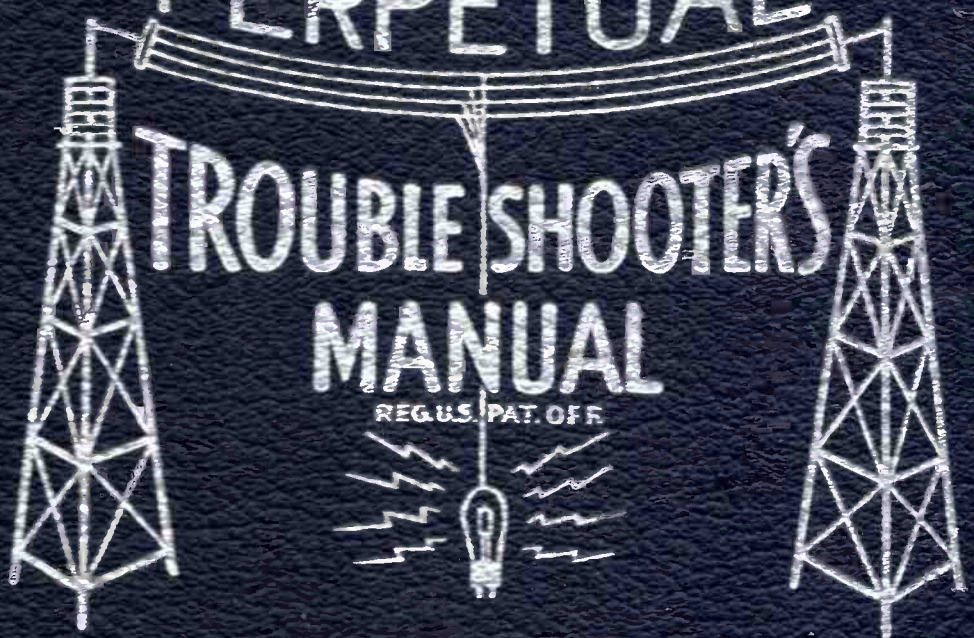
VOLUME XVI

PERPETUAL TROUBLE SHOOTER'S MANUAL

REG. U.S. PAT. OFF.

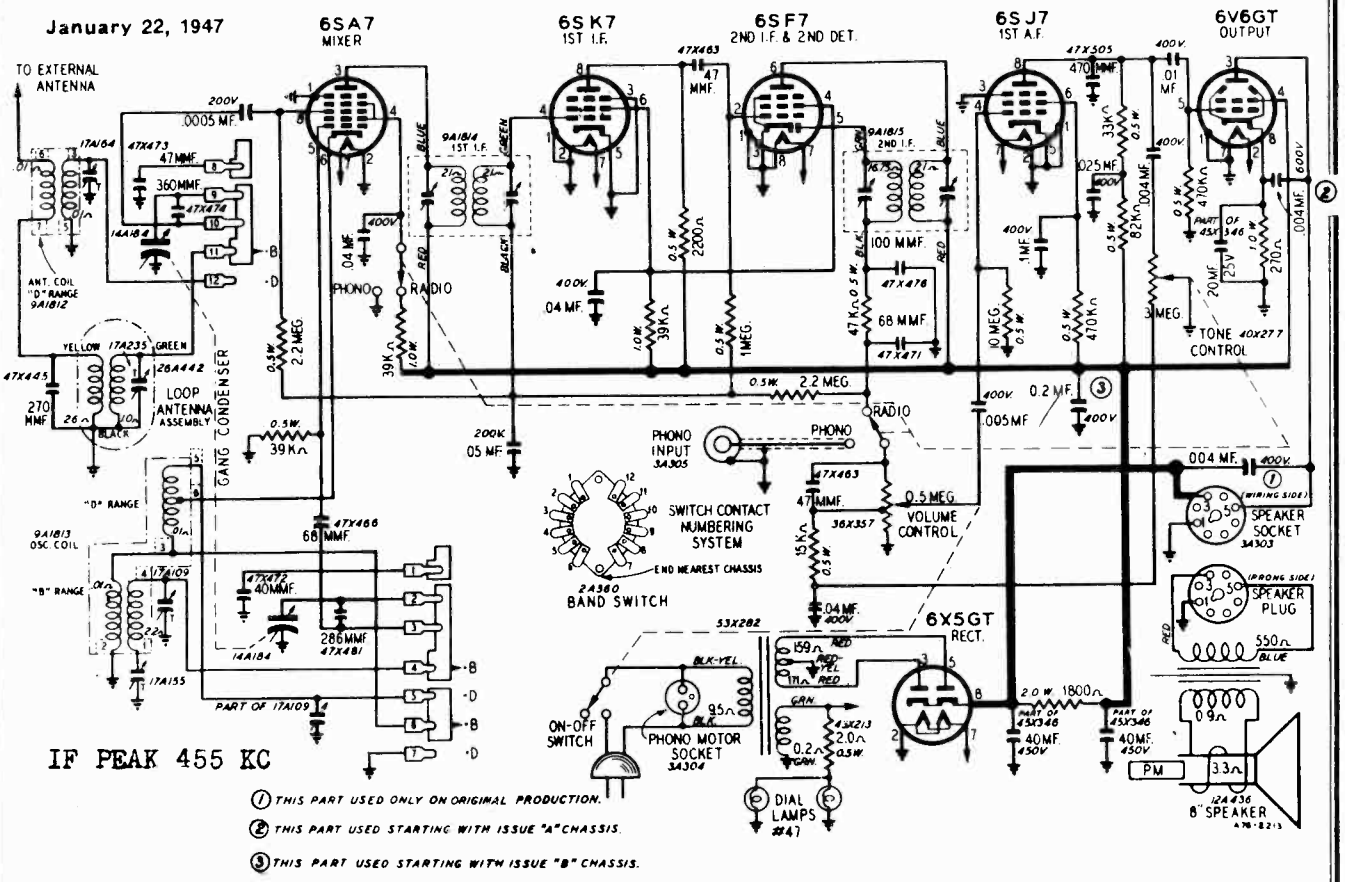


JOHN F. RIDER

GAMBLE-SKOGMO INC.

MODELS 43-7601, 43-7601A, 43-7601B
MODEL 43-7602

January 22, 1947



SUBSTITUTE PARTS LIST

The following parts are used in some receivers only. Check part number on part before ordering and order part originally used in receiver.

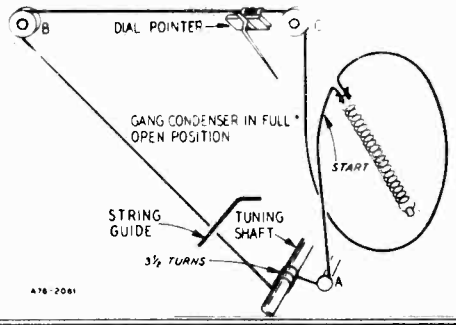
40X282 Tone Control (Substitute for 40X277)

25X1539 Radio-Phono. Switch Lever (When 40X282 is used)
No. 6-32 x 5/16" Slab Hd. Set Screw (Mtg. 25X1539)

2A161 D.P.D.T. Switch (When 40X282 is used)

DRIVE CORD REPLACEMENT

To install a new drive cord, turn the large drive pulley until the gang condenser is completely unmeshed. Hook one end of the new drive cord to the tension spring and fasten the other end of the tension spring to the tab on the drive pulley. Pass the cord through the slot in the rim of the drive pulley and run it ¼ turn counter-clockwise around the pulley. Pass it around the idler stud A and wind three turns clockwise around the tuning shaft with the turns progressing away from the chassis. Run the string behind the string guide, around pulleys B and C, down and under the large drive pulley, then counterclockwise around the pulley to the slot in the rim. Hook the end of the cord to the end of the tension spring and turn the tuning shaft a few turns to remove any slack in the cord.



SPECIFICATIONS

6 Tube Superheterodyne, including rectifier tube	
Power Consumption	40 w. normal, 60 w. phono operating (at 117 v. A.C.)
Selectivity	40 kc. broad at 1,000 times signal
Intermediate Frequency	455 kc.
Speaker	8 inch P.M. dynamic
Tuning Frequency Range	B range, 540-1,600 kc.; D range, 9-15.5 meg.
Sensitivity	B range, 9 mv. avg.; D range, 20 mv. avg. (for 9.5 w. output with external antenna)
Power Supply	105-125 v. 60 cycles only
Power Output	4 w. maximum 2.3 w., 10% harmonics
Record Changer	Plays ten 12 inch or twelve 10 inch

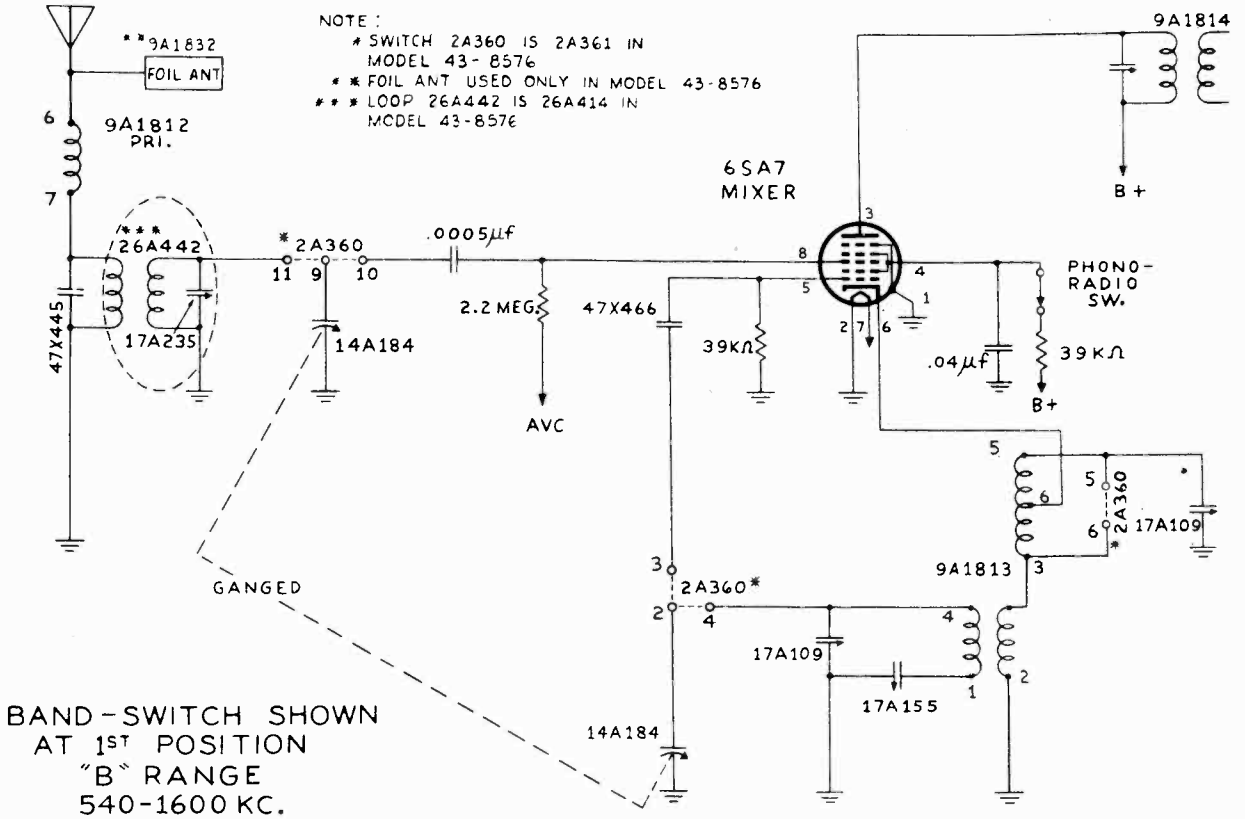
CIRCUIT DESCRIPTION

The automatic record changer is connected to the rear of the chassis through jacks marked "Phono" and "Phono Motor." The "Phono" jack is switched in or out of the audio circuit by a switch controlled by the tone control knob. This switch also shorts out the r-f signal when it is turned to the phono position.

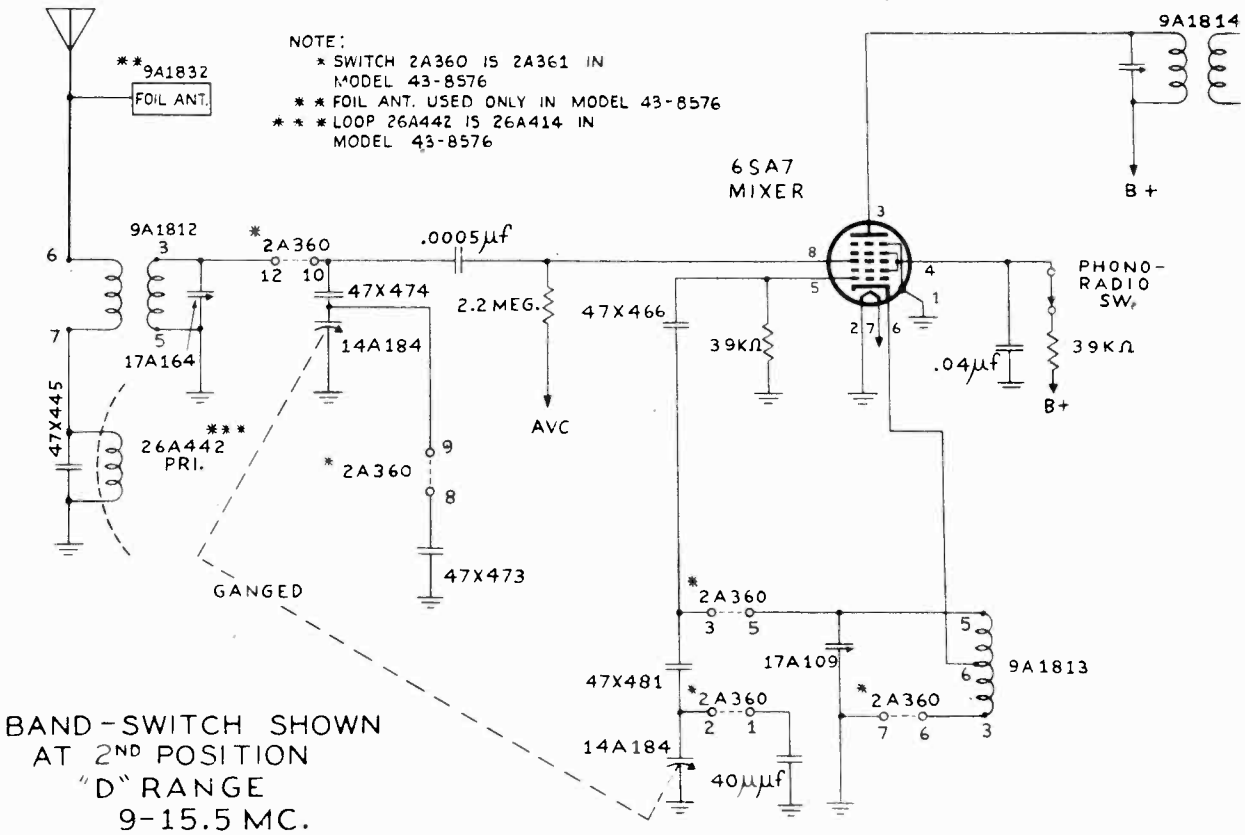
"clarified schematics"

MODELS 43-7601,43-7601A, 43-7601B
MODEL 43-7602
MODEL 43-8576

GAMBLE-SKOGMO INC.



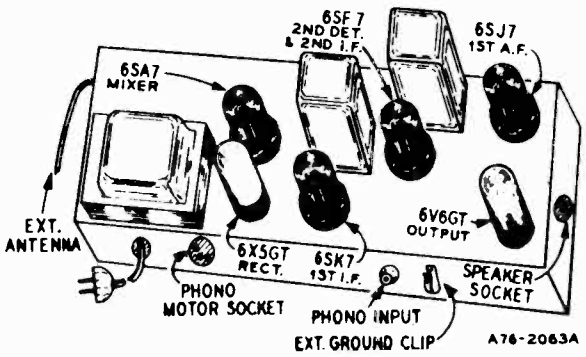
BAND-SWITCH SHOWN AT 1ST POSITION
"B" RANGE
540-1600 KC.

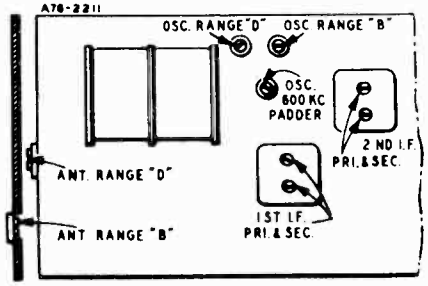


BAND-SWITCH SHOWN AT 2ND POSITION
"D" RANGE
9-15.5 MC.

GAMBLE-SKOGMO INC.

MODELS 43-7601, 43-7601A, 43-7601B
MODEL 43-7602





ALIGNMENT PROCEDURE

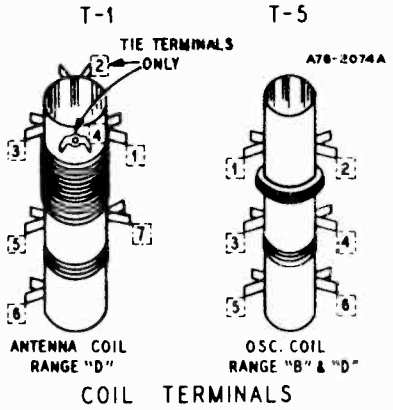
Volume Control—Maximum all adjustments.
Connect radio chassis to ground post of signal generator with a short heavy lead.
Allow chassis and signal generator to "heat up" for several minutes.
The following equipment is required for aligning:

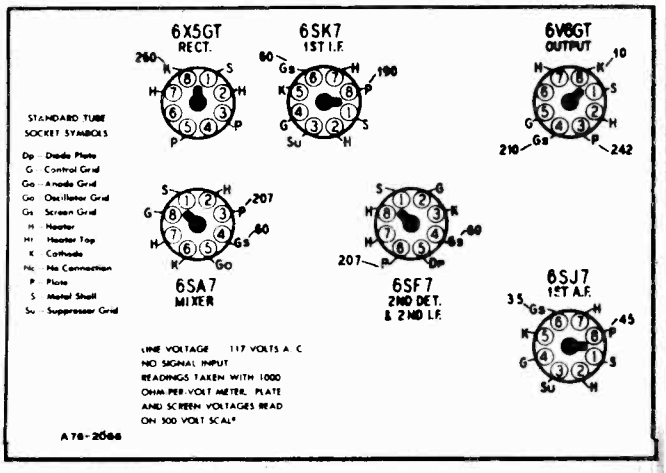
An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter—Non-metallic screwdriver.
Dummy Antennas—.1 mf., 100 mmf., and 400 ohms.

	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I. F.	455 Kc	Grid of 6SA7 Pin 8	.1 mf.	B Range	Turn Rotor to Full Open	2nd I.F. (Pri.) and (Sec.) 1st I.F. (Pri.) and (Sec.)
RANGE B	1,620 Kc.	Antenna Lead	100 mmf	B Range	Turn Rotor to Full Open	Oscillator Range B
	1,400 Kc.	Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output Set Pointer to 1,400 Kc. (See Note A)	Antenna Range B
	600 Kc.	Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output	Oscillator (600 Kc. Padder) Rock Rotor See Note B
	Repeat above steps at 1,620 and 600 Kc. until readjusting the oscillator. Range B Trimmer causes no further improvement of output.					
RANGE D	15,600 Kc.	Antenna Lead	400 ohm	D Range	Turn Rotor to Full Open	Oscillator Range D
	14,000 Kc.	Antenna Lead	400 ohm	D Range	Tune Rotor to Max. Output	Antenna Range D Rock Rotor—See Note B
LOOP RANGE B	1,400 Kc.	Reassemble chassis in cabinet. Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output	Antenna Range B

NOTE A—Set pointer at the 1,400 KC. mark on the dial scale. Attach pointer to drive cord.

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





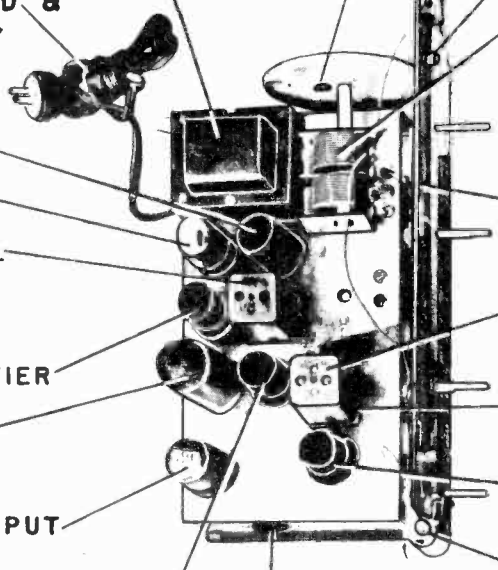
CIRCUIT CHANGES

Issue A chassis differ from the original production by the use of a .004 mf 600 volt tubular capacitor connected between the plate and cathode of the output tube instead of the .004 mf 400 volt tubular capacitor originally connected across the primary of the output transformer.

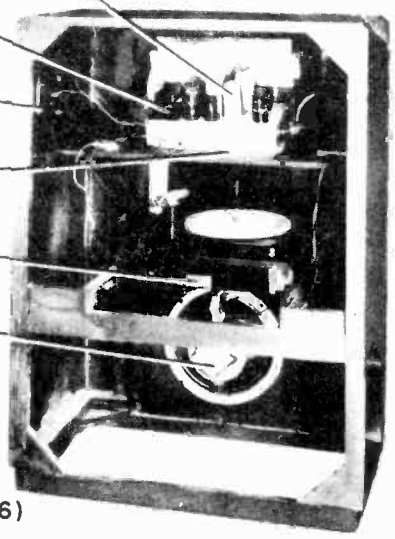
Issue B chassis differ from issue A chassis by the addition of a .2 mf 400 volt tubular capacitor connected from B — to chassis ground as an R-F filter.

MODELS 43-7601, 43-7601A, 43-7601B
MODEL 43-7602

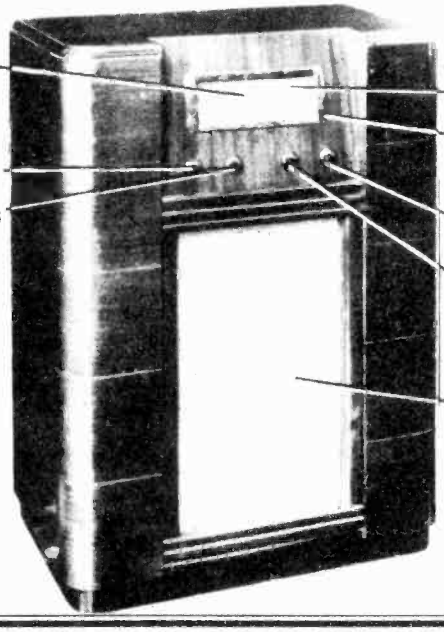
GAMBLE-SKOGMO INC.



MODELS 43-7601, 43-7601A, 43-7601B; 43-7602

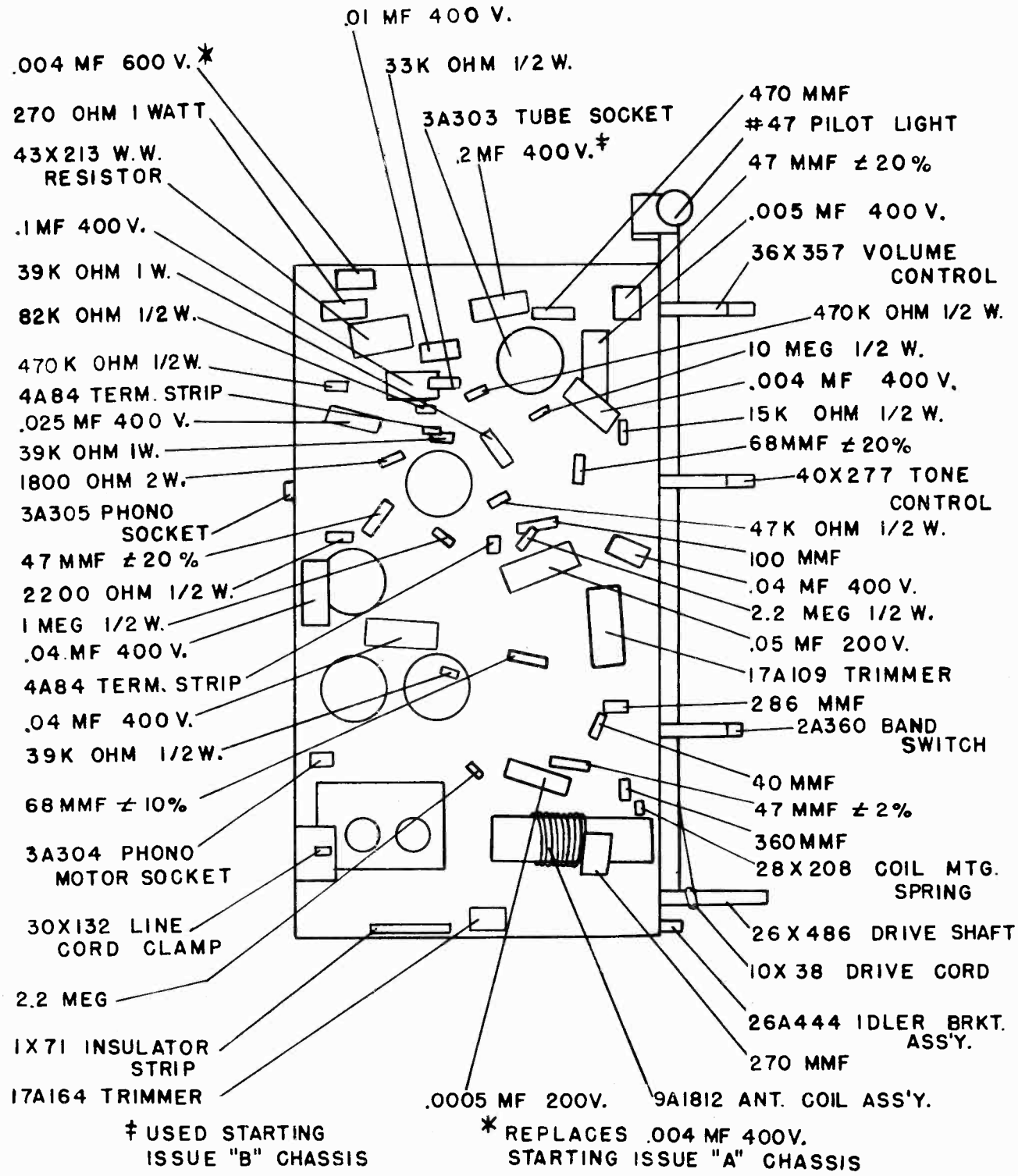


MODELS 43-7601, 43-7601A, 43-7601B



GAMBLE-SKOGMO INC.

MODELS 43-7601, 43-7601A, 43-7601B
MODEL 43-7602



‡ USED STARTING ISSUE "B" CHASSIS

* REPLACES .004 MF 400V. STARTING ISSUE "A" CHASSIS

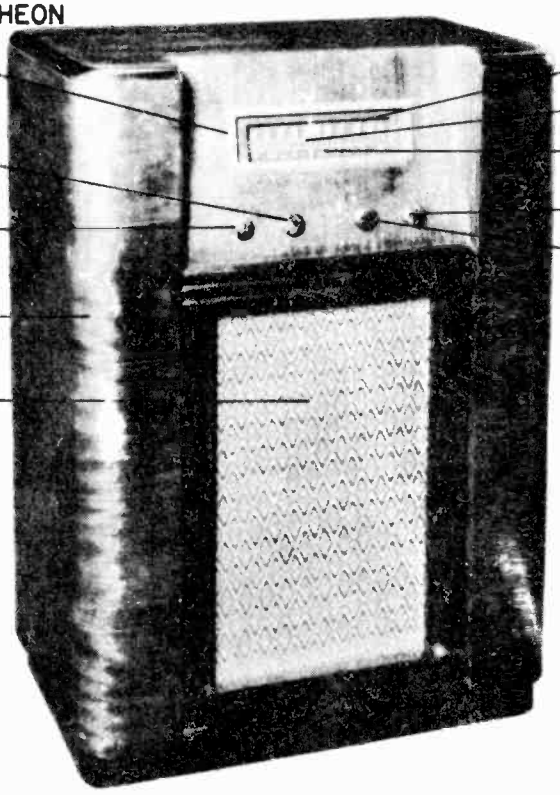
SUBSTITUTE PARTS LIST

The following parts are used in some receivers only. Check part number on part before ordering and order part originally used in receiver.

40X282	Tone Control (Substitute for 40X277)
25X1539	Radio-Phono. Switch Lever (When 40X282 is used)
	No. 6-32 x 5/16" Slab Hd. Set Screw (Mtg. 25X1539)
2A161	D.P.D.T. Switch (When 40X282 is used)

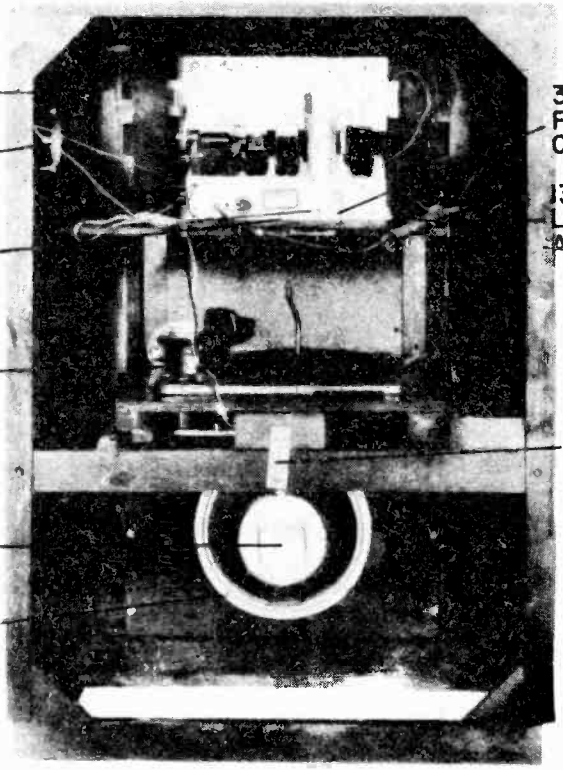
MODEL 43-7602

GAMBLE-SKOGMO INC.



FRONT VIEW

SHURE PICKUP CARTRIDGE P30-1.



REAR VIEW

MODEL 43-8160

GAMBLE-SKOGMO INC.

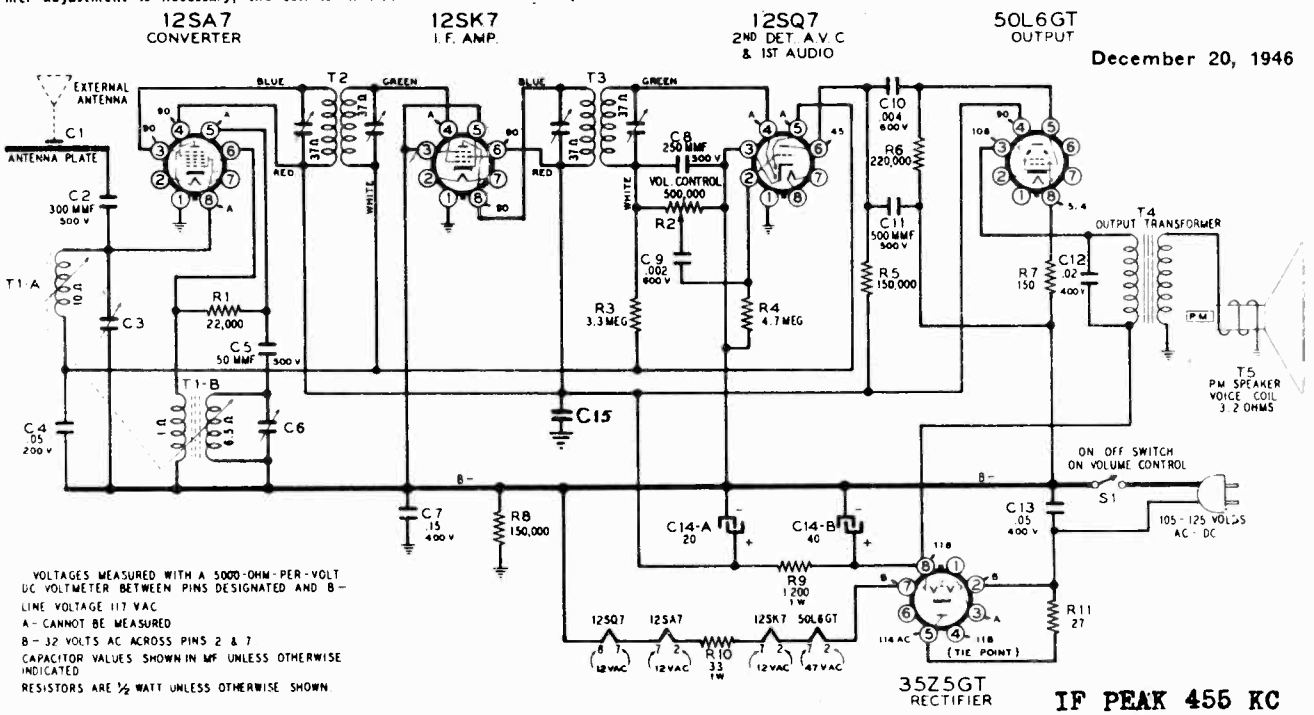
ALIGNMENT PROCEDURE

Output meter across 3.2-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.

FREQUENCY	SIGNAL GENERATOR COUPLING CAPACITOR	SIGNAL GENERATOR CONNECTION TO RADIO	GROUND CONNECTION	TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
455 kc	.1 mf	Metal antenna plate	12SQ7 Pin 3 (B—)	Iron cores all the way out	Trimmers on output and input I.F. cans
1720 kc	.1 mf	Metal antenna plate	12SQ7 Pin 3	Iron cores all the way out	Oscillator trimmer C6
1720 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Iron cores all the way out	Antenna trimmer C3
1400 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Turn dial to 1400 kc	Adjust position of antenna coil (see coil assembly view)
1720 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Turn dial to 1720 kc	Antenna trimmer C3*

*After the antenna coil has been tracked at 1400 kc, it is necessary to check the antenna trimmer C3 again at 1720 kc. If no appreciable change in trimmer adjustment is necessary, the coil is in track. If the trimmer requires considerable change, the position of the antenna coil at 1400 kc must be readjusted. These two adjustments should be made several times, until no trimmer adjustment is required at 1720 kc.



SCHEMATIC DIAGRAM LEGEND

C 1 Antenna plate, walnut color
C 1 Antenna plate, ivory color
C 2 300 mmf. 20% mica
C 3 Dual trimmer 74-136 mmf. (antenna)
C 4 .05 mf. 200 v. 25%
C 5 .05 mf. 400 v. 25%
C 6 95-175 mmf. (oscillator)
C 7 .15 mf. 400 v. 25%
C 8 250 mmf. 20% mica
C 9 .002 mf. 600 v. 25%
C10 .004 mf. 600 v. 25%
C11 500 mmf. 20% mica
C12 .02 mf. 400 v. 25%
C13 .05 mf. 400 v. 25%
C14-A, B Electrolytic 40 mf. x 150 v.
20 mf. x 150 v. for 60 cycles
Electrolytic 60 mf. x 150 v.
40 mf. x 150 v. for 25 cycles
C15 .01 mf. 400 v. 25%

RESISTORS

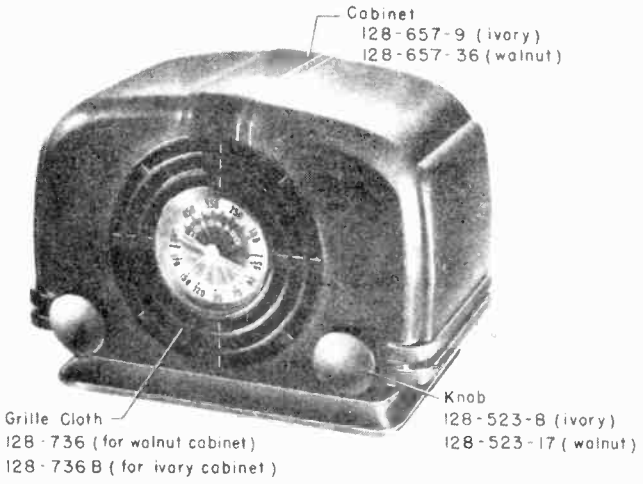
R 1 22,000 ohms ½ w. 10%
R 2 Volume control, 500,000 ohms, on-off switch
R 3 3.3 megohms ½ w. 20%
R 4 4.7 megohms ½ w. 20%
R 5 150,000 ohms ½ w. 20%
R 6 220,000 ohms ½ w. 20%
R 7 150 ohms ½ w. 10%
R 8 150,000 ohms ½ w. 20%
R 9 1,200 ohms 1 w. 10%
R10 33 ohms 1 w. 10%
R11 27 ohms ½ w. 10%

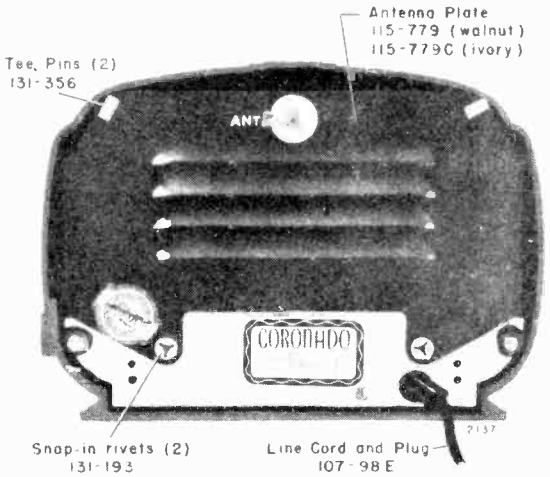
MISCELLANEOUS

T1A, B Permeability tuning unit complete, including antenna and oscillator coils
T2 Input I.F. coil complete in can. Range of trimmers: 39-73 mmf. each
T3 Output I.F. coil complete in can. Range of trimmers: 39-73 mmf. each
T4 Output transformer
T5 Speaker 4 inch P.M. voice coil impedance, 3.2 ohms

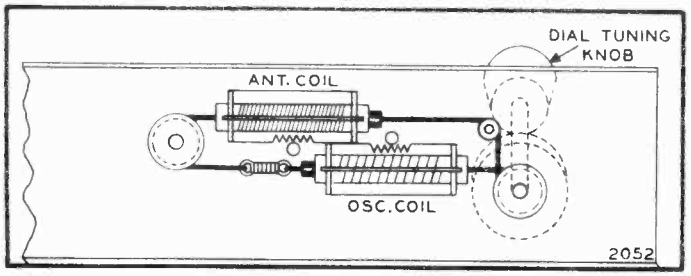
MODEL 43-8160

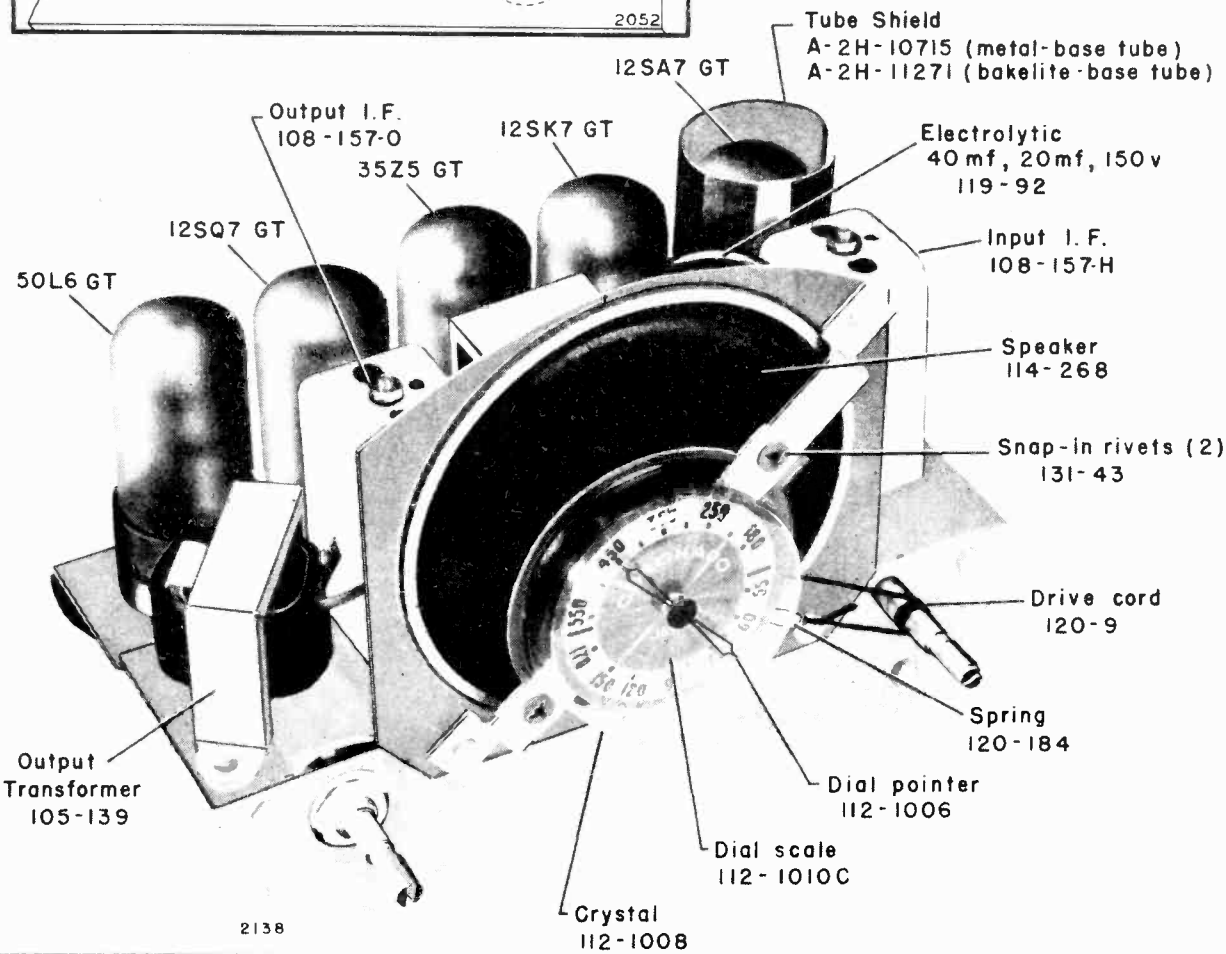
GAMBLE-SKOGMO INC.

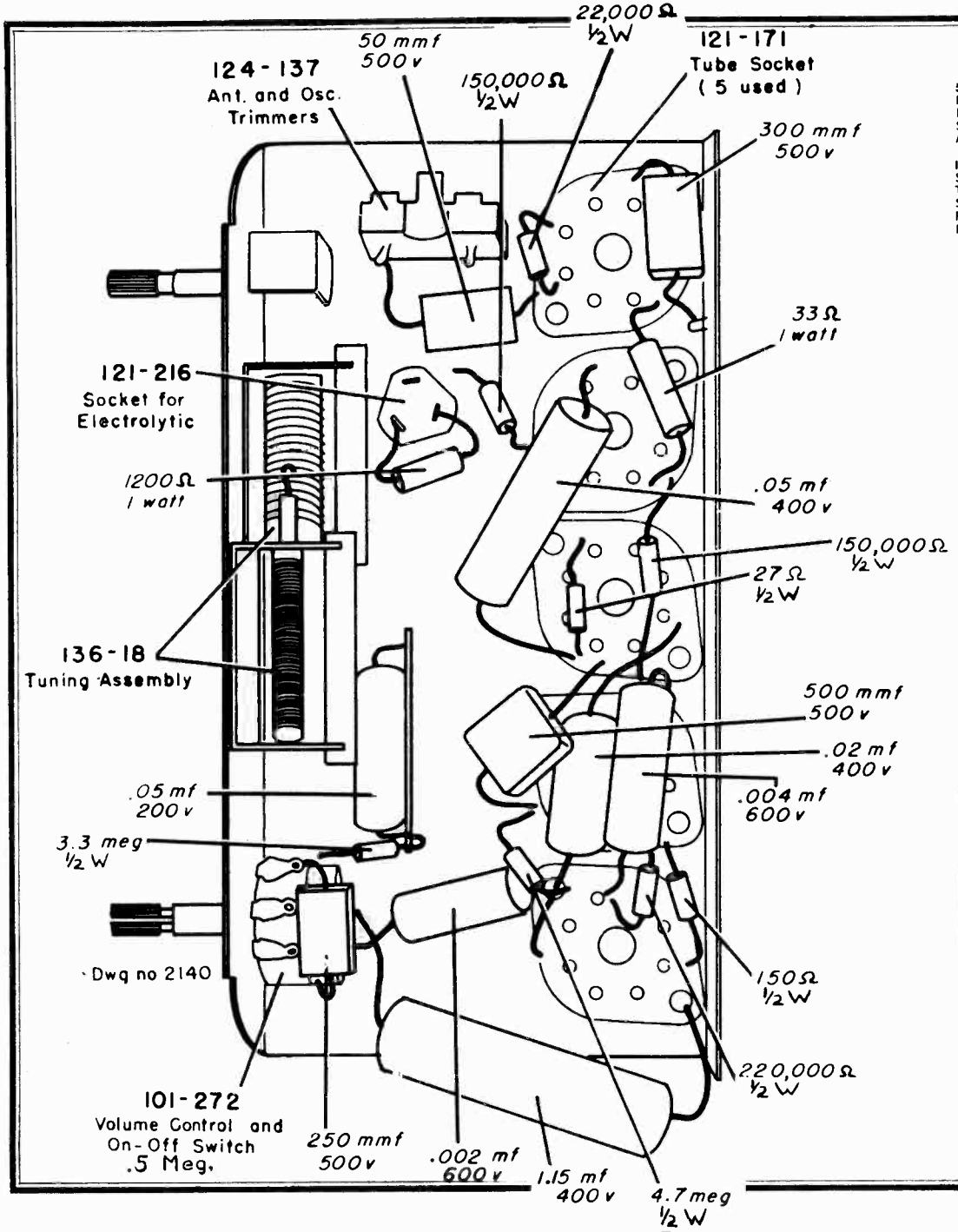




SLUG TUNER



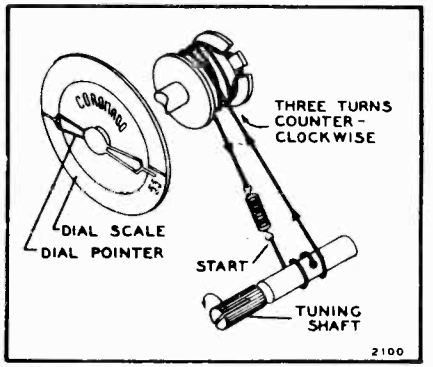




SPECIFICATIONS

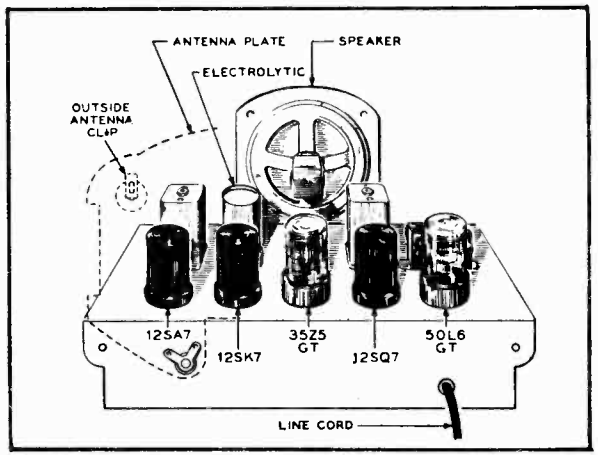
5 Tube Superheterodyne, including rectifier tube	
Power Consumption	28 w.
Power Output	0.80 w. undistorted, 1.5 w. maximum
Selectivity	71 kc. broad at 1,000 times signal at 1,000 kc.
Antenna	Self-contained plate antenna. Also provision for connection of external antenna
Intermediate Frequency	455 kc.
Speaker	4 inch P.M., voice coil impedance, 3.2 ohms
Tuning	Two permeability-tuned circuits
Sensitivity	40 mv. avg. for 50 mw. output
Frequency Range	540 to 1,720 kc.
Power Supply	105 to 125 v., A.C.-D.C., 50-60 cycle

DRIVE CORD REPLACEMENT



1. Turn tuning shaft counter-clockwise.
2. Re-string as shown.
3. Adjust pointer so that the band is covered properly when turning the tuning shaft back and forth.

CHASSIS VIEW



GAMBLE-SKOGMO INC.

MODEL 43-8160

MODEL 43-8437

GAMBLE-SKOGMO INC.

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following enuipment is required for aligning.
An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output indicating Meter—Non Metallic Screwdriver.
Dummy Antennas—I.R.E.

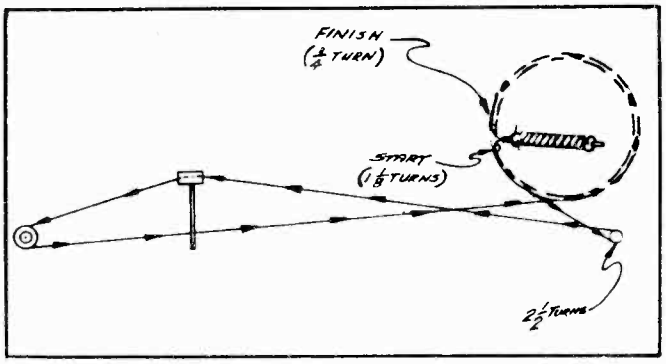
	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	CONDENSER SETTING	ADJUST TRIMMERS
I.F. (See Note A)	455 kc	Apply signal to the converter grid 12SA7 throunh a .05MFD Condenser	I.R.E. Dummy Antenna	Turn rotor to fult open	2nd I.F. (Pri.) & (Sec.) 1st I.F. (Pri.) & (Sec.) Adjust for maximum output
R.F. Alignment	1720 kc	Antenna Lead	I.R.E. Dummy Antenna	Turn rotor to full open	C17B Antenna Trimmer
	1500 kc	Antenna Lead	I.R.E. Dummy Antenna	Set Pointer to 1500 kc (See Note B)	Tune C17A for maximum output

NOTE A—Connect an output meter across the voice coil.

NOTE B—Set pointer at the 1500KC mark on the dial scale. Attach pointer to drive cord.

DRIVE CORD REPLACEMENT

The drive cord can be replaced by carefully following the drawing showing cord replacement. Care should be taken to follow arrows showing start and finish.



FRONT OF CHASSIS

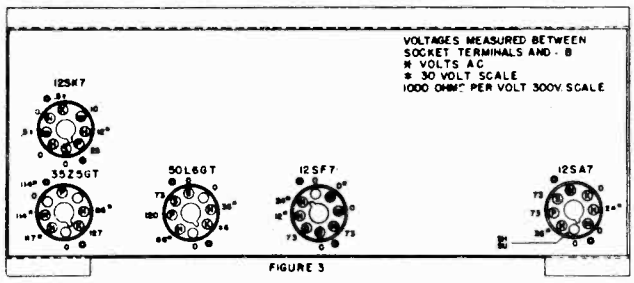
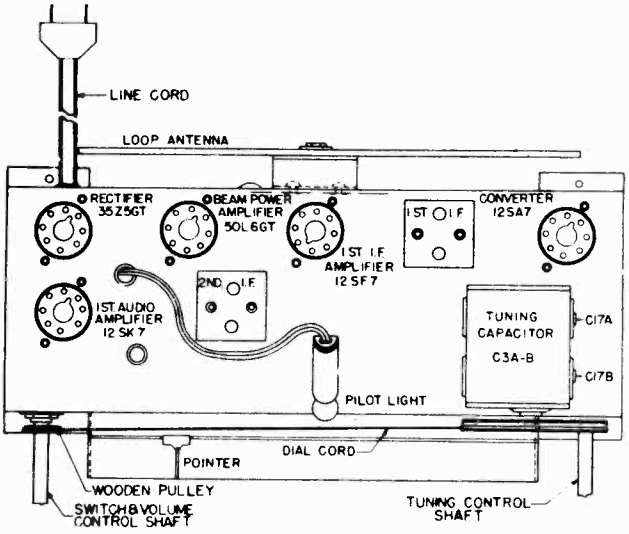


FIGURE 3

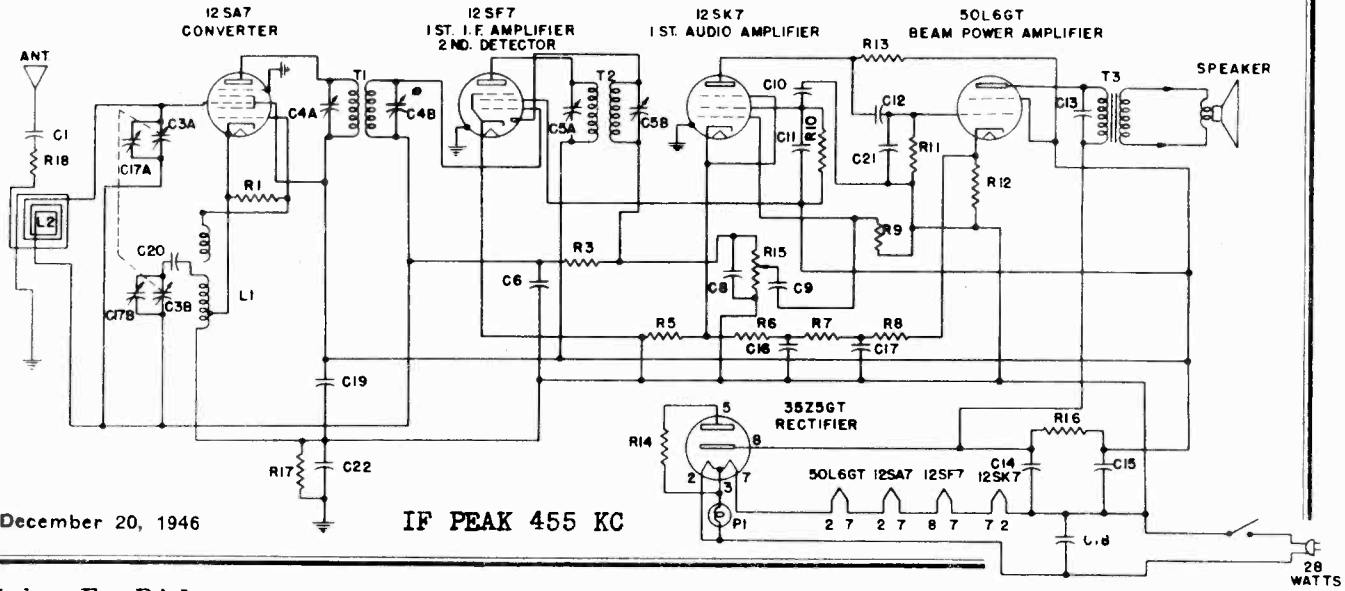
BOTTOM VIEW OF CHASSIS

SPECIFICATIONS

5 Tube Superheterodyne, including rectifier tube
Power Consumption.....28 w. (at 117 v. A.C.)
Power Output.....1.5 w. maximum 1 w., 10% harmonics
Selectivity.....65 kc. broad at 1,000 times signal
Intermediate Frequency.....455 kc.
Speaker.....5¼ inch P.M. dynamic
Tuning Frequency Range.....540 to 1,700 kc.
Sensitivity.....85 mv. avg. (for 0.5 w. output with external antenna)



AC LINE VOLTS-117 MAX VOLUME GANG CLOSED NO SIGNAL

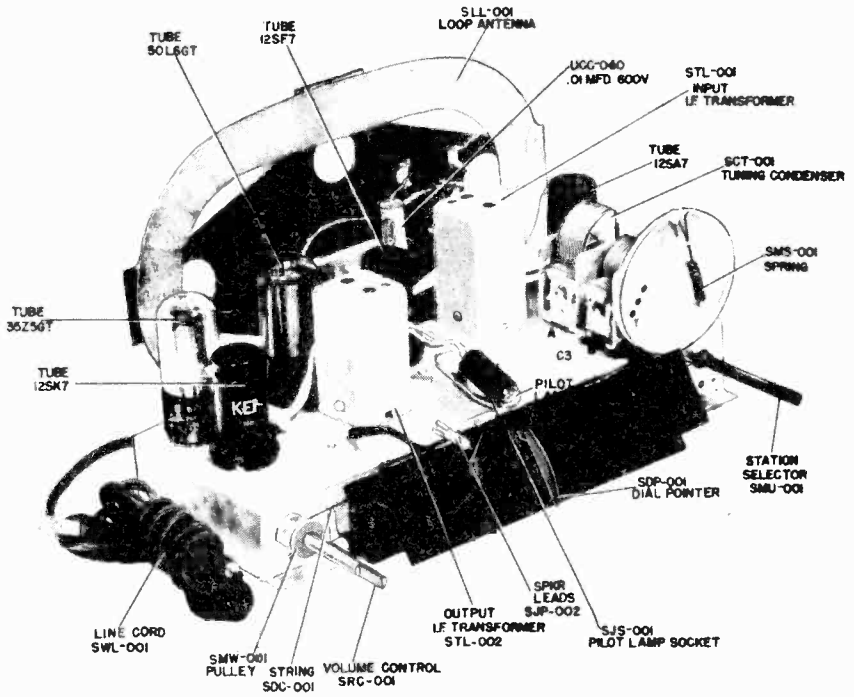


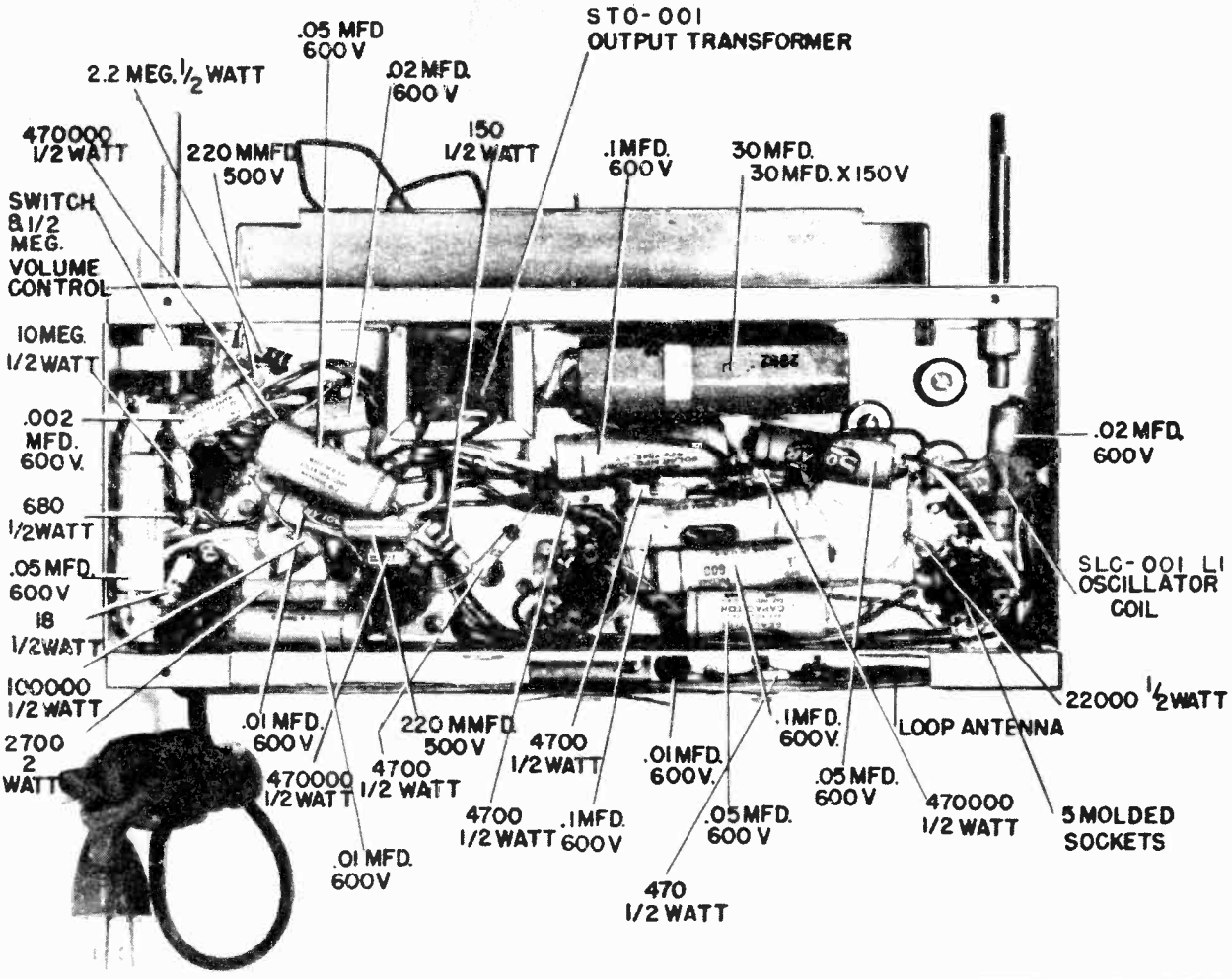
December 20, 1946

IF PEAK 455 KC

GAMBLE-SKOGMO INC.

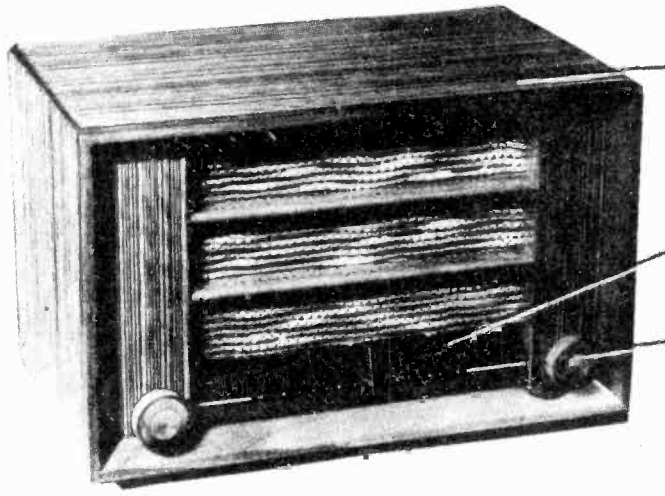
MODEL 43-8437

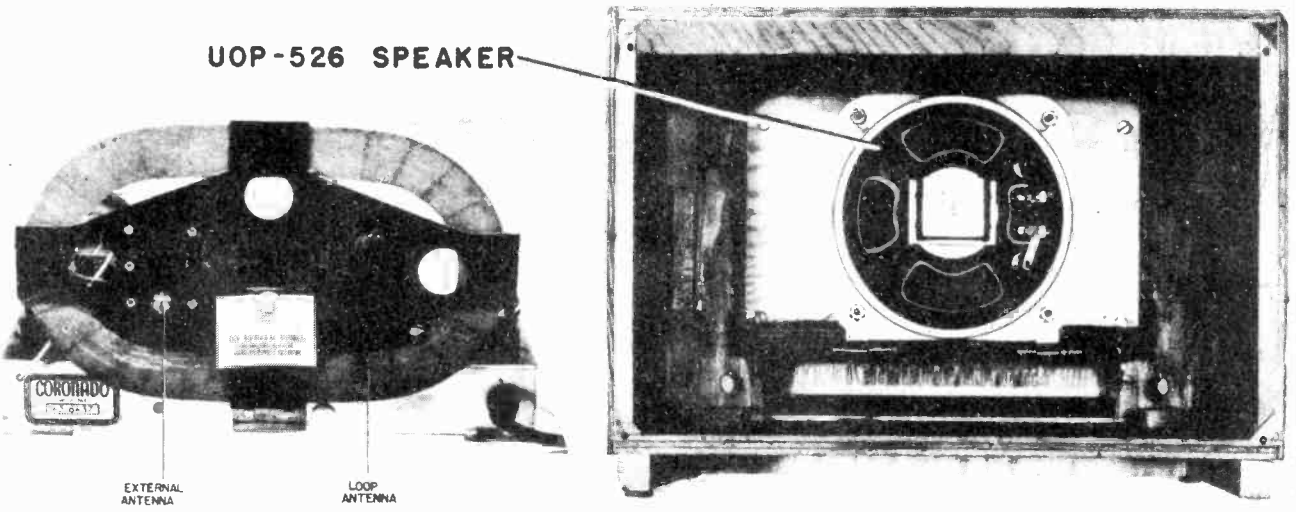




MODEL 43-8437

GAMBLE-SKOGMO INC.





PRECAUTION

If the signal generator is A-C operated, use an isolating transformer between the power supply and radio receiver power input. The use of an isolating capacitor is not recommended, as A-C through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

REMOVAL OF CHASSIS FROM CABINET

In order to remove the chassis from the cabinet, pull off the two control knobs, remove the four push pins holding the cabinet-back in place, and take out the four chassis mounting bolts from the bottom of the cabinet. When the chassis has been loosened, disconnect the two clips which connect the chassis to the speaker. The chassis can now be removed from the cabinet.

SCHEMATIC DIAGRAM LEGEND

RESISTORS

R 1	220,000 ohm carbon, ½ watt
R 3	2.2 megohm carbon resistor, ½ watt
R 5	680 ohm carbon resistor, ½ watt
R 6	4,700 ohm carbon resistor, ½ watt
R 7	4,700 ohm carbon resistor, ½ watt
R 8	4,700 ohm carbon resistor, ½ watt
R 9	10 megohm carbon resistor, ½ watt
R10	470,000 ohm carbon resistor, ½ watt
R11	470,000 ohm carbon resistor, ½ watt
R12	150 ohm carbon resistor, ½ watt
R13	100,000 ohm carbon resistor, ½ watt
R14	18 ohm carbon resistor, 1 watt
R15	500,000 ohm carbon resistor, ½ watt
R16	2,700 ohm carbon resistor, 2 watt
R17	470,000 ohm carbon resistor, ½ watt
R18	470 ohm carbon resistor, ½ watt

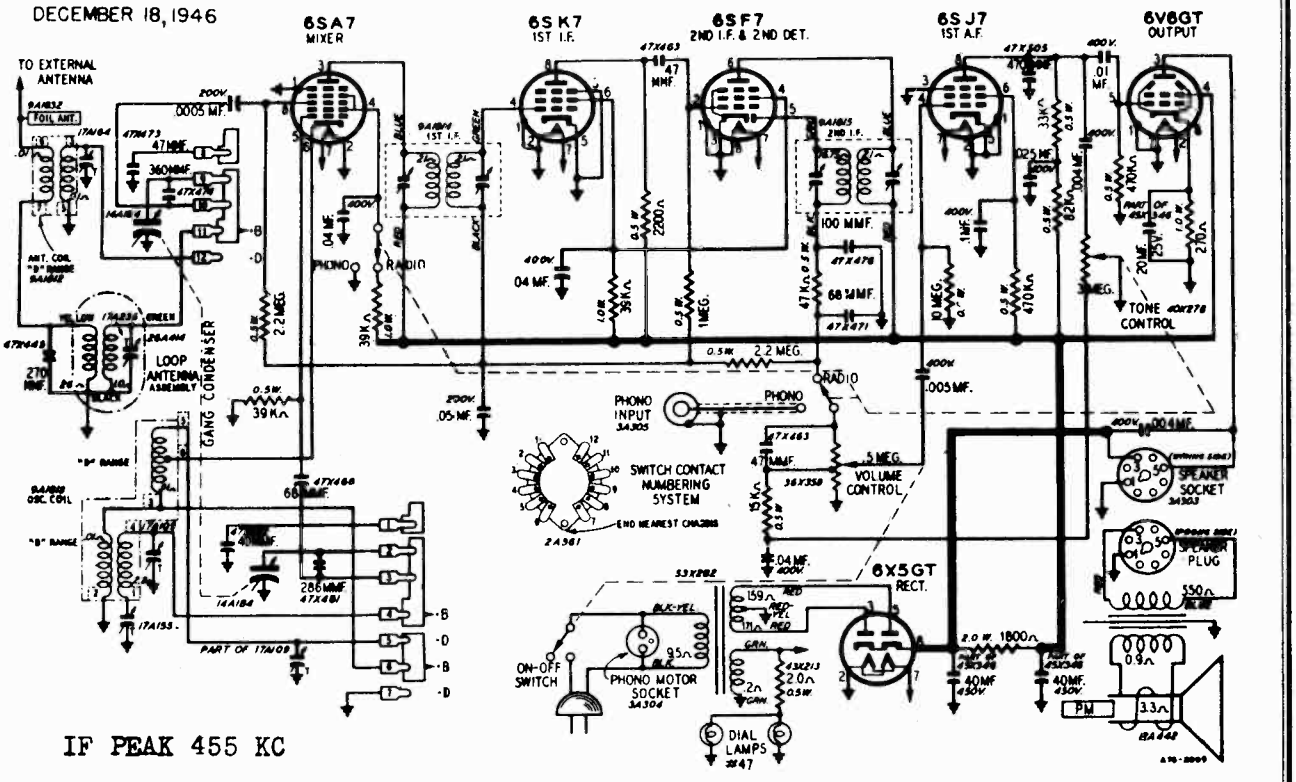
CONDENSERS

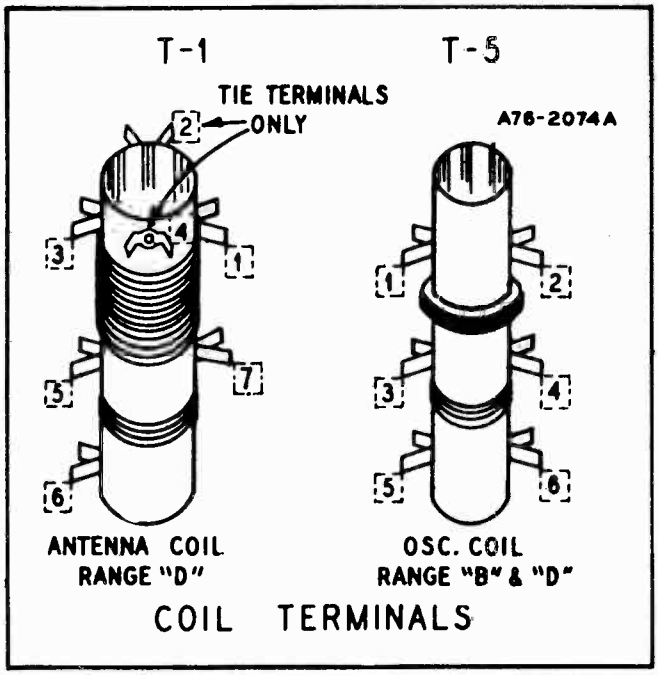
C 1	.01 mfd. paper capacitor
C 2	47 mmfd. mica capacitor
C 3A	Antenna section
C 3B	Oscillator section
C 6	.05 mfd. paper capacitor
C 8	22 mmfd. mica capacitor
C 9	.002 mfd. paper capacitor
C10	.05 mfd. paper capacitor
C11	.02 mfd. paper capacitor
C12	.01 mfd. paper capacitor
C13	.01 mfd. paper capacitor
C14	30 mfd. 150 v. electrolytic capacitor
C15	30 mfd. 150 v. electrolytic capacitor
C16	.1 mfd. paper capacitor
C17A	Antenna trimmer
C17B	Oscillator trimmer
C18	.05 mfd. paper capacitor
C19	.05 mfd. paper capacitor
C20	.02 mfd. paper capacitor
C21	22 mmfd. mica capacitor
C22	.1 mfd. paper capacitor

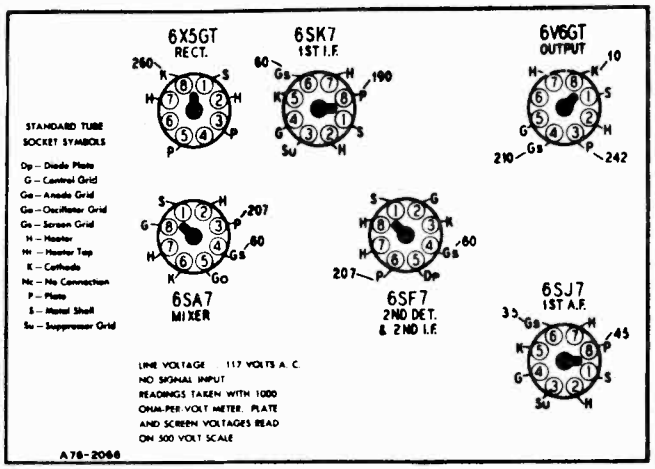
MISCELLANEOUS

L1	Oscillator coil
L2	Antenna loop
T1	1st I.F. transformer
T2	2nd I.F. transformer
T3	Output transformer
P1	Pilot light—Mazda No. 51

GAMBLE-SKOGMO INC. MODEL 43-8576







CIRCUIT DESCRIPTION

The circuit and tube complement of the receiver are as follows: 1—6SA7 1st Detector and Oscillator, 1—6SK7 1st I-F Amplifier, 1—6SF7 2nd I-F Amplifier and 2nd Detector, 1—6SJ7 1st Audio Amplifier, 1—6V6GT Power Output, 1—6X5GT Rectifier. Two No. 47 dial lamps are used for dial illumination.

A jack is provided at the rear of the chassis for record player or other special service connections. This jack is switched in or out of the audio circuit with a switch controlled by the tone control knob that also shorts out the r-f signal when it is turned to the phono position.

SPECIFICATIONS

6 Tube Superheterodyne, Including Rectifier Tube

Speaker ..... 6" PM Dynamic

Intermediate Frequency ..... 455 Kc.

Selectivity ..... 40 Kc. Broad at 1,000 Times Signal

Sensitivity (For 0.5 Watt Output, with External Antenna)

B Range ..... 9 Microvolts Av.

D Range ..... 20 Microvolts Av.

Power Consumption (at 117 Volts AC) ..... 40 Watts (normal)

Power Output ..... 4 Watts Maximum 2.3 Watts, 10% Harmonics

Tuning Frequency Range

B Range ..... 540-1600 Kilocycles

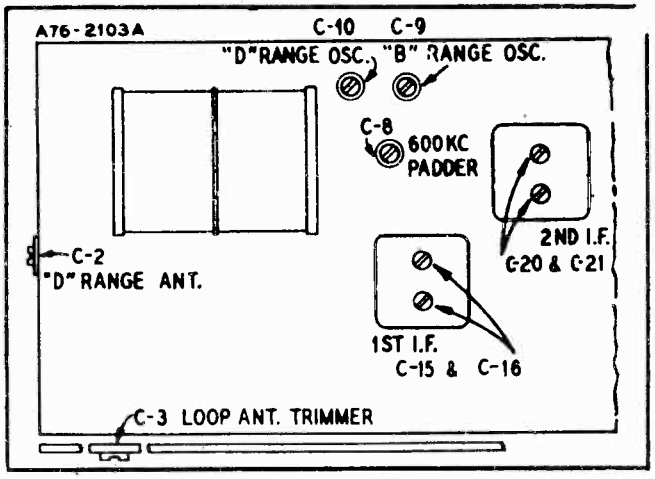
D Range ..... 9-15.5 Megacycles

MODEL 43-8576

GAMBLE-SKOGMO INC.

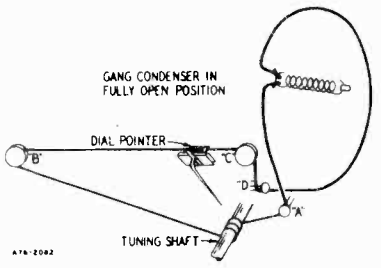
REMOVAL OF CHASSIS FROM CABINET

After the cabinet back has been taken off, it is necessary to disconnect the white lead from the foil antenna mounted in the top of the cabinet and to loosen the screw and remove the black lead fastened to the lower left rear corner of the chassis. The chassis may then be pulled from the cabinet.



DRIVE CORD REPLACEMENT

When installing a new drive cord, turn the large drive pulley until the gang condenser plates are fully unmeshed. Hook one end of the new drive cord to the tension spring and hook the tension spring to the tab on the large drive pulley. Pass the cord through the slot in the drive pulley rim and continue one-fourth turn counterclockwise around the drive pulley. Then pass the cord around idler stud A (see illustration) and wind three turns clockwise around the tuning shaft with the turns progressing away from the chassis. Pass the cord over pulleys B and C and around idler stud D. Wrap the cord one-half turn counterclockwise around the large drive pulley and hook the end of the drive cord to the tension spring. It may be necessary to unhook the tension spring from the drive pulley in order to attach the cord, after which it should be again hooked to the drive pulley and the tuning shaft turned a few turns in order to take up the slack in the drive cord.



ALIGNMENT PROCEDURE

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

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

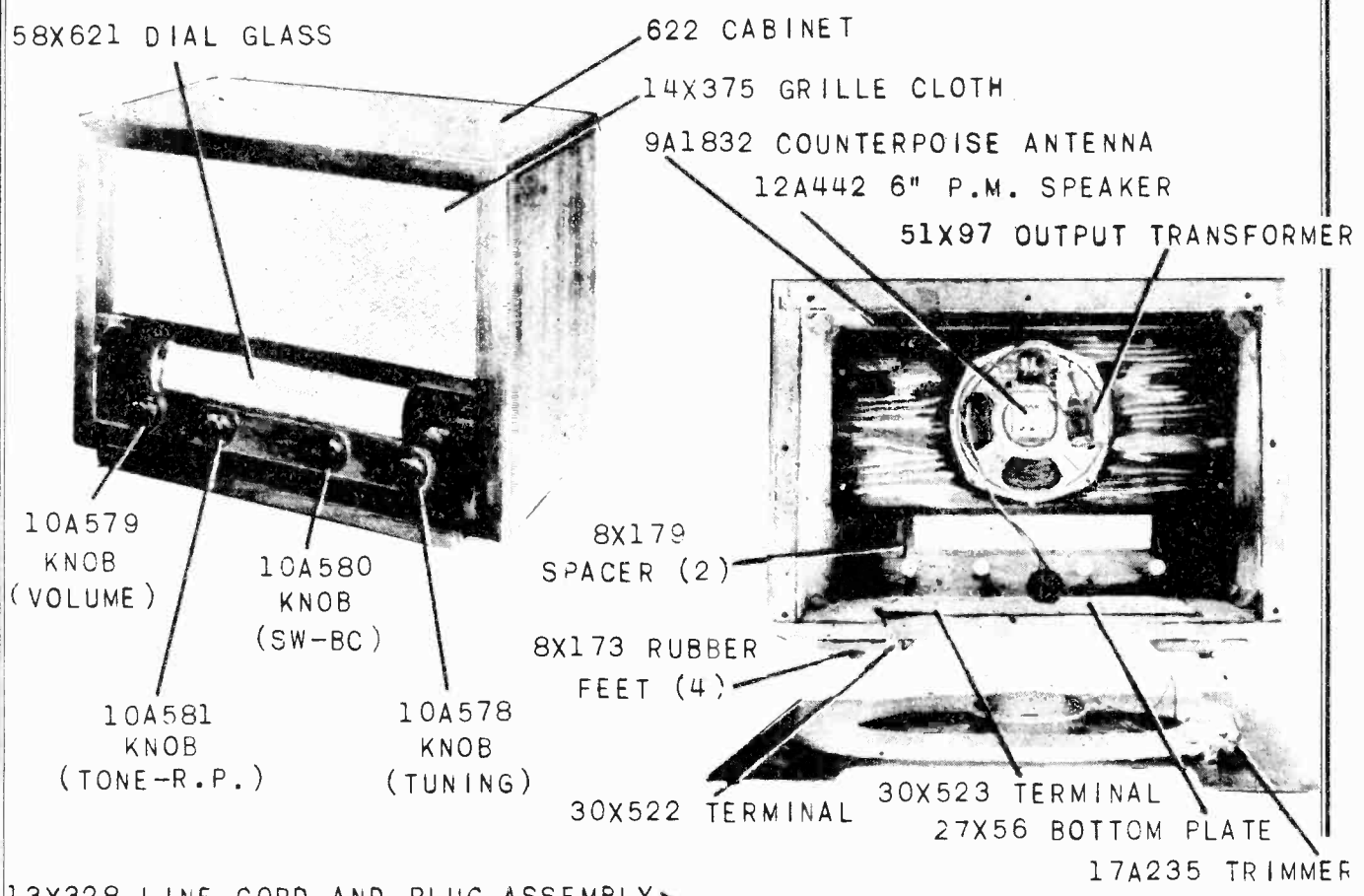
	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I.F.	455 Kc.	Grid of 6SA7 Pin 8	.1 mf.	B Range	Turn Rotor to Full Open	2nd I.F. (C20) & (C21) 1st I.F. (C15) & (C16)
RANGE B	1.620 Kc.	Antenna Lead	100 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C9)
	1.400 Kc.	Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output Set Pointer to 1.400 Kc. (See Note A)	Ant. Range B (C3)
	600 Kc.	Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output	Oscillator (C8) Rock Rotor See Note B
	Repeat above steps at 1.620 and 600 Kc. until readjusting the oscillator Range B Trimmer (C9) causes no further improvement of output.					
RANGE D	15.600 Kc.	Antenna Lead	400 ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C10)
	14.000 Kc.	Antenna Lead	400 ohm	D Range	Tune Rotor to Max. Output	Ant. Range D (C2)
LOOP RANGE B	1.400 Kc.	Reassemble chassis in cabinet. Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output	Rock Rotor—See Note B Ant. Range B (C3)

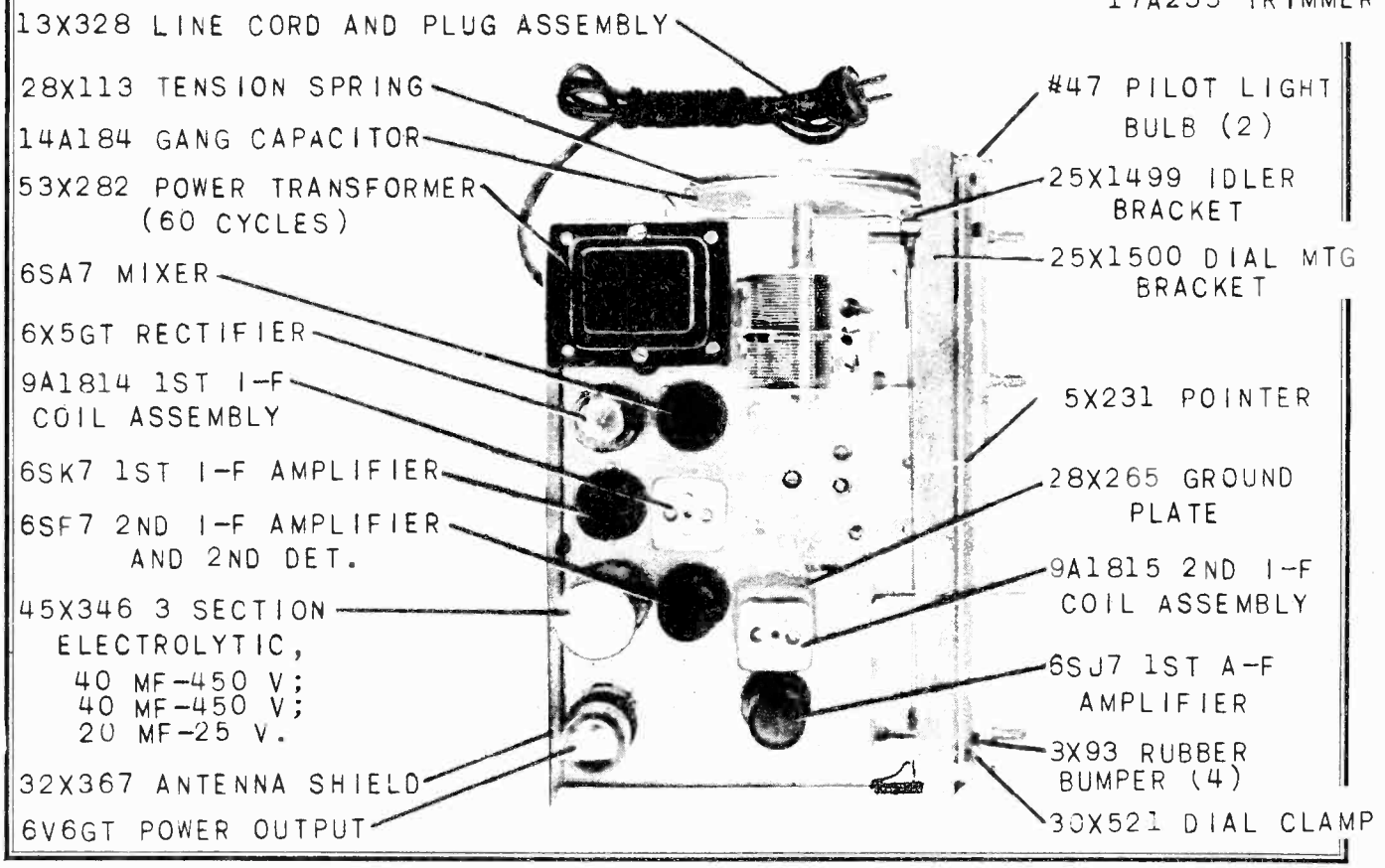
NOTE A—Set pointer at the 1.400 Kc. mark on the dial scale. Attach pointer to drive cord.

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

MODEL 43-8576

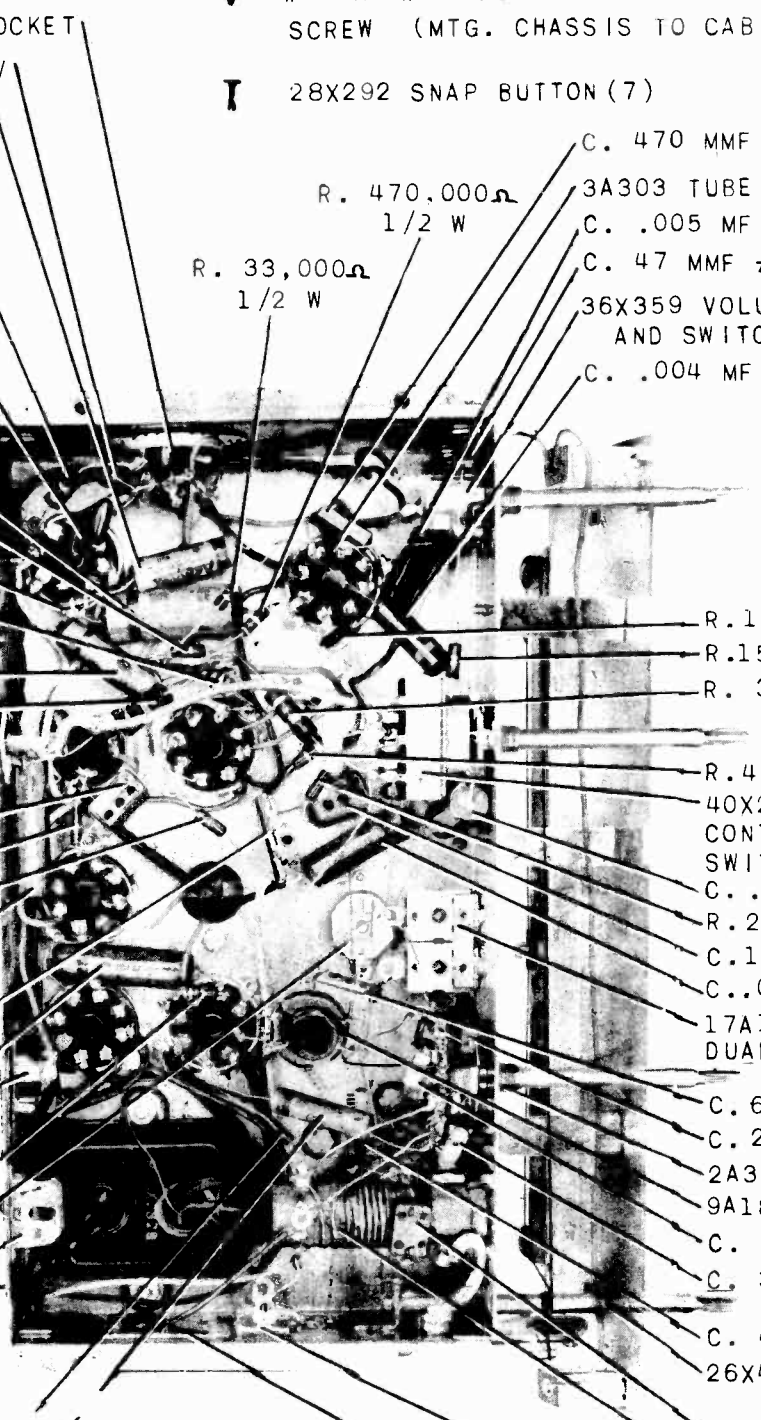
GAMBLE-SKOGMO INC.





MODEL 43-8576

GAMBLE-SKOGMO INC.



19X8 FLAT WASHER

#10 X 1/2" SLOTTED HEX HD. P-K TYPE "Z" SCREW (MTG. CHASSIS TO CABINET) (4)

28X292 SNAP BUTTON (7)

3A303 SPEAKER SOCKET

C. .004 MF 200 V

C. .01 MF 400 V

R. 270Ω 1 W

R., WIRE WOUND 2Ω ± 20% 1/2 W

C. .1 MF 400 V

R. 82,000Ω 1/2 W

R. 470Ω 1/2 W

R. 39,000Ω 1 W

30X138 CLIP

C. .025 MF 400 V

R. 1,800Ω 2 W

3A305 PHONO SOCKET

C. 47 MMF ± 20%

R. 2,200Ω 1/2 W

R. 1 MEG. 1/2 W

C. .04 MF ± 10% 400 V

4A84 TERMINAL STRIP (2)

C. .04 MF 400 V

3A304 PHONO MOTOR SOCKET

R. 39,000Ω 1/2 W

17A155 TRIMMER 350-430 MMF

30X132 LINE CORD CLAMP

R. 2.2 MEG. 1/2

C. .0005 MF 200 V

1X71 INSULATOR STRIP

C. 470 MMF ± 10%

R. 470,000Ω 1/2 W

3A303 TUBE SOCKET (6)

C. .005 MF 400 V

R. 33,000Ω 1/2 W

C. 47 MMF ± 20%

36X359 VOLUME CONTROL AND SWITCH .5 MEG.

C. .004 MF 400 V

R. 10 MEG. 1/2 W

R. 15,000Ω 1/2 W

R. 39,000Ω 1 W

R. 47,000Ω 1/2 W

40X278 TONE CONTROL AND R.P. SWITCH

C. .04 MF 400 V

R. 2.2 MEG. 1/2 W

C. 100 MMF ± 20%

C. .05 MF, 200 V

17A109 TRIMMER DUAL 2.5-35 MMF

C. 68 MMF ± 10%

C. 286 MMF ± 2%

2A361 BAND SWITCH

9A1813 OSC. COIL

C. 40 MMF ± 2%

C. 360 MMF ± 2%

C. 47 MMF ± 2%

26X487 DRIVE SHAFT

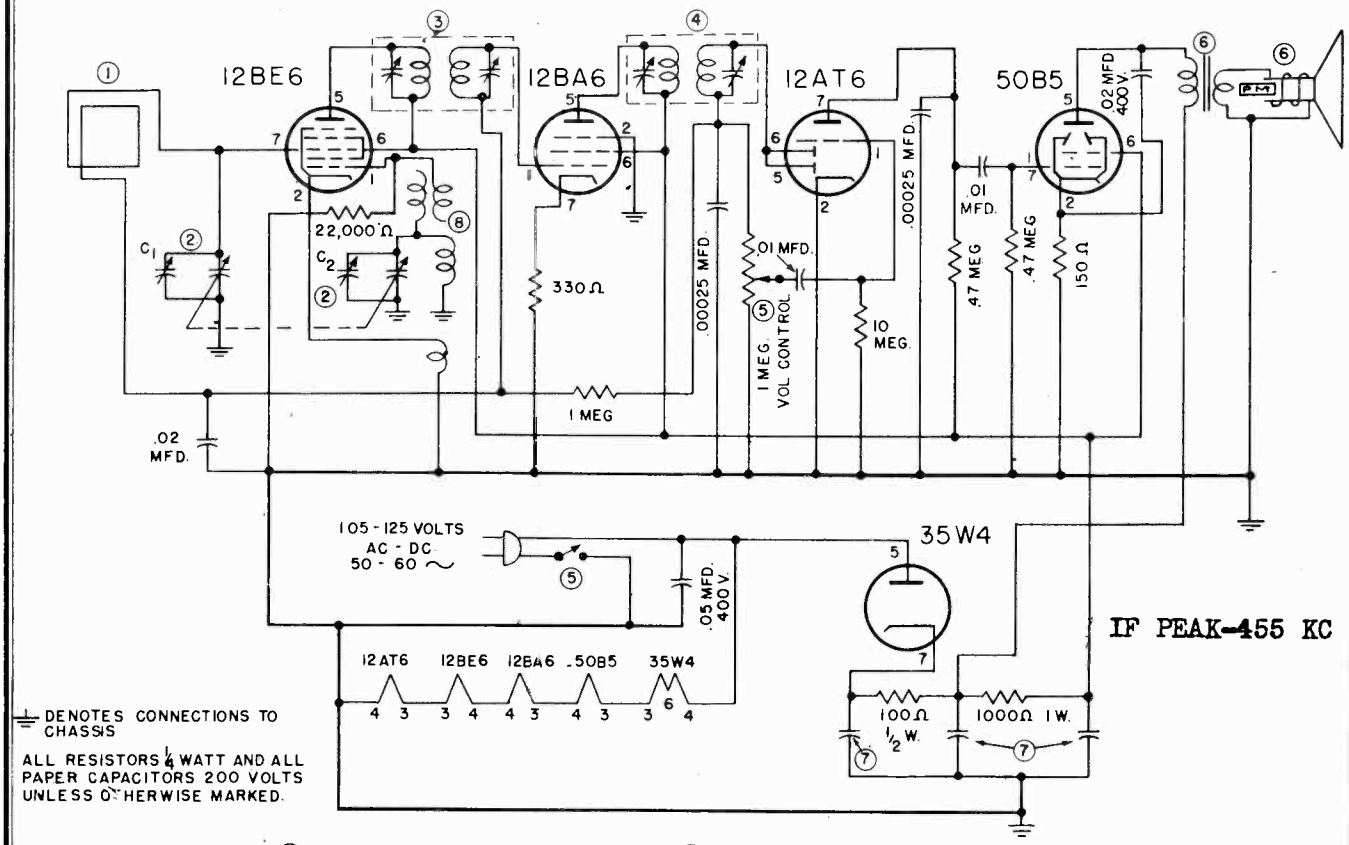
C. 270 MMF ± 10%

9A1812 ANTENNA COIL

17A164 TRIMMER 5-50 MMF

GAROD ELECTRONICS CORP.

The Ensign
MODEL 5A1



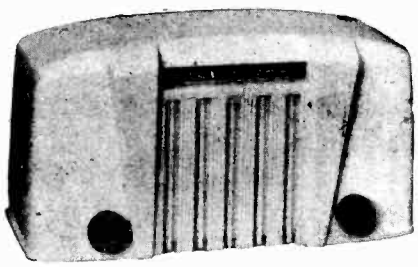
① 1.443 LOOP ASSEMBLY
② 2.200. 2 GANG VARIABLE COND.
③ 1.259 1ST I.F. TRANSFORMER
④ 1.259 2ND I.F. TRANSFORMER
⑤ 8.200-9 OR 8.200-4 VOLUME CONTROL & SWITCH
⑥ 30.303 P.M. 4" SPEAKER & OUTPUT TRANS.
⑦ 5.415-2 ELECTROLYTIC CAP. 20-20-20 MFD.
⑧ 1.444-1 OSCILLATOR COIL

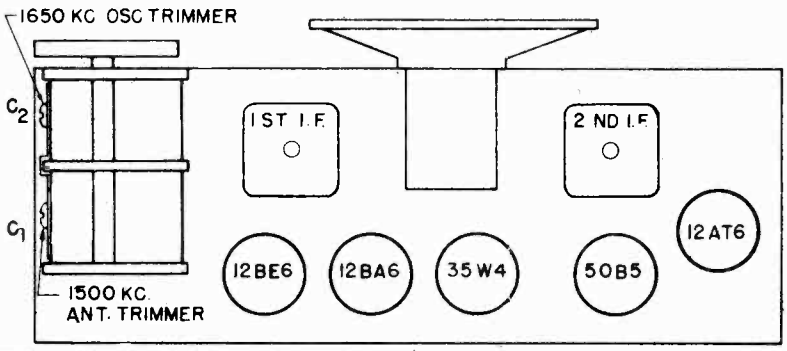
2-47

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts, 50-60 Cycles, either Alternating or Direct Current (AC-DC).

POWER CONSUMPTION: 30 Watts.

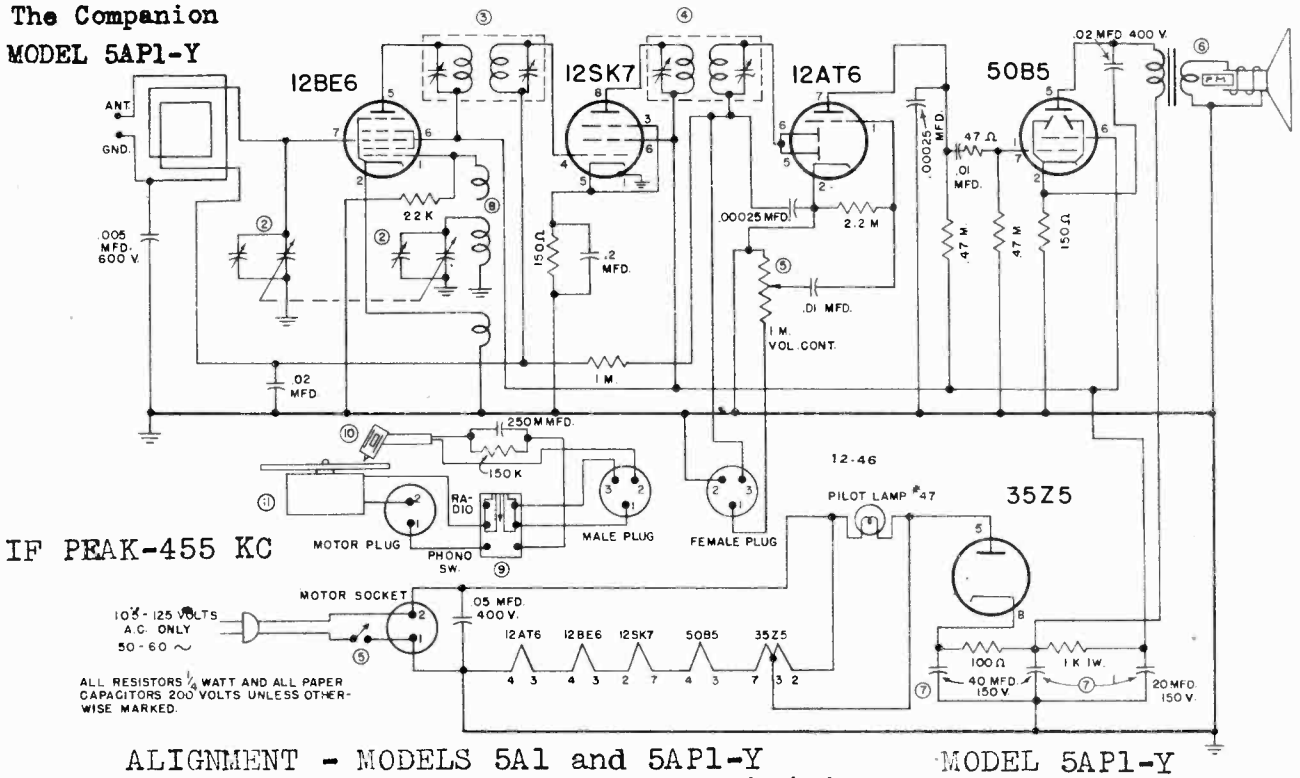
TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters).





