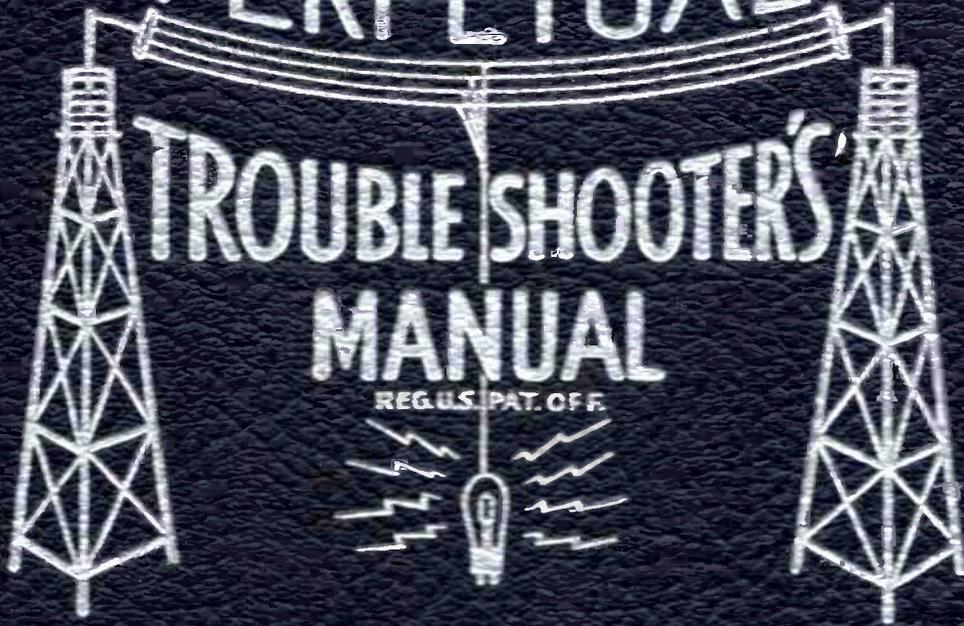


VOLUME XX

PERPETUAL

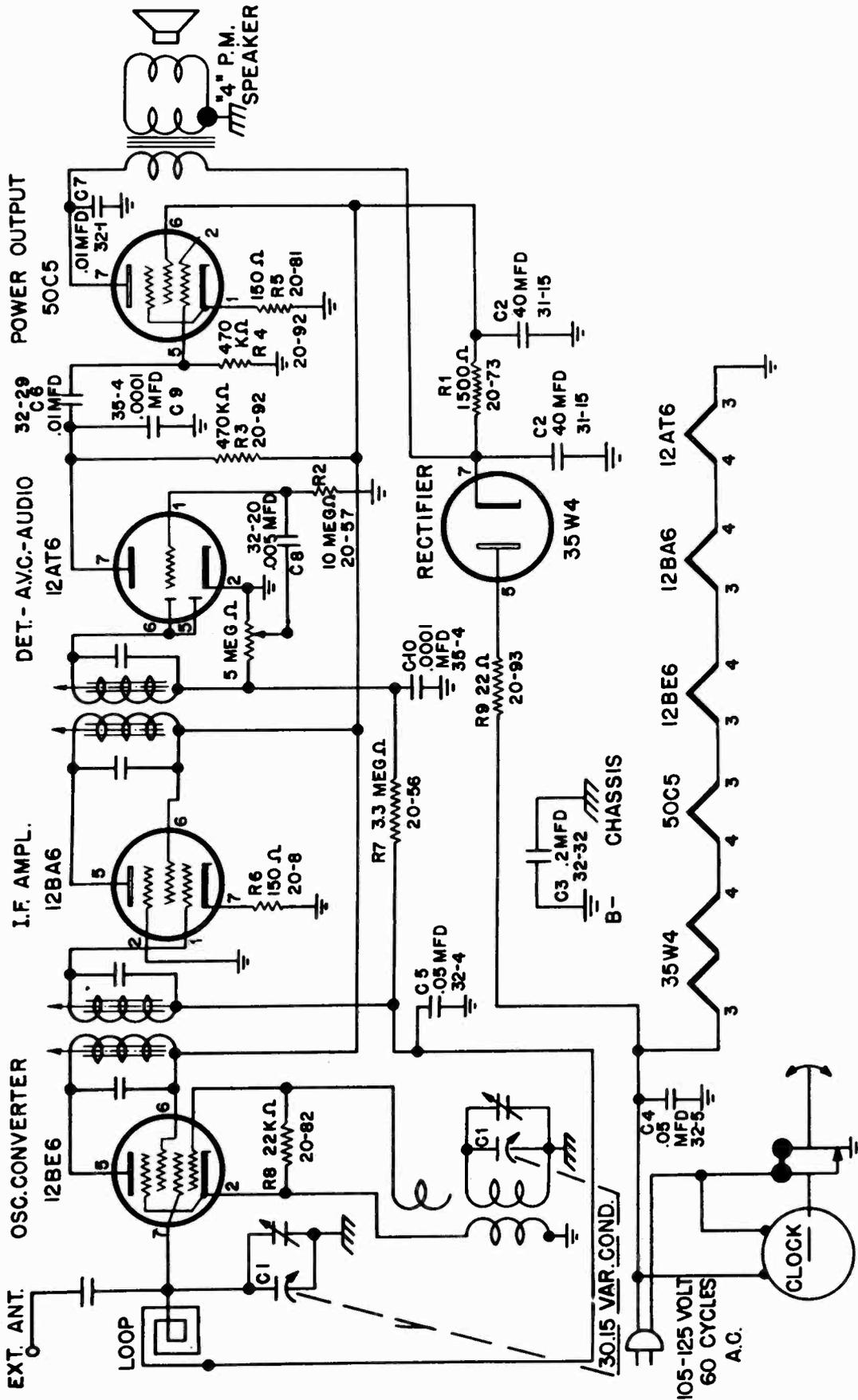
TROUBLE SHOOTER'S  
MANUAL

