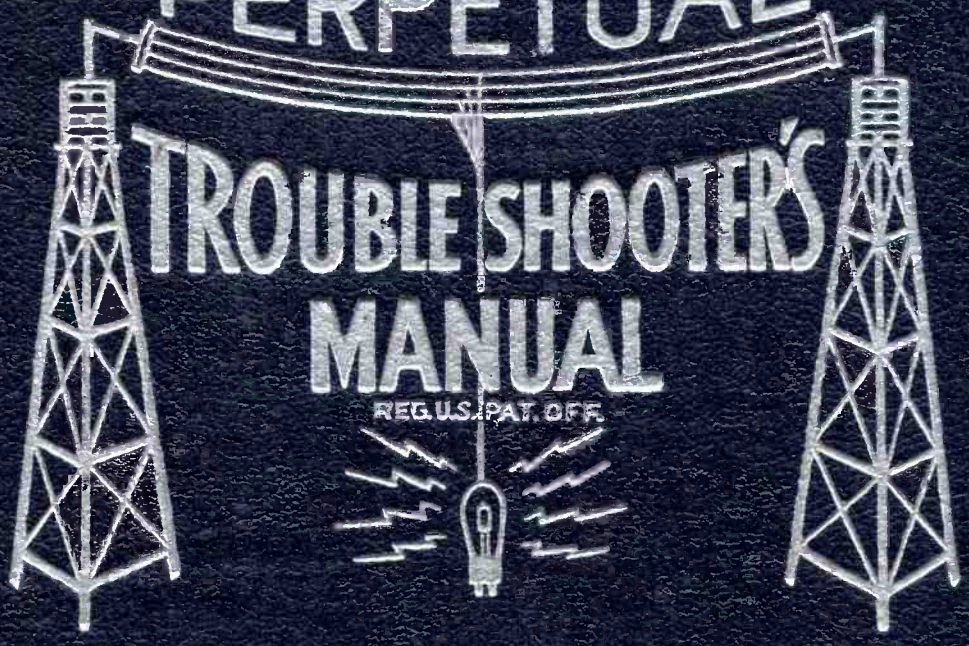
VOLUME VIII

PERPETUAL TROUBLE SHOOTER'S MANUAL

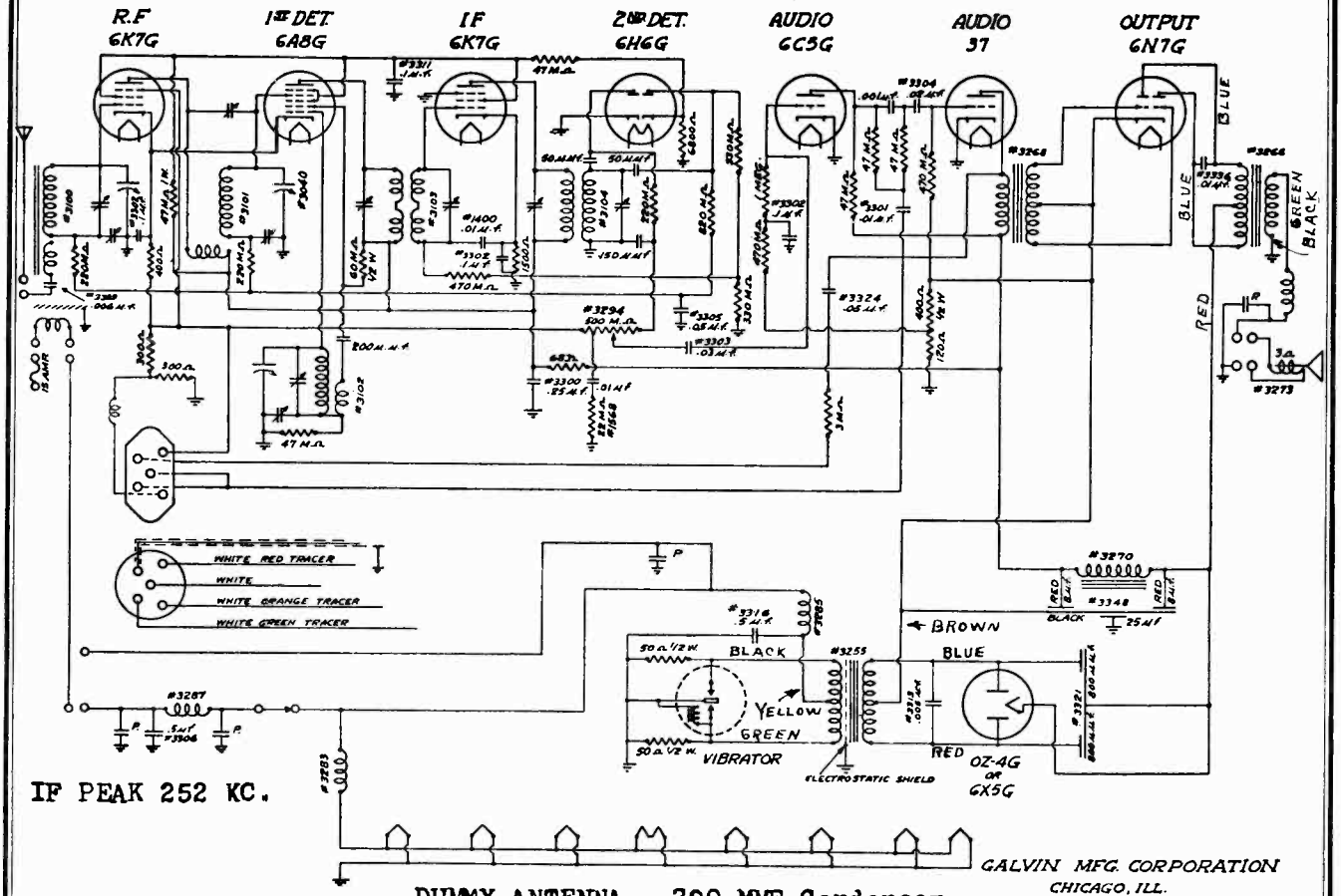
REG. U.S. PAT. OFF.



JOHN F. RIDER

GALVIN MFG. CO.

MODEL Golden Voice
1937 Early
Schematic, Alignment
Sensitivity, Voltage
Chassis



IF PEAK 252 KC.

GALVIN MFG. CORPORATION
CHICAGO, ILL.
CIRCUIT DIAGRAM OF MODEL
GOLDEN VOICE
1-26-37

DUMMY ANTENNA - 200 MMF Condenser in series & 500000 Ohms in shunt with the Generator output.

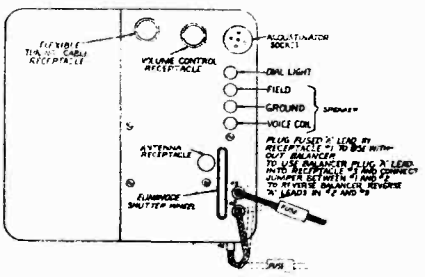
Average Microvolt Input	Generator Feeder Connected to Grid of	Generator Set At	Output meter Across Voice Coil
50,000	6K7G	262 K.C.	Voice coil resistance is 3 ohms—
1,000	6A8G	262 K.C.	
1,200	6A8G*	600 K.C.	
50	6K7G*	600 K.C.	1.73 Volts equals
1.5	Ant.	600 K.C.	1 Watt output

Microvolt input may be 10 to 20% more at 600 K.C. than at 262 K.C. This is due to normal conversion loss in the Translator tube. If greater, replace Translator tube. CURRENT DRAIN — 7 AMPS

ALIGNMENT

Peak the oscillator at 1600 kc and pad the oscillator at 600 kc. Peak the r-f circuits at 1400 kc.

SEE INDEX FOR THE DATA ON MAGIC ELI. MINODE ADJUSTMENT AND ACOUSTINATOR.



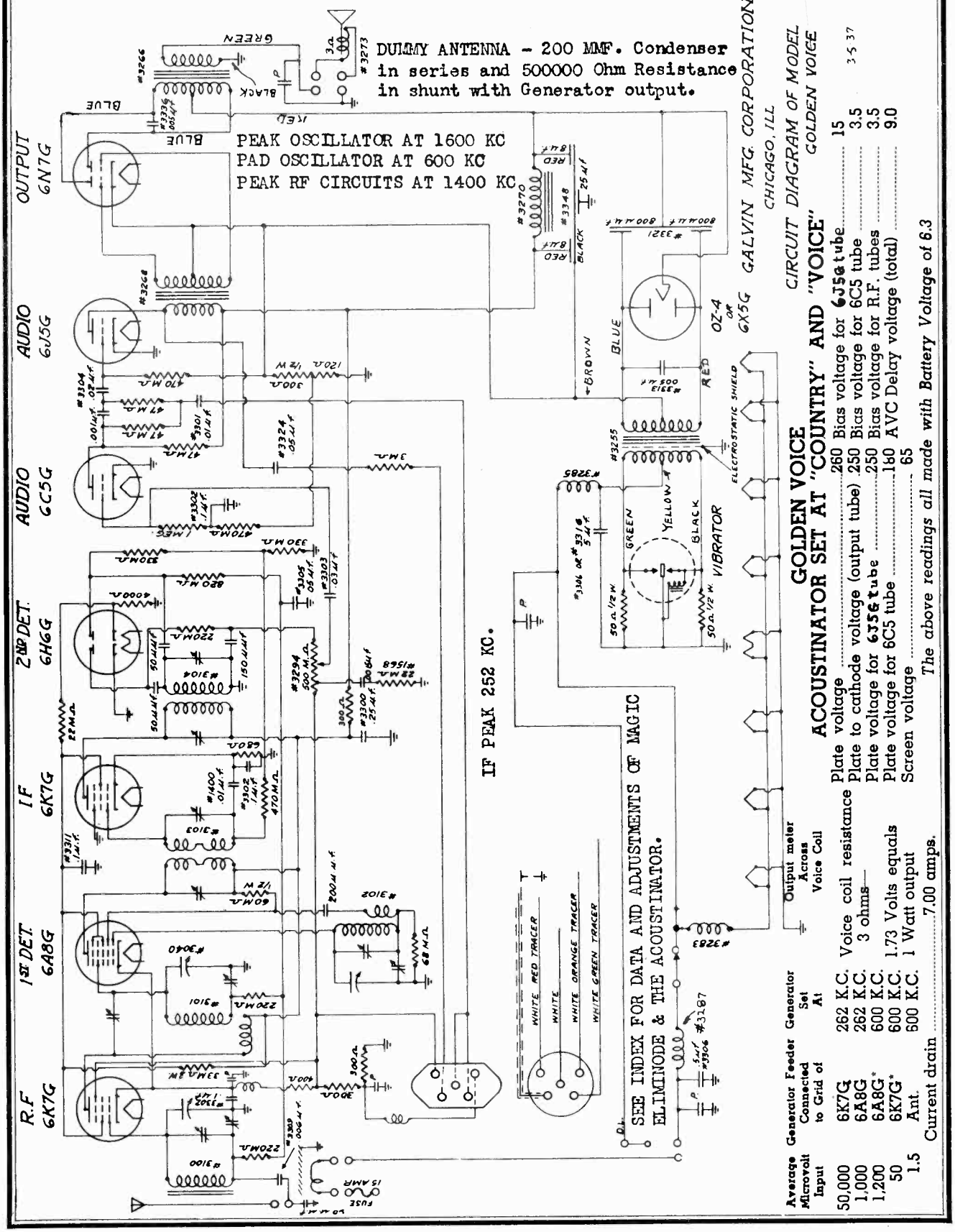
(FIG. 2)

Plate voltage	260
Plate to cathode voltage (output tube)	250
Plate voltage for 37 tube	250
Plate voltage for 6C5 tube	180
Screen voltage	65
Bias voltage for 37 tube	15
Bias voltage for 6C5 tube	3.5
Bias voltage for R.F. tubes	3.5
AVC Delay voltage (total)	9.0

The above readings all made with Battery Voltage of 6.3

MODEL Golden Voice
1937 Late
Schematic, Voltage
Sensitivity, Alignment

GALVIN MFG. CO.



Average Microvolt Input	Generator Feeder Connected to Grid of	Generator Set At	Output meter Across Voice Coil
50,000	6K7G	262 K.C.	Voice coil resistance
1,000	6A8G	262 K.C.	3 ohms
1,200	6A8G*	600 K.C.	
50	6K7G*	600 K.C.	1.73 Volts equals
1.5	Ant.	600 K.C.	1 Watt output

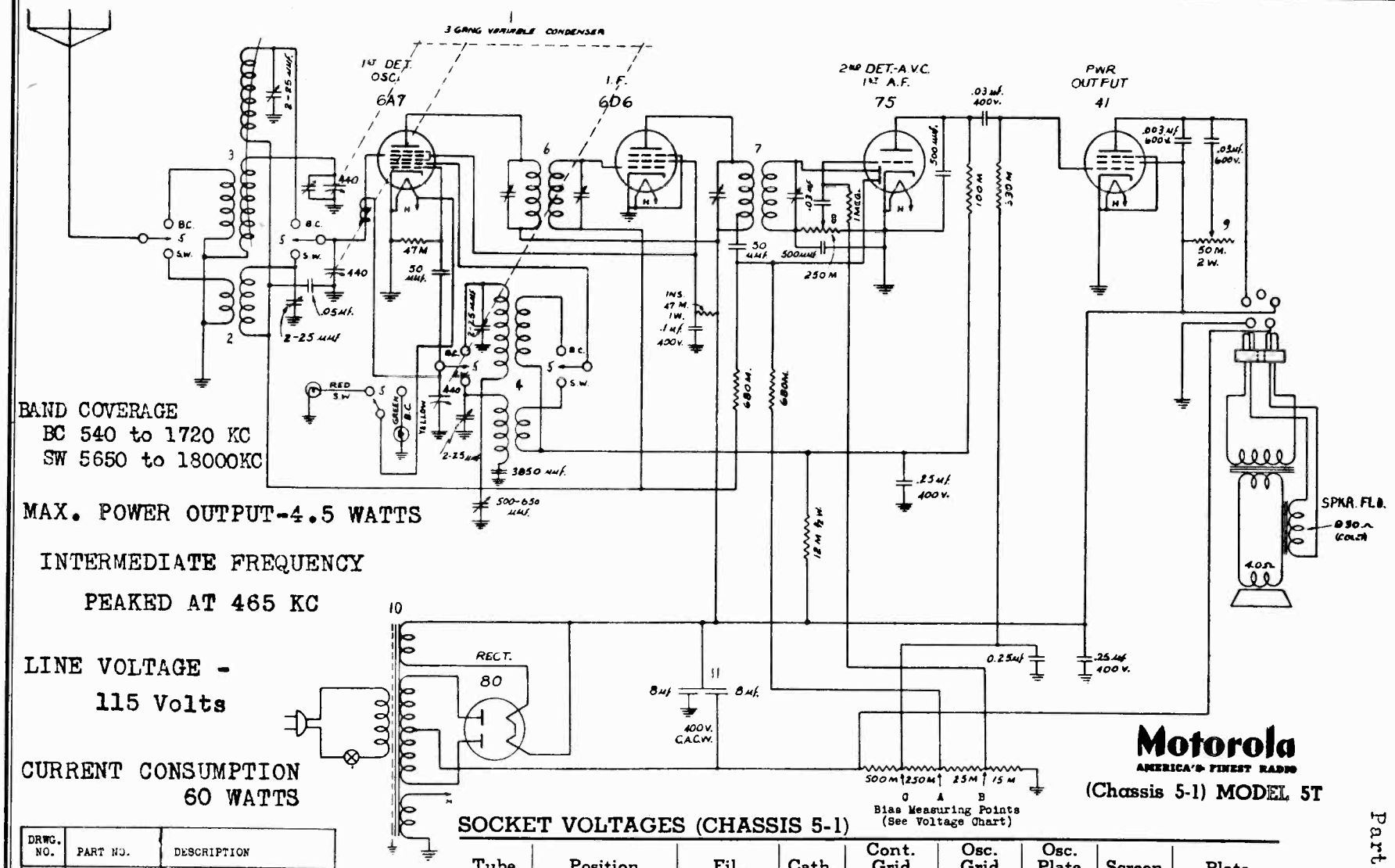
Plate voltage	260
Plate to cathode voltage (output tube)	250
Plate voltage for 6J5 tube	250
Plate voltage for 6C5 tube	180
Screen voltage	65
Current drain	7.00 amps.

Bias voltage for 6J5 tube 15
Bias voltage for 6C5 tube 3.5
Bias voltage for R.F. tubes 3.5
AVC Delay voltage (total) 9.0

The above readings all made with Battery Voltage of 6.3

GALVIN MFG. CO.

MODEL 5T
Chassis 5-1
Schematic, Voltage Parts



BAND COVERAGE
BC 540 to 1720 KC
SW 5650 to 18000KC

MAX. POWER OUTPUT-4.5 WATTS

INTERMEDIATE FREQUENCY
PEAKED AT 465 KC

LINE VOLTAGE -
115 Volts

CURRENT CONSUMPTION
60 WATTS

DRWG. NO.	PART NO.	DESCRIPTION
1	14-H-37263	3 Gang Condenser
2	13-H-37234	Ant.Coil (S.W.)
3	13-H-37233A	Ant.Coil (B.C.)
4	13-H-37244	Osc. Coil
5	54-H-37762	Band Switch
6	47-H-37684A	1st. I.F. Coil assem.
7	47-H-37686A	2nd. I.F. Coil assem.
8	60-H-37838	Volume Control
9	60-H-37835	Tone Control & switch
10	56-H-37781	Power Transformer
11	14-H-37285	Electrolytic cond.

Motorola
AMERICA'S FINEST RADIO

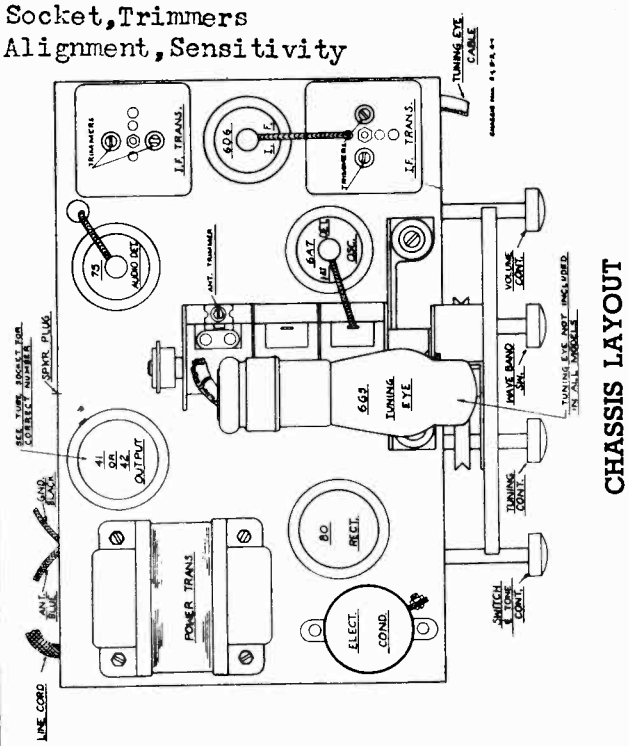
(Chassis 5-1) MODEL 5T

SOCKET VOLTAGES (CHASSIS 5-1)

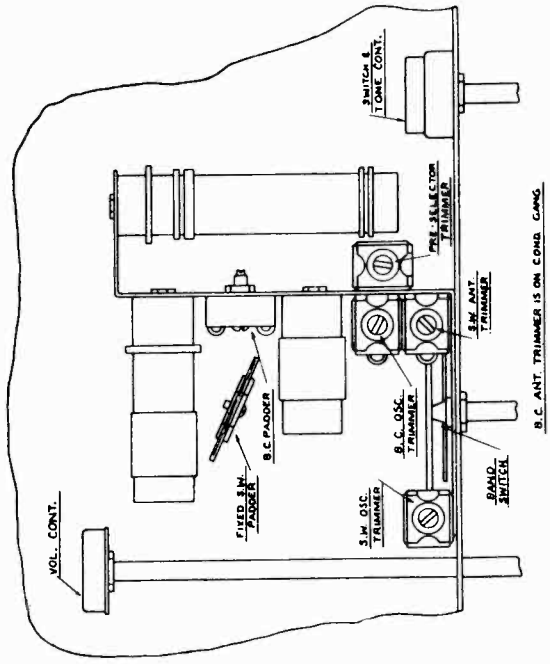
Tube	Position	Fil.	Cath.	Cont. Grid	Osc. Grid	Osc. Plate	Screen	Plate
6A7	1st. det.-osc.	6.0 AC	0	Note A	−9.3	170	75	250
6D6	I. F.	6.0 AC	0	Note A	.....	....	75	250
75	2nd det.-AVC	6.0 AC	0	Note B	.....	....	....	50
41	Output	6.0 AC	0	Note C	.....	....	250	235
80	Rectifier	4.75 AC	...	.....	.....	....	....	No.1 265 AC No.2 265 AC

MODEL 5T
Chassis 5-1
MODELS 5T-1, 5T-2, 5Y
Chassis 5-2
MODEL 6A
Chassis 6-1
Socket, Trimmers
Alignment, Sensitivity

GALVIN MFG. CO.



CHASSIS LAYOUT



TRIMMERS

BAND COVERAGE
American Programs 540-1720 KC
Foreign Programs 5650-18,000 KC

ALIGNMENT PROCEDURE

CHASSIS 5-1, 5-2 and 6-1

Connect signal generator to control grid of first detector tube (6A7) through a .05 MF condenser, and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn band switch to "American Programs" position. Turn condenser gang completely out of mesh.

Set signal generator at 465 K.C. and carefully adjust the four I.F. trimmers (located in top of I.F. coil cans) to point showing highest reading on output meter.

Leave band switch in "American Programs" position. Connect signal generator to antenna and ground leads using a .0002 MF condenser in antenna lead.

Set signal generator and receiver dial both at 1700 K.C. Adjust B.C. OSC. trimmer until 1700 K.C. signal is heard.

Set signal generator at 1400 K.C. and turn condenser gang to the signal at 1400 K.C. Adjust antenna section and second section of preselector to point showing highest reading on output meter.

Set signal generator at 600 K.C. and rock pointer at 600 K.C. position on dial scale, while adjusting B.C. padder, until combination is found which gives highest output reading. (Note: If there is noise level at 600 K.C., padder can be adjusted to maximum noise without rocking gang and without use of signal generator. Use short wire for pick-up if necessary.)

Turn band switch to "Foreign Programs" position. Replace .0002 MF condenser in signal generator antenna lead with a 400 ohm carbon resistor.

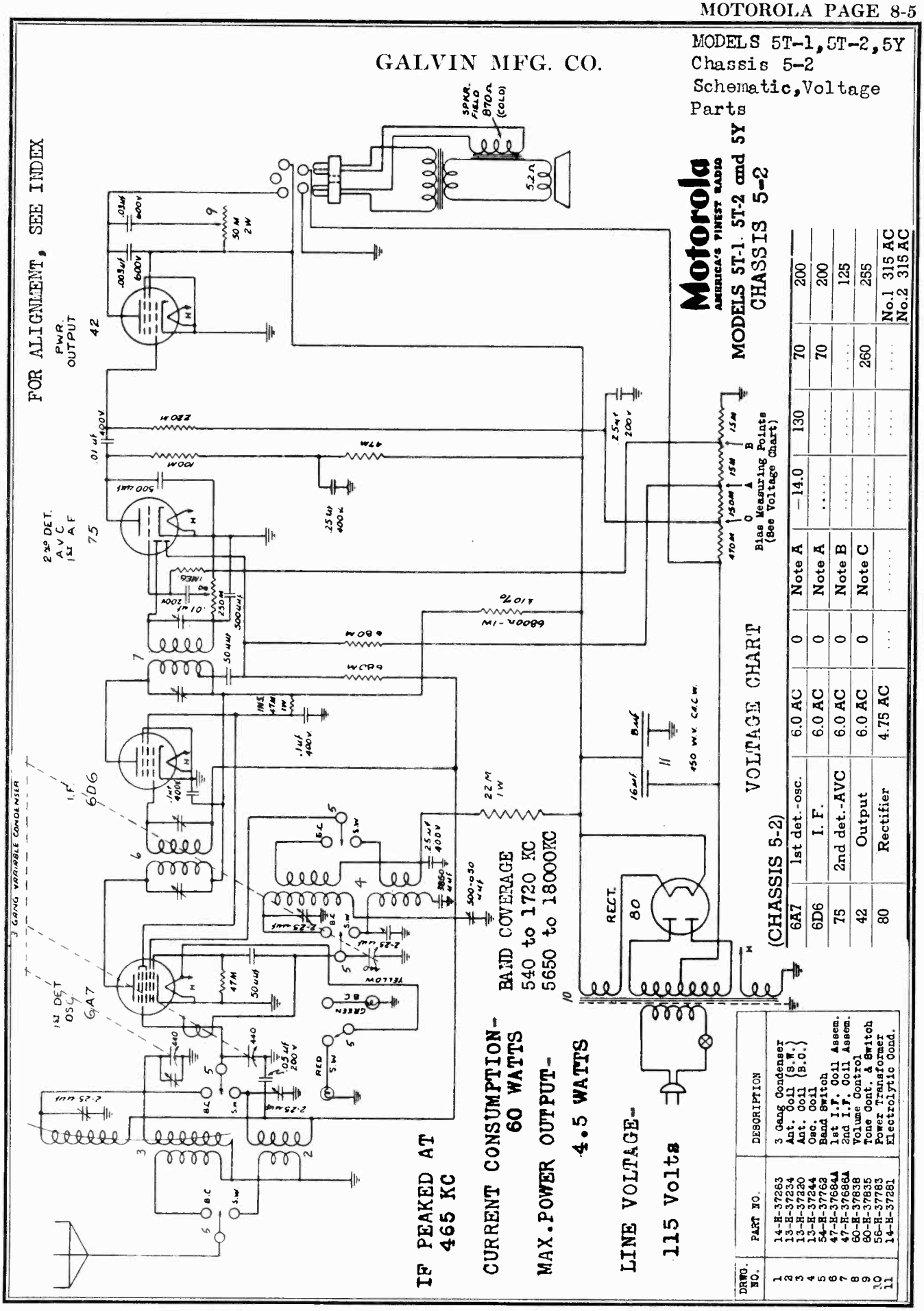
Set signal generator and receiver dial both at 18.0 MC. Adjust SW OSC. trimmer until 18.0 MC signal is heard.

Set signal generator at 16.0 MC and turn condenser gang to the signal at 16.0 M.C. Adjust SW ANT. trimmer to point giving greatest output reading, while slightly rocking condenser gang.

SW padder is fixed (no adjustment necessary.)

NOTE: I.F. Sensitivity at 465 K.C. is 50 microvolts for 50 milliwatts output
Ant. Sensitivity at 600 K.C. is 30 microvolts for 50 milliwatts output (Chassis 5-1)
Ant. Sensitivity at 600 K.C. is 25 microvolts for 50 milliwatts output (Chassis 5-2 and 6-1)

Note A:— .3 V measured point A to ground on 10 V scale (see circuit diagram).
Note B:— .2 V measured point B to ground on 10 V scale (see circuit diagram).
Note C:—1.3 V measured point C to ground on 10 V scale (see circuit diagram).
All voltages, except rectifier filaments, measured from socket terminal indicated to chassis ground, using 1000 ohms per volt meter.
Line voltage 115. — Current consumption 60 watts. — Maximum power output 4.5 watts.

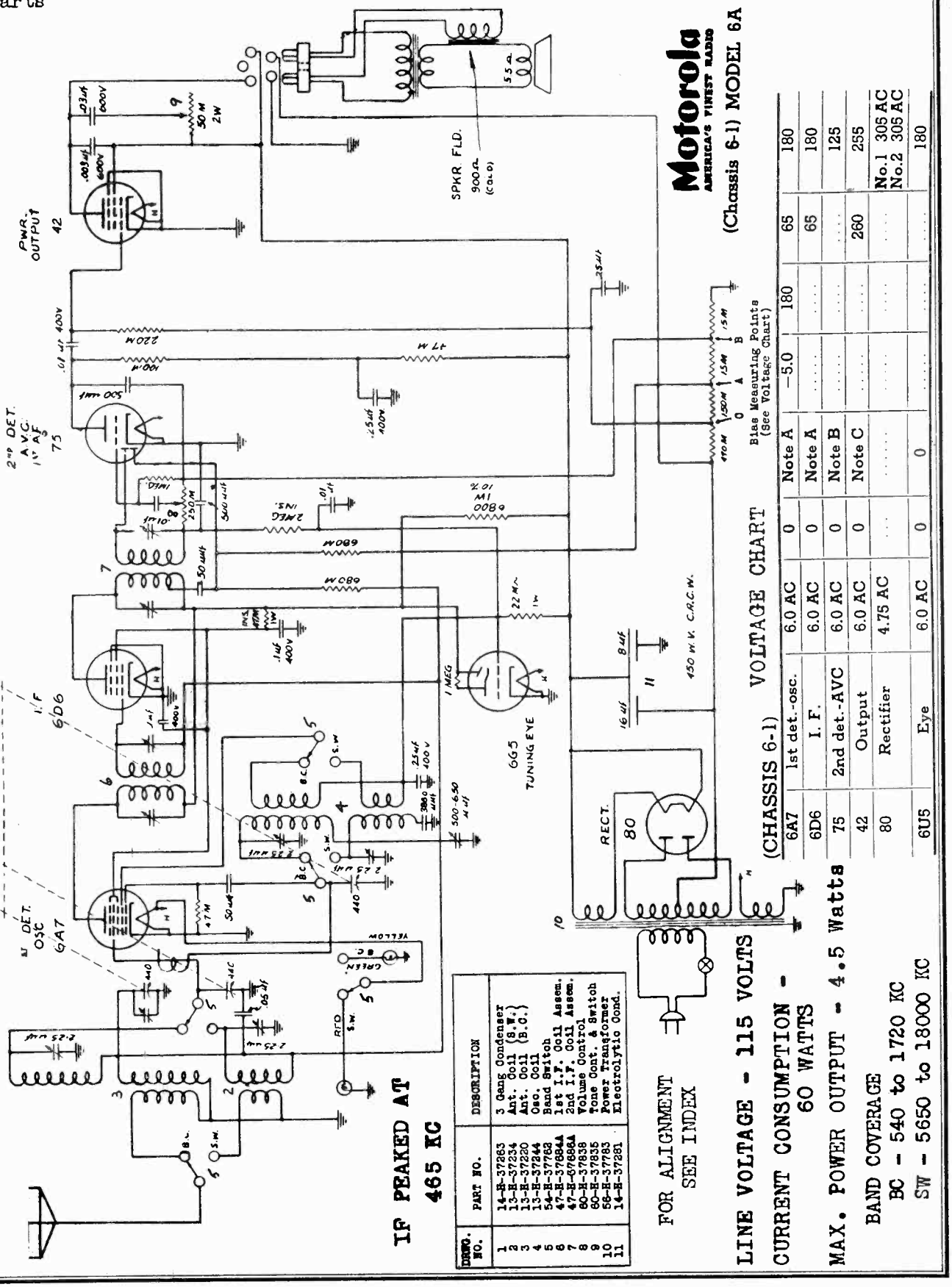


DRWG. NO.	PART NO.	DESCRIPTION
1	14-R-37263	3 Gang Condenser
2	13-R-37234	Ant. Coil (B.W.)
3	13-R-37230	Ant. Coil (B.C.)
4	13-R-37244	Osc. Coil
5	54-R-37762	Band Switch
6	47-R-37684A	1st I.F. Coil Assem.
7	47-R-37686A	2nd I.F. Coil Assem.
8	60-R-37838	Volume Control
9	80-R-37835	Tone Cont. & Switch
10	56-R-37783	Power Transformer
11	14-R-37281	Electrolytic Cond.

6A7	1st det.-osc.	6.0 AC	0	Note A	−14.0	130	70	200
6D6	I. F.	6.0 AC	0	Note A	.....	.....	70	200
75	2nd det.-AVC	6.0 AC	0	Note B	.....	.....	.....	125
42	Output	6.0 AC	0	Note C	.....	.....	260	265
80	Rectifier	4.75 AC	...	.....	.....	.....	.....	No.1 315 AC No.2 315 AC

MODEL 6A
Chassis 6-1
Schematic, Voltage
Parts

GALVIN MFG. CO.



VOLTAGE CHART
(CHASSIS 6-1)

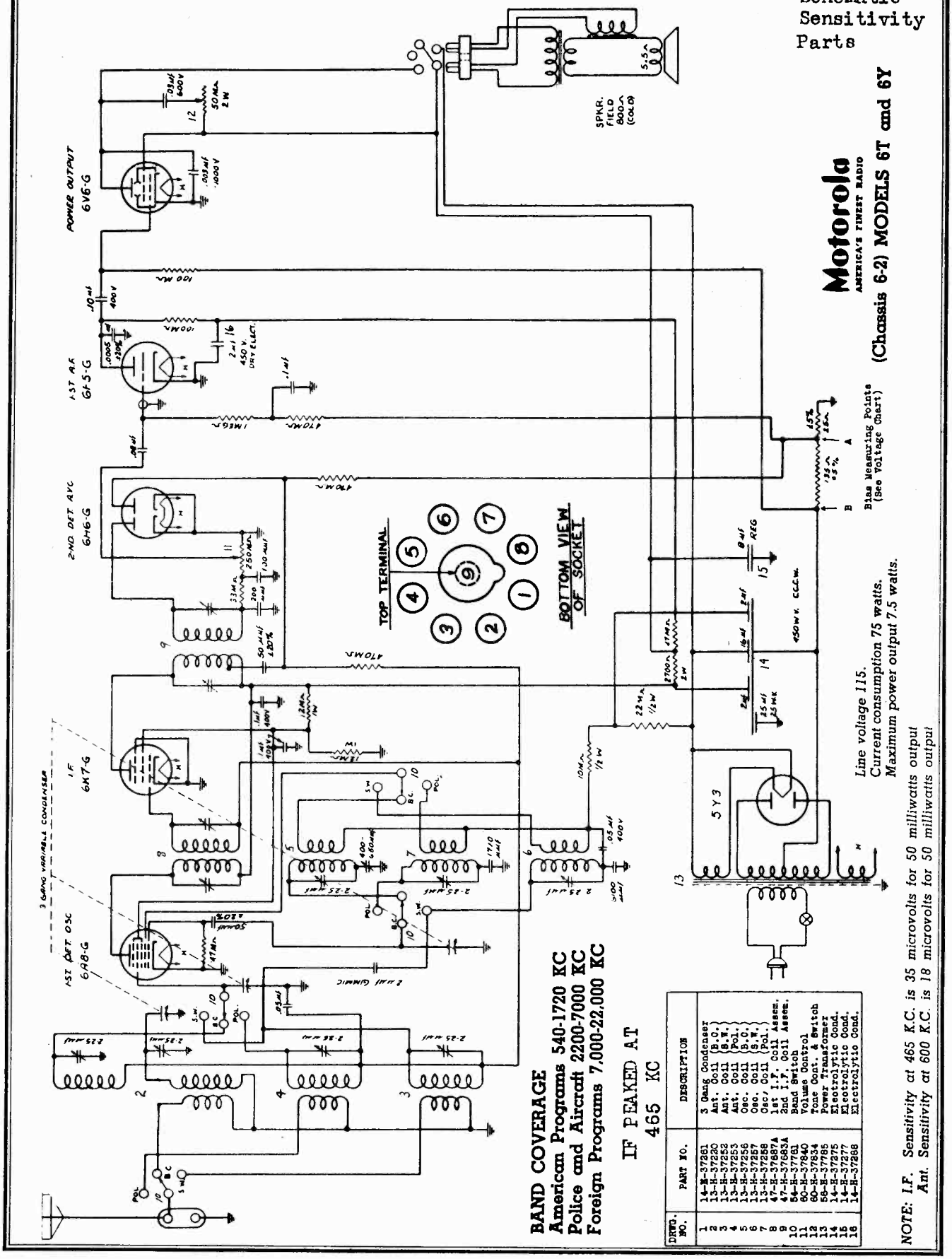
6A7	1st det.-osc.	6.0 AC	0	Note A	−5.0	180	65	180
6D6	I. F.	6.0 AC	0	Note A	.....	.....	65	180
75	2nd det.-AVC	6.0 AC	0	Note B	.....	.....	....	125
42	Output	6.0 AC	0	Note C	.....	.....	260	255
80	Rectifier	4.75 AC	....	.....	.....	.....	....	No.1 305 AC No.2 305 AC
6U5	Eye	6.0 AC	0	0	.....	.....	....	180

Bias Measuring Points (See Voltage Chart)

DESIG. NO.	PART NO.	DESCRIPTION
1	14-B-37263	3 Gang Condenser
2	13-B-37234	Ant. Coil (B.W.)
3	13-B-37220	Ant. Coil (B.C.)
4	13-B-37244	Osc. Coil
5	54-B-37783	Band Switch
6	47-B-37684A	1st I.F. Coil Assem.
7	47-B-37686A	2nd I.F. Coil Assem.
8	60-B-37838	Volume Control
9	60-B-37835	Tone Cont. & Switch
10	56-B-37783	Power Transformer
11	14-B-37281	Electrolytic Cond.

GALVIN MFG. CO.

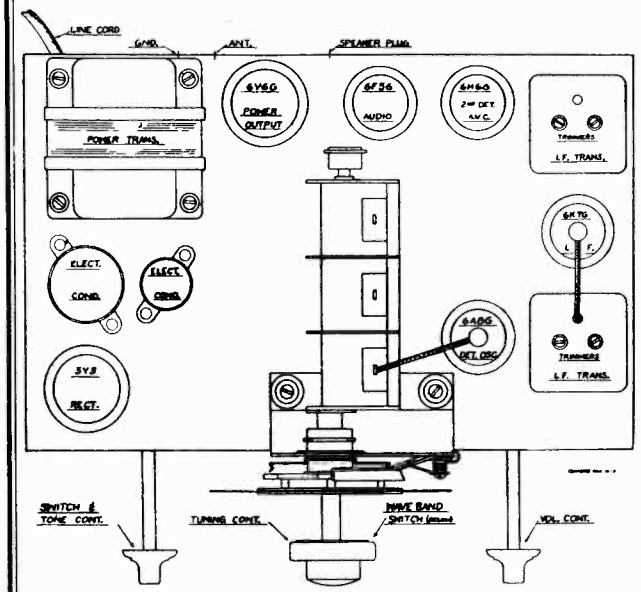
MODELS 6T, 6Y
Chassis 6-2
Schematic
Sensitivity
Parts



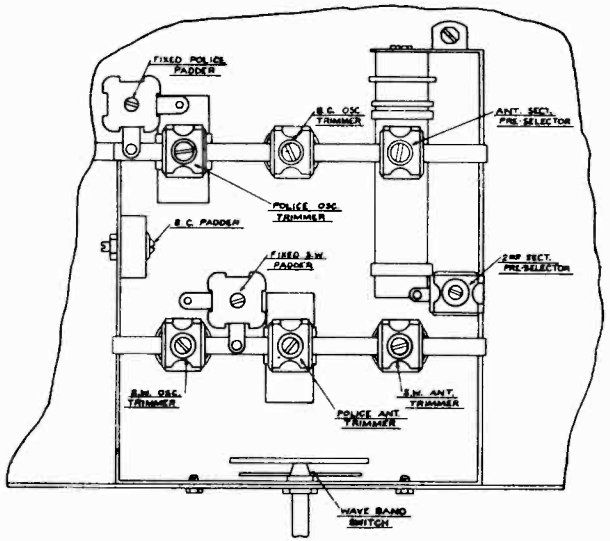
DRWG. NO.	PART NO.	DESCRIPTION
1	14-B-37261	3 Gang Condenser
2	13-B-37220	Ant. Coil (B.C.)
3	13-B-37252	Ant. Coil (S.W.)
4	13-B-37253	Ant. Coil (Pol.)
5	13-B-37256	Osc. Coil (B.C.)
6	13-B-37257	Osc. Coil (S.W.)
7	13-B-37258	Osc. Coil (Pol.)
8	47-B-37687A	1st I.F. Coil Assem.
9	47-B-37683A	2nd I.F. Coil Assem.
10	54-B-37781	Band Switch
11	80-B-37840	Volume Control
12	80-B-37834	Tone Cont. & Switch
13	56-B-37785	Power Transformer
14	14-B-37275	Electrolytic Cond.
15	14-B-37277	Electrolytic Cond.
16	14-B-37288	Electrolytic Cond.

NOTE: I.F. Sensitivity at 465 K.C. is 35 microvolts for 50 milliwatts output
Ant. Sensitivity at 600 K.C. is 18 microvolts for 50 milliwatts output

ALIGNMENT PROCEDURE — CHASSIS 6-2



CHASSIS LAYOUT



TRIMMERS

Connect signal generator to control grid of first detector tube (6A8G) through a .05 MF condenser, and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn band switch to "American Programs" position. Turn condenser gang completely out of mesh.

Set signal generator at 465 K.C. and carefully adust the four I.F. trimmers (located in top of I.F. coil cans) to point showing highest reading on output meter.

Leave band switch in "American Programs" position. Connect signal generator to antenna and ground terminals using a .0002 MF condenser in antenna lead.

Set signal generator and receiver dial both at 1700 K.C. Adjust B.C. OSC. trimmer until 1700 K.C. signal is heard.

Set signal generator at 1400 K.C. and turn condenser gang to the signal at 1400 K.C. Adjust antenna section and second section of preselector trimmers to point showing highest reading on output meter.

Set signal generator at 600 K.C. and rock pointer at 600 K.C. position on dial scale, while adjusting B.C. padder, until combination is found which gives highest output reading. (Note: If there is noise level at 600 K.C., padder can be adjusted to maximum noise without rocking gang and without use of signal generator. (Use short wire for pick-up if necessary.)

Turn band switch to "Police and Aircraft" position. Replace .0002 MF condenser in signal generator antenna lead with a 400 ohm carbon resistor.

Set signal generator and receiver dial both at 7.0 MC. Adjust POLICE OSC. trimmer until 7.0 MC signal is heard.

Set signal generator at 5.8 MC and turn condenser gang to signal at 5.8 MC. Adjust POLICE ANT. trimmer to point giving greatest output reading, while slightly rocking condenser gang.

Turn band switch to "Foreign Programs" position, still using 400 ohm carbon resistor in antenna lead to signal generator.

Set signal generator and receiver dial both at 22.0 MC. Adjust SW OSC. trimmer until 22.0 MC signal is heard.

Set signal generator at 18.7 MC. and turn condenser gang to signal at 18.7 MC. Adjust SW ANT. trimmer to point giving greatest output reading, while slightly rocking condenser gang.

Padders on "Police" and "Foreign" bands are fixed (no adjustment necessary).

SOCKET VOLTAGES (CHASSIS 6-2)

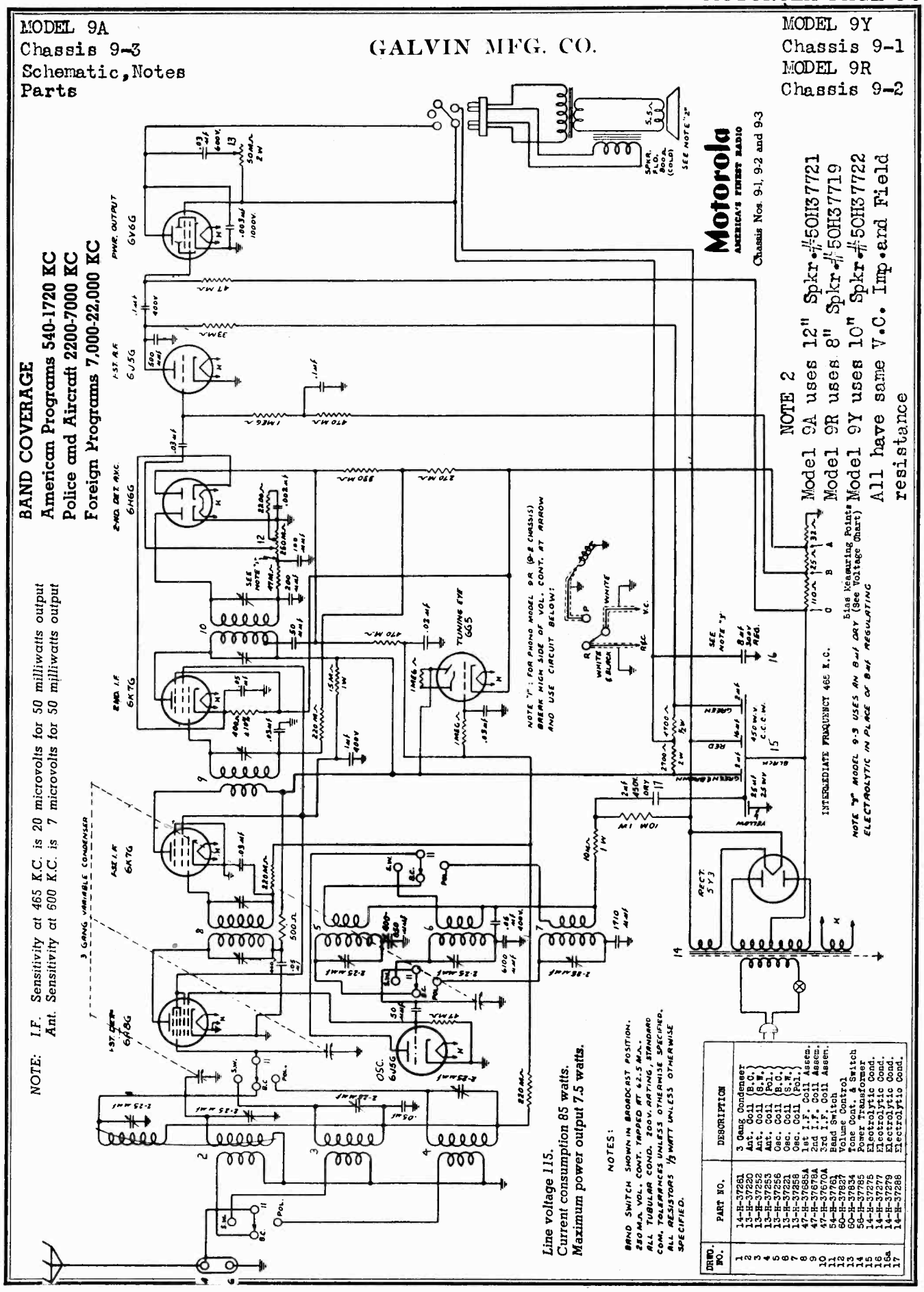
Tube	Position	1	2	3	4	5	6	7	8	9—Top Grid
6A8G	1st det.-osc.	0	0	225	80	—7.0	175	6.3 AC	0	Note A
6K7G	I. F.	0	0	225	80	0	X	6.3 AC	0	Note A
6H6G	2nd det.-AVC	0	6.3 AC	0	0	Note A	X	0	0	.....
6F5G	A. F.	0	6.3 AC	X	120	X	X	0	0	Note A
6V6G	Output	0	6.3 AC	255	260	Note B	X	0	0	.....
5Y3	Rectifier	0	5.0 AC	.....	350 AC	....	350 AC	X	5.0 AC	.....

"X" indicates socket terminals used as dummy tie points.
Note A:— 2.0 V measured point A to ground on 10 V scale (see circuit diagram).
Note B:—13.0 V measured point B to ground on 50 V scale (see circuit diagram).
All voltages except rectifier filaments measured from socket terminal indicated to chassis ground, using 1000 ohms per volt meter.

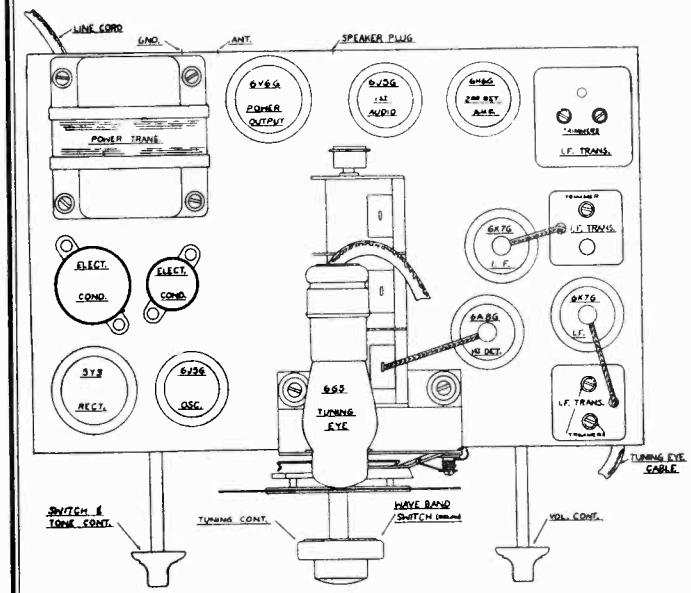
MODEL 9A
Chassis 9-3
Schematic, Notes
Parts

GALVIN MFG. CO.

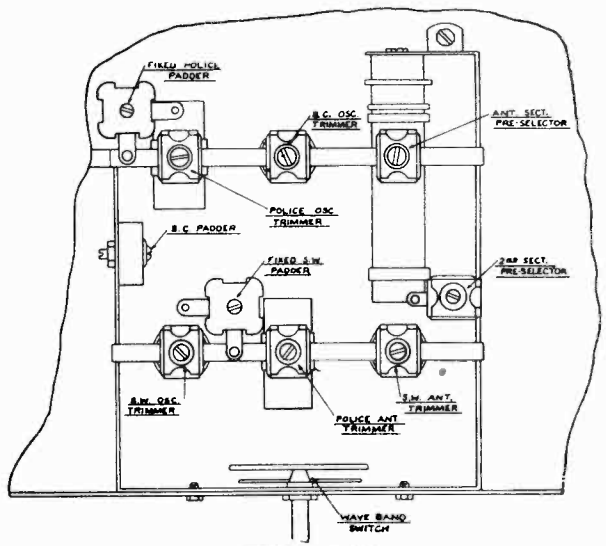
MODEL 9Y
Chassis 9-1
MODEL 9R
Chassis 9-2



DRWG. NO.	PART NO.	DESCRIPTION
1	14-H-37261	3 Gang Condenser
2	13-H-37320	Ant. Coil (B.C.)
3	13-H-37252	Ant. Coil (S.W.)
4	13-H-37253	Ant. Coil (Pol.)
5	13-H-37256	Osc. Coil (B.C.)
6	13-H-37321	Osc. Coil (S.W.)
7	13-H-37258	Osc. Coil (Pol.)
8	47-H-37685A	1st I.F. Coil Assem.
9	47-H-37678A	2nd I.F. Coil Assem.
10	47-H-37670A	3rd I.F. Coil Assem.
11	54-H-37762	Band Switch
12	60-H-37827	Volume Control
13	60-H-37834	Tone Cont. & Switch
14	56-H-37785	Power Transformer
15	14-H-37275	Electrolytic Cond.
16	14-H-37277	Electrolytic Cond.
15a	14-H-37279	Electrolytic Cond.
17	14-H-37288	Electrolytic Cond.



CHASSIS LAYOUT



TRIMMERS

CHASSIS 9-1, 9-2 and 9-3

ALIGNMENT PROCEDURE

Connect signal generator to control grid of first detector tube (6A8G) through a .05 MF. condenser, and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn band switch to "American Programs" position. Turn condenser gang completely out of mesh.

Set signal generator at 465 K.C. and carefully adjust the five I.F. trimmers (located in top of I.F. coil cans) to point showing highest reading on output meter.

Leave band switch in "American Programs" position. Connect signal generator to antenna and ground terminals using a .0002 MF condenser in antenna lead.

Set signal generator and receiver dial both at 1700 K.C. Adjust BC OSC. trimmer until 1700 K.C. signal is heard.

Set signal generator at 1400 K.C. and turn condenser gang to the signal at 1400 K.C. Adjust antenna section and second section of preselector trimmers to point showing highest reading on output meter.

Set signal generator at 600 K.C. and rock pointer at 600 K.C. position on dial scale, while adjusting BC padder, until combination is found which gives highest output reading. (Note: If there is noise level at 600 K.C., padder can be adjusted to maximum noise without rocking gang and without use of signal generator. Use short wire for pick-up if necessary.)

Turn band switch to "Police and Aircraft" position. Replace .0002 MF condenser in signal generator antenna lead with a 400 ohm carbon resistor.

Set signal generator and receiver dial both at 7.0 MC. Adjust POLICE OSC. trimmer until 7.0 MC signal is heard.

Set signal generator at 5.8 MC and turn condenser gang to the signal at 5.8 MC. Adjust POLICE ANT. trimmer to point giving greatest output reading, while slightly rocking condenser gang.

Turn band switch to "Foreign Programs" position still using 400 ohm carbon resistor in antenna lead to signal generator.

Set signal generator and receiver dial both at 22.0 MC. Adjust SW OSC. trimmer until 22.0 MC signal is heard.

Set signal generator at 18.7 MC and turn condenser gang to the signal at 18.7 MC. Adjust SW ANT. trimmer to point giving greatest output reading, while slightly rocking condenser gang.

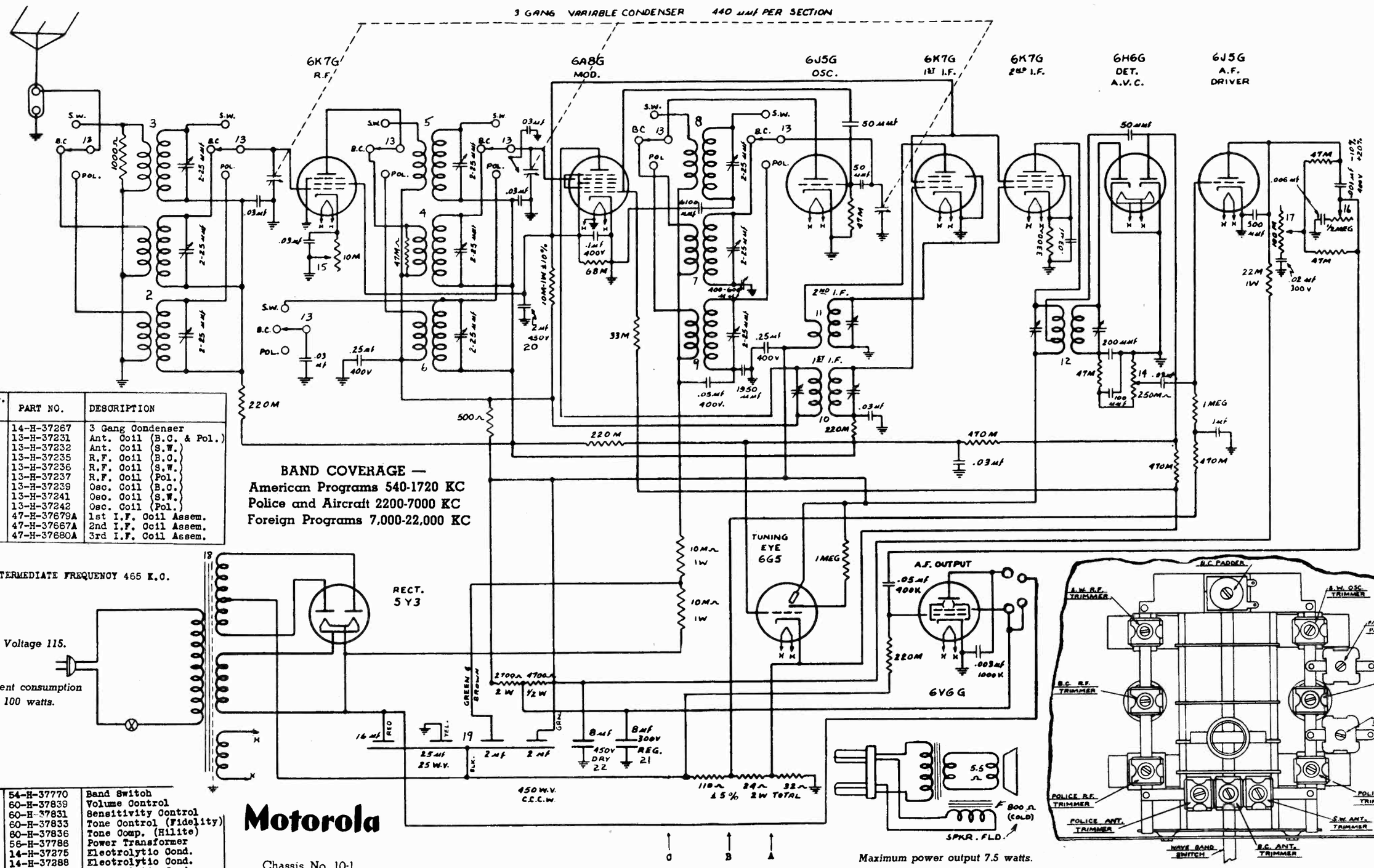
Padders on "Police" and "Foreign" bands are fixed (no adjustment necessary).

SOCKET VOLTAGES (CHASSIS 9-1, 9-2, AND 9-3)

Tube	Position	1	2	3	4	5	6	7	8	9
6A8G	1st det.	0	6.3 AC	195	80	−6.0	80	0	0	Note A
6J5G	Osc.	0	0	160	−6.0	−16.0	....	6.3 AC	0	...
6K7G	1st I. F.	0	0	200	80	0	X	6.3 AC	0	Note A
6K7G	2nd I. F.	0	6.3 AC	200	80	−3.0	X	0	1.2	Note A
6H6G	2nd det.-AVC	0	6.3 AC	0	0	Note A	X	0	1.2	...
6J5G	A. F.	0	6.3 AC	125	240	Note B	X	0	0	...
6V6G	Output	0	6.3 AC	250	260	Note C	X	0	0	...
5Y3	Rectifier	0	5.0 AC	..	350 AC	....	350 AC	X	5.0 AC	...
6G5	Eye	Fil. (Brown wire) 6.3 AC Plate (Red wire) 200 Cathode (Black wire) Note A Grid (Green Wire) Note A								

MODEL 10Y
Chassis 10-1
Schematic, Parts
Trimmers

GALVIN MFG. CO.



DRWG. NO.	PART NO.	DESCRIPTION
1	14-H-37267	3 Gang Condenser
2	13-H-37231	Ant. Coil (B.C. & Pol.)
3	13-H-37232	Ant. Coil (S.W.)
4	13-H-37235	R.F. Coil (B.C.)
5	13-H-37236	R.F. Coil (S.W.)
6	13-H-37237	R.F. Coil (Pol.)
7	13-H-37239	Osc. Coil (B.C.)
8	13-H-37241	Osc. Coil (S.W.)
9	13-H-37242	Osc. Coil (Pol.)
10	47-H-37679A	1st I.F. Coil Assem.
11	47-H-37667A	2nd I.F. Coil Assem.
12	47-H-37680A	3rd I.F. Coil Assem.

BAND COVERAGE —
American Programs 540-1720 KC
Police and Aircraft 2200-7000 KC
Foreign Programs 7,000-22,000 KC

13	54-H-37770	Band Switch
14	60-H-37839	Volume Control
15	60-H-37831	Sensitivity Control
16	60-H-37833	Tone Control (Fidelity)
17	60-H-37836	Tone Comp. (Hilite)
18	56-H-37786	Power Transformer
19	14-H-37275	Electrolytic Cond.
20	14-H-37288	Electrolytic Cond.
21	14-H-37277	Electrolytic Cond.
22	14-H-37279	Electrolytic Cond.

Motorola

Chassis No. 10-1
MODEL 10Y

TRIMMERS 10-1

ALIGNMENT PROCEDURE

CHASSIS 10-1

1. Read alignment notes on Page 14 .

2. Connect signal generator to control grid of first detector tube (6A8G) through a .05 MF. condenser and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn band switch to "American Programs" position. Turn condenser gang completely out of mesh.

3. Set signal generator at 465 K.C. and carefully adjust the five I.F. trimmers (located in top of I.F. coil cans) to point showing highest reading on output meter.

4. Leave band Switch in "American Programs" position. Connect signal generator to antenna and ground terminals, using a .0002 MF condenser in antenna lead.

5. Set signal generator and receiver dial both at 1700 K.C. Adjust BC OSC. trimmer until 1700 K.C. signal is heard.

6. Set signal generator at 1400 K.C. and turn condenser gang to the signal at 1400 K.C. Adjust BC ANT. and BC RF. trimmers to point showing highest reading on output meter.

7. Set signal generator at 600 K.C. and rock pointer at 600 K.C. position on dial scale, while adjusting BC padder, until combination is found which gives highest output reading. (Note: If there is noise level at 600 K.C., padder can be adjusted to maximum noise without rocking gang and without use of signal generator. (Use short wire for pick-up if necessary.)

8. Turn band switch to "Police and Aircraft" position. Replace .0002 M.F. condenser in signal generator lead with a 400 ohm carbon resistor.

9. Set signal generator and receiver dial both at 7.0 MC. Adjust POLICE OSC. trimmer until 7.0 MC signal is heard.

10. Set signal generator at 5.8 MC and turn condenser gang to signal at 5.8 MC. Adjust POLICE ANT. and POLICE RF. trimmers to point giving greatest output reading, while slightly rocking condenser gang.

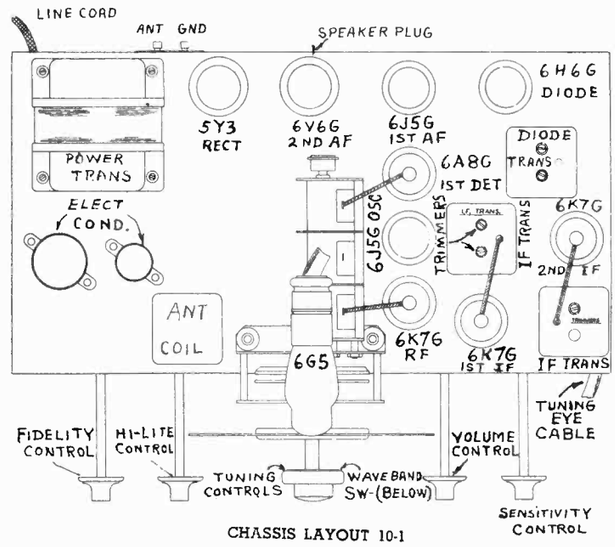
11. Turn band switch to "Foreign Programs" position, still using 400 ohm carbon resistor in antenna lead to signal generator.

12. Set signal generator and receiver dial both at 22.0 MC. Adjust SW OSC. trimmer until 22.0 MC signal is heard.

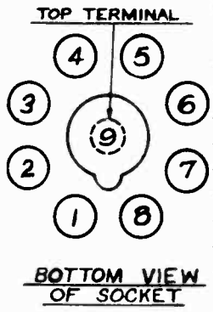
13. Set signal generator at 18.7 MC and turn condenser gang to the signal at 18.7 MC. Adjust SW ANT. and SW RF. trimmers to point giving greatest output reading, while slightly rocking condenser gang.

14. Padders on "Police" and "Foreign" bands are fixed. (No adjustment necessary.)

NOTE: I.F. Sensitivity at 465 K.C. is 90 microvolts for 50 milliwatts output
Ant. Sensitivity at 600 K.C. is 1 microvolt for 50 milliwatts output



CHASSIS LAYOUT 10-1



SOCKET VOLTAGE (CHASSIS 10-1)

Tube	Position	1	2	3	4	5	6	7	8	9
6K7G	R. F.	0	6.3 AC	215	85	0	X	0	7.0	Note A
6A8G	1st det.	0	6.3 AC	225	90	−25	90	0	0	Note A
6J5G	Osc.	0	6.3 AC	160	0	−23	...	0	0	...
6K7G	1st I. F.	0	6.3 AC	220	100	0	X	0	0	Note A
6K7G	2nd I. F.	0	6.3 AC	220	100	8	...	0	8	0
6H6G	2nd det.-AVC	0	6.3 AC	0	0	Note A	X	0	0	...
6J5G	A. F.	0	6.3 AC	150	0	Note B	X	0	0	...
6V6G	Output	0	6.3 AC	260	265	Note C	...	0	0	...
5Y3	Rectifier	0	5.0 AC	X	350 AC	X	350 AC	X	5.0 AC	...
6G5	Eye	Filament (Brown wire) 6.3 AC Cathode (Black wire) Note A					Plate (Red wire) 210 Grid (Green wire) Note A			

"X" indicates socket terminals used as dummy tie points.

Note A:— 3.0 V measured point A to ground on 10 V scale (see circuit diagram).

Note B:— 5.0 V measured point B to ground on 10 V scale (see circuit diagram).

Note C:—15.0 V measured point C to ground on 50 V scale (see circuit diagram).

All voltages, except rectifier filaments, measured from socket terminal indicated to chassis ground, using 1000 ohms per volt meter.

THE 1937 IMPROVED MAGIC ELIMINODE

The 1937 Magic Eliminode consists of filters in the various supply leads to the radio set to prevent the introduction of "motor noise" at these points and an improved bucking or balancing circuit in Models 65, 70, and Golden Voice which may be adjusted to prevent the development of "motor noise" in the antenna circuit.

The manner in which the cancellation of "motor noise" in the antenna circuit is accomplished is as follows:

Developed on the antenna coil, from the antenna system we have both "motor noise" and "broadcast signal." Developed on the "A" lead of the radio set which is connected into the electrical system we have "motor noise" alone. We introduce "motor noise" into the antenna circuit from the "A" lead in opposite phase to that picked up by the antenna.

We then vary the intensity introduced from the "A" circuit into the antenna coil by means of the metal shutter between the two circuits, until the intensity from both antenna system and "A" circuit is the same. When this is accomplished there is cancellation of "motor noise" in the antenna system and the broadcast signal comes through without being affected in any way.

For those cases in which the motor noise developed in the "A" circuit is *in phase* with that of the antenna system, provision is made to reverse the phase at the coupling coil to the antenna circuit so that bucking action may occur. Refer to Fig. (2).

MAGIC ELIMINODE BALANCING PROCEDURE

After the set is completely installed, if any ignition noise is present with the shutter in a closed position and with the "A" lead plugged into the bottom of the set it will be necessary to use the balancer.

To use the balancer, pull the end of the fused "A" lead out of the bottom of the set No. 1 (Fig. 2) and plug it into the balancer terminal receptacle No. 3 (Fig. 2). Take the short heavy jumper with pin prongs on either end and plug one end into receptacle No. 1 (Fig. 2) on the bottom of the set and plug the other end into balancer terminal receptacle No. 2 (Fig. 2). Tune the set then to the point on the dial where the noise appears with greatest intensity.

Adjust the eliminode shutter wheel by revolving it with the thumb as shown in (Fig. 2) until the motor noise disappears.

If it is found when turning the shutter toward an open position that the noise gradually becomes louder without any sign of decrease at any point, it will be necessary to reverse the connections in receptacles No. 2 and No. 3 (Fig. 2). Then readjust the shutter wheel with the thumb as described above.

When this adjustment is once made, it will not change unless some change is later made in the car wiring or the radio set is installed in another car.

CHASSIS PICKUP

In extreme cases of "motor noise" in the Models No. 65, 70 and Golden Voice, a preliminary test for chassis pickup should be made before attempting to balance out antenna interference.

When making this test, it is necessary to use a well shielded dummy antenna plugged into the set in place of the regular antenna lead-in. The dummy antenna can be made by using a standard Motorola antenna series condenser, part M-94, and short circuiting the inside connection to the shell.

Balance the antenna trimmer very carefully to this dummy antenna so that the set is at maximum sensitivity and then run the car motor.

Should "motor noise" occur after this test, it will be entering the radio set through some other source than the antenna.

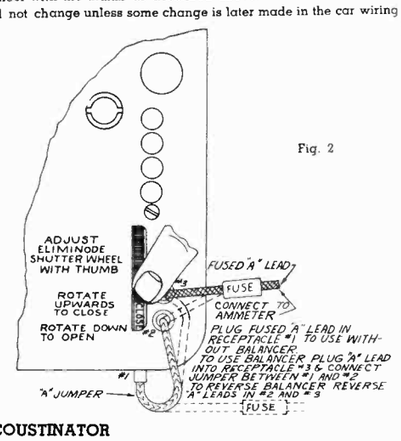


Fig. 2

ACOUSTINATOR

The Acoustinator used on the 1937 MOTOROLAS must be mounted always at a point most convenient to the customer since its operation is just as essential as the tuning dial or the volume control in giving complete enjoyment and maximum performance from the radio set.

The Acoustinator performs the function of varying the sensitivity of the radio set in three logical predetermined steps from the extreme sensitivity necessary in isolated communities to the noise free smooth reception desired in Metropolitan areas, and changes the tone characteristics in three distinctly different positions to correct for the acoustic differences in the various makes of cars give a pleasing effect to any type of program that anyone might prefer.

The three steps of the sensitivity switch controlled by the left hand knob are:
Country: average sensitivity 1.5 Microvolt for 1 Watt.
City: average sensitivity 5 Microvolts for 1 Watt.
Street Car: average sensitivity 15 Microvolts for 1 Watt.

"High Fidelity" is a term applied to an audio system that reproduces all frequencies of the audible spectrum at the same level of output.

The human ear however is most sensitive to frequencies in the middle register occupied by the human voice. The acoustics of the average automobile tend to accentuate this effect. The actual effect to the ear then of "High Fidelity" is that the pleasing higher and lower frequencies of music are dropped into the background and tends to spotlight the human voice as shown on the chart in Fig. (1).

This is the condition that occurs when the right hand knob of the acoustinator is set at "Voice" position.

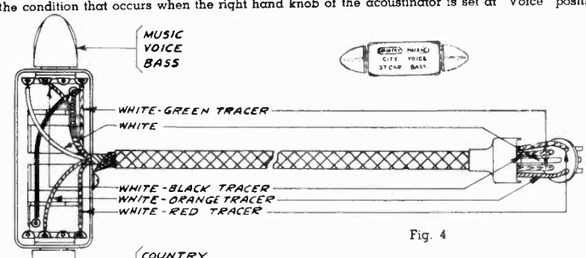


Fig. 4

A beautifully pleasing and lifelike effect would be given to any musical program if we would compensate for the limitations of the ear and in some manner drop the center portion of the audio register slightly below the level of the two ends. The deep bass notes and high notes that give expression to music would then stand out in a very natural manner. This has been done by means of an electrical filter network that is switched into the circuit when we turn to the "Music" position. Fig. (1).

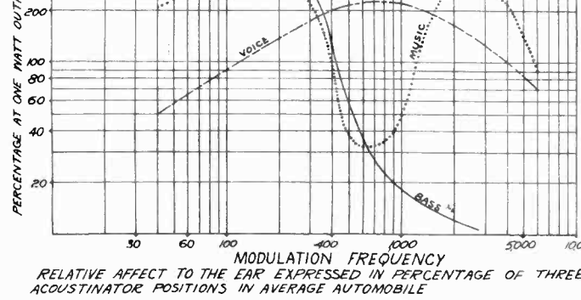


Fig. 1

RELATIVE AFFECT TO THE EAR EXPRESSED IN PERCENTAGE OF THREE ACOUSTINATOR POSITIONS IN AVERAGE AUTOMOBILE

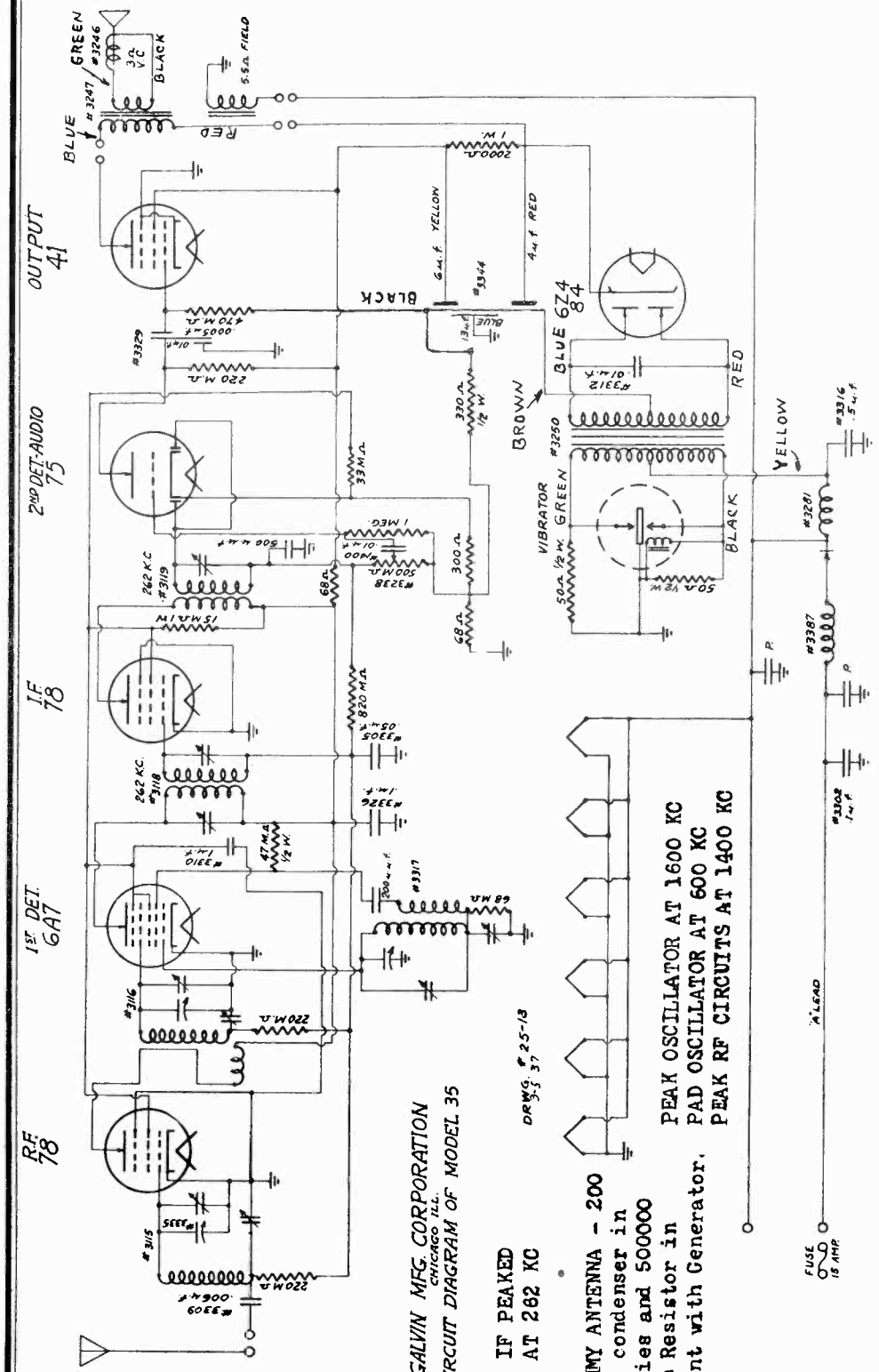
Many people prefer the deep bass instruments that mark the rhythm of music to be accentuated above all others. A soft mellowness is given music when this is done and the sound of static and man-made electrical interference which is reproduced at a very high audio frequency is reduced to a minimum when the acoustinator is set to the bass position.

Many combinations of positions then of right and left knobs are available to give us the finest reception, regardless of the demands of the region through which we are driving and regardless of the tonal balance required of the program to which we may be listening.

MODEL 35
Schematic, Voltage
Sensitivity, Alignment

GALVIN MFG. CO.

ALL VOLTAGE ANALYSIS READINGS MADE WITH A BATTERY VOLTAGE OF 6.3 VOLTS.



GALVIN MFG. CORPORATION
CHICAGO ILL.
CIRCUIT DIAGRAM OF MODEL 35

IF PEAKED AT 262 KC

DUMMY ANTENNA - 200 MMF condenser in Series and 500000 Ohm Resistor in Shunt with Generator.

PEAK OSCILLATOR AT 1600 KC
PAD OSCILLATOR AT 600 KC
PEAK RF CIRCUITS AT 1400 KC

MODEL 35

	AVERAGE MICROVOLT INPUT	GEN. FEEDER CONNECTED TO GRID OF -	GENERATOR SET AT	OUTPUT METER ACROSS VOICE COIL
Plate voltage 210	30,000	- 78	262 K.C.	Voice coil resistance is 3 ohms—
Screen voltage 65	2,000	- 6A7	262 K.C.	
Bias voltage for R.F. tubes 3.5	2,000	- 6A7*	600 K.C.	1.73 Volts equals 1 Watt output
Bias voltage for 75 tube 1.0	70	- 78*	600 K.C.	
Bias voltage for 41 tube 16	3.5	- Ant.	600 K.C.	
Delay voltage 1.0				

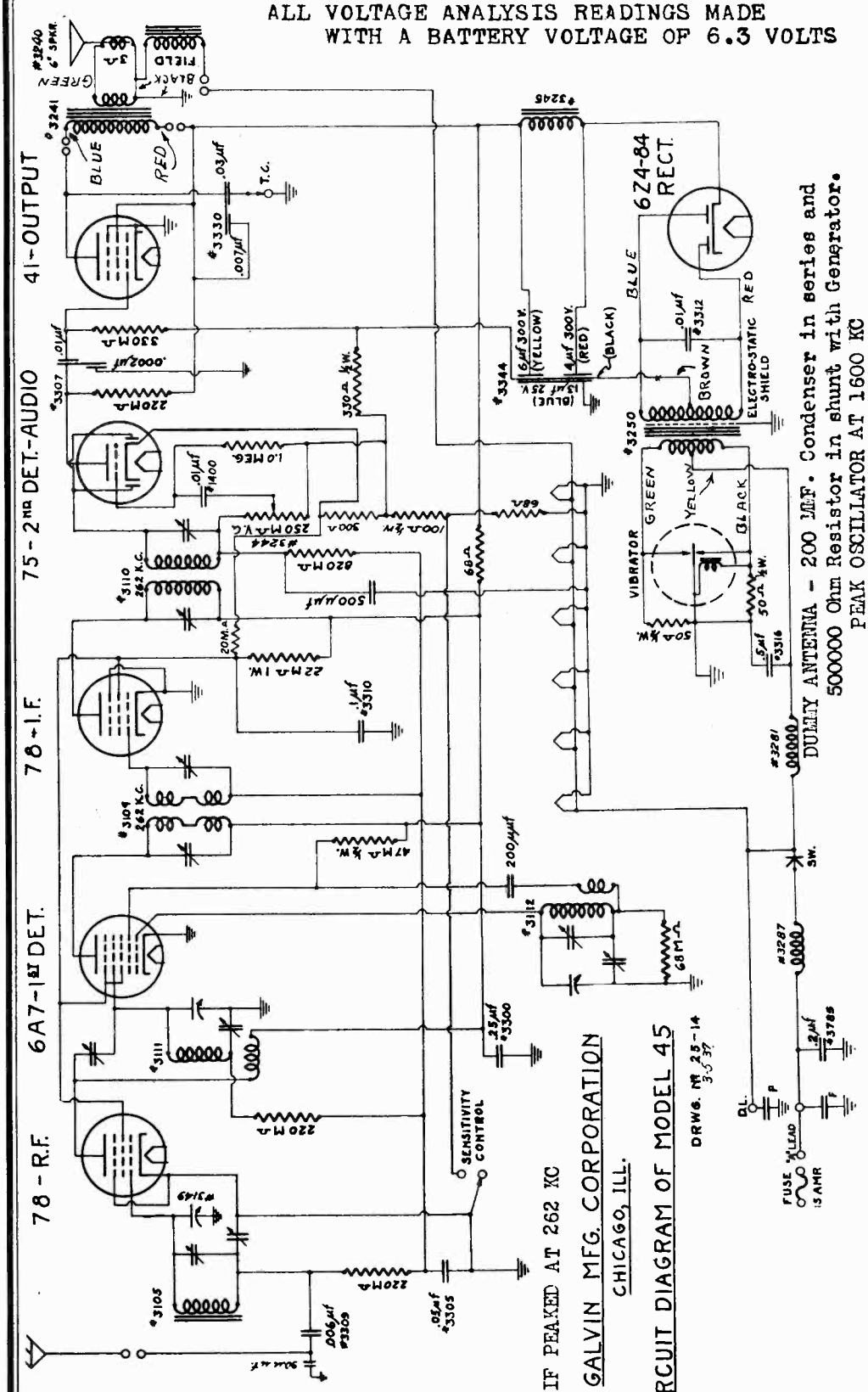
Current drain ..... 5.75 amps.

*Microvolt input may be 10 to 20% more at 600 K.C. than at 262 K.C. This is due to normal conversion loss in the Translator tube. If greater, replace Translator tube.

MODEL 45
Schematic, Voltage
Sensitivity, Alignment

GALVIN MFG. CO.

ALL VOLTAGE ANALYSIS READINGS MADE
WITH A BATTERY VOLTAGE OF 6.3 VOLTS



MODEL 45

		AVERAGE	GEN. FEEDER	OUTPUT METER
		MICROVOLT	CONNECTED	ACROSS
		INPUT	TO GRID OF	VOICE COIL
Plate voltage	210	15,000	- 78	262 K.C.
Plate on output tube	210	500	- 6A7	262 K.C.
Screen voltage	65	500	- 6A7*	600 K.C.
Bias voltage for R.F. tubes	3.5	50	- 78*	600 K.C.
Bias voltage for 75 tube	1.0	-	- Ant.	600 K.C.
Bias voltage for 41 tube	16			
Delay voltage	1.0			
Current Drain	6.00 amps.	1.5		

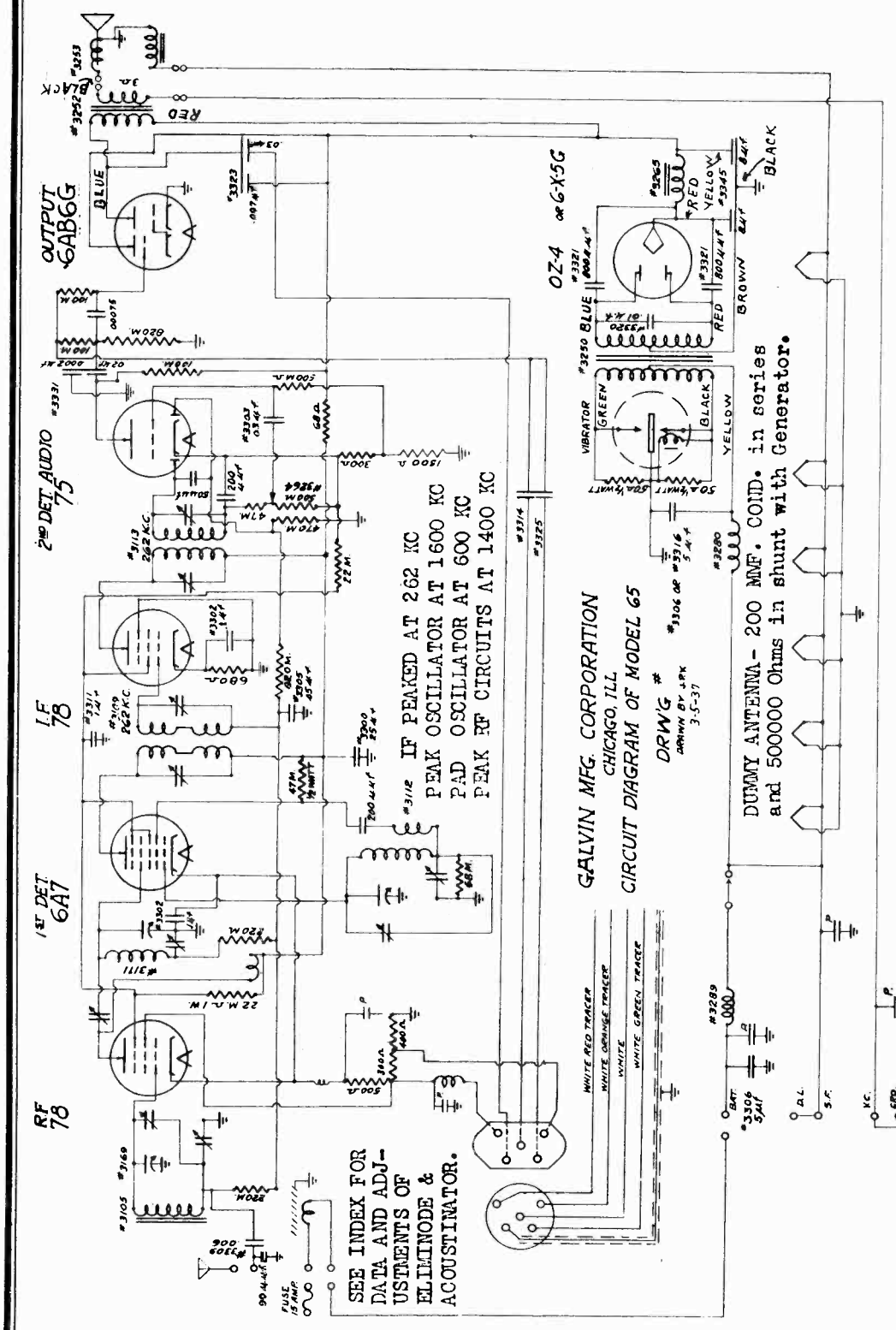
Voice coil resistance is 3 ohms

1.73 Volts equals 1 Watt output

GALVIN MFG. CO.

MODEL 65
Schematic, Voltage
Sensitivity, Alignment

ALL VOLTAGE ANALYSIS READINGS MADE WITH A BATTERY VOLTAGE OF 6.3 VOLTS.



MODEL 65

Plate voltage	220
Plate on output tube	210
Screen voltage	65
Bias voltage for R.F. tubes	3.5
Bias voltage for 75 tube	1.0
Bias voltage for 6AB6G tube	0.0
Delay voltage	1.0
Current drain	6.40 amps.

AVERAGE MICROVOLT INPUT	GEN. FEEDER CONNECTED TO GRID OF	MODEL 65 GEN. SET AT	OUTPUT METER ACROSS VOICE COIL
15,000	78	262 K.C.	Voice coil resistance is 3 ohms—
500	6A7	262 K.C.	
500	6A7*	600 K.C.	
50	78*	600 K.C.	1.73 Volts equals
1.5	Ant.	600 K.C.	1 Watt output

MODEL 70
Schematic, Voltage
Sensitivity, Alignment

GALVIN MFG. CO.

PEAK OSCILLATOR AT 1600 KC
PAD OSCILLATOR AT 600 KC
PEAK RF CIRCUITS AT 1400 KC

DUMMY ANTENNA - 200 MMF. Condenser in series and 500000 Ohm Resistor in shunt with the Generator.

ALL VOLTAGE ANALYSIS READINGS MADE WITH A BATTERY VOLTAGE OF 6.3 VOLTS.

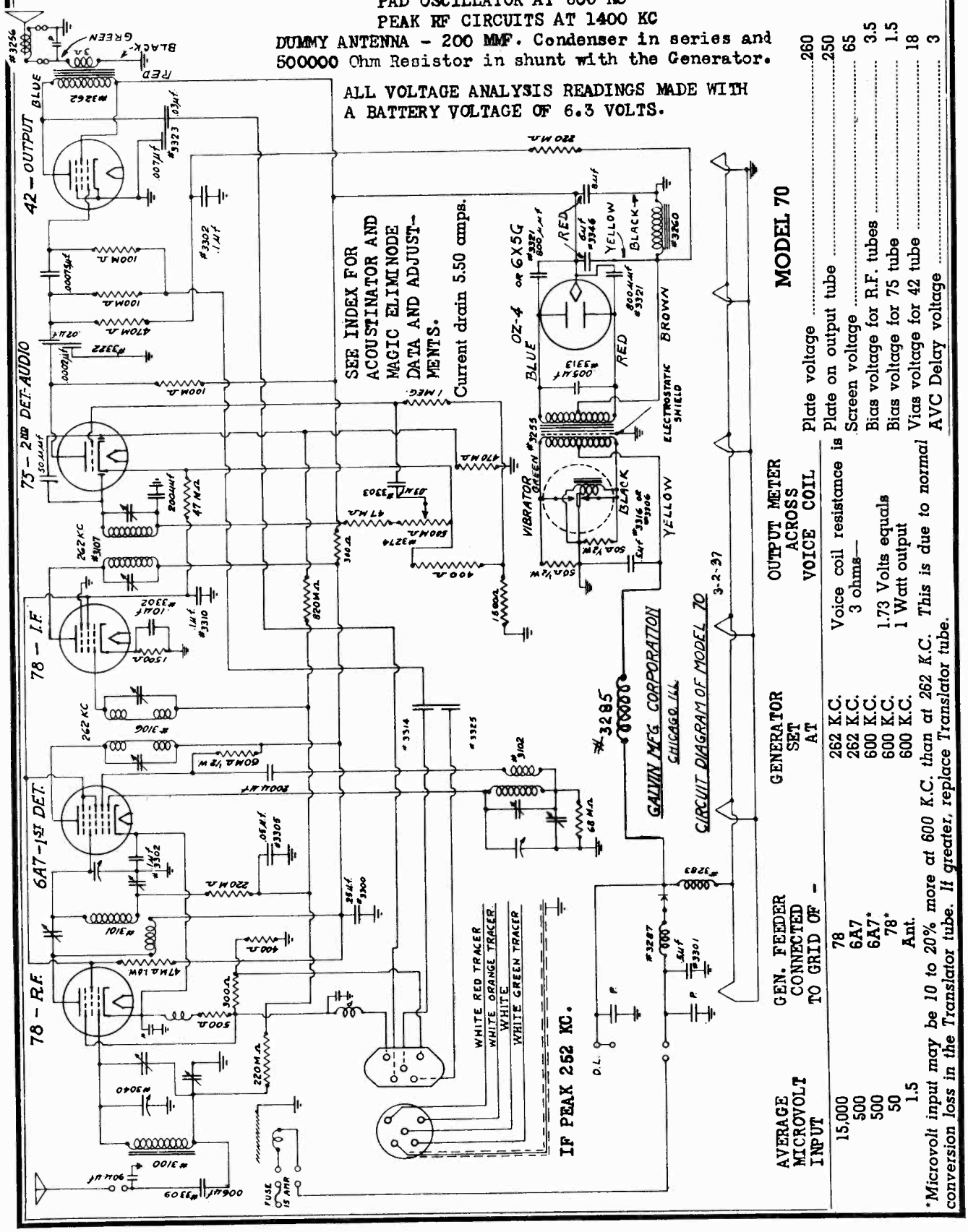


Plate voltage	260
Plate on output tube	250
Screen voltage	65
Bias voltage for R.F. tubes	3.5
Bias voltage for 75 tube	1.5
Vias voltage for 42 tube	18
AVC Delay voltage	3

OUTPUT METER ACROSS VOICE COIL

Voice coil resistance is 3 ohms

GENERATOR SET AT	GEN. FEEDER CONNECTED TO GRID OF -	AVERAGE MICROVOLT INPUT
262 K.C.	78	15,000
262 K.C.	6A7	500
600 K.C.	6A7*	500
600 K.C.	78*	50
600 K.C.	Ant.	1.5

1.73 Volts equals 1 Watt output

*Microvolt input may be 10 to 20% more at 600 K.C. than at 262 K.C. This is due to normal conversion loss in the Translator tube. If greater, replace Translator tube.

GAMBLE-SKOGMO, INC.

MODEL 6C1
Schematic
Data

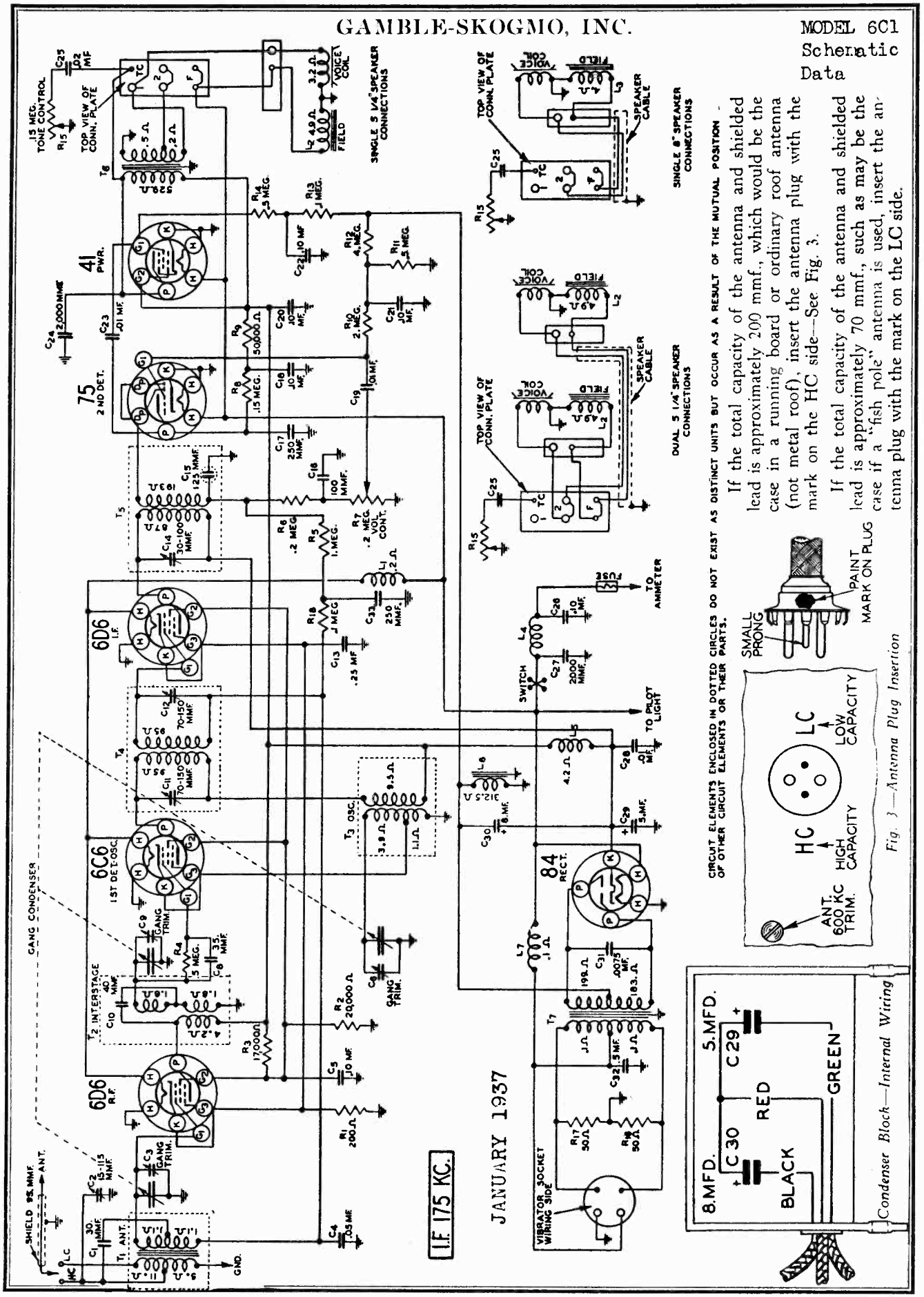


Fig. 3—Antenna Plug Insertion

Condenser Block—Internal Wiring

If the total capacity of the antenna and shielded lead is approximately 200 mmf., which would be the case in a running board or ordinary roof antenna (not metal roof), insert the antenna plug with the mark on the HC side—See Fig. 3.

If the total capacity of the antenna and shielded lead is approximately 70 mmf., such as may be the case if a "fish pole" antenna is used, insert the antenna plug with the mark on the LC side.

I. F. Adjustment

Set the signal generator for a signal of 175 KC.

Connect the output of the signal generator through a .05 mf. condenser to the stator of the R.F. interstage section of the tuning condenser. (See Fig. 2 for location of this section.)

Connect the ground lead of the signal generator to the chassis. The chassis should be in the case.

Set the volume control at the maximum position.

Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.

Then adjust the three I.F. trimmers until maximum output is obtained. The location of these trimmers is shown in Fig. 2.

1581 KC Adjustment

Set the signal generator for 1581 KC.

Turn the rotor of the tuning condenser to the full open position.

Insert the antenna plug with the mark on the high capacity (HC) side. Connect the shielded antenna lead from the chassis through a 120 mmf. condenser to the antenna post of the signal generator.

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.

Adjust the trimmer of the oscillator section of the three gang condenser until maximum output is obtained—see Fig. 2 for location of this trimmer.

1400 KC Adjustment

Set the signal generator for 1400 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the R.F. interstage and antenna 1400 KC trimmers for maximum output.

Do not change the setting of the oscillator trimmer.

600 KC Adjustment

Set the signal generator for 600 KC.

Tune in this signal and adjust the 600 KC antenna trimmer to maximum (See Fig. 3 for location of this trimmer).

After the alignment procedure is completed, the antenna plug may be withdrawn and reinserted on the LC side if a low capacity (70 mmf.) car antenna is used.

Adjusting Antenna 600 KC Trimmer

After the radio is installed and the car antenna is connected, it will be necessary to readjust the antenna trimmer. Tune in a weak signal at approximately 600 KC with the volume control about three-fourths on. Turn the adjusting screw of the antenna 600 KC trimmer up or down until maximum output is obtained. See Fig. 3 for location of this trimmer.

Calibrating the Radio

To calibrate the radio, tune in a station of known frequency. At the back of the control head is the calibration screw. Remove the pilot lamp assembly. Hold the tuning knob. Insert a fine blade screwdriver and turn this screw until the pointer on the dial scale is at the frequency of the station being received.

A very short insulated screwdriver will be helpful.

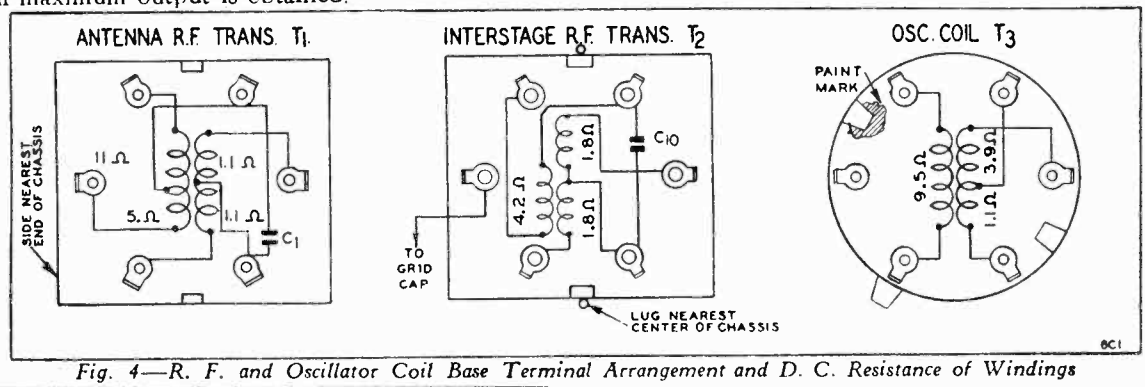


Fig. 4—R. F. and Oscillator Coil Base Terminal Arrangement and D. C. Resistance of Windings

VOLTAGES AT SOCKETS

Battery—6.3 Volts Under Load

Type of Tube	Function	Across Heater	Plate to Ground	Screen to Ground	Cathode to Ground
6D6	R.F.	6.0	245	105	3.2
6C6	1st Det. and Osc.	6.0	243	105	
6D6	I.F.	6.0	245	105	3.2
75	2nd Det.	6.1	127		
41	Power	6.1	230	245	17(1)
84	Rectifier	6.1	600(2)		

(1) Grid bias read across filter choke L6
(2) A.C. voltage across plates

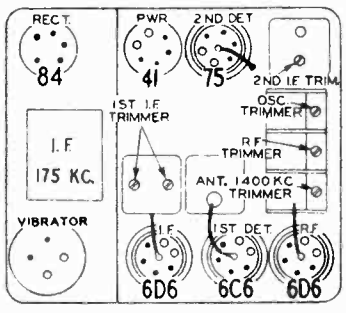
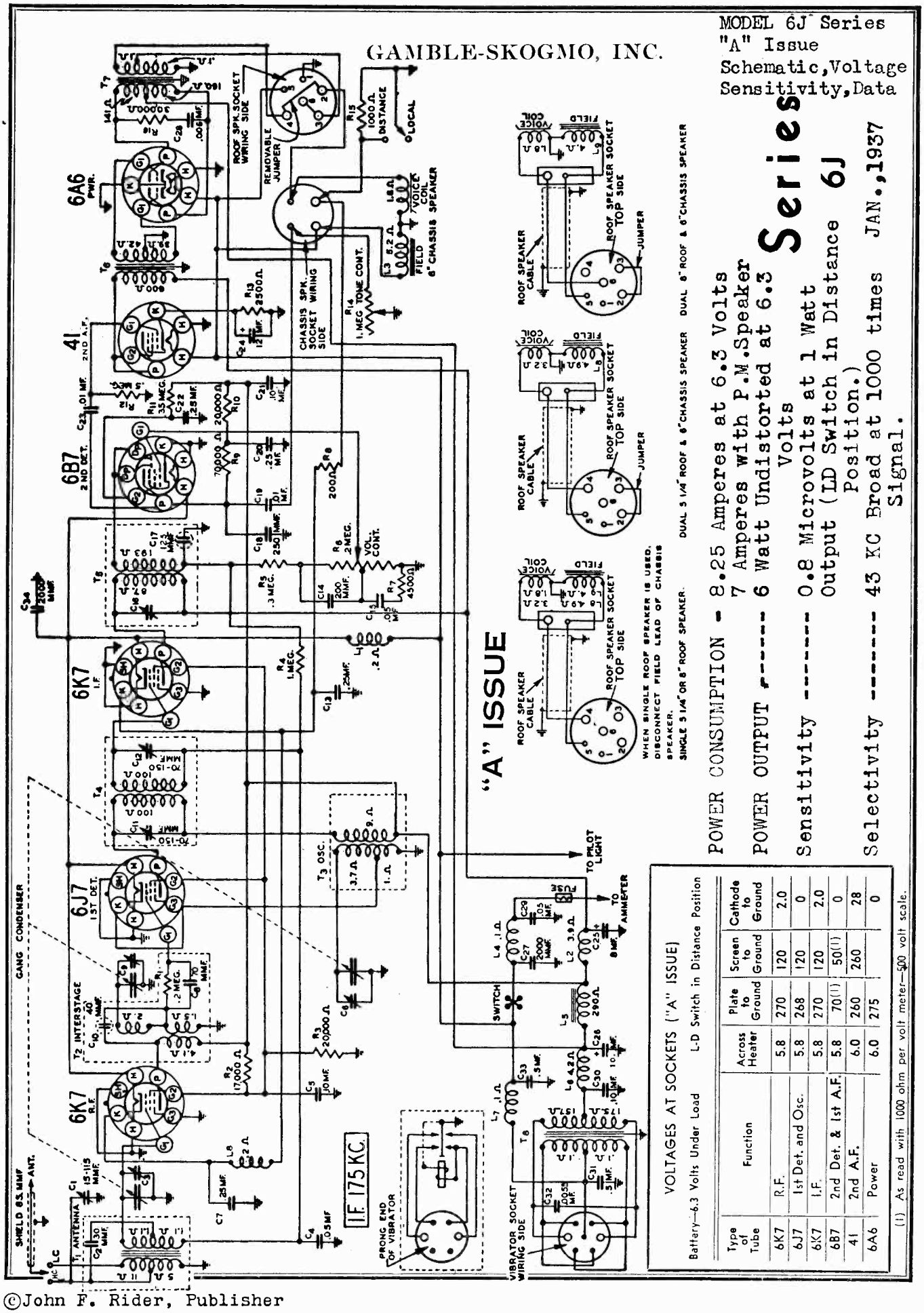


Fig. 2—Location of Tubes and Vibrator



VOLTAGES AT SOCKETS ("A" ISSUE)

Battery—6.3 Volts Under Load L-D Switch in Distance Position

Type of Tube	Function	Across Heater	Plate to Ground	Screen to Ground	Cathode to Ground
6K7	R.F.	5.8	270	120	2.0
6J7	1st Det. and Osc.	5.8	268	120	0
6K7	I.F.	5.8	270	120	2.0
6B7	2nd Det. & 1st A.F.	5.8	70(1)	50(1)	0
41	2nd A.F.	6.0	260	260	28
6A6	Power	6.0	275		0

(1) As read with 1000 ohm per volt meter—500 volt scale.

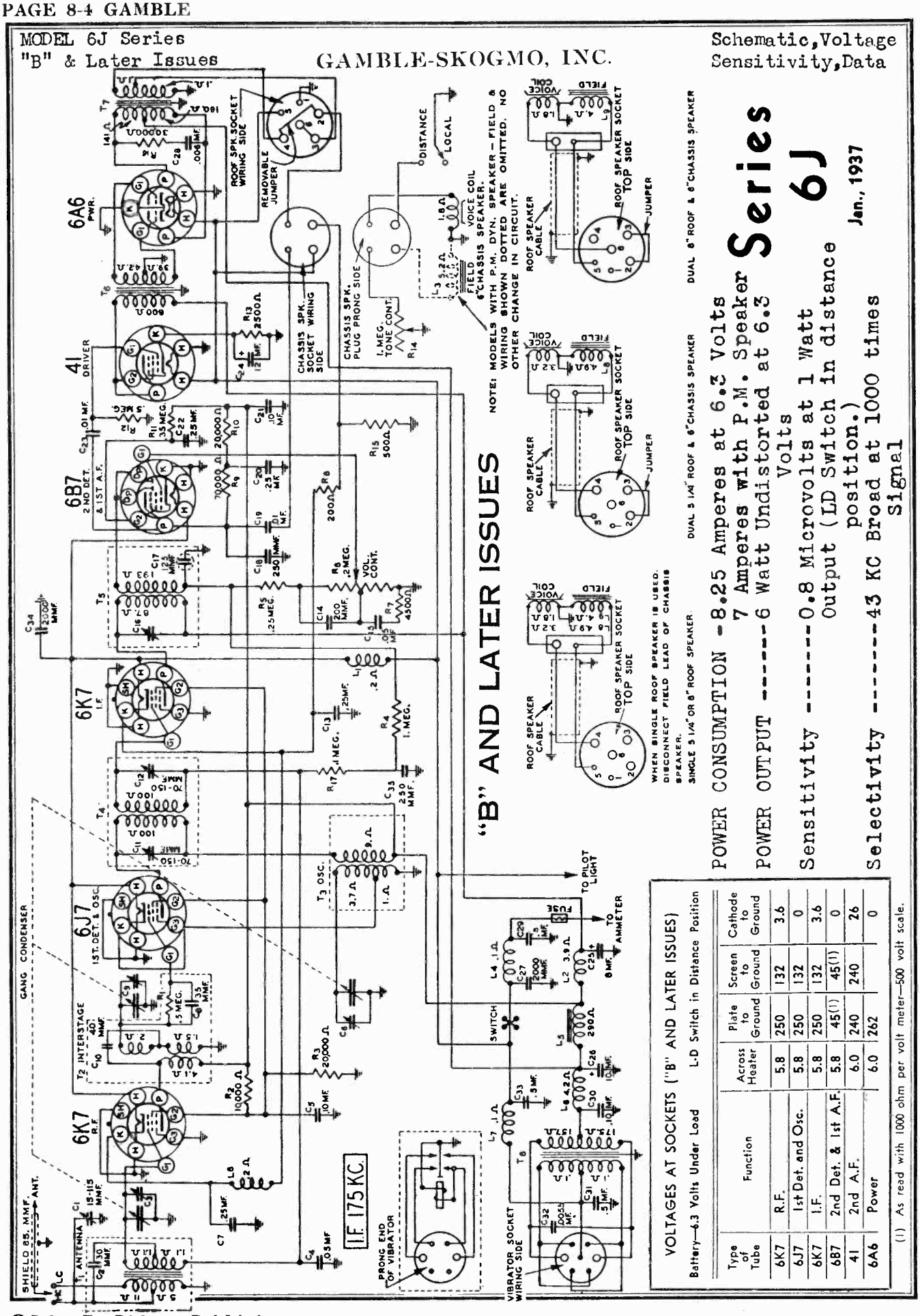
MODEL 6J Series
"B" & Later Issues

GAMBLE-SKOGMO, INC.

Schematic, Voltage
Sensitivity, Data

Series 6J

Jan., 1937



POWER CONSUMPTION - 8.25 Amperes at 6.3 Volts
7 Amperes with P.M. Speaker
POWER OUTPUT ------6 Watt Undistorted at 6.3 Volts
Sensitivity -------0.8 Microvolts at 1 Watt Output (LD Switch in distance position.)
Selectivity -------43 KC Broad at 1000 times Signal

VOLTAGES AT SOCKETS ("B" AND LATER ISSUES)

Battery—6.3 Volts Under Load L-D Switch in Distance Position

Type of Tube	Function	Across Heater	Plate to Ground	Screen to Ground	Cathode to Ground
6K7	R.F.	5.8	250	132	3.6
6J7	1st Det. and Osc.	5.8	250	132	0
6K7	I.F.	5.8	250	132	3.6
6B7	2nd Det. & 1st A.F.	5.8	45(1)	45(1)	0
41	2nd A.F.	6.0	240	240	26
6A6	Power	6.0	262		0

(1) As read with 1000 ohm per volt meter—500 volt scale.

Coils, Socket Trimmers, Data

GAMBLE-SKOGMO, INC.

MODEL 6J Series All Issues

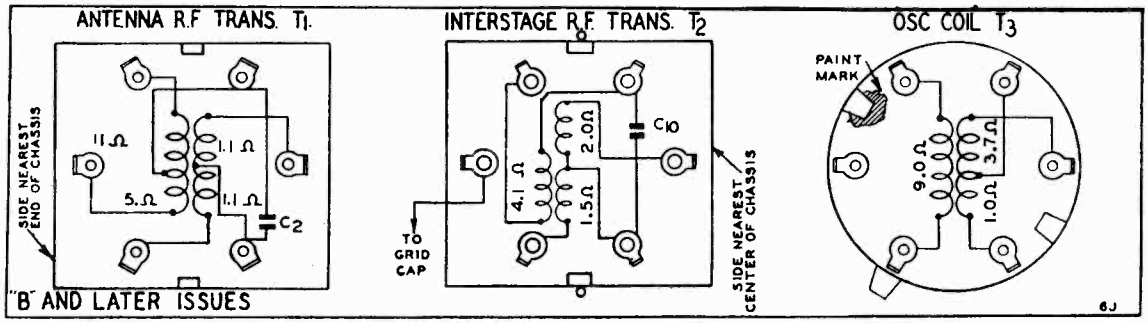


Fig. 4—R.F. and Oscillator Coil Base Terminal Arrangement and D.C. Resistance of Windings

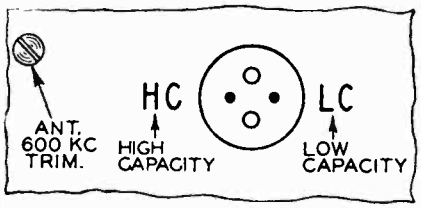
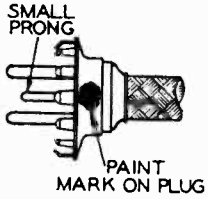


Fig. 5—Antenna Plug Insertion



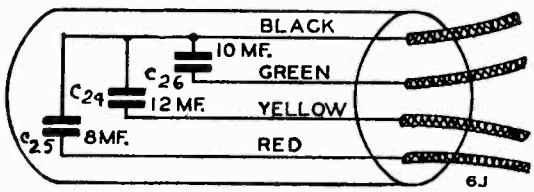


Fig. 6—Electrolytic Condenser Internal Connections

Instrument Panel Mounting Kits

Car	Year & Model	Kit No.
Buick	1937 40-60 Series	21A68
	1937 80-90 Series	21A69
	1936	21A16
Cadillac	1937	21A70
	1936	21A39
Chevrolet	1937 All Models	21A58
	1936-35 Standard & Master	21A11
Chrysler	1937 Royal	21A59
	1937 Imperial	21A71
	1937 Airflow	21A72
	1936 Six	21A19
	1936 Eight	21A30
	1936 Airflow	21A31
	1935-34 Except Imperial	21A47
DeSoto	1937	21A60
	1936 Airflow & Airstream Custom	21A22
	1936 Airstream DeLuxe	21A26
	1935 DeLuxe	21A46
	1934	21A47
Dodge	1937	21A61
	1936 DeLuxe	21A13
	1935	21A45
	1934	21A49

Car	Year & Model	Kit No.
Ford	1937 DeLuxe	21A74
	1937 Standard	21A73
	1936 Std. & DeLuxe	21A10
	1935 DeLuxe	21A10
	1935 Standard	21A32
	1934	21A38
Graham	1937 Cavalier & Supercharger	21A87
	1937 Crusader	21A86
Hudson	1937	21A75
	1936	21A17
	1935	21A48
	1934	21A35
LaFayette	1936-35	21A50
LaSalle	1937	21A89
	1936	21A40
Lincoln	Zephyr 1937	21A76
	Zephyr 1936	21A10
Nash	1937 Ambassador	21A63
	1936-35	21A36
Nash Lafayette 400	1937	21A62
Oldsmobile	1937	21A88
	1936	21A14
	1935	21A34

Car	Year & Model	Kit No.
Packard	Six	21A56
	1937 120-C	21A57
	Super 8 & 12	21A77
	1936 120-B	21A21
	1935 120	21A41
Plymouth	1937 DeLuxe	21A78
	1937 Standard	21A64
	1936 DeLuxe	21A12
	1936-35 Standard	21A37
	1935 DeLuxe	21A33
	1934	21A49
Pontiac	1937	21A79
	1936-35 Standard-DeLuxe 6 & 8	21A15
Studebaker	1937 Dictator Coupe	21A65
	1937 Dictator	21A54
	1937 President	21A55
	1936 Dictator	21A20
	1936 President	21A24
Terraplane	1937	21A80
	1936	21A18
	1935	21A48
	1934	21A35
Steering column and under panel kit.	Chromium	21A66
	Black	21A67

1934, 1935, 1936 and No. 21A67 Steering Column Kits.....Net Price....Ea. $0.60
1937 and No. 21A66 Steering Column Kits.....Net Price....Ea. .75

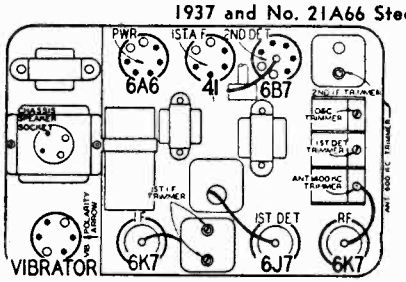


Fig. 3—Location of Tubes and Vibrator

Polarity in inserting the vibrator must be observed. It can be inserted in two ways, and the correct method depends on which terminal of the car storage battery is grounded. Full instructions are on the vibrator.

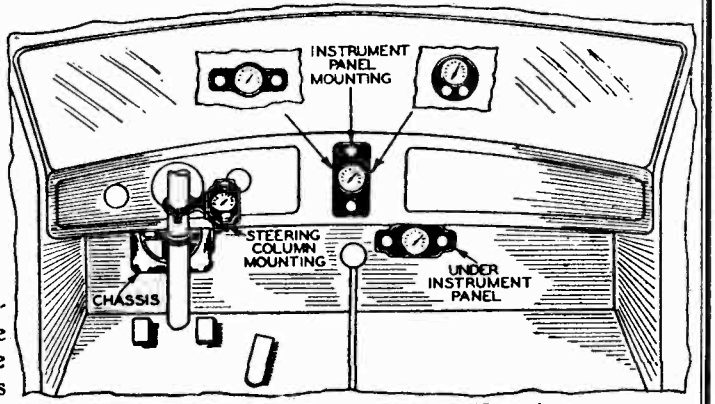


Fig. 7—Various Control Head Mountings

I. F. Adjustment

Set the signal generator for a signal of 175 KC.

Connect the output of the signal generator through a .05 mf. condenser to the stator of the 1st detector section of the tuning condenser. (See Fig. 3 for location of this section.)

Connect the ground lead of the signal generator to the chassis. The chassis should be in the case.

Set the volume control at the maximum position.

Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.

Then adjust the three I.F. trimmers until maximum output is obtained. The location of these trimmers is shown in Fig. 3.

1581 KC Adjustment

Set the signal generator for 1581 KC.

Turn the rotor of the tuning condenser to the full open position.

Insert the antenna plug with the mark on the high capacity (HC) side. Connect the shielded antenna lead from the chassis through a 120 mmf. condenser to the antenna post of the signal generator.

For this and all subsequent adjustments, keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.

Adjust the trimmer of the oscillator section of the three gang condenser until maximum output is obtained—see Fig. 3 for location of this trimmer.