The Ensign
MODEL 5A1
The Companion
MODEL 5AP1-Y

GAROD ELECTRONICS CORP.



IF PEAK-455 KC

ALIGNMENT - MODELS 5A1 and 5AP1-Y

Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

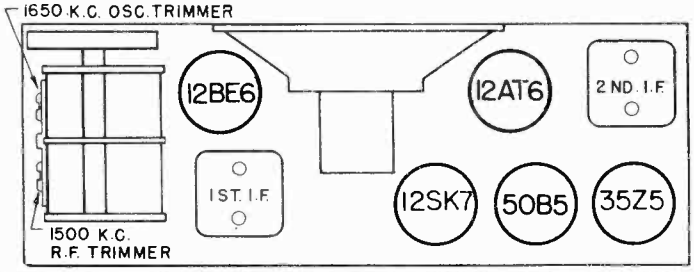
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position.

(2) Adjust the trimmers located at the top of the first and second I. F. Transformers for maximum output as indicated on the Output Meter.

(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

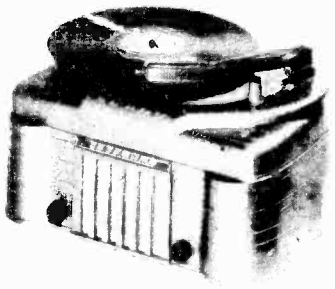
(4) With the Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.



MODEL 5AP1-Y

① 1.410 LOOP ASSEMBLY
② 2.200 2 GANG VARIABLE CONDENSER
③ 1.259 1ST. I.F. TRANSFORMER
④ 1.259 2ND I.F. TRANSFORMER
⑤ 8.201-2 VOL. CONTROL & SWITCH
⑥ 30.301 P.M. 4" SPEAKER & OUTPUT TRANS.
⑦ 5.400-8 ELECTROLYTIC CAP. 40-40-20 MFD
⑧ 1.402-2 OSCILLATOR COIL
⑨ 11.207 D.P.D.T. SWITCH
⑩ 36.104 PHONO PICKUP
⑪ 36.108 PHONOMOTOR & TURNTABLE



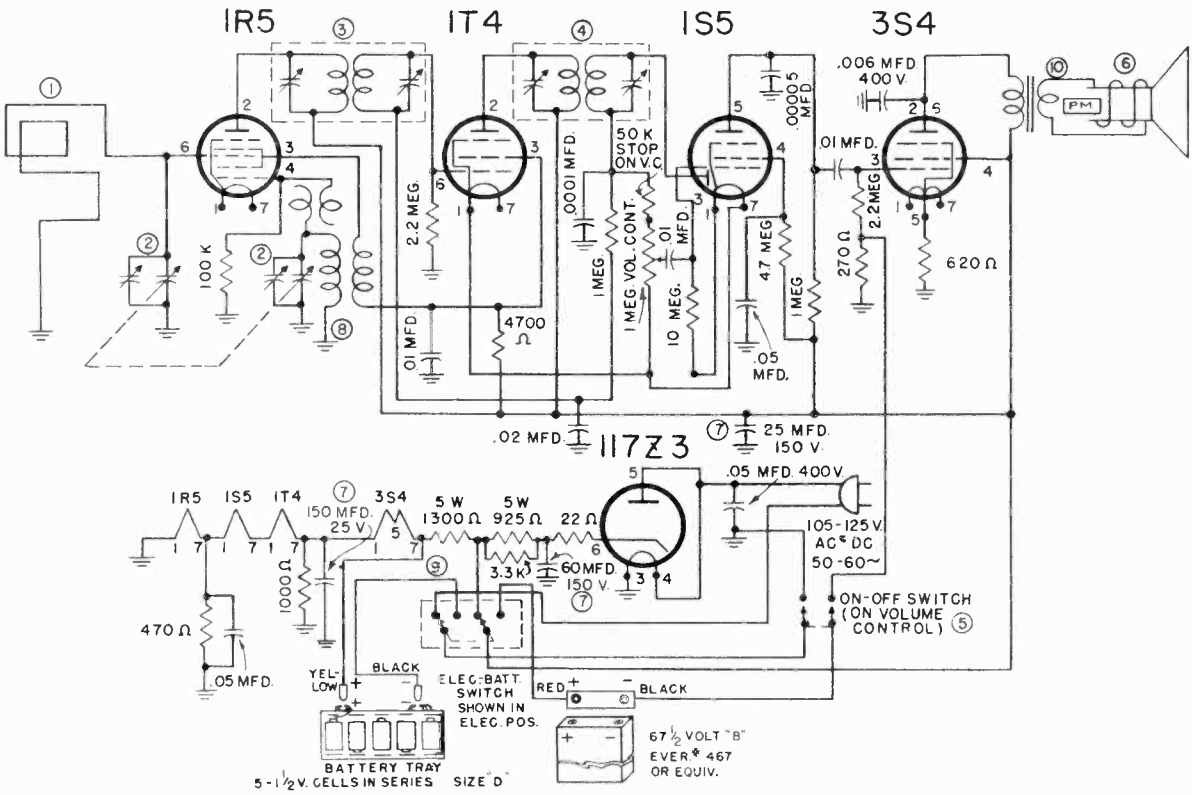
LINE VOLTAGE: 105-125 Volts, 60 Cycles, Alternating Current (AC) only.

POWER CONSUMPTION: 45 Watts.

TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters).

GAROD ELECTRONICS CORP.

MODELS 5D-3, 5D-3A



ALL RESISTORS ¼ WATT AND ALL PAPER CAPACITORS 200 VOLTS UNLESS OTHERWISE MARKED.

K = KILOHMS

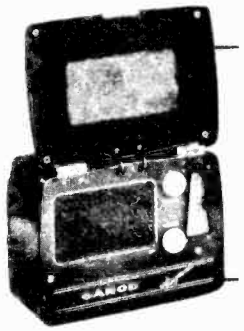
I.F. = 455 K.C.

① 1.437 LOOPANTENNA
② 2.203 2GANG VARIABLE CONDENSER
③ 1.412 1ST I.F. TRANSFORMER
④ 1.413 2ND I.F. TRANSFORMER
⑤ 8.200-2 VOLUME CONTROL & SWITCH
⑥ 30313 4" P.M. SPEAKER
⑦ 5.400-3 ELECTROLYTIC CAP. 60-25-150 MFD.
⑧ 1.414 OSCILLATOR COIL
⑨ 11.207 ELECTRIC-BATTERY SWITCH
⑩ 9.205 OUTPUT TRANSFORMER

3-47

THE FOLLOWING CHANGES IN PARTS ARE MADE FOR MODEL 5D-3

① 1.405 LOOPANTENNA
⑥ 30302 3½" P.M. SPEAKER
⑨ 11.200 ELECTRIC-BATTERY SWITCH



BATTERY OR LINE VOLTAGE: This receiver is designed for operation on 105-125 volts, 50-60 cycles either Alternating or Direct Current (AC-DC) and also from self contained batteries.

POWER CONSUMPTION: 20 Watts on Electric Operation.

BATTERY REQUIREMENTS: The following batteries are required for battery operation:

QUANTITY	TYPE	MANUFACTURER
5	1½ volt "A"	Eveready #950, Burgess #2 or equivalent.
1	67½ volt "B"	Eveready #467, Burgess #XX45 or equivalent.

TUNING RANGE: Broadcast 540 to 1650 Kilocycles (180 to 555 meters).

ALIGNMENT: (Electric Operation) Receiver removed from cabinet. Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

(1) Set the Signal Generator to 455 KC and connect to the stator lug (front section) of variable capacitor. Extend the loop leads and solder to the lug connecting green wire from Ant. Section of variable capacitor and chassis. Connect the Signal Generator ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn the variable capacitor to the extreme counter clockwise position (minimum capacity).

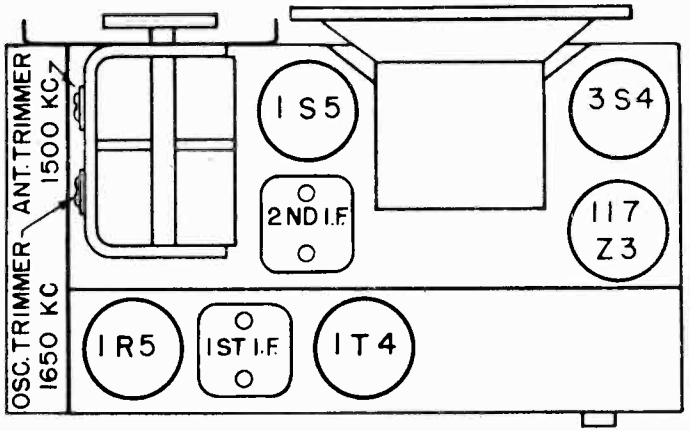
(2) Adjust the trimmers located at the top of the first and second I. F. transformers for maximum output as indicated on the output meter.

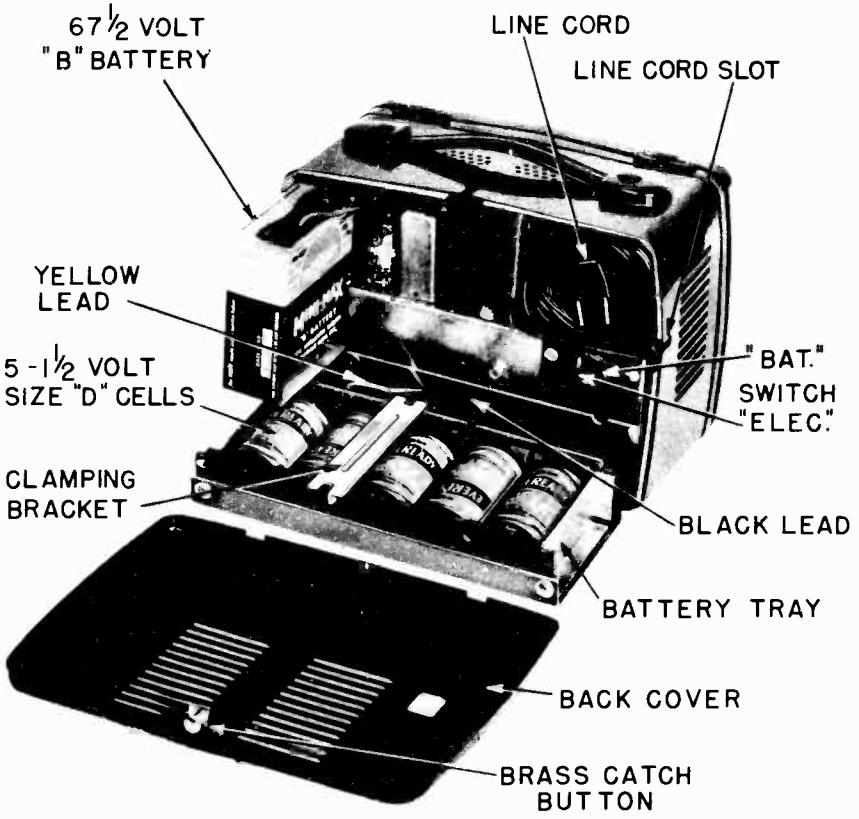
(3) Loosely couple the Signal Generator lead to the Loop (open position) and set to 1650 KC.

(4) With the variable capacitor set at the extreme counter clockwise position (minimum capacity), tune in the 1650 KC signal by means of the oscillator trimmer on the variable capacitor (rear section).

(5) Set the Signal Generator to 1500 KC and turn the tuning control so that this frequency is indicated on the dial. Adjust the antenna trimmer on the variable capacitor (front section) for maximum output.

(6) Install the chassis into cabinet and check the dial calibration. If further adjustment is required, remove the two plug buttons on the side of the cabinet adjacent to the variable capacitor and adjust the oscillator trimmer as required. Adjust the antenna trimmer for maximum output and replace plug buttons.

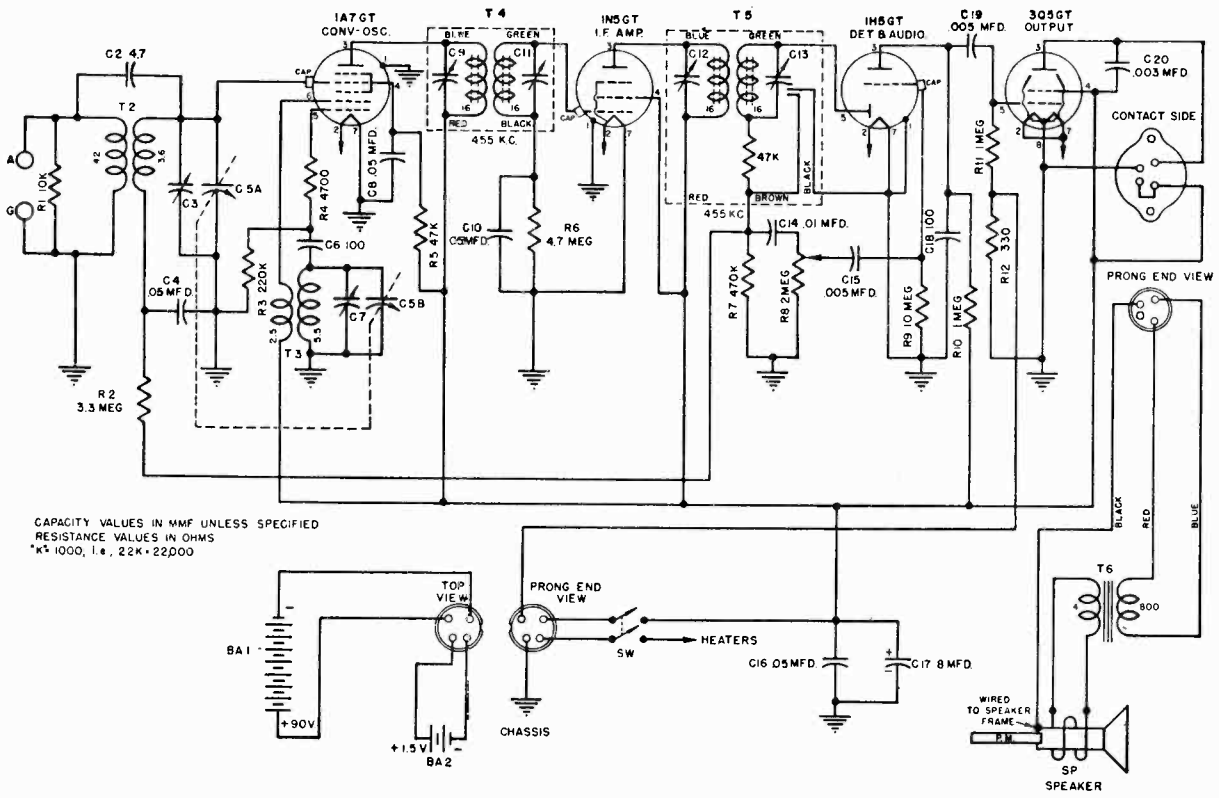




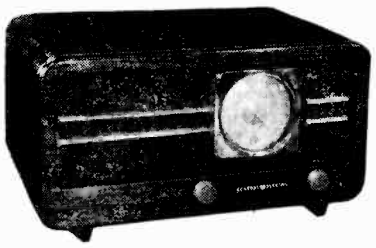
MODEL 5D-3A REAR VIEW
SHOWING BATTERIES REMOVED FROM CABINET

GENERAL ELECTRIC CO.

MODEL 180



PART NO.	SYMBOL	DESCRIPTION
UNIVERSAL REPLACEMENT PARTS		
UCC-011	C4, 8, 10	CAPACITOR—.05 mfd., 200 v., paper
UCC-028	C16	CAPACITOR—.05 mfd., 400 v., paper
UCC-037	C20	CAPACITOR—.003 mfd., 600 v., paper
UCC-039	C15, 19	CAPACITOR—.005 mfd., 600 v., paper
UCC-040	C14	CAPACITOR—.01 mfd., 600 v., paper
UCU-1028	C6, 18	CAPACITOR—100 mmf., mica
UOP-629	SP	SPEAKER—6½ in. permanent magnet
UOX-001		CONE—Replacement speaker cone
URD-037	R12	RESISTOR—330 ohm, ⅓ w., carbon
URD-065	R4	RESISTOR—4700 ohm, ⅓ w., carbon
URD-073	R1	RESISTOR—10,000 ohm, ½ w., carbon
URD-089	R5	RESISTOR—47,000 ohm, ⅓ w., carbon
URD-105	R3	RESISTOR—220,000 ohm, ⅓ w., carbon
URD-113	R7	RESISTOR—470,000 ohm, ⅓ w., carbon
URD-121	R10 11	RESISTOR—1 meg., ⅓ w., carbon
URD-133	R2	RESISTOR—3.3 meg., ⅓ w., carbon
URD-137	R6	RESISTOR—4.7 meg., ⅓ w., carbon
URD-145	R9	RESISTOR—10 meg., ⅓ w., carbon



PART NO.	SYMBOL	DESCRIPTION
SPECIALIZED REPLACEMENT PARTS		
RAB-5001		BACK—Cabinet back
RAV-5001		CABINET—Model 180 cabinet
RCE-5001	C17	CAPACITOR—8 mfd., 150 v., electrolytic
RCT-5001	C5A, 5B	CAPACITOR—Tuning condenser
RCU-5002	C2	CAPACITOR—4.7 mmf., mica
RDC-5001		CORD—Drive cord
RDE-5001		ESCUTCHEON—Dial escutcheon assembly
RDF-5001		WASHER—Felt washer for knobs
RDK-5001		KNOB—Volume or tuning knob
RDM-5001		FLAG—Off-On indicator flag
RDP-5001		POINTER—Plastic dial pointer
RDW-5001		GLASS—Dial glass
RDX-5001		BRACKET—Dial bracket and pulley assembly
RHC-5001		CLIP—Off-On indicator retaining clip
RJS-5001		SOCKET—Octal tube socket
RJS-5002		SOCKET—Speaker socket
RLA-5001	T2	COIL—Antenna coil
RLC-5001	T3	COIL—Oscillator coil
RMB-5001		BEARING—Dial drive shaft supporting bearing
RMC-5001		CAM—Off-On indicator cam
RMU-5001		SHAFT—Dial drive shaft
RRC-5001	R8, S3	VOLUME CONTROL—2 meg. vol. control and switch
RTL-5001	T5	TRANSFORMER—2nd i-f transformer
RTL-5002	T4	TRANSFORMER—1st i-f transformer
RTO-5001	T6	TRANSFORMER—Output transformer
RWX-5501		CABLE ASSEMBLY—Battery cable
RYM-5001		CHART—Dial calibration chart

MODEL 180 GENERAL ELECTRIC CO.

POWER SUPPLY AND REQUIREMENTS:

(1.5 volts "A", 90 volts "B" pack)

Burgess	17GD60
Ray-O-Vac	AB-82
Eveready	748 or 758
General	60 DL-11L

OPERATING FREQUENCIES:

Broadcast Band	540-1710 kc
I-F Amplifier	455 kc

POWER OUTPUT:

Undistorted	0.15 watt
Maximum	0.27 watt

LOUDSPEAKER:

Type	Alnico P.M.
Outsider Cone Diameter	6 in.
Voice Coil Impedance (400 cycles)	3.2 ohms

TUBE COMPLEMENT:

Oscillator-Converter	Type 1A7GT
I-F Amplifier	Type 1N5GT
Detector-Audio	Type 1H5GT
Power Output	Type 3Q5GT

ALIGNMENT CHART

Step	Connect Test Oscillator To	Test Oscillator Setting	Pointer Setting On Radio	Adjust For Max. Output
1	1N5GT IF grid in series with .05 mfd.	455 KC	550 KC	1st IF trans. trimmers
2	1A7GT Conv. grid in series with .05 mfd.	455 KC	550 KC	2nd IF trans. trimmers
3	To Ant. Post through 200 mmf. dummy and to Grd. Post.	1500 KC	1500 KC	C7* (osc.) and C3 (R-F)

*Rock gang condenser when making alignment.

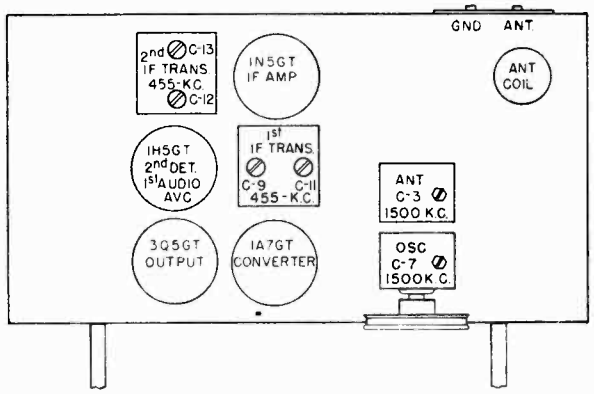
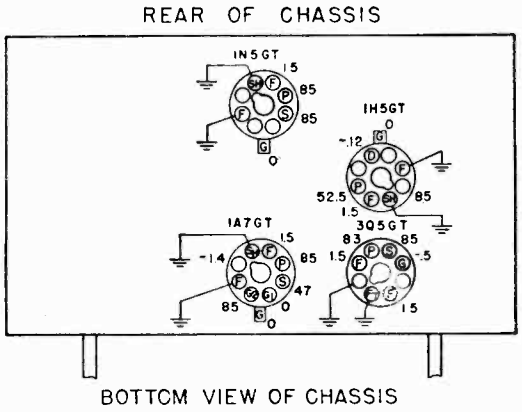


Fig. 1. Tube and Trimmer Location

RSM-1



MEASUREMENTS TAKEN ON 20,000 OHMS PER VOLT METER.
MEASURED FROM PIN TO CHASSIS.
1.5 V "A" – 90 V "B" BATTERY PACK. NO SIGNAL INPUT.
VOLUME CONTROL AT MAXIMUM.

Fig. 2. Socket Voltage Diagram

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of 20%. Readings taken with low signal input so that AVC is not effective.

(1) R-F Stage Gains.

Antenna post to 1A7GT grid	6.6 at 1000 kc
1A7GT grid to 1N5GT grid	46 at 1000 kc
1A7GT grid to 1N5GT grid	60 at 455 kc
IN5GT grid at 1H5GT diode plates	80 at 455 kc

(2) Audio Gain.
.06 volt at 400 cycles across volume control (R8) with control set at maximum will give approximately .05 watts output across speaker voice coil.

(3) D-C voltage developed across oscillator grid resistor (R2) averages 7 volts at 1000 kc.

(4) Socket Pin Voltages.
Figure 2 shows voltages from all tube pins to B-. Voltage readings much lower than those specified may help localize defective components or tubes.

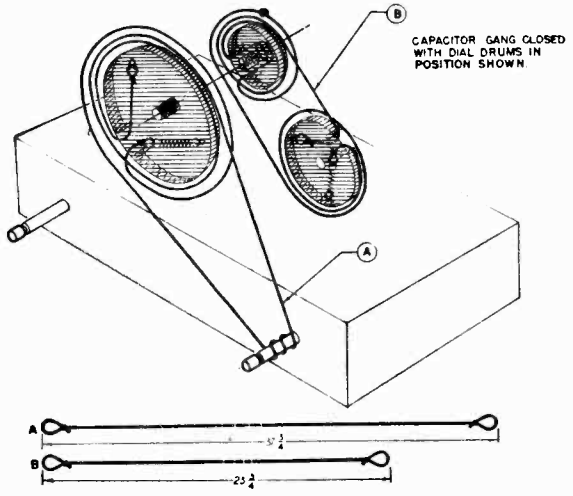
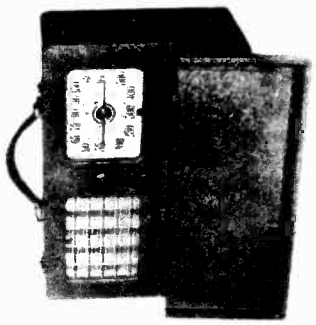


Fig. 3. Dial Stringing

GENERAL ELECTRIC CO.

MODEL 254



IF PEAK
455 KC

CONDITIONS OF TEST

MEASUREMENTS TAKEN WITH 20,000 OHMS PER VOLT METER
READINGS TAKEN BETWEEN SOCKET PIN & B-
A-C LINE VOLTS - 117 V.
SWITCH S2 IN AC-DC POSITION

* 10 VOLT SCALE
≠ 2.5 VOLT SCALE

BOTTOM VIEW OF CHASSIS

MODEL 254 GENERAL ELECTRIC CO.

POWER SUPPLY:

(AC-DC Operation)
Voltage ..... 105–125 volts
Frequency (on a-c) ..... 50–60 cycles
Power Consumption ..... 18 watts
(Battery Operation)
2—4½-volt "A" Batteries. Eveready No. 746 or equivalent
2—45-volt "B" Batteries. Eveready No. 482 or equivalent

OPERATING FREQUENCIES:

Broadcast Band ..... 540–1620 kc
I-F Amplifier ..... 455 kc

POWER OUTPUT:

Undistorted ..... 0.15 watts
Maximum ..... 0.27 watts

LOUDSPEAKER:

Type ..... Alnico PM
Outside Cone Diameter ..... 5¼ in.
Voice Coil Impedance (400 cycles) ..... 3.2 ohms

TUBE COMPLEMENT:

R-F Amplifier 1N5GT
Oscillator-Converter 1A7GT
I-F Amplifier 1N5GT
Detector-Audio 1H5GT
Power Output 3Q5GT
Rectifier 117Z6GT

ELECTRICAL CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES:

R-F ..... 1620, 1500 kc and 600 kc
I-F ..... 455 kc

EQUIPMENT REQUIRED:

1. Test oscillator with tone modulation
2. A-C output meter
3. .05 mfd. paper capacitor
4. Insulated screwdriver

PROCEDURE—GENERAL. 1. The alignment procedure is given in table form. All i-f and r-f alignments may be made with the chassis removed from the cabinet. The location of the i-f and r-f adjustments is shown in Figure 1.

2. Adjustment of L2 is accomplished by loosening the lock washer and turning the slug with a screwdriver. Retighten the lock washer, being careful not to turn the slug.

3. For accurate frequency calibration, set the test oscillator at 1000 kc, and turn the dial to tune in maximum a 1000-kc signal. Set pointer to read 100 on the dial, making sure the gang condenser does not turn. This adjustment should be made only after all steps on the alignment chart are carried out.

4. The output meter should be connected across the voice coil terminals on the speaker. The low side of the test oscillator output should be connected to the chassis ground; the high side of the oscillator output should be connected as indicated in the alignment chart. During the entire alignment procedure, the volume control should be at its maximum (clockwise) position. The test oscillator should be attenuated so that the output meter reading doesn't exceed ½ volt.

5. For alignment of the oscillator and r-f trimmers, the input signal should be inductively coupled to the radio loop antenna by connecting a 4-turn, 6-inch diameter loop of bell wire across the signal generator output terminals, and then locate the loop about one foot from the radio loop antenna. To prevent possible errors in peak readings, the position of the loop with respect to the radio loop antenna should not be changed during any one set of adjustments.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Oscillator Setting	Pointer Setting on Radio	Adjustment for Maximum Output
1	1N5GT I-F grid in series with .05 mfd	455 kc	550 kc	2nd I-F Trans. (T2) Trimmers
2	1A7GT Conv. grid in series with .05 mfd	455 kc	550 kc	1st I-F Trans. (T1)
3	Repeat Steps 1 and 2			
4	Inductively coupled	1620 kc	Max. freq. cond. open	CIB OSC
5	Inductively coupled	1500 kc	1500 kc	C1A Ant. C1C RF
6	Inductively coupled	600 kc	600 kc	L2 Ant. Loading Coil
7	Inductively coupled	1500 kc	1500 kc	C1A Ant. C1C RF
8	Recheck Steps 5, 6, and 7			

STAGE GAIN AND VOLTAGE CHECKS

Stage gain by vacuum tube voltmeter or similar measuring devices may be used to check circuit performances and isolate trouble. The gain values listed may have tolerances of 20 per cent. Readings should be taken with low signal input so that the AVC is not effective.

(1) RF STAGE GAINS.

1N5GT r-f grid to 1A7GT grid ..... 25 at 1000 kc
1A7GT grid to 1N5GT i-f grid ..... 25 at 1000 kc
1A7GT grid to 1N5GT i-f grid ..... 30 at 455 kc
1N5GT i-f grid to 1H5GT diode plate ..... 65 at 455 kc

(2) AUDIO GAIN.

.06 volt at 400 cycles across volume control (R17) with control set at maximum will give approximately .05 watt output across speaker voice coil.

(3) DC voltage developed across oscillator grid resistor (R6) averages 13 volts at 1000 kc.

(4) SOCKET PIN VOLTAGES.

Figure 3 shows voltages from all tube pins to B—. Voltage readings much lower than those specified may help localize defective components or tubes.

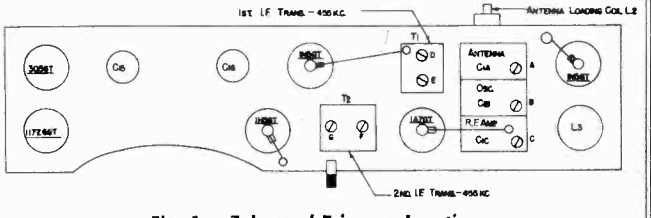


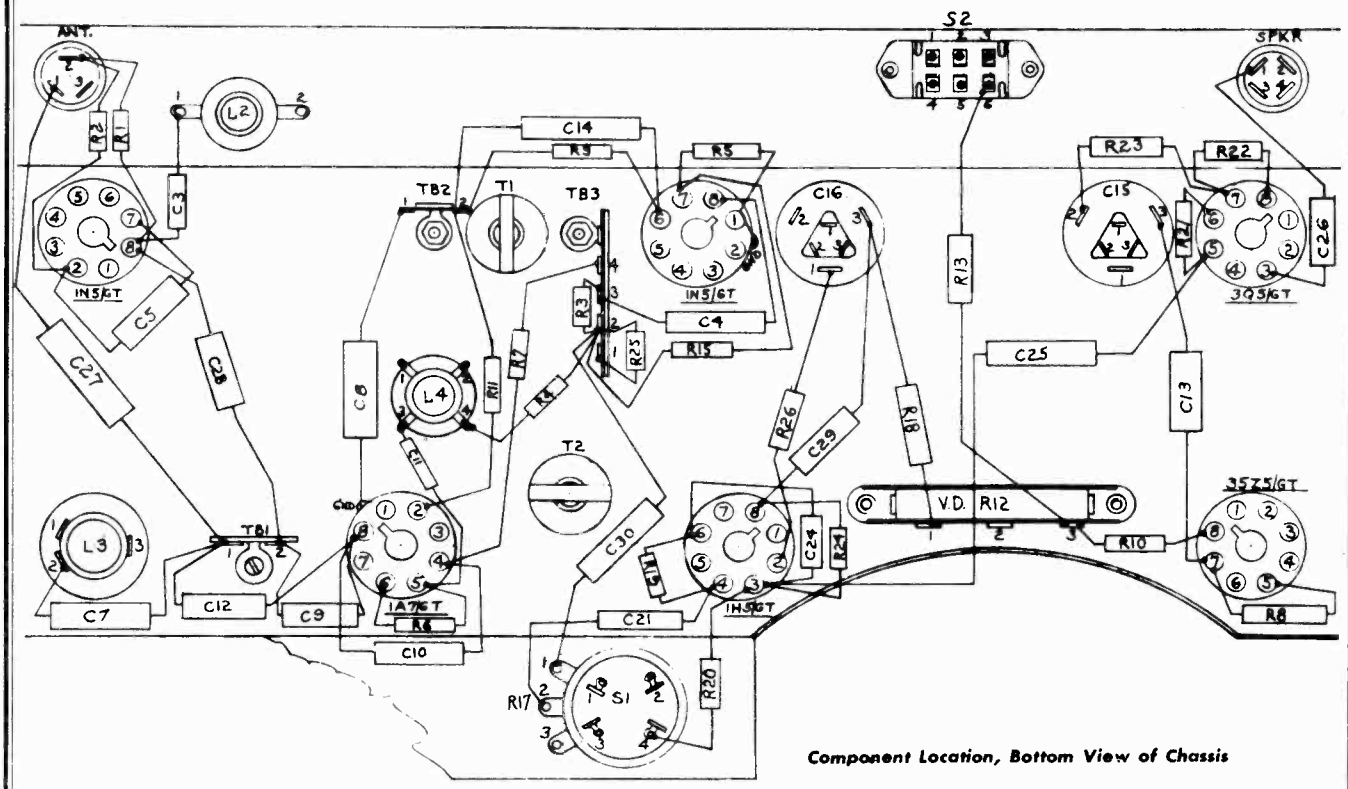
Fig. 1. Tube and Trimmer Location

GENERAL ELECTRIC CO.

REPLACEMENT PARTS LIST—MODEL 254

CAT. NO.	SYMBOL	DESCRIPTION
SPECIALIZED REPLACEMENT PARTS (CONT'D)		
SCE-021	C15A, B, C	CAPACITOR—40 mf., 150 v.; 40 mf., 150 v.; 40 mf., 150 v.; electrolytic
SCT-010	C1A, B, C	CONDENSER—Tuning condenser, pulley, and trimmers
SDC-002		CORD—Dial cord
SDK-036		KNOB—Control knob
SDP-003		POINTER—Dial pointer
SDS-012		SCALE—Dial scale
SDW-003		WINDOW—Dial scale window
SDX-006		DRIVE—Dial drive assembly
SJJ-009		CONNECTOR—Female speaker connector
SJJ-010		CONNECTOR—Female antenna connector
SJP-007		CONNECTOR—Male 2-contact "A" battery connector
SJP-008		CONNECTOR—Male 3-contact "B" battery connector
SJP-009		CONNECTOR—Male speaker connector, 4-contact
SJS-031		SOCKET—Octal tube socket
SJS-035		SOCKET—Octal tube socket
SLA-002	L2	COIL—Antenna loading coil
SLB-002	L3	COIL—R-F transformer
SLC-011	L4	COIL—Oscillator coil
SLL-003	L1	BEAM-A-SCOPE—Loop antenna assembly
SMS-012		SPRING—Dial cord spring
SMS-013		SPRING—Indicator spring
SMX-014		TRIGGER—Trigger bushing assembly
SRC-044	R17, S1	VOLUME CONTROL—1.0 meg., potentiometer and switch
SRW-024	R12A, B	RESISTOR—1900 ohms, CT, 5 w., w.w.
SRW-025	R8	RESISTOR—39 ohms, 5 w., w.w.
SRW-026	R10	RESISTOR—340 ohms, 5 w., w.w.
SSS-009	S2	SWITCH—Battery-line selector slide switch
STL-009	T1	TRANSFORMER—1st I-F transformer
STL-010	T2	TRANSFORMER—2nd I-F transformer
STO-007	T3	TRANSFORMER—Output transformer
SWL-006		CORD—Power cord

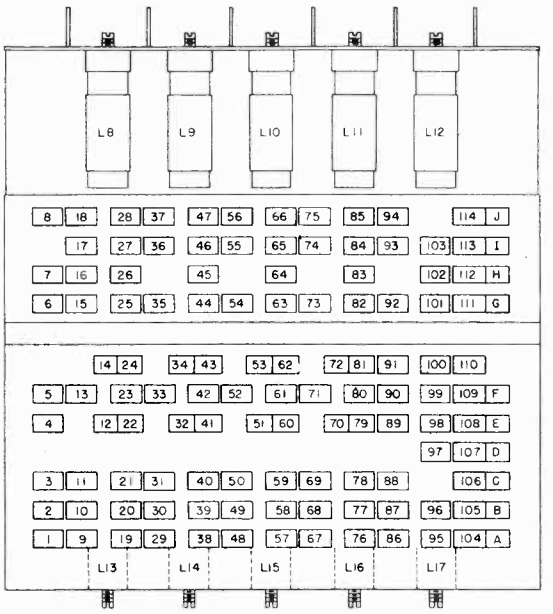
CAT. NO.	SYMBOL	DESCRIPTION
UNIVERSAL REPLACEMENT PARTS		
UCC-018	C29	CAPACITOR—0.001 mfd., 400 v., paper
UCC-025	C14, 28, 30	CAPACITOR—0.01 mfd., 400 v., paper
UCC-030	C7, 8	CAPACITOR—0.1 mfd., 400 v., paper
UCC-039	C21, 26	CAPACITOR—0.005 mfd., 400 v., paper
UCC-041	C5, 25	CAPACITOR—0.02 mfd., 600 v., paper
UCC-045	C4, 9, 10, 12, 13, 27	CAPACITOR—0.05 mfd., 600 v., paper
UCU-1004	C6	CAPACITOR—10 mmfd., 500 v., mica
UCU-1022	C11	CAPACITOR—56 mmfd., 500 v., mica
UCU-1028	C24	CAPACITOR—100 mmfd., 500 v., mica
UCU-1038	C3	CAPACITOR—270 mmfd., 500 v., mica
UOP-546		LOUDSPEAKER—5¼-inch PM speaker
UOX-008		CONE—Replacement cone
URD-049	R26	RESISTOR—1000 ohms, ½ w., carbon
URD-057	R11	RESISTOR—2200 ohms, ½ w., carbon
URD-093	R7	RESISTOR—68,000 ohms, ½ w., carbon
URD-101	R24	RESISTOR—150,000 ohms, ½ w., carbon
URD-105	R5, 6	RESISTOR—220,000 ohms, ½ w., carbon
URD-113	R25	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R20, 21	RESISTOR—1 meg., ½ w., carbon
URD-129	R1, 4	RESISTOR—2.2 meg., ½ w., carbon
URD-133	R9	RESISTOR—3.3 meg., ½ w., carbon
URD-137	R2, 3	RESISTOR—4.7 meg., ½ w., carbon
URD-145	R15	RESISTOR—10 meg., ½ w., carbon
URD-149	R19	RESISTOR—15 meg., ½ w., carbon
URE-033	R13	RESISTOR—200 ohms, 1 w., carbon
URE-035	R22	RESISTOR—270 ohms, 1 w., carbon
URE-1042	R23	RESISTOR—510 ohms, 1 w., carbon
URF-075	R18	RESISTOR—12,000 ohms, 2 w., carbon
SPECIALIZED REPLACEMENT PARTS		
SAT-001		CABINET—Tan finish cabinet
SCE-020	C16A, B, C	CAPACITOR—20 mf., 150 v.; 40 mf., 150 v.; 100 mf., 50 v.; electrolytic



Component Location, Bottom View of Chassis

REPLACEMENT PARTS LIST—MODEL 260

Part No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-030	C8, 17	CAPACITOR—.1 mfd., 400 v., paper
UCC-032	C22	CAPACITOR—.25 mfd., 400 v., paper
UCC-039	C21, 38	CAPACITOR—.005 mfd., 600 v., paper
UCC-040	C23	CAPACITOR—.01 mfd., 600 v., paper
UCC-041	C24	CAPACITOR—.02 mfd., 600 v., paper
UCC-048	C6, 16, 25, 32	CAPACITOR—.05 mfd., 400 v., paper
UCG-3049	C13	CAPACITOR—750 mmf., silver mica
UCN-501	C54	CAPACITOR—1.0 mmf., ceramic
UCN-2506	C49	CAPACITOR—6.8 mmf., ceramic
UCU-028	C19, 20	CAPACITOR—100 mmf., mica
UCU-064	C12, 27, 28	CAPACITOR—3300 mmf., mica
UCU-1032	C36	CAPACITOR—150 mmf., mica
UCU-1040	C4, 18	CAPACITOR—330 mmf., mica
UCU-2563	C9	CAPACITOR—3000 mmf., mica
UCW-1004	C5	CAPACITOR—10 mmf., ceramic
UCW-2007	C44	CAPACITOR—13 mmf., ceramic
UCW-2009	C53	CAPACITOR—16 mmf., ceramic
UCW-2010	C46	CAPACITOR—18 mmf., ceramic
UCW-2016	C47	CAPACITOR—33 mmf., ceramic
UCW-2017	C50, 52	CAPACITOR—36 mmf., ceramic
UCW-2022	C37, 45	CAPACITOR—56 mmf., ceramic
UCW-2025	C48	CAPACITOR—75 mmf., ceramic
UIC-001		CEMENT—Cement for speaker cone replacement
UIC-002		THINNER—Speaker cement thinner
UOP-545	SPKR	SPEAKER—5¼-in. P.M. speaker
UOX-006		CONE—Replacement cone kit
URD-051	R23	RESISTOR—1200 ohms, ½ w., carbon
URD-059	R15	RESISTOR—2700 ohms, ½ w., carbon
URD-061	R6	RESISTOR—3300 ohms, ½ w., carbon
URD-073	R21	RESISTOR—10,000 ohms, ½ w., carbon
URD-075	R16	RESISTOR—12,000 ohms, ½ w., carbon
URD-085	R5	RESISTOR—33,000 ohms, ½ w., carbon
URD-089	R9	RESISTOR—47,000 ohms, ½ w., carbon
URD-093	R13	RESISTOR—68,000 ohms, ½ w., carbon
URD-095	R3	RESISTOR—82,000 ohms, ½ w., carbon
URD-105	R2, 12	RESISTOR—220,000 ohms, ½ w., carbon
URD-109	R24	RESISTOR—330,000 ohms, ½ w., carbon
URD-121	R1, 4, 14	RESISTOR—1.0 meg., ½ w., carbon
URD-129	R8	RESISTOR—2.2 meg., ½ w., carbon
URD-137	R11, 19, R20, 22	RESISTOR—4.7 meg., ½ w., carbon
URE-053	R17	RESISTOR—1500 ohms, 1 w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAC-002		COVER—Battery compartment cover
RAC-003		COVER—Power supply compartment cover
RAC-006		COVER—Case back cover (crinkle brown)
RAC-007		COVER—Case back cover (crinkle grey)
RAC-008		COVER—Case right end cover (crinkle brown)
RAC-009		COVER—Case right end cover (crinkle grey)
RAC-012		COVER—Case left end cover (crinkle brown)
RAC-013		COVER—Case left end cover (crinkle grey)
RAC-018		COVER—Back cover (Hammertone grey)
RAC-019		COVER—Back cover (Hammertone blue-green)
RAC-020		COVER—Back cover (Hammertone copper)
RAC-024		COVER—Left end cover (Hammertone grey)
RAC-025		COVER—Left end cover (Hammertone blue-green)
RAC-026		COVER—Left end cover (Hammertone copper)
RAC-030		COVER—Right end cover (Hammertone grey)
RAC-031		COVER—Right end cover (Hammertone blue-green)
RAC-032		COVER—Right end cover (Hammertone copper)
RAC-036		COVER—Antenna plug (crinkle brown)
RAC-037		COVER—Antenna plug (crinkle grey)
RAC-038		COVER—Antenna plug (Hammertone grey)
RAC-039		COVER—Antenna plug (Hammertone blue-green)
RAC-040		COVER—Antenna plug (Hammertone copper)
RAC-041		COVER—Trimmer cover (crinkle brown)
RAC-042		COVER—Trimmer cover (crinkle grey)
RAC-043		COVER—Trimmer cover (Hammertone grey)
RAC-044		COVER—Trimmer cover (Hammertone blue-green)
RAC-045		COVER—Trimmer cover (Hammertone copper)
RAG-005		COVER—Case front and grille cover (crinkle brown)
RAG-006		COVER—Case front and grille cover (crinkle grey)
RAG-013		COVER—Case front and grille cover (Hammertone grey)
RAG-014		COVER—Case front and grille cover (Hammertone blue-green)
RAG-015		COVER—Case front and grille cover (Hammertone copper)
RAI-001		BRACE—Cover brace assembly, supports hinge (crinkle brown)
RAI-002		BRACE—Cover brace assembly supports hinge (crinkle grey)
RAI-004		BRACE—Cover brace assembly, supports cover (Hammertone grey)
RAI-005		BRACE—Cover brace assembly, supports cover (Hammertone blue-green)
RAI-006		BRACE—Cover brace assembly, supports cover (Hammertone copper)
RAX-004		COVER—Case top cover assembly (crinkle brown)
RAX-005		STAY ARM ASSEMBLY
RAX-006		COVER—Case top cover assembly (crinkle grey)
RAX-011		COVER—Top cover (Hammertone grey)
RAX-012		COVER—Top cover (Hammertone blue-green)
RAX-013		COVER—Top cover (Hammertone copper)
RBC-001	B2	CELL—Bias cell assembly
RCC-068	C30	CAPACITOR—0.5 mfd., 120 v., paper
RCC-069	C29	CAPACITOR—0.5 mfd., 120 v., paper
RCC-070	C34, 35	CAPACITOR—0.5 mfd., 120 v., paper
RCC-073	C31	CAPACITOR—.003 mfd., 1500 v., paper
RCE-007	C26A, B, C	CAPACITOR—15 mfd., 150 v.; 15 mfd., 150 v.; 1200 mfd., 1.5 v.; dry electrolytic
RCE-012	C51	CAPACITOR—10 mfd., 150 v., dry electrolytic
RCE-016	C33	CAPACITOR—1200 mfd., 1.5 v., dry electrolytic
RCT-011	C1A, B; C2A, B; C3A, B	CONDENSER—Tuning condenser and trimmers
RCW-062	C7	CAPACITOR—100 mmf., ceramic
RCY-012	C39, 40, 41, C42, 43	TRIMMER STRIP—Antenna trimmer strip
RDB-005		PUSH BUTTON—Single push button
RDC-011		ASSEMBLY—Dial cord and spring
RDE-009		ESCUTCHEON—Main dial escutcheon
RDK-020		KNOB—Tuning knob
RDK-033		KNOB—Volume control knob
RDP-013		POINTER—Dial pointer assembly
RDS-019		SCALE—Dial scale
RDX-017		PUSH BUTTON—Charge-Tone push button and escutcheon assembly
RDX-018		PUSH BUTTON—Band selector push button and escutcheon assembly
RDX-022	S1	SWITCH—Push button band switch assembly
REF-001	F1	FUSE—⅓ amp. fuse, Type 3AG-¼
REV-001	V1	VIBRATOR—Vibrator unit
REX-001	X1, 2, 3, 4	RECTIFIER—Copper oxide rectifier assembly
RHF-001		FOOT—Cabinet foot
RHK-001		KNOB—Lock mechanism (crinkle brown)
RHK-002		KNOB—Lock mechanism (crinkle grey)
RHK-003		KNOB—Lock mechanism (Hammertone grey)
RHK-004		KNOB—Lock mechanism (Hammertone blue-green)
RHK-005		KNOB—Lock mechanism (Hammertone copper)
RHX-003		HARDWARE—Tuning condenser mounting hardware
RHX-008		STUD—Handle stud and cotter
RHY-001		HANDLE—Case cover handle (crinkle brown)
RHY-002		HANDLE—Case cover handle (crinkle grey)
RHY-003		HANDLE—Case cover handle (Hammertone grey)
RHY-004		HANDLE—Case cover handle (Hammertone blue-green)
RHY-005		HANDLE—Case cover handle (Hammertone copper)
RIG-001		GASKET—Dial scale gasket
RJB-004	P2	BOARD—Loop antenna terminal board
RJP-014		PLUG—Battery terminal contact pins
RJS-019		SOCKET—Vibrator socket
RJS-020		SOCKET—Loktal base tube socket
RJS-021		SOCKET—Electrolytic mounting plate socket
RJS-026		SOCKET—Octal base tube socket
RJW-001		HOLDER—Fuse holder
RLL-011	L3	COIL—Broadcast RF coil
RLB-012	L8	COIL—RF coil, 49 meter
RLB-013	L9	COIL—RF coil, 31 meter
RLB-014	L10	COIL—RF coil, 25 meter
RLB-015	L11	COIL—RF coil, 19 meter
RLB-016	L12	COIL—RF coil, 16 meter
RLC-018	L4	COIL—Broadcast oscillator coil
RLC-035	L13	COIL—Oscillator coil, 49 meter
RLC-036	L14	COIL—Oscillator coil, 31 meter
RLC-037	L15	COIL—Oscillator coil, 25 meter
RLC-038	L16	COIL—Oscillator coil, 19 meter
RLC-039	L17	COIL—Oscillator coil, 16 meter
RLF-001	L5 and 6	CHOKE—Vibrator and B+ choke
RLF-004	L7	CHOKE—Filament choke
RLL-007	L2	BEAM-A-SCOPE—SW band loop antenna (external)
RLL-012	L1	BEAM-A-SCOPE—"B" band loop in cover (crinkle brown)
RLL-019	L1	BEAM-A-SCOPE—"B" band loop in cover (crinkle grey)
RLL-020	L1	BEAM-A-SCOPE—"B" band loop in cover (Hammertone grey)
RLL-021	L1	BEAM-A-SCOPE—"B" band loop in cover (Hammertone blue-green)
RLL-022	L1	BEAM-A-SCOPE—"B" band loop in cover (Hammertone copper)
RLP-009	L18	CHOKE—I-f plate choke
RMC-008		CAM—Cover lock mechanism cam
RMC-009		CATCH—Cover lock mechanism catch
RMU-013		SHAFT—Tuning shaft and retainer ring
RMW-004		PULLEY—Dial drive pulley (small), and stud
RMW-009		PULLEY—Dial drive pulley (large), and stud
RMX-013		CATCH—Battery compartment cover catch
RMX-020		CHAIN—Trimmer cover chain
RMX-082		CATCH—Spring catch for rear cabinet cover
RMX-083		TUBE—Vent tube and casing
RRC-015	R10	VOLUME CONTROL—1.0 megohm potentiometer
RRW-018	R18	RESISTOR—7.5 ohm, ½ w., w.w.
RSP-003	S2 and 3	SWITCH—Operation and tone push button switch
RTC-001	T4	TRANSFORMER—Charging transformer
RTC-002	T6	TRANSFORMER—Charging transformer
RTL-028	T1 and 2	TRANSFORMER—IF transformer, 1st or 2nd
RTO-007	T3	TRANSFORMER—Output transformer
RTV-001	T5	TRANSFORMER—Vibrator transformer
RWL-005	P3	CORD—Power cord



TERMINALS A THROUGH J ARE NON-OPERATING LUGS ON THE SWITCH AND ARE USED ONLY FOR TIE-IN CONNECTIONS.

ELECTRICAL RATING:

Charging from A-C Line:

Voltage	105-125 volts, a-c only
Frequency	50/60 cycles/sec.
Wattage	12 watts

Operating from Internal Battery:

Voltage	2.1 volts
Current	1.9 amperes
Wattage	4 watts
Hours of Operation without Recharging Battery	10-13 Approx.

Battery Requirement:

Willard 2.0 volt, No. 25-2, rechargeable battery or equivalent.

Fuse:

GE, No. 2548, ¼-ampere rating.

OPERATING FREQUENCIES:

I-F Amplifier	455 kc
Broadcast Band	540-1600 kc
49 M. Band	5.9-6.5 mc
31 M. Band	9.5-9.85 mc
25 M. Band	11.65-11.9 mc
19 M. Band	15.07-15.35 mc
16 M. Band	17.65-17.9 mc

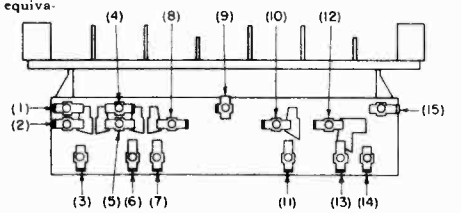
POWER OUTPUT:

Undistorted	248 milliwatts
Maximum	365 milliwatts

LOUDSPEAKER:

Type	Alnico PM
Outside Cone Diameter	5¼ inches
Voice Coil Impedance (400 cps)	3.2 ohms

Band Selector Switch Terminal Diagram

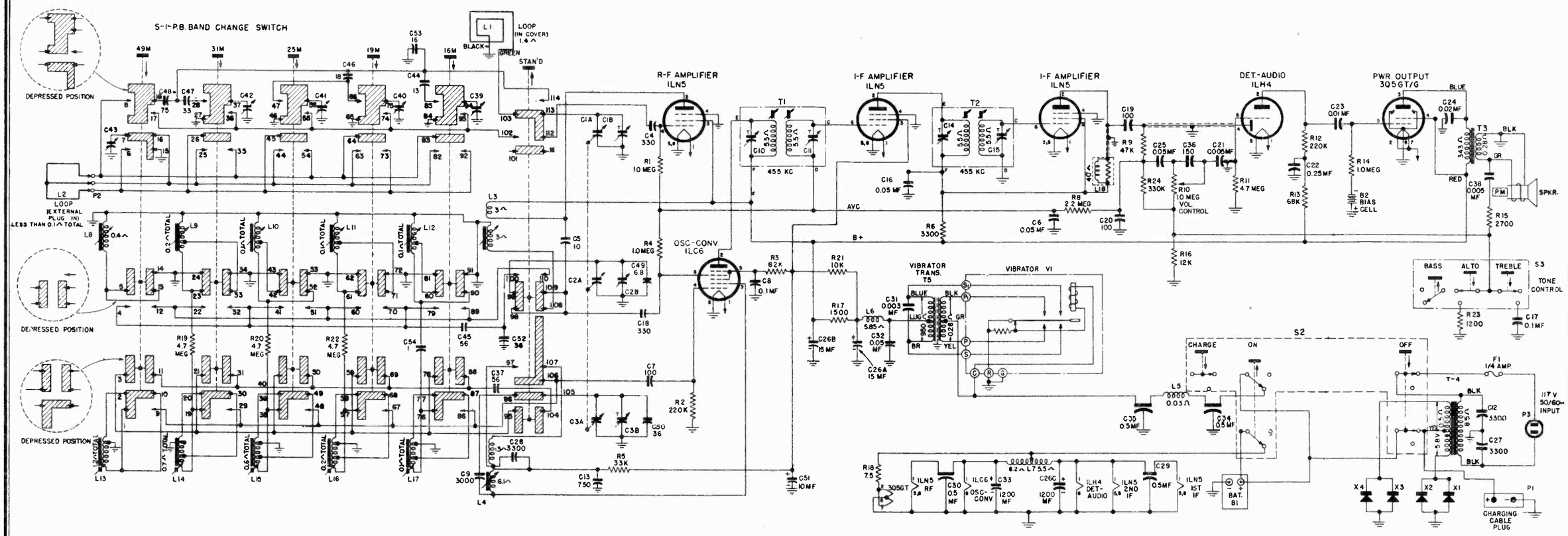


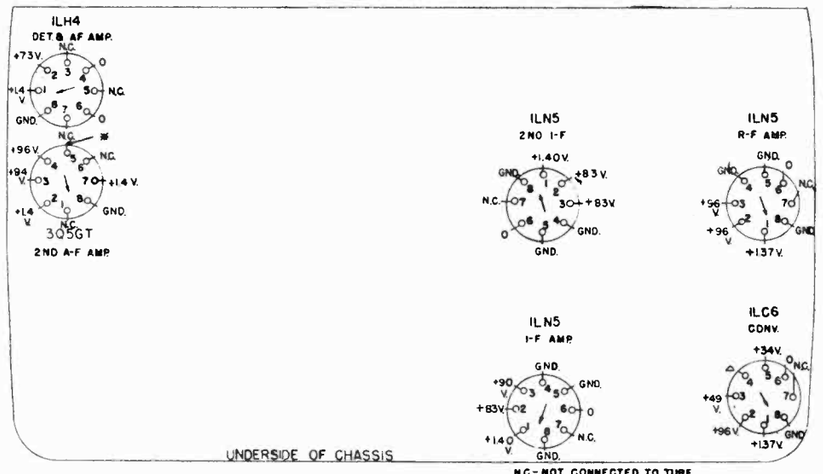
(1) TO F1
(2) TO JUNCTION T4 & C12
(3) TO JUNCTION R18 & 3Q5GT FIL. (2&7)
(4) TO P1 & CENTER TAP T4 SECONDARY
(5) TO BATTERY (+)
(6) TO C34
(7) TO L7 (CENTER) & R18
(8) TO BATTERY (+)
(9) TO GND.
(10)(12) TO R15
(11) TO R23
(13) TO C17
(14) TO R10 & C21
(15) TO C21 & R11

Operations Switch Wiring Diagram

GENERAL ELECTRIC CO.

MODEL 260

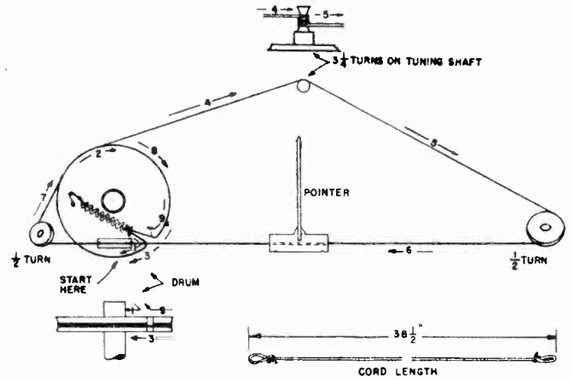




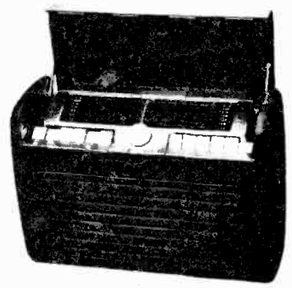
CONDITIONS OF TEST:
ALL MEASUREMENTS D-C
MEASUREMENTS MADE TO GROUND
MEASUREMENTS MADE WITH 20,000 OHM/VOLT METER
LINE VOLTAGE 117 V- BATTERY FULLY CHARGED
VOL CONTROL MAX. CLOCKWISE
TONE CONTROL TREBLE POSITION
RECEIVER OPERATING ON BROADCAST BAND

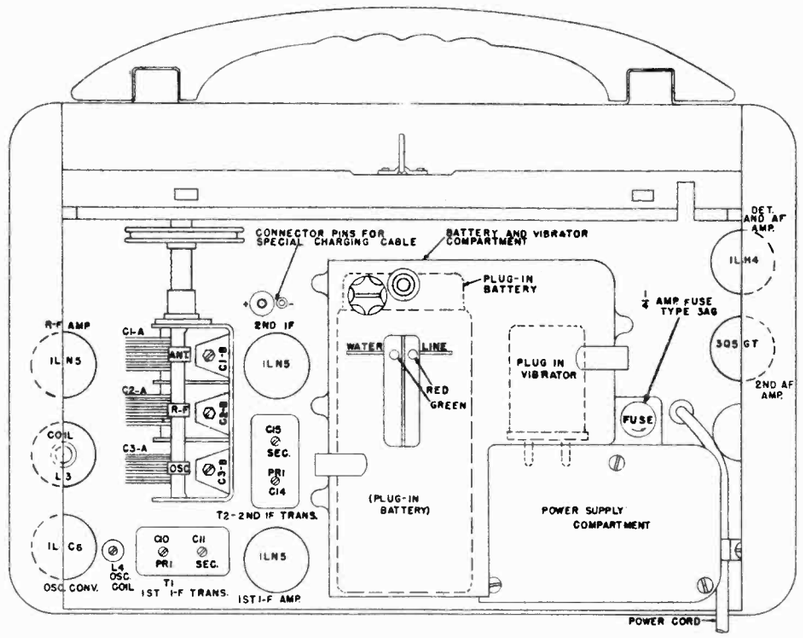
N.C.- NOT CONNECTED TO TUBE
- 4.5V IF MEASURED WITH V.T.V.M.
CENTER POST ON ALL LOCTAL TUBES IS GROUNDED
△ READING AFFECTED BY INSTRUMENT

Socket Voltage Diagram



Dial Stringing Diagram





Tube and Trimmer Location

GENERAL ELECTRIC CO.

MODEL 260

PUSH BUTTON BAND CHANGE SWITCH SHOWN IN 19 METER POSITION 15.07-15.35MC

PUSH BUTTON BAND CHANGE SWITCH SHOWN IN 16 METER POSITION 17.65-17.9 MC

PUSH BUTTON BAND CHANGE SWITCH SHOWN IN STANDARD POSITION BROADCAST BAND 540-1600KC

GENERAL ELECTRIC CO.

MODEL 260

PUSH BUTTON BAND CHANGE SWITCH SHOWN IN 31 METER POSITION 9.5-9.85MC

PUSH BUTTON BAND CHANGE SWITCH SHOWN IN 25 METER POSITION 11.65-11.9 MC

PUSH BUTTON BAND CHANGE SWITCH SHOWN IN 49 METER POSITION 5.9-6.5 MC

ELECTRICAL CIRCUIT ALIGNMENT

1. EQUIPMENT REQUIRED.

1. Signal Generator with Audio Tone Modulation.
2. A-c output meter, 1 or 1½ volts full scale, 1000 ohms/volt.
3. Insulated screwdriver.

2. ALIGNMENT PROCEDURE.

1. General.—The alignment procedure is given in table form for convenience. Reference is made to Figures 3, 5, and 6 for the trimmer locations. The low side of the signal generator should be connected to the chassis of the receiver for i-f alignment; the high side should be connected as indicated in the Alignment Chart. A meter or some other suitable indicating device must be connected to the output of the receiver. Two methods for connecting an output meter are given in later paragraphs.

When aligning the receiver, the Volume Control on the receiver should be turned to its maximum position and the TREBLE push button should be depressed. The output signal of the signal generator should be kept as low as possible at all times; the reading of a meter connected across the voice coil leads of the receiver should be kept below ½ volt by changing the signal generator output. If the signal level is too high, the AVC becomes effective and alignment errors may result.

The following paragraphs give greater details regarding the connection of the output meter and the signal generator to the receiver during alignment.

2. Connecting the Output Meter.—In aligning the receiver, some means for indicating differences in the output voltage will be required. Either of the following methods is satisfactory. The first requires more disassembly of the receiver case than the second, but the second requires additional test equipment.

Method 1.—A satisfactory method for indicating differences in output is to connect a rectifier-type a-c meter of 1 or 1½ volts full scale deflection across the speaker voice coil terminals. To gain access to the speaker, remove the front panel from the radio as previously described. Connect a lead to the green lead that connects to the ungrounded side of the speaker voice coil. Thread this lead through into the rear compartment. The front panel is reinstalled in place so that the stray capacities in the set will be the same as when the set is operating normally. Connect the meter between this lead and ground. A convenient ground connection may be obtained by removing the push-button band change switch escutcheon, and connecting a clip lead to the exposed chassis.

STAGE GAINS AND VOLTAGE CHECKS

Stage gain measurements may be made with a vacuum tube voltmeter to check circuit performance and to locate stages which are not operating properly. The gain values listed may have a tolerance of 20%.

1. R-F and I-F Stage Gains.

R-F amplifier grid (6) to converter grid (6)	8.0 at 1000 kc
R-F amplifier grid (6) to converter grid (6)	6.0 at 6100 and 9600 kc
R-F amplifier grid (6) to converter grid (6)	5.0 at 11.8, 15.2 and 17.8 mc
Converter grid (6) to 1st IF grid (6)	26 at 455 kc
Converter grid (6) to 1st IF grid (6)	15 at 1000 kc
Converter grid (6) to 1st IF grid (6)	15 at 6100 kc, 9600 kc, 11.8 mc, 15.2 mc, and 17.8 mc
1st IF grid (6) to 2nd IF grid (6)	69 at 455 kc
2nd IF grid (6) to diode plates	3.9 at 455 kc

2. Audio Gain.

The power output across the speaker voice coil should be approximately 50 milliwatts with a 400 cps audio signal of 0.07 volts applied across the volume control, R10 (volume control maximum—TREBLE push button depressed).

3. Oscillator Grid Bias.

The d-c voltage developed across the oscillator grid leak (R2) averages 6.5 volts at 1000 kc.

Method 2.—The following is an alternate method which eliminates the necessity of removing the front panel of the set, but which requires additional test equipment. Make an indicating device by connecting a 4- to 6-inch diameter magnetic speaker or the high-impedance leads from the output transformer of a good p-m dynamic speaker to the terminals of a rectifier-type microammeter with a full scale deflection of 100 microamperes or less. For convenience, the meter and speaker may be mounted in a small box in such a way that the meter will be visible when the speaker is placed in front of the speaker on the receiver being aligned.

To use this device, place its speaker in front of and about an inch away from the speaker of the receiver being aligned. The meter will then deflect in proportion to the intensity of the sound produced by the speaker, and therefore may be used as an output meter. The meter must not be moved during alignment.

3. Connecting the Signal Generator.—For aligning the i-f transformers, the output of the signal generator should be coupled through a 0.05 mf. capacitor to the grid (pin 6) of the 1LC6 oscillator-converter tube. This may be accomplished easily by connecting the capacitor to the stator of C2-A, the middle section of the tuning gang, as this stator is connected to the converter grid through a blocking condenser. The low side of the signal generator output should be connected to the chassis ground to complete the circuit.

For aligning the oscillator, r-f, and loop circuits, the r-f signal should be inductively coupled by means of a three- or four-turn, 6-inch diameter, loop of bell wire across the signal generator output terminals. The loop should be located about one foot from the radio cover, with cover open for broadcast alignment, and about one foot away from the external loop when making the shortwave band alignment. To prevent possible errors in peak-readings, the position of the loop with respect to the receiver should not be changed during any one set of adjustments.

4. Alignment Suggestions.—The dial pointer should fall under the extreme left end mark on the dial scale when the gang condenser is fully closed. If necessary, move the dial pointer along the dial drive cord until such registration is obtained.

To gain access to the shortwave oscillator tuning slugs, L13 through L17, remove the snap cover from the bottom of the receiver. The short-wave antenna and converter trimmers are accessible when the push-button band-change switch escutcheon (right-hand side) is removed. When aligning the trimmers on the gang condenser (for broadcast band alignment), close the cabinet back cover and make the adjustments through the snap button openings in the back cover.

The oscillator operates on the high frequency side of the signal on all bands. With this method of operation, and with the dial set at an alignment point, the image response should be heard when the signal generator is tuned to a frequency 910 kc higher than the alignment frequency.

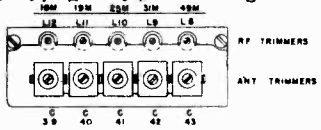


Fig. 5. RF and Antenna Trimmer Location

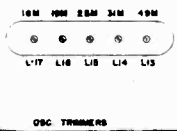


Fig. 6. Oscillator Trimmer Location

ALIGNMENT CHART

Depress Treble Push Button
Turn Volume Control to Maximum

Step	Sig. Gen. Setting	Connect Signal Generator to	Depress Push Button	Dial Scale Setting	Adjust
1	455 kc	Stator of C-2A in series with .05 mf	Standard	Below 550 kc	2nd i-f (T2) trimmers for max.
2	455 kc	Stator of C-2A in series with .05 mf	Standard	Below 550 kc	1st i-f (T1) trimmers for max.
3	1500 kc	Inductively coupled	Standard	1500 kc	**C-3B, C-2B, and C-1B for max. in sequence given
4	580 kc	Inductively coupled	Standard	580 kc	* L4 and L3 for max.
5	Repeat Step 3				
6	6.1 mc	Inductively coupled	49 M	6.1 mc	L13 for max.
7	6.1 mc	Inductively coupled	49 M	6.1 mc	* L8 and C43 for max.
8	9.6 mc	Inductively coupled	31 M	9.6 mc	L14 for max.
9	9.6 mc	Inductively coupled	31 M	9.6 mc	* L9 and C42 for max.
10	11.8 mc	Inductively coupled	25 M	11.8 mc	L15 for max.
11	11.8 mc	Inductively coupled	25 M	11.8 mc	* L10 and C41 for max.
12	15.22 mc	Inductively coupled	19 M	15.22 mc	L16 for max.
13	15.22 mc	Inductively coupled	19 M	15.22 mc	* L11 and C40 for max.
14	17.8 mc	Inductively coupled	16 M	17.8 mc	L17 for max.
15	17.8 mc	Inductively coupled	16 M	17.8 mc	* L12 and C39 for max.

* Alternately peak circuits to obtain peak while rocking gang condenser.
** Remove snap buttons on back cover to permit these adjustments and close back cover while aligning.
NOTE.—The oscillator operates on the high frequency side of the signal on all bands.

BATTERY INFORMATION

The receiver uses a 2-volt Willard Radio Battery No. 25–2 or equivalent. It has a 25 ampere-hour capacity and should be cared for in the same manner as any other storage battery.

Charge Indicator

The degree of charge of the battery can be determined by raising the back cover of the radio and referring to the charge ball indicators visible through the hole in the metal battery case.

If the battery is fully charged, two indicator balls will be visible at the surface of the liquid in the battery. When the battery discharges, these ball indicators will sink and disappear in the following order:

1. Green indicator sinks when approximately 20 per cent of battery capacity has been discharged.
2 The red ball sinks when battery is 80 per cent discharged.

On charge, the balls rise or float in the reverse order and the charge may be stopped when both balls appear in the opening.

To Charge Battery

The battery is charged by merely plugging the receiver power cord in the rated a-c power outlet and depressing the CHARGE push button. Frequent check should be made of the charge indicator and when both indicator balls are visible, the battery is adequately charged. Charging the battery after all indicator balls are visible will not harm the battery except that it will evaporate the water faster. A completely discharged battery will be restored usually within 20 to 30 hours.

When operating the receiver from the a-c house current, the battery floats or is being charged at a slow rate. Thus, if you wish to operate the receiver at the same time that you are charging even a fully discharged battery, plug the power cord in the a-c receptacle and depress the ON push button. Prolonged operation in this manner usually will cause the battery potential to stabilize at some voltage determined by the line voltage and the characteristics of the charging circuit components. The degree of charge obtainable with this method of operation likewise is dependent on the line voltage and the characteristics of the charging circuit components.

Battery Operating Instructions

1. Add distilled or tap water in the filler cap at sufficiently frequent intervals to keep liquid level at indicator mark as viewed through opening in battery case. DO NOT OVERFILL as this impairs the nonspill feature.
2. Whenever possible, it is best not to allow the battery to become discharged to the extent that both indicators disappear.

However, if both indicators have sunk, the battery should be recharged immediately or within 24 hours.

3. A battery will continually discharge at a slow rate even when not in use. For this reason, monthly checks should be made of the charge condition, and the battery should be placed on charge when necessary. This will prevent damage to the battery such as freezing during cold weather.

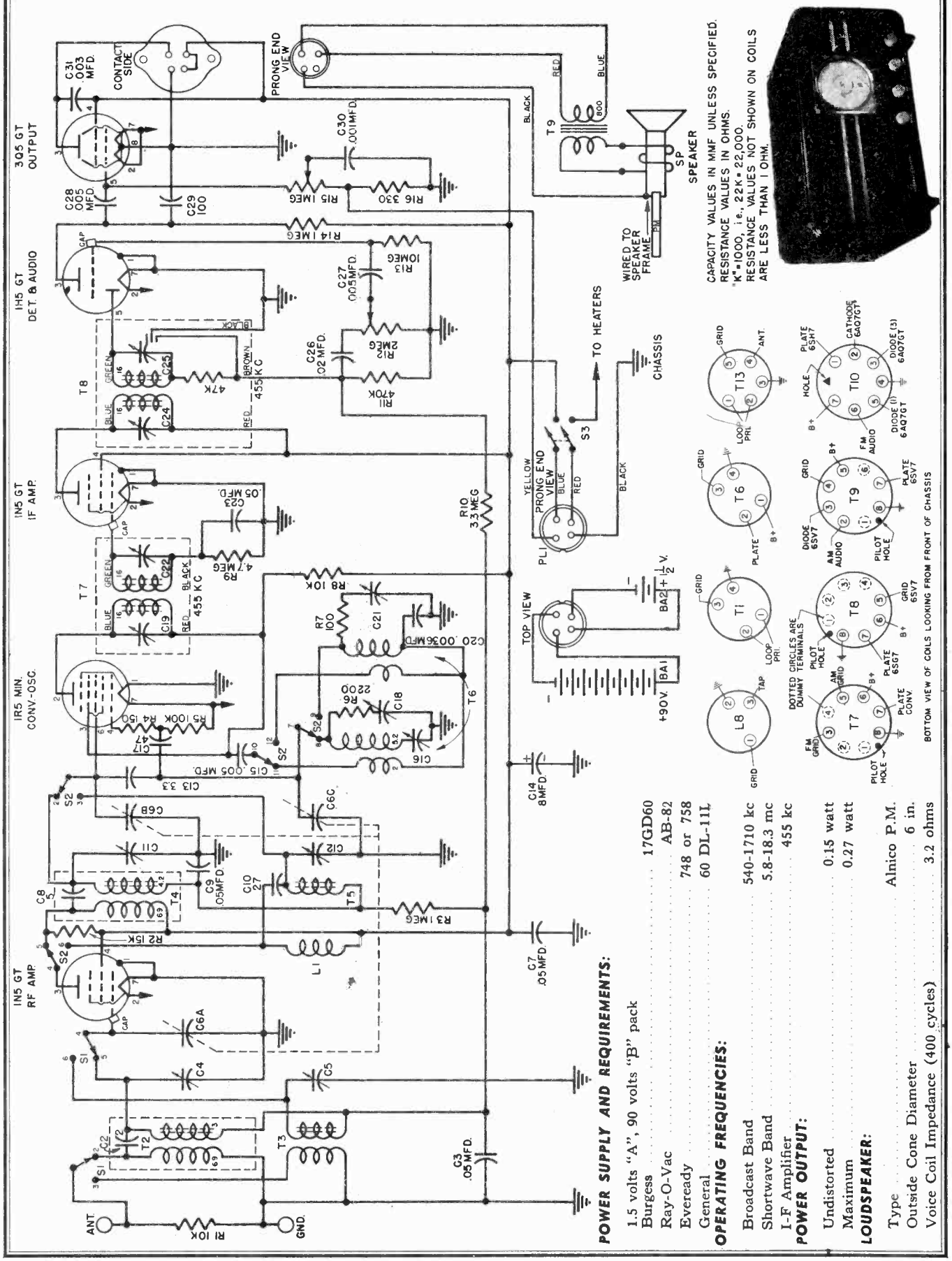
BATTERY INSTALLATION

The following instructions should be carefully followed in installing a battery, or replacing an old one:

1. Remove new battery from packing carton.
2. If needed, add water to bring liquid level to indicator mark on battery container. *Do not overfill.*
3. Raise back cover on radio, remove battery case cover. The latter is removed by unclipping the two catches. Pry off cover.
4. Unplug old battery if present, and replace with new battery.
5. Place battery on charge, if necessary, as described in a previous paragraph, until both indicators are showing in the opening in the case cover.

GENERAL ELECTRIC CO.

MODEL 280



POWER SUPPLY AND REQUIREMENTS:

1.5 volts "A", 90 volts "B" pack

Burgess	17GD60
Ray-O-Vac	AB-82
Eveready	748 or 758
General	60 DL-11L

OPERATING FREQUENCIES:

Broadcast Band	540-1710 kc
Shortwave Band	5.8-18.3 mc
I-F Amplifier	455 kc

POWER OUTPUT:

Undistorted	0.15 watt
Maximum	0.27 watt

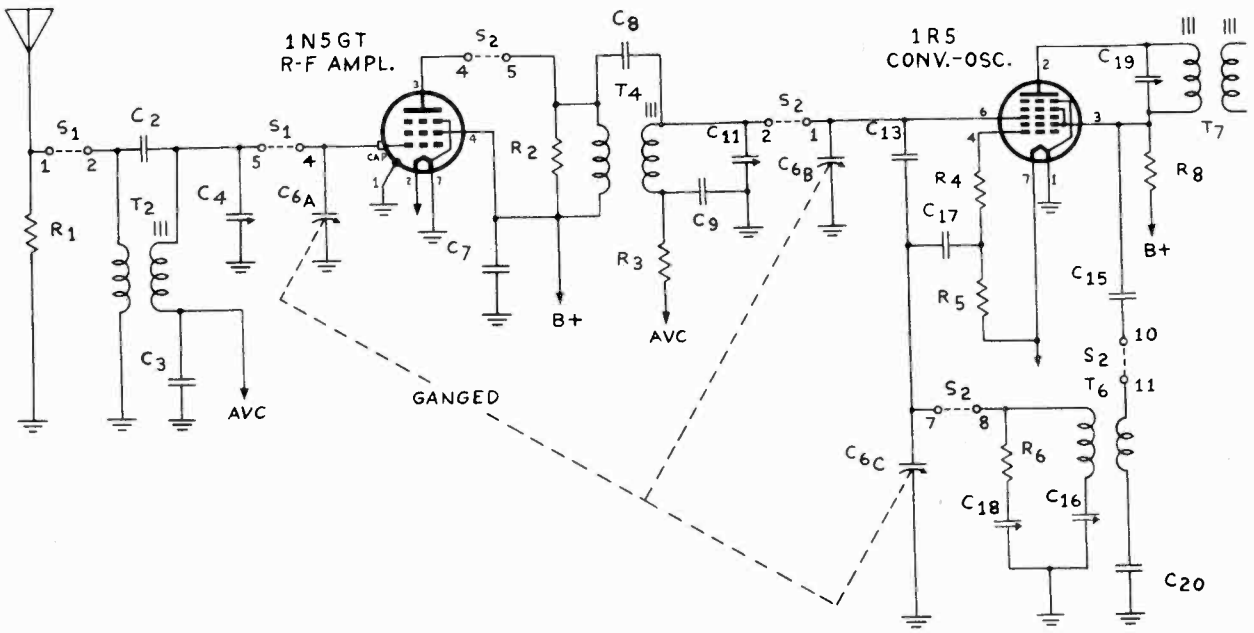
LOUDSPEAKER:

Type	Alnico P.M.
Outside Cone Diameter	6 in.
Voice Coil Impedance (400 cycles)	3.2 ohms

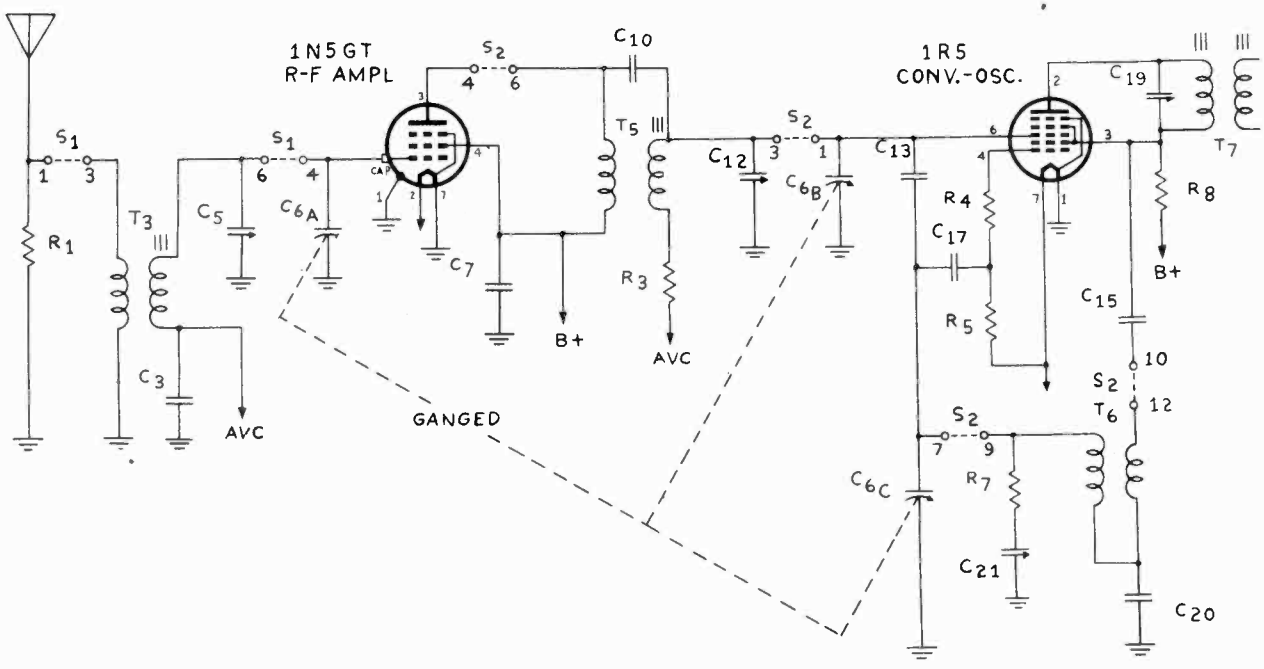
"clarified schematics"

MODEL 280

GENERAL ELECTRIC CO.



BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
540-1710 KC



BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE
SHORT WAVE BAND
5.8-18.3 MC

GENERAL ELECTRIC CO.

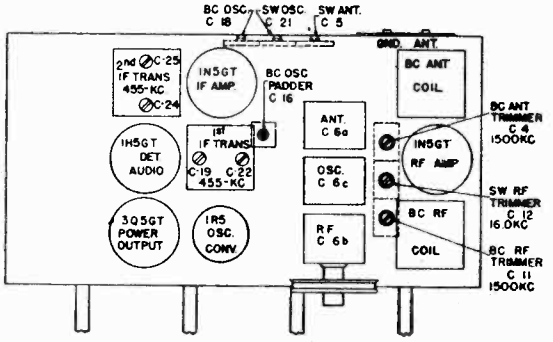
MODEL 280

ELECTRICAL CIRCUIT ALIGNMENT

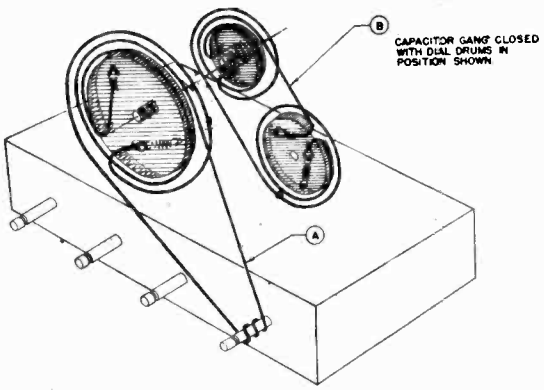
PROCEDURE—GENERAL. 1. Connect output meter across loud speaker voice coil terminals.

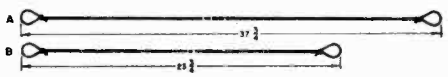
2. Keep radio volume control at maximum and attenuate test oscillator signal output for low output meter reading.

3. All trimmer adjustments are made with the chassis removed from the cabinet.

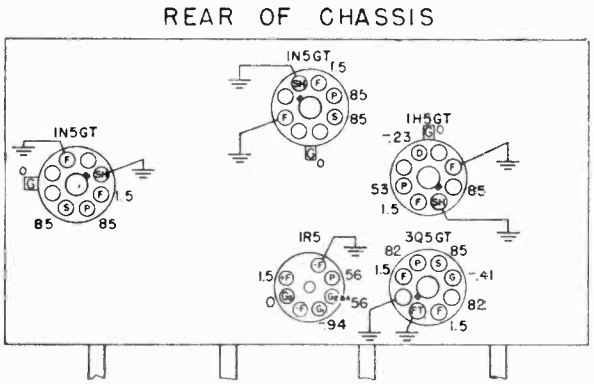


Tube and Trimmer Location





Dial Stringing



MEASUREMENTS TAKEN ON 20,000 OHMS PER VOLT METER MEASURED FROM PIN TO CHASSIS.
1.5 V "A" — 90 V "B" BATTERY PACK. NO SIGNAL INPUT
VOLUME CONTROL AT MAXIMUM

Socket Voltages

ALIGNMENT CHART

Step	Connect Test Oscillator To	Test Oscillator Setting	Pointer Setting On Radio	Adjust For Max. Output
1	1N5GT IF grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	1st IF transformer trimmers
2	1R5 conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	2nd IF transformer trimmers
3	1N5GT RF grid in series with .05 mfd.	1710 KC	HF End	C18 (osc.)
4	1N5GT RF grid in series with .05 mfd.	1500 KC	1500 KC	C11 (conv.)
5	1N5GT RF grid in series with .05 mfd.	600 KC	600 KC	* **C16 (osc. padder)
6	Antenna Post in series with 200 mmf.	1500 KC	1500 KC	C4 (RF)
7	1N5GT RF grid in series with .05 mfd.	18.3 MC	HF End	C21 (osc.)
8	Antenna Post in series with 400 ohms	16.0 MC	16.0 MC	* C12 and C5 (Conv. and R-F)

*Rock Gang condenser when making alignment.
**Repeat steps 3 and 4 for best results.

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of 20%. Readings taken with low signal input so that AVC is not effective.

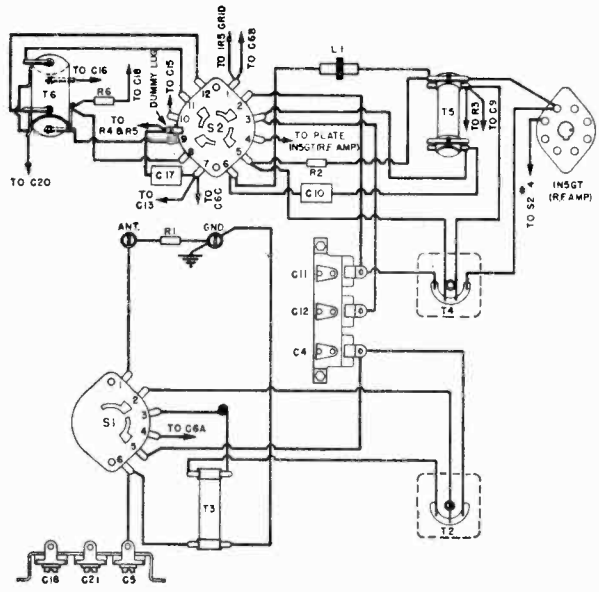
(1) R-F Stage Gains.

Antenna post to 1N5GT r-f grid	3 at 1000 kc
1N5GT r-f grid to 1R5	10 at 1000 kc
1R5 grid to 1N5GT i-f grid	46 at 1000 kc
1R5 grid to 1N5GT i-f grid	60 at 455 kc
1N5GT grid to 1H5GT i-f diode plates	80 at 455 kc

(2) Audio Gain.
.06 volt at 400 cycles across volume control (R12) with control set at maximum will give approximately .05 watts output across speaker voice coil.

(3) D-C voltage developed across oscillator grid resistor (R5) averages 8 volts at 1000 kc.

(4) Socket Pin Voltages.
Figure 5 shows voltages from all tube pins to B-. Voltage eadings much lower than those specified may help localize lefective components or tubes.



Switch Wiring

PARTS LIST - MODEL 417

Part No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-039	C43	CAPACITOR—.005 md., 600 v. paper
UCC-040	C17, 30, 64, 69, 91, 103	CAPACITOR—.01 mfd., 600 v., paper
UCC-041	C9, 18, 74, 104	CAPACITOR—.02 mfd., 600 v., paper
UCC-042	C37	CAPACITOR—.03 mfd., 600 v., paper
UCC-045	C47, 66, 77, 101, 102	CAPACITOR—.05 mfd., 600 v., paper
UCG-2048	C76	CAPACITOR—680 mmfd., 500 v., silver mica
UCN-506	C52	CAPACITOR—6.8 mmf., ceramic
UCU-020	C21, 53	CAPACITOR—47 mmf., 500 v., mica
UCU-028	C68	CAPACITOR—100 mmf., 500 v., mica
UCU-048	C38	CAPACITOR—680 mmf., 500 v., mica
UCU-520	C10	CAPACITOR—47 mmf., mica
UCU-528	C70, 79	CAPACITOR—100 mmf., 500 v., mica
UCU-536	C85	CAPACITOR—220 mmf., 500 v., mica
UCU-544	C78	CAPACITOR—470 mmf., 500 v., mica
UCU-1042	C29	CAPACITOR—390 mmfd., 500 v., mica
UCU-1054	C42, 73	CAPACITOR—10 mmfd., mica
UCU-1512	C90, 72	CAPACITOR—22 mmfd., 500 v., mica
UCU-1532	C31	CAPACITOR—150 mmfd., mica
UCU-1544	C8	CAPACITOR—470 mmfd., mica
UCW-1004	C50	CAPACITOR—10 mmf., ceramic
UCW-1014	C22	CAPACITOR—27 mmf., ceramic
UCW-1020	C41	CAPACITOR—47 mmf., ceramic
UCW-1028	C34	CAPACITOR—100 mmf., ceramic
UIC-001		CEMENT—Speaker cone replacement cement
UJB-014		TERMINALS—4 lug terminal strip
UJB-018		TERMINALS—2 lug terminal strip
UOP-1230		SPEAKER—12 in. permanent magnet speaker
UOX-002		CONE—Loudspeaker replacement cone assembly
URD-007	R30	RESISTOR—18 ohms, ½ w., carbon
URD-009	R26	RESISTOR—22 ohms, ½ w., carbon
URD-017	R2	RESISTOR—47 ohms, ½ w., carbon
URD-025	R33	RESISTOR—100 ohms, ½ w., carbon
URD-033	R29	RESISTOR—220 ohms, ½ w., carbon
URD-049	R12, 34	RESISTOR—1000 ohms, ½ w., carbon
URD-057	R38, 46	RESISTOR—2200 ohms, ½ w., carbon
URD-061	R101	RESISTOR—3300 ohms, ½ w., carbon
URD-065	R20	RESISTOR—4700 ohms, ½ w., carbon
URD-077	R10	RESISTOR—15,000 ohms, ½ w., carbon
URD-085	R104	RESISTOR—27,000 ohms, ½ w., carbon
URD-085	R19	RESISTOR—33,000 ohms, ½ w., carbon
URD-089	R24	RESISTOR—47,000 ohms, ½ w., carbon
URD-091	R7	RESISTOR—56,000 ohms, ½ w., carbon
URD-093	R21	RESISTOR—68,000 ohms, ½ w., carbon
URD-095	R28, 39	RESISTOR—82,000 ohms, ½ w., carbon
URD-097	R9, 40	RESISTOR—100,000 ohms, ½ w., carbon
URD-099	R22, 23	RESISTOR—120,000 ohms, ½ w., carbon
URD-103	R6	RESISTOR—180,000 ohms, ½ w., carbon
URD-105	R13, 16, 27, 41	RESISTOR—220,000 ohms, ½ w., carbon
URD-113	R32	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R37	RESISTOR—1.0 meg., ½ w., carbon
URD-125	R1, 4, 8	RESISTOR—1.5 meg., ½ w., carbon
URD-129	R14, 18	RESISTOR—2.2 meg., ½ w., carbon
URD-133	R102, 103	RESISTOR—3.3 meg., ½ w., carbon
URD-145	R42	RESISTOR—10.0 meg., ½ w., carbon
URD-1079	R5	RESISTOR—16,000 ohms, ½ w., carbon
URD-1104	R105	RESISTOR—200,000 ohms, ½ w., carbon
URE-035	R31	RESISTOR—270 ohms, 1 w., carbon
URE-073	R3	RESISTOR—10,000 ohms, 1 w., carbon
URE-083	R15	RESISTOR—27,000 ohms, 1 w., carbon
URE-085	R17	RESISTOR—36,000 ohms, 1 w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAB-021	L17	BEAM-A-SCOPE—Cabinet back and loop assembly
RAD-016		BRACKET—For band switch mounting at front
RAX-007	R12, 13, 14, 15, 16	COIL—Pushbutton coils mounted on bracket
RAX-008		BRACKET—Bracket and roller fork for elevator shaft
RCC-001	C40	CAPACITOR—.007 mfd., 600 v., paper
RCC-041	C16, 19, 60, 62	CAPACITOR—.02 mfd., 600 v., paper
RCC-056	C51	CAPACITOR—.002 mfd., 1000 v., paper
RCE-030	C105A	CAPACITOR—15 mfd., 350 v., dry electrolytic
	C105B	CAPACITOR—15 mfd., 350 v., dry electrolytic
RCE-029	C46A	CAPACITOR—30 mfd., 400 v., dry electrolytic
	C46B	CAPACITOR—30 mfd., 400 v., dry electrolytic
	C46C	CAPACITOR—15 mfd., 400 v., dry electrolytic
	C46D	CAPACITOR—20 mfd., 25 v., dry electrolytic
RCW-001	C12	CAPACITOR—47 mfd., ceramic
RCW-013	C67	CAPACITOR—10 mmf., ceramic
RCW-014	C27, 44	CAPACITOR—15 mmf., ceramic
RCW-015	C87	CAPACITOR—3.3 mmf., ceramic
RCW-060	C71	CAPACITOR—5.6 mmf., ceramic
RCW-1028	C7, 11, 25	CAPACITOR—100 mmf, ceramic
RCX-011	C80	CAPACITOR—5-80 mmf., pushbutton antenna trimmer
	C81	CAPACITOR—9-180 mmf., pushbutton antenna trimmer
	C82	CAPACITOR—45-380 mmf., pushbutton antenna trimmer
	C83	CAPACITOR—45-380 mmf., pushbutton antenna trimmer
	C84	CAPACITOR—45-380 mmf., pushbutton antenna trimmer
RCX-016	C5	CAPACITOR—200-250 mmf., trimmer capacitor
	C58	CAPACITOR—280-380 mmf., trimmer capacitor
	C59	CAPACITOR—475-575 mmf., trimmer capacitor
RCX-022	C3	CAPACITOR—2-20 mmf., trimmer capacitor
	C4	CAPACITOR—34-70 mmf., trimmer capacitor
	C56	CAPACITOR—475-575 mmf., trimmer capacitor
	C57	CAPACITOR—280-380 mmf., trimmer capacitor
	C63	CAPACITOR—45-80 mmf., trimmer capacitor
RCX-023	C1	CAPACITOR—34-70 mmf., trimmer capacitor
	C55	CAPACITOR—4-50 mmf., trimmer capacitor
RCX-024	C2	CAPACITOR—3-30 mmf., trimmer capacitor
	C85	CAPACITOR—80-130 mmf., trimmer capacitor

Part No.	Symbol	Description
RCY-011	C54	CAPACITOR—3-30 mmf., trimmer for loop
RCY-017	C6, 45	CAPACITOR—3-30 mmf., air trimmer
RDB-001		PUSHBUTTON—Black pushbutton used at bottom of strip only
RDB-004		PUSHBUTTON—Black pushbuttons used in upper five positions only
RDC-019		CORD—Hoist cord 6¼" long
RDC-021		CORD—Drive cord 40¼"
RDE-016		ESCUTCHEON—For dial scale and pushbuttons
RDG-003		BACK PLATE—Large metal panel plate
RDK-004		KNOB—Black knob, plain
RDK-032		KNOB—Black control knob with pointer
RDP-016		POINTER—Dial pointer and slide
RDP-022		POINTER—Dial pointer
RDS-018		SCALE—Tuning dial scale
REI-006		CORE—Iron core for broadcast antenna, r-f, and oscillator coils
REX-002		CORE—Iron core with glass tubing for broadcast antenna, r-f, and oscillator coils
RHC-007		PIN—Hairpin cotter for securing shaft through pushbuttons
RHC-009		PIN—Hairpin cotter for idler wheel
RHC-010		SPRING CLIP—Holds FM coil assembly
RHE-001		EYELET—For connecting FM coil links
RHG-005		GROMMET—For power cord
RHM-016		CLIP—Mounting clip for L1 and L7
RHM-024		LINK—Hoist link holding end of hoist cord
RHM-025		RING—Retaining ring for flywheel
RHM-026		COIL LINK—Rectangular coil link for assembling FM coils T2 and T5
RHM-027		COIL LINK—Rectangular coil link for assembling FM coil, T4
RII-001		POST—Mycalex posts for assembling all FM coils
RJC-001		CONTACT PIN—For speaker connection
RJJ-004		RECEPTACLE—Pre-amp. and pushbutton receptacle
RJP-002		PLUG—Four-prong pre-amp. power plug
RJP-003		PLUG—Phono power male plug
RJP-004		PLUG—Male phono plug from pre-amplifier
RJP-005		PLUG—Plug and cover for pushbutton cable
RJP-010		SOCKET—Phono input socket
RJP-011		PLUG—Shipping screw hole plug
RJS-003		SOCKET—Octal socket for V5, V6, and V7
RJS-012		PLATE—For mounting electrolytic
RJS-027		SOCKET—Dial light socket
RJS-030		SOCKET—Octal socket for V4, V8, and V9
RJS-044		TUBE SOCKET—Tube socket for V1, V2, and V3
RJS-049		SOCKET—Phono power female socket
RJS-051		RECEPTACLE—3 pin receptacle for Beam-a-scope
RJX-009		PLUG—Plug attached to Beam-a-scope
RLA-009	T1	COIL—Broadcast band antenna coil
RLA-011	L6	COIL—FM antenna choke coil
	L19	COIL—FM oscillator cathode choke coil
	L20	COIL—SW loop shunt coil
RLA-016	T13	COIL—Pushbutton antenna coil
RLB-005	T2, 5	COILS—FM antenna coil and FM RF coil
RLB-006	T6	COIL—Broadcast band RF coil
RLB-007	L5	COIL—FM oscillator cathode choke coil
RLB-008	L3	COIL—SW band RF plate choke coil
RLB-009	L2	COIL—Broadcast band plate choke dummy
RLB-010	L4	COIL—FM RF plate choke coil
RLC-013	T4	COIL—FM band oscillator coil
RLC-014	T3	COIL—Broadcast band oscillator coil
RLC 015	L1	COIL—SW oscillator loading coil
RLC-016	L8	COIL—Broadcast band oscillator shunt coil
RLC-017	L7	COIL—SW band RF loading coil
RLC-003	L9	COIL—Filament choke coil
RLI-002	L11	CHOKE—Power line choke
RLP-004	L10	COIL—FM IF plate coil
RLP-006	L18	COIL—Oscillator plate choke coil
RMC-012		CLAMP—For holding cover on RF unit
RMC-013		CLIP—Support for clamp RMC-012
RMC-014		CLIP—For holding shielded phono cable
RMK-001		CAPACITOR—Large bi-metallic strip forming moving element of temperature-compensating capacitor
RMK-002		CAPACITOR—Small metallic strip forming stationary plate of temperature-compensating capacitor
RMM-009		SPACER—Metal sleeve on hoist pulley shaft
RMM-010		VANE—Tuner vane for FM coils T2 and T5
RMM-011		VANE—Tuner vane for FM oscillator coil, T4
RMM-015		SUPPORT—Cabinet drop-leaf support
RMR-002		ROLLER—Presses against hoist shaft
RMS-032		SPRING—Maintains pushbutton tension
RMS-039		WASHER—"C" washer on idler pulley
RMS-040		SPRING—Flat spring against hoist pulley shaft
RMS-041		SPRING—Wire spring against hoist pulley shaft
RMS-042		SPRING—Hoist cord tension spring
RMS-043		SCREW—Iron core adjusting screw
RMS-044		SPRING—Guide wire spring in elevator plate
RMS-072		SPRING—Dial cord tension spring in large drum
RMU-016		SHAFT—Manual tuning shaft
RMW-016		PULLEY—Main tuning drum
RMW-017		PULLEY—Small idler pulley
RMX-018		FLYWHEEL—Flywheel with setscrew
RMX-019		PULLEY—Hoist pulley and shaft
RMX-021		PLATE AND SHAFT—Elevator top plate and vertical shaft
RRC-014	R25	VOLUME CONTROL—2 meg. potentiometer tapped at 1 meg.
RRC-031	S2	SWITCH—Bass tone switch
RRW-010	R35, 36	RESISTOR—1150 and 5000 ohm, w.w.
RSP-002	S5	SWITCH—Pushbutton switch
RSW-023	S1	SWITCH—Band change switch
RSX-003	S3	SWITCH—Treble tone and power switch
RTD-001	T10	TRANSFORMER—Discriminator
RTL-017	T7	TRANSFORMER—1st I-F transformer
RTL-018	T8	TRANSFORMER—2nd I-F transformer
RTL-019	T9	TRANSFORMER—3rd I-F transformer
RTO-012	T11	TRANSFORMER—Output transformer
RTP-020	T12	TRANSFORMER—Power transformer
RWL-004		CORD—Power cord
RWX-004		WIRE—Guide wire for pointer

PARTS LIST - MODEL 280

PART NO.	SYMBOL	DESCRIPTION
UNIVERSAL REPLACEMENT PARTS		
UCC-011	C3, 9, 23	CAPACITOR—.05 mfd., 200 v., paper
UCC-028	C7	CAPACITOR—.05 mfd., 400 v., paper
UCC-035	C30	CAPACITOR—.001 mfd., 600 v., paper
UCC-037	C31	CAPACITOR—.003 mfd., 600 v., paper
UCC-039	C15, 27, 28	CAPACITOR—.005 mfd., 600 v., paper
UCC-041	C26	CAPACITOR—.02 mfd., 600 v., paper
UCU-1014	C10	CAPACITOR—27 mmf., mica
UCU-1020	C17	CAPACITOR—47 mmf., mica
UCU-1028	C29	CAPACITOR—100 mmf., mica
UCU-2065	C20	CAPACITOR—3600 mmf., mica
UOP-654	SP	SPEAKER—6½ in. permanent magnet speaker
UOX-011		CONE—Speaker cone
URD-025	R7	RESISTOR—100 ohm, ½ w., carbon
URD-029	R4	RESISTOR—150 ohm, ½ w., carbon
URD-037	R16	RESISTOR—330 ohm, ½ w., carbon
URD-057	R6	RESISTOR—2200 ohm, ½ w., carbon
URD-073	R1, 8	RESISTOR—10,000 ohm, ½ w., carbon
URD-077	R2	RESISTOR—15,000 ohm, ½ w., carbon
URD-097	R5	RESISTOR—100,000 ohm, ½ w., carbon
URD-113	R11	RESISTOR—470,000 ohm, ½ w., carbon
URD-121	R3, 14	RESISTOR—1 meg., ½ w., carbon
URD-133	R10	RESISTOR—3.3 meg., ½ w., carbon
URD-137	R9	RESISTOR—4.7 meg., ½ w., carbon
URD-145	R13	RESISTOR—10 meg., ½ w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAB-5001		BACK—Cabinet back
RCE-5001	C14	CAPACITOR—8 mfd., 150 v., electrolytic
RCT-5000	C6A, 6B, 6C	CONDENSER—Tuning condenser
RCU-5000	C13	CAPACITOR—3.3 mmfd., mica

PART NO.	SYMBOL	DESCRIPTION
SPECIALIZED REPLACEMENT PARTS LIST (Cont'd)		
RCY-5000	C5, 18, 21	CAPACITOR—SW antenna trimmer, BC oscillator trimmer and SW oscillator trimmer
RHC-5001		CLIP—Off-On indicator retaining clip
RJB-5000		SOCKET—Miniature tube socket
RJS-5001		SOCKET—Octal tube socket
RJS-5002		SOCKET—Speaker socket
RLA-5000	T2	COIL ASSEMBLY—Broadcast antenna coil
RLA-5002	T3	COIL ASSEMBLY—Short wave antenna coil
RLB-5000	T4	COIL ASSEMBLY—Broadcast RF
RLB-5002	T5	COIL ASSEMBLY—Short wave RF
RLC-5000	T6	COIL ASSEMBLY—BC and SW oscillator
RLI-5000	L1	COIL ASSEMBLY—SW RF choke coil
RMB-5001		BEARING—Dial drive shaft supporting bearing
RMC-5000		CAM—Off-On indicator cam
RMU-5001		SHAFT—Dial drive shaft
RRC-5000	R12	VOLUME CONTROL—2 meg. volume control
RRC-5002	R15, S3	TONE CONTROL—1 meg. control and power switch
RSW-5000	S1, 2	SWITCH—Band change switch
RTO-5001	T9	TRANSFORMER—Output transformer
RTL-5000	T8	TRANSFORMER—2nd i-f transformer
RTL-5003	T7	TRANSFORMER—1st i-f transformer
RWX-5000		CABLE ASSEMBLY—Battery cable
RYM-5000		CHART—Dial calibration chart
RCV-5001	C16	CAPACITOR—BC oscillator padder
RDC-5001		CORD—Drive cord
RDE-5001		ESCUTCHEON—Dial scale escutcheon
RDF-5001		WASHER—Felt washer for knobs
RDK-5000		KNOB—Control knobs
RDM-5000		FLAG—Off-On indicator flag
RDP-5000		POINTER—Plastic dial pointer
RDX-5001		BRACKET—Dial bracket and pulley assembly

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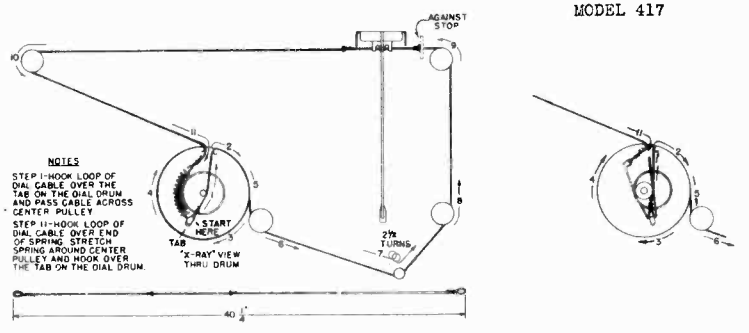
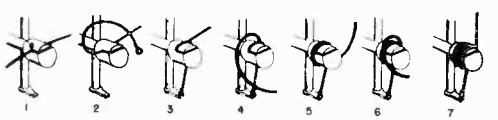


Dial Stringing Diagram Showing Later Production Spring at Right



—Elevator Windlass Stringing Procedure

Model 417 -- Howl on FM Band

Howl may be caused by a microphonic 6AK5 converter tube. If this doesn't remedy the condition, the howl is possibly set up in the "guillotine" tuning unit. Apply Vistac to the moving vane of the "guillotine" tuning unit where it contacts the runners so that it is coated for its full length. Use only a small amount.