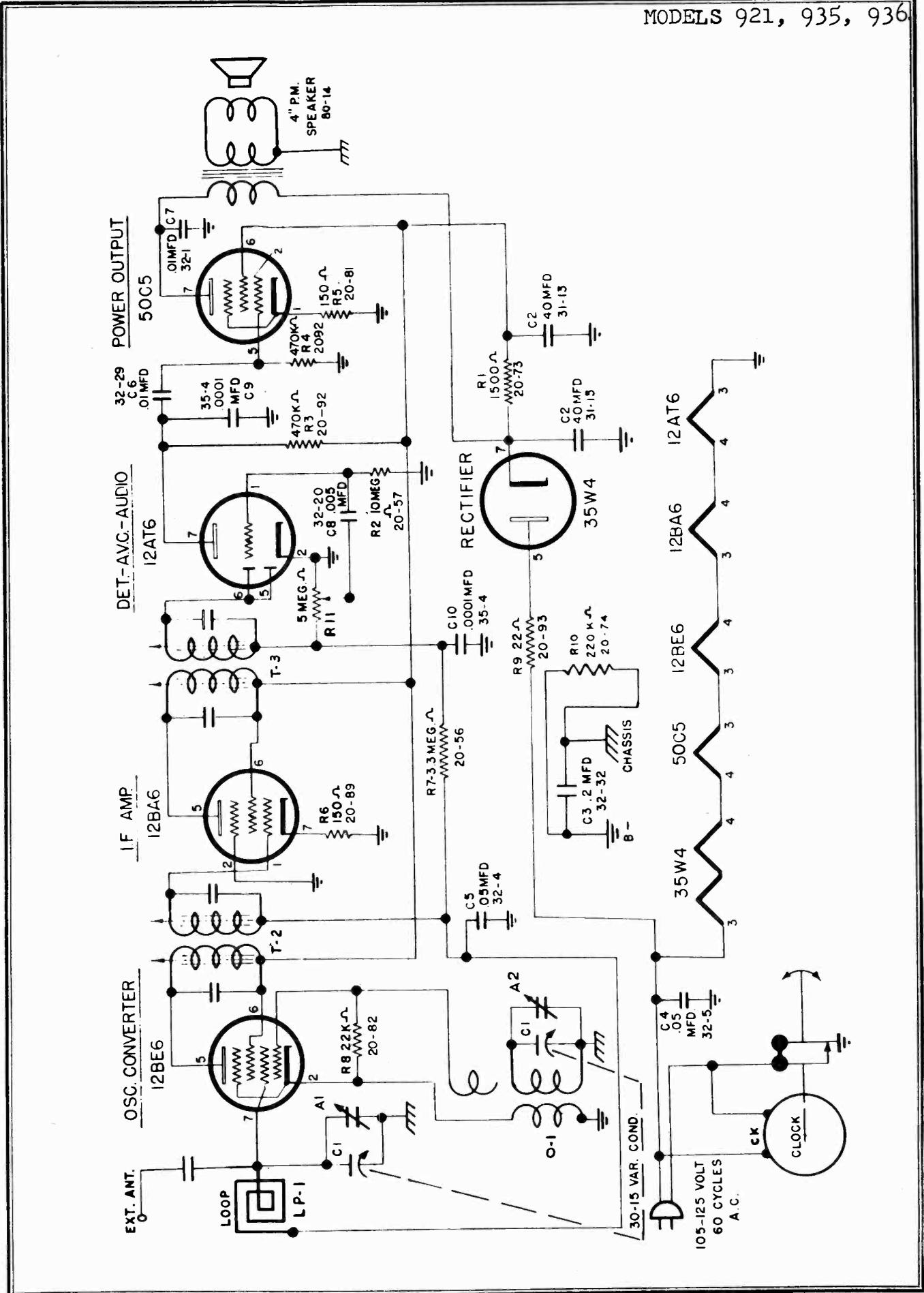
REG. U.S. PAT. OFF.



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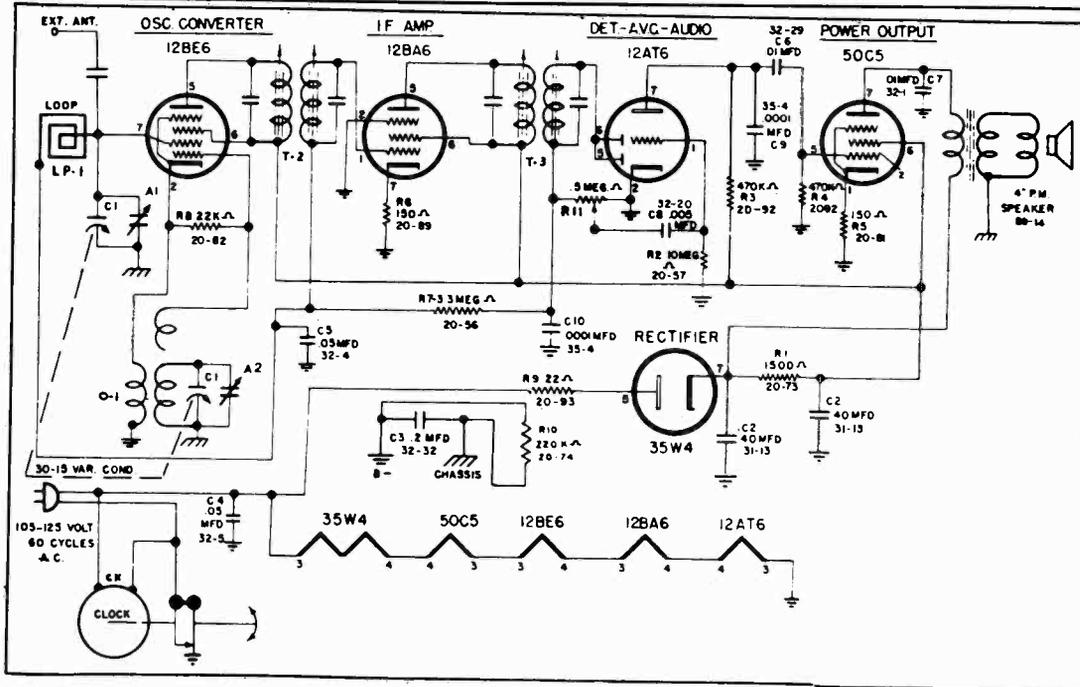


