 ohms 2/2 watt	
R6, R12, R22, R25	Resistor 82,000 ohms 1 watt	
R7	Resistor 220,000 ohms 1/4 watt	
R8, R16, R17	Resistor 150,000 ohms 1/4 watt	
R9	Resistor 120 ohms 2 watts	
R10	Resistor 330,000 ohms 1/4 watt	
R11	Resistor 47000 ohms 1/4 watt	
R13	Resistor 22,000 ohms 1/4 watt	
R14	Resistor 1000 ohms 1/4 watt	
R15, R26, R28	Resistor 6,800 ohms 1 watt	
R18	Resistor 86 ohms 1/4 watt	
R20	Resistor 22,000 ohms 2 watts	
R21	Resistor 4,000 ohms 10 watts	
R23	Shaft-Dial Drive	X14.037
R24	Socket-2 Contact Ant. Loop	X17.016
R27	Socket-Insulated Pilot Lamp	X13604
	Socket-Speaker Cord	X13621
	Socket-Tube Octal	X14588
	Socket-Phono Motor	X14048
	Speaker-10" PM	X13939
	Switch-Rotary Tone	X13579
	Switch Band	X13578
	Transformer - Power	X13570
	Transformer - 1st I.F.	X13603
	Transformer - 2nd I.F.	X13.019
	Transformer-Output	X13.015
	Trimmer-Dual 2 mmf-18 mmf	X13635
	Trimmer-Triple 8mmf-30 mmf	

MODEL 7111,
Ch. 434.140

ALIGNMENT PROCEDURE

PRELIMINARY:

Output Meter Connection . . . . . Across loud speaker voice coil
Output meter reading to indicate .5 watts . . . . . 1.3 Volts
Generator ground lead connection . . . . . Receiver chassis
Dummy Antenna value to be in series with generator output . . . . . See chart below
Connection of generator output lead . . . . . See chart below
Generator Modulation . . . . . 30%, 400 cycles
Position of Volume Control. . . . . Fully on
Position of Tone Control . . . . . Maximum Clockwise (Treble)
Position of pointer with tuner fully closed. "X" mark below 550 kc calibration mark

WAVE BAND SWITCH POSITION	POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	ADJUSTMENTS (IN ORDER) SHOWN	FUNCTION
BC	Open	455 KC	.1 mfd.	RF Tuning condenser stator	Z2,Z1	IF
BC	Open	1680 KC	.0002 mfd.	Ant. Term.	C35	Osc.
BC	1500	1500 KC	.0002 mfd.	Ant. Term.	C36,C37	RF, Antenna
BC	600 (rock)	600 KC	.0002 mfd.	Ant. Term.	C38,S1	Pad.Ant.Slug
Police	Open	7.2 MC	.01 mfd.	Converter grid	C39	Osc.
Police	2.5 (rock)	2.5 MC	400 ohm	Ant. Term.	C42	Padder
Police	6.0	6.0 MC	400 ohm	Ant. Term.	C40,C41	RF, Antenna
SW	Open	23.5 MC	400 ohm	Ant. Term.	C43	Osc.
SW	21	21.0 MC	400 ohm	Ant. Term.	C44,C45	RF, Antenna

IMPORTANT ALIGNMENT NOTES

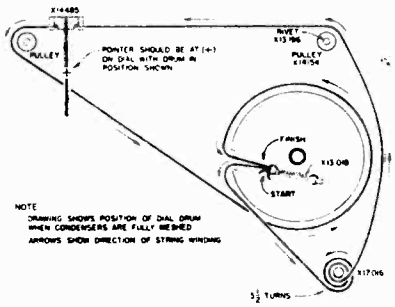
The alignment must be done in the order given.

The entire alignment Procedure should be repeated step by step in the original order for greatest accuracy.

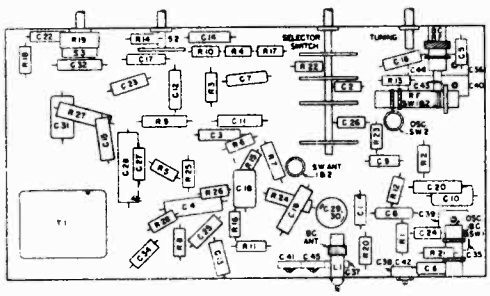
Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

During alignment of the "BC" Band Padder and both "SW" Band converter (RF) trimmers, the tuner should be rocked through resonance to assure alignment.

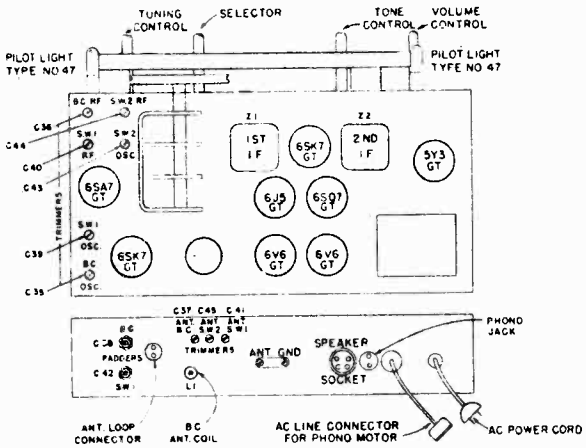
Power Output Undistorted.....10 Watts Maximum...13 Watts



DIAL STRING HOOKUP



LOCATION OF PARTS UNDER CHASSIS 434.140



LOCATION OF PARTS ON TOP OF CHASSIS 434.140

Moto-Matic Tuner for use on Models 7216, 7217, 7218, 7222; Ch. 100.184, 100.185, 100.186

REFER TO INDIVIDUAL CHASSIS SERVICE MANUAL FOR OTHER DATA

The Moto-Matic Tuner is used on Models 100.184, 100.185 and 100.186. It is an electrically driven device for automatically tuning the receiver to any one of fifteen preselected frequencies. The receiver can be tuned either automatically or manually without the need of turning a switch.

The operating mechanism of this tuning device consists of fifteen sets each of keys: station selector cams and pawls. In addition it has two mult-contact control switches.

The back switch, mounted on the rear of the tuner, has four sets of contacts. From front to rear, they are:

1. REVERSING: for reversing the direction of motor rotation.
2. POWER: for opening and closing the motor power supply line.
3. MUTE: for killing the audio system to prevent noises during automatic tuning.
4. A.F.C.: for cutting out A.F.C. during automatic tuning.

The side switch, mounted on the right end of the tuner, has two sets of contacts. From the top down, they are:

1. A.F.C.: for cutting out A.F.C. during manual tuning and during setting up.
2. POWER: for opening and closing the motor and automatic light power supply line.

With the tuner in the manual tuning position all switch contacts are in the position shown in figure 1. As a button is pressed in, its pawl is pulled against a station selector cam. It will be noted that these cams have two different heights, that is, a high and a low side. If the pawl comes to rest against the high side of the cam, the reversing contacts on the back switch are closed to the front for one direction of motor rotation. If the pawl comes to rest against the low side of the cam, the reversing contacts close to the back for the other direction of motor rotation. The direction of rotation will always be such as to bring the notch on the cam around to the pawl by the shortest route.

The motor drives the mechanism to the proper position for the desired station. Then the pawl falls into the notch on the selector cam and causes the bakelite cam to set the back switch contacts in new positions. The Power contacts open, shutting off the motor. The Mute contacts open allowing the signal to come in. The A.F.C. contacts open and A.F.C. puts the finishing touch to the automatic tuning operation.

A friction clutch in the gear train, driving the cam shaft, acts as a buffer and absorbs the shock of the sudden stop when the pawl falls into the notch on station selector cam.

The flywheel on the back end of the tuning shaft provides a "spinner" action while tuning manually.

TROUBLE CHART

The following service chart lists the most typical troubles, gives the most likely causes, and indicates the figures and paragraphs in which information may be found to aid in correcting the troubles. While this chart is necessarily incomplete, its careful study will enable the serviceman to diagnose most of the service complaints he receives on the Moto-Matic Tuner.

No reference is made to failures of the Moto-Matic Tuner when such failures are due to broken leads, loose connections, etc. It must be borne in mind, however, that certain indications are common to both radio and tuner troubles. For examples, Automatic Frequency Control may not be functioning because of improper contact adjustment of the tuner switches or because of an electrical defect in the chassis. Therefore, when servicing the tuner, check the possibilities of radio troubles causing the same symptoms.

BUTTON DOES NOT STAY IN OR DOES NOT RELEASE

COMPLAINT	PROBABLE CAUSE	FOR REMEDY SEE
Button will not stay in when pushed in.	Kickout pointer tip improperly adjusted.	Section 34.
	Kickout spring bent down too far.	Section 35.
	Insufficient tension in key stop bar return spring.	Section 35.
	Jammed or stuck key stop bar.	
	Star wheel stuck or not moving freely on tuning shaft.	Section 37.
	Bent or sprung key stop bar.	
Depressed button does not release when another button is pushed in.	Kickout tip jams against star wheel.	Section 36.
	Stuck or jammed pawl.	Sections 25, 26 and 36.
	Stuck or jammed key.	
Depressed button will not release when tuning knob is turned.	Kickout tip not engaging star wheel.	Section 34.
	Also check those listed for previous fault.	Section 36.

POINTER DOES NOT MOVE WHEN BUTTON IS PUSHED

Motor hums but does not run.	Reversing contacts on back switch not closing.	Secs. 1 & 3 or 1 & 9
	Motor stalled due to mechanical overload and clutch not slipping.	Secs. 20 and 22.
	Defective motor.	
	Low line voltage or improper frequency	Section 49.
Motor runs but pointer does not move.	Clutch slipping.	Sections 20, 21 & 22.
	Pointer drive gear slipping on shaft or out of mesh.	Section 52.
	Pointer loose on cord.	
	Pointer sticking on guide rail due to rust.	
Motor does not hum and tuner does not move with button in.	Power contacts on back switch not closing	Secs. 1,4,5, or 1,10,11.
	Power contacts on side switch not closing	Sections 14, 15 & 18.
	Bakelite back switch operating cam binding on contact arms or out of position.	Section 13.

POINTER MOVES BUT DOES NOT TUNE STATION PROPERLY

COMPLAINT	PROBABLE CAUSE	FOR REMEDY SEE
Pointer stops at wrong point.	Improper setting-up of mechanism.	Sections 44, 45, 46 and 47.
	Not locked up tight.	
Pointer stops at proper point, but	Mute contacts on back switch not opening. (No noise will be heard in this case).	Secs. 1 & 5 or 1 & 11
	Tuning backlash.	See "Tuning Backlash" below.
(A) No signal is heard.	Gang condenser drive gears out of mesh or slipping on shaft.	Section 52.
	Flexible coupling slipping on shaft.	
	Station not broadcasting or signal too weak as in daytime or during period of fading.	
(B) Signal is not heard clearly.	A.F.C. contacts on back or side switch not opening.	1,5,17,57 or 1,11,17, 57.
	A.F.C. not functioning.	Sections 55 to 57.
	Weak signal or no aerial.	Section 44.
(C) Wrong station comes in.	Desired signal off, weak or faded.	Section 44.
	Not set up properly.	Sections 44, 45, 46 and 47.
	Set off calibration.	Sections 51 and 54.
(D) Motor continues to run.	Pawl does not fall far enough into station selector cam to cut power off.	Burrs on pawl or cam. Sticking pawl.
	Power contacts on back switch not adjusted properly.	Sections 1, 4, 5 or 1, 10, 11
Pointer stops at a different place each time for a certain button.	Mechanism not locked up tight.	Sections 31 and 44g.
	Dial pointer slipping on cord.	Section 53g.
	Left end bearing bracket loose.	Sections 54 and 60.
	Pointer drive gears slipping out of mesh or on shaft.	Sections 52.
	Loose set screw.	
Pointer stops off station occasionally.	Pointer backlash. (Note pointer backlash will cause apparent rather than actual mistuning.)	Section 60.
	Pawl does not fall far enough into station selector cam.	Sec. 1 & 5a, 1& 11a, and 24
Pointer goes to end of dial and motor stalls and hums, or continues to run by slipping the clutch.	Station selector cam turned around beyond its normal operating range.	Section 27.
	Reversing contacts on back switch not adjusted properly.	Secs. 1 & 3 or 1 & 9.
	Bakelite cam binding on contact arm or out of position.	Section 13.
Motor continues to operate, moving the pointer back and forth over a short distance, after tuning to the approximate frequency to which the button is set.	Reversing contacts on back switch are not adjusted properly - set too close.	Secs. 1 & 3 or 1 & 9.
Motor starts before button is pushed in far enough to catch.	Side switch power contacts are being closed too soon.	Section 16.
Motor starts in the wrong direction then corrects itself as the button is pushed the rest of the way in.		
Intermittent operation of motor, lights, etc.	Insufficient contact pressure or dirty contacts on back or side switch.	Sections 3a, 4b and 15 or 9a, 10b and 15.
	Loose silver contact in contact blade of switches.	
	Bakelite cam binding on contact arms or out of position.	Section 13.
Tuning backlash. (Note: the high tuning ratio greatly exaggerates the effect of most of these conditions.)	Clutch slips.	Sections 21 and 22.
	Play between gang condenser drive gears due to insufficient compression in thrust spring in flexible coupling.	Sections 41 and 42.
	Play between gears due to improper setting of anti-backlash springs.	Section 40.
	Play between gear and stud.	
	Gear stud loose.	
	Gang condenser sways.	Section 59.
	Loose set screw in coupling or gear.	
	Loose or worn bearings.	
	Friction roller rotates relative to tuning shaft.	
Calibration incorrect.	Dial pointer or gang condenser drive gears jump teeth, slip on cam shaft or out of mesh.	Sections 42 and 52.
	Loose set screw in gear or coupling.	
	Dial pointer slips on dial cord.	Section 53g.
	Left end bearing bracket loose.	Sections 54 and 60.
	Excessive pointer backlash.	Section 60.

Moto-Matic Tuner

MANUAL TUNING DIFFICULTIES

COMPLAINT	PROBABLE CAUSE	FOR REMEDY SEE
Set tunes very broadly	A.F.C. contacts on side switch not closing.	Section 17.
Tuning knob sticks and catches in going from automatic to manual tuning.	Burrs on tip of kickout arm and star wheel.	Sections 38 and 61.
	Adjustable tip of kickout arm set improperly.	Section 34.
Pointer does not move when tuning knob is turned, although works OK in automatic position.	Oil or grease on drive rubber on friction wheel.	Section 58.
	Jammed bar and arm assembly.	
	Insufficient tension in bar and arm assembly return spring.	Section 58.
Pointer does not move when tuning knob is tuned.	Bent tuning shaft.	
	Oil or grease on drive rubber of friction wheel.	Section 58.
	Jammed bar and arm assembly.	
	Insufficient pressure between friction wheel and friction roller.	Section 58
	Gear driving dial cord drum is out of mesh or slipping on shaft.	Section 52.
	Slipping clutch.	Sections 21 and 22.

DIFFICULTIES OCCURRING DURING SET-UP BUT NOT IN NORMAL OPERATION

Set tunes very broadly.	A.F.C. contacts on side switch not closing when set-up knob is out and a button is in.	Sec. 17 & Fig. 7.
Button does not release when set-up knob is worked in or out.	Kickout spring set too far from kickout arm.	Section 35.
Visual tuning indicator off or flickers on and off. (This applies only to chassis with visual indicator wired to side switch. See section 14.) Automatic light off or flickers on and off.	Improper adjustment of side switch.	Section 15.
	Loose silver contact on contact blade.	
Mechanism locks up during setting up of a station.	Was not completely unlocked.	Section 30.
	Defective locking mechanism.	Section 32.
	Station selector cam sticking.	Section 32.
	Turning the set-up knob too suddenly.	Section 32.

MISCELLANEOUS TUNER TROUBLES

During automatic tuning visual tuning indicator light is on or flickers on and off. (Applies only to chassis with visual indicator wired to side switch. See section 14.)	Improper adjustment of side switch.	Sections 14 and 15.
	Loose silver contact in switch blade.	
Dial and automatic lights go out and set is killed momentarily when a button is pushed in or released.	Both reversing contacts on back switch closed at once and shorting 6 volt winding of power transformer.	Section 3a or 9a.
	Short operating arm of side switch grounding against friction roller assembly at point C.	Figure 5A.
Gears noisy during automatic tuning.	Motor pinion and first reduction gear not meshing properly.	Section 39.
	Too much compression in anti-backlash springs in gears.	Section 40.
	Burrs, bent teeth, and other irregularities on gears, especially the higher speed ones.	
Black ground lead near 6H6 tube under chassis heats up and smokes.	Short operating arm of side switch grounding against friction roller assembly at point C.	Figure 5A.
	A short between hot B-V. line and chassis.	
	Tuning shaft bearing stop out of place and grounding power blade of side switch.	Section 48.
Slight hum when button is depressed - not heard when button is released.	Poor or defective discriminator tube.	Change discriminator (6H6) tube.
Short in wiring when turning set-up knob.	Tuning shaft bearing stop out of place grounds power blade of side switch.	Section 48.
Signals are heard when tuning from one station to another automatically.	Mute contact on back switch not closing or making poor contact.	Sections 4b or 10b.
Set noisy electrically when starting and stopping during automatic-tuning.	Set used with insufficient antenna or mute contacts on back switch closing too late and opening too soon.	Reduce spacing between mute contacts on Back Switch. (Figure 4)
Mechanism reaches a definite stop before the pointer reaches either end of the dial.	The cam assembly stop pin and the gang condenser stops are not set so they reach their respective stop points at approximately the same time.	Section 51.
Band indicator hangs up when changing ranges.	Knot on band indicator cord jams against visual tuning indicator light bulb.	
	Torsion spring slipped out of place.	
	Link on range switch over dead center.	

ADJUSTMENT OF THE BACK SWITCH

THE SUCCESSFUL OPERATION OF THE ENTIRE MECHANISM DEPENDS TO A LARGE DEGREE ON THE CORRECT ADJUSTMENT OF THE BACK SWITCH: For this reason it is highly important that all contacts be set exactly right.

1 Two different types of Back Switches, and associated Bakelite Operating Cams, have been used. To determine whether the Switch is of the early or later type, notice the shape of the Bakelite Cam. The shape of the Bakelite Cam used on early units is shown in figure 1A: on later units it is shaped as in figure 1B. The various operating positions of the early type are shown in figures 1A, 2A, 3A and 4A. The positions of the later type are shown in figures 1B, 2B, 3B and 4B. Details of the correct settings for the early type are explained in sections 2 to 6. Details of the correct settings for the later type are explained in sections 8 to 12. MINOR ADJUSTMENTS OF THE BACK SWITCH TO SECURE THESE SETTINGS MAY BE MADE BY BENDING THE VARIOUS BLADES OF THE SWITCH.

EARLY TYPE BACK SWITCH

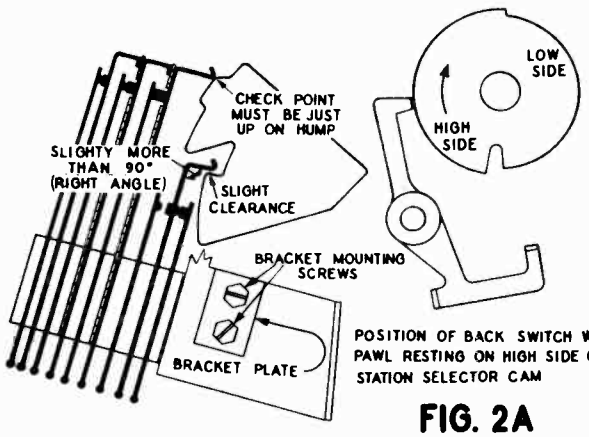
2 Run the dial pointer to 530 KC. Turn the power off. With the mechanism in the manual position, the Back Switch Operating Arms should clear the Bakelite Cam by the amounts indicated in figure 1A. Push any button so that the Pawl falls on the high side of the Station Selector Cam. The Reversing Contacts Operating Arm should clear the Bakelite Cam as indicated in figure 2A. IF THESE CLEARANCES ARE APPROXIMATELY CORRECT, PROCEED WITH SECTION 3. However, if the clearances are not as shown, slight discrepancies can be corrected by bending the Arms, but if the entire switch seems to be out of position, loosen the Bracket Mounting Screws (Figure 2A) and move the entire Back Switch assembly to give the proper clearances.

3 Release any depressed buttons. Move the Bakelite Cam up and down by hand to make sure that the Reversing Contacts make and break properly as follows. These are the three short switch blades nearest the Bakelite Cam.

a. With the Bakelite Cam down as in figure 2A, the center contact should make with the front contact, while with the Bakelite Cam pulled up as in figure 3A, the center contact should make with the Back Reversing Contact. After the instant of closing the blades should move slightly to show adequate contact pressure. IMPORTANT: Make sure that the center contact is not touching both the front and back contacts at any one time, since this may short circuit the 6-volt winding of the power transformer. If the Reversing Contacts do not make or break properly, bend the switch blades to secure proper operation.

b. With the dial pointer at 530 KC. push each button and make sure that the Reversing Contacts Operating Arm does not touch the Bakelite Cam. See figure 2A. The Pawl, in every case, should rest on the High Side of the Station Selector Cam.

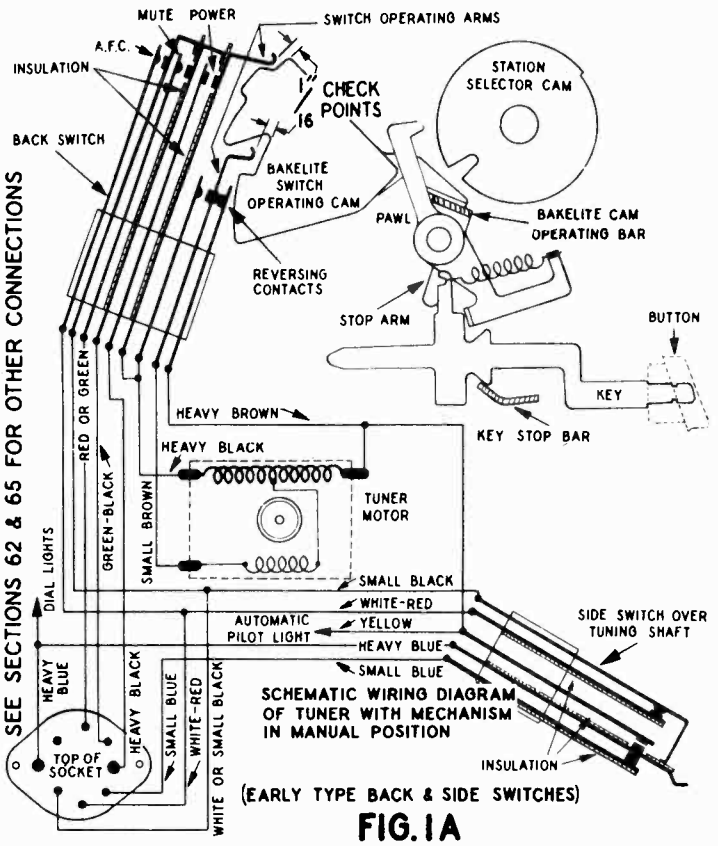
c. Now pull out the Set-up Knob and run the pointer to the high frequency end of the dial by turning the Set-up Knob clockwise. Push each button to make sure that the center contact closes with the back Reversing contact. See figure 3A. In every case the Pawl should rest on the Low Side of its cam.



POSITION OF BACK SWITCH WITH PAWL RESTING ON HIGH SIDE OF STATION SELECTOR CAM

FIG. 2A

4 Turn the Tuning Knob to release the depressed button. This puts the Bakelite Cam in the position shown in figure 1A. so the Power, Mute and A.F.C. contacts of the Back Switch can be checked as follows:



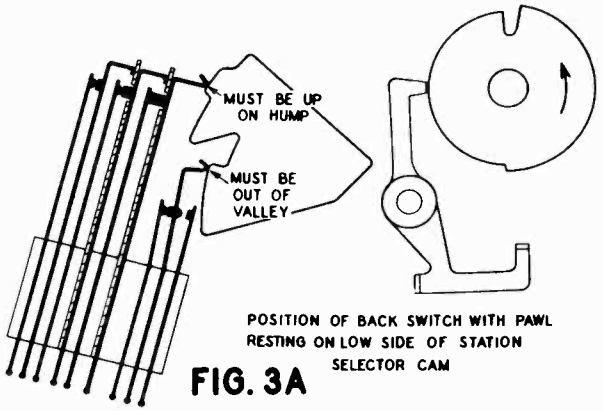
SCHEMATIC WIRING DIAGRAM OF TUNER WITH MECHANISM IN MANUAL POSITION

(EARLY TYPE BACK & SIDE SWITCHES)

FIG. 1A

a. The long Mute blade should barely hold the thin bakelite strip against the Power blade, and the long A.F.C. blade should barely hold the thin bakelite strip against the Mute blade.

b. All three sets of contacts should be open approximately 1/64 to 1/32 of an inch. Move the Bakelite Cam up and down by hand and observe the action of the contacts. As the Bakelite Cam is moved up (to the position of figures 2A or 3A) all three sets of contacts should close. After the instant of closing the blades should move slightly to show adequate contact pressure.



POSITION OF BACK SWITCH WITH PAWL RESTING ON LOW SIDE OF STATION SELECTOR CAM

FIG. 3A

5 To finish checking the setting; pull out the Set-up Knob, unlock the Cam Assembly by turning the Set-up Knob clockwise as far as it will go. A slight click should be heard as the mechanism is unlocked. Then proceed as follows:

a. Run the dial pointer to the low frequency end of the dial. Push any button so that the Pawl falls on the High Side of the Station Selector Cam. The upper Back Switch Operating Arm should rest just up on the "Hump" of the Bakelite Cam, at the "Check Point" shown in figure 2A. If the Operating Arm is not in this position, bend the Arm slightly to secure such setting. If the Operating Arm is down off the "Hump", the Power, Mute or A.F.C. contacts may remain closed after a station is tuned in. If

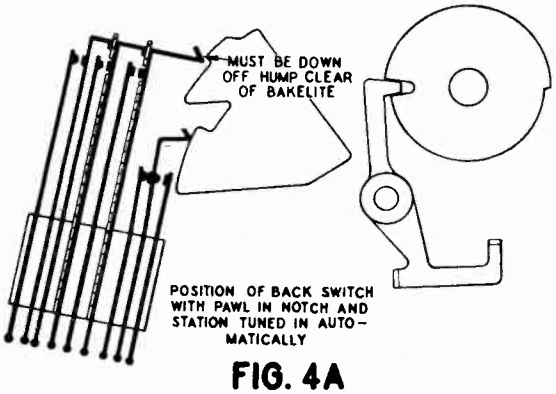


FIG. 4A

the Operating Arm is farther up on the "Hump", the Power contacts may open and cut the power off before the Pawl falls completely into the Notch.

b. Turn the Set-up Knob until the Pawl of the depressed button falls into the Notch on the Station Selector Cam. The Power, Mute and A.F.C. contacts should now be open at least 1/64 inch as shown in Figure 4A.

c. Repeat step 5a. with each of the other buttons then repeat step 5b. with each button. Due to slight variations in the Pawls, it may not be possible to adjust for all buttons so that the Back Switch Operating Arm comes exactly at the "Check Point" but make sure that the Power, Mute and A.F.C. contacts are open at least 1/64 of an inch for each button when the Pawl is in the Notch. Notice, too, that the bending of any switch blade or operating arm may throw out a preceding adjustment. For this reason it is well to check through the entire adjustment procedure a second time.

6 Lock up the Cam Assembly by turning the Set-up Knob as far counter-clockwise as possible. Turn on the power and check the operation of the unit.

REPLACING EARLY TYPE BACK SWITCH

7 If it is necessary to replace the early type Back Switch with the later type, since we stock only the later type, part number 10054112564, it will also be necessary to change the Bakelite Cam to the later type, part number 10054112563. To make this change proceed as follows:

a. File off the two rivets holding the Bakelite Cam to its arm.

b. Put the new Cam in place and secure with two 6/32 machine screws.

c. Remove the two screws holding the Back Switch to its bracket and transfer the wires from the old switch to corresponding terminals on the new switch.

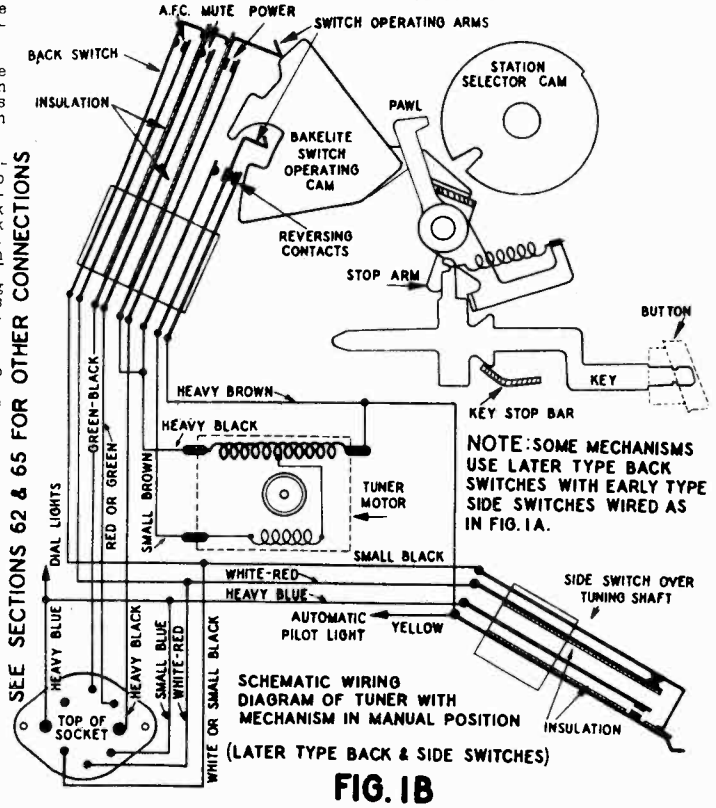
d. Fasten the new switch in place and adjust as described in sections 8 to 12.

LATER TYPE BACK SWITCH

8 Run the dial pointer to 530 KC. Turn the power off. Push any button so that the Pawl falls on the High Side of the Station Selector Cam. The Back Switch Operating Arms should clear the Bakelite Cam by the amounts indicated in figure 2B. IF THE CLEARANCES ARE APPROXIMATELY CORRECT, PROCEED WITH SECTION 9. However, if the clearances are not as shown, slight discrepencies can be corrected by bending the Arms, but if the entire switch seems to be out of position, loosen the Bracket Mounting Screws (see figure 2B) and move the entire Back Switch assembly to give the proper clearances.

9 Move the Bakelite Cam up and down by hand to make sure that the Reversing Contacts make and break properly as follows. These are the three short switch blades nearest the Bakelite Cam.

a. With the Bakelite Cam down as in figure 2B, the center contact should make with the front contact, while with the Bakelite Cam pulled up as in figure 3B, the center contact should make with the back Reversing Contact. After the instant of closing the blades should move slightly to show adequate contact pressure. IMPORTANT: Make sure that the center contact is not touching both the front and back contacts at any one time, since this may short circuit the 6-volt winding of the power transformer. If the Reversing Contacts do not make or break, bend the switch blades to secure proper operation.



NOTE: SOME MECHANISMS USE LATER TYPE BACK SWITCHES WITH EARLY TYPE SIDE SWITCHES WIRED AS IN FIG. 1A.

SCHEMATIC WIRING DIAGRAM OF TUNER WITH MECHANISM IN MANUAL POSITION (LATER TYPE BACK & SIDE SWITCHES)

FIG. 1B

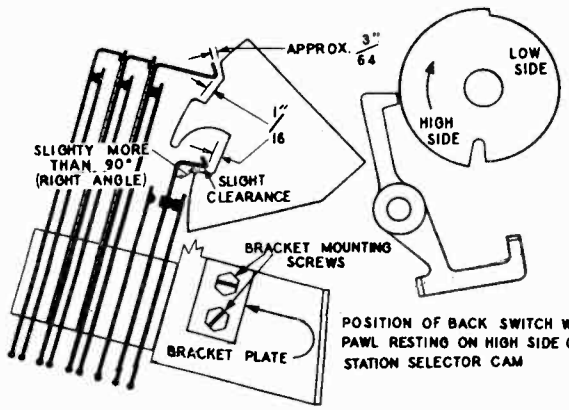


FIG. 2B

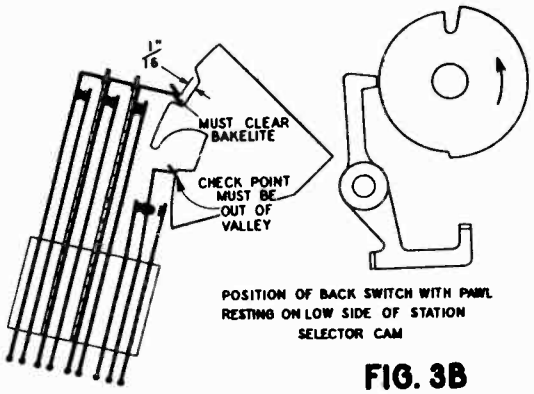
b. With the dial pointer at 530 KC. push each button and make sure that the Reversing Contacts Operating Arm does not touch the Bakelite Cam. See figure 2B. The Pawl, in every case, should rest on the High Side of the Station Selector Cam.

c. Now pull out the Set-up Knob and run the pointer to the high frequency end of the dial by turning the Set-up Knob clockwise. Push each button to make sure that the center contact closes with the back Reversing Contact. In every case the Pawl should rest on the Low Side of the cam. See figure 3B.

10 With the Pawl still resting on the Low Side of the Station Selector Cam, the Power, Mute and A.F.C. contacts of the Back Switch are to be checked as follows:

a. Leave the Bakelite Cam in the Position of figure 3B. The long Mute blade should barely hold the thin bakelite strip against the Power blade, and the long A.F.C. blade should barely hold the thin bakelite strip against the Mute blade.

b. Move the Bakelite Cam up and down by hand and observe the action of the contacts. With the Bakelite Cam up as shown in figure 4B all three sets of contacts should be open approximately 1/32 of an inch. As the Bakelite Cam is moved down (to the position of figure 3B) all three sets of contacts should close. After the instant of closing the blades should move slightly to show adequate contact pressure.



POSITION OF BACK SWITCH WITH PAWL RESTING ON LOW SIDE OF STATION SELECTOR CAM

FIG. 3B

SIDE SWITCH ADJUSTMENT

14 There are two general types of Side Switches, namely the early type with five blades and the later type with only four blades. The Side Switch change was made after the Back Switch change, so that there are units equipped with the early Side Switch but with later type Back Switch.

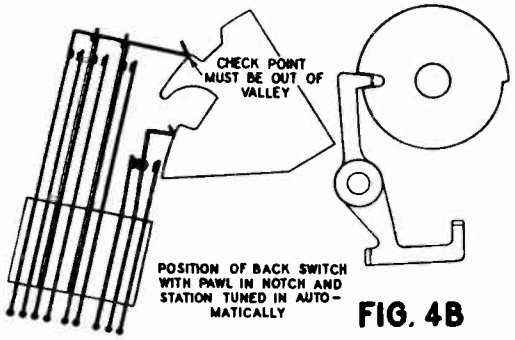
The extra blade in the early Side Switch was used to switch the Visual Tuning Indicator light on during Manual tuning and off during Automatic Tuning. With the later Side Switch this light remains on during both Manual and Automatic tuning. In addition, with the later side switch the 6 volt line and Motor-Automatic light circuit wires were reversed. See figure 1A and 1B for circuit difference.

15 With the power off, adjust to secure the making and breaking of the contacts as illustrated. FOR EARLY TYPE SIDE SWITCH REFER TO FIGURES 5A, 6A AND 7A. FOR LATER TYPE SIDE SWITCH REFER TO FIGURES 5B, 6B and 7B. After the instant of closing the blades should move slightly to show adequate contact pressure. For some adjustments it may be better to bend the Long or Short Switch Operating Arms instead of the Switch blades.

CONCLUDED ON NEXT PAGE

11 To finish the checking Pull out the Set-up Knob. Unlock the Cam Assembly by turning the Set-up Knob clockwise as far as it will go. A slight click should be heard as the mechanism is unlocked. Then proceed as follows:

a. Push any button. Turn the Set-up Knob until the Pawl drops into the Notch on the Station Selector Cam. The upper Back Switch Operating Arm should rest just up out of the "Valley" on the Bakelite Cam (See "Check Point" on figure 4B), and



POSITION OF BACK SWITCH WITH PAWL IN NOTCH AND STATION TUNED IN AUTOMATICALLY

FIG. 4B

the Power, Mute and A.F.C. contacts should be open at least 1/32 of an inch. If the Operating Arm is not out of the "Valley" far enough to open the contacts properly, bend the Operating Arm down slightly. If the Operating Arm is farther out of the "Valley" than indicated by the "Check Point", the Power contacts may open and cut the power off before the Pawl falls completely into the Notch. If the Operating Arm does not come out of the "Valley" far enough, the Power, Mute or A.F.C. contacts may remain closed after a station is tuned in.

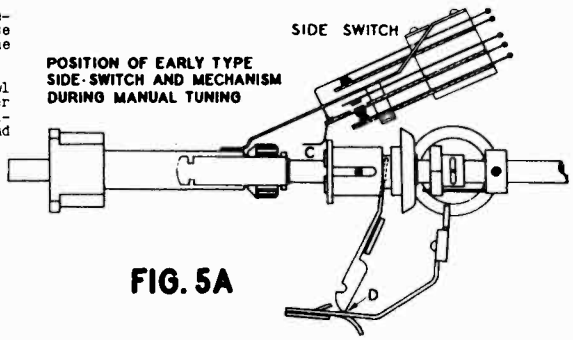
b. Repeat the above step for each of the other buttons. This is important. Due to slight variations in the Pawls, it may not be possible to adjust for all buttons so that the Back Switch Operating Arm comes exactly at the "Check Point" of figure 4B, but make sure that the Power, Mute and A.F.C. contacts are open at least 1/32 of an inch for each button, when the Pawl is in the Notch. Notice, too, that the bending of any switch blade or operating arm may throw out a preceding adjustment. For this reason it is well to check through the entire adjustment procedure a second time

12 Lock up the Cam Assembly by turning the Set-up Knob as far counter-clockwise as possible. Turn the power on and check the operation of the unit.

BAKELITE SWITCH OPERATING CAM

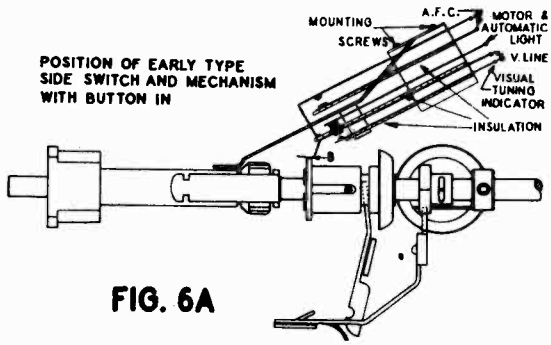
13 The Bakelite Cam may stick because of improper adjustment of the Back Switch. The clearances shown in figures 1A or 1B should be maintained. This prevents too much pressure by the Back Switch Operating Arms against the Bakelite Cam. See paragraph 4a or 10a. Other causes for the Bakelite Cam to stick are; rough edges on the Bakelite, and insufficient tension in the Bakelite Cam Return Spring (figure 13). Tension in the Return Spring may be increased, if found necessary, by simply cutting off a few turns and forming a new hook on the end.

The Stop Arm (figure 1B) on the bar carrying the Bakelite Cam, should hit against the Rubber Stop (figure 14). This keeps the Bakelite Cam from jumping too high and catching over the Reversing Contact Arm. If this Rubber Stop is missing, a couple of turns of friction tape around the shaft will serve the same purpose.



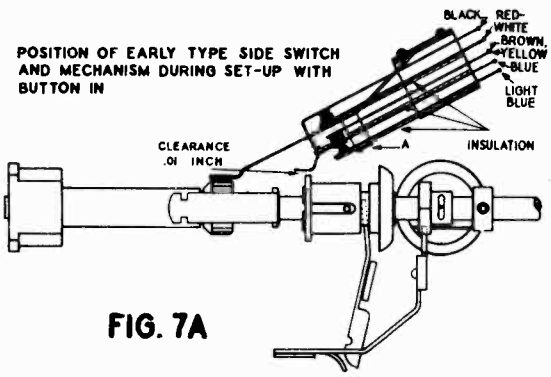
POSITION OF EARLY TYPE SIDE-SWITCH AND MECHANISM DURING MANUAL TUNING

FIG. 5A



POSITION OF EARLY TYPE SIDE SWITCH AND MECHANISM WITH BUTTON IN

FIG. 6A



POSITION OF EARLY TYPE SIDE SWITCH AND MECHANISM DURING SET-UP WITH BUTTON IN

FIG. 7A

16 IT IS IMPORTANT THAT THE MOTOR CONTACTS ON THE SIDE SWITCH DO NOT CLOSE UNTIL AFTER THE REVERSING CONTACTS OF THE BACK SWITCH CLOSE. To secure such sequence of contact closing, the bakelite ring on the Friction Roller Assembly (figure 13) should not come farther forward, under the Short Operating Arm of the Side Switch, than shown at point B, figure 6. If loosening the Switch Mounting Screws does not permit enough movement of the switch to secure this positioning, it may be necessary to bend the Short Switch Operating Arm.

17 Care must be taken that the Automatic Frequency Control contacts on the Side Switch are open during automatic tuning and closed during manual tuning. If they are open when tuning manually the set will appear to tune broadly. The A.F.C. Contacts must be closed during setting up, or the Station Selector Cams may be set improperly. If the A.F.C. contacts do not open when tuning automatically, mistuning by the mechanism will result in poor tone quality. In extreme cases of mistuning the station may not be heard at all.

18 When tuning automatically or during set-up, if the automatic Light does not come on and the Motor does not move or the Automatic Light flickers, bend the Side Switch blade, third from the top, down a little. If the blade is bend down too far the light will remain on all the time, even during manual tuning. Also the sequence of contact closing mentioned in section 16 will not be obtained.

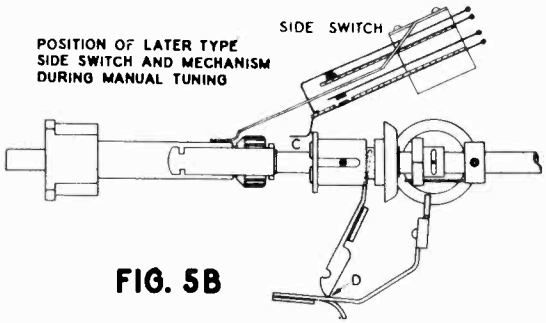


FIG. 5B

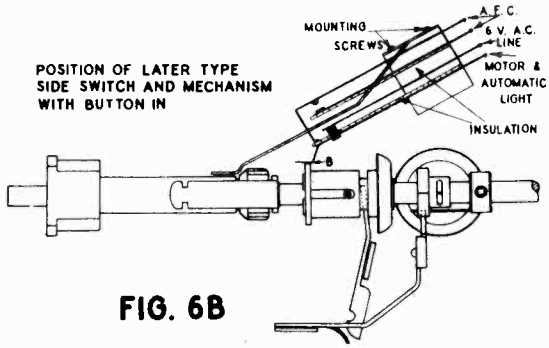


FIG. 6B

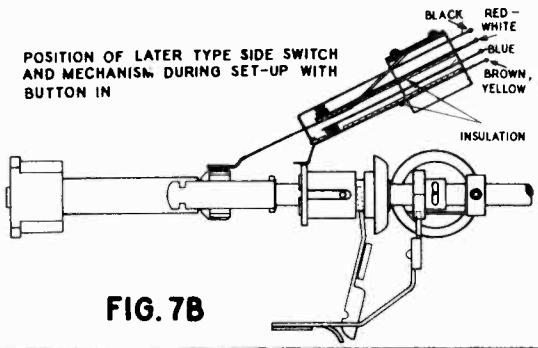


FIG. 7B

19 If the Visual Tuning Indicator Light flickers or goes out during set-up, when a button is pressed, the following may oe the cause. The bakelite ring on the Friction Roller Assembly is probably lifting the Short Side Switch Operating Arm, causing it to open the Visual Tuning Indicator circuit. There should be a very slight clearance, about .01 of an inch, between the bakelite ring and the Operating Arm during set-up, with a button in, as shown in figure 7A. Either the end of the Long Switch Operating should be bent down, so it will press harder against the Set-up Gear, or the lifting hook (A, figure 7A) should be bent up slightly.

CLUTCH

20 The Clutch is purely a friction device. It is a standard anti-backlash gear held on a Collar by a flat, horseshoe shaped Spring Washer as shown in figure 8. The frictional resistance between Spring and Collar and the Gear normally can transmit enough power to drive the Cam Shaft, Dial Pointer and Gang Condenser. If an abnormal load is placed on the Clutch it should slip. If the Clutch becomes locked or stuck so it cannot slip when overloaded, other parts of the mechanism may be damaged because of the absence of the "shock absorber" action of the Clutch.

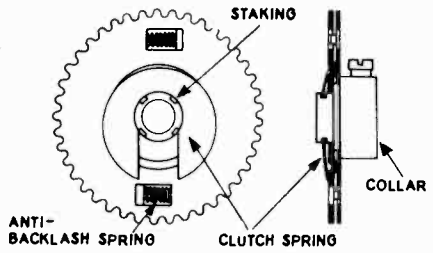


FIG. 8

21 THE CLUTCH MAY SLIP BECAUSE IT IS FULL OF OIL OR GREASE OR THE HORSESHOE SHAPED SPRING HAS CRACKED OR WEAKENED. If oil or grease is present, wash it off with carton tetrachloride or similar cleaning fluid. The Spring can be slipped out and replaced without any dismantling of the mechanism. NOTICE THAT THE SET SCREW IN THE CLUTCH MUST BE SO POSITIONED, IF THE CLUTCH IS MOVED OR REPLACED, THAT IT WILL NOT JAM AGAINST THE SET-UP CROWN GEAR. Sometimes the Clutch may slip because the Pawl, although falling far enough into the Notch on its Station Selector Cam to prevent the shaft from rotating, does not fall far enough to operate the Back Switch and cut the power off. Check the Back Switch adjustment as outlined in sections 4 to 6 if an early type Back Switch is used, or sections 10 to 12 if the later type Back Switch is used. Also remove any rough edges from Pawl and Notch with emery cloth or a small oil stone.

22 OVERLOAD ON THE CLUTCH MAY ARISE FROM ANY ONE OR COMBINATION OF THE FOLLOWING CAUSES:

a. Binding of the Dial Pointer against the Dial, Dial Frame or cabinet, or rough, rusty or bent Dial Pointer Guide Rail.

b. Dial Pointer drive cable too tight.

c. Jammed or stuck dial cord guide pulley or pulleys.

d. Crossed dial cord on the Drum. Re-thread the dial cord correctly as shown in figure 11 and section 53.

e. Dial Cord Drum binding against Driver Gear or stuck on shaft.

f. The Pointer Driver Gear (figure 15) out of mesh and binding against the Drum Gear. Set Driver Gear to mesh with center of face of gear on Drum and check end play in Cam Shaft (See section 52.)

g. Misalignment or tight Cam Shaft Bearings. Loosen the screws holding the End Bearing Bracket (figures 10 and 15). Hold the Knurled Gears (figure 10) out of mesh by compressing the Flexible Coupling. Rotate the Cam Shaft back and forth a few times to permit the bearings to realign themselves. Then tighten the screws, taking care not to shift the Brackets while doing so. Be sure that both Right End Bearing Bracket Mounting Screws are tight, otherwise dial calibration cannot be maintained. Binding or tightness in the inner bearings is usually the result of sprung End Brackets, which should be straightened.

h. Cam Shaft sprung or bent. In most cases it will be necessary to replace the whole unit.

i. Collar on left end of Cam Shaft (figure 14) binding against Left End Bracket. Push the Cam Shaft as far to the left

as it will go. Loosen the Collar Set Screw and reset the Collar so it will have from .006 to .010 of an inch clearance between it and the Left End Bracket.

j. Set-up Crown Gear assembly binding (Fig. 13).

k. Gang Condenser Drive Gears out of mesh and binding (figure 10).

l. Thrust Spring in Flexible Coupling compressed too much. The Thrust Spring should exert just enough pressure on the Condenser Drive Gears (Fig. 10) to prevent backlash.

m. Extension Shaft out of line and binding (Fig. 10).

n. Tight, jammed or sticking Gang Condenser.

If correcting the above conditions does not stop the clutch from slipping replace the Clutch Spring, part number 10054111138. In extreme cases it may be necessary to replace entire Clutch Assembly as indicated below.

23 TO REMOVE THE CLUTCH PROCEED AS FOLLOWS:
a. Remove the L shaped horizontal brace on the back of the Dial Frame. This is the part supported by the brackets screwed to the sides of the chassis.

b. Take the Side Switch Mounting Screws out and swing the switch out of the way.

c. Drive out the pin through the Friction Roller Assembly (Figure 13). Pull out the pin in the Star Wheel. Loosen the set screws in the Star Spring Collar and Flywheel. The Tuning Shaft can now be pulled out. (NOTE that there is a groove around the tuning shaft. The Set Screw of the Star Spring Collar fits into this groove, thus fixing the lateral position of the shaft with respect to the End Bracket.)

d. Take the Set-up Knob off. Remove the Tuning Shaft Bearing and pull the Sleeve and Set-up Gear out of the End Bracket.

e. Take the Retaining Ring off the Set-up Crown Gear Stud and remove the Crown Gear Assembly.

f. Remove the Right End Bearing and Bracket (Figure 10).

g. Take the Knurled Crown Gear off the Extension Shaft (Figure 10).

h. Loosen the Clutch Set Screw, disassemble the Clutch and slide the Collar and Gear Sections off the Cam Shaft to the right.

PAWLS

24 If a Pawl does not fall completely into the Notch on the Station Selector Cam, check the setting of the Back Switch. It is probable that the Power contacts are opening too soon. Notice that in order to fall into the Notch, the Pawl must work against the bar carrying the Bakelite Cam. Anything that makes this Bar operate hard should be corrected. See that the end of the Pawl and Notch on the Station Selector Cam are smooth and free from burrs. Then try closing up the Power contacts on the Back Switch a little more, but only after checking the above points. This may be done by bending the Power blade so the Power contacts are closer together, when the Bakelite Cam is in the position shown in figure 4. DO NOT CHANGE THE OUTLINE OF THE PAWL OR CAM NOTCH.

25 The Pawls can sometimes be made to jam when two Station Selector Cams are set to one station, especially if both Cams are not set exactly to the same frequency and an attempt is made to push one button, then the other button. The Motor will hum or the Clutch will slip until the button is released. What actually happens is this: When such a button is pushed that its Pawl, in falling directly into the Notch on the Station Selector Cam, binds against the high-side wall of the Notch, the Bakelite Cam assumes the position shown in figure 3. The Motor drives the Station Selector Cam tighter against the Pawl and prevents it from falling farther into the Notch. The jammed Pawl may be released by pushing another button and no damage is done. It is possible, with close adjustments of the Back Switch Contacts, to make the Pawls jam as indicated above even when they are set exactly to the same frequency. FOR THIS REASON THE SETTING OF TWO OR MORE BUTTONS TO ONE FREQUENCY ON DEMONSTRATOR SETS IS NOT RECOMMENDED AS GOOD PRACTICE

26 A similar condition may exist when the set is tuned to a station manually, and then the button set for that station is pushed.

STATION SELECTOR CAMS

27 The Cam Assembly is designed to operate through slightly less than 180°. The Cams though, can be rotated all the way around. Obviously then, it is possible to set a Cam so that its Notch will not pass under the Pawl. If a Cam were so set and the button pushed in, the Pointer would run to the end of the Dial and the Motor would continue to operate. This occurs because the Notch has not come around so the Pawl could fall in and cut the power off. TO CORRECT SUCH FAULT: Turn the power off. Pull out the Set-up Knob. Unlock the Cam Assembly by turning the Set-up Knob clockwise as far as it will go. A slight click should be heard as the mechanism is unlocked. Then push in the offending button. Rotate the Set-up Knob to run the Dial Pointer clear to the very end of the Dial in one direction then in the other. The Cam should now be in the proper position, ready to be set up to a station.

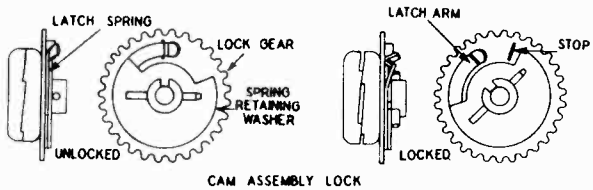
28 A similar condition is when a Cam is set to bring the Pointer to the very end of the Dial. The Pawl may lack just a very little bit of falling in far enough to cause the power to be cut off. Reset the Cam so the Pawl can fall in before the Cam Assembly Stop Pin (Figure 14) hits the stop.

KEYS

29 It is quite unlikely that the Keys will require any adjustment. Their failure to work properly will usually be due to improper adjustment or operation of some other part or parts of the mechanism.

CAM ASSEMBLY LOCK

30 Refer to figure 9. The left saw-tooth section of the Lock, the Spring Retaining Washer and the Latch Spring are keyed to the Cam Shaft. The right saw-tooth section of the Lock and Lock Gear (Figure 13) are free to turn on the Cam Shaft, subject to certain limits. These limits are complete engagement of the teeth on the two sections of the Lock in one direction, and a stop on the Lock Gear in the other direction. Rotating the right half of the Lock counter-clockwise (by turning the Set-up Knob clockwise) will cause the two saw-tooth sections to assume the meshed or unlocked position shown in figure 9A. It should relieve the pressure on the Station Selector Cams and Friction Washers enough so that they can be turned on the Cam Shaft quite freely. In this position the flat Latch Spring Arm should be hooked over the Stop on the Lock Gear (Figure 9A). The Cam Assembly may then be rotated within its working range, by the use of the Set-up Knob, without causing the mechanism to lock up.



CAM ASSEMBLY LOCK

FIG. 9A FIG. 9B

31 The Cam Assembly will be locked up if the Set-up Knob is turned after the Cam Assembly Stop Pin (Figure 14) reaches the Back Stop on the Left End Bracket. This occurs because the Latch Arm slips over the Stop on the Lock Gear and permits expansion of the lock as shown in figure 9B. When fully unmeshed the lock has expanded about .030 of an inch. The stop on the Lock Gear would be against the stop portion of the Spring Retaining Washer, and only the tips of the teeth on the saw-tooth sections would be touching each other. The pressure exerted on the Station Selector Cams will depend upon the amount the saw-tooth sections are unmeshed. When unmeshed (locked up) as far as possible, with the Stop on the Lock Gear against the Stop on the Retaining Washer, if there is still insufficient pressure being exerted to keep the Station Selector Cams from slipping, proceed as follows: Unlock the Cam Assembly and slip a horse-shoe shaped shim, about .01 on an inch thick, down between the left Station Selector Cam and the Bushing (Figure 14). Do not make this shim too thick or the mechanism will tend to lock up while attempting to set up stations.

32 Locking up of the mechanism during set-up may be due to a Station Selector Cam not turning freely enough because of dirt, grit, etc. between the Cams and the Friction Spacer Washers. This may also result from defective Latch parts or a quick sudden turn of the Set-up Knob. TO REMOVE THE LATCH SPRING OR THE LOCK GEAR, first remove the Clutch as outlined in section 23. Then remove the Reduction Gears. Unlock the Assembly and pull out the pin through the Cam Shaft, to the right of the Lock (Figure 14). The Retaining Washer, Latch Spring and Lock Gear may now be slid off the right end of the Cam Shaft.

BAR AND ARM ASSEMBLY

33 The lower end of the Arm should rest right on the "hump" of the Kickout as shown at D in figures 5, with the mechanism in the manual tuning position. If the adjustment is correct any movement of the Arm, either forward or backwards, should allow the Kickout Arm to rise. This setting can usually be secured by moving the Friction Wheel in or out on the Motor Shaft, thus sliding the Friction Roller Assembly (Figure 13) backward or forward on the Tuning Shaft. The amount of adjustment possible by this method is limited by the movement of the Friction Wheel possible without causing it to interfere with the

Star Wheel, or the Motor Pinion becoming disengaged from the First Reduction Gear. Further adjustment, if necessary, may be made by bending the Arm slightly, preferably at its upper end. THE ADJUSTMENT SHOULD NOT BE CARRIED OUT TO THE DETRIMENT OF THOSE ADJUSTMENTS REQUIRED FOR THE SIDE SWITCH AS INDICATED IN SECTIONS 15 AND 19.

KEY STOP BAR AND KICKOUT ARM

34 The Adjustable Tip on the Kickout Arm in engaging the Star Wheel (Figure 6) determines the position of the Key Stop Bar (Figures 1B and 13), which holds the buttons in. If the Tip on the Kickout is set too low, the Key Stop Bar swings up so far that the buttons are hard to release. If the Tip is set too high the buttons will not stay depressed, since the Key Stop Bar (Figure 1B) cannot come up far enough to catch and hold the keys in. Therefore, the Adjustable Tip on the Kickout Arm should be set as high as possible and still allow the buttons to stay in.

35 Failure of buttons to stay depressed may also be due to: the Kickout Spring (Figure 13) being bent down too far (it should clear the Kickout Arm by about 1/16 of an inch when the mechanism is in the automatic position); insufficient tension in the Return Spring on the Key Stop Bar; or the Key Stop Bar is sprung down in the middle. Also see section 37.

36 If a button will not release when another is pushed, the Key Stop Bar may be jammed or sprung, or held from normal movement by the Kickout Arm being caught on the Star Wheel; or a Pawl may be sticking in its Station Selector Cam.

STAR WHEEL

37 The Star Spring Collar (Figure 13) should be set so that the spring holds the Star Wheel in such position that the Pin is midway between the ends of the slot in the Star Wheel hub. At the same time the set screw in the Collar should be in the groove around the tuning shaft, to locate the tuning shaft in the End Bracket. Within the limits of movement allowed by the Slot and Pin, the Star Wheel should turn quite freely on the Tuning Shaft except as restrained by the Spring. Otherwise the Tip of the Kickout Arm may sometimes engage one of the points of the Star Wheel and hold the Key Stop Bar down, thus preventing the Key from catching and staying depressed. (Sections 34 to 36 and Figure 6.)

38 All edges and corners of the Star Wheel must be smooth and free from burrs. If not, the Tip of the Kickout Arm (Figure 13) may catch and prevent the buttons from staying in or being released.

MOTOR

39 The Motor is mounted on the Right End Bracket by two Mounting Screws (Figure 13) through oversize holes in the Bracket. The size of the holes permit adjusting the meshing of the Motor Pinion and the First Reduction Gear for minimum noise. Noisy operation may be caused by either too tight or too loose meshing of the Gears. Too tight meshing will also load up the drives because of binding. See section 49 for details on "Universal" type motor.

ANTI-BACKLASH GEARS

40 There are two types of Anti-backlash Gears used in the Moto-Matic Tuner. One type is made up of two spur gear sections and two small coil springs. Such gears are used in the gear reduction train driving the Cam Shaft (Figure 13), the Clutch (Figure 8) and the Pointer Drive Gear (Figure 15). The springs in these gears should be compressed by displacing the two gear sections one or two teeth with respect to each other. DISPLACEMENT OF THE GEAR SECTION FACING YOU SHOULD ALWAYS BE CLOCKWISE WITH RESPECT TO THE OTHER GEAR SECTION. Too little compression in the springs cause play and backlash. Too much compression causes binding, tending to load up the driver, and noisy operation. The First Reduction Gear (next to the motor pinion, Figure 13) uses light springs, part number 85815; the Second Reduction Gear (nest to the Clutch, Figure 13) uses heavier springs, part number 10054112465; the Clutch and Pointer Drive Gear use still heavier springs, part number 1005489086. The correct displacement between sections of these gears, when equipped with the proper springs, should be not less than one nor more than two teeth.

41 The other type of gear is used to drive the Gang Condenser (Figure 10). The teeth of such gears are so shaped that, when the gears are kept tightly meshed together, backlash is prevented.

FLEXIBLE COUPLING

42 This device permits some misalignment of the Gang Condenser Shaft and the Extension Shaft (Figure 10), without causing binding in the bearings supporting the shafts. Inside of it is a coiled compression spring which keeps the Knurled Gears in mesh and prevents backlash. TO ADJUST THIS SPRING: Set the Coupling so the end of the Gang Condenser Shaft is flush with the inside edge of the back coupling collar. Tighten the set screw in the back coupling collar. Put the Knurled Gears in mesh, then compress the spring in the Coupling slightly and tighten the set screw in the front collar of the coupling. There now should be just enough thrust by the compressed coil spring to keep the Knurled Gears in mesh and free from backlash. If not, loosen the front set screw in the coupling, compress the spring a little more and retighten the set screw.

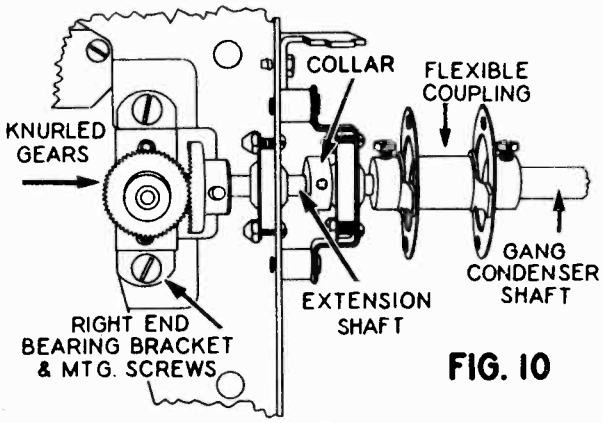


FIG. 10

GANG CONDENSER DRIVE

43 A few of the early chassis used a single section coupling. Later sets use a double section coupling, part number 10054112450, as shown in figure 10. This latter type is more flexible than the former and consequently, causes less binding when the Extension and Gang Condenser shafts are badly out of line. Only the later type is carried in stock. Therefore, if it is necessary to replace the older type, it will also be necessary to use Spring, part number 10054112490, and Extension Shaft, part number 10054112488, with the new coupling. Or in place of the new shaft, the old shaft may be used by cutting off 11/16 of an inch and chamfering the end like the piece which was cut off. The new shaft should be 2 3/16 inches long.

SETTING UP

44 THE FOLLOWING POINTS MUST BE OBSERVED DURING THE SETTING UP AND USE OF THE AUTOMATIC MECHANISM IF BEST RESULTS ARE TO BE OBTAINED.

ON MODEL 100.186 THE TONE CONTROL BROADENS THE TUNING WHEN IN THE TREBLE POSITION, MAXIMUM CLOCKWISE, THEREFORE THIS POSITION POSITIVELY MUST NOT BE USED DURING SET-UP.

a. Use a GOOD antenna.

b. Allow the set to warm up for twenty minutes before setting it up.

c. Set up the buttons from left to right, that is, the right hand buttons should be the last to be set up.

d. Avoid setting buttons on weak or fading signals.

e. Tune carefully when setting up.

f. After a button is set up, do not push that button again until the mechanism is locked. To do so will spoil the setting of that button.

g. Lock up tight. Continue to force the Set-up Knob in a counter-clockwise direction even after it seems to reach a definite stop. If you do not use force, the setting of the buttons may change.

45 Detailed, illustrated instructions for setting up the Moto-Matic Tuner are included with each receiver. In brief, the setting up procedure is as follows:

a. Pull off the Tuning Knob. This reveals the Set-up Knob (Figure 13). Pull the Set-up Knob out. Unlock the mechanism by turning the Set-up Knob clockwise until a slight click is heard.

b. Push in a button. After the Pointer has stopped moving, grasp the Set-up Knob and tune in the station to which the button is to be set.

c. Push in another button. After the pointer has stopped moving, again grasp the Set-up Knob and tune in the Station to which this button is to be set.

d. Continue to push in buttons and tune in the stations until as many are set up as desired. Then release the last button set up, by pushing the Set-up Knob part way in.

e. Pull the Set-up Knob back out. Lock up the Cam Assembly by turning the Set-up Knob counter-clockwise as far as it will go. Continue to force the Set-up Knob in a counter-clockwise direction even after it seems to reach a definite stop. If you do not use force, the settings of the buttons may change.

f. Push in the Set-up Knob and replace the Tuning Knob.

46 Occasionally a unit may be encountered in which it is difficult to set up accurately, the extreme right hand buttons. In such case, they should be set to stations at the low frequency end of the dial, or used to locate short wave bands.

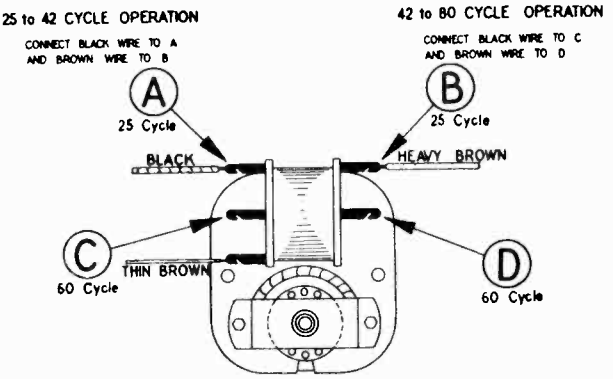
47 In case of complaint that a button set for some frequency, does not tune to that point within 10 K.C., or more, after locking up, it usually develops that the Station Selector Cam has inadvertently been moved before it was locked. This may come about by turning the Set-up Knob slightly when releasing the button, preparatory to locking the mechanism. Another possibility, if the Back Switch is not adjusted properly, is that by pushing a second button the motor will start before the pawl falls clear of the first cam, thus causing this cam to be shifted slightly before it is locked in place.

48 A short may occur in the unit due to the Tuning Shaft Bearing Stop (Figure 13) getting out of place. It then catches on the Set-up Gear. When the gear is turned counter-clockwise it forces the Bearing Stop against the hot blade of the Side Switch. Solder the Bearing Stop in place.

UNIVERSAL MODELS CONNECTIONS

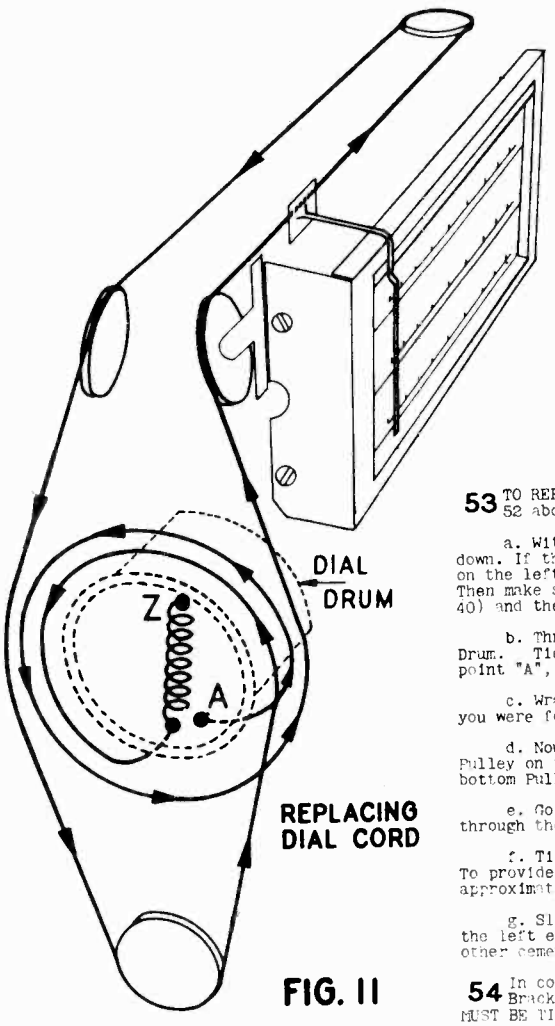
49 The tuner motor may not operate if the line voltage drops very much below 105 volts. The motor used in the 60 cycle models will only operate properly on 50 to 60 cycles. Special motors, used in 25 to 80 cycle models, can be connected for operation on other frequencies as shown below:

MOTOR CONNECTIONS FOR TUNER MOTOR USED ON 25-80 CYCLES UNIVERSAL MODELS.



50 The connections for the Light Ray Tuner transformer, both standard 60 cycles, and universal 25 to 80 cycle types are shown on the various chassis service manuals.

DIAL MECHANISM AND CALIBRATION



REPLACING DIAL CORD

FIG. 11

51 The Cam Assembly Stop Pin, located on the left end of the Cam Assembly (Figure 14), allows approximately 180° of rotation of the Assembly and provides a strong, positive stop for the mechanism during locking and unlocking. It also protects the less rugged stops on the Gang Condenser. This Pin should strike the Stop just before the Gang Condenser is in full mesh or fully open. If it does not, to establish the correct relation between these two sets of stops: Loosen the set screw in the Knurled Condenser Drive Gear (Figures 10 and 15) on the Cam Shaft. Turn the Cam Assembly until the Stop Pin on it points to the back and is resting against the Stop on the Left End Bracket (Figure 14). Close the Gang Condenser to full mesh, then open it up just the least bit to relieve the Condenser Stop and tighten the set screw in the Knurled Gear. This allows the heavy Cam Assembly Stop Pin to reach its Stop first in each direction, since its working arc is slightly less than that of the Gang Condenser. See chassis service manual for complete calibration instructions.

52 The Knurled Gear (Figure 10) driving the Gang Condenser should be set on the Cam Shaft so that the center of its face engages the Crown Gear on the Extension Shaft. The dial Drive Gear, located on the left end of the Cam Shaft, (Figure 15) should engage the center of the face of the gear on the Dial Cord Drum. Check the end play in the Cam Shaft to see that these two sets of gears will not become unmeshed. If there is excessive end play in the Cam Shaft, move the collar (Figure 14) in closer to the Left End Bracket. There should be approximately .010 of an inch play between the Collar and Bracket.

53 TO REPLACE THE DIAL CORD: First check the points outlined in sections 51 and 52 above, then refer to figure 11 and proceed as follows:

a. With the Gang Condenser closed, the holes in the Dial Cord Drum should be down. If they are not, loosen the set screw in the Pointer Drive Gear (Figure 15) on the left end of the Cam Shaft, and rotate the Dial Cord Drum so that they are. Then make sure that the anti-backlash springs are compressed one tooth (section 40) and the gears are meshing properly before tightening the set screw.

b. Thread one end of the Dial Cord through the front hole of the two on the Drum. Tie a knot near the end of the inside of the Drum. This is the starting point "A", figure 11.

c. Wrap one and one quarter turns around the Drum counter-clockwise as though you were following the threads of a left hand screw.

d. Now go up over the front Pulley on the left end of the Dial; around the Pulley on the right end; over the back Pulley on the left end; down around the bottom Pulley and up to the front of the Drum.

e. Go around the Drum three quarters of a turn counter-clockwise and up through the back hole.

f. Tie the Tension Spring on and hook it over the hook on the Drum at "Z". To provide proper tension in the Dial Cord the extended spring should measure approximately 1 1/4 inch in length over all, when the Cord system is equalized.

g. Slip the Pointer clip under the Cord, set the Pointer at the last mark on the left end of the Dial Scale, close the clip and put on a drop of household or other cement on the Cord and clip junction.

54 In connection with Calibration, notice that movement of the Left End Bearing Bracket (Figure 15) changes the Pointer setting. BOTH SCREWS IN THIS BRACKET MUST BE TIGHT.

CHECKING A.F.C.

55 In order to determine if the Automatic Frequency Control System is working, either of the following methods may be employed without removing the chassis from the cabinet.

a. Select a local station whose signal is fairly strong and which operates on a frequency below 1000 KC. Tune manually to a frequency slightly above that of the selected station, but close enough to the signal that it can be heard somewhat distorted.

b. Open the A.F.C. (two upper) contacts on the Side Switch, by reaching into the back of the set with a pointed stick and forcing the contacts apart.

c. A.F.C. should then pull the signal in clearly and hold it, while the contacts remain open.

d. Now tune below the station frequency a few KC. and open the A.F.C. contacts again. Again A.F.C. should pull the signal in clearly.

56 The same check on Automatic Frequency Control action can be made from the front of the set by proceeding as follows:

a. Pull off the Tuning Knob. Pull out the Set-up Knob. Unlock the mechanism by turning the Set-up Knob clockwise until a slight click is heard.

b. Push a button in. After the pointer stops, tune in a fairly strong station below 1000 KC. Then detune until the signal is somewhat distorted.

c. Now, push the Set-up Knob in and leave it in. This also releases the depressed button. Push the same button in again. This should open the A.F.C. contacts on the Side Switch, and allow A.F.C. to bring the signal in clearly.

d. Pull the Set-up Knob out. Push the same button in again. Detune the other side of the station and repeat paragraph c.

57 If Automatic Frequency Control does not appear to be working: First make sure that the A.F.C. contacts on the Back and Side Switches (Figure 1 to 7) are open when a station is tuned in automatically and that the A.F.C. contacts on the Side Switch are closed when tuning manually or setting up the mechanism. Then check the Discriminator, Control,R.F., Mixer, and I.F. tubes. Re-align the I.F., Broadcast and discriminator trimmers as explained in the chassis service manuals before attempting to locate a fault in the chassis.

MANUAL TUNING

58 There should be sufficient traction between the Friction Roller and the Friction Wheel (Figure 13) to provide positive movement of the mechanism when the Tuning Knob is turned, providing there is no mechanical overload in the system. If the Dial Pointer fails to move when tuning manually, first, try washing the Rubber Ring on the Friction Wheel with carbon tetrachloride to remove any oil or grease. The traction between the Friction Roller and Friction Wheel may be increased slightly by sliding the Friction Wheel out farther on the Motor Shaft. The contact pressure between the Friction Wheel and Roller can be increased by shortening the Return Spring on the Bar and Arm Assembly (Figure 13). However, shortening this spring makes the buttons harder to pusn in.

59 Because of the exceptionally high tuning ratio used in this unit, the compounding effect on any slight lost motion is such that every precaution must be taken to keep backlash within satisfactory limits. Backlash will be at a minimum with proper adjustment of the various gears, as outlined in sections 40 and 41. Considerable lost motion will result if the Gang Condenser sways because of too loose mounting or because it turns too stiffly. Assuming the Clutch is in good working condition, it will only slip if mechanically overloaded.

60 In case of excessive Pointer backlash, check the following points; BOTH screws in the Left End Bearing Bracket must be tight. See that the Pointer Drive Gear(Figure 15) is not slipping on the Cam Shaft, that the anti-backlash springs in the gear are compressed at least one tooth, and that it does not slip out of mesh with the gear on the drum. The Dial Cord should be tight enough to extend the Tension Spring in the Drum so it measures about 1 1/4 inches long. See that the Pointer does not slip on the Cord and slides freely on the Guide Rail.

61 If the Tuning Shaft turns only a part of a revolution then catches, with a button depressed, it is probably due to burrs or rough edges on the Star Wheel or Adjustable Tip of the Kickout Arm (Figure 13). Or it may be that the buttons are too hard to release, because of improper adjustment of the Kickout Arm tip. See sections 35 and 37.

CHANGING MECHANISM

62 The early production sets have the Moto-Matic Tuner wired directly to the chassis. Later sets are equipped with a socket and plug to facilitate removal of the mechanism. The socket on the later mechanism is mounted about four inches from the right end, and facing the rear, on the horizontal reinforcing member on the back of the Dial Assembly. It is connected in as shown in figures 1A or 1B, depending upon the type of Side Switch (See Section 14.)

63 To change the Moto-Matic Tuner and Dial Assembly, part number 10054112727, it is only necessary to unsolder the green and the green-black wires to the volume control, take the volume control off the bracket, slip the Visual Tuning Indicator Light socket off, pull the above mentioned plug, loosen the set screw in the Flexible Coupling (Figure 10) and take out the four screws holding the assembly to the chassis. If the assembly has no plug on it see section 65.

When installing the new Moto-Matic Tuner and Dial Assembly see section 51 for dial calibration instructions, and section 42 for information on adjusting the tension in the spring in the flexible coupling.

64 To change the Moto-Matic Tuner, part number 10054111350, only, it is necessary to remove the Dial Cord from the Drum (Figure 11), take out the four screws holding the two End Bearing Brackets to the frame, pull out the plug and take out the four screws holding the unit to the frame. The two front screws holding the unit to the frame can be reached by removing the second or third and the sixth or seventh button shells in the bottom row. If the unit has no plug on it see section 65.

When installing the new Moto-Matic Tuner, see section 22g for alignment of the End Bearings, sections 51 to 53 for restringing the dial cord and dial calibration, and section 42 for information on adjusting the tension in the spring in the flexible coupling.

65 If it is necessary to put one of the later mechanism, having the socket, on an early chassis, the Plug (Figure 12), part number 10054112736, must be wired to the chassis. The plug is provided with seven color coded wires of sufficient length to connect to the proper points on the under side of the chassis. Disconnect an old wire and connect the corresponding new wire, following the colors for identification, before disconnecting the next old wire. However, some of the cable wires may have a different color than the original chassis wires. Briefly the cable wires are:

Black (Heavy)	To grounded side of 6 volt winding of power transformer.
Blue (Heavy)	To other terminal of 6 volt winding of power transformer.
Light Blue	To one leg of the Reactance Dimmer Coil (The Visual Tuning Indicator Light is connected to the other leg.)
White - Red	On models 100.184 and 100.185 to A.V.C. cathode (the one with the white-green wire attached to it) of the 6H6 tube. On model 100.186 to the ungrounded cathode of the discriminator (6H6) tube.
Small Black or White	On models 100.184 and 100.185 to other cathode of the 6H6 tube - the one with the brown wire attached to it. On model 100.186 to ground.
Green - Black	On model 100.184 to ground. On models 100.185 and 100.186 to one end of the audio input choke - the end connected to the control grid of one of the 6V6 output tubes with a green-black wire.
Green or Red	On model 100.184 to the control grid of the 6L6 output tube. On models 100.185 and 100.186 to the other end of the audio input choke - the end connected to the control grid of the other 6V6 output tube with a green wire.

TOP VIEW OF PLUG

FIG. 12

SPECIAL TOOLS

66 A special spring adjuster tool, part number 10054117468, list price $0.75 may be obtained from the factory for adjusting the Back and Side switch blades, although a pair of duck-bill pliers or a screw driver can be used.

67 Wrenches can also be supplied by the factory for the fluted (Bristol) set screws used in various parts of the Moto-Matic Tuner. For the #6 (small) set screws, the wrench is part number 10054112483, and for the #8 (large) set screw, the wrench is part number 1005412484. These wrenches have a list price of 7 cents each.

HOW TO ORDER PARTS FOR THE "MOTO-MATIC TUNER" USED ON CHASSIS HAVING IDENTIFICATION NUMBER 100.184 ; 100.185 OR 100.186 .

1. Use Purchase Order Form 5284.
2. On the Purchase Order always give the following information:
   (1) PART NUMBER and DESCRIPTION for each part ordered, as given in this parts list, regardless of number printed on part itself. When no part number is assigned, order by description and rating Also give PRICE of part (indicate if no selling).
   (2) THE IDENTIFICATION NUMBER, WHICH IS 100.184 ; 100.185 OR 100.186 THIS NUMBER IS FOUND ON THF LEFT REAR CORNER OF THE CHASSIS.
3. ORDERING INSTRUCTIONS.
   Send Purchase Orders DIRECT to Stewart-Warner Corp., 1828 Diversey Pkwy., Chicago, Ill.

BUTTON RETAINING SPRING, 10054111633 — **BUTTON WASHER 10054111576** — **BUTTON SPRING 10054111577** — **BUTTON BODY 10054112428**

RADIO STATION LIST

BUTTON REINFORCING DISC 10054112547 — **BUTTON CAP 10054112545** — **BUTTON WINDOW 10054111878** — **TABS, STATION CALL LETTERS 10054112005**

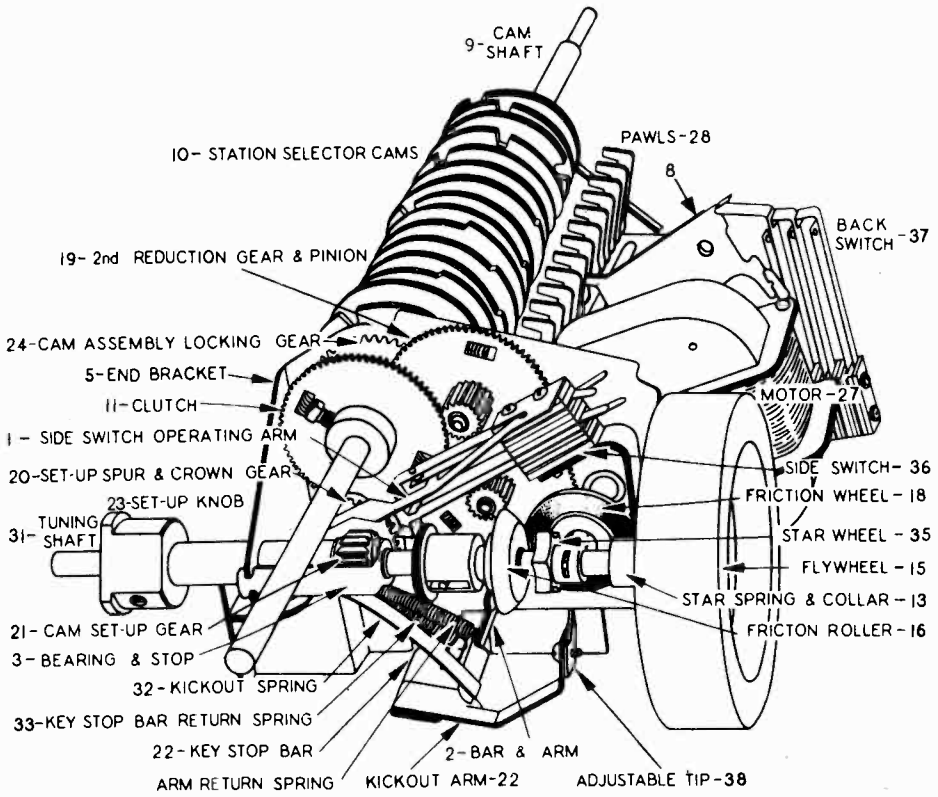
PARTS LIST-SOURCE NO. 100

Wherever the word "right" or "left" appears in the following list, it is understood that you are standing in front of the mechanism.

The Identification Numbers are to assist you in identifying parts shown on figures 13, 14 and 15 or to indicate in which figure the part can be seen. The identification is NOT TO BE USED in place of the part number, when ordering parts.

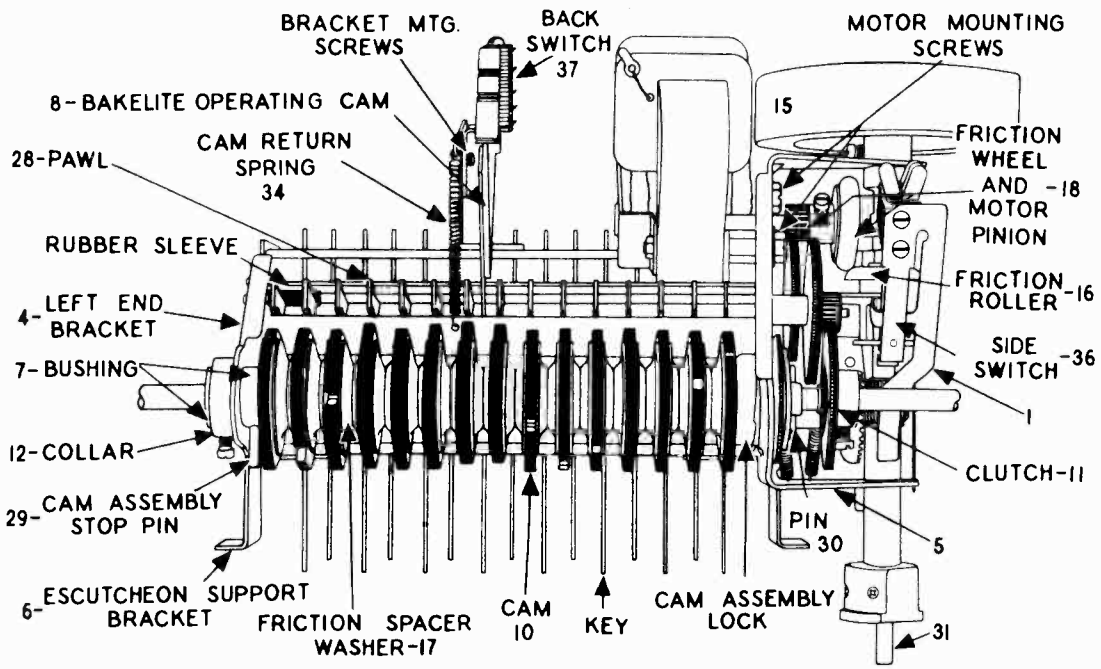
PART NUMBER	IDENTIFICATION NO.	DESCRIPTION
10054111581	1	Arm (long) side switch operating
10054111627	2	Bar & Arm Assembly
10054111526	3	Bearing - on tuning shaft
10054111176	4	Bracket - left end of mechanism
10054111547	5	Bracket - with studs (right end of mechanism)
10054111569	6	Bracket - pust button escutcheon support
10054111162	7	Bushing - left end of cam shaft
10054112428		Button Body - for tuner
10054112545		Button Cap - for push button
10054111878		Button Window - celluloid for push button
10054112547		Button Reinforcing Disc - for push button
10054111633		Button retaining spring - inside push button
10054111577		Button Spring
10054111576		Button Washer - in push button
10054111617 / 10054112563	8	Cam - bakelite for back switch operation (with arm) / Cam - bakelite-less operating arm
10054111625	9	Cam Shaft - with cams and right end bracket
10054111168	10	Cams - station selector
10054111146	11	Clutch - collar, spring & gear
10054111160	12	Collar - retaining (less set screw) left end of cam shaft
10054111161		Collar - retainer for pawls
10054111616	13	Collar & Spring - for star wheel
10054111882		Collar - inside of locking cam
10054111137		Drive Ring - rubber (on friction wheel)
10054111693	14	Escutcheon - metal, for push button
10054111310	15	Flywheel -with set screws
10054111549	16	Friction Roller - on rear end of tuning shaft
10054111169	17	Friction Spacer - between cams
10054111402 / 10054111137	18	Friction Wheel - (on motor shaft) with rubber ring / Drive ring rubber (on frict.wheel)
10054111145	19	Gear - and pinion (reduction)
10054111157	20	Gear - crown & pinion, for "Setting-up"
10054111523	21	Gear - set up (on tuning shaft)
10054112726		Housing - with keys
10054112522	22	Key stop bar - kickout assembly
10054111632	23	Knob - for setting up
10054111408		Lock - saw tooth adjacent to cam (left half)-Fig. 14
10054111548	24	Lock - saw tooth with gear (right half)
10054112727	25	Moto-Matic Tuner-complete with all dials-ready to mount on chassis
10054111350	26	Moto-Matic Tuner only, less dial frame assembly
10054111380	27	Motor - 6 volt 60 cycles
10054112354		Motor - 6 volt 25 to 80 cycles
10054111491	28	Pawl & Bushing - single unit
10054111624		Pawls & Shaft - (assembly)
10054111148	29	Pin - cam shaft, left end
10054111409		Pin - for friction roller-Fig.13
10054111410		Pin - in star wheel
10054111411	30	Pin - cam shaft - right end
10054111883		Pin - inside of lock
10054111557		Retainer - over left end of pawl shaft (brass)
10054111152		Retaining Ring-for reduction gears
10054111153		Retaining Ring-for crown gear
1005475032		Screw - #4 for kickout tip---Per C
1005485040		Screw - #6 Hex.hd.for mtg. frame---Per C
1005488707		Screw - Binder Hd. for mtg. push button escutcheon---Per dz.
10054111673		Screws - (through back switch)
10054111968		Screw - side switch mtg.-Fig.6
1005485827		Set Screw - on clutch collar-Fig.8
10054111554		Set Screw - #4 headless (for pawl collar)
10054111403		Set Screw - #8 for set up knob - Figure 13
10054111588		Set Screw - for collar and star spring mtg. (6/32)
10054112138		Set Screw - 8/32 round head
10054111166		Shaft - for pawls
10054111405		Shaft - for key stop bar
10054111406		Shaft - for bar & arm assembly
10054111590	31	Shaft - tuning
1005485815		Spring - between reduction gear sections (next to motor)
1005489086		Spring - coil between sections of clutch gear - Fig. 8
10054112465		Spring - between reduction gear sections (next to clutch)
10054111138		Spring - horseshoe shaped on clutch
10054111151		Spring - key stop bar shaft retainer
10054111528		Spring - coil (inside of lock)
10054111552		Spring - flat, with tongue, on lock (latch spring)-Fig.9
10054111555		Spring - for key and pawls
10054111609	32	Spring - kickout
10054111933	33	Spring - coil,key stop bar return
10054112568	34	Spring - bakelite cam return
10054111440	35	Star Wheel - on tuning shaft
10054111674	36	Switch - side (above tuning shaft)
10054112564	37	Switch - back, later type
10054112521	38	Tip - adjustable on kickout arm
1005476999		Washer - lock,for kickout tipPer C
1005477113		Washer - flat,for kickout tipPer C
10054111169	17	Washer - friction spacer (between cams)
10054111553		Washer - spring retainer on lock mechanism - Figure 9
10054112483		Wrench - for #6 fluted set screw
10054112484		Wrench - for #8 fluted set screw

Moto-Matic Tuner



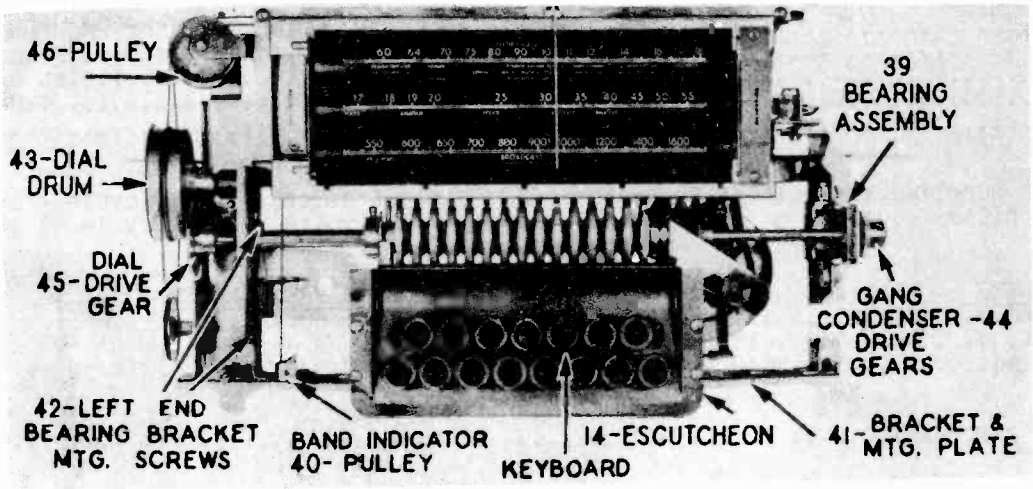
LEFT END VIEW OF MECHANISM

FIG. 13



26 TOP VIEW OF MECHANISM

FIG. 14



25 FRONT VIEW OF MYSTIC MECHANISM AND DIAL ASSEMBLY

FIG. 15

DIAL MECHANISM AND MISCELLANEOUS PARTS LIST

Wherever the word "right" or "left" appears in the following list, it is understood that you are standing in front of the mechanism. The Identification Numbers are to assist you in identifying parts shown in figures 13, 14 and 15 or to indicate in which figure the part can be seen. The identification is NOT TO BE USED in place of the part number, when ordering parts.

PART NUMBER	IDENTIFICATION NO.	DESCRIPTION
10054111930		Band Indicator & frame assem.
10054111894	39	Bearing Assembly-self aligning, on right end of cam shaft & supports gang extension shaft
10054111601		Bearing - self aligning
10054111692		Bearing Retainer-plate, copper
10054112658		Belt - for range switch drive
10054111261		Bolt - chassis mtg.(#14X1-1/4)
1005488631		Bracket - for range switch support (under chassis)
10054111630	40	Bracket & Pulley-for band indicator cord
10054111893	41	Bracket & Mounting Plate - for Moto-Matic Tuner
10054111894	39	Bracket & Bearing - right side of shaft
10054111899	42	Bracket & Bearing - left side of shaft
10054111260		Bushing - rubber(for chass.mtg.)
10054111892		Bushing - rubber, Moto-Matic Tuner mtg. to chassis
10054111658		Clip - for pulley retaining
10054110782		Cord - for band inciator (2 ft. required) - Per ft.
10054111302		Cord - dial drive(6 ft. lgths.)
10054111864	43	Dial Drum - with gear
10054111226		Escutcheon-for dial(with glass)
10054111227		Escutcheon - around push button opening
10054111690		Felt - oil wick for bearing
10054112450		Flexible Cplg. -with set screws
10054111865		Frame - dial, with scale
10054111608	44	Gear - right end of cam shaft drive gang condenser
10054111629	45	Gear - dial drive (left end of cam shaft)
10054111631	44	Gear - crown, on extension gang shaft
10054111496		Knob - tuning or volume
10054111497		Knob - range or tone
10054111197		Lever-for band ind.(on shaft)
10054111370		Link & Lever - for range switch drive(used in early production)
10054112633		Plug - for mech. connecting (8 prong)
10054112736		Plug and cable-for mechanism connecting
10054111859		Pointer - for dial, with slider
10054111622	46	Pulley - dial cord drive
10054111630		Pulley & Bracket-for band ind.
10054112628		Pulley - on range switch shaft under chassis
1005484214		Retaining Ring - for dial drum
1005489837		Retaining Spring - for holding escutcheon to cabinet
10054111222		Scale - dial
10054110716		Screw - band ind. pivot(shaft)
10054111116		Screw - #5X5/8 Moto-Matic Tuner mtg.
1005485827		Set Screw - 8/32 square head
10054111403		Set Screw - 8/32 fluted head
10054112138		Set Screw - 8/32 slotted head
10054110716		Shaft, band indicator
10054112488		Shaft, extension (between gang condenser & unit) - Figure 10
10054111373		Shaft - for range switch
1005485427		Socket - octal base
10054110501		Socket - 4 prong (for speaker)
10054110627		Socket - dial lamp and automatic lamp
10054111008		Socket - Light Ray dimmer lamp
10054112630		Socket & Bracket - for electrical connections to mechanism
10054111090		Spacer - Steel, Moto-Matic Tuner mtg. to chassis
10054111570		Spacer - rubber for Moto-Matic Tuner mtg. to chassis
10054117468		Spring Bender - (switch adjusting tool)
1005489066		Spring - between sections of dial dr. gear left side of mech.
10054111232		Spring - torsion for band ind.
10054111862		Spring - dr. cord tension Fig.11
10054112490		Spring - in flexible coupling
10054111676		Stud - lower left idler pulley
10054112667		Stud - for pulley mtg. (for top pulley)
10054112005		Tabs - sta. call letters(6 sheets)
1005485066		Terminal Strip - G.D.A.
1005489709		Terminal Strip - phono
10054112483		Wrench - for #6 fluted set screw
10054112484		Wrench - for #7 fluted set screw

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ELECTRICAL SPECIFICATIONS

TUBE COMPLEMENT

1 6K7.....R.F. Amp.	1 6H6.....Discriminator-2nd Det.-A.V.C.
1 6L7.....1st Det.	1 6L6.....Power output
1 6C5..... Osc.	1 6F5.....1st A.F. Amp.
1 6K7.....1st I.F. Amp.	1 5U4-G.....Rectifier
1 6K7.....2nd I.F. Amp.	1 6J7.....Control

POWER SUPPLY

Model 7218 is supplied for either 25 or 60 cycle power supplies

105-135 volts, - 50-60 cycle - 140 watts
105-135 volts, - 25 cycle - 140 watts

FREQUENCY RANGES

Broadcast Band.....525 to 1680KC.	1500 KC.: 600 KC.
Police Band.....1655 to 5600 KC.	5000 KC.
Short Wave Band.....5540 to 18,100 KC.	16,000 KC.

INTERMEDIATE FREQUENCY.....465 KC

POWER OUTPUT

Type.....Single Stage beam power
Undistorted.....6 watts
Maximum.....8 watts

LOUD SPEAKERS

Part No.	Size	Model	Field Res. (Hot)	Field Coil Voltage
10058281	12"	7216	400	45 volts

OPERATING FEATURES

Fidelity Rge. (±6DB).....50-3000 cycle
Tone control.....3 position
Resonance indicator....."Light Ray" Indicator
Volume stabilizer.....A.V.C. system
Tuning corrector.....A.F.C. system
"Moto-Matic" tuner.....Push button control

CHASSIS FEATURES

R. F. stages.....one
Number of I.F. stages.....two
Number of Cond. in gang.....three
Antenna.....Conv. or Doublet
Wave trap.....465 KC

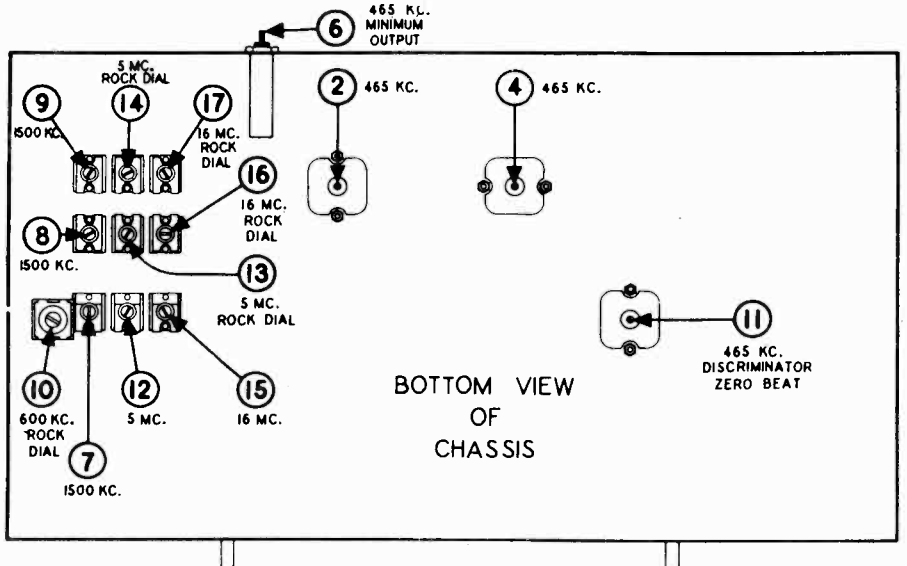
MECHANICAL SPECIFICATIONS

OPERATING CONTROLS

1. Upper Left Knob.....Power Switch & Volume
2. Lower Left Knob.....Tone Control
3. Upper Right Knob..... Station Selector
4. Lower Right Knob.....Band Switch

CONTROL OPERATION

Turning right.....Power on, Vol. Incr.
Turning right.....Bass to Brilliant
Spinner Tuning.....
Turning Right to Left.....S.W.-P.-B.C.



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The 100.184 automatic tuning superheterodyne receiver has a frequency range extending from 525 KC. to 18,100 KC. The intermediate frequency is 465 KC.

The receiver is designed for use with either a conventional single wire type or a special noise reducing doublet. A 465 KC. wave trap is connected in series with the antenna input to prevent code interference from stations operating in the vicinity of 465 KC.

A conventional superheterodyne circuit is used with the exception that maximum efficiency and stability are insured by the use of a separate oscillator and a specially constructed R.F. bridge. The bridge has the distinct advantages of being extremely compact and may be removed by the disconnecting of only a few leads. This means a great saving of time in the servicing of any part of the R.F. unit.

Since the R.F. and I.F. systems are typical of the superheterodyne it will not be necessary to discuss their function other than stating that the filtered automatic volume control voltage is applied to both the R.F. and 1st detector and the I.F. stages.

The second I.F. stage is followed by a new type of I.F. transformer in order that the A.F.C. voltage may be obtainable. The A.F.C. discriminator is coupled through the third (discriminator) I.F. transformer directly to the 2nd I.F. stage. The third (or discriminator) I.F. transformer secondary is connected directly to the diode plates of the 6H6 tube, which performs the triple function of a linear second detector, A.V.C. and discriminator. The audio component of the output of this tube is supplied to the volume control and amplified in the usual manner. The A.V.C. voltage is taken off at the same point of the diode load resistor network and supplied to the R. F. 1st dectector and 1st I.F. tubes while the A.V.C. voltage for the 2nd I.F. tube is taken off at another point on this same network.

The center tap of the secondary of the third I. F. transformer is connected to the high side of the primary of this transformer, through a coupling condenser. Since the ends of the secondary are connected directly to the diode plates of the 6H6 discriminator tube, this connection serves to introduce the proper voltages to each of the diode plates and thus satisfies the first conditions for an A.F.C. system.

The two rectified voltages appearing between each of the diode plates and its respective cathode are arranged to buck each other.

This is accomplished by connecting both diode load resistors to the center tap of the 3rd I.F. transformer. Thus when the cathode of one 6H6 is grounded a voltage will appear between the second cathode and ground if the frequency coming through the I.F. stage is not 465 KC. (indicating improperly tuned receiver). This voltage may be either positive or negative depending upon whether the frequency coming through the I.F. system is above or below 465 KC. This voltage is known as the control voltage and is filtered and applied to the grid of the control tube which in turn supplies either more or less lagging current to the tank circuit of the oscillator. The amount of lagging current flowing in the oscillator coil will determine the amount of apparent inductance added to the coil. The amount of inductance added or subtracted will in turn correct the frequency of oscillator as near as possible so that the frequency going through the I.F. system will be nearly 465 KC; thus giving a perfectly tuned program even though the station pointer may not be set to the exact frequency of the incoming signal.

Another important feature of this receiver is the "Moto-Matic" Electric Tuner, which automatically tunes the receiver to the desired station. Since this feature is extremely important from a service angle we have prepared a separate manual on the "Moto-Matic" Electric Tuner, which covers in detail the service procedure for this unit. This manual also contains a complete itemized and pictorial parts list of "Moto-Matic" tuner parts. Specify Part Number 10059112932 when ordering this booklet.

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A.F.C. ALIGNMENT

IMPORTANT:- The following adjustment must be made after every re-adjustment of the I.F. and broadcast band trimmers.

The A.F.C. discriminator should be adjusted as follows:

1. Be sure no buttons are depressed. Loosely couple the output of the signal generator to the 6L7 control grid by clipping the signal generator output lead to the insulation on the control grid wire, or connect to the grid clip through a 50 mmfd. mica condenser. BE SURE THE RANGE SWITCH IS IN THE BROADCAST (COUNTER-CLOCKWISE) POSITION.

2. Adjust the signal generator to resonance with I.F. system by tuning the signal generator dial for maximum output meter deflection. Be sure that the receiver dial is at some point where it has no tuning effect on the generator signal. Switch off the modulation.

3. With the signal generator connected and operating as in #2, connect antenna and manually tune in powerful local station in region of 1000 KC. or lower. (Avoid stations around 930 KC. which might beat with second harmonic of test oscillator.)

4. Adjust receiver tuning dial to obtain zero beat between the test oscillator and the incoming signal. (A very slight adjustment is all that is required. Be careful not to tune off signal.)

5. Refer to the illustration above. It is now necessary to open the A.F.C. contacts and allow the A.F.C. to function. This may be done by placing a piece of smooth cardboard between the A.F.C. contacts as shown in the figure. Be careful not to bend or malform the switch in any way.

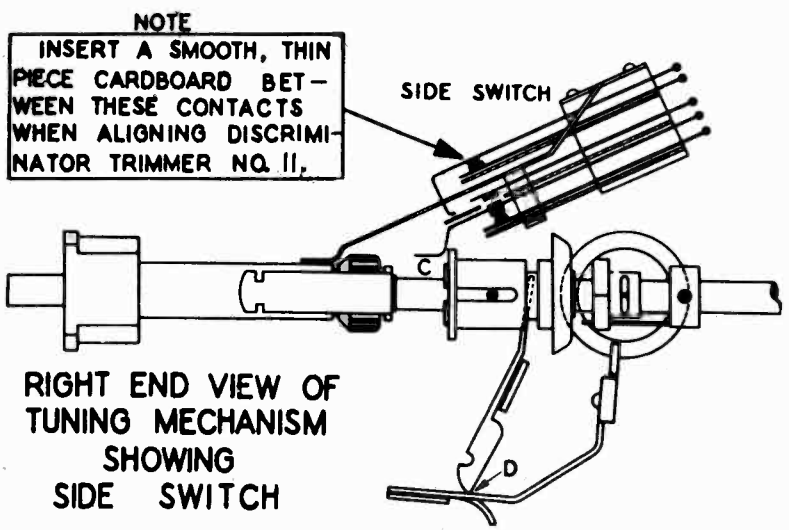
6. Now, adjust the secondary of the discriminator transformer (Trimmer #11) to restore zero beat. NOTE: This trimmer should be adjusted to the point where the frequency of the beat note increases rapidly if the trimmer is turned in either direction. Other zero beat points may be found with the trimmer all the way in or all the way out, but these settings are incorrect.

If this operation has been performed correctly, the opening or closing of the A.F.C. contacts on the side switch by inserting or removing the cardboard, should not change the beat note by more than a slight rumble.

NOTE:- Where a second signal generator is available step #3 above may be varied as follows:

Connect second signal generator (set at about 1000 KC.) to antenna and tune in its signal. Switch off modulation and proceed as before.

This method is somewhat preferable to the first as the zero beat setting is more easily determined when both signals are unmodulated.



RIGHT END VIEW OF TUNING MECHANISM SHOWING SIDE SWITCH

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ALIGNMENT PROCEDURE

Before attempting to align the receiver check to see that the dial pointer is opposite the last scale division on the low frequency end of the dial when the gang condenser is in full mesh. Also when the gang condenser is in full mesh the stop pin on the left side of the tuner should be resting against the back stop. If after examination it is found that the gang is in full mesh and the stop pin is against the back stop, but the pointer is set to the wrong position, it will only be necessary to loosen the set screw on the dial drive gear at the left side of the mechanism. Then grasp the large drum on the same side of the tuner and turn it until the pointer is set correctly. Now retighten the set screw in the gear being careful to see that the gear is meshing properly.

On the other hand if the stop pin does not rest against the back stop with the gang condenser in full mesh, loosen the set screw on the gang condenser side of the flexible coupler. Then turn the tuning knob until the stop pin rests against the back stop on the tuner. Now tighten the set screw in the flexible coupler and proceed to set the pointer to its correct position by the method described in the previous paragraph.

Output meter connections	Across voice coil leads
Output meter reading to indicate 0.5 watt output	1.42 volts
Average sensitivity in microvolts for 0.5 watt output	15 Microvolts
Generator ground connection	Receiver Chassis
Connection of generator output lead	See chart below
Generator modulation	30%, 400 cycles
Position of volume control	Maximum clockwise

HOW TO TEST THE A.F.C. SYSTEM

Connect the antenna and tune in a powerful local station. The setting of the tone control does not affect this test. Remove the cardboard that you placed between the A.F.C. contacts on the side switch when aligning. The A.F.C. is now off.

Next, detune the receiver dial until the music or speech becomes somewhat distorted. Now place a piece of smooth cardboard between the A.F.C. contacts on the side switch as shown in the illustration at the top of this page. This allows A.F.C. to function and it should improve the quality of the program.

Similarly detune the receiver dial in the opposite direction, with the cardboard removed from between the A.F.C. contacts (contacts closed). Then place the cardboard between the contacts again and check for improved quality of reception.

It will be noted that the correction for mistuning afforded by the A.F.C. system is not as marked at stations near the low frequency end of the dial scale as it is at the higher broadcast frequencies. This is characteristic of A.F.C. systems. However, if opening the A.F.C. contacts on the side switch (by inserting the piece of cardboard betweeen the contacts) has no effect on the signal, or if it corrects for mistuning in one direction only, check the receiver as follows:

1. Re-align I.F. broadcast band, and discriminator trimmers.
2. Check all the tubes in the receiver. Defective 6H6 and 6J7 tubes, also the R.F. 1st Detector, and I.F. tubes may cause poor A.F.C. action.
3. If the above procedure fails to remedy the defect in A.F.C. action, check the entire A.F.C. circuit itself for possible troubles.

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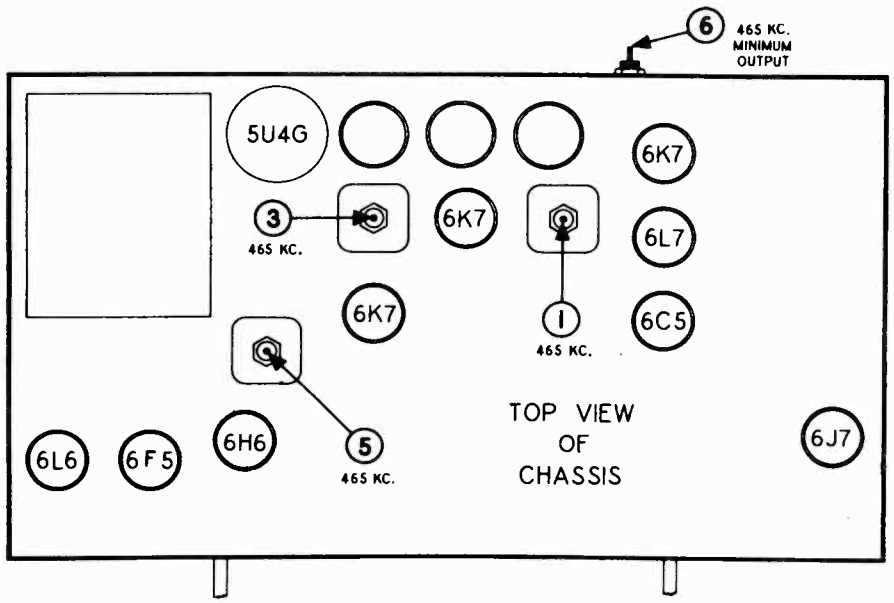
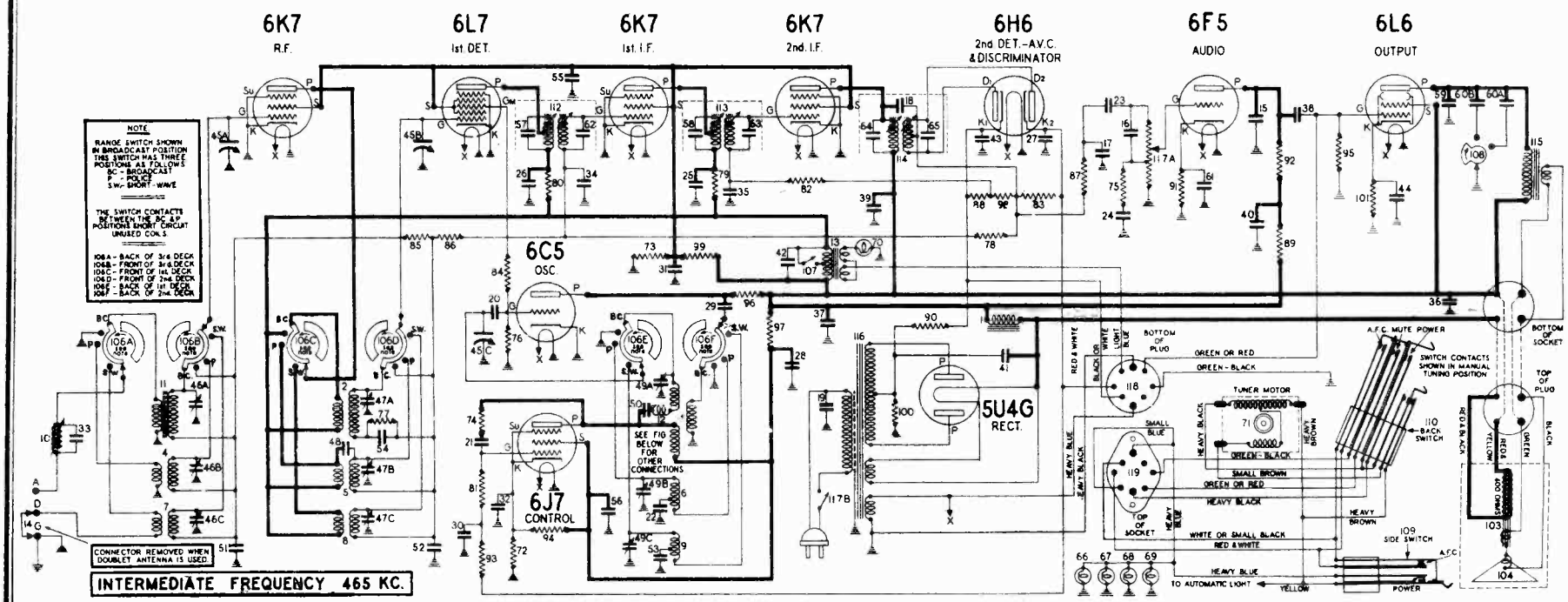
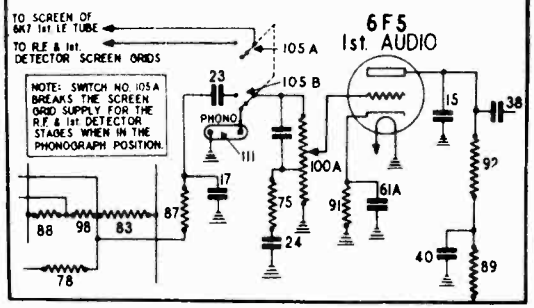
DUMMY ANT. IN SERIES WITH SIG. GEN.	CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER	SIGNAL GENERATOR FREQUENCY	RANGE SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.1 MFD CONDENSER	CONTROL GRID OF 6L7 TUBE	465 KC.	BROADCAST (Counter-clockwise)	ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL	1-2	1ST I. F.	Adjust for maximum output. Then repeat adjustment.
					3-4	2ND I. F.	
					5	3RD I. F.	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	465 KC.	BROADCAST (Counter-clockwise)	ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL	6	WAVE TRAP	Adjust for minimum output using a strong generator signal.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	1500 KC.	BROADCAST (Counter-clockwise)	1500 KC.	7	BROADCAST OSCILLATOR (Shunt)	Adjust trimmer to bring in signal.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	1500 KC.	BROADCAST (Counter-clockwise)	TUNE TO 1500 KC. GENERATOR SIGNAL	8	BROADCAST DETECTOR	Adjust for maximum output.
					9	BROADCAST ANTENNA	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	600 KC.	BROADCAST (Counter-clockwise)	TUNE TO 600 KC. GENERATOR SIGNAL	10	BROADCAST OSCILLATOR (Series Pad)	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
THE A.F.C. MUST NOW BE ALIGNED. SEE "A.F.C. ALIGNMENT" ON THE NEXT PAGE FOR PROCEDURE							
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	5 MC.	POLICE (Center)	5 MC.	12	POLICE OSCILLATOR (Shunt)	Adjust to bring in signal. Check to see if proper peak was obtained by tuning in image at approx. 4.1 MC. If image does not appear realign at 5 MC. with trimmer screw farther out. Recheck image.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	5 MC.	POLICE (Center)	TUNE TO 5 MC. GENERATOR SIGNAL	13	POLICE DETECTOR	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					14	POLICE ANTENNA	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	16 MC.	SHORT-WAVE (Clockwise)	16 MC.	15	SHORT-WAVE OSCIALLATOR (Shunt)	Adjust to bring in signal. Check to see if proper peak was obtained by tuning in image at approx. 15.1 KC. If image does not appear realign at 16 KC. with trimmer screw farther out. Recheck image
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	16 MC.	SHORT-WAVE (Clockwise)	16 MC.	16	SHORT-WAVE DETECTOR	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					17	SHORT-WAVE ANTENNA	

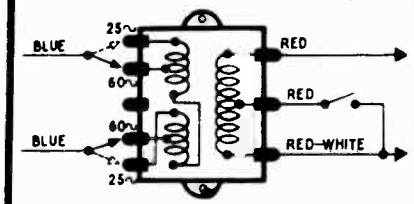




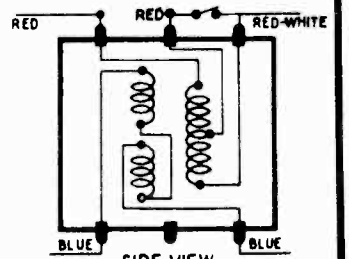
PHONOGRAPH CONNECTIONS



LIGHT RAY TUNER CONNECTIONS FOR UNIVERSAL 25 to 80 CYCLE



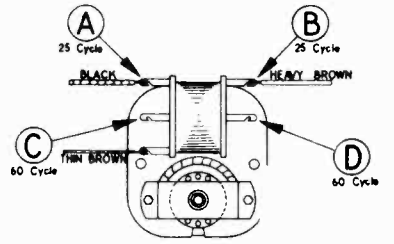
LIGHT RAY TUNER CONNECTIONS 50 to 60 CYCLES



CONNECTIONS FOR UNIVERSAL TUNER MOTOR USED ON 25 TO 80 CYCLE MODELS.

25 to 42 CYCLE OPERATION — CONNECT BLACK WIRE TO A AND BROWN WIRE TO B

42 to 80 CYCLE OPERATION — CONNECT BLACK WIRE TO C AND BROWN WIRE TO D



NOTE These sets are designed for 105 to 125 volt A.C. operation. To convert these sets for operation at other voltages, it is necessary to replace the power transformer with the Universal voltage transformer #10010112333 listed under "Replacement Parts" on Page 6. Sets already equipped with this transformer can be identified by the square metal cover on the top of the power transformer. Voltage taps are brought out, enabling operation at voltages of 90 to 140 and 180 to 260 volts.

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NOTE: The frequency rating of your receiver is indicated on the label affixed to the rear of the chassis. The models marked "50 to 60 cycles" are already connected for 50 to 60 cycle operation, and cannot be operated at a lower frequency. THE MODELS MARKED "25 TO 80 CYCLES" ARE CONNECTED FOR OPERATION AT 25 CYCLES. For operation at other frequencies, the connections to the "Moto-Matic Tuner" motor and the "Light Ray" tuner transformer must be changed. Illustrations showing these connections are found on Page 8 of this manual.

In the event that you wish to convert a "50 to 60 cycle" model to a "25 to 80 cycle" model, it will be necessary to replace the power transformer, tuner motor and "Light Ray" tuner transformer. These parts are listed under "Replacement Parts" on Page 6.

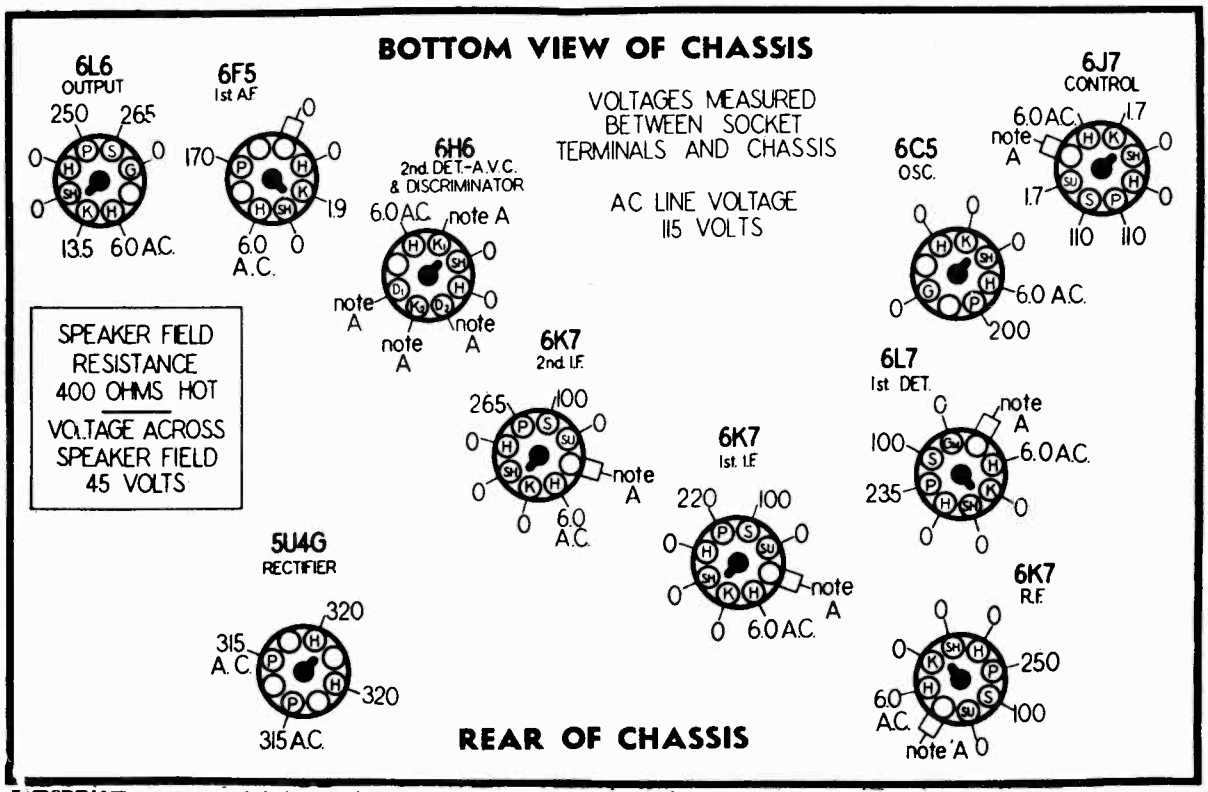
NOTE: Certain types of metal tubes used in this set may be replaced with the equivalent glass tubes, provided the proper shield assembly is used. These types are listed in the table below:

Metal Tube	Equivalent Glass Tube	Tube Shield Assembly Required
6C5	6C5-G	10054112921
6F5	6F5-G	10054112921
6H6	6H6-G	10054112921
6K7	6K7-G	10054112921
6L7	6L7-G	10054112921

The 6J7 control tube cannot be replaced with the equivalent glass tube, so a metal tube is required when replacing this tube. The 6L6 must also be replaced with a metal tube. The 5U4-G tube never requires a shield.

SOCKET VOLTAGES

ANTENNA GROUNDED — DIAL TUNED TO 525 KC



IMPORTANT: Use a high resistance voltmeter of 1000 ohms per volt.

NOTE A: The bias for the control grids of the 6L7 1st Det., 6K7 R.F., 6K7 1st I.F and 6K7 2nd I.F. tubes, also the voltage on the 6H6 diodes and cathodes and the control grid of the 6J7. is -3.6 volts measured across resistor number 100.

MODEL 7216,
Ch. 100.184

PART NUMBER	SCHEMATIC LOCATION	DESCRIPTION

ELECTRICAL PARTS

10014112097	-----1-----	Choke - Filter
10014112327		Choke - Filter (Special Wax Dipped)
10028111056	-----2-----	Coil - R. F. (broadcast)
10028111057	-----3-----	Coil - oscillator (broaccast)
10028111058	-----4-----	Coil - antenna (police)
10028111059	-----5-----	Coil - R. F. (police)
10028111060	-----6-----	Coil - oscillator (police)
10028111062	-----7-----	Coil - antenna (short-wave)
10028111063	-----8-----	Coil - R. F. (short-wave)
10028111064	-----9-----	Coil - oscillator (short-wave)
10031111079	-----10----	Coil - wave trap
10028111103	-----11----	Coil - antenna (broadcast)
10028111488	-----12----	Coil - compensating inductance
10014112103	-----13----	Coil - Light Ray transf. (60 cycle)
10014112204		Coil - Light Ray transf. (25 to 60 cycles
10014112328		Coil - Light Ray transf. (Special Wax Dip
1005485321	-----14----	Connector - ground
1001983783	15-16-17-18	Condenser - mica, 110 mmf.
1001983976	-----19----	Condenser - .012 mfd. - 1000 volt
1001985061	-----20----	Condenser - mica, 51 mmfd.
1001985394	-----21----	Condenser - mica, 510 mmf.
1001985467	-----22----	Condenser - mica, 1370 mmfd.(3%)
1001988189	-----23----	Condenser - paper .05 mfd. 200 volt
1001988030	24-25-26-27-28-29	Condenser - paper .01 mfd. 400 volt
1001988046	-----30----	Condenser - paper .1 mfd. 150 volt
1001988191	-----31----	Condenser - paper .1 mfd. 300 volt
1001988193	-----32----	Condenser - paper .25 mfd. 150 volt
1001988205	-----33----	Condenser - mica, 2100 mmfd.
1001988534	---34-35---	Condenser - paper .05 mfd. 150 volt
10020111469	---36-37---	Condenser - electrolytic 16 mfd. 450 volt
10019111252	-----38----	Condenser - paper .05 mfd. 400 volt
1001988682	---39-40---	Condenser - paper .1 mfd. 400 volt
1002089937	-----41----	Condenser - electrolytic 30 mfd. 450 volt
10020110377	-42-43-44--	Condenser - electrolytic 10 mfd. 25 volt-
10020112113		Condenser - electrolytic 10 mfd. 50 volt-
10016111073	45A to 45C	Condenser - variable gang
10017111078	46A to 46C 47A to 47C	Condenser - trimmer (3 section) for R. F. or antenna (all bands)
10019111080	----48-----	Condenser - 3 mmfd. (wire)
10017111089	49A to 49C	Condenser - trimmer (3 section) (for oscillator) (all bands)
10017111115	----50-----	Condenser - pad (single section)
10019111117	---51-52---	Condenser - low loss .05 mfd. 150 volt
10019111122	-----53----	Condenser - mica, 3580 mmfd. (3%)
10019111123	-----54----	Condenser - mica, 7750 mmfd. (5%)
10020112467	---55-56---	Condenser - electrolytic 4 mfd. 200 volt-
10020111298		Condenser - electrolytic 4 mfd. 200 volt-
10019111342	---57-58---	Condenser - mica, 200 mmfd. (5%)
1001989826	-----59----	Condenser - paper .004 mfd. 750 volt
10019111364	60A to 60B	Condenser - shielded (Section A - .02 mfd. - 600 volt) (Section B - .03 mfd. - 600 volt)
10020110377	-----61----	Condenser - electrolytic 10 mfd. 25 volt-
10020112113		Condenser - electrolytic 10 mfd. 50 volt-
10019111575	62-63-64-65	Condenser - mica 220 mmfd. (5%)
10049110629	66-67-68-69	Lamp - 6.3 volt - .25 amps.
10049110911	-----70----	Lamp - Light Ray Tuner - 2.5 volt .5 amp.
10054111380	-----71----	Motor - 6 volt - 60 cycles
10054112354		Motor - 6 volt, 25 to 80 cycles
10022112096	-----72----	Resistor - wire wound 130 ohms 1/2 watt-
10023110551	-----73----	Resistor - carbon 15,000 ohm 1 watt
10023110599	-----74----	Resistor - carbon 56,000 ohm 1/4 watt
10023110566	-----75----	Resistor - carbon 33,000 ohm 1/4 watt
10023110552	-----76----	Resistor - carbon 47,000 ohm 1/4 watt
10023110553	-----77----	Resistor - carbon 220,000 1/4 watt
10023110554	-----78----	Resistor - carbon 1 megohm 1/4 watt
10023110557	---79-80---	Resistor - carbon 4700 ohm 1/4 watt
10023110559	-81-82-83--	Resistor - carbon 470,000 ohm 1/4 watt
10023110560	-----84----	Resistor - carbon 100 ohm 1/4 watt
10023110564	85-86-87-88	Resistor - carbon 100,000 ohm 1/4watt
10023110552	-----89----	Resistor - carbon 47,000 ohm 1/4 watt
10023110557	-----90----	Resistor - carbon 4700 ohm 1/4 watt
10023110587	-----91----	Resistor - carbon 3900 ohm 1/4 watt
10023110564	-----92----	Resistor - carbon 100,000 ohm 1/4 watt
10023110580	-----93----	Resistor - carbon 3.3 megohm 1/4 watt
10023110575	-----94----	Resistor - carbon 12,000 ohm 2 watt
10023110553	-----95----	Resistor - carbon 220,000 ohm 1/4 watt
10023110592	-----96----	Resistor - carbon, 22, 000 ohm 1 watt
10023110593	-----97----	Resistor - carbon 18,000 ohm 3 watt
10023110594	-----98----	Resistor - carbon 390,000 ohm 1/4 watt
10023110596	-----99----	Resistor - carbon 15,000 ohm 3 watt
10022111515	-----100---	Resistor - wire wound 27 ohm 1/2watt (5%)
10022111514	-----101---	Resistor - wire wound 170 ohm 2 watt
10028111111	-----102---	R. F. unit - coils, range switch, gang & trimmers - complete
10058281	-----103---	Speaker - dynamic 12 inch
10058111490	-----104---	Cone - voice coil assem. for 10058281spkr.
10037111077	106A - 106F	Switch - range
10038111218	-----107---	Switch - for Light Ray Tuner
10038111381	-----108---	Switch - tone control
10054111874	-----109---	Switch - multi contact(above tuning shaft)
10054112564	-----110---	Switch - at rear
10033111336	-----112---	Transformer - 1st I.F.
10034111675	-----113---	Transformer - 2nd I.F.
10035111340	-----114---	Transformer - I. F. discriminator
10013111361	-----115---	Transformer - output
10013112326		Transformer - output (Special Wax Dipped)
10010111447		Transformer - power 115 volt - 60 cycle
10010112176	-----116---	Transformer - power 115 volt - 25 cycle
10010112300		Transformer - power 100-240V.-50-133 cy.
10024111358	117A-117B	Volume Control - 1 meg.(with off-on sw.)

DIAL DRIVE AND MISCELLANEOUS PARTS

(FOR COMPLETE LIST OF PARTS SEE MOTO-MATIC TUNER MANUAL)

10054111930	Band indicator - and frame assembly
10054112658	Belt - for range switch drive
10054111261	Bolt - chassis mtg. (#14 X 1-1/4)
10054111260	Bushing - rubber (for chassis mtg.)
10054111892	Bushing - hard rubber,Moto-Matic Tuner to chassis
10054111658	Clip - for pulley retaining
10054110782	Cord - for band ind.(2 ft. required) Per Ft.
10054111302	Cord - dial drive (6 ft. lengths)
10044112922	Escutcheon - for dial (with glass)
10044111227	Escutcheon - around push button opening
10054111865	Frame - dial, with scale
10039111496	Knob - tuning or volume
10039111497	Knob - range or tone
10054111197	Lever - for band indicator (on shaft)
10054111370	Link & Lever - for range switch drive (used in early production)
10054112633	Plug - for mechanism connecting (8 prong)
10054110496	Plug - speaker (4 prong)
10041111859	Pointer - for dial, with slider
10054111622	Pulley - dial cord drive
10054111630	Pulley & Bracket - for band indicator
10054112628	Pulley - on range switch shaft under chassis
1005484214	Retaining Ring - for dial drum shafts
1005489837	Retaining Spring - for retaining escut. to cab.
10040111222	Scale - dial
10054110716	Screw - band indicator pivot
10054111116	Screw - #5 X 5/8, Moto-Matic Tuner mtg.
1005485827	Set Screw - 8/32 square head
10054111403	Set Screw - 8/32 fluted head
10054112138	Set Screw - 8/32 slotted head
10054111373	Shaft - for range switch
10054112921	Shield - for use with glass tubes
1001885427	Socket - octal base
10018110501	Socket - 4 prong (for spkr.)
10054110627	Socket - dial lamp & automatic lamp
10054111008	Socket - Light Ray tuner lamp
10054112630	Socket & Bracket - for elect. conn. to mech.
10054111232	Spring - torsion for band indicator
10054111862	Spring - drive cord tension
10054112490	Spring - in flexible coupler
10054111676	Stud - lower left idler pulley
10054112667	Stud - for pulley mtg. (for top pulleys)
10054112005	Tabs - station call letters (6 sheets)
10054185056	Terminal Strip - G.D.A.
1005487568	Washer - embossed (for mtg.electrolytic cond.)
1005489746	Washer - (paper) for back of knobs
1005489027	Washers - spring for range shaft
10054111262	Washer - flat steel mtg. (15/16" O.D.)
10044112925	Name Label for Dial Escutcheon

MOTO-MATIC TUNER PARTS

(FOR COMPLETE LIST OF PARTS SEE MOTO-MATIC TUNER MANUAL)

10054112727	Moto-Matic Tuner - complete with all dials ready to mount on chassis
10054111350	Moto-Matic Tuner only, less dial frame assembly
10054112428	Button Body - for tuner
10054112545	Button Cap - for push button
10054111678	Button Window - celluloid for push button
10054112547	Button Reinforcing Disc - for push button
10054111633	Button Retaining Spring - inside push button
10054111577	Button Spring - in push button
10054111576	Button Washer - in push button
10054112563	Cam - bakelite - less operating arm
10054111146	Clutch - bushing, spring and gear
10054111137	Drive Ring - rubber
10054111380	Motor - 6 volt, 60 cycles
10054112354	Motor - 6 volt, 25 to 80 cycles
10054112736	Plug - with cable for tuner connection
10054111138	Spring - horseshoe shaped on clutch
10054111674	Switch Side - multiple contact(over tuning shaft
10054112564	Switch Back -(multiple contact)
10054112521	Tip - adjustable for key stop and kickout arm
10054112483	Wrench - for fluted head set screws #6
10054112484	Wrench - for fluted head set screws #8
10054117468	Spring Benders
10059112926	Instruction Book

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ELECTRICAL SPECIFICATIONS

TUBE COMPLEMENT

1 6K7	R.F. Amp.	1 6H6	Discriminator-2nd Det.-A.V.C.
1 6L7	1st Det.	1 6C5	1st A.F. Amp.
1 6C5	Osc.	2 6V6	Power output
1 6K7	1st I.F. Amp.	1 5U4	Rectifier
1 6K7	2nd I.F. Amp.	1 6J7	Control

POWER SUPPLY

Model 7218 is supplied for either 25 or 60 cycle power supplies.

105-135 volts, - 50-60 cycle - 140 watts
105-135 volts, - 25 cycle - 140 watts

FREQUENCY RANGES		ALIGNMENT FREQUENCIES
Broadcast Band	525 to 1680 KC.	1500 KC.; 600 KC.
Police Band	1655 to 5600 KC.	5000 KC.
Short Wave Band	5540 to 18,100 KC.	16,000 KC.

INTERMEDIATE FREQUENCY.....465 KC

POWER OUTPUT

Type.....Push-pull beam power
Undistorted.....8 watts
Maximum.....10 watts

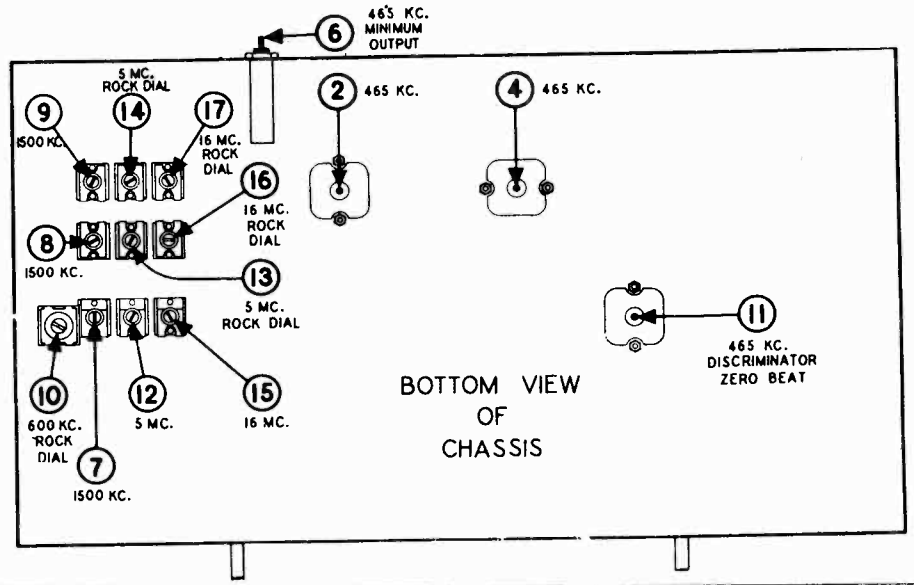
LOUD SPEAKERS

Part No.	Size	Model	Field Res. (Hot)	Field Coil Voltage
10058282	12"	7217	400	50 volts

OPERATING FEATURES		CHASSIS FEATURES	
Fidelity Rge. (±6DB)	50-3000 cycle	R. F. stages	one
Tone control	4 position	Number of I.F. stages	two
Resonance indicator	"Light Ray" Indicator	Number of Cond. in gang	three
Volume stabilizer	A.V.C. system	Antenna	Conv. or Doublet
Tuning corrector	A.F.C. system	Wave trap	465 KC
"Moto-Matic" tuner	Push button control		

MECHANICAL SPECIFICATIONS

OPERATING CONTROLS		CONTROL OPERATION	
1. Upper Left Knob	Power Switch & Volume	Turning right	Power on, Vol. Incr.
2. Lower Left Knob	Tone Control	Turning right	Bass to Brilliant
3. Upper Right Knob	Station Selector	Spinner Tuning	
4. Lower Right Knob	Band Switch	Turning Right to Left	S.W.-P.-B.C.



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GENERAL INFORMATION & SERVICE HINTS

The 100.185 automatic tuning superheterodyne receiver has a frequency range extending from 525 KC. to 18,100 KC. The intermediate frequency is 465 KC.

The receiver is designed for use with either a conventional single wire type or a special noise reducing doublet. A 465 KC wave trap is connected in series with the antenna input to prevent code interference from stations operating in the vicinity of 465 KC.

A conventional superheterodyne circuit is used with the exception that maximum efficiency and stability are insured by the use of a separate oscillator and a specially constructed R.F. bridge. The bridge has the distinct advantages of being extremely compact and may be removed by the disconnecting of only a few leads. This means a great saving of time in the servicing of any part of the R.F. unit.

Since the R.F. and I.F. systems are typical of the superheterodyne it will not be necessary to discuss their function other than stating that the filtered automatic volume control voltage is applied to both the R.F. and 1st detector and the I.F. stages.

The second I.F. stage is followed by a new type of I.F. transformer in order that the A.F.C. voltage may be obtainable. The A.F.C. discriminator is coupled through the third (discriminator) I.F. transformer directly to the 2nd I.F. stage. The third (or discriminator) I.F. transformer secondary is connected directly to the diode plates of the 6H6 tube, which performs the triple function of a linear second detector, A.V.C. and discriminator. The audio component of the output of this tube is supplied to the volume control and amplified in the usual manner. The A.V.C. voltage is taken off at the same point of the diode load resistor network and supplied to the R. F. 1st dectector and 1st I.F. tubes while the A.V.C. voltage for the 2nd I.F. tube is taken off at another point on this same network.

The center tap of the secondary of the third I. F. transformer is connected to the high side of the primary of this transformer, through a coupling condenser. Since the ends of the secondary are connected directly to the diode plates of the 6H6 discriminator tube, this connection serves to introduce the proper voltages to each of the diode plates and thus satisfies the first conditions for an A.F.C. system.

The two rectified voltages appearing between each of the diode plates and its respective cathode are arranged to buck each other.

This is accomplished by connecting both diode load resistors to the center tap of the 3rd I.F. transformer. Thus when the cathode of one 6H6 is grounded a voltage will appear between the second cathode and ground if the frequency coming through the I.F. stage is not 465 KC. (indicating improperly tuned receiver). This voltage may be either positive or negative depending upon whether the frequency coming through the I.F. system is above or below 465 KC. This voltage is known as the control voltage and is filtered and applied to the grid of the control tube which in turn supplies either more or less lagging current to the tank circuit of the oscillator. The amount of lagging current flowing in the oscillator coil will determine the amount of apparent inductance added to the coil. The amount of inductance added or subtracted will in turn correct the frequency of oscillator as near as possible so that the frequency going through the I.F. system will be nearly 465 KC; thus giving a perfectly tuned program even though the station pointer may not be set to the exact frequency of the incoming signal.

Another important feature of this receiver is the "Moto-Matic" Electric Tuner, which automatically tunes the receiver to the desired station. Since this feature is extremely important from a service angle we have prepared a separate manual on the "Moto-Matic" Electric Tuner, which covers in detail the service procedure for this unit. This manual also contains a complete itemized and pictorial parts list of "Moto-Matic" tuner parts. Specify Part Number 10059112932 when ordering this booklet.

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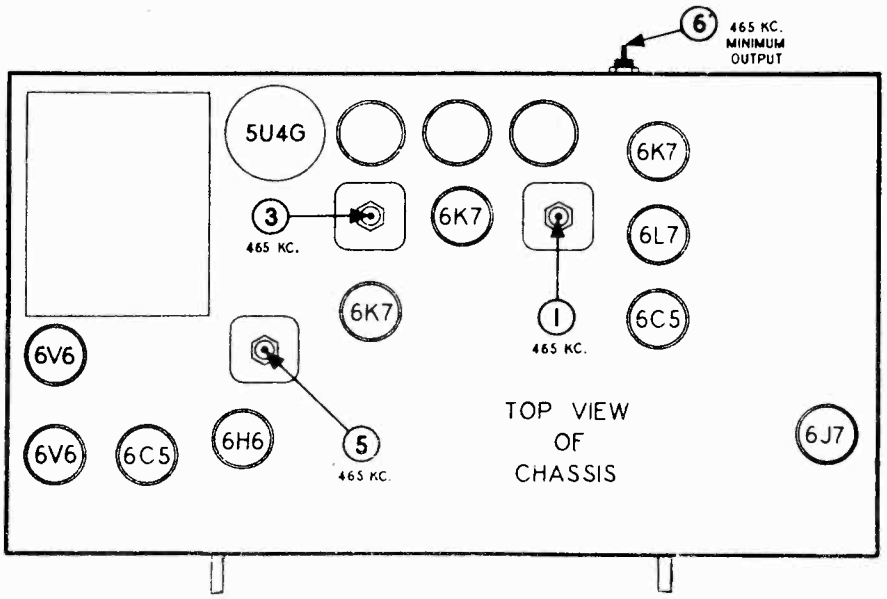
DUMMY ANT. IN SERIES WITH SIG. GEN.	CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER	SIGNAL GENERATOR FREQUENCY	RANGE SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.1 MFD CONDENSER	CONTROL GRID OF 6L7 TUBE	465 KC.	BROADCAST (Counter-clockwise)	ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL	1-2	1ST I. F.	Adjust for maximum output. Then repeat adjustment.
					3-4	2ND I. F.	
					5	3RD I. F.	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	465 KC.	BROADCAST (Counter-clockwise)	ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL	6	WAVE TRAP	Adjust for minimum output using a strong generator signal.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	1500 KC.	BROADCAST (Counter-clockwise)	1500 KC.	7	BROADCAST OSCILLATOR (Shunt)	Adjust trimmer to bring in signal.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	1500 KC.	BROADCAST (Counter-clockwise)	TUNE TO 1500 KC. GENERATOR SIGNAL	8	BROADCAST DETECTOR	Adjust for maximum output.
					9	BROADCAST ANTENNA	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	600 KC.	BROADCAST (Counter-clockwise)	TUNE TO 600 KC. GENERATOR SIGNAL	10	BROADCAST OSCILLATOR (Series Pad)	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
THE A.F.C. MUST NOW BE ALIGNED. SEE "A.F.C. ALIGNMENT" ON THE NEXT PAGE FOR PROCEDURE							
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	5 MC.	POLICE (Center)	5 MC.	12	POLICE OSCILLATOR (Shunt)	Adjust to bring in signal. Check to see if proper peak was obtained by tuning in image at approx. 4.1 MC. If image does not appear realign at 5 MC. with trimmer screw farther out. Recheck image.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	5 MC.	POLICE (Center)	TUNE TO 5 MC. GENERATOR SIGNAL	13	POLICE DETECTOR	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					14	POLICE ANTENNA	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	16 MC.	SHORT-WAVE (Clockwise)	16 MC.	15	SHORT-WAVE OSCIALLATOR (Shunt)	Adjust to bring in signal. Check to see if proper peak was obtained by tuning in image at approx. 15.1 KC. If image does not appear realign at 16 KC. with trimmer screw farther out. Recheck image
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	16 MC.	SHORT-WAVE (Clockwise)	16 MC.	16	SHORT-WAVE DETECTOR	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					17	SHORT-WAVE ANTENNA	



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ALIGNMENT PROCEDURE

Before attempting to align the receiver check to see that the dial pointer is opposite the last scale division on the low frequency end of the dial when the gang condenser is in full mesh. Also when the gang condenser is in full mesh the stop pin on the left side of the tuner should be resting against the back stop. If after examination it is found that the gang is in full mesh and the stop pin is against the back stop, but the pointer is set to the wrong position, it will only be necessary to loosen the set screw on the dial drive gear at the left side of the mechanism. Then grasp the large drum on the same side of the tuner and turn it until the pointer is set correctly. Now retighten the set screw in the gear being careful to see that the gear is meshing properly.

On the other hand if the stop pin does not rest against the back stop with the gang condenser in full mesh, loosen the set screw on the gang condenser side of the flexible coupler. Then turn the tuning knob until the stop pin rests against the back stop on the tuner. Now tighten the set screw in the flexible coupler and proceed to set the pointer to its correct position by the method described in the previous paragraph.

Output meter connections	Across voice coil leads
Output meter reading to indicate 0.5 watt output	1.42 volts
Average sensitivity in microvolts for 0.5 watt output	15 Microvolts
Generator ground connection	Receiver Chassis
Connection of generator output lead	See chart below
Generator modulation	30%, 400 cycles
Position of volume control	Maximum clockwise

HOW TO TEST THE A.F.C. SYSTEM

Connect the antenna and tune in a powerful local station. The setting of the tone control does not affect this test. Remove the cardboard that you placed between the A.F.C. contacts on the side switch when aligning. The A.F.C. is now off.

Next, detune the receiver dial until the music or speech becomes somewhat distorted. Now place a piece of smooth cardboard between the A.F.C. contacts on the side switch as shown in the illustration at the top of this page. This allows A.F.C. to function and it should improve the quality of the program.

Similarly detune the receiver dial in the opposite direction, with the cardboard removed from between the A.F.C. contacts (contacts closed). Then place the cardboard between the contacts again and check for improved quality of reception.

It will be noted that the correction for mistuning afforded by the A.F.C. system is not as marked at stations near the low frequency end of the dial scale as it is at the higher broadcast frequencies. This is characteristic of A.F.C. systems. However, if opening the A.F.C. contacts on the side switch (by inserting the piece of cardboard betweeen the contacts) has no effect on the signal, or if it corrects for mistuning in one direction only, check the receiver as follows:

1. Re-align I.F. broadcast band, and discriminator, trimmers.
2. Check all the tubes in the receiver. Defective 6H6 and 6J7 tubes, also the R.F. 1st Detector, and I.F. tubes may cause poor A.F.C. action.
3. If the above procedure fails to remedy the defect in A.F.C. action, check the entire A.F.C. circuit itself for possible troubles.

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A.F.C. ALIGNMENT

IMPORTANT:- The following adjustment must be made after every re-adjustment of the I.F. and broadcast band trimmers.