1400 KC Adjustment

Set the signal generator for 1400 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the 1st detector and antenna 1400 KC trimmers for maximum output.

Do not change the setting of the oscillator trimmer.

600 KC Adjustment

Set the signal generator for 600 KC.

Tune in this signal and adjust the 600 KC antenna trimmer to maximum. (See Fig. 5 for location of this trimmer).

After the alignment procedure is completed, the antenna plug may be withdrawn and reinserted on the LC side if a low capacity (70 mmf.) car antenna is used.

Adjusting Antenna 600 KC Trimmer

After the radio is installed and the car antenna is connected, it will be necessary to readjust the antenna trimmer. Tune in a weak signal at approximately 600 KC with the volume control about three-fourths on. Turn the adjusting screw of the antenna 600 KC trimmer up or down until maximum output is obtained. See Fig. 5 for location of this trimmer.

Calibrating the Radio

To calibrate the radio, tune in a station of known frequency. At the back of the control head is the calibration screw. Remove the pilot lamp assembly. Hold the tuning knob. Insert a fine blade screwdriver and turn this screw until the pointer on the dial scale is at the frequency of the station being received

Inserting Antenna Plug

IMPORTANT—The antenna plug can be inserted in two ways depending on whether the antenna is of high or low capacity.

If the total capacity of the antenna and shielded lead is approximately 200 mmf., which would be the case in a running board or ordinary roof antenna (not metal roof), insert the antenna plug with the mark on the HC side—See Fig. 5.

If the total capacity of the antenna and shielded lead is approximately 70 mmf., such as may be the case if a "fish pole" antenna is used, insert the antenna plug with the mark on the LC side.

The 1936 Chrysler Motors cars (except Plymouth —but including Chrysler, Dodge and DeSoto) have a steel roof, separated from the body proper, which is used as an antenna. The capacity of these antennas is about 1500 mmf. If this radio is installed in these cars, it will be necessary to use a running board or "fish pole" antenna.

Most 1937 General Motors cars are equipped with an antenna built into the running board which is insulated from the body proper.

If a running board or under-car antenna is used, it must be one which is covered with a suitable insulation, to prevent short circuiting in wet weather.

Changes in Later Models

The "B" and later issues of this series have changes incorporated in them as explained in this article. The issue letter is a large letter stamped on the chassis base.

The "B" and later issue models are different from the "A" issue models in the following respects: The antenna, interstage and oscillator assemblies have been redesigned; condensers C13, 21, 22, and 32 have been changed to a different type with a new part number; the value of condenser C8 has been changed from 70 mmf. to 35 mmf.; condenser C35, 250 mmf., has been added to the circuit. On radios with the

Roof Speaker and Dual Speakers

(1936 Cars)

The Ford and General Motors 1936 automobiles have provision for mounting a speaker in the car roof (Ford 5¼ inch speaker, General Motors 5¼ or 8 inch speaker). This radio is so designed that roof speaker installations in these cars can readily be made.

Five types of speaker installations can be made as follows:

Single 6 inch Speaker on Chassis Case Cover
Single 5¼ inch Roof Speaker
Single 8 inch Roof Speaker
Dual 5¼ inch Roof and 6 inch Chassis Speakers
Dual 8 inch Roof and 6 inch Chassis Speakers.

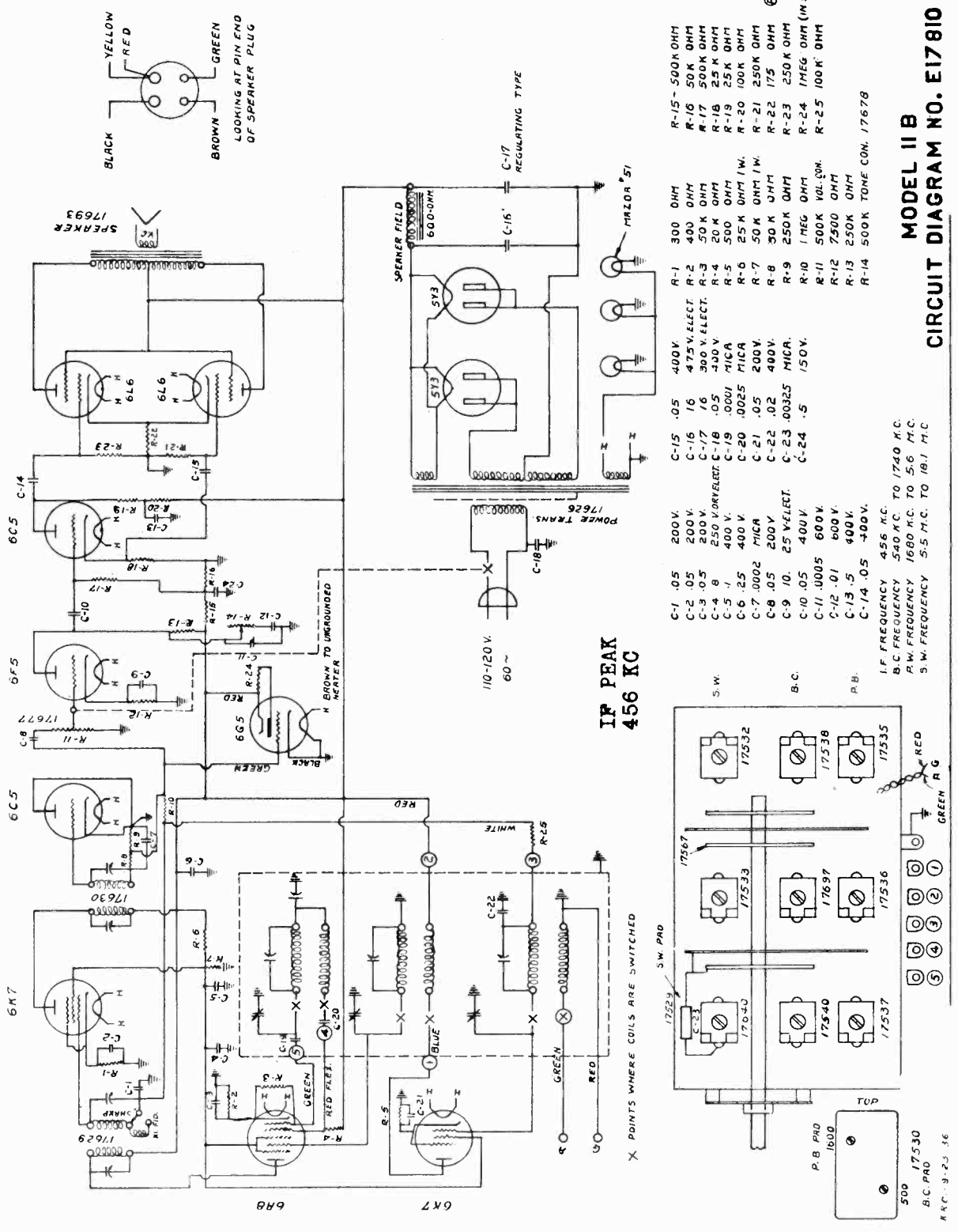
The electrical connections of the different speaker installations are shown in the schematics—Figs. 1 and 2.

Complete information regarding the method of making the installations is in the installation manual packed with each radio. The kits of parts required are listed in the installation manual and in the parts list at the back of this manual.

GAMBLE-SKOGMO, INC.

MODEL 11B
Schematic
Trimmers, Change

TUBE FUNCTIONS: 6-K-7 RF Stage on all bands, 6-A-8 Oscillator-First detector, 6-K-7 Intermediate amplifier, 6-C-5 Diode second detector, 6-F-5 first audio, 6-C-5 Phase inverter, 2 6-L-6 in push-pull class A Beam power amplifiers, 2 5-Y-3 as rectifiers, 6-G-5 Tuning indicator.



MODEL 11B
Alignment
Voltage,Data

GAMBLE-SKOGMO, INC.

IF ALIGNMENT. If all parts and tubes check OK and sensitivity is low on all bands it is probably due to IF being out of adjustment. It is necessary to use a test oscillator or signal generator having accurate calibration and positive attenuation. Proceed as follows:

IF ALIGNMENT. Put wave switch in B. C. position, tone control in normal (not high fidelity), open tuning condenser, connect signal generator to Grid of 6-A-8 tube leaving present cap in place. A small condenser .002-.01 should be used in series with the signal generator lead. Set the signal generator at exactly 456 K. C. and adjust the trimmers in the top of the IF cans, going over them several times and reducing the output of the signal generator as the sensitivity increases, do not reduce by the volume control on the set. The 6-G-5 "Eye" may be watched to indicate "peak" or an output meter may be used, connected across the speaker.

HIGH FREQUENCY ALIGNMENT. This should not be changed unless all other possible defects are eliminated and the set still does not perform properly.

BROADCAST: Connect signal generator to Ant. post thru .0002 condenser. Trim oscillator at 1750 K. C. and pad at 535 K. C. See drawing on circuit diagram for location of trimmer and padding condensers. Trim B. C. Ant. and R. F. coils at 1400 K. C.

POLICE BAND. Trim oscillator at 5.6 M. C. and pad at 1.7 M. C. Trim Ant. and R. F. coils at 4.5 M. C.

SHORT WAVE. Use 400 ohms in series with the signal generator. Trim oscillator at 18 M. C. The pad is fixed so that the low frequency end point is approximately 5.5 M. C. Care should be taken to be sure that the oscillator is trimmed for reception of the fundamental frequency. With the tuning condenser set at the high frequency end, and the signal generator set at 18 M. C., two settings of the oscillator trimmer will be found to give response—one fairly tight and the other, loose—the loose one is the correct setting.

Trim the ant. and R. F. coils on 15 M. C., retuning the tuning condenser to compensate for reaction on the oscillator.

TUNING BELT SLIPPING: Usually due to:

1. Idler spring too loose.
2. Belt worn or stretched.
3. Condenser thrust bearing too tight or not lubricated.
4. Defective gear on condenser.

If the belt only slips slightly it can usually be remedied by applying a small amount of "belt dressing" such as used in machine shops, to the belt while the knob is turned through the entire range. Care should be used to not get too heavy a coating which will build up the pulleys. Idler spring tension may be increased by cutting off about one quarter inch of the spring and forming a new loop on the end. A worn or badly stretched belt should of course be replaced. A tight thrust bearing should be very carefully adjusted, usually one eighth turn to the left on the adjusting screw will be sufficient. A gear may stick due to dirt in the teeth, but if a tooth is damaged, the gear should be replaced, making sure that the floating gear is turned about two "teeth" against the spring to eliminate back lash.

REPLACING DIAL SCALE. Should the dial scale be broken in shipment, or for any reason need to be replaced, care should be taken to see that: the plate that holds the glass is not bent, that the glass lays "flat" on the plate, that there is clearance around the pointer shaft, and that rubber bands are in place on the hold down clamps.

Voltage Readings at 115 volt A. C. Line

ANTENNA OFF — NO SIGNAL

		Plate	*Screen*	*Cathode*	*Other*
6K7 RF		250	80	2	Fil. 6.1
6A8 OSC		250	80	2.2	Anode 170
6K7 IF		250	80	2	
6C5 Diode		0		0	
6F5 1st AF	250V. Scale	65		1	
6C5 Inverter	250V. Scale	110		30	
6L6 Power		245	250	16	
5Y3 Rect.		330AC			Fil. 4.9

Input to Speaker Field 340V.

All voltages read from ground except rect. fil. and taken with a 1000 ohm per volt meter. Voltages may vary plus or minus 10 due to tolerances in tubes, resistors, etc., without affecting performance.

MODEL 42DL670
Schematic
Sensitivity

GAMBLE-SKOGMO, INC.

Power Consumption - 170 Watts (At 115 volts 60 cycles)

Power Output - - - - - - 20 Watts Undistorted

Selectivity - 19 KC Broad at 1000 times Signal (Sharp)

Intermediate Frequency - - - - - - - 456 KC.

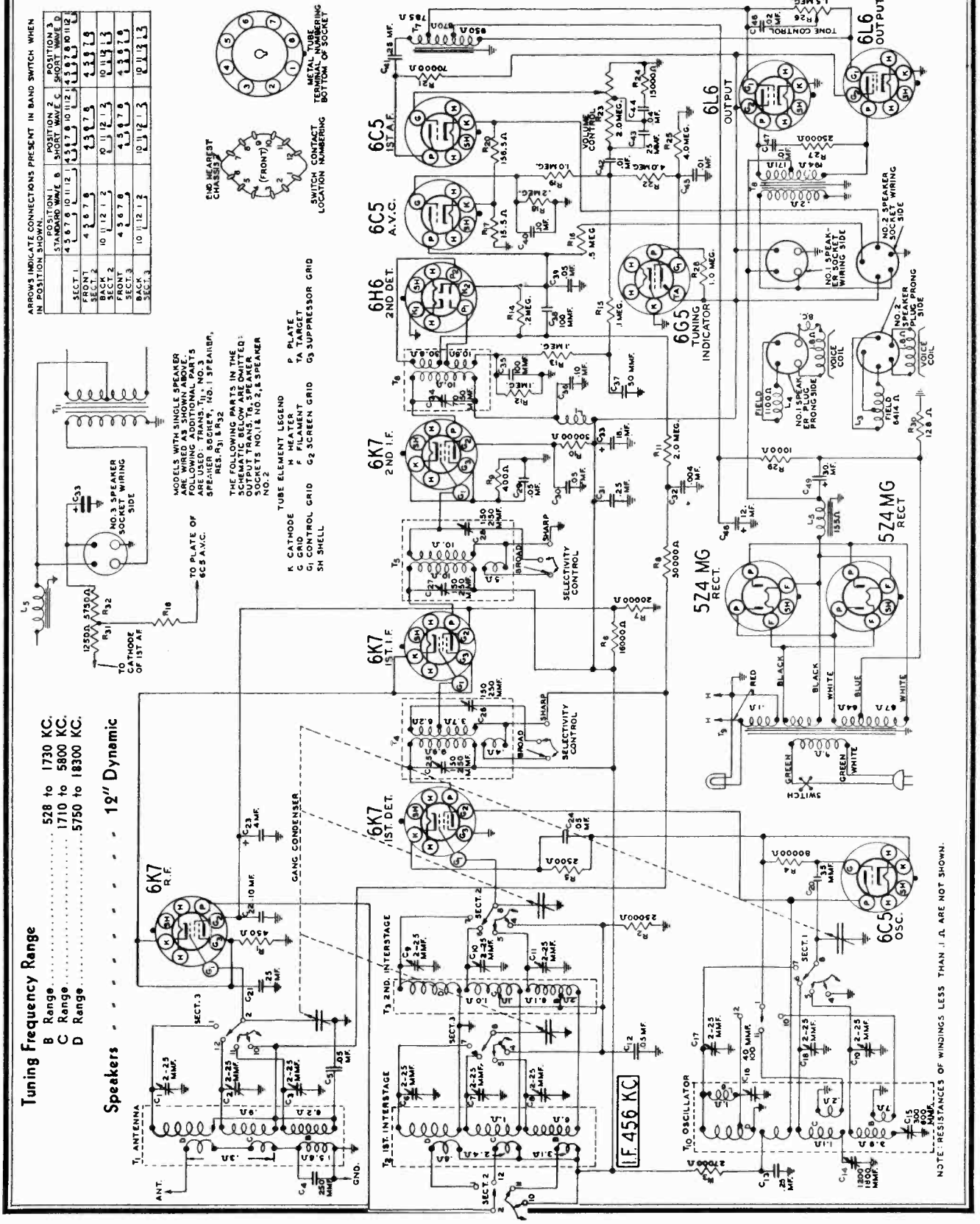
Sensitivity

B Range.....1.0 Microvolt Absolute
C Range.....0.5 to 3 Microvolts Absolute
D Range.....1.0 to 5 Microvolts Absolute

Tuning Frequency Range

B Range.....528 to 1730 KC.
C Range.....1710 to 5800 KC.
D Range.....5750 to 18300 KC.

Speakers - - - - - - - - - 12" Dynamic



ARROWS INDICATE CONNECTIONS PRESENT IN BAND SWITCH WHEN IN POSITION SHOWN

	POSITION 1 STANDARD WAVE B	POSITION 2 SHORT WAVE C	POSITION 3 SHORT WAVE D
SECT. 1	4 5 6 7 8 9 10 11 12	4 5 6 7 8 9 10 11 12	4 5 6 7 8 9 10 11 12
FRONT SECT. 2	4 5 6 7 8 9 10 11 12	4 5 6 7 8 9 10 11 12	4 5 6 7 8 9 10 11 12
BACK SECT. 2	10 11 12 1 2 3 4 5 6 7 8	10 11 12 1 2 3 4 5 6 7 8	10 11 12 1 2 3 4 5 6 7 8
FRONT SECT. 3	4 5 6 7 8 9 10 11 12	4 5 6 7 8 9 10 11 12	4 5 6 7 8 9 10 11 12
BACK SECT. 3	10 11 12 1 2 3 4 5 6 7 8	10 11 12 1 2 3 4 5 6 7 8	10 11 12 1 2 3 4 5 6 7 8

MODEL 42DL670
Socket, Trimmers
Coils, Phono Data

GAMBLE-SKOGMO, INC.

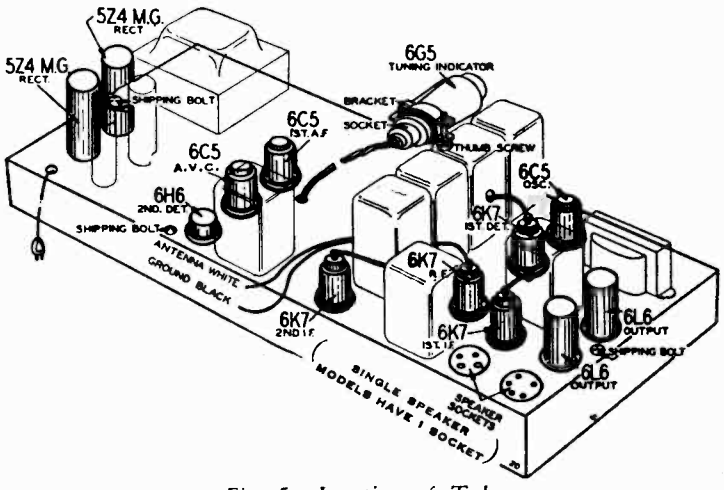


Fig. 5—Location of Tubes

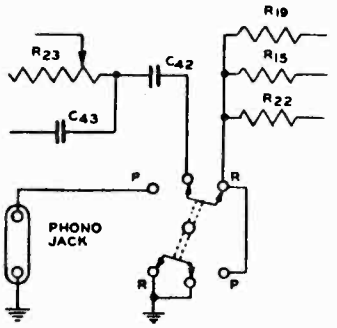


Fig. 7—Phonograph Connections

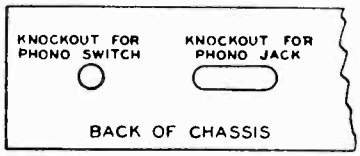


Fig. 8—Location of Phono Knockouts

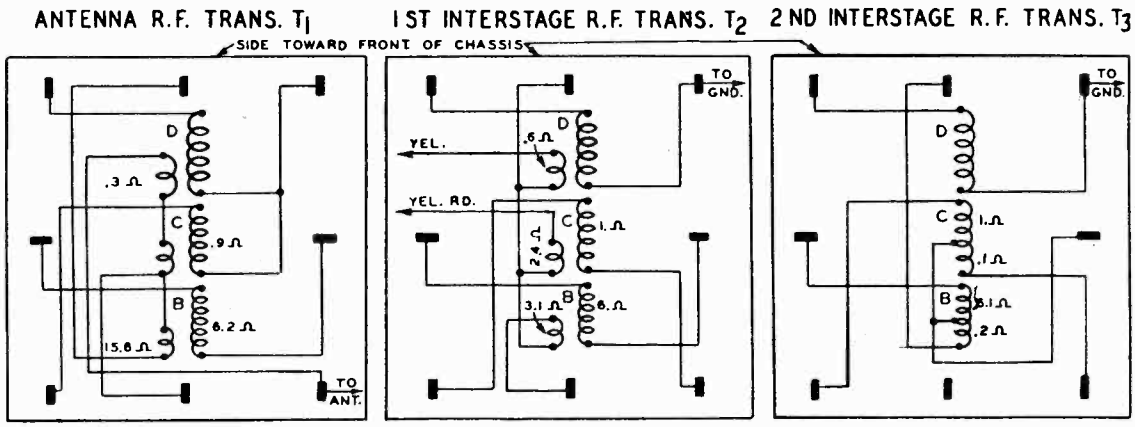
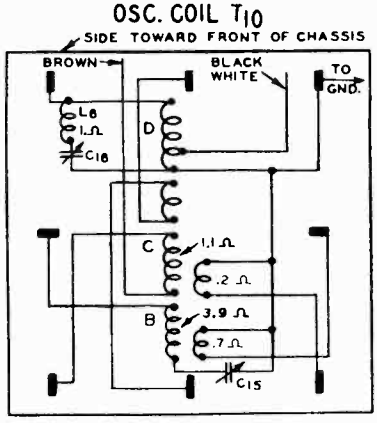


Fig. 6—R.F. and Oscillator Coil Base Terminal Arrangement and D.C. Resistance of Windings



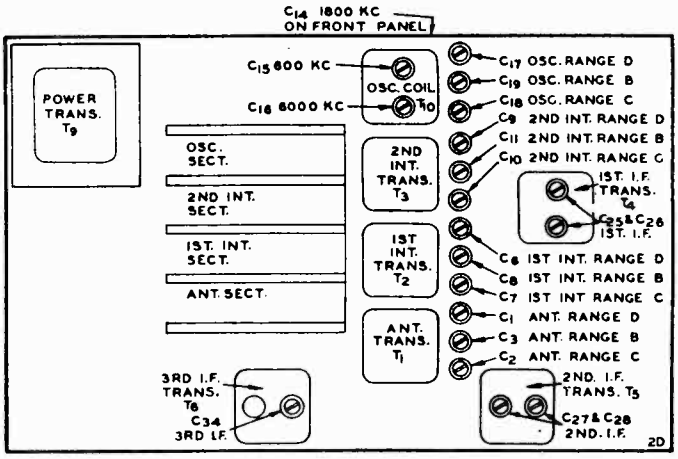


Fig. 3—Location of Trimmers

I. F. Adjustment

Set the signal generator for a signal of 456 KC.

Connect the output of the signal generator through a .1 mf condenser to the grid of the 1st detector.

Connect the ground lead of the receiver to the ground post of the signal generator.

Turn the band switch to the Range B position (standard wave band).

Turn the selectivity control to the sharp position and keep it in this position for all adjustments.

Turn the volume control to the maximum position.

Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.

Then adjust the five I.F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis and the location is shown in Fig. 3.

Range B Alignment

After the procedure for the alignment of each range, as explained below, is completed, it is advisable to repeat the procedure as a final check.

1730 KC Adjustment

Set the signal generator for 1730 KC.

Turn the rotor of the tuning condenser to the full open position.

Keep the band switch in the standard wave position.

Connect the antenna lead of the receiver through a 200 mmf. condenser to the output of the signal generator.

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.

Adjust the oscillator Range B trimmer (C19) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

1500 KC Adjustment

Set the signal generator for 1500 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

In sets using pointers, loosen the screw of the large pointer and set the pointer at the 1500 KC mark on the standard wave band scale. Retighten the screw.

In sets using the moving beam of light, there is moving light assembly held to the front of the drive drum by means of a screw. Loosen this screw and move the light assembly until it is at the 1500 KC mark on the dial. Retighten the screw.

Adjust the 1st and 2nd interstage Range B trimmers (C8 and C11) and antenna Range B trimmer (C3) to maximum.

Do not change the setting of the oscillator Range B trimmer.

600 KC Adjustment

Set the signal generator for 600 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 600 KC trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Range C Alignment

CAUTION—When aligning the short wave bands be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 5000 KC. The signal will then be heard at 5000 KC on the dial of the radio. The image signal, which is much weaker, will be heard at 5000 less 912 KC, or 4088 KC. It may be necessary to increase the input signal to hear the image.

5800 KC Adjustment

Set the signal generator for 5800 KC.

Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range C position (first short wave band).

Adjust the oscillator Range C trimmer (C18) until maximum output is obtained. See Fig. 3 for location of this trimmer.

5000 KC Adjustment

Set the signal generator for 5000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the 1st and 2nd interstage Range C trimmers (C7 and C10) and antenna Range C trimmer (C2) to maximum.

Do not change the setting of the oscillator Range C trimmer.

1800 KC Adjustment

Set the signal generator for 1800 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 1800 KC trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Range D Alignment

18,300 KC Adjustment

Set the signal generator for 18,300 KC.

Keep the antenna lead of the receiver connected through the 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range D position (second short wave band).

Adjust the oscillator Range D trimmer (C17) until maximum output is obtained. See Fig. 3 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the 1st and 2nd interstage Range D trimmers (C6 and C9) and antenna Range D trimmer (C1) to maximum.

When adjusting the 2nd interstage Range D trimmer, it will be necessary at the same time to turn the tuning condenser rotor slowly back and forth until the peak of greatest intensity is obtained.

Do not change the setting of the oscillator Range D trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 6000 KC trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Trimmer Replacement

If one trimmer of the gang trimmer strip should become defective, it is not necessary to replace the entire strip. A single trimmer P-17A36, as shown in the replacement parts list, may be used. Disconnect the lead from the coil side (side not grounded) of the defective trimmer in the strip. This connection is then made to the single trimmer. Connect it to the side of the trimmer not in contact with the adjusting screw. The other side of the single trimmer is then connected to a good ground, using a piece of heavy wire in order to support the trimmer adequately. In replacing a trimmer, be sure to keep both leads as short as possible and keep the ungrounded lead as far from ground as possible.

Planetary Drive Assembly

The planetary assembly is the unit that is integral with the tuning shaft.

If the nut on the back end of this assembly is too tight, the drive will be jerky and will turn hard in high speed. If this condition exists, back off this nut one or two turns and note the effect.

If this nut is too loose, the drive will slip in slow speed. The remedy in this case, of course, is to tighten the nut.

Should the condenser drive cord slip when the planetary pulley is turning, inspect the tuning condenser, drive drum and gears to see if they are turning properly or if they are being obstructed in some way.

If the drive turns unevenly (rough in spots), this may mean that the planetary assembly is defective or damaged internally and a new unit will be required.

Phonograph Connections

Phonograph connections can be made as shown in Fig. 7. The parts required as shown in the parts list. Knockouts are provided in the back of the chassis for mounting the phono jack and phono switch—See Fig. 8.

The phono switch should be mounted with one set of terminals nearest the bottom of the chassis base.

The connections are made by opening the diode return circuit at the volume control. This is done by removing the wire connecting condenser C42 to resistors R15, R19 and R22, at the terminal strip located near the back of the planetary drive. Cut this wire to correct length and solder it to the proper terminal on the phono switch—See Fig. 7, keeping the wire close to the back of the chassis base.

A wire is then connected from the lug on the above mentioned terminal strip to which C42 was connected, to the correct terminal on the phono switch—See Fig. 7. This wire should be brought directly to the back of the chassis at a point close to the phono jack pin tip nearest the channel provided for a chassis mounting bolt, and then routed over to the switch.

Complete the other connections as illustrated in Fig. 7.

It will be necessary to re-route the AC line cord away from the 6C5 1st audio grid lead by running it between the volume control and the filter choke and then straight back to the hole provided for it in the chassis base.

If a hum is heard when the phono pickup is touched, reverse the two pickup leads.

Twenty-five Cycle Models

The twenty-five cycle receiver differs from the sixty cycle receiver only in the fact that a different power transformer is used. The correct power transformer is shown in the parts list.

The twenty-five cycle receiver can be operated satisfactorily from a sixty cycle power supply. However, the reverse is not true, the sixty cycle receiver cannot be operated from a twenty-five cycle power supply.

A 115-230 volt, 40 to 60 cycle as well as other power transformers with special power ratings are also available for this model.

Line Voltage: 115
Volume Control: Maximum

Antenna Shorted to Ground
Position of Band Switch: Standard Wave

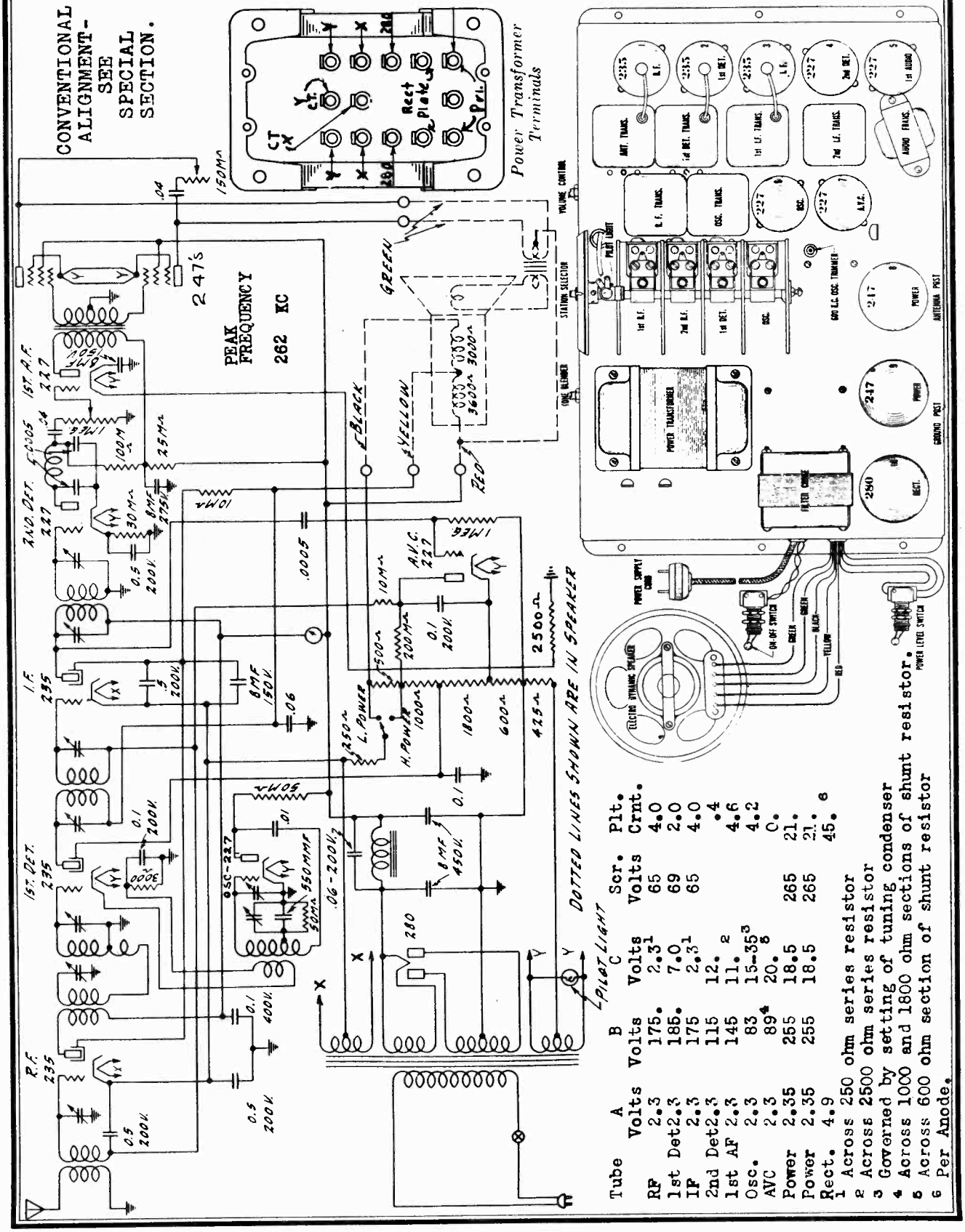
TUBE	FUNCTION	VOLTAGE BETWEEN SOCKET PRONGS AND GROUND (unless otherwise indicated)							
		Prong No. 1	Prong No. 2	Prong No. 3	Prong No. 4	Prong No. 5	Prong No. 6	Prong No. 7	Prong No. 8
6K7	R.F.	0	6.2(1)	250	110	7.5(2)		6.2(1)	7.5(2)
6K7	1st Det.	0	6.2(1)	250	110			6.2(1)	9.0
6C8	Osc.	0	6.2(1)	110				6.2(1)	
6K7	1st I.F.	0	6.2(1)	250	110	7.5		6.2(1)	7.5(2)
6K7	2nd I.F.	0	6.2(1)	250	145	8(2)		6.2(1)	8.0
6H6	2nd Det.	0	6.2(1)					6.2(1)	
6C8	A.V.C.	0	6.2(1)	8(3)				6.2(1)	8.2
6C8	1st A.F.	0	6.2(1)	130				6.2(1)	6.0
6L6	Power	0	6.2(1)	350	280	20(4)		6.2(1)	
5Z4M@	Rectifier	0	5.0(5)		1024(6)		1024(6)		5.0(5)
6G5	Tuning Indicator	Plate to Ground 25(3)		Target to Ground 250		Cathode to Ground 0		Across Heater 6.2 A.C.	

(1) A.C. voltage as read across heater terminals 2 and 7.
(2) Subject to variation.
(3) As read with 500,000 ohm meter.
(4) As read across R-30.
(5) A.C. voltage as read across heater terminals 2 and 8.
(6) A.C. voltage as read across terminals 4 and 6.

GAMBLE-SKOGMO, INC.

MODEL 70
Schematic, Voltage
Socket, Alignment
Chassis

GAMBLE-SKOGMO, INC.



Tube	A Volts	B Volts	C Volts	Scr. Volts	Plt. Crnt.
RF	2.3	175.	2.3[1]	65	4.0
1st Det	2.3	185.	7.0	69	2.0
IF	2.3	175	2.3[1]	65	4.0
2nd Det	2.3	115	12. [2]		.4
1st AF	2.3	145	11. [2]		4.6
Osc.	2.3	83	15-35[3]		4.2
AVC	2.3	89[4]	20. [5]		C.
Power	2.35	255	18.5	265	21.
Power	2.35	255	18.5	265	21. [6]
Rect.	4.9				45. [6]

1 Across 250 ohm series resistor
2 Across 2500 ohm series resistor
3 Governed by setting of tuning condenser
4 Across 1000 and 1800 ohm sections of shunt resistor.
5 Across 600 ohm section of shunt resistor
6 Per Anode.

MODEL 46L
Schematic
Coils, Data

GAMBLE-SKOGMO, INC.

Power Consumption - - 7.0 Amperes at 6.0 Volts
Power Output - - - - - - 3 Watts Undistorted
Sensitivity - - - - - - 1.0 Microvolt Absolute
Selectivity - - 45 KC Broad at 1000 Times Signal

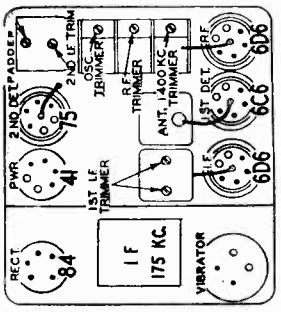


Fig. 2—Location of Tubes and Vibrator

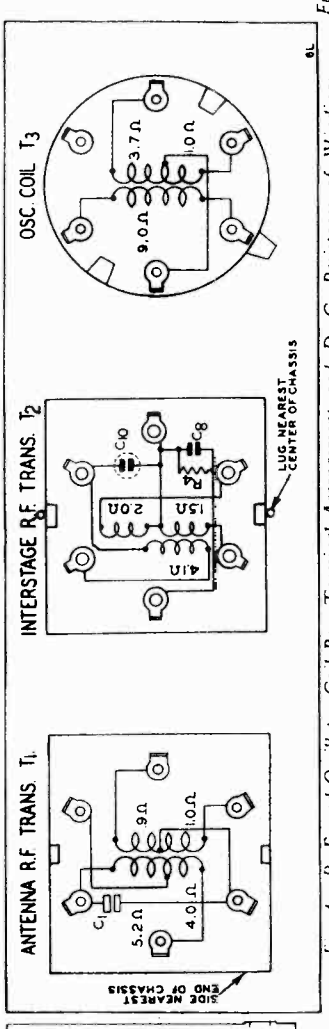


Fig. 4—R. F. and Oscillator Coil Base Terminal Arrangement and D. C. Resistance of Windings

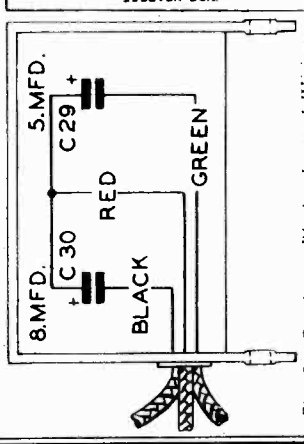
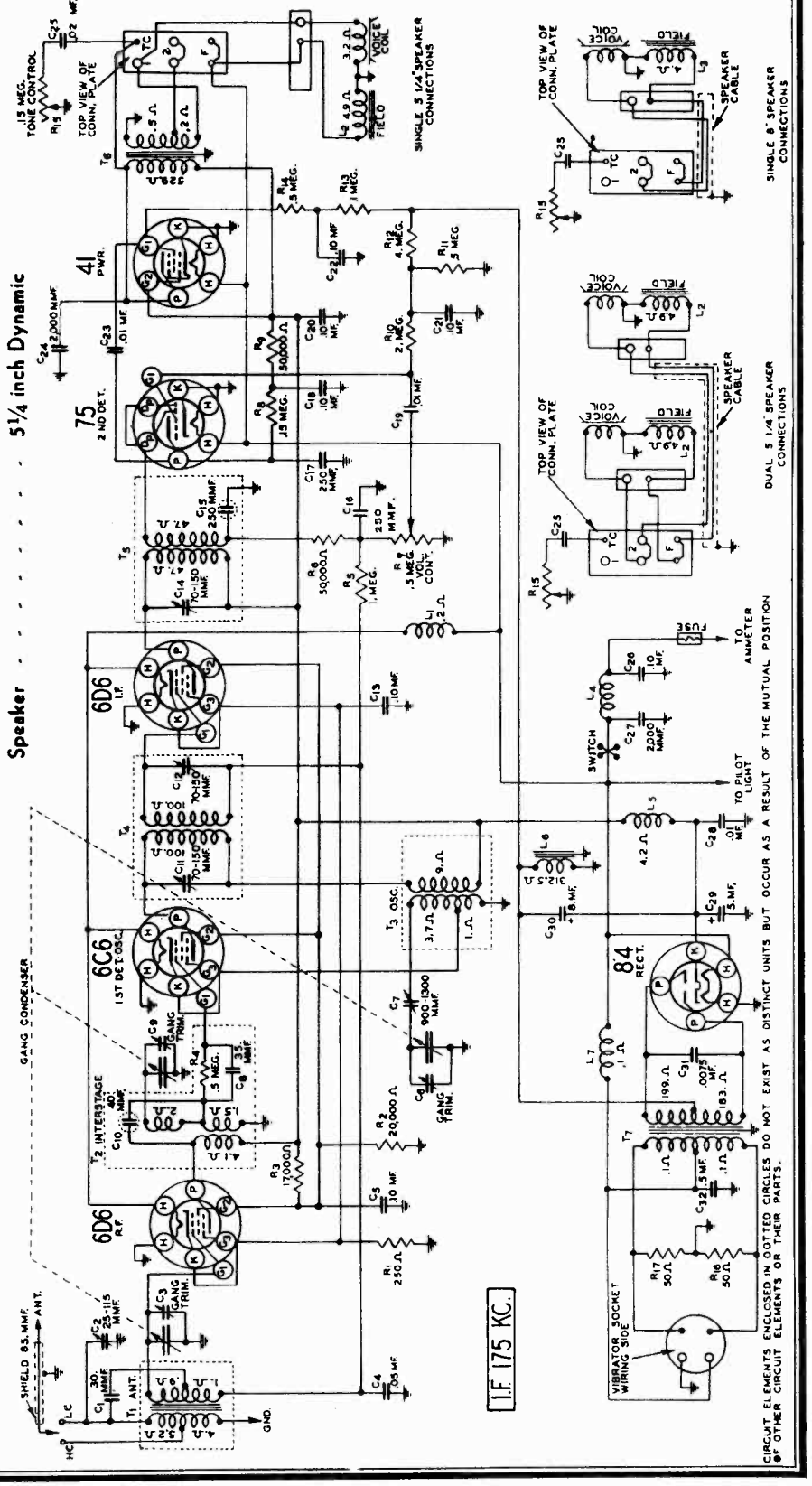


Fig. 5—Condenser Block—Internal Wiring

Tuning Frequency Range - - - 530 to 1575 KC
Intermediate Frequency - - - - - - - - - 175 KC
Speaker - - - - - - - - - - 5¼ inch Dynamic



6 Tube
Automobile Radio

June 1936

I. F. Adjustment

Set the signal generator for a signal of 175 KC.

Connect the output of the signal generator through a .05 mf. condenser to the stator of the R. F. interstage section of the tuning condenser. (See Fig. 2 for location of this section.)

Connect the ground lead of the signal generator to the chassis ground.

Set the volume control at the maximum position.

Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.

Then adjust the three I.F. trimmers until maximum output is obtained. The location of these trimmers is shown in Fig. 2.

1575 KC Adjustment

Set the signal generator for 1575 KC.

Turn the rotor of the tuning condenser to the full open position.

If a low capacity antenna is used, connect the shielded antenna lead from the chassis through a 150 mmf. condenser to the antenna post of the signal generator. (If high capacity, use 1500 mmf.)

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.

Adjust the trimmer of the oscillator section of the three gang condenser until maximum output is obtained—see Fig. 2 for location of this trimmer.

1400 KC Adjustment

Set the signal generator for 1400 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the R.F. interstage and antenna 1400 KC trimmers for maximum output.

Do not change the setting of the oscillator trimmer.

600 KC Adjustment

Set the signal generator for 600 KC.

Connect the output of the signal generator through a .05 mf. condenser to the control grid of the 6D6 R.F. tube.

Turn the tuning condenser rotor until maximum output is obtained. Then turn the tuning condenser rotor back and forth, at the same time adjusting the 600 KC padder (see Fig. 2) until the peak of greatest intensity is obtained.

Re-connect the output of the signal generator to the shielded antenna lead.

Adjust the 600 KC antenna trimmer to maximum. This trimmer is reached from the outside of the case—see Fig. 3.

Adjusting Antenna 600 KC Trimmer

After the receiver is installed and the car antenna is connected, it will be necessary to adjust the antenna trimmer. Tune in a weak signal at approximately 600 KC with the volume control about three-fourths on. Turn the adjusting screw of the antenna 600 KC trimmer up or down until maximum output is obtained. See Fig. 3 for location of this trimmer.

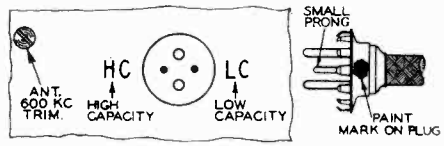


Fig. 3—Antenna Plug Insertion

Antenna Disconnected — Battery 6 Volts Under Load

Type of Tube	Function	Across Heater	Plate to Ground	Screen to Ground	Cathode to Ground
6D6	R.F.	6	233	103	4.0
6C6	1st Det. & Osc.	6	233	103	
6D6	I.F.	6	233	103	4.0
75	2nd Det.	6	130		
41	Power	6	215	233	16.0(1)
84	Rectifier	6	560(2)		

(1) Grid bias read across filter choke L6
(2) Plate to Plate A.C. voltage

Calibrating the Receiver

To calibrate the receiver, tune in a station of known frequency. At the back of the control head is the calibration screw. Remove the pilot lamp assembly. Insert a fine blade screwdriver and turn this screw until the pointer on the dial scale is at the frequency of the station being received. The knob must be held during this adjustment.

If the control head is inaccessible it may be calibrated by setting the pointer from the front. Remove the crystal by inserting a knife blade under the lower edge. Loosen the pointer screw, set the pointer and retighten.

RESISTORS

CARBON

Part No.	Code	Resistance	Wattage	List Price
P-A94251	R1	250 Ohms	0.2	$0.15
P-B94203	R2	20,000 Ohms	0.5	.15
P-C94173	R3	17,000 Ohms	1.0	.15
P-A94504	R4	500,000 Ohms	0.2	.15
P-A95105	R5	1 Megohm	0.2	.10
P-A95503	R6	50,000 Ohms	0.2	.10
P-A95154	R8	150,000 Ohms	0.2	.10
P-A95503	R9	50,000 Ohms	0.2	.10
P-A95205	R10	2 Megohms	0.2	.10
P-A94504	R11	500,000 Ohms	0.2	.15
P-A94405	R12	4 Megohms	0.2	.15
P-A94104	R13	100,000 Ohms	0.2	.15
P-A95504	R14	500,000 Ohms	0.2	.10
P-B94500	R16	50 Ohms	0.5	.15
P-B94500	R17	50 Ohms	0.5	.15

VARIABLE

P-36X216	R7	.5 Megohm Vol. Control and Switch	$0.95
P-40X207	R15	.15 Megohm Tone Control	.70

CONDENSERS

TUBULAR

Part No.	Code	Capacitance	Voltage	List Price
P-46X80	C4	.05 mf.	180	$0.15
P-46X98	C5	.10 mf.	180	.20
P-46X98	C13	.10 mf.	180	.20
P-46X105	C18	.10 mf.	360	.20
P-46X120	C19	.01 mf.	360	.15
P-46X105	C20	.10 mf.	360	.20
P-49X4	C21	.10 mf.	180	.35
	C22	.10 mf.	180	.35
P-46X120	C23	.01 mf.	360	.15
P-46X180	C25	.02 mf.	600	.15
P-46X98	C26	.10 mf.	180	.20
P-46X120	C28	.01 mf.	360	.15
P-46X177	C31	.0075 mf.	1600	.20
P-46X135	C32	.50 mf.	180	.40

ELECTROLYTIC

P-45X210	C29	5.0 mf.	Electrolytic Block	$1.70
	C30	8.0 mf.		

MOULDED

P-47X66	C1	30 mmf.	$0.15
P-47X53	C8	35 mmf.	.10
P-47X52	C16	250 mmf.	.15
P-47X52	C17	250 mmf.	.15
P-47X41	C24	2000 mmf.	.20
P-47X41	C27	2000 mmf.	.20

TRANSFORMERS AND COILS

Part No.	Code	Description	List Price
P-9A561	T1	Antenna Transformer and Can Assembly	$1.65
P-9A562	T2	Interstage Transformer and Can Assembly	1.55
P-9A563	T3	Oscillator Coil and Can Assembly	.80
P-9A564	T4	1st I.F. Transformer and Can Assembly	1.45
P-9A565	T5	2nd I.F. Transformer and Can Assembly	1.80
P-51X42	T6	Output Transformer	1.10
P-53X123	T7	Power Transformer	2.95
P-9A568	L1	Filament Reactor } One Assembly	.55
	L5	R.F. "B" Plate Reactor }	
P-9A566	L4	Motor Noise Reactor	.25
P-52X42	L6	Filter Choke	.90
P-9A567	L7	Vibrator Reactor	.50

TRIMMER

P-17A48	C2	25-115 mmf.	Antenna 600 KC Trimmer — $0.20
	C3		Antenna Trimmer—Part of Gang Condenser
	C6		Oscillator Trimmer—Part of Gang Condenser
	C9		Interstage Trimmer—Part of Gang Condenser
P-17A33	C11	70-150 mmf. }	1st I.F. Trimmers — .40
	C12	70-150 mmf. }	
P-17A46	C14	70-150 mmf.	2nd I.F. Primary Trimmer } .55
	C7	900-1700 mmf.	600 KC Oscil. Pad. Cond. }

MISCELLANEOUS

	C10	40 mmf.	Integral Part of Interstage Transformer Assembly
	C15	250 mmf.	Integral Part of 2nd I.F. Transformer
P-14A51			Three Section Gang Condenser Assembly Complete with Drive Gears — 4.50

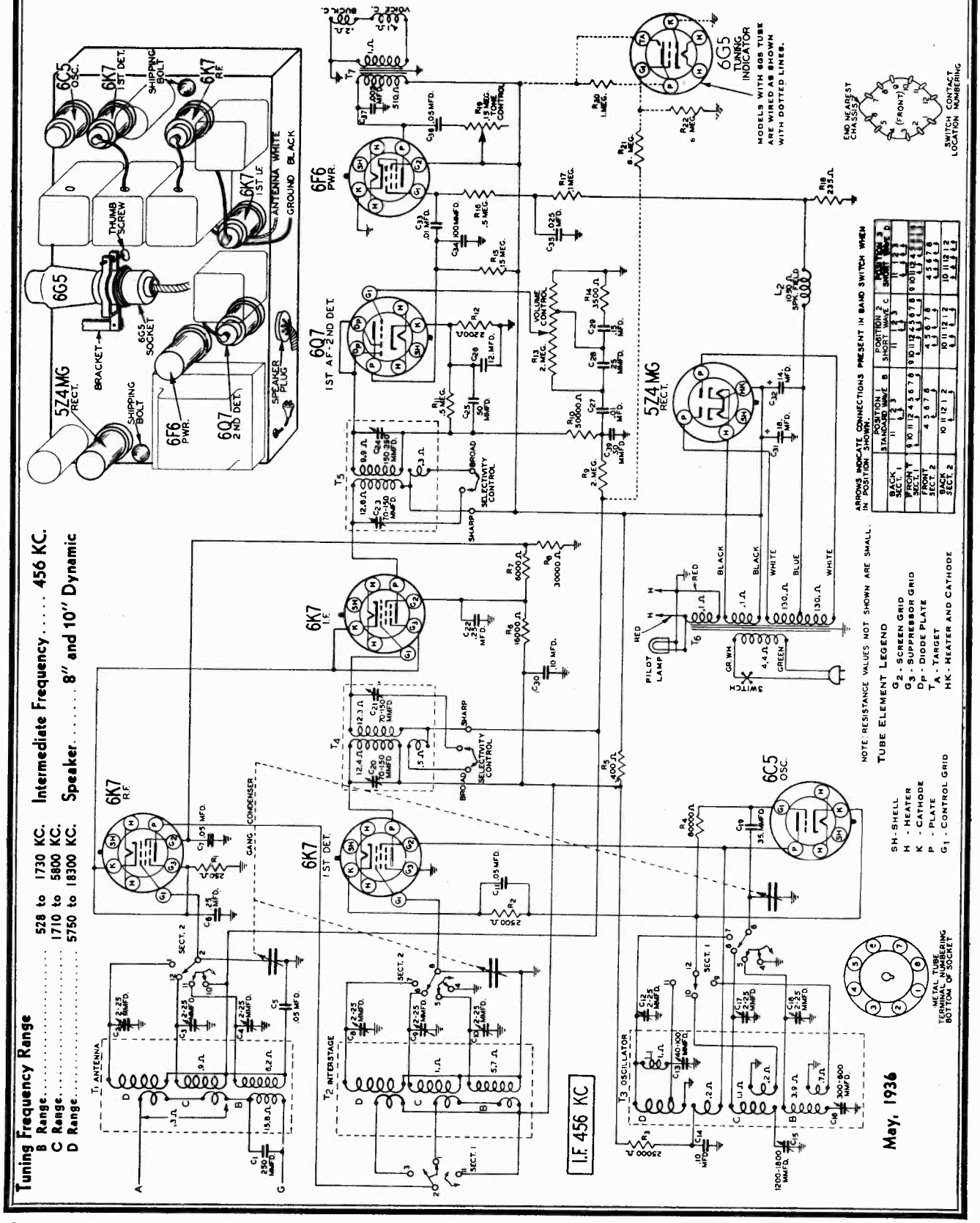
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

GAMBLE-SKOGMO, INC.

MODEL 47LL
Schematic, Socket Data

Power Consumption . . 85 Watts (At 115 volts 60 cycles)
Power Output . . . . . 3 Watts Undistorted
Selectivity . . . . 28 KC Broad at 1000 times Signal (Sharp)

Sensitivity
B Range . . . . . 0.5 to 2 Microvolts Absolute
C Range . . . . . 0.5 to 2 Microvolts Absolute
D Range . . . . . 1.0 to 4 Microvolts Absolute



MODEL 47LL
Alignment, Trimmers
Voltage, Coils
Phono Connections

GAMBLE-SKOGMO, INC.

Fig. 4—R. F. and Oscillator Coil Base Terminal Arrangement and D. C. Resistance of Windings

Fig. 7—Phonograph Connections

I. F. Adjustment

Set the signal generator for a signal of 456 KC.
Connect the output of the signal generator through a .1 mf. condenser to the grid of the 1st detector.
Connect the ground lead of the receiver to the ground post of the signal generator.
Turn the band selector to the Range B position (standard wave band).
Turn the selectivity control to the sharp position and keep it in this position for all adjustments.
Turn the volume control to the maximum position.
Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.
Then adjust the four I.F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis, and the location is shown in Fig. 3.

Twenty-five Cycle Receivers

Set the signal generator for 1730 KC.
Turn the rotor of the tuning condenser to the full open position.
Keep the band selector in the standard wave position.
Connect the antenna lead of the receiver through a 200 mmf. condenser to the output of the signal generator.
For this and *all* subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.
Adjust the oscillator Range B trimmer (C18) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

1500 KC Adjustment

Set the signal generator for 1500 KC.
Turn the rotor of the tuning condenser carefully until maximum output is obtained.
Loosen the pointer set screw and set the large pointer at the 1500 KC mark on the standard wave band scale. Retighten the set screw.
Adjust the interstage Range B trimmer (C10) and antenna Range B trimmer (C4) to maximum.
Do not change the setting of the oscillator Range B trimmer.

600 KC Adjustment

Set the signal generator for 600 KC.
Turn the tuning condenser rotor until maximum output is obtained.
Turn the rotor slowly back and forth, at the same time adjusting the 600 KC trimmer, until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Range B Alignment

After the procedure for the alignment of each range, as explained below, is completed, it is advisable to repeat the procedure as a final check.

Range C Alignment

CAUTION—When aligning the short wave bands be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 5000 KC. The signal will then be heard at 5000 KC on the dial of the radio. The image signal, which is much weaker, will be heard at 5000 less 912 KC, or 4088 KC. It may be necessary to increase the input signal to hear the image.

5800 KC Adjustment

Set the signal generator for 5800 KC.
Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator.
Turn the rotor of the tuning condenser to the full open position.
Turn the band selector to the Range C position (1st short wave band).
Adjust the oscillator Range C trimmer (C17) until maximum output is obtained. See Fig. 3 for location of this trimmer.

5000 KC Adjustment

Set the signal generator for 5000 KC.
Turn the rotor of the tuning condenser carefully until maximum output is obtained.
Adjust the interstage Range C trimmer (C9) and antenna Range C trimmer (C3) to maximum.
Do not change the setting of the oscillator Range C trimmer.

1800 KC Adjustment

Set the signal generator for 1800 KC.
Turn the tuning condenser rotor until maximum output is obtained.
Turn the rotor slowly back and forth, at the same time adjusting the 1800 KC trimmer, until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

18,300 KC Adjustment

Set the signal generator for 18,300 KC.
Keep the antenna lead of the receiver connected through the 400 ohm resistor to the output of the signal generator.
Turn the rotor of the tuning condenser to the full open position.
Turn the band selector to the Range D position (2nd short wave band).
Adjust the oscillator Range D trimmer (C12) until maximum output is obtained. See Fig. 3 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC.
Turn the rotor of the tuning condenser carefully until maximum output is obtained.
Adjust the interstage Range D trimmer (C8) and antenna Range D trimmer (C2) to maximum.
When adjusting the interstage Range D trimmer, it will be necessary at the same time to turn the tuning condenser rotor slowly back and forth until the peak of greatest intensity is obtained.
Do not change the setting of the oscillator Range D trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC.
Turn the tuning condenser rotor until maximum output is obtained.
Turn the rotor slowly back and forth at the same time adjusting the 6000 KC trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Fig. 3—Location of Trimmers

Line Voltage: 115
Volume Control: Maximum

Voltage Chart

Antenna Shorted to Ground
Position of Band Switch: Standard Wave

TUBE	FUNCTION	VOLTAGE BETWEEN SOCKET PRONGS AND GROUND (Unless otherwise indicated)								
		Prong No. 1	Prong No. 2	Prong No. 3	Prong No. 4	Prong No. 5	Prong No. 6	Prong No. 7	Prong No. 8
6K7	R.F.	0	6.1(1)	260	100	4.0	.....	6.1(1)	4.0
6K7	1st Det.	0	6.1(1)	260	118	0	.....	6.1(1)	9.0
6C5	Osc.	0	6.1(1)	120	....	0	.....	6.1(1)	0
6K7	1 F.	0	6.1(1)	260	138	4.0	.....	6.1(1)	4.0
6Q7	1st A.F.—2nd Det.	0	6.1(1)	105	0	0	.....	6.1(1)	1.4
6F6	Power Amp.	0	6.1(1)	238	260	18	.....	6.1(1)	0
5Z4MG	Rect.	0	4.9(2)	.....	680(3)	.....	680(3)	.....	4.9(2)
6E5	Tuning Indicator	Plate to Ground 304		Target to Ground 270	Cathode to Ground 0		Across Heater 6.1 A.C.		

(1) A.C. voltage as read across heater terminals 2 and 7.
(2) A.C. voltage as read across heater terminals 2 and 8.
(3) A.C. voltage as read across terminals 4 and 6.
(4) As read with 500,000 ohm meter.

GAMBLE-SKOGMO, INC.

MODEL 47P608
Schematic, Data

7 Tube - 2 Band
32 Volt D. C. Radio

October, 1936

SPECIFICATIONS

Power Consumption - 1.45 Amperes at 32 Volts DC
Power Output - - - - - - .17 Watts Undistorted
Selectivity - - 22 KC Broad at 1000 Times Signal
Intermediate Frequency - - - - - - - - - 456 KC
Speaker - - - - - - - - - 8 inch Dynamic

Tuning Frequency Range
B Range ..... 528 to 1730 KC
D Range ..... 5650 to 16000 KC

Sensitivity
B Range ..... 4 Microvolts Absolute
D Range ..... 6 Microvolts Absolute

MODEL 47P608
Voltage, Trimmers
Socket, Coils
Data

GAMBLE-SKOGMO, INC.

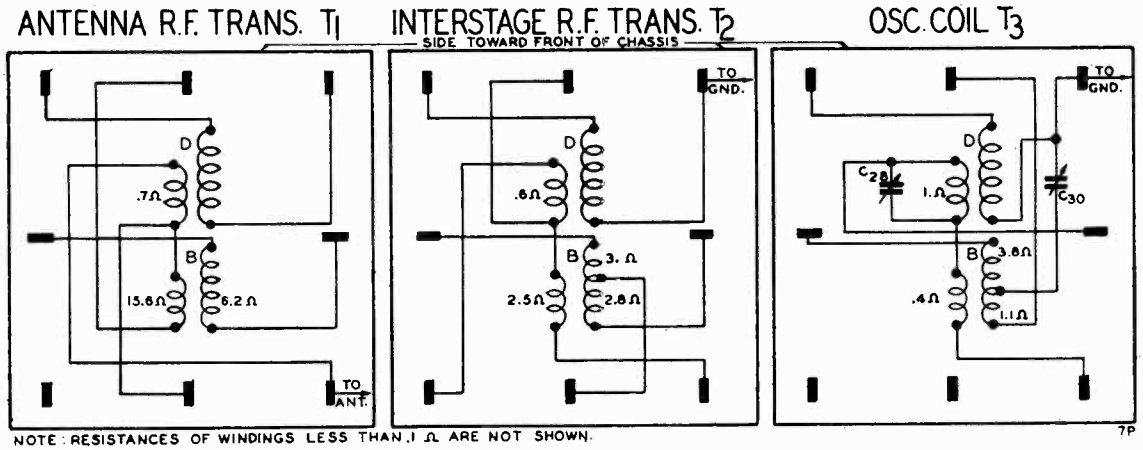


Fig. 4—R.F. and Oscillator Coil Base Terminal Arrangement and D.C. Resistance of Windings

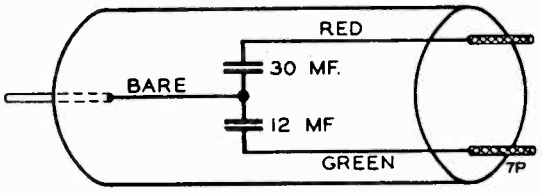


Fig. 5—Electrolytic Condenser Internal Connections

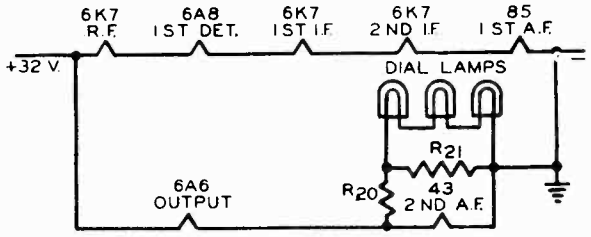


Fig. 7—Abridged Wiring Diagram Showing Tube Heater and Dial Lamp Wiring System

VOLTAGES AT SOCKETS

Volume Control at Maximum — Antenna Shorted to Ground
Line Voltage: 32

Type of Tube	Function	Across Filament	Plate to Ground	Screen to Ground	Cathode to Ground
6K7	R.F.	6.3(1)	31	31	3.2
6A8	1st Det. and Osc.	6.3(1)	31 31(2)	20	1.25
6K7	1st I.F.	6.3(1)	31	31	3.2
6K7	2nd I.F.	6.3(1)	31	31	3.0
85	2nd Det. and 1st A.F.	6.3(1)	10		1:5
43	2nd A.F.	26.0(1)	28.2	31	3.2
6A6	Output	6.0(1)	31		*6.4(3)

(1) Subject to Variation
(2) Anode Grid to Ground
(3) Center Tap of Output Transformer to Ground

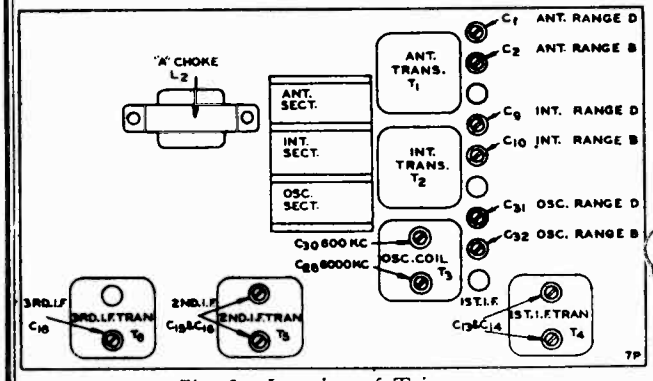


Fig. 3—Location of Trimmers

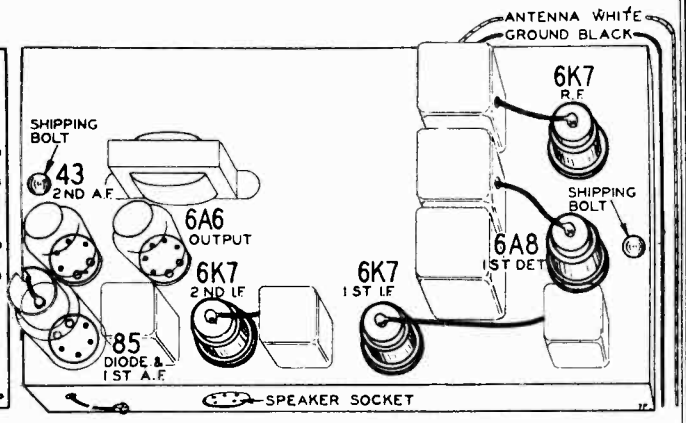


Fig. 6—Tube Arrangement

GAMBLE-SKOGMO, INC.

MODEL 47P608
Alignment
Power Supply Notes
Notes

7 TUBE - 2 BAND | 32 VOLT D.C. RADIO | OCTOBER 1936

ALIGMENT & NOTES

I. F. Adjustment

Set the signal generator for a signal of 456 KC.

Connect the output of the signal generator through a .1 mf. condenser to the grid of the 1st detector (G_4).

Connect the ground lead of the radio to the ground post of the signal generator.

Turn the band switch to the Range B position (standard wave band).

Turn the volume control to the maximum position.

Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.

Then adjust the five I.F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis, and the location is shown in Fig. 3.

Range B Alignment

After the procedure for the alignment of each range, as explained below, is completed, it is advisable to repeat the procedure as a final check.

1730 KC Adjustment

Set the signal generator for 1730 KC.

Turn the rotor of the tuning condenser to the full open position.

Keep the band switch in the standard wave position.

Connect the antenna lead of the radio through a 200 mmf. condenser to the output of the signal generator.

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.

Adjust the oscillator Range B trimmer (C32) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

1500 KC Adjustment

Set the signal generator for 1500 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Loosen the pointer screw and set the pointer at the 1500 KC mark on the standard wave band scale. Retighten the screw.

Adjust the interstage Range B trimmer (C10) and antenna Range B trimmer (C2) to maximum.

Do not change the setting of the oscillator Range B trimmer.

600 KC Adjustment

Set the signal generator for 600 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 600 KC trimmer (C30) until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Range D Alignment

CAUTION—When aligning the short wave band be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000 less 912 KC..or 14,088 KC. It may be necessary to increase the input signal to hear the image.

16,000 KC Adjustment

Set the signal generator for 16,000 KC.

Connect the antenna lead of the radio through a 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range D position (short wave band).

Adjust the oscillator Range D trimmer (C31) until maximum output is obtained. See Fig. 3 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage Range D trimmer (C9) and antenna Range D trimmer (C1) to maximum. When adjusting these trimmers, it will be necessary at the same time to turn the tuning condenser rotor slowly back and forth until the peak of greatest intensity is obtained.

Do not change the setting of the oscillator Range D trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 6000 KC (C28) trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Antenna and Ground

Run the antenna at right angles to any 32 volt lines and keep it as far away from these lines as possible, in order to avoid line noise being carried into the radio via the antenna.

A ground connection may be obtained by connecting to a water pipe, a pipe driven in the ground, or the metal jacket of a water pump. *Do not ground the receiver to the 32 volt system conduit or fittings at any point.*

CAUTION—Read the Following

To avoid the danger of damage to the radio and accidental short circuit, the following facts should be understood.

The metal chassis is connected to one side of the line—See Fig. 2. 32 volt lines are generally grounded on one side — either side may be used. If the side of the line, not connected to the metal chassis, is grounded and the metal chassis comes in contact with the external ground, the line will be short circuited and an excessive current may result.

In any service work, therefore, on this chassis keep it on a wood or other insulated surface. Disconnect the antenna and ground leads to avoid the possibility of any external ground contacts with the chassis. The person working on the set should avoid coming in contact with any ground.

32 Volt Power Supply

Polarity of Power Supply

There is a red mark on the plug at the end of the power supply cord of the radio. The prong of the plug at which the red mark is placed must be plugged into the positive side of the line.

Use a receptacle on the 32 volt line from which the plug will not have to be removed after it has once been inserted correctly

If the polarity of the line is not known, that is, if it is not known which side of the line is positive, a meter may be used to indicate the polarity. A voltmeter of 50 volt range or up is used. Connect the meter across the line. If the pointer deflects correctly, then the positive post of the meter is connected to the positive side of the line.

If the polarity of the line is not known and there is no way of determining it, insert the power supply plug, turn on the set, advance the volume control and proceed to tune the radio. If no sounds are heard from the speaker after the plug has been in two minutes, withdraw the plug, turn it around and re-insert it. This time sounds should be heard after the tubes have been heated.

Caution

If used on any other type of power supply than 32 volt DC, severe damage may be done to the receiver.

Do not turn the radio on unless all of the tubes and the dial lamps are in the proper sockets. Use only No. 51 bayonet pin base lamps.

Do not leave the plug inserted for more than five minutes if it is found that the radio does not operate.

Line Voltage Range

The radio will operate satisfactorily within a line voltage range of 25 to 42 volts.

Series Resistor

If the line voltage is higher than 42, it will be necessary to use a series resistor to cut it down. If the voltage varies, a variable resistor may be required.

Starting Current

When first turned on, the drain for a few seconds is slightly higher than normal until the tubes heat up. Some automatic plants are adjusted to start under a load of 200 to 300 watts. If a number of devices such as lights or motors are being used and the radio set is turned on the total drain may be sufficient to start the plant.

Eliminating Ignition and Generator Noise

After the radio is in working order, the following procedure must be followed in practically all cases to eliminate ignition and generator noise caused by the charging plant. If the charging plant causes no noise, then of course, these steps do not have to be taken.

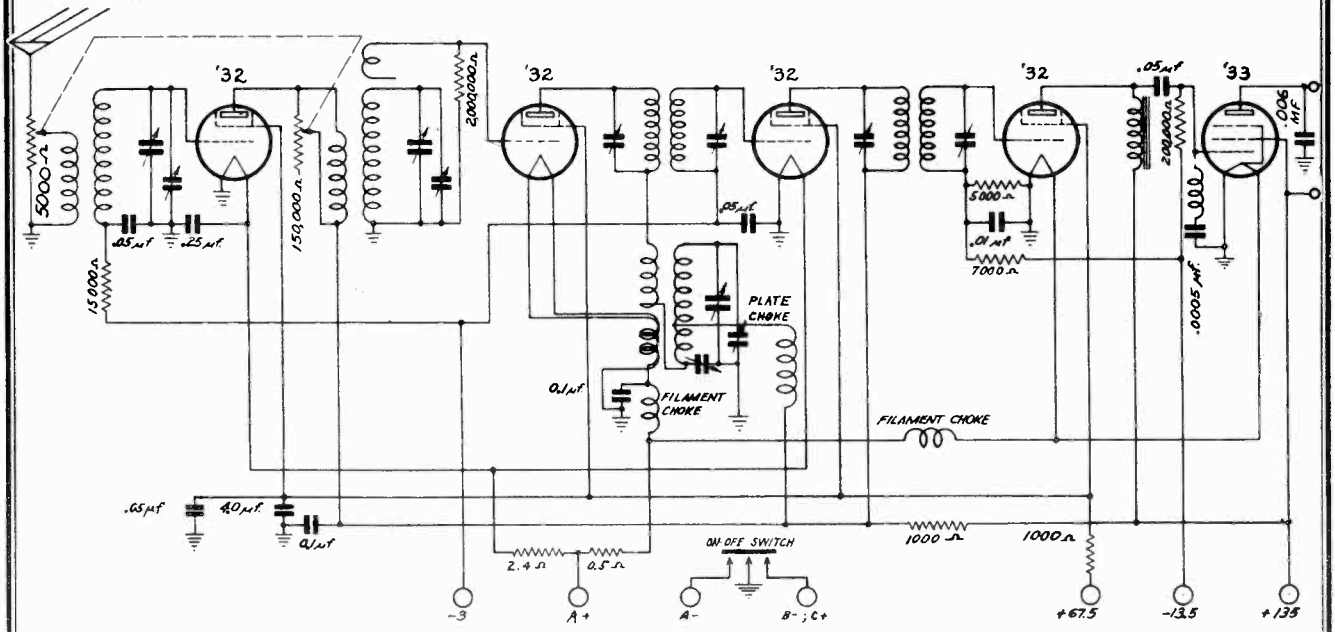
One spark plug suppressor must be placed on each spark plug of the engine. One spark plug for example would be required on a one-cylinder engine and four must be used on a four-cylinder engine. To connect the spark plug suppressor, remove the wire from the top of the plug, put the suppressor on and attach the wire to the other end of the suppressor.

A generator condenser must be used. This consists of two .5 mf. sections in one unit. The two sections have one side grounded to the metal case of the condenser. Mount the condenser on the frame of the charging plant. This will ground it. Then connect the two leads to the charging switch, one on each side of the line.

In some large installations, where the charging unit is on only two or three times a week, the above steps do not have to be taken as interference is caused only when the generating plant is in operation.

MODEL 90
Schematic
Socket, Notes

GAMBLE-SKOGMO, INC.



CONVENTIONAL ALIGNMENT - SEE SPECIAL SECTION

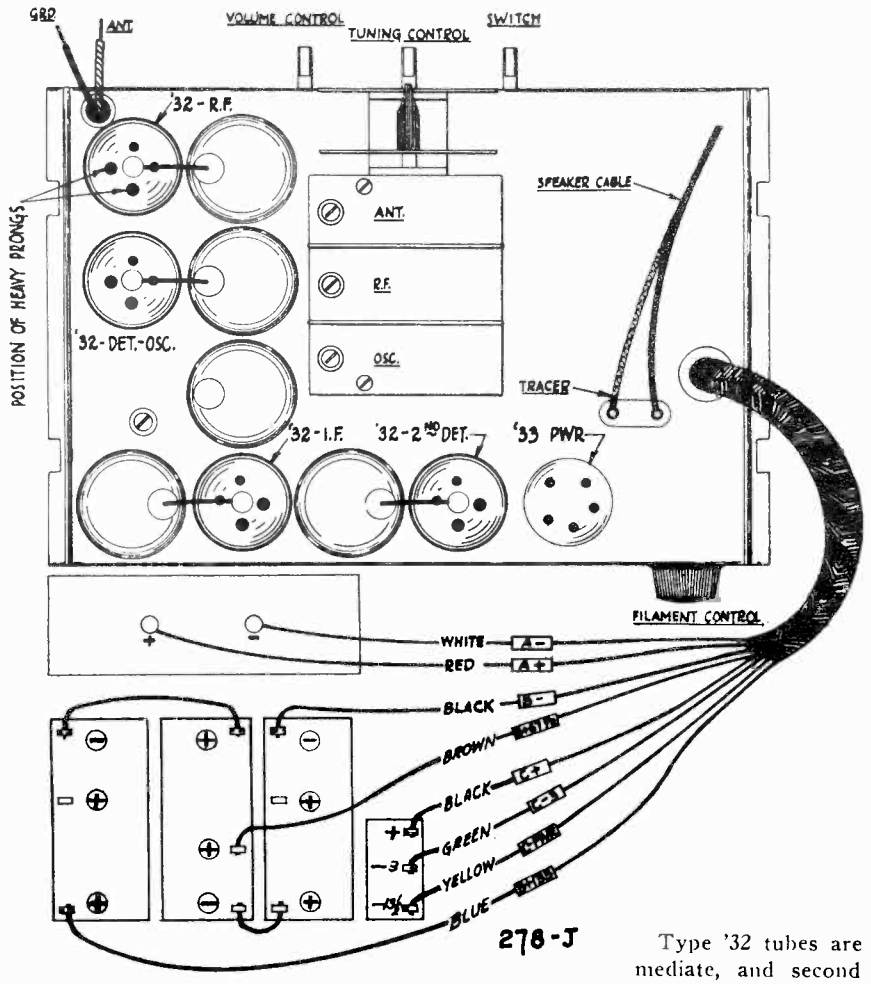


Figure 2. Top View of Chassis

IF PEAK 175 KC

Circuit

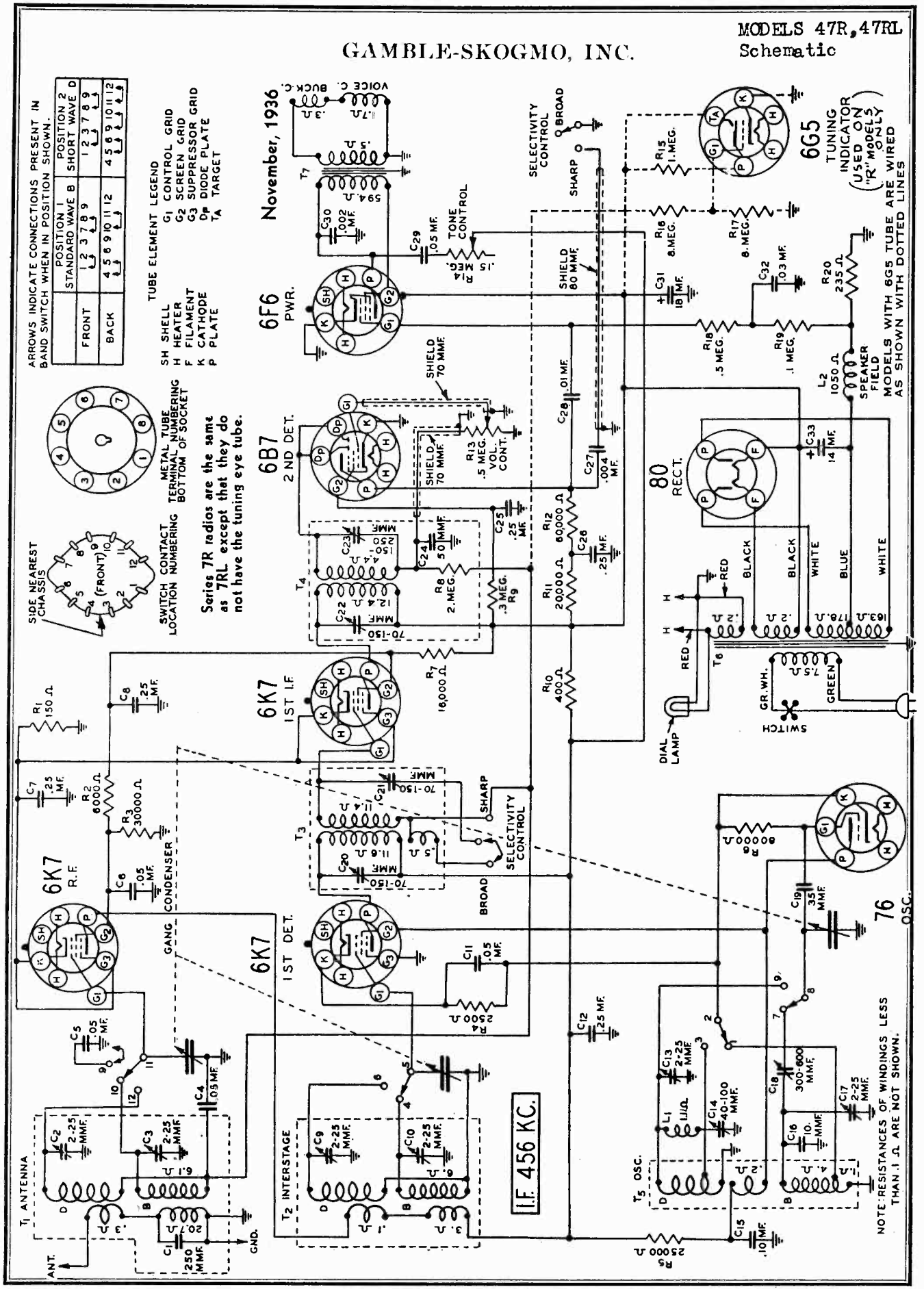
This chassis has one stage of radio frequency amplification, a combined detector and oscillator, one stage of intermediate frequency amplification, a second detector, and one stage of audio frequency amplification. The intermediate stage operates at a frequency of 175 K.C. All stages are transformer coupled with the exception of the audio stage which is coupled to the detector by a choke, condenser and resistor network.

The plate choke in the oscillator circuit has been substituted for the 15,000 ohm resistor to allow wider limits on the tube used in this circuit.

The complete chassis is mounted on rubber to prevent any vibration being transmitted to the tubes.

Tubes

Type '32 tubes are used in the R.F., 1st detector, intermediate, and second detector stages. The audio output tube is a type '33 pentode.



MODELS 47R,47RL
Voltage,Socket
Trimmers,Coils
Sensitivity

GAMBLE-SKOGMO, INC.

SPECIFICATIONS

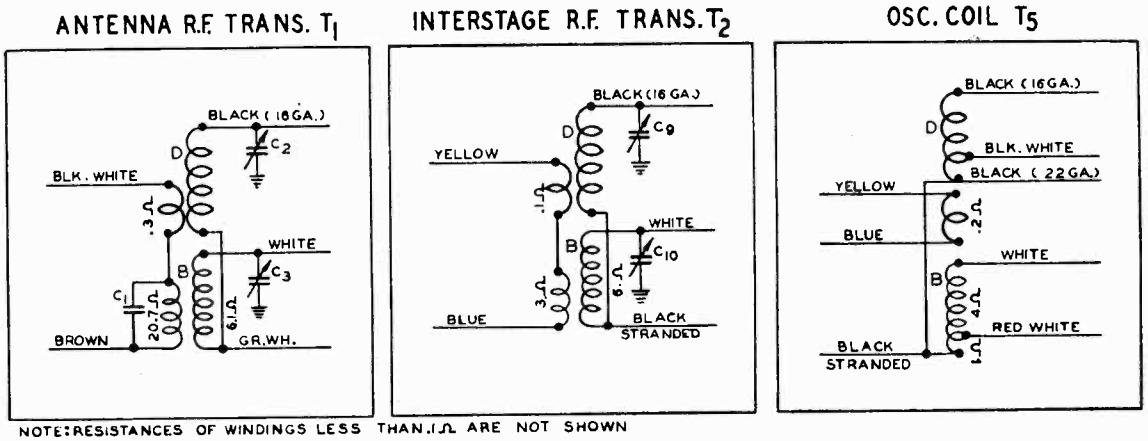
Power Consumption - 71 Watts (At 115 volts 60 cycles)
Power Output - - - - - - - 3 Watts Undistorted
Selectivity - 28 KC Broad at 1000 times Signal (Sharp)
Intermediate Frequency - - - - - - - - 456 KC.
Speaker - - - - - - - - - - - - 8" Dynamic

Tuning Frequency Range

B Range..... 535 to 1730 KC.
D Range..... 5.75 to 18.3 MC.

Sensitivity

B Range Average..... .5 Microvolts Absolute
D Range Average.....2.0 Microvolts Absolute



NOTE: RESISTANCES OF WINDINGS LESS THAN 1Ω ARE NOT SHOWN

Fig. 4—R.F. and Oscillator Coil Base Terminal Arrangement and D.C. Resistance of Windings

VOLTAGES AT SOCKETS

Line Voltage: 115 — Antenna Shorted to Ground
Volume Control: Maximum — Band Switch: Standard Wave

Tube	Function	Across Filament	Plate to Ground	Screen to Ground	Cathode to Ground
6K7	R.F.	6.2	245	105	2.8
6K7	1st Det.	6.2	245	105	9.0
76	Osc.	6.2	105		
6K7	1st I.F.	6.2	250	130	2.8
6B7	2nd Det.	6.2	50	35	
6F6	Output	6.2	230	250	17(1)
80	Rectifier	5.0			
				Target to Ground	
6G5	Tuning Eye	6.2	25	250	

(1) As read across resistor, R20.

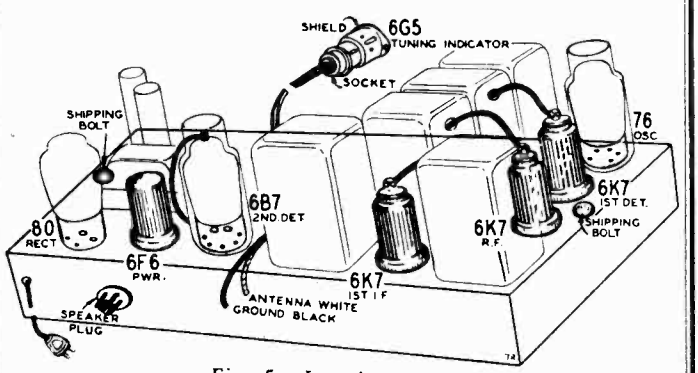
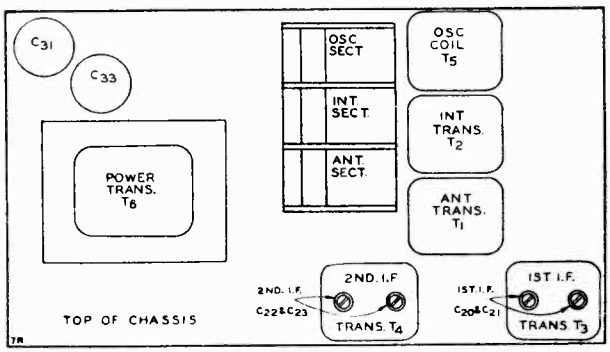


Fig. 5—Location of Tubes



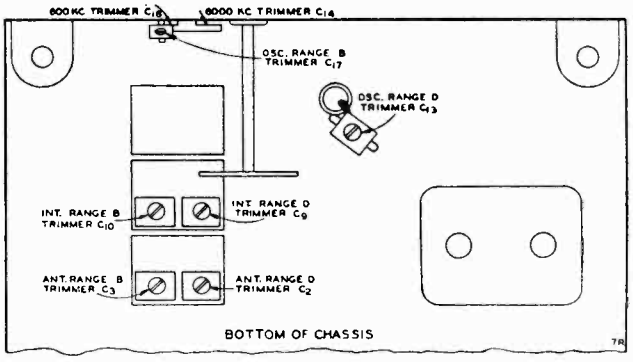


Fig. 3—Location of Trimmers

I. F. Adjustment

Set the signal generator for a signal of 456 KC.

Connect the output of the signal generator through a .1 mf. condenser to the grid of the 1st detector.

Connect the ground lead of the receiver to the ground post of the signal generator.

Turn the band switch to the Range B position (standard wave band).

Turn the selectivity control to the sharp position and keep it in this position for all adjustments.

Turn the volume control to the maximum position.

Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.

Then adjust the four I.F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis, and the location is shown in Fig. 3.

Range B Alignment

After the procedure for the alignment of each range, as explained below, is completed, it is advisable to repeat the procedure as a final check.

1730 KC Adjustment

Set the signal generator for 1730 KC.

Turn the rotor of the tuning condenser to the full open position.

Keep the band switch in the standard wave position.

Connect the antenna lead of the receiver through a 200 mmf. condenser to the output of the signal generator.

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.

Adjust the oscillator Range B trimmer (C17) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

1500 KC Adjustment

Set the signal generator for 1500 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Loosen the pointer set screw and set the pointer at the 1500 KC mark on the standard wave band scale. Retighten the set screw.

Adjust the interstage Range B trimmer (C10) and antenna Range B trimmer (C3) to maximum.

Do not change the setting of the oscillator Range B trimmer.

600 KC Adjustment

Set the signal generator for 600 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 600 KC trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Range D Alignment

18,300 KC Adjustment

Set the signal generator for 18,300 KC.

As mentioned above, keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range D position (short wave band).

Adjust the oscillator Range D trimmer (C13) until maximum output is obtained. See Fig. 3 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage Range D trimmer (C9) and antenna Range D trimmer (C2) to maximum.

When adjusting the interstage and antenna Range D trimmers it will be necessary at the same time to turn the tuning condenser rotor slowly back and forth until the peak of greatest intensity is obtained.

Then go back and repeat the procedure as given for the 18,300 KC adjustment. If it is found necessary to make any appreciable change in the setting of the oscillator short wave trimmer, the 15,000 KC adjustment must be repeated.

Do not change the setting of the oscillator Range D trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 6000 KC trimmer until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Twenty-five Cycle Models

The twenty-five cycle receiver differs from the sixty cycle receiver only in the fact that a different power transformer is used. The correct power transformer is shown in the parts list.

The twenty-five cycle receiver can be operated satisfactorily from a sixty cycle power supply. However, the reverse is not true, the sixty cycle receiver cannot be operated from a twenty-five cycle power supply.

A 115-230 volt, 40 to 60 cycle as well as other power transformers with special power ratings are also available for this model.

General Data

The models with the tuning indicator tube are wired as shown in the schematic. This tube contains a triode and cathode ray section in one envelope.

The cathode ray is produced by the attraction of electrons from the upper end of the cathode to the coated target or anode which is operated at a high positive potential. When this electron stream strikes the target, the coating glows. The electron stream is controlled by an additional element, or control electrode, in the tube.

As a signal is tuned in, the control grid of the triode section of the 6G5 cathode ray tube becomes increasingly negative, the negative bias voltage being taken from the AVC line. The AVC voltage is reduced to a suitable value by the voltage divider arrangement of the 8 megohm resistors. The increased bias voltage reduces the triode plate current. This reduces the voltage drop across the 1 megohm plate resistor and raises the triode plate voltage. The triode plate is connected to the control electrode of the cathode ray section of the tube.

The shape and size of the area on the target struck by the cathode ray is governed by the voltage of the control electrode. When the signal is tuned to resonance, practically no plate current flows and the voltage of the control electrode is the same as that of the target. There is no opposition to the flow of electrons to the target. Tuning off resonance decreases the control electrode voltage and causes the darkened sector of the target to widen, because of the opposition to the flow of electrons in the direction of the control electrode.

Referring to the 1st I.F. transformer T3 in Fig. 2, it will be noted that there is a coupling winding shown below the primary.

When the selectivity control is in the sharp position, the coupling winding is open circuited and the loose coupling which exists between the primary and secondary of this transformer results in high selectivity; also, the plate of the audio section of the 6B7 tube is bypassed by condenser C27.

When the selectivity control is in the broad position, the coupling winding which is wound under the primary is connected in series with the secondary. This provides overcoupling which results in a greatly widened resonance curve. Passage of a wide range of audio frequencies is thus obtained. Condenser C27 is open circuited in this position to avoid bypassing the higher audio frequencies.

Replacement Parts

NOTICE—**There is a large letter on the chassis which identifies the set as to major part changes. When ordering parts, please be sure to mention the series number and this large letter.**

MISCELLANEOUS

SOCKETS

Part No.	Description	List Price
P-3A126	7A Tube Socket	$0.10
P-3A211	6K7 Tube Socket	.15
P-3A120	6B7 Tube Socket	.15
P-3A218	6A6 Tube Socket	.15
P-3A129	80 Tube Socket	.10
P-3A88	Speaker Socket	.10
P-13X256	Tuning Indicator Tube Socket and Cable Assembly (Used on models with tuning eye)	.65

SPEAKER

P-12A211	8" Dynamic Speaker Complete with Output Trans. (T7)	$5.95

KNOBS

Specify Name of knob used Model of Radio	Tuning Control Knob	.20
	Band Switch Knob	.20
	Volume Control Knob	.20
	Tone Control Knob	.20

GENERAL

P-2X38	Felt Washers (Used behind knobs)	doz.	.10
P-4A38	Single Lug Terminal Strip		.10
P-4A50	Two Lug Terminal Strip		.10
P-4A41	Four Lug Terminal Strip		.10
P-2A43	1 Section, 2 Position, Band Change Switch		.95
P-3X214	Grid Clip Only (Glass Tube)	doz.	.10
P-3X644	Grid Clip Only (Metal Tube)	doz.	.10
P-13X80	Line Cord and Plug		.50
P-13X214	Antenna and Ground Lead Assembly		.30
P-32X69	Tube Shield (Used on models with tuning eye)		.15
P-32X70	Tube Shield Base (Used on models with tuning eye)		.10
P-32X38	Tube Shield Bases	ea.	.10
P-32X32	Tube Shields	ea.	.15
P-8X27	Rubber Cushions for Gang Condensers	ea.	.10
P-8X23	Rubber Chassis Mounting Cushions	ea.	.10
P-25X231	Mounting Feet for Chassis (Rear)	ea.	.10
P-25X221	Mounting Feet for Chassis (Front)	ea.	.10
P-17X17	Glass Crystal (Mounted in Escutcheon Plate)		.15
P-29X77	Retaining Ring (for above Crystal)		.10

TRANSFORMERS AND COILS

Part No.	Code	Description	List Price
P-9A648	T1	Antenna Transformer and Can Assembly	$2.20
P-9A649	T2	R.F. Interstage Transformer and Can Assembly	1.85
P-9A681	T3	1st I.F. Transformer and Can Assembly	1.85
P-9A682	T4	2nd I.F. Transformer and Can Assembly	2.10
P-9A650	T5	Oscillator Coil and Can Assembly	1.75
P-53X91	T6	115 Volt, 60 Cycle, Power Transformer	3.60
P-53X92	T6	115 Volt, 25 Cycle, Power Transformer	5.95
P-53X99	T6	115-230 Volt, 40-60 Cycle Power Transformer	4.95
P-53X99	T6	230 Volt, 50 Cycle, Power Transformer	4.10
P-51X31	T7	Output Transformer (Part of Speaker Assembly)	2.45
P-9A683	L1	Oscillator Tracking Coil	.25

DIAL AND DRIVE ASSEMBLY

Part No.	Description	List Price
Specify Name and Model of Radio	Dial and Drive Assembly Complete with Pointer	$2.60
	Dial Face Only (Included in above Assembly)	.60
P-18X269	Double End Pointer (Included in above Assembly)	.10
P-20X252	Mounting Bracket for Dial and Drive Assembly	.10
P-7A37	Dial Lamp Sockets and Clips ea.	.10
P-7A32	Dial Lamps, No. 51 Bayonet Type ea.	.20

CONDENSERS

TUBULAR

Part No.	Code	Capacitance	Voltage	List Price
P-46X80	C4	.05 mf.	180	$0.15
P-46X88	C5	.05 mf.	180	.15
P-46X103	C6	.05 mf.	240	.15
P-46X117	C7	.25 mf.	180	.25
P-46X104	C8	.25 mf.	240	.25
P-46X88	C11	.05 mf.	180	.15
P-46X121	C12	.25 mf.	360	.30
P-46X105	C15	.10 mf.	360	.20
P-46X109	C16	.25 mf.	360	.30
P-46X107	C26	.25 mf.	360	.30
P-46X114	C27	.004 mf.	600	.15
P-46X109	C29	.01 mf.	400	.15
P-46X205	C29	.05 mf.	600	.20
P-46X100	C30	.002 mf.	600	.15
P-46X110	C32	.03 mf.	180	.15

ELECTROLYTIC

P-46X11	C31	10 mf.	300	Wet	1.10
P-46X10	C33	14 mf.	400	Wet	1.25

MOLDED

P-47X39	C1	250 mmf.	.15
P-47X63	C16	10 mmf.	.15
P-47X53	C19	35 mmf.	.10
P-47X54	C24	50 mmf.	.10

TRIMMER

P-17A36	C2	2-25 mmf.	Antenna Range "D" Trimmer	.10
P-17A36	C3	2-25 mmf.	Antenna Range "B" Trimmer	.10
P-17A36	C9	2-25 mmf.	Interstage Range "D" Trimmer	.10
P-17A36	C10	2-25 mmf.	Interstage Range "B" Trimmer	.10
P-17A41	C13	2-25 mmf.	Oscillator Range "D" Trimmer	.10
P-17A41	C17	2-25 mmf.	Oscillator Range "B" Trimmer	.10
P-7A35	C14	45-100 mmf.	6000 KC Trimmer	.45
	C18	300-600 mmf.	600 KC Trimmer	
P-17A33	C20	70-150 mmf.	1st I.F. Trimmers	.40
	C21	70-150 mmf.		
P-17A34	C22	70-150 mmf.	2nd I.F. Trimmers	.40
	C23	150-250 mmf.		

MISCELLANEOUS

P-14A42	3 Gang Condenser less Dial and Drive Assembly	3.85

RESISTORS

CARBON

Part No.	Code	Resistance	Wattage	List Price
P-A9415	R1	150 Ohm	0.2	$0.15
P-A9467	R2	6000 Ohm	0.5	.15
P-A9383	R3	30,000 Ohm	0.5	.20
P-A9425	R4	2500 Ohm	0.2	.15
P-A9425	R5	25,000 Ohm	1.0	.15
P-A9480	R6	80,000 Ohm	0.2	.15
P-D9163	R7	16,000 Ohm	2.0	.45
P-A95208	R8	2 Megohm	0.2	.10
P-A9430	R9	.3 Megohm	0.5	.15
P-A95401	R10	400 Ohm	0.2	.10
P-A94203	R11	20,000 Ohm	0.2	.15
P-A94403	R12	40,000 Ohm	0.5	.15
P-A95105	R15	1 Megohm	0.2 Used on models with tuning eye	.10
P-A94805	R16	8 Megohm	0.2 Used on models with tuning eye	.15
P-A94805	R17	8 Megohm	0.2 Used on models with tuning eye	.15
P-A95604	R18	.5 Megohm	0.2	.10
P-A94104	R19	.1 Megohm	0.2	.15

WIRE WOUND

P-41X42	R20	235 Ohm	2.0	.25

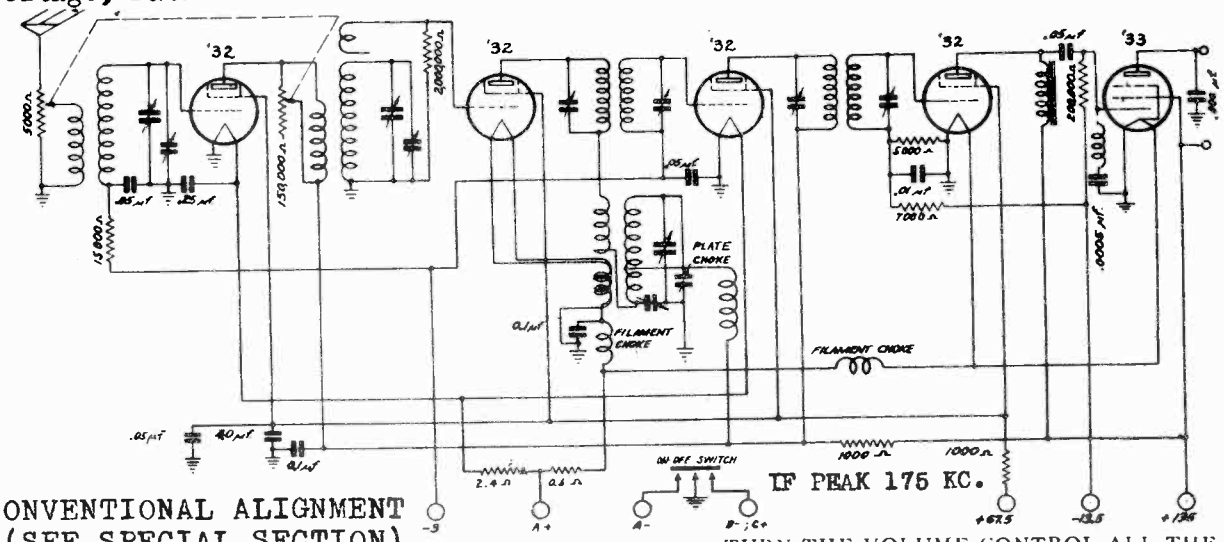
VARIABLE

P-36X205	R13	.5 Megohm	Volume Control and On-Off Switch	1.05
P-40X217	R14	.15 Megohm	Tone Control and Selectivity Switch	1.25

Prices subject to change without notice

MODELS 92D, 92M
Schematic, Socket
Voltage, Data

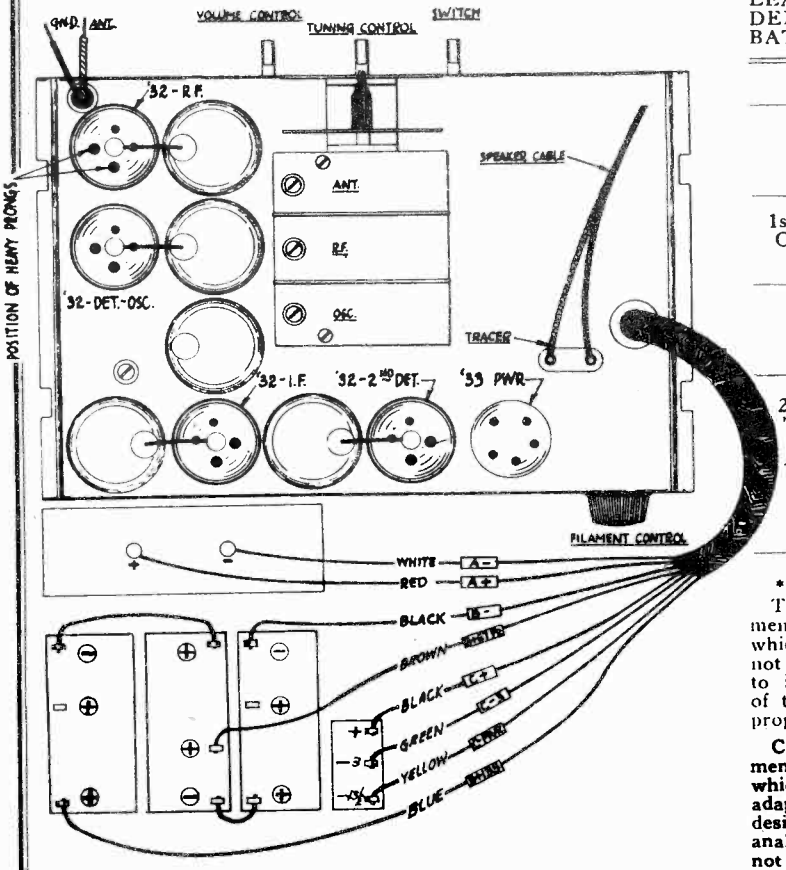
GAMBLE-SKOGMO, INC.



CONVENTIONAL ALIGNMENT (SEE SPECIAL SECTION)

IF PEAK 175 KC.

TURN THE VOLUME CONTROL ALL THE WAY ON, CONNECT THE ANTENNA AND GROUND LEADS TOGETHER AND TURN THE GANG CONDENSER PLATES ALL THE WAY OUT. CHECK BATTERY VOLTAGES.



TUBE	CIRCUIT	VOLTAGE
R.F. '32	Filament	2.
	Screen Grid	65.
	Plate	127.
	Control Grid	1.4
1st Det. & Oscillator '32	Filament	2.
	Screen Grid	65.
	Plate	85.
	Control Grid	No Reading
I.F. '32	Filament	2.
	Screen Grid	65.
	Plate	125.
	Control Grid	5. *
2nd Det '32	Filament	2.
	Screen Grid	67.
	Plate	127.5
	Control Grid	3.2
Audio '33	Filament	2.
	Screen Grid	132.5
	Plate	117.5
	Control Grid	7.5 **

*This includes filament voltage.
**250 v. Scale.

The measurement of **grid** bias voltages is not recommended as this causes an abnormal rise in plate current which is injurious to the tube. When the receiver does not function properly and the trouble is apparently due to incorrect grid bias on any tube or tubes, the cause of the incorrect bias may be determined by applying the proper continuity test.

CAUTION: Do not attempt to take voltage measurements or test the '33 pentode tube with a set analyzer which is not designed to test that type of tube. A special adaptor is necessary. The latest type analyzers only are designed to test pentode tubes. The UY socket in an analyzer which is used to test '24, '35, and '27 tubes cannot be used to test '33 pentode tubes. A break-in adaptor and the external binding posts of the set analyzer may be used to take voltage measurements when an adaptor is not available.

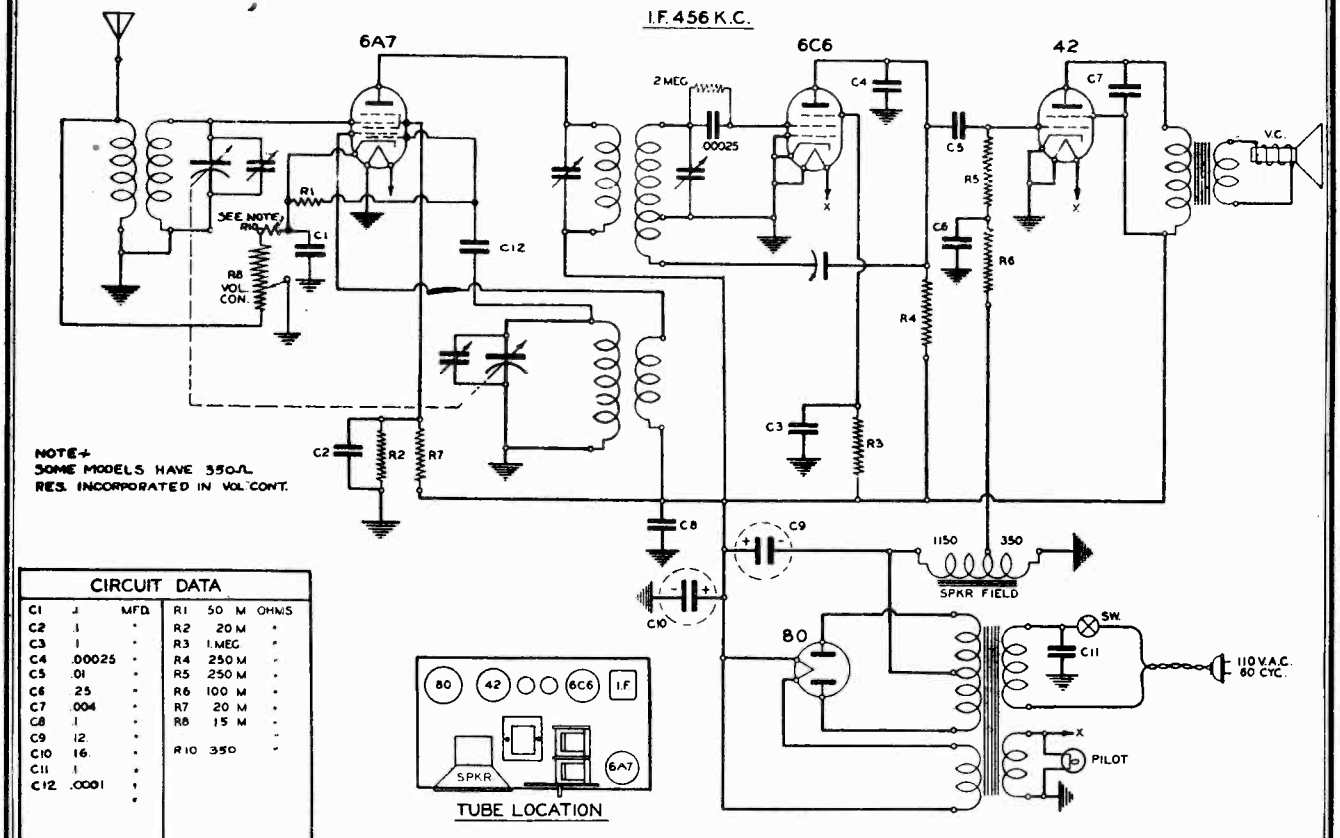
Comparison of the voltage measurements taken and those shown in the chart below will show any irregularities. The cause of any variation may be determined by applying the proper continuity test. REMEMBER—Voltage measurements will vary slightly with different sets of tubes, and also with different chassis. Unless the voltages are radically different than normal, they may be considered satisfactory.

The voltages shown in the chart were taken with a 1000 ohm per volt voltmeter; voltage measurements taken with a voltmeter having a different resistance will, of course, differ from those shown.

The .006 mfd. condenser connected from the plate of the pentode tube to ground is there for two reasons,—one, to prevent any I.F. or harmonic of the intermediate frequency from getting into the speaker and possibly coupling back into the antenna to cause a squeal; two, to put the proper amount of capacity across the speaker winding to produce a pleasing tone quality. This condenser may be varied to any value from .002 mfd. to .006 mfd. without losing its effectiveness in preventing the I.F. from getting into the speaker.

GAMBLE-SKOGMO, INC.

MODEL 460
Schematic, Socket Parts



PARTS LIST—460 A. C. Superheterodyne

1925	2 Gang Condenser	1.65
8030	Power Trans	1.73
2441	Volume Control	.73
1841	Wet Electrolytic 16 mfd.	.60
1840	Wet Electrolytic 12 mfd.	.60
1142	Ant. Coil	.32
1143	Osc. Coil	.10
1126	I. F. Trans.	.85
2054	Trimmer	.10
1600	.1—200 V. Bypass Condenser	.12
1601	.1—400 V. Bypass Condenser	.13
1604	.01—600 V. Bypass Condenser	.10
1614	.25—200 V. Bypass Condenser	.16
1651	.004—600 V. Bypass Condenser	.12
6017	1 Meg. 1/3 W 20% Resistor	.06
6020	2 Meg. 1/3 W 20% Resistor	.06
6024	¼ Meg. 1/3 W 20% Resistor	.06
6025	50 M. 1/3 W 20% Resistor	.06
6026	100 M. 1/3 W. 20% Resistor	.06
6120	20 M. ½ W. 20% Resistor	.08
1501	.0001—20% Mica. Cond.	.10
1504	.00025—20% Mica Cond.	.12
8901	No. 40 Pilot Light Bulb	.18
242	Pilot Light Bracket	.06
6850	4 Prong Socket	.10
6852	6 Prong Socket	.10
6853	7 Prong Socket	.10
7933	Speaker	3.00
	Dial—(order by name and description)	.75
5218	Knobs, Plain	.12

TUBES
6A7
6C6
42
80

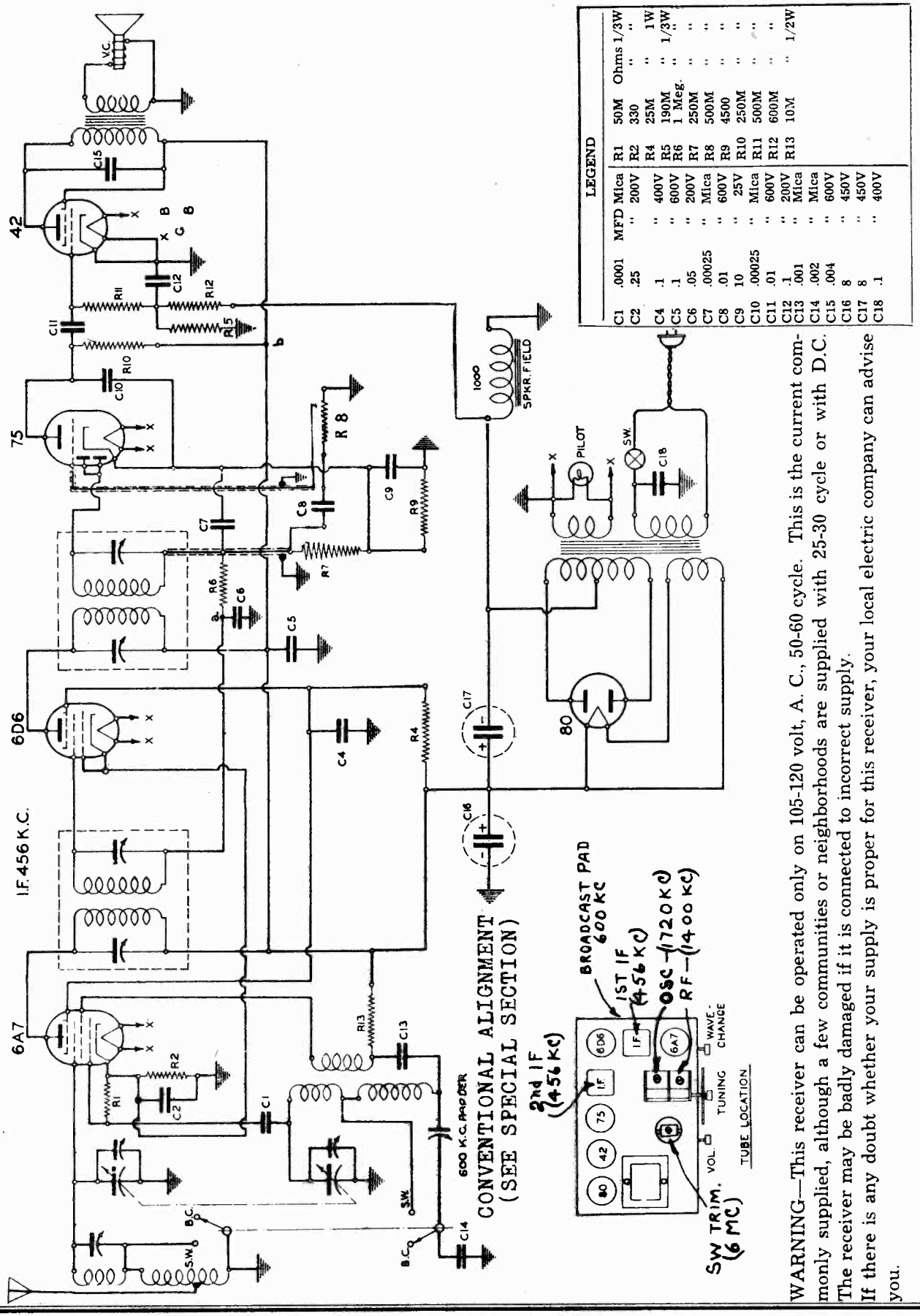
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

This receiver should be connected ONLY to an electric light outlet supplying current of 110 to 120 volts, 50 to 60 cycle A.C. If connected to any other type of current or voltage, the set may be seriously damaged. If you are in doubt as to the type of current available, your electric power company will be glad to furnish the needed information.

MODELS 510,511

GAMBLE-SKOGMO, INC.

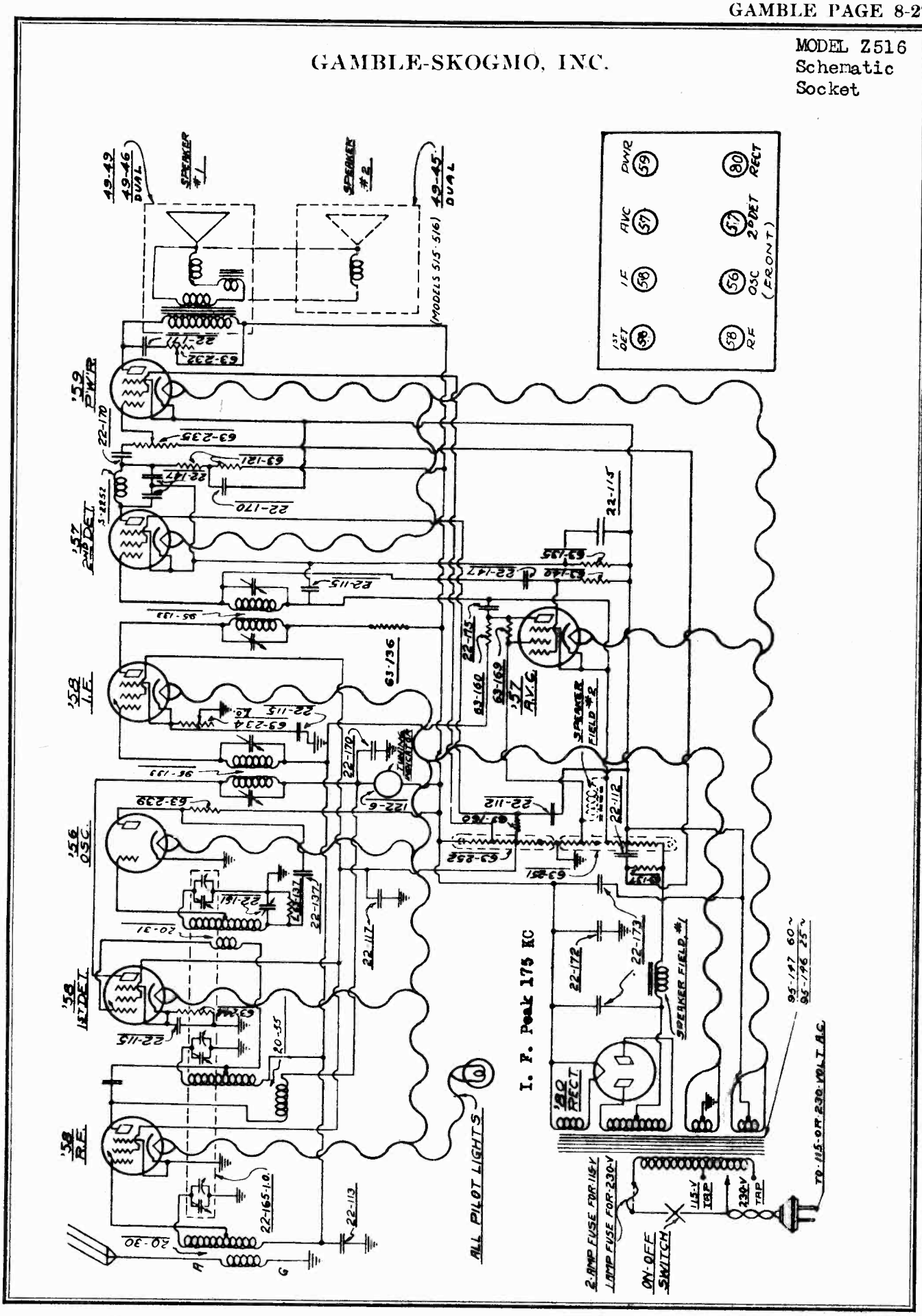
Schematic, Socket Trimmers, Alignment



WARNING—This receiver can be operated only on 105-120 volt, A. C., 50-60 cycle. This is the current commonly supplied, although a few communities or neighborhoods are supplied with 25-30 cycle or with D.C. The receiver may be badly damaged if it is connected to incorrect supply. If there is any doubt whether your supply is proper for this receiver, your local electric company can advise you.

GAMBLE-SKOGMO, INC.