**ALIGNMENT PROCEDURE**

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

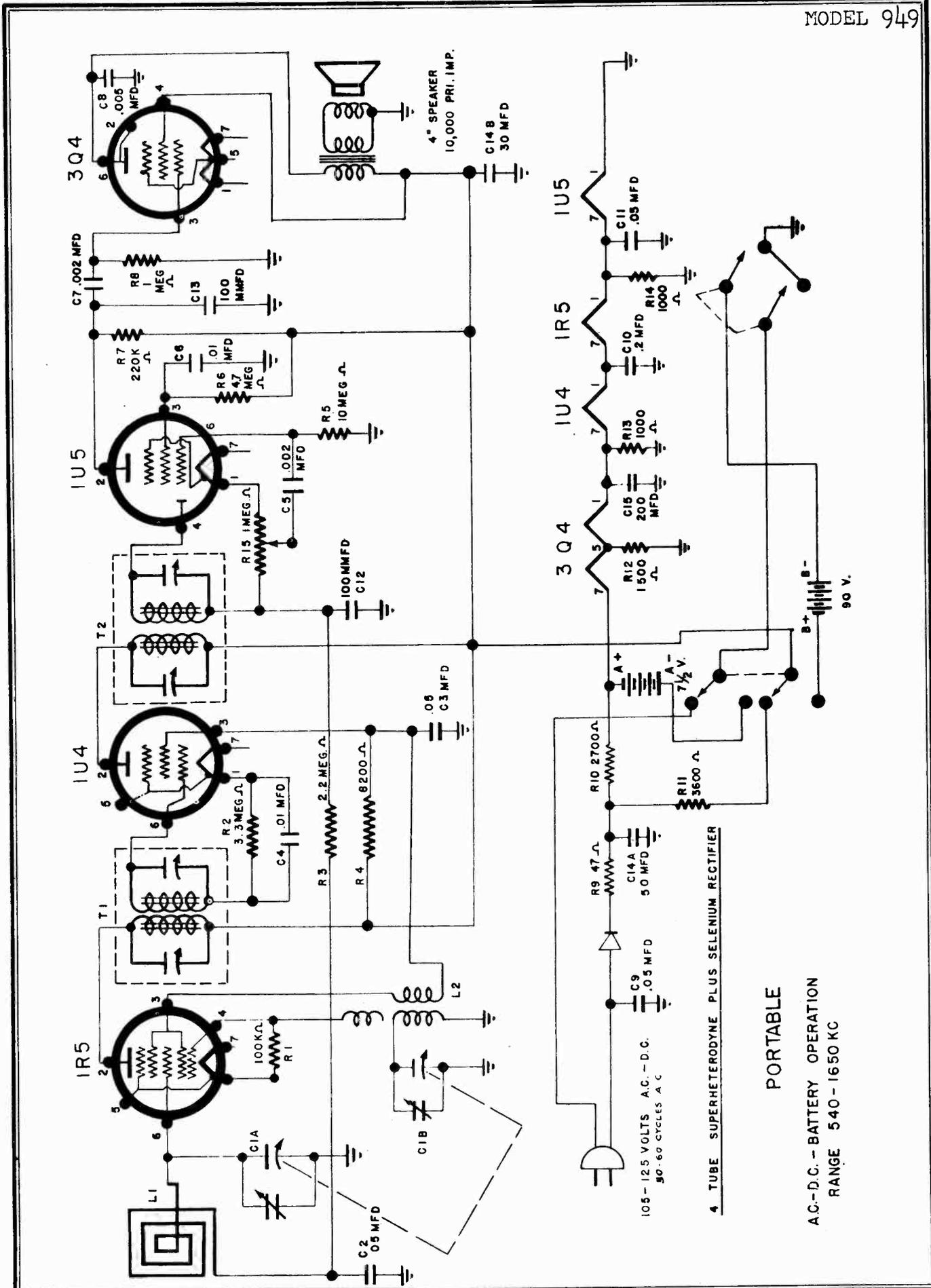
SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Capacitor	Connections to Receiver	Ground Connection		
455 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	12BE6 grid	B—	Rotor full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

\* Seven markings on the dial bracket represent respectively 550 kc, 600 kc, 700 kc, 900 kc, 1100 kc, 1400 kc, and 1600 kc reading from left to right. These points are to be used for the alignment of the receiver.