The A.F.C. discriminator should be adjusted as follows:

1. Be sure no buttons are depressed. Loosely couple the output of the signal generator to the 6L7 control grid by clipping the signal generator output lead to the insulation on the control grid wire, or connect to the grid clip through a 50 mmfd. mica condenser. BE SURE THE RANGE SWITCH IS IN THE BROADCAST (COUNTER-CLOCKWISE) POSITION.

2. Adjust the signal generator to resonance with I.F. system by tuning the signal generator dial for maximum output meter deflection. Be sure that the receiver dial is at some point where it has no tuning effect on the generator signal. Switch off the modulation.

3. With the signal generator connected and operating as in #2, connect antenna and manually tune in powerful local station in region of 1000 KC. or lower. (Avoid stations around 930 KC. which might beat with second harmonic of test oscillator.)

4. Adjust receiver tuning dial to obtain zero beat between the test oscillator and the incoming signal. (A very slight adjustment is all that is required. Be careful not to tune off signal.)

5. Refer to the illustration above. It is now necessary to open the A.F.C. contacts and allow the A.F.C. to function. This may be done by placing a piece of smooth cardboard between the A.F.C. contacts as shown in the figure. Be careful not to bend or malform the switch in any way.

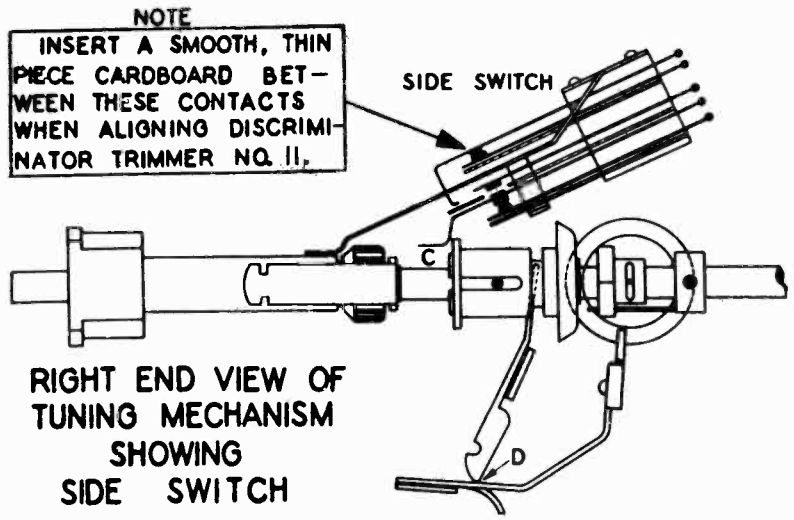
6. Now, adjust the secondary of the discriminator transformer (Trimmer #11) to restore zero beat. NOTE: This trimmer should be adjusted to the point where the frequency of the beat note increases rapidly if the trimmer is turned in either direction. Other zero beat points may be found with the trimmer all the way in or all the way out, but these settings are incorrect.

If this operation has been performed correctly, the opening or closing of the A.F.C. contacts on the side switch by inserting or removing the cardboard, should not change the beat note by more than a slight rumble.

NOTE:- Where a second signal generator is available step #3 above may be varied as follows:

Connect second signal generator (set at about 1000 KC.) to antenna and tune in its signal. Switch off modulation and proceed as before.

This method is somewhat preferable to the first as the zero beat setting is more easily determined when both signals are unmodulated.



RIGHT END VIEW OF TUNING MECHANISM SHOWING SIDE SWITCH

MODEL 7217,
Ch. 100.185

NOTE: The frequency rating of your receiver is indicated on the label affixed to the rear of the chassis. The models marked "50 to 60 cycles" are already connected for 50 to 60 cycle operation, and cannot be operated at a lower frequency. THE MODELS MARKED "25 TO 80 CYCLES" ARE CONNECTED FOR OPERATION AT 25 CYCLES. For operation at other frequencies, the connections to the "Moto-Matic Tuner" motor and the "Light Ray" tuner transformer must be changed. Illustrations showing these connections are found on Page 8 of this manual.

In the event that you wish to convert a "50 to 60 cycle" model to a "25 to 80 cycle" model, it will be necessary to replace the power transformer, tuner motor and "Light Ray" tuner transformer. These parts are listed under "Replacement Parts" on Page 6.

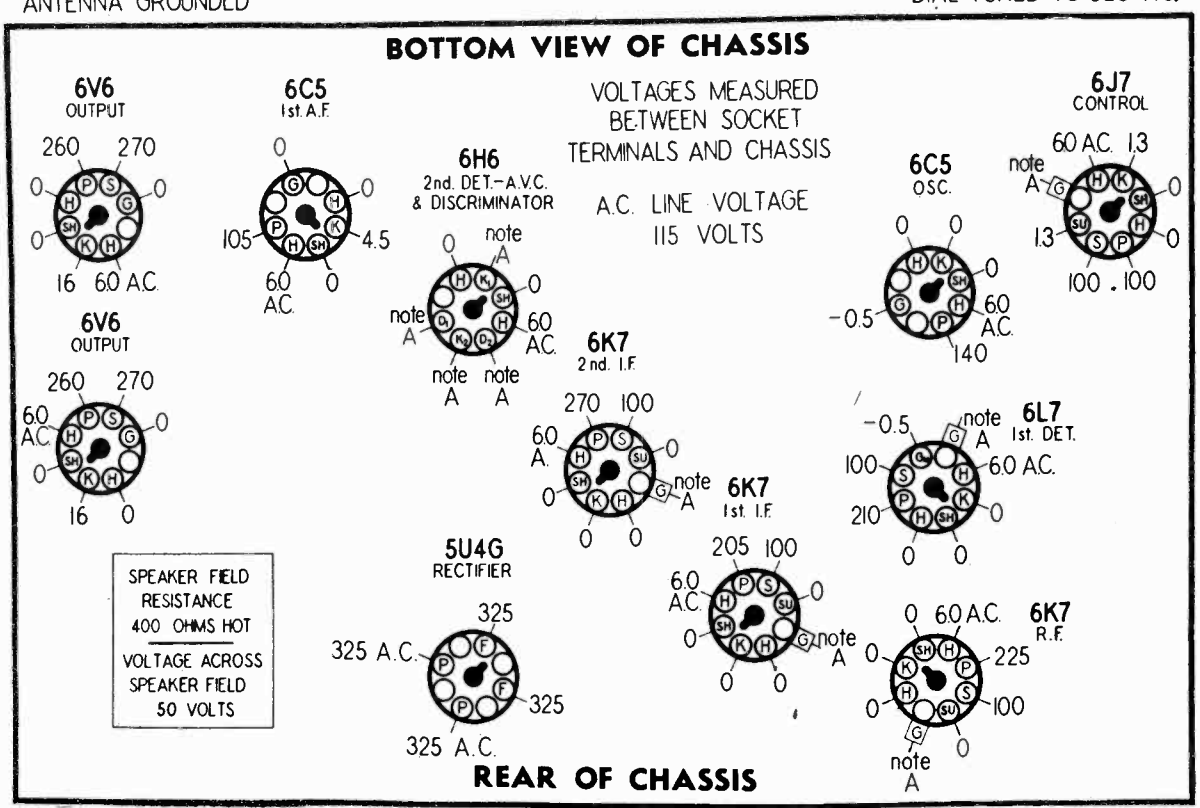
NOTE: Certain types of metal tubes used in this set may be replaced with the equivalent glass tubes, provided the proper shield assembly is used. These types are listed in the table below:

Metal Tube	Equivalent Glass Tube	Tube Shield Assembly Required
6C5	6C5-G	10054112921
6H6	6H6-G	10054112921
6K7	6K7-G	10054112921
6L7	6L7-G	10054112921

The 6J7 control tube cannot be replaced by a glass tube, so a metal tube must be used for replacement purposes. The 6V6 tubes may be replaced with 6V6-G glass tubes, and these tubes require no shield. The 5U4-G rectifier tube is never shielded.

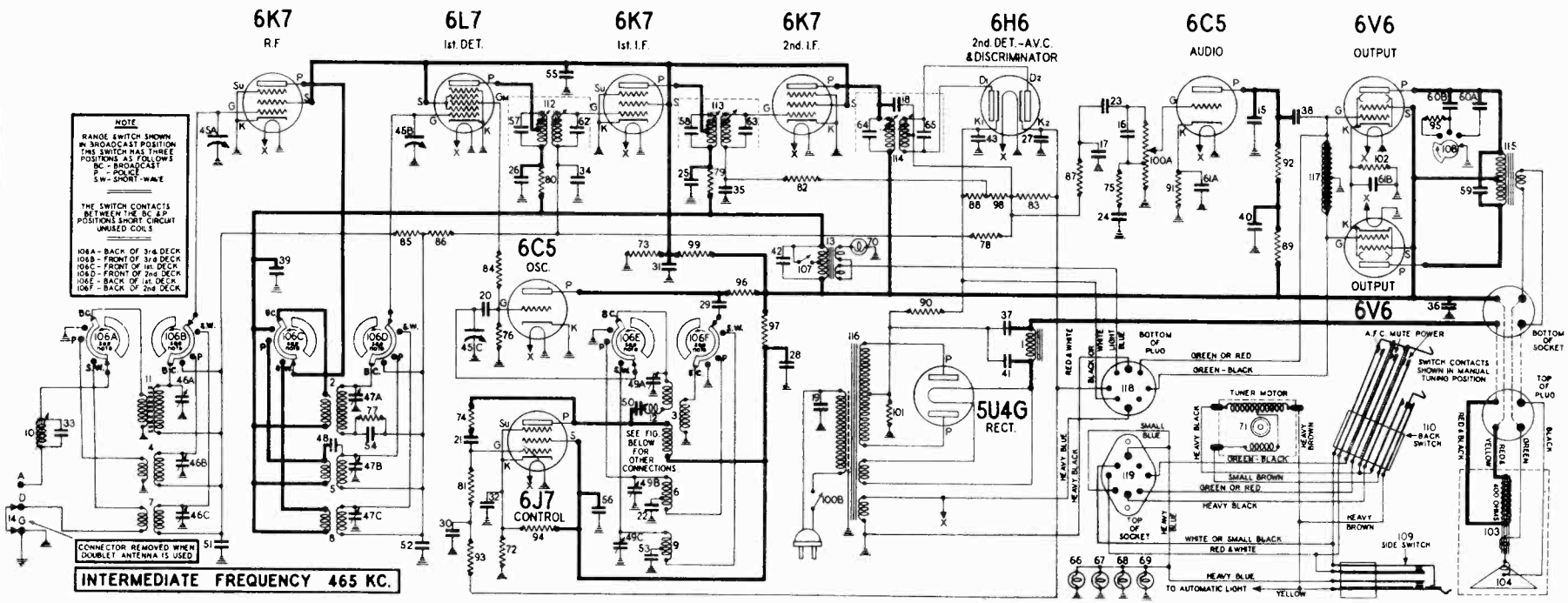
SOCKET VOLTAGES

ANTENNA GROUNDED — DIAL TUNED TO 525 KC.

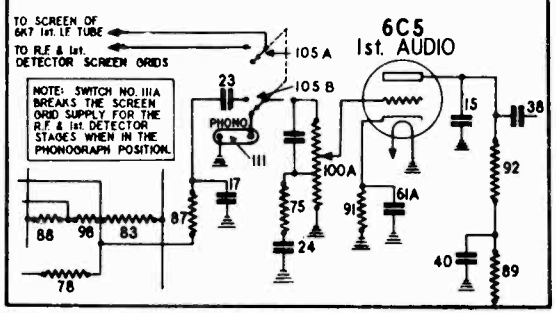


IMPORTANT: Use a high resistance voltmeter of 1000 ohms per volt.

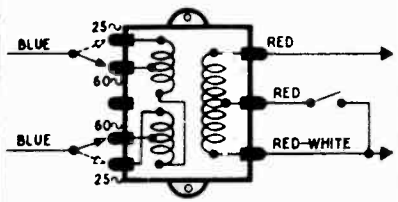
NOTE A: The bias for the control grids of the 6L7 1st Det., 6K7 R.F., 6K7 1st I.F. and 6K7 2nd I.F. tubes, also the voltage on the 6H6 diodes and cathodes and the control grid of the 6J7, is -3.6 volts measured across resistor number 101.



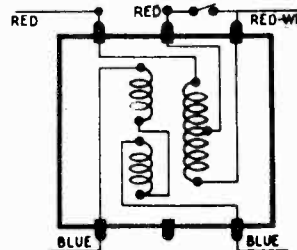
PHONOGRAPH CONNECTIONS



LIGHT RAY TUNER CONNECTIONS FOR UNIVERSAL 25 to 80 CYCLE



LIGHT RAY TUNER CONNECTIONS 50 to 60 CYCLES

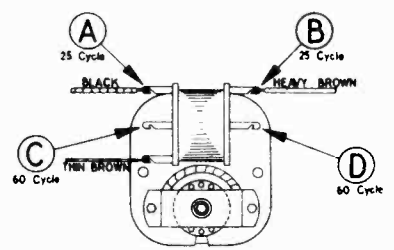


CONNECTIONS FOR UNIVERSAL TUNER MOTOR USED ON 25 TO 80 CYCLE MODELS.

25 to 42 CYCLE OPERATION 42 to 80 CYCLE OPERATION

CONNECT BLACK WIRE TO A AND BROWN WIRE TO B

CONNECT BLACK WIRE TO C AND BROWN WIRE TO D



NOTE These sets are designed for 105 to 125 volt A.C. operation. To convert these sets for operation at other voltages, it is necessary to replace the power transformer with the Universal voltage transformer #10010112333 listed under "Replacement Parts" on Page 6. Sets already equipped with this transformer can be identified by the square metal cover on the top of the power transformer. Voltage taps are brought out, enabling operation at voltages of 90 to 140 and 180 to 260 volts.

MODEL 7217,
Ch. 100.185

ELECTRICAL PARTS

PART NUMBER	SCHEMATIC LOCATION	DESCRIPTION
10014111330	-----1-----	Choke - filter
10014112330		Choke - filter (Special Wax Dipped)
10028111056	-----2-----	Coil - R. F. (broadcast)
10028111057	-----3-----	Coil - oscillator (broadcast)
10028111058	-----4-----	Coil - antenna (police)
10028111059	-----5-----	Coil - R. F. (police)
10028111060	-----6-----	Coil - oscillator (police)
10028111062	-----7-----	Coil - antenna (short wave)
10028111063	-----8-----	Coil - R. F. (short wave)
10028111064	-----9-----	Coil - oscillator (short wave)
10031111079	-----10----	Coil - wave trap
10028111103	-----11----	Coil - antenna (broadcast)
10028111488	-----12----	Coil - compensating inductance
10014112103		Coil - light ray tuner (60 cycle)
10014112204	-----13----	Coil - light ray tuner (25 to 80 cycle)
10014112328		Coil - light ray tuner
10054853?1	-----14----	Connector - ground
10019837?3	15-16-17-18	Condenser - mica, 110 mmf.
10019837?6	-----19----	Condenser - shielded .012 mfd. 1000 volt-
10019E5061	-----20----	Condenser - mica, 51 mmfd.
10019857394	-----21----	Condenser - mica, 510 mmf.
10019857457	-----22----	Condenser - mica, 1370 mmfd. (3%)
10019880?6	-----23----	Condenser - paper .02 mfd. 400 volt-
10019880?9	-----24----	Condenser - paper .004 mfd. 400 volt-
10019880?0	25-26-27-28-29	Condenser - paper .01 mfd. 400 volt-
10019880?6	-----30----	Condenser - paper .1 mfd. 150 volt-
10019881?1	-----31----	Condenser - paper .1 mfd. 300 volt-
10019881?3	-----32----	Condenser - paper .25 mfd. 150 volt-
10019882?5	-----33----	Condenser - mica, 2100 mmfd.
10019805?4	--34-35----	Condenser - paper .05 mfd. 150 volt-
10019886?0	--36-37----	Condenser - electrolytic 8 mfd. 450 volt-
10019886?2	--38-39-40-	Condenser - paper .1 mfd. 400 volt-
10020899?7	-----41----	Condenser - electrolytic 30 mfd. 450 volt
10020110377	--42-43----	Condenser - electrolytic 10 mfd. 25 volt-
10020112113		Condenser - electrolytic 10 mfd. 50 volt-
10016111073	45A to 45C-	Condenser - variable gang
10017111078	46A to 46C 47A to 47C	Condenser - trimmer (3 section) for R. F. or antenna (all bands)
10019111080	-----48----	Condenser - 3 mmfd. (wire)
10017111089	49A to 49C-	Condenser - trimmer (3 section) for oscillator (all bands)
10017111115	-----50----	Condenser - pad (single section)
10019111117	--51-52----	Condenser - low loss .05 mfd. 150 volt-
10019111122	-----53----	Condenser - mica, 3580 mmfd. (3%)
10019111123	-----54----	Condenser - mica, 7750 mmfd. (5%)
10020111298	--55-56----	Condenser - electrolytic 4 mfd. 200 volt-
10020112467		Condenser - electrolytic 4 mfd. 200 volt-
10019111342	--57-58----	Condenser - mica, 200 mmfd. (5%)
10019111346	-----59----	Condenser - mica, 2000 mmfd. 1000 volt-
10019111384	-60A - 60B-	Condenser - shielded (Section A - .02 mfd. - 600 volt) (Section B - .03 mfd. - 600 volt)
10020111468	-61A - 61B-	Condenser - elect. dual 10 mfd. 25 volt-
10019111575	62-63-64-65	Condenser - mica, 220 mmfd. (5%)
10049110629	66-67-68-69	Lamp - 6.3 V. .25 amps.
10049110911	-----70----	Lamp - light ray tuner 2.5 volt .5 amp.
10054111380	-----71----	Motor - 6 volt - 60 cycles
10054112354		Motor - 6 volt - 25 to 80 cycles
1002288460	-----72----	Resistor - wire wound 150 ohms 1/2 watt-
10023110551	-----73----	Resistor - carbon 15,000 ohm 1 watt-
10023110552	-74-75-76--	Resistor - carbon 47,000 ohm 1/4 watt-
10023110553	-----77----	Resistor - carbon 220,000 ohm 1/4 watt-
10023110554	-----78----	Resistor - carbon 1 megohm 1/4 watt-
10023110557	--79-80----	Resistor - carbon 4,700 ohm 1/4 watt-
10023110559	-81-82-83--	Resistor - carbon 470,000 ohm 1/4 watt-
10023110560	-----84----	Resistor - carbon 100 ohm 1/4 watt-
10023110564	85-86-87-88	Resistor - carbon 100,000 ohm ½ watt (20%)
10023110565	-----89----	Resistor - carbon 22,000 ohm 1/4 watt-
10023110573	-----90----	Resistor - carbon 2,200 ohm 1/4 watt-
10023110577	-----91----	Resistor - carbon 3,300 ohm 1/4 watt-
10023110578	-----92----	Resistor - carbon 68,000 ohm 1/4 watt-
10023110580	-----93----	Resistor - carbon 3.3 megohm 1/4 watt-
10023110582	-----94----	Resistor - carbon 12,000 ohm 1 watt-
10023110583	-----95----	Resistor - carbon 4,700 ohm 1/2 watt-
10023110592	-----96----	Resistor - carbon 22,000 ohm 1 watt-
10023110593	-----97----	Resistor - carbon 18,000 ohm 3 watt-
10023110594	-----98----	Resistor - carbon 390,000 ohm 1/4 watt-
10023110595	-----99----	Resistor - carbon 12,000 ohm 3 watt-
10024111358	100A - 100B	Resistor - volume control (1 meg.) (with off-on switch)
10022111515	----101----	Resistor - wire wound 27 ohm 1/2 watt(5%)
10022111638	----102----	Resistor - wire wound 200 ohm 2 watt (5%)
10028111111		R. F. unit - coils, range switch, gang and trimmers complete
10058282	----103----	Speaker - dynamic 12 inch
10057111490	----104----	Cone - voice coil assembly for 10058282 speaker
10037111077	106A - 106F	Switch - range
10038111218	----107----	Switch - for Light Ray Tuner
10038111351	----108----	Switch - tone control
10054111674	----109----	Switch - multiple contact (above tuning shaft)
10054112564	----110----	Switch - at rear
10033111336	----112----	Transformer - 1st I.F.
10034111675	----113----	Transformer - 2nd I.F.
10035111340	----114----	Transformer - I.F. discriminator
10013111334	----115----	Transformer - output
10013112329		Transformer - output-(Special Wax)
10010111447		Transformer - power 115 volt - 60 cycle-
10010112176	----116----	Transformer - power 115 volt - 25 cycle-
10010112300		Transformer - power 100-240V.-50-133 cy.-
10012111331	----117----	Transformer - impedance coupler
10012112331		Transformer - impedance coupler(Spec. Wax
10054112632	----118----	Plug - for mechanism connecting(8 prong)-
10054112630	----119----	Socket & Bracket - for electrical connections to tuner unit

DIAL DRIVE AND MISCELLANEOUS PARTS

(FOR COMPLETE LIST OF PARTS SEE MOTO-MATIC TUNER MANUAL)

10054111930-----Band indicator - and frame assembly
10054112658-----Belt - for range switch drive
10054111261-----Bolt - chassis mtg. (#14 X 1-1/4)
10054111260-----Bushing - rubber (for chassis mtg.)
10054111892-----Bushing - hard rubber, Moto-Matic Tuner to chass
10054111658-----Clip - for pulley retaining
10054110762-----Cord - for band ind. (2 ft. required)----Per Ft.
10054111302-----Cord - dial drive (6 ft. lengths)
10044112922-----Escutcheon - for dial (with glass)
10044111227-----Escutcheon - around push button opening
10054111865-----Frame - dial, with scale
10039111496-----Knob - tuning or volume
10039111497-----Knob - range or tone
10054111197-----Lever - for band indicator (on shaft)
10054111370-----Link & Lever - for range switch drive (used in early production)
10054112633-----Plug - for mechanism connecting (8 prong)
10054110496-----Plug - speaker (4 prong)
10041111859-----Pointer - for dial, with slider
10054111622-----Pulley - dial cord drive
10054111630-----Pulley & Bracket - for band indicator
10054112628-----Pulley - on range switch shaft under chassis
10054084214-----Retaining Ring - for dial drum shafts
10054?9837-----Retaining Spring - for retaining escut. to cab.
10040111222-----Scale - dial
10054110716-----Screw - band indicator pivot
10054111116-----Screw - #5 X 5/8, Moto-Matic Tuner
10054085827-----Set Screw - 8/32 square head
10054111403-----Set Screw - 8/32 fluted head
10054112138-----Set Screw - 8/32 slotted head
10054111373-----Shaft - for range switch

10054112921---- Shield - for use with glass tubes

10001685427-----Socket - octal base
10018110501-----Socket - 4 prong (for spkr.)
10054110627-----Socket - dial lamp & automatic lamp
10054111008-----Socket - Light Ray tuner lamp
10054112630-----Socket & Bracket - for elect. conn. to mech.
10054111232-----Spring - torsion for band indicator
10054111862-----Spring - drive cord tension
10054112490-----Spring - in flexible coupler
10054111676-----Stud - lower left idler pulley
10054112667-----Stud - for pulley mtg. (for top pulleys)
10054112005-----Tabs - station call letters (6 sheets)
10054850?6-----Terminal Strip - G.D.A.
10054?7568-----Washer - embossed (for mtg. electrolytic cond.)
10054?9746-----Washer - (paper) for back of knobs
10054?9027-----Washers - spring for range shaft
10054111262-----Washer - flat steel mtg. (15/16" O.D.)
10044112925-----Name Label for Dial Escutcheon

MOTO-MATIC TUNER PARTS

(FOR COMPLETE LIST OF PARTS SEE MOTO-MATIC TUNER MANUAL)

10054112727-----Moto-Matic Tuner - complete with all dials ready to mount on chassis
10054111350-----Moto-Matic Tuner only, less dial frame assem.
10054112428-----Button Body - for tuner
10054112545-----Button Cap - for push button
10054111878-----Button Window - celluloid for push button
10054112547-----Button Reinforcing Disc - for push button
10054111633-----Button Retaining Spring - inside push button
10054111577-----Button Spring - in push button
10054111576-----Button Washer - in push button
10054112563-----Cam - bakelite - less operating arm
10054111146-----Clutch - bushing, spring and gear
10054111137-----Drive Ring - rubber
10054111380-----Motor - 6 volt, 60 cycles
10054112354-----Motor - 6 volt, 25 to 80 cycles
10054112736-----Plug - with cable for tuner connection
10054111138-----Spring - horseshoe shaped on clutch
10054111674-----Switch Side - mult. contact (above tuning shaft)
10054112564-----Switch Back - (multiple contact)
10054112521-----Tip - adjustable for key stop and kickout arm
10054112483-----Wrench - for fluted head set screws #6
10054112484-----Wrench - for fluted head set screws #8
10054117468-----Spring Benders
10059112927-----Instruction Book

MODELS 7218, 7222,
Ch. 100.186

ELECTRICAL SPECIFICATIONS

TUBE COMPLEMENT

1 6K7	R.F. Amp.	1 6U6	2nd Det.-A.V.C.
1 6L7	1st Det.	1 6C5	1st A.F. Amp.
1 6C5	Osc.	1 6C5	2nd A.F. Amp.
1 6K7	1st I.F. Amp.	2 6V6	Power output
1 6K7	2nd I.F. Amp.	2 5W4	Rectifier
1 6H6	Discriminator	1 6J7	Control

POWER SUPPLY

Model 7218 is supplied for either 25 or 60 cycle power supplies.

105-135 volts, - 50-60 cycle - 140 watts
105-135 volts, - 25 cycle - 140 watts

FREQUENCY RANGES

		ALIGNMENT FREQUENCIES
Broadcast Band	525 to 1680 KC.	1500 KC.; 600 KC.
Police Band	1655 to 5600 KC.	5000 KC.
Short Wave Band	5540 to 18,100 KC.	16,000 KC.

INTERMEDIATE FREQUENCY.....465 KC

POWER OUTPUT

Type.....Push-pull beam power
Undistorted.....10 watts
Maximum.....16 watts

LOUD SPEAKERS

Part No.	Size	Model	Field Res. (Hot)	Field Coil Voltage
10058288	12"	7218	400	55 volts

OPERATING FEATURES

Fidelity Rge. (±10DB)	30-7000 cycle
Tone control	4 position
Resonance indicator	"Light Ray" Indicator
Volume stabilizer	A.V.C. system
Tuning corrector	A.F.C. system
"Moto-Matic"tuner	Push button control

CHASSIS FEATURES

R. F. stages	one
Number of I.F. stages	two
Number of Cond. in gang	three
Antenna	Conv. or Doublet
Wave trap	465 KC
Combined selectivity & tone control	

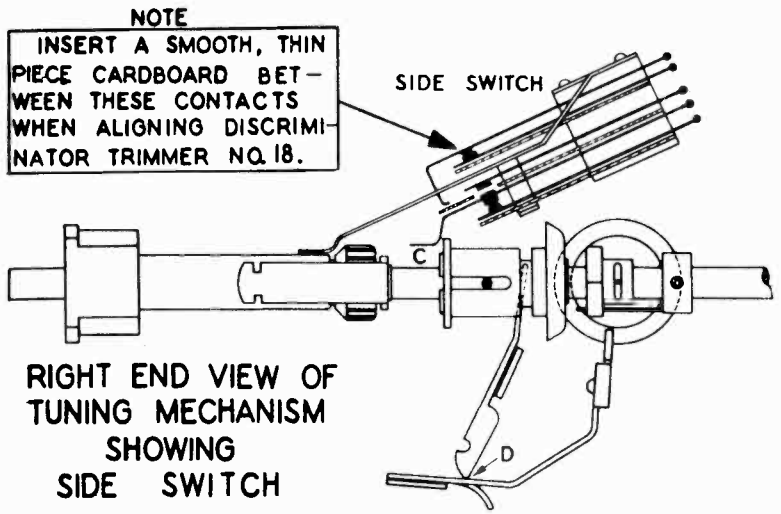
MECHANICAL SPECIFICATIONS

OPERATING CONTROLS

1. Upper Left Knob..... Power Switch & Volume
2. Lower Left Knob...Tone & Selectivity Control
3. Upper Right Knob..... Station Selector
4. Lower Right Knob..... Band Switch

CONTROL OPERATION

Turning right.....Power on, Vol.Incr.
Turning right.....Bass to Brilliant
Spinner Tuning.....
Turning Left to Right.....S.W.-P-B.C.



RIGHT END VIEW OF TUNING MECHANISM SHOWING SIDE SWITCH

MODELS 7218, 7222,
Ch. 100.186

The 100.186 automatic tuning superheterodyne receiver has a frequency range extending from 525 KC. to 18,100 KC. The intermediate frequency is 465 KC.

The receiver is designed for use with either a conventional single wire type or a special noise reducing doublet. A 465 KC. wave trap is connected in series with the antenna input to prevent code interference from stations operating in the vicinity of 465 KC.

A conventional superheterodyne circuit is used with the exception that maximum efficiency and stability are insured by the use of a separate oscillator and a specially constructed R.F. bridge. The bridge has the distinct advantages of being extremely compact and may be removed by the disconnecting of only a few leads. This means a great saving of time in the servicing of any part of the R.F. unit.

Since the R.F. and I.F. systems are typical of the superheterodyne it will not be necessary to discuss their function other than stating that the filtered automatic volume control voltage is applied to both the R.F. and 1st detector and 1st I.F. stages.

A selectivity control is combined with the tone control switch. When this switch is in the maximum clockwise (brilliant) position, the response curve of the I.F. amplifier is broadened.

The second I.F. stage is followed by a new arrangement of I.F. transformers in order that the A.F.C. system may be introduced. The A.F.C. discriminator is coupled through the third (discriminator) I.F. transformer directly to the 2nd I.F. stage. The third I.F. transformer also contains a special "pick-up" coil which is inductively coupled to the primary of that transformer. This pick-up coil introduces the intermediate frequency voltage in the 4th I.F. transformer which in turn is applied to the diode plates of a 6H6 linear 2nd detector and A.V.C. tube. The audio component is now supplied to the volume control and amplified in the usual manner.

Returning again to the third (or discriminator) I.F. transformer we find that the ends of its secondary are connected to the diode plates of a 6H6 discriminator tube. The center tap of the secondary of the third I.F. is connected to the high side of the primary of the 3rd I.F. through a coupling condenser. This connection serves to introduce the proper voltages to each of the diode plates of the discriminator tube and thus satisfies the first conditions for an A.F.C. system.

The two rectified voltages appearing between each of the diode plates and its respective cathode are arranged to buck each other.

This is accomplished by connecting both diode load resistors to the center tap of the 3rd I.F. transformer. Thus when the cathode of one 6H6 is grounded a voltage will appear between the second cathode and ground if the frequency coming through the I.F. stage is not 465 KC. (indicating improperly tuned receiver). This voltage may be either positive or negative depending upon whether the frequency coming through the I.F. system is above or below 465 KC. This voltage is known as the control voltage and is filtered and applied to the grid of the control tube which in turn supplies either more or less lagging current to the tank circuit of the oscillator. The amount of lagging current flowing in the oscillator coil will determine the amount of apparent inductance added to the coil. The amount of inductance added or subtracted will in turn correct the frequency of oscillator as near as possible so that the frequency going through the I.F. system will be nearly 465 KC; thus giving a perfectly tuned program even though the station pointer may not be set to the exact frequency of the incoming signal.

Another important feature of this receiver is the "Moto-Matic" Electric Tuner, which automatically tunes the receiver to the desired station. Since this feature is extremely important from a service angle we have prepared a separate manual on the "Moto-Matic" Electric Tuner, which covers in detail the service procedure for this unit. This manual also contains a complete itemized and pictorial parts list of "Moto-Matic" tuner parts. Specify Part Number 10059112932 when ordering this booklet.

MODELS 7218, 7222,
Ch. 100.186

Certain types of metal tubes used in this set may be replaced with the equivalent glass tubes, provided the proper shield assembly is used. These types are listed in the table below:

Metal Tube	Equivalent Glass Tube	Tube Shield Assembly Required
6C5	6C5-G	10054112921
6H6	6H6-G	10054112921
6K7	6K7-G	10054112921
6L7	6L7-G	10054112921

The 6J7 control tube cannot be replaced by a glass tube, so a metal tube must be used for replacement purposes. The 6V6 tubes may be replaced with 6V6-G glass tubes, and these tubes require no shield. 5W4-G glass tubes may be substituted for the 5W4 metal tubes, and no shield is required.

The frequency rating of your receiver is indicated on the label affixed to the rear of the chassis. The models marked "50 to 60 cycles" are already connected for 50 to 60 cycle operation, and cannot be operated at a lower frequency. THE MODELS MARKED "25 TO 80 CYCLES" ARE CONNECTED FOR OPERATION AT 25 CYCLES. For operation at other frequencies, the connections to the "Moto-Matic Tuner" motor and the "Light Ray" tuner transformer must be changed. Illustrations showing these connections are found on Page 8 of this manual.

In the event that you wish to convert a "50 to 60 cycle" model to a "25 to 80 cycle" model, it will be necessary to replace the power transformer, tuner motor and "Light Ray" tuner transformer. These parts are listed under "Replacement Parts" on Page 6.

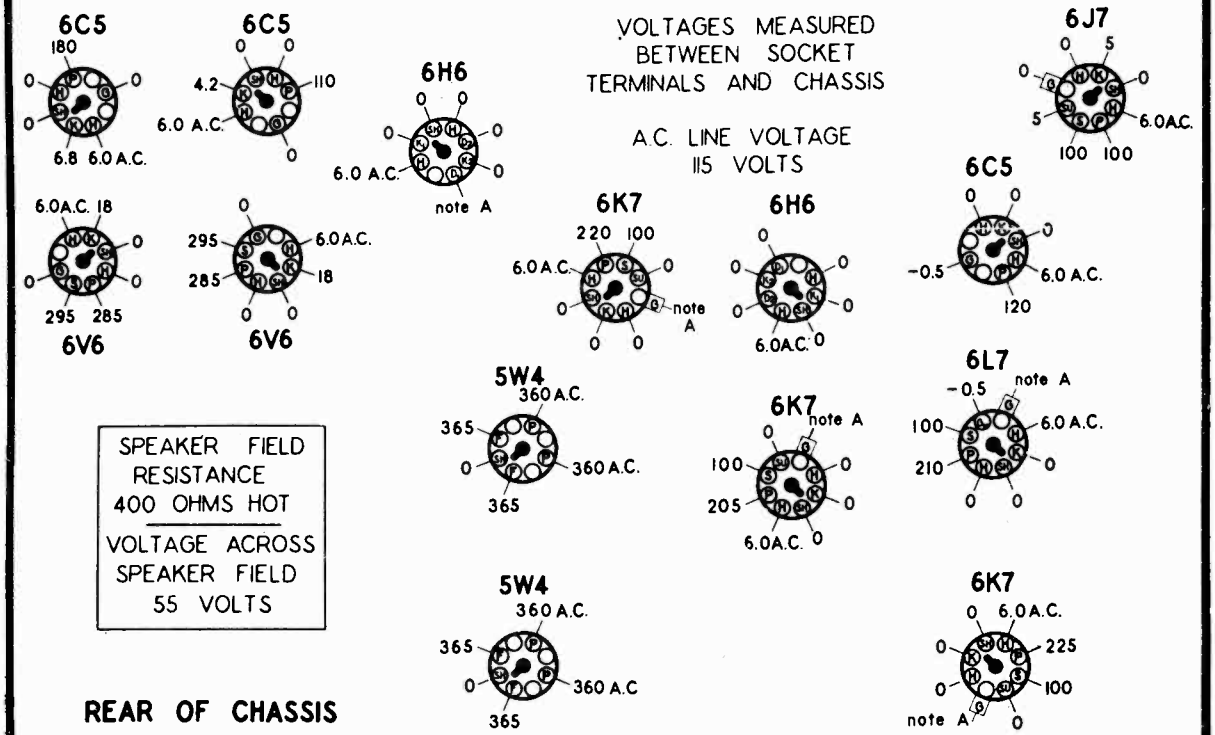
SOCKET VOLTAGES

ANTENNA GROUNDED — DIAL TUNED TO 525 K.C.

BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS

A.C. LINE VOLTAGE 115 VOLTS



IMPORTANT: Use a high resistance voltmeter of 1000 ohms per volt.

NOTE A: The bias for the control grids of the 6L7 1st Det., 6K7 R.F., 6K7 1st I.F. and 6K7 2nd I.F. tubes, also the voltage on the 6H6 A.V.C. diode, is -4 volts measured across resistor number 76.

MODELS 7218, 7222,
Ch. 100.186

A.F.C. ALIGNMENT

IMPORTANT:- The following adjustment must be made after every re-adjustment of the I.F. and broadcast band trimmers.

The A.F.C. discriminator should be adjusted as follows:

1. Be sure no buttons are depressed. Loosely couple the output of the signal generator to the 6L7 control grid by clipping the signal generator output lead to the insulation on the control grid wire, or connect to the grid clip through a 50 mmfd. mica condenser. BE SURE THE RANGE SWITCH IS IN THE BROADCAST (COUNTER-CLOCKWISE) POSITION.

2. Adjust the signal generator to resonance with I.F. system by tuning the signal generator dial for maximum output meter deflection. Be sure that the receiver dial is at some point where it has no tuning effect on the generator signal. Switch off the modulation.

3. With the signal generator connected and operating as in #2, connect antenna and manually tune in powerful local station in region of 1000 KC. or lower. (Avoid stations around 930 KC. which might beat with second harmonic of test oscillator.)

4. Adjust receiver tuning dial to obtain zero beat between the test oscillator and the incoming signal. (A very slight adjustment is all that is required. Be careful not to tune off signal.)

5. Refer to the illustration above. It is now necessary to open the A.F.C. contacts and allow the A.F.C. to function. This may be done by placing a piece of smooth cardboard between the A.F.C. contacts as shown in the figure. Be careful not to bend or malform the switch in any way.

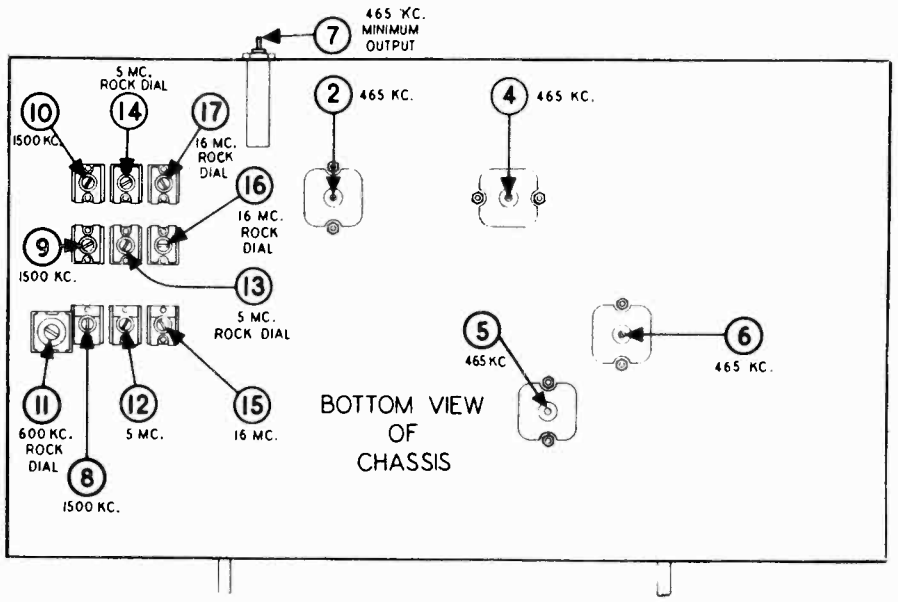
6. Now, adjust the secondary of the discriminator transformer (Trimmer #18) to restore zero beat. NOTE: This trimmer should be adjusted to the point where the frequency of the beat note increases rapidly if the trimmer is turned in either direction. Other zero beat points may be found with the trimmer all the way in or all the way out, but these settings are incorrect.

If this operation has been performed correctly, the opening or closing of the A.F.C. contacts on the side switch by inserting or removing the cardboard, should not change the beat note by more than a slight rumble.

NOTE:- Where a second signal generator is available step #3 above may be varied as follows:

Connect second signal generator (set at about 1000 KC.) to antenna and tune in its signal. Switch off modulation and proceed as before.

This method is somewhat preferable to the first as the zero beat setting is more easily determined when both signals are unmodulated.



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HOW TO TEST THE A.F.C. SYSTEM

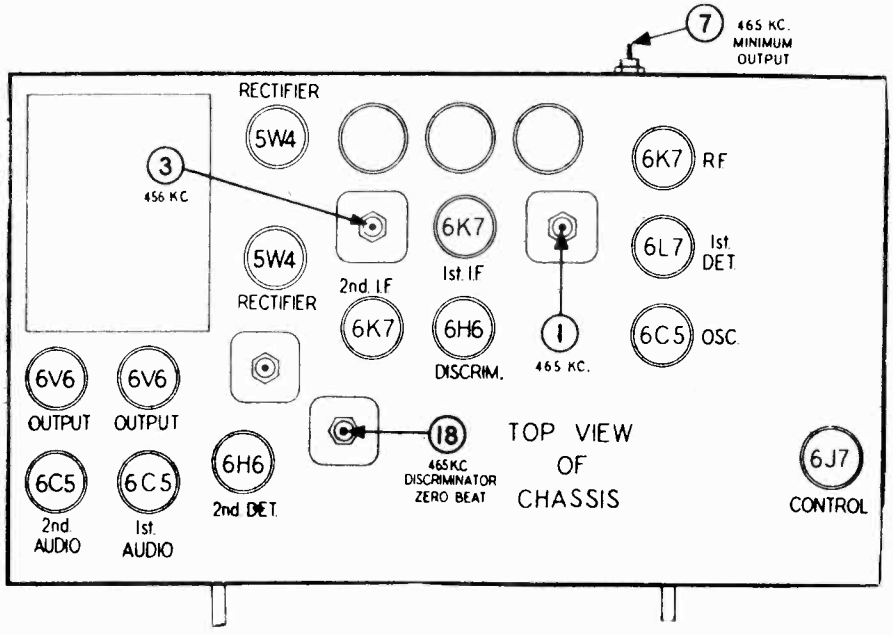
Connect the antenna and tune in a powerful local station. BE SURE THE TONE SWITCH IS IN THE MAXIMUM COUNTER-CLOCKWISE POSITION. Remove the cardboard that you placed between the A.F.C. contacts on the side switch when aligning. The A.F.C. is now off.

Next, detune the receiver dial until the music or speech becomes somewhat distorted. Now place a piece of smooth cardboard between the A.F.C. contacts on the side switch as shown in the illustration at the top of this page. This allows A.F.C. to function and it should improve the quality of the program.

Similarly detune the receiver dial in the opposite direction, with the cardboard removed from between the A.F.C. contacts (contacts closed). Then place the cardboard between the contacts again and check for improved quality of reception.

It will be noted that the correction for mistuning afforded by the A.F.C. system is not as marked at stations near the low frequency end of the dial scale as it is at the higher broadcast frequencies. This is characteristic of A.F.C. systems. However, if opening the A.F.C. contacts on the side switch (by inserting the piece of cardboard between the contacts) has no effect on the signal, or if it corrects for mistuning in one direction only, check the receiver as follows:

1. Re-align I.F. broadcast band, and discriminator trimmers.
2. Check all the tubes in the receiver. Defective 6H6 and 6J7 tubes, also the R.F. 1st Detector, and I.F. tubes may cause poor A.F.C. action.
3. If the above procedure fails to remedy the defect in A.F.C. action, check the entire A.F.C. circuit itself for possible troubles.



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ALIGNMENT PROCEDURE

Before attempting to align the receiver check to see that the dial pointer is opposite the last scale division on the low frequency end of the dial when the gang condenser is in full mesh. Also when the gang condenser is in full mesh the stop pin on the left side of the tuner should be resting against the back stop. If after examination it is found that the gang is in full mesh and the stop pin is against the back stop, but the pointer is set to the wrong position, it will only be necessary to loosen the set screw on the dial drive gear at the left side of the mechanism. Then grasp the large drum on the same side of the tuner and turn it until the pointer is set correctly. Now retighten the set screw in the gear being careful to see that the gear is meshing properly.

On the other hand if the stop pin does not rest against the back stop with the gang condenser in full mesh, loosen the set screw on the gang condenser side of the flexible coupler. Then turn the tuning knob until the stop pin rests against the back stop on the tuner. Now tighten the set screw in the flexible coupler and proceed to set the pointer to its correct position by the method described in the previous paragraph.

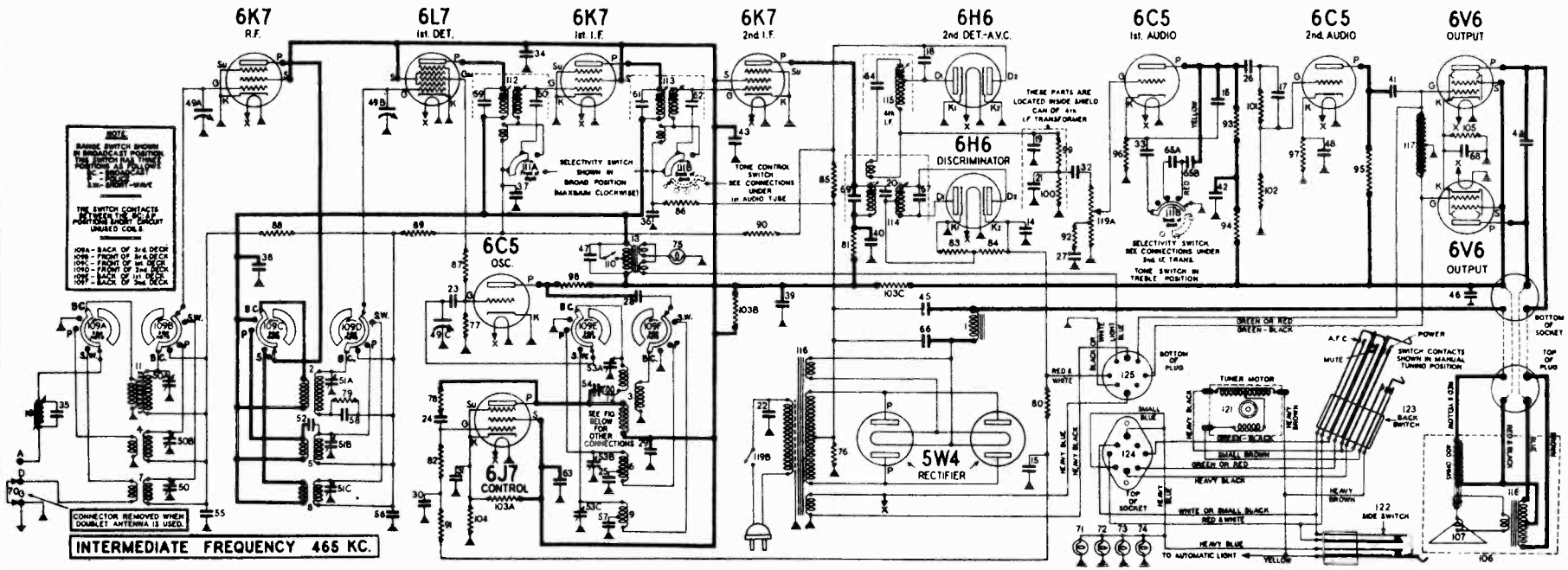
Output meter connections.....Across voice coil leads
Output meter reading to indicate 0.5 watt output.....1.0 volts
Average sensitivity in microvolts for 0.5 watt output.....15 Microvolts
Generator ground connection.....Receiver Chassis
Connection of generator output lead.....See chart below
Generator modulation.....30%, 400 cycles
Position of volume control.....Maximum clockwise

-IMPORTANT-

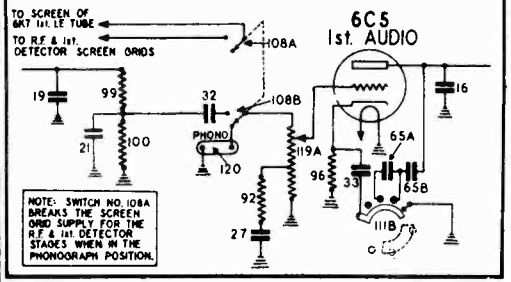
1.- TONE CONTROL MUST BE IN SHARP POSITION (COUNTER-CLOCKWISE)
2.- ALLOW RECEIVER TO WARM UP 15 MINUTES BEFORE ALIGNING.
3.- SEE THAT NO BUTTONS ARE DEPRESSED WHEN ALIGNING RECEIVER.

TYPE OF DUMMY ANT. IN SERIES WITH SIG.GEN.	POINT TO CONNECT OUTPUT OF SIGNAL GENERATOR.	SIGNAL GENERATOR FREQUENCY	RANGE SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER (see diag. next page)	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.1 MFD CONDENSER	CONTROL GRID OF 6L7 TUBE	465 KC.	BROADCAST (Counter-clockwise)	ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL	1-2	1ST I.F.	Adjust for maximum output. Then repeat adjustment. The tone control switch must be in the SHARP-POSITION (Counter-clockwise),or the alignment will be incorrect.
					3-4	2ND I.F.	
					5	3RD I.F.	
					6	4TH I.F.	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	465 KC.	BROADCAST (Counter-clockwise)	ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL	7	WAVE TRAP	Adjust for minimum output using a strong generator signal.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	1500 KC.	BROADCAST (Counter-clockwise)	1500 KC.	8	BROADCAST OSCILLATOR (Shunt)	Adjust trimmer to bring in signal.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	1500 KC.	BROADCAST (Counter-clockwise)	TUNE TO 1500 KC. GENERATOR SIGNAL	9	BROADCAST DETECTOR	Adjust for maximum output.
					10	BROADCAST ANTENNA	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	600 KC.	BROADCAST (Counter-clockwise)	TUNE TO 600 KC. GENERATOR SIGNAL	11	BROADCAST OSCILLATOR (Series Pad)	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	5 MC.	POLICE (Center)	5 MC.	12	POLICE OSCILLATOR (Shunt)	Adjust to bring in signal. Check to see if proper peak was obtained by tuning in image at approx. 4.1 MC. If image does not appear realign at 5 MC. with trimmer screw farther out. Recheck image.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	5 MC.	POLICE (Center)	TUNE TO 5 MC. GENERATOR SIGNAL	13	POLICE DETECTOR	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					14	POLICE ANTENNA	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	16 MC.	SHORT-WAVE (Clockwise)	16 MC.	15	SHORT-WAVE OSCILLATOR (Shunt)	Adjust to bring in signal. Check to see if proper peak was obtained by tuning in image at approx. 15.1 MC. If image does not appear realign at 16 MC. with trimmer screw farther out. Recheck image.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	16 MC.	SHORT-WAVE (Clockwise)	16 MC.	16	SHORT-WAVE DETECTOR	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					17	SHORT-WAVE ANTENNA	

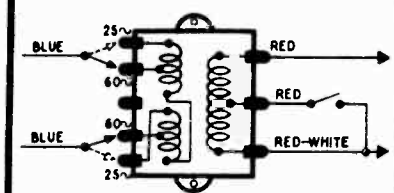
THE AFC MUST NOW BE ALIGNED.
SEE "A.F.C. ALIGNMENT" ON THE NEXT PAGE FOR PROCEDURE



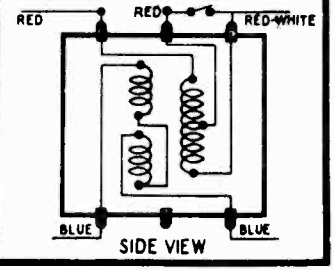
PHONOGRAPH CONNECTIONS



LIGHT RAY TUNER CONNECTIONS FOR UNIVERSAL 25 to 80 CYCLE



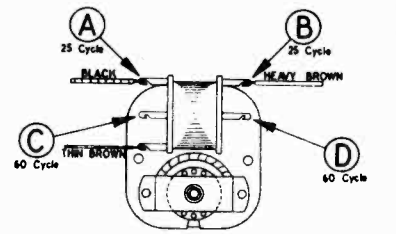
LIGHT RAY TUNER CONNECTIONS 50 to 60 CYCLES



CONNECTIONS FOR UNIVERSAL TUNER MOTOR USED ON 25 TO 80 CYCLE MODELS.

25 to 42 CYCLE OPERATION — CONNECT BLACK WIRE TO A AND BROWN WIRE TO B

42 to 80 CYCLE OPERATION — CONNECT BLACK WIRE TO C AND BROWN WIRE TO D



NOTE These sets are designed for 105 to 125 volt A.C. operation. To convert these sets for operation at other voltages, it is necessary to replace the power transformer with the Universal voltage transformer #10010112333 listed under "Replacement Parts" on Page 6. Sets already equipped with this transformer can be identified by the square metal cover on the top of the power transformer. Voltage taps are brought out, enabling operation at voltages of 90 to 140 and 180 to 260 volts.

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ELECTRICAL PARTS

PART NUMBER	SCHEMATIC LOCATION	DESCRIPTION
10014111330	-----1-----	Choke - filter
10014112730		Choke - filter (Special Wax Dipped)
10028111056	-----2-----	Coil - R. F. Broadcast
10028111057	-----3-----	Coil - oscillator broadcast
10028111058	-----4-----	Coil - antenna (police)
10028111059	-----5-----	Coil - R. F. (police)
10028111060	-----6-----	Coil - oscillator (police)
10028111062	-----7-----	Coil - antenna (short wave)
10028111063	-----8-----	Coil - R. F. (short wave)
10028111064	-----9-----	Coil - oscillator (short wave)
10031111079	-----10----	Coil - wave trap
10028111103	-----11----	Coil - antenna broadcast
10028111486	-----12----	Coil - compensating inductance
10014112103	-----13----	Coil - Light Ray Tuner (60 cycle)
10014112204		Coil - Light Ray Tuner (25 to 80 cycle)
10014112328		Coil - Light Ray Tuner(Special Wax Dipped)
1001983539	-14-15-16-17-18--	Condenser - mica 260 mmf.
1001983763	-19-20-21--	Condenser - mica, 110 mmf.
1001983976	-----22----	Condenser - shielded .012 mfd. 1000 volt
1001985051	-----23----	Condenser - mica .51 mmfd.
1001985494	-----24----	Condenser - mica 510 mmf.
1001985467	-----25----	Condenser - mica, 1370 mmfd. (3%)
1001986026	-----26----	Condenser - paper .02 mfd. 400 volt
1001968030	-27-28-29--	Condenser - paper .01 mfd. 400 volt
1001988046	---30-31---	Condenser - paper .1 mfd. 150 volt
1001988189	---32-33---	Condenser - paper .05 mfd. 200 volt
1001988191	-----34----	Condenser - paper .1 mfd. 300 volt
1001988205	-----35----	Condenser - mica, 2100 mmfd.
1001988534	---36-37---	Condenser - paper .05 mfd. 150 volt
1001988682	-38-39-40-41-42--	Condenser - paper .1 mfd. 400 volt
1001989532	-----43----	Condenser - paper .25 mfd. 200 volt
1001989826	-----44----	Condenser - paper .004 mfd. 750 volt
1002089937	---45-46---	Condenser - electrolytic 30 mfd. 450 volt
10020110377	---47-48---	Condenser - electrolytic 10 mfd. 25 volt
10020112480		Condenser - electrolytic 10 mfd. 25 volt
10016111073	-49A to C--	Condenser - variable gang
10017111078	-50A to C- -51A to C-	Condenser - trimmer (3 section) for R. F. or Ant.)
10019111080	-----52----	Condenser - wire 1.8 mmfd.
10017111089	-53A to C--	Condenser - trimmer (3 section) for osc.
10017111115	-----54----	Condenser - padder
10019111117	---55-56---	Condenser - low loss .05 mfd. 150 volt
10019111122	-----57----	Condenser - mica, 3580 mmfd. (3%)
10019111123	-----58----	Condenser - mica, 7750 mmfd.
10019111342	59-60-61-62-63-64	Condenser - mica, 200 mmfd. (5%)
10019111387	65A - 65B-	Condenser - shielded dual (Section A - .01 mfd. 600 volt) (Section B - .02 mfd. 600 volt)
10020111469	-----66----	Condenser - electrolytic 16 mfd. 450 volt
10020111652	-----67----	Condenser - electrolytic 12 mfd. 150 volt
10020112476		Condenser - electrolytic 12 mfd. 150 volt
10020111688	-----68----	Condenser - electrolytic 20 mfd. 25 volt
10020112481		Condenser - electrolytic 20 mfd. 25 volt
10019111910	-----69----	Condenser - mica, 150 mmfd. (5%)
1005485321	-----70----	Connector - ground doublet
10049110429	71-72-73-74	Lamp - dial 6 to 8 volt .25 amp.
10049110911	-----75----	Lamp - Light Ray Tuner 2.5 volt .5 amp.
1002289769	-----76----	Resistor - wire wound 40 ohm 1 watt
10023110552	---77-78---	Resistor - carbon 47,000 ohm 1/4 watt
10023110553	-----79----	Resistor - carbon 220,000 ohm 1/4 watt
10023110554	-----80----	Resistor - carbon 1 megohm 1/4 watt
10023110557	-----81----	Resistor - carbon 4700 ohm 1/4 watt
10023110559	-82-83-84-85-86-	Resistor - carbon 470,000 ohm 1/4 watt
10023110560	-----87----	Resistor - carbon 100 ohm 1/4 watt
10023110564	-88-89-90--	Resistor - carbon 100,000 ohm 1/4 watt
10023110580	-----91----	Resistor - carbon 3.3 megohm 1/4 watt
10023110585	92-93-94-95	Resistor - carbon 33,000 ohm 1/4 watt
10023110586	---96-97---	Resistor - carbon 2,200 ohm 1/4 watt
10023110592	-----98----	Resistor - carbon 22,000 ohm 1/4 watt
10023110597	---99-100--	Resistor - carbon 100,000 ohm 1/4 watt
10023110598	--101-102--	Resistor - carbon 330,000 ohm ½ W. (10%)
10021111417	103A - 103C	Resistor - bleeder: Section A 5600 ohms Section B 5500 ohms Section C 1500 ohms
10022111685	----104----	Resistor - wire wound 280 ohms ½ W. (5%)
10022111686	----105----	Resistor - wire wound 250 ohms 2 watt
10028111111		R. F. unit - coils, range switch, gang and trimmers - complete
1005828?		Speaker - dynamic 12 inch
10058115006	----106----	Speaker - dynamic 10 inch
10058115007		Speaker - P.M. dynamic 8 inch
10057112109		Cone - voice coil assem. for 10058288 spkr.
10057112575	----107----	Cone - voice coil for 10011500? speaker
10057112673		Cone - voice coil assy.(10011500? spkr.)
10037111077	-109A to F-	Switch - range
10038111218	----110----	Switch - Light Ray Tuner
10038111401	111A - 111B	Switch - tone & selectivity control
10033111425	--112-113--	Transformer - 1st or 2nd I.F.
10034111426	----114----	Transformer - discriminator I.F.
10035111427	----115----	Transformer - 4th I.F.
10010111393	----116----	Transformer - power 115 volt 60 cycle
10010112183		Transformer - power 117 volt 25 cycle
10010112333		Transformer - power 100-240V.-50-133 cy.
10014111331	----117----	Transformer - impedance coupler
10014112331		Transformer - impedance coupler(Spec. Wax
10013111398	----118----	Transformer - output for 10058288 spkr.)
10013112573		Transformer - output for 10058115006 spkr.
10024111358	119A - 119B	Vol. Cont. - 1 meg. (with-off-on switch)
10054112554	----121----	Motor - 6 volt, 25 to 80 cycles
10054111780		Motor - 6 volt, 60 cycles
10054111074	----122----	Switch - mult. contact (above tuning shft.)
10054112564	----123----	Switch - at rear
10054112630	----124----	Socket & Brkt. - for elect. conn. to tuning unit
10054112633	----125----	Plug - for tuner unit conn. (8 prong)

DIAL DRIVE AND MISCELLANEOUS PARTS

(FOR COMPLETE LIST OF PARTS SEE MOTO-MATIC TUNER MANUAL)

10054111930	Band indicator - and frame assembly
10054112758	Belt - for range switch drive
10054111231	Bolt - chassis mtg. (#14 X 1-1/4)
10054111280	Bushing - rubber (for chassis mtg.)
10054111892	Bushing - hard rubber, Moto-Matic Tuner to chass
10054111058	Clip - for pulley retaining
10054110782	Cord - for band ind. (2 ft. required) Per Ft.
10054111302	Cord - dial drive (3 ft. lengths)
10044112923	Escutcheon - for dial (with glass)
10044112827	Escutcheon - ground push button opening
10054111836	Frame - dial, with scale
10039111496	Knob - tuning or volume
10039111497	Knob - range or tone
10054111197	Lever - for band indicator (on shaft)
10054111370	Link & Lever - for range switch drive (used in early production)
10054112534	Plug - for mechanism connecting (8 prong)
10054110496	Plug - speaker (4 prong)
10044111850	Pointer - for dial, with slider
10054111622	Pulley - dial cord drive
10054111830	Pulley & Bracket - for band indicator
10054112388	Pulley - on range switch shaft under chassis
1005484214	Retaining Ring - for dial drum shafts
1005486837	Retaining Spring - for retaining escut. to cab.
10040111222	Scale - dial
10054110718	Screw - band indicator pivot
10054111115	Screw - #5 X 5/8, Moto-Matic Tuner
1005485627	Set Screw - 8/32 square head
10054111403	Set Screw - 8/32 fluted head
10054112136	Set Screw - 8/32 slotted head
10054111774	Shaft - for range switch
10054112921	Shield - for use with glass tubes
1001065127	Socket - octal base
1001811050?	Socket - 4 prong (for spkr.)
10058110627	Socket - dial lamp & automatic lamp
10054111038	Socket - Light Ray tuner lamp
10054112030	Socket & Bracket - for elect. conn. to mech.
10054111232	Spring - torsion for band indicator
10054111862	Spring - drive cord tension
10054112190	Spring - in flexible coupler
10054111676	Stud - lower left idler pulley
10054112367	Stud - for pulley mtg. (for top pulleys)
10054112005	Tabs - station call letters (6 sheets)
1005485058	Terminal Strip - G.D.A.
10054107508	Washer - embossed (for mtg. electrolytic cond.)
1005482446	Washer - (paper) for back of knobs
10054109027	Washers - spring for range shaft
10054112262	Washer - flat steel mtg. (15/16" O.D.)

MOTO-MATIC TUNER PARTS

(FOR COMPLETE LIST OF PARTS SEE MOTO-MATIC TUNER MANUAL)

10054112727	Moto-Matic Tuner - complete with all dials ready to mount on chassis
10054111550	Moto-Matic Tuner only, less dial frame assembly
10054111728	Button Body - for tuner
10054112545	Button Cap - for push button
10054111678	Button Window - celluloid for push button
10054112547	Button Reinforcing Disc - for push button
10054111833	Button Retaining Spring - inside push button
10054111577	Button Spring - in push button
10054111576	Button Washer - in push button
10054112563	Cam - bakelite - less operating arm
10054111146	Clutch - bushing, spring and gear
10054111137	Drive Ring - rubber
10054111780	Motor - 6 volt, 60 cycles
10054112554	Motor - 6 volt, 25 to 80 cycles
10054112736	Plug - with cable for tuner connection
10054111138	Spring - horseshoe shaped on clutch
10054111374	Switch Side - mul. contact (above tuning shaft)
10054112564	Switch Back - (multiple contact)
10054112521	Tip - adjustable for key stop and kickout arm
10054112483	Wrench - for fluted head set screws #6
10054112464	Wrench - for fluted head set screws #8
10054117488	Spring Bendars
10059112920	Instruction Book

MODEL 8021,
Ch. 132.868

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection	Across speaker voice coil
Output meter reading to indicate 50 MW (Standard Output)	.4 volt
Generator modulation	30 % 400 cycles
Position of volume control	Fully clockwise
Set dial pointer	Last mark left end dial, variable condenser closed
Set band switch	To left for AM alignment; to right for FM alignment

AM ALIGNMENT

Position of Variable	Generator Frequency	Dummy Antenna	Generator Connection High Side	Generator Connection Ground Lead	Adjust Trimmers In Order Shown For Max. Output	Trimmer Function
Open	455 Kc	.05 Mfd.	Mixer Grid	Chassis	(1) (2) (3) (4)	I. F.
1400 Kc	1400 Kc		*Test loop	Test loop	(11)	Oscillator
1400 Kc	1400 Kc		*Test loop	Test loop	(12)	Antenna
**600 Kc	600 Kc		*Test loop	Test loop	Check point	Antenna

*Connect generator lead to a Standard Hazeltine Test Loop, Model 1150, placed two feet from the set loop, or three turns of wire about six inches in diameter, placed about one foot from the set loop. Or the generator can be connected with the high side lead to the green lead on the set loop and the ground lead to the chassis.

**With a generator signal of 600 Kc, tune the set to the point where maximum output is obtained, which should be approximately 600 Kc on the dial. Adjust antenna section plates of variable for maximum output.

The alignment procedure should be repeated in the original order for greatest accuracy.

Always keep the output from the signal generator at its lowest possible value to make the A. V. C. action of the receiver ineffective.

FM ALIGNMENT

DETECTOR AND IF ALIGNMENT USING SIGNAL GENERATOR AND OSCILLOSCOPE

1.—Connect FM Generator, High Side, to grid of 2nd IF tube through .005 mfd. dummy.

2.—Set generator frequency to 10.7 Mc modulated either 60 cycles or 400 cycles, 250 Kc sweep (125 Kc deviation).

3.—Connect vertical input of scope across volume control of receiver (Grounded terminal to chassis, ungrounded terminal to high side of the control).

4.—Set scope switch for internal syncronization and set horizontal oscillator to 2 X frequency of modulating voltage of generator. (120 or 800 cycles).

5.—Turn variable condenser fully open, and band switch to right (FM).

6.—Adjust frequency vernier of horizontal oscillator on scope until the pattern becomes stationary.

7.—Adjust detector primary slug No. 5 for maximum vertical sweep of the scope pattern.

8.—Adjust detector secondary slug No. 6 to center the cross over point of the pattern. Pattern should look like figure 1, with the same amount of curve on both ends, and the cross-over point in the center.

9.—Connect generator, high side, to grid of 12BE6 converter tube (socket pin No. 7).

10.—Adjust IF slugs 7, 8, 9, and 10 for the greatest vertical sweep of the pattern, consistent with linearity. (If the IF slugs are adjusted for maximum sweep of the pattern, the pattern may become non-linear. Therefore, adjustment should be made for the greatest sweep which can be obtained and still have all four ends of the "X" pattern similar in size and shape.

11.—Check the alignment of the IF and detector circuits by varying the signal generator frequency above and below the center frequency of 10.7 Mc. If the receiver is perfectly aligned, two smaller "X" patterns of similar size and shape will result, one on either side of the center frequency. See figure 2.

X PATTERN
CENTER FREQUENCY

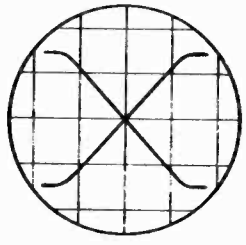

FIG 1

SMALL X PATTERN
ABOVE AND BELOW
CENTER FREQUENCY

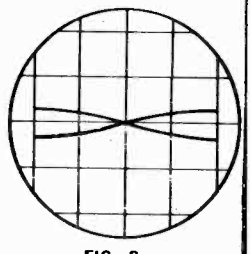

FIG. 2

RF

Position of Variable	Generator Frequency	Dummy Antenna	Generator Connection High Side	Generator Connection Ground Lead	Adjust Trimmers In Order Shown	Trimmer Function
108 Mc	108 Mc	★ 300 Ohm	Ant. Terminal	Ant. Terminal	(14)	Oscillator
88 Mc	88 Mc	★ 300 Ohm	Ant. Terminal	Ant. Terminal	(13)	Oscillator

Repeat the above oscillator adjustments until proper coverage is obtained on both ends of band since the two adjustments effect each other.

105 Mc	105 Mc	300 Ohm	Ant. Terminal	Ant. Terminal	(17) (18)	RF and Ant.
91 Mc	91 Mc	300 Ohm	Ant. Terminal	Ant. Terminal	(15) (16)	RF and Ant.

Repeat "RF and Ant." adjustments until proper tracking is obtained at both 91 and 105 Mc, since tracking the set at one frequency affects the track at the other frequency.

All RF trimmers are adjusted for maximum output, measured with output meter across speaker voice coil.

For RF alignment, use FM generator signal modulated with 400 cycles 45 Kc sweep (22.5 Kc deviation).

★The 300 ohm dummy should be made up of two 150 ohm resistors, one placed in each lead at the receiver antenna terminals.

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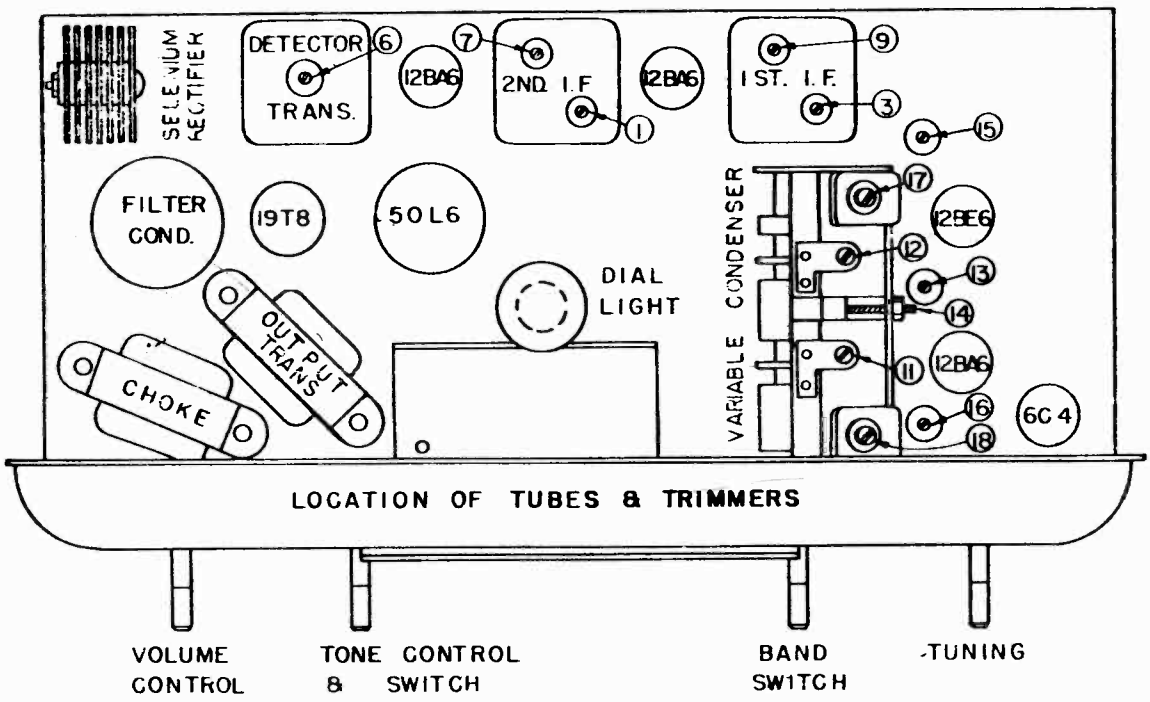

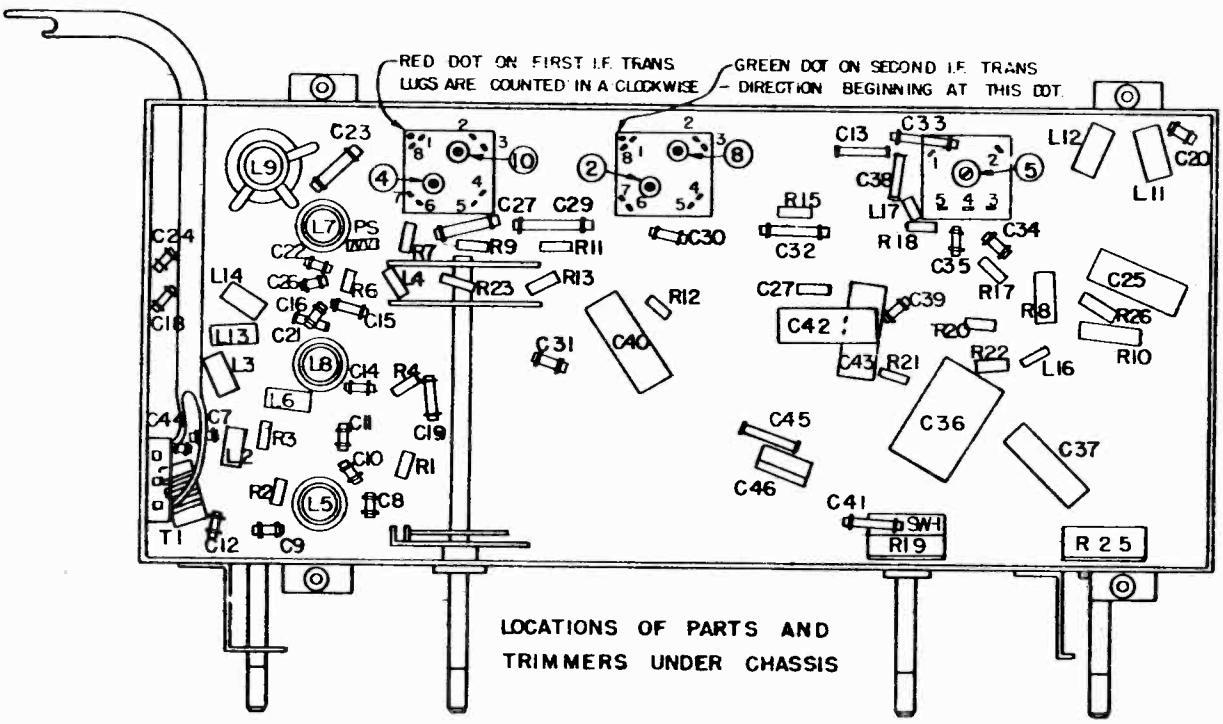

NOTE: On some sets of this model, a separate condenser was used as a bypass on the 50L6 cathode, and the low voltage section of Part No. N21744 was not used. This was done to prevent Hum due to coupling between the high and low voltage sections of N21744. This coupling was caused by improper sequence of winding of the sections in some of the N21744 condensers.

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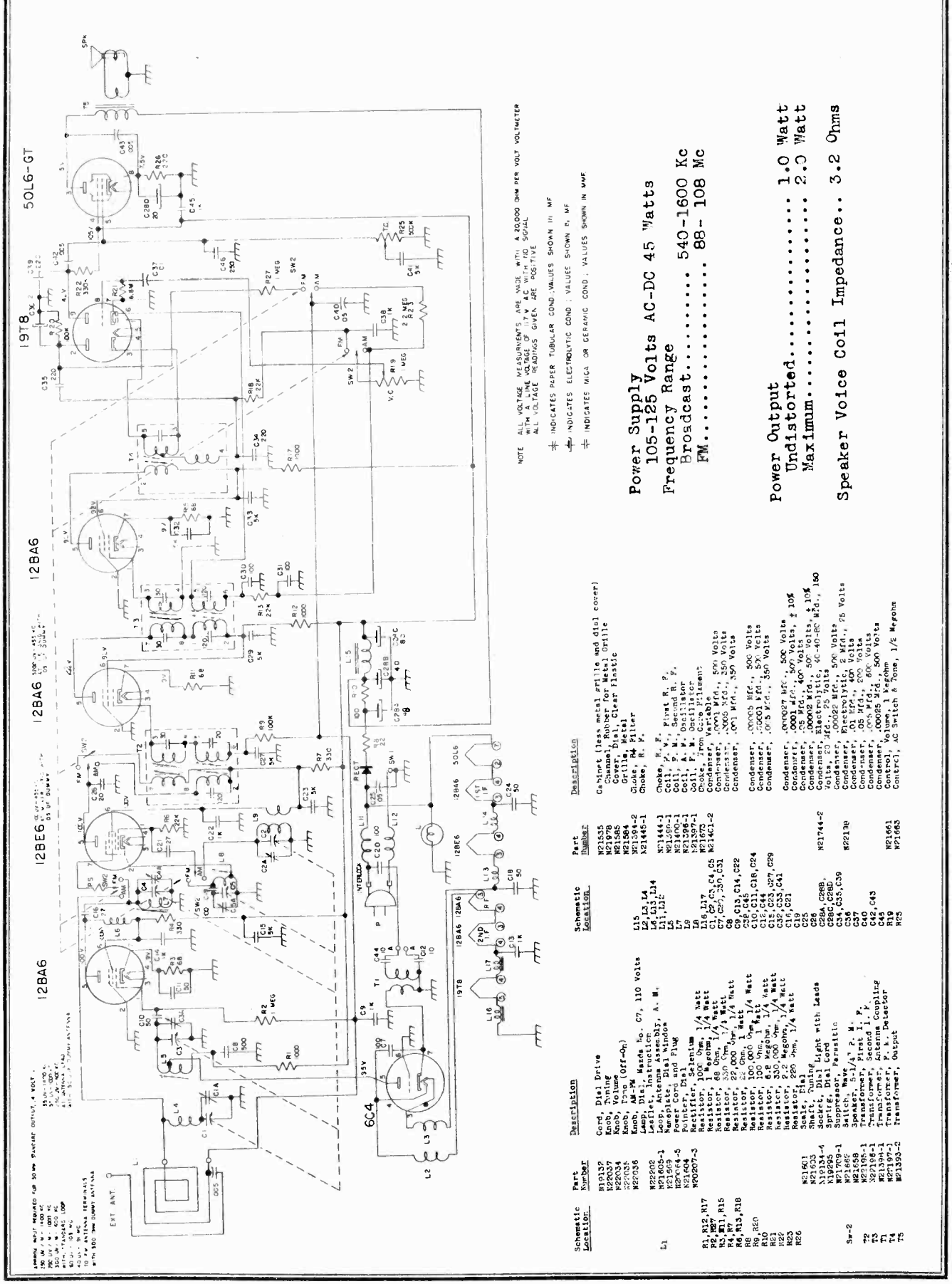
Ch. 132.868



Schematic Location	Part Number	Description
	M29132	Cord, Dial Drive
	M28037	Knob, Tuning
	M22034	Knob, Volume
	M22035	Knob, Tone (Off-On)
	M22036	Knob, AM-FM Wards No. C7, 110 Volts
		Lamp, Dial
	M22602	Leaflet, Instruction
	M21605-1	Loop, Antenna Assembly, A. M.
	M21669	Nameplate, Dial Window
	M20764-5	Power Cord and Plug
	M21604	Pointer, Dial
	M20207-3	Rectifier, Selenium
R1,R12,R17		Resistor, 1000 Ohms, 1/4 Watt
P2,R27		Resistor, 1 Megohm, 1/4 Watt
R3,R11,R15		Resistor, 68 Ohm, 1/4 Watt
R4,R7		Resistor, 330 Ohm, 1/4 Watt
R5,R13,R18		Resistor, 22,000 Ohm, 1/4 Watt
R6		Resistor, 22 Ohm, 1 Watt
R8		Resistor, 100,000 Ohm, 1/4 Watt
R9,R20		Resistor, 100 Ohm, 1 Watt
R10		Resistor, 6.8 Megohm, 1/4 Watt
R21		Resistor, 330,000 Ohm, 1/4 Watt
R22		Resistor, 2.2 Megohm, 1/4 Watt
R23		Resistor, 220 Ohm, 1/4 Watt
R26		
	M21601	Scale, Dial
	M21633	Shaft, Dial
	X19134-4	Socket, Miniature Light with Leads
	M21605	Spring, Dial Cord
	M21709-1	Suppressor, Parasitic
	M21665	Switch, Wave
	M21658	Speaker, 5-1/4" P. M.
T2	M29196-1	Transformer, Second I. F.
T3	M29198-1	Transformer, Antenna Coupling
T4	M21394-1	Transformer, Oscillator
T5	M29193-2	Transformer, P. A. Detector
		Transformer, Output

Schematic Location	Part Number	Description
	M21535	Cabinet (less metal grille and dial cover)
	M21978	Channel, Rubber for Metal Grille
	M21585	Cover, Dial, Clear Plastic
	M21584	Grille, Metal
	M21394-2	Choke, AM Filter
	M21445-1	Choke, R. F.
L15		Choke, R. F.
L2,L3,L4	M21444-1	Coil, P. V., First R. F.
L6,L13,L14	M21400-1	Coil, P. M., Second R. F.
L11,L12	M21400-1	Coil, A. M. Oscillator
L5	M21398-1	Coil, F. M. Oscillator
L9	M21397-1	Coil, Frequency Control
L8	M21673	Choke, R. F. Filament
L16,L17	M21403-2	Condenser, Variable
C1,C2,C3,C4,C5		Condenser, .0001 Mfd., 500 Volts
C6,C27,C30,C31		Condenser, .0005 Mfd., 350 Volts
C7		Condenser, .001 Mfd., 350 Volts
C9,C13,C14,C22		
C35,C45		Condenser, .0005 Mfd., 500 Volts
C10,C11,C18,C24		Condenser, .05 Mfd., 350 Volts
C12,C44		Condenser, .05 Mfd., 350 Volts
C15,C23,C27,C29		
C16,C25,C41		Condenser, .00027 Mfd., 500 Volts
C17,C21		Condenser, .0001 Mfd., 500 Volts, ± 10%
C19		Condenser, .05 Mfd., 400 Volts
C25		Condenser, .05 Mfd., 400 Volts, ± 10%
C28		Condenser, Electrolytic, 40-40-20 Mfd., 150
C28A,C28B,	M21744-2	Volts, 25 Mfd., 25 Volts
C28C,C28D		Condenser, .00022 Mfd., 500 Volts
C36,C38,C39		Condenser, Electrolytic, 2 Mfd., 25 Volts
C37	M22138	Condenser, .01 Mfd., 400 Volts
C40		Condenser, .05 Mfd., 200 Volts
C42,C43		Condenser, .0025 Mfd., 500 Volts
C46		Control, Volume, 1 Megohm
R19	M21661	Control, AC Switch & Tone, 1/2 Megohm
R25	M21663	

NOTE ALL VOLTAGE MEASUREMENTS ARE MADE WITH A 20,000 OHM PER VOLT VOLTMETER WITH A LINE VOLTAGE OF 117 V AC WITH NO SIGNAL ALL VOLTAGE READINGS GIVEN ARE POSITIVE

⏚ INDICATES PAPER TUBULAR COND.; VALUES SHOWN IN MF

⏚ INDICATES ELECTROLYTIC COND.; VALUES SHOWN IN MF

⏚ INDICATES MICA OR CERAMIC COND.; VALUES SHOWN IN MMF

Power Supply
105-125 Volts AC-DC 45 Watts

Frequency Range
Brosdcast..... 540-1600 Kc
FM..... 88- 108 Mc

Power Output
Undistorted..... 1.0 Watt
Maximum..... 2.0 Watt

Speaker Voice Coil Impedance.. 3.2 Ohms

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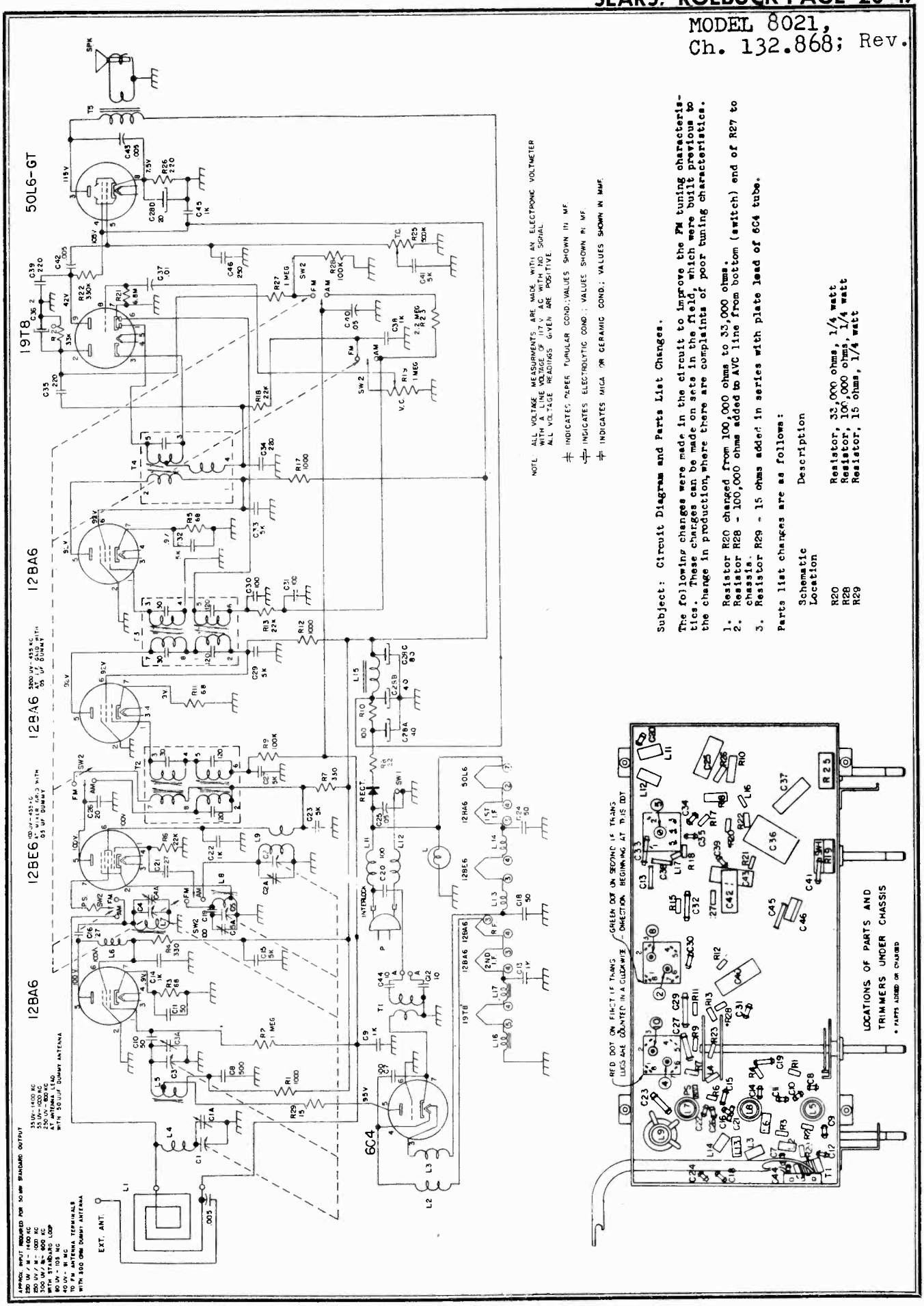

Subject: Circuit Diagram and Parts List Changes.

The following changes were made in the circuit to improve the FM tuning characteristics. These changes can be made on sets in the field, which were built previous to the change in production, where there are complaints of poor tuning characteristics.

1. Resistor R20 changed from 100,000 ohms to 33,000 ohms.
2. Resistor R28 - 100,000 ohms added to AVC line from bottom (switch) end of R27 to chassis.
3. Resistor R29 - 15 ohms added in series with plate lead of 604 tube.

Parts list changes are as follows:

Schematic Location	Description
R20	Resistor, 33,000 ohms, 1/4 watt
R28	Resistor, 100,000 ohms, 1/4 watt
R29	Resistor, 15 ohms, 1/4 watt

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Ch. 478,206

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection . . . . . Across speaker voice coil
Output meter reading to indicate 500 MW (Standard Output). . . . . 1.27 volt
Generator modulation . . . . . 30% - 400 cycles
Position of volume control . . . . . Fully clockwise
Set Dial Pointer . . . . . 1 3/32" from center of left shaft, variable condenser closed
Set band switch . . . . . To left for AM alignment; to right for FM alignment

AM ALIGNMENT

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN FOR MAX. OUTPUT	TRIMMER FUNCTION
Open	455 Kc	.05 Mfd	Mixer grid	Chassis	T8, T12, T11	I. F.
1620 Kc	1620 Kc		*Test loop	Test loop	T1	Oscillator
1400 Kc	1400 Kc		*Test loop	Test loop	T3	Antenna
**600 Kc	600		*Test loop	Test loop	Check point	Antenna

* Connect generator lead to a Standard Hazeltine Test Loop. Model 1150, placed two feet from the set loop, or three turns of wire about six inches in diameter, placed about one foot from the set loop.

**With a generator signal of 600 Kc, tune the set to the point where maximum output is obtained, which should be approximately 600 Kc on the dial. Adjust antenna section plates of variable for maximum output.

The alignment procedure should be repeated in the original order for greatest accuracy.

Always keep the output from the signal generator at its lowest possible value to make the A. V. C. action of the receiver ineffective.

FM ALIGNMENT

DETECTOR AND IF ALIGNMENT USING SIGNAL GENERATOR AND OSCILLOSCOPE

1. Connect vertical input of scope across volume control of receiver (Grounded terminal to chassis, ungrounded terminal to high side of the control).
2. Connect FM Generator, High Side, to grid of 2nd IF tube through .01 mfd. dummy, Low Side, to chassis.
3. Connect sweep voltage of generator to horizontal terminals of scope.
4. Set generator frequency to 10.7 Mc modulation either 60 cycles or 400 cycles, 250 Kc sweep (125 Kc deviation).
5. Set volume control to maximum, variable condenser fully open, band switch to right (FM).
6. Adjust detector primary slug *T9 for maximum vertical sweep of the scope pattern.
7. Adjust detector secondary slug *T10 for symmetry of the pattern. Pattern should look like Fig. 1, with the same amount of curve on both ends
8. Connect generator, high side, to mixer coil as in Fig. 6, low side to chassis.
9. Short A. V. C. to chassis at junction of R21 and R16.
10. Disconnect the negative lead of C19 from pin #2 of 19T8.
11. Connect vertical input of scope across R22. (Grounded terminal to chassis, ungrounded terminal to high side of resistor.)
12. Adjust IF slugs T7, T6, T5, for greatest vertical sweep of the pattern. Stagger tune (detune) slightly so that pattern looks like Fig. 7.
13. Resolder the negative lead of condenser disconnected after alignment is completed.

NOTE: A double trace pattern, as in Fig. 2 or Fig. 3 for detector alignment, or Fig. 4 for IF alignment, may be caused by a slight out of phase condition between the sweep voltage to the horizontal terminals of the scope and the modulation on the generator signal. To correct this condition, connect a condenser of about .005 mf. across the horizontal input terminals of the scope and a 1 megohm variable resistance in series with the lead to the ungrounded terminal. Adjust the resistance until the two traces coincide.

DETECTOR ALIGNMENT USING SIGNAL GENERATOR AND VTVM

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN FOR MAX. OUTPUT	TRIMMER FUNCTION
Open	10.7 Mc	.01 Mfd.	2d IF grid	Chassis	*T9, *T10	Detector

* T9 is adjusted for maximum A. V. C. voltage. A vacuum tube voltmeter or a 20,000 ohm per volt voltmeter with a low V. range can be used to measure the A. V. C. voltage. Connect negative lead to junction of R21 and R16 on band switch and positive lead to the chassis.

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* T10 is adjusted for zero reading of a vacuum tube voltmeter or a 20,000 ohm per volt voltmeter, connected as shown in Fig. 5. Rock this adjustment through the zero point to see that the voltage is positive on one side of the zero point and negative on the other.

NOTE: If a 10.7 Mc FM generator is not available for alignment of detector, an unmodulated signal of 10.7 Mc from an accurately calibrated conventional AM type generator can be used. (Voltmeter alignment only).

I.F. alignment using signal generator and V. T. V. M. not recommended.

RF

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN FOR MAX. OUTPUT	TRIMMER FUNCTION
Open	109 Mc	300 Ohm	Ant. Term.	Ant. Term.	T2	Oscillator
Closed	87.5 Mc	300 Ohm	Ant. Term.	Ant. Term.	Spacing of LC-11	Oscillator
Repeat the above oscillator adjustments until proper coverage is obtained on both ends of band since the two adjustments effect each other.						
106 Mc	106 Mc	300 Ohm	Ant. Term.	Ant. Term.	T4***	RF
90 Mc	90 Mc	300 Ohm	Ant. Term.	Ant. Term.	Spacing of LC-12	RF

Repeat "RF'and Ant." adjustments until proper tracking is obtained at both 90 and 106 Mc, since tracking the set at one frequency effects the tracking at the other frequency.

All RF trimmers are adjusted for maximum output, measured with output meter across speaker voice coil.

For RF alignment, use FM generator signal modulated with 400 cycles 45 Mc sweep (22.5 Kc deviation).

NOTE: On sets which use LF-33 A in place of LF-33, the trimmer locations are reversed.

***On sets where T4 has been eliminated (Fig. 6) adjust R. F. by spacing of LC-12 at 106 Mc. and check for tracking at 90 Mc.

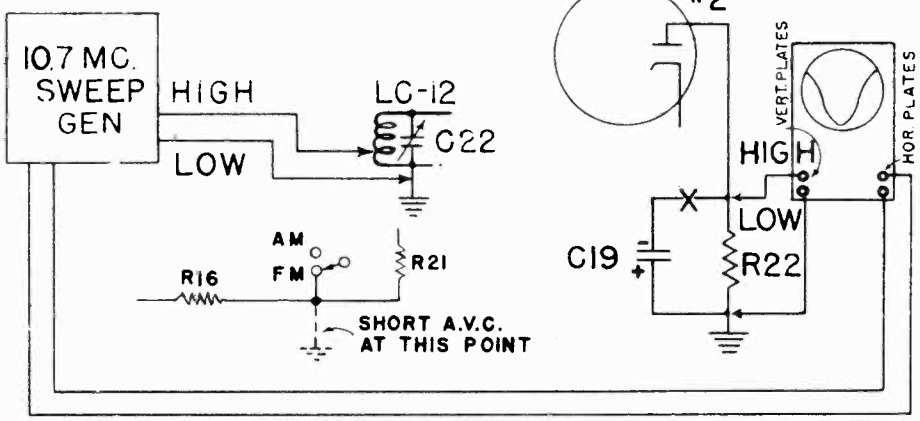
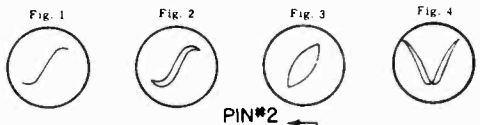


Fig. 6
DETECTOR AND I F ALIGNMENT CONNECTIONS

OSCILLOSCOPE PATTERNS



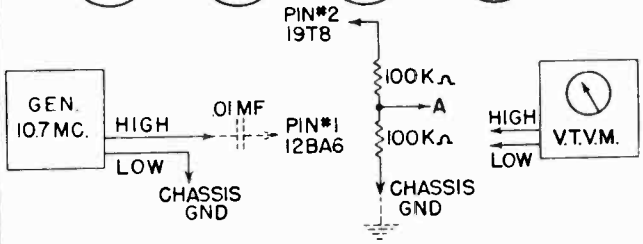


Fig. 5
DETECTOR ALIGNMENT CONNECTIONS

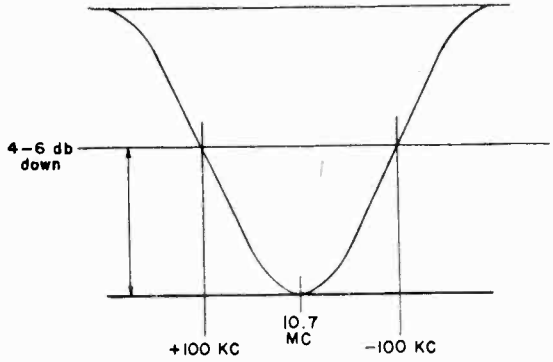


Fig. 7

MODEL 8022,
Ch. 478.206

TUBE LOCATIONS

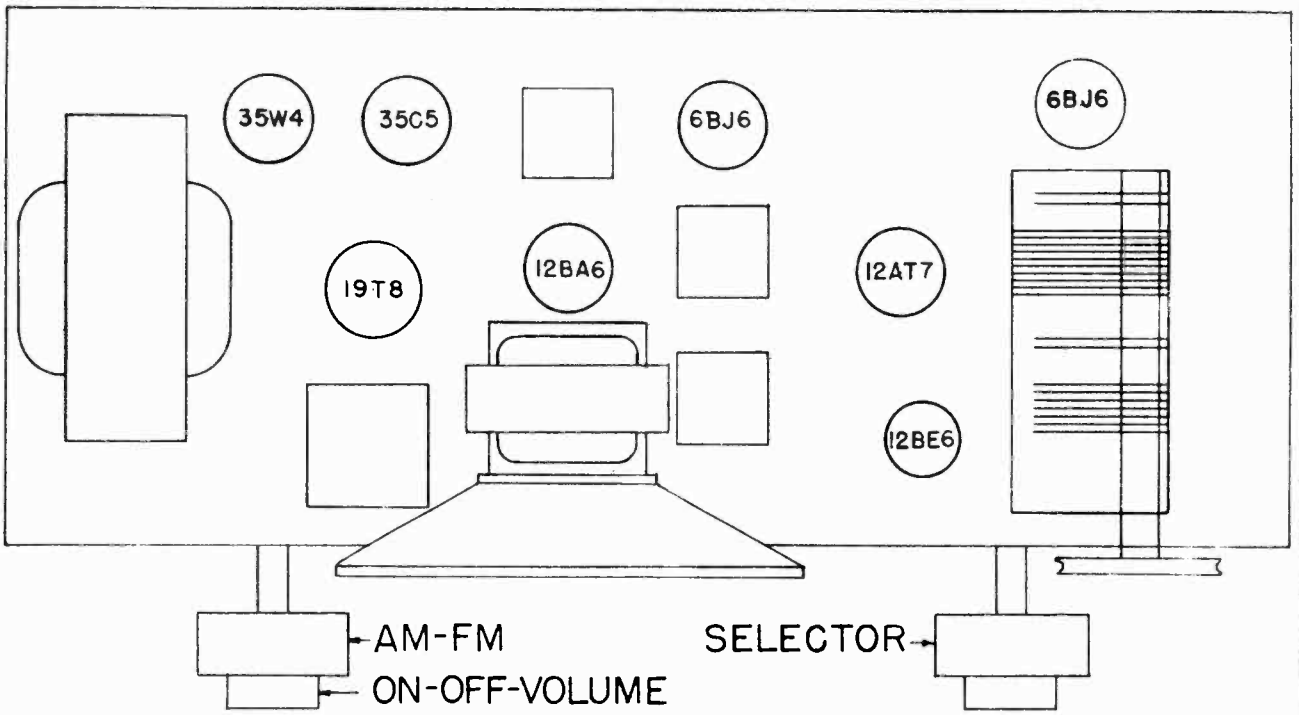


Fig. 8

REPAIR PARTS LIST

Schematic Location	Part Number	Description	MU Code
LF-30	LF-30	Transformer, FM-IF	
LF-31	LF-31	Transformer, AM-FM-IF	
LF-32	LF-32	Transformer, AM-IF	
LF-33	LF-33	Transformer, Ratio Det	
TR-19	TR-19	Transformer, Isolation	
LC-9	LC-9	Coil, Oscillator AM	
LC-11	LC-11	Coil, Oscillator, FM	
LC-12	LC-12	Coil, RF-FM	
LC-13	LC-13	Choke, Filament	
LC-14	LC-14	Choke, Plate	
LC-15	LC-15	Choke, Grid	
LC-16	LC-16	Choke, Cathode	
LC-17	LC-13	Choke, Filament	
LC-18	LC-13	Choke, Filament	
	SO-17-S	Socket, Min Wafer, 7 Pin With Shield	
	SO-19-S	Socket, Min Wafer, 9 Pin With Shield	
	SO-17	Socket, Min Wafer, Without Shield	
C1a, b) C2a, b) C3a, b) C4a, b) C5a, b)	CC-2-1	Capacitor, 2X.002 MFD Ceramic.	
C6a, b)	CC-2-2	Capacitor, 2X.004 MFD Ceramic.	
C7,26,27	CC-1-1	Capacitor, .005 MFD Ceramic	
C8a,b,c,d) CE-18)	CE-18	Capacitor 20x40x20x10 MFD 150 V. Electrolytic.	
C9,28	CP-202-2	Capacitor, .002 MFD 400 V.	
C10,19	CC-047-8	Capacitor, 47MMF Ceramic 10%.	
C11	CC-101-7	Capacitor, 100 MMF Ceramic 20%.	
C12	CMS-033-9	Capacitor, 33 MMF Silver Mica 5%	
C13	CM-102	Capacitor, .001 MFD Mica	
C14	CSP-1	Capacitor, 1 MMF	
C15,30	CC-068-7	Capacitor, 68 MMF Ceramic ± 20%	
C16, 31	CM-151-1	Capacitor, 150 MMF Mica 20%.	
C18,32) C33,34)	CP-503-1	Capacitor, .05 MFD 400 V	
C19	CE-19	Capacitor, 4 MFD 500 W V. Elect	
C20	CP-203-20	Capacitor, .02 MFD 800 V	
C21	CP-103-1	Capacitor, .01 MFD 400 V	
C22,23) C24,25)	CV-17	Capacitor, Variable	A5
R1,4,6) R8,12,16	RC-102-1	Resistor, 1000 ohms 1/2 W. 20%	
R2,10 R13,14	RC-104-1	Resistor, 1000000 ohms 1/2 W. 20%.	
R3,9,11	RC-680-2	Resistor, 68 ohms 1/2 W. 10%.	
R5	RC-222-2	Resistor, 2200 ohms, 1/2 W. 10%	
R7	RC-103-2	Resistor, 10000 ohms 1/2 W. 10%	
R15	RC-225-1	Resistor, 2.2 Meg Ohms 1/2 W. 20%	
R17,26	RC-181-2	Resistor, 180 ohms 1/2 W. 10%	
R18	RC-393-2	Resistor, 39000 ohms 1/2 W. 10%	
R19	RC-106-1	Resistor, 10 Meg ohms 1/2 W. 20%	
R20	VC-17	Control, On-Off & Volume, 1 Meg	
R21,24) R28)	RC-224-1	Resistor, 220000 ohms 1/2 W. 20%	
R22	RC-163-3	Resistor, 16000 ohms 1/2 W. 5%	
R23	RC-223-1	Resistor, 22000 ohms 1/2 W. 20%	
R25	RC-271-8	Resistor, 270 ohms, 2 W. 10%	
R27	RC-474-1	Resistor, .47 Meg ohms 1/2 W. 20%.	
R29	RC-471-8	Resistor, 470 ohms 2 W. 10%	
S1,2,3,4		W/AM-FM Four Pole, D.T.Switch. (On R-20)	
LP-13	LP-13	Loop, Antenna.	
	CB-120	Cabinet, Bakelite	AAO
	GR-27	Silk Cloth on Cardboard	
	DL-26	Dial Plate W/Lettering.	
	PN-17	Dial Pointer.	
	KN-28	Knob Assembly	
	KN-26	Knob - Large	
	KN-27	Knob - Small	
	IB-20	Instruction Sheet	
	PY-3	Pulley, Drive Shaft	
	SA-24	Shaft Drive	
	SP-41-10B	Speaker, 4" P.M. & O.T. TR-10B	AAO
	SG-1	Spring, Dial.	
	CR-2	Dial Cord	

MODEL 8022,
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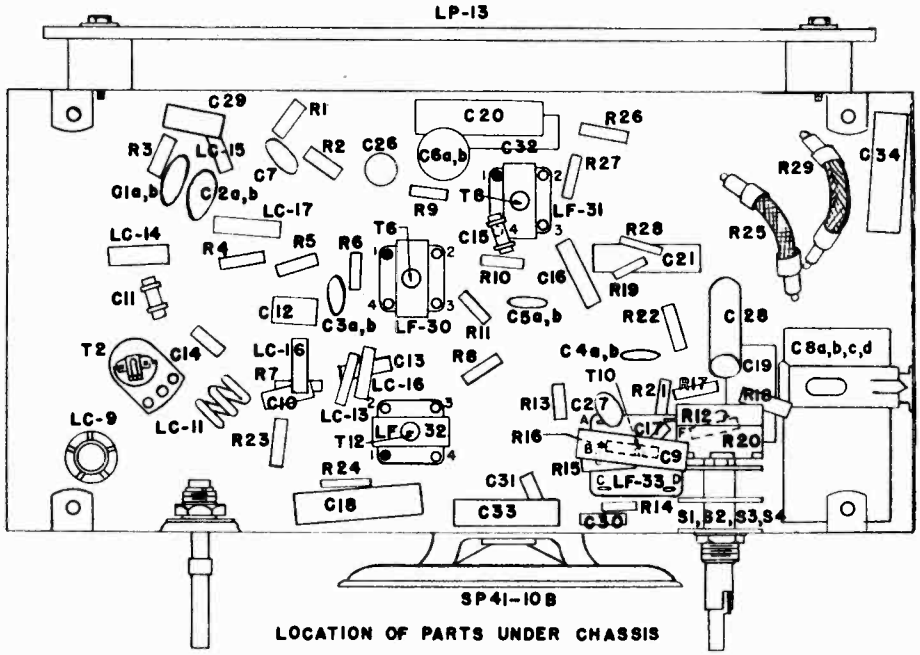
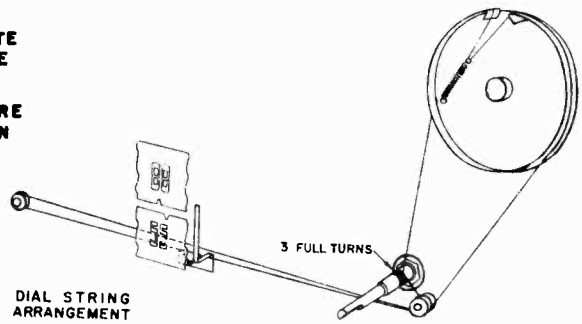


LOCATION OF PARTS UNDER CHASSIS

NOTE:
GREEN DOTS ON THREE I.F. TRANSFORMERS INDICATE LUG NO. 1. LUGS ARE COUNTED IN A CLOCKWISE DIRECTION FROM THESE DOTS.

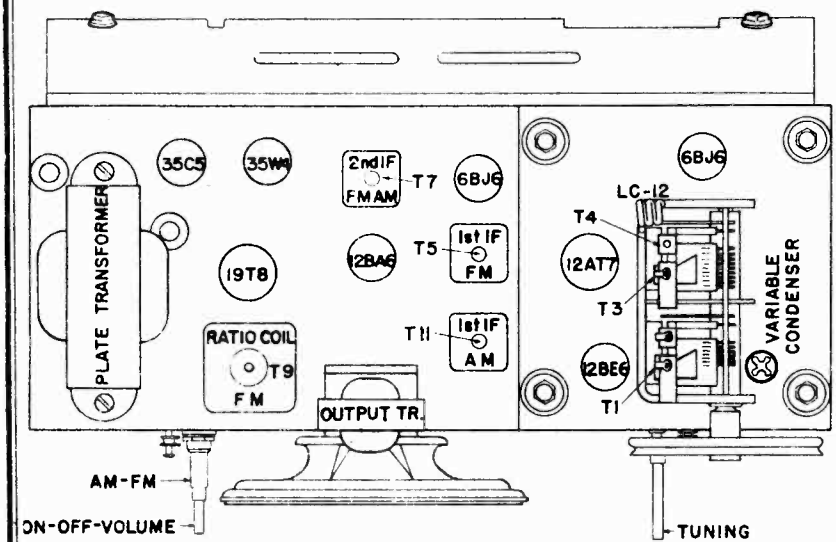
RATIO DETECTOR TRANSFORMER (LF-33) LUGS ARE LETTERED IN A COUNTER-CLOCKWISE DIRECTION STARTING AT POINT "A".

Fig. 9



DIAL STRING ARRANGEMENT

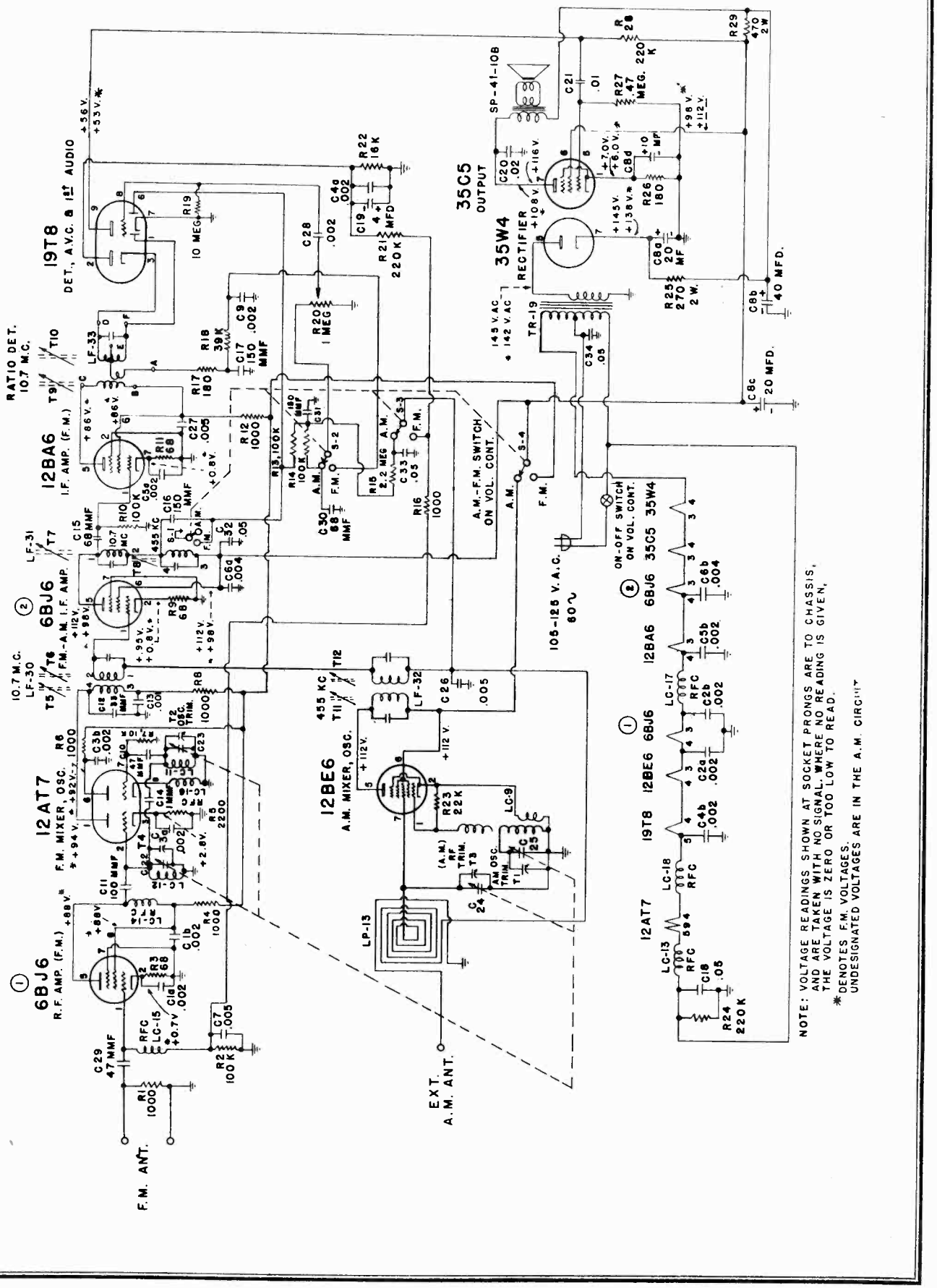
Fig. 10



LOCATION OF TUBES & TRIMMERS ON TOP OF CHASSIS

Fig. 11

MODEL 8022,
Ch. 478.206



MODELS 8024, 8025,
Ch. 478.206-1

REPAIR PARTS LIST

Schematic Location	Part Number	Description	MU Code
T1	LF-30	Transformer, FM-IF	
T5	LF-32	Transformer, AM-IF	
T3	LF-33A	Transformer, Ratio Det.	
T2	LF-34	Transformer, FM-IF	
T4	LF-35	Transformer, AM-IF	
T6	TR-21	Transformer, Isolation	B5
L7	LC-9	Coil, Oscillator AM	
L5	LC-11	Coil, Oscillator	
L3	LC-12	Coil, RF FM	
L8, 9	LC-13	Choke, Filament	
L2	LC-14	Choke, Plate	
L1	LC-15	Choke, Grid	
L4	LC-16	Choke, Cathode	
TC-2	TA-2	Ceramic Trimmer-520 MMF	
C2a, 2b, C3a, 3b, C4a, 4b	CC-2-1	Capacitor, 2 x .004 MFD Ceramic	
C5a, 5b	CC-2-2	Capacitor, 2 x .004 MFD Herlec	
C8, 16, 24	CC-1-1	Capacitor, .005 MFD Herlec	
C15, 23	CP-503-1	Capacitor, .05 MFD 400 V	
C22	CE-19	Capacitor, 4 MFD 50 W;V. Electrolytic	
C25	CP-203-20	Capacitor, .02 MFD 800 V	
C28	CP-103-1	Capacitor, .01 MFD 400 V	
C17	CC-3.3-11	Capacitor, 3.3 MMF ±10%	
C29, 30, C31, 32 TC1, TC3, TC4	CV-17	Capacitor, Variable (AM-FM) Capacitors, Trimmer	A5
C26, 27	CP-203-1	Capacitor, .02 - 400 V. Paper	
R1, 4, 7, 8, 11, 19	RC-102-1	Resistor, 1000 ohms 1/2W 20%	
R2, 17	RC-104-1	Resistor, 100,000 ohms 1/2W 20%	
R3, 9, 10	RC-680-2	Resistor, 68 ohms 1/2W ±10%	
R5	RC-222-2	Resistor, 2200 ohms 1/2W ±10%	
R6	RC-103-2	Resistor, 10,000 ohms 1/2W ±10%	
R18	RC-225-1	Resistor, 2.2 Meg ohms 1/2W 20%	
R22	RC-181-2	Resistor, 180 ohms 1/2W ±10%	
R14	RC-273-3	Resistor, 27,000 ohms 1/2W ±5%	
R21, 25	RW-101-8	Resistor, 100 ohms W.W	
C6a, 6b, C6c, 6d	CE-18	Capacitor, 20x40x20 (150V)x10 (25V) Electrolytic	
C1a, 1b, C1c	CC-3-0	Capacitor, 3 x .0015 Herlec	
C18, 21	CP-202-2	Capacitor, .002 MFD 400 V	
C7, 11	CC-047-8	Capacitor, 47 MMF Ceramic 10%	
C9	CC-101-7	Capacitor, 100 MMF Ceramic 20%	
C12	CMS-033-9	Capacitor, 33 MMF Silver Mica 5%	
C13	CM-102	Capacitor, .001 MFD Mica	
C10	CSP-1	Capacitor, 1 MMF 10%	
C20	CC-068-7	Capacitor, 68 MMF Ceramic ±20%	
C19	CM-151-1	Capacitor, 150 MMF Mica 20%	
C14	CM-331-8	Capacitor, 330 MMF Mica ±10% 500 V 2W ±10%	
R12	RC-393-2	Resistor, 39,000 ohms 1/2W 10%	
R13	RC-106-1	Resistor, 10 Meg ohms 1/2W 20%	
R16	VC-17	Control, On-Off & Volume 1 meg Includes S1, S2, S3-D.T. Switch	
R15, 24	RC-224-1	Resistor, 220,000 ohms 1/2W 20%	
R20	RC-223-1	Resistor, 22,000 ohms 1/2W 20%	
R23	RC-474-1	Resistor, .47 Meg ohms 1/2W 20%	
R26	RW-471-8	Resistor, 470 ohms 2W W.W. ±10%	
L6	LP-18	Loop Antenna	
	CB-158-1	Cabinet, Bakelite (Ivory)	A0
	CB-158-W	Cabinet, Bakelite (Walnut)	AA0
	GR-27	Silk Cloth on Cardboard	
	DL-26	Dial Plate	
	PN-17	Dial Pointer	
	KN-28	Knob Assembly	
	KN-26	Knob, Large	
	KN-27	Knob, Small	
	IB-20	Instruction Sheet	
	PY-3	Pulley, Drive Shaft	
	SA-24	Shaft, Drive	
	SG-1	Spring Dial	
	CR-2	Dial Cord	
T7	SP41-10B	Speaker 4" P.M. & O.T.	AA0

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection ..... Across speaker voice coil
Output meter reading to indicate 500 MW (Standard Output) ..... 1.27 volt
Generator modulation ..... 30% 400 cycles
Position of volume control ..... Fully clockwise
Set Dial Pointer ..... 1-3/32" from center of left shaft, variable condenser closed
Set band switch ..... To left for AM alignment; to right for FM alignment

AM ALIGNMENT

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN FOR MAX. OUTPUT	TRIMMER FUNCTION
Open	455 Kc	.05 Mfd.	Mixer grid	Chassis	1, 2, 3, 4	I.F.
1620 Kc	1620 Kc		*Test loop	Test loop	11	Oscillator
1400 Kc	1400 Kc		*Test loop	Test loop	12	Antenna
**600 Kc	600 Kc		*Test loop	Test loop	Checkpoint	Antenna

*Connect generator lead to a Standard Hazeltine Test Loop, Model 1150, placed two feet from the set loop, or three turns of wire about six inches in diameter, placed about one foot from the set loop.

**With a generator signal of 600 Kc, tune the set to the point where maximum output is obtained, which should be approximately 600 Kc on the dial. Adjust antenna section plates of variable for maximum output.

MODELS 8024, 8025,
Ch. 478.206-1

The alignment procedure should be repeated in the original order for greatest accuracy.

Always keep the output from the signal generator at its lowest possible value to make the A. V. C. action of the receiver ineffective.

FM ALIGNMENT

DETECTOR AND IF ALIGNMENT USING SIGNAL GENERATOR AND OSCILLOSCOPE

1. Connect vertical input of scope across volume control of receiver (grounded terminal to chassis, ungrounded terminal to high side of the control).
2. Connect FM Generator, High Side, to grid of 2nd IF tube through .01 mfd. dummy, Low Side, to chassis.
3. Connect sweep voltage of generator to horizontal terminals of scope.
4. Set generator frequency to 10.7 Mc modulated either 60 cycles or 400 cycles, 250 Kc sweep (125 Kc deviation.
5. Set volume control to maximum, variable condenser fully open, band switch to right (FM).
6. Adjust detector primary slug #5 for maximum vertical sweep of the scope pattern.
7. Adjust detector secondary slug #6 for symmetry of the pattern. Pattern should look like Fig. 1, with the same amount of curve on both ends.
8. Connect generator, high side, to mixer coil as in Fig. 7, low side to chassis.
9. Short A. V. C. to chassis at junction of R15 and R19.
10. Disconnect the negative lead of C22 from pin #2 of 6T8.
11. Connect vertical input of scope across R14. (Grounded terminal to chassis, ungrounded terminal to high side of resistor.)
12. Adjust IF slugs 7, 8, 9, 10 for greatest vertical sweep of the pattern. Stagger tune (detune) slightly so that pattern looks like Fig. 4.
13. Resolder the negative lead of condenser disconnected after alignment is completed.

NOTE: A double trace pattern, as in Fig. 2 or Fig. 3 for detector alignment, or Fig. 5 for IF alignment, may be caused by a slight out of phase condition between the sweep voltage to the horizontal terminals of the scope and the modulation on the generator signal. To correct this condition, connect a condenser of about .0005 mf. across the horizontal input terminals of the scope and a 1 megohm variable resistance in series with the lead to the ungrounded terminal. Adjust the resistance until the two traces coincide.

DETECTOR ALIGNMENT USING SIGNAL GENERATOR AND VTVM

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN	TRIMMER FUNCTION
Open	10.7 Mc	.01 Mfd.	2d IF grid	Chassis	#*5, #*6	Detector

#*5 is adjusted for maximum A. V. C. voltage. A vacuum tube voltmeter or a 20,000 ohm per volt voltmeter with a low V. range can be used to measure the A. V. C. voltage. Connect negative lead to junction of R15 and R19 on band switch and positive lead to the chassis.

#*6 is adjusted for zero reading of a vacuum tube voltmeter or a 20,000 ohm per volt voltmeter, connected as shown in Fig. 6. Rock this adjustment through the zero point to see that the voltage is positive on one side of the zero point and negative on the other.

NOTE: If a 10.7 Mc FM generator is not available for alignment of detector, and unmodulated signal of 10.7 Mc from an accurately calibrated conventional AM type generator can be used. (Voltmeter alignment only.)

I.F. alignment using signal generator and V.T.V.M. not recommended.

RF

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN	TRIMMER FUNCTION
Open	109 Mc	300 Ohm	Ant. Term.	Ant. Term.	#13	Oscillator
Closed	87.5 Mc	300 Ohm	Ant. Term.	Ant. Term.	Spacing of L-5	Oscillator

Repeat the above oscillator adjustments until proper coverage is obtained on both ends of band since the two adjustments effect each other.

106 Mc	106 Mc	300 Ohm	Ant. Term.	Ant. Term.	#14	RF
90 Mc	90 Mc	300 Ohm	Ant. Term.	Ant. Term.	Spacing of L-3	RF

Repeat "RF and Ant." adjustments until proper tracking is obtained at both 90 and 106 Mc, since tracing the set at one frequency effects the tracking at the other frequency.

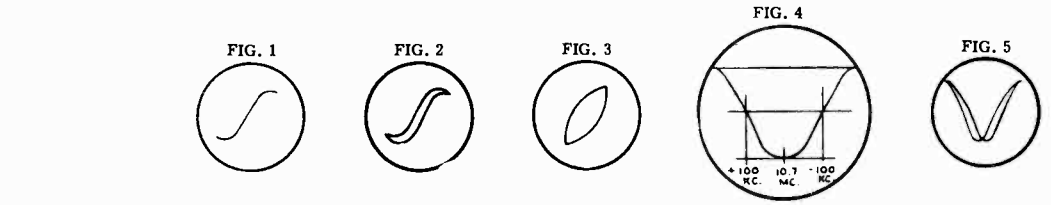
All RF trimmers are adjusted for maximum output, measured with output meter across speaker voice coil.

For RF alignment, use FM generator signal modulated with 400 cycles 45 Kc sweep (22.5 Kc deviation).

MODELS 8024, 8025,
Ch. 478.206-1

OSCILLOSCOPE PATTERNS

FIG. 1 FIG. 2 FIG. 3 FIG. 4 FIG. 5



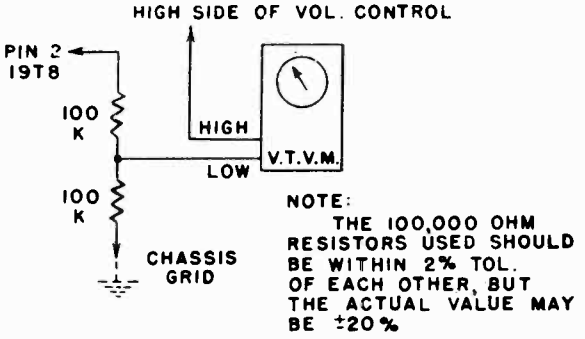


FIG. 6

DETECTOR ALIGNMENT

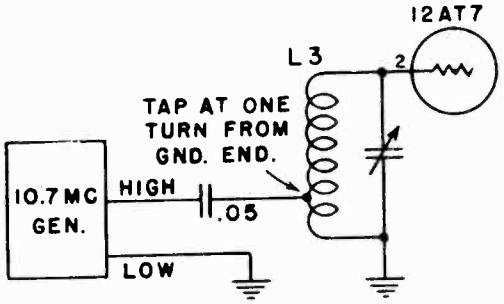
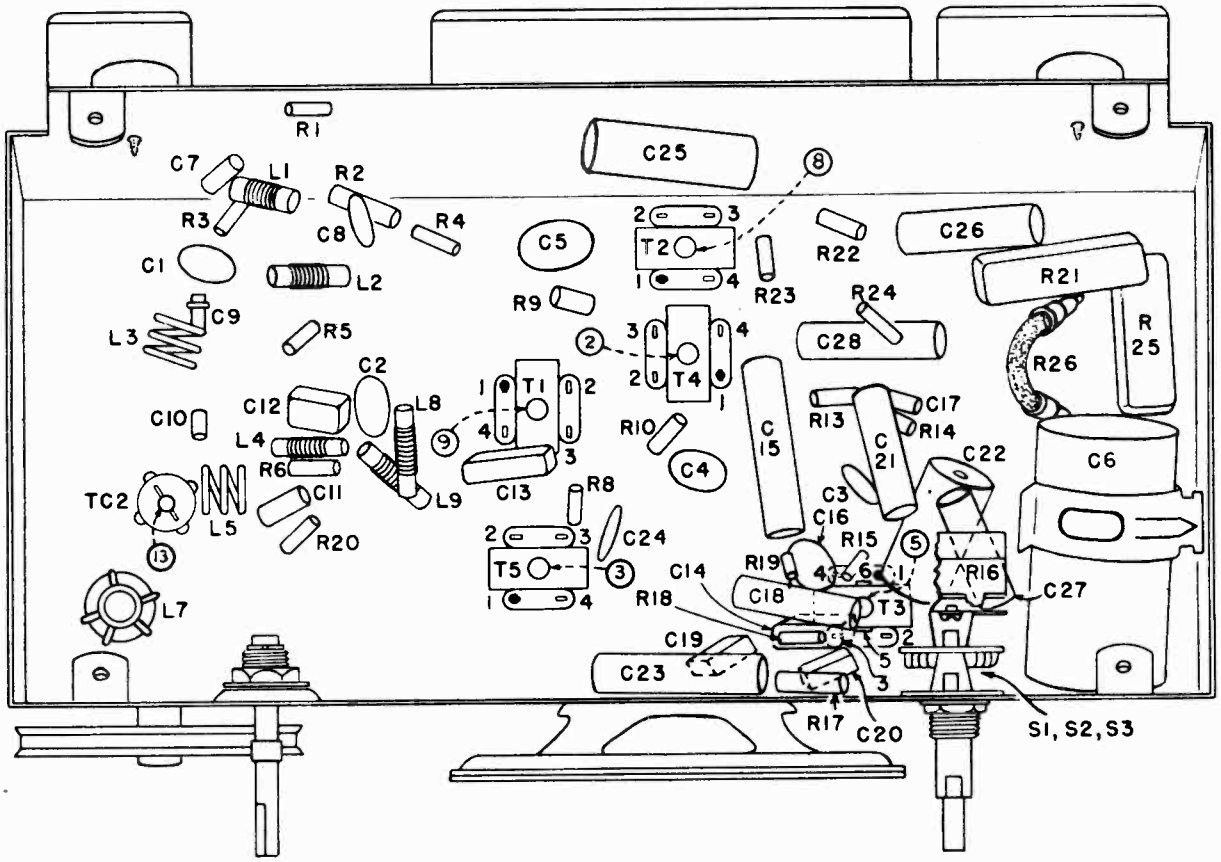


FIG. 7

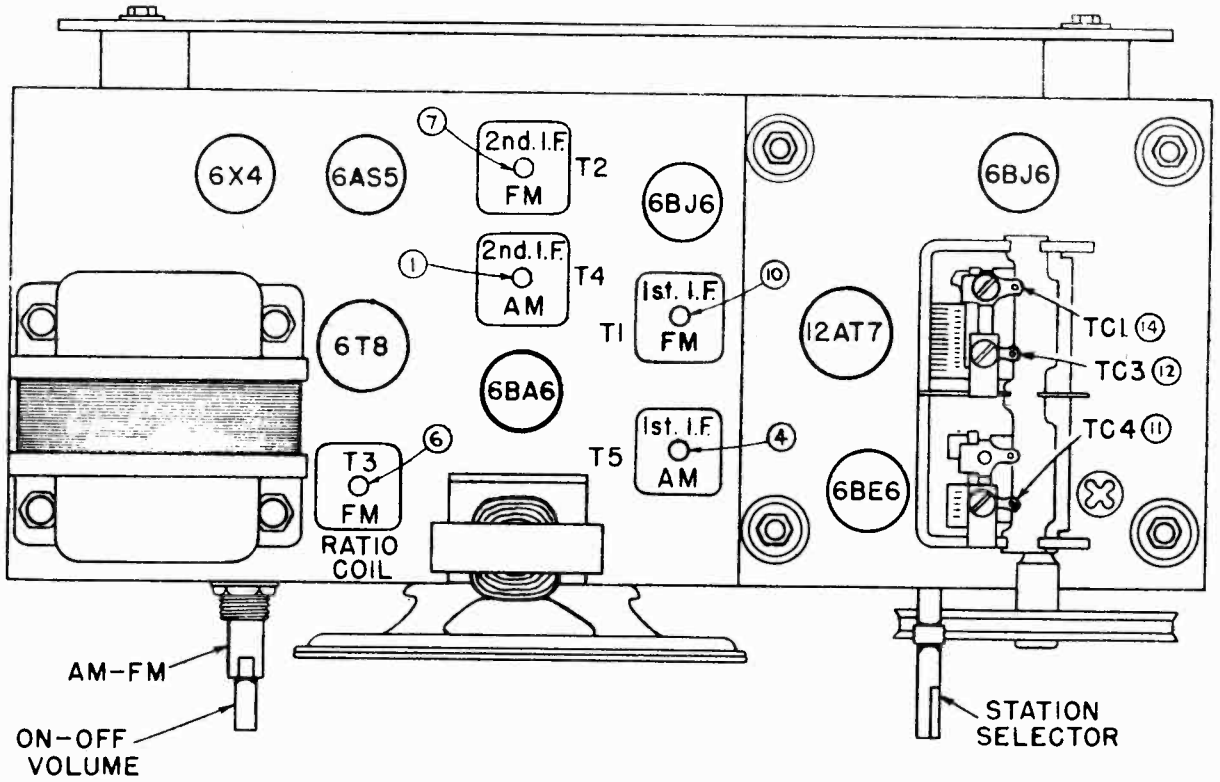
DETECTOR ON I F ALIGNMENT



LOCATION OF PARTS UNDER CHASSIS

FIG. 8

MODELS 8024, 8025,
Ch. 478.206-1



LOCATIONS OF PARTS ON TOP OF CHASSIS

FIG. 9

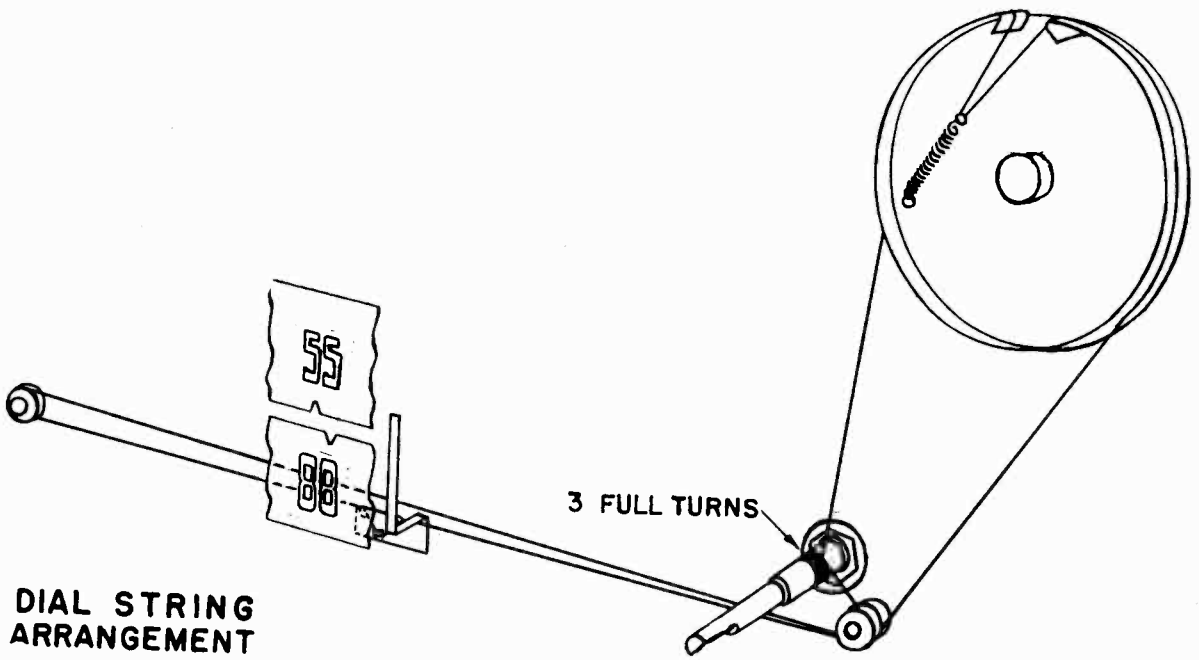
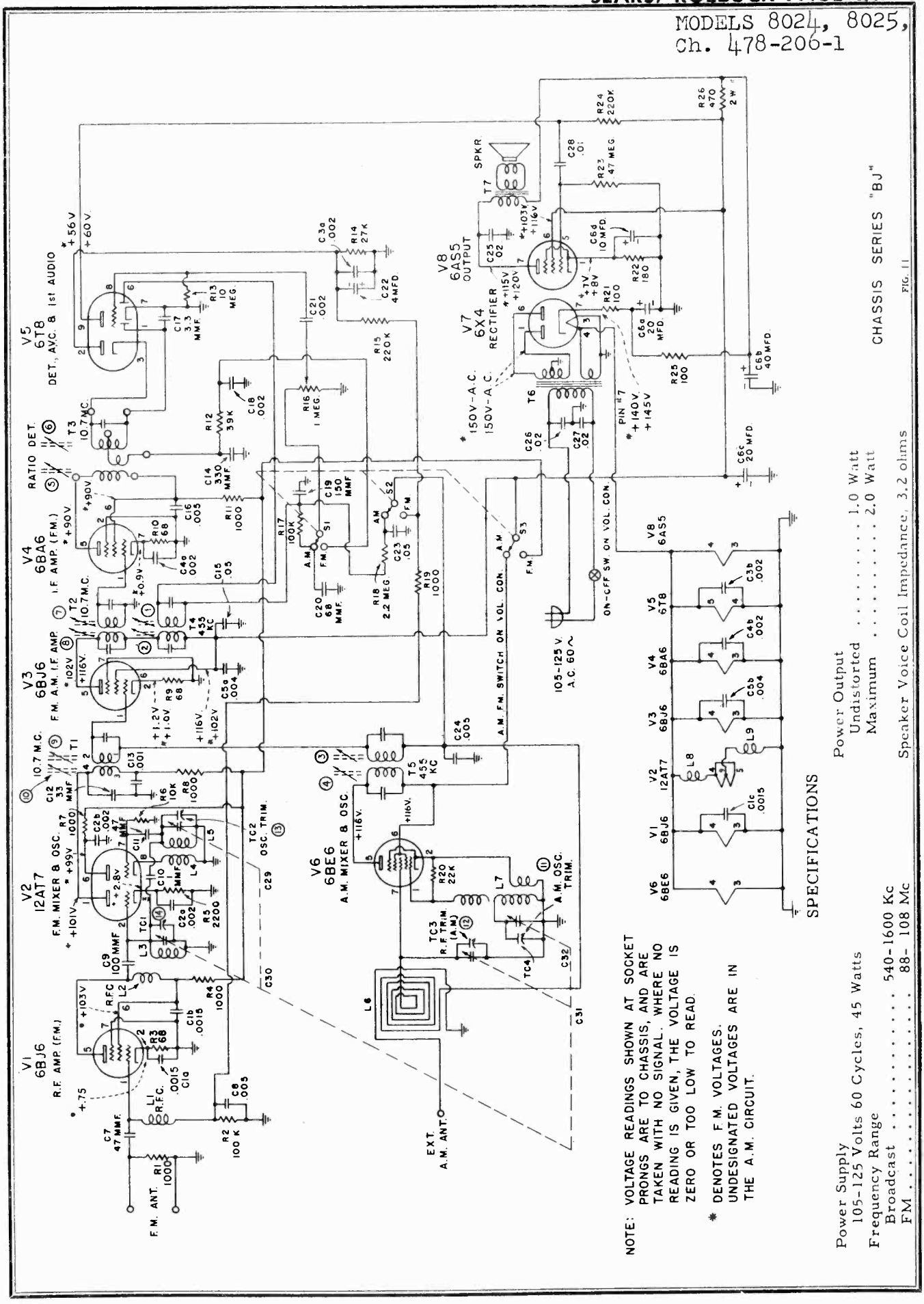


FIG. 10

MODELS 8024, 8025,
Ch. 478-206-1



NOTE: VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS, AND ARE TAKEN WITH NO SIGNAL. WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ.

* DENOTES F.M. VOLTAGES. UNDESIGNATED VOLTAGES ARE IN THE A.M. CIRCUIT.

SPECIFICATIONS

Power Output
Undistorted ..... 1.0 Watt
Maximum ..... 2.0 Watt

Power Supply
105-125 Volts 60 Cycles, 45 Watts

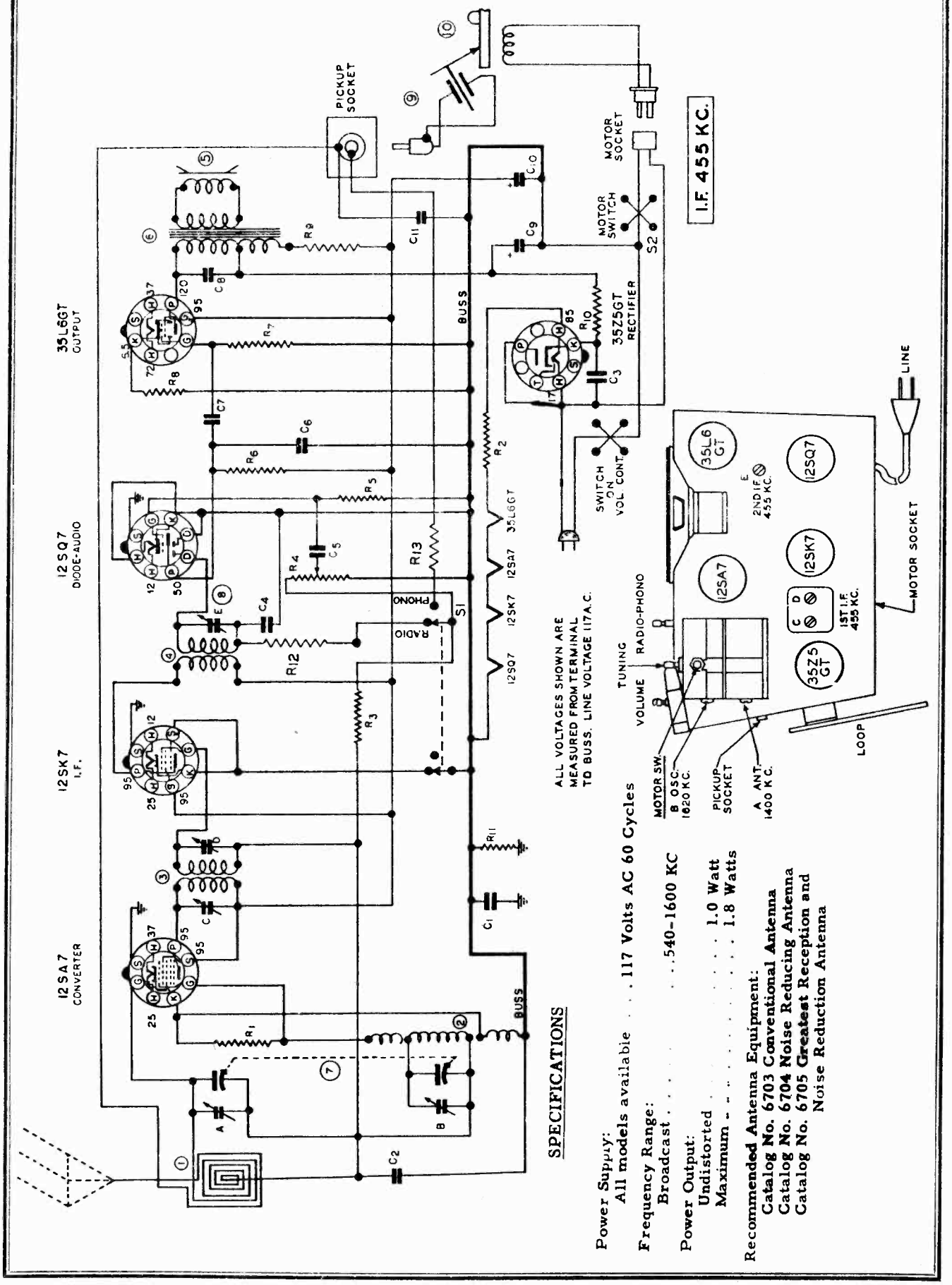
Frequency Range
Broadcast ..... 540-1600 Kc
FM ..... 88- 108 Mc

Speaker Voice Coil Impedance, 3.2 ohms

CHASSIS SERIES "BJ"

FIG. 11

MODEL 8071,
Ch. 135.242



SPECIFICATIONS

Power Supply:
All models available . . . 117 Volts AC 60 Cycles

Frequency Range:
Broadcast . . . . . 540-1600 KC

Power Output:
Undistorted . . . . . 1.0 Watt
Maximum . . . . . 1.8 Watts

Recommended Antenna Equipment:
Catalog No. 6703 Conventional Antenna
Catalog No. 6704 Noise Reducing Antenna
Catalog No. 6705 Greatest Reception and Noise Reduction Antenna

MODEL 8071,
Ch. 135.242

ALIGNMENT PROCEDURE

PRELIMINARY:

Output Meter Connection . . . . . Across loud speaker voice coil
Generator ground lead connection . . . . . Receiver chassis
Dummy Antenna value to be in series with generator output . . . . . See chart below
Connection of generator output lead . . . . . See chart below
Generator Modulation . . . . . 30%, 400 cycles
Position of Volume Control . . . . . Fully on

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENTS (IN ORDER) SHOWN	TRIMMER FUNCTION
Closed	455 KC	.1 mfd.	125A7 Transl. grid.	E, D, C	IF
Open	1620 KC	.0001 mfd.	Ant.	B	Oscillator
1400 KC	1400 KC	.0001 mfd.	Ant. 1	A	Transl.

IMPORTANT ALIGNMENT NOTES

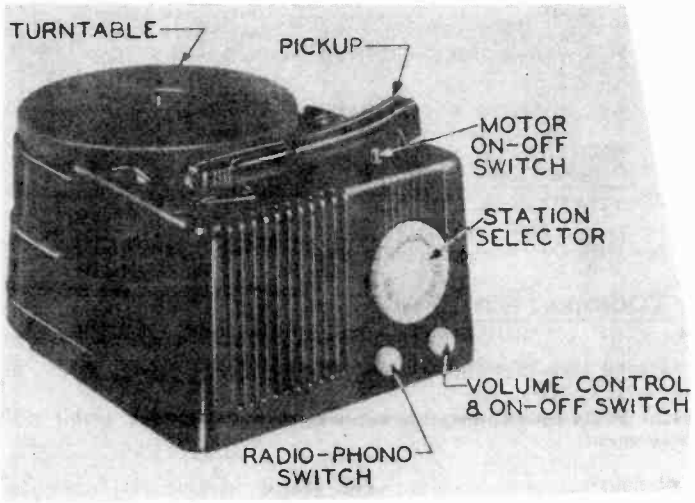
The alignment must be done in the order given.

The entire alignment Procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	F-7520	Arm - Pickup (Less Crystal)
	F-5763	Cartridge - Crystal - Astatic L70
	F-242	Cabinet - Radio - Molded
	F-241	Cabinet - Radio - Molded ivory
	F-6093	Capacitor - Variable Assembly
8	F-4048	Capacitor - Trimmer - Single
C9,C10	F-5051	Capacitor - Electrolytic - 40 Mfd. 150 V. 40 Mfd. 150 V.
C4	F-1374	Capacitor - Mica - .0001 Mfd. 500 V. 20%
C6	F-4890	Capacitor - .0005 Mfd. 600 V. 25% +60%
C5	F-4894	Capacitor - .005 Mfd. 600 V. 20% +40%
C7	F-1344	Capacitor - .01 Mfd. 400 V. 20% +20%
C8	F-1376	Capacitor - .02 Mfd. 400 V. 20% +20%
C1,C2	F-1345	Capacitor - .05 Mfd. 200 V. 20% +20%
C3	F-1346	Capacitor - .05 Mfd. 400 V. 20% +20%
C11	F-4897	Capacitor - .09 Mfd. 200 V. 10% +10%
2	F-4810	Coil - Oscillator
R4	F-6239	Control - On-Off & Volume
	F-1090	Cord - Line
	F-1577	Knob - Volume Control & Radio - Phono Switch
	F-6103	Knob - Station Selector
	F-7513	Leaflet - Instruction
1	F-6100	Loop - Antenna
10	F-7526	Motor - Phono - 60 Cycle (Less Turntable)
	F-7527	Idler Wheel
	F-7528	Turntable - 8"
R10	F-4022	Resistor - 33 Ohm - 1/2 W. - 20%
R8	F-4067	Resistor - 180 Ohm - 1.2 W. - 10%
R1	F-4025	Resistor - 22,000 Ohm - 1/2 W. - 20%
R12	F-4069	Resistor - 47,000 Ohm - 1/2 W. - 20%
R6,R11	F-4026	Resistor - 220,000 Ohm - 1/2W. - 20%
R7	F-4027	Resistor - 470,000 Ohm - 1/2W. - 20%
R3,R13	F-1262	Resistor - 1 Megohm - 1/2 W. - 20%
R5	F-4028	Resistor - 6.8 Megohm - 1/2 W. - 20%
R9	F-5358	Resistor - 1,000 Ohm - 1 W. - 10%
	F-4978	Shield - L.F. Transformer
	F-3229	Socket - Tube + 8 Prong - Octal
	F-6102	Speaker - 4" P.M.
	F-2877	Switch - Radio - Phono
	F-2094	Switch - Motor - On-Off
T1	F-4813	Transformer - I.F. #1
T2	F-4846	Transformer - I.F. #2
T3	F-4875	Transformer - Output

MODEL 8073,
Ch. 135.243



REPAIR PARTS LIST

SCHEMATIC LOCATION	NUMBER	DESCRIPTION
	F-7525	Arm - Pickup (Less Crystal)
	F-5763	Cartridge - Crystal - Astatic L70
	F-293	Cabinet - Radio - Molded
	F-7516	Capacitor - Variable Assembly
C11	F-4048	Capacitor - Trimmer - Single
C17,C18	F-5051	Capacitor - Electrolytic - 40 MFD. 150V. 40 MFD. 150V.
C12	F-1374	Capacitor - Mica - .0001 Mfd. 500V. 20%
C14	F-4890	Capacitor - .0005 Mfd. 600V. -25% + 60%
C13	F-4894	Capacitor - .005 Mfd. 600V. -20% + 40%
C15	F-1344	Capacitor - .01 Mfd. 400V. -20% + 20%
C16	F-1376	Capacitor - .02 Mfd. 400V. -20% + 20%
C5,C6,C9	F-1345	Capacitor - .05 Mfd. 200V. -20% + 20%
C19	F-1346	Capacitor - .05 Mfd. 400V. -20% + 20%
C10	F-4957	Capacitor - .09 Mfd. 200V. -10% + 10%
L1	F-7139	Coil - Oscillator
R6	F-6239	Control - On-Off & Volume
	F-1090	Cord - Line
	F-1577	Knob - Volume Control & Radio-Phono Switch
	F-7511	Knob - Station Selector
	F-7513	Leaflet - Instruction
	F-6100	Loop - Antenna
	F-7526	Motor - Phono - 60 Cycle (Less Turntable)
	F-7527	Idler Wheel
	F-7528	Turntable - 8"
R9	F-4067	Resistor - 180 Ohm - 1/2 W. - 10%
R1	F-4025	Resistor - 22,000 Ohm - 1/2 W. - 20%
R4	F-4069	Resistor - 47,000 Ohm - 1/2 W. - 20%
R2,R8	F-4026	Resistor - 220,000 Ohm - 1/2 W. - 20%
R10	F-4027	Resistor - 470,000 Ohm - 1/2 W. - 20%
R3,R5	F-1262	Resistor - 1 Megohm - 1/2 W. - 20%
R7	F-4028	Resistor - 6.8 Megohm - 1/2 W. - 20%
R11	F-5358	Resistor - 1,000 Ohm - 1 W. - 10%
	F-4978	Shield - I. F. Transformer
	F-7515	Socket - Tube - 8 Prong - Octal
	F-6102	Speaker - 4" P. M.
	F-2877	Switch - Radio - Phono
	F-2094	Switch - Motor - On-Off
T1	F-4813	Transformer - I. F. #1
T2	F-4846	Transformer - I. F. #2
T3	F-4875	Transformer - Output

SPECIFICATIONS

Power Supply:
All models available . . . . . 117 Volts AC 60 Cycles

Frequency Range:
Broadcast . . . . . 535-1620 KC

Recommended Antenna Equipment
Catalog No. 6703 Conventional Antenna
Catalog No. 6704 Noise Reducing Antenna
Catalog No. 6705 Greatest Reception and Noise Reduction Antenna

Power Output:
Undistorted . . . . . 1.0 Watt
Maximum . . . . . 1.8 Watts

ALIGNMENT PROCEDURE

PRELIMINARY:

Output Meter Connection. . . . . Across loud speaker voice coil
Generator ground lead connection. . . . . Floating Ground
Dummy Antenna Value to be in series with generator output. . . . . See chart below
Connection of Generator Output lead . . . . . See chart below
Generator Modulation . . . . . 30%, 400 Cycles
Position of Volume Control . . . . . Fully on

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENTS (IN ORDER) SHOWN	TRIMMER FUNCTION
Closed	455 KC	.1 mfd.	12SA7GT Transl.Grid	C11,C8 & C7	I.F.
Open	1620 KC	.0002 mfd.	Loop	C4	Oscillator
1400 KC	1400 KC	.0002 mfd.	Loop	C2	Transl.