MODEL Z516
Schematic
Socket



MODEL Z516
Voltage, Parts
Alignment

GAMBLE-SKOGMO, INC.

Resistors

63-121 100M ohm, 1 Watt (2nd Detector Plate).....
63-135 25M " ½ " (2nd Detector Cathode).....
63-137 250M " ½ " (Oscillator & Power Grid)..
63-140 1 meg" ½ " (A.V.C. Screen).....
63-160 100M " ½ " (A.V.C.Plate).....
63-169 400M " ½ " (A.V.C. Grid).....
63-239 24M ohm 1 Watt (Oscillator Plate).....
63-244 500 " ¼ " (1st Detector Cathode).
63-251 Voltage Divider (six tap).....
63-252 Voltage Divider (five tap).....

Coils and Chokes

20-30 Antenna Coil.....
20-31 Oscillator Coil.....
20-35 Detector Coil.....
95-133 1st & 2nd I. F. Transformer.....

Condensers

22-112 .1 mfd 300 volt(2nd Detector Screen & Power Grid).....
22-113 .5 " .....(R.F.1st Detector & I.F.Grid Return).....
*22-115 .1 " 200 volt(Four used, see below).....
22-117 .5 " .....(R.F.1st Detector, & I.F. Screen).....
22-137 .05 " 400 volt(Oscillator Plate).....
22-147 .0005 600 volt(2nd Detector Plate & A.V.C.Screen).....
22-170 .1 mfd 400 volt(R.F.& 1st Detector Plate,2nd Detector Plate)..
22-171 .05 " 600 volt(Tone Control).....
22-172 2. " 450 volt(Filter).....
22-173 8. " 500 volt(Filter).....

Socket Voltages

Tube Type	Position	Fil. Volt.	Plate Volt.	Cath. Volt.	Screen Volt.	Supp. Volt.	Plate Current
Z-58	R.F.	2.4	190	0	95	0	7.
Z-58	1st Det.	2.4	190	2.3	95	2.3	4.
Z-56	Osc.	2.4	100	0	-	-	4.
Z-58	I.F.	2.4	190	0	90	0	2.
Z-57	2nd Det.	2.4	90	-60	70	-60	.2
Z-57	A.V.C.	2.4	-10	-65	-2	-65	0
Z-59	Power	2.4	175	-70	165	-70	25
Z-80	Rect.	5.	*350	-	-	-	*36

Line 115 Volts

All Controls Maximum

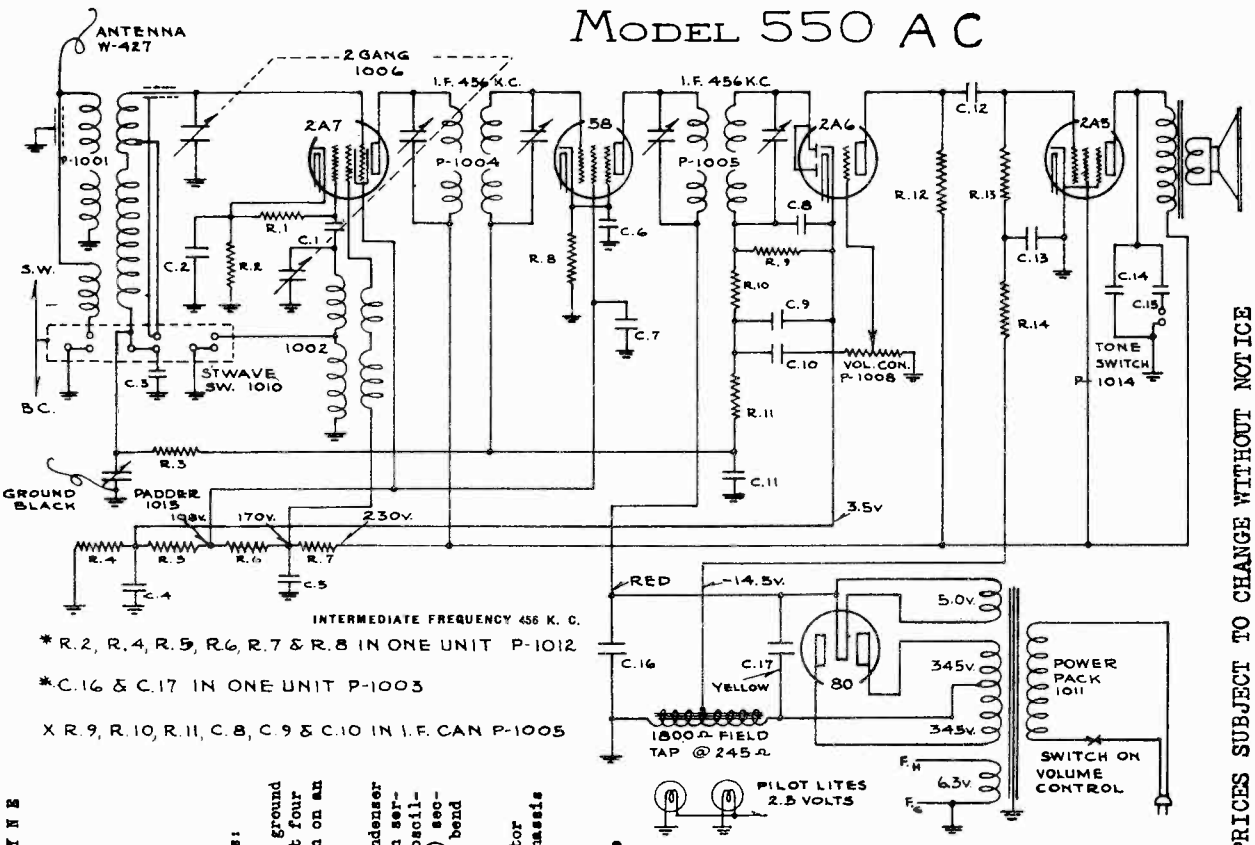
All readings, with exception of heaters, taken from socket connections to ground. Use 1,000 ohm per volt D. C. meter.)

BALANCE I.F. frequency at 175 K.C. Condenser gang at 1500 K.C. and oscillator padder at 600 K.C.

GAMBLE-SKOGMO, INC.

MODEL 550 AC
Schematic, Voltage
Parts, Alignment

MODEL 550 A C



* R.2, R.4, R.5, R.6, R.7 & R.8 IN ONE UNIT P-1012

*C.16 & C.17 IN ONE UNIT P-1003

X R.9, R.10, R.11, C.8, C.9 & C.10 IN I.F. CAN P-1005

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

SERVICE MANUAL FIVE TUBE TWO BAND SUPERHETERODYNE

WITH A. V. C.

105-115 volts alternating current 50-60 cycles - 60 watts.
GREEN (Broadcast band) 550 - 1560 Kilocycles
RED (Short wave band) 1560 - 14,000 Kilocycles

SERVICE NOTES

Should it be at any time necessary to rebalance this set, the correct procedure is as follows:

To peak I.F. transformers connect oscillator (set at 456 KC) to grid of 247 tube and (Black) ground wire. With variable condenser set at minimum capacity, (extreme left of its rotation) adjust four trimmers (one nut and one screw on each transformer trimmer) to resonance (maximum deflection on an output meter connected across the primary of the speaker input transformer).

To align Broadcast band, set wave changing switch to Green (right turn) and with variable condenser at minimum capacity disconnect antenna wire and connect 1560 KC oscillator to antenna coil in series with a .75 MMFD condenser. Adjust oscillator (front) section trimmer to resonance. Set oscillator to 1400 KC, rotate variable condenser until signal is tuned in, then adjust R.F. (rear) section trimmer to resonance. Check output at 1200, 1000, 800, and 600 Kilocycles if necessary bend plates (of rear R.F. section of variable only).

To align Short wave band, set wave changing switch to RED (left turn) and with input oscillator connected as above and set at 1720 KC, tune in signal, adjust padding condenser on rear of chassis to resonance. Check for output at 1550 KC and at harmonics of 1000 KC (2000 KC), of 1200 KC (2400 KC), of 1400 KC (2800 KC), and of 1720 KC (3440 KC). DO NOT BEND PLATES.

For failure to operate over both bands check 247 tube and connections to and contacts of wave changing switch.

Part No.	Description	List Price
1001	Antenna Coil	$ 2.50 ea.
1002	Oscillator Coil & Bracket	1.20 ea.
1002	8-8 MFD electrolytic filter condenser.	2.50 ea.
1004	Input I.F. Transformer and can	1.50 ea.
1005	Output I.F. Transformer with can and including parts as indicated on schematic circuit diagram.	2.50 ea.
1006	Two gang gear drive variable condenser.	2.75 ea.
1008	500M Ohm volume control with switch	1.35 ea.
1010	Wave changing switch	.75 ea.
1011	105-115 volt 50-60 cycle power transformer	3.50 ea.
1012	31,050 Ohm metal clad resistor.	1.00 ea.
1014	Tone control switch	.30 ea.
1015	400-300M-MFD Padding condenser	.60 ea.
1017	Special light socket	.10 ea.
1019	Rubber line cord & plug	.50 ea.
1039	Celluloid selector scale	.15 ea.
1040	Celluloid volume scale	.15 ea.
1041	Escutcheon for parts 1039 and 1040	.35 ea.
1044	Color indicating strip assembly.	.25 ea.
5031	Small knobs for wave changing switch & tone control.	.15 ea.
5032	2.5 volt pilot lights	.20 ea.
K214	Knob (selector and volume controls)	.15 ea.
	All molded mica condensers	.26 ea.
	All single section tubular paper bypass condensers.	.25 ea.
	All dual section tubular paper bypass condensers.	.50 ea.

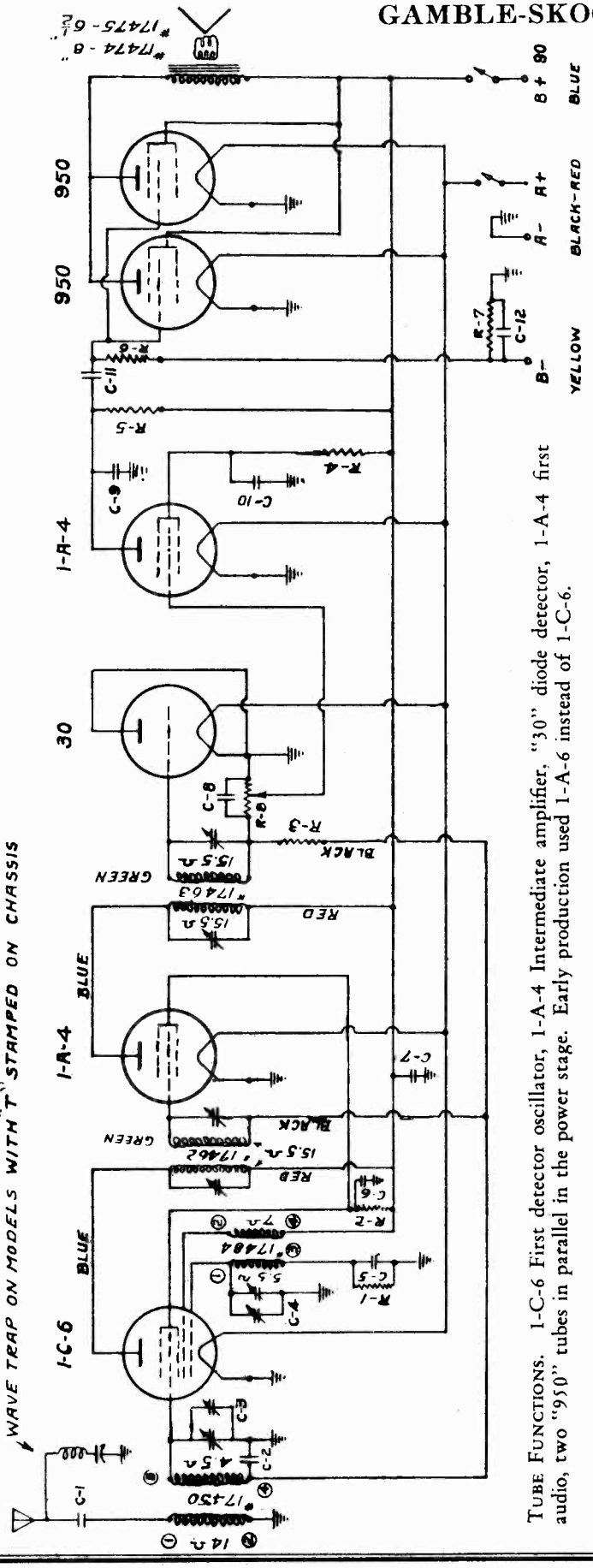
LEGEND

R.1 :-	50M	
R.2 :-	500	*
R.3 :-	250M	
R.4 :-	250	*
R.5 :-	20M	*
R.6 :-	6M	*
R.7 :-	4M	*
R.8 :-	300	*
R.9 :-	250M	X
R.10 :-	50M	X
R.11 :-	250M	X
R.12 :-	250M	
R.13 :-	300M	
R.14 :-	250M.	
C.1 :-	250MMF.	
C.2 :-	.05	
C.3 :-	.05	
C.4 :-	.05	
C.5 :-	.05	
C.6 :-	.05	
C.7 :-	.1	
C.8 :-	500MMF.	X
C.9 :-	500MMF.	X
C.10 :-	.01	X
C.11 :-	.1	
C.12 :-	.01	
C.13 :-	.05	
C.14 :-	.01	
C.15 :-	.02	
C.16 :-	8MF.	*
C.17 :-	8MF.	*

MODEL 650 A-B-C

Schematic, Alignment

GAMBLE-SKOGMO, INC.

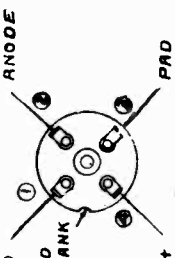


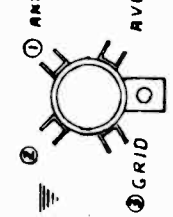
TUBE FUNCTIONS. 1-C-6 First detector oscillator, 1-A-4 Intermediate amplifier, "30" diode detector, 1-A-4 first audio, two "950" tubes in parallel in the power stage. Early production used 1-A-6 instead of 1-C-6.

I.F. FREQUENCY	456 K.C.		
B.C. FREQUENCY	540 K.C TO 1725 K.C.		

C-1	.01	200 V.
C-2	.05	200 V.
C-3 } C-4 }	.00037 TUNING COND.	
C-5	.0005	PAD
C-6	.05	200 V
C-7	.25	200 V.
C-8	.0005	600 V.
C-9	.0005	600 V.
C-10	.05	200V.
C-11	.01	200V.
C-12	10 MFD. 25 V. ELECT.	

R-1	50,000	
R-2	15,000	
R-3	2-MEG.	
R-4	500,000	
R-5	100,000	
R-6	1 MEG.	
R-7	450	
R-8	500,000	VOL. CONTROL # 17451





BATTERY RADIO

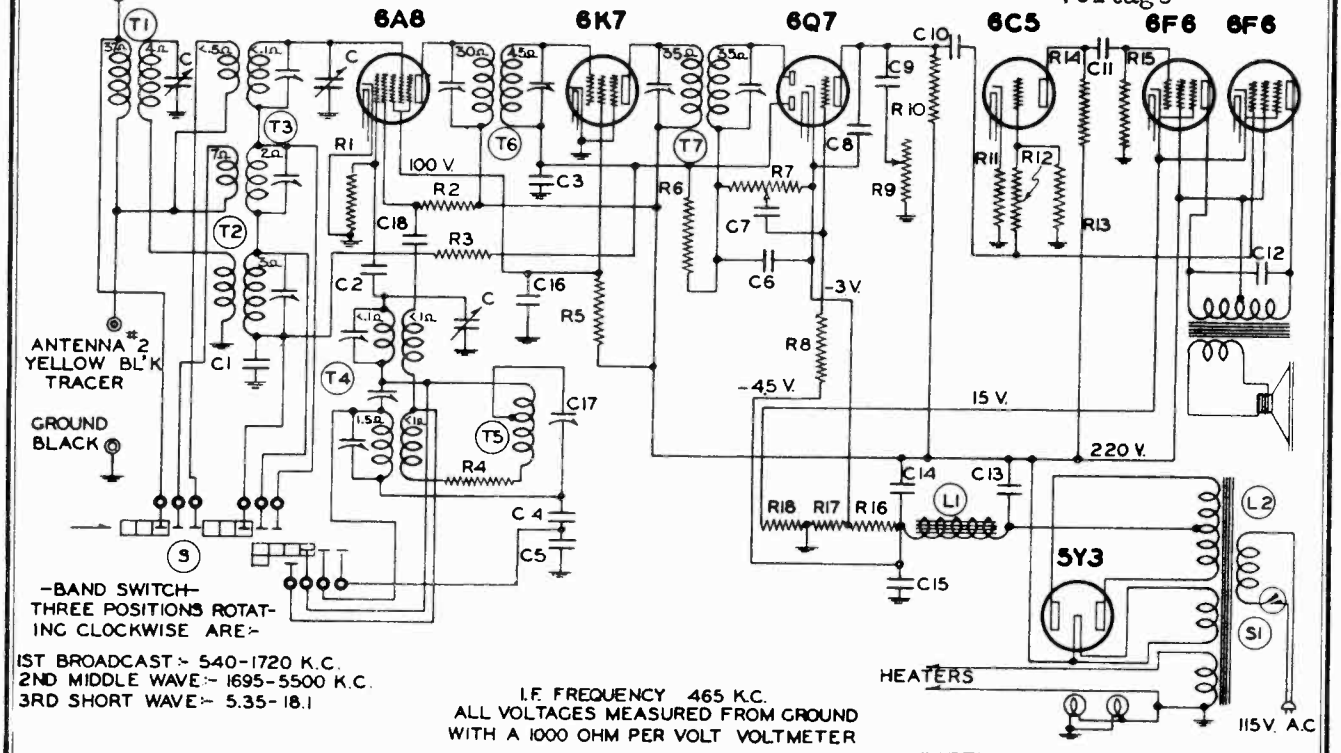
ALIGNMENT. IF and Broadcast alignment same as Model 11-B. For IF, connect signal generator to grid of 1-C-6 tube, be sure tuning condenser is open.

CODE INTERFERENCE. This may be noticeable in regions close to the Great Lakes and is due to ship to shore radio-telegraph service being received directly on the IF amplifier and usually comes in regardless of tuning. All late production of this model going into Great Lakes territory were equipped with a wave trap which greatly reduces such interference. Such sets had the letter "T" marked on back of chassis and on carton. This wave trap No. 17736 may be added to any other production sets as shown in the circuit diagram. *After installation it must be tuned* to minimum response to a 456 signal applied to the antenna lead or to minimum reception of the code interference.

K.R.C. 5-6-36

GAMBLE-SKOGMO, INC.

MODEL 740
Schematic, Socket
Trimmers, Parts
Voltage



I.F. FREQUENCY 465 K.C.
ALL VOLTAGES MEASURED FROM GROUND
WITH A 1000 OHM PER VOLT VOLTMETER

No.	Part No.	Description
		RESISTORS
R1	130-12	50M ohms - 1/3 w.
R2	130-48	15M ohms - 1/3 w.
R3	130-103	100M ohms - 1/3 w.
R4	130-27	50 ohms - 1/3 w.
R5	130-96	25M ohms - 1/2 w.
R6	130-4	3 megohm - 1/3 w.
R7	101-74	1 megohm - Volume Control
R8	130-4	3 megohm - 1/3 w.
R9	101-75	300M ohm - Tone Control
R10	130-100	150M ohms - 1/3 w.
R11	130-22	5M ohms - 1/3 w.
R12	130-163	400M ohms - 1/3 w.
R13	130-103	100M ohms - 1/3 w.
R14	130-12	50M ohms - 1/3 w.
R15	130-100	150M ohms - 1/3 w.
R16	106-37	20 ohms - Muter
R17	106-37	42 ohms - Muter
R18	106-37	250 ohms - Muter

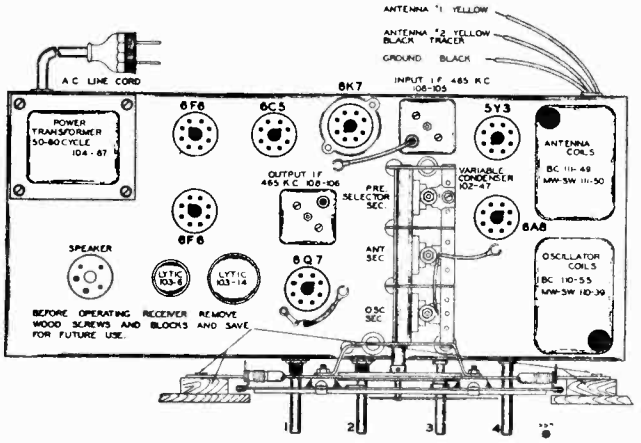
NOTE: R16, R17 and R18 in one unit, No. 106-37

		CONDENSERS
C1	100-22	.05 x 200 v.
C2	129-39	.00005 Mica
C3	100-22	.05 x 200 v.
C4	129-55	.0034 Mica
C5	129-54	.003 Mica
C6	129-5	.0001 Mica
C7	100-11	.01 x 400 v.
C8	129-2	.0005 Mica
C9	100-57	.006 x 600 v.
C10	100-26	.02 x 400 v.
C11	100-26	.02 x 400 v.
C12	100-12	.003 x 600 v.
C13	103-6	8 mfd. x 350 v.
C14	103-14	16 mfd. x 250 v.
C15	100-20	.1 x 200 v.
C16	100-39	.1 x 400 v.
C17	124-35	Adjustable Padder - Working Capacity 740 mmf.
C18	100-12	.003 x 600 v.

PARTS

C	102-47	One section of three gang condenser
T1	111-51	B.C. Pre-Selector
T2	111-49	B.C. Antenna Coil Assembly
T3	111-50	MW - SW Antenna Coil Assembly
T4	110-39	MW - SW Oscillator Coil Assembly
T5	110-55	B.C. Oscillator Coil Assembly
T6	108-105	Input I.F. - 465 kc.
T7	108-106	Output I.F. - 465 kc.
L1	114-66	6" Speaker (Field Resistance 900 ohms)
L2	104-87	Power Transformer (60 cycle) 115 volts
S	125-17	Band Switch
S1	101-74	On-off Switch on volume control.

1—Type 6A8G—Pentagrid mixer, first detector and oscillator.
1—Type 6K7 Remote cut-off pentode I.F. amplifier (465 K.C.)
1—Type 6Q7G duplex diode triode second detector, A.V.C. and audio.
1—Type 6C5 Inverter stage.
2—Type 6F6G—pentode push-pull output amplifier.
1—Type 5Y3G high vacuum rectifier.



Vol. Control On-Off Switch | Tone Control | Tuning Control | Band Switch

MODEL 740

GAMBLE-SKOGMO, INC.

Alignment
Trimmers

SERVICE NOTES:

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the circuit diagram.

IN ORDER TO PREVENT SIGNAL FROM ACTING UPON AVC AND AFFECTING ACCURACY OF VOLTAGE MEASUREMENTS, AERIAL AND GROUND LEADS SHOULD BE SHORT CIRCUITED WHILE MAKING MEASUREMENTS.

All voltages are to measured with 115 volts on the primary of the power transformer.

Resistances of coils and transformer windings are indicated in ohms on schematic circuit diagrams.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser, open by-pass condensers frequently cause oscillation and distorted tone.

RESONANCE INDICATOR:

Use as a resonance indicator an output meter connected across the primary of the speaker input transformer or by means of an adapter between the plate and cathode terminals of the 5 prong speaker socket. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of a multi-range meter should be used.

DUMMY ANTENNAS:

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1", "Dummy 2", and "Dummy 3".

Dummy 1: (I.F.)—Consists of a .1 mfd. condenser connected in series with the external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 mmfd. condenser and a 20 ohm resistor connected in series with each other and in series with the external oscillator.

Dummy 3: (Middle and Short Wave)—Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

ALIGNING I.F. TRANSFORMERS: (465 K.C.):

Part No. 108-106 Output I.F. Transformer
Part No. 108-105 Input I.F Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With volume control full on, (the extreme right of its rotation), the band changing switch in the broadcast position, (extreme left of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1", to the control grid cap of the type 6K7 tube, and adjust the output I.F. transformer (No. 108-106) to resonance.
   (b) With "Dummy 1" still connected, move oscillator output clip from grid of 6K7 to grid cap of 6A8G and adjust input I.F. transformer (No. 108-105) to resonance.

BROADCAST BAND ALIGNMENT:

540 to 1720 Kilocycles

1. With band changing switch in the broadcast position, extreme left of its rotation, and with gang condenser in its minimum capacity position, plates entirely out of mesh, and with external oscillator connected in series with "Dummy 2" to tan antenna lead and black ground lead, make following adjustments:
   (a) Set external oscillator to 1720 K.C. and adjust broadcast oscillator trimmer to resonance (adjustment number 1; see bottom view of coil assembly. Fig. 3.)
   (b) Re-set external oscillator to 1550 K.C., rotate variable gang condenser and pick up signal. Adjust broadcast antenna trimmer (Adjustment number 4) to resonance; also adjust preselector trimmer which is mounted on the top of the rear section of the three gang variable tuning condenser to resonance. (See top view of chassis, Fig. 1, for location of this adjustment.)
   (c) Re-set external oscillator to 600 K.C., and adjust broadcast series pad to resonance by rotating condenser to approximately 600 K.C., rocking it slowly to and fro until by adjusting series pad maximum output is attained. This adjustment is located on the bottom of the chassis directly under the variable gang condenser. (See bottom view of chassis, Fig. 3.)
   (d) Repeat adjustments "a" and "b" until sensitivity is at its maximum.
   (e) Check for tracking and sensitivity at 1000 kilocycles. **Under no circumstances bend plates of variable condenser sections to correct tracking.**

SHORT WAVE BAND ALIGNMENT:

5.35 to 18.1 Megacycles

1. With band changing switch in the short wave position, extreme right of its rotation, and with external oscillator set at 17 megacycles and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:
   (a) Move dial pointer to 17 megacycles and adjust short wave oscillator (Adjustment number 3) and short wave antenna (Adjustment number 6) to resonance.
   (b) Re-set external oscillator to 6 megacycles and pick up signal by rotating variable condenser and check sensitivity.
   (c) Re-set external oscillator and check set at 18.1 megacycles and 5.3 megacycles for band coverage.

NOTE: It is extremely necessary in making all of these adjustments that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental. An example of this is an image of a fundamental 18.3 megacycle signal appears near 17.4 megacycles.

MIDDLE WAVE BAND ALIGNMENT:

1690 to 5500 Kilocycles

1. With band changing switch in the middle wave position, center of its rotation, and with external oscillator set at 5000 kilocycles and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:
   (a) Move dial pointer to 5000 kilocycles and adjust middle wave oscillator (Adjustment number 2) and middle wave antenna (Adjustment number 5) to resonance.
   (b) Re-set external oscillator to 1800 kilocycles and pick up signal by rotating variable condenser and check sensitivity.
   (c) Re-set external oscillator and check set at 5400 kilocycles and 1700 kilocycles for band coverage.
   (d) Recheck broadcast band alignment.

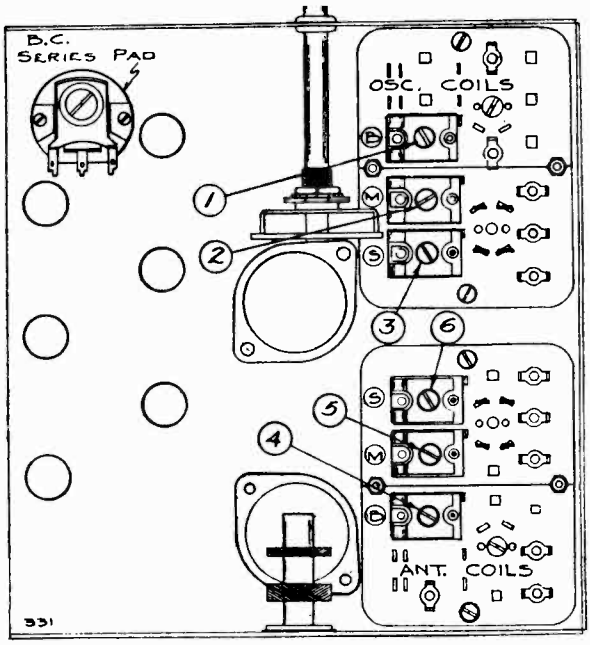


FIG. 3.—BOTTOM VIEW SHOWING TRIMMERS

MODEL 762
Schematic
Data

GAMBLE-SKOGMO, INC.

Power Consumption - 67 Watts (At 117 volts 60 cycles)

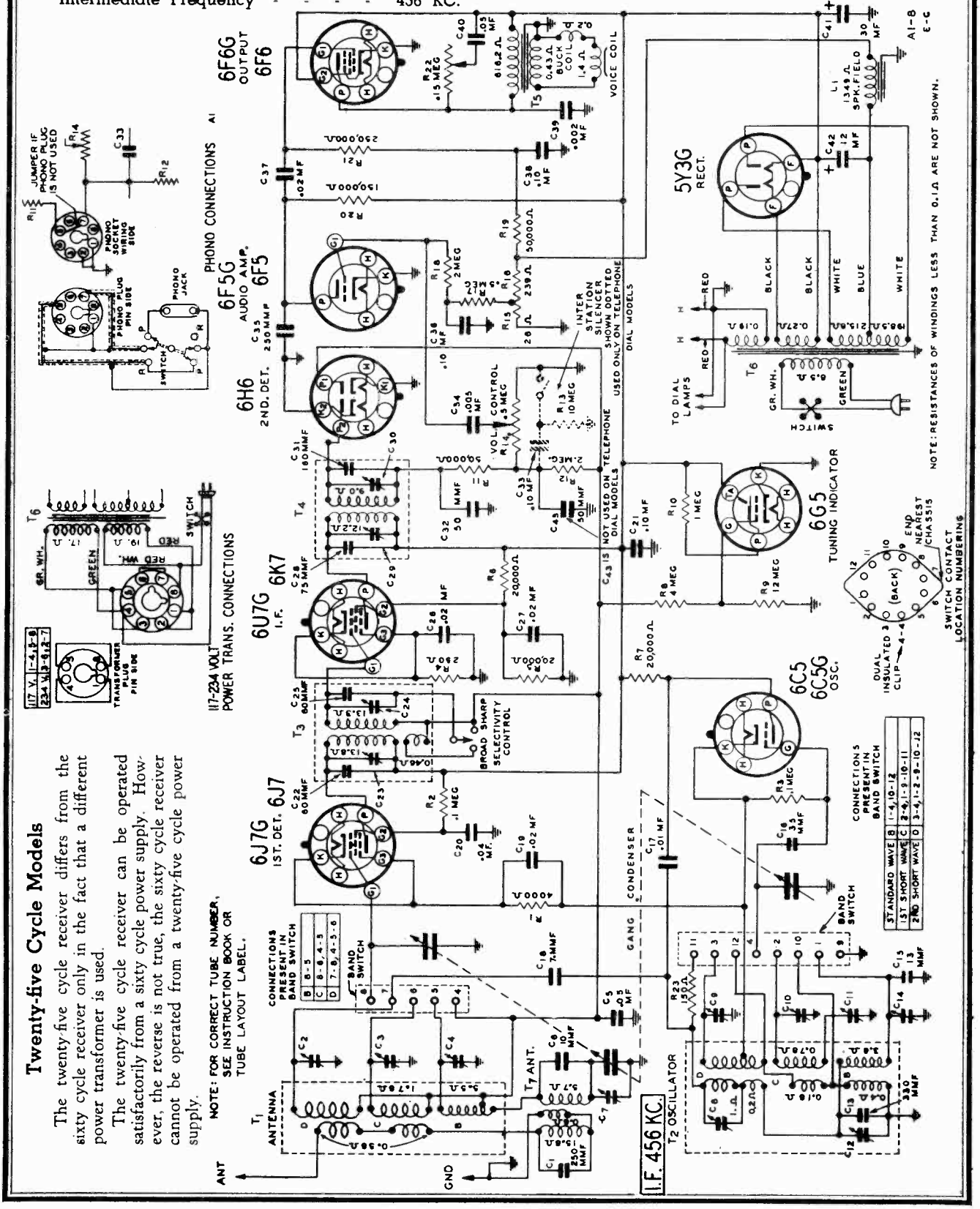
Power Output - - - - - 2.5 Watts Undistorted
4.5 Watts Maximum

Selectivity - 30 KC Broad at 1000 times Signal
(Sharp)

Intermediate Frequency - - - - - 456 KC.

Sensitivity

B Range..... 8 Microvolts Average
C Range..... 13 Microvolts Average
D Range..... 9 Microvolts Average



Twenty-five Cycle Models

The twenty-five cycle receiver differs from the sixty cycle receiver only in the fact that a different power transformer is used.

The twenty-five cycle receiver can be operated satisfactorily from a sixty cycle power supply. However, the reverse is not true, the sixty cycle receiver cannot be operated from a twenty-five cycle power supply.

LODEL 762
Socket,Chassis
Voltage,Coils

GAMBLE-SKOGMO, INC.

1ST ANT. "B" TRANS. T7 — ANT. R.F. TRANS. "C" & "D" - 2ND ANT. "B" T1 — OSC. COIL T2

Fig. 7—Coil Terminal Arrangement and D.C. Resistance of Windings

Fig. 6—Location of Tubes—Metal Tube Chassis

Fig. 4—Location of Tubes—Glass Tube Chassis

VOLTAGES AT SOCKETS

Line Voltage: 117—Volume Control: Maximum
Readings taken with 1000 Ohm-per-volt meter.

Antenna Shorted to Ground
Position of Band Switch: Standard Wave

TUBE	FUNCTION	VOLTAGE BETWEEN SOCKET PRONG AND GROUND (Unless otherwise indicated)							
		Prong No. 1	Prong No. 2	Prong No. 3	Prong No. 4	Prong No. 5	Prong No. 6	Prong No. 7	Prong No. 8
6J7 6J7G	1st Det.	0	6.1(1)	220	100	7.9		6.1(1)	7.9
6C5 6C5G	Osc.	0	6.1(1)	140				6.1(1)	0
6K7 6U7G	I.F.	0	6.1(1)	220	100	2		6.1(1)	2
6H6	2nd Det.	0	6.1(1)		0			6.1(1)	0
6F5 6F5G	Audio Amp.	0	6.1(1)		75			6.1(1)	0(2)
6F6 6F6G	Power	0	6.1(1)	215	220			6.1(1)	0(3)
5Y3G	Rectifier	0	4.9(4)		610(5)		610(5)		4.9(4)
6G5	Tuning Indicator	Plate to Ground 20		Target to Ground 220		Cathode to Ground 0		Across Heater 6.1 A. C.	

(1) A.C. voltage as read across heater terminals 2 and 7.
(2) Bias (1.5 volts) as read across resistor R15.
(3) Bias (14 volts) as read across resistors R15 and R16.
(4) A.C. voltage as read across filament terminals 2 and 8.
(5) A.C. voltage as read across terminals 4 and 6.

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Selectivity Control—Sharp Position 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., 200 mmf., and 400 ohms.

STEP (Follow Order as Given)	BAND SWITCH SETTING	DUMMY ANTENNA	SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	TRIMMERS ADJUSTED See Illustration	PROCEDURE INITIAL STEPS	PROCEDURE ADJUSTMENT
I. F.							
2nd I.F. Adj.	Range B	.1 mf.	456 KC	Grid of I.F. Tube	2nd I.F. (C29) & (C30)	Turn Rotor to Full Open	Adjust to Maximum Output
1st I.F. Adj.	Range B	.1 mf.	456 KC	Grid of 1st Det.	1st I.F. (C23) & (C24)	Turn Rotor to Full Open	Adjust to Maximum Output
RANGE B							
1830 KC	Range B	200 mmf.	1830 KC	Antenna Lead	Oscillator Range B (C14)	Turn Rotor to Full Open	Adjust to Maximum Output
1500 KC	Range B	200 mmf.	1500 KC	Antenna Lead	1st Ant. Range B (C7) 2nd Ant. Range B (C4)	Turn Rotor to Max. Output Set Indicator to 1500 KC— See Note A	Adjust to Maximum Output
600 KC	Range B	200 mmf.	600 KC	Antenna Lead	600 KC (C12)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B
RANGE C							
6350 KC	Range C	400 Ohm	6350 KC	Antenna Lead	Oscillator Range C (C10)	Turn Rotor to Full Open	Adjust to Maximum Output
6000 KC	Range C	400 Ohm	6000 KC	Antenna Lead	Antenna Range C (C3)	Turn Rotor to Max. Output	Adjust to Maximum Output
2000 KC	Range C	400 Ohm	2000 KC	Antenna Lead	2000 KC (C11)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B
RANGE D							
22,000 KC	Range D	400 Ohm	22,000 KC	Antenna Lead	Oscillator Range D (C9)	Turn Rotor to Full Open	Adjust to Maximum Output
20,000 KC	Range D	400 Ohm	20,000 KC	Antenna Lead	Antenna Range D (C2)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B
7000 KC	Range D	400 Ohm	7000 KC	Antenna Lead	7000 KC (C8)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

After each range is completed, repeat the procedure as a final check.

NOTE A—In sets using the telephone dial tuning, there will be seen inside the telephone dial button ring an escutcheon plate held in place by four screws. Loosen the 2 screws nearest the pointer. An extension of the pointer will be seen protruding over the edge of this escutcheon plate. Move the pointer to the 1500 KC mark on the dial and then tighten the 2 escutcheon screws. (Do not tighten these screws too much.)

In sets using the moving beam of light indicator, there is a moving light assembly held to the front of the drive drum by means of a screw. Loosen this screw and move the light assembly until the beam is at the 1500 KC mark on the dial. Retighten the screw.

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

CAUTION—When aligning the short wave bands, be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 5000 KC. The signal will then be heard at 5000 KC on the dial of the radio. The image signal, which is much weaker, will be heard at 5000 less 912 KC, or 4088 KC on the dial. It may be necessary to increase the input signal to hear the image.

NOTICE—Re-alignment is necessary if glass tubes are replaced by their equivalent in metal tubes, or vice versa, in the R.F. and I.F. stages.

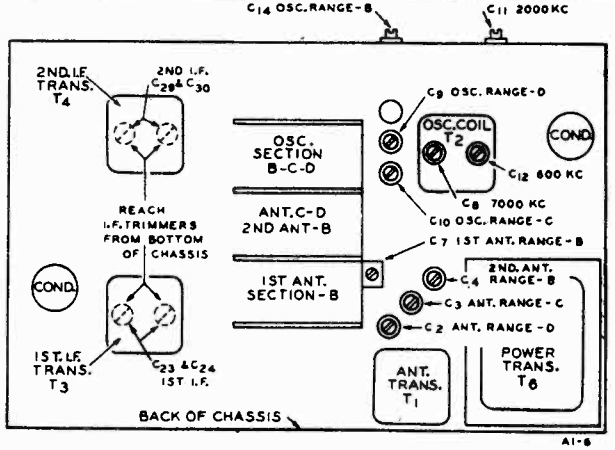


Fig. 3—Location of Trimmers

Circuit

This model is a three band AC operated radio with a tuning range as shown in the specifications above.

Referring to the schematic circuit diagram, Fig. 2, T1 and T7 are the antenna coil assemblies and T2 is the oscillator coil assembly. The standard wave, 1st and 2nd short wave coils in each assembly are indicated by the letters B, C and D respectively.

The band switch completes connections to the coils in use. When it is in the Range B position, a double tuned antenna R.F. stage is used while for the C and D Ranges, a single tuned secondary is used.

A type 6J7 tube functions as the 1st detector.

A separate type 6C5 tube is employed in the oscillator circuit. The oscillating circuit is always resonant at 456 KC above the frequency to which the R.F. amplifier is tuned.

One stage of I.F. amplification is employed using a 6K7 tube. The primaries and secondaries of the 1st and 2nd I.F. transformers are tuned by small trimmer condensers.

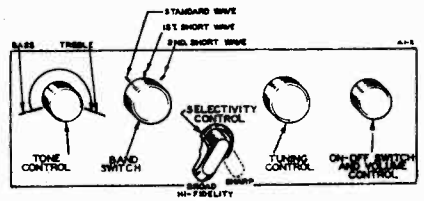


Fig. 1—Arrangement of Controls

Referring to Fig. 2, it will be noted that there is a coupling winding connected in series with the secondary of I.F. transformer T3. When the selectivity control is in the sharp position, the coupling winding is open circuited and the loose coupling which exists between the primary and secondary of this transformer results in high selectivity.

When the selectivity control is in the broad position, the coupling winding which is wound under the primary is connected in series with the secondary. This provides overcoupling which results in a greatly widened resonance curve. Passage of a wide range of audio frequencies is thus obtained.

A 6H6 tube functions as a diode 2nd detector. AVC voltage is applied to the control grid circuits of the 1st detector and I.F. tubes.

A 6F5 triode tube functions as the first audio amplifier while the output stage uses a 6F6 output pentode tube. A dynamic reproducer is employed.

The power unit uses a 5Y3G full wave rectifier. A 6G5 tuning indicator tube is employed.

Glass and Metal Tubes

All sets of this series use a 6H6 metal tube and 5Y3G and 6G5 glass tubes.

It will be noted in the schematic that there are two tube type numbers shown at the other sockets. The "metal" tube sets use the upper tube type numbers which are for metal tubes while the "glass" tube sets use the lower tube type numbers which are for glass tubes.

Re-alignment is necessary if glass tubes are replaced by their equivalent in metal tubes, or vice versa, in the R.F. and I.F. stages.

Phonograph Connections

Phonograph connections are made as shown in the schematic circuit diagram Fig. 2. On the side panel of the chassis base is a round knockout 1⅛ inches in diameter. An octal base socket is mounted in this knockout opening and wired as shown in the schematic.

A phono cable assembly may then be purchased (see parts list). On one end of this cable is an octal plug and on the other end is a phonograph-radio switch and double tip jack.

Some models are shipped from the factory equipped with the phono socket. A jumper is inserted in this socket which must be removed, if the phonograph installation is made—See Fig. 2.

Early Models—A few of the early models did not have the circular knockout for the phonograph socket as mentioned above. If a phonograph installation is to be made in connection with one of these early models, write the factory for detailed instructions.

117-234 Volt Power Transformers

Some models are equipped with a 117-234 volt 40 to 60 cycle power transformer. Connections as shown in Fig. 2 are completed to a special octal socket mounted on the back panel of the chassis. A plug which goes with this socket may then be inserted for either the 117 volt or 234 volt connection.

If one of these transformers is to be installed in a chassis equipped with a regular transformer, there is a 1⅛ inch round knockout on the back panel which may be removed to permit installation of the octal socket mentioned above.

Dial and Drive Assembly

Complete information regarding the dial and drive assemblies will be found in the Dial and Drive Service Manual issued for this chassis.

Replacement Parts

NOTICE—There is a large letter on the chassis which identifies the set as to major part changes. When ordering parts, please be sure to mention the series number and this large letter. With the exception of the parts otherwise indicated, the following parts are common to Series A1 chassis using either the Telephone Dial or the Phantom Light Dial.

MISCELLANEOUS

SOCKETS

Part No.	Description	List Price
3A256	Tube Socket—Octal (7 Prong)	$0.15
3A251	Tube Socket—Octal (5 Prong)	.10
3A268	Tube Socket—Octal (8 Prong)	.15
3A262	Speaker Socket—(4 Prong)	.15
13X795	6P4 Tube Socket and Cable Assembly	.55
3A266	Phone Socket—Octal (4 Prong)	.10
3A252	Dual Keyway Socket—Octal (8 Prong)—Universal Power Transformer Connections	.15
6A214	Plug (4 Prong)—Used with above socket	.25

SPEAKERS

When ordering parts for speakers, specify part number of speaker and letter preceding part number stamped on the speaker.

12A288	8" Dynamic Speaker compl. with Output Transformer (TS)	6.30
	Cone and Voice Coil Assy. for above Spkr.	2.75
	Output Transformer only (TS)	2.45
12A286	10" Dynamic Speaker compl. with Output Transformer (TS)	6.65
	Cone and Voice Coil Assy. for above Spkr.	3.50
	Output Transformer only (TS)	2.45
12A291	12" Dynamic Speaker compl. with Output Transformer (TS)	7.95
	Cone and Voice Coil Assy. for above Spkr.	4.40
	Output Transformer only (TS)	2.45

KNOBS

Specify name of knob & name & model of radio	Volume Control	.15
	Tone Control	.15
	Tuning Control	.15
	Band Switch	.20
	Selectivity Control	.25

GENERAL

22Q81	Tube Shield Base	.10
22X12	Tube Shield—Open Top (Used only on models having glass tubes)	.15
22X50	Tube Shield—Closed Top (Used on glass & metal tube chassis)	.15
8X23	Rubber Cushions (Chassis Mounting)	.10
2X28	Felt Washers (Used behind Knobs) doz.	.10
13X80	Line Cord and Plug	.90
13X214	Antenna and Ground Lead Assembly	.30
2A87	Band Change Switch (1 section, 3 position)—Used on Phantom Light Dial Radios only	1.05
2A86	Dial Lamp Switch—Used with above Switch on Phantom Light Dial only	.30
2A77	Band Change Switch (1 section, 3 position)—Used on Telephone Dial Radios only	1.00
20X375	Chassis Mounting Foot	.10
20X44	Grid Clip Only doz.	.10
2A78	Selectivity Switch	.40
4A48	Terminal Strip (3 Lugs Insulated)	.10
25X378	Clamp Bracket for Tuning Eye Tube	.10

TRANSFORMERS AND COILS

Part No.	Code	Description	List Price
9A774	T1	Antenna Transformer and Can Assembly "B" Range Secondary; C & D Range	$2.00
9A778	T7	1st Antenna Coil Assembly "B" Range	1.20
9A775	T2	Oscillator Coil and Can Assembly	2.75
9A776	T3	1st I.F. Transformer and Can Assembly	2.40
9A777	T4	2nd I.F. Transformer and Can Assembly	2.35
	T5	Output Transformer only (See "Speakers")	
53X164	T6	117 Volt, 60 Cycle, Standard Power Transformer	3.10
53X165	T6	117 Volt, 25 Cycle, Standard Power Transformer	6.20
53X166	T6	117-234 Volt, 40-60 Cycle, Universal Power Transformer	4.35

CONDENSERS

TUBULAR

Part No.	Code	Capacitance	Voltage	List Price
46X89	C6	.05 mf.	180	$0.15
46X130	C17	.01 mf.	360	.15
46X187	C19	.02 mf.	180	.15
46X212	C20	.04 mf.	360	.15
46X188	C21	.1 mf.	360	.20
46X187	C25	.02 mf.	180	.15
46X202	C27	.02 mf.	360	.15
46X98	C33	.1 mf.	180	.20
46X147	C34	.005 mf.	360	.15

CONDENSERS (Cont.)

TUBULAR (Cont.)

Part No.	Code	Capacitance	Voltage	List Price
46X98	C36	.1 mf.	180	$0.20
46X202	C37	.02 mf.	360	.15
46X98	C38	.1 mf.	180	.20
46X188	C39	.002 mf.	400	.15
46X188	C40	.05 mf.	400	.20

ELECTROLYTIC

44X85	C41	30 mf.	250	.75
44X51	C42	12 mf.	340	.80

MOLDED

47X69	C1	250 mmf.		.15
47X68	C4	10 mmf.		.15
47X69	C18	7 mmf.		.10
47X86	C32	50 mmf.		.10
47X65	C35	250 mmf.		.15
†47X86	C43	50 mmf.		.10

TRIMMER

17A73	C2	2-25 mmf.	Antenna Range—"D"	.35
	C3	2-25 mmf.	Antenna Range—"C"	
	C5	2-25 mmf.	2nd Antenna Range—"B"	
17A74	C7	2-25 mmf.	1st Antenna Range—"B"	.10
17A69	C11	40-100 mmf.	Oscillator 7000 KC	.40
	C12	40-120 mmf.	Oscillator 600 KC	
	C9	2-25 mmf.	Oscillator Range "D"	
17A76	C10	2-25 mmf.	Oscillator Range "C"	.25
17A75	C11	(300-1700 mmf.	Range "C"—Series Padding	.90
17A68	C14	1-12 mmf.	Oscillator Range "B"	.20
17A70	C23	15-80 mmf.	1st I.F. Trimmers	.40
	C24	15-80 mmf.		
17A70	C29	15-80 mmf.	2nd I.F. Trimmers	.40
	C30	15-80 mmf.		

MISCELLANEOUS

47X82	C13	330 mmf.	Iron Clad	.30
47X81	C16	75 mmf.	Iron Clad	.25
47X85	C22	60 mmf.	Iron Clad	.30
47X85	C26	60 mmf.	Iron Clad	.30
47X84	C28	75 mmf.	Iron Clad	.25
47X87	C31	160 mmf.	Iron Clad	.30
47X80	C16	13 mmf.	Compensating Capacitor	.50
14A70	3 Section Gang Condenser less Gears and Dial Assy.			4.20

* Used only on Telephone Dial Models.
† Used only on Phantom Light Dial Models.

RESISTORS

CARBON

Part No.	Code	Resistance	Wattage	List Price
A95402	R1	4000 Ohm	0.2	$0.10
A94104	R2	100,000 Ohm	0.2	.15
A94104	R3	100,000 Ohm	0.2	.15
A94251	R4	250 Ohm	0.2	.15
C94203	R5	20,000 Ohm	1.0	.15
C94203	R6	20,000 Ohm	1.0	.15
B94203	R7	20,000 Ohm	0.5	.15
A94408	R8	4 Megohm	0.2	.15
A94124	R9	12 Megohm	0.2	.15
A95105	R10	1 Megohm	0.2	.10
A95803	R11	50,000 Ohm	0.2	.10
A95206	R12	2 Megohm	0.2	.10
*A95104	R13	10 Megohm	0.2	.10
A95504	R17	500,000 Ohm	0.2	.10
A95205	R18	2 Megohm	0.2	.10
A95803	R19	50,000 Ohm	0.2	.10
A95154	R20	150,000 Ohm	0.2	.10
A95254	R21	250,000 Ohm	0.2	.10
A95151	R23	150 Ohm	0.2	.10

WIRE WOUND

43X76	R15	.24 Ohm	.25	.35
	R16	239 Ohm	2.0	

VARIABLE

34X235	R14	.5 Megohm Volume Control and On-Off Switch	.90
40X223	R22	.15 Megohm Tone Control	.45

* Used only on Telephone Dial Models.

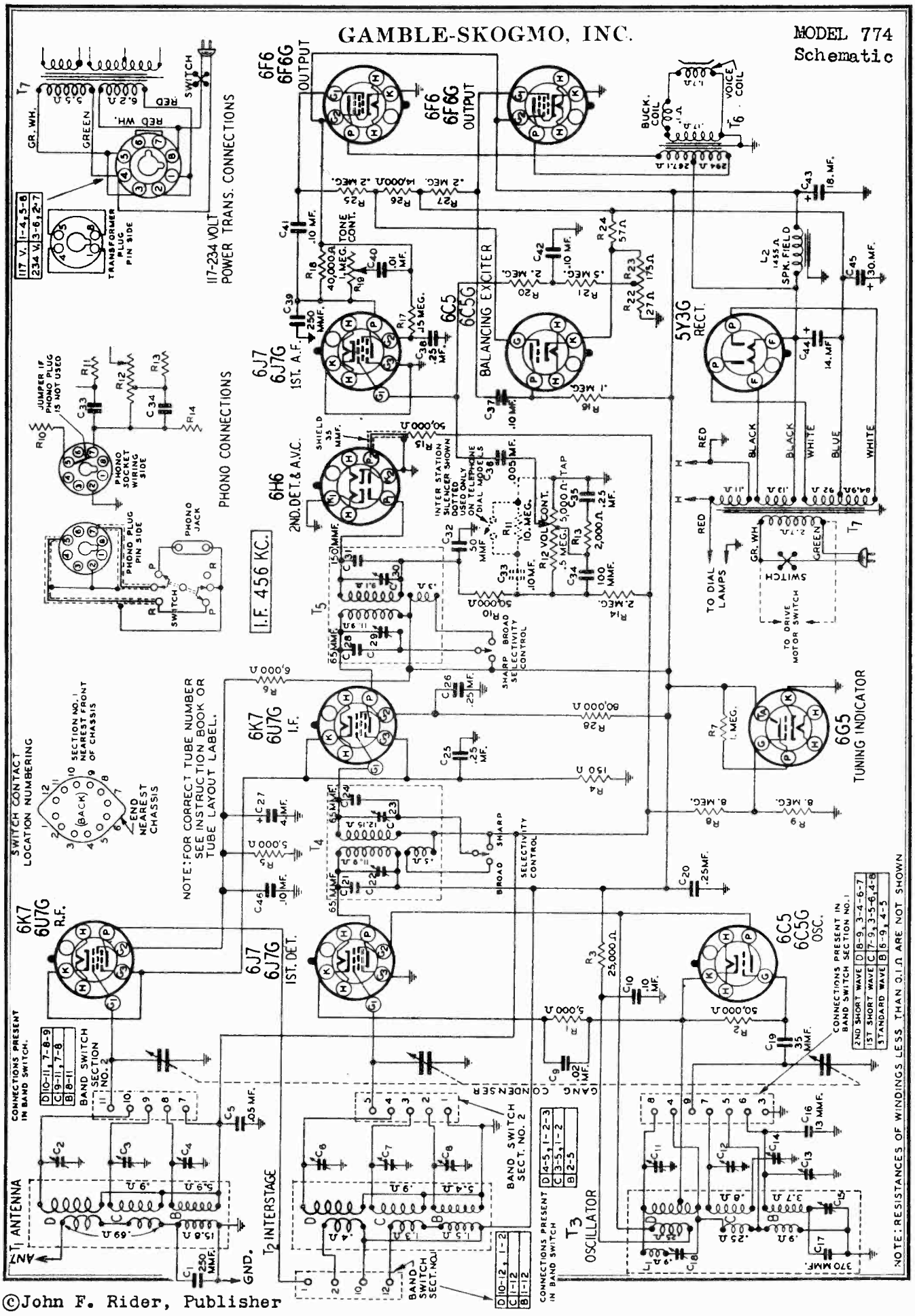
PHONO ATTACHMENT PARTS

Part No.	Description	List Price
13X298	30" Phono Cable Assembly Complete (Includes Plug, Double-tip Phono Jack, Switch, and Knob)	$2.55
3A266	Phono Socket—Octal (4 Prong)—Must be ordered for Chassis not equipped with this socket	.10
6A218	Plug (8 Prong) Only of Phono Cable	.15
3A12	Phono Jack Only of Phono Cable	.10
2A80	Phono Switch Only of Phono Cable	.70
10A90	Knob Only of Phono Cable	.20

DIAL AND DRIVE ASSEMBLY

DIAL AND DRIVE PARTS WILL BE FOUND IN SPECIAL DIAL AND DRIVE MANUAL.

Prices Subject to Change Without Notice.



ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Selectivity Control—Sharp Position 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., 200 mmf., and 400 ohms.

STEP (Follow Order as Given)	BAND SWITCH SETTING	DUMMY ANTENNA	SIGNAL GENERATOR		TRIMMERS ADJUSTED See Illustration	PROCEDURE	
			FREQUENCY SETTING	CONNECTION AT RADIO		INITIAL STEPS	ADJUSTMENT
I. F.							
2nd I.F. Adj.	Range B	.1 mf.	456 KC	Grid of I.F. Tube	2nd I.F. (C29) & (C30)	Turn Rotor to Full Open	Adjust to Maximum Output
1st I.F. Adj.	Range B	.1 mf.	456 KC	Grid of 1st Det.	1st I.F. (C22) & (C23)	Turn Rotor to Full Open	Adjust to Maximum Output
RANGE B							
1830 KC	Range B	200 mmf.	1830 KC	Antenna Lead	Oscillator Range B (C13)	Turn Rotor to Full Open	Adjust to Maximum Output
1500 KC	Range B	200 mmf.	1500 KC	Antenna Lead	Ant. Range B (C4) Int. Range B (C8)	Turn Rotor to Max. Output Set Indicator to 1500 KC— See Note A	Adjust to Maximum Output
600 KC	Range B	200 mmf.	600 KC	Antenna Lead	600 KC (C15)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B
RANGE C							
6350 KC	Range C	400 Ohm	6350 KC	Antenna Lead	Oscillator Range C (C12)	Turn Rotor to Full Open	Adjust to Maximum Output
6000 KC	Range C	400 Ohm	6000 KC	Antenna Lead	Antenna Range C (C3) Int. Range C (C7)	Turn Rotor to Max. Output	Adjust to Maximum Output
2000 KC	Range C	400 Ohm	2000 KC	Antenna Lead	2000 KC (C14)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B
RANGE D							
22,000 KC	Range D	400 Ohm	22,000 KC	Antenna Lead	Oscillator Range D (C11)	Turn Rotor to Full Open	Adjust to Maximum Output
20,000 KC	Range D	400 Ohm	20,000 KC	Antenna Lead	Ant. Range D (C2) Int. Range D (C6)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B
7000 KC	Range D	400 Ohm	7000 KC	Antenna Lead	7000 KC (C18)	Turn Rotor to Max. Output	Adjust to Maximum Output Rock Rotor — See Note B

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

After each range is completed, repeat the procedure as a final check.

NOTE A—In sets using the telephone dial tuning, there will be seen inside the telephone dial button ring an escutcheon plate held in place by four screws. Loosen the 2 screws nearest the pointer. An extension of the pointer will be seen protruding over the edge of this escutcheon plate. Move the pointer to the 1500 KC mark on the dial and then tighten the 2 escutcheon screws. (Do not tighten these screws too much.)

In sets using the moving beam of light indicator, there is a moving light assembly held to the front of the drive drum by means of a screw. Loosen this screw and move the light assembly until the beam is at the 1500 KC mark on the dial. Retighten the screw.

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

CAUTION—When aligning the short wave bands, be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 5000 KC. The signal will then be heard at 5000 KC on the dial of the radio. The image signal, which is much weaker, will be heard at 5000 less 912 KC, or 4088 KC on the dial. It may be necessary to increase the input signal to hear the image.

NOTICE—Re-alignment is necessary if glass tubes are replaced by their equivalent in metal tubes, or vice versa, in the R.F. and I.F. stages.

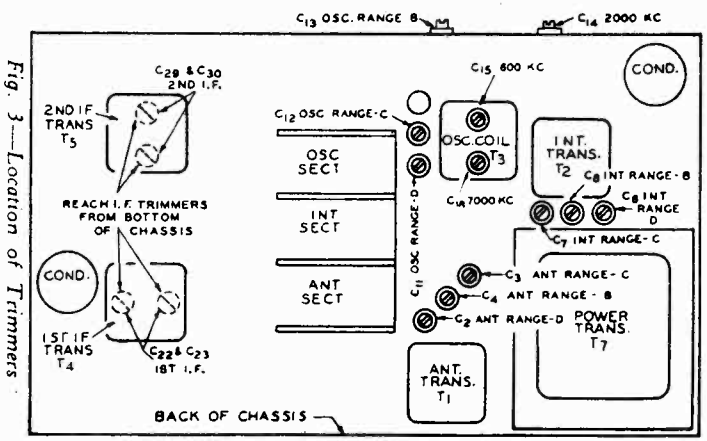


Fig. 3—Location of Trimmers

GAMBLE-SKOGMO, INC.

MODEL 774
Voltage, Socket
Chassis, Coils

Power Consumption - 100 Watts (At 117 volts 60 cycles)

Power Output - - - - - - 9.8 Watts Undistorted, 12 Watts Maximum

Selectivity (Sharp) - - 27 KC Broad at 1000 times Signal

Intermediate Frequency - - - - - - - - 456 KC.

Speaker - - - - - - - - - - 12" Dynamic

Tuning Frequency Range

B Range	528 to 1830 KC.
C Range	1810 to 6350 KC.
D Range	6300 to 22000 KC.

Sensitivity

B Range	1.0 Microvolts Average
C Range	1.0 Microvolts Average
D Range	2.0 Microvolts Average

MAY, 1937

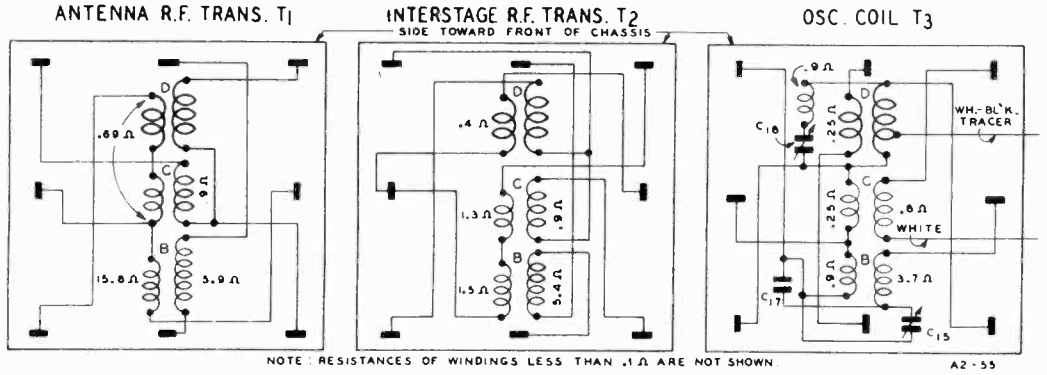


Fig. 6—Coil Terminal Arrangement and DC Resistance of Windings

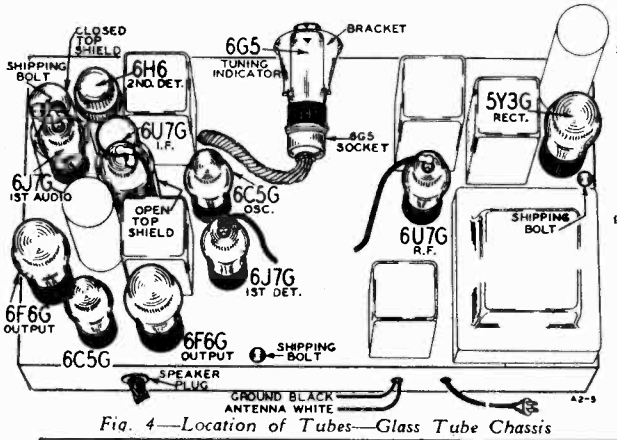


Fig. 4—Location of Tubes—Glass Tube Chassis

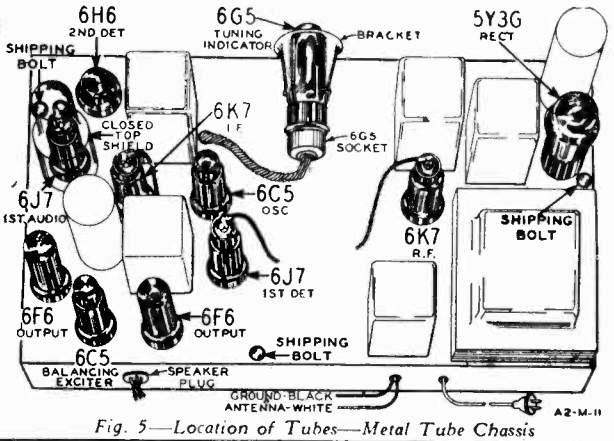


Fig. 5—Location of Tubes—Metal Tube Chassis

VOLTAGES AT SOCKETS

Line Voltage: 117—Volume Control: Maximum
Readings taken with 1000 Ohm-per-volt meter.

Antenna Shorted to Ground
Position of Band Switch: Standard Wave

TUBE	FUNCTION	VOLTAGE BETWEEN SOCKET PRONG AND GROUND (Unless otherwise indicated)							
		Prong No. 1	Prong No. 2	Prong No. 3	Prong No. 4	Prong No. 5	Prong No. 6	Prong No. 7	Prong No. 8
6K7 6U7G	R.F.	0	6.1(1)	250	105	2.5		6.1(1)	2.5
6J7 6J7G	1st Det.	0	6.1(1)	250	125	0		6.1(1)	5.8
6C5 6C5G	Osc.	0	6.1(1)	125(2)				6.1(1)	0
6K7 6U7G	I.F.	0	6.1(1)	250	100	2.5		6.1(1)	2.5
6H6	2nd Det.—A.V.C.	0	6.1(1)					6.1(1)	0
6J7 6J7G	1st A.F.	0	6.1(1)	110	120	0(3)		6.1(1)	0(3)
6C5 6C5G	Balancing Exciter	0	6.1(1)	100				6.1(1)	18.5
6F6 6F6G	Output	0	6.1(1)	330	250			6.1(1)	0(4)
5Y3G	Rectifier	0	4.8(5)		730(6)		730(6)		4.8(5)
6G5	Tuning Indicator	Plate to Ground 20		Target to Ground 250		Cathode to Ground 0		Across Heater 6.1 A.C.	

(1) A.C. voltage as read across heater terminals 2 and 7.
(2) Subject to variation.
(3) Bias (2.5 volts) as read across resistor R22.
(4) Bias (24 volts) as read across resistors R22, R23, & R24.
(5) A.C. voltage as read across filament terminals 2 and 8.
(6) A.C. voltage as read across terminals 4 and 6.

Twenty-Five Cycle Models

The twenty-five cycle receiver differs from the sixty cycle receiver only in the fact that a different power transformer is used.

The twenty-five cycle receiver can be operated satisfactorily from a sixty cycle power supply. However, the reverse is not true—the sixty cycle receiver cannot be operated from a twenty-five cycle power supply.

Phonograph Connections

Phonograph connections are made as shown in the schematic circuit diagram Fig. 2. On the front panel of the chassis base is a round knockout 1⅛ inches in diameter. An octal base socket is mounted in this knockout opening and wired as shown in the schematic.

A phono cable assembly may then be purchased (see parts list). On one end of this cable is an octal plug and on the other end is a phonograph-radio switch and double tip jack.

Some models are shipped from the factory equipped with the phono socket. A jumper is inserted in this socket which must be removed if the phonograph installation is made—see Fig. 2.

117-234 Volt Power Transformers

Some models are equipped with a 117-234 volt 40 to 60 cycle power transformer. Connections as shown in Fig. 2 are completed to a special octal socket mounted on the back panel of the chassis. A plug which goes with this socket may then be inserted for either the 117 volt or 234 volt connection.

If one of these transformers is to be installed in a chassis equipped with a regular transformer, there is a 1⅛ inch round knockout on the back panel which may be removed to permit installation of the octal socket mentioned above.

Dial and Drive Assembly

Complete information regarding the dial and drive assemblies will be found in the Dial and Drive Service Manual issued for this chassis.

Changes in Later Models

Later models of this series have the following changes incorporated in them.

On the first models, the 2nd I.F. Coil was not expanded. In other words, the extra selectivity coupling winding was not incorporated in the early type coil. Models with the letter "C" or any later issue stamped on the chassis use the new type coil with the selectivity coupling winding. Because of the change in coil connections, the selectivity switch used on the late model is not interchangeable with that on the early model.

When ordering parts, therefore, it is important that the issue letter on the chassis be noted and the correct part number as shown in the parts list be specified.

The R.F. circuit of early models was slightly different from that used in later models. The screen grids of the R.F. and I.F. tubes now supplied by separate voltage sources were formerly connected together and supplied from a single source. On the latter models, resistor R 28 and condenser C 46 were not used.

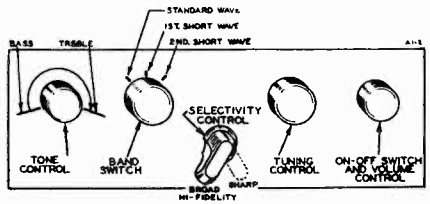


Fig. 1—Arrangement of Controls

Re-alignment is necessary if glass tubes are replaced by their equivalent in metal tubes, or vice versa, in the R.F. and I.F. stages.

Prices Subject to Change Without Notice.

Replacement Parts

NOTICE—There is a large letter on the chassis which identifies the set as to major part changes. When ordering parts, please be sure to mention the series number and this large letter.

MISCELLANEOUS

SOCKETS

Part No.	Description	List Price
3A256	Tube Socket—Octal (7 Prong)	$0.15
3A263	Tube Socket—Octal (8 Prong)	.15
3A261	Tube Socket—Octal (5 Prong)	.10
3A262	Speaker Socket (6 Prong)	.15
13X296	Tuning Eye Tube Socket and Cable Assembly	.55
3A266	Phono Socket—Octal (4 Prong)	.10
3A252	Dual Keyway Socket—Octal (8 Prong)—Universal Power Transformer Connections	.15
6A214	Plug (4 Prong)—Used with above Socket	.25

SPEAKERS

When ordering parts for speakers, specify part number of speaker and letter preceding part number stamped on the speaker.

12A269	12" Dynamic Speaker, complete with Output Trans. (T6)	7.70
	Cone and Voice Coil Assembly for above speaker	4.60
	Output Transformer only (T6)	2.45

KNOBS

Specify Name of Knob & Name & Model of Radio		
	Volume Control Knob	.15
	Tone Control Knob	.15
	Tuning Control Knob	.15
	Band Switch Knob	.20
	Selectivity Control Knob	.25

GENERAL

25X378	Clamp Bracket for Tuning Eye Tube	.10
32X60	Tube Shield—Closed Top (Used on glass and metal tube chassis)	.15
32X32	Tube Shield—Open Top (Used only on models having glass tubes)	.15
32X51	Tube Shield Base	.10
2X38	Felt Washers (Used Behind Knobs) ..... doz.	.10
8X23	Rubber Cushions (Chassis Mounting)	.10
30X44	Grid Clip only ..... doz.	.10
2A78	Selectivity Switch (Early Type—Used when 2nd I.F. is not expanded)	.40
2A83	Selectivity Switch (Late Type—Used when 2nd I.F. is expanded)	.45
4A38	Terminal Strip (1 lug insulated, one lug used for mtg.)	.10
4A63	Terminal Strip (3 lugs insulated, mounting hole used)	.10
4A48	Terminal Strip (3 lugs insulated)	.10
13X214	Antenna and Ground Lead Assembly	.30
13X80	Line Cord and Plug	.50
2A79	Band Switch (2 section, 3 position)	1.65

TRANSFORMERS AND COILS

Part No.	Code	Description	List Price
9A779	T1	Antenna Transformer and Can Assembly	$2.15
9A780	T2	R.F. Interstage Transformer and Can Assembly	2.30
9A781	T3	Oscillator Coil and Can Assembly	3.60
9A782	T4	1st I.F. Transformer and Can Assembly	2.40
9A783	T5	2nd I.F. Transformer and Can Assembly (Early Type—Without selectivity coupling winding)	2.25
9A857	T5	2nd I.F. Transformer and Can Assembly (Late Type—With selectivity coupling winding)	2.25
	T6	Output Transformer (See "Speakers")	
53X148	T7	117 Volt, 60 Cycle, Standard Power Transformer	4.45
53X149	T7	117 Volt, 25 Cycle, Standard Power Transformer	7.15
53X150	T7	117-234 Volt, 40-60 Cycle, Universal Power Transformer	5.75

CONDENSERS

TUBULAR

Part No.	Code	Capacitance	Voltage	List Price
46X80	C5	.05 mf.	180	$0.15
46X187	C9	.02 mf.	180	.15
46X105	C10	.10 mf.	360	.20
46X121	C20	.25 mf.	360	.30
46X117	C25	.25 mf.	180	.25
46X121	C26	.25 mf.	360	.30
46X98	C33	.10 mf.	180	.20
46X197	C35	.25 mf.	180	.25
46X147	C36	.005 mf.	360	.15
46X105	C37	.10 mf.	360	.20
46X121	C38	.25 mf.	360	.30
46X161	C40	.01 mf.	600	.15
46X105	C41	.10 mf.	360	.20
46X98	C42	.10 mf.	180	.20
46X181	C46	.10 mf.	240	.15

CONDENSERS (Cont.)

ELECTROLYTIC

Part No.	Code	Capacitance	Voltage	List Price
45X223	C27	4 mf.	150 Dry	$0.75
44X11	C43	18 mf.	290 Wet	1.10
44X30	C44	14 mf.	450 Wet	1.00
45X222	C45	30 mf.	25 Dry	.95

MOLDED

47X69	C1	250 mmf.		.15
47X81	C19	35 mmf.		.25
47X56	C32	50 mmf.		.10
47X57	C34	100 mmf.		.10
47X65	C39	250 mmf.		.15

TRIMMER

17A73	C2	2-25 mmf.	Range "D" Antenna Trimmer	.35
	C3	2-25 mmf.	Range "C" Antenna Trimmer	
	C4	2-25 mmf.	Range "B" Antenna Trimmer	
17A73	C6	2-25 mmf.	Range "D" Interstage Trimmer	.35
	C7	2-25 mmf.	Range "C" Interstage Trimmer	
	C8	2-25 mmf.	Range "B" Interstage Trimmer	
17A76	C11	2-25 mmf.	Range "D" Oscillator Trimmer	.25
	C12	2-25 mmf.	Range "C" Oscillator Trimmer	
17A68	C13	1-12 mmf.	Range "B" Oscillator Trimmer	.20
17A75	C14	1300-1700 mmf.	2000 KC Adjustment	.50
17A69	C15	40-120 mmf.	Oscillator 600 KC Adjustment	.40
	C18	40-100 mmf.	Oscillator 7000 KC Adjustment	
17A70	C22	15-55 mmf.	1st I.F. Trimmer	.40
	C23	15-55 mmf.		
17A70	C29	15-55 mmf.	2nd I.F. Trimmer	.40
	C30	15-55 mmf.		

MISCELLANEOUS

47X80	C16	13 mmf.	Compensating Capacitor	.50
47X89	C17	370 mmf.	Iron Clad	.30
47X91	C21	65 mmf.	Iron Clad	.25
47X91	C24	66 mmf.	Iron Clad	.25
47X91	C28	65 mmf.	Iron Clad	.25
47X83	C31	150 mmf.	Iron Clad	.35
14A70	3 Section Gang Condenser (less dial and drive assembly)			6.20

* Used on late models only.

RESISTORS

CARBON

Part No.	Code	Resistance	Wattage	List Price
A94502	R1	5,000 Ohm	0.2	$0.15
A94503	R2	50,000 Ohm	0.2	.15
C94253	R3	25,000 Ohm	1.0	.15
A94151	R4	150 Ohm	0.2	.15
E94502	R5	5,000 Ohm	3.0	.30
G94602	R6	6,000 Ohm	5.0	.40
A95105	R7	1 Megohm	0.2	.10
A94805	R8	8 Megohm	0.2	.15
A94805	R9	8 Megohm	0.2	.15
A95603	R10	50,000 Ohm	0.2	.10
A95106	R11	10 Megohm	0.2	.10
A94202	R13	2,000 Ohm	0.2	.15
A95208	R14	2 Megohm	0.2	.10
A95603	R15	50,000 Ohm	0.2	.10
A94104	R16	100,000 Ohm	0.2	.15
A94164	R17	150,000 Ohm	0.2	.15
B94403	R18	40,000 Ohm	0.5	.15
A95208	R20	2 Megohm	0.2	.10
A95804	R21	500,000 Ohm	0.2	.10
B93570	R24	57 Ohm	0.5	.20
A93204	R25	200,000 Ohm	0.2	.20
A93143	R26	14,000 Ohm	0.2	.20
A95204	R27	200,000 Ohm	0.2	.10
*B94803	R28	80,000 Ohm	0.5	.15

WIRE WOUND

43X77	R22	27 Ohm	0.25	.35
	R23	175 Ohm	2.0	

VARIABLE

36X236	R12	500,000 Ohm	Volume Control and On-Off Switch	1.00
40X224	R19	1 Megohm	Tone Control	.65

* Used on late models only.

PHONO ATTACHMENT PARTS

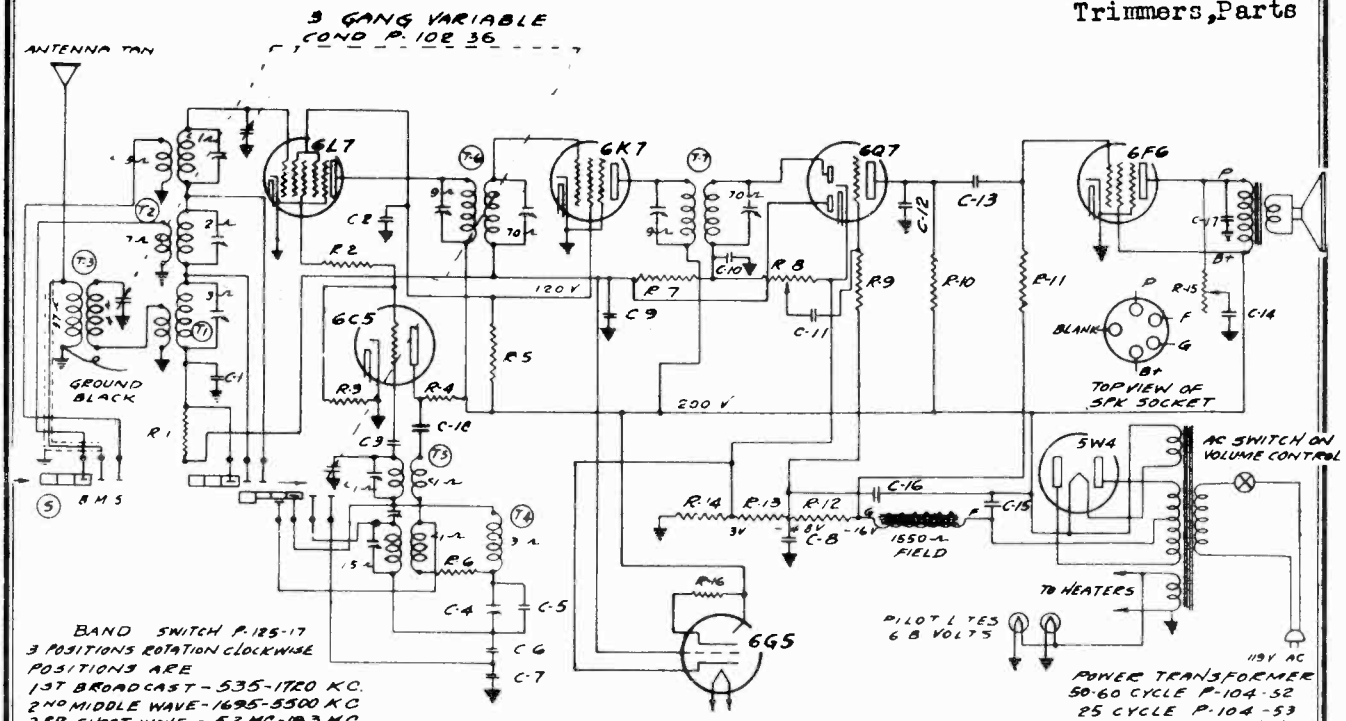
Part No.	Description	List Price
13X298	30" Phono Cable Assembly Complete (Includes Plug, Double-Tip Phono Jack, Switch, and Knob)	$2.85
3A266	Phono Socket—Octal (4 Prong)—Must be ordered for Chassis not equipped with this socket	.10
6A218	Plug (6 Prong) Only of Phono Cable	.15
3A12	Phono Jack Only of Phono Cable	.10
2A52	Phono Switch Only of Phono Cable	.70
10A90	Knob Only of Phono Cable	.20

DIAL AND DRIVE ASSEMBLY

DIAL AND DRIVE PARTS WILL BE FOUND IN SPECIAL DIAL AND DRIVE MANUAL

GAMBLE-SKOGMO, INC.

MODEL 787
Schematic
Voltage, Socket
Trimmers, Parts



RESISTORS

No.	Part No.	Description
R1	130-20	100M Ohm—½ Watt—20%— 50 Volt Carbon
R2	130-105	150 Ohm—½ Watt—20%— 10 Volt Carbon
R3	130-12	50M Ohm—½ Watt—20%— 10 Volt Carbon
R4	130-104	9M Ohm— 1 Watt—20%—100 Volt Carbon
R5	130-34	19M Ohm— 1 Watt—20%—100 Volt Carbon
R6	130-27	50 Ohm—½ Watt—20%— 3 Volt Carbon
R7	130-18	1 Meg Ohm—½ Watt—20%—100 Volt Carbon
R8	101-46	1 Meg Ohm—Volume Control
R9	130-4	3 Meg Ohm—½ Watt—20%—100 Volt Carbon
R10	130-103	100M Ohm—½ Watt—20%— 50 Volt Carbon
R11	130-102	500M Ohm—½ Watt—10%— 50 Volt Carbon
R12	106-26	220 Ohm
R13		32 Ohm
R14		52 Ohm
R15	101-53	50M Ohm—Tone Control
R16	130-110	1 Meg Ohm—1/10 Watt—10%—100 Volt Carbon

CONDENSERS

C1	100-22	.05x200 Volt—25%
C2	100-1	.1x400 Volt—+50%—10%
C3	129-39	.00005 Mica (MT-O)—20%
C4	124-28	Series Pad (80-225)
C5	129-65	.00055 Mica (MT-O)—5%
C6	129-55	.0034 Mica (MW-W)—2½%
C7	129-54	.003 Mica (MW-W)—2½%
C8	100-20	.1x200 Volt—25%
C9	100-22	.05x200 Volt—25%
C10	129-12	.00025 Mica (MT-O)—20%
C11	100-11	.01x400 Volt—25%
C12	129-2	.0005 Mica (MT-O)—20%
C13	100-11	.01x400 Volt —25%
C14	100-27	.025x600 Volt—25%
C15	103-6	8 Mfd. x 350 Volt Electrolytic
C16	103-7	8 Mfd. x 300 Volt Electrolytic
C17	100-25	.002x600 Volt—20%
C18	100-37	.003x600 Volt—10%

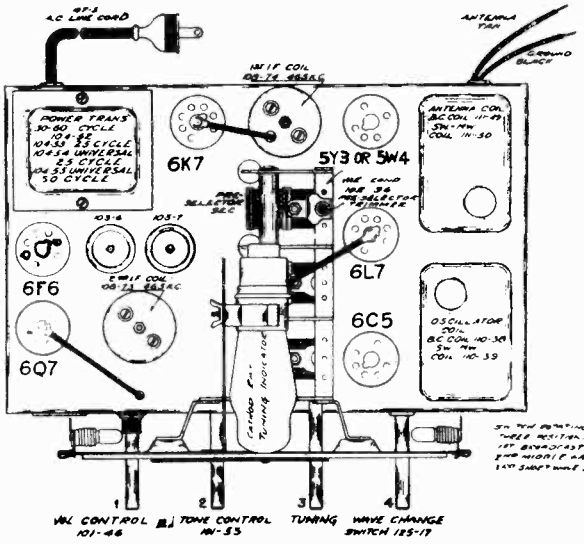
PARTS

T1	111-49	Broadcast Antenna Coil
T2	111-50	S.W.-M.W. Antenna Coil
T3	111-51	B.C.-Pre-Selector Coil Assem.
T4	110-38	H.C. Oscillator Coil
T5	110-39	S.W.-M.W. Oscillator Coil
T6	108-74	Input I.F. - 465 K.C.
T7	108-73	Output I.F. - 465 K.C.
S	125-17	Wave Change Switch

I. F. FREQUENCY
465 K. C.

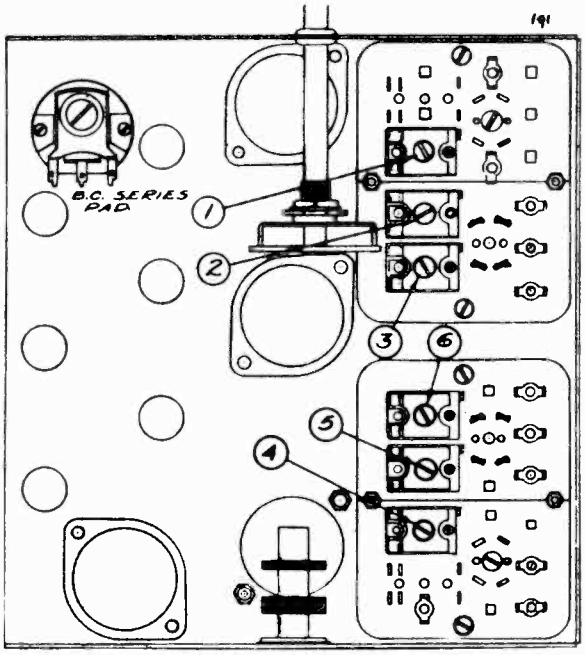
FIG. 3—BOTTOM VIEW

(Showing Trimmers)



60 Cycle, 55 Watt, 105-115 Volt
BRC-787 (Model 787), Series A

FIG. 1—TOP VIEW



MODEL 787
Alignment
Notes

GAMBLE-SKOGMO, INC.

Including Cathode-Ray Tuning Indicator
3-Band A. C. Superheterodyne Receiver

TUNING RANGE—
Standard Broadcast Band
535-1720 Kilocycles.

Middle Wave Band
1695-5500 Kilocycles.
Short Wave Band
5.2-18.3 Megacycles.

DESCRIPTION:

Model 787 is a seven tube A.C. all wave superheterodyne receiver. It has a tuning range of 535 K.C. to 18.3 megacycles in three bands, and is characterized by its exceptional stability, and by a sensitivity both high and uniform, with high signal to noise ratio on all bands. The I.F. frequency used is 465 K.C., which in conjunction with the pre-selector circuit, gives high image and I.F. attenuation (freedom from whistles and telegraphic interference).

A separate oscillator; effective automatic volume control; broad nose sharp skirt selectivity and new type oval airplane dial, are a few of the outstanding features of this model.

Transformers are available and chassis are sometimes equipped with universal transformers for operation on 25, 40, and 60 cycles and with primary taps for 108, 127, 150, 225 and 260 volts (see instructions). and also sometimes equipped with 25 cycle transformers with 105-115 volt or 220 volt primaries, not universals.

TUBE COMPLEMENT:

The tube complement of the model 787 consists of the latest metal tubes. They are as follows:

1-Type 6L7 Pentagrid Mixer, First Detector.

1-Type 6C5 Oscillator.

1-Type 6K7 Remote Cut-off Pentode, I.F. Amplifier (465 K.C.).

1-Type 6Q7 Duplex Diode Triode Second Detector, A.V.C. and First Audio.

1-Type 6F6 Pentode Output Amplifier.

1-Type 5W4 High Vacuum Rectifier.

1-Type 6G5 Cathode-Ray Tuning Indicator. (Note: 6G5 available in all glass only.)

SERVICE NOTES:

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

All voltages as indicated on diagram are measured with 119 volts on the primary of the power transformer.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser; open by-pass condensers frequently cause oscillation and distorted tone.

ALIGNING INSTRUCTIONS:

CAUTION:—No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltages, defective tubes, condensers and resistors. In order to properly align this chassis, an oscillator (generator) is absolutely necessary. No aligning adjustments should be attempted with the chassis in the cabinet. Remove the knobs and the four bolts which are used to fasten the chassis.

All adjustments should be made with a non-metallic screw driver.

DUMMY ANTENNAS:

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1," "Dummy 2," and "Dummy 3."

Dummy 1: (I.F.)—Consists of a .1 mfd. condenser connected in series with the external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 mmfd. condenser and a 20 ohm resistor connected in series with each other and in series with the external oscillator.

Dummy 3: (Middle and Short Wave)—Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

RESONANCE INDICATOR:

Use as a resonance indicator an output meter connected across the primary of the speaker input transformer, or by means of an adapter between the plate and screen terminals of the type 6F6 output tube. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of a multi-range meter should be used.

ALIGNING I.F. TRANSFORMERS; (465 K.C.):

Part No. 108-73 Output I.F. Transformer.
Part No. 108-74 Input I.F. Transformer.

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With volume control full on (the extreme right of its rotation), the band changing switch in the broadcast position (extreme left of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1," to the control grid cap of the type 6K7 tube, and adjust the output I.F. transformer (No. 108-73) to resonance.
   (b) With "Dummy 1" still connected, move oscillator output clip from grid of 6K7 to grid cap to 6L7 and adjust input I.F. transformer (No. 108-74) to resonance.
   (c) With oscillator still connected to 6L7, readjust output I.F. transformer (108-73) if necessary.

ALIGNMENT PROCEDURE:

The following adjustments to be made after the I.F.'s have been aligned as explained above.

BROADCAST BAND ALIGNMENT:

535 to 1720 Kilocycles

1. With band changing switch in the broadcast position, extreme left of its rotation, and with gang condenser in its minimum capacity position, plates entirely out of mesh, and with external oscillator connected in series with "Dummy 2" to tan antenna lead and black ground lead, make following adjustments:
   (a) Set external oscillator to 1720 K.C. and adjust broadcast oscillator trimmer to resonance (adjustment number 1; see bottom view of coil assembly, Fig. 3).
   (b) Re-set external oscillator to 1550 K.C., rotate variable gang condenser and pick up signal. Adjust broadcast antenna trimmer (Adjustment number 4) to resonance; also adjust preselector trimmer which is mounted on the top of the rear section of the three gang variable tuning condenser to resonance. (See top view of chassis, Fig. 1, for location of this adjustment.)
   (c) Re-set external oscillator to 600 K.C., and adjust broadcast series pad to resonance by rotating condenser to approximately 600 K.C., rocking it slowly to and fro until by adjusting series pad maximum output is attained. This adjustment is located on the bottom of the chassis directly under the variable gang condenser. (See bottom view of chassis, Fig. 3.)
   (d) Repeat adjustments "a" and "b" until sensitivity is at its maximum.
   (e) Check for tracking and sensitivity at 1000 kilocycles. **Under no circumstances bend plates of variable condenser sections to correct tracking.**

SHORT WAVE BAND ALIGNMENT:

5.2 to 18.3 Megacycles

1. With band changing switch in the short wave position, extreme right of its rotation, and with external oscillator set at 17 megacycles and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:
   (a) Move dial pointer to 17 megacycles and adjust short wave oscillator (Adjustment number 3) and short wave antenna (Adjustment number 6) to resonance.
   (b) Re-set external oscillator to 6 megacycles and pick up signal by rotating variable condenser and check sensitivity.
   (c) Re-set external oscillator and check set at 18.1 megacycles and 5.3 megacycles for band coverage.

NOTE: It is extremely necessary in making all of these adjustments that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental. An example of this is an image of a fundamental 18.3 megacycle signal appears near 17.4 megacycles.

MIDDLE WAVE BAND ALIGNMENT:

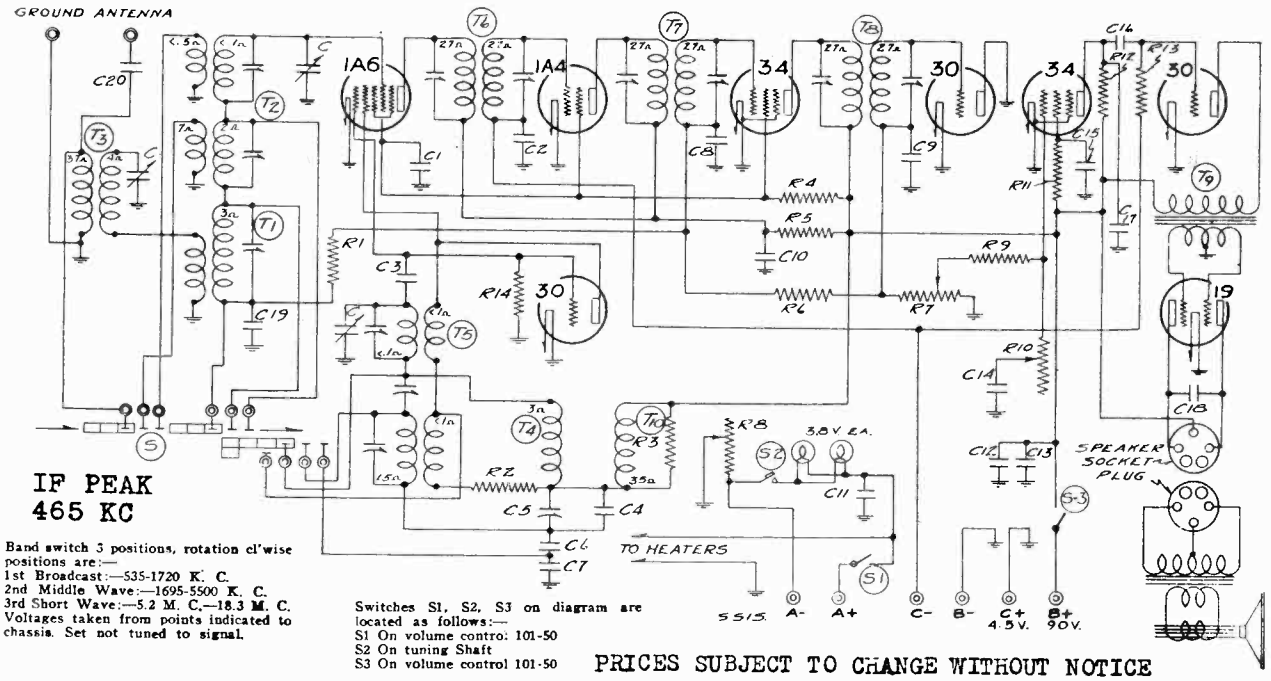
1695 to 5500 Kilocycles

1. With band changing switch in the middle wave position, center of its rotation, and with external oscillator set at 5000 kilocycles and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:
   (a) Move dial pointer to 5000 kilocycles and adjust middle wave oscillator (Adjustment number 2) and middle wave antenna (Adjustment number 5) to resonance.
   (b) Re-set external oscillator to 1800 kilocycles and pick up signal by rotating variable condenser and check sensitivity.
   (c) Re-set external oscillator and check set at 5400 kilocycles and 1700 kilocycles for band coverage.

Schematic, Socket Trimmers, Parts

GAMBLE-SKOGMO, INC.

MODEL 822



Band switch 3 positions, rotation cl'wise positions are:—
1st Broadcast:—535-1720 K. C.
2nd Middle Wave:—1695-5500 K. C.
3rd Short Wave:—5.2 M. C.—18.3 M. C.
Voltages taken from points indicated to chassis. Set not tuned to signal.

Switches S1, S2, S3 on diagram are located as follows:—
S1 On volume contro: 101-50
S2 On tuning Shaft
S3 On volume control 101-50

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

LIST OF REPAIR PARTS (Serial No. 6K 411500 and up)

Use Only Genuine Factory Replacement Parts

Part No.	Circuit Diagram Reference	Description	No. Used in Set	List Price Each
		CONDENSERS		
100-5B	C11	1.0 x 120 Volt Tubular with Bracket	1	.50
100-6	C1	.25 x 200 Volt Tubular less Bracket	1	.35
100-6B	C13	.25 x 200 Volt Tubular with Bracket	1	.35
100-11	C14, C16, C20	.01 x 400 Volt Tubular	3	.25
100-20	C10	.1 x 200 Volt Tubular	1	.25
100-22	C2, C8, C15, C19	.05 x 200 Volt Tubular	4	.25
100-25	C18	.002 x 600 Volt Tubular	1	.25
103-11	C12	8 Mfd. x 200 Volt Electrolytic	1	.75
129-5	C17	.0001 Mica—Type MT—20%	1	.25
129-12	C9	.00025 Mica—Type MT—20%	1	.25
129-50	C3	.00004 Mica—Type MT—30%	1	.25
129-54	C7	.003 Mica—Type MW—2½%	1	.35
129-55	C6	.0034 Mica—Type MW—2½%	1	.35
129-65	C4	.00055 Mica—Type MT—5%	1	.25
		MISCELLANEOUS		
101-50	R7	Volume Control and Switch (250 M ohm)	1	1.25
101-51	R10	Tone Control (300 M ohm)	1	.70
101-52	R8	Filament Rheostat (2 ohm)	1	.50
102-28	C	Three Gang Variable Condenser	1	4.00
105-28	T9	Audio Input Transformer	1	1.75
113-34		Ant.-Gnd. Strip	1	.15
115-35		Antenna-Oscillator Shield	2	.15
115-46		Shield Cap for Part 115-49	2	.05
115-49		Tube Shield for Types 1A4—1A6 Tubes	2	.15
115-55		Tube Shield for Type 34 Tube	1	.10
124-28	C5	J-3 Series Pad	1	.35

Part No.		Description	No. Used in Set	List Price Each
125-17	S	Band Switch	1	.85
128-51		Wood Knob with Spring	3	.15
128-52		"Tuning" Knob with Set Screw—Wood	1	.15
131-12		Bakelite Knob with Arrow	1	.15
		RESISTORS		
130-11	R12	250M Ohm—⅓ Watt—20%—50 Volt Carbon	1	.20
130-12	R3, R9, R14	50M Ohm—⅓ Watt—20%—20 Volt Carbon	3	.20
130-19	R6, R11, R13	1 Meg Ohm—⅓ Watt—20%—100 Volt Car.	3	.20
130-20	R1	100M Ohm—⅓ Watt—20%—50 Volt Carbon	1	.20
130-27	R2	50 Ohm—⅓ Watt—20%—3 Volt Carbon	1	.20
130-31	R5	1500 Ohm—⅓ Watt—20%—10 Volt Carbon	1	.20
130-109	R4	7500 Ohm—⅓ Watt—20%—50 Volt Carbon	1	.20
		COILS		
108-77	T6	Input I.F. complete with Can	1	1.25
108-78	T7	Interstage I.F. complete with Can	1	1.25
108-79	T8	Output I.F. complete with Can	1	1.25
110-38	T4	Broadcast Oscillator Coil Complete	1	.50
110-39	T5	Mid-Wave & Short Wave Oscillator Coil Com.	1	1.50
111-49	T1	Broadcast Antenna Coil Assembly Complete	1	.75
111-50	T2	Mid-Wave & Short Wave Antenna Coil Assem. Complete	1	1.50
111-51	T3	Broadcast Preselector Coil	1	.75
123-3	T10	R.F. Choke Coil	1	.35

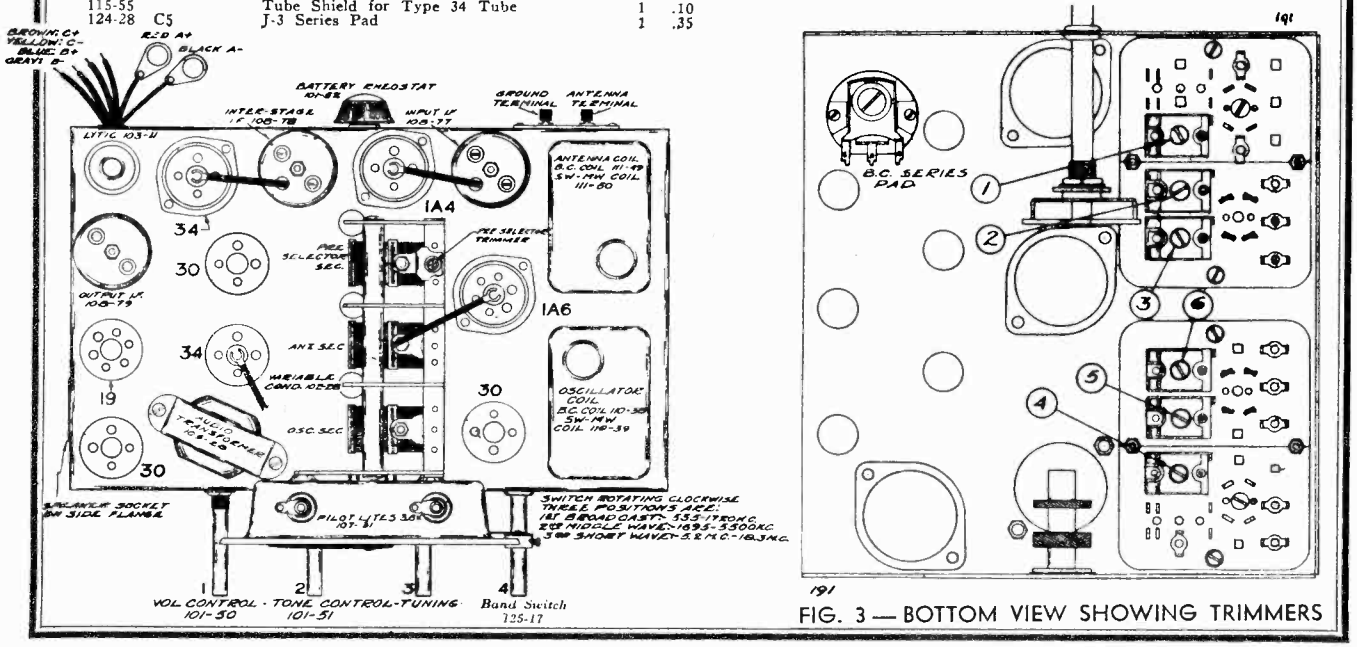


FIG. 3 — BOTTOM VIEW SHOWING TRIMMERS

MODEL 822
Alignment
Notes

GAMBLE-SKOGMO, INC.

BAND	DIAL SCALE	FREQUENCY RANGE
Broadcast	Outer Scale	535 to 1720 K.C. (Kilocycles)
Middle Wave	Center Scale	1695 to 5500 K.C. (Kilocycles)
Short Wave	Inner Scale	5.2 to 18.3 M.C. (Megacycles)

BATTERIES REQUIRED:

The following batteries are required:

2—45 Volt "B" Batteries.
1—4½ Volt "C" Battery.
1—3 Volt Dry "A" Battery or 2 Volt Storage Battery.

TUBES:

The tube complement of this chassis is as follows:

1—Type 1A6 Pentagrid Mixer, First Detector.
1—Type 1A4 Tetrode First I.F. Amplifier (465 K.C.)
1—Type 34 Remote Cut-Off Pentode, 2nd I.F. Amplifier (465 K.C.)
1—Type 30 Oscillator.
1—Type 30 Second Detector and A. V. C.
1—Type 34 A.F. Amplifier.
1—Type 30 Driver Amplifier.
1—Type 19 Class "B" Push-Pull Output Amplifier.

SERVICE NOTES:

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

All voltages as indicated on diagram, are measured with a new set of batteries.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

The approximate current consumption is as follows:
"A"—660 ma., "B"—18 to 24 ma.

RESONANCE INDICATOR:

Use as a resonance indicator an output meter connected across the primary of the speaker input transformer, or by means of an adapter between the two plate terminals of the type 19 output tube. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of a multi-range meter should be used.

DUMMY ANTENNAS

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1", "Dummy 2", and "Dummy 3".

Dummy 1: (I.F.)—Consists of a .1 mfd. condenser connected in series with the external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 mmfd. condenser and a 20 ohm resistor connected in series with each other and in series with the external oscillator.

Dummy 3: (Middle and Short Wave)—Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

ALIGNING I.F. TRANSFORMERS: (465 K.C.):

Part No. 108-79 Output I.F. Transformer
Part No. 108-78 Interstage I.F. Transformer
Part No. 108-77 Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With volume control full on, (the extreme right of its rotation), the band changing switch in the broadcast position, (extreme left of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1", to the control grid cap of the type 34 tube, and adjust the output I.F. transformer (No. 108-79) to resonance.
   (b) With "Dummy 1" still connected, move oscillator output clip from grid of 34 to grid cap to 1A4 and adjust interstage I.F. transformer (No. 108-78) to resonance.
   (c) Move oscillator to grid cap of 1A6 and adjust input I.F. transformer (No. 108-77).

BROADCAST BAND ALIGNMENT:

535 to 1720 Kilocycles

1. With band changing switch in the broadcast position, extreme left of its rotation, and with gang condenser in its minimum capacity position, plates entirely out of mesh, and with external oscillator connected in series with "Dummy 2" to antenna and ground posts, make following adjustments:
   (a) Set external oscillator to 1720 K.C. and adjust broadcast oscillator trimmer to resonance. (Adjustment number 1; see bottom view of coil assembly, Fig. 3)
   (b) Re-set external oscillator to 1550 K.C., rotate variable gang condenser and pick up signal. Adjust broadcast antenna trimmer (adjustment number 4) to resonance; also adjust preselector trimmer which is mounted on the top of the rear section of the three gang variable tuning condenser to resonance. (See top view of chassis, Fig. 1, for location of this adjustment).
   (c) Re-set external oscillator to 600 K.C., and adjust broadcast series pad to resonance by rotating condenser to approximately 600 K.C., rocking it slowly to and fro until by adjusting series pad maximum output is attained. This adjustment is located on the bottom of the chassis directly under the variable gang condenser. (See bottom view of chassis, Fig. 3).
   (d) Repeat adjustments "a" and "b" until sensitivity is at its maximum.
   (e) Check for tracking and sensitivity at 1000 kilocycles. Under no circumstances bend plates of variable condenser sections to correct tracking.

SHORT WAVE BAND ALIGNMENT:

5.2 to 18.3 Megacycles

1. With band changing switch in the short wave position, extreme right of its rotation, and with external oscillator set at 17 megacycles and connected in series with "Dummy 3" to the antenna and ground posts, make the following adjustments:
   (a) Move dial pointer to 17 megacycles and adjust short wave oscillator (adjustment number 3) and short wave antenna (adjustment number 6) to resonance.
   (b) Re-set external oscillator to 6 megacycles and pick up signal by rotating variable condenser and check sensitivity.
   (c) Re-set external oscillator and check set at 18.1 megacycles and 5.3 megacycles for band coverage.

NOTE: It is extremely necessary in making all of these adjustments that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental on the receiver dial. As an example of this a fundamental 18.3 megacycle signal can be tuned in not only at 18.3 on the dial but also at approximately 17.4 megacycles.

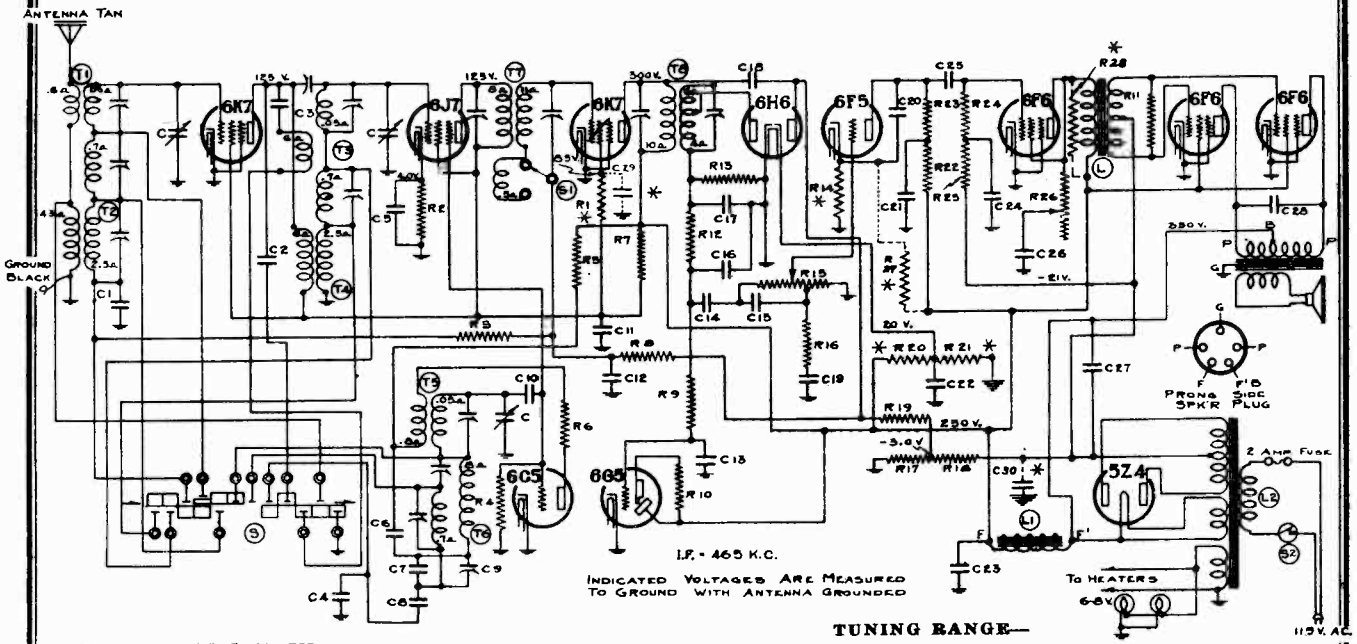
MIDDLE WAVE BAND ALIGNMENT:

1695 to 5500 Kilocycles

1. With band changing switch in the middle wave position, center of its rotation, and with external oscillator set at 5000 kilocycles and connected in series with "Dummy 3" to the antenna and ground posts make the following adjustments:
   (a) Move dial pointer to 5000 kilocycles and adjust middle wave oscillator (adjustment number 2) and middle wave antenna (adjustment number 5) to resonance.
   (b) Re-set external oscillator to 1800 kilocycles and pick up signal by rotating variable condenser and check sensitivity.
   (c) Re-set external oscillator and check set at 5400 kilocycles and 1700 kilocycles for band coverage.

GAMBLE-SKOGMO, INC.

MODEL 1170
Schematic, Voltage
Socket, Trimmers, Parts



BAND CHANGE SWITCH
THREE POSITIONS, ROTATING CLOCKWISE ARE:
1st BROADCAST: 535-1720 K.C.
2nd MIDDLE WAVE: 1690-5300 K.C.
3rd SHORT WAVE: 5.2-18.1 M.C.

I. F. FREQUENCY
465 K. C.

TUNING RANGE—

Standard Broadcast Band
535-1720 Kilocycles.
Middle Wave Band
1690-5300 Kilocycles
Short Wave Band
5.2-18.1 Megacycles.

Part No.		Description
		RESISTORS
*R1	130-76	30M Ohm—½ Watt—20%—Carbon
R2	130-129	2500 Ohm—½ Watt—10%—Carbon
R3	130-20	100M Ohm—½ Watt—20%—Carbon
R4	130-12	50M Ohm—½ Watt—20%—Carbon
R5	130-77	10M Ohm—1 Watt—20%—Carbon
R6	130-60	100 Ohm—½ Watt—20%—Carbon
R7	130-88	10M Ohm—2 Watt—20%—Wire Wound
R8	130-19	1 meg Ohm—½ Watt—20%—Carbon
R9	130-4	3 meg Ohm—½ Watt—20%—Carbon
R10	130-110	1 meg Ohm—1/10 Watt—10%—Carbon
R11	130-21	20M Ohm—½ Watt—20%—Carbon
R12	130-20	100M Ohm—½ Watt—20%—Carbon
R13	130-20	100M Ohm—½ Watt—20%—Carbon
*R14	130-70	500 Ohm—½ Watt—10%—Carbon
R15	101-47	1 meg Ohm—Volume Control
R16	130-22	5M Ohm—½ Watt—20%—Carbon
R17	106-31	30 Ohm—Muter
R18	106-31	175 Ohm—Muter
R19	130-3	500M Ohm—½ Watt—20%—Carbon
*R20	130-130	100M Ohm—½ Watt—10%—Carbon
*R21	130-82	10M Ohm—½ Watt—10%—Carbon
R22	130-20	100M Ohm—½ Watt—20%—Carbon
R23	130-20	100M Ohm—½ Watt—20%—Carbon
R24	130-45	250M Ohm—½ Watt—20%—Carbon
R25	130-45	250M Ohm—½ Watt—20%—Carbon
R26	101-40	5000 Ohm Tone Control
*R27	130-130	100M Ohm—½ Watt—10%—Carbon
*R28	130-131	20M Ohm—½ Watt—10%—Carbon

NOTE: R17 and R18 in one Unit—No. 106-31.

		CONDENSERS
C1	100-9	.05 x 200 Volt—25%
C2	129-59	.0003 Mica—5%—MT—0
C3	129-39	.00005 Mica—20%—MT—0
C4	129-69	.0023 Mica—2½%—MT—0
C5	100-9	.05 x 200 Volt—25%
C6	100-13	.05 x 400 Volt—25%
C7	129-57	.0005 Mica—5%—MT—0
C8	129-55	.0034 Mica—2½%—MT—0
C9	124-34	200 mmf. Working cap. adjustable Pad
C10	129-31	.000025 Mica—15%—MT—0
C11	100-41	.25 x 400 Volt—20%
C12	100-9	.05 x 200 Volt—25%
C13	100-11	.01 x 400 Volt—25%
C14	100-22	.05 x 200 Volt—25%
C15	129-12	.00025 Mica—20%—MT—0
C16	129-60	.00015 Mica—20%—MT—0
C17	129-60	.00015 Mica—20%—MT—0
C18	129-3	.00002 Mica—20%—MT—0
C19	100-9	.05 x 200 Volt—25%
C20	129-5	.0001 Mica—20%—MT—0
C21	100-20	.1 x 200 Volt—25%
C22	100-19	.006 x 600 Volt—25%
C23	103-8	14 mfd.—400 Volt—Electrolytic
C24	100-20	.1 x 200 Volt—25%
C25	100-13	.05 x 400 Volt—25%
C26	100-45	.1 x 600 Volt—25%
C27	103-10	30 mfd. x 450 Volt—Electrolytic
C28	100-32	.0005 x 1000 Volts—20%
*C29	100-11	.01 x 400 Volts—25%
*C30	100-20	.1 x 200 Volt—25%

		PARTS
C	102-35	One section of three gang condenser
T1	111-54	MW and SW Antenna Coil Assem.
T2	111-55	Broadcast Antenna Coil Assem.
T3	109-29	MW and SW R.F. Coil Assem.
T4	109-30	Broadcast R.F. Coil
T5	110-42	MW and SW Osc. Coil Assem.
T6	110-43	Broadcast Osc. Coil Assem.
T7	108-64	Input I.F. Coil—465 Kc.
T8	108-63	Output I.F. Coil—465 Kc.
L	105-33	Audio Transformer
L1	114-47C	Speaker (Field Resist. 1225 ohm) Hot
L2	104-72	Power Transformer (50-60 Cycle)
S	125-18	Band Switch
S1	101-40	Fidelity Switch on Tone Control
S2	101-47	On-Off Switch on Volume Control

NOTE: Resistors and Condensers which are prefixed with an asterisk (*) on the circuit diagram and parts list were added or the values changed during production to meet certain conditions.

Resistors R1, R27, R28, and Condensers C29, C30 were added to correct certain variances of tube characteristics. Resistors R14, R20, R21 the values were changed. In some chassis the values of these resistors are as follows:

R14—2500 Ohm—½ Watt
R20—200M Ohm—½ Watt
R21—20M Ohm—½ Watt

Present values of these resistors are:

R14—500 Ohm—½ Watt
R20—100M Ohm—½ Watt
R21—10M Ohm—½ Watt

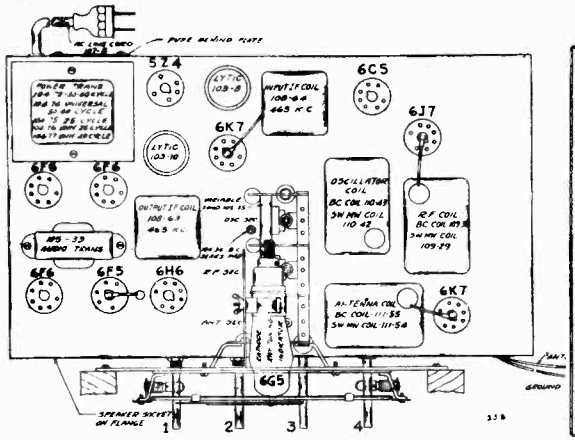


FIG. 3—TOP VIEW MODEL 1170

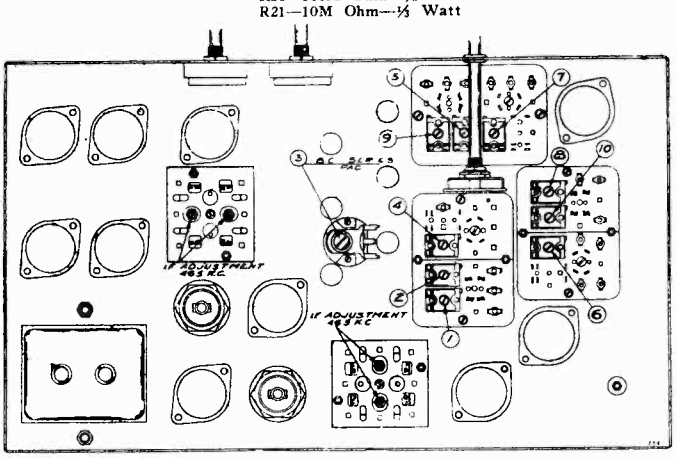


FIG. 1—BOTTOM VIEW SHOWING TRIMMERS

DESCRIPTION

The tube complement of this chassis is as follows:

1—Type 6K7 Remote cut-off pentode R.F. amplifier
1—Type 6J7 Pentode first detector
1—Type 6C5 Oscillator
1—Type 6K7 Remote cut-off pentode I.F. amplifier (465 K.C.)
1—Type 6H6 Duplex diode second detector and A.V.C.
1—Type 6F5 First audio amplifier
1—Type 6F6 Triode driver stage
2—Type 6F6 Class AB Output pentodes in push-pull
1—Type 5Z4 High vacuum rectifier
1—Type 6G5 Cathode Ray Tuning Indicator.