Vistac is obtainable from the Advance Solvent and Chemical Corp., Jersey City, New Jersey.

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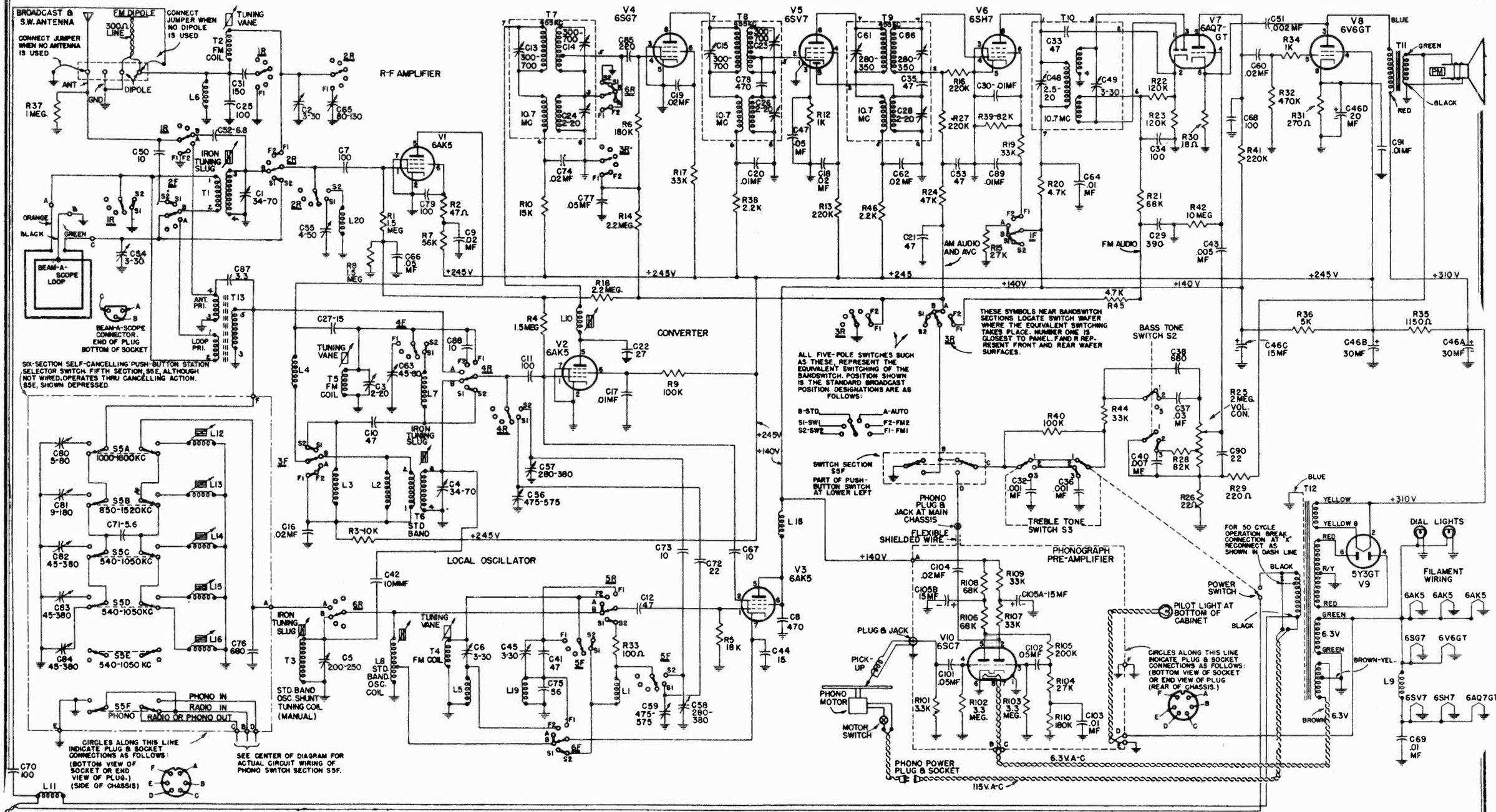

ELECTRICAL RATING (INPUT):

	Rating A5	Rating A6
Voltage	100–125	100–125
Frequency	50 cycles	60 cycles
Wattage	105	105

OPERATING FREQUENCIES:

Standard Band	540 to 1600 kc
Short Wave 1	9.4 to 9.9 mc
Short Wave 2	11.6 to 12.1 mc
Frequency Modulation 1	42 to 50 mc
Frequency Modulation 2	88 to 108 mc
AM I-F Frequency	455 kc
FM I-F Frequency	10.7 mc

POWER OUTPUT (117 volts line):

Undistorted	4.0 watts
Maximum	5.5 watts

LOUDSPEAKER:

Type	Alnico PM
Size	12 inches
Voice Coil Impedance (400 cps)	8 ohms

PHONOGRAPH PICK-UP:

Type	Variable Reluctance
D-C Resistance	250 ohms

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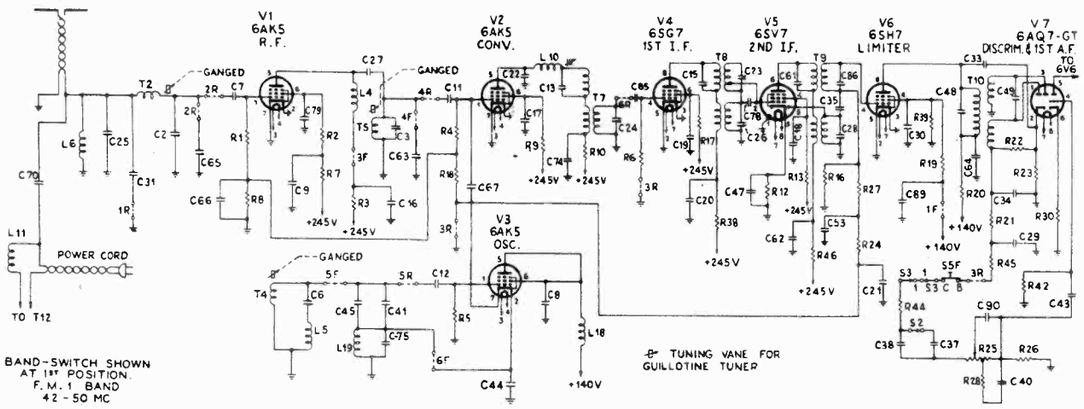
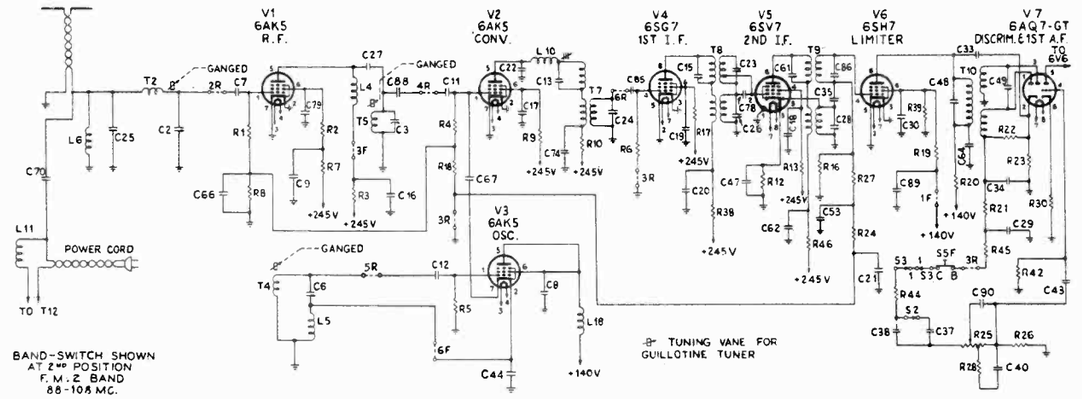
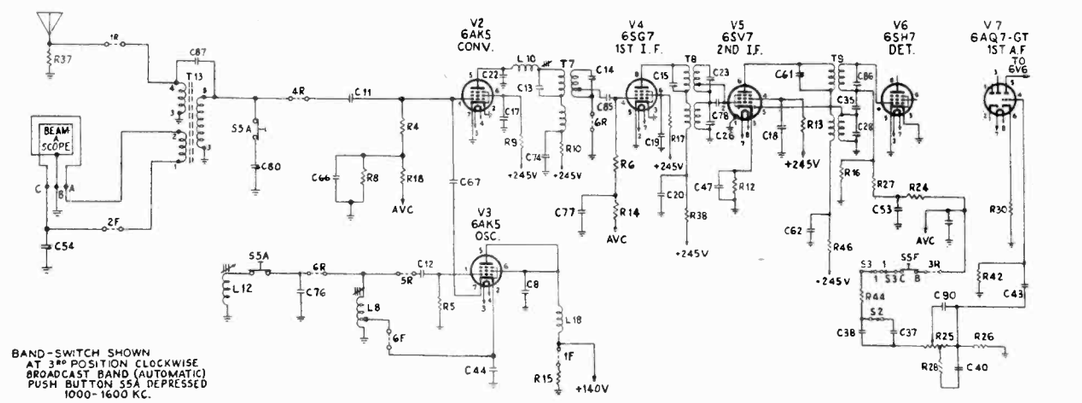


BAND-SWITCH SHOWN AT 1ST POSITION. F.M.1 BAND 42 - 50 MC



BAND-SWITCH SHOWN AT 2ND POSITION F.M.2 BAND 88-108 MC.



BAND-SWITCH SHOWN AT 3RD POSITION CLOCKWISE BROADCAST BAND (AUTOMATIC) PUSH BUTTON S5A DEPRESSED 1000-1600 KC.

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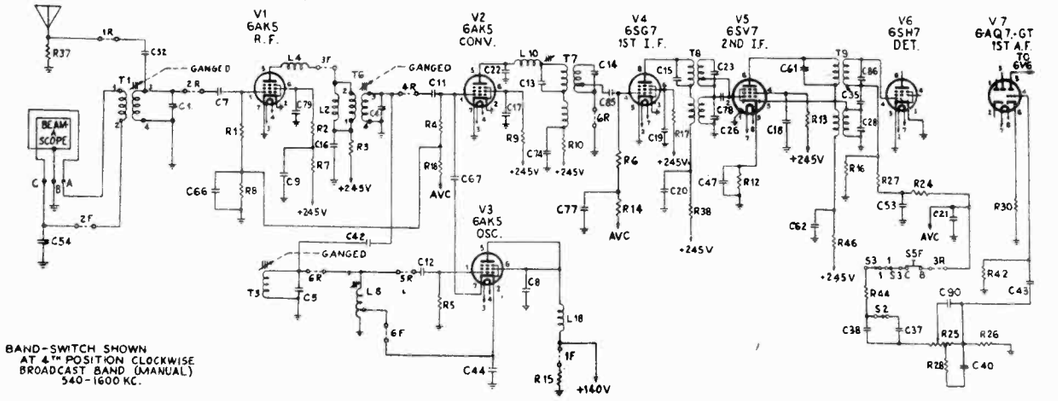
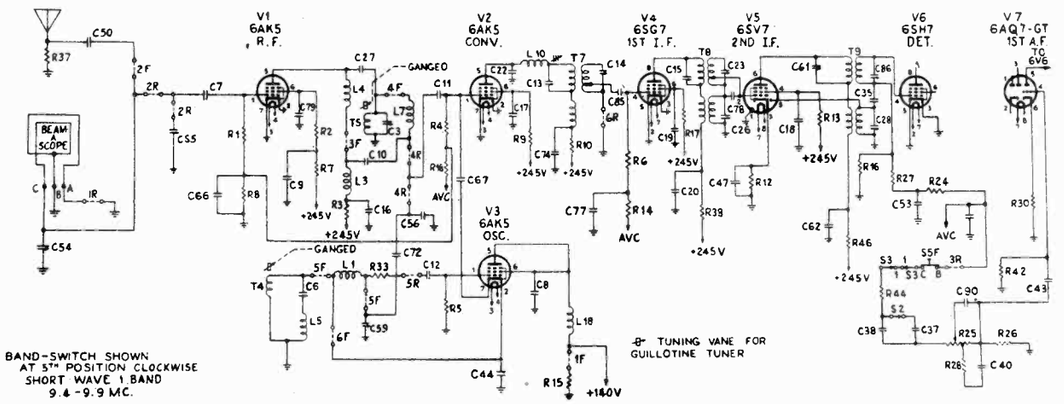
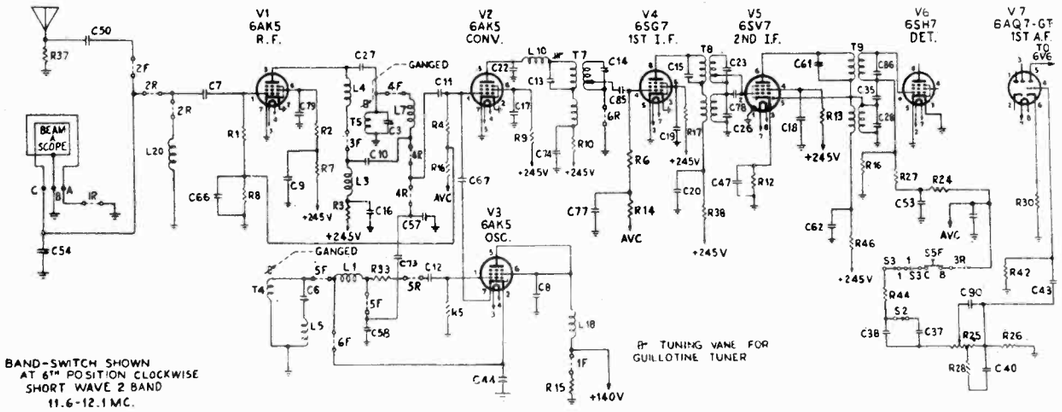


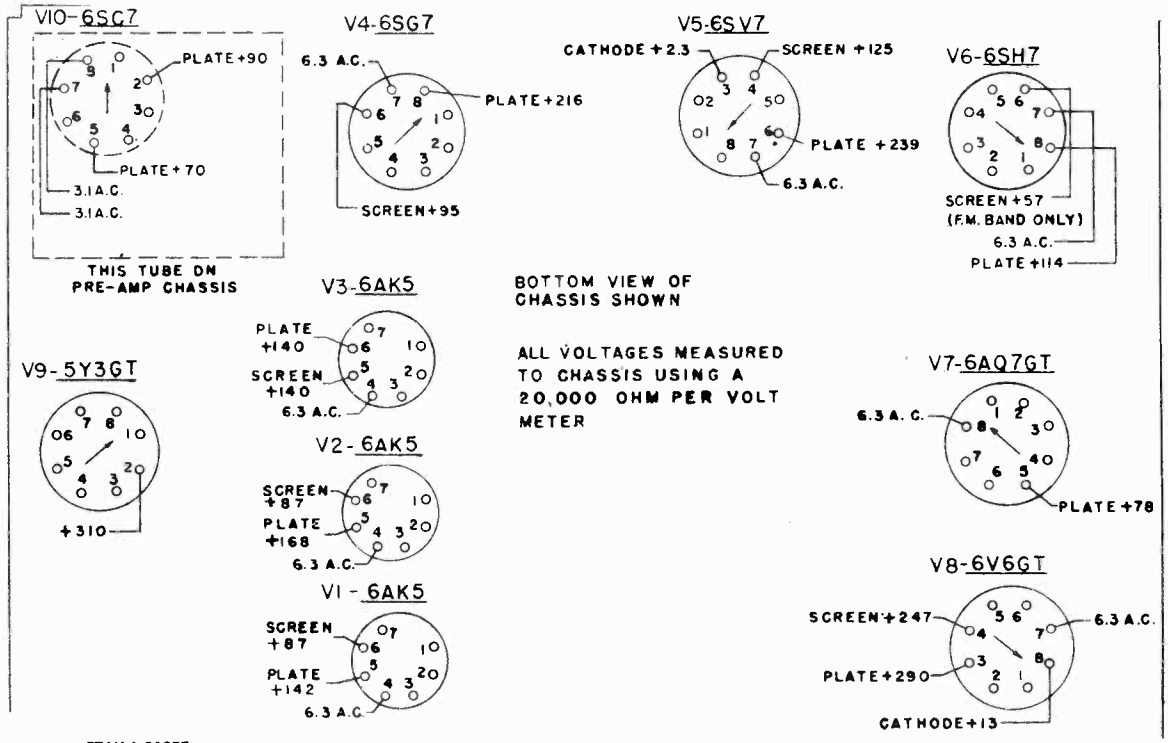
BAND-SWITCH SHOWN AT 4TH POSITION CLOCKWISE BROADCAST BAND (MANUAL) 540-1600 KC.



BAND-SWITCH SHOWN AT 5TH POSITION CLOCKWISE SHORT WAVE 1 BAND 9.4 - 9.9 MC.



BAND-SWITCH SHOWN AT 6TH POSITION CLOCKWISE SHORT WAVE 2 BAND 11.6-12.1 MC.



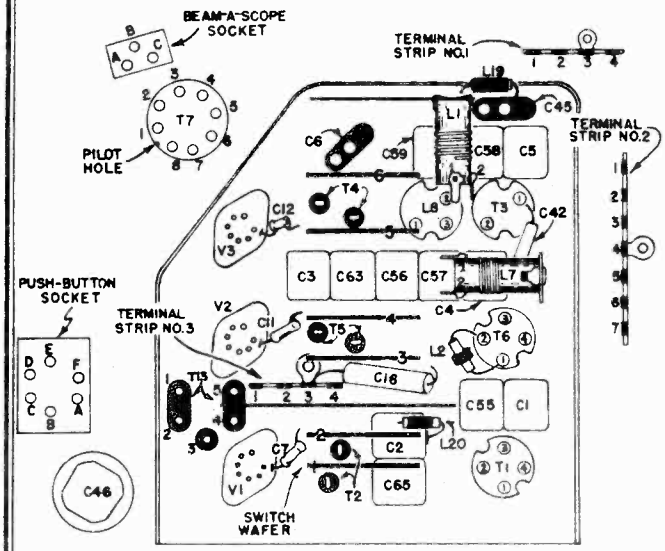
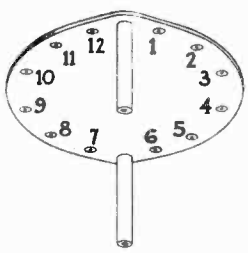


Figure 4—Physical Location of Components Listed in Band Switch Wiring Table



—Identification of Switch Lugs
—Set Inverted and Viewed from Panel

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of 20%. Readings taken with low signal so that AVC is not effective.

(1) *R-F and I-F Stage Gains*

Signal applied through IRE dummy antenna:

Antenna post to V1 grid	4 @ 1000 kc
Antenna post to V1 grid	2 @ 9.6 mc
Antenna post to V1 grid	2 @ 11.8 mc

Signal applied through 300-ohms, including signal generator impedance:

Dipole terminals to V1 grid	1.5 @ 45 mc
Dipole terminals to V1 grid	2 @ 98 mc

These checks with oscillator tube (V3) removed:

V1 grid to V2 grid	13 @ 1000 kc
V1 grid to V2 grid	6 @ 9.6 mc
V1 grid to V2 grid	9 @ 11.8 mc
V1 grid to V2 grid	13 @ 45 mc
V1 grid to V2 grid	10 @ 98 mc

These checks with oscillator tube (V3) removed:

V2 grid to V4 grid	23 @ 455 kc
V2 grid to V4 grid	37 @ 10.7 mc
V4 grid to V5 grid	23 @ 455 kc
V4 grid to V5 grid	58 @ 10.7 mc
V5 grid to V6 grid	40 @ 455 kc
V5 grid to V6 grid	17 @ 10.7 mc

(2) *Audio Gain*

.07 volts at 400 cps across volume control with control set at maximum will give approximately ½ watt output across the speaker voice coil.

(3) *Oscillator Grid Bias*

D-c voltage developed across R5 (average):

13 v. @ 1000 kc — 2.7 v. @ 11.8 mc
2.7 v. @ 9.6 mc — 5.5 v. @ 45 mc
7 v. @ 98 mc

(4) *Socket Pin Voltages*

Fig. 8 shows typical tube pin voltages. All readings should be made from the pins to ground unless otherwise indicated.

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ALIGNMENT

EQUIPMENT REQUIRED:

1. Test Oscillator with tone modulation. (See Table.)
2. D-C Voltmeter or Microammeter. (See notes 2 and 3.)
3. A-C Voltmeter, 2-volts. (See note 6.)
4. Insulated hex wrench, ¼". (See steps 1, 10, 13.)
5. 01 MF Paper Capacitor. (See steps 1 to 5.)
7. 400-ohm, ½ watt resistor. (See steps 16 to 21.)
7. 200 mmf. mica capacitor. (See steps 22 to 28.)

Important detailed instructions and references in connection with the alignment table which follows are keyed in by means of column 7, headed "See Note." The notes are included in numerical order after the table. They are important—refer to them carefully.

ALIGNMENT TABLE

Step	Signal Generator Frequency	Signal Input Point	Band Switch	Dial Setting	Adjust	See Note	Remarks
1	10.7 mc	6SH7 grid thru .01 mf	FM1		C49 for zero**	1, 2	Adjust C49 for *zero* meter reading. Apply 1 volt signal input.
2	See last column	6SH7 grid thru .01 mf	FM1		Signal Generator	1, 2,	Detune signal generator to point of *maximum* meter reading.
3	As in step 2	6SG7 grid thru .01 mf	FM1		Peak C48	1, 2	
4	10.7 mc	6SV7 grid thru .01 mf	FM1		Peak C28	1, 3	6AQ7GT tube removed from its socket.
5	10.7 mc	6SG7 grid thru .01 mf	FM1		Peak C26	1, 3	6AQ7GT tube removed from its socket.
6	10.7 mc	Conv. grid directly	FM1		Peak C24 & L10	1, 3, 4	6AQ7GT tube removed from its socket.
7	455 kc	Conv. grid directly	STD		Peak C86 & C61	5, 6	
8	455 kc	Conv. grid directly	STD		Peak C15 & C23	5, 6	
9	455 kc	Conv. grid directly	STD		Peak C13 & C14	5, 6	
10	88 mc	DIPOLE terminals	FM2	88 mc—6.8 to 6.9 in.*	Peak C6**	1, 3, 7, 10	Set dial accurately—then adjust C6.
11	98 mc	DIPOLE terminals	FM2	For max. output	Peak C3	1, 3, 8	Tune dial for maximum output, then peak C3 while rocking dial.
12	98 mc	DIPOLE terminals	FM2	Do not change	Peak C2	1, 3	
13	43 mc	DIPOLE terminals	FM1	43 mc—6 to 6.1 in.*	Peak C45**	1, 3, 7	Set dial accurately—then adjust C45.
14	46 mc	DIPOLE terminals	FM1	For max. output	Peak C63	1, 3, 8	Tune dial for maximum output, then peak C63 while rocking dial.
15	46 mc	DIPOLE terminals	FM1	Do not change	Peak C65	1, 3	
16	11.8 mc	Antenna thru 400-ohms	SW2	11.8 mc—4.5 to 4.6 in.*	Peak C58	5, 6, 7, 10	Set dial accurately—then adjust C58.
17	11.8 mc	Antenna thru 400-ohms	SW2	Do not change	Peak C57	5, 6, 8	Peak C57 while rocking dial.
18	11.8 mc	Antenna thru 400-ohms	SW2	Do not change	Peak C54	5, 6	C54 is located on back apron of chassis.
19	9.6 mc	Antenna thru 400-ohms	SW1	9.6 mc—4.5 to 4.6 in.*	Peak C59	5, 6, 7, 10	Set dial accurately—then adjust C59.
20	9.6 mc	Antenna thru 400-ohms	SW1	Do not change	Peak C56	5, 6, 8	Peak C56 while rocking dial.
21	9.6 mc	Antenna thru 400-ohms	SW1	Do not change	Peak C55	5, 6	
22	1620 kc	Antenna via 200 mmf	STD	Extreme right-hand position	Peak C5	5, 6	

* Important! See Note 7.
** Use insulated hex wrench, ¼"

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ALIGNMENT TABLE (Cont'd)

Step	Signal Generator Frequency	Signal Input Point	Band Switch	Dial Setting	Adjust	See Note	Remarks
23	1620 kc	Antenna via 200 mmf	STD	Extreme right-hand position	Peak C4	5, 6	
24	1620 kc	Antenna via 200 mmf	STD	Extreme right-hand position	Peak C1	5, 6	
25	1500 kc	Antenna via 200 mmf	STD	1500 kc—1.4 to 1.5 in.*	Osc. Coil T3 iron slug	5, 6, 7, 9	T3 iron slug is the rear one on the left side. Adjust for peak.
26	1000 kc	Antenna via 200 mmf	STD	For max. output	Conv. coil T6 iron slug	5, 6, 9	T6 iron slug is the center one on the left side. Adjust for peak.
27	1000 kc	Antenna via 200 mmf	STD	Do not change	R-F coil T1 iron slug	5, 6, 9	T1 iron slug is the front one on the left side. Adjust for peak.
28	580 kc	Antenna via 200 mmf	STD	For max. output	Peak L8	5, 6, 8	Peak L8 while rocking dial.
29							Repeat steps 22 to 28.

* Important! See Note 7.

Notes in Connection with Alignment Table

1. Use *unmodulated* signal.
2. Connect 20,000-ohm-per-volt meter from junction of R21 and C29 to chassis. Use ten-volt scale. (Steps 1-3.)
3. Connect 20,000-ohm-per-volt meter from grid pin 4 of 6SH7 to chassis with a 200,000-ohm resistor in series. The resistor must be connected directly to the grid so that capacity loading will be negligible and so that the meter is isolated from the i-f signal voltage. Keep signal generator output down so that the meter indicates not more than one volt at the grid (5 micro-amperes through 200,000-ohms). (Alignment steps 4 to 6, 10 to 15.)
4. Connect signal generator directly to the converter grid at some convenient point. The generator lead must be shielded up to this connection so that not more than 1/16 inch of exposed lead exists. Ground the shield solidly by clamping it firmly to the chassis or a shield as close to the connection as possible. (Steps 6-9.)
5. Use 400-cycle modulation. (Steps 7 to 9, 16 to 28.)
6. Connect a standard output meter across speaker voice coil. Turn volume control fully on. Keep signal generator output down so that the meter indicates not more than ½ watt output (2 volts) during alignment. (Steps 7 to 9, 16 to 28.)
7. If dial scale is not available, index pointer as follows: Turn pointer to right-hand limit of travel. Mark the dial back plate at a reference edge of the pointer slider. Then set pointer by turning dial knob until the indicated dimension exists between the reference edge and the mark.
8. "Rocking" consists of adjusting the indicated adjuster while turning the dial a small amount back and forth through peak output. The object is to find the maximum peak. Rocking is necessary and is permissible only when interlocking circuits are being adjusted.
9. The main tuning iron slugs are suspended from the left side of the tuning "elevator." They are individually adjustable by loosening the locknut and turning the supporting screw into which the suspending wire is soldered.
10. *Two* oscillator settings will give response. The higher frequency response point is the correct one; the other is the image. If in doubt, start with the trimmer screw loosened completely and adjust for the *first* response.

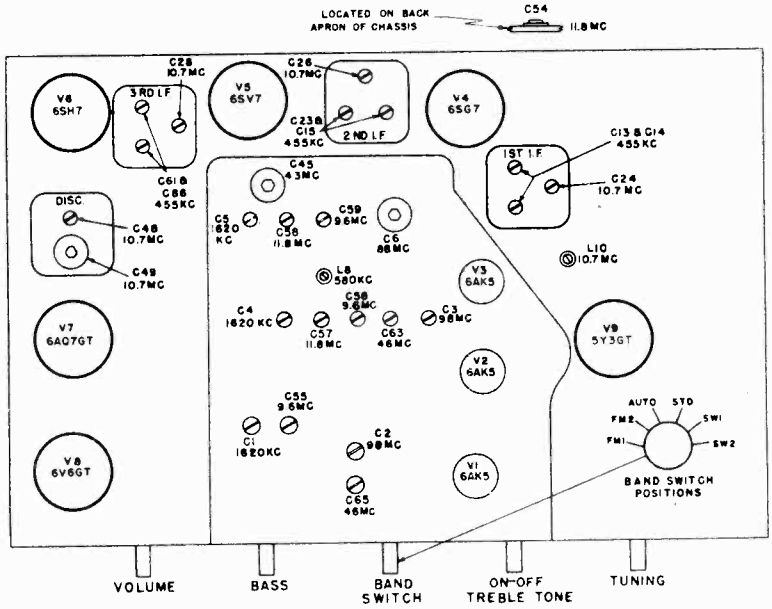
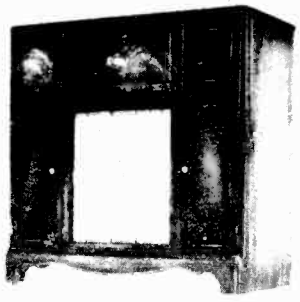


Figure 7—Location of Tubes and Adjusters

TUBE COMPLEMENT:

R-F Amplifier	6AK5
Converter	6AK5
Oscillator	6AK5
1st I-F Amplifier	6SG7
2nd I-F Amplifier	6SV7
FM Limiter—AM Detector	6SH7
Discriminator—1st A-F Amplifier	6AQ7-GT
Power Amplifier	6V6GT
Phono Pre-Amplifier	6SC7
Rectifier	5Y3GT
Dial Lamp (2)	GE No. 44
Pilot Lamp (bottom of cabinet)	GE No. 47



MODEL 417 GENERAL ELECTRIC CO.

WIRING OF BAND SWITCH

(Wire length given from end to end before stripping)

SECTION 1

At this lug—	—connect this—	—the other end of which is connected to this—
1	Insulated wire, 5" lg.	Antenna transformer T13, terminal 4
2	a. Insulated wire, 11½" lg. b. Insulated wire, 2" lg. c. Capacitor C50	Antenna terminal at rear of chassis Switch section 1, lug 6 Switch section 2, lug 1
3	Capacitor C52	Switch section 2, lug 3
4	a. Insulated wire, 1¼" lg. b. Insulated wire, 14" lg. c. Insulated wire, 5½" lg.	Antenna transformer T1, terminal 1 Beam-a-scope plug, terminal A Antenna transformer T13, terminal 2
5	a. Short bare bus b. Resistor R15	Ground lug on C65 Switch section 1, lug 11
6	See lug 2b, above	
7	Insulated wire, 11" lg.	Terminal strip 1, lug 4
8	Capacitor C31	Front terminal of T2
9	a. Insulated wire, 9" lg. b. Insulated wire, 7" lg.	Terminal strip 2, lug 5 Filter capacitor, C46C
11	See lug 5b, above	

SECTION 2

At this lug—	—connect this—	—the other end of which is connected to this—
1	See section 1, lug 2c	
3	a. Insulated wire, 2½" lg. b. See section 1, lug 3	Trimmer C1, lug nearer T1
4	Insulated wire, 1½" lg.	Trimmer C55, lug nearer T1
5	Coil L20	Ground lug on trimmer C2
6	Short bare bus	Trimmer C65, left-hand terminal*
7	Short bare bus	Trimmer C2, left-hand terminal*
8	Capacitor C7	Tube socket V1, pin 1
9	Insulated wire, 4" lg.	Antenna transformer T13, terminal 1
10	Insulated wire, 3½" lg.	Antenna transformer T1, terminal 2
11**	Insulated wire, 11½" lg.	Beam-a-scope plug, terminal C

SECTION 3

At this lug—	—connect this—	—the other end of which is connected to this—
1	Shielded wire, 8¾" lg.	Terminal strip 2, lug 6
2	Insulated wire, 1½" lg.	Switch section 3, lug 12
3	a. Insulated wire, 2½" lg. b. Capacitor C16 c. Choke L3	Converter coil T6, terminal 1 Ground lug on terminal strip 3 Switch section 3, lug 11
4	Insulated wire, 7½" lg.	Terminal strip 2, lug 3
5	Insulated wire, 1⅜" lg.	Converter coil T6, terminal 2
6	Short bus with spaghetti	Chassis
7	Short bare bus	Terminal strip 3, lug 4
10	Shielded wire, 10½" lg.	Terminal strip 2, lug 2
11	a. See lug 3c, above b. Capacitor C10	Switch section 4, lug 3
12	a. See lug 2, above b. Shielded wire, 7¾" lg.	Push-button socket, Terminal B

SECTION 4

At this lug—	—connect this—	—the other end of which is connected to this—
1	a. Insulated wire, 5½" lg. b. Insulated wire, 7¼" lg.	Antenna transformer T13, terminal 5 Push-button socket, terminal F
2	Insulated wire, 2½" lg.	Trimmer C4, lug nearer T6
3	a. See Section 3, lug 11b b. Short bus with spaghetti c. Short jumper	Coil L7, terminal 2 (toward front) Switch Section 4, lug 4 (adjacent)
4	See lug 3c, directly above	
5**	Short bare bus	Trimmer C63, lug nearer front
6	Capacitor C88	Tuner T5, left-hand terminal*
7	Short bare bus	Tuner T5, left-hand terminal
8	Capacitor C11	Tube socket V2, pin 1
9	a. Capacitor C72 b. Insulated wire, 2½" lg.	Section 5, lug 11 Trimmer C56, front terminal
10	a. Capacitor C73 b. Insulated wire, 2½" lg.	Section 5, lug 12 Trimmer C57, front terminal
12	Bus with spaghetti, 2½" lg.	Coil L7, terminal 1

SECTION 5

At this lug—	—connect this—	—the other end of which is connected to this—
1	a. Bus with spaghetti, 1¾" lg. b. Resistor R33	Coil L1, terminal 1 Section 5, lug 4
2	a. Insulated wire, 3" lg. b. Insulated wire, 1⅜"	Coil L8, terminal 1 Section 6, lug 4
4	See Section 5, lug 1b	
5	Bus with spaghetti, 3" lg.	Coil L1, terminal 2
6	a. Bus with spaghetti, 3" lg. b. Bus with spaghetti, 1½" lg.	Capacitor C45, left-hand terminal* Section 5, lug 10
7**	Short bare bus	Tuner T4, left-hand terminal*
8	Capacitor C12	Tube socket V3, pin 1
9	Insulated wire, 4" lg.	Trimmer C5, lug nearer T3
10	a. See Section 5, lug 6b b. Capacitor C41	Section 6, lug 6
11	a. Insulated wire, 3¾" lg. b. See Section 4, lug 9a	Trimmer C59, lug nearer front
12	a. Insulated wire, 3½" lg. b. See Section 4, lug 10a	Trimmer C58, lug nearer front

SECTION 6

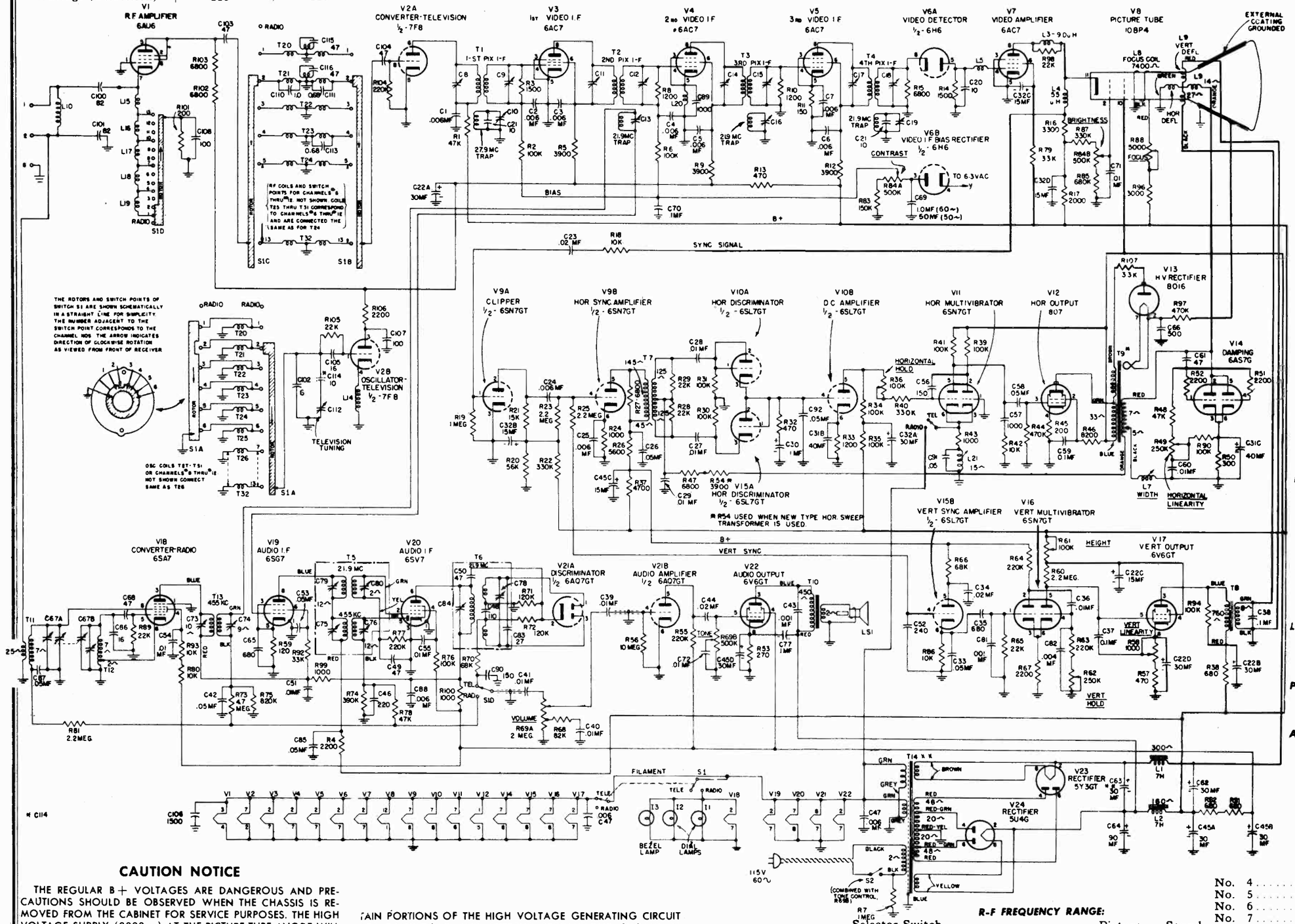
At this lug—	—connect this—	—the other end of which is connected to this—
1	Insulated wire, 4½" lg.	I-F transformer T7, terminal 8
2	Bus with spaghetti, 1½" lg.	Coil L1, terminal 2
4	See Section 5, lug 2b	
5	Insulated wire, 12" lg.	Push-button socket, terminal A
6	a. Bus with spaghetti, 2" lg. b. Capacitor C75 c. See section 5, lug 10b	Trimmer C45, center terminal Ground at C59
7	Short bare bus	Trimmer C6, center terminal
8	Bare bus, 1" lg.	Tube socket V3, pin 7
9	Insulated wire, 2¼" lg.	I-F transformer T7, terminal 5
10	Insulated wire, 2¾" lg.	I-F transformer T7, terminal 3
12	Insulated wire, 3½" lg.	Coil L8, terminal 3

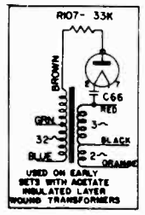
* Looking from front, chassis inverted.
** Double lug (front and rear) soldered together.

GENERAL ELECTRIC CO.

MODEL 801

	50/60 cps	60 cps
Frequency		
Voltage	105–125 v.	105–125 v.
Wattage (Radio)	85	85
Wattage (Television)	215	215





INTERMEDIATE FREQUENCIES:

Television Video (carrier freq. equivalent) ..... 26.4 mc
Television Audio ..... 21.9 mc
Radio ..... 455 kc

AUDIO POWER OUTPUT:

Undistorted ..... 3 watts
Maximum ..... 4.5 watts

LOUDSPEAKER:

Type ..... Alnico "PM" Dynamic
Size ..... 12 inches
Voice Coil Impedance (400 cycles) ..... 3.2 ohms

PICTURE SIZE:

Height ..... 6 inches
Width ..... 8 inches

ANTENNA REQUIREMENTS:

Type ..... Folded Dipole
Impedance ..... 300 ohms

CAUTION NOTICE

THE REGULAR B+ VOLTAGES ARE DANGEROUS AND PRECAUTIONS SHOULD BE OBSERVED WHEN THE CHASSIS IS REMOVED FROM THE CABINET FOR SERVICE PURPOSES. THE HIGH VOLTAGE SUPPLY (8000 v.) AT THE PICTURE TUBE ANODE WILL GIVE AN UNPLEASANT SHOCK BUT DOES NOT SUPPLY ENOUGH CURRENT TO GIVE A FATAL BURN OR SHOCK. HOWEVER, SECONDARY HUMAN REACTIONS TO OTHERWISE HARMLESS SHOCKS HAVE BEEN KNOWN TO CAUSE INJURY. SINCE THE HIGH VOLTAGE IS OBTAINED FROM THE B+ VOLTAGE, CERTAIN PORTIONS OF THE HIGH VOLTAGE GENERATING CIRCUIT ARE DANGEROUS AND EXTREME PRECAUTIONS SHOULD BE OBSERVED.

THE PICTURE TUBE IS HIGHLY EVACUATED AND IF BROKEN, GLASS FRAGMENTS WILL BE VIOLENTLY EXPELLED. IF IT IS NECESSARY TO CHANGE THE PICTURE TUBE, USE SAFETY GOGGLES AND GLOVES.

R-F FREQUENCY RANGE:

Selector Switch Position	Freq. Range	Picture Carrier	Sound Carrier
Radio	540–1600 kc		
No. 1	44– 50 mc	45.25	49.75
No. 2	54– 60 mc	55.25	59.75
No. 3	60– 66 mc	61.25	65.75
No. 4	66– 72 mc	67.25	71.75
No. 5	76– 82 mc	77.25	81.75
No. 6	82– 88 mc	83.25	87.75
No. 7	174– 180 mc	175.25	179.75
No. 8	180– 186 mc	181.25	185.75
No. 9	186– 192 mc	187.25	191.75
No. 10	192– 198 mc	193.25	197.75
No. 11	198– 204 mc	199.25	203.75
No. 12	204– 210 mc	205.25	209.75
No. 13	210– 216 mc	211.25	215.75

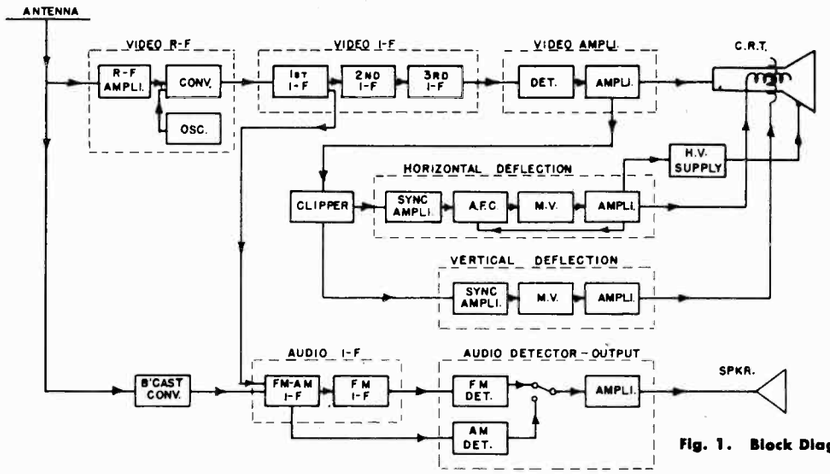


Fig. 1. Block Diagram, Model 801

DESCRIPTION—TELEVISION CIRCUITS

The television receiver circuits are divided into the following sections:

1. R-f amplifier, converter and oscillator
2. Video and audio i-f amplifier
3. Video detector and amplifier
4. Sync pulse clipper-amplifier
5. Horizontal multivibrator and AFC sync.
6. Horizontal sweep output
7. Vertical multivibrator and sweep output
8. High voltage power supply (H.V. supply)
9. Low voltage power supply (L.V. supply)

A brief description of the operation of each section is described in the following paragraphs. This is supplemented by a comprehensive television training course in the publication, RSM-4-TV.

A block diagram of the complete receiver is shown in Figure 1 to assist in signal tracing and to better visualize the operation of the receiver as a whole.

1. R-F AMPLIFIER, CONVERTER & OSCILLATOR (See Figure 2)—The r-f amplifier makes use of a Type 6AU6 tube connected as a triode grounded-grid amplifier. The antenna is connected into the cathode circuit so as to provide a substantially constant input impedance of 300 ohms to the antenna at all frequencies. With a 300-ohm antenna and transmission line system, this coupling arrangement permits optimum transfer of signal from antenna to r-f amplifier for all 13 channels. R101 is the normal bias resistor. A choke, L_K, is placed in series with this cathode resistor to prevent the input impedance from being lowered by the shunting effect of the total stray capacity to ground of the cathode of the tube. The choke value is changed with frequency.

The r-f amplifier is coupled to the converter tube by a wide band transformer consisting of windings L_p and L_s. The windings are self-tuned by the distributed and tube capacities to provide optimum gain. On channels No. 1 and No. 2 the transformer is triple tuned to prevent the image frequencies of the 88-108 mc FM band from interfering with these two channels. The triode converter is one section of a Type 7F8 dual triode, V2A. Bias for this tube is provided by the oscillator voltage appearing in the grid of V2A causing grid rectification charging the grid resistor-condenser combination, R104 and C104.

The oscillator makes use of the remaining half of the Type 7F8 tube, V2B, and is inductively coupled to the converter grid by locating the oscillator grid coil, T22, on the same coil form as the converter grid coil, L_s. The oscillator is a modified Colpits oscillator, oscillation being produced by the cathode-to-grid, C_g, and cathode-to-plate, C_k, interelectrode capacities of the oscillator tube. The choke L_f provides a d-c ground to the cathode of the oscillator but maintains the cathode off-ground at the r-f frequencies. The oscillator operates on the high frequency side of the r-f signal on all bands.

The r-f amplifier, converter and oscillator is constructed as a complete unit sub-assembly which can readily be demounted from the main chassis.

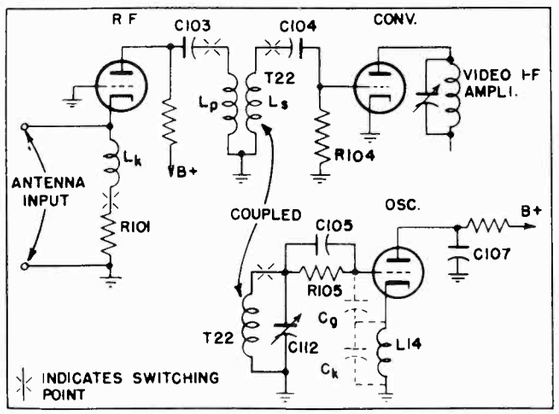


Fig. 2. R-f Amplifier, Converter & Oscillator

2. VIDEO AND AUDIO I-F AMPLIFIERS (See Figure 3)—The video i-f amplifier makes use of a three-stage band-pass amplifier using three Type 6AC7 tubes. The transformers, T1, T2, T3, and T4, are overcoupled and then loaded with resistance, R_L, to give an adequate (approx. 4 mc) band-pass frequency characteristic. A third winding is added to each video transformer and tuned to trap out the adjacent audio and associated audio interference. The trap on T1 is tuned to 27.9 mc to provide rejection of the adjacent channel audio i-f, while the traps at T2, T3, and T4 are tuned to 21.9 mc to provide rejection of the same channel audio.

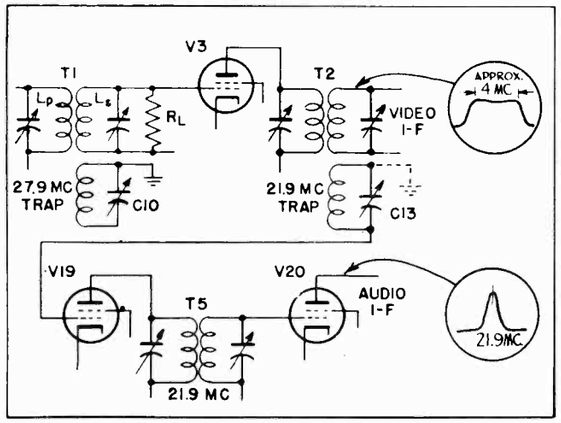


Fig. 3. Video & Audio I-f Amplifier

The audio i-f frequency is developed by taking the 21.9 mc signal from across the trap on T2 and applying it to the grid of the audio i-f amplifier tube V19. The ground return side of the trap is effectively connected to ground at 21.9 mc through the low impedance circuit offered by the capacitors C74 and C42. Since the audio channel of the television is frequency-modulated, the transformer T6 functions with the diode sections of V21 as the discriminator.

Bias voltage, derived by rectifying 6.3 volts a-c through the diode V6B, is applied to the grid circuits of the video i-f amplifier tubes, V3 and V4. A variable potentiometer contrast control, permits this voltage to be changed so as to vary the gain of the i-f amplifier.

3. VIDEO DETECTOR AND AMPLIFIER (See Figure 4)—The video i-f amplifier output is applied to a diode rectifier, V6, and the diode load, R14, is connected so as to develop a negative-going signal voltage at this point. The signal is amplified by tube V7 and then applied directly to the cathode of the picture tube, V8. This provides direct coupling so that d-c reinsertion is unnecessary. The chokes L5 and L3 are series peaking chokes, while L4 is a shunt peaking choke. These are used to obtain good high frequency response. L5 also prevents harmonics of the i-f frequency from being passed through the video amplifier. R16 is the V7 tube plate load resistor.

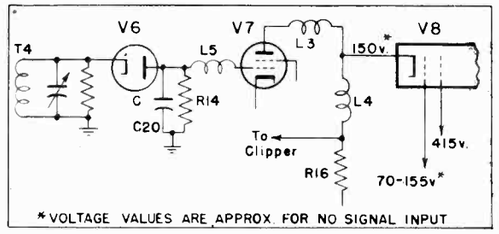


Fig. 4. Video Detector & Amplifier

With the cathode of V8 coupled directly into the plate circuit of V7, it is necessary to apply a variable positive voltage to the control grid of the picture tube in order to control the beam current and, therefore, the brightness of the picture. In late production receivers where the rectifier V23 is a Type 5Y3G tube, the cathode and control grid voltages of V8 will be approximately 25 volts less.

4. CLIPPER AND SYNC AMPLIFIER—The triode section, V9A, of a Type 6SN7GT tube is used to separate the sync pulses from the video signal taken off at the load resistor, R16, see Figure 4. This is accomplished by applying very low plate voltage to V9A, then the resulting grid rectification causes negative bias to be developed at the grid of V9A so that conduction occurs only during the sync pulse intervals which are the most positive component of the video signal.

Tube V9B is a horizontal synchronizing amplifier which rejects the vertical pulse at the transformer, T7, by virtue of its low inductance to the vertical synchronizing pulse. The cathode impedance is required to raise the control grid to a positive voltage with respect to chassis for proper operation of V15B. The tube V15B is operated as a cathode follower vertical synchronizing amplifier. Integration of the vertical signal is provided in both the grid and cathode circuits.

5. HORIZONTAL MULTIVIBRATOR AND AFC SYNC (See Figure 5)—The horizontal sawtooth oscillator makes use of a Type 6SN7GT tube, V11, in a conventional cathode-coupled multivibrator circuit. Instead of its frequency being controlled directly by the horizontal sync pulses, it is controlled by a d-c voltage on its grid, which is the resultant of the phase error between the incoming sync signal and a sawtooth voltage derived from the output of the horizontal sweep amplifier. This voltage is called an automatic frequency control (AFC) voltage.

The AFC voltage is developed by the diode-connected triodes V10A and V15A by mixing the horizontal sync pulse at the secondary of transformer T7 with a sawtooth waveform derived at the output of the sweep amplifier. When the sync pulse occurs at the time "a" shown in the sawtooth waveform drawing in Figure 5, no voltage will be developed at the output of the filter. However if the multivibrator runs faster or slower so that the pulse falls at a point other than at "a," a positive or negative voltage will appear at the filter, which will be amplified by the d-c amplifier V10B and then applied to the grid of the multivibrator. This change in d-c voltage on the grid of the multivibrator will cause it to speed up or slow down so as to cause the sawtooth wave to combine with the incoming sync pulses until the correction voltage becomes zero. With the filter, consisting of C92, R32, and C30, the change is relatively slow in controlling the speed, permitting a synchronizing system which is relatively free from random noise triggering. The Horizontal Hold control, R36, controls the speed of the multivibrator, permitting the free-running speed of it to be set near the correct frequency during the time when no sync pulses are available.

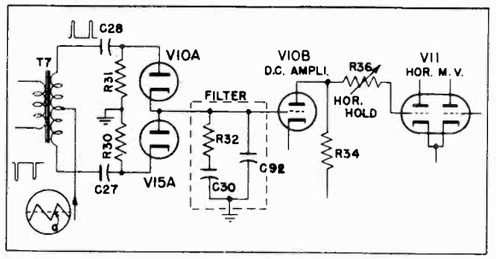


Fig. 5. Horizontal M.V. & Sync Circuit

6. HORIZONTAL SWEEP OUTPUT (See Figure 6)—The horizontal sawtooth voltage generated by the multivibrator, V11, is shaped and then amplified by a Type 807 tube, V12. The output of this tube is coupled to the horizontal deflection yoke through an impedance matching transformer, T9. An oscillatory voltage, as shown in the dotted line in the wave shape at the upper left of Figure 6, which results from the rapid retrace in transformer T9, is removed by the damping tube, V14. This tube is a triode Type 6AS7 and by its use the transient may be dampened, linearity controlled and the positive overshoot voltage retained for use in the high voltage supply. The linearity of the horizontal trace is controlled by varying the voltage wave shape applied to the grid of V14 by potentiometer R49. The horizontal size is varied by the adjustable iron core inductance, L7, which is in series with the output to the yoke.

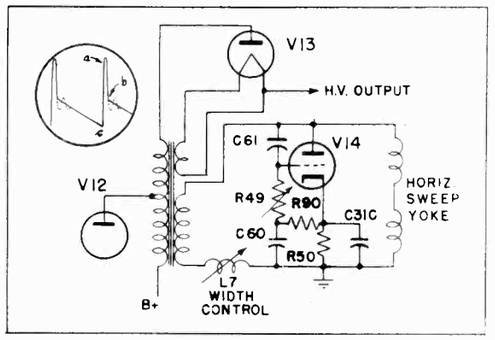


Fig. 6. Horizontal Sweep Output

7. VERTICAL MULTIVIBRATOR AND SWEEP OUTPUT (See Figure 7)—The vertical sawtooth voltage is generated by a Type 6SN7-GT tube, V16, connected as a multivibrator. This voltage is coupled directly to a Type 6V6G vertical sweep output tube, V17, and then to the vertical sweep yoke through the impedance matching transformer, T8. Vertical speed is controlled by changing the time constant of the multivibrator grid circuit by the potentiometer, R62. Sweep size is changed by the potentiometer, R61, which changes the B+ voltage applied to the charging network of tube V16 simultaneously with the screen voltage on tube V17. Vertical linearity is controlled by feeding back voltage through C37 from the cathode to grid of the output tube. The amount of the voltage is varied by the variable cathode resistor, R58.

8. HIGH VOLTAGE SUPPLY (See Figure 6)—The high voltage is derived by making use of the inductive "kick" voltage produced during retrace in the horizontal output transformer.

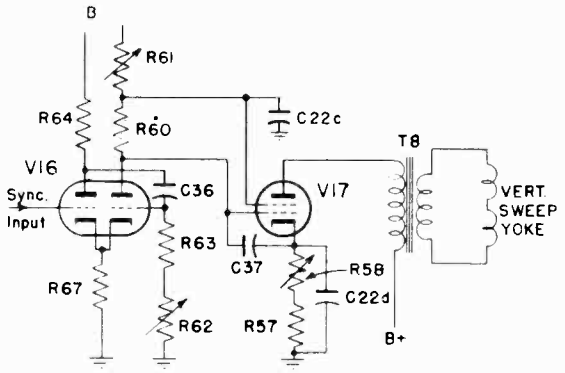


Fig. 7. Vertical Sweep Output

This "kick" voltage is shown in the wave shape shown as a-b in Figure 6. This voltage is generated in the primary winding and is further increased by an additional winding added to the transformer which connects to the rectifier tube plate of V13. The rectifier tube, V13, is a Type 8016 which derives its filament voltage from the horizontal sweep transformer T9 by a single turn around the transformer. Because of the high frequency which is rectified, a 500 mmf capacitor is more than sufficient for filtering purposes.

9. LOW VOLTAGE POWER SUPPLY—Two rectifiers are used to supply the required plate current for the television and radio receiver. A Type 5U4G tube, V24, supplies the bulk of the current and makes use of combination inductive and resistance type filter. A Type 5V4G or 5Y3G tube, V23, is used to supply higher voltage to the horizontal output, horizontal multivibrator, and the cathode ray tube 1st anode. This is followed by a choke filter. All filament supply leads except for tubes V19, V20, V21, V22 and the rectifier filaments pass through the band switch so that tubes may be switched ON or OFF when switching from radio to television.

CIRCUIT ALIGNMENT

GENERAL—A complete alignment of the Model 801 television receiver consists of the following individual alignment procedures. These are listed below in the correct sequence of alignment. However, any one alignment may be performed without the necessity of realignment of any one of the other sectional alignments.

1. Broadcast i-f amplifier
2. Broadcast r-f amplifier
3. Television i-f traps
4. Television sound i-f amplifier
5. Video i-f amplifier
6. Oscillator adjustments
7. Television r-f amplifier

The alignment procedure is in table form on pages 8 through 11. The following paragraphs are important suggestions to be followed when attempting alignment and should be read thoroughly before alignment is attempted.

TEST EQUIPMENT REQUIREMENTS—To provide the over-all alignment as outlined above, the following test equipment is required.

1. Cathode Ray Oscilloscope—This scope should preferably have a 5-inch screen and should preferably have good high frequency response, wbich will be useful in making waveform voltage measurements on pages 20 and 21.

2. Signal Generator—This signal generator must have good frequency stability and be accurately calibrated. It should be capable of covering the following frequency ranges with tone modulation where desired.

(a) 455 kc for broadcast
(b) 550-1600 kc for broadcast
(c) 21.9 mc for video i-f trap
(d) 27.9 mc for video i-f trap
(e) 23.0 mc for video i-f marker
(f) 25.65 mc for video i-f marker
(g) 26.4 mc for video i-f marker
(h) 44-110 mc and 174-238 mc for oscillator adjustment and markers for the r-f channel bandwidth measurements.

3. R-F Sweep Generator—This should give approximately 0.1-volt output with adjustable attenuation of the output. The output should be flat over wide frequency variations. The frequency coverage should be:

(a) 20 to 30 mc, with 10 mc sweep width
(b) 40 to 90 mc, with 25 mc sweep width
(c) 170 to 220 mc, with 25 mc sweep width

4. Output Meter—An output meter with a voltage range 0-2.5 volts a-c.

ALIGNMENT SUGGESTIONS—With the exception of the broadcast i-f and r-f trimmers and the FM sound i-f discriminator trimmers, all alignment adjustments are performed from the underside of the chassis. Remove the chassis from the cabinet and turn it on its side with the power transformer down. This is the only safe position in which the chassis will rest and leave all adjustments accessible. The following suggestions apply to each individual alignment procedure.

1. Broadcast I-F Alignment—(a) Although the oscilloscope is recommended in the table for indicating the output voltage during alignment, an output meter may be connected across the speaker voice coil as an alternate output indicating device. When this is used, the volume control should be set for maximum volume and then attenuate the signal generator output so as not to cause audio overload.

(b) Use a 200 mmf mica capacitor or standard RMA dummy between the high side of the signal generator and the signal input point, as indicated in the Alignment Table.

2. Broadcast R-F Alignment—Apply signal generator input to one of dipole input terminals through a 200 mmf mica capacitor as in (1) above. An output meter may be used in place of the oscilloscope for indicating output. First adjust oscillator trimmer by tuning gang condenser to minimum capacity and aligning oscillator trimmer for maximum with a 1620 kc input signal. Next with 1500 kc input signal, tune in signal, set pointer to 1500 kc calibration then align r-f trimmer for maximum output.

3. Video I-F Trap Alignment—The video i-f traps are used to attenuate the sound i-f of the same and adjacent channels from being detected and reproduced as sound bar interference on the picture tube. Misalignment of these traps results in the interference pattern, as shown in Figure 31.

Set the contrast control about half-way up. Turn the Station Selector to channel 13. Connect the oscilloscope through a 10,000-ohm resistor, to the top of the 3300-ohm video load resistor, R16.

Connect the output of an accurately calibrated signal generator with tone modulation to the grid of the converter tube, V2A, through a 200 mmf mica capacitor. The alignment frequencies are:

T1 (C10)—27.9 mc
T2 (C13)—21.9 mc
T3 (C16)—21.9 mc
T4 (C19)—21.9 mc

The trimmers should be aligned for minimum output, care being taken to get the lowest possible indication at the output. The input signal should be attenuated below saturation of the i-f amplifier tubes at start, then raised as signal is attenuated during alignment.

4. Television Sound I-F Alignment—Since the television sound i-f amplifier transformer is slightly overcoupled, alignment by a sweep generator is recommended. Connect the generator through a 200 mmf capacitor to grid (4) of V3. For alignment, connect the oscilloscope through a 100,000 ohm isolating resistor across capacitor C49.

For step 1, insert a 21.9 mc marker signal from an unmodulated signal generator into the same point of input as the sweep generator. This input from the signal generator should be very loosely coupled by clipping the signal generator through insulation to the grid (4) of V3.

Keep the input of the sweep generator low enough so that the sound i-f amplifier does not overload. Check by increasing the output of the sweep; the response curve on the scope should increase in size proportionally. Set Contrast Control to half-advanced position.

The response curve of the amplifier at the grid return of V20 should appear as in Figure 8A.

For discriminator alignment the secondary trimmer, C78, of T6 is aligned by using a tone modulated 21.9 mc signal and listening to the tone at the loudspeaker. The trimmer is adjusted for minimum tone signal output. If the sweep is used for the secondary trimmer alignment, the cross-over should be symmetrical about a 21.9 mc marker and should be a straight line between the alternate peaks, as shown in Figure 8B. Reconnect oscilloscope across the top of the volume control.

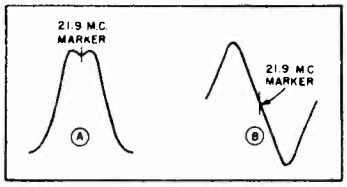


Fig. 8. T-V Audio I-F Curves

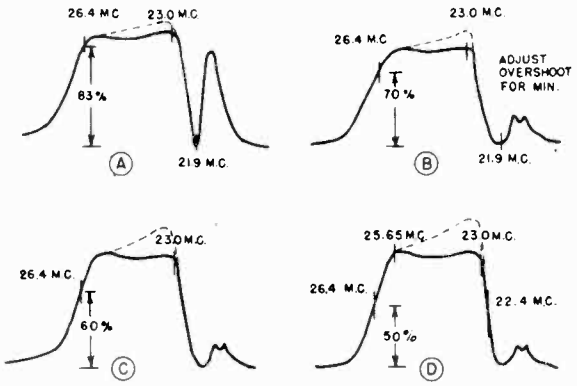


Fig. 9. Video I-F Alignment Curves

With the same sweep input as in step 1, adjust the primary trimmer, C84, of T6 for maximum peak-to-peak amplitude of the positive and negative peaks as shown in Figure 8B.

5. Video I-F Alignment—The video i-f amplifier uses transformers which are coupled and loaded to give the proper band-pass characteristic. Before attempting alignment of the video i-f, the sound i-f traps should be aligned as in (3), then do not touch these trimmers when making the video i-f alignment.

Stage-by-stage alignment should be performed so as to duplicate the curves, as shown in Figures 9A, B, C, and D. The markers are used to establish the correct bandwidth and frequency limits.

The trap formed by L20 and C89 in the cathode of V4 is used to reduce the overshoot of the 21.9 mc traps. Adjust the spacing of turns comprising L20 by either pushing them together or separating them so as to give a minimum amplitude to the overshoot.

Connect the sweep generator to the tube grid preceding the transformer to be aligned. Adjust the sweep width for a minimum of 10 mc about the center frequency of the video i-f. The marker frequencies are supplied by a signal generator and sufficient marker signal may be supplied in most cases by merely connecting the high side of the signal generator to the television chassis.

The primary of the transformer preceding the grid where the signal is applied will act as a trap putting a hole in the alignment curves as viewed on the scope unless it is short circuited or detuned. It may be detuned readily by connecting a 100 to 200 mmf capacitor across the primary trimmer or place a temporary short circuit across the primary trimmer. ***Be sure to remove this capacitor after the stage is aligned.***

Keep the input of the sweep generator low so as not to overload the video i-f amplifier.

The response curves shown are obtained on an oscilloscope at the junction of L4 and R16. Use a 10,000 resistor in series with the input lead to the oscilloscope.

The contrast control should be advanced approximately to its half-advanced position.

The Selector Switch should be turned to radio position and a temporary jumper put across filament switch wafer so as to keep the television tube filaments lit while in this radio position. If a television position is used, the i-f curve will be affected by the interaction from the r-f coil in the converter tube grid. NOTE—When jumper is used, remove B+ from r-f assembly by disconnecting external lead to terminal (2) of r-f assembly, see Fig. 12.

6. Oscillator Adjustment—The oscillator coil must be adjusted so that the Television Tuning Condenser, C112, will tune the sound carrier of the television signal at the middle of its range. Set the condenser, C112, to mid-position. Then adjust oscillator coil for channels No. 1 through No. 6 by spreading turns to raise frequency or compressing turns to lower frequency. For channels No. 7 through No. 13, the oscillator coil consists of a single turn. Adjust these coils by spreading the gap to lower frequency or closing the gap to raise frequency in the leads of the coil which run to the terminals.

Apply the signal generator with tone modulation to the antenna input terminals and set the generator to the sound carrier frequency for the channel under alignment. The signal generator must be very accurately calibrated. This can be done by beating its output against a known channel carrier or use a station operating on the channel and tune in the sound.

For output indication, advance the volume control about to mid-position so that the tone modulation or audio modulation on the channel station may be heard through the loudspeaker.

The oscillator coil is located on the coil form or assembly nearest to the front of the switch assembly and is wound of heavier wire than the other coils. This is shown in Figure 10.

7. R-F Coil Alignment—The r-f coil assembly is designed for stable, band-pass operation and under normal conditions will seldom require adjustment. In cases where it is definitely known that alignment is necessary (such as when the present coil is damaged and has been changed), do not attempt the adjustment unless suitable equipment is available. When tubes V1 or V2 are changed, alignment of r-f and oscillator may be necessary.

The minimum requirements for correct r-f alignment is to provide the correct band width, and for the response curve to be centered within the limit frequencies shown for each of the individual bands, as shown in Figure 11. It is also necessary that the curve be adjusted for maximum amplitude consistent with correct band width. To provide these minimum requirements, the r-f coils are overcoupled in a very similar manner to the video i-f transformers. However, instead of adjusting capacity to tune the coils, the inductance is varied by moving a few turns. Coupling is also adjustable by moving the entire coil either away from or toward the adjacent coil on the form.

The physical assembly of the coils in the band switch locates the r-f amplifier plate coil at the rear of the switch and the oscillator coil towards the front end. Two types of coils are used—the Channel No. 1 and No. 2 coils have an additional link circuit between the grid and plate coils to provide better image rejection of the FM band (88 to 108 mc) signals on these two channels. These links are tuned by means of two copper rings which are moved along the coil forms for adjustments.

The input sweep signal is applied to the antenna terminal board at the r-f unit. The 300-ohm cable between the antenna terminal board and r-f amplifier input must be disconnected at the r-f unit when making r-f alignment. The marker signal

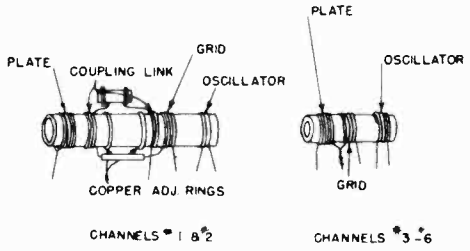


Fig. 10. R-F Coil Assembly

generator may be coupled loosely to the antenna input terminals.

The output r-f response curve is taken off at the junction of R1 and C1. The Contrast Control should be set for minimum for all r-f alignment.

For channels No. 1 and No. 2, the r-f coil should be aligned to give approximately the curve shown in Figure 11A. The high frequency end of curve (at S marker) may be peaked slightly higher than the low frequency end of curve, but the low frequency end should never be aligned with more amplitude than the high frequency end. The markers should be located on the inside of the humps of the curves, the video marker (P) preferably being inside slightly farther than the sound marker (S). Adjustment of the bandwidth is made by moving the plate coil closer to the grid coil or vice-versa. In most cases the sliding of the copper rings will give both the required bandwidth and frequency adjustment. Spread

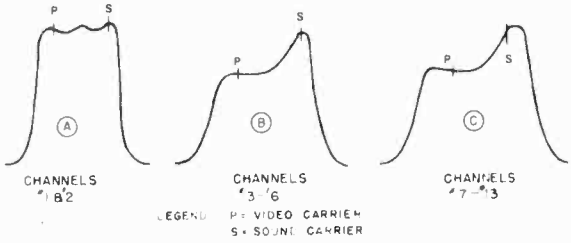


Fig. 11. R-F Alignment Curves

or squeeze turns in plate and grid coils if the frequency cannot be obtained by sliding the rings. Spreading turns results in a raising of the frequency; while squeezing turns lowers the frequency.

For the remainder of the channels, the adjustment of the plate coil in relation to the grid coil changes the bandwidth while the spreading or squeezing of the plate and grid coil turns results in the raising or lowering of frequency. Only when the plate and grid coils are tuned to the same frequency will the amplitude be greatest with the correct bandwidth. The outside peaks of the r-f response curve should be aligned to the carrier markers. In general it is desirable to have a slight rise on the high frequency (sound carrier) side of the curve, however the rise should not exceed approximately 30 per cent of the low frequency side. A low frequency rise in the response curve is not desirable and must be avoided, as a picture with poor definition will result if this is done.

The upper channel coils (No. 11, No. 12, and No. 13) may have the plate winding reversed from the winding direction of the plate coil of the other transformers. If this is the case, the bandwidth will be increased by separating the plate and grid coils and vice-versa. This condition can be determined by inspection or by the effect on the curve when making the alignment.

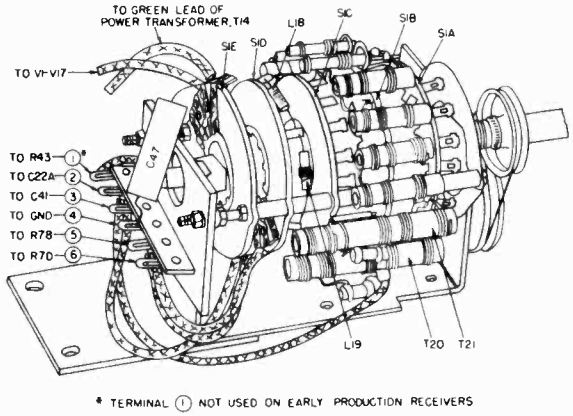


Fig. 12. R-F Coil & Switch Assembly

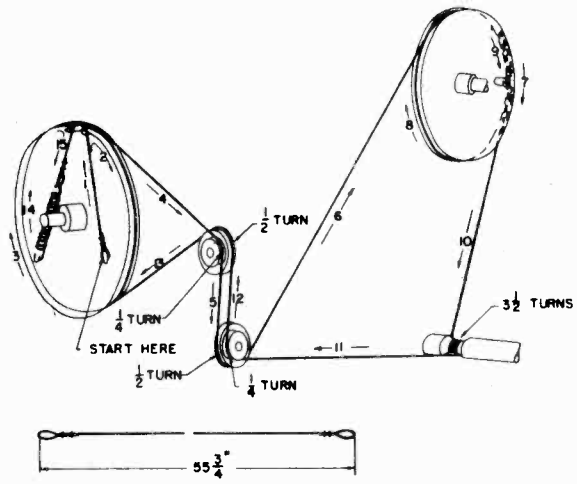


Fig. 15. Radio Tuning, Dial Drive Stringing

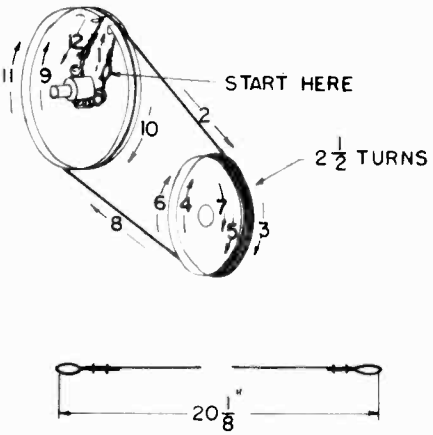


Fig. 16. Television Tuning, Drive Stringing

MISCELLANEOUS INSTALLATION AND SERVICE ADJUSTMENTS

REPLACEMENT OF PICTURE TUBE

To remove the picture tube from the television chassis, remove the picture tube socket and then untape and slide off the ion trap adjustment assembly. The ion trap can be removed readily, if the gap in the assembly is pulled apart slightly with the fingers while attempting to slide it. Loosen the two set screws partially that clamp the left side of the picture tube mounting strap, then slide the strap backward from the top-front rim of the picture tube until the rim of the tube is free from the strap. Carefully pull the tube out through the focus and deflection coils.

To replace a picture tube the reverse procedure should be followed, being careful never to force the picture tube if it sticks or fails to slip into place readily. Investigate and remove the source of the trouble. The picture tube should be oriented so that the anode cap is adjacent to the H.V. rectifier, V13, and the high voltage lead.

Wipe the screen surface of the tube to remove finger marks and dust. *PRECAUTION—Do not handle, remove, or install a picture tube unless shatterproof goggles and heavy gloves are worn.*

ION TRAP ADJUSTMENT

The ion trap may be approximately located as shown in Figure 17; however its final adjustment must be made with the television receiver operating.

The approximate adjustment requires that the gaps in the two magnets be lined up with the break in the rubber holder. NOTE—Some ion traps have been magnetized so that it is necessary to rotate the small magnet at 180 degrees to this normal position. Then slide the assembly onto the picture tube neck so that the ion trap assembly slit is at the bottom or top (dependent upon picture tube) and lines up with pin #12 or #6. Slide the assembly forward on the picture tube until it is about the position shown in the illustration. NOTE—The wider of the two magnets should be located at the rear or the base end of the picture tube. The final following steps should be taken with the television receiver operating:

1. With Brilliance control advanced, turn ion trap assembly so that gap in rubber holder is faced up or down and lines up with either pin #6 or pin #12. Whichever way gives some illumination, is the correct approximate orientation of assembly. If the tube V16 is removed, it will be found much easier to adjust for maximum illumination since the resultant thin line will illuminate even though the magnets are considerably out of adjustment.
2. Move assembly back and forth and rotating it while viewing screen, adjust for maximum brightness.
3. If illuminated area gets very bright, reduce brightness with control and repeat step 2. If tube V16 was removed as suggested in Step 1, replace it before proceeding with step 4.
4. If any shadowing of the tube neck is present after completing step 3, rotate the small (front) magnet to correct shadow and repeat step 2 and 3. NOTE—Badly out-of-line focus coils can also cause neck shadowing. The focus coil should be symmetrical and straight before starting the ion trap adjustment.

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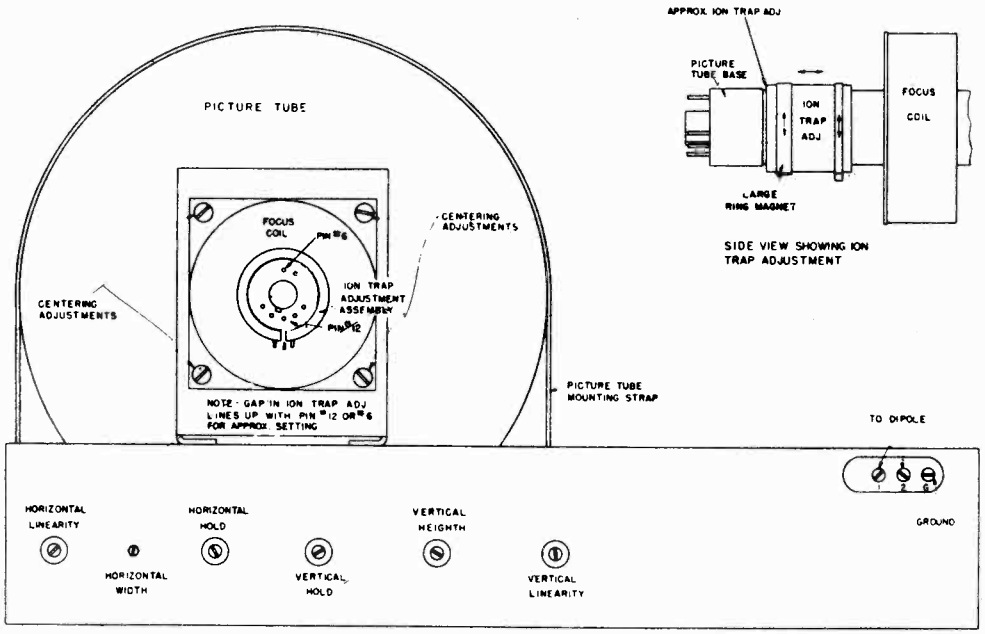

Fig. 17. Location of Installation Adjustment Controls

CENTERING (FOCUS COIL) ADJUSTMENT

The four focus coil adjustment screws should all be tightened sufficiently so that the springs are always under tension. Too loose pressure on the springs will result in the picture centering being unstable. These adjustments are not readily available with the back cover in place unless a long screwdriver is used. Since each screw adjustment reacts in both the horizontal and vertical directions, a maladjustment in the centering may have to be corrected by the adjustment of one to four screws.

DEFLECTION YOKE ADJUSTMENT

Three set screws permit the deflection yoke to be loosened, permitting limited turning in either direction. If the picture does not line up horizontally or square with the picture tube mask, rotate the yoke until this condition is remedied, then tighten the set screws.

HORIZONTAL (HOLD) OSCILLATOR SPEED ADJUSTMENT

The horizontal hold control is a preset adjustment on the rear of the chassis which is used to adjust the speed. In late production receivers, a tuned circuit consisting of L21 and C91 was added to the horizontal oscillator cathode circuit to stabilize the horizontal hold operation. For complete alignment both controls must be adjusted. Check operation first as follows:

Check on Alignment—With a normal television signal being received, free from excessive noise, turn the horizontal hold control to the position where the picture locks in horizontally and passes the following tests:

1. With a picture being received, switch the Station Selector to a channel having no program and then back to the desired channel. The picture should immediately lock into position.

2. With a picture being received, turn the television receiver power "off" for two or three seconds and then turn it back "on" again. The picture should come into synchronization within ten seconds after the picture tube has been illuminated.

3. Turn the Station Selector to the "radio" position and allow the television receiver to transfer for two or three minutes to Broadcast reception, and then return to the television channel transmitting a picture. The picture should synchronize within ten seconds after the picture tube becomes illuminated with receivers not equipped with L21. Receivers with L21 should sync immediately upon showing raster.

4. Turn power off for three or four minutes and then turn "ON." The picture should lock-in horizontally within ten seconds after the raster becomes illuminated.

Minor Adjustments—If the receiver does not have the tuned circuit consisting of L21 and C91 in the cathode of the horizontal multivibrator, V11, the horizontal hold control, R36, should be adjusted until the above checks can be satisfactorily accomplished. If attempted adjustment of the hold control will not permit all the above checks to be met when the tuned circuit is incorporated, then make the adjustment as outlined under "Complete Realignment."

Complete Realignment—Tune in a television signal for optimum sound and adjust for normal contrast.

1. Adjust the Horizontal Hold control to the center of its range.

2. Remove tube V9, and then adjust the iron core of L21 until the picture is approximately synchronized (held in frame) in the horizontal direction.

3. Replace tube V9 and then adjust the Horizontal Hold control until the picture passed all tests as outlined in "Check on Alignment."

VERTICAL (HOLD) OSCILLATOR SPEED ADJUSTMENT

This control, R62, is used to lock the picture in synchronism with the transmitted picture in the vertical direction. When the control is maladjusted the picture will slide vertically out-of-frame or lock out-of-frame, giving overlapping vertical images or even double images in the vertical direction. After the picture is locked in vertically on a normal picture, reduce the contrast control until the picture is barely visible, then readjust the control until the picture holds in frame.

HORIZONTAL LINEARITY AND WIDTH CONTROL

These controls react on each other so that when one control is adjusted the other may have to be. The adjustment of the linearity control should only be made on a test pattern signal. First, obtain the correct width by adjusting the width control, L7, until the picture extends approximately $\frac{1}{8}$-inch outside the edge of the mask on both sides. Next, adjust the Horizontal Linearity control, R49, until the test pattern is symmetrical in the left and right direction. A slight readjustment of the Width control may now be necessary, as well as touching up of the centering adjusting screws.

VERTICAL LINEARITY AND HEIGHT CONTROL

The Height control, R61, is adjusted until the picture extends approximately $\frac{1}{8}$ inch outside the edge of the mask on both top and bottom. Next, adjust the Vertical Linearity control, R58, until the test pattern is symmetrical from top to bottom. Readjustment of the Height and Vertical Hold controls as well as the centering adjustments may be necessary.

PRODUCTION CHANGES

The following production changes have taken place up to the time that this service data was compiled. In most cases the change can not be accurately identified with the serial number of the chassis. The order of listing below does not indicate the chronological order of the change.

1. Power Transformer, T14 and V23—The original transformer, T14, supplied, gave insufficient B+ voltage (385 volts) when using a Type 5Y3GT rectifier tube, V23. This resulted in a low anode voltage of 7500 volts for the picture tube. To increase this voltage, a Type 5V4G tube was substituted for the 5Y3G tube, V23. At approximately serial number 2500, a new transformer T14 having Stock No. RTP-040 was substituted, which gave the correct B+ voltage of 415 volts when a Type 5Y3G tube was used as V23. This B+ voltage gives an anode voltage to the picture tube of 8500 volts.

2. Television Tuning Trimmer C112—For approximately the first 2000 receivers, the tuning trimmer C112 did not quite have the correct tuning range, making it necessary to add a fixed 10 mmf. capacitor C114 in series with it. The shunt capacitor C102 had a value of 4.7 mmf. Later production trimmer, C114, has the correct range. With this new value of trimmer, the shunt capacitor C112 was changed to 6.0 mmf. This shunt capacitor in a few receivers was merely a 5.0 mmf., while in most it will consist of two capacitors; a 5 mmf. and a 1.0 mmf. capacitor in parallel. The early production trimmer has a $\frac{1}{4}$-in. O.D. shaft, while the late production trimmer is slightly larger and has a $\frac{3}{16}$-in. O.D. shaft.

3. Tone Control, R69B—The tone control R69B, on early production receivers was connected in series between the Volume Control R69A, movable arm, and C39. C72 was a 680 mmf. capacitor from C39 to ground. Hum in the audio dependent upon the tone control setting necessitated a revision as shown in the schematic.

4. Tuned Circuit, L20 and C89—The capacitor, C89, was originally 240 mmf. and the coil, L20, was fixed-tuned and wound on a resistor form. This was later changed to 1000 mmf. and the coil turns were reduced and made variable, resulting in a higher Q circuit. This change permitted adjustment of the trap as described in the alignment procedure.

5. Resistor, R87—This resistor was changed from 100,000 ohms to 330,000 ohms to prevent excessive beam current in the picture tube, V8. This excessive beam current caused the high voltage to be reduced when the Brilliance control was advanced to maximum with the result that the control reduced brightness at end of its clockwise travel instead of increasing brightness.

6. Resistor, R47—This resistor has been changed from $\frac{1}{2}$-watt to a 1-watt size. In some cases, the original $\frac{1}{2}$-watt resistor dissipation is exceeded, especially if the Width control iron core is nearly all the way in the coil, resulting in a reduction in the resistance value. This reduced resistance changes the waveshape across C29 so much that the horizontal multivibrator may lock in at half frequency or not lock at all. It may also result in the resistor burning out.

7. Change in Horizontal Output Transformer, T9—A new design horizontal output transformer, T9, was used in late production receivers. This may be identified by the fact that it has two windings instead of the single winding design, as characterized the early production receivers. When the late production transformer is used, a 3900-ohm, 1-watt resistor must be added in series to the existing 6800-ohm, 1-watt resistor, R47. *Do not use a single 1-watt resistor for this.* The capacitor, C66, should be returned to ground when the new type transformer is used.

8. Horizontal Multivibrator Cathode Switching—After the first 150 receivers were built, a shorting contact was added to the filament wafer of the Station Selector switch so as to stop the horizontal multivibrator as soon as the Station Selector was switched to "Radio" position. This connects the multivibrator cathode to ground through the filament circuit when switching to "Radio" so that "birdies" are not heard on the broadcast band as the television tubes cool off after switching from television to radio reception.

9. Screen Resistor, R79—This resistor was changed from an original 47,000 ohms to 33,000 ohms. This reduces the operating d-c voltage on the plate of V7, and gives greater brightness.

10. Addition of C21—A fixed 10 mmf. mica capacitor, C21, was added across C10 so that the trimmer C10 would peak at the center of its range.

11. Change in R63—The 330,000 ohm resistor, R63, was changed to 220,000 ohms so that the Vertical Hold control will operate near its mid-adjustment position.

12. Removal of R95—To correct a transient which appeared in the vertical retrace as a white line at the top of the picture, the 2200 ohm resistor, R95, in series with capacitor, C37, was removed. The potentiometer, R58, was reconnected as a variable resistance as shown on the schematic.

13. Value Change of C52—The original capacity of C52 was 47 mmf. To improve vertical interlace, this capacitor was changed to 240 mmf.

14. Addition of Tuned Circuit, L21 and C91—A 15.75 kc tuned circuit was added to the cathode of the horizontal multivibrator, V11. This stabilizes the horizontal AFC circuit to the extent that it prevents picture wiggles on noise pulses and echoes. With this addition, the 240 $\mu\mu$f capacitor, C56, should be changed to 150 mmf. and the 150,000 ohm resistor, R40, should be increased to 330,000 ohms. This prevents a white line at the left-center of the picture which may result with installation of L21-C91. With addition of L21, the capacitor, C30, was changed from a 40 mfd to a 1.0 mfd, and C92 was changed from 1.0 mfd to a .05 mfd.

15. Connection of Primary of T11—On early production receivers the primary of T11 was connected to a mid-tap on choke L10. This connection caused a resonant condition to develop which affected the lower television bands. This was corrected temporarily by shunting a 47 mmf. capacitor between the midtap of L10 and ground. Later the primary of T11 was connected to the junction of L10 and C101 as shown on the schematic.

50-CYCLE OPERATION

The supplement schematic diagram, Figure 18, shows the wiring of the power transformer, T14, through the special terminal board installed. Also, it shows the addition of capacitors C98 and C99 required for additional filtering. The changes involved in changing from 60-cycle to 50-cycle operation are listed below:

1. The 50-cycle power transformer, T14, is separated from the chassis and installed on a mounting plate at the base of the cabinet.

2. All filament and high voltage leads are extended on the transformer and terminated at the chassis proper in a terminal board. The connection of these leads through this terminal board is shown in Figure 18. All leads are twisted.

3. A 90 mfd. capacitor, C98, is shunted across C62. A 90 mfd. capacitor, C99, is shunted across C45-A.

4. The bias supply filter capacitor, C69, is changed to a 50 mfd. capacitor.

5. Filament leads to V6, V7, V9, V10, V11, V12, V14, V15, V16, and V17 are twisted. The ground connection is made at one point only for this series of tubes, and the high side is connected through the filament wafer of the band switch.

TROUBLE SHOOTING

The following is a listing of possible troubles and their cures. This is not intended as a comprehensive coverage of all possible failures but serves to point out some of the more difficult troubles that may be experienced. From time to time this information will be expanded as information becomes available.

1. NO RASTER ON PICTURE TUBE

(a) Ion trap adjustment incorrectly made. Assembly on backward or improperly oriented. See ion trap adjustment under "Miscellaneous Preset and Service Adjustments."

(b) Check for waveform at output of T9. If present, the trouble is probably in the Type 8016 rectifier tube or filter circuit. Check for open in high voltage winding of T9. If the V13 tube filament glows yellow, high-voltage is being generated and the trouble will possibly exist in the picture tube, V8.

(c) If there is no waveform at output of T9, check operation of 807, V12, V7, and multivibrator V11 by oscilloscope waveform measurement.

(d) Check that high voltage anode cap is contacting the anode terminal of V8.

1. NO RASTER ON PICTURE TUBE (Cont'd)

(e) Open Brightness control R84B, R87, or R85.
(f) No B+ voltage at junction L4 and L3.
(g) If only two or three thousand volts are generated, check deflection yoke, L9, and Width control, L7, for continuity.

2. RASTER NORMAL, NO PICTURE OR SOUND

(a) Oscillator V2B defective, or oscillator coil resonates out of band.
(b) Defective antenna or lead-in.
(c) Converter, r-f amplifier, or first video i-f amplifier stage defective.

3. PICTURE NORMAL, NO SOUND

(a) 21.9 mc audio i-f amplifier, discriminator, or audio amplifier defective.
(b) Oscillator V2B off frequency.
(c) Defective speaker.

4. RASTER NORMAL, SOUND NORMAL, NO PICTURE

(a) Video i-f amplifier (after 1st i-f) inoperative.
(b) Resistor R83 in contrast control defective or open.
(c) Screen by-pass C32C open or shorted.

5. NORMAL PICTURE AND SOUND, NO HORIZONTAL OR VERTICAL SYNC.

(a) Check for signal input waveform at grid (1) of V9A.
(b) Defective V9A or plate circuit components.
(c) Operation of receiver with Contrast control advanced too far.

6. PICTURE NORMAL, NO VERTICAL SYNC.

(a) Check grid of V15B for normal waveform.
(b) Check speed of vertical multivibrator. Should be capable of free running speed less than 60 cps.
(c) Check V15B circuit components.

7. PICTURE NORMAL, NO HORIZONTAL SYNC.

(a) Check AFC transformer, T7.
(b) Check alignment of L21 and C91.
(c) Check socket voltages and waveforms of V10B and V11.
(d) Check resistor R47 for correct value.

8. NO VERTICAL OR NO HORIZONTAL DEFLECTION

(a) Check waveform and socket voltages of output and multivibrator tubes of respective sweep circuits.
(b) Check output transformer and yoke for continuity.

9. ONE OR MORE HORIZONTAL WHITE LINES AT TOP OF PICTURE

(a) Check for Production Change #12.

10. RIPPLE ON EDGE OF PICTURE

(a) Reflections on antenna lead-in.
(b) Instability of horizontal AFC circuit. See Production Change #14.
(c) Defective capacitor, C30.

11. RASTER EDGE NOT STRAIGHT—KEYSTONING

(a) Defective yoke.
(b) Defective sweep transformer.
(c) Improperly adjusted ion trap adjustment assembly.

12. PICTURE JUMPY

(a) Operation at too high contrast control setting.
(b) If picture moves at regular rate sideways, check capacitor C30, R32 and C92. Put in change #14.
(c) If left of picture jitters, change 807 sweep tube, V12.
(d) Noisy sweep or sync circuit tubes.

13. POOR INTERLACE OF VERTICAL SWEEP

(a) Check Production Change #13.

14. POOR PICTURE DETAIL

(a) Mismatch in antenna or lead-in.
(b) Misalignment of i-f or r-f circuits.
(c) Defective chokes L3, L4 or L5 in video amplifier.
(d) Make sure that focus control operates on both sides of proper focus point.
(e) Overload of video amplifier, check contrast control operation.

15. PICTURE CANNOT BE CENTERED

(a) Move focus coil back by loosening all four adjustment screws.

16. FOCUS CONTROL AT END OF TRAVEL

(a) Short out resistor R96.
(b) Check for correct B+ voltages.

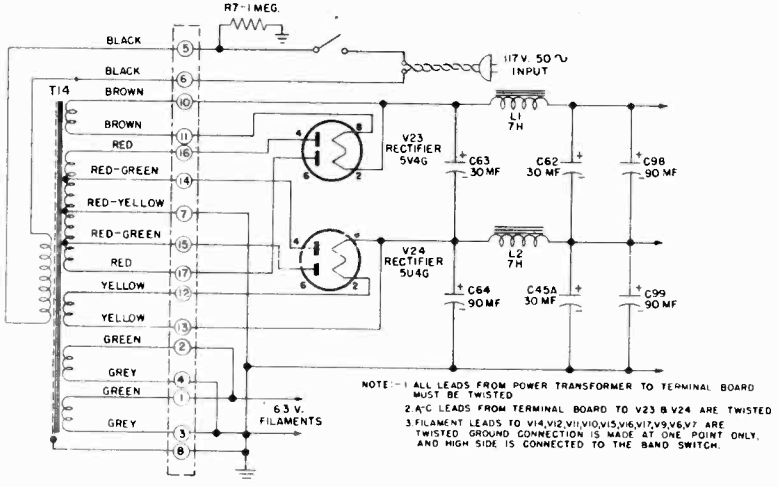

Fig. 18. Schematic Changes for 50-cycle Operation

SOCKET VOLTAGE CHART

NOTE—All d-c measurements taken by a 20,000 ohm/volt meter. Station selector switch at Channel No. 1 unless noted. Contrast control at maximum, Brilliance at minimum.