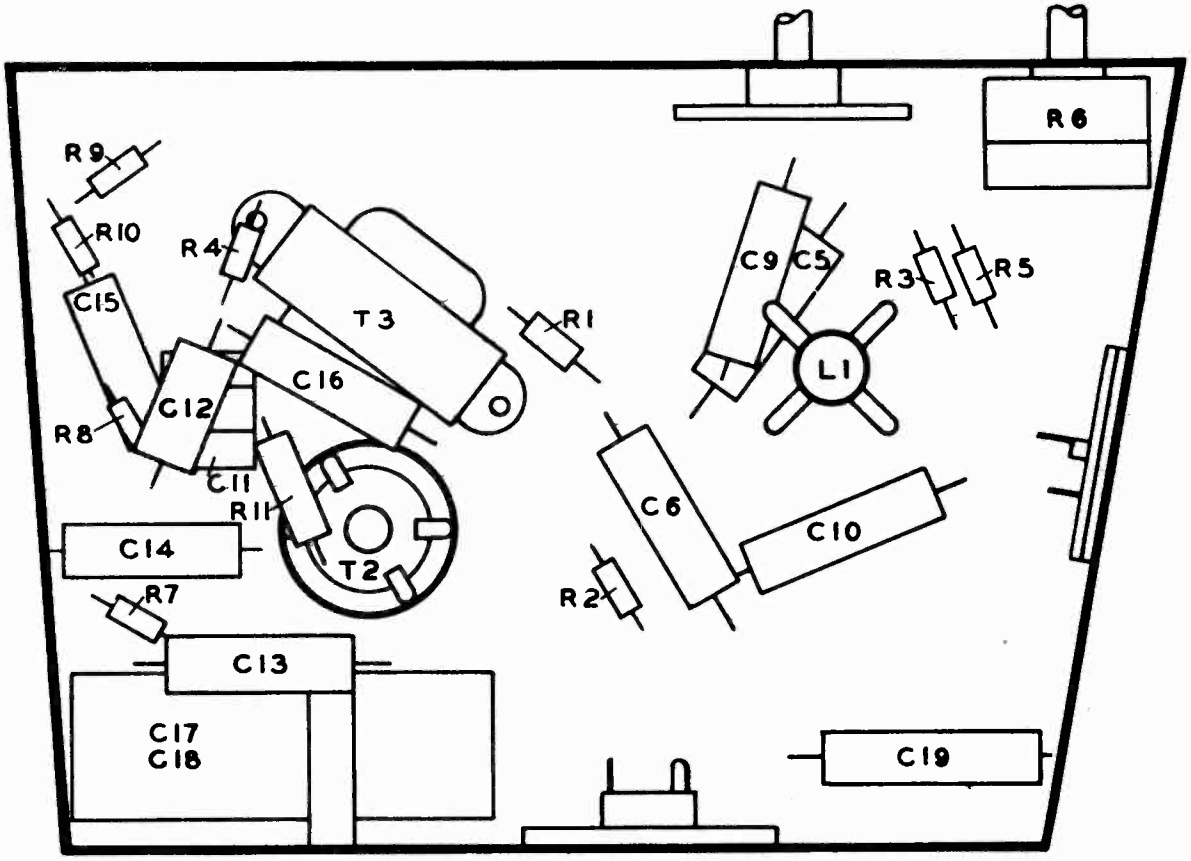
IMPORTANT ALIGNMENT NOTES

The alignment must be done in the order given.

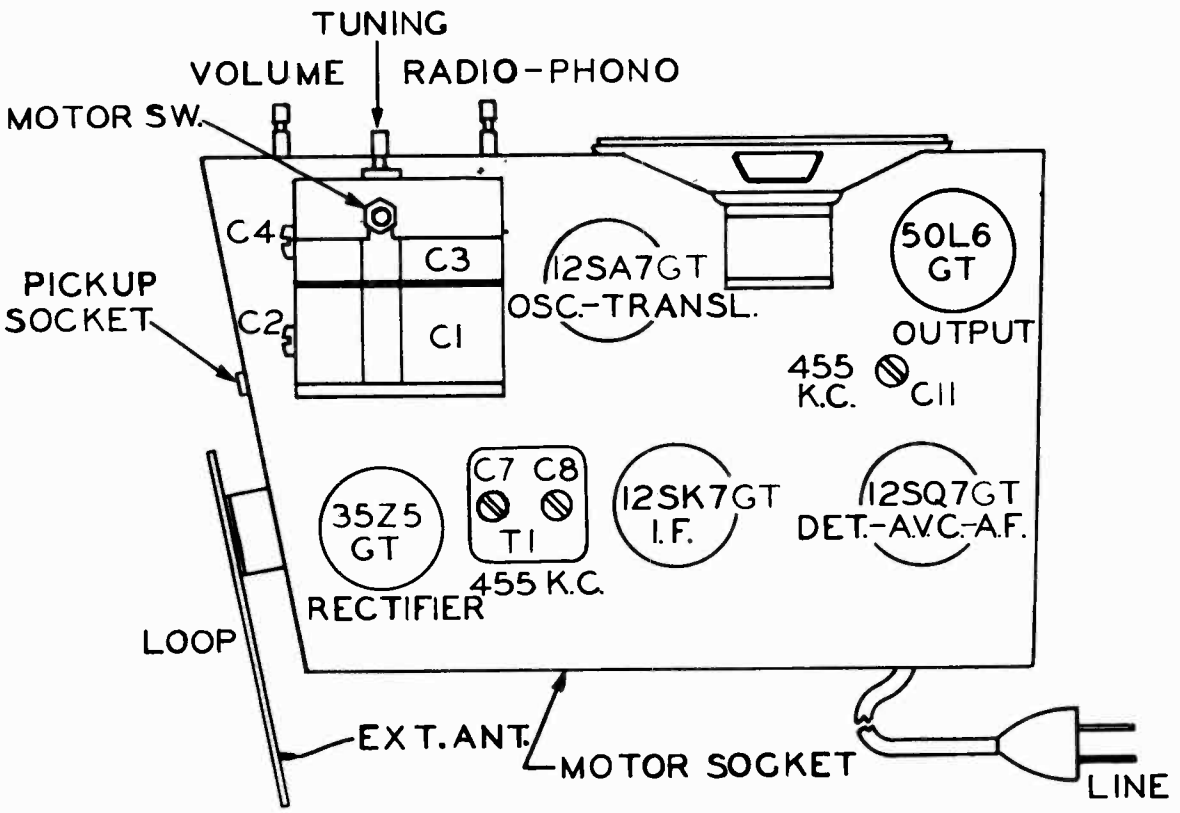
The entire Alignment Procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

MODEL 8073,
Ch. 135.243

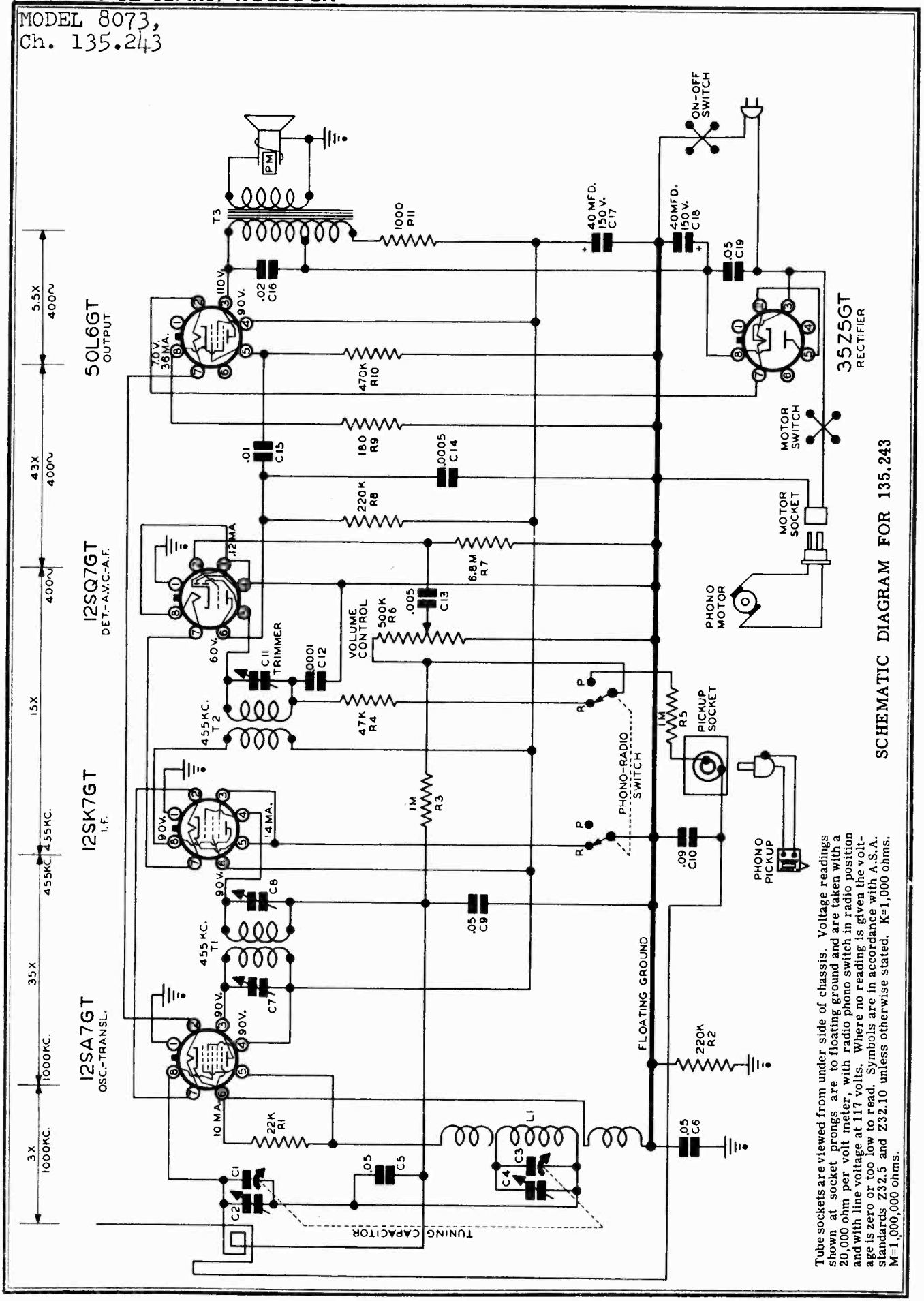


LOCATION OF PARTS UNDER CHASSIS



LOCATION OF PARTS ON TOP OF CHASSIS

MODEL 8073,
Ch. 135.243



Tube sockets are viewed from under side of chassis. Voltage readings shown at socket prongs are to floating ground and are taken with a 20,000 ohm per volt meter, with radio phono switch in radio position and with line voltage at 117 volts. Where no reading is given the voltage is zero or too low to read. Symbols are in accordance with A.S.A. standards Z32.5 and Z32.10 unless otherwise stated. K=1,000 ohms. M=1,000,000 ohms.

MODEL 9000,
Ch. 132.857

SPECIFICATIONS

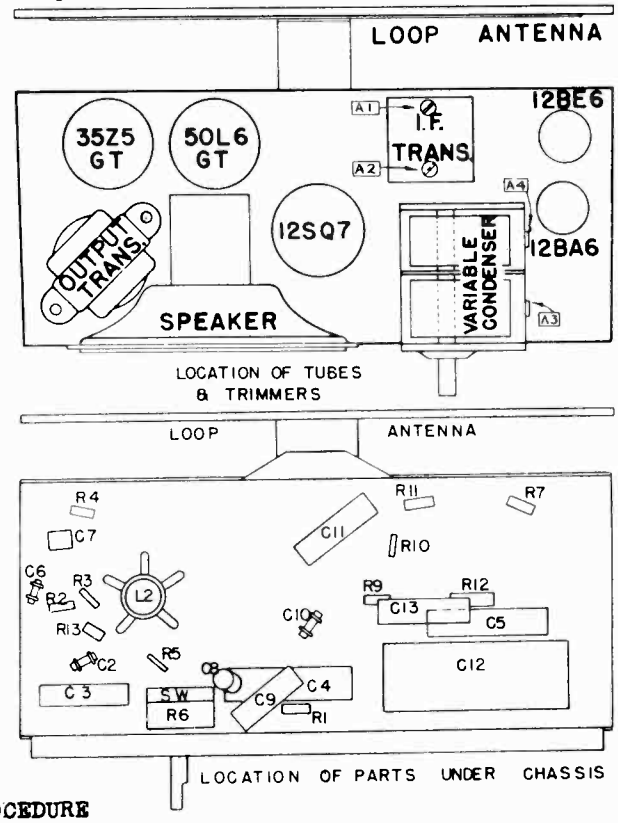
Power Supply
105-125 Volts AC-DC 30 Watts

Frequency Range
Broadcast 540-1600 Kc

Power Output
Undistorted .85 Watt
Maximum 2.3 Watt

Speaker Voice Coil Impedance 3.2 Ohms

SCHEMATIC LOCATION	PART NO.	DESCRIPTION
	N22084	Cabinet, Brown
L2	N22101-1	Coil, Oscillator
C1A, C1B	N22105	Condenser, Variable, 2 Gang
C2, C6		Condenser, Ceramic, .00022 Mfd.350 V. G.P.
C3		Condenser, .05 Mfd., 200 Volt
C4, C5		Condenser, .05 Mfd., 400 Volt
C7		Condenser, Molded, .00005 Mfd., J.P.
C8, C10		Condenser, Mica, .00025 Mfd., 500 Volt
C9		Condenser, .002 Mfd., 600 Volt
C11		Condenser, .005 Mfd., 600 Volt
C12A, C12B C12C		Condenser, Electrolytic, 50-30 Mfd., 150 Volt, 20 Mfd., 25 Volt
C13		Condenser, .01 Mfd., 400 Volt
P	N20254-2	Cord, Power
	N22085	Knob, Tuning, Brown
	N22086	Knob, Volume, Brown
	N22089	Leaflet, Instruction
L1	N22100	Loop, Antenna & Rear Cover Assy.
R1		Resistor, 330,000 Ohms, 1/4 Watt
R2		Resistor, 3300 Ohms, 1/4 Watt
R3, R9, R10		Resistor, 470,000 Ohms, 1/4 Watt
R4		Resistor, 22,000 Ohms, 1/4 Watt
R5		Resistor, 4.7 Megohm, 1/4 Watt
R6	N22107	Resistor, 2 Megohm, Vol. Control & Sw.
R7		Resistor, 33 Ohm, 1/4 Watt
R8		Resistor, 10 Megohm, 1/4 Watt
R11		Resistor, 150 Ohms, 1/4 Watt
R12		Resistor, 1200 Ohms, 1 Watt
Spk.	N22104	Speaker, 4" P. M.
T1	N22102-1	Transformer, I. F.
T2	N22103-1	Transformer, Output



ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection ..... Across speaker voice coil
Output meter reading to indicate 200 MW (Standard output)..... .8 volt
Generator modulation ..... 30% 400 cycles
Position of volume control ..... Fully clockwise

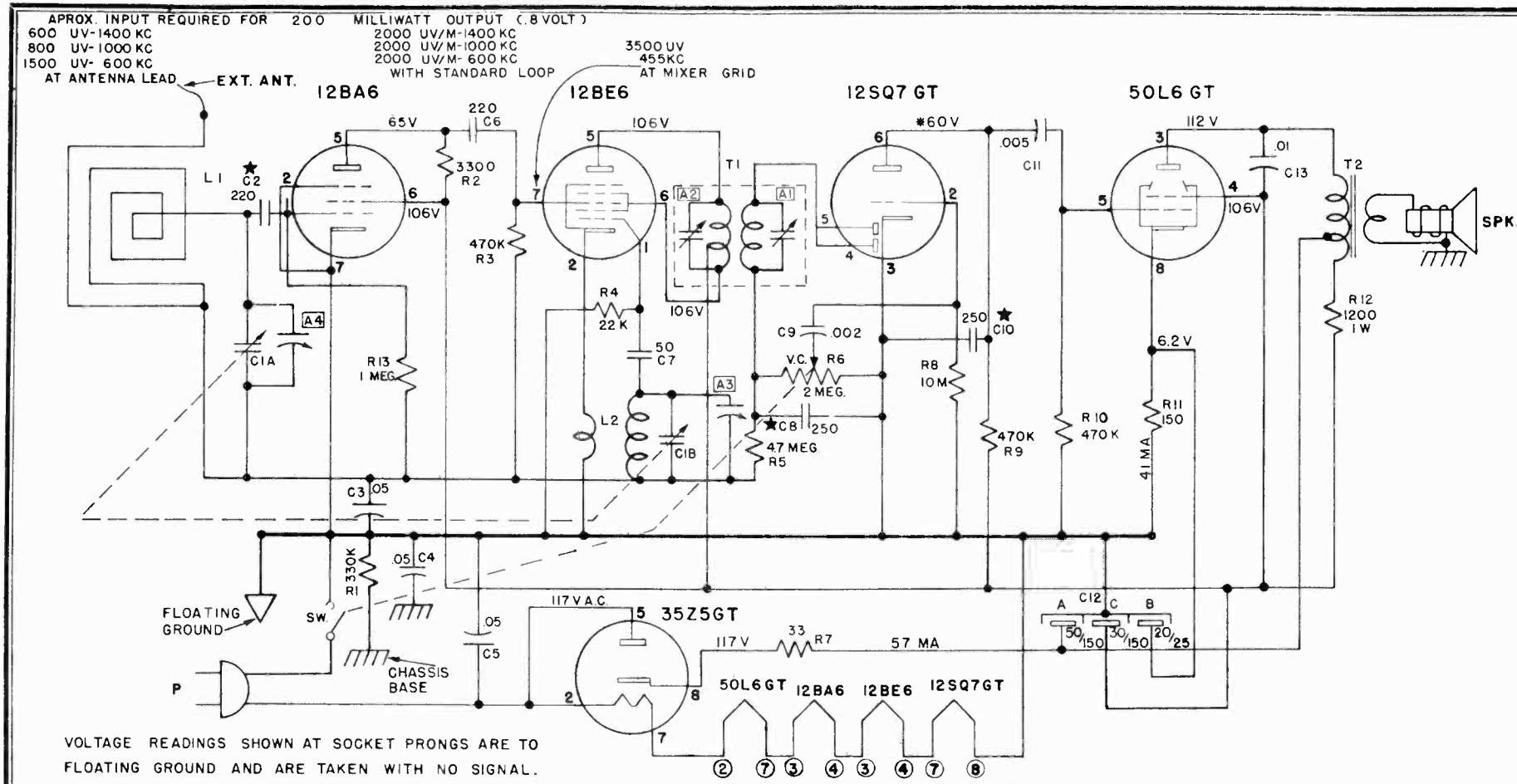
POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GND. LEAD	ADJUST TRIMMERS IN ORDER SHOWN	TRIMMER FUNCTION
Open	455 Kc	.05 Mfd	Mixer Grid	Fltg. Gnd.	A1 - A2	I. F.
Open	1620 Kc		Test Loop	Test Loop	A3	Oscillator
1400 Kc	1400 Kc		Test Loop	Test Loop	A4	Antenna
600 Kc	600 Kc		Test Loop	Test Loop	** Check Point	Antenna

IMPORTANT ALIGNMENT NOTES

* Connect generator lead to a test loop placed a short distance from the set loop, or connect high side to green lead on set loop through a 200 mmf. condenser and ground lead to floating ground of receiver.

** Check sensitivity at 600 Kc. If low, adjust antenna section plates of variable for maximum output at 600 Kc.

The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the A. V. C. action of the receiver ineffective.



VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO FLOATING GROUND AND ARE TAKEN WITH NO SIGNAL.

AC LINE VOLTAGE AT 117 VOLTS.

* MEASURED WITH VACUUM TUBE VOLTMETER.

CAPACITY OF CONDENSERS LESS THAN .001 MF IS SHOWN IN MMF.

★CERTAIN CONDENSERS VALUES IN EARLY PRODUCTION SETS WERE SLIGHTLY DIFFERENT THAN THOSE SHOWN:
C2 WAS 250 MMFD. — NOW IS 220 MMFD.
C10 WAS 220 MMFD. — NOW IS 250 MMFD.
C8 WAS 50 MMFD. — NOW IS 250 MMFD.
THESE CHANGES WERE MADE FOR EASE OF PRODUCTION AND THE USE OF EITHER VALUE WILL HAVE NO EFFECT ON THE PERFORMANCE OF THE RECIVER.

CHANGES

Condenser Value Changes: C2 was changed from 250 mmf. Mica to 220 mmf. Ceramic
C10 was changed from 220 mmf. Ceramic to 250 mmf. Mica
C8 was changed from 50 mmf. Molded to 250 mmf. Mica

Circuit Change: A few of the first sets produced had a .001 Mfd. 600 Volt Condenser on the Loop Antenna connected from the external antenna winding to A. V. C.

Correction: The Schematic Diagram printed on some of the first Instruction Sheets and Chassis Labels showed R10 connected to B+: this should have been shown connected to floating ground.

MODELS 9005, 9006,
Ch. 132.858

SPECIFICATIONS

Power Supply
105-125 Volts AC-DC 35 Watts

Frequency Range
Broadcast 540-1600 Kc

Power Output
Undistorted .8 Watt
Maximum 2.0 Watt

Speaker Voice Coil Impedance 3.2 Ohms

ALIGNMENT PROCEDURE

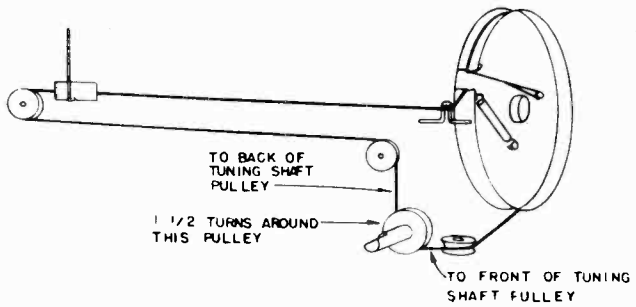
PRELIMINARY:

Output meter connection ..... Across speaker voice coil
Output meter reading to indicate .5 W (Standard Output)..... 1.26 volt
Generator modulation ..... 30% 400 cycles
Position of volume control ..... Fully clockwise
Dial pointer position with variable condenser closed.....Last mark on dial

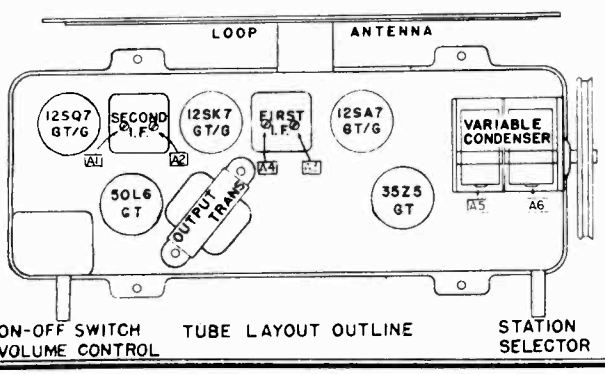
POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GND. LEAD	ADJUST TRIMMERS IN ORDER SHOWN	TRIMMER FUNCTION
Open	455 Kc	.05 Mfd.	Mixer Grid	Fltg. Gnd.	A1,A2,A3,A4	I. F.
1400 Kc	1400 Kc	200 Mmf.	*Ant. Lead	Fltg. Gnd.	A5	Oscillator
1400 Kc	1400 Kc	200 Mmf.	*Ant. Lead	Fltg. Gnd.	A6	Antenna
600 Kc	600 Kc	200 Mmf.	*Ant. Lead	Fltg. Gnd.	**Check Point	Antenna

IMPORTANT ALIGNMENT NOTES

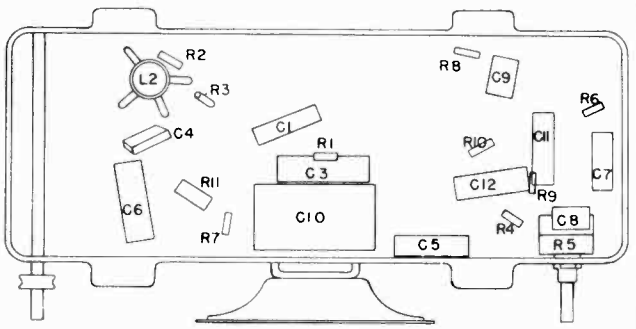
* Connect generator lead to green wire on loop antenna or a test loop may be used on the generator placed a short distance from the set loop.
** Check sensitivity at 600 Kc. If low, adjust antenna section plates of variable for maximum output at 600 Kc.
The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the A. V. C. action of the receiver ineffective.



DIAL STRINGING ARRANGEMENT

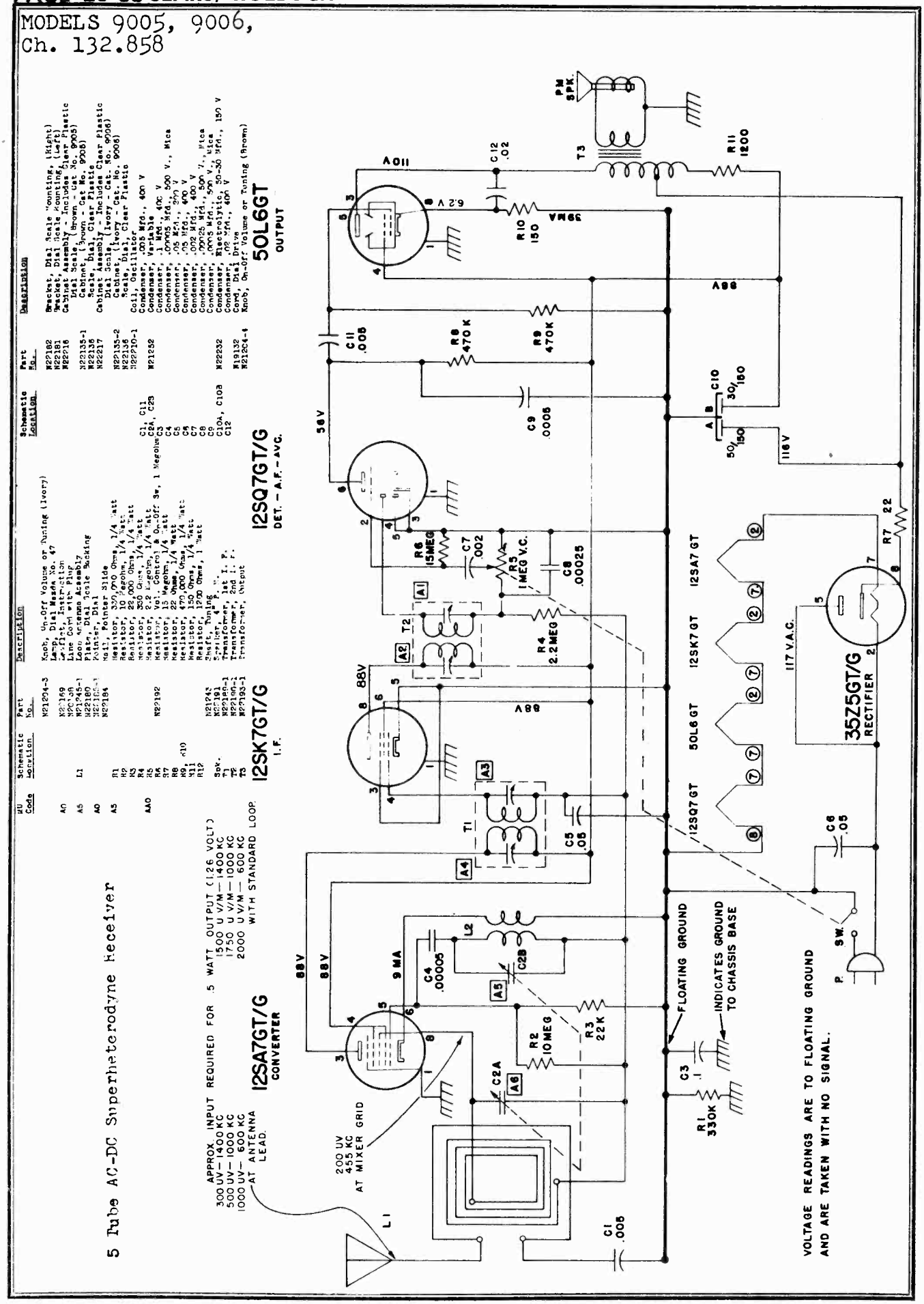


ON-OFF SWITCH VOLUME CONTROL — TUBE LAYOUT OUTLINE — STATION SELECTOR



LOCATION OF PARTS UNDER CHASSIS

MODELS 9005, 9006,
Ch. 132.858



MU Code	Schematic Location	Part No.	Description	Schematic Location	Part No.	Description
		M21294-3	Knob, On-Off Volume or Tuning (Ivory)		M22182	Bracket, Dial Scale Mounting, (Right)
	A0	M22169	Dial Mask, No. 47		M22181	Bracket, Dial Scale Mounting, (Left)
		M22038	Lamp, Instruction		M22216	Cabinet Assembly - Includes Clear Plastic Dial Scale (Brown Cat. No. 9005)
	A5	M21945-1	Line Cord with Plug		M22135-1	Cabinet Assembly - Includes Clear Plastic Dial Scale (Brown Cat. No. 9006)
	L1	M22180	Loop Antenna Assembly		M22136	Escutcheon, Dial, Clear Plastic
	A0	M21884-1	Plate, Dial Scale Backing		M22217	Cabinet Assembly - Includes Clear Plastic Dial Scale (Ivory - Cat. No. 9006)
		M21884-2	Pointer, Dial		M22135-2	Cabinet, (Ivory - Cat. No. 9006)
	A5	M22184	Rail, Pointer Slide		M22136	Scale, Dial, Clear Plastic
			Resistor, 330,000 Ohms, 1/4 Watt		M22P10-1	Coil, Oscillator
	R1		Resistor, 10 Megohm, 1/4 Watt	C1, C11		Condenser, .005 Mfd., 400 V
	R2		Resistor, 22 Ohms, 1/4 Watt	C2A, C23	M21252	Condenser, Variable
	R3		Resistor, 330 Ohms, 1/4 Watt	C3		Condenser, .1 Mfd., 400 V
	R4		Resistor, 2.2 Megohm, 1/4 Watt	C4		Condenser, .00005 Mfd., 500 V., Mica
	R5		Resistor, Vol. Control & On-Off Sw, 1 Megohm	C5		Condenser, .05 Mfd., 200 V
	AA0	M22192	Resistor, 15 Megohm, 1/4 Watt	C6		Condenser, .05 Mfd., 400 V
	R7		Resistor, 22 Ohms, 1/4 Watt	C7		Condenser, .002 Mfd., 400 V
	R8		Resistor, 470,000 Ohms, 1/4 Watt	C8		Condenser, .00025 Mfd., 500 V., Mica
	R9, R10		Resistor, 150 Ohms, 1/4 Watt	C9		Condenser, .0005 Mfd., 500 V., Mica
	R11		Resistor, 1200 Ohms, 1 Watt	C10A, C10B	M22232	Condenser, Electrolytic, 30-30 Mfd., 150 V
	R12		Shaft, Tuning	C12		Condenser, .02 Mfd., 400 V
		M21243	Spring, "		M19132	Cord, Dial
Sch.		M21180	Transformer, 1st I. F.		M21264-4	Knob, On-Off Volume or Tuning (Brown)
T1		M22180-1	Transformer, 2nd I. F.			
T2		M22196-1	Transformer, Output			
T3		M22193-1				

MODEL 9022,
Ch. 132.871

SPECIFICATIONS

Power Supply
105 120 Volts AC 50 Watts
Frequency Range
Broadcast . . . . . 540-1600 Kc
FM . . . . . 88- 108 Mc

Power Output
Undistorted . . . . 1.0 watt
Maximum . . . . . 2.5 watt

Speaker Voice Coil Impedance 3.2 ohms

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection ---------- Across speaker voice coil.
Output meter reading to indicate 500 MW ---------- 1.27 volts.
Generator Modulation ---------- 30%, 400 cycles.
Position of volume control ---------- Fully clockwise.
Set dial pointer ---------- Horizontal, variable condenser closed.
Set band switch ---------- To left for AM alignment, to right for FM alignment.

AM ALIGNMENT

Position of Variable	Generator Frequency	Dummy Ant.	Generator Connection (high)	Generator Connection Ground Lead	Adjust Trimmer In Order Shown For Max. Output	Trimmer Function
Open	455 Kc	.05 mfd.	Mixer Grid	Chassis	A1, A2, A3, A4,	I.F.
Open	1650 Kc		*Test Loop	Test Loop	A5	Oscillator
1400 Kc	1400 Kc		*Test Loop	Test Loop	A6	Antenna
**600 Kc	600 Kc		*Test Loop	Test Loop	Check Point	Antenna

* Connect generator lead to a Standard Hazeltine Test Loop, Model 1150, placed two feet from the set loop, or three turns of wire about six inches in diameter, placed about one foot from the set loop. Or the generator can be connected with the high side lead to the AM antenna screw terminal and the ground lead to the chassis.

** With a generator signal of 600 Kc, tune the set to the point where maximum output is obtained, which should be approximately 600 Kc on the dial. Adjust antenna section places of variable for maximum output.

The alignment procedure should be repeated in the original order for greatest accuracy.

Always keep the output from the signal generator at its lowest possible value to make the A. V. C. action of the receiver ineffective.

FM ALIGNMENT

Detector and I.F. alignment using Signal Generator and Oscilloscope.

1. Connect FM Generator, High side, to grid (pin 1) of 6BA6 2nd I.F. tube through .005 mfd. dummy.
2. Set generator frequency to 10.7 Mc. modulated either 60 cycles or 400 cycles, 250 Kc sweep (125 Kc. deviation).
3. Connect vertical input of scope across volume control of receiver (grounded terminal to chassis, ungrounded terminal to high side of control).
4. Set scope switch for internal synchronization and set horizontal oscillator to 2X frequency of modulating voltage of generator. (120 or 800 cycles)
5. Turn variable condenser fully open, and band switch to right (FM).
6. Adjust frequency vernier of horizontal oscillator on scope until the pattern becomes stationary.
7. Adjust ratio detector primary slug No. A7 for maximum vertical sweep of the scope pattern.
8. Adjust ratio detector secondary slug No. A8 to center the cross over point of the pattern. Pattern should look like Fig. 1, with the same amount of curve on both ends, and the cross over point in the center.
9. Connect generator, high side, to center antenna screw terminal on bottom of chassis.
10. Adjust I.F. slugs A9, A10 and All for the greatest vertical sweep of the pattern, consistent with linearity. If the I.F. slugs are adjusted for maximum sweep of the pattern, the pattern may become non-linear. Therefore, adjustment should be made for the greatest sweep which can be obtained and still have all four ends of the "X" pattern similar in size and shape.
11. Check the alignment of the I.F. and detector circuits by varying the signal generator frequency above and below the center frequency of 10.7 Mc. If the receiver is perfectly aligned, two smaller "X" patterns of similar size and shape will result, one on either side of the center frequency. See Figure 2.

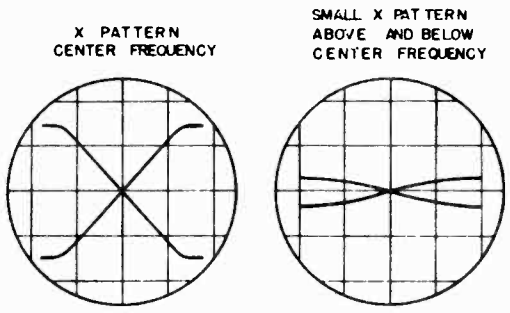


FIG 1 FIG 2

Position of Variable	Generator Frequency	Dummy Ant.	RF Generator Connection High Side Ant. (FM) Terminal	Generator Connection Ground Lead Ground (G) Terminal	Adjust Trimmers In Order Shown	Trimmer Function
Fully Open	108.5 Mc.	*300 ohm	Ant. (FM) Terminal	Ground (G) Terminal	A12	Oscillator
Fully Closed	87.5 Mc.	*300 ohm	Ant. (FM) Terminal	Ground (G) Terminal	† Check Point	Oscillator
105 Mc.	105 Mc.	*300 ohm	Ant. (FM) Terminal	Ground (G) Terminal	**A13	R.F.
91 Mc.	91 Mc.	*300 ohm	Ant. (FM) Terminal	Ground (G) Terminal	† Check Point	R.F.

For R.F. alignment use FM generator signal modulated with 400 cycles 45 Kc. sweep (22.5 Kc.) deviation).

* The 300 ohm dummy should be made up of two 150 ohm resistors, one placed in each lead at the receiver antenna terminals.

**When this trimmer is adjusted the Variable Condenser should be rocked back and forth through the frequency, to prevent erroneous maximum readings, due to oscillator pulling.

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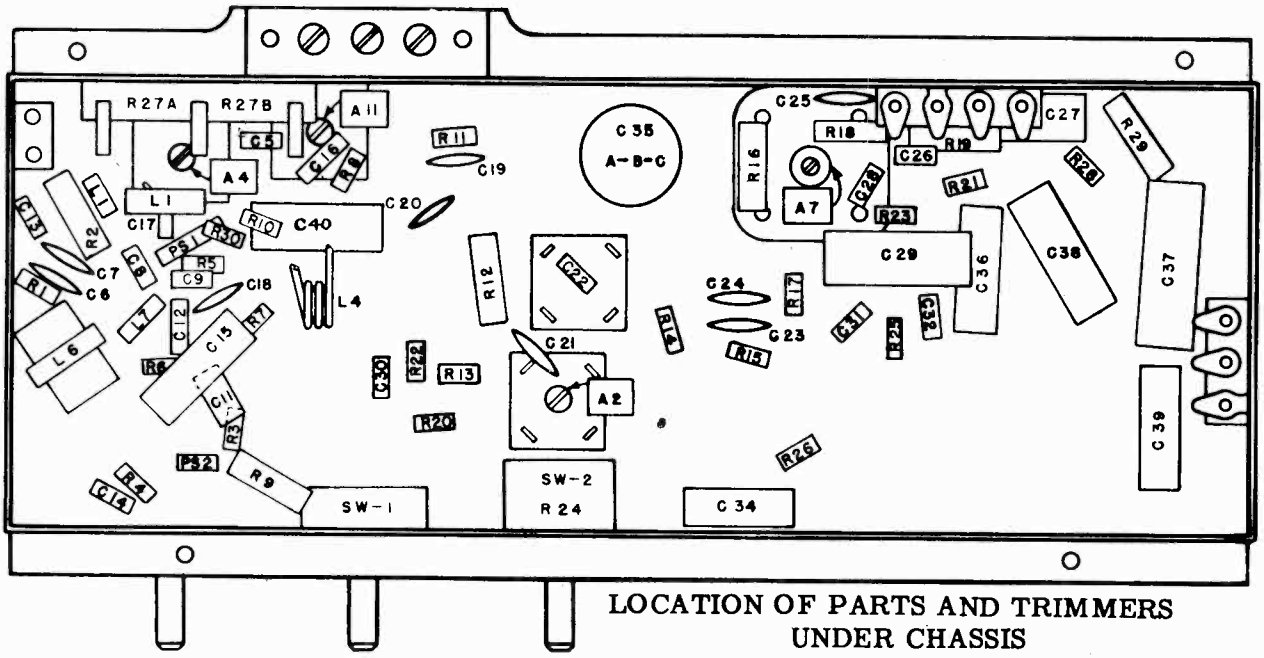
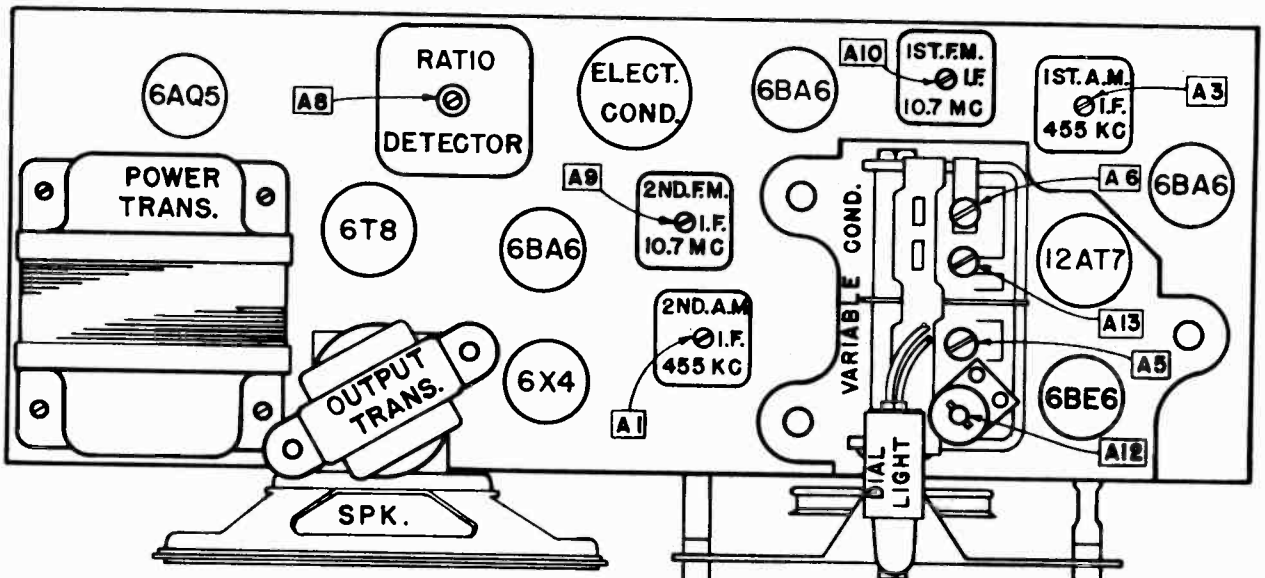
† The Coils L4 and L5 can be spread or squeezed together if necessary to obtain the proper band coverage and track at the low frequency end of the band. This should not be necessary in most cases, and the high frequency end of the band should always be realigned if the Coils are adjusted.



LOCATION OF PARTS AND TRIMMERS UNDER CHASSIS



LOCATION OF TUBES AND TRIMMERS ON TOP OF CHASSIS

VOLUME CONTROL & SWITCH

BAND SWITCH

TUNING

TECHNICAL INFORMATION FOR SERVICE MEN

AM Tuning range – 540 Kc to 1600 Kc. Intermediate Frequency – 455 Kc. I.F. and R.F. measurements made at 500 milliwatts output – approximately 1.27 volts on a rectifier type voltmeter connected across speaker voice coil.

Approximate input for 500 MW output: I.F. 300 uv; R.F. with standard loop: at 600 Kc, 1200 uv/m. at 1000 Kc, 1050 uv/m; at 1400 Kc, 800 uv/m.

FM Tuning range – 88 megacycles to 108 megacycles. Intermediate Frequency 10.7 megacycles. I.F. and R.F. measurements made at 500 milliwatts output – approximately 1.27 volts on a rectifier type voltmeter connected across speaker voice coil. Approximate input for 500 MW output: I.F. 300 uv; R.F. "Absolute Measurements": 91 megacycles, 125 uv; ~~105~~ megacycles, 100 uv.

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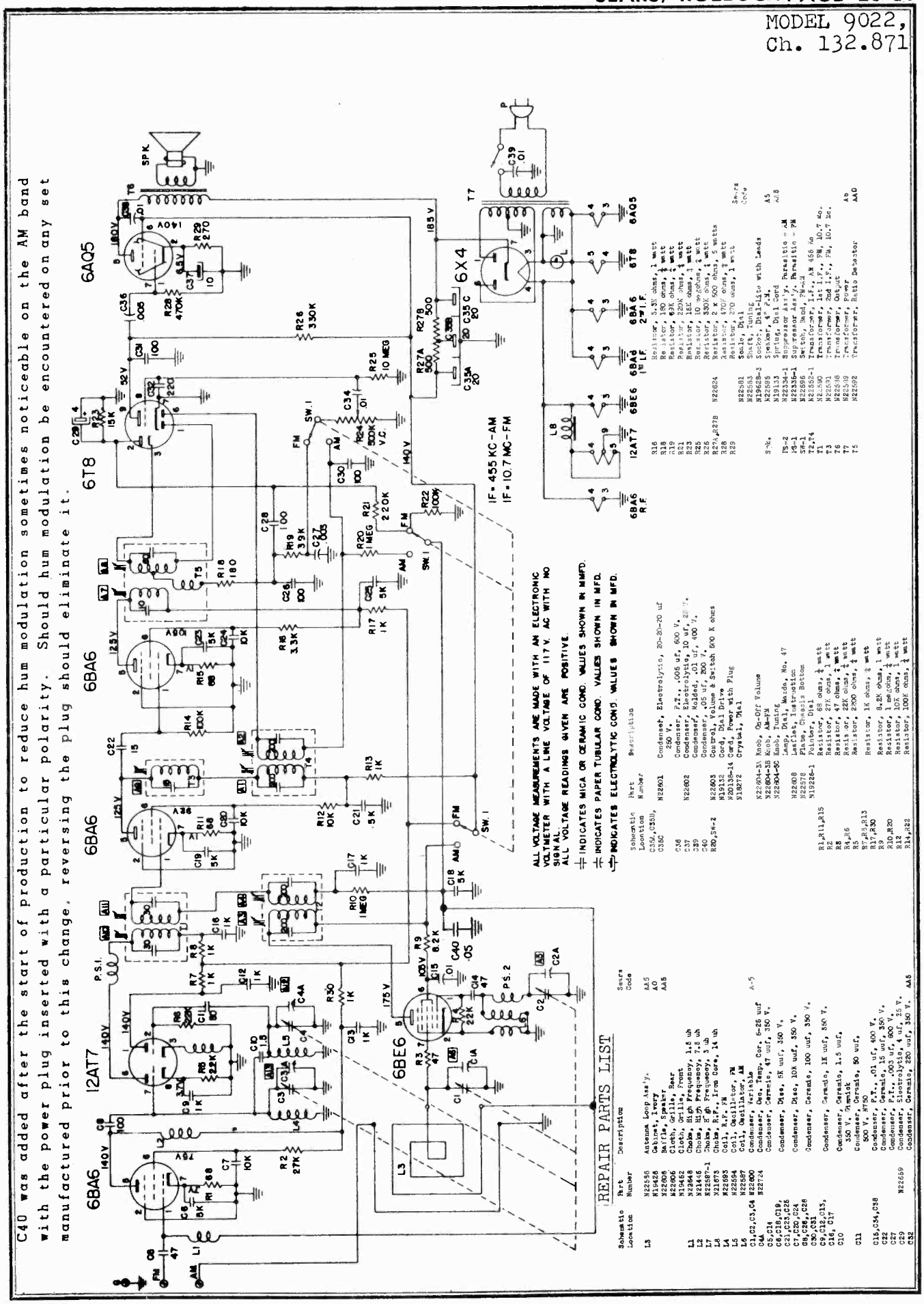
C40 was added after the start of production to reduce hum modulation sometimes noticeable on the AM band with the power plug inserted with a particular polarity. Should hum modulation be encountered on any set manufactured prior to this change, reversing the plug should eliminate it.



REPAIR PARTS LIST

Schematic Location	Part Number	Description	Sears Code
L3	N22536	Antenna Loop Ass'y.	AA5
	N19428	Cabinet, Speaker	AA0
	N22805	Baffle	AA8
	N22806	Cloth, Grille, Rear	
	N19462	Cloth, Grille, Front	
L1	N22648	Choke, High Frequency, 1.5 uh	
L2	N21446	Choke, High Frequency, 7.5 uh	
L7	N22587-1	Choke, R.F., Iron Core, 14 uh	
L4	N22593	Coil, R.F. FM	
L5	N22594	Coil, Oscillator, FM	
L6	N22587	Coil, Oscillator, AM	
C1,C2,C3,C4	N22800	Condenser, Variable, Temp. Cor. 6-25 uuf	A-5
C5	N22724	Condenser, Ceramic, 47 uuf, 350 V.	
C6,C14		Condenser, Ceramic, 47 uuf, 350 V.	
C7,C18,C19, C21,C23,C26		Condenser, Disc, 5K uuf, 350 V.	
C7,C20,C24		Condenser, Disc, 10K uuf, 350 V.	
C8,C25,,C28 C30,C31		Condenser, Ceramic, 100 uuf, 350 V.	
C9,C12,C13, C16, C17		Condenser, Ceramic, 1K uuf, 350 V.	
C10		Condenser, Ceramic, 1.5 uuf, 350 V. Phenolic	
C11		Condenser, Ceramic, 50 uuf, 500 V. NPO	
C15,C34,C38		Condenser, Ceramic, P.T., .01 uf, 400 V.	
C22		Condenser, Ceramic, 15 uuf, 350 V.	
C27		Condenser, P.T., .003 uf, 600 V.	
C29	N22669	Condenser, Electrolytic, 4 uf, 25 V.	
C32		Condenser, Ceramic, 220 uuf, 350 V.	AA5
C35A,C35B, C35C	N22601	Condenser, Electrolytic, 20-20-20 uf 250 V.	
C36		Condenser, P.T., .005 uf, 600 V.	
C37	N22602	Condenser, Electrolytic, 10 uf, 25 V.	
C39		Condenser, Molded, .01 uf, 400 V.	
C40		Condenser, .05 uf, 200 V.	
R20,SW-2	N22603	Control, Volume & Switch 500 K ohms	
	N19133	Cord, Power with Plug	
	N20139-14	Crystal, Dial	
	N19272	Dial, Tuning	
	N22604-33	Knob, On-Off Volume	
	N22604-58	Knob, AM-FM	
	N22604-36	Knob, Tuning	
		Lamp, Dial, Mazda, No. 47	
	N22608	Leaflet, Instruction	
	N22578	Plate, Chassis Bottom	
	N19226-1	Pointer, Dial	
R1,R11,R15		Resistor, 68 ohms, ½ watt	
R2		Resistor, 27K ohms, 1 watt	
R3		Resistor, 47 ohms, ½ watt	
R4,R6		Resistor, 22K ohms, ½ watt	
R5		Resistor, 2200 ohms, ½ watt	
R7,R8,R13 R17,R30		Resistor, 1K ohms, ½ watt	
R9		Resistor, 8.2K ohms, 1 watt	
R10,R20		Resistor, 1 megohm, ½ watt	
R12		Resistor, 10K ohms, 1 watt	
R14,R22		Resistor, 100K ohms, ½ watt	
R16		Resistor, 5.5K ohms, 1 watt	
R18		Resistor, 180 ohms, ½ watt	
R19		Resistor, 39K ohms, ½ watt	
R21		Resistor, 220K ohms, ½ watt	
R23		Resistor, 15K ohms, 1 watt	
R25		Resistor, 10 megohms, ½ watt	
R26		Resistor, 330K ohms, ½ watt	
R27A,R27B	N22624	Resistor, 2 x 500 ohms, 5 watts	
R28		Resistor, 470K ohms, ½ watt	
R29		Resistor, 270 ohms, 1 watt	
	N22581	Shield, Tuning	Sears Code
	N22583	Shield, Tuning	
	N19628-3	Socket, Dial-Light with Leads	
S-3,	N22595	Speaker, 4" P.M.	A5
	N19133	Spring, Dial Cord	AA8
TS-2	N22334-1	Suppressor Assy. Parasitic - AM	
TS-1	N22335-1	Suppressor Assy. Parasitic - FM	
SW-1	N22896	Switch, Band, PM-AM	
T2,T4	N22582-1	Transformer, 1st I.F., AM 455 kc	
T1	N22590	Transformer, 1st I.F., FM, 10.7 Mc.	
T3	N22591	Transformer, 2nd I.F., FM, 10.7 Mc.	
T6	N22588	Transformer, Output	A5
T7	N19629	Transformer, Power	AA0
T5	N22592	Transformer, Ratio Detector	

MODEL 9073,
Ch. 135.244

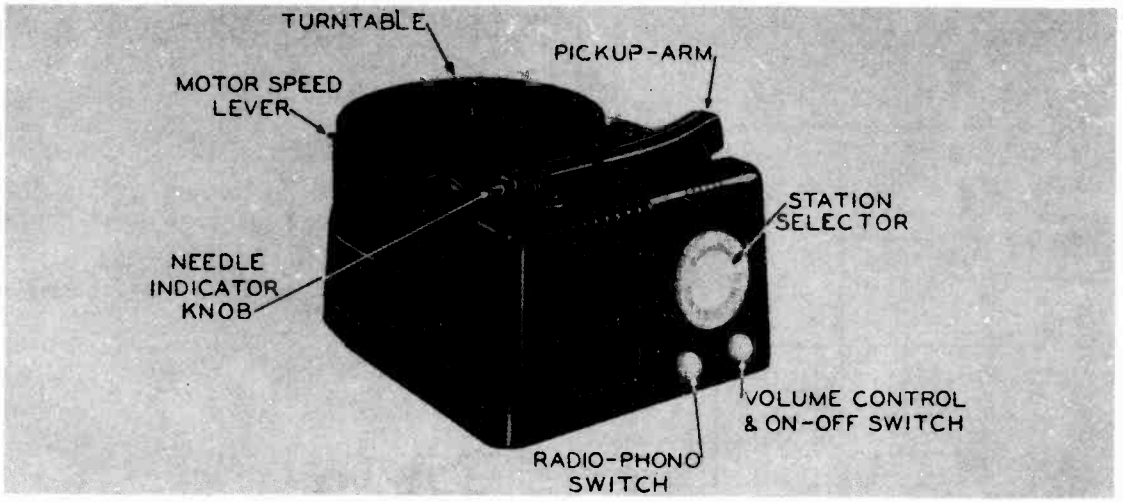
SPECIFICATIONS

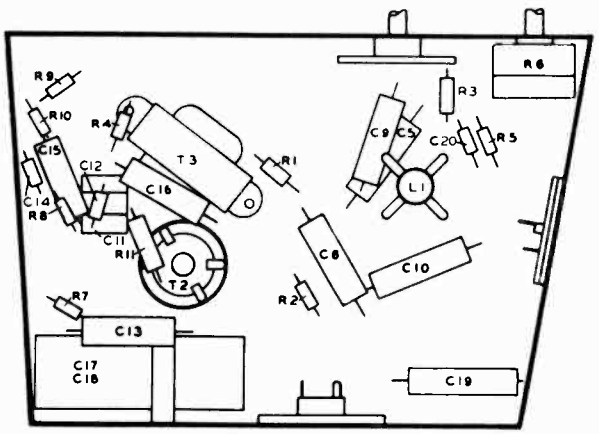
Power Supply:
All models available . . . . . 117 Volts AC 60 Cycles

Frequency Range:
Broadcast . . . . . 535-1620 KC

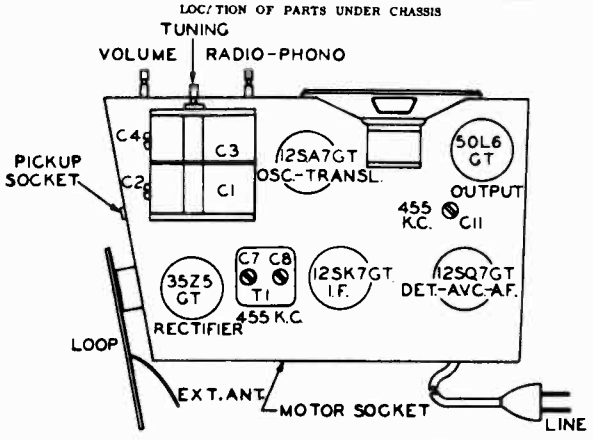
Recommended Antenna Equipment
Catalog No. 6703 Conventional Antenna
Catalog No. 6704 Noise Reducing Antenn
Catalog No. 6705 Greatest Reception and Noise Reduction Antenna

Power Output:
Undistorted . . . . . 1.0 Watt
Maximum . . . . . 1.8 Watts





LOCATION OF PARTS UNDER CHASSIS



LOCATION OF PARTS ON TOP OF CHASSIS

MODEL 9073,
Ch. 135.244

REPAIR PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION	MU CODE
	F-7569	Arm Pickup (Less Crystal)	AAO
	F-7570	Cartridge Crystal (Incl. Needles)	B5
	F-7581	Needle, Phono (for 33 and 45 RPM Records)	
	F-7582	Needle, Phono (for 78 RPM Records)	
	F-294	Cabinet Radio Molded	AO
	F-7563	Capacitor—Variable Assembly	AAO
C11	F-4048	Capacitor—Trimmer—Single	
C17, C18	F-5051	Capacitor—Electrolytic—40 MFD. 150V. 40 MFD. 150V.	
C12, C14, C20	F-6488	Capacitor—Ceramic 250 MMFD. 500V.	
C13	F-4894	Capacitor—.005 MFD. 600V.	
C15, C16	F-1344	Capacitor—.01 MFD. 400V.	
C5, C6, C9	F-1345	Capacitor—.05 MFD. 200V.	
C19	F-1346	Capacitor—.05 MFD. 400V.	
C10	F-4957	Capacitor—.09 MFD. 200V.	
L1	F-7139	Coil—Oscillator	
R6	F-7555	Control—On-Off & Volume	
	F-1090	Cord—Line	
	F-1577	Knob—Volume Control & Radio Phono Switch	
	F-7511	Knob—Station Selector	
	F-7557	Leaflet—Instruction	
	F-6100	Loop—Antenna	
	F-7568	Motor—Phono—60 Cycle (Less Turntable)	AO
	F-7527	Idler Wheel	
	F-7528	Turntable—8″	
R9	F-4067	Resistor—180 Ohm—½ W.—10%	
R1	F-4025	Resistor—22,000 Ohm—½ W—20%	
R4	F-4069	Resistor—47,000 Ohm—½ W—20%	
R2, R8	F-4026	Resistor—220,000 Ohm—½ W—20%	
R5, R10	F-4027	Resistor—470,000 Ohm—½ W—20%	
R3	F-1262	Resistor—1 Megohm—½ W—20%	
R7	F-4028	Resistor—6.8 Megohm—½ W—10%	
R11	F-5358	Resistor—1,000 Ohm—1W—10%	
	F-4978	Shield—I. F. Transformer	
	F-7515	Socket—Tube—8 Prong—Octal	
	F-6102	Speaker—4″ P. M.	A5
	F-7554	Switch—Radio-Phono	
T1	F-4813	Transformer—I.F. #1	
T2	F-4846	Transformer—I.F. #2	
T3	F-4875	Transformer—Output	

ALIGNMENT PROCEDURE

PRELIMINARY:

Output Meter Connection . . . . . Across loud speaker voice coil
Generator ground lead connection . . . . . Floating Ground
Dummy Antenna Value to be in series with generator output . . . . . See chart below
Connection of Generator Output lead . . . . . See chart below
Generator Modulation . . . . . 30%, 400 Cycles
Position of Volume Control . . . . . Fully on

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENTS (IN ORDER) SHOWN	TRIMMER FUNCTION
Closed	455 KC	.1 mfd.	12SA7GT Transl.Grid	C11,C8 & C7	I.F.
Open	1620 KC	.0002 mfd.	Loop	C4	Oscillator
1400 KC	1400 KC	.0002 mfd.	Loop	C2	Transl.

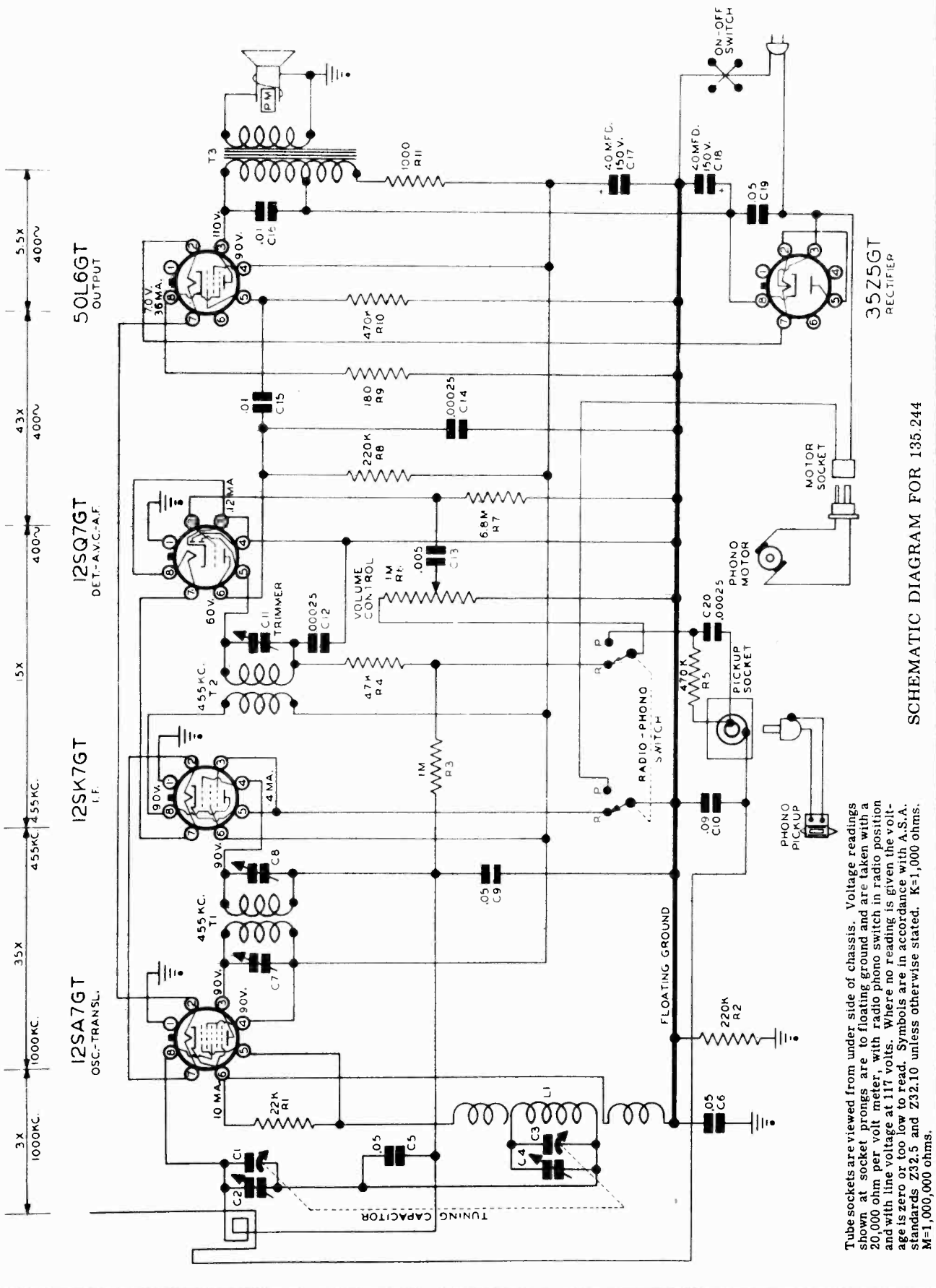
IMPORTANT ALIGNMENT NOTES

The alignment must be done in the order given.

The entire Alignment Procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

MODEL 9073,
Ch. 135.244



SCHEMATIC DIAGRAM FOR 135.244

Tube sockets are viewed from under side of chassis. Voltage readings shown at socket prongs are to floating ground and are taken with a 20,000 ohm per volt meter, with radio phono switch in radio position and with line voltage at 117 volts. Where no reading is given the voltage is zero or too low to read. Symbols are in accordance with A.S.A. standards Z32.5 and Z32.10 unless otherwise stated. K=1,000 ohms. M=1,000,000 ohms.

MODEL 9270,
Ch. 547.245

SPECIFICATIONS

Power Supply: . . . . . 117 Volts, DC or 50-60 Cycles AC, 15 Watts or Catalog No. 6404 Battery Pack.

Power Output:
Undistorted . . . . . 0.15 Watt (min.)
Maximum . . . . . 0.30 Watt (min.)

Frequency Range:
Broadcast . . . . . .540-1600 KC

REPAIR PARTS LIST

Schematic Location	Part Number	Description	MU Code
		CHASSIS PARTS	
	V4169-1	Base, miniature tube shield	
	V3449	Bearing, tuning shaft . . .	
	V6554-1	Cable Assembly, battery .	
C1,C2, C3,C4	V6552	Capacitor, electrolytic.	AAO
C5,C6, C7,C8,C9	V6556	Capacitor, variable (3 gang).	A5
C10,C11, C12,C13, C14,C15	V6066-2503M	Capacitor, .05 mfd 200 v .	
C16,C17	V6066-4202M	Capacitor, .002 mfd 400 v .	
C18	V6066-3502M	Capacitor, .005 mfd 499 v .	
C19,C20	V6066-2154M	Capacitor, .15 mfd 200 v .	
C21	V6066-4503M	Capacitor, .05 mfd 400 v .	
C22,C23	RCM20A221M	Capacitor, 220 mmfd. mica	
C24	RCM20A101M	Capacitor, 100 mmfd. mica	
L1	V5661	Coil, oscillator.	
R1,SW1	V5666-3	Control, volume	
	V4349-6	Cord, power A-C.	
	V4304-25	Cord Assembly, dial . . .	
C25,C26, R2	V6232-2	Filter, diode	
	V6563	Insulator, A-C cord . . .	
	V3359	Insulator, electrolytic capacitor.	
L2,C27	V6952	Loop, antenna.	
	V6568	Pointer	
	V5398-2	Pulley, dial cord	
	V6558-1	Rectifier, selenium. . . .	
R3	RC20AE220M	Resistor, 22 ohms 1/2 w. (carbon).	
R4	RC20AE474M	Resistor, 470,000 ohms 1/2 w. (carbon). . . .	
R5	RC20AE273M	Resistor, 26,000 ohms 1/2 w. (carbon). . . .	

Schematic Location	Part Number	Description	MU Code
		CHASSIS PARTS--Continued	
R6	RC20AE104M	Resistor, 100,000 ohms 1 1/2 w. (carbon). . . .	
R7	RC20AE103M	Resistor, 10,000 ohms 1/2 w. (carbon).	
R8,R9	RC20AE225M	Resistor, 2.2 meg. 1/2 w. (carbon).	
R10	RC20AE105M	Resistor, 1 meg. 1/2 w. (carbon). . . .	
R11	RC20AE106M	Resistor, 10 meg. 1/2 w. (carbon). . . .	
R12,R18	RC20AE685M	Resistor, 6.8 meg. 1/2 w. (carbon). . . .	
R13	RC20AE155M	Resistor, 1.5 meg. 1/2 w. (carbon). . . .	
R14	RC20AE224M	Resistor, 220,000 ohms 1/2 w. (carbon). . . .	
R15,R16	RC20AE102K	Resistor, 1000 ohms 1/2 w. (carbon). . . .	
R17	RC20AE222K	Resistor, 2200 ohms 1/2 w. (carbon). . . .	
R19	RC20AE222K	Resistor, 2200 ohms 1 w. (carbon).	
R20	V6559	Resistor, ballast, 2470 ohms plus or minus 5% 10 w.	
R21	RC20AE101M	Resistor, 100 ohms 1/2 w. (carbon). . . .	
	V9015-1	Shaft, tuning	
	V4169-2	Shield, miniature tube . .	
	V4292S-1	Socket, min. molded (3V4)	
	V6295-3	Socket, min. wafer (1U4, 1R5)	
	V6295-4	Socket, min. wafer (1U5) .	
	V4057	Spring, dial cord	
	V6555	Speaker, 5" PM	AO
SW2	V6565	Switch, line-battery . . .	
L3	V6561	Transformer, RF. . . .	
T3	V6567	Transformer, audio output	
T1	V6972-3	Transformer, 1st IF . . .	
T2	V6972-4	Transformer, 2nd IF. . .	
	V3436	"C" Washer, tuning shaft .	
		CABINET PARTS	
	V6944-1	Baffle and Grille Cloth Assembly.	
	V6945	Bracket (on chassis for mtg.)	
	V6946	Bracket (on cabinet for mtg. chassis).	
	V4836-2	Button, plug (trimmer hole)	
	V1186-1	Cabinet	B5
	V6947-1	Catch, friction	
	V8162	Cover, back (less loop and hardware	A5
	V6951	Dial.	
	V5569	Escutcheon	
	V5829-1	Eyelet	
	V6432-2	Feet, cabinet	
	V4828	Handle	
	V5630-2	Hinge	
	V6146-8	Knob	
	V5920	Nut, #8-32 wing.	
	V5052S-62	Screw, #6 hex. hd. self tapping.	
	V6661-2	Screw, #8 self retaining (chassis mtg. brkts.). .	
	V6661-3	Screw, #8 self retaining (mtg. batt. shield) . . .	
	V6954	Shield Assembly, battery.	
	V6569-1	Strike (for V6967-1 catch)	
	V6949	Stud, (mtg. handle)	
	V3668S	Washer, felt (knobs) . .	

ALIGNMENT PROCEDURE

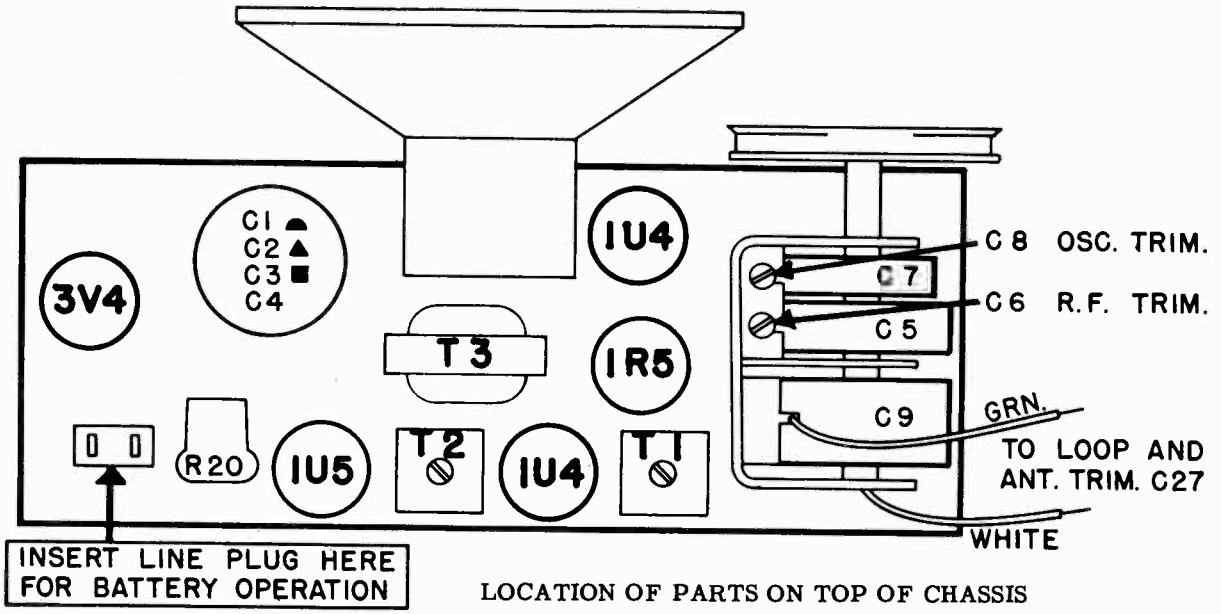
Output meter reading to indicate 0.05 watt across voice coil .. . . . . 0.4 v.
Generator ground lead connected . . . . . To B- through 0.1 mfd capacitor
Generator modulation . . . . . 30%, 400 cycles
Position of volume control . . . . . Fully on
Position of pointer with tuner fully closed . . . Center of pointer lined up with left edge of dial opening

MODEL 9270,
Ch. 547.245

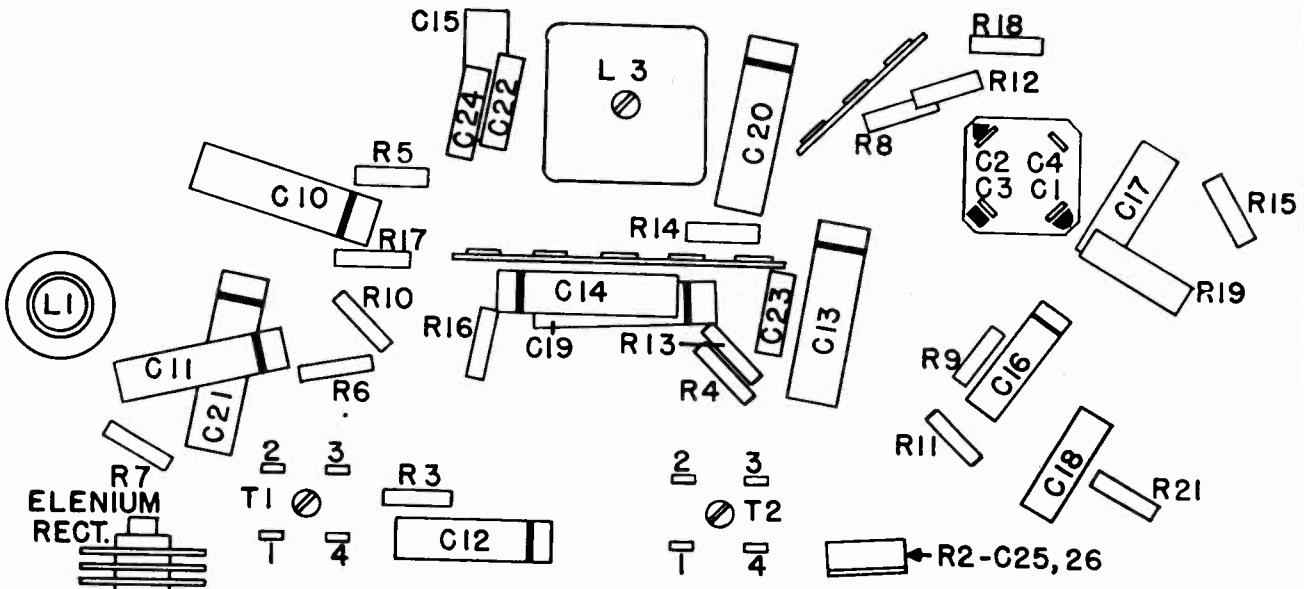
Position of tuner	Generator Freq.	Dummy Antenna	Generator Connection	Adjustments (in order shown)	Function	Max. Microvolts Input to Produce .05 W. Output
Min. Cap.	455 kc.	0.1 mfd.	Pin #6 of 1U4 I-F Amp.	T2 (top and bottom)	I.F.	5000
Min. Cap.	455 kc.	0.1 mfd.	Pin #6 of 1R5 Conv.	T1 (top and bottom)	I.F.	250
Min. Cap.	1615 kc.	0.1 mfd.	Stator of Ant. Tuner (C9)	C8	Osc.	
1400 kc.	1400 kc.	0.1 mfd.	"	C6	R.F.	30
600 kc.	600 kc.	0.1 mfd.	"	L3	R.F.	40
1400 kc.	1400 kc.		Hazeltine Test Loop	C27	Loop	100

ALIGNMENT NOTES:

1. It is recommended that this set be connected to an isolation transformer when aligning on AC.
2. The alignment must be done in the order given above.
3. While making the above adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

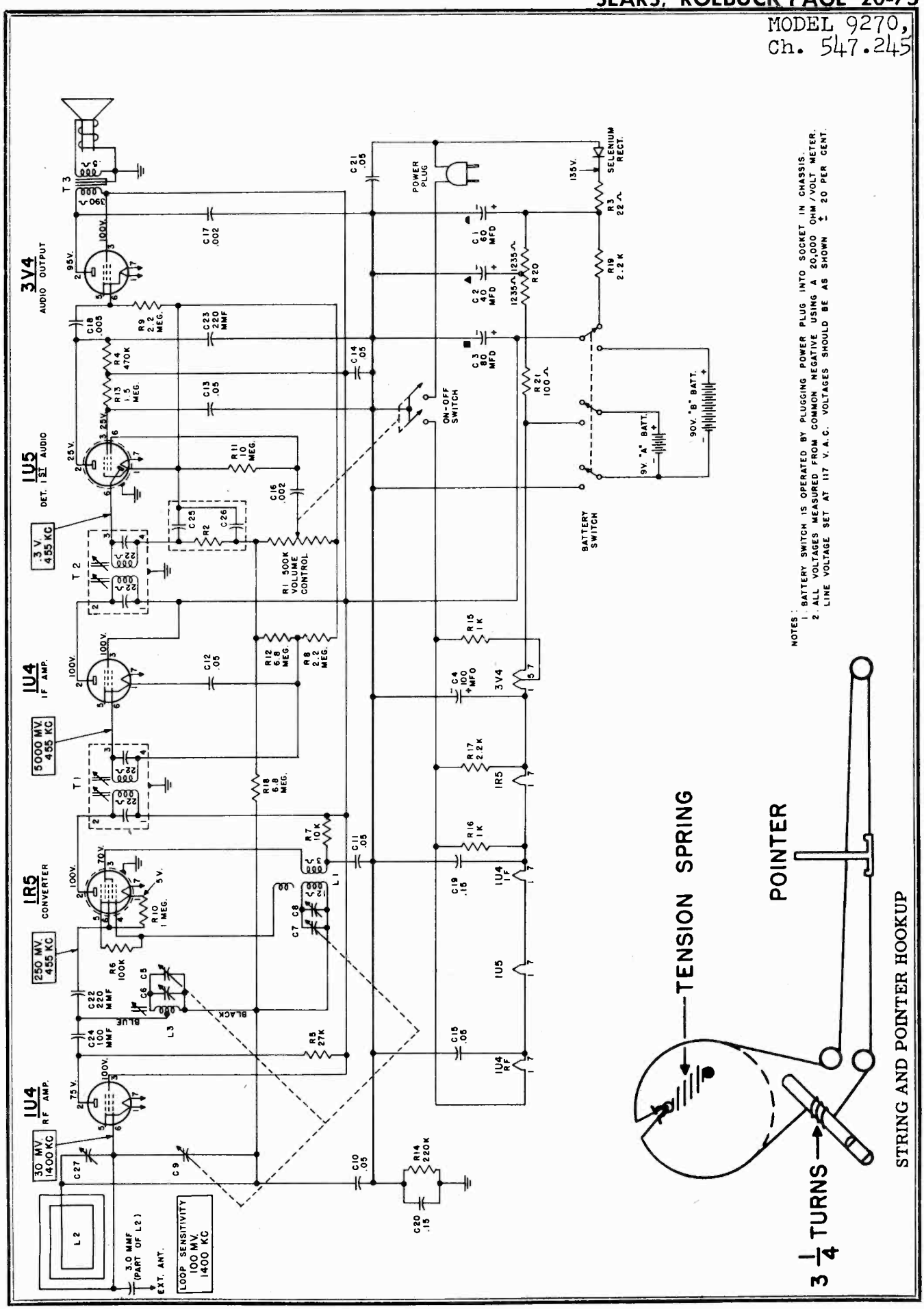


LOCATION OF PARTS ON TOP OF CHASSIS



LOCATION OF PARTS UNDER CHASSIS

MODEL 9270,
Ch. 547.245



NOTES:
1. BATTERY SWITCH IS OPERATED BY PLUGGING POWER PLUG INTO SOCKET IN CHASSIS.
2. ALL VOLTAGES MEASURED FROM COMMON NEGATIVE USING A 20,000 OHM/VOLT METER. LINE VOLTAGE SET AT 117 V. A.C. VOLTAGES SHOULD BE AS SHOWN ± 20 PER CENT.

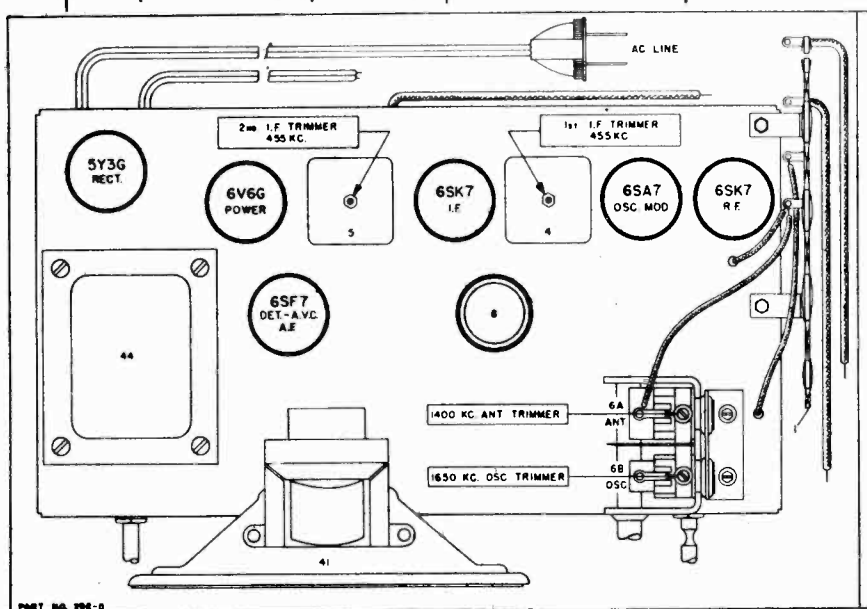
STRING AND POINTER HOOKUP

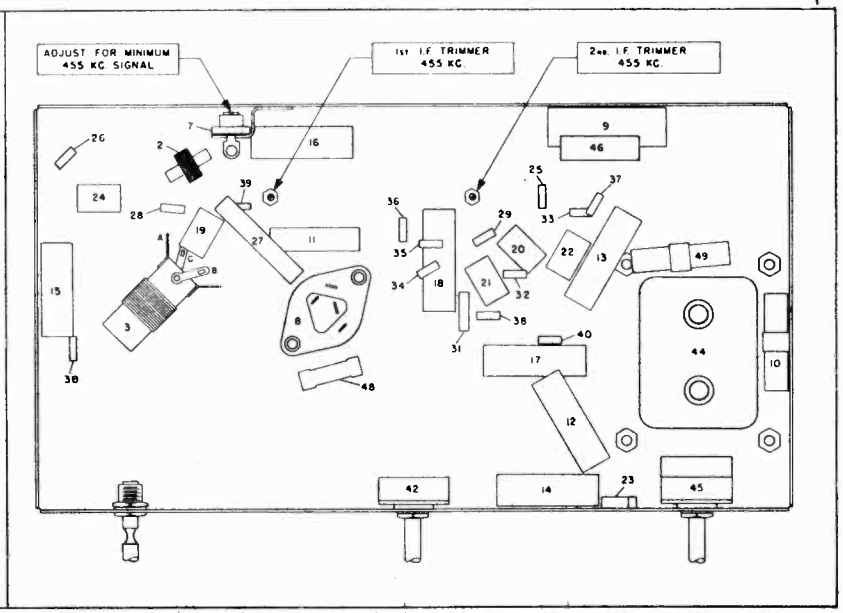
ALIGNMENT PROCEDURE

For Alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third.
IMPORTANT: BEFORE ALIGNING, HAVE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET. BE SURE THAT IT DOES NOT MOVE WHILE ALIGNING.

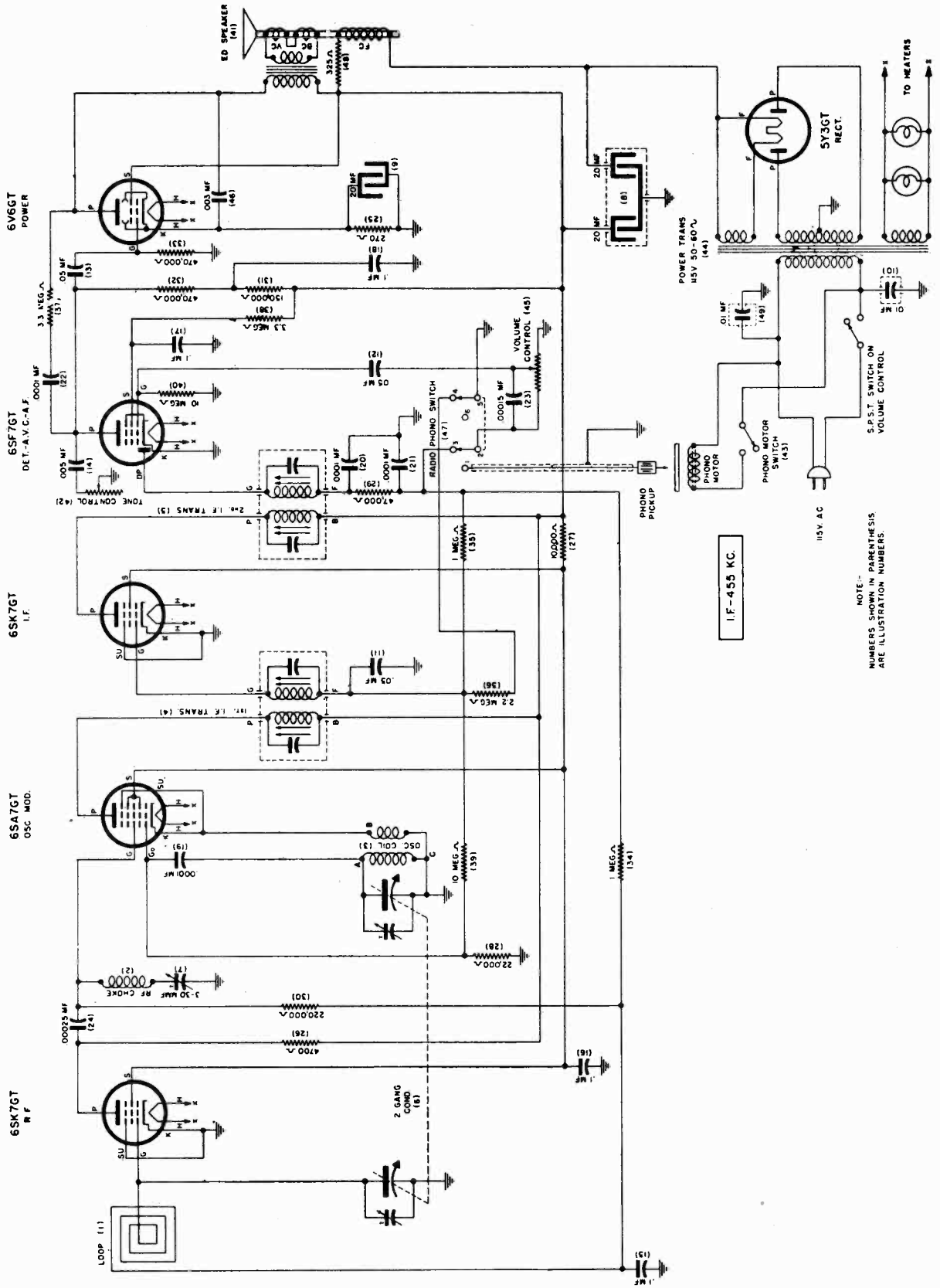
When adjusting 1650 kilocycle oscillator trimmer, 455 K.C. R.F. trimmer and 1400 kilocycle antenna trimmer, connect test oscillator to loop external antenna and ground connections with a .0002 Mfd. capacitor in series with antenna lead.

Steps	Set receiver dial to:	TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Use dummy antenna in series with output of test oscillator consisting of:	TEST OSCILLATOR: Attach output of test oscillator to	Refer to parts layout diagram for location of trimmers mentioned below:
	Any point where no interfering signal is received	Exactly 455 K. C.	0.2 Mfd. Condenser	High side to grid of 6SA7 Tube. Low side to chassis.	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.
1	Rotate gang condenser to maximum capacity	Exactly 455 K. C.	.0002 Mfd. Condenser	To loop external antenna and ground connections	Adjust R.F. coil trimmer for minimum 455 K. C. signal.
2	Rotate gang condenser to minimum capacity	Exactly 1650 K. C.	.0002 Mfd. Condenser	To loop external antenna and ground connections	Adjust 1650 K. C. oscillator trimmer for maximum output.
3	Approximately 1400 K. C.	Approx. 1400 K. C.	.0002 Mfd. Condenser	To loop external antenna and ground connections	Adjust 1400 K. C. antenna trimmer for maximum output.





MODEL 292-K



PARTS LIST

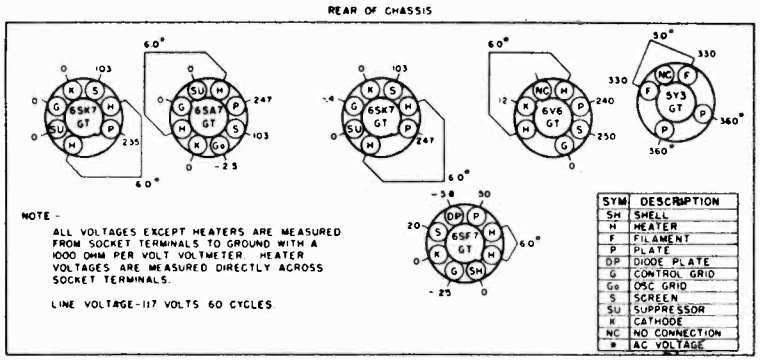
Illus. No.	Part No.	Part Name	Description
1	20E51	Antenna	Loop
2	2E19	Coil	R. F. Choke
3	20E38	Coil	Oscillator
4	20E41	Coil	1st I. F. Transformer
5	20E42	Coil	2nd I F. Transformer
6	24E6	Condenser	2 Gang Tuning
7	24E30	Condenser	Trimmer 3-30 MMF
8	25E2	Condenser	Dry Electrolytic 20-20 Mfd. 450 V.
9	25E3	Condenser	Dry Electrolytic 20 Mfd. 25 V.
10	23E250	Condenser	.01 Mfd. 220 V. In Metal Can
11	23E216	Condenser	Tubular .05 Mfd. 200 V.
12	23E416	Condenser	Tubular .05 Mfd. 400 V.
13	23E416	Condenser	Tubular .05 Mfd. 400 V.
14	23E408	Condenser	Tubular .005 Mfd. 400 V.
15	23E218	Condenser	Tubular .1 Mfd. 200 V.
16	23E418	Condenser	Tubular .1 Mfd. 400 V.
17	23E418	Condenser	Tubular .1 Mfd. 400 V.
18	23E418	Condenser	Tubular .1 Mfd. 400 V.
19	23E39	Condenser	Mica .0001 Mfd.
20	23E39	Condenser	Mica .0001 Mfd.
21	23E39	Condenser	Mica .0001 Mfd.
22	23E39	Condenser	Mica .0001 Mfd.
23	23E40	Condenser	Mica .00015 Mfd.
24	23E42	Condenser	Mica .00025 Mfd.

Illus. No.	Part No.	Part Name	Description
25	27E271-2	Resistor	Carbon 270 Ohm, 1/2 W.
26	27E472	Resistor	Carbon 4700 Ohm. 1/3 W.
27	27E103-3	Resistor	Carbon, 10,000 Ohm. 1 W.
28	27E223	Resistor	Carbon, 22,000 Ohm, 1/3 W.
29	27E473	Resistor	Carbon, 47,000 Ohm, 1/3 W.
30	27E224	Resistor	Carbon, 220,000 Ohm, 1/3 W.
31	27E154	Resistor	Carbon, 150,000 Ohm. 1/3 W.
32	27E474	Resistor	Carbon, 470,000 Ohm, 1/3 W.
33	27E474	Resistor	Carbon, 470,000 Ohm, 1/3 W.
34	27E105	Resistor	Carbon, 1 Megohm, 1/3 W.
35	27E105	Resistor	Carbon, 1 Megohm, 1/3 W.
36	27E225	Resistor	Carbon, 2.2 Megohm, 1/3 W.
37	27E335	Resistor	Carbon, 3.3 Megohm, 1/3 W.
38	27E335	Resistor	Carbon, 3.3 Megohm, 1/3 W.
39	27E106	Resistor	Carbon, 10 Megohm, 1/3 W.
40	27E106	Resistor	Carbon, 10 Megohm, 1/3 W.
41	1E10	Speaker	6" Electro Dynamic
42	28E18	Tone Control	500,000 Ohm
44	22E5	Transformer	Power 115 Volt, 50-60 Cycles
45	28E4	Volume Control	500,000 Ohm with S.P.S.T. Switch
46	23E606	Condenser	Tubular, .003 Mfd. 600 Volt
47	20E203	Switch Assembly	D.P.D.T. (Radio-Phono)
48	27E1004	Resistor	Wire Wound 325 Ohm 5 Watt

MISCELLANEOUS PARTS

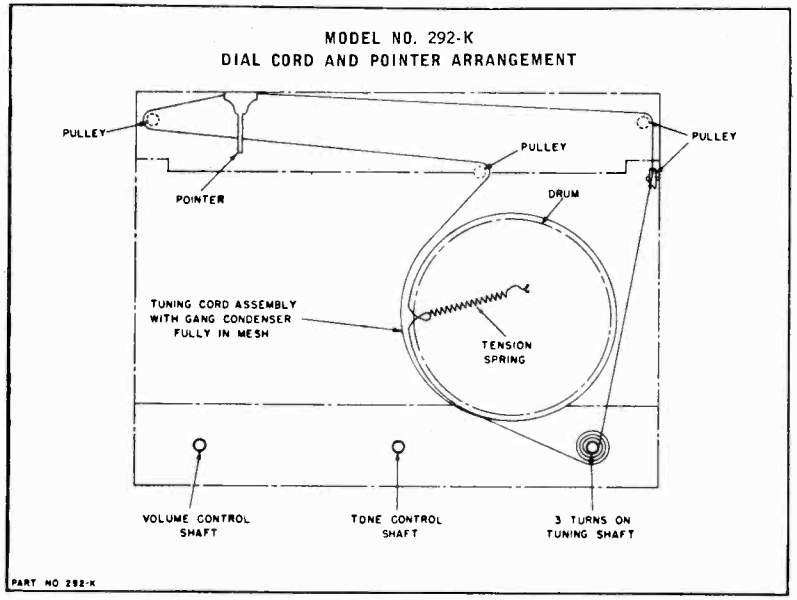
Part No.	Part Name	Description
7E39	Cabinet	Complete Cabinet and Lid
7E103	Cabinet Back	Back for Cabinet
7E104	Cabinet Bottom	Bottom for Cabinet
36E12	Dial Scale	Calibrated Glass Scale
4E1	Dial Cord	18 Lb. Drive Cord
35E8-2	Dial Pointer	Dial Indicator

Part No.	Part Name	Description
65E2	Dial Spring	Tension Spring for Dial Cord
68E3	Dial Shaft	Drive Shaft Assembly
37E25-5	Knob	Walnut
40E2	Pilot Lamp	6-8 Volt, .250 Amp. Type No. 47
17E5	Plug	2 Prong for Motor
17E7	Plug	4 Prong for Phono



VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

NO 292-D



PART NO 292-K

VOLTAGE RATING

THIS RADIO IS DESIGNED FOR USE ON 110-120 VOLT, 50-60 CYCLE, ALTERNATING CURRENT (AC) OR 110-120 VOLT DIRECT CURRENT (DC).

SPECIAL INSTRUCTIONS FOR "DIRECT CURRENT" OPERATION:

If the current supply is DIRECT CURRENT, and the radio does not play after it has been turned on for approximately one minute, simply reverse radio power cord plug in electric power receptacle.

THE AM AND FM AERIALS FURNISHED WITH THIS RECEIVER ARE MOUNTED AS AN INTEGRAL PART OF THE RADIO. THEY REQUIRE NO INSTALLATION AND IN AVERAGE LOCATIONS THEY WILL PROVIDE SATISFACTORY RECEPTION.

Only when the radio is located a considerable distance from desired stations or is operated under unusual conditions, such as in steel constructed buildings, etc., will it be necessary to use another aerial.

See the following "AM STANDARD BROADCAST AERIAL" and "FM AERIAL" paragraphs for special aerial instructions.

AM STANDARD BROADCAST AERIAL

The AM Standard Broadcast Aerial, mounted inside of the rear of the cabinet is a loop-type antenna. Because loop aerials are directional, the volume of a weak station, operating in the 535-1730 KC Band, may be improved, or undesired electrical noise may be reduced by placing the radio in a different position. A trial will reveal position for best reception with least interference.

When the volume of the AM Broadcast stations is not satisfactory, improved results can be obtained by attaching a 50 ft. to 75 ft. Outdoor Aerial to the BLUE wire coming out of the rear of the cabinet and a ground to the BLACK wire.

WARNING — DO NOT CONNECT A GROUND TO ANY METAL PART OF THE CHASSIS BECAUSE THIS WILL CAUSE A SHORT AND POSSIBLE DAMAGE.

FM AERIAL

Due to the high frequencies used by FM stations, signals from these stations reach only to the "line of sight." This means that reliable FM reception can usually be expected only when the radio is within 20 to 30 miles from the station transmitter. The actual area serviced by FM stations depends on the height of the station aerial and receiver aerial.

If the radio happens to be located on the edge or just outside of the FM station service area, satisfactory FM reception may not be obtained with the self contained FM aerial furnished with the radio, in which case it will be necessary to install a suitable outdoor FM aerial. This should be the type having a 300 Ohm transmission line, and it must be erected as high as possible.

If an outdoor aerial is required, consult your Sentinel dealer—he can furnish a satisfactory outdoor FM aerial.

TO CONNECT AN OUTDOOR "FM" AERIAL TO THE RADIO:

(1) Disconnect the wire attached to posts marked #1 and #2 mounted on back of loop aerial.

(2) Attach outdoor FM aerial transmission leads to the posts marked #1 and #3.

IMPORTANT — WHEN THE RADIO IS LOCATED TOO CLOSE TO AN FM STATION, the volume may be ample but the signal may be distorted. An outdoor FM aerial would only aggravate this condition. Usually, disconnecting the jumper wire connecting posts #1 and #2 on back of loop will eliminate the distortion.

FUNCTION OF CONTROLS ON RADIO

THE LEFT HAND KNOB is the Volume Control and Off-On Switch.

THE CENTER KNOB is the AM-FM Band Selector Switch.

THE RIGHT HAND KNOB is the Station Selector Knob.

AM STANDARD BROADCAST OPERATING INSTRUCTIONS

Turn "AM-FM" Band Selector Switch Knob to RIGHT hand position.
Use section of dial that is calibrated from 535 to 1730 K. C.

FM FREQUENCY MODULATION OPERATING INSTRUCTIONS

Turn "FM-AM" Band Selector Switch Knob to LEFT hand position.
Place Volume Control Knob in maximum volume position.
Use section of dial that is calibrated from 88 to 108 M.C.

WHEN TUNING FOR FM STATIONS, care must be taken to tune properly, otherwise the brilliant tone and noise-free reception possible from FM stations will not be fully realized. Always carefully tune to the point where the volume is greatest with clearest tone and least background noise.

It will be noticed that FM stations will be heard at two positions that are close together on the dial scale, with a distortion point between the two. As these two clear-tone signals will be substantially equal in tone and volume, either one may be used.

ALIGNMENT PROCEDURE

BE SURE TO MAKE THE ADJUSTMENTS IN THE ORDER GIVEN BELOW.

(A) Connect Output Meter across voice coil of speaker.

(B) Remove jumper wire from terminals #1 and #2 on loop terminal strip.

(C) Connect the hot Signal Generator lead through a 300 Ohm Resistor to the #1 post on terminal strip and the other lead to the post marked #3.

27.75 MC PLATE COIL ADJUSTMENT

(A) Set Signal Generator to deliver a modulated 27.75 MC Signal.

(B) Adjust 27.75 MC Plate Coil Trimmer for maximum reading on Output Meter.

108 MC and 105 MC ADJUSTMENT

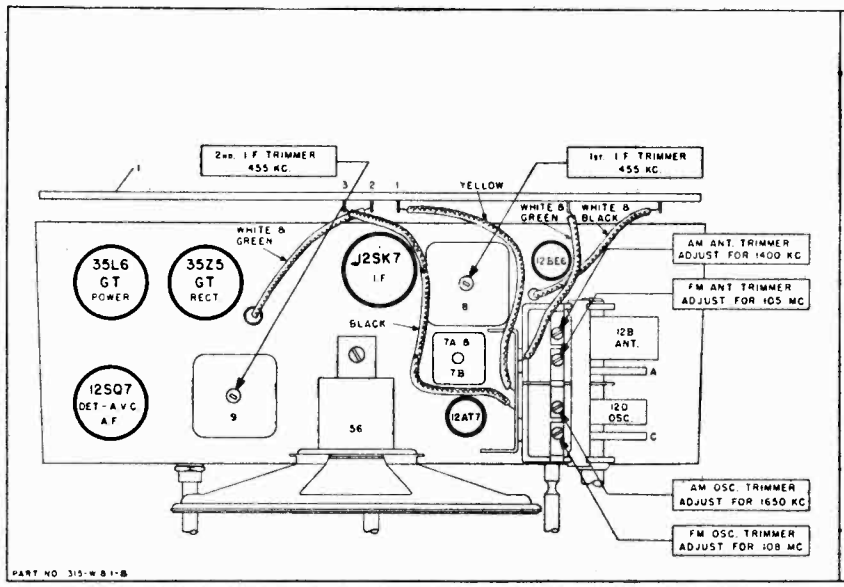
(A) Set Signal Generator to deliver a modulated 108 MC signal.

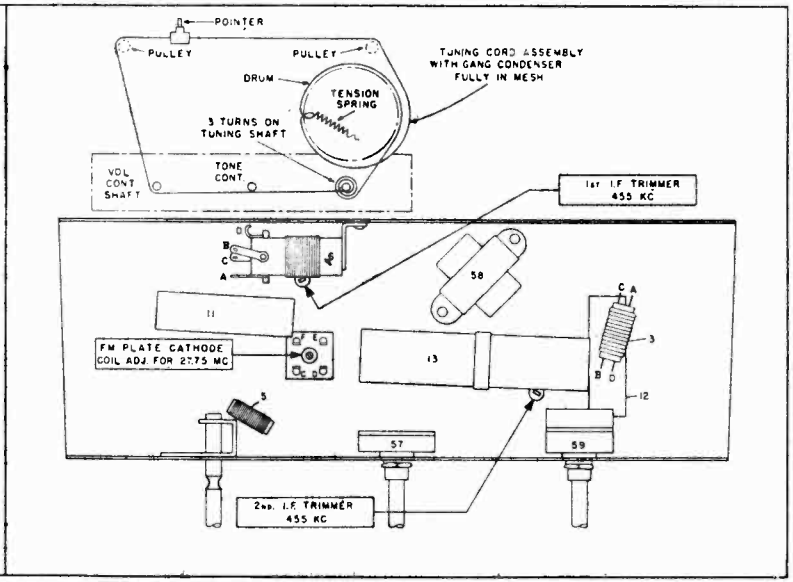
(B) Tune receiver dial to MINIMUM CAPACITY STOP.

(C) Adjust 108 MC Oscillator Trimmer for maximum reading on Output Meter.

(D) Tune receiver dial and Signal Generator to 105 MC.

(E) Adjust 105 MC Antenna Trimmer for maximum reading on the Output Meter.





AM 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.

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 pointer must be exactly even with the last line at the low frequency end of the AM 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) Place loop antenna in the same position it will be in when set is in the cabinet.

Steps	Place band switch for operation on:	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	AM Band position	Any point where no interfering signal is received	Exactly 455 K. C.	0.2 Mfd. Condenser	High side to AM-Osc. stator plates of tuning condenser (10D). Low side to frame of condenser through .01 Mfd. condenser.	Adjust each of the 2nd 455 K. C. AM I. F. transformer trimmers for maximum output, then adjust each of the 1st 455 K. C. AM I. F. transformer trimmers for maximum output.
2	AM Band position	Exactly 1730 K.C.	Exactly 1730 K.C.		Receiver blue antenna lead Receiver black ground lead	Adjust 1730 K. C. oscillator trimmer for maximum output.
3	AM Band position	Approx. 1400 K. C.	Approx. 1400 K. C.		Receiver blue antenna lead Receiver black ground lead	Adjust 1400 K. C. AM Ant. trimmer for maximum output.

FM ALIGNMENT

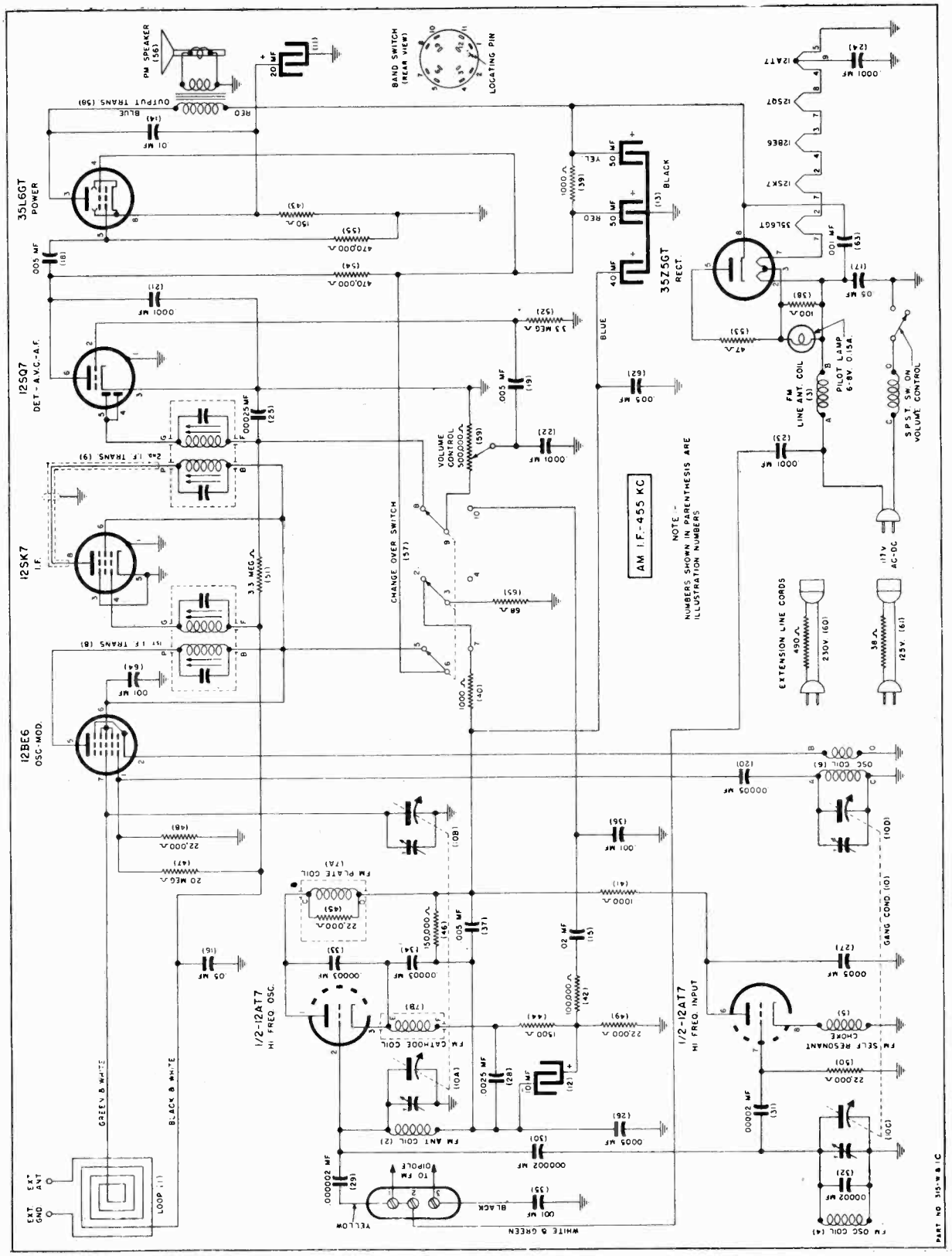
The only portion of this receiver which is used during FM reception, other than the AF and Power Supply, is the 12AT7 Dual Triode tube and its associated circuits. One triode of the tube is used for HF Oscillator and covers a band 27.75 MC above the 88 to 108 FM Band. The other triode is used for RF Input, Super-regenerator and Detector. This triode oscillates at 27.75 MC and is quenched by an RC network at about 25 KC.

In tuning this receiver on FM, it will be noticed that two signals will be received with a null point between them. These two signals will be substantially equal in tone and volume and either one can be used. They represent the frequency discrimination which takes place due to the receiver being tuned to one side of the carrier center frequency and this, therefore, is not the spot of greatest quieting. Greatest quieting is found at the null point, at which no frequency discrimination takes place and therefore no audio signal is produced.

The equipment necessary for FM alignment consists of the following:

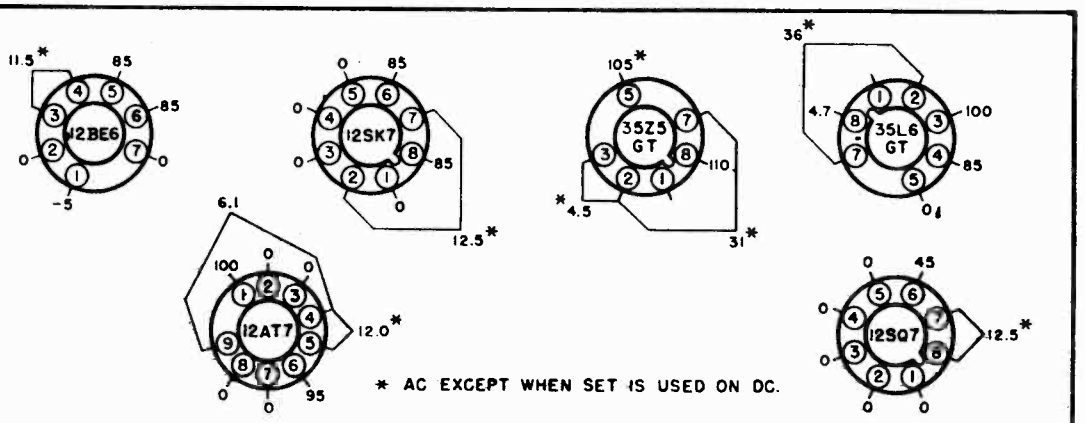
(A) An Audio Output Meter.

(B) An AM or FM Signal Generator that will supply a 27.75 MC, 105 MC and 108 MC signal. A Signal Generator that only goes up to 30 MC but which has sufficient fourth harmonic present in the carrier could be used for this purpose.



MODELS 315-I, 315-W

REAR OF CHASSIS



NOTE:- ALL VOLTAGES EXCEPT HEATERS ARE MEASURED FROM SOCKET CONTACTS TO CHASSIS WITH A 20,000 OHM PER VOLT VOLTMETER. HEATER VOLTAGES ARE MEASURED DIRECTLY ACROSS SOCKET CONTACTS.

PART NO. 315-W & I

VOLTAGE TABLE

(BOTTOM VIEW OF CHASSIS)

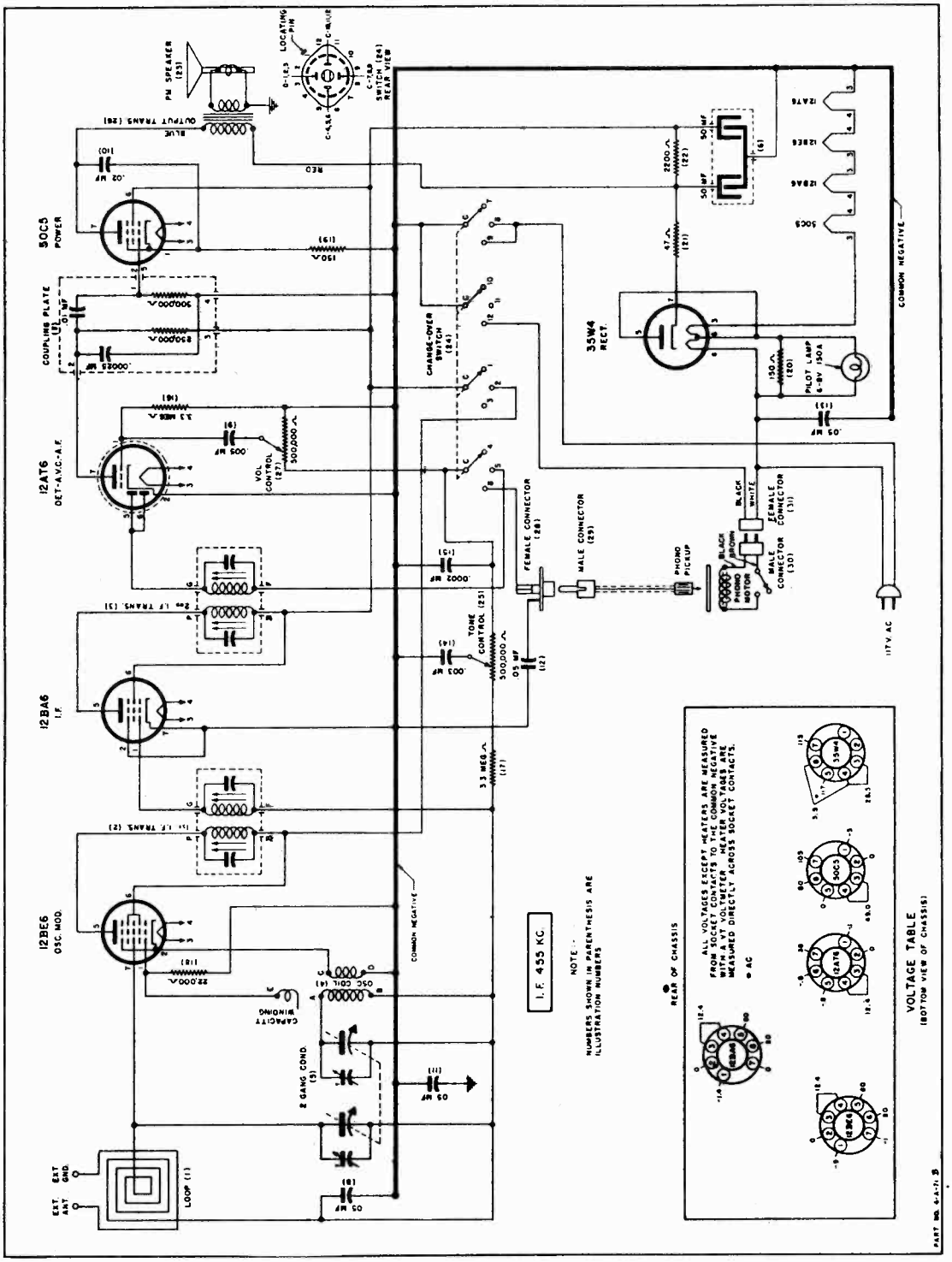
PARTS LIST

Illus. No.	Part No.	Part Name	Description
1	20E315	*Antenna	Loop (Not interchangeable)
	or		
1	20E346	**Antenna	Loop (Not interchangeable)
2	2E71	Coil	FM Antenna
3	2E69	Coil	FM Line Antenna
4	2E70	Coil	FM Oscillator
5	2E68	Coil	FM Self Resonant Choke
6	20E312	Coil	Oscillator Coil
7	20E313	Coil	FM Plate Cathode
8	20E261	Coil	1st I. F. Transformer
	or		
8	20E307	Coil	1st I. F. Transformer
9	20E261-2	Coil	2nd I. F. Transformer
	or		
9	20E307-2	Coil	2nd I. F. Transformer
10	24E38	Condenser	Tuning, 2 Gang
11	25E3	Condenser	Dry Elect. 20 Mfd. 25 V.
12	25E8	Condenser	Dry Elect. 10 Mfd. 25 V.
13	25E26	Condenser	Dry Elect. 50-50-40 Mfd. 150 V.
14	23E411	Condenser	Tubular, .01 Mfd. 400 V.
15	23E413	Condenser	Tubular, .02 Mfd. 400 V.
16	23E216	Condenser	Tubular, .05 Mfd. 200 V.
17	23E416	Condenser	Tubular, .05 Mfd. 400 V.
18	23E408	Condenser	Tubular, .005 Mfd. 400 V.
19	23E408	Condenser	Tubular, .005 Mfd. 400 V.
20	23E37	Condenser	Mica, .00005 Mfd.
21	23E39	Condenser	Mica, .0001 Mfd.
22	23E39	Condenser	Mica, .0001 Mfd.
23	23E39	Condenser	Mica, .0001 Mfd.
24	23E39	Condenser	Mica, .0001 Mfd.
25	23E42	Condenser	Mica, .00025 Mfd.
26	23E45	Condenser	Mica, .0005 Mfd.
27	23E45	Condenser	Mica, .0005 Mfd.
28	23E53	Condenser	Mica, .0025 Mfd.
29	23E21	Condenser	Ceramic, .000002 Mfd. 500 V.
30	23E21	Condenser	Ceramic, .000002 Mfd. 500 V.
31	23E22	Condenser	Ceramic, .00002 Mfd. 500 V.
32	23E22	Condenser	Ceramic, .00002 Mfd. 500 V.
33	23E23	Condenser	Ceramic, .00003 Mfd. 500 V.
34	23E23	Condenser	Ceramic, .00003 Mfd. 500 V.
35	23E2012	Condenser	Ceramic, .001 Mfd. 350 V.
36	23E2012	Condenser	Ceramic, .001 Mfd. 350 V.
37	23E2012-4	Condenser	Ceramic, .005 Mfd. 350 V.
38	27E101-2	Resistor	Carbon, 100 Ohm 1/2 Watt
39	27E102-3	Resistor	Carbon, 1000 Ohm 1 Watt
40	27E102	Resistor	Carbon, 1000 Ohm 1/3 Watt
41	27E102	Resistor	Carbon, 1000 Ohm 1/3 Watt
42	27E104	Resistor	Carbon, 100,000 Ohm 1/3 Watt
43	27E151	Resistor	Carbon, 150 Ohm 1/3 Watt
44	27E152	Resistor	Carbon, 1500 Ohm 1/3 Watt
45	27E223	Resistor	Carbon, 22,000 Ohm 1/3 Watt
46	27E154	Resistor	Carbon, 150,000 Ohm 1/3 Watt
47	27E206	Resistor	Carbon, 20 Meg Ohm 1/3 Watt
48	27E223	Resistor	Carbon, 22,000 Ohm 1/3 Watt
49	27E223	Resistor	Carbon, 22,000 Ohm 1/3 Watt
50	27E223	Resistor	Carbon, 22,000 Ohm 1/3 Watt
51	27E335	Resistor	Carbon, 3.3 Meg Ohm 1/3 Watt
52	27E335	Resistor	Carbon, 3.3 Meg Ohm 1/3 Watt
53	27E470-2	Resistor	Carbon, 47 Ohm 1/2 Watt
54	27E474	Resistor	Carbon, 470,000 Ohm 1/3 Watt
55	27E474	Resistor	Carbon, 470,000 Ohm 1/3 Watt
56	1E1	Speaker	P.M. 4"x6"
57	29E8	Switch	FM-AM Selector
58	22E8	Transformer	Output
59	28E7	Volume Control	500,000 Ohm
62	23E2012-4	Condenser	Ceramic, .005 Mfd. 350 V.
63	23E2012	Condenser	Fixed Ceramic .001 MF 350 V.
64	23E2012	Condenser	Fixed Ceramic .001 MF 350 V.
65	27E680	Resistor	Carbon, 68 Ohm 1/3 W.

MISCELLANEOUS PARTS

Part No.	Part Name	Description
*7E48-2	Cabinet Back	Back for Cabinet
7E46-1	Cabinet	Walnut Plastic
7E46-2	Cabinet	Ivory Plastic
65E2	Dial Cord Spring	Dial Cord Tension Spring
20E253-16	Dial Cord	Drive Cord
40E1	Dial Light	6-8 Volt .150 Amp. Type No. 47
20E270-5	Dial Shaft Assem.	Drive Shaft Assembly
20E65-2	Dial Back Plate	Backplate Assembly less Calibrated Scale
36E38	Dial Scale	Calibrated Glass Scale
35E8-9	Dial Pointer	Dial Indicator
37E27-11	Knob	Walnut
37E27-36	Knob	Ivory

*Used with chassis having serial number below 10,000.
**Used with chassis having serial number above 10,000.



RECORD CHANGER: See G.I. Model 700R, Pages RCD.CH. 19-1,2 to RCD.CH. 19-9

ALIGNMENT PROCEDURE

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

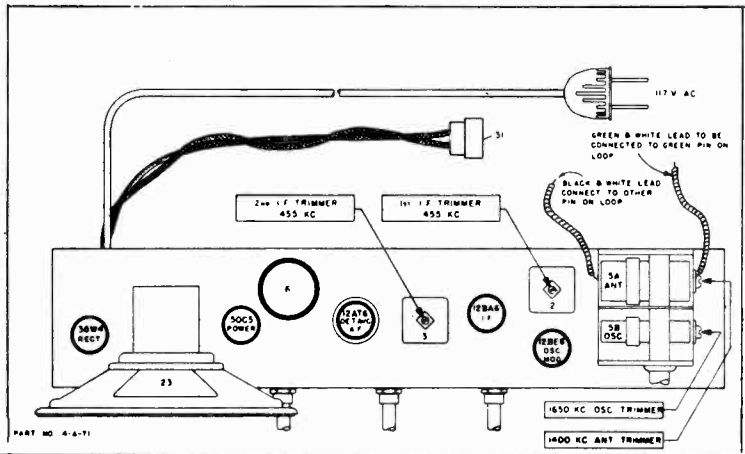
Before starting alignment:

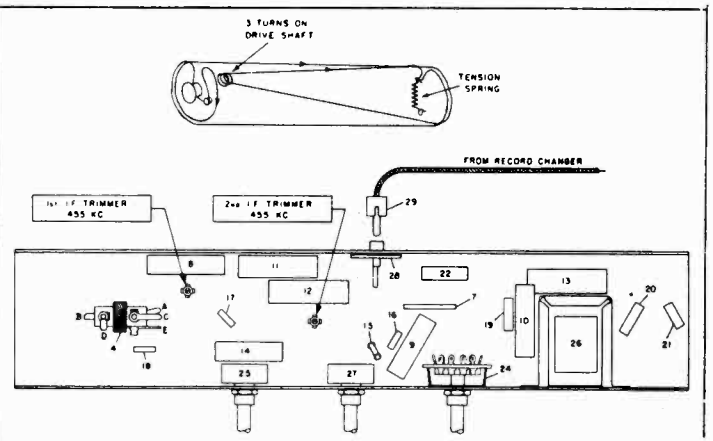
(A) Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If the dial needle does not point exactly to the last line move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

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

(C) THE LOOP MAY BE LEFT IN THE CABINET and the chassis with its mounting board pulled out of the cabinet just far enough for adjustment of the trimmers, or the loop and chassis may be removed from the cabinet and the loop placed in the same position and plane it will be in when both are mounted in cabinet—approximately 1″ space between receiver loop and chassis. Couple test oscillator to receiver loop by: (1) make loop consisting of 5 to 10 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.

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	Any point where no interfering signal is received	455 K. C.	.02 MFD. See Paragraph (C) Above	High side to rear stator plates of tuning condenser. Low side to frame of condenser through a .02 Mfd. blocking 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.
2	Exactly 1650 K. C.	Exactly 1650 K. C.	See Paragraph (C) Above	See Paragraph (C) Above	Adjust 1650 K. C. oscillator trimmer for maximum output.
3	Approx. 1400 K. C.	Approx. 1400 K. C.	See Paragraph (C) Above	See Paragraph (C) Above	Adjust 1400 K. C. antenna trimmer for maximum output.





RADIO PARTS LIST

Illus. No.	Part No.	Part Name	Description
1	64E21	Antenna	Loop
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	20E397	Coil	Oscillator
5	24E47	Condenser	2 Gang, Tuning
*6	**25E16**	**Condenser**	**Dry Elect. 50-50 MFD. 150 V.**
7	23E2023	Condenser	Ceramic Coupling Plate
8	23E216	Condenser	Paper .05 MF. 200 V.
9	23E208	Condenser	Paper .005 MF. 200 V.
10	23E413	Condenser	Paper .02 MF. 400 V.
11	23E416	Condenser	Paper .05 MF. 400 V.
12	23E416	Condenser	Paper .05 MF. 400 V.
13	23E416	Condenser	Paper .05 MF. 400 V.
14	23E406	Condenser	Paper .003 MF. 400 V.
15	23E41	Condenser	Mica, .0002 MF
	OR		
15	23E2027-3	Condenser	Ceramic, .0002 MF
16	27E335	Resistor	Carbon, 3.3 MEG OHM 1/3 W.
17	27E335	Resistor	Carbon, 3.3 MEG OHM 1/3 W.
18	27E223	Resistor	Carbon, 22,000 OHM 1/3 W.
19	27E151	Resistor	Carbon, 150 OHM 1/3 W.
20	27E151	Resistor	Carbon, 150 OHM 1/3 W.
21	27E470-2	Resistor	Carbon, 47 OHM 1/2 W.
22	27E222-3	Resistor	Carbon, 2200 OHM 1 W.
23	1E33	Speaker	5" PM
24	29E23	Switch	"Off-Radio-Phono"
*25	**28E41**	**Tone Control**	**500,000 Ohm**
26	22E8-2	Transformer	Output
*27	**28E41**	**Vol. Control**	**500,000 Ohm**
28	17E21-5	Connector	Female, for Pickup
29	47E9	Plug	Male Phono Plug for Pickup
30	17E21-3	Plug	Male, Attached to Phono Motor
31	20E184-1	Socket	Female, 4 Contact, for Phono Motor

*Fast Moving Items.

MISCELLANEOUS PARTS

Part No.	Part Name	Description
7E185	Cabinet	Cabinet only, less Frontplate Bezel Assembly
20E428	Cabt. Frontplate	Bezel, Frontplate with crystal
7E171-2	Cabinet Bottom	Cardboard Cabinet Bottom
41E8-2	Cord	8 Ft. Rubber Line Cord
30E116	Dial Plate Assembly	Dial Back Plate Assembly less Scale
20E253-1	Dial Cord	Dial Drive Cord
36E46	Dial Scale	Calibrated Scale
20E394	Dial Shaft & Pulley	Drive Shaft & Pulley Assembly with Mounting Bracket
68E16	Dial Shaft	Drive Shaft only with 12E124 "C" Washer
35E25	Dial Pointer	Dial Indicator with Set Screw
65E2	Dial Spring	Tension Spring for Drive Cord
37E21-22	Knob	
37E21-23	Knob	With Dot, for "Off-Radio-Phono" Switch
17E34	Pilot Lamp Socket	Pilot Lamp Socket Assembly
40E1	Pilot Lamp	6-8 Volt, .150 Amp., Type 47

MOUNTING HARDWARE

Part No.	Part Name	Description
P-122	Lid Stop	Cabinet Lid Stop
13E103-1	Speed Nut	For Mounting Front Plate Bezel to Cabt.
10E41	Stud	Trimount, for Mtg. Dial Scale to Back Plate
82E1111-F10	Screw	6x7/8 Hx Hd—no slot—for holding Chassis to Mounting Board
71E162	Screw	3-48x3/8" for Dial Pointer
86E227-F43	Screw	6x7/8 Rd Hd Copper Colored Iron Wood Screw for attaching Chassis Mtg. Board to Cabt.
86E183-F49	Screw	4x3/8 Rd Hd Iron Wood Screw for Mtg. Cardboard to Cabinet Bottom
12E124	Washer	"C" Washer for Dial Drive Shaft

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.

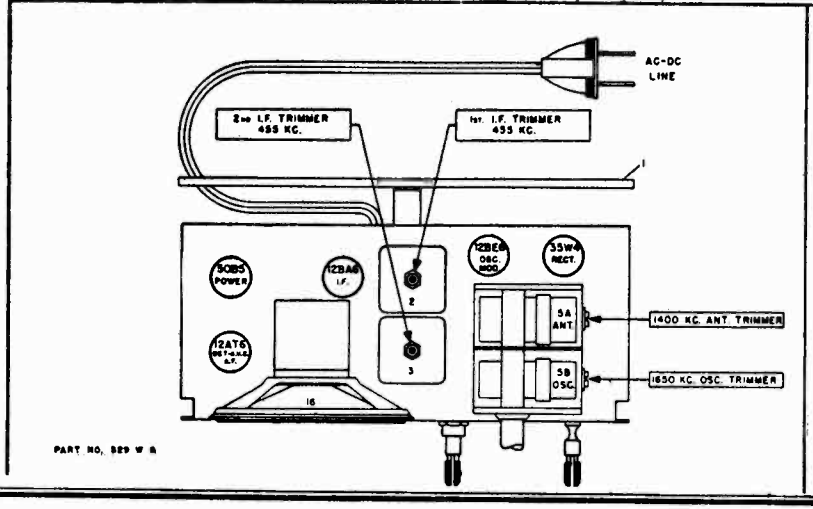
(B) Use an accurately calibrated test oscillator with some type of output measuring device.

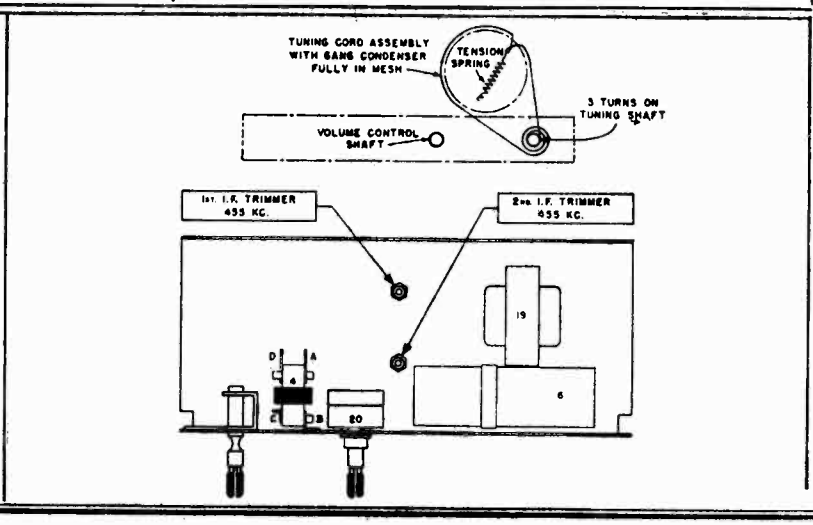
(C) WHEN ADJUSTING THE 1650 KC OSCILLATOR TRIMMER, remove chassis from cabinet and disconnect the loop connection wires from the loop. Attach a 1 megohm resistor across these connections and feed output of test oscillator across the 1 megohm resistor.

(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 5/8" SPACE BETWEEN LOOP AND CHASSIS.

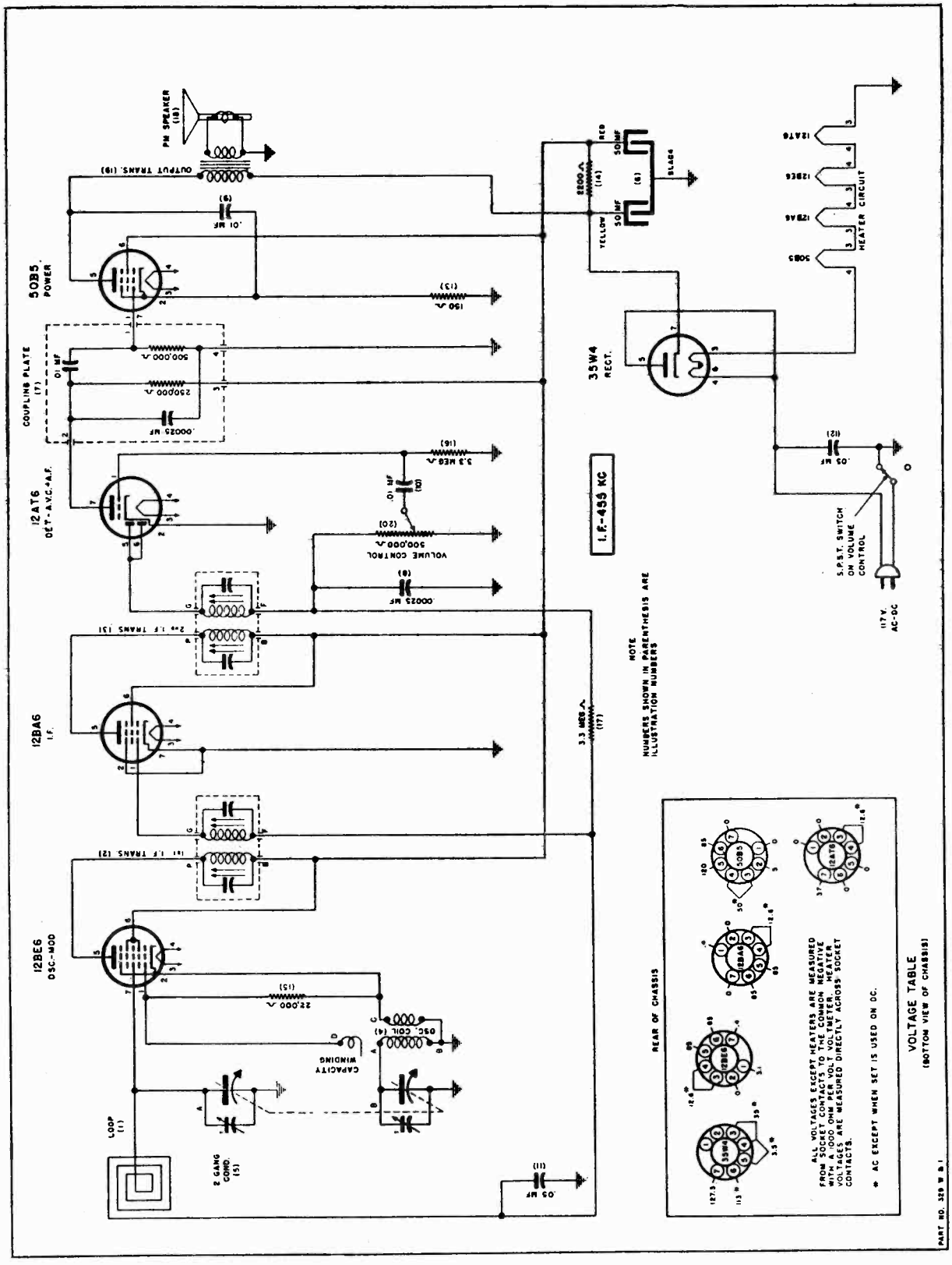
When aligning the 1400 KC Antenna Trimmer, couple test oscillator to receiver loop by: (1) make loop consisting of five to ten turns of No. 20 to No. 30 size wire, wound on a 2" or 3" form; (2) connect this loop across output of test oscillator; (3) place test oscillator loop near radio loop. BE SURE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

Steps	Set receiver dial to:	TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Use dummy antenna in series with output of test oscillator consisting of:	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.	455 K. C.	.02 MFD. condenser	High side to rear stator plates of tuning condenser. Low side to frame of condenser through a .02 Mfd. blocking 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.
2	Exactly 1650 K. C.	Exactly 1650 K. C.	See paragraph (C) above	See paragraph (C) above	Adjust 1650 K. C. oscillator trimmer for maximum output.
3	Approx. 1400 K. C.	Approx. 1400 K. C.	See paragraph (D) above	See paragraph (D) above	Adjust 1400 K. C. antenna trimmer for maximum output.





MODELS 329-I, 329-R,
329-W, Series A & B



Series A & B

PARTS LIST

Illus. No.	Part No.	Part Name	Description
1	64E12	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	20E333	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	3½" P.M.
19	22E23	Transformer	Output
20	28E27	Volume Control	500,000 Ohm, with Switch

Series A

MISCELLANEOUS PARTS

Part No.	Part Name	Description
7E168-2	Cabinet	Walnut Plastic with Dial Scale
7E168-3	Cabinet	Ivory Plastic with Dial Scale
7E168-6	Cabinet	Red Plastic with Dial Scale
41E13	Cord	5 Ft. Rubber Line Cord
20E253-14	Dial Cord	Dial Drive Cord
36E41	Dial Scale	Calibrated Dial Scale
20E348-3	Dial Shaft Assembly	Dial Drive Shaft with Bracket
35E24	Dial Pointer	Dial Indicator
65E2	Dial Spring	Tension Spring for Dial Cord
37E52-10	Knob	For Walnut Cabinet
37E52-11	Knob	For Ivory and Red Cabinet
10E42	Stud	Trimount Stud for Loop & Back
13E105	Nut	Used to hold chassis in Cabinet
12E123	Washer	Fibre Cushion, used with 13E105 Nut

Misc. Series B

MISCELLANEOUS PARTS

Part No.	Part Name	Description
7E134-2	Cabinet	Walnut Plastic with Dial Scale
7E134-3	Cabinet	Ivory Plastic with Dial Scale
7E134-4	Cabinet	Red Plastic with Dial Scale
41E13	Cord	5 Ft. Rubber Line Cord
20E253-14	Dial Cord	Dial Drive Cord
36E48	Dial Scale	Calibrated Dial Scale
20E348-3	Dial Shaft Assembly	Dial Drive Shaft with Bracket
35E27	Dial Pointer	Dial Indicator cements on type
35E27	Dial Pointer	Dial Indicator snaps on type
65E2	Dial Spring	Tension Spring for Dial Cord
37E47-11	Knob	For Walnut Cabinet
37E47-2	Knob	For Ivory and Red Cabinet
10E42	Stud	Trimount Stud for Loop & Back
13E105	Nut	Used to hold chassis in Cabinet
12E123	Washer	Fibre Cushion, used with 13E105 Nut

VOLTAGE RATING

THIS RADIO IS DESIGNED FOR USE ON EITHER:
110-120 VOLTS 50-60 CYCLES ALTERNATING CURRENT (AC)
OR
110-120 VOLTS DIRECT CURRENT (DC)

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.

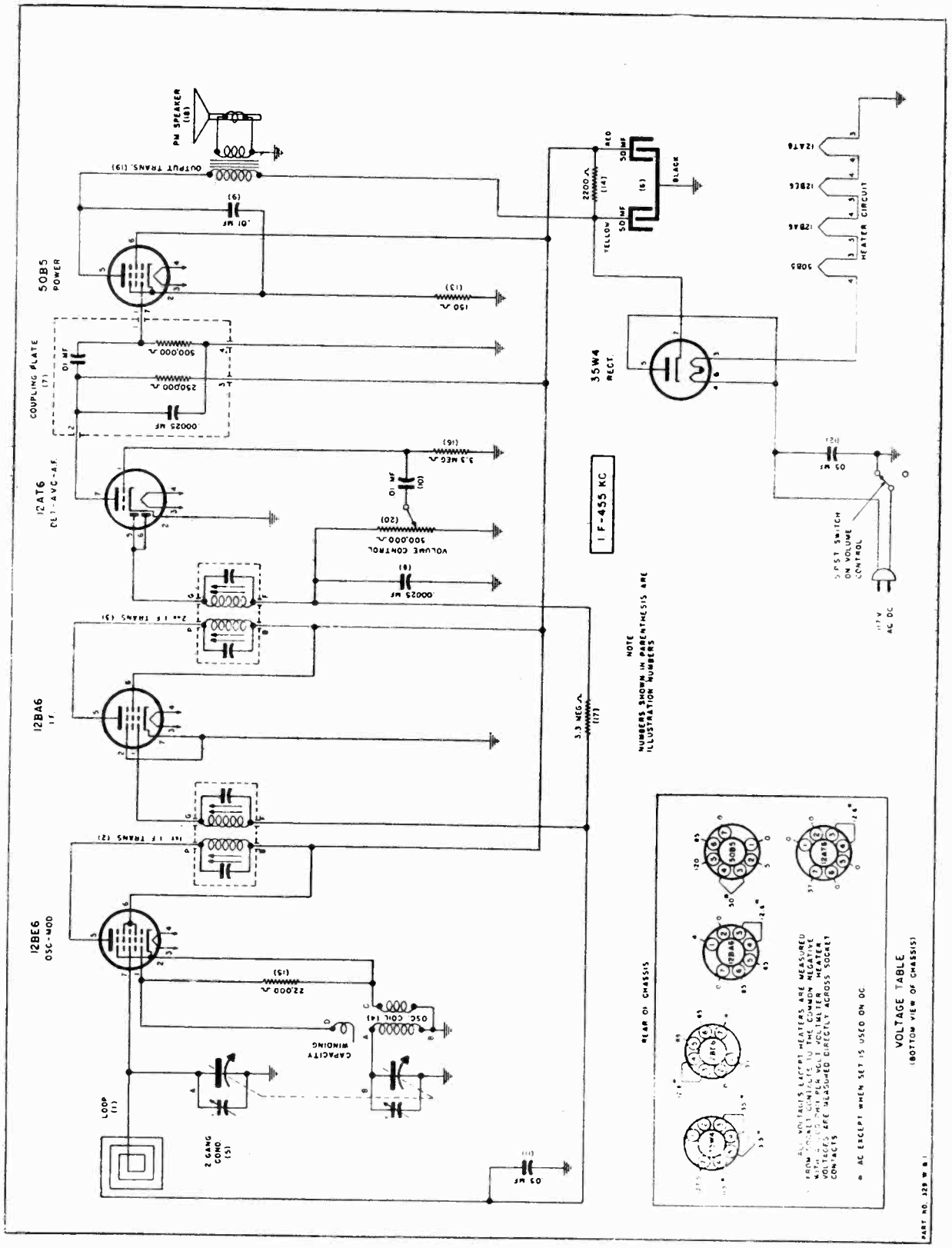
(C) WHEN ADJUSTING THE 1650 KC OSCILLATOR TRIMMER, remove chassis from cabinet and disconnect the loop connection wires from the loop. Attach a 1 megohm resistor across these connections and feed output of test oscillator across the 1 megohm resistor.

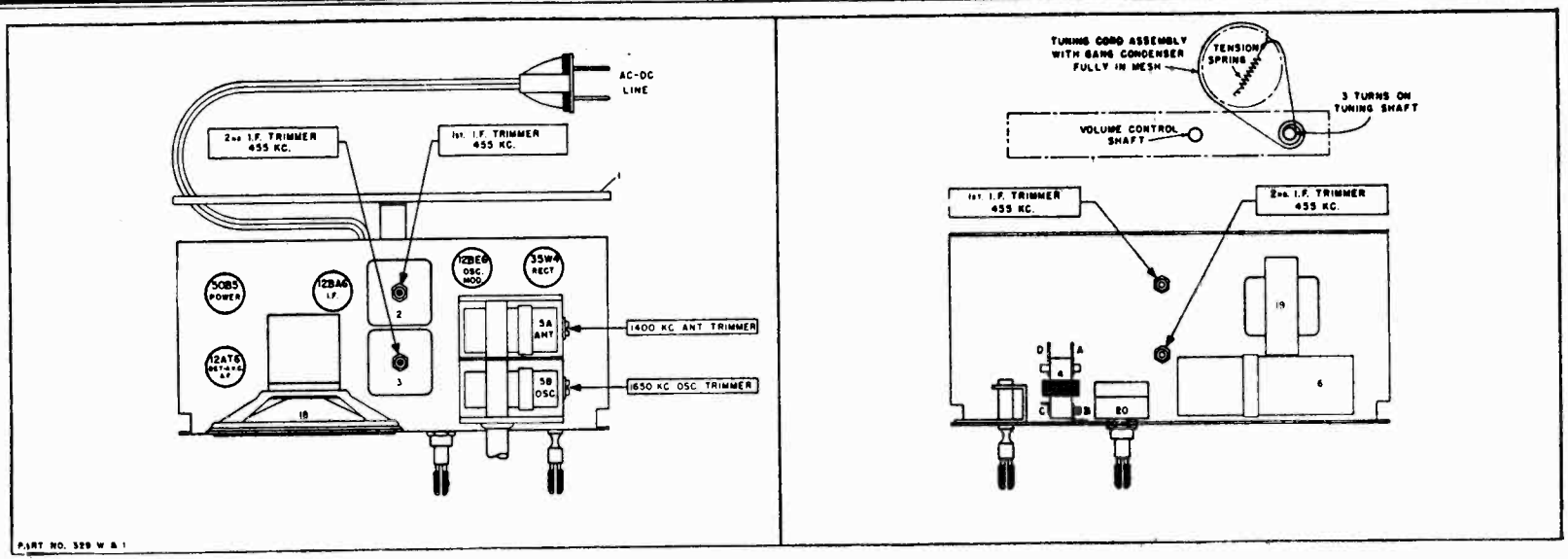
(D) THE 1400 KC LOOP ANTENNA TRIMMER should be adjusted only after all other adjustments have been made. PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET — APPROXIMATELY ⅝" SPACE BETWEEN LOOP AND CHASSIS.

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.

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	Any point where no interfering signal is received.	455 K. C.	.02 MFD. condenser	High side to rear stator plates of tuning condenser. Low side to frame of condenser through a .02 Mfd. blocking 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.
2	Exactly 1650 K. C.	Exactly 1650 K. C.	See paragraph (C) above	See paragraph (C) above	Adjust 1650 K. C. oscillator trimmer for maximum output.
3	Approx. 1400 K. C.	Approx. 1400 K. C.	See paragraph (D) above	See paragraph (D) above	Adjust 1400 K. C. antenna trimmer for maximum output.