Transformers are available and chassis are sometimes equipped with universal transformers for operation on 25, 40 and 60 cycles and with primary taps for 108, 127, 150, 225, and 260 volts, (see instructions) and also sometimes equipped with 25 cycle transformers with 105-115 volt or 220 volt primaries, not universals.

SERVICE NOTES

NOTE: DeLuxe Model 1172 differs only from the Model 1170 in that dual speakers and a de luxe console cabinet are used. Both chasses are identical and the circuit diagram, the alignment procedure and the parts list contained in this manual apply to both models.

Attention is called to the circuit diagram contained in this manual. Several minor changes were made during production of these models to correct certain conditions. These changes are shown on the circuit diagram in dotted lines and explained in detail. Some of the chassis were equipped with 5Z3 rectifier tubes in place of the 5Z4 and do not have a fuse assembly in the power line.

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the circuit diagram.

IN ORDER TO PREVENT SIGNAL FROM ACTING UPON AVC AND AFFECTING ACCURACY OF VOLTAGE MEASUREMENTS, AERIAL AND GROUND LEADS SHOULD BE SHORT CIRCUITED WHILE MAKING MEASUREMENTS.

All voltages are to be measured with 115 volts on the primary of the power transformer.

Resistances of coils and transformer windings are indicated in ohms on schematic circuit diagrams.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser, open by-pass condensers frequently cause oscillation and distorted tone.

This chassis is protected against damage from faulty tubes or abnormal line conditions by a fuse in the primary circuit.

If when set is turned on pilot lights do not light, look for a blown fuse.

This fuse is made accessible for replacement by removing fuse cover located on back flange of chassis, replace only with a 2 ampere fuse. If replacement fuse blows out, check tubes, (particularly 5Z4 rectifier) circuit, repair or replace defective tubes or parts.

NEVER ATTEMPT TO REPLACE FUSE WITHOUT FIRST DISCONNECTING POWER.

NEVER REPLACE WITH FUSE OTHER THAN 2 AMPERE RATING.

ALIGNING INSTRUCTIONS

Dummy Antennas

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1", "Dummy 2", and "Dummy 3".

Dummy 1: (I.F.)—Consists of a .1 mfd. condenser connected in series with the external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 mmfd. condenser and a 20 ohm resistor connected in series with each other and in series with the external oscillator.

Dummy 3: (Intermediate and Short Wave)—Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

Resonance Indicator:

Use as a resonance indicator an output meter connected across the primary of the speaker input transformer or by means of an adapter between the plate and cathode terminals of the 5 prong speaker socket. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of a multi-range meter should be used.

CAUTION:

No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltages, defective tubes, condensers and resistors. In order to properly align this chassis, an oscillator (generator) is absolutely necessary. No aligning adjustments should be attempted with the chassis in the cabinet. To remove the knobs, pull them off and to take the chassis out of the cabinet, remove the four bolts by which it is fastened.

ALIGNING I.F. TRANSFORMERS (465 K.C.)

Part No. 108-63 Output I.F. Transformer
Part No. 108-64 Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the underside of chassis (see bottom view Fig. 1).

1. With volume control full on, (the extreme right of its rotation), the band changing switch in the broadcast position, (extreme left of its rotation), the tone control on "Hi" part of the sharp position (as much right rotation as possible without operating the Hi Fidelity switch), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1", to the control grid cap of the type 6K7 tube, located between the two I.F. transformers, and adjust the output I.F. transformer 108-63 to resonance.
   (b) With "Dummy 1" still connected, move oscillator output clip from grid of 6K7 to grid cap to 6J7 and adjust input I.F. transformer (108-64) to resonance.
   (c) With oscillator still connected to 6J7, re-adjust output I.F. transformer if necessary.

ALIGNMENT PROCEDURE

The following adjustments to be made after the I.F.'s have been aligned as explained above.

BROADCAST BAND ALIGNMENT:

1. With band changing switch in the broadcast position, extreme left of its rotation, and with external oscillator set at 600 kilocycles and connected in series with "Dummy 2" to the tan antenna and black ground lead, make the following adjustments:
   (a) Adjust broadcast series pad (adjustment number 3) to resonance with oscillator. Keep set in tune with oscillator by slowly rocking to and fro the variable condenser until maximum output is obtained. Note: This adjustment is accessible from the top of the chassis and is located between the variable condenser and the 108-63 output I.F. transformer. See top view, Fig. 3.
   (b) Re-set external oscillator to 1400 K.C., move dial pointer to 1400 K.C. and adjust oscillator (adjustment number 4), R.F. (adjustment number 6) and antenna (adjustment number 7) to resonance. See bottom view for location of these adjustments, Fig. 1.
   (c) Repeat adjustments "a" and "b" until sensitivity is at its maximum.

NOTE: IT IS EXTREMELY NECESSARY IN MAKING ALL OF THESE ADJUSTMENTS THAT THE FUNDAMENTAL OSCILLATOR SIGNAL BE TUNED IN AND NOT THE IMAGE FREQUENCY WHICH WILL FALL BELOW THE FUNDAMENTAL.

SHORT WAVE BAND ALIGNMENT:

1. With band changing switch in the short wave position, extreme right of its rotation, and with external oscillator set at 17 megacycles and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:
   (a) Move dial pointer to 17 megacycles and adjust short wave oscillator (adjustment number 1), short wave R.F. (adjustment number 8) and short wave antenna (adjustment number 9) to resonance.
   (b) Re-set external oscillator to 6 megacycles and pick up signal by rotating variable condenser and check for sensitivity.

MIDDLE WAVE BAND ALIGNMENT:

1. With band changing switch in the middle wave position, center of its rotation, and with external oscillator set at 5 M.C. and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:
   (a) Rotate condenser, pick up signal and adjust middle wave R.F. (adjustment number 10), middle wave antenna (adjustment number 5) and middle wave oscillator (adjustment number 2) to resonance.
   (b) Re-check broadcast alignment and if it is found necessary to re-adjust either R.F. or antenna trimmers, repeat the 17 M.C. short wave and 5 M.C. middle wave adjustments.

GAMBLE-SKOGMO, INC.

MODEL 1170
Parts

11-Tube Including Cathode-Ray Tuning Indicator

3-Band A. C. High Fidelity Superheterodyne Receiver

Serial No. 6J391150 to 6J391649 and from 6J408950 and up

Use only genuine factory replacement parts

Part No.	DESCRIPTION	Circuit Diagram Reference	List Price Each
	CONDENSERS		
100-9	.05 x 200 Volt Tubular	C1, C5, C12, C19	$0.25
100-11	.01 x 400 Volt Tubular	C13, C29	.25
100-13	.05 x 400 Volt Tubular	C6, C25	.25
100-19	.006 x 600 Volt Tubular	C22	.25
100-20	.1 x 200 Volt Tubular	C21, C24, C30	.25
100-22	.05 x 200 Volt Tubular	C14	.25
100-32	.0005 x 1000 Volt Condenser	C28	.25
100-41	.25 x 400 Volt Tubular (with Bracket)	C11	.35
100-45	.1 x 600 Volt Tubular	C26	.35
103-8	14 mfd. x 400 Volt Electrolytic	C23	1.35
103-10	30 mfd. x 450 Volt Electrolytic	C27	1.35
129-3	.00002 Mica—Type MT—20%	C18	.25
129-5	.0001 Mica—Type MT—20%	C20	.25
129-12	.00025 Mica—Type MT—20%	C15	.25
129-31	.000025 Mica—Type MT—15%	C10	.25
129-39	.00005 Mica—Type MT—20%	C3	.25
129-55	.0034 Mica—Type MT—2½%	C8	.35
129-57	.0005 Mica—Type MT—5%	C7	.25
129-59	.0003 Mica—Type MT—5%	C2	.25
129-60	.00015 Mica—Type MT—20%	C16, C17	.25
129-69	.0023 Mica—Type MT—2½%	C4	.35
	RESISTORS		
130-3	500M Ohm—1/3 Watt—20%—100 V. Carbon	R19	.20
130-4	3 meg Ohm—1/3 Watt—20%—20 V. Carbon	R9	.20
130-12	50M Ohm—1/3 Watt—20%—20 V. Carbon	R4	.20
130-19	1 meg Ohm—1/3 Watt—20%—20 V. Carbon	R8	.20
130-20	100M Ohm—1/3 Watt—20%—50 V. Carbon	R3, R12, R13, R22, R23	.20
130-21	20M Ohm—1/3 Watt—20%—20 V. Carbon	R11	.20
130-22	5M Ohm—1/3 Watt—20%—10 V. Carbon	R16	.20
130-76	30M Ohm—1/3 Watt—20%—Carbon	R1	.20
130-45	250M Ohm—1/3 Watt—20%—20 V. Carbon	R24, R25	.20
130-60	100 Ohm—1/3 Watt—20%—10 V. Carbon	R6	.20
130-70	500 Ohm—1/3 Watt—10%—Carbon	R14	.20
130-77	10M Ohm—1 Watt—20%—100 V. Carbon	R5	.20
130-82	10M Ohm—1/3 Watt—10%—Carbon	R21	.20
130-88	10M Ohm—2 Watt—20%—Wire Wound	R7	.40
130-129	2500 Ohm—1/3 Watt—10%—10 V. Carbon	R2	.20
130-130	100M Ohm—½ Watt—10%—Carbon	R20, R27	.20
130-131	20M Ohm—½ Watt—10%—Carbon	R28	.20
130-110	1 meg Ohm—1/10 Watt—10%—Carbon	R10	.20
106-31	(30 Ohm, R17) (175 Ohm, R18) Metal Clad Resistor	R17, R18	.40
	COILS		
108-63	Output I.F. Coil Assembly Complete, Less Can	T8	1.50
108-64	Input I.F. Coil Assembly Complete, Less Can	T7	1.65
109-29	Mid-Wave and Short-Wave R.F. Coil Assembly Complete, Less Can	T3	1.50
109-30	Broadcast R.F. Coil Assembly Complete, Less Can	T4	1.00
110-42	Mid-Wave and Short-Wave Oscillator Coil Assembly Complete, Less Can	T5	1.25
110-43	Broadcast Oscillator Coil Assembly Complete, Less Can	T6	.50
111-54	Mid-Wave and Short-Wave Antenna Coil Assembly Complete, Less Can	T1	1.50
111-55	Broadcast Antenna Coil Assembly Complete, Less Can	T2	1.00
	TRANSFORMERS		
104-72	50/60 Cycle Power Transformer	L2	4.00
104-74	Universal—50/60 Cycle Primary		6.00
104-75	25 Cycle Power Transformer		7.00
104-76	Universal—25 Cycle Primary		7.50
104-77	Universal—40 Cycle Primary		6.00
	SOCKETS		
121-8	Five-Prong Socket Marked "Spkr"		.10
121-12	Seven-Prong Socket Marked "6K7"		.15
121-13	Seven-Prong Socket Marked "6J7"		.15
121-14	Seven-Prong Socket Marked "6F6"		.15
121-16	Five-Prong Socket Marked "5Z4"		.10
121-17	Six-Prong Socket Marked "6C5"		.15
121-19	Seven-Prong Socket Marked "6H6"		.15
121-33	Five-Prong Socket Marked "6F5"		.10
121-34	Four-Prong Socket Marked "5Z3"		.10
	SPEAKER FOR MODEL 1170		
114-47C	Twelve Inch Dynamic (Field 1225 Ohms)	L1	8.50
	SPEAKERS FOR MODEL 1172		
114-53	Twelve Inch Dynamic, with Special Voice Coil for Dual Speaker Operation		8.50
114-54	Ten Inch Permanent Magnet Dynamic		10.00
	MISCELLANEOUS		
101-40	Tone Control and Fidelity. Switch (5M Ohm)	R26, S1	1.35
101-47	Volume Control and Switch (1 Meg Ohm)	R15, S2	1.25
102-35	Three-Gang Variable Condenser	C	5.00
107-5	Line Cord and Plug		.50
115-35	Antenna, Oscillator and R.F. Shield Can		.15
115-36	I.F. Shield Can		.15
105-33	Input Audio Transformer	L	1.35
115-54	Fuse Cover		.05
113-47	Fuse Clip Assembly		.15
125-18	Band Switch	S	.90
124-34	Single J Padder 200 mmf	C9	.35
131-34	2 Amp. Fuse Type 3AG		.10
128-51	Wood Knob with Spring		.15

All resistors and mica condensers are RMA color coded—specify value and/or resistor or condenser (per schematic diagram) and model number.

Mica condensers are coded with an additional dot indicating tolerance:

Tolerance Percent	Color of Dot
2½%	White
5%	Green
10%	Blue
15%	Yellow
20%	Red
More Than 20%	None.

When ordering condensers, specify part number, model and/or capacitor (per schematic diagram) and model number.

When ordering parts, always specify part and model number as well as serial number of chassis.

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

Prices subject to change without notice.

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

WE CANNOT SUPPLY SPEAKER PARTS, CONES, TRANSFORMERS, OR FIELDS SEPARATELY. WE CAN REPLACE OR REPAIR A DAMAGED SPEAKER FOR $2.50 NET, IF IT IS RETURNED TO OUR FACTORY, TRANSPORTATION CHARGES PREPAID.

DIAL PARTS LIST—MODEL 1170A

Part No.	DESCRIPTION	List Price Each
	ASSEMBLIES	
112-188	Dial Plate Assembly—Including: 1—No. 117-17A Dial Plate 2—No. 117-11 Dial Bracket 1—No. 117-73A Bushing 4—No. 162-4 Rivets	.75
112-189	Switch Assembly—Including: 2—No. 117-16 Band Indicator Arm 1—No. 117-15 Link (small) 1—No. 117-14 Elbow 1—No. 117-13 Link (large) 1—No. 131-26 Washer 3—No. 162-5 Rivets 1—No. 117-22A Stud for link 1—No. 134-9 Horseshoe Spring Washer 1—No. 131-30 Spring Washer Red Cellulose	.35
112-190	Switch Arm Assembly—Including: 1—No. 117-12 Switch Arm 1—No. 117-35 Switch Arm Bushing 2—No. 132-13 Set Screws	.10
112-191	Tone Indicator Assembly—Including: 1—No. 112-178 Celluloid Disc 1—No. 117-75 Disc Bushing 1—No. 120-54R Coil Spring Fish Line	.60
112-192	Volume Indicator Assembly—Including: 1—No. 112-178 Celluloid Disc 1—No. 117-75 Disc Bushing 1—No. 120-54L Coil Spring Fish Line	.60

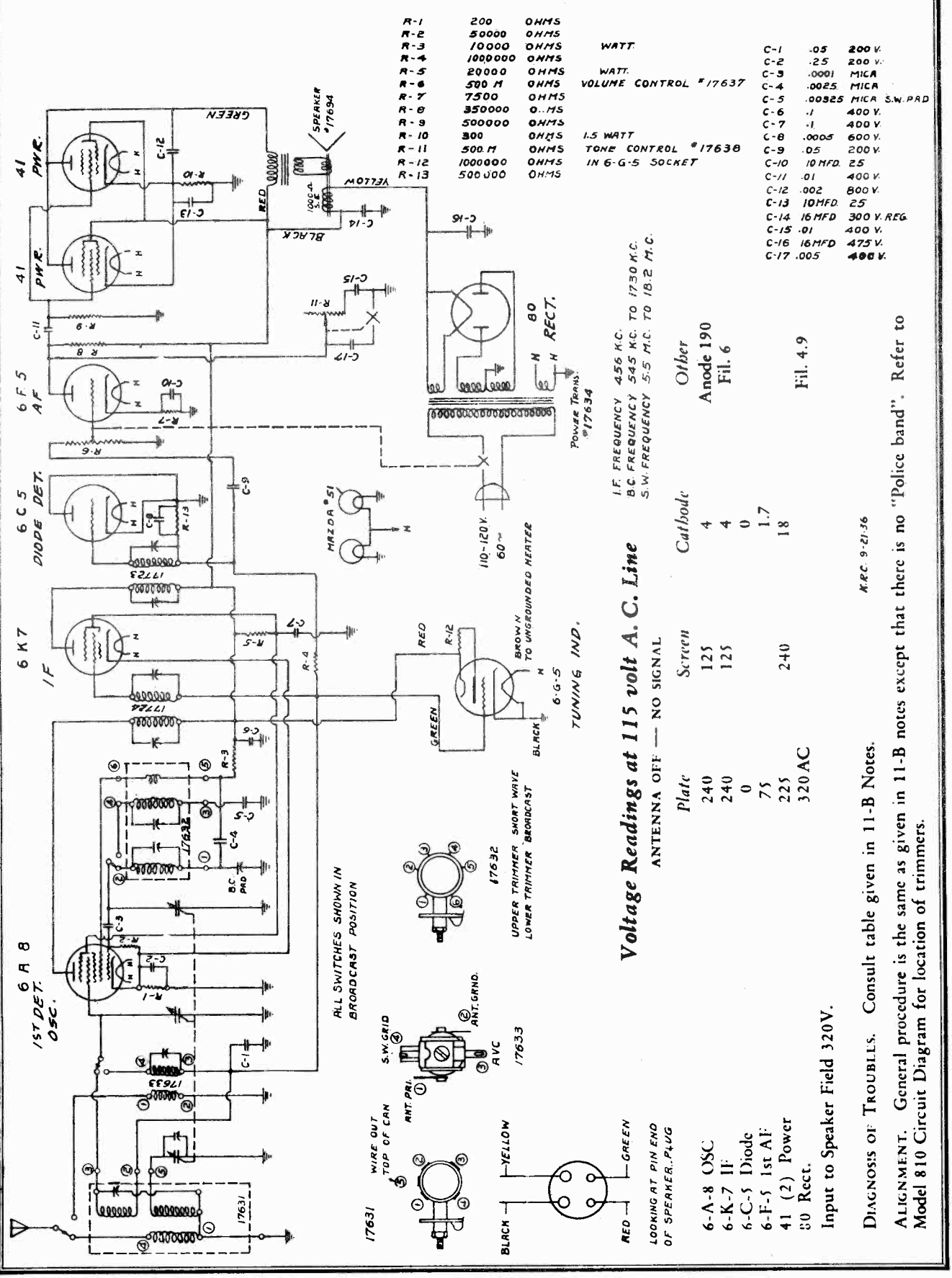
Part No.	DESCRIPTION	List Price Each
	DIAL PARTS ONLY	
112-117A	Tuning Shaft	.05
112-118	Metal Oval Escutcheon Only	1.25
112-119	Dial Pointer with 132-8 Screw	.20
112-123	Oval Glass Crystal Only	.35
112-139	Oval Glass Retaining Ring	.10
112-175	Background Plate Gasket	.10
112-176	Drive Belt	.20
112-179	Band Spread Pointer	.10
112-180	Glass Dial Scale	.90
107-46	Right Pilot Light Bracket and Socket	.10
107-47	Left Pilot Light Bracket and Socket	.10
115-65	Tuning Indicator Paper Tube Shield	.01
107-14	6-8 Volt, T-46 Pilot Light	.10
117-20A	Drive Belt Pulley	.05
117-25A	Tone and Volume Shaft	.05
117-33A	Stud for Switch	.03
117-39	Drive Belt Take-up Pulley	.03
117-57	Tuning Indicator Holder	.25
117-64	Background Plate	.25
117-72	Reflector Plate	.10
117-74	Bushing	.10
120-53	Drive Belt Take-up Coil Spring	.05
131-30	Spring Washer for Switch Link Assembly	.03
131-31	Spring Washer for Switch Arm	.01
131-33	Glass Dial Retaining Clips	.03
154-2	Set Screw	.02

CATHODE-RAY TUNING INDICATOR PARTS

107-53	Cable and Socket Assembly (With 130-110 Resistor)	$0.75
117-57	Holder and Clamp	.25

MODEL 810
Schematic, Voltage

GAMBLE-SKOGMO, INC.



R-1	200	OHMS
R-2	50000	OHMS
R-3	10000	OHMS
R-4	1000000	OHMS
R-5	20000	OHMS
R-6	500 M	OHMS
R-7	7500	OHMS
R-8	350000	OHMS
R-9	500000	OHMS
R-10	300	OHMS
R-11	500 M	OHMS
R-12	1000000	OHMS
R-13	500000	OHMS

WATT
WATT
VOLUME CONTROL #17637
1.5 WATT
TONE CONTROL #17638
IN 6-G-5 SOCKET

C-1	.05	200 V.
C-2	.25	200 V.
C-3	.0001	MICA
C-4	.0025	MICA
C-5	.00325	MICA S.W. PAD
C-6	.1	400 V.
C-7	.1	400 V.
C-8	.0005	600 V.
C-9	.05	200 V.
C-10	10 MFD.	25
C-11	.01	400 V.
C-12	.002	800 V.
C-13	10 MFD.	25
C-14	16 MFD	300 V. REG.
C-15	.01	400 V.
C-16	16 MFD	475 V.
C-17	.005	400 V.

Voltage Readings at 115 volt A. C. Line

ANTENNA OFF — NO SIGNAL

	Plate	Screen	Cathode	Other
6-A-8 OSC	240	125	4	Anode 190
6-K-7 IF	240	125	4	Fil. 6
6-C-5 Diode	0		0	
6-F-5 1st AF	75		1.7	
41 (2) Power	225	240	18	Fil. 4.9
80 Rect.	320 AC			

Input to Speaker Field 320 V.

K-REC 9-21-36

DIAGNOSIS OF TROUBLES. Consult table given in 11-B Notes.

ALIGNMENT. General procedure is the same as given in 11-B notes except that there is no "Police band". Refer to Model 810 Circuit Diagram for location of trimmers.

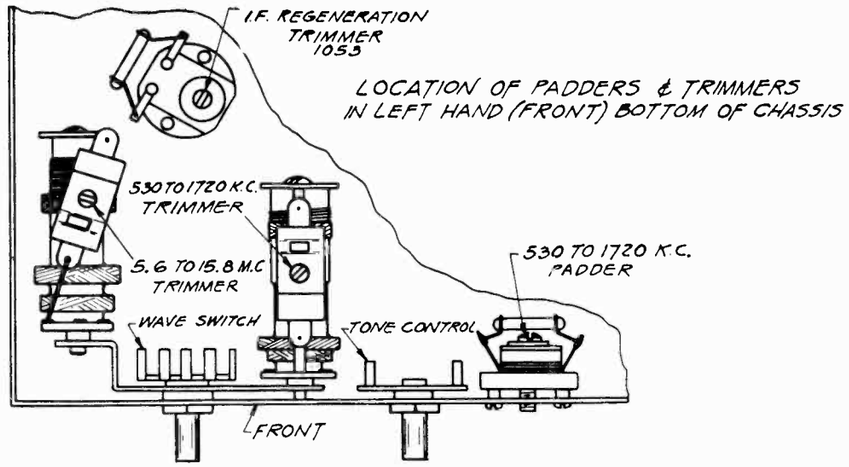
GAMBLE-SKOGMO, INC.

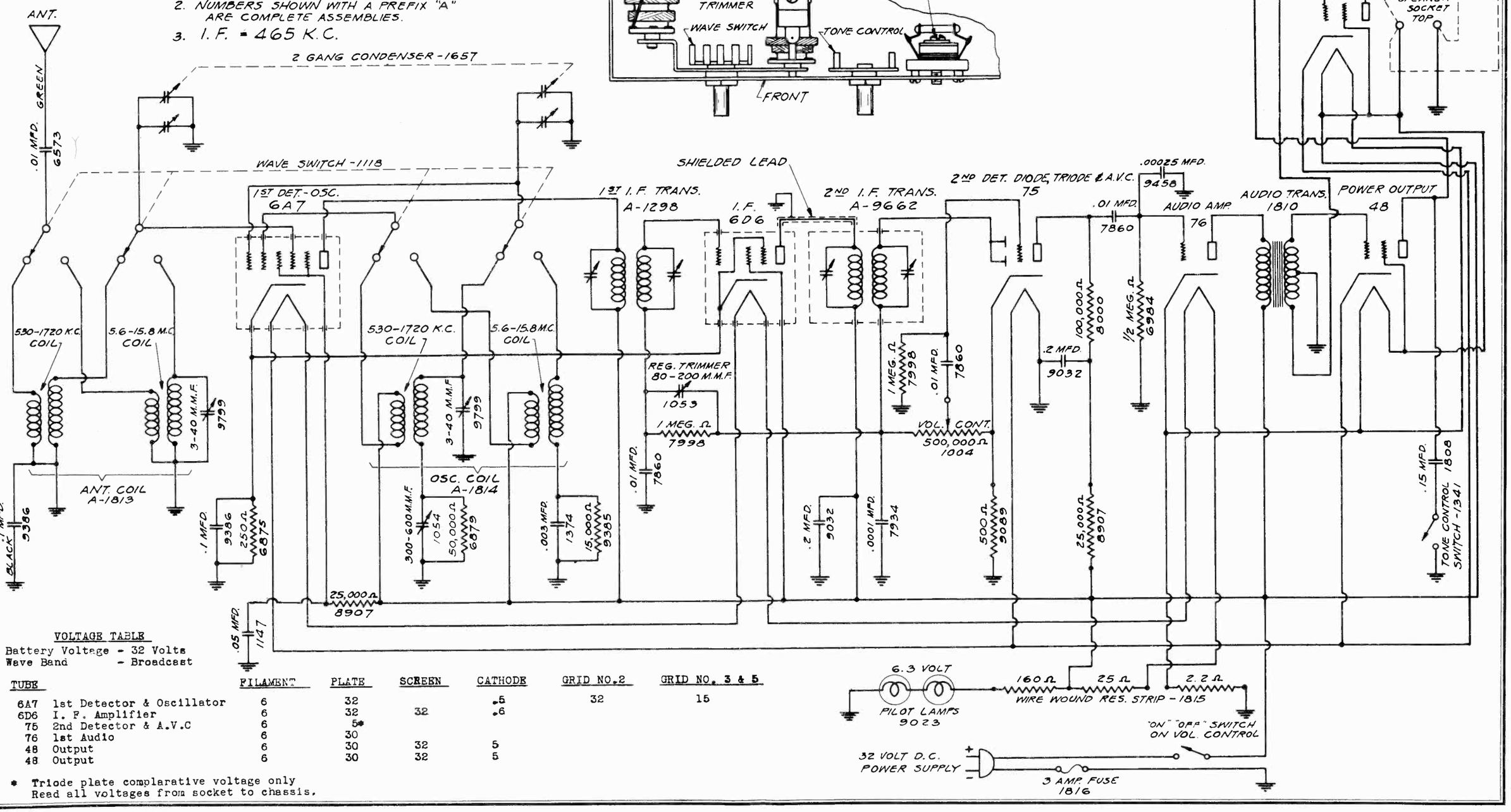
SIX TUBE SUPERHETERODYNE
TWO BAND
1720 to 530 KC
15.8 to 5.6 MC
32 Volt

This receiver is designed for operation on 32 volt battery plants only; and must not be used on battery plants of a higher rated voltage than 32 volts without a voltage regulator.

Schematic, Voltage Trimmers — MODEL 5953A

NOTE:
1. ALL NOS. SHOWN RELATIVE TO PARTS ARE OUR PART NUMBERS.
2. NUMBERS SHOWN WITH A PREFIX "A" ARE COMPLETE ASSEMBLIES.
3. I. F. = 465 K.C.





VOLTAGE TABLE

Battery Voltage - 32 Volts
Wave Band - Broadcast

TUBE		FILAMENT	PLATE	SCREEN	CATHODE	GRID NO.2	GRID NO. 3 & 5
6A7	1st Detector & Oscillator	6	32		.5	32	15
6D6	I. F. Amplifier	6	32	32	.6		
75	2nd Detector & A.V.C	6	5*				
76	1st Audio	6	30				
48	Output	6	30	32	5		
48	Output	6	30	32	5		

* Triode plate comparative voltage only
Read all voltages from socket to chassis.

GAMBLE-SKOGMO, INC.

MODEL 5953A
Alignment, Parts

INTERMEDIATE ALIGNMENT:

1. Connect the high side of the oscillator output to the control grid of the 6A7 tube. Leave the grid cap disconnected and connect a 1 meg ohm resistor from the modulator grid to the chassis base. Connect the ground side of the oscillator to the receiver ground lead.

2. Set the test oscillator frequency to 465 kilocycles (this must be accurate).

3. Align the first intermediate transformer by turning one of the trimmer screws up and down (increasing and decreasing capacity) until maximum reading is obtained on the output meter, after which adjust the other trimmer screw of the same transformer for maximum sensitivity.

4. Adjust the other intermediate transformers in the same manner.

NOTE: Two types of intermediate transformer trimmers have been used in this receiver. One type has two parallel holes in the top of the shield, one for each trimmer. The other type has a brass hex nut for adjusting one trimmer, the other intermediate trimmer being adjusted with the trimmer screw located inside of the brass hex nut. Regardless of which type trimmer is used the procedure is the same.

5. Adjust the IF regeneration trimmer located underneath the chassis for maximum 465 kilocycle signal sensitivity. If adjustment of this trimmer causes the receiver to oscillate always adjust to a point where oscillation just stops, and then back off 1/8 turn.

TO ALIGN THE VARIABLE CONDENSER: It is important when aligning the gang condenser and padding and trimmer condensers to follow the procedure given carefully, otherwise the receiver will be insensitive and the dial calibration will be incorrect. The two coils located on the underside of the chassis which have trimmer condensers mounted on them will be referred to by their function as indicated on the circuit diagram.

1. Connect the high output side of the test oscillator through a .00025 Mfd. condenser to the set antenna lead and the ground to the set ground.

2. Place the band selector switch for operation on the 15.8 to 5.6 megacycle band, tune the receiver to EXACTLY 14 MEGACYCLES on the dial, and set the test oscillator frequency to EXACTLY 14 MEGACYCLES. THEN BRING IN THE 14 MEGACYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING THE TRIMMER CONDENSER LOCATED ON TOP OF THE OSCILLATOR SECTION OF THE GANG CONDENSER. Looking at the front of the receiver the oscillator section is the rear section of the gang condenser. When adjusting this trimmer two peaks, the fundamental and the image peak, will be noticed. CARE MUST BE TAKEN SO THAT THE FUNDAMENTAL PEAK AND NOT THE IMAGE PEAK IS USED FOR ALIGNING THE RECEIVER AT 14 MEGACYCLES. First back off the trimmer to minimum capacity, next screw down the trimmer (add capacity) until the first peak, which is the fundamental and the one you are to use, is tuned in. If the trimmer is screwed down beyond the point where this first peak is received the incorrect image peak will be tuned in. When the first peak has been located adjust the trimmer to bring in the 14 megacycle signal to maximum output. After completing this adjustment always check to see if the proper peak has been used. To do this leave the test oscillator frequency at 14 megacycles, increase the output of the test oscillator and then tune the receiver dial to approximately 13 megacycles. Vary the receiver dial slightly to the right and left of 13 megacycles and if the fundamental peak was used in aligning at 14 megacycles the test oscillator signal will be heard at approximately 13 megacycles on the receiver dial. If it is not possible to receive the signal then the fundamental peak was not used and the 14 megacycle adjustment of the trimmer on top of the oscillator section of the gang condenser must be gone over and properly adjusted.

3. Set the band selector switch for operation on the broadcast band (1720-530 K.C.) adjust the test oscillator frequency to EXACTLY 1400 KILOCYCLES and the receiver dial to EXACTLY 1400 KILOCYCLES. THEN BRING IN THE 1400 KILOCYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING THE 1720-530 KILOCYCLE TRIMMER (see circuit diagram) mounted on one of the coils located underneath the chassis. Next adjust the trimmer located on the front section of the gang condenser for maximum 1400 kilocycle signal sensitivity.

4. Leave the band selector switch for operation on the broadcast band (1720-530 K.C.), tune the receiver dial and set the test oscillator frequency to approximately 600 kilocycles. While rocking the gang condenser slightly to the right and left adjust the 1720-530 kilocycle padder condenser which is located on and accessible through the small hole in the front of the chassis, for maximum sensitivity.

5. Recheck the 1400 kilocycle signal adjustment.

6. Place the band selector switch for operation on the short wave 15.8 to 5.6 megacycle band, set the test oscillator frequency to EXACTLY 14 MEGACYCLES and tune the receiver to EXACTLY 14 MEGACYCLES. While rocking the gang condenser slightly to the right and left adjust the 5.6 to15.8 megacycle trimmer (see circuit diagram) mounted on one of the coils underneath the chassis.

This completes the alignment and it is recommended that all the adjustments be gone over again, as generally it will be found that improved results can be obtained if this is done. Assuming that all tubes and component parts of the set are okeh, then extreme inaccuracies in the dial calibration, low sensitivity, and poor selectivity are indications that the alignment procedure has not been followed.

PART NUMBER		LIST PRICE
1813	Antenna Coil	$1.63
1814	Oscillator Coil	1.63
1298	First I.F. Transformer	2.05
9662	Second I. F. Transformer	2.05
1810	Audio Transformer	1.75
1657	Two Gang Variable Condenser	4.00
1106	Drive Disc with Hub	.30
1641	Calibrated Dial (Calibration No. 1653) with Frame and Gasket	.50
	Glass for above Dial	.35
1744	Calibrated Dial (Calibration No. 1745) with Frame and Gasket	.48
	Glass for above Dial	.35
9023	6.3 Volt .15 Ampere Pilot Light	.19
1118	Wave Switch	.75
9799	Trimmer Condenser	.15
1053	Padding Condenser	.50
1054	Padding Condenser	.55
1004	Volume Control and Off and On Switch	1.24
1816	3 Ampere Fuse	.12
7934	.0001 Mfd. Moulded Condenser	.21
9458	.00025 Mfd. Moulded Condenser	.21
1374	.003 Mfd. Moulded Condenser	.21
1148	.5 Mfd. 200 Volt Condenser	$ .55
9032	.2 Mfd. 200 Volt Condenser	.23
9386	.1 Mfd. 200 Volt Condenser	.19
1147	.05 Mfd. 200 Volt Condenser	.17
6573	.01 Mfd. 200 Volt Condenser	.17
1808	.15 Mfd. 200 Volt Condenser	.17
7860	.01 Mfd. 400 Volt Condenser	.17
1815	Resistor Strip	.95
1333	18,000 Ohm 1/2 Watt Resistor	.19
7998	1 Meg Ohm 1/3 Watt Resistor	.19
6984	500,000 Ohm 1/3 Watt Resistor	.19
8907	25,000 Ohm 1/3 Watt Resistor	.19
6879	50,000 Ohm 1/3 Watt Resistor	.19
9385	15,000 Ohm 1/3 Watt Resistor	.19
8000	100,000 Ohm 1/3 Watt Resistor	.19
9089	500 Ohm 1/3 Watt Resistor	.19
6875	250 Ohm 1/3 Watt Resistor	.19
1817	6" Dynamic Speaker	7.25
1818	8" Dynamic Speaker	9.00
1341	Tone Control Switch	.39
1548	Fuse Block Receptacle	.25

Prices are subject to change without notice.

MODEL 850B

GAMBLE-SKOGMO, INC.

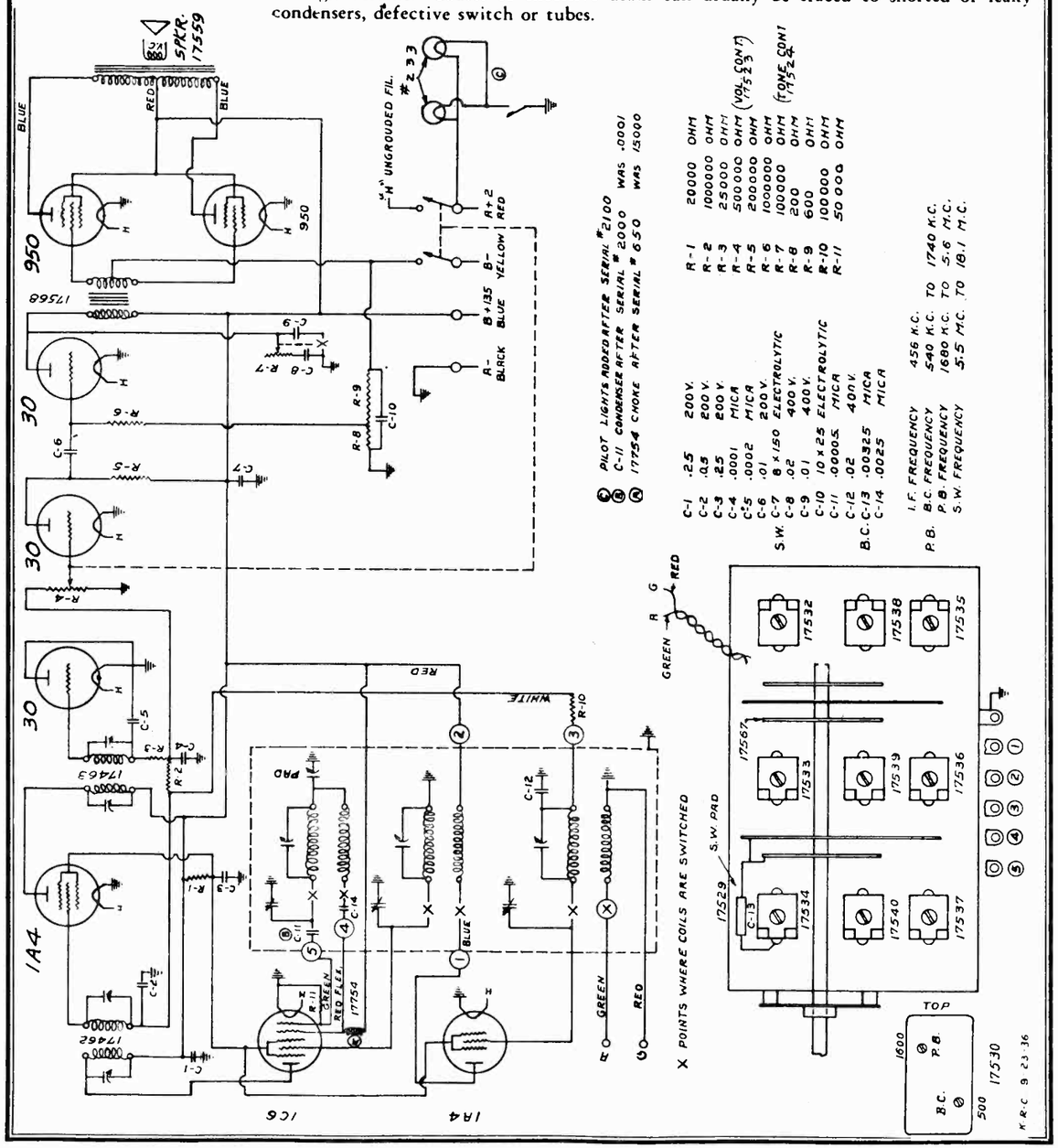
Schematic, Trimmers
Alignment

ALIGNMENT. Refer to "Alignment" in 11-B notes. Connect signal generator to grid cap of 1-C-6 tube for IF alignment .

BELT AND DIAL REPLACEMENT. Belt may be replaced without removing any parts on this model. Also see notes on 11-B dial and belt.

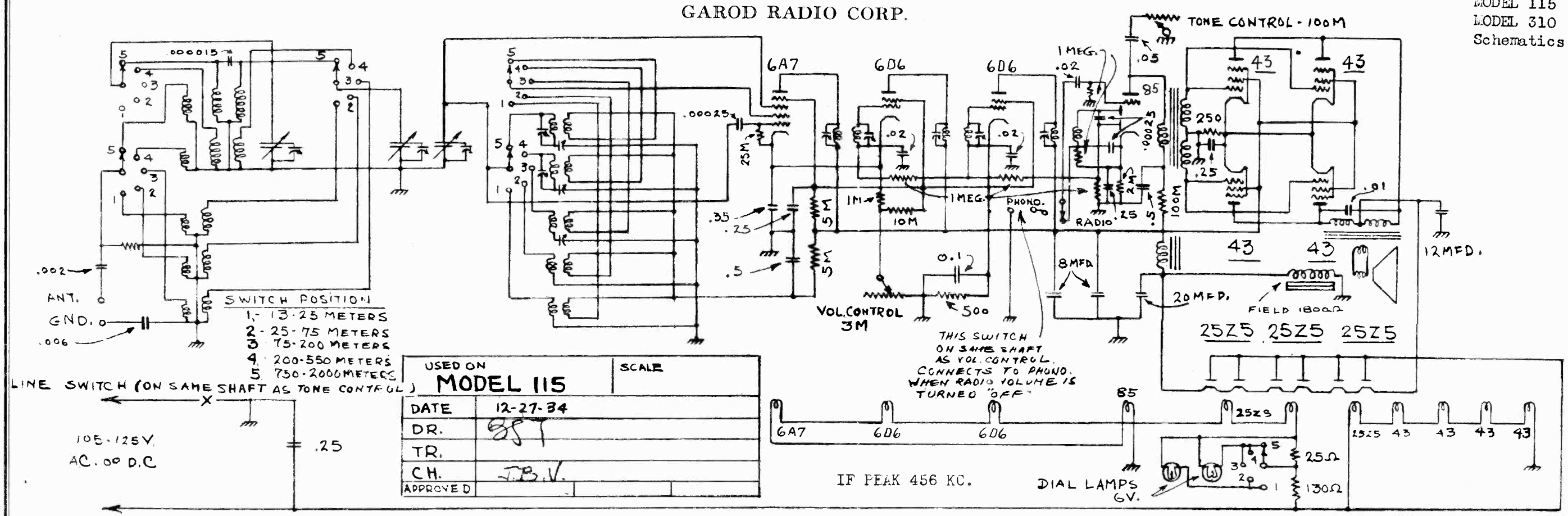
TUBE FUNCTIONS. 1-A-4 R. F. Stage on all wave bands, 1-C-6 first detector-oscillator, 1-A-4 intermediate amplifier, "30" as diode detector, "30" as first audio, "30" as second audio, two type 950 Pentodes operating in push-pull class A prime as power tubes.

Excessive Battery Drain .....This should always be checked with a meter, since some people use a set more than they realize or may leave it "on" over night. The "A" drain should measure not over .68 amp. and the "B" 20 to 22 Milliamperes on low volume—increasing some when tuned in on high volume. Causes of excessive drain can usually be traced to shorted or leaky condensers, defective switch or tubes.

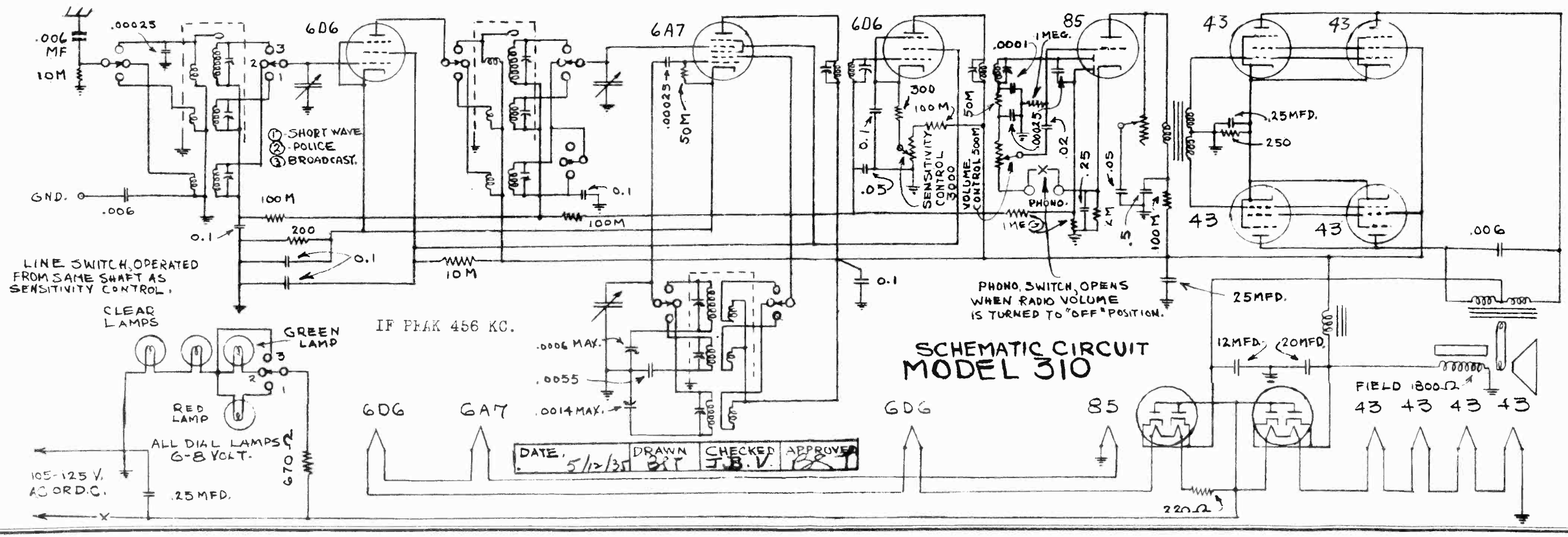


MODEL 115
MODEL 310
Schematics

GAROD RADIO CORP.



USED ON	MODEL 115	SCALE
DATE	12-27-34	
DR.	BST	
TR.		
CH.	J.B.V.	
APPROVED		

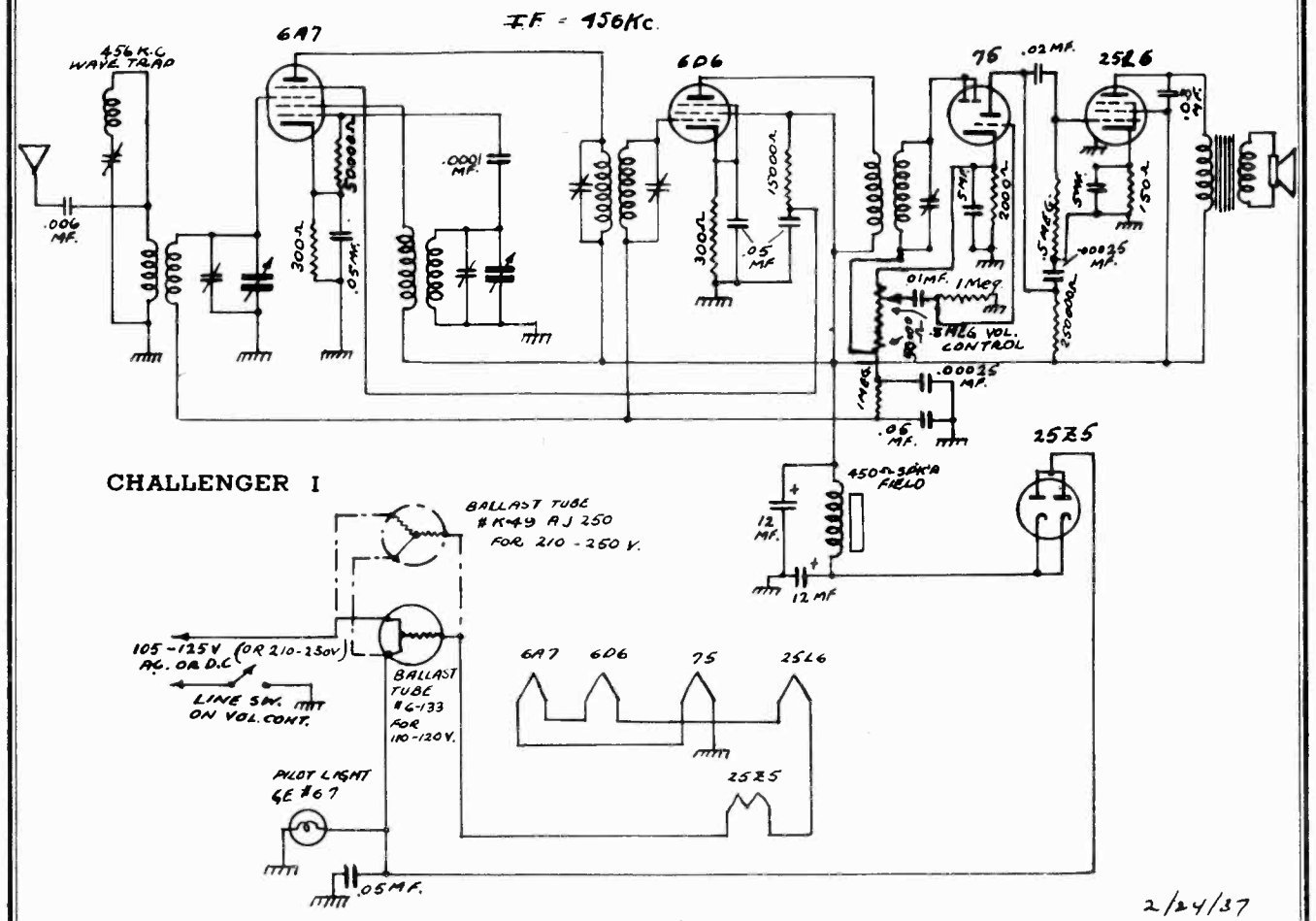


DATE	5/12/35	DRAWN	CHECKED	APPROVED
		BST	J.B.V.	

SCHEMATIC CIRCUIT
MODEL 310

GAROD RADIO CORP.

MODEL Challenger I
Schematic, Socket
Alignment, Voltage



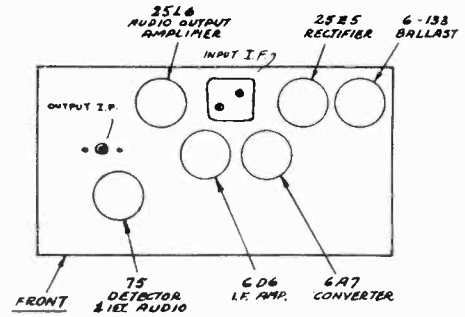
2/24/37

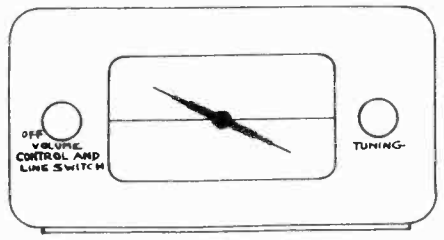
This receiver operates on either direct current or alternating current of any frequency on voltage between 105 and 130. If voltages in excess of this value are to be applied to the receiver, a special Ballast Tube must be used. When operating from direct current, if after the receiver has been turned on for about three quarters of a minute, no reception is obtained, the plug must be reversed in the socket. On alternating current, there is generally no difference, though sometimes quieter operation results.

I.F. ADJUSTMENT - The signal generator is set at 456 kc. The "hot" lead from the signal generator is connected to the grid cap on the 1st detector (6A7) tube, the clip having first been removed from the tube cap. The ground lead is connected to the receiver chassis. The oscillator section (front) of the gang tuning condenser is short-circuited and the volume control turned on full. The i.f. trimmers are then adjusted for maximum gain in the receiver. These trimmers are located on top of the i.f. transformer shield can and on the chassis to the left of the 6D6 tube. The one towards the right is the 1st i.f. transformer and the left one is the 2nd i.f. transformer. The oscillator section of the variable condenser is the one nearest the front of the chassis. The antenna trimmer is then adjusted for maximum output.

1500 KILOCYCLE ADJUSTMENT - The short-circuit is removed from the oscillator condenser and the grid clip replaced in its normal position on the cap of the 6A7 tube. The "hot" lead from the signal generator is connected to the antenna lead of the receiver and the ground lead to the ground of the receiver. With the volume control set at maximum and a minimum input signal from the signal generator, the band switch is turned to the left and the receiver dial set at 1500 K.C. The oscillator trimmer is adjusted so as to bring the signal in at this setting.

456 K.C. WAVE TRAP ADJUSTMENT: The signal generator is again set to 456 kc. The output of the signal generator is increased so as to obtain a good reading (about half scale) on the output meter connected to the receiver. The wave trap is then adjusted for a MINIMUM reading by rotating the trimmer on top of the antenna coil. This is located directly behind the dial scale.





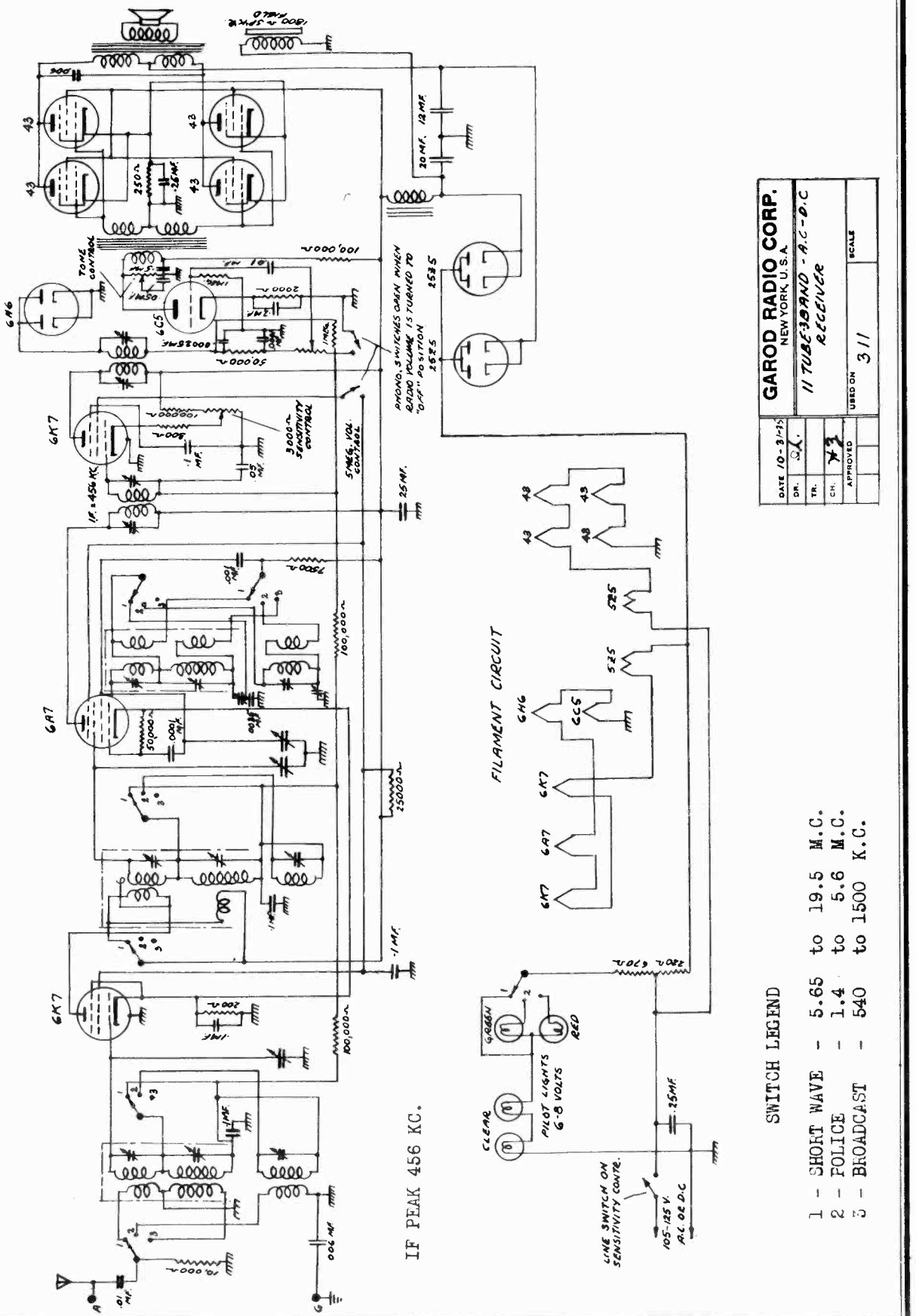
VOLTAGE TABLE

TUBE	FUNCTION	H'T'R	PLATE	SC.GR.	CATH	OSC.PL.
6A7	det.-osc.	6.3	92	65.0	2.5	92
6D6	1.f. ampl.	6.3	92	92	2.0	----
75	diode det. and 1st audio	6.3	40.0	----	----	----
2516	audio oupt.	25.	90	92	7.5	----
2525	rectifier	25.	92	----	120.	----

NOTE: Fil. voltages measured with a high impedance A.C. voltmeter, other potentials with a high resistance (1000 OHMS per volt) voltmeter.

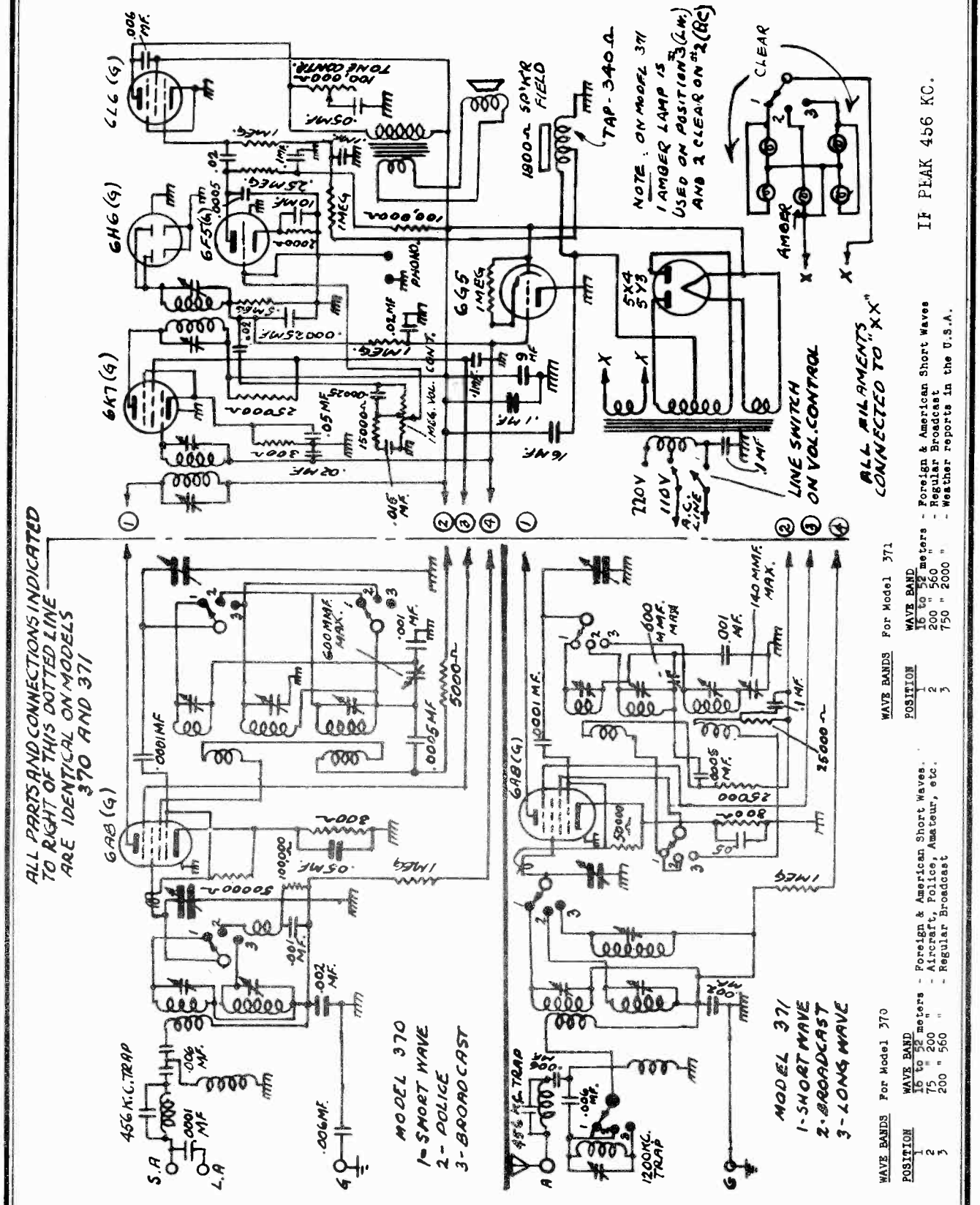
MODEL 311
Schematic

GAROD RADIO CORP.



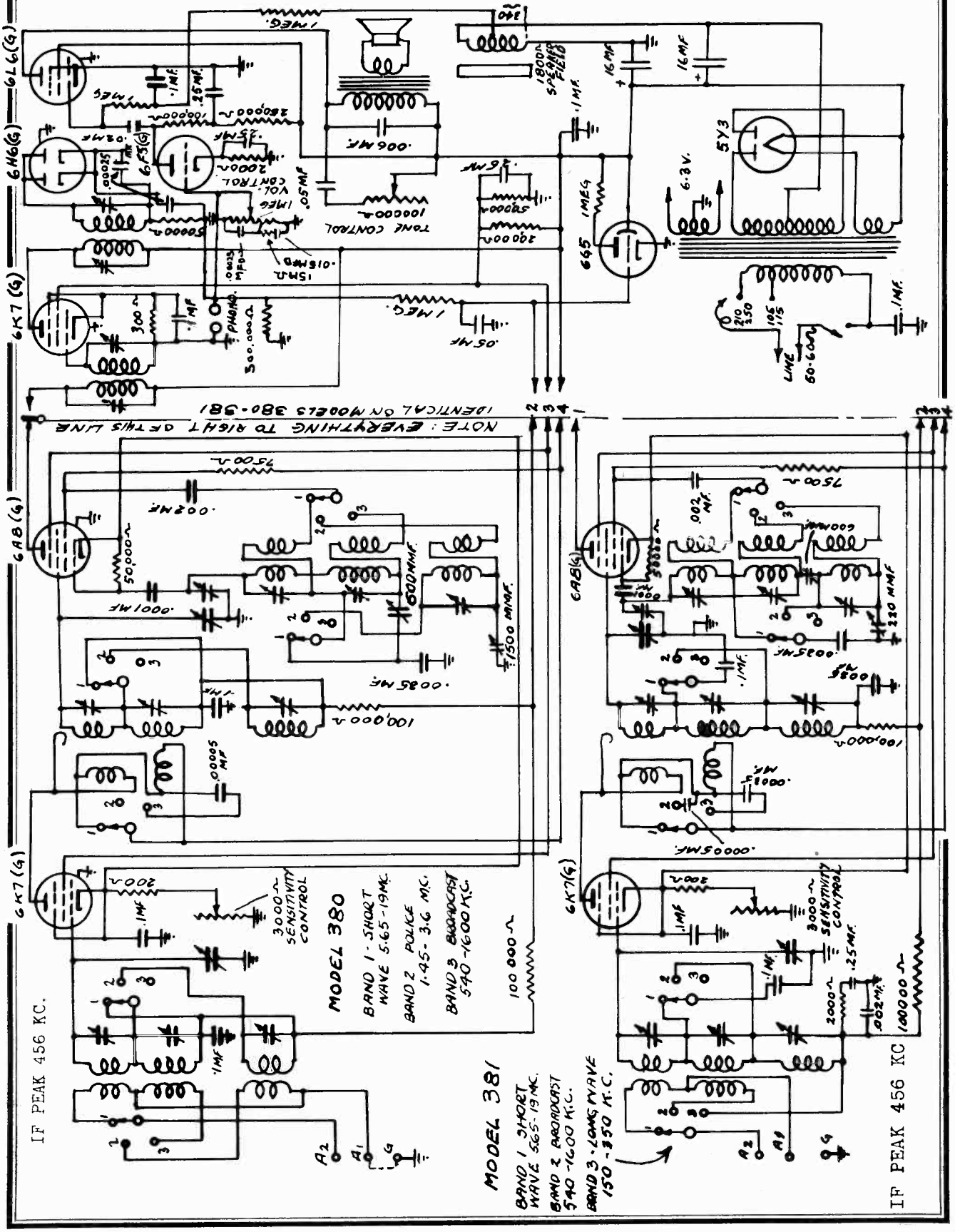
GAROD RADIO CORP.

MODELS 370,370C,370D,370KC
MODELS 371,371C,371D,371KC
Schematics



MODELS 380,380D,380KC
MODELS 381,381D,381KC
Schematics

GAROD RADIO CORP.



Alignment, Voltage
Socket, Trimmers

GAROD RADIO CORP.

MODELS 380, 380D, 380KC
MODELS 381, 381D, 381KC

I.F. ADJUSTMENT - The signal generator is set at 456 kc. and is connected to the grid of the first detector (6A8). With the oscillator section of the tuning condenser short-circuited and the receiver volume control at its maximum position, the i.f. trimmers are adjusted for maximum output. These trimmers may be found on tops of the i.f. transformer shield cans.

MODEL 380

18 MEGACYCLE ADJUSTMENT - The high side of the signal generator is connected to the antenna lead of the receiver and the low side to the ground lead. The receiver and the signal are both tuned to a frequency of 18 mc. with the selector switch in position for band no. 1. The oscillator trimmer condenser is adjusted so that the 18 mc signal is tuned in exactly at the 18 mc calibration point, with the volume control on full and the signal generator adjusted for minimum input. The antenna preselector and first detector trimmers are then adjusted in the order named for maximum output. These trimmers are located on the sides of the shield cans and are opposite the lower openings. This is the only adjustment on Band #1.

1500 K.C. ADJUSTMENT - With the band selector switch in position for operation on band no. 3. and the receiver and signal generator both set at 1500 K.C. the procedure outlined above is repeated. The oscillator trimmer is found on the rear coil can, and is opposite the upper opening. The antenna preselector and interstage coil trimmers are located in the same positions on the corresponding shield cans.

The signal generator is set at 600 K.C. and the signal tuned in on the dial. The padder condenser for this band is adjusted for maximum gain while the gang tuning condenser is rocked slightly to the right and left. The 1500 K.C. adjustment should then be rechecked. The 600 K.C. Padder is located as indicated in the sketch.

3 MC. ADJUSTMENT - The band selector switch is set in position for operation on the No. 2. band. The receiver and signal generator are both set at 3 M.C. and the procedure outlined above is repeated. The oscillator trimmer is found on the Police Band Coil located under the chassis and is towards the rear. The other trimmers for this band are located in similar positions on the corresponding coils.

The signal generator is set at 1.7 M.C. and the signal tuned in on the dial. The padder condenser for the police band is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 3 M.C. adjustment should then be rechecked. The 1.7 MC. padder is located as indicated:

MODEL 381

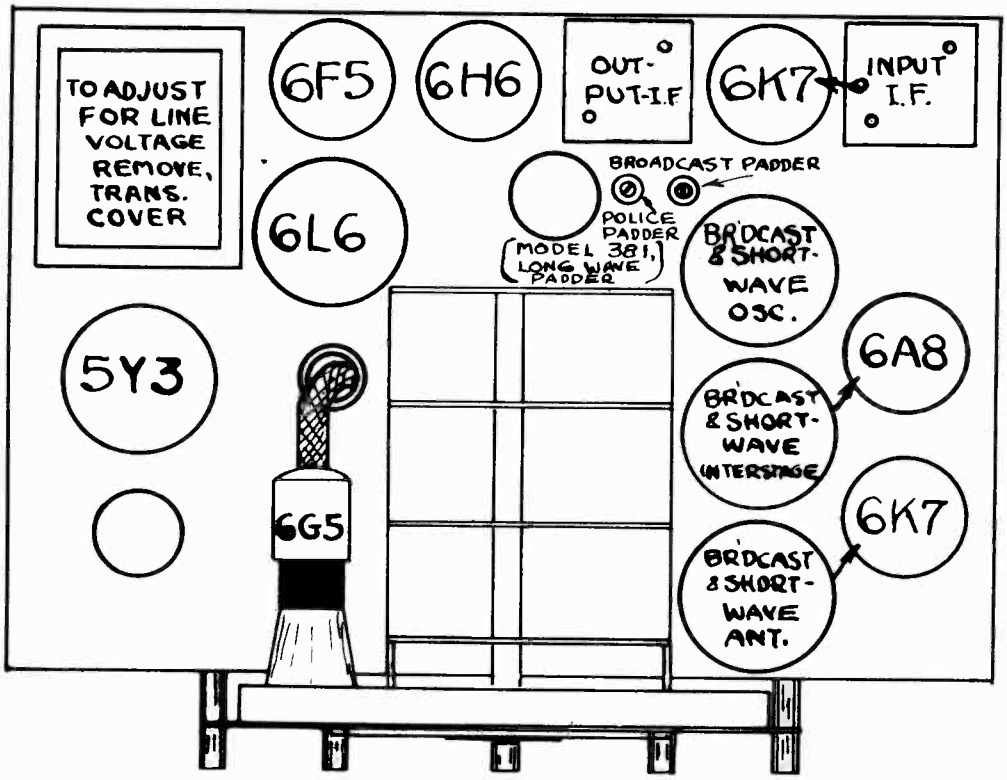
Model 381 is the same as Model 380 except that the Long Wave band is substituted for the Police Band. Alignment procedure is identical for the Short Wave and Broadcast Bands. The Long Wave Band is aligned as follows:

300 KC. ADJUSTMENT - The band selector switch is set in position for operation on band no. 3. The receiver and generator are both tuned to 340 kc. and the procedure outlined above is repeated. The oscillator trimmer is located under the chassis and is mounted on the rear coil.

The signal generator is set at 150 kc. and the signal is tuned in on the dial. The padder condenser for this band is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 300 kc. adjustment should then be rechecked. The 150 kc. padder is located as indicated.

All voltages except filament, are measured from socket terminals to chassis and with a 1000 Ohms per volt voltmeter. The set must be in operation and the sensitivity control in its maximum clockwise position. Wave Band switch in broadcast position.

Filament voltages are taken from filament prong to filament prong at tube socket and measured with a low impedance AC voltmeter.



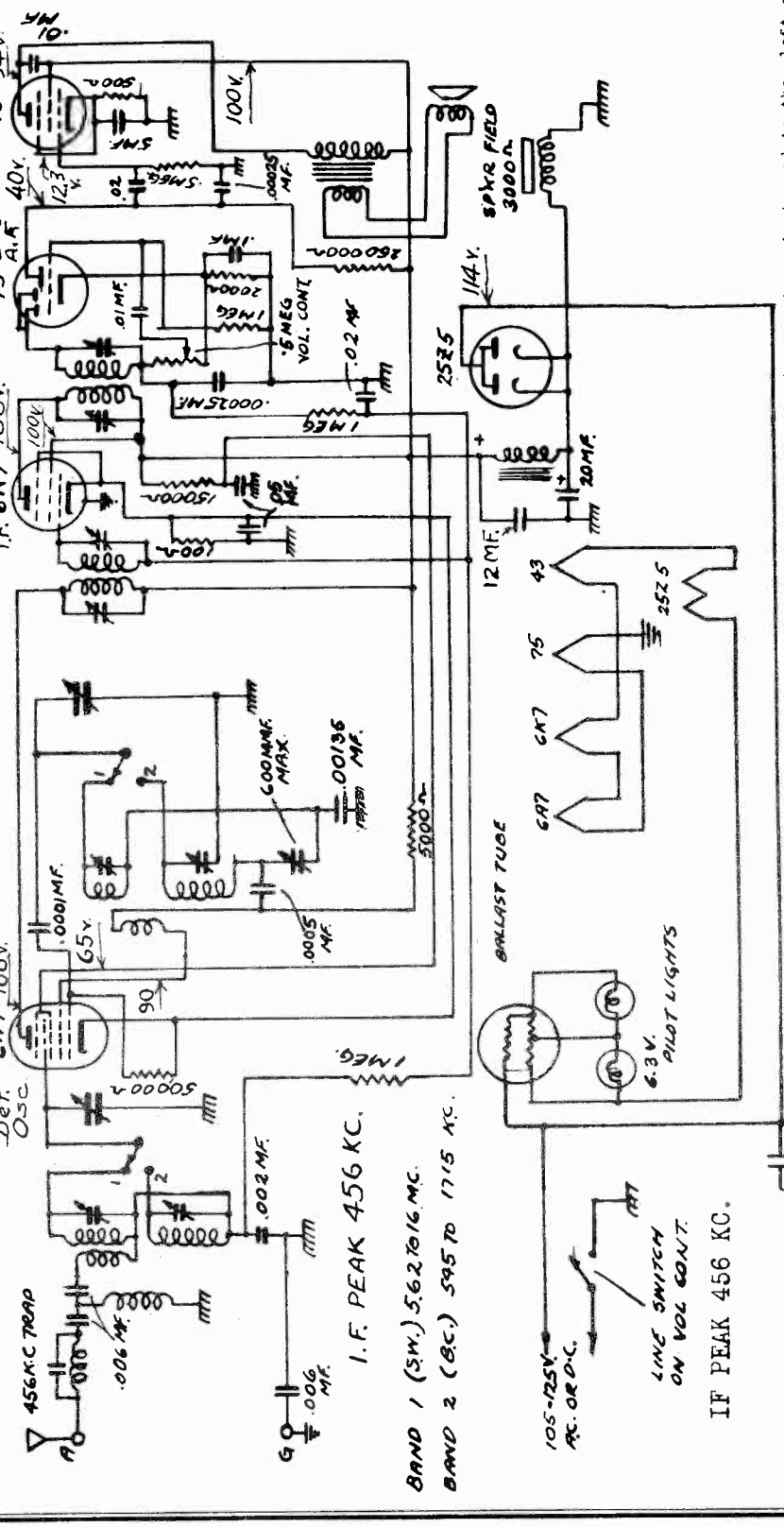
CHASSIS AND TUBE LAYOUT

MODEL 380 - 381

TUBE	FUNCTION	HEATER	PLATE	SC. GR.	CATH Volts	CATH Curr.	OSC. PL.
6K7(G)	R.F. Amp.	6.3	265	110	3	7	
6A8(G)	Det. Osc.	6.3	265	110	3	8	
6K7(G)	I.F. Amp.	6.3	265	110	3.5	7	220
6H6(G)	Diode Det.	6.3	0				
6F5(G)	1st Audio Amp.	6.3	80		1	.5	
6L6(G)	Audio Output	6.3	255	265	0	45	
5Y3	Rectifier	5.0			380	68	

MODEL 620
Schematic
Alignment

GAROD RADIO CORP.



Realignment of this receiver should not be attempted unless all other possible causes of faulty operation have first been thoroughly investigated. An accurately calibrated signal generator which will cover the various wave-bands, and an output meter for indicating the effects of adjustments, are required.

I.F. ADJUSTMENT - The signal generator is set at 456 kc. The "hot" lead from the signal generator is connected to the grid cap on the 1st detector (6A7) tube, the clip having first been removed from the tube cap. The ground lead is connected to the receiver chassis. The oscillator section (front) of the gang tuning condenser is short-circuited and the volume control turned on full. The i.f. trimmers are then adjusted for maximum gain in the receiver. These trimmers are located on top of the i.f. transformer shield cans, which are situated in the rear of the chassis, The one towards the right is the 1st i.f. transformer and the left one is the 2nd i.f. transformer.

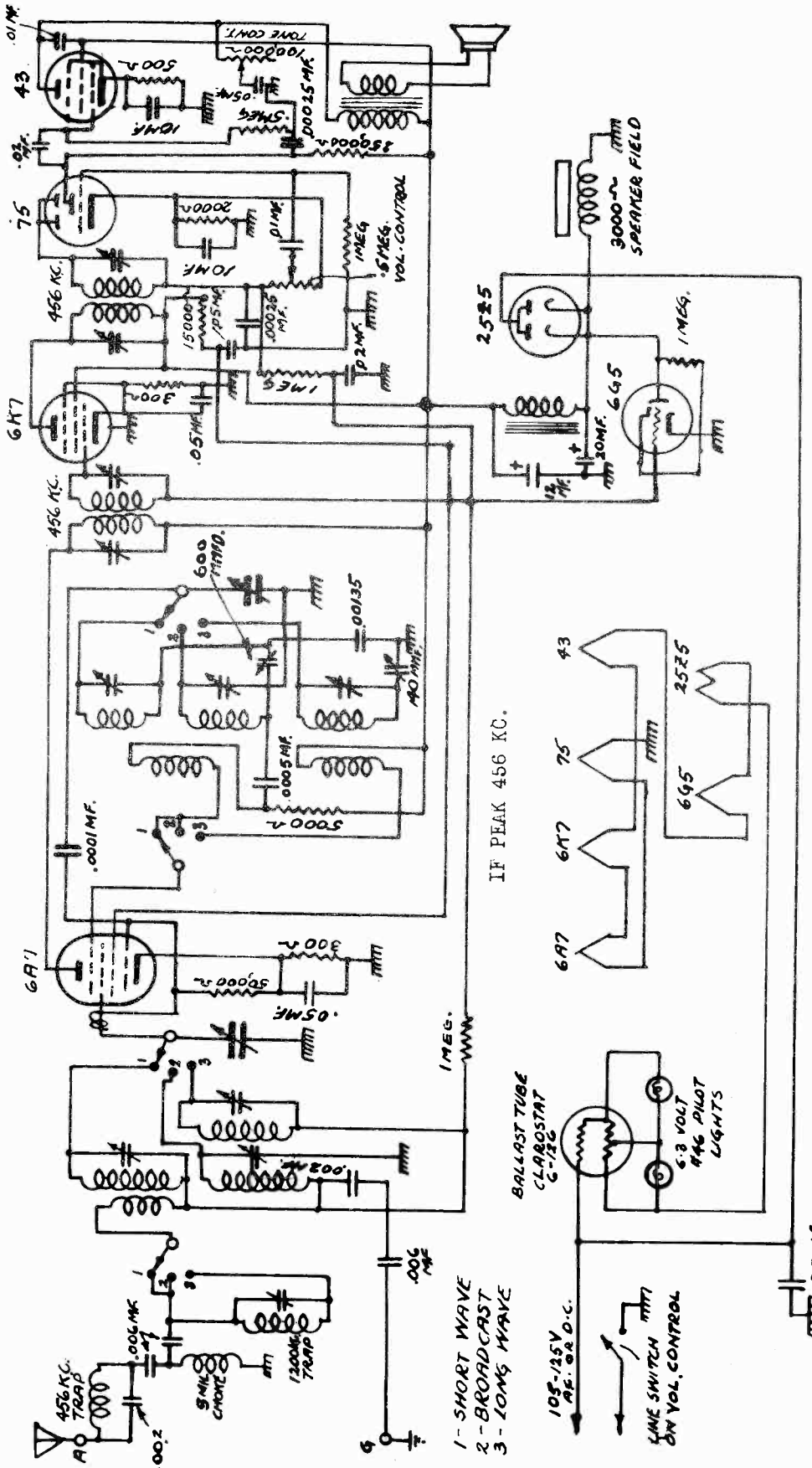
14 MEGACYCLE ADJUSTMENT - The short-circuit is removed from the oscillator condenser and the grid clip replaced in its normal position on the cap of the 6A7 tube. The "hot" lead from the signal generator is connected to the antenna lead of the receiver and the ground lead to the ground of the receiver. With the volume control set at maximum and a minimum input signal from the signal generator, the band switch is turned to the left and the receiver dial set at 14 mc. The oscillator trimmer is adjusted so as to bring the signal in at this setting. The oscillator coil is underneath the chassis and is located directly under the variable gang condenser. The short wave trimmer is over the short wave winding (Heavy spaced wire) After the oscillator is set, the antenna trimmer is adjusted for maximum output as indicated by the output meter. (Again the S. W. antenna trimmer is located over the heavy spaced winding on the antenna coil, and is accessible from the top of the chassis.) There are no other adjustments on this band.

1500 KC KILOCYCLE ADJUSTMENT - Turn the Wave Band Switch to the right. Set the signal generator to 1500 kc. and turn the dial pointer to correspond to this frequency. Adjust the oscillator trimmer for this band so that the signal is received exactly at this setting. (This trimmer is located over the close-wound fine winding on the oscillator coil.) Adjust the Broadcast antenna trimmer for maximum output as described previously, (this trimmer is over the small 5 section winding and is accessible from the top.)

600 KC PADDER ADJUSTMENT - With all connections as above, the signal generator is set at 600 KC and the signal tuned in on the dial. The padder for this frequency is found on the front sub-panel of the receiver, directly under the dial. This padder should be adjusted for maximum response of the receiver, while the tuning condenser is rocked slightly back and forth. The 1500 kc adjustment should then be rechecked.

GAROD RADIO CORP.

MODEL 731
Schematic
Notes



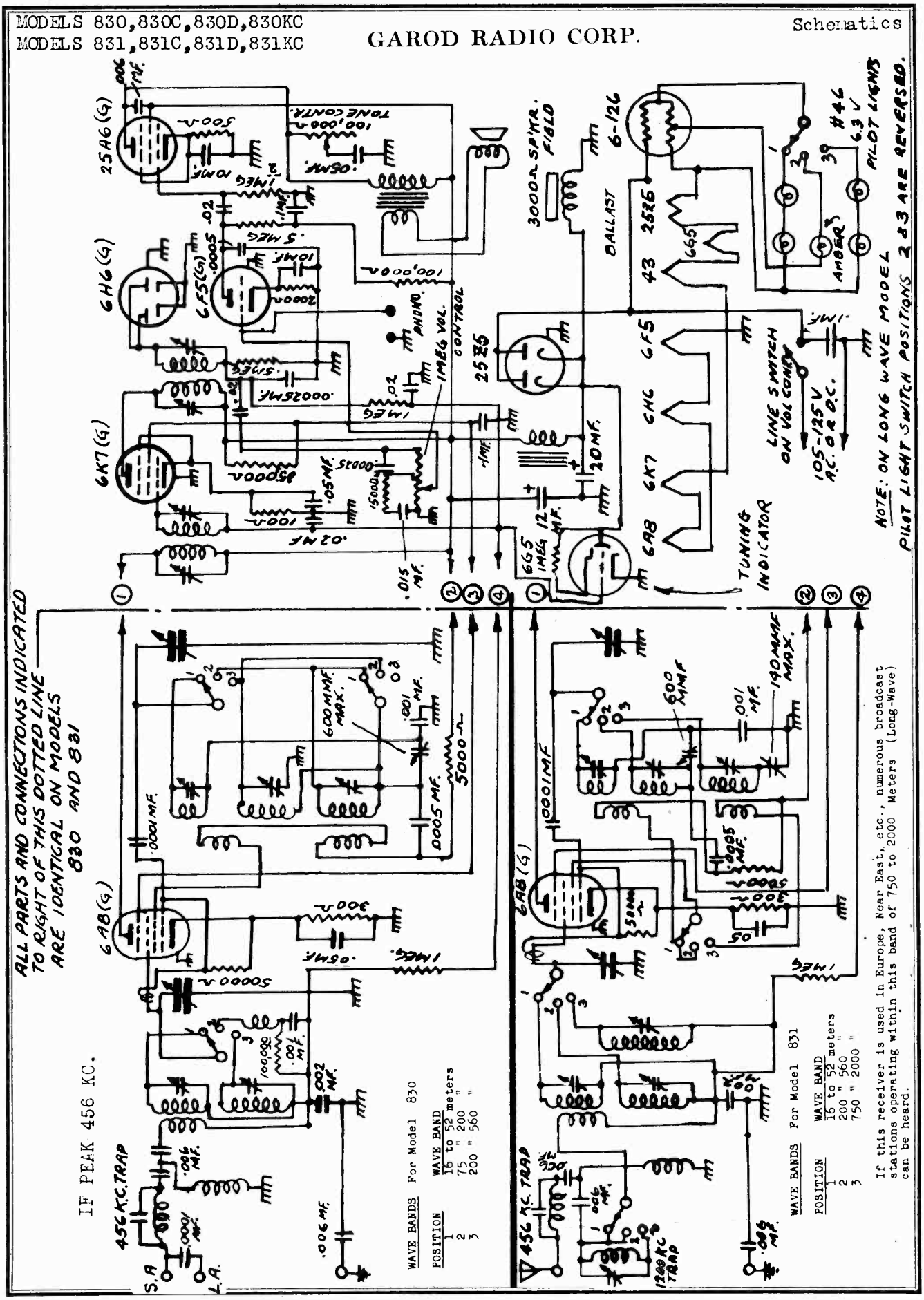
This receiver operates on either direct current or alternating current of any frequency on voltage between 105 and 130. If voltages in excess of this value are to be applied to the receiver, a special voltage reducing resistor must be used. When operating from direct current, if after the receiver has been turned on for about three quarters of a minute, no reception is obtained, the plug must be reversed in the socket. On alternating current, there is generally no difference, though sometimes, quieter operation results.

POSITION	WAVE BAND	
1	17 to 53 meters	- Foreign & American Short Waves
2	200 " 560 "	- Regular Broadcast
3	750 " 2000 "	- Weather reports in the U.S.A.

MODELS 830,830C,830D,830KC
MODELS 831,831C,831D,831KC

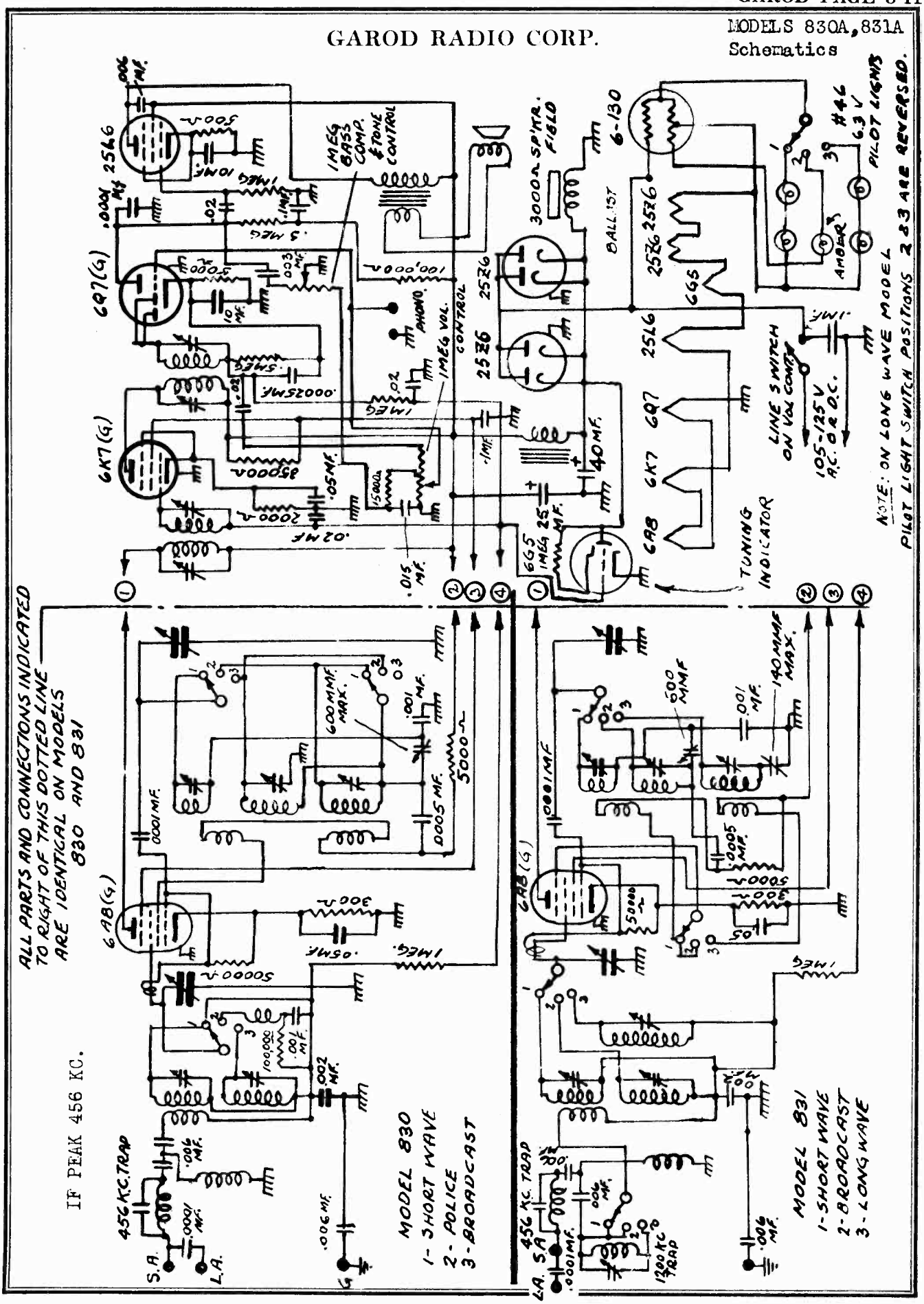
GAROD RADIO CORP.

Schematics



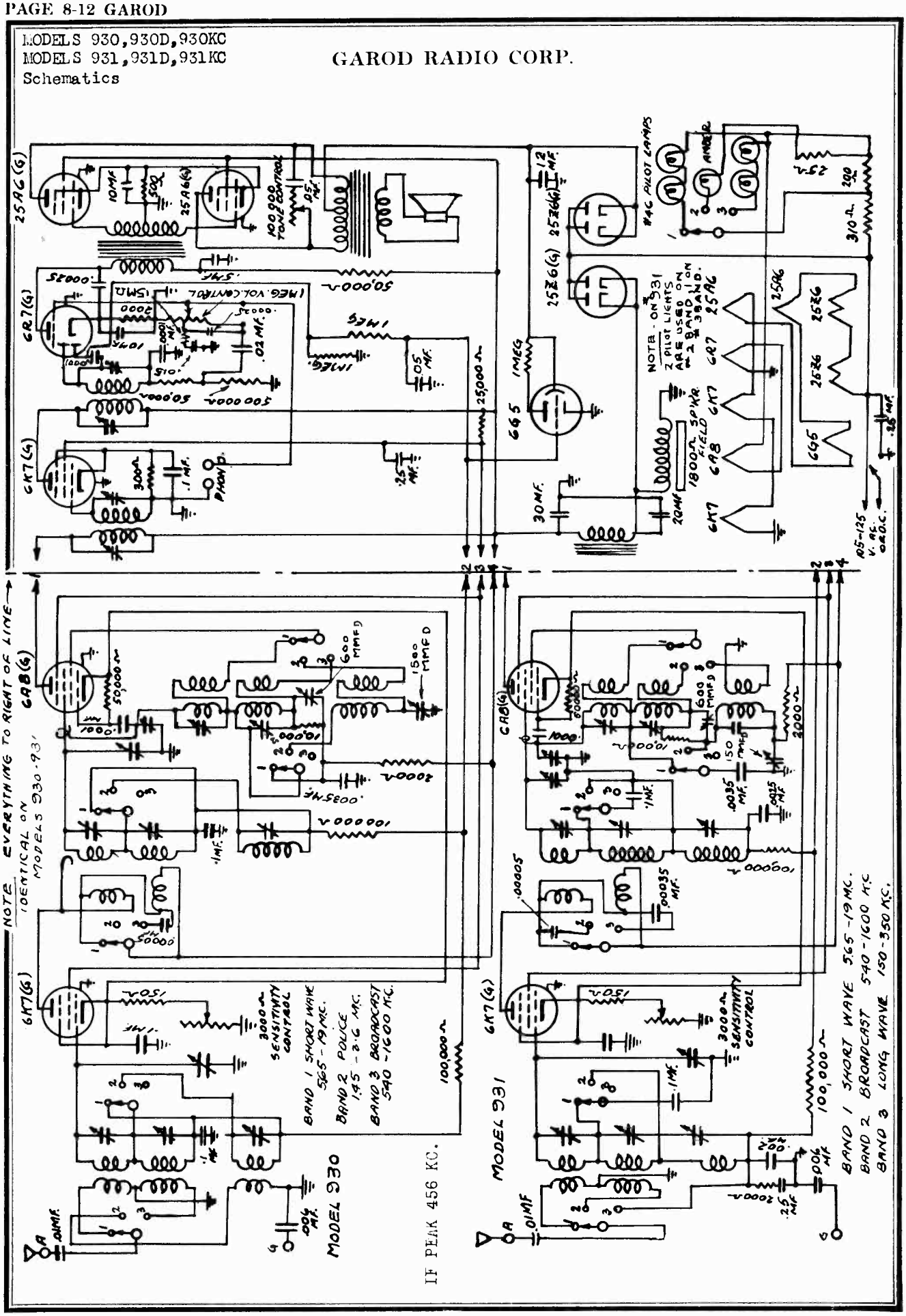
GAROD RADIO CORP.

MODELS 830A, 831A
Schematics



MODELS 930,930D,930KC
MODELS 931,931D,931KC
Schematics

GAROD RADIO CORP.



Alignment, Socket, Trimmers
Voltage

GAROD RADIO CORP.

MODELS 930, 930A, 930D, 930KC
MODELS 931, 931A, 931D, 931KC

I.F. ADJUSTMENT - The signal generator is set at 456 kc. and is connected to the grid of the first detector (6A8). With the oscillator section of the tuning condenser short-circuited and the receiver volume control at its maximum position, the i.f. trimmers are adjusted for maximum output. These trimmers may be found on tops of the i.f. transformer shield cans.

MODEL 930

18 MEGACYCLE ADJUSTMENT - The high side of the signal generator is connected to the antenna lead of the receiver and the low side to the ground lead. The receiver and the signal are both tuned to a frequency of 18 mc. with the selector switch in position for band no. 1. The oscillator trimmer condenser is adjusted so that the 18 mc signal is tuned in exactly at the 18 mc calibration point, with the volume control on full and the signal generator adjusted for minimum input. The antenna preselector and first detector trimmers are than adjusted in the order named for maximum output. These trimmers are located on the sides of the shield cans and are opposite the lower openings. This is the only adjustment on band #1.

1500 K.C. ADJUSTMENT - With the band selector switch in position for operation on band no. 3. and the receiver and signal generator both set at 1500 K.C. the procedure outlined above is repeated. The oscillator trimmer is found on the rear coil can, and is opposite the lower opening. The antenna preselector and interstage coil trimmers are located in the same positions on the corresponding shield cans.

The signal generator is set at 600 K.C. and the signal tuned in on the dial. The padder condenser for this band is adjusted for maximum gain while the gang tuning condenser is rocked slightly to the right and left. The 1500 K.C. adjustment should then be rechecked. The 600 K.C. Padder is located as indicated in the sketch.

3 MC ADJUSTMENT - The band selector switch is set in position for operation on the no. 2. band. The receiver and signal generator are both set at 3 M.C. and the procedure outlined above is repeated. The oscillator trimmer is found on the police band coil located under the chassis and is towards the rear. The other trimmers for this band are located in similar positions on the corresponding coils.

The signal generator is set at 1.7 M.C. and the signal tuned in on the dial. The padder condenser for the police band is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 3 M.C. adjustment should then be rechecked. The 1.7 M.C. padder is located as indicated.

MODEL 931

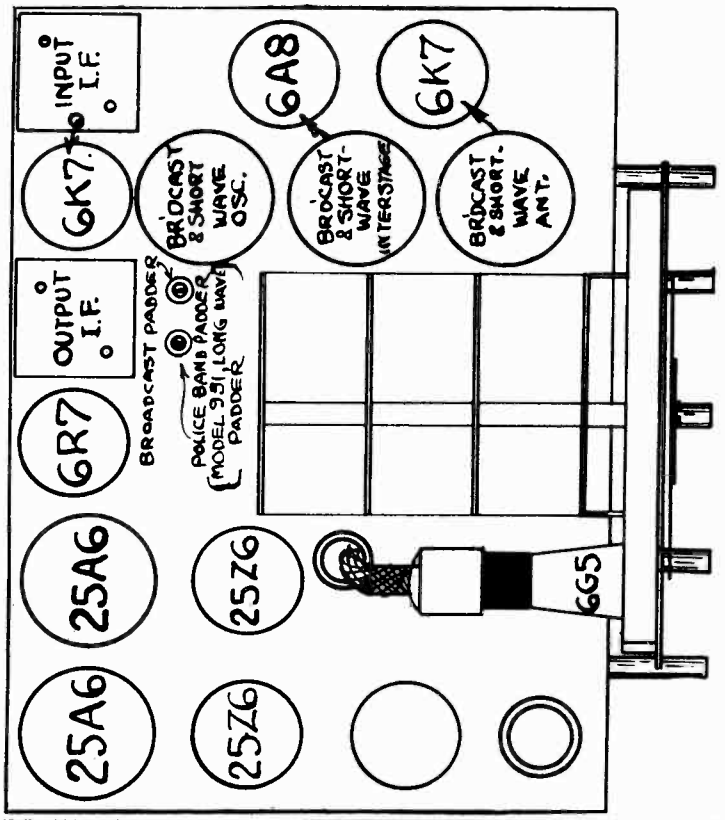
Model 931 is the same as Model 930 except that the Long Wave band is substituted for the Police Band. Alignment procedure is identical for the Short Wave and Broadcast Bands. The Long Wave Band is aligned as follows:

300 KC. ADJUSTMENT - The band selector switch is set in position for operation on band no. 3. The receiver and generator are both tuned to 340 kc. and the procedure outlined above is repeated. The oscillator trimmer is located under the chassis and is mounted on the rear coil.

The signal generator is set at 150 kc. and the signal is tuned in on the dial. The padder condenser for this band is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 300 kc. adjustment should then be rechecked. The 150 kc. padder is located as indicated.

All voltages except filament, are measured from socket terminals to chassis and with a 1000 Ohms per volt voltmeter. The set must be in operation and the sensitivity control in its maximum clockwise position. Wave band switch in the broadcast position.

Filament voltages are taken from filament prong to filament prong at tube socket and measured with a high impedance AC voltmeter. (Rectifier Type)



TUBE AND CHASSIS LAYOUT

MODEL 930 - 931

TUBE	FUNCTION	HEATER	PLATE	SC. GR.	CATH Volts	CATH Curr.	OSC. PL.
6K7 (G)	R.F. Amp.	6.3	120	50	1.3	3.5	
6A8 (G)	Det. Osc.	6.3	120	50	1.3	5.5	100
6K7 (G)	I.F. Amp.	6.3	120	50	1.2	4	
6R7 (G)	Diode Det. & 1st Audio Amp	6.3	60		2.	1.6	
25A6 (G)(2)	Audio Output	25.	125	120	19.	20.	
25Z6(G)	Rectifier (B+ for RF Amp)	25.			125.	80.	
*25Z6	Rectifier (B+ for output tube plates)	25.			128.	35.	

MODELS 930A, 931A
Schematics, Voltage
Socket

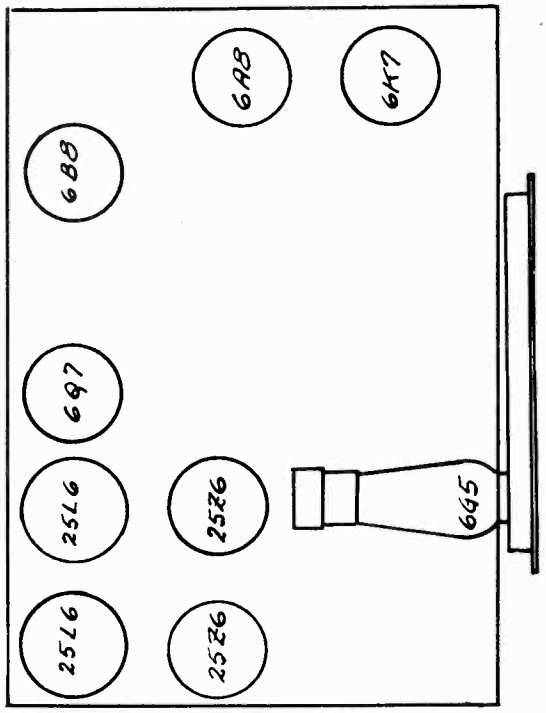
GAROD RADIO CORP.

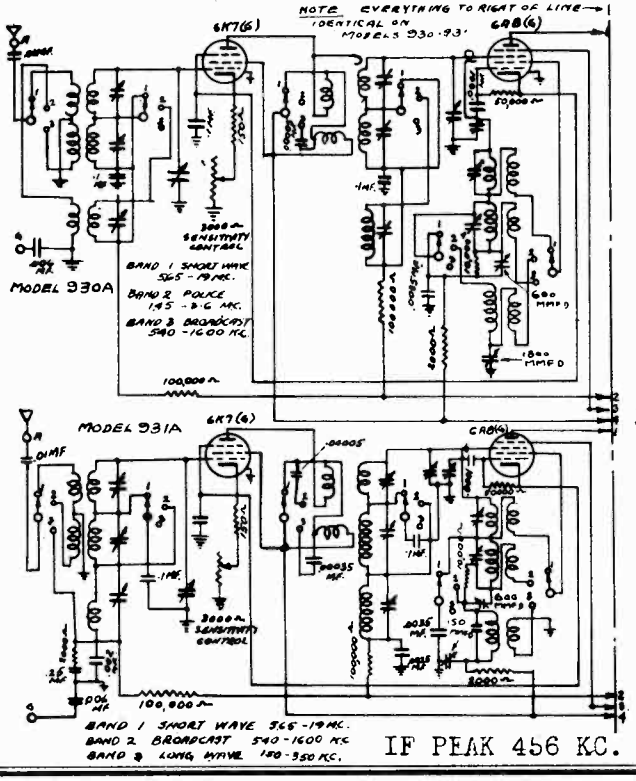
MODEL 930A- 931A

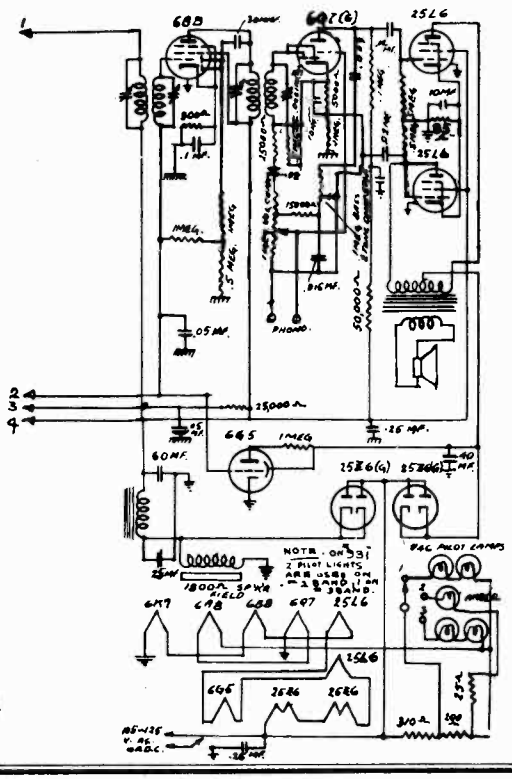
TUBE	FUNCTION	HEATER	PLATE	SC.GR.	CATH Volts	CATH Curr.	OSC.PL.
6K7 (G)	R.F. Amp.	6.3	120	120	2.0	7.0	
6A8 (G)	Det. Osc.	6.3	120	50	2.0	5.5	100
6B8	I.F. Amp& AVC	6.3	120	120	1.2	4	
6Q7 (G)	Diode Det. & 1st Audio Amp.	6.3	80		2.0	.2	
25L6(G)(2)	Audio Output	25.	125	120	8.5	52.	
25Z6(G)	Rectifier (B+ for RF Amp)	25.			125.	80.	
25Z6(G)	Rectifier (B+for output tube plates)	25.			128.	90.	

All voltages except filament, are measured from socket terminals to chassis and with a 1000 Ohms per volt voltmeter. The set must be in operation and the sensitivity control in its maximum clockwise position. Wave band switch in the broadcast position.

Filament voltages are taken from filament prong to filament prong at tube socket and measured with a high impedance AC voltmeter. (Rectifier Type)



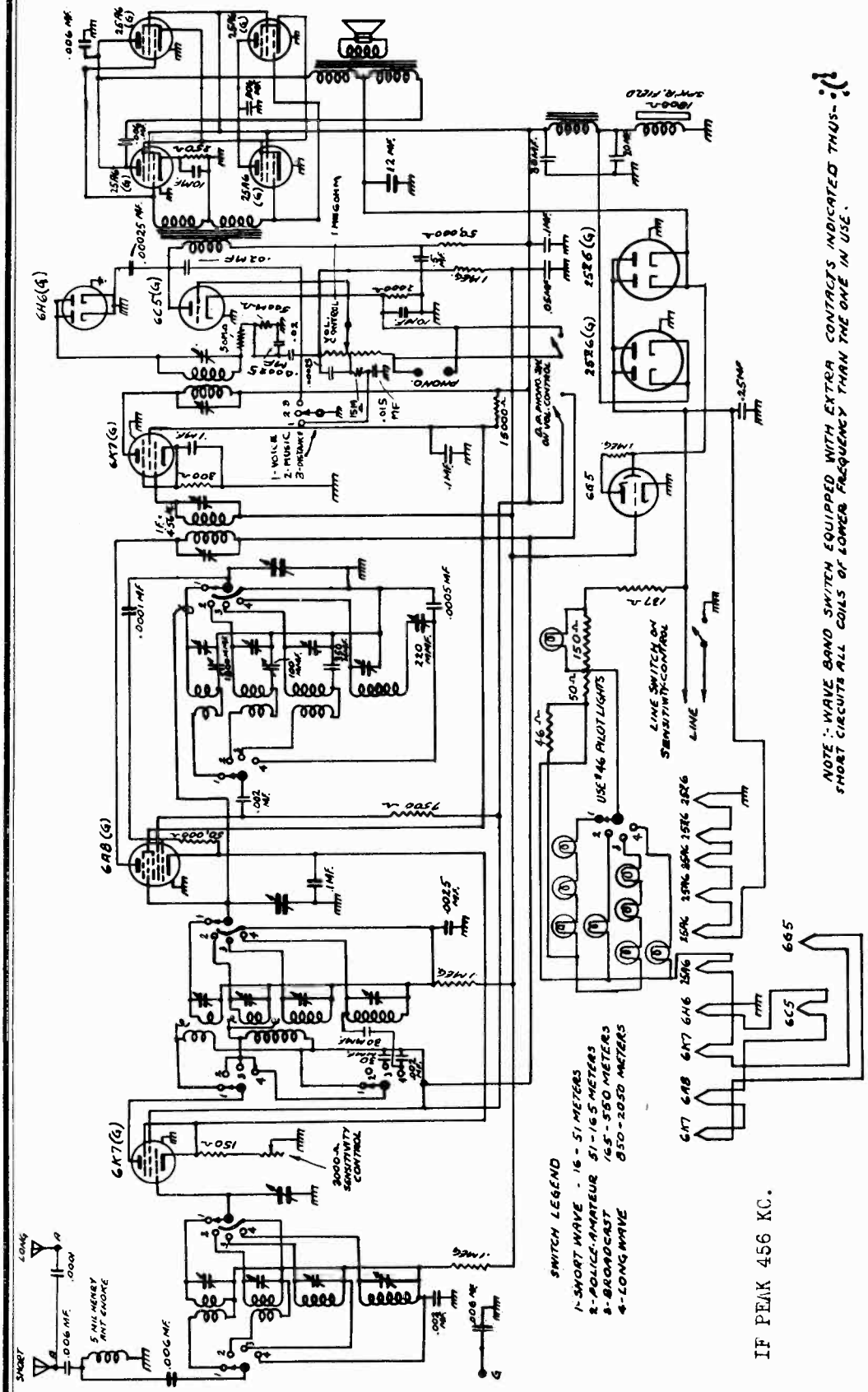




IF PEAK 456 KC.

GAROD RADIO CORP.

MODELS 1240, 1240E, 1240LC
Schematic, Voltage



TUBE	FUNCTION	HEATER V	PLATE V	SC. GR V	CATH V	OSC. PL V
6K7 (G)	RF Amp.	6.3	100	100	1.75 8.0	
6A8 (G)	1st Det. & Osc.	6.3	100	55	1.75 5.5	80
6K7 (G)	IF Amp.	6.3	100	55	1.25 4.0	
6H6 (G)	Diode detector	6.3	0		0	
6C5 (G)	1st Audio Amp.	6.3	60		1.5 .75	
25A6 (G)	(4) Audio Output	25	120	100	20 15.	
2526	Rectifier for Set	25			107 87.	
2526	Rectifier for Output Plates	25			125 60.	

MODELS 1240,1240E,1240LC
Socket,Trimmers,Alignment

GAROD RADIO CORP.

MODEL 1240A
Alignment

I.F.ADJUSTMENT - The signal generator is set at 456 kc. and is connected to the grid of the first detector (6A8). With the oscillator section of the tuning condenser short-circuited and the receiver volume control at its maximum position, the i.f. trimmers are adjusted for maximum output. These trimmers may be found on the tops of the I.F. Transformers.

18 MEGACYCLE ADJUSTMENT - The high side of the signal generator is connected to the antenna lead of the receiver and the low side to the ground lead. The receiver and the signal are both tuned to a frequency of 18 mc. with the selector switch in position for band no. 1. The oscillator trimmer condenser is adjusted so that the 18 mc. signal is tuned in exactly at the 18 mc. calibration point, with the volume control on full and the signal generator adjusted for minimum input. The antenna preselector and interstage trimmers are then adjusted in the order named for maximum output. These trimmers are located as indicated in the bottom view of the chassis.

6 MEGACYCLE ADJUSTMENT - The signal generator is set at 6 megacycle and the signal tuned in on the dial. The short wave padding condenser is adjusted for maximum output, while the gang condenser is rocked slightly to the right and left. The 18 megacycle adjustment should then be rechecked.

5 MC. ADJUSTMENT - With the band selector switch in position for operation on band no. 2. and the receiver and signal generator both set at 5 mc. the procedure outlined above is repeated.

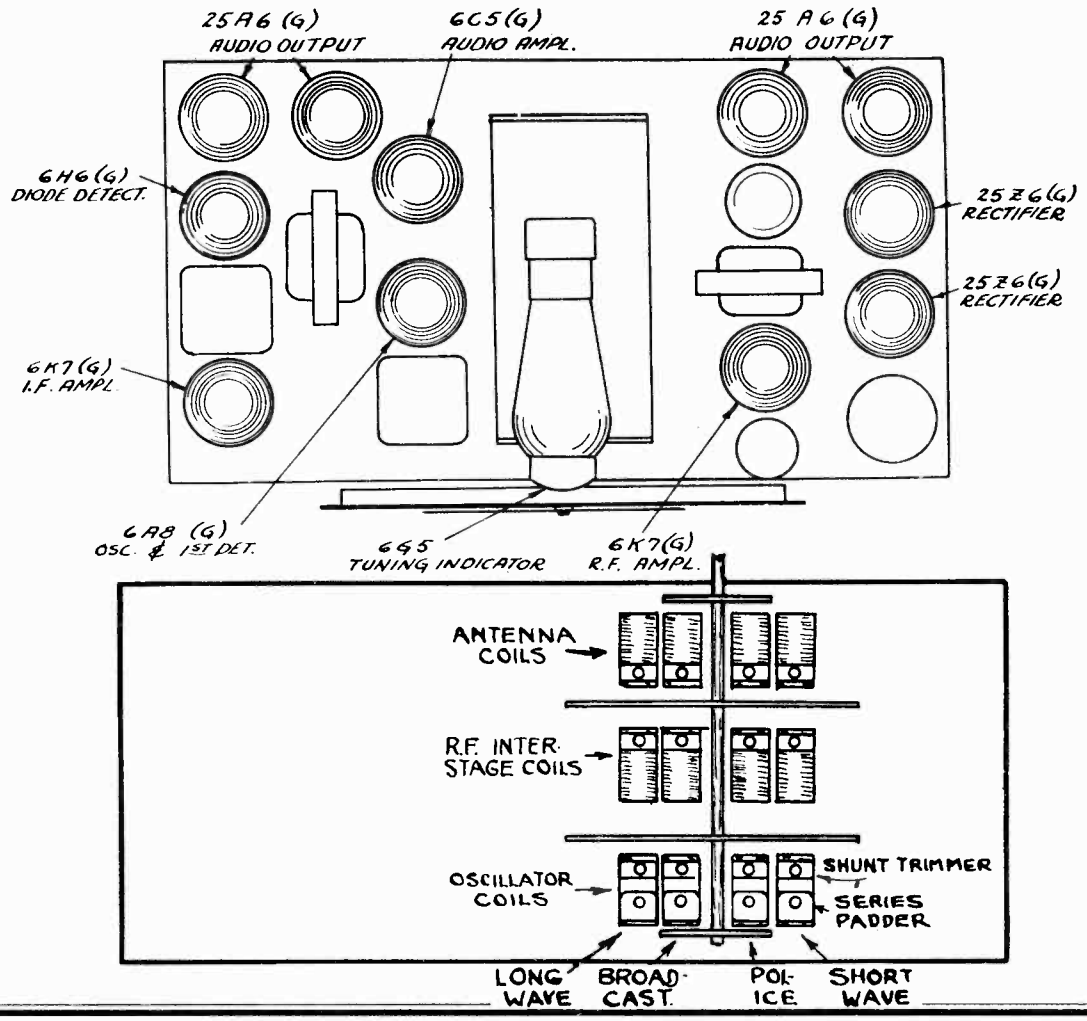
The signal generator is set at 1.8 mc. and the signal tuned in on the dial. The police band padder condenser is adjusted for maximum gain while the gang tuning condenser is rocked slightly to the right and left. The 5 mc. adjustment should then be rechecked.

1500 KC. ADJUSTMENT - The band selector switch is set in position for operation on the no. 3. band. The receiver and signal generator are both set at 1500 kc. and the procedure outlined above is repeated.

The signal generator is set at 600 kc. and the signal tuned in on the dial. The broadcast padder condenser is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 1500 kc. adjustment should then be rechecked.

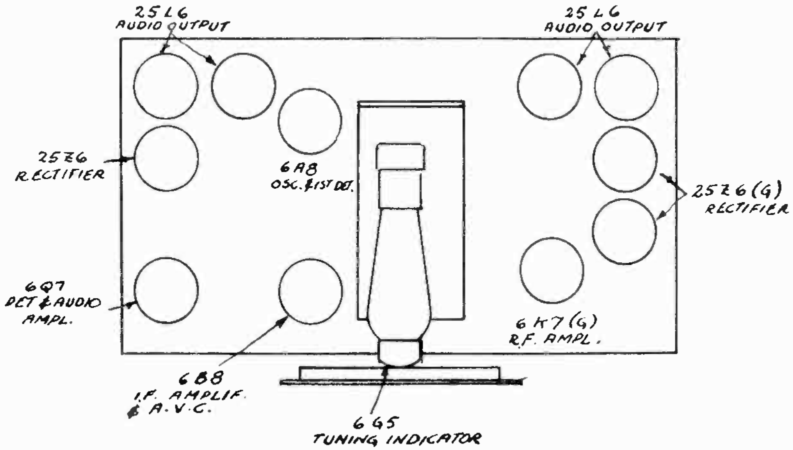
300 KC. ADJUSTMENT - The band selector switch is set in position for operation on band no. 4. The receiver and generator are both tuned to 300 kc. and the procedure outlined above is repeated.

The signal generator is set at 150 kc. and the signal is tuned in on the dial. The long wave padder condenser is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 300 kc. adjustment should then be rechecked.



GAROD RADIO CORP.