SYMBOL	TUBE TYPE	PLATE		SCREEN		CATHODE		GRID		PLATE M.A.	SCREEN M.A.	NOTES
		PIN	VOLTS	PIN	VOLTS	PIN	VOLTS	PIN	VOLTS			
V1	6AU6	5	140	6	140	7	1.3	1	0	7.2	—	
V2A	7F8	6	115	—	—	5	0	8	−4.5*	2.5	—	* Measured with V.T.V.M.
V2B		3	180	—	—	4	0	1	0	10	—	
V3	6AC7	8	150	6	150	5	0	4	−2*	14	3	* Measured on 50 v scale
V4	6AC7	8	160	6	160	5	0	4	−2*	15	3.2	* Measured on 50 v scale
V5	6AC7	8	170	6	170	5	2	4	0	14	3	
V6A	6H6	5	0	—	—	8	0	—	—	4	—	
V6B		3	−8.5	—	—	4	6.3AC	—	—	0	—	
V7	6AC7	8	150	6	125	5	0	4	0	15	3.7	
V8	10BP4	CAP	8300*	10	415	11	150	2	90	—	—	* Use multiplier with 1000 v scale
V9A	6SN7GT	2	12.5	—	—	3	0	1	−1	.2	—	
V9B		5	110*	—	—	6	11	4	6	10	—	
V10A	6SL7GT	2	−95	—	—	3	0.5	1	−9.5	0	—	
V10B		5	42.5	—	—	6	0.5	4	0.5	1	—	
V11A	6SN7GT	5	170	—	—	6	6	4	−25	2.5	—	
V11B		2	135	—	—	3	6	1	0	2.9	—	
V12	807	CAP	415	2	345	4	22	3	−10	76	13	
V13	8016	CAP	—	—	—	2	8300*	—	—	—	—	* Use multiplier with 1000 v scale
V14	6AS7GT	2 & 5	0	—	—	3 & 6	10	1 & 4	−15	—	—	
V15A	6SL7GT	2	0.5	—	—	3	7.5	1	0.5	0	—	
V15B		5	105	—	—	6	10	4	4	1	—	
V16A	6SN7GT	2	30	—	—	3	1.5	1	0	.7	—	
V16B		5	14.5	—	—	6	1.5	4	4.5	.1	—	
V17	6V6GT	3	195	4	135	8	23.5	5	14.5	20	1.85	
V18*	6SA7	3	200	4	80	8	0	6	0	3	8.5	
V19	6SG7	8	200	6	110	5	1	4	0	10	4	
V20	6SV7	6	195	4	88	2	−0.5	3	0	9.7	1.7	
V21A	6AQ7GT	1 & 3	0	—	—	2	0	—	—	0	—	
V21B		5	75	—	—	6	0	4	0	1	—	
V22	6V6GT	3	230	4	200	8	10	5	0	41.5	4.5	
V23	5Y3GT	4 & 6	315AC	—	—	2	425	—	—	85*	—	* Cathode current
V24	5U4G	4 & 6	240AC	—	—	2	250	—	—	160*	—	* Cathode current.

ALIGNMENT TABLE

Before attempting the following tabular alignment procedure, read the preceding section "ALIGNMENT SUGGESTIONS"

STEP NO.	SIGNAL GENERATOR FREQUENCY	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINT	CONNECT OSCILLOSCOPE TO CHASSIS &	STATION SELECTOR SWITCH	DIAL SETTING	ADJUST	REMARKS
				(1) BROADCAST I-F ALIGNMENT				
1	455 kc with tone modulation	Not Used	Grid (4) of V19 thru 200 mmf	Junction C41 & R69A	Radio	550 kc	C75 & C76 for max. output	
2	455 kc with tone modulation	Not Used	Grid (5) of V18 thru 200 mmf	Junction C41 & R69A	Radio	550 kc	C73 & C74 for max. output	
				(2) BROADCAST R-F ALIGNMENT				
1	1500 kc with tone modulation	Not Used	Ant. terminal thru 200 mmf	Junction C41 & R69A	Radio	*	C67B osc. trimmer for maximum output	* Tune gang condenser to minimum capacity setting.
2	1500 kc with tone modulation	Not Used	Ant. terminals thru 200 mmf	Junction C41 & R69A	Radio	1500 kc**	C67A r-f trimmer for maximum output	** If pointer does not fall on the 1500 kc calibration when 1500 kc signal is tuned in, slip pointer drum on dial cord until it does.
				(3) TELEVISION I-F TRAP ALIGNMENT				
1	21.9 mc with tone modulation	Not Used	Grid (8) of V2A thru 200 mmf	Junction L4 & R16	Channel #13	—	C19 on T4 for minimum output	Connect 10,000 ohms in series with oscilloscope input lead.
2	21.9 mc with tone modulation	Not Used	Grid (8) of V2A thru 200 mmf	Junction L4 & R16	Channel #13	—	C16 on T3 for minimum output	
3	21.9 mc with tone modulation	Not Used	Grid (8) of V2A thru 200 mmf	Junction L4 & R16	Channel #13	—	C13 on T2 for minimum output	
4	27.9 mc with tone modulation	Not Used	Grid (8) of V2A thru 200 mmf	Junction L4 & R16	Channel #13	—	C10 on T1 for minimum output	
				(4) TELEVISION SOUND I-F AMPLIFIER ALIGNMENT				
1	21.9 mc unmodulated	21.9 mc with 2 mc sweep width	Grid (4) of V3	Junction of R77 & C49	Channel #13	—	C79 & C80 for max. amplitude and symmetry at 21.9 mc	Detune C84 on T6; then adjust trimmers C79 and C80. Adjust for max. amplitude and symmetry about 21.9 mc marker as shown in Fig. 8A.
2	21.9 mc with tone modulation	Not Used	Grid (4) of V3		Channel #13	—	C78 for minimum tone output	With volume control halfway up and speaker connected, adjust C78 for minimum tone output.
3	Not Used	21.9 mc with 2 mc sweep width	Grid (4) of V3	Junction of C41 and R69A	Channel #13	—	C84 for max. peak to peak amplitude	Peak trimmer so that the positive and negative peaks have max. peak to peak amplitude. See Fig. 8B.
4	Repeat steps 2 and 3.							

ALIGNMENT TABLE (CONT'D)

STEP NO.	SIGNAL GENERATOR FREQUENCY	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINT	CONNECT OSCILLOSCOPE TO CHASSIS &	STATION SELECTOR SWITCH	DIAL SETTING	ADJUST	REMARKS
				(5) VIDEO I-F AMPLIFIER ALIGNMENT				
1	23.0 mc & 26.4 mc marker	20-30 mc sweep	Grid (4) of V5	Junction of L4 and R16	Channel #13	—	C17 and C18 for max. amplitude, bandwidth, and correct positioning of markers.	Shunt C14, T3 primary trimmer with a 100 mmf capacitor. See Fig. 9A.
2	23.0 mc & 26.4 mc marker	20-30 mc sweep	Grid (4) of V4	Junction of L4 and R16	Channel #13	—	C14 and C15 for max. amplitude, bandwidth, and correct positioning of markers.	Remove 100 mmf capacitor from C14, and shunt C11, T2 primary trimmer, with it. See Fig. 9B.
3	23.0 mc & 26.4 mc marker	20-30 mc sweep	Grid (4) of V4	Junction of L4 and R16	Channel #13	—	Adjust L20 for minimum overshoot	See Fig. 9B. Either spread or squeeze turns together to give minimum amplitude of overshoot.
4	23.0 mc & 26.4 mc	20-30 mc sweep	Grid (4) of V3	Junction of L4 and R16	Channel #13	—	C11 and C12 for max. amplitude, bandwidth, and correct position of markers	Remove 100 mmf capacitor from C11 and shunt C8, T1 primary trimmer, with it. See Fig. 9C.
5	23.0 mc & 26.4 mc	20-30 mc sweep	Grid (4) of V3	Junction of L4 and R16	Channel #13	—	Readjust L20 for minimum overshoot	See Fig. 9 C. Repeat procedure as in step 3, except for point of signal input.
6	23.0 mc, 26.4 mc, & 25.65 mc	20-30 mc sweep	Grid (8) of V2A	Junction of L4 and R16	Radio*	—	C8 and C9 for max. amplitude, bandwidth, and correct position of markers	Remove 100 mmf. capacitor from C8. See Fig. 9D. * Jump filament wafer switch with clip lead so that tube filaments will be lit. Remove B+ from r-f assembly.
				(6) OSCILLATOR COIL ADJUSTMENT				
1	49.75 mc with tone modulation	—	Antenna terminals	—	Channel #1	—	Turns of osc. coil, T20.	Make sure that C112 is at mid-position of travel. Use sound output as indicator.
2	59.75 mc with tone modulation	—	Antenna terminals	—	Channel #2	—	Turns of osc. coil, T21.	Same as for Step #1.
3	65.75 mc with tone modulation	—	Antenna terminals	—	Channel #3	—	Turns of osc. coil, T22.	Same as for Step #1.
4	71.75 mc with tone modulation	—	Antenna terminals	—	Channel #4	—	Turns of osc. coil, T23.	Same as for Step #1.
5	81.75 mc with tone modulation	—	Antenna terminals	—	Channel #5	—	Turns of osc. coil, T24.	Same as for Step #1.
6	87.75 mc with tone modulation	—	Antenna terminals	—	Channel #6	—	Turns of osc. coil, T25.	Same as for Step #1.
7	179.75 mc with tone modulation	—	Antenna terminals	—	Channel #7	—	Lead gap of oscillator coil, T26.	Same as for Step #1.

ALIGNMENT TABLE (CONT'D)

STEP NO.	SIGNAL GENERATOR FREQUENCY	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINT	CONNECT OSCILLOSCOPE TO CHASSIS &	STATION SELECTOR SWITCH	DIAL SETTING	ADJUST	REMARKS
				(6) OSCILLATOR COIL ADJUSTMENT (Cont'd)				
8	185.75 mc with tone modulation	—	Antenna terminals	—	Channel #8	—	Lead gap of oscillator coil, T27.	Same as for Step #1.
9	191.75 mc with tone modulation	—	Antenna terminals	—	Channel #9	—	Lead gap of oscillator coil, T28.	Same as for Step #1.
10	197.75 mc with tone modulation	—	Antenna terminals	—	Channel #10	—	Lead gap of oscillator coil, T29.	Same as for Step #1.
11	203.75 mc with tone modulation	—	Antenna terminals	—	Channel #11	—	Lead gap of oscillator coil, T30	Same as for Step #1
12	209.75 mc with tone modulation	—	Antenna terminals	—	Channel #12	—	Lead gap of oscillator coil, T31.	Same as for Step #1
13	215.75 mc with tone modulation	—	Antenna terminals	—	Channel #13	—	Lead gap of oscillator coil, T32.	Same as for Step #1
				(7) R-F COIL ALIGNMENT				
1	Markers 45.25 mc & 49.75 mc	Channel #1 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #1	—	For max. amplitude and for recommended response	See Fig. 11A for resultant alignment curve.
2	Markers 55.25 mc & 59.75 mc	Channel #2 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #2	—	For max. amplitude and for recommended response	See Fig. 11A for resultant alignment curve.
3	Markers 61.25 mc & 65.75 mc	Channel #3 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #3	—	For max. amplitude and for recommended response	See Fig. 11B.
4	Markers 67.25 mc & 71.75 mc	Channel #4 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #4	—	For max. amplitude and for recommended response	See Fig. 11B for resultant alignment curve.

ALIGNMENT TABLE (CONT'D)

STEP NO.	SIGNAL GENERATOR FREQUENCY	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINT	CONNECT OSCILLOSCOPE TO CHASSIS &	STATION SELECTOR SWITCH	DIAL SETTING	ADJUST	REMARKS
				(7) R-F COIL ALIGNMENT (Cont'd)				
5	Markers 77.25 mc & 81.75 mc	Channel #5 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #5	—	For max. amplitude and for recommended response	See Fig. 11B for resultant alignment curve.
6	Markers 83.25 mc & 87.75 mc	Channel #6 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #6	—	For max. amplitude and for recommended response	See Fig. 11B for resultant alignment curve.
7	Markers 175.25 mc & 179.75 mc	Channel #7 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #7	—	For max. amplitude and for recommended response	See Fig. 11C for resultant alignment curve.
8	Markers 181.25 mc & 185.75 mc	Channel #8 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #8	—	For max. amplitude and for recommended response	See Fig. 11C for resultant alignment curve.
9	Markers 187.25 mc & 191.75 mc	Channel #9 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #9	—	For max. amplitude and for recommended response	See Fig. 11C for resultant alignment curve.
10	Markers 193.25 mc & 197.75 mc	Channel #10 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #10	—	For max. amplitude and for recommended response	See Fig. 11C for resultant alignment curve.
11	Markers 199.25 mc & 203.75 mc	Channel #11 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #11	—	For max. amplitude and for recommended response	See Fig. 11C for resultant alignment curve.
12	Markers 205.25 mc & 209.75 mc	Channel #12 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #12	—	For max. amplitude and for recommended response	See Fig. 11C for resultant alignment curve.
13	Markers 211.25 mc & 215.75 mc	Channel #13 with 25 mc sweep	Antenna terminals at r-f amplifier	Junction R1 and C1	Channel #13	—	For max. amplitude and for recommended response	See Fig. 11C for resultant alignment curve.

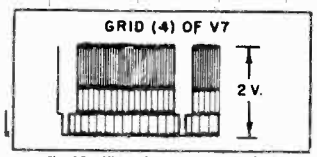

Fig. 35. Video Output of Detector (Osc. Synced at Half of Vert. Speed)

WAVEFORM MEASUREMENTS

The waveforms shown in Figures 35 through 55 represent measurements on an average receiver wherein the controls have been adjusted for a normal picture with correct Contrast, Height, Width and Linearity. Most measurements must be made when a signal is being received.

An oscilloscope where the vertical deflection amplifier has been pre-calibrated is used to take measurements at the point indicated in the waveform boxes. The oscilloscope sweep frequency is indicated in the waveform title.

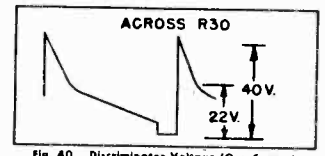

Fig. 40. Discriminator Voltage (Osc. Synced at Half of Hor. Sweep Speed)

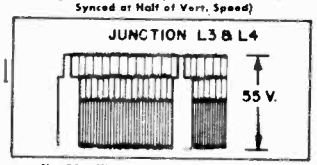

Fig. 36. Video Output of V7. (Osc. Synced at Half of Vert. Sweep Speed)

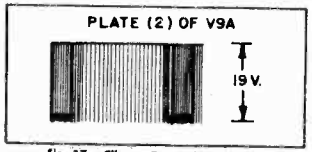

Fig. 37. Clipper Output (Osc. Synced at Half of Vert. Sweep Speed)

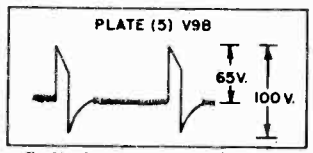

Fig. 38. Sync Amplifier Output (Osc. Synced at Half of Hor. Sweep Speed)

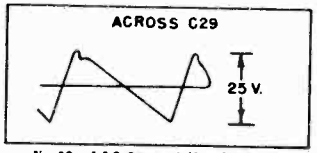

Fig. 39. A.F.C. Sawtooth (Osc. Synced at Half of Hor. Sweep Speed)

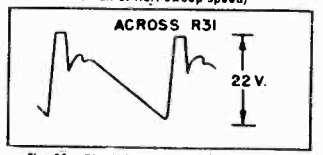

Fig. 41. Discriminator Voltage (Synced at Half of Hor. Sweep Speed)

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MODEL 801

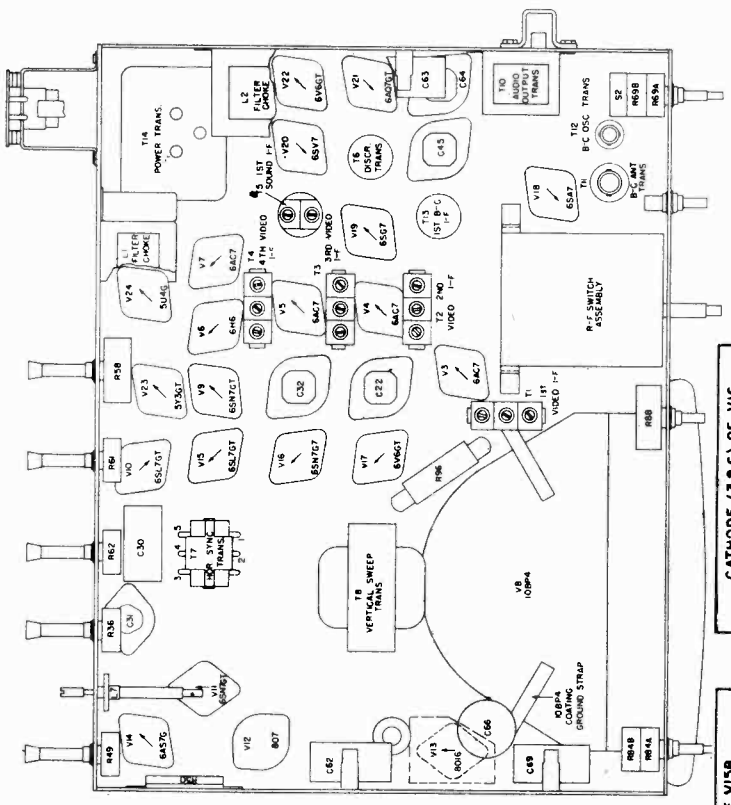


Fig. 14. Component Location, Bottom View of Chassis

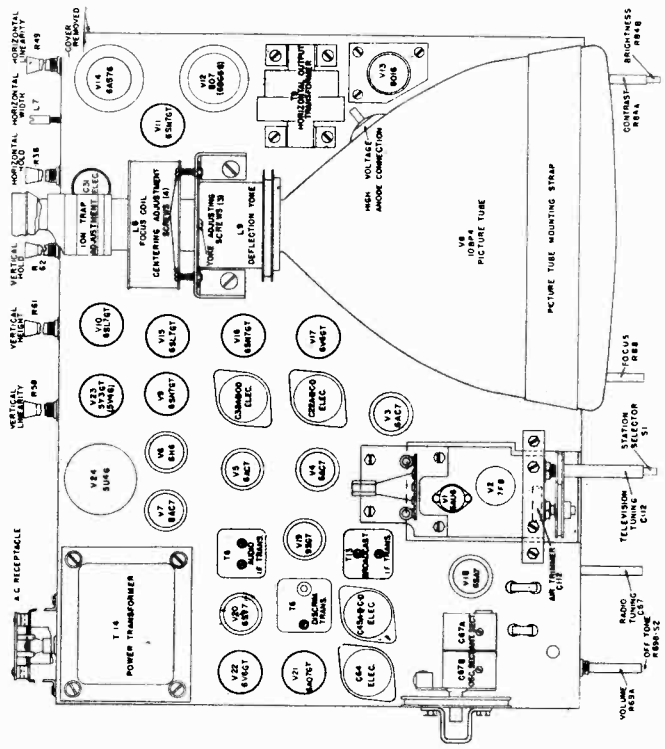


Fig. 13. Component Location, Top View of Chassis

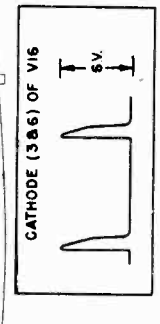


Fig. 51. Vert. M-V Cathode (Osc. Synced at Half of Vert. Sweep Speed)

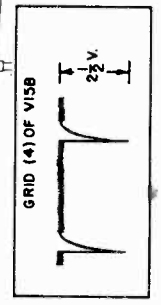


Fig. 48. Vert. Sync at V15B. (Osc. Synced at Half of Vert. Sweep Speed)

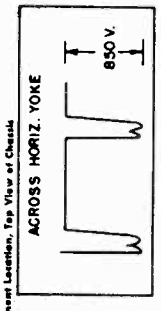


Fig. 45. Hor. Yoke Input (Osc. Synced at Half of Hor. Sweep Speed)

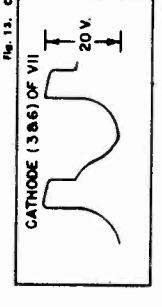


Fig. 42. Hor. M-V Cathode (Osc. Synced at Half of Hor. Sweep Speed)

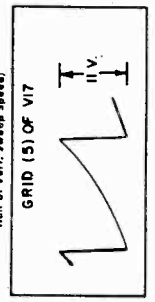


Fig. 52. Vert. M-V Output. (Osc. Synced at Half of Vert. Sweep Speed)

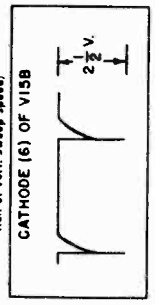


Fig. 49. Vertical Sync at Cathode V15B (Osc Synced at Half of Vert. Sweep Speed)

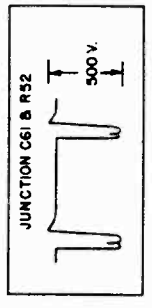


Fig. 46. V14 Control Voltage (Osc. Synced at Half of Hor. Sweep Speed)

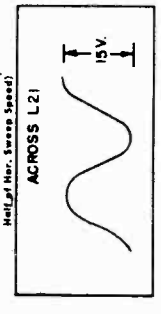


Fig. 43. Cathode Tuned Circuit (Synced at Half of Hor. Sweep Speed)

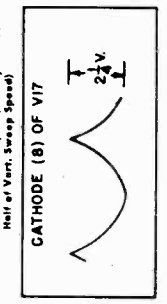


Fig. 54. Vert. Output at V17 (Osc. Synced at Half of Vert. Sweep Speed)

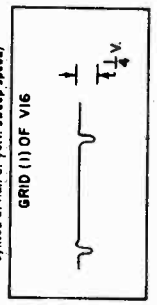


Fig. 53. Vert. Output Cathode (Osc. Synced at Half of Vert. Sweep Speed)

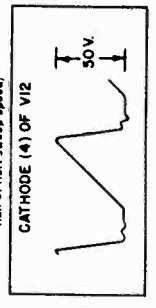


Fig. 50. Vert. Sync at Grid of M-V. (Osc. Synced at Half of Vert. Sweep Speed)

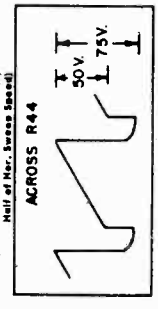


Fig. 47. 807 Cathode (Osc. Synced at Half of Hor. Sweep Speed)

Fig. 44. Hor. M-V Output (Osc. Synced at Half of Hor. Sweep Speed)

Fig. 55. Vert. Yoke Input (Osc. Synced at Half of Vert. Sweep Speed)

MODEL 801

GENERAL ELECTRIC CO.

UNIVERSAL REPLACEMENT PARTS

UCC-011	C42, 87	CAPACITOR—.05 mfd., 200 v., paper
UCC-017	C30, 69	CAPACITOR—1.0 mfd., 200 v., paper (C69 for 60-cycle receiver only)
UCC-025	C27, 28	CAPACITOR—.01 mfd., 400 v., paper
UCC-035	C43, 81	CAPACITOR—.001 mfd., 600 v., paper
UCC-040	C36, 39, 40, 41, 51, 54, 55, 60, 71, 29, 72	CAPACITOR—.01 mfd., 600 v., paper
UCC-041	C23, 34, 44	CAPACITOR—.02 mfd., 600 v., paper
UCC-045	C26, 33, 53, 58, 85, 92	CAPACITOR—.05 mfd., 600 v., paper
UCC-048	C37, 38, 59, 70, 77	CAPACITOR—.10 mfd., 600 v., paper
UCU-520	C50	CAPACITOR—47 mmf., mica
UCU-1014	C83	CAPACITOR—27 mmf., mica
UCU-1048	C35, 65	CAPACITOR—680 mmf., mica
UCU-1052	C57, 89	CAPACITOR—1000 mmf., mica
UCU-1504	C20, 21	CAPACITOR—10 mmf., mica
UCU-1520	C49, 61, 68	CAPACITOR—47 mmf., mica
UCU-1526	C100, 101	CAPACITOR—82 mmf., mica
UCU-1532	C90, 56	CAPACITOR—150 mmf., mica
UCU-1536	C46	CAPACITOR—220 mmf., mica
UCU-2538	C52	CAPACITOR—240 mmf., mica
UCW-1020	C103, 104	CAPACITOR—47 mmf., ceramic
UCW-2009	C86, 105	CAPACITOR—16 mmf., ceramic
UOP-1206	LS1	LOUDSPEAKER—12-inch PM speaker
UOX-005		CONE—Replacement speaker cone assembly
URD-027	R59	RESISTOR—120 ohms, ½ w., carbon
URD-029	R11	RESISTOR—150 ohms, ½ w., carbon
URD-049	R24, 43, 99, 100	RESISTOR—1000 ohms, ½ w., carbon
URD-057	R4, 51, 52, 67	RESISTOR—2200 ohms, ½ w., carbon
URD-073	R18, 42, 86	RESISTOR—10,000 ohms, ½ w., carbon
URD-077	R21	RESISTOR—15,000 ohms, ½ w., carbon
URD-081	R65, 89, 28, 29	RESISTOR—22,000 ohms, ½ w., carbon
URD-085	R92	RESISTOR—33,000 ohms, ½ w., carbon
URD-089	R78, 79	RESISTOR—47,000 ohms, ½ w., carbon
URD-091	R20	RESISTOR—56,000 ohms, ½ w., carbon
URD-093	R66, 70	RESISTOR—68,000 ohms, ½ w., carbon
URD-095	R68	RESISTOR—82,000 ohms, ½ w., carbon
URD-097	R2, 6, 94, 39, 41, 76	RESISTOR—100,000 ohms, ½ w., carbon
URD-099	R71, 72	RESISTOR—120,000 ohms, ½ w., carbon
URD-101	R83	RESISTOR—150,000 ohms, ½ w., carbon
URD-105	R55, 77, 63, 64	RESISTOR—220,000 ohms, ½ w., carbon
URD-109	R22, 87, 40	RESISTOR—330,000 ohms, ½ w., carbon
URD-111	R74	RESISTOR—390,000 ohms, ½ w., carbon
URD-113	R44, 97	RESISTOR—470,000 ohms, ½ w., carbon
URD-117	R85	RESISTOR—680,000 ohms, ½ w., carbon
URD-119	R75	RESISTOR—820,000 ohms, ½ w., carbon
URD-121	R7, 19	RESISTOR—1.0 meg., ½ w., carbon
URD-129	R23, 25, 81, 60	RESISTOR—2.2 meg., ½ w., carbon
URD-137	R73	RESISTOR—4.7 meg., ½ w., carbon
URD-145	R56	RESISTOR—10.0 meg., ½ w., carbon
URD-1041	R32, 57	RESISTOR—470 ohms, ½ w., carbon
URD-1051	R33, 8, 10	RESISTOR—1200 ohms, ½ w., carbon
URD-1053	R14, 3	RESISTOR—1500 ohms, ½ w., carbon
URD-1069	R15, 27	RESISTOR—6800 ohms, ½ w., carbon
URD-1097	R34, 35	RESISTOR—100,000 ohms, ½ w., carbon
URE-035	R53	RESISTOR—270 ohms, 1 w., carbon
URE-045	R38	RESISTOR—680 ohms, 1 w., carbon
URE-065	R37	RESISTOR—4700 ohms, 1 w., carbon
URE-067	R26	RESISTOR—5600 ohms, 1 w., carbon
URE-089	R1, 48	RESISTOR—47,000 ohms, 1 w., carbon
URE-097	R90	RESISTOR—100,000 ohms, 1 w., carbon
URE-1056	R17	RESISTOR—2000 ohms, 1 w., carbon
URE-1063	R5, 9, 12, 54	RESISTOR—3900 ohms, 1 w., carbon
URF-041	R13	RESISTOR—470 ohms, 2 w., carbon
URF-045	R82, 91	RESISTOR—680 ohms, 2 w., carbon
URF-071	R46	RESISTOR—8200 ohms, 2 w., carbon
URF-073	R80, 93	RESISTOR—10,000 ohms, 2 w., carbon
URF-1061	R16	RESISTOR—3300 ohms, 2 w., carbon

SPECIALIZED REPLACEMENT PARTS

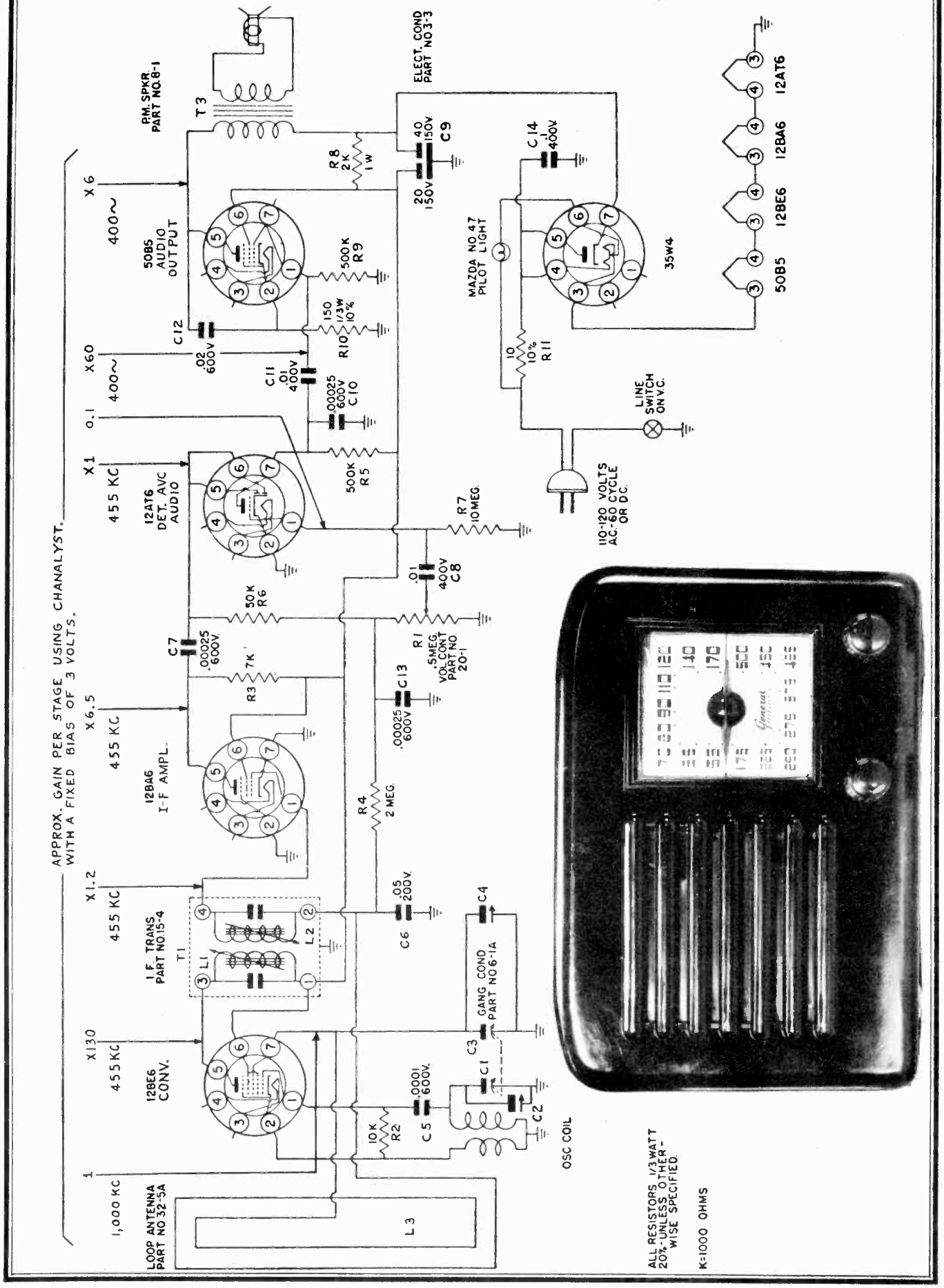
RAB-040		BACK—Cabinet back cover
RAL-001		BEZEL—Pilot light bezel, bottom of cabinet
RAV-033		CABINET—Model 801 cabinet (less hardware)
RCC-002	C1, 2, 3, 4, 5, 6, 7, 24, 25, 47, 88	CAPACITOR—.006 mfd., 600 v., paper
RCC-038	C82	CAPACITOR—.004 mfd., 600 v., paper
RCE-017	C64	CAPACITOR—90 mfd., 450 v., electrolytic
RCE-018	C31A, B, C	CAPACITOR—40 mfd., 40 mfd., 40 mfd., 25 v., electrolytic
RCE-019	C45A, B, C, D; 22A, B, C, D	CAPACITOR—30 mfd., 30 mfd., 15 mfd., 450 v.; 30 mfd., 15 v., electrolytic
RCE-020	C32A, B, C, D	CAPACITOR—30 mfd., 15 mfd., 15 mfd., 15 mfd., 450 v., electrolytic
RCE-021	C62, 63	CAPACITOR—30 mfd., 300 v., electrolytic
RCE-048	C69	CAPACITOR—50 mfd., 25 v., electrolytic (used on 50-cycle receivers only)
RCN-001	C110	CAPACITOR—1 mmf., miniature
RCN-002	C111, 113	CAPACITOR—0.68 mmf., miniature
RCN-003	C66	CAPACITOR—500 mmf., lectrofilm
RCS-001	C91	CAPACITOR—.05 mfd., 200 v., paper
RRC-023	R84A, B	POTENTIOMETER—500,000 ohms, ½ w., (Brightness control); 500,000 ohms, ½ w., (Contrast control)
RRC-024	R58	POTENTIOMETER—1000 ohms, 2 w., w.w., (Vertical Linearity)
RRC-025	R88	POTENTIOMETER—5000 ohms, 4 w., w.w., (Focus control)
RRC-034	L7	CHOKE—Variable choke (Horizontal size)
RRD-1032	R101	RESISTOR—200 ohms, ½ w., carbon
RRD-1057	R106	RESISTOR—2200 ohms, ½ w., carbon
RRD-1081	R105	RESISTOR—22,000 ohms, ½ w., carbon
RRD-1097	R30, 31	RESISTOR—100,000 ohms, ½ w., carbon
RRD-1105	R104	RESISTOR—220,000 ohms, ½ w., carbon
RRE-1069	R102, 103, 47	RESISTOR—6800 ohms, 1 w., carbon
RRW-011	R50	RESISTOR—300 ohms, 7.4 w., wirewound
RRW-012	R96	RESISTOR—3000 ohms, 7.4 w., wirewound
RTD-003	T6	TRANSFORMER—FM i-f discriminator
RTL-023	T1	TRANSFORMER—1st video i-f transformer

SPECIALIZED REPLACEMENT PARTS (Cont'd)

RCT-013	C67A, B	CONDENSER—2-section broadcast tuning condenser
RCW-2001	C102	CAPACITOR—5 mmf., ceramic
RCW-026	C106	CAPACITOR—1500 mmf., ceramic
RCW-1028	C107, 108	CAPACITOR—100 mmf., ceramic
RCY-015	C112	CONDENSER—Television tuning condenser
RDC-029		CORD—Television tuning drive cord
RDC-027		CORD—Broadcast dial cord
RDD-007		HUB AND DRUM ASSEMBLY—On Broadcast dial
RDD-008		DRUM AND SHAFT ASSEMBLY—For Broadcast dial
RDD-009		DRUM—Dial drive pointer drum and shaft assembly for B-C tuning
RDK-071		KNOB—Control knob for Radio Tuning or Focus
RKD-072		KNOB—Control knob for Television Tuning
RKD-073		KNOB—Control knob for Station Selector
RDK-074		KNOB—Control knob for Volume or Contrast
RDK-075		KNOB—Control knob Off-Tone or Brightness
RDL-002		LIGHT—Pilot light, Mazda No. 44, 6-8 v., 0.25 A., frosted for B-C tuning scale
RDM-006		MASK—Picture tube mask
RDP-023		POINTER—Broadcast dial pointer and hub assembly
RDS-034		GLASS—Broadcast dial glass
RDW-004		GLASS—Picture tube safety glass
RDX-028		SCALE—Broadcast dial scale assembly
RHC-008		CLIP—Clip for holding tubular capacitors
RHG-006		GROMMET—Power cord grommet
RHM-016		CLIP—B-C oscillator coil clip
RHM-028		CLIP—B.C. r-f coil clip
RHX-010		HARDWARE—Hardware for mounting gang condenser
RJC-001		PIN—Speaker lead contact pin
RJC-007		CONNECTOR—High voltage anode connector for picture tube
RJJ-005		RECEPTACLE—A-C receptacle (male) on chassis
RJP-015		PLUG—A-C plug (on back cover)
RJS-012		PLATE—Mounting plate for electrolytic capacitor (small size)
RJS-030		SOCKET—Octal base tube socket
RJS-037		PLATE—Mounting plate for electrolytic capacitor (large size)
RJS-041		SOCKET—Miniature tube socket for 6AU6
RJS-042		SOCKET—Loctal tube socket for 7F8
RJS-057		TUBE SOCKET—5-pin socket for 807
RJS-058		SOCKET—Tube socket for picture tube
RJS-059		SOCKET—Dial scale pilot lamp socket
RJS-064		SOCKET—Bezel pilot lamp socket
RJX-014	S1	SWITCH—R-f coil assembly completely wired and aligned (including tubes)
RLA-007	T11	TRANSFORMER—B-C antenna transformer
RLC-012	T12	TRANSFORMER—B-C oscillator transformer
RLD-001	L9	COIL—Deflection coil
RLF-005	L1	CHOKE—7 h., 75 ma. filter choke
RLF-006	L2	CHOKE—7 h., 140 ma. filter choke
RLF-008	L8	COIL—Focus coil
RLF-009	L10	CHOKE—Broadcast choke coil
RLI-003	L18	CHOKE—R-F amplifier cathode choke
RLI-006	L15, 19	CHOKE—R-F amplifier cathode choke
RLI-007	L3 and L98	CHOKE—90 uh. video choke
RLI-008	L4	CHOKE—55 uh. video choke
RLI-009	L5	CHOKE—Video detector choke
RLI-011	T26	COIL—R-F and oscillator coil (Band 7)
RLI-012	T27	COIL—R-F and oscillator coil (Band 8)
RLI-013	T28	COIL—R-F and oscillator coil (Band 9)
RLI-014	T29	COIL—R-F and oscillator coil (Band 10)
RLI-015	T30	COIL—R-F and oscillator coil (Band 11)
RLI-016	T31	COIL—R-F and oscillator coil (Band 12)
RLI-017	T32	COIL—R-F and oscillator coil (Band 13)
RLI-019	L14	CHOKE—Oscillator cathode choke
RLI-031	L21	CHOKE—Cathode choke assembly
RLM-003	T22	COIL—R-F and oscillator coil (Band 3)
RLM-004	T23	COIL—R-F and oscillator coil (Band 4)
RLM-005	T24	COIL—R-F and oscillator coil (Band 5)
RLM-006	T25	COIL—R-F and oscillator coil (Band 6)
RLM-008	T20	COIL—R-F and oscillator coil (Band 1)
RLM-009	T21	COIL—R-F and oscillator coil (Band 2)
RMB-009		BUSHING—B-C tuning shaft bushing
RMF-004		CLIP—Dial window clip
RMR-004		RUBBER—Channel rubber for dial
RMM-039		CUSHION—Picture tube cushion
RMM-040		TRAP—Ion trap assembly
RMM-041		SHIELD—Tube base shield for 7F8 tube
RMM-042		SHIELD—Tube base shield for television tube
RMS-004		SPRING—Television tuning drive cord tension spring
RMS-109		SPRING—For focus coil assembly
RMS-110		STRAP—Safety strap for picture tube
RMS-111		SPRING—B-C drive cord tension spring
RMW-027		PULLEY—Idler pulley for B-C drive cord, ½ in. O. D.
RMW-035		PULLEY—Idler pulley for B-C drive cord, 13/16 in. O. D.
RMX-100		SHAFT—B-C tuning shaft assembly and "C" washer
RMX-101		SHAFT—Television tuning shaft and pulley assembly
RRC-020	R36, 61	POTENTIOMETER—100,000 ohms, 2 w., (Hor. Hold and Height)
RRC-021	R49, 62	POTENTIOMETER—250,000 ohms, ½ w., (Hor. Linearity and Vertical Hold)
RRC-022	R69A, B	POTENTIOMETER—2 meg., ½ w., (Volume control); 500,000 ohms, ½ w., (Tone control)
RTL-024	T2	TRANSFORMER—2nd video i-f transformer
RTL-025	T3	TRANSFORMER—3rd video i-f transformer
RTL-027	T13	TRANSFORMER—455 kc i-f transformer
RTL-033	T4	TRANSFORMER—4th video i-f transformer
RTL-034	T5	TRANSFORMER—Composite 455 kc and 10.7 mc i-f transformer
RTM-001	T7	TRANSFORMER—AFC synchronizing transformer
RTO-016	T8	TRANSFORMER—Vertical sweep output
RTO-017	T10	TRANSFORMER—Audio output transformer
RTO-032	T9	TRANSFORMER—Horizontal sweep output
RTP-037	T14	TRANSFORMER—Power transformer (50 cycles)
RTP-040	T14	TRANSFORMER—Power transformer (60 cycles)
RWL-004		CORD—Power cord
RWL-010		CORD—Power cord assembly, includes female plug

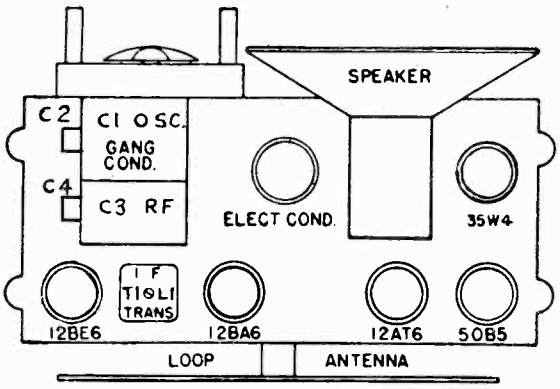
GENERAL TELEV. & RADIO CORP.

MODEL 4B5

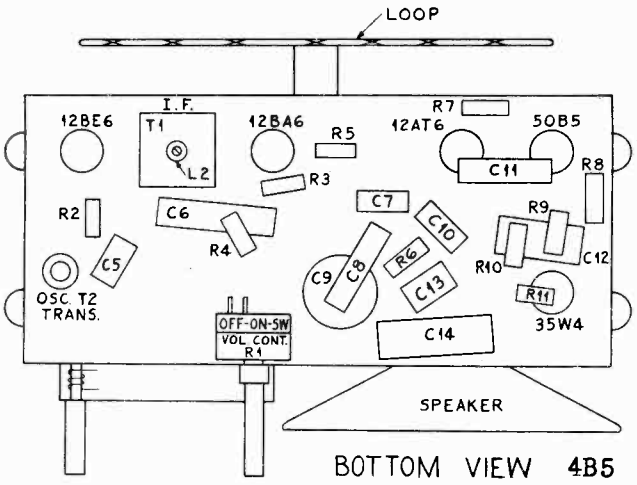


MODEL 4B5
MODEL 5B5, MODEL 9A5,
MODEL 23A6, MODEL 24B6,
MODEL 25B5

GENERAL TELEV. & RADIO CORP.

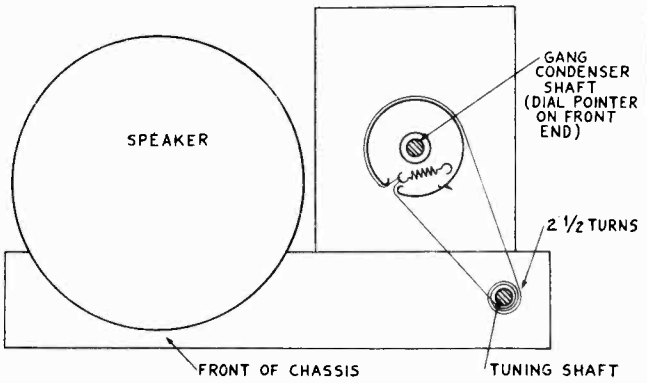


TUBE LAYOUT 4B5



BOTTOM VIEW 4B5

DIAL CORD DRIVE - MODELS 4B5,5B5,9A5, 23A6,24B6,25B5



Model 4B5

SOCKET	PIN	VTVM	20,000Ω/P.V.	1,000Ω/P.V.	RESISTANCE
12BE6 CONV.	1	-6	-6	-6 ON 100V SCALE -3.5 ON 10V SCALE	10K
	2	0	0	0	0
	3	AC	AC	AC	45Ω
	4	AC	AC	AC	30Ω
	5	+82	+82	+82	OVER 5 MEGS
	6	+82	+82	+82	OVER 5 MEGS
	7	-1.0	-0.5	-0.2	3 MEGS
12BA6 I.F. AMPL.	1	-1.0	-0.5	-0.2	3 MEGS
	2	0	0	0	0
	3	AC	AC	AC	25Ω
	4	AC	AC	AC	15Ω
	5	+25	+24	+22	OVER 5 MEGS
	6	+82	+82	+82	OVER 5 MEGS
	7	0	0	0	0
12AT6 DET. AVC AUDIO	1	-0.5	-0.2	0	10 MEGS
	2	0	0	0	0
	3	0	0	0	0
	4	AC	AC	AC	15Ω
	5	-0.5	-0.2	0	500K
	6	-0.5	-0.2	0	500K
	7	+40	+38	+15	OVER 5 MEGS
50B5 AUDIO OUTPUT	1	0	0	0	500K
	2	+5	+5	+5	150Ω
	3	AC	AC	AC	85Ω
	4	AC	AC	AC	35Ω
	5	+120	+120	+120	OVER 5 MEGS
	6	+82	+82	+82	OVER 5 MEGS
	7	--	--	--	--
35W4 RECT	1	AC	AC	AC	110Ω
	2	--	--	--	--
	3	AC	AC	AC	85Ω
	4	AC	AC	AC	115Ω
	5	AC	AC	AC	115Ω
	6	AC	AC	AC	110Ω
	7	+125	+125	+125	OVER 5 MEGS

ALL VOLTAGE AND RESISTANCE MEASUREMENT MADE WITH RESPECT TO CHASSIS GROUND AND WITH A LINE VOLTAGE OF 116 V. A. C.

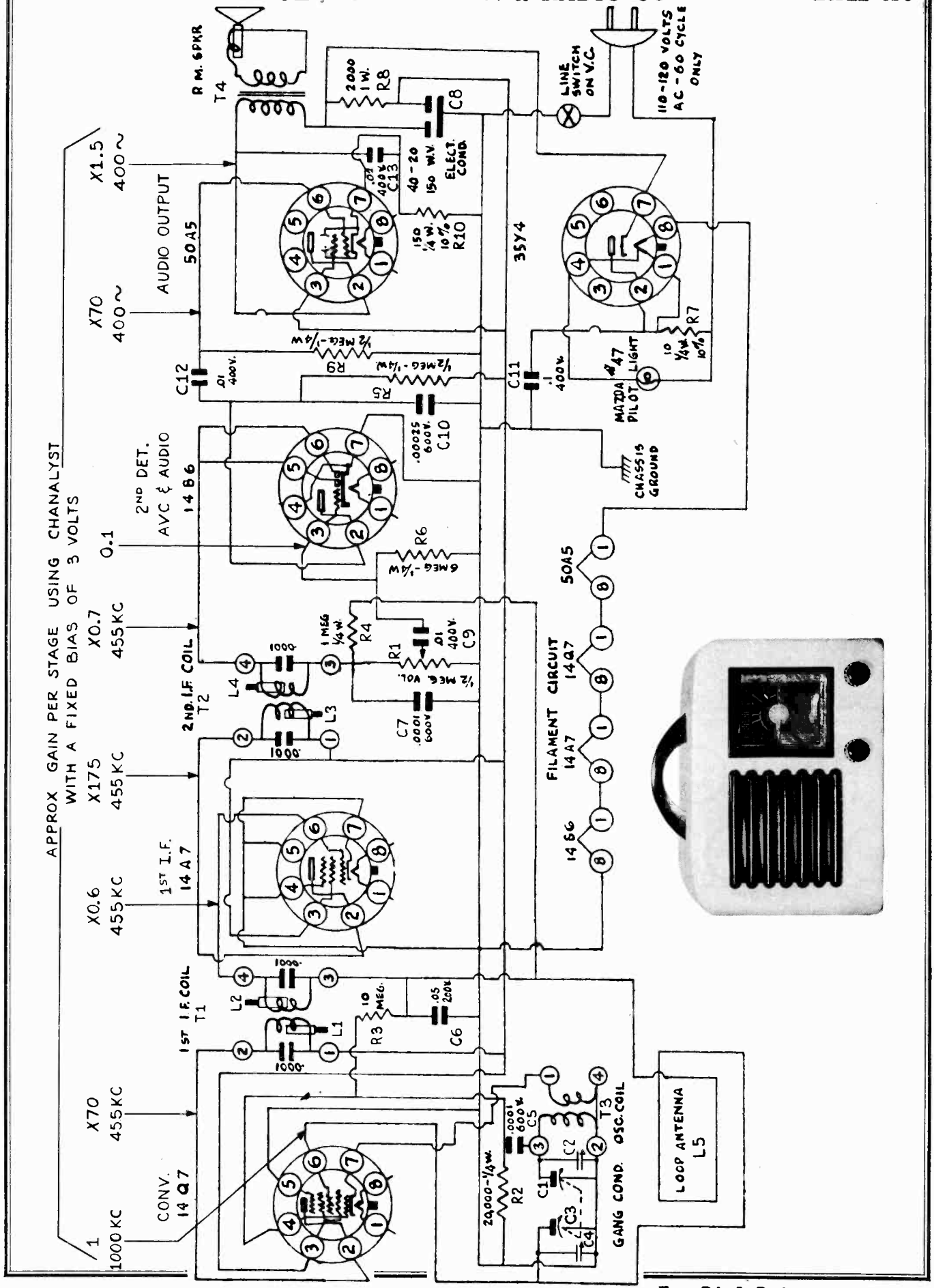
A L I G N M E N T - 4B5

THE CHASSIS MUST BE REMOVED FROM THE CABINET IN ORDER TO ALIGN THE RECEIVER. CONNECT THE OUTPUT METER ACROSS THE VOICE COIL. CONNECT THE SIGNAL GENERATOR TO THE STANDARD HAZELTINE MODEL 1150 LOOP, AND COUPLE LOOSELY TO THE RECEIVER LOOP. SET THE RECEIVER VOLUME CONTROL AT MAXIMUM.

THE TUNING CONDENSER PLATES SHOULD BE FULLY MESHED WHEN THE DIAL POINTER IS AT THE INDEX MARK AT THE LOW FREQUENCY END OF THE DIAL. THE SIGNAL GENERATOR OUTPUT SHOULD BE SUFFICIENT TO GIVE HALF SCALE DEFLECTION ON THE LOWEST SCALE OF THE OUTPUT METER. SET THE SIGNAL GENERATOR TO 455 KC. ADJUST THE I.F. TUNING SLUGS FOR MAXIMUM METER DEFLECTION IN THE FOLLOWING SEQUENCE: L2, L1. SET THE GENERATOR AND RECEIVER TO 700 KC AND ADJUST OSCILLATOR TRIMMER C2 FOR MAXIMUM OUTPUT. SET THE GENERATOR AND RECEIVER TO 1400 KC AND ADJUST LOOP TRIMMER C4 FOR MAXIMUM OUTPUT.

GENERAL TELEV. & RADIO CORP.

MODEL 5B5



For Dial Data, see P.16-2

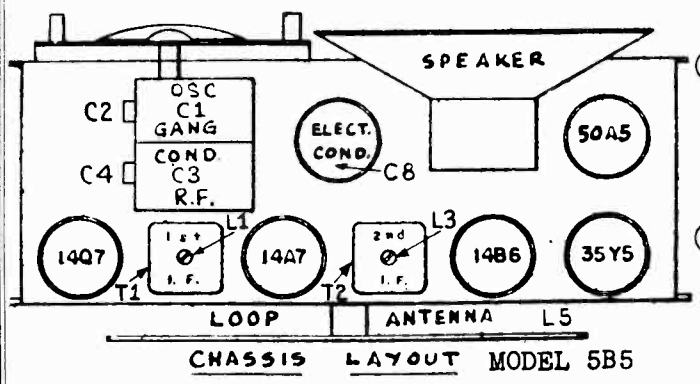
MODEL 5B5
MODEL 9A5
MODEL 24B6
MODEL 23A6
MODEL 25B5

GENERAL TELEV. & RADIO CORP.

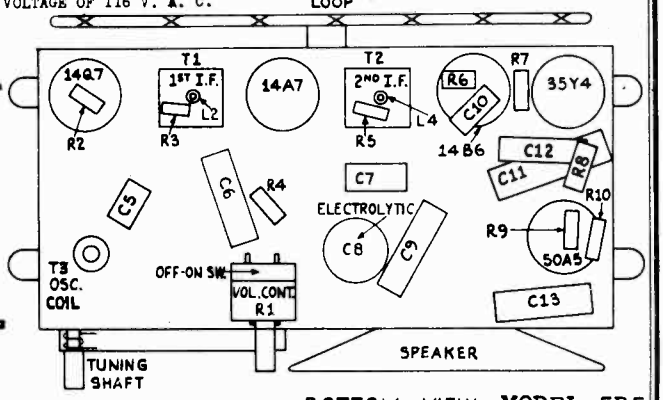
Model 5B5

SOCKET	PIN	VTVM	20,000Ω/P.V.	1,000Ω/P.V.	RESISTANCE
14Q7	1	AC	AC	AC	40Ω
CONV.	2	+86	+86	+86	OVER 5 MEGS
	3	+86	+86	+86	OVER 5 MEGS
	4	-12	-10	-7	20K
	5	0	0	0	0
	6	-1.5	-1.0	-0.2	1 MEG
	7	0	0	0	1Ω
	8	AC	AC	AC	25Ω
14A7	1	AC	AC	AC	15Ω
I.F.	2	+86	+86	+86	OVER 5 MEGS
	3	+86	+86	+86	OVER 5 MEGS
	4	0	0	0	0
	5	0	0	0	0
	6	-1.5	-1.0	-0.2	1 MEG
	7	0	0	0	0
	8	AC	AC	AC	25Ω
14B6	1	AC	AC	AC	15Ω
2ND DET.	2	+58	+52	+40 ON 1000V RANGE +12 ON 100V RANGE	OVER 5 MEGS
AVC AND AUDIO	3	-1.0	-0.6	-013	5.5 MEGS
	4	--	--	--	--
	5	-1.0	-0.6	-0.3	400K
	6	-1.0	-0.6	-0.3	400K
	7	0	0	0	0
	8	0	0	0	0
50A5	1	AC	AC	AC	85Ω
AUDIO OUTPUT	2	+120	+120	+120	OVER 5 MEGS
	3	+86	+86	+86	OVER 5 MEGS
	4	--	--	--	--
	5	--	--	--	--
	6	0	0	0	OVER 5 MEGS
	7	+5.0	+5.0	+5.0	150Ω
	8	AC	AC	AC	35Ω
35Y4	1	AC	AC	AC	120Ω
RECT.	2	AC	AC	AC	120Ω
	3	--	--	--	--
	4	AC	AC	AC	110Ω
	5	AC	AC	AC	110Ω
	6	AC	AC	AC	0
	7	+125	+125	+125	OVER 5 MEGS
	8	AC	AC	AC	85Ω

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND AND WITH A LINE VOLTAGE OF 116 V. A. C.



CHASSIS LAYOUT MODEL 5B5



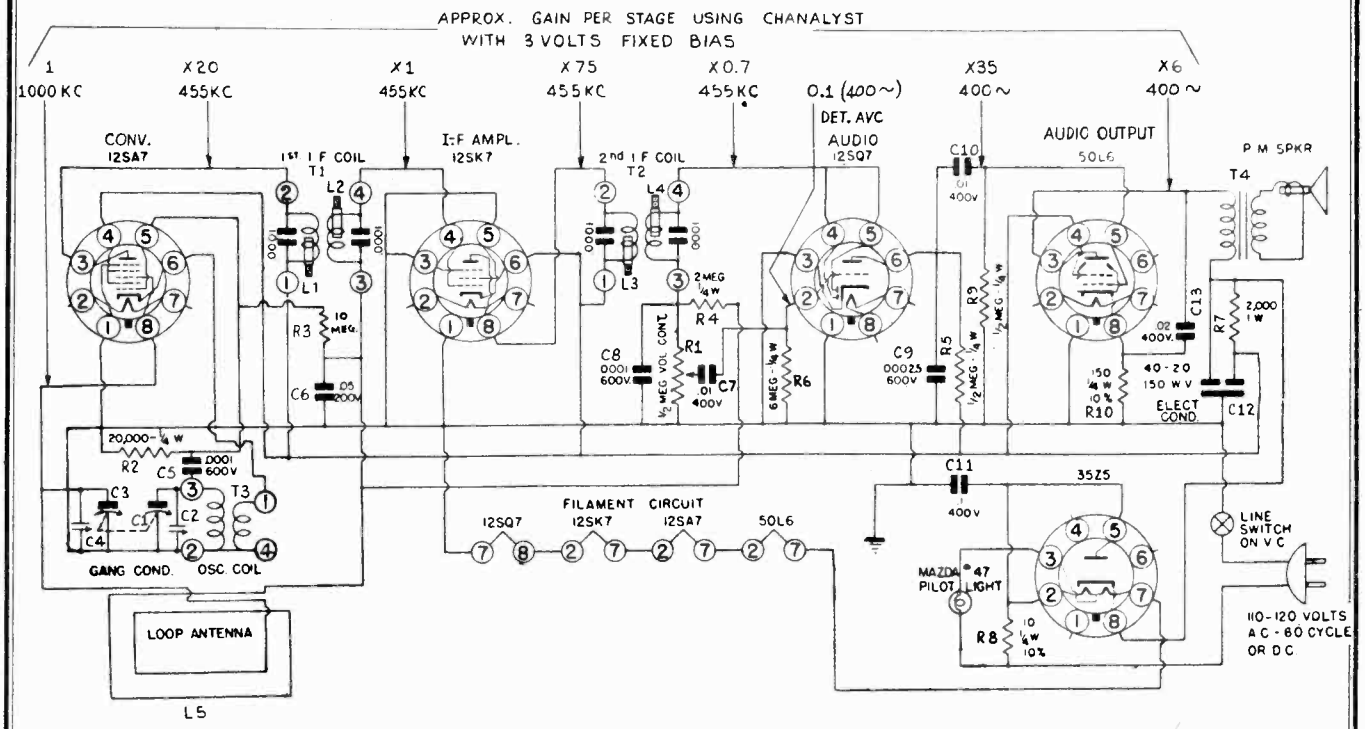
BOTTOM VIEW MODEL 5B5

ALIGNMENT - MODELS 5B5,9A5,23A6,24B6,25B5

THE CHASSIS MUST BE REMOVED FROM THE CABINET IN ORDER TO ALIGN THE RECEIVER. CONNECT THE OUTPUT METER ACROSS THE VOICE COIL. CONNECT THE SIGNAL GENERATOR TO THE STANDARD HAZELTINE MODEL 1150 LOOP, AND COUPLE LOOSELY TO THE RECEIVER LOOP. SET THE RECEIVER VOLUME CONTROL AT MAXIMUM. THE TUNING CONDENSER PLATES SHOULD BE FULLY MESHED WHEN THE DIAL POINTER IS AT THE INDEX MARK AT THE LOW FREQUENCY END OF THE DIAL. THE SIGNAL GENERATOR OUTPUT SHOULD BE JUST SUFFICIENT TO OBTAIN HALF SCALE DEFLECTION ON THE LOWEST SCALE OF THE OUTPUT METER. SET THE SIGNAL GENERATOR TO 455 KC. ADJUST THE I.F. TUNING SLUGS FOR MAXIMUM OUTPUT IN THE FOLLOWING SEQUENCE: L4, L3, L2, L1. SET THE GENERATOR AND RECEIVER TO 1600 KC AND ADJUST OSCILLATOR TRIMMER C2 FOR MAXIMUM OUTPUT. SET THE GENERATOR AND RECEIVER TO 1400 KC AND ADJUST R.F. TRIMMER C4 FOR MAXIMUM OUTPUT.

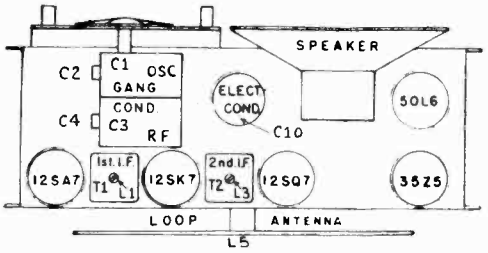
MODEL 9A5

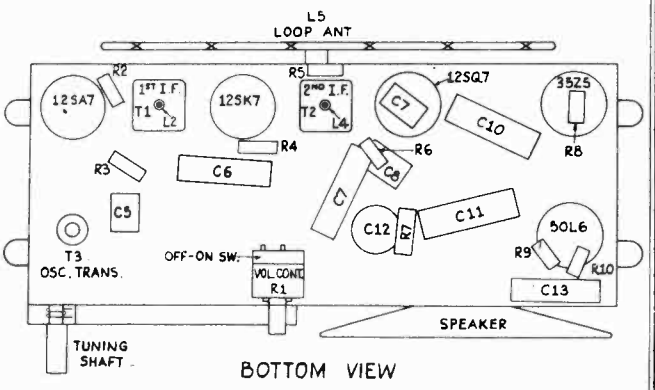
GENERAL TELEV. & RADIO CORP.



SOCKET	PIN	VTVM	20,000Ω/P2	1,000Ω/P2	RESISTANCE
12SA7GT	1	0	0	0	0
CONV	2	AC	AC	AC	25Ω
	3	+78	+78	+76	OVER 5 MEGS
	4	+78	+78	+76	OVER 5 MEGS
	5	-9	-8	-4.5	17K
	6	0	0	0	1Ω
	7	AC	AC	AC	40Ω
	8	-6	-2	-0.5	1.3 MEGS
12SK7GT	1	0	0	0	0
I-F AMPL.	2	AC	AC	AC	15Ω
	3	0	0	0	0
	4	-2	-0.8	-0.4	1.3 MEGS
	5	0	0	0	0
	6	+78	+78	+76	OVER 5 MEGS
	7	AC	AC	AC	25Ω
	8	+78	+78	+76	OVER 5 MEGS
12SQ7GT	1	0	0	0	0
DET. AVC	2	-1	-0.8	-0.4	6MEGS
AUDIO	3	0	0	0	0
	4	-1.5	-0.4	-0.2	400K
	5	-1.5	-0.4	-0.2	400K
	6	+48	+46	+12	OVER 5 MEGS
	7	AC	AC	AC	16Ω
	8	AC	AC	AC	0
50L6GT	1	0	0	0	0
AUDIO OUTPUT	2	AC	AC	AC	40Ω
	3	+115	+115	+115	OVER 5 MEGS
	4	+75	+75	+75	OVER 5 MEGS
	5	0	0	0	550K
	6	--	--	--	--
	7	AC	AC	AC	80Ω
	8	+5	+5	+5	150Ω
35Z5GT	1	--	--	--	--
	2	AC	AC	AC	120Ω
	3	AC	AC	AC	110Ω
	4	--	--	--	--
	5	AC	AC	AC	120Ω
	6	AC	AC	AC	120Ω
	7	AC	AC	AC	90Ω
	8	+115	+115	+115	OVER 5 MEGS

"NOTE" ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND AND WITH A LINE VOLTAGE OF 116 V. A. C.





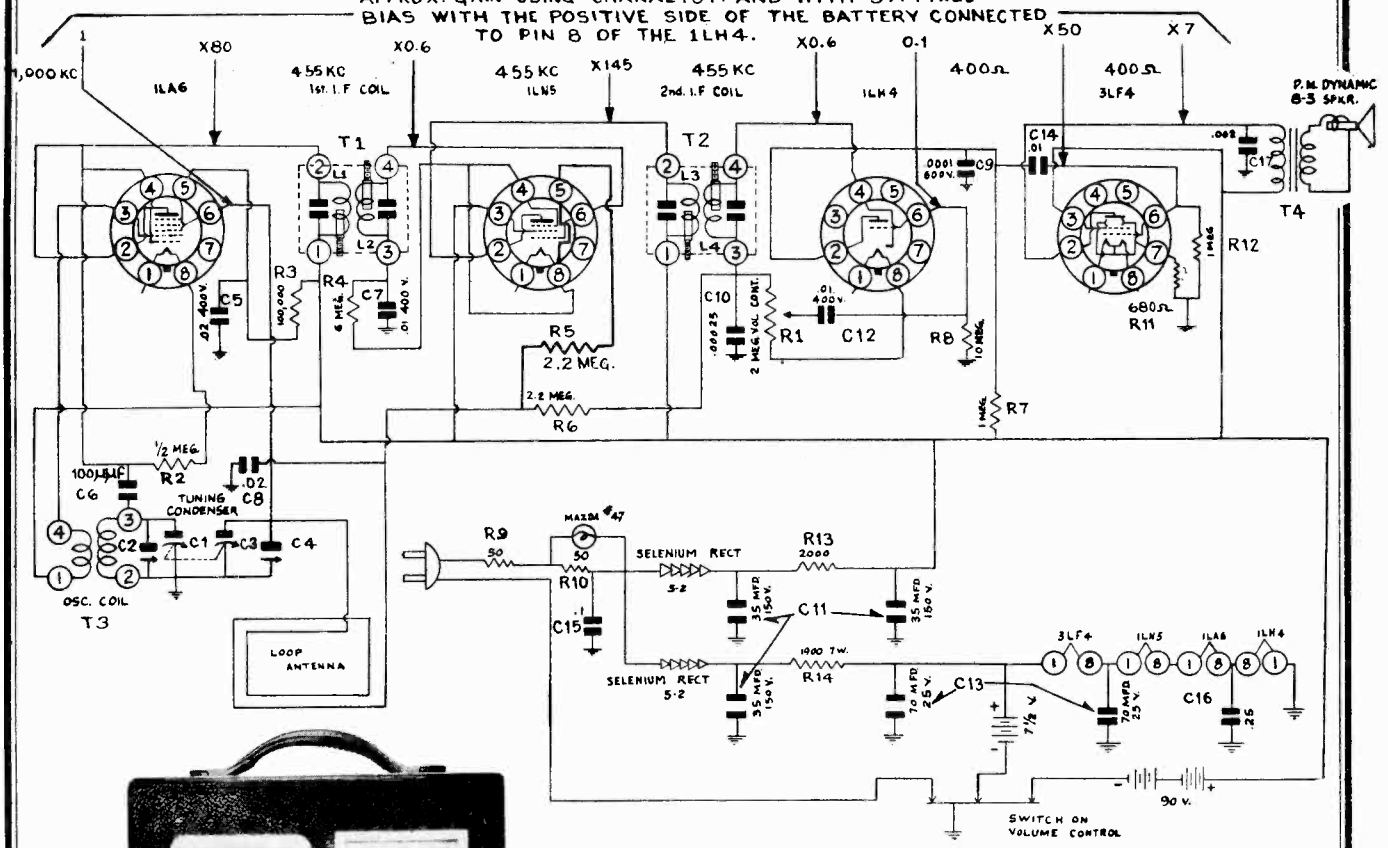
BOTTOM VIEW

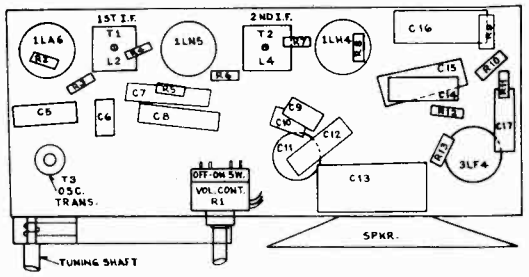
For Alignment, see P.16-4
For Dial Data, see P.16-2

MODEL 23A6

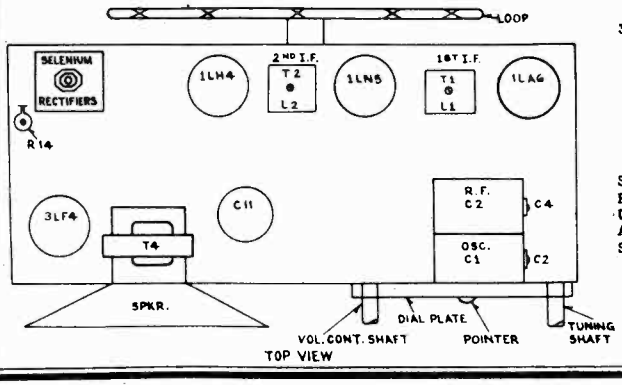
GENERAL TELEV. & RADIO CORP.

APPROX. GAIN USING CHANALYST. AND WITH -3V. FIXED BIAS WITH THE POSITIVE SIDE OF THE BATTERY CONNECTED TO PIN 8 OF THE 1LH4.





BOTTOM VIEW



TOP VIEW

SOCKET	PIN	VTVM	20,000Ω/P.V.	1,000Ω/P.V.	RESISTANCE
1LA6	1	+3.5	+3.4	+3.4	24 Ω
	2	+100	+100	+100	500K TO 1 MEG
	3	+100	+100	+100	500K TO 1 MEG
	4	-2	-0.2	0	500K
	5	+40	+40	--	500K TO 1 MEG
	6	+0.5	+0.2	+32	1.5 MEG
	7	--	--	--	--
	8	+1.8	+1.7	+1.7	14 Ω
1LN5	1	+5.3	+5.2	+5.2	34 Ω
	2	+100	+100	+100	500K TO 1 MEG
	3	+100	+100	+100	500K TO 1 MEG
	4	+3.5	+3.4	+3.4	24 Ω
	5	+3.5	+3.4	+3.4	24 Ω
	6	+2.5	+0.2	0	6 MEGS
	7	+1.5	+0.2	0	1.5 MEGS
	8	+3.5	+3.4	+3.4	24 Ω
1LH4	1	0	0	0	0
	2	+56	+48	+8	1.5 MEG TO 2 MEGS
	3	+8.2	+8	+8	52 Ω
	4	+0.7	+0.2	0	1.2 MEGS
	5	--	--	--	--
	6	-0.2	0	0	10 MEGS
	7	--	--	--	--
	8	+1.8	+1.7	+1.7	14 Ω
3LF4	1	+8.2	+8	+8	52 Ω
	2	+98	+98	+96	500K TO 1 MEG
	3	+100	+100	+100	500K TO 1 MEG
	4	--	--	--	--
	5	+130	+130	+130	500K TO 1 MEG
	6	0	0	0	1.3 MEGS
	7	+6.6	+6.4	+6.4	44 Ω
	8	+5.3	+5.2	+5.2	36 Ω

SELENIUM RECTIFIERS USED FOR A AND B SUPPLY

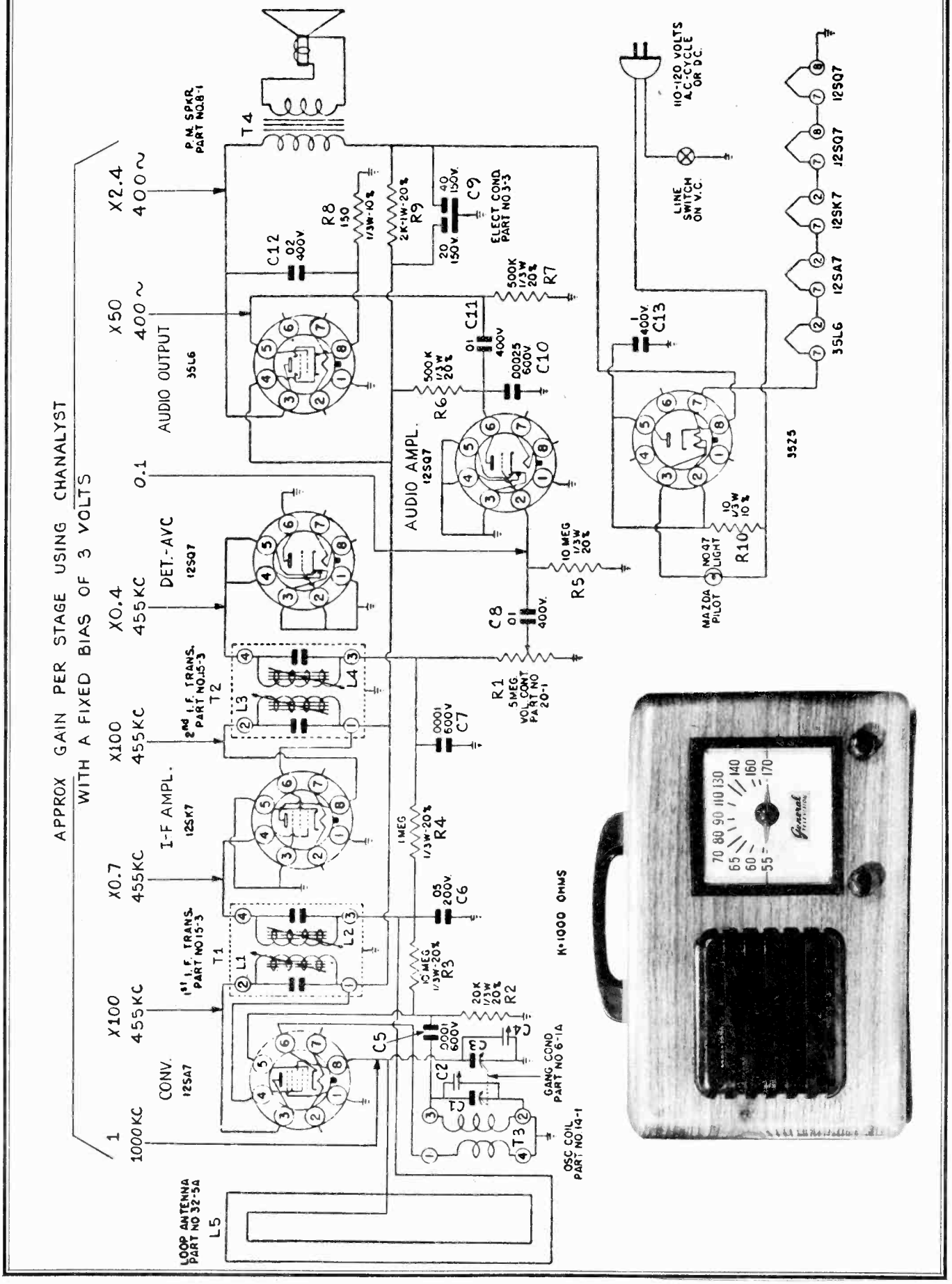
FILAMENT SUPPLY = 8.2 V. D. C.
PLATE SUPPLY = 130V

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND AND WITH A LINE VOLTAGE OF 116 V. A. C.

For Alignment, see P.16-4
For Dial Data, see P.16-2

GENERAL TELEV. & RADIO CORP.

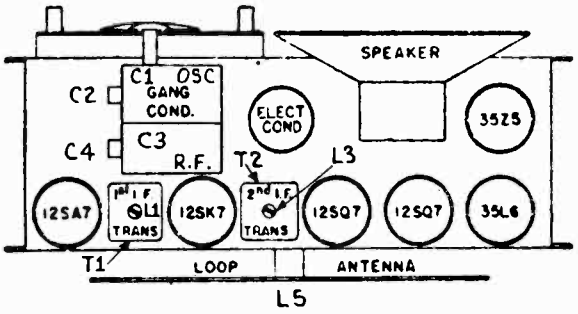
MODEL 24B6

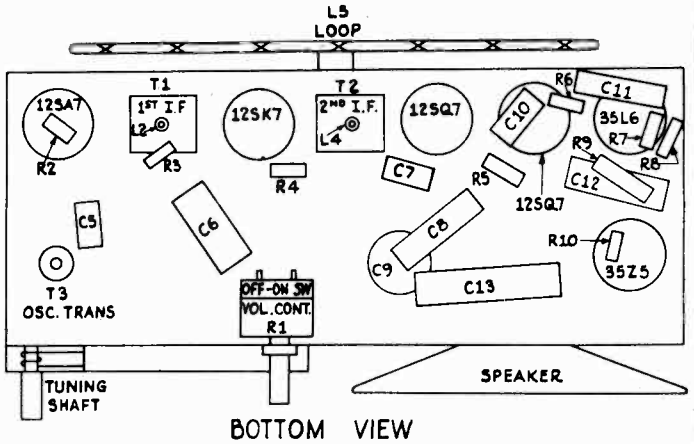


For Alignment, see P.16-4
For Dial Data, see P.16-2

MODEL 24B6

GENERAL TELEV. & RADIO CORP.





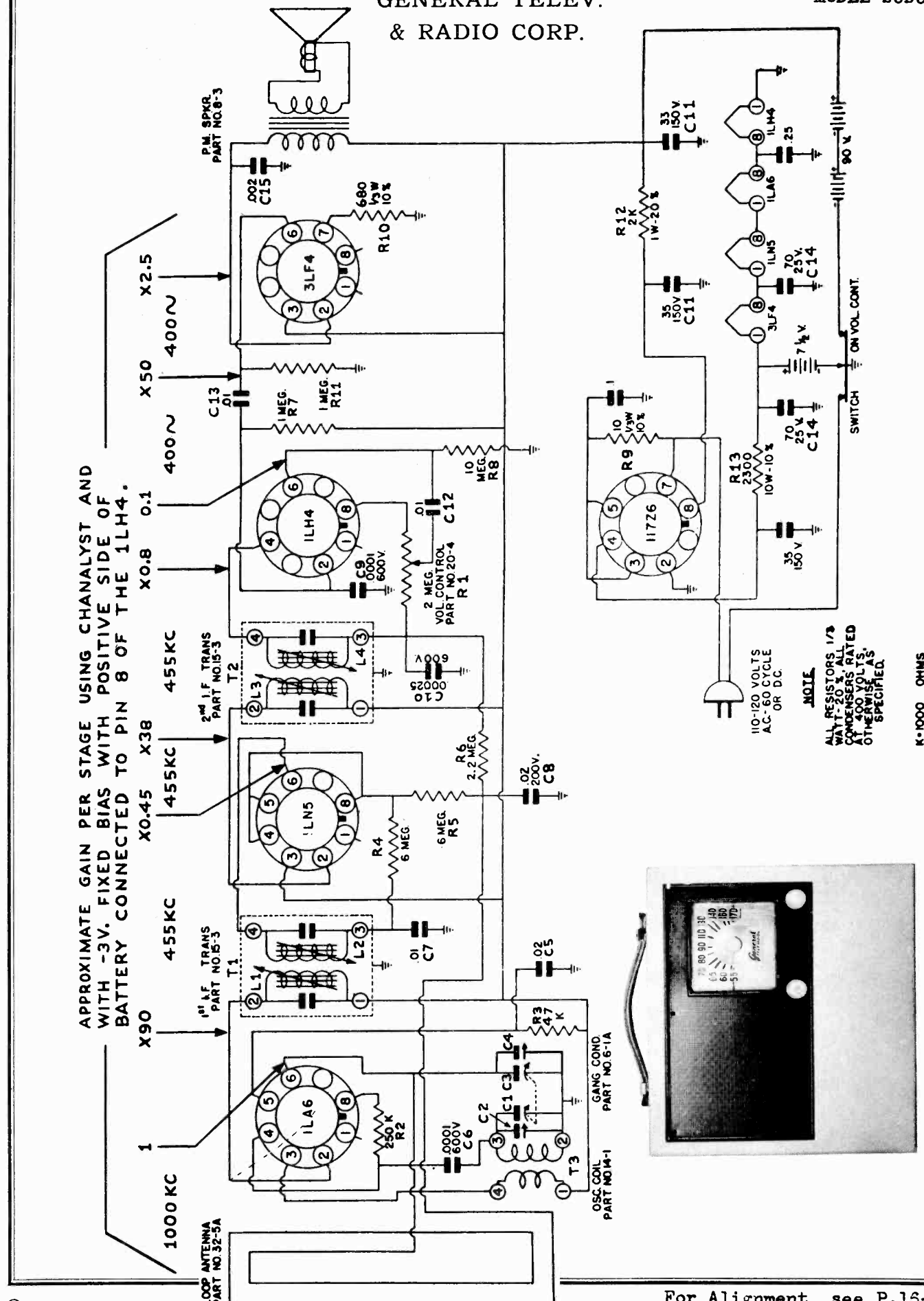
BOTTOM VIEW

SOCKET	PIN	VTVM	20,000Ω/P.V.	1,000Ω/P.V.	RESISTANCE
12SA7	1	0	0	0	0
CONV.	2	AC	AC	AC	70
	3	+84	+84	+84	OVER 5 MEGS
	4	+84	+84	+84	OVER 5 MEGS
	5	-11	-10	-9 ON 100V SCALE	
				-5 ON 10V SCALE	17K
	6	0	0	0	1.2Ω
	7	AC	AC	AC	70Ω
	8	-1.5	-0.6	-0.4	1 MEG
12SK7	1	0	0	0	0
I-F AMPL	2	AC	AC	AC	30Ω
	3	0	0	0	0
	4	-1.5	-0.6	-0.4	1 MEG
	5	0	0	0	0
	6	+84	+84	+84	OVER 5 MEGS
	7	AC	AC	AC	45Ω
	8	+84	+84	+84	OVER 5 MEGS
12SQ7	1	0	0	0	0
DET	2	0	0	0	0
AVC	3	0	0	0	0
	4	-0.5	-0.4	-0.2	450K
	5	-0.5	-0.4	-0.2	450K
	6	0	0	0	0
	7	AC	AC	AC	30Ω
	8	AC	AC	AC	20Ω
12SQ7	1	0	0	0	0
AUDIO	2	-0.8	-0.6	-0.2	9 MEG
AMPL.	3	0	0	0	0
	4	0	0	0	0
	5	0	0	0	0
	6	+52	+48	+14	OVER 5 MEG
	7	AC	AC	AC	15Ω
	8	0	0	0	0
35L6	1	0	0	0	0
AUDIO	2	AC	AC	AC	55Ω
CUTPUT	3	+125	+125	+125	OVER 5 MEGS
	4	+84	+84	+84	OVER 5 MEGS
	5	0	0	0	525K
	6	--	--	--	--
	7	AC	AC	AC	90Ω
	8	+4.5	+4.5	+4.5	150Ω
35Z5	1	--	--	--	--
RECT.	2	AC	AC	AC	120Ω
	3	AC	AC	AC	110Ω
	4	AC	AC	AC	0
	5	AC	AC	AC	120Ω
	6	AC	AC	AC	115Ω
	7	AC	AC	AC	85Ω
	8	+130	+130	+130	OVER 5 MEGS

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND AND WITH A LINE VOLTAGE OF 116 V.A.C.

GENERAL TELEV. & RADIO CORP.

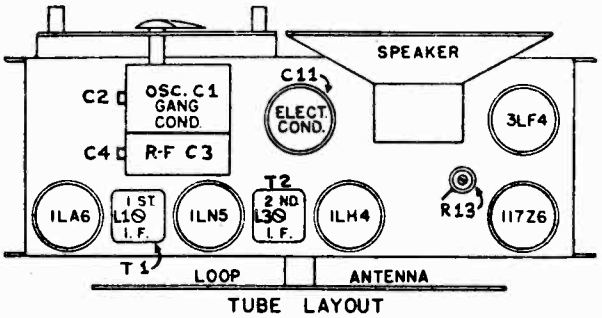
MODEL 25B5



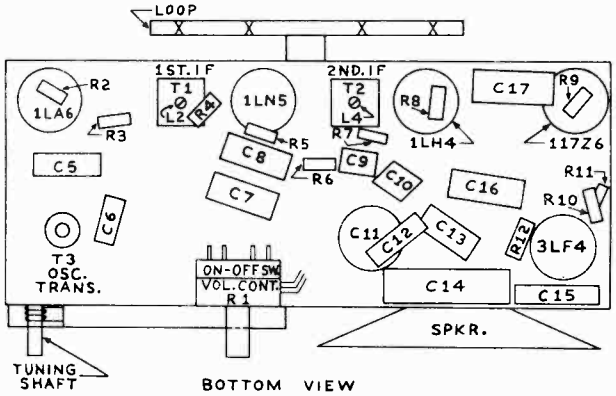
For Alignment, see P.16-4
For Dial Data, see P.16-2

MODEL 25B5

GENERAL TELEV. & RADIO CORP.



TUBE LAYOUT



BOTTOM VIEW

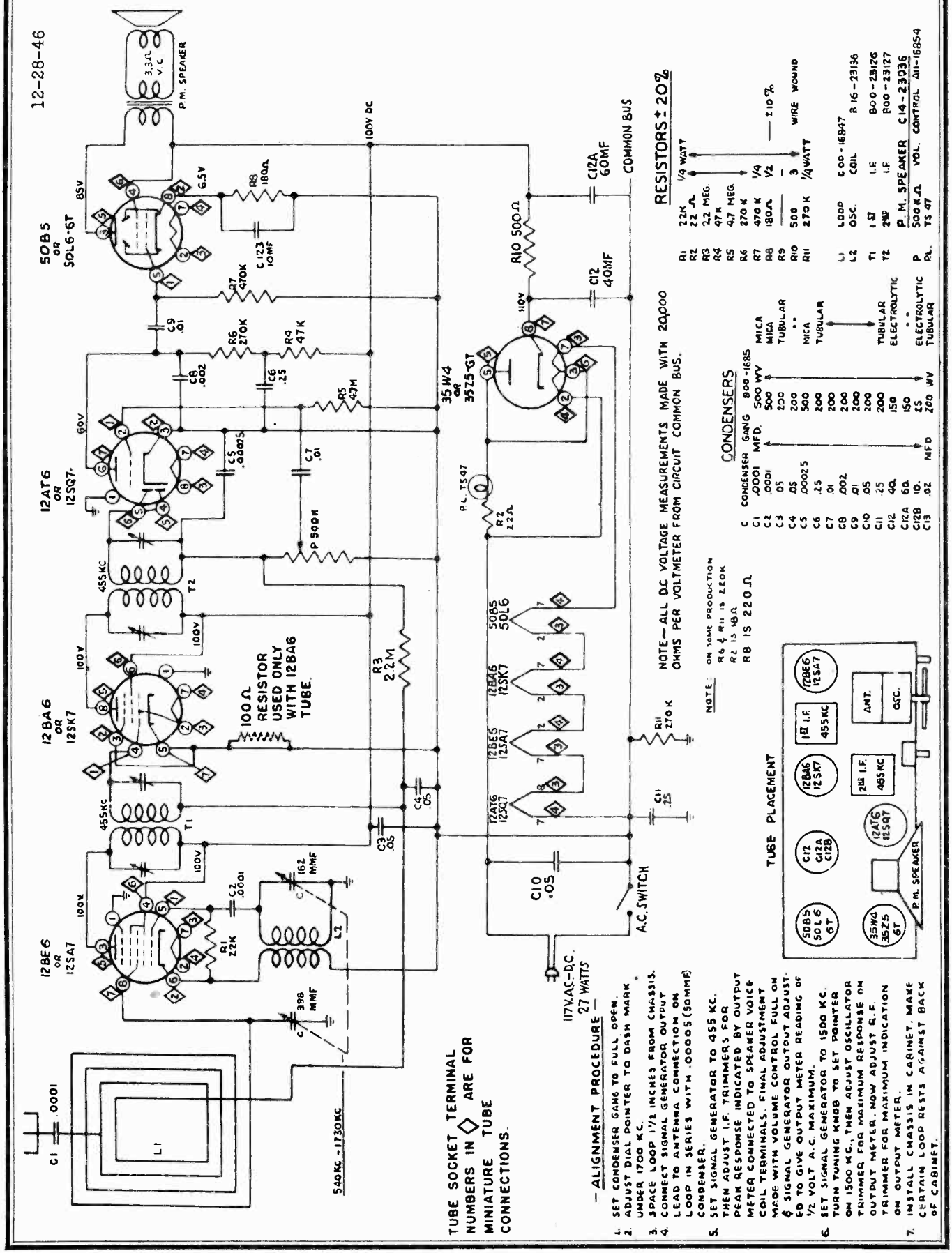
SOCKET	PIN	VTVM	20,000Ω/P2	1,000Ω/P2	RESISTANCE
1LA6	1	+3.5	+3.4	+3.4	50Ω
CONV.	2	+110	+110	+110	OVER 5 MEGS
	3	+110	+110	+110	OVER 5 MEGS
	4	-3	-0.6	0	280K
	5	+58	+57	+48	OVER 5 MEGS
	6	+1.3	0	0	2.7 MEGS
	7	--	--	--	--
	8	+1.7	+1.7	+1.7	30Ω
1LN5	1	+4.8	+4.7	+4.7	60Ω
I-F AMPL	2	+110	+110	+110	OVER 5 MEGS
	3	+110	+110	+110	OVER 5 MEGS
	4	+3.3	+3.2	+3.2	50Ω
	5	+3.3	+3.2	+3.2	50Ω
	6	+2.5	0	0	6 MEGS
	7	+1.3	0	0	2.6 MEGS
	8	+3.4	+3.2	+3.2	50Ω
1LH4	1	0	0	0	0
DET	2	+62	+55	+40	OVER 5 MEGS
AVC	3	+7.4	+7.1	+7.1	70Ω
AUDIO	4	+0.6	+0.2	0	1.5 MEGS
	5	0	0	0	0
	6	-0.4	0	0	8 MEGS
	7	--	--	--	--
	8	+1.7	+1.6	+1.6	30Ω
3LF4	1	+7.3	7.2	7.2	70Ω
AUDIO	2	+107	+107	+107	OVER 5 MEGS
OUTPUT	3	+110	+110	+110	OVER 5 MEGS
	4	--	--	--	--
	5	+118	+118	+118	OVER 5 MEGS
	6	0	0	0	1 MEG.
	7	+6.2	+6	+6	55Ω
	8	+5	+4.8	+4.8	50Ω
117Z6GT	1	--	--	--	--
RECT.	2	0	0	0	0
	3	AC	AC	AC	250Ω
	4	+125	+125	+125	2.5K
	5	AC	AC	AC	250Ω
	6	--	--	--	--
	7	AC	AC	AC	240Ω
	8	+142	+140	+140	OVER 5 MEGS

VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND AND WITH A LINE VOLTAGE OF 116 V. A. C.

GILFILLAN BROS. INC.

MODELS 56A, 56B, 56C, 56D, 56E

12-28-46



RESISTORS ± 20%

R1	22K	1/4 WATT	
R2	22Ω		
R3	2.2 MEG.		
R4	47K		
R5	4.7 MEG.		
R6	270 K	1/4	± 10%
R7	470 K	1/2	
R8	180Ω	—	
R9	500	3 WIRE WOUND	
R10	270 K	1/4 WATT	
R11	270 K		

L1	LOOP	C 00-16847	
L2	OSC. COIL	B 16-23136	
T1	1ST I.F.	B00-23126	
T2	2ND I.F.	B00-23127	
P	P. M. SPEAKER	C14-23036	
P1.	500Ω VOL. CONTROL	A11-16854	

CONDENSERS

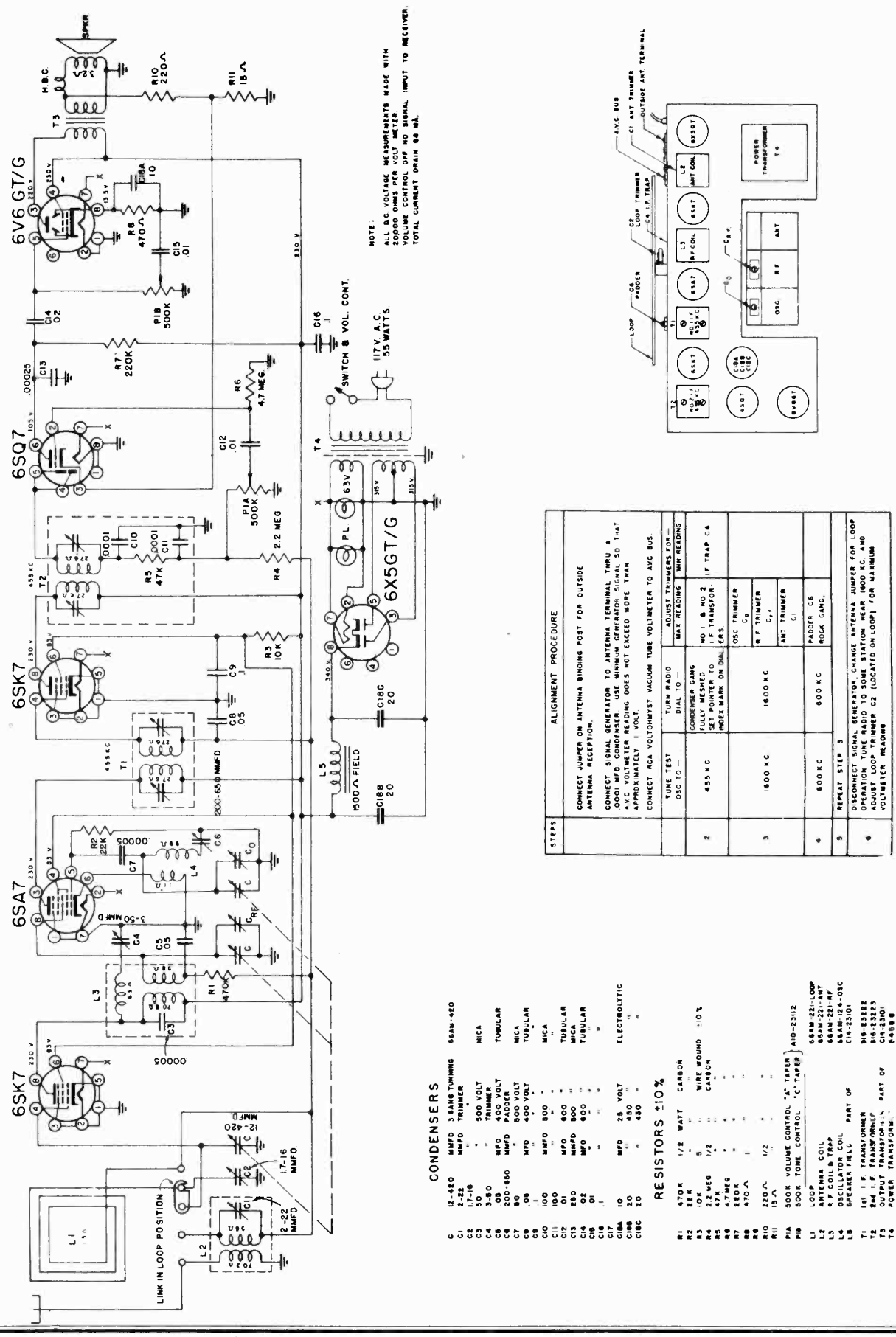
C	CONDENSER GANG	B00-1685	
C1	.0001 MFD.	500 WV	MICA
C2	.0001	500	MICA
C3	.05	200	TUBULAR
C4	.05	200	"
C5	.00025	500	MICA
C6	.25	200	TUBULAR
C7	.01	200	
C8	.002	200	
C9	.01	200	
C10	.05	200	TUBULAR
C11	.25	200	ELECTROLYTIC
C12	40	150	"
C12A	60	150	
C12B	10.	25	ELECTROLYTIC
C13	.02	200 WV	TUBULAR
	MFD		

— ALIGNMENT PROCEDURE —

1. SET CONDENSER GANG TO FULL OPEN.
2. ADJUST DIAL POINTER TO DASH MARK UNDER 1700 KC.
3. SPACE LOOP 1½ INCHES FROM CHASSIS.
4. CONNECT SIGNAL GENERATOR OUTPUT LEAD TO ANTENNA CONNECTION ON LOOP IN SERIES WITH .00005 (50MMF) CONDENSER.
5. SET SIGNAL GENERATOR TO 455 KC. THEN ADJUST I.F. TRIMMERS FOR PEAK RESPONSE INDICATED BY OUTPUT METER CONNECTED TO SPEAKER VOICE COIL TERMINALS. FINAL ADJUSTMENT MADE WITH VOLUME CONTROL FULL ON & SIGNAL GENERATOR OUTPUT ADJUSTED TO GIVE OUTPUT METER READING OF ½ VOLT A.C. MAXIMUM.
6. SET SIGNAL GENERATOR TO 1500 KC. TURN TUNING KNOB TO SET POINTER ON 1500 KC., THEN ADJUST OSCILLATOR TRIMMER FOR MAXIMUM RESPONSE ON OUTPUT METER. NOW ADJUST R.F. TRIMMER FOR MAXIMUM INDICATION ON OUTPUT METER.
7. INSTALL CHASSIS IN CABINET. MAKE CERTAIN LOOP RESTS AGAINST BACK OF CABINET.

MODELS 66AM, 66DM

GILFILLAN BROS. INC.



NOTE:
ALL D.C. VOLTAGE MEASUREMENTS MADE WITH 20000 OHMS PER VOLT METER.
VOLUME CONTROL OFF NO SIGNAL INPUT TO RECEIVER.
TOTAL CURRENT DRAIN 68 MA.

ALIGNMENT PROCEDURE

STEPS		TUNE TEST OSC TO—	TURN RADIO DIAL TO—	ADJUST TRIMMERS FOR— MAX READING	MIN READING
	CONNECT JUMPER ON ANTENNA BINDING POST FOR OUTSIDE ANTENNA RECEPTION.				
	CONNECT SIGNAL GENERATOR TO ANTENNA TERMINAL THRU A .0001 MFD. CONDENSER. USE MINIMUM GENERATOR SIGNAL SO THAT A.V.C. VOLTMETER READING DOES NOT EXCEED MORE THAN APPROXIMATELY 1 VOLT.				
	CONNECT RCA VOLTOHMYST VACUUM TUBE VOLTMETER TO AVC BUS.				
2		455 KC	CONDENSER GANG FULLY MESHED SET POINTER TO INDEX MARK ON DIAL	NO 1 & NO 2 I.F. TRANSFORMERS.	I.F. TRAP C4
3		1600 KC	1600 KC	OSC TRIMMER C_o	
				R.F. TRIMMER $C_{r.f.}$	
				ANT. TRIMMER C1	
4		600 KC	600 KC	PADDER C6 ROCK GANG.	
5	REPEAT STEP 3				
6	DISCONNECT SIGNAL GENERATOR. CHANGE ANTENNA JUMPER FOR LOOP OPERATION. TUNE RADIO TO SOME STATION NEAR 1600 KC. AND ADJUST LOOP TRIMMER C2 (LOCATED ON LOOP) FOR MAXIMUM VOLTMETER READING				

CONDENSERS

C	12-420	MMFD	3 GANG TUNING	66AM-420
C1	2-22	MMFD	TRIMMER	"
C2	17-16	"	"	"
C3	50	"	500 VOLT	MICA
C4	3-80	"	TRIMMER	"
C5	.05	MFD	400 VOLT	TUBULAR
C6	200-650	MMFD	PADDER	"
C7	80	"	600 VOLT	MICA
C8	.05	MFD	400 VOLT	TUBULAR
C9	.1	"	"	"
C10	100	MMFD	600	MICA
C11	.0001	MFD	600	"
C12	.01	"	600	TUBULAR
C13	250	MMFD	600	MICA
C14	.02	MFD	600	TUBULAR
C15	.01	"	"	"
C16	.1	"	"	"
C17				
C18A	10	MFD	25 VOLT	ELECTROLYTIC
C18B	20	"	450	"
C18C	20	"	450	"

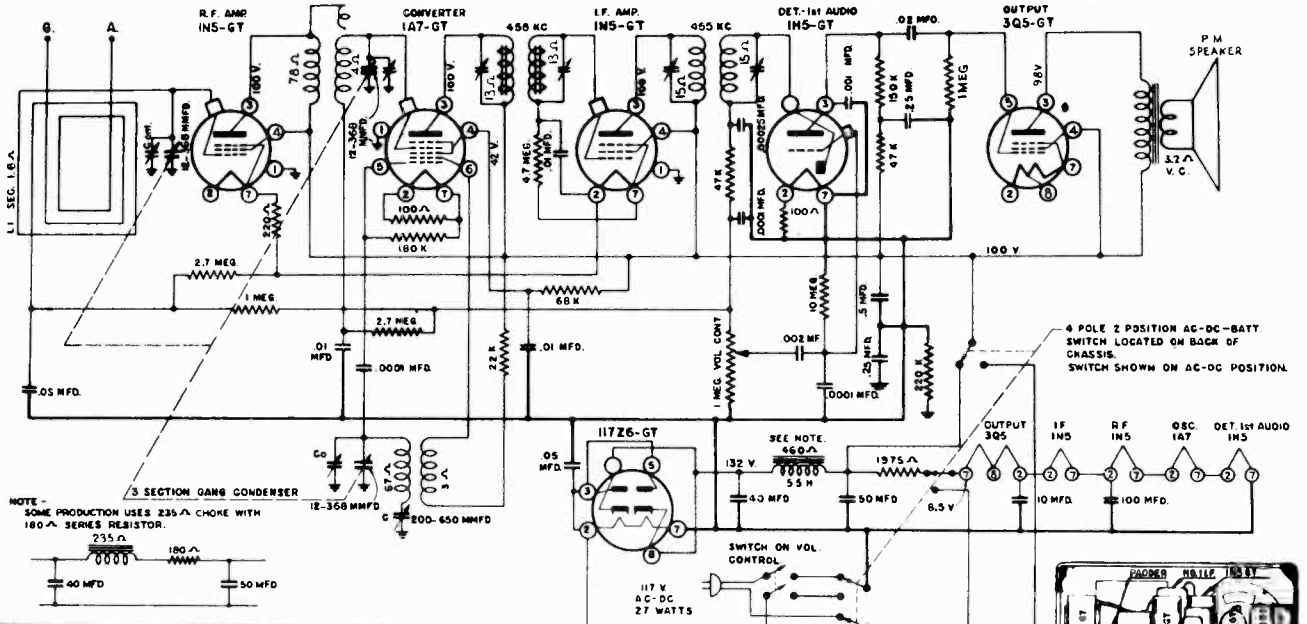
RESISTORS ±10%

R1	470K	1/2 WATT	CARBON
R2	22K	"	"
R3	10K	5	WIRE WOUND ±10%
R4	2.2 MEG	1/2	CARBON
R5	47K	"	"
R6	4.7 MEG	"	"
R7	220K	"	"
R8	470Ω	1	"
R10	220Ω	1/2	"
R11	15Ω	"	"
P1A	500K VOLUME CONTROL "A" TAPER		A10-23112
P1B	500K TONE CONTROL "C" TAPER		

L1	LOOP	66AM-22-LOOP
L2	ANTENNA COIL	66AM-221-ANT
L3	R.F. COIL & TRAP	66AM-221-RF
L4	OSCILLATOR COIL PART OF	66AM-124-OSC
L5	SPEAKER FIELD	C14-23101
T1	1st I.F. TRANSFORMER	816-23202
T2	2nd I.F. TRANSFORMER	816-23203
T3	OUTPUT TRANSFORMER PART OF	C14-23101
T4	POWER TRANSFORMER	A4188
PL	PILOT LIGHTS 6.8V MA	15-47
SPKR	ELECTRO-DYNAMIC	C14-23101

GILFILLAN BROS. INC.