MODELS 331-I,
331-R, 331-W





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	20E333	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	3½" P.M.
19	22E23	Transformer	Output
20	28E27	Volume Control	500,000 Ohm, with Switch

MISCELLANEOUS PARTS

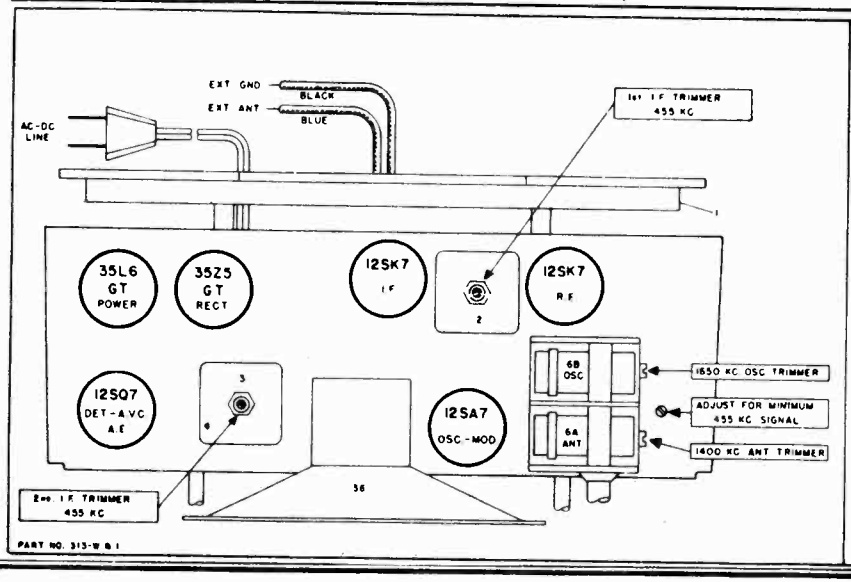
Part No.	Part Name	Description
7E196-2	Cabinet	Walnut Plastic
7E196-9	Cabinet	Ivory Plastic
7E196-6	Cabinet	Red Plastic
41E13	Cord	5 Ft. Rubber Line Cord
20E253-14	Dial Cord	Dial Drive Cord
36E50	Dial Scale	Calibrated Dial Scale
20E348-3	Dial Shaft Assembly	Dial Drive Shaft with Bracket
35E27-2	Dial Pointer	Dial Indicator
65E2	Dial Spring	Tension Spring for Dial Cord
37E52-12	Knob	For Walnut Cabinet
37E52-14	Knob	For Ivory and Red Cabinet
10E42	Stud	Trimount Stud for Loop & Back

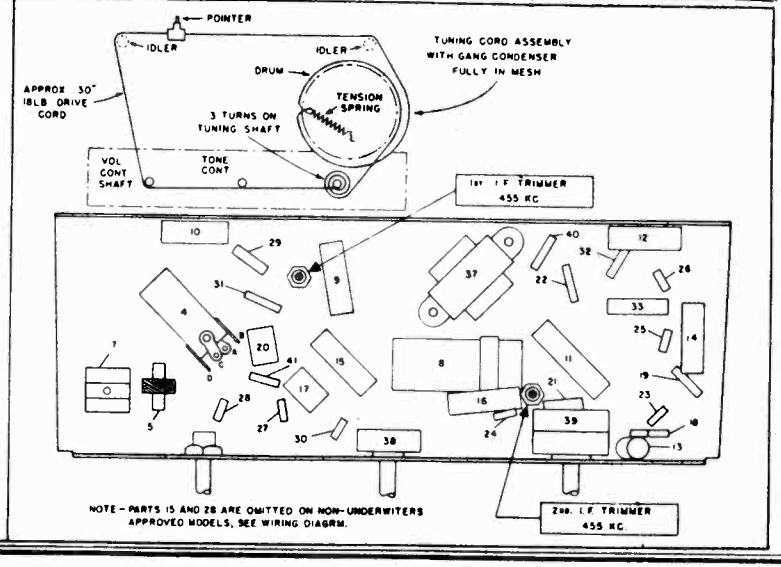
ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third.
IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET. BE SURE THAT IT DOES NOT MOVE WHILE ALIGNING.

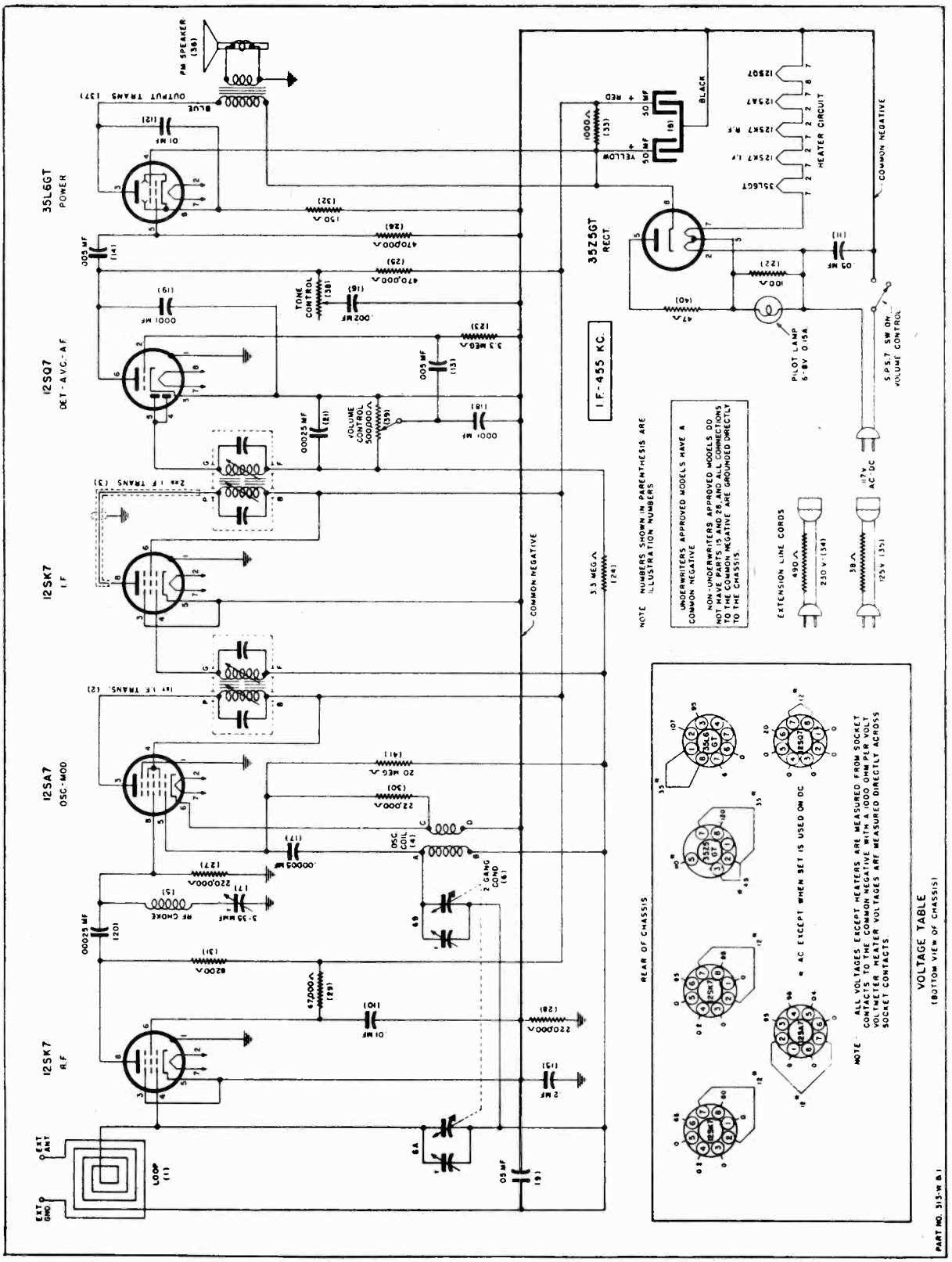
When adjusting 1650 kilocycle oscillator trimmer, 455 K.C. R.F. trimmer and 1400 kilocycle antenna trimmer, connect test oscillator to loop external antenna and ground connections with a .0002 Mfd. capacitor in series with antenna lead.

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:	
	Any point where no interfering signal is received	Exactly 455 K. C.	0.2 Mfd. Condenser	High side to grid of 12SA7 tube. Low side to chassis. (To Common Negative in UND Models.)	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.
1	Rotate gang condenser to maximum capacity	Exactly 455 K. C.	.0002 Mfd. Condenser	To loop external antenna and ground connections	Adjust R. F. coil trimmer for minimum 455 K. C. signal.
2	Rotate gang condenser to minimum capacity	Exactly 1650 K. C.	.0002 Mfd. Condenser	To loop external antenna and ground connections	Adjust 1650 K. C. oscillator trimmer for maximum output.
3	Approximately 1400 K. C.	Approx. 1400 K. C.	.0002 Mfd. Condenser	To loop external antenna and ground connections	Adjust 1400 K. C. antenna trimmer for maximum output.





MODELS 332-I, 332-W



OUTSIDE AERIAL

If the radio is used in shielded areas or located a great distance from broadcast stations, the volume of some or all stations may not be ample, in which case it would be necessary to ATTACH A 25-50 ft. OUTDOOR AERIAL TO THE BLUE LEAD COMING OUT OF THE REAR OF THE CHASSIS.

GROUND

When a regular aerial is used, best results will be obtained with a ground attached to the black lead coming out of the rear of the chassis. WARNING — DO NOT ATTACH A GROUND DIRECT TO THE RADIO CHASSIS — ANY EXTERNAL GROUND CONNECTION TO ANY METAL PART OF THE CHASSIS WILL CAUSE A SHORT AND POSSIBLE DAMAGE.

DIAL LIGHT

It is normal for the dial light to be dim for approximately 60 seconds after set is turned "on" and then attain normal brilliance—also, on very loud signals the light may fluctuate.

Always use a 6.3 volt .150 ampere dial light, Mazda type 47.

VOLTAGE RATING

THIS RADIO IS DESIGNED FOR USE ON EITHER:

110-120 VOLTS 50-60 CYCLES ALTERNATING CURRENT (AC)

OR

110-120 VOLTS DIRECT CURRENT (DC)

PARTS LIST

Illus. No.	Part No.	Part Name	Description
1	7E149	Antenna	Loop & Cabinet Back
	or		
1	7E150	Antenna	Loop & Cabinet Back
2	20E261	Coil	1st I. F. Transformer
	or		
2	20E307	Coil	1st I. F. Transformer
3	20E261-2	Coil	2nd I. F. Transformer
	or		
3	20E307-2	Coil	2nd I. F. Transformer
4	20E64	Coil	Oscillator
5	2E19	Coil	R. F. Choke
6	24E8	Condenser	Tuning, 2 Gang
7	24E3	Condenser	Trimmer (3-35 MMF)
8	25E6	Condenser	Tubular, Dry Elect. 50-50 Mfd. 150 V.
9	23E216	Condenser	Tubular, .05 Mfd. 200 V.
10	23E211	Condenser	Tubular, .01 Mfd. 200 V.
11	23E416	Condenser	Tubular, .05 Mfd. 400 V.
12	23E411	Condenser	Tubular, .01 Mfd. 400 V.
13	23E408	Condenser	Tubular, .005 Mfd. 400 V.
14	23E408	Condenser	Tubular, .005 Mfd. 400 V.
15	23E421	Condenser	Tubular, .2 Mfd. 400 V. (UND. Models Only)
16	23E405	Condenser	Tubular, .002 Mfd. 400 V.
17	23E37	Condenser	Mica, .00005 Mfd.
18	23E39	Condenser	Mica, .0001 Mfd.
19	23E39	Condenser	Mica, .0001 Mfd.
20	23E42	Condenser	Mica, .00025 Mfd.
21	23E42	Condenser	Mica, .00025 Mfd.
22	27E101-2	Resistor	Carbon, 100 Ohm 1/2 Watt
23	27E335	Resistor	Carbon, 3.3 Meg Ohm 1/3 Watt
24	27E335	Resistor	Carbon, 3.3 Meg Ohm 1/3 Watt
25	27E474	Resistor	Carbon, 470,000 Ohm 1/3 Watt
26	27E474	Resistor	Carbon, 470,000 Ohm 1/3 Watt
27	27E224	Resistor	Carbon, 220,000 Ohm 1/3 Watt
28	27E224	Resistor	Carbon, 220,000 Ohm 1/3 Watt (UND. Models Only)
29	27E473	Resistor	Carbon, 47,000 Ohm 1/3 Watt
30	27E223	Resistor	Carbon, 22,000 Ohm 1/3 Watt
31	27E822	Resistor	Carbon, 8,200 Ohm 1/3 Watt
32	27E151	Resistor	Carbon, 150 Ohm 1/3 Watt
33	27E102-3	Resistor	Carbon, 1,000 Ohm 1 Watt
36	1E1	Speaker	4" x 6" Elliptical P.M.
37	22E8	Transformer	Output
38	28E8	Tone Control	
39	28E7	Volume Control	500,000 Ohm with S.P.S.T. Switch
40	27E470-2	Resistor	Carbon, 47 Ohm 1/2 Watt
41	27E206	Resistor	Carbon, 20 Megohm 1/3 Watt

MISCELLANEOUS PARTS

Part No.	Part Name	Description
40E1	Bulb	6-8 Volt, .150 Amp. Type 47
7E149	Cabinet Back	With Loop Antenna
or		
7E150	Cabinet Back	With Loop Antenna
7E195-2	Cabinet	Walnut Plastic
7E195-9	Cabinet	Ivory Plastic
65E2	Dial Cord Spring	Tension Spring
20E253-18	Dial Cord	30" of 18 lb. Drive Cord
20E348-2	Dial Shaft Assem.	Drive Shaft Assembly
20E65-5	Dial Back Plate	Backplate Assembly, less scale
36E53	Dial Scale	Calibrated Glass Scale
35E8-4	Dial Pointer	Dial Indicator
37E27-11	Knob	For Walnut Cabinet
37E27-36	Knob	For Ivory Cabinet
17E22	Socket	Dial Light Socket Assembly
10E42	Studs	Trimount for Mounting Back to Cabinet

VOLTAGE RATING

THIS RADIO IS DESIGNED FOR USE ON 110-120 VOLT, 50-60 CYCLE, ALTERNATING CURRENT (AC) OR 110-120 VOLT DIRECT CURRENT (DC).

AM STANDARD BROADCAST AERIAL

The AM Standard Broadcast Aerial, mounted inside of the rear of the cabinet is a loop-type antenna. Because loop aerials are directional, the volume of a weak station, operating in the 535-1730 KC Band, may be improved, or undesired electrical noise may be reduced by placing the radio in a different position. A trial will reveal position for best reception with least interference.

When the volume of the AM Broadcast stations is not satisfactory, improved results can be obtained by attaching a 50 ft. to 75 ft. Outdoor Aerial to the BLUE wire coming out of the rear of the cabinet and a ground to the BLACK wire.

WARNING — DO NOT CONNECT A GROUND TO ANY METAL PART OF THE CHASSIS BECAUSE THIS WILL CAUSE A SHORT AND POSSIBLE DAMAGE.

FM AERIAL

Due to the high frequencies used by FM stations, signals from these stations reach only to the "line of sight." This means that reliable FM reception can usually be expected only when the radio is within 20 to 30 miles from the station transmitter. The actual area serviced by FM stations depends on the height of the station aerial and receiver aerial.

If the radio happens to be located on the edge or just outside of the FM station service area, satisfactory FM reception may not be obtained with the self contained FM aerial furnished with the radio, in which case it will be necessary to install a suitable outdoor FM aerial. This should be the type having a 300 Ohm transmission line, and it must be erected as high as possible.

If an outdoor aerial is required, consult your Sentinel dealer—he can furnish a satisfactory outdoor FM aerial.

TO CONNECT AN OUTDOOR "FM" AERIAL TO THE RADIO:

(1) Disconnect the wire attached to posts marked #1 and #2 mounted on back of loop aerial.

(2) Attach outdoor FM aerial transmission leads to the posts marked #1 and #3.

IMPORTANT — WHEN THE RADIO IS LOCATED TOO CLOSE TO AN FM STATION, the volume may be ample but the signal may be distorted. An outdoor FM aerial would only aggravate this condition. Usually, disconnecting the jumper wire connecting posts #1 and #2 on back of loop will eliminate the distortion.

AM STANDARD BROADCAST OPERATING INSTRUCTIONS

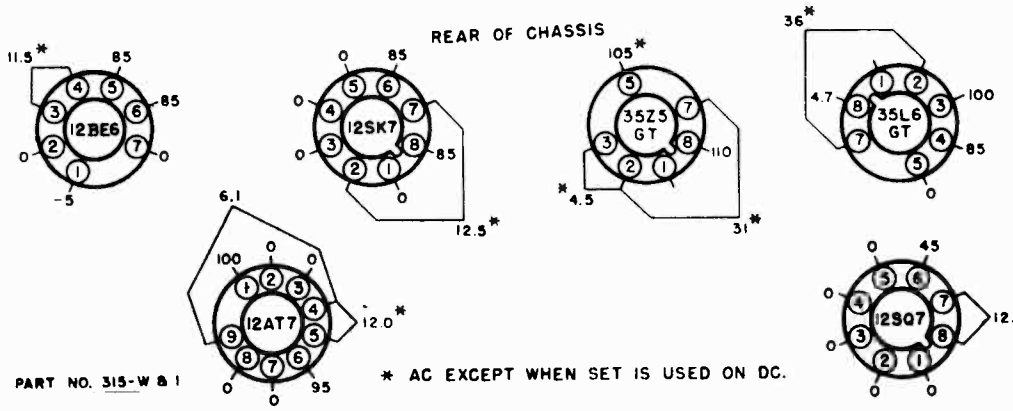
Turn "AM-FM" Band Selector Switch Knob to RIGHT hand position.
Use section of dial that is calibrated from 535 to 1730 K. C.

FM FREQUENCY MODULATION OPERATING INSTRUCTIONS

Turn "FM-AM" Band Selector Switch Knob to LEFT hand position.
Place Volume Control Knob in maximum volume position.
Use section of dial that is calibrated from 88 to 108 M.C.

WHEN TUNING FOR FM STATIONS, care must be taken to tune properly, otherwise the brilliant tone and noise-free reception possible from FM stations will not be fully realized. Always carefully tune to the point where the volume is greatest with clearest tone and least background noise.

It will be noticed that FM stations will be heard at two positions that are close together on the dial scale, with a distortion point between the two. As these two clear-tone signals will be substantially equal in tone and volume, either one may be used.



NOTE:- ALL VOLTAGES EXCEPT HEATERS ARE MEASURED FROM SOCKET CONTACTS TO CHASSIS WITH A 20,000 OHM PER VOLT VOLTMETER. HEATER VOLTAGES ARE MEASURED DIRECTLY ACROSS SOCKET CONTACTS.

VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

AM 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.

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 pointer must be exactly even with the last line at the low frequency end of the AM 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) Place loop antenna in the same position it will be in when set is in the cabinet.

Steps	Place band switch for operation on:	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	AM Band position	Any point where no interfering signal is received	Exactly 455 K. C.	0.2 Mfd. Condenser	High side to AM-Osc. stator plates of tuning condenser (10D). Low side to frame of condenser through .01 Mfd. condenser.	Adjust each of the 2nd 455 K. C. AM I. F. transformer trimmers for maximum output, then adjust each of the 1st 455 K. C. AM I. F. transformer trimmers for maximum output.
2	AM Band position	Exactly 1730 K.C.	Exactly 1730 K.C.		Receiver blue antenna lead Receiver black ground lead	Adjust 1730 K. C. oscillator trimmer for maximum output.
3	AM Band position	Approx. 1400 K. C.	Approx. 1400 K. C.		Receiver blue antenna lead Receiver black ground lead	Adjust 1400 K. C. AM Ant. trimmer for maximum output.

FM ALIGNMENT

The only portion of this receiver which is used during FM reception, other than the AF and Power Supply, is the 12AT7 Dual Triode tube and its associated circuits. One triode of the tube is used for HF Oscillator and covers a band 27.75 MC above the 88 to 108 FM Band. The other triode is used for RF Input, Super-regenerator and Detector. This triode oscillates at 27.75 MC and is quenched by an RC network at about 25 KC.

In tuning this receiver on FM, it will be noticed that two signals will be received with a null point between them. These two signals will be substantially equal in tone and volume and either one can be used. They represent the frequency discrimination which takes place due to the receiver being tuned to one side of the carrier center frequency and this, therefore, is not the spot of greatest quieting. Greatest quieting is found at the null point, at which no frequency discrimination takes place and therefore no audio signal is produced.

The equipment necessary for FM alignment consists of the following:

(A) An Audio Output Meter.

(B) An AM or FM Signal Generator that will supply a 27.75 MC, 105 MC and 108 MC signal. A Signal Generator that only goes up to 30 MC but which has sufficient fourth harmonic present in the carrier could be used for this purpose.

ALIGNMENT PROCEDURE

BE SURE TO MAKE THE ADJUSTMENTS IN THE ORDER GIVEN BELOW.

(A) Connect Output Meter across voice coil of speaker.

(B) Remove jumper wire from terminals #1 and #2 on loop terminal strip.

(C) Connect the hot Signal Generator lead through a 300 Ohm Resistor to the #1 post on terminal strip and the other lead to the post marked #3.

27.75 MC PLATE COIL ADJUSTMENT

(A) Set Signal Generator to deliver a modulated 27.75 MC Signal.

(B) Adjust 27.75 MC Plate Coil Trimmer for maximum reading on Output Meter.

108 MC and 105 MC ADJUSTMENT

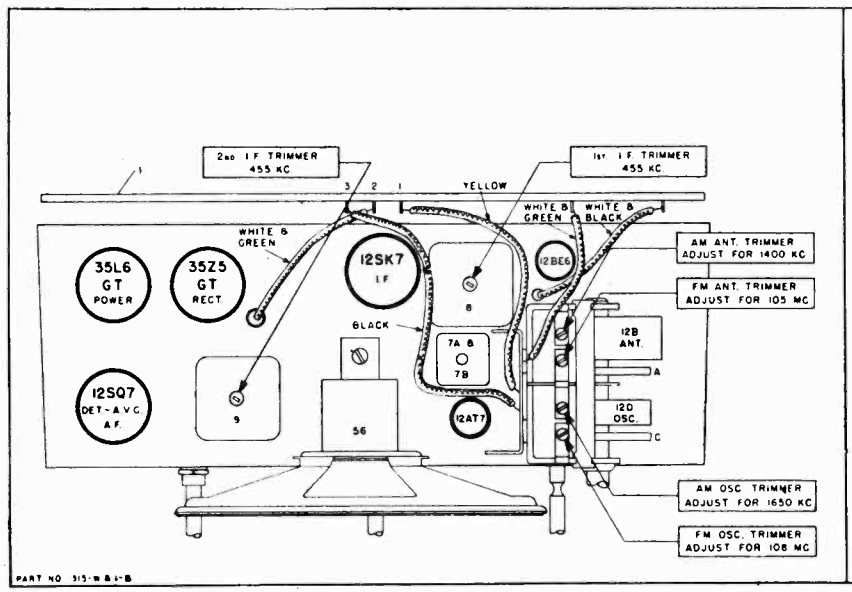
(A) Set Signal Generator to deliver a modulated 108 MC signal.

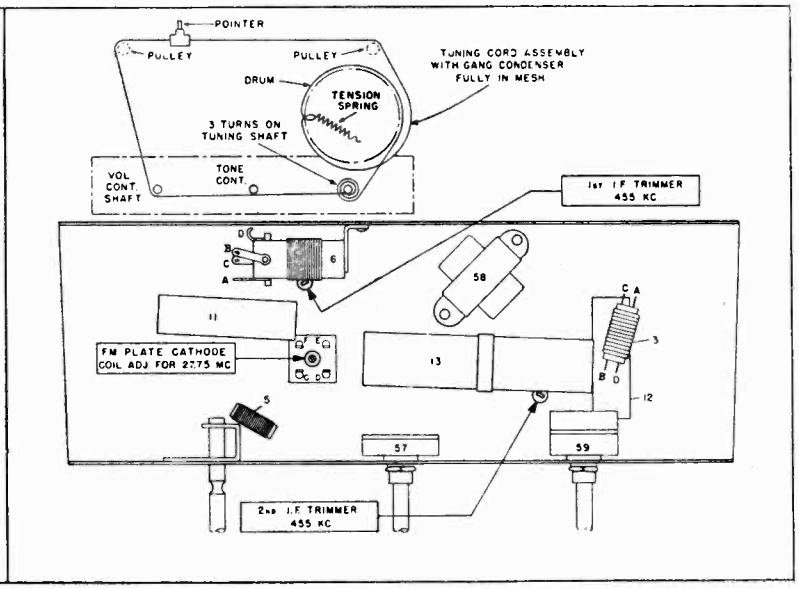
(B) Tune receiver dial to MINIMUM CAPACITY STOP.

(C) Adjust 108 MC Oscillator Trimmer for maximum reading on Output Meter.

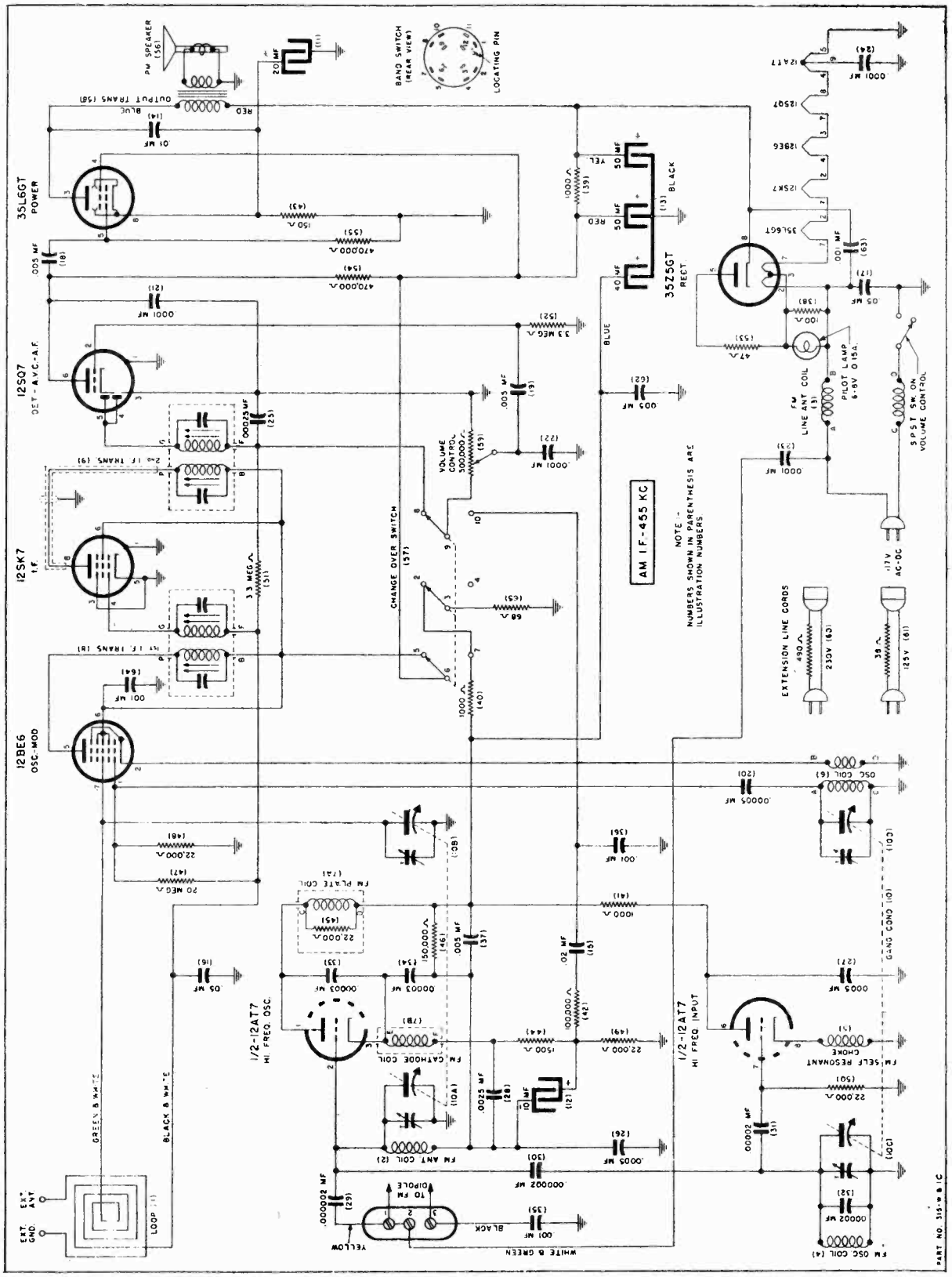
(D) Tune receiver dial and Signal Generator to 105 MC.

(E) Adjust 105 MC Antenna Trimmer for maximum reading on the Output Meter.





MODELS 333-I, 333-W

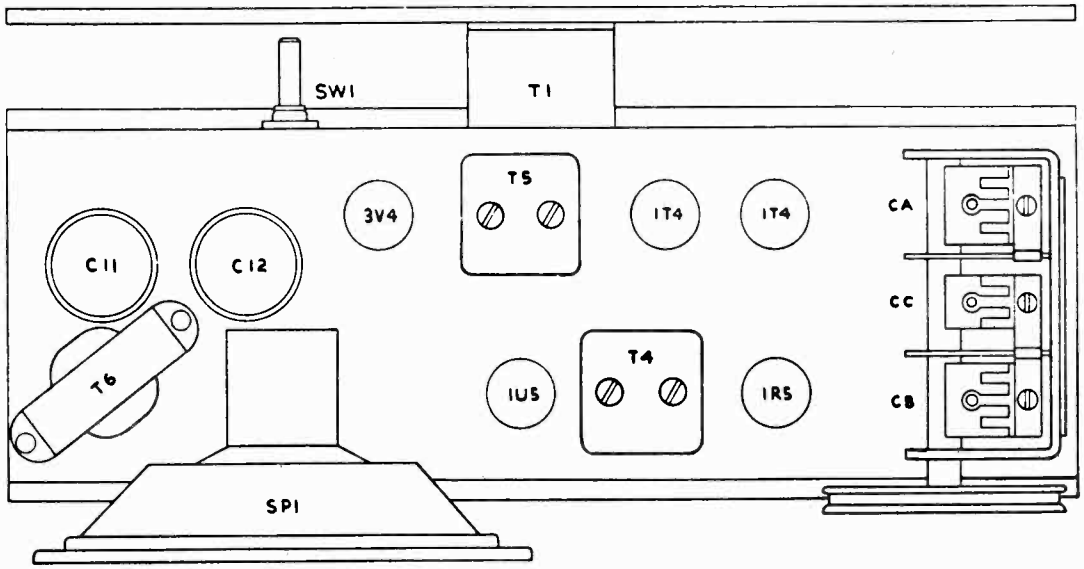


PARTS LIST

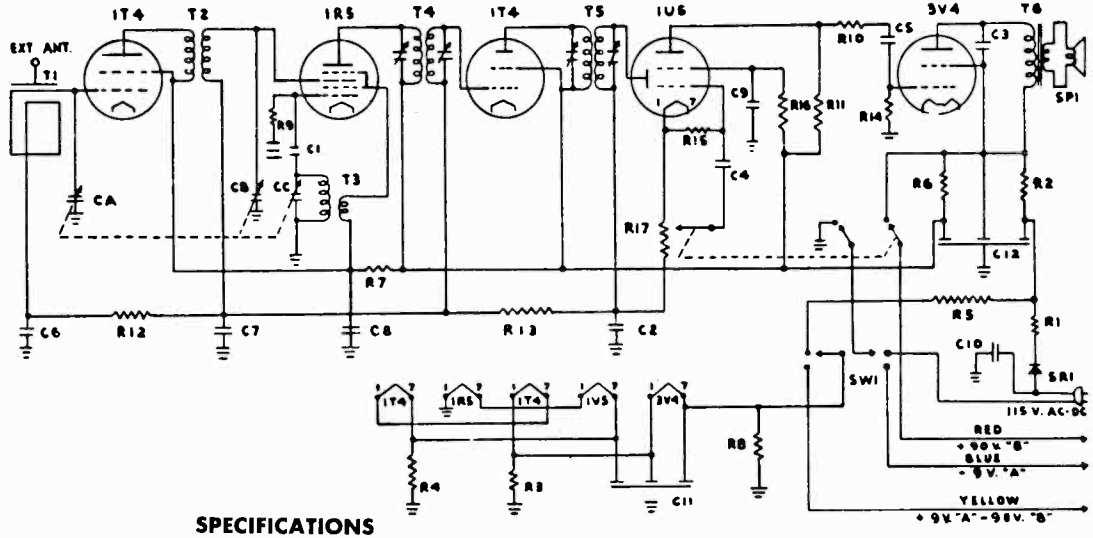
Illus. No.	Part No.	Part Name	Description
1	20E436	Antenna	Loop with Back (Not interchangeable)
2	2E71	Coil	FM Antenna
3	2E69	Coil	FM Line Antenna
4	2E70	Coil	FM Oscillator
5	2E68	Coil	FM Self Resonant Choke
6	20E312	Coil	Oscillator Coil
7	20E313	Coil	FM Plate Cathode
8	20E261	Coil	1st I. F. Transformer
	or		
8	20E307	Coil	1st I. F. Transformer
9	20E261-2	Coil	2nd I. F. Transformer
	or		
9	20E307-2	Coil	2nd I. F. Transformer
10	24E38	Condenser	Tuning, 2 Gang
11	25E3	Condenser	Dry Elect. 20 Mfd. 25 V.
12	25E8	Condenser	Dry Elect. 10 Mfd. 25 V.
13	25E26	Condenser	Dry Elect. 50-50-40 Mfd. 150 V.
14	23E411	Condenser	Tubular, .01 Mfd. 400 V.
15	23E413	Condenser	Tubular, .02 Mfd. 400 V.
16	23E216	Condenser	Tubular, .05 Mfd. 200 V.
17	23E416	Condenser	Tubular, .05 Mfd. 400 V.
18	23E408	Condenser	Tubular, .005 Mfd. 400 V.
19	23E408	Condenser	Tubular, .005 Mfd. 400 V.
20	23E37	Condenser	Mica, .00005 Mfd.
21	23E39	Condenser	Mica, .0001 Mfd.
22	23E39	Condenser	Mica, .0001 Mfd.
23	23E39	Condenser	Mica, .0001 Mfd.
24	23E39	Condenser	Mica, .0001 Mfd.
25	23E42	Condenser	Mica, .00025 Mfd.
26	23E45	Condenser	Mica, .0005 Mfd.
27	23E45	Condenser	Mica, .0005 Mfd.
28	23E53	Condenser	Mica, .0025 Mfd.
29	23E21	Condenser	Ceramic, .000002 Mfd. 500 V.
30	23E21	Condenser	Ceramic, .000002 Mfd. 500 V.
31	23E22	Condenser	Ceramic, .00002 Mfd. 500 V.
32	23E22	Condenser	Ceramic, .00002 Mfd. 500 V.
33	23E23	Condenser	Ceramic, .00003 Mfd. 500 V.
34	23E23	Condenser	Ceramic, .00003 Mfd. 500 V.
35	23E2012	Condenser	Ceramic, .001 Mfd. 350 V.
36	23E2012	Condenser	Ceramic, .001 Mfd. 350 V.
37	23E2012-4	Condenser	Ceramic, .005 Mfd. 350 V.
38	27E101-2	Resistor	Carbon, 100 Ohm 1/2 Watt
39	27E102-3	Resistor	Carbon, 1000 Ohm 1 Watt
40	27E102	Resistor	Carbon, 1000 Ohm 1/3 Watt
41	27E102	Resistor	Carbon, 1000 Ohm 1/3 Watt
42	27E104	Resistor	Carbon, 100,000 Ohm 1/3 Watt
43	27E151	Resistor	Carbon, 150 Ohm 1/3 Watt
44	27E152	Resistor	Carbon, 1500 Ohm 1/3 Watt
45	27E223	Resistor	Carbon, 22,000 Ohm 1/3 Watt
46	27E154	Resistor	Carbon, 150,000 Ohm 1/3 Watt
47	27E206	Resistor	Carbon, 20 Meg Ohm 1/3 Watt
48	27E223	Resistor	Carbon, 22,000 Ohm 1/3 Watt
49	27E223	Resistor	Carbon, 22,000 Ohm 1/3 Watt
50	27E223	Resistor	Carbon, 22,000 Ohm 1/3 Watt
51	27E335	Resistor	Carbon, 3.3 Meg Ohm 1/3 Watt
52	27E335	Resistor	Carbon, 3.3 Meg Ohm 1/3 Watt
53	27E470-2	Resistor	Carbon, 47 Ohm 1/2 Watt
54	27E474	Resistor	Carbon, 470,000 Ohm 1/3 Watt
55	27E474	Resistor	Carbon, 470,000 Ohm 1/3 Watt
56	1E1	Speaker	P.M. 4"x6"
57	29E8	Switch	FM-AM Selector
58	22E8	Transformer	Output
59	28E7	Volume Control	500,000 Ohm
62	23E2012-4	Condenser	Ceramic, .005 Mfd. 350 V.
63	23E2012	Condenser	Fixed Ceramic .001 MF 350 V.
64	23E2012	Condenser	Fixed Ceramic .001 MF 350 V.
65	27E680	Resistor	Carbon, 68 Ohm 1/3 W.

MISCELLANEOUS PARTS

Part No.	Part Name	Description
*7E48-2	Cabinet Back	Back for Cabinet
7E195-2	Cabinet	Walnut Plastic
7E195-9	Cabinet	Ivory Plastic
65E2	Dial Cord Spring	Dial Cord Tension Spring
20E253-16	Dial Cord	Drive Cord
40E1	Dial Light	6-8 Volt .150 Amp. Type No. 47
20E270-5	Dial Shaft Assem.	Drive Shaft Assembly
20E65-4	Dial Back Plate	Backplate Assembly less Calibrated Scale
36E52	Dial Scale	Calibrated Glass Scale
35E8-9	Dial Pointer	Dial Indicator
37E27-11	Knob	Walnut
37E27-36	Knob	Ivory



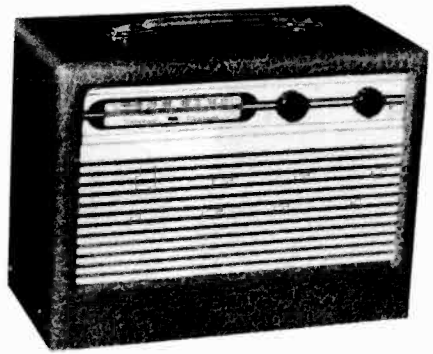
TOP VIEW



CIRCUIT DIAGRAM

SPECIFICATIONS

- Super-het circuit—455 KC I. F.
- Band coverage: 540 KC to 1700 KC.
- Five miniature tubes—plus selenium rectifier 1—1T4 R. F., 1—1R5 Mixer, 1—1T4 I. F., 1—1U5 Det. and 1st audio, 1—3V4 Pr. output (6-tube performance).
- Battery life—approximately 170 hours. Burgess No. F6A60, Eveready No. 753, Ray-O-Vac No. AB994.
- Five-inch P. M. dynamic speaker—1.47 oz. Alnico 5.



MODEL 449

C1 —.0001 MFD. 400 V. CONDENSER
C2 —.0001 MFD. 400 V. CONDENSER
C3 —.006 MFD. 400 V. CONDENSER
C4 —.01 MFD. 400 V. CONDENSER
C5 —.01 MFD. 400 V. CONDENSER
C6 —.05 MFD. 200 V. CONDENSER
C7 —.05 MFD. 200 V. CONDENSER
C8 —.05 MFD. 200 V. CONDENSER
C9 —.05 MFD. 200 V. CONDENSER
C10—.1 MFD. 400 V. CONDENSER
C11—50+50+50 MFD. 150V. COND.
C12—50+50+50 MFD. 150 V. COND.
C A-B-C — 3-GANG. CONDENSER

R1 —100 OHM — 5 W. RESISTOR
R2 —150 OHM — 1/2 W. RESISTOR
R3 —500 OHM — 1/3 W. RESISTOR
R4 —1200 OHM — 1/3 W. RESISTOR
R5 —2000 OHM — 10 W. RESISTOR
R6 —3000 OHM — 1/3 W. RESISTOR
R7 —5000 OHM — 1/3 W. RESISTOR
R8 —25M OHM — 1/3 W. RESISTOR
R9 —100M OHM — 1/3 W. RESISTOR
R10—100M OHM — 1/3 W. RESISTOR
R11—1Meg. OHM — 1/3 W. RESISTOR
R12—2Meg. OHM — 1/3 W. RESISTOR
R13—2Meg. OHM — 1/3 W. RESISTOR
R14—2Meg. OHM — 1/3 W. RESISTOR
R15—5Meg. OHM — 1/3 W. RESISTOR
R16—5Meg. OHM — 1/3 W. RESISTOR
R17—500M OHM POT.—1/3 WITH SWITCH

T1—LOOP ANT.
T2—RF COIL
T3—OSC. COIL
T4—455 KC INPUT I.F. COIL
T5—455 KC OUTPUT I.F. COIL
T6—OUTPUT TRANSFORMER
SW1—2 POLE 2 POS. SWITCH
SP1—5" PM. SPEAKER
SR1—SELENIUM RECTIFIER

ALIGNMENT PROCEDURE

I. F. Alignment 455 KC (Connect to 1R5 Grid) Loop and R. F. Alignment — 1400, 1000 and 600 KC. Dial Pointer Setting—535 KC with fully closed condenser.

MODEL 458RD, Dor-A-fone

The Model 458 Radio Dor-A-fone is a combination radio and communication system. It employs quick heating tubes, making it ready for instant use.

The radio circuit is a straight-forward four-tube superhetrodyne, using the conventional tube lineup; namely, a mixer tube, I. F. tube, detector first audio tube and power output tube. It uses a selenium rectifier which supplies DC voltage to the filaments as well as the plate and screen circuits.

The communication system uses the audio section of the radio in conjunction with a special input transformer and switch. The gain or sensitivity of the communication circuit is fixed at the factory and is not altered by the setting of the volume control located on the front panel.

The extension unit uses a standard 3.2 ohm voice coil speaker housed in a baffle. This extension unit is connected to the master unit by means of a two-conductor cable and the distance between these two units should be sufficient to eliminate feedback, howl, etc. A 50-foot coil of wire is furnished with each unit which is sufficient for many installations. Additional length of wire can be used, but it should be remembered that the sensitivity or volume output of the set will be reduced when too long a wire is used or if the wire is too small which increases the resistance.

Below is pictured the Model 458RD showing the functions of the four push buttons. Figure 2 shows the chassis and tube layout.

Caution, do not change tubes when set is turned on.

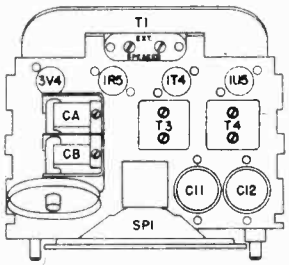


Fig. 2

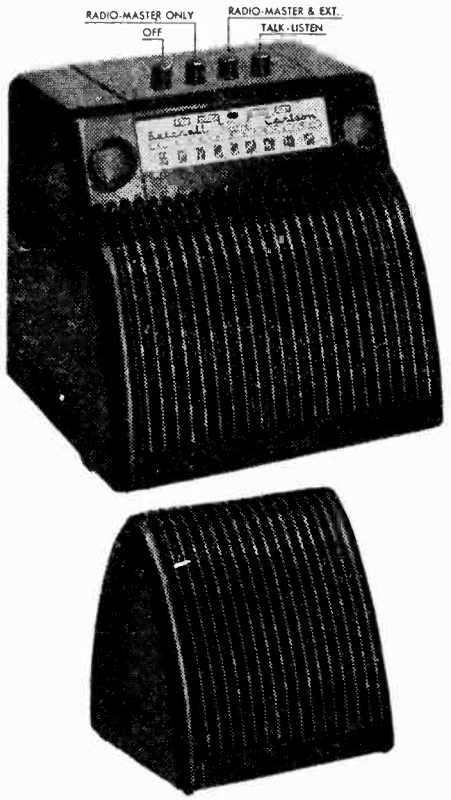
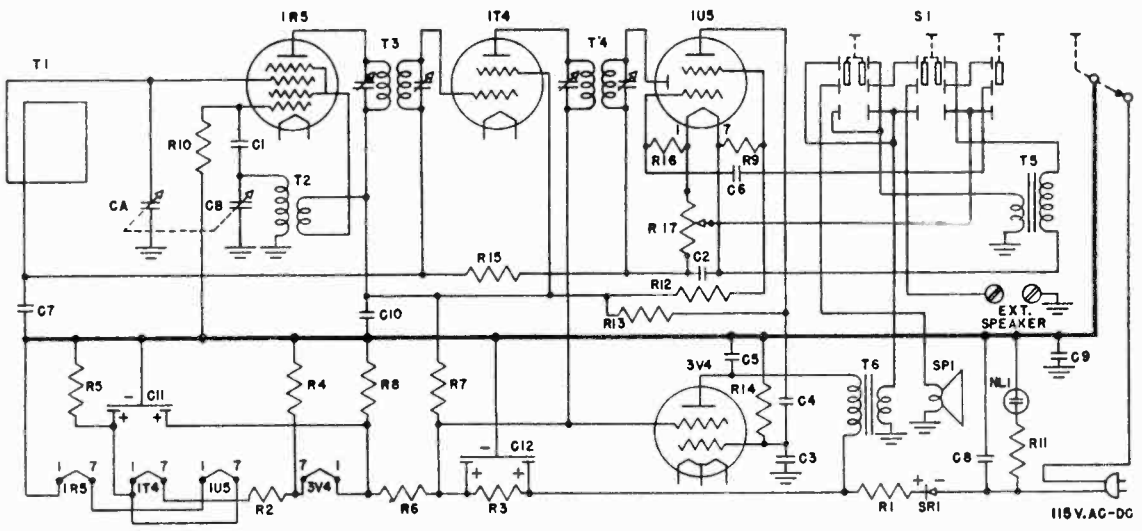


Fig. 1

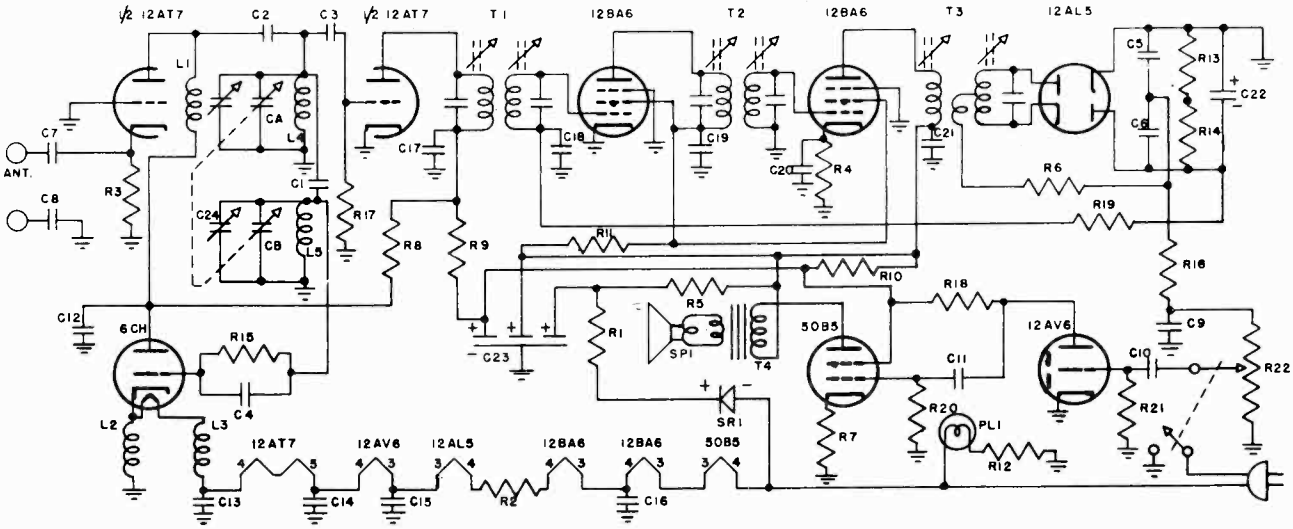


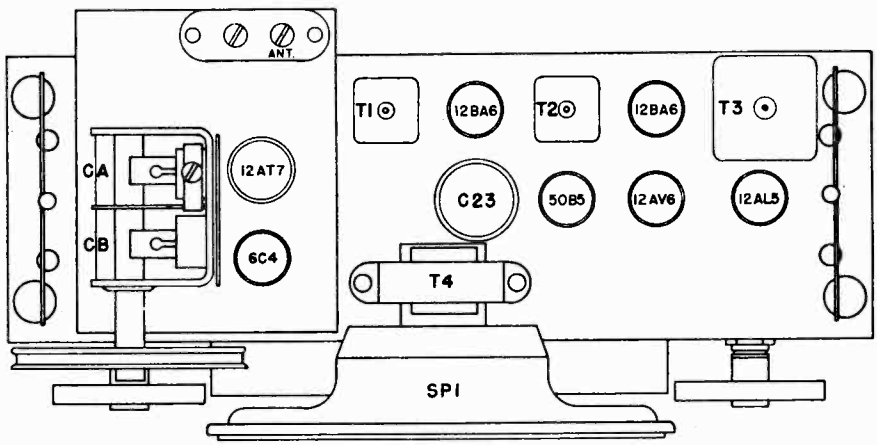
Circuit Diagram

PARTS

R 1— 15 Ohms ½ Watt Resistor
R 2— 24 Ohms ½ Watt Resistor
R 3— 500 Ohms 5 Watt Resistor
R 4— 500 Ohms ⅓ Watt Resistor
R 5— 1200 Ohms ⅓ Watt Resistor
R 6— 2000 Ohms 10 Watt Resistor
R 7— 5000 Ohms ⅓ Watt Resistor
R 8— 25M Ohms ⅓ Watt Resistor
R 9—100M Ohms ⅓ Watt Resistor
R 10—100M Ohms ⅓ Watt Resistor
R 11—100M Ohms ⅓ Watt Resistor
R 12—200M Ohms ⅓ Watt Resistor
R 13—500M Ohms ⅓ Watt Resistor
R 14—2MEG Ohms ⅓ Watt Resistor
R 15—5MEG Ohms ⅓ Watt Resistor
R 16—5MEG Ohms ⅓ Watt Resistor
R 17—500M Ohms Pot. Resistor
C 1—.0001 Mfd. 400 V. Condenser
C 2—.0001 Mfd. 400 V. Condenser
C 3—.0001 Mfd. 400 V. Condenser
C 4—.004 Mfd. 400 V. Condenser
C 5—.004 Mfd. 400 V. Condenser
C 6—.004 Mfd. 400 V. Condenser
C 7—.05 Mfd. 200 V. Condenser
C 8—.05 Mfd. 400 V. Condenser
C 9—.1 Mfd. 400 V. Condenser
C 10—.25 Mfd. 200 V. Condenser
C 11—75+75 Mfd. 150 V. Condenser
C 12—75+75 Mfd. 150 V. Condenser
C A and B Gang Condenser
T 1—Loop Antenna
T 2—Osc. Coil 458C
T 3—Input IF Coil 621
T 4—Output IF Coil 622
T 5—Input Trans. N458
T 6—Output Trans. 0458
S 1—Push Button Switch
SP 1—5 Inch PM Speaker
SR 1—Selenium Rect.
NL 1—Neon Lamp G. E. NE2

MODEL 469





R 1— 15 ohm ½ W. Resistor
R 2— 50 ohm 2 W.W.W. "
R 3— 60 ohm 2 W.W.W. "
R 4— 68 ohm ½ W. "
R 5— 100 ohm 5 W. "
R 6— 180 ohm ½ W. "
R 7— 180 ohm ½ W. "
R 8— 500 ohm ½ W. "
R 9— 500 ohm ½ W. "
R10— 500 ohm ½ W. "
R11—1200 ohm ½ W. "
R12— 2M ohm 10 W. "
R13—6800 ohm ½ W. "
R14—6800 ohm ½ W. "
R15—50M ohm ½ W. "
R16—25M ohm ½ W. "
R17—500M ohm ½ W. "
R18—500M ohm ½ W. "
R19—500M ohm ½ W. "
R20—1 Megohm ½ W. "
R21—5 Megohm ½ W. "
R22—500M ohm Pot. with switch

L1—2 UH Choke
L2—2 UH "
L3—2 UH "
L4—RF Coil
L5—Oscillator Coil

T1—10.7MC 1. F. Transformer
T2—10.7 MC 1. F. "
T3—10.7 Ratio Detector Transformer
T4—Audio O. P. Transformer

C 1— 1.5 mmf. 400 V. Condenser
C 2—100 mmf. 400 V. Ceramic Cond.
C 3—100 mmf. 400 V. " "
C 4—100 mmf. 400 V. " "
C 5—100 mmf. 400 V. " "
C 6—100 mmf. 400 V. " "
C 7—500 mmf. 400 V. Mica "
C 8—500 mmf. 400 V. " "
C 9— .002 mf. 400 V. Paper "
C10— .004 mf. 400 V. " "
C11— .01 mf. 400 V. " "
C12— .01 mf. 400 V. Ceramic Disc Cond
C13— .01 mf. 400 V. " " "
C14— .01 mf. 400 V. " " "
C15— .01 mf. 400 V. " " "
C16— .01 mf. 400 V. " " "
C17— .01 mf. 400 V. " " "
C18— .01 mf. 400 V. " " "
C19— .01 mf. 400 V. " " "
C20— .01 mf. 400 V. " " "
C21— .01 mf. 400 V. " " "
C22— 4 mf. 50 V. Electrolytic "
C23— 50+50+50 mfd. 150 V. " "
CA&B—Gang Condenser

C24—Ceramic Trimmer

SP1—6-inch P. M. Speaker
PL1—120 V.—6 W. Pilot Lamp
SR1—Selenium Rectifier

To align I. F.'s, connect standard R. F. oscillator—unmodulated—direct to antenna and grd. posts. Set oscillator at 10.7 M. C. Connect negative terminal of 0-1 Milliameter in series with a 5000 ohm resistor to junction point of Resistors R13 and R14. Connect positive terminal of meter in series with 5000 ohm resistor to chassis. Adjust all coils—except top of Ratio Detector Coil T3—to highest meter reading. (AVC Voltage)

For top adjustment of Radio Detector Coil (T3), connect positive meter terminal, in series with a 5000 ohm resistor, to junction point of Resistors R6 and R16 and leave negative meter connection as is. Adjust or balance for Zero Voltage.

Adjust gang trimmers for calibration and maximum sensitivity to F. M. oscillator or F. M. station.

MODEL 4182

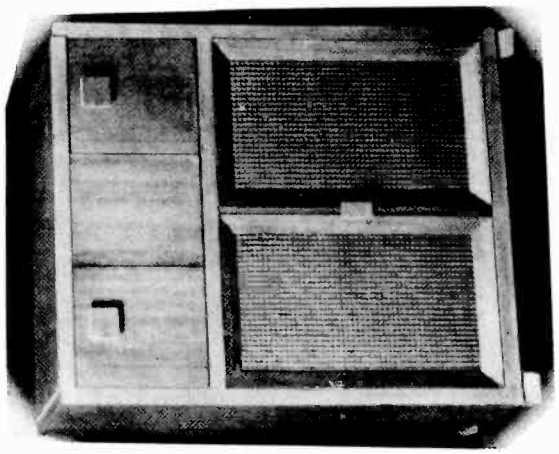
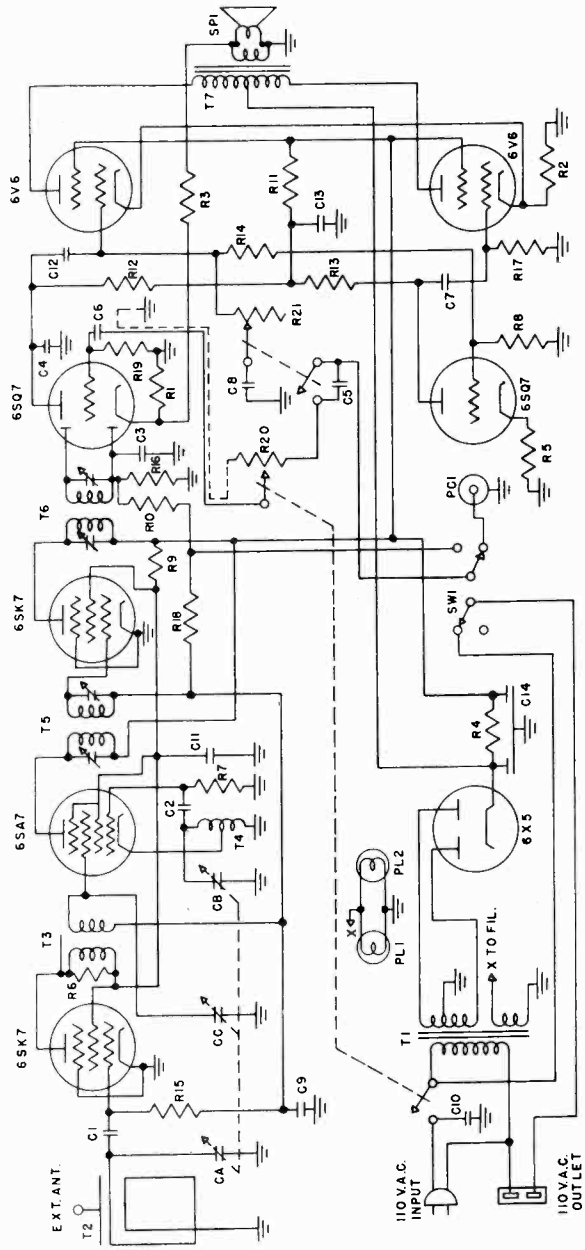


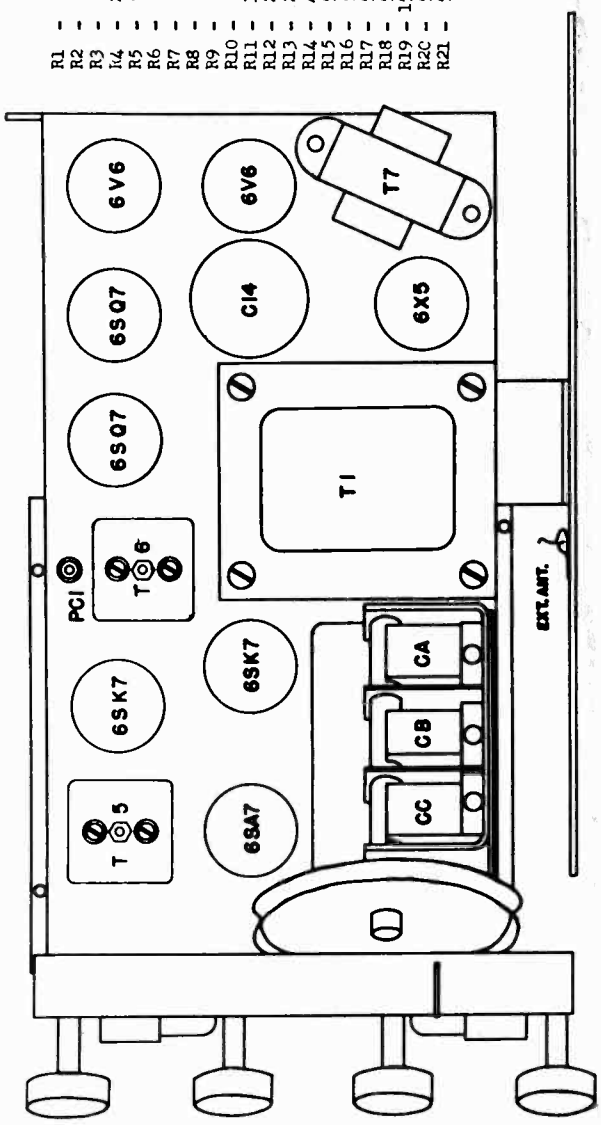
TABLE OF PARTS RADIO RECEIVER MODEL 4182

R1	-	25 Ohm	1/3 Watt	Resistor	
R2	-	360	" 2	"	"
R3	-	500	" 1/3	"	"
R4	-	2000	" 10	"	"
R5	-	5000	" 1/3	"	"
R6	-	25M	" 1/3	"	"
R7	-	25M	" 1/3	"	"
R8	-	25M	" 1/3		
R9	-	50M	" 1	"	"
R10	-	50M	" 1	"	"
R11	-	100M	" 1	"	"
R12	-	200M	" 1	"	"
R13	-	200M	" 1	"	"
R14	-	47CM	" 1	"	"
R15	-	50CM	" 1	"	"
R16	-	50CM	" 1	"	"
R17	-	50CM	" 1	"	"
R18	-	5 Meg.	" 1	"	"
R19	-	15 Meg	" 1	"	"
R20	-	50CM	"	Audio Taper Pot.	
R21	-	50CM	"	Reverse Taper Pot.	

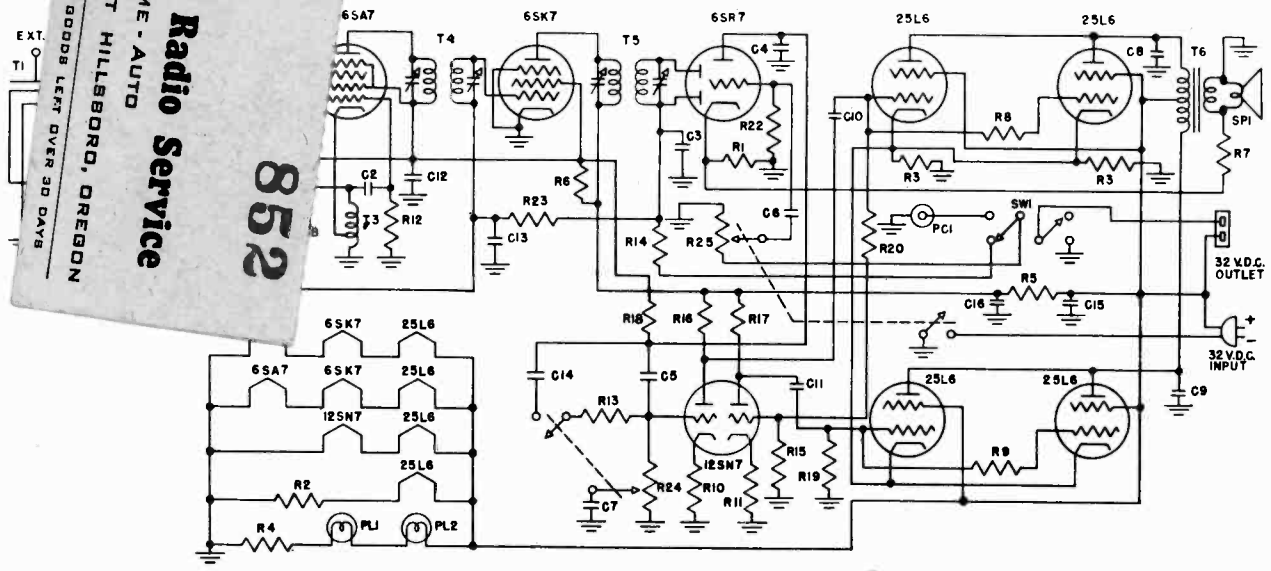
C1	-	.0001	Mfd.	400	Volt Condenser
C2	-	.0001	"	400	" "
C3	-	.0001	"	400	" "
C4	-	.0001	"	400	" "
C5	-	.0005	"	400	" "
C6	-	.01	"	400	" "
C7	-	.01	"	400	" "
C8	-	.02	"	400	" "
C9	-	.05	"	200	" "
C10	-	.05	"	400	" "
C11	-	.1	"	400	" "
C12	-	.1	"	400	" "
C13	-	.1	"	400	" "
C14	-	20 + 20	Mfd.	475	"
C-AB&C		Gang Condenser			

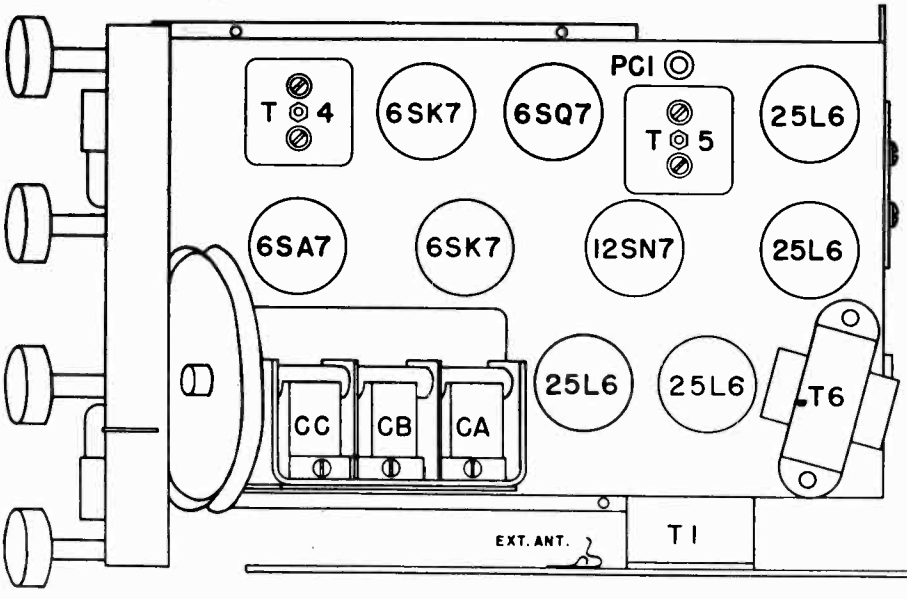
T1	-	Power Transformer P-4182
T2	-	Loop Antenna
T3	-	R. F. Coil
T4	-	Oscillator Coil
T5	-	Input I. F. Coil
T6	-	Output I. F. Coil
T7	-	Output Transformer O-4182
SW1	-	2-Pole 2-Position Switch
PL1	-	#44 or #47 Pilot Lamp
PL2	-	#44 or #47 Pilot Lamp
PC1	-	Phono Connector
SP1	-	10-inch P. M. Speaker





MODEL 4382





MODEL 32-110 32 VOLT CONVERTER

C1 - .02 Mfd. 400 Volt Condenser
C2 - .25 " 200 " "
C3 - .25 " 200 " "
C4 - .25 " 200 " "
C5 - 4 " 330 " AC "
S1 - Vibrator Socket
Use A.T.R., 3210 or equivalent
T1 - Power Transformer P32-110
L1 - #20 Wire A Choke

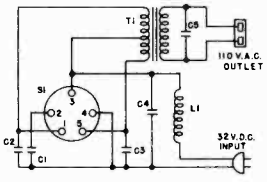
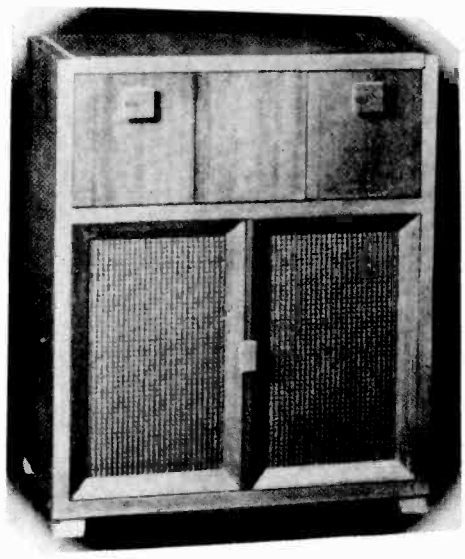


TABLE OF PARTS MODEL 4382 — 32 VOLT RADIO RECEIVER

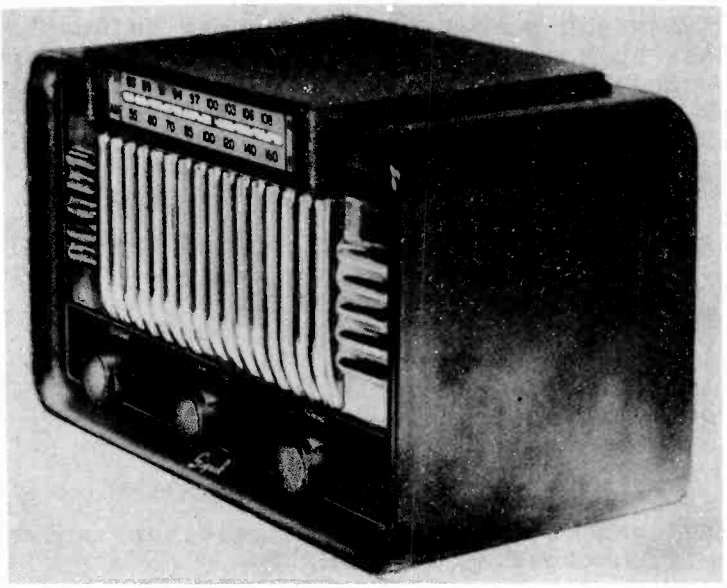
R1	-	24	Ohm	1/2	Watt	Resistor
R2	-	50	"	10	"	"
R3	-	150	"	1/2	"	"
R4	-	175	"	5	"	"
R5	-	500	"	1/3	"	"
R6	-	500	"	1/3	"	"
R7	-	1500	"	1/3	"	"
R8	-	5M	"	1/3	"	"
R9	-	5M	"	1/3	"	"
R10	-	8M	"	1/3	"	"
R11	-	8M	"	1/3	"	"
R12	-	25M	"	1/3	"	"
R13	-	50M	"	1/3	"	"
R14	-	50M	"	1/3	"	"
R15	-	50M	"	1/3	"	"
R16	-	100M	"	1/3	"	"
R17	-	100M	"	1/3	"	"
R18	-	200M	"	1/3	"	"
R19	-	200M	"	1/3	"	"
R20	-	200M	"	1/3	"	"
R21	-	500M	"	1/3	"	"
R22	-	1 Meg	"	1/3	"	"
R23	-	5 Meg	"	1/3	"	"
R24	-	500M	"	Reverse Taper Pot.		
R25	-	500M	"	Audio Taper Pot.		

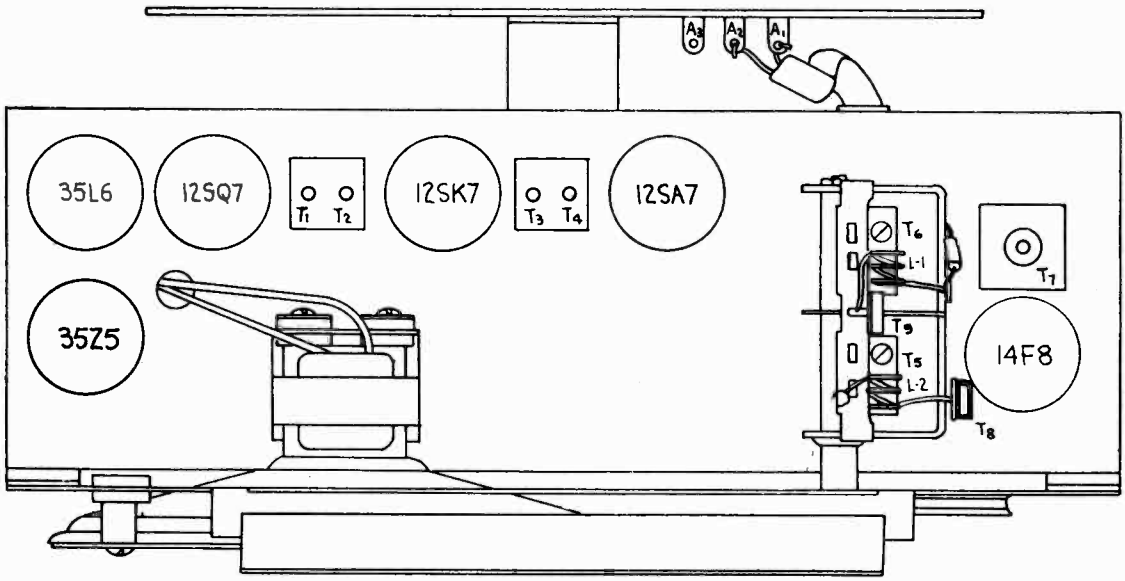
C1	-	.0001	Mfd.	400	Volt	Condenser
C2	-	.0001	"	400	"	"
C3	-	.0001	"	400	"	"
C4	-	.0001	"	400	"	"
C5	-	.00025	"	400	"	"
C6	-	.01	"	400	"	"
C7	-	.01	"	400	"	"
C8	-	.01	"	400	"	"
C9	-	.01	"	400	"	"
C10	-	.02	"	400	"	"
C11	-	.02	"	400	"	"
C12	-	.05	"	200	"	"
C13	-	.05	"	200	"	"
C14	-	.1	"	400	"	"
C15	-	.25	"	200	"	"
C16	-	50	"	150	"	"

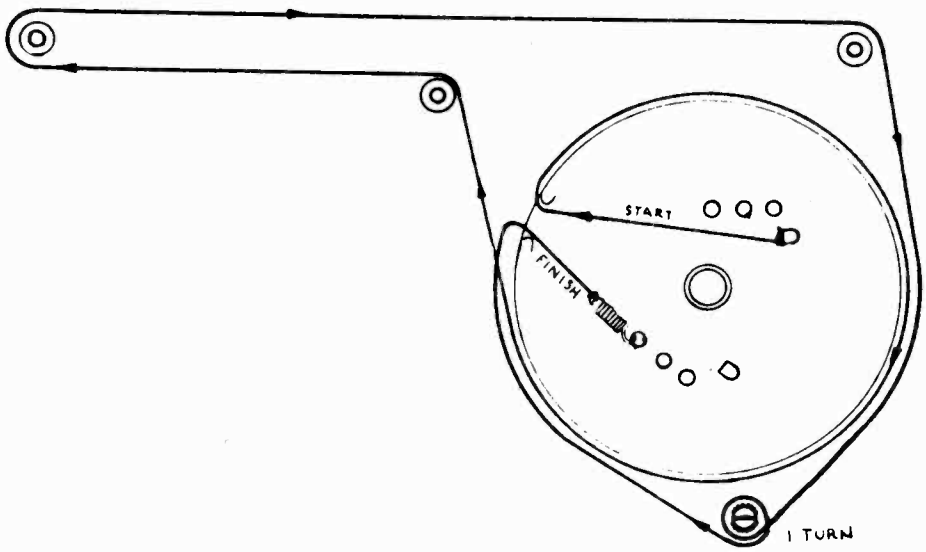
C A, B&C Gang Condenser
T1 - Loop Antenna
T2 - R. F. Coil
T3 - Oscillator Coil
T4 - Input I. F. Coil
T5 - Output I. F. Coil
T6 - Output Transformer
SP1- 10" P.M. 1" V. C. Speaker
PL1- #47 Pilot Lamp
PL2- #47 Pilot Lamp
SW1- 2-Pole 2-Position Switch
PC1- Phono Connector



MODEL AF252







MODEL AF252

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open resistors or shorted condensers, etc. DO NOT ATTEMPT TO REALIGN THIS RECEIVER UNTIL ALL OTHER POSSIBLE SOURCES OF TROUBLE HAVE BEEN FIRST THOROUGHLY INVESTIGATED AND DEFINITELY PROVED NOT TO BE THE CAUSE.

EQUIPMENT NECESSARY

ALIGNMENT PROCEDURE

1. Signal generator-accurately calibrated that will cover the following frequencies:
   AM BAND - 455 KC, 1400 KC, 1620 KC.
   FM BAND - 21.75 MC, 88 MC, 103 MC, 108 MC.

2. Output indicator; to be connected across the voice coil or primary of the output transformer.

BROADCAST BAND ALIGNMENT - (AM)

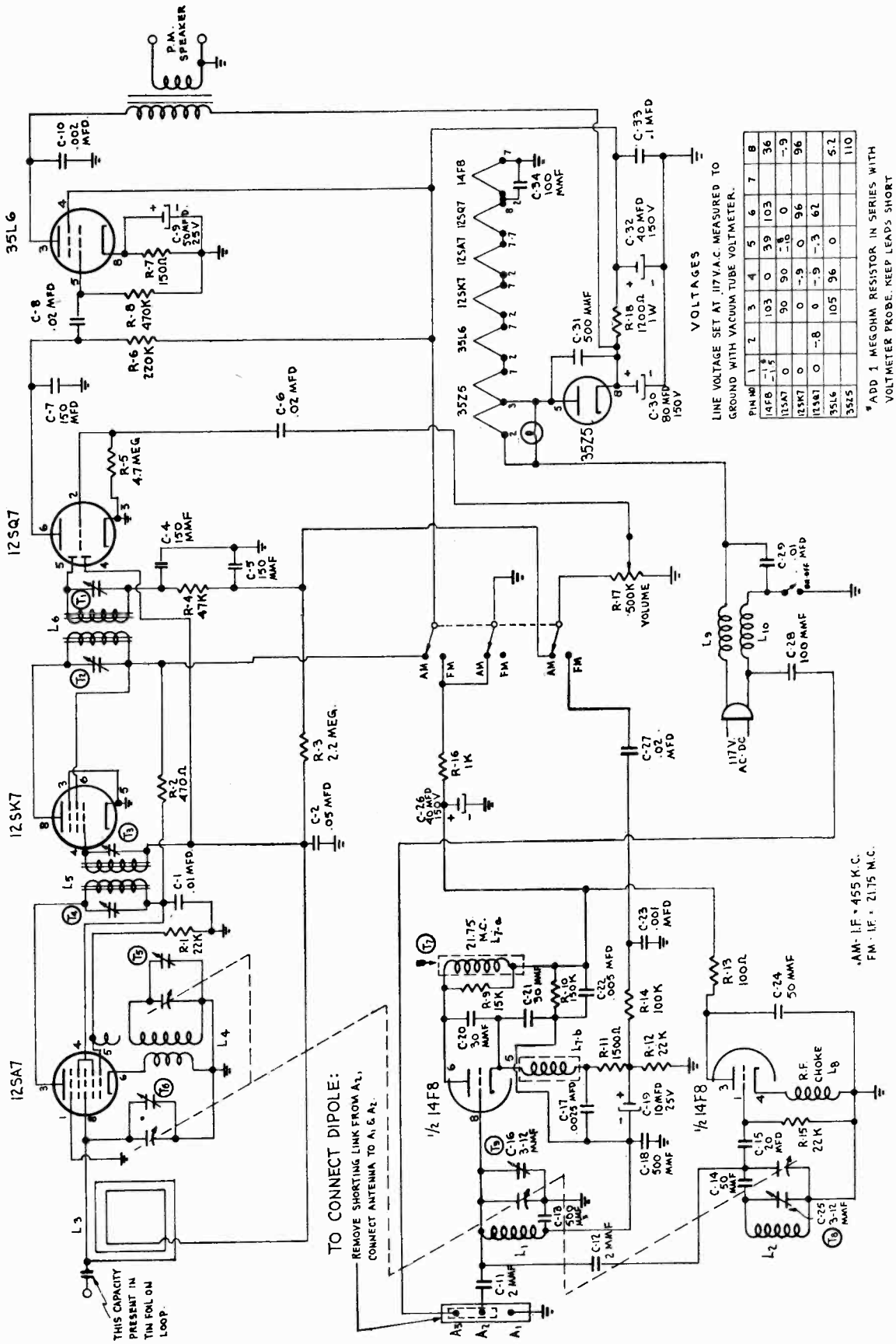
1. Set signal generator at 455 KC. Receiver variable condenser plates completely unmeshed.
2. Connect generator to grid of convertor tube through a .1 mfd. condenser.
3. Adjust trimmers T1, T2, T3, and T4 in order for maximum output.
4. Connect generator to external antenna lead on loop.
5. Set generator at 1620 KC. Receiver variable condenser completely unmeshed.
6. Adjust oscillator trimmer T5 for maximum output.
7. Set generator and receiver at 1400 KC.
8. Adjust RF trimmer T6 for maximum output.

FREQUENCY MODULATION BAND ALIGNMENT (FM)

NOTES:- The average noise output of this receiver, when no FM signal is present is approximately 150 milliwatts in 3.2 ohms (4 volts across 3.2 ohms). The output meter range should be set accordingly.

1. Set generator at 21.75 MC, with modulation off.
2. Couple generator to RF grid (pin #8) of 14F8 through a 2 mmfd. condenser.
3. Adjust T7 on IF can for minimum output.
4. Remove jumper between terminals A2 and A3 on loop and connect generator to terminals A1 and A2 through a 300 ohm resistor, ground lead of generator to A1.
5. Set RF trimmer T9 to 1/2 capacity, (lettering on the trimmer should be at right angles to its length.)
6. Turn receiver dial to the market on the extreme right side of the dial back. This corresponds to 108 mc.
7. Set generator at 108 mc.
8. Adjust oscillator trimmer T8 for minimum output.
9. Set generator at 88 mc.
10. Set receiver dial to second marker from the extreme left side of the dial back. This corresponds to 88 mc.
11. Adjust oscillator coil for minimum output. Squeeze turns together to bring frequency lower, separate turns to bring frequency higher. Care must be exercised in this adjustment as a slight movement of the turns of the coil will change the frequency of the oscillator a few magacycles. Make certain that the turns do not touch each other.
12. Repeat steps 6 to 11 inclusive as the adjustment at 88 mc. will affect the adjustment at 108 mc and vice versa.
13. Set generator at 103 mc.
14. Tune receiver to 103 mc.
15. Adjust RF trimmer T9 for minimum output while rocking the variable condenser.

MODEL AF252

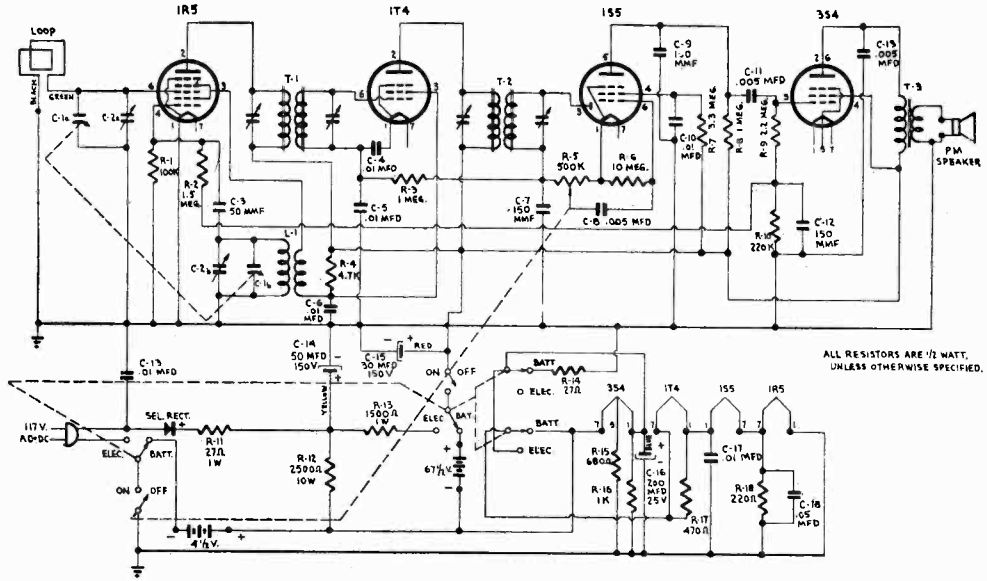


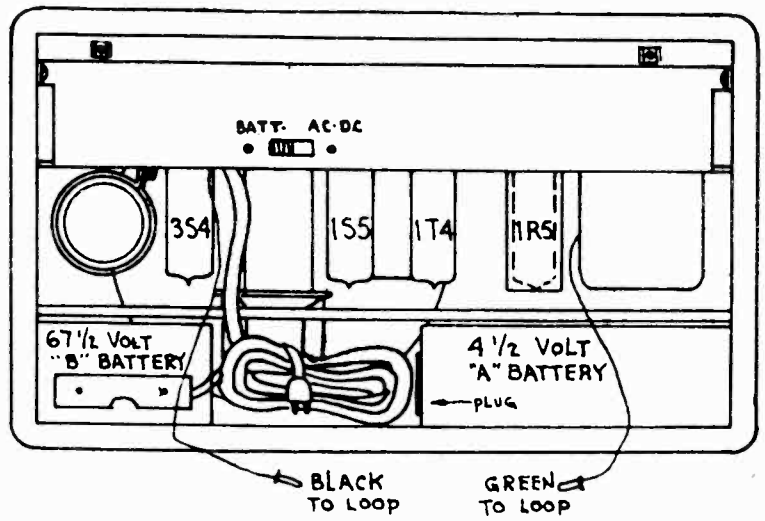
VOLTAGES

LINE VOLTAGE SET AT 117 V.A.C. MEASURED TO GROUND WITH VACUUM TUBE VOLTMETER.

PIN NO	1	2	3	4	5	6	7	8
14F8	-1.5	-1.5	103	0	39	103		36
12SA7	0		90	90	-8	0		-9
12SK7	0		0	-9	0	96		96
12SQ7	0	-8	0	-9	-3	62		
35L6			105	96	0			5.2
3525								110

*ADD 1 MEGOHM RESISTOR IN SERIES WITH VOLTMETER PROBE. KEEP LEADS SHORT

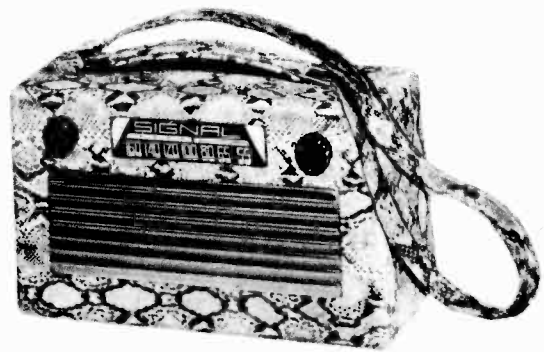




Voltage Measurements

1. All measurements with respect to pin #1 of each tube.
2. Line E set at 117 V AC.
3. Battery E -"A"=4.4V "B"=65volts.
4. B+ at rectifier after 27Ω resistor=132 volts.
5. A volts at pin 7 of 3S4 with respect to ground = 7.4 volts.

	E P		E S G		E G I		E F	
	Batt	Elec	Batt	Elec	Batt	Elec	Batt	Elec
1R5	70	91	55	75	-10 -14	-15 -20	1.6	1.7
1T4	65	91	50	75	-.5	-.6	1.4	1.4
1S5	12	14	15	18	-1.5	-1.7	1.4	1.55
3S4	57	82	65	100	-2.7 -3.2	-6.5 -7.2	2.8	2.8



In later productions of this model, C16, the 200 μμf. capacitor is connected to pin 7 of the 3S4 output tube instead of to pin 1.

MODELS 121, 1058, 1059, 1060, 1061, 1064, 1072 Ch. 8L9, 8L9A

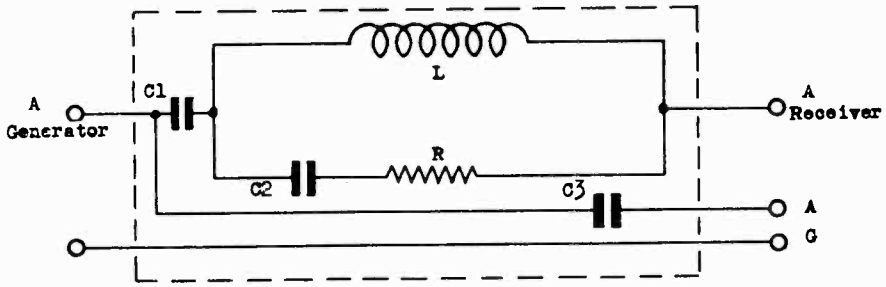
MODELS 122, 141, 142, 1071MGP, 1072MGP; Ch. 8L9A

STEP BY STEP ALIGNMENT PROCEDURE

OPERATION	ALIGNMENT OF	GENERATOR CONNECTED TO	DUMMY ANT.	GENERATOR FREQUENCY	BAND SWITCH SETTING	TUNING COND. SETTING	TRIMMER	REMARKS
1.	Set dial pointer even with left-hand stop line with condenser gang closed.							
2.	Connect output meter across speaker terminals.							
3.	A.M. - I.F.	Pin #7 of 6BE6 Conv. Tube	.02 MFD. Cond.	456 KC.	A.M.	Open	T4 Sec. Slug	Max. Reading
							T4 Pri. Slug	Max. Reading
							T2 Sec. Slug	Max. Reading
							T2 Pri. Slug	Max. Reading
4.	Repeat operation #3.							
5.	A.M. - R.F.	A.M. Ant. On Cabinet	*	1500 KC.	A.M.	1500 KC.	C2B Osc. Tri.	Peak Accurately
6.				1500 KC.		1500 KC.	C2D Ant. Tri.	Peak Accurately
7.	Repeat operations #5 and #6.							
8.	Check Calibrations at 600, 1000 and 1500 KC.							
9.	SPECIAL NOTE: For complete F.M. - I.F. Visual alignment instructions please refer to pages 4, 5, 6, 7, 8 and 9 of this bulletin.							
10.	F.M. - I.F. Alignment using an A.M. Generator and Output Meter.							
11.	T5 F.M. Ratio Det.	Pin #1 of 2nd 6BA6 Tube	.02 MFD. Cond.	10.7 MC.	F.M.	Open	T5 Sec. Slug	Max. Reading
							T5 Pri. Slug	Max. Reading
12.	NOTE: Operations 11, 13, 14, 15, 18 and 19 must be made with generator output as low as possible, consistent with a usable output meter reading.							
13.	T3 2nd F.M. - I.F.	Pin #1 1st 6AB6 Tube	.02 MFD. Cond.	10.7 MC.	F.M.	Open	T3 Sec. Slug	Max. Reading
							T3 Pri. Slug	Max. Reading
14.	T1 1st F.M. - I.F.	Pin #8 on 7F8 Conv. Tube	.02 MFD. Cond.	10.7 MC.	F.M.	Open	T1 Sec. Slug	Max. Reading
							T1 Pri. Slug	Max. Reading
15.	Adjust secondary slug on T5 ratio detector transformer to minimum deflection or dip on output meter. Under certain conditions it is possible to adjust T5 sec. slug to minimum noise with the receiver tuned to a weak station. This operation is very critical and the receiver must be tuned to the center response only.							
16.	F.M. - R.F. alignment using an A.M. generator with frequencies of 88 to 108 MC. and a vacuum tube voltmeter, or D.C. voltmeter. (20,000 OHMS per volt).							
17.	Place meter across C32 elect. condenser. (Meter reading approx. 1 volt.)							
18.	F.M. - R.F.	F.M. Ant.	Match Gen. to 300 OHMS	106 MC.	F.M.	106MC.	C39 Osc. Tri.	Max. A.V.C.V.
							C2C Ant. Tri.	Peak Accurately
19.	Check calibration at 88 MC.							

* Use standard dummy antenna

DUMMY ANTENNA



C1 - 200 mmf. Condenser 400 V.D.C.
C2 - 400 mmf. Condenser 400 V.D.C.
C3 - .02 mmf. Condenser 400 V.D.C.
R - 100 Ohms Resistor 1/4 Watt
L - Choke Coil

----Case Shield
Choke Coil Specification
Tubing - 3/8" Diameter Bakelite
Wire - No. 38 Enameled
Turns - 59 closely wound (Impregnated)

NOTE: When using this dummy antenna the generator output impedance should be 10 ohms or lower.

CHASSIS 8L9, 8L9A

VOLTAGE CHART

Line Voltage: 117 Volts AC — Position of volume control: Full with set tuned to quiet channel. Position of Band Switch: B.C. - A.M. ***

TUBE	FUNCTION	Voltage of Sockets Prongs to Ground See Prong Nos. on Schematic.								
		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
6BE6	A.M. Conv. & F.M. Osc.	-5.2	0	6.3*	0	100	100	-0.5		
6BA6	I.F. Amp.	-0.2	0	6.3*	0	225	100	1.0		
6AT6	A.M. Det., AVC. & 1st Audio	-0.8	0	6.3*	0	-0.3	-0.3	60		
6BA6	Ratio Det. Driver ***	-0.2	0	6.3*	0	80	80	1.2		
6AL5	Ratio Detector ***	**	-0.3	6.3*	0	0	0	**		
6V6	Power Amplifier	0	6.4*		240	0	110	0	14	
5V3G	Rectifier	0	270	0	257*	0	257*	0	270	
7F8	F.M. - R.F. Mixer ***	**	0	105	0	0	100	6.3*	-0.25	
12AT7	F.M. - R.F. Mixer ***	100	-.25	0	0	0	105	0	0	6.3*

NOTES: Voltage readings are for schematic diagram in this bulletin. Allow 15% + or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 20,000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter.

* AC Volts

** Cannot be measured with 20,000 Ohms per volt voltmeter.

*** Band switch on F.M.

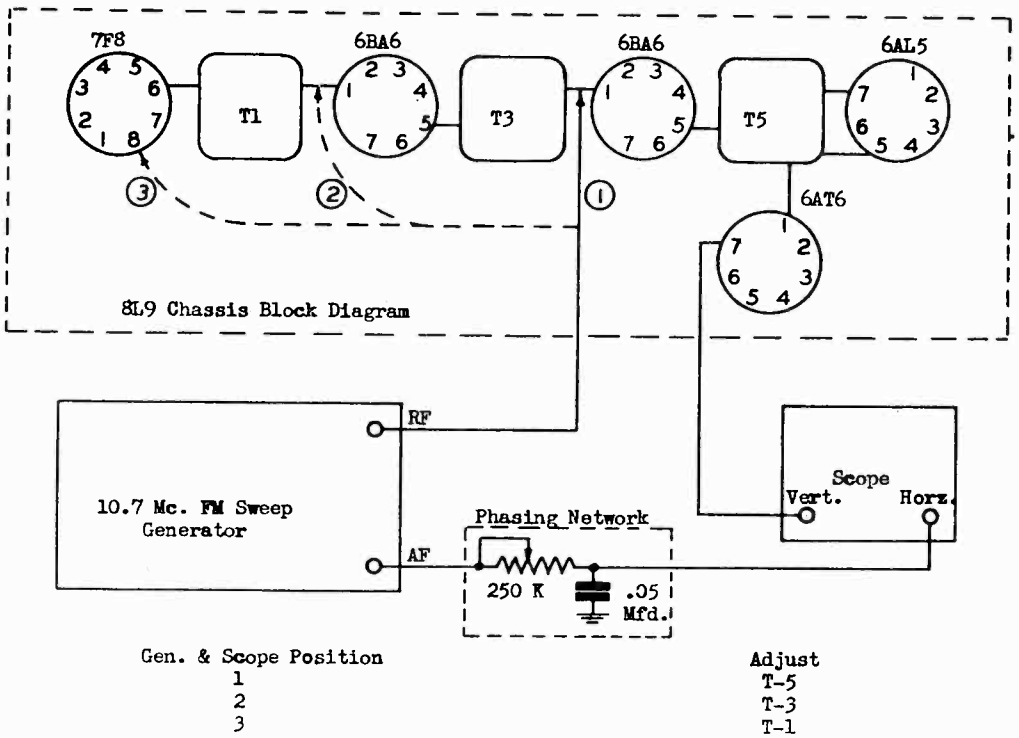
SPECIAL NOTE: F.M. - R.F. mixer may be either 7F8 or 12AT7 tubes.

VISUAL I. F.-F. M. ALIGNMENT DATA

WARNING: Do not proceed with any of the following alignment instructions unless it is certain that the AM-IF is in accurate alignment. If not, align the AM-IF system according to the step by step alignment procedure.

1. DESCRIPTION OF CIRCUIT USED:

A 6AL5 is employed as a ratio detector. This tube is preceeded by a 6BA6 ratio detector driver and a stage of amplification at 10.7 Mc. also utilizing a 6BA6 tube. The 2nd section of the 7F8 tube is used as the FM mixer. All IF coupling uses individual slug tuned transformers.

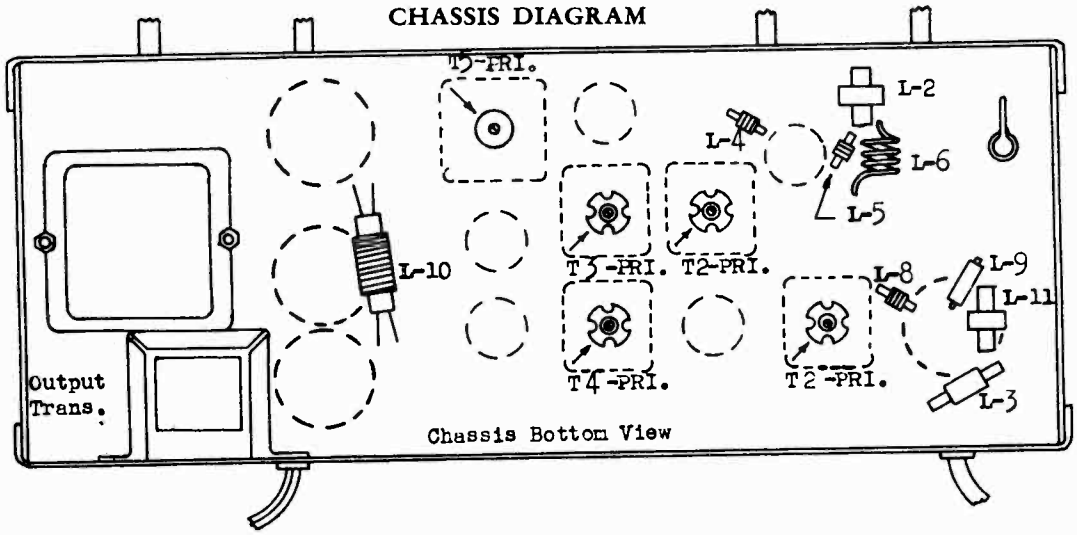


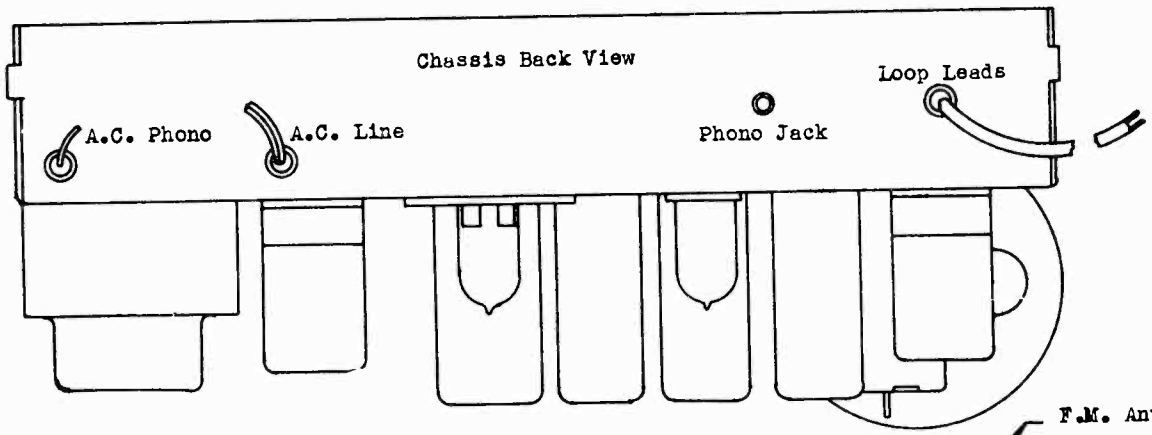
Gen. & Scope Position	Adjust
1	T-5
2	T-3
3	T-1

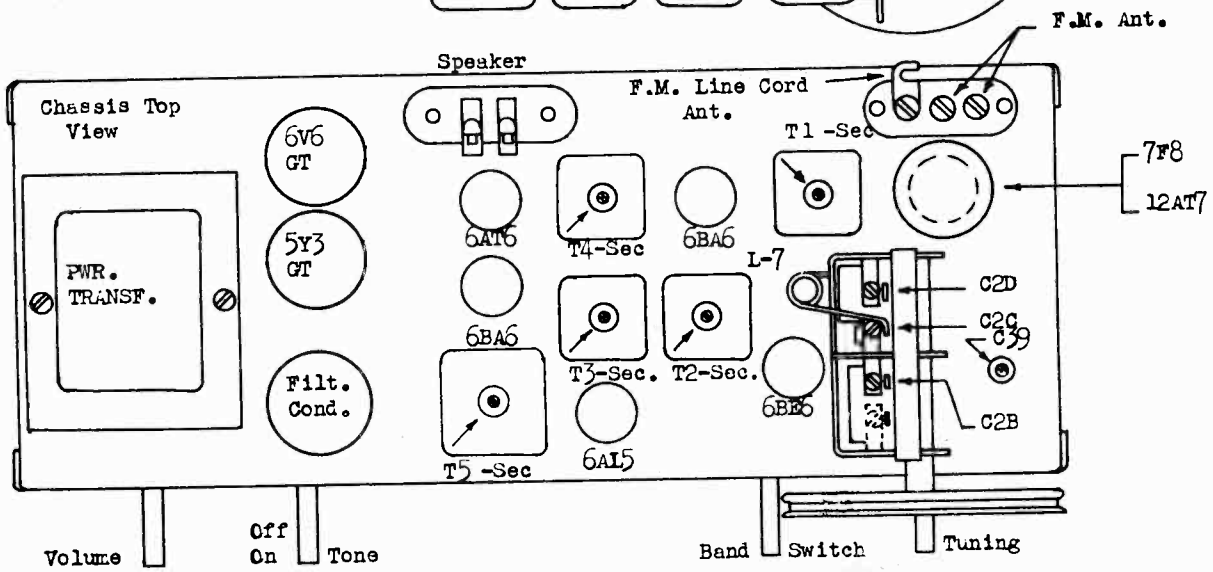
2. THEORY OF VISUAL ALIGNMENT.

One of the characteristics of a tuned circuit is the fact that when it is excited or driven by a generator such as a vacuum tube or another tuned circuit, the voltage developed across it will vary with slight changes in frequency. This voltage will be greatest when the frequency is equal to the resonant frequency of the circuit and will be less if the frequency is higher or lower than the resonant frequency.

CHASSIS DIAGRAM



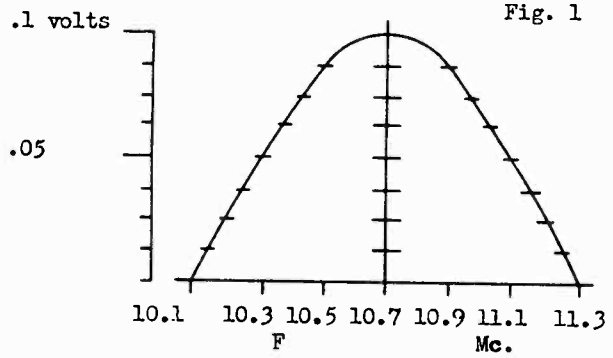


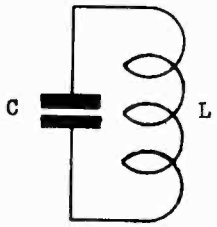


VISUAL I. F.-F. M. ALIGNMENT DATA

Thus if we were to shift the frequency from high to low or low to high across the resonant frequency and make a record of the voltage across the tuned circuit, we could plot the voltage against frequency and obtain a curve which might look like Fig. 1.

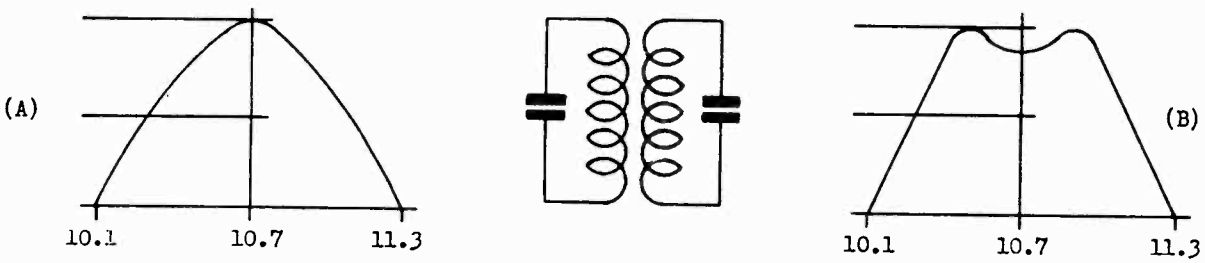
Fig. 1





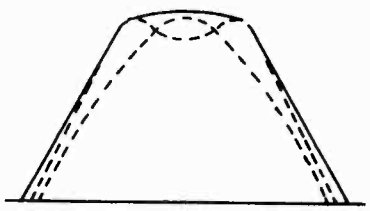
This is the selectivity curve or response curve for the circuit under discussion. This type of circuit may be aligned or adjusted to resonance by simply changing either L or C until maximum voltage is obtained at the resonant frequency. Now if another circuit tuned to the same resonant frequency is coupled to the simple case above, a number of things can happen. First current flowing in one circuit will induce current in the second circuit, the magnitude of this current depending on the degree or amount of coupling between the two circuits. This coupling may be in the form of mutual inductance, mutual capacitance or any impedance common to the two circuits. Now if we repeat the proceedure outlined for obtaining the response curve of a single tuned circuit using the voltage developed across the secondary of the coupled circuit while driving the primary, we may get either of two types of curves depending on the magnitude of the coupling, (a) in Fig. 2 is a typical curve for two circuits coupled below critical coupling and (b) is a representation of the curve for an over coupled circuit.

Fig. 2



Overcoupled circuits producing a response curve like (b) Fig. 2 are often employed where it is important that the response curve remain approximately flat over a narrow band of frequencies near the resonant frequency. They are also frequently combined with single peaked circuits to produce a response curve like Fig. 3.

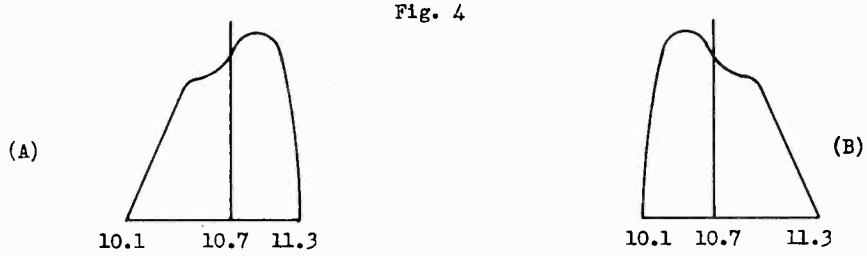
Fig. 3



The dotted lines indicate the curves of the individual circuits and the solid curve shows the overall response of the two or more pairs of coupled circuits. Circuits like the above or approaching them in form are desirable in an FM receiver where the pass band should be of the order of 200 Kc. Now from the above it is evident that simple peaking both sides of a circuit coupled below critical for maximum voltage will provide optimum alignment but if this proceedure is followed with an overcoupled circuit it is almost a certainty that the two circuits will not be tuned to the resonant frequency but will instead be aligned so that either one or the other is accentuated. The response curve will then look like Fig. 4 (a) or (b).

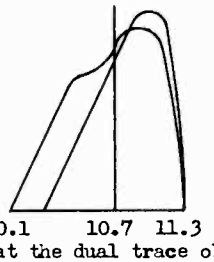
VISUAL I. F.-F. M. ALIGNMENT DATA

Fig. 4



Now if this overcoupled circuit is combined with a single peaked circuit (where the coupling is below critical), the misalignment becomes worse, something like Fig. 5.

Fig. 5



This control should be adjusted so that the dual trace observed on the oscilloscope will blend into a single trace and thereby eliminate any confusion due to the two traces.

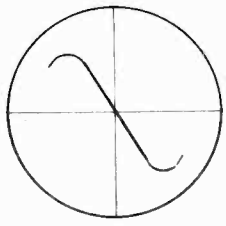
(b) An Oscilloscope with either a 3" or 5" tube equipped with both vertical and horizontal amplifiers.

4. ALIGNMENT OF THE 10.7 I.F.

Turn the wave band switch to F.M. and the generator to 10.7 Mc. Connect the F.M. signal generator output lead to the grid of the ratio detector driver tube and the scope to the 1st audio plate. Now proceed to align the ratio detector transformer for maximum linearity and output, being careful to maintain as symmetrical a trace as possible. Note that the adjustment of the secondary circuit, controls to a large extent, the linearity and symmetry of the pattern, and adjustment of the primary will influence the gain of the circuit. Fig. 6 represents a linear detector curve properly aligned.

It is important that the generator sweep a sufficiently wide band of frequencies so that the curves on both ends of the straight portion can be seen. Maximum linearity of alignment will result when these curves are symmetrically shaped and as previously stated this will result in minimum distortion and noise.

Fig. 6



Connect the generator output lead to the grid of the I.F. amplifier. Align primary and secondary of the I.F. transformer being careful to maintain the same basic ratio detector trace as just described.

Observe that by alternately adjusting the primary and secondary, the vertical amplitude can be increased without the response curve becoming distorted. At all times it is important to reduce the signal generator output to maintain the scope picture on the screen. This will avoid overload and possible misalignment therefrom.

Move the generator lead to the grid of the converter tube and align No. 1 I.F. transformer following the same proceedure as above.

Fig. 7, (A), (B), (C), and (D) represent typical selectivity curves of an overall I.F. Amplifier. Fig. 7, (AA), (BB), (CC), and (DD) represent the corresponding ratio detector curves.

VISUAL I. F.-F. M. ALIGNMENT DATA

From the above it appears that to properly align a receiver using overcoupled IF transformers it will be necessary to take a response curve of each stage and align the circuit so that the two peaks are symmetrical, that is, approximately equal in amplitude and displaced equally from the center frequency. To do this with a CW or AM signal would be laborious and time consuming whereas the use of visual equipment makes it nearly as simple as adjusting a simple single peaked amplifier.

Visual alignment test equipment performs the operation of plotting the response curve almost exactly as described above except that instead of manually changing the generator frequency, recording the voltage and then plotting the results, these operations are performed automatically and simultaneously by a combination of electronic circuits. The operation is briefly as follows.

In the signal generator a low AC voltage is applied to a reactance tube modulator which shifts the oscillator frequency from low to high or from high to low at a rate determined by the frequency of the AC voltage and by an amount determined by the AC voltage. The frequency at any instant is dependant on the AC voltage present at that instant of time. An oscilloscope is provided which may be considered a voltmeter used to read the voltage across the tuned circuit, provided a detector is used to convert the RF to a low audio frequency. This voltage is then applied to the vertical plates and results in a vertical displacement of the spot on the screen. Some of the voltage used to shift the oscillator frequency is also applied to the horizontal plates of the oscilloscope providing a means of displacing the spot horizontally. It is now evident that since for any given AC voltage only one frequency may be obtained and since that AC voltage will result in an exact amount of spot deflection on the scope we can read the voltage across the circuit under examination by noticing the position of the spot at this exact instant.

Now if we consider the frequency as shifting from low to high 60 times per second and remember that the spot is moving across the screen of the scope 60 times per second at exact synchronization with the change in frequency it is only necessary to apply the voltage from our circuit to the vertical plates to obtain a replica of the response curve on the face of the cathode ray tube. This curve will be repeated 60 times per second if our sweep frequency is 60 cycles. Adjustments to the circuit may now be made and the effect on the response curve noted instantaneously.

Although it is possible to observe the selectivity curves as shown in Fig. 1, 2, and 3 on the scope by the use of an auxiliary special detector coupled to the plate of the last IF tube, it is much more convenient to observe the effects of IF alignment upon the shape of the ratio detector output trace. When this is done the auxiliary detector is not necessary and a direct connection of the scope into the receiver circuits will provide all the necessary connections.

If the overall selectivity curve is not "flat-topped" (solid line in Fig. 3) the ratio detector curve cannot be linear (straight) throughout the center section, symmetrical and have sufficient band width (Fig. 6).

Under these conditions it would not be possible to receive a signal without distortion and higher than normal noise, the degree of distortion and abnormal noise dependent upon the extent to which the center of the ratio detector trace departs from a straight line and the extent to which the entire trace departs from true symmetry.

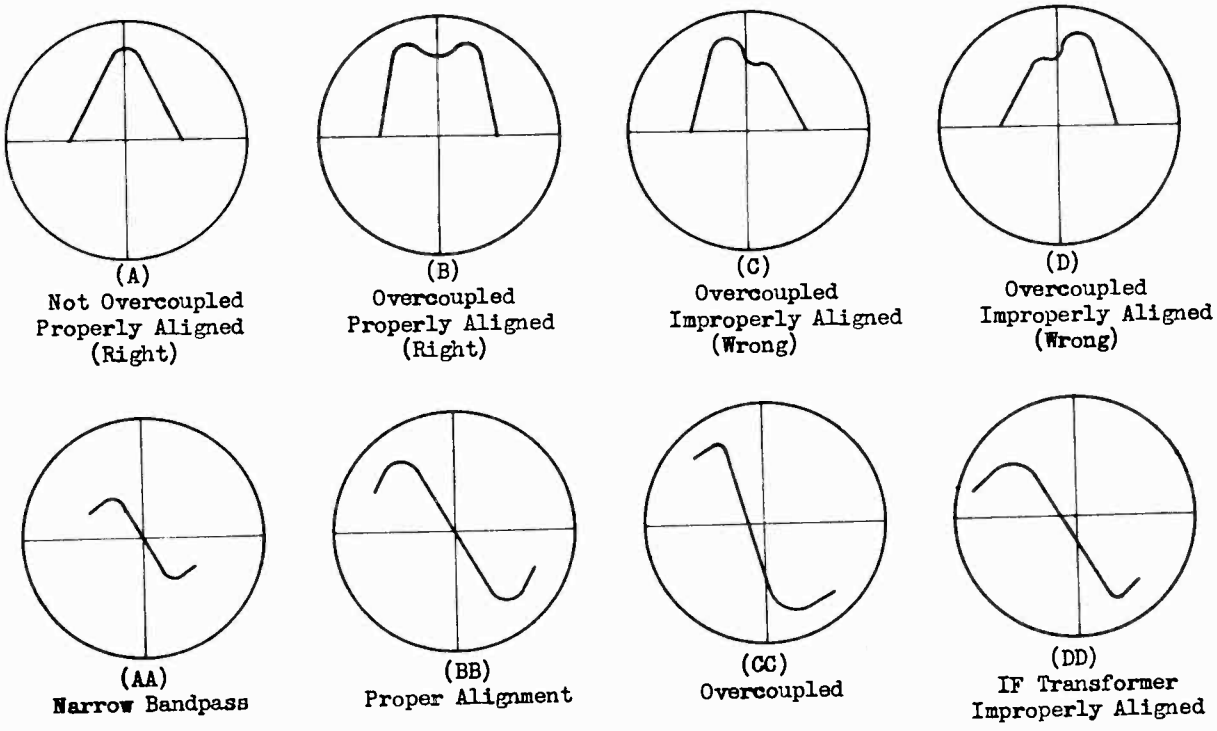
After a pattern similar to Fig. 6 is obtained with connection #1 shown in the block diagram, the generator lead may be moved ahead through the IF system one tube at a time and the intervening transformer aligned for maximum output but at all times a curve very similar to Fig. 6 must be maintained.

3. EQUIPMENT REQUIRED.

(a) A sweep signal generator with a center frequency of 10.7 Mc. and a total sweep width of at least 400 Kc. Examination of the block diagram will reveal a variable resistor-capacitor circuit inserted in the lead between the FM sweep generator and the horizontal amplifier of the oscilloscope.

VISUAL I. F.-F. M. ALIGNMENT DATA

Fig. 7



(A) Not Overcoupled Properly Aligned (Right)

(B) Overcoupled Properly Aligned (Right)

(C) Overcoupled Improperly Aligned (Wrong)

(D) Overcoupled Improperly Aligned (Wrong)

(AA) Narrow Bandpass

(BB) Proper Alignment

(CC) Overcoupled

(DD) IF Transformer Improperly Aligned

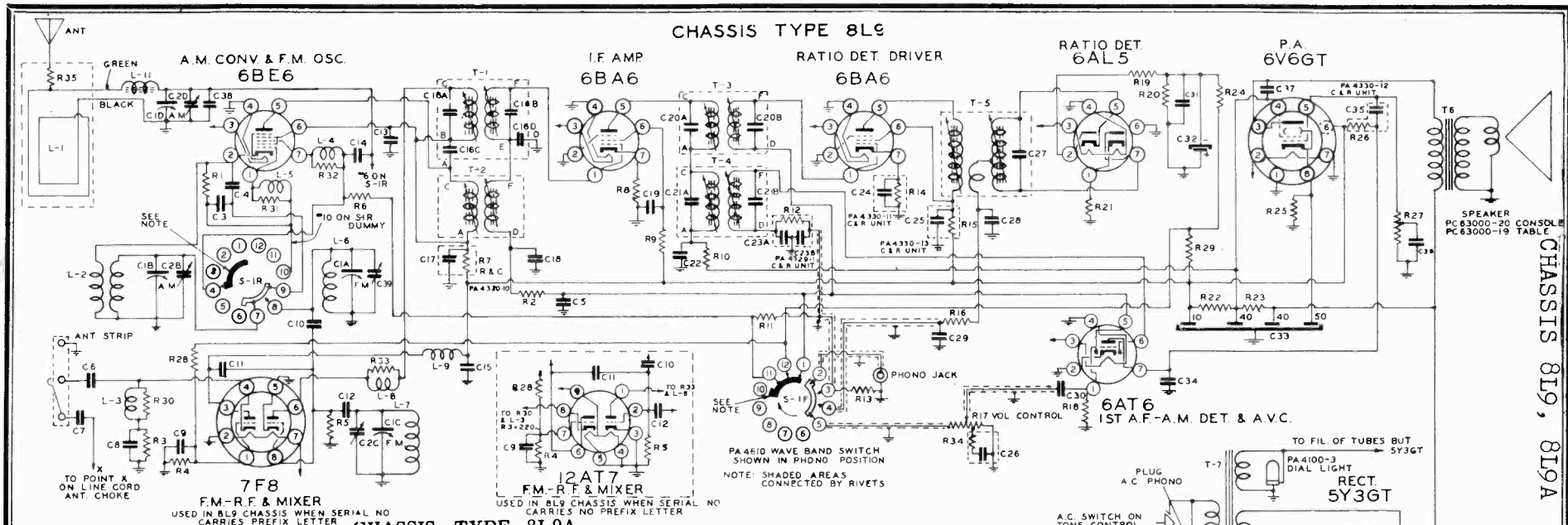
Should the trace appear unsatisfactory, a very slight readjustment of the detector secondary alignment may be made at this time as the need for any but a slight correction is an indication of incorrect alignment in one of the other stages. This is permissible only if the degree of correction necessary is slight. If this is not the case the entire alignment procedure should be repeated.

	DESCRIPTION	PART NO.
C1A,C	F.M. GANG CONDENSER	PC85002
C1B,D	A.M. " " "	
C2C	F.M. TRIMMER ON GANG	
C2B,D	A.M. " " "	
C3	30 MMF. CERAMIC	CC30H-300K
C4	2 MMF. "	CC30H-020K
C5	.02 MFD. "	HK35G-203
C6	110 MMF. CERAMIC	CC30H-111A
C7	110 MMF. "	CC30H-111A
C8	510 MMF. "	HK35G-511
C9	5000 MMF. "	HK35G-502
C10	2 MMF. "	CC30H-020K
C11	110 MMF. "	CC30H-111A
C12	110 MMF. "	CC30H-111A
C13	510 MMF. "	HK35G-511
C14	110 MMF. "	CC30H-111A
C15	10,000 MMF. "	HK35G-103
C16A	(F.M. PRI.) & C16B (F.M. SEC.) I.F. TRIMMERS	*
C17	.01 MFD. C & R UNIT	PA4330-10
C18	.02 MMF. CERAMIC	HK35G-203
C19	.01 MFD. DISC TYPE	PA4334-2
C20A	(F.M. PRI.) C20B (F.M. SEC.) I.F. TRIMMERS	*
C21A	(A.M. PRI.) C21B (A.M. SEC.) I.F. TRIMMERS	*
C22	.01 MFD. DISC TYPE	PA4334-2
C23A	100 MMF. C & R UNIT	PA4329-1
C23B	100 MMF. C & R UNIT	
C24	.01 MFD. C & R UNIT	PA4330-11
C25	.01 MFD. C & R UNIT	PA4330-13
C26	10,000 MMF. C & R UNIT	PA4330-14
C27	33 MMF. MICA	*
C28	1000 MMF. CERAMIC	HK35G-102
C29	1000 MMF. "	HK35G-102
C30	10,000 MMF. "	HK35G-103
C31	10000 MMF. "	HK35G-103
C32	3 MFD. 50V. ELECT.	PA4308-1
C33	10-40-40-50 MFD. ELECT.	PA4307-4
C34	100 MMF. CERAMIC	HK35F-101
C35	.02 MFD. C & R UNIT	PA4330-12
C36	10000 MMF. CERAMIC	HK35G-103
C37	.002 MFD. 1000 V.	PC40GN-202
C38	5 MMF. MICA	MC80F-050
C39	TRIMMER F.M. OSC.	PA4366

	DESCRIPTION	PART NO
R1	22,000 OHMS	½ W. BR12S-223
R2	470,000 "	" " BR12S-474
R3	470 "	" " BR12S-471
R4	470,000 "	" " BR12S-474
R5	470,000 "	" " BR12S-474
R6	2.2 MEGOHM	" " BR12S-225
R7	470 OHMS C & R UNIT	PA4330-10
R8	68 "	" " BR12S-680
R9	1000 "	" " BR12S-102
R10	1000 " C & R UNIT	PA4330-12
R11	1 MEGOHM	BR12S-105
R12	47000 OHMS C & R UNIT	PA4329-1
R13	1 MEGOHM	½ W BR12S-105
R14	68 OHMS C & R UNIT	PA4330-11
R15	1000 " " "	PA4330-13
R16	47000 OHMS " "	BR12S-473
R17	VOLUME CONTROL (1 MEG)	PA4408-2
R18	.5 MEGOHM	½ W BR12S-156
R19	220 OHMS	" " BR12S-221
R20	15,000 "	" " BR12S-153
R21	470 "	" " BR12S-471
R22	3500 "	10 " PA4200-8
R23	470 "	2 " DR12S-471
R24	220,000 OHMS	½ W BR12S-224
R25	330 "	1 " CR12S-331
R26	220,000 " C & R UNIT	PA4330-12
R27	1 MEG. TONE CONTROL	PA4400-10
R28	2.2 MEGOHM	½ W BR12S-225
R29	3.3 "	" " BR12S-335
R30	1500 OHMS (IN L-3)	2 " DR12S-152
R31	22 " (IN L-5)	½ " BR12S-220
R32	22 " (IN L-4)	" " BR12S-220
R33	820 " (IN L-8)	" " BR12S-821
R34	22000 OHMS C & R UNIT	PA4330-14
R35	3300 "	½ W BR12S-332

	DESCRIPTION	PART NO
L1	LOOP ANTENNA	AC67020-1
L2	B.C. OSC. COIL	AA6685-1
L3	100 MC. CHOKE COIL (1500 OHM FORM)	AA6798-3
L4	" " (22 " ")	AA6796-5
L5	" " (22 " ")	AA6798-5
L6	F.M. OSC. COIL	PA5200-4
L7	F.M. R.F. COIL	PA5200-5
L8	CHOKE COIL (820 OHM FORM)	AA6798-4
L9	" "	AA6795-2
L10	LINE CORD ANT. CHOKE	AA6684-1
L11	ANT. CHOKE COIL	AA6686-5
T1	NO. 1 F.M.-I.F. TRANS	AA6687-2
T2	NO. 1 A.M.-I.F. "	AA6688-5
T3	NO. 2 F.M.-I.F. "	AA6567-4
T4	NO. 2 A.M.-I.F. "	AA6688-2
T5	RATIO DET.	AA6684-1
T6	OUTPUT TRANS.	AB44081-1
T7	POWER "	AB44013-1

CHASSIS 8L9



CHASSIS TYPE 8L9A

USED IN MODELS 121, 122, 141, 142, 1058, 1059, 1060, 1061, 1064, 1072, 1071MGP AND 1072MGP.

The 8L9 chassis with the following mechanical and electrical revisions was released and run in production and was designated chassis type 8L9A. This chassis was used in the models as listed above and differs from chassis type 8L9 as follows:

MECHANICAL CHANGE

1. The dial light assembly has been designed to travel with the pointer across and in back of the dial scale.

ELECTRICAL CHANGES

1. Resistor R23, 470 Ohm. 2 Watt removed from circuit.
2. Filter choke T-8 is connected across same terminals where R23 resistor was removed.
3. Red lead from putput transformer disconnected and tied into B + after passing through filter choke T-8.

INTERMEDIATE FREQUENCY A.M. 456 Kc.
F.M. 10.7 Mc.

BOTTOM VIEW OF ALL SOCKET CONNECTIONS SHOWN

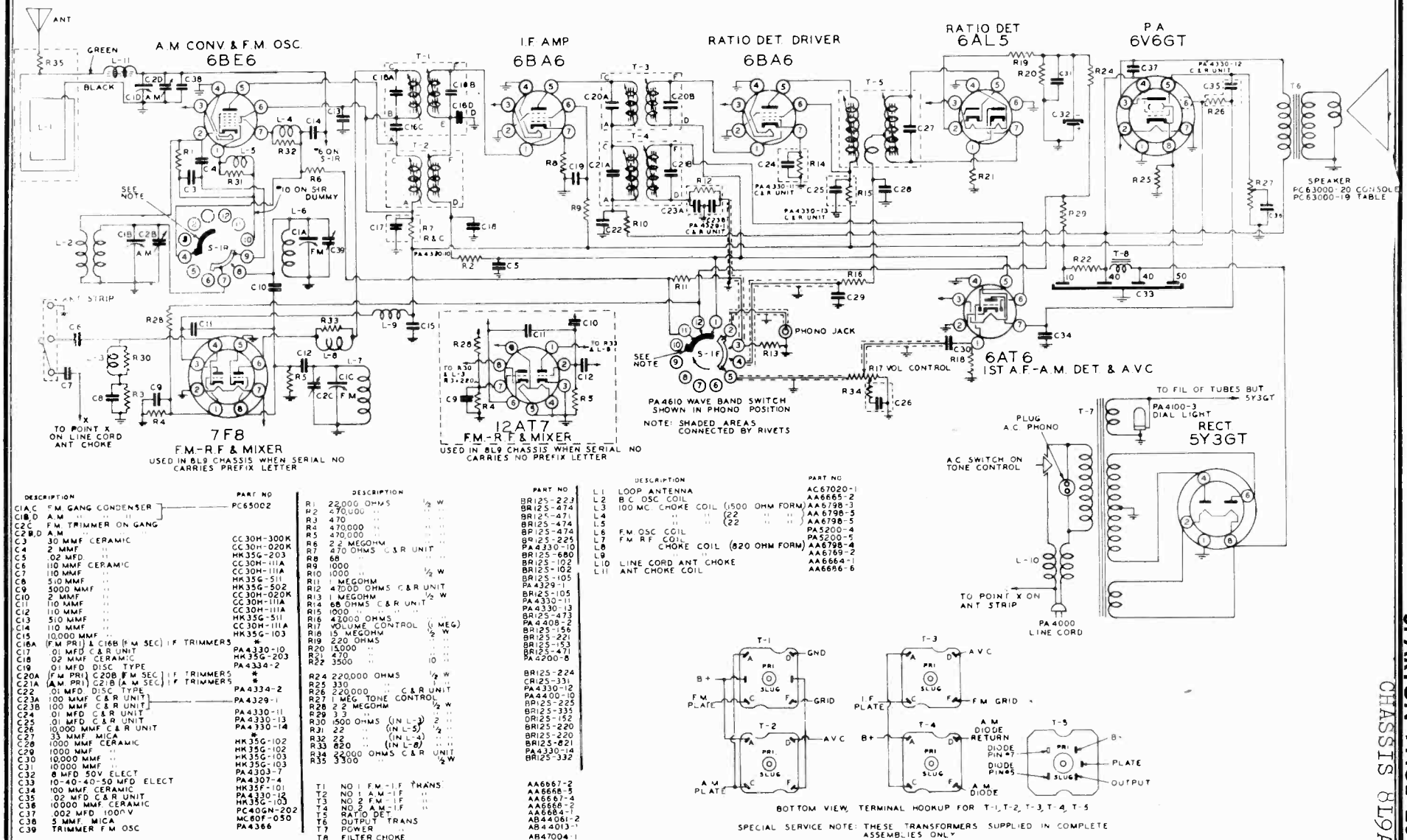
Receiver alignment and other specification was not affected by this circuit revision.

(ORIGINAL) SEPT. 10, 1948

Effective May 15, 1949

SCHEMATIC DIAGRAM
SPARTON SUPERHETERODYNE CHASSIS TYPE 8L9A
INTERMEDIATE FREQUENCY A.M. 456 Kc. F.M. 10.7 Mc.

BOTTOM VIEW OF ALL SOCKET CONNECTIONS SHOWN



DESCRIPTION	PART NO
C1A,C FM GANG CONDENSER	PC65002
C1B,D A.M. " "	
C2C FM. TRIMMER ON GANG	
C2B,D A.M. " "	
C3 30 MMF CERAMIC	CC30H-300K
C4 2 MMF "	CC30H-020K
C5 .02 MFD "	HK35G-203
C6 110 MMF CERAMIC	CC30H-111A
C7 110 MMF "	CC30H-111A
C8 510 MMF "	HK35G-511
C9 5000 MMF "	HK35G-502
C10 2 MMF "	CC30H-020K
C11 110 MMF "	CC30H-111A
C12 110 MMF "	CC30H-111A
C13 510 MMF "	HK35G-511
C14 110 MMF "	CC30H-111A
C15 10,000 MMF "	HK35G-103
C16A (F.M PRI) & C16B (F.M SEC) I.F TRIMMERS	*
C17 .01 MFD C&R UNIT	PA4330-10
C18 .02 MMF CERAMIC	HK35G-203
C19 .01 MFD. DISC TYPE	PA4334-2
C20A (F.M PRI) C20B (F.M SEC) I.F TRIMMERS	*
C21A (A.M PRI) C21B (A.M SEC) I.F TRIMMERS	*
C22 .01 MFD. DISC TYPE	PA4334-2
C23A 100 MMF C&R UNIT	PA4329-1
C23B 100 MMF C&R UNIT	
C24 .01 MFD C&R UNIT	PA4330-11
C25 .01 MFD C&R UNIT	PA4330-13
C26 10,000 MMF C&R UNIT	PA4330-14
C27 .35 MMF MICA	*
C28 1000 MMF CERAMIC	HK35G-102
C29 1000 MMF "	HK35G-102
C30 10,000 MMF "	HK35G-103
C31 10,000 MMF "	HK35G-103
C32 8 MFD. 50V ELECT	PA4303-7
C33 10-40-40-50 MFD ELECT	PA4307-4
C34 100 MMF CERAMIC	HK35F-101
C35 .02 MFD C&R UNIT	PA4330-12
C36 10000 MMF CERAMIC	HK35G-103
C37 .002 MFD 1000V	PC40GN-202
C38 5 MMF MICA	MC80F-050
C39 TRIMMER F.M OSC	PA4366

DESCRIPTION	PART NO
R1 22,000 OHMS 1/2 W	BR12S-223
R2 470,000 " "	BR12S-474
R3 470 " "	BR12S-471
R4 470,000 " "	BR12S-474
R5 470,000 " "	BR12S-474
R6 2.2 MEGOHM "	BR12S-225
R7 470 OHMS C&R UNIT	PA4330-10
R8 68 " "	BR12S-680
R9 1000 " "	BR12S-102
R10 1000 " 1/2 W	BR12S-102
R11 1 MEGOHM "	BR12S-105
R12 47,000 OHMS C&R UNIT	PA4329-1
R13 1 MEGOHM 1/2 W	BR12S-105
R14 68 OHMS C&R UNIT	PA4330-11
R15 1000 " "	PA4330-13
R16 47,000 OHMS "	BR12S-473
R17 VOLUME CONTROL (1 MEG)	PA4408-2
R18 .15 MEGOHM 1/2 W	BR12S-156
R19 220 OHMS " "	BR12S-221
R20 15,000 " "	BR12S-153
R21 470 " 10 "	BR12S-471
R22 3500 " "	PA4200-8
R24 220,000 OHMS 1/2 W	BR12S-224
R25 330 " "	CR12S-331
R26 220,000 " C&R UNIT	PA4330-12
R27 1 MEG TONE CONTROL	PA4400-10
R28 2.2 MEGOHM 1/2 W	BR12S-225
R29 3.3 " "	BR12S-335
R30 1500 OHMS (IN L-3) 2 "	DR12S-152
R31 22 " (IN L-5) 1/2 "	BR12S-220
R32 22 " (IN L-4) " "	BR12S-220
R33 820 " (IN L-8) " "	BR12S-821
R34 22,000 OHMS C&R UNIT	PA4330-14
R35 3300 " 1/2 W	BR12S-332

T1 NO 1 F.M.-I.F TRANS.	AA6667-2
T2 NO 1 A.M.-I.F "	AA6668-5
T3 NO 2 F.M.-I.F "	AA6667-4
T4 NO 2 A.M.-I.F "	AA6668-2
T5 RATIO DET.	AA6684-1
T6 OUTPUT TRANS	AB44061-2
T7 POWER "	AB44013-1
T8 FILTER CHOKE	AB47004-1

DESCRIPTION	PART NO
L1 LOOP ANTENNA	AC67020-1
L2 B.C. OSC. COIL	AA6665-2
L3 100 MC. CHOKE COIL (1500 OHM FORM)	AA6798-3
L4 " " (22 " ")	AA6798-5
L5 " " (22 " ")	AA6798-5
L6 F.M. OSC. COIL	PA5200-4
L7 F.M. R.F. COIL	PA5200-5
L8 CHOKE COIL (820 OHM FORM)	AA6798-4
L9 " "	AA6769-2
L10 LINE CORD ANT. CHOKE	AA6664-1
L11 ANT. CHOKE COIL	AA6666-6

BOTTOM VIEW, TERMINAL HOOKUP FOR T-1, T-2, T-3, T-4, T-5

SPECIAL SERVICE NOTE: THESE TRANSFORMERS SUPPLIED IN COMPLETE ASSEMBLIES ONLY

MODELS 130, 132, 135, 139; Ch. 5A10

Due to mechanical design of the tuning mechanism in this Sparton model, the receiver chassis cannot be removed from the cabinet without removing the dial scale and pointer. When chassis removal becomes necessary, the serviceman will experience little if any difficulty in chassis removal or installtion if the following procedure is adhered to.

CHASSIS REMOVAL

1. Remove both control knobs.
2. The dial scale is held into position by flanges on the outer edge directly above and below the calibration numbers 1600KC and 5.50KC respectively and a small tab under the metal grill at approximately the 900KC mark. Using a small screwdriver, snap out the ends of the scale from under the cabinet front panel and slide the dial scale to the right and out of position. Sliding scale to the right prevents the holding tab at 900KC point from being broken off.
3. Remove the (3) rubber footed chassis mounting screws.
4. Remove the (2) fasteners which hold the back cover at top corners. Do not remove the (2) hex-head screws at the bottom corners.
5. At this point proceed to remove pointer from tuning shaft and to slide receiver chassis out of the cabinet simultaneously. When the dial pointer has been removed from the tuning shaft, the receiver chassis is free and may be removed from the cabinet.

CHASSIS INSTALLATION

1. Turn tuning condenser to the fully closed position (550KC).
2. Slide receiver chassis into cabinet until the tuning shaft starts to enter the clearance hole in grill. At this point, place the dial pointer over the end of the tuning shaft between the metal grill and the Bakelite panel and continue to slide the chassis forward and at the same time push the pointer onto the shaft until the pointer seats into position on the planetary drive collar of the tuning condenser and the chassis has reached its mounting position in the cabinet.
3. At this point turn the dial pointer counter-clockwise to the straight down position. (Approximately the 550KC position).
4. Install the (3) rubber footed chassis mounting screws and the (2) snap fasteners for back cover.
5. Install the dial scale by sliding the holding tab in and under the slot in the metal grill. Snap the end into position in the cabinet front panel.
6. At this point, turn receiver on and air check for pointer calibration. Should the pointer be slightly past the stop mark on dial scale, the pointer may be moved slightly forward or back with a small pointed instrument through the opening between dial scale and cabinet panel until pointer calibration is correct.
7. Install control knobs.

VOLTAGE CHART

Line Voltage: 117 Volts AC — Position of volume control: Full with set tuned to quiet channel.

TUBE	FUNCTION	Voltage of Sockets Prongs to B- See Prong Nos. on Schematic.							
		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
12BE6	Converter	**	0	23*	11.5*	95	95	**	
12BA6	I.F. Amp.	**	0	23*	34.5*	95	93	0.55	
12AV6	2nd Det. & Audio Amp.	**	0	11.5*	0	**	0	48	
50L6GT	Power Amp.	0	34.5*	115	95	0	0	84.5*	6.3
35W4	Rectifier	0	118	84.5*	117*	117*	108*	120	

NOTES: Voltage readings are for schematic diagram in this bulletin. Allow 15% + or - on all measurements. Alsways use meter scale which will give greatest deflection within scale limits. All DC measurements made with 20,000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter.

* AC Volts.

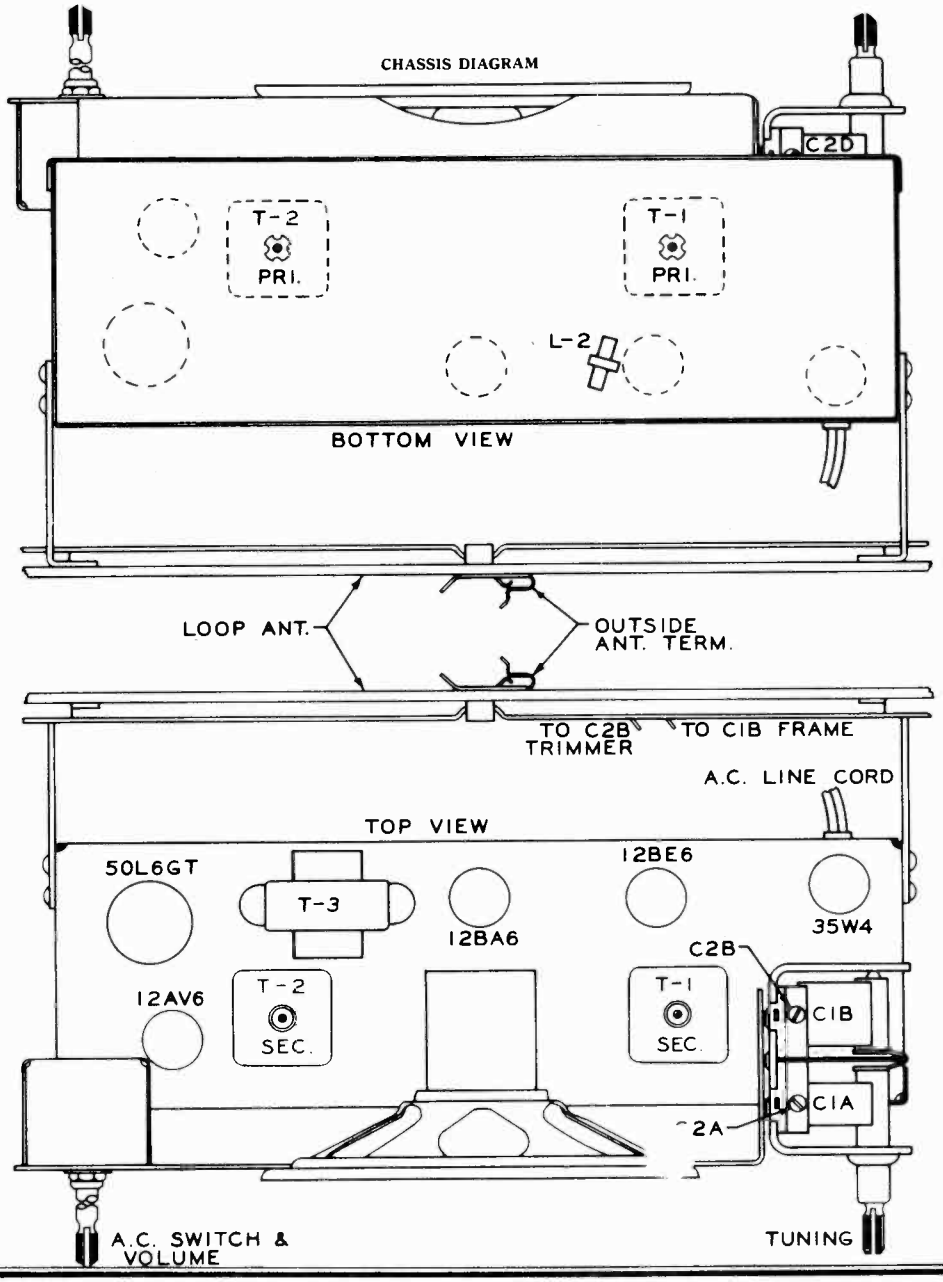
** Cannot be measured with 20,000 ohms per volt voltmeter.

MODELS 130, 132, 135, 139; Ch. 5A10

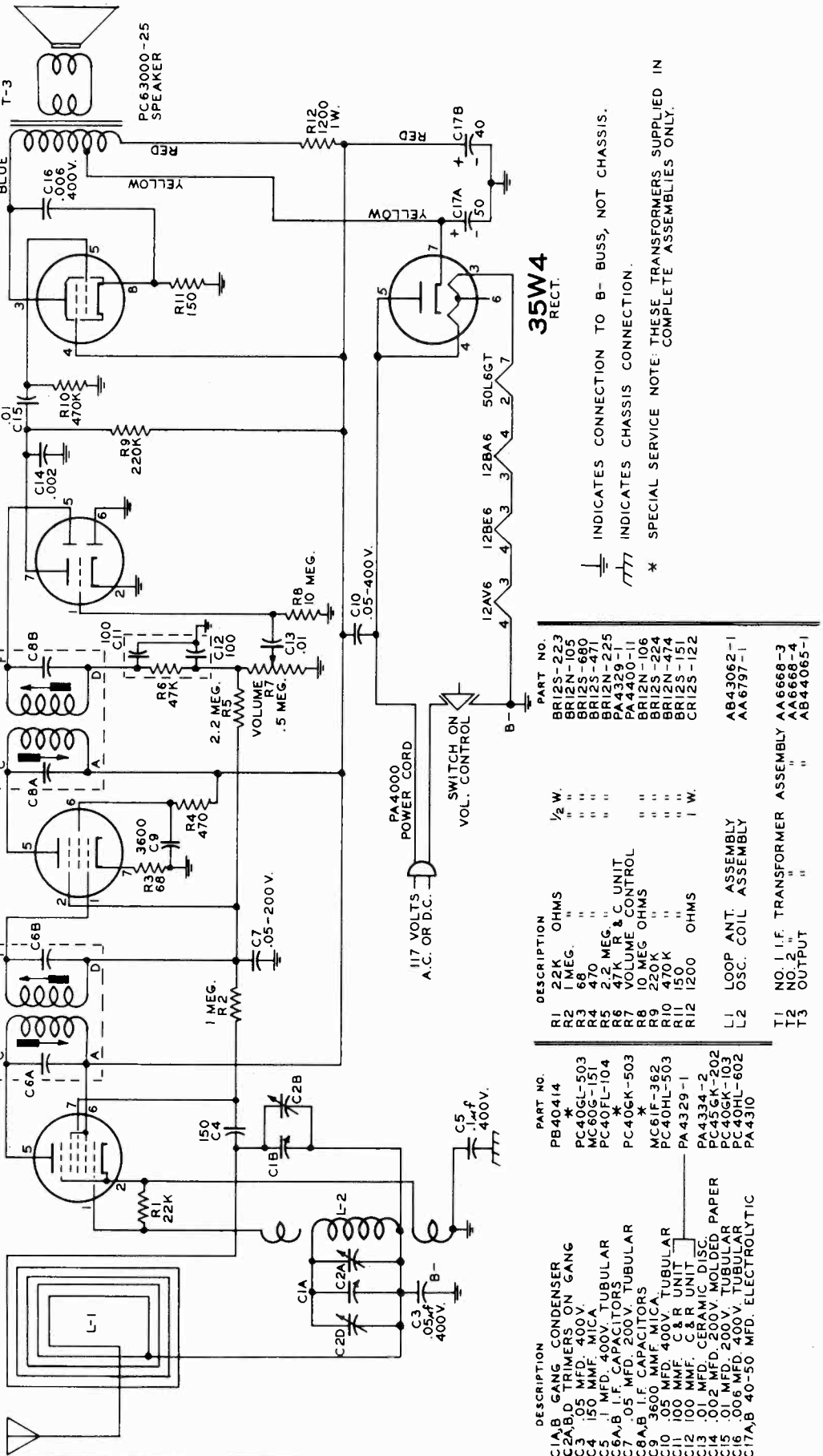
STEP BY STEP ALIGNMENT PROCEDURE

OPERATION	ALIGNMENT OF	GENERATOR CONNECTED TO	DUMMY ANTENNA	GENERATOR FREQUENCY	TUNING COND. SETTING	TRIMMER	REMARKS
1.	See instructions for chassis removal and installation						
2.	I.F.	Pin #7 on 12BE6	.02 MFD. Cond.	456 KC.	Fully Open	Slug T-2 Top & Bottom	Peak Accurately
						Slug T-1 Top & Bottom	Peak Accurately
3.	Broadcast	*	Driver Loop	1500 KC.	1500 KC.	C2A Osc. Tr.	Peak Accurately
						C2D Osc. Tr.	* *
						C2B Ant. Tr.	* * *
4.	Repeat operations 2 and 3.						
5.	Check calibrations at 600, 1000 and 1500 KC.						

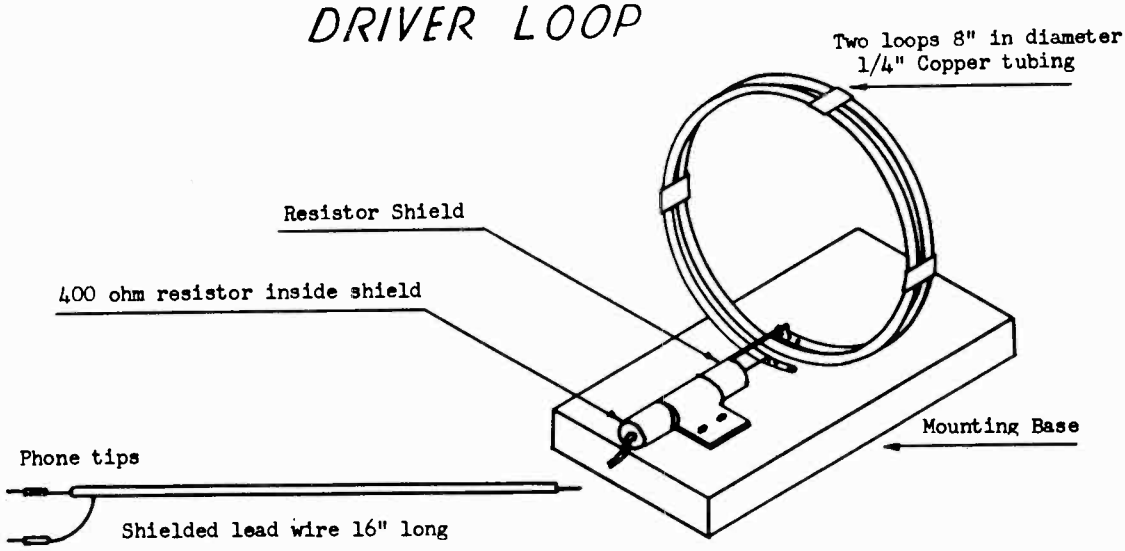
* Use driver loop as shown in this bulletin.
* * Trimmer C2D as sown on schematic is preset at factory and only on certain conditions will have to be re-adjusted in the field.
* * * Rock dial while adjusting for maximum output.