MODEL 1240A
Schematic, Socket Voltage



MODEL 1240A

TUBE	FUNCTION	HEATER	PLATE	SC.GR.	CATH V	CATH I	OCS.PL
6K7 (G)	RF Amp.	6.3	100	100	1.75	8.0	
6A8 (G)	1st Det. & Osc.	6.3	100	55	1.75	5.5	80
6B8 (G)	IF Amp.	6.3	100	100	2.00	6.0	
25L6	(4) Audio Output	25	120	100	8.5	.50	
25Z6 (G)	Rectifier for Set	25			107	87.	
25Z6(G)(2)	Rectifier for Output Plates	25			125	85.	
6Q7 G	Det. & 1st Audio	6.3	80		20	.2	

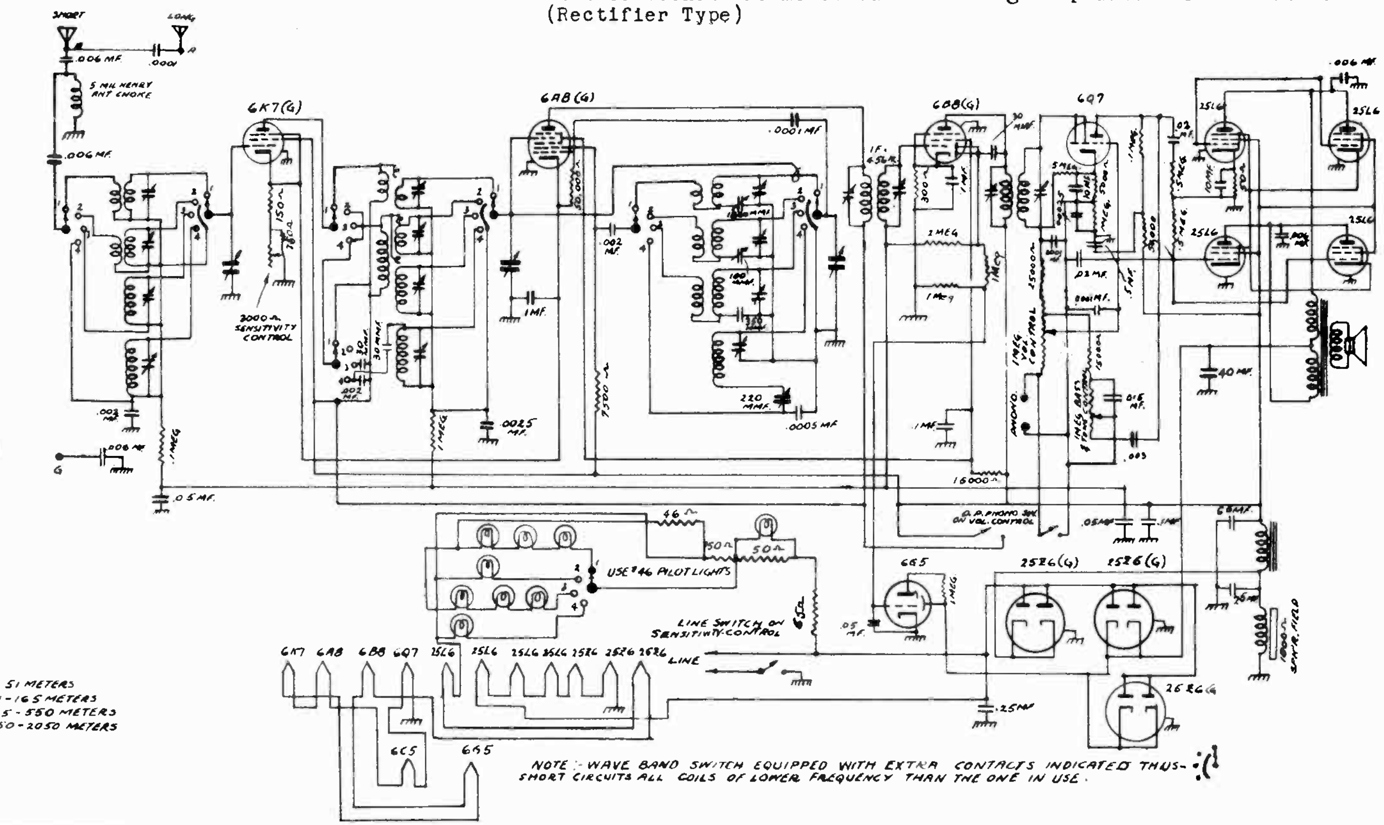
All voltages except filament, are measured from socket terminals to chassis and with a 1000 Ohms per volt voltmeter. The set must be in operation and the sensitivity control in its maximum clockwise position.

Filament voltages are taken from filament prong to filament prong at tube socket and measured with a high impedance AC voltmeter. (Rectifier Type)

IF PEAK 456 KC.

NOTE: On Model 1240A

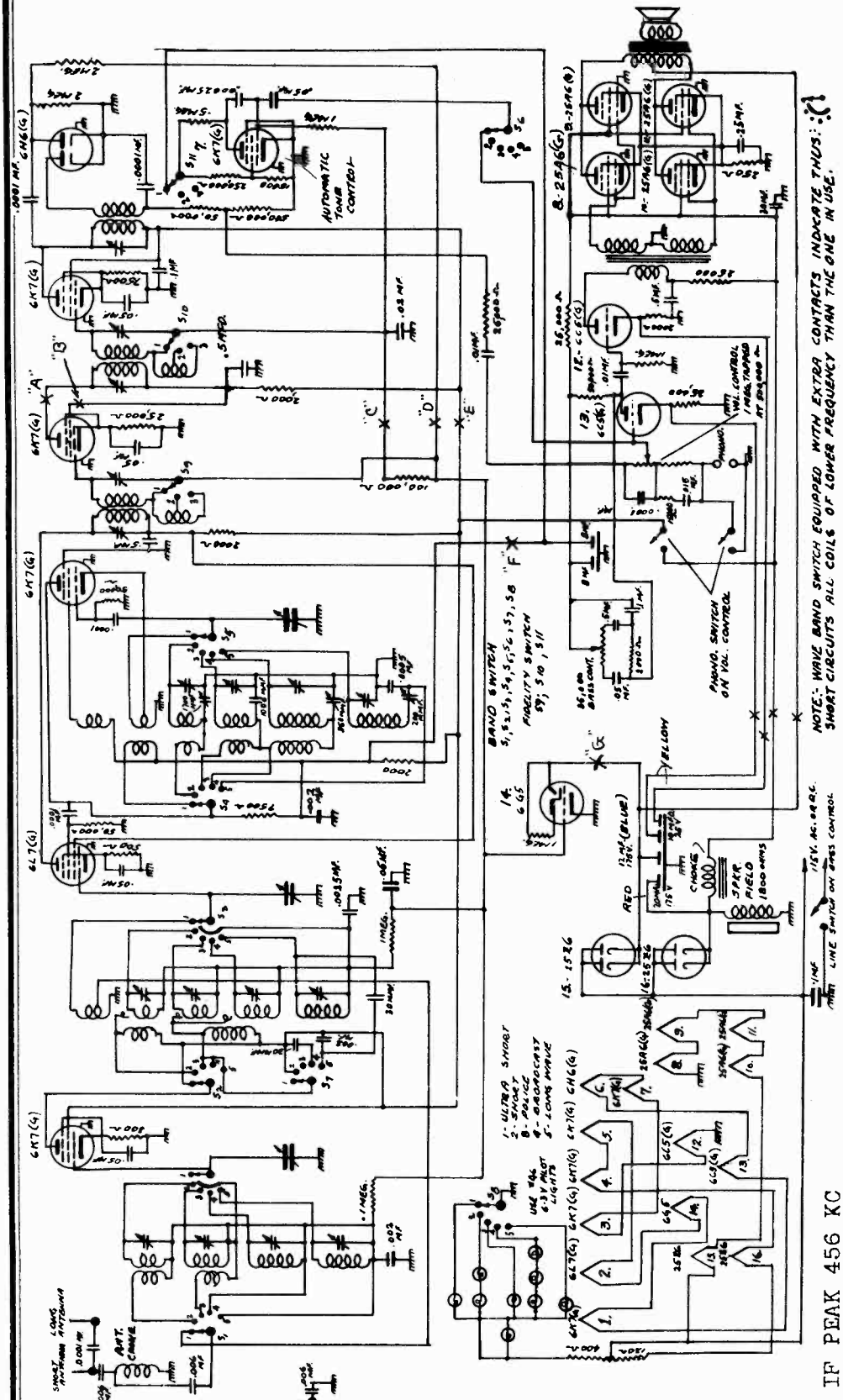
The tone control is continuously variable, instead of 3 points as in earlier sets of this model (1240). To obtain maximum treble turn tone control all the way to the right (clockwise), and to increase bass or low frequencies, turn to the left.



SWITCH LEGEND
1-SHORT WAVE 16 - 51 METERS
2-POLICE-AMATEUR 51 - 165 METERS
3-BROADCAST 165 - 550 METERS
4-LONG WAVE 850 - 2050 METERS

MODELS 1650,1650H,1650LC
Schematic,Voltage

GAROD RADIO CORP.



MODEL 1650

TUBE	FUNCTION	HEATER	PLATE	SC. GRID.	CATH. V.	CATH. I.MA.
6K7(G)	R.F. Amp.	6.3	100	100	2	6.7
6L7(G)	Converter	6.3	95	95	2.5	5.0
6K7(G)	Oscillator	6.3	80	100	0	4
6K7(G)	1st I.F. Amp.	6.3	95	95	12	5
6K7(G)	2nd I.F. Amp.	6.3	100	100	6	1
6H6(G)	Diode Det. & A.V.C.	6.3	0		0	
6C5(G)	1st Audio Amp.	6.3	30		1.5	0.3

TUBE	FUNCTION	HEATER	PLATE	SC. GR.	CATH
6C5(G)	2nd Audio Amp.	6.3	60		1.5 0.75
25A6(G)(4)	Audio Output	25.	120	100	20 15
2526(G)	Rectifier For Set	25.			107 87
2526(G)	Rectifier For Output Plates	25.			125 60
6K7(G)	Automatic Tone Control	6.3	50	5	0 1

All voltages except filament, are measured from socket terminals to chassis and with a 1000 Ohms per volt voltmeter. The set must be in operation and the sensitivity control in its maximum clockwise position.

Filament voltages are taken from filament prong to filament prong at tube socket and measured with a low impedance AC voltmeter.

GAROD RADIO CORP

MODELS 1650,1650H,1650LC
Socket,Trimmers,Alignment
MODEL 1650A
Alignment

I.F. ADJUSTMENT: The signal generator is set at 456 kc. and is connected to the grid of the first detector (6L7). With the oscillator section of the tuning condenser short-circuited and the receiver volume control at its maximum position, the i.f. trimmers are adjusted for maximum output. These trimmers may be found on the tops of the I.F. transformers.

18 MEGACYCLE ADJUSTMENT: The high side of the signal generator is connected to the antenna lead of the receiver and the low side to the ground lead. The receiver and the signal are both tuned to a frequency of 18 mc. with the selector switch in position for band no. 2 (Short Wave). The oscillator trimmer condenser is adjusted so that the 18 mc. signal is tuned in exactly at the 18 mc. calibration point, with the volume control on full and the signal generator adjusted for minimum input. The antenna preselector and interstage trimmers are then adjusted in the order named for maximum output. These trimmers are located as indicated in the bottom view of the chassis.

6 MEGACYCLE ADJUSTMENT: The signal generator is set at 6 megacycles and the signal tuned in on the dial. The Short Wave padding condenser is adjusted for maximum gain while the gang tuning condenser is rocked slightly to the right and left.

5 MC. ADJUSTMENT: With the band selector switch in position for operation on band no. 3 (Police) and the receiver and signal generator both set at 5 mc. the procedure outlined above is repeated.

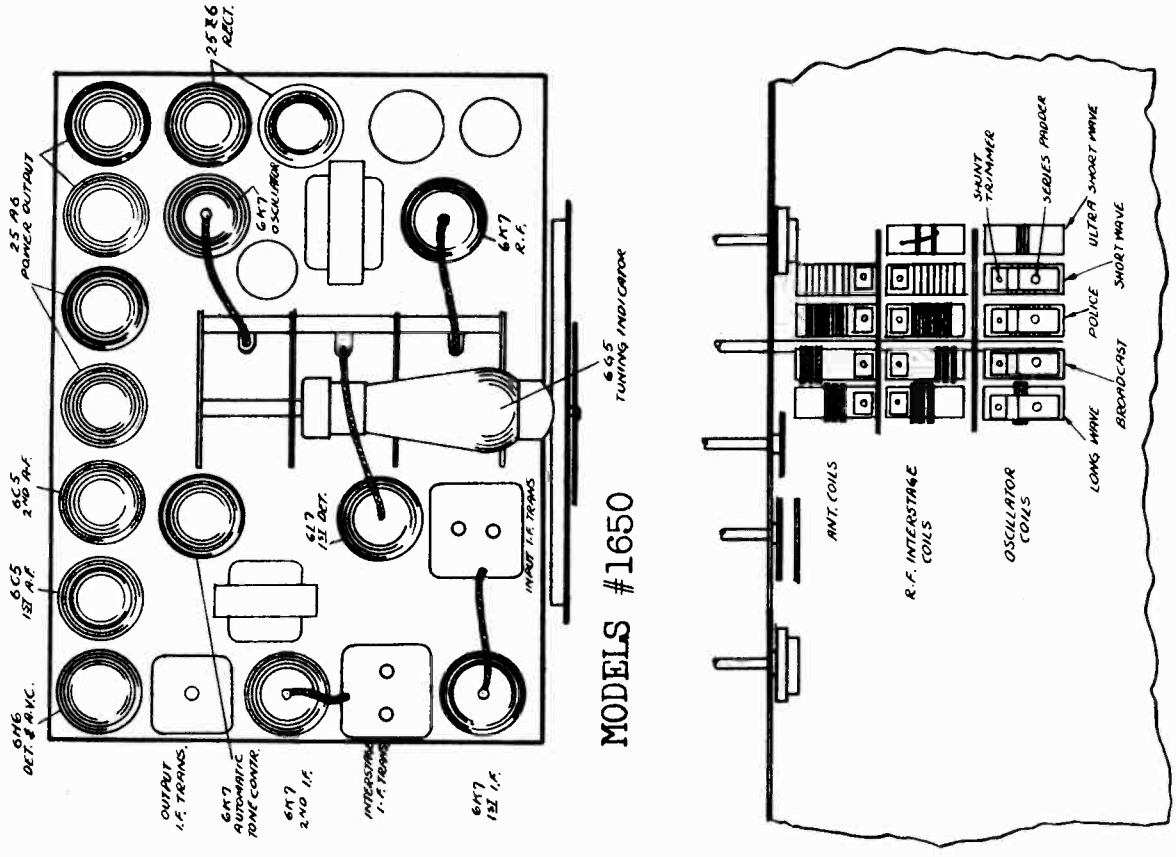
The signal generator is set at 1.8 mc. and the signal tuned in on the dial. The padder condenser for this band is adjusted for maximum gain while the gang tuning condenser is rocked slightly to the right and left. The 5 mc. adjustment should then be rechecked.

1500 KC. ADJUSTMENT: The band selector switch is set in position for operation on the no. 4 band. (Broadcast). The receiver and signal generator are both set at 1500 kc. and the procedure outlined above is repeated.

The signal generator is set at 600 kc. and the signal tuned in on the dial. The padder condenser for this band is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 1500 kc. adjustment should then be rechecked.

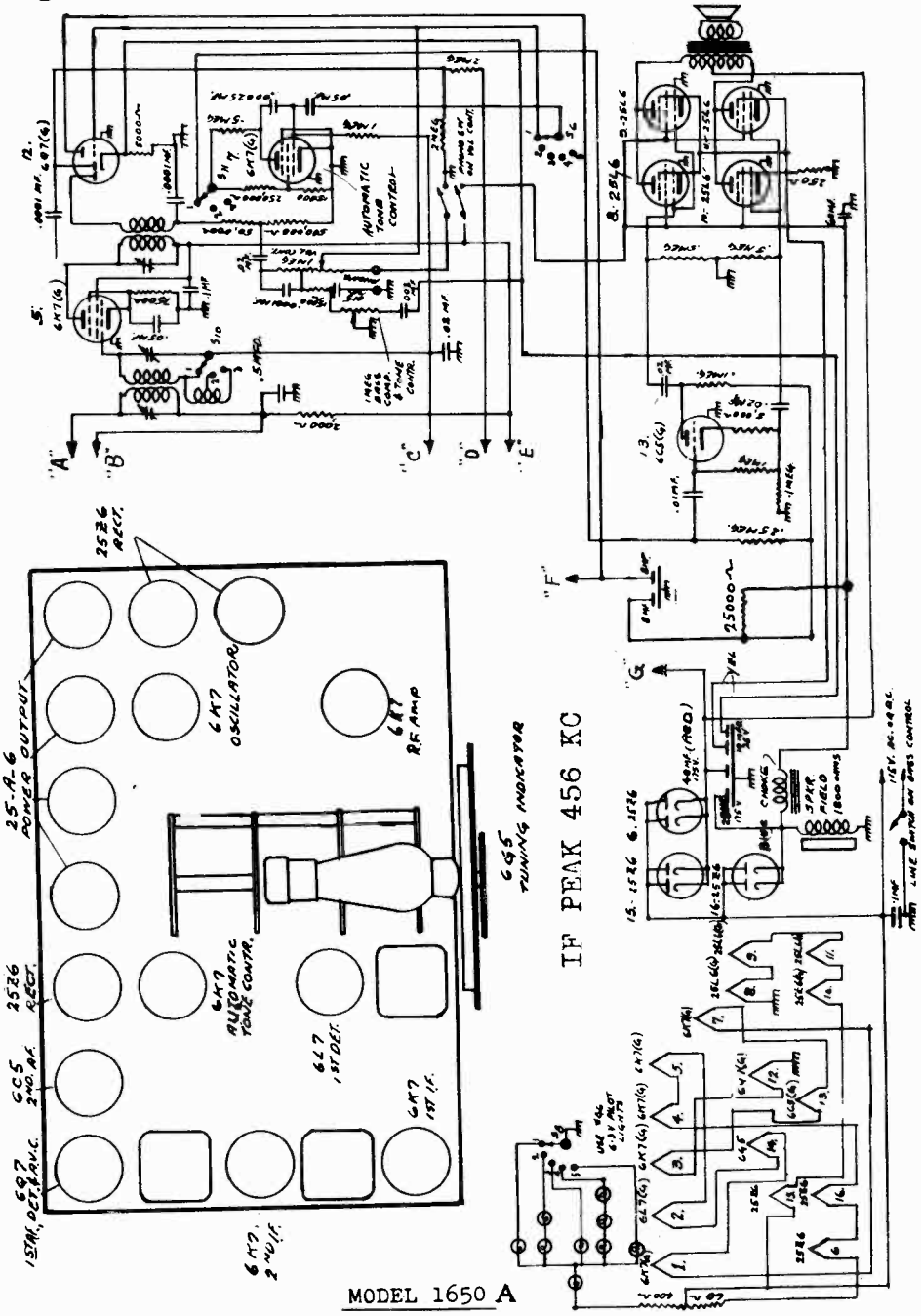
300 KC. ADJUSTMENT: The band selector switch is set in position for operation on band no. 5. The receiver and generator are both tuned to 300 kc. and the procedure outlined above is repeated.

The signal generator is set at 150 kc. and the signal is tuned in on the dial. The Long Wave padder condenser is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 300 kc. adjustment should then be rechecked.



MODEL 1650A
Schematic, Notes
Voltage, Socket

GAROD RADIO CORP.



MODEL 1650 A

TUBE	FUNCTION	HEATER	PLATE	SC.GR.	CATH. V	CATH. I.MA.
6K7(G)	R.F. Amp.	6.3	100	100	2	6.7
6L7(G)	Converter	6.3	95	95	2.5	5.0
6K7(G)	Oscillator	6.3	80	100	0	4
6K7(G)	1st I.F. Amp.	6.3	95	95	12	5
6K7(G)	2nd I.F. Amp.	6.3	100	100	6	1
6Q7(G)	Diode Det. & AVC & 1st Audio	6.3	60		1.5	.3
6C5(G)	2nd Audio Amp.	6.3	80		20.	2.
25L6(G)(4)	Audio Output	25.	120	100	8.5	50
25Z6(G)	Rectifier for Set	25.			107	87
25Z6(G)(2)	Rectifier for Output Plates	25.			125	85
6K7(G)	Automatic Tone Control	6.3	50	5	0	1

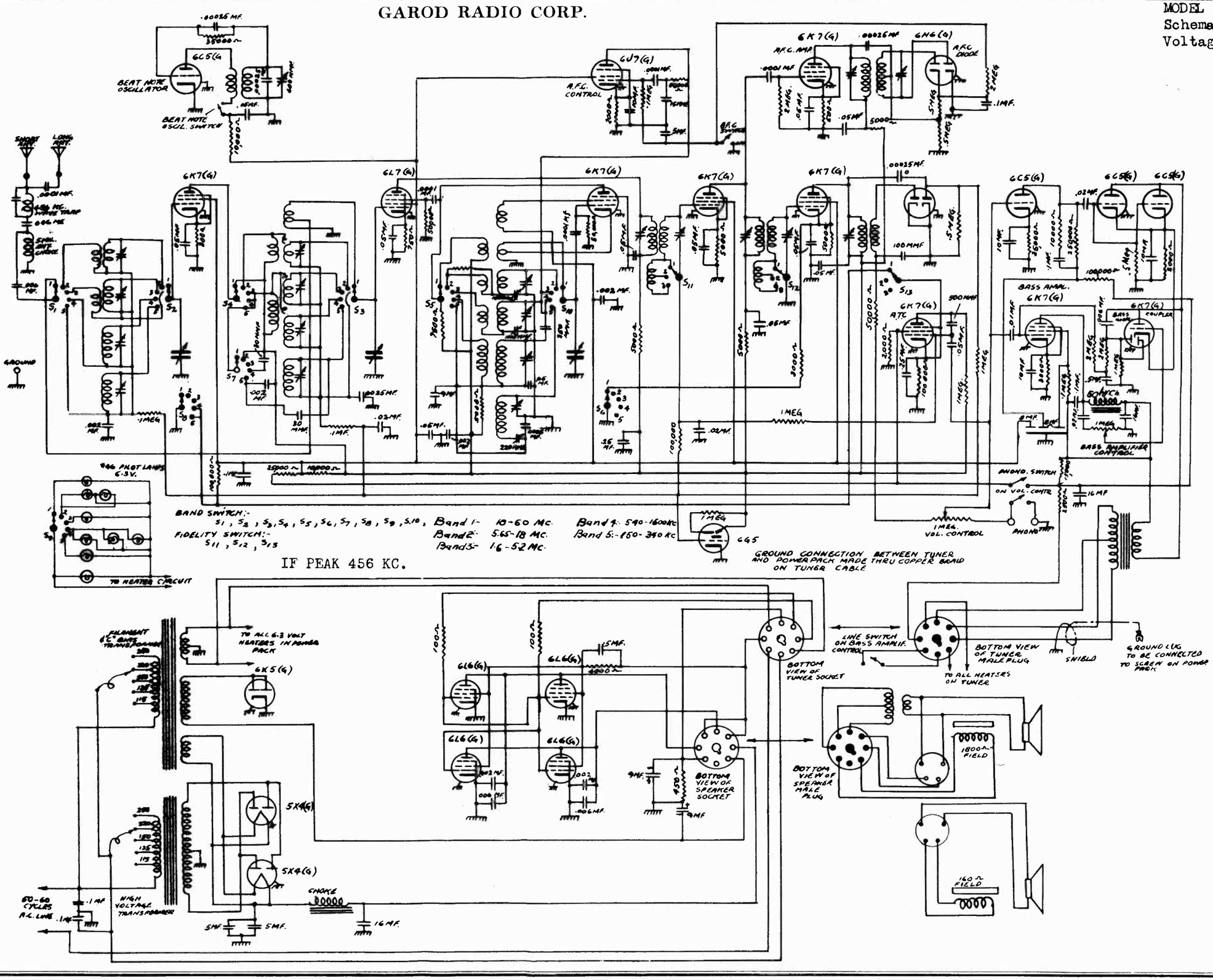
The RF and Oscillator circuits with their corresponding band switching arrangements for the MODEL 1650A, are the same as those of the MODEL 1650.

The schematic of the MODEL 1650 is shown broken at the various points marked with "X", lettered "A", "B", "C", "D", "E", "F", and "G", which are connected to the corresponding points marked in the same manner on the schematic above.

1650A

GAROD RADIO CORP.

MODEL 5240
Schematic
Voltage

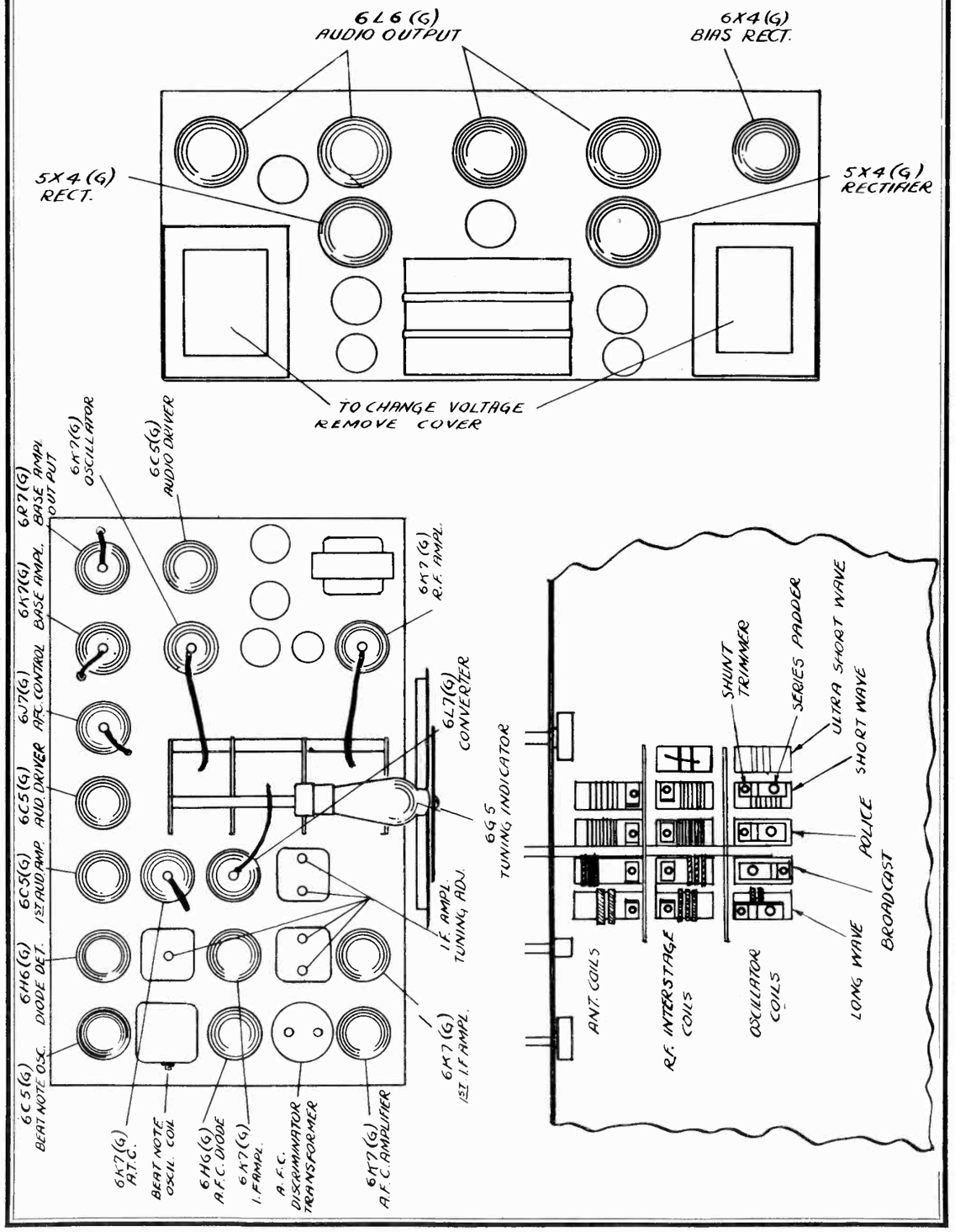


TUBE	FUNCTION	HTR.	PLATE	SCREEN	CATHODE	TUBE
6K7	R.F. Amp.	6.3	250	100	4	6C5
6L7	Converter	"	245	100	6	
6K7	Oscillator	"	220	100	0	6V7
6K7	1st I.F.	"	250	100	13	
6K7	2nd I.F.	"	250	100	9	6K7
6H6	Audio det.	"	0		0	
6K7	A.F.C. Amp.	"	240	100	4	6L6)
6H6	A.F.C. Diodes	"	0		0	6L6)
6C5	1st Audio	"	125		9	6L6)
6C5)	driver	"	150		8	6L6)
6K7	Bass Amp.	"	150	90	11	6X5
6R7	Bass Amp. Coupler	"	150		8	5X4G) 5X4G)

FUNCTION	HTR.	PLATE	SCREEN	CATHODE GRID
Beat note USC. with switch on 100V.	5.0	0		0
AFC Control tube	"	220	100	
ATC	"	25	7	0
Audio Output	"	325	300	0 26
Bias Rectifier	"	140		0
Rectifier	5.0			410

GAROD RADIO CORP.

MODEL 5240
Socket, Trimmers



MODEL 5240
Alignment

GAROD RADIO CORP.

SERVICE NOTES FOR THE MODEL 5240
24 TUBE 5 BAND A.C. SUPERHETERODYNE RECEIVER
ALIGNMENT PROCEDURE

I.F. ADJUSTMENT - The signal generator is set at 456 kc. and is connected to the grid of the first detector (6L7). With the oscillator section of the tuning condenser short-circuited and the receiver volume control at its maximum position, the i.f. trimmers are adjusted for maximum output. These trimmers may be found on the tops of the I.F. transformers.

18 MEGACYCLE ADJUSTMENT - The high side of the signal generator is connected to the antenna lead of the receiver and the low side to the ground lead. The receiver and the signal are both tuned to a frequency of 18 mc. with the selector switch in position for band no. 2 (short wave). The oscillator trimmer condenser is adjusted so that the 18 mc. signal is tuned in exactly at the 18 mc. calibration point, with the volume control on full and the signal generator adjusted for minimum input. The antenna preselector and interstage trimmers are then adjusted in the order named for maximum output. These trimmers are located as indicated in the bottom view of the chassis.

5 MC. ADJUSTMENT - With the band selector switch in position for operation on band no. 3. (Police) and the receiver and signal generator both set at 5 mc. the procedure outlined above is repeated.

6 MEGACYCLE ADJUSTMENT - The signal generator is set at 6 megacycles and the signal tuned in on the dial. The Short Wave padding condenser is adjusted for maximum gain while the gang tuning condenser is rocked slightly to the right and left.

The signal generator is set at 1.8 mc. and the signal tuned in on the dial. The padder condenser for this band is adjusted for maximum gain while the gang tuning condenser is rocked slightly to the right and left. The 5 mc. adjustment should then be rechecked.

1500 KC. ADJUSTMENT - The band selector switch is set in position for operation on the no. 4 band (Broadcast). The receiver and signal generator are both set at 1500 kc. and the procedure outlined above is repeated.

The signal generator is set at 600 kc. and the signal tuned in on the dial. The padder condenser for this band is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 1500 kc. adjustment should then be rechecked.

300 KC. ADJUSTMENT - The band selector switch is set in position for operation on band no. 5. The receiver and generator are both tuned to 300 kc. and the procedure outlined above is repeated.

The signal generator is set at 150 kc. and the signal is tuned in on the dial. The Long Wave padder condenser is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 300 kc. adjustment should then be rechecked.

BEAT OSCILLATOR ADJUSTMENT - The signal generator, set at 456 K.C. is connected to the mixer tube (6L7) as described for the I.F. adjustment. The moduletion switch is set to the "OFF" position and only a hiss or slight hum should be heard. Turn the Beat Oscillator "ON". If this is in exact adjustment (zero beat) no signal should be heard. If it has drifted however, a whistle will be heard the pitch of which can be varied by rotating the screw protruding from the side of square can on the left side of the chassis. As this is turned the pitch will change from high to low, then pass through a zero point, and then it will rise again in frequency. The "Zero Beat" position, where no signal is heard is the correct setting.

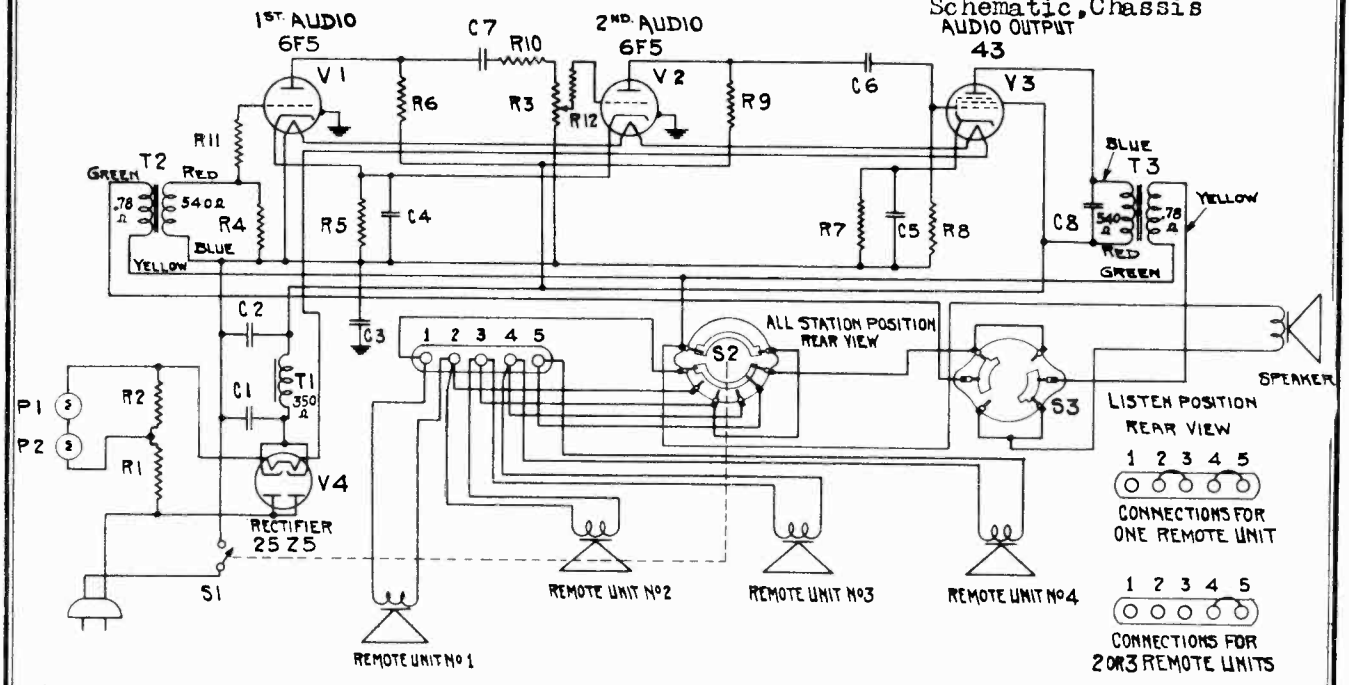
AUTOMATIC FREQUENCY CONTROL - Should it be found that after a station is tuned in accurately (in the selective position) as indicated by the cathode ray tube, that when the A.F.C. switch is turned "ON", the signal is detuned or a change observed in the tone of the receiver, it will be necessary to readjust the "Discriminator" transformer which controls this action. A low range (0-5 or 0-10V.) high resistance volt meter or preferably a microammeter is inserted in series with the diode load resistor at the grounded end, which will indicate a maximum when a signal is tuned to exact resonance. This 500,000 Ohms load resistor is located directly under the discriminator transformer. A 0-10 milliammeter is inserted in the cathode circuit of the A.F.C. control tube. An R.F. signal (any frequency in the Broadcast Band) is fed into the antenna and the receiver is tuned as accurately as possible to resonance (with the switch turned OFF). Now throw the secondary trimmer of the discriminator off resonance. Tune the primary for maximum output as indicated by the diode load meter. Turn the AFC switch "ON". Now tune the secondary trimmer, identified by a red paint mark, so that when the A.F.C. switch is turned from the ON to the OFF position and vice-versa, no change takes place in the cathode, current of the A.F.C. control tube, as indicated by the milliammeter. Be sure that the receiver has been accurately tuned first without the A.F.C., or improper adjustment may result, whereby the frequency is automatically detuned instead of tuned. When this condition of no change in cathode current is obtained, it is indicated that no control voltage is being generated at exact resonance, which is the desired condition. If now the receiver is slightly detuned either above or below resonance, the cathode current will either increase or decrease above its normal value with the A.F.C. OFF, or no signal fed into the antenna. The voltage thus generated as indicated by this change in current serves to shift the frequency of the oscillator in the proper direction so as to automatically retune the oscillator to the exact frequency required to bring in the desired station with maximum clarity and a minimum of noise.

NOTE - IN ALLIGNING THE BROADCAST BAND (1500 KC AND 600 KC) THE A.F.C.MUST BE OFF

All voltages except filament measured with 1,000 Ohms per volt meter from socket to chassis with band switch in broadcast position, and fidelity switch in selective position. Filament voltages are taken across filament prongs at tube socket and measured with a low impedance AC Voltmeter.

GENERAL ELECTRIC CO.

MODEL FM-41, Handy Phone
MODEL FS-5, Remote Station
Schematic, Chassis



SYMBOL	DESCRIPTION		
C1	DRY ELECTROLYTIC CAP.	16 MFD	150 V
C2	DRY ELECTROLYTIC CAP	16 MFD	150 V
C3	LINE CAPACITOR	.1 MFD	400 V A.C
C4	DRY ELECTROLYTIC CAP.	20 MFD	6 V
C5	DRY ELECTROLYTIC CAP	10 MFD	25 V
C6	PAPER CAPACITOR	.001 MFD	200 V
C7	MICA CAPACITOR	500 MMF	
C8	PAPER CAPACITOR	.005 MFD	200 V
P1	PILOT LAMP	6.3 V .25 AMP	
P2	PILOT LAMP	6.3 V .25 AMP	
R1	BLEEDER RESISTOR	20 W 140 OHMS	
R2	BLEEDER RESISTOR	5 W 60 OHMS	
R3	VOLUME CONTROL	50000 OHMS	
R4	CARBON RESISTOR	10000 OHMS ± W	
R5	CARBON RESISTOR	1000 OHMS ± W	
R6	CARBON RESISTOR	47000 OHMS ± W	

SYMBOL	DESCRIPTION	
R7	CARBON RESISTOR	680 OHMS ± W
R8	CARBON RESISTOR	470000 OHMS ± W
R9	CARBON RESISTOR	120000 OHMS ± W
R10	CARBON RESISTOR	100000 OHMS ± W
R11	CARBON RESISTOR	36000 OHMS ± W
R12	CARBON RESISTOR	36000 OHMS ± W
S1	POWER SWITCH	
S2	SELECTOR SWITCH	
S3	SPEAK. LISTEN. SWITCH	
T1	FILTER REACTOR	
T2	INPUT TRANSFORMER	
T3	OUTPUT TRANSFORMER	
V1	6F5 TUBE	
V2	6F5 TUBE	
V3	43 TUBE	
V4	25Z5 TUBE	

Fig. 1. Schematic Circuit Diagram

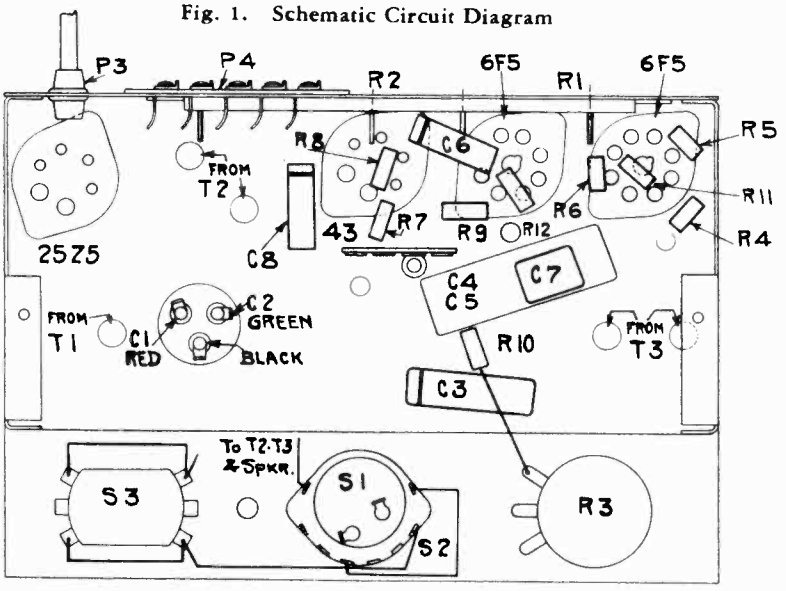


Fig. 2. Chassis Parts Layout

MODEL FM-41, Handy Phone
MODEL FS-5, Remote Station GENERAL ELECTRIC CO.
Circuit Data, Operation
Notes

Tubes

1st Audio Amplifier	6F5 High-gain Triode
2nd Audio Amplifier	6F5 High-gain Triode
Audio Power Amplifier	43 Power Amplifier Pentode
Rectifier	25Z5 Rectifier
Dial Lamps	MAZDA No. 46

Permanent-Magnet "Speaker-Phone"

Over-all diameter	5¼ inches
Cone diameter	5 inches
Voice Coil Impedance	5.0 ohms at 400 cycles

GENERAL INFORMATION

The Handy-Phone is an efficient loudspeaker phone system for use in offices, homes, hospitals or other places where voice communication between a central station and one or more remote stations is desirable. The system consists of one Model FM-41 Master Station and from one to four Model FS-5 remote "speaker-phone" stations.

The Master Station Model FM-41, employs four General Electric tubes in a three stage audio amplifier circuit with power supply. Volume is controlled by a variable potentiometer R-3 in the grid circuit of the 2nd audio amplifier. The "speaker-phone" used in this unit is of the permanent magnet type and is connected either as a microphone to the input circuit of the amplifier or as a loudspeaker to the output circuit of the amplifier by means of the talk-listen switch (S-3).

The heaters of all tubes and the dial lights with their shunt ballast resistor (R-2) are all in series and are furnished current from the power line through a dropping resistor (R-1). The two 6F5 tubes use the common self-biasing resistor R-5 for obtaining grid bias. The 43 output tube is self-biased by the voltage drop in R-7.

Note that the chassis is not the "B-" lead of the power supply. This "B-" lead is by-passed to the chassis through the capacitor C-3.

The Remote Station FS-5 uses a similar "speaker-phone" of the permanent magnet type but does not incorporate an amplifier or power supply; all operating power being supplied from the Master Station unit. The Remote Station speaker is also connected either to the input or output circuits of the amplifier in the Master Unit by means of the talk-listen switch (S-3).

As an example of the operation of the system: When the talk-listen switch (S-3) is in the normal "listen" position, the Remote Station functions as a microphone and is connected to the input of the amplifier while the Master Station speaker is connected across the output of the amplifier. When S-3 is placed in the "talk" position, the Master Station speaker then functions as a microphone and is connected to the input of the amplifier, while the Remote Station is connected to the output of the amplifier and functions as a speaker. The selector switch (S-2) connects either any *one* individual Remote Station or *all* Remote Stations to the Master unit. When the selector switch (S-2) is turned to the *all* position, the Remote Station units are connected in a series-parallel combination across the output of the amplifier.

DC Operation

When operating from a D.C. source, it is necessary to insert the plug with proper polarity. If the unit fails to function, after allowing time for the tubes to reach their operating temperature, reverse the power plug in the receptacle.

When the system is used on a D.C. supply, the 25Z5 rectifier tube and the filter remain in the circuit and serve two purposes. If the power cord should be plugged in with incorrect polarity, the 25Z5 tube protects the filter condensers from damage. On correct D.C. polarity the 25Z5 tube passes the D.C. and the filter circuit aids in smoothing the supply voltage, thus minimizing line noise.

AC Operation

When the system is used on alternating current, all D.C. potentials are supplied by a 25Z5 rectifier tube and its associated filter circuit. The tube is connected as a half-wave rectifier.

If any hum is noticed when the system is used on A.C., reverse the power plug in the receptacle. When the system has not been used for some time, a slight hum may be audible when the system is first turned on. This hum may not immediately clear up upon reversal of the power plug. However, it will probably be eliminated after approximately five minutes operation by which time the anode plates of the electrolytic capacitors will have re-formed.

Operating Distance

The following table gives the size of the twisted wire and additional equipment necessary to wire a remote station to the master station for various distances:

Distance of Remote from Master Station	Wire Size	Additional Equipment
1—500 Feet	No. 19—No. 22 B & S Gauge	None
500—2000 Feet	No. 16—No. 19 B & S Gauge	None
2000 Feet and Over	No. 19 B & S Telephone Wire	*Line Transformers

* Standard line transformers may be used. The transformers should be designed to operate from a five-ohm source into a line of 200, 500 or 600 ohms impedance. A similar transformer should be used on the remote station end to match the line impedance to the five-ohm load. These transformers may be procured from any radio supply house.

GENERAL ELECTRIC CO.

MODEL FM-41, Handy Phone
MODEL FS-5, Remote Station
Voltage, Parts

SOCKET VOLTAGES

Tube No.	PLATE TO -B (*) VOLTS D.C.		SCREEN TO -B (*) VOLTS D.C.		CATHODE TO -B (*) VOLTS D.C.		CATHODE CURRENT M.A. -D.C.		HEATER VOLTS	
	A.C.	D.C.	A.C.	D.C.	A.C.	D.C.	A.C.	D.C.	A.C.	D.C.
6F5 1st Audio	105	81	...	...	0.9	0.9	combined	combined	6.3	6.3
6F5 2nd Audio	85	63	...	...	0.9	0.9	0.9	0.9	6.3	6.3
43 Power Amplifier	121	94	133	103	18.0	14.0	27.0	20.0	25.0	25.0
25Z5 Rectifier	115	115	...	...	142	113	29.0	22.0	23.0	23.0

Measured at 115 volts, 60 cycles or 115 volts DC supply—Voltmeter 1000 ohms per volt—Measurements on highest readable scale.

* NOTE: The chassis is not the "B-" lead of the power supply. For voltage measurements, the "B-" may be taken at the black terminal of the electrolytic capacitor.

Physical Specifications

	FM-41	FS-5
Model		
Height	8⅜ in.	7⅝ in.
Width	11⅛ in.	7¼ in.
Depth	7 5/16 in.	4⅛ in.
Wt. Packed	13 pounds	5 pounds

Electrical Power Output

	A.C.	D.C.
Undistorted	0.7 watt	0.45 watt
Maximum	1.0 watt	0.65 watt

Electrical Specifications

Power Supply Volts	Frequency Cycles on A.C.	Power Consumption Watts (At 120 V. Line)
100-125 A.C.	25-100	46
100-125 D.C.	.....	38

REPLACEMENT PARTS LIST

HANDY-PHONE MODEL FM-41

INSIST ON GENUINE FACTORY-TESTED PARTS WHICH MAY BE PURCHASED FROM AUTHORIZED DEALERS

Stock No.	Description	List Price
*RB-040	BOARD—Terminal Board (near 43 socket)	$0.10
RB-067	BOARD—Remote Station Terminal Board (5 terminals)	.25
RC-005	CAPACITOR—.001 mfd., 400 volt, Paper (C-6)	.25
*RC-023	CAPACITOR—.005 mfd., 600 volt, Paper (C-8)	.25
*RC-123	CAPACITOR—.1 mfd., 400 volt, Paper (C-3)	.35
*RC-296	CAPACITOR—500 mmf., Mica (C-7)	.25
RC-577	CAPACITOR—Dry Electrolytic 16-16 mfd., 150 volt (C-1, C-2)	1.75
RC-578	CAPACITOR—Dry Electrolytic 20 mfd., 6 volt; 10 mfd., 25 volt (C-4, C-5)	1.25
RC-865	CORD—Power Cord with Plug	.45
RC-926	CONE—5-inch Cone and Voice Coil	.90
RE-020	ESCUTCHEON—Volume Control Escutcheon	.20
RG-009	GRID CAP—Insulated Grid Cap and Lead	.25
RI-007	INDICATOR—Selector Switch Indicator Plate	.55
RK-019	KNOB—Speech Control Knob	.20
RK-020	KNOB—Station Selector Knob (Pkg. of 5)	.40
RK-022	KNOB—Volume Control Knob (Pkg. of 5)	.60
RL-333	REACTOR—Filter Reactor (T-1)	1.30
RL-920	LAMP—Dial Lamp 6.3 volt, .25 amp. (Pkg. of 10)	1.50
RQ-1255	RESISTOR—680 ohm, ½ watt, Carbon (R-7) (Pkg. of 5)	.70
RQ-1259	RESISTOR—1000 ohm, ½ watt, Carbon (R-5) (Pkg. of 5)	$0.70
RQ-1283	RESISTOR—10,000 ohm, ½ watt, Carbon (R-4) (Pkg. of 5)	.70
RQ-1296	RESISTOR—36,000 ohm, ½ watt, Carbon (R-11, R-12) (Pkg. of 5)	.70
RQ-1299	RESISTOR—47,000 ohm, ½ watt, Carbon (R-6) (Pkg. of 5)	.70
RQ-1307	RESISTOR—100,000 ohm, ½ watt, Carbon (R-10) (Pkg. of 5)	.70
RQ-1309	RESISTOR—120,000 ohm, ½ watt, Carbon (R-9) (Pkg. of 5)	.70
RQ-1323	RESISTOR—470,000 ohm, ½ watt, Carbon (R-8) (Pkg. of 5)	.70
RR-729	RESISTOR—Bleeder Resistor, 140 ohm, 20 watt, 60 ohm, 5 watt (R-1, R-2)	.60
RS-059	SPEAKER—5-inch Permanent Magnet Type Speaker (Complete) (FM-41 and FS-5)	5.10
RS-220	SOCKET—Lamp Socket Assembly	.25
RS-354	SWITCH—Talk-listen Switch (S-3)	.75
RS-355	SWITCH—Power and Selector Switch (S-1, S-2)	.40
RT-429	TRANSFORMER—Input or Output Transformer (T-2, T-3)	1.40
RV-032	VOLUME CONTROL—50,000 ohm, Volume Control (R-3)	.70
*RW-101	WASHER—Felt Washer (Pkg. of 10)	.45
RX-026	ASSEMBLY—Chassis Mounting Screws and Washers	.10

* Used on previous receivers.

(Prices subject to change without notice)

MODELS E-50, E-52
Chassis Wiring

GENERAL ELECTRIC CO.

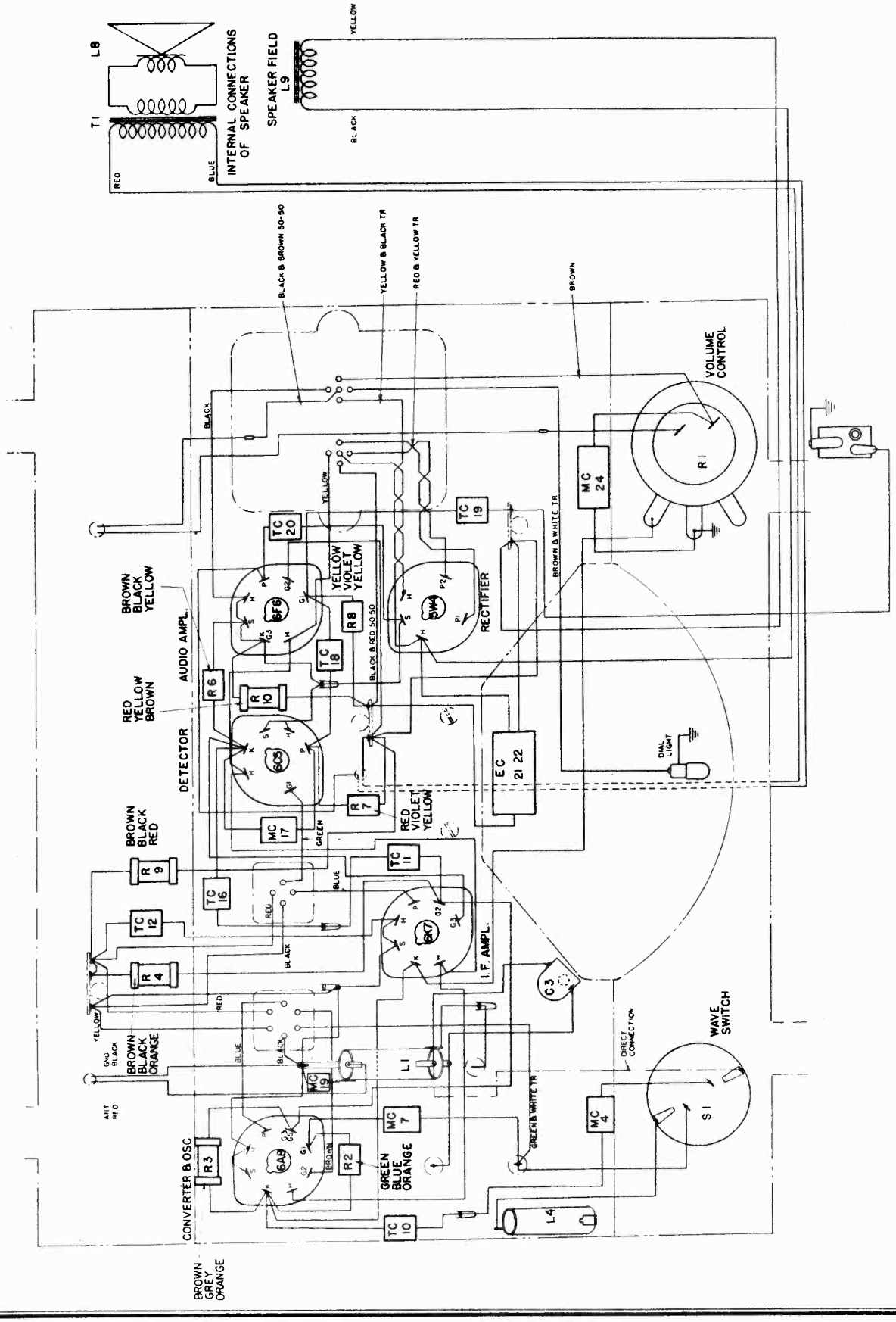


Fig. 2. Chassis Wiring Diagram

GENERAL ELECTRIC CO.

MODELS E-50, E-52
Schematic, Socket Trimmers

Electrical Specifications

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A C V	115	50–60	50
	115	25–60	55
	105–130 and 200–250	40–60	55

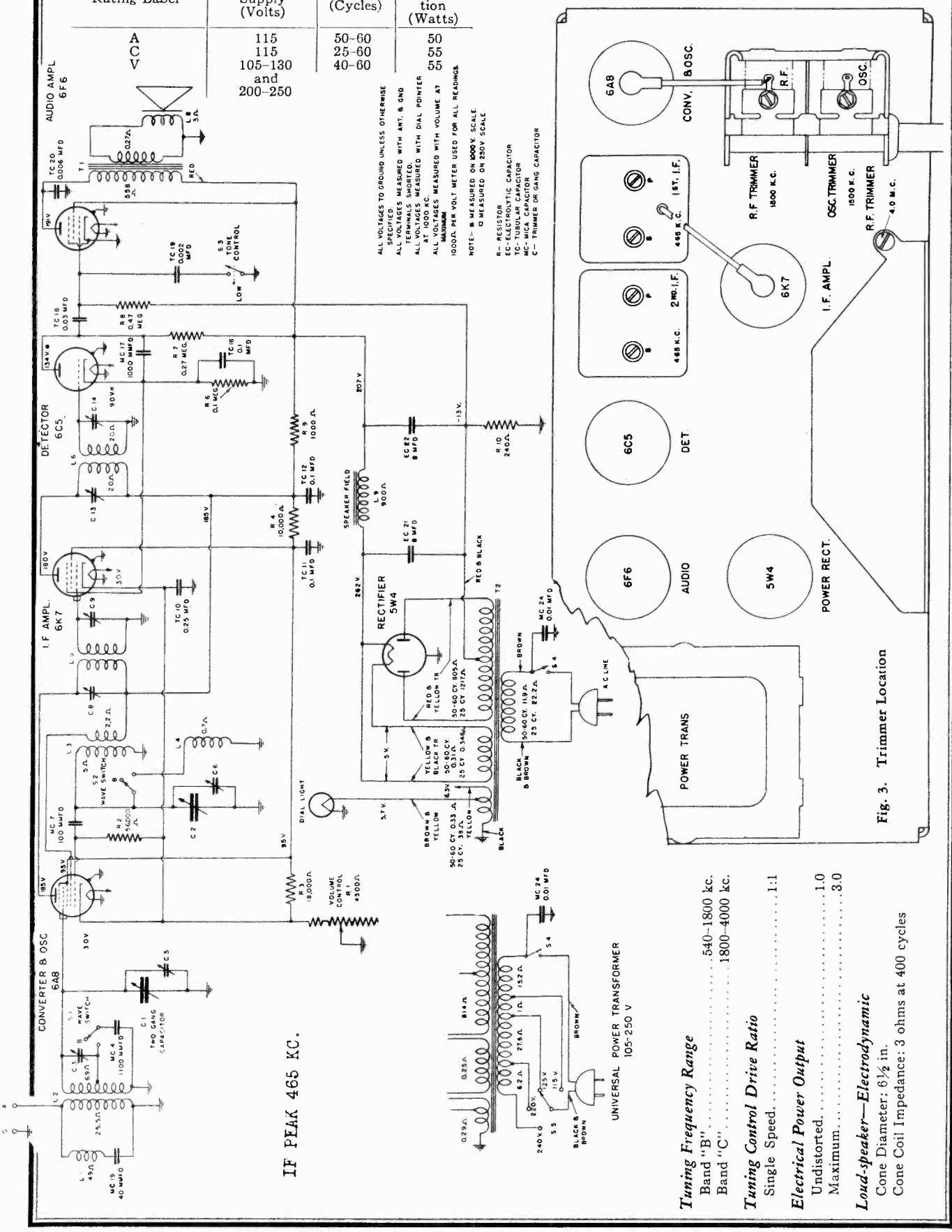


Fig. 3. Trimmer Location

Tuning Frequency Range
Band "B" ..... 540–1800 kc.
Band "C" ..... 1800–4000 kc.

Tuning Control Drive Ratio
Single Speed 1:1

Electrical Power Output
Undistorted 1.0
Maximum 3.0

Loud-speaker—Electrodynamic
Cone Diameter: 6½ in.
Cone Coil Impedance: 3 ohms at 400 cycles

DESCRIPTION OF ELECTRICAL CIRCUIT

The signal from the antenna is applied to the control grid of the 6A8 tube through the R.F. transformer, the secondary of which is tuned to the incoming signal by the rear section of the main tuning condenser. In the 6A8 tube the incoming signal is combined with the local oscillator signal which is 465 kc higher in frequency. The local signal is generated by the oscillator section of this tube, and the proper frequency difference is maintained throughout the tuning range by the front section of the tuning condenser in conjunction with the oscillator coils. The special-cut rotor of the front condenser section permits dispensing with the usual padding capacitor.

The combination of the two signals produces the intermediate frequency of 465 kc. This particular frequency is chosen to reduce image response and improve short-wave performance. The intermediate frequency amplifier consists of a 6K7 tube and two transformers, both of which have tuned primaries and secondaries. Volume is controlled by the 4500-ohm variable resistor, R-1, which varies the bias applied to the control grids of the 6A8 and 6K7 tubes.

The output of the I.F. amplifier is applied to the grid of the 6C5 detector which is properly biased for this service by the .1 megohm cathode resistor, R-6.

The output of the 6C5 detector is resistance coupled to the grid of the 6F6 power amplifier pentode. The plate circuit of the 6F6 is suitably matched to the loud-speaker by means of a step-down output transformer.

The tone control circuit consists of a .002 mfd. capacitor, connected in series with a two-point grounding switch, S-3, in the grid circuit of the 6F6 power pentode. When it is desired to reduce the high frequency output of the receiver, the switch, S-3, is turned to its counterclockwise grounding position.

Plate and grid voltages for all tubes are supplied by the power supply system employing a 5W4 full-wave rectifier tube which, together with a suitable network of resistors and capacitors, supplies the required voltages and filtering action.

ALIGNMENT PROCEDURE

Before making any adjustments to the R.F. circuits, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal from the test oscillator to the receiver and inserting a "tuning wand" into the antenna coil. The "tuning wand" consists of a bakelite rod having a brass cylinder attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the brass cylinder end into the antenna coil, the inductance is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the circuits are in exact alignment, inserting either end of the tuning wand in the coil will result in a decrease in output. When an increase in signal is obtained with the iron-filled end of the wand at the 1500-kc. point or the 4.0-mc. point, a decrease in resonant frequency of that circuit by increasing the antenna trimmer capacity is indicated. When an increase in signal is obtained with the brass cylinder, a decrease in antenna trimmer capacity is indicated.

Changes Indicated by Wand

Wand	Signal	Trimmer Adjustment Required
Brass cylinder	Decrease	None
Iron filings	Decrease	
Brass cylinder	Increase	Decrease capacity
Iron filings	Decrease	
Brass cylinder	Decrease	Increase capacity
Iron filings	Increase	

ALIGNMENT FREQUENCIES

I.F.	Broadcast	Short-wave
465 Kc.	1500 Kc.	4000 Kc.

In order to align these receivers properly it is necessary to have available:

1. A modulated test oscillator capable of producing the above alignment frequencies.
2. An output indicator, such as a high-resistance a-c voltmeter with a maximum scale reading of 3 to 5 volts, or a neon lamp indicator.
3. An alignment tool consisting of an insulating shaft with a small screwdriver blade.

The location of all alignment trimmer capacitors are illustrated in Fig. 3.

(1) *I.F. Alignment*

Set the frequency band switch of the receiver to the broadcast position and turn the volume control to maximum (extreme clockwise position). Tune the receiver to a point where no signal comes in and short-circuit the antenna and ground leads.

Connect the test oscillator output between the chassis and the control grid of the 6A8 tube. Connect the output meter across the cone coil of the speaker. Set the test oscillator to 465 kc. and adjust the output until a small deflection is observed in the output meter.

The four I.F. trimmers, see Fig. 3, are adjusted in the following sequence:

1. Secondary trimmer on second I.F. transformer.
2. Primary trimmer on second I.F. transformer.
3. Secondary trimmer on first I.F. transformer.
4. Primary trimmer on first I.F. transformer.

Throughout all adjustments the output should be maintained at a low level by decreasing the test oscillator output as the various stages are brought in line. After these adjustments have been made, the same procedure should be repeated as a final check. The I.F. alignment will then be complete.

(2) *I.F. Wave Trap*

No adjustable trimmer is provided for the I.F. trap adjustment in this receiver. The capacitor MC-19, in conjunction with the inductance, L-1, automatically provides rejection of incoming I.F. signals.

(3) *R.F. Alignment*

The R.F. and oscillator trimmers are aligned at 1500 kc. First of all, check the position of the dial pointer. To do this, rotate the gang condenser to the maximum capacity position, i.e., plates fully meshed. While in this position, align the pointer with the last black line on the scale by loosening the dial drum set screws and rotating the drum on the gang shaft. Remove the short-circuit from the antenna and ground terminals and connect the test oscillator to same through a dummy antenna consisting of a 400-ohm resistor in series with a 250-mmf. capacitor. Connect the output indicator across the speaker cone coil.

(a) *Broadcast Band—(540-1800 Kc.)*

With the band switch in the clockwise position, set the tuning indicator to 1500 kc. Set the test oscillator at 1500 kc. and adjust the broadcast band oscillator trimmer, C-6, for maximum output. Next, set the R.F. trimmer, C-5, for maximum output, taking care that the output from the test oscillator is not high enough to overload any part of the set. No padding adjustment is required.

To complete the broadcast band line-up, repeat the R.F. trimmer adjustment after aligning the short-wave band.

(b) *Short-wave Band (1800-4000 Kc.)*

Turn the band switch to its counterclockwise position. Set the test oscillator at 4000 kc. and tune the receiver to resonate at this frequency. No trimmer is provided for short-wave oscillator alignment. To perform the R.F. short-wave adjustment, rock the tuning condenser back and forth through resonance while adjusting the short-wave R.F. trimmer, C-3, for maximum output indication on the tuning meter. It may now be necessary to readjust the broadcast band R.F. trimmer as indicated above.

Alignment of the receiver is now complete.

Physical Specifications

Dimensions	Model E-50	Model E-52
Height	8⅝ in.	8⅞ in.
Length	12⅜ in.	12⅜ in.
Depth	6 11/16 in.	6 11/16 in.
Weight Packed	14 lb.	14 lb.

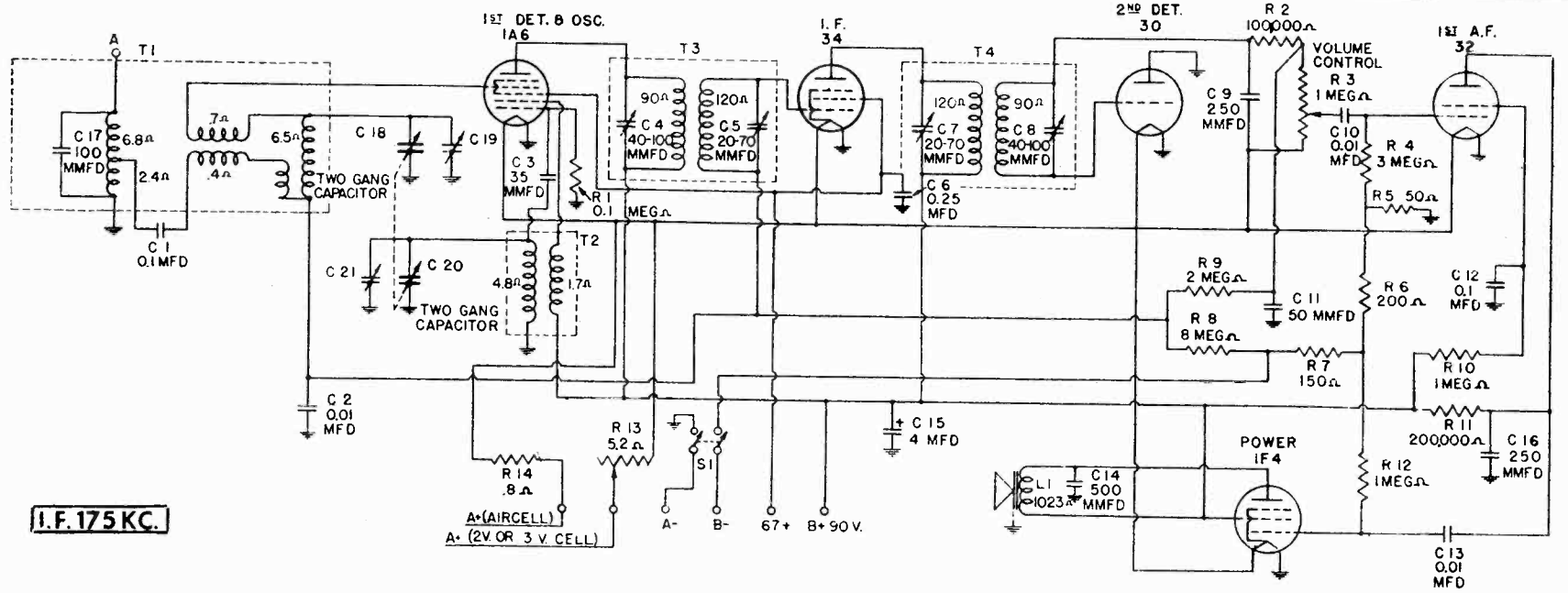
REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLY	
RA-308	ASSEMBLY—Dial Scale and Lamp Housing Assembly (Complete)	$1.00
*RB-008	BOARD—Terminal Board Double-lug (Adjacent to Power Transformer)	.10
RB-041	BOARD—Terminal Board (Center of Chassis deck)	.10
RB-053	BOARD—Terminal Board—3 Lug (Mounted on rear chassis wall)	.10
*RC-013	CAPACITOR—.002 Mfd., 200 V. Paper (TC-19)	.25
RC-026	CAPACITOR—.006 Mfd., 1000 V. Paper (TC-20)	.30
*RC-083	CAPACITOR—.03 Mfd., 400 V. Paper (TC-18)	.25
*RC-096	CAPACITOR—.1 Mfd., 200 V. Paper (TC-16, TC-11)	.30
*RC-123	CAPACITOR—.1 Mfd., 400 V. Paper (TC-12)	.35
*RC-136	CAPACITOR—.25 Mfd., 200 V. Paper (TC-10)	.30
RC-235	CAPACITOR—100 Mmfd., Mica (MC-7)	.25
RC-333	CAPACITOR—1000 Mmfd., Mica (MC-17)	.30
RC-338	CAPACITOR—1100 Mmfd., Mica (MC-4)	.35
RC-564	CAPACITOR—8 Mfd., 350 V.; 8 Mfd., 350 V.; Dry Electrolytic Capacitor (EC-21, EC-22)	1.25
RC-631	CAPACITOR—Trimmer Capacitor (C-3)	.30
RC-714	CONDENSER—Two Gang Tuning Condenser (C1, C-2) Including (C-5, C-6)	3.00
RC-756	CAPACITOR—.01 Mfd., 200 V. Paper (Bakelite Case) (C-24)	.25
RC-823	CABLE—Dial Cable Assembly (Complete)	.15
RC-860	CORD—Power Cord	.65
RC-944	CUSHION—Gang Mounting Cushion	.10
RC-945	CLAMP-Electrolytic Capacitor Mounting Clamp	.05
RD-043	DIAL—Dial Scale	.15
RD-044	DRUM—Gang Drive Drum	.30
*RG-001	GRID CAP—Control Grid Clip (Pkg. of 5)	.10
RK-010	KNOB—Control Knob (Walnut or Gum Cabinet) (Pkg. of 5)	.40
RK-011	KNOB—Control Knob (Black or White Cabinet) (Pkg. of 5)	.50
RK-012	KNOB—Control Knob (Red Cabinet) (Pkg. of 5)	.50
RL-024	COIL—Antenna Coil (Complete) (L-1, L-2, MC-19)	1.00
RL-234	COIL—Oscillator Coil (C Band) (L-4)	$0.40
RP-062	POINTER—Dial Scale Pointer	.10
RQ-101	RESISTOR—56,000 Ohm, ¼ Watt Carbon (R-2) (Pkg. of 5)	.60
*RQ-107 (RR-050)	RESISTOR—100,000 Ohm, ¼ Watt Carbon (R-6) (Pkg. of 5)	.70
RQ-117	RESISTOR—270,000 Ohm, ¼ Watt Carbon (R-7) (Pkg. of 5)	.70
RQ-123	RESISTOR—470,000 Ohm, ¼ Watt Carbon (R-8) (Pkg. of 5)	.70
RQ-444	RESISTOR—240 Ohm, 1 Watt Carbon (R-10)	.15
RQ-459	RESISTOR—1000 Ohm, 1 Watt Carbon (R-9)	.15
RQ-483	RESISTOR—10,000 Ohm, 1 Watt Carbon (R-4)	.15
RQ-489	RESISTOR—18,000 Ohm, 1 Watt Carbon (R-3)	.15
*RS-200	SOCKET—8 Pin Tube Socket (Pkg. of 5)	.75
*RS-204	SOCKET—5 Pin Tube Socket (Pkg. of 5)	.75
RS-211	SOCKET—Pilot Lamp Socket	.05
RS-332	SWITCH—Band Change Switch (S-1, S-2)	.60
RS-333	SWITCH—Tone Control Switch (S-3)	.40
RT-057	TRANSFORMER—115 V. 50-60 Cycle Transformer (T-2)	3.85
RT-058	TRANSFORMER—115 V. 25-60 Cycle Transformer (T-2)	7.50
RT-059	TRANSFORMER—Universal Transformer (T-2)	8.00
RT-229	TRANSFORMER—1st I.F. Transformer (Complete) and B Band Oscillator Coil (L-3, L-5, C-8, C-9)	1.90
RT-230	TRANSFORMER—2nd I.F. Transformer (Complete) (L-6, C-13, C-14)	1.50
RV-019	VOLUME CONTROL—4500-ohm Volume Control and Power Switch (R-1, S-4)	.95
*RW-101	WASHER—Felt Washer for Knobs (Pkg. of 10)	.45
RX-019	WASHER—For mounting chassis in cabinet (Pkg. of 4)	.10
	SPEAKER ASSEMBLY	
RC-915	CONE—Speaker Cone	$0.90
RS-040	SPEAKER—6½ in. Type Speaker (Complete with Output Trans.) (L-7, L-8, L-9, T-1)	6.00
RT-420	TRANSFORMER—Output Transformer (T-1)	1.00

*Indicates part also used on 1936 "A" line of receivers.

(Prices subject to change without notice)



Voltages

Check the voltages at the sockets to see if correct values are being delivered to the tubes. The antenna and ground should be disconnected and the antenna

VOLTAGES AT SOCKETS

Volume Control at Maximum — Antenna Shorted to Ground — "A" Battery—2 Volts

Type of Tube	Function	Across Filament	Plate to Ground	Screen to Ground	Grid to Ground
1A6	1st Det.-Osc.	2	85 85(1)	62	
34	I.F.	2	85	62	
30	2nd Det.	2			
32	1st A.F.	2	25	13	2(2)
1F4	Power	2	80	85	4(3)

(1) Anode Grid to ground.
(2) As read across resistor, R5, with 100,000 ohm meter.
(3) As read across resistors, R5 and R6, with 250,000 ohm meter.

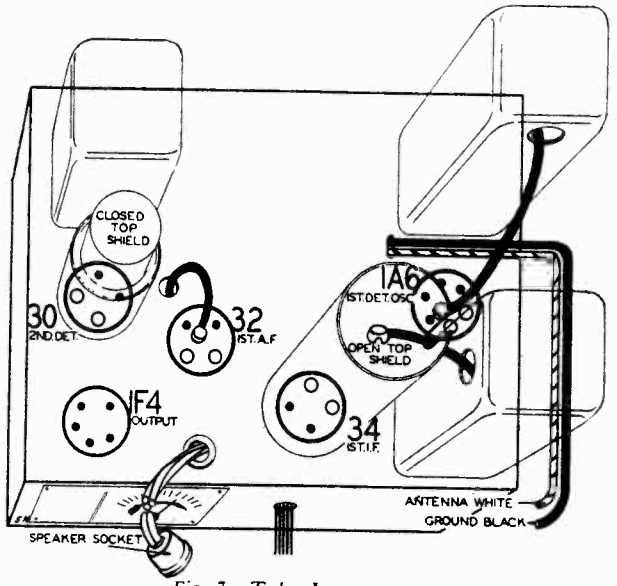


Fig. 7—Tube Arrangement

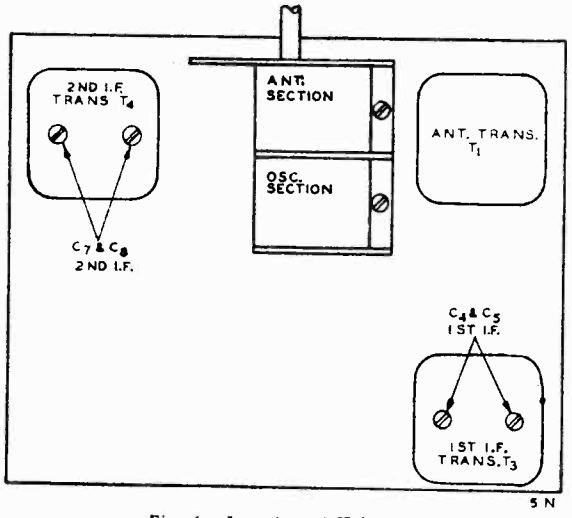


Fig. 6—Location of Trimmers

MODEL U-5C
Alignment
Dial Drive Data

GENERAL ELECTRIC CO.

Alignment and Calibration

I. F. Adjustment

Set the signal generator for a signal of 175 KC.

Connect the output of the signal generator through a .1 mf. condenser to the grid of the 1st detector.

Connect the ground lead of the receiver to the ground post of the signal generator.

Turn the volume control to the maximum position.

Attenuate the signal from the signal generator to prevent the levelling off action of the AVC.

Then adjust the four I.F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis, and the location is shown in Fig. 6.

1730 KC Adjustment

Set the signal generator for 1730 KC.

Turn the rotor of the tuning condenser to the full open position.

Connect the antenna lead of the receiver through a 200 mmf. condenser to the output of the signal generator.

Keep the volume control at the maximum position.

Adjust the trimmer of the oscillator section of the two gang condenser until maximum output is obtained. The location of this trimmer is shown in Fig. 6.

1500 KC Adjustment

Set the signal generator for 1500 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

The dial indicator should be near the 1500 KC mark on the dial scale. If it is a considerable distance from this mark, the position of the indicator on the drive cord must be changed. This procedure, however, should not be followed unless it is absolutely necessary as there is danger of breaking the clamps (See Fig. 8) which hold the indicator in place, and of fraying the drive cord. If the indicator must be moved, loosen the clamps at the back which hold it in place, and then retighten as explained in the article "Replacing Drive Cord."

Adjust the antenna trimmer for maximum output.

Do not change the setting of the oscillator trimmer.

Grid Lead of 32 1st A. F. Tube

Keep the grid lead of the 32 1st A.F. tube in its normal position as shown in the tube arrangement, Fig. 7. If this lead is swung around so that it is close to the 1F4 output tube, an audio feedback may result which will manifest itself as a squeal.

Replacing Drive Cord

Remove the chassis from the cabinet.

Remove the old drive cord, pulleys, washer and indicator.

Turn the drive drum until the slot in the rim is in the position shown in Fig. 8.

Insert one end of the drive cord in the slot and wind the cord around the drum in a clockwise direction for about two-thirds of a turn, or until it reaches the top of the drum.

Now, before putting the right pulley (from front) in place, bring the cord around the pulley from back to front so that the cord is adjacent to the celluloid dial scale; then place the pulley in position.

Extend the cord over to the left and bring it around the other pulley from front to back before placing this pulley. Put the small brass washer on the upper shaft of the pulley and place the pulley in position as shown in Fig. 8.

Bring the cord over to the drive drum and wind it around the drum in a clockwise direction, keeping it behind the cord already on the drum.

Push the pulley tension spring in toward the drive drum so as to provide slack in the cord while the free end is being inserted into the slot in the rim.

Now mesh the condenser plates completely. Replace the celluloid indicator on the dial strip and attach it to the drive cord as shown in Fig. 8. The line on the indicator should cover the 530 KC mark on the dial scale.

CAUTION—When attaching the indicator to the drive cord, do not pinch the center clamp too tightly on the cord or the cord will be cut. After the clamp is pinched slightly a small amount of shellac on it will hold the cord securely.

Input Voltages and Currents

"A" Battery	2 Volts—.36 Amperes
"B" Batteries	90 Volts—10 to 15 Ma.
Power Output	**.1 Watt Undistorted**
Speaker	**6" Magnetic**
Intermediate Frequency	**175 KC**
Tuning Frequency Range	**528 to 1730 KC**

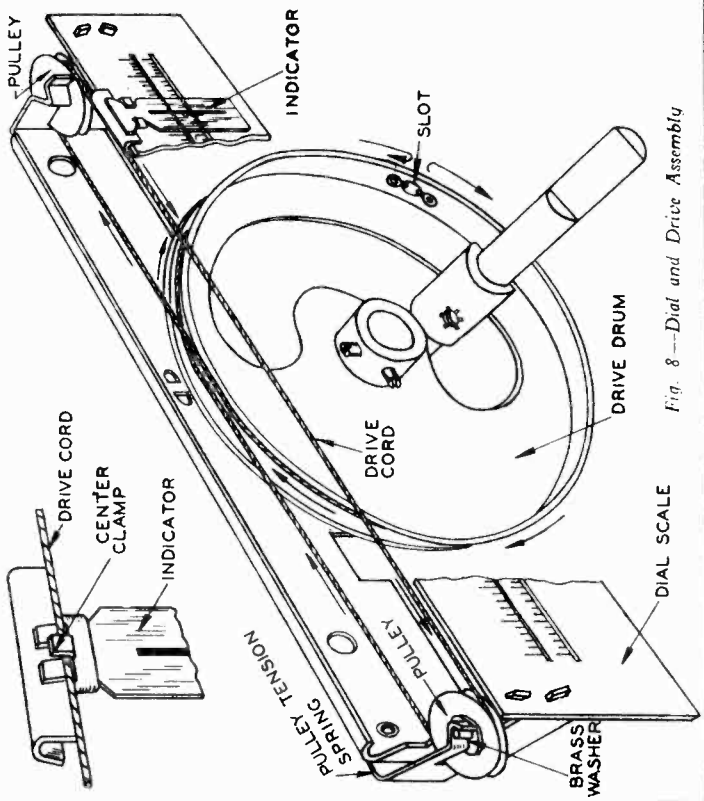


Fig. 8—Dial and Drive Assembly

GENERAL ELECTRIC CO.

MODEL E-51
Schematic, Voltage
Socket, Trimmers

Physical Specifications

Model	E-51
Height	$9\frac{5}{16}$ in.
Width	$14\frac{3}{4}$ in.
Depth	$7\frac{5}{16}$ in.
Weight Packed	17 lb.

Electrical Specifications

Power Supply— Volts	Frequency Cycles on A.C.	Power Watts
115 A.C. or D.C.	50–60	45

Tuning Frequency Range

Broadcast	540–1720 kc.
Short-wave	2.2–7.0 mc.
Tuning Control Drive Ratio:	8:1

Electrical Power Output

Undistorted	0.3 watts
Maximum	0.7 watts

Loud-speaker—Electrodynamic

Cone: $6\frac{1}{2}$-in. type.
Cone Coil Impedance 3.3 ohms at 400 cycles.

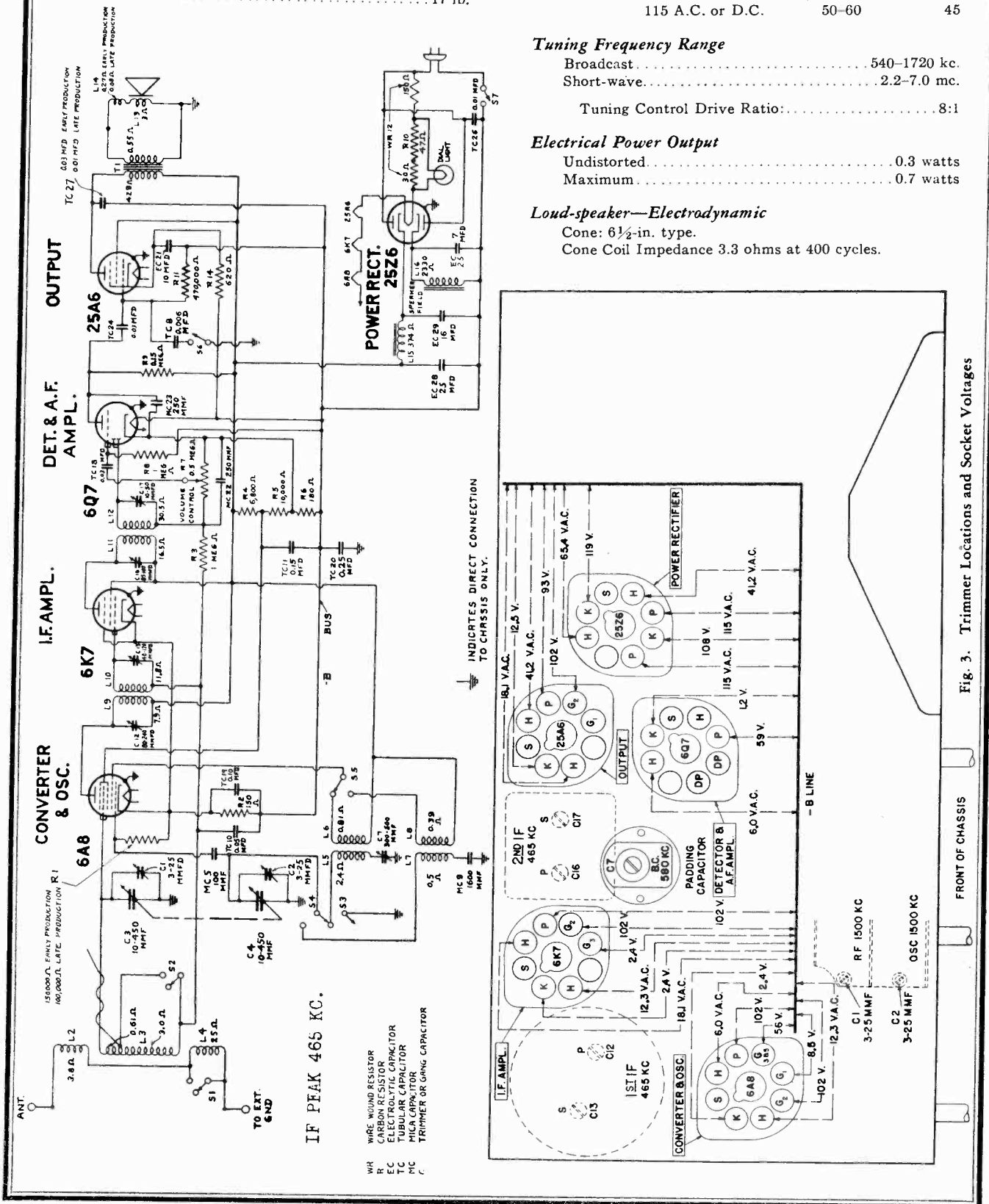


Fig. 3. Trimmer Locations and Socket Voltages

MODEL E-51
Chassis Wiring

GENERAL ELECTRIC CO.

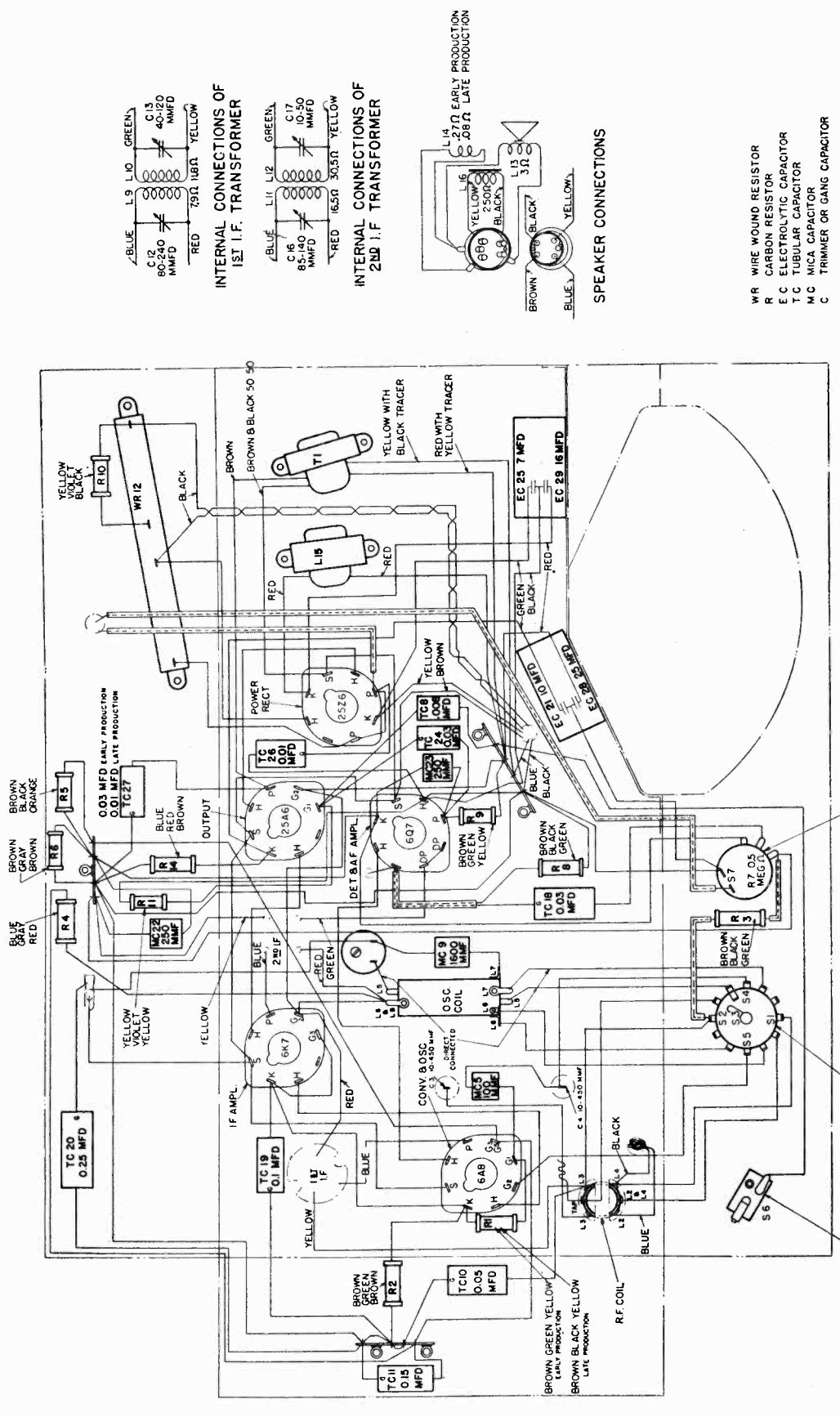


Fig. 2. Chassis Wiring Diagram

DESCRIPTION OF ELECTRICAL CIRCUIT

The signal from the antenna is applied to the control grid of the 6A8 tube through the R.F. transformer, the secondary of which is tuned to the incoming signal by the rear section of the main tuning condenser. In the 6A8 tube the incoming signal is combined with the local oscillator signal which is 465 kc. higher in frequency. The local signal is generated by the oscillator section of this tube, and the proper frequency difference is maintained throughout the tuning range by the front section of the tuning condenser in conjunction with the oscillator coils and padding capacitors.

The combination of the two signals produces the intermediate frequency of 465 kc. This particular frequency is chosen to reduce image response and improve short-wave performance. The intermediate frequency amplifier consists of a 6K7 tube and two transformers, both of which have tuned primaries and secondaries.

The output of the I.F. amplifier is rectified by the diode section of the 6Q7 tube, providing automatic volume control bias as well as detection. The audio frequency voltage developed across R-7 is applied through TC-18 to the grid of the triode section of this tube from the variable arm of R-7, which constitutes the volume control of the receiver. The D.C. voltage developed across R-7 is applied to the control grids of the 6A8 and 6K7 tubes for automatic volume control.

The output of the 6Q7 amplifier section is resistance coupled to the grid of the 25A6 power amplifier pentode. The plate circuit of the 25A6 is suitably matched to the loud-speaker by means of a step-down output transformer.

The tone control circuit consists of a .006-mfd. capacitor which is connected from the grid of the 25A6 tube to ground through the tone control switch. When it is desired to reduce the high frequency output of the receiver the tone control switch is closed by turning the tone control knob to the left.

When the receiver is used on alternating current, plate and grid voltages and loud-speaker field current are supplied by a 25Z6 rectifier tube and its associated filter circuits. Each section of the 25Z6 tube acts as a separate half-wave rectifier, one for speaker field current, and the other for plate and grid voltages, each section having its own filter circuit.

When the receiver is used on a D.C. supply the 25Z6 rectifier tube remains in the circuit and serves two purposes. If the power cord should be plugged in with incorrect polarity, the 25Z6 tube protects the filter condensers from damage. On correct D.C. polarity the 25Z6 tube aids the filter circuits in smoothing the supply, thus minimizing line noise.

The heaters of all tubes and the dial light with its shunt ballast resistor (the 30-ohm section of WR-12 and R-10) are all in series and are furnished current from the power line through a dropping resistor (the 150-ohm section of WR-12).

Note that the chassis is not connected directly to either the ground lead or to the power supply, but is by-passed to the "B-" lead capacitor TC-20.

ALIGNMENT PROCEDURE

Before making any adjustments to the R.F. circuits, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal from the test oscillator to the receiver and inserting a "tuning wand" into the antenna coil. The "tuning wand" consists of a bakelite rod having a brass cylinder attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the brass cylinder end into the antenna coil, the inductance is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the circuits are in exact alignment, inserting either end of the tuning wand in the coil will result in a decrease in output. When an increase in signal is obtained with the iron-filled end of the wand at the 1500-kc. point, a decrease in resonant frequency of that circuit by increasing the antenna trimmer capacity is indicated. When an increase in signal is obtained with the brass cylinder, a decrease in antenna trimmer capacity is indicated. In the event that the brass cylinder end causes an increase in output at the 580-kc. point when inserted in the antenna coil, it is necessary to increase the oscillator padder capacity, meanwhile rocking the tuning dial. An increase in output, resulting from inserting the iron-filled end, indicates a decrease in oscillator padder capacity.

ALIGNMENT FREQUENCIES

I.F.	Broadcast	Short-wave
465 kc.	580 kc.	None
	1500 kc.	

In order to properly align this receiver, it will be necessary to have the following service tools

1. Test Oscillator capable of producing the above alignment frequencies.
2. Non-metallic alignment screwdriver.
3. Output meter.

Trimmer locations as well as socket voltages are illustrated in Fig. 3.

(1) I.F. Alignment

The I.F. amplifier should be tuned to 465 kc.; set the test oscillator dial at this frequency. Turn the volume control to maximum and short-circuit the antenna and ground leads. Tune the receiver to a point where no signal comes in.

Connect the test oscillator output between the 6A8 converter tube grid (with the grid cap on) and the chassis. Connect the output meter across the cone coil of the speaker and adjust the oscillator output until a small deflection is observed in the output meter.

The four I.F. trimmers are adjusted in the following sequence:

1. Secondary trimmer on second I.F. transformer.
2. Primary trimmer on second I.F. transformer.
3. Secondary trimmer on first I.F. transformer.
4. Primary trimmer on first I.F. transformer.

Throughout all adjustments the output should be maintained at a low level by decreasing the test oscillator output as the various stages are brought in line. After these adjustments have been made, the same procedure should be repeated as a final check. The I.F. alignment will then be complete.

(2) R.F. Alignment

The R.F. and oscillator transformers are aligned at 580 and 1500 kc. With the tuning condenser plates fully meshed, line up the pointer and dial by adjusting the dial drive drum set screws so that the line at the extreme right-hand end of the dial is indicated.

(a) Broadcast Band

With the band switch in the clockwise position, set the tuning dial to 1500 kc. Set the test oscillator at 1500 kc. and adjust the oscillator trimmer for maximum output. Next, adjust the R.F. trimmer for maximum output, taking care that the output from the test oscillator is not high enough to overload any part of the set. After these adjustments, tune the set and the test oscillator to 580 kc. Adjust the broadcast padding capacitor for maximum output while rocking the tuning condenser back and forth until maximum output is obtained. The dial setting after this adjustment may not agree exactly with the frequency, but this is not important.

To complete the broadcast band line-up, repeat the adjustment at 1500 kc. as before.

(b) Short-wave—22-7.0 M.C. (2200-7000 kc)

No separate short-wave trimmers are provided on this receiver. The correct adjustment of the broadcast band automatically aligns the short-wave band.

SOCKET VOLTAGES

Power Supply	CATHODE TO "—B" VOLTS D.C.		SCREEN GRID TO "—B" VOLTS D.C.		PLATE TO "—B" VOLTS D.C.		PLATE CURRENT M.A.—D.C.		HEATER VOLTS	
	AC	DC	AC	DC	AC	DC	AC	DC	AC	DC
6A8 Converter	2.4	2.2	56	51	102	92	1.1	.9	6.3	6.3
Oscillator					102	92	.9	.8		
6K7 I.F. Amplifier	2.4	2.2	102	92	102	92	9.1	7.8	5.8	5.8
6Q7 Detector and A.F. Amplifier	1.2	1.1			59	51	.2	.19	6.0	6.0
25A6 Pur. Amp.	12.5	10.5	102	92	93	84	17.2	15 6	23.1	23.1
25Z6 Rectifier "+B"	119	108			(15 A.C.)	115	42.8	37.2	24.2	24.2
Spkr. Field	108	106				115	45.6	45.6		

Measured at 115 volts 60 cycles or 115 volts D.C. supply. Dial 1000 kc. No signal input. Voltmeter 1000 ohms per volt; measurements taken on highest scale giving accurate readable deflection.

REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLY	
*RB-002	BOARD—Terminal Board (Chassis Deck)	$0.15
*RB-021	BOARD—Terminal Board (Chassis side wall)	.10
*RB-023	BOARD—Terminal Board (Rear Chassis Wall)	.10
RB-150	BRACKET—Dial Light Bracket and Scale Support	.25
*RC-030	CAPACITOR—.006 mfd., 400 V Paper (TC-8)	.25
*RC-037	CAPACITOR—.01 mfd., 250 V A.C. (TC-26) (Pkg. of 5)	.75
*RC-040	CAPACITOR—.01 mfd., 400 V Paper (TC-27)	.25
*RC-058	CAPACITOR—.03 mfd., 200 V Paper (TC-18, TC-24)	.25
*RC-072	CAPACITOR—.05 mfd., 200 V Paper (TC-10)	.25
*RC-096	CAPACITOR—.1 mfd., 200 V Paper (TC-19)	.30
*RC-110	CAPACITOR—.15 mfd., 200 V Paper (TC-11)	.30
*RC-150	CAPACITOR—.25 mfd., 200 V Paper (TC-20)	.30
RC-235	CAPACITOR—100 mmfd., Mica (MC-5)	.25
*RC-258	CAPACITOR—250 mmfd., Mica (MC-22, MC-23)	.25
*RC-348	CAPACITOR—1600 mmfd., Mica (MC-9)	.35
RC-565	CAPACITOR—25 mfd., 150 V; 10 mfd., 25 V. Dry Electrolytic (EC-28, EC-21)	1.30
RC-566	CAPACITOR—16 mfd., 150 V; 7 mfd., 150 V Dry Electrolytic (EC-29, EC-25)	1.20
RC-608	CAPACITOR—Oscillator Padder, 300-500 mmfd. (C-7)	.45
RC-713	CONDENSER—Two-gang Tuning Condenser (C-3, C-4)	3.00
RC-815	CABLE—Dial Cable (Pkg. of 5)	.50
RC-822	CABLE—Speaker Cable and Female Plug	.50
RC-860	CORD—Power Cord and Plug	.65
RD-030	DRUM—Dial Drive Drum	.40
RD-041	DIAL—Dial Scale	.25
RD-042	DRIVE—Condenser Drive Shaft	.80
*RG-001	GRID CAP—Control Grid Cap (Pkg. of 5)	.10
*RK-004	KNOB—Control Knob (Push-on) (Pkg. of 5)	.40
RK-008	KNOB—Knob for use with Red Cabinet	.10
RK-009	KNOB—Knob for use with Black or Ivory Cabinet	.10
RL-023	COIL—Antenna Coil (L-2, L-3, L-4)	1.10
*RL-221	COIL—Oscillator Coil (L-5, L-6, L-7, L-8)	.90
RL-302	REACTOR—Filter Reactor (L-15)	1.35
RP-041	POINTER—Dial Pointer and Guide	.10
RP-042	PULLEY—Dial Pulley (Pkg. of 2)	.25
RP-061	PLATE—Asbestos Plate (Under Chassis)	$0.15
*RQ-039 (RR-005)	RESISTOR—150 ohm, ¼ watt Carbon (R-2) (Pkg. of 5)	.60
RQ-041	RESISTOR—180 ohm, ¼ watt Carbon (R-6) (Pkg. of 5)	.60
*RQ-083 (RR-021)	RESISTOR—10,000 ohm, ¼ watt Carbon (R-5) (Pkg. of 5)	.60
*RQ-107 (RR-049)	RESISTOR—100,000 ohm, ¼ watt Carbon (R-1) Late Production (Pkg. of 5)	.70
*RQ-111 (RR-054)	RESISTOR—150,000 ohm, ¼ watt Carbon (R-9) [(R-1) Early Production] (Pkg. of 5)	.70
RQ-123	RESISTOR—470,000 ohm, ¼ watt Carbon (R-11) (Pkg. of 5)	.70
*RQ-131 (RR-067)	RESISTOR—1 meg., ¼ watt Carbon (R-3, R-8) (Pkg. of 5)	.70
RQ-254	RESISTOR—620 ohm, ½ watt Carbon (R-14) (Pkg. of 5)	.70
RQ-279	RESISTOR—6800 ohm, ½ watt Carbon (R-4) (Pkg. of 5)	.70
RQ-427	RESISTOR—47 ohm, 1 watt Carbon (R-10) (Pkg. of 5)	.70
RR-714	RESISTOR—Candohm Tapped Bleeder Resistor (WR-12)	.65
RR-904	REFLECTOR—Dial Light Reflector	.15
*RS-200	SOCKET—8 Pin Tube Socket (Pkg. of 5)	.75
RS-210	SOCKET—Dial Light Socket	.30
*RS-314	SWITCH—Band Switch (S-1, S-2, S-3, S-4, S-5)	.80
RS-331	SWITCH—Tone Control Switch (S-6)	.30
RS-415	SPRING—Spring Bracket Supporting Cable Pulley (Pkg. of 2)	.10
RT-214	TRANSFORMER—2nd I.F. Transformer Assembled (L-11, L-12)	1.50
RT-219	TRANSFORMER—1st I.F. Transformer Assembled (L-9, L-10)	1.50
RT-419	TRANSFORMER—Output Transformer (T-1)	1.45
RV-018	VOLUME CONTROL—Volume Control and Power Switch (R-7, S-7)	.90
RW-004	WINDOW—Dial Window	.15
*RW-101	WASHER—Felt Washers for Control Shafts (Pkg. of 10)	.45
RX-018	SCREW ASSEMBLY—Chassis Mounting Screw Assembly	.15
	SPEAKER ASSEMBLY	
RC-914	CONE—6½-in. Cone and Voice Coil (L-13)	$0.85
RP-059	PLUG—Male Speaker Plug	.20
RP-060	PLUG—Female Speaker Plug	.20
RS-039	SPEAKER—6½-in. Type Speaker (L-13, L-14, L-16)	5.50

*Indicates part also used on 1936 "A" line of receivers.

Sept. 1936 (5M)

(Prices subject to change without notice)

MODELS U-51, U-65
Parts, Notes

GENERAL ELECTRIC CO.

Replacement Parts

Stock No.	Description	List Price
RBB-001	BOARD—Terminal board, 2 lugs	$ .10
RBB-002	BOARD—Terminal board, 3 lugs	.10
RBB-003	BOARD—Terminal board, 5 lugs	.10
RBB-004	BOARD—Fuse board	.10
RBB-100	BRACKET—Dial support bracket with drive cord spring	.10
RBB-101	BRACKET—Dial mounting bracket	.20
RBC-001	CAPACITOR—.1 Mfd., 180 volt paper (C-7, C-10, C-11, C-23, C-25, C-37, C-33, C-42)	.20
RBC-003	CAPACITOR—.25 Mfd., 180 volt paper (C-21, C-31)	.25
RBC-004	CAPACITOR—.01 Mfd., 180 volt paper (C-16, C-18)	.15
RBC-005	CAPACITOR—.05 Mfd., 180 volt paper (C-4)	.15
RBC-006	CAPACITOR—.5 Mfd., 180 volt paper (C-19, C-20, C-39)	.40
RBC-007	CAPACITOR—.5 Mfd., 180 volt paper (C-22)	.30
RBC-008	CAPACITOR—.01 Mfd., 1000 volt paper (C-24)	.15
RBC-009	CAPACITOR—.02 Mfd., 180 volt paper (C-36, C-40, C-44)	.20
RBC-010	CAPACITOR—.5 Mfd., 180 volt paper (C-43)	.30
RBC-014	CAPACITOR—.01 Mfd., 240 volt paper (C-38)	.15
RBC-203	CAPACITOR—50 Mmfd., Mica (C-13, C-15, C-17)	.10
RBC-205	CAPACITOR—250 Mmfd., Mica (C-1)	.15
RBC-206	CAPACITOR—35 Mmfd., Mica (C-28)	.10
RBC-207	CAPACITOR—100 Mmfd., Mica (C-14, C-41)	.10
RBC-502	CAPACITOR—4 Mfd., 18 Mfd., 18 Mfd., 150 volt dry electrolytic (C-32, C-26, C-27)	1.55
RBC-602	CAPACITOR—Quadruple trimmers, antenna and oscillator bands B and D (C-2, C-3, C-29, C-30)	.45
RBC-603	CAPACITOR—Double trimmers 1st IF (C-5, C-6)	.45
RBC-604	CAPACITOR—Double trimmers, 2nd IF (C-8, C-9)	.40
RBC-605	CAPACITOR—Double padder, bands B and D (C-34, C-35)	.45
RBC-606	CAPACITOR—Trimmer, 3rd IF (C-12)	.25
RBC-609	CAPACITOR—Replacement trimmer for any one section of trimmer strip RBC-602	.10
RBC-701	CONDENSER—Two gang tuning condenser and reduction drive	3.65
RBC-800	CABLE—Drive cable	.10
RBC-801	CABLE—Speaker cable and socket assembly	.40
RBC-803	CABLE—Shielded battery cable	1.00
RBC-901	CONE—6" Speaker cone (U51)	2.50
RBC-904	CONE—8" Speaker cone (U55)	3.00
RBC-950	CUSHION—Rubber chassis mounting cushions	.10
RBC-952	CLIP—Vibrator spring clip	.10
RBD-001	DRUM—Dial drive drum	.30
RBD-003	DIAL—Dial scale	.35
RBD-004	DRIVE—Tuning cord reduction drive assembly	.90
RBF-002	FOOT—Chassis mounting foot ea.	.10
RBF-300	FUSE—5 Ampere fuse	.10
RBG-001	GRID CAP—Control grid cap ea.	.10
RBK-001	KNOB—Control knob	.10
RBL-002	COIL—Antenna coil and shield assembly (T-1)	.55
RBL-201	COIL—Oscillator coil and shield assembly (T-2)	2.45
RBL-300	REACTOR—{"B" Reactor (L-1) / "A" Reactor (L-8)}	.60
RBL-301	REACTOR—"B" Reactor (L-2)	.25
RBL-302	REACTOR—Vibrator reactor (L-3)	$ .35
RBL-303	REACTOR—"A" line reactor (L-4, L-5)	.35
RBL-304	REACTOR—"B" reactor (L-6)	.80
RBL-305	REACTOR—Transformer (L-7)	1.25
RBL-900	LEADS—Antenna and ground lead assembly	.30
RBP-001	PULLEY—Dial pulley ea.	.10
RBP-002	POINTER—Dial pointer	.10
RBQ-001	RESISTOR—100,000 ohm, .2 Watt Carbon (R-2, R-6, R-12, R-13)	.15
RBQ-002	RESISTOR—3 megohm, .2 Watt Carbon (R-9, R-10)	.10
RBQ-008	RESISTOR—1 megohm, .2 Watt Carbon (R-17)	.10
RBQ-010	RESISTOR—30,000 ohm, .2 Watt Carbon (R-1)	.15
RBQ-011	RESISTOR—80,000 ohm, .2 Watt Carbon (R-3)	.15
RBQ-012	RESISTOR—10,000 ohm, .2 Watt Carbon (R-4)	.15
RBQ-013	RESISTOR—4 megohm, .2 Watt Carbon (R-5)	.10
RBQ-014	RESISTOR—50,000 ohm, .2 Watt Carbon (R-7, R-8)	.15
RBQ-015	RESISTOR—15,000 ohm, .2 Watt Carbon (R-15)	.15
RBQ-016	RESISTOR— 1,000 ohm, .2 Watt Carbon (R-16)	.10
RBR-702	RESISTOR—16.8 ohm, wire wound (R-14)	.25
RBS-002	SPEAKER—6" type speaker complete with output transformer (T-6)	5.70
RBS-003	SPEAKER—8" type speaker complete with output transformer (T-6)	6.00
RBS-100	SHIELD—Large tube shield	.20
RBS-101	SHIELD—Small tube shield (closed top)	.10
RBS-102	SHIELD BASE—Large tube shield base and vibrator shield base	.10
RBS-103	SHIELD BASE—Small tube shield base	.10
RBS-104	SHIELD—Small tube shield (open top)	.15
RBS-105	SHIELD—Vibrator shield	.20
RBS-106	SHIELD—Shield can for filter assembly (under vibrator and transformer assembly)	.50
RBS-201	SOCKET—4 prong tube socket	.10
RBS-202	SOCKET—5 prong tube socket	.10
RBS-203	SOCKET—6 prong tube socket	.10
RBS-204	SOCKET—6 prong vibrator socket	.10
RBS-300	SWITCH—Band change switch (S-1)	.80
RBS-301	SWITCH—Tone control switch (S-3)	.20
RBT-050	TRANSFORMER—Power transformer (T-7)	2.45
RBT-202	TRANSFORMER—1st IF transformer and shield assembly (T-3)	1.45
RBT-203	TRANSFORMER—2nd IF transformer and shield assembly (T-4)	1.50
RBT-204	TRANSFORMER—3rd IF transformer and shield assembly (T-5)	1.60
RBT-400	TRANSFORMER—Output transformer (T-6)	1.50
RBV-001	VOLUME CONTROL—1 megohm volume control and on-off switch (R-11) (S-2)	1.00
RBV-200	VIBRATOR—Vibrator unit	3.90
RBW-002	WINDOW—Dial window	.15
RBW-101	WASHERS—Felt washers used behind knobs ea.	.10
RX-751	ASSEMBLY—Gang condenser mounting assembly (complete)	.15
RBT-051	TRANSFORMER—Power transformer assembly, includes RBT-050, RBS-204, RBS-102, RBC-952, RBC-609	3.85

Prices subject to change without notice.

Trimmer Replacement

If one trimmer of the gang trimmer strip should become defective, it is not necessary to replace the entire strip. A single trimmer RBC-609, as shown in the replacement parts list, may be used. Disconnect the lead from the coil side (side not grounded) of the defective trimmer in the strip. This connection is then made to the single trimmer. Connect it to the side of the trimmer not in contact with the adjusting screw. The other side of the single trimmer is then connected to a good ground, using a piece of heavy wire in order to support the trimmer adequately. In replacing a trimmer, be sure to keep both leads as short as possible and keep the ungrounded lead as far from ground as possible.

Tubes

The tubes used in this receiver are of the 2 volt series. All of them are of the filament or directly heated types. The filaments are connected in the series-parallel arrangement shown in Fig. 6.

Synchronous Vibrator—The action of the synchronous vibrator used in the power unit is shown in the abridged wiring diagram Fig. 7. When the switch is closed, the armature is drawn up (from the standpoint of diagram) as a result of the current through the vibrator coil. When this occurs, the upper contacts are closed and the vibrator coil is short circuited. The spring action then causes the armature to spring back and the upper contacts are opened. The vibrator coil is again energized, but the inertia of the armature causes it to continue in motion until the two bottom contacts are closed.

The spring action then brings the armature up, opening the bottom contacts. The vibrator coil is again energized and the armature is drawn up to start the next cycle.

The "A" current (heavy lines, Fig. 7) flows first through one side of the power transformer primary and then through the other side in the opposite direction. An AC voltage is induced in the secondary as a result. That portion of the armature shown in light lines rectifies the current in the secondary circuit.

GENERAL ELECTRIC CO.

MODELS U-51, U-55
Schematic

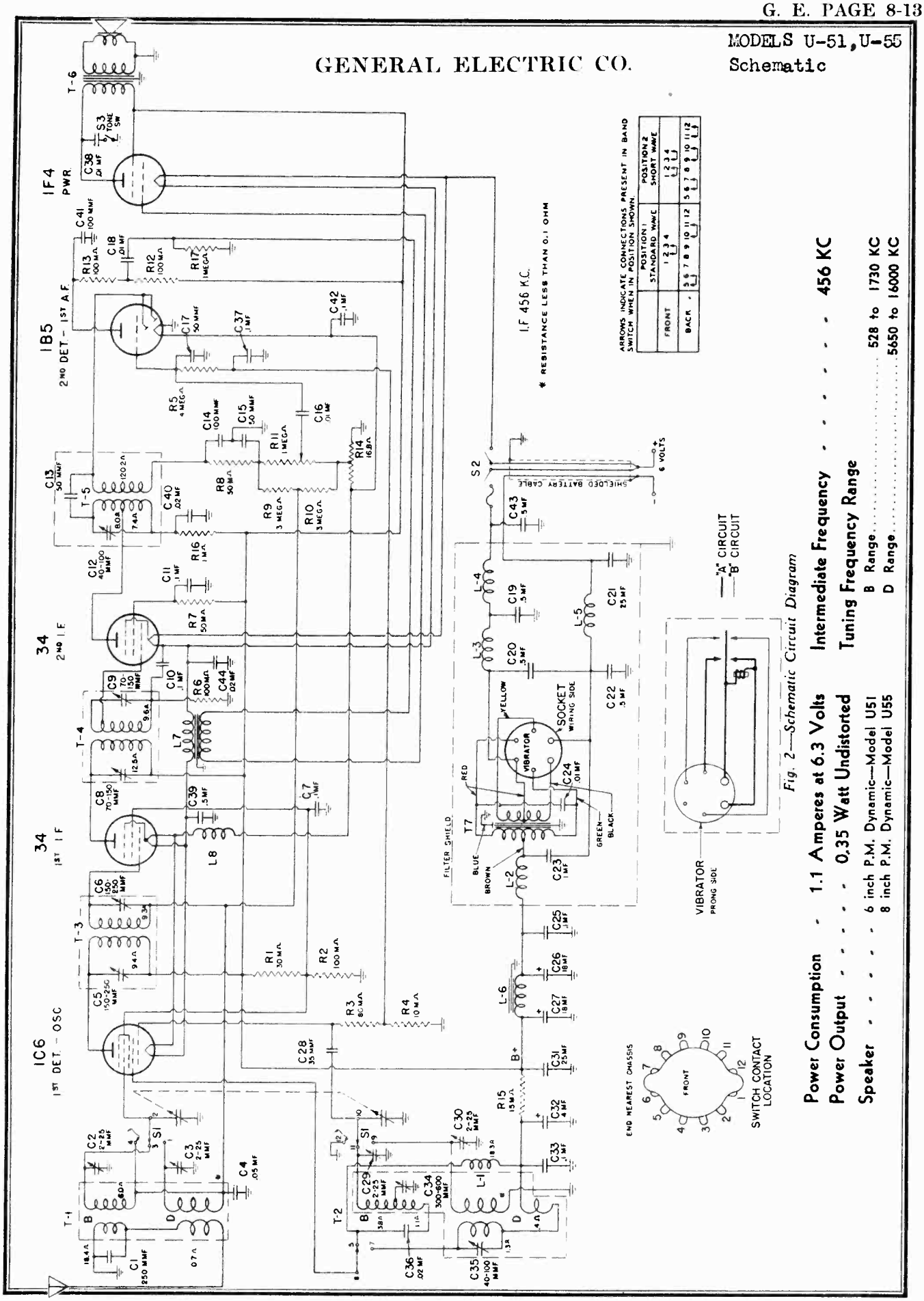


Fig. 2—Schematic Circuit Diagram

Power Consumption - 1.1 Amperes at 6.3 Volts
Power Output - - - - - 0.35 Watt Undistorted
Speaker - - - - - 6 inch P.M. Dynamic—Model U51
8 inch P.M. Dynamic—Model U55

Intermediate Frequency - - - - - - - - 456 KC

Tuning Frequency Range

B Range..... 528 to 1730 KC
D Range..... 5650 to 16000 KC

MODELS U-51,U-55
Coils,Resistance
Vibrator, Notes

GENERAL ELECTRIC CO.

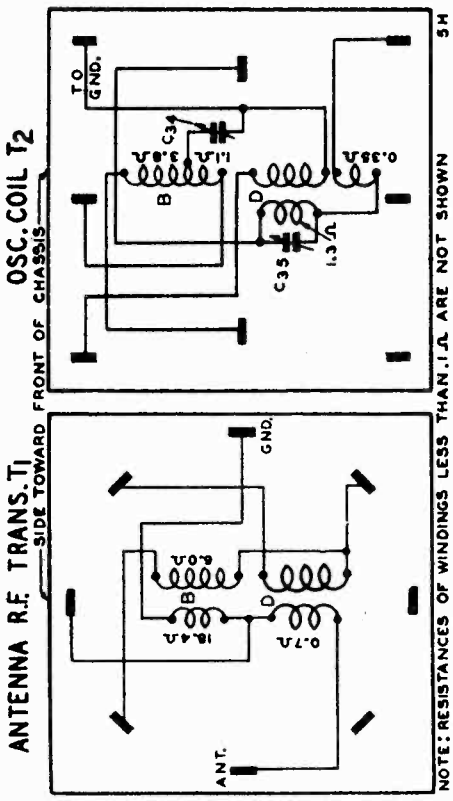


Fig. 8—R.F. and Oscillator Coil Base Terminal Arrangement and D.C. Resistance of Windings

D. C. Resistances of Audio and Filter Circuit Windings – Other Resistances are Shown in Fig. 2

The values given below will vary slightly in different sets.