MODEL 66B, Series 2, Overland
MODEL 66B, Series 3, Overland



NOTE - SOME PRODUCTION USES 235 Ω CHOKE WITH 180 Ω SERIES RESISTOR.

ALIGNMENT PROCEDURE

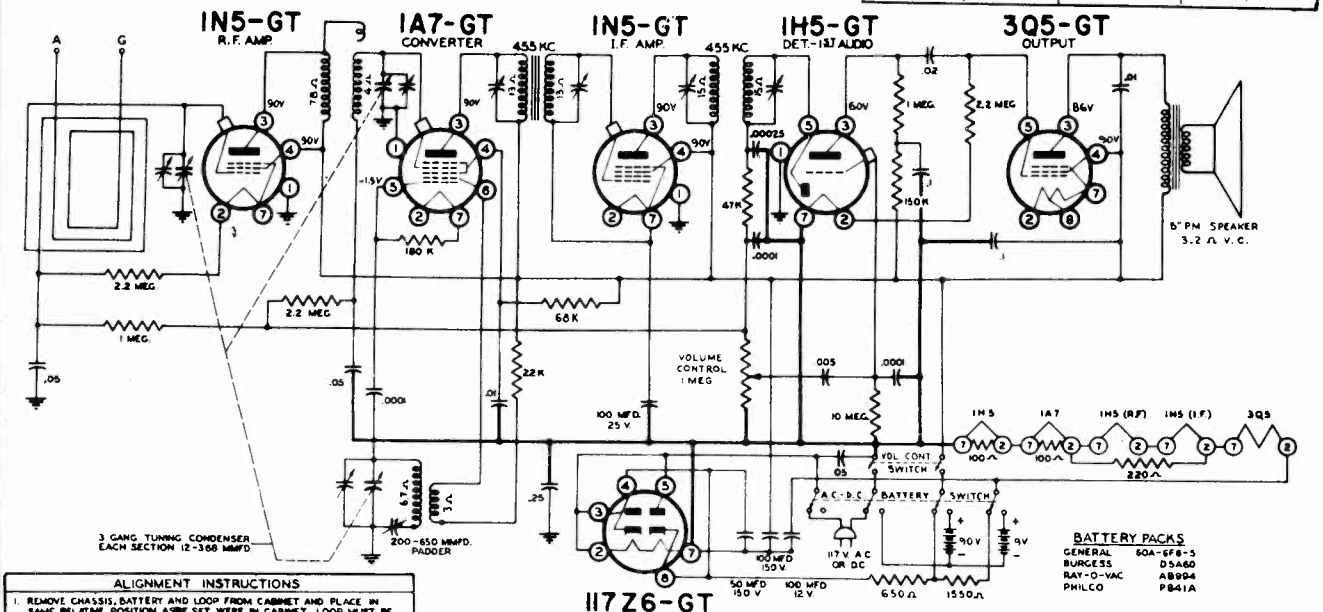
PRELIMINARY INFORMATION	CONNECT SIGNAL GENERATOR TO ANTENNA AND GROUND TERMINALS. USE ONLY SUFFICIENT SIGNAL STRENGTH TO CAUSE -5 VOLT ON A.V.C. BUS (LARGE TERMINAL OF LOOP PLUG) AS READ ON RCA VOLTOHMYST VACUUM TUBE VOLTMETER OR EQUIVALENT.

STEPS	TUNE TEST OSC. TO—	TUNE RADIO DIAL TO—	ADJUST TRIMMER FOR MAXIMUM READING
1	455 KC	CONDENSER GANG FULLY MESHED SET POINTER HORIZONTAL	IF TRANSFORMERS T1 AND T2
2	1600 KC	1600 KC	OSC TRIMMER Co R.F. TRIMMER C#1 ANT TRIMMER Cant
3	600 KC	600 KC	PADDER C WHILE ROCKING GANG
4	REPEAT STEP 2		
5	MOVE POINTER SLIGHTLY IF CALIBRATION CAN BE IMPROVED.		

THE OVERLAND - MODEL 66B SERIES 2

THIS RADIO IS SUPPLIED WITH COMBINATION A-B BATTERY PACK. FOR YOUR CONVENIENCE AN EXTRA BATTERY CABLE MAY BE OBTAINED FROM YOUR DEALER SO THAT YOU MAY MAKE BATTERY REPLACEMENTS BY MEANS OF SEPARATE "A" AND "B" BATTERIES. YOUR GILFILLAN PORTABLE RADIO HAS BEEN ESPECIALLY DESIGNED TO GIVE 200-250 HOURS OF BATTERY LIFE WHEN USED ON BATTRIES AN AVERAGE OF 4 HOURS PER DAY WHEN OPERATED ON A.C. OR D.C. HOUSE CURRENT YOUR BATTERIES ARE NOT USED.

MFGR	A-B PACKS	"A" BATTERIES	"B" BATTERIES
	NO	NO	NO
GENERAL	60A-6F6-5	3H3	V30A OR F30A
BURGESS	B5A60	6B	M30
EVEREADY		746	482
RAY-O-VAC	AB994	P83A	P430
PHILCO	P841A	P1D0	P210



ALIGNMENT INSTRUCTIONS

1. REMOVE CHASSIS, BATTERY AND LOOP FROM CABINET AND PLACE IN SAME RELATIVE POSITION AS IF SET WERE IN CABINET. LOOP MUST BE CLOSE TO BACK OF CHASSIS TO OBTAIN PROPER ALIGNMENT.
2. CONNECT SIGNAL GENERATOR LEADS TO ANT.-GND. POSTS ON LOOP; CONNECT AUDIO OUTPUT METER ACROSS VOICE COIL TERMINALS. DO NOT EXCEED +3 VOLT READING ON METER. ADJUST POINTER TO HORIZONTAL POSITION WITH GANG CLOSED.

STEP	TUNE TEST OSCILLATOR TO	TUNE RADIO DIAL TO	ADJUST TRIMMERS FOR MAXIMUM OUTPUT READING
1	455 KC	1600 KC	I.F. TRANSFORMERS
2	1400 KC	1400 KC	OSC., R.F., ANT.
3	600 KC	600 KC	PADDER CONDENSER

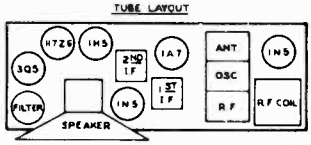
IN SOME CASES IT IS IMPOSSIBLE TO OBTAIN SUFFICIENT ATTENUATION OF THE GENERATOR SIGNAL FOR ACCURATE ALIGNMENT. IN SUCH CASES THE GENERATOR SHOULD BE CONNECTED TO AN AUXILIARY LOOP PLACED A FOOT OR SO FROM THE RECEIVER LOOP.

THE OVERLAND - MODEL 66B THIRD SERIES

BATTERY PACKS

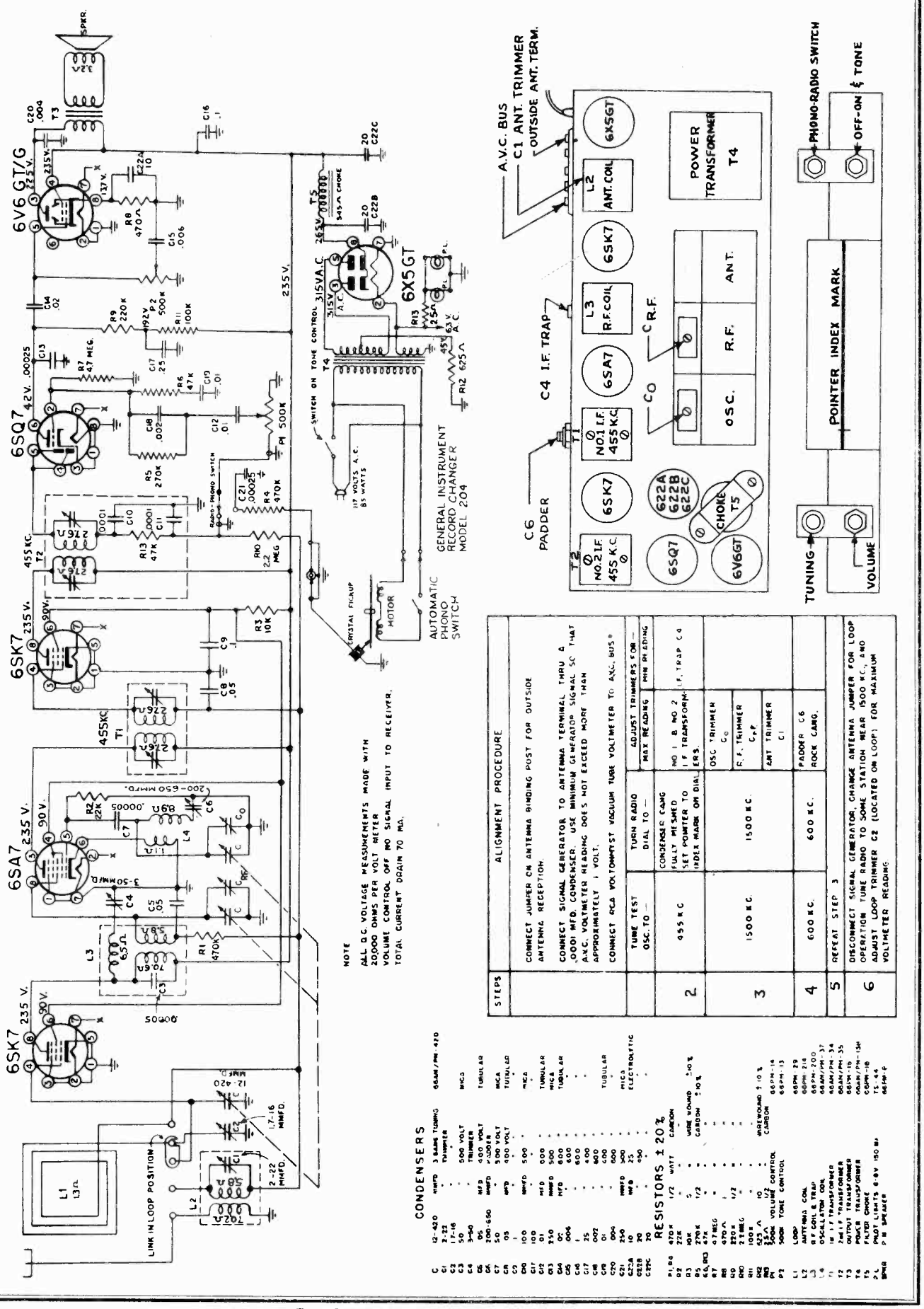
GENERAL	60A-6F8-5
BURGESS	D5A60
RAY-O-VAC	AB994
PHILCO	P841A

TUBE LAYOUT



MODEL 66PM

GILFILLAN BROS. INC.



STEPS	ALIGNMENT PROCEDURE	TUNE TEST OSC. TO —	TURN RADIO DIAL TO —	ADJUST TRIMMERS FOR — MAX READING	MIN READING
	CONNECT JUMPER ON ANTENNA BINDING POST FOR OUTSIDE ANTENNA RECEPTION.				
	CONNECT SIGNAL GENERATOR TO ANTENNA TERMINAL THRU A .0001 MFD. CONDENSER. USE MINIMUM GENERATOR SIGNAL SO THAT A.V.C. VOLTMETER READING DOES NOT EXCEED MORE THAN APPROXIMATELY 1 VOLT.				
	CONNECT RCA VOLTOHMYST VACUUM TUBE VOLTMETER TO A.V.C. BUS.				
2		455 K.C.	CONDENSER GANG FULLY MESHED SET POINTER TO INDEX MARK ON DIAL.	NO 1 & NO 2 I.F. TRANSFORMERS.	I.F. TRAP C4
3		1500 K.C.	1500 K.C.	OSC. TRIMMER C_o	
				R.F. TRIMMER C_{RF}	
				ANT. TRIMMER C1	
4		600 K.C.	600 K.C.	PADDER C6 ROCK CARG.	
5	REPEAT STEP 3				
6	DISCONNECT SIGNAL GENERATOR, CHARGE ANTENNA JUMPER FOR LOOP OPERATION TUNE RADIO TO SOME STATION NEAR 1500 KC, AND ADJUST LOOP TRIMMER C2 (LOCATED ON LOOP) FOR MAXIMUM VOLTMETER READING.				

CONDENSERS

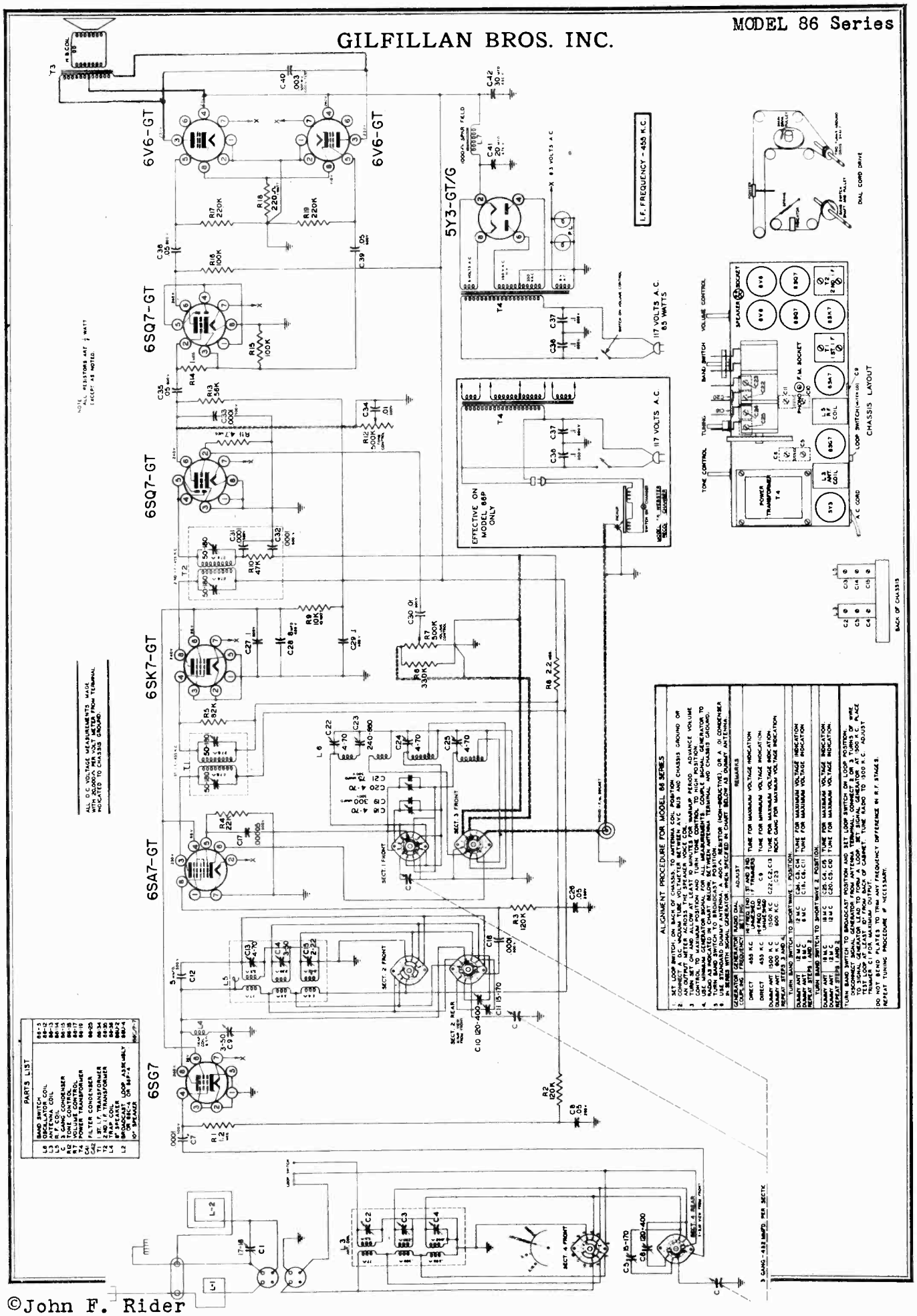
C	12-420	MMFD	3 GANG TUNING	65AM/PM 420
C1	7-25	"	TRIMMER	"
C2	12-16	"	"	"
C3	5-80	"	500 VOLT	MICA
C4	3-80	"	TRIMMER	"
C5	.05	MFD	400 VOLT	TUBULAR
C6	200-650	MMFD	J-DOCER	MICA
C7	50	"	500 VOLT	"
C8	.05	MFD	400 VOLT	TUBULAR
C9	1	"	"	"
C10	.0001	MMFD	500	MICA
C11	.0001	"	"	"
C12	.1	MFD	600	TUBULAR
C13	.00025	MMFD	500	MICA
C15	.006	MFD	600	TUBULAR
C16	.1	"	600	"
C17	25	"	400	"
C19	.01	"	600	"
C20	.004	"	600	"
C21	.00025	MMFD	500	MICA
C22A	20	MFD	450	ELECTROLYTIC
C22B	20	"	450	"
C22C	20	"	450	"

RESISTORS ± 20%

R1,R8	470Ω	1/2	WATT	CARBON
R2	22K	5	"	WIRE WOUND ± 10 %
R3	10K	1/2	"	CARBON ± 10 %
R4,R10	470K	"	"	"
R5	270K	"	"	"
R6	47K	"	"	"
R7	4.7 MEG.	"	"	"
R9	220K	"	"	"
R11	2.2 MEG.	"	"	"
R12	625Ω	10	"	WIREWOUND ± 10 %
R13	25Ω	1/2	"	CARBON
P1	500K	VOLUME CONTROL		65AM/PM-37
P2	500K	TONE CONTROL		65AM/PM-35

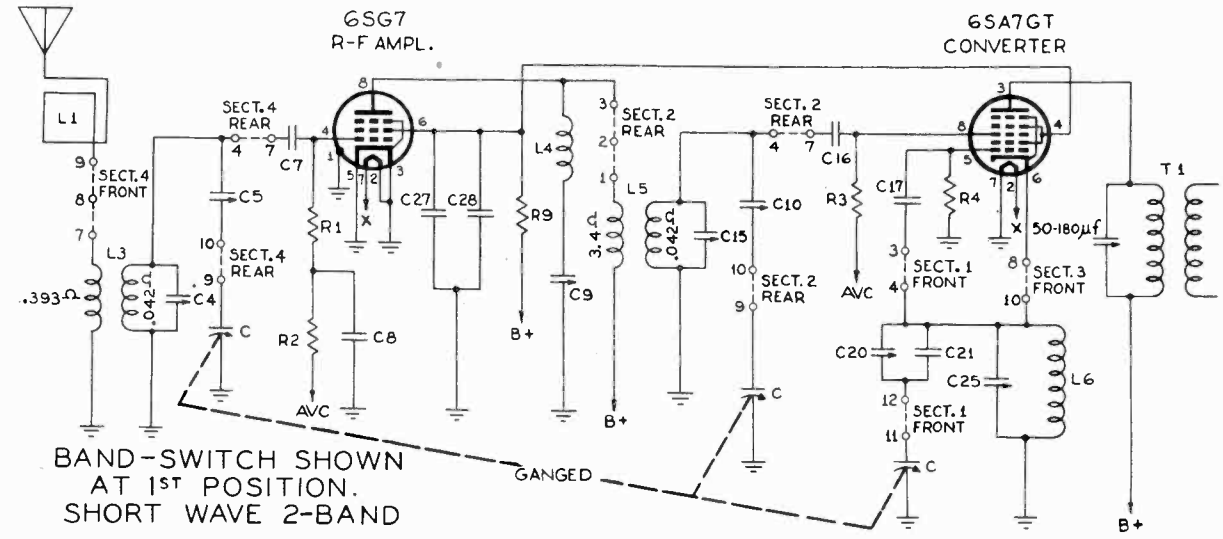
L1	LOOP	65PM-39
L2	ANTENNA COIL	65PM-218
L3	R.F. COIL & TRAP	65PM-200
L4	OSCILLATOR COIL	65AM/PM-37
T1	I.F. TRANSFORMER	65AM/PM-34
T2	I.F. TRANSFORMER	65AM/PM-35
T3	POWER TRANSFORMER	65AM/PM-13M
T4	FILTER CHOKE	65PM-18
T5	PILOT LIGHTS 6.3V 150 MA.	T.S.-44
SPKR	P.M. SPEAKER	66PM-P

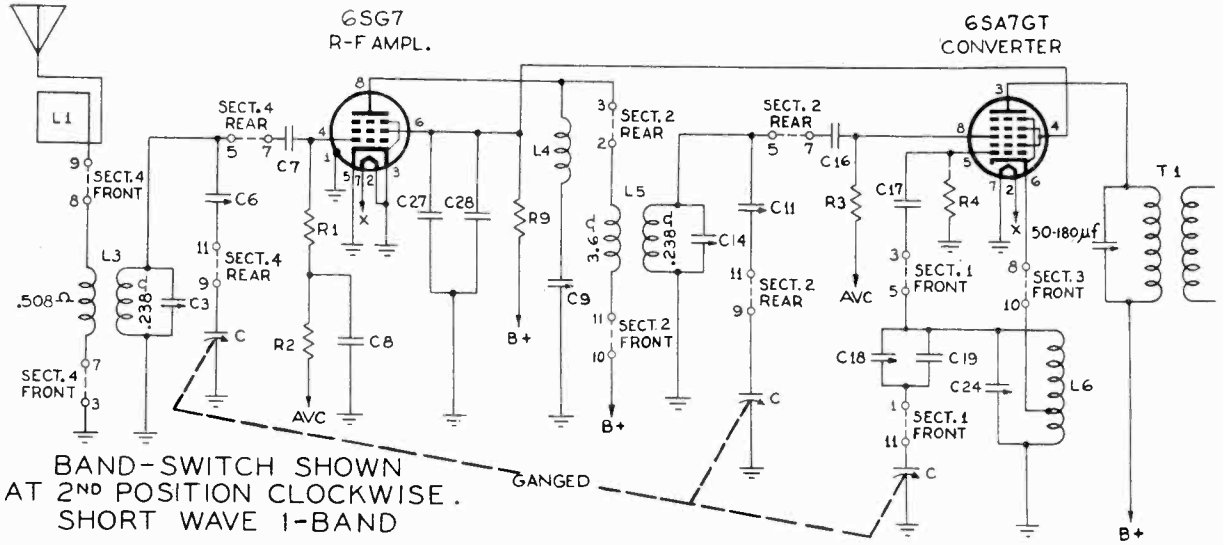
RECORD CHANGER: General Instrument 204, RCD. CH. P.15-1

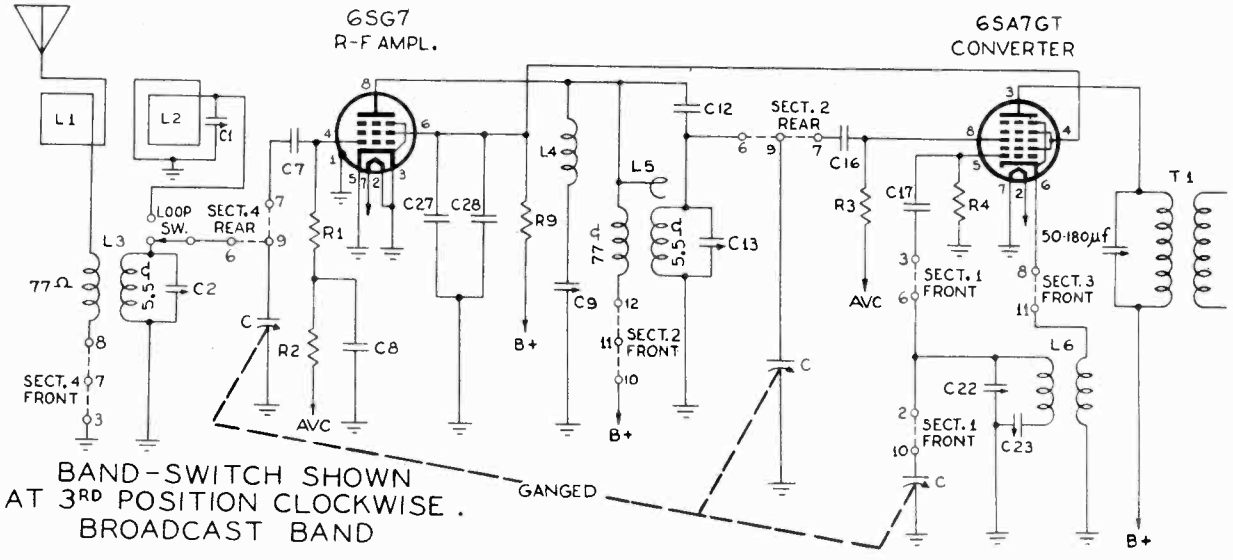


MODEL 86 Series

GILFILLAN BROS. INC.

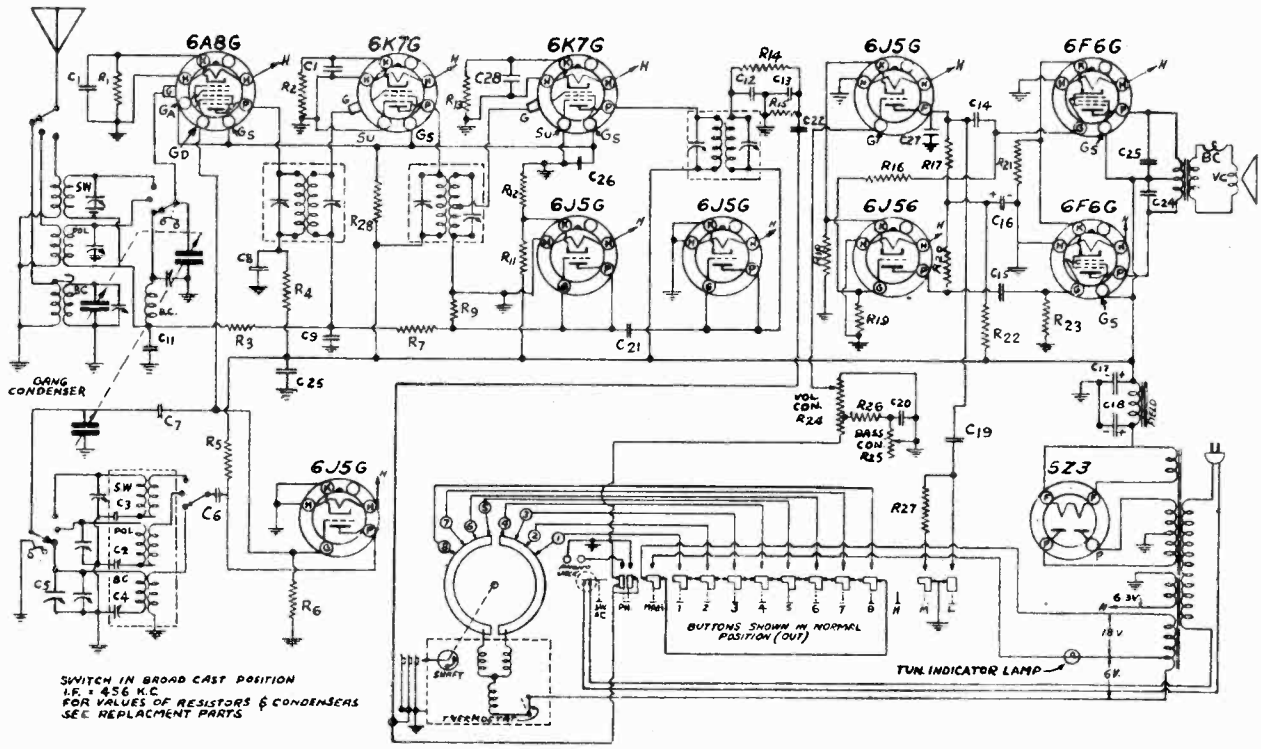






MODEL R-635

B. F. GOODRICH CO.



11A REPLACEMENT PARTS LIST

PAPER CONDENSERS

C 1—P148	.05	Mfd. 200 V.
C 2		Police Band Padder—(.0008—.0016 Mfd.)
C 4		Broadcast Band Padder—(.003—.0006 Mfd.)
C 6—P1322	.005	Mfd. 600 V.
C 8—P276	.1	Mfd. 400 V.
C 9—P148	.05	Mfd. 200 V.
C11—P142	.1	Mfd. 200 V.
C14—P334	.05	Mfd. 400 V.
C15—P334	.05	Mfd. 400 V.
C19—P334	.05	Mfd. 400 V.
C20—P1322	.005	Mfd. 600 V.
C22—P148	.05	Mfd. 200 V.
C23—P1322	.005	Mfd. 600 V.
C24—P1322	.005	Mfd. 600 V.
C25—P276	.1	Mfd. 400 V.
C26—P276	.1	Mfd. 400 V.
C28—P148	.05	Mfd. 200 V.

MICA CONDENSERS

C 3—P1683	.004	Mfd.
C 7—P480	.0001	Mfd.
C12—P480	.0001	Mfd.
C13—P480	.0001	Mfd.
C21—P1382	.00025	Mfd.
C27—P480	.0001	Mfd.

ELECTROLYTIC CONDENSERS

C16, C17	P1939	Dual Electrolytic
C18—P1937		Electrolytic

ADJUSTABLE CONDENSERS

P1918A Variable Condenser
P2743 Gang Trimmer Strip
P1682 Oscillator Padder Condensers

RESISTORS

R 1—P140	500 Ohm	¼ Watt
R 2—P1950	350 Ohm	¼ Watt 10%
R 3—P139	250,000 Ohm	¼ Watt
R 4—P481	3,000 Ohm	¼ Watt
R 5—P673	10,000 Ohm	½ Watt
R 6—P417	50,000 Ohm	¼ Watt
R 7—P137	500,000 Ohm	¼ Watt
R 9—P137	1,000,000 Ohm	¼ Watt
R11—P2731	25,000 Ohm	1 Watt
R12—P278	600 Ohm	¼ Watt
R13—P1950	350 Ohm	¼ Watt
R14—P417	50,000 Ohm	¼ Watt
R15—P139	250,000 Ohm	¼ Watt
R16—P1220	200,000 Ohm	¼ Watt
R17—P166	25,000 Ohm	¼ Watt
R18—P376	750 Ohm	¼ Watt
R19—P258	15,000 Ohm	¼ Watt
R20—P166	25,000 Ohm	¼ Watt
R21—P2732	220 Ohm	2 Watt
R22—P167	10,000 Ohm	¼ Watt
R23—P139	250,000 Ohm	¼ Watt
R24	Volume Control—2,000,000 Ohms	
R25	Bass Control—1,000,000 Ohms	
R26—P1217	60,000 Ohm	¼ Watt
R27—P167	10,000 Ohm	¼ Watt
R28—P165	25,000 Ohm	¼ Watt
R29	Speaker Field—600 Ohm	

TRANSFORMERS AND COILS

P2710	Power Transformer
P1930	1st I.F. Transformer
P2704	2nd I.F. Transformer
P2711	3rd I.F. Transformer
G5794	Oscillator Coil Assembly
G5310	Police and Short Wave Antenna Coil
G5347	Broadcast Antenna Coil

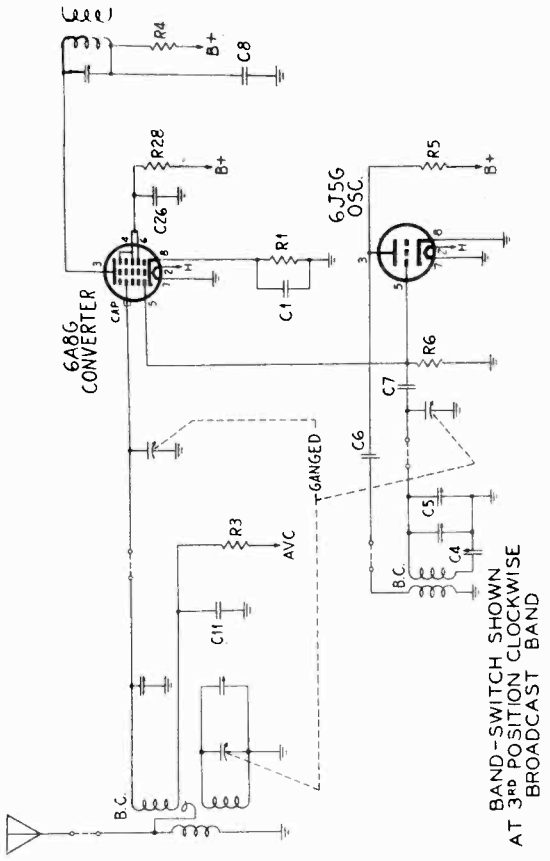
MISCELLANEOUS

P1928	Tube Socket
P1153	5Z3 Socket
P945	Speaker Socket
P2705	Volume Control
P2706	Bass Control
G5788	Band Switch and Lead Assembly
P929	A.C. Line Cord
P1455	Tube Shield
P1456	Tube Shield Base
P2716	12" Dynamic Speaker
P2694	Push Button Switch
3	Pilot Light Socket
P1504	Pilot Light Bulb
50	Electric Motor
P2689	Rubber Drive Belt
P2688	Dial Scale
P2644	Dial Pointer
G5462	Lower Segment Adjustment Bracket and Contact
G5463	Upper Segment Adjustment Bracket and Contact

"clarified schematics"

MODEL R-635

B. F. GOODRICH CO.



BAND-SWITCH SHOWN AT 3RD POSITION CLOCKWISE BROADCAST BAND

MOTOR TUNED PUSH BUTTON

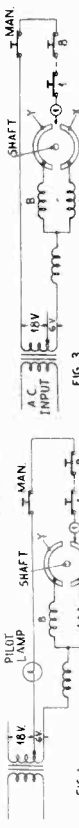


FIG. 1

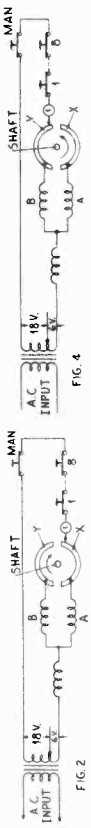


FIG. 2

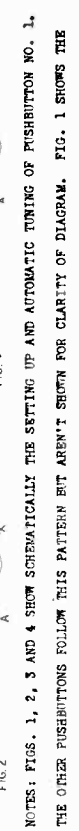


FIG. 3

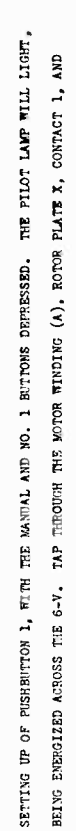
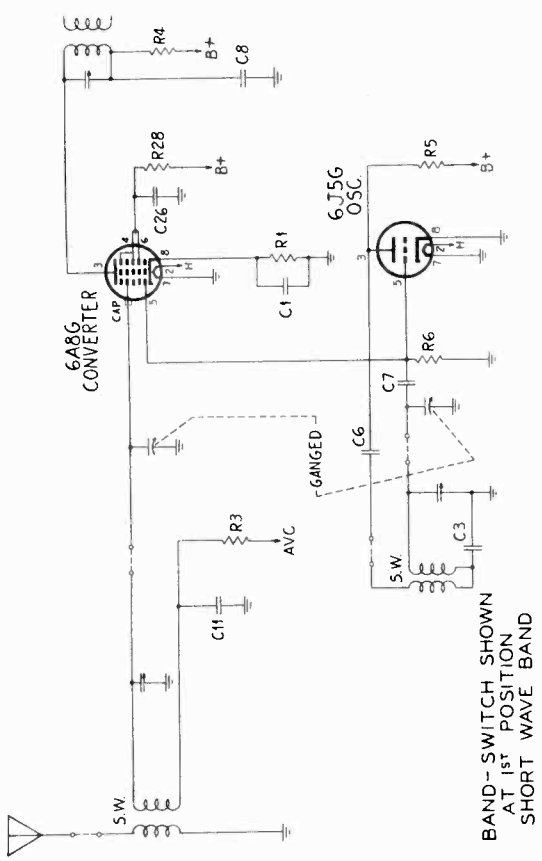
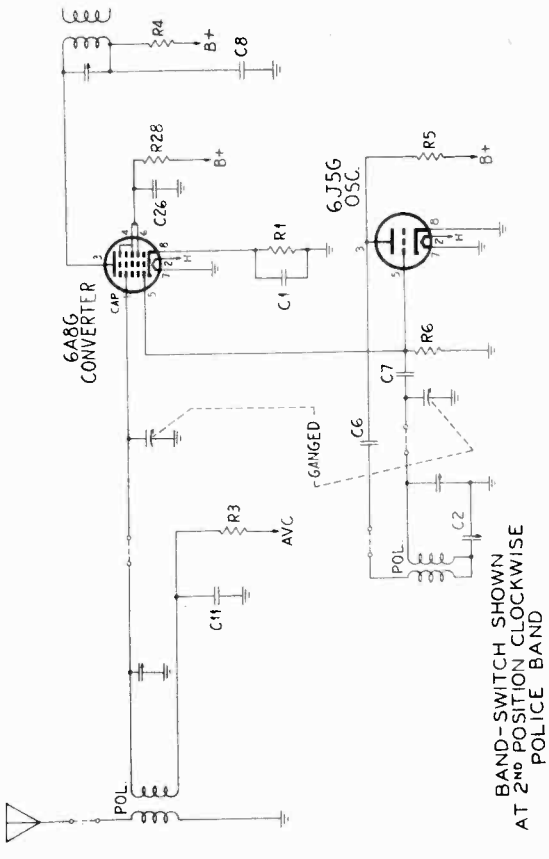


FIG. 4

NOTES: FIGS. 1, 2, 3 AND 4 SHOW SCHEMATICALLY THE SETTING UP AND AUTOMATIC TUNING OF PUSHBUTTON NO. 1. THE OTHER PUSHBUTTONS FOLLOW THIS PATTERN BUT AREN'T SHOWN FOR CLARITY OF DIAGRAM. FIG. 1 SHOWS THE SETTING UP OF PUSHBUTTON 1, WITH THE MANUAL AND NO. 1 BUTTONS DEPRESSED. THE PILOT LAMP WILL LIGHT, BEING ENERGIZED ACROSS THE 6-V. TAP THROUGH THE MOTOR WINDING (A), ROTOR PLATE X, CONTACT 1, AND THE PUSHBUTTONS. WHEN BUTTON NO. 1 IS ADJUSTED TO THE CORRECT FREQUENCY, THE PILOT LAMP GOES OUT BECAUSE CONTACT 1 IS THEN POSITIONED BETWEEN PLATES X AND Y, SIMILAR TO FIG. 3, WHICH BREAKS THE ELECTRICAL CONTACT. IN ORDER TO TUNE TO STATION 1 AUTOMATICALLY, PUSHBUTTON 1 IS DEPRESSED, ENERGIZING THE MOTOR ACROSS 18-V AS SHOWN IN FIG. 2. SINCE THE (A) WINDING IS ENERGIZED, THE MOTOR WILL TURN PLATES X AND Y IN DIRECTION OF ARROW SHOWN UNTIL CONTACT IS BROKEN, WHICH WILL OCCUR WHEN PLATES REACH POSITION SHOWN IN FIG. 3. IF THE MOTOR DOES NOT STOP FAST ENOUGH, THEN PLATES X AND Y, WHICH ARE MECHANICALLY GANGED BY THE SHAFT TO THE TUNING CAPACITORS, WILL TURN TOO FAR, PUTTING THE STATION OUT OF TUNE BUT IF THEY DO ROTATE TOO MUCH THEY MUST ASSUME THE POSITION SHOWN IN FIG. 4 WHICH THEN ENERGIZES THE OTHER (B) WINDING OF THE MOTOR, REVERSING THE DIRECTION OF ROTATION UNTIL IT COMES TO A STOP AT ITS CORRECTLY TUNED POSITION SHOWN IN FIG. 3.



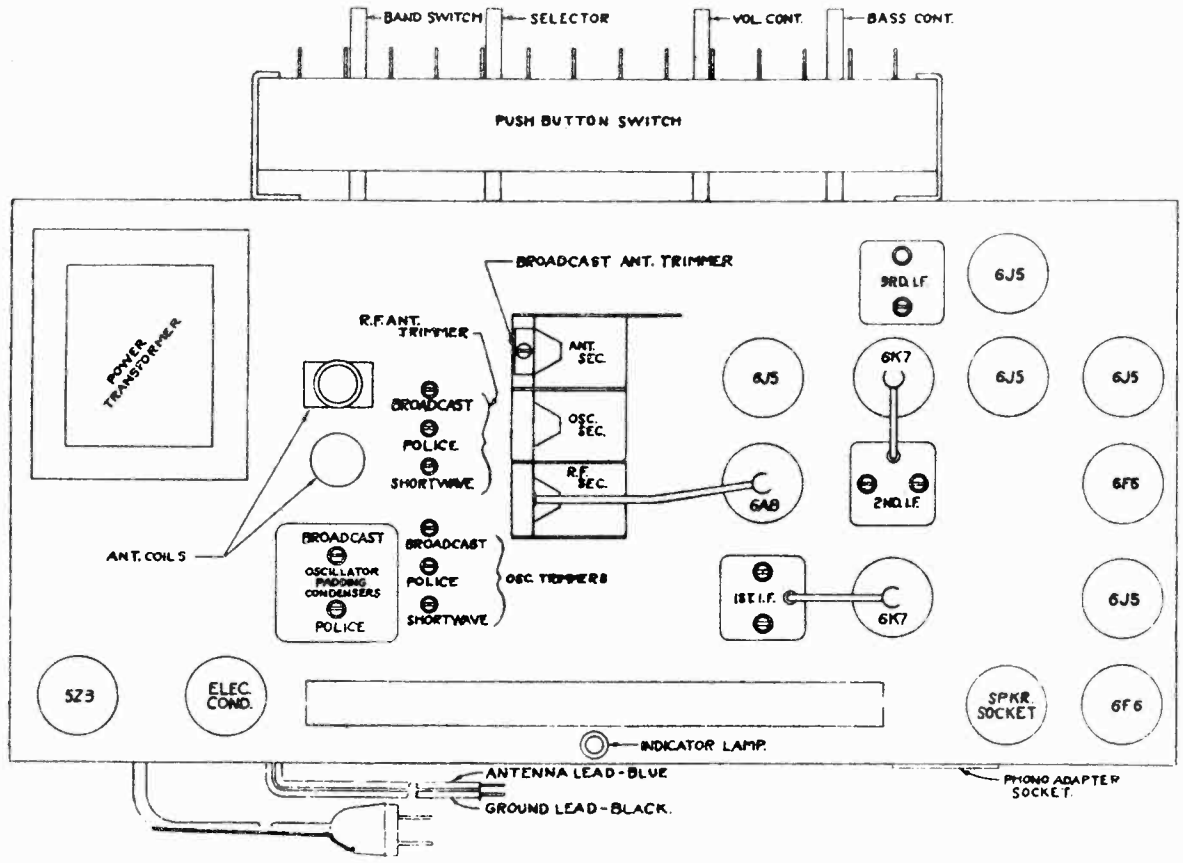
BAND-SWITCH SHOWN AT 1ST POSITION SHORT WAVE BAND



BAND-SWITCH SHOWN AT 2ND POSITION CLOCKWISE POLICE BAND

MODEL R-635

B. F. GOODRICH CO.



ALIGNMENT DATA AND SERVICING

GENERAL DATA The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400, 1730, 1800, 4000, 5600, 6000, 16,000 and 18,100 KC and an output meter to be connected across the primary or secondary of the output transformers. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the Broadcast Band should always be the next procedure; after which, either or both of the Short Wave Bands may be aligned.

I.F. ALIGNMENT With the wave switch in the Broadcast Band and the gang condenser set at minimum push in the white button until it locks. Adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (6A7) through a .05 or .1 mfd. condenser. The ground on the test oscillator can be connected to the chassis ground. Align the six I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT Connect the output of the signal generator to the antenna lead (blue) through a .0002 mfd. mica condenser. Set the gang condenser to minimum and the oscillator to 1730 KC and adjust the "oscillator trimmer" to receive this signal. Make no other adjustments at this frequency. Then set the generator to 1400 KC and tune in this signal by rotating the gang to 1400 on the dial. Adjust the "preselector" and "antenna" trimmer to maximum signal. Set the signal generator to 600 KC and tune in the signal on the receiver. **Note:** approximately the same sensitivity should be noted at this point as was at 1400 KC. The signal strength may sometimes be improved by padding the circuits. This is done by slowly increasing or decreasing the oscillator padding condenser and, at the same time, continuously tuning back and forth across the signal with the receiver until the maximum reading is obtained on the output meter. This adjustment may seem a little complicated but is the easiest way to adjust the oscillator to the preselector of the R.F. section. Return to 1400 KC and again go over the adjustments of this frequency to be certain that they were not put slightly out of alignment when adjustment was made at 600 KC.

POLICE BAND ALIGNMENT The police band is adjusted by first replacing the .0002 dummy with a 400 ohm resistor and setting the generator to 5600 KC. With the gang set at minimum, adjust the "police oscillator trimmer" to receive this signal, then set the signal generator to 4000 KC and adjust "police antenna trimmer" to give maximum output. Next, set the oscillator to 1800 KC and "pad" the circuit of this frequency as described in the instructions for padding the broadcast circuits.

SHORT WAVE BAND ALIGNMENT The short wave band is adjusted by setting the generator to 18,100 KC and with the gang at minimum, adjust the "short wave oscillator trimmer" to receive the signal. Set the generator at 16,000 KC, tune in the signal and adjust the "short wave antenna" trimmer to give maximum output. As there is no variable low frequency padding condenser on this band, the sensitivity of the receiver should be checked at 6000 KC to determine whether the circuits are in line at this frequency. Should the receiver lack sensitivity at 6000 KC, the antenna and oscillator coils, as well as the .004 mica padding condenser, should be tested for defects as sometimes these components become subject to mechanical or electrical injuries, despite their rugged construction and liberal ratings.

MODEL R-635

B. F. GOODRICH

INSTRUCTIONS FOR ADJUSTMENT AND OPERATION OF THE ELECTRIC TUNER

It is very important to read the following instructions carefully before attempting to adjust the electric tuner.
The electric tuner is made up of three integral units:

PUSH BUTTON SWITCH: The push button switch consists of eight (8) brown push buttons flanked on either side by three (3) white push buttons.

SELECTOR MECHANISM: The selector mechanism is made up of the selector plate, eight (8) thumb screws, and the adjustment light bulb.

ELECTRIC MOTOR: The power for this tuner is provided by a small, efficient electric motor, of the brushless variety. It is fitted with an automatic clutch. The bearings and the oil retainer hold sufficient oil to lubricate the motor for a lifetime.

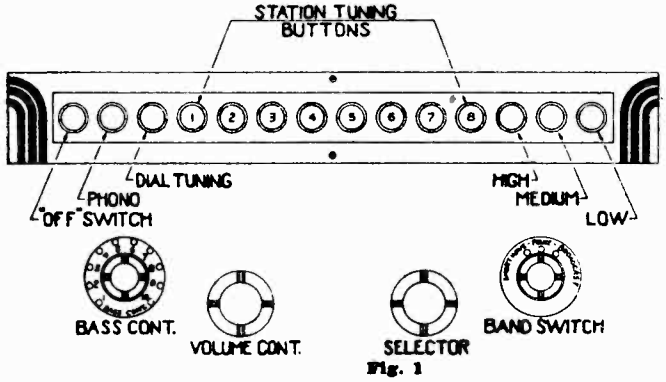


Fig. 1

SETTING UP STATIONS The first step to take in adjusting the electric push button device incorporated into this receiver is to choose eight (8) of the most powerful local stations, stations which are free from excess fading. Turn on the receiver (broadcast band) and press in the dial tuning button; tune in the station of the **lowest frequency,** using the station selector knob. Now hold the dial tuning button in and press in button number one (1). (See Figure 1). Both buttons are now locked into place; a small pilot lamp located at the rear of the chassis will light up unless the thumb screw at the rear accidently happens to be correctly set. Loosen thumb screw number one (See Figure 2 for order of thumb screws) enough to allow it to slide freely back and forth until the light goes out. Now tighten the thumb screw; the adjustment for the first station is now complete. Out of the station call letter sheet supplied remove the proper station call disc and insert into the recess of button number one. Push one of the clear celluloid discs into the recess also, over the station call disc. Now release button number one by pressing the dial tuning button in as far as it will go.

With the white button still in, tune in the station of the next highest frequency and holding the white button, press in button number two. Both buttons are now locked into place. Loosen thumb screw number two (see Figure 2) and slide back and forth until a point is reached at which the pilot lamp in the rear goes out; tighten the thumb screw. Insert the proper station call disc and celluloid disc into the window of button number two.

Follow this same procedure for the remaining stations, always choosing the station with the next highest frequency. After all eight (8) stations have been adjusted, check each adjustment by tuning in each station. Note: In the window above the white button, insert the word "OFF" found in the call letter sheet.

NOTE: In the recesses of the white push buttons insert the words found in the call letter sheet as shown in Figure 1.

HOW TO TUNE IN STATIONS USING THE ELECTRIC PUSH BUTTON TUNER

In order to operate the receiver satisfactorily—using the electric push button tuner, the dial tuning button must be in released position, that is, all the way out. To tune in a station, merely press the selector button which designates the station desired. **Note:** Should the station fail to come in clearly, check the adjustment by following the adjustment procedure described in the paragraph above.

To change from electric tuning to manual selecting, simply press in the dial tuning button. When the dial tuning button is in, the set may be tuned as a conventional receiver. **Note:** If it is desired to tune Short Wave or Police while the set is being operated with push buttons, it is not necessary to change over from push button tuning to manual tuning. Simply turn the band switch and proceed to tune with the selector knob. When the band switch is returned to broadcast, the station last selected by button will automatically tune in by itself.

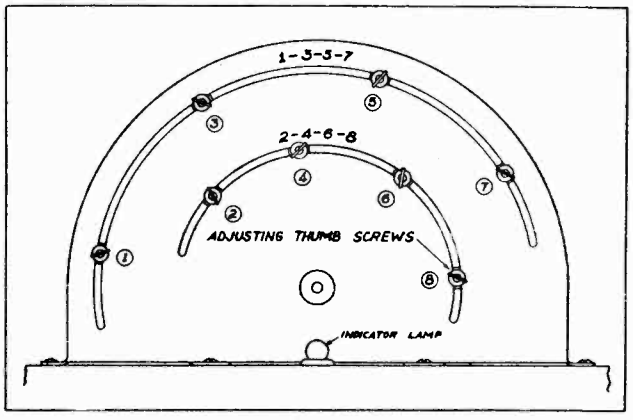
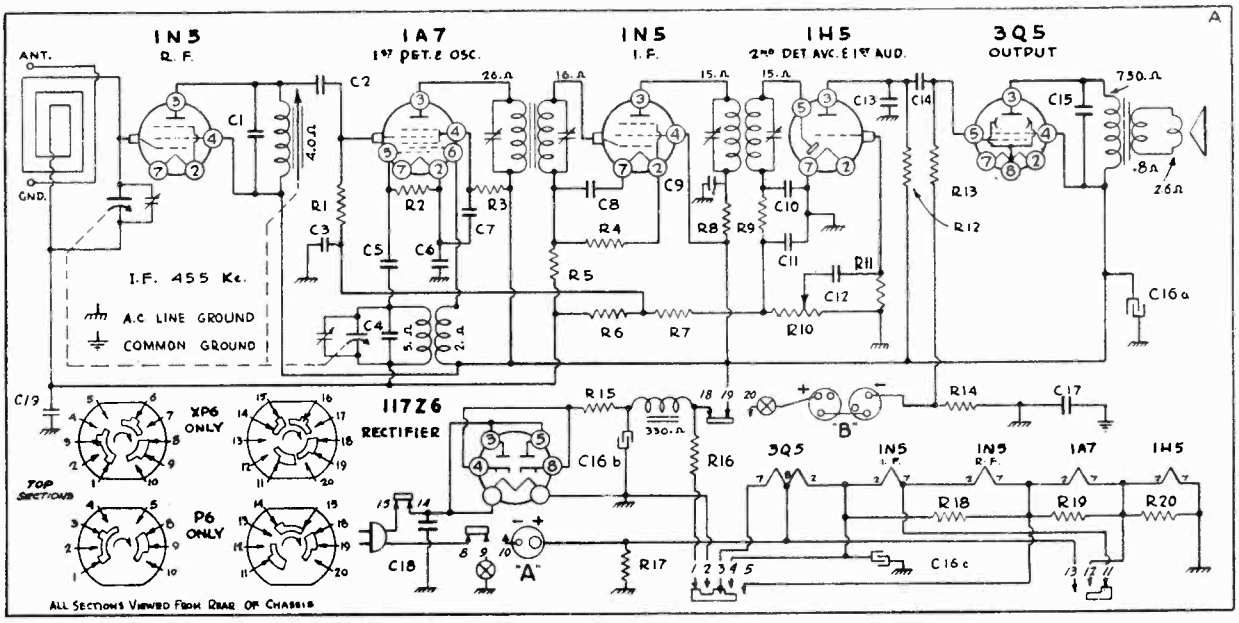


Fig. 2

B. F. GOODRICH

MODEL R-661



Late Model.

Power switch in line position. Common ground is chassis ground.

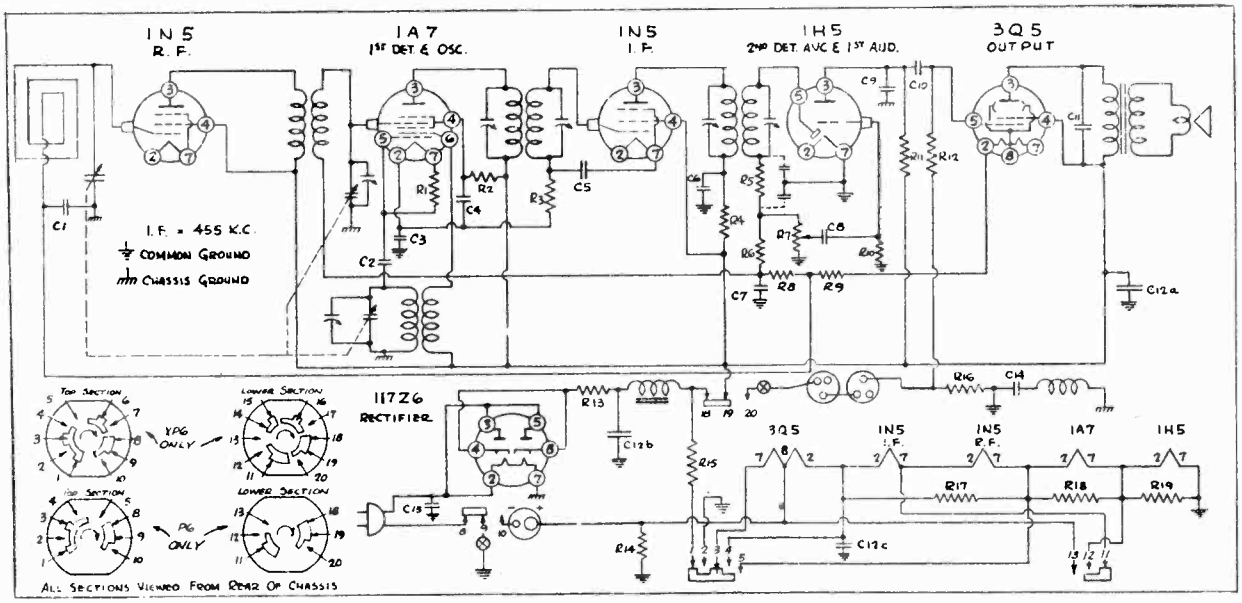
CONDENSERS

No.	Ohms	Watts	No.	Ohms	Watts
R1	100,000	½	R11	15,000,000	½
R2	200,000	½	R12	1,000,000	½
R3	5,000,000	½	R13	2,000,000	½
R4	5,000,000	½	R14	400	½
R5	5,000,000	½	R15	22	½
R6	5,000,000	½	R16	2,150	5
R7	3,000,000	½	R17	3,000	½
R8	5,000	½	R18	500	½
R9	70,000	½	R19	200	½
R10	1,000,000	V.C.	R20	110	½

RESISTORS

No.	Capacity (Mfd.)	Volts
C1	.000367 Silver Mica	
C2	.00025 Mica	
C3	.01	400
C4	.000015 Mica	
C5	.00005 Mica	
C6	.25	200
C7	.01	400
C8	.01	400
C9	.05	400
C10	.00005 In I.F. Can	

No.	Capacity (Mfd.)	Volts
C11	.0001	Mica
C12	.01	400
C13	.00025	Mica
C14	.01	400
C15	.002	600
C16a	40.	150
C16b	30.	150
C16c	100.	25
C17	.1	400
C18	.05	400
C19	.05	200



Early Model.

RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	200,000	½	R11	1,000,000	½
R2	50,000	½	R12	2,000,000	½
R3	5,000,000	½	R13	22—10%	½
R4	5,000	½	R14	1,000	½
R5	70,000	½	R15	2,150—10%	5
R6	3,000,000	¼	R16	400—10%	½
R7	1,000,000	V.C.	R17	500—10%	½
R8	5,000,000	½	R18	200—10%	½
R9	10,000,000	¼	R19	110—10%	½
R10	15,000,000	½			

CONDENSERS

No.	Capacity (Mfd.)	Volts
C1	.05	200
C2	.00005	Mica
C3	.25	200
C4	.01	400
C5	.001	600
C6	.05	400
C7	.05	200
C8	.001	600

No.	Capacity (Mfd.)	Volts
C9	.00025	Mica
C10	.001	600
C11	.002	600
C12a	50. Elect.	150
C12b	30. Elect.	150
C12c	100. Elect.	25
C13	.05	400
C14	.2	200

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MODEL R-661

B. F. GOODRICH

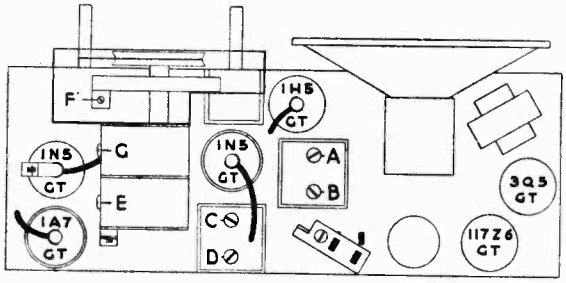


FIG. 1 TOP VIEW

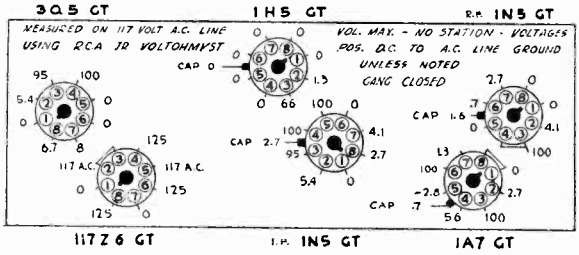


FIG. 2 VOLTAGE CHART

STEP	Connect Signal Generator to—	Dummy Antenna Between Radio and Generator	Set Generator Controls to—	Set Radio Controls to—	Adj. Following Trimmers to Max. Output
1	Grid 1A7 GT	.1	455 Kc	1600 Kc.	A, B, C, D, I. F.
2	Grid 1N5 GT	.1	1600 Kc.	1600 Kc.	E Osc.
3	Grid 1A7 GT	.1	1400 Kc.	1400 Kc.	F — R. F. (Gang Early) on (Slug Late)
4	Loop Radiator	Two feet from Radio No Connection	1400 Kc.	1400 Kc.	G Ant.

Use Aerometer or three turn loop in series with 400 ohm resistor 10" diameter on Signal Generator in Step 4.

REPLACEMENT PARTS LIST

PAPER CONDENSERS

P1193 .002 mfd. 600 volt..... .20
P164 .01 mfd. 400 volt..... .25
P148 .05 mfd. 200 volt..... .20
P334 .05 mfd. 400 volt..... .40
P276 .1 mfd. 400 volt..... .40
P141 .25 mfd. 200 volt..... .30

MICA CONDENSERS

P5209 .000015 mfd..... .20
P1382 .00005 mfd..... .20
P480 .0001 mfd..... .20
P817 .00025 mfd..... .20
P1599 .000367 mfd. silver..... .65
or
P5200 .000367 mfd. special..... .60

ELECTROLYTIC CONDENSERS

VARIABLE CONDENSERS

P4860A { 40 mfd. 150 volt / 30 mfd. 150 volt / 100 mfd. 25 volt } 1.60

VARIABLE RESISTORS

P4820 R10 1 meg. Volume control..1.25

TRANSFORMERS AND COILS

G6543 R.F. Coil and Mtg. Bracket .55
P5208 Oscillator Coil..... .65
P3967 Oscillator Coil (Early)..... .65
P4818 1st I.F. Transformer.....1.50
P4819 2nd I.F. Transformer.....1.70

P5187 Gang Condenser, 2 gang....3.50
P4817 Gang Condenser, 3 gang.....3.50

RESISTORS

P5268 R15 22 ohm ½ w (wirewound)..... .20
P3801 R20 110 ohm ½ w..... .20
P3806 R19 200 ohm ½ w..... .20
P3816 R14 400 ohm ½ w..... .20
P3820 R18 500 ohm ½ w..... .20
P4856 R16 2,150 ohm 5 w (wirewound)..... .60
P3833 R17 3,000 ohm ½ w..... .20
P3836 R8 5,000 ohm ½ w..... .20
P3853 R3 50,000 ohm ½ w..... .20
P3857 R9 70,000 ohm ½ w..... .20
P3860 R1 100,000 ohm ½ w..... .20
P3864 R2 200,000 ohm ½ w..... .20
P3882 R12 1,000,000 ohm ½ w..... .20
P3883 R13 2,000,000 ohm ½ w..... .20
P4663 R7 3,000,000 ohm ½ w..... .20
P3886 R4,R5,R6 5,000,000 ohm ½ w..... .20
P3891 R11 15,000,000 ohm ½ w..... .20

MISCELLANEOUS

P4583 Tube Socket..... .20
P5206 Electrolytic Mounting Base..... .15
P5194 Drive shaft..... .20
P1399 Horseshoe Washer (for drive shaft) ½ doz. .15
P2925 Takeup Spring..... .15
P1585 Snap button for scale ½ doz. .15
P4435 Dial Pointer..... .20
P4816 Dial Background..... .25
P4876 Knob..... .20
P4695 Escutcheon..... 1.75
P4833 Indicator disc..... .20
P929A Line cord..... .65
P3557 Line cord clamp..... .15
P3017 Two-prong battery plug..... .15
P3016 Three-prong battery plug. .15

P470 Grid clip..... .05
P3571 Tube shield..... .15
G6538 Drum and cam assembly..... .30
P5193 Left hand dial bracket..... .20
P6546 Lever arm assembly..... .20
P5005 Spring
P5032 Spacer
P5197 Washer
P931 Screw
} Lever mounting hdw. ..... set .10
P4979 Iron Slug..... .40
P5192 Right hand dial bracket..... .25
P4852 I.F. Shield..... .20

All prices quoted are list and subject to the usual trade discount.

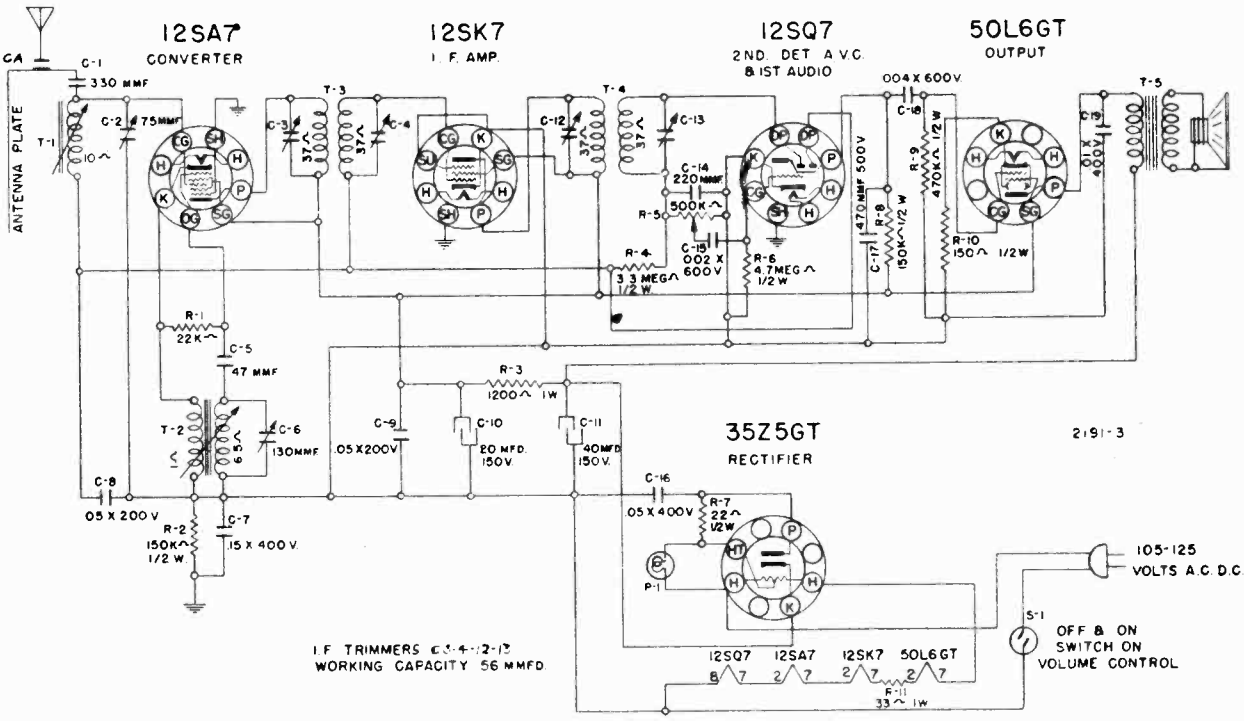
A handling charge of $0.25 will be made on all orders under $0.75 list.

Shipments are F.O.B. our factory. When remitting in advance please include postage.

Price are subject to change without notice.

W. T. GRANT CO.

MODELS 500,501,Series A



CORRECTION:— Pin 7 of 12SA7 tube goes to pin 7 of 12SQ7 tube. Pin 2 of 12SA7 tube goes to Pin 2 of 12SK7 tube.

POWER SUPPLY.....105 to 125 volts, DC or 50-60 cycle AC, 35 watts.

FREQUENCY RANGE.....545 to 1700 kc.

INTERMEDIATE FREQ....455 kc.

TUNING.....Permeability.

ANTENNA.....Built-in plate type. Also provisions for external antenna. No ground required.

SPEAKER.....4-inch; P.M.; voice coil impedance 3.2 ohms.

POWER OUTPUT.....800 milliwatts, undistorted. 1.0 watts maximum.

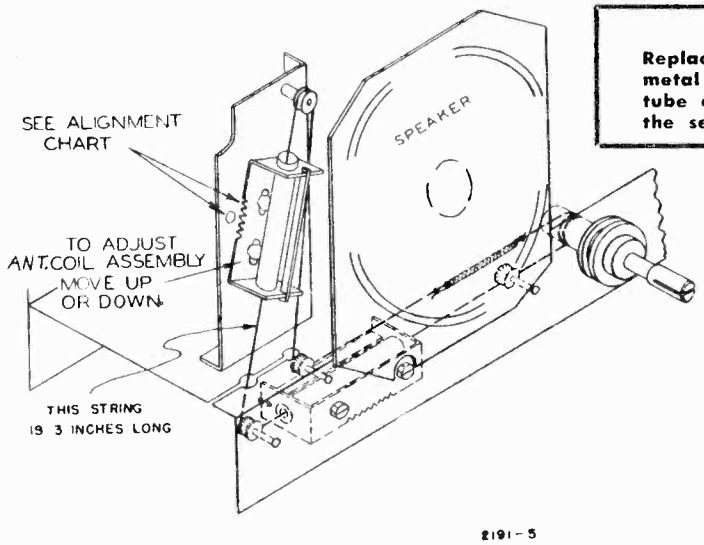
SENSITIVITY.....35 microvolts average for 50-milliwatt output.

SELECTIVITY.....75 kc. broad at 1000 times signal at 1000 kc.

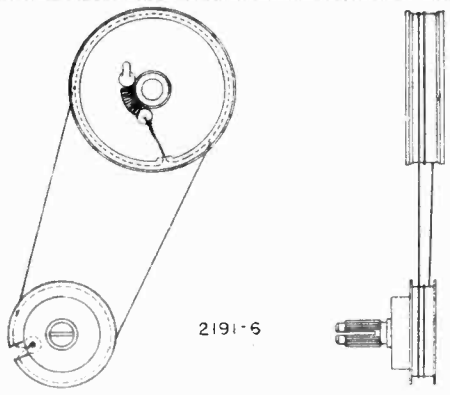
TUBE COMPLEMENT.....12SA7, converter
12SK7, I. F. amplifier
12SQ7, 2nd detector, AVC, 1st audio
50L6GT, output amplifier
35Z5GT, rectifier

NOTE ON TUBE REPLACEMENT

Replace a defective metal 12SK7 tube with another metal tube. Replace a glass 12SK7 tube with a metal tube or with an exact duplicate of the tube now in the set.



Coil Assembly View

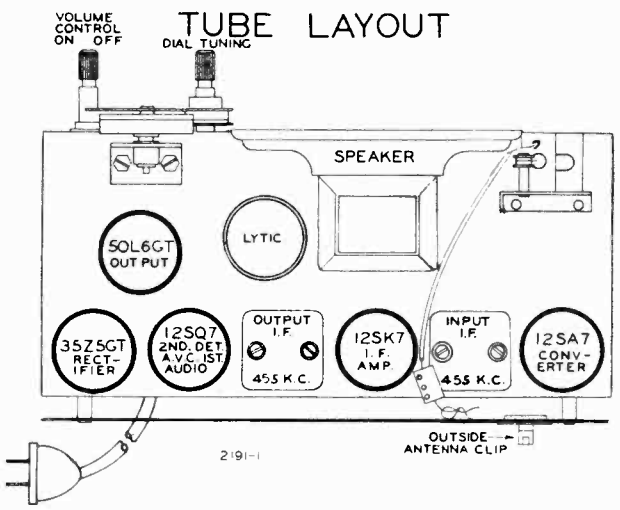


Dial Stringing View

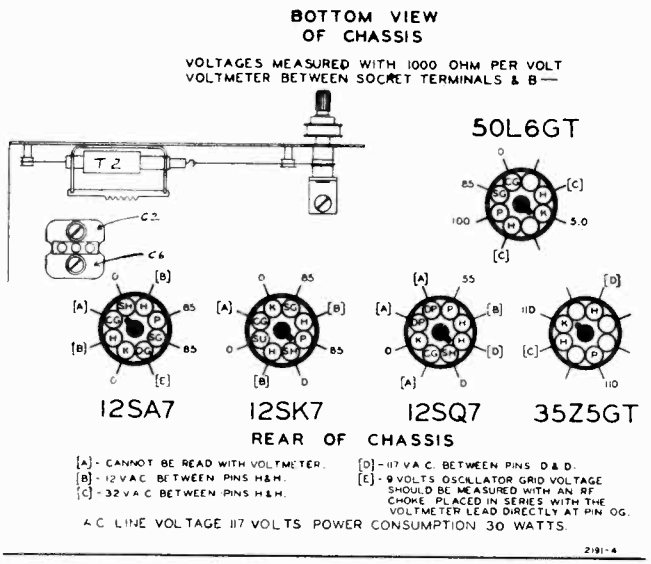
For Parts List, see P.16-5

MODELS 500,501, Series A

W. T. GRANT CO.



Chassis View



Voltage Chart

ALIGNMENT PROCEDURE

(Refer to Chassis View and Voltage Chart for location of trimmers)

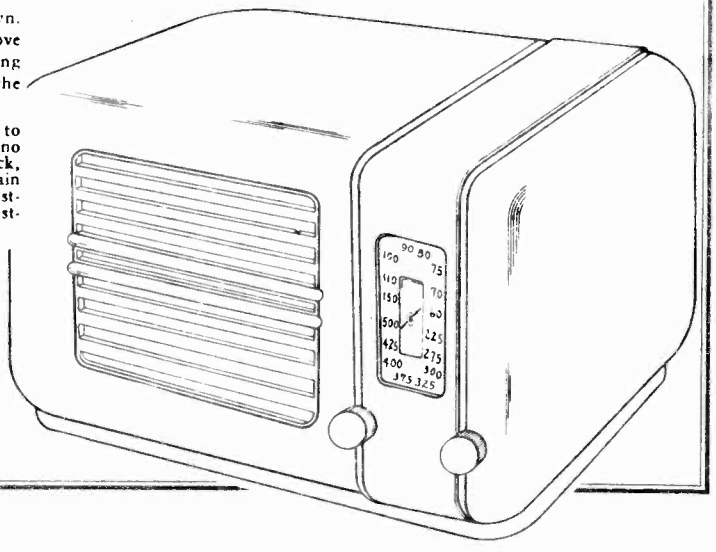
Output meter across 3.2-ohm output load.
Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

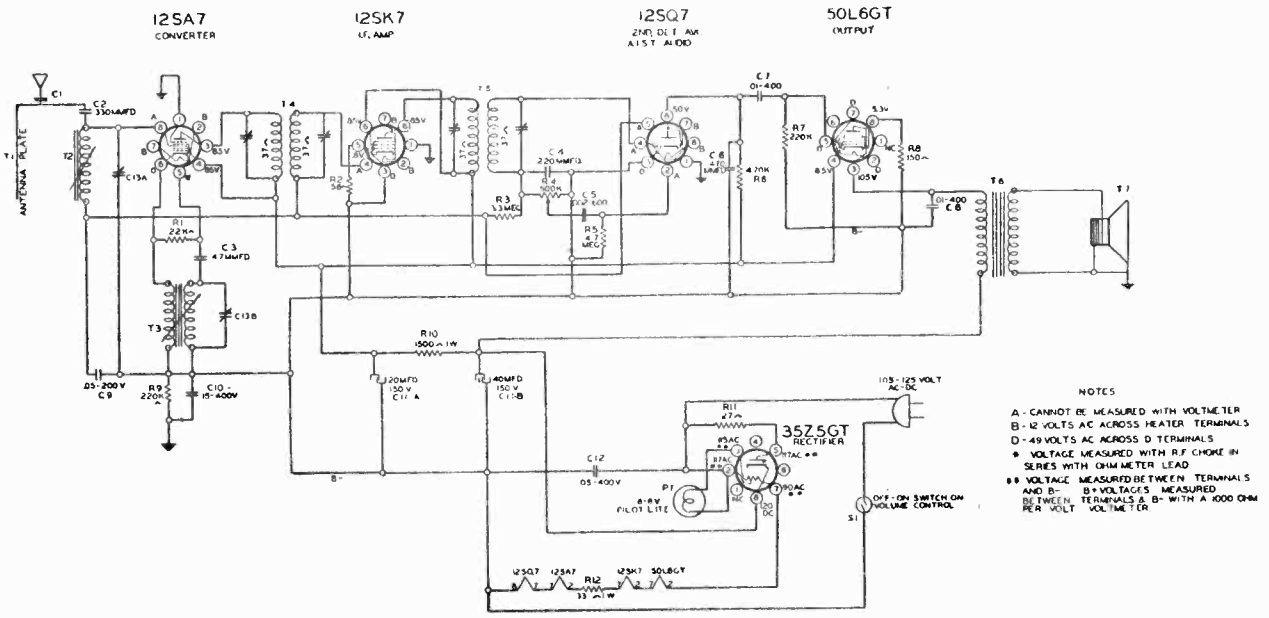
- Volume control at maximum for all adjustments.
- Chassis must be removed from cabinet for proper alignment

SIGNAL GENERATOR				*TUNER SETTING*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Dummy Antenna*	*Connection to Radio*	*Ground Connection*		
455 kc	.1 mf	Metal antenna plate	12SQ7 Pin 3	Iron cores all the way out	Trimmers on output and input I.F. cans
1720 kc	.1 mf	Metal antenna plate	12SQ7 Pin 3	Iron cores all the way out	Oscillator trimmer C6
1720 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Iron cores all the way out	Antenna trimmer C2
1400 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Turn dial to 1400 kc	Adjust position of ant. coil (see coil assembly view)
1720 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Turn dial to 1720 kc	Antenna trimmer C2

The antenna coil assembly is made so that it is movable up or down. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

After the antenna coil has been tracked at 1400 Kc. it is necessary to check the antenna trimmer (C2) adjustment again at 1720 Kc. If no appreciable change in trimmer adjustment is made the coil is in track, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1720 Kc.





POWER SUPPLY.....105 to 125 volts, DC or 50-60 cycle AC, 35 watts.

FREQUENCY RANGE.....545 to 1700 kc.

INTERMEDIATE FREQ....455 kc.

TUNING.....Permeability.

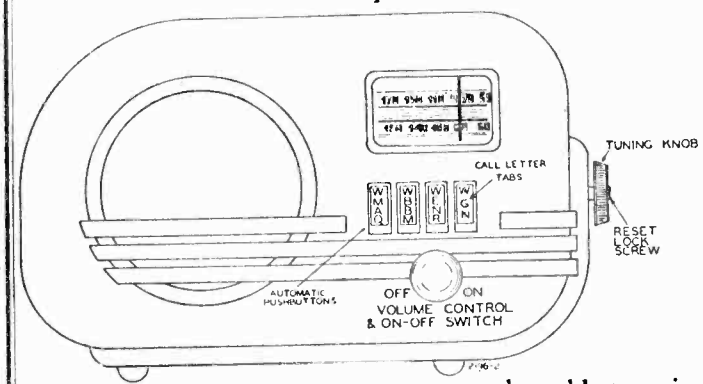
ANTENNA.....Built-in plate type. Also provisions for external antenna. No ground required.

SPEAKER.....5-inch; P.M.; voice coil impedance 3.2 ohms.

POWER OUTPUT.....800 milliwatts, undistorted. 1.2 watts maximum.

SENSITIVITY.....35 microvolts average for 50-milliwatt output.

TUBE COMPLEMENT.....12SA7, converter
12SK7, I. F. amplifier
12SQ7, 2nd detector, AVC, 1st audio
50L6GT, output amplifier
35Z5GT, rectifier



SETTING THE PUSHBUTTONS—The pushbuttons may be used, after proper adjustment, for the automatic tuning of any four stations on the standard broadcast band. They can be set up in any order.

1. Turn on the radio.

2. Push out the call letters of the four stations from the call-letter sheets supplied with this manual.

3. Insert one call-letter tab in the rectangular opening in the front of each pushbutton, in any order. Press an acetate tab (supplied in small envelope) into each of the pushbuttons.

4. With the screwdriver supplied, check to see that the locking screw in the center of the tuning knob (see front view) is loose. If it is not, turn it several turns to the left (counterclockwise).

5. Press the first pushbutton down *all the way*. With one hand hold the button down firmly and with the other carefully tune in the desired station. Release the pushbutton.

6. Follow this procedure for each of the three other buttons, setting each one for a different station.

7. Rotate the tuning knob on the side of the cabinet as far to the right as it will go. Tighten the locking screw in the center of the knob.

IT IS IMPORTANT THAT THIS SCREW BE TIGHTENED VERY FIRMLY.

8. The pushbuttons are now properly set for automatic tuning. Any of the four stations may be tuned in simply by pressing the proper button down as far as it will go. If you wish to reset any of the buttons for a new station, loosen the locking screw, set the pushbutton as described above, and re-tighten the locking screw.

MODELS 502,503, Series A

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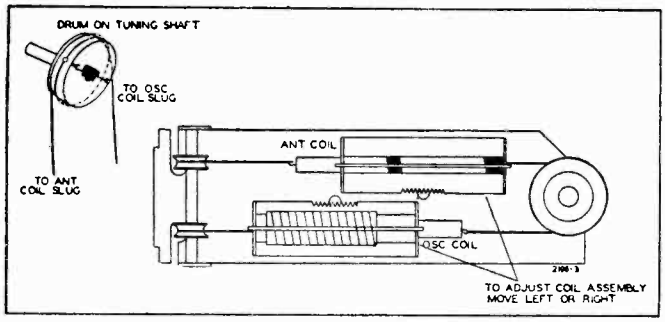
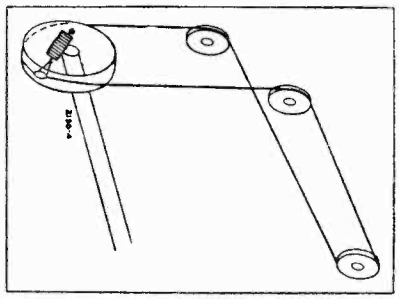
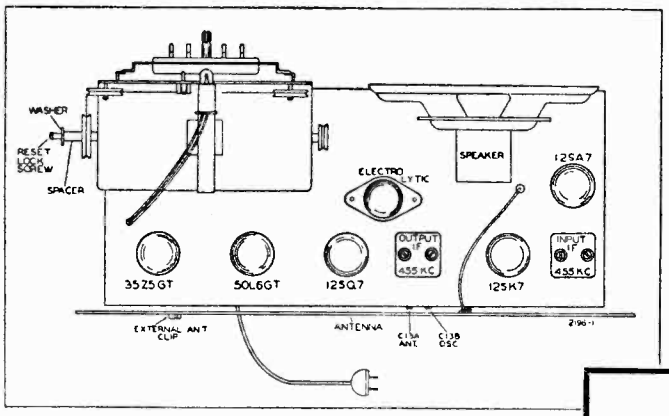


Coil View



Dial Stringing View



Chassis View

DIAL LIGHT—If the dial lamp burns out the set should not be operated until a new lamp has been installed. Failure to heed this caution may result in a burned-out 35Z5GT tube. To replace the lamp, first remove the buttons which hold the back to the cabinet. The Chassis View illustration shows the location of the dial lamp. *Pull* the lamp bracket toward the rear of the radio. The lamp can now be removed and replaced. Use a 6- to 8-volt lamp, type T-47.

• NOTE ON TUBE REPLACEMENT

Replace a defective metal 12SK7 tube with another metal tube. Replace a glass 12SK7 tube with a metal tube or with an exact duplicate of the tube now in the set.

ALIGNMENT PROCEDURE

(Refer to Chassis View for location of trimmers)

Output meter across 3.2-ohm output load.
Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

- Volume control at maximum for all adjustments.
- Chassis must be removed from cabinet for proper alignment.

SIGNAL GENERATOR				*TUNER SETTING*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Dummy Antenna*	*Connection to Radio*	*Ground Connection*		
455 kc	.1 mf	Metal antenna plate	12SQ7 Pin 3	Iron cores all the way out	Trimmers on output and input I.F. cans
1700 kc	.1 mf	Metal antenna plate	12SQ7 Pin 3	Iron cores all the way out	Oscillator trimmer C13-B
1700 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Iron Cores all the way out	Antenna trimmer C13-A
1400 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Turn dial to 1400 kc	Adjust position of ant. coil (see coil assembly view)
1700 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Iron cores all the way out	Antenna trimmer C13-A

The antenna coil assembly is made so that it is movable. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

After the antenna coil has been tracked at 1400 Kc. it is necessary to check the antenna trimmer (C13-A) adjustment again at 1700 Kc. If no appreciable change in trimmer adjustment is made the coil is in track, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1700 Kc.

Models 502 and 503—Series A

Reference No.	Part No.	Description
		CAPACITORS
C11-A	11992	Electrolytic—20 mf; 40 mf x 150 volts
C11-B		For use on 60 cycles
C11-A	11993	Electrolytic—40 mf; 60 mf x 150 volts
C11-B		For use on 25 cycles
C13-A	124151	Dual Trimmer—Ant. and OSC.
C13-B		
C9	C-8D-10770	.05 Mf x 200 Volts—Tubular
C7, 8	C-8D-10761	.01 Mf x 400 Volts—Tubular.
C12	C-8D-10813	.05 Mf x 400 Volts—Tubular
C5	C-8D-10778	.002 Mf x 600 Volts—Tubular
C10	C-8D-10953	.15 Mf x 400 Volts—Tubular
C6	C-8F3-12	470 Mmf, 20% Mica
C4	C-8F3-10	220 Mmf, 20% Mica
C2	C-8F3-11	330 Mmf, 20% Mica
C3	C-8F3-6	47 Mmf, 20% Mica
		***RESISTORS**
R4	101-238	Volume Control (500 K) and Switch
S1		or
R4	A-10A-11306	Volume Control (500 K) and Switch
S1		
R8	C-9B1-52	150 Ohms ½ Watt 10%
R7, 9	C-9B1-27	220K Ohms ½ Watt 20%
R5	C-9B1-35	4.7 Megohms ½ Watt 20%
R3	C-9B1-34	3.3 Megohms ½ Watt 20%
R1	C-9B1-78	22K Ohms ½ Watt 10%
R10	C-9B2-64	1500 Ohms 1 Watt 10%
R2	C-9B1-47	56 Ohms ½ Watt 10%
R12	C-9B2-4	33 Ohms 1 Watt 20%
R6	C-9B1-94	470K Ohms ½ Watt 10%
R11	C-9B1-43	27 Ohms ½ Watt 10.
		COILS
T4	108157L	Input I. F. Coil Complete in Can
T5	108157N	Output I. F. Coil Complete in Can
T2, T3	112877	Antenna and Oscillator Coil Tuning Assembly R-F. Choke
		SOCKETS
	121210	Eight Prong Octal Socket
	121216	Bakelite Socket Base for Filter Condenser
		SPEAKER
T7	114225	Five Inch P.M. Dynamic Speaker
T6	105108E	Output Transformer for Speaker
		MISCELLANEOUS
	10798D	Line Cord and Plug
	120389	Coiled Tension Spring (For Coil Assembly)
P1	107249	6-8 Volt Pilot Lite Bulb—Type T47
	107274	Socket Assembly for Pilot Lite
	107205	Insulating Shield for Pilot Lite Sock
	134101	Rubber Feet for Bottom of Cabinet
T1, C1	128586-S-1	Back for Cabinet—Walnut
T1, C1	128-586-S	Back for Cabinet—Ivory
	131193	Snap-in Rivets to Fasten Back
	128333-18	Bakelite Cabinet—Dark Walnut
	128333-9	Bakelite Cabinet—Ivory Color
	128162-17	Knob for Volume Control—Walnut
	128162-8	Knob for Volum Control—Ivory
	B-5B-10994-18	Tuning Knob—Walnut
	B-5B-10994-9	Tuning Knob—Ivory
	A-2H-10996	Reset Key
	120388	Locking Spring for Tuning Knob
	A-3F-10995	Locking Screw
	128-292B-17	Molded Pushbuttons—Walnut
	128-292B-8	Molded Pushbuttons—Ivory
	112784	Set of Station Call Letters
	112-606	Acetate Tabs
		TUNER PARTS
	117837	Cam Shaft
	117840	Brass Spacer
	117838	Thrust Collar.
	131142	"C" Washer
	115146	Cam
	115143	Keywasher
	117528	Brass Spacer
	117529	Brass Spacer.
	131181	Spring Washer
	117604	Locking Collar
	117610	Brass Spacer
	112602	Drum for Dial String
	120285	Coiled Spring for Dial String
	120214	Silk Line Dial String
	115361	Lever with Roller.
	120283	Return Spring for Lever
		DIAL PARTS
	112878	Dial Scale
	112661	Crystal for Dial
	131277	Metal Clamp for Crystal
	115453	Dial Bracket—with 3 Pulleys
	112668	Pointer
	117609	Brass Spacer for Pointer

Models 500 and 501—Series A

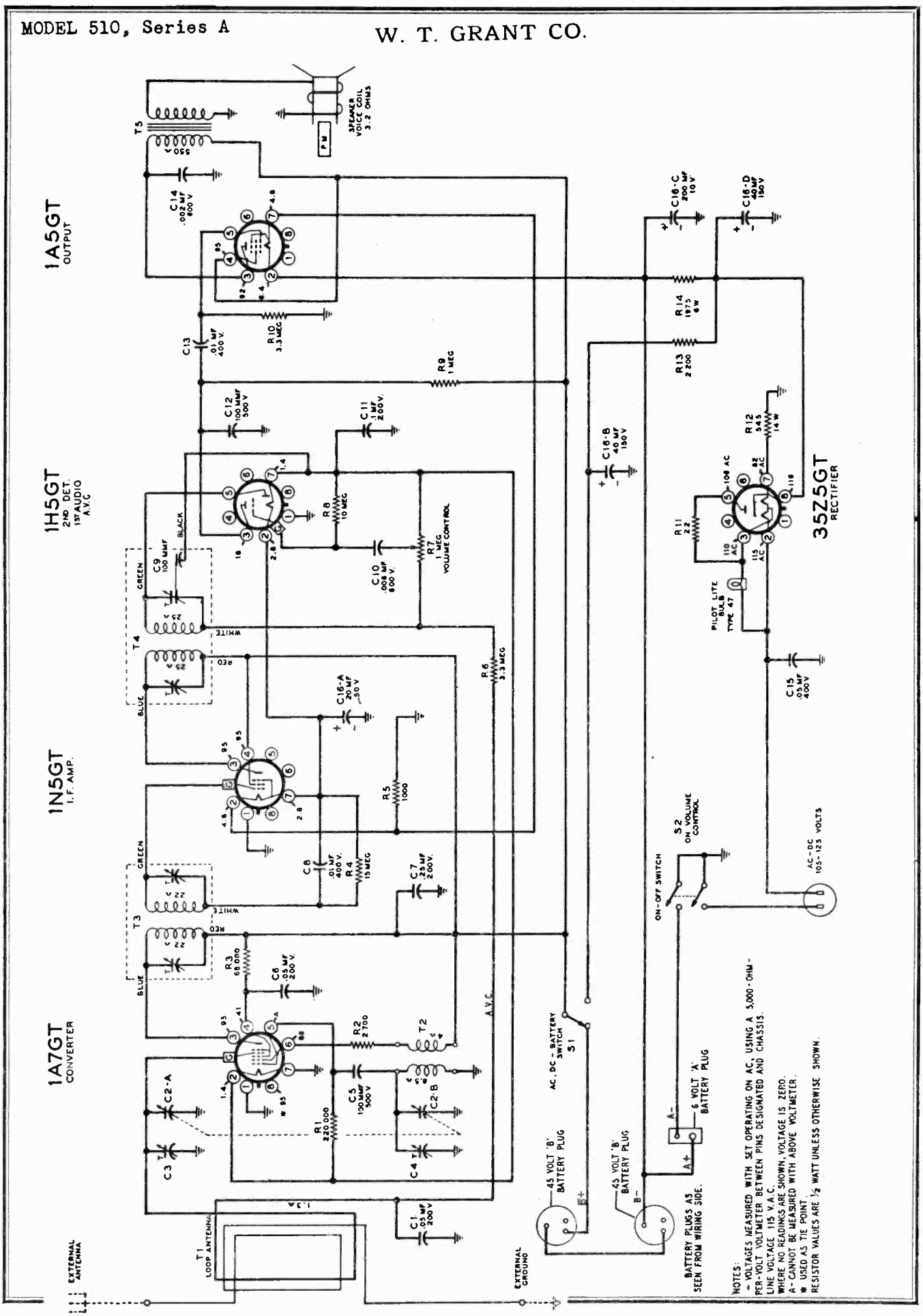
Reference No.	Part No.	Description
		CAPACITORS*
C18	C-8D-10788	.004 x 600 Volt Tubular Condenser
C19, C15	C-8D-10761	.01 x 400 Volt Tubular Condenser
C16	C-8D-10813	.05 x 400 Volt Tubular Condenser
C8, C9	C-8D-10770	.05 x 200 Volt Tubular Condenser
C15	C-8D-10789	.002 x 600 Volt Tubular Condenser
C7	C-8D-10953	.15 x 400 Volt Tubular Condenser
C10, C11	119-92	20 Mfd.—40 Mfd. x 150 Volt Electrolytic (For 60 Cycle)
C2, C6	124100	Trimmer (Antenna; Oscillator)
C17	C-8F6-121	.00047 Mica Condenser
C14	C-8F3-10	.00022 Mica Condenser
C5	C-8F3-11	.00033 Mica Condenser
C1	C-8F3-6	.000047 Mica Condenser.
		RESISTORS*
R4	C-9B1-34	3.3 megohm, ½ watt resistor
R9	C-9B1-29	470M ohm, ½ watt resistor
R2, R8	C-9B1-26	150M ohm, ½ watt resistor
R10	C-9B1-52	150 ohm, ½ watt resistor
R1	C-9B1-78	22M ohm, ½ watt resistor
R6	C-9B1-35	4.7 megohm, ½ watt resistor
R3	C-9B2-63	1200 ohm, 1 watt resistor
R7	C-9B1-42	22 ohm, ½ watt resistor
R11	C-9B2-44	33 ohm, 1 watt resistor
R5, S1	101196	Volume control and on-off switch (500M ohm)
		COILS
T3-C3-C4	108157C	Input I.F. coil assembly complete
T4-C12-C13	108157C	Output I.F. coil assembly complete
T2	110126	Oscillator coil assembly complete
T1	111136B	Antenna coil assembly complete with bracket
	112-676	Iron core for antenna coil
	112-677	Iron core for oscillator coil
		SOCKETS
	121210	Eight prong octal socket
	121177	Eight prong octal socket 12SK7
		SPEAKER
T5	B-18A-11124	4 Inch P.M. dynamic speaker complete with output transformer
		MISCELLANEOUS
	10798	Line cord and plug
	115408	Mounting bracket complete with brass pulley (for mounting ant. coil)
CA	115-459-18	Walnut finish metal antenna plate (back for cabinet)
CA	115-459-9	Ivory finish metal antenna plate (back for cabinet)
	12742	Flat fibre washer for mounting antenna plate (back)
	127138	Fibre grommet for mounting antenna plate
	13255	No. 6 x ¼" hex. head screws (mount antenna plate to chassis)
	132-69	No. 6 x ⅜" hex. head self-tapping screw, holds antenna plate to cabinet
	13220	No. 6—32 x ⅜ screws; unslotted head; chassis mounting
	128-345-18	Walnut cabinet complete (less back)
	128-345-9	Ivory cabinet complete (less back)
	128342-17	Walnut knobs
	128342-8	Ivory knobs
		DIAL PARTS LIST
	112-673	Dial scale (calibrated)
	112675	Pointer disc
P1	107249	6-8 volt pilot light bulb type T-47
	A55A-11408	Socket assembly for pilot light
	A2D-11331	Bracket for socket assembly
	117625	Tuning control drive shaft
	117624	Drive pulley with stop pin (for drive shaft)
	115464	Bracket for dial shaft
	115465	Dial bracket
	117627	Dial shaft
	112602	Dial drum
	120214	Silk drive string for pointer (1 ft. used)
	120285	Tension spring for drive string
	131269	Speed nut to fasten dial scale

*The values of the resistors and mica capacitors listed above are based on RMA standards. Due to conditions beyond our control, some receivers have been shipped with components of pre-standardized values. This receiver will operate equally well with components of either group. An illustration of the differences follows:

Pre-standardized value—200,000 ohms, 20%, 1/3 watt
RMA value—220,000 ohms, 20%, 1/2 watt
Pre-standardized value—50 mmf, 500 volts, 20%
RMA value—47 mmf, 500 volts 20%

MODEL 510, Series A

W. T. GRANT CO.



ELECTRICAL SPECIFICATIONS

Power Supply..... 105 to 125 volts, DC or 50-60 cycle AC, 30 watts.
Battery: A—6 volts, 58 ma.
B—90 volts, 9 ma.

Frequency Range..... 530 to 1650 kc.

Intermediate Freq...... 455 kc.

Tuning..... Two-gang capacitor.

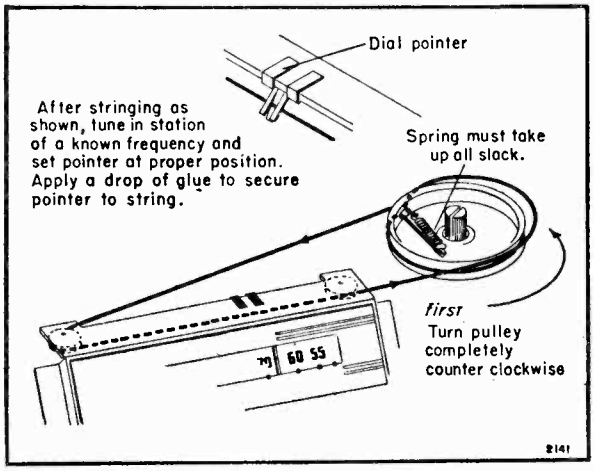
Antenna..... Built-in loop. Provisions also for external antenna and ground.

Speaker..... 5-inch; P.M.; voice coil impedance 3.2 ohms.