MODELS 130, 132,
135, 139; Ch. 5A10



DRIVER LOOP



SPECIFICATIONS

Two loops of 1/4" copper tubing 8" in diameter spaced 1/4" apart with 400 ohms resistor in series. Connecting cable and resistor must be shielded.
The loop should be spaced twice the diameter of the loop from the receiver being aligned to prevent an over modulated signal and poor alignment of the receiver.

DESCRIPTION	PART NUMBER
COILS	
L-1 Loop Antenna Ass'y	AB43062-1
L-2 Osc. Coil Assembly	AA6797-2
CONDENSERS AND CONTROL	
Condenser - 2 Gang Variable	PB40414
Condenser - (C17A & B) 40-50 Mfd. Elect.	PA4310
Condenser - C & R Unit (C11 & 12 with R6)	PA4329-1
Control - (R7) .5 Megohm Volume & A.C. Switch	PA4400-11
CABINET & ACCESSORIES	
Cabinet - (Black)	PD90032-1
Cabinet - (Red)	PD90032-2
Cabinet -(Green)	PD90032-3
Cabinet - (Ivory)	PD90032-4
Knob - (Black)	PA5643-1
Knob - (Red)	PA5643-2
Knob -(Green)	PA5642-3
Knob - (Ivory)	PA5643-4
Cabinet Grill	PB40317
Escutcheon - Dial	PB30014
Escutcheon - On-Off Volume	PA5506
Dial Pointer	PA5410
TRANSFORMERS	
T1-Transformer, No. 1 I.F.	AA6618-3
T2-Transformer, No. 2 I.F.	AA6668-4
T3-Transformer, Output	AB44065-1
*Speaker-5-Inch P.M.	PC63000-18

* Complete speakers may be returned to factory Service Department for repair or replacement.

MODELS 150, 151,
152, 155; Ch. 4E10

SPARTON SUPERHETERODYNE RECEIVERS

CHASSIS TYPE 4E10
MODELS 150, 151, 152 & 155

VOLTAGE CHART

Line Voltage: 117 Volts AC		Position of volume control: Full with set tuned to quiet channel.						
TUBE	FUNCTION	Voltage of Sockets Prongs to -B See Prong Nos. on schematic.						
		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
1R5	Osc. Converter	1.37	93	60	**	1.37	0	2.7
1U4	I.F. Amplifier	2.7	93	93	0	2.7	0	4.1
1U5	Det. A.V.C. & 1st Audio	1.37	15	11.5	0	0	0	0
3V4	Output	4.1	93	93	0	5.9	0	7.5

NOTES: Voltage readings are for schematic diagram in this bulletin. Allow 15% + or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 20,000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter.

** Cannot be measured with 20,000 Ohms per volt voltmeter.

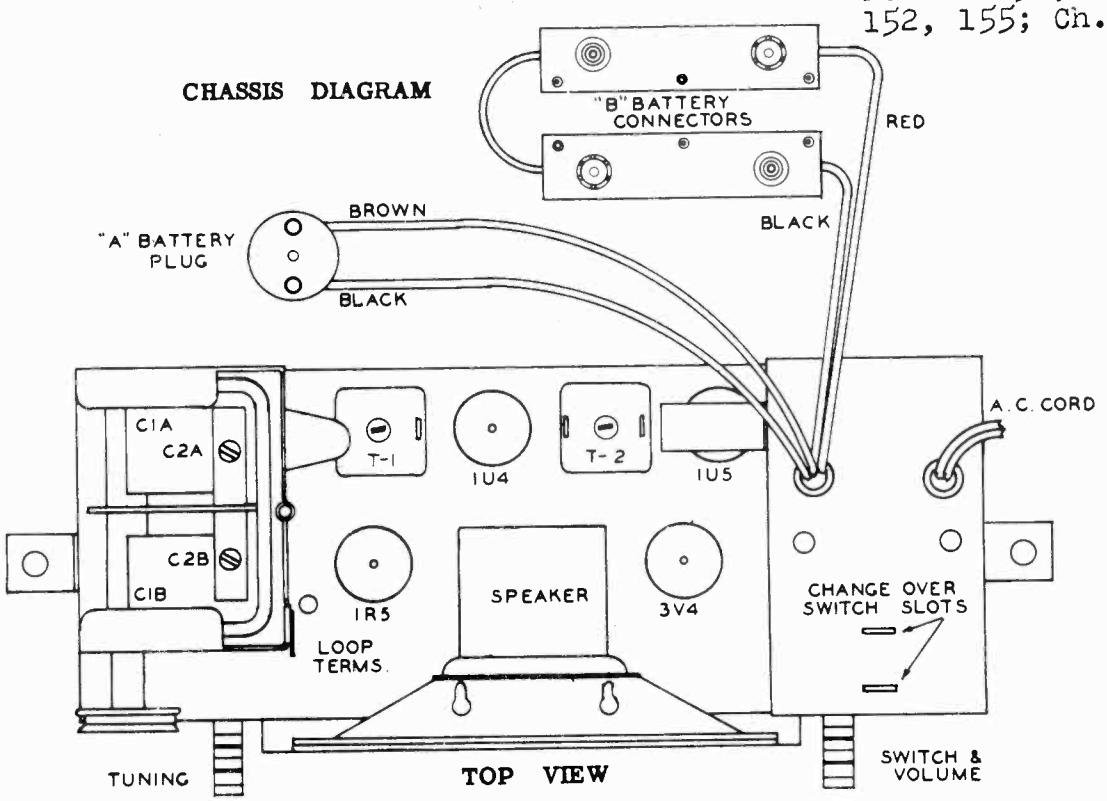
STEP BY STEP ALIGNMENT PROCEDURE

OPERATION	ALIGNMENT OF	GENERATOR CONNECTED TO	DUMMY ANTENNA	GENERATOR FREQUENCY	TUNING COND. SETTING	TRIMMER	REMARKS
1.	Set stop line on dial drum even with marker line on frame assembly with condenser gang fully closed.						
2.	I.F.	Pin #6 1R5 Tube	.1 Mfd. Cond.	456 KC.	Open	Slug T-2 Top & Bottom	Peak Accurately
						Slug T-1 Top & Bottom	Peak Accurately
3.	R.F.	SEPARATE LOOP	*	1500 KC.	1500 KC.	C2B Osc. Tr.	Peak Accurately
						C2A Ant. Tr.	Peak Accurately
4.	Repeat operation #3.						
5.	Check calibration at 600 KC., 1000 KC. and 1500 KC.						
6.	Check operations #1 to #6 inclusive.						

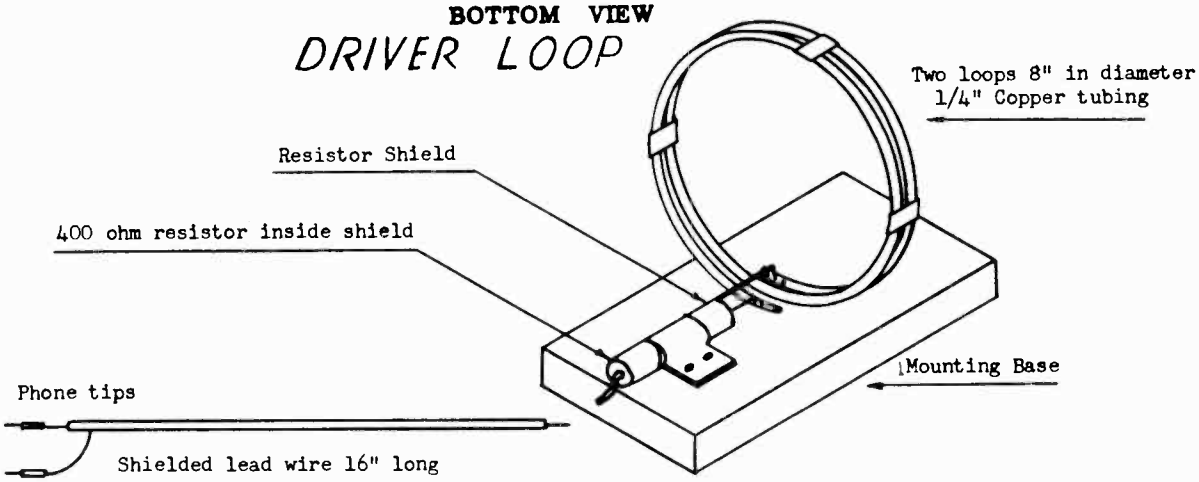
* Use driver loop as shown in this bulletin.
The generator must be connected to the dummy loop antenna and not to the loop of the receiver for R.F. alignments.
Trimmer C2C as shown on schematic is preset at factory and only on certain conditions will have to be moved. However, should it become necessary to adjust this trimmer on the bottom of the gang a cutout in the chassis base has been provided.

MODELS 150, 151, 152, 155; Ch. 4E10

CHASSIS DIAGRAM



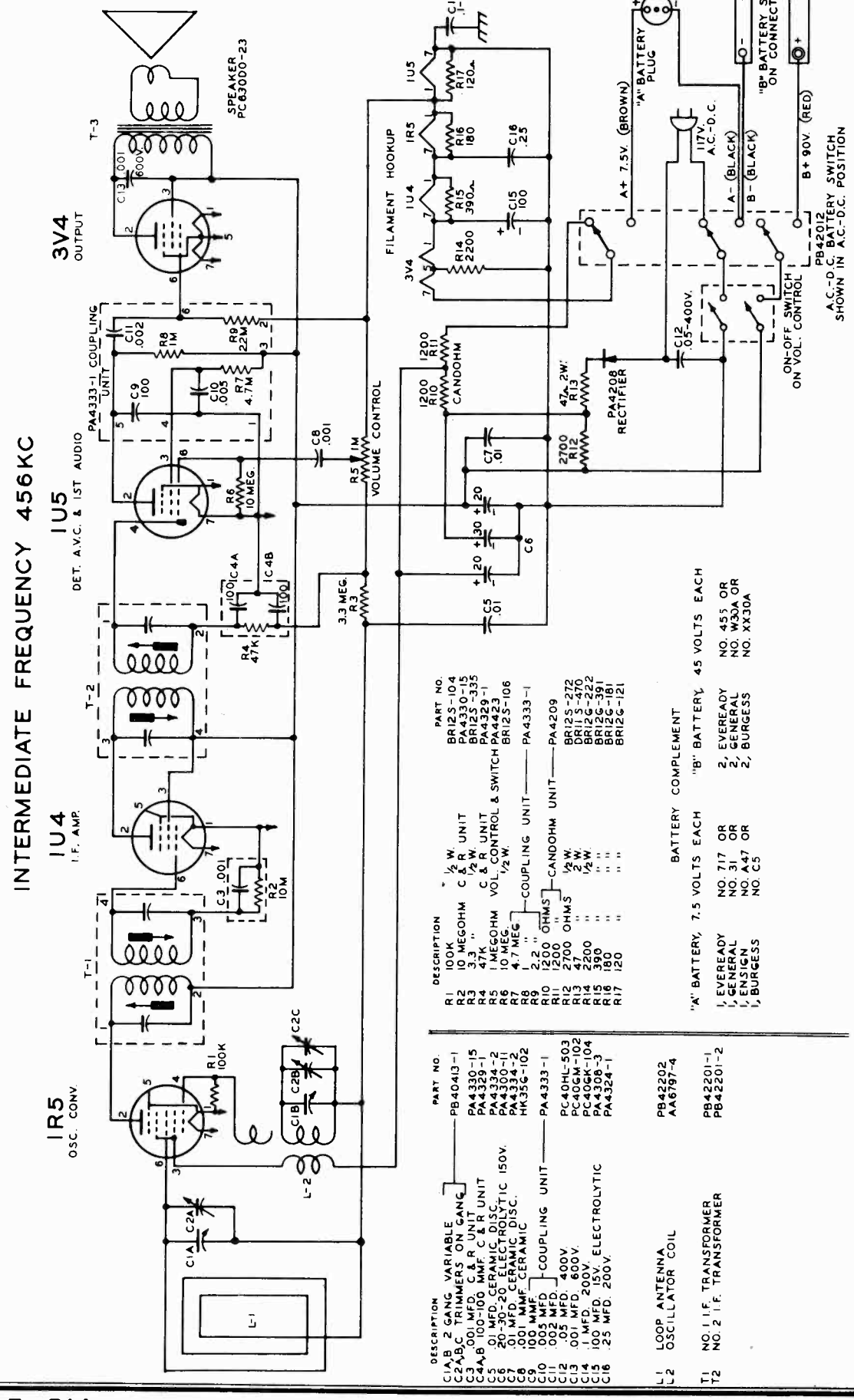
DRIVER LOOP



SPECIFICATIONS

Two loops of 1/4" copper tubing 8" in diameter spaced 1/4" apart with 400 ohms resistor in series. Connecting cable and resistor must be shielded.
The loop should be spaced twice the diameter of the loop from the receiver being aligned to prevent an over modulated signal and poor alignment of the receiver.

MODELS 150, 151,
152, 155; Ch. 4E10



MODEL SC-448,
FM Tuner

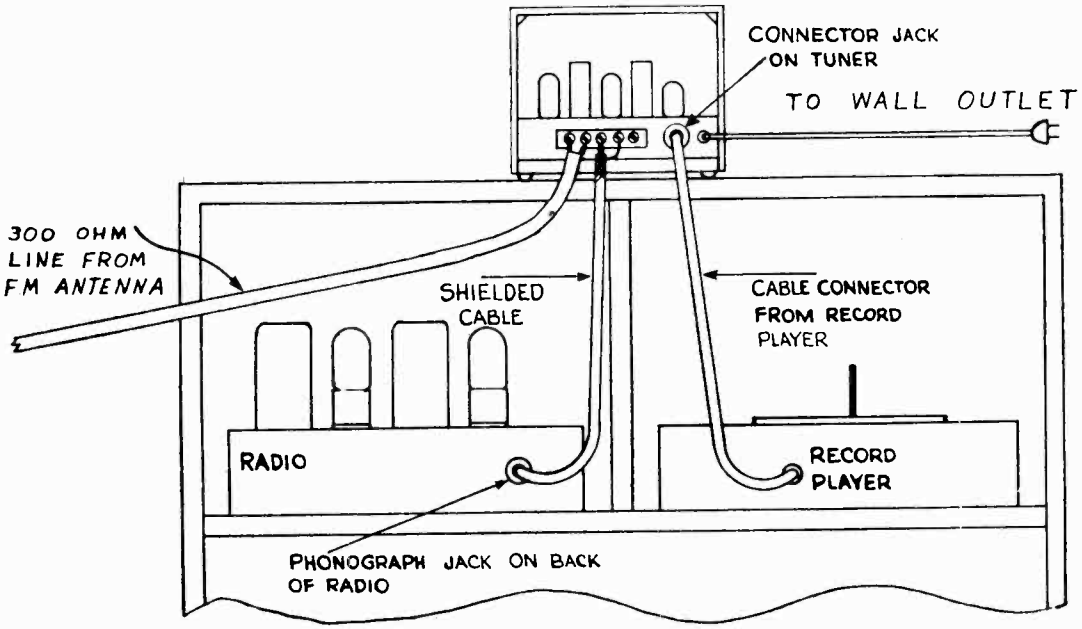


Figure 1—Console Installation

DESCRIPTION

Your FM tuner is a four-tube (plus rectifier) superheterodyne designed to cover the frequency range of the FM broadcast band from 88 to 108 megacycles. It must be operated in conjunction with a broadcast receiver or other audio amplifier. It requires a power source of from 105 to 125 volts, alternating current (AC).

WARNING: Do not connect to any other source.

INSTALLATION

The tuner must be connected to the audio or phonograph circuit of your standard broadcast receiver or to a separate audio amplifier. This can be done in several ways, depending on the type of set. Some of the methods are outlined below. Determine the type of installation you require and proceed as directed.

WARNING: Before proceeding with installation, make certain that the tuner and the radio or amplifier are both disconnected from the power outlet.

NOTE—In every case, the output of the tuner will come from terminals No. 3 and No. 4 at the rear of the tuner. Connections to these terminals should be made with a single conductor shielded cable, with the center conductor connected to No. 3 and the outer shield to No. 4. A length of this cable is packed with your tuner. This cable has a phonograph plug connected to one end which will simplify most installations.

1. If your radio is of the combination type, that is, it also plays records, it probably has the record pickup connected to the radio chassis with a shielded cable and plug like that supplied with your tuner. To connect the tuner to this type of set, pull out the record player plug and plug in the tuner output cable, connected as above. Plug the record player cable into the receptacle at the rear of the tuner. This method of connection is shown in Fig. 1.

2. If your radio is of the combination type but does not have the above type of plug on the record pickup cable, or has no plug connection at all, it will be necessary to disconnect the pickup cable where it connects to the radio. This cable is then connected to terminals No. 4 and No. 5 on the tuner. The shield or ground connection should be made to No. 4 and the center conductor to No. 5. Then connect the tuner output cable to the points where the pickup cable was removed. In order to do this, it will be necessary to cut off the plug at the end of the cable. This connection could best be made by your radio service man.

3. If your radio does not have a record player, the tuner output lead will have to be connected to the audio amplifier portion of your radio. This connection will vary with the type of set that you have, and it is best that this be done by your radio service man.

4. If you are going to use your tuner with an audio amplifier, terminals No. 3 and No. 4 should be connected to the input of the amplifier. If you have a choice of inputs, use the one intended for use with a phonograph.

For best operation, your tuner should be connected to an FM antenna, preferably located out-of-doors. (Select an Aircastle FM Antenna from your big Spiegel catalog.) The tuner is designed for an antenna of the folded-dipole type that uses 300 ohm parallel-line lead-in. Make the lead-in connections to terminals No. 1 and No. 2.

In many cases, you can get satisfactory reception with a short piece of wire (6 to 8 feet long) connected to terminal No. 1.

OPERATION

Insert the tuner power cord into the power receptacle. Turn on your radio or amplifier and switch it to phonograph (if necessary). Your tuner has three conditions of operation, as follows:

1. With the left-hand knob in extreme counter-clockwise or left position the phonograph of your set is connected for normal phonograph operation, and the tuner is off.

2. With this knob in the center position, the tuner power is on, but the phonograph of your set is still connected for normal operation. This standby position allows you to switch from phonograph to tuner without waiting for the tuner to warm up.

3. In the extreme clockwise or right position, the tuner is on and the phonograph off. This is the position in which the tuner makes it possible for you to pick up FM stations on your AM radio.

With the tuner on (and after about a 30 second warm-up) turn the right-hand knob slowly until a station is heard clearly and adjust the volume control on your broadcast receiver or amplifier to the desired intensity. Do not reduce the volume by tuning the unit off station.

MODEL SC-448,
FM Tuner

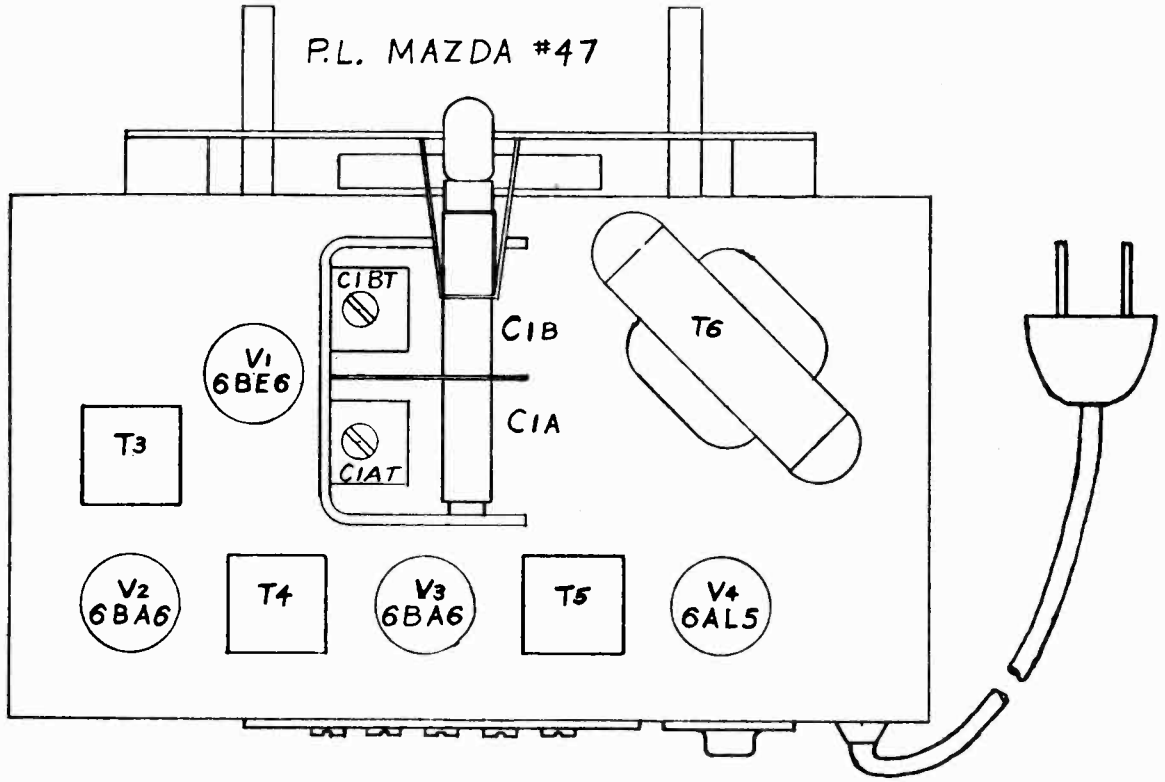


Figure 2—Location Diagram

Alignment Procedure

I. F. ALIGNMENT

An unmodulated or AM signal generator set at 10.7 Mc. is required. For each step, the generator output should be adjusted to give from 1 to 5 volts on the vacuum tube voltmeter as connected below. For best results a VTVM employing a probe should be used. Refer to Fig. 2 and Fig. 3 for symbol numbers.

1. Connect generator to pin 1 of V_3 and ground. Using a VTVM connected from V_4 pin 7 to ground, tune T_5 top to maximum reading.

2. Connect a 200,000 ohm center-tapped resistor from V_4 pin 2 to ground. Connect the VTVM ground lead to the resistor center-tap and the probe to the junction of R_7 and C_{10}. With the generator connected as in (1.) above, tune T_5 bottom for 0 volts.

3. Move the generator connections to V_2 pin 1 and ground. Connect VTVM as in step (1.). Shunt T_4 secondary with a 1000 ohm resistor and tune primary (bottom) to peak reading on the VTVM. Move shunting resistor to primary and tune secondary in like manner.

4. Move generator connections to V_1 pin 7 and ground. Repeat the operations of step (3.) on I. F. transformer T_3.

R. F. ALIGNMENT

A signal generator of good frequency accuracy and low leakage is required. For all of the following adjustments, the signal generator is connected to terminals No. 1 and No. 2 through two 120 ohm resistors (one resistor on each terminal).

1. Set the signal generator at 90 Mc. and tune to 90 on the dial. Adjust the spacing of the turns on T_2 for maximum output. For best results on output indication, use a VTVM connected to pin 7 of V_4 and ground.

2. Set the signal generator at 106 Mc. and tune to 106 on the dial. Alternately adjust C1B trimmer and C1A until no further increase in output can be obtained.

3. Repeat Step (1.), then repeat step (2.). If necessary, go back and forth between step (1.) and step (2.) until no further improvement is obtained.

HOW TO ORDER PARTS

Always give part number (and number printed on part if different from number shown on parts list), and name of part. When this information is not available, give complete description of part. Be sure to give Model and Catalog number.

The Model number will be found stamped on the rear of the chassis.

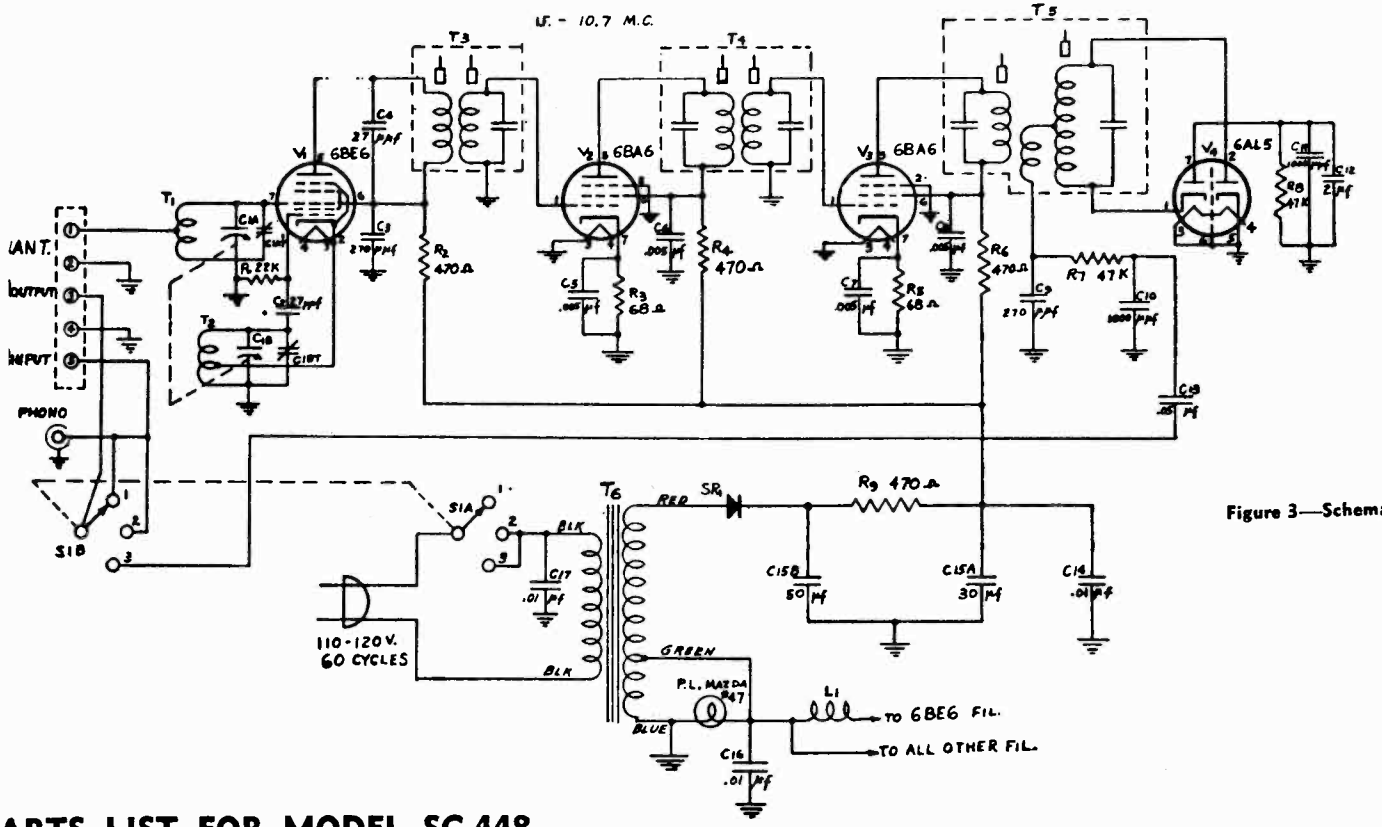


Figure 3—Schematic Diagram

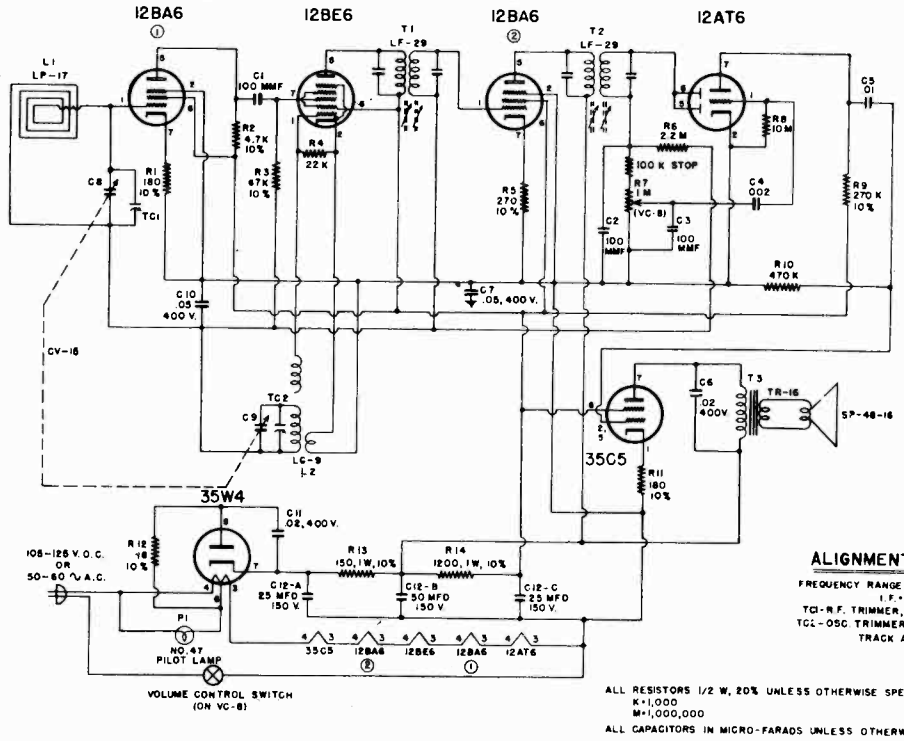
PARTS LIST FOR MODEL SC-448

Schematic Symbol	Part No.	Description
		CONDENSERS
C1A, C1B	2004	Variable Condenser with Pulley
C2, C4	ESC270	27 MMFD Ceramic Condenser
C3, C9	ESM271	270 MMFD Mica Condenser
C5, C7	3006	.005 MFD, 68 Ohm Capristor
C6, C8	BBP502	.005 MFD, 200 Volt Condenser
C10, C11	EBC102	1000 MMFD Ceramic Condenser
C12	3005	2 MFD 50 Volt Electrolytic Condenser
C13	DBP503	.05 MFD, 400 Volt Condenser
C14, C16, C17	DBP103	.01 MFD, 400 Volt Condenser
C15A, C15B	3003	50-30 MFD, 150 Volt Electrolytic Condenser
		RESISTORS
R1	XS223	22K Ohm ½ Watt Resistor
R2, R4, R6, R9	XB471	470 Ohm ½ Watt Resistor
R3, R5		See C5, C7 above
R7, R8	XS473	47K Ohm ½ Watt Resistor

		COILS AND TRANSFORMERS
T1	4017	Antenna Coil
T2	4018	Oscillator Coil
T3	4015	First I. F. Transformer
T4	4014	Second I. F. Transformer
T5	4016	Ratio Detector Transformer
T6	4013	Power Transformer
L1	4005	Filament Choke
		MISCELLANEOUS PARTS
SR1	3004	Selenium Rectifier
S1A, S1B	1004	AC Phono Switch
	6034	Knob, Off-On and Tuning
	6035	Terminal Board, 5 Binderhead Terminals
	6036	Tuning Shaft, with Bushing
	6037	Dial Face
	6039	Dial Window
	6040	Dial Pointer
	3007	Pilot Lamp Socket
	5003	Power Cord
	6041	Cabinet, Mahogany
	6043	Phonograph Receptacle
	5004	Output Cable
	6042	Dial Cord and Spring

MODEL 201

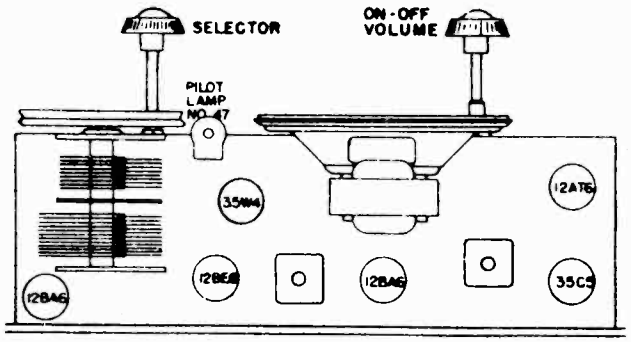
The tuning range of this receiver is 550 to 1600 kilocycles. The dial has the last 0 omitted so that 55 is 550 Kc. and 160 is 1600 Kc.



PARTS PRICE LIST

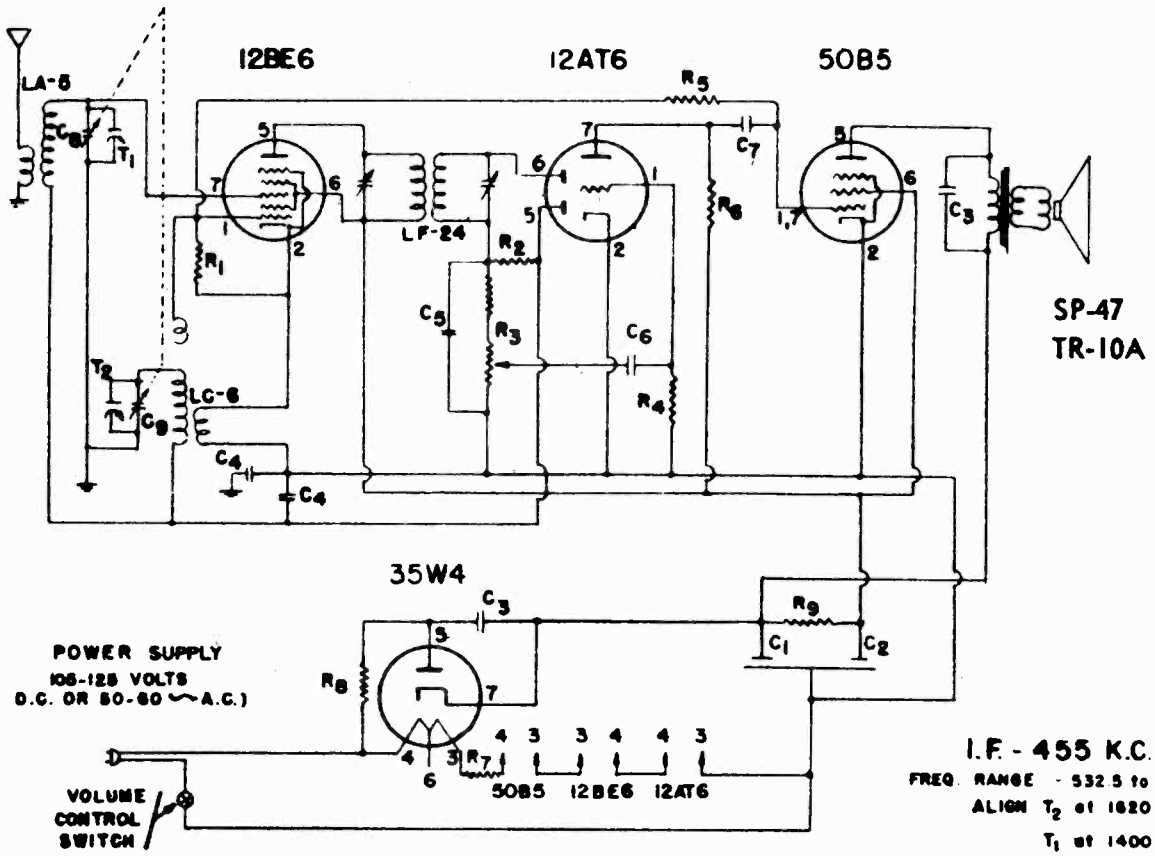
DIAGRAM LETTER	PART NO,	DESCRIPTION
	MS-65	PILOT LIGHT BRACKET
PI	BU-47	PILOT LAMP #47
	SP-48-16	SPKR. 4PM 1 .02 MAG W/O.T. TR-16
C 8,9	CV-15	VARIABLE CONDENSER
L 2	LC-9	OSCILLATOR COIL
T1-2	LF-29	I. F. TRANSFORMER
R 7	VC-8	VOLUME CONTROL
C12,A.B.C.	CE-21	25-50-25 MFD 150 V. ELECT. COND.
	PN-18	POINTER
	LP-17	ANTENNA LOOP
	LD-61	6FT. LINE CORD U.L. APPROVED
C 6, 11	CP-203-1	.02 MFD 400 V. PAPER COND. 7/16X1¼
C 7, 10	CP-503-1	.05 MFD 400 V. PAPER COND. 7/16X1½
C 4	CP-202-2	.002 MFD 400 V. PAPER COND. 3/8X1-3/16
C 5	CP-103-1	.01 MFD 400 V. PAPER COND. 3/8X1¼
C 1,2,3	CM-101-1	100 MMF MICA COND.
R 2	RC-472-2	4700 OHM ½W -10% RESISTOR
R 1, 11	RC-181-2	180 OHM ½W - 10% RESISTOR
R 4	RC-223-1	22,000 OHM ½W -20% RESISTOR
R 12	RC-180-2	18 OHM ½W -10% RESISTOR
R 10	RC-474-1	470,000 OHM ½W -20% RESISTOR
	RC-274-1	270,000 OHM ½W-20% RESISTOR
R 8	RC-106-1	10 MEG ½W -20% RESISTOR
R 6	RC-225-1	2.2 MEG ½W -20% RESISTOR
R 13	RC-151-5	150 OHM 1W -10% RESISTOR
R 5	RC-271-2	270 OHM ½W -10% RESISTOR
R 3	RC-473-2	47,000 OHM ½W-10% RESISTOR
R 14	RC-122-5	1200 OHM 1W -10% RESISTOR
	CB-105	CABINET PLASTIC
	GR-22	PLASTIC GRILLE
	DL-31	PLASTIC DIAL
	KN-20	KNOB

TUBE LOCATION CHART



ALIGNMENT PROCEDURE

1. Connect a suitable signal generator to the R.F. section of the tuning condenser. Connect the ground side of the generator to the frame of the condenser Use a .05 condenser to isolate the generator from the R.F. section.
2. Connect a suitable output meter to the voice coil leads of the speaker.
3. With the variable condenser open, apply a 455 Kc. signal. Use the lowest level consistent with good output indication.
4. Adjust I.F. transformer trimmers to this frequency.
5. Apply a 1620 Kc. signal to loop and adjust trimmer to maximum.
6. Set the signal generator to 1400 Kc. Tune the receiver dial to maximum response, then adjust R.F. trimmer to maximum response. This completes the alignment.



ELECTRICAL SPECIFICATIONS

Power Supply	105–125 Volts D.C. or 50–60 Cycles A.C. 30 Watts	Power Output	1 watt undistorted 1.5 watt maximum
Frequency Range	530 to 1620 kc.	Sensitivity	800 Microvolts at 50 milli-watts Output
Intermediate Freq.	455 kc.	Selectivity	120 kc broad at 1000 times signal at 1000 kc.
Tuning	Two gang capacitor		
Speaker	4 inch PM 3.5 ohm voice coil impedance		

ALIGNMENT PROCEDURE

- Output meter across 3.5 ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

SIGNAL GENERATOR				SETTING Tuner	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Factor	Connection to Receiver	Ground Connection		
455 kc	.1 mfd	12BE6 Grid	B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1620 kc	.1 mfd	12BE6 Grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1400 kc	75 mmf	Hank	B—	1400 kc	Antenna trimmer T1

MODEL 211

POWER SUPPLY

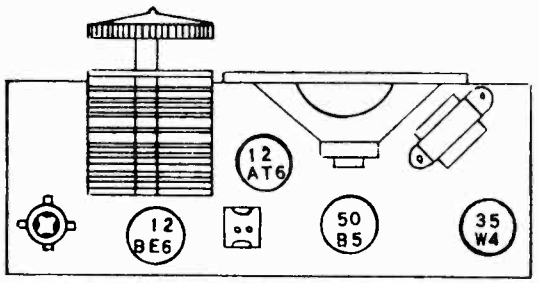
This receiver is designed to operate on either an A.C. or D.C. power supply. The following operation ratings should be observed:

Voltages.....105-125 Volts, A.C. or D.C.

Frequency.....50 to 60 cycles on A.C.

If in doubt as to the voltage and frequency supplied to your home, telephone your local power company.

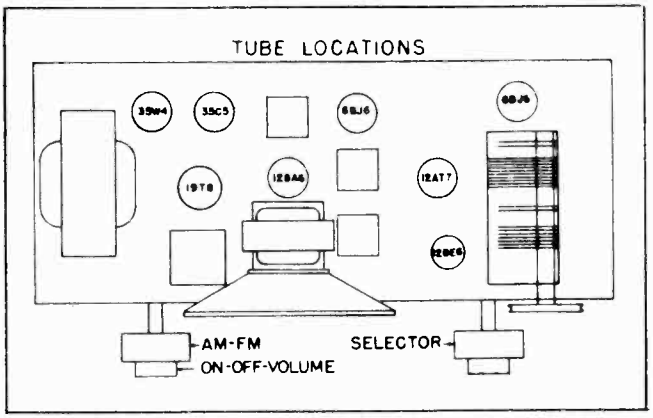
When operating on a D.C. source, it is necessary to insert the power plug with the proper polarity. If the set fails to function after an interval sufficient for the tubes to reach their operating temperature, reverse the power plug in the outlet.



Remove back to replace tubes

PARTS LIST

SCHEMATIC DIAGRAM REFERENCE	PART NUMBER	DESCRIPTION
C1, C2	CE-15	Electrolytic Cond. 2x40 MFD. 150 V
		12BE6 Mini Tube
		50B5 Mini Tube
		12AT6 Mini Tube
		35W4 Mini Tube
C3	CP-203-1	.02 MFD. 400V Paper Cond.
C4	CP-503-4	.05 MFD. 200V Paper Cond.
C5	CM-101-2 }	100 MMF-Mica or Ceramic (or
	CC-121-1 }	120 MMF-Mica or Ceramic (or
	CM-151-1 }	150 MMF-Mica or Ceramic)
C6	CP-202-2	.002 MFD. 400V Paper Cond.
C7	CP-502-3 }	.005 MFD. 200V Paper Cond. (or
	CP-103-5 }	.01-150V Molded Paper)
C8, C9	CV-14	Variable Condenser (2 gang)
	SP-47-10A	4" Speaker
	TR-10A	Output Transformer
		Speaker with Output Trans. TR-10A Mounted
	LF-24	IF Transformer
	MS-15	IF Clip
	LA-5	Antenna Coil
	LC-6	Oscillator Coil
R1	RC-183-2	18,000 OHMS ½w 10% Res.
R2	RC-475-1	4.7 Meg. ½w 20% Res.
R3	VC-11	Vol. Control - 2 Meg Look Stop
	BK-24	Back & Printing
	CB-106	Cabinet (Ebony)
	KN-20	Knob
	KN-21	Pointer Knob (Ivory)
R4	RC-106-1	10 Meg. ½w 20% Res.
R5	RC-334-1	330,000 OHMS ½w 20% Res.
R6	RC-224-1	220,000 OHMS ½w 20% Res.
R7	RW-390-5	39 OHMS 1 watt 10%
R8	RC-180-1	18 OHMS ½w 20% Res.
R9	RC-222-5	2,200 OHMS 1w 10% Res.
	LD-62	Line Cord
	HK-2	17 Ft. Antenna Hank



POWER SUPPLY

This receiver is designed to operate on A.C. only. The following operation ratings should be observed:

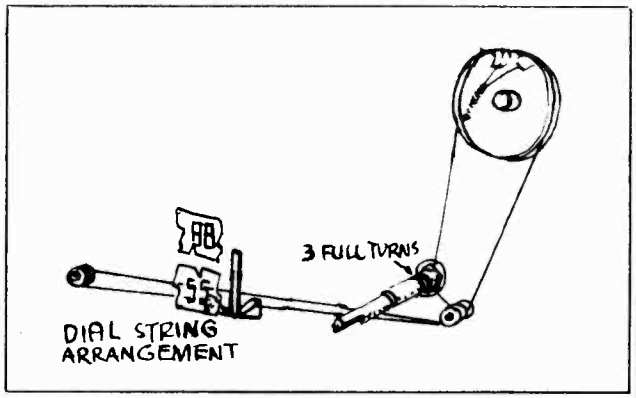
Voltages.....105 – 125 Volts, A.C.

Frequency.....60 cycles

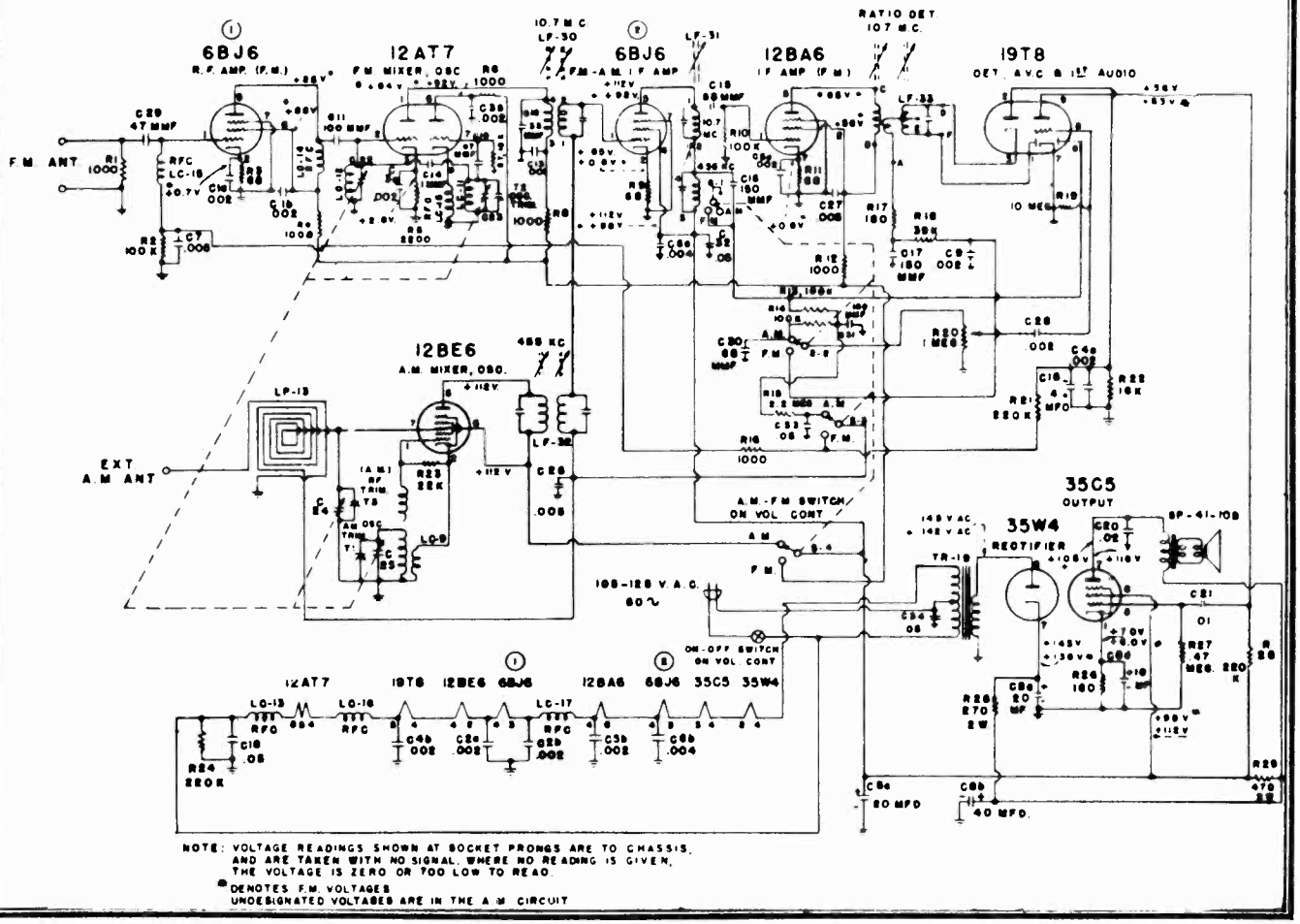
FREQUENCY RANGES

AM.....535–1620 KC

FM.....87.5–109 MC



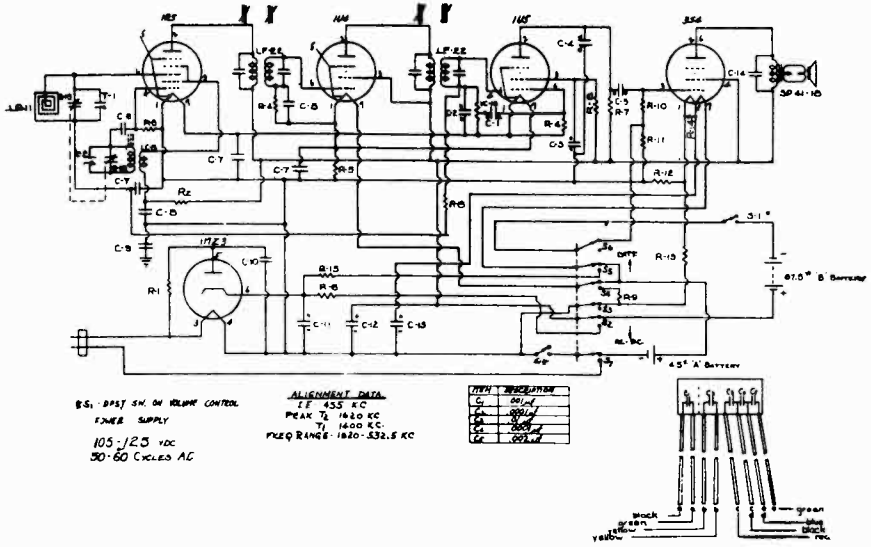
Replacement of Drive Cord

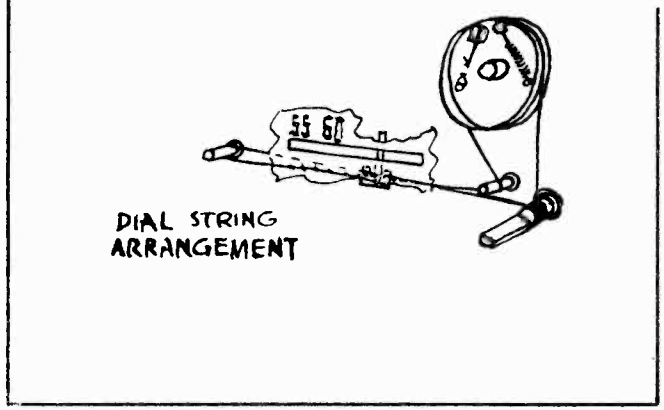


MODEL 212

PARTS LIST

SCHEMATIC DIAGRAM REFERENCE	PART NUMBER	DESCRIPTION
	SP-41-10B	4" PM SPKR. 1 OZ. MEG. TR-10B MOUNTED TO SPKR.
	SA-24	DRIVE SHAFT
	PN-17	DIAL POINTER
	LF-33	RATIO DETECTOR TRANSFORMER
	LF-30	F.M. I.F. TRANSFORMER
	LF-31	F.M. I.F. TRANSFORMER
	LF-32	A.M. I.F. TRANSFORMER
	LC-12	R.F. COIL - F.M.
	LC-11	OSCILLATOR COIL - F.M.
	LC-13	FILAMENT CHOKE
	LC-14	PLATE CHOKE
	LC-15	GRID CHOKE
	LC-16	CATHODE CHOKE
	LC-9	BROADCAST OSCILLATOR COIL
	TA-2	CERAMIC TRIMMER ASSEMBLY
C-7, C-26, C-27	CC-1-1	CAPACITOR .005 MFD CERAMIC
C3-A, 3-B, C4-A, 4-B, C5-A, 5-B, C2-A, 1-B, C2-A, 2-B	CC-2-1	CAPACITOR 2X.002 MFD CERAMIC
C6-A, 6-B	CC-2-2	CAPACITOR 2X.004 MFD CERAMIC
C-13	CM-102	CAPACITOR .001 MFD MICA
C-12	CMS-033-9	33 MMF SILVER MICA + - 5%
C-16, C-31	CM-151-1	150 MMF MICA + - 20%
C-15, C-30	CC-068-7	68 MMF MICA + - 20%
C-11	CC-101-7	100 MMF INSULATED CERAMIC-20%
C-10, C-29	CC-047-8	47 MMF INSULATED CERAMIC-10%
C-17	CM-151-2	150 MMF MICA - 10%
C-14	CSP-1	CAPACITOR 1 MMF
R-19	RC-106-1	10 MEG. ½W - 20% RESISTOR
R-15	RC-225-1	2.2 MEG. ½W - 20% RESISTOR
R-29	RW-271-8	270 OHMS 2W - 10% RESISTOR
R-29	RW-475-8	470 - 2W -10%
R-21, R-2 R-28	RC-224-1	220,000 ½W - 20%
R-2, R-10, R-13, R-14	RC-104-1	100,000 ½W - 20%
R-1, R-4, R-6, R-18, R-12 R-16	RC-102-1	1000 ½W - 20%
R-3, R-9, R-11	RC-680-2	68 ½W - 10%
R-5	RC-222-2	2200 ½W - 10%
R-7	RC-103-2	10,000 ½W - 10%
R-23	RC-223-1	22,000 ½W - 20%
R-18	RC-393-2	39,000 ½W - 10%
R-27	RC-474-1	470,000 ½W - 20%
R-22	RC-163-3	16,000 ½W - 5%
R-17, R-26	RC-181-2	180 ½W - 10%
C-9, C-28	CP-202-2	.002 MFD 400V PAPER COND.
C-21	CP-103-1	.01 MFD 400V PAPER COND.
C-20	CP-203-20	.02 MFD 800V PAPER COND.
C-18, C-32, C-33, C-34	CP-503-1	.05 MFD 400V PAPER COND.
C-19	CE-19	4 MFD 50 W.V. ELECTROLYTIC COND.
C-8A, B, C, D	CE-18	ELECTROLYTIC COND.
	TR-19	TRANSFORMER ISOLATION
	LP-13	ANTENNA LOOP
	LD-84	2 CONDUCTOR LINE COR. 6 FT.
	MS-15	K TRAN. MOUNTING CLIP
R-20, S-1, S-2, S-3, S-4	VC-17	VOLUME CONTROL & AM FM SWITCH
C-22, 23, 24, 25	CV-17	VARIABLE CONDENSER
	50-17	MIN. WAFER SOCKET WITHOUT SHIELD 7 PINS
	50-17-S	MIN. WAFER SOCKET WITH SHIELD 7 PINS
	50-19-S	MIN. WAFER SOCKET WITH SHIELD 9 PINS
	CB-158	BAKELITE CABINET
	KN-28	KNOB ASSEMBLY
	KN-26	LARGE KNOB
	KN-27	SMALL KNOB
	DL-26	DIAL PLATE
	GR-27	GRILLE (SILK CLOTH ON CARDBOARD)





Replacement of Drive Cord

ELECTRICAL SPECIFICATIONS

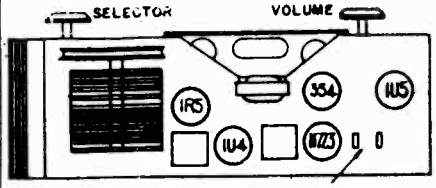
Power supply	105–125 volts DC or 50–60 cycles AC 15 watts	Antenna	Built-in loop
Batteries	A–4½ volts. 100 ma. B—67½ volts. 8 ma. average	Speaker	4 inch PM; voice coil impedance 3.5 ohms.
Frequency Range	535 to 1620 kc.	Power Output	80 milliwatts undistorted 140 milliwatts maximum
Intermediate Freq.	455 kc.	Sensitivity	500 microvolts per meter for 50 milliwatt output
Tuning	Two-gang capacitor	Selectivity	55 kc broad at 1000 times signal at 1000 kc.

ALIGNMENT PROCEDURE

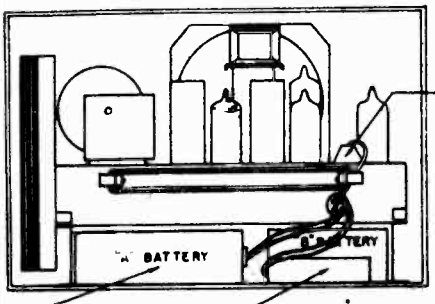
- Output meter across 3.5 ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4. volts.

SIGNAL GENERATOR				SETTING TUNER	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Factor	Connection to Receiver	Ground Connection		
455 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1620 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1500 kc		Radiating Loop		1500 kc●	Antenna trimmer T1

MODEL 213



INSERT LINE CORD PLUG HERE FOR BATTERY OPERATION



Line cord plug shown in position for battery operation, with line cord wrapped around line cord retainers.

For A.C.-D.C. operation remove plug from chassis, unwrap cord and bring out of notch in side of cover.

Insert two-prong plug into "A" BATTERY. Make sure large pin engages large contact in battery. Excessive force is not required to push plug into battery.

Place "B" BATTERY so that contacts are toward bottom. Snap fasteners onto battery.

POWER SUPPLY

This receiver is designed to operate on either an A.C. or D.C. power supply. The following operation ratings should be observed:

Voltages.....105-125 Volts, A.C. or D.C.

Frequency ..... 50 to 60 cycles on A.C.

If in doubt as to the voltage and frequency supplied to your home, telephone your local Power Company.

When operating on a D.C. source, it is necessary to insert the power plug with the proper polarity. If the set fails to function after an interval sufficient for the tubes to reach their operating temperature, reverse the power plug in the outlet.

The battery supply to be used with this receiver is as follows:

"A" supply.....4½ volts. Use Aircastle No. 1512; Eveready No. 746; RCA VS 002, Rayovac P-83A; SEARS-6440 or equivalent. Eveready No. 736 or equivalent.

"B" supply.....67½ volts. Use Aircastle No. 1523 or Burgess No. XX45 or Eveready No. 467 or RCA-VS-016 or equivalent.

SCHEMATIC DIAGRAM REFERENCE	PART NUMBER	DESCRIPTION
	IM-10	Bottom Cover
	SP-41-18	4" Spkr. 1 oz. Magnet with Output Trans.
	MS-90	Dial Plate
	SO-17-S	Min. Socket with Shield
	SO-17	Min. Socket without Shield
	VC-16	Vol. Control 1 Meg. with OPST switch
C-15, C-16	CV-15	Variable Cond. with 2½" pulley (Trimmers on variable)
	SA-23	Drive Shaft Assembly
S-2,3,4,5,6,7	SW-11	Battery Switch-6 Pole D.T.
	LP-11	Antenna Loop
	LF-22	IF Transformer
	MS-15	IF Mtg. Clip
	FA-12	"A" Battery Cable
	FA-15	"B" Battery Cable
	LD-83	Line Cord
	LC-8	OSC. Coil
C11,C-12,C-13	CE-17	Elect. Cond. 40-40 MF 150V 200 MF 10V
C-14	CP-502-2	.005 MFD. 400V Paper Plus 40% Minus 15%
C-7	CP-503-2	.05 MFD. 150V Paper Plus 60% Minus 25%
C-9	CP-104-1	.1 MFD. 200V Paper Plus 20% Minus 10%
C-10	CP-503-1	.05 MFD. 400V Paper Plus 60% Minus 25%
C-8	CP-103-2	.01 MFD. 150V Paper Plus 60% Minus 25%
C-6	CM-470-1	.00047 MFD. Mica Cond. Plus/Minus 20%
R-6	RC-682-5	6800 OHMS 1w Plus/Minus 10% Car. Res.
R-14	RC-391-2	390 OHMS ½w Plus/Minus 10% Car. Res.
R-12	RC-152-2	1500 OHMS ½w Plus/Minus 10% Car. Res.
R-5	RC-222-2	2200 OHMS ½w Plus/Minus 10% Car. Res.
R-9	RC-390-2	39 OHMS ½w Plus/Minus 10% Car. Res.
R-13	RC-270-3	27 OHMS ½w Plus/Minus 5% Car. Res.
R-4	RC-106-1	10 Meg. ½w Plus/Minus 20% Car. Res.
R-8	RC-335-1	3.3 Meg. ½w Plus/Minus 20% Car. Res.
R-10	RC-225-1	2.2 Meg. ½w Plus/Minus 20% Car. Res.
R-7	RC-105-1	1w ½w Plus/Minus 20% Car. Res.
R-2	RC-153-1	15000 OHMS ½w Plus/Minus 20% Car. Res.
R-3	RC-104-1	10000 OHMS ½w Plus/Minus 20% Car. Res.
R-11	RC-681-2	680 OHMS ½w Plus/Minus 10% Car. Res.
R-1	RC-180-1	18 OHMS ½w Plus/Minus 20% Car. Res.
	PM-16	Dial Pointer
	BK-25	Back cover with Wire Hinge
	FA-13	Fuse Clip
	EY-10 or EY-7	Eyelet - Stimpson A 526
	HA-5	Handle Assembly (with 2 Springs 2 Cotter pins)
	KN-24	Knobs
	CB-113-A	Plastic Cabinet
	BK-25	Cabinet Back
	HA-2	Molded Handle
	SG-4	Spring
	EY-10	Eyelet

ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment.

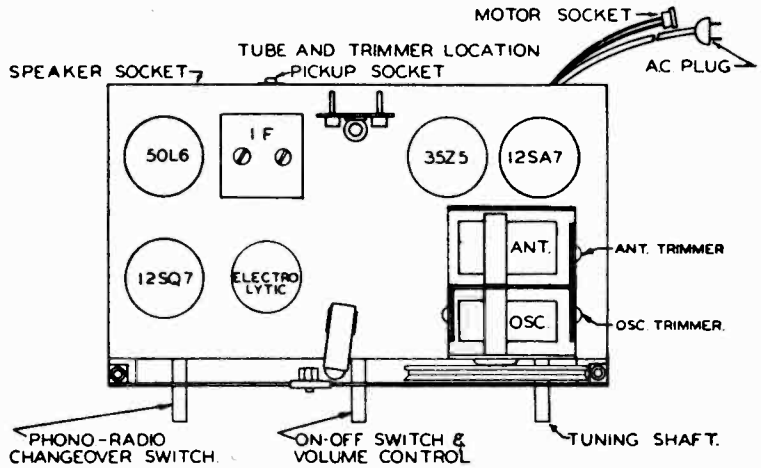
A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1620 KC. An output meter should be connected across the speaker.

The receiver volume control should be turned to maximum during the I.F. and all subsequent alignments to keep the AVC from working and giving false readings. Keep the generator output as low as possible to prevent overloading.

FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD condenser. The ground lead from the generator must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

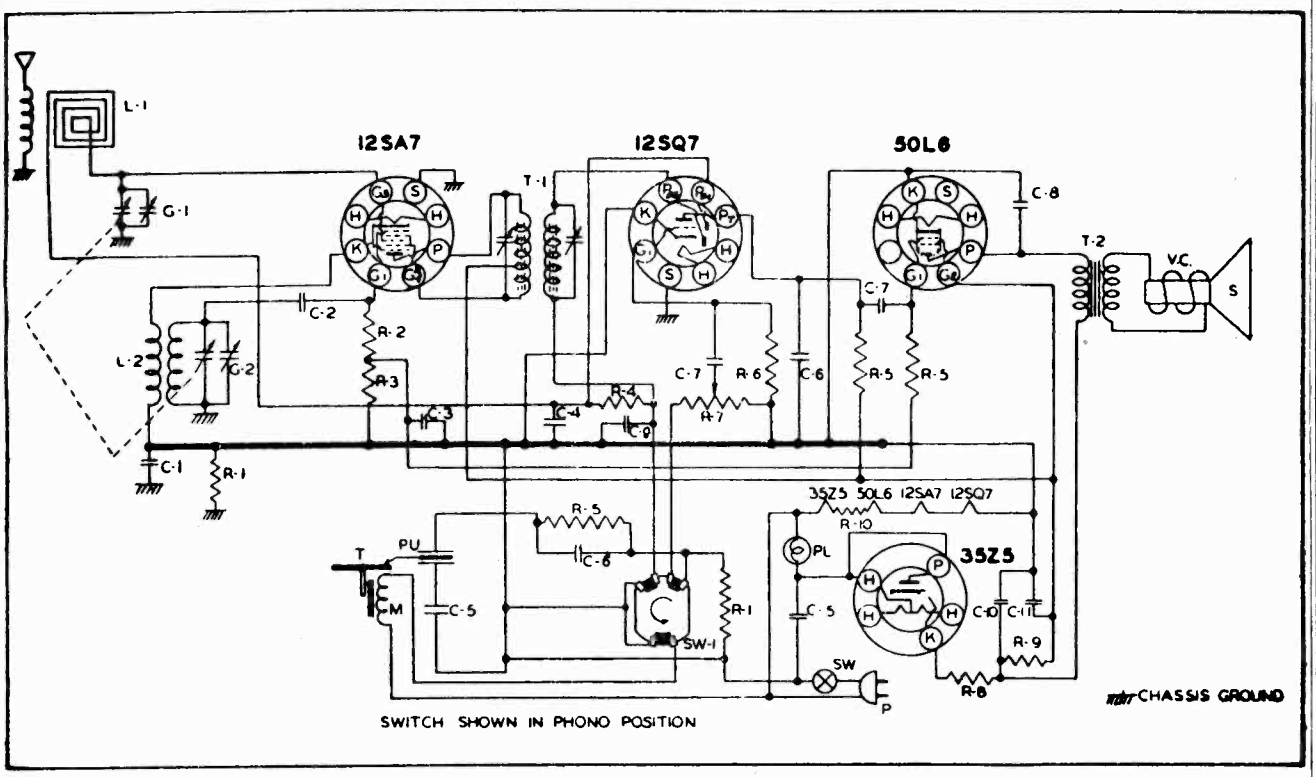
SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1620 KC. The OSC. trimmer is located on the front of the chassis. Adjust this trimmer until the 1620 KC signal is tuned in.

THIRD STEP: Remove the hot lead of the generator from the ANT section of the gang condenser. Connect this lead to the primary of the antenna coil through a 200 MMFD condenser. Adjust the Signal Generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The ANT trimmer is located on the top of the ANT. section of the gang condenser. Adjust this trimmer until a maximum reading is noted on the output meter. No further adjustment should be necessary, unless the set has been damaged, as the coils and condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.



POWER SOURCES: This combination will operate on alternating (AC) current only, of 110 to 125 volts at 60 cycles.

MODEL 5036



PARTS LIST

PART NO.	SCHEMATIC LOCATION	DESCRIPTION
IR-20	R-1	220M ~ RESISTOR 1/2W 20%
IR-9	R-2	22M ~ RESISTOR 1/2W 20%
IR-10	R-3	47M ~ RESISTOR 1/2W 20%
IR-23	R-4	33MEG. ~ RESISTOR 1/2W 20%
IR-11	R-5	470M ~ RESISTOR 1/2W 20%
IR-3	R-6	10MEG. ~ RESISTOR 1/2W 20%
VC-4	R-7	1 MEG. VOLUME CONTROL
IR-17	R-8	33 ~ RESISTOR 1/2 W 20%
IR-25	R-9	2200 ~ RESISTOR 1 W 10%
IR-41	R-10	47 ~ RESISTOR 1 W 10%
PC-8	C-1	.1MFD. CONDENSER 400V
MC-4	C-2	50MMFD MICA
PC-4	C-3	.25MFD. CONDENSER 200V
PC-2	C-4	.05MFD. CONDENSER 200V
PC-5	C-5	.05MFD. CONDENSER 400V
MC-5	C-6	500MMFD. MICA

PART NO.	SCHEMATIC LOCATION	DESCRIPTION
PC-10	C-7	.005 MFD. CONDENSER 400V
PC-7	C-8	.01MFD. CONDENSER 400V
MC-2	C-9	100MMFD. MICA
EC-12	C-10	40MFD.
	C-11	20MFD. ELECTROLYTIC
	SW	SWITCH ON VOLUME CONTROL
SW-1	SW-1	RADIO-PHONO. SWITCH
LI-8	T-1	I.F. TRANSFORMER
	T-2	OUTPUT TRANSFORMER
SPK-10	VC	VOICE COIL
	S	4" PM SPEAKER
LL-19	L-1	LOOP ANT.
LO-14	L-2	OSC: COIL
M-2	M-2	110V 60 CYCLES MOTOR
PU-5	PU	TONE ARM WITH L-75 CARTRIDGE
PB-1	PL	#47 PILOT BULB
CO-1A	P	LINE CORD
TT-2	T	8" TURNTABLE
GC-6	G-1	GANG CONDENSER
	G-2	

ALIGNMENT DATA

Remove the chassis from the cabinet. A Signal Generator with the following frequencies is required: 455 KC, 1400 KC and 1720 KC.

The receiver volume control should be turned to maximum during the I.F. and all subsequent alignments to keep the A.V.C. from working and giving false readings. Turn the tone control to complete left hand position. Keep the generator output as low as possible to prevent overloading.

Connect an output meter across the voice coil of the speaker.

Connect a 20,000 ohm resistor across the loop connector terminals to reflect the proper loop impedance.

FIRST STEP: Connect the hot lead from the generator to the "ANT." section of the gang condensor through a .1 MFD. condensor. The ground lead must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455 KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator connected in the same manner as in I.F. alignment, adjust the signal generator to 1720 KC. The "OSC." trimmer is located on the front section of the gang condenser. Adjust this trimmer until the signal is tuned in. The gang condenser should be at complete minimum capacity for this setting.

THIRD STEP: Remove the generator leads from the chassis. Remove the 20,000 ohm resistor from the loop connector terminals. Reinstall the chassis in the cabinet, connect the loop leads, motor plug and phono pickup leads.

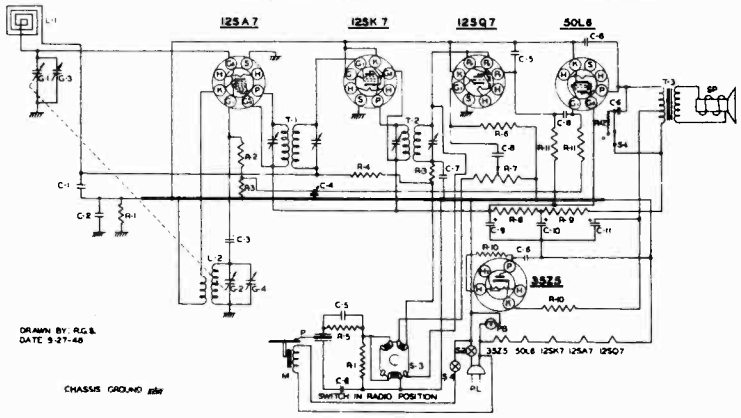
Connect the generator leads to a transmitting loop, made of a few turns of wire, and loosely couple to the receiver loop antenna which is located on the back end of the cabinet. Adjust the generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The "ANT." trimmer is located on the rear section of the gang condenser. Adjust this trimmer until a maximum signal is noted on the output meter.

No further adjustment should be necessary, unless the receiver has been damaged, as the coils and tuning condenser have been specially handled at the factory to insure proper alignment at the lower frequencies.

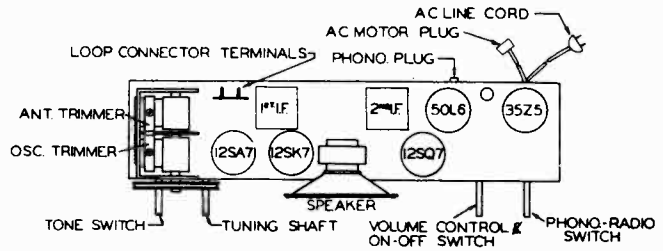
HOW TO ORDER REPAIR PARTS

Always give the part No. (No. printed on the part if different from that shown on list), and the name of the part. When No. is not available, give complete description of part. Be sure to always give the Model No. and Catalog No. The Model No. will be found on either the metal plate at the rear of the chassis or on a printed label which may be on the chassis or cabinet.

MODEL-6042 SD-77 U



TUBE AND TRIMMER LOCATION



TL-77-U FIGURE-1

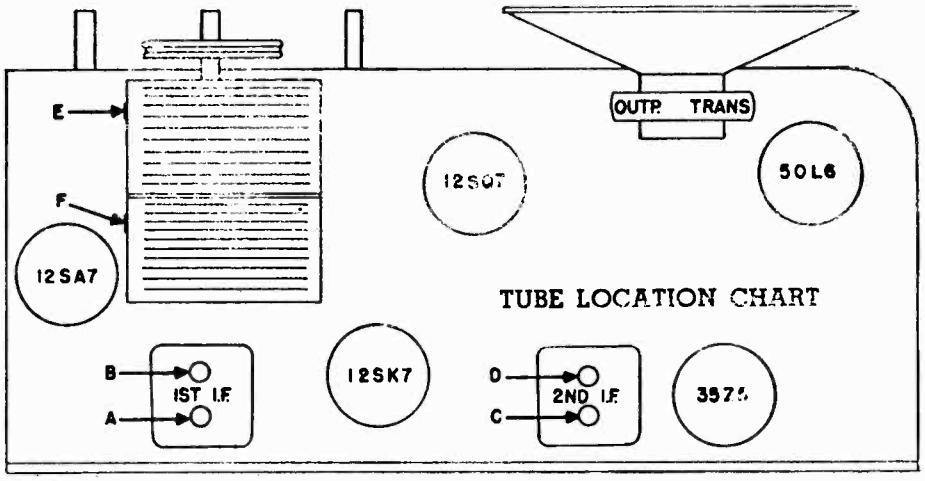
Schematic Location	Part No.	Description
C-1	PC-2	.05 MFD. COND. 200 V.
C-2	PC-8	.1 MFD. COND. 400 V.
C-3	MC-4	.00005 MFD. MICA COND.
C-4	PC-4	.25 MFD. COND. 200 V.
C-5	MC-5	.0005 MFD. MICA COND.
C-6	PC-5	.05 MFD. COND. 400 V.
C-7	MC-2	.0001 MFD. MICA COND.
C-8	PC-7	.01 MFD. COND 400 V.
C-9) (C-10)	EC-14	20 MFD.) 40 MFD.) 150 W.V. ELECTROLYTIC
C-11)		40 MFD.)
R-1	IR-20	220,000 OHM RESISTOR 1/2 W 20%
R-2	IR-9	22,000 OHM RESISTOR 1/2 W 20%
R-3	IR-10	47,000 OHM RESISTOR 1/2 W 20%
R-4	IR-23	3.3 MEG OHM RESISTOR 1/2 W 20%
R-5	IR-12	1 MEG OHM RESISTOR 1/2 W 20%
R-6	IR-13	2.2 MEG OHM RESISTOR 1/2 W 20%
R-7	VC-4	1 MEG VOLUME CONTROL

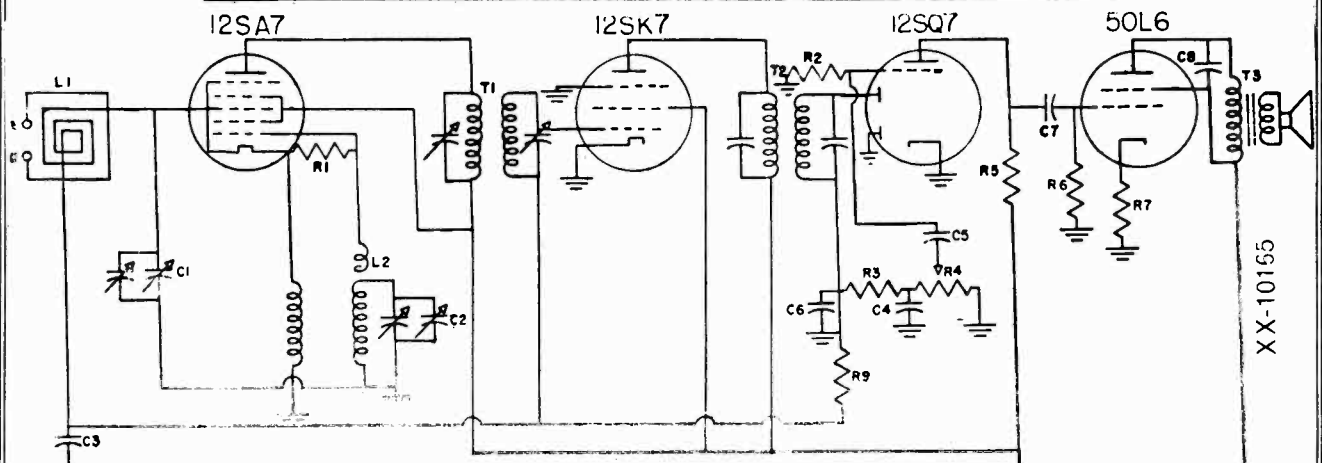
Schematic Location	Part No.	Description
R-8	IR-1	470 OHM RESISTOR 1/2 W 20%
R-9	IR-42	1000 OHM RESISTOR 1 W 10%
R-10	IR-17	33 OHM RESISTOR 1/2 W 20%
R-11	IR-11	470,000 OHM RESISTOR 1/2 W 20%
R-12	IR-15	2,200 OHM RESISTOR 1/2W20%
G1) G2)	GC-5	GANG CONDENSER
T1	LI-6	INPUT IF TRANSFORMER
T2	LI-7	OUTPUT IF TRANSFORMER
L1	LL-17	LOOP ANT.
L2	LO-14	OSC. COIL
SP	SPK-12	5" P.M. SPEAKER
S-1	SW-2	TONE SWITCH
S-3	SW-1	PHONO. RADIO SWITCH
M	AC-M-7	RECORD CHANGER MOTOR
P	AC-PU-7	CRYSTAL PICKUP ARM WITH CARTRIDGE S-1
PB	PB-2	110 V. 7½ W. PILOT BULB
PL	CO-2	LINE CORD (9 FT. LONG)

MODEL 10003

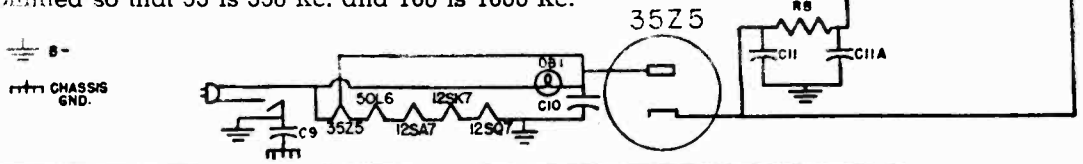
ALIGNMENT PROCEDURE

1. Connect a suitable signal generator to the R.F. section of the tuning condenser. Connect the ground side of the generator to the frame of the condenser. Use a .05 condenser to isolate the generator from the R.F. section.
2. Connect a suitable output meter to the voice coil leads of the speaker.
3. With the variable condenser open, apply a 455 Kc. signal. Use the lowest level consistent with good output indication.
4. Adjust trimmers A, B, C, and D for maximum response, reducing the input signal as required to keep the output meter on scale.
5. Connect the generator to terminals A & G through a 400 ohm dummy antenna. Apply a 1720 Kc. signal and adjust trimmer E to maximum.
6. Set the signal generator to 1400 Kc. Tune the receiver dial to maximum response, then adjust trimmer F to maximum response. This completes the alignment.





The tuning range of this receiver is 550 to 1600 kilocycles. The dial has the last 0 omitted so that 55 is 550 Kc. and 160 is 1600 Kc.



CIR. SYM.	PART NO.	DESCRIPTION
C1-2	CV-10022	CONDENSER VARIABLE
C3	CP-12503	" PAPER .05 MFD 200 VOLTS.
C4-6	CM-15251	" MICA 250 MMF
C8-7	CP-12502	" PAPER .005 MFD 200 VOLTS.
C8	CP-18203	" " .02 MFD 200 VOLTS.
C9	CP-14154	" " .15 MFD 400 VOLTS.
C10	CP-14503	" " .05 MFD 400 VOLTS.
C11-11A	CL-10010	" ELECT. 50-50 MFD 150 VOLTS.
DB1	DB-10000	DIAL LIGHT BULB NO. 47
L1	AL-10021	ANTENNA LOOP
L2	TRC-10015	OSCILLATOR COIL

CIR. SYM.	PART NO.	DESCRIPTION
R1	RC-12202	RESISTOR CARBON 22,000 OHM 1/4 W.
R2	RC-11005	" " 10 MEG OHM 1/4 W.
R3	RC-11003	" " 10,000 OHM 1/4 W.
R4	VC-12110	VOLUME CONTROL 1 MEG
R5	RC-12203	RESISTOR CARBON 220,000 OHM 1/4 W.
R6	RC-14703	" " 470,000 OHM 1/4 W.
R7	RC-31500	" " 150 OHM 1/2 W.
R8	RC-41001	" " 1000 OHM 1 W.
R9	RC-12204	" " 2.2 MEG OHM 1/4 W.
T1	TS-10020	TRANSFORMER I.F. 1ST.
T2	TS-10021	" I.F. 2ND.
T3	TO-10000	" OUTPUT

ALIGNMENT PROCEDURE

1. Connect suitable signal generator to AM R.F. section of the tuning condenser. Connect ground side of generator to chassis. Isolate the generator with .05 condenser from AM R.F. section.

2. Connect a suitable output meter to the voice coil loads of the speaker.

3. With the band switch in AM or counter clockwise position and the gang open, apply a 455 Kc signal. Use the lowest level consistent with good output indication.

4. Adjust slugs E-F-I-J for maximum response reducing the input signal as required to keep the output meter on scale.

5. Connect a vacuum tube voltmeter from test point "A" to chassis -- isolate both sides with 1 meg resistor.

6. Turn band switch to FM or clockwise position. Connect generator to FM mixer grid. Apply a 10.7 Mc signal. Use the lowest level consistent with good output indication.

7. Adjust slugs G-H-K-L-N for maximum output as indicated on vacuum tube voltmeter.

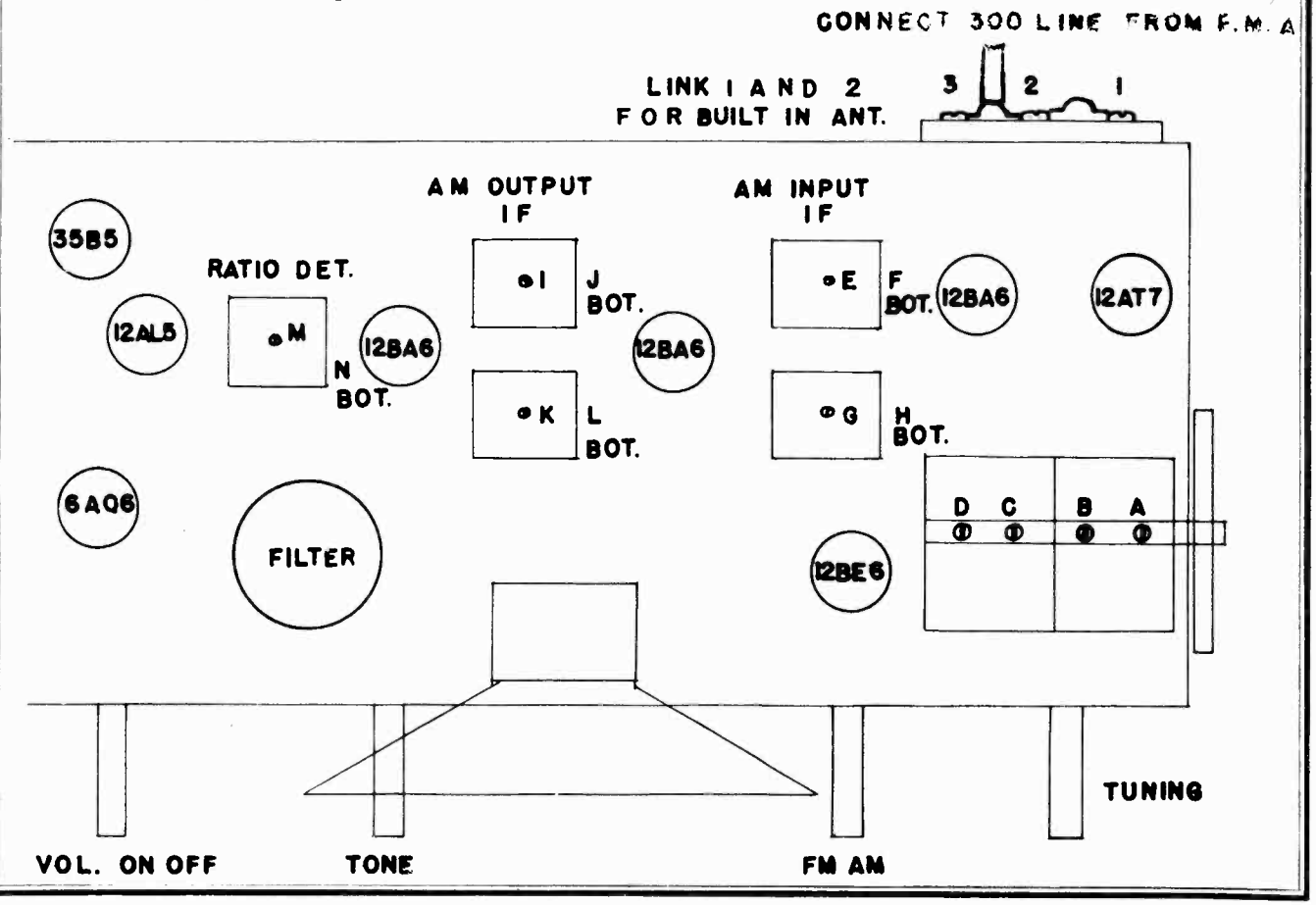
8. Across "A" and "C" (test points indicated on schematic) balance M (top slug) to zero voltage on meter.

9. Return band switch to AM position and connect generator to Terminals "A" "G" (on rear of chassis). Apply a 1720 signal and set trimmer "B" to maximum; set signal generator to 1400 Kc and tune set to maximum response, adjust trimmer "D" to maximum response.

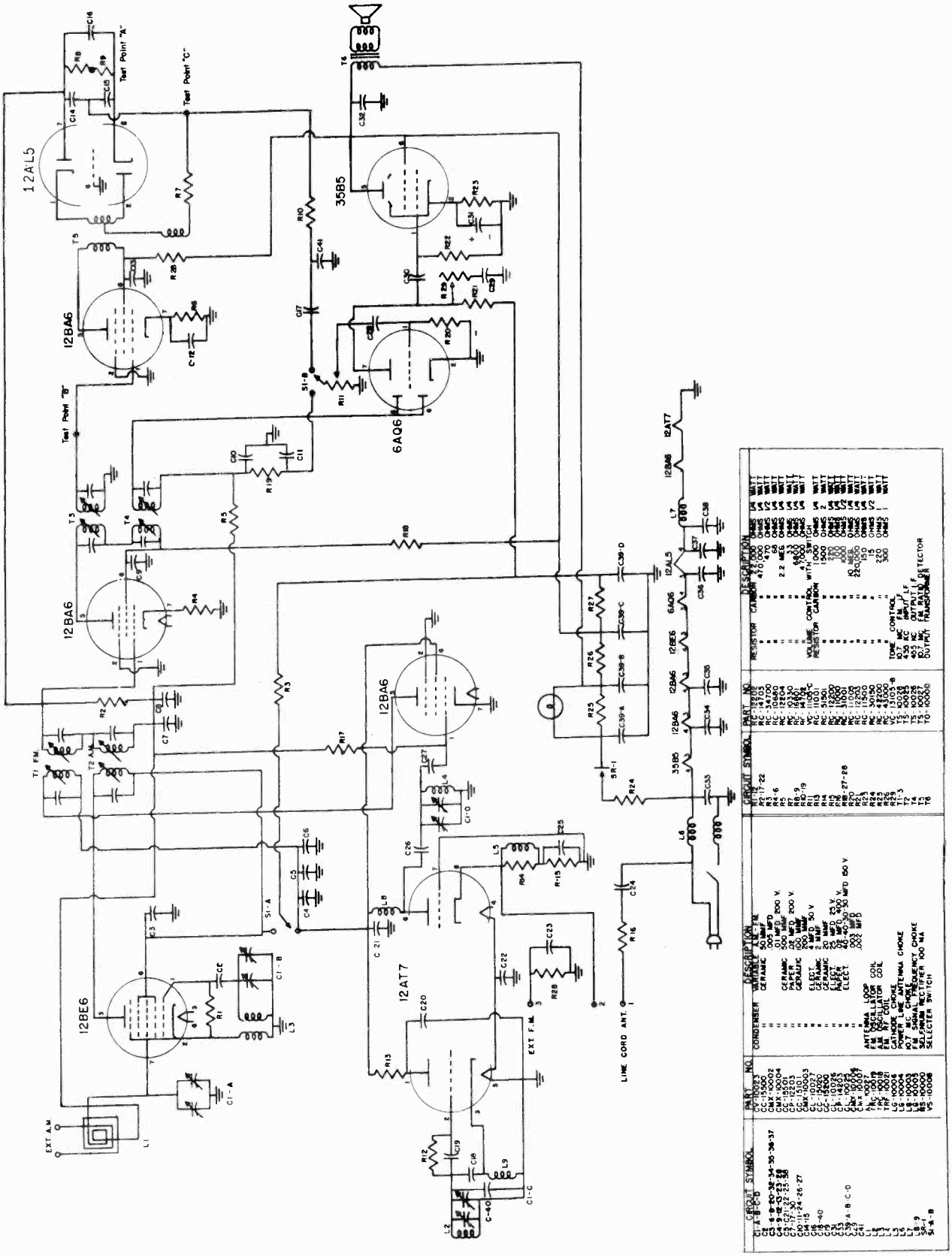
10. Return band switch to FM position and open gang. Connect suitable generator to Terminals #2 and #3 (use 300 ohm dummy).

11. Adjust trimmer "A" for maximum response.

12. Set generator to 105 Mc and tune set to maximum response. Adjust trimmer "C" to maximum by rocking gang as the trimmer is adjusted. This completes alignment.



MODEL 10005

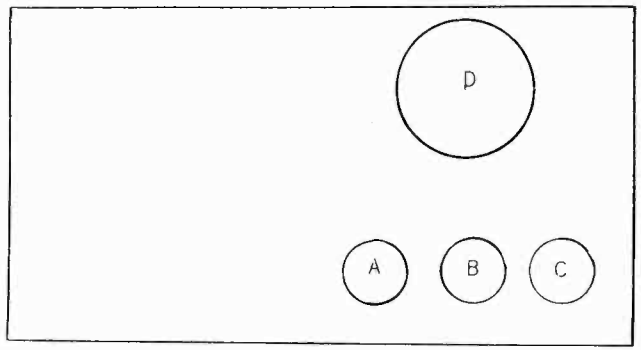


CIRCUIT SYMBOL	PART NO.	DESCRIPTION
C1-A-B-C-D	CV-10023	CONDENSER, VARIABLE A.M.-F.M.
C2	CC-15300	CERAMIC 300 MMFD
C3-9-22-30-32-34-35-36-37	CC-10002	
C4-8-20-23-33	CMX-10004	.01 MFD 200 V.
C5-10-21	CC-15101	CERAMIC .001 MFD 200 V.
C6	CC-15201	PAPER .002 MFD 200 V.
C7-12-24-26-27	CC-15100	CERAMIC 100 MMF
C11-24-26-27	CMX-10003	
C14-15	CC-10007	ELECT. 4 MFD 350 V.
C16	CC-15000	CERAMIC 25 MMF
C17	CC-15002	CERAMIC 2 MMF
C18-40	CC-14203	PAPER .05 MFD 400 V.
C19	CC-10006	ELECT. 20 MFD 350 MFD 150 V.
C28	CMX-10005	.003 MFD
C31	CMX-10007	
C41	PRC-10019	ANTENNA LOOP
L1	TPC-10018	F.M. OSCILLATOR COIL
L2	TPC-10017	F.M. R.F. COIL
L3	LG-10004	CATHODE CHOKE
L5	LG-10004	POWER LINE ANTENNA CHOKE
L6	LG-10004	OUTPUT F.M. FREQUENCY CHOKE
L7-8-9	LG-10003	F.M. SIGNAL FREQUENCY CHOKE
SR-1	RS-10000	SELENIUM RECTIFIER 100 MA
S1-A-B	VS-10008	SELECTOR SWITCH

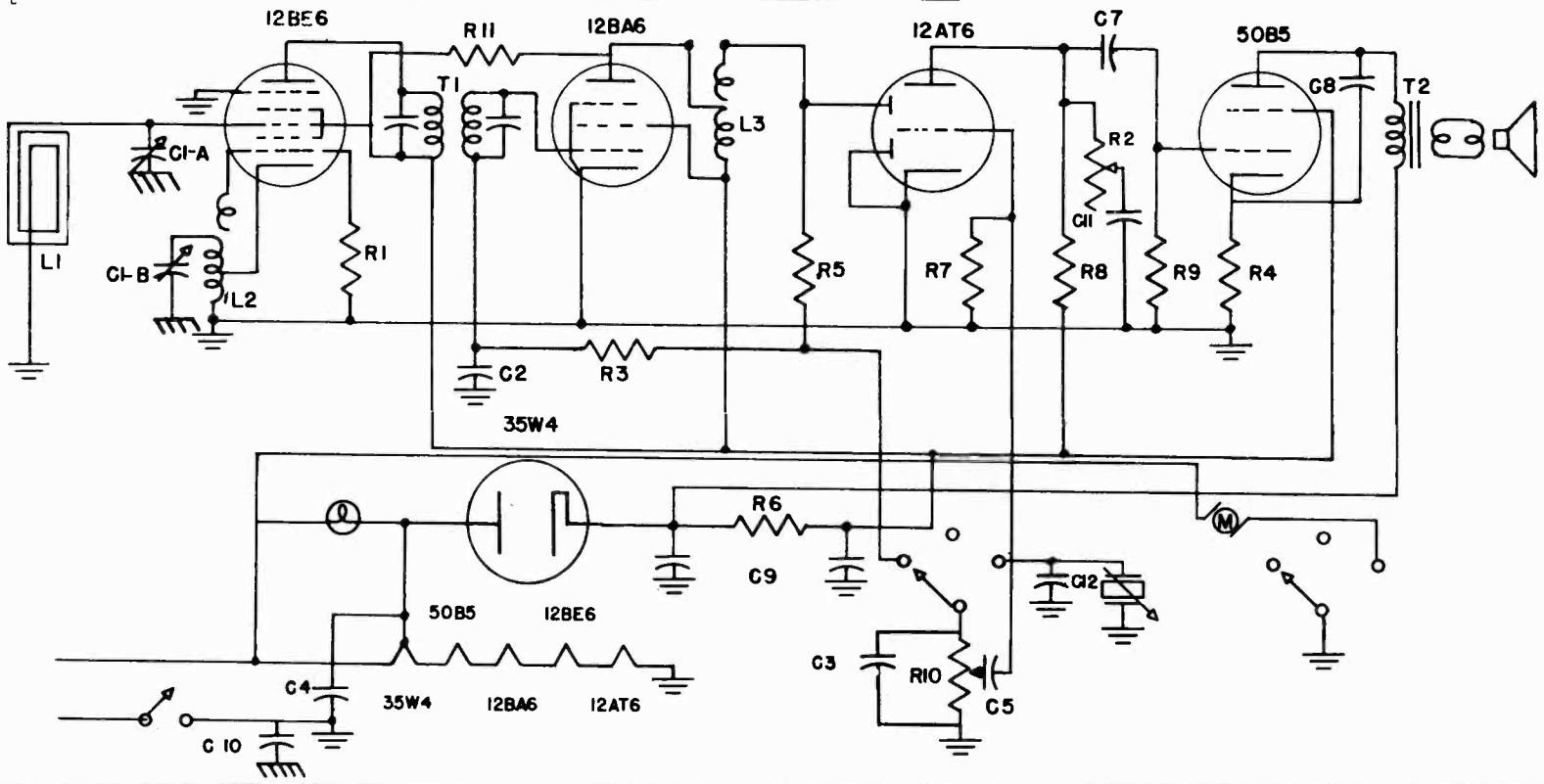
CIRCUIT SYMBOL	PART NO.	DESCRIPTION
R1-12	RC-12100	RESISTOR, CARBON 10,000 OHMS 1/2 WATT
R3	RC-12470	470,000 OHMS
R4-6	RC-34700	4700 OHMS
R7	RC-10680	68 OHMS
R8-9	RC-10224	220,000 OHMS
R10	RC-10130	13 OHMS
R11	RC-14601	4600 OHMS
R13	VC-11001	VOLUME CONTROL WITH SWITCH 1 MEG
R14	VC-11004-C	VOLUME CONTROL WITH SWITCH 1500 OHMS
R15	RC-12200	220 OHMS
R16	RC-11000	100 OHMS
R17	RC-11503	150,000 OHMS
R18	RC-11000	100 OHMS
R20	RC-11503	150,000 OHMS
R21	RC-30150	15 OHMS
R22	RC-43300	330 OHMS
R23	RC-43300	330 OHMS
R24	VC-11005-B	TONE CONTROL
R25	T1-5	455 KC INPUT I.F.
R26	T2-5	455 KC OUTPUT I.F.
R27	T3	OUTPUT TRANSFORMER
R28	T4	F.M. RATIO DETECTOR
T1	T5	
T2	T6	
T3		
T4		
T5		
T6		

OPERATION

Insert the power cord plug into the AC outlet receptacle. Turn knob "A" to the right until a click is heard. After a warm-up period of approximately 30 seconds, the set will be in operating condition. Advance the Volume Control (Knob A) to the right until the desired volume level is attained. Tuning knob (Knob D) setting is indicated by means of a beam of light through the translucent knob. Tone of the set is varied by turning knob "B", to the left for more bass, and to the right for more treble tones. The phono will be put in operation by setting knob "C" to its extreme right hand position. Never carry the set by its handle without first locking tone arm to the stand provided for it.



CIR. SYM.	PART NO.	DESCRIPTION
C1, A-B	CV-10010	CONDENSER VARIABLE
C2	CPP-12103	" PAPER .01 MFD 200 V.
C3	CMP-15251	" MICA 250 MMF 500 V.
C4 C10	CPP-14508	" PAPER .05 MFD 400 V.
C5	CPP-12202	" " .002 MFD 200 V.
C6 C12	CPP-14103	" " .01 MFD 400 V.
C7 C11	CPP-12502	" " .005 MFD 200 V.
C9	CL-10007	" ELECTROLYTIC 50/30MFD 150 V.
L1	ALP-10004A	ANTENNA LOOP
L2	TRO-10014	OSCILLATOR COIL
L3	TRF-10020	INTERSTAGE I.F. COIL
R1 R11	RC-12002	RESISTOR CARBON 20,000 OHM 1/4 WATT
R2	VC-11107	TONE CONTROL 1 MEGOHM
R3	RC-12204	RESISTOR CARBON 2.2 MEGOHM 1/4 WATT
R4	RC-11500	" " 150 OHMS 1/4 WATT
R5	RC-11503	" " 150,000 OHM 1/4 WATT
R6	RC-31001	" " 1000 OHM 1/2 WATT
R7	RC-11005	" " 10 MEGOHM 1/4 WATT
R8	RC-12205	" " 220,000 OHM 1/4 WATT
R9	RC-14703	" " 470,000 OHM 1/4 WATT
R10	VC-10105	VOLUME CONTROL WITH SWITCH
T1	TS-10017X	IF TRANSFORMER
T2	TO-10000	OUTPUT TRANSFORMER



117 volts 60 cycles AC

It covers the standard AM broadcast frequency range, 540-1600 kilocycles (KC) and the FM frequency range from 88 to 108 megacycles (MC) and comes to you equipped with a built-in loop antenna for use on AM reception. Also included is a flexible folded dipole antenna attached to the inside of the cabinet for use on FM reception.

SPECIFICATIONS

Power Supply	117 volts AC 60 cycle
Power Consumption	95 Watts
Frequency Range FM	88 to 108 MC.
Frequency Range AM	540 to 1600 KC.
I.F. frequency FM	10.7 MC.
I.F. frequency AM	455 KC.
Band width, FM, Ratio detector	360 KC.
Band width, FM, 2nd I.F.	280 KC.
Band width, FM, 1st I.F.	240 KC.
Band width, FM, Converter	180 KC.
Tubes	10
Rectifiers	Selenium, 150 ma.
Speaker	10" P.M.

The tubes used are as follows:

12BA6	FM, R.F. Amplifier
12BE6	FM, Converter
12BA6	FM, 1st I.F. Amplifier
12BA6	FM, 2nd I.F. Amplifier
12BA6	FM, 3rd I.F. Amplifier
6AL5	FM, Ratio detector
12BE6	AM, Converter
12BA6	AM, I.F. Amplifier
12AT6	AM, Detector-AVC-1st audio
50L6GT	Power output
A83-463	Selenium rectifier (2)
No. 47	Pilot lights (2)

SERVICE NOTES

GENERAL

Due to the high frequencies at which FM signals are received the service man must use great care when servicing these sets. Extreme caution must be used regarding the moving of component parts in the R.F. and oscillator circuits of the receiver as those circuits can be detuned in this manner.

If it becomes necessary to replace components such as resistors and condensers they must be replaced with parts of the same size, type, voltage rating and tolerance as called for in the parts list.

When installing new parts they should be placed in the same position as the original, and the leads should be cut to the same length.

ALIGNMENT NOTES

This receiver has been thoroughly inspected and tested at the factory, using the most modern test equipment available, such as FM sweep generators and Oscilloscopes. All I.F. circuit adjustments have been sealed at the factory and no attempt should be made to realign these circuits unless it is absolutely necessary.

CAUTION: If realignment is necessary be sure the proper test equipment is available, as listed below, before proceeding with the alignment procedure as given on page 5. This receiver employs the "double peak" type of I.F. circuits, and can not be satisfactorily aligned with conventional AM equipment. Visual alignment procedures must be used.

EQUIPMENT USED FOR ALIGNMENT

AM Signal generator

FM Sweep generator.

Oscilloscope.

Vacuum tube voltmeter.

Insulated screw driver.

Dummy antenna:
- .1 MFD condenser
- .00025 MFD mica condenser
- 150 ohm resistor (2)

Output meter.

ALIGNMENT PROCEDURE

STEPS	RECEIVER DIAL SETTING	BAND SWITCH POSITION	SIGNAL GENERATOR FREQUENCY	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTIONS	OUTPUT INDICATOR	TRIMMER ADJUSTMENT	TRIMMER FUNCTION	REMARKS
1	Minimum capacity	AM	455 KC 400 cycle AM	.1 MFD	High side—Grid of AM converter tube (12BE6) Low side—Chassis	Output Meter across voice coil	T5A, T5B T6A, T6B	AM I.F.	Adjust for maximum output
2	"	"	1600 KC 400 cycle AM	.00025 MFD	"	"	C2C	AM Oscillator	Adjust for maximum output
3	1400 KC	"	1400 KC 400 cycle AM	"	High side—One ant. terminal Low side—Other ant. terminal	"	C36 (on back)	AM Antenna	Adjust for maximum output
4	Any position where there is no station interference.	FM	10.7 MC unmodulated .1 volt output.	.1 MFD	High side—Grid of 3rd I.F. amplifier tube (12BA6) Low side—Chassis	Connect V.T.V.M. to plate of Ratio detector tube, pin 2 (6AL5)	T4B	Ratio detector primary	Adjust for maximum negative voltage, about —5 volts
5	"	"	10.7 MC 400 cycle 30% Modulation. (See note A)	"	"	Connect scope to audio take off point (across C30)	T4A	Ratio detector secondary	Adjust for a balanced pattern on scope. See Fig. 4.
6	"	"	"	"	High side—Grid of 2nd I.F. amplifier tube (12BA6) Low side—Chassis	Connect scope across 100K ohm grid return resistor of 3rd I.F. (R16)	T3A, T3B	FM 3rd I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 5 (See note "B" below)
7	"	"	"	"	High side—Grid of 1st I.F. amplifier tube (12BA6) Low side—Chassis	"	T2A, T2B	FM 2nd I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 6.
8	"	"	"	"	High side—Plate of FM R.F. tube, pin 5 (12BA6) Low side—Chassis	"	T1A, T2B	FM 1st I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 7.
9	109 MC	"	109 MC 400 cycle 30% modulation. (22.5 KC Deviation)	150 ohms in each lead.	High side—One ant. terminal Low side—Other ant. terminal	Connect output meter across voice coil	C2B	FM Oscillator	Adjust for maximum output (remove AVC ground)
10	103 MC	"	103 MC 400 cycle 30% modulation. (22.5 KC Deviation)	"	"	"	C2A	FM R.F.	Adjust for maximum output
11	100 MC	"	100 MC 400 cycle 30% modulation. (22.5 KC Deviation)	"	"	"	L1	FM Antenna	Adjust for maximum output

NOTE A: When aligning the FM I.F. circuits, keep the out put from the signal generator as low as possible.

NOTE B: The AVC circuit must be grounded to the chassis when aligning the FM I.F. circuits.

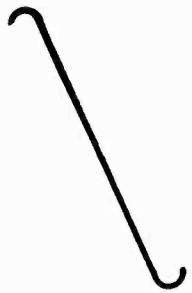


FIGURE 4

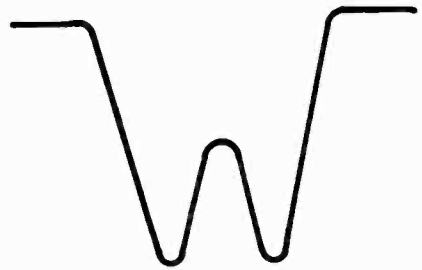


FIGURE 5

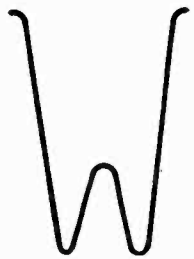


FIGURE 6

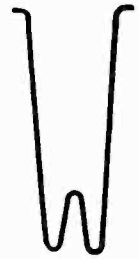


FIGURE 7

MODEL 121104

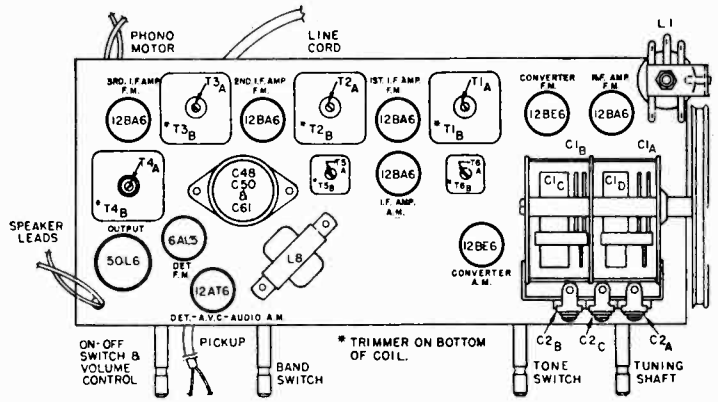


FIG. 1 TUBE AND TRIMMER LOCATIONS

VOLTAGE CHART

TUBE No.	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
12BE6 AM—Converter	—6	0	29ac	17ac	100	100	0	
12BA6 AM—I.F. Amp.	0	0	75ac	63ac	100	100	1	
12AT6 AM—Det.-AVC-Audio	0	0	17ac	6ac	0	0	30	
12BA6 FM—R.F. Amp.	0	0	29ac	39ac	100	95	1	
12BE6 FM—Converter	0	0	6ac	18ac	95	95	0	
12BA6 FM—1st I.F. Amp.	0	0	39ac	50ac	95	95	1	
12BA6 FM—2nd I.F. Amp.	0	0	50ac	63ac	95	95	1	
12BA6 FM—3rd I.F. Amp.	0	0	18ac	31ac	95	95	1	
6AL5 FM—Ratio detector	0	—3	0	6ac	—4	0	0	
50L6GT Power output	0	31ac	225	100	0	30	80ac	6.5

All voltage readings are taken from tube pin to chassis.

All measurements are made with no signal, using a 20,000 ohm per volt meter.

AC input voltage must be maintained at 117 volts for accurate readings.

AC voltages shown are at 1000 ohms per volt.

All voltages shown are approximate.

RESISTANCE CHART

TUBE No.	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
12BE6 AM—Converter	20K	1	27	18	25K	25K	3 meg.	
12BA6 AM—I. F. Amp.	2 meg.	0	70	62	25K	25K	70	
12AT6 AM—Det.-AVC-Audio	10 meg.	0	18	5	470K	120K	540K	
12BA6 FM—R.F. Amp.	1 meg.	0	27	40	25K	25K	70	
12BE6 FM—Converter	20K	0	5	18	25K	25K	22K	
12BA6 FM—1st I.F. Amp.	220K	0	40	50	25K	25K	70	
12BA6 FM—2nd I.F. Amp.	220K	0	50	62	25K	25K	70	
12BA6 FM—3rd I.F. Amp.	100K	0	18	28	25K	25K	70	
6AL5 FM—Ratio Detector	0	25K	0	5	750K	0	750K	
50L6GT Power output	0	28	25K	25K	450K	250K	70	150

All resistance readings are taken from tube pin to chassis.

Due to manufacturing tolerance on component parts, resistance readings may vary as much as 20%.

All readings are shown in ohms unless otherwise noted.

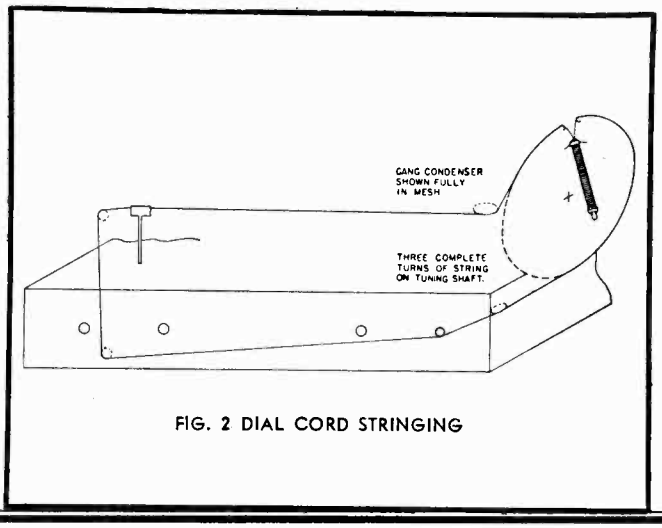


FIG. 2 DIAL CORD STRINGING

MODEL 121104

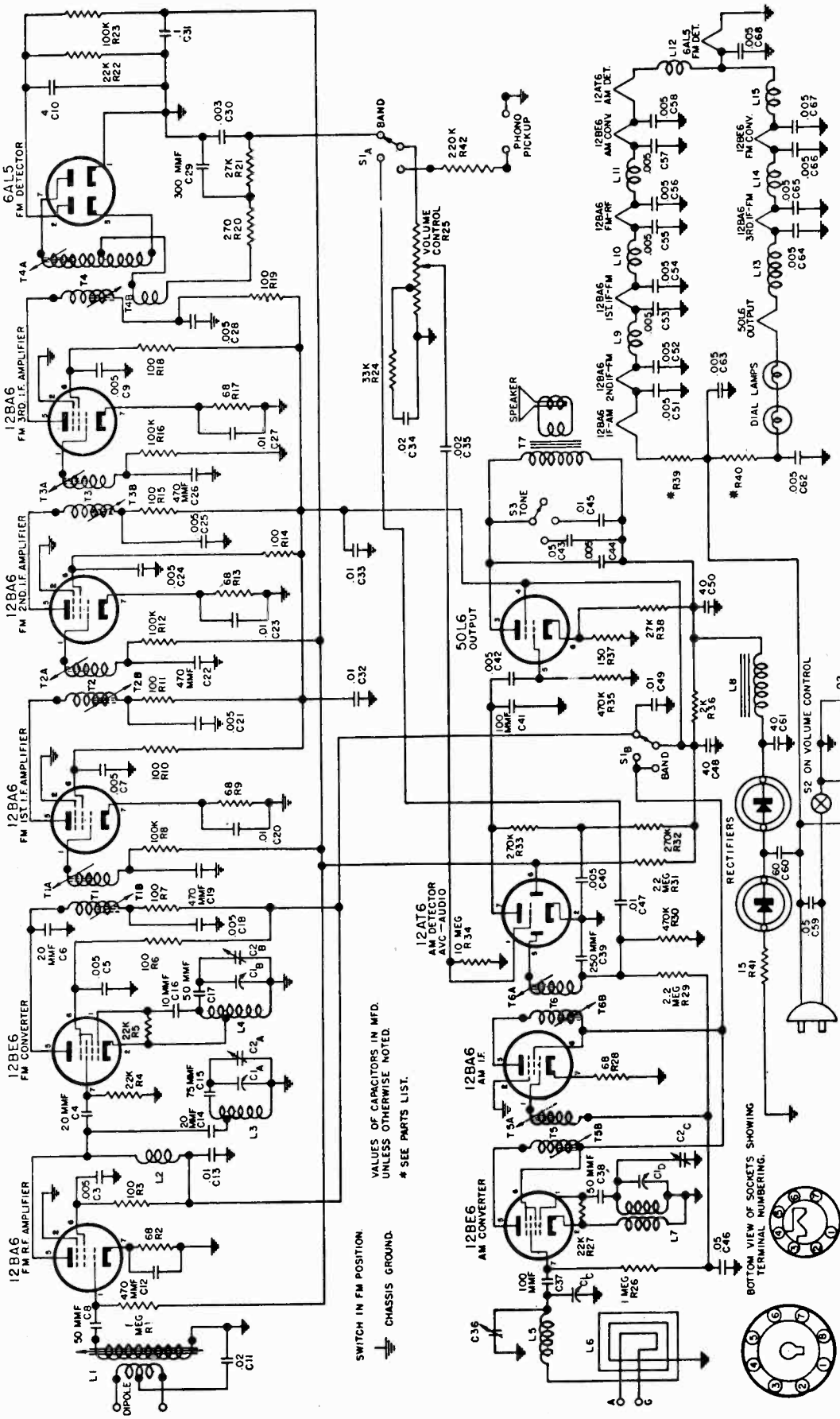


FIG. 3 SCHEMATIC DIAGRAM

RECORD CHANGER: See Milwaukee Model 11200, Page RCD.CH. 20-1

PARTS LIST

Schematic Diagram Reference	Part No.	Description
C1A, C1B C1C, C1D	C19-191	Variable Condenser
C2A C2B C2C	A20-144	FM—R.F. Trimmer FM—Oscillator Trimmer AM—Oscillator Trimmer
C3, C5, C7, C9, C18, C21, C23, C24, C25, C28, C40, C51 C52, C53, C54 C55, C56, C57 C58, C62, C64 C65, C66, C67	A16-177	005 MFD Ceramic Condenser (Centralab No. DA048 or Equiv.)
C68		
C4, C14	A15-198	20 MMF 20% Ceramic Condenser (Erie Style "A" or Equiv.)
C6	A15-193	20 MMF 20% Ceramic Condenser (Erie Style K or Equiv.)
C8, C17	A15-194	50 MMF 10% Ceramic Condenser (Erie Style K or Equiv.)
C10	A18-273	4 MFD 150 Volt Elec. Condenser
C34, C69	A16-150	.02 MFD 400 Volt Tubular Condenser
C12, C19 C22, C26	A15-200	470 MMF 20% Mica Condenser
C13, C32, C33 C47 C49	A16-165	.01 MFD 200 V Tubular Condenser
C15	A15-195	75 MMF 10% Ceramic Condenser (Erie Style K or Equiv.)
C16	A15-197	10 MMF 10% Ceramic Condenser (Erie Style A or Equiv.)
C20, C23, C27	A16-163	.01 MFD 120 V Molded Paper Condenser
C42, C44	A16-153	.005 MFD 600 Volt Tubular Condenser
C29	A15-199	300 MMF 20% Mica Condenser
C30	A16-180	.003 MFD 200 V Molded Paper Condenser
C31	A16-157	.1 MFD 200 V Tubular Condenser
C35	A16-178	.002 MFD 200 V Molded Paper Condenser
C36	A20-139	AM Antenna Trimmer
C37	A15-190	100 MMF 20% Mica Condenser
C38	A15-191	50 MMF 20% Mica Condenser
C39	A15-176	250 MMF 20% Mica Condenser
C41	A15-196	100 MMF 20% Ceramic Condenser (Erie Style K or Equiv.)
C46 C69, C43, C59	A16-158	.05 MFD 400 V Tubular Condenser
C45	A16-156	.01 MFD 400 V Tubular Condenser
C48 C50 C61	A18-284	40 MFD 150 Volt Electrolytic Condenser 40 MFD 300 Volt Electrolytic Condenser 40 MFD 300 Volt Electrolytic Condenser
C60	A18-285	60 MFD 150 Volt Electrolytic Condenser
R1, R26	A60-668	1 Megohm Resistor 20% 1/2 Watt
R2, R13, R17, R28, R9	A60-742	68 Ohm Resistor 10% 1/2 Watt
R3, R6, R7, R10, R19, R11 R14, R15, R18	A60-743	100 Ohm Resistor 20% 1/2 Watt
R4, R5, R22 R27	A60-744	22 K Ohm Resistor 10% 1/2 Watt
R8, R12, R16 R23	A60-727	100 K Ohm 20% 1/2 Watt
R20	A60-723	270 Ohm 20% 1/2 Watt Resistor
R21	A60-745	27 K Ohm 10% 1/2 Watt Resistor
R24	A60-748	33 K Ohm 10% 1/2 Watt Resistor
R25	B24-173	Volume Control with Switch
R29, R31	A60-726	2.2 Megohm 20% 1/2 Watt
R30, R35	A60-731	470K Ohm 1/2 Watt Resistor 20%
R32, R33	A60-747	270K Ohm 20% 1/2 Watt
R34	A60-728	10 Megohm 20% 1/2 Watt
R36	A60-739	2K Ohm Resistor 5% 10 Watt
R37	A60-741	150 Ohm 10% 1 Watt Resistor
R38	A60-740	27K Ohm Resistor 10% 2 Watt
R39	A60-734	Special Compensating Resistor (Order from Spiegel)
R40	A60-735	Special Compensating Resistor (Order from Spiegel)
R41	A60-738	15 Ohm — Glassohm 10% 3 Watt Resistor
R42	A60-667	220K Ohm Resistor 20% 1/2 Watt
L1	SB10-488	Antenna Coil, FM
L3	B10-489	R. F. Coil, F.M.
L4	B10-490	Oscillator Coil, F. M.
L5	A10-504	Antenna Loading Coil
L6	S84-245	Loop Antenna Assembly
L7	B10-491	Oscillator Coil, A. M.
L8	A33-225	Filter Choke
L2, L9, L10 L11, L12, L14 L15	A33-226	Filament Choke, 11 mh.
L13	A33-227	Filament Choke
S1A, S1B	A69-178	Switch, FM-AM-PHONO
S2		Switch, ON-OFF, (on volume control)
S3	A26-125	Tone Control
T1	SA10-493	1st I. F. Transformer, F. M.
T2 T3	SC10-494	2nd & 3rd I. F. Transformer, F.M.
T4	SC10-492	Ratio detector transformer, F.M.
T5	A10-499	1st I. F. transformer, A. M.
T6	A10-500	2nd I. F. transformer, A. M.
T7	A80-241	Output Transformer
	B39-285	Drum, for Variable Condenser
	A23-153	Line Cord
	A83-463	Selenium rectifier, 150 ma.
	A75-63	Tuning shaft
	C79-358	Speaker, 10" P.M.
	A21-111	Cover, for Compensating Resistors
	SB82-53	FM Antenna Assembly, Dipole
	C67-532	Dial Scale
	C83-471	Retainer, Dial Scale
	B83-482	Dial Diffusing Plate
	A58-68	Dial Pointer
	A52-263	Knob, Tuning
	A52-260	Knob, Tone
	A52-261	Knob, ON-OFF-VOLUME
	A52-262	Knob, PH-AM-FM
	11200	Milwaukee Automatic Record Changer

117 volts 60 cycles AC current.

It covers the standard AM broadcast frequency range, 540-1600 kilocycles (KC) and the FM frequency range from 88 to 108 megacycles (MC) and comes to you equipped with a built-in loop antenna for use on AM reception. Also included is a flexible folded dipole antenna attached to the inside of the cabinet for use on FM reception.

SPECIFICATIONS

Power Supply	117 volts AC 60 cycle
Power Consumption	95 Watts
Frequency Range FM	88 to 108 MC.
Frequency Range AM	540 to 1600 KC.
I.F. frequency FM	10.7 MC.
I.F. frequency AM	455 KC.
Band width, FM, Ratio detector	360 KC.
Band width, FM, 2nd I.F.	280 KC.
Band width, FM, 1st I.F.	240 KC.
Band width, FM, Converter	180 KC.
Tubes	10
Rectifiers	Selenium, 150 ma.
Speaker	10" P.M.

The tubes used are as follows:

12BA6	FM, R.F. Amplifier
12BE6	FM, Converter
12BA6	FM, 1st I.F. Amplifier
12BA6	FM, 2nd I.F. Amplifier
12BA6	FM, 3rd I.F. Amplifier
6AL5	FM, Ratio detector
12BE6	AM, Converter
12BA6	AM, I.F. Amplifier
12AT6	AM, Detector-AVC-1st audio
50L6GT	Power output
A83-463	Selenium rectifier (2)
No. 47	Pilot lights (2)

SERVICE NOTES

GENERAL

Due to the high frequencies at which FM signals are received the service man must use great care when servicing these sets. Extreme caution must be used regarding the moving of component parts in the R.F. and oscillator circuits of the receiver as those circuits can be detuned in this manner.

If it becomes necessary to replace components such as resistors and condensers they must be replaced with parts of the same size, type, voltage rating and tolerance as called for in the parts list.

When installing new parts they should be placed in the same position as the original, and the leads should be cut to the same length.

ALIGNMENT NOTES

This receiver has been thoroughly inspected and tested at the factory, using the most modern test equipment available, such as FM sweep generators and Oscilloscopes. All I.F. circuit adjustments have been sealed at the factory and no attempt should be made to realign these circuits unless it is absolutely necessary.

CAUTION: If realignment is necessary be sure the proper test equipment is available, as listed below, before proceeding with the alignment procedure as given on page 5. This receiver employs the "double peak" type of I.F. circuits, and can not be satisfactorily aligned with conventional AM equipment. Visual alignment procedures must be used.

EQUIPMENT USED FOR ALIGNMENT

AM Signal generator

FM Sweep generator.

Oscilloscope.

Vacuum tube voltmeter.

Insulated screw driver.

Dummy antenna:
- .1 MFD condenser
- .00025 MFD mica condenser
- 150 ohm resistor (2)

Output meter.

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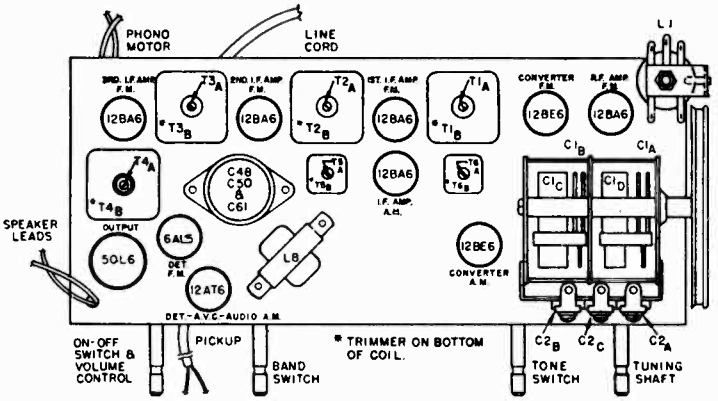


FIG. 1 TUBE AND TRIMMER LOCATIONS

VOLTAGE CHART

TUBE No.	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
12BE6 AM—Converter	—6	0	29ac	17ac	100	100	0	
12BA6 AM—I.F. Amp.	0	0	75ac	63ac	100	100	1	
12AT6 AM—Det.-AVC-Audio	0	0	17ac	6ac	0	0	30	
12BA6 FM—R.F. Amp.	0	0	29ac	39ac	100	95	1	
12BE6 FM—Converter	0	0	6ac	18ac	95	95	0	
12BA6 FM—1st I.F. Amp.	0	0	39ac	50ac	95	95	1	
12BA6 FM—2nd I.F. Amp.	0	0	50ac	63ac	95	95	1	
12BA6 FM—3rd I.F. Amp.	0	0	18ac	31ac	95	95	1	
6AL5 FM—Ratio detector	0	—3	0	6ac	—4	0	0	
50L6GT Power output	0	31ac	225	100	0	30	80ac	6.5

RESISTANCE CHART

TUBE No.	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
12BE6 AM—Converter	20K	1	27	18	25K	25K	3 meg.	
12BA6 AM—I. F. Amp.	2 meg.	0	70	62	25K	25K	70	
12AT6 AM—Det.-AVC-Audio	10 meg.	0	18	5	470K	120K	540K	
12BA6 FM—R.F. Amp.	1 meg.	0	27	40	25K	25K	70	
12BE6 FM—Converter	20K	0	5	18	25K	25K	22K	
12BA6 FM—1st I.F. Amp.	220K	0	40	50	25K	25K	70	
12BA6 FM—2nd I.F. Amp.	220K	0	50	62	25K	25K	70	
12BA6 FM—3rd I.F. Amp.	100K	0	18	28	25K	25K	70	
6AL5 FM—Ratio Detector	0	25K	0	5	750K	0	750K	
50L6GT Power output	0	28	25K	25K	450K	250K	70	150

All voltage readings are taken from tube pin to chassis.

All measurements are made with no signal, using a 20,000 ohm per volt meter.

AC input voltage must be maintained at 117 volts for accurate readings.

AC voltages shown are at 1000 ohms per volt.

All voltages shown are approximate.

All resistance readings are taken from tube pin to chassis.

Due to manufacturing tolerance on component parts, resistance readings may vary as much as 20%.

All readings are shown in ohms unless otherwise noted.

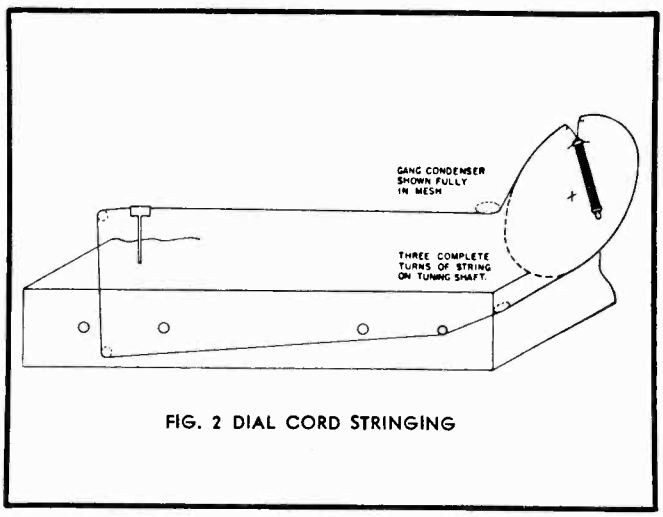


FIG. 2 DIAL CORD STRINGING

MODEL 121124

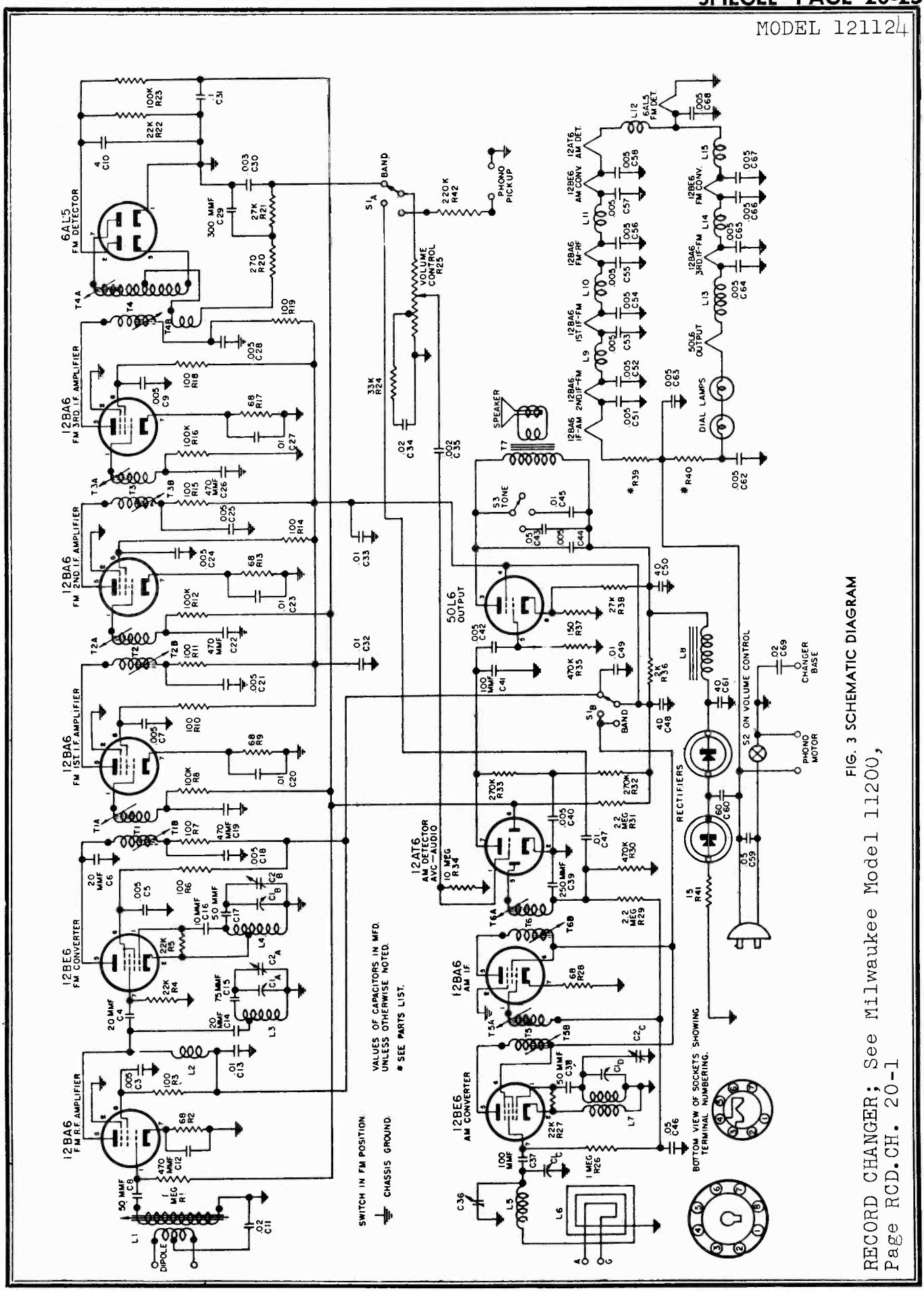


FIG. 3 SCHEMATIC DIAGRAM

RECORD CHANGER; See Milwaukee Model 11200, Page RCD.CH. 20-1

ALIGNMENT PROCEDURE

STEPS	RECEIVER DIAL SETTING	BAND SWITCH POSITION	SIGNAL GENERATOR FREQUENCY	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTIONS	OUTPUT INDICATOR	TRIMMER ADJUSTMENT	TRIMMER FUNCTION	REMARKS
1	Minimum capacity	AM	455 KC 400 cycle AM	.1 MFD	High side—Grid of AM converter tube (12BE6) Low side—Chassis	Output Meter across voice coil	T5A, T5B T6A, T6B	AM I.F.	Adjust for maximum output
2	"	"	1600 KC 400 cycle AM	.00025 MFD	"	"	C2C	AM Oscillator	Adjust for maximum output
3	1400 KC	"	1400 KC 400 cycle AM	"	High side—One ant. terminal Low side—Other ant. terminal	"	C36 (on back)	AM Antenna	Adjust for maximum output
4	Any position where there is no station interference.	FM	10.7 MC unmodulated .1 volt output.	.1 MFD	High side—Grid of 3rd I.F. amplifier tube (12BA6) Low side—Chassis	Connect V.T.V.M. to plate of Ratio detector tube, pin 2 (6AL5)	T4B	Ratio detector primary	Adjust for maximum negative voltage, about —5 volts
5	"	"	10.7 MC 400 cycle 30% Modulation. (See note A)	"	"	Connect scope to audio take off point (across C30)	T4A	Ratio detector secondary	Adjust for a balanced pattern on scope. See Fig. 4.
6	"	"	"	"	High side—Grid of 2nd I.F. amplifier tube (12BA6) Low side—Chassis	Connect scope across 100K ohm grid return resistor of 3rd I.F. (R16)	T3A, T3B	FM 3rd I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 5 (See note "B" below)
7	"	"	"	"	High side—Grid of 1st I.F. amplifier tube (12BA6) Low side—Chassis	"	T2A, T2B	FM 2nd I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 6.
8	"	"	"	"	High side—Plate of FM R.F. tube, pin 5 (12BA6) Low side—Chassis	"	T1A, T2B	FM 1st I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 7.
9	109 MC	"	109 MC 400 cycle 30% modulation. (22.5 KC Deviation)	150 ohms in each lead.	High side—One ant. terminal Low side—Other ant. terminal	Connect output meter across voice coil	C2B	FM Oscillator	Adjust for maximum output (remove AVC ground)
10	103 MC	"	103 MC 400 cycle 30% modulation. (22.5 KC Deviation)	"	"	"	C2A	FM R.F.	Adjust for maximum output
11	100 MC	"	100 MC 400 cycle 30% modulation. (22.5 KC Deviation)	"	"	"	L1	FM Antenna	Adjust for maximum output

NOTE A: When aligning the FM I.F. circuits, keep the out put from the signal generator as low as possible.

NOTE B: The AVC circuit must be grounded to the chassis when aligning the FM I.F. circuits.

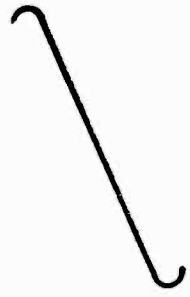


FIGURE 4

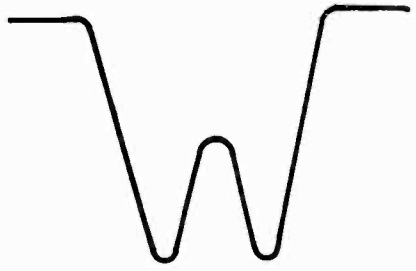


FIGURE 5

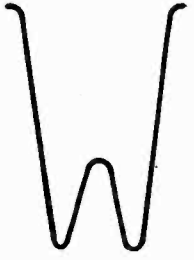


FIGURE 6

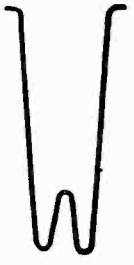


FIGURE 7

PARTS LIST

Schematic Diagram Reference	Part No.	Description
R4, R5, R22 R27	A60-744	22 K Ohm Resistor 10% ½ Watt
R8, R12, R16 R23	A60-727	100 K Ohm 20% ½ Watt
R20	A60-723	270 Ohm 20% ½ Watt Resistor
R21	A60-745	27 K Ohm 10% ½ Watt Resistor
R24	A60-748	33 K Ohm 10% ½ Watt Resistor
R25	B24-173	Volume Control with Switch
R29, R31	A60-726	2.2 Megohm 20% ½ Watt
R30, R35	A60-731	470K Ohm ½ Watt Resistor 20%
R32, R33	A60-747	270K Ohm 20% ½ Watt
R34	A60-728	10 Megohm 20% ½ Watt
R36	A60-739	2K Ohm Resistor 5% 10 Watt
R37	A60-741	150 Ohm 10% 1 Watt Resistor
R38	A60-740	27K Ohm Resistor 10% 2 Watt
R39	A60-734	Special Compensating Resistor (Order from Spiegel)
R40	A60-735	Special Compensating Resistor (Order from Spiegel)
R41	A60-738	15 Ohm — Glassohm 10% 3 Watt Resistor
R42	A60-667	220K Ohm Resistor 20% ½ Watt
L1	SB10-488	Antenna Coil, FM
L3	B10-489	R. F. Coil, F.M.
L4	B10-490	Oscillator Coil, F. M.
L5	A10-504	Antenna Loading Coil
L6	S84-236	Loop Antenna Assembly
L7	B10-491	Oscillator Coil, A. M.
L8	A33-225	Filter Choke
L2, L9, L10 L11, L12, L14 L15	A33-226	Filament Choke, 11 mh.
L13	A33-227	Filament Choke
S1A, S1B	A69-178	Switch, FM-AM-PHONO
S2		Switch, ON-OFF, (on volume control)
S3	A26-125	Tone Control
T1	SA10-493	1st I. F. Transformer, F. M.
T2, T3	SC10-494	2nd & 3rd I. F. Transformer, F.M.
T4	SC10-492	Ratio detector transformer, F.M.
T5	A10-499	1st I. F. transformer, A. M.
T6	A10-500	2nd I. F. transformer, A. M.
T7	A80-241	Output Transformer
	B39-285	Drum, for Variable Condenser
	A23-153	Line Cord
	A83-463	Selenium rectifier, 150 ma.
	A75-63	Tuning shaft
	C79-358	Speaker, 10" P.M.
	A21-111	Cover, for Compensating Resistors
	SB82-53	FM Antenna Assembly, Dipole
	C67-527	Dial Scale
	A83-537	Retainer, Dial Scale
	B83-536	Dial Diffusing Plate
	A58-67	Dial Pointer
	A52-263	Knob, Tuning
	A52-260	Knob, Tone
	A52-261	Knob, ON-OFF-VOLUME
	A52-262	Knob, PH-AM-FM
	11200	Milwaukee Automatic Record Changer

Schematic Diagram Reference	Part No.	Description
C1A, C1B	C19-191	Variable Condenser
C1C, C1D	A20-144	FM—R.F. Trimmer FM—Oscillator Trimmer AM—Oscillator Trimmer
C2A C2B C2C		
C3, C5, C7, C9, C18, C21, C23, C24, C25, C28, C40, C51 C52, C53, C54 C55, C56, C57 C58, C62, C64 C65, C66, C67	A16-177	035 MFD Ceramic Condenser (Centralab No. DA048 or Equiv.)
C68		
C4, C14	A15-198	20 MMF 20% Ceramic Condenser (Erie Style "A" or Equiv.)
C6	A15-193	20 MMF 20% Ceramic Condenser (Erie Style K or Equiv.)
C8, C17	A15-194	50 MMF 10% Ceramic Condenser (Erie Style K or Equiv.)
C10	A18-273	4 MFD 150 Volt Elec. Condenser
C34, C69	A16-150	.02 MFD 400 Volt Tubular Condenser
C12, C19 C22, C26	A15-200	470 MMF 20% Mica Condenser
C13, C32, C33 C47 C49	A16-165	.01 MFD 200 V Tubular Condenser
C15	A15-195	75 MMF 10% Ceramic Condenser (Erie Style K or Equiv.)
C16	A15-197	10 MMF 10% Ceramic Condenser (Erie Style A or Equiv.)
C20, C23, C27	A16-163	.01 MFD 120 V Molded Paper Condenser
C42, C44	A16-153	.005 MFD 600 Volt Tubular Condenser
C29	A15-199	300 MMF 20% Mica Condenser
C30	A16-180	.003 MFD 200 V Molded Paper Condenser
C31	A16-157	.1 MFD 200 V Tubular Condenser
C35	A16-178	.002 MFD 200 V Molded Paper Condenser
C36	A20-139	AM Antenna Trimmer
C37	A15-190	100 MMF 20% Mica Condenser
C38	A15-191	50 MMF 20% Mica Condenser
C39	A15-176	250 MMF 20% Mica Condenser
C41	A15-196	100 MMF 20% Ceramic Condenser (Erie Style K or Equiv.)
C46 C69, C43, C59 C45	A16-158	.05 MFD 400 V Tubular Condenser
	A16-156	.01 MFD 400 V Tubular Condenser
C48 C50 C61	A18-284	40 MFD 150 Volt Electrolytic Condenser 40 MFD 300 Volt Electrolytic Condenser 40 MFD 300 Volt Electrolytic Condenser
C60	A18-285	60 MFD 150 Volt Electrolytic Condenser
R1, R26	A60-668	1 Megohm Resistor 20% ½ Watt
R2, R13, R17, R28, R9	A60-742	68 Ohm Resistor 10% ½ Watt
R3, R6, R7, R10, R19, R11 R14, R15, R18	A60-743	100 Ohm Resistor 20% ½ Watt

MODEL 139144

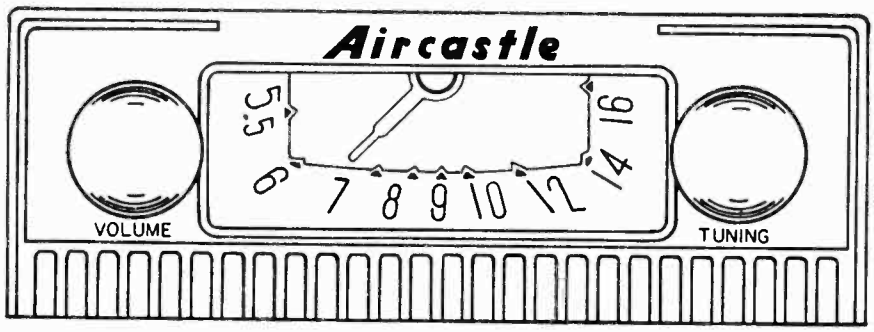


Fig. 1 Front View

INSTALLATION

This radio comes to you complete with all hardware necessary for mounting, and also with a distributor suppressor, ammeter condenser and generator condenser. By referring to Figures 1 and 2, and following the instructions outlined below, you will find that it is very simple to install.

First determine where the receiver is to be mounted by holding it with the hands in the approximate location in the car. Using the front mounting bracket as a template, mark and drill two 5/8" holes in the instrument panel flange. Now secure the mounting bracket to the radio receiver with the screws provided, and then mount the front of the radio to the instrument panel, using the bolts, lock washers and nuts provided for this purpose. The back of the radio is supported by means of the rear mounting strap. The mounting strap should be formed to the correct angles, as illustrated in Figure 2, so that it can then be fastened to the fire wall. After marking and center-punching the fire wall at the correct location, drill with a 3/8" drill. The mounting strap is then secured to the radio and fastened to the fire wall of the car with the 1/4" bolt, lock washer and nut furnished with the receiver.

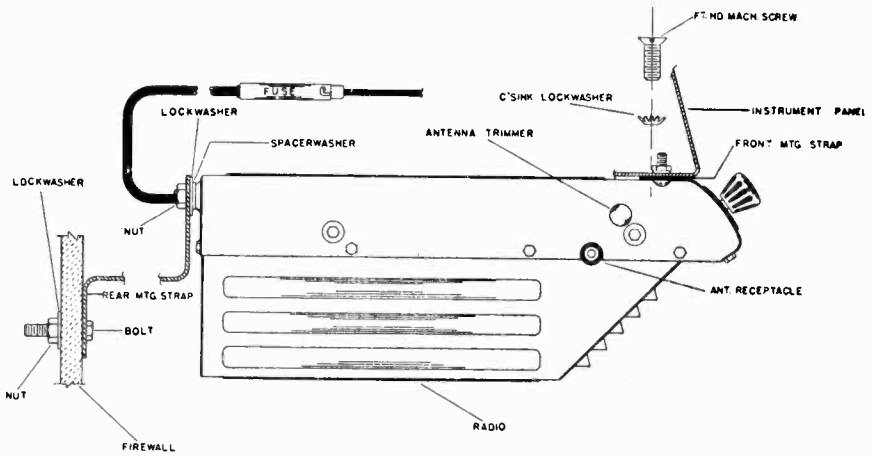


Fig. 2 Side View, Showing Mounting

CONNECTING THE RADIO

The antenna cable should be connected to the radio by inserting the jack into the socket provided on the side of the radio. Connect the battery cable to the hot side of the ammeter behind the instrument panel. The fuse should then be inserted into the cable receptor.

FINAL ADJUSTMENTS

The input circuit has been especially designed to be used with a low capacity antenna, of the fish pole or whip type.

To adjust the antenna trimmer condenser, carefully tune the receiver to a weak station at approximately 600 kilocycles (K.C.). Remove the snap button covering the antenna trimmer (See Figure 2) and adjust the trimmer for maximum volume. A small screw driver will be needed for this purpose.

MODEL 139144

SUGGESTIONS FOR ELIMINATING POSSIBLE MOTOR NOISE

IMPORTANT: Special care should be taken when mounting the radio to make sure all paint, grease, rust, etc., is removed from all three mounting points. A good electrical contact at these points will aid materially in eliminating motor noise. (The following steps may not be necessary in all cases. Install your radio and operate it before making changes.)

GENERATOR CONDENSER

The generator condenser must be connected to the battery terminal of the generator in all cases. If your car is equipped with a generator using an automatic regulator, make sure the condenser IS NOT fastened to the field winding terminal. If in doubt, your local car dealer can advise you as to where the car manufacturer recommends connecting it.

AMMETER CONDENSER

A .5 MFD bypass condenser is furnished for attaching to the ammeter. This should be connected to either side of the ammeter with the ground lug fastened to a good ground nearby. In most cases the use of this condenser, the distributor suppressor, and the generator condenser, will eliminate all objectionable ignition interference.

DISTRIBUTOR SUPPRESSOR

Detach the high tension wire where it goes into the top of the distributor cap and cut two inches off the end. Screw the piece you cut off into one end of the distributor suppressor and then screw the other end of the suppressor on the long wire which leads to the coil. Insert the wire back into the distributor cap.

IGNITION COILS

In cars where the ignition coil is located on the back side of the instrument panel it is often necessary to use an additional .5 MFD condenser. It must be installed from the battery side of the ignition coil to the closest ground on the instrument panel.

Short wires are very important. Where coils are mounted either on the instrument panel or in the driver's compartment, it may be necessary to shield the high tension wire from the coil to the distributor.

HIGH AND LOW TENSION WIRES

In many cases the low tension battery wires, etc., are grouped together with the high tension wires. These wires will very often pick up motor noise and feed it into the receiver through the battery circuit. In cases such as these it will be necessary to separate the low tension from the high tension wires and run them through another hole if they run from the engine compartment up to the instrument panel. These wires should be placed in a flexible wire shield and the shield grounded to frame or motor. This condition is particularly true on the V-8 Ford, as the battery and primary leads run through a special tube which also houses the high tension wires.

BONDING OF FIRE WALL

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 cables 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. A 1/4" piece of wire braid 20 inches long is furnished in the suppression kit assembly for this purpose.

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 the interference is found. The condenser then should be permanently mounted in this location.

ACCESSORIES FURNISHED FOR INSTALLATION

All of the parts that are needed for installing this receiver are furnished in the Mounting Parts Kit, part No. S84-192, and the Supression & Misc. Parts Kit, part No. S84-228, as listed below. Also supplied are the rear mounting strap, part No. B31-134, and the front mounting plate, part No. A31-137.