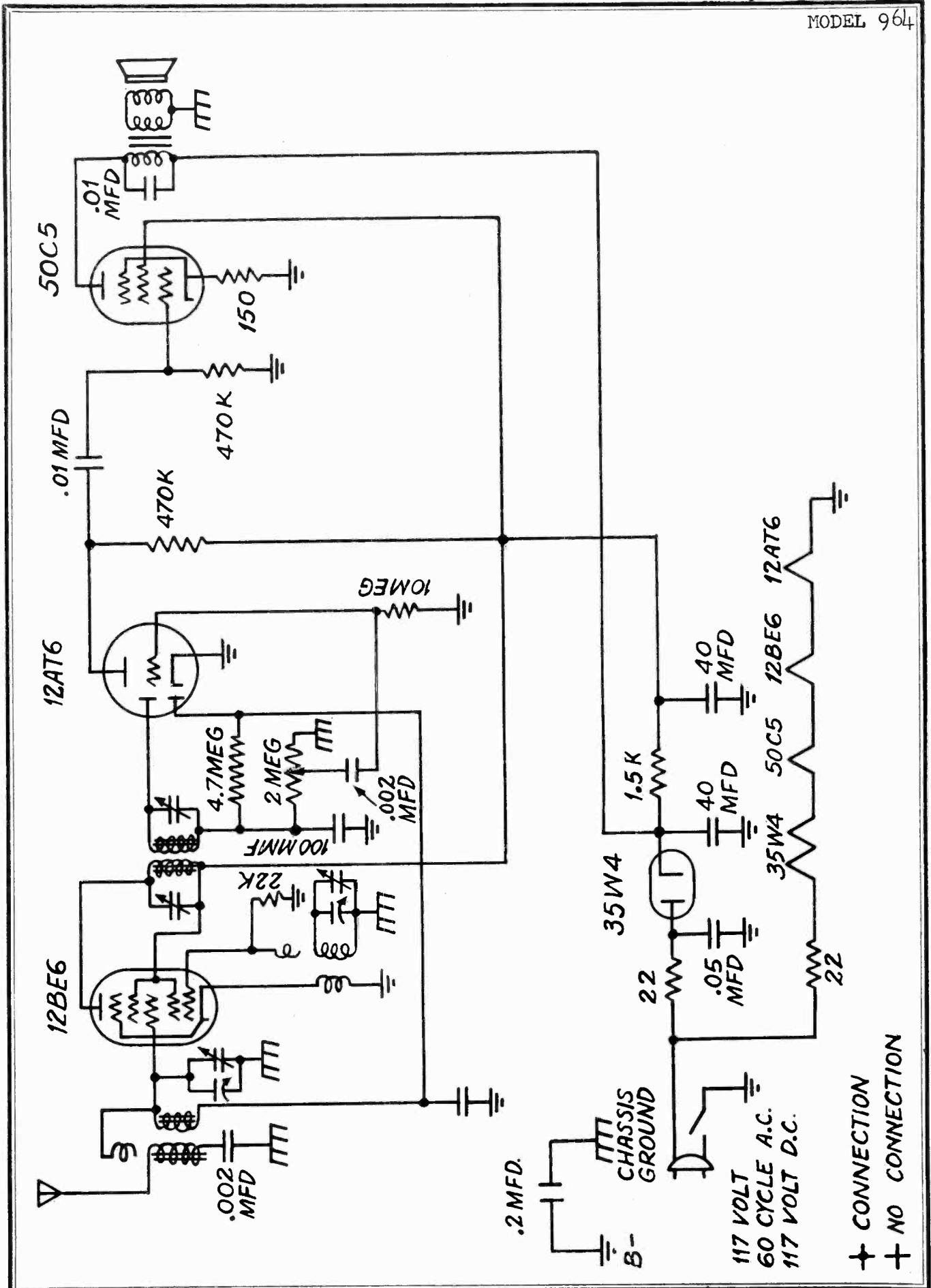
**REPLACEMENT PARTS LIST**

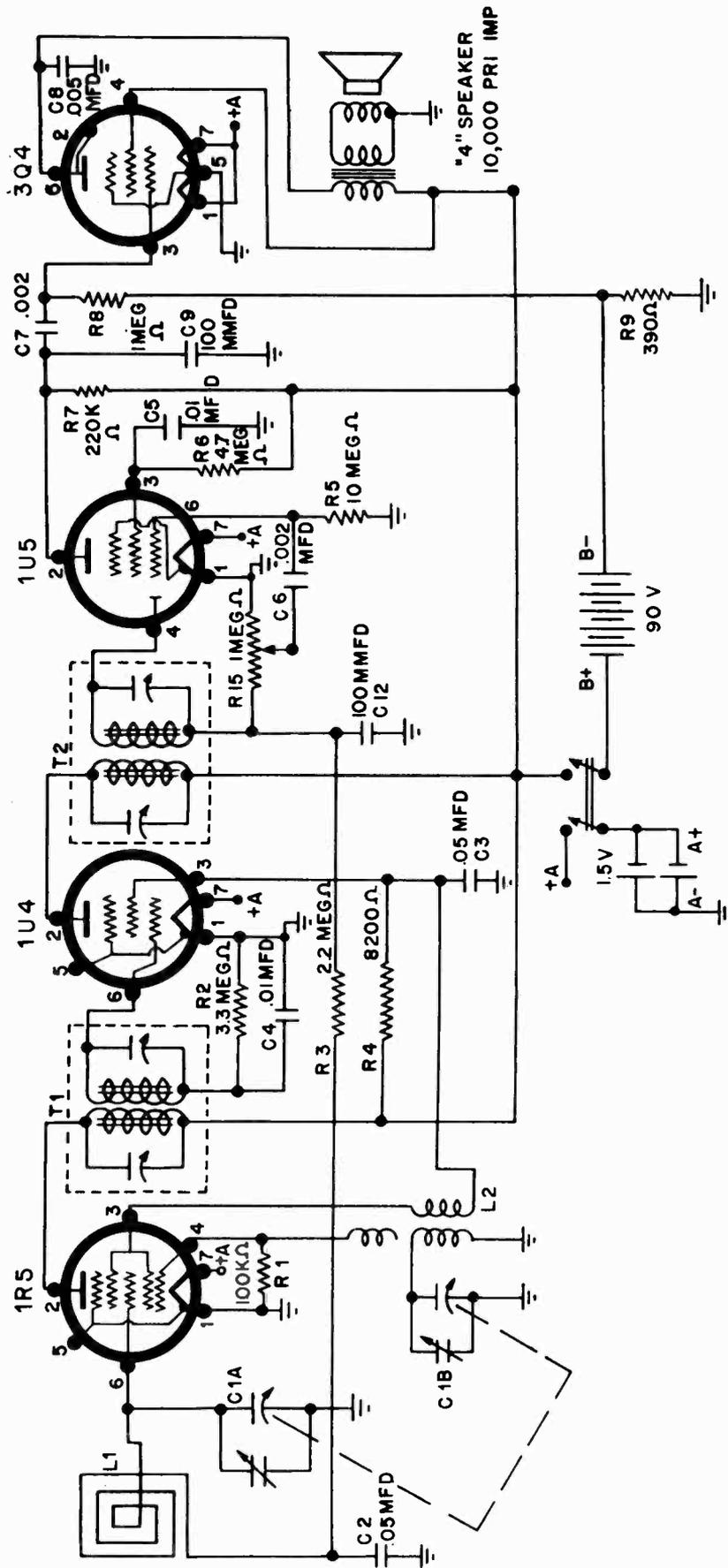
Ref. No.	Part No.	DESCRIPTION
<b>CAPACITATORS</b>		
C1	30-15	Variable Condenser, 2 gang
C2	31-13	40 mfd.—40 mfd., 150 volt dual electrolytic condenser
C3	32-32	.2 mfd., 200 volt, paper
C4	32-5	.05 mfd., 400 volt, paper
C5	32-4	.05 mfd., 200 volt, paper
C6	32-1	.01 mfd., 400 volt, paper
C7	32-1	.01 mfd., 400 volt, paper
C8	32-20	.005 mfd., 600 volt, paper
C9	35-4	.0001 mfd., 500 volt, mica
C10	35-4	.0001 mfd., 500 volt, mica
<b>RESISTORS</b>		
R1	20-73	1500 ohm, 1 watt 20%
R2	20-57	10 megohm, 1/4 watt 20%
R3	20-92	470,000 ohm, 1/4 watt 20%
R4	20-92	470,000 ohm, 1/4 watt 20%
R5	20-81	150 ohm, 1/2 watt 20%
R6	20-89	150 ohm, 1/4 watt 20%
R7	20-56	3.3 megohm, 1/4 watt 20%
R8	20-82	22,000 ohm, 1/4 watt 20%
R9	20-93	22 ohm, 1/2 watt 20%
R10	20-74	220,000 ohm, 1/4 watt 20%
R11	50-15B	1/2 meg. volume control with switch
<b>COILS AND TRANSFORMERS</b>		
O-1	60-9	Oscillator coil
T-2	61-11	Input IF transformer
T-3	61-11	Output IF transformer
LP-1	62-15	Loop antenna
<b>MISCELLANEOUS</b>		
80-14	80-14	4 inch P.M. speaker with output transformer
122-19	122-19	Selector knob
122-15	122-15	Volume knob
120-33	120-33	Cabinet—walnut
CK	140-6	Clock