Part No.	Winding	Code	D. C. Resistance in Ohms
RBT-400	Output Transformer	T6	
	Primary Winding		713.
	Secondary Winding		0.4
RBS-002 & 003	Dynamic Speaker 6" and 8" Speaker Voice Coil		5.4
RBT-050	Power Transformer	T7	
	Primary Winding		
	Center Tap to Inside		0.3
	Center Tap to Outside		0.3
	Secondary Winding		
	Center Tap to Inside		166.
	Center Tap to Outside		185.
RBL-300	"B" Reactor	L1	18.3
RBL-301	"B" Reactor	L2	17.7
RBL-302	Vibrator Reactor	L3	0.1
RBL-303	"A" Line Reactor	L4	0.1
RBL-303	"A" Line Reactor	L5	0.1
RBL-304	"B" Reactor	L6	305.
RBL-305	Transformer	L7	
	Audio Choke (Primary)		1.3
	Hum Bucking Winding (Secondary)		22.7
RBL-306	"A" Reactor	L8	0.3

Caution

Do not turn the receiver on unless ALL the tubes are in the sockets. Removal of any of them will result in abnormal voltages on the remaining tubes.

Be sure that the battery clips are connected to the battery with the correct polarity. Reversed connections may damage the receiver.

Do not use any power source other than a 6 volt storage battery.

If the receiver does not operate after being turned on, turn the switch off immediately, examine the battery connections and the fuse and see if all tubes are properly inserted.

Switch Contact Location Numbering

A standard arrangement for switch contact location numbering has been adopted. This numbering is illustrated in Fig. 2. In contact locations not used, the number applying to that particular location is not employed.

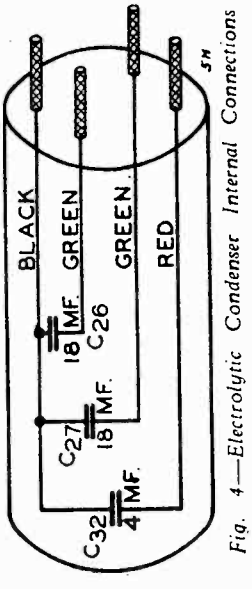


Fig. 4—Electrolytic Condenser Internal Connections

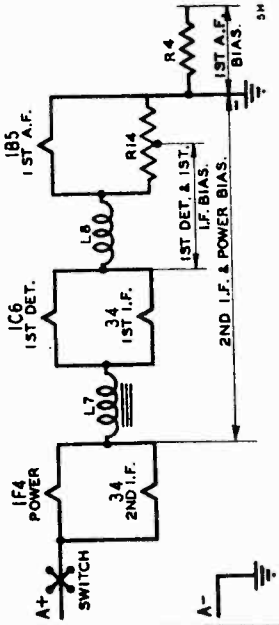


Fig. 6—Abridged wiring diagram showing filament wiring system and points at which no-signal bias voltages are obtained.

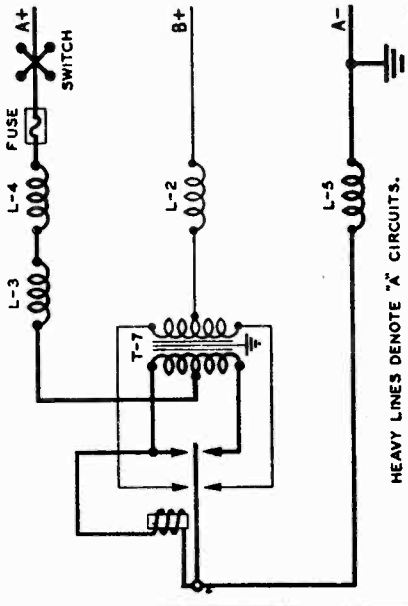


Fig. 7—Abridged wiring diagram showing action of synchronous vibrator

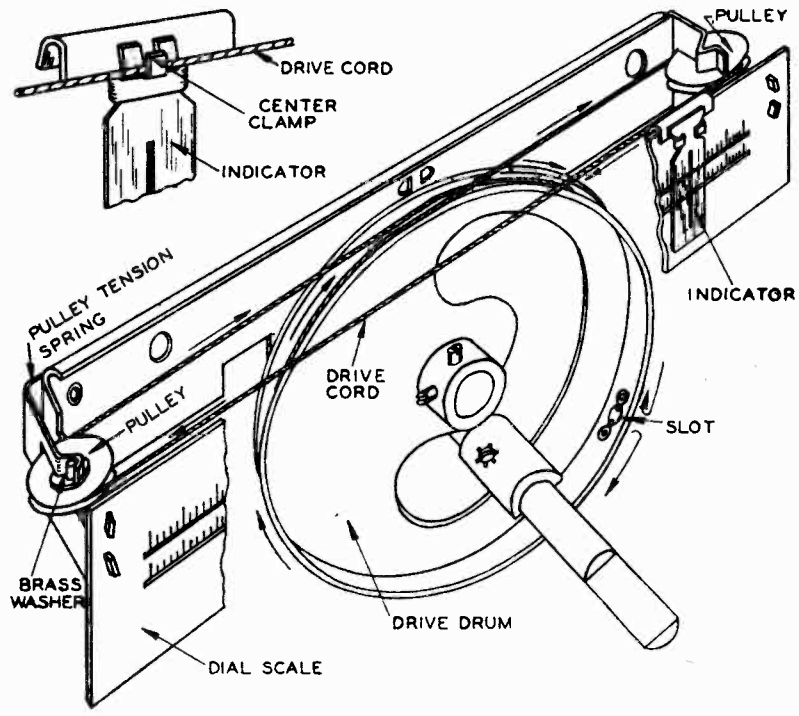


Fig. 9—Dial and Drive Assembly

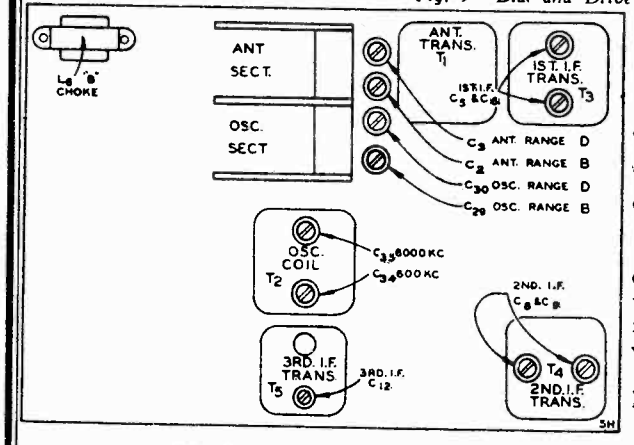


Fig. 3—Location of Trimmers

Voltages

Check the voltages at the sockets to see if correct values are being delivered to the tubes. The antenna and ground should be disconnected and the antenna and ground leads from the set connected together. The volume control should be turned to the right or maximum position.

The voltage chart gives the voltages with all tubes in, the speaker connected and the set in operating condition. These voltages are typical of the sets but will vary slightly with variations in individual receivers, tubes, test equipment used and battery voltage.

The voltage readings are taken with a voltmeter having a resistance of 1000 ohms per volt.

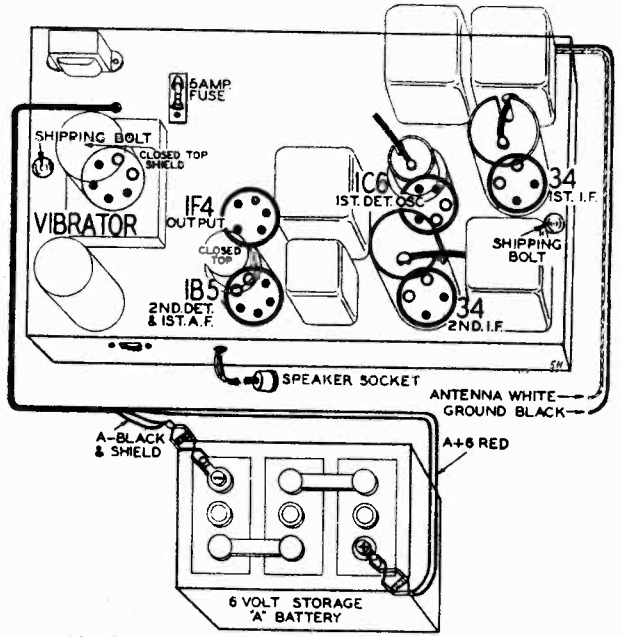


Fig. 5—Tube Arrangement and Battery Connections

VOLTAGES AT SOCKETS

Volume Control at Maximum — Antenna Shorted to Ground
Battery—6 Volts — Band Switch in Standard Wave Position

Type of Tube	Function	Across Filament	Plate to Ground	Screen to Ground	Bias Voltage
1C6	1st Det.-Osc.	2.0	140 110(1)	55	1.1(2)
34	1st I.F.	2.0	140	55	1.1(2)
34	2nd I.F.	2.0	140	75	4.0
1B5	2nd Det. 1st A.F.	2.0	75		3.0(3)
1F4	Power	2.0	135	140	4.0

(1) Anode Grid to ground.
(2) As read from negative filament leg to center tap of R14.
(3) As read across Resistor R4 (using 100,000 ohm meter). This voltage is subject to considerable variation depending on band and frequency setting.

MODELS U-51, U-55
Alignment, Notes
Drive Cord Data

GENERAL ELECTRIC CO.

The receivers are all properly aligned at the factory with precision instruments and re-alignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and upless the service technician has the proper equipment.

A signal generator that will provide an accurately calibrated signal at 456, 1730, 1500, 600, 16,000, 15,000 and 6000 KC and an output indicating meter are required. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

I. F. Adjustment

Set the signal generator for a signal of 456 KC.

Connect the output of the signal generator through a .1 mf. condenser to the control grid of the 1st detector.

Connect the ground lead of the receiver to the ground post of the signal generator,

Turn the band switch to the Range B position (standard wave band).

Turn the volume control to the maximum position.

Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.

Then adjust the five I.F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis, and the location is shown in Fig. 3.

Range B Alignment

After the procedure for the alignment of each range, as explained below, is completed, it is advisable to repeat the procedure as a final check.

1730 KC Adjustment

Set the signal generator for 1730 KC.

Turn the rotor of the tuning condenser to the full open position.

Keep the band switch in the standard wave position.

Connect the antenna lead of the receiver through a 200 mmf. condenser to the output of the signal generator.

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent AVC action.

Adjust the oscillator Range B trimmer (C29) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

1500 KC Adjustment

Set the signal generator for 1500 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

The dial indicator should be near the 1500 KC mark on the dial scale. If it is a considerable distance from this mark, the position of the indicator on the drive cord must be changed. This procedure, however, should not be followed unless it is absolutely necessary as there is danger of breaking the clamps (See Fig. 9) which hold the indicator in place, and of fraying the drive cord. If the indicator must be moved, loosen the clamps at the back which hold it in place, and ,then retighten as explained in the article "Replacing Drive Cord."

Adjust the antenna Range B trimmer (C2) to maximum.

Do not change the setting of the oscillator Range B trimmer.

600 KC Adjustment

Set the signal generator for 600 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 600 KC padder (C34) until the peak of greatest intensity is obtained. See Fig. 3 fnr location of this trimmer.

Range D Alignment

CAUTION—When aligning the short wave band be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000 less 912 KC, or 14,088 KC. It may be necessary to increase the input signal to hear the image.

16,000 KC Adjustment

Set the signal generator for 16,000 KC.

Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range D position (short wave band).

Adjust the oscillator Range D trimmer (C30) until maximum output is obtained. See Fig. 3 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the antenna Range D trimmer (C3) to maximum. When adjusting this trimmer, it will be necessary at the same time to turn the tuning condenser rotor slowly back and forth until the peak of greatest intensity is obtained.

Do not change the setting of the oscillator Range D trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 6000 KC (C35) padder until the peak of greatest intensity is obtained. See Fig. 3 for location of this trimmer.

Servicing Power Unit

The power unit is that portion of the chassis assembly contained within the large rectangular shield can and the circuit for which is shown within the dotted lines at the lower center of the schematic diagram, Fig. 2.

Continuity Resistance Check—The power transformer, choke coil circuits and condenser shorts may be checked by utilizing the vibrator socket terminals and various points on the "A" or "B" lines, or ground without removal of the shield can. For example: when checking the continuity or resistance of the upper half of the transformer secondary, contact may be made with the test prods at the proper vibrator socket terminal, as shown on the circuit diagram, and at the terminal strip lug to which the 18 mf. electrolytic condenser, C26 is connected.

Removing Transformer and Vibrator Socket Assembly—Take off the filter unit shield can by removing the four self tapping screws at the right side (from front) of the chassis base and the five hex nuts from the bolts at the top of the chassis.

Unsolder the ground connections from the two lugs on the inside of the chassis base (right side from front).

Now unsolder the mounting lug holding the terminal strip to the transformer cover.

Remove the four nuts from the bolts holding the transformer assembly to the chassis. Do not remove these bolts from the transformer core. Then lift the assembly to free it from the chassis so that all parts of the assembly are readily accessible.

Proceed with replacement of the power transformer or with any other necessary service or replacements and then reassemble.

Replacement of Buffer Condenser C24—This condenser is located in the top of the transformer and vibrator assembly just underneath the vibrator socket. To replace, remove the assembly as explained in the preceding article.

In addition, the two screws holding the vibrator socket to the transformer cover assembly should be taken out. The condenser is then easily replaced.

Replacing Drive Cord

Remove the chassis from the cabinet.

Remove the old drive cord, pulleys, washer and indicator.

Turn the drive drum until the slot in the rim is in the position shown in Fig. 9.

Insert one end of the drive cord in the slot and wind the cord around the drum in a clockwise direction for about two-thirds of a turn, or until it reaches the top of the drum.

Now, before putting the right pulley (from front) in place, bring the cord around the pulley from back to front so that the cord is adjacent to the celluloid dial scale; then place the pulley in position.

Extend the cord over to the left and bring it around the other pulley from front to back before placing this pulley. Put the small brass washer on the upper shaft of the pulley and place the pulley in position as shown in Fig. 9.

Bring the cord over to the drive drum and wind it around the drum in a clockwise direction, keeping it behind the cord already on the drum.

Push the pulley tension spring in toward the drive drum so as to provide slack in the cord while the free end is being inserted into the slot in the rim.

Now mesh the condenser plates completely. Replace the celluloid indicator on the dial strip and attach it to the drive cord as shown in Fig. 9. The line on the indicator should cover the 530 KC mark on the dial scale.

Caution—When attaching the indicator to the drive cord, do not pinch the center clamp too tightly on the cord or the cord will be cut. After the clamp is pinched slightly a small amount of shellac on it will hold the cord securely.

This receiver is designed to operate from a 6 volt storage battery and uses a synchronous vibrator and a transformer to provide the required high voltage. The tubes used are of the 2 volt type. They are connected in a series-parallel arrangement across the 6 volt battery.

Two bands are covered with a tuning range in each band as shown in the specifications above. Two band coverage is accomplished by means of two sets of antenna and oscillator coils and a single section double throw switch.

Referring to the schematic circuit diagram, Fig. 2, T1 and T2 are the antenna transformer and oscillator coil assemblies. The standard wave and short wave coils are indicated by the letters B and D respectively.

The band switch completes connections to the antenna transformer secondary and oscillator grid and plate coils in use. It also short circuits the antenna

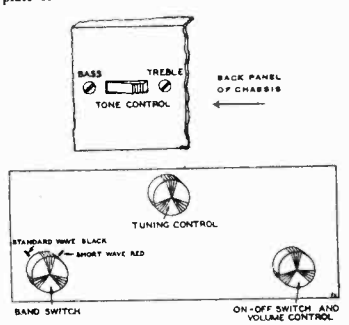


Fig. 1—Location of Controls

transformer B Range secondary and oscillator B Range grid coil when it is in the D Range position.

The antenna transformer with tuned secondary feeds into a type 1C6 pentagrid converter tube which functions as the oscillator and 1st detector.

The oscillator potential on the oscillator control grid of this tube modulates the electron stream from the cathode in such a manner as to impress on it the oscillator frequency which is always 456 KC above the frequency to which the R.F. amplifier is tuned. The electron stream is also modulated at the signal frequency by the detector control grid. As a result of the beating of the two frequencies, the intermediate or beat frequency of 456 KC is present in the plate circuit of this tube.

Two stages of I.F. amplification are employed using type 34 tubes. The primaries and secondaries of the first and second I.F. transformers and the primary of the 3rd I.F. transformer are tuned by small trimmer condensers.

A type 1B5 duo-diode triode tube functions as the second detector and a one stage audio amplifier. AVC voltage is applied through isolating resistors to the control grid circuits of the 1st detector and 1st I.F. tubes. The audio voltage developed across volume control resistor R11 is applied through the movable arm to the control grid of the 1B5 tube.

Resistance coupling is used between the 1st audio stage and the output stage which employs a 1F4 output pentode tube. A P.M. dynamic reproducer is employed.

The primary of transformer L7 serves as an audio choke in the filament circuit. The secondary of this transformer is in the control grid circuit of the 1F4, and acts as a hum bucking winding.

Filament Wiring—Fig. 6 is an abridged wiring diagram which shows the tube filament wiring system and also indicates the points at which the no-signal bias voltages are obtained.

GENERAL ELECTRIC CO.

MODELS FB-52, FB-53
FB-56, FB-57
Schematic, Batt. Conn.
Power Adapter

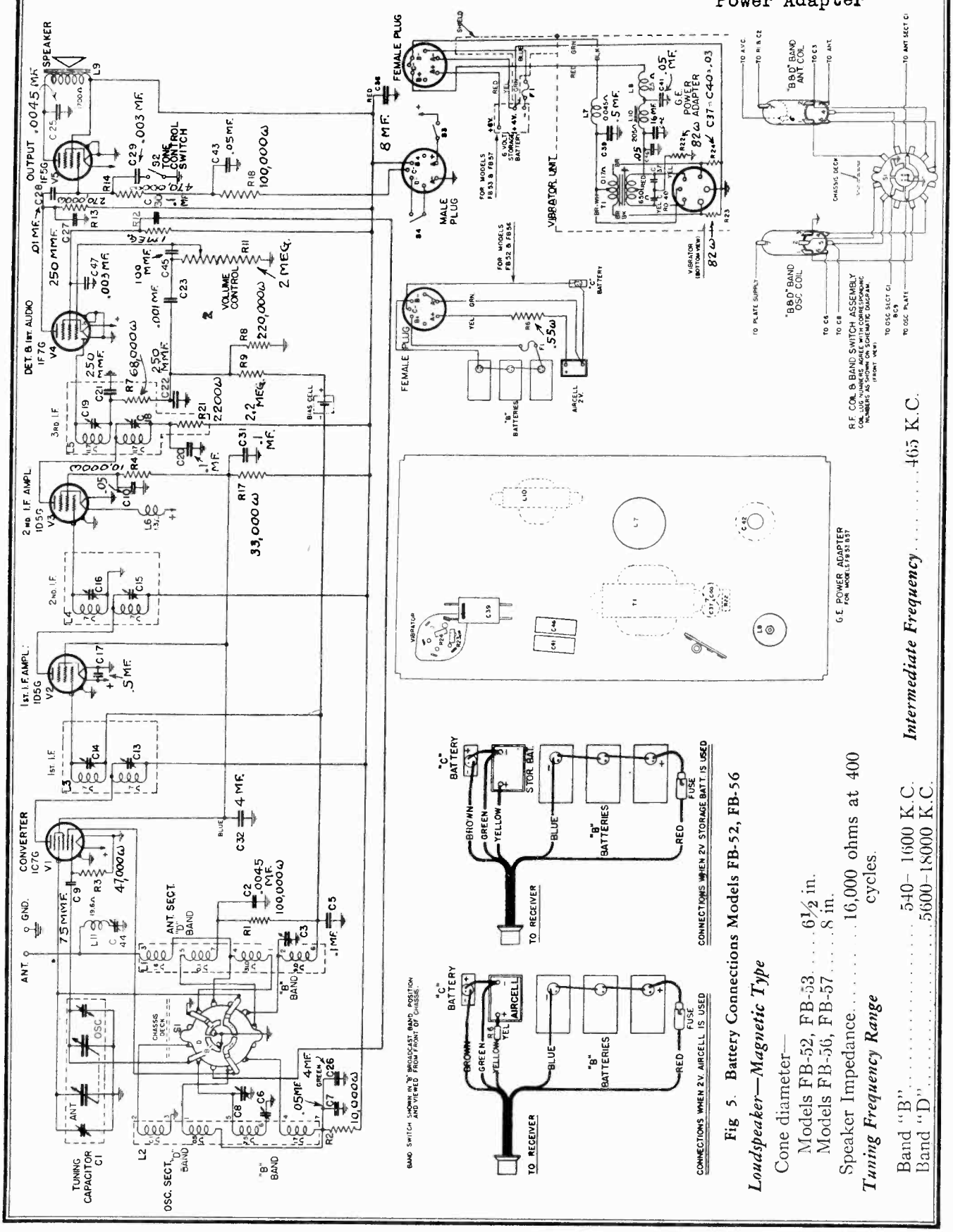


Fig 5. Battery Connections Models FB-52, FB-56

Loudspeaker—Magnetic Type

Cone diameter—
Models FB-52, FB-53 . . . . 6½ in.
Models FB-56, FB-57 . . . . 8 in.
Speaker Impedance . . . . . 16,000 ohms at 400 cycles.

Tuning Frequency Range

Band "B" . . . . . 540- 1600 K.C.
Band "D" . . . . . 5600-18000 K.C.

Intermediate Frequency . . . . . 465 K.C.

MODELS FB-52,FB-53
FB-56,FB-57
Voltage,Chassis

GENERAL ELECTRIC CO.

AVERAGE SOCKET VOLTAGES

Tube	Plate to Ground Volts D.C.	Screen Grid to Ground Volts D.C.	Filament Volts D.C.	D.C. Plate Current M.A.
1C7G Oscillator	134	...	2.0	2.8
1C7G Converter	136	46	2.0	1.3
1D5G 1st I.F. Amp.	136	46	2.0	2.3
1D5G 2nd I.F. Amp.	128	46	2.0	3.5
1F7G Det., AVC, Audio Amp.	40	15	2.0	0.4
1F5G Output	121	135	2.0	7.6

Measured with normal battery voltages using a 1000 ohm per volt meter—dial pointer at 540 K.C. with no signal input-volume control at minimum.

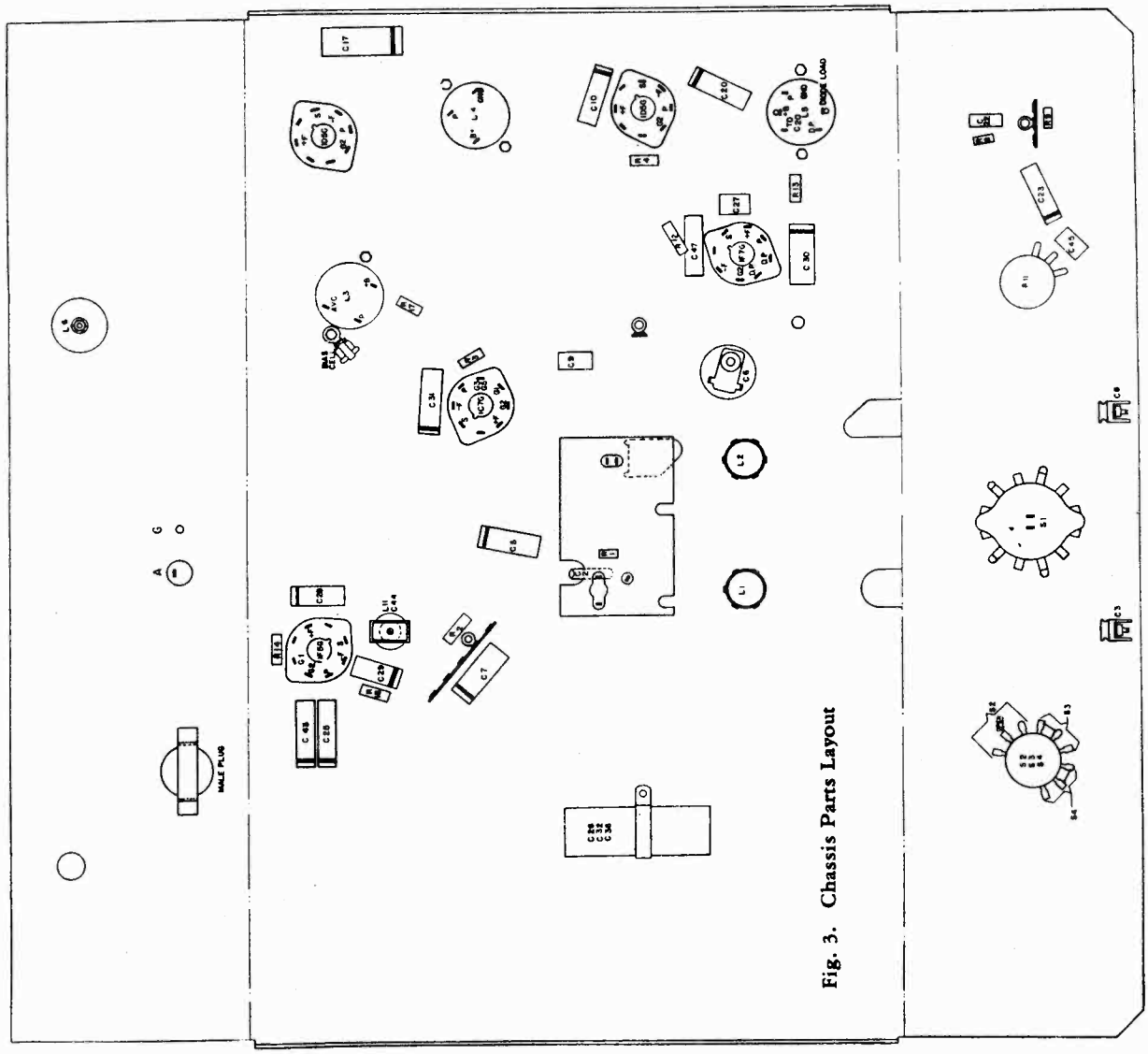


Fig. 3. Chassis Parts Layout

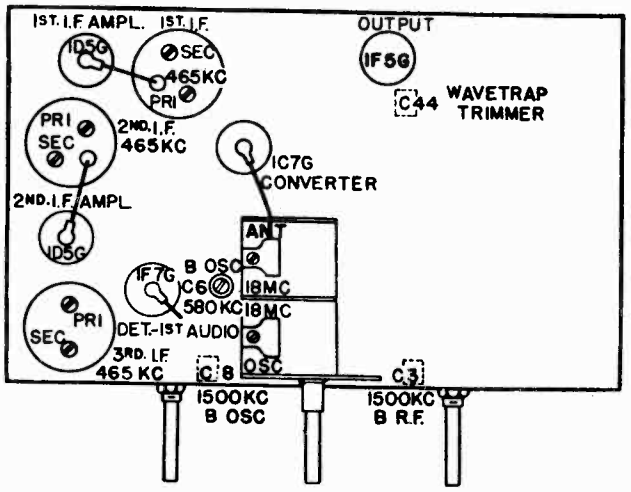


Fig. 1. Chassis Layout and Trimmer Locations

A 1-volt bias cell is used to supply initial bias for the 1C7G converter and the 1D5G 1st I.F. tubes which are controlled by the AVC. Do not attempt to measure the voltage of the cell with any device which draws current. The cell will last indefinitely under normal conditions. If the receiver oscillator stops functioning on the low frequency end of the "D" band, try substituting a new bias cell.

ALIGNMENT PROCEDURE

On the "D" Band (5600 to 18,000 K.C.) the oscillator operates on the *low* frequency side of the incoming signal; therefore, adjust the trimmer until the second oscillator peak is reached as the trimmer is *increased* in capacity. When the correct adjustment is made, it will be possible to tune the image of any signal on the "D" band 970 K.C. *higher* than the signal if the input is sufficiently high. Example: The image of 15 M.C. should be heard at 15,970 K.C.

The alignment procedure is given in table form on page 3. The "Dummy Antenna" is the capacitor or capacitor and resistor used in series with the signal generator antenna lead.

I.F. ALIGNMENT WITH OSCILLOSCOPE

Band Switch Setting	Input Frequency	Point of Input	Dummy Ant.	Trimmer	Remarks
1 Band "B"	465 K.C. Sweep	1st I.F. Grid	.05 MFD or Larger	3rd I.F. Sec. (C-19) 3rd I.F. Pri. (C-18)	Gang condenser plates closed—connect audio input of oscilloscope to ground and to the diode load terminal of the 3rd I.F. transformer—Adjust trimmers in order mentioned for a single symmetrical curve of maximum amplitude.
2 Band "B"	465 K.C. Sweep	1st I.F. Grid	.05 MFD or Larger	2nd I.F. Sec. (C-16) 2nd I.F. Pri. (C-15)	
3 Band "B"	465 K.C. Sweep	Converter Grid	.05 MFD or Larger	1st I.F. Sec. (C-14) 1st I.F. Pri. (C-13)	
4 Band "B"	465 K.C. Sweep	Antenna Post	250 MMF 400 ohms	Wave Trap Trimmer	Adjust trimmer for minimum amplitude.

I.F. ALIGNMENT WITH OUTPUT METER

1 Band "B"	465 K.C. with modulation	1st I.F. Grid	.05 MFD or Larger	3rd I.F. Sec. (C-19) 3rd I.F. Pri. (C-18)	Adjust trimmer for maximum output
2 Band "B"	465 K.C. with modulation	1st I.F. Grid	.05 MFD or Larger	2nd I.F. Sec. (C-16) 2nd I.F. Pri. (C-15)	
3 Band "B"	465 K.C. with modulation	Converter Grid	.05 MFD or Larger	1st I.F. Sec. (C-14) 1st I.F. Pri. (C-13)	
4 Band "B"	465 with modulation	Antenna Post	250 MMF 400 ohms	Wave Trap Trimmer	Adjust trimmer for minimum output.

R.F. ALIGNMENT WITH OUTPUT METER

1 Band "B"					Close gang plates—adjust pointer to first line at left end of tuning scale (530 K.C.).
2 Band "D"	18 MC with modulation	Antenna Post	250 MMF 400 ohms	Oscillator (18 MC) Antenna (18 MC) See Trimmer Location View	Connect output meter across Loudspeaker—tone control on "Bass" position—set osc. trimmer. While rocking the gang cond., adjust the antenna trimmer for maximum output.
3 Band "B"	1500 K.C. with modulation	Antenna Post	250 MMF 400 ohms	Osc. (C-8) Ant. (C-3)	Peak trimmers for maximum output with a low input signal.
4 Band "B"	580 K.C. with modulation	Antenna Post	250 MMF 400 ohms	Osc. Padder (C-6)	Adjust padder for a maximum output meter indication in vicinity of 580 K.C. while rocking the gang condenser.
5 Band "B"	1500 K.C. with modulation.	Antenna Post	250 MMF 400 ohms	Osc. (C-8)	As in operation No. 3.

ELECTRICAL SPECIFICATIONS

Tuning Frequency Range

Band "B" ..... 540– 1600 K.C.
Band "D" ..... 5600–18000 K.C.

Intermediate Frequency ..... 465 K.C.

Electrical Power Output

Undistorted ..... 0.35 Watts
Maximum ..... 0.65 Watts

Tone Control ..... 2-point control

Batteries Required

Models FB-52, FB-56
1—2-volt Aircell Battery (Eveready A-600)
or
1—2-volt Storage Battery
3—45-volt "B" Batteries (Eveready No. 386, No. 485, No. 486 or equivalent)
1—4½-volt "C" Battery (Eveready No. 771 or equivalent)

Models FB-53, FB-57
1—6-volt storage battery.

Current Consumption

Models FB-52, FB-56
"A" Battery ..... 0.42 Amps at 2 Volts
"B" Battery ..... 26 M.A. at 135 Volts

Models FB-53, FB-57
"A" Battery ..... 6 Volts
Filament (2 volts) ..... 0.42 Amps.
G.E. Power Adapter ..... 1.7 Amps.
(4 volts)

Loudspeaker—Magnetic Type

Cone diameter—
Models FB-52, FB-53 ..... 6½ in.
Models FB-56, FB-57 ..... 8 in.
Speaker Impedance ..... 16,000 ohms at 400 cycles.

Tubes

Converter and Oscillator	1C7G Pentagrid Converter
1st I.F. Amplifier	1D5G Super Control Amplifier
2nd I.F. Amplifier	1D5G Super Control Amplifier
Detector, AVC and Audio Amplifier	1F7G Duplex Diode Pentode
Output	1F5G Power Amplifier Pentode

REPLACING DRIVE CORD

Remove the old drive cord, pulleys, washer and indicator.

Turn the drive drum until the slot in the rim is in the position shown in Fig. 4.

Insert one end of the drive cord in the slot and wind the cord around the drum in a clockwise direction for about two-thirds of a turn, or until it reaches the top of the drum.

Now, before putting the right pulley (from front) in place, bring the cord around the pulley from back to front so that the cord is adjacent to the celluloid dial scale; then place the pulley in position.

Extend the cord over to the left and bring it around the other pulley from front to back before placing this pulley. Put the small brass washer on the upper shaft of the pulley and place the pulley in position as shown in Fig. 4.

Bring the cord over to the drive drum and wind it around the drum in a clockwise direction, keeping it behind the cord already on the drum.

Push the pulley tension spring in toward the drive drum so as to provide slack in the cord while the free end is being inserted into the slot in the rim.

Now mesh the condenser plates completely. Replace the celluloid indicator on the dial strip and attach it to the drive cord as shown in Fig. 4. The line on the indicator should cover the 530 K.C. make on the dial scale.

CAUTION—When attaching the indicator to the drive cord, do not pinch the center clamp too tightly on the cord or the cord will be cut. After the clamp is pinched slightly, a small amount of shellac on it will hold the cord securely.

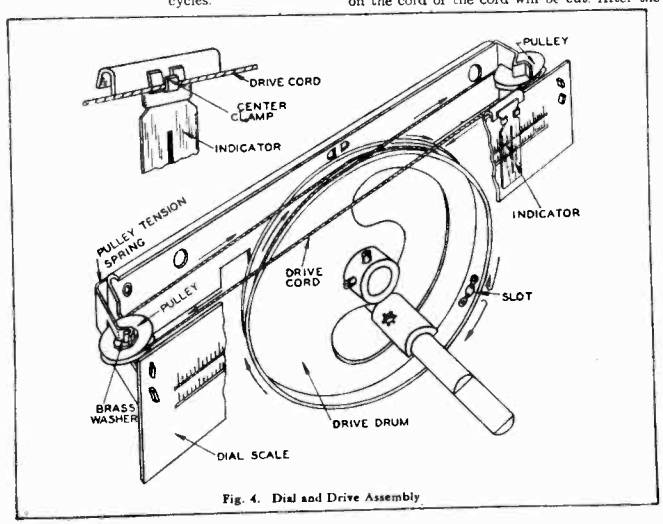


Fig. 4. Dial and Drive Assembly

Power Supply

The chassis used in these receivers are identical except for the type of power supply employed. The 2-volt Models FB-52 and FB-56 are operated by "A," "B" and "C" batteries which are connected to the receiver by a battery cable, Stock No. BK-527.

Models FB-53 and FB-57 are operated entirely by a 6-volt storage battery, 1 cell (2 volts) of which supplies filament current. The remaining two cells (4-volts) supply the G.E. Power Adapter which, in turn, provides "B" and "C" voltages.

If desired, the 2-volt receivers may be converted to 6-volt operation at any time by the addition of a G.E. Power Adapter, Model BA-407.

In connecting a 6-volt receiver to the storage battery, first clip the yellow and green leads on the battery to avoid applying excessive voltage to the filaments, accidentally. Also, be sure to separate the two clips by connecting them to opposite ends of the battery connector strap, as shown on the Power Adapter label. This avoids establishing a common path for the filament and Power Adapter supply which would result in objectionable vibrator noise.

If it is difficult to snap the Power Adapter into position on the chassis, apply a little vaseline to the rubber mounting feet.

REPLACEMENT PARTS LIST

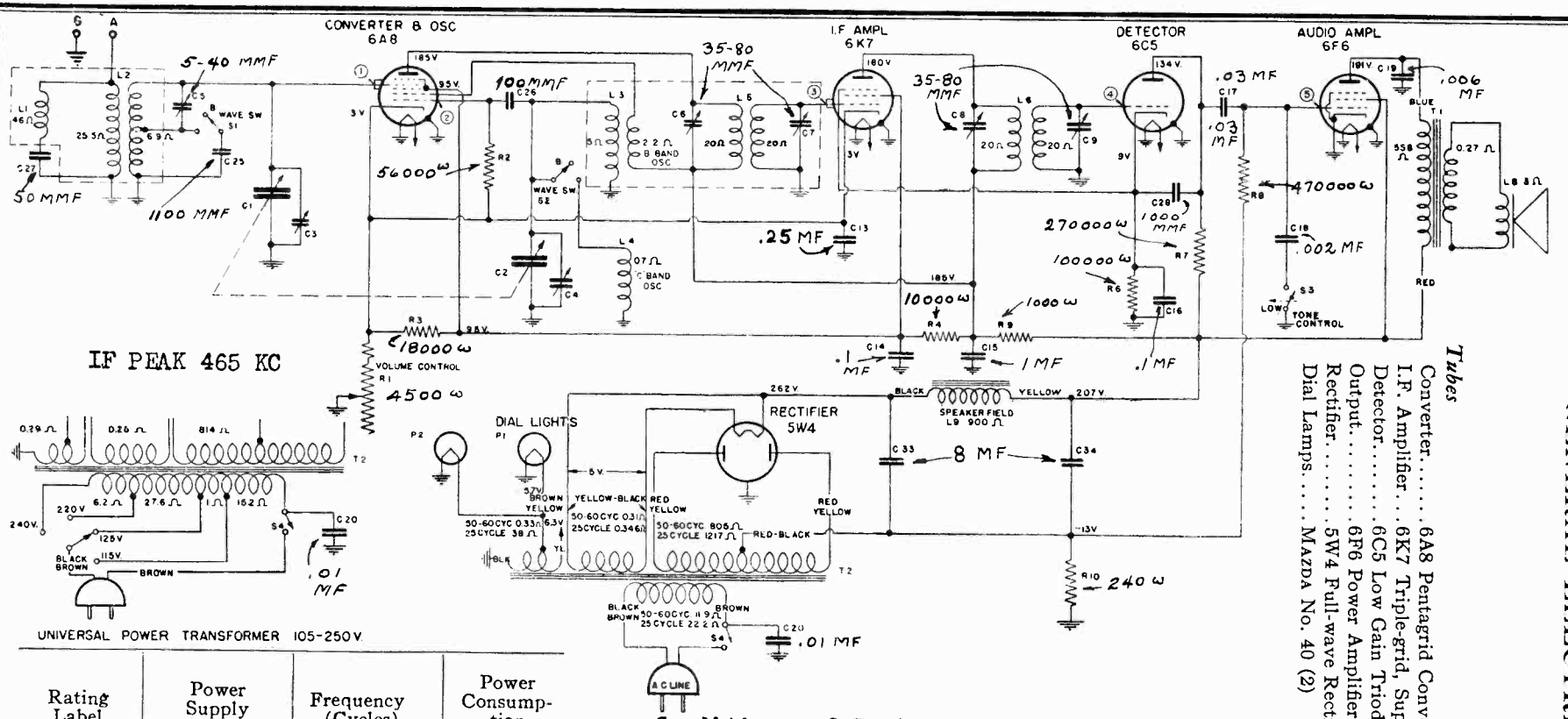
Stock No.	Description	List Price
*RB-008	BOARD—Terminal Board (on front wall of chassis)	$0.10
*RB-009	BOARD—Terminal Board (single terminal)	.15
*RB-019	BOARD—Terminal Board (3 terminals)	.10
*RB-026	BOARD—Antenna ground terminal board	.10
RB-154	BRACKET—Bias cell bracket	.15
RC-008	CAPACITOR—.001 Mfd., 200 V. paper (C-23)	.25
*RC-014	CAPACITOR—.003 Mfd., 200 V. Paper (C-29, C-47)	.25
*RC-017	CAPACITOR—.0045 Mfd., 200 V. paper (C-2, C-25)	.25
RC-032	CAPACITOR—.01 Mfd., 200 V. paper (C-28)	.25
*RC-072	CAPACITOR—.05 Mfd., 200 V. paper (C-7, C-10, C-43)	.25
*RC-096	CAPACITOR—.1 Mfd., 200 V. paper (C-5, C-20, C-30, C-31)	.30
RC-178A	CAPACITOR—.5 Mfd., 200 V. paper (C-17)	.40
RC-223	CAPACITOR—75 Mmf. Mica (C-9)	.25
*RC-235	CAPACITOR—100 Mmf. Mica (C-45)	.25
*RC-261	CAPACITOR—250 Mmf. Mica (C-22, C-27)	.25
RC-572	CAPACITOR—4 Mfd., 4 Mfd, 8 Mfd., 150 V. dry electrolytic (C-26, C-32, C-36)	1.10
*RC-608	CAPACITOR—300-500 Mmf. osc. padder (C-6)	.45
*RC-618	CAPACITOR—5-45 Mmf. trimmer ant. and osc. (C-3, C-8)	.25
RC-637	CAPACITOR—190 Mmf. double trimmer 3rd IF (C-18, C-19, C-21)	.60
RC-642	CAPACITOR—200-350 Mmf. double trimmers 1st or 2nd IF (C-13, C-14, C-15, C-16)	.45
RC-717	CONDENSER—2 gang tuning condenser (C-1)	3.20
*RC-815	CABLE—Drive Cable (Pkg. of 5)	.50
RC-833	CABLE—Speaker cable	2.25
RC-834	CABLE—Battery Cable (For models FB-52 and FB-56 only)	1.60
RC-1958	CLIP—Battery clip marked (+)	.30
RC-1959	CLIP—Battery clip (plain)	.30
RC-1960	CLIP—Shield grounding clip	.10
RC-1961	CELL—1.0 volt Bias cell	.25
*RR-905	REFLECTOR—Dial scale reflector	$0.15
RS-050	SPEAKER—6½-inch armature type speaker (Models FB-52, FB-53)	3.70
RS-051	SPEAKER—8-inch armature type speaker (Models FB-56, FB-57)	4.10
RS-173	SHIELD—Tube shield	.15
*RS-200	SOCKET—Tube socket (Pkg. of 5)	.75
RS-345	SWITCH—Tone control and power switch (S-2)	.70
RS-346	SWITCH—Band change switch	1.25
RT-237	TRANSFORMER—1st or 2nd IF transformer (complete)	1.60
RT-238	TRANSFORMER—3rd IF transformer (Complete)	1.90
RV-023	VOLUME CONTROL—2 meg. volume control (R-11)	.80
*RW-101	WASHER—Felt washer for control shaft (Pkg. of 10)	.45
*RW-400	WAVE TRAP—Wave trap (complete) (C-44, L-11)	.80
*RX-016	ASSEMBLY—Condenser mounting assembly	.30
*RD-030	DRUM—Condenser drive drum	$0.40
RD-048	DIAL—Dial scale	.25
*RD-033-22	DRIVE—Condenser reduction drive	1.00
*RF-010	FOOT—Mounting foot assembly	.30
RF-303	FUSE—½ Amp fuse (Used on FB-52 and FB-56 only) (Pkg. of 10)	1.20
RF-304	FUSE—5 Amp. 25 V. fuse (Used on models FB-53 and FB-57 only) (Pkg. of 10)	1.00
*RG-001	GRID CAP—Control grid cap (Pkg. of 5)	.10
*RK-004	KNOB—Control knob (Pkg. of 5)	.40
*RK-005	KNOB—Control knob with dot (Pkg. of 5)	.50
RL-041	COIL—Ant. coil Band B-D (L-1)	1.25
RL-243	COIL—Osc. coil Band B-D (L-2)	1.30
RL-328	REACTOR—RF filament reactor (L-6)	.40
RP-042	PULLEY—Dial pulley (Pkg. of 2)	.15
*RP-045	POINTER—Dial pointer and guide	.10
RP-070	PLUG—Battery plug (male)	.25
*RQ-067	RESISTOR—2200 ohm, ½ W. Carbon (R-21) (Pkg. of 5)	.60
*RQ-083	RESISTOR—10,000 ohm, ½ W. Carbon (R-2, R-4) (Pkg. of 5)	.60
*RQ-095	RESISTOR—33,000 ohm, ½ W. Carbon (R-17) (Pkg. of 5)	.60
*RQ-099	RESISTOR—47,000 ohm, ½ W. Carbon (R-3) (Pkg. of 5)	.60
*RQ-103	RESISTOR—68,000 ohm, ½ W. Carbon (R-7) (Pkg. of 5)	.60
*RQ-107	RESISTOR—100,000 ohm, ½ W. Carbon (R-1, R-18) (Pkg. of 5)	.70
*RQ-115	RESISTOR—220,000 ohm, ½ W. Carbon (R-8) (Pkg. of 5)	.70
*RQ-117	RESISTOR—270,000 ohm, ½ W. Carbon (R-13) (Pkg. of 5)	.70
*RQ-123	RESISTOR—470,000 ohm, ½ W. Carbon (R-14) (Pkg. of 5)	.70
*RQ-131 (RR-067)	RESISTOR—1 meg., ½ W. Carbon (R-12) (Pkg. of 5)	.70
*RQ-139	RESISTOR—2.2 meg., ½ W. Carbon (R-9) (Pkg. of 5)	.70
RR-306	RESISTOR—.55 ohm, 1 W. flexible (R-6) (Used on models FB-52, FB-56) (Pkg. of 5)	.60
	POWER ADAPTER (Models FB-53 and FB-57)	
*RB-053	BOARD—Terminal board (3 terminals)	$0.10
RB-603	BASE—Vibrator grounding base	.15
RC-054	CAPACITOR—.03 Mfd., 1500 V. paper (C-37, C-40)	.35
*RC-072	CAPACITOR—.05 Mfd., 200 V. paper (C-41, C-46)	.25
RC-156B	CAPACITOR—.5 Mfd., 120 V. paper (C-39)	.40
RC-573	CAPACITOR—16 Mfd., 150 V. dry electrolytic (C-42)	.90
RC-832	CABLE—Battery Cable	2.30
RL-322	REACTOR—RF B+ reactor (L-8)	.30
RL-323	REACTOR—Vibrator reactor (L-7)	.70
RL-329	REACTOR—Filter reactor (L-10)	.90
RQ-033	RESISTOR—82 ohm, ½ W. Carbon (R-22, R-23, R-24,) (Pkg. of 5)	.60
RS-215	SOCKET—Vibrator tube socket (Pkg. of 5)	.75
RT-077	TRANSFORMER—Vibrator transformer (T-3)	2.50
RV-201	VIBRATOR—4-volt vibrator	4.00

* Used on previous receivers.

(Prices subject to change without notice)

GENERAL ELECTRIC CO.

MODEL F-53
Schematic, Resistance
Transformer Data



Tubes

Converter.....6A8 Pentagrid Converter
I.F. Amplifier...6K7 Triple-grid, Super-control Amplifier
Detector.....6C5 Low Gain Triode
Output.....6F6 Power Amplifier Pentode
Rectifier.....5W4 Full-wave Rectifier
Dial Lamps.....Mazda No. 40 (2)

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A	115	60	50
C	115	25–60	55
V	105–130 and 200–250	40–60	55

Tuning Frequency Range

Band "B".....540–1800 kc.
Band "C".....1800–4000 kc.

Electrical Power Output

Undistorted.....1.0
Maximum.....3.0

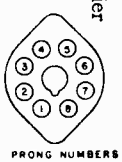
Loud-speaker—Electrodynamic

Cone Diameter: 6½ in.
Cone Coil Impedance: 3 ohms at 400 cycles

Conditions of Test:
Wave switch on "B" band -- Power switch Off

APPROXIMATE RESISTANCE MEASUREMENTS:

	RESIST. TO GND.	TUBE	SOCKET
1.	7 ohms	Conv.Grid	Cap
2.	60,000 "	Osc. Grid	Prong 5
3.	20 "	I-f Grid	Cap
4.	20 "	Det. Grid	Prong 5
5.	470,000 "	O.P. Grid	Prong 5



All voltages to ground unless otherwise specified
" " measured with Ant. and Gnd.Terminals shorted
" " " " Dial Pointer at 1000 kc
" " " " volume at maximum

ALIGNMENT PROCEDURE

Before making any adjustments to the R.F. circuits, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal from the test oscillator to the receiver and inserting a "tuning wand" into the antenna coil. The "tuning wand" consists of a bakelite rod having a brass cylinder attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the brass cylinder end into the antenna coil, the inductance is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the circuits are in exact alignment, inserting either end of the tuning wand in the coil will result in a decrease in outpnt. When an increase in signal is obtained with the iron-filled end of the wand at the 1500-kc. point or the 4.0-mc. point, a decrease in resonant frequency of that circuit by increasing the antenna trimmer capacity is indicated. When an increase in signal is obtained with the brass cylinder, a decrease in antenna trimmer capacity is indicated.

Changes Indicated by Wand

Wand	Signal	Trimmer Adjustment Required
Brass cylinder	Decrease	None
Iron filings	Decrease	
Brass cylinder	Increase	Decrease capacity
Iron filings	Decrease	
Brass cylinder	Decrease	Increase capacity
Iron filings	Increase	

ALIGNMENT FREQUENCIES

I.F.	Broadcast	Short-wave
465 Kc.	1500 Kc.	4000 Kc.

In order to align these receivers properly it is necessary to have available:

1. A modulated test oscillator capable of producing the above alignment frequencies.
2. An output indicator, such as a high-resistance a-c voltmeter with a maximum scale reading of 3 to 5 volts, or a neon lamp indicator.
3. An alignment tool consisting of an insulating shaft with a small screwdriver blade.

The location of all alignment trimmer capacitors are illustrated in Fig. 2.

(1) *I.F. Alignment*

Set the frequency band switch of the receiver to the broadcast position and turn the volume control to maximum (extreme clockwise position). Tune the receiver to a point where no signal comes in and short-circuit the antenna and ground leads.

Connect the test oscillator output between the chassis and the control grid of the 6A8 tube. Connect the output meter across the cone coil of the speaker. Set the test oscillator to 465 kc. and adjust the output until a small deflection is observed in the output meter.

The four I.F. trimmers, see Fig. 2, are adjusted in the following sequence:

1. Secondary trimmer on second I.F. transformer.
2. Primary trimmer on second I.F. transformer.
3. Secondary trimmer on first I.F. transformer.
4. Primary trimmer on first I.F. transformer.

Throughout all adjustments the output should be maintained at a low level by decreasing the test oscillator output as the various stages are brought in line. After these adjustments have been made, the same procedure should be repeated as a final check. The I.F. alignment will then be complete.

(2) *I.F. Wave Trap*

No adjustable trimmer is provided for the I.F. trap adjustment in this receiver. The capacitor C-27, in conjunction with the inductance, L-1, automatically provides rejection of incoming I.F. signals.

(3) *R.F. Alignment*

The Ant. and oscillator trimmers are aligned at 1500 kc. First of all, check the position of the dial pointer. To do this, rotate the gang condenser to the maximum capacity position, i.e., plates fully meshed. While in this position, align the pointer with the last black line on the scale by loosening the dial drum set screws and rotating the drum on the gang shaft. Remove the short-circuit from the antenna and ground terminals and connect the test oscillator to same through a dummy antenna consisting of a 400-ohm resistor in series with a 250-mmf. capacitor. Connect the output indicator across the speaker cone coil.

(a) *Broadcast Band—(540-1800 Kc.)*

With the band switch in the clockwise position, set the tuning indicator to 1500 kc. Set the test oscillator at 1500 kc. and adjust the broadcast band oscillator trimmer, C-4 for maximum output. Next, set the Ant. trimmer, C-3, for maximum output, taking care that the output from the test oscillator is not high enough to overload any part of the set. No padding adjustment is required.

To complete the broadcast band line-up, repeat the Ant. trimmer adjustment after aligning the short-wave band.

(b) *Short-wave Band (1800-4000 Kc.)*

Turn the band switch to its counterclockwise position. Set the test oscillator at 4000 kc. and tune the receiver to resonate at this frequency. No trimmer is provided for short-wave oscillator alignment. To perform the Ant. short-wave adjustment, rock the tuning condenser back and forth through resonance while adjusting the short-wave Ant. trimmer, C-5, for maximum output indication on the tuning meter. It may now be necessary to readjust the broadcast band Ant. trimmer as indicated above.

Alignment of the receiver is now complete.

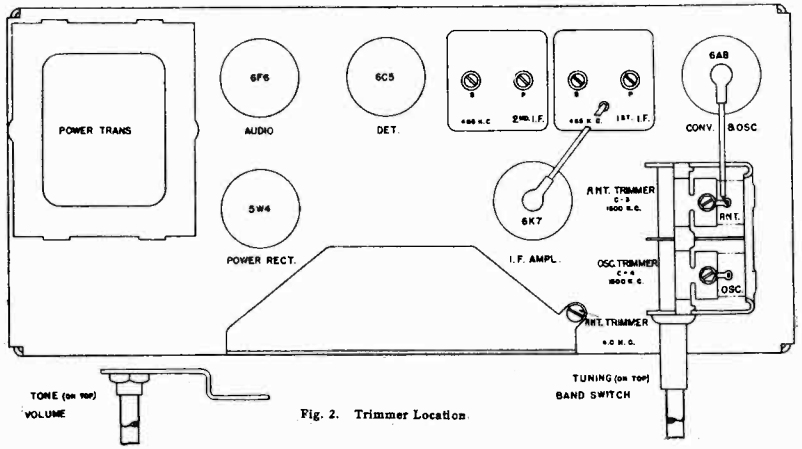


Fig. 2. Trimmer Location

DESCRIPTION OF ELECTRICAL CIRCUIT

The signal from the antenna is applied to the control grid of the 6A8 tube through the R.F. transformer, the secondary of which is tuned to the incoming signal by the rear section of the main tuning condenser. In the 6A8 tube the incoming signal is combined with the local oscillator signal which is 465 kc. higher in frequency. The local signal is generated by the oscillator section of this tube, and the proper frequency difference is maintained throughout the tuning range by the front section of the tuning condenser in conjunction with the oscillator coils. The special-cut rotor of the front condenser section permits dispensing with the usual padding capacitor.

The combination of the two signals produces the intermediate frequency of 465 kc. This particular frequency is chosen to reduce image response and improve short-wave performance. The intermediate frequency amplifier consists of a 6K7 tube and two transformers, both of which have tuned primaries and secondaries. Volume is controlled by the 4500-ohm variable resistor, R-1, which varies the bias applied to the control grids of the 6A8 and 6K7 tubes.

The output of the I.F. amplifier is applied to the grid of the 6C5 detector which is properly biased for this service by the .1 megohm cathode resistor, R-6.

The output of the 6C5 detector is resistance coupled to the grid of the 6F6 power amplifier pentode. The plate circuit of the 6F6 is suitably matched to the loud-speaker by means of a step-down output transformer.

The tone control circuit consists of a .002 mfd. capacitor, connected in series with a two-point grounding switch, S-3, in the grid circuit of the 6F6 power pentode. When it is desired to reduce the high frequency output of the receiver, the switch, S-3, is turned to its counterclockwise grounding position.

Plate and grid voltages for all tubes are supplied by the power supply system employing a 5W4 full-wave rectifier tube which, together with a suitable network of resistors and capacitors, supplied the required voltages and filtering action.

REPLACEMENT PARTS MODEL F-53

(Insist on genuine factory-tested parts which may be purchased from authorized dealers)

Stock No.	Description	List Price
	RECEIVER ASSEMBLY	
*RB-008	BOARD—Terminal Board (two lugs)	$0.10
*RB-053	BOARD—Terminal Board (3 lugs)	.10
*RC-013	CAPACITOR—.002 Mfd., 200 V. paper (C-18)	.25
*RC-027	CAPACITOR—.006 Mfd., 1000 V. paper (C-19)	.30
RC-039	CAPACITOR—.01 Mfd., 600 V. paper (C-20)	.25
*RC-083	CAPACITOR—.03 Mfd., 400 V. paper (C-17)	.25
*RC-096	CAPACITOR—.1 Mfd., 200 V. paper (C-14, C-16)	.30
*RC-123	CAPACITOR—.1 Mfd., 400 V. paper	.35
*RC-136	CAPACITOR—.25 Mfd., 200 V. paper (C-13)	.30
*RC-210	CAPACITOR—50 Mmf., Mica (C-27)	.25
*RC-235	CAPACITOR—100 Mmf., Mica (C-26)	.25
*RC-333	CAPACITOR—1000 Mmf., Mica (C-28)	.30
*RC-338	CAPACITOR—1100 Mmf., Mica (C-25)	.25
*RC-564	CAPACITOR—8 Mfd., 350 V.; 8 Mfd., 350 V. dry electrolytic (C-33, C-34)	1.25
*RC-631	CAPACITOR—5-40 Mmf., Mica trimmers (C-5)	.30
*RC-714	CONDENSER—2 section tuning condenser with trimmers (C-1, C-2, C-3, C-4)	3.00
RC-835	CABLE—Dial cable assembly (complete) (pkg. of 5)	.15
*RC-860	CORD—Power Cord	.65
*RC-944	CUSHION—Gang mtg. cushion	.10
*RC-945	CLAMP—Electrolytic mounting clamp	.05
RD-049	DIAL—Dial scale	.50
RD-050	DRUM—Gang drive drum	.30
RE-015	ESCUTCHEON—Escutcheon plate	1.25
*RG-001	GRID CLIP—Control grid clip (Pkg. of 5)	.10
RK-016	KNOB—Control knob (Pkg. of 5)	.40
*RL-024	COIL—Antenna coil (L-1, L-2)	1.00
*RL-234	COIL—Osc. coil Band "C" (L-4)	.40
RL-919	LAMP—6.3 volt dial lamp (P-1, P-2) (pkg. of 10)	1.20
RP-071	POINTER—Dial scale pointer (Pkg. of 5)	.25
*RQ-101	RESISTOR—56,000 ohms, ¼ W. Carbon (R-2) (Pkg. of 5)	$0.60
*RQ-107 (RR-050)	RESISTOR—100,000 ohms, ¼ W. Carbon (R-6) (Pkg. of 5)	.70
*RQ-117	RESISTOR—270,000 ohms, ¼ W. Carbon (R-7) (Pkg. of 5)	.70
*RQ-123	RESISTOR—470,000 ohms, ¼ W. Carbon (R-8) (Pkg. of 5)	.70
*RQ-444	RESISTOR—240 ohms, 1 W. Carbon (R-10)	.15
*RQ-459	RESISTOR—1000 ohms, 1 W. Carbon (R-9)	.15
*RQ-483	RESISTOR—10,000 ohms, 1 W. Carbon (R-4)	.15
*RQ-489	RESISTOR—18,000 ohms, 1 W. Carbon (R-3)	.15
*RS-200	SOCKET—8-pin tube socket (Pkg. of 5)	.75
*RS-204	SOCKET—5-pin tube socket (Pkg. of 5)	.75
RS-216	SOCKET—Pilot lamp socket	.01
*RS-332	SWITCH—Band change switch (S-1)	.60
*RS-333	SWITCH—Tone control switch (S-3)	.40
*RT-229	TRANSFORMER—1st I.F. transformer (complete) (L-3, L-5, C-6, C-7)	1.90
*RT-230	TRANSFORMER—2nd I.F. transformer (complete) (L-6, C-8, C-9)	1.50
*RT-057	TRANSFORMER—Power transformer, 60 cycles, 115-120 volt (T-2)	3.85
*RT-058	TRANSFORMER—Power transformer, 25-60 cycles, 115-120 volts (T-2)	7.50
*RT-059	TRANSFORMER—Universal power transformer	8.00
*RW-101	WASHER—Felt washer for knobs (Pkg. of 10)	.45
*RX-019	WASHER—Mounting washers and screws	.10
*RV-019	VOLUME CONTROL—4500 ohm volume control and power switch (R-1, S-4)	.95
	SPEAKER ASSEMBLY	
*RC-915	CONE—Speaker cone	.90
*RS-040	SPEAKER—6½-inch type speaker (Complete with output transformer)	6.00
*RT-420	TRANSFORMER—Output transformer (T-1)	1.00

* Used on previous receivers.

(Prices subject to change without notice)

GENERAL ELECTRIC CO.

MODELS FA-60, FA-61
Schematic, Socket
Trimmers, Resistance

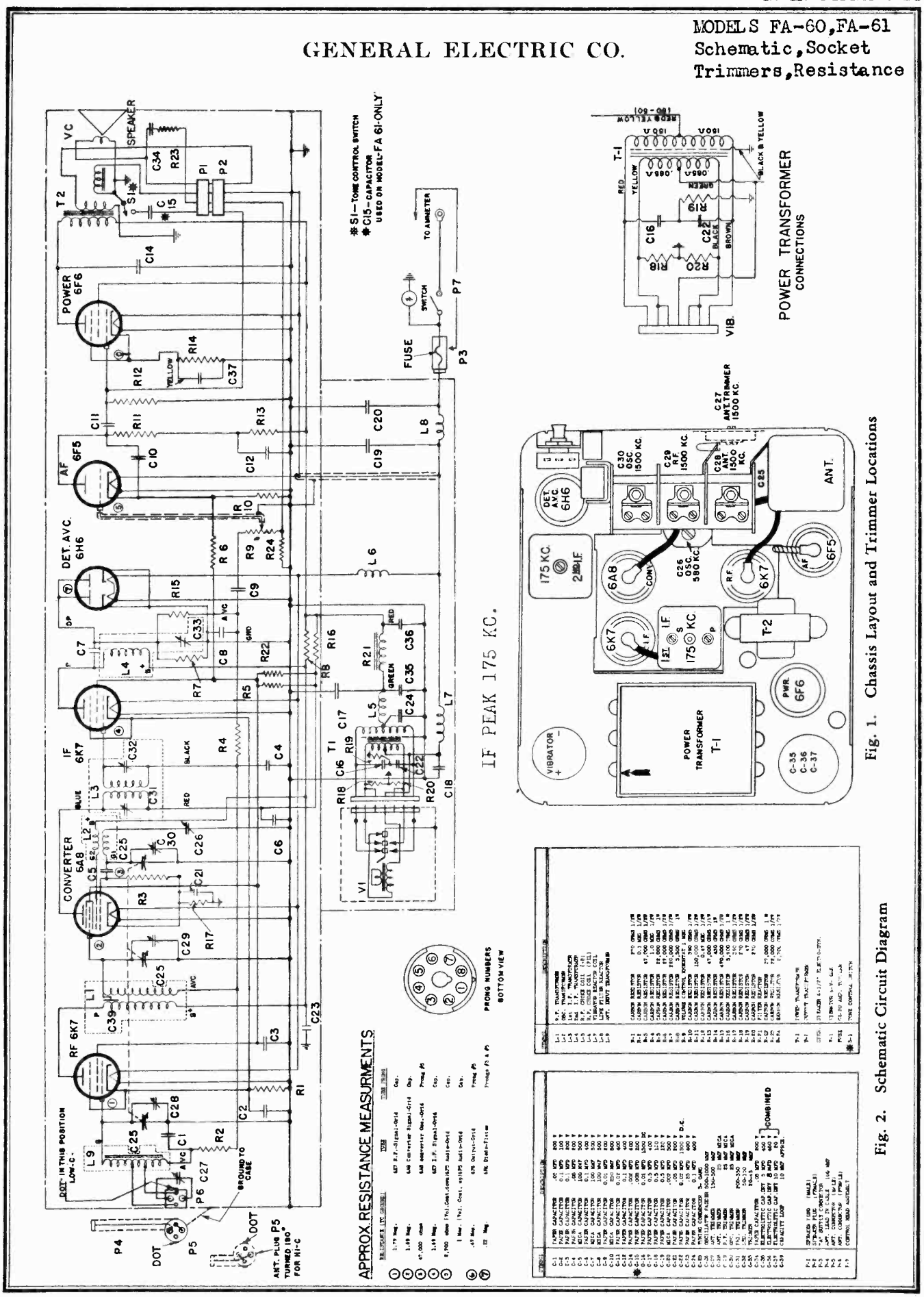


Fig. 1. Chassis Layout and Trimmer Locations

Fig. 2. Schematic Circuit Diagram

MODELS FA-60, FA-61
Chassis and Spkr. Layouts

GENERAL ELECTRIC CO.

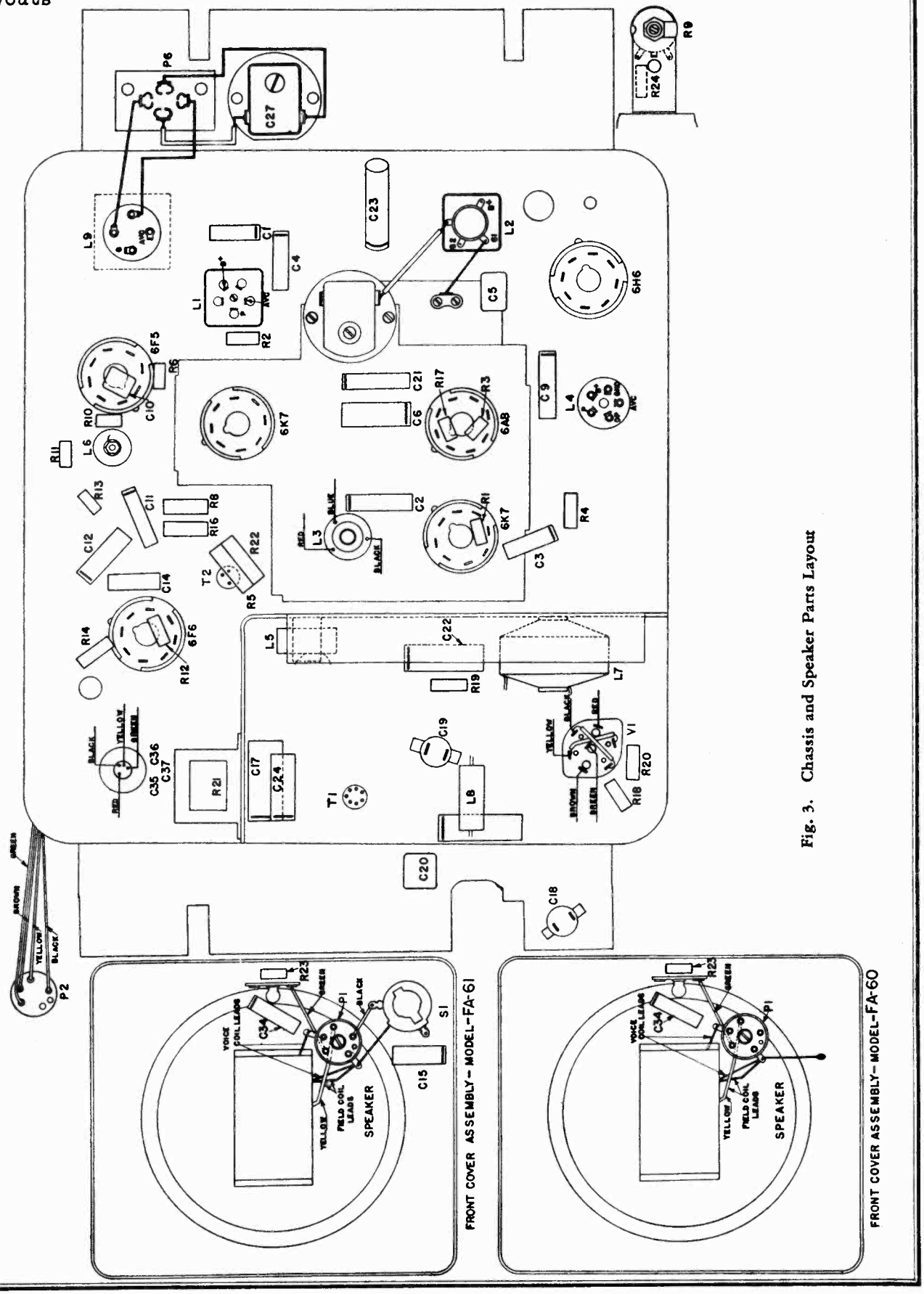


Fig. 3. Chassis and Speaker Parts Layout

GENERAL ELECTRIC CO.

ELECTRICAL SPECIFICATIONS

Tuning Frequency Range.....540–1600 kc

Intermediate Frequency.....175 kc

Electrical Power Output

Undistorted.....3 watts
Maximum.....4 watts

Tone Control

Model FA-61.....2-point control

Current Consumption

Storage Battery.....6.3 volts—7.0 amps.

Loudspeaker—Electrodynamic

Speaker Diameter.....6½ inches
Cone Coil Impedance.....5.5 ohms at 400 cycles

AVERAGE SOCKET VOLTAGES

Tube	Plate to Ground Volts DC	Screen Grid to Ground Volts DC	Cathode to Ground Volts DC	Heater Volts DC	Cathode Current M.A.
6K7 R.F.	200	97	3.4	6.3	5.8
6A8 Oscillator	200	..	..	6.3	9.5
6A8 Converter	210	97	4		
6K7 I.F.	200	97	3.4	6.3	5.8
6F5 1st A.F.	147	..	1.5	6.3	0.3
6F6 Output	231	251	15.6	6.3	37

Filter Input Voltage—265
Filter Output Voltage—251

Total Plate Current 63 M.A.

Storage Battery 6.4 volts—no signal input—1000 ohms per volt meter—dial pointer at 54.

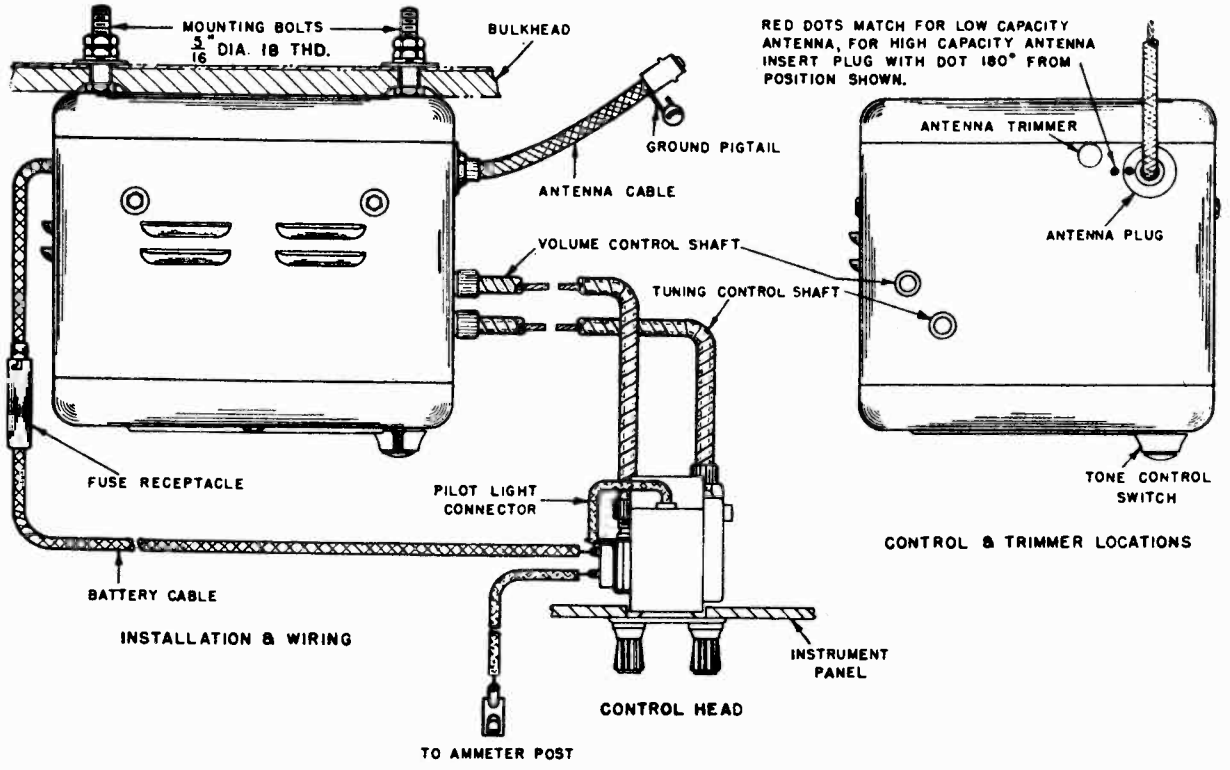


Fig. 1A. Installation Diagram

MODELS FA-60, FA-61
Alignment, Parts
Installation Notes

GENERAL ELECTRIC CO.

GENERAL INFORMATION

Models FA-60 and FA-61 are compact, single-unit superheterodyne receivers employing six General Electric Metal Tubes and a synchronous type vibrator power supply. A 6F6 pentode output tube provides ample power for the 6½-in. electrodynamic speaker. The use of an iron core antenna coil and an antenna matching trimmer, results in maximum transfer of energy from the antenna to the control grid of the 6K7 R.F. tube, providing a high signal-to-noise ratio.

The receiver chassis are housed in st..dy metal cases. To change tubes or align the receiver it is only necessary to remove the speaker cover which is secured by four snap fasteners. The chassis can be taken out of the case for servicing by removing seven self-tapping screws.

Tubes

R.F. Amplifier	6K7 Super-control triple-grid amplifier
Converter and Oscillator	6A8 Pentagrid converter
First I.F. Amplifier	6K7 Super-control triple grid amplifier
Detector and A.V.C.	6H6 Twin diode
Audio Amplifier	6F5 High gain triode
Output	6F6 Power amplifier pentode
Dial Lamp	6.3 Volt, Mazda No. 44

PHYSICAL SPECIFICATIONS

Height	8⅛ in.
Width	9 in.
Depth	7⅝ in.
Weight Packed	22 lbs.

Tuning Control Drive Ratio.... 12 to 1

ANTENNA MATCHING SYSTEM

The design of the antenna input system makes it possible to use these receivers with either low or high capacity antennas with maximum efficiency. In general, the fish-pole, under-car, built-in top, and over-top antennas are of the low-capacity type. Insulated metal top or insulated running board antennas, used in some cars, are of the high-capacity type.

The antenna male plug can be inserted into the female receptacle on the receiver in either of two positions. If the car antenna is of the low-capacity type, the plug should be inserted so that the red dots on the male plug and the receiver case are on the same side. If a high-capacity antenna is used, the red dots should be opposite each other.

The antenna coupling trimmer (C-27) should be adjusted on a weak signal between 1200 and 1500 K.C. with volume control nearly full on.

It may not be possible to "peak" the trimmer if an extremely low-capacity antenna is used. In such cases, turn the trimmer (C-27) to its maximum capacity (counter-clockwise) position, and "peak" the trimmer (C-28) on the antenna section of the gang condenser. (Antenna plug in low-capacity position).

If the antenna coupling trimmer (C-27) can be peaked with the antenna plug inserted in either position, it is recommended that the low-capacity position (red dots adjacent) be used.

In some installations, where there is not much room to work, it is advisable to adjust the antenna coupling trimmer before bolting the receiver in place.

The wiring of the antenna plugs is such that, in the low capacity position, C-27 is in series with the antenna to the high tap on the antenna coil. In the high capacity position, C-27 is in series with the antenna to the low tap on the antenna coil. These connections may be traced on the schematic diagram.

Degeneration

Audio degeneration is provided by returning a portion of the voice coil voltage of the proper phase to a section of the volume control. This is accomplished by grounding one side of the voice coil and connecting the high side of the voice coil through the capacitor (C-34) and resistor (R-23) to the resistor (R-24) which is in series with the volume control to ground.

The use of degeneration improves the frequency response and reduces non-linear distortion introduced by the audio amplifier.

ALIGNMENT PROCEDURE

In order to align these receivers properly, it is necessary to have the following test equipment:

1. A modulated test oscillator.
2. An output indicator such as a 3 to 5 volt a-c voltmeter.
3. An alignment tool with a small screw driver blade.

All trimmers for aligning the receiver can be reached by removing the speaker cover. When the speaker cover is removed from the case, the field return should be made by a jumper lead between the speaker cover and case. The alignment adjustments should be made with the test oscillator output at the lowest level which will give a readable output indication.

I. F. Alignment

1. Connect an output meter across the voice coil of the loud speaker. Place a modulated 175 K.C. signal on the grid of the converter (6A8) tube through a .05 Mfd. condenser. Set the volume control at maximum and adjust the 2nd I.F. trimmer and the 1st I.F. secondary and primary trimmers in the order mentioned for maximum output. Readjust all the trimmers to insure accurate alignment.

R. F. Alignment

Attach the flexible cables to the control head and to the proper bushings on the receiver. Make sure that the control head is rigidly fastened and that its relative position in respect to the receiver will not change.

1. Adjust the scale calibration by rotating the station selector knob in a counterclockwise direction until the low frequency end of the dial has reached its stop and the gang plates are completely meshed.

2. Set the test oscillator to 1500 K.C. with the modulation "on." Connect its output through a 250 Mmf. condenser to the prong nearest the red dot on the receiver antenna receptacle. Set the receiver dial to 150 and peak the oscillator (C-30), R.F. (C-29) and antenna (C-28) trimmers respectively (see trimmer location drawing) to give maximum deflection on the output meter.

3. Set the test oscillator to 580 K.C. and tune the receiver to this signal. Peak the 580 K.C. capacitor (C-26) while rocking the tuning condenser back and forth through resonance. Leave the padder at the setting which gives the greatest deflection.

4. Realign the oscillator trimmer (C-30) at 1500 K.C. as in operation No. 2.

INSTALLATION NOTES

BATTERY POLARITY

If the receiver is being used in a car with the positive battery terminal grounded, the vibrator should be inserted so that the arrow on the label points to (+) on the vibrator top. For use with cars having the negative terminal grounded the arrow must point to (−). The receiver will not operate if the vibrator is inserted in the wrong position.

ATTACHING VOLUME CONTROL CABLE

1. Rotate the volume control fully clockwise with a screwdriver.

2. Turn the volume control knob to its extreme counter-clockwise position, then insert the flexible cable into the receiver bushing.

3. Rotate the knob fully clockwise against the slip-clutch built in the volume control. If the cable tip does not engage the slot in the volume control during the first half of its rotation, reset the volume control with a screwdriver, so that this will occur.

4. Tape both the volume and tuning control cables securely in place to prevent them from changing position.

If these instructions are followed, there will be no tendency for the switch to snap "on" due to tension in the flexible cable.

SETTING THE DIAL

The gang condenser drive is equipped with a friction clutch. After the flexible drive cables have been connected and taped securely in position, rotate the tuning knob in a counter-clockwise direction until the dial reaches its stop at the low frequency end. Continue to rotate the knob for several turns against the friction clutch and the dial will be set correctly.

SUPPRESSION OF IGNITION NOISE

Included with each receiver is a distributor suppressor, a generator condenser, and an ammeter condenser. When these are properly installed, the receiver should be free of ignition noise but if the interference persists, try one or more of the following suggestions:

See that the distributor contacts and spark plug points do not have too wide a gap. They should be set as recommended by the car manufacturer.

If a built-in roof antenna is used, shield the lead-in from the set up to the antenna and place an R.F. filter, consisting of a choke and condenser, in the lead to the dome light as close as possible to the point where the lead enters the corner post.

When grounding the antenna cable shield, or making any other grounds, select a point which is most effective in reducing the noise pick-up. In some cases quieter operation may be obtained by omitting the antenna shield ground connection entirely.

Ground the motor block to the frame by means of ½-inch copper braid. Also ground the steering post, speedometer cable, oil gauge line, etc., to the bulkhead. It is possible that interference may be carried from the motor compartment to the receiver by these cables.

In cars with composite wood and steel bodies, it may be necessary to bond various parts together such as the instrument panel and the corner posts.

If the ignition coil is mounted on the inside of the bulkhead, it may be helpful to move it to the motor side.

Wheel static interference may be overcome by installing static collector springs under the hub caps.

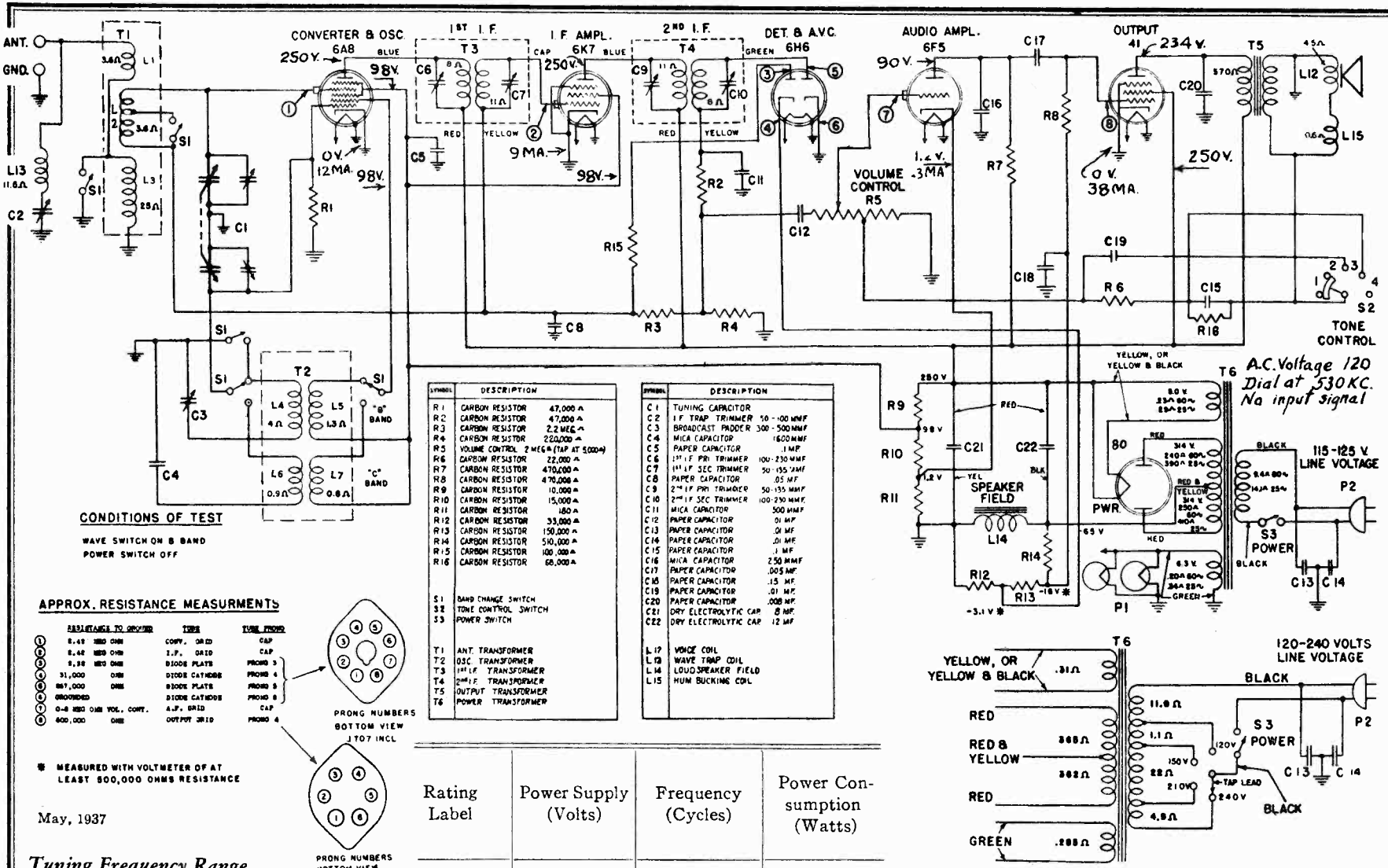
REPLACEMENT PARTS LIST

MODELS FA-60 AND FA-61

Insist on genuine factory-tested parts which may be purchased from authorized dealers.

Stock No.	Description	List Price
RA-309	ASSEMBLY—Receiver mounting studs, nuts, and washers	$0.20
*RB-008	BOARD—Terminal Board (2 lugs)	.10
*RB-013	BOARD—Terminal Board (2 lugs)	.10
*RB-017	BOARD—Terminal Board (1 lug)	.10
*RB-019	BOARD—Terminal Board (3 lugs)	.10
RB-603	BASE—Vibrator grounding base	.15
*RC-011	CAPACITOR—.002 mfd., 600 volt paper (C-14)	.25
RC-032	CAPACITOR—.01 mfd., 200 volt paper (C-9)	.25
*RC-036	CAPACITOR—.008 mfd., 200 volt paper (C-15) (Model FA-61 only)	.30
RC-051	CAPACITOR—.02 mfd., 1500 volt paper (C-10) (C-22)	.30
*RC-072	CAPACITOR—.05 mfd., 200 volt paper (C-1, C-4, C-21, C-34)	.25
*RC-080	CAPACITOR—.02 mfd., 400 volt paper (C-11)	.25
*RC-096	CAPACITOR—.1 mfd., 200 volt paper (C-2)	.30
RC-102	CAPACITOR—1 mfd., 100 volt paper (C-2)	.30
*RC-123	CAPACITOR—1 mfd., 400 volt paper (C-6, C-12, C-24)	.35
RC-149	CAPACITOR—.25 mfd. 400 volt (C-23)	.35
RC-156A	CAPACITOR—.5 mfd., 120 volt paper (C-18, C-19)	.45
RC-157A	CAPACITOR—.5 mfd., 200 volt interference filter capacitor	.45
RC-182	CAPACITOR—.5 mfd., 400 volt paper (C-17)	.40
*RC-235	CAPACITOR—100 mmf. Mica (C-5, C-7, C-8)	.25
*RC-258	CAPACITOR—250 mmf. Mica (C-10)	.25
*RC-349	CAPACITOR—.002 mfd., Mica (C-20)	.30
RC-570	CAPACITOR—5 mfd., 450 volt (C-35); 8 mfd., 450 volt (C-36); 10 mfd., 20 volt (C-37); Dry Electrolytic	1.40
RC-639	CAPACITOR—Antenna padder capacitor (C-27) 150-500 mmf.	.40
RC-640	CAPACITOR—Oscillator padder capacitor (C-26), 500-1000 mmf.	.40
RC-716-22	CONDENSER—3 gang condenser and trimmers (C-25, C-28, C-29, C-30)	4.60
RC-825	CABLE—Antenna lead-in cable complete with plugs (P-4)	1.60
RC-826	CABLE—Battery cable from set to fuse including connector	.20
RC-1955	CUSHION—Gang condenser rubber mounting cushion assembly	.20
RD-200-22	DRIVE—Gang drive assembly complete	.60
RF-202	FASTENER—Case cover snap fastener (pkg. of 4)	.10
RP-302	FUSE—20 amp fuse (pkg. of 10)	1.00
*RG-001	GRID CAP—(Pkg. of 5)	.10
RK-014	KNOB—Tone control knob	.10
RL-037	COIL—Antenna coil (L-9)	1.30
RL-132	COIL—RF coil assembly (L-1)	1.30
RL-239	COIL—Oscillator coil assembly (L-2)	.70
RL-321	REACTOR—Line filter reactor (L-8)	.20
RL-322	REACTOR—B+ reactor (L-5)	.25
RL-323	REACTOR—Vibrator reactor (L-7)	.65
RL-324	REACTOR—R.F. choke coil (L-6)	.35
RL-325	REACTOR—Iron core filter reactor (R-21)	.95
RP-067	PLUG—Female antenna plug (P-6)	.15
RP-068	PLUG—Male antenna plug (P-5)	.15
RQ-1227	RESISTOR—47 ohm, ½ W. Carbon (R-19) (Pkg. of 5)	.70
RQ-1245	RESISTOR—270 ohm, ½ W. Carbon (R-1, R-18, R-20) (Pkg. of 5)	.70
RQ-1249	RESISTOR—390 ohm, ½ W. Carbon (R-10, R-17) (Pkg. of 5)	.70
RQ-1269	RESISTOR—2700 ohm, ½ W. Carbon (R-24) (Pkg. of 5)	$0.70
RQ-1291	RESISTOR—22,000 ohm, ½ W. Carbon (R-23) (Pkg. of 5)	.70
RQ-1293	RESISTOR—27,000 ohm, ½ W. Carbon (R-6) (Pkg. of 5)	.70
RQ-1299	RESISTOR—47,000 ohm, ½ W. Carbon (R-3, R-13) (Pkg. of 5)	.70
RQ-1307	RESISTOR—.1 meg ½ W. Carbon (R-2) (Pkg. of 5)	.70
RQ-1311	RESISTOR—150,000 ohm, ½ W. Carbon (R-11) (Pkg. of 5)	.70
RQ-1315	RESISTOR—220,000 ohm, ½ W. Carbon (R-7) (Pkg. of 5)	.70
RQ-1323	RESISTOR—.47 meg. ½ W. Carbon (R-12, R-15) (Pkg. of 5)	.70
RQ-1331	RESISTOR—1.0 meg. ½ W. Carbon (R-4) (Pkg. of 5)	.70
RQ-1450	RESISTOR—430 ohm, 1 W. Carbon (R-14)	.20
RQ-1471	RESISTOR—3300 ohm, 1 W. Carbon (R-8)	.20
RQ-1473	RESISTOR—3900 ohm, 1 W. Carbon (R-16)	.20
RQ-1491	RESISTOR—22,000 ohm, 1 W. Carbon (R-5)	.20
RQ-1493	RESISTOR—27,000 ohm, 1 W. Carbon (R-22)	.20
RS-170	SHIELD—Antenna coil shield	.20
RS-213	SOCKET—Vibrator socket (Pkg. of 5)	.75
RS-214	SOCKET—8 pin tube socket (Pkg. of 5)	.60
RS-339	SWITCH—Tone control switch (S-1) (Model FA-61 only)	.40
RS-503	SLEEVE—Fuse insulating sleeve	.05
RS-504	SUPPRESSOR—Ignition suppressor resistor	.35
RT-234	TRANSFORMER—1st I.F. transformer (complete) (L-3)	1.75
RT-235	TRANSFORMER—2nd I.F. transformer (complete) (L-4)	1.85
RT-424	TRANSFORMER—Output transformer (T-2)	1.15
RT-0610	TRANSFORMER—Power transformer (T-1)	3.80
RV-022	VOLUME CONTROL—1 meg. volume control (R-9)	.90
RV-200	VIBRATOR—Rectifier type vibrator (V-1)	4.00
	CONTROL HEAD ASSEMBLY	
RH-700	HEAD—Control head assembly (not including drive cables)	4.25
RC-827	CABLE—Battery cable from switch to fuse including connector	.25
RC-828	CABLE—20-inch drive cable	1.25
RC-829	CABLE—18-inch drive cable	1.25
RC-830	CABLE—24-inch drive cable	1.25
RK-015	KNOB—Control knobs and skirts (4 pieces). Specify Instrument Panel Control Kit Number	.45
RL-916	LAMP—Pilot lamp (Pkg. of 10)	1.50
RS-342	SWITCH—Power switch (mounted on control head)	.30
	SPEAKER ASSEMBLY	
*RC-916	CONE—Speaker cone and voice coil including gaskets	.90
*RC-1950	CLAMP—Cone spider clamp	.05
*RP-012	PLUG—Female speaker plug (P-2)	.20
RP-069	PLUG—Male speaker plug (P-1)	.20
RS-045	SPEAKER—6½-in. type speaker (Model FA-61)	4.00
RS-047	SPEAKER—6½-in. type speaker (Model FA-60)	4.00

* Used on previous receivers. (Prices subject to change without notice.)



CONDITIONS OF TEST

WAVE SWITCH ON B BAND
POWER SWITCH OFF

SYMBOL	DESCRIPTION	
R1	CARBON RESISTOR	47,000 Ω
R2	CARBON RESISTOR	47,000 Ω
R3	CARBON RESISTOR	2.2 MEG Ω
R4	CARBON RESISTOR	220,000 Ω
R5	VOLUME CONTROL	2 MEG Ω (TAP AT 5000Ω)
R6	CARBON RESISTOR	22,000 Ω
R7	CARBON RESISTOR	470,000 Ω
R8	CARBON RESISTOR	470,000 Ω
R9	CARBON RESISTOR	10,000 Ω
R10	CARBON RESISTOR	15,000 Ω
R11	CARBON RESISTOR	180 Ω
R12	CARBON RESISTOR	33,000 Ω
R13	CARBON RESISTOR	150,000 Ω
R14	CARBON RESISTOR	510,000 Ω
R15	CARBON RESISTOR	100,000 Ω
R16	CARBON RESISTOR	68,000 Ω
S1	BAND CHANGE SWITCH	
S2	TONE CONTROL SWITCH	
S3	POWER SWITCH	
T1	ANT. TRANSFORMER	
T2	OSC. TRANSFORMER	
T3	1ST I.F. TRANSFORMER	
T4	2ND I.F. TRANSFORMER	
T5	OUTPUT TRANSFORMER	
T6	POWER TRANSFORMER	

SYMBOL	DESCRIPTION	
C1	TUNING CAPACITOR	
C2	I.F. TRAP TRIMMER	50 - 100 MMF
C3	BROADCAST PADDER	300 - 500 MMF
C4	MICA CAPACITOR	1600 MMF
C5	PAPER CAPACITOR	.1 MF
C6	1ST I.F. PRI. TRIMMER	100 - 230 MMF
C7	1ST I.F. SEC. TRIMMER	50 - 135 MMF
C8	PAPER CAPACITOR	.05 MF
C9	2ND I.F. PRI. TRIMMER	50 - 135 MMF
C10	2ND I.F. SEC. TRIMMER	100 - 230 MMF
C11	MICA CAPACITOR	500 MMF
C12	PAPER CAPACITOR	.01 MF
C13	PAPER CAPACITOR	.01 MF
C14	PAPER CAPACITOR	.01 MF
C15	PAPER CAPACITOR	.1 MF
C16	MICA CAPACITOR	250 MMF
C17	PAPER CAPACITOR	.005 MF
C18	PAPER CAPACITOR	.15 MF
C19	PAPER CAPACITOR	.01 MF
C20	PAPER CAPACITOR	.008 MF
C21	DRY ELECTROLYTIC CAP.	8 MF
C22	DRY ELECTROLYTIC CAP.	12 MF
L12	VOICE COIL	
L13	WAVE TRAP COIL	
L14	LOUD SPEAKER FIELD	
L15	HUM BUCKING COIL	

APPROX. RESISTANCE MEASURMENTS

	RESISTANCE TO GROUND	TUBE	TUBE PRONG
1	8.48 MEG OHM	CONV. GRID	CAP
2	8.48 MEG OHM	I.F. GRID	CAP
3	9.38 MEG OHM	DIODE PLATE	PRONG 3
4	31,000 OHM	DIODE CATHODE	PRONG 4
5	887,000 OHM	DIODE PLATE	PRONG 5
6	GROUNDED	DIODE CATHODE	PRONG 6
7	0-8 MEG OHM VOL. CONT.	A.F. GRID	CAP
8	600,000 OHM	OUTPUT GRID	PRONG 4

* MEASURED WITH VOLTMETER OF AT LEAST 500,000 OHMS RESISTANCE

PRONG NUMBERS BOTTOM VIEW 1 TO 7 INCL

PRONG NUMBERS BOTTOM VIEW FOR 8

May, 1937

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A	115–125	50–60	70
C	115–125	25–60	70
V	115–155 and 190–250	50–60	75

NOTE: Rating "V" receivers may be used on 40-cycle circuits provided the voltage does not exceed 110 volts on the 115–125-volt tap or 200 volts on the 190–220-volt tap.

Tuning Frequency Range

Band "B" . . . . . 540–1750 KC
Band "C" . . . . . 2.2–7.0 MC

Intermediate Frequency . . . . . 465 KC

Electrical Power Output

Undistorted . . . . . 2.5 Watts
Maximum . . . . . 5.0 Watts

Loud-speaker—Electrodynamic

Cone: Model F-63 . . . . . 6½ in.
Model F-65 . . . . . 8 in.
Model F-66 . . . . . 12 in.

Speaker Impedance . . . . . 5.5 ohms at 400 cycles

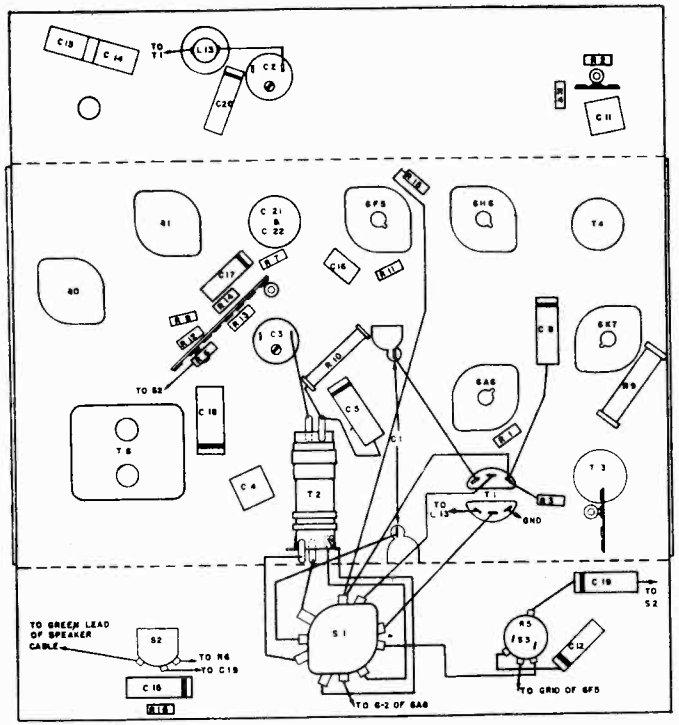


Fig. 2. Chassis Parts Layout

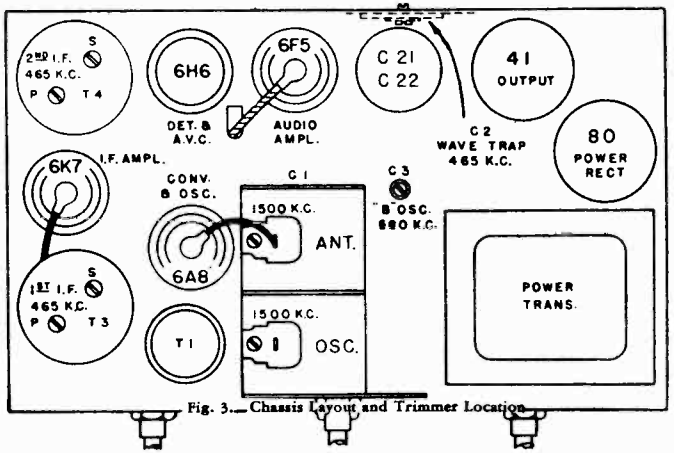


Fig. 3.—Chassis Layout and Trimmer Location

I. F. ALIGNMENT WITH OSCILLOSCOPE

Band Switch Setting	Input Freq.	Point of Input	Dummy Antenna	Trimmer	Comments
1. Band "B"	465 K.C. Sweep	I.F. Grid	.05 Mfd. or Larger	2nd I.F. Sec. (C-10) 2nd I.F. Pri. (C-9)	Gang condenser plates wide open—connect audio input of oscilloscope to ground and to the junction of R-3 and R-4 of the 2nd I.F. transformer—Adjust trimmers in order mentioned for a single symmetrical curve of maximum amplitude.
2. Band "B"	465 K.C. Sweep	Converter Grid	.05 Mfd. or Larger	1st I.F. Sec. (C-7) 1st I.F. Pri. (C-6)	
3. Band "B"	465 K.C. Sweep	Antenna Post	250 Mmf. 400 ohms	Wave Trap Trimmer (C-2)	Adjust trimmer for minimum amplitude.

I. F. ALIGNMENT WITH OUTPUT METER

1. Band "B"	465 K.C. with Modulation	I.F. Grid	.05 Mfd. or Larger	2nd I.F. Sec. (C-10) 2nd I.F. Pri. (C-9)	Gang condenser plates wide open—connect output meter across voice coil—keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output
2. Band "B"	465 K.C. with Modulation	Converter Grid	.05 Mfd. or Larger	1st I.F. Sec. (C-7) 1st I.F. Pri. (C-6)	
3. Band "B"	465 K.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Wave Trap Trimmer (C-2)	Adjust trimmer for minimum output.

R. F. ALIGNMENT

1. Band "B"					Close gang plates—Adjust pointer to first line at left end of tuning scale.
2. Band "C"	No adjustments necessary				
3. Band "B"	1500 K.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. trimmer (Front sect. of gang cond.) Ant. trimmer (Rear sect. of gang cond.)	Connect output meter across voice coil—tone control on "bass" position—peak trimmers for maximum output with a low input signal.
4. Band "B"	580 K.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. padder (C-3)	Adjust padder for a maximum output meter indication in vicinity of 580 K.C. while rocking the gang condenser.
5. Band "B"	Repeat operation No. 3				

L1, L2 and L3 are the components of the "B" band antenna coil and are wound on the same coil form. When operating in the "C" band, L3 and a part of L2 are shorted out by the wave change switch. L4–L5 and L6–L7 are the "B" and "C" band oscillator coils respectively and are wound on the same coil form. The "B" band oscillator grid coil is shorted out by a contact of S-1 when the set is operating on the "C" band.

The intermediate frequency amplifier consists of a 6K7 tube and two transformers, both of which have tuned primaries and secondaries. The output of this amplifier is applied to one plate of the 6H6 diode which is a combined detector, initial bias and automatic volume control tube.

Volume is controlled by the variable potentiometer R-5 in the grid circuit of the 6F5 1st audio amplifier tube. The output of the 6F5 tube is resistance coupled to the grid of the type 41 power amplifier pentode. The plate circuit of the 41 tube is suitably matched to the loud-speaker by means of a step-down output transformer.

Proper bias voltages for the various tubes are obtained by the use of a tapped bleeder circuit across the speaker field L14. One of the cathodes of the 6H6 diode is returned to −3.1 volts on this bleeder circuit in order to provide initial bias to all the tubes controlled by the A.V.C.

Tone Control

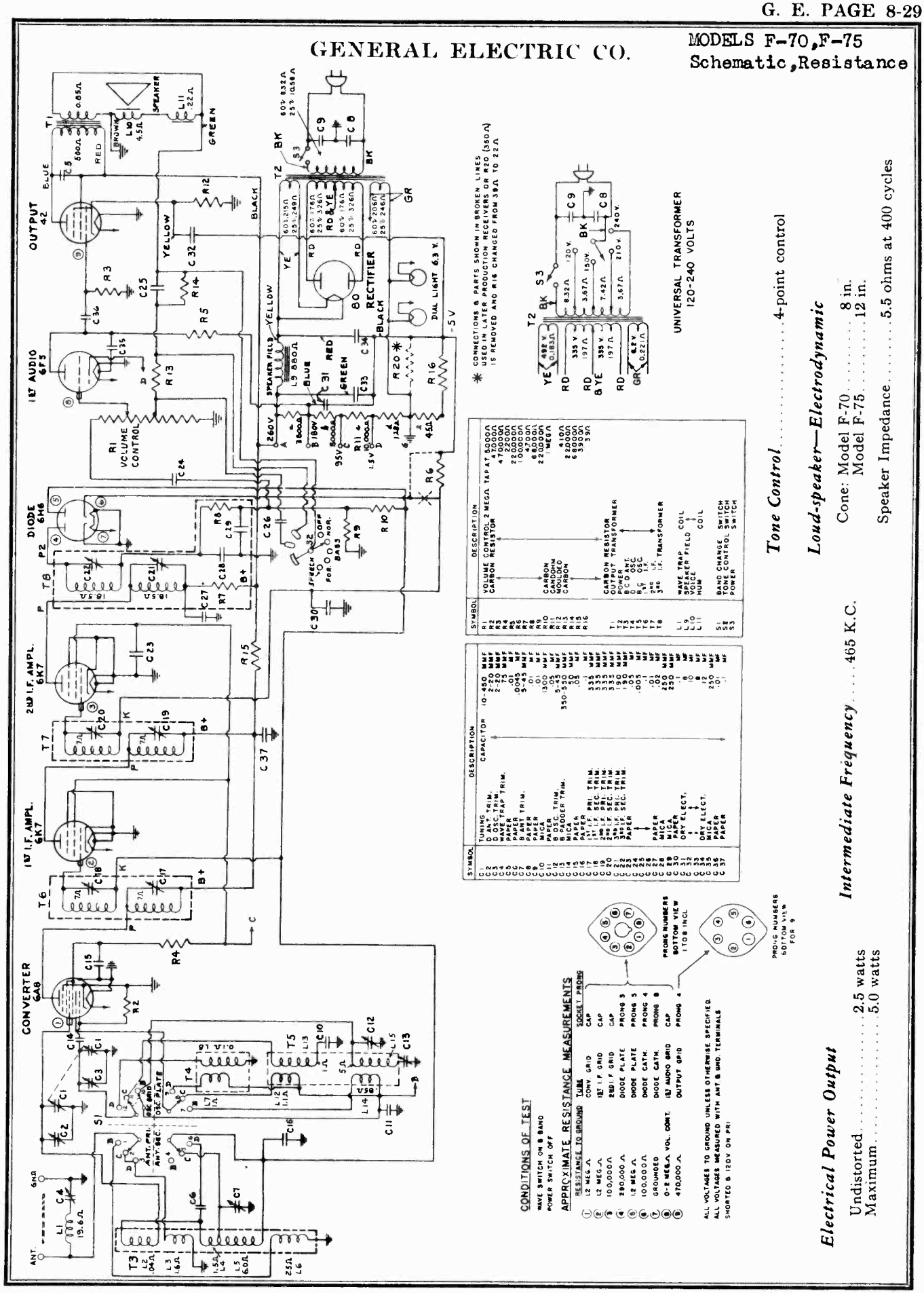
When the tone control switch is in the "normal" position, a portion of the output voltage of the receiver is fed back through a resistor-capacitor network consisting of C-15, R-16 and R-6 to a tap on the volume control. This feed back voltage is out of phase with the input and the resulting degeneration improves the frequency characteristic and reduces distortion. In the "bass" position, the tone control switch connects C-19 in parallel with the above network. The value of C-19 is such that more degeneration of the high than the low frequency notes occurs, thereby increasing the bass response. The "foreign" position of the switch shorts out C-15 and R-16 and places C-19 and R-6 in parallel which gives a frequency response best suited for short-wave reception. In the "speech" position, C-15 and R-16 are shorted out, C-19 is removed from the circuit, leaving R-6, thereby providing flat degeneration at all frequencies which is the most desirable condition for the reception of programs predominating in speech. The tone control switching described can be traced on the schematic diagram shown in Fig. 1.

Tubes

Oscillator and Converter	6A8 Pentagrid converter
IF Amplifier	6K7 Triple-grid Super-control Amplifier
Detector and AVC	6H6 Twin Diode
First Audio Amplifier	6F5 High-gain Triode
Audio Power Amplifier	41 Power Amplifier Pentode
Rectifier	80 Full-wave Rectifier
Dial Lamp	MAZDA No. 46

GENERAL ELECTRIC CO.

MODELS F-70, F-75
Schematic, Resistance



SYMBOL	DESCRIPTION	CAPACITOR
C1	TUNING	10-450 MMF
C2	D. ANT. TRIM.	2-20 MMF
C3	D. OSC. TRIM.	75 MMF
C4	WAVE TRAP TRIM.	.0005 MF
C5	PAPER	.01 MF
C6	B. ANT. TRIM.	5-45 MMF
C7	PAPER	.01 MF
C8	PAPER	.01 MF
C9	MICA	1300 MMF
C10	B. OSC. TRIM.	5-55 MMF
C11	B. PADDER TRIM.	350-530 MMF
C12	MICA	.05 MF
C13	PAPER	.05 MF
C14	PAPER	.1 MF
C15	1ST I.F. PRI. TRIM.	335 MMF
C16	1ST I.F. SEC. TRIM.	335 MMF
C17	2ND I.F. PRI. TRIM.	335 MMF
C18	2ND I.F. SEC. TRIM.	335 MMF
C19	3RD I.F. PRI. TRIM.	190 MMF
C20	3RD I.F. SEC. TRIM.	190 MMF
C22	PAPER	.05 MF
C23	PAPER	.005 MF
C24	PAPER	.1 MF
C25	MICA	.02 MF
C26	MICA	250 MMF
C27	PAPER	.02 MF
C30	DRY ELECT.	8 MF
C31	DRY ELECT.	8 MF
C32	PAPER	.02 MF
C33	PAPER	.05 MF
C34	PAPER	.05 MF
C35	PAPER	.05 MF
C36	PAPER	.05 MF
C37	PAPER	.1 MF

SYMBOL	DESCRIPTION	
R1	VOLUME CONTROL 2 MEGA TAP AT 500Ω	
R2	CARBON RESISTOR	4700Ω
R3		22000Ω
R4		2200000Ω
R5		1000000Ω
R6		68000Ω
R7		2200000Ω
R8		1 MEGA
R9	CARBON	2400Ω
R10	CANDOHM	6800000Ω
R11	MOULDED	390000Ω
R12	CARBON	39Ω
R13		
R14		
R15		
R16		
T1	CARBON RESISTOR	
T2	OUTPUT TRANSFORMER	
T3	POWER	
T4	B.C.O. ANT.	
T5	B.C.O. OSC.	
T6	1ST I.F.	
T7	2ND I.F. TRANSFORMER	
T8	3RD I.F.	
L1	WAVE TRAP	
L9	SPEAKER FIELD COIL	
L10	VOICE	
L11	HUM COIL	
S1	BAND CHANGE SWITCH	
S2	TONE CONTROL SWITCH	
S3	POWER SWITCH	

Tone Control.....4-point control

Loud-speaker—Electrodynamic

Cone: Model F-70.....8 in.
Model F-75.....12 in.

Speaker Impedance.....5.5 ohms at 400 cycles

Intermediate Frequency.....465 K.C.

Electrical Power Output

Undistorted.....2.5 watts
Maximum.....5.0 watts

MODELS F-70, F-75
Alignment, Socket
Trimmers

GENERAL ELECTRIC CO.

Fig. 3. Overall I.F. Curve

ALIGNMENT INFORMATION

A "dummy antenna" should be used in all alignments and is the capacitor or capacitor and resistor used in series with the signal generator. The grid lead should not be removed from the tube to which the input signal is applied when aligning the I.F. as this would remove the grid bias from the tube.

Band Switch Setting	Input Freq.	Point of Input	Dummy Antenna	Trimmer	Comments
I. F. ALIGNMENT WITH OSCILLOSCOPE					
1. Band "B"	465 K.C. Sweep	2nd I.F. Grid	.05 Mfd.	3rd I.F. Sec. (C-22) 3rd I.F. Pri. (C-21)	Gang condenser plates wide open—connect vertical input of oscilloscope to ground and the junction of C-24 and R-9 on 3rd I.F. transformer. Adjust trimmers for a single symmetrical curve of maximum amplitude. The resulting curve with input at converter grid is shown in Figure 3.
2. Band "B"	465 K.C. Sweep	1st I.F. Grid	.05 Mfd.	2nd I.F. Sec. (C-20) 2nd I.F. Pri. (C-19)	
3. Band "B"	465 K.C. Sweep	Converter Grid	.05 Mfd.	1st I.F. Sec. (C-18) 1st I.F. Pri. (C-17)	
4. Band "B"	465 K.C. Sweep	Antenna Post	250 Mmf. 400 ohms	Wave Trap Trimmer (C-4)	Adjust for minimum amplitude.
I. F. ALIGNMENT WITH OUTPUT METER					
1. Band "B"	465 K.C. with Modulation	2nd I.F. Grid	.05 Mfd.	3rd I.F. Sec. (C-22) 3rd I.F. Pri. (C-21)	Gang condenser plates wide open—connect output meter across voice coil—keep input signal low and volume control at maximum. Adjust all trimmers in order mentioned for maximum output. Do not attempt an overall realignment after stage by stage alignment has been accomplished.
2. Band "B"	465 K.C. with Modulation	1st I.F. Grid	.05 Mfd.	2nd I.F. Sec. (C-20) 2nd I.F. Pri. (C-19)	
3. Band "B"	465 K.C. with Modulation	Converter	.05 Mfd.	1st I.F. Sec. (C-18) 1st I.F. Pri. (C-17)	
4. Band "B"	465 K.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Wave Trap Trimmer (C-4)	Adjust for minimum output.
R. F. ALIGNMENT					
1. Band "B"					Close gang plates—adjust pointer to first line at left end of tuning scale.
2. Band "D"	18 M.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. (C-3) Ant. (C-2)	Connect output meter across voice coil—tone control on "Bass" position. The image of any "D" band signal should be heard 930 K.C. above input signal when (C-3) is on proper peak. Example: 15 M.C. image—15,930 K.C. Peak (C-2) while rocking the gang condenser.
3. Band "C"	No adjustments necessary.				
4. Band "B"	1500 K.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. (C-12) Ant. (C-7)	Peak trimmers for maximum output with a low input signal.
5. Band "B"	580 K.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. Padder (C-13)	Adjust padder for maximum output in vicinity of 580 K.C. while rocking the gang condenser.
6. Band "B"	1500 K.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. (C-12) Ant. (C-7)	Peak trimmers for maximum output with a low input signal.

CHASSIS LAYOUT AND TRIMMER LOCATIONS

GENERAL ELECTRIC CO.

MODELS F-70, F-75
Chassis, Voltage

SOCKET VOLTAGES

Tube No.	Plate to Ground Volts D-C	Screen Grid to Ground Volts D-C	Cathode to Ground Volts D-C	Cathode Current M.A.	Heater Volts A-C
6A8 Oscillator	190	....	....	....	....
6A8 Converter	235	100	0	11	6.3
6K7 1st I.F. Amplifier	235	105	0	5	6.3
6K7 2nd I.F. Amplifier	235	105	0	7	6.3
6H6 Detector and A.V.C.	0 sig. −6 delay	....	0 sig. −6 delay	0 0	6.3
6F5 Audio Amplifier	120*	....	1.2	0.2	6.3
42 Output	250	265	16	39	6.3
80 Power Rectifier	640/320 RMS	....	335 D-C	70	5.0

A-C line voltage 120—No signal input—1000 ohms per volt-meter—dial pointer at 530 K.C.
* Measured on 500-volt scale.

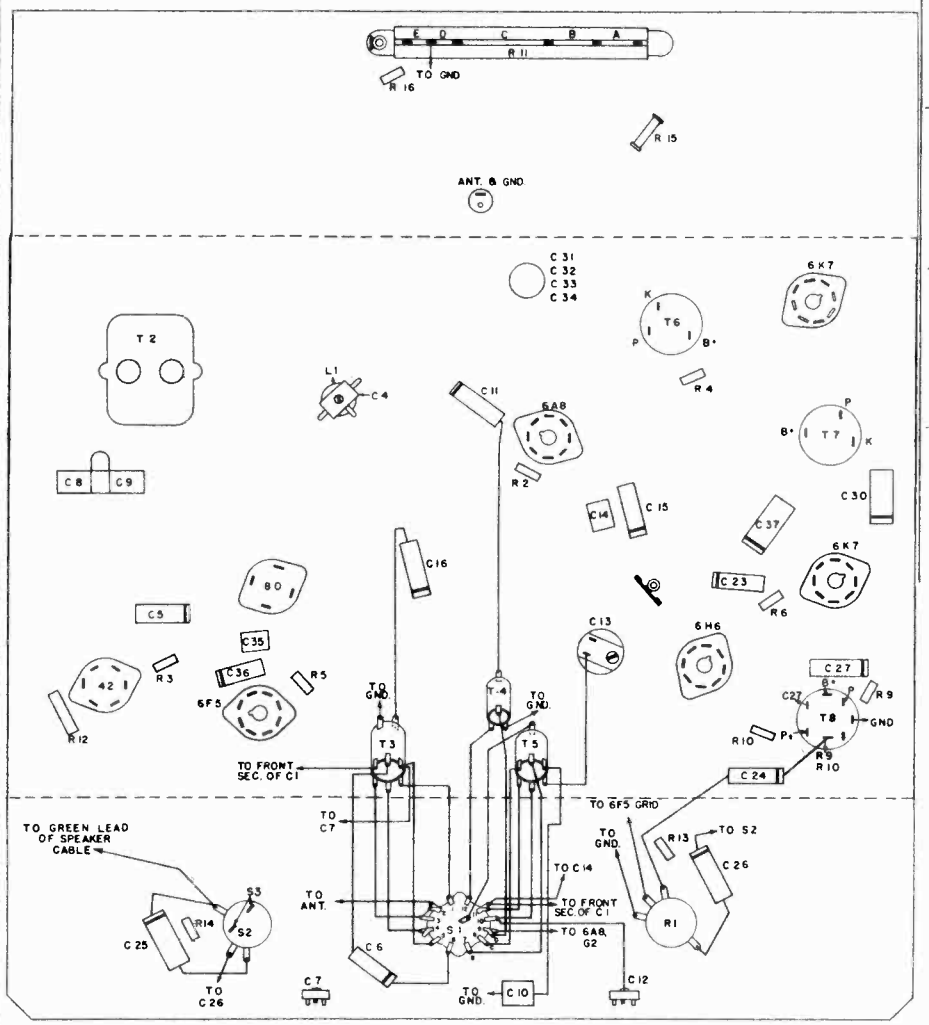


Fig. 2. Chassis Parts Layout

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A	115–125	50–60	80
C	115–125	25–60	85
V	115–155 and 190–250	50–60	85

NOTE: Rating "V" receivers may be used on 40-cycle circuits provided the voltage does not exceed 110 volts on the 115-125 volt tap or 200 volts on the 190-220 volt tap.