NOTE: For shipping, the two control knobs have been removed from the tuning and volume control shafts. To install the knobs, line up the flat side of the knob spring, (inside knob) with the flat side of the control shaft and push the knob forward until it stops.

S84-192 MOUNTING PARTS KIT

- 1 1/4" Bolt
- 2 1/4" Lock Washers
- 2 1/4" Hexagon Nuts
- 2 10-32 x 5/8" Screws
- 2 External Tooth Lock Washers
- 2 Internal Tooth Lock Washers
- 2 10-32 Hexagon Nuts

S84-228 SUPPRESSION KIT & MISC. PARTS ASSEMBLY

- 1—S84-233 "A" lead assembly
- 1—A43-10 Fuse
- 2—A52-258 Control knobs
- 1—A81-13 Sleeve (for fuse)
- 1—S84-193 Suppression Kit consisting of:
  - 2—.5 MFD Condensers
  - 1—Distributor Suppressor
  - 20"—Wire Braid

MODEL 139144

ELECTRICAL SPECIFICATIONS

Power Supply	6.3 volts DC
Current	4.8 amp. average
Frequency Range	540 to 1600 KC
I. F. Frequency	455 KC
Speaker	4" P. M.
Power Output	1.2 watts, undistorted 2.5 watts, maximum
Sensitivity	10 microvolts average for 1 watt output
Selectivity	20 KC broad at 1000 times signal, at 1000 KC

The tube compliment of this receiver is as follows:

1—6SK7GT—R. F. Amplifier.

1—6SA7GT—Converter.

1—6SK7GT—I.F. Amplifier.

1—6SQ7—Detector—AVC—1st audio.

1—6V6GT—Power output.

1—6X5GT—Rectifier.

SERVICE NOTES

Voltages 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 a final check.

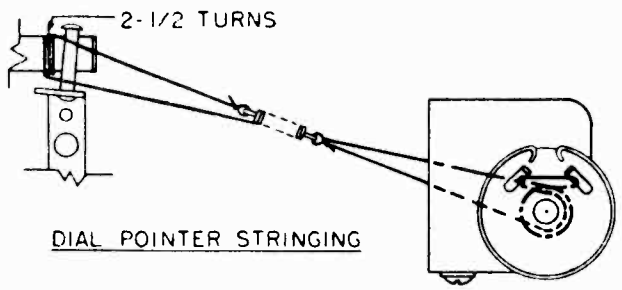
INSTRUCTIONS FOR REMOVING CHASSIS FROM THE CASE

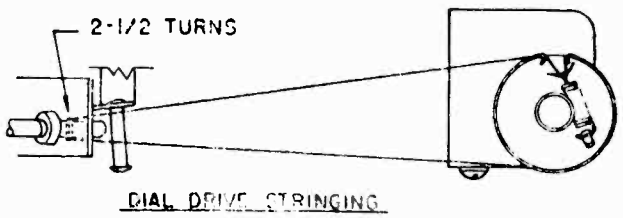
The bottom cover (the one with the speaker louvers) can be removed to permit servicing of major components, such as tubes and vibrator, by removing the eight (8) screws holding it to the top cover. There are three (3) screws on each side, one (1) in the rear, and one (1) in the front.

CAUTION: Before attempting to remove the top cover, to service condensers, resistors, etc., the screw connecting the spark plate to the "A" terminal (inside case) must be removed. This is a round head screw, and is located on the rear of the case, close to the mounting stud bolt. It is recessed in a ½ inch hole in the case itself, thereby permitting contact with the spark plate.

After removing the spark plate screw, remove the two knobs by pulling forward and remove the eight (8) screws securing the cover to the chassis. Lift the chassis at the rear, at the same time moving it away from the front of the case so that the volume and tuning shafts will clear the holes in the cover.

NOTE: When reinstalling the chassis into the case, be sure the screw connecting the spark plate to the "A" terminal (inside case) is tightened very securely, otherwise the receiver will not operate properly.





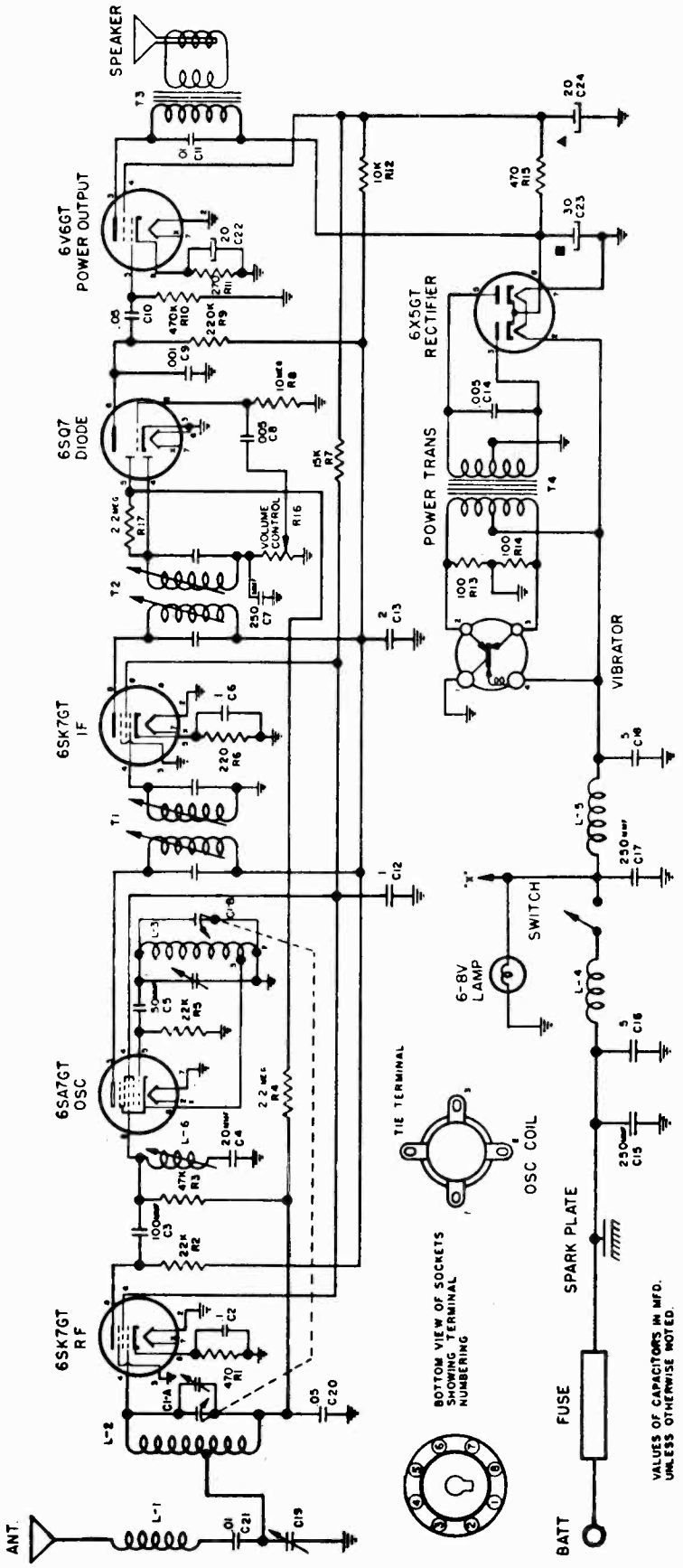


Fig. 3 Schematic Diagram

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 output meter across voice coil.

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.

Non-metallic screwdriver.

Output meter.

Dummy antennas—.1 MFD., .00025 MFD.

For alignment points refer to Figures 4 ad 5.

Dial Setting	*Generator Frequency*	*Dummy Ant.*	*Generator Connections*	*Trimmer Reference*	*Trimmer Adjustment*	*Trimmer Function*
Fully Open	455 KC	.1 MFD.	6SA7 Grid	T2	Maximum	Output I.F.
Fully Open	455 KC	.1 MFD.	6SA7 Grid	T1	Maximum	Input I.F.
Fully Open	455 KC	.00025 MFD.	Ant. lead	L6	Minimum	Wave trap
Fully Open	1600 KC	.00025 MFD.	Ant. lead	C1B	Maximum	Oscillator
Tune in signal from generator	1400 KC	.00025 MFD.	Ant. lead	C1A	Maximum	Antenna

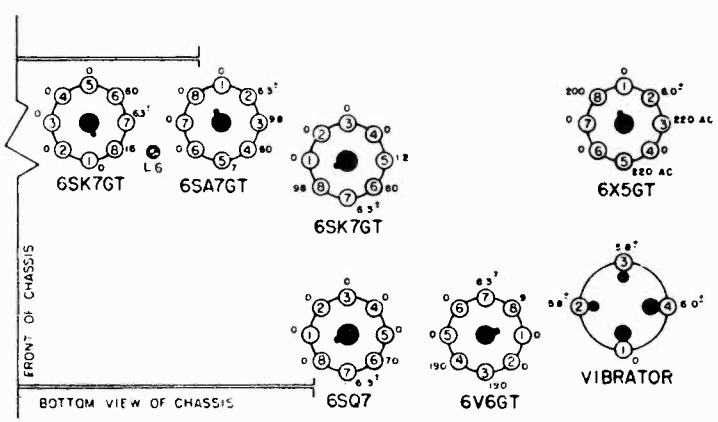


Fig. 4 Socket Voltages

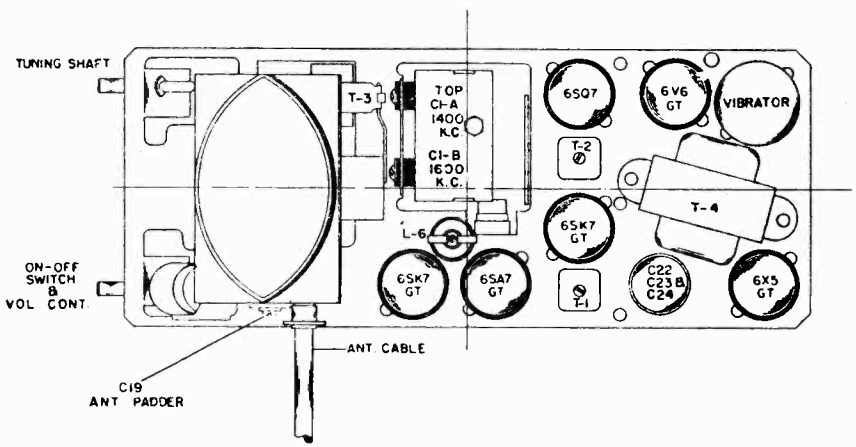


Fig. 5 Tube and Trimmer Locations

MODEL 139144

PARTS LIST

Schematic Diagram Reference	Part No.	Description
CONDENSERS		
C1A, C1B	B19-196	Variable Condenser
C2, C6, C12	A16-187	.1 MFD. 400 Volt Condenser
C3	A15-196	100 MMFD Ceramic Condenser
C4	A15-202	20 MMFD Ceramic Condenser
C5	A15-204	50 MMFD Ceramic Condenser
C7, C15, C17	A15-176	250 MMFD Mica Condenser
C8	A16-190	.005 MFD. 600 Volt Condenser
C9	A16-195	.001 MFD. Ceramic Condenser
C10	A16-193	.05 MFD. 600 Volt Condenser
C11, C21	A16-192	.01 MFD. 400 Volt Condenser
C13	A16-188	.2 MFD. 400 Volt Condenser
C14	A16-185	.005 MFD. 1600 Volt Oil Filled Condenser
C16, C18	A16-184	.5 MFD. 100 Volt Condenser
C19	A20-145	Trimmer Condenser
C20	A16-189	.05 MFD. 400 Volt Condenser
C22	A18-289	20 MFD 25 Volt Electrolytic Condenser
C23	A18-289	30 MFD 350 Volt Electrolytic Condenser
C24	A18-289	20 MFD. 350 Volt Electrolytic Condenser
RESISTORS		
R1	A60-722	470 Ohm ½ Watt 20% Resistor
R13, R14	A60-752	100 Ohm ½ Watt 10% Resistor
R2, R5	A60-744	22K Ohm ½ Watt 10% Resistor
R3	A60-685	47K Ohm ½ Watt 20% Resistor
R4, R17	A60-726	2.2 Megohm ½ Watt 20% Resistor
R6	A60-753	220 Ohm ½ Watt 10% Resistor
R7	A60-716	15K Ohm 1 Watt 10% Resistor
R8	A60-728	10 Megohm ½ Watt 20% Resistor
R9	A60-667	220K Ohm ½ Watt 20% Resistor
R10	A60-731	470K Ohm ½ Watt 20% Resistor
R11	A60-754	270 Ohm 1 Watt 10% Resistor
R12	A60-698	10K Ohm 1 Watt 10% Resistor
R15	A60-694	470 Ohm 1 Watt 10% Resistor
R16	A24-177	Volume Control, 500,000 Ohms, with Switch
COILS		
L1	A10-513	Antenna Loading Coil
L2	B10-511	Antenna Coil
L3	A10-512	Oscillator Coil
L4	A33-229	Choke, "A" Line
L5	A33-228	Choke, Vibrator Hash
L6	A10-510	I.F. Trap Coil
T1	A10-508	1st I.F. Transformer
T2	A10-509	2nd I.F. Transformer
TRANSFORMERS		
T3	B80-242	Output Transformer (Part of Speaker, not furnished separately)
T4	B80-243	Power Transformer
DIAL PARTS		
	A11-303	Bracket, Dial Scale
	A11-304	Bracket, String Guide
	A72-29	Bushing, Tuning Shaft Bearing
	A70-130	Clip, Spring, for Tuning Shaft
	A40-143	Dial Escutcheon
	A58-55	Dial Pointer
	B67-523	Dial Scale
	A28-101	Gasket for Speaker
	A52-258	Knob
	A89-10	Pilot Light, Type G.E. No. 422
	A65-37	Rivet, Shoulder, for String Guide Bracket
	A75-68	Shaft, Tuning
	A75-67	Shaft, for Dial Pointer
	A70-132	Spring, for Pilot Light Socket
	A70-133	Spring, String Tension, Pointer Drive and Tuning
MISCELLANEOUS		
	A83-421	Clip, I.F. Transformer Mounting
	A83-517	Clip, Oscillator Coil Maunting
	A43-10	Fuse, 15 Amp.
	A47-112	Grommet, Rubber (for Mounting Speaker and Variable Condenser)
	B31-134	Mounting Strap, Rear
	A31-137	Mounting Plate, Front
	S84-192	Mounting Parts Kit
	A87-38	Receptacle, Antenna Cable
	B79-362	Speaker, 4" P.M. (includes Output Transformer)
	S84-193	Suppression Kit Assembly
	A34-105	Vibrator
	A83-519	Wiper, Grounding, for Case Covers

MODEL 149654

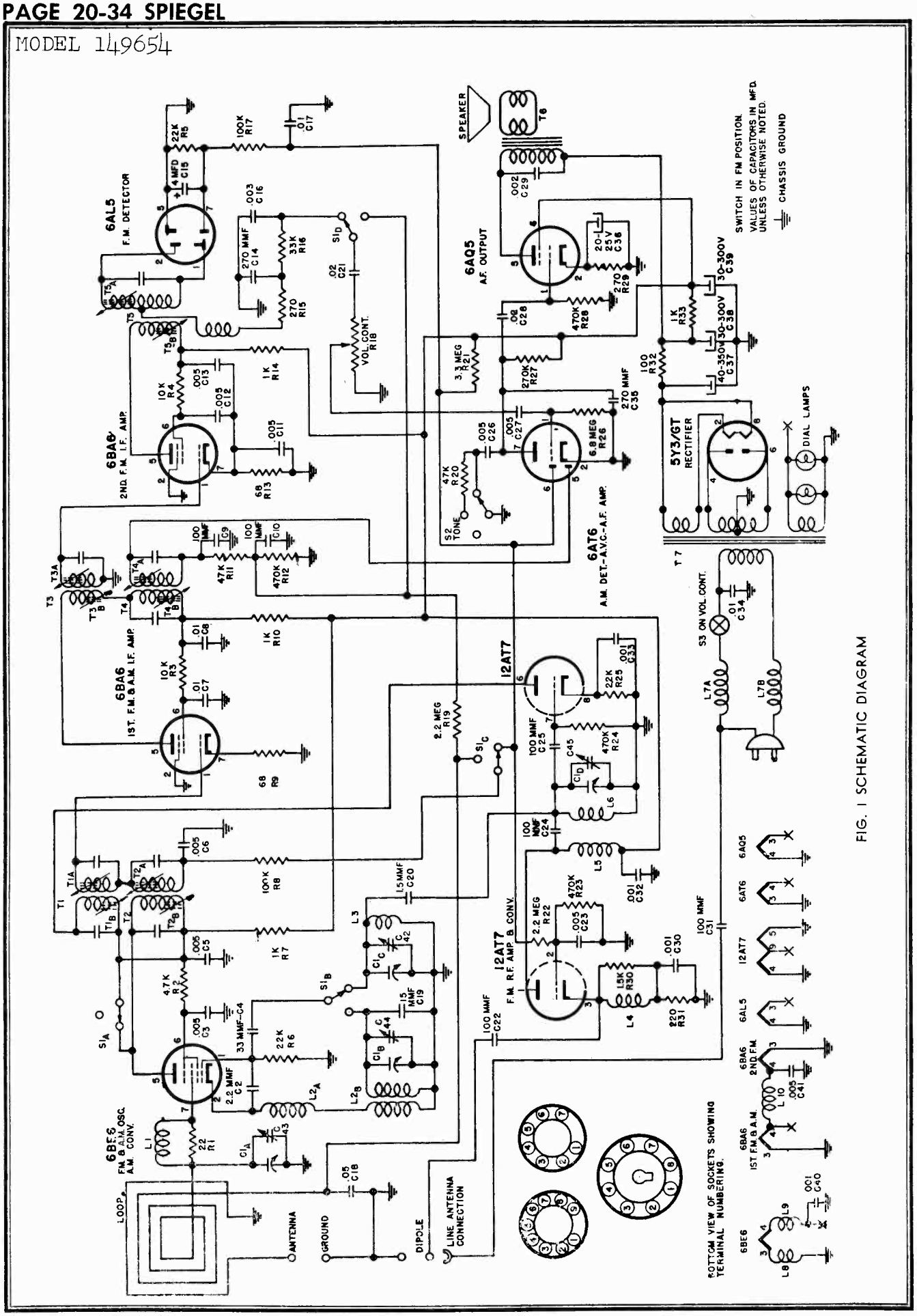


FIG. 1 SCHEMATIC DIAGRAM

ALIGNMENT PROCEDURE

STEPS	RECEIVER DIAL SETTING	BAND SWITCH POSITION	SIGNAL GENERATOR FREQUENCY	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTIONS	OUTPUT INDICATOR	TRIMMER ADJUSTMENT	TRIMMER FUNCTION	REMARKS
1	Minimum capacity	AM	455 KC 400 cycle AM	.1 MFD	High side—grid of AM converter tube (6BE6) Low side—chassis	Output Meter across voice coil	T4A, T4B T2A, T2B	AM I.F.	Adjust for maximum output
2	"	"	1600 KC 400 cycle AM	"	"	"	C44	AM Oscillator	"
3	1400 KC	"	1400 KC 400 cycle AM	.00025 MFD	High side—One ant. terminal Low side—Other ant. terminal	"	C43	AM Antenna	"
4	Any position where there is no station interference.	FM	10.7 MC unmodulated .1 volt output.	.1 MFD	High side—grid of 2nd I.F. amplifier tube (6BA6) Low side—chassis	Connect V.T.V.M. to plate of Ratio Detector tube, pin 7 (6AL5)	T5B	Ratio detector primary	Adjust for maximum negative voltage, about —5 volts
5	"	"	10.7 MC 400 cycle 30% Modulation. (See note A)	"	"	Connect scope to audio take-off point (across C16)	T5A	Ratio detector secondary	Adjust for a balanced pattern on scope. See Fig. 2
6	"	"	"	"	High side—grid of 1st I.F. amplifier tube (6BA6) Low side—chassis	"	T3A T3B	FM 2nd I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 2
7	"	"	"	"	High side—grid (pin 7) of FM converter tube (12AT7) Low side—chassis	"	T1A T1B	FM 1st I.F.	"
8	108.5 MC	"	108.5 MC 400 cycle 30% modulation (22.5 KC deviation)	300 ohms in high side	High side—ant. terminal Low side—chassis	Connect output meter across voice coil	C42	FM oscillator	Adjust for maximum output
9	105 MC	"	105 MC 400 cycle 30% modulation (22.5 KC deviation)	"	"	"	C45	FM R.F.	"

NOTE A: When aligning the FM I.F. circuits, keep the out put from the signal generator as low as possible.

EQUIPMENT USED FOR ALIGNMENT

Vacuum tube voltmeter.
AM Signal generator
FM Sweep generator.
Oscilloscope.
Insulated screw driver.
Dummy antenna:
.1 MFD condenser
.00025 MFD mica condenser
150 ohm resistor (2)
Output meter.

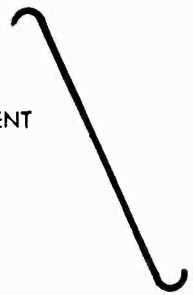


FIGURE 2

SPECIFICATIONS

Power Supply	105-125 volts 60 cycle AC only.
Power Consumption	65 Watts
Frequency Range FM	88 to 108 MC.
Frequency Range AM	540 to 1600 KC.
I.F. Frequency FM	10.7 MC.
I.F. Frequency AM	455 KC.
Band width, FM, Ratio Detector	330 KC.
Band width, FM, 1st I.F.	280 KC.
Band width, FM, Converter	220 KC.
Speaker	6¼" P.M.

The tubes used are as follows:

12AT7	FM RF Amplifier, Converter
6BE6	FM Osc, Am Osc, Converter
6BA6	FM-AM, 1st I.F. Amplifier
6BA6	FM-AM, 2nd I.F. Amplifier
6AL5	FM Detector
6AT6	AM Detector, AVC, Audio
6AQ5	Power Output
5Y3	Power Rectifier
No. 47	Pilot Lights (2)

VOLTAGE CHART

	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
6BE6 FM & AM OSC AM CONV	0	0	0	6 AC	155	125	0		
12AT7 FM RF AMP & CONV	170	0	1.5	0	0	155	0	1	6 AC
6BA6 1st IF AM & FM	0	0	0	6 AC	150	100	0		
6BA6 2nd IF AM & FM	0	0	0	6 AC	155	110	1		
6AL5 FM DETECTOR	0	0	6 AC	0	0	0	0		
6AT6 AM DETECTOR, AVC, AUDIO	—.5	0	0	6	0	0	60		
6AQ5 POWER OUTPUT	0	7.5	6 AC	0	215	170	0		
5Y3 POWER RECTIFIER		235		230 AC		230 AC		235	

RESISTANCE CHART

	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
6BE6 FM & AM OSC AM CONV	22K	1.5	.5	.5	3.5M	3.5M	2.5M		
12AT7 FM RF AMP & CONV	3.3M	500K	250	0	0	3.5M	500K	2K	0
6BA6 1st IF AM & FM	200K	0	0	0	3.5M	3.5M	70		
6BA6 2nd IF AM & FM	0	0	0	0	3.5M	3.5M	70		
6AL5 FM DETECTOR	OPEN	OPEN	0	0	0	0	22K		
6AT6 AM DETECTOR, AVC, AUDIO	7M	0	0	0	500K	120K	3.5M		
6AQ5 POWER OUTPUT	470K	300	0	0	3.5M	3.5M	0		
5Y3 POWER RECTIFIER		3.5M		0		0		3.5M	

All voltage readings are taken from tube pin to chassis.

All measurements are made with no signal, using a 20,000 ohm per volt meter.

AC input voltage must be maintained at 117 volts for accurate readings.

AC voltages shown are at 1000 ohms per volt.

All voltages shown are approximate.

All resistance readings are taken from tube pin to chassis.

Due to manufacturing tolerance on component parts, resistance readings may vary as much as 20%.

All readings are shown in ohms unless otherwise noted.

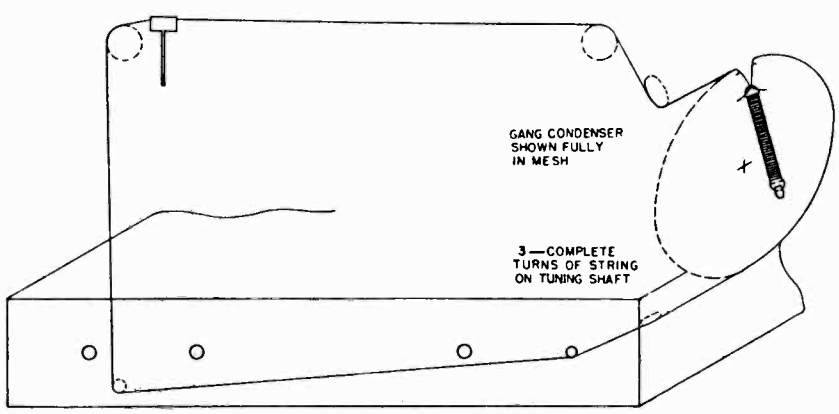


FIG. 4 DIAL CORD STRINGING

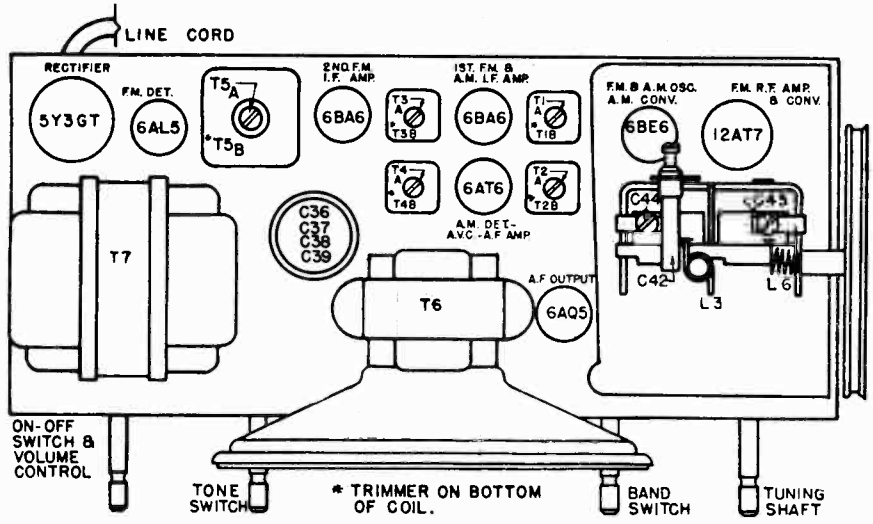


FIG. 3 TUBE AND TRIMMER LOCATIONS

PARTS LIST

Schematic Diagram Reference	Part No.	Description
C1A, C1B, C1C, C1D	C19-200	Variable Condenser
C2	A83-376	2.2 MMF, gimmick
C3, C5, C6, C23, C41	A16-177	.005 MFD ceramic (Centralab NO. DAO48 or equiv.)
C4	A15-210	33 MMF ceramic, 20%, (Erie Style "A" N1400)
C7, C8, C34	A16-192	.01-400 volts, paper tubular
C9, C10, R11	A17-101	100 MMF, 100 MMF, 47K ohms (Diode filter unit, Herlec F06-001)
C11, C12, C13	A17-102	3 x .005 MFD Herlec B34-005
C14, C35	A15-208	270 MMF ceramic, 20%, (Erie Style "K" or equiv.)
C15	A18-292	4 MFD—50 volt electrolytic
C16	A16-180	.003-200 volts, paper tubular
C17	A16-165	.01-200 volts, paper tubular
C18	A16-197	.05-200 volts, paper tubular
C19	A15-209	15 MMF ceramic, 10%, (Erie Style "A" or equiv.)
C20	A15-206	1.5 MMF ceramic, 33%, (Erie Style "A" or equiv.)
C21, C28	A16-196	.02-400 volts, paper tubular
C22, C24, C25, C31	A15-196	100 MMF 20% Ceramic Condenser (Erie Style K or Equiv.)
C26, C27	A16-199	.005-400 volts, paper tubular
C29	A16-198	.002-600 volts, paper tubular
C30, C32, C33, C40	A16-195	.001 MMF ceramic (Centralab NO. BC20A or equiv.)
C36, C37, C38, C39	A18-291	20-25 volts, 40-350 volts 30-300 volts, 30-300 volts electrolytic
C42	A20-146	FM oscillator trimmer
R1	A33-231	See L1.
R2	A60-759	4.7 K ohms, 1/2 watt, 10%
R3, R4	A60-760	10 K ohms, 1/2 watt, 10%
R5, R6	A60-744	22 K ohms, 1/2 watt, 10%
R7, R10, R14	A60-675	1 K ohms, 1/2 watt, 20%
R8, R17	A60-727	100 K ohms, 1/2 watt, 20%
R9, R13	A60-742	68 ohms, 1/2 watt, 10%
R11, C9, C10	A17-101	47 K ohms, 100 MMF, 100 MMF (Diode filter unit, Herlec FO6-001)
R12, R23, R24, R28	A60-731	470 K ohms, 1/2 watt, 20%
R15	A60-723	270 ohms, 1/2 watt, 20%
R16	A60-748	33 K ohms, 1/2 watt, 10%
R18	B24-181	Volume control and switch S3
R19, R22	A60-726	2.2 Megohms, 1/2 watt, 20%
R20	A60-730	47 K ohms, 1/2 watt, 20%
R21	A60-761	3.3 Megohms, 1/2 watt, 20%
R25	A60-714	2.2 K ohms, 1/2 watt, 10%
R26	A60-762	6.8 Megohms, 1/2 watt, 20%
R27	A60-747	270 K ohms, 1/2 watt, 20%
R29	A60-754	270 ohms, 1/2 watt, 10%
R30	A10-516	See L4
R31	A60-753	220 ohms, 1/2 watt, 10%
R32	A60-755	100 ohms, 1 watt, 10%
R33	A60-763	1 K ohms, 4 watts, 10%
L1	A33-231	Choke, wound on R1, 22 ohms
L2A, L2B	A10-515	Oscillator coil, AM
L3	A10-517	Oscillator coil, FM
L4	A10-516	Antenna coil, FM, wound on R30, 1.5 K ohms
L5	A33-233	Plate choke, FM RF
L6	A10-518	RF coil, FM
L7A, L7B	A33-230	Line choke
L8, L9	A33-232	FM oscillator filament choke
L10	A33-227	Filament choke
S1A, S1B, S1C, S1D	A69-183	Band switch
S2	A26-125	Tone control
S3	B24-181	ON-OFF SWITCH, on volume control
T1	A10-519	1st I.F., FM
T2	A10-521	1st I.F., AM
T3	A10-520	2nd I.F., FM
T4	A10-522	2nd I.F., AM
T5	SC10-492	Ratio detector, FM
T6	A80-247	Output transformer
T7	C80-246	Power transformer
	A23-151	Line cord and plug
	B79-351	Speaker, 6 1/4", P.M.
	B79-342	Speaker, 6 1/4", P.M. Alternate
	B79-341	Speaker, 6 1/4", P.M. Alternate
	D42-379	Cabinet, walnut
	C67-536	Dial scale
	SD84-291	Loop and back
	A52-284	Knob, FM-AM
	A52-253	Knob, ON-OFF-VOLUME
	A52-254	Knob, TONE 1-2-3
	A52-255	Knob, TUNING
	A83-293	Retainer, dial scale, LH
	A83-292	Retainer, dial scale, RH
	A58-65	Dial pointer
	A70-122	Spring, string tension
	A51-105	String, pointer travel, 42"
	A87-31	Socket, pilot light

Power Supply	105-125 volts 60 cycle AC only.
Power Consumption	65 Watts
Frequency Range FM	88 to 108 MC.
Frequency Range AM	540 to 1600 KC.
I.F. Frequency FM	10.7 MC.
I.F. Frequency AM	455 KC.
Band width, FM, Ratio Detector	330 KC.
Band width, FM, 1st I.F.	280 KC.
Band width, FM, Converter	220 KC.
Speaker	6¼" P.M.

The tubes used are as follows:

12AT7	FM RF Amplifier, Converter
6BE6	FM Osc, Am Osc, Converter
6BA6	FM-AM, 1st I.F. Amplifier
6BA6	FM-AM, 2nd I.F. Amplifier
6AL5	FM Detector
6AT6	AM Detector, AVC, Audio
6AQ5	Power Output
5Y3	Power Rectifier
No. 47	Pilot Lights (2)

GENERAL

Due to the high frequencies at which FM signals are received the service man must use great care when servicing these sets. Extreme caution must be used regarding the moving of component parts in the R.F. and oscillator circuits of the receiver as those circuits can be detuned in this manner.

If it becomes necessary to replace components such as resistors and condensers they must be replaced with parts of the same size, type, voltage rating and tolerance as called for in the parts list.

When installing new parts they should be placed in the same position as the original, and the leads should be cut to the same length.

ALIGNMENT NOTES

This receiver has been thoroughly inspected and tested at the factory, using the most modern test equipment available, such as FM sweep generators and oscilloscopes. All R.F. and I.F. circuits have been accurately adjusted at the factory and no attempt should be made to realign these circuits unless it is absolutely necessary.

CAUTION: If realignment is necessary be sure the proper test equipment is available, as listed below, before proceeding with the alignment procedure as given on page 5.

EQUIPMENT USED FOR ALIGNMENT

Vacuum tube voltmeter.
AM Signal generator
FM Sweep generator.
Oscilloscope.
Insulated screw driver.
Dummy antenna:
.1 MFD condenser
.00025 MFD mica condenser
150 ohm resistor (2)
Output meter.

ALIGNMENT PROCEDURE

STEPS	RECEIVER DIAL SETTING	BAND SWITCH POSITION	SIGNAL GENERATOR FREQUENCY	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTIONS	OUTPUT INDICATOR	TRIMMER ADJUSTMENT	TRIMMER FUNCTION	REMARKS
1	Minimum capacity	AM	455 KC 400 cycle AM	.1 MFD	High side—grid of AM converter tube (6BE6) Low side—chassis	Output Meter across voice coil	T4A, T4B T2A, T2B	AM I.F.	Adjust for maximum output
2	"	"	1600 KC 400 cycle AM	"	"	"	C44	AM Oscillator	"
3	1400 KC	"	1400 KC 400 cycle AM	.00025 MFD	High side—One ant. terminal Low side—Other ant. terminal	"	C43	AM Antenna	"
4	Any position where there is no station interference.	FM	10.7 MC unmodulated .1 volt output.	.1 MFD	High side—grid of 2nd I.F. amplifier tube (6BA6) Low side—chassis	Connect V.T.V.M. to plate of Ratio Detector tube, pin 7 (6AL5)	T5B	Ratio detector primary	Adjust for maximum negative voltage, about —5 volts
5	"	"	10.7 MC 400 cycle 30% Modulation. (See note A)	"	"	Connect scope to audio take-off point (across C16)	T5A	Ratio detector secondary	Adjust for a balanced pattern on scope. See Fig. 2
6	"	"	"	"	High side—grid of 1st I.F. amplifier tube (6BA6) Low side—chassis	"	T3A T3B	FM 2nd I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 2
7	"	"	"	"	High side—grid (pin 7) of FM converter tube (12AT7) Low side—chassis	"	T1A T1B	FM 1st I.F.	"
8	108.5 MC	"	108.5 MC 400 cycle 30% modulation (22.5 KC deviation)	300 ohms in high side	High side—ant. terminal Low side—chassis	Connect output meter across voice coil	C42	FM oscillator	Adjust for maximum output
9	105 MC	"	105 MC 400 cycle 30% modulation (22.5 KC deviation)	"	"	"	C45	FM R.F.	"

MODEL 150084

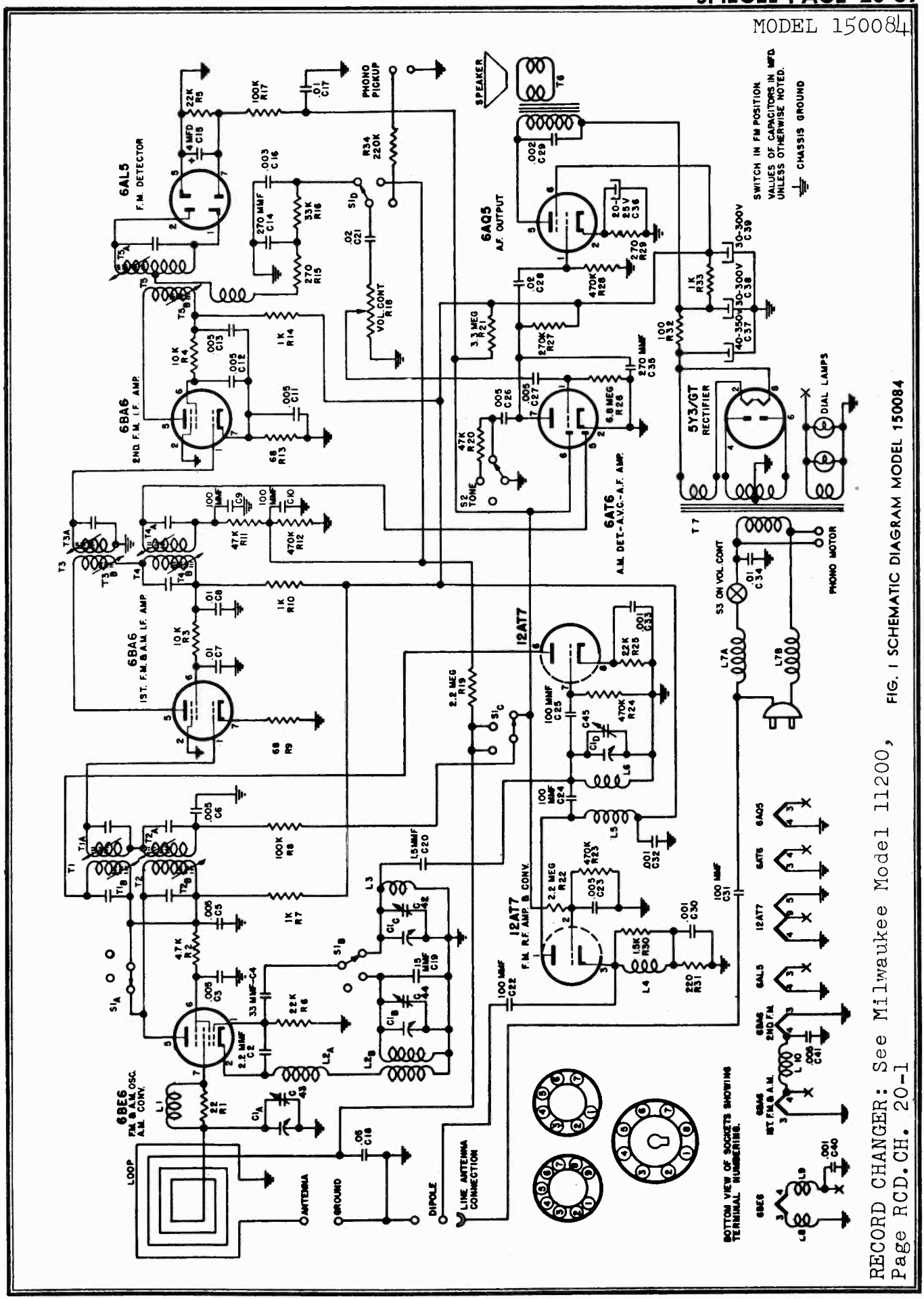


FIG. 1 SCHEMATIC DIAGRAM MODEL 150084

RECORD CHANGER: See Milwaukee Model 11200, Page RCD.CH. 20-1

MODEL 150084

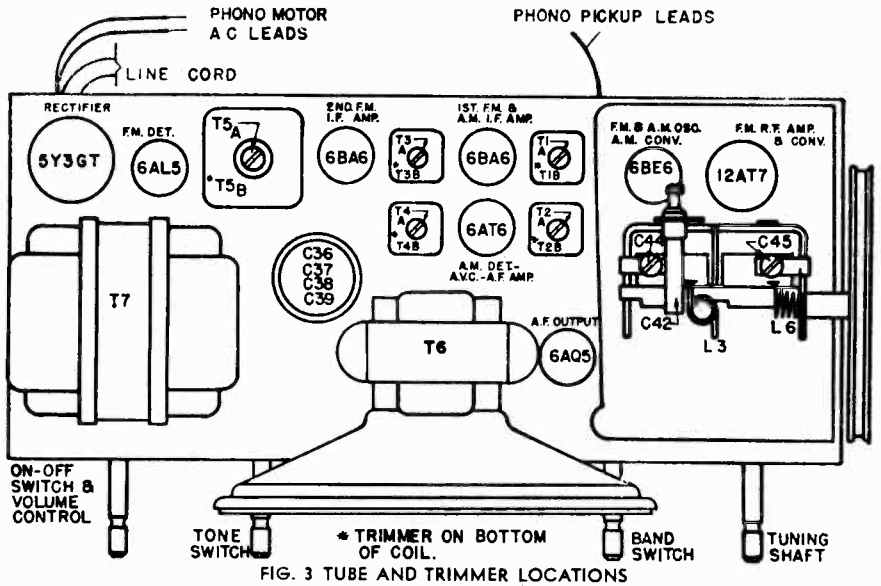


FIG. 3 TUBE AND TRIMMER LOCATIONS

VOLTAGE CHART

	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
6BE6 FM & AM OSC AM CONV	0	0	0	6 AC	155	125	0		
12AT7 FM RF AMP & CONV	170	0	1.5	0	0	155	0	1	6 AC
6BA6 1st IF AM & FM	0	0	0	6 AC	150	100	0		
6BA6 2nd IF AM & FM	0	0	0	6 AC	155	110	1		
6AL5 FM DETECTOR	0	0	6 AC	0	0	0	0		
6AT6 AM DETECTOR, AVC, AUDIO	—.5	0	0	6	0	0	60		
6AQ5 POWER OUTPUT	0	7.5	6 AC	0	215	170	0		
5Y3 POWER RECTIFIER		235		230 AC		230 AC		235	

All voltage readings are taken from tube pin to chassis.

All measurements are made with no signal, using a 20,000 ohm per volt meter.

AC input voltage must be maintained at 117 volts for accurate readings.

AC voltages shown are at 1000 ohms per volt.

NOTE A: When aligning the FM I.F. circuits, keep the out put from the signal generator as low as possible.

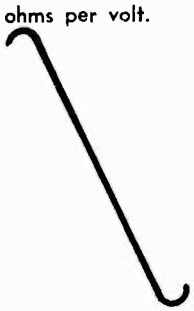


FIGURE 2

HOW TO ORDER REPAIR PARTS

Always give the part No. (No. printed on the part if different from that shown on the parts list), and the name of the part. When No. is not available, give complete description of part. Be sure to always give the Model No. and Catalog No. The Model No. will be found on either the metal plate at the rear of the chassis or on a printed label which may be on the chassis or cabinet.

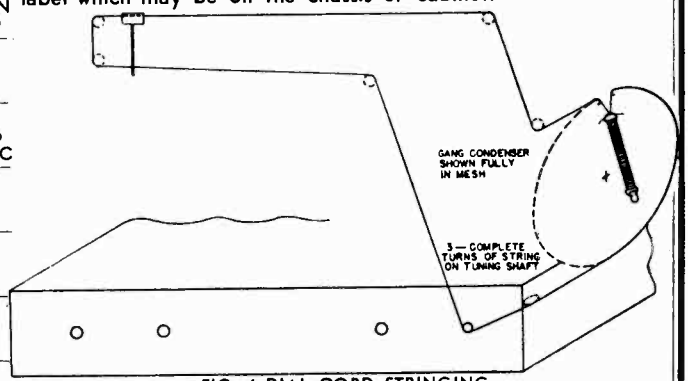


FIG. 4 DIAL CORD STRINGING

RESISTANCE CHART

	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
6BE6 FM & AM OSC AM CONV	22K	1.5	.5	.5	3.5M	3.5M	2.5M		
12AT7 FM RF AMP & CONV	3.3M	500K	250	0	0	3.5M	500K	2K	0
6BA6 1st IF AM & FM	200K	0	0	0	3.5M	3.5M	70		
6BA6 2nd IF AM & FM	0	0	0	0	3.5M	3.5M	70		
6AL5 FM DETECTOR	OPEN	OPEN	0	0	0	0	22K		
6AT6 AM DETECTOR, AVC, AUDIO	7M	0	0	0	500K	120K	3.5M		
6AQ5 POWER OUTPUT	470K	300	0	0	3.5M	3.5M	0		
5Y3 POWER RECTIFIER		3.5M		0		0		3.5M	

All voltages shown are approximate.

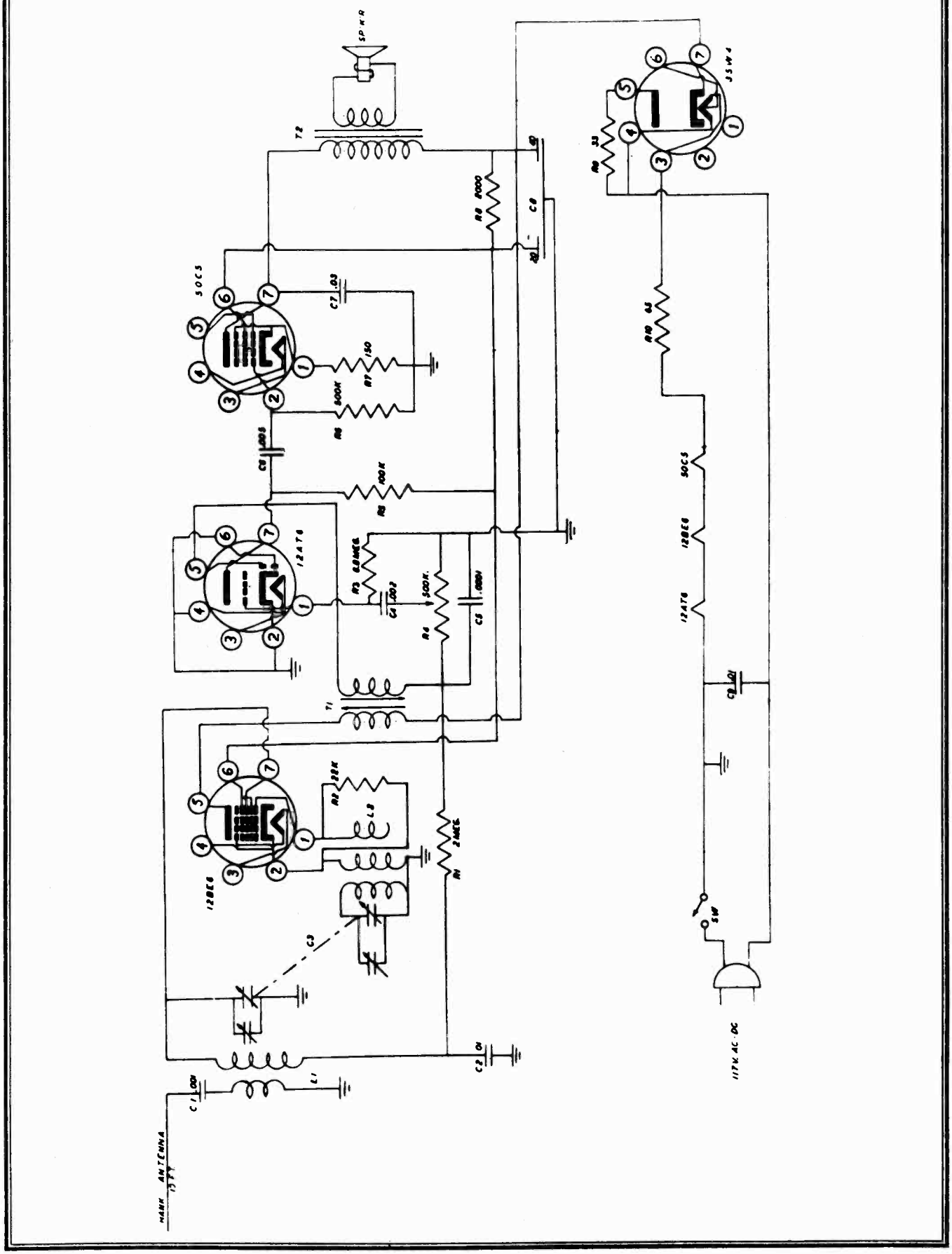
All resistance readings are taken from tube pin to chassis.

Due to manufacturing tolerance on component parts, resistance readings may vary as much as 20%.

All readings are shown in ohms unless otherwise noted.

PARTS LIST FOR MODEL 150084

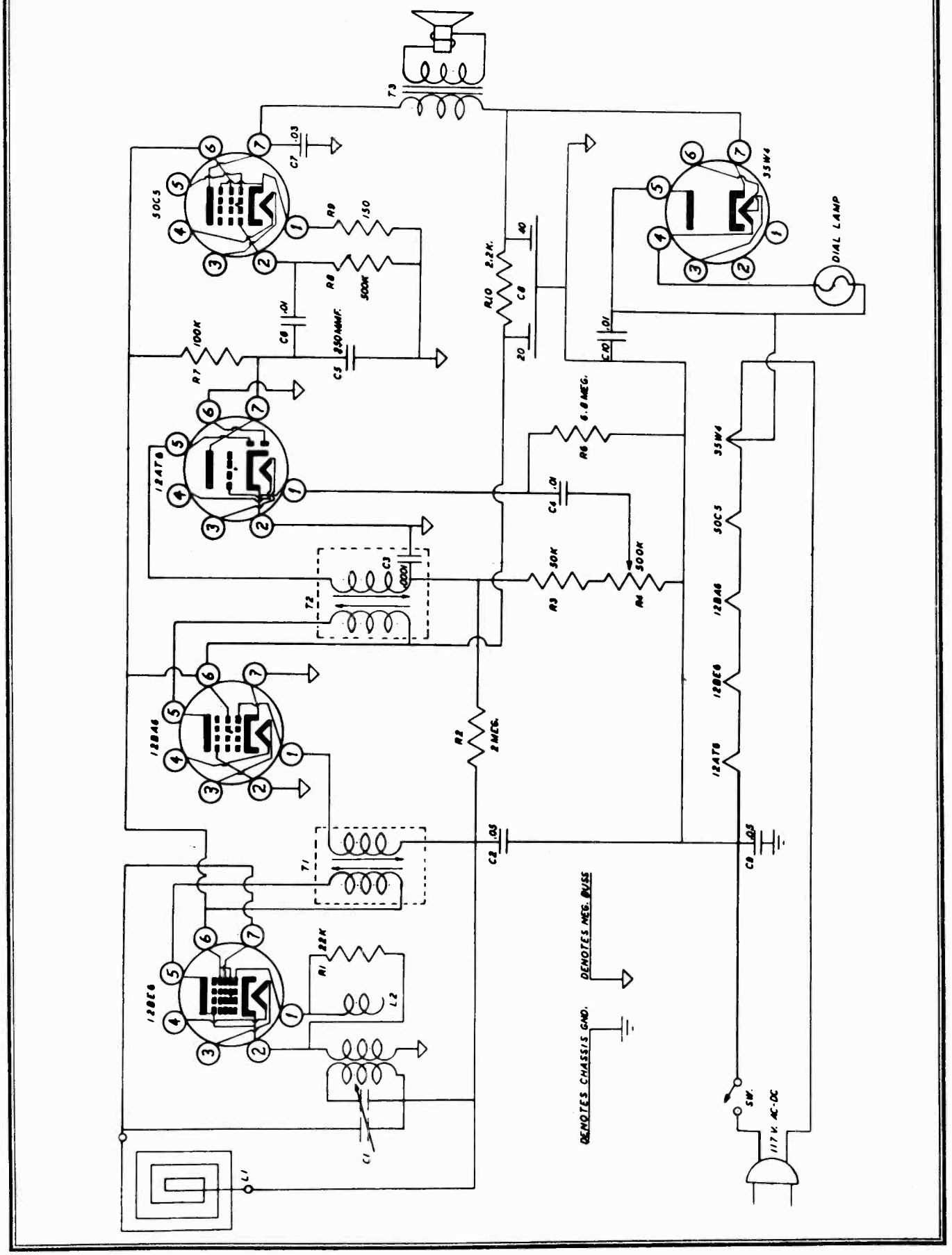
Schematic Diagram Reference	Part No.	Description
C1A, C1B, C1C, C1D	C19-200	Variable Condenser
C2	A83-376	2.2 MMF, gimmick
C3, C5, C6, C23, C41	A16-177	.005 MFD ceramic (Centralab NO. DAO48 or equiv.)
C4	A15-210	33 MMF ceramic, 20%, (Erie Style "A" N1400)
C7, C8, C34	A16-192	.01-400 volts, paper tubuler
C9, C10, R11	A17-101	100 MMF, 100 MMF, 47K ohms (Diode filter unit, Herlec F06-001)
C11, C12, C13	A17-102	3 x .005 MFD Herlec B34-005
C14, C35	A15-208	270 MMF ceramic, 20%, (Erie Style "K" or equiv.)
C15	A18-292	4 MFD—50 volt electrolytic
C16	A16-180	.003-200 volts, paper tubular
C17	A16-165	.01-200 volts, paper tubular
C18	A16-197	.05-200 volts, paper tubular
C19	A15-209	15 MMF ceramic, 10%, (Erie Style "A" or equiv.)
C20	A15-206	1.5 MMF ceramic, 33%, (Erie Style "A" or equiv.)
C21, C28	A16-196	.02-400 volts, paper tubular
C22, C24, C25, C31	A15-196	100 MMF 20% Ceramic Condenser (Erie Style K or Equiv.)
C26, C27	A16-199	.005-400 volts, paper tubular
C29	A16-198	.002-600 volts, paper tubular
C30, C32, C33, C40	A16-195	.001 MMF ceramic (Centralab NO. BC20A or equiv.)
C36, C37, C38, C39	A18-291	20-25 volts, 40-350 volts 30-300 volts, 30-300 volts electrolytic
C42	A20-146	FM oscillator trimmer
R1	A33-231	See L1.
R2	A60-759	4.7 K ohms, 1/2 watt, 10%
R3, R4	A60-760	10 K ohms, 1/2 watt, 10%
R5, R6	A60-744	22 K ohms, 1/2 watt, 10%
R7, R10, R14	A60-675	1 K ohms, 1/2 watt, 20%
R8, R17	A60-727	100 K ohms, 1/2 watt, 20%
R9, R13	A60-742	68 ohms, 1/2 watt, 10%
R11, C9, C10	A17-101	47 K ohms, 100 MMF, 100 MMF (Diode filter unit, Herlec FO6-001)
R12, R23, R24, R28	A60-731	470 K ohms, 1/2 watt, 20%
R15	A60-723	270 ohms, 1/2 watt, 20%
R16	A60-748	33 K ohms, 1/2 watt, 10%
R18	B24-181	Volume control and switch S3
R19, R22	A60-726	2.2 Megohms, 1/2 watt, 20%
R20	A60-730	47 K ohms, 1/2 watt, 20%
R21	A60-761	3.3 Megohms, 1/2 watt, 20%
R25	A60-714	2.2 K ohms, 1/2 watt, 10%
R26	A60-762	6.8 Megohms, 1/2 watt, 20%
R27	A60-747	270 K ohms, 1/2 watt, 20%
R29	A60-754	270 ohms, 1/2 watt, 10%
R30	A10-516	See L4
R31	A60-753	220 ohms, 1/2 watt, 10%
R32	A60-755	100 ohms, 1 watt, 10%
R33	A60-763	1 K ohms, 4 watts, 10%
R34	A60-667	220 K ohms 1/2 watt 20%
L1	A33-231	Choke, wound on R1, 22 ohms
L2A, L2B	A10-515	Oscillator coil, AM
L3	A10-517	Oscillator coil, FM
L4	A10-516	Antenna coil, FM, wound on R30, 1.5 K ohms
L5	A33-233	Plate choke, FM RF
L6	A10-518	RF coil, FM
L7A, L7B	A33-230	Line choke
L8, L9	A33-232	FM oscillator filament choke
L10	A33-227	Filament choke
S1A, S1B, S1C, S1D	A69-184	Band switch
S2	A26-125	Tone control
S3	B24-181	ON-OFF SWITCH, on volume control
T1	A10-519	1st I.F., FM
T2	A10-521	1st I.F., AM
T3	A10-520	2nd I.F., FM
T4	A10-522	2nd I.F., AM
T5	SC10-492	Ratio detector, FM
T6	A80-247	Output transformer
T7	C80-246	Power transformer
	A23-153	Line cord and plug
	B79-351	Speaker, 6 1/4", P.M.
	B79-342	Speaker, 6 1/4", P.M. Alternate
	B79-341	Speaker, 6 1/4", P.M. Alternate
	S84-296	Back and loop
	C67-538	Dial scale, glass
	A52-286	Knob, mahogany, FM-AM-PH
	A52-261	Knob, mahogany, ON-OFF-VOL
	A52-260	Knob, mahogany, TONE 1-2-3
	A52-263	Knob, mahogany, TUNING
	A58-54	Pointer, slide type
	A83-429	Retainer, dial scale
	A87-29	Socket, pilot light
	A70-122	Spring, string tension
	A51-105	String, pointer travel, 42"
	B59-24	Record changer, MILWAUKEE-ERWOOD No. 11200



MODEL 1010

ANTENNA	GEN. COUPLING	GEN. FREQ.	RADIO DIAL	OUTPUT METER	ADJUST
1. .02mfd	Hi side to front section of tuning condenser	455 kcs	closed max. cap.	across V.C.	T1 bottom slug first for max. output T1 top slug for max. output.
2. 50mmf	Ant. coil Ant. input Remove hank	545 kcs	closed max. cap.	across V.C.	adjust osc. trimmer (front section tuning condenser) for max. output
3. 50mmf	same as No. 2	1500 kcs.	1500 kcs.	across V.C.	adjust rear section tuning condenser trimmer for uniform output between 545kc and 1500 kc

Circuit Location	Part No.	Description
C1		Condenser, paper tubular, .001mfd., 400v
C3	29A002	Condenser, variable 2 gang
C2		Condenser, paper tubular, .01 mfd., 400v
C4		Condenser, paper tubular, .002mfd., 400v
C5		Condenser, mica, .0001mfd., 600v
C6		Condenser, paper tubular, .005 mfd., 400v
C7		Condenser, paper tubular, .03 mfd., 400v
C8	31E003	Condenser, tubular cardboard, 40X20mfd, 150v
C9		Condenser, paper tubular, .01 mfd., 400v
R1		Resistor, composition, 2 meg., ½ watt
R2		Resistor, composition, 22k., ½ watt
R3		Resistor, composition, 6.8 meg., ½ watt
R4	26G008	Resistor, variable, 500k ohms
R5		Resistor, composition, 100k., ½ watt
R6		Resistor, composition, 500k., ½ watt
R7		Resistor, composition, 150 ohms, 1 watt
R8		Resistor, composition, 2k., 1 watt
R9		Resistor, composition, 33 ohms, ½ watt
R10		Resistor, wire wound, 65 ohms, 5 watts
L1	35D004	Coil, antenna
L2	35C002	Coil, oscillator
T1	18A005	Transformer, I.F. 455 KCS.
T2	15D001	Transformer, audio output
SP'K'R	19H100	Speaker, 4" P. M.
12BE6		Tube, 12BE6
12AT6		Tube, 12AT6
50C5		Tube, 50C5
35W4		Tube, 35W4
	5D004	Knob, pointer, walnut, split spline
	5D005	Knob, pointer, ivory, split spline
	5D006	Knob, walnut, split spline
	5D007	Knob, ivory, split spline
	11G007	Cover, back, chipboard
	40B011	Cabinet, model 1010 walnut
	40B010	Cabinet, model 1010 ivory

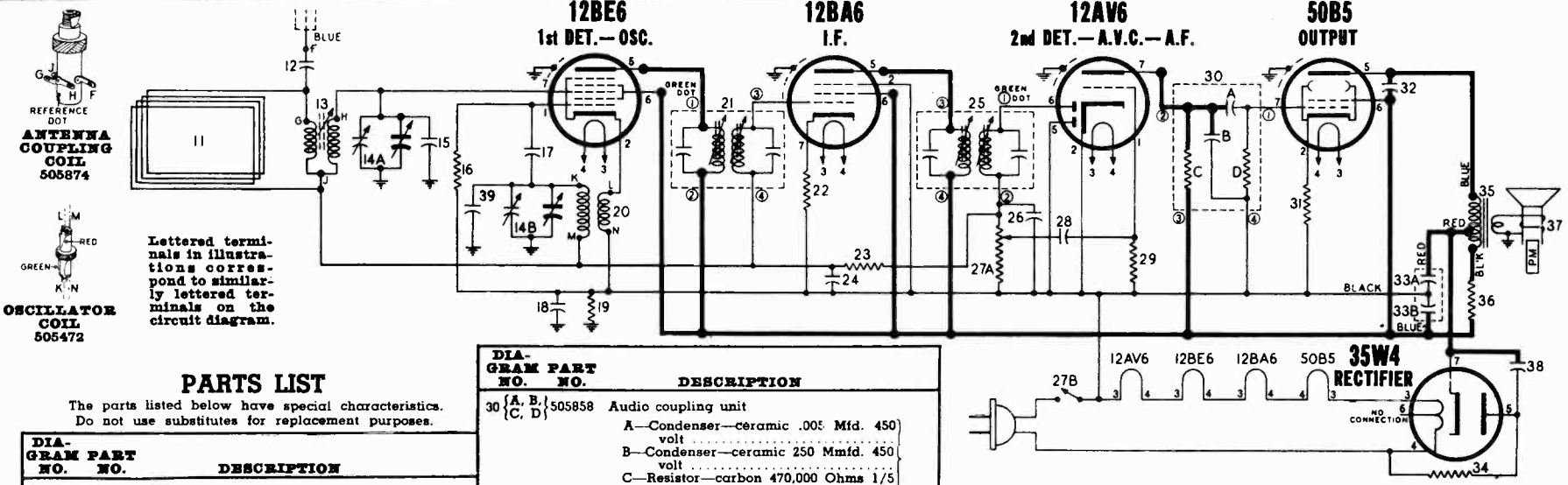


MODEL 1020

	ANTENNA	GEN. COUPLING	GEN. FREQ.	RADIO DIAL	OUTPUT METER	ADJUST
1.	.02mfd.	Connect gen. hi side to osc. section of tuning condenser. Connect gen. gnd. to radio neg. buss.	455 kcs.	open min. cap.	across V.C.	Adjust T2 top & bottom slug for max output. Adjust T1 top and bottom slugs for max. output
2.	50mmf	Connect gen. Hi side to antenns lead. (rear section tuning condenser) Connect gen. gnd. to radio neg. buss.	1400 kcs.	1400 kcs.	Across V.C.	Tune osc. trimmer for max output.
3.	50mmf	same as No. 2.	600 kcs.	600 kcs.	across V.C.	adjust for uniform output between 1400 kc and 600 kc.

Circuit Location	Part No.	Description
R1		Resistor, composition, 22k, ½ w.
R2		Resistor, composition, 2 meg., ½ w.
R3		Resistor, composition, 50k, ½ w.
R4 R6)	26G009	Resistor, variable, 500k, w/switch
C4)	40L103	Caprister, 6.8 meg., ½w. .01 mfd, 400v
R7&C5	40L101	Caprister, 100k, ½ w., 250mmf., 400v.
R8&C6	40L102	Caprister, 500k, ½w., .01 mfd., 400v.
C1	29A003	Condenser, variable 2 gang
R9		Resistor, 150 ohms, 1 watt
R10		Resistor, composition, 2.2k., 1 watt
C5-C9		Condenser, paper tubular, .05mfd., 400v.
C3		Condenser, ceramic, 100mmf., 400v., (inT2)
C7		Condenser, paper tubular, .03mfd., 400v.
C8	31E003	Condenser, electrolytic, 40X20mfd, 150v.
C10		Condenser, paper tubular, .01mfd., 400v.
L1	35D003	Loop, antenna
L2	35C001	Coil, oscillator, with capacity winding 50mmf
T1	18A005	Transformer, I.F. 455 kc.
T2	18A006	Transformer, I.F. 455 kc. with 100mmf. diode filter
T3	15D001	Transformer, audio output
S'P'KR	19H101	Speaker, 4" P.M.
Dial Lamp		Lamp, dial. miniature bayonet No. 47
Sw.		Switch, off-on, on vol. cotrol R4
	40B008	Cabnet, plastic, walnut
	40B009	Cabinet, plastic, ivory
	2R100	Pointer, dial
	2Q103	Glass, dial plate with calibration
	5D008	Knob, push on, split knurl
1 23E6		12BE6
12BA6		L 12BA6
12AT6		12AT6
		50C5
50C5		35W4
35W4		
	11G006	Cover, back, chipboard

MODELS B51T1, Code 9044-A; B51T2, Code 9044-B; B51T3, Code 9044-C; B51T4, Code 9044-D



PARTS LIST

The parts listed below have special characteristics. Do not use substitutes for replacement purposes.

DIAGRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
12	505873	Condenser—ceramic .005 Mfd. 450 volt
14-A, B	505490	Condenser—variable gang (with drum)
15	505475	Condenser—ceramic 7 Mmfd. 500 volt
17	504434	Condenser—ceramic 50 Mmfd. 500 volt
18	512157	Condenser—.15 Mfd. 400 volt
24	504444	Condenser—.05 Mfd. 400 volt
26	502271	Condenser—mica 260 Mmfd. 500 volt
28	505873	Condenser—ceramic .005 Mfd. 450 volt
30-A	505858	Condenser—ceramic .005 Mfd. 450 volt (part of audio coupling unit)
30-B	505858	Condenser—ceramic 250 Mmfd. 450 volt (part of audio coupling unit)
32	505873	Condenser—ceramic .005 Mfd. 450 volt
33-A, B	503655	Condenser—electrolytic (includes shield) A—30 Mfd. 150 volt } B—20 Mfd. 150 volt }
38	504444	Condenser—.05 Mfd. 400 volt
39	505475	Condenser—ceramic 7 Mmfd. 500 volt
		RESISTORS
16	510061	Resistor—carbon 22,000 Ohms ¼ watt
19	510079	Resistor—carbon 220,000 Ohms ¼ watt
22	510016	Resistor—carbon 68 Ohms ¼ watt
23	510093	Resistor—carbon 2.2 Meg. ¼ watt
27-A, B	505871	Volume control 1 Meg. (with switch)
29	510094	Resistor—carbon 3.3 Meg. ¼ watt
30-C, D	505858	Resistor—carbon 470,000 Ohms 1/5 watt (part of audio coupling unit)
31	510421	Resistor—wire wound 150 Ohms ½ watt ±10%
34	510510	Resistor—wire wound 33 Ohms 1 watt
36	510239	Resistor—carbon 1,500 Ohms 1 watt ±10%
		OTHER ELECTRICAL PARTS
11	505865	Loop antenna
13	505874	Coil—antenna (includes slug)
	505894	Slug core for antenna coil
20	505472	Coil—oscillator
21	505867	Transformer—I. F.
25	505867	Transformer—I. F.

DIAGRAM NO.	PART NO.	DESCRIPTION
30 {A, B, C, D}	505858	Audio coupling unit A—Condenser—ceramic .005 Mfd. 450 volt B—Condenser—ceramic 250 Mmfd. 450 volt C—Resistor—carbon 470,000 Ohms 1/5 watt D—Resistor—carbon 470,000 Ohms 1/5 watt
35	505869	Transformer—output
37	505868	Speaker—P.M. dynamic (3½ inch) includes output transformer
		MISCELLANEOUS
	505878	Baffle and grill cloth for Models B51T1 and B51T2
	505879	Baffle and grill cloth for Model B51T3
	504389	Bottom plate
	503647	Cabinet—ivory; Model B51T1 (includes baffle and metal grill)
	503648	Cabinet—mahogany; Model B51T2 (includes baffle and metal grill)
	503649	Cabinet—black; Model B51T3 (includes baffle and metal grill)
	———	Cabinet—College colors; Model B51T4—specify name of college when ordering replacement cabinet
	113019	Clip—retains dial scale
	114955	Clip—retainer on end of dial cord
	505101	Clip for mounting I. F. transformers
	506902	College letters for Model B51T4 ea.
	117057	Cord—dial drive (2 ft. required) per ft.
	505884	Dial scale for Models B51T1 and B51T2
	505885	Dial scale for Model B51T3
	505103	Insulating sheet on bottom of cabinet
	504470	Knob—black; Model B51T3
	504474	Knob—ivory; Model B51T1
	504541	Knob—mahogany; Model B51T2
	———	Knob—College colors; Model B51T4—specify name of college when ordering replacement knob
	505877	Metal grill and "S-W" name plate
	505886	Pointer
	119087	Ring for dial cord
	116584	Rubber feet
	12531	Screw—No. 8-32 x ⅜; retains bottom plate to cabinet
	17861	Screw—Set No. 4-40; shaft extension
	83624	Screw—No. 8 x ¼; retains chassis to bottom plate
	504721	Shaft extension for tuning gang
	505894	Slug core for antenna coil
	504397	Socket—miniature
	505299	Spring; dial cord tension
	504472	Window for dial

NOTE

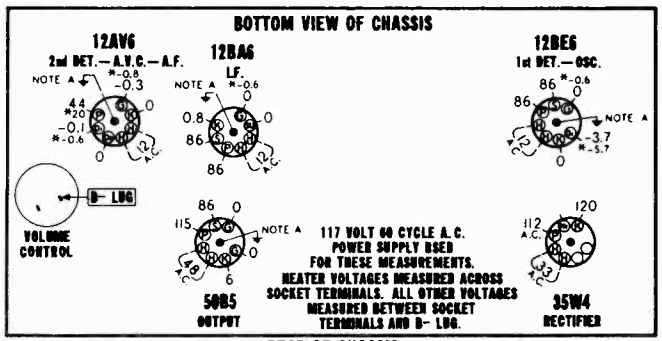
Condenser #39 was added to improve frequency stability. Chassis incorporating this change are stamped with the letter "S".

I. F. 455 KC.

SOCKET VOLTAGES

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

VOLUME ON FULL WITH NO SIGNAL **DIAL TUNED TO 540 KC.**



NOTE A: Grounding of center stud on tube socket is necessary to reduce capacity coupling between other pins. Oscillation may result if this ground is omitted.

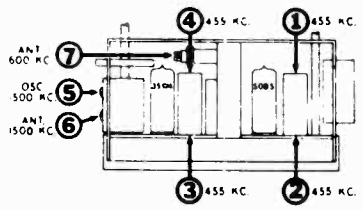
MODELS B51T1, Code 9044-A; B51T2, Code 9044-B; B51T3, Code 9044-C; B51T4, Code 9044-D

ALIGNMENT PROCEDURE

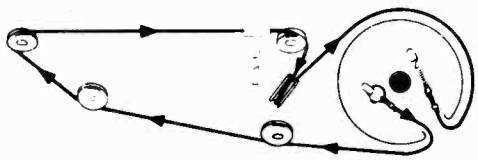
1. To remove chassis from cabinet lift edge of insulating sheet at bottom of cabinet and take out mounting screws at each corner. Then remove bottom plate by taking out screws at each end holding it to chassis. Solder approximately 8" of insulated wire to any B— connection (see voltage chart on opposite side for convenient B— location).
2. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 55 on the dial. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.
3. Connect ground lead of signal generator to B— lug.
   CAUTION: If your test oscillator is designed with an AC-DC power supply, connect ground lead of signal generator to B— lug through a .25 mfd. condenser.
4. Connect output meter from plate of 50B5 tube to B – through a 0.1 Mfd condenser.
5. Set volume control at maximum volume position and use a weak signal from the signal generator.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF GENERATOR TO	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Lug on trimmer No. 6 at bottom section of gang (see figure below for location of trimmer).	455 KC	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
				3-4	1st I.F.	
200 MMFD. Mica Condenser	External antenna lead	1500 KC	1500 KC	5	Broadcast Oscillator	Adjust for maximum output.
200 MMFD. Mica Condenser	External antenna lead	1500 KC	Tune to 1500 KC generator signal.	6	Broadcast Antenna	Adjust for maximum output.
200 MMFD. Mica Condenser	External antenna lead	600 KC	Tune to 600 KC generator signal.	7	Broadcast Antenna (shunt)	Adjust for maximum output.

Repeat Adjustment of Trimmers 6 and 7 Until One No Longer Detunes the Other.



REAR VIEW OF CHASSIS



DIAL AND POINTER DRIVE CORD ARRANGEMENT

To string dial cord, turn the drive drum to maximum clockwise position and use the following parts:

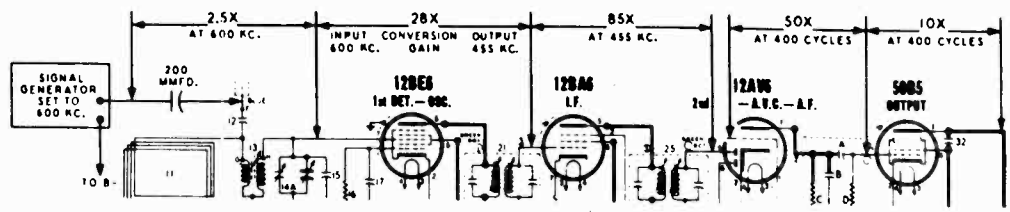
114955	Clip on end of cord	119087	Ring for dial cord
117057	Cord (2 feet required)	505299	Tension Spring

STAGE GAIN MEASUREMENT PROCEDURE

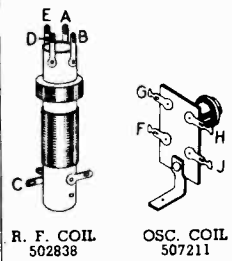
REQUIRED INSTRUMENTS: The amount of amplification or "gain" of each of the stages of this receiver may be measured with an A.C. Vacuum Tube Voltmeter or a "channel" type instrument containing a tuned and calibrated amplifier.

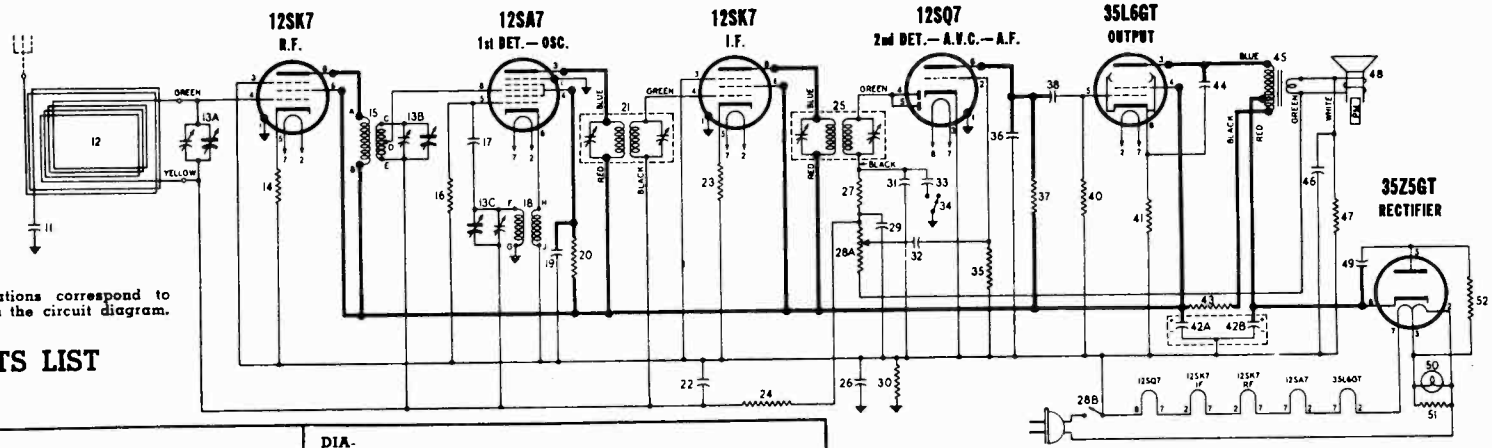
PROCEDURE: It is exceedingly important to adhere to the procedure outlined below since the accuracy of these measurements will be affected to a considerable extent by the failure to establish proper operating conditions.

1. Be sure that R.F. and I.F. stages are carefully and accurately aligned by utilizing the alignment procedure given above.
2. Connect Signal Generator as shown below.
3. The values of stage gain which are given here were measured with a fixed bias of 3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to A.V.C. at terminal "J" of antenna coupling coil and connect the positive battery lead to B— in receiver chassis.
4. Set Signal Generator for operation at 600 Kc with 400 cycle modulation and carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
5. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.
6. When using a "channel" type instrument, carefully tune it for maximum output at desired frequency before making measurements.



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





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

PARTS LIST

DIA-GRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
11	502152	Condenser—.02 Mfd. 400 volt
13-A, B, C	502123	Condenser—variable gang (with drum)
17	502159	Condenser—mica 50 Mmfd. 500 volt
19	502262	Condenser—.25 Mfd. 200 volt
22	502155	Condenser—.1 Mfd. 200 volt
26	502158	Condenser—.15 Mfd. 400 volt
29	505026	Condenser—ceramic 150 Mmfd. 350 volt
31	505026	Condenser—ceramic 150 Mmfd. 350 volt
32, 33	504977	Condenser—ceramic .002 Mfd. 150 volt
36	502160	Condenser—mica 110 Mmfd. 500 volt
38	505028	Condenser—.05 Mfd. 150 volt
42-A, B	500256	Condenser—electrolytic A—20 Mfd. 150 volt B—40 Mfd. 150 volt
44	502151	Condenser—.01 Mfd. 400 volt
46	505071	Condenser—.2 Mfd. 400 volt
49	502157	Condenser—.05 Mfd. 400 volt
		RESISTORS
14	510025	Resistor—carbon 220 Ohms ¼ watt
16	510061	Resistor—carbon 22,000 Ohms ¼ watt
20	510049	Resistor—carbon 4700 Ohms ¼ watt
23	510021	Resistor—carbon 150 Ohms ¼ watt + 10%
24	510091	Resistor—carbon 1 Meg. ¼ watt
27	510064	Resistor—carbon 33,000 Ohms ¼ watt
28-A, B	504967	Volume control 1 Meg. (with switch)
30	510079	Resistor—carbon 220,000 Ohms ¼ watt
35	510097	Resistor—carbon 10 Meg. ¼ watt
37	510085	Resistor—carbon 470,000 Ohms ¼ watt
40	510085	Resistor—carbon 470,000 Ohms ¼ watt
41	510121	Resistor—carbon 150 Ohms ½ watt + 10%
43	510239	Resistor—carbon 1,500 Ohms 1 watt + 10%
47	510073	Resistor—carbon 100,000 Ohms ¼ watt
51	510029	Resistor—carbon 390 Ohms ¼ watt + 10%
52	510210	Resistor—carbon 33 Ohms 1 watt
		COILS AND TRANSFORMERS
12	506282	Loop Antenna
15	502838	Coil—R.F.
18	507211	Coil—oscillator
21	502102	Transformer—1st I.F.
25	502103	Transformer—2nd I.F.

DIA-GRAM NO.	PART NO.	DESCRIPTION
		COILS AND TRANSFORMERS—Cont'd
45	502904	Transformer—output for A-502998 speaker
	504781	Transformer—output for C-502998 speaker
	502213	Transformer—output for R-502998 speaker
	504244	Transformer—output for W-502998 speaker
	504756	Transformer—ouput for Y-502998 speaker
	504758	Transformer—output for Z-502998 speaker
		OTHER ELECTRICAL PARTS
34	500546	Switch—tone control
48	502998	Speaker—P. M. dynamic (5 inch) includes transformer
50	118921	Lamp—dial (Mazda No. 47) 6-8V. 150 Ma.
		MISCELLANEOUS PARTS
	506329	Back for cabinet
	116467	Base for mtg. electrolytic condenser
	502665	Cabinet—Ivory for Model B61T1
	502666	Cabinet—Mahogany for Model B61T2
	502506	Clamp—dial scale mtg.
	112745	Clip—coil mounting
	500497	Clip—retainer for cabinet back
	114955	Clip—retainer on end of dial cord
	113019	Clip—retains light shield
	117057	Cord—dial drive (5 ft. required)—per ft.
	500324	Cover—cardboard for elect. cond.
	506294	Dial scale—glass
	502564	Knob—for Model B61T1
	502563	Knob—for Model B61T2
	506285	Light diffusing strip
	502690	Pointer
	81145	Retaining ring for tuning shaft
	17063	Screw—No. 6 x ¼; holds dial clamp
	114628	Screw—No. 8 x ½; chassis mounting
	79905	Screw—No. 8 x 1½; loop mounting
	502173	Shaft—tuning control
	506284	Shield—light
	500499	Socket—dial lamp (with leads)
	116690	Socket—octal base
	160392	Socket—octal (rectifier)
	161394	Spring—dial cord tension
	111456	Washer—spring washer for tuning shaft

NOTE

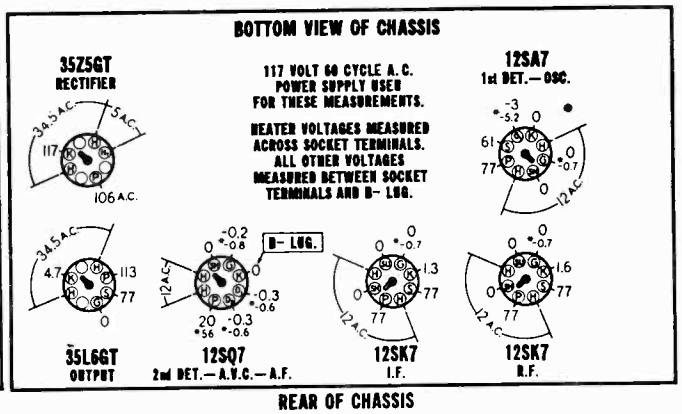
Condenser #39 (22 Mmfd.), formerly connected between pins 3 and 5 of the 35L6GT output tube, has been omitted to eliminate tone distortion at high volume levels in a small percentage of receivers. Chassis incorporating this change are stamped with the letter "S".

I. F. 455 KC.

SOCKET VOLTAGES

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

VOLUME ON FULL WITH NO SIGNAL **DIAL TUNED TO 540 KC.**



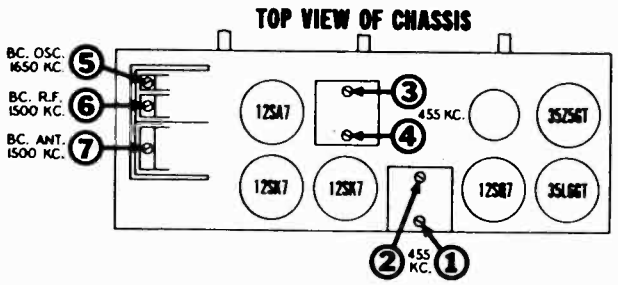
REAR OF CHASSIS

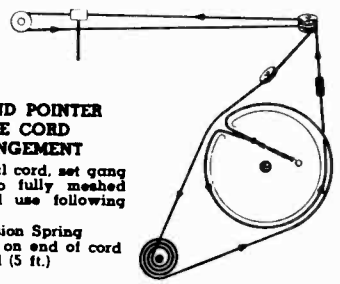
MODELS B61T1, Code 9046-A;
B61T2, Code 9046-B

ALIGNMENT PROCEDURE

1. Remove chassis from cabinet—allow loop antenna to remain attached to chassis.
2. Note that there are four calibrating lines stamped into front edge of the metal dial frame. When gang condenser is fully meshed, dial pointer should be in the position indicated by first line at the left. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.
3. Connect an output meter across the speaker voice coil or from plate of 35L6GT tube to B— through a .1 Mfd. condenser (see voltage chart for convenient B— connection).
4. Connect ground lead of signal generator to B— lug. CAUTION: If your test oscillator is designed with an AC-DC power supply, connect ground lead of signal generator to B— lug through a .25 Mfd. condenser.
5. Set volume control to maximum volume position and use a weak signal from the signal generator.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Control Grid of 12SA7	455 KC	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
				3-4	1st I.F.	
200 MMFD. Mica Condenser	External Antenna Terminal on Loop Frame	1650 KC	Gang condenser fully open.	5	Broadcast Oscillator (Shunt)	Adjust for maximum output.
200 MMFD. Mica Condenser	External Antenna Terminal on Loop Frame	1500 KC	Tune to 1500 KC generator signal	6	Broadcast R.F.	Adjust for maximum output.
200 MMFD. Mica Condenser	External Antenna Terminal on Loop Frame	1500 KC	Tune to 1500 KC generator signal	7	Broadcast Antenna	Adjust for maximum output.



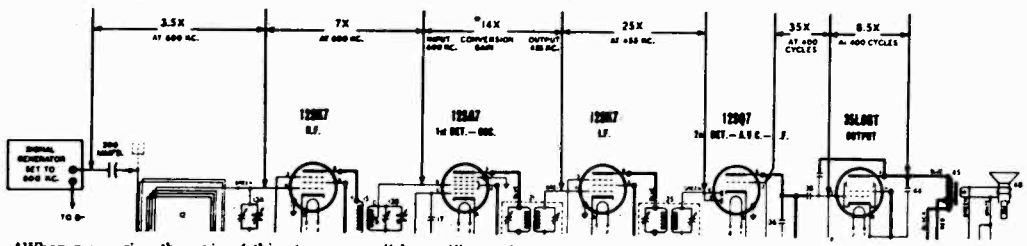


STAGE GAIN MEASUREMENT PROCEDURE

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

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

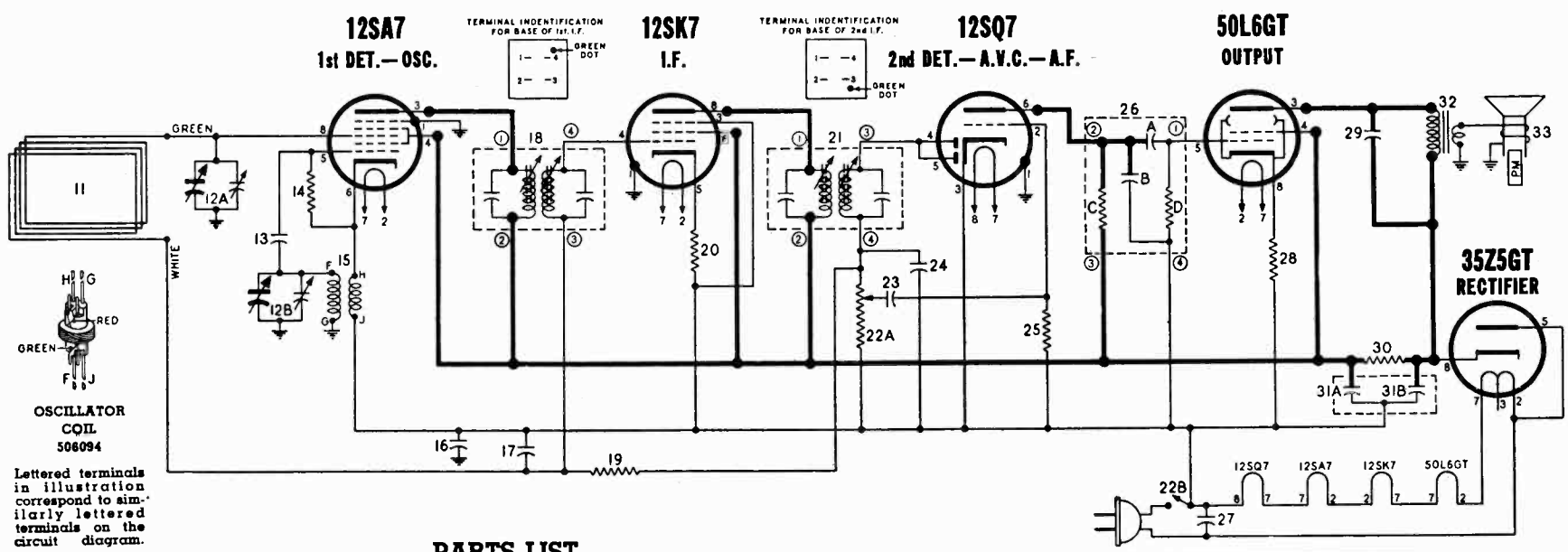
1. Be sure that R.F. and I.F. stages are carefully and accurately aligned by utilizing the alignment procedure given above.
2. Connect Signal Generator as shown below.
3. The values of stage gain which are given here were measured with a fixed bias of 3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to A.V.C. at terminal "E" of the R.F. coil and connect the positive battery lead to B— in receiver chassis.
4. Set Signal Generator for operation at 600 Kc with 400 cycle modulation and carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes set generator to a nearby frequency and re-tune the receiver.
5. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.
6. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.



*When measuring the gain of this stage use a "channel" type instrument or a signal generator with calibrated output voltage.

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

MODELS C51T1, Code 9045-A;
C51T2, Code 9045-B



PARTS LIST

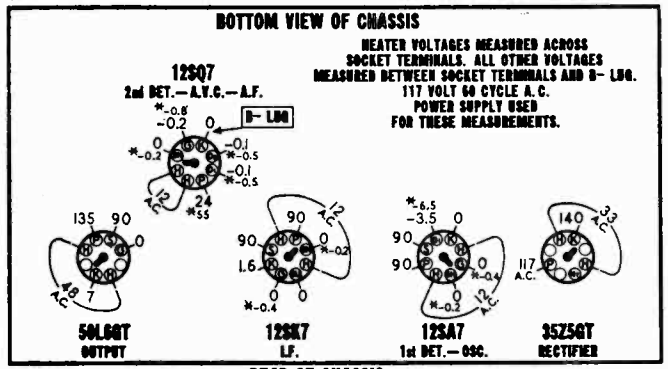
DIAGRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
12-A, B.	506081	Condenser—variable gang (with drum)
13	502931	Condenser—mica 100 Mmfd. 500 volt
16	502158	Condenser—.15 Mfd. 400 volt
17	502153	Condenser—.05 Mfd. 200 volt
23	504726	Condenser—.01 Mfd. 200 volt
24	502931	Condenser—mica 100 Mmfd. 500 volt
26-A	505858	Condenser—ceramic .005 Mfd. 450 volt (part of audio coupling unit)
26-B	505858	Condenser—ceramic 250 Mmfd. 450 volt (part of audio coupling unit)
27	502154	Condenser—.05 Mfd. 600 volt
29	504726	Condenser—.01 Mfd. 200 volt
31-A, B.	506090	Condenser—electrolytic A—20 Mfd. 150 volt; B—30 Mfd. 150 volt
		RESISTORS
14	510061	Resistor—carbon 22,000 Ohms ¼ watt
19	510094	Resistor—carbon 3.3 Meg. ¼ watt
20	510022	Resistor—carbon 150 Ohms ¼ watt
22-A, B.	506087	Volume control 1 Meg. (with switch)
25	510097	Resistor—carbon 10 Meg. ¼ watt
26-C, D.	505858	Resistor—carbon 470,000 Ohms 1/5 watt (part of audio coupling unit)
28	510128	Resistor—carbon 330 Ohms ½ watt
30	510243	Resistor—carbon 2,200 Ohms 1 watt
		OTHER ELECTRICAL PARTS
11	506088	Loop antenna and cabinet back
15	506094	Coil—oscillator
18	506083	Transformer—1st I.F.
21	506084	Transformer—2nd I.F.

DIAGRAM NO.	PART NO.	DESCRIPTION
26	505858	Audio coupling unit A—Condenser—ceramic .005 Mfd. 450 volt; B—Condenser—ceramic 250 Mmfd. 450 volt; C—Resistor—carbon 470,000 Ohms 1/5 watt; D—Resistor—carbon 470,000 Ohms 1/5 watt
32	506089	Transformer—output
33	506079	Speaker—P.M. dynamic (4 inch)
		MISCELLANEOUS
	505165	"C" washer—retains tuning shaft
	505901	Cabinet—ivory; Model C51T1
	505902	Cabinet—mahogany; Model C51T2
	117057	Cord-dial drive (2 ft. required) per ft.
	114955	Clip—retainer on end of dial cord
	160326	Clip—retains dial scale
	506092	Clip—retains loop and cabinet back to chassis
	506096	Clip—retains loop and cabinet back to cabinet
	506082	Dial Pointer disc
	506095	Dial scale
	502563	Knob—volume or tuning for Model C51T2
	502564	Knob—volume or tuning for Model C51T1
	119087	Ring for dial cord
	18785	Screw—#8 x 7/8" chassis mounting
	506085	Shaft—tuning
	116690	Socket—octal base
	160392	Socket—octal (rectifier)
	503161	Spring—tension

SOCKET VOLTAGES

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

VOLUME ON FULL WITH NO SIGNAL — DIAL TUNED TO 540 KC.

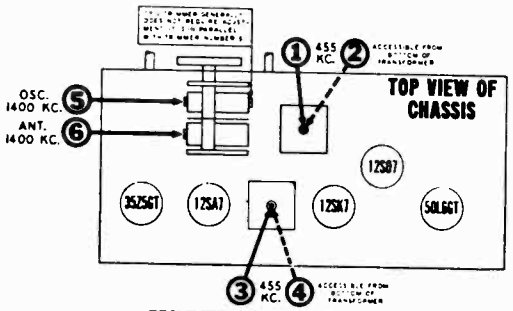


MODELS C51T1, Code 9045-A;
C51T2, Code 9045-B

ALIGNMENT PROCEDURE

1. Remove chassis and loop antenna (on cabinet back) from cabinet—allow loop to remain attached to chassis.
2. With the gang condenser fully meshed, the dial indicator should be pointing horizontally to the left. If it is set incorrectly, reposition by firmly holding the gang condenser shaft while rotating the indicator. Then check to see that the dial indicator is pointing horizontally to the right when the gang condenser is fully open.
3. Couple the signal generator to the receiver by connecting its output to several turns of wire formed in a circular shape so that it may be placed adjacent and parallel to the receiver loop antenna.
4. Connect an output meter across the speaker voice coil or from the plate of the 50L6GT tube to B— through a 0.1 Mfd. condenser.
5. Set volume control at maximum volume position and use a weak signal from the signal generator.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	SIGNAL GENERATOR CONNECTION	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
None	Connect directly to coupling turn as instructed in Step 3 above.	455 KC	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
				3-4	1st I.F.	
None	Connect directly to coupling turn as instructed in Step 3 above.	1400 KC	1400 KC	5	Broadcast Oscillator	Adjust for maximum output.
None	Connect directly to coupling turn as instructed in Step 3 above.	1400 KC	Tune to 1400 KC generator signal	6	Broadcast Antenna	Adjust for maximum output.

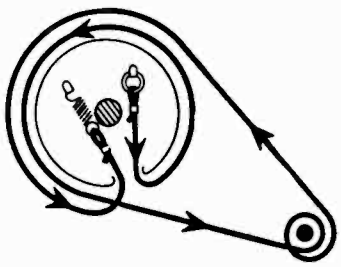


TRIMMER LOCATIONS

DIAL AND POINTER DRIVE CORD ARRANGEMENT

To string dial cord, turn the main drive drum to maximum counter - clockwise position and use following parts:

114955 Clip on end of cord
117057 Cord (2 feet)
119087 Ring for dial cord
505161 Tension Spring

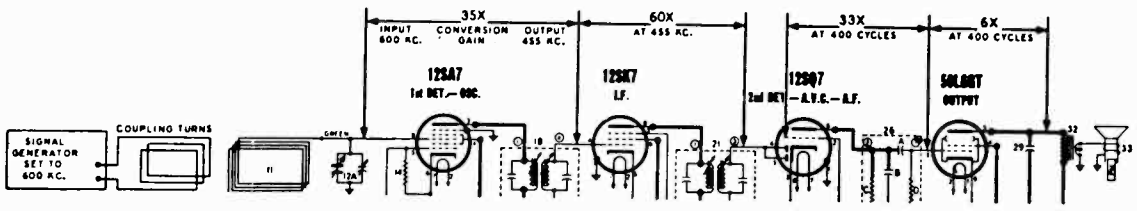


STAGE GAIN MEASUREMENT PROCEDURE

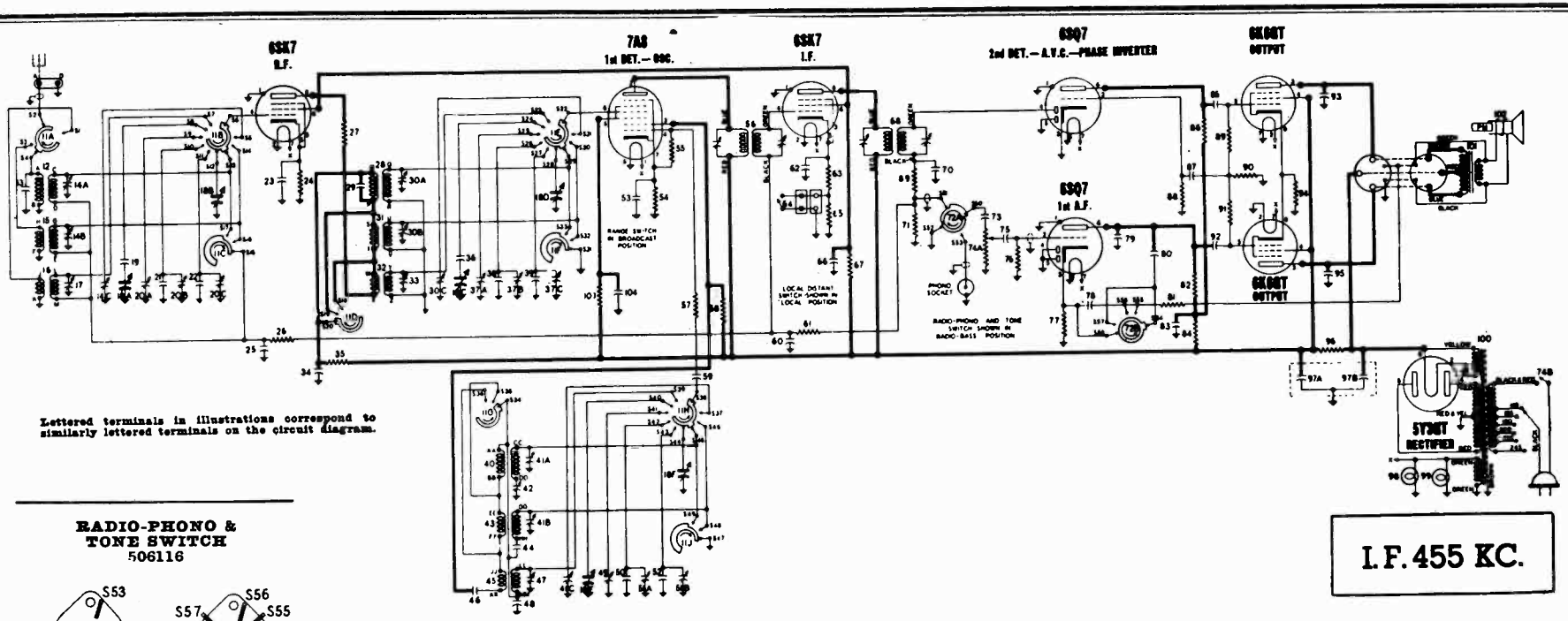
REQUIRED INSTRUMENTS: The amount of amplification or "gain" of each of the stages of this receiver may be measured with an A.C. Vacuum Tube Voltmeter or a "channel" type instrument containing a tuned and calibrated amplifier.

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

1. Be sure that R.F. and I.F. stages are carefully and accurately aligned by utilizing the alignment procedure given above.
2. Connect Signal Generator as shown below.
3. The values of stage gain which are given here were measured with a fixed bias of 3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to A.V.C. at terminal #3 of the 1st I.F. transformer and connect the positive battery lead to B— in receiver chassis.
4. Set Signal Generator for operation at 600 Kc with 400 cycle modulation and carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
5. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.
6. When using a "channel" type instrument, carefully tune it for maximum output at desired frequency before making measurements.



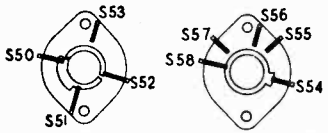
DIFFERENCES in tube characteristics, tolerance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown above.



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

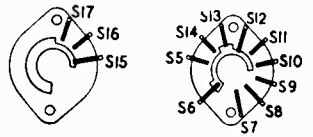
I.F. 455 KC.

RADIO-PHONO & TONE SWITCH 506116

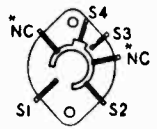


FRONT VIEW REAR VIEW

BAND SWITCH 506106

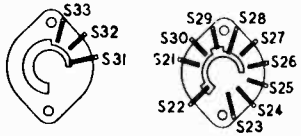


SECTION 1 FRONT VIEW SECTION 1 REAR VIEW

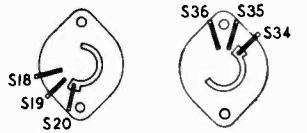


SECTION 2 FRONT VIEW

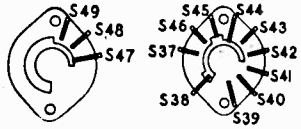
*Not used; may serve as wiring junction point.



SECTION 3 FRONT VIEW SECTION 3 REAR VIEW



SECTION 4 FRONT VIEW SECTION 4 REAR VIEW

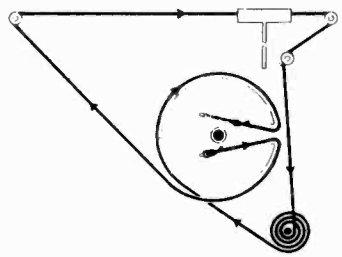


SECTION 5 FRONT VIEW SECTION 5 REAR VIEW

AUDIO OSCILLATION

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

TUNING DIAL AND POINTER DRIVE CORD ARRANGEMENT



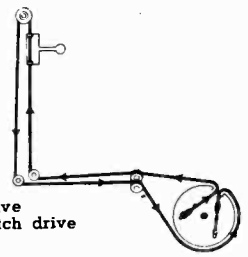
To string tuning dial drive cord, set gang condenser to fully open position.

To string band switch drive cord, turn "Band Selector" knob to its extreme counter-clockwise position.

When stringing drive cord, use the following parts:

113177 Tension Spring
114955 Clip on end of cord
119087 Ring
502773 Cord (9 feet)
5 ft. for tuning drive
4 ft. for band switch drive

BAND SWITCH INDICATOR DRIVE CORD ARRANGEMENT



MODEL 9041-A

ALIGNMENT PROCEDURE

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

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

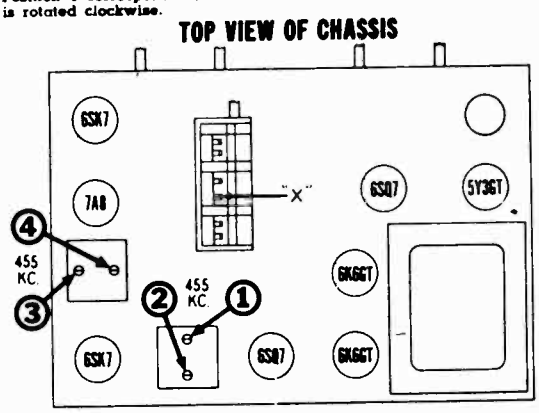
DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Lug on RF section of gang; see point "X" in chart on next page.	455 KC	Broadcast (*Position 1)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	1st I.F.	
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	1500 KC	Broadcast (*Position 1)	1500 Kc.	5	Broadcast Oscillator (Shunt)	Adjust for maximum output.
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	1500 KC	Broadcast (*Position 1)	Tune to 1500 Kc. generator signal.	6	Broadcast Antenna	Adjust for maximum output.
					7	Broadcast R.F.	
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	600 KC	Broadcast (*Position 1)	Tune to 600 Kc. generator signal.	8	Broadcast Oscillator (Series Pad)	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	Repeat adjustment of trimmers 5, 6, and 7 at 1500 Kc. Then re-check adjustment of trimmer 8 at 600 Kc.					
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	5 MC	Intermediate (*Position 2)	5 Mc.	9	Intermediate Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 4.1 Mc. If image does not appear, realign at 5 Mc, with trimmer screw further out. Recheck image.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	5 MC	Intermediate (*Position 2)	Tune to 5 Mc. generator signal.	10	Intermediate Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					11	Intermediate R.F.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	21 MC	13-16 Meter (*Position 4)	21 Mc.	12	13-16 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 21.9 Mc. If image does not apear, realign at 21 MC. with trimmer screw further in. Recheck image.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	21 MC	13-16 Meter (*Position 4)	Tune to 21 Mc. generator signal.	13	13-16 Meter Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					14	13-16 Meter R.F.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	15.5 MC	19 Meter (*Position 5)	15.5 Mc.	15	19 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 16.4 Mc. If image does not appear, realign at 15.5 Mc, with trimmer screw further in. Recheck image.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	15.5 MC	19 Meter (*Position 5)	Tune to 15.5 Mc. generator signal.	16	19 Meter Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					17	19 Meter R.F.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	11.5 MC	25 Meter (*Position 6)	11.5 Mc.	18	25 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by setting signal generator to 10.6 Mc. and tuning radio in vicinity of 11.5 Mc. If signal is not heard, realign at 11.5 Mc. with trimmer screw further in. Recheck.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	11.5 MC	25 Meter (*Position 6)	Tune to 11.5 Mc. generator signal.	19	25 Meter Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					20	25 Meter R.F.	

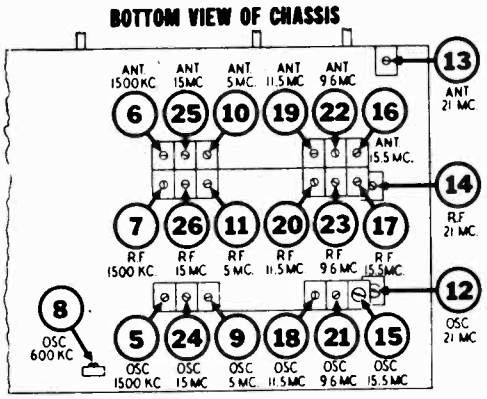
(Continued on next page)

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

400 OHM Carbon Resistor	"A" terminal at rear of chassis.	9.6 MC	31 Meter (*Position 7)	9.6 Mc.	21	31 Meter Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by setting signal generator to 8.7 Mc. and tuning radio in vicinity of 9.6 Mc. If signal is not heard realign at 9.6 Mc. with trimmer screw further in. Recheck.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	9.6 MC	31 Meter (*Position 7)	Tune to 9.6 Mc. generator signal.	22	31 Meter Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					23	31 Meter R.F.	
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	15 MC	S.W. (*Position 3)	15 Mc.	24	S.W. Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 14.1 Mc. If image does not appear, realign at 15 Mc., with trimmer screw further out. Recheck image.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	15 MC	S.W. (*Position 3)	Tune to 15 Mc. generator signal.	25	S.W. Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
					26	S.W. R.F.	

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



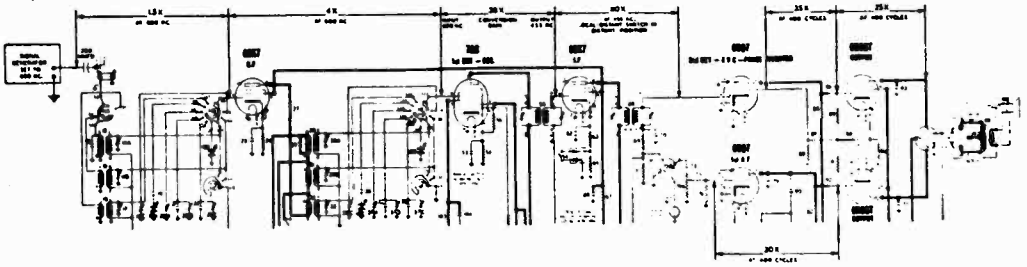


STAGE GAIN MEASUREMENT PROCEDURE

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

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

1. Be sure that R.F. and I.F. stages are carefully and accurately aligned by utilizing the alignment procedure given above.
2. Connect Signal Generator as shown below.
3. The values of stage gain which are given here were measured with a fixed bias of 3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to A.V.C. at the black lead of the 1st I.F. transformer and connect the positive battery lead to the receiver chassis.
4. Set Signal Generator for operation at 600 Kc with 400 cycle modulation and carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
5. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.
6. When using a "channel" type instrument, carefully tune it for maximum output at desired frequency before making measurements.



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

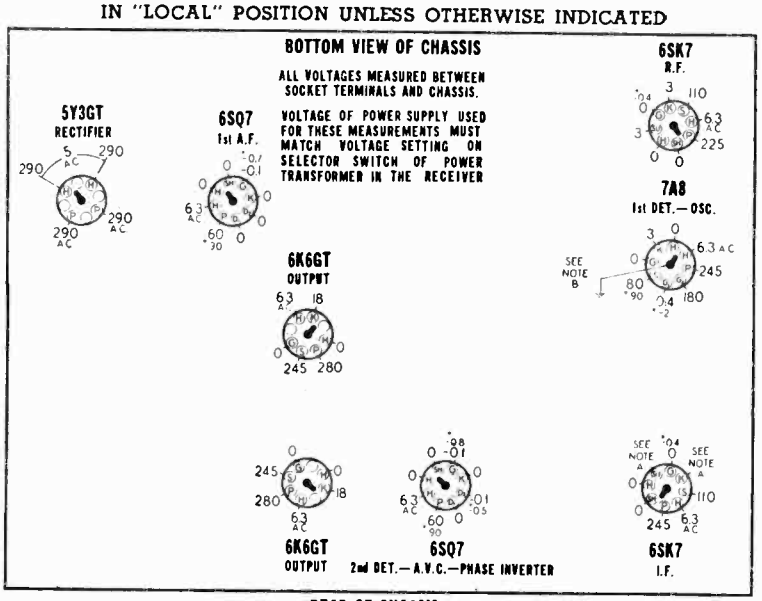
MODEL 9041-A

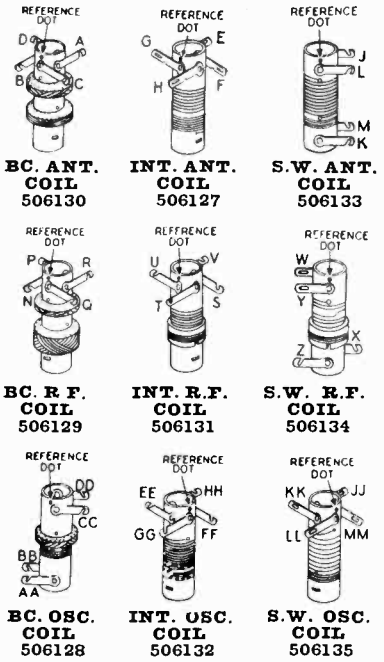
SOCKET VOLTAGES

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

BE SURE THAT SWITCH ON POWER TRANSFORMER IS SET TO POSITION WHICH MOST NEARLY MATCHES LINE VOLTAGE

RADIO-PHONO AND TONE SWITCH IN "RADIO-BASS" POSITION
VOLUME ON FULL WITH NO SIGNAL — DIAL TUNED TO 540 KC
BAND SWITCH IN BROADCAST POSITION
ANTENNA TERMINAL GROUNDED
LOCAL-DISTANT SWITCH
IN "LOCAL" POSITION UNLESS OTHERWISE INDICATED



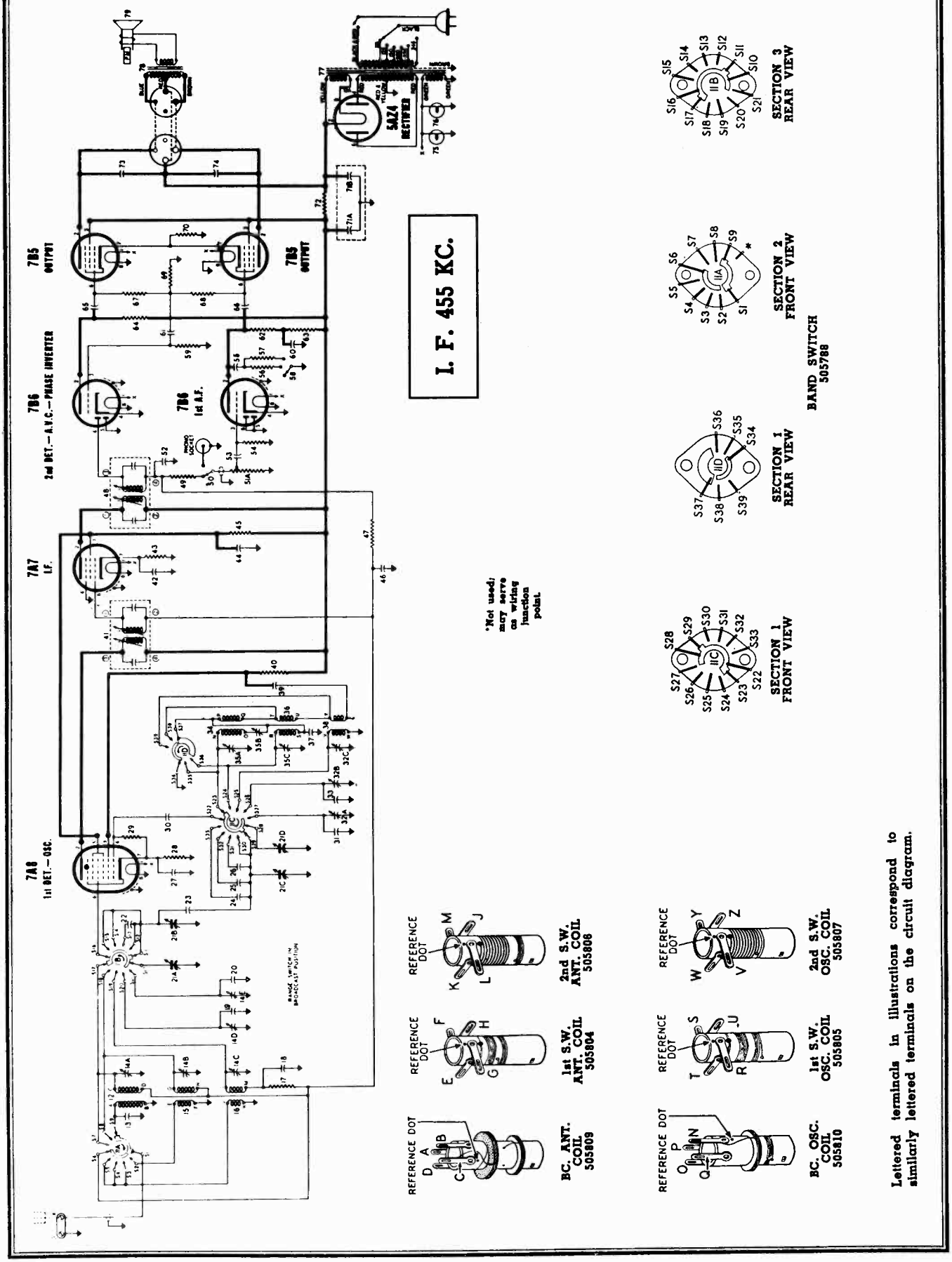


NOTE A: The voltage at the cathode or suppressor terminals of this tube is 13 volts when Local-Distant switch is in "Local" position and 2 volts when switch is set to "Distant" position.

NOTE B: Grounding of center stud on tube socket is necessary to reduce capacity coupling between other pins. Oscillation may result if this ground is omitted.

DIA-GRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
13	504434	Condenser ceramic 50 Mmfd. 500 volt
14A, B, C	506121	Condenser trimmer assembly A 1.6 to 18 Mmfd. B 1.6 to 18 Mmfd. C 4 to 70 Mmfd.
17	502758	Condenser trimmer: 1.6 to 18 Mmfd.
18A to F	506104	Condenser variable gang
19	506124	Condenser ceramic 250 Mmfd. 500 v. ±2%
20A, B, C	502754	Condenser trimmer assembly A 3 to 35 Mmfd. B 3 to 35 Mmfd. C 1.6 to 18 Mmfd.
21	502779	Condenser ceramic 56 Mmfd. 500 v. ±2%
22	505824	Condenser ceramic 120 Mmfd. 500 v. ±2%
23	502807	Condenser .05 Mfd. 400 volt
25	502807	Condenser .05 Mfd. 400 volt
29	504434	Condenser ceramic 50 Mmfd. 500 volt
30A, B, C	506121	Condenser trimmer assembly A 1.6 to 18 Mmfd. B 1.6 to 18 Mmfd. C 4 to 70 Mmfd.
33	502758	Condenser trimmer: 1.6 to 18 Mmfd.
34	502807	Condenser .05 Mfd. 400 volt
36	506124	Condenser ceramic 250 Mmfd. 500 v. ±2%
37A, B, C	502754	Condenser trimmer assembly A 3 to 35 Mmfd. B 3 to 35 Mmfd. C 1.6 to 18 Mmfd.
38	502779	Condenser ceramic 56 Mmfd. 500 v. ±2%
39	505824	Condenser ceramic 120 Mmfd. 500 v. ±2%
41A, B, C	506122	Condenser trimmer assembly A 4 to 70 Mmfd. B 1.6 to 18 Mmfd. C 4 to 70 Mmfd.
42	502922	Condenser trimmer: 300 to 600 Mmfd.
44	502791	Condenser mica 1600 Mmfd. 500 v. ±5%
46	502792	Condenser mica 4000 Mmfd. 500 volt
47	504954	Condenser trimmer: 3 to 12 Mmfd.
48	502793	Condenser mica 5600 Mmfd. 500 v. ±2%
49	506120	Condenser trimmer: 5 to 30 Mmfd.
50	502167	Condenser ceramic 68 Mmfd. 500 v. ±2%
51A, B	502755	Condenser trimmer assembly A 3 to 35 Mmfd. B 1.6 to 18 Mmfd.
52	505822	Condenser ceramic 160 Mmfd. 500 v. ±2%
53	502807	Condenser .05 Mfd. 400 volt
59	502931	Condenser ceramic 100 Mmfd. 500 volt
60	502805	Condenser .02 Mfd. 400 volt
62	502807	Condenser .05 Mfd. 400 volt
66	502807	Condenser .05 Mfd. 400 volt
70	502931	Condenser ceramic 100 Mmfd. 500 volt
73	502802	Condenser .004 Mfd. 600 volt
75	502802	Condenser .004 Mfd. 600 volt
78	502880	Condenser .1 Mfd. 400 volt
79	502931	Condenser ceramic 100 Mmfd. 500 volt
80	502803	Condenser .006 Mfd. 600 volt
83	502809	Condenser .25 Mfd. 400 volt
85	502804	Condenser .01 Mfd. 400 volt
87	502804	Condenser .01 Mfd. 400 volt
92	502804	Condenser .01 Mfd. 400 volt
93	506125	Condenser .001 Mfd. 600 volt
95	506125	Condenser .001 Mfd. 600 volt
97A, B	506118	Condenser electrolytic A 15 Mfd. 450 volt B 20 Mfd. 450 volt
104	502809	Condenser .25 Mfd. 400 volt
		RESISTORS
24	510025	Resistor carbon 220 Ohms ½ watt
26	510085	Resistor carbon 470,000 Ohms ¼ watt
27	510031	Resistor carbon 470 Ohms ¼ watt
35	510140	Resistor carbon 1,500 Ohms ½ watt
54	510028	Resistor carbon 330 Ohms ¼ watt
55	510067	Resistor carbon 47,000 Ohms ¼ watt
57	510016	Resistor carbon 68 Ohms ¼ watt
58	510157	Resistor carbon 15,000 Ohms ½ w. ±10%
61	510092	Resistor carbon 1.5 Meg. ¼ watt
63	510025	Resistor carbon 220 Ohms ½ watt
65	510053	Resistor carbon 8,200 Ohms ½ w. ±10%
67	510363	Resistor carbon 33,000 Ohms 2 w. ±10%
69	510067	Resistor carbon 47,000 Ohms ¼ watt
71	510085	Resistor carbon 470,000 Ohms ¼ watt
74A, B	506115	Volume control 2 Meg. (with switch)
76	510097	Resistor carbon 10 Meg. ¼ watt
77	510016	Resistor carbon 68 Ohms ¼ watt
81	510031	Resistor carbon 470 Ohms ¼ watt
82	510079	Resistor carbon 220,000 Ohms ¼ watt
84	510073	Resistor carbon 100,000 Ohms ¼ watt
86	510079	Resistor carbon 220,000 Ohms ¼ watt
88	510097	Resistor carbon 10 Meg. ¼ watt
89, 90, 91	510079	Resistor carbon 220,000 Ohms ¼ watt
94	510626	Resistor wire wound 270 Ohms 2 w. ±10%
96	510638	Resistor wire wound 1200 Ohms 2 w. ±10%
103	510168	Resistor carbon 56,000 Ohms ½ w. ±10%
		COILS AND TRANSFORMERS
12	506130	Coil BC. Antenna
15	506127	Coil Int. Antenna
16	506133	Coil S.W. Antenna
28	506129	Coil—BC. R.F.
31	506131	Coil—Int. R.F.
32	506134	Coil—S.W. R.F.
40	506128	Coil—BC. Oscillator
43	506132	Coil—Int. Oscillator
45	506135	Coil S.W. Oscillator
56	502725	Transformer—1st I.F.
68	502726	Transformer—2nd I.F.
100	506105	Transformer—power
101	506311	Transformer—output for T-506173 speaker
		OTHER ELECTRICAL PARTS
11A to J	506106	Switch—band
64	506174	Switch—local-distant
72A, B	506116	Switch—"RADIO-PHONO and TONE"
98, 99	110629	Lamp—dial (Mazda No. 44) 6.3 v., 0.25 A.
102	506173	Speaker P.M. dynamic: 8 inch (includes output transformer)
		MISCELLANEOUS
	506175	Back for cabinet
	506137	Background for dial
	160026	Base—for mtg. electrolytic condenser
	505165	"C" washer—for tuning shaft
	500420	Clamp—for dial glass
	112745	Clip—coil mounting
	114955	Clip—retainer on end of dial cord
	502773	Cord—tuning & band switch drive (9 ft. req'd.) per ft.
	506164	Dial scale—glass
	503628	Drum—for band indicator
	503629	Drum—for dial drive
	506172	Knob—"BAND SELECTOR"
	506171	Knob—"RADIO-PHONO and TONE"
	505848	Knob—"TUNE"
	505845	Knob—"VOLUME"
	502762	Plug—for local-distant switch
	500966	Plug—for phono pick-up cable
	502984	Plug—Speaker
	506169	Pointer—band indicator
	506139	Pointer—tuning
	119087	Ring for dial cord
	505944	Rubber pad for mounting chassis
	116584	Rubber spacer for mtg. dial scale
	506149	Rubber washer for mtg. chassis
	85827	Screw—No. 8-32 for Dial Drum
	501777	Screw—No. 4x½" for mtg. back
	170038	Screw—No. 8x1⅛" for mtg. chassis
	506117	Shaft—tuning
	502770	Socket—for dial lamp
	502761	Socket—local-distant switch
	505783	Socket—loktal base
	114876	Socket—octal base
	160039	Socket—phono input
	502769	Socket—speaker
	113177	Spring—dial cord tension
	502767	Terminal strip—"GND-ANT"
	505022	Washer—felt: for knobs

MODEL 9042-A



MODEL 9042-A

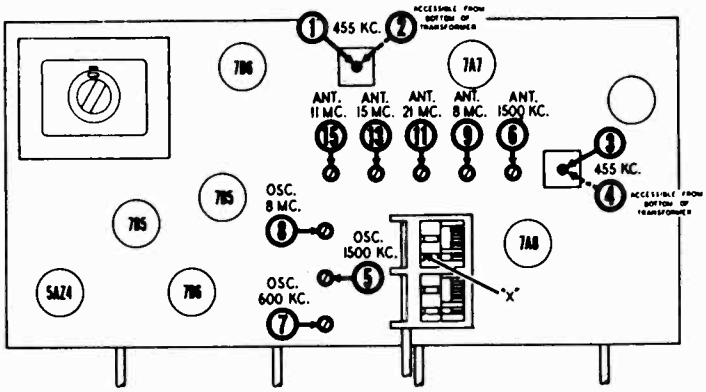
ALIGNMENT PROCEDURE

1. Remove chassis and speaker from cabinet.
2. When gang condenser is fully meshed, dial pointer should be in the position indicated by the left hand starting edge of the dial scale. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.
3. Connect an output meter across the speaker voice coil or from the plate of a 7B5 tube to chassis through a 0.1 Mfd. condenser.
4. Connect the ground lead of the signal generator to the receiver chassis.
5. Set volume control to maximum volume position and use a weak signal from the signal generator.

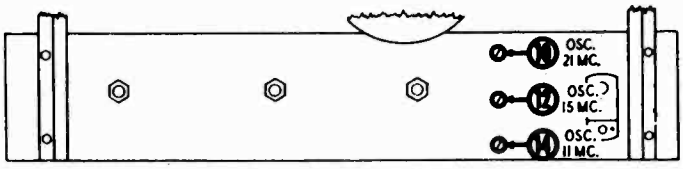
IMPORTANT: Align this receiver in exactly the order shown below.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Lug on Antenna section of gang; see point "X" in chart on next page.	455 KC	Broadcast (*Position 1)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	1st I.F.	
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	1500 KC	Broadcast (*Position 1)	1500 Kc.	5	Broadcast Oscillator (Shunt)	Adjust for maximum output.
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	1500 KC	Broadcast (*Position 1)	Tune to 1500 Kc. generator signal.	6	Broadcast Antenna	Adjust for maximum output.
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	600 KC	Broadcast (*Position 1)	Tune to 600 Kc. generator signal.	7	Broadcast Oscillator (Series Pad)	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
200 MMFD. Mica Condenser	"A" terminal at rear of chassis.	Repeat adjustment of trimmers 5 and 6 at 1500 Kc. Then re-check adjustment of trimmer 7 at 600 Kc.					
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	8 MC	Short Wave 1 (*Position 2)	8 Mc.	8	Short Wave 1 Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 7.1 Mc. If image does not appear, realign at 8 Mc. with trimmer screw further out. Recheck image.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	8 MC	Short Wave 1 (*Position 2)	Tune to 8 Mc. generator signal.	9	Short Wave 1 Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	21 MC	Short Wave 2 (*Position 3)	21 Mc.	10	Short Wave 2 Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 21.9 Mc. If image does not appear, realign at 21 Mc. with trimmer screw further in. Recheck image.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	21 MC	Short Wave 2 (*Position 3)	Tune to 21 Mc. generator signal.	11	Short Wave 2 Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	15 MC	Short Wave 3 (*Position 4)	15 Mc.	12	Short Wave 3 Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by setting signal generator to 14.1 Mc. and tuning radio in vicinity of 15 Mc. If signal is not heard realign at 15 Mc. with trimmer screw further in. Recheck.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	15 MC	Short Wave 3 (*Position 4)	Tune to 15 Mc. generator signal.	13	Short Wave 3 Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	11 MC	Short Wave 4 (*Position 5)	11 Mc.	14	Short Wave 4 Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by setting signal generator to 10.1 Mc. and tuning radio in vicinity of 11 Mc. If signal is not heard, realign at 11 Mc. with trimmer screw further in. Recheck.
400 OHM Carbon Resistor	"A" terminal at rear of chassis.	11 MC	Short Wave 4 (*Position 5)	Tune to 11 Mc. generator signal.	15	Short Wave 4 Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.

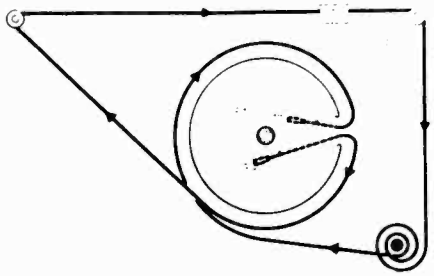
* Position 1 corresponds to extreme counter-clockwise setting of band switch. Succeeding positions are numbered in ascending order as switch is rotated clockwise.



TOP VIEW OF CHASSIS



FRONT VIEW OF CHASSIS



DIAL AND POINTER DRIVE CORD ARRANGEMENT

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

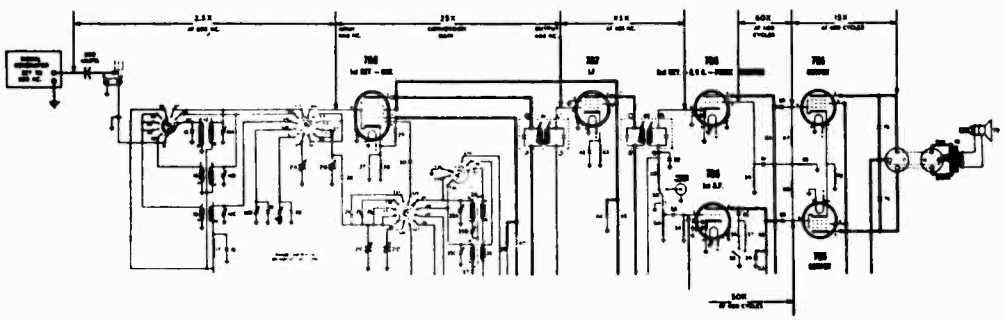
113177 Tension Spring
114955 Clip on end of cord
119087 Ring
502773 Cord (4 ft.)

STAGE GAIN MEASUREMENT PROCEDURE

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

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

1. Be sure that R.F. and I.F. stages are carefully and accurately aligned by utilizing the alignment procedure given on preceding page.
2. Connect Signal Generator as shown below.
3. The values of stage gain which are given here were measured with a fixed bias of 3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to A.V.C. at terminal No. 2 of the 1st I.F. transformer and connect the positive battery lead to the receiver chassis.
4. Set Signal Generator for operation at 600 Kc with 400 cycle modulation and carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
5. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.
6. When using a "channel" type instrument, carefully tune it for maximum output at desired frequency before making measurements.



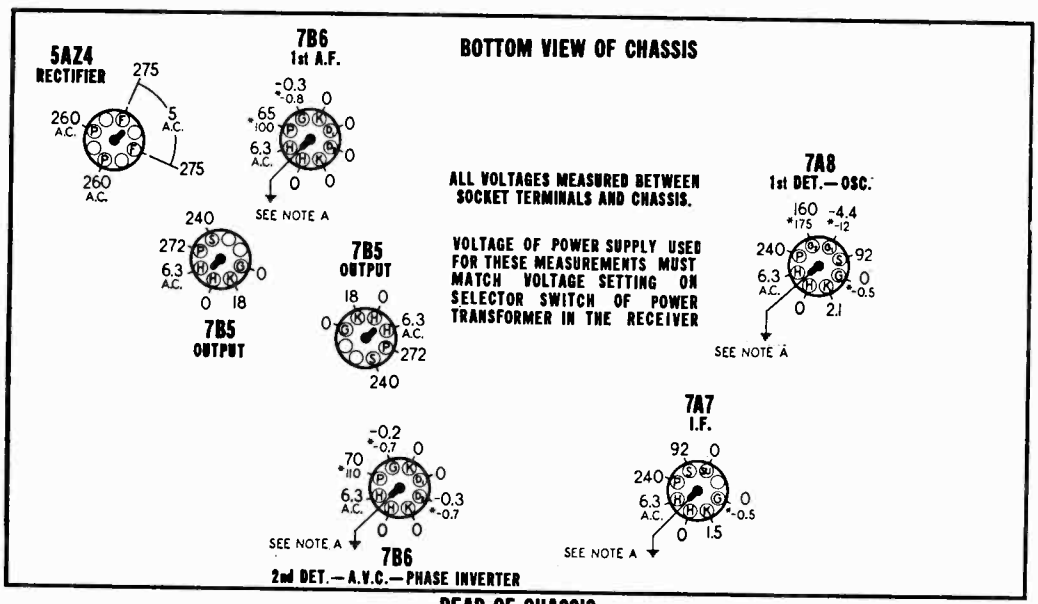
DIFFERENCES in tube characteristics, tolerance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown above.

MODEL 9042-A

SOCKET VOLTAGES

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

BE SURE THAT SWITCH ON POWER TRANSFORMER IS SET TO POSITION WHICH MOST NEARLY MATCHES LINE VOLTAGE
RADIO-PHONO SWITCH IN "RADIO" POSITION
TONE SWITCH IN FULLY COUNTER-CLOCKWISE POSITION
BAND SWITCH IN BROADCAST POSITION
VOLUME ON FULL WITH NO SIGNAL **DIAL TUNED TO 540 KC.**
ANTENNA TERMINAL GROUNDED



NOTE A: Grounding of center stud on tube socket is necessary to reduce capacity coupling between other pins. Oscillation may result if this ground is omitted.

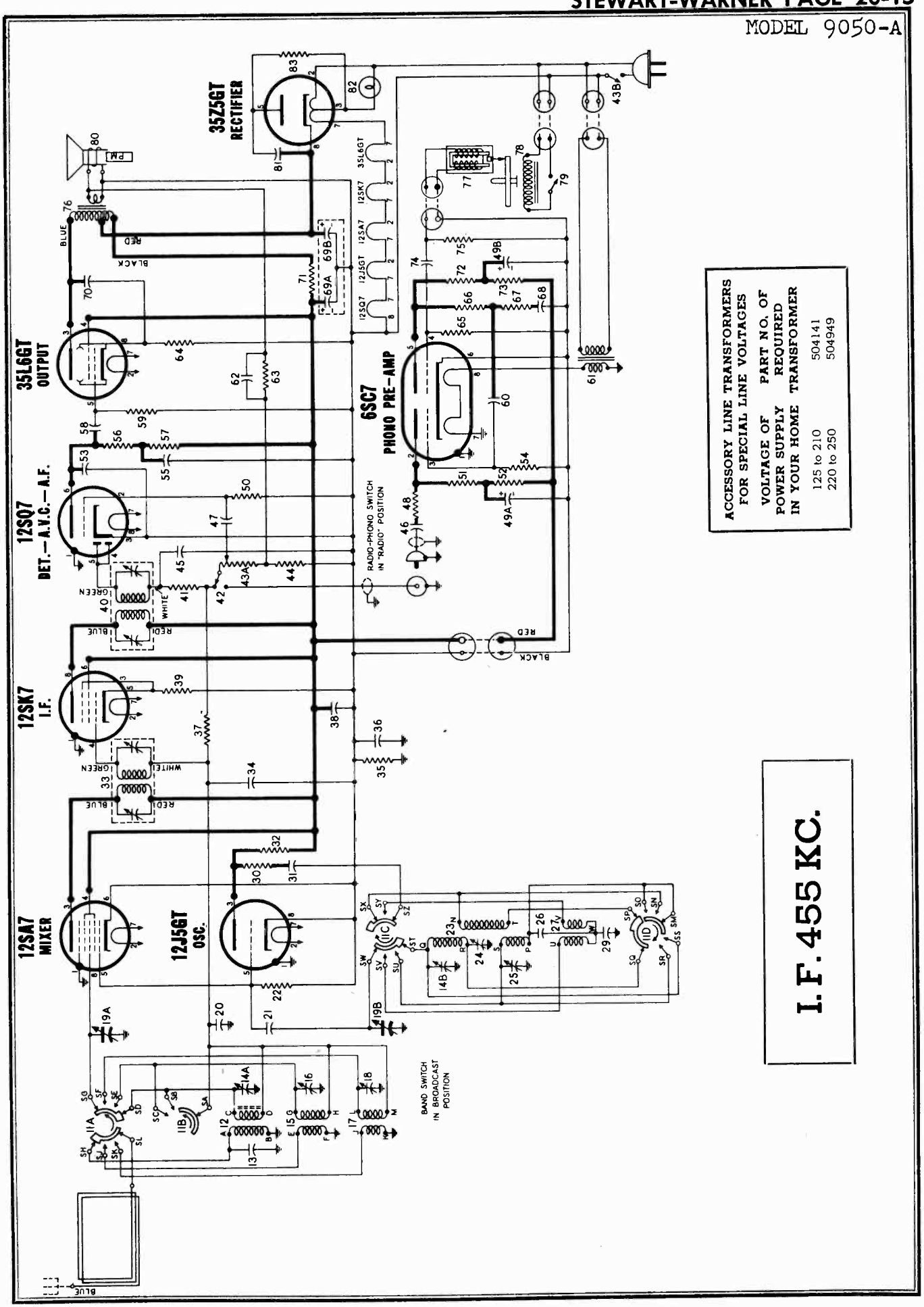
PARTS LIST

DIA-GRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
13	504434	Condenser-ceramic 50 Mmfd. 500 volt
14A. to E.	505785	Condenser-trimmer assembly A—1.6 to 18 Mmfd. B—1.6 to 18 Mmfd. C— 3 to 35 Mmfd. D—1.6 to 18 Mmfd. E—1.6 to 18 Mmfd.
18	502805	Condenser—.02 Mfd. 400 volt
19	505825	Condenser-ceramic 47 Mmfd. 500 v. ± 5%
20	505826	Condenser-ceramic 125 Mmfd. 500 v. ± 2%
21A. to D.	505793	Condenser-variable gang (with drum)
22	505821	Condenser-ceramic 180 Mmfd. 500 v. ± 2%
23	504983	Condenser-ceramic 1.0 Mmfd. 500 volt
24	505820	Condenser-mica 1600 Mmfd. 500 v. ± 2%
25	505819	Condenser-mica 1200 Mmfd. 500 v. ± 2%
26	505822	Condenser-ceramic 160 Mmfd. 500 v. ± 2%
27	502807	Condenser—.05 Mfd. 400 volt
30	502931	Condenser-ceramic 100 Mmfd. 500 volt
31	505824	Condenser-ceramic 120 Mmfd. 500 v. ± 2%
32A. to C.	505786	Condenser-trimmer assembly A—1.6 to 18 Mmfd. B—1.6 to 18 Mmfd. C—1.6 to 18 Mmfd.
33	505823	Condenser-ceramic 43 Mmfd. 500 v. ± 5%
35A. to C.	505784	Condenser-trimmer assembly A— 3 to 35 Mmfd. B—440 to 660 Mmfd. C— 1.6 to 18 Mmfd.
37	505818	Condenser-mica 3300 Mmfd. 500 v. ± 2%
39	502804	Condenser—.01 Mfd. 400 volt
42	502807	Condenser—.05 Mfd. 400 volt
44	502807	Condenser—.05 Mfd. 400 volt
46	502807	Condenser—.05 Mfd. 400 volt
52	502931	Condenser-ceramic 100 Mmfd. 500 volt
53	502802	Condenser—.004 Mfd. 600 volt
55	502802	Condenser—.004 Mfd. 600 volt
60	502809	Condenser—.25 Mfd. 400 volt
61	502804	Condenser—.01 Mfd. 400 volt

DIA-GRAM NO.	PART NO.	DESCRIPTION
65, 66	502805	Condenser—.02 Mfd. 400 volt
71	502720	Condenser-electrolytic A—15 Mfd. 400 volt B—20 Mfd. 400 volt
73, 74	502802	Condenser—.004 Mfd. 600 volt
		RESISTORS
17	502134	Resistor-carbon 470,000 Ohms ¼ watt
28	502125	Resistor-carbon 220 Ohms ¼ watt
29	510165	Resistor-carbon 39,000 Ohms ½ w. ± 10%
40	505681	Resistor-carbon 12,000 Ohms ½ w. ± 10%
43	502138	Resistor-carbon 130 Ohms ¼ watt ± 10%
45	502512	Resistor-carbon 22,000 Ohms 1 w. ± 10%
47	502135	Resistor-carbon 2.2 Meg. ¼ watt
49	502131	Resistor-carbon 47,000 Ohms ¼ watt
51A, B.	505789	Volume control 1 Meg. (with switch)
54	502136	Resistor-carbon 10 Meg. ¼ watt
56	502131	Resistor-carbon 47,000 Ohms ¼ watt
57	502291	Resistor-carbon 4,700 Ohms ¼ watt
59	502136	Resistor-carbon 10 Meg. ¼ watt
62	502133	Resistor-carbon 220,000 Ohms ¼ watt
63	502132	Resistor-carbon 100,000 Ohms ¼ watt
64	502133	Resistor-carbon 220,000 Ohms ¼ watt
67, 68, 69	502133	Resistor-carbon 220,000 Ohms ¼ watt
70	502289	Resistor-wire wound 430 Ohms 2 w. ± 5%
72	505817	Resistor-wire wound 1,200 Ohms 2w ± 10%
		COILS AND TRANSFORMERS
12	505809	Coil-BC. antenna
15	505804	Coil-1st S.W. antenna
16	505806	Coil-2nd S.W. antenna
34	505810	Coil-BC. oscillator
36	505805	Coil-1st S.W. oscillator
38	505807	Coil-2nd S.W. oscillator
41	505797	Transformer-1st I.F.
48	505798	Transformer-2nd I.F.
77	505787	Transformer-power
78	505837	Transformer-output for T-505836 speaker
		OTHER ELECTRICAL PARTS
11A to D	505788	Switch-band
50	116896	Switch-"Phono-Radio"

DIA-GRAM NO.	PART NO.	DESCRIPTION
58	505790	Switch-tone
75, 76	118921	Lamp-dial (Mazda No. 47) 6-8V. 150 Ma.
79	505836	Speaker-P.M. dynamic (8 inch) includes output transformer
		MISCELLANEOUS
	505843	Back for cabinet
	505839	Background for dial
	160026	Base for mtg. electrolytic condenser
	505314	"C" Washer-tuning shaft
	119989	Clamp for dial glass
	112745	Clip-coil mounting
	505101	Clip-mtg. I.F. transformer
	114955	Clip-retainer on end of dial cord
	502773	Cord-dial drive (4 ft. required) per ft.
	505840	Dial scale-glass
	505792	Flywheel
	505847	Knob-"4-3-2-1-BC"
	505846	Knob-"Tone"
	505848	Knob-"Tune"
	505845	Knob-"Volume"
	500966	Plug-phono pick-up cable
	504108	Plug-speaker
	505841	Pointer
	119087	Ring for dial cord
	505944	Rubber pad for mtg. chassis
	116584	Rubber spacer for mtg. dial scale
	506149	Rubber washer for mtg. chassis
	501777	Screw-No. 4 x ½"; for mtg. back
	170038	Screw-No. 8 x ⅛"; for mtg. chassis
	170020	Screw-Set, #6-32 x ¼"; for mtg. flywheel
	505791	Shaft-tuning
	505796	Socket-dial lamp (with leads)
	505783	Socket-loktal base
	160039	Socket-phono input
	504035	Socket-speaker
	113177	Spring-dial cord tension
	502767	Terminal strip-"GND-ANT"
	505022	Washer-felt; for knobs

MODEL 9050-A



MODEL 9050-A

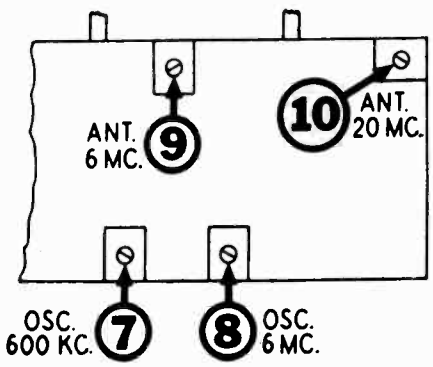
ALIGNMENT PROCEDURE

1. With the gang condenser fully meshed, the dial pointer should be in the position indicated by the last mark below 55 on the dial. If it is set incorrectly, release the pointer clip on the dial cord and reposition pointer.
2. During the alignment of this receiver it will be necessary to set the dial pointer to the following frequencies: 1500 Kc., 600 Kc., 6 Mc., 5.1 Mc., 20 Mc., and 19.1 Mc. In order to avoid replacing the chassis in the cabinet each time a dial setting is required, it will be found more convenient to mark the required frequency points on the white dial background plate before starting the alignment.
3. Connect an output meter across the speaker voice coil or from plate of 35L6GT tube to B- lug through a .1 Mfd. condenser (see voltage chart for convenient B— connection).
4. Connect ground lead of signal generator to B— lug.
   CAUTION: If your test oscillator is designed with an AC-DC power supply, connect ground lead of signal generator to B— lug through a .25 mfd. condenser.
5. Set volume control at maximum volume position and use a weak signal from the signal generator.

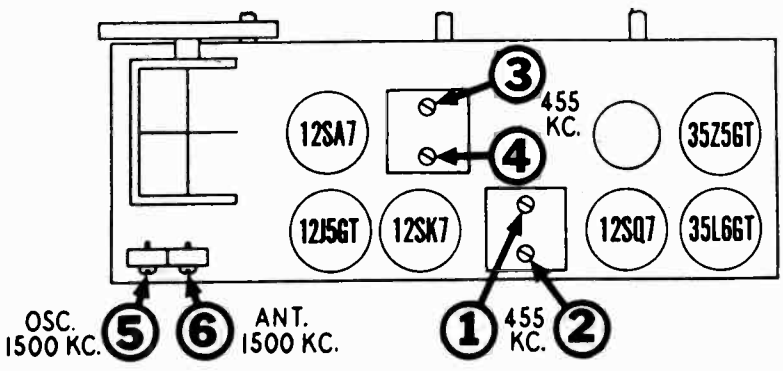
IMPORTANT: Align this receiver in exactly the order shown below. Broadcast band should be aligned before short wave bands.

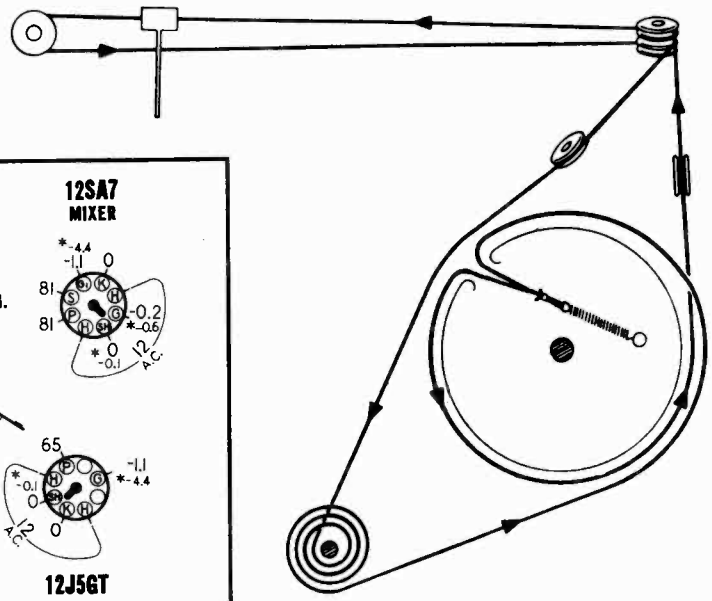
DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Lug on front section of gang.	455 KC	Broadcast (counter-clockwise)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	1st I.F.	
200 MMFD. Mica Condenser	External antenna lead (blue)	1500 KC	Broadcast (counter-clockwise)	1500 KC	5	Broadcast Oscillator (Shunt)	Adjust for maximum output.
200 MMFD. Mica Condenser	External antenna lead (blue)	1500 KC	Broadcast (counter-clockwise)	Tune to 1500 KC Generator Signal	6	Broadcast Antenna	Adjust for maximum output.
200 MMFD. Mica Condenser	External antenna lead (blue)	600 KC	Broadcast (counter-clockwise)	Tune to 600 KC Generator Signal	7	Broadcast Oscillator (Series Pad)	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
200 MMFD. Mica Condenser	External antenna lead (blue)	Repeat adjustment of trimmers 5 and 6 at 1500 Kc. Then re-check adjustment of trimmer 7 at 600 Kc.					
400 OHM Carbon Resistor	External antenna lead (blue)	6 MC	Intermediate (middle)	6 MC	8	Intermediate Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 5.1 MC. If image does not appear, realign at 6 MC. with trimmer screw farther out. Recheck image.
400 OHM Carbon Resistor	External antenna lead (blue)	6 MC	Intermediate (middle)	Tune to 6 MC Generator Signal	9	Intermediate Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
400 OHM Carbon Resistor	External antenna lead (blue)	20 MC	Short wave (Clockwise)	Tune to 20 MC Generator Signal	10	S.W. Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.