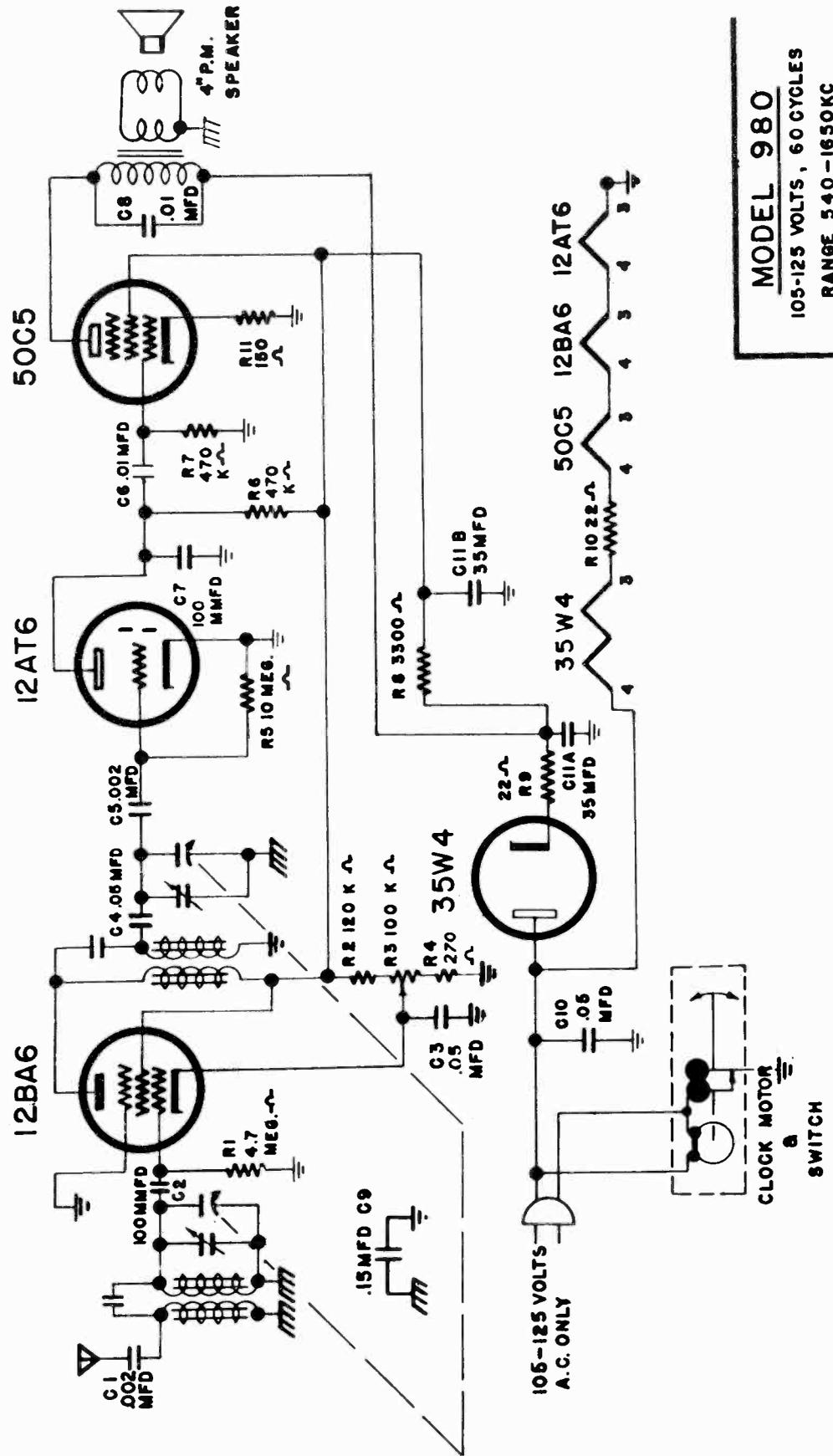


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**MODEL 980**  
 105-125 VOLTS, 60 CYCLES  
 RANGE 540-1650KC



MODELS 6A47WT,  
6A47WTR, 6AWC2, 6AWC3

### INSTALLATION

YOUR RADIO IS DESIGNED FOR 110 TO 120 V. ONLY.

#### Installing The Outside Antenna.

The built in loop antenna on your Radio is highly efficient for the reception of local or nearby stations on the broadcast band. Short-wave reception will require some sort of an antenna connected to the set -- 5 to 15 ft. of wire stretched on the floor and connected to one of the antenna clips.

However, in locations where reception with the built in loop antenna is not satisfactory, a good outside antenna should be installed. The total length of the outside antenna, including the lead-in, should be from 50 to 80 ft. for good operation, and it should be as high as possible. Keep the antenna away from metallic objects such as other wires, guttering, grounded fire escapes, etc.

When the antenna is connected to a receiver, the antenna trimmer on the back of the chassis base must be readjusted. To do this, connect the antenna to one of the antenna terminals in the rear of the set; tune in a weak station near 600 kc. (60 on the dial); and adjust the trimmer screw with a screw driver until the signal is loudest. Antennas shorter than about 30 ft. should be connected to the SHORT Ant. clip; those much longer than this will need to be connected to the LONG Ant clip. If in doubt which to use, try both adjusting the trimmer for each, and use the connection which gives the best performance.

A good ground connection should always be provided when an outside antenna is used, and sometimes it is useful in reducing noise even when no antenna is connected to the set. Connect a wire from the GND clip in the rear of the receiver to a convenient water pipe, radiator, or conduit. If none of these are available, a wire may be run to a metal stake or pipe driven into the ground to a distance of 4 to 6 ft.

#### PREPARING Record Changer For Operation.

The record changer has been mounted tightly to the cabinet shelf ( or drawer bottom in the Console Model) to prevent damage in shipping. A string tied around the needle arm post holds the drawer closed in the Console Model. Cut this string BEFORE trying to open the drawer. Before attempting to use the phonograph, loosen the three mounting bolt nuts on the UNDER SIDE of the shelf or drawer until the record changer is floating on its shock absorbers. (These mounting bolts are located on top of the rectangular base.) Now, remove the two rubber bands that hold the pickup arm secure and remove the cardboard holder. Remove the cardboard disc from the turntable. Finally, remove the needle guard from the pick-up arm by grasping the guard with your thumb and forefinger at the rounded ends and pulling firmly but gently downward.

#### Operation.

Broadcast Band (535 - 1620 Kilocycles); The broadcast band is calibrated in channel numbers. Add a zero to the dial number to get the kilocycle number.

Short-Wave Band (9 to 15.6 Megacycles) ; The short-wave band is calibrated in megacycles.

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### Tone Control and Phono-Radio Switch:

Turning the knob all the way to the right throws a switch which cuts out radio reception and connects the phono-jack on the rear of the chassis base. Phonograph records may then be played through Model 6A47WT by connecting any record player to this jack. To restore radio reception, turn the tone knob all the way to the left to throw the switch back to the radio portion.

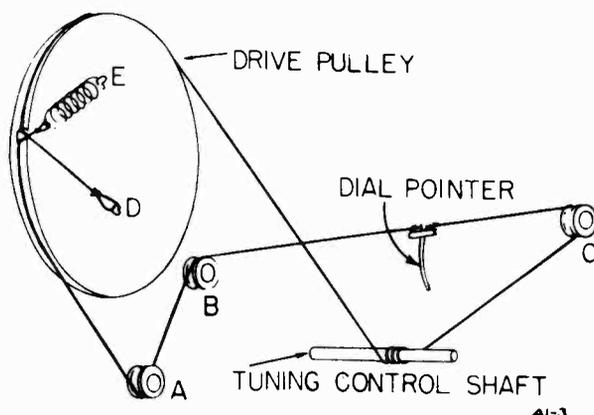
### Band Switch:

This knob has two positions. The position to the right (SW) switches the tuning to the short-wave band. The position to the left (BC) provides reception on the regular broadcast band.