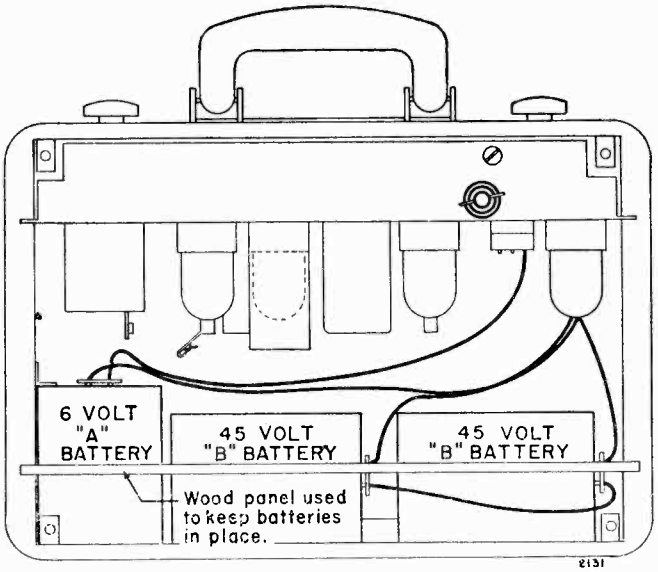
Power Output..... 80 milliwatts undistorted.
180 milliwatts maximum.

Sensitivity..... 30 microvolts average for 50-milliwatt output.

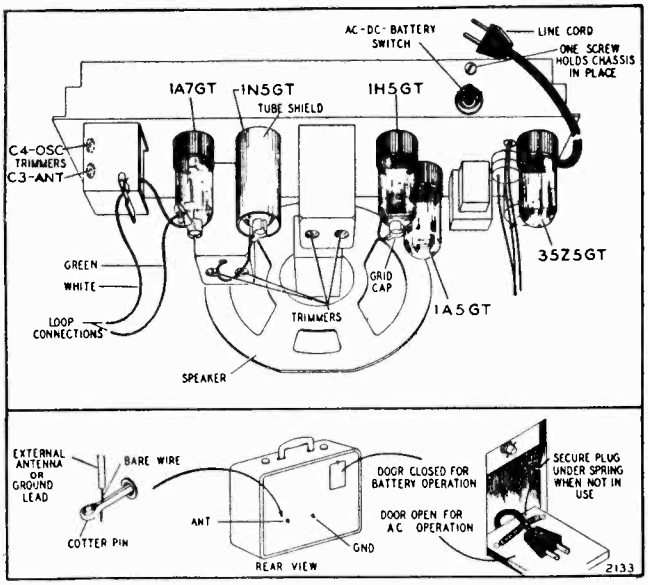
Selectivity..... 43 kc broad at 1000 times signal at 1000 kc.



Replacement of Dial Pointer Drive Cord



Battery Installation



Chassis View, Showing Tube Location

ALIGNMENT PROCEDURE

- Output meter across 3.2-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				*TUNER SETTING*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Capacitor*	*Connection to Radio*	*Ground Connection*		
455 kc	.1 mf	1A7GT grid cap*	Chassis	Rotor full open (plates out of mesh)	Input and output trimmers on IF cans
1650 kc	.1 mf	1A7GT grid cap*	Chassis	Rotor full open (plates out of mesh)	Oscillator trimmer C4
1400 kc†	200 mmf	External antenna clip	External ground clip	1400 kc	Antenna trimmer C3

* If loop is not connected when making this adjustment, substitute a 1-megohm resistor across the loop leads.

† For this adjustment chassis should be remounted in cabinet and loop connected. Antenna trimmer can be reached through a hole in the side of the cabinet.

MODEL 510, Series A

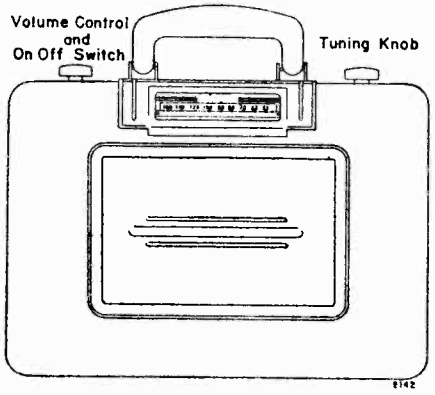
W. T. GRANT CO.

Ref. No.	Part No.	Description
		CAPACITORS
C2-A, C2-B, C3, C4	B-8A-10246	Two gang, including antenna and oscillator trimmers. Range of gang: 14-452 mmf (ant) and 10-198 (osc).
C16-A-B-C-D	119-123	Electrolytic; 20 mf x 50 volts; 40 mf x 150 volts; 200 mf x 10 volts; 40 mf x 150 volts.
C15	C-8D-10813	.05 mf x 400 volts tubular
C14	C-8D-10789	.002 mf x 600 volts tubular
C11	C-8D-10771	.1 mf x 200 volts tubular
C1, C6	C-8D-10770	.05 mf x 200 volts tubular
C10	C-8D-10785	.006 mf x 600 volts tubular
C7	C-8D-10775	.25 mf x 200 volts tubular
C8, C13	C-8D-10761	.01 mf x 400 volts tubular
C5, C12	C-8F3-8	.0001 mf x 500 volts 20 % mica
C9	C-8F3-8	.0001 mf x 500 volts 20% mica (Part of 2nd I.F. coil assembly.)
		RESISTORS*
R1	C-9B1-27	220,000 ohms, ½ watt, 20%
R2	C-9B1-67	2,700 ohms, ½ watt, 10%
R3	C-9B1-84	68,000 ohms, ½ watt, 10%
R4	C-9B1-302	15 megohms, ½ watt, 20%
R5	C-9B1-62	1,000 ohms, ½ watt, 10%
R6, R10	C-9B1-34	3.3 megohms, ½ watt, 20%
R7, S2	101252	Volume contol (1 megohm) and on-off switch
R8	C-9B1-37	10 megohms, ½ watt, 20%
R9	C-9B1-31	1 megohm, ½ watt, 20%
R11	C-9B1-42	22 ohms, ½ watt, 10%
R12	130343	545 ohms, 14 watts, 5%
R13	C-9B1-66	2,200 ohms, ½ watt, 10%
R14	130344	1,975 ohms, 6 watts, 5%

Ref. No.	Part No.	Description
		COILS AND TRANSFORMERS
T1	B-13E-10250	Loop antenna assembly
T2	A-13D-10239	Oscillator coil
T3	108201	Input I.F. transformer. Range of trimmers: 53-97 mmf each.
T4, C9	108200	Output I.F. transformer. Range of trimmers: 39-71 mmf each.
T5	105127	Output transformer
		MISCELLANEOUS
	114240B	Speaker, 5-inch, P.M.
	120406	"B"-battery cable assembly
	120407	"A"-battery cable assembly
	121171	Tube socket
S1	125153	Line-battery switch
	120417	Spring for line-battery switch
	107-363	Line cord and plug
	115396B	Tube shield
	B-6D-11301	Dial scale
	112925	Diffuser
	A-2M-7758	Snap-in rivets for diffuser and dial scale
	131-307	Cotter pin
	112922	Dial pointer
	120-214	Drive cord for dial pointer (20")
	120197	Spring for drive cord
	107249	Pilot light, 6-8 volts, type T-47
	107362	Socket assembly for pilot light
	128641	Cabinet back
	120410	Spring for securing line cord plug
	112910-1	Escutcheon for dial
	128643	Escutcheon for grille
	128645	Knob, tuning
	128647	Knob, volume
	131253	Snap-in rivet, for trimmer hole
	13448B	Rubber grommet for trimmer hole
	112-928	Drive pulley

*The values of the resistors and mica capacitors listed above are based on RMA standards. Due to conditions beyond our control, some receivers have been shipped with components of pre-standardized values. This receiver will operate equally well with components of either group. An illustration of the differences follows:

Pre-standardized value—200,000 ohms, 20%, 1/3 watt
RMA value—220,000 ohms, 20%, 1/2 watt
Pre-standardized value—50 mmf, 500 volts, 20%
RMA value—47 mmf, 500 volts, 20%



BATTERY REPLACEMENT — Run-down batteries are indicated when (1) the volume cannot be brought up to the desired level; (2) the tone of the radio is "mushy" (not clear); or (3) reception fails completely. If you are in doubt as to whether the batteries are faulty, have your radio dealer check them for you.

If the batteries need replacement, get two 45-volt "B" batteries (size: 3½" x 2¼" x 4½") and one 6-volt "A" battery (size: 2⅝" x 2⅝" x 4").

PILOT LIGHT — If the pilot lamp burns out, the set should not be operated on AC or DC power until a new lamp has been installed. Failure to heed this caution may result in a burned-out 35Z5GT tube.

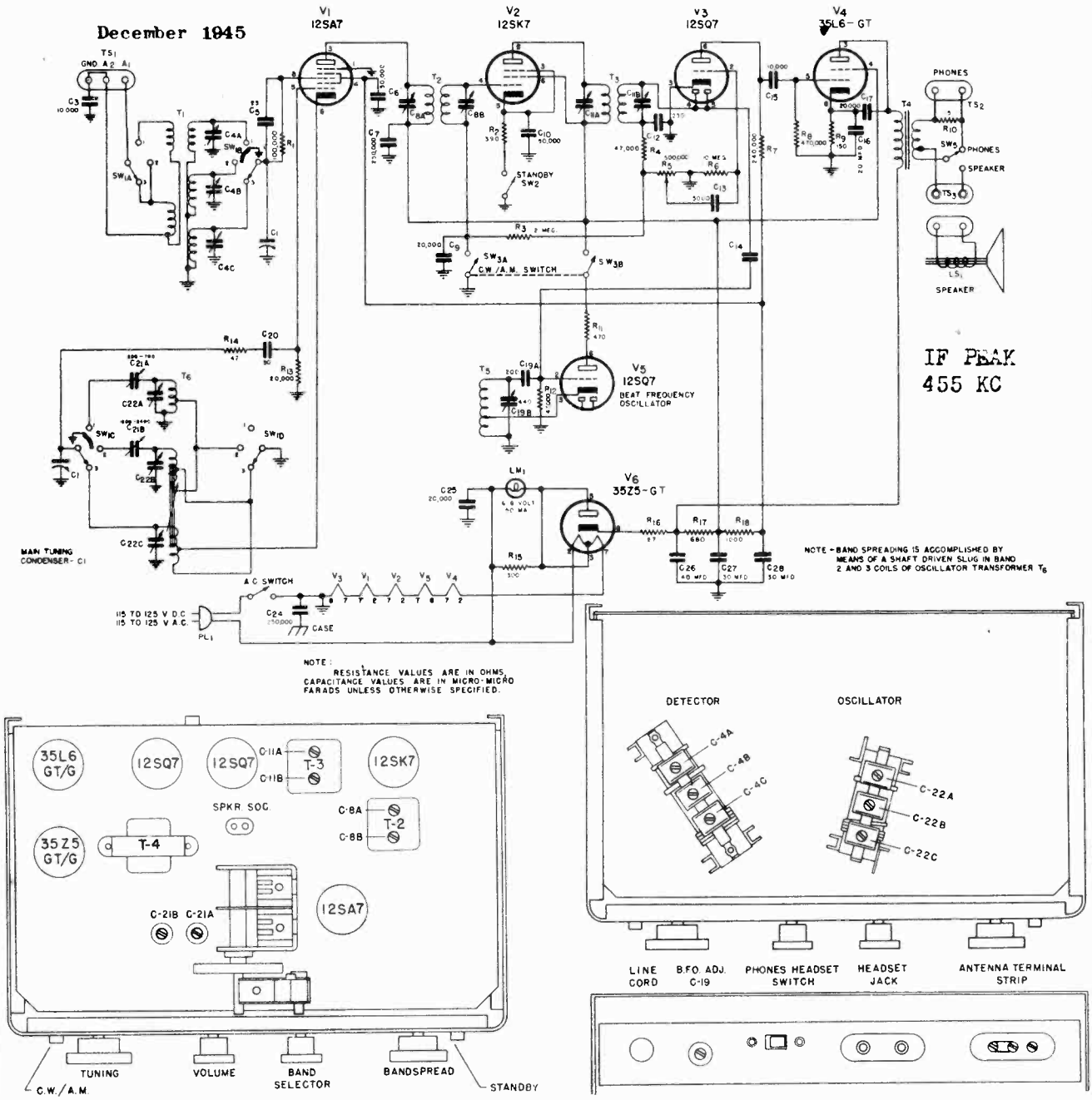
TUBES—Tubes which have weakened with age may cause poor or erratic reception; therefore have the tubes tested periodically and replace those which are weak. To remove the tubes, first remove the back of the cabinet. Pull the grid caps from the tops of the 1A7GT, 1N5GT, and 1H5GT tubes (see Chassis View). Then remove the tube shields where present. When removing a tube, rock it back and forth gently while pulling it out of its socket.

When replacing tubes, grid caps, and shields, refer to the Chassis View illustration to make sure that the replacements are properly made.

THE HALLICRAFTERS CO.

MODEL EC-1B, Echophone

December 1945



Listed below in table form, are the alignment frequencies and adjustments necessary to align the receiver. CAUTION - Do not connect signal generator ground directly to the chassis, connect it to the "G" terminal of the antenna terminal strip.

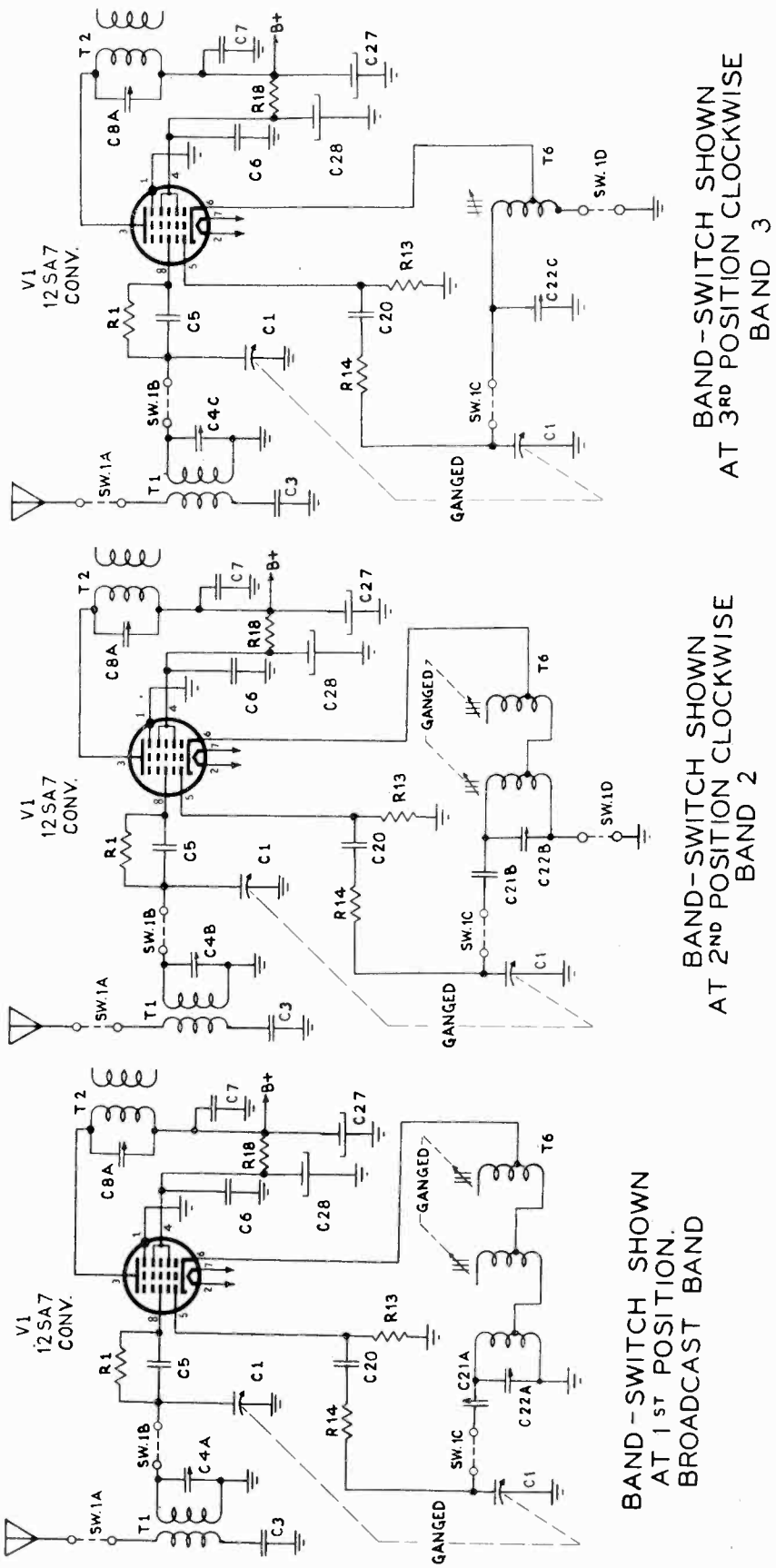
NOTE - Set BANDSPREAD dial at "0" before attempting alignment. (Slug should be between Band 1 and Band 2 coils.)

ALIGNMENT DATA

BAND	Signal Generator Frequency	Dummy Antenna	Adjust Pads	Adjust Trimmers
I-F	455 kc.	None	None	C-8A, C-8B, C-11A, C-11B
BFO	455 kc.	None	Adjust capacitor C-19 for zero beat.	
1	600 kc. 1600 kc	330 ohm 330 ohm	C-21A None	None C-22A, C-4A
2	2.4 mc. 7.0 mc.	330 ohm 330 ohm	C-21B None	None C-22B, C-4B
3	No low frequency adjustment on this band. 28 mc.	330 ohm	None	C-22C, C-4C

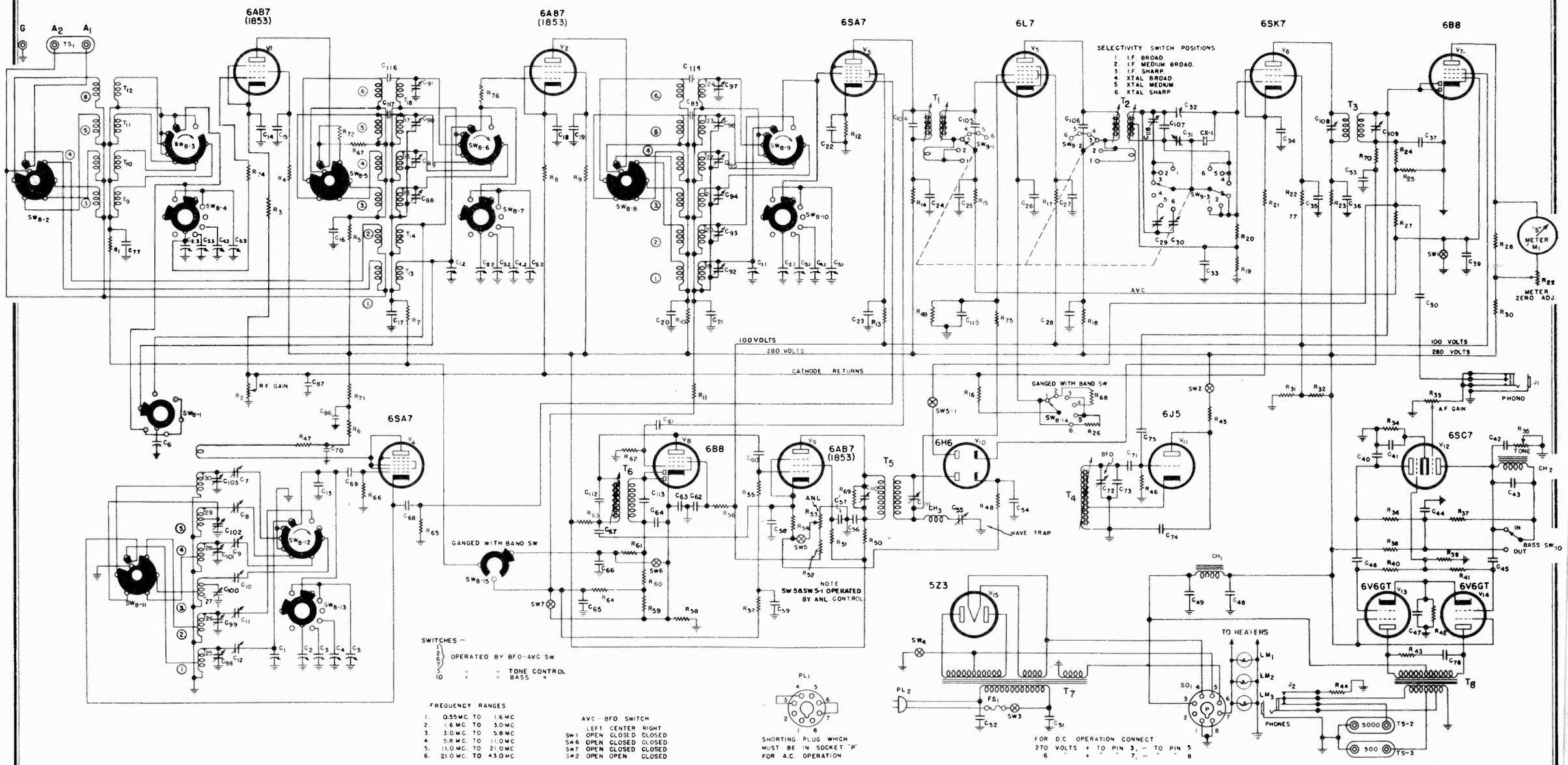
MODEL EC-1B, Echophone

THE HALLICRAFTERS CO.



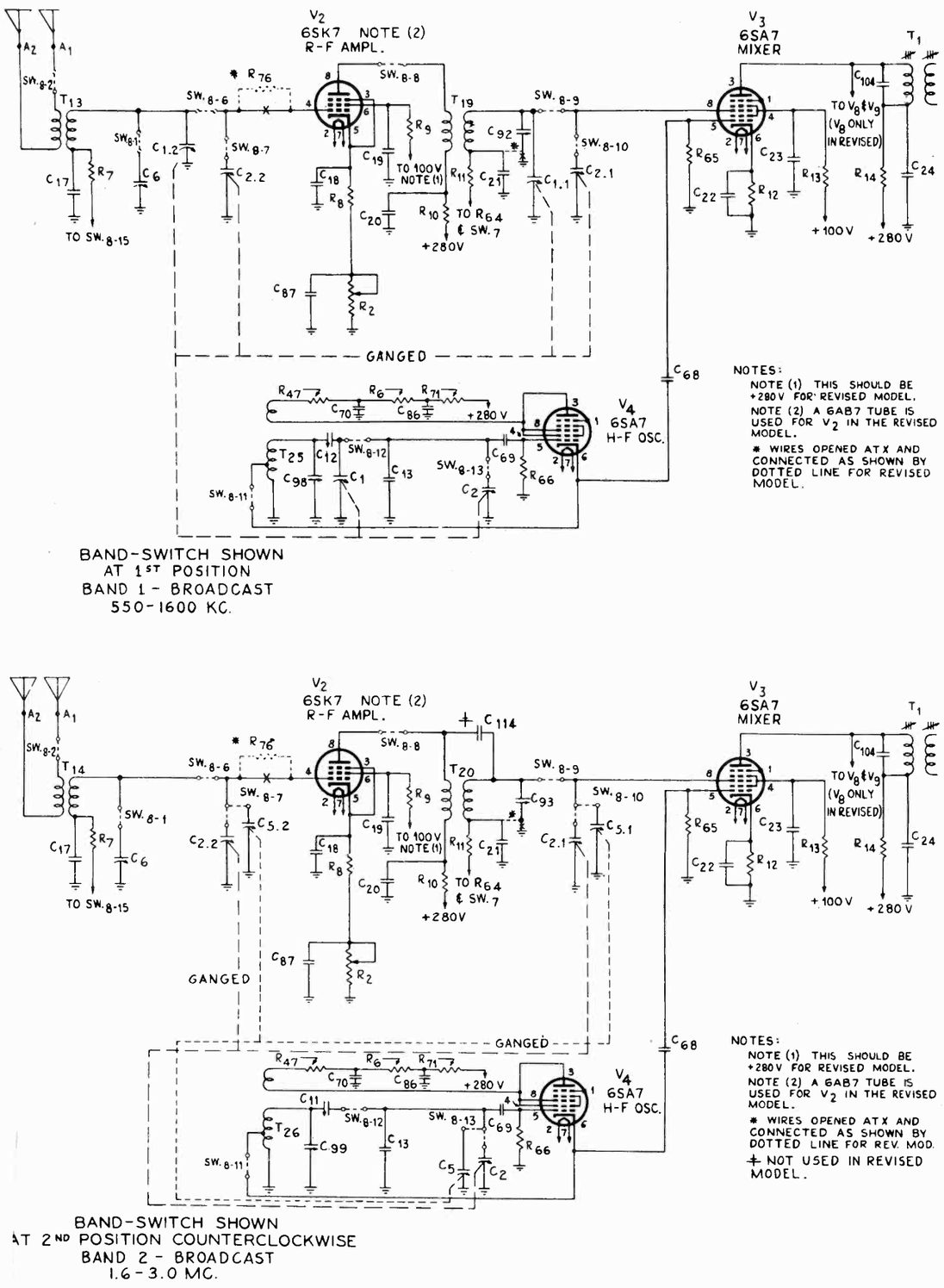
THE HALLICRAFTERS CO.

MODEL SX-28A, Super Skyrider



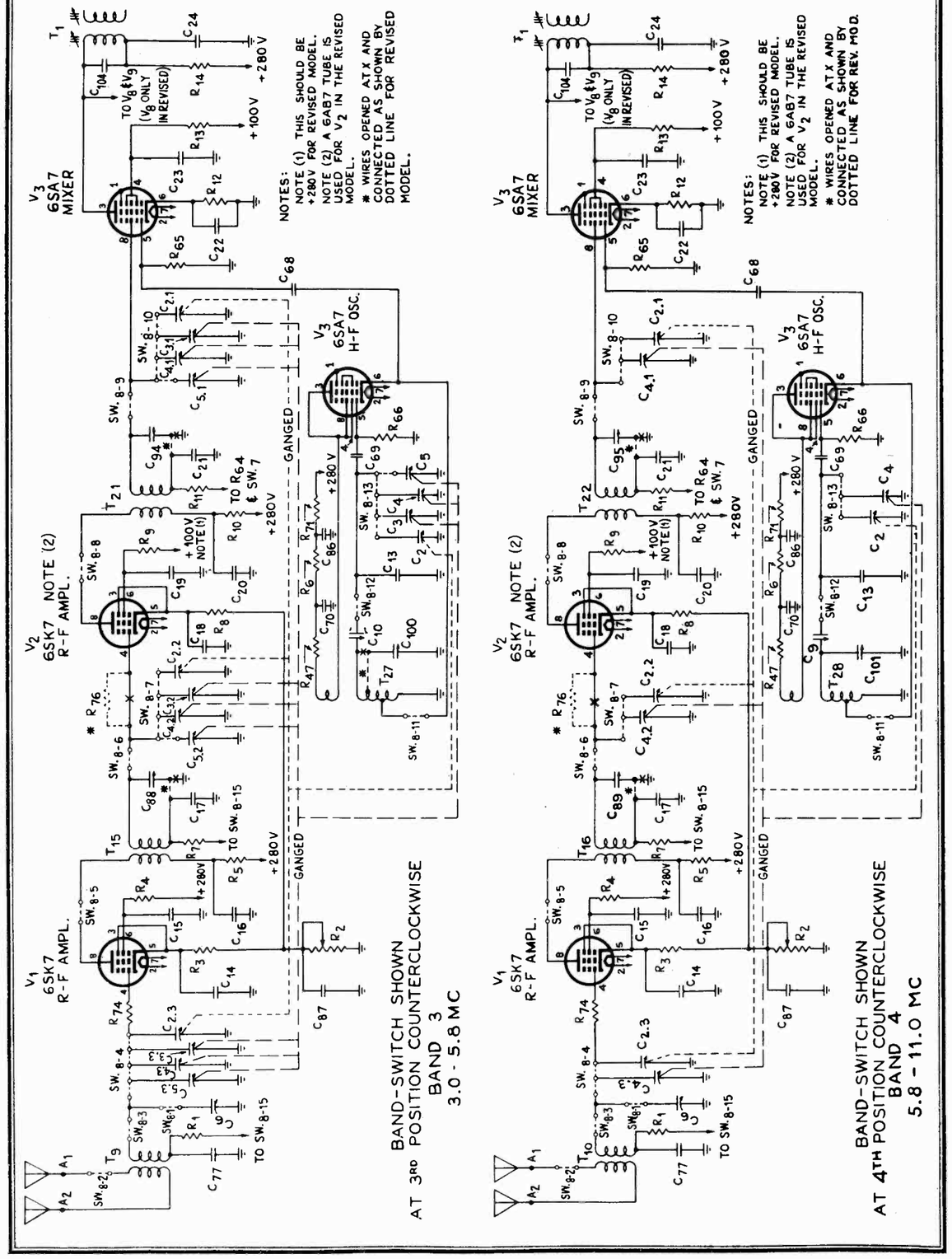
THE HALLICRAFTERS CO.

MODEL SX-28A,
Super Skyrider



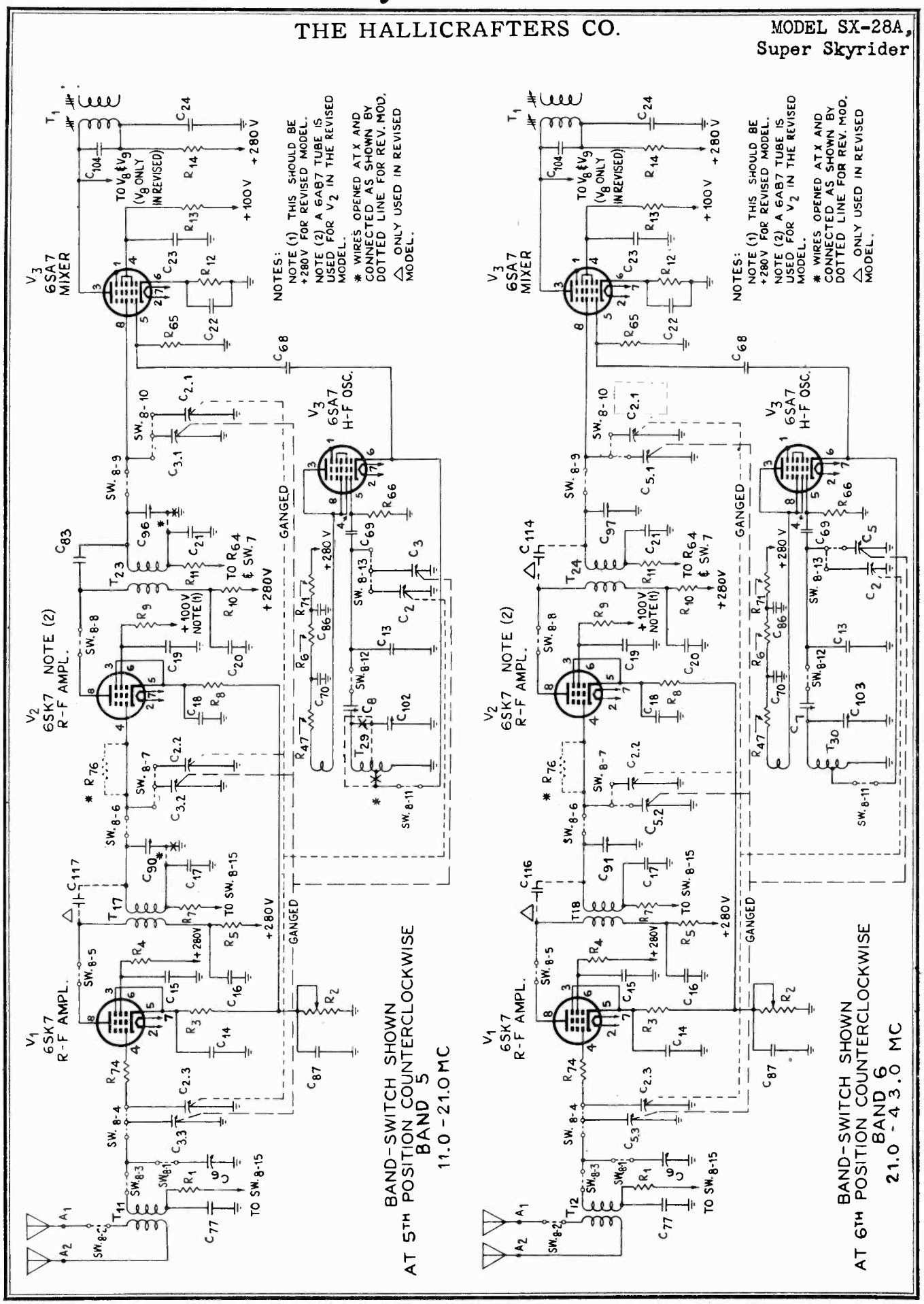
BAND-SWITCH SHOWN
AT 1ST POSITION
BAND 1 - BROADCAST
550-1600 KC.

BAND-SWITCH SHOWN
AT 2ND POSITION COUNTERCLOCKWISE
BAND 2 - BROADCAST
1.6-3.0 MC.



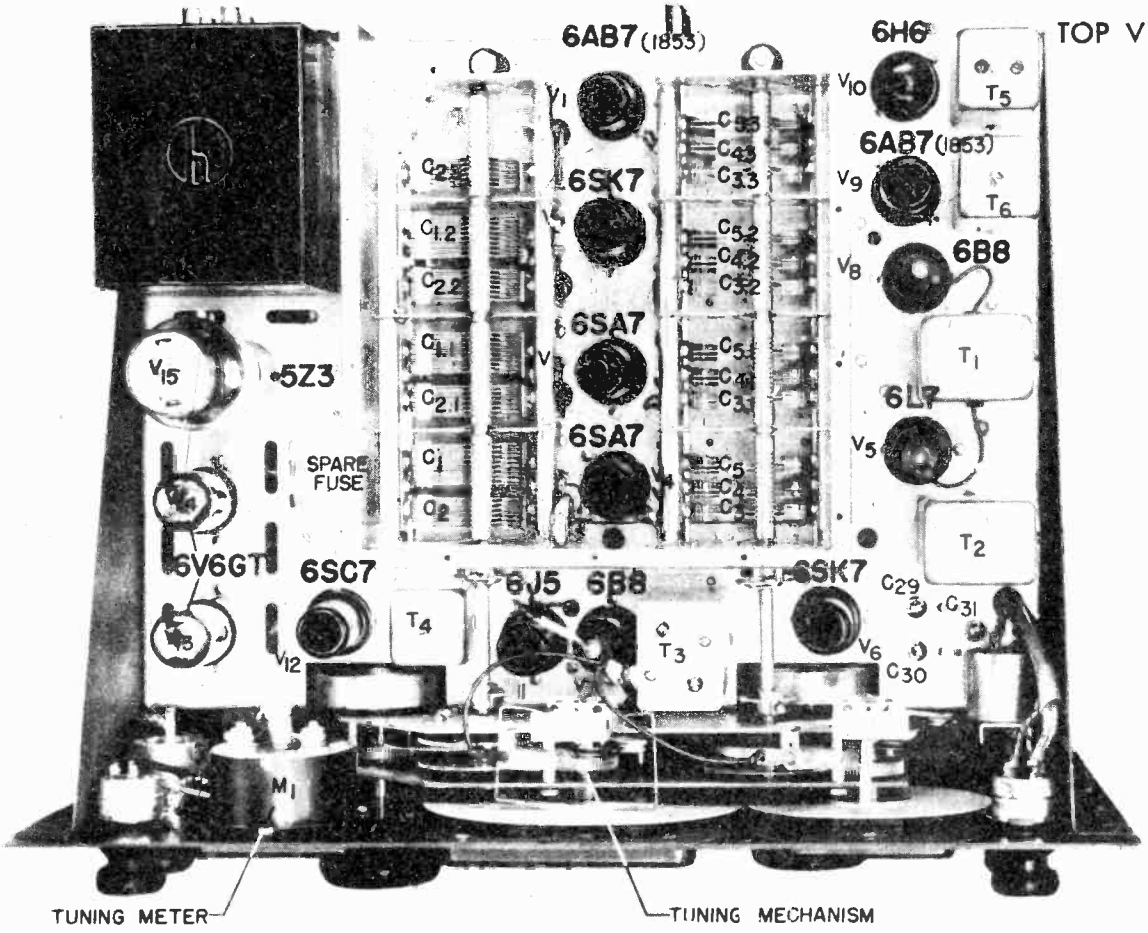
BAND-SWITCH SHOWN
AT 3RD POSITION COUNTERCLOCKWISE
BAND 3
3.0 - 5.8 MC

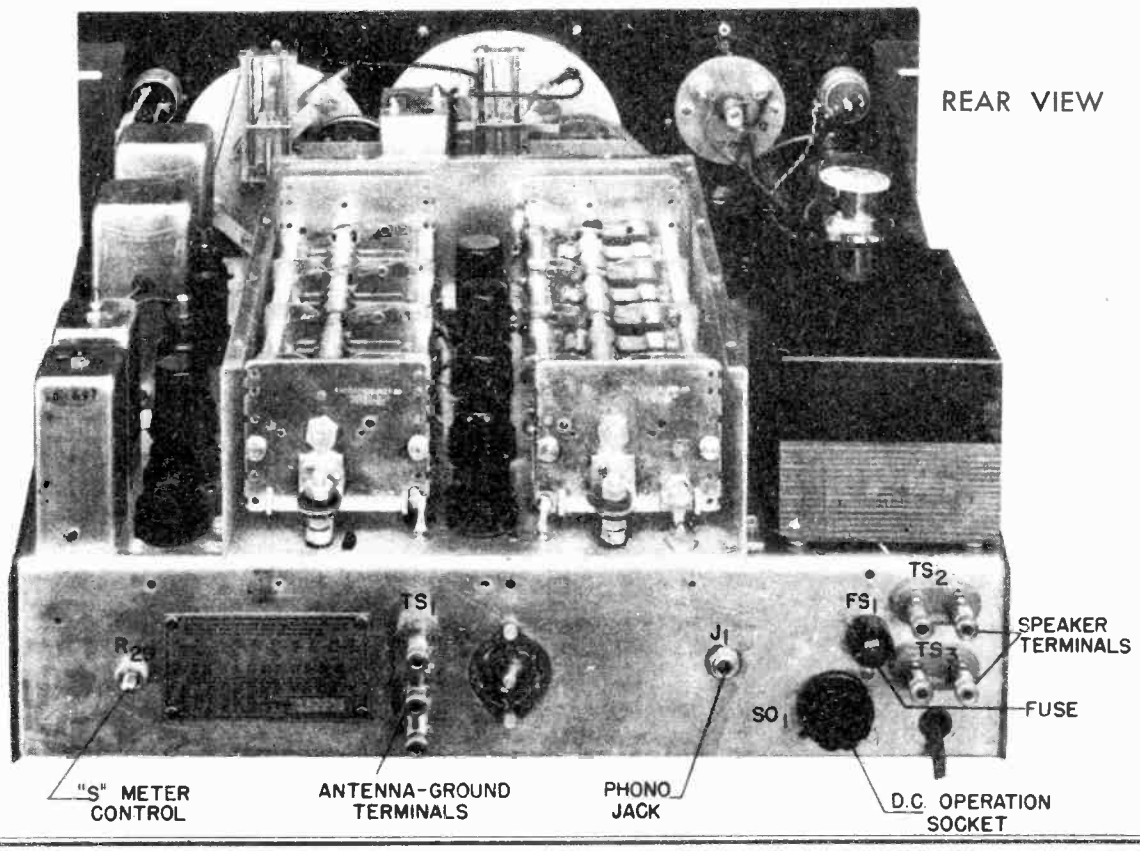
BAND-SWITCH SHOWN
AT 4TH POSITION COUNTERCLOCKWISE
BAND 4
5.8 - 11.0 MC



MODEL SX-28A,
Super Skyrider

THE HALLICRAFTERS CO.





THE HALLICRAFTERS CO.

MODEL SX-28A, Super Skyrider

TERMINALS AND CONNECTIONS ON REAR OF RECEIVER

(1) SPEAKER

On the rear apron of the receiver's chassis appear two terminal strips for connecting either a 500 or 5000 ohm speaker to the receiver. Should a matching HALLICRAFTERS Bass-Reflex speaker be used with the receiver, it should be connected to the 5000 ohm terminals. The 500 ohm terminals can be connected to a speaker or other load of that impedance value.

(2) ANTENNA

To the terminals marked A1-A2 and G should be connected the antenna you have chosen to use with the model SX-28-A receiver.

Very satisfactory results throughout the tuning range of the SX-28-A will be obtained with a conventional inverted "L" Marconi type of antenna 75 to 100 feet long including lead-in. This antenna should be erected as high as possible and removed from surrounding objects. Be sure that the antenna is insulated from the ground at all points. When this type of antenna is used it is connected to terminal A-1. The Jumper between A-2 and G should remain connected.

In the event a doublet antenna is used with the model SX-28-A SUPER SKYRIDER receiver, the two wires of the doublet lead-in should be connected to terminals A1 and A2. The Jumper between A2 and G can remain connected or removed, depending upon its effect on favorable reception.

A ground can be used if desired and should be connected to the G terminal. Connecting the receiver to a good ground (cold water pipe or 6 foot rod driven in moist soil) might improve reception and reduce noise. Under normal conditions no noticeable difference will exist so a ground is suggested only if it aids reception.

Should you wish to have a separate antenna for some one short wave frequency or band, a half-wave antenna cut to the proper length for the desired frequency will prove very effective. The following formula will give the length of the ½ wavelength antenna depending on the desired frequency.

$$\text{Length in feet} = \frac{463}{\text{frequency in megacycles.}}$$

or, for example, a half wave 40 meter antenna would be $\frac{463}{7} = 66.14$ feet long.

The antenna should preferably be of solid soft drawn enameled copper wire for ease in handling. The center of the wire is cut and an insulator inserted at that point. The twisted pair, or open wire transmission line, is then soldered to each 33 foot length, after the enamel has been scraped off, directly on either side of this center insulator. The other end of the transmission line should be connected to A1 and A2 on the receiver. It should be remembered that such an antenna has directional properties broadside to its length and should be so oriented if maximum pickup from a certain direction is to be expected.

In designing transmission line systems for a more accurate match of the line to the antenna input circuit, it will be helpful to know that the approximate antenna input impedance of the receiver is 400 ohms.

(3) PHONO-JACK

The Phono-Jack enables you to use the high fidelity audio amplifier of the receiver for phonograph record or transcription play-back purposes. A high impedance crystal or magnetic pick-up arm should be used for this purpose and connected to a standard headphone plug. This plug is then inserted in the PHONO-JACK when record playing is desired. The receiver is inoperative to radio signals, when the plug is in the phono-jack.

The volume of the audio amplifier is varied by rotating the AF Gain control until the proper level is obtained. Removal of the plug from the Phono-Jack once more places the RF and IF portions of the receiver in operation.

(4) DC POWER SOCKET

The octal socket on the rear of the chassis is used when it is necessary to furnish power to the receiver from a direct current source. For conventional AC operation, the shorting plug must remain in the DC OPERATION SOCKET. The shorting plug is removed for battery or vibrapack operation. A similar plug to the shorting plug is then wired, as shown in Fig. 13, and inserted in the octal socket.

A "B" supply capable of delivering 270 volts at 150 milliamperes is necessary for successful operation. Refer to the section on receiver specifications for the total battery drain for DC operation.

In addition to its function as connector for a DC supply, this socket also serves as an outlet for a remote stand-by switch. If the remote stand-by switch or relay is connected between pins #1 and #5 on the shorting plug and the SEND-RECEIVE switch on the front panel of the receiver is set at SEND, the remote switch or relay will control the operation of the receiver in the same manner as the SEND-RECEIVE switch.

(5) "S" METER ZERO SET

"S" METER CONTROL is obtained by varying the knurled knob appearing on the left hand chassis apron edge. This control enables you to properly set the "S" Meter to zero. In order to make the adjustment correctly, the RF GAIN CONTROL must be advanced clockwise as far as it will go. In addition, the switch directly below the bandspread hand-wheel must be in the AVC—ON Position. When these conditions have been complied with, remove the antenna from the Receiver and then adjust the S meter control until the S meter reads zero. Reconnecting the antenna to the receiver will then make the meter indicate the relative carrier strength of each incoming signal as various signals are tuned in.

B OPERATION

Each control of the Model SX-28-A SUPER SKYRIDER receiver performs a definite function that contributes to the outstanding reception capabilities of the unit. Full appreciation of the receiver is to be expected only after you have become familiar with each of the controls and the effect their operation has on the receiver's performance.

The large calibrated main dial shows the frequencies covered throughout the 6 band, 550 kc to 43 mc frequency range of the reciever. They are as follows:

Band 1—550 to 1,600 kilocycles
Band 2— 1.6 to 3.0 megacycles
Band 3— 3.0 to 5.8 megacycles
Band 4— 5.8 to 11.0 megacycles
Band 5— 11.0 to 21.0 megacycles
Band 6— 21. to 43. megacycles

(1) The BAND SWITCH, directly below the main dial, will place the proper set of coils in the circuit to cover the desired frequency. The main dial is turned by the large handwheel which is equipped with a micrometer scale for maximum accuracy in resetting or logging purposes. Of particular interest is the locking clutch which will be found directly below the handwheel. This feature will allow you to lock the main dial after a desired signal has been tuned in. Subsequent movement of the handwheel will not detune the receiver because the control is provided with a clutch which disengages the handwheel once the dial lock has been set.

The International Shortwave broadcast bands are indicated on the main dial by heavier lines showing the frequencies on which these transmissions will be heard.

The Amateur band setting positions of the main dial are indicated by a small 0 appearing over the red numbers which identify each amateur band. The hairline on the main dial window should be set so that it intersects this small circle when the main dial is placed in position for the desired amateur band.

(2) The BANDSPREAD dial is calibrated for the 10-20-40 and 80 meter amateur bands. When tuning on the 160 meter band the main dial should be used.

Note: The calibration on the main dial will be accurate *only* if the bandspread condenser is set at minimum capacity which is indicated by a setting of 100 on the bandspread logging scale. It should be recognized that if the bandspread condenser is left at any other setting but 100, that small amount of bandspread condenser capacity, added to the main tuning condenser capacity, would throw off the main tuning dial calibration because the receiver is calibrated with the Bandspread condenser set at minimum capacity. The portions of the amateur bands on which type A3, or telephone, transmissions will be heard are underscored with another dark line.

The numbered outer edge of the bandspread dial will prove to be of great help for logging or pre-setting purposes when the bandspread tuning control is used for easier tuning on frequencies other than those covered by the amateur bands.

When "bandspreading" any frequency throughout the tuning range of the receiver remember the main dial must then be set to a slightly higher frequency than the desired signal. The difference depends on the amount of bandspread condenser capacity used and the frequency of the received signal.

When switching from one range to another, an indicator moves vertically behind both the main and bandspread dials. Tuning fatigue is thereby greatly minimized by focusing attention on only the frequencies covered by that particular setting of the bandswitch.

The translucent, indirectly lighted dials are easily read and so arranged that parallax is reduced to an absolute minimum.

To operate the receiver adjust the following controls in the order in which they are mentioned:

(3) The TONE CONTROL turns the receiver *on* and *off* and in addition emphasizes either the base or treble frequencies to the extent required by various receiving conditions. The effect the Tone Control has on the fidelity of reproduction is shown in Fig. 10.

(4) Place the SEND-RECEIVE switch in the RECEIVE position—have the ANL control off (turned to the left until the switch operates).

Place the bandswitch in position .55 to 1.65 mc, which will then enable you to tune in stations on the standard Broadcast Band.

(5) Rotate the RF GAIN control to the right until #9 on the skirt of the control appears under the panel marker. (The RF Gain must be full ON as above indicated before the S meter will indicate correctly.) So that the S meter will be properly connected in the circuit, the AVC-BFO switch appearing to the lower right of the bandspread handwheel, must be in the AVC ON position.

(6) Note: The *Antenna Trimmer* control is operated on all Bands. Proper adjustment of this control is indicated by the maximum signal.

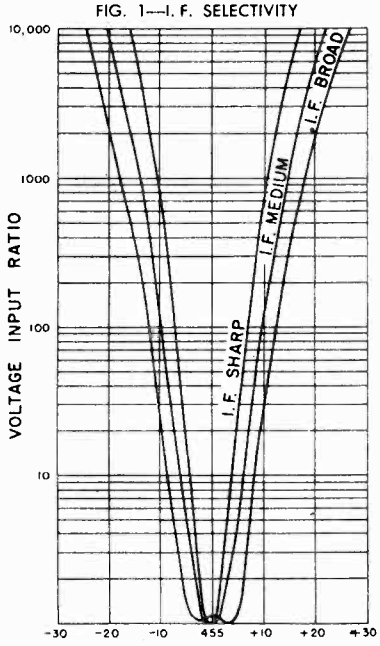
(7) After complying with the above conditions, the AF GAIN control should be advanced to the right until the desired volume is obtained. Tuning the receiver by operating the main dial handwheel will now allow you to pick up stations throughout the .55 to 1.65 mc tuning range of the Broadcast band. Maximum deflection of the S Meter will indicate when each station is accurately tuned in.

When covering the short-wave or higher frequency bands the above procedure should be followed—except that greater care should be used because it is so easy to completely pass over a station.

The other controls on the model SX-28-A SUPER SKYRIDER receiver will enable you to obtain the best results from the receiver once you have become used to their effects on the reception of various types of signals.

(8) The SELECTIVITY control acts as a shutter or gate and varies the width of the path on which signals reach the second detector of the receiver. Six different selectivity steps are provided so that you can successfully cope with different degrees of interference. Reference to Fig. 1 and Fig. 4 will show, graphically, how the control trims the width of the signal so that what interference might be present in the signal's skirts or sidebands is effectively clipped off. Should an interfering signal lap over into the desired signal, adjustment of the SELECTIVITY control, will reduce that interference.

FIG. 1—I. F. SELECTIVITY



Once more refer to Fig. 1 and Fig. 4 and recognize the fact that with the control set in the BROAD IF position, the signal proper and all its parts, which are combined in the side bands, or skirts, will be passed to the 2nd detector, audio amplifier, and then Speaker. As the selectivity of the receiver is increased from BROAD-IF to XTALSHARP, the gate, or admittance path, is so narrowed that only the main portion of the signal is allowed to pass through. This fact and its effect on the quality of reproduction is readily appreciated by listening to a signal and noting the reduction in higher frequency response in the more selective settings of the switch. (See Fig. 10 and Fig. 11)

At this point, it is suggested that the CRYSTAL SHARP setting be used only in cases of extreme interference—the receiver must then be tuned exactly to the signal. Only then will the signal be intelligible because you have clipped off its sidebands in which the sibilants and overtones are embodied.

The CRYSTAL SHARP position of the selectivity switch is to be used principally for the reception of code, or CW, signals. By proper associated operation of the CRYSTAL PHASING control true single signal operation and the maximum in selectivity can be obtained (crystal circuit discussed in detail in the summary of related circuits). See Fig. 3.

MODEL SX-28A, Super Skyrider

THE HALLICRAFTERS CO.

(3) THE IF AMPLIFIER

The IF Amplifier of the Model SX-28-A was designed with a view towards permanency of adjustment under conditions of extreme changes in temperature and humidity as well as unusual mechanical vibration.

The first two IF Transformers are permeability tuned. In comparing this type of transformer with one having compression mica tuning condensers, it must be remembered that it takes many more turns of the adjusting screw to cause the equivalent change in tuning of the permeability tuned type. Hence a slight change in the position of the screw will have negligible effect upon the tuning. The adjusting screw is under spring tension thereby making it impossible to turn under vibration.

The diode transformer is air-tuned with two variable condensers each with a lump capacity of 50 mmf and variable of 50 mmf. These air trimmers are also under spring tension so that they can withstand considerable vibration. Being of the air tuned type, their capacity change is negligible with wide changes in humidity. Reference to the Schematic will show that the IF transformers are expanded in two steps—thereby enabling medium or full reproduction of the higher frequencies to be obtained.

(4) VARIABLE SELECTIVITY

Six ranges of selectivity are provided in the model SX-28-A receiver. They are:

1—Broad IF—(for high fidelity reception)
2—Medium IF—(more selectivity—less highs)
3—Sharp IF—(reduces annoying interference—far less highs)
4—Crystal Broad—(Similar to Sharp IF but cleaner cutting of side bands)
5—Crystal Medium—(next selectivity step to #4—greatly increased sideband cutting—more pronounced crystal "Slot" for interference—very little highs present)
6—Crystal Sharp—(position of extreme selectivity—practically no sideband content—very pronounced crystal "slot")

The graphic effects of the different steps of selectivity on a signal are shown in Fig. 1 and Fig. 4.

(5b)

CRYSTAL

The CRYSTAL FILTER and holder are wired directly into the receiver and do not plug in as heretofore. In this manner exceptional crystal filter action is obtained because of the elimination of the capacity and losses of a socket. So mounting the crystal prevents possible change in polarity which would occur if the crystal were improperly inserted in the circuit.

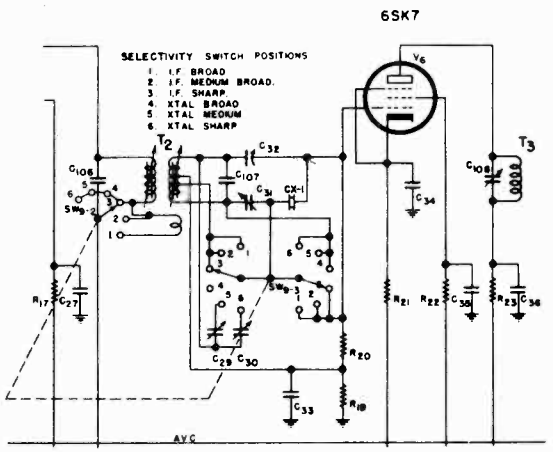
The size of the crystal has been carefully determined to allow the BROAD CRYSTAL position to tune as broadly as possible. The capacity of the crystal holder has been reduced to a minimum through the use of a specially designed polystyrene holder.

(5) CRYSTAL FILTER CIRCUIT

In positions 1, 2, 3 the crystal is short circuited. In position 4 the short across the crystal is opened and the iron core in the secondary of the transformer is adjusted for Broad Crystal Action and at this point is accurately tuned to the crystal frequency. Due to the close coupling of the secondary to the crystal, the sharply rising resonance curve of the crystal causes, in contrast, a sharply falling resonance curve in the secondary. The combined action of these two characteristics results in a relatively broad resonance curve for the CRYSTAL BROAD selectivity setting. In the MEDIUM CRYSTAL No. 5 position, C_{29} is adjusted for selectivity midway between the BROAD and CRYSTAL SHARP settings. (See Fig. 2 and Fig. 4)

In position 6, or CRYSTAL SHARP, the trimmer C_{30} is adjusted for the Sharpest crystal action. Under this condition, the Secondary is slightly detuned from the resonant crystal frequency sufficiently so that its resonance curve is not greatly affected by the crystal but still coupled tightly enough so that it can transfer energy to the crystal circuit. When this point is reached it is indicated by a rise in the output. Two such points of increased output will normally occur—one for each adjustment of the secondary on either side of the resonant frequency of the crystal.

FIG. 2—CRYSTAL FILTER SCHEMATIC



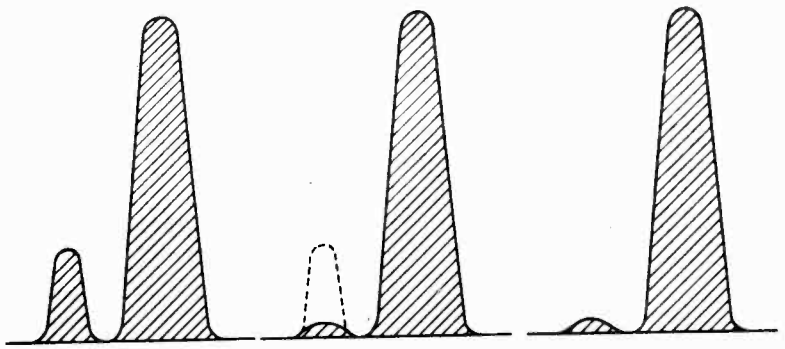
(5a)

SINGLE SIGNAL ADJUSTMENT

It is extremely simple to attain single signal reception with the SX-28-A. First, turn on the BFO to the desired Beat Note and turn the selectivity switch to the XTAL SHARP position. Pick a good solid CW signal, preferably a commercial station because a commercial is likely to stay on long enough for you to complete the phasing adjustment for single signal reception.

You will find on tuning across this signal that it has two amplitudes. Tune first to the weaker of these two amplitudes. Now, turn the PHASING control until this weaker of the two amplitudes is reduced to a minimum. (If the weaker amplitude appears on the right the above procedure still holds.) Then tune to stronger of the two amplitudes and adjust the BFO control to a tone most pleasing to you. This adjustment for single signal selectivity will hold with no further adjustment unless you change the phasing control. (See Fig. 3.)

FIG. 3—SINGLE SIGNAL OPERATION



With Selective Switch in XTAL Sharp position identify the weaker amplitude—Tune Receiver to the weaker.

Adjust phasing control carefully until this weaker amplitude is reduced to a minimum.

Retune Receiver to the stronger amplitude and then adjust pitch control until you get note most pleasing to copy.

(9) CRYSTAL PHASING CONTROL

The Phasing Control is in the circuit on three positions of the selectivity control namely—XTAL Sharp, XTAL Medium and XTAL Broad.

The control is used to remove heterodyne interference as well as to minimize other forms of interference having a predominance of high frequency components—such as static and interference from electrically operated devices.

(10) The A.N.L., or *Automatic Noise Limiter*, materially contributes to the satisfactory operation of the receiver by limiting objectionable interference caused by ignition systems or other man made causes of electrical disturbances. With the A.N.L. control retarded to the left as far as it will go, or until the A.N.L. switch is heard to operate—the noise limiter circuit is not functioning. Turning the control to the right closes the switch which is mounted on the control. The noise limiter is now operating. Progressively turning the control clockwise varies the threshold at which the noise limiter starts to take hold. The setting at which the control will be left depends entirely on the type and amount of interference present as well as the signal strength. The noise limiter should be judiciously adjusted because through its operation the desired signal can even be eliminated or badly distorted which destroys its usefulness. Only after you have become familiar with the operation of this control by actual practice can you determine how far it should be advanced before the best compromise between noise and signal is obtained. (See Fig. 6.)

(11) The AVC-BFO OFF-ON switch performs a dual function. The AVC circuit should be operating for the reception of telephone, or modulated, signals in order to reduce fading to a minimum. As previously mentioned, the functioning of the S Meter is dependent upon AVC action so the switch must be in the AVC ON position when the S meter is used to measure relative carrier intensity.

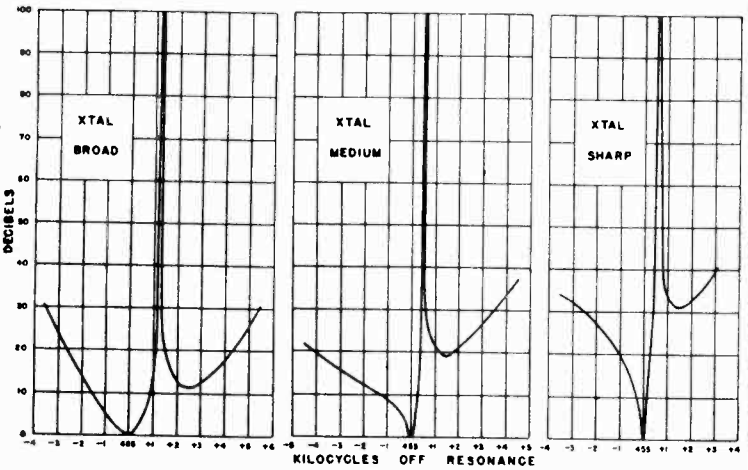
Inasmuch as the AVC circuit levels all signals to a predetermined value (See Fig. 7) no one signal can overload the receiver and cause distortion. At times, in searching for distant or weak signals, it might be desirous to use the full sensitivity of the Model SX-28-A. In that case place the AVC switch in the AVC OFF position. Remember that with the receiver operating with no AVC action, strong signals will overload the input circuit with resultant distortion. Under such a condition of operation the sensitivity of the set must be then controlled, manually, by properly retarding the RF Gain control until you have reached the point below which overloading takes place.

The other function of this switch is to turn on the Beat Frequency oscillator. When receiving code signals, a beat note is absolutely essential. With the BFO switch in the ON position, each signal tuned in will be accompanied with a beat note or whistle. For proper adjustment of the BFO control which appears directly under the TONE CONTROL the following procedure is suggested. Set the BFO control to zero, now tune in a signal either voice or code. If a code signal is received, only the carrier or thump of the signal will be audible because no beat note is present. Be sure that you have the signal accurately resonated. Now, without retuning the receiver, rotate the BFO control until a beat note of the desired pitch is obtained. You now have introduced a beat note which differs from the IF frequency of the receiver, namely 455 kc, by the frequency of the audible signal. Variation of the BFO control will allow you to change the pitch, or frequency, of the oscillator which will prove to be of help under various conditions of interference.

(12) Directly under the BFO control will be seen the BASS IN-OUT Switch. With this switch in the BASS IN position you will have normal audio fidelity. Placing the switch in the BASS OUT position, the audio filter CH_2 is inserted. The effect of this filter on the band of frequencies passed is shown Fig. 11. This filter will contribute greatly to the intelligibility of the received signal when the receiver is operated in the advanced positions of selectivity.

(13) The Head Phone Jack is connected to a tap on the output transformer. The signal in the headphones is of the proper volume for satisfactory communications reception. Since no direct current is present in the headphone circuit crystal type phones can be used.

FIG. 4—CRYSTAL SELECTIVITY



(1) THE 2-STAGE PRESELECTOR

The RF AMPLIFIER, or pre-selector, of the Model SX-28-A SUPER SKYRIDER has 1-6AB7, 1-6SK7 tubes in cascade on Bands 3, 4, 5, and 6. On Bands 1 and 2 more than one stage is unnecessary to obtain the required image ratio and reduction of spurious interference. With two RF stages using three pre-selection circuits, the band width would be narrowed to such an extent that even expanding the IF Amplifier to its utmost would still not provide high-fidelity reception. The modern communications receiver requires two stages of preselection on the higher frequencies to accomplish only one primary object —satisfactory image rejection.

The Model SX-28-A has an image ration of 20 to 1 at 28 mc—350 to 1 at 14 mc and a proportionately increasing ratio as the frequency is lowered. While the two RF stages are principally needed to obtain such image ratios they also perform two other useful functions—more favorable signal to noise ratio and slightly increased selectivity.

Examining the coil assembly will immediately show how rigidly it is constructed and what care has been taken to completely shield each section from the other. The manner in which the RF and antenna coils are tuned on bands 3, 4, 5, and 6 will be interesting. Rather than push turns to compensate for variations in inductance, each coil is permeability tuned. This results in exact adjustment of inductance with improved tracking and gain as the result. On Bands 1 and 2 the inductance of the antenna coils is sufficiently large so that lead length differences do not cause any noticeable inductance change.

2) THE OSCILLATOR AND CONVERTER

A separate 6SA7 tube is used as the High Frequency Oscillator in the Model SX-28-A SUPER SKYRIDER. This tube proves desirable in this function because of its very high value of transconductance which enables the oscillator to operate with very little coupling to the coil. This feature reduces the unfavorable effects of tube variations and voltage fluctuations on the tuned circuit. The HF Oscillator is coupled to the 6SA7 converter tube at the Cathode Tap—a point where variations of operating parameters of the converter tube will least affect the 6SA7 Oscillator. A 6SA7 tube is used in the Mixer Circuit because tests indicated that changes in operating voltages caused less reflection in the injector grid loading than would occur in most converter tubes. Another feature in favor of the 6SA7 tube is that a negative loading is applied to the tuned circuit feeding its control grid. This characteristic improves the gain and selectivity of the tuned circuit which in turn improves the image and signal to noise ratio.

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FIG. 5—NOISE LIMITER SCHEMATIC

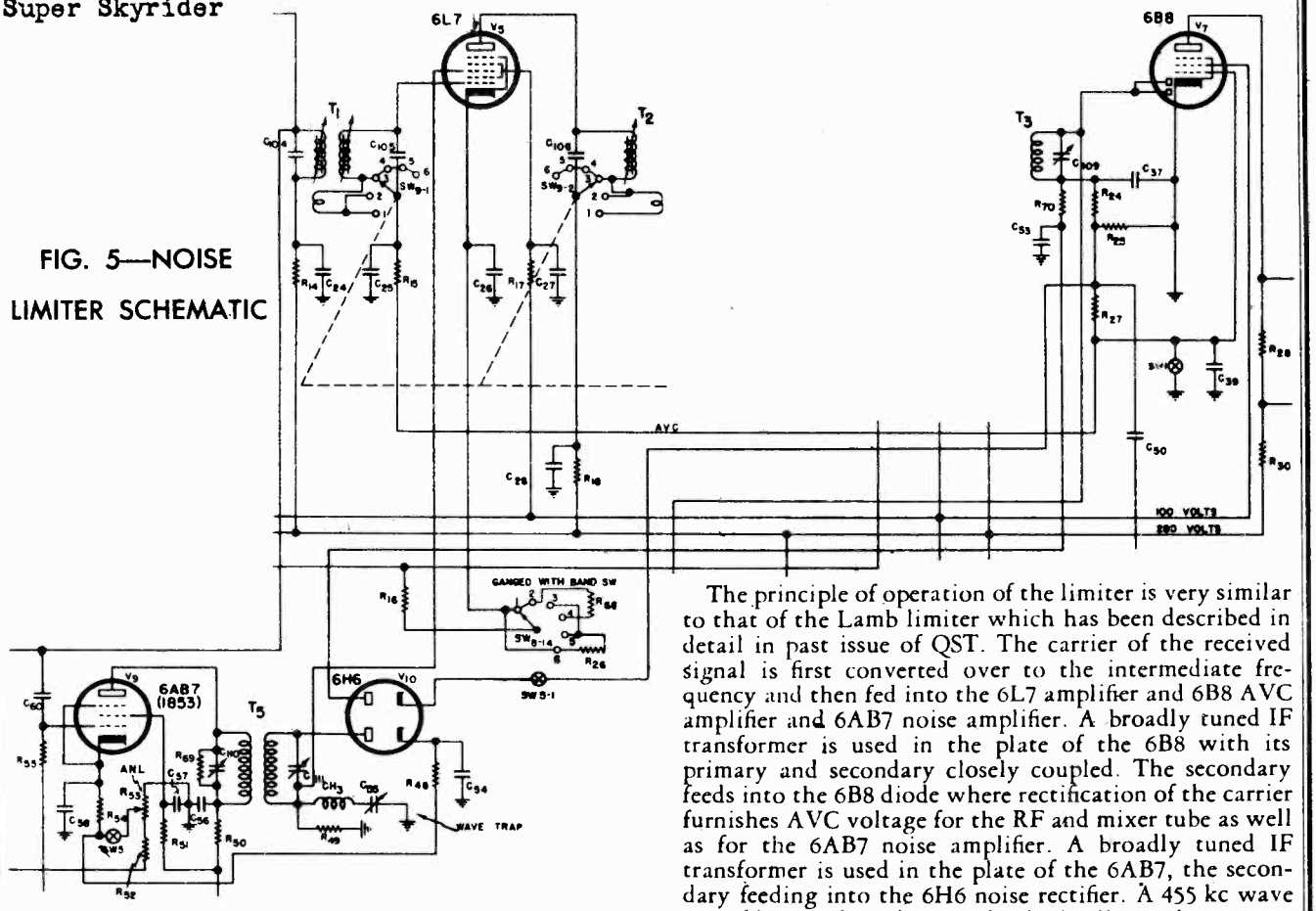
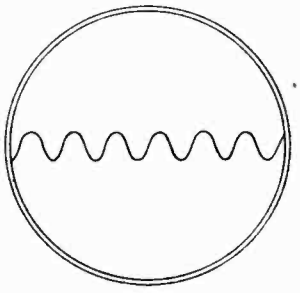
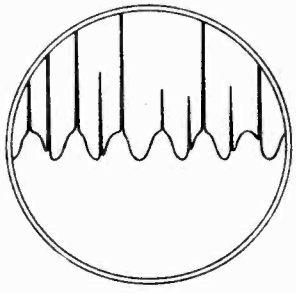


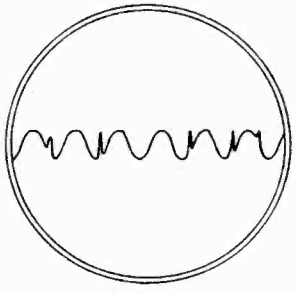
FIG. 6—NOISE LIMITER ACTION



Constant tone signal no interference ANL OFF.



Same Signal ANL OFF. (Note transient peaks extend well beyond range of screen. Signal not readable.)



Same signal. Same noise. ANL-ON adjusted for most favorable signal to noise ratio.

The principle of operation of the limiter is very similar to that of the Lamb limiter which has been described in detail in past issue of QST. The carrier of the received signal is first converted over to the intermediate frequency and then fed into the 6L7 amplifier and 6B8 AVC amplifier and 6AB7 noise amplifier. A broadly tuned IF transformer is used in the plate of the 6B8 with its primary and secondary closely coupled. The secondary feeds into the 6B8 diode where rectification of the carrier furnishes AVC voltage for the RF and mixer tube as well as for the 6AB7 noise amplifier. A broadly tuned IF transformer is used in the plate of the 6AB7, the secondary feeding into the 6H6 noise rectifier. A 455 kc wave trap (CH4 and C55) is used which allows the passage of the higher audio frequencies without attenuation. In the form of further explanation of our approach toward noise elimination, it must be remembered that noise in general is composed of a random mixture of high and low frequencies. Of this mixture the predominating higher frequencies are the most objectionable. It is to our advantage to retain the high frequency components. Thus, these transients will be allowed to rise to a point far above the carrier level with the result that they will be applied to the injector grid of the 6L7 tube without being reduced in value. Transients, such as ignition interference having a steep wave front, consist largely of high frequency components. The voltage applied to the grid of the 6L7 tube has a negative polarity because of the 6H6 noise rectifier. By varying the ANL control, we raise or lower the negative voltage applied to the 6L7 tube until it is barely sufficient to overcome the noise impulses applied to the grid of this tube without allowing the modulation peaks of the carrier to become badly distorted.

If the noise limiter adjustment permits too great a value of transient voltage to be applied to the 6L7 injector grid, detection will take place and rectified components of this modulated carrier will appear in the 6L7 plate circuit. This effect will appear as distortion in the output of the receiver. If, on the other hand, not enough noise voltage is applied, then the momentary decrease in sensitivity will not be great enough to stop the noise from getting through and some of it will appear in the plate circuit of the 6L7 tube and consequently in the output of the receiver. As a result the noise limiter must be carefully adjusted to the particular carrier and noise level being received. (See Fig. 6)

The following measurements made with a 20,000 ohms per volt meter and taken from the socket terminal indicated to ground or receiver chassis. Antenna and ground were disconnected from the receiver when these measurements were taken and the RF and AF gain controls set at maximum. "DL" means Dead Lug but will indicate voltage when used as a tie. Normal tolerance allows a variation of ±10% from the indicated values.

TUBE	FUNCTION	SOCKET TERMINALS								
		1	2	3	4	5	6	7	8	Cap.
V_1-6AB7	RF Amp. (1)	...	...	...	0.1	4.15	170	6.3	227	.....
V_2-6SK7	RF Amp. (2)	...	...	4.35	0.1	4.35	105	6.3	279	.....
V_3-6SA7	Mixer	...	...	250	100	0.12	4.1	6.3	...	.....
V_4-6SA7	HF Osc.	...	...	116	116	0.3	...	6.3	116	.....
V_5-6L7	IF Amp. (1) Noise Limiter	...	...	245	102	...	...	6.3	4	−.075
V_6-6SK7	IF Amp. 2	...	...	4	...	4	107.5	6.3	235	.....
V_7-6B8	2nd Det. S Meter Tube	...	...	17.2	−.255	−.255	108	6.3	...	−.17
V_8-6B8	AVC Amp.	...	...	225.5	0.2	0.2	107	6.3	2	.....
V_9-6AB7	Noise Amp.	...	...	...	.07	1.1	150	6.3	225	.....
V_{10}-6H6	Noise Rectifier	...	...	...	.1	...	17.6 DL	6.3	−.1	.....
V_{11}-6J5	Beat Osc.	...	...	140	...	−7.4	...	6.3	...	BFO ON ONLY FOR TEST
V_{12}-6SC7	1st Audio Amp.	...	140	...	...	137	1.4	6.3	...	.....
V_{13}-6V6GT	P.P. Audio Amp.	...	...	310	290	...	198 DL	6.3	17	.....
V_{14}-6V6GT	P.P. Audio Amp.	...	...	310	290	...	...	6.3	17	.....
V_{15}-5Z3	Rectifier *	320	340 AC	340 AC	320	...	...	...	...	.....

* 5 V. AC between Terminals 1 & 4

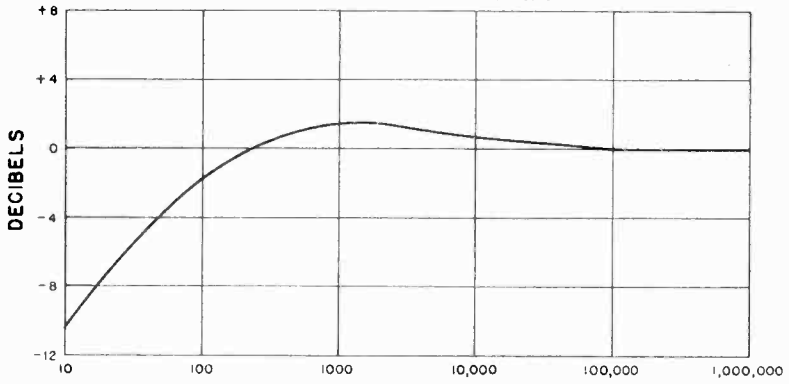


FIG. 7—A.V.C. CURVE—AT 3 MC.

FIG. 10—AUDIO FIDELITY CURVE

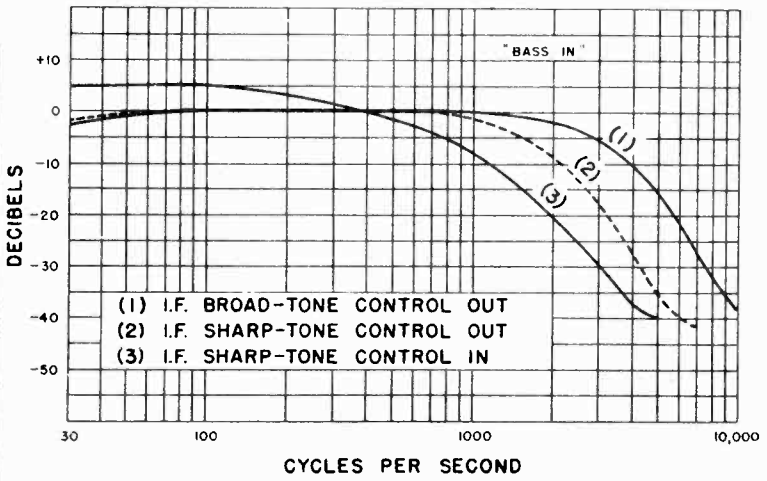


FIG. 11—AUDIO FILTER CURVE

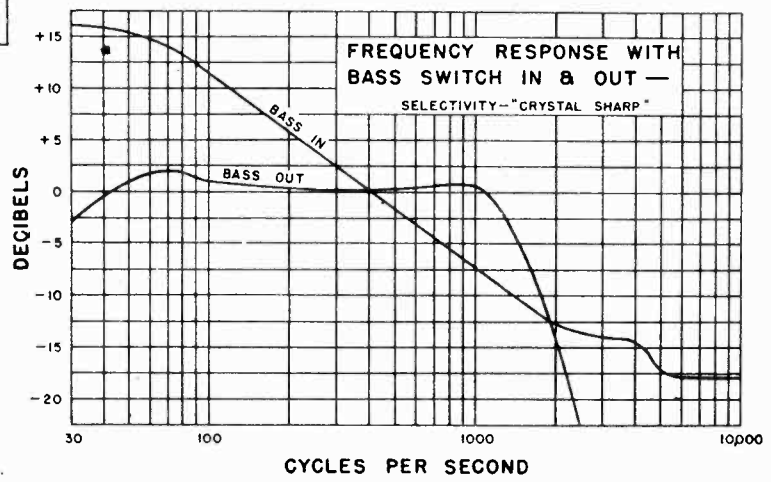


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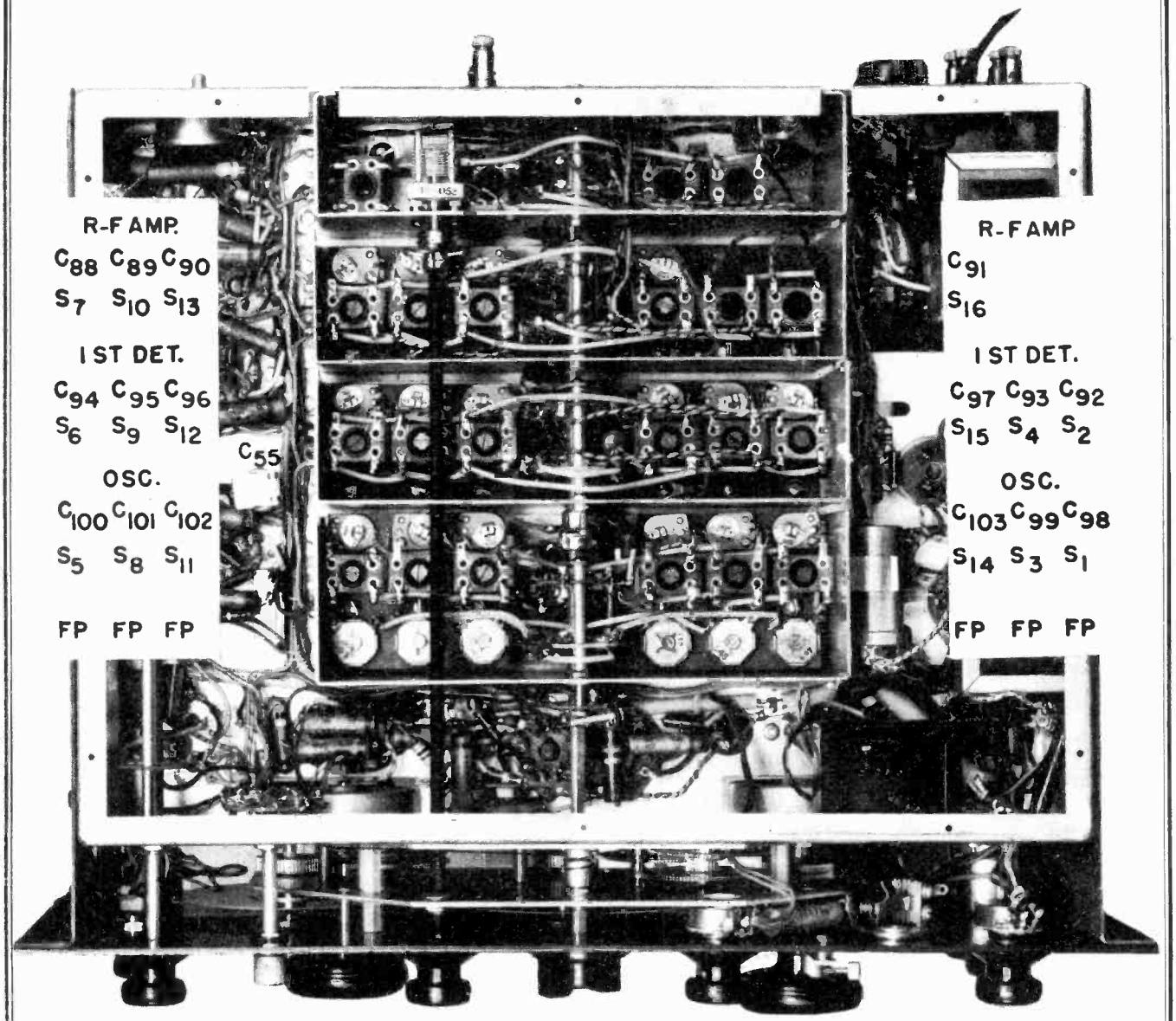
FIG. 12—RF AND OSC ADJUSTMENT LOCATION AND ALIGNMENT PROCEDURE



Equipment Needed for Aligning:

1—An all wave signal generator which will provide an accurately calibrated signal at the test frequencies indicated.

2—Output indicating meter connected to 5000 ohm output terminals.

3—Non-metallic screw driver.

4—Dummy antenna of 200 mmf and also 400 ohm carbon resistor.

Setting of controls prior to alignment—IF and RF.

Tone control at maximum high frequency position (#9)—BFO at 0—Bass switch at Bass IN—AF Gain at #9—RF Gain at #9—Band switch—IF alignment position .55 to 1.6 band—RF alignment depending on band aligned.

Selectivity control at sharp IF—Send-Receive switch in Receive—Crystal phasing at #3 on left side—ANL—OFF at 0—AVC OFF.

Important: Have bandspread control so logging scale reads 100.

Antenna trimmer adjusted for Maximum gain at each RF alignment point on all bands.

(1) **455 KC—IF Alignment:** Tune main dial to 1400 kc on .55 to 1.6 mc band. Connect the hot lead from the signal generator to 6SA7 mixer terminal #8—Ground to chassis. Roughly adjust the aligning screws of T1, the lower screw of which is accessible through hole in right mounting bracket, for maximum gain. Now adjust lower screw on T2 (do not adjust upper screw). Also adjust C31 and the air trimmer condensers at the top of T3 for maximum gain. (See Fig. 8 for location of IF adjustments)

Switch to Crystal Broad Position—Turn on BFO and adjust to a tone of about 1000 cycles. Vary the frequency of the signal generator while adjusting the top screw on T2 until the output goes through a maximum, dips down and starts going up again. Adjust the phasing control for maximum selectivity and then back off the top screw on T2 until the output reaches a minimum value between the two maximum values first noted. The frequency of the signal generator should be varied over a small range while adjusting the top screw of T2. A swishing note, in contrast to the usual sharp crystal tone will be apparent when the correct adjustment has been reached.

Switch to "Xtal Sharp" and adjust C_{30} for maximum output while varying signal generator frequency. Two points of maximum output will be noted corresponding to two adjustments of C_{30}. Either one of these points may be used at which to leave C_{30} a sharply peaked tone will result at the correct adjustment.

Switch to "Xtal Medium" and adjust C_{29} till the output is midway between the outputs reached while aligning the "Xtal Sharp" and "Xtal Broad" positions. The apparent sharpness of tone should be midway between the "Sharp" and "Broad" positions.

Switch again to "Xtal Sharp" and set the signal generator to exact crystal frequency. Set BFO front panel control to a tone of approximately 1000 cycles. Switch again to "Sharp IF" and carefully realign the IF transformers as earlier described in the first paragraph of these instructions.

(2) **BFO Adjustment:** Set front panel control to zero—BFO switch ON—Signal Generator tuned to crystal frequency—selectivity switch in IF Sharp position—now, adjust screw on top of T4, after loosening lock nut, to zero best. (See Fig. 8)

(3) **Noise Limiter and AVC Amplifier Adjustment:** Have the controls set as before except that the AVC switch is now in the ON position. Connect a high resistance type voltmeter across R49 which is connected between terminal #5 of the 6L7 tube and chassis. Connect a 50,000 ohm resistor across primary of T5 (Red and Blue leads) Set generator at 455 kc as for IF alignment. Connect generator to grid of 6AB7 tube (pin #4). Rotate ANL control all the way to the right, or position #9. Adjust screws on top of T5 for maximum indication on DC meter connected across R47. Reconnect generator, as for IF alignment, to mixer grid of 6SA7 tube. Remove 50,000 ohm resistor which was inserted across primary of T5 during alignment. Remove grid clip off top of 6L7 tube. With generator set at 455 kc and ANL control at extreme right adjust wave trap trimmer C55 for minimum signal as indicated on output meter. (See Fig. 8 and Fig. 12 for location of adjustments).

With generator connected to 6SA7 mixer grid as above, replace 6L7 grid and turn ANL control to extreme left until switch clicks. Connect high resistance DC meter across 6B8 diode filter condenser C64. Adjust screw on top of T6 for maximum indication on DC meter across C64.

(4) For RF and oscillator adjustment location and alignment procedure see Fig. 12.

Connect hot lead of signal generator to A_1—through dummy antenna shown in table. Leave jumper connected between A_2 and G Ground of Generator to Chassis. "FP" indicates fixed pad—*do not adjust.*

Band	Rec. Dial Setting	Sig. Gen. Freq.	Dummy Antenna	HIGH FREQUENCY END		LOW FREQUENCY END	
				Adjust Osc. With	Adjust Trimmers for Max. Gain	Adjust Osc. With	Permeability Tuned By
1	1.5 mc	1.5 mc	200 mmf	C_{98}	C_{92}	....	.....
1	.6	.6	200 mmf	....	.....	S_1	S_2
2	3.0	3.0	400 ohms	C_{99}	C_{93}	....	.....
2	1.8	1.8	400 ohms	....	.....	S_3	S_4
3	5.4	5.4	400 ohms	C_{100}	C_{94} C_{88}	....	.....
3	3.0	3.0	400 ohms	....	.....	S_5	S_6 S_7
4	10.0	10.0	400 ohms	C_{101}	C_{95} C_{89}	....	.....
4	7.0	7.0	400 ohms	....	.....	S_8	S_9 S_{10}
5	20.0	20.0	400 ohms	C_{102}	C_{96} C_{90}	....	.....
5	12.0	12.0	400 ohms	....	.....	S_{11}	S_{12} S_{13}
6	36.0	36.0	400 ohms	C_{103}	C_{97} C_{91}	....	.....
6	24.0	24.0	400 ohms	....	.....	S_{14}	S_{15} S_{16}

AVC ACTION

A double AVC system is used. The RF and mixer tubes are operated by the broadly tuned carrier coming through only three tuned IF circuits. The final signal however passes through six-tuned IF circuits. As a result, when the signal is slightly detuned, the receiver output has dropped considerably while the AVC action has dropped but very little. This results in a reduction of between-station noise and a more sharply defined aural tuning action.

"S" OR SIGNAL INTENSITY METER

The approximate DB per S unit equivalent is 6 DB's. As is known, a DB, or decibel, is a unit of change in signal level and is defined as being the least detectable change the average ear can appreciate when listening to a single pitched tone. 3DB is the least change the ear detects when listening to sounds varying in both amplitude and pitch. By comparison, a variation of one S unit on the meter will indicate a change of two detectable steps in signal level. Quantitatively, a DB gain or loss is equal to 20 $\log_{10}\left(\frac{E_1}{E_2}\right)$ where E_1 = input voltage and E_2 = output voltage.

THE SECOND DETECTOR

As will be noted, a diode type of second detector is used in the Model SX-28-A. Its choice was prompted by the fact that such a detector is capable of handling large percentages of modulation with very little distortion. This is due to the output of the diode being easily filtered (IF Removed). In addition, the rectified output contains a DC component which can be used for AVC purposes.

THE BEAT FREQUENCY OSCILLATOR

The BFO is turned on with the switch below the bandspread handwheel and adjusted by the skirted knob directly below the tone control. The BFO circuit, as will be seen by referring to Fig. 13, is the well known Hartley oscillator. It will be noticed that a plate dropping resistor is used to compensate for plate voltage variations. An increase in receiver voltage causes an increase in the plate current of the oscillator. This increase in turn causes the voltage drop across the resistor to increase, thus maintaining a more constant voltage at the plate of the beat oscillator tube. A favorable ratio of capacity to inductance is used. The fixed tank capacity has been artifically aged by alternately exposing it to very high and then low temperatures. In this manner any residual strains of the component parts are removed and the capacity of the condenser remains constant. The BFO coil is permeability tuned which further removes the possibility of drift which would occur should a compression variable be used to resonate the circuit.

Proper location of the Beat Oscillator tube and its associated components plus excellent shielding and mechanical rigidity do much to keep stray fields from being established. Little BFO leakage is to be expected in the Model SX-28-A so "tweets" or BFO harmonics will not prove to be bothersome.

THE AUDIO AMPLIFIER

The second or output stage of the audio amplifier in the Model SX-28-A receiver uses two 6V6GT tubes connected in push-pull. These tubes are driven by the 6SC7 double triode. One of the triode sections of the 6SC7 tube is used as the inverter to the 6V6GT tubes. A portion of the signal from the plate circuit of the first 6SC7 triode is fed to the grid of the other 6SC7 triode Section, thereby giving two output voltages in opposite phase suitable for exciting the push-pull 6V6GT output amplifier.

THE POWER SUPPLY

The power supply in the Model SX-28-A is quite normal except that it supplies voltage for the 6V6GT output tubes directly from the rectifier or before the filter system. Voltage fluctuations in the receiver are greatly reduced—increasing the audio output of the receiver and stabilizing the operation of all circuits.

The filter circuit consisting of a total of 60 mfds of capacity plus an additional filter in the 6SC7 plate supply and a 12 henry choke keep the hum level of the receiver in excess of 60 DB below maximum output. The power transformer is built to withstand continuous operation at 250 degrees F but has been designed to run at approximately 160 degrees F under normal conditions.

SPECIFICATIONS

Tubes:

1—6AB7	1st RF Amplifier
1—6SK7	2nd RF Amplifier
1—6SA7	Mixer
1—6SA7	HF Oscillator
1—6L7	1st IF Amplifier Noise Limiter
1—6SK7	2nd IF Amplifier
1—6B8	2nd Detector and S meter tube
1—6B8	AVC Amplifier
1—6AB7	Noise Amplifier
1—6H6	Noise Rectifier
1—6J5	Beat-Oscillator
1—6SC7	1st Audio Amplifier
2—6V6GT	Push-Pull Output Amplifiers
1—5Z3	Rectifier

Power Consumption—at 117 volts—60 cycles—138 watts
Power Consumption—DC operation—18 amp. at 6 volts or 108 watts
Power Output —8 watts undistorted
Sensitivity—(for 500 milliwatts output) varies between the limits of 6 to 20 microvolts over the entire frequency range of the receiver.

	2 x	1000 x
Selectivity—IF broad (high fidelity)	12 kc	36 kc
IF Sharp	4.1 kc	22 kc

Frequency Range RF—Note: These are the actual frequencies covered corresponding to nominal figures indicated on the front panel.

550	to	1,620 kilocycles
1.5	to	3.1 megacycles
2.9	to	5.9 megacycles
5.75	to	11.5 megacycles
10.3	to	21.5 megacycles
20.4	to	43 megacycles

Frequency response AF (audio filter out—broad IF—tone control high) -70 to 3000 cycles ± 2½ DB
Speaker Output Impedances—5000 and 500 ohms
Intermediate Frequency—455 kc
Table cabinet dimensions—20½" long x 10" high x 14$^{3}/_{4}$" deep
Relay Rack dust cover dimensions—14$^{3}/_{4}$" deep x 17$^{3}/_{8}$" long x 8$^{3}/_{4}$" high
Panel dimensions—19" x 8$^{3}/_{4}$"
Chassis dimensions—17$^{3}/_{8}$" x 13½"
Weight—(unpacked)—75 lbs. packed 87 lbs.

MODEL SX-28A,
Super Skyrider

THE HALLICRAFTERS CO.