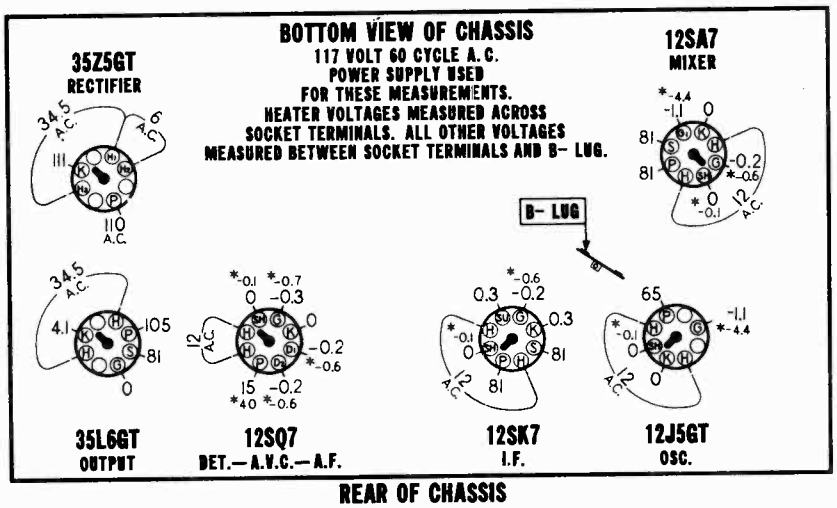
BOTTOM VIEW



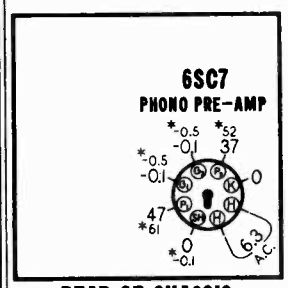
TOP VIEW OF CHASSIS







REAR OF CHASSIS



REAR OF CHASSIS

SOCKET VOLTAGES

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

DIAL TUNED TO 540 KC.

VOLUME ON FULL WITH NO SIGNAL

BAND SWITCH IN BROADCAST POSITION

RADIO-PHONO SWITCH IN "RADIO" POSITION

DIAL AND POINTER DRIVE CORD ARRANGEMENT

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

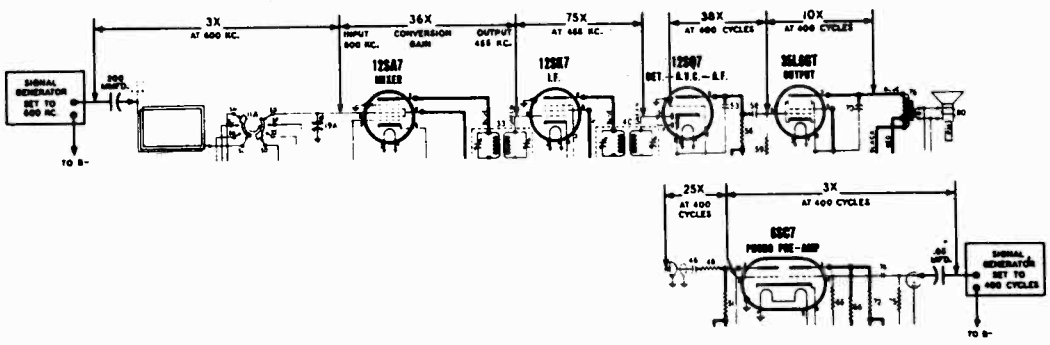
161384	Tension Spring
114955	Clip on end of cord
502773	Cord (60 inches)

STAGE GAIN MEASUREMENT PROCEDURE

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

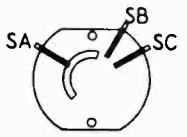
PROCEDURE: It is exceedingly important to adhere to the procedure outlined below since the accuracy of these measurements will be affected to a considerable extent by the failure to establish proper operating conditions.

1. Be sure that R.F. and I.F. tuned circuits are carefully and accurately aligned by utilizing the alignment procedure given above.
2. Connect Signal Generator as shown below.
3. The values of stage gain which are given here were measured with a fixed bias of 3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to A.V.C. at terminal "M" of Short wave Band Antenna Coil (17) and connect the positive battery lead to B- in receiver chassis.
4. Set Signal Generator for operation at 600 Kc with 400 cycle modulation and carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes set generator to a nearby frequency and re-tune the receiver.
5. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.
6. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

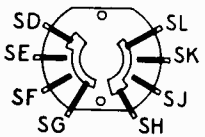


DIFFERENCES in tube characteristics, tolerance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown above.

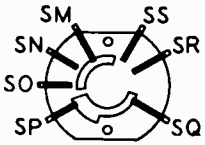
Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram



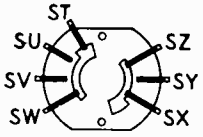
FRONT SECTION FRONT VIEW



FRONT SECTION REAR VIEW

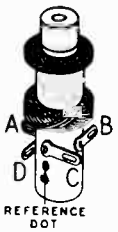


REAR SECTION FRONT VIEW



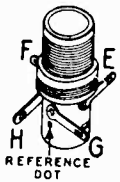
REAR SECTION REAR VIEW

BAND SWITCH 506428



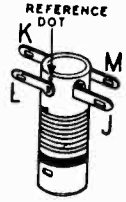
BC. ANTENNA COIL

505751



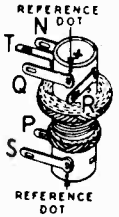
INT. ANTENNA COIL

506368



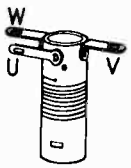
S.W. ANTENNA COIL

505753



BC. & INT. OSCILLATOR COIL

505752



S.W. OSCILLATOR COIL

506364

PARTS LIST

DIA-GRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
13	502931	Condenser—ceramic 100 Mmfd. 500 volt
14-A, B	504067	Condenser—trimmer assembly. A-1.6 to 18 Mmfd. B-3 to 35 Mmfd.
16	504069	Condenser—trimmer; 3 to 35 Mmfd.
18	504069	Condenser—trimmer; 3 to 35 Mmfd.
19-A, B	504064	Condenser—variable gang with drum.
20	512213	Condenser—.05 Mfd. 200 volt.
21	502929	Condenser—mica 47 Mmfd. 500 volt.
24	504068	Condenser—trimmer; 300 to 600 Mmfd.
25	502758	Condenser—trimmer; 1.6 to 18 Mmfd.
26	512522	Condenser—Mica 4300 Mmfd. 500 volt ±2%
29	512522	Condenser—Mica 4300 Mmfd. 550 volt ±2%
31	512205	Condenser—.01 Mfd. 400 volt.
34	512213	Condenser—.05 Mfd. 200 volt.
36	512223	Condenser—.25 Mfd. 400 volt.
38	512214	Condenser—.05 Mfd. 400 volt.
45	502931	Condenser—ceramic 100 Mmfd. 500 volt.
46	512208	Condenser—.02 Mfd. 400 volt.
47	512203	Condenser—.005 Mfd. 600 volt.
49-A, B	506466	Condenser—electrolytic A—15 Mfd. 150 volt. B—15 Mfd. 150 volt.
53	502931	Condenser—ceramic 100 Mmfd. 500 volt.
55	512214	Condenser—.05 Mfd. 400 volt.
58	512203	Condenser—.005 Mfd. 600 volt.
60	512214	Condenser—.05 Mfd. 400 volt.
62	512216	Condenser—.1 Mfd. 200 volt.
68	512205	Condenser—.01 Mfd. 400 volt.
69-A, B	506286	Condenser—electrolytic A—40 Mfd. 150 volt. B—40 Mfd. 150 volt.
70	512205	Condenser—.01 Mfd. 400 volt.
74	512214	Condenser—.05 Mfd. 400 volt.
81	512214	Condenser—.05 Mfd. 400 volt.
		RESISTORS
22	510061	Resistor—carbon 22,000 Ohms ¼ watt
30	510014	Resistor—carbon 56 Ohms ¼ watt ± 10%
32	510151	Resistor—carbon 6800 Ohms ½ watt ± 10%
35	510079	Resistor—carbon 220,000 Ohms ¼ watt
37	510093	Resistor—carbon 2.2 Meg. ¼ watt
39	510008	Resistor—carbon 27 Ohms ¼ watt ± 10%
41	510067	Resistor—carbon 47,000 Ohms ¼ watt
43-A, B	506428	Volume control—500,000 Ohms (with switch)
44	510026	Resistor—carbon 270 Ohms ¼ watt ± 10%
48	510170	Resistor—carbon 68,000 Ohms ½ watt
50	510094	Resistor—carbon 3.3 Meg. ¼ watt
51, 52	510164	Resistor—carbon 33,000 Ohms ½ watt
54	510194	Resistor—carbon 3.3 Meg. ½ watt
56, 57	510079	Resistor—carbon 220,000 Ohms ¼ watt
59	510085	Resistor—carbon 470,000 Ohms ¼ watt
63	510042	Resistor—carbon 2200 Ohms ¼ watt ± 10%
64	510120	Resistor—carbon 120 Ohms ½ watt ± 10%
65	510194	Resistor—carbon 3.3 Megohms ½ watt
66	510178	Resistor—carbon 220,000 Ohms ½ watt ± 10%
67	510162	Resistor—carbon 27,000 Ohms ½ watt ± 10%
71	510238	Resistor—carbon 1200 Ohms 1 watt ± 10%
72, 73	510170	Resistor—carbon 68,000 Ohms ½ watt
75	510151	Resistor—carbon 6800 Ohms ½ watt ± 10%
83	510410	Resistor—wire wound 33 Ohms ½ watt
		COILS AND TRANSFORMERS
12	505751	Coil—Bc. antenna
15	506366	Coil—Int. antenna
17	505753	Coil—S.W. antenna
23	505752	Coil—Bc. and Int. oscillator
27	506364	Coil—S.W. oscillator
33	504065	Transformer—1st I.F.
40	504066	Transformer—2nd I.F.
61	506467	Transformer—filament
76	506425	Transformer—output
		OTHER ELECTRICAL PARTS
11-A, B, C, D	506426	Switch—band
42	116896	Switch—"Phono-Radio"
77	506707	Pick-up, Cartridge (includes sapphire point)
78	506705	Motor for Record Changer, 115 volt 60 cycle
79	506704	Switch—"ON-OFF" for record changer
80	506437	Speaker—P.M. dynamic (10 inch)
82	118921	Lamp-dial (Mazda 47) 6-8 V. 150 Ma.

DIA-GRAM NO.	PART NO.	DESCRIPTION
		MISCELLANEOUS PARTS
	506443	Back for cabinet
	506446	Background for dial
	504034	Base for mtg. electrolytic condenser
	112745	Clip-coil mounting
	113019	Clip—retains light shield and insulator on speaker
	506431	Clip—retains "Radio-Phono" sleeve
	114955	Clip-retainer on end of dial cord
	502773	Cord—dial drive (5 ft. required). Per ft.
	500324	Cover—cardboard for elect. cond.
	506442	Dial scale
	506481	Drawer-record changer (less hardware)
	505666	Emblem-plastic
	506380	Fastener for loop antenna
	506408	Handle for drawer
	506438	Knob—"RADIO-PHONO"
	506439	Knob—"SW-INT-BC"
	505935	Knob—"TUNING"
	505936	Knob—"VOLUME"
	506285	Light diffusing strip
	506635	Plug for pre-amp power cable
	500966	Plug for phono input to receiver
	506795	Plug for phono pick-up cable
	501031	Plug for phono-motor and filament transformer cables
	506435	Pointer
	81145	Retaining ring for tuning shaft
	506234	Rail for drawer (supplied in sets)
	505944	Rubber pad for mtg. chassis
	113463	Rubber stop for drawer
	506149	Rubber washer for mtg. chassis
	114914	Screw—No. 2 x ⅜" for mtg. dial scale
	170038	Screw—No. 8 x 1⅛" for mtg. chassis
	501777	Screw—No. 4 x ½" for mtg. cabinet back
	506427	Shaft-tuning control
	503826	Sleeve and arm for "Radio-Phono" switch
	160392	Socket—octal
	506469	Socket—octal (for 6SC7 tube)
	505307	Socket and filament cable
	505307	Socket and phono motor cable
	504099	Socket for dial lamp (with leads)
	160039	Socket for phono input to pre-amp
	506470	Socket for phono pick-up input to receiver
	502761	Socket for pre-amp power cable
	161384	Spring—dial cord tension
	506277	Trim strip for dial

TO REPLACE BATTERIES

Unscrew the two bolts holding the loop to the chassis and loosen the metal bar holding the "B" batteries in place. Pull the battery out and replace new batteries in the same relative position. Use 2 Eveready #746 (or equivalent) and 2 Eveready #482 (or equivalent)

Batteries are considered to be poor or defective when they measure 1/3 less terminal voltage than the normal voltage than the normal value thus the 90 volt "B" batteries should read better than 60 volts and the 9 volts "A" batteries should read better than 6 volts. These voltage measurements are to be taken after the set has been playing in the battery position for approximately one quarter hour. Use a voltmeter with low drain to read voltages (a 1000 ohm per volt meter or better)

TO OPERATE THIS SET ON A 120 VOLT POWER LINE.

Disconnect the set from the power line. Take voltage selector plug (behind loop under loop mounting bracket) and insert into the 120 volt jack (red).

TO OPERATE THIS SET ON A 220 VOLT POWER LINE

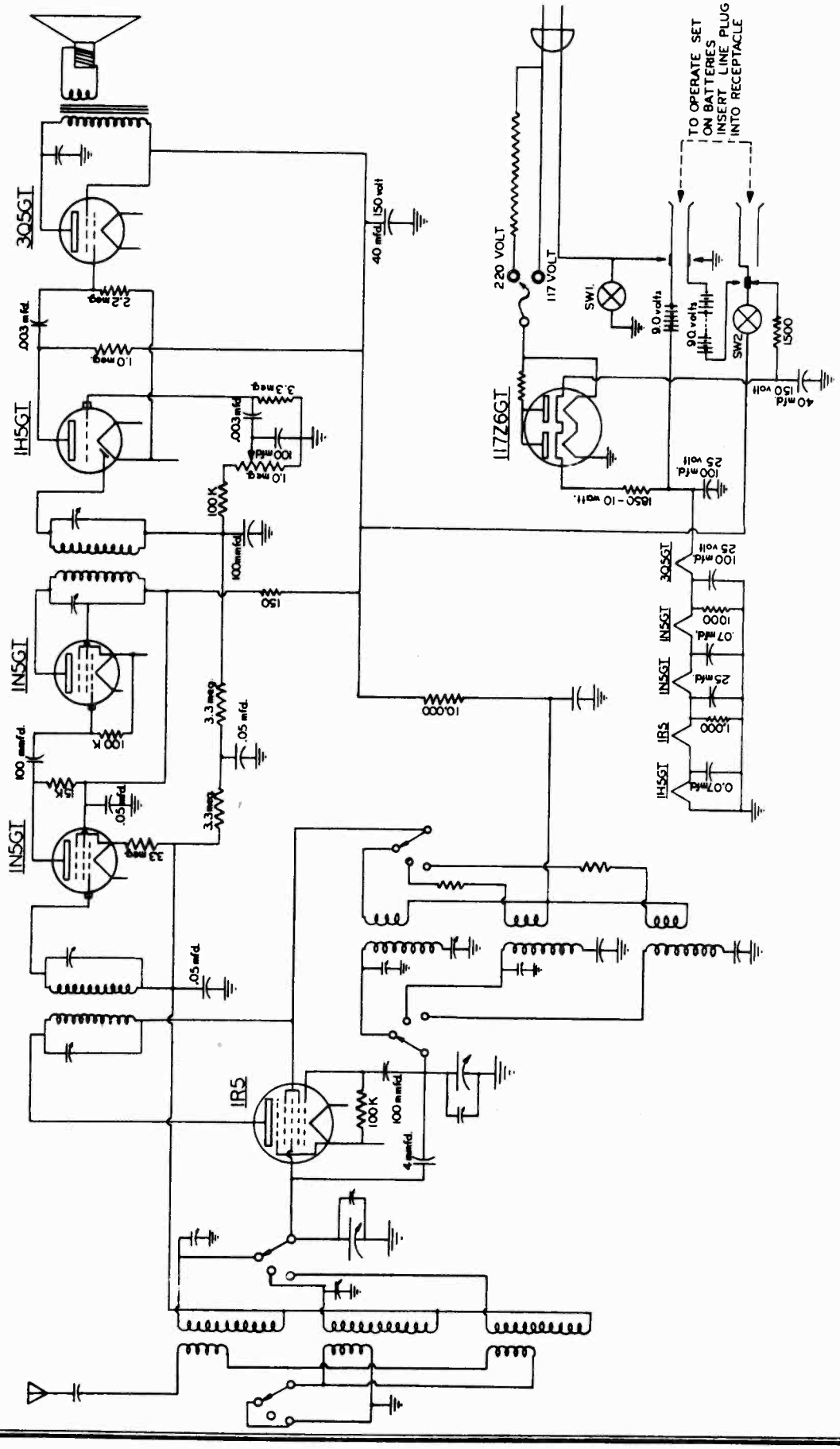
Disconnect the set from the power line. Take voltage selector plug (behind loop under loop mounting bracket) and insert it into the 220 volt jack (red).

CAUTION:

NEVER PLUG THIS SET INTO A 220 VOLT POWER LINE WHEN THE VOLTAGE SELECTOR PLUG IS IN THE 120 VOLT POSITION (BLACK JACK) OTHERWISE PERMANENT DAMAGE WILL RESULT. DO NOT CUT THE LINE CORD OR OTHERWISE CHANGE IT'S CHARACTERISTICS OR DAMAGE WILL OCCUR. DO NOT CHANGE TUBES WHILE THE SET IS TURNED ON SINCE DAMAGE CAN BE CAUSED BY SO DOING.

Step	Set Gen at	Connect Gen to	Set Bendswitch	Set dial At	Vary	For	Check for
#1	455KC	R.F. Sec of Variable	BC	Min cap	I.F. Trimmer	Max. response	Max. sensitivity
#2	18MC	Antenna terminal	SW (6-18MC)	18MC	Variable osc. trimmer	gen. sig.	To make sure not image frequency (image should appear in frequency)
#3	16MC	"	"	16MC	Variable RF trimmer	Max. response	Check entire band for good sensitivity
#4	6MC	"	PB (2-6MC)	6MC	P.B. osc trimmer	Gen. signal	To make sure not on image frequency
#5	5MC	"	"	5MC	P.B. ant trimmer	Max. resp.	Check entire band for good sensitivity
#6	1600KC	"	B.C.	1600KC	B.C. ant trimmer	Gen. signal	
#7	1600KC	"	"	"	"	Max. response	
#8	600KC	"	"	600KC	B.C. Padder	Gen. Signal	
#9	Recheck all steps						

MODEL 653



Operating Instructions

POWER SOURCES: This combination will operate on an alternating (AC) current only, of 110 to 125 volts at 60 cycles.

CAUTION: Always predetermine voltage of power source. Never try to plug this combination into a 220 volt line, as this will cause serious damage.

Never try to operate this combination on 50 cycle current, as this will cause the motor to rotate at an incorrect speed. The normal speed is 78 R.P.M., (revolutions per minute) and to insure proper reproduction of recordings 60 cycle current must be used.

This receiver is equipped with a sensitive hank antenna and under ordinary conditions no external antenna would be required. However, in steel constructed buildings or in distant isolated locations, the reception may be improved by using an outside antenna. This should be a single wire not more than 50 feet long and should be connected to the antenna lead that projects from the back of the receiver. No ground wire is required at any time.

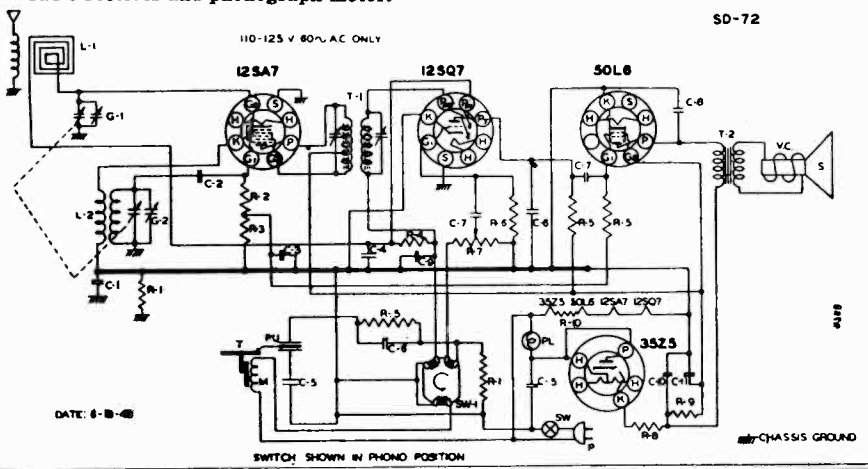
INSTALLATION: Unwind power cord and plug into a convenient power outlet. Follow instructions under "Controls" to operate receiver.

CONTROLS: Three controls are provided on the front panel for operation of this combination. The right hand control is the station selector which is used only in "Radio" operation. The left hand control is a switch which selects operation of either "Radio" or "Phonograph". The center control is used to adjust volume on either "Radio" or "Phonograph" and is also used as a power switch to turn the combination "On" or "Off."

RADIO RECEPTION: After the power cord plug has been connected to your power outlet, turn the center control to the right in a clockwise direction and a click will be heard. This indicates that the power is turned on, and the pilot light in the dial should begin to glow. After about 30 seconds, the set will be ready for operation.

Make sure that the left hand control is turned to the left, in "Radio" position. Turn the center control about halfway on, in a clockwise direction to increase volume. Rotate the right hand control to the right or left to select the desired station. By mentally adding a zero to the figures on the upper half of the dial, the result will be read directly in kilocycles (i.e., 60 plus 0 equals 600KC or 140 plus 0 equals 1400KC). After a station has been tuned in, adjust the center control to your desired volume.

PHONOGRAPH REPRODUCTION: To operate the phonograph, be sure that the left hand control is turned to the right. This puts the circuit in "Phonograph" position and also turns on the power for the motor. The center control must also be turned on (as in Radio instructions) as it is the master control for power to the radio receiver and phonograph motor.



ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment.

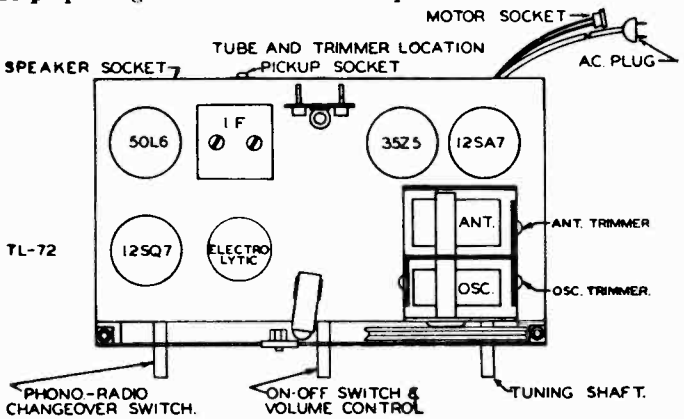
A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1720 KC. An output meter should be connected across the speaker.

The receiver volume control should be turned to maximum during the I.F. and all subsequent alignments to keep the AVC from working and giving false readings. Keep the generator output as low as possible to prevent overloading.

FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD condenser. The ground lead from the generator must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1720 KC. The OSC. trimmer is located on the front of the chassis. Adjust this trimmer until the 1720 KC signal is tuned in.

THIRD STEP: Remove the hot lead of the generator from the ANT section of the gang condenser. Connect this lead to the primary of the loop antenna through a 200 MMFD condenser. Adjust the Signal Generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The ANT trimmer is located on the top of the ANT. section of the gang condenser. Adjust this trimmer until a maximum reading is noted on the output meter. No further adjustment should be necessary, unless the set has been damaged, as the coils and condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.



PART NO.		DESCRIPTION	PART NO.		DESCRIPTION
IR-20	R-1	220M ~ RESISTOR 1/2W 20%		SW	SWITCH ON VOLUME CONTROL
IR-9	R-2	22M ~ RESISTOR 1/2 W 20%	SW-1	SW-1	RADIO PHONO SWITCH
IR-10	R-3	47M ~ RESISTOR 1/2 W 20%	LI-8	T-1	I F TRANSFORMER
IR-23	R-4	3.3MEG ~ RESISTOR 1/2 W 20%		T-2	OUTPUT TRANSFORMER
IR-11	R-5	470M ~ RESISTOR 1/2 W 20%	SPK-10	VC	VOICE COIL
IR-3	R-6	10MEG ~ RESISTOR 1/2 W 20%		S	4" PM SPEAKER
VC-4	R-7	1 MEG. VOLUME CONTROL	LL-10	L-1	LOOP ANT
IR-17	R-8	33 ~ RESISTOR 1/2 W 20%	LO-14	L-2	OSC COIL
IR-23	R-9	2200 ~ RESISTOR 1 W 10%	M-2	M2	110 V 60 CYCLES MOTOR
IR-41	R-10	47 ~ RESISTOR 1 W 10%	PU-5	PU	TONE ARM WITH L-75 CARTRIDGE
PC-8	C-1	.1 MFD. CONDENSER 400 V	PB-1	PL	#47 PILOT BULB
MC-4	C-2	500MMFD. MICA	CO-1A	P	LINE CORD
PC-2	C-3	.25MFD. CONDENSER 200 V	TT-2	T	8" TURNTABLE
PC-2	C-4	.05MFD. CONDENSER 200 V			
PC-5	C-5	.05MFD. CONDENSER 400 V	GC-6	G-1	GANG CONDENSER
MC-8	C-6	500MMFD. MICA		G-2	
PC-10	C-7	.005 MFD. CONDENSER 400 V			
PC-7	C-8	.01MFD. CONDENSER 400 V			
MC-2	C-9	100MMFD. MICA			
EC-12	C-10	40MFD. ELECTROLYTIC			
	C-11	20MFD.			

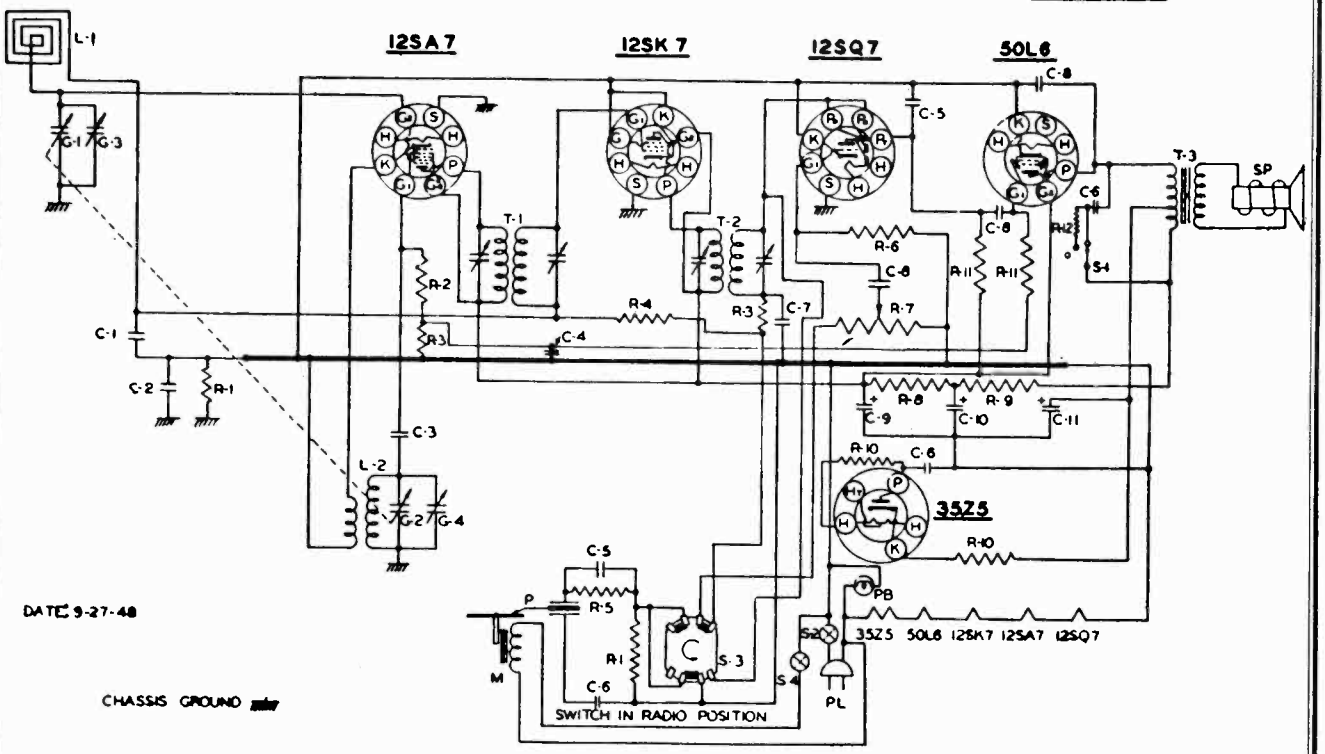
MODELS 6050, 6053

No. 6050

No. 6053

SCHEMATIC DIAGRAM — MODELS 6050 & 6053

SD-77 U



PART NO.		DESCRIPTION	PART NO.		DESCRIPTION	PART NO.		DESCRIPTION
PC-2	C-1	.05MFD. CONDENSER 200 V.	IR-1	R-8	470Ω RESISTOR 1/2W. 20 %	SW-2	S-1	TONE SWITCH
PC-8	C-2	.1 MFD. CONDENSER 400 V.	IR-42	R-9	1000Ω RESISTOR 1 W. 10 %		S-2	SWITCH ON VOLUME CONTROL
MC-4	C-3	.0005MFD. MICA,	IR-17	R-10	33 Ω RESISTOR 1/2W. 20 %	SW-1	S-3	PHONO-RADIO SWITCH
PC-4	C-4	.25MFD. CONDENSER 200 V.	IR-11	R-11	470Ω RESISTOR 1/2 W. 20 %		S-4	SWITCH ON RECORD CHANGER
MC-5	C-5	.0005MFD. MICA	IR-15	R-12	2200Ω RESISTOR 1/2 W. 20%	AC-M-7	M	RECORD CHANGER MOTOR
PC-5	C-6	.05MFD. CONDENSER 400 V.	GC-5	G-1	GANG CONDENSER	AC-PU-7	P	CRYSTAL PICKUP ARM, CARTRIDGE S-1
MC-2	C-7	.0001MFD. MICA		G-2		PB-2	PB	110 V. 7½ W. PILOT BULB
PC-7	C-8	.01 MFD. CONDENSER 400 V.		G-3	ANT. TRIMMER	CO-2	PL	LINE CORD
EC-14	C-9	20MFD.		G-4	OSC. TRIMMER,			
	C-10	40MFD. 150 W.V. ELECTROLYTIC						
	C-11	40MFD.	LI-6	T-1	INPUT I.F. TRANFORMER			
IR-20	R-1	220M Ω RESISTOR 1/2 W. 20 %	LI-7	T-2	OUTPUT I.F. TRANSFORMER			
IR-9	R-2	22 M Ω RESISTOR 1/2 W. 20%		T-3	OUTPUT TRANSFORMER			
IR-10	R-3	47 M Ω RESISTOR 1/2 W. 20%						
IR-23	R-4	.33MEG Ω RESISTOR 1/2 W. 20%	LL-17	L-1	LOOP ANT.			
IR-12	R-5	1 MEG. Ω RESISTOR 1/2 W. 20%	LO-14	L-2	OSC. COIL			
IR-13	R-6	2.2MEG Ω RESISTOR 1/2 W. 20%						
VC-4	R-7	1 MEG. VOLUME CONTROL	SPK-12	SP	5" P.M. SPEAKER			

ALIGNMENT DATA

Remove the chassis from the cabinet. A Signal Generator with the following frequencies is required: 455 KC, 1400 KC and 1720 KC.

The receiver volume control should be turned to maximum during the I.F. and all subsequent alignments to keep the A.V.C. from working and giving false readings. Turn the tone control to complete left hand position. Keep the generator output as low as possible to prevent overloading.

Connect an output meter across the voice coil of the speaker.

Connect a 20,000 ohm resistor across the loop connector terminals to reflect proper loop impedance.

FIRST STEP: Connect the hot lead from the generator to the "ANT." section of the gang condenser through a .1 MFD. condenser. The ground lead must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455 KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator connected in the same manner as in I.F. alignment, adjust the signal generator to 1720 KC. The "O.S.C." trimmer is located on the front section of the gang condenser. Adjust this trimmer until the signal is tuned in. The gang condenser should be at complete minimum capacity for this setting.

THIRD STEP: Remove the generator leads from the chassis. Remove the 20,000 ohm resistor from the loop connector terminals. Reinstall the chassis in the cabinet, connect the loop leads, motor plug and phono pickup leads.

Connect the generator leads to a transmitting loop, made of a few turns of wire, and loosely couple to the receiver loop antenna which is located on the back end of the cabinet. Adjust the generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The "ANT." trimmer is located on the rear section of the gang condenser. Adjust this trimmer until a maximum signal is noted on the output meter.

No further adjustment should be necessary, unless the receiver has been damaged, as the coils and tuning condenser have been specially handled at the factory to insure proper alignment at the lower frequencies.

HOW TO INSTALL THE RADIO

POWER SUPPLY: This receiver is designed to operate from a power source of 110 to 125 volts AC current at 60 cycles only.

Always predetermine the type of power in your location by consulting the local power company for this information.

CAUTION: Never plug this unit into a 220 Volt or a DC power source as you will seriously damage the component parts, which have been designed for 110 to 125 volts AC current at 60 cycles only.

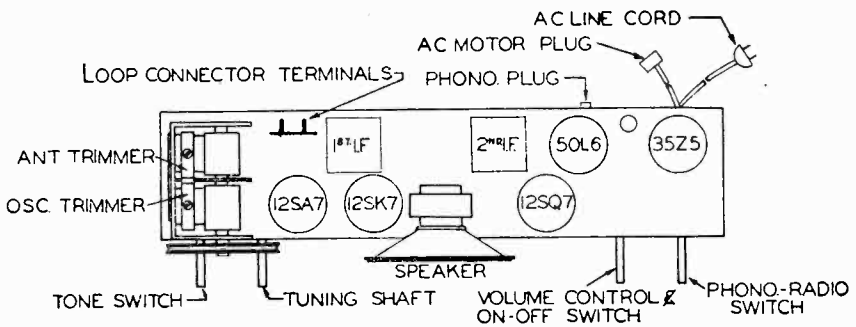
ANTENNA: This receiver is equipped with a sensitive loop antenna and will require no external antenna or ground. However, due to the directional qualities of the loop antenna, the reception of some stations may be improved by turning the receiver in different directions.

CONTROL KNOBS: This instrument is equipped with four knobs to control the operation. The extreme left knob is the "Tone" control. This control has three positions. The left hand position is "Normal" usually used for speech. The center position is "Medium" and is used for music. The right hand position is "Low" and is used to attenuate the high notes and increase the low notes. The second knob is the "Tuning" selector. This knob may be moved to the right or left to select the desired station. By mentally adding a zero to the numbers on the dial, the result will be read directly in kilocycles, i. e. 60 + 0 = 600 KC or 170 + 0 = 1700 KC.

The first knob to the right of the speaker opening is the "Volume" control and also the "OFF-ON" switch. In the extreme left hand position the switch is in "OFF" position. Turn this knob to the right and a click will be heard. This indicates that the power has been turned on. Allow about 30 seconds for the tubes to heat up and the instrument will be ready for operation. To increase volume, turn this knob to the right.

The extreme right hand knob is the "Radio-Phono" switch. The right hand position is for "Radio" operation and the left hand position is for "Phono" operation.

TUBE AND TRIMMER LOCATION



TL-77-U

FIGURE-1

SERVICE PARTS LIST

Illus. No. (On Illus. 11)	Part No.	Description
1	(See Radio Bulletin)	Backplate - Pointer
	115529	Ball Bearing Pkg.
2	(See Radio Bulletin)	Bushing and Manual Drive Shaft
3	*	Clutch Cam Assembly
4	7258072	Clutch Disc - Driven
5	*	Clutch Lever
6	*	Coil Housing
7	(See Radio Bulletin)	Core Guide Bar-Parallel
8	(See Radio Bulletin)	Core Bar Connecting Link
9	(See Radio Bulletin)	Core - Powdered Iron
10	(See Radio Bulletin)	Escutcheon Assembly
	(See Radio Bulletin)	Dial
	(See Radio Bulletin)	Dial Backplate
13	*	Front Bearing Plate
14	(See Radio Bulletin)	Gear and Bushing
15	*	Grommet
16	(See Radio Bulletin)	Pointer Assembly
	(See Radio Bulletin)	Pointer Tip
	7256271	Pointer Connecting Link
19	(See Radio Bulletin)	Push Button and Slide Assembly
20	(See Radio Bulletin)	Spring - Clutch
	7257415	Spring - Core Bar Connecting Link
	7255992	Spring - Pointer Connecting Link
23	7255984	Spring - Slide Return
	*	Treadle
25	*	Tuner Mounting Plate
26	(See Radio Bulletin)	Worm Gear and Bracket

* These parts are not normally required for service but can be ordered by specifying the model radio, and the Illustration number and description as shown in this parts list.

GENERAL:

Push-Pull Lockup Tuners are used on the following radios:

Buick Model
980782 — 1949

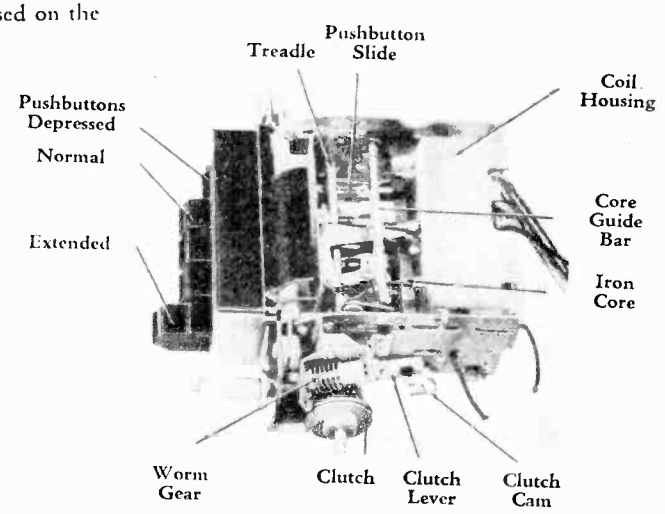
Cadillac Models
7256609 — 1948
7258155 — 1949

Chevrolet Models
986067 — 1947-48-49
986240 — 1949

GMC Truck Model
2233029 — 1947-48-49

Oldsmobile Models
982454 — 1948
982455 — 1948
982400 — 1949
982421 — 1949

Pontiac Model
984296 — 1949



The service bulletin for any radio using this type of tuner, and not listed above, will refer to this bulletin for tuner service.

The push-pull lockup tuner is a mechanism used to tune the radio through the broadcast band. This tuner uses permeability tuning. The tuning is done either with the manual tuning control or any of five push buttons.

TUNER OPERATION

MANUAL TUNING MECHANISM

In a permeability tuned radio the tuning is done by moving powdered iron cores in and out on the tuning coils. Therefore, the manual drive mechanism connects the rotary motion of the manual tuning knob to the straight line motion of the iron cores. This is done as follows: (See Illustration #1)

1. The manual knob (1) and shaft (2) turn the worm gear (3) in its bracket.
2. The worm gear (3) then turns at a slower speed the flat anti-backlash gear (4) which is fastened through the clutch (5) to the treadle shaft (6).
3. As the treadle (7) rotates it moves the

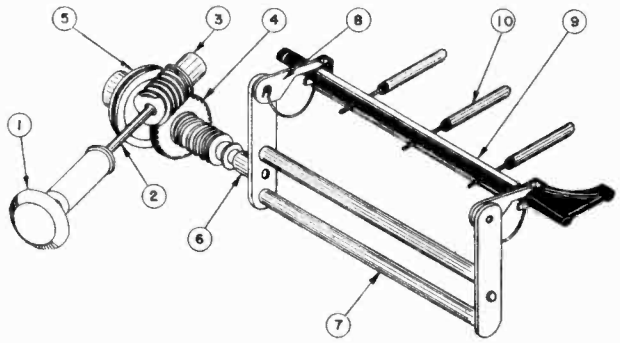


Illustration #1

core guide bar (9) which is connected to it by the links (8), in or out along the slots in the tuner side plates (not shown).

4. The iron cores (10) are fastened to the core guide bar (9) and move in or out of the coil forms (not shown).

The worm gear drive acts as a positive brake to hold the tuning cores in position even though the radio is jarred. A worm gear drive can only be turned from the worm gear (manual tuning knob) end of the drive. This brake eliminates any mechanical drift of the tuner.

PUSH BUTTON OPERATION

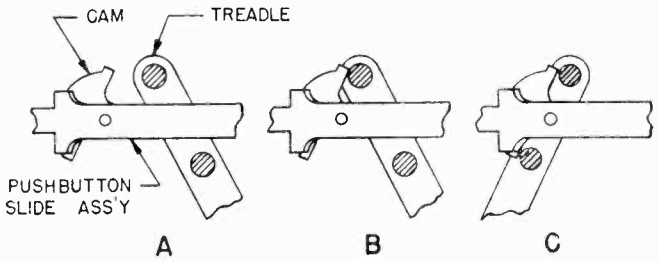


Illustration #2

The push button is operated by pushing the button all the way in and releasing. The sequence of operation is as follows: (See Illustration #2)

1. The push button is in its normal position and the relationship between the push button slide assembly and the treadle is shown in Illustration 2, Figure A.
2. As the push button is pushed in to the position shown in Illustration 2, Figure B, the clutch is disengaged (see clutch operation) allowing the treadle to move easily.
3. When the push button is pushed all the way in, the treadle takes a position in accordance with the setting of the cam on the push button slide assembly, (See Illustration 2, Figure C) thereby changing the frequency to which the radio is tuned.
4. The push button is released allowing the button slide assembly to return to its normal position shown in Illustration 2, Figure A. During this operation the clutch is re-engaged.

PUSH BUTTON SET UP PROCEDURE

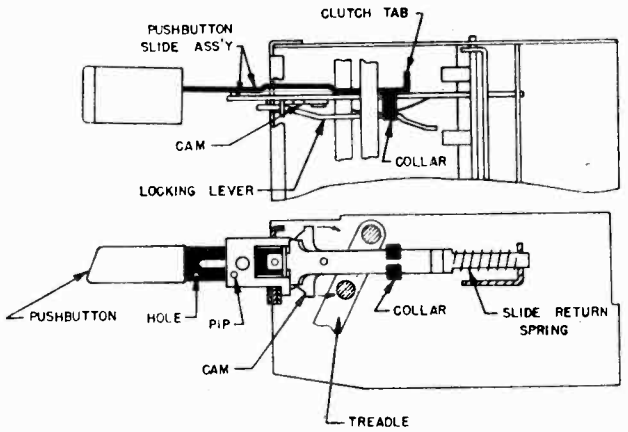
1. Tune the desired station in manually.
2. Select the button to be set up and push it to the side or down (see bulletin for radio involved) and pull all the way out (about ½ inch).
3. Push the button all the way in.

How It Works:

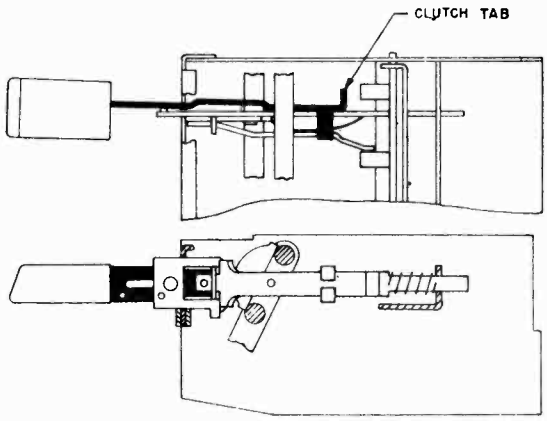
To set up the push buttons to tune in a station it is necessary to position the cam on the push button slide assembly so that when the push button is depressed it will move the treadle to the correct position to tune the radio to the desired frequency. This is done as follows:

1. The desired station is tuned in manually. This positions the treadle correctly for the desired frequency and holds it securely in position.
2. The push button is moved to the side. This moves the black portion of the push button slide away from the white portion (See Illustration 3, Step 1) disengaging the pip from the hole.
3. The push button is pulled all the way out to the extended position as shown in Step 1. In this position the locking lever exerts no pressure on the cam, allowing the cam to move freely.
4. As the push button slide assembly is pushed in, it remains extended until the cam is positioned against the treadle as shown in Illustration 3, Step 2. This places the cam in a position so that when the cam is locked, the push button will return the treadle to the same position whenever it is operated.
5. As the push button is pushed further in, the white portion remains stationary while the black portion moves forward past the white portion as shown in Step 3. During this part of the operation the collar slides along the inclined plane of the locking lever causing the locking lever to exert pressure on the cam to hold it securely in position thus setting up the push button. Immediately after the cam has been locked the clutch tab operates the clutch mechanism. (See "Clutch Operation"). This clutch action has nothing to do with the push button set up operation.
6. The push button is released and assumes its normal position as shown in Illustration 3, Step 4.

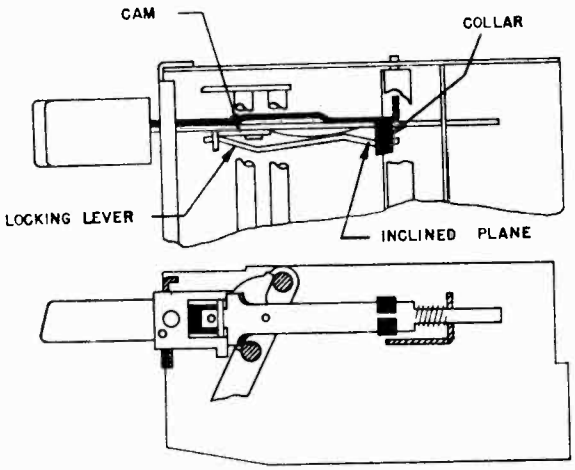
The push button is now set up and any time the push button is operated it will tune the radio to the frequency for which it has been set.



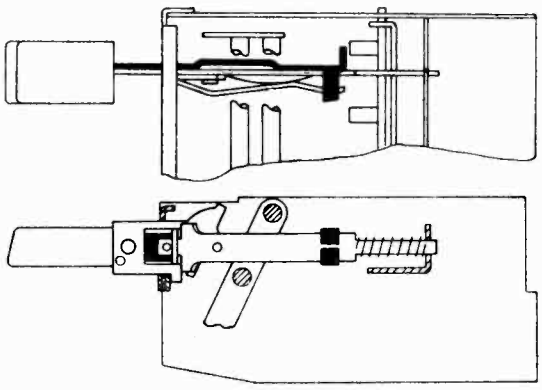
STEP 1- BUTTON EXTENDED- CAM FREE



STEP 2- BUTTON EXTENDED- CAM ALIGNED



STEP 3- BUTTON LOCKED- CAM LOCKED IN POSITION



STEP 4- CAM LOCKED- BUTTON IN NORMAL POSITION

Illustration #3

CLUTCH OPERATION

The clutch in this tuner is used to release the braking action of the manual tuning mechanism by completely disengaging the manual drive mechanism from the treadle while the push button is operated. The clutch operates as follows:

1. As the push button is depressed the clutch operating tab "B" (See Illustration 4) pushes the finger "C" on the clutch cam assembly "D."

2. This rotates the clutch cam "D", causing the roller on the clutch lever "E" to move toward the tuner.

3. This lever "E" is fastened to the inside face of the clutch "A" and moves the inside face away from the outer face of the clutch "A."

4. The inside face of the clutch "A" is fastened to the flat anti-backlash gears and therefore to the manual drive. The outer face of the clutch is fastened to the shaft of the treadle and when the faces of the clutch "A" are separated the treadle is free to move easily.

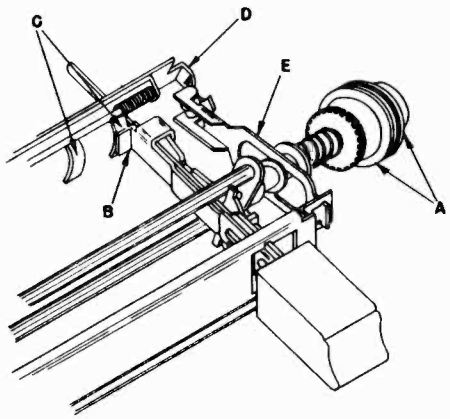


Illustration #4

TUNER ADJUSTMENTS

No tuner adjustments should be necessary unless some parts have been changed in the tuner. The factory makes all adjustments with precision equipment. Always be sure an adjustment is necessary before it is made.

POINTER CALIBRATION ADJUSTMENT

The procedure for calibrating the pointer is as follows:

1. Connect the signal lead of a signal generator to the antenna connector of the radio and the return lead to chassis.
2. Tune the signal generator to the frequency specified under "Alignment Procedure" in the service bulletin for the radio involved. (This is important because the adjustment screw is not accessible at all frequencies)
3. The pointer should then be adjusted by turning the pointer adjustment screw (See Illustration 5) until the pointer indicates the correct frequency on the dial. Any special instructions for this adjustment will be included in the service bulletin for the particular radio.

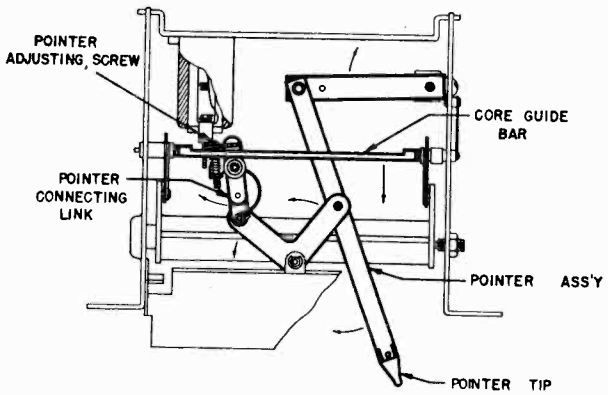


Illustration #5

ANTI-BACKLASH GEAR ADJUSTMENT

An anti-backlash gear is a special gear used to take out any looseness or "play" in the mesh of two gears. The anti-backlash gear of this tuner consists of two flat gears, side by side. One of these gears is fastened to the shaft on which it is mounted while the other is free to rotate around the shaft. These gears are spring loaded against each other so their teeth will completely fill the space between the teeth of the mating gear (worm gear) even though this space may vary. The anti-backlash gear is adjusted as follows:

1. Loosen or remove the worm gear and bracket assembly.
2. Turn the part of the gear that is free to rotate against the spring tension between the halves of the gear a distance of five teeth.
3. Replace the worm gear and bracket assembly, being careful not to lose the spring tension between the anti-backlash gears.

CLUTCH ADJUSTMENT

The only clutch adjustment on this tuner controls the amount of pressure between the faces of the clutch and the timing of the clutch operation. It must be made anytime the clutch disc driven is removed and is made as follows:

1. Place a 20 to 30 thousandth shim between the clutch lever roller and the clutch cam assembly (See Illustration 6).
2. Push the outer clutch disc on the treadle shaft up snug to the other face of the clutch. Do not use force.

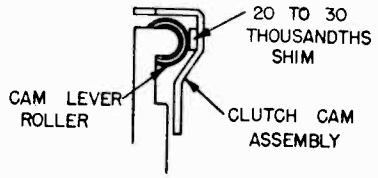


Illustration #6

3. Tighten the set screws on the clutch disc and remove the shim.

TUNER PARTS REPLACEMENTS

The replacement of most of the tuner parts is straight forward, in accordance with the blown up view shown in the Illustration 11. The tuners used on the various models listed in this bulletin will vary in detail from this illustration, but their operation is identical and the replacing of parts is very similar. Whenever parts are replaced on a tuner, careful consideration should be given to the removal of the tuner from the radio. Many times this removal is made when it is not necessary.

The procedure for making some special replacements is described below to aid in a speedy and efficient replacement..

REPLACING TUNING COILS — ALL RADIOS USING SHEET METAL COIL HOUSINGS

Before attempting the replacement of the tuning coils examine the radio involved carefully to determine the necessity of removing the complete tuner from the radio. Whenever possible leave the tuner in the radio.

1. Dissolve the cement from the iron tuning core stud at the core guide bar with acetone and remove the iron core from the core bar and coil.
2. Remove the fiber board support at the front of the shield cans.
3. Remove the nuts which hold the sheet metal can in place (on the rear of the tuner) and remove the can from the coil.
4. Remove the defective coil from the rubber grommet to which it is mounted and replace with a new coil.
5. Reassemble the parts that have been removed and realign the radio in accordance with the alignment instructions in the Radio Service Bulletin.

REPLACING TUNING COILS — ALL RADIOS USING DIE CAST COIL HOUSINGS

It is necessary to remove only the rear cover of the radio to make this replacement on all tuners using the die cast coil housing with the exception of the Chevrolet model 986240. On this model it is necessary to remove the rear cover and wraparound from the R.F. unit and to loosen the R.F. chassis enough to have free access to the coil mounting strip. The procedure for making this replacement on these tuners is as follows:

1. Remove the four screws holding the coil mounting strip to the die cast coil housing.
2. Remove the coil assembly from the housing.
3. Remove the defective coil from the rubber grommet to which it is mounted and replace with a new coil.
4. Reassemble all the parts and realign the radio in accordance with the alignment instructions in the Radio Service Bulletin.

CLUTCH REASSEMBLY

When the clutch is reassembled the clutch operating lever must be in the position shown in the Illustration 7. The procedure for positioning this lever is as follows:

1. Depress the clutch spring until the assembly bottoms.
2. Assemble the clutch lever on the side of the clutch operating collar toward the gears and slide the lever into its fulcrum as shown.
3. Release the clutch face and adjust the clutch in accordance with "Clutch Adjustment."

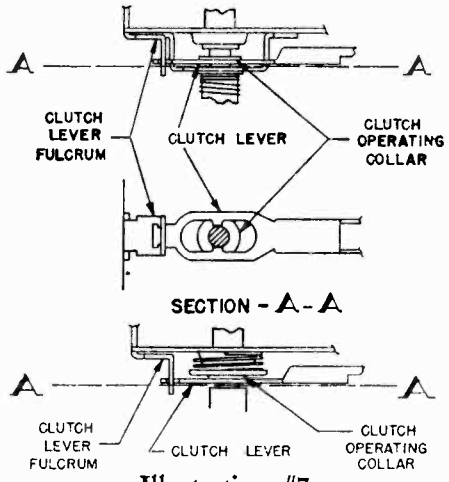


Illustration #7

Note: Both of the above types of clutch assemblies have been used. The only difference is in the position of the spring.

BEARING REPLACEMENTS

This tuner uses ball bearings on the treadle and worm gear. A small amount of grease will hold these bearings in place during assembly and will also provide lubrication for the bearings.

REPLACING THE POINTER ASSEMBLY

Use the following procedure to replace the complete pointer assembly. On radios having plastic pointers it is not necessary to replace the complete pointer assembly to replace the pointer tip. In such cases the pointer tip will be listed separately in the service parts list.

1. Remove the tuner from the radio.
2. Unfasten the pointer connecting link from the pointer assembly by removing the pointer connecting link spring. (See Illustration #5)
3. Remove the screw which fastens the pointer assembly to the tuner side plate.
4. Remove the "C" washer holding the pointer to the dial light shield.
5. Remove the pointer from the tuner.
6. Mount the new pointer assembly by making the same connections that were removed.

REPLACING PUSH BUTTON AND SLIDE ASSEMBLIES

In this bulletin the replacement of push button and slide assemblies in the 1949 or later model radios (assemblies using the cam that has an ear on each end) is described. For the replacement of this assembly in earlier models see the December 1947, Volume 4, No. 5 issue of "Testing Tips." The procedures are similar in both cases.

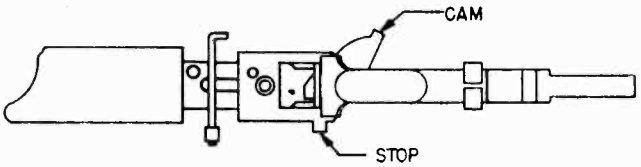


Illustration #8

1. Remove the tuner from the radio and tear it down as shown in the Illustration 11 until you have the front bearing plate and the five push button and slide assemblies.
2. Place the push button and slide assembly that is to be removed in the extended position as shown in Illustration 8 (move the button to the side or down and pull all the way out).
3. Position the slide with respect to the holes in the front bearing plate as shown in Illustration 9.

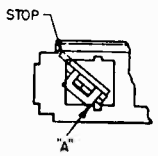


Illustration #9

4. Pull the slide in the direction of the button until the stop hits the front bearing plate. Work this stop through the bearing plate.
5. Turning the slide slightly, guide point "A" through the notch in the hole of the front bearing plate. (See Illustration 9)
6. Pull the slide on through the front bearing plate until the cam hits the front bearing plate. One end of the cam should readily pass through the bearing plate when this is done.
7. Maneuver the cam with your fingers until it is roughly perpendicular to the center line of the slide assembly and work the cam through the hole.
8. Pull the slide the rest of the way out of the front bearing plate. NO EXCESSIVE FORCE IS NECESSARY IN ANY OF THIS PROCEDURE.

The new push button and slide assembly can be put in the front bearing plate by using the exact reverse of this procedure.

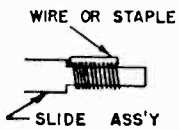


Illustration #10

When the bearing plate and the five push button and slide assemblies are put back in the tuner the slide return springs may make the reassembly difficult. However, this can be avoided by holding these springs in a compressed position on the ends of the slides with a paper staple or piece of wire during the assembly operation as shown in the Illustration 10. Be sure to remove the staple or wire before returning the tuner to the radio.

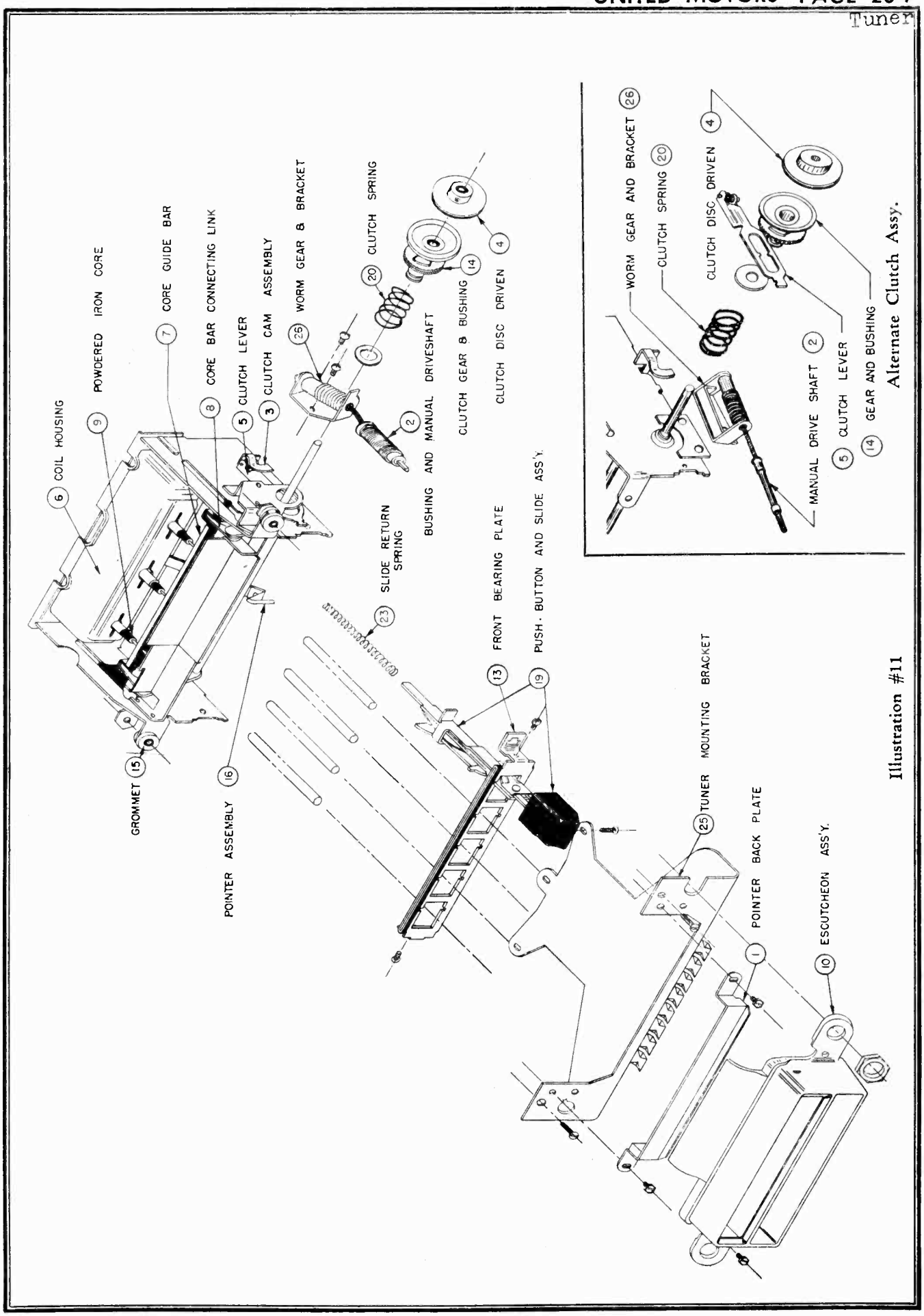
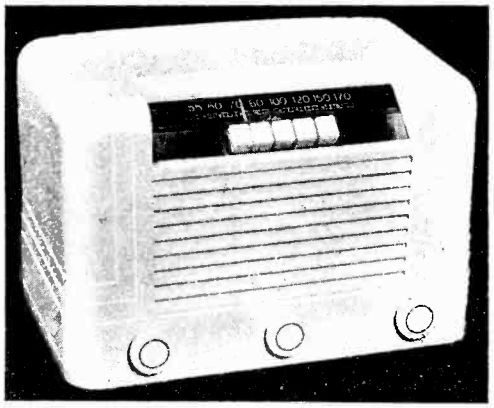


Illustration #11

MODEL R-1236

GENERAL:

Tubes	6
Speaker	5" PM
Tuning	Manual and 5 Pushbuttons
Tuning Range	540 to 1720 KC
Intermediate Frequency	456 KC
Power Supply	105/125 volts AC-DC
Power Consumption	35 Watts
Cabinet	Ivory Plastic



Model R-1236

PUSHBUTTON SETUP PROCEDURE

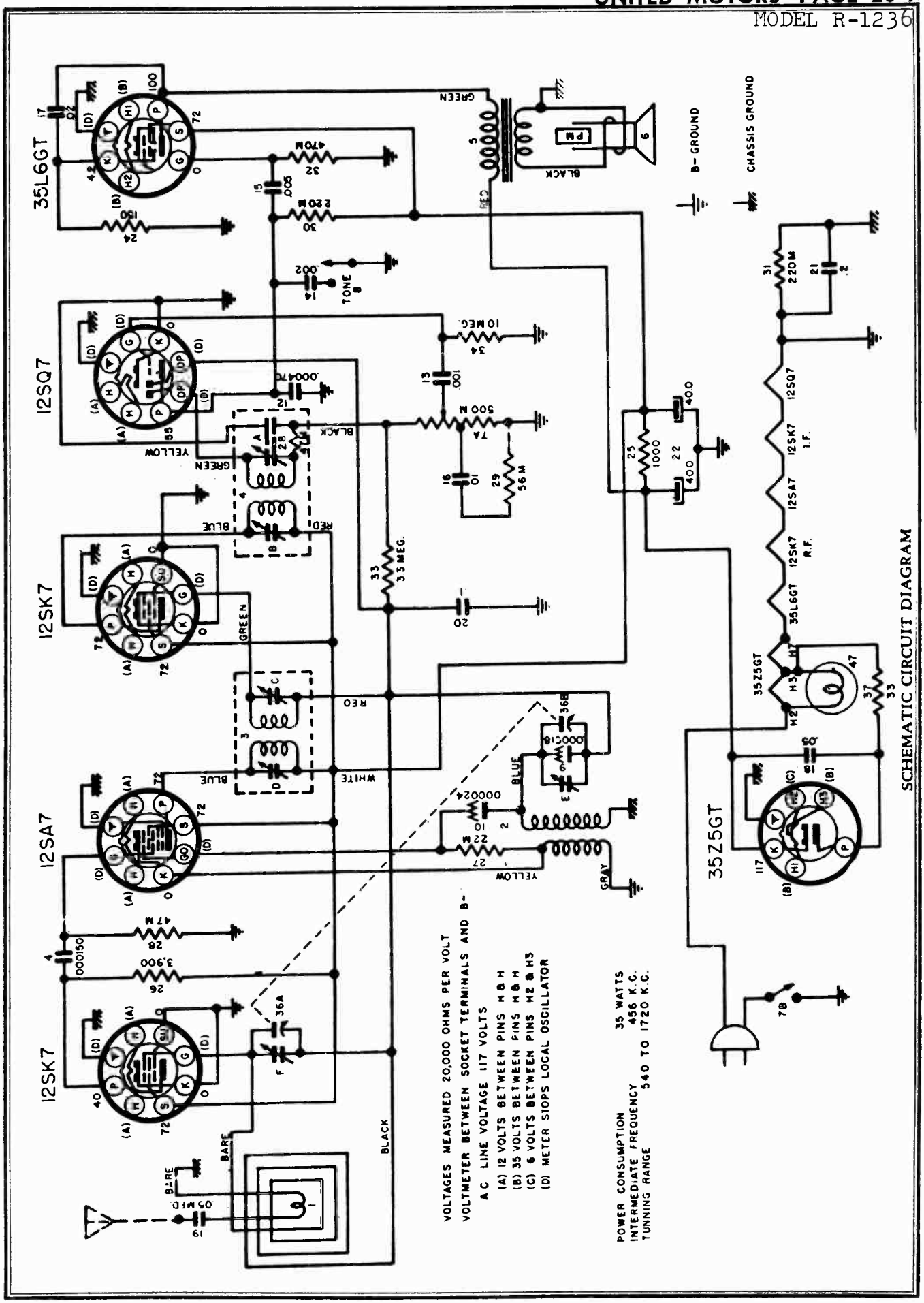
1. Remove button from pushbutton shaft.
2. Loosen exposed screw by means of screwdriver.
3. Push shaft all the way in and hold in this position with screwdriver.
4. Tune in desired station manually.
5. Release shaft carefully and tighten shaft screw.
6. Replace button over shaft and push all the way in to be sure the pushbutton is set up accurately.

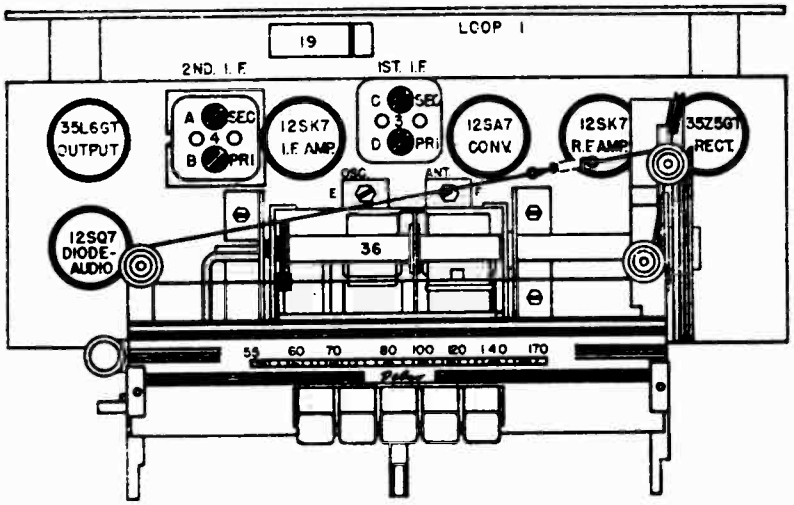
ALIGNMENT PROCEDURE

Output Meter Connections	Across Voice Coil Winding
Generator Ground	To Chassis through .01 MFD
Dummy Antenna	In Series with generator
Volume Control Position	Fully on

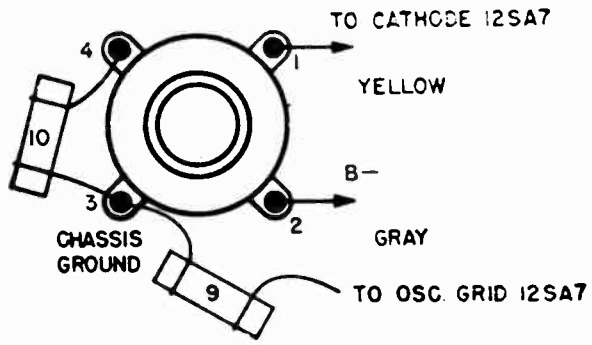
Steps	Series Condenser or Dummy Antenna	Connect Signal Generator To	Adjust Signal Generator To	Turn Radio Dial To	Adjust Trimmers
1	.02 Mfd.	12SA7 Grid (Pin #8)	456 KC	Quiet point near H. F. end	A-B (2nd IF Trans) C-D (1st IF Trans)
2	.000200 Mfd.	Ant. lead	1720 KC	1720 KC	E (Osc.)
3	.000200 Mfd.	Ant. lead	1400 KC	1400 KC	F (Ant.)

MODEL R-1236

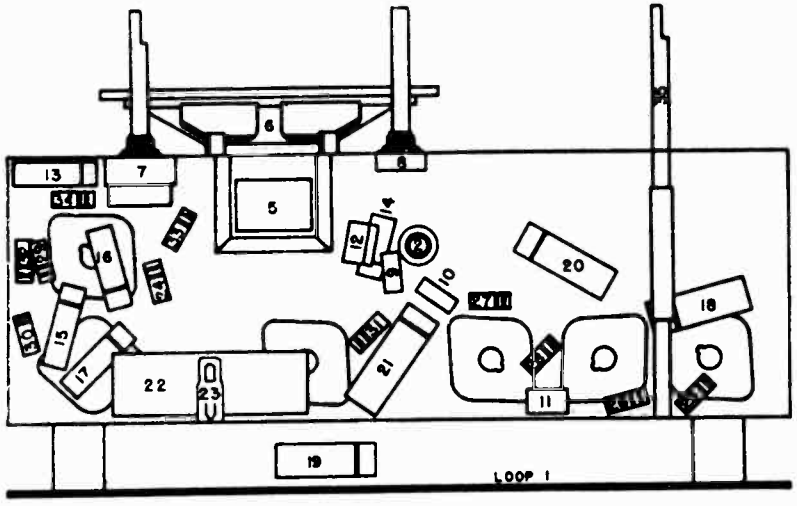




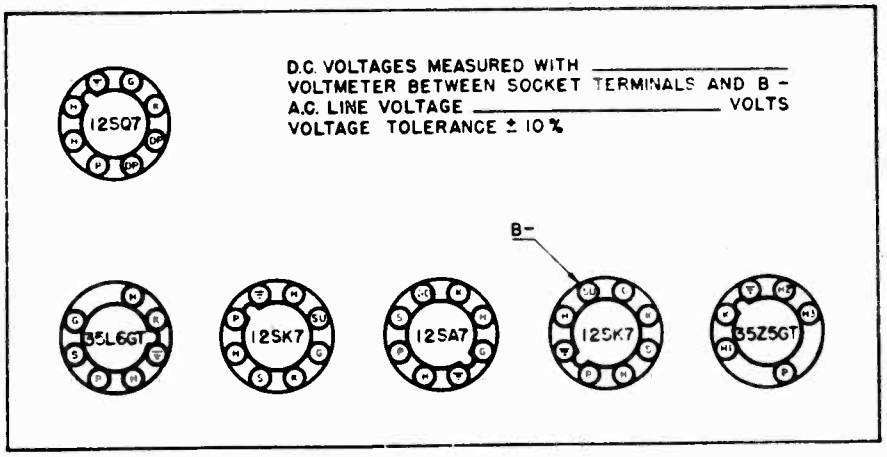
PARTS LAYOUT - TUBE VIEW



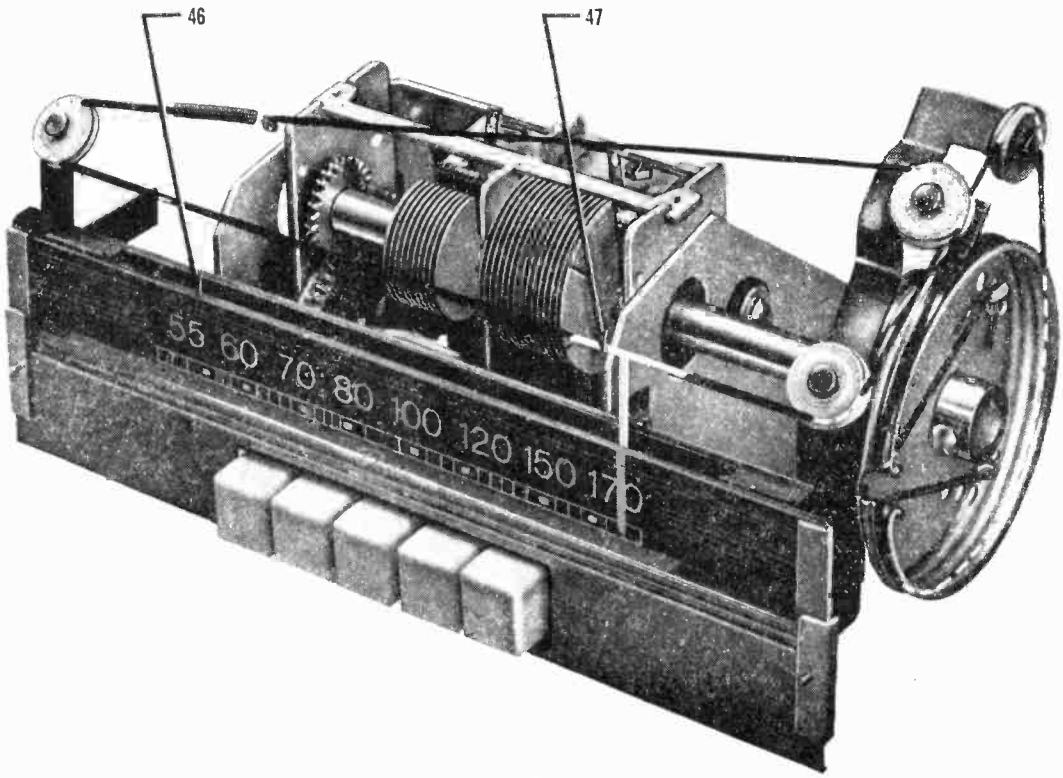
OSCILLATOR COIL ASSY.
Chassis View



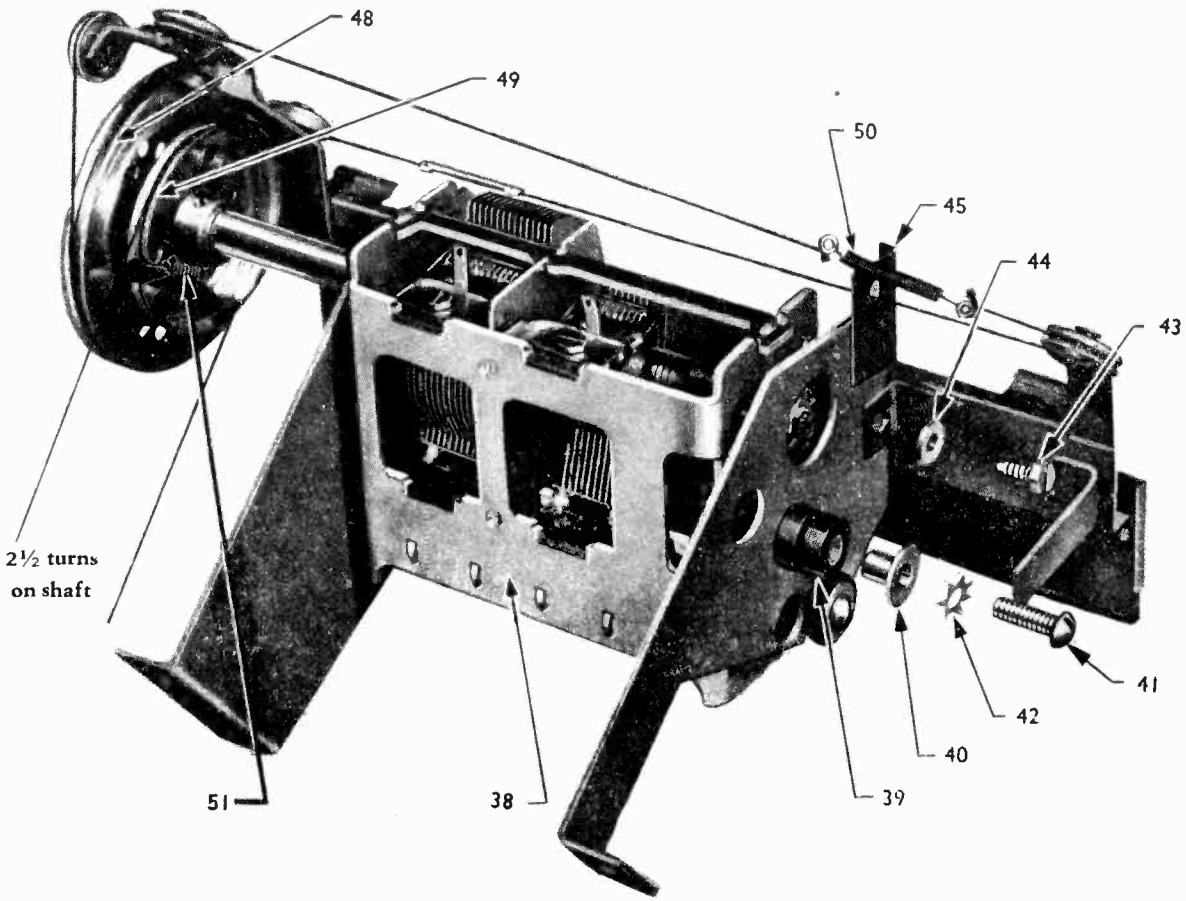
PARTS LAYOUT - CHASSIS VIEW



VOLTAGE CHART
(Socket View)



TUNER ASSEMBLY - FRONT



TUNER ASSEMBLY - REAR

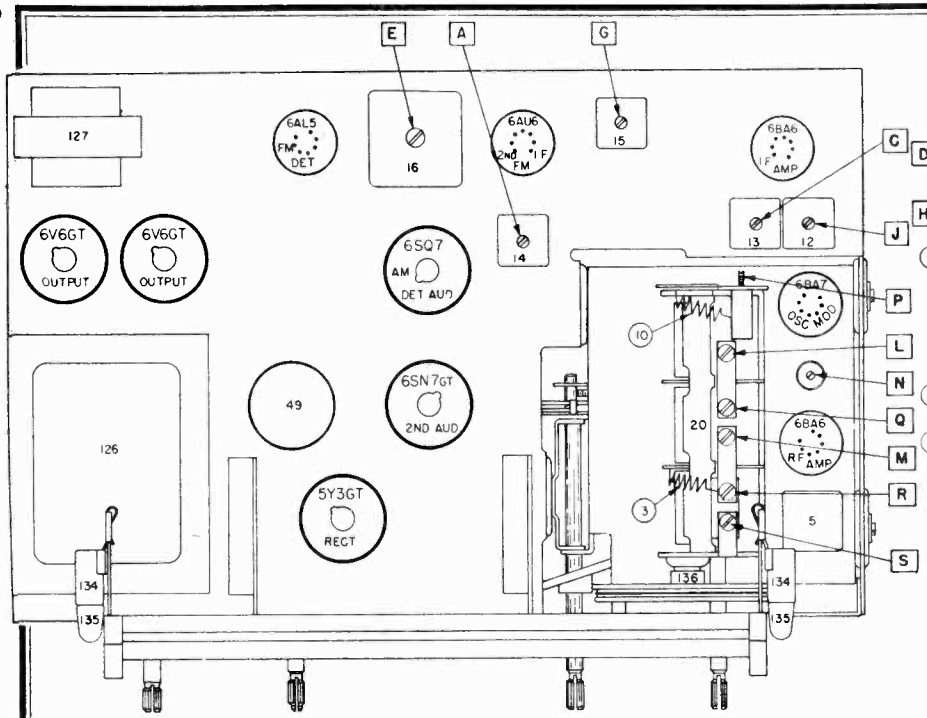
SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			COILS
1	1216621	1216621	Antenna-Loop and Back Cover
2	1216572	1216572	Oscillator
3	1216605	1216605	1st I.F. Assy.
4	1217973	1217973	2nd I.F. Assy.
			CONDENSERS
9	1216659	1216659	0.000018 mfd compensating
10	7239153	7239153	0.000024 mfd compensating
11	7230721	G 151	0.000150 mfd molded
12	7232958	G 471	0.000470 mfd molded
13	7239188	E 102	0.001 mfd 600 V. Tubular
14	7236756	E 202	0.002 mfd 600 V. Tubular
15	7230767	E 502	0.005 mfd 600 V. Tubular
16	7237957	E 103	0.01 mfd 400 V. Tubular
17	7237720	E 203	0.02 mfd 400 V. Tubular
18	7230592	E 503	0.05 mfd 600 V. Tubular
19	7236842	E 503	0.05 mfd 200 V. Tubular
20	7238789	E 104	0.1 mfd 400 V. Tubular
21	7238787	E 204	0.2 mfd 400 V. Tubular
22	1217026	J 907	2 Section Electrolytic
22A			40 mfd 150 V.
22B			40 mfd 150 V.
36	1217399	1217399	Gang Condenser Package
38			Gang Condenser
39			Grommet
40			Spacer Sleeve
41			Screw
42			Lockwasher
43			Screw
44			Shoulder Washer
45			Insulator
			RESISTORS
24	1213220	A 151	150 ohms ½ W Insulated
25	1211037	B 102	1000 ohms 1 W Insulated
26	1214546	A 392	3900 ohms ½ W Insulated
27	1211192	A 223	22,000 ohms ½ W Insulated
28	7240731	A 473	47,000 ohms ½ W Insulated
29	1213267	A 563	56,000 ohms ½ W Insulated
30	1214479	A 224	220,000 ohms ½ W Insulated
31	1214479	A 224	220,000 ohms ½ W Insulated
32	1211196	A 474	470,000 ohms ½ W Insulated
33	1211150	A 335	3.3 megohms ½ W Insulated
34	1212980	A 106	10 megohms ½ W Insulated
37	1214538	A 330	33 ohms ½ W Insulated

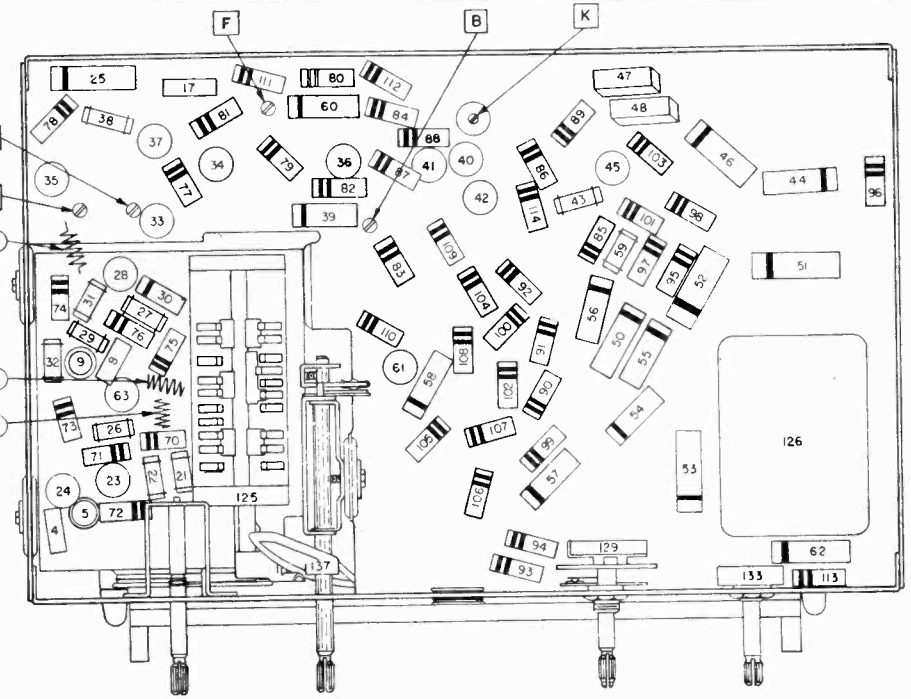
Illus. No.	Production Part No.	Service Part No.	Description
			MISCELLANEOUS ELECTRICAL PARTS
8	1216544	1216544	Control - Tone
7	1216505		Control - Volume and Switch
7A		6242	Volume Control
7B		6200	Switch
	435433	47	Lamp - Dial
	1216563	6102	Speaker - 5" PM
5	1216557	1216557	Transformer - Output
			MECHANICAL PARTS
			Chassis
	1217307	1217307	Backplate - Dial (Includes dial glass)
	1216458	1216458	Bracket - Gang Mtg - R.H.
	1216459	1216459	Bracket - Gang Mtg - L.H.
	1216559	1216559	Clip - Condenser
		6040	Cord - Pointer Drive
	1216512	1216512	Cord - Power
46	1216578	1216578	Dial Glass
47	1216498	1216498	Pointer
48	1216705	1216705	Pulley - Large
49	1216704	1216704	Pulley - Small
35	1216650	1216650	Shaft - Manual Tuning
	1217839	1217839	Socket - Dial Light
	7236279	7236279	Socket - Octal Tube
50	1217422	1217422	Spring - Cord Tension
51	7238950	7238950	Spring - Cord Tension
	7245333	7245333	Washer "C" Manual Shaft
			Cabinet
	1216657	1216657	Cabinet
	1216878	1216878	Knob
	1216877	1216877	Pushbutton - Ivory
	1217752	1217752	Pushbutton - Maroon

TUBE COMPLEMENT

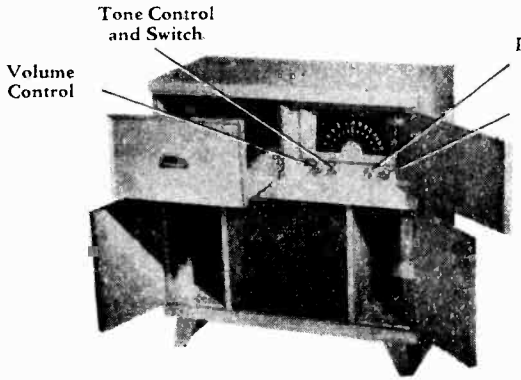
1213848	5408	35Z5GT Rectifier
1213818	5405	35L6GT
1213812	5348	12SK7
1213809	5341	12SA7
1213813	5350	12SQ7



PARTS LAYOUT — TUBE VIEW



PARTS LAYOUT — CHASSIS VIEW



MODEL R-1250 - MODERN

MODEL R-1248 - WALNUT
MODEL R-1249 - MAHOGANY

GENERAL SPECIFICATIONS

TUBES: Nine, plus rectifier

SPEAKER: 12" Electro-magnetic

TUNING: Manual

TUNING RANGE: AM - 550 - 1600 KC
FM - 88 - 108 MC

POWER SUPPLY: 105/125 Volts, 60 Cycle AC

NOTE: When servicing this receiver, special care must be taken to replace some parts with identical parts only. These parts are marked with an asterisk in the service parts list. Also, the position of the replacement should be as close as possible that of the original part.

MODELS R-1248, R-1249, R-1250

ALIGNMENT PROCEDURE

CAUTION: Be sure to have speaker plugged in before turning receiver power on.

Generator Return ..... To Receiver Chassis
Dummy Antenna ..... In Series With Generator
Volume Control Position ..... Maximum Volume
Tone Control Position ..... Treble
Generator Output ..... Minimum for Readable Indication

Steps	Dummy Antenna	Connect Generator to	Signal Generator Freq.	Band Switch Pos.	Tune Receiver to	Adjust	Meter Connection for
1	.0002 Mfd.	Stator lug AM-RF section of gang	455 KC	AM	Quiet point on dial	A, B, C, D	Adjust for maximum with output meter across voice coil
2	.0002 Mfd.	Stator lug FM-RF section of gang	10.7 MC	FM	Quiet point on dial	E*, F G, H, J	Adjust for maximum AVC with output meter from junction of Illus.#78 and #103 to ground
3	.0002 Mfd.	Stator lug FM-RF section of gang	10.7 MC	FM	Quiet point on dial	K	Adjust for Min. Audio output measured from junction of Ills. #85 and #44 to ground.
4	.0002 Mfd.	External loop ant. connection	1615 KC	AM	High Freq. stop	L	Adjust for max. with output meter across voice coil.
5	.0002 Mfd.	External loop ant. connection	1380 KC	AM	1380 KC	M	Adjust for max. with output meter across voice coil.
6	.0002 Mfd.	External loop ant. connection	600 KC	AM	600 KC	N**	Adjust for max. with output meter across voice coil.
7	300 ohm ½W resistor	External dipole ant. connection	106 MC	FM	106 MC	P	Adjust for max. AVC with output meter from junction of Ills. #78 and #103 to ground.
8	300 ohm ½W resistor	External dipole ant. connection	90 MC	FM	90 MC	Ill. #10***	Adjust for maximum AVC with output meter from junction of Ills. #78 and #103 to ground.
9	300 ohm ½W resistor	External dipole ant. connection	106 MC	FM	106 MC	Q, **** R	Adjust for maximum AVC with output meter from junction of Ills. #78 and #103 to ground.
10	300 ohm ½W resistor	External dipole ant. connection	90 MC	FM	90 MC	Ills. #6 #3*****	Adjust for maximum AVC with output meter from junction of Ills. #78 and #103 to ground.
11	None	Test loop******	1380 KC	AM	1380 KC	S	Adjust for maximum with output meter across voice coil.

*Completely misalign the secondary of the ratio detector before proceeding with step 2.

**Rock in oscillator.

***Distort oscillator coil for maximum AVC voltage and repeat steps 7 and 8 until dial calibration is correct at 106 and 90 MC. This is done by physically compressing or lengthening the coil as the need may be. WARNING!! Do not bend FM gang condenser plates.

****Rock in Trimmer.

*****Distort RF and antenna coils for Maximum AVC voltage and repeat steps 9 and 10 for correct dial calibration.

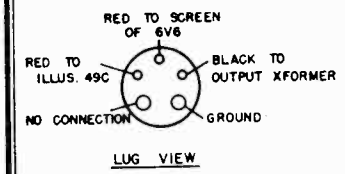
******The Signal generator may be coupled to the receiver by placing a loop electrically across the output of the signal generator and physically near the receiver loop. This loop may be a loop from another radio, a home made loop of 10 or 15 turns, or other similar devices.

The tube socket voltages, as measured at the factory and under the conditions shown on the schematic diagram, are shown here. The blank spaces are provided so the service man may fill in actual voltage readings as measured with his own equipment. A normal operating radio should be used for these measurements.

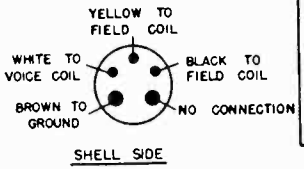
VOLTMETER RESISTANCE ..... Ohms Per Volt

LINE VOLTAGE ..... Volts

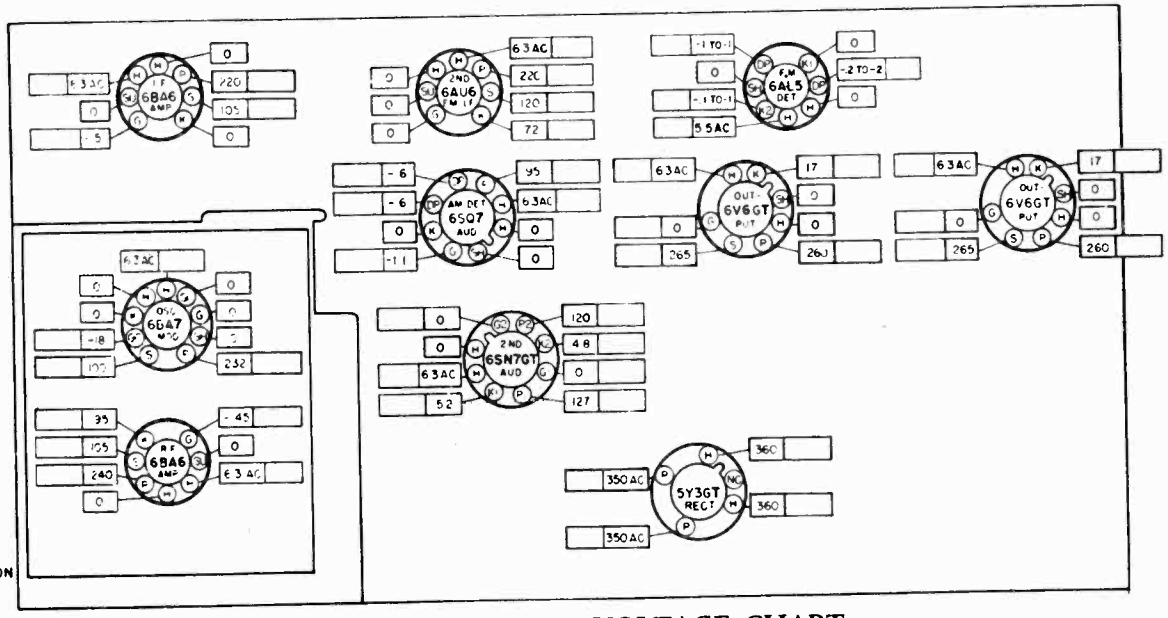
VOLTAGE TOLERANCE ..... ± 10%



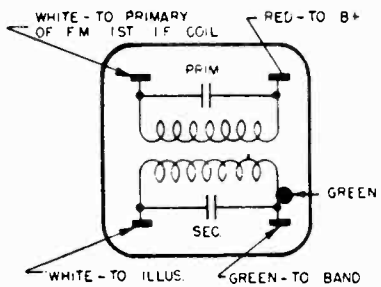
SPEAKER SOCKET



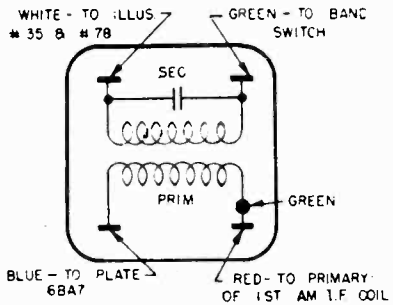
SPEAKER PLUG



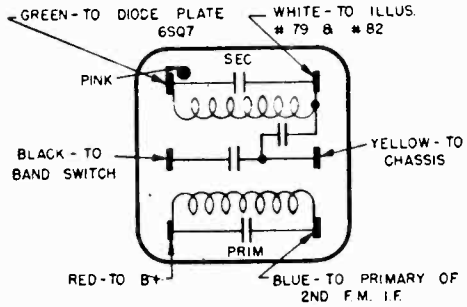
TUBE SOCKET — VOLTAGE CHART



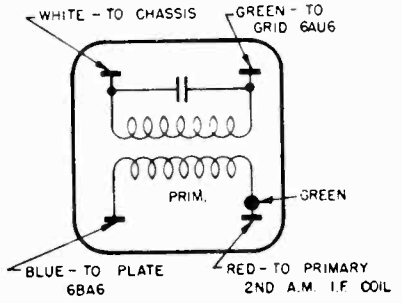
1ST AM I.F. COIL



1ST FM I.F. COIL

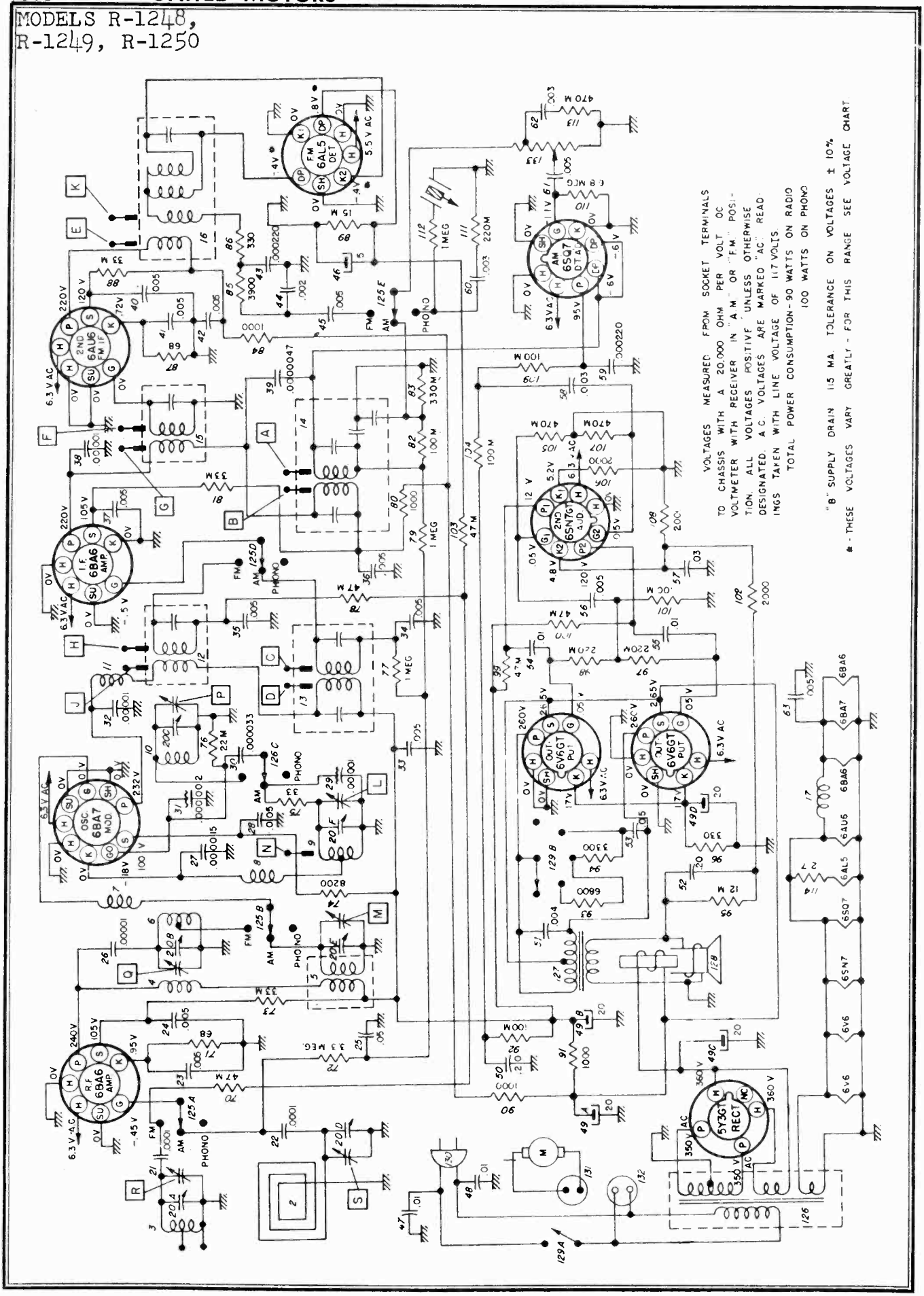


2ND AM I.F. COIL

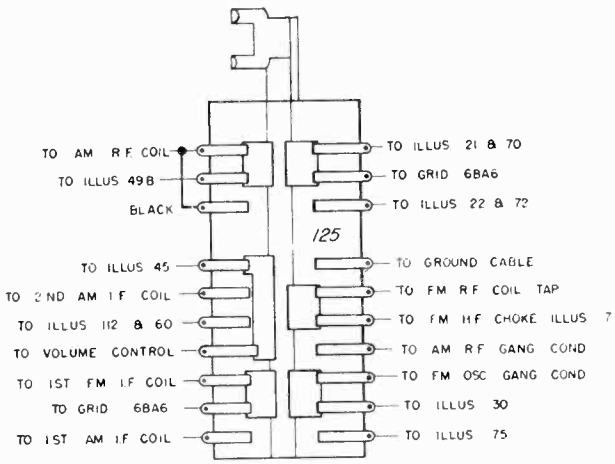


2ND FM I.F. COIL

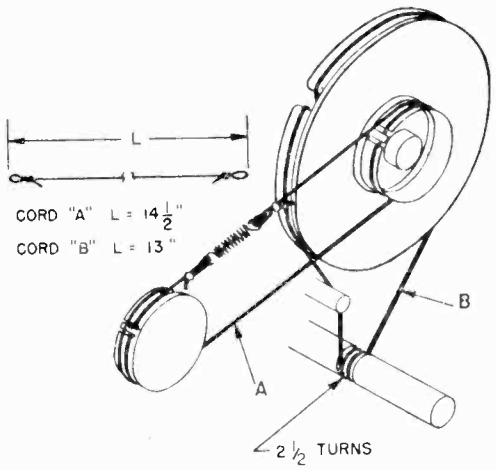
MODELS R-1248,
R-1249, R-1250



MODELS R-1248, R-1249, R-1250



BAND SLIDE SWITCH CONNECTIONS



DIAL CORD DRAWING

SERVICE PARTS LIST

R-1248, R-1249, R-1250

Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			Coils
1	1218462	1218462	FM Folded Dipole Antenna
2	1218391	1218391	AM Loop Antenna
3	1219075	1219075	FM - Antenna Coil
4	1218838	1218838	FM-RF Choke Coil
5	1218176	1218176	AM-RF Coil
6	1219074	1219074	FM-RF Coil
7	1219145	1219145	FM-HF Choke Coil
8	1218838	1218838	RF-RF Choke Coil
9	1218171	1218171	AM Oscillator Coil
10	1219073	1219073	FM - Oscillator Coil
11			Approx. 2½ turns #22 wire
12	1218832	1219197	FM 1st I.F. Transformer (10.7 MC)
13	1218830	1219195	AM 1st I.F. Transformer (456 KC)
14	1218831	1219196	AM 2nd I.F. Transformer (456 KC)
15	1218832	1219197	FM 2nd I.F. Transformer (10.7 MC)
16	1218813	1218813	Ratio Detector
17	1218319	1218319	Filament Choke
			Condensers
20	1218801	1218801	Variable Condenser
21	1217925	G 101	.0001 mfd ceramic
22	1217925	G 101	.0001 mfd ceramic
23	1218298	1218298	.005 mfd Hi Cap. (Disc type)*
24	1218298	1218298	.005 mfd Hi Cap. (Disc type)*
25	7236842	E 503	.05 mfd 200 V tubular
26	1218328	G 100	.00001 mfd ceramic
27	1218845	G 150	.000015 mfd ceramic
28	1218298	1218298	.005 mfd Hi Cap (Disc type)*
29	1219072	1219072	.00001 mfd Temp. Comp.*
30	1218348	G 330	.000033 mfd ceramic
31	1219071	1219071	.000002 mfd Temp. Comp.*
32	1218328	G 100	.00001 mfd ceramic
33	1218298	1218298	.005 mfd Hi Cap (Disc type)*
34	1218298	1218298	.005 mfd Hi Cap (Disc type)*
35	1218298	1218298	.005 mfd Hi Cap (Disc type)*
36	1218298	1218298	.005 mfd Hi Cap (Disc type)*
37	1218298	1218298	.005 mfd Hi Cap (Disc type)*
38	1218328	G 100	.00001 mfd ceramic

MODELS R-1248,
R-1249, R-1250

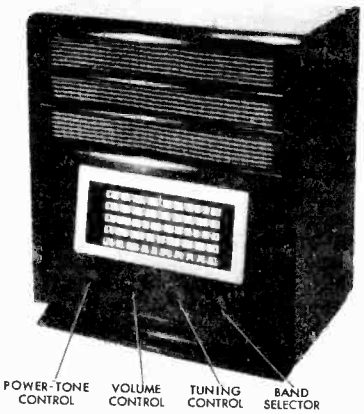
SERVICE PARTS LIST (Cont.)

Illus. No.	Production Part No.	Service Part No.	Description
		Condensers	
39	1218408	1218408	.0000047 mfd*
40	1218298	1218298	.005 mfd Hi Cap (Disc type)*
41	1218298	1218298	.005 mfd Hi Cap (Disc type)*
42	1218298	1218298	.005 mfd Hi Cap (Disc type)*
43	1218846	G 221	.00022 mfd ceramic
44	7237836	E 202	.002 mfd 600 V tubular
45	1218298	1218298	.005 mfd Hi Cap (Disc type)*
46	1218842	J 051	5 mfd 50 V Electrolytic
47	1217227	1217227	.01 mfd 600 V Molded mica
48	1217227	1217227	.01 mfd 600 V Molded mica
49	1218843	1218843	Electrolytic
49A			20 mfd 450 Volt
49B			20 mfd 450 Volt
49C			20 mfd 450 Volt
49D			20 mfd 25 Volt
50	1217876	E 204	.2 mfd 200 V Tubular
51	1217875	H 402	.004 mfd 1600 V Tubular
52	7240579	E 204	.2 mfd Tubular 400 Volt
53	7230592	E 503	.05 mfd 600 V Tubular
54	1209309	E 103	.01 mfd 400 V Tubular
55	1209309	E 103	.01 mfd 400 V Tubular
56	7230767	E 502	.005 mfd 600 V Tubular
57	1218844	E 303	.03 mfd 200 V Tubular
58	7257699	E 302	.003 mfd 600 V Tubular
59	1218846	G 221	.00022 mfd ceramic
60	7257699	E 302	.003 mfd 600 V Tubular
61	1218298	1218298	.005 mfd Hi Cap (Disc type)*
62	7257699	E 302	.003 mfd 600 V Tubular
63	1218298	1218298	.005 mfd Hi Cap (Disc type)*
		Resistors	
70	7240731	A 473	47,000 ohms ½ W
71	1215558	A 680	68 ohms ½ W
72	1211150	A 335	3.3 Megohm ½ W
73	1213484	A 333	33,000 ohms ½ W
74	1216155	B 822	8200 ohms 1 W
75	1214538	A 330	33 ohms ½ W
76	1211192	A 223	22,000 ohms ½ W
77	7238873	A 105	1 Megohm ½ W
78	1216157	B 473	47,000 ohms 1 W
79	7238873	A 105	1 Megohm ½ W
80	1211037	B 102	1,000 ohms 1 W
81	1213484	A 333	33,000 ohms ½ W
82	1211118	A 104	100,000 ohms ½ W
83	7240732	A 334	330,000 ohms ½ W
84	1211037	B 102	1,000 ohms 1 W
85	1214546	A 392	3900 ohms ½ W
86	1213224	A 331	330 ohms ½ W
87	1215558	A 680	68 ohms ½ W
88	1213484	A 333	33,000 ohms ½ W
89	1213257	A 153	15,000 ohms ½ W
90	1215185	C 102	1,000 ohms 2 W
91	1211037	B 102	1,000 ohms 1 W
92	1211118	A 104	100,000 ohms ½ W
93	1215315	A 682	6800 ohms ½ W
94	1216127	B 332	3300 ohms 1 W
95	1213254	A 123	12,000 ohms ½ W
96	1214572	C 331	330 ohms 2 W
97	1213479	A 224	220,000 ohms ½ W
98	1213479	A 224	220,000 ohms ½ W
99	7240734	A 473	47,000 ohms ½ W
100	7240731	A 473	47,000 ohms ½ W
101	1211118	A 104	100,000 ohms ½ W
102	1213238	A 182	2,000 ohms ½ W
103	1216157	B 473	47,000 ohms 1 W
104	1211118	A 104	100,000 ohms ½ W
105	1211196	A 474	470,000 ohms ½ W
106	1213238	A 182	2,000 ohms ½ W
107	1211196	A 474	470,000 ohms ½ W
108	1213238	A 182	2,000 ohms ½ W
109	1211118	A 104	100,000 ohms ½ W
110	7241937	A 685	6.8 Megohm ½ W

SERVICE PARTS LIST (Cont.)

Illus. No.	Production Part No.	Service Part No.	Description
111	1213479	A 224	220,000 ohms ½ W
112	7238873	A 105	1 Megohm ½ W
113	1211196	A 474	470,000 ohms ½ W
114	1219144	1219144	2.7 Ohms 1 W
		Miscellaneous Electrical Parts	
125	1218729	1218729	Slide Switch Assy.
126	1218230	1218230	Transformer - Power
127	1218320	1218320	Transformer - Output
128	1218219	1218219	Speaker - 12" Electro Magnetic - DC Resistance Field Coil - 650 ohms - Voice Coil - 5 ohms
129	1218494	1218494	Control - Tone and Switch Tone Control Power on-off Switch
133	1218228	1218228	Volume Control
	115273	51	Lamp - Jewel
135	435433	47	Lamp - Dial
		Tubes	
	1217690	5252	6BA6
	1218849	5267	6BA7
	1218106	5260	6AU6
	1217689	5251	6AL5
	7237753	5231	6SQ7
	1217376	5258	6SN7GT
	1213793	5241	6V6GT
	1216134	5123	5Y3GT
		MISCELLANEOUS MECHANICAL	
		Chassis	
130	1218334	1218334	Cord - Power
		6040	Cord - Pointer drive
	1219190	1219190	Socket - Jewel light assy.
134	1218340	1218340	Socket and clamp assy. - Dial light
	7236279	7236279	Socket - Octal Tube
	1218170	1218170	Socket - Nine pin miniature tube
	1218071	1218071	Socket - Seven pin miniature tube
	1851850	1851850	Plug - Pick-up arm
	1217515	1217515	Plug and Shell - Phono motor
136	1218968	1218968	Pulley and hub assy.
	7242189	7242189	Spring - Pointer cord tension
	1218169	1218169	Socket - Speaker
132	1216925	1216925	Socket - Phono power
	1216747	1216747	Socket - Phono pick-up arm
	1218785	1218785	Shaft - Manual tuning
	1218786	1218786	Shaft - Slide switch
	1219179	1219179	Pointer, pulley, and backplate assy.
137	1219189	1219189	Cam and set screws
	1219188	1219188	Switch latch Yoke and clip
	169066	169066	Ball bearing
		Cabinet Parts	
	1218466	1218466	Dial glass
	1218229	1218229	Knobs
	1218854	1218854	Cabinet (R-1250) Modern
	1218453	1218453	Cabinet (R-1249) Mahogany
	1218452	1218452	Cabinet (R-1248) Walnut

*Service with identical parts only.



POWER SUPPLY:

CAUTION: This receiver must be operated from a 105-125 V. or 210-250 V. 50/60 cycle AC supply. The receiver will not function on direct current (DC). If you are in doubt as to the voltage and frequency of the power supplied to your home, consult the local power company representative. Before plugging the power cord plug into the wall outlet, check to see that the line voltage switch, located on the chassis, is set for the source available. Refer to Fig. 5 for the location of this switch. The power receptacle provided for the record player supplies 115 V. regardless of the setting of the "110/220 V." switch on the receiver or the source to which the receiver has been connected.

ANTENNA:

A loop antenna has been installed inside the cabinet of the receiver and for reception of local stations no other additional antenna is usually required.

Metal structures concealed in walls, radiators, or other large metal objects near the receiver prevent best possible pickup of radio signals. Locate your receiver as far as possible from such objects.

For best results, especially at remote points from broadcast stations, an outside antenna about 25 to 100 feet long, including lead-in, may be necessary. The lead-in wire is connected to the terminal marked "A" located on the rear apron of the chassis. To avoid excessive electrical noise, erect the antenna so that its length runs at right angles to nearby power lines, streetcar lines, and other similar types of electrical apparatus. For some installations it will be found desirable to connect a ground wire between the "G" terminal and a suitable ground such as a water pipe or radiator.

LOCATION:

Do not place the radio in a warm location, such as on a radiator or over a hot air register. When placing the radio against a wall, leave sufficient clearance for the circulation of air.

BAND SELECTOR - The band selector knob has six positions which perform the following functions in the order of its rotation from left to right. The position of the band selector knob is indicated by the illumination of the particular band being tuned. When operating in the "phono" position, the whole dial will be illuminated.

Position 1 - Phono - With the record player connected to power and pick-up receptacles on the rear apron of the receiver, the reciever operates as a phonograph. The volume and tone controls function as they do for radio reception.

Position 2 - BROADCAST Band - The receiver will tune the standard broadcast band in this position. The receiver frequency is read from the dial scale marked BROADCAST.

Positions 3, 4, 5, 6 - SHORTWAVE Bands - The receiver tunes the shortwave ranges (A - 2.2 to 7 mc), (B - 7 to 22 mc), (C - 9 to 12 mc) and (D - 15 to 18 mc) on these last four positions and dial scales SHORTWAVE A, B, C and D respectively indicating the receiver frequency directly in megacycles.

DAY AND NIGHT RECEPTION:

You will notice that you are able to receive several more stations during the night than during the day. This is a phenomenon due to the sun's effect on the ionosphere. It is not a peculiairty of your receiver.

FADING:

Fading will be encountered only on distant stations. It will be recognized by a gradual diminishing of volume, sometimes to a point where the signal is no longer heard, followed by a gradual return to normal volume. This happens without any change of the controls of the radio. It is often accompanied by distortion or "garbling" of the signal. By means of the automatic volume control in your receiver this effect is reduced considerably. In severe cases it will be necessary to tune to some other station.

STATIC:

Static, like fading, is not attributable to a defective receiver. It is caused by electrical disturbances in the atmosphere (lightning flashes will be heard as severe static) and the more sensitive the receiver the more static will be heard. It us usually most prevalent in the summer and during storm periods.

STATION INTERFERENCE:

Because of the limited number of channels to which broadcasting stations can be assigned it has been necessary to assign more than one station to a channel. This results in interference between the stations particularly if the desired station is not powerful or if it tends to fade. The interference will take the form of whistles or growls and in some cases the interfering station will actually be louder than the desired station. There is no remedy for this other than to tune to a different station at another point on the dial.

LOCAL INTERFERENCE:

Interference caused by electrical apparatus is known as local or "man made" static. Though somewhat similar to static it can usually be distinguished by its regularity or by some peculiar tone. It is caused by arcing or leaking of current in industrial equipment, appliances, high tension power lines, automobile ignition systems, electric razors, etc. It is usually much more prevalent in cities or industrial areas although rural power lines are a common source.

Local interference can be controlled to some exfent by proper filtering of appliances and equipment and to this end present day manufacturers of such equipment are contributing a great deal in improved designs. Power companies are also helpful and cooperative in seeking out and eliminating interference where their equipment is at fault.

TUBE AND DIAL LAMP REPLACEMENT:

The types of tubes required and their relative position in the receiver are shown in Fig. 5. When installing a replacement tube, insert the center guide pin into the center hole of the tube socket. Rotate the tube until the key on the guide pin drops into the notch in the socket hole. Push down until the base of the tube rests firmly on the socket.

To replace two of the dial lamps, it will be necessary to remove the chassis from the cabinet. To replace the dial lamps for the individual bands, unclip the socket by pinching the side springs of the socket together and withdrawing them from their light shield.

SOCKET VOLTAGES:

The socket voltages shown in the voltage chart were obtained with a 20,000 ohm per volt meter while operating the receiver from a 117-volt a-c source. All voltages are to be measured between the tube pin and receiver chassis. Blanks are provided for your meter readings to establish an average set of readings for this receiver as measured with your test equipment. The normal power consumption for the receiver is 85 watts.

ALIGNMENT:

All connections and adjustments necessary for alignment are accessible from the top of the chassis. The output transformer is located on the under side of the chassis, hence, the output meter connection should be made at the speaker socket. The speaker voice coil impedance is 3 ohms.

All alignment adjustments are made at maximum volume. Refer to the alignment chart for the dial and bandswitch settings.

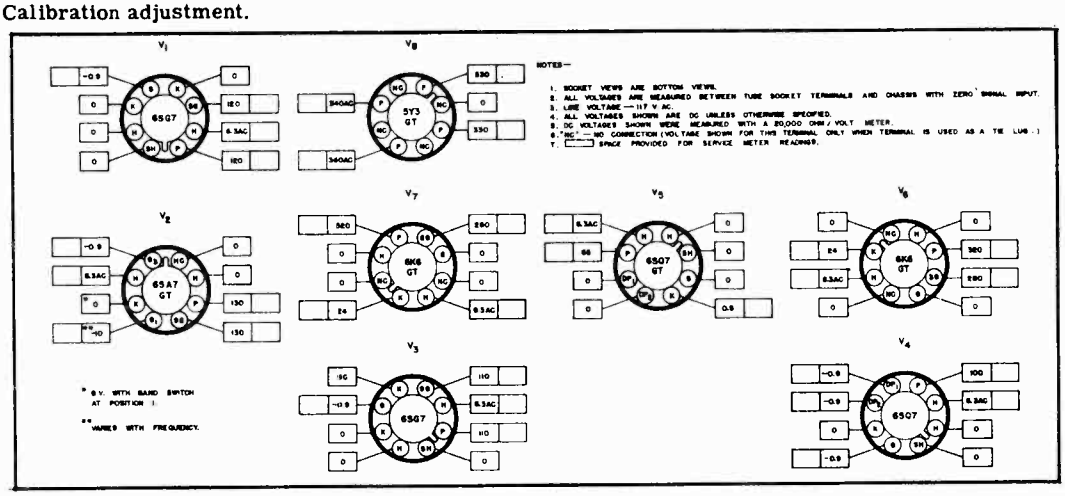
The standard RMA dummy antenna specified in the alignment chart consists of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

CAUTION: The loop antenna must be connected during alignment.

ALIGNMENT CHART

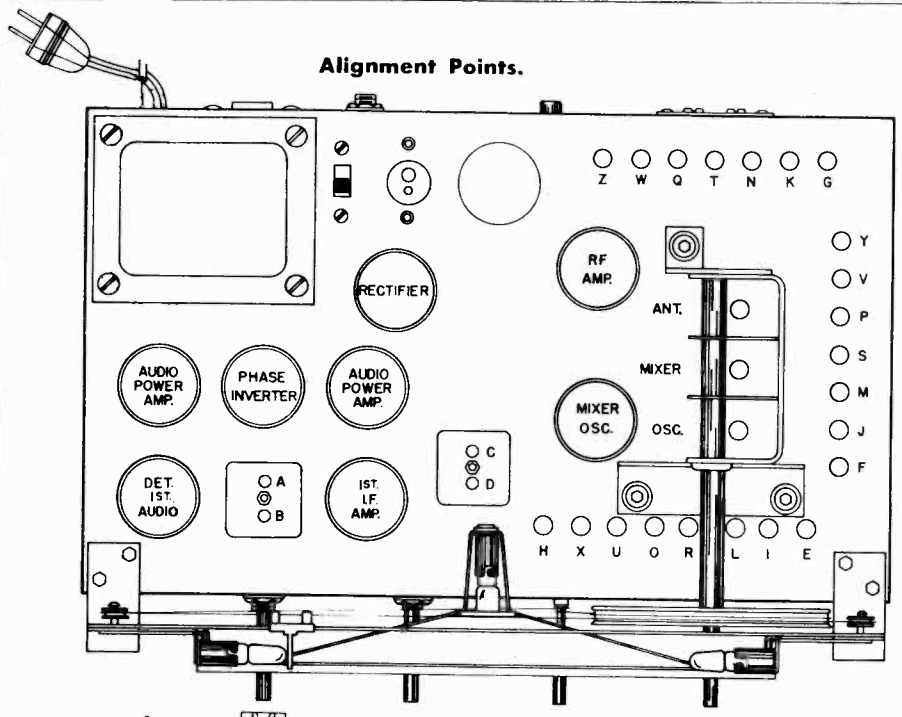
Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Setting	Receiver Dial Setting	Adjust
1	.01 mfd capacitor	Connect to rear section stator of tuning cap.	455 kc	BC	1000 kc	ABCD
2	Std RMA dummy	Connect to terminals A and G of ant. term. strip TS_1.	1500 kc	BC	1500 kc	E*FG
			600 kc		600 kc	H*
3	Std RMA dummy	See step 2.	6 mc	SW (A)	6 mc	I*JK
4	Std RMA dummy	See step 2.	20 mc	SW (B)	20 mc	L*MN
5	Std RMA dummy	See step 2.	11.5 mc	SW (C)	11.5 mc	O*PQ
			9.2 mc		9.2 mc	R*ST
6	Std RMA dummy	See step 2.	17.5 mc	SW (D)	17.5 mc	U*VW
			15.1 mc		15.1 mc	X*YZ

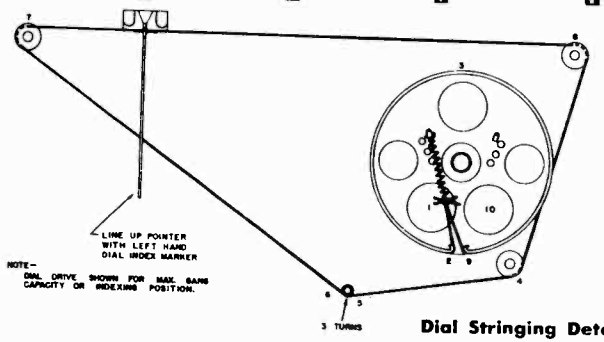
* Note - Calibration adjustment.



Voltage Chart.

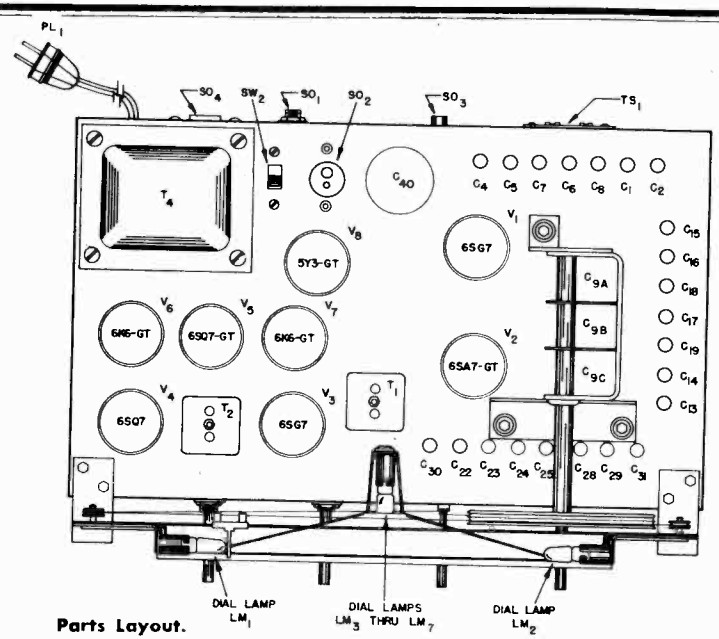
Alignment Points.



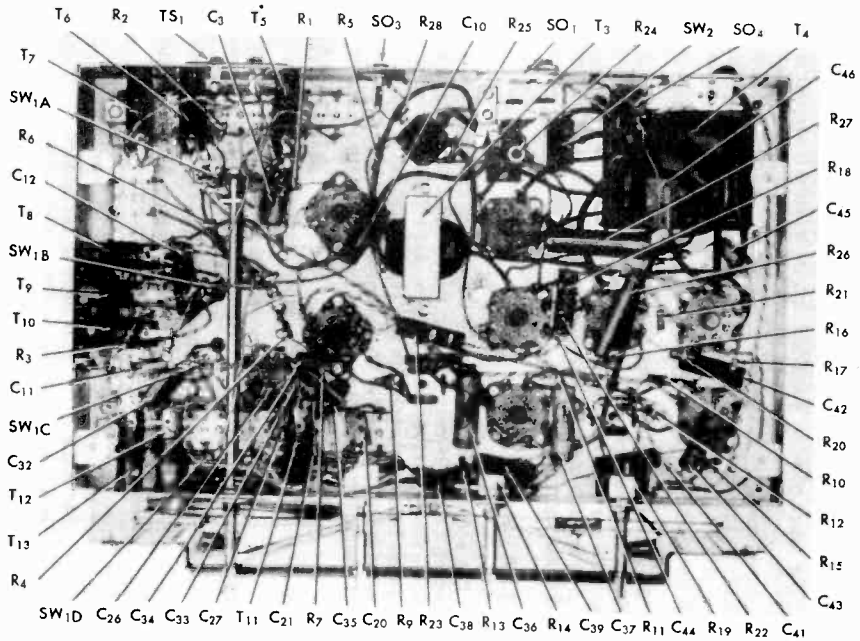


Dial Stringing Detail.

Restring the dial drive with 30 lb. test dial cord. Tie one end to the tension spring and follow the sequence outlined in Fig. 4. Stretch the tension spring and tie the end of the cord securely to the spring as shown. Set the tuning condenser at maximum capacity (closed), attach the pointer to the string and line it up with the left hand index mark on the dial scale.



Parts Layout.



Parts Layout.

MODEL 808

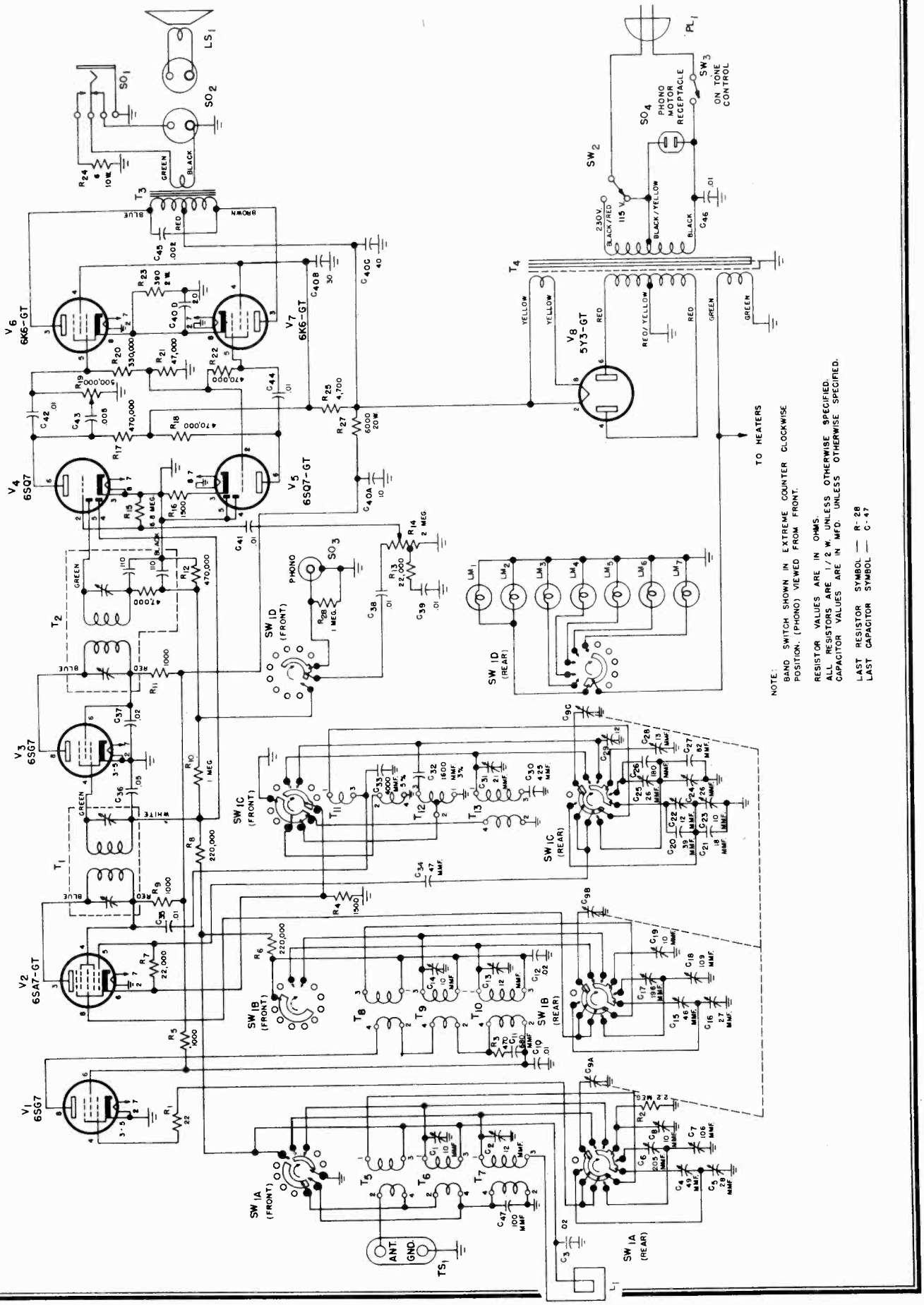


Illustration No.	Production Part No.	Service Part No.	Description
	ELECTRICAL PARTS		
	COILS AND TRANSFORMERS		
T-1	50C365		Transformer, 1st I.F.
T-2	50C364		Transformer, detector stage
T-3	55B098		Transformer, audio output
T-4	52C146		Transformer, power
T-5	51B959		Transformer, antenna stage, SW bands (B) (C) (D)
T-6,9	51B960		Transformer, antenna and mixer stages SW band A
T-7	51B1060		Transformer, antenna stage, BC band
T-8	51B961		Transformer, mixer stage, SW bands (B) (C) (D)
T-10	51B957		Transformer, mixer stage, BC band
T-11	51B964		Transformer, oscillator stage, SW bands (B) (C) (D)
T-12	51B963		Transformer, oscillator stage, SW band A
T-13	51B962		Transformer, oscillator stage, BC band
	CONDENSERS		
C-1,2,4,5,6,7,8, 13,14,15,16,17, 18,19	44B209		Trimmer assembly, 7 section, antenna stage and mixer stage
C-3,12,37	46AY203F	E203	.02 mfd. 600 V., tubular
C-9	48B183		Tuning condenser, 3 section
C-10,35,38,39, 41,42,44	46AZ103F	E103	.01 mfd. 600 V., tubular
C-11	CM20A681M	G681	680mmf. 500 V., mica
C-20	CM20A390K		39 mmf. 500 V., mica
C-21	CM20A180J		18 mmf. 500 V., mica
C-22,23,24,25, 28,29,30,31	44B208		Trimmer assembly, 8 section, oscillator stage
C-26	CM20A181J		180 mmf. 500 V., mica
C-27	CM20A820J		82 mmf. 500 V., mica
C-32	CM30C162G	G162	1600 mmf. 500 V., silver mica
C-33	CM35A402J	G402	4000 mmf. 500 V., mica
C-34	CM20A470M	G470	47 mmf. 500 V., mica
C-36	46AY503F	E503	.05 mfd. 600 V., tubular
C-40	45B112		40-30-10 mfd. 450 V., 20 mfd. 25 V., electrolytic
C-43	46AZ502J	E502	.005 mfd. 600 V., tubular
C-45	46AZ202J	E202	.002 mfd. 600 V., tubular
C-46	46AG103J		.01 mfd. 600 V., molded
C-47	CM20A101M	G101	100 mmf. 500 V., mica
	RESISTORS		
R-1	RC20AE220M	A220	22 ohms 1/2 watt, insulated
R-2	RC20AE225M	A225	2.2 megohms 1/2 watt, insulated
R-3	RC20AE471M	A471	470 ohms 1/2 watt, insulated
R-4,16	RC20AE152M	A152	1500 ohms 1/2 watt, insulated
R-5,9,11	RC20AE102M	A102	1000 ohms 1/2 watt, insulated
R-6,8	RC20AE224M	A224	220,000 ohms 1/2 watt, insulated
R-7,13	RC20AE223M	A223	22,000 ohms 1/2 watt, insulated
R-10,28	RC20AE105M	A105	1 megohm 1/2 watt, insulated
R-12,17,18,22	RC20AE474M	A474	470,000 ohms 1/2 watt, insulated
R-15	RC20AE685M	A685	6.8 megohms 1/2 watt, insulated
R-20	RC20AE334M	A334	330,000 ohms 1/2 watt, insulated
R-21	RC20AE473M	A473	47,000 ohms 1/2 watt, insulated
R-23	RC40AE391K	C391	390 ohms 2 watts, insulated
R-24	24BG060E		6 ohms 10 watts, WW
R-25	RC20AE472M	A472	4700 ohms 1/2 watt, insulated
R-27	24BH602E		6000 ohms 20 watts, WW
	TUBES AND RECTIFIER COMPLEMENT		
V-1,3	90X6SG7	5226	6SG7, antenna and 1st I.F.
V-2	90X6SA7GT	5223	6SA7GT, mixer
V-4	90X6SQ7	5231	6SQ7, detector and 1st audio amp.
V-5	90X6SQ7GT	5232	6SQ7GT, phase inverter
V-6,7	90X6K6GT	5196	6K6GT, power amp.
V-8	90X5Y3GT	5123	5Y3GT, rectifier
	MISCELLANEOUS ELECTRICAL PARTS		
R-14	25B621		Volume control
R-19	25B640		Tone control, includes power switch SW-3
SW-1	60C295		Band switch assembly
SW-2	60A228		Line voltage switch (SPDT)
LM-1,2,3,4,5,6,7	39A003	44	Lamp 6-8 V., 250 Ma., Mazda #44
PL-1	87A078		Line cord and plug
LS-1	85C074		Speaker, P.M.
	MECHANICAL PARTS		
	CHASSIS PARTS		
SO-1	36A036-1		Receptacle, headphone jack
SO-2	88A072		Receptacle, speaker
SO-3	36A029		Receptacle, phono
SO-4	10A015	1217633	Receptacle, phono motor
	6A256		Socket, octal (tube)
	86A054		Socket, dial light (General illumination)
	86A055		Socket, dial light (Individual bands)
TS-1	88A327		Terminal strip, antenna
	76A299	1217671	Lock, line cord
	38A001		Cable, dial drive
	75A012	1217624	Spring, dial drive
	67B727		Rail, pointer
	82A135		Pointer
	63C325-1		Plate, dial
	69B188		Shield, light
	83C336		Dial scale
	5A006		Trimount stud (dial scale mtg)
	15B068-3		Knob

SUBJECT: SERVICE INSTRUCTIONS - BUICK MODEL 980851

GENERAL

MOUNTING—All 1949 Buick Cars.

TUBES—Six, Plus Rectifier.

SPEAKER—8" Round, Permanent Magnet.

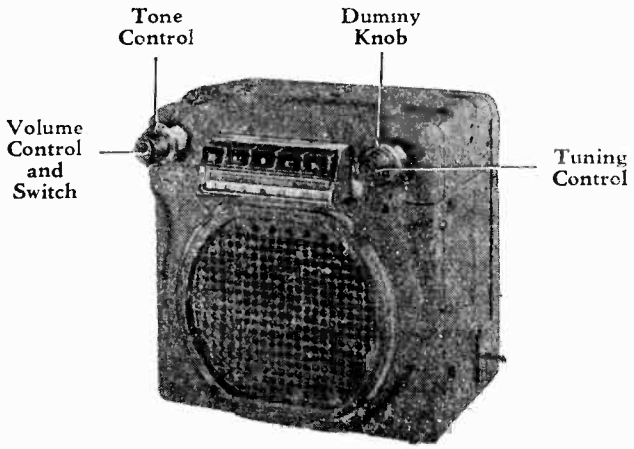
TUNING—Manual and 5 P. B. Mechanical.

ANTENNA TRIMMER COMPENSATION—For Antennas Between 0.000052 — 0.000068 Mfd.

TUNING RANGE—550-1600 KC.

PUSH BUTTON SETUP PROCEDURE

Pull Push Button to the left and out. Tune in desired station manually. Push button all the way in.



MODEL 980851

ALIGNMENT PROCEDURE

Output Meter Connections	Across Voice Coil
Generator Return	To Receiver Chassis
Dummy Antenna	In Series With Generator
Volume Control Position	Maximum Volume
Tone Control Position	Treble
Generator Output	Minimum for Readable Indication

Steps	Series Condenser or Dummy Antenna	Connect Signal Generator to	Signal Generator Frequency	Tune Receiver to	Adjust in Sequence For Max. Output
1	0.1 Mfd.	6SA7 Grid (Pin #8)	260 KC	High Frequency Stop	A, B, C, D
2	0.000056 Mfd.	Antenna Connector	1615 KC	High Frequency Stop	*E, F, G
3	0.000056 Mfd.	Antenna Connector	1000 KC	Signal Generator Signal	J, K
4	0.000056 Mfd.	Antenna Connector	1615 KC	High Frequency Stop	F, G
5	0.000056 Mfd.	Antenna Connector	1000 KC	Signal Generator Signal	L**

*Before making this adjustment check mechanical setting of oscillator core "H." The rear of the core should be 1 25/32" from the mounting end of the coil form. (This measurement is readily made by inserting a suitable plug in the mounting end of the coil form.) Core adjustments should be made with an insulated screw driver, and core studs should be cemented in place with glyptal or household cement after alignment.

**L is the pointer adjustment screw which is on the connecting link, between the pointer assembly and the parallel guide bar. It should be adjusted so that the dial pointer corresponds with the 1000 KC mark on the dial. (On first "0" of "100.")

With the radio installed and the car antenna plugged in adjust the antenna trimmer "G" for maximum volume with the radio tuned to a weak station near 1400 KC (see sticker on case).

MODELS 980851,980868

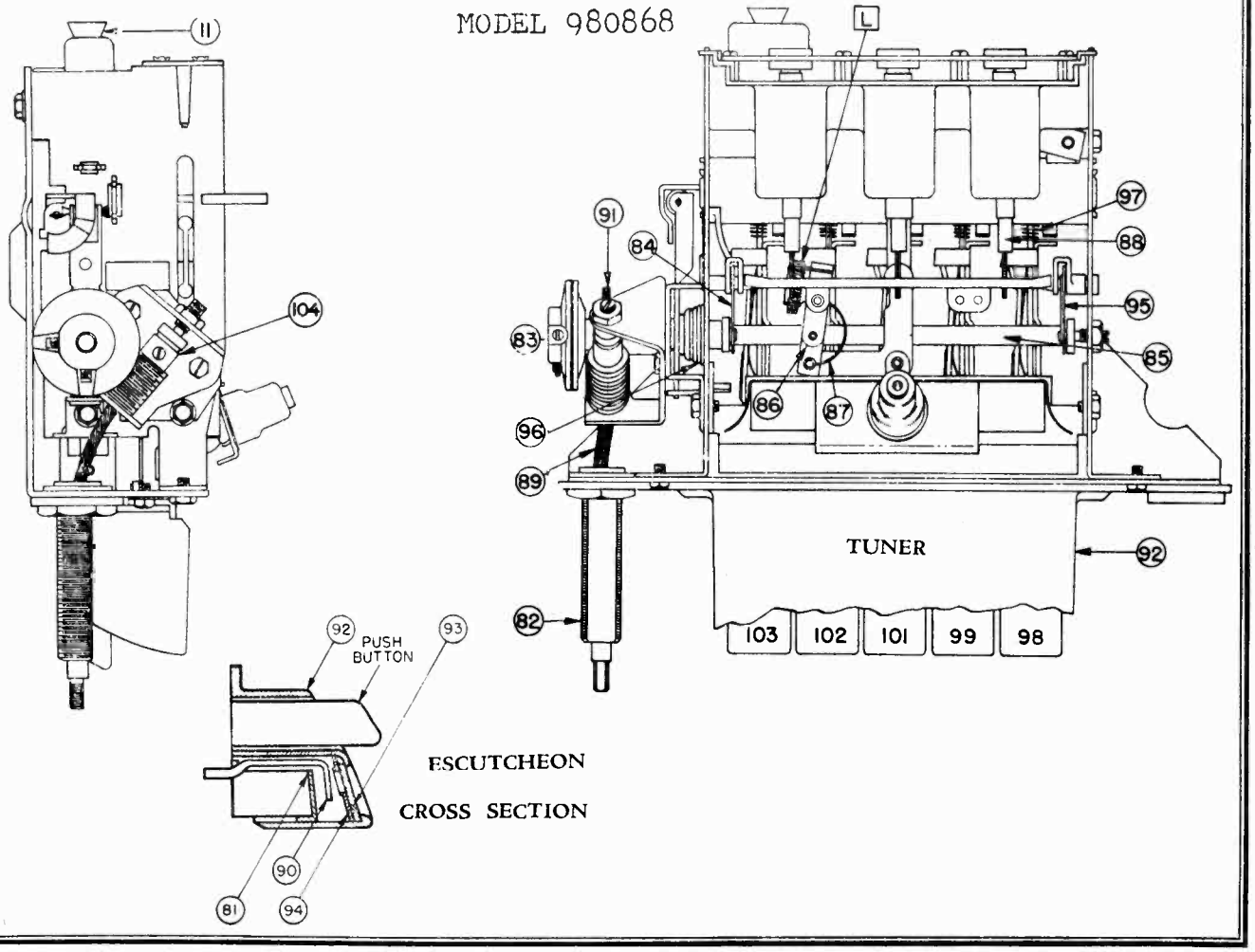
MODEL 980851

NOTE: This set is identical to the Buick Model 980868 covered in Bulletin 6D-928 except for the following Service Parts:

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
60	7256847	7256847	Control - Volume Tone and Switch
81	7257606	7257606	Backplate - Pointer
82	7256874	7256874	Bushing - Manual Drive
89	7256871	7256871	Drive Shaft - Manual
90	7256861	7256861	Pointer Assembly
92	7256883	7256883	Escutcheon Assy.
98	1219150	1219150	Push Button and Slide Assy. "B"
99	1219151	1219151	Push Button and Slide Assy. "U"
101	1219152	1219152	Push Button and Slide Assy. "I"
102	1219153	1219153	Push Button and Slide Assy. "C"
103	1219154	1219154	Push Button and Slide Assy. "K"
	1334393	1334393	Knob - Control
	1320577	1320577	Knob - Dummy
	1320576	1320576	Knob - Tone Control

MODEL 980868



SUBJECT: SERVICE INSTRUCTIONS - BUICK MODEL 980868

GENERAL

MOUNTING—All 1950 Buick Cars.

TUBES—Six, Plus Rectifier.

SPEAKER—8" Round, Permanent Magnet.

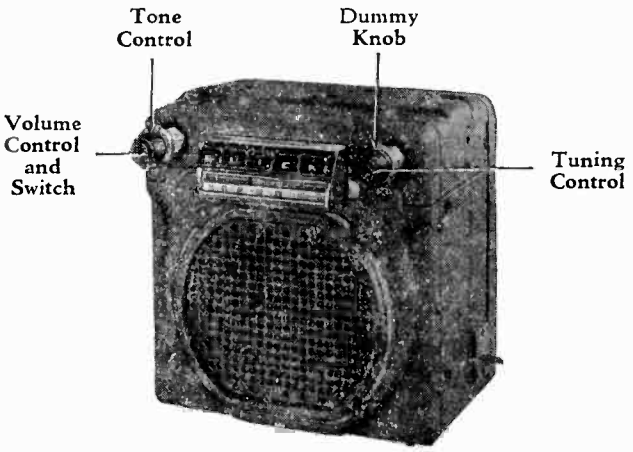
TUNING—Manual and 5 P. B. Mechanical.

ANTENNA TRIMMER COMPENSATION—For Antennas Between 0.000072 - 0.000088 Mfd.

TUNING RANGE—550-1600 KC.

PUSH BUTTON SETUP PROCEDURE

Pull Push Button to the left and out. Tune in desired station manually. Push button all the way in.



MODEL 980868

ALIGNMENT PROCEDURE

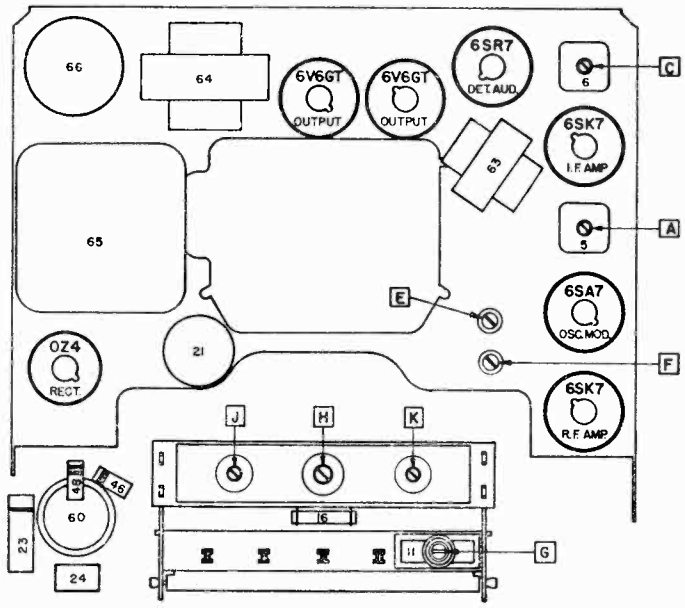
Output Meter Connections ..... Across Voice Coil
Generator Return ..... To Receiver Chassis
Dummy Antenna ..... In Series With Generator
Volume Control Position ..... Maximum Volume
Tone Control Position ..... Treble
Generator Output ..... Minimum for Readable Indication

Steps	Series Condenser or Dummy Antenna	Connect Signal Generator to	Signal Generator Frequency	Tune Receiver to	Adjust in Sequence For Max. Output
1	0.1 Mfd.	6SA7 Grid (Pin #8)	260 KC	High Frequency Stop	A, B, C, D
2	0.000082 Mfd.	Antenna Connector	1615 KC	High Frequency Stop	*E, F, G
3	0.000082 Mfd.	Antenna Connector	1000 KC	Signal Generator Signal	J, K
4	0.000082 Mfd.	Antenna Connector	1615 KC	High Frequency Stop	F, G
5	0.000082 Mfd.	Antenna Connector	1000 KC	Signal Generator Signal	L**

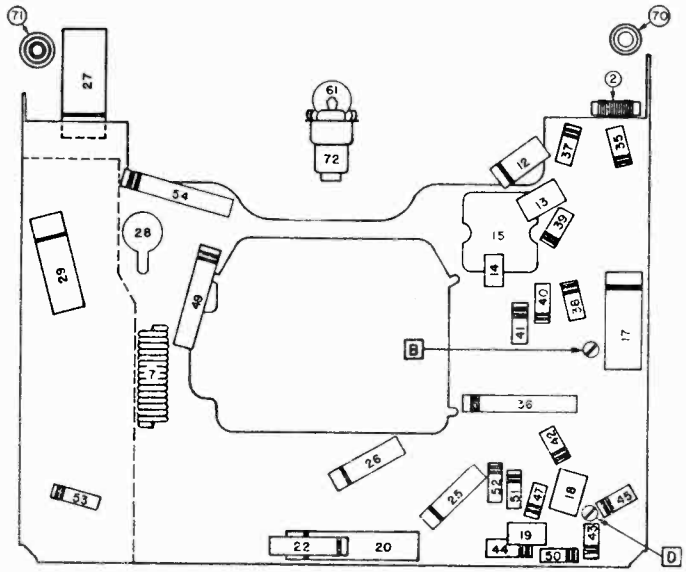
*Before making this adjustment check mechanical setting of oscillator core "H." The rear of the core should be 1 25/32" from the mounting end of the coil form. (This measurement is readily made by inserting a suitable plug in the mounting end of the coil form.) Core adjustments should be made with an insulated screw driver, and core studs should be cemented in place with glyptal or household cement after alignment.