### SERVICE DATA

#### Stringing the Dial Drum.

1. Turn the gang condenser to FULL CLOSED position.
2. Attach the looped end of the line cord assembly (Part #WCA103) to lug "D" as shown in the diagram.
3. String the cord through the opening on the rim of the pulley, down behind the dial and under the tuning shaft.
4. Take four turns around the shaft in a clockwise direction as viewed from the front of the chassis, progressing outward from the chassis. (Check to be sure that none of the turns lie on top of one another to avoid sloppy tuning).
5. Continue stringing the cord from the tuning shaft up to and around the small pulley "C" at the upper left hand corner of the dial bracket (as viewed from the front of the chassis). In going, from the shaft to pulley "C", be sure to lead the cord between the bracket mounting leg and the tone control shaft.
6. Now, string the cord along the upper edge of the dial bracket to pulley "B" at the upper right hand corner of the bracket. (As the cord passes along the top of the dial, be sure to thread it through the opened prongs on the dial pointer.)



7. String the cord over the pulley "B" downward around pulley "A" (at the lower right hand corner of the chassis as viewed from the front), up through the opening on the rim of the dial pulley, and hook to the tension spring which has been hooked over lug "E" on the pulley.

MODELS 6A47WT,  
6A47WTR, 6AWC2, 6AWC3

The stringing is now completed. To fasten the pointer to the cord:

1. With the gang condenser still in CLOSED POSITION, slide the pointer to the last dot at the left hand end of the BC band (as viewed from the front of the chassis).
2. Pull the cord out from the prongs in the pointer and wrap a small piece of 1/4" tape around it at the point where the pointer prongs come.
3. Re-insert, and bend the two end prongs backward over the tape and middle prong forward. This fastens the pointer securely to the cord in the correct position, completing the stringing of the dial.

#### STRINGING THE TUNER

In order to string the tuner, remove tuner assembly from the chassis and remove the dial drum from the condenser shaft with a soldering iron. In doing this, it is important to note the position of the dial drum relative to the condenser plates, in order to reassemble properly.

Part #WCA102 --cord and core assembly is used for stringing the tuner. Proceed as follows:

1. Remove the S.W. coil from the fuse clip brackets.
2. Insert the S.W. coil as shown in the diagram, attaching the tuner spring to loop "E" and allowing the spring to lie loose until it is to be stretched around the pulleys and connected to the right hand hook of the B.C. core.
3. Replace the S.W. coil in the fuse clips in the approximate position shown in the diagram.
4. Rotate the gang condenser to FULL OPEN position (counter-clockwise looking from above as in the diagram).
5. Pull the core by means of the cord fastened to the left hand hook, until the left end of the core is exactly 1/4" from the first tooth on the larger radius of the cam (tooth "A" with cam rotated 180° from position shown on the diagram).
6. Proceed with the stringing as shown in the diagram, making sure that the cord is not unduly stretched or left loose between any of the teeth on the cam.

When the stringing has been completed around the cam:

7. Lay the B.C. core, which has been attached to the other end of the cord, on the bracket and remove the BC coil from the clips that hold it.
8. Insert the B.C. core in the coil form and push it through (with a small wire) until the bare hook comes into view at the other end.
9. Replace the B.C. coil in the approximate position shown on the diagram.
10. Recheck the gang--it should be in FULL OPEN position.
11. Grasp the tuner shaft firmly to prevent it from rotating. String the cordloop with the spring attached, from the right end of the S.W. core around pulley "B" only. Hook the spring to the right hand hook on the B.C. core. (The spring should be barely accessible at the right end of the B.C. coul.)
12. Release the gang condenser (being sure it is still in FULL OPEN position), and stretch the spring around the second pulley "C". Be careful not to damage the spring during this operation.
13. Adjust the B.C. coil to its correct position by sliding the coil to a point 1 1/4" from the right-hand end of the B.C. core to the beginning of the coil winding. The tuner is now strung and ready for adjustment of the S.W. coil position.

MODELS 6A47WT,  
6A47WTR, 6AWC2, 6AWC3

Turn the gang condenser to its FULL CLOSED position. Insert a piece of wire which has been marked  $5/8$ " from one end into the coil form until it hits the S.W. core. The distance from the left end of the coil form to the left end of the core should be  $5/8$ ". If this measure is not within  $1/32$ ", there has been some error made during the stringing procedure or the parts are defective. Carefully review the steps taken. If no apparent error is in evidence and the measure does not fall within this tolerance, get in touch with your Lytle & Canon firm who will furnish you a complete tuner sub-assembly already strung.

If the final measure was within the tolerance, the tuner is properly strung and ready to be replaced on the chassis base. Solder the dial drum back on, making sure that you replace it in the same position with respect to the gang plates as it originally was.

**WARNING:** When removing the B.C. and S.W. coils from the fuse clips, be careful not to break the fine wires or loosen any soldered connections.

**NOTE:** The S.W. core is distinguished from the B.C. core in that the S.W. core has a somewhat lighter color and a more satiny surface.

To remove the tubes in the 6A47WTR model it is necessary to remove the record changer first. To do this, remove the three mounting screws in the base of the changer. Disconnect all "plug-ins" as described. Lift the record changer out of the cabinet. Next, remove the three screws holding the metal cover in front of the changer and remove this cover. The tubes should now be easily accessible without removing the set from the cabinet. If not, proceed as described in the preceding paragraph and remove the chassis from the cabinet.

#### ALIGNMENT PROCEDURE

##### I.F. Alignment

Whenever one or both I.F. transformers (T3 and T4) are changed, or the wiring associated with these transformers or with the 6SA7 or 6SF7 tubes is disturbed, it is imperative to realign the I.F. transformers. Proceed as follows:

1. Connect an output meter, a.c. voltmeter, or other suitable instrument across either primary or secondary of the output transformer, T5.
2. Turn the volume control to its maximum (clockwise); and turn the bandswitch to BC (counterclockwise).
3. Connect a signal generator from the input grid (pin 8) of the 6SA7 tube to ground, and feed in a modulated signal at 455 kc., using as small an input signal as possible yet maintaining a convenient deflection on the output meter.
4. Adjust each of the 4 screws on top the I.F. transformers for maximum output, at the same time decreasing the input from the signal generator to be sure to get a true maximum reading.
- 5.

When this is completed, the I.F. transformers are in alignment.

##### R.F. Alignment:

When service operations of any sort have been performed on the antenna coil, interstage coils (T1, T2), loop antenna, gang condenser-oscillator assembly, 6SG7 tube, or circuits associated with any of these, it is important to realign the R.F. circuits for best performance.