REF. SYMBOL	NAME OF PART AND DESCRIPTION	MFR. CODE	CONTR'S. PART NO.
R_1	Resistor, 100,000 ohm ± 10%, ½ watt, carbon	ASA	RC21AE104K
R_2	Resistor, variable, 10,000 ohm ± 20% carbon, type 35	CT	25C066
R_3	Resistor, 330 ohm ± 10%, ½ watt, carbon	ASA	RC21AE331K
R_4	Resistor, 27,000 ohm ± 10%, 1 watt, carbon	ASA	RC31AE273K
R_5	Resistor, 1000 ohm ± 10%, ½ watt, carbon	ASA	RC21AE102K
R_6	Resistor, 6,800 ohm ± 10%, 2 watt, carbon	ASA	RC41AE682K
R_7	Same as R_1		
R_8	Same as R_3		
R_9	Same as R_5		
R_{10}	Resistor, 2700 ohm, ± 10%, ½ watt, carbon	ASA	RC21AE272K
R_{11}	Same as R_1		
R_{12}	Resistor, 390 ohm ± 10%, ½ watt, carbon	ASA	RC21AE391K
R_{13}	Same as R_5		
R_{14}	Same as R_{10}		
R_{15}	Same as R_1		
R_{16}	Resistor, 270 ohm ± 10%, ½ watt, carbon	ASA	RC21AE271K
R_{17}	Same as R_5		
R_{18}	Same as R_{10}		
R_{19}	Same as R_1		
R_{20}	Resistor, 470,000 ohm ± 10%, ½ watt, carbon	ASA	RC21AE474K
R_{21}	Resistor, 270 ohm ± 10%, ½ watt, carbon	ASA	RC21AE271K
R_{22}	Same as R_5		
R_{23}	Same as R_{10}		
R_{24}	Same as R_1		
R_{25}	Same as R_{20}		
R_{26}	Resistor, 1,000 ohm ± 10%, ½ watt, carbon	ASA	RC21AE102K
R_{27}	Same as R_{20}		
R_{28}	Resistor, 100 ohm ± 10%, ½ watt, carbon	ASA	RC21AE101K
R_{29}	Resistor, variable, 500 ohm ± 20%, carbon, type 25	CT	25C022
R_{30}	Resistor, 27,000 ohm ± 10%, 2 watt, carbon	ASA	RC41AE273K
R_{31}, R_{32}	Resistor, two sections; section #1 (R_{31}), 11,000 ohm ± 10%, 1½ watts; section #2 (R_{32}) 4,000 ohm ± 10%, 7 watts; metal clad, wire wound	CS	24A046
R_{33}	Resistor, variable, 500,000 ohm ± 20%, carbon	CT	25C065
R_{34}	Same as R_5		
R_{35}	Resistor, variable, 500,000 ohm ± 20%, carbon type AE-35-500M	CT	25C064
R_{36}	Same as R_1		
R_{37}	Same as R_1		
R_{38}	Resistor, 47,000 ohm ± 10%, ½ watt, carbon	ASA	RC21AE473K
R_{39}	Resistor, 180,000 ohm ± 10%, ½ watt, carbon	ASA	RC21AE184K
R_{40}	Resistor, 270,000 ohm ± 10%, ½ watt, carbon	ASA	RC21AE274K
R_{41}	Same as R_{40}		
R_{42}	Resistor, 220 ohm ± 10%, 2 watt, wire wound, type BW2	IRC	24BV221E
R_{43}	Resistor, 20,000 ohm ± 5%, 2 watt, carbon	ASA	RC41AE203J
R_{44}	Resistor, 5,000 ohm ± 20%, 10 watt, wire wound, viterous enamel, type CC	U	24BG502F
R_{45}	Same as R_{43}		
R_{46}	Same as R_{38}		
R_{47}	Resistor, 10 ohm ± 10%, ½ watt, carbon	ASA	RC21AE100K
R_{48}	Same as R_1		
R_{49}	Resistor, 1 megohm ± 10%, ½ watt carbon,	ASA	RC21AE105K
R_{50}	Resistor, 560 ohm ± 10%, ½ watt, carbon	ASA	RC21AE561K
R_{51}	Resistor, 20,000 ohm ± 5%, 1 watt, carbon	ASA	RC31AE203J
R_{52}	Same as R_{38}		
R_{53}	Resistor, variable, 50,000 ohm ± 20%, carbon with DPST switch, type WR-35	CT	25C067
R_{54}	Resistor, 33 ohm ± 10%, ½ watt, carbon	ASA	RC21AE330K
R_{55}	Same as R_{20}		
R_{56}	Same as R_5		
R_{57}	Same as R_1		
R_{58}	Resistor, 180 ohm ± 10%, ½ watt, carbon	ASA	RC21AE181K
R_{59}	Same as R_1		
R_{60}	Same as R_{40}		
R_{61}	Same as R_{20}		
R_{62}	Same as R_{20}. Part of transformer T_1. Shown for reference only.		
R_{63}	Same as R_{10}		
R_{64}	Same as R_{20}		
R_{65}	Same as R_{38}		
R_{66}	Same as R_{38}		
R_{67}	Same as R_{50}		
R_{68}	Resistor, 1,200 ohm ± 10%, ½ watt, carbon	ASA	RC21AE122K
R_{69}	Same as R_1		
R_{70}	Same as R_{49}		
R_{71}	Resistor, 4700 ohm ± 10%, 1 watt, carbon	ASA	RC31AE472K
R_{72}	Same as R_{50}		
R_{73}	Not used		
R_{74}	Same as R_{47}		

REF. SYMBOL	NAME OF PART AND DESCRIPTION	MFR. CODE	CONTR'S. PART NO.
C_1, $C_{1.1}$, $C_{1.2}$, C_2, $C_{2.1}$, $C_{2.2}$, $C_{2.3}$	Capacitor, variable, 4 unit gang, each unit consists of 2 sections, except unit 4 at rear which contains only one section (section #2), air dielectric, special; Section #1-min. cap. 16.3 mmfd., max. cap. 187.5 mmfd. (C_1, $C_{1.1}$, $C_{1.2}$); Section #2-min. cap. 21.5 mmfd., max. cap. 250.0 mmfd. (C_2, $C_{2.1}$, $C_{2.2}$, $C_{2.3}$).	RC	48B050
C_3, $C_{3.1}$, $C_{3.2}$, $C_{3.3}$, C_4, $C_{4.1}$	Capacitor, variable, 4 unit gang, each unit consists of 3 sections, air dielectric, special; Section #1-min. cap. 6 mmfd., max. cap. 16 mmfd. (C_3, $C_{3.1}$, $C_{3.2}$, $C_{3.3}$); Section #2-min. cap. 6.5 mmfd., max. cap. 21.5 mmfd. (C_4, $C_{4.1}$, $C_{4.2}$, $C_{4.3}$); Section #3-min. cap. 6.5 mmfd., max. cap. 27 mmfd. (C_5, $C_{5.1}$, $C_{5.2}$, $C_{5.3}$)	RC	48B051
$C_{4.2}$, $C_{4.3}$, C_5, $C_{5.1}$	Capacitor, variable, 4 unit gang, each unit consists of 3 sections, air dielectric, special; Section #1-min. cap. mmfd., max. cap. 16 mmfd. (C_3, $C_{3.1}$, $C_{3.2}$, $C_{3.3}$); Section #2-min. cap. 6.5 mmfd., max. cap. 2.5 mmfd. (C_4, $C_{4.1}$, $C_{4.2}$, $C_{4.3}$) Section #3-min. cap. 6.5 mmfd., max. cap. 27 mmfd. (C_5, $C_{5.1}$, $C_{5.2}$, $C_{5.3}$)	RC	48B051
C_6	Capacitor, variable, min. cap. 3.5 mmfd., max. cap. 50 mmfd., air dielectric, ceramic insulation, type 22	RC	48A053
C_7	Capacitor, 2980 mmfd. adjustable ± 5%, mica dielectric, steel mtg. frame, special	UE	44B110
C_8	Capacitor, 2400 mmfd. adjustable ± 5%, mica dielectric, steel mtg. frame, special	UE	44B109
C_9	Capacitor, 2240 mmfd. adjustable ± 5%, mica dielectric, steel mtg. frame, special	UE	44B108
C_{10}	Capacitor, 1700 mmfd. adjustable ± 5%, mica dielectric, steel mtg. frame, special	UE	44B107
C_{11}	Capacitor, 822 mmfd. adjustable ± 5%, mica dielectric, steel mtg. frame, special	UE	44B106
C_{12}	Capacitor, 541 mmfd. adjustable ± 5%, mica dielectric, steel mtg. frame, special	UE	44B105
C_{13}	Capacitor, adjustable, 5 mmfd. ± 0.2 mmfd. at 25° C., capacity change -0.02 mmfd. per ° C., type S-2739	UE	44A092
C_{14}	Capacitor, 0.02 mfd. -10 + 40%, 400 V.D-C working, paper dielectric	SP	46AW203J
C_{15}	Same as C_{14}		
C_{16}	Capacitor, fixed, 0.02 mfd. - 10 + 40%, 600 V. D-C working, paper dielectric	SP	46AY203J
C_{17}	Capacitor, fixed, 0.05 mfd. - 10 + 40%, 200 V. D-C working, paper dielectric	SP	46AU503J
C_{18}	Same as C_{14}		
C_{19}	Same as C_{14}		
C_{20}	Same as C_{16}		
C_{21}	Same as C_{17}		
C_{22}	Same as C_{14}		
C_{23}	Same as C_{14}		
C_{24}	Same as C_{16}		
C_{25}	Capacitor, fixed, 2200 mmfd. ± 10%, 500 V. D-C working, mica dielectric	ASA	CM30A222K
C_{26}	Same as C_{17}		
C_{27}	Same as C_{14}		
C_{28}	Same as C_{16}		
C_{29}	Capacitor, variable, min. cap. 2 mmfd., max. cap. 6 mmfd., ceramic dielectric, special mtg. bracket, type B-820-202	CRL	44A079
C_{30}	Capacitor, variable, min. cap. 4 mmfd., max. cap. 20 mmfd., ceramic dielectric, special mtg bracket, type B-820-304	CRL	44A078
C_{31}	Same as C_{30}		
C_{32}	Capacitor, variable, min. cap. 3.0 mmfd., max. cap. 25 mmfd., air dielectric, ceramic insulation, type 22-7	RC	48A039
C_{33}	Same as C_{14}		
C_{34}	Same as C_{17}		
C_{35}	Same as C_{14}		
C_{36}	Same as C_{16}		
C_{37}	Capacitor, fixed, 47 mmfd. ± 10%, 500 V. D-C working, mica dielectric	ASA	CM20A470K
C_{38}	Not used		
C_{39}	Same as C_{14}		

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REF. SYMBOL	NAME OF PART AND DESCRIPTION	MFR. CODE	CONTR'S. PART NO.
C_{40}	Capacitor, fixed, 470 mmfd. ± 10%, 500 V. D-C working, mica dielectric	ASA	CM35A512J
C_{41}	Capacitor, fixed, one unit of dual unit, 40 mfd. - 10 + 40%, 25 V. D-C working, electrolytic (See C_{44})		
C_{42}	Same as C_{16}		
C_{43}	Capacitor, fixed, 5100 mmfd. ± 5%, 300 V. D-C working, mica dielectric	ASA	CM20A471K
C_{44}	Capacitor, fixed, one unit of dual unit, 10 mfd. - 10 + 40%, 300 V. D-C working, electrolytic (See C_{41})	SP	42A032
C_{45}	Capacitor, fixed, 0.05 mfd. - 10 + 40%, 400 V. D-C working, paper dielectric	SP	46AW503J
C_{46}	Same as C_{45}		
C_{47}	Capacitor, fixed, one unit of dual unit, 40 mfd. - 10 + 40%, 5 V. D-C working, electrolytic (See C_{48})	SP	42A031
C_{48}	Capacitor, fixed, one unit of dual unit, 30 mfd. - 10 + 40%, 400 V. D-C working, electrolytic in same container with C_{47}		
C_{49}	Capacitor, fixed, 30 mfd. - 10 + 40%, 450 V. D-C working, electrolytic, type D8290	SP	42A030
C_{50}	Same as C_{14}		
C_{51}	Capacitor, fixed, 0.01 mfd. - 10 + 40%, 600 V. D-C working, paper dielectric	SP	46AY103J
C_{52}	Same as C_{51}		
C_{53}	Same as C_{17}		
C_{54}	Same as C_{45}		
C_{55}	Capacitor, variable, compression type, 50 mmfd. (nominal), mica dielectric, type SW-1530	SWI	53A012
C_{56}	Same as C_{16}		
C_{57}	Same as C_{14}		
C_{58}	Same as C_{17}		
C_{59}	Same as C_{17}		
C_{60}	Same as C_{37}		
C_{61}	Capacitor, fixed, 250 mmfd. ± 20%, 500 V. D-C working, mica dielectric, type 1468. Part of transformer T_1. Shown for reference only.		
C_{62}	Same as C_{14}		
C_{63}	Same as C_{17}		
C_{64}	Capacitor, fixed, 100 mmfd. ± 10%, 500 V. D-C working, mica dielectric	ASA	CM20A101K
C_{65}	Same as C_{14}		
C_{66}	Same as C_{17}		
C_{67}	Same as C_{16}		
C_{68}	Same as C_{37}		
C_{69}	Same as C_{37}		
C_{70}	Same as C_{25}		
C_{71}	Same as C_{64}		
C_{72}	Capacitor, variable, min. cap. 5 mmfd., max. cap. 25 mmfd., air dielectric, special	RC	48A064
C_{73}	Capacitor, fixed, 500 mmfd. ± 5%, 500 V. D-C working, silver mica, type 1469, Part of transformer T_4. Shown for reference only.	A	47BT501D
C_{74}	Capacitor, fixed, 0.01 mfd. -10 + 40%, 600 V. D-C working, paper dielectric, braided leads, type A8	SP	46A021
C_{75}	Capacitor, 2 mmfd., twisted leads		
C_{76}	Same as C_{25}		
C_{77}	Same as C_{17}		
C_{78}	Not used		
C_{79}	Not used		
C_{80}	Not used		
C_{81}	Not used		
C_{82}	Not used		
C_{83}	Capacitor, fixed, 2.5 mmfd. ± 20%, 500 V. D-C working, bakelite dielectric		49A001
C_{84}	Not used		
C_{85}	Not used		
C_{86}	Same as C_{40}		
C_{87}	Capacitor, fixed, 0.25 mfd. - 10 + 40%, 200 V. D-C working, paper dielectric	SP	46AT254J
C_{88}	Capacitor, variable, min. cap. 4 mmfd., max. cap. 20 mmfd., ceramic insulation, temp. coeff. - 0.005 mmfd mmfd/ ° C., type 820-B	CRL	44A102
C_{89}	Same as C_{88}		
C_{90}	Same as C_{88}		
C_{91}	Same as C_{88}		
C_{92}	Capacitor, variable, min. cap. 2.5 mmfd., max. cap. 6 mmfd., ceramic insulation, temp. coeff. 0.0005 mmfd. mmfd/ ° C, special	CRL	44A119
C_{93}	Same as C_{88}		
C_{94}	Same as C_{88}		
C_{95}	Same as C_{88}		
C_{96}	Same as C_{88}		
C_{97}	Same as C_{88}		
C_{98}	Same as C_{88}		
C_{99}	Same as C_{88}		
C_{100}	Same as C_{88}		
C_{101}	Same as C_{88}		
C_{102}	Same as C_{88}		
C_{103}	Same as C_{88}		
C_{104}, C_{105}, C_{106}	Capacitor, fixed, 275 mmfd., silver mica. Part of transformer T_1. Shown for reference only. Capacitor, fixed, 125 mmfd., silver mica. Part of transformer T_2. Shown for reference only.		
C_{107}	Capacitor, fixed, 85 mmfd., silver mica. Part of transformer T_2. Shown for reference only.		
C_{108}, C_{109}	Capacitor assembly; fixed capacitor, 25 mmfd. ± 5%, silver mica; variable capacitor, min. cap. 70 mmfd., max. cap. 90 mmfd., ceramic dielectric; both capacitors connected in parallel to form assembly. Part of transformer T_3. Shown for reference only.		
C_{110}, C_{111}	Capacitor, variable, compression type, 80 mmfd., (nominal), mica dielectric. Part of transformer T_5. Shown for reference only.		
C_{112}	Capacitor, fixed, 100 mmfd. ± 10%, 500 V. D-C working mica. Part of transformer T_6. Shown for reference only.		
C_{113}	Capacitor, fixed, 25 mmfd. ± 10%, 500 V. D-C working, mica. Part of transformer T_6. Shown for reference only.		
C_{114}	Capacitor, fixed, 10 mmfd. ± 10%, 500 V. D-C working, ceramic dielectric, -0.00075 mmfd./mmfd./deg. Cent. temp. coeff., type class D modified	CRL	47A041
T_1	Transformer, I-F, 455KC, primary and secondary tuned by adjustable iron core, secondary has expander winding, special.	SI	50B082
T_2	Transformer, I-F, 455KC, primary and secondary tuned by adjustable iron core, secondary tapped for crystal filter and variable band width, primary has expander winding, special	SI	50B081
T_3	Transformer, I-F, 455KC, primary and secondary tuned by variable capacitor, iron core coils, type 3365	SWI	50B063
T_4	Transformer, 455KC, tuned by adjustable iron core, special	SWI	54B014
T_5	Transformer, I-F, 455KC, primary and secondary tuned by variable capacitor, iron core coils special	SWI	50B097
T_6	Transformer, I-F, 455KC, primary tuned by adjustable iron core, secondary untuned air core, special	SWI	50B080
T_7	Transformer, power, standard; primary, 117 V. A-C, single phase, 50/60 cycles; secondary, 580 V. A-C @ 185 ma., center tapped; 6.3 V. A-C @ 5.5 amperes, 5 V. A-C @ 3 amperes, type 6K53	GT	52B033
	Transformer, power, universal; primary, 117/230 V A-C, single phase, 50/60 cycles; secondary-same as standard transformer, type 9G62	GT	52B034
T_8	Transformer, A-F; primary, 10,000 ohm winding center tapped; secondary, 5000 ohm winding tapped at 500 and 100 ohms, iron core, type 3A347	GT	55B009
T_9	Transformer, R-F, range 3.0-5.8 megacycles, air core, special	SWI	51B568
T_{10}	Transformer, R-F, range 5.8-11.5 megacycles, air core, special	SWI	51B569
T_{11}	Transformer, R-F, range 10.5-21 megacycles, air core, special	SWI	51B570
T_{12}	Transformer, R-F, range 21-43 megacycles, air core, special	SWI	51B571
T_{13}	Transformer, R-F, range .55-1.6 megacycles, air core, special	SWI	51B566
T_{14}	Transformer, R-F, range, 1.6-3.0 megacycles, air core, special	SWI	51B567
T_{15}	Transformer, R-F, range, 3.0-5.8 megacycles, adjustable iron core, special	SWI	51B572
T_{16}	Transformer, R-F, range 5.8-11.5 megacycles, adjustable iron core, special	SWI	51B573
T_{17}	Transformer, R-F, range 10.5-21 megacycles, adjustable iron core, special	SWI	51B574
T_{18}	Transformer, R-F, range 21-42 megacycles, adjustable iron core, special	SWI	51B575
T_{19}	Transformer, R-F, range .55-1.6 megacycles, adjustable iron core, special	SWI	51B576
T_{20}	Transformer, R-F, range 1.6-3.0 megacycles, adjustable iron core, special	SWI	51B577
T_{21}	Transformer, R-F, range 3.0-5.8 megacycles, adjustable iron core, special	SWI	51B578
T_{22}	Transformer, R-F, range 5.8-11.5 megacycles adjustable iron core, special	SWI	51B579
T_{23}	Transformer, R-F, range 10.5-21 megacycles, adjustable iron core, special	SWI	51B580
T_{24}	Transformer, R-F, range 21-42 megacycles, adjustable iron core, special	SWI	51B581
T_{25}	Transformer, R-F, range, .55-1.6 megacycles, adjustable iron core, special	SWI	51B582
T_{26}	Transformer, R-F, range 1.6-3.0 megacycles, adjustable iron core, special	SWI	51B583
T_{27}	Transformer, R-F, range 3-5.8 megacycles, adjustable iron core, special	SWI	51B584
T_{28}	Transformer, R-F, range 5.8-11.5 megacycles, adjustable iron core, special	SWI	51B585

MODEL SX-28A, Super Skyrider

THE HALLICRAFTERS CO.

REF. SYMBOL	NAME OF PART AND DESCRIPTION	MFG. CODE	CONTR'S. PART NO.
T_{29}	Transformer, R-F, range 10.5-21 megacycles, adjustable iron core, special	SWI	51B586
T_{30}	Transformer, R-F, range 21-42 megacycles, adjustable iron core, special	SWI	51B587
SO_1	Socket, octal, female, low loss mica-filled bakelite insulation, type MIP8T	AP	6A042
TS_1	Terminal strip, black bakelite, marked "A_2" "A_1", special	H	8A039
TS_2	Terminal strip, black bakelite, marked "5000", special	H	8A040
TS_3	Terminal strip, black bakelite, marked "500", special	H	8A041
CH_1	Inductor, 13 henries ± 10%, @ 100 milliamperes D-C, d-c resistance 300 ohms ± 10%, iron core, type 1D25	GT	56B008
CH_2	Inductor, 4 henries ± 10% d-c resistance 220 ohms ± 10%, iron core, type 10C5	ST	55A010
CH_3	Inductor, universal winding, iron core, designed to resonate at 455KC with 47 mmfd. ± 7% across the coil, type 774	SWI	53B012
J_1	Jack, single circuit, switching type, single pole double throw, 1 pair contacts normally closed, bushing 3/8-32 x 5/16" long, type 503C	U	36B003
J_2	Jack, switching type, single pole double throw, 1 pair contacts normally closed, bushing 3/8-32 x 3/8" long, type ST-627A	U	36B011
FS_1	Fuse, 1.5 amperes @ 250 V., 4AG, glass enclosed, type 1041	LF	39A320
PL_1	Plug, octal, male, bakelite body, jumpers connect terminals 6 and 7, and terminals 3 and 4, type CP-8	AP	35A003
PL_2	Plug and line cord assemble, 2 conductor rubber covered #18 copper stranded wire moulded rubber plug at one end, length 6 feet	E	87A078
M_1	Meter 0.5 milliamperes, 8.8 ohms internal resistance, pointer swing 90 degrees, special mtg bracket, special	BE	82A070
CX_1	Crystal, frequency 455KC ± 5KC, type CF6	BL	19A123
SW_1, SW_2	Switch, rotary selector, single section, 3 position, shorting type rotar contacts, bakelite wafer, shaft 2-1/16" long x 1/4" dia., bushing 1/4" deep, type H	OM	60B052
SW_3	Switch, SPST, toggle action, located on rear of resistor R_{35}		
SW_4	Switch, SPST, bat handle toggle, rated 3 amperes @ 250 V., type 21350GA	HH	60A103
SW_5, SW_{5-1}	Switch, DPST, toggle action, located on the rear of resistor R_{53}		
SW_6, SW_7	Same as SW_1		
SW_{8-1}, SW_{8-2}, SW_{8-3}, SW_{8-4}	Switch, rotary selector, 3 section, 6 position, bakelite wafers, sections are assembled to struts, type H	OM	62B025
SW_{8-5}, SW_{8-6}, SW_{8-7}	Switch, rotary selector, 2 section, 6 position, bakelite wafers, sections are assembled to struts, type 18908-H2	OM	62B013
SW_{8-8}, SW_{8-9}, SW_{8-10}	Same as SW_{8-5}, SW_{8-6} and SW_{8-7}		
SW_{8-11}, SW_{8-12}, SW_{8-13}	Switch, rotary selector, 2 section, 6 position, bakelite wafers, sections are assembled to struts type H	OM	62B015
SW_{8-14}, SW_{8-15}	Switch, rotary selector, single section, 6 position, shorting type rotor contacts, bakelite wafer, type 23586-H	OM	62B023
SW_{9-1}, SW_{9-2}, SW_{9-3}	Switch, rotary selector, 3 section, 6 position, shorting type rotor, contacts, bakelite wafers, shaft 2-3/8" long x 1/4" dia., bushing 1/4" deep, type 22659-H3	OM	60B048
SW_{10}	Switch, SPDT, bat handle toggle, rated 1 ampere @ 250 V. and 3 amperes @ 125 V., type 20994KF	HH	60A102
LM_1	Lamp 6.3 V. @ 250 milliamperes, bayonet base type 44	GE	39A003
LM_2	Same as LM_1		
LM_3	Lamp, 6.3 V. @ 150 milliamperes, bayonet base type 47	GE	39A004

REF. SYMBOL	NAME OF PART AND DESCRIPTION	MFR. CODE	CONTR'S. PART NO.
V_1	Tube, pentode type 6AB7	RCA	90X6AB7
V_2	Tube, triple-grid super-control amplifier, type 6SK7	RCA	90X6SK7
V_3	Tube, multi-electrode pentagrid converter, type 6SA7	RCA	90X6SA7
V_4	Same as V_3		
V_5	Tube, multi-electrode pentagrid mixer amplifier, type 6L7	RCA	90X6L7
V_6	Same as V_2		
V_7	Tube, duplex-diode pentode, type 6B8	RCA	90X6B8
V_8	Same as V_7		
V_9	Same as V_1		
V_{10}	Tube, twin diode, type 6H6	RCA	90X6H6
V_{11}	Tube, triode, type 6J5	RCA	90X6J5
V_{12}	Tube, twin triode, type 6SC7	RCA	90X6SC7
V_{13}	Tube, beam power amplifier, type 6V6GT	RCA	90X6V6GT
V_{14}	Same as V_{13}		
V_{15}	Tube, full wave high vacuum rectifier; type 5Z3	RCA	90X5Z3

TROPICALIZED PARTS LIST

R_{31}, R_{32}	Resistor, two sections; section #1 (R_{31}) 10,000 ohm ± 10%, 2 watts; section #2 (R_{32}) 4,000 ohm ± 10%, 8 watts; metal clad, wire wound, type MW 5	IRC	24A822
T_3	Transformer, I-F, 455 KC., primary and secondary tuned by adjustable capacitors, fixed iron cores, vacuum impregnated with zophar #1340 and flash dipped in Hallowax #2002, special	SWI	50B132
T_4	Transformer, 455 KC., tuned by adjustable iron core, winding vacuum wax impregnated and dipped in zophar #1598, special	SWI	54B020
T_5	Transformer, I-F, 455 KC., primary and secondary tuned by adjustable capacitors, air core, vacuum impregnated with zophar #1340 and flash dipped in Hallowax #2002, trimmers heat cycled at nominal capacity setting (80 mmfd.) and humidity stablized, special	SWI	50B131
T_6	Transformer, I-F, 455 KC., primary tuned by adjustable iron core, secondary untuned air core, vacuum impregnated with zophar #1340 and flash dipped in Hallowax #2002, special	SWI	50B130
T_7	Transformer, power, standard; primary, 115 V. A-C, single phase, 50/60 cycles; secondary #1, to provide 290 V. A-C @185 milliamperes with a 5Z3 rectifier and a 30 mfd. input capacitor, center tapped; secondary #2, 6.3 V. A-C @5.5 amperes; secondary #3, 5 V. A-C @3 amperes; windings and core vacuum wax impregnated; transformer potted in a high melting point compound, type 6K64	GT	52B045
T_8	Transformer, A-F; primary, 10,000 ohm winding, center tapped; secondary, 5000 ohm winding tapped at 500 and 100 ohms, iron core, entire unit dipped in Korite #4, type 3A517	GT	55B052
CH_1	Inductor, 13 henries, ± 15% @100 milliamperes D-C, d-c resistance 300 ohms ± 10%, iron core, winding impregnated with vacuum wax, entire unit dipped in Korite #4, type 1D34	GT	56B035
SW_1, SW_2	Switch, rotary selector, single section, 3 position, shorting type rotor contacts, wax impregnated bakelite wafer, shaft 2-5/16" long x 1/4" dia., bushing 1/4" deep, type H	OM	60B144
SW_4	Switch, SPST, bat handle toggle, rated 3 amperes @250 V., type 8280 15/32 bushing	CH	60A138
SW_6, SW_7	Switch, rotary selector, single section, 3 position, shorting type rotor contacts, wax impregnated bakelite wafer, shaft 2-5/16" long x 1/4" dia., bushing 1/4" deep, type H	OM	60B144
SW_{8-1}, SW_{8-2}, SW_{8-3}, SW_{8-4}	Switch, rotary selector, 3 section, 6 position, wax impregnated bakelite wafers, sections are assembled to struts, type H	OM	62B033
SW_{8-5}, SW_{8-6}, SW_{8-7}	Switch, rotary selector, 2 section, 6 position, wax impregnated bakelite wafers, sections are assembled to struts, type H	OM	62B031
SW_{8-8}, SW_{8-9}, SW_{8-10}	Switch, rotary selector, 2 section, 6 position, wax impregnated bakelite wafers, sections are assembled to struts, type H	OM	62B031
SW_{8-11}, SW_{8-12}, SW_{8-13}	Switch, rotary selector, 2 section, 6 position, wax impregnated bakelite wafers, sections are assembled to struts, type H	OM	62B032

THE HALLICRAFTERS CO.

MODEL SX-28A, Super Skyrider

SW_{8-14} SW_{8-15}	Switch, rotary selector, single section, 6 position, wax impregnated bakelite wafer, section is assembled to strut, type H	OM	60B135
SW_{9-1} SW_{9-2} SW_{9-3}	Switch, rotary selector, 3 section, 6 position, wax impregnated bakelite wafers, shorting type rotar contacts	OM	60B134
	shaft 2-5/8" long x $\frac{1}{4}$" dia., bushing $\frac{1}{4}$" deep, type	CH	60A139
SW_{10}	Switch, SPDT, bat handle toggle, 3 amperes @125 V., type 8282 15/32 bushing		

INDEX TO PARTS MANUFACTURERS

SYMBOL	MANUFACTURER
A	Aerovox Corp. New Bedford, Mass.
AP	American Phenolic Corp. Cicero, Illinois
ASA	Any manufacturer meeting the applicable American Standard Association specification
BE	Beede Electrical Inst. Co. Penacook, N. H.
BL	Bliley Electric Co. Erie, Pa.
CH	Cutler-Hammer Inc. Milwaukee, Wis.
CM	Chicago Molding Co. Chicago, Illinois
CRL	Centralab Milwaukee, Wis.
CS	Clarostat Mfg. Co. Brooklyn, N. Y.
CT	Chicago Telephone Supply Co. Elkhart, Ind.
E	Essex Wire Co. Chicago, Illinois
GE	General Electric Co. Schenectady, N. Y.
GT	General Transformer Corp. Chicago, Illinois
H	The Hallicrafters Co. Chicago, Illinois
HH	Hart & Hegeman Elec. Co. Hartford, Conn.
IRC	International Resistance Co. Philadelphia, Pa.
LF	Littlefuse Inc. Chicago, Illinois
OM	Oak Mfg. Co. Chicago, Illinois
RC	Radio Condenser Camden, N. J.
RCA	R.C.A. Mfg. Co. Harrison, N. J.
SI	F.W. Sickles Co. Springfield, Mass.
SP	Sprague Specialties Co. North Adams, Mass.
ST	Standard Transformer Corp. Chicago, Illinois
SWI	S.W. Inductor Chicago, Illinois
U	Utah Radio Products Co. Chicago, Illinois
UE	Underwood Elec. Co. Chicago, Illinois

MODEL S-39, Skyranger

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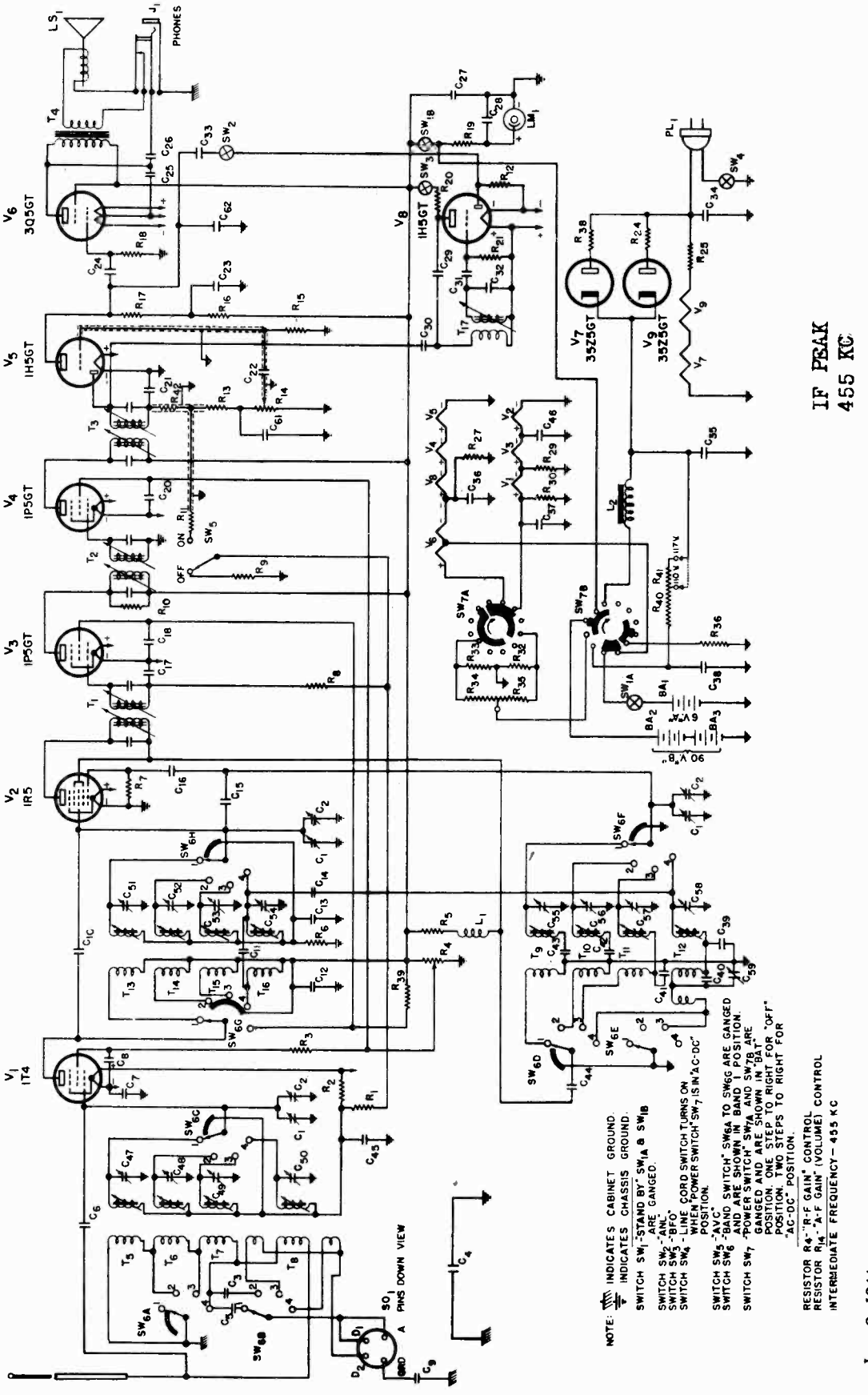
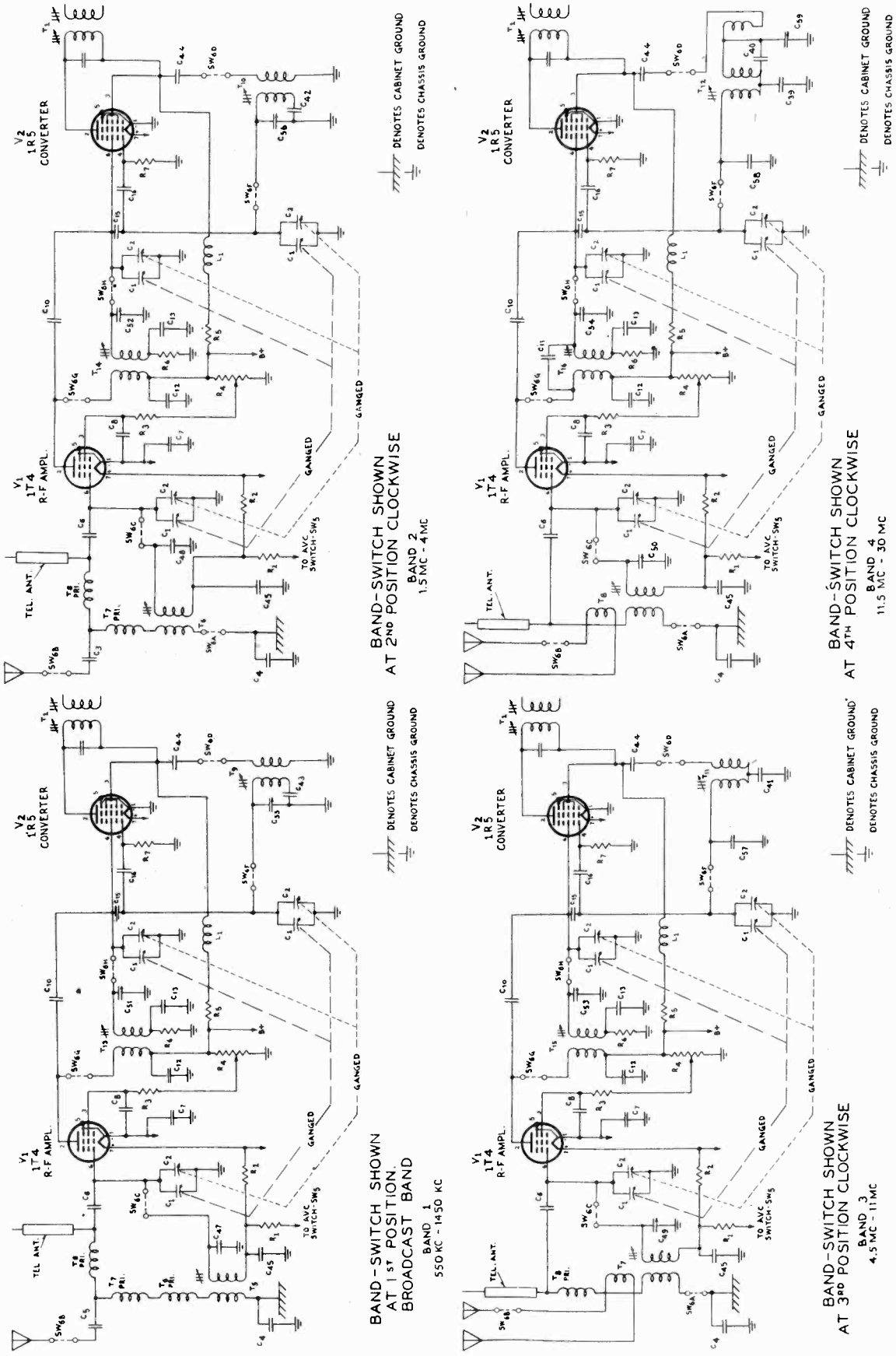
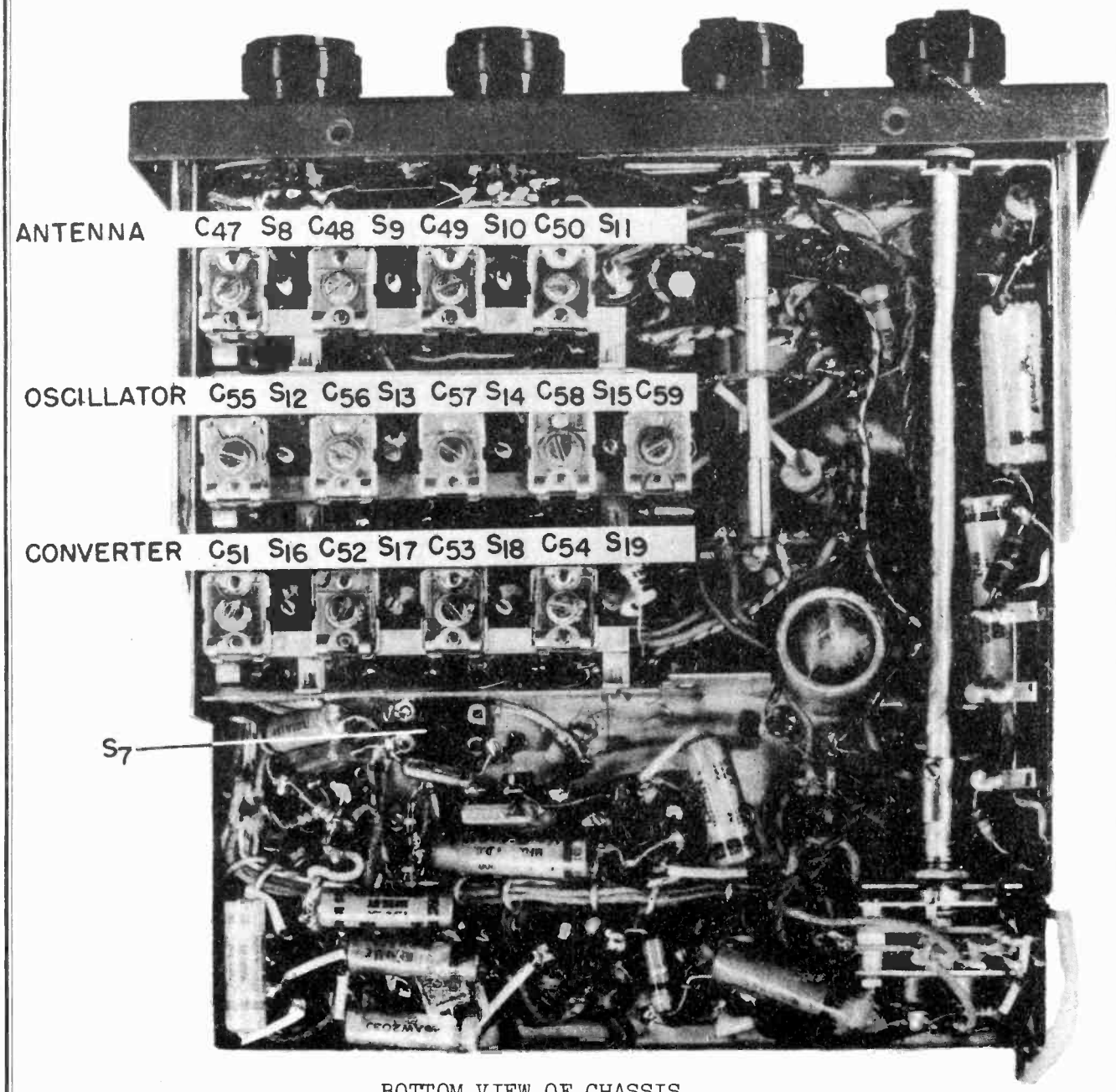


THE HALLICRAFTERS CO. MODEL S-39, Skyranger



MODEL S-39, Skyranger THE HALLICRAFTERS CO.



BOTTOM VIEW OF CHASSIS

TUBE	TYPE	PURPOSE
V_1	1T4	R-F amplifier
V_2	1R5	Converter and oscillator
V_3	1P5GT	First i-f amplifier
V_4	1P5GT	Second i-f amplifier
V_5	1H5GT	Detector, A-V-C and first audio amplifier
V_6	3Q5GT	Audio amplifier
V_7	35Z5GT	Rectifier
V_8	1H5GT	Beat frequency oscillator and automatic noise limiter
V_9	35Z5GT	Rectifier

F-4. TABLE OF TUBE SOCKET VOLTAGES

Measured from socket pin to ground with 1000 ohm-per-volt meter
All voltages are D-C unless otherwise specified.

Tube		Pin Number 1	2	3	4	5	6	7	8	Cap.
Battery Supply										
V_1	1T4	2.62	87	84	NC	2.62	0	4.1	X	X
V_2	1R5	0	65	65	0	0	0	1.5	X	X
V_3	1P5GT	0	2.7	87	60	NC	†1.5	1.5	NC	0
V_4	1P5GT	0	2.8	88	88	NC	X	1.4	NC	0
V_5	1H5GT	0	1.45	62	NC	0	X	0	NC	0
V_6	3Q5GT	NC	7.4	84	88	0	X	4.4	5.9	X
V_7	35Z5GT	NC	0	NC	X	0	X	0	0	X
V_8	1H5GT	0	4.4	*70	NC	0	X	2.8	NC	3.5
V_9	35Z5GT	NC	0	NC	X	0	X	0	0	X
117 Volts AC										
V_1	1T4	2.6	103	92	NC	2.7	0	4.2	X	X
V_2	1R5	0	75	75	0	0	0	1.5	X	X
V_3	1P5GT	0	2.5	105	75	NC	†1.45	1.45	NC	0
V_4	1P5GT	0	2.95	102	105	NC	X	1.55	NC	0
V_5	1H5GT	0	1.5	70	NC	0	X	0	NC	0
V_6	3Q5GT	NC	7.6	100	110	0	X	4.6	6.1	X
V_7	35Z5GT	NC	0	7.8 A-C	X	114A-C	X	33.5 A-C	110	X
V_8	1H5GT	0	4.3	*82.5	NC	0	X	2.95	NC	3.5
V_9	35Z5GT	†115 A-C	33.5 A-C	43 A-C	X	114A-C	†115 A-C	65 A-C	110	X
120 Volts DC										
V_1	1T4	2.8	103	92	NC	2.8	0	4.2	X	X
V_2	1R5	0	72	72	0	0	0	1.5	X	X
V_3	1P5GT	0	2.8	103	72	NC	†1.5	1.5	NC	0
V_4	1P5GT	0	3.2	102	102	NC	X	1.6	NC	0
V_5	1H5GT	0	1.6	87	NC	0	X	0	NC	0
V_6	3Q5GT	NC	7.7	100	103	0	X	4.8	6.3	X
V_7	35Z5GT	NC	0	7.3	X	118	X	35.	110	X
V_8	1H5GT	0	4.8	*85	NC	0	X	3.2	NC	4
V_9	35Z5GT	†120	35	43	X	118	120	70	110	X

NC - No Connection.
X - No Pin.
* - With BFO switch at ON.
† - Tie Lug.

E-1. RECEIVER ALIGNMENT -

(a) Equipment needed to align the receiver -
Signal generator to cover 455 KC to 30 MC
Non-metallic screwdriver
Output meter with a phone plug connector
.1 mfd. condenser
6.5 mmfd. condenser. (Dummy antenna)

(b) Setting of controls for I-F alignment -
ANL, AVC and BFO switches at OFF
STAND BY switch it ON
A.F. and R.F. GAIN controls set at maximum gain
BAND SWITCH at #1 Band
POWER SWITCH at BAT. (power cord removed from wall socket)
BANDSPREAD TUNING at "0"
Telescoping antenna completely collapsed.

(c) I-F alignment (455 KC) -
Remove top and bottom cover for access to internal components
Have external antenna plug PL_2 out of socket SO_1
Connect "hot" lead of signal generator through the .1 mfd condenser to the lug on rear stator section of main tuning condenser (C_1).
Connect "ground" lead of signal generator to chassis
Plug output meter plug in the phone jack (J_1)
Set MAIN TUNING dial at 1500 KC - Band #1
Tune signal generator to 455 KC. Adjust slugs S_1 to S_6 inclusive for maximum output. Refer to figure 4 for location of the adjusting screws on transformers T_1, T_2 and T_3.
Repeat adjustments of slugs S_1 to S_6 to peak all the i-f transformers for maximum output.

(d) B-F-0 adjustment -
Without disconnecting the signal generator, after completing the i-f transformer alignment, adjust the BFO transformer as follows:
Set BFO switch at ON
Remove modulation from the signal generator
Adjust tuning slug S_7 to desired pitch (Approx. 1000 cycles). Slug S_7 is located under the chassis just in back of the coil shield plate.
Note: It is possible to adjust the B-F-0 pitch without the use of the signal generator. Tune in a c-w signal to exact resonance with the BFO switch set at OFF. Set BFO switch at ON and adjust pitch to the tone desired by turning slug S_7. Replace top cover after aligning the I-F and B-F-0 transformers.

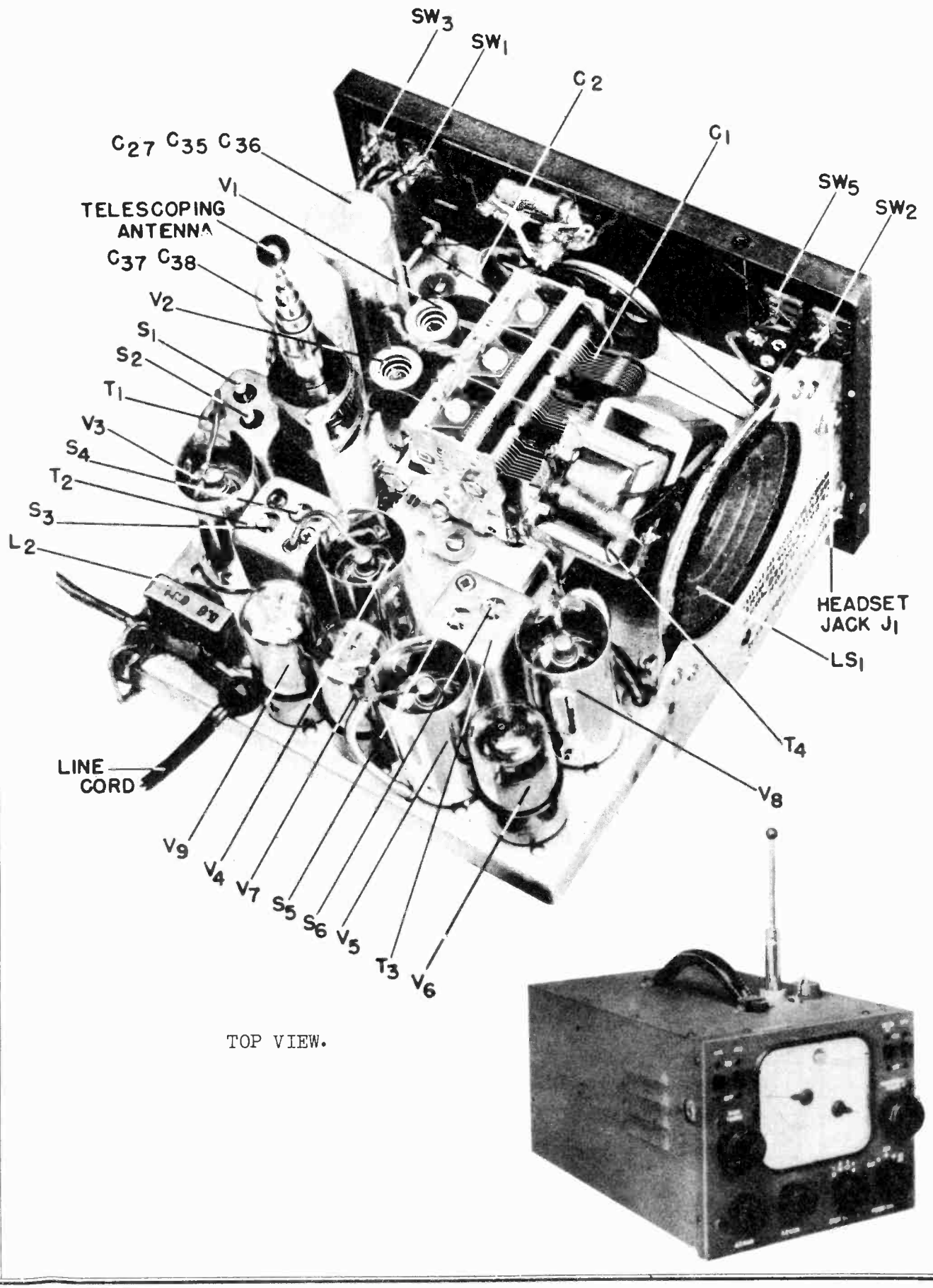
(e) Setting of controls for R-F alignment -
ANL, AVC and BFO switches at OFF
STAND BY switch at ON
A.F. and R.F. GAIN controls set at maximum gain
BAND SWITCH at Band to be aligned (See alignment chart)
POWER SWITCH at BAT. (power cord removed from wall socket)
BANDSPREAD TUNING at "0"
Telescoping antenna is collapsed except for bottom section

(f) R-F alignment -
Leave output meter plug in phone jack (J_1)
Connect "Hot" lead of signal generator to extended section of the telescoping antenna through the 6.5 mmfd dummy antenna condenser.
Connect ground side of generator to chassis
Have external antenna plug PL_2 out of socket SO_1
Set MAIN TUNING dial of receiver and signal generator frequency as shown in the alignment chart.
Adjust trimmers (C_{47} to C_{58}) and slugs (S_8 to S_{19}) in the order shown on the alignment chart. (See figure 5 for location of adjustment screws).
Note: When aligning bands 3 and 4 "rock" the MAIN TUNING control slightly to peak the adjustment.
When aligning the low frequency end of band 4 by adjusting slug S_{15}, the oscillator may cease to function. A slight adjustment of condenser C_{59} will bring it back into oscillation.
Note: Only one section of the telescoping antenna shall extend above the top cover of the receiver. (This procedure is necessary to obtain an accurate calibration for the receiver when aligning with the dummy antenna of 6.5 mmfd.) The receiver's top cover must be fastened down for the following adjustments.

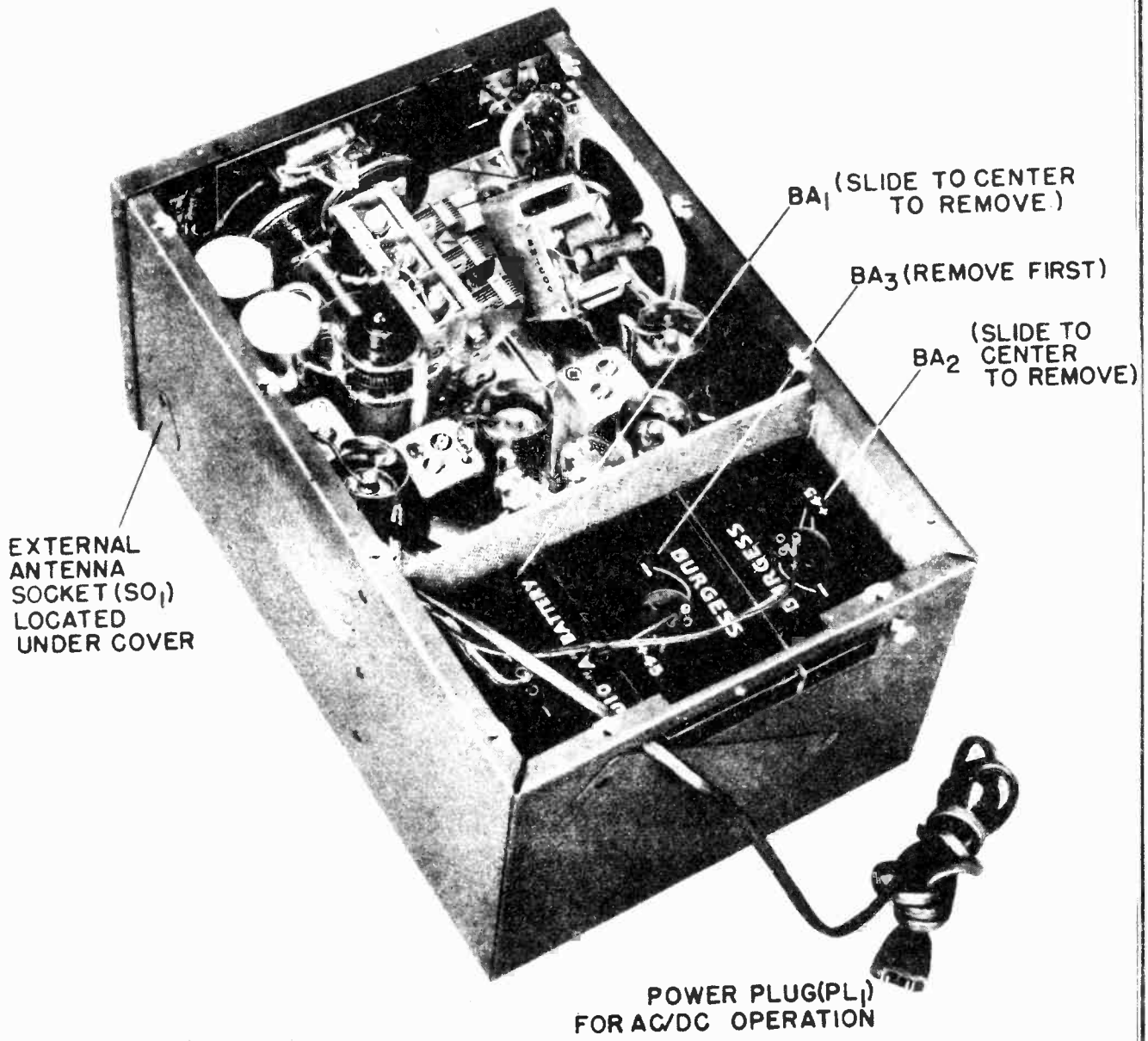
ALIGNMENT CHART

BAND	SIGNAL GENERATOR FREQUENCY AND "MAIN TUNING" DIAL SETTING	ADJUST FOR MAXIMUM OUTPUT: OSCILLATOR SECTION	ADJUST FOR MAXIMUM OUTPUT: ANTENNA AND CONVERTER SECTIONS	OSCILLATOR FREQUENCY RELATIVE TO SIGNAL FREQUENCY
1	1.4 MC	C_{55}	C_{47} and C_{51}	455 KC Above
	.6 MC	S_{12}	S_8 and S_{16}	
2	4.0 MC	C_{56}	C_{48} and C_{52}	455 KC Above
	2.0 MC	S_{13}	S_9 and S_{17}	
3	10.0 MC	C_{57}	C_{49} and C_{53}	455 KC Above
	5.0 MC	S_{14}	S_{10} and S_{18}	
4	28.0 MC	C_{58}	C_{50} and C_{54}	455 KC Below
	14.0 MC	S_{15} C_{59}	S_{11} and S_{19}	

MODEL S-39, Skyranger THE HALLICRAFTERS CO.



TOP VIEW.



MODEL S-39 RECEIVER, REAR VIEW, COVER REMOVED, SHOWING POWER CORD COMPARTMENT AND BATTERY COMPARTMENT.

A-3. POWER SUPPLIES - Two separate and independent power supplies are incorporated in the receiver, namely an internal battery supply and a rectifier-filter type of supply for use with an external a-c/d-c source.

The battery supply consists of two 45-volt "B" batteries (BA_2 and BA_3) connected in series, and one 6-volt "A" battery (BA_1) all of which are located in the back section of the carrying-case cabinet. See figure 6.

The a-c/d-c supply consists of two type 35Z5GT rectifier tubes (V_7 and V_9) and the associated filter (L_2, C_{35} and C_{27}) and filament voltage dropping resistors (R_{32}, R_{33}, R_{34} and R_{35}). This supply may be used whenever commercial power lines, delivering 110-to 117-volts A-C or D-C are accessible. Refer to Section D for operating instructions.

The supply to be used is selected from the front panel by POWER SWITCH, SW_7. Refer to figure 2 for circuit details.

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REF. SYMBOL	NAME OF PART AND DESCRIPTION	MFR. CODE	CONTR S. PART NO.
R_1	Resistor, 2.2 megohm ± 10%, ¼ watt, carbon	ASA	RC10AE225K
R_2	Same as R_1		
R_3	Resistor, 8,200 ohm ± 10%, ½ watt, carbon	ASA	RC21AE822K
R_4	Resistor, variable, ½ megohm ± 20%, carbon	CT	25C071
R_5	Resistor, 4700 ohm ± 10%, ¼ watt, carbon	ASA	RC10AE472K
R_6	Same as R_1		
R_7	Resistor, 100,000 ohm ± 10%, ¼ watt, carbon	ASA	RC10AE104K
R_8	Resistor, 1.0 megohm ± 10%, ¼ watt, carbon	ASA	RC10AE105K
R_9	Same as R_1		
R_{10}	Resistor, 51,000 ohm ± 5%, ½ watt, carbon	ASA	RC21AE513J
R_{11}	Same as R_1		
R_{12}	Same as R_8		
R_{13}	Same as R_7		
R_{14}	Resistor, variable, ½ megohm ± 20%, carbon	CT	25C070
R_{15}	Resistor, 10 megohm ± 20%, ¼ watt, carbon	ASA	RC10AE106M
R_{16}	Same as R_7		
R_{17}	Resistor, 470,000 ohm ± 20%, ¼ watt, carbon	ASA	RC10AE474M
R_{18}	Same as R_{17}		
R_{19}	Same as R_{17}		
R_{20}	Resistor, 47,000 ohm ± 20%, ¼ watt, carbon	ASA	RC10AE473M
R_{21}	Same as R_{20}		
R_{22}	Not used		
R_{23}	Not used		
R_{24}	Resistor, 24 ohm ± 5%, 1 watt, carbon	ASA	RC31AE240J
R_{25}	Resistor, 330 ohm ± 5%, 9 watt, wire wound, candohm, type FH	MT	24A829
R_{26}	Not used		
R_{27}	Resistor, 1000 ohm ± 10%, ¼ watt, carbon	ASA	RC10AE102K
R_{28}	Not used.		
R_{29}	Resistor, 560 ohm ± 10%, ¼ watt, carbon	ASA	RC10AE561K
R_{30}	Same as R_{29}		
R_{31}	Not used		
R_{32}	Same as R_{27}		
R_{33}	Resistor, 820 ohm ± 10%, 1 watt, carbon	ASA	RC31AE821K
R_{34}, R_{35}	Resistor, 1645 ohm ± 10%, tapped at 800 ohm, 7.4 watt, 2 unit, wire wound, unit #1 800 ohm (R_{34}), unit #2 845 ohm (R_{35}), candohm, type MW-2	IRC	24A044
R_{36}	Resistor, 820 ohm ± 10%, ¼ watt, carbon	ASA	RC10AE821K
R_{37}	Not used.		
R_{38}	Same as R_{24}		
R_{39}	Resistor, 1.5 meghom ± 20%, ¼ watt, carbon	ASA	RC10AE155M
R_{40}, R_{41}	Resistor, 450 ohm tapped at 87 ohm, 7 watt, 2 unit, wire wound, unit #1 363 ohm (R_{40}), unit #2 87 ohm (R_{41}) candohm, special	MT	24A819
R_{42}	Same as R_7		
C_1, C_2	Capacitor, variable, 3 section, 2 unit, unit #1-(C_1), max. cap. per section 352 mmfd., air dielectric, unit #2-(C_2) max. cap. per section 22 mmfd. air dielectric, each unit has separate drive shaft to which pulleys are fixed, type 945-3-20	OM	48B055
C_3	Capacitor, 51 mmfd. ± 5%, 500 V. D-C working, low loss mica dielectric	ASA	CM20C510J
C_4	Capacitor, 0.1 mfd. -10 + 40%, 400 V. D-C working, paper dielectric, type 464	A	46AV104J
C_5	Capacitor, 15 mmfd. ± 20%, 500 V. D-C working, temp. coeff., -.00075 mmfd./ mmfd./ degree Cent., ceramic dielectric, type 809-047	CRL	47A027
C_6	Capacitor, 10 mmfd. ± 20%, 500 V. D-C working, temp. coeff., -.00075 mmfd./ mmfd./ degree Cent., ceramic dielectric, type 811-013.	CRL	47A028
C_7	Capacitor, 0.05 mfd. -10 + 40%, 200 V. D-C working, paper dielectric, type AB	SP	46AU503J
C_8	Capacitor, 0.01 mfd. -10 + 40%, 400 V. D-C working, paper dielectric, type AR	SP	46AW103J
C_9	Same as C_8		
C_{10}	Capacitor, adjustable, min. cap. 5 mmfd., max. cap. 6.5 mmfd., 500 V. D-C working, temp. coeff. -.00075 mmfd./ mmfd./ degree Cent., ceramic dielectric, type 807-004	CRL	47A005
C_{11}	Same as C_{10}		
C_{12}	Same as C_7		
C_{13}	Same as C_7		
C_{14}	Capacitor, 3 mmfd., twisted wire leads		
C_{15}	Capacitor, 2 mmfd., twisted wire leads		
C_{16}	Same as C_3		
C_{17}	Same as C_7		
C_{18}	Same as C_8		
C_{19}	Not used		
C_{20}	Same as C_7		
C_{21}	Capacitor, 100 mmfd. ± 20%, 500 V. D-C working, mica dielectric	ASA	CM20A101M
C_{22}	Capacitor, 0.004 mfd. -10 + 40%, 600 V. D-C working, paper dielectric, type 684	A	46AZ402J
C_{23}	Capacitor, 0.1 mfd. - 10 + 40%, 200 V. D-C working, paper dielectric, type 284	A	46AU104J
C_{24}	Same as C_8		
C_{25}	Capacitor, 0.005 mfd. - 10 + 40%, 400 V. D-C working, paper dielectric, type 484	A	46AW502J
C_{26}	Capacitor, 0.02 mfd. -10 + 40%, 400 V. D-C working, paper dielectric, type AB	SP	46AW203J
C_{27}	Capacitor, 60 mfd. -10 + 50%, 150 V. D-C working, electrolytic, one section of 3 section unit, 6 prong plug-in assembly, type 10B336	IC	45A065
C_{28}	Capacitor, 0.02 mfd. -10 + 40%, 400 V. D-C working, paper dielectric, type AB	SP	46AW203J
C_{29}	Same as C_{28}		
C_{30}	Capacitor, 3 turn twisted wire leads		
C_{31}	Same as C_{21}		
C_{32}	Capacitor, 510 mmfd. ± 5%, 500 V. D-C working, mica dielectric	ASA	CM20A511J
C_{33}	Same as C_7		
C_{34}	Capacitor, 0.05 mfd. -10 + 40%, 400 V. D-C working, paper dielectric, type 484	A	46AW503J
C_{35}	Capacitor, 30 mfd. -10 + 50%, 150 V. D-C working, electrolytic, one part of triple unit - refer to C_{27}		
C_{36}	Capacitor, 100 mfd. -10 + 65%, 5 V. D-C working, electrolytic, one part of triple unit - refer to C_{27}		
C_{37}, C_{38}	Capacitor, dual, 120 mfd. -10 + 50%, 150 V. D-C working (C_{38}), 60 mfd. -10 + 65%, 5 V. D-C working (C_{37}), unit hermetically sealed 4 prong plug-in assembly, type 10B335	IC	45A066
C_{39}	Capacitor, 4300 mmfd. ± 5%, 500 V. D-C working, mica dielectric	ASA	CM35A432J
C_{40}	Capacitor, 240 mmfd. ± 5%, 500 V. D-C working, mica dielectric	ASA	CM20A241J

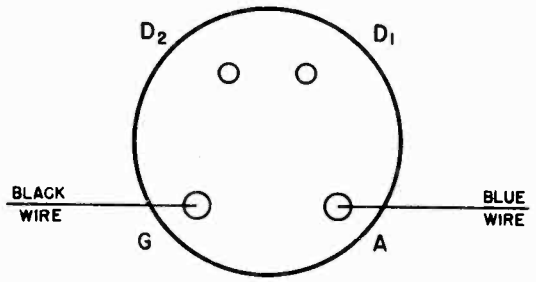
THE HALLICRAFTERS CO.

MODEL S-39, Skyranger

REF. SYMBOL	NAME OF PART AND DESCRIPTION	MFR. CODE	CONTR'S. PART NO.
C_{41}	Capacitor, 2000 mmfd. ± 5%, 500 V. D-C working, mica dielectric	ASA	CM30A202J
C_{42}	Capacitor, 910 mmfd. ± 5%, 500 V. D-C working, mica dielectric	ASA	CM30A911J
C_{43}	Capacitor, 390 mmfd. ± 5%, 500 V. D-C working, mica dielectric	ASA	CM20A391J
C_{44}	Same as C_8		
C_{45}	Same as C_7		
C_{46}	Capacitor, 0.5 mfd. -10 + 40%, 200 V. D-C working, paper dielectric		46AT504J
C_{47} C_{48} C_{49} C_{50}	Capacitor, 4 unit assembly, mica dielectric, compression type adjustment, trimmers mounted on a single metal strip, 3 units with min. cap. 2.7 mmfd., max. cap. 35 mmfd. (C_{47}, C_{49}, C_{50}) 1 unit with min. cap. 1.5 mfd., max. cap. 10 mmfd. (C_{48} special	UE	44A064
C_{51} C_{52} C_{53} C_{54}	Same as C_{47}, C_{48}, C_{49}, C_{50}, assembly. C_{51}, C_{53}, C_{54} same as C_{47}, C_{48}, C_{50}; and C_{52} same as C_{48})		
C_{55} C_{56} C_{57} C_{58} C_{59}	Capacitor, 5 unit assembly, mica dielectric, compression type adjustment, trimmers mounted on a single metal strip, 2 units with min. cap. 1.5 mmfd., max. cap. 10 mfd. (C_{57} and C_{58}), 2 units with min. cap. 2.7 mmfd., max. cap. 35 mmfd. (C_{55} and C_{56}), 1 unit with min. cap. 25 mmfd., MAX. 140 mmfd. (C_{59}), special	UE	44A092
C_{60}	Not used		
C_{61}	Same as C_{40}		
C_{62}	Same as C_{21}		
T_1	Transformer, I-F, 455 KC., fixed primary trimmer 155 mmfd., fixed secondary trimmer 80 mmfd., primary and secondary are tuned by adjustable iron cores, special	SI	50A086
T_2	Same as T_1 except for length of leads	SI	50B157
T_3	Same as T_1, except for length of leads	SI	50B158
T_4	Transformer, A-F, primary to match the output of the type 3Q5GT tube, part of speaker assembly LS_1. Shown for reference only		
T_5 T_6 T_7 T_8	Transformer, R-F, 4 unit assembly, tunes from .55 MC. to 30 MC. in 4 bands with condenser C_1 and C_2, inductance adjusted by movable iron cores.	SWI	51B301
T_9 T_{10} T_{11} T_{12}	Transformer, R-F, 4 unit assembly, tunes from .55 MC. to 30 MC. in 4 bands with condensers C_1 and C_2, inductance adjusted by movable iron cores	SWI	51B303
SW_2	Switch, DPST, slide action, bakelite insulation, steel mtg. plate with 2 holes having 1-1/8" mtg. centers, type 71	OM	60A061
SW_3	Same as SW_2		
SW_4	Switch, SPST, toggle action, refer to SW_7		
SW_5	Switch, SPDT, slide, bakelite insulation, brass solder lugs, steel mtg. plate with 2 holes having 1-1/8" mtg. centers, type 77	OM	60A130
SW_6	Switch, rotary selector, 4 position, 3 section, shorting type contacts, bushing ¼" long, type RM	MA	60B160
SW_7	Switch, rotary selector, 3 position, single section, non-shorting type contacts, has a type 8030-K4 toggle action, SPST A-C switch ganged on rear of assembly "ON" position full clockwise, type H	OM	60A162
SO_1	Socket, female, 4 contacts, bakelite insulation, wafer type, brass contacts, 2 mtg. holes with 1¼" mtg. centers, type 2642	CN	10A080
PL_1	Plug with line cord, 2 conductor, rubber insulation. #18 ga. stranded copper wire, length 6 feet, 2 prong spring type molded on plug, special	E	87A078
BA_1	Battery, 6 V. D-C, 2 hole socket, 3-7/8" x 2-15/16" x 5½", type P698A	ROV	27A010
BA_2	Battery, 45 V. D-C, combination "B" socket, 4-1/8" x 2-9/16" x 5-5/16", type P5303	ROV	27A009
BA_3	Same as BA_2		
J_1	Jack, single circuit, normally closed, brass mechanism, bakelite insulation, type 1J102	U	36A002
LS_1	Loudspeaker; 4 inch O.D. permanent magnet dynamic, includes transformer T_4 in the assembly, type 4-OM-11A	OT	85B009
LM_1	Lamp, indicator, 1-1/8" leads, clear glass bulb type 4½, type NE-7	GE	39A007
V_1	Tube, pentode, type 1T4	RCA	90X1T4
V_2	Tube, pentagrid converter, type 1R5	RCA	90X1R5
V_3	Tube, type, 1P5GT	RCA	90X1P5GT
V_4	Same as V_3		
V_5	Tube, diode triode, type 1H5GT	RCA	90X1H5GT
V_6	Tube, beam power amplifier, type 3Q5GT	RCA	90X3Q5GT
V_7	Tube, half-wave high-vacuum rectifier, type 35Z5GT	RCA	90X35Z5GT
V_8	Same as V_5		
V_9	Same as V_7		
	FOR TROPICAL RECEIVERS USE THE ABOVE PARTS		
T_1	Transformer, I-F, 455 KC., fixed primary trimmer 155 mmfd., fixed secondary trimmer 85 mmfd., primary and secondary are tuned by adjustable iron cores, vacuum impregnated with zophar #1340 and flash dipped in Hollowax #2012, special (Note: T_1 differs from T_2 and T_3 in the length of the wire leads)	SI	50A150
T_2	Transformer, I-F, 455 KC., fixed primary trimmer 155 mmfd., fixed secondary trimmer 85 mmfd., primary and secondary are tuned by adjustable iron cores, vacuum impregnated with zophar #1340 and flash dipped in Hollowax #2012, special (Note: T_2 differs from T_1 and T_3 in the length of the wire leads)	SI	50A159
L_1	Reactor, R-F, inductance 170 microhenries, air core, vacuum impregnated with zophar #1340 and flash dipped in Hallowax #2012, type 3485	SWI	53A057
L_2	Reactor, filter, d-c resistance 250 ohms ± 20%, max. load current 30 milliamperes, inductance 3.6 henrys at 30 milliamperes, vacuum wax impregnated and flash dipped in Hallowax #2012, type 1A1251 modified	GT	56B051
SW_8	Switch, rotary selector, 4 position, 3 section, shorting type contacts, bushing ¼" long, terminal 6 of section 2 front and rear are electrically connected, type RM	MA	60B179

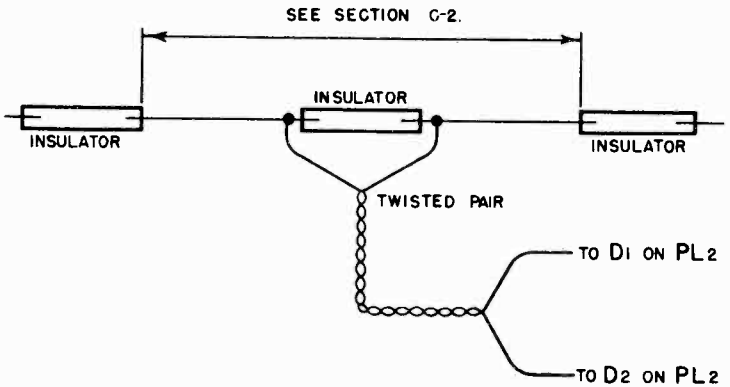
REF. SYMBOL	NAME OF PART AND DESCRIPTION	MFR. CODE	CONTR'S. PART NO.
T_3	Transformer, I-F, 455 KC., fixed primary trimmer 155 mmfd., fixed secondary trimmer 85 mmfd., primary and secondary are tuned by adjustable iron cores, vacuum impregnated with zophar #1340 and flash dipped in Hollowax #2012, special, (Note T_3 differs from T_1 and T_2 in the length of the wire leads)	SI	50A151
T_5 T_6 T_7 T_8	Transformer, R-F, 4 unit assembly, tunes from 0.55 MC. to 30 MC. in 4 bands with condenser C_1 and C_2, inductance adjusted by movable iron cores, wax impregnated with Hallowax #2012	SWI	51B648
T_9 T_{10} T_{11} T_{12}	Transformer, R-F, 4 unit assembly, tunes from 0.55 MC. to 30 MC. in 4 bands with condenser C_1 and C_2, inductance adjusted by movable iron cores, wax impregnated with Hallowax #2012	SWI	51B650
T_{13} T_{14} T_{15} T_{16}	Transformer, R-F, 4 unit assembly, tunes from 0.55 MC. to 30 MC. in 4 bands with condenser C_1 and C_2, inductance adjusted oy movable iron cores. wax impregnated with Hallowax #2012	SWI	51B649

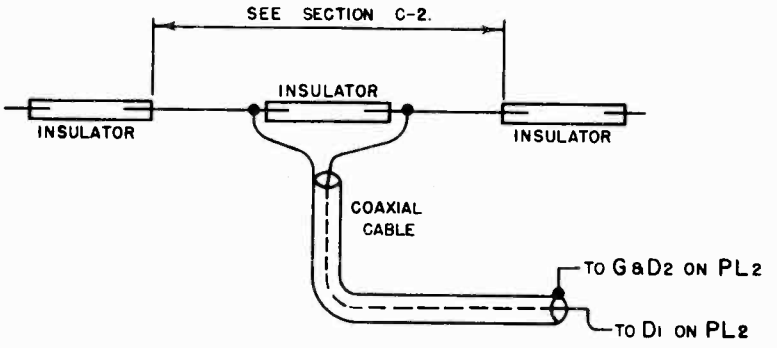
RECOMMENDED ANTENNA INSTALLATIONS

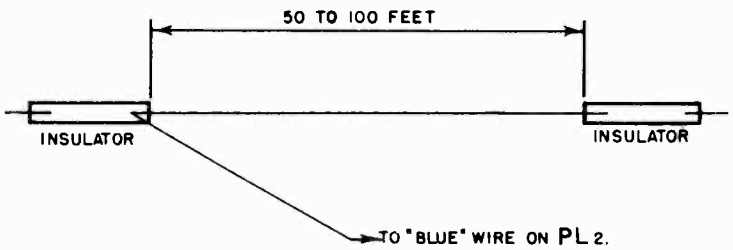


PL2
PIN VIEW

NOTE: PL2 IS SUPPLIED WIRED AS ABOVE

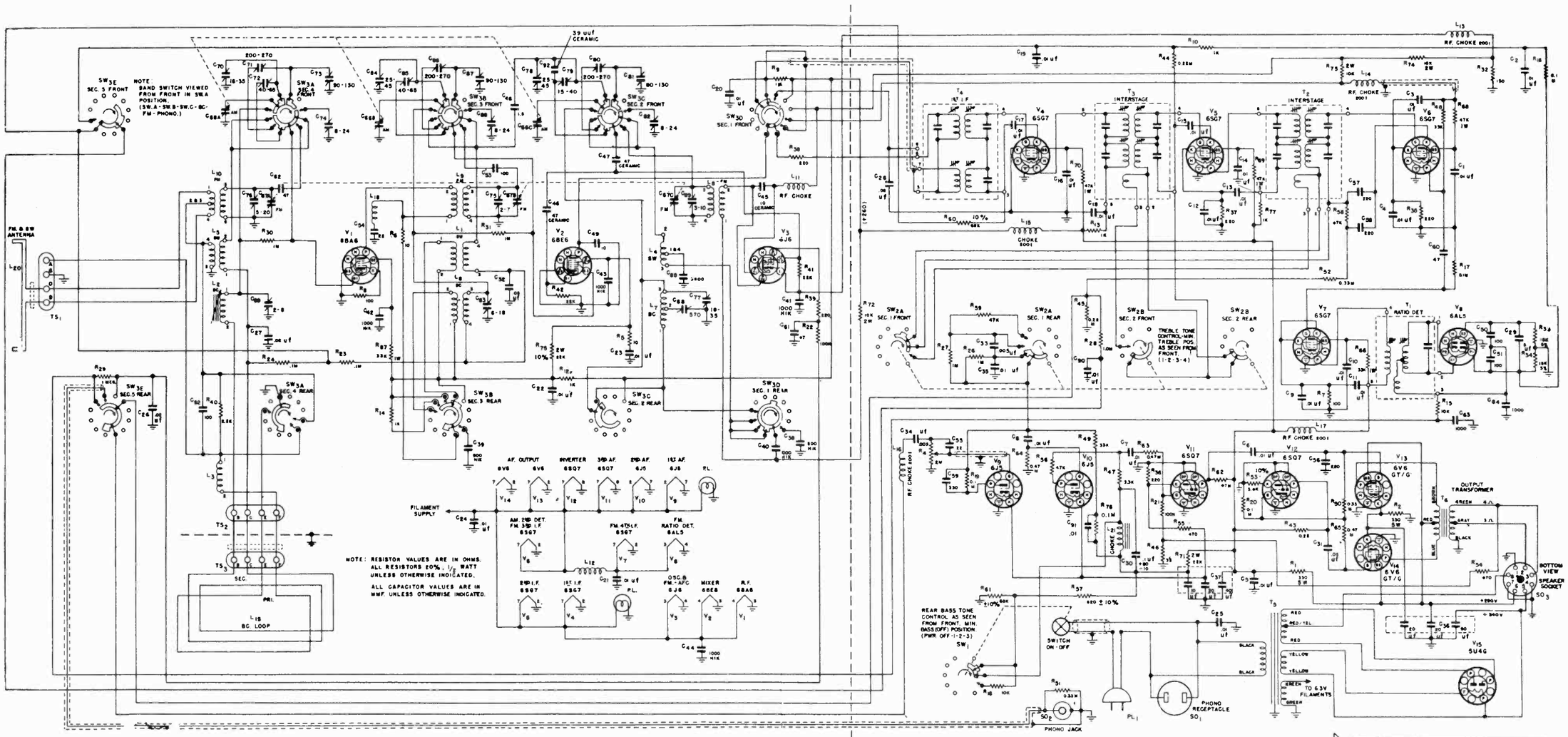






THE HALLICRAFTERS CO.

MODELS EC-403, EC-404,
Echophone



BUTTON SETTING:

1. Select any one pushbutton.
2. Pull translucent insert straight out.
3. Insert screw driver blade through large hole of pushbutton into slot of locking screw. (See Fig. 1).
4. Loosen locking screw about one-half turn. (Not more than one full turn.)
5. With pushbutton depressed, carefully tune in desired station with the manual control.
6. With the manual control held firm, tighten the locking screw.

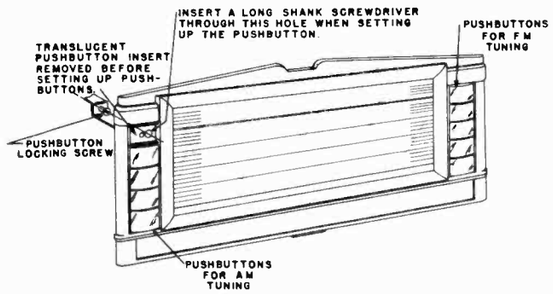
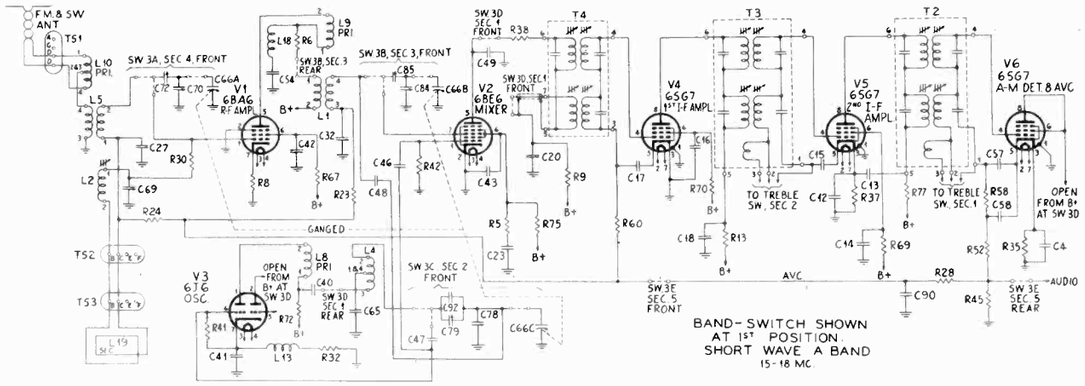


Fig. 1. View showing pushbutton setup.

Tuning Range	(BC)	540 kc — 1700 kc
	(A)	15 mc — 18 mc
	(B)	9 mc — 12 mc
	(C)	5.8 mc — 18 mc
	(FM)	88 mc — 108 mc
Intermediate Frequency		455 kc
Intermediate Frequency		10.7 mc
Power Supply		105–125 V. 60 cycle AC
Power Consumption		180 watts

THE HALLICRAFTERS CO. MODELS EC-403, EC-404, Echophone

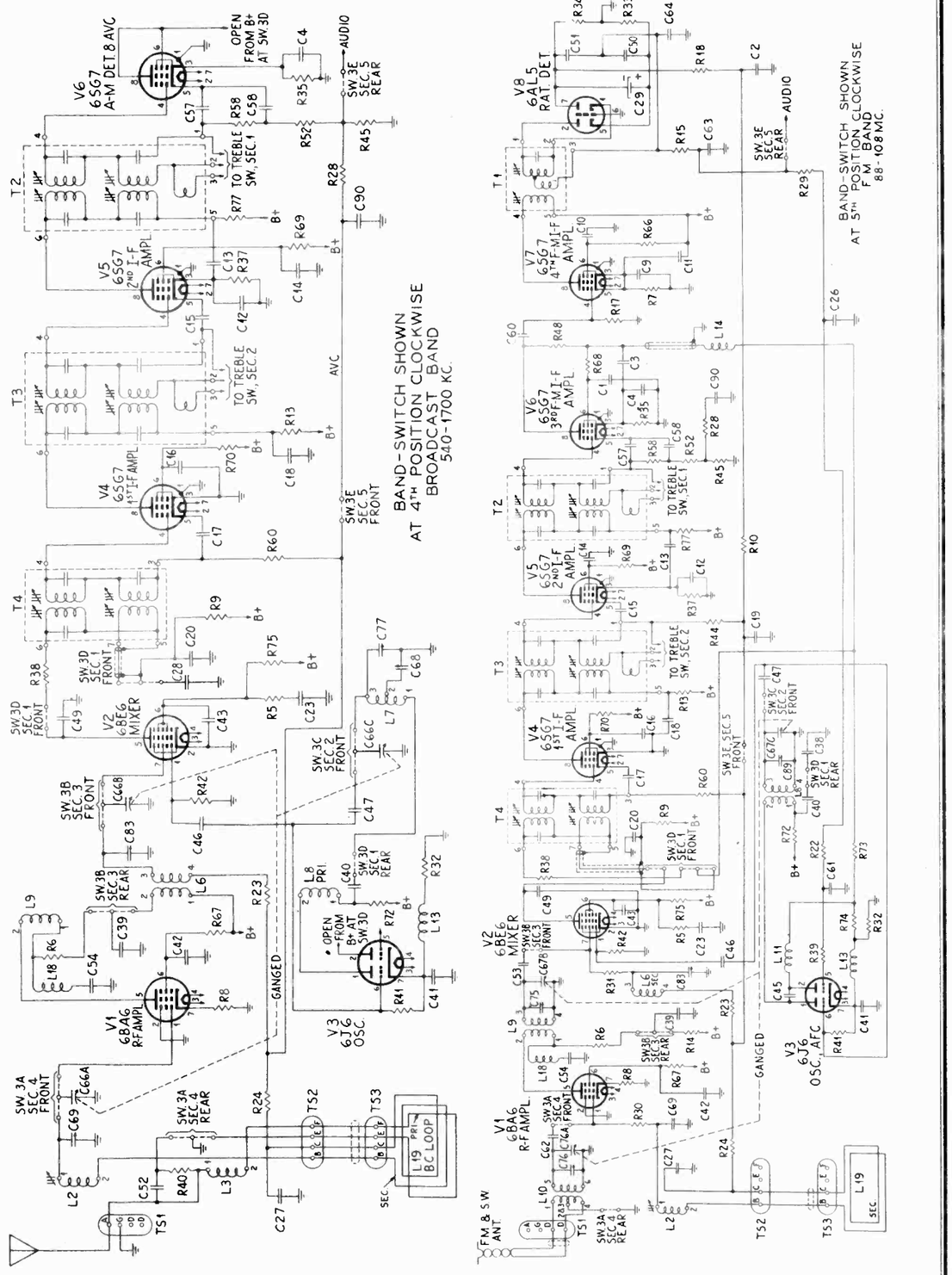


BAND-SWITCH SHOWN AT 1ST POSITION SHORT WAVE A BAND 15-18 MC.

BAND-SWITCH SHOWN AT 2ND POSITION CLOCKWISE SHORT WAVE B BAND 9-12 MC.

BAND-SWITCH SHOWN AT 3RD POSITION CLOCKWISE SHORT WAVE C BAND 5.8-18 MC.

MODELS EC-403, EC-404, Echophone THE HALLICRAFTERS CO.



BAND-SWITCH SHOWN AT 4TH POSITION CLOCKWISE BROADCAST BAND 540-1700 KC.

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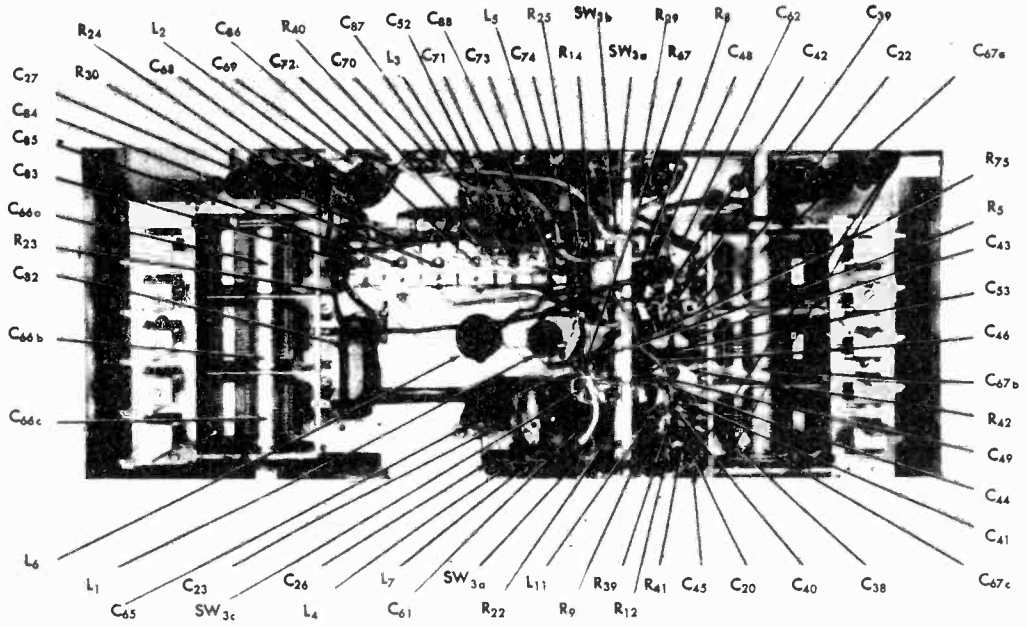
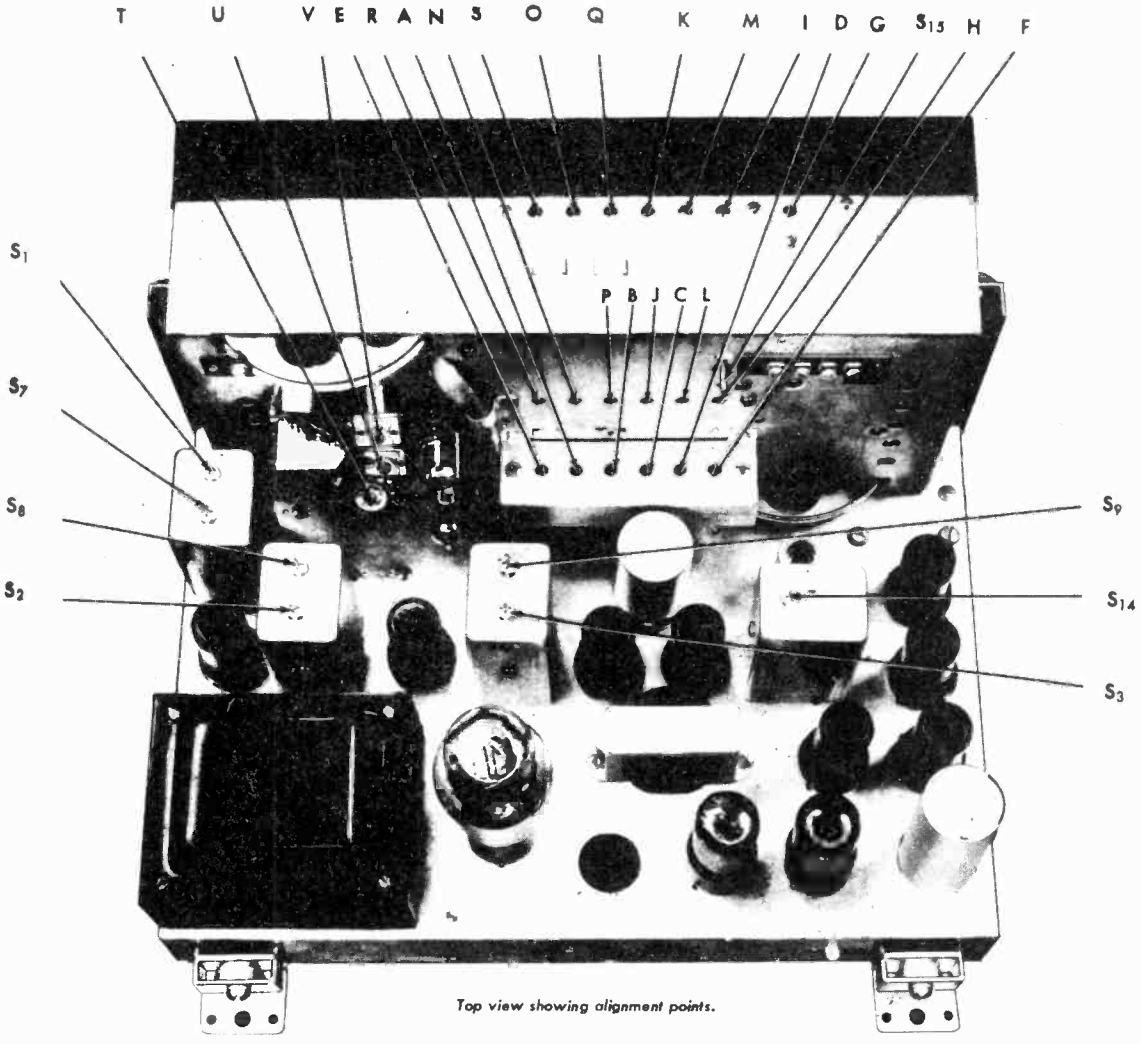
MODELS EC-403, EC-404,
Echophone



Back view of R.F. chassis showing component location.



Top view showing alignment points.

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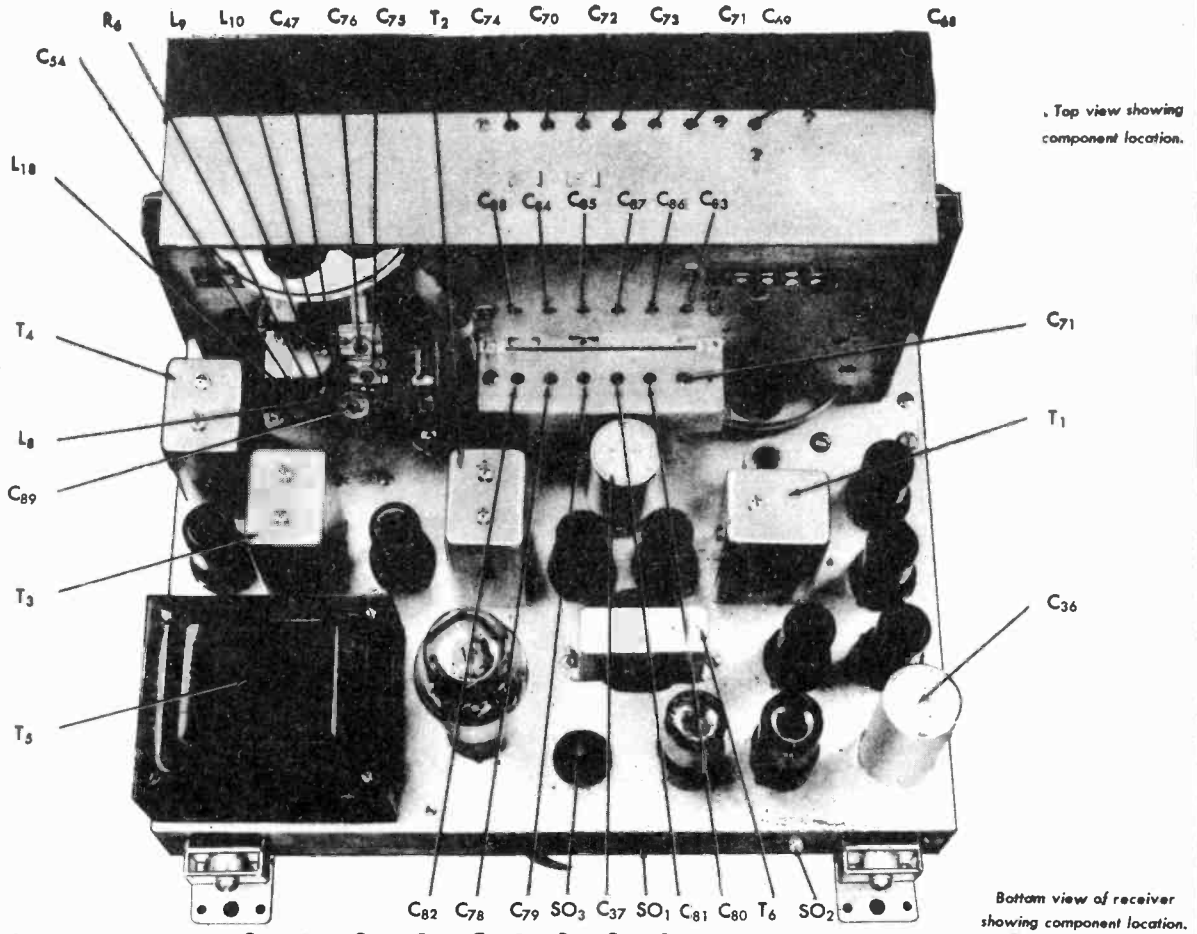
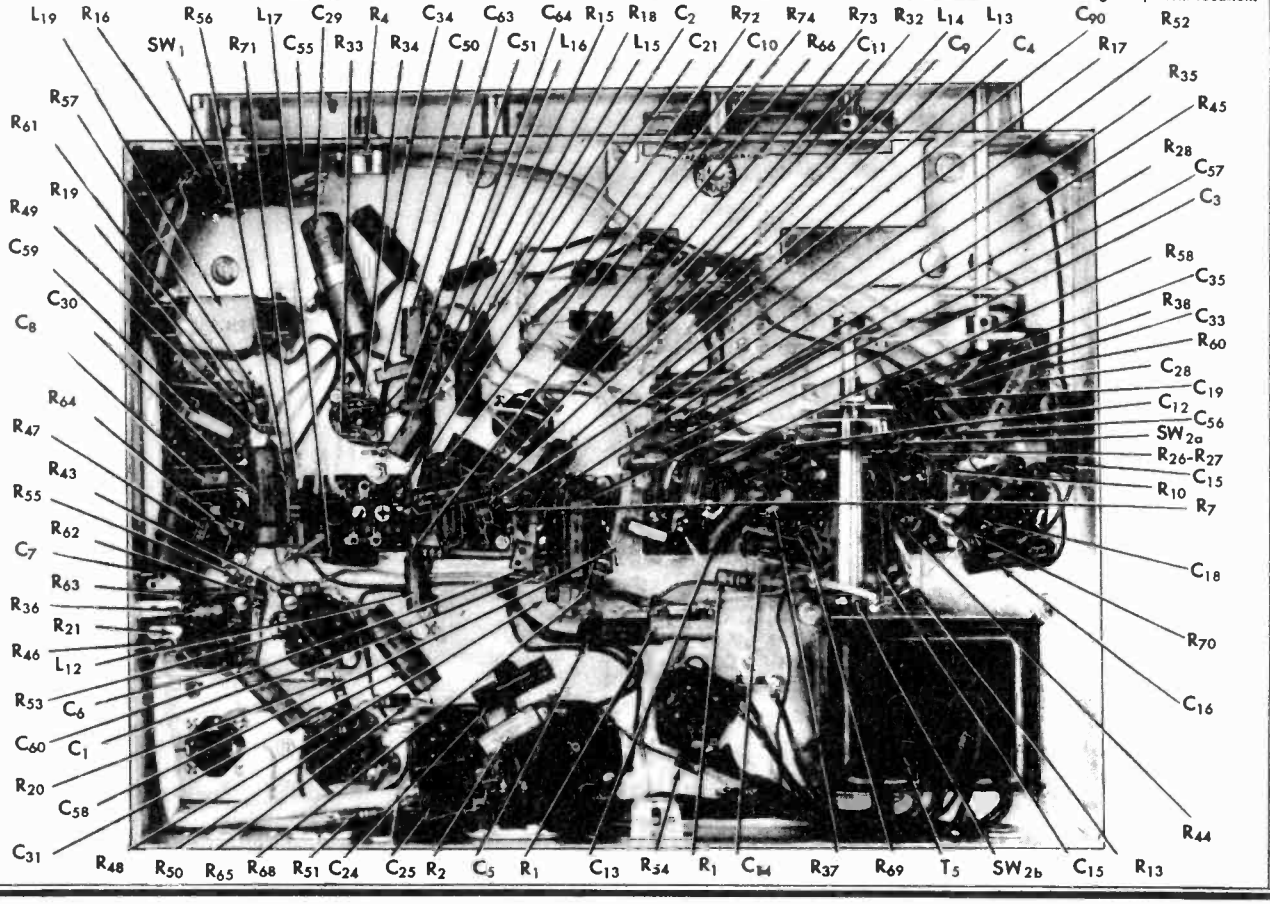


Top view showing component location.



Bottom view of receiver showing component location.

ALIGNMENT PROCEDURE

Removal of the receiver chassis from the cabinet requires the use of other calibration means than the dial glass. Calibration strips mounted on the pointer rails are provided for alignment purposes.

In order to see these calibration strips, it is necessary that the dial plate (brown metal cover) be removed in the following order:

1. Pull out dial pointers.
2. Remove seven self-tapping screws holding dial plate to chassis.
3. Remove the Right hand and Left hand Dial lamp assemblies fastened by one self-tapping screw each.
4. Remove dial plate.

With the variable condensers fully "meshed," the right hand side of the pointer carriage will be indexed to "0" on the calibration strips (see fig. 3).

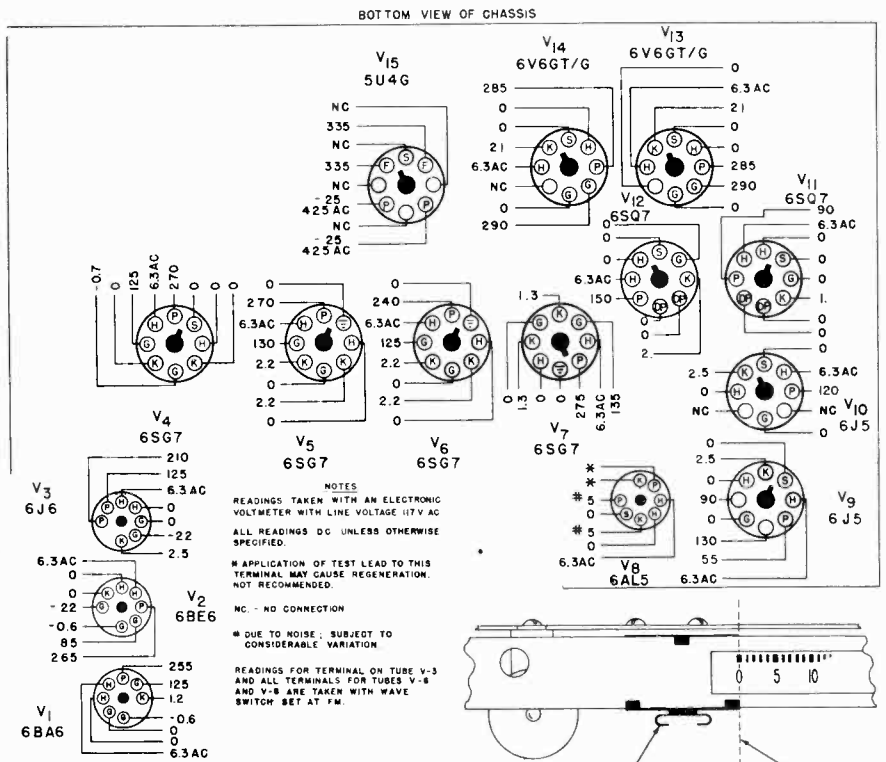
Proceed with alignment of the receiver as indicated on the alignment chart.

NOTE: This receiver has AUTOMATIC FREQUENCY CONTROL employed on the "FM" band in order to compensate for mechanical variations in the push-button mechanism. Correction factor is approximately 5 times; "take hold" characteristics are: "Before" 100 kc and "Release" before 450 kc at .1 volt input signal.

Standard RMA dummy consisting 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.

ALIGNMENT PROCEDURE

Steps	*Signal Generator Thru .01 Mfd to:*	*Sig. Gen. Tuned to:*	*Receiver Tuned to:*	*Cal. No.*	*Adjust the Following Slugs/Trimmers for:*
"AM" i.f.	1. 2nd i.f. control grid	455 kc	"BC" Band 1000 kc	55	S3 and S6, Max. output
	2. 1st i.f. control grid	455 kc	1000 kc	55	S2 and S5, Max. output
	3. 1st Det. control grid	455 kc	1000 kc	55	S1 and S4, Max. output
NOTE: Set "Bass" control at No. 1, and "Treble" control at No. 4, read output for maximum AVC voltage, using a VTVM or 20,000 ohms/volt meter connected to pin No. 7 of the 6AL5 radio detector tube to ground.					
"FM" i.f.	4. 2nd i.f. control grid	10.7 mc	"FM" Band Mid-scale	55	S9, S12, S13 Max. output
	5. 1st i.f. control grid	10.7 mc	Mid-scale	55	S8 & S11 Max. output
	6. 1st Det. control grid	10.7 mc	Mid-scale	55	S7, S10 Max. output
NOTE: For ratio detector alignment, clip output meter to C-34 leading to audio control potentiometer and ground.					
	7. 1st Det. control grid	10.7 mc	Mid-scale	55	S14 for "0" audio voltage
	8. Standard RMA dummy ant. to:	1500 kc	"BC" Band 1500 kc	82	"E," Calibration
	9. "A" "G"	1500 kc	1500 kc	82	"H," Max. output
	10. "A" "G"	1500 kc	1500 kc	82	"I," Max. output
	11. "A" "G"	600 kc	600 kc	15.5	"G," Calibration
	12. "A" "G"	600 kc	600 kc	15.5	S15, Max. output
	13. "A" "G"	12 mc	"B" Band 12 mc	91.5	"C," Calibration
	14. "A" "G"	12 mc	12 mc	91.5	"J," Max. output
	15. "A" "G"	12 mc	12 mc	91.5	"K," Max. output
	16. "A" "G"	9 mc	9 mc	6.5	"D," Calibration
	17. "A" "G"	9 mc	9 mc	6.5	"L," Max. output
	18. "A" "G"	9 mc	9 mc	6.5	"M," Max. output
	19. "A" "G"	18 mc	"A" Band 18 mc	94.5	"A," Calibration
	20. "A" "G"	18 mc	18 mc	94.5	"N," Max. output
	21. "A" "G"	18 mc	18 mc	94.5	"O," Max. output
	22. "A" "G"	15 mc	15 mc	7.5	"B," Calibration
	23. "A" "G"	15 mc	15 mc	7.5	"P," Max. output
	24. "A" "G"	15 mc	15 mc	7.5	"Q," Max. output
	25. "A" "G"	16 mc	"C" Band 16 mc	84	"E," Calibration
	26. "A" "G"	16 mc	16 mc	84	"R," Max. output
	27. "A" "G"	16 mc	16 mc	84	"S," Max. output
	28. Two 150 ohm resistors to: "D" "D"	108 mc	"FM" Band 108 mc	83.5	"T," Calibration
	29. "D" "D"	108 mc	108 mc	83.5	"U," Max. output
	30. "D" "D"	108 mc	108 mc	83.5	"V," Max. output



Calibration strip detail.