Electrical Specifications

Tuning Frequency Range

Band "B" ..... 540– 1600 K.C.
Band "C" ..... 1550– 5800 K.C.
Band "D" ..... 5400–18000 K.C.

Tuning Control Drive Ratio

Fast Tuning ..... 8 to 1
Vernier Tuning ..... 40 to 1

MODELS U-70,U-75
Socket,Vibrator
Dial Assembly,Data

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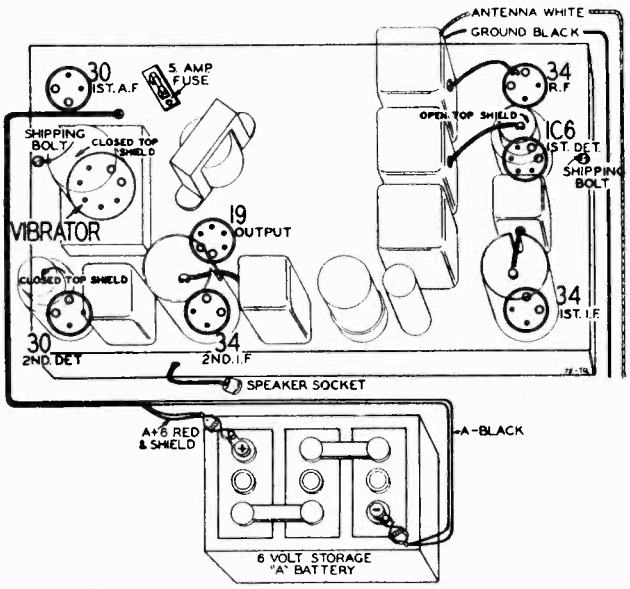

Fig. 4—Tube Arrangement and Battery Connections

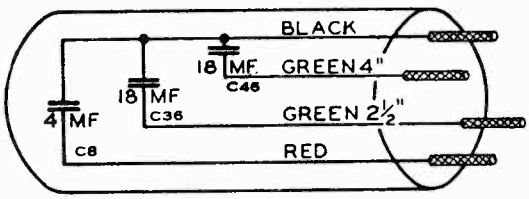

Fig. 8—Electrolytic Condenser Internal Connections

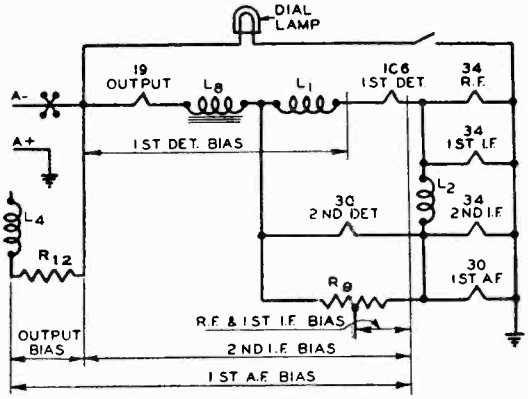

Fig. 5—Abridged wiring diagram showing filament wiring system and points at which no-signal bias voltages are obtained.

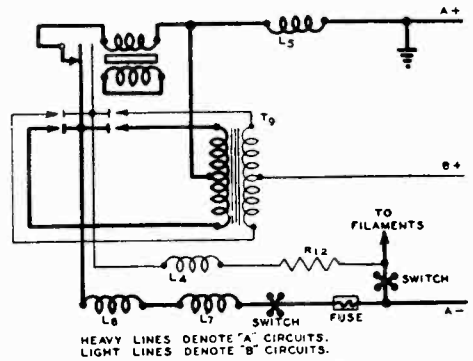

Fig. 6—Abridged wiring diagram showing action of synchronous vibrator

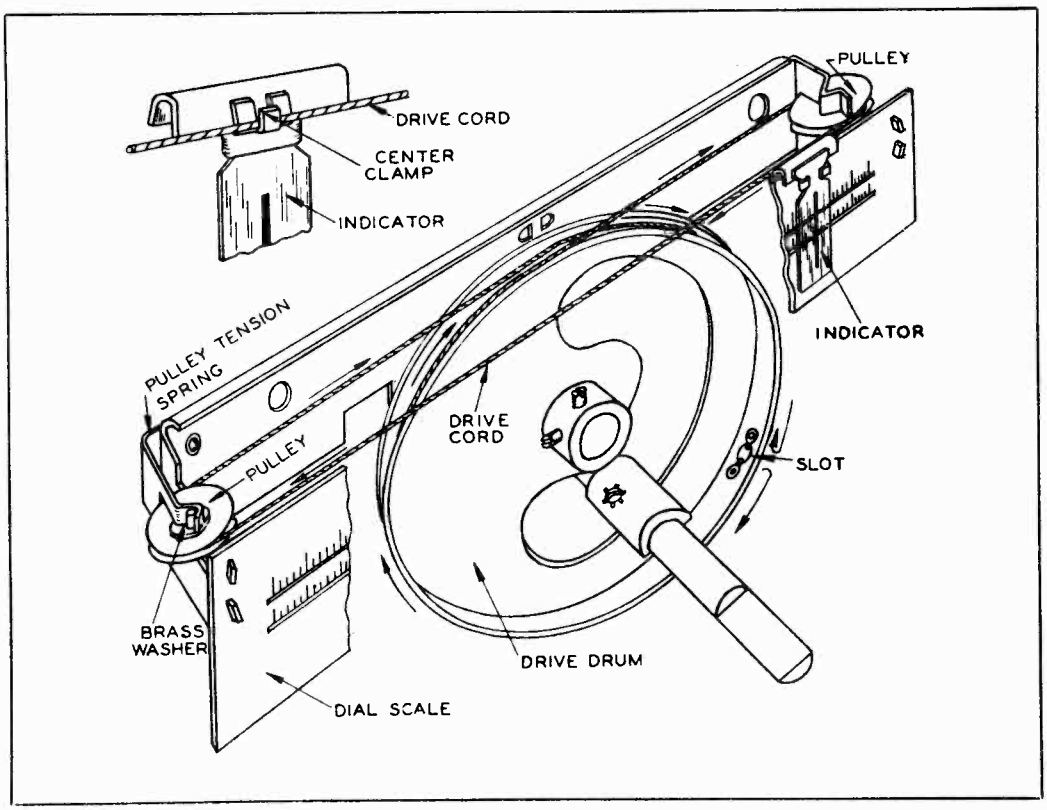

Fig. 9—Dial and Drive Assembly

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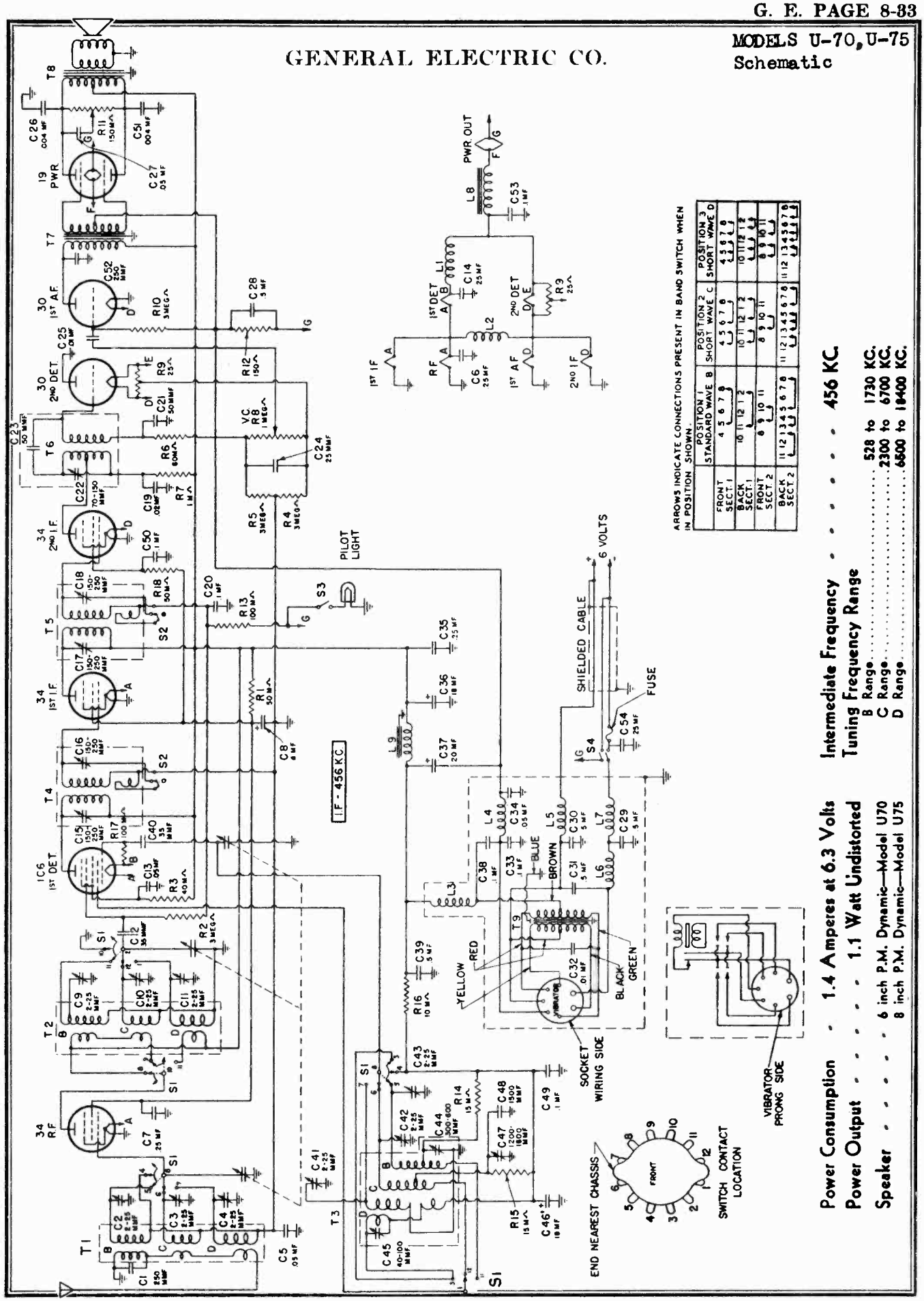
MODELS U-70, U-75
Schematic



ARROWS INDICATE CONNECTIONS PRESENT IN BAND SWITCH WHEN IN POSITION SHOWN.

	POSITION 1 STANDARD WAVE B	POSITION 2 SHORT WAVE C	POSITION 3 SHORT WAVE D
FRONT SECT. 1	4 5 6 7 8	4 5 6 7 8	4 5 6 7 8
BACK SECT. 1	10 11 12 1 2	10 11 12 1 2	10 11 12 1 2
FRONT SECT. 2	8 9 10 11	8 9 10 11	8 9 10 11
BACK SECT. 2	11 12 1 3 4 5 6 7 8	11 12 1 3 4 5 6 7 8	11 12 1 3 4 5 6 7 8

Power Consumption - 1.4 Amperes at 6.3 Volts
Power Output - 1.1 Watt Undistorted
Speaker - 6 inch P.M. Dynamic—Model U70
8 inch P.M. Dynamic—Model U75

Intermediate Frequency - 456 KC.
Tuning Frequency Range
B Range.....528 to 1730 KC.
C Range.....2300 to 6700 KC.
D Range.....6500 to 18400 KC.

MODELS U-70, U-75
Trimmers, Voltage
Resistance, Coils

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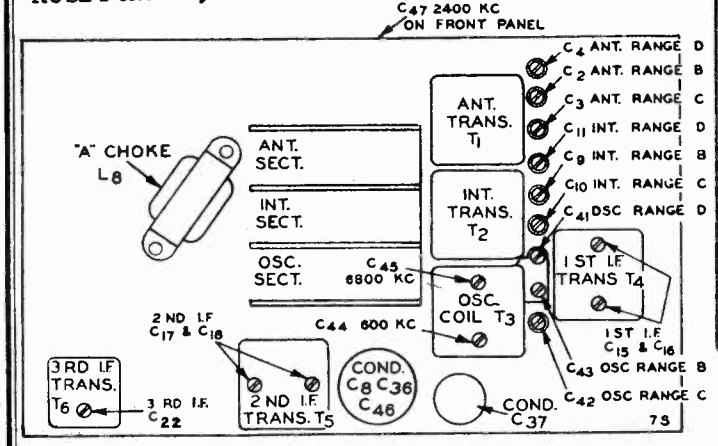

Fig. 3—Location of Trimmers

VOLTAGES AT SOCKETS

Volume Control at Maximum — Antenna Shorted to Ground
Battery - 6 Volts — Band Switch in Standard Wave Position

Type of Tube	Function	Across Filament	Plate to Ground	Screen to Ground	Bias Voltage See Notes
34	R.F.	2.0	145	55	1.0(1)
1C6	1st Det.-Osc.	2.0	145 90(2)	60	2 (3)
34	1st I.F.	2.0	145	55	1.0(1)
34	2nd I.F.	2.0	140	90	4.0(3)
30	2nd Det.	2.0			
30	1st A.F.	2.0	140		9 (4)
19	Power	2.0	140		5 (5)

(1) As read from negative filament leg to tap of resistor R9.
(2) Anode grid to ground.
(3) As read from negative filament leg to A—.
(4) Total voltage drop from negative filament leg to low potential end of resistor R12.
(5) As read across resistor R12.

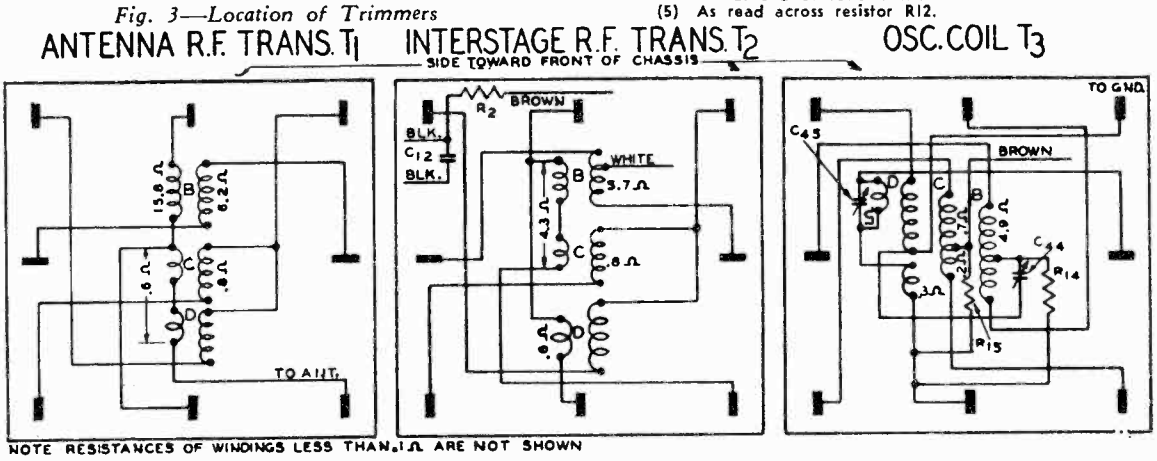

Fig. 7—R.F. and Oscillator Coil Base Terminal Arrangement and D. C. Resistance of Windings

Switch Contact Location Numbering

A standard arrangement for switch contact location numbering has been adopted. This numbering is illustrated in Fig. 2. In contact locations not used, the number applying to that particular location is not employed.

D. C. Resistance of Windings

Refer to Figs. 2 & 7

Following are the D. C. resistances of the various windings in the chassis. The values given below will vary slightly in different sets.

Part No.	Winding	Code	D. C. Resistance in Ohms
RBL-003	Antenna R.F. Transformer	T1	
	Range B Primary Winding		15.8
	Range C Primary Winding		0.6
	Range D Primary Winding		
	Range B Secondary Winding		6.2
	Range C Secondary Winding		0.8
	Range D Secondary Winding		Small
RBL-100	Interstage R.F. Transformer	T2	
	Range B Primary Winding		4.3
	Range C Primary Winding		0.6
	Range D Primary Winding		
	Range B Secondary Winding		6.3
	Range C Secondary Winding		0.8
	Range D Secondary Winding		Small
RBL-202	Oscillator Coils	T3	
	Range B Oscillator Grid Coil		3.9
	Range C Oscillator Grid Coil		0.7
	Range D Oscillator Grid Coil		Small
	Range B Oscillator Plate Coil		1.0
	Range C Oscillator Plate Coil		0.2
	Range D Oscillator Plate Coil		0.3
	Range D Oscillator Tracking Reactor		1.0

Part No.	Winding	Code	D. C. Resistance in Ohms
RBT-205	1st I.F. Tranformer	T4	
	Primary Winding		12.9
	Secondary Winding		12.8
	Coupling Winding		0.5
RBT-206	2nd I.F. Transformer	T5	
	Primary Winding		12.9
	Secondary Winding		12.9
	Coupling Winding		0.5
RBT-207	3rd I.F. Transformer	T6	
	Primary Winding (Upper Winding)		8.5
	Primary Winding (Lower Winding)		7.7
	Secondary Winding		126.5
RBT-500	Input Transformer	T7	
	Primary Winding		1035.
	Secondary Winding		
	Center Tap to Inside		610.
	Center Tap to Outside		660.
RBT-401	Output Transformer	T8	
	Primary Winding		
	Center Tap to Inside		118.
	Center Tap to Outside		135.
	Secondary Winding		0.7
RBS-004 & 005	Dynamic Speaker 6" and 8"		
	Speaker Voice Coil		0.5
RBT-070	Power Transformer	T9	
	Primary Winding		
	Center Tap to Inside		0.3
	Center Tap to Outside		0.3
	Secondary Winding		
	Center Tap to Inside		166.
	Center Tap to Outside		194.
RBL-313	1st Det. Filament Reactor	L1	0.5
RBL-312	1st I.F. Filament Reactor	L2	0.6
RBL-311	"B" Reactor	L3	17.
RBL-310	"B" Reactor	L4	0.3
RBL-308	"A" Line Reactor	L5	0.1
RBL-309	"A" Line Reactor	L6	0.1
RBL-308	"A" Line Reactor	L7	0.1
RBL-307	"A" Reactor (Iron Core)	L8	0.7
RBL-306	"B" Reactor (Iron Core)	L9	350.

A signal generator that will provide an accurately calibrated signal at 456, 1730, 1500, 600, 6700, 6000, 2400, 18,400, 15,000 and 6800 KC and an output indicating meter are required. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

I. F. Adjustment

Set the signal generator for a signal of 456 KC.

Connect the output of the signal generator through a .1 mf. condenser to the control grid of the 1st detector.

Connect the ground lead of the receiver to the ground post of the signal generator.

Turn the band switch to the Range B position (standard wave band).

Turn the volume control to the maximum position.

Turn the selectivity control to the sharp position and keep it in this position for all adjustments.

Attenuate the signal from the signal generator to prevent the levelling-off action of the AVC.

Then adjust the five I.F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis and the location is shown in Fig. 3.

Range B Alignment

After the procedure for the alignment of each range, as explained below, is completed, it is advisable to repeat the procedure as a final check.

1730 KC Adjustment

Set the signal generator for 1730 KC.

Turn the rotor of the tuning condenser to the full open position.

Range C Alignment

CAUTION—When aligning the short wave band be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 5000 KC. The signal will then be heard at 5000 KC on the dial of the radio. The image signal, which is much weaker, will be heard at 5000 less 912 KC, or 4088 KC. It may be necessary to increase the input signal to hear the image.

6700 KC Adjustment

Set the signal generator for 6700 KC.

Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range C position (first short wave band).

Adjust the oscillator Range C trimmer (C42) until maximum output is obtained. See Fig. 3 for location of this trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage Range C trimmer (C10) and antenna Range C trimmer (C3) to maximum.

6700 KC Adjustment

Set the signal generator for 6700 KC.

Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range C position (first short wave band).

Adjust the oscillator Range C trimmer (C42) until maximum output is obtained. See Fig. 3 for location of this trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage Range C trimmer (C10) and antenna Range C trimmer (C3) to maximum.

Do not change the setting of the oscillator Range C trimmer.

2400 KC Adjustment

Set the signal generator for 2400 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 2400 KC padder (C47) until the peak of greatest intensity is obtained. See Fig. 3 for location of this padder.

Range D Alignment

18,400 KC Adjustment

Set the signal generator for 18,400 KC.

Keep the antenna lead of the receiver connected through the 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band switch to the Range D position (second short wave band).

Adjust the oscillator Range D trimmer (C41) until maximum output is obtained. See Fig. 3 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage Range D trimmer (C11) and antenna Range D trimmer (C4) to maximum.

When adjusting the interstage and antenna Range D trimmers, it will be necessary at the same time to turn the tuning condenser rotor slowly back and forth until the peak of greatest intensity is obtained.

Do not change the setting of the oscillator Range D trimmer.

6800 KC Adjustment

Set the signal generator for 6800 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 6800 KC padder (C45) until the peak of greatest intensity is obtained. See Fig. 3 for location of this padder.

Caution

Do not turn the receiver on unless ALL the tubes are in the sockets. Removal of any of them will result in abnormal voltages on the remaining tubes.

Be sure that the battery clips are connected to the battery with the correct polarity. Reversed connections may damage the receiver.

Do not use any power source other than a 6 volt storage battery.

If the receiver does not operate after being turned on, turn the switch off immediately, examine the battery connections and the fuse and see if all tubes are properly inserted.

Servicing Power Unit

The power unit is that portion of the chassis assembly contained within the large rectangular shield can and the circuit for which is shown within the dotted lines at the lower left side of the schematic diagram, Fig. 2.

Continuity Resistance Check—The power transformer, choke coil circuits and condenser shorts may be checked by utilizing the vibrator socket terminals and various points on the "A" or "B" lines, without removal of the shield can. For example: when checking the continuity or resistance of the upper half of the transformer secondary, contact may be made with the test prods at the proper vibrator socket terminal, as shown on the circuit diagram, and at the positive terminal of the 20 mf. electrolytic condenser, C37.

Removing Transformer and Vibrator Socket Assembly—Take off the filter unit shield can by removing the four self tapping screws at the right side (from front) of the chassis base and the five hex nuts from the bolts at the top of the chassis.

Unsolder the ground connections from the two lugs on the inside of the chassis base (right side from front). Unsolder the black and white coded wire from the terminal strip lug nearest the front of the chassis. This terminal strip is mounted on the transformer cover. Now unsolder the bracket holding the terminal strip to the transformer cover.

Proceed with replacement of the power transformer or with any other necessary service or replacements and then reassemble.

Replacement of Buffer Condenser C32—This condenser is located in the top of the transformer and vibrator assembly just underneath the vibrator socket. To replace, remove the assembly as explained in the preceding article.

In addition, the two screws holding the vibrator socket to the transformer cover assembly should be taken out. The condenser is then easily replaced.

Replacing Drive Cord

Remove the chassis from the cabinet.

Lift off the dial lamp assembly and remove the old drive cord, pulleys, washer and indicator.

Turn the drive drum until the slot in the rim is in the position shown in Fig. 9.

Insert one end of the drive cord in the slot and wind the cord around the drum in a clockwise direction for about two-thirds of a turn, or until it reaches the top of the drum.

Now, before putting the right pulley (from front) in place, bring the cord around the pulley from back to front so that the cord is adjacent to the celluloid dial scale; then place the pulley in position.

Extend the cord over to the left and bring it around the other pulley from front to back before placing this pulley. Put the small brass washer on the upper shaft of the pulley and place the pulley in position as shown in Fig. 9.

Bring the cord over to the drive drum and wind it around the drum in a clockwise direction, keeping it behind the cord already on the drum.

Push the pulley tension spring in toward the drive drum so as to provide slack in the cord while the free end is being inserted into the slot in the rim.

Now mesh the condenser plates completely. Replace the celluloid indicator on the dial strip and attach it to the drive cord as shown in Fig. 9. The line on the indicator should cover the 530 KC mark on the dial scale.

Caution—When attaching the indicator to the drive cord, do not pinch the center clamp too tightly on the cord or the cord will be cut. After the clamp is pinched slightly a small amount of shellac on it will hold the cord securely.

Replace the dial lamp assembly.

Trimmer Replacement

If one trimmer of the gang trimmer strip should become defective, it is not necessary to replace the entire strip. A single trimmer RBC-609, as shown in the replacement parts list, may be used. Disconnect the lead from the coil side (side not grounded) of the defective trimmer in the strip. This connection is then made to the single trimmer. Connect it to the side of the trimmer not in contact with the adjusting screw. The other side of the single trimmer is then connected to a good ground, using a piece of heavy wire in order to support the trimmer adequately. In replacing a trimmer, be sure to keep both leads as short as possible and keep the ungrounded lead as far from ground as possible.

MODELS U-70, U-75
Parts

GENERAL ELECTRIC CO.

Replacement Parts – Models U70 and U75

Insist on genuine factory-tested parts which may be purchased from authorized dealers.

Stock No.	Description	List Price
RBB-004	BOARD—Fuse Board	$ .10
RBB-005	BOARD—Terminal board, single lug (Mtg. Foot left of lug)	.10
RBB-006	BOARD—Terminal board single lug (Mtg. Hole at one end)	.10
RBB-007	BOARD—Terminal board, 2 lugs (Mtg. Hole in center)	.10
RBB-008	BOARD—Terminal board, single lug (Mtg. Foot to right of lug)	.10
RBB-100	BRACKET—Dial support bracket	.10
RBB-102	BRACKET—Dial mtg. bracket and reflector	.15
RBB-103	BRACKET—Gang support bracket	.20
RBB-104	BRACKET—Dial extension bracket	.10
RBB-105	BRACKET—Dial lamp bracket and socket	.20
RBC-001	CAPACITOR—.1 Mfd., 180 V. paper (C-20, C-33, C-38, C-49, C-50, C-53)	.20
RBC-003	CAPACITOR—.25 Mfd., 180 V. paper (C-6, C-7, C-14, C-35, C-54)	.25
RBC-004	CAPACITOR—.01 Mfd., 180 V. paper (C-25)	.15
RBC-005	CAPACITOR—.05 Mfd., 180 V. paper (C-5, C-13, C-34)	.15
RBC-006	CAPACITOR—.05 Mfd., 180 V. paper (C-28, C-29, C-39)	.40
RBC-008	CAPACITOR—.01 Mfd., 1000 V. paper (C-32)	.15
RBC-009	CAPACITOR—.02 Mfd., 180 V. paper (C-19)	.15
RBC-010	CAPACITOR—.5 Mfd., 180 V. paper (C-31)	.30
RBC-011	CAPACITOR—.5 Mfd., 180 V. paper (C-30)	.30
RBC-012	CAPACITOR—.05 Mfd., 240 V. paper (C-27)	.15
RBC-013	CAPACITOR—.004 Mfd., 600 V. paper (C-26, C-51)	.15
RBC-201	CAPACITOR—35 Mmfd., Mica (C-12, C-40)	.10
RBC-203	CAPACITOR—50 Mmfd., Mica (C-21, C-23)	.10
RBC-208	CAPACITOR—250 Mmfd., Mica (C-1, C-52)	.15
RBC-209	CAPACITOR—1500 Mmfd., Mica (C-48)	.20
RBC-210	CAPACITOR—25 Mmfd., Mica (C-24)	.10
RBC-503	CAPACITOR—4 Mfd., 18 Mfd., 18 Mfd., 150 V. dry electrolytic (C-8, C-36, C-46)	1.50
RBC-504	CAPACITOR—20 Mfd., 150 V. wet electrolytic (C-37)	.95
RBC-604	CAPACITOR—70-150 Mmfd., double trimmers 1st and 2nd IF transformer (C-15, C-16, C-17, C-18)	.40
RBC-605	CAPACITOR—300-600, 40-100 Mmfd., double padder Band "B" and "D" (C-44, C-45)	.45
RBC-606	CAPACITOR—40-100 Mmfd. trimmer 3rd IF transformer (C-22)	.25
RBC-607	CAPACITOR—2-25 Mmfd. Ant., R.F., and osc. trimmers, Bands "B", "C" and "D" (C-2, C-3, C-4, C-9, C-10, C-11, C-41, C-42, C-43) (See RBC-609 for replacement of any one section)	.95
RBC-608	CAPACITOR—1200-1600 Mmfd., padding capacitor (C-47)	.50
RBC-609	CAPACITOR—2-25 Mmfd., Mica Replacement trimmer for any section of trimmer strip RBC-607	.10
RBC-702	CONDENSER—3 gang condenser and reduction drive	4.85
RBC-800	CABLE—Drive Cable	.10
RBC-804	CABLE—Spkr. cable and socket assembly	.45
RBC-805	CABLE—Shielded battery cable	1.00
RBC-902	CONE—Spkr. Cone for U-70	2.50
RBC-903	CONE—Spkr. Cone for U-75	3.00
RBC-950	CUSHIONS—Rubber chassis mtg. cushions ea.	.10
RBC-951	CLIP—25 Amp. Batt. clip ea.	.15
RBC-952	CLIP—Vibrator spring clip	.10
RBC-954	CUSHION—Gang condenser rubber mounting cushion assembly	.40
RBD-001	DRUM—Dial drive drum	.30
RBD-005	DIAL—Dial scale	.35
RBD-006	DRIVE—Tuning cord reduction drive assembly	1.10
RBF-002	FOOT—Chassis mtg. foot	.10
RBF-003	FOOT—Rear mounting foot for gang condenser	.10
RBF-300	FUSE—5 Amp. fuse	.10
RBG-001	GRID CAP—Control grid cap	.10
RBK-001	KNOB—Control knob (except band switch)	$ .10
RBK-003	KNOB—Band switch knob	.15
RBL-003	COIL—Ant. coil and shield assembly (T-1)	1.90
RBL-100	COIL—R.F. coil and shield assembly (T-2)	2.35
RBL-202	COIL—Oscillator coil and shield assembly (T-3)	3.20
RBL-306	REACTOR—"B" reactor (iron core) (L-9)	1.00
RBL-307	REACTOR—"A" reactor (iron core) (L-8)	.85
RBL-308	REACTOR—"A" line reactor (L-5, L-7)	.35
RBL-309	REACTOR—"A" line reactor (L-6)	.35
RBL-310	REACTOR—"B" reactor (L-4)	.30
RBL-311	REACTOR—"B" reactor (L-3)	.30
RBL-312	REACTOR—1st IF filament reactor (L-2)	.35
RBL-313	REACTOR—1st Det. filament reactor (L-1)	.40
RBL-900	LEADS—Ant. and gnd. lead assembly	.30
RBL-902	LAMP—Dial lamp	.15
RBP-001	PULLEY—Dial pulley	.10
RBP-003	POINTER—Dial pointer	.10
RBQ-002	RESISTOR—3 megohm, .2 Watt Carbon (R-2, R-4, R-5, R-10)	.15
RBQ-012	RESISTOR—10,000 ohm, .2 Watt Carbon (R-16)	.15
RBQ-016	RESISTOR—1,000 ohm, .2 Watt Carbon (R-7)	.10
RBQ-017	RESISTOR—50,000 ohm, .2 Watt Carbon (R-1, R-18)	.15
RBQ-018	RESISTOR—40,000 ohm, .2 Watt Carbon (R-3)	.10
RBQ-019	RESISTOR—60,000 ohm, .2 Watt Carbon (R-6)	.10
RBQ-020	RESISTOR—15.000 ohm, .2 Watt Carbon (R-14, R-15)	.10
RBQ-021	RESISTOR—100,000 ohm, .2 Watt Carbon (R-13, R-17)	.15
RBR-703	RESISTOR—25 ohm, 3.0 Watt; 150 ohm, 2.0 Watt wire wound resistor (R-9, R-12)	.45
RBS-004	SPEAKER—6" speaker complete with output transformer T8	5.70
RBS-005	SPEAKER—8" speaker complete with output transformer T8	6.00
RBS-100	SHIELD—Large tube shield	.20
RBS-101	SHIELD—Small tube shield (closed top)	.10
RBS-102	SHIELD BASE—Large tube shield base and vibrator shield base	.10
RBS-103	SHIELD BASE—Small tube shield base	.10
RBS-104	SHIELD—Small tube shield (open top)	.15
RBS-105	SHIELD—Vibrator shield	.20
RBS-106	SHIELD—Shield can for filter assembly (under vibrator and transformer assembly)	.50
RBS-201	SOCKET—4 prong tube socket	.10
RBS-203	SOCKET—6 prong tube socket	.10
RBS-205	SOCKET—7 prong Vibrator socket	.20
RBS-302	SWITCH—Band change switch (S1)	1.55
RBS-303	SWITCH—Selectivity Switch (S2)	.45
RBS-304	SWITCH—Dial lamp push button switch assembly (S3)	.50
RBS-400	SPRING—Pulley tension spring	.10
RBT-070	TRANSFORMER—Power transformer (T-9)	2.45
RBT-071	TRANSFORMER—Power Transformer Assembly (Includes RBC-008, RBC-952, RBS-102, RBS-205, RBT-070)	3.85
RBT-205	TRANSFORMER—1st IF transformer and shield assembly (T-4)	1.55
RBT-206	TRANSFORMER—2nd IF transformer and shield assembly (T-5)	1.55
RBT-207	TRANSFORMER—3rd IF transformer and shield assembly (T-6)	1.65
RBT-401	TRANSFORMER—Output transformer (T-8)	1.30
RBT-500	TRANSFORMER—Input transformer (T-7)	1.95
RBT-700	TONE CONTROL—150,000 ohm tone control (R-11)	.65
RBV-002	VOLUME CONTROL—1 megohm Volume Control and on-off switch (R-8) (S-4)	1.00
RBV-201	VIBRATOR—Vibrator unit	4.55
RBW-002	WINDOW—Dial window	.15
RBW-101	WASHER—Felt washer used behind knob ea.	.10

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Schematic, Batt. Conn. Switch Assembly Adapter

GENERAL ELECTRIC CO.

MODELS FB-72, FB-73 FB-76, FB-77

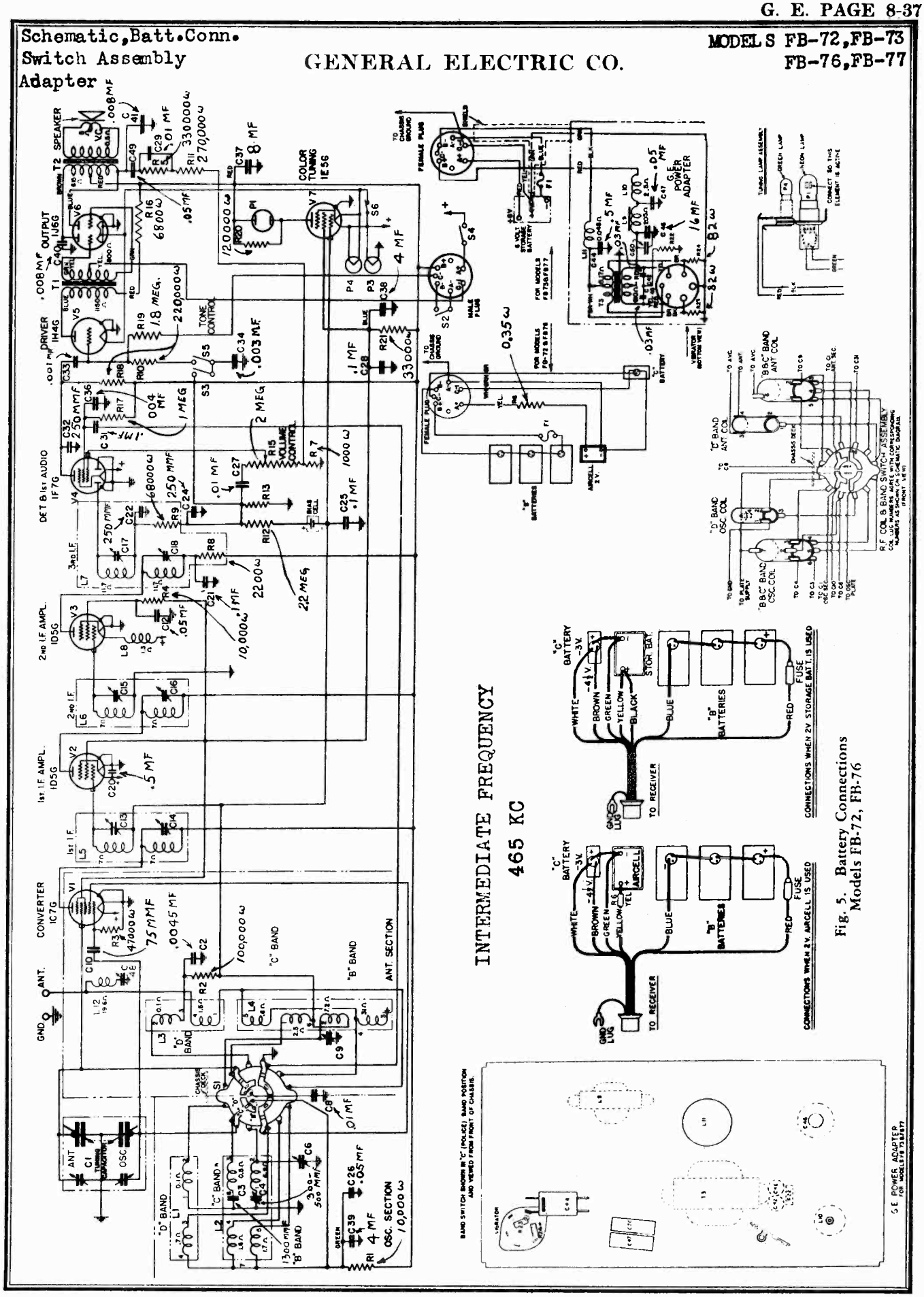

Fig. 5. Battery Connections Models FB-72, FB-76

MODELS FB-72,FB-73
FB-76,FB-77
Socket,Trimmers
Alignment,Notes

GENERAL ELECTRIC CO.

Power Supply

The chassis used in these receivers are identical except for the type of power supply employed. The 2-volt Models FB-72 and FB-76 are operated by "A," "B" and "C" batteries which are connected to the receiver by a battery cable, Stock No. BK-727.

Models FB-73 and FB-77 are operated entirely by a 6-volt storage battery, 1 cell (2 volts) of which supplies filament current. The remaining two cells (4 volts) supply the G.E. Power Adapter which, in turn, provides "B" and "C" voltages.

If desired, the 2-volt receivers may be converted to 6-volt operation at any time by the addition of a G.E. Power Adapter, Model BA-407.

In connecting a 6-volt receiver to the storage battery, first clip the yellow and green leads on the battery to avoid applying excessive voltage to the filaments, accidentally. Also, be sure to separate the two clips by connecting them to opposite ends of the battery connector strap, as shown on the Power Adapter label. This avoids establishing a common path for the filament and Power Adapter supply which would result in objectionable vibrator noise.

If it is difficult to snap the Power Adapter into position on the chassis, apply a little vaseline to the rubber mounting feet.

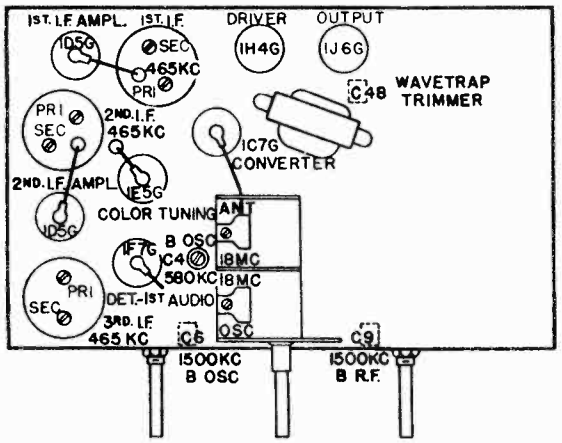

Fig. 1. Chassis Layout and Trimmer Locations

On the "D" Band (5600 to 18,000 K.C.) the oscillator operates on the *low* frequency side of the incoming signal; therefore, adjust the trimmer until the second oscillator peak is reached as the trimmer is *increased* in capacity. When the correct adjustment is made, it will be possible to tune the image of any signal on the "D" band 970 K.C. *higher* than the signal if the input is sufficiently high. Example: The image of 15 M.C. should be heard at 15,970 K.C.

The alignment procedure is given in table form on page 3. The "Dummy Antenna" is the capacitor or capacitor and resistor used in series with the signal generator antenna lead.

ALIGNMENT PROCEDURE

I.F. ALIGNMENT WITH OSCILLOSCOPE

	Band Switch Setting	Input Freq.	Point of Input	Dummy Ant.	Trimmer	Remarks
1	Band "B"	465 K.C. Sweep	1st I.F. Grid	.05 Mfd. or Larger	3rd I.F. Sec. (C-17) 3rd I.F. Pri. (C-18)	Gang condenser plates closed—connect audio input of oscilloscope to ground and to the diode load terminal of the 3rd I.F. transformer. Adjust the trimmers in order mentioned for a single symmetrical curve of maximum amplitude.
2	Band "B"	465 K.C. Sweep	1st I.F. Grid	.05 Mfd. or Larger	2nd I.F. Sec. (C-15) 2nd I.F. Pri. (C-16)	
3	Band "B"	465 K.C. Sweep	Converter Grid	.05 Mfd. or Larger	1st I.F. Sec. (C-13) 1st I.F. Pri. (C-14)	
4	Band "B"	465 K.C. Sweep	Antenna Post	250 Mmf. 400 ohms	Wave Trap (C-48)	Adjust trimmer for minimum amplitude.

I.F. ALIGNMENT WITH OUTPUT METER

1	Band "B"	465 K.C. with Modulation	1st I.F. Grid	.05 Mfd. or Larger	3rd I.F. Sec. (C-17) 3rd I.F. Pri. (C-18)	Gang condenser plates closed—Connect output meter across Voice Coil—Keep input signal low and Volume Control on as far as possible. Adjust all trimmers in order mentioned for maximum output reading on the meter.
2	Band "B"	465 K.C. with Modulation	1st I.F. Grid	.05 Mfd. or Larger	2nd I.F. Sec. (C-15) 2nd I.F. Pri. (C-16)	
3	Band "B"	465 K.C. with Modulation	Converter Grid	.05 Mfd. or Larger	1st I.F. Sec. (C-13) 1st I.F. Pri. (C-14)	
4	Band "B"	465 K.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Wave Trap (C-48)	Adjust trimmer for minimum output.

R.F. ALIGNMENT WITH OUTPUT METER

1	Band "B"					Close gang plates—adjust pointer to first line at left end of tuning scale (530 KC).
2	Band "D"	18 M.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Oscillator (18 M.C.) Antenna (18 M.C.) See Trimmer Location View	Connect output meter across Voice Coil—tone control on "Bass" position—set osc. trimmer. While rocking the gang cond. adjust the antenna trimmer for maximum output.
3	Band "C"	No adjustments necessary				
4	Band "B"	1500 K.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. (C-6) Ant. (C-9)	Peak trimmers for maximum output with a low input signal.
5	Band "B"	580 K.C. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. Padder (C-4)	Adjust padder for maximum output meter indication in vicinity of 580 K.C. while rocking the gang condenser.
6	Band "B"	1500 K.C. with Modulation	Antenna Post	250 Mmf. 400 Ohms	Osc. (C-6)	As in Operation No. 4.

GENERAL ELECTRIC CO.

MODELS FB-72,FB-73
FB-76,FB-77
Chassis,Voltage

AVERAGE SOCKET VOLTAGES

Tube	Plate to Ground Volts D.C.	Screen Grid to Ground Volts D.C.	Filament Volts D.C.	D.C. Plate Current M.A.
1C7G Oscillator	134	..	2.0	2.8
1C7G Converter	136	46	2.0	1.3
1D5G 1st I.F. Amp.	136	46	2.0	2.3
1D5G 2nd I.F. Amp.	128	46	2.0	3.5
1F7G Det. A.V.C. Audio Amp.	40	15	2.0	0.4
1H4G Driver	100	..	2.0	4.1
1J6G Output	136	..	2.0	3.9
*1E5G Color Tuning	58	43	2.0	1.5

Measured with normal battery voltages using a 1000 ohm-per-volt meter dial pointer at 540 K.C. with no signal input volume control at minimum.
* Silent tuning switch pressed.

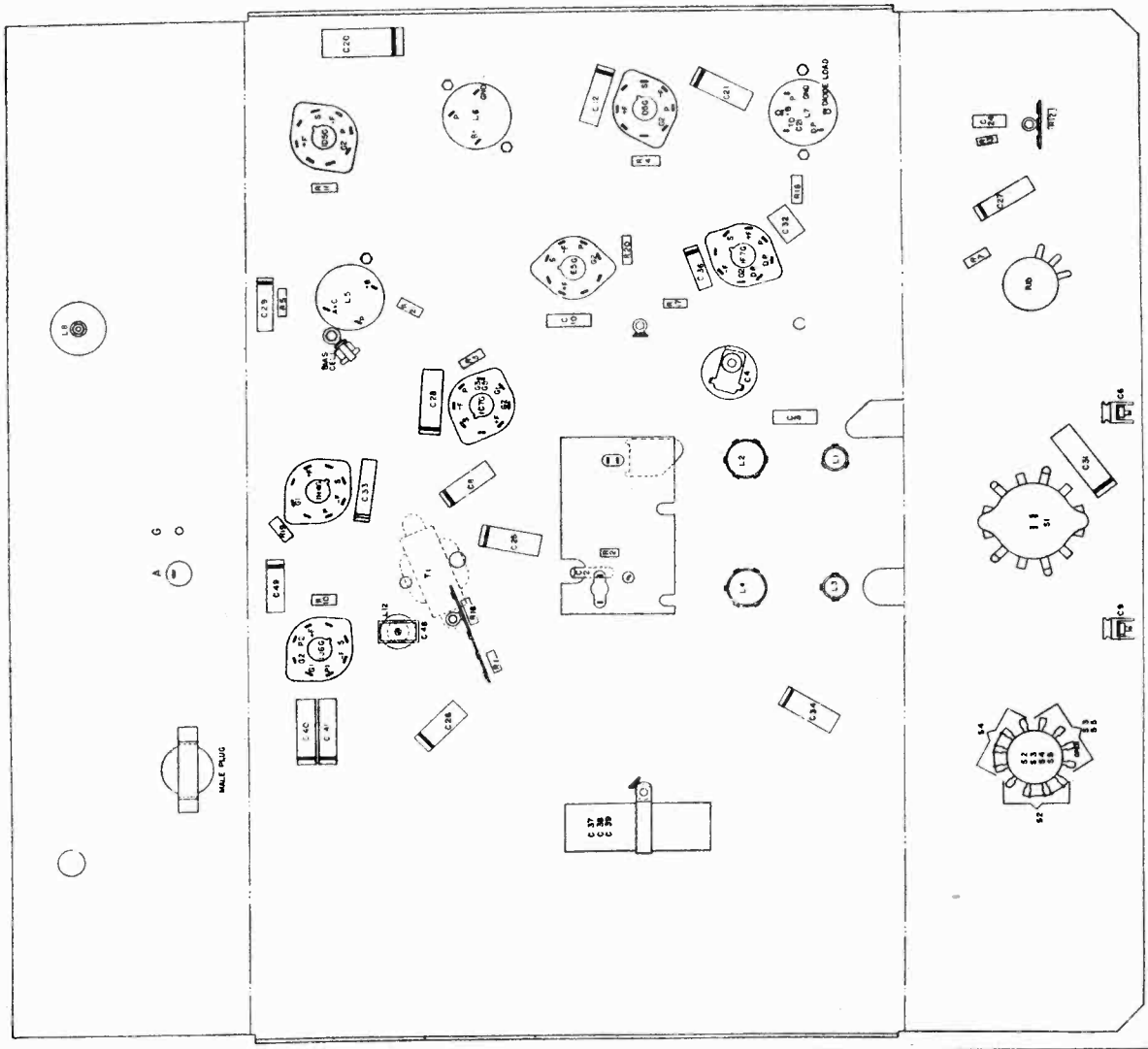

Fig. 3. Chassis Parts Layout

ELECTRICAL SPECIFICATIONS

Tuning Frequency Range

Band "B"	540-1600 K.C.
Band "C"	1600-5800 K.C.
Band "D"	5600-18,000 K.C.
Intermediate Frequency	465 K.C.

Electrical Power Output

Models FB-72—FB-76	
Undistorted	1.3 Watts
Maximum	2.2 Watts
Models FB-73—FB-77	
Undistorted	1.0 Watts
Maximum	1.6 Watts
Tone Control	3-point

Batteries Required

Models FB-72, FB-76

1—2-volt Aircell Battery (Eveready A-600)
or
1—2-volt Storage Battery
3—45-volt "B" Batteries (Eveready No. 386, No. 485, No. 486 or equivalent)
1—4½-volt "C" Battery (Eveready No. 771 or equivalent)

Models FB-73, FB-77

1—6-volt Storage Battery

Current Consumption

Models FB-72, FB-76

"A" Battery (2 volts)—0.66 Amps.—0.49 Amps.*
"B" Battery (135 volts)—22 M.A.—18 M.A.*

Models FB-73, FB-77

6-Volt Storage Battery
Filament (2 volts)—0.66 Amps.—0.49 Amps.*
G-E Power Adapter (4 volts)—1.7 Amps.

*Silent tuning switch pressed.

Loud-speaker—Permanent Magnet Dynamic

Cone diameter:

Models FB-72 and FB-73	8 inches
Models FB-76 and FB-77	12 inches
Voice Coil Impedance	5.5 ohms at 400 cycles

Tubes

Converter and Oscillator	1C7G Pentagrid converter
1st IF Amplifier	1D5G Super-control Amplifier
2nd IF Amplifier	1D5G Super-control Amplifier
Detector, AVC and Audio Amplifier	1F7G Duplex Diode Pentode
Audio Driver	1H4G Detector Amplifier Triode
Output	1J6G Class "B" Twin Amplifier
Color Tuning Control	1E5G Screen Grid Amplifier Pentode

Colorama Tuning Indicator

These receivers are equipped with a novel resonance indicator located directly above the dial, and operated by pressing the silent tuning switch (S-6) on the side of the cabinet. When no signal is tuned in, the indicator will be amber in color, but as the receiver is tuned, it will change to green. Although this device is very sensitive, some signals may be too weak to cause a change to green. In such cases, the point of exact resonance is indicated by the greatest color change obtainable.

The Colorama Tuning Indicator consists of a Neon lamp and a green bulb mounted on a metal bracket which fits in the reflector housing mounted behind the bull's-eye. The brilliance of the Neon lamp is varied by the plate current of the 1E5G tube. The control grid of the 1E5G is connected to the AVC circuit. At a condition of no signal, the grid bias is at minimum and the resulting high plate current causes a voltage drop across R-20 (Fig. 2) which illuminates the Neon lamp brightly. When a signal is tuned in the AVC increases the 1E5G bias, lowers the plate current and the voltage drop across R-20, which partially or entirely extinguishes the Neon lamp. The brilliance of the green lamp does not vary.

During listening periods, the silent tuning switch S-6) shorts out the filaments of the green colorama bulb (P-4) and the 1E5G tube and full voltage is applied to the 1H4G and 1J6G filaments. When the switch is depressed, while tuning the receiver, the parallel connected filaments of the green bulb and the 1E5G are placed in series with the filaments of the audio tubes. Due to the low resistance of the latter, most of the voltage is applied to the green bulb and the 1E5G filaments. Thus the Colorama Indicator is illuminated and the audio system becomes inoperative during the tuning period. It should be noted that the battery drain is lessened during the time the switch is depressed.

Only one plate of a Neon lamp is illuminated when operated on D.C. It is important, therefore, to turn the lamp so that the illuminated plate is toward the front when making a replacement. The Neon lamp is encased in an insulating jacket and is free to turn in the bracket.

Degeneration

A portion of the 1J6G output voltage is fed back to the audio input circuit through the resistor condenser network, C-49, C-29, R-5, R-11 and R-7. This feedback voltage is out of phase with the input and the resulting degeneration improves the frequency response and reduces distortion.

Greatest degeneration occurs at the lower settings of the volume control. As the volume is increased, the degeneration is reduced, making it possible to realize the full gain of the audio amplifier.

Bias Cell

A 1-volt bias cell is used to supply initial bias for the 1C7G converter and the 1D5G 1st IF tubes which are controlled by the AVC. Do not attempt to measure the voltage of the cell with any device which draws current. The cell will last indefinitely under normal conditions. If the receiver oscillator stops functioning on the low frequency end of the "D" band, try substituting a new bias cell.

REPLACING DRIVE CORD

Remove the old drive cord, pulleys, washer and indicator.

Turn the drive drum until the slot in the rim is in the position shown in Fig. 4.

Insert one end of the drive cord in the slot and wind the cord around the drum in a clockwise direction for about two-thirds of a turn, or until it reaches the top of the drum.

Now, before putting the right pulley (from front) in place, bring the cord around the pulley from back to front so that the cord is adjacent to the celluloid dial scale; then place the pulley in position.

Extend the cord over to the left and bring it around the other pulley from front to back before placing this pulley. Put the small brass washer on the upper shaft of the pulley and place the pulley in position as shown in Fig. 4.

Bring the cord over to the drive drum and wind it around the drum in a clockwise direction, keeping it behind the cord already on the drum.

Push the pulley tension spring in toward the drive drum so as to provide slack in the cord while the free end is being inserted into the slot in the rim.

Now mesh the condenser plates completely. Replace the celluloid indicator on the dial strip and attach it to the drive cord as shown in Fig. 4. The line on the indicator should cover the 530 K.C. mark on the dial scale.

CAUTION—When attaching the indicator to the drive cord, do not pinch the center clamp too tightly on the cord or the cord will be cut. After the clamp is pinched slightly, a small amount of shellac on it will hold the cord securely.

Replace the dial lamp assembly.

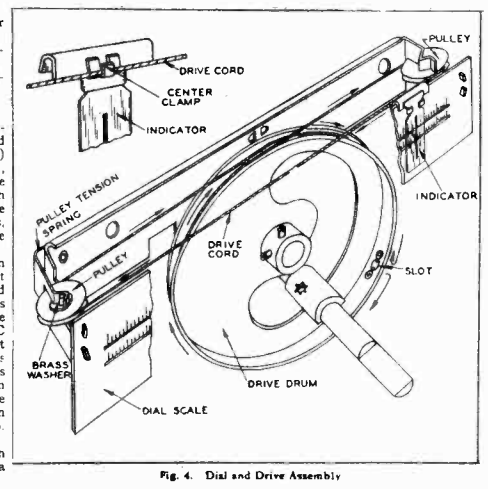

Fig. 4. Dial and Drive Assembly

Stock No.	Description	List Price
*RB-008	BOARD—Terminal Board (on front wall of chassis)	$0.10
*RB-009	BOARD—Terminal Board (1 lug)	.15
*RB-019	BOARD—Terminal Board (near interstage transformer)	.10
*RB-026	BOARD—Ant. Terminal Board	.10
RB-152	BRACKET—Band change bracket	.05
RB-154	BRACKET—Bias cell bracket	.15
RC-008	CAPACITOR—.001 Mfd., 200 V. paper (C-33)	.25
*RC-014	CAPACITOR—.003 Mfd., 200 V. paper (C-34)	.25
*RC-017	CAPACITOR—.0045 Mfd., 200 V. paper (C-2)	.25
RC-019	CAPACITOR—.004 Mfd., 200 V. paper (C-36)	.25
RC-032	CAPACITOR—.01 Mfd., 200 V. paper (C-8, C-27)	.25
*RC-034	CAPACITOR—.01 Mfd., 200 V. paper (C-29)	.25
RC-035	CAPACITOR—.008 Mfd., 400 V. paper (C-40, C-41)	.25
*RC-072	CAPACITOR—.05 Mfd., 200 V. paper (C-12, C-26, C-49)	$0.25
*RC-096	CAPACITOR—.1 Mfd., 200 V. paper (C-2, C-25, C-28, C-31)	.30
RC-178A	CAPACITOR—.5 Mfd., 200 V. paper (C-20)	.40
RC-223	CAPACITOR—75 Mmf. Mica (C-10)	.25
*RC-261	CAPACITOR—250 Mmf. Mica (C-24, C-32)	.25
RC-339	CAPACITOR—1300 Mmf. Mica (C-3)	.35
RC-572	CAPACITOR—Dry Electrolytic 8 Mfd., 150 V.; 4 Mfd. 150 V.; 4 Mfd., 150 V. (C-37, C-38, C-39)	1.10
*RC-608	CAPACITOR—300-500 Mmf. osc. padder (C-4)	.45
*RC-618	CAPACITOR—5-45 Mmf. trimmer (C-6, C-9)	.25
RC-637	CAPACITOR—3rd I.F. double trimmer (C-17, C-18, C-22)	.60
RC-642	CAPACITOR—1st or 2nd I.F. double trimmer (C-14, C-13, C-15, C-16)	.45
*RC-710	CONDENSER—2 gang tuning condenser (C-1)	$3.60
*RC-816	CABLE—Speaker cable	.50
RC-831	CABLE—Battery Cable	1.80
RC-1958	CLIP—Battery clip (marked +)	.30
RC-1959	CLIP—Battery clip (plain)	.30
RC-1960	CLIP—Shield grounding clip	.10
RC-1961	CELL—1.0-volt bias cell	.25
*RD-034	DRIVE—Condenser drive	1.10
Code 22	FOOT—Mounting foot assembly	.30
*RF-010	FUSE—½ Amp. fuse (Pkg. of 10) Models	
RF-303	FB-72, FB-76	1.20
*RG-001	GRID CAP—Control grid cap (Pkg. of 5)	.10
*RK-004	KNOB—Control knob (Pkg. of 5)	.40
*RK-005	KNOB—Control knob with dot (Pkg. of 5)	.50
RL-039	COIL—Ant. coil band B-C (L-4)	1.30
RL-040	COIL—Ant. coil, Band "D" (L-3)	.70
RL-241	COIL—Oscillator coil band "D" (L-1)	.70
RL-242	COIL—Oscillator coil, Band B-C (L-2)	1.30
RL-328	REACTOR—RF filament reactor (L-8)	.40
RL-913	LAMP—Neon tuning indicator lamp, ¼ Watt, 115 Volt	.95
RL-914	LAMP—Green tuning indicator lamp (pkg. of 10)	3.10
RP-070	PLUG—Male battery plug	.25
*RQ-059 (RR-014)	RESISTOR—1000 ohm, ¼ W. Carbon (Pkg. of 5) (R-7)	.70
*RQ-067	RESISTOR—2200 ohm, ¼ W. Carbon (R-8) (Pkg. of 5)	.60
RQ-079	RESISTOR—6800 ohm, ¼ W. Carbon (R-16) (Pkg. of 5)	.60
RQ-083	RESISTOR—10,000 ohm, ¼ W. Carbon (R-1, R-4) (Pkg. of 5)	.60
*RQ-095	RESISTOR—33,000 ohm, ¼ W. Carbon (R-21) (Pkg. of 5)	.60
*RQ-099	RESISTOR—47,000 ohm, ¼ W. Carbon (R-3) (Pkg. of 5)	.60
*RQ-103	RESISTOR—68,000 ohm, ¼ W. Carbon (R-9) (Pkg. of 5)	.60
*RQ-107 (RR-060)	RESISTOR—.1 meg. ¼ W. Carbon (R-2) (Pkg. of 5)	.70
*RQ-109	RESISTOR—120,000 ohm, ¼ W. Carbon (R-20) (Pkg. of 5)	.70
*RQ-115	RESISTOR—220,000 ohm, ¼ W. Carbon (R-10, R-13, R-18) (Pkg. of 5)	.70
*RQ-117	RESISTOR—270,000 ohm, ¼ W. Carbon (R-11) (Pkg. of 5)	.70
*RQ-119	RESISTOR—330,000 ohm, ¼ W. Carbon (R-5) (Pkg. of 5)	.70
*RQ-131 (RR-067)	RESISTOR—1 meg. ¼ W. Carbon (R-17) (Pkg. of 5)	.70
*RQ-137	RESISTOR—1.8 meg. ¼ W. Carbon (R-19) (Pkg. of 5)	.70
*RQ-139	RESISTOR—2.2 meg. ¼ W. Carbon (R-12) (Pkg. of 5)	.70
RR-302	RESISTOR—35 ohm, 1 W. flexible (R-6) (Pkg. of 5)	.70
RS-172	SHIELD—1st, 2nd or 3rd IF transformer shield	.25
RS-173	SHIELD—Tube shield	.15
*RS-204	SOCKET—Tube socket (Pkg. of 5)	.75
*RS-323	SWITCH—Band-change switch (S-1)	1.25
RS-343	SWITCH—Color tuning switch (S-6)	.50
RS-344	SWITCH—Tone control and power switch (S-2, S-3, S-4)	.75
RT-237	TRANSPORMER—1st or 2nd IF transformer (complete)	1.60
RT-238	TRANSPORMER—3rd I.F. transformer (complete)	1.90
RT-507	TRANSPORMER—Audio input transformer (T-1)	1.50
RV-023	VOLUME CONTROL—2.0 meg. volume control (R-15)	.80
*RW-101	WASHER—Felt washer (Pkg. of 10)	.45
*RW-400	WAVE TRAP—Wave trap (complete) (C-48, L-12)	$0.80
*RX-016	ASSEMBLY—Tuning Condenser mounting assembly	.30
RX-020	LAMP ASSEMBLY—Tuning indicator lamp assembly (including lamps)	1.40

DIAL MECHANISM

RB-153	BRACKET—Lamp bracket	.30
*RC-815	CABLE—Dial cable (Pkg. of 5)	.50
*RD-030	DRUM—Condenser drive drum (includes set screws)	.40
RD-047	DIAL—Dial scale	.30
RI-005	INDICATOR—Band indicator assembly	.10
RL-915	LAMP—Dial lamp—2 volt 60 M.A. (pkg. of 10)	3.10
RP-042	PULLEY—Pulley assembly (Pkg. of 2)	.15
*RP-045	POINTER—Dial pointer and guide	.10
RR-909	REFLECTOR—Dial lamp reflector	.15
RS-203	SOCKET—Lamp socket assembly	.10
RS-858	SCREWS—Set screws for dial drive drum (Pkg. of 10)	.10

VIBRATOR POWER SUPPLY MODELS FB-73, FB-77

*RB-053	BOARD—Terminal Board (3 terminals)	.10
RB-603	BASE—Vibrator grounding base	.15
RC-054	CAPACITOR—.03 Mfd., 1500 V. paper (C-42, C-45)	.35
RC-072	CAPACITOR—.05 Mfd., 200 V. paper (C-47, C-50)	.25
RC-156B	CAPACITOR—.5 Mfd., 120 V. paper (C-44)	.40
RC-573	CAPACITOR—16 Mfd., 150 V. dry electrolytic (C-46)	.90
RC-832	CABLE—Battery Cable	2.30
RF-304	FUSE—5 amp. 25 V. fuse (Pkg. of 10)	1.00
RL-322	REACTOR—R.F. B+ reactor (L-10)	.30
RL-323	REACTOR—Vibrator reactor (L-11)	.70
RL-329	REACTOR—Filter reactor (L-9)	.90
RQ-033	RESISTOR—82 ohm, ½ W. Carbon (Pkg. of 5) (R-22, R-23, R-24)	.60
RS-215	SOCKET—Vibrator tube socket (Pkg. of 5)	.75
RT-077	TRANSFORMER—Vibrator transformer (T-3)	2.50
RV-201	VIBRATOR—4-volt vibrator	4.00

*Used on previous receivers.

(Prices subject to change without notice)

(GENERAL ELECTRIC CO.

Notes, Parts Dial Assembly

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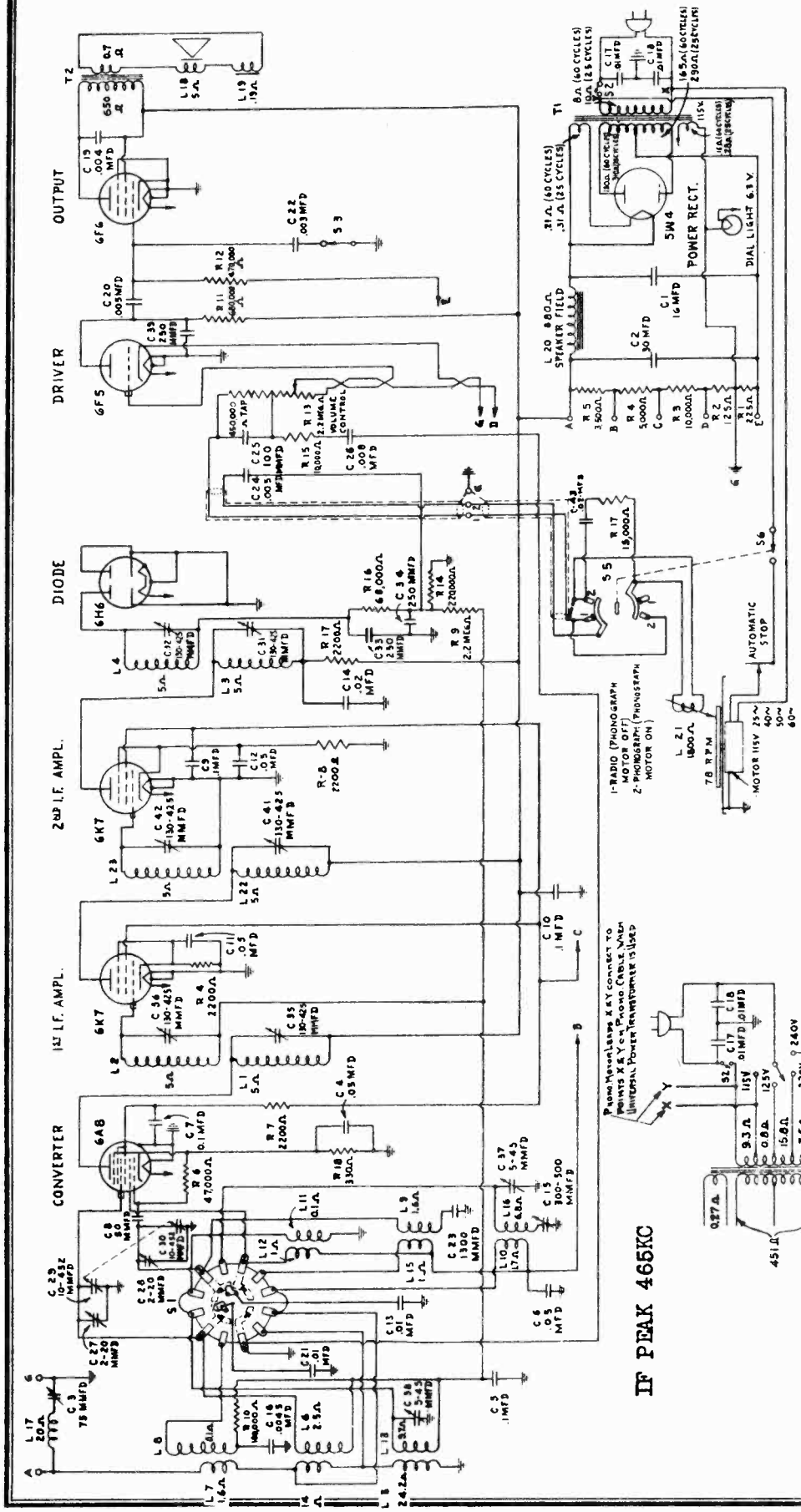
MODEL E-79
Schematic



Electrical Power Output

Undistorted ..... 2.5 watts
Maximum ..... 5.0 watts

Loud-speaker—Electrodynamic

Cone diameter ..... 12 in.
Cone Coil Impedance ..... 5.5 ohms at 400 cycles

Phonograph Pickup

Type—Magnetic
Impedance—18,000 ohms at 1000 cycles

Tuning Frequency Range

Band "B" ..... 540–1600 kc.
Band "C" ..... 1560–5800 kc.
Band "D" ..... 5.6–18.0 mc. (5,600–18,000 kc.)

Tuning Control Drive Ratio

Fast Tuning ..... 8 to 1
Vernier Tuning ..... 40 to 1

MODEL E-79
Chassis Wiring

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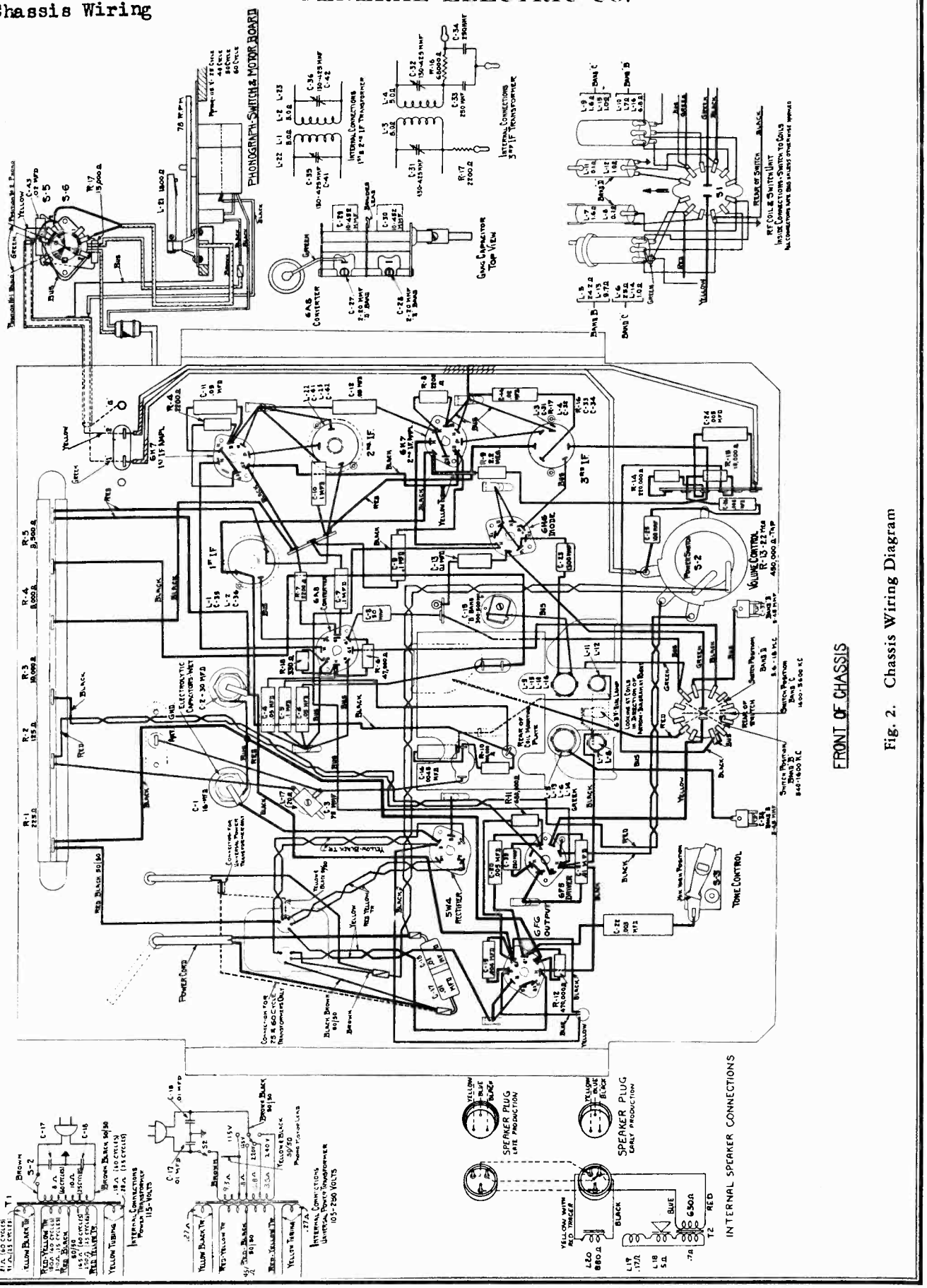

Fig. 2. Chassis Wiring Diagram

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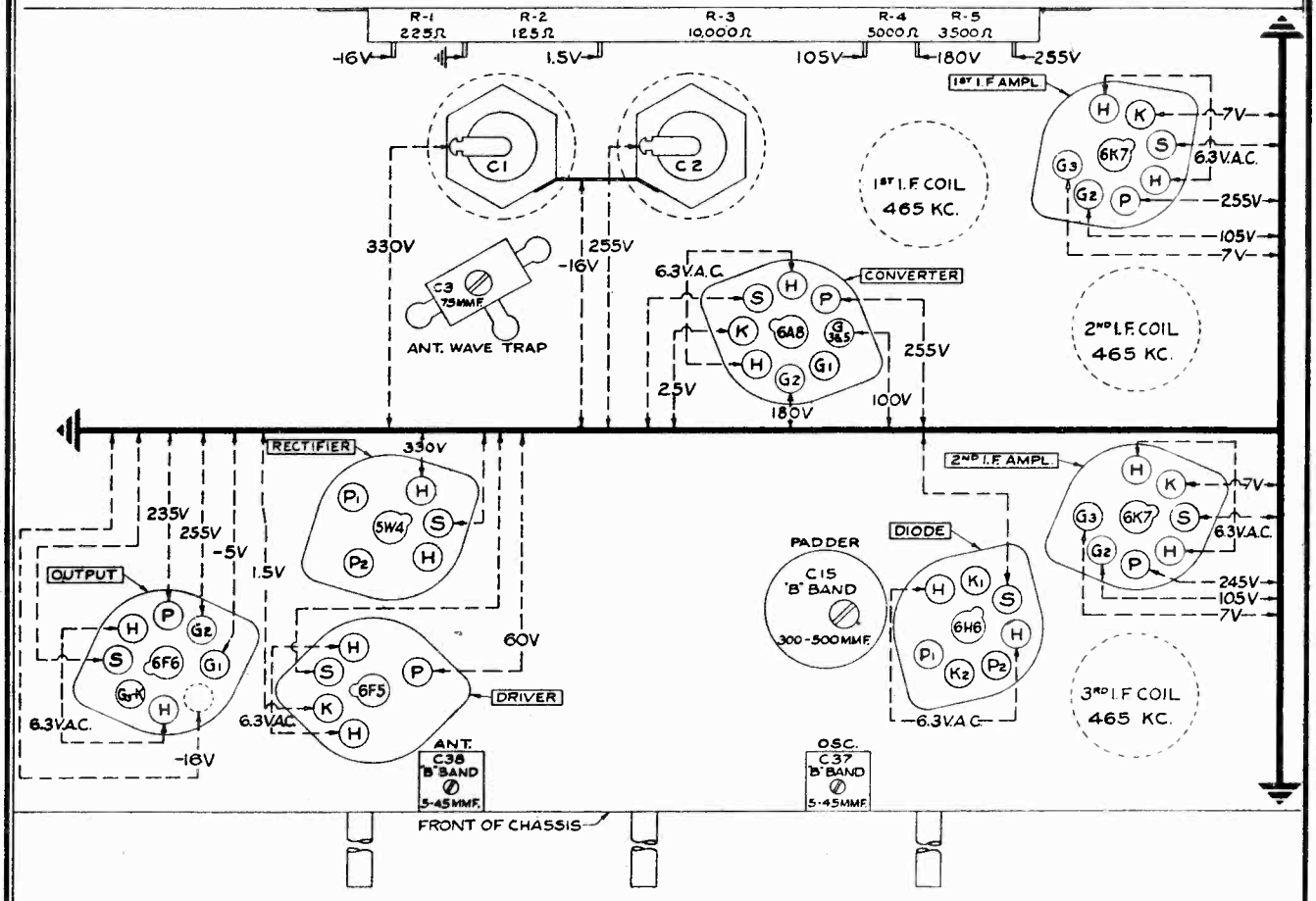
MODEL E-79
Voltage, Socket Trimmers

SOCKET VOLTAGES

Tube No.		Cathode to Ground Volts D.C.	Screen Grid to Ground Volts D.C.	Plate to Ground Volts D.C.	Cathode Current M.A.	Heater Volts A.C.
6A8	Oscillator	2.5	...	180	12.0	6.3
	Converter	...	100	255		
6K7 1st I. F. Amp.		7.0	105	255	9.0	6.3
6K7 2nd I. F. Amp.		7.0	105	245	9.0	6.3
6H6 Detector & AVC.		...	...	...	...	6.3
6F5 Audio Amplifier		1.5	...	*60	0.3	6.3
6F6 Output		...	255	235	36.0	6.3
5W4 Power Rectifier		300 D.C.	...	650/325 R.M.S.	70.0	5.0

Measured at 115 volts supply. No signal input. Volume control maximum. Voltmeter 1000 ohms per volt; measurements taken on highest scale giving accurate readable deflection.
*Supply voltage minus drop in load resistor.



VIEWED FROM UNDERSIDE OF CHASSIS

Fig. 3. Trimmer Location & Socket Voltages

DESCRIPTION OF ELECTRICAL CIRCUIT—RADIO

Model E-79 employs seven metal envelope tubes to perform the above functions in a superheterodyne circuit, giving the excellent selectivity and sensitivity inherent in this type circuit. The "B" and "C" band coils are wound on a common form, while the "D" band coils have individual forms. Ample undistorted output is obtained through diode detection and two audio amplifier stages.

The signal from the antenna is applied to the control grid of the 6A8 converter tube through the antenna coil, the secondary of which is tuned to the incoming signal by the rear section of the main tuning condenser. The secondary of the coil for the band next lower in frequency to the one in use is short-circuited through a capacitor to prevent absorption of energy at its resonant frequency which falls in the next higher band. (NOTE.—On the schematic diagram, Fig. 1, the center portion of the wave band switch supporting the two shorting lugs rotates simultaneously with the four contact pins.) In the 6A8 tube the incoming signal is combined with the local oscillator signal which is 465 kc. different in frequency. The local signal is generated by the oscillator elements of this tube and the proper frequency difference is maintained throughout the tuning range by the front section of the main tuning condenser in conjunction with the oscillator coil and padding capacitors.

The combination of the signal frequency with the local oscillator frequency in the converter tube produces the intermediate frequency of 465 kilocycles. This particular intermediate frequency is chosen to reduce image response and improve short-wave performance. The intermediate frequency amplifier consists of two 6K7 tubes and three transformers, each with two tuned circuits.

The output of the I. F. amplifier is applied to the 6H6 diode rectifier, which is a combined detector and automatic volume control tube. The direct current component of the rectified signal produces a voltage drop across R-14. This voltage drop provides automatic bias for the R. F. and I. F. amplifier and converter tubes and so gives automatic volume control action. Full automatic bias voltage is applied to the pentagrid converter tube and to the first I. F. amplifier tube. The second I. F. tube is operated on self bias, obtained by the drop through R-8. This enables the second I. F. tube to provide maximum power to the 6H6 diode rectifier.

The manual volume control, R-13, selects the amount of audio signal applied to the grid of the 6F5 audio amplifier tube and this regulates the output of the receiver. The output of the 6F5 tube is resistance coupled to the grid of the 6F6 power amplifier pentode. The plate circuit of the 6F6 is suitably matched to the loud-speaker by means of a step-down output transformer.

The tone control circuit consists of a .003-mfd. capacitor connected in series with a grounding switch S-3 in the grid circuit of the 6F6 output tube. When it is desired to reduce the high frequency output of this receiver the switch S-3 is closed to ground.

Plate and grid voltages for all tubes are supplied by the power supply system employing a 5W4 full-wave rectifier tube which, together with a suitable network of resistors and capacitors, supplies the required voltages and filtering action.

PHONOGRAPH

The record reproducing facilities consist of a high impedance magnetic pickup with its associated balanced tone-arm, a compensated volume control, audio amplifier and loud-speaker of the receiver. In changing from radio reception to phonograph reproduction the phono-radio switch simultaneously disconnects the 6H6 diode from the volume control, connects the phono-pickup across this control, and shorts the 6H6 diode output, rendering the R. F. and I. F. sections inoperative.

The turntable assembly consists of a combination line switch which is simultaneously turned on when the phono-radio switch is turned on the phonograph position. A separate motor switch is provided to permit starting and an adjustable automatic stop

Electrical Specifications

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A 6	115	60	105
A 5	115	50	105
C 2	115	25	105
V 6	105–130/200–250	60	105
V 5	105–130/200–250	50	105
V 4	105–130/200–250	40	110

NOTE.—Taps on universal transformers (Rating "V") are accessible by removing the cap cover on the top of the transformer.

Tubes

Converter and Oscillator	6A8 Pentagrid Converter
1st I. F. Amplifier	6K7 Super-control Amplifier
2nd I. F. Amplifier	6K7 Super-control Amplifier
Detector and AVC	6H6 Twin Diode
Audio Amplifier	6F5 High Gain Triode
Output	6F6 Power Amplifier Pentode
Power Rectifier	5W4 Full-wave Rectifier
Dial Lamp	MAZDA No. 46

ALIGNMENT PROCEDURE

The receiver should first be allowed to run for fifteen minutes in order to reach its approximate normal operating temperature. Before making any adjustments, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal at the alignment frequency from the test oscillator to the receiver and inserting a "Tuning Wand" into the coil involved. The "Tuning Wand" consists of a bakelite rod having a brass cylinder attached to one end, and a small core of finely divided iron compacted into the opposite end. For use on this receiver, it is recommended that a "Tuning Wand" having a flexible center portion be employed. The standard "Tuning Wand" may be adapted by cutting the bakelite rod in half and joining the two resulting pieces with a short length of rubber tubing. By inserting the brass cylinder end into the center of a particular coil, the inductance of the coil is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the circuits are in exact alignment, inserting either end of the tuning wand in any coil will result in a decrease in output. When an increase in signal is obtained with the iron-filled end of the wand, a decrease in resonant frequency of that circuit by increasing its trimmer capacity is indicated. When an increase in signal is obtained with the brass cylinder, a decrease in trimmer capacity is indicated.

Changes Indicated by Wand

Wand	Signal	Trimmer Adjustment Required
Brass cylinder	Decrease	None
Iron filings	Decrease	
Brass cylinder	Increase	Decrease capacity
Iron filings	Decrease	
Brass cylinder	Decrease	Increase capacity
Iron filings	Increase	

ALIGNMENT FREQUENCIES

I. F.	Band "B"	Band "D"	Wave Trap
465 kc.	580 kc. 1500 kc.	18,000 kc.	465 kc.

In order to align these receivers properly, it is necessary to have available the following test equipment:

1. A modulated test oscillator with frequencies available of 465, 580, 1500, and 18,000 kc.
2. An output indicator, such as a high resistance a-c. voltmeter with a maximum scale reading of 3 to 5 volts, or a neon lamp output indicator.
3. An alignment tool consisting of an insulating shaft with a small screwdriver blade.
4. A tuning wand.

The location of all trimmer capacitors, as well as socket voltages to chassis, is shown in Figs. 2 and 3.

1. I. F. Alignment

Set the frequency band switch of the receiver to Band "B," short-circuit the antenna and ground terminals and tune the receiver to some point where no signal is heard. Set the volume control at its maximum position and ground the chassis.

The I. F. amplifier is tuned to 465 kc., set the test oscillator dial at this frequency. Connect the test oscillator output between the converter tube (6A8) control grid and chassis. Connect the output meter across the cone coil of the speaker and adjust the test oscillator output control so that, with the receiver volume control at maximum, a small deflection is observed on the output meter. During both I. F. and R. F. alignment, the test oscillator signal should be maintained at the lowest level that will give a good readable output indication.

Adjust the secondary trimmer of the third I. F. transformer until a maximum output reading is obtained. Maintain a small deflection on the output meter throughout alignment by adjusting the test oscillator output. Next, adjust the primary trimmer of the third I. F. transformer for maximum output. Continue this procedure, adjusting the secondary and primary trimmers, respectively, of the second I. F. transformer. The secondary trimmer of the first I. F. transformer may then be adjusted and, lastly, the primary trimmer of the first I. F. transformer. After completing this procedure, repeat it a second time for final alignment. The I. F. alignment will then be complete.

I. F. Wave Trap Alignment

After completion of the I. F. alignment, with the test oscillator still set on 465 kc., apply this frequency to the antenna post of the receiver through a dummy antenna. This dummy antenna consists of a 400-ohm resistor in series with a 250-mmfd. capacitor and should be connected in series between the test oscillator output and the receiver antenna post. With the 465-kc. signal applied to the receiver antenna post, adjust the I. F. Wave Trap trimmer for *minimum* output indication.

2. R. F. Alignment

First of all, check the position of the dial pointer. To do this, rotate the gang condenser to the maximum capacity position, i.e., plates fully meshed. While in this position, align the pointer with the last black line on the scale by loosening the dial drum set screws and rotating the drum on the gang shaft. Make sure the antenna and ground terminals of the receiver are not short-circuited and connect to them the output of the test oscillator, preferably using the dummy antenna described above between the test oscillator and the receiver antenna terminal. Connect the output indicator across the speaker cone coil.

"D" Band (5.6-18.0 mc.)

Because of the R. F. circuit used in this receiver, the "D" band must be aligned first. Set the frequency band switch to the "D" band position by rotating it to its most clockwise position. Tune the test oscillator to 18,000 kc. (18 mc.) and set the dial pointer on the receiver at this frequency. Adjust the "D" band oscillator trimmer, located on the front section of the gang condenser, for maximum output. (NOTE.—The oscillator operates on the *low* frequency side of the incoming signal; therefore adjust the trimmer until the second oscillator peak is reached as the trimmer is *increased* in capacity. A check for the correctness of this adjustment may be made by rotating the gang to the 17,070 kc. calibration mark. If with increased input from the test oscillator, no signal is detected, the correct oscillator peak has been used.) Keep the receiver volume control at its extreme clockwise position and adjust the test oscillator output to maintain a small reading on the output indicator. When the optimum adjustment on the oscillator trimmer has been obtained, adjust the "D" band antenna trimmer on the rear section of the gang for maximum output while rocking the tuning condenser through the signal.

"C" Band (1.56-5.80 mc.)

No separate trimmers are provided for adjustment of this band. The correct adjustment of the "D" band and "B" band automatically aligns the "C" band. The adjustment procedure for the "B" band follows immediately.

"B" Band (540-1600 kc.)

Set the frequency band switch to the broadcast position. Rotate the gang condenser until the dial pointer indicates the 1500 kc. calibration point, and adjust the test oscillator to this frequency. The "B" band trimmers are located underneath the chassis. (See Fig. 2.) Adjust the broadcast oscillator trimmer for maximum output. This trimmer is the one nearest the volume control. When the oscillator has been peaked, adjust the antenna trimmer for maximum output. Here again, as pointed out previously, it is necessary to maintain a small R. F. input from the test oscillator to avoid erratic action of the output indicator due to automatic volume control action.

Now set the test oscillator at 580 kc. and tune the receiver to that frequency. Slowly, rocking the tuning condenser back and forth through the signal, adjust the 580-kc. padding capacitor for maximum output. When this has been done, return to 1500 kc. on the receiver and test oscillator and recheck the alignment at that frequency for maximum output. The broadcast band should now be in alignment.

ADJUSTMENT OF DIAL MECHANISM

The dial mechanism is rigidly mounted to the frame of the tuning condenser by means of two removable, self-tapping screws. The complete assembly is rubber-mounted on rubber cushions at the points of support.

The dial mechanism consists of the following parts:

1. Dial Scale.
2. Reflector.
3. Mounting Bracket.
4. Dial Pointer.
5. Dial Pointer Drive Cable.
6. Drive Cable Tension Spring.
7. Two Idler Pulleys.
8. Cable Drum (mounted on condenser shaft).
9. Vernier Drive.

To Replace Dial Scale or Reflector

Twist the supporting tabs at either end of the scale into alignment with the slots and remove the scale and reflector. Disengage the old scale from the reflector and insert the new scale in its place with the mounting slots in alignment. Replace scale and reflector on the bracket and twist the inner corner of each tab over the outer edge of the slot with which it is engaged.

To Replace Dial Pointer

Disengage the clamping tabs at the rear of the slider from the cable by bending down the center one of the three tabs. Place the new pointer on the scale in a position to agree with the calibration. Secure the pointer to the cable by pinching together the clamping tabs with enough pressure to hold firmly without damaging the cable.

To Replace Dial Pointer Drive Cable

Remove the dial pointer as explained above and set the tuning condenser gang for maximum capacity (plates all meshed). Remove the old cable from the cable drum and engage one end of the new cable with the upper end of the keyhole slot in the drum circumference. Draw the cable clockwise over the top of the drum and through the notch in the right-hand end of the bracket, then around the idler pulley and to the left, close to the scale, passing around the idler pulley mounted in the tension spring and clockwise over the top of the drum. Note that the pulleys are held in place by the tension on the cable. Release the spring tension on the drive cable by pressing inwardly on the tension idler pulley, then insert the free end of the cable in the keyhole slot.

To Replace Cable Drum

Remove the dial scale and reflector bracket as explained elsewhere. The cable drum can then be removed by loosening the two set screws in the hub. When replacing the cable drum, set the condenser so that all plates are fully meshed. The right-hand end of the radial slot in the drum web should then be approximately $\frac{1}{8}$ of an inch clear of the tuning knob shaft bearing bushing. Locate the cable drum axially on the condenser shaft so as to clear the heads of the two mounting bracket screws.

To Replace Mounting Bracket

Remove the dial scale and reflector bracket, also the cable drum. Access may be had to the mounting bracket self-tapping screws when this is done. In replacing the mounting bracket it is necessary to insure that the lower edge of the bracket is parallel to and at height above the top of the cabinet chassis support panel of $5\frac{3}{4}$ inches.

To Adjust the "Automatic Vernier" Drive

The vernier drive used on this receiver includes a planetary reduction unit equipped with a clutch which automatically changes the reduction ratio. This clutch consists of a sleeve mounted on the knob shaft. To adjust, loosen the locking screw and move the sleeve axially along the shaft until the cam surface in the end of the sleeve engages with the pin in the knob shaft. This engagement should take place at a point on the cam surface as near to the stop as possible and still allow complete release of the clutch.

REPLACING COILS

In case of an open or shorted pickup coil, the method of replacement is obvious upon inspection of the pickup assembly and by study of Fig. 6. It is important to adjust the armature as previously explained after reassembly of the mechanism. Only rosin core solder should be used in soldering the coil leads to the lugs.

GENERAL ELECTRIC CO.

PHONOGRAPH

The phonograph mechanism in this receiver has been designed to be simple and foolproof. Under normal operating conditions, service difficulties should be negligible. Occasionally, however, certain adjustments may be required. These adjustments are explained in the following paragraphs.

MOTOR ADJUSTMENTS

The speed of the turntable motor is controlled by a governor which allows correct adjustment of the turntable rotation to 78 revolutions per minute. A pointer is provided under the turntable and the base plate is marked "F" and "S" to indicate direction to move pointer for faster or slower operation. A check of the turntable rotational speed may be made by placing a piece of paper under a record on the turntable and counting the number of times it rotates past a fixed point in one minute.

There is another type motor used in some sets of this model that does not have a speed control on the base plate. The speed of this motor is regulated by an adjustable collar on the governor. This is adjusted to 78 RPM at the factory and should not require attention.

The motor bearings and gears are properly lubricated for long operation under normal weather conditions. If the motor chatters or runs uneven, place a few drops of light machine oil on the governor felt.

TRIP MECHANISM

The trip mechanism is of simple design and consists of a latch bar connected to the motor switch and a trip lever. The latch is held closed by means of a spring between the latch bar and the trip lever Be sure the parts work freely without binding.

The trip is actuated by an adjustable arm on the trip lever. When the eccentric groove in the record swings the tonearm back and forth, it pushes the latch out of engagement.

MAGNETIC PICKUP

The pickup used in the phonograph is of an improved design. It is horizontally mounted in the tonearm and is held by a single set screw. The horseshoe magnet is fastened to the pole pieces by means of a set screw and clamp. The armature is centered by means of a split rubber block, which also provides a damping effect on the armature movement. The frequency response is uniform over a wide range.

Service operations which may be necessary on the pickup are as follows:

CENTERING ARMATURE

Refer to Fig. 6 showing the pickup inner structure. The armature (11) is shown in its proper relation to the magnet pole pieces, i.e., exactly centered. Whenever this centering adjustment has been disturbed, the screws (5) and (10) should be loosened and the armature rubber cushion (12) adjusted so the vertical axis of the armature is at right angles to the horizontal axis of the pole piece (8). Adjust the tension on the armature until there is a slight rocking motion. The spacing between the pole pieces and armature should be .0125 inch on each side.

DAMPING BLOCK

The top projection of the armature is imbedded in a rubber block (6) attached to the top of the pole pieces. This damping block acts as a mechanical filter to eliminate undesirable resonances and to cause the frequency reponse to be uniform. Should it be necessary to replace this damping block, it may be done by removing the yoke (7).

MAGNETIZING

The loss of magnetization will not occur when the pickup has received normal care, due to the fact that the magnet and pole pieces are one unit and the magnetic circuit remains closed at all times. When the pickup has been mishandled, subjected to a strong AC field, jolted or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to remagnetize the entire structure. This should be done by placing the pickup assembly on the poles of a standard pickup magnetizer and changing the pickup in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnet and to remagnetize it so that the same polarity is maintained.

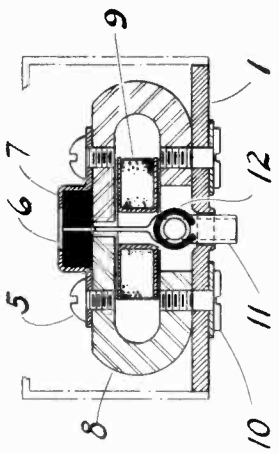


Fig. 6. Front View of Pickup

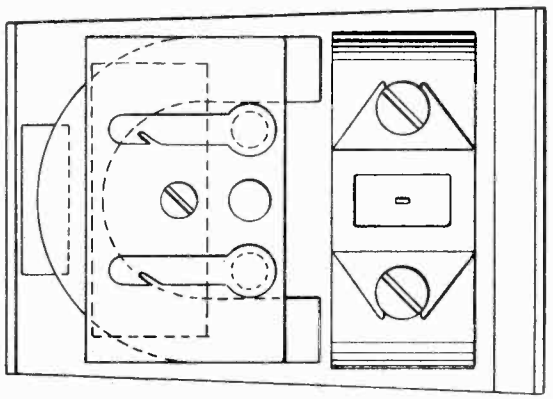


Fig. 5. Top View of Pickup

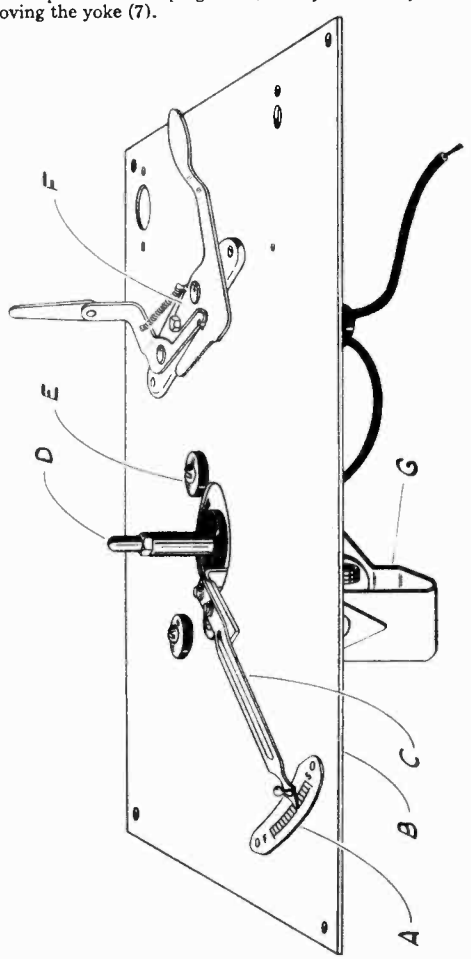


Fig. 4. Phonograph Motor Board

MODEL E-79
Parts

GENERAL ELECTRIC CO.

REPLACEMENT PARTS

INSIST ON GENUINE FACTORY-TESTED PARTS, WHICH MAY BE PURCHASED FROM AUTHORIZED DEALERS

Stock No.	Description	List Price
*RB-026	BOARD—Antenna & Ground Terminal Board	$0.10
RB-040	BOARD—Terminal Board Near Oscill. Padder	.10
RB-054	BOARD—Terminal Board on Front Wall near Volume Control	.10
RB-134	BRACKET—Dial Light Bracket	.15
RB-135	BRACKET—Dial Support Bracket	.15
RC-014	CAPACITOR—.003 mfd., 200 volt, Paper (C-22)	.25
RC-017	CAPACITOR—.0045 mfd., 200 volt, Paper (C-16)	.25
RC-018	CAPACITOR—.004 mfd., 600 volt, Paper (C-19)	.30
*RC-024	CAPACITOR—.005 mfd., 200 volt, Paper (C-24)	.25
*RC-029	CAPACITOR—.005 mfd., 400 volt, Paper (C-20)	.30
*RC-034	CAPACITOR—.01 mfd., 200 volt, Paper (C-21)	.25
RC-036	CAPACITOR—.008 mfd., 200 volt, Paper (C-26)	.25
*RC-072	CAPACITOR—.05 mfd. 200 volt, Paper (C-4, C-11, C-12)	.25
*RC-080	CAPACITOR—.02 mfd., 400 volt, Paper (C-14)	.25
*RC-091	CAPACITOR—.05 mfd., 400 volt, Paper (C-6)	.30
*RC-096	CAPACITOR—.1 mfd.. 200 volt, Paper (C-5, C-13)	$0.30
*RC-123	CAPACITOR—.1 mfd., 400 volt, Paper (C-7, C-9, C-10)	.35
RC-218	CAPACITOR—50 mmfd.. Mica (C-8)	.25
RC-235	CAPACITOR—100 mmfd., Mica (C-25)	.25
RC-261	CAPACITOR—250 mmfd., Mica (C-33, C-34, C-39)	.25
*RC-344	CAPACITOR—1300 mmfd., Mica (C-23)	.35
*RC-412	CAPACITOR—30 mfd., 280 volt, Wet Electrolytic (C-2)	1.20
RC-413	CAPACITOR—16 mfd., 340 volt, Wet Electrolytic (C-1)	1.25
*RC-608	CAPACITOR—Oscillator Padder, 300-500 mmfd. (C-15)	.40
RC-618	CAPACITOR—Trimmer Capacitor (On Lower Front Wall) (C-37, C-38)	.25
RC-710	CONDENSER—Two-gang Tuning Condenser, 10-452 mmfd. (C-29, C-30)	3.60
RC-754	CAPACITOR—Line Capacitor, .01-.01 mfd., 250 volt A.C. (C-17, C-18)	.40
RC-815	CABLE—Dial Cable (Pkg. of 5)	.50
*RC-854	CORD—Power Cord and Plug	.60
RD-030	DRUM—Condenser Drive Drum	.40
RD-032	DIAL—Dial Scale	.30
RD-034	DRIVE—Condenser Drive	1.10
RF-010	FOOT—Chassis Mounting Foot	.30
*RG-001	GRID CAP—Control Grid Cap, Pkg. of 5	.10
*RK-004	KNOB—Control Knob (Without Dot) (Pkg. of 5)	$0.40
*RK-005	KNOB—Control Knob (With Dot) (Pkg. of 5)	.50
RL-121	COIL—R.F. Coil Band D (L-7, L-8)	.75
RL-122	COIL—R.F. Coil Band B and C (L-5, L-13; L-6, L-14)	1.10
RL-223	COIL—Osc. Coil Band D (L-11, L-12)	.70
RL-224	COIL—Osc. Coil Band B and C (L-9, L-15; L-10, L-16)	1.00
RP-042	PULLEY—Dial Pulley (Pkg. of 2)	.15
RP-045	POINTER—Dial Pointer and Guide	.10
RP-046	PLATE—R.F. Coil Unit End Plate with Shield	.25
RQ-047	RESISTOR—330 ohms, ¼ watt, Carbon (R-18) (Pkg. of 5)	.60
RQ-067	RESISTOR—2200 ohms, ¼ watt, Carbon (R-4, R-7, R-8) (Pkg. of 5)	.60
*RQ-083 (RR-021)	RESISTOR—10,000 ohms, ¼ watt, Carbon (R-15) (Pkg. of 5)	.60
RQ-099	RESISTOR—47,000 ohms, ¼ watt, Carbon (R-6) (Pkg. of 5)	.60
RQ-103	RESISTOR—68,000 ohms, ¼ watt, Carbon (R-16) (Pkg. of 5)	.60
*RQ-107 (RR-050)	RESISTOR—100,000 ohms, ¼ watt, Carbon (R-10) (Pkg. of 5)	.70
RQ-115	RESISTOR—220,000 ohms, ¼ watt. Carbon (R-14) (Pkg. of 5)	.70
RQ-128	RESISTOR—470,000 ohms, ¼ watt, Carbon (R-12) (Pkg. of 5)	.70
RQ-127	RESISTOR—680,000 ohms, ¼ watt, Carbon (R-11) (Pkg. of 5)	.70
RQ-139	RESISTOR—2.2 megohms, ¼ watt, Carbon (R-9) (Pkg. of 5)	.70
RR-716	RESISTOR—Tapped Bleeder Resistor (R-1, R-2, R-3, R-4, R-5)	.90
RR-905	REFLECTOR—Dial Light Reflector	.15
RS-136	SHIELD—1st or 2nd I.F. Shield Can	.20
RS-137	SHIELD—3rd I.F. Shield Can	.20
RS-164	SHIELD—Chassis End Shield	.30
*RS-200	SOCKET—8 Pin Tube Socket (Pkg. of 5)	.75
*RS-204	SOCKET—5 Pin Tube Socket (Pkg. of 5)	.75
RS-321	SWITCH—Tone Control Switch (S-3)	.30
RS-323	SWITCH—Band Change Switch (S-1)	1.25
RS-415	SPRING—Spring Bracket Supporting Cable Pulley (Pkg. of 2)	.10
RS-423	SPRING—Knob Spring (Push-on type) (Pkg. of 10)	.25
RS-858	SCREWS—Set Screws for Dial Drive Drum (Pkg. of 10)	.10
RT-074	TRANSFORMER—Power Transformer, 115 volts, 50-60 cycles (T-1)	4.50
RT-075	TRANSFORMER—Power Transformer, 115 volts, 25-60 cycles (T-1)	8.35
RT-076	TRANSFORMER — Universal Power Transformer, 105-130 volts and 200-250 volts, 40-60 cycles (T-1)	8.50
RT-223	TRANSFORMER—1st or 2nd I.F. Transformer (Complete) (L-1, L-2; C-35, C-36) (L-22, L-23; C-41, C-42)	1.50
RT-224	TRANSFORMER—3rd I.F. Transformer (Complete) (L-3, L-4; C-31, C-32)	1.75
RV-014	VOLUME CONTROL—Volume Control and Power Switch, 2.2 meg. Total Res. (R-13, S-2)	1.15
RW-005	WINDOW—Dial Window	.15
*RW-101	WASHER—Felt Washers for Control Shafts (Pkg. of 10)	.45
*RW-102	WASHER—Insulating Washer for Mounting Electrolytic (Pkg. of 10)	.20
RW-400	WAVE TRAP COMPLETE—(L-17, C-3)	.80
RX-016	MOUNTING ASSEMBLY—Screws and Cushions for Mounting Tuning Condenser	.30

SPEAKER ASSEMBLY

Stock No.	Description	List Price
RC-910	CONE—12-in. Cone and Voice Coil and Gasket (L-18)	$1.45
RC-991	CLAMP—Cone Spider Clamp	.05
*RP-012	PLUG—Female Speaker Plug	.20
RP-044	PLUG—Male Speaker Plug	.20
RS-031	SPEAKER—12-in. Reproducer Unit Complete with Transformer (L-18, L-19, L-20, T-2)	9.80
RS-416	SPRING—V.C. Leads Spring (Pkg. of 2)	.10
RT-413	TRANSFORMER—Output Transformer (T-2)	1.30

PHONOGRAPH MOTOR BOARD ASSEMBLY

Stock No.	Description	List Price
RPB-007	BASE PLATE—13 in. by 13 in. Base plate (Brown enamel finish) (B)	2.50
RPB-008	BASE PLATE—13 in. by 13 in. Base plate Brown enamel finish (for motor with fixed speed regulator) (B)	2.50
RPL-004	LEVER—Motor speed regulator lever (C)	.25
RPP-010	PLATE—Speed Regulator Plate (A)	.35
RPR-004	RIVET—Rivet for Holding Automatic Stop to Base Plate (Pkg. of 5)	.05
RPS-025	SCREW—Turntable shaft thumb screw (D)	.20
RPS-026	SCREW—Screw for attaching speed regulator lever to bracket (Pkg. of 5)	.10
RPS-027	STOP—Automatic stop and switch (complete) (F)	1.50
RPT-002	TURNTABLE—10-in. turntable (Brown velveteen)	1.75
RPW-005	WASHER—Turntable drive washer (rubber)	.05
RPW-019	WASHER—Turntable drive washer (metal)	.05

MOTOR ASSEMBLIES

Stock No.	Description	List Price
RPM-005	MOTOR—Motor complete—78 RPM 115 V. AC 60 cycles (G)	13.75
RPM-006	MOTOR—Motor complete (with fixed speed reg. mech.) 78 RPM 115 V. AC 60 cycles (G)	12.00
RPM-007	MOTOR—Motor complete—78 RPM 115 V. 50 cycles (G)	13.75
RPM-008	MOTOR—Motor complete—78 RPM 115 V. 40 cycles (G)	15.25
RPM-009	MOTOR—Motor complete—78 RPM 115 V. 25 cycles (G)	15.25
RPX-003	MOUNTING ASSEMBLY—Six steel washers, six rubber washers, three mounting screws and hex. mtg. screw nuts (E)	.20

INSIST ON GENUINE FACTORY-TESTED PARTS, WHICH MAY BE PURCHASED FROM AUTHORIZED DEALERS

REPLACEMENT PARTS

PICKUP AND TONEARM ASSEMBLY

Stock No.	Description	List Price
RPA-007	ARM—Pickup arm complete (including base and tonearm mtg. bracket)	2.30
RPA-008	ARMATURE—Pick-up armature (11)	.80
RPB-009	BASE—Pickup base plate (1)	.30
RPC-009	CABLE—Shielded pickup cable	1.50
RPC-010	CUSHION—Armature Rubber damping cushion (6) (Pkg. of 5)	.25
RPL-800	COIL—Pick-up coil assembly (9)	1.50
RPP-011	PICKUP—Pickup unit complete (L-21) (Less tone arm)	5.40
RPS-028	SCREW—Needle clamp screw	.30

MISCELLANEOUS ASSEMBLIES

Stock No.	Description	List Price
RPB-005	BOARD—Terminal board for phono leads (Rear of chassis)	.15
RPC-011	CABLE—Phono radio switch cable with 3 lugs	.35
RPC-013	CORD—Phonograph power cord with female connector	.80
*RC-046	CAPACITOR—Phono radio switch capacitor (.02 mfd. 200 V.) (C-43)	.25
RK-002	KNOB—Phono radio switch knob (Pkg. of 5)	.50
RQ-087	RESISTOR—Phono radio switch resistor (5,000 ohm ¼ watt carbon (R-17) (Pkg. of 5)	.60
RPS-302	SWITCH—Phono radio switch with hex. nut ⅜-32 (S5, S6)	1.10

* Indicates part also used on 1936 "A" line receivers.

(Prices subject to change without notice)

MODEL FA-80
Schematic
Resistance

GENERAL ELECTRIC CO.

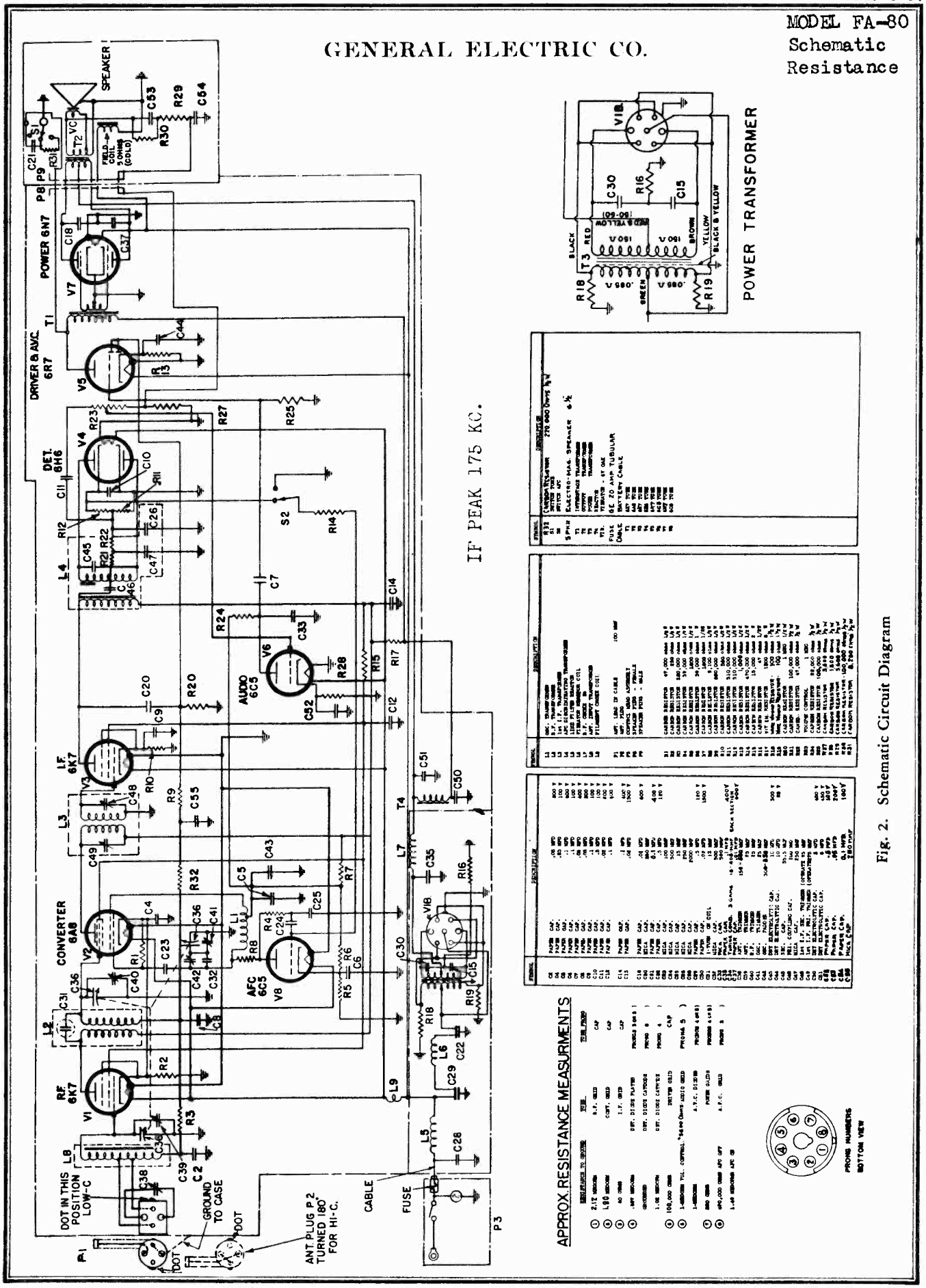


Fig. 2. Schematic Circuit Diagram

MODEL FA-80 GENERAL ELECTRIC CO. Socket, Trimmers Chassis, Voltage

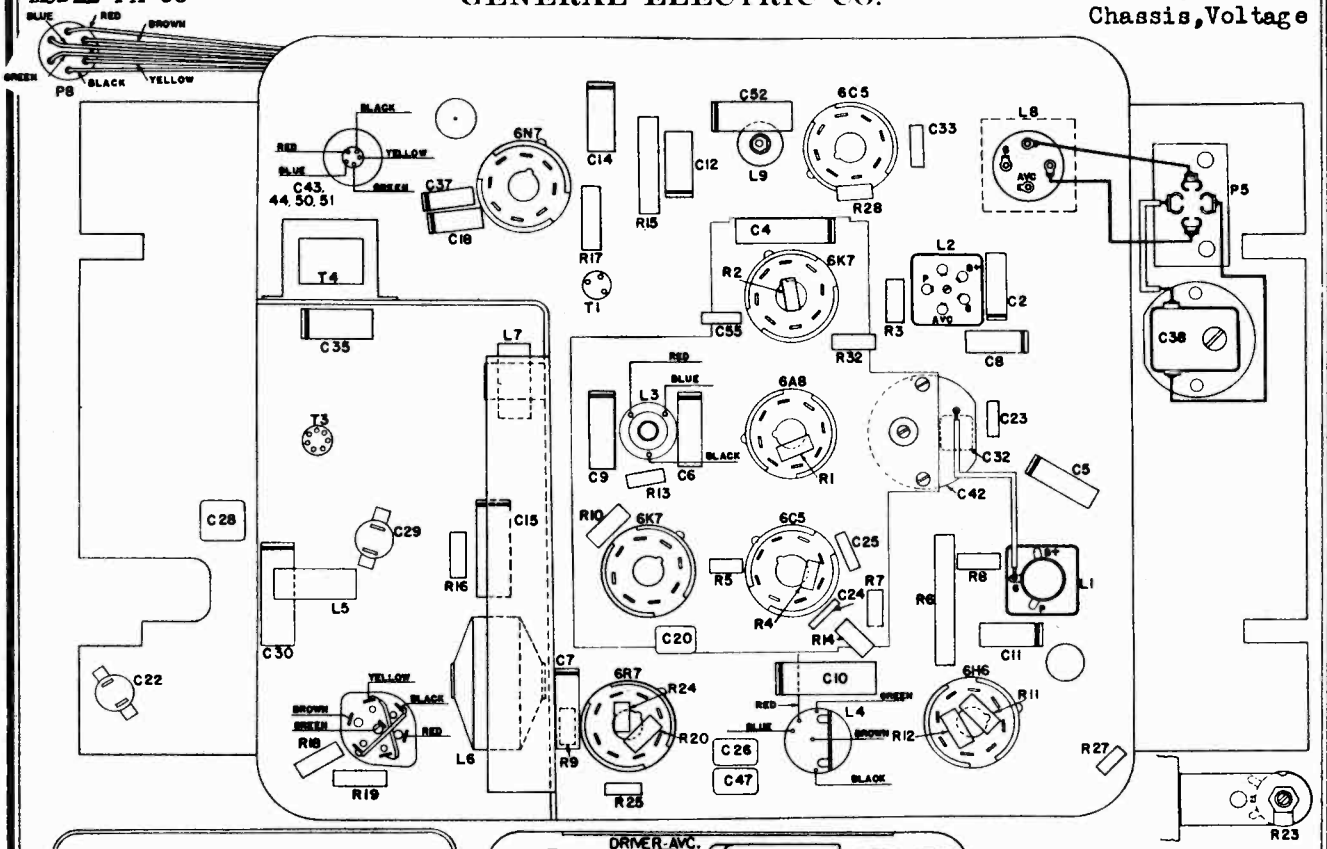
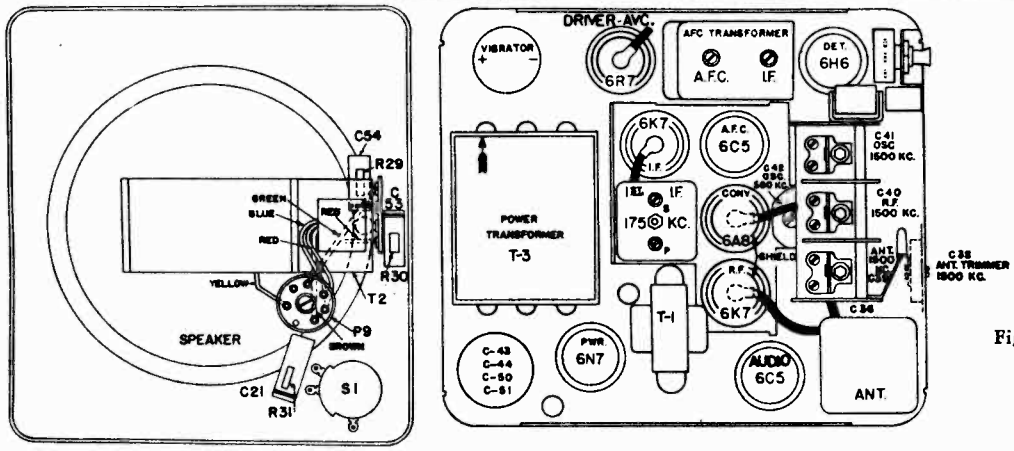


Fig. 3. Chassis and Speaker Parts Layout



FRONT COVER ASSEMBLY-MODEL-FA-80

Fig. 1. Chassis Layout and Trimmer Locations

AVERAGE SOCKET VOLTAGES

Tube	Plate to Ground Volts DC	Screen Grid to Ground Volts DC	Cathode to Ground Volts DC	Heater Volts DC	Cathode Current M.A.
6K7 R.F.	200	102	3.9	6.3	7.3
6A8 Oscillator	180			6.3	11.2
6A8 Converter	200	102	3.9		
6K7 I.F.	200	102	3.9	6.3	7.3
6C5 A.F.C.	172		8.3	6.3	0.6
6C5 1st Audio	115		3.9	6.3	2.8
6R7 Driver	235		7.4		7.7
6N7 Output	250		0	6.3	30.0

Filter Input Voltage—258 Volts
Filter Output Voltage—246 Volts Storage Battery—6.4 volts—no signal input—1000 ohms per volt meter—dial pointer at 54.
Total Plate Current—72 M.A.