MODELS 6A47WT,  
6A47WTR, 6AWC2, 6AWC3

### Shortened Alignment Procedure

If the service operations have not involved the gang condenser-oscillator assembly or its associated capacitors (C18, C19, C13, C14, a shortened procedure may be used, as follows:

1. Connect the output meter and check the I.F. alignment.
2. Using broadcast stations as a guide, check the calibration of the broadcast and short-wave bands. (If no stations are available, use a signal generator--it is less likely to be accurate however, WWV time signals on 10 mc. and 15 mc. can sometimes be used to check the short-wave band calibrations). If the calibration is not reasonably close, the complete alignment procedure will be necessary. If satisfactory, proceed to connect the signal generator or multivibrator from GND terminal to the LONG ANT terminal on the loop frame.
3. Turn the band switch to BC, and set the dial to about 600 kc.
4. If a multivibrator is used, adjust the loop trimmer C6 for maximum output. If a signal generator is used, tune in the signal at about 600 kc. and adjust C6 for maximum output.
5. Turn to 1500 kc. and tune in a signal.
6. Adjust trimmers C7 and C4 for maximum output.
7. Go back to 600 kc. and disconnect the signal generator or multivibrator from the LONG ANT terminal, but leave the wire from the signal source in the vicinity of the antenna terminals. Turn up the signal source output so that the signal can be heard and readjust C6 for maximum output.
8. Reconnect the lead from the signal source to the SHORT ANT terminal through a 600 ohm resistor.
9. Turn the band switch to SW and the dial to 15 mc. Tune in a signal from the signal source at this point. (Be sure you have the correct signal and not an image.)
10. Adjust trimmers C2 and C3 for maximum output, "rocking" the tuning control as you do so.

The receiver is now in alignment for reception with the loop antenna. If an external antenna is used, the loop trimmer C6 must be realigned with the actual antenna connected as described in the installation instructions.

### Complete R.F. Alignment Procedure

It is strongly recommended that the receiver be returned to the factory for any repairs involving replacement or any adjustment of the gang condenser-oscillator assembly (tuner assembly) other than adjustment of trimmers C4 and C7. If, however, it has been necessary to replace the gang condenser-oscillator assembly or capacitors C18, C19, C13, or C14 in the field, the alignment procedure is as follows:

1. Set the dial pointer so that it lines up exactly with the left hand and mark when the gang is fully closed.
2. Connect the output meter, Turn the volume control to its maximum and the bandswitch to BC. Feed in the signal generator on the grid of the 6SA7 (pin 8 to ground).
3. Check the I.F. alignment. Set the signal generator to 1000 kc. and check the generator calibration against a broadcast signal in place of the generator. Adjust C19 so that the receiver is on calibration at this point.
4. Throw the bandswitch to SW. Set the signal generator to 12 mc. and adjust C18 so that the correct signal (the one which comes in at the higher frequency on the receiver dial) is right on the 12 mc. mark.
5. From here on, follow the shortened procedure until the alignment of the receiver is complete.

MODELS 6A47WT,  
6A47WTR, 6AWC2, 6AWC3

SUPPLEMENT

F M Operation

FM Band--88 to 180 Megacycles:

Turn the radio on by turning the volume control knob to the right. Turn the Frequency Modulation tuner on by turning the "FM On-Off" switch to the right. Wait a few seconds for the tubes to heat. Turn the tone control knob clockwise until a click is heard. The receiver will now be set for FM reception.

FM Tuning Knob:

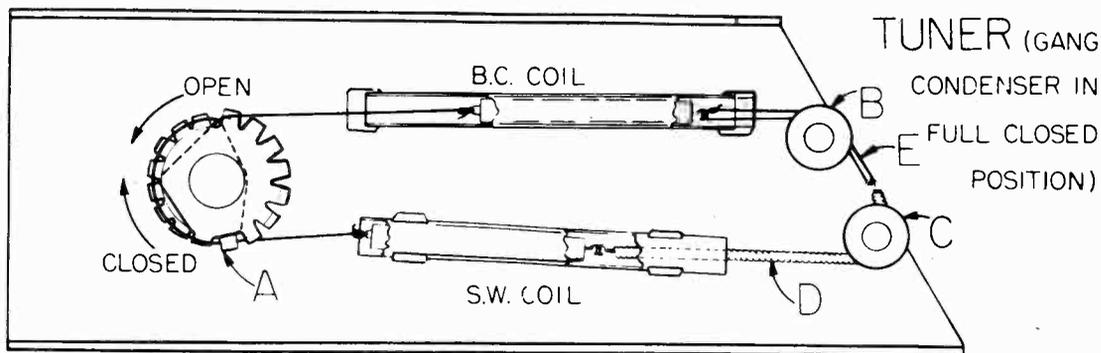
Turn the FM tuning knob until the station is heard. Rotate the knob slowly back and forth across the station desired. The station may be heard in three positions -- the correct position is the center one in which the signal is the clearest and strongest. If the signal is too strong, reduce it by means of the VOLUME CONTROL.

Antenna:

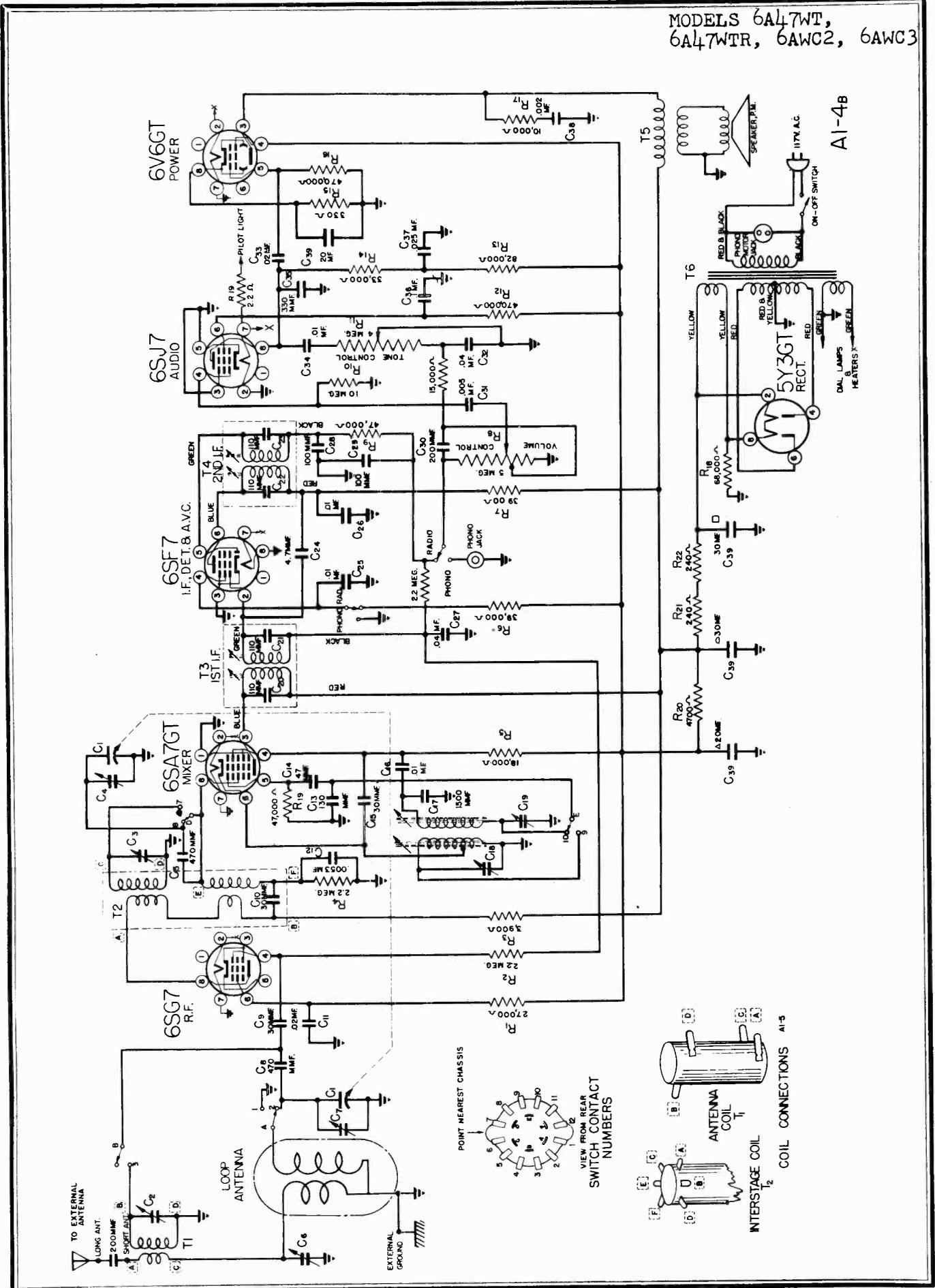
For reception of distant stations, and improved results in locations unfavorable to FM reception, install an outside FM dipole antenna, equipped with a 300 ohm flat lead-in. Disconnect the built in antenna, by removing the wires from terminals #1 and #3 on the tuner chassis. Connect the lead-in wires of the outside antenna to the same terminals.