**L is the pointer adjustment screw which is on the connecting link, between the pointer assembly and the parallel guide bar. It should be adjusted so that the dial pointer corresponds with the 1000 KC mark on the dial. (On first "0" of "100.")

With the radio installed and the car antenna plugged in adjust the antenna trimmer "G" for maximum volume with the radio tuned to a weak station near 1400 KC (see sticker on case).



PARTS LAYOUT — TUBE VIEW

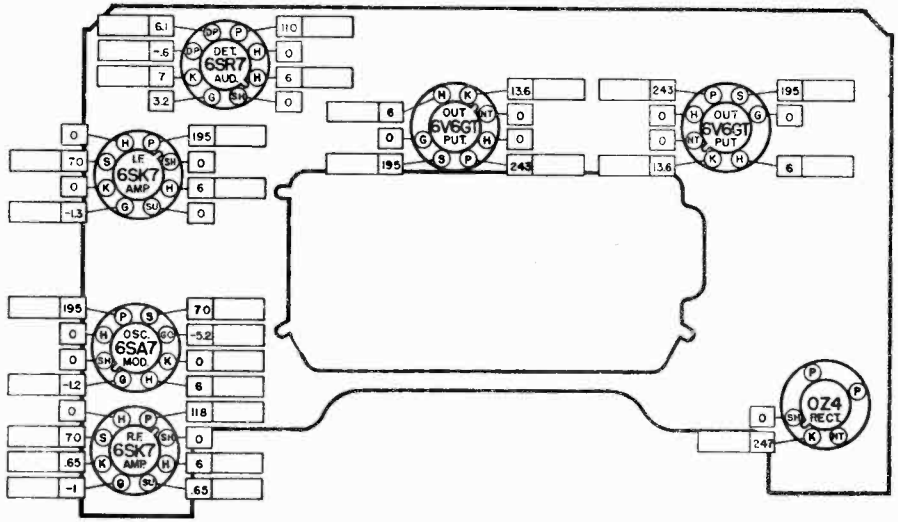


PARTS LAYOUT — CHASSIS VIEW

TUBE SOCKET VOLTAGE CHART

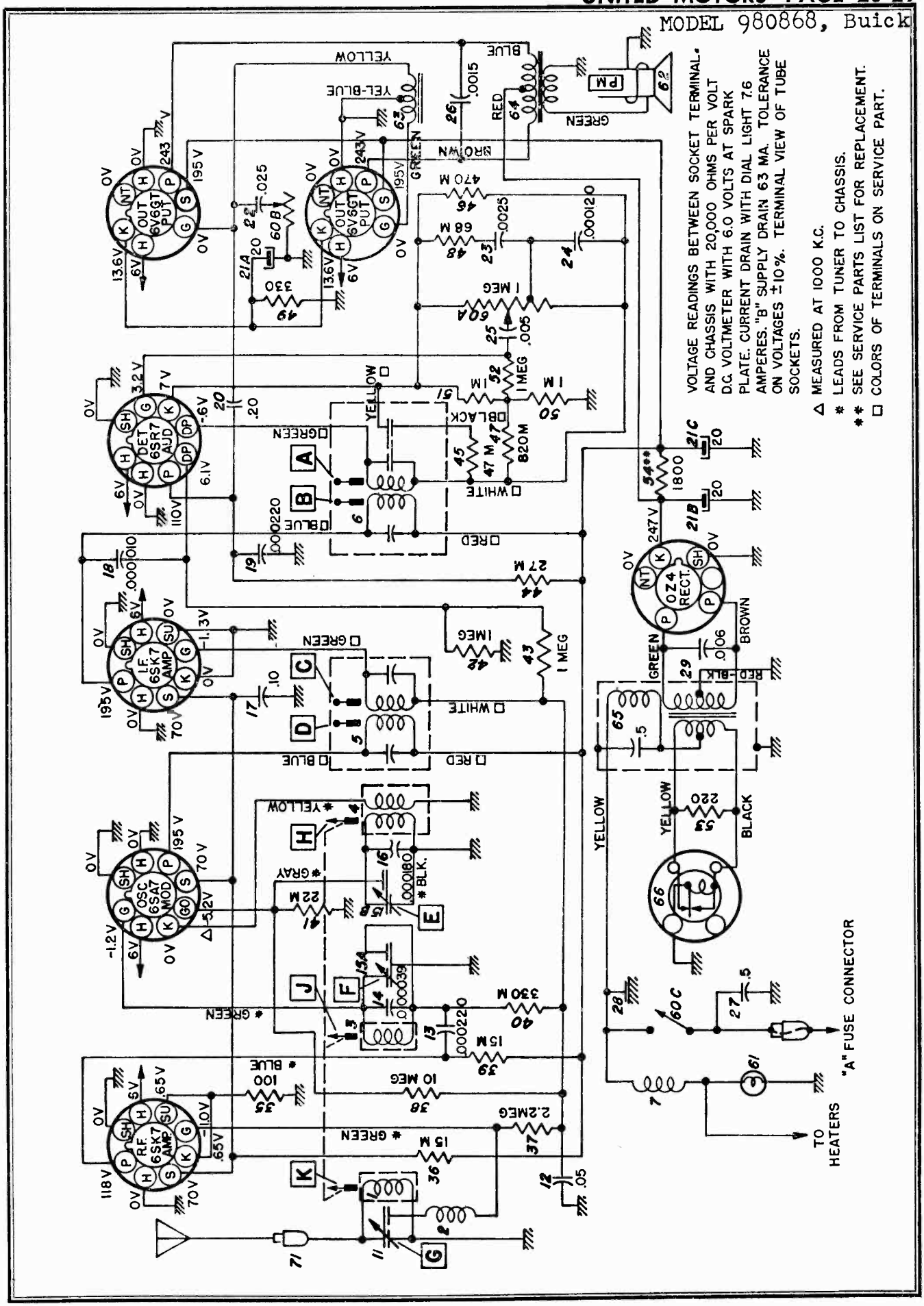
The tube socket voltages, as measured at the factory and under the conditions shown on the schematic diagram on Page 3 are shown.

The blank spaces are provided so the service man may fill in the actual voltage readings as taken with his own equipment. A normal operating radio should be used for these measurements.



VOLT METER RESISTANCE _____ OHMS PER VOLT. READINGS TAKEN WITH _____ VOLTS AT SPARK PLATE. VOLTAGES MEASURED FROM SOCKET TERMINALS TO CHASSIS AND ARE POSITIVE UNLESS MARKED OTHERWISE.

MODEL 980868, Buick



MODEL 980868, Buick

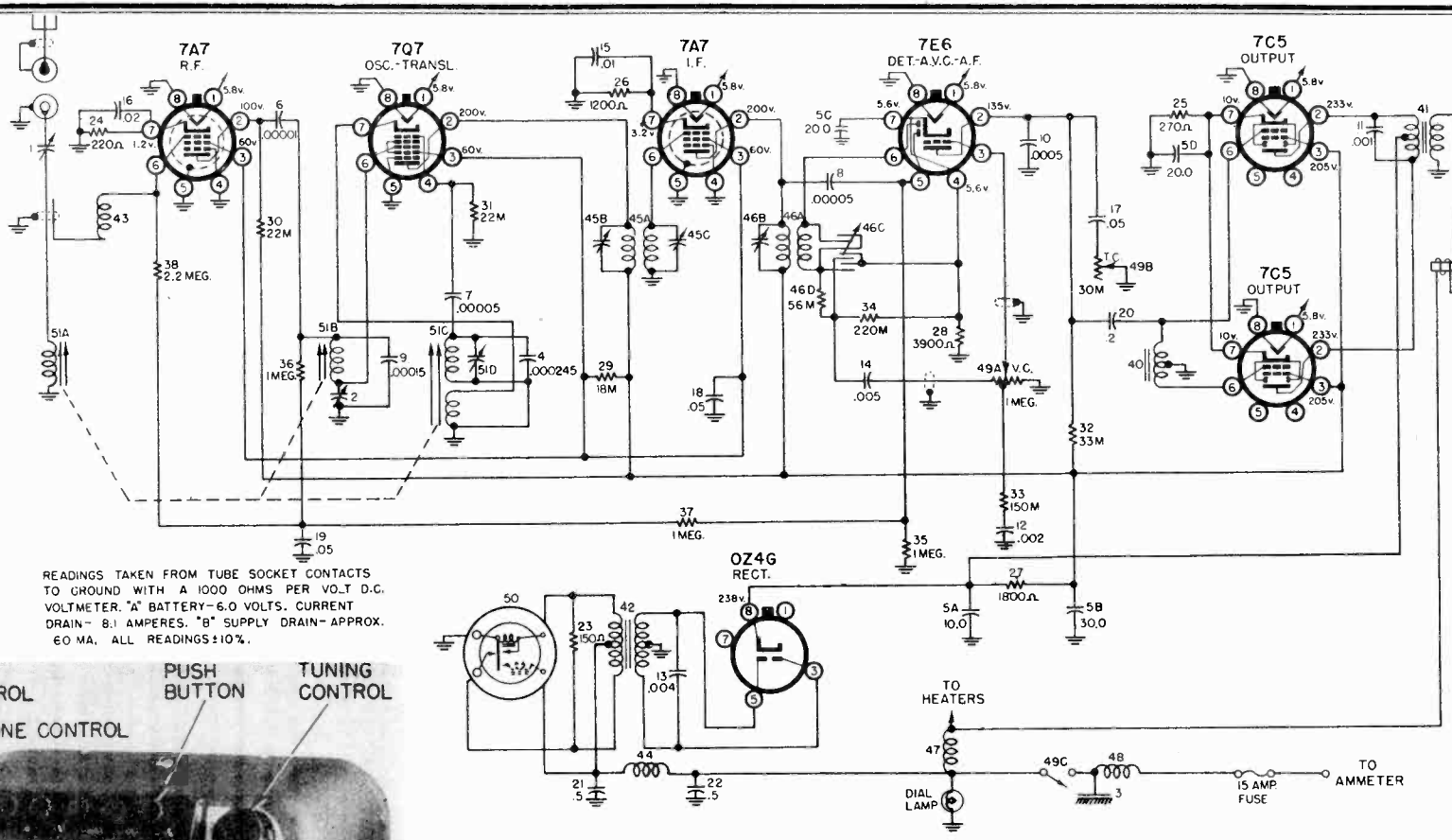
SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			COILS
1	7258914	7258914	Antenna
2	7240251	7240251	Antenna Spark Choke
3	7258914	7258914	R.F.
4	7258911	7258911	Oscillator
5	1219508	1219508	1st I.F.
6	1219509	1219509	2nd I.F.
7	1217846	1217846	"A" Spark Choke
			CONDENSERS
11	7258733	7258733	Antenna Trimmer
12	7236842	E 503	.05 mfd. 200 Volt Tubular
13	7238792	G 221	.000220 mfd Mica
14	7258221	G 390	.000039 mfd Ceramic
15	7242454	7242454	Dual Trimmer
15A			R.F. Section
15B			Oscillator Section
16	7257424	G 181	.000180 mfd Ceramic
17	7238788	E 104	.1 mfd 400 Volt Tubular
18	1215189	G 100	.000010 mfd Mica
19	7238792	G 221	.000220 mfd Mica
20	7240579	E 204	.2 mfd 400 Volt Tubular
21	7240724	M 908	Electrolytic
21A			20 mfd 25 Volt
21B			20 mfd 400 Volt
21C			20 mfd 400 Volt
22	1211232	1211232	.025 mfd 400 Volt Tubular
23	7240578	7240578	.002500 mfd 400 Volt Tubular
24	7240577	G 121	.000120 mfd Mica
25	7232956	E 502	.005 mfd 600 Volt Tubular
26	7236134	7236134	.001500 mfd 800 Volt Tubular
27	7236621	E 504	.5 mfd 200 Volt Tubular
28	1217848	1217848	Chassis Plate Condenser
29	7240906	H 602	.006 mfd 1600 Volt Tubular
			RESISTORS
35	1213217	A 101	100 ohms ½ Watt Insulated
36	7233653	C 153	15,000 ohms 2 Watt Insulated
37	1211147	A 225	2.2 Megohms ½ Watt Insulated
38	1215564	A 106	10 Megohms ½ Watt Insulated
39	7237595	B 153	15,000 ohms 1 Watt Insulated
40	7240732	A 334	330,000 ohms ½ Watt Insulated
41	1211192	A 223	22,000 ohms ½ Watt Insulated
42	7238873	A 105	1 Megohm ½ Watt Insulated
43	7238873	A 105	1 Megohm ½ Watt Insulated
44	7236080	B 273	27,000 ohms 1 Watt Insulated
45	7240731	A 473	47,000 ohms ½ Watt Insulated
46	1214559	A 474	470,000 ohms ½ Watt Insulated
47	1214561	A 824	820,000 ohms ½ Watt Insulated
48	1213844	A 683	68,000 ohms ½ Watt Insulated
49	1214572	C 331	330 ohms 2 Watt Insulated
50	1213235	A 102	1,000 ohms ½ Watt Insulated
51	1213235	A 102	1,000 ohms ½ Watt Insulated
52	7238873	A 105	1 Megohm ½ Watt Insulated
53	7237994	B 221	220 ohms 1 Watt Insulated
54	1214573	(C 272	1800 ohms { Replace with 2700 ohms 2 W
		B 562)	2 Watt { and 5600 ohms 1 W in parallel
			TUBES
	1211924	5003	OZ4
	7237751	5229	6SK7
	7237752	5222	6SA7
	1218107	5233	6SR7
	1213793	5241	6V6

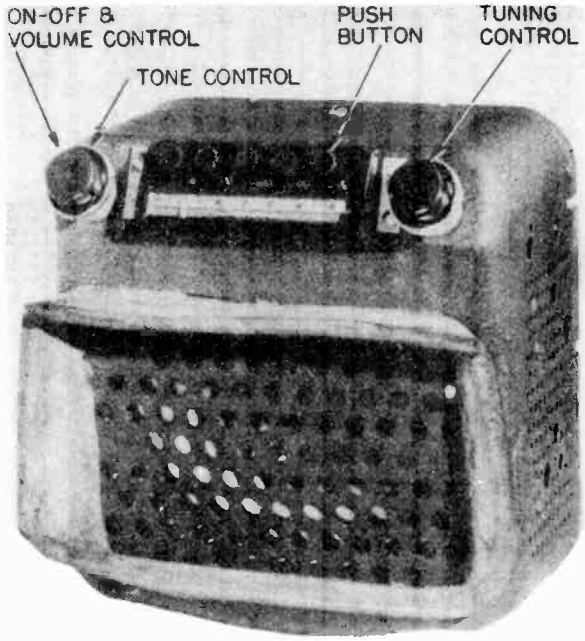
SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			MISCELLANEOUS ELECTRICAL
60	7258683	7258683	Control-Volume-Tone and Switch
60A			Volume Control
60B			Tone Control
60C			Switch
61	125588	55	Lamp - Dial Light
62	7255895	7255895	Speaker - 8" Round PM
63	7258941	7258941	Transformer - Input
64	7258945	7258945	Transformer - Output
65	7258941	6060	Transformer - Power
66	7239124	8542	Vibrator - Non-Synchronous
			MECHANICAL PARTS
70	7242034	7242034	Connector - "A" Lead
71	7242035	7242035	Connector - Antenna
72	1219547	1219547	Socket - Dial Light
73	7236279	7236279	Socket - Octal Tube
74	7239125	7239125	Socket - Vibrator
			TUNER
81	7258679	7258679	Backplate - Pointer
82	7258675	7258675	Bushing - Manual Drive
83	7258072	7258072	Clutch Disc - Driven
84	7258203	7258203	Connecting Link - Core Bar
85	7258211	7258211	Core Guide Bar - Parallel
86	7256271	7256271	Pointer Connecting Link
87	7255992	7255992	Spring - Pointer Connecting Iink
88	7258468	7258468	Core - Powdered Iron
89	7258673	7258673	Drive Shaft - Manual
90	7258678	7258678	Pointer Assembly
	1219093	1219093	Pointer Tip Package
91	7256102	7256102	Gear and Bushing - Clutch
92	7258676	7258676	Escutcheon Assy.
93	7256885	7256885	Dial
94	7256886	7256886	Dial Backplate
95	7257415	7257415	Spring - Core Bar Connecting Link
96	7258756	7258756	Spring - Clutch
97	7255984	7255984	Spring - Slide Return
98	1219455	1219455	Push Button and Slide Assy. "B"
99	1219456	1219456	Push Button and Slide Assy. "U"
101	1219457	1219457	Push Button and Slide Assy. "I"
102	1219458	1219458	Push Button and Slide Assy. "C"
103	1219459	1219459	Push Button and Slide Assy. "K"
	1219124	1219124	Push Button Insert "B"
	1219125	1219125	Push Button Insert "U"
	1219126	1219126	Push Button Insert "I"
	1219127	1219127	Push Button Insert "C"
	1219128	1219128	Push Button Insert "K"
104	7256866	7256866	Worm Gear and Bracket Assy.
			INSTALLATION PARTS
	1321178	1321178	"A" Lead and Fuse Connector
	1336763	6015	Condenser - Generator
	1910147	6015	Condenser - Ignition Coil
	120151	120151	Fuse - 15 Amps
	1341566	1341566	Knob - Control
	1341535	1341535	Knob - Dummy
	1341536	1341536	Knob - Tone Control
	1853686	6008	Suppressor Adaptor
	1207820	6001	Suppressor - Distributor

MODEL 982375,
Above Ser. No. 700C001,
Oldsmobile



READINGS TAKEN FROM TUBE SOCKET CONTACTS TO GROUND WITH A 1000 OHMS PER VOLT D.C. VOLTMETER. "A" BATTERY-6.0 VOLTS. CURRENT DRAIN- 8.1 AMPERES. "B" SUPPLY DRAIN- APPROX. 60 MA. ALL READINGS ±10%.



SCHEMATIC DIAGRAM-MODEL 982375 ABOVE SERIAL NO. 700C001

GENERAL

MOUNTING — All 1946 — 1947 Oldsmobile Cars

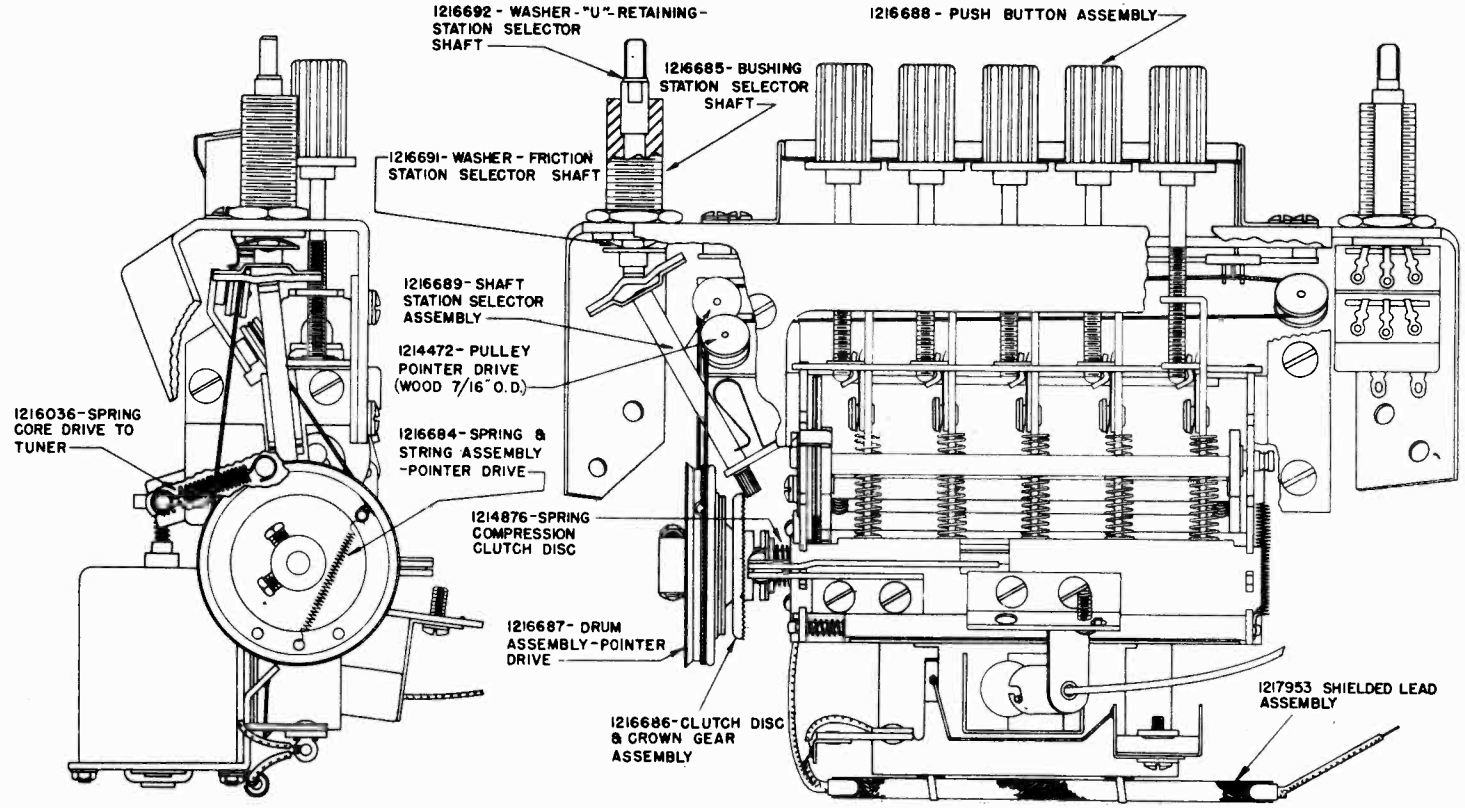
TUNING — Manual and 5 P. B.

TUBES — 7A7, 7Q7, 7A7, 7E6, 7C5, 7C5, OZ4G

TUNING RANGE — 540 KC — 1610 KC

SPEAKER — 6" x 9" Elliptical

CAR ANTENNA CAPACITY — 65 mmfd.



TUNER UNIT

ALIGNMENT PROCEDURE

Volume Control maximum.
Tone Control on high position.
Signal Generator Output minimum for satisfactory output indication.

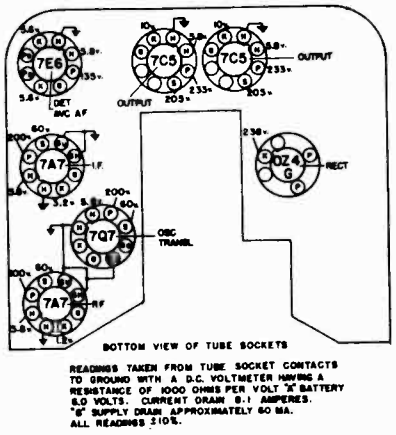
Series Capacitor Or Dummy Antenna	Connect To	Signal Generator Frequency	Adjust Screws In Order
0.1 mfd.	Terminal X (See Parts Layout)	257.5 KC	A, B, C, D
.000065 mfd.	Antenna Terminal	1610 KC	E, F, G

Low frequency alignment not required.
Adjust Trimmer F to match car antenna (1400 KC) when radio is installed.

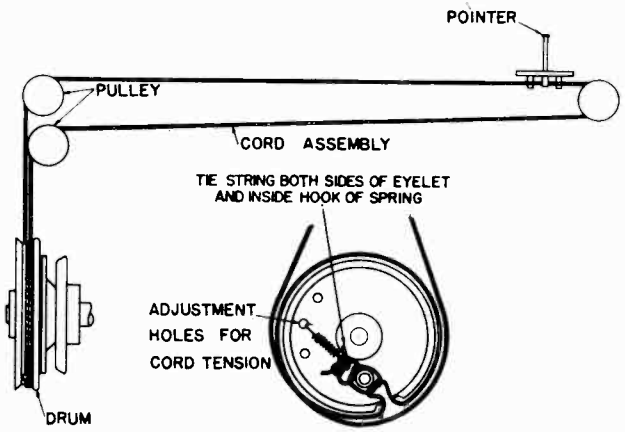
PUSH BUTTON SET-UP

Turn counter clockwise - tune in manually - depress loosened button - turn button clockwise to tighten.

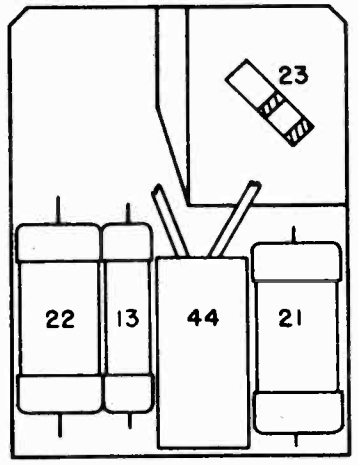
MODEL 982375,
Above Ser. No. 700C001,
Oldsmobile



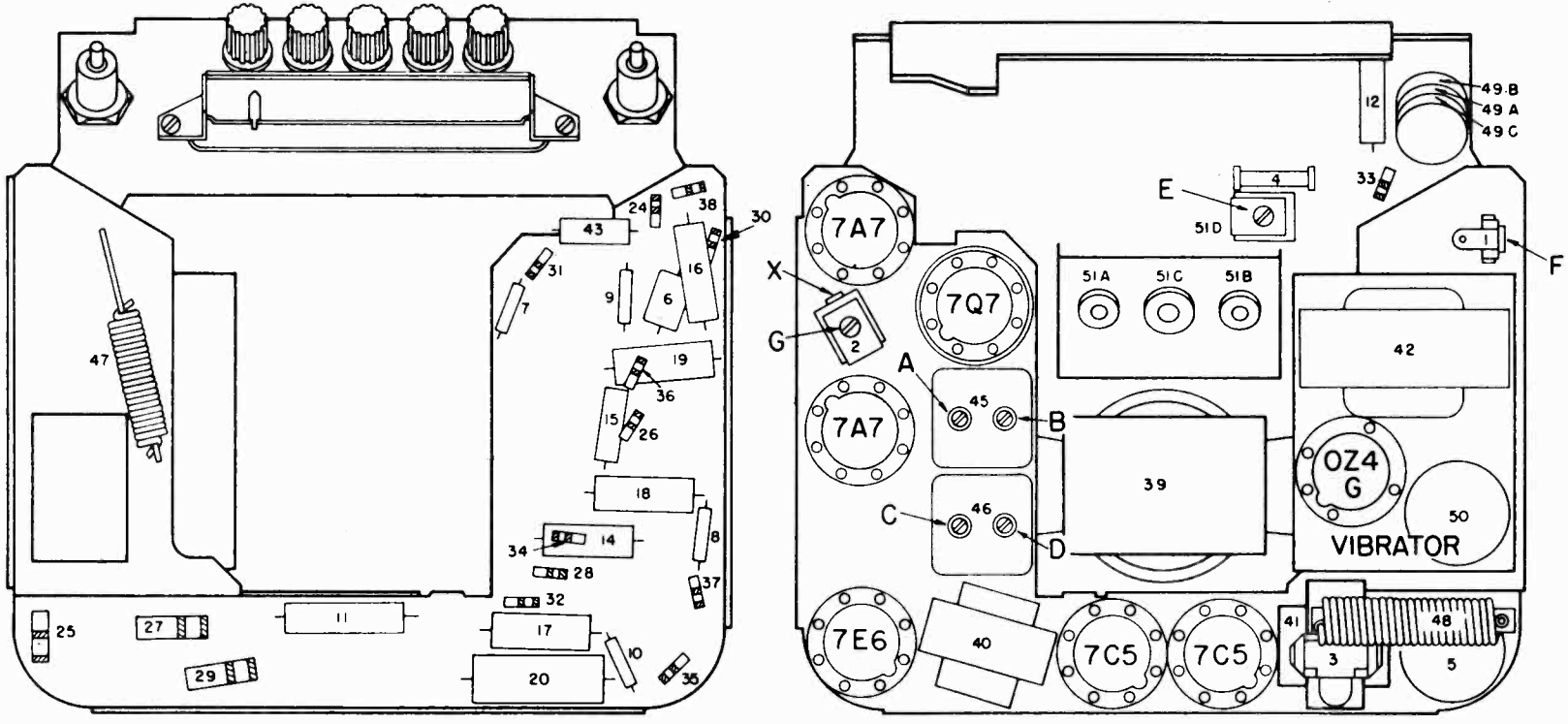
SOCKET VOLTAGES



DIAL CORD HOOKUP



POWER PACK LAYOUT



PARTS LAYOUT

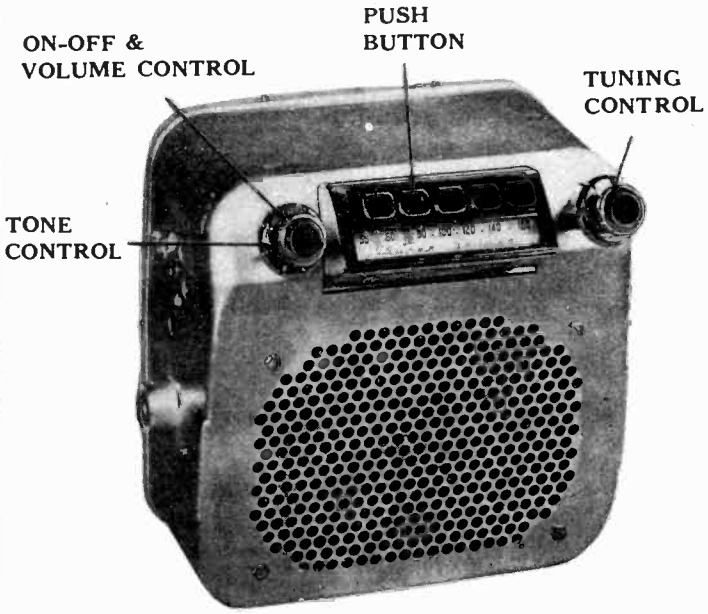
MODEL 982375, Above Ser. No. 700C001. Oldsmobile

Illus. No.	Service * Part No.	Production Part No.	Description
			CAPACITORS
1		1216671	Antenna Trimmer Capacitor
2		1216672	R. F. Trimmer Capacitor
3		1212278	Spark Capacitor
4		1217522	.000245 Mfd. Compensating
5		1214417	Electrolytic
5A			10 Mfd. 350 Volt
5B			30 Mfd. 300 Volt
5C			20 Mfd. 25 Volt
5D			20 Mfd. 25 Volt
6	G100	1215189	.00001 Mfd. Moulded
7	G470	1207625	.00005 Mfd. Moulded
8	G470	1207625	.00005 Mfd. Moulded
9	G151	7230893	.00015 Mfd. Moulded
10	G471	7238879	.0005 Mfd. Moulded
11	E102	7239188	.001 Mfd. 600 Volt
12	E202	7237954	.002 Mfd. 600 Volt
13	E402	1217875	.004 Mfd. 1500 Volt
14	E502	7230912	.005 Mfd. 600 Volt
15	E103	1208600	.01 Mfd. 600 Volt
16	E203	7233770	.02 Mfd. 600 Volt
17	E503	7230592	.05 Mfd. 600 Volt
18	E503	7230592	.05 Mfd. 600 Volt
19	E503	7230592	.05 Mfd. 600 Volt
20	E204	1217876	.2 Mfd. 200 Volt
21		7236621	.5 Mfd. 100 Volt
22		7236621	.5 Mfd. 100 Volt
			RESISTORS
23	B151	1211005e	150 Ohm 1 Watt
24	A221	7237835	220 Ohm 1/2 Watt
25	B271	1213846	270 Ohm 1 Watt
26	B122	1211040	1200 Ohm 1 Watt
27	C182	1214573	1800 Ohm 2 Watt
28	A392	1214546	3900 Ohm 1/2 Watt
29	C183	7239157	18,000 Ohm 2 Watt
30	A223	1214550	22,000 Ohm 1/2 Watt
31	A223	1214550	22,000 Ohm 1/2 Watt
32	A333	1213845	33,000 Ohm 1/2 Watt
33	A154	1213272	150,000 Ohm 1/2 Watt
34	A224	1214555	220,000 Ohm 1/2 Watt
35	A105	7238873	1 Megohm 1/2 Watt
36	A105	7238873	1 Megohm 1/2 Watt
37	A105	7238873	1 Megohm 1/2 Watt
38	A225	1211147	2.2 Megohm 1/2 Watt
			MISCELLANEOUS ELECTRICAL PARTS
39		1216674	Speaker - 6" x 9" Elliptical Electro-Dynamic
39		1217874	Speaker - 6" x 9" Elliptical Permanent-Dynamic
40		1214405	Transformer - Audio Input
41		1216675	Transformer - Audio Output
42		1214411	Transformer - Power
43		1214382	Antenna Choke
44		1213663	Hash Choke
			MOUNTING AND INSTALLATION PARTS
	414997		Washer - Flat 33/64" I. D.
	419522		Nut - 1/2 - 28 Hex
	419512		Washer - Rubber - 9/32" I. D. (Anti-Rattle) Dummy Control
	419511		Washer - Felt - 9/32" I. D. (Anti-Rattle) Tone Control
	419509		Knob - Tone & Dummy
	1562090		Washer - Felt 3/16" I. D. (Anti-Rattle) Tuning & Volume Control
	419499		Knob (Tuning & Volume Control) Includes Set Screw
	419497		Bracket - Receiver Mounting
	121797		Bolt - 1/4-20 x 3/8" Long - Hex Head
	419498		Bolt - 1/4-20 x 1/2" Long - Wing Head
	120386		Washer - Lock (Internal Tooth)
	103319		Washer - Lock 1/4" (Split)
	415640		"A" Lead Connector and Filter Capacitor Assembly
	120151		Fuse - "A" Lead 15 Amp. 25 Volt
	1845913		Tube - Fuse Insulator
6015	1866865		Capacitor - Generator - .5 Mfd.
6000	1207821		Distributor Suppressor - 15,000 Ohm
6008	1853686		Distributor Suppressor Adaptor
6013	415823		Static Collector (Front Wheel)

Illus. No.	Service * Part No.	Production Part No.	Description
			MISCELLANEOUS ELECTRIC PARTS - Continued
45		1217955	1st I. F. Transformer Assy.
45A			I. F. Coil Assembly
45B			Primary Trimmer
45C			Secondary Trimmer
46		1217956	2nd I. F. Transformer Assy.
46A			I. F. Coil Assembly
46B			Primary Trimmer
46C			Secondary Trimmer
46D			Resistor 68,000 Ohm
47		1216668	Filament Choke
48		1216669	Spark Choke Assembly
49		1216673	Control - Volume - Tone - On-Off Switch
49A			Volume Control 1 Megohm
49B			Tone Control 30,000 Ohm
49C			On-Off Switch
50		8638	Vibrator
			TUNER UNIT & PARTS
51		1216665	Unit - Perm Tuning Coils
51A			Antenna Coil
51B			R. F. Coil
51C			Osc. Coil
51D			Osc. Trimmer
		1216685	Bushing - Station Selector Shaft
		1217953	Lead Assembly - Shielded
		1214472	Pulley - Pointer Drive, Wood 7/16" O. D.
		1216689	Shaft - Station Selector Assy. (Includes Coupling & Pinion Gear)
		1216036	Spring - Core Drive to Tuner
		1216684	Spring & String Assembly
		1216691	Washer Friction - Station Selector Shaft
		1216692	Washer - "U" Retaining - Station Selector Shaft
		1216690	Tuner Unit Assembly
		1216688	Button Assembly - Push
		1216686	Clutch Disc & Crown Gear Assy.
		1216687	Drum - Pointer Drive Assy.
		1214876	Spring - Compression - Clutch Disc
			TUBES
	5290	1213583	7A7 - R. F. Amplifier
	5301	1213853	7Q7 - Oscillator - Translator
	5290	1213583	7A7 - I. F. Amplifier
	5298	1213582	7B6 - Detector AVC - 1st Audio
	5295	1213586	7C5 - Audio Output
	5295	1213586	7C5 - Audio Output
	5004	7231596	0Z4G - Rectifier
			MISCELLANEOUS CHASSIS PARTS
		1213684	Socket - Vibrator
		7238455	Socket - Tube, 8 Prong Lock-in
		1214420	Socket - Tube, 4 Prong Octal
		1216683	Socket Assembly - Pilot Light
		125588	Lamp #55 Mazda - Pilot Lamp
		1216676	Clip - Dial Retaining - L. H.
		1216677	Clip - Dial Retaining - R. H.
		1216678	Cover - Case Back
		1217954	Cover Assy. - Power Supply
		1216679	Dial Glass - Calibrated
		1216680	Escutcheon - Including Dial
		1216681	Gasket - Rubber - Speaker Seal
		1216682	Pointer - Dial
		1216684	String Assembly - Pointer Drive

* Order parts, using service part number where shown, otherwise use production part number for service.

MODEL 982420, Oldsmobile,
Starting with Serial No.
B59-40001



MODEL 982420

(Starting with serial number B59-40001).

PUSHBUTTON SET-UP

Pull pushbutton to the left and then out. Tune in desired station manually. Push button all the way in.

GENERAL

MOUNTING ... All 1949 Oldsmobile Cars

TUBES ... Six, Plus Rectifier

SPEAKER ...
6" x 9" Elliptical Permanent Magnetic

TUNING ... Manual and 5 P.B. Mechanical

ANTENNA TRIMMER COMPENSATION—For Antennas between
0.000055—0.000090 Mfd.

TUNING RANGE ... 535 - 1610 KC.

ALIGNMENT PROCEDURE

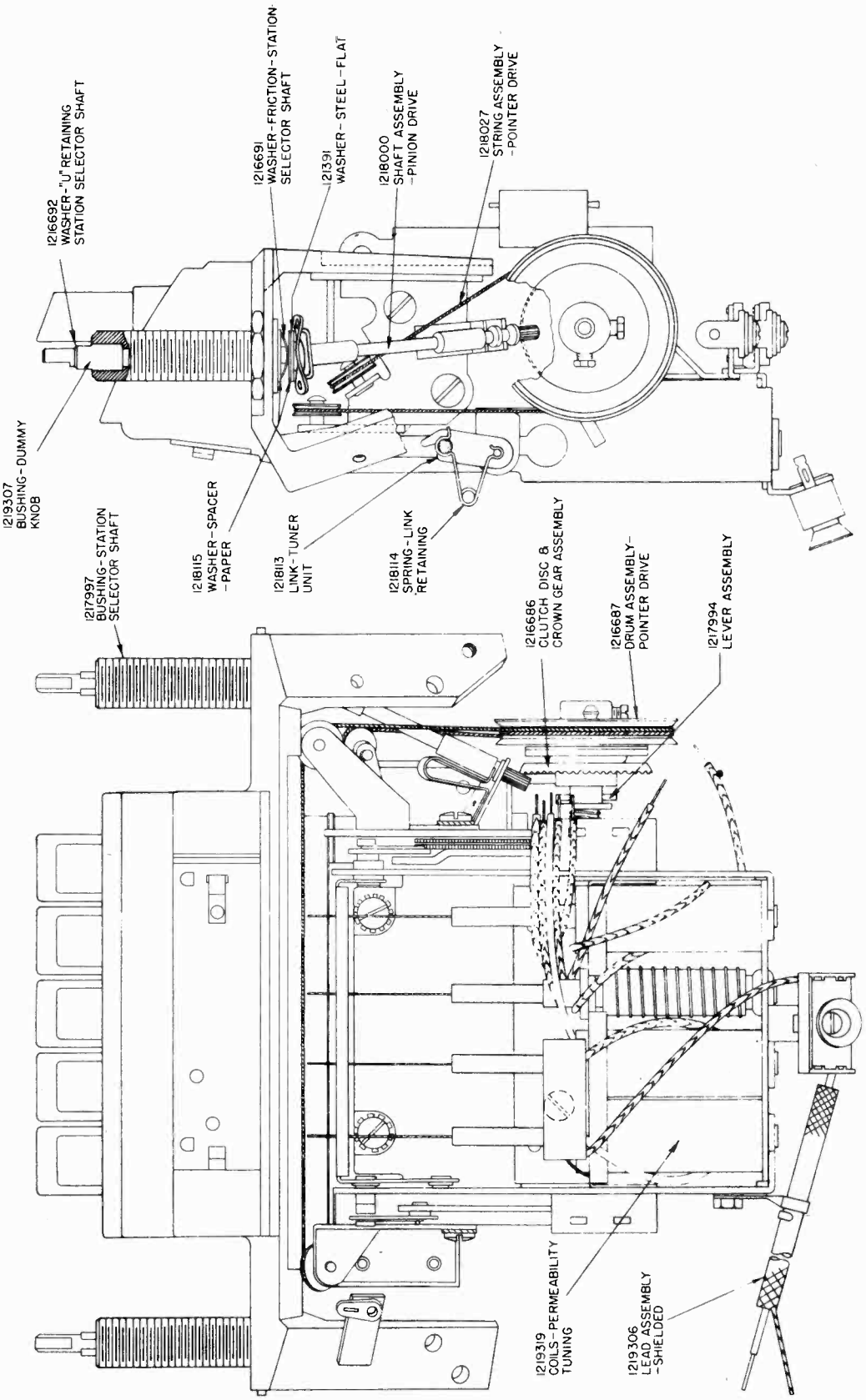
Output Meter Connection ... Across Voice Coil
Generator Return ... To Receiver Chassis
Dummy Antenna ... In Series with Generator
Volume Control Position ... Maximum Volume
Tone Control Position ... Treble
Generator Output ... Minimum for Readable Indication

Steps	Series Condenser or Dummy Antenna	Connect to	Signal Generator Frequency	Tune Receiver To	Adjust In Sequence For Max. Output
1	0.1 Mfd.	7Q7 Grid (Pin #6)	257.5 KC.	High Frequency Stop	A, B, C, D
2	0.000070 Mfd.	Antenna Connector	1610 KC.	High Frequency Stop	E, F, G, H

Low frequency alignment not required.

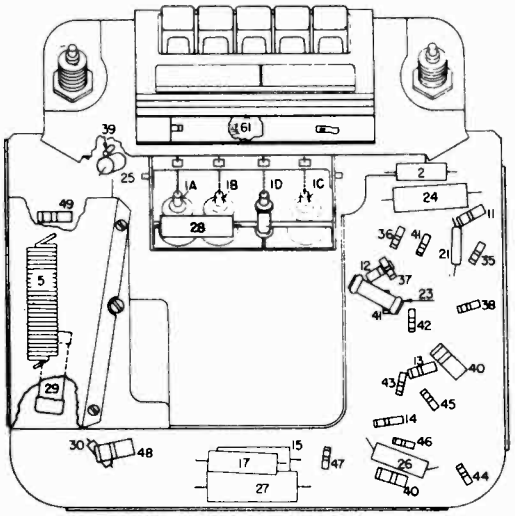
With the radio installed, and the car antenna plugged in, adjust the antenna trimmer "H" for maximum volume with the radio tuned in to a weak station near 1400 KC.

MODEL 982420, Oldsmobile,
Starting with Serial No.
B59-40001

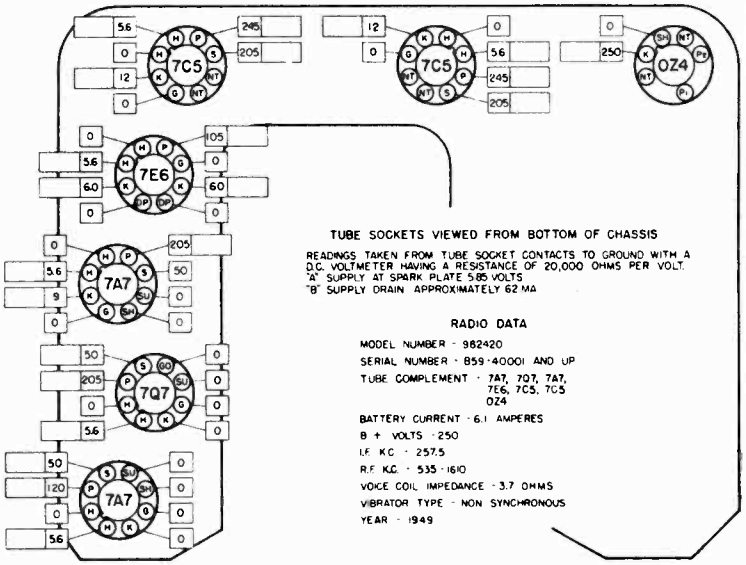


TUNER

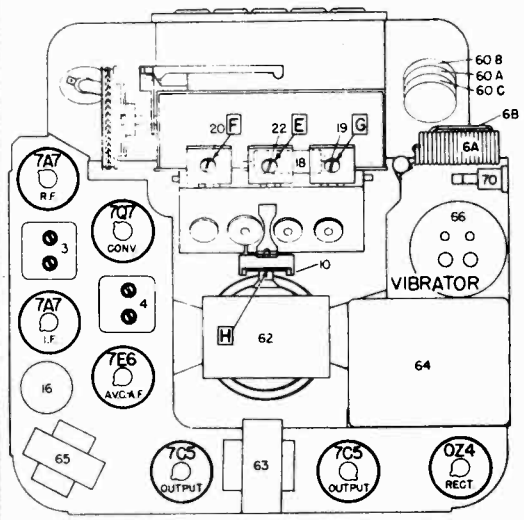
MODEL 982420, Oldsmobile,
Starting with Serial No.
B59-40001



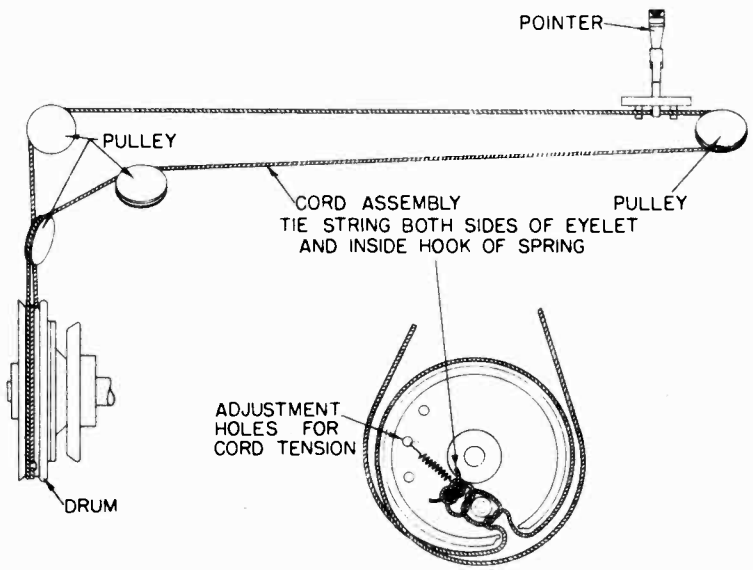
PARTS LAYOUT—CHASSIS VIEW



TUBE SOCKET VOLTAGE CHART

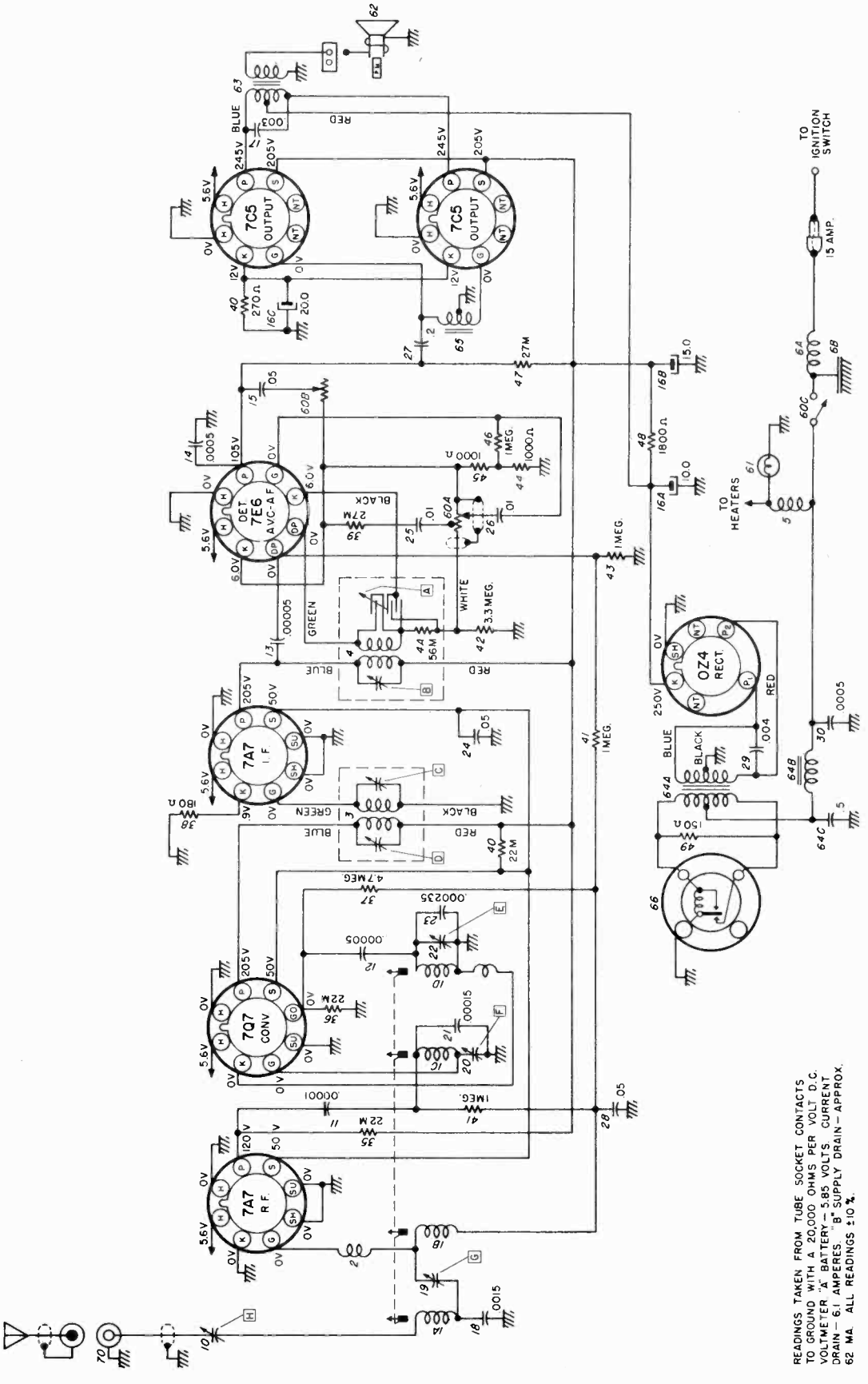


PARTS LAYOUT—TUBE VIEW



POINTER STRING HOOKUP

MODEL 982420, Oldsmobile,
Starting with Serial No.
B59-40001



MODEL 982420, Oldsmobile,
Starting with Serial No.
B59-40001

SERVICE PARTS LIST

Illus. No.	Service Part No.	Production Part No.	Description
			ELECTRICAL PARTS
			COILS
1		1219319	Coils—Permeability Tuning
1A			Antenna Coil
1B			Preselector Coil
1C			R. F. Coil
1D			Oscillator Coil
2		1214382	Antenna Choke
3		1218033	1st I. F. Assembly
4		1218035	2nd I.F. Assembly
4A			56,000 Ohm 1/2 Watt
5		1217996	Filament Choke
6		1219310	Spark Filter & "A" Connector Assembly
6A			Spark Choke
6B			Spark Plate
			CONDENSERS
10		1219312	Antenna Trimmer
11	G-100	7234242	.00001 Mfd. Molded
12	G-470	1207625	.00005 Mfd. Molded
13	G-470	1207625	.00005 Mfd. Molded
14	G-471	7238879	.0005 Mfd. Molded
15	E-503	7236350	.05 Mfd. 200 V. Tubular
16		1218009	Electrolytic Condenser
16A			10 Mfd. 350 V.
16B			15 Mfd. 350 V.
16C			20 Mfd. 25 V.
17		1219301	.003 Mfd. 800 V. Tubular
18		1219302	.0015 Mfd. 200 V. Tubular
19		1218047	Grid Trimmer
20		1218046	R. F. Trimmer
21		7230893	.00015 Mfd. Molded
22		1218043	Oscillator Trimmer
23		1219305	.000235 Mfd. Temperature Compensator
24		7236350	.05 Mfd. 200 V. Tubular
25	E-103	7237957	.01 Mfd. 400 V. Tubular
26	E-103	7237957	.01 Mfd. 400 V. Tubular
27		1217876	.2 Mfd. 200 V. Tubular
28		7236350	.05 Mfd. 200 V. Tubular
29	H-402	1219303	.004 Mfd. 1500 V. Tubular
30	G-471	7238879	.0005 Mfd. Molded
			RESISTORS
35	A-223	1214550	22,000 Ohm ½ W. Insulated
36	A-223	1214550	22,000 Ohm ½ W. Insulated
37	A-475	1214566	4.7 Megohm ½ W. Insulated
38	A-181	1215559	180 Ohm ½ W. Insulated
39	A-273	1214551	27,000 Ohm ½ W. Insulated
40	C-223	7240590	22,000 Ohm 2 W. Insulated
41	A-105	1213282	1 Megohm ½ W. Insulated
42	A-335	1214564	3.3 Megohm ½ W. Insulated
43	A-105	1213282	1 Megohm ½ W. Insulated
44	A-102	1213235	1,000 Ohm ½ W. Insulated
45	A-102	1213235	1,000 Ohm ½ W. Insulated
46	A-105	1213282	1 Megohm ½ W. Insulated
47	A-273	1214551	27,000 Ohm ½ W. Insulated
48	C-182	1214573	1,800 Ohm 2 W. Insulated
49	B-151	1211005	150 Ohm 1 W. Insulated
			TUBES
	5290	1213562	7A7—R. F. Amplifier
	5301	1213981	7Q7—Oscillator—Translator
	5290	1213562	7A7—I. F. Amplifier
	5298	1213980	7E6—Detector AVC—1st Audio
	5295	1213568	7C5—Audio Output
	5295	1213568	7C5—Audio Output
	5003	1211924	OZ4—Rectifier

MODEL 982420, Oldsmobile, Starting with Serial No. B59-40001

MISCELLANEOUS ELECTRICAL PARTS

60	1219313	Control—Volume, Tone and Switch
60A		Volume Control
60B		Tone Control
60C		On-Off Switch
61	125588	Lamp, Dial (Mazda #51)
62	1219291	Speaker—6" x 9" Elliptical
		Permanent Magnetic
63	1219314	Transformer—Output
64	1219316	Power Transformer and Filter Assembly
64A		Transformer—Power
64B		Hash Choke
64C		Capacitor—.5 Mfd. 100 V.
65	1219315	Transformer—Audio Input
66	8542	Vibrator

MECHANICAL PARTS

CHASSIS

Illus. No.	Service Part No.	Production Part No.	Description
70		1218651	Socket—Antenna Connector
		1214420	Socket—Rectifier Tube
		1213684	Socket—Vibrator
		1218013	Socket—Loctal Tube
		1218007	Cover Assembly—Case Back
		1217991	Shield—Tube
		1219311	Antenna Connector Assembly

INSTALLATION PARTS

41497	Washer—Flat $^{33}/_{64}$ I.D.
7255287	Nut—½—28 Hex.
419512	Washer—Rubber—$^{9}/_{32}$ I.D. (Anti-Rattle) Dummy Control
7257400	Washer—Wave—$^{3}/_{16}$ I.D. (Anti-Rattle) Tuning and Volume Control
554515	Knob—Tone and Dummy
7256702	Knob—(Tuning and Volume Control) Includes Set Screw
7256654	Bracket—Receiver Mounting
554519	Bracket—Side Mounting
554690	Bolt—¼—20 x ⅜ Long Truss Head
120706	Bolt—¼—20 x ½ Long—Hex. Head
121797	Bolt—¼—20 x ⅜ Long—Hex. Head
120392	Washer—Flat—$^{17}/_{64}$ I.D. ⅝ O.D.
120423	Washer—Lock—¼ (Internal Tooth type "B")
103319	Washer—Lock—¼ (Split)
554691	"A" Lead Connector and Filter Condenser Assembly
120151	Fuse—"A" Lead 15 Amp. 25 Volt
555437 or	Condenser—Ignition Coil
1912757	Condenser—Ignition Coil
1911095	Condenser—Generator—.5 Mfd.
7257239	Distributor Suppressor—15,000 Ohm
414237	Grommet—Distributor Suppressor
415823	Static Collector (Front Wheel)
164349	Screw—#8-32 x¼ Cross Recessed Self-Tapping
554339	Panel—Radio Control
7256684	Gasket—Speaker Baffle
7256717	Spacer—Instrument Panel to Gasket
555348	Clip—Hood Grounding
1912900	Condenser—Voltage Regulator
557531	Condenser—Voltage Regulator

TUNER PARTS

1217997	Bushing—Station Selector Shaft
1219309	Tuner Unit Assembly—Mechanical Portion only—Includes Push Buttons, Clutch Disc And Crown Gear Assembly
1216686	Clutch Disc and Crown Gear Assembly
1219317	Dial Glass—Calibrated
1219318	Escutcheon without Dial
1216687	Drum Assembly—Pointer Drive
1219306	Lead Assembly—Shielded
1218000	Shaft Assembly—Drive Pinion
1219308	Pointer and Slide Assembly
1216692	Washer—"U" Retaining—Station Selector Shaft.
1219307	Bushing—Dummy Knob
1216691	Washer—Friction—Station Selector Shaft
1217999	Lever Actuating Plate Assembly
1217994	Lever Assembly
1217992	Screw—#10-32 Special
1218027	String Assembly—Pointer Drive
1218115	Washer—Spacing—Paper
121391	Washer—Steel—Flat
1218113	Link—Tuner Unit
1218114	Spring—Link Retaining

MODEL 984570,
Pontiac

SUBJECT: SERVICE INSTRUCTIONS - PONTIAC CHIEFTAIN MODEL 984570

GENERAL

MOUNTING—All 1950 Pontiac Cars.

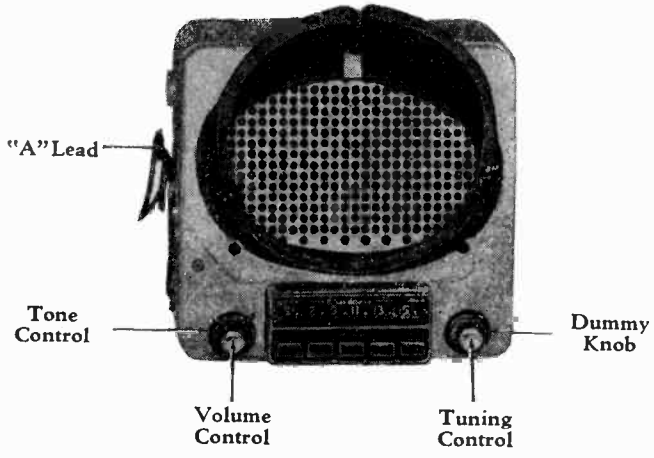
TUBES—Seven, Plus Rectifier.

SPEAKER—6" x 9" Elliptical, Permanent Magnet.

TUNING—Manual and 5 Push Button Mechanical.

ANTENNA TRIMMER COMPENSATION — For Antennas Between 0.000060 - 0.000090 Mfd.

TUNING RANGE — 550-1600 KC.



MODEL 984570

PUSHBUTTON SET-UP

Pull button to the right and out. Tune in desired station manually. Push button in as far as it will go.

ALIGNMENT PROCEDURE

Output Meter Connections ..... Across Voice Coil

Generator Ground ..... Receiver Chassis

Dummy Antenna ..... In Series With Generator

Volume Control Position ..... Maximum Volume

Tone Control Position ..... Treble

Generator Output ..... Minimum for Readable Indication

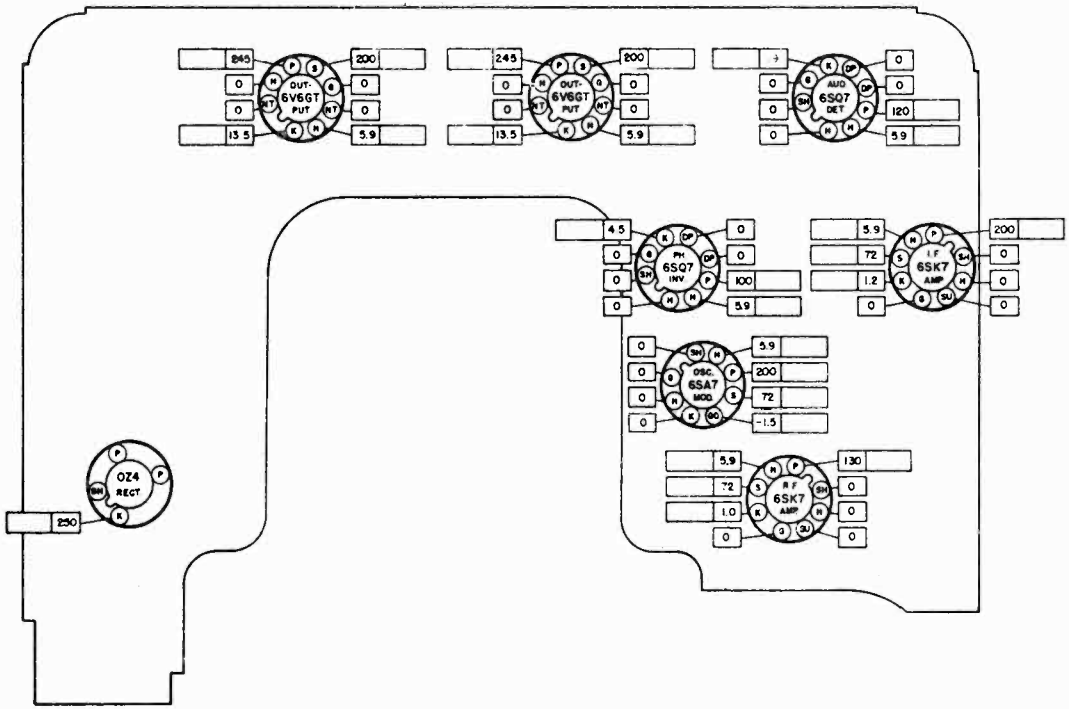
Steps	Series Condenser or Dummy Antenna	Connect to	Signal Generator Frequency	Tune Receiver To	Adjust in Sequence for Max. Output
1	0.1 Mfd.	6SA7 Grid (Pin #8)	260 KC	High Freq. Stop	A, B, C, D
2	0.000068 Mfd.	Antenna Connector	1615 KC	High Freq. Stop	*E, F, G
3	0.000068 Mfd.	Antenna Connector	1000 KC	Signal Gen. Signal	J, K
4	0.000068 Mfd.	Antenna Connector	1615 KC	High Freq. Stop	F, G
5	0.000068 Mfd.	Antenna Connector	1000 KC	Signal Gen. Signal	L**

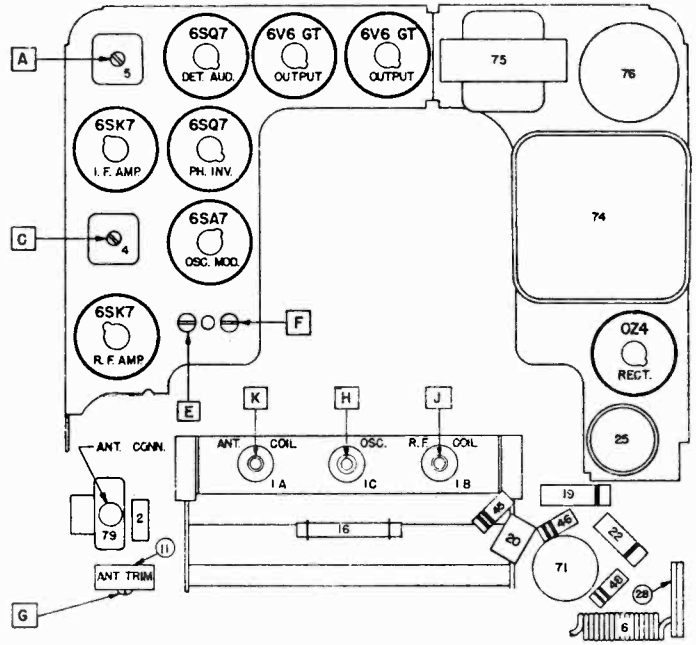
*Before making this adjustment check the mechanical setting of the oscillator core "H." The slotted end of the core should be 1 25/32" from the mounting end of the coil form. (This measurement is readily made by inserting a suitable plug in the mounting end of the coil form). If adjustment is necessary be sure to first dissolve the glyptal seal on the core studs. Core adjustments are made from the mounting end of the coil form with an insulated screwdriver, and core studs should be resealed with glyptal or household cement after alignment.

**"L" is the pointer adjustment screw on the pointer connecting link (see tuner drawing). Adjust so pointer reads 1000 KC.

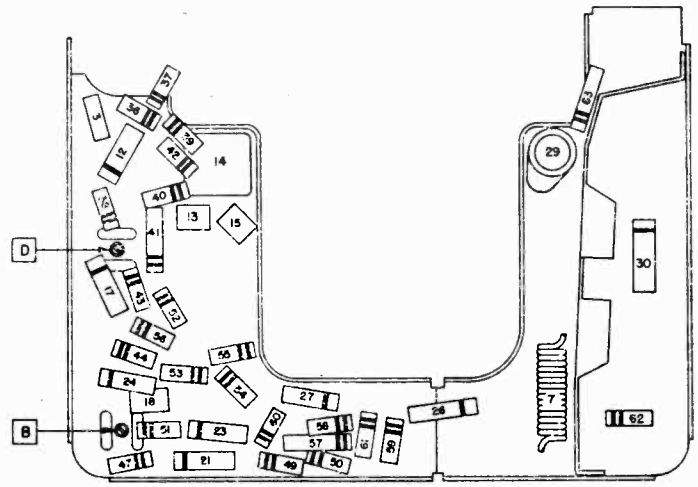
With the radio installed and the car antenna plugged in adjust antenna trimmer "G" (see sticker on case) for maximum volume with the radio tuned to a weak station near 1400 KC.

TUBE SOCKET VOLTAGE CHART





PARTS LAYOUT — TUBE VIEW

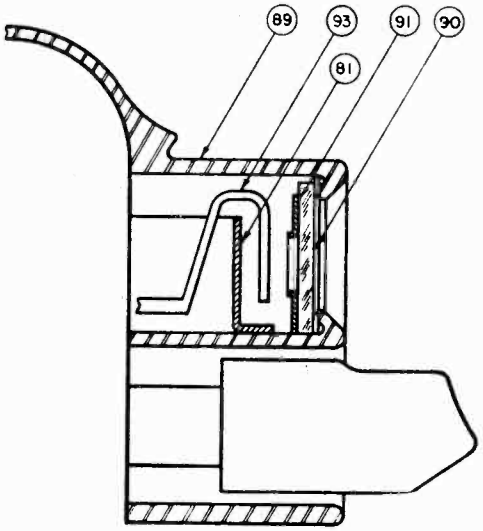


PARTS LAYOUT — CHASSIS VIEW

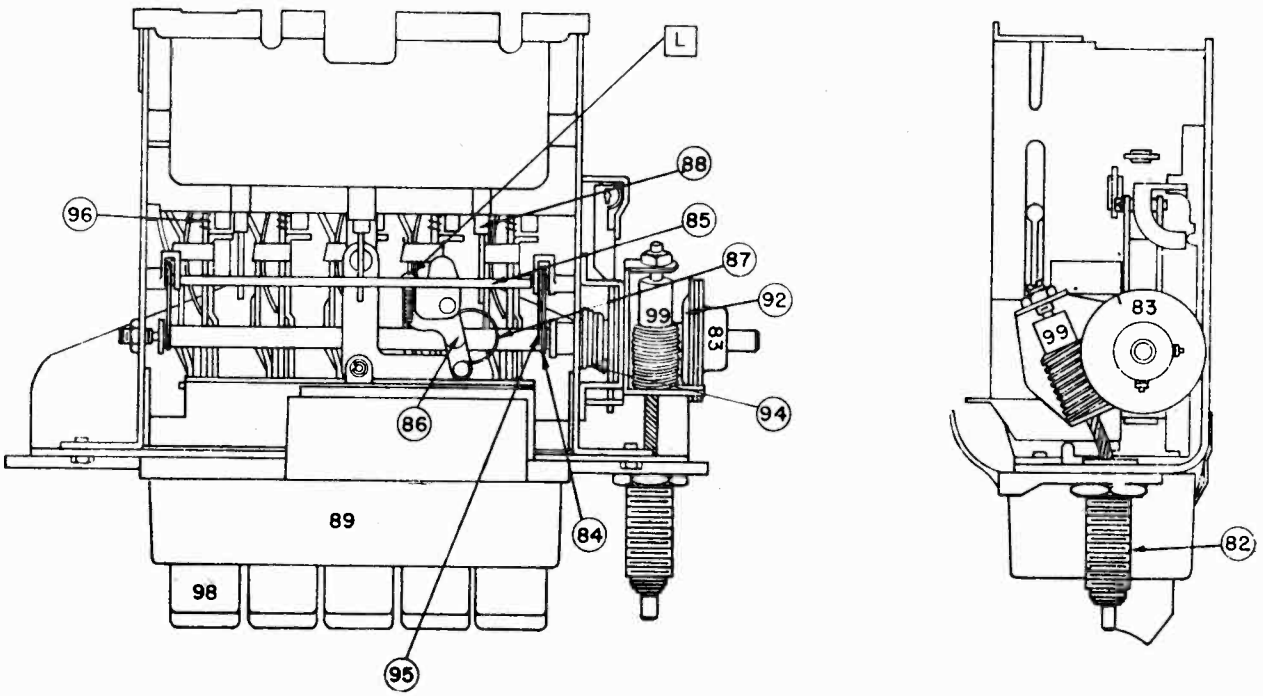
The tube socket voltages, as measured at the factory and under the conditions shown on the Schematic Diagram on Page 3, are shown above. The blank spaces are provided so the serviceman may fill in actual voltage readings as taken with his own equipment. A normal operating radio should be used for these measurements.

Voltmeter resistance is ..... ohms per volt. Voltages taken with ..... volts at the spark plate. Tolerance on voltages is ± 10%. All readings are taken from socket terminals to chassis.

MODEL 984570,
Pontiac

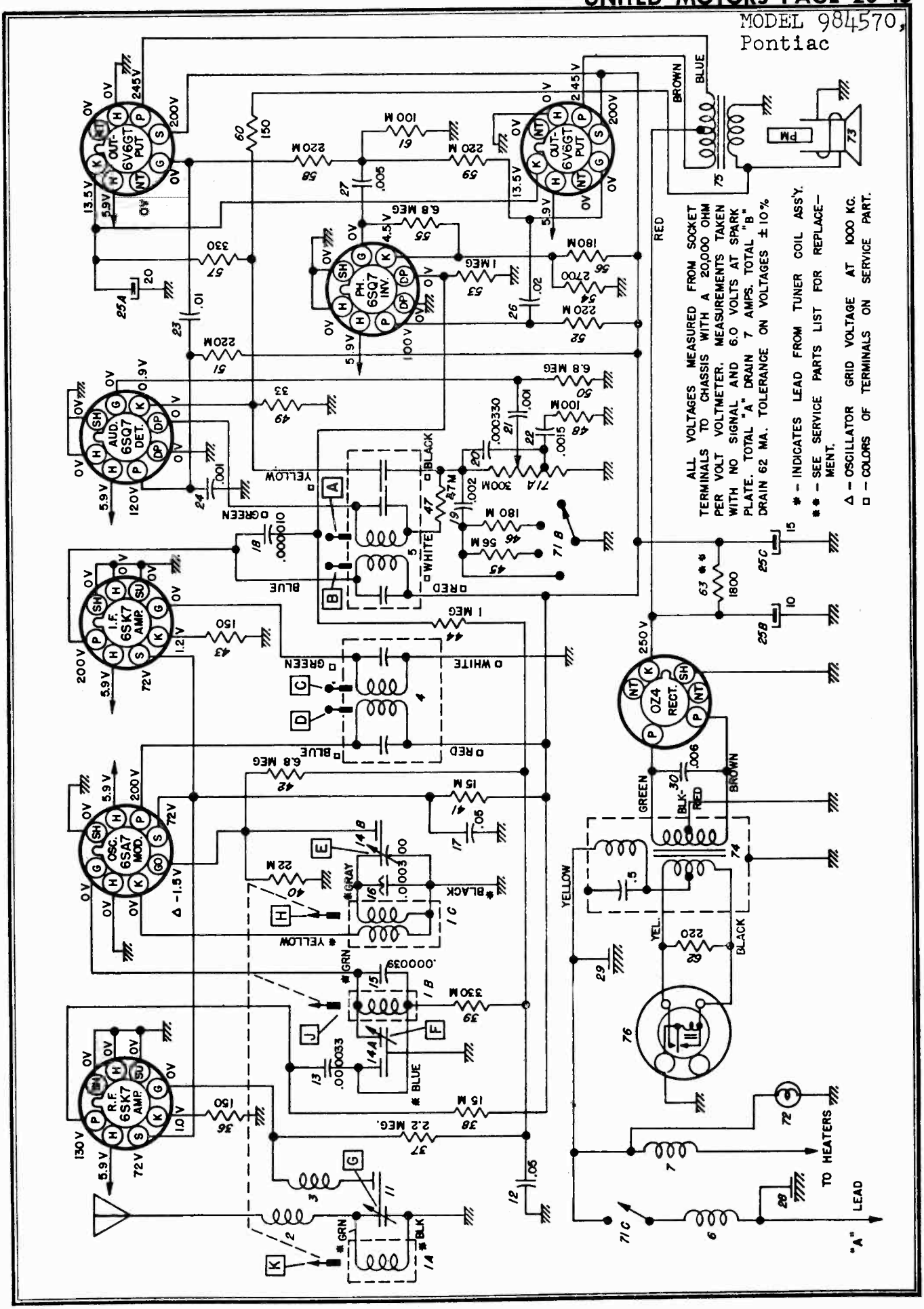


ESCUTCHEON CROSS SECTION



TUNER

MODEL 984570,
Pontiac



MODEL 984570,
Pontiac

SERVICE PARTS LIST

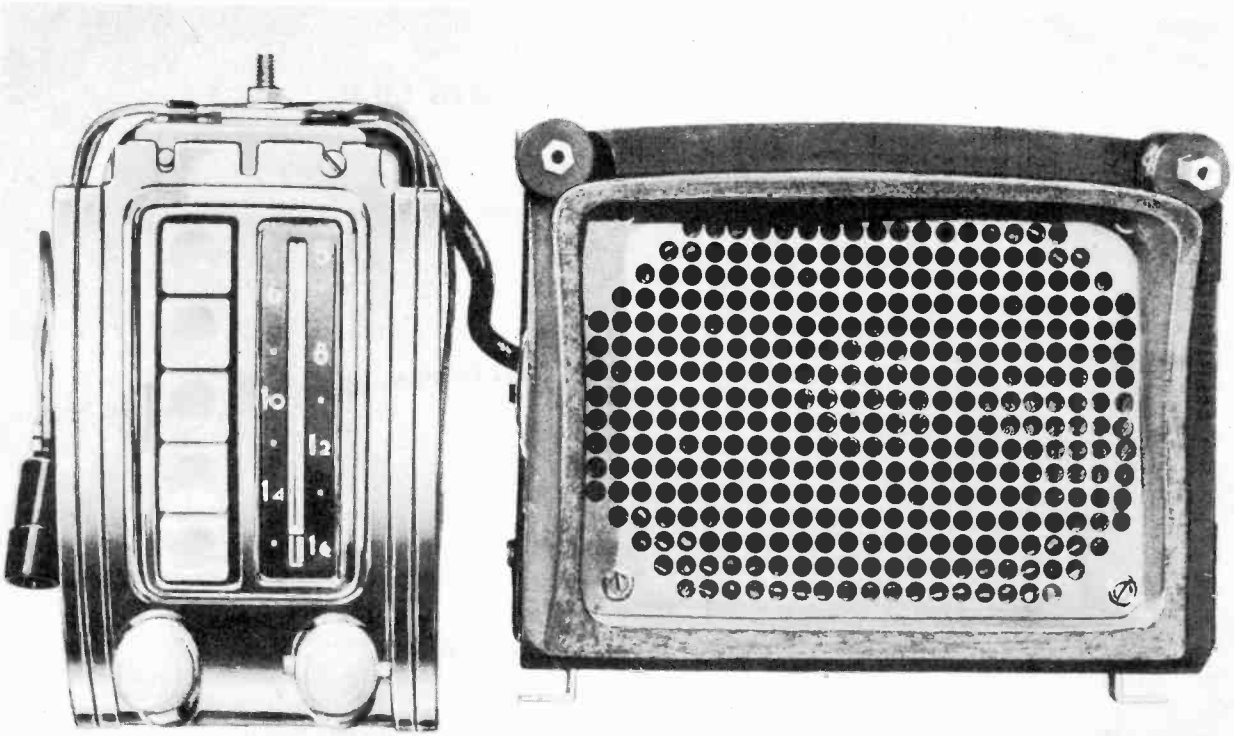
Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			Coils
1	7257956	7257956	Coil Assy. - Tuning
1 A			Antenna
1 B			R.F.
1 C			Oscillator
2	7255738	7255738	Antenna Series Choke
3	7240251	7240251	Antenna Spark Choke
4	1219508	1219508	1st IF
5	1219509	1219509	2nd IF
6	1217846	1217846	"A" Spark Choke
7	7241708	7241708	Hash Choke
			Condensers
11	7257959	7257959	Antenna Trimmer
12	7236842	E 503	.05 mfd 200 V Tubular
13	1218348	G 330	.000033 mfd Ceramic
14	7242454	7242454	Dual Trimmer
14 A			RF Section
14 B			Oscillator Section
15	7258221	G 390	.000039 mfd Ceramic
16	7258445	7258445	.000300 mfd Temp. Comp.
17	7258125	E 503	.05 mfd 400 V Tubular
18	1215189	G 100	.000010 mfd Mica
19	7237954	E 202	.002 mfd 600 V Tubular
20	7232957	G 331	.000330 mfd Mica
21	7239188	E 102	.001 mfd 600 V Tubular
22	1218499	1218499	.0015 mfd 200 V Tubular
23	1208600	1208600	.01 mfd 600 V Tubular
24	7239188	7239188	.001 mfd 600 V Tubular
25	7238830	M 908	Electrolytic
25 A			20 mfd 25 V
25 B			10 mfd 400 V
25 C			15 mfd 400 V
26	7258124	7258124	.02 mfd 400 V Tubular
27	7230767	7230767	.005 mfd 600 V Tubular
28	7241259	7241259	Spark Plate
29	1217848	1217848	Chassis Plate
30	7240906	H 602	.006 mfd 1600 V Tubular
			Resistors
36	1213220	A 151	150 Ohms ½ W Insulated
37	1211147	A 225	2.2 Megohms ½ W Insulated
38	7237595	B 153	15,000 Ohms 1 W Insulated
39	7240732	A 334	330,000 Ohms ½ W Insulated
40	1211192	A 223	22,000 Ohms ½ W Insulated
41	7233653	C 153	15,000 Ohms 2 W Insulated
42	1215563	A 685	6.8 Megohms ½ W Insulated
43	1213220	A 151	150 Ohms ½ W Insulated
44	7238873	A 105	1 Megohm ½ W Insulated
45	1213267	A 563	56,000 Ohms ½ W Insulated
46	1215560	A 184	180,000 Ohms ½ W Insulated
47	7240731	A 473	47,000 Ohms ½ W Insulated
48	1213270	A 104	100,000 Ohms ½ W Insulated
49	1214538	A 330	33 Ohms ½ W Insulated
50	7241937	A 685	6.8 Megohm ½ W Insulated
51	1214555	A 224	220,000 Ohms ½ W Insulated
52	1214555	A 224	220,000 Ohms ½ W Insulated
53	7238873	A 105	1 Megohm ½ W Insulated
54	1213240	A 272	2700 Ohms ½ W Insulated
55	7241937	A 685	6.8 Megohms ½ W Insulated
56	1215560	A 184	180,000 Ohms ½ W Insulated
57	7233773	B 331	330 Ohms 1 W Insulated
58	1214555	A 224	220,000 Ohms ½ W Insulated
59	1214555	A 224	220,000 Ohms ½ W Insulated
60	1213220	A 151	150 Ohms ½ W Insulated
61	1213270	A 104	100,000 Ohms ½ W Insulated
62	7237994	B 221	220 Ohms 1 W Insulated
63	1214573	C 272 / B 562	1800 Ohms 2 W — Replace with 2700 2 W and 5600 1 W resistor in parallel

MODEL 984570,
Pontiac

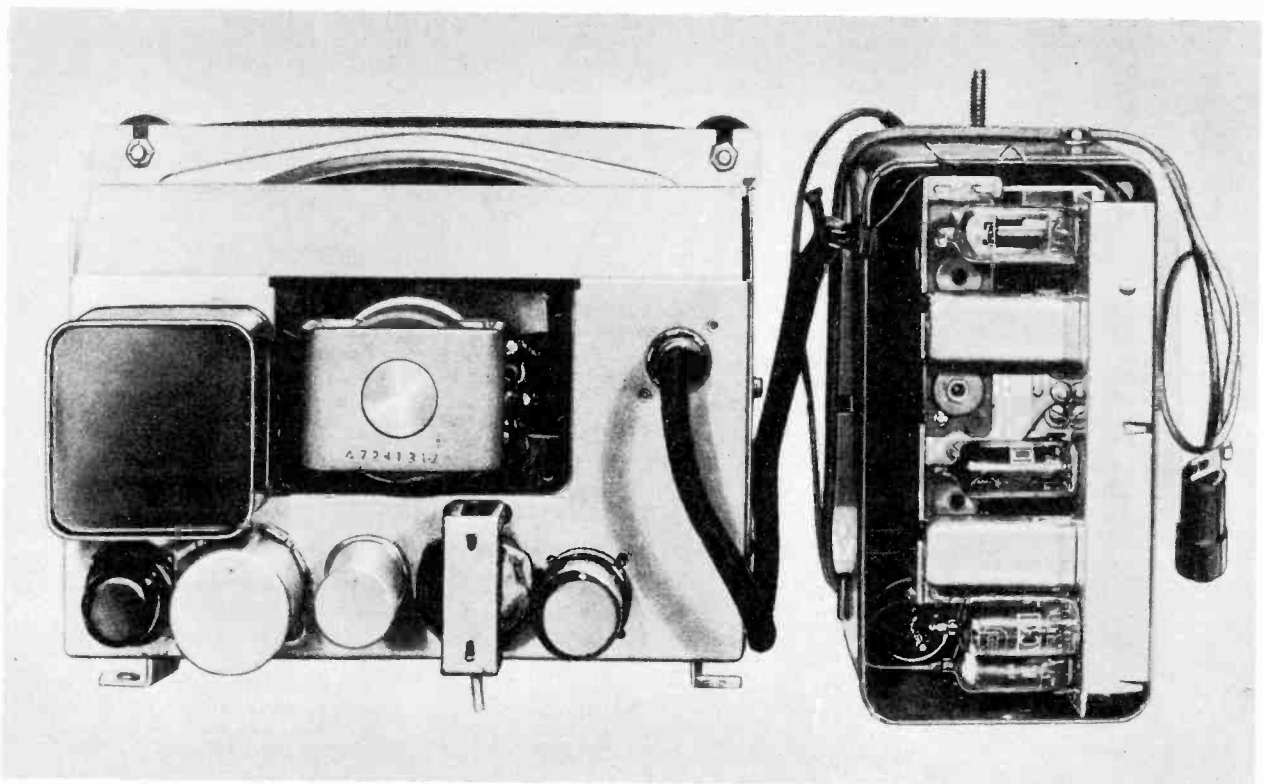
SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
		Tubes	
	7237751	5229	6SK7
	7237753	5231	6SQ7
	7237752	5222	6SA7
	1213793	5241	6V6GT
	1211924	5003	OZ4
		Miscellaneous Electrical	
71	7257708	7257708	Control - Volume, Tone and Switch
71 A			Volume Control
71 B			Tone Control
71 C			Switch
72	187189	44	Lamp - Dial Light
73	7259381	7259381	Speaker 6 x 9 Elliptical, P.M.
74	7255881	7255881	Transformer - Power
75	7240453	7240453	Transformer - Output
76	7239124	8542	Vibrator - Nonsynchronous
		MECHANICAL PARTS	
		Chassis	
79	7257746	7257746	Socket - Antenna
	7236279	7236279	Socket - Octal Tube
	7239125	7239125	Socket - Vibrator
		Tuner	
81	7257722	7257722	Backplate - Pointer
82	7258494	7258494	Bushing and Manual Drive Shaft
83	7258072	7258072	Clutch Disc - Driven
84	7258203	7258203	Conn. Link - Core Bar
85	7258210	7258210	Core Guide Bar - Parallel
86	7256271	7256271	Pointer Conn. Link
87	7255992	7255992	Spring - Pointer Conn. Link
88	7258468	7258468	Core - Powdered Iron
89	7257717	7257717	Escutcheon Assy.
90	7257721	7257721	Dial
91	7257719	7257719	Backplate - Dial
	7257718	7257718	Spring Dial Retainer
92	7256495	7256495	Gear and Bushing - Clutch
93	7257742	7257742	Pointer Assy.
	1219120	1219120	Pointer Tip Pkg.
94	7258756	7258756	Spring - Clutch
95	7257415	7257415	Spring - Core Bar Conn. Link
96	7255984	7255984	Spring - Slide Return
	1218884	1218884	Socket - Dial Light
98	1218885	1218885	Push Button and Tuner Slide
99	7257711	7257711	Worm Gear and Bracket
		INSTALLATION PARTS	
	1911095	6015	Condenser - Generator
	1913140	1913140	Condenser - Voltage Regulator
	147685	147685	Fuse 14 Amps
	511834	511834	Knob - Control
	511831	511831	Knob - Dummy
	511833	511833	Knob - Tone Control
	511836	511836	Trim Plate - Radio
	513486	513486	Washer - Anti Rattle

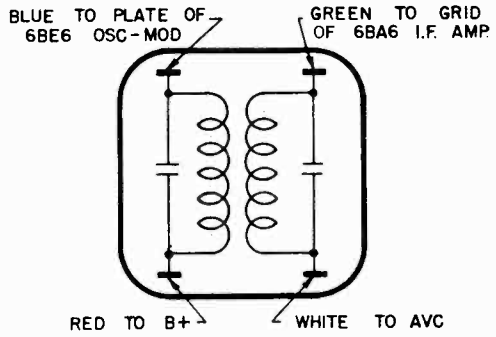
MODEL 986240,
Chevrolet



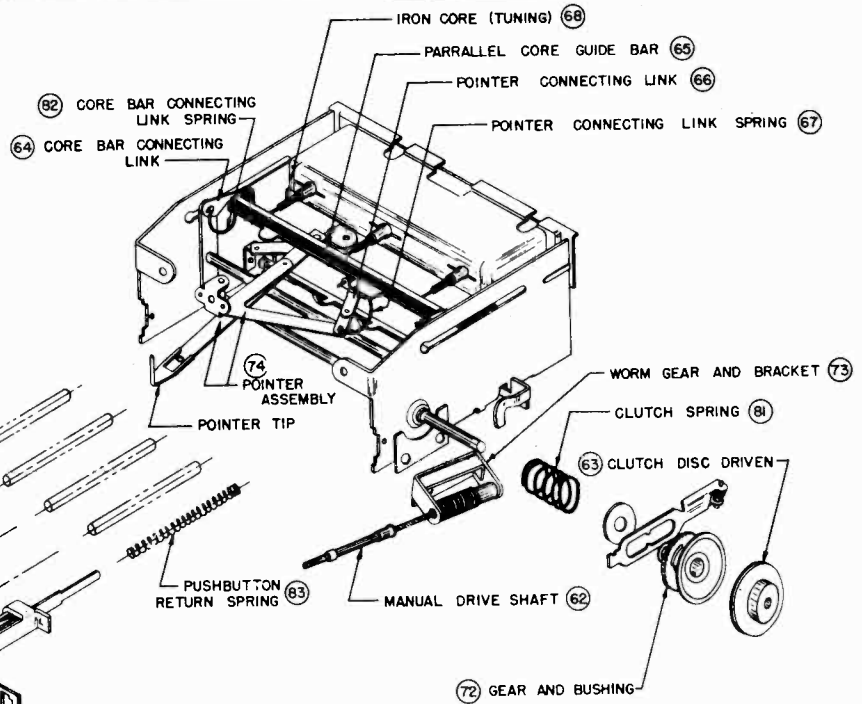
1949 PASSENGER CAR-RADIO 986240



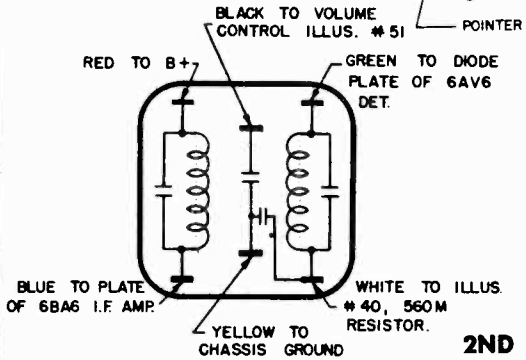
REAR VIEW COMPLETE



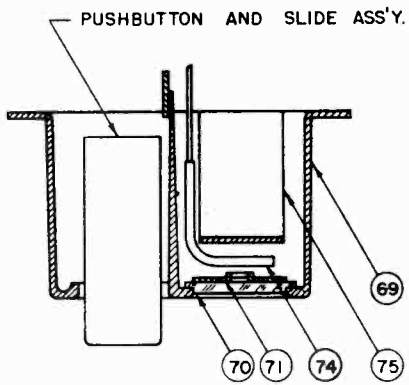
1ST I.F. COIL CONNECTIONS



EXPLODED VIEW—TUNER UNIT

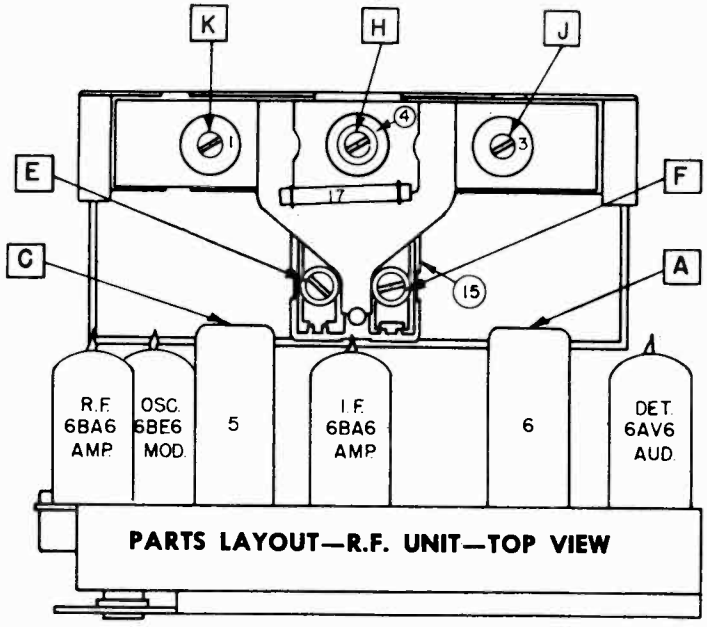


2ND I.F. COIL CONNECTIONS

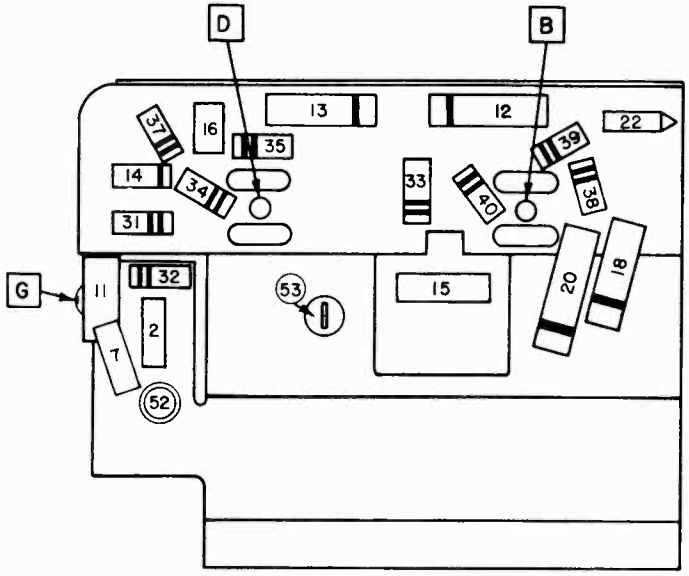


ESCUTCHEON CROSS-SECTION

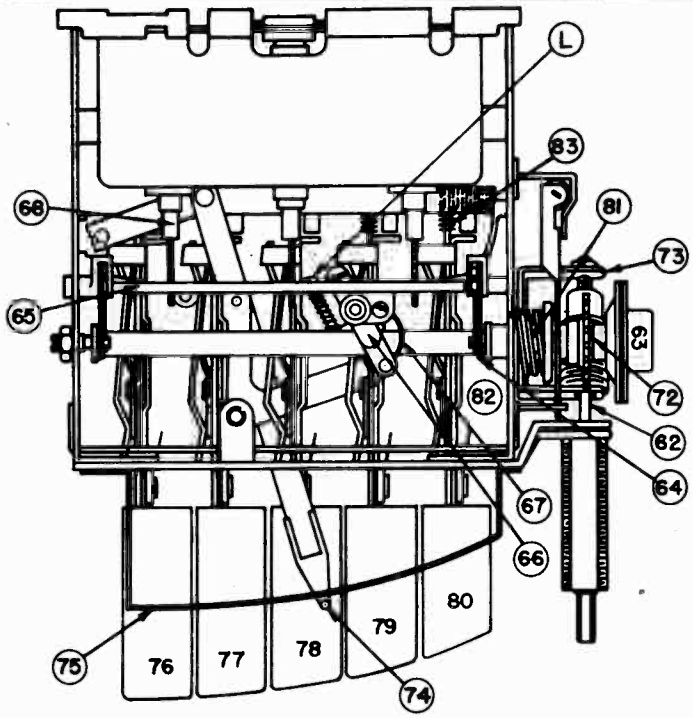
UNITED MOTORS PAGE 20-49
MODEL 986240, Chevrolet



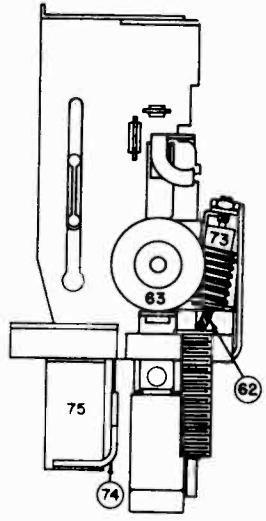
PARTS LAYOUT—R.F. UNIT—TOP VIEW



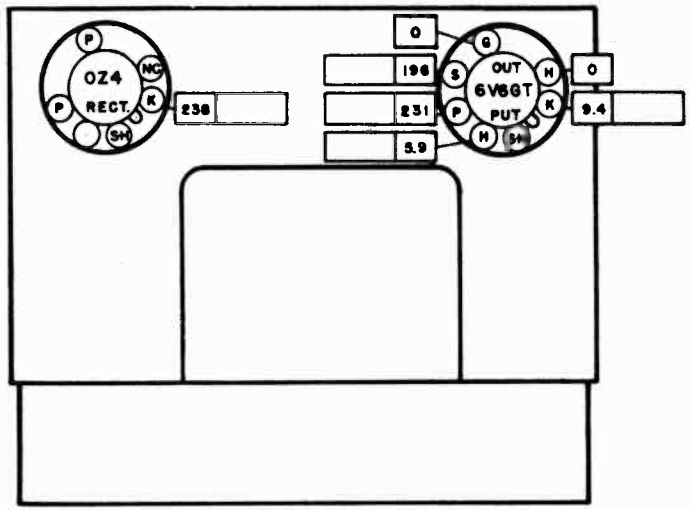
PARTS LAYOUT—R.F. UNIT—BOTTOM VIEW



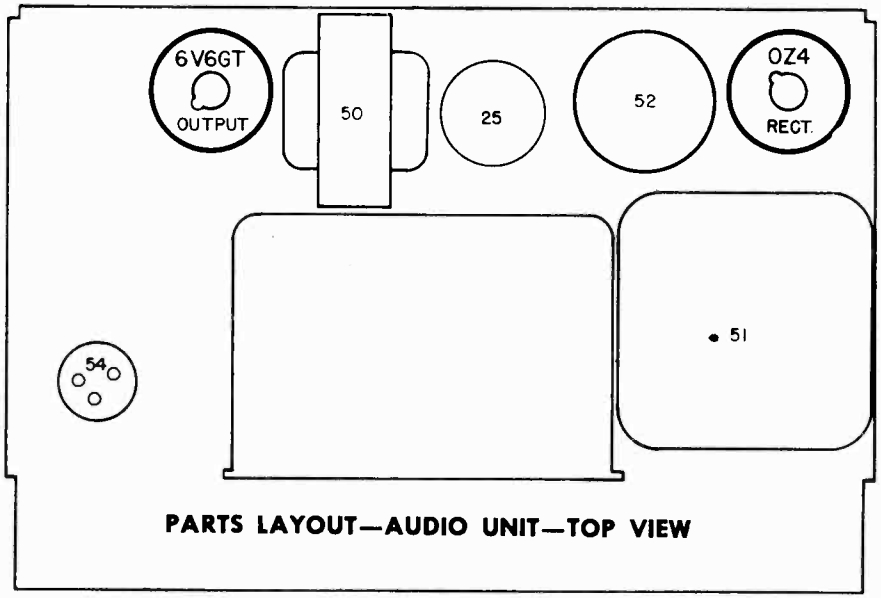
TUNER UNIT



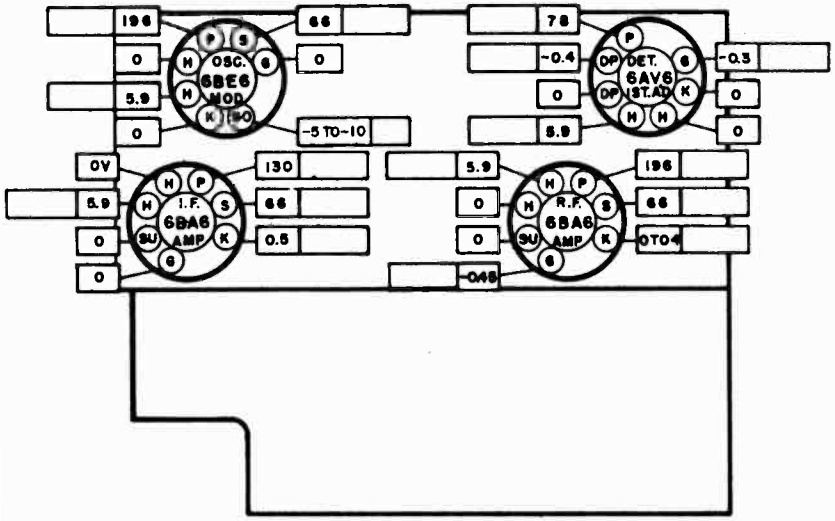
TUNER UNIT—SIDE VIEW



AUDIO UNIT

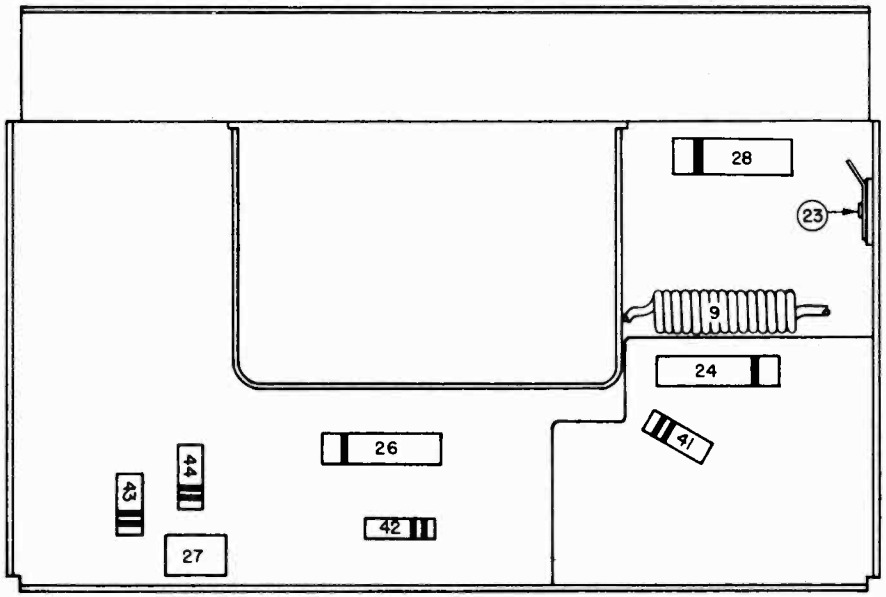


PARTS LAYOUT—AUDIO UNIT—TOP VIEW



R.F. UNIT

VOLTAGE CHART



PARTS LAYOUT—AUDIO UNIT—BOTTOM VIEW

MODEL 986240,
Chevrolet

ALIGNMENT

Trimmer condensers in this receiver have been carefully adjusted at the factory and should require no further adjustment (except antenna trimmer) unless a coil or iron core has been replaced. It is advisable not to attempt any adjustment unless it is definitely known that alignment is necessary. Since the iron cores of the tuning unit are set at the factory, only the trimmer adjustments as outlined under "Alignment Procedure" should be made. A signal generator and an output meter must be used to align the receiver circuits correctly. All alignment adjustments must be made with radio frequency unit removed from the car.

1. I.F. Alignment at 262 Kilocycles

Note: The signal generator output should be as low as possible to give a readable indication on the output meter for all adjustments.

(a) Connect one lead from the output meter in parallel with speaker voice coil, other lead to chassis ground.
(b) Connect the ground lead of the signal generator to chassis ground.
(c) Connect the signal lead of the signal generator to the grid (G) prong of the 6BE6 tube socket through a .02 mfd. condenser.
(d) Turn the set volume control on full and rotate the tone control knob to center of its range. Set the signal generator to 262 kilocycles and tune the receiver to a frequency where no squeals or beat notes may be heard and so when tuning control is moved through narrow limits no appreciable change in output is noticeable.
(e) Adjust I.F. trimmers A, B, C and D for maximum output.

2. Alignment at 1615 Kilocycles

(a) Connect the signal lead of the signal generator to the antenna connection through a .000075 mfd. condenser.
(b) Turn the manual tuning control of the receiver to stop at the high frequency end of the dial.
(c) Set signal generator to 1615 kilocycles.
(d) Adjust oscillator trimmer "E" for maximum output.

3. Alignment at 1400 Kilocycles

(a) Set the signal generator to 1400 kilocycles and tune the receiver to 1400 kilocycles.
(b) Adjust R.F. trimmer "F" for maximum output.
(c) Adjust Antenna trimmer "G" for maximum output.

4. Alignment with Car Antenna

Antenna trimmer "G" must be adjusted to match the car antenna when receiver is installed. With antenna fully extended, tune in a weak station around 1400 kilocycles and adjust antenna trimmer "G" for maximum volume.

CAPACITY AND INDUCTANCE ALIGNMENT

This alignment should be used only when there is definite evidence that the iron cores are out of adjustment or coils have been changed.

1. I.F. Alignment at 262 Kilocycles

The same procedure as outlined in Alignment Procedure.

2. Alignment at 1615 Kilocycles

(a) Connect signal lead of signal generator to receiver antenna connection of the set through a .000075 mfd. condenser.
(b) Set signal generator to 1615 kilocycles.
(c) Turn manual tuning knob of receiver to the high frequency end of dial.

CAPACITY AND INDUCTANCE ALIGNMENT—(Cont'd)

(d) Mechanically align the oscillator, R.F., and antenna iron core "H" "J" "K" so that slotted end of iron cores is $1\frac{25}{32}$ inches from mounting end of coil form.
(e) Adjust oscillator trimmer "E" for maximum output.
(f) Adjust R.F. trimmer "F" for maximum output.
(g) Adjust antenna trimmer "G" for maximum output.

3. Alignment at 1400 Kilocycles

(a) Adjust signal generator to 1400 kilocycles.
(b) Tune manual tuning knob until dial pointer is at 1400 kilocycles.
(c) Adjust R.F. core "J" for maximum output.
(d) Adjust antenna core "K" for maximum output.

Note: The rear end of iron cores are slotted so these adjustments can be made with a non-metallic screw driver that fits loosely in coil form. (No inward force should be used)

4. Realignment at 1615 and 1400 Kilocycles

(a) Repeat alignment procedure as noted in paragraphs 2 and 3 under Capacity and Inductance (except oscillator core "E") until adjustment for maximum output at 1615 and 1400 kilocycles coincides with 1400 kilocycles alignment.

5. Alignment with Car Antenna

With antenna fully extended tune in a weak station around 1400 kilocycles, volume on full, adjust antenna trimmer "G" for maximum volume.

COIL REPLACEMENT PROCEDURE

To replace the Antenna, R.F. or Oscillator Coil proceed as follows:

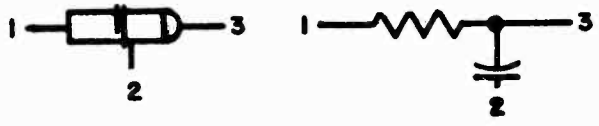
(a) Remove rear cover of set.
(b) Remove "PK" screws holding center section of receiver case and remove.
(c) Remove tubes and spring clips holding 1st and 2nd I.F. coils in place.
(d) Remove 4 screws on coil assembly mounting strip.
(e) Pull coil mounting strip towards the I.F. coils, until antenna, R.F. and oscillator coils are exposed.
(f) Unsolder leads to coil being replaced.
(g) Remove coil from mounting grommet.

TO REASSEMBLE COIL ASSEMBLY

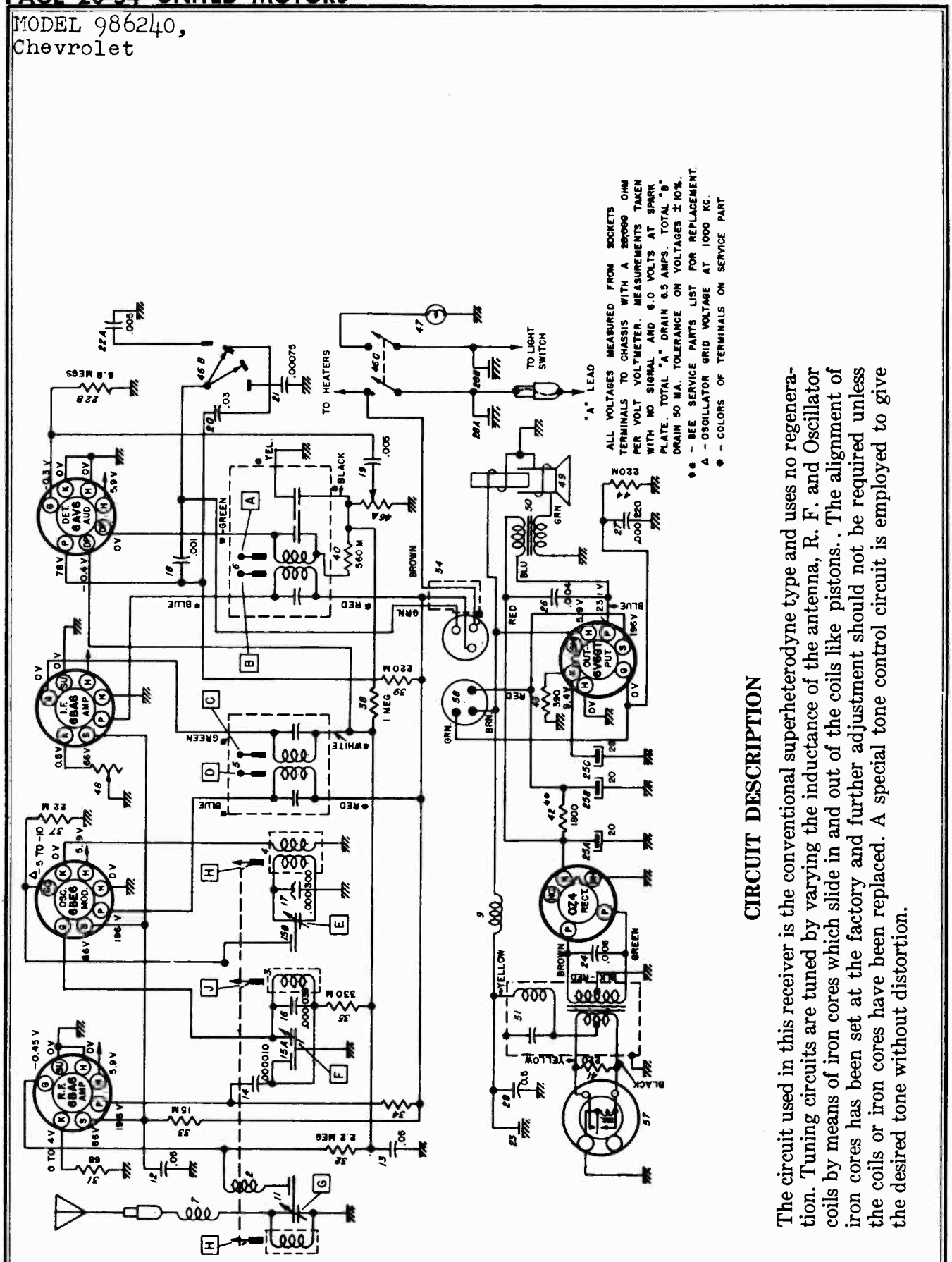
(a) Place coil on mounting grommet.
(b) Solder coil leads to proper terminals.
(c) Place coil assembly mounting strip in to shield.
(d) Replace 4 screws holding mounting strip.
(e) Replace springs holding I.F. coils in place, replace tubes.
(f) Replace center case section.
(g) Realign receiver as outlined under "Capacity and Inductance Alignment."

NEW COMPONENT

This component is a condenser and resistor in one unit, and will be known as a capristor.

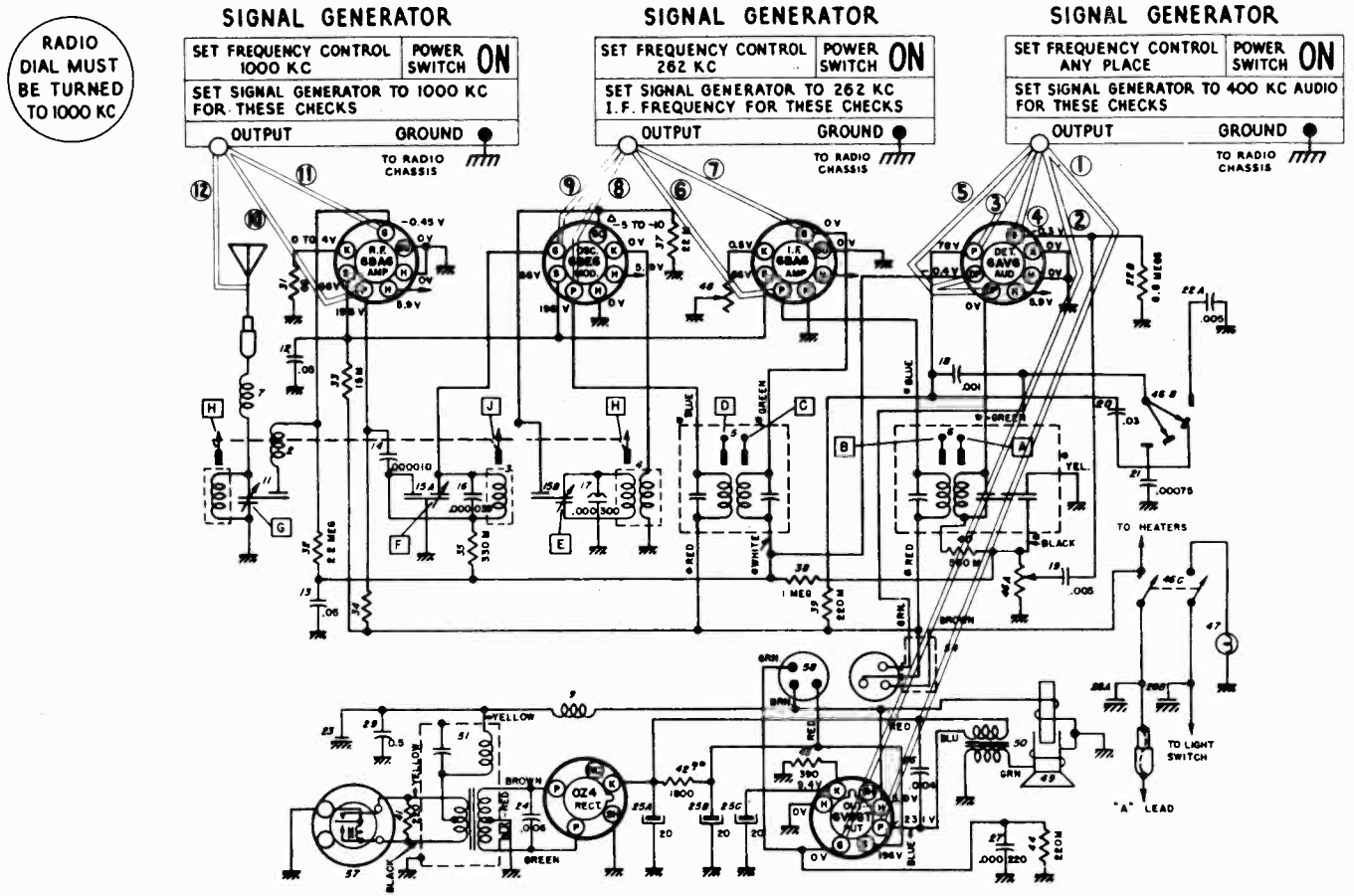


MODEL 986240,
Chevrolet



CIRCUIT DESCRIPTION

The circuit used in this receiver is the conventional superheterodyne type and uses no regeneration. Tuning circuits are tuned by varying the inductance of the antenna, R. F. and Oscillator coils by means of iron cores which slide in and out of the coils like pistons.. The alignment of iron cores has been set at the factory and further adjustment should not be required unless the coils or iron cores have been replaced. A special tone control circuit is employed to give the desired tone without distortion.



AT POINT SIGNAL STOPS	CHECK OR REPLACE ITEMS LISTED
NO SIGNAL AT POINT ①	CHECK OR REPLACE ITEMS # 26-49-50
" " " " ②	" " " " 6V6 GT TUBE
" " " " ③	" " " " # 18-20-21-22A-46B-54-58
" " " " ④	" " " " 6AV6 TUBE
" " " " ⑤	" " " " 6AV6 TUBE
" " " " ⑥	" " " " # 6-19-40-46A
" " " " ⑦	" " " " 6BA6
" " " " ⑧	" " " " # 5-38-48
" " " " ⑨	" " " " 6BE6
" " " " ⑩	" " " " # 3-14-15A-16-35
" " " " ⑪	" " " " 6BA6 TUBE
" " " " ⑫	" " " " # 1-2-7-11-13-32

SIGNAL TRACING SEQUENCE

MODEL 986240,
Chevrolet

SERVICE PARTS LIST

Production Part No.	Service Part No.	Part Name	Description—Function	Illus. No.
	7257979	Coil	Coil, Antenna	1
	7240251	Coil	Choke, Antenna Spark	2
	7257979	Coil	Coil, R.F.	3
	7257977	Coil	Coil, Oscillator	4
	1218725	Coil	Coil, 1st I.F.	5
	1218726	Coil	Coil, 2nd I.F.	6
	7258502	Coil	Choke, Antenna Series	7
	7241708	Coil	Choke, Hash	9
	7258000	Condenser	Trimmer, Antenna	11
7236841 use	7230592	Condenser	Tubular, .05 mfd., 400 volts, Screen By-pass	12
7236842 use	7230592	Condenser	Tubular, .05 mfd., 200 volts, A.V.C. By-pass	13
1218737 use	1215189	Condenser	Ceramic, .000010 mfd., Coupling	14
	7242454	Condenser	Trimmer Dual	15
			Sec. A. R.F. Trimmer	15A
			Sec. B. Oscillator Trimmer	15B
	1217736	Condenser	Ceramic, .000039 mfd., Image Trap	16
	7258162	Condenser	Compensating, .000300 mfd., Temperature	17
7242942 use	1217790	Condenser	Tubular, .001 mfd., 600 volts, Output Coupling	18
	1218298	Condenser	Disc, .005 mfd., Audio Coupling	19
	7242448	Condenser	Tubular, .03 mfd., 400 volts, Tone Control, Voice	20
	1218372	Condenser	Ceramic, .000750 mfd., Tone Control, Music	21
	1218258	Capristor	Capristor	22
			Sec. A. .005 mfd., Condenser Tone Control, Bass	22A
			Sec. B. 6.8 megohm, ½ watt resistor Grid Leak	22B
	1217848	Condenser	Condenser, Chassis Plate Noise Filter	23
	7240906	Condenser	Tubular, .006 mfd., 1600 volts, Buffer	24
	7240724	Condenser	Electrolytic	25
			Sec. A. 20 mfd., 400 bolts, "B" Voltage Filter (Plate)	25A
			Sec. B. 20 mfd., 400 volts, "B" Voltage Filter (Screen)	25B
			Sec. C. 20 mfd., 25 volt, Cathode By-pass	25C
	7233243	Condenser	Tubular, .004 mfd., 800 volts, Output Padder	26
	7236105	Condenser	Mica, .000220 mfd., R.F. & I.F. By-pass	27
	7258332	Condenser	Spark Plate Dual—Ripple Filter	28
			Sec. A. "A" Lead Section	28A
			Sec. B. Dial Light Section	28B
7242885 use	7232403	Condenser	Tubular, .5 mfd., 100 volts, Noise Filter	29
	1215558	Resistor	Insulated, 68 ohm, ½ watt, R.F. Amplifier Bias	31
	1214563	Resistor	Insulated, 2.2 megohm, ½ watt, Isolating	32
	7233653	Resistor	Insulated, 15,000 ohm, 2 watt, Screen Dropping	33
	7237595	Resistor	Insulated, 15,000 ohm, 1 watt, Plate Dropping	34
	1214557	Resistor	Insulated, 330,000 ohm, ½ watt, Isolating	35
	1214550	Resistor	Insulated, 22,000 ohm, ½ watt, Oscillator Grid Leak	37
	1213282	Resistor	Insulated, 1 megohm, ½ watt, A.V.C., Isolating	38
	1214555	Resistor	Insulated, 220,000 ohm, ½ watt, Plate Dropping	39
	1214560	Resistor	Insulated, 560,000 ohm, ½ watt, Tweet Filter	40
	7237994	Resistor	Insulated, 220 ohm, 1 watt, Power Transformer Primary Load	41
	1214573	Resistor	Insulated, 1800 ohm, 2 watt, "B+" Filter	42
	1216149	Resistor	Insulated, 390 ohm, 1 watt, 6V6GT Cathode Bias	43

MODEL 986240, Chevrolet

SERVICE PARTS LIST—(Cont'd)

Production Part No.	Service Part No.	Part Name	Description—Function	Illus. No.
	1214555	Resistor	Insulated, 220,000 ohm, ½ watt, 6V6GT Grid Leak	44
	7258084	Control	Control, Volume, Tone and Switch	46
			Sec. A. Volume Control	46A
			Sec. B. Tone Control	46B
			Sec. C. Switch on and off	46C
	125588	Lamp	Lamp, Dial #55	47
	7242204	Control	Control, Sensitivity	48
	7241312	Speaker	Speaker, 6″ x 9″ Electro-Dynamic	49
	7256355	Speaker	Permanent Magnet 6″ x 9″ optional with 7241312	49
	7256009	Transformer	Transformer, Output	50
	7255881	Transformer	Transformer, Power	51
	7239124	Vibrator	Vibrator, Non-Synchronous	52
	7258022	Cable	Cable, R.F.	54
	7239475	Socket	Socket, Antenna	55
	1218724	Socket	Socket, Dial Light	56
	7258111	Plug	Plug, Cable, Audio	58
	7236279	Socket	Socket, Octal, Tube	
	7239125	Socket	Socket, Vibrator	
	7258073	Socket	Socket, Tube 7 Pin Miniature	
			TURNER UNIT	
115529	Not Serviced	Bearing	Ball, Bearing Tuner (10 used)	
	7258054	Shaft	Shaft, Manual Drive Shaft	62
	7258072	Clutch	Clutch Disc, Driven	63
	7258203	Link	Connecting Link, Core Bar	64
	7258206	Bar	Core Guide Bar, Parallel	65
	7256271	Link	Connecting Link, Pointer	66
	7255992	Spring	Spring, Pointer Connecting Link	67
	7258468	Core	Core, Iron (Tuning)	68
	7258151	Escutcheon	Escutcheon, Dial	69
	7258002	Dial	Dial	70
	7258003	Plate	Dial Backplate	71
	7258042	Gear&Bush.	Gear and Bushing	72
	7258052	Gear	Gear and Bracket (Worm)	73
	7258059	Pointer	Pointer Assembly	74
	1218848	Tip	Pointer Tip Package	
	7258004	Plate	Pointer Backplate	75
	1218731	Slide	Push Button and Slide #1	76
	1218732	Slide	Push Button and Slide #2	77
	1218733	Slide	Push Button and Slide #3	78
	1218734	Slide	Push Button and Slide #4	79
	1218735	Slide	Push Button and Slide #5	80
	7258043	Spring	Spring, Clutch	81
	7257415	Spring	Spring, Core Bar Connecting Link	82
	7255984	Spring	Spring, Push Button Return	83
			TUBES	
	1213793	Tube	Tube, 6V6GT, Output	
	1211924	Tube	Tube, 0Z4, Rectifier	
	1217690	Tube	Tube, 6BA6, R.F. & I.F. Amplifier	
	1217691	Tube	Tube, 6BE6, Oscillator, Modulator	
	1218506	Tube	Tube, 6AV6, Detector and 1st Audio	

MODEL 986240,
Chevrolet

Service Part No.	Part Name	Description—Function	Illus. No.

INSTALLATION PARTS

7257917	Condenser	Condenser, Ammeter .5 mfd.	
1911095	Condenser	Condenser, Generator .3 mfd.	
1910147	Condenser	Condenser, Ignition Coil .3 mfd.	
1887829	Suppressor	Suppressor, Distributor	
7257928	Knob	Knob, Control	
7257929	Knob	Knob, Dummy	
7257930	Knob	Knob, Tone Control	
7257918	Nut	Nut, Speed	
1888204	Nipple	Nipple, Rubber, Distributor Suppressor	
7257920	Spacer	Spacer, R.F. Unit Mtg. (small)	
7257922	Spacer	Spacer, R.F. Unit Mtg. (outer)	
7257925	Shroud	Shroud, Speaker (rubber)	
494786	Collector	Collector, Static Front Wheel	
7257917	Stud	Stud, Audio Unit Mtg.	
7257924	Plate	Plate, Trim, Instrument Panel	
1912900	Condenser	Condenser, Voltage Regulator .5 mfd.	
7257921	Holder	Holder, Fuse Body, Male	
1216212	Holder	Holder, Fuse Body, Female	
1219181	Ferrule Assy.	Fuse Ferrule, Spring and Tip	

PROCEDURE FOR SETTING PUSH BUTTONS

Turn on the receiver for 10 minutes or longer to allow circuits to stabilize.

1. Select five good stations in order of their frequency.
2. Pull top push button slightly down and out as far as it will go.
3. With manual tuning knob tune-in desired station.
4. Push button in firmly to end of its travel.
5. Repeat same procedure for remaining four buttons.

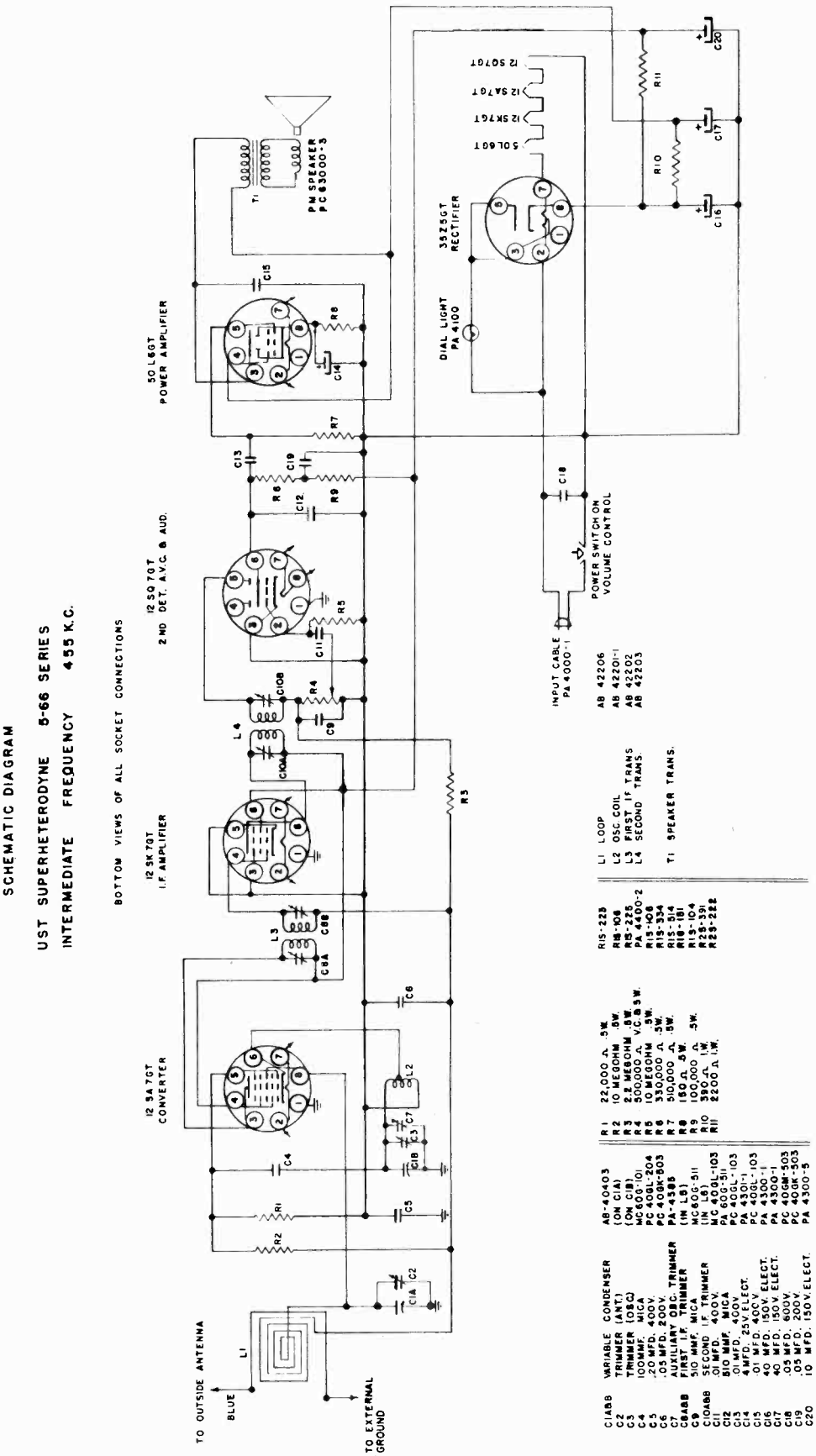
ANTENNA SYSTEM

An 80-inch fully extended (25⅝ inches collapsed) fender type antenna is furnished with this receiver, designed expressly for use on the 1949 Chevrolet passenger car and will operate very efficiently with this Chevrolet radio.

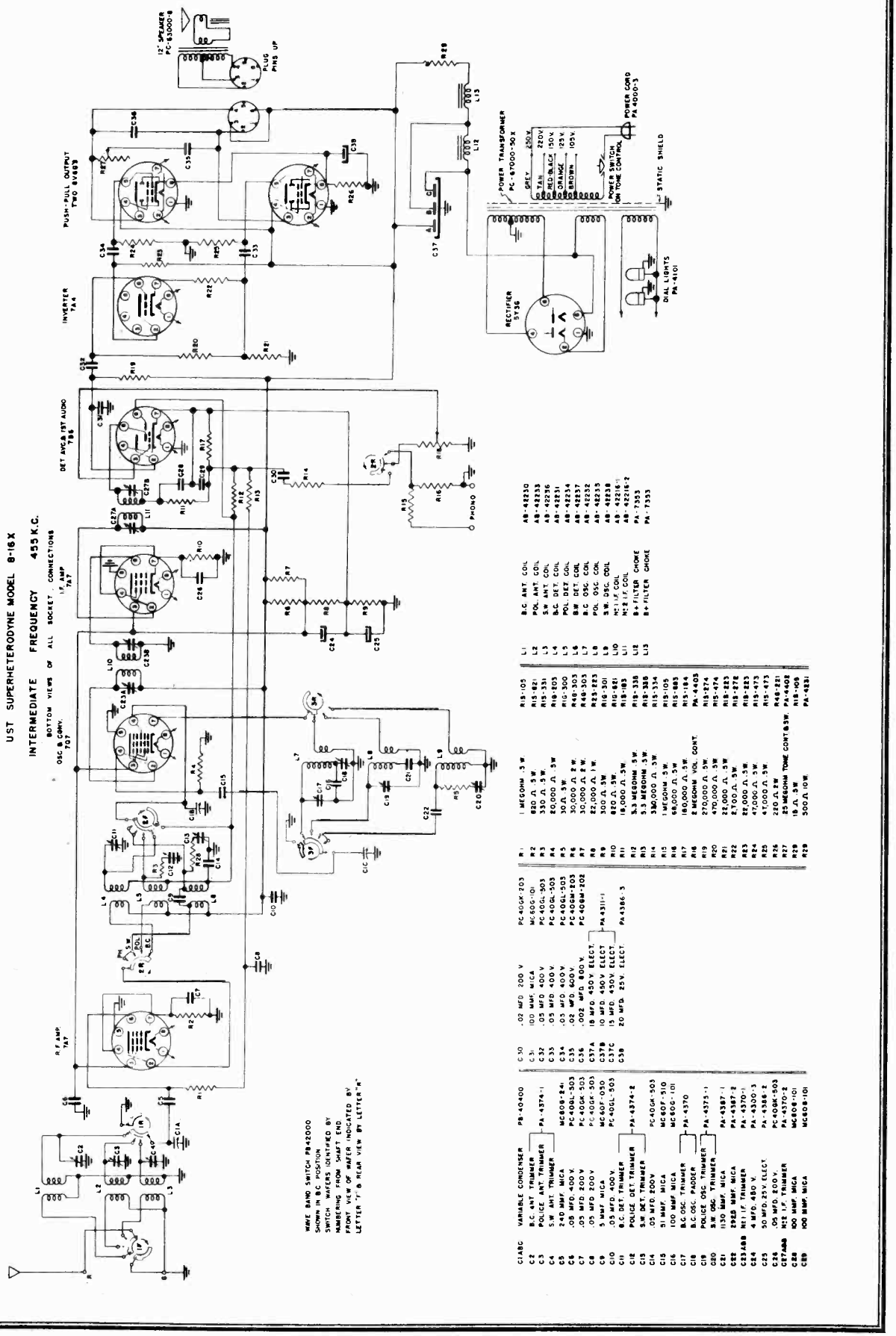
ANTENNA CIRCUIT

The antenna circuit is directly coupled to the antenna. The antenna, oscillator and R.F. circuit are tuned by means of iron cores. The antenna circuit is adjusted for slight variations in antenna by means of an antenna trimmer located on the bottom of the radio frequency unit.

MODEL 5-66 Series



MODEL 8-16X

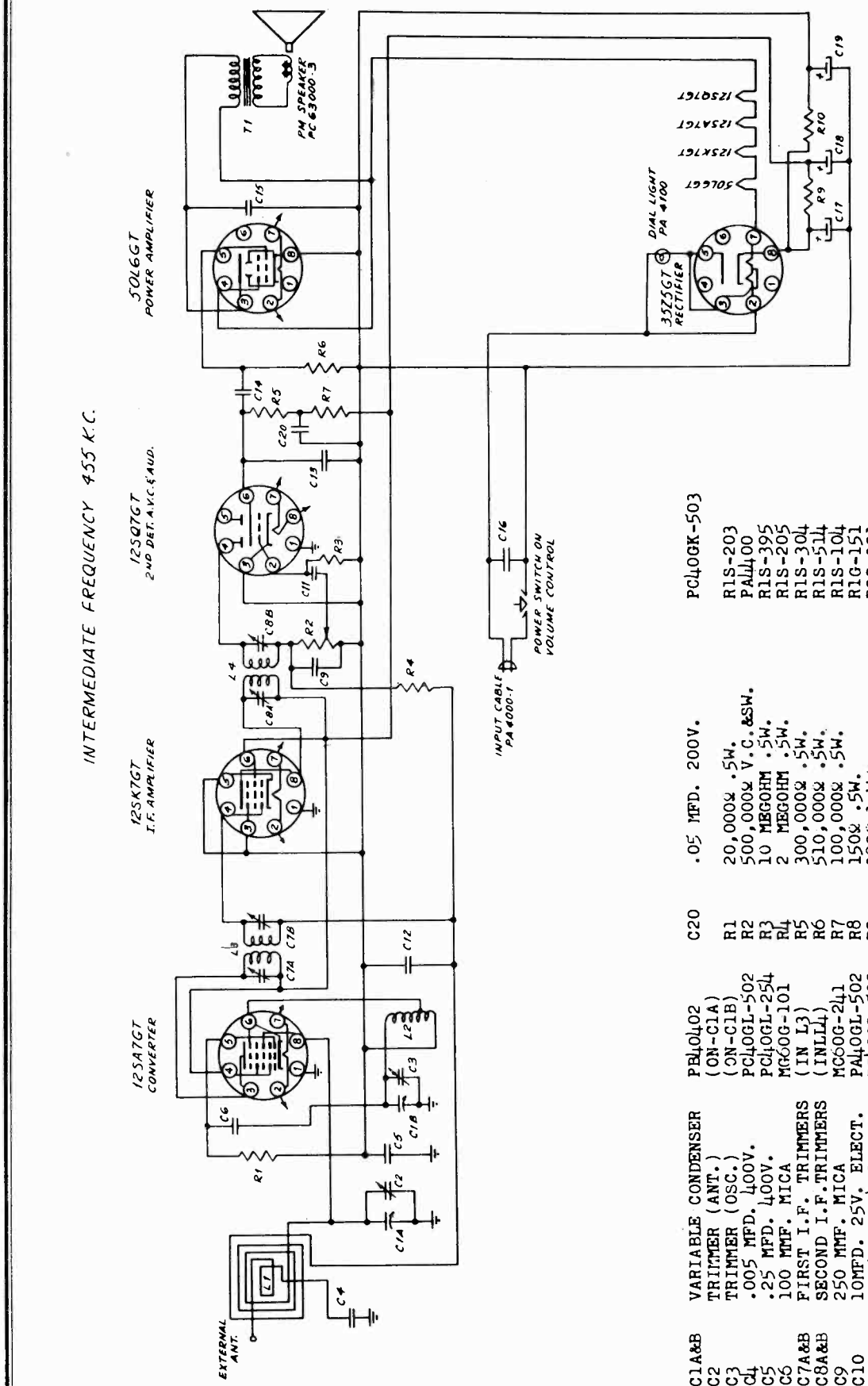


CIRC				
C1	VARIABLE CONDENSER	PB-40400		
C2	B.C. ANT TRIMMER		C30	.02 MFD 200 V
C3	POLICE ANT. TRIMMER	PA-4374-1	C31	100 MMF. MICA
C4	S.W. ANT. TRIMMER		C32	.05 MFD 400 V
C5	240 MMF. MICA	MC80B-241	C33	.05 MFD 400 V
C6	.05 MFD 400 V.	PC-40GL-503	C34	.05 MFD 400 V
C7	.05 MFD 200 V	PC-40GK-503	C35	.02 MFD 600 V
C8	.05 MFD 200 V	PC-40GK-503	C36	.002 MFD 800 V.
C9	5 MMF MICA	MC60F-050	C37A	18 MFD 450 V ELECT.
C10	.05 MFD 400 V.	PC-40GL-503	C37B	10 MFD 450 V ELECT.
C11	B.C. DET. TRIMMER		C37C	15 MFD 450V ELECT.
C12	POLICE DET TRIMMER	PA-4374-2	C38	20 MFD. 25V. ELECT.
C13	S.W. DET. TRIMMER			
C14	.05 MFD 200V	PC-40GK-503		
C15	51 MMF. MICA	MC60F-510		
C16	100 MMF MICA	MC60G-101		
C17	B.C. OSC. TRIMMER	PA-4370		
C18	B.C. OSC. PADDER			
C19	POLICE OSC. TRIMMER	PA-4373-1		
C20	S.W. OSC. TRIMMER			
C21	1500 MMF. MICA	PA-4387-1		
C22	1215 MMF. MICA	PA-4387-2		
C23A&B	M.I. I.F. TRIMMER	PA-4370-1		
C24	4 MFD. 450 V.	PA-4300-3		
C25	50 MFD. 25V ELECT.	PA-4388-2		
C26	.05 MFD 200 V.	PC-40GK-503		
C27A&B	M.I. I.F. TRIMMER	PA-4370-2		
C28	100 MMF. MICA	MC80B-101		
C29	100 MMF. MICA	MC80B-101		

R		
R1	1 MEGOHM .5 W	R18-105
R2	820 Ω .5W	R15-821
R3	330 Ω .5W	R15-331
R4	80,000 Ω .5W	R18-803
R5	30 Ω .5W	R10-300
R6	30,000 Ω 2 W.	R48-303
R7	30,000 Ω 2 W.	R48-303
R8	82,000 Ω 1 W.	R23-823
R9	300 Ω .5W	R10-301
R10	820 Ω .5W.	R10-821
R11	18,000 Ω .5W.	R18-183
R12	5.3 MEGOHM .5W	R18-538
R13	5.3 MEGOHM .5W	R18-538
R14	330,000 Ω .5W	R15-334
R15	1 MEGOHM .5W.	R18-105
R16	68,000 Ω .5W	R15-683
R17	180,000 Ω .5W.	R15-184
R18	2 MEGOHM VOL. CONT.	PA-4405
R19	270,000 Ω .5W.	R15-274
R20	470,000 Ω .5W	R15-474
R21	22,000 Ω .5W	R15-223
R22	2,700 Ω .5W	R15-272
R23	22,000 Ω .5W.	R15-223
R24	47,000 Ω .5W	R15-473
R25	47,000 Ω .5W	R15-473
R26	220 Ω .5W	R48-221
R27	2.5 MEGOHM TONE CONT. & SW.	PA-4402
R28	18 Ω 5W	R15-180
R29	300 Ω 10W.	PA-4281

L		
L1	B.C. ANT. COIL	AB-42230
L2	POL. ANT. COIL	AB-42233
L3	S.W. ANT. COIL	AB-42236
L4	B.C. DET. COIL	AB-42231
L5	POL. DET. COIL	AB-42234
L6	B.C. OSC. COIL	AB-42237
L7	POL. OSC. COIL	AB-42232
L8	S.W. OSC. COIL	AB-42235
L9	M.I. I.F. COIL	AB-42216-1
L10	M.I. I.F. COIL	AB-42216-2
L11	B+ FILTER CHOKE	PA-7353
L12	B+ FILTER CHOKE	PA-7353
L13		

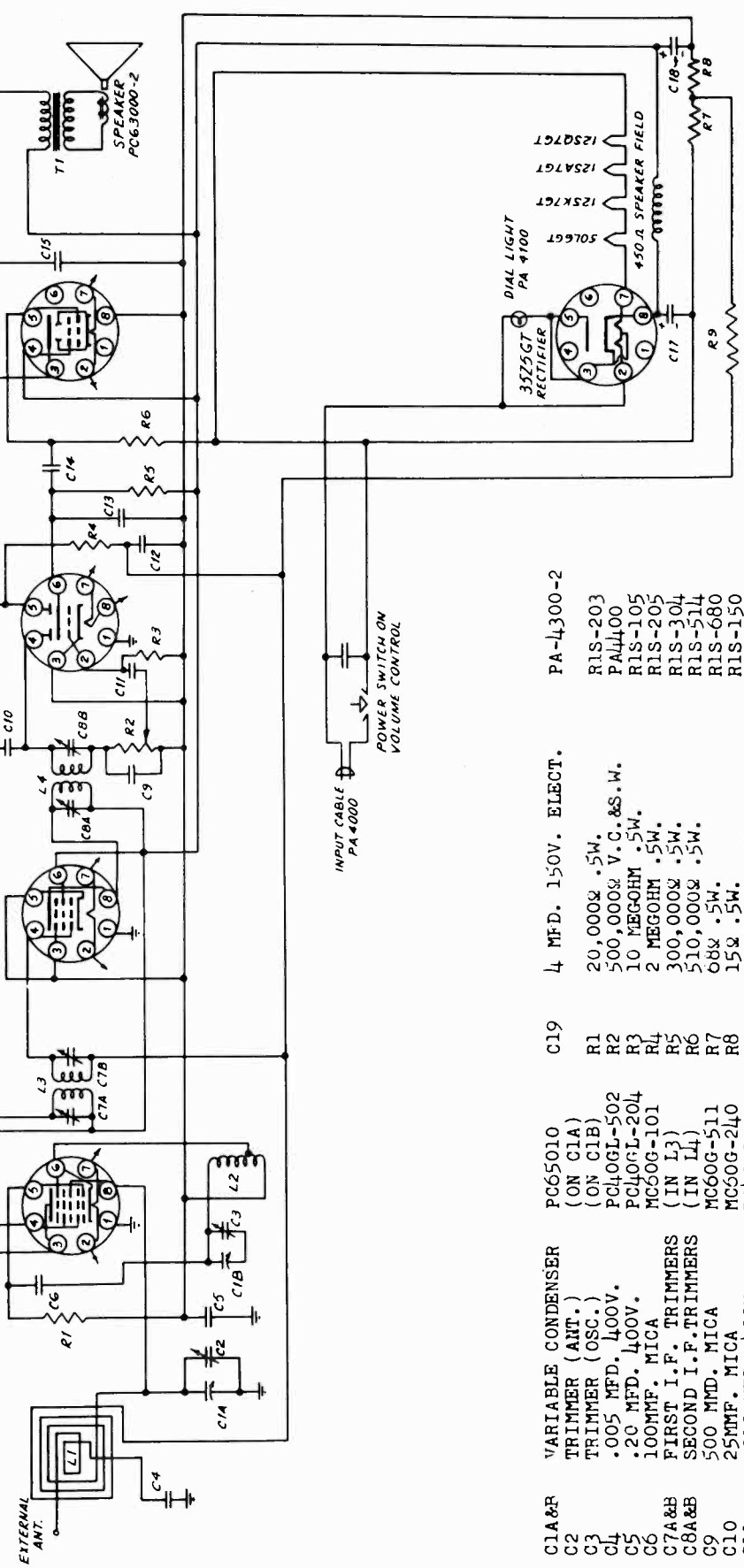
MODEL 526



C1A&B	VARIABLE CONDENSER	PB40402	C20	.05 MFD. 200V.
C2	TRIMMER (ANT.)	(ON-C1A)		
C3	TRIMMER (OSC.)	(ON-C1B)	R1	20,000Ω .5W.
C4	.005 MFD. 400V.	PC40GL-502	R2	500,000Ω V.C. &SW.
C5	.25 MFD. 400V.	PC40GL-254	R3	10 MEGOHM .5W.
C6	100 MMF. MICA	MC60G-101	R4	2 MEGOHM .5W.
C7A&B	FIRST I.F. TRIMMERS	(IN L3)	R5	300,000Ω .5W.
C8A&B	SECOND I.F. TRIMMERS	(IN LL4)	R6	510,000Ω .5W.
C9	250 MMF. MICA	MC60G-241	R7	100,000Ω .5W.
C10	10MFD. 25V. ELECT.	PA40GL-502	R8	150Ω .5W.
C11	.005 MFD. 400V.	PC40GL-502	R9	390Ω 1.W.
C12	.05 MFD. 200V	PC40GK-503	R10	220Ω 1.W.
C13	500 MMF. MICA	MC60G-511		
C14	.01 MFD. 400V.	PC40GL-103	L1	LOOP
C15	.01 MFD. 400V.	PC40GL-103	L2	OSCILLATOR COIL
C16	.05 MFD. 600V.	PC40GM-103	L3	FRIST I.F.
C17	40 MFD. 150V. ELECT.	PA-4300-1	L4	SECOND I.F.
C18	40 MFD. 150V. ELECT.	PA-4300-1		
C19	10 MFD. 150V. ELECT.	PA-4300-5	T1	SPEAKER TRANS.

	PC40GK-503
R1S-203	
PA4400	
R1S-395	
R1S-205	
R1S-304	
R1S-514	
R1S-104	
R1G-151	
R2S-391	
R2S-222	
AB42200	
AB42201	
AB42202	
AB42203	

MODEL 2001



C1A&B	VARIABLE CONDENSER	PC65010	C19	4 MFD. 150V. ELECT.	PA-4300-2
C2	TRIMMER (ANT.)	(ON C1A)			
C3	TRIMMER (OSC.)	(ON C1B)	R1	20,000Ω .5W.	R1S-203
C4	.005 MFD. 400V.	PC40GL-502	R2	500,000Ω V.C. &S.W.	PA4400
C5	.20 MFD. 400V.	PC40GL-204	R3	10 MEGOHM .5W.	R1S-105
C6	100MMF. MICA	MC60G-101	R4	2 MEGOHM .5W.	R1S-205
C7A&B	FIRST I.F. TRIMMERS	(IN L3)	R5	300,000Ω .5W.	R1S-304
C8A&B	SECOND I.F.TRIMMERS	(IN L4)	R6	510,000Ω .5W.	R1S-514
C9	500 MMD. MICA	MC60G-511	R7	68Ω .5W.	R1S-680
C10	25MMF. MICA	MC60G-240	R8	15Ω .5W.	R1S-150
C11	.010 MFD. 400V.	PC40GL-103	R9	2 MEGOHM .5W.	R1S-205
C12	.05 MFD. 200V	PC40GK-503			
C13	500 MMF. MICA	MC60G-511	L1	LOOP	AB42200
C14	.01 MFD. 400V.	PC40GL-103	L2	OSCILLATOR	AB42201
C15	.01 MFD. 400V.	PC40GL-103	L3	FIRST I.F.	AB42202
C16	.05 MFD. 600V.	PC40GM-103	L4	SECOND I.F.	AB42203
C17	40MFD. 150V. ELECT.	PA-4300-1			
C18	40MFD. 150V. ELECT.	PA-4300-1	T1	SPEAKER TRANS.	