GENERAL ELECTRIC CO.

MODEL FA-80
Circuit Data
Alignment, Installation

Fig. 4. Installation Diagram

GENERAL INFORMATION

Model FA-80 is a compact, single-unit superheterodyne receiver employing eight General Electric Metal Tubes and a synchronous type vibrator power supply. High power output is provided by the use of a 6N7 tube in push-pull class "B" output and an efficient 6½-inch electrodynamic speaker. The use of an iron-core antenna coil and an antenna matching trimmer, results in maximum transfer of energy from the antenna to the control grid of the 6K7 R.F. tube, providing a high signal-to-noise ratio.

The receiver chassis is housed in a sturdy metal case. To change tubes or align the receiver, it is only necessary to remove the speaker cover which is secured by four snap fasteners. The chassis can be taken out of the case for servicing by removing seven self-tapping screws.

ANTENNA MATCHING SYSTEM

The design of the antenna input system makes it possible to use these receivers with either low- or high-capacity antennas with maximum efficiency. In general, the fish-pole, under-car, built-in top, and over-top antennas are of the low-capacity type. Insulated metal top or insulated running board antennas, used in some cars, are of the high-capacity type.

The antenna male plug can be inserted into the female receptacle on the receiver in either of two positions. If the car antenna is of the low-capacity type, the plug should be inserted so that the red dots on the male plug and the receiver case are on the same side. If a high-capacity antenna is used, the red dots should be opposite each other.

The antenna coupling trimmer (C-38) should be adjusted on a weak signal between 1200 and 1500 kc with volume control nearly full on. It may not be possible to "peak" the trimmer if an extremely low-capacity antenna is used. In such cases, turn the trimmer (C-38) to its maximum capacity (counterclockwise) position, and "peak" the trimmer (C-39) on the antenna section of the gang condenser. (Antenna plug in low-capacity position.)

If the antenna coupling trimmer (C-38) can be peaked with the antenna plug inserted in either position, it is recommended that the low-capacity position (red dots adjacent) be used, as some installations where there is not much room to work, it is advisable to adjust the antenna coupling trimmer before bolting the receiver in place.

The wiring of the antenna plugs is such that, in the low-capacity position, C-38 is in series with the antenna to the high tap on the antenna coil. In the high-capacity position, C-38 is in series with the antenna to the low tap on the antenna coil. These connections may be traced on the schematic diagram.

DEGENERATION

Audio degeneration is provided by returning a portion of the voice coil voltage of the proper phase to a section of the volume control circuit. This is accomplished by grounding one side of the output transformer secondary and connecting the high side through the resistor and capacitor combination consisting of R-30, C-36, R-29, and C-34, back to the 6B6G grid (R-26) resistor (R-27) which is in series with the low-frequency audio is accomplished in the cathode circuit of the 6C5 tube by tube by limiting the value of the by-pass condenser (C-35) to .5 mfd.

The use of degeneration improves the frequency response and reduces non-linear distortion introduced by the audio amplifier.

AUTOMATIC FREQUENCY CONTROL

Through a special circuit arrangement, the frequency of the heterodyne oscillator is varied up or down so that the resultant I.F. signal is held closely to 175 kc (the frequency to which the I.F. channel is peaked) even though the receiver is mistuned.

When the signal is tuned, the AFC transformer is of a frequency higher than 175 kc the d-c voltages developed across the 6H6 diode load resistors R-11 and R-12 are unequal. Since these voltages are bucking, the AFC voltage taken from the top end of R-12 will be either positive or negative in respect to ground depending on which side of resonance the receiver is tuned. When the receiver is detuned to the low-frequency side of the desired station the control voltage will be positive; when detuned to the high side it will be negative.

The AFC 6C5 is connected in parallel with the oscillator tank coil and, because of the excitation on its control grid, acts like a shunt inductance, capable of varying the oscillator frequency in the required direction to correct mistuning. Positive control voltage applied to the 6C5 control grid raises the oscillator frequency; negative voltage lowers the frequency. Because of the bias placed on the 6C5 cathode, its control grid never actually goes positive; positive control voltage merely lowering the normal negative grid bias.

The AFC may be made inoperative by switching S-2 to the position wherein the 6C5 grid resistor R-14 is returned to ground. The receiver will then operate in the conventional manner.

The AFC transformer is tuned to resonance by changing the position of the primary and secondary iron cores by means of adjustment screws. These cores fit very tightly into the coils so that vibration will not vary their position. Permanence of adjustment is further assured by the use of special fixed capacitors which are made of a single strip of mica, silver plated on each side. The silver plating constitutes the two plates and the mica, the dielectric of the capacitors.

ALIGNMENT PROCEDURE

In order to align these receivers properly, it is necessary to have the following test equipment:

1. A modulated test oscillator.
2. An output indicator such as a 3- to 5-volt a-c voltmeter.
3. An alignment tool with a small screwdriver blade.

The R.F., oscillator and 1st I.F. transformer trimmers are available by removing the speaker cover. The variable iron-core plugs of the 2nd I.F. transformer can be reached from the control side of the receiver case by removing the snap button on each side of the volume control. When the speaker cover is removed from the case, the field return should be made by a jumper lead between the speaker cover and case. The alignment adjustments should be made with the test oscillator output at the lowest level which will give a readable output indication.

I.F. Alignment

1. Connect a low-range a-c voltmeter across the voice coil of the loud-speaker. Place a modulated 175 kc signal on the grid of the converter (6A8) tube through a .05 mfd. condenser. With the AFC switch turned "off" and the volume set at maximum, adjust the 1st I.F. transformer secondary and primary trimmers and the AFC transformer I.F. trimmer for maximum output in the order mentioned. A readjustment of all trimmers should be made.

2. Next adjust the secondary AFC trimmer of the AFC transformer as follows: Without disturbing the 175-kc setting of the signal generator, place a modulated 1400-kc signal on the insulation of the converter (6A8) grid lead. This will provide a small signal input through the receiver antenna system. Increase the attenuator setting if necessary to make the output audible. If the signal generator is provided with a switch for removing the modulation, switch it "off." However, the adjustment may be carried out satisfactorily even with a modulated signal.

3. Tune in a weak broadcast station at about 1000 kc and with the AFC switch "off" tune the receiver carefully for zero beat between this carrier and the 175-kc generator signal. Throw the AFC switch "on" and adjust the AFC secondary trimmer to give a zero beat note. This adjustment is very critical and must be made with great care. When the alignment is properly made, there will be no appreciable difference in the beat note when the AFC switch is thrown "on" or "off."

R.F. Alignment

Attach the flexible cables to the control head and to the proper bushings on the receiver. Make sure that the control head is rigidly fastened and that its relative position in respect to the receiver will not change. The AFC switch must be in the "off" position.

1. Adjust the scale calibration by rotating the station selector knob in a counterclockwise direction until the low-frequency end of the dial has reached its stop and the gang plates are completely meshed.

2. Set the test oscillator to 1400 kc with the modulation "on." Connect its output through a 250-mmf. condenser to the prong nearest the red dot on the receiver antenna receptacle. Turn the tone control to the middle—"bass"—position and set the receiver dial to 160. Peak the oscillator (C-41), R.F. (C-40), and antenna (C-39) trimmers respectively (see trimmer location drawing) to give maximum deflection on the output meter.

3. Set the test oscillator to 580 kc and tune the receiver to this signal. Peak the 580-kc capacitor (C-42) while rocking the tuning condenser back and forth through resonance. Leave the padder at the setting which gives the greatest deflection.

4. Realign the oscillator trimmer (C-41) at 1500 kc as in operation No. 2.

INSTALLATION NOTES

BATTERY POLARITY

If the receiver is being used in a car with the positive battery terminal grounded, the vibrator should be inserted so that the arrow on the label points to (+) on the vibrator sup. For use with cars having the negative terminal grounded the arrow must point to (−). The receiver will not operate if the vibrator is inserted in the wrong position.

G-E MONOGRAM

If the receiver is mounted in a position in which the G-E monogram is inverted, the cover should be reversed. To do this it is necessary to turn the speaker 180 degrees to obtain clearance for the output transformer. The speaker can be turned when the two connections to the cone-control switch are lengthened.

ATTACHING VOLUME-CONTROL CABLE

1. Rotate the volume control fully clockwise with a screwdriver.
2. Turn the volume-control knob to its extreme counterclockwise position, then insert the flexible cable into the receiver bushing.
3. Rotate the knob fully clockwise against the slip-clutch built in the volume control. If the cable tip does not engage the slot in the volume control during the first half of its rotation, reset the volume control with a screwdriver, so that this will occur.
4. Tape both the volume and tuning control cables securely in place to prevent them from changing position.

If these instructions are followed, there will be no tendency for the switch to snap "on" due to tension in the flexible cable.

SETTING THE DIAL

The gang condenser drive is equipped with a friction clutch. After the flexible drive cables have been connected and taped securely in position, rotate the tuning knob in a counterclockwise direction until the dial reaches its stop at the low-frequency end. Continue to rotate the knob for several turns against the friction clutch and the dial will be set correctly.

SUPPRESSION OF IGNITION NOISE

Included with each receiver is a distributor suppressor, a generator condenser, and an ammeter condenser. When these are properly installed, the receiver should be free of ignition noise but if the interference persists, try one or more of the following suggestions:

See that the distributor contacts and spark-plug points do not have too wide a gap. They should be set as recommended by the car manufacturer.

If a built-in roof antenna is used, shield the lead-in from the set up to the antenna and place an R.F. filter, consisting of a choke and condenser, in the lead to the dome light as close as possible to the point where the lead enters the corner post.

When grounding the antenna cable shield, or making any other grounds, select a point which is most effective in reducing the noise pick-up. In some cases quieter operation may be obtained by omitting the antenna-shield ground connection entirely.

Ground the motor block to the frame by means of ¼-inch copper braid. Also ground the steering post, speedometer cable, oil gauge line, etc., to the bulkhead. It is possible that interference may be carried from the motor compartment to the receiver by these cables.

In cars with composite wood and steel bodies, it may be necessary to bond various parts together such as the instrument panel and the corner posts.

If the ignition coil is mounted on the inside of the bulkhead, it may be helpful to remove it to the motor side.

Wheel static interference may be overcome by installing static collector springs under the hub caps.

ELECTRICAL SPECIFICATIONS

Tuning Frequency Range.....540-1600 kc

Intermediate Frequency.....175 kc

Electrical Power Output

Undistorted.....6 watts
Maximum.....9 watts

Tone Control.....3-point control

Current Consumption

Storage Battery:.....6.3 volts—8.5 amps.

Loudspeaker—Electrodynamic

Speaker Diameter.....6½ inches
Cone Coil Impedance.....5.5 ohms at 400 cycles

MODEL FA-80
Parts

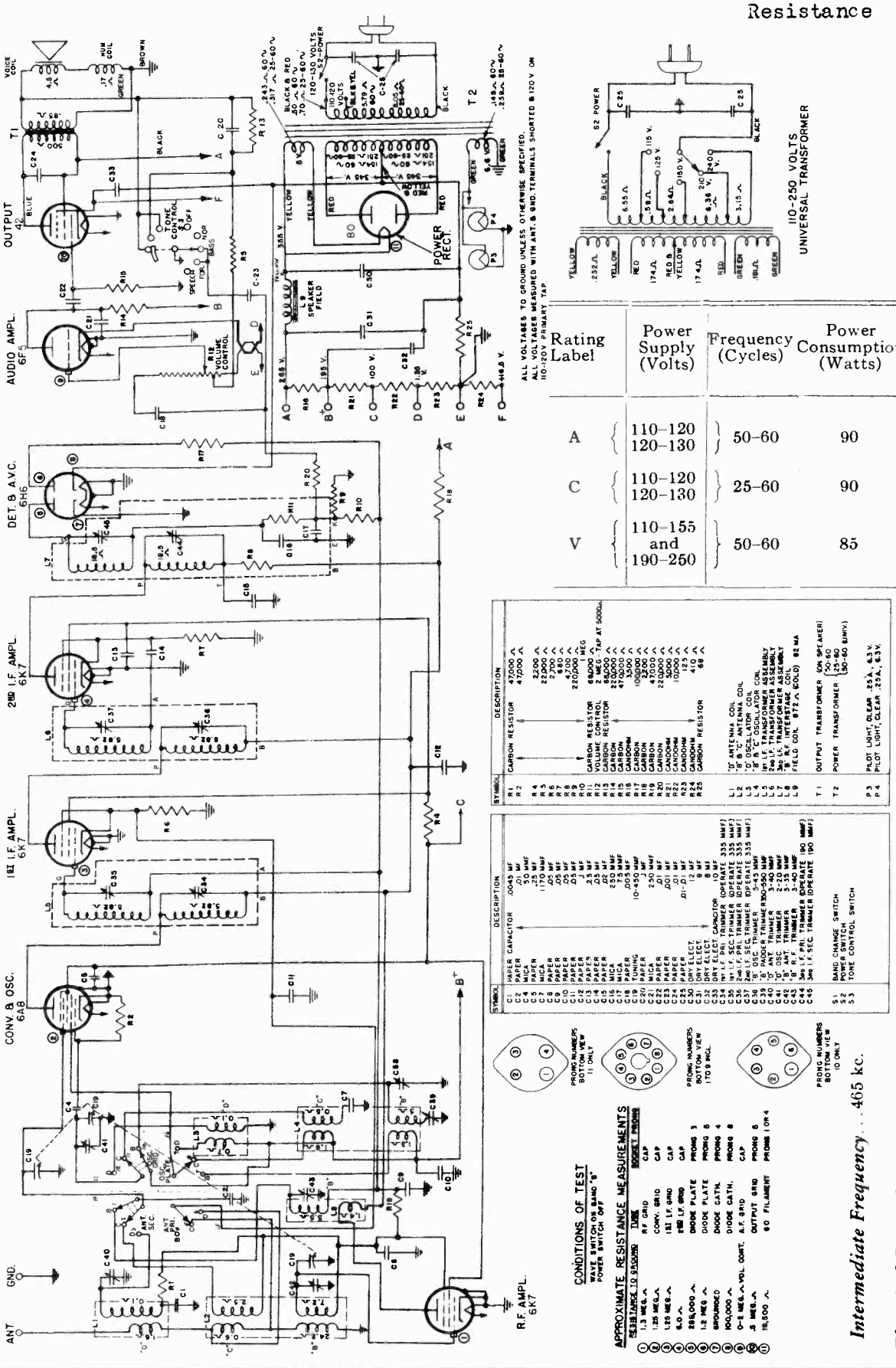
GENERAL ELECTRIC CO.

Stock No.	Description	List Price
RF-202	FASTENER—Case cover snap fastener (Pkg. of 4)	$0.10
*RF-302	FUSE—20 amp fuse (Pkg. of 10)	1.00
*RG-001	GRID CAP—Control grid cap (Pkg. of 5)	.10
RK-014	KNOB—Tone control knob	.10
RL-037	COIL—Antenna coil (L-8)	1.30
RL-133	COIL—R.F. coil assembly (L-2)	1.30
RL-240	COIL—Osc. coil assembly (L-1)	.70
RL-321	REACTOR—Line filter reactor (L-5)	.20
RL-322	REACTOR—B+ reactor (L-7)	.25
RL-323	REACTOR—Vibrator reactor (L-6)	.65
RL-324	REACTOR—Filament reactor (L-9)	.35
RL-325	REACTOR—Iron core reactor (T-4)	.95
RP-067	PLUG—Female antenna plug	.15
RP-068	PLUG—Male antenna plug	.15
RQ-497	RESISTOR—39,000 ohm, 1 W. Carbon (R-6)	.15
RQ-687	RESISTOR—15,000 ohm, 2 W. Carbon (R-15)	.35
RQ-1016	RESISTOR—1200 ohm, 5 W. Vitreous (R-17)	.35
RQ-1227	RESISTOR—47 ohm, ½ W. Carbon (R-16) (Pkg. of 5)	.70
RQ-1243	RESISTOR—220 ohm, ½ W. Carbon (R-2) (Pkg. of 5)	.70
RQ-1253	RESISTOR—560 ohm, ½ W. Carbon (R-10) (Pkg. of 5)	.70
RQ-1259	RESISTOR—1000 ohm, ½ W. Carbon (R-13) (Pkg. of 5)	.70
RQ-1263	RESISTOR—1500 ohm, ½ W. Carbon (R-28) (Pkg. of 5)	.70
RQ-1265	RESISTOR—1800 ohm, ½ W. Carbon (R-5, R-7) (Pkg. of 5)	.70
RQ-1277	RESISTOR—5600 ohm, ½ W. Carbon (R-27, R-29) (Pkg. of 5)	.70
RQ-1281	RESISTOR—8200 ohm, ½ W. Carbon (R-31) (Pkg. of 5)	.70
RQ-1282	RESISTOR—9100 ohm, ½ W. Carbon (R-8) (Pkg. of 5)	.70
RQ-1291	RESISTOR—22,000 ohm, ½ W. Carbon (R-24) (Pkg. of 5)	.70
RQ-1297	RESISTOR—39,000 ohm, ½ W. Carbon (R-4) (Pkg. of 5)	.70
RQ-1299	RESISTOR—47,000 ohm, ½ W. Carbon (R-1, R-22) (Pkg. of 5)	.70
RQ-1307	RESISTOR—100,000 ohm, ½ W. Carbon (R-21, R-25, R-30) (Pkg. of 5)	.70
RQ-1315	RESISTOR—220,000 ohm, ½ W. Carbon (R-3, R-32) (Pkg. of 5)	.70
RQ-1323	RESISTOR—470,000 ohm, ½ W. Carbon (R-14) (Pkg. of 5)	.70
RQ-1324	RESISTOR—510,000 ohm, ½ W. Carbon (R-11, R-12) (Pkg. of 5)	.70
RQ-1327	RESISTOR—680,000 ohm, ½ W. Carbon (R-9) (Pkg. of 5)	$0.70
RQ-1331	RESISTOR—1 meg. ½ W. Carbon (R-20) (Pkg. of 5)	.70
RR-1003	RESISTOR—100 ohm, 1½ Watt W.W. (R-18, R-19) (Pkg. of 5)	.70
RS-170	SHIELD—Antenna coil shield	.20
RS-171	SHIELD—R.F. or oscillator coil shield	.15
RS-213	SOCKET—Vibrator socket (Pkg. of 5)	.75
RS-214	SOCKET—8 pin tube socket (Pkg. of 5)	.60
RS-340	SWITCH—Tone control switch (S-1)	.50
RS-341	SWITCH—A.F.C. switch (S-2)	.70
RS-503	SLEEVE—Fuse insulating sleeve	.05
RS-504	SUPPRESSOR—Ignition suppressor resistor	.35
RT-234	TRANSFORMER—1st I.F. transformer (Complete) (L-3)	1.75
RT-236	TRANSFORMER—2nd (A.F.C.) I.F. transformer (Complete) (L-4)	3.20
RT-506	TRANSFORMER—Audio input transformer (T-1)	1.40
RT-0610	TRANSFORMER—Power transformer (T-3)	3.80
RV-022	VOLUME CONTROL—1.0 megohm volume control (R-23)	.90
RV-200	VIBRATOR—Rectifier type vibrator	4.00
	CONTROL HEAD ASSEMBLY	
RH-700	HEAD—Control head assembly (Not including drive cables)	4.25
RC-827	CABLE—Battery cable from switch to fuse including connector	.25
RC-828	CABLE—20-inch drive cable	1.25
RC-829	CABLE—18-inch drive cable	1.25
RC-830	CABLE—24-inch drive cable	1.25
RK-015	KNOB—Control knobs and skirts (4 pieces) Specify Instrument Panel Control Kit Number	.45
RL-916	LAMP—Pilot Lamp (Pkg. of 10)	1.50
RS-342	SWITCH—Power switch (Mounted on control head)	.30
	SPEAKER ASSEMBLY	
RC-922	CONE—Speaker cone and voice coil (Including gaskets)	.90
*RC-1950	CLAMP—Cone spider clamp and screw	.05
*RP-012	PLUG—Female speaker plug	.20
*RP-015	PLUG—Male speaker plug	.20
RS-046	SPEAKER—6½-in. type speaker (Complete with output transformer)	5.80
RT-425	TRANSFORMER—Output transformer (T-2)	1.30
RA-309	ASSEMBLY—Receiver mtg. studs, nuts and washers	$0.20
*RB-008	BOARD—Terminal Board (2 lugs)	.10
*RB-013	BOARD—Terminal Board (under power transformer)	.10
*RB-023	BOARD—Terminal Board (under gang condenser)	.10
RB-057	BOARD—Terminal Board (under interstage transformer)	.10
RB-603	BASE—Vibrator grounding base	.15
RC-039	CAPACITOR—.01 mfd., 600 volt paper (C-18, C-37)	.25
*RC-046	CAPACITOR—.02 mfd., 200 volt paper (C-11)	.25
RC-051	CAPACITOR—.02 mfd., 1500 volt paper (C-15, C-30)	.30
*RC-072	CAPACITOR—.05 mfd., 200 volt paper (C-2, C-8, C-53)	.25
*RC-091	CAPACITOR—.05 mfd., 400 volt paper (C-7)	.30
RC-100	CAPACITOR—.1 mfd., 100 volt paper (C-6, C-9, C-54)	.30
RC-101	CAPACITOR—.1 mfd., 400 volt paper (C-21, C-35)	.35
*RC-123	CAPACITOR—.1 mfd., 400 volt paper (C-5, C-12, C-14)	.35
RC-156A	CAPACITOR—.5 mfd., 120 volt paper (C-22, C-29)	.45
RC-157A	CAPACITOR—.5 mfd., 200 volt interference filter capacitor	.45
RC-160	CAPACITOR—.25 mfd., 100 volt paper (C-4)	.30
RC-161	CAPACITOR—.5 mfd., 100 volt paper (C-10, C-52)	$0.40
*RC-204	CAPACITOR—15 mmf., Mica, (C-25)	.25
*RC-235	CAPACITOR—100 mmf., Mica (C-23)	.25
*RC-261	CAPACITOR—250 mmf., Mica (C-20, C-26, C-47, C-55)	.25
*RC-296	CAPACITOR—500 mmf., Mica (C-24, C-32, C-33)	.25
*RC-349	CAPACITOR—2000 mmf., Mica (C-28)	.30
RC-571	CAPACITOR—Dry Electrolytic condenser 10 mfd., 300 volt (C-43) 10 mfd., 25 volt (C-44) 5 mfd., 450 volt (C-50) 8 mfd., 450 volt (C-51)	1.75
RC-639	CAPACITOR—Antenna padder (C-38) 150-500 mmf.	.40
RC-641	CAPACITOR—Oscillator padder 300-850 mmf. (C-42)	.40
RC-646	CAPACITOR—1st I.F. Double Trimmers (C-48, C-49)	.40
RC-716-14	CONDENSER—3-gang tuning condenser and trimmers (C-36, C-39, C-40, C-41)	4.60
RC-825	CABLE—Antenna lead-in cable complete with plugs (P-1)	1.60
RC-826	CABLE—Battery cable from set to fuse including connector	.20
RC-1955	CUSHION—Gang condenser rubber mounting cushion assembly	.20
RD-200-14	DRIVE—Gang drive assembly gears, complete	.60

* Used on previous receivers. (Prices subject to change without notice.)

GENERAL ELECTRIC CO.

MODELS F-81, F-86
Schematic
Resistance



Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A	110–120 120–130	50–60	90
C	110–120 120–130	25–60	90
V	110–155 and 190–250	50–60	85

NOTE: Rating "V" receivers may be used on 40-cycle circuits provided the voltage does not exceed 105 volts on the 110–120-volt tap or 200 volts on the 190–220-volt tap.

SYMBOL	DESCRIPTION
R1	CARBON RESISTOR 47000 Ω
R2	CARBON RESISTOR 47000 Ω
R 4	2200 Ω
R5	22000 Ω
R6	2700 Ω
R7	4700 Ω
R8	220,000 Ω
R9	2 MEG. TAP AT 500Ω
R10	CARBON RESISTOR 68000 MEG
R11	VOLUME CONTROL 2 MEG.
R12	CARBON RESISTOR 82000 Ω
R13	CARBON 220,000 Ω
R14	CARBON 470,000 Ω
R15	CARBON 3500 Ω
R16	CARBON 100,000 Ω
R17	CARBON 1000 Ω
R18	CARBON 47000 Ω
R19	CARBON 220,000 Ω
R20	CARBON 1500 Ω
R21	CARBON 125 Ω
R22	CARBON 410 Ω
R23	CARBON 68 Ω
R24	CARBON RESISTOR
R25	CARBON RESISTOR
L1	"D" ANTENNA COIL
L2	"B" & "C" ANTENNA COIL
L3	"D" OSCILLATOR COIL
L4	"B" & "C" OSCILLATOR COIL
L5	2nd I.F. TRANSFORMER ASSEMBLY
L6	2nd I.F. TRANSFORMER ASSEMBLY
L7	3rd I.F. TRANSFORMER ASSEMBLY
L8	R.F. INTERSTAGE COIL
L9	FIELD COIL 872 Ω (COLD) 82 MA
T1	OUTPUT TRANSFORMER (ON SPEAKER)
T2	POWER TRANSFORMER (25-60 / 50-60 B/W/V)
P3	PILOT LIGHT, CLEAR .25A., 6.3 V.
P4	PILOT LIGHT, CLEAR .25A., 6.3 V.

SYMBOL	DESCRIPTION
C1	PAPER CAPACITOR .0045 MF
C2	PAPER 50 MMF
C4	MICA .25 MF
C5	PAPER 1170 MMF
C7	MICA .05 MF
C8	PAPER .05 MF
C9	PAPER .05 MF
C10	PAPER .05 MF
C11	PAPER .5 MF
C12	PAPER .25 MF
C13	PAPER .05 MF
C14	PAPER .05 MF
C15	MICA .02 MF
C16	MICA 250 MMF
C17	MICA 75 MMF
C18	PAPER .005 MF
C19	TRIMMER 10-450 MMF
C20	PAPER .1 MF
C21	MICA 250 MMF
C22	PAPER .01 MF
C23	PAPER .02 MF
C24	PAPER .01 MF
C25	PAPER .01-.01 MF
C30	DRY ELECT. 12 MF
C31	DRY ELECT. 8 MF
C32	DRY ELECT. CAPACITOR 10 MF
C34	1st I.F. PRI. TRIMMER (OPERATE 335 MMF)
C35	1st I.F. SEC. TRIMMER (OPERATE 335 MMF)
C36	2nd I.F. PRI. TRIMMER (OPERATE 335 MMF)
C37	2nd I.F. SEC. TRIMMER (OPERATE 335 MMF)
C38	"B" OSC. TRIMMER 3-40 MMF
C39	"B" ANT. TRIMMER 8.5-500 MMF
C40	"D" ANT. TRIMMER 3-40 MMF
C41	"D" OSC. TRIMMER 2-20 MMF
C42	R.F. PRI. TRIMMER 3-40 MMF
C43	"B" R.F. TRIMMER 3-40 MMF
C44	3rd I.F. PRI. TRIMMER (OPERATE 190 MMF)
C45	3rd I.F. SEC. TRIMMER (OPERATE 190 MMF)
S1	BAND CHANGE SWITCH
S2	POWER SWITCH
S3	TONE CONTROL SWITCH

PRONG NUMBERS BOTTOM VIEW 11 ONLY

PRONG NUMBERS BOTTOM VIEW 1 TO 8 INCL.

PRONG NUMBERS BOTTOM VIEW 10 ONLY

CONDITIONS OF TEST
WAVE SWITCH ON BAND "B"
POWER SWITCH OFF

APPROXIMATE RESISTANCE MEASUREMENTS

RESISTANCE IN OHMS	FROM	SOCKET PRONG
1.3 MEG. Ω	R.F. GRID	CAP
1.25 MEG. Ω	CONV. GRID	CAP
1.25 MEG. Ω	1ST I.F. GRID	CAP
6.0 Ω	2ND I.F. GRID	CAP
250,000 Ω	DIODE PLATE	PRONG 3
1.2 MEG Ω	DIODE PLATE	PRONG 5
APPROXIMATE	DIODE CATH.	PRONG 4
100,000 Ω	DIODE CATH.	PRONG 8
0-2 MEG. Ω VOL. CONT.	A.F. GRID	CAP
.5 MEG. Ω	OUTPUT GRID	PRONG 6
18,500 Ω	80 FILAMENT	PRONGS 1 OR 4

Electrical Power Output

Undistorted ..... 2.5 watts
Maximum ..... 5.0 watts

Intermediate Frequency ... 465 kc.

MODELS F-81,F-86
Voltage,Chassis

GENERAL ELECTRIC CO.

SOCKET VOLTAGES

Tube No.		Plate to Ground Volts D-c	Screen Grid to Ground Volts D-c	Cathode to Ground Volts D-c	Cathode Current M.A.	Heater Volts A-c
6K7	R.F. Amplifier	225	100	0	6.8	6.3
6A8	Oscillator	180	100	0	11.0	6.3
	Converter	225	100	0		
6K7	1st I.F. Amplifier	225	92	4.6	1.8	6.3
6K7	2nd I.F. Amplifier	200	92	4.0	5.6	6.3
6H6 Det. and AVC	Sig. Plate	0	....	....	....	6.3
	Delay Plate	—4.5	....	....	....	
6F5	Audio Amplifier	137*	....	1.3	0.4	6.3
42	Output	237	250	14.5	34	6.3
80	Power Rectifier	....	....	Filament to ground 330	70	5.2

A-C line voltage—120 volts with transformer connected for 120-130-volt operation—no signal input—1000 ohms per volt meter-dial pointer at 530 K.C. on "B" band.

* Measured on 1000-volt scale.

Loud-speaker—Electrodynamic
Cone: Model F-81 ..... 8-inch
Model F-86 ..... 12-inch
Speaker Impedance ..... 5.5 ohms at 400 cycles

Tuning Frequency Range
Band "B" ..... 540-1620 kc.
Band "C" ..... 1600-6000 kc.
Band "D" ..... 5400-18,000 kc.

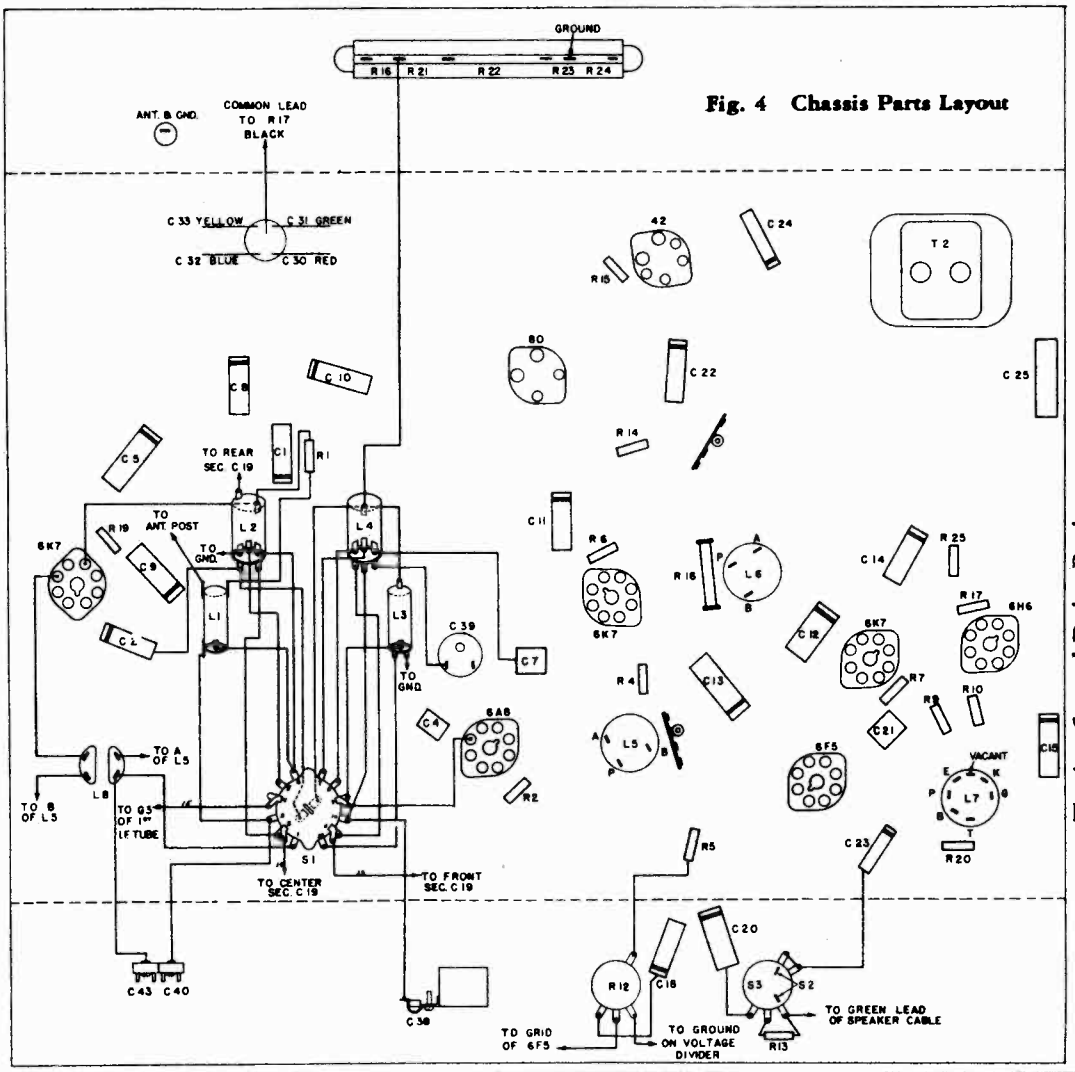


Fig. 4 Chassis Parts Layout

Tuning Control Drive Ratio
Fast Tuning ..... 10 to 1
Vernier Tuning ..... 55 to 1

Fig. 1. Overall I.F. Curve

Fig. 2. Chassis Layout and Trimmer Location

The alignment procedure is given in table form along with the trimmer location drawing, Fig. 2. A "dummy antenna" should be used in all alignments and is the capacitor or capacitor and resistor used in series with the signal generator. The grid lead should not be removed from the tube to which the input signal is applied when aligning the IF as this would remove the grid bias from the tube.

Band Switch Setting	Input Frequency	Point of Input	Dummy Ant.	I.F. Alignment with Oscilloscope Trimmer	Remarks
1. Band "B"	465 K.C. Sweep	2nd I.F. Grid	.05 Mfd.	3rd I.F. Sec. (C-45) Pri. (C-44)	Gang condenser plates wide open—connect vertical input of oscilloscope to ground and the junction of R-9 and R-10 on 3rd I.F. transformer. Adjust trimmers for a single symmetrical curve of maximum amplitude. The resulting curve with input at converter grid is shown in Fig. 1.
2. Band "B"	465 K.C. Sweep	1st I.F. Grid	.05 Mfd.	2nd I.F. Sec. (C-37) Pri. (C-36)	
3. Band "B"	465 K.C. Sweep	Converter Grid	.05 Mfd.	1st I.F. Sec. (C-35) Pri. (C-34)	
I.F. Alignment with Output Meter					
1. Band "B"	465 K.C. with Modulation	2nd I.F. Grid	.05 Mfd.	3rd I.F. Sec. (C-45) Pri. (C-44)	Gang condenser plates wide open—connect output meter across voice coil—keep input signal low and volume control at maximum. Adjust all trimmers in order mentioned for maximum output. Do not attempt an overall realignment after stage by stage alignment has been accomplished.
2. Band "B"	465 K.C. with Modulation	1st I.F. Grid	.05 Mfd.	2nd I.F. Sec. (C-37) Pri. (C-36)	
3. Band "B"	465 K.C. with Modulation	Converter Grid	.05 Mfd.	1st I.F. Sec. (C-35) Pri. (C-34)	
R.F. Alignment					
1. Band "B"					Close gang plates—adjust pointer to first line at left end of tuning scale.
2. Band "D"	18 M.C. with Modulation	Antenna Post	250 Mmf. 400 Ohms	Osc. (C-41) Ant. (C-40)	Connect output meter across voice coil—tone control on "Bass" position. The image of any "D" band signal should be heard 930 K.C. above input signal when (C-41) is on proper peak. Example: 15 M.C. image—15,930 K.C. Peak (C-40) while rocking the gang condenser.
3. Band "C"	No adjustment necessary				
4. Band "B"	1500 K.C. with Modulation	Antenna Post	250 Mmf. 400 Ohms	Osc. (C-38) R.F. (C-43) Ant. (C-42)	Peak trimmers for maximum output with a low input signal.
5. Band "B"	580 K.C. with Modulation	Antenna Post	250 Mmf. 400 Ohms	Osc. padder (C-39)	Adjust padder for maximum output in vicinity of 580 K.C. while rocking the gang condenser.
6. Band "B"	Repeat operation 4				

MODELS F-81, F-86
Dial Data, Notes

GENERAL ELECTRIC CO.

Power Supply

The power supply consists of an 80-type rectifier, power transformer, and the associated filter system; the speaker field acting as the filter choke.

The transformers on the "A" and "C" rating receivers have two primary taps so as to accommodate a range of voltages from 110–130 volts. As shipped from the factory the receivers have the power cord connected to the 120–130-volt tap of the transformer (black and red lead). If the normal voltage of the power supply is always below 115 volts, the connection of the power cord should be removed from the lead and soldered to the 110–120-volt tap (black and yellow lead). After changing the connection, tape the soldered joint as well as the exposed end of the unused lead. This change requires removal of the chassis from the cabinet.

Speaker

Two different types of voice coil suspensions are used in both the 8- and 12-in. speakers.

The 8-in. cone assemblies are designated as early and late production and are not interchangeable. The early production voice coil suspension is 4 5/8 inches between points of clamping, while the later production voice coil suspension is 2 3/8 inches between points of clamping.

The 12-in. cone assemblies which were changed in design during production are interchangeable.

DIAL MECHANISM

The dial mechanism (Fig. 5) is rigidly mounted to the chassis by means of two brackets and four self-tapping screws. The dial pointer is operated by means of an "automatic vernier" reduction drive unit, mounted on the receiver chassis, and connected to the gang drive drum by a drive cord.

Motion imparted to the gang condenser rotor is transmitted through a series of pulleys and an interconnecting cable to the dial pointer slider which is supported on a rail in the rear of the dial scale. The following instructions should aid you in making any repairs to this mechanism.

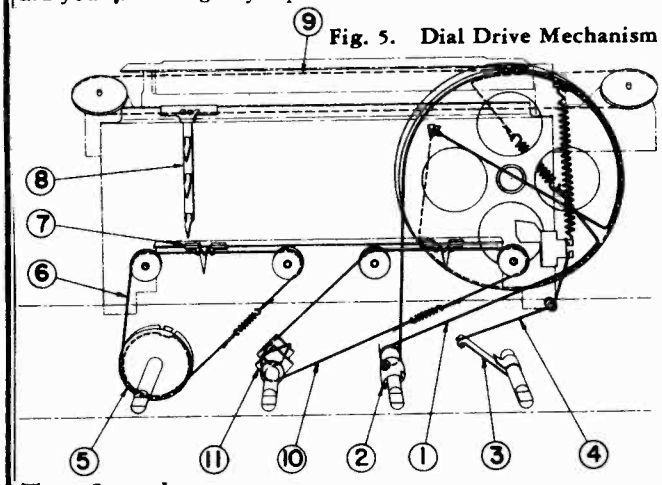


Fig. 5. Dial Drive Mechanism

Tone Control

When the tone control is in the "normal position," a portion of the output voltage of the receiver is fed back through a resistor-capacitor network consisting of C-20, R-13, and R-5 to a tap on the volume control. This feedback voltage is out of phase with the input and the resulting degeneration reduces the speaker resonance boom due to pentode output, gives an extended and relatively flat response to a wide range of low frequencies, and reduces distortion arising in the audio amplifier. In the "bass" position, the tone control switch connects C-23 in series with R-20 across the diode load resistance (R-9), reducing the high frequency response. The "foreign" position of the switch shorts out capacitor C-20 and resistor R-13 from the above network and gives a frequency response best suited for short-wave reception. In the speech position, C-20 and R-13 are shorted out; C-23 is removed from the circuit, leaving R-5; thereby providing flat degeneration at all frequencies. This is the most desirable condition for the reception of programs predominating in speech. The tone control switching described can be traced on the schematic diagram shown in Fig. 3.

To Replace Pointer Cable and Drive Cable

Remove the dial scale, allowing ready access to the dial scale mechanism.

To replace the drive cord (1), set the drive drum to the relative position as shown in Fig. 5, loop the cord through the tab on the drum, then thread it down through the hole in the chassis and around the vernier drive as indicated. The other end of the cord is looped through one end of the tension spring in back of the drive drum.

To replace the wire pointer drive cord (9), set the drive drum to the relative position as shown in Fig. 5. Loop the cord through the tab on the drum, and thread it around the drive pulley and idler pulleys and back to the tension spring on the drive drum. With the gang condenser plates fully meshed, adjust the pointer (8) along the drive cord until it coincides with the end mark at the left-hand end of the scale. The scale may be slid into place to ascertain this correct position. After final adjustment is made, solder the pointer to the wire cable (9).

To Replace Tone Control Cable

Thread the cable (6) as shown in Fig. 5 around the drive pulley (5) and around the idler pulleys, fastening the ends to the tension spring. For adjustment; turn the pulley (5) to the extreme counterclockwise, setting the pointer (7) so it extends about 1/16 in. over the left-hand edge of the rail. Crimp the pointer tab on the drive cable. A final adjustment of the pointer may be made by means of the drive pulley (5) with the dial scale in place.

To Replace Volume Control Cable

Thread the cable (10) around the drive pulley (11) as shown in Fig. 5. Fasten the loops of the cable into the tension spring. To adjust, turn the control to the extreme clockwise direction and set the pointer so that the right-hand side of the pointer rider coincides with the right-hand edge of the rail. Crimp the pointer tab on the drive cable. A final adjustment of this pointer may be made by adjusting the pulley (11) on the volume control shaft after the scale has been replaced.

Band and Indicator Control

The threading and assembly of the band indicator is self-explanatory from an inspection of Fig. 5.

To "Adjust Automatic Vernier" Drive

The vernier drive used on this receiver includes a planetary reduction unit equipped with a clutch which automatically changes the reduction ratio. This clutch consists of a sleeve mounted on the knob shaft. To adjust, loosen the locking screw and move the sleeve (2) axially along the shaft until the cam surface in the end of the sleeve engages with the pin in the knob shaft. This engagement should take place at a point on the cam surface as near to the stop as possible and still allow complete release of the clutch.

To Change Dial Lamps

Dial lamps are located at either end of the dial scale assembly. Remove the dial lamp bracket from the projection at the top of the dial mechanism and replace bulb. This may be accomplished without removing the chassis from the cabinet.

Coil System

L1 is the "D" band antenna coil. The "B" and "C" band antenna coils are wound on a single coil form designated as L2 in Fig. 3. The coil L8, tuned by the center section of the gang condenser C-19 and coupled to a 6K7 tube are the essential elements of an R.F. stage, used only on the "B" band. L3 and L4 are the oscillator coils for the "D," "C," and "B" bands respectively. The antenna secondary and oscillator plate coils on the next lower frequency band to the one in use are shunted out by the wave switch contacts which are connected to C-2 and the B+ lead respectively.

The various contact terminals of the wave-change switch are numbered from 1 to 16 to facilitate the tracing of the circuit to the switch.

GENERAL ELECTRIC CO.

MODELS F-81, F-86
Parts

Stock No.	Description	List Price
*RB-026	BOARD—Ant. and gnd. terminal board	$0.10
*RB-040	BOARD—Terminal Board (3 lugs)	.10
*RB-139	BRACKET—Gang condenser mtg. brackets	.15
RC-003	CAPACITOR—.001 Mfd., 200 V. Paper (C-23) (Close Tolerance)	.25
*RC-017	CAPACITOR—.0045 Mfd., 200 V. Paper (C-1)	.25
*RC-023	CAPACITOR—.005 Mfd., 600 V. Paper (C-18)	.25
*RC-042	CAPACITOR—.01 Mfd., 1000 V. Paper (C-2, C-22, C-24)	.30
*RC-080	CAPACITOR—.02 Mfd., 400 V. Paper (C-15)	.25
*RC-091	CAPACITOR—.05 Mfd., 400 V. Paper (C-8, C-9, C-10, C-11, C-14)	.30
*RC-123	CAPACITOR—0.1 Mfd., 400 V. Paper (C-12, C-20)	.35
*RC-150	CAPACITOR—.25 Mfd., 400 V. Paper (C-5, C-13)	.35
*RC-213	CAPACITOR—50 Mmf., Mica (C-4)	.25
*RC-223	CAPACITOR—75 Mmf., Mica (C-17)	.25
*RC-259	CAPACITOR—250 Mmf., Mica (C-21)	.30
*RC-336	CAPACITOR—1170 Mmf., Mica (C-7)	.30
RC-569	CAPACITOR—12 Mfd., 450 V.; 8 Mfd., 400 V.; 8 Mfd., 350 V.; 10 Mfd., 25 V. dry electrolytic (C-30, C-31, C-32, C-33)	2.20
*RC-618	CAPACITOR—"B" band oscillator trimmer (5-45 Mmfd.) (C-38)	.25
*RC-632	CAPACITOR—Double trimmer (3-40 Mmfd.) (C-40, C-43)	.25
*RC-634	CAPACITOR—"B" band padder (350-550 Mmfd.) (C-39)	.35
RC-635	CAPACITOR—Double trimmers, 1st or 2nd I.F. transformer (C-34, C-35, C-36, C-37)	.45
*RC-637	CAPACITOR—Double trimmer, 3rd I.F. (C-44, C-45, C-16)	.60
RC-718	CONDENSER—3-gang tuning condenser (C-19) (Includes trimmers C-41, C-42)	4.20
*RC-755	CAPACITOR—Line capacitor, .01-.01 Mfd. 250 V. A-C (C-25)	.40
RC-849	CABLE—Speaker cable and plug	.55
*RC-863	CORD—Power cord and plug	.65
RC-992	CUSHION—Gang condenser mtg. cushions (Pkg. of 3)	.10
RD-201	DRIVE—Vernier drive mechanism	1.55
RE-016	ESCUTCHEON—Escutcheon plate	2.05
*RF-002	FOOT—Chassis mtg. foot	.20
*RF-008	FOOT—Chassis mtg. foot (red rubber)	.20
*RG-001	GRID CAP—Control grid clip (Pkg. of 5)	.10
RK-017	KNOB—Control knob (plain) (Pkg. of 5)	.40
RK-018	KNOB—Control knob (band selector and tone control (Pkg. of 5)	.40
*RL-035	COIL—Ant. coil band "D" (L-1)	.70
*RL-036	COIL—Ant. coil "B" and "C" band (L-2)	1.10
*RL-131	COIL—RF coil "B" band (L-8)	.75
*RL-237	COIL—Osc. coil band "D" (L-3)	.70
*RL-238	COIL—Osc. coil "B" and "C" band (L-4)	1.00
RQ-1231	RESISTOR—68 ohms, ½ W. Carbon (R-25) (Pkg. of 5)	.70
RQ-1255	RESISTOR—680 ohm, ½ W. Carbon (R-7) (Pkg. of 5)	.70
RQ-1267	RESISTOR—2200 ohm, ½ W. Carbon (R-4) (Pkg. of 5)	.70
RQ-1269	RESISTOR—2700 ohm, ½ W. Carbon (R-6) (Pkg. of 5)	.70
RQ-1275	RESISTOR—4700 ohm, ½ W. Carbon (R-8) (Pkg. of 5)	.70
RQ-1291	RESISTOR—22,000 ohm, ½ W. Carbon (R-5) (Pkg. of 5)	$0.70
RQ-1299	RESISTOR—47,000 ohm, ½ W. Carbon (R-1, R-2, R-19) (Pkg. of 5)	.70
RQ-1303	RESISTOR—68,000 ohm, ½ W. Carbon (R-11, R-13) (Pkg. of 5)	.70
RQ-1307	RESISTOR—100,000 ohm, ½ W. Carbon (R-17) (Pkg. of 5)	.70
RQ-1315	RESISTOR—220,000 ohm, ½ W. Carbon (R-9, R-14, R-20) (Pkg. of 5)	.70
RQ-1323	RESISTOR—470,000 ohm, ½ W. Carbon (R-15) (Pkg. of 5)	.70
RQ-1331	RESISTOR—1.0 Megohm, ½ W. Carbon (R-10) (Pkg. of 5)	.70
RQ-1467	RESISTOR—2200 ohms, 1 W. Carbon (R-18)	.20
RR-725	RESISTOR—Tapped bleeder resistor (R-16, R-21, R-22, R-23, R-24)	1.00
RS-140	SHIELD—"B" Band RF Transformer Shield Can	.20
RS-172	SHIELD—1st, 2nd, or 3rd I.F. Transformer Shield	.25
*RS-200	SOCKET—8-pin Tube Socket (Pkg. of 5)	.75
RS-215	SOCKET—6-prong Tube Socket (Pkg. of 5)	.60
RS-217	SOCKET—4-prong Glass Tube Socket (Pkg. of 5)	.50
RS-350	SWITCH—Tone control and Power Switch (S-2, S-3)	1.10
RS-351	SWITCH—Band Change Switch (S-1)	1.30
RT-0810	TRANSFORMER—Power Transformer, 110-130 volts, 50/60 cycles (T-2)	4.75
RT-0811	TRANSFORMER—Power Transformer Universal 50/60 cycles (T-2)	8.50
RT-0812	TRANSFORMER—Power Transformer 110-130 V., 25/60 cycles (T-2)	8.00
RT-233	TRANSFORMER—1st or 2nd IF Transformer	1.50
RT-243	TRANSFORMER—3rd IF Transformer	1.60
RV-030	VOLUME CONTROL—2 megohm control tapped at 5,000 ohms	.80
RW-014	WINDOW—Escutcheon Window and Rubber Mounting	.45
*RW-101	WASHER—Felt Washer for Control Shafts (Pkg. of 10)	.45
RX-021	ASSEMBLY—Chassis Mounting Assembly	.10

SPEAKER ASSEMBLY F-81

Stock No.	Description	List Price
RC-924	CONE—8-in. Cone and Voice Coil Assembly (early production)	.90
RC-927	CONE—8-in. Cone and Voice Coil Assembly (late production)	.90
*RC-990	CLAMP—Voice Coil Spider Clamp (early production)	.05
RC-1967	CLAMP—Voice Coil Spider Clamp (late production)	.05
*RP-015	PLUG—Male speaker plug	.20
RS-058	SPEAKER—8-in. Speaker (complete)	6.00
*RS-416	SPRING—Voice Coil Leads Spring (Pkg. of 2)	.10
RT-421	TRANSFORMER—Output Transformer	1.30

See text under Speaker

SPEAKER ASSEMBLY F-86

Stock No.	Description	List Price
RC-925	CONE—12-in. Cone and Voice Coil Assembly	1.25
*RC-991	CLAMP—12-in. Cone Spider Clamp and Screw	.05
*RP-015	PLUG—Male Speaker Plug	$0.20
RS-057	SPEAKER—12-in. Speaker (complete)	6.80
*RS-416	SPRING—Voice Coil Leads Spring (Pkg. of 2)	.10
RT-421	TRANSFORMER—Output Transformer (T-1)	1.30

DIAL SCALE MECHANISM

Stock No.	Description	List Price
RB-155	BRACKET—Band Change Indicator Bracket)	.05
RB-604	BUSHING—Volume Control Cable Drive Bushing	.10
RC-846	CABLE—Volume Control Cable (Pkg. of 5)	.40
RC-847	CABLE—Tone Control Cable (Pkg. of 5)	.40
RC-848	CABLE—Condenser Drum Drive Cable and Pointer Cable (Pkg. of 5)	.90
*RD-013	DRUM—Condenser Drive Drum	.35
RD-053	DIAL—Dial Scale	$1.40
RL-920	LAMP—Dial Lamp, .25 amp., 6.3 V. (Pkg. of 10)	1.50
*RP-049	PULLEY—Idler Pulley for Cond. Drive Cable	.15
RP-073	POINTER—Volume or Tone Control Pointers (Pkg. of 5)	.10
RP-075	PULLEY—Idler Pulley for Tone and Volume Control Cords (Pkg. of 6)	.20
RP-076	PULLEY—Tone Control Drive Pulley	.15
RP-077	POINTER—Dial Scale Pointer Assembly (Pkg. of 5)	.90
RS-218	SOCKET—Lamp Socket Assembly	.10
RS-401	SPRING—Tuning Drive Cord Tension Spring (Pkg. of 5)	.10
RS-426	SPRING—Volume or Tone Control Drive Cord Tension Spring	.10
RX-023	ASSEMBLY—Band Indicator Assembly (Includes cord, pointer, and spring)	.20

* Used on previous receivers.

(Prices subject to change without notice)

GENERAL INFORMATION

The model E-115 is a three-band superheterodyne employing eleven G.E. Metal Tubes described above. It incorporates two stages of I.F., push-pull output, three-point tone control, and a high and low note compensated volume control. Full wave rectification is obtained from two 5W4's connected as half-wave rectifiers. L1 is the "D" band antenna coil. L2 is the "B" and "C" band antenna coil. The rear section of the gang condenser, L3, and a 6K7 tube are the essential elements of an R.F. stage, used only on the "B" band. L4 and L5 are the oscillator coils for the "D," "B" and "C" bands respectively. The antenna secondary and oscillator plate coils on the next lower frequency band to the one in use are shunted out by the wave switch contacts which are connected to C3 and B+.

Colorama Tuning

This receiver is equipped with a novel tuning device which indicates the point of exact resonance by the color of the dial illumination. When no signal is tuned-in, the dial illumination is red, but as the receiver is tuned, a smooth change to green occurs. Powerful stations will produce the darkest green color. Weak stations may only change the dial illumination to pink. The point at which any station is exactly in tune is indicated by the greatest color change obtainable.

The colored light is produced by a red and a green pilot bulb mounted behind the dial scale. These are controlled by a saturable reactor in a circuit which is shown in the schematic diagram, Fig. 2. The two bulbs are placed in series across one of the secondaries on the power transformer. In shunt with the green bulb is a reactor whose impedance is varied by a d-c coil wound on the same core. The plate current of the AVC controlled tubes flows through the d-c coil. At a condition of no-signal, the bias on the AVC controlled tubes is at minimum and their plate current is at maximum causing saturation of the reactor, which in turn shunts out and nearly extinguishes the green bulb. This causes most of the a-c supply voltage to be impressed across the RED bulb and its parallel resistor. At no signal, then, the dial is deepest red. When a station is tuned-in, the above conditions are reversed and the GREEN bulb is illuminated brightly. The impedance of the reactor changes in exact relationship with the incoming signal resulting in a smooth change from red to green or from green to red.

Phase Inverter

A 6C5, used as a phase-inverter, makes it possible to use push-pull output without the use of an interstage transformer. The audio signal from the volume control is impressed on the grid of the 6C5 audio amplifier. A portion of the 6C5 output is taken from a tap on one of the 6F6 grid resistors, and impressed on the grid of the phase inverter. (The ratio of R-19 and R-20 is chosen so that the excitation on the grid of the phase inverter is equal to that applied to the grid of the 6C5 audio amplifier.) Thus, the input signal to one of the 6F6's passes through two tubes while the input to the other 6F6 passes through one tube. As a result, the excitation on the 6F6 grids is 180 degrees out of phase, which is the requirement for push-pull operation.

ADJUSTMENT OF DIAL MECHANISM

The dial mechanism (Fig. 4) is mounted to the chassis by means of two brackets and four self-tapping screws. Motion is imparted to the gang condenser rotor through a series of pulleys and an interconnecting cable to the dial pointer slider which is supported on a rail above the dial scale.

To Replace Drive Cable

Rotate the drive drum (14) counter-clockwise until the gang condenser plates are fully open. Place the end of the cable having an eyelet in slot (A). Thread the cable as shown in Fig. 4, making certain that the cable passes *over* the pin (B) and runs along the *correct* grooves, the looped end hooking over the tension spring (16). Check the position of the drive wheel (14) on the condenser shaft to make sure that the cable coming off the right-hand idler pulley lines up with the groove in the drive pulley. Also, as the condenser plates become fully meshed, the drive wheel (14) should just meet the bushing (D) of the reduction drive unit (13). With the drive wheel in this position, place the pointer on the rail (E) and, with the tip of the pointer (11) on the extreme left-hand dial scale division of Broadcast band, crimp the pointer tab on the drive cable.

To Adjust Pointer or Scale Calibration

Three positions of the dial pointer cable are provided on the drive drum (14) to adjust the dial pointer up or down scale. The position shown in Fig. 4 with the cable over pin (B) is the medium position. Changing the cable to the position between pins (B) and (C) moves the pointer *down* scale. The position below the pin (C) moves the pointer *up* scale from the medium position. With the gang plates closed, set the pointer at the extreme left-hand dial scale marking on the Broadcast band.

To Replace Scale

Remove the band change cable (12) by unhooking it from the fork (F) on bracket (3). Remove the end support bracket (8) held by a single self-tapping screw and withdraw the scale assembly from its housing. Replace the end caps (5) and (6) on the new scale and reassemble. Before reattaching the band change cable to the fork (F) the tension spring (7) should be given two full turns to provide proper tension for the cable.

To Ajdust Rotation of Scale

The bracket arm (3) may be moved up or down by means of the set screw to give the correct position of the scale divisions with respect to the dial pointer. The pointer tip should slightly overlap the scale divisions.

To Change Dial Lamps

Lift the lamp bracket (17) from the housing (20) to which it is clipped. With the lamp bracket laid back horizontally, the lamps may be replaced.

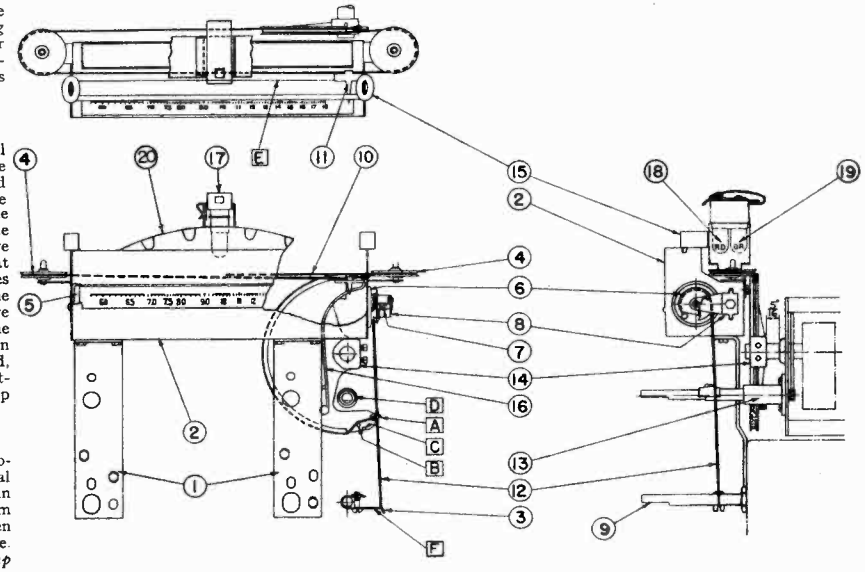


Fig. 4. Dial Mechanism

SOCKET VOLTAGES

Tube	Cathode to Ground Volts DC	Screen Grid to Ground Volts DC	Plate to Ground Volts DC	Cathode Current M.A.	Heater Volts A.C.
6A8 Oscillator	....	.....	190	10.0	6.3
6A8 Converter	3.2	93	235		
6K7 1st I.F.	3.0	103	235	8.5	6.3
6K7 2nd I.F.	6.8	103	235	3.1.	6.3
6H6 Det. AVC	....	....	....	....	6.3
6C5 1st A.F.	6.4	....	95	1.3	6.3
6F6's Output	18	280	260	42	6.3
6C5 Inverter	6.4	.....	95	1.3	6.3
5W4's Rectifiers	Fil. to gnd. 340	....	335 A-c EACH	65 EACH	5.0
6K7 R.F.	3.0	103	235	8.5	6.3

AC line voltage 117—no signal input—1000 ohms per volt meter—dial pointer at 530 K.C.

GENERAL ELECTRIC CO.

MODEL E-115
Schematic
Resistance

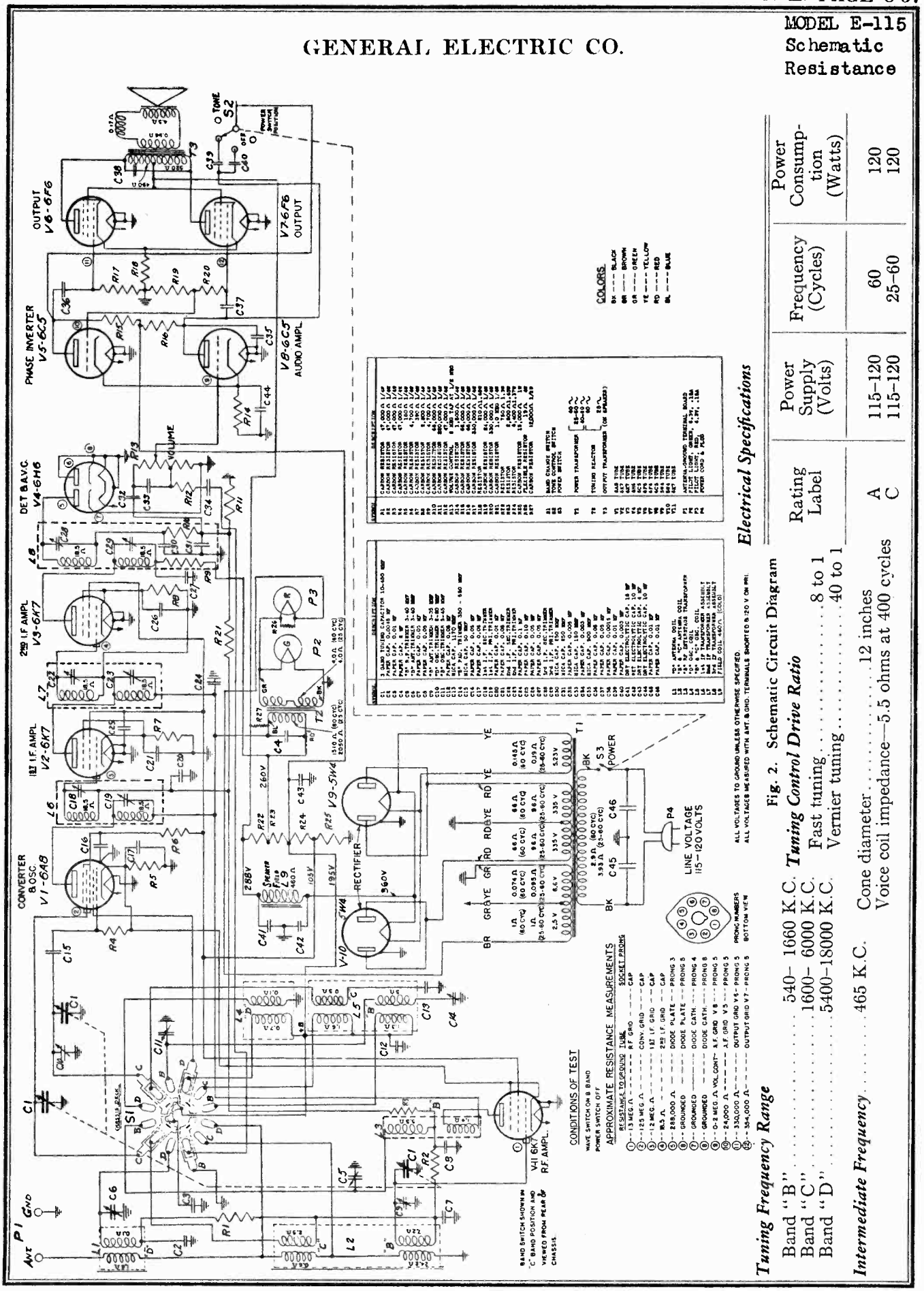


Fig. 2. Schematic Circuit Diagram

Electrical Specifications

	Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
	A	115–120	60	120
	C	115–120	25–60	120

Tuning Frequency Range

Band "B" ..... 540– 1660 K.C.
Band "C" ..... 1600– 6000 K.C.
Band "D" ..... 5400–18000 K.C.

Intermediate Frequency ..... 465 K.C.

Tuning Control Drive Ratio

Fast tuning ..... 8 to 1
Vernier tuning ..... 40 to 1

Cone diameter ..... 12 inches
Voice coil impedance—5.5 ohms at 400 cycles

MODEL E-115
Chassis Wiring

GENERAL ELECTRIC CO.

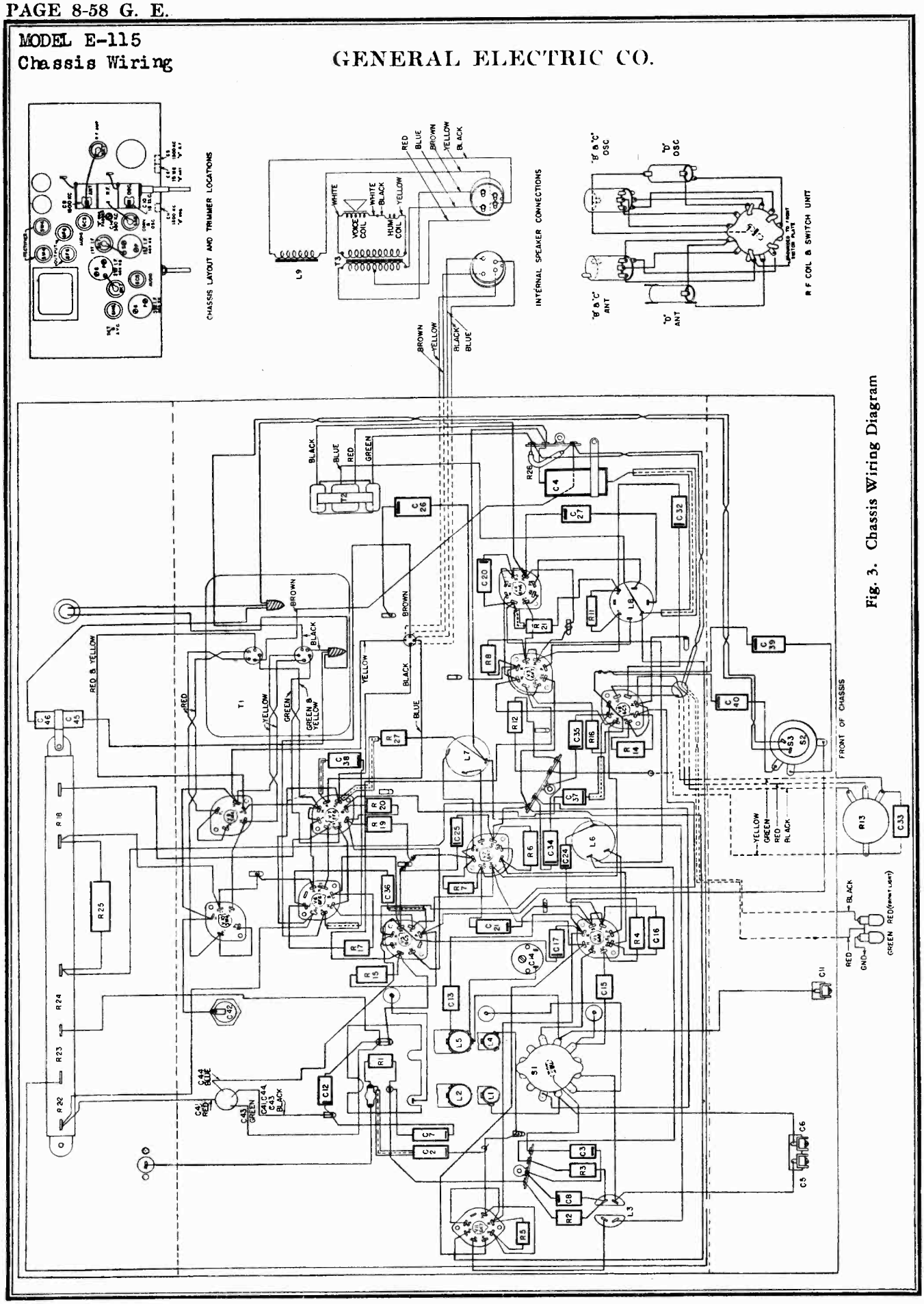


Fig. 3. Chassis Wiring Diagram

ALIGNMENT PROCEDURE

IF ALIGNMENT WITH OSCILLOSCOPE

	Band Switch Setting	Input Frequency	Point of Input	Dummy Ant.	Trimmer	Remarks
1	Band "B"	465 K.C. Sweep	1st IF Grid	.05 MFD or Larger	3rd IF Sec. (C-28) 3rd IF Pri. (C-29)	Gang condenser plates closed—connect audio input of oscilloscope to ground and to the junction of R-21, R-11—adjust for a single symmetrical curve of maximum amplitude.
2	Band "B"	465 K.C. Sweep	1st IF Grid	.05 MFD or Larger	2nd IF Sec. (C-22) 2nd IF Pri. (C-23)	
3	Band "B"	465 K.C. Sweep	Converter Grid	.05 MFD or Larger	1st IF Sec. (C-18) 1st IF Pri. (C-19)	

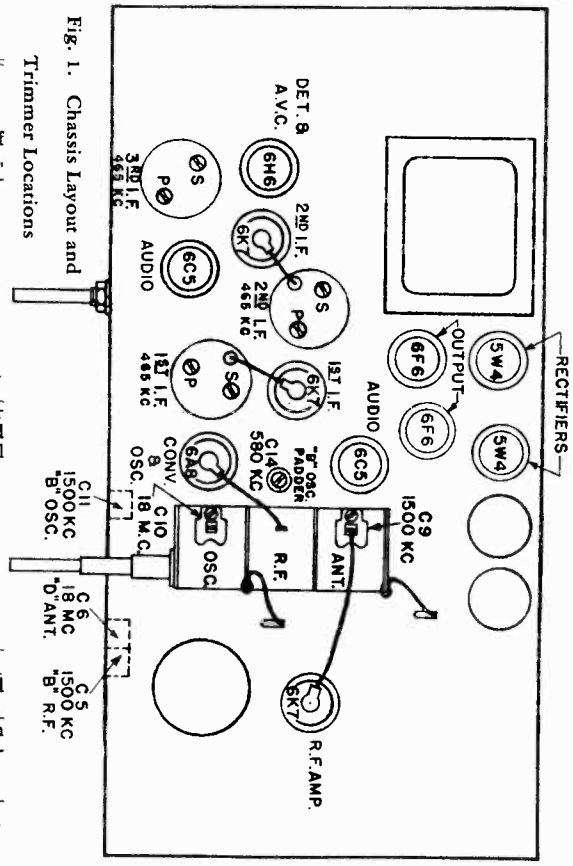
IF ALIGNMENT WITH OUTPUT METER

1	Band "B"	465 K.C. with 400-cycle modulation	1st IF Grid	.05 MFD or Larger	3rd IF Sec. (C-28) 3rd IF Pri. (C-29)	Gang condenser plates closed—connect output meter across Voice Coil—keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output.
2	Band "B"	465 K.C. with 400-cycle modulation	1st IF Grid	.05 MFD or Larger	2nd IF Sec. (C-22) 2nd IF Sec. (C-23)	
3	Band "B"	465 K.C. with 400-cycle modulation	Converter Grid	.05 MFD or Larger	1st IF Sec. (C-18) 1st IF Pri. (C-19)	

RF ALIGNMENT

1	Band "B"					Close gang plates—adjust pointer to first line at left end of tuning scale.
2	Band "D"	18 M.C. with 400-cycle modulation	Antenna Post	250 MMF 400 ohms in Series	Oscillator (C-10) Antenna (C-6)	Connect output meter across voice coil—tone control on "Bass" position—set osc. trimmer. Rock gang condenser when adjusting the antenna trimmer.
3	Band "C"	No adjustments necessary				
4	Band "B"	1500 K.C. with 400-cycle modulation	Antenna Post	250 MMF 400 ohms in Series	Oscillator (C-11) RF (C-5) Ant. (C-9)	Peak trimmers for max. output with a low input signal.
5	Band "B"	580 K.C. with 400-cycle modulation	Antenna Post	250 MMF 400 ohms in Series	Osc. Padder (C-14)	Adjust for maximum output in vicinity of 580 KC while rocking the gang.
6	Band "B"	1500 K.C. with 400-cycle modulation	Antenna Post	250 MMF 400 ohms in series	Oscillator (C-11)	

Fig. 1. Chassis Layout and Trimmer Locations



To realize all the performance built into these receivers at the factory, alignment using cathode ray equipment is to be preferred.

On the "D" band (5400 to 18,000 K.C.), the oscillator operates on the *LOW* frequency side of the incoming signal; therefore, adjust the oscillator trimmer until the second peak is reached as the trimmer is *INCREASED* in capacity. When the correct adjustment is made, it will be possible to tune the image of any signal on the "D" band 930 K.C. *HIGHER* than the signal if the input is sufficiently high. Example: The image of 15 M.C. should be heard at 15,970 K.C.

The alignment procedure is given in table form on page 3. The "Dummy Antenna" is the capacitor or capacitor and resistor used in series with the signal generator antenna lead.

MODEL E-115
Parts

GENERAL ELECTRIC CO.

REPLACEMENT PARTS

INSIST ON GENUINE FACTORY-TESTED PARTS, WHICH MAY BE PURCHASED FROM AUTHORIZED DEALERS

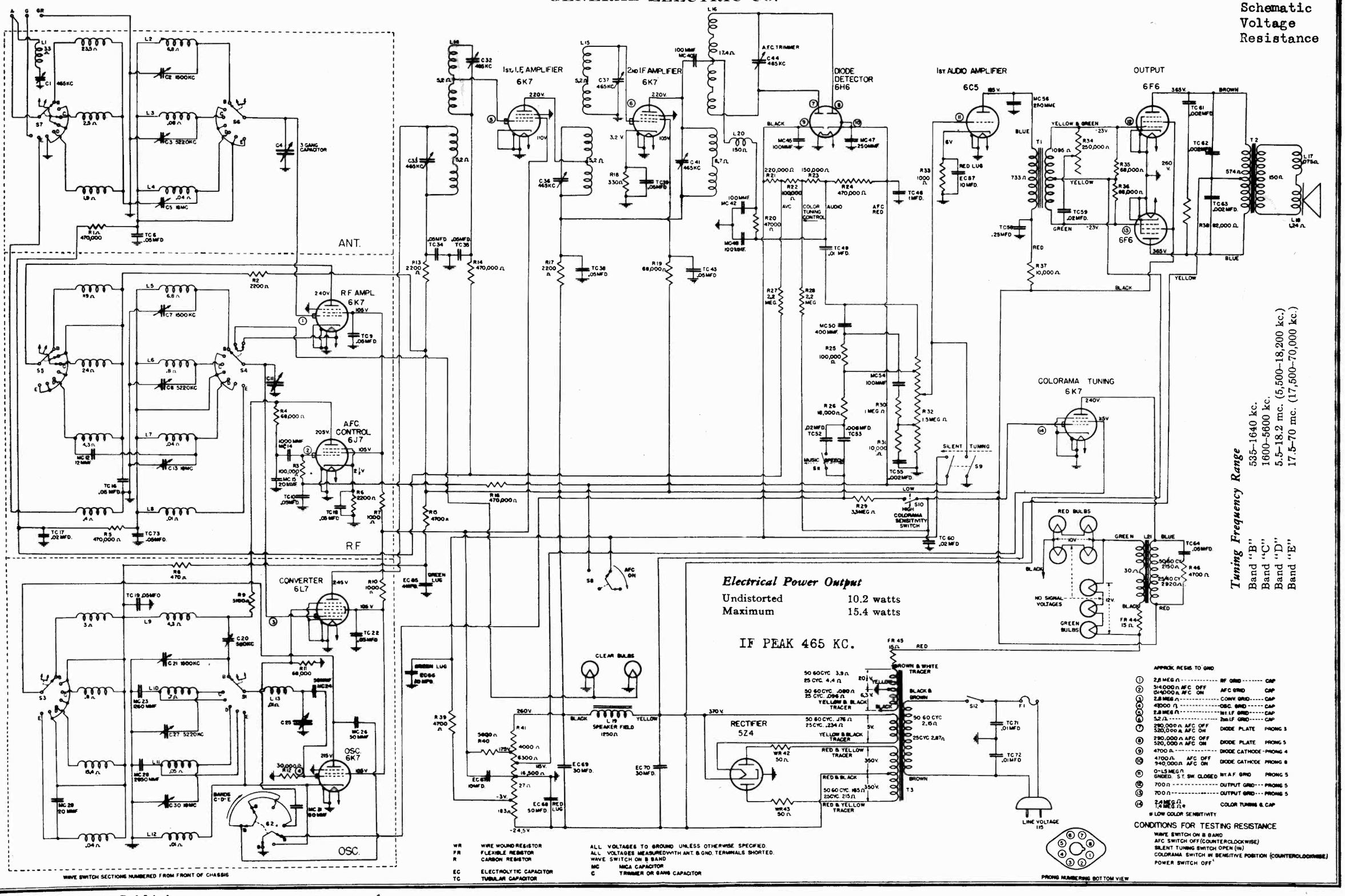
Stock No.	Description	List Price
*RB-023	BOARD—Terminal Board (Near Electrolytic Cond.)	$0.10
*RB-026	BOARD—Ant. Ground Terminal Board	.10
*RB-040	BOARD—Terminal Board (4 Lugs)	.10
*RB-053	BOARD—Terminal Board (3 Lugs) Between 1st and 2nd IF Transformer	.10
*RB-139	BRACKET—Gang Condenser Mtg. Brackets	.15
*RC-014	CAPACITOR—.003 Mfd. 200 V. Paper (C-34)	.25
RC-015	CAPACITOR—.003 Mfd. 400 V. Paper (C-40)	.25
*RC-017	CAPACITOR—.0045 Mfd. 200 V. Paper (C-2)	.25
RC-032	CAPACITOR—.01 Mfd. 200 V. Paper (C-3)	.25
*RC-040	CAPACITOR—.01 Mfd. 400 V. Paper (C-39)	.25
*RC-046	CAPACITOR—.02 Mfd. 200 V. Paper (C-20)	.25
*RC-072	CAPACITOR—.05 Mfd. 200 V. Paper (C-7, C-8, C-17, C-21, C-26)	.25
RC-091	CAPACITOR—.05 Mfd. 400 V. Paper (C-12, C-16, C-27, C-36, C-37)	.30
*RC-096	CAPACITOR—.1 Mfd. 200 V. Paper (C-25)	.30
*RC-123	CAPACITOR—.1 Mfd. 400 V. Paper (C-24)	.35
RC-715	CONDENSER—3 Gang Tuning Condenser (10–450 Mmf.) (Trimmers C-9, C-10) (C-1)	$5.25
*RC-755	CAPACITOR—Line Capacitors .01–.01 Mfd. 250 V. AC (C-45, C-46)	.40
RC-824	CABLE—Speaker Cable Complete with Plug	.55
*RC-860	CORD—Power Cord	.65
RC-977	CUSHION—Gang Cond. Mtg. Cushions (Pkg. of 3)	.15
*RE-011	ESCUTCHEON—Escutcheon Plate (with Mtg. Screws)	1.25
*RF-006	FOOT—Chassis Mtg. Foot (white rubber)	.30
*RF-008	FOOT—Chassis Mtg. Foot (red rubber)	.20
*RG-001	GRID CAP—Control Grid Clip (Pkg. of 5)	.10
*RK-004	KNOB—Control Knob (push-on) (Pkg. of 5)	.40
*RK-005	KNOB—Tone Control Knob (Pkg. of 5)	.50
RL-035	COIL—Antenna Coil Band "D" (L-1)	.70
RL-036	COIL—Antenna Coil "B" and "C" (L-2)	1.10
RL-131	COIL—RF Coil "B" Band (L-3)	.75
RL-237	COIL—Osc. Coil Band "D" (L-4)	.70
RL-238	COIL—Osc. Coil "B" and "C" Band (L-5)	1.00
RL-315	REACTOR—Colorama Tuning Reactor 25 Cycle (T-2)	2.75
RL-316	REACTOR—Colorama Tuning Reactor 60 Cycle (T-2)	2.25
RQ-041	RESISTOR—180 ohm ¼ watt Carbon (R-5) (Pkg. of 5)	.60
RQ-049	RESISTOR—390 ohm ¼ watt Carbon (R-7) (Pkg. of 5)	.60
*RQ-063	RESISTOR—1,500 ohm ¼ watt Carbon (R-14) (Pkg. of 5)	.60
*RQ-067	RESISTOR—2,200 ohm ¼ watt Carbon (R-8) (Pkg. of 5)	.60
*RQ-075	RESISTOR—4,700 ohm ¼ watt Carbon (R-6, R-9) (Pkg. of 5)	.60
RQ-092	RESISTOR—24,000 ohm ¼ watt Carbon (R-19) (Pkg. of 5)	.60
*RQ-099	RESISTOR—47,000 ohm ¼ watt Carbon (R-1, R-2, R-3, R-4, R-12) (Pkg. of 5)	.60
*RQ-103	RESISTOR—68,000 ohm ¼ watt Carbon (R-10, R-15, R-16) (Pkg. of 5)	.60
*RQ-115	RESISTOR—220,000 ohm ¼ watt Carbon (R-11) (Pkg. of 5)	.70
*RQ-119	RESISTOR—330,000 ohm ¼ watt Carbon (R-17, R-20) (Pkg. of 5)	.70
*RQ-131	RESISTOR—1.0 megohm ¼ watt Carbon (R-21) (Pkg. of 5)	.70
RQ-285	RESISTOR—12,000 ohm ½ watt Carbon (R-27) (Pkg. of 5)	.60
*RQ-487	RESISTOR—15,000 ohm 1 watt Carbon (R-25) (Pkg. of 5)	1.00
RR-317	RESISTOR—19 ohm 4 watt Flexible Resistor (R-26)	.20
RR-724	RESISTOR—Tapped Bleeder Resistance (R-18, R-22, R-23, R-24)	1.00
RS-140	SHIELD—"B" Band RF Transformer Shield Can	.20
RS-167	SHIELD—Shield Can for 1st or 2nd IF Transformer	.20
RS-168	SHIELD—Shield Can for 3rd IF Transformer	.20
*RS-200	SOCKET—8 Pin Tube Socket (Pkg. of 5)	.75
RC-195	CAPACITOR—.0015 Mfd. 1000 V. Paper (C-38)	$0.25
RC-197	CAPACITOR—.005 Mfd. 200 V. Paper (C-32)	.25
*RC-199	CAPACITOR—2 Mfd. 100 V. Paper (C-4)	.75
*RC-218	CAPACITOR—50 Mmfd. Mica Capacitor (C-15)	.25
*RC-242	CAPACITOR—150 Mmf. Mica (C-33)	.25
*RC-261	CAPACITOR—250 Mmfd. Mica (C-30, C-31)	.25
*RC-298	CAPACITOR—500 Mmf. Mica (C-35)	.30
RC-336	CAPACITOR—Mica "C" Band Padder 1170 Mmf. (C-13)	.30
*RC-405	CAPACITOR—10 Mfd. 480 V. Wet Electrolytic (C-42)	1.15
RC-568	CAPACITOR—Dry Electrolytic 18 Mmfd. 4 Mfd., 10 Mfd. (C-41, C-43, C-44)	2.25
*RC-618	CAPACITOR—"B" Band Osc. Trimmer (5–45 Mmf.) (C-11)	.25
RC-632	CAPACITOR—Double "B" and "D" Band Trimmer Capacitors 3–40 Mfd. (C-5, C-6)	.25
RC-634	CAPACITOR—"B" Band Padding Capacitor 350–550 Mmf. (C-14)	.35
RC-637	CAPACITOR—Double Trimmers 3rd IF Transformer (C-28, C-29)	.60
RC-638	CAPACITOR—Double Trimmers 1st or 2nd IF Transformer (C-18, C-19, C-22, C-23)	.50
*RS-204	SOCKET—5 Pin Socket (Pkg. of 5)	$0.75
RS-334	SWITCH—Band Change Switch (S-1)	1.25
RS-335	SWITCH—Tone Control and Power Switch (S-2, S-3)	1.00
*RS-423	SPRING—Knob Spring "Push-on" Type (Pkg. of 10)	.25
RT-093	TRANSFORMER—Power Transformer 115–120 V. 60 Cycles (T-1)	5.95
RT-095	TRANSFORMER—Power Transformer 115–120 V., 25/60 Cycles (T-1)	10.95
RT-231	TRANSFORMER—1st or 2nd IF Transformer (complete) (L-6, C-18, C-19) or (L-7, C-22, C-23)	1.50
RT-232	TRANSFORMER—3rd IF Transformer (L-8, C-28, C-29)	1.75
RV-020	VOLUME CONTROL—2 Megohm Volume Control (R-13)	.80
RW-012	WINDOW—Escutcheon Window	.50
*RW-101	WASHER—Felt washer for Control Shafts (Pkg. of 10)	.45
	SPEAKER ASSEMBLY	
*RC-910	CONE—12-in. Type Cone and Voice Coil	1.45
*RC-991	CLAMP—12-in. Cone Spider Clamp and Screw	.05
*RP-040	PLUG—Male Speaker Plug	.20
RP-063	PLUG—Female Speaker Plug (includes 1 plug, 4 contacts, 1 eyelet, 1 washer)	.20
RS-041	SPEAKER—12-in. Type Speaker (complete with output transformer)	10.00
*RS-416	SPRING—Voice Coil Leads Spring (Pkg. of 2)	.10
*RT-401	TRANSFORMER—Output Transformer (T-3)	1.90
	DIAL MECHANISM	
*RB-137	BRACKET—Dial Mask and Reflector Box Support Bracket (1)	.20
RB-151	BRACKET—Lamp Bracket Assembly (17)	.05
RB-152	BRACKET—Band Change Bracket (3)	.05
RB-514	BOX—Scale Housing Box (2)	.70
*RC-817	CABLE—Drive Cable (10) (Pkg. of 5)	.40
*RC-818	CABLE—Band Change Cable (12) (Pkg. of 5)	.40
*RC-993	CUSHION—Rubber Buffer Cushion (Dial) (15) (Pkg. of 2)	.10
*RC-994	CAP—Scale Cap (Free end) (5)	.10
*RC-995	CAP—Scale Cap (pulley end) (6)	.10
*RD-035	DRIVE—Tuning Condenser Reduction Drive Assembly (13)	1.10
RD-046	DIAL—Slide Rule Dial Scale	.65
RL-908	LAMP—Colorama Tuning Green Lamp (19) (P-2) (Pkg. of 10)	1.50
RL-909	LAMP—Colorama Tuning Red Lamp (18) (P-3) (Pkg. of 10)	1.50
*RP-047	POINTER—Dial Pointer (Pkg. of 5) (11)	.25
*RP-048	PULLEY—Gang Drive Pulley (14)	.35
*RP-049	PULLEY—Drive Cord Idler Pulley (4)	.15
RR-906	REFLECTOR—Lamp Reflector (20)	.50
*RS-418	SPRING—Gang Drive Pulley Spring (16)	.05
RS-424	SPRING—Dial Scale Spring (7)	.05
RS-608	SUPPORT—Dial Scale Spring Support (8)	.05

* Indicates parts used on previous receivers.

(Prices subject to change without notice)

GENERAL ELECTRIC CO.

MODEL E-126
Schematic
Voltage
Resistance



Electrical Power Output

Undistorted	10.2 watts
Maximum	15.4 watts

Tuning Frequency Range

Band "B"	535–1640 kc.
Band "C"	1600–5600 kc.
Band "D"	5.5–18.2 mc. (5,500–18,200 kc.)
Band "E"	17.5–70 mc. (17,500–70,000 kc.)

WR	WIRE WOUND RESISTOR
FR	FLEXIBLE RESISTOR
R	CARBON RESISTOR
EC	ELECTROLYTIC CAPACITOR
TC	TUBULAR CAPACITOR
MC	MICA CAPACITOR
C	TRIMMER OR GANG CAPACITOR

ALL VOLTAGES TO GROUND UNLESS OTHERWISE SPECIFIED.
ALL VOLTAGES MEASURED WITH ANT. & GND. TERMINALS SHORTED.
WAVE SWITCH ON B BAND

APPROX. RESIS. TO GND

1	2.8 MEG Ω	RF GRID	CAP
2	514,000 Ω AFC OFF 154,000 Ω AFC ON	AFC GRID	CAP
3	2.8 MEG Ω	CONV. GRID	CAP
4	47000 Ω	OSC. GRID	CAP
5	2.8 MEG Ω	1st I.F. GRID	CAP
6	52 Ω	2nd I.F. GRID	CAP
7	290,000 Ω AFC OFF 520,000 Ω AFC ON	DIODE PLATE	PRONG 3
8	290,000 Ω AFC OFF 520,000 Ω AFC ON	DIODE PLATE	PRONG 5
9	4700 Ω	DIODE CATHODE	PRONG 4
10	4700 Ω AFC OFF 940,000 Ω AFC ON	DIODE CATHODE	PRONG 6
11	0–1.5 MEG Ω GNDED. S.T. SW. CLOSED	1st A.F. GRID	PRONG 5
12	700 Ω	OUTPUT GRID	PRONG 5
13	700 Ω	OUTPUT GRID	PRONG 5
14	2.4 MEG Ω 1.4 MEG Ω *	COLOR TUNING G.	CAP

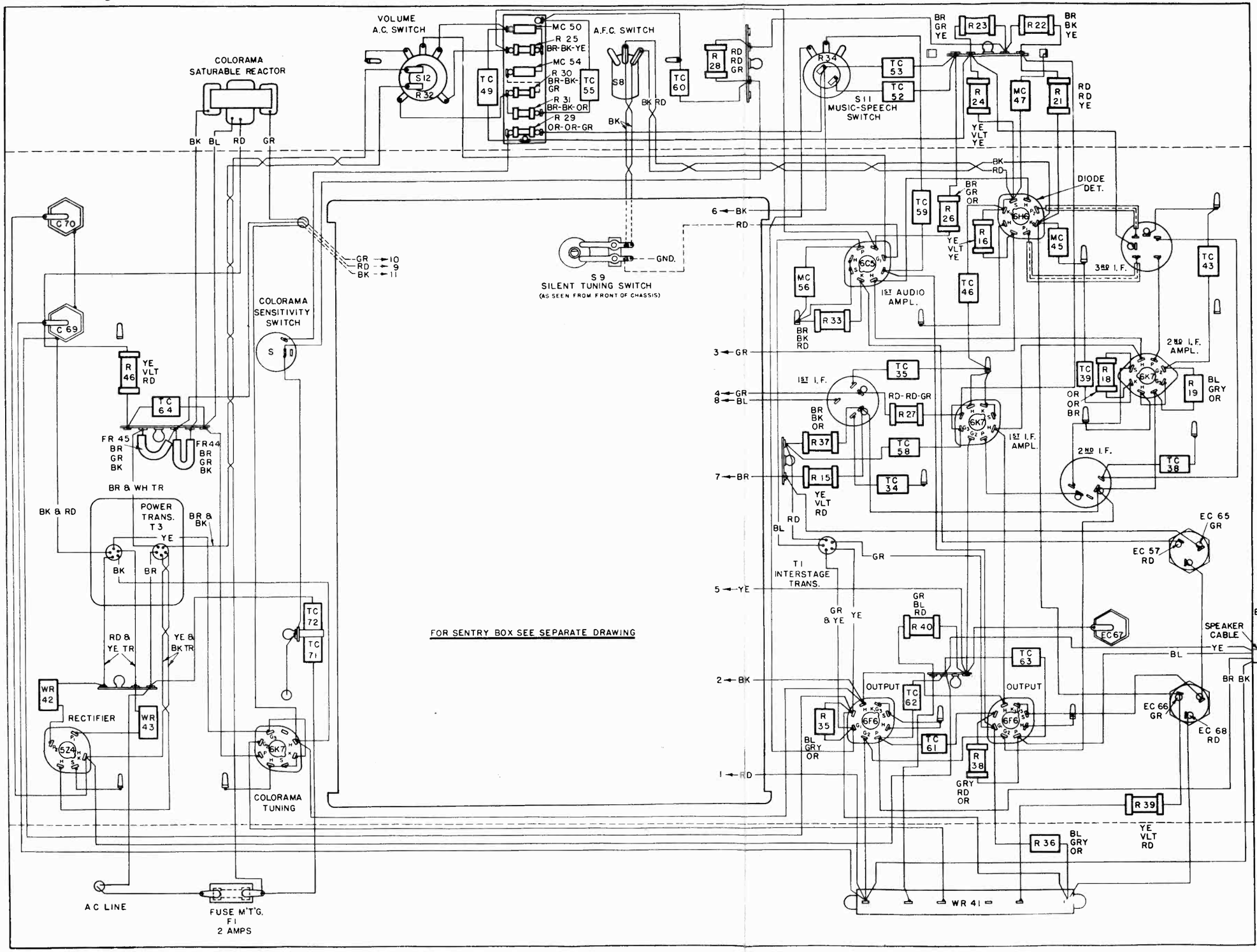
* LOW COLOR SENSITIVITY

CONDITIONS FOR TESTING RESISTANCE

WAVE SWITCH ON B BAND
AFC SWITCH OFF (COUNTERCLOCKWISE)
SILENT TUNING SWITCH OPEN (IN)
COLORAMA SWITCH IN SENSITIVE POSITION (COUNTERCLOCKWISE)
POWER SWITCH OFF

MODEL E-126
Chassis Wiring

GENERAL ELECTRIC CO.



MODEL E-126
SentryBox Wiring

GENERAL ELECTRIC CO.

To Change the Dial Lamps

Make certain that the copper-plated hex head shipping screw (which secures the dial lamp bracket during shipment) has been removed before attempting to remove the dial lamp bracket (No. 17). Lift the lamp bracket from the tabs under which it is clipped. Care should be taken that the lamp leads do not put an undue strain upon the drive cable. With the lamp bracket lead laid back horizontally the lamps may be placed. When the lamp bracket is reinserted care should be exercised to avoid having the lamp leads foul the gang mechanism.

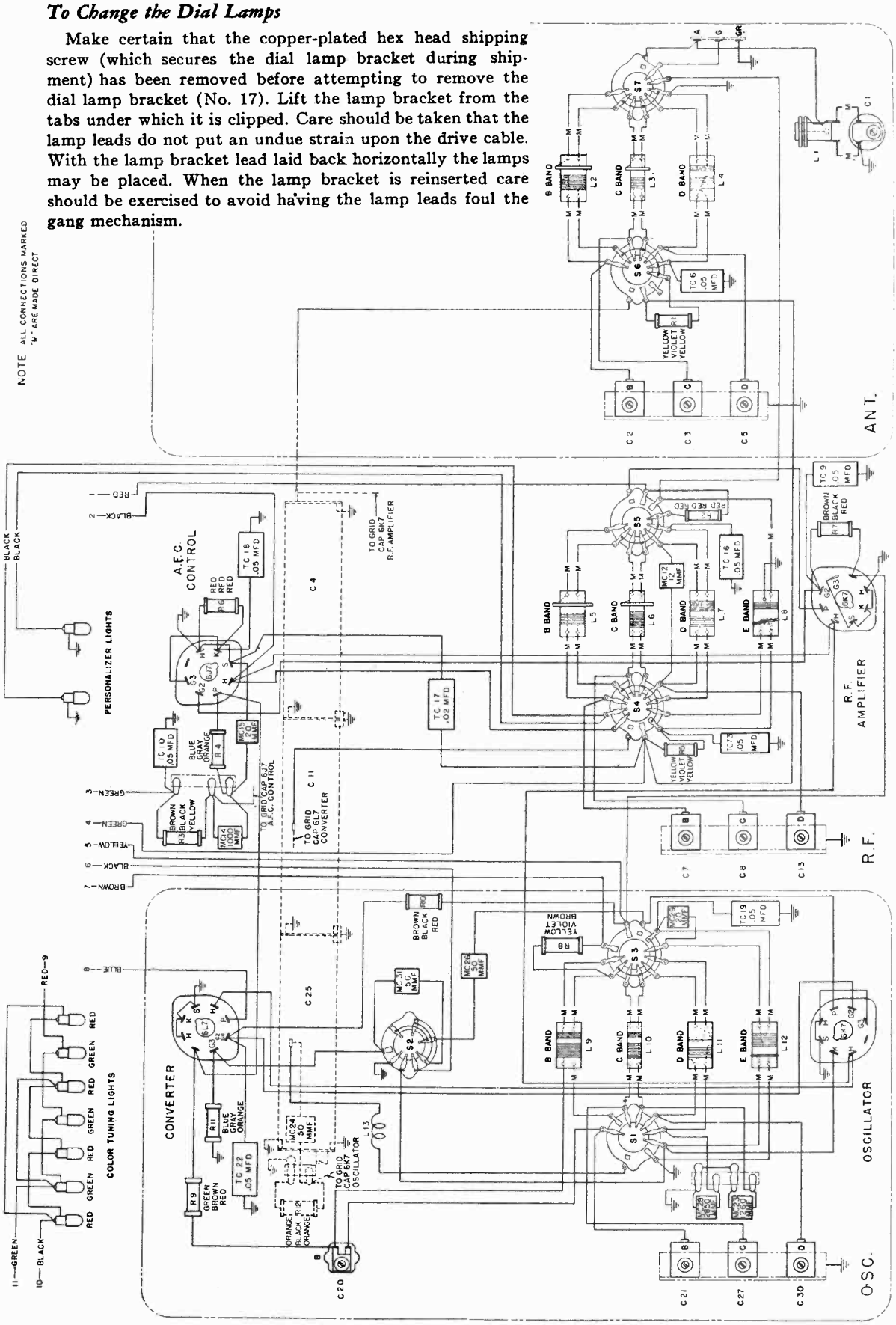


Fig. 1. "Sentry Box" Wiring Diagram

MODEL E-126
Socket, Trimmers
Voltage

GENERAL ELECTRIC CO.

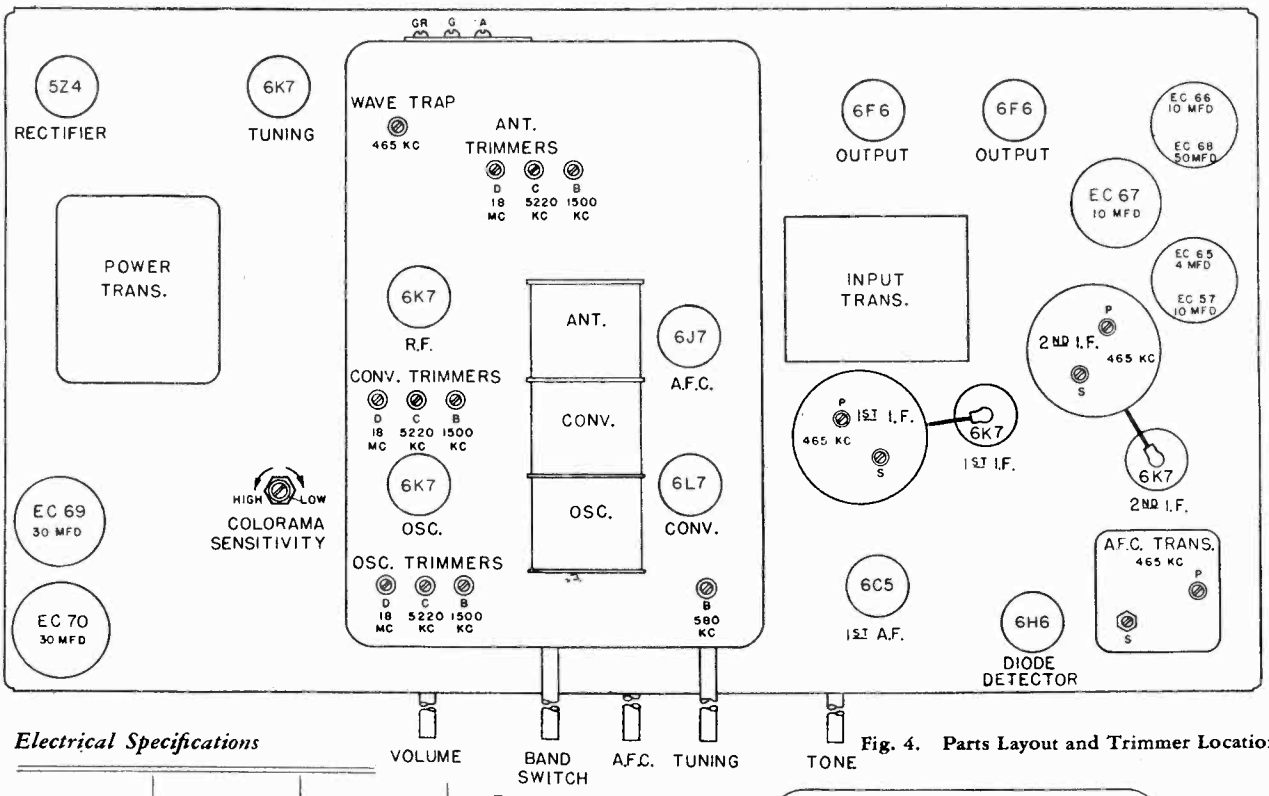
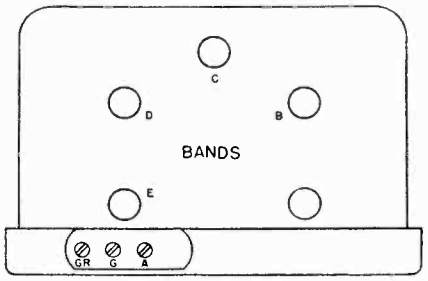


Fig. 4. Parts Layout and Trimmer Location

Electrical Specifications

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A	115	50–60	120
C	115	25–60	120
V	105–130 and 200–250	40–60	125

NOTE.—Taps on universal transformers (Rating "V") are accessible by removing the cap cover on the top of the transformer.



SOCKET VOLTAGES

Tube No.	Cathode to Ground Volts D.C.	Screen Grid to Ground Volts D.C.	Plate to Ground Volts D.C.	Cathode Current M.A.	Heater Volts A.C.
6K7 R.F. Amp.	†	105	240	8.5	6.3
6L7 Converter	†	105	245	10.0	6.3
6K7 Oscillator	. . .	105	215	7.5	6.3
6K7 1st I. F. Amp.	†	110	220	9.5	6.3
6K7 2nd I. F. Amp.	3.0	105	220	10.0	6.3
6H6 Detector & AVC.	. . .	. . .	. . .	. . .	6.3
6C5 Audio Amplifier	6.0	. . .	185	5.6	6.3
6F6 Output	*	260	365	21.0	6.3
6F6 Output	*	260	365	21.0	6.3
6K7 Colorama Control	. . .	115	240	9.0	6.3
6J7 AFC.	2.5	105	205	1.0	6.3
5Z4 Rectifier	370 D.C.	. . .	700/350 R.M.S.	114.0	5.0

Measured at 115 volts supply. No signal input. Volume control maximum. Voltmeter 1000 ohms per volt. Measurements taken on highest scale giving accurate readable deflection.
† Grid bias at source −3 volts.
* Grid bias at source −23 volts.

Alignment Oscillograms

GENERAL ELECTRIC CO.

MODEL E-126
Dial Mechanism

Tuning Control Drive Ratio

Fast Tuning	8 to 1
Vernier Tuning	50 to 1

Physical Specifications

Model	E-126
Height	41 in.
Width	27¼ in.
Depth	14 5/16 in.
Weight packed	124 lb.

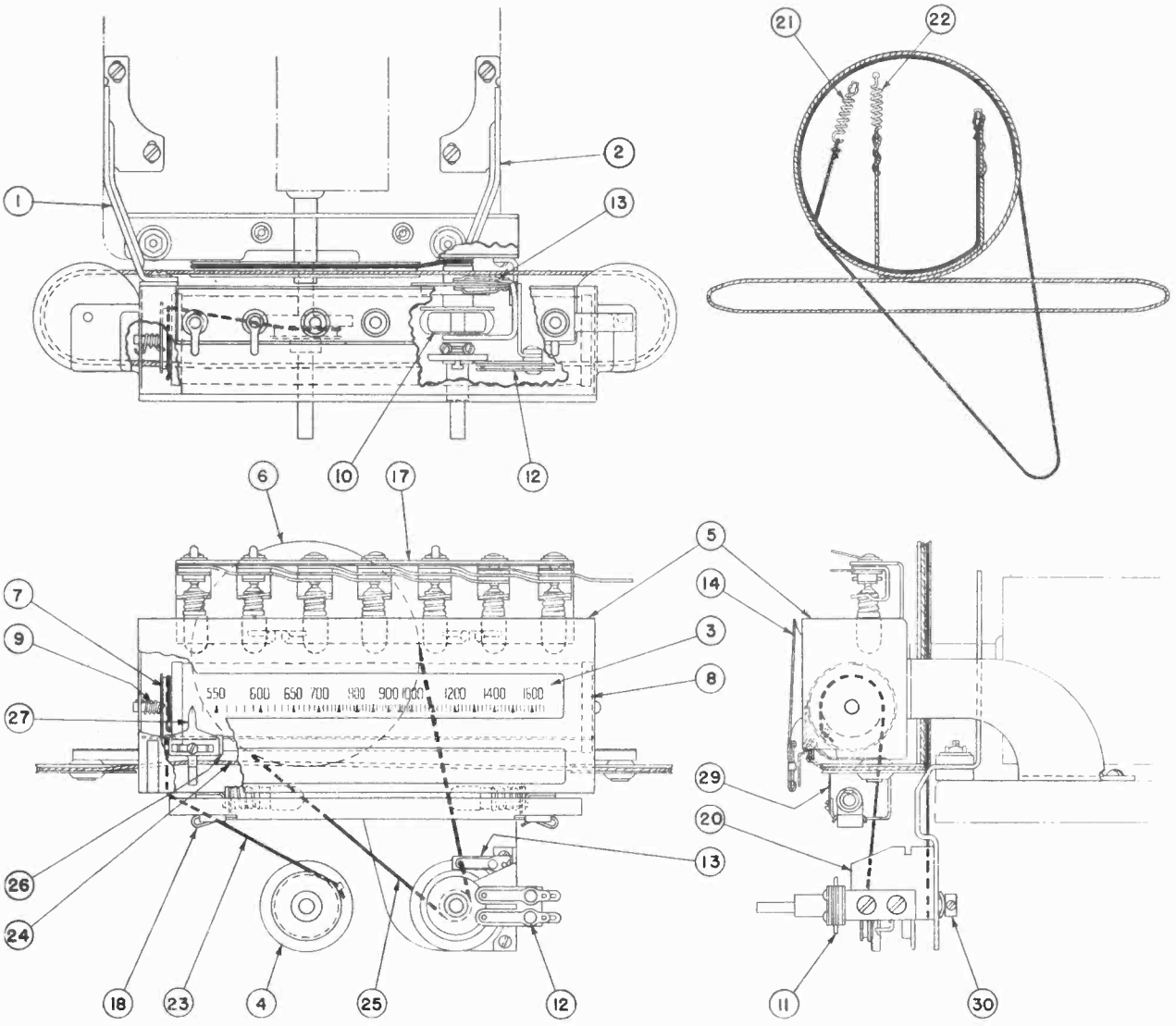


Fig. 7. Dial Drive Mechanism

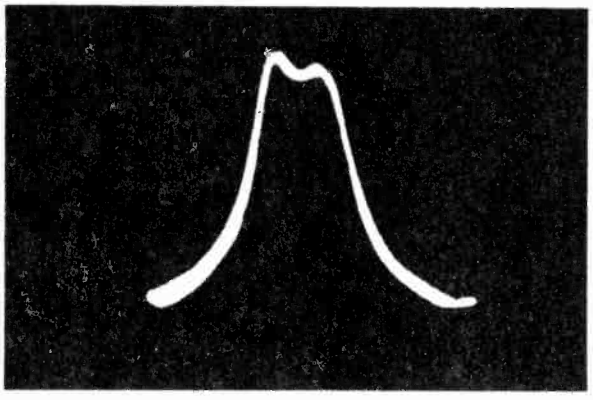


Fig. 5. Overall I. F. Curve

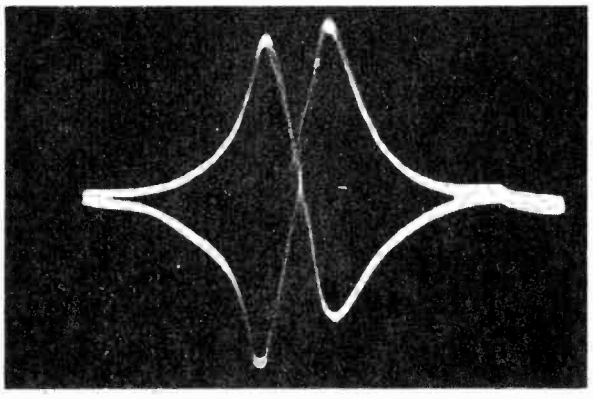


Fig. 6. AFC Trimmer Adjustment Curve

ALIGNMENT PROCEDURE

The receiver should first be allowed to run for fifteen minutes in order to reach its approximate normal operating temperature. Before making any adjustments, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal from the test oscillator to the receiver and inserting a "Tuning Wand" into the coil involved. The "Tuning Wand" consists of a rod of insulating material having a ring of nonmagnetic metal attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the metal ring end into the center of a particular coil, the inductance of the coil is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the circuits are in exact alignment, inserting either end of the tuning wand in any coil will result in a decrease in output. When an increase in signal is obtained with the iron-filled end of the wand, a decrease in resonant frequency of that circuit by increasing its trimmer capacity is indicated. When an increase in signal is obtained with the metal ring, a decrease in trimmer capacity is indicated.

Changes Indicated by Wand

Wand	Signal	Trimmer adjustment required
Metal Ring	Decrease	None
Iron filings	Decrease	
Metal Ring	Increase	Decrease capacity
Iron filings	Decrease	
Metal Ring	Decrease	Increase capacity
Iron filings	Increase	

Alignment Frequencies

I.F.	Band "B"	Band "C"	Band "D"	Wave Trap
465 kc.	580 kc. 1500 kc.	5220 kc.	18,000 kc.	465 kc.

In order to align this receiver properly, it is necessary to have available the following test equipment:

1. A modulated test oscillator with frequencies available of 465, 580, 1500, 5220 and 18,000 kc.
2. An output indicator, such as a high resistance a-c voltmeter with a maximum scale reading of 3 to 5 volts, or a neon lamp indicator.
3. An alignment tool consisting of an insulating shaft with a small screwdriver blade.
4. A tuning wand.

To realize the full advantage of the performance built into these receivers at the factory, circuit alignment using cathode ray oscilloscope equipment is much to be preferred. The oscilloscopic method is particularly advantageous in aligning the I.F. tuned circuits.

See Fig. 4 for location of all trimmer capacitors.

1. Visual Alignment of I. F.

For visual alignment it is necessary to vary the frequency of an unmodulated test oscillator signal over a range extending on both sides of the peak frequency. This variation must take place in synchronism with the horizontal traverse of the cathode ray beam on its screen. The frequency modulator must, therefore, provide means for synchronizing the periodic test frequency variation with the cathode ray horizontal deflection circuit. The test oscillator may advantageously have facilities for audio frequency amplitude modulation of a fixed radio frequency test signal, as well as for frequency modulation, but audio modulation is not required for visual I.F. alignment.

In place of an output meter across the speaker voice coil, the vertical plates of the cathode ray tube are connected across the load resistor of the diode rectifier. With the frequency modulator in operation in conjunction with the test oscillator, the resonance curve of the circuit under test will be then shown on the screen.

Set the tuning dial indicator at the low end of the broadcast band at some point where no signal is received, since an extraneous signal might interfere with the aligning process. The volume control should be in an "off" or nearly off position. Apply a frequency modulated signal to the grid of the 1st I.F. amplifier tube through a 0.05 Mfd. (RC-072) capacitor. Connect the vertical plates of the oscilloscope between ground and the junction point between R-23 and R-24, and with the AFC switch in the "off" position proceed to align the primary and secondary of the 2nd I.F. and the AFC I.F. transformers.

The object should be to make the two curves coincide with each other at the top and throughout their length with the maximum amplitude obtainable. This will require that all four I.F. trimmers be adjusted in the usual manner *excepting the AFC secondary (hexagonal nut) trimmer which must be adjusted for minimum amplitude* before the curves will coincide properly. Fig. 5 gives the appearance of the curve when the alignment adjustments have been completed satisfactorily thus far. Apply the same frequency modulated input to the grid of the converter (6L7) tube through a 0.05 mfd. capacitor as before. Adjust the primary and secondary of the 1st I.F. transformer until the curves coincide and have the appearance of Fig. 6.

A further adjustment of the A.V.C. secondary (hexagonal nut) trimmer is necessary in order to complete the I.F. alignment satisfactorily. Apply the *same* signal to the grid of the second I.F. amplifier tube. Unsolder the ground end of TC-46 and connect the vertical deflecting plates of the oscilloscope between ground and the 6H6 cathode prong K2 (Fig. 3) or to the center terminal of the AFC switch.

Carefully adjust the AFC secondary trimmer until a curve is obtained which is similar to that shown in Fig. 6. Correct adjustment is made when the two sides of the curve are symmetrical and intersect exactly at the horizontal axis. No adjustment of the other I.F. trimmers should be made at this time.

If a metal aligning tool is used, the curve will change when the tool is withdrawn. Therefore, it is advisable to use a fiber hex-headed wrench for this aligning adjustment. At any rate, the final curve should be as shown with aligning tool removed.

2. I. F. Wave Trap Alignment

Leave the band switch at Band "B" and tune receiver to about 1000 kc.

With the test oscillator set at 465 kc. apply this signal to the antenna terminal through a dummy antenna consisting of a 400-ohm resistor and 250-mmfd. capacitor in series. With the 465-kc. signal applied to the antenna terminal, adjust the I.F. Wave Trap Trimmer for *minimum* output indication.

3. R.F. Alignment

First check the position of the dial pointer by rotating the tuning condenser to maximum capacity position, i.e., plates fully meshed. At this position, the pointer should coincide with the end mark at the left-hand end of the scale. If it does not, it may be set by loosening the pointer set screw and setting the pointer to its correct position. During R.F. alignment the AFC switch *must* be set in its "off" (counter-clockwise) position.

BAND "B" (535-1640 KC.)

Set the test oscillator for operation at 1500 kc. and connect its output to the antenna terminal of the receiver through the dummy antenna described under "I.F. Wave Trap Alignment." Tune the receiver until the pointer is at 1500 on the scale. Set the tone control for minimum high response and reduce the volume control setting so as to avoid excessive noise response. Adjust the Band "B" oscillator, R.F., and antenna trimmers respectively (location shown on Fig. 4) to give maximum deflection on the output meter. Maintain the test oscillator output at the lowest level which will give an easily readable output indication.

Now set the test oscillator at 580 kc. and tune the receiver to resonance with this signal. Adjust the 580 kc. padding capacitor, C-20, rocking the tuning condenser back and forth through resonance as