FM Tuner:

If your radio does not have an FM band, an FM tuner may be installed.



MODELS 6A47WT,  
6A47WTR, 6AWC2, 6AWC3



PAGE 20-8 LYTLE & CANON

MODELS 6A47WT,  
6A47WTR, 6AWC2, 6AWC3

CONDENSERS

<u>Code No.</u>	<u>SPECIFICATIONS</u>	<u>Tolerances</u>	
C 24	4.7 mmf.	600 v.	.5%
C 15, C4	30 mmf.	600 v.	10%
C 14	47 mmf.	600 v.	10%
C 13	130 mmf.	600 v.	5%
C 10, C 30	200 mmf.	600 v.	20%
C 35	330 mmf.	600 v.	20%
C 5, C 8	470 mmf.	600 v.	3%
C 17	1500 mmf.	600 v.	10%
C 38	0.002 mfd.	600 v.	25%
C 12	0.005 mfd.	400 v.	10%
C 31	0.0053 mfd.	400 v.	5%
C 11, C 16,			
C 25, C 34	0.01 mfd.	400 v.	20%
C 33	0.02 mfd.	400 v.	20%
C 37	0.025 mfd.	400 v.	20%
C 27, C 32	0.04 mfd.	200 v.	20%
C 36	0.01 mfd.	400 v.	20%
C 26	0.01 mfd.	600 v.	20%
C 39	4 sect. electrolytic		
	30 mfd.	450 v.	-50%
	30 mfd.	450 v.	10%
	20 mfd.	450 v.	
	20 mfd.	25 v.	

TRANSFORMERS & COILS

<u>Part No.</u>	<u>Code No.</u>	<u>Description</u>
TRX 101	T6	Power Supply
TRX 102	T5	Output Transformer
TRX 103	T3	1st I.F. Transformer
TRX 104	T4	2nd I.F. Transformer
CLA 102	T2	R.F. Interstage Coil
CLA 101	T1	S.W. Antenna Coil
CLA 107		Loop Antenna Assembly for 6A47WT
CLA 115		Loop Antenna Assembly for 6A47WTR
CLA 116		Loop Antenna Assembly for 6AWC2 & 6AWC3

KNOBS & CONTROLS

<u>PART NO.</u>	<u>Description</u>
SWX 101	Band Switch Assembly
KNX 101A	Band Switch
KNX 102	Tuning Knob
KNX 103	Volume Control Knob
KNX 104	Tone Control Knob
SHX 100C	Tuning Shaft Assembly
PHX 100A	Volume Control Assembly
PHX 101	Tone Control Assembly

MODELS 6A47WT,  
6A47WTR, 6AWC2, 6AWC3

<u>PART NO.</u>	<u>Description</u>
BEX 103	Mounting Sleeve
BRA 118	Tuner Assembly Complete
BRA 123	Dial and Bracket Assembly Complete
DNX 100	Glass Dial Plate
FHX 101	A.C. Line Cord Lock
FSA 100	Mounting Parts Assembly
PHA 103	Complete Dial and Cord
PHA 105	Speaker Assembly Complete 6A47WT Model
PHA 106	Speaker Assembly Complete 6A47WTR Model
PHX 102	Speaker 6A47WT Model
PHX 103	Speaker 6A47WTR Model
PHX 104	Speaker 5AWC2 and 6AWC3 Models
RCX 101	Aero-Record Changer Model E
RIX 105	Grommet for Mounting
RIX 107	Washer for Mounting
RIX 117	Mounting Screw
SMX 146	Speaker Cover - 6A47WTR Model
SMX 163	Loop Shield - 6AWC2 and 6AWC3 Models
SOX 100	Socket Octal
Sox 103	Phone Motor Socket 3 Prong
SPX 115	Dial Cord Spring
WCA 103	Dial and Cord Assembly
WCX 101	A.C. Line Cord with Plug
WCX 102	Dial Cord

RESISTORS

<u>Code No.</u>	<u>Specifications</u>	<u>Tolerances</u>	
R 10	10 meg.	1/2 w.	20%
R 2, R 23	2.2 meg.	1/2 w.	10%
R 12			
R 16	470,000 ohms	1/2 w.	10%
R 13	82,000 ohms	1/2 w.	10%
R 18	68,000 ohms	2 w.	20%
R 9, R 4	47,000 ohms	1/2 w.	10%
R 6	39,000 ohms	1/2 w.	10%
R 14	33,000 ohms	1/2 w.	10%
R 1	27,000 ohms	1/2 w.	10%
R 5	18,000 ohms	2 w.	10%
R 24	15,000 ohms	1/2 w.	20%
R 17	10,000 ohms	1/2 w.	10%
R 20	4,700 ohms	2 w.	20%
R 7, R 3	3,900 ohms	1/2 w.	10%
R 15	300 ohms	1 w.	10%
R 21, R 22	240 ohms	2 w.	10%
R 19	2.2 ohms	1/2 w.	10%