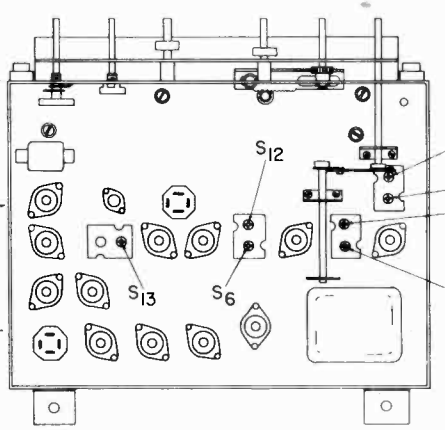
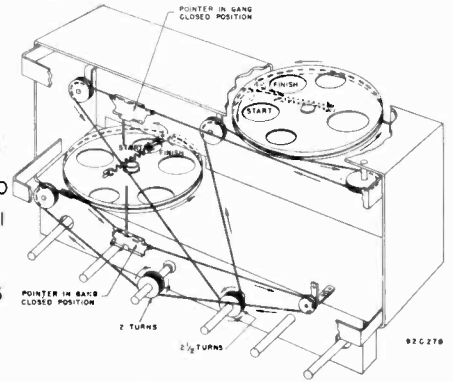


Fig. 5. Bottom view showing alignment points.



DIAL CORD STRINGING INSTRUCTIONS

For restringing the "FM" gang and dial, cut a 5 ft. piece of 9 lb. test dial cord and proceed as indicated in Fig. 9.

For restringing the "AM" gang and dial, cut a 4½ ft. piece of dial cord and proceed as indicated in Fig. 9.

MODELS EC-403, EC-404,
Echophone

THE HALLICRAFTERS CO.

SERVICE PARTS LIST

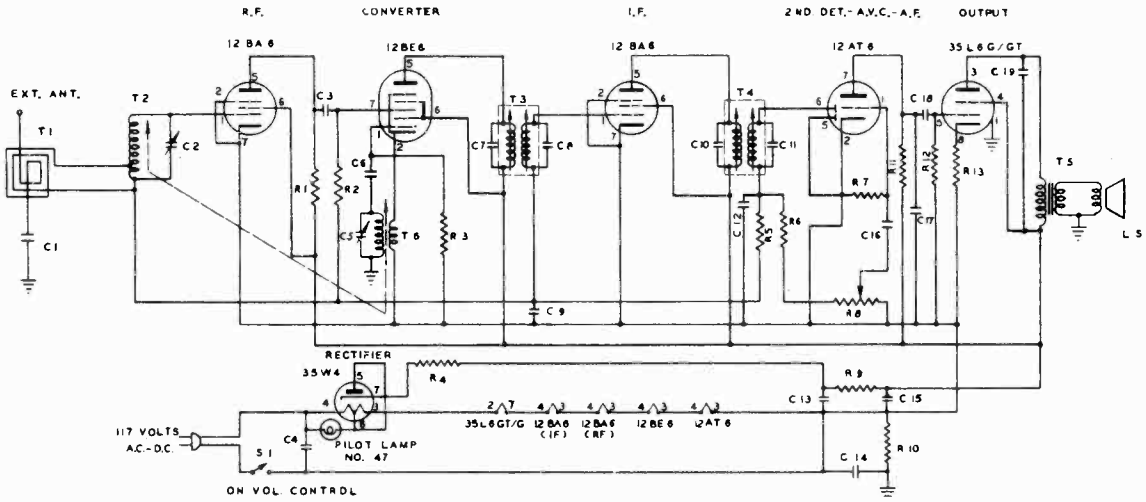
Illustration No.	Description	Hallicrafters Part No.
	CABINET PARTS	
	Mahogany, cabinet	66F341
	Walnut, cabinet	66F342
	TRANSFORMERS AND COILS	
T1	Freq. detector trans. FM	50C208
T2, 3	Interstage I.F. trans.	50C209
T4	1st I.F. trans.	50C210
L1	R.F. Coil, short wave	51B905
L2	Loading coil, ant., BC	51B906
L3	Loop loading coil	51B907
L4	Osc. coil, short wave	51B908
L5	Ant. coil, short wave	51B909
L6	R.F. Coil, B.C.	51B910
L7	Osc. coil, B.C.	51B911
L8	Osc. coil, FM	51B914
L9	R.F. coil, FM	51B915
L10	Ant. coil, FM	51B916
L11	Plate choke	53B008
L12	Filament choke	53B009
L13, 14, 15, 16, 17	R.F. choke	53A106
L18	R.F. choke	53A115
L19	BC-SW loop ant.	57D106
L20	FM dipole ant.	57C108
T5	Power transformer	52C132
T6	Output transformer	55B086
L21	Audio choke	56B082
	CONDENSERS	
C1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 90, 91.	.01 mfd. 600 v. tubular	46AZ103F
C26, 27, 28	.02 mfd 600 v. tubular	46AV203F
C30	.1 mfd 200 v. tubular	46AU104H
C31, 32	.05 mfd 600 v. tubular	46AY503F
C33	.002 mfd 600 v. tubular	46AZ202J
C34, 35	.003 mfd 600 v. tubular	46AZ302J
C38, 39	500 uuf ceramic	47A147
C40, 41, 42, 43, 44, 16	1000 uuf ceramic	47A148
C45	10 uuf ceramic	47A149
C46, 47	47 uuf ceramic	47A150
C48	1.5 uuf "Gimmick," wire	Not Supplied
C49	10 uuf 500 v. mica, 10%	CM20A100K
C50, 51, 52, 53	100 uuf 500 v. mica	CM20A101M
C54	22 uuf 500 v. mica, 10%	CM20A220K
C55	22 uuf 500 v. mica	CM20A220M
C56, 57, 58	220 uuf 500 v. mica	CM20A221M
C59	330 uuf 500 v. mica	CM20A331M
C60, 61, 62	47 uuf 500 v. mica	CM20A470M
C63 64	1000 uuf 500 v. mica	CM30A102M
C65	3900 uuf 500 v. mica	CM35A392J
C36	60-20 mfd 450 v. electrolytic 20 mfd 30 v. electrolytic	45B099
C37	40-10 mfd 450 v. electrolytic 20 mfd 30 v. electrolytic	45B100
C29	5 mfd. 50 v. electrolytic	45A108
C68	570 uuf, trimmer	44A189
C75	Trimmer, FM, RF	44A192
C89	Trimmer, FM, Osc.	44A193
C76	Trimmer, FM, Ant.	44A194
C69, 70, 71, 72, 73, 74	Trimmer assembly, ant.	44B190
C77, 78, 79, 80, 81, 82	Trimmer assembly, Osc.	44B195
C83, 84, 85, 86, 87, 88	Trimmer assembly, RF	44B196
C67a-b-c	Variable condenser, "FM"	48C175
C66a-b-c	Variable Condenser, "AM"	48C176
C92	39 uuf, Ceramic	CC30SH390M
	RESISTORS	
R1, 2	330 ohm, 5W WW	24A864
R76	330 ohm 10 W WW	24BG331E
R3	200 ohm 5W WW	24A865
R4	2 meg. volume control	25A571
R5, 6	10 ohm, ½ W	RC20AE100M
R7, 8	100 ohm, ½ W	RC20AE101M
R9, 10, 11, 12, 13, 14, 77	1000 ohm, ½ W	RC20AE102M
R15, 16	10,000 ohm ½ W	RC20AE103M
R17, 18, 19, 20, 21, 22, 23, 24, 25, 78	100,000 ohm ½ W	RC20AE104M
R26, 27, 28, 29, 30, 31	1 meg. ½ W.	RC20AR105M
R32	150 ohm ½ W	RC20AE151M
R33, 34	15,000 ohm ½ W	RC20AE153J
R35, 36, 37, 38, 39	220 ohm, ½ W	RC20AE221M
R40	2200 ohm, ½ W	RC20AE222M
R41, 42	22,000 ohm, ½ W	RC20AE223M
R43, 44, 45	220,000 ohm, ½ W	RC20AE224M
R46	33 ohm, ½ W	RC20AE330M
R47, 48	3300 ohm, ½ W	RC20AE332M
R49	33,000 ohm, ½ W	RC20AE333M
R50, 51, 52	330,000 ohm, ½ W	RC20AE334M
R53	3900 ohm, ½ W (10%)	RC20AE392K
R54, 55	470 ohm, ½ W	RC20AE471M
R56	4700 ohm, ½ W	RC20AE472M
R57	820 ohm, ½ W	RC20AE821K
R58, 59	47,000 ohm, ½ W	RC20AE473M

SERVICE PARTS LIST (Continued)

Illustration No.	Description	Hallicrafters Part No.
	RESISTORS (Continued)	
R60, 61	68,000 ohm, ½ W	RC20AE683K
R62, 63, 64, 65	470,000 ohm, ½ W	RC20AE474M
R66, 67	33,000 ohm, 1 W	RC30AE333M
R68, 69, 70	47,000 ohm, 1 W	RC30AE473M
R71	68,000 ohm, 1 W	RC30AE683M
R72, 73, 74	10,000 ohm, 2 W	RC40AE103M
R75	22,000 ohm, 2 W	RC40AE223K
	MISCELLANEOUS	
SW1	Bass, on and off, complete	60B265
SW2	Treble, complete	60B264
SW3	Band switch, 5 sec. 6 pos.	60C266
	Phono motor receptacle	10A015
	Phono pick-up jack	36A034
	Speaker socket	6A190
	Octal socket, (tube)	6A190
	Miniature socket	6A276
	Pilot light socket and bracket, L.H.	86A046
	Pilot light socket and bracket, R. H.	86A047
	Pointer carriage	67B645
	Tube shield spring retainer	69A104
	Shield base	69A169
	Dial cord	38A014
	Line cord and plug	87A1570
	Pilot lamp	39A004
	Pointer, FM	82A120
	Pointer, AM	82A121
	Insert, pointer, FM	17A022
	Insert, pointer, AM	17A023
	Push-button	17B028
	Speaker, PM, 15"	85C045
	Speaker, PM, 10"	85C043 No. 1 85C047 No. 2.
	Knob, with index	15B093
	Knob	15B096
	Push-button insert	17A027
	Call letters	17A025
	Record changer	115C002-2
	Dial glass, lower	22B179
	Dial glass, upper	22B178
	Escutcheon	7D039
	TUBES	
V15	5U4G Rectifier	90X5U4G
V8	6AL5 FM Freq. detector	90X6AL5
V1	6BA6 RF amplifier	90X6BA6
V2	6BE6 1st detector	90X6BE6
V9, 10	6J5 1st and 2nd audio amp.	90X6J5
V3	6J6 H.F. osc. and FM AFC	90X6J6
V4, 5, 6, 7	6SG7 1st and 2nd I.F., AM 2nd det., FM 3rd and 4th I.F.	90X6SG7
V13, 14	6V6GT/G push pull audio amp.	90X6V6GT
V12, 11	6SQ7 Inverter and 3rd audio amp.	90X6SQ7

HOFFMAN RADIO CORP.

MODELS A202, A309,
Chassis 119



SYMBOL	DESCRIPTION	HOFFMAN No.
C1	.005 Mfd. 600 Volt Tubular Paper	4102
C2, C5	Dual Padder 280 Mmf. Per Section	4307
C3, C6	100 Mmf. ± 20% Mica	4000
C4	.05 Mfd. 400 Volt Tubular Paper	4101
C7, C8	100 Mmf. ± 10% Ceramic	4012
C9	.05 Mfd. 200 Volt Tubular Paper	4100
C10, C11	100 Mmf. ± 10% Ceramic	4012
C12	270 Mmf. ± 20% Mica	4001
C13, C15	Dry Electrolytic (30-50 Mfd./150 V)	4201
C14	.2 Mfd. 200 Volt Paper Tubular	4108
C16	.005 Mfd. 600 Volt Paper Tubular	4102
C17	270 Mmf. ± 20% Mica	4001
C18	.005 Mfd. 600 Volt Tubular Paper	4102
C19	.02 Mfd. 400 Volt Tubular Paper	4106
LS	5" PM Loudspeaker	9003
R1	2200 Ohm ± 20% ½ Watt	4512
R2, R6	47,000 Ohm ± 20% ½ Watt	4504
R3	22,000 Ohm ± 20% ½ Watt	4501
R4	47 Ohm ± 20% ½ Watt	4508
R5	2.2 Megohm ± 20% ½ Watt	4502
R7	10 Megohm ± 20% ½ Watt	4505
R8	.5 Megohm Pot. with Switch (Volume)	4802
R9	500 Ohm ± 10% 5 Watt	4700
R10, R12	.47 Megohm ± 20% ½ Watt	4506
R11	.22 Megohm ± 20% ½ Watt	4500
R13	150 Ohm ± 20% ½ Watt	4510
S1	On-Off Switch (on Volume Control)	
T1	Antenna Loop	5238
T2	R.F. Coil	55203
T3	Input I.F. Transformer (455 Kc.)	55201
T4	Output I.F. Transform (455 Kc.)	55202
T5	Audio Output Transformer	5101
T6	Oscillator Coil	55204

MODELS A202 & A309

DESCRIPTION

Hoffman Models A202 and A309 are electrically identical and differ in cabinet design only. The receiver consists of a 6-tube broadcast band AC-DC Superheterodyne incorporating a built-in loop antenna.

SPECIFICATIONS

Tuning Range ..... 540 Kc to 1650 Kc
Intermediate Frequency ..... 455 Kc.
Power Supply ..... 115 V. D.C. or 115 V. A.C. 50-60 C.P.S.
Power Consumption ..... 28 Watts
Undistorted Audio Output ..... .6 Watt
Maximum Audio Output ..... .9 Watt
Loudspeaker ..... 5-inch round P.M.

NORMAL OPERATING CURRENTS

35W4	Cathode Current	60 Ma.
35L6	Cathode Current	30 Ma.

Meter inserted in circuit at cathode.

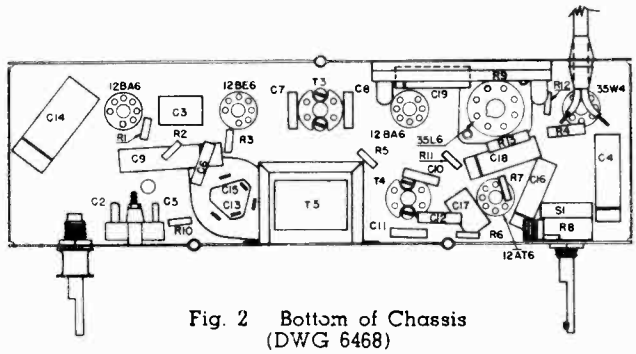


Fig. 2 Bottom of Chassis
(DWG 6468)

NORMAL OPERATING VOLTAGES

The following table lists the normal operating voltages to be expected at the various tube socket terminals.

PIN NO.	1	2	3	4	5	6	7	8
12BA6(R.F.)	— .45	0.	25. A.C.	37.5 A.C.	+65.	+80.	0.	
12BE6	4.6*	0.	12.5 A.C.	25. A.C.	+80.	+80.	0.	
12BA6 (I.F.)	— .45	0.	37.5 A.C.	50. A.C.	+80.	+80.	0.	
12AT6	—1.5*	0.	0.	12.5 A.C.	0.	—15.	+37.5	
35L6	0.	85 A.C.	+75 D.C.	+80. D.C.	0.	0.	50. A.C.	+4.6
35W4	115 A.C.	0.	85. A.C.	115. A.C.	110. A.C.	110. A.C.	+110. D.C.	

D.C. voltages measured with 1000 ohm/volt meter
A.C. voltages measures with 1000 ohm/volt meter
All voltages measured with reference to B-
Line voltage 115.

* These readings taken with V. T.V .M.

NOTE: The above readings are obtained with no signal input to receiver.

MODELS A202, A309
MODEL B400

HOFFMAN RADIO CORP.

A202, A309

ALIGNMENT PROCEDURE

CAUTION:

No alignment adjustments should be attempted without first thoroughly checking over all other possible causes of trouble such as defective tubes, resistors, and condensers. In order to align the receiver properly, remove the chassis from the cabinet and proceed as follows:

EQUIPMENT REQUIRED:

1. Signal Generator.
2. Output Meter with 2.5 Volt Scale.
3. .25 Mfd. Condenser.

I.F. ALIGNMENT:

1. Connect output meter across speaker voice coil; set meter on 2.5 volt scale.
2. Connect output of signal generator directly to 12BE6 control grid; connect ground side of generator to chassis of receiver through .25 Mfd. condenser. Set signal generator on 455 Kc (modulated).
3. Adjust I.F. slugs (first T4 and then T3) for maximum reading on output meter.
   Note: Keep signal level low, just enough to keep maximum reading on lower half of meter scale. Tuning condenser plates should be all the way out; volume control should be on full. After adjustment, put a drop of wax on each I.F. tuning slug to hold it in place.

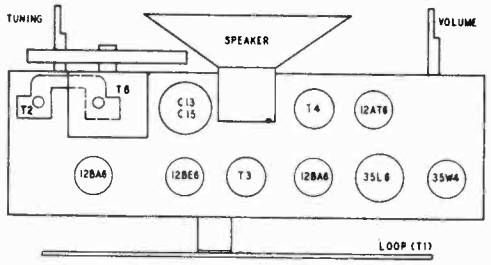


Fig. 1 Top of Chassis
(DWG 1023-4)

R.F. ALIGNMENT: control slugs

1. Set receiver tuning ~~condenser~~ with ~~plates~~ all the way in.
2. Set signal generator on 540 Kc (modulated) and connect generator output to antenna post on receiver. The ground side of the generator should be connected to receiver B- through a .25 Mfd. condenser.
3. Tune in signal by adjusting oscillator trimmer C5.
4. Adjust output of signal generator to obtain deflection on lower half of meter scale.
5. Adjust oscillator trimmer for maximum output.
6. Set signal generator on 1650 Kc and check signal with tuning condenser plates all the way out.
7. Set signal generator on 1470 Kc.
8. Tune in signal on receiver and adjust rf trimmer C2 for maximum reading on output meter. Feed only enough signal from the generator to keep maximum reading on lower half of meter scale.
9. Recheck at 600 Kc, 1000 Kc and 1410 Kc for tracking and readjust as required.

DIAL ADJUSTMENT:

To set the dial on calibration, pick up a station of known frequency near the center of the dial and move the pointer by hand as required.

B400

ALIGNMENT PROCEDURE

CAUTION:

No alignment adjustments should be attempted without first thoroughly checking over all other possible causes of trouble such as defective tubes, resistors, and condensers. In order to align the receiver properly, remove the chassis from the cabinet and proceed as follows:

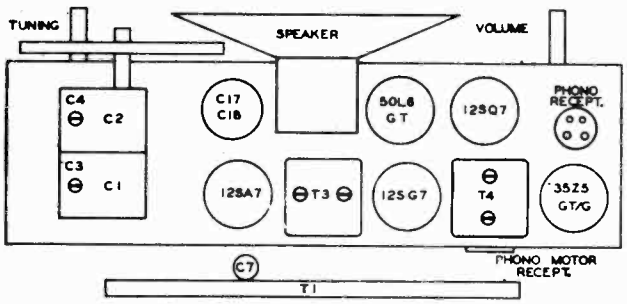
EQUIPMENT REQUIRED:

1. Signal Generator.
2. Output Meter with 2.5 Volt Scale.
3. .1 Mfd. Condenser.

I. F. ALIGNMENT:

1. Connect output meter across speaker voice coil; set meter on 2.5 volt scale.
2. Connect output of signal generator directly to antenna post on loop; connect ground side of generator to chassis of receiver through .1 Mfd. condenser. Set signal generator on 455 Kc (modulated).
3. Adjust I.F. trimmers (first T4 and then T3) for maximum reading on output meter.

NOTE: Keep signal level low, just enough to keep maximum reading on lower half of meter scale. Tuning condenser plates should be all the way out, volume control should be on full.



R.F. ALIGNMENT:

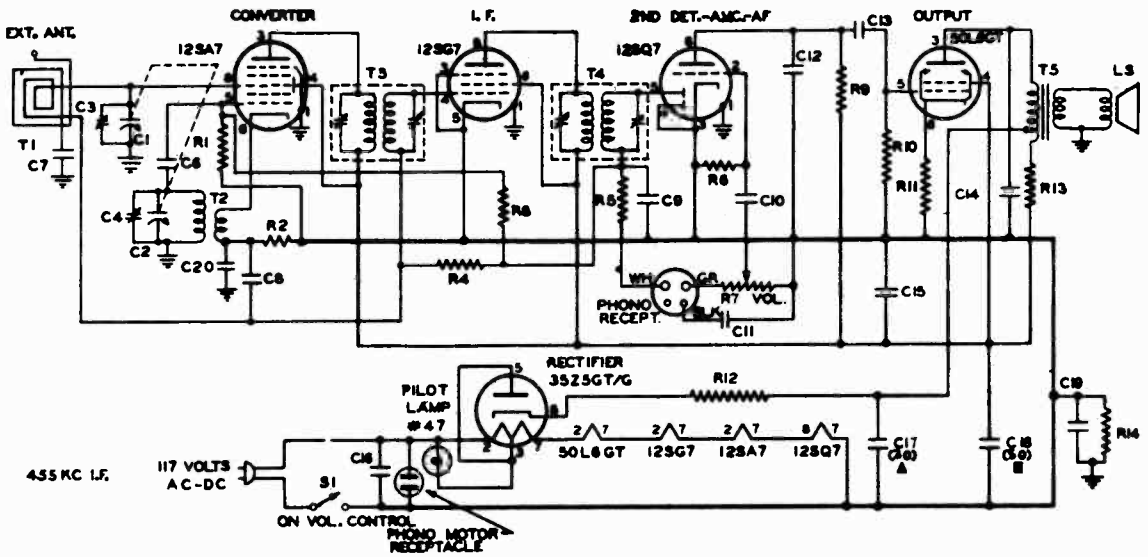
1. Set tuning condenser with plates completely out.
2. Set signal generator at 1650 Kc (modulated) and feed its output into a loop of wire about 6" in diameter. Place this loop about one foot away from and parallel to the receiver loop antenna.
3. Tune in signal by adjusting oscillator trimmer (C4).
4. Adjust output of signal generator to obtain deflection on lower half of meter scale.
5. Adjust oscillator trimmer (C4) for maximum output.
6. Set signal generator at 1400 Kc and tune in signal with tuning condenser.
7. Adjust antenna trimmer (C3) while rocking gang condenser for maximum reading on output meter. Feed only enough signal from generator to keep maximum reading on lower half of meter scale.

DIAL ADJUSTMENT:

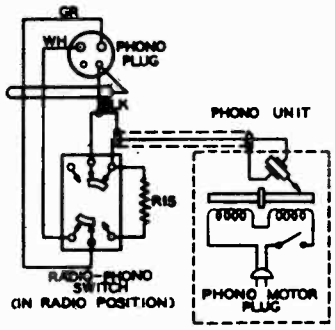
To set the dial on calibration, tune in a station of known frequency near the center of the dial and move the pointer by hand as required.

MODEL B400, Chassis 118

HOFFMAN RADIO CORP.



SYMBOL	DESCRIPTION	HOFFMAN No.
C1, C2	Two Section Variable (388-180 Mmf.)	4401
C3, C4	Trimmer: Part of Variable Cond.	
C6	100 Mmf. ±20% Mica	4000
C7, C10, C13	.005 Mfd. 600 Volt Tubular Paper	4102
C8, C11, C15	.05 Mfd. 200 Volt Tubular Paper	4100
C9, C12	270 Mmf. ±20% Mica	4001
C14	.02 Mfd. 400 Volt Tubular Paper	4106
C16	.05 Mfd. 400 Volt Tubular Paper	4101
C17, C18	Dry Electrolytic (50/30 Mfd./150 V.)	4201
C19	.2 Mfd. 200 Volt Tubular Paper	4108
C20	.001 Mfd. 600 Volt Tubular Paper	4104
R1	22,000 Ohm ±20% ½Watt	4501
R4	2.2 Megohm ±20% ½Watt	4502
R5	47,000 Ohm ±20% ½Watt	4504
R6, R8	10 Megohm ±20% ½Watt	4505
R7	.5 Megohm Pot. with Switch (Vol.)	4802
R9	.22 Megohm ±20% ½Watt	4500
R10, R14, R15	.47 Megohm ±20% ½Watt	4506
R11	150 Ohm ±20% ½Watt	4510
R12	47 Ohm ±20% ½Watt	4508
R13	1500 Ohm ±20% 1 Watt	4552
S2	Phono-Radio-Tone Switch	6021
LS	PM Loudspeaker	9023
S1	On-Off Switch (on Vol. Control)	
T1	Antenna Loop	5255
T2	Oscillator	5208
T3	Input I.F. Transformer (455Kc.)	5205
T4	Output I.F. Transformer (455Kc.)	5206
T5	Audio Output Transformer	5117



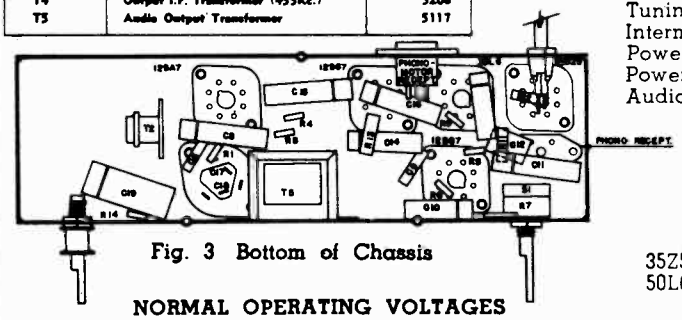


Fig. 3 Bottom of Chassis

DESCRIPTION

Hoffman model B400 is a table model radio-phonograph combination. The radio section consists of a 5-tube AC-DC superheterodyne receiver with a built-in loop antenna. The phonograph section consists of an automatic record changer which plays either fourteen 10-inch records or twelve 12-inch records at one loading. The record changer may also be operated manually.

SPECIFICATIONS

Tuning Range	540 Kc to 1650 Kc
Intermediate Frequency	455 Kc
Power Supply	115 V. D.C. or A.C. 50-60 C.P.S.
Power Consumption	48 Watts
Audio Output	1.25 Watts

NORMAL OPERATING CURRENTS

35Z5	Cathode Current	57 Ma
50L6	Cathode Current	33 Ma

NORMAL OPERATING VOLTAGES

The following table lists the normal operating voltages to be expected at the various tube socket terminals.

PIN NO.	1	2	3	4	5	6	7	8
12SA7	0	24 A.C.	+85	+92	−5.5	0	11.5 A.C.	−.4
12SG7	0	22 A.C.	0	−.4	0	+92	36 A.C.	+86
12SQ7	0	−.8	0	0	−1.0	+60	0	9 A.C.
50L6	0	36 A.C.	+101	+93	+.2	0	87 A.C.	+7.5
35Z5	0	117 A.C.	114 A.C.	+112	114 A.C.	0	87 A.C.	+116

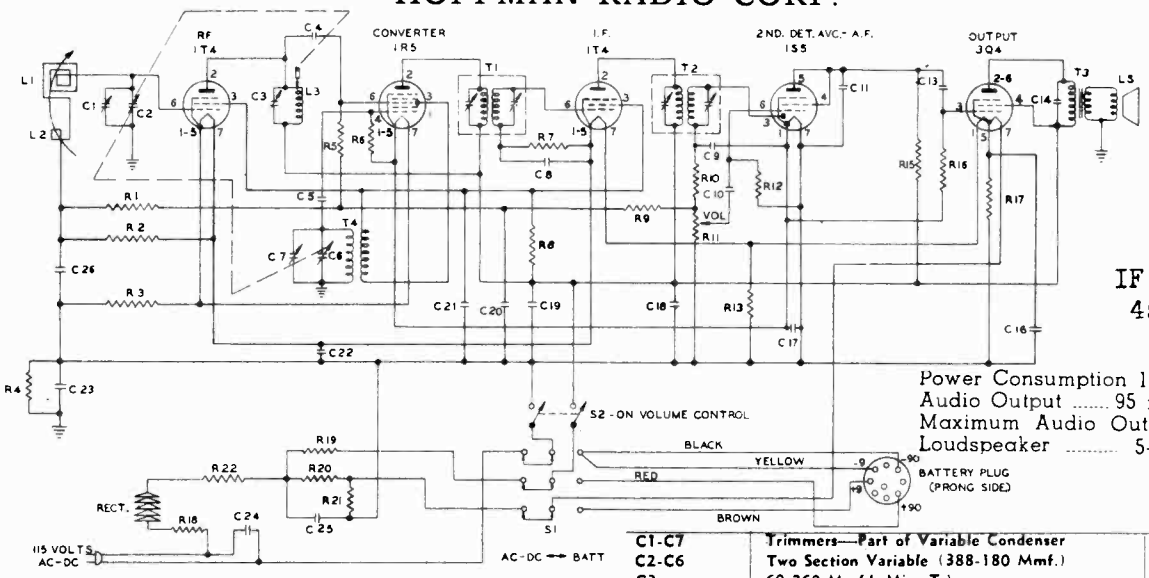
D.C. voltages measured with 20,000 ohm/volt meter.
A.C. voltages measured with 1,000 ohm/volt meter.
All voltages measured with reference to B−.
Line voltage 117.

NOTE: The above readings are obtained with no signal input to the receiver, radio-phono switch in the RADIO position, and volume control full on.

RECORD CHANGER: Aero 46A, RCD. CH. P.16-1
For alignment, see P.16-2

MODEL A700, Chassis 110S

HOFFMAN RADIO CORP.



IF PEAK
455KC

Power Consumption 17 watts at 117 V.
Audio Output ..... 95 mw. at 10% dist.
Maximum Audio Output ... 225 mw.
Loudspeaker ..... 5-inch round P.M.

In order to align the receiver properly, remove the chassis from the cabinet and remove the bottom plate from the chassis.

I. F. Alignment

1. Connect output meter across speaker voice coil; set meter on 1-volt scale.
2. Connect output of signal generator to trimmer C3 (blue wire on trimmer located at rear of chassis). The ground side of the signal generator should be connected to B- through a .1 Mfd. condenser. Set signal generator on 455 Kc (modulated).
3. Adjust I.F. trimmers (first T2 and then T1) for maximum reading on output meter.
   NOTE: Keep signal level low, just enough to keep the maximum reading on the output meter at 0.4 volt or less. tuning gang should be set with plates all the way out; volume control full on.
4. Replace bottom cover plate.

R. F. Alignment

1. Leave tuning gang with plates all the way out.
2. Set signal generator on 1650 Kc (modulated) and feed generator output into a loop of wire approximately 6" in diameter. Place the loop about one foot away and parallel to the receiver loop antenna.
3. Tune in signal by adjusting oscillator trimmer C7.
4. Adjust output of signal generator to obtain deflection of .4 volt or less on output meter.
5. Adjust oscillator trimmer for maximum output.
6. Set Signal generator to 1400 Kc and tune in signal with tuning condenser.
7. Adjust loop antenna trimmer C1 and R. F. Coil assembly for maximum output. The R. F. coil adjustment is made by loosening the coil mounting clamp and sliding the coil up or down as required.
8. Set signal generator and tuning gang to 600 Kc and adjust R. F. trimmer C3 for maximum output.
9. Go back to 1400 Kc to check tracking and readjust at 1400 Kc and 600 Kc as required.

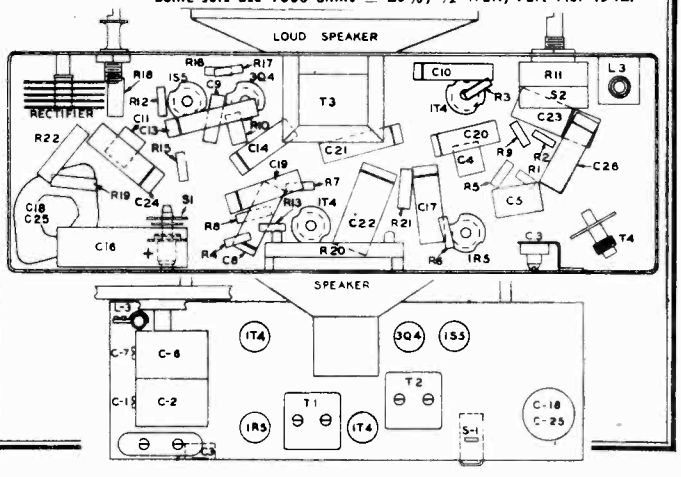
PIN NO.	1	2	3	4	5	6	7	8
1T4 (RF)	2.6	84	65		2.6		3.9	
1R5	1.3	84	64	—5.0*	1.3	3*	2.6	
1T4 (RF)	3.9	84	65	1.2*	3.9	1.5*	5.2	
1S5	1.3	0	.5*	20*	1	—.5*	0	
3Q4	5.2	84	—1.3*	84	6.5	84	7.8	

NOTE: All voltages are measured with reference to B- (black wires on volume control switch) and no signal input to receiver.

* These readings must be taken with a V. T. V. M.

C1-C7	Trimmers—Part of Variable Condenser	
C2-C6	Two Section Variable (388-180 Mmf.)	4401
C3	60-260 Mmfd. Mica Trimmer	4306
C4-C9-C11	.0001 Mfd. Mica	4000
C5	47 Mfd. Mica	4009
C8-C26	.01 Mfd. 400 Volt Tubular Paper	4112
C10-C12-C13-C14	.005 Mfd. 600 Volt Tubular Paper	4102
C15-C16	100 Mfd. 25 Volt Dry Electrolytic	4204
C17-C19-C20-C21	.05 Mfd. 200 Volt Tubular Paper	4100
C18-C25	Dry Electrolytic Condenser (30-50 Mfd. 150-150 Volt)	4201
C22-C23	.2 Mfd. 200 Volt Tubular Paper	4108
C24	.05 Mfd. 400 Volt Tubular Paper	4101
L1	Antenna Loop	55208
L2	Antenna Loop Compensator	5250
L3	R.F. Coil Permeability Tuned	5245
L.S.	5¼" P.M. Speaker	9019
R1-R14	3.3 Megohm, ½ Watt	4535
R2-R7-R9-R16	2.2 Megohm, ½ Watt	4502
R3	680 Ohms, ½ Watt	4514
R4	.47 Megohm, ½ Watt	4506
R5-R15	1 Megohm, ½ Watt	4513
R6-R10	.1 Megohm, ½ Watt	4511
R8	3900 Ohms ± 10%, ½ Watt	4527
R11	1 Megohm Potentiometer with D.P.S.T. Switch (Volume)	4808
R12	10 Megohm, ½ Watt	4505
R13*	820 Ohm ± 10%, ½ Watt	4533
R17	1500 Ohm, ½ Watt	4534
R18-R22	47 Ohm, 2 Watt	4532
R19	1000 Ohm, 1 Watt	4522
R20	1500 Ohm, 6½ Watt ± 5% Wirewound	4701
R21	470 Ohm, 1 Watt ± 10%	4531
S1	AC/DC Battery Switch Plug Operated	6010
S2	On-Off Switch (on Volume Control)	
T1	Input I.F. Transformer (455 K.C.)	5242
T2	Output I.F. Transformer (455 K.C.)	5243
T3	Output Audio Transformer	5104
T4	Oscillator Coil	5244
Rect.	Selenium Rectifier	9517

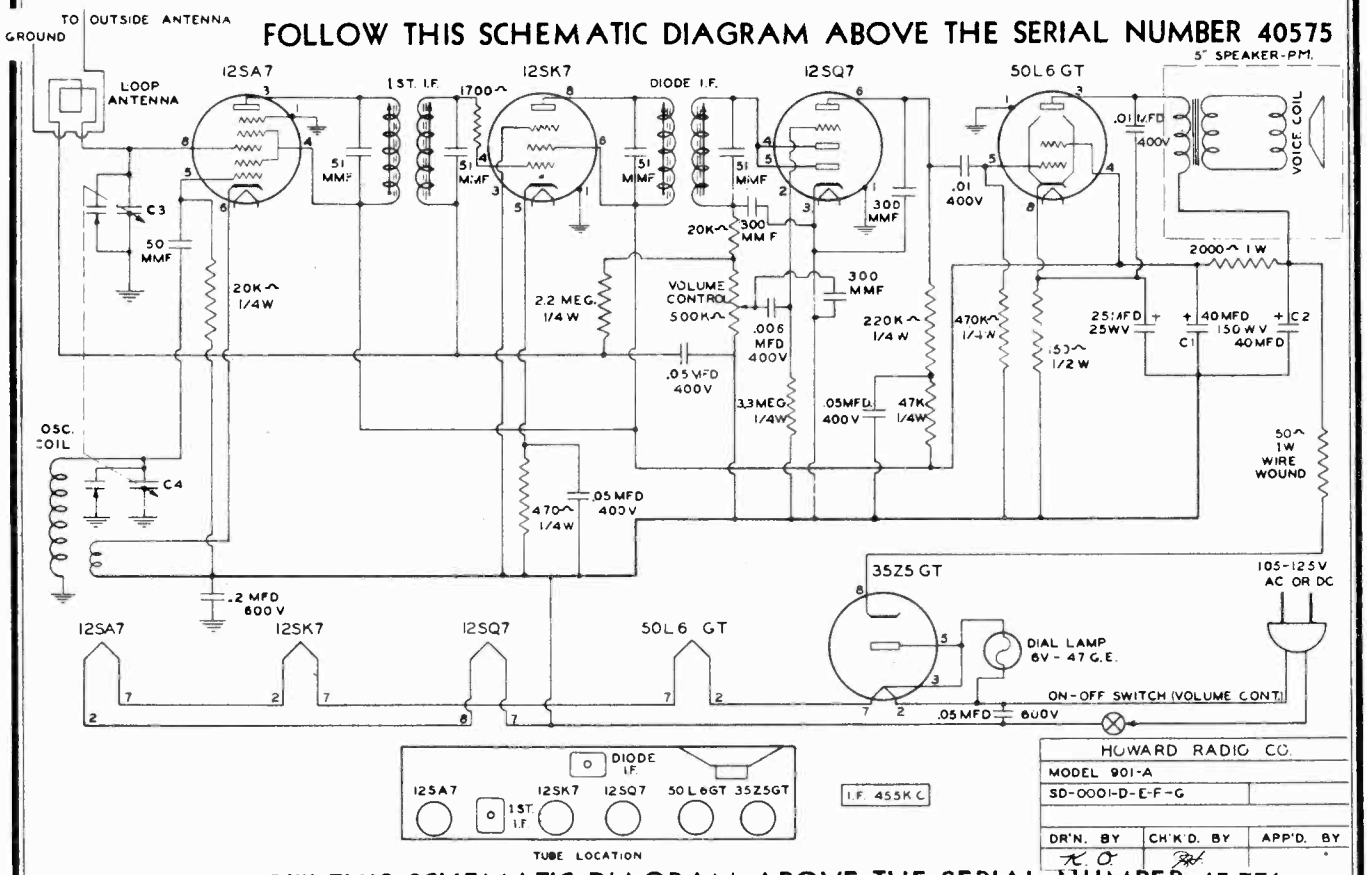
* Some sets use 1000 ohms ± 20%, ½ Watt, Part No. 4542.



MODEL 901-A
MODEL M901-A

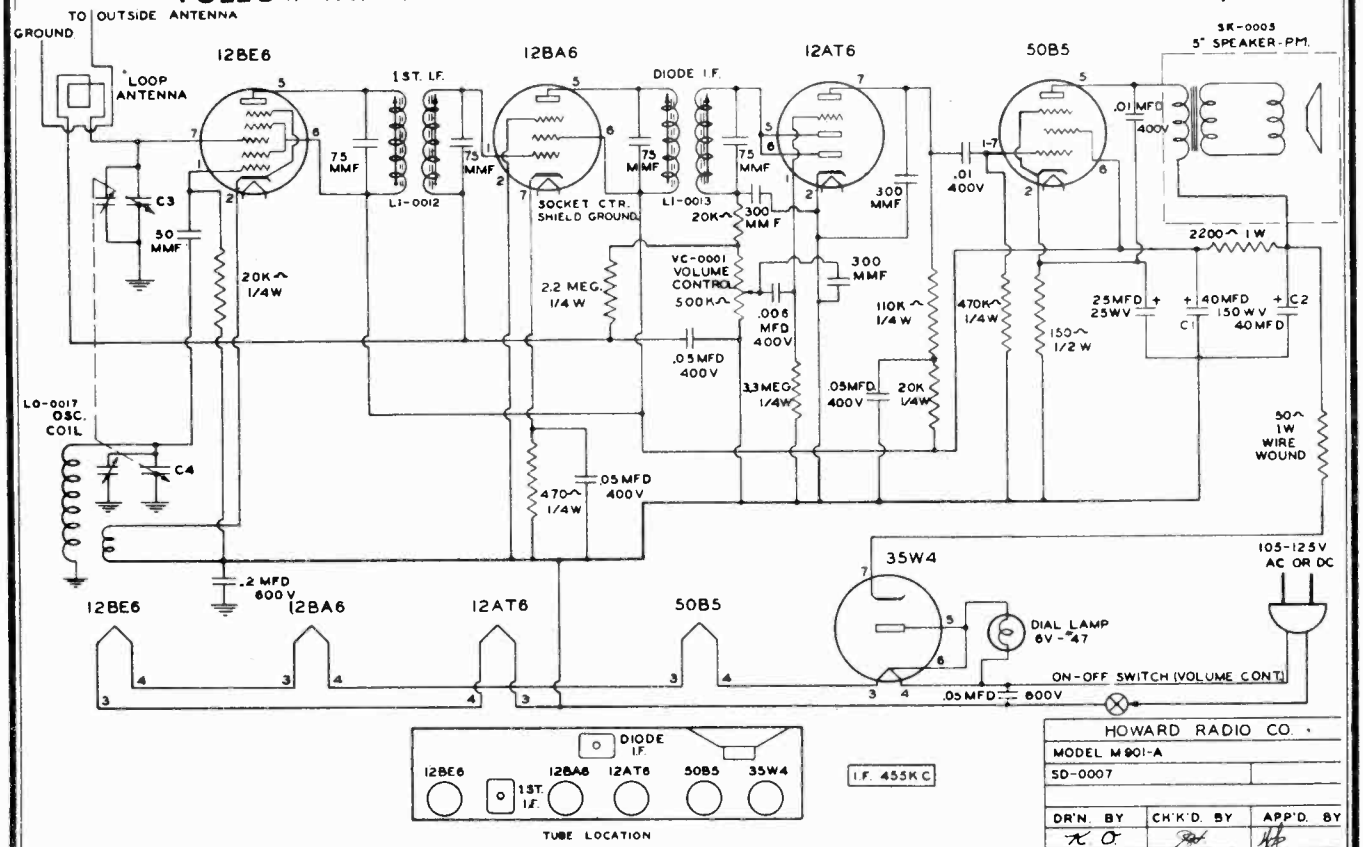
HOWARD RADIO CO.

FOLLOW THIS SCHEMATIC DIAGRAM ABOVE THE SERIAL NUMBER 40575



HOWARD RADIO CO.		
MODEL 901-A		
SD-0001-D-E-F-G		
DR'N. BY	CH'K'D. BY	APP'D. BY
R.O		

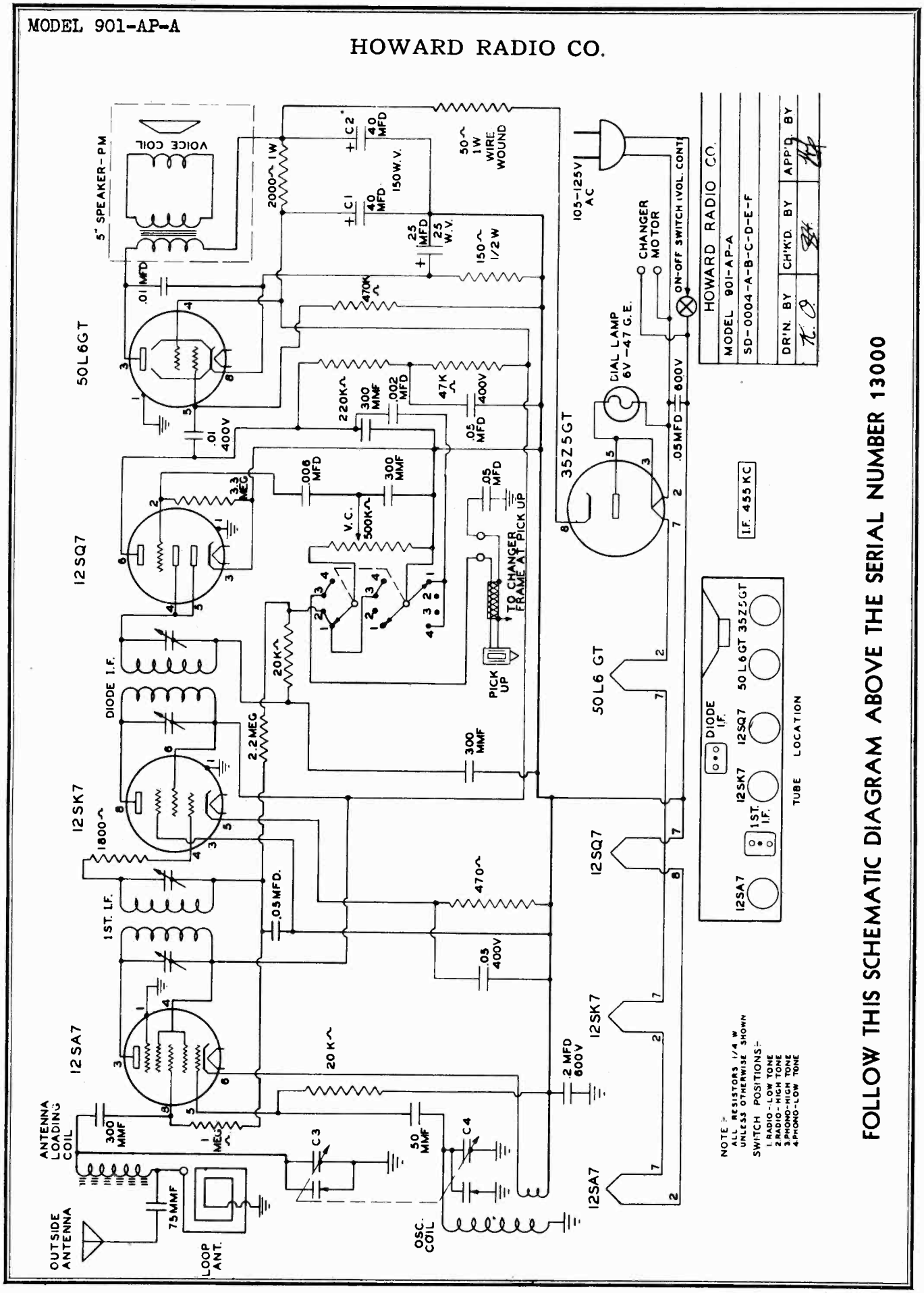
FOLLOW THIS SCHEMATIC DIAGRAM ABOVE THE SERIAL NUMBER 45,771



HOWARD RADIO CO.		
MODEL M901-A		
SD-0007		
DR'N. BY	CH'K'D. BY	APP'D. BY
R.O		

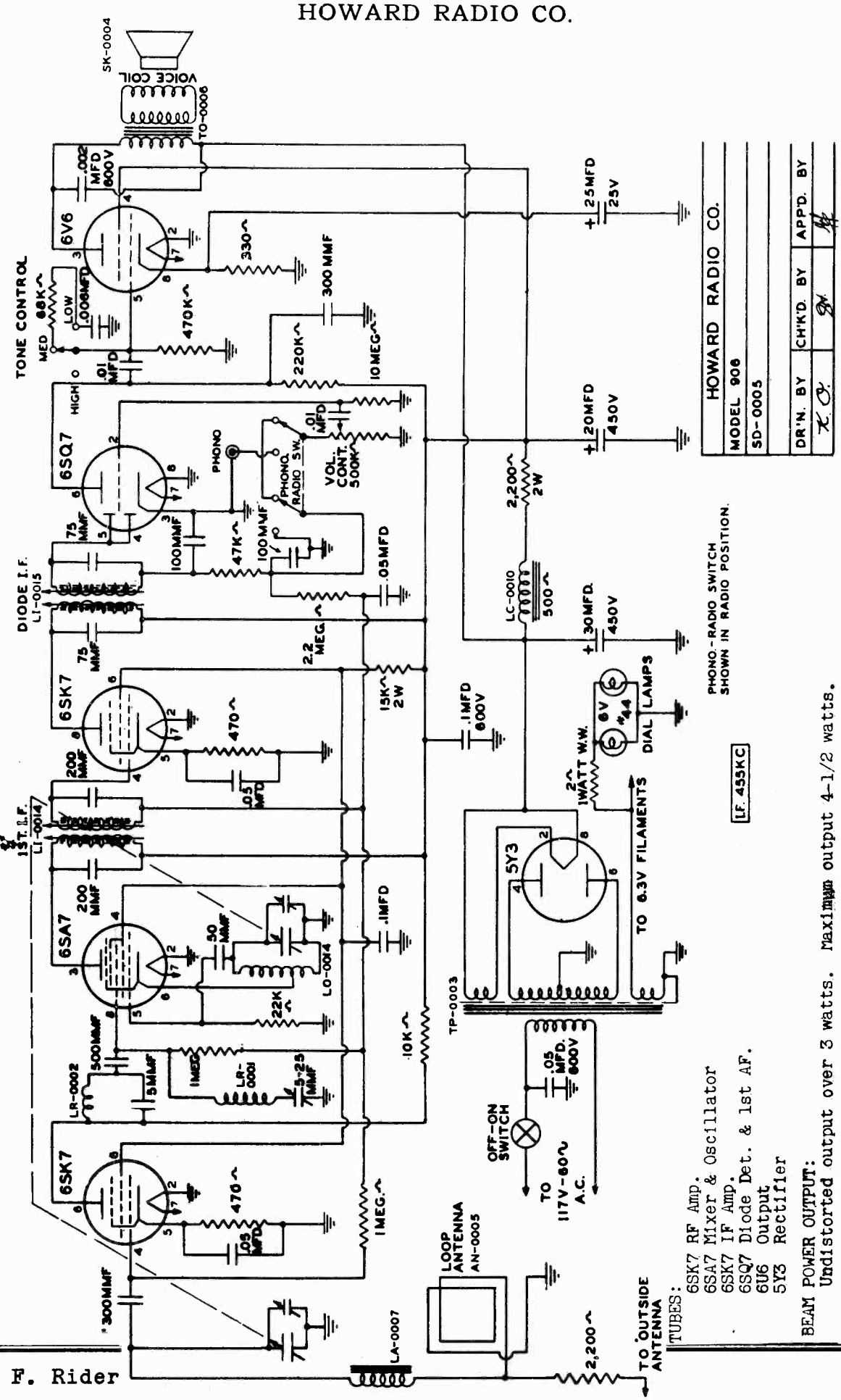
MODEL 901-AP-A

HOWARD RADIO CO.



MODEL 906

HOWARD RADIO CO.



HOWARD RADIO CO.			
MODEL 906			
SD-0005			
DR'N. BY	CH'K'D. BY	APP'D. BY	
K.O.			

TUBES:
6SK7 RF Amp.
6SA7 Mixer & Oscillator
6SK7 IF Amp.
6SQ7 Diode Det. & 1st AF.
6V6 Output
5Y3 Rectifier

BEAM POWER OUTPUT:
Undistorted output over 3 watts. Maximum output 4-1/2 watts.

SPEAKER:
Rubber floated 6x9 inch HOWARD P.M., using large Alnico No. 5 core.

SOCKET VOLTAGE READINGS - 906 AND 906C

Voltage reading taken from ground with voltage at line set at 110 volts A.C. These readings were taken with a vacuum tube voltmeter of the VoltOhmyst type.

TUBE	FUNCTION	CATH.	*	SC.	*	PLATE	*	B+	*
6SK7	R.F	1.8	5	79.	6	210.	8		
6SA7	Converter .			79.	4	230.	3		
6SK7	1st. I.F. .	2.3	5	79.	6	240.	8		
6SQ7	Det. & 1st. Audio. . .					115.	6		
6V6	Output. . .	11.	8	235.	4	225.	3		
5Y3	Rectifier .							285	8

* Socket Terminal Number.

Voltage drop across filter choke 10 volts.

PARTS LIST - 906

CONTROLS

VC-0005 Volume Control with Switch
or
VC-0006 Volume Control with Switch

CONDENSERS

AC-0004 Tuning Gang with Gears and Drive Hub.
CE-0009 Capacitor - Electrolytic 30-20-20 mfd. 450 volts or the following 3 capacitors.
CE-0005 Capacitor - 25 mfd. 25 volts.
CE-0011 Capacitor - 30 mfd. 450 volts.
CE-0012 Capacitor - 20 mfd. 450 volts.

COILS

AN-0005 Loop Antenna
LA-0007 Loop Load Coil
LI-0014 1st IF Transformer in can
LI-0015 2nd IF Transformer in can
LO-0014 Oscillator Coil
LR-0001 Wave Trap 455 KC
LR-0002 Untuned RF Coil

DIAL AND CONTROL ACCESSORIES

AS-0213 Tuning Shaft Assembly
AS-0217 Dial Pointer Assembly
AR-0019 Dial Light Bracket Assembly - Right Side
AR-0024 Dial Light Bracket Assembly - Left Side
ES-0001 Dial covering - Plastic escutcheon for cabinet
SP-0010 Dial Drive Spring
DC-0001 Dial Drive Cord 52" long
PR-0062 Dial Glass Snaps
GR-0001 Rubber Grommets for Tuning Gang and Speaker Mounting
DG-0004 Calibrated Lucite Dial
LS-0002 #44 Blue Bead Pilot Lamp

KNOBS

AR-0025 Thumb Wheel Assembly (Tone Control)
AR-0026 Thumb Wheel Assembly (Radio Phono)
KB-0015-1 Knobs Brown Bakelite

SPEAKER

SK-0004 Speaker 9" Elliptical PM Table Model

TRANSFORMERS

TO-0006 Speaker Output Transformer
TP-0003 Power Transformer - 60 cycle 110 volt
LC-0010 Power Choke (500 ohm D.C.)

TUBE COMPLEMENT

TU-5Y3 Tube
TU-6SK7 Tubes (2 used)
TU-6SA7 Tube
TU-6SQ7 Tube
TU-6V6 Tube

SOCKETS

SO-0010 Phono Socket
SO-0017 Tube Socket
TB-0007 Terminal Strip, External Antenna

SWITCHES

SW-0009 Radio Phono Switch D.P.D.T.
SW-0010 Tone Switch - 3 position

CABINET

CW-0008 Cabinet complete
AS-0240 Metal Grill Assembly (1 used)
BC-0003 Wood Baffle used with above item
or
MO-0026 Plastic Grill (2 used)

LINE CORD

CA-0038 Line Cord - 6 ft and Moulded Plug

ALIGNMENT CHART-MODELS 906 AND 906C

Set controls at indicated positions before following alignment chart.

Tone switch high
Volume control on full
Set dial between stations
Radio phono control at radio

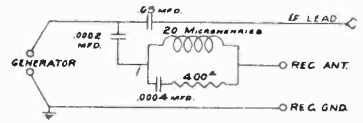
DUMMY ANTENNA	SIG. GEN. CONNECTION TO	GEN. FREQ.	BAND POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION	SEE NOTE
.05 Mfd.	Grid of 6SA7	455 KC	BC	Off Station	①②③④	I.F. Peak to Max. Output	A
.05 Mfd.	Ant.	455 KC	BC	Off Station	⑤	Null	B
400 Ohm. Resistor	"A" Ant. Post	1400 KC	BC	1400 KC	⑥⑦	BC Osc. and RF	C

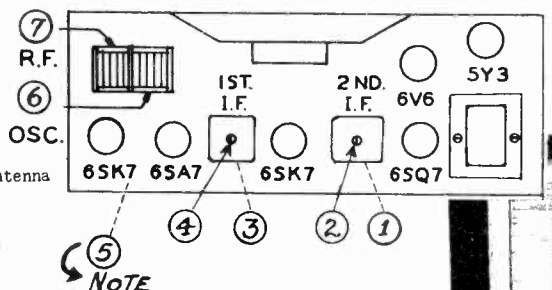
NOTE A. The I.F. adjustments are iron core slug tuning and it should not be necessary to move them very far in either direction from the factory setting, since they are of a very stable nature.

NOTE B. Important. Connect the signal generator to the antenna screw on the outside of the radio chassis and keep the metal of the chassis between the generator lead and the wave trap coil. Use your signal generator in a turned up powerful position and adjust the wave trap trimmer to null.

NOTE C. Set dial at 1400 KC. Adjust oscillator and R.F. trimmer for maximum sensitivity.

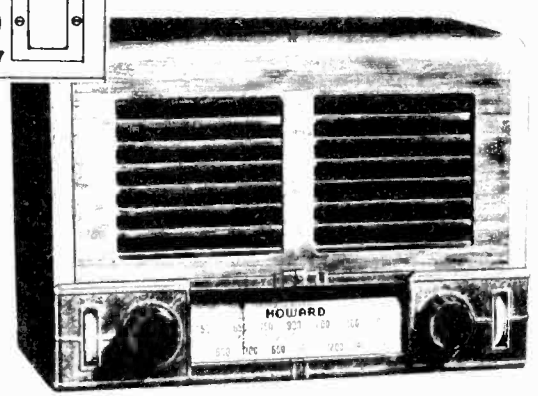
RECOMMENDED DUMMY ANTENNA. Although the values as shown in above table for antenna load may be satisfactory, we urgently recommend the circuit as shown at the right to properly take care of the various frequencies to accomplish the correct alignment.





Wave Trap adjustment is located beneath chassis at this point. Adjustments 1 & 3 also beneath chassis.

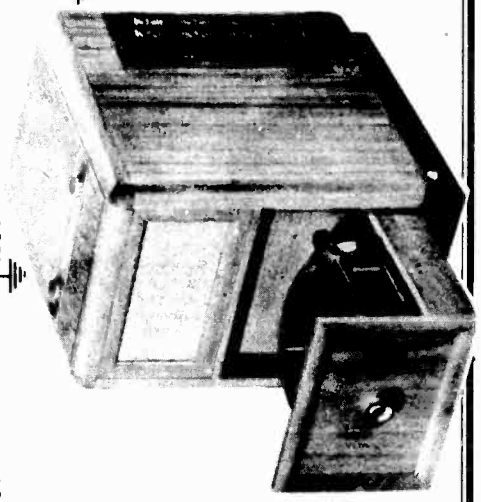
TUBE LAYOUT



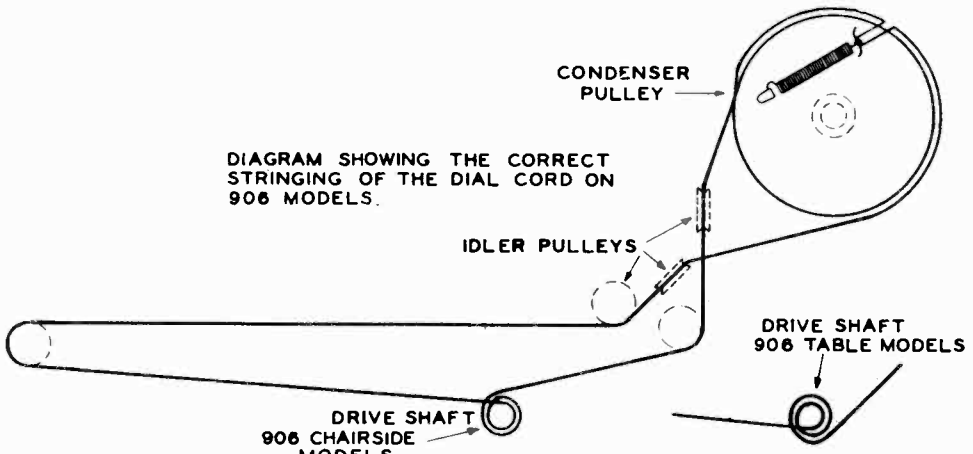
MODEL 906

MODEL 906C

HOWARD RADIO CO.



HOWARD RADIO CO.			
MODEL 906 C			
SD-0011			
DR'N. BY	CH'K'D. BY	APP'D. BY	
K.O.		RGT	



TO REMOVE RADIO CHASSIS FROM CABINET

Take knobs off volume control and tuning control by loosening set screws. Remove the wood screws that are located inside the record storage space at the top rear of cabinet. The entire top wood panel lifts out by pushing upward inside the storage space one inch, and then remove panel by lifting to the rear of the cabinet. After the panel is removed, it is easy to see the mounting bolts that hold the chassis.

TO REMOVE DRAWER

Pull the drawer out to its full extremity. Place your hands (one on each side) beneath the drawer about 3 inches from the back and feel along the track until you hit two little metal flaps that are the stops for the drawer. Lift these up with your index fingers and the drawer can then be pulled right out of the cabinet.

PARTS LIST

CONTROLS

VC-0005	Volume Control with A.C. Switch
	or
VC-0006	Volume Control with A.C. Switch

CONDENSERS

AC-0004	Tuning Gang with Gears and Drive Hub
CE-0009	Capacitor - Electrolytic 30-20 M.F.D. 450 V. - 25 M.F.D. 25 V.
CE-0005	Capacitor - 25 M.F.D. 25 V. } Substitute for CE-0009
CE-0011	Capacitor - 30 M.F.D. 450 V. } Substitute for CE-0009
CE-0012	Capacitor - 20 M.F.D. 450 V. } Substitute for CE-0009

COILS

AN-0006	Loop Antenna (low impedance)
LA-0007	Loop Load Coil
LI-0014	1st I.F. Transformer in can - iron slug tuned
LI-0015	2nd I.F. Transformer in can - iron slug tuned
	or
LI-0021	1st I.F. Transformer - air trimmers
LI-0022	2nd I.F. Transformer - air trimmers
LO-0014	Oscillator Coil
LR-0001	Wave Trap 455 KC
LR-0002	Untuned RF Coil

TRANSFORMERS

TO-0006	Speaker Output Transformer
TP-0003	Power Transformer - 60 cycle 110 V.
LC-0010	Power Choke - 500 Ohm. D.C.

SOCKETS AND PLUGS

SO-0017	Tube Socket
TB-0007	Terminal Strip, external antenna
SO-0010	Phono and Speaker Socket (female)
SO-0012	Power Socket 110 V.
TL-0005	Phono Speaker Plug (male)

SWITCHES

SW-0009	Radio Phono Switch DPDT
SW-0010	Tone Switch - 3 position

CABINET

CW-0009-1	Cabinet - Mahogany
CW-0009-2	Cabinet - Blonde
AA-0008-1	Drawer Sub-assembly (Mahogany)
AA-0008-2	Drawer Sub-assembly (Blonde)
AW-0015	Carriage Assembly

AUTOMATIC RECORD CHANGER

PH-0003	Record Changer VM400

LINE CORD

CA-0039	Line Cord - 8 ft. and Moulded Plug
CA-0043	Line Cord & Plug 42" long for record changer motor

DIAL AND CONTROL ACCESSORIES

AS-0213	Tuning Shaft Assembly
AS-0217	Dial Pointer Assembly
AR-0019	Dial Light Bracket Assembly - right side
AR-0024	Dial Light Bracket Assembly - left side
SP-0010	Dial Drive Spring
PR-0062	Dial Glass Snaps
DC-0001	Dial Drive Cord 52" long
GR-0001	Rubber Grommets for tuning gang & Mounting Bracket
DG-0008	Calibrated Lucite Dial 550 KC at right
LS-0002	#44 Blue Bead Pilot Lamp
ES-0004-1	Metal Escutcheon (Mahogany)
ES-0004-2	Metal Escutcheon (Blonde)

KNOBS

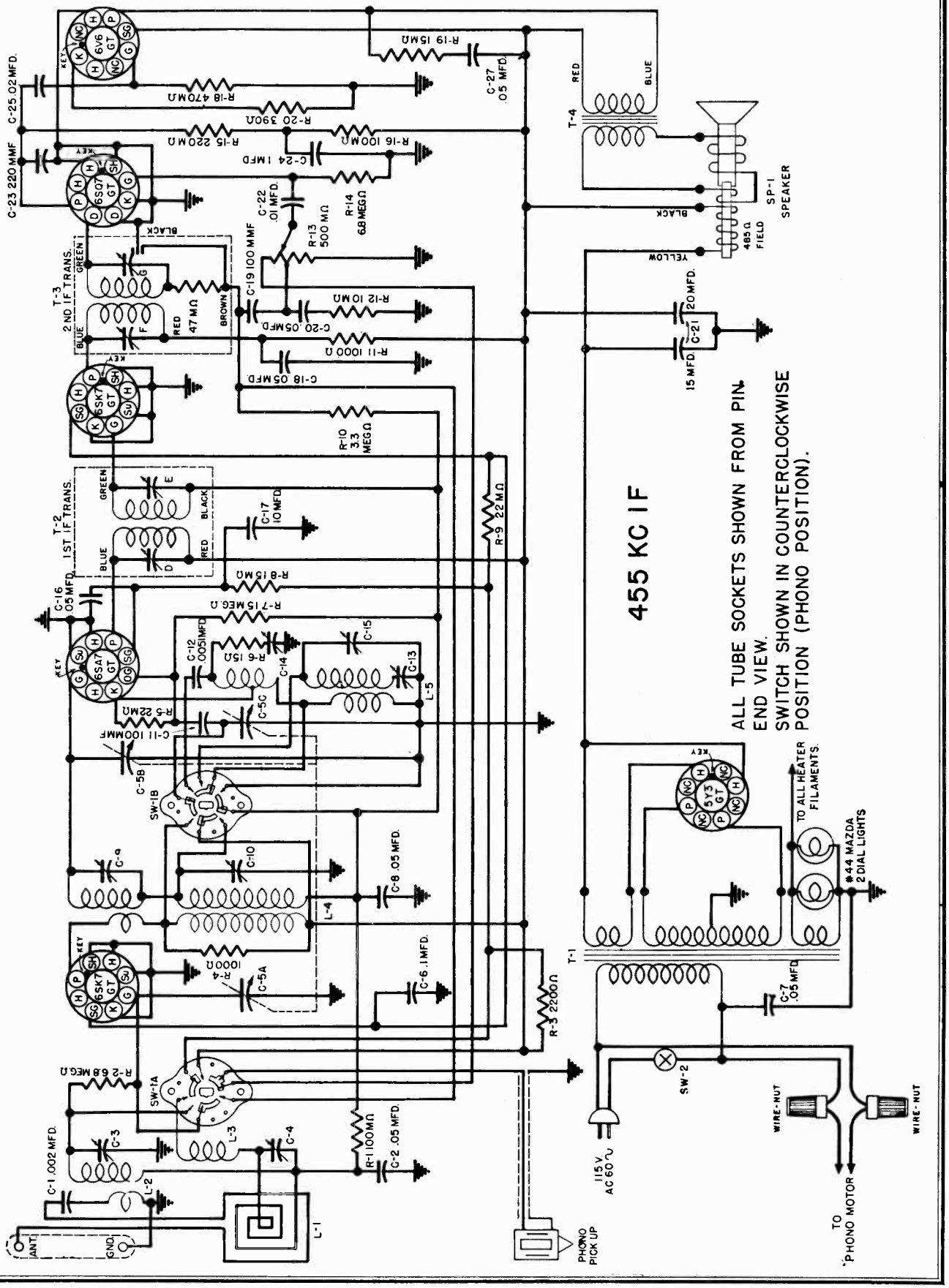
AR-0042	Thumb Wheel Assembly (Tone Control)
AR-0043	Thumb Wheel Assembly (Radio Phono)
KB-0015-1	Knob for Radio (Walnut)
KB-0015-3	Knob for Radio (Blonde)
KB-0014-1	Knob for Drawer (Mahogany)
KB-0014-2	Knob for Drawer (Blonde)

SPEAKER

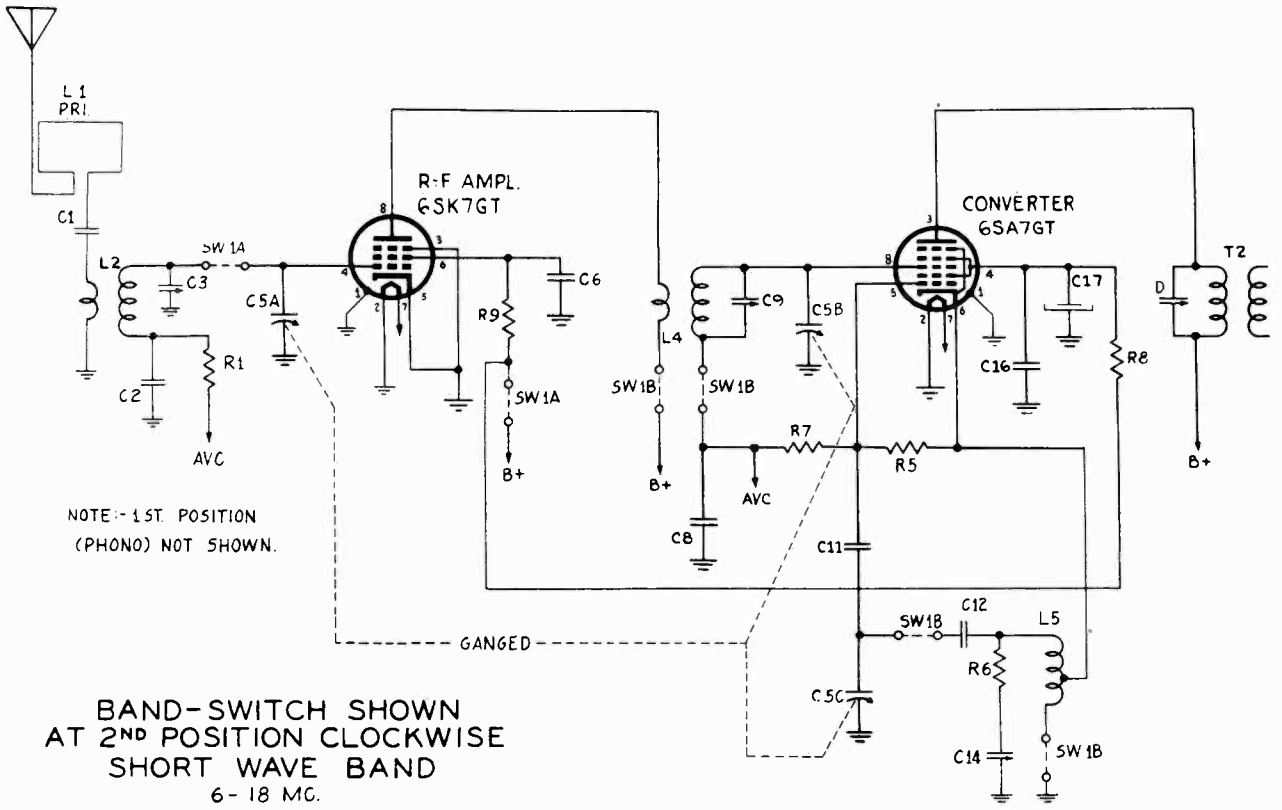
SK-0004	Speaker 9" Elliptical P.M.

INTERNATIONAL DETROLA CORP.

MODEL 582

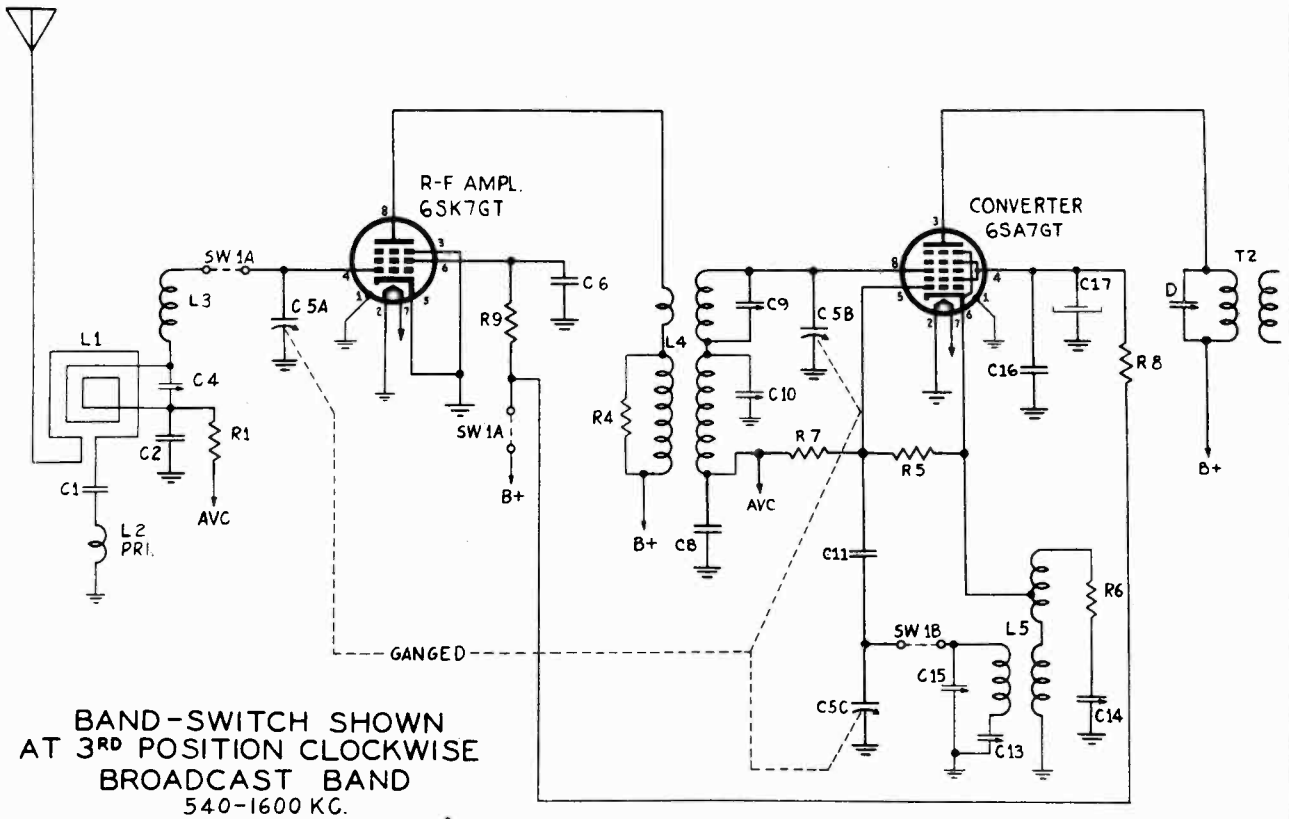


INTERNATIONAL DETROLA CORP.



NOTE:- 1ST. POSITION (PHONO) NOT SHOWN.

BAND-SWITCH SHOWN AT 2ND POSITION CLOCKWISE SHORT WAVE BAND
6-18 MC.



BAND-SWITCH SHOWN AT 3RD POSITION CLOCKWISE BROADCAST BAND
540-1600 KC.

MODEL 582 INTERNATIONAL DETROLA CORP MODEL 582 MODEL 7270

Electrical and Mechanical Specifications

Frequency Range	540-1600 kc., 6-18 mc.	Power Output (Undistorted)	1.8 watts
Intermediate Frequency	455 kc.	Power Output (Maximum)	3.75 watts
Power Supply	105-125 volts, 60 cycle AC	Rated Power Input	65 watts at 115 volts
Loudspeaker	8-inch, Dynamic	Tuning Drive Ratio	6 to 1
V.C. Impedance	3.5 ohms at 400 cycles		

ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this chassis:

A signal generator which will provide an accurately calibrated signal at the frequencies listed.

An output meter.

A non-metallic screwdriver.

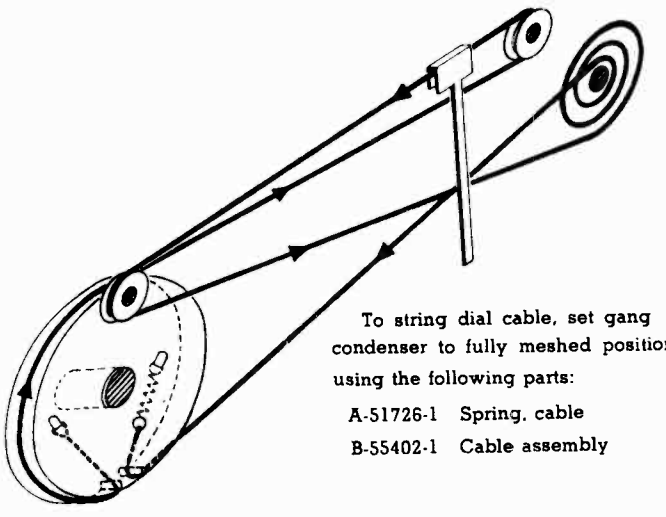
Dummy antenna: .1 mfd. — 400 ohm resistor — RMA loop.

NOTE: Intermediate Frequency and Oscillator Adjustments may be made with the loop disconnected provided a resistor of 10,000 to 50,000 ohms is substituted to close the RF grid circuit. The loop alignment must be done with the loop and chassis mounted in operating position in the cabinet. A single turn loosely coupled to the loop may be substituted for RMA loop.

CONNECT TEST OSCILLATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	BAND	SET DIAL AT	TRIMMERS	PURPOSE
6SA7GT grid	.1 mfd.	455 kc.	Broadcast	HF end	D E F G	Align IF
6SK7GT RF grid	.1 mfd.	18.3 mc.	Short wave	HF end	C-14	Set limit of band
6SK7GT RF grid	.1 mfd.	16 mc.	Short wave	16 mc.	C-9	Align RF
Antenna post	400 ohms	16 mc.	Short wave	16 mc.	C-3	Align antenna
6SK7GT RF grid	.1 mfd.	1620 kc.	Broadcast	HF end	C-15	Set limit of band
6SK7GT RF grid	.1 mfd.	1400 kc.	Broadcast	1400 kc.	C-10	Align RF
6SK7GT RF grid	.1 mfd.	600 kc.	Broadcast	600 kc.	C-13	Rock gang and adjust to maximum
RMA loop	Through loop	1400 kc.	Broadcast	1400 kc.	C-4	Align antenna

MODEL 7270

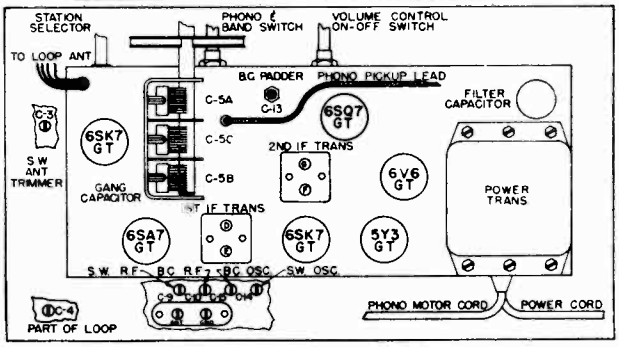
DIAL AND POINTER DRIVE CABLE ARRANGEMENT



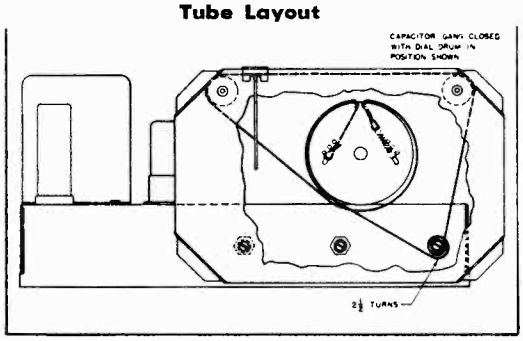
To string dial cable, set gang condenser to fully meshed position, using the following parts:

A-51726-1 Spring, cable

B-55402-1 Cable assembly



Tube Layout

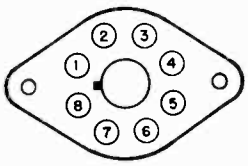


Dial Mechanism

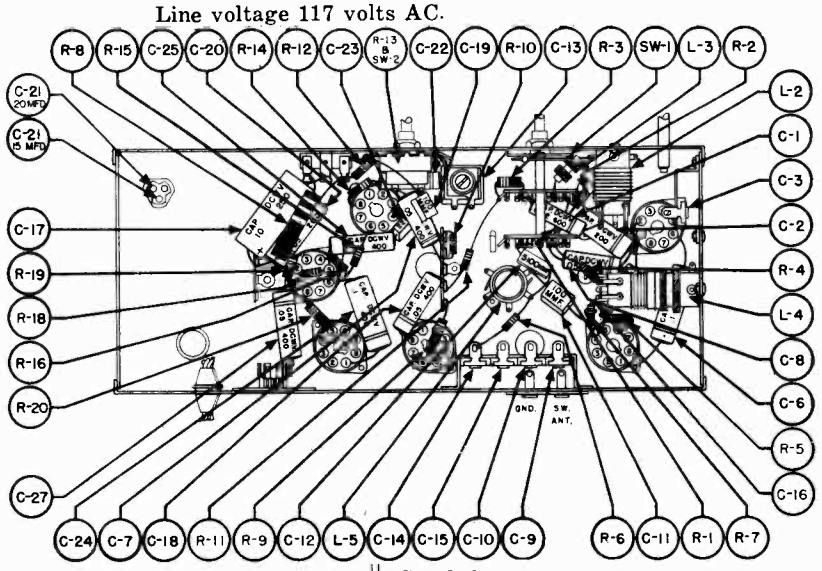
SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7	8
6SK7GT	RF Amplifier	0	0	0	0	0	107	6AC	255
6SA7GT	Converter	0	6AC	250	103	0	0	0	0
6SK7GT	IF Amplifier	0	0	0	0	0	105	6AC	237
6SQ7GT	Det.—AVC—1st Audio	0	0	0	0	0	34	6AC	0
6V6GT	Power Output	0	0	235	250	0	0	6AC	13
5Y3GT	Rectifier	0	310	0	300 AC	0	300 AC	0	310

NOTE: The above glass tubes are interchangeable with their metal equivalent.



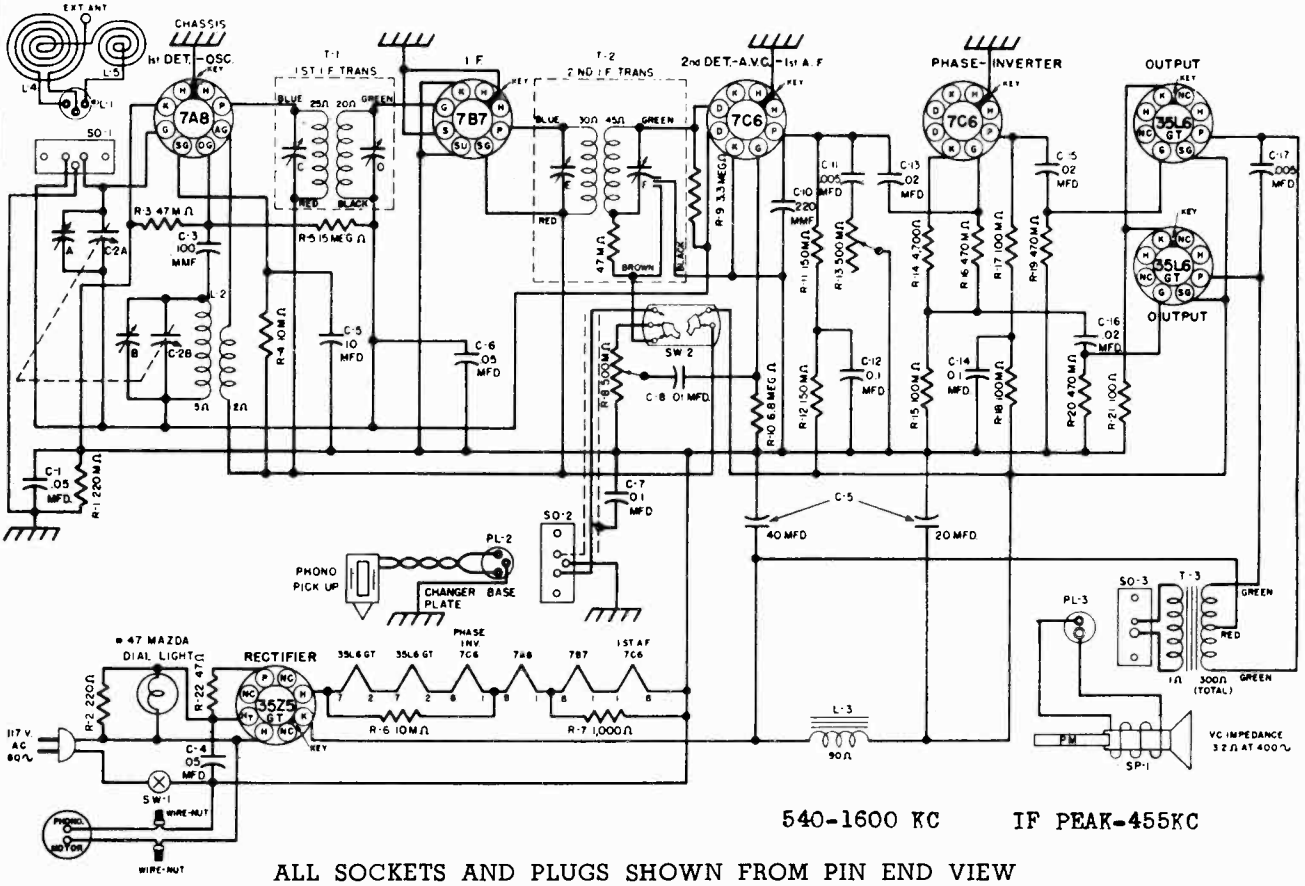
NOTE: Band switch in "Broadcast" position.
All voltages measured from chassis to socket contact indicated. DC voltages measured with a 1000 ohm-per-volt meter.
All voltages are positive DC unless otherwise marked.
Volume control full on. No signal.
Line voltage 117 volts AC.



Parts Layout
Chassis Model 582

Symbol	Part No.	Description
C-2, 8, 20	BD210503	Capacitor, Paper, .05 mfd., 200 v.
C-22	BD410103	Capacitor, Paper, .01 mfd., 400 v.
C-6, 24	BD410104	Capacitor, Paper, .1 mfd., 400 v.
C-25	BD410203	Capacitor, Paper, .02 mfd., 400 v.
C-16, 18, 29, 7	BD410503	Capacitor, Paper, .05 mfd., 400 v.
C-1	BD610202	Capacitor, Paper, .002 mfd., 600 v.
C-12	BM58D512	Capacitor, Mica, 5100 mmf.
C-11, 19	BM78A101	Capacitor, Mica, 100 mmf.
C-23	BM78A221	Capacitor, Mica, 200 mmf.
R-20	BR16E391	Resistor, 390 ohm, 1 w.
R-4, 11	BR17B102	Resistor, 1000 ohm, 1/3 w.
R-12	BR17B103	Resistor, 10M ohm, 1/3 w.
R-1, 16	BR17B104	Resistor, 100M ohm, 1/3 w.
R-6	BR17B150	Resistor, 15 ohm, 1/3 w.
R-19	BR17B153	Resistor, 15M ohm, 1/3 w.
R-7	BR17B156	Resistor, 15 megohm, 1/3 w.
R-5	BR17B223	Resistor, 22M ohm, 1/3 w.
R-15	BR17B224	Resistor, 220M ohm, 1/3 w.
R-10	BR17B335	Resistor, 3.3 megohm, 1/3 w.
R-18	BR17B474	Resistor, 470M ohm, 1/3 w.
R-2, 14	BR17B685	Resistor, 6.8 megohm, 1/3 w.
R-3	BR17E222	Resistor, 2200 ohm, 1 w.
R-9	BR17E223	Resistor, 22M ohm, 1 w.
R-8	BR17G153	Resistor, 15M ohm, 2 w.
	A-2163	Cable, Drive
	A-9285	Lamp, Pilot, Mazda No. 44
	A-54847	Cord, Power, 6 ft.
	B-51162-7	Shaft, Dial Drive
	A-51163	Clip, Spring
	A-51260	Shield, Tube
	A-51331	Spring, Dial Bracket
C-21	A-51356	Cap., Electrolytic, 15-20-20 mfd.
C-5	C-51401-2	Capacitor, Variable, 3-section
T-2	B-51416-1	Transformer Assembly, 1st IF
T-3	B-51417-1	Transformer Assembly, 2nd IF
C-17	A-51419	Cap., Electrolytic, 10 mfd., 250 v.
L-5	B-51420	Coil Assembly, Oscillator
T-1	C-51421	Transformer, Power
L-4	B-51425	Coil Assembly, RF
C-13	A-51428-5	Capacitor, Padder
L-2	B-51430	Coil Assembly, S.W. Antenna
R-13	B-51445-3	Control, Volume & Sw., 500M ohm
C-9, 10, 14, 15	A-51656	Capacitor Assembly, Trimmer (4)
C-3	A-51657	Capacitor Assem., Trimmer (Spec.)
	A-51787	Spring, Cable
	A-51801	Rivet, Pronged (for dial cable)
SW-1	B-51952-1	Switch, Band
SP-1	C-51961	Speaker, 8-inch Dyn., 485 ohm
L-3	B-51968	Coil Assembly, Antenna Loading
	A-57464	Sheet, Service
	A-54848	Bushing, Strain Relief

INTERNATIONAL DETROLA CORP. MODEL 7270



540-1600 KC IF PEAK-455KC

ALL SOCKETS AND PLUGS SHOWN FROM PIN END VIEW
ALL SWITCHES SHOWN IN COUNTERCLOCKWISE POSITION, SHAFT END VIEW

SYMBOL	PART NO.	DESCRIPTION	LIST PRICE
		CAPACITORS	
C-1	BD410503	Capacitor—.05 Mfd., 400 volt	$ .35
C-2A, B	C-57243-1	Capacitor—Variable gang	4.50
C-3	BM74A101	Capacitor—Mica 100 Mmfd. ± 20%	.35
C-4	BD410503	Capacitor—.05 Mfd., 400 volt	.35
C-5	A-56154	Capacitor—Electrolytic 40-20-10 Mfd., 150 volt.	1.60
C-6	BD210503	Capacitor—.05 Mfd., 200 volt	.30
C-7	BD410104	Capacitor—0.1 Mfd., 400 volt	.40
C-8	BD410103	Capacitor—.01 Mfd., 400 volt	.30
C-10	BM74A221	Capacitor—Mica 220 Mmfd. ± 20%	.40
C-11	BD610502	Capacitor—.005 Mfd., 600 volt	.30
C-12	BD410104	Capacitor—0-1 Mfd., 400 volt	.40
C-13	BD410203	Capacitor—.02 Mfd., 400 volt	.30
C-14	BD410104	Capacitor—0.1 Mfd., 400 volt	.40
C-15	BD410203	Capacitor—.02 Mfd., 400 volt	.30
C-16	BD410203	Capacitor—.02 Mfd., 400 volt	.30
C-17	BD610502	Capacitor—.005 Mfd., 600 volt	.30
		RESISTORS	
R-1	BR17B224	Resistor—Carbon, 220,000 Ohms, 1/3 watt	.15
R-2	BR17C221	Resistor—Carbon, 220 Ohms, 1/2 watt	.15
R-3	BR17B473	Resistor—Carbon, 47,000 Ohms, 1/3 watt	.15
R-4	BR17B103	Resistor—Carbon, 10,000 Ohms, 1/3 watt	.15
R-5	BR17B156	Resistor—Carbon, 15 Meg., 1/3 watt	.15
R-6	BR17E103	Resistor—Carbon, 10,000 Ohms, 1 watt	.15
R-7	BR17B102	Resistor—Carbon, 1,000 Ohms, 1/3 watt	.15
R-8	B-56142-1	Control—Dual Potentiometer, with switch 500,000 Ohms, (V. C.)	2.25
R-9	BR17B335	Resistor—Carbon, 3.3 Meg., 1/3 watt	.15
R-10	BR17B685	Resistor—Carbon, 6.8 Meg., 1/3 watt	.15
R-11	BR17B154	Resistor—Carbon, 150,000 Ohms, 1/3 watt	.15
R-12	BR17B154	Resistor—Carbon, 150,000 Ohms, 1/3 watt	.15
R-13	B-56142-1	Control—500,000 Ohms, (T. C.) part of R-8	
R-14	BR17B472	Resistor—Carbon, 4,700 Ohms, 1/3 watt	.15
R-15	BR17B104	Resistor—Carbon, 100,000 Ohms, 1/3 watt	.15
R-16	BR17B474	Resistor—Carbon, 470,000 Ohms, 1/3 watt	.15
R-17	BR17B104	Resistor—Carbon, 100,000 Ohms, 1/3 watt	.15
R-18	BR17B104	Resistor—Carbon, 100,000 Ohms 1/3 watt	.15
R-19	BR17B474	Resistor—Carbon, 470,000 Ohms, 1/3 watt	.15
R-20	BR17B474	Resistor—Carbon, 470,000 Ohms, 1/3 watt	.15
R-21	BR16C101	Resistor—Carbon, 100 Ohms, ± 10% 1/2 watt	.15
R-22	BR17G470	Resistor—Carbon, 47 Ohms ± 20% 2 watt	.30

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

SYMBOL	PART NO.	DESCRIPTION	LIST PRICE
		COILS AND TRANSFORMERS	
L-4, 5	D-57259	Loop Antenna assembly	$1.00
L-2	B-56143	Coil—Oscillator assembly	*
L-3	B-51726-1	Filter Choke, 80 ma.	2.00
T-1	B-51010-3	Transformer—1st I.F.	2.00
T-2	B-51011-3	Transformer—2nd I.F.	2.50
T-3	B-57253-1	Transformer—Output	1.50
		OTHER ELECTRICAL PARTS	
SW-1		Switch—power part of R-8 and R-13	
SW-2	B-56156-1	Switch—Radio-Phono	1.00
SP-1	C-57272	Speaker—6" x 9" Permanent Magnet	*
	A-6158	Lamp—Dial Mazda No. 47	.15
		MISCELLANEOUS PARTS	
	B-57275-1	Background for dial	*
	A-54848	Bushing—Strain relief (power cord)	.20
	A-56155	Bushing—Tuning control shaft	*
	E-57270-1	Cabinet	*
	B-51330-1	Channel rubber—mtg. for Dial scale	.04
	B-55402-1	Dial Cable assembly (includes clips at end of cable)	.25
	B-57269-1	Dial scale—plastic	*
	B-51427-2	Grommet—rubber; mtg., for variable gang	.05
	B-51124-1	Knob—Volume & switch, tuning or radio-phono	.15
	B-56138-1	Knob—Tone Control	.15
	BN751V02	Palnut—No. 3/8-32; for mtg., controls	.02
	BN770S02	Palnut—No. 10-24; for mtg., record changer	.01
	A-57271	Plug—3 Prong—Phono pick-up connection	*
	B-55130-9	Pointer	.15
	B-58069-1	Power Cord	.75
	BP934G02	Screw—No. 4 x 1/2"; for mtg., loop & back	.03
	BP928N02	Screw—No. 8 x 1 1/8"; for mtg., chassis	.03
	BS016S09	Screw—No. 10-24 x 1"; for mtg., record changer	.04
	A-56136	Shaft—tuning control	*
	A-54726	Socket—octal base	.20
	A-54900	Socket—loctal base	.25
	A-57273	Socket—3 Prong; Phono pick-up & loop antenna	.20
	A-57258	Socket—2 Prong; speaker connection	.20
	A-6182-5	Socket—dial lamp (with leads)	.15
	A-51331	Spring—Mtg., for channel rubbers	.10
	A-51787	Spring—dial cable tension	.07
	A-50147	Spring—conical; for mtg., record changer	.10
	BF13NT05	Washer—flat; for mtg., record changer	.02
	B-50156-1	Washer—rubber; for mtg., record changer	.04
	A-54492	Washer—"C"; tuning shaft	.02
	A-1089	Washer—cup; variable gang mtg.	.05
	B-50964-3	Wirenut—phono motor power connection	.03

*PRICE AVAILABLE UPON REQUEST

For Dial Data, see P.16-3

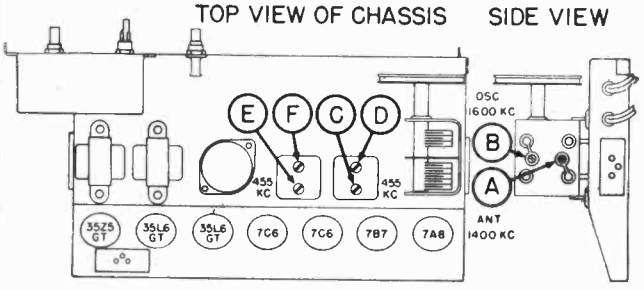
MODEL 7270

INTERNATIONAL DETROLA CORP.

MEASURED WITH VOLTMETER HAVING SENSITIVITY OF 1000 OHMS PER VOLT

TONE CONTROL IN CLOCKWISE POSITION
VOLUME ON FULL WITH NO SIGNAL
RADIO-PHONO SWITCH IN RADIO POSITION
DIAL TUNED TO 540 KC.

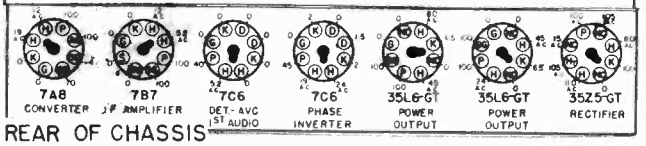
TOP VIEW OF CHASSIS



SIDE VIEW

BOTTOM VIEW OF CHASSIS

117 VOLT 60 CYCLE AC POWER SUPPLY USED FOR THESE MEASUREMENTS.
ALL VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS.



REAR OF CHASSIS

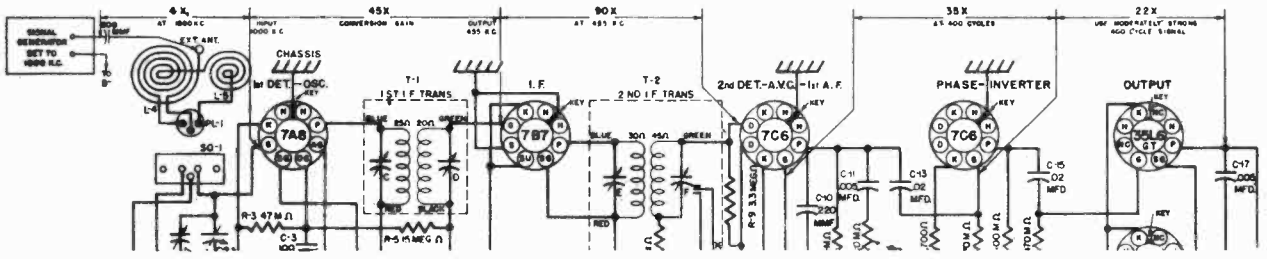
1. The chassis, record changer and loop should remain in their normal position in the cabinet when making loop adjustment.
2. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 55 on the dial. If it is set incorrectly, slide pointer along dial cord to correct position.
3. Connect output meter across speaker voice coil.
4. Connect the ground of signal generator to B–.
5. Set volume control at maximum volume position and use a weak signal from the signal generator.
6. Radio-Phono switch in Radio position.

NOTE: For best results, it is advisable to use an isolation transformer between the 117 V. AC line and AC input to receiver.

DUMMY ANT.	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER LETTER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
0.1 Mfd. Condenser	7A8 Grid	**455 KC**	Any point where it does not affect the signal	**F-E** **D-C**	2nd IF 1st IF	Adjust for maximum output. Then repeat adjustment.
0.1 Mfd. Condenser	7A8 Grid	**1620 KC**	Gang condenser completely out of mesh.	**B**	Oscillator	Adjust for maximum output.
RMA Loop		**1400 KC**	Tuned to 1400 kc Generator signal	**A**	Loop Antenna	Adjust for maximum output.

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

1. For all gain measurements connect signal generator as shown. Use 1000 KC signal with 400 cycle modulation (use nearby frequency if local station interferes).
2. Be sure radio is carefully tuned to generator signal. (Use weak signal for sharp tuning.)
3. When using a "channel" type instrument, carefully tune it for maximum output at desired frequency before making measurements.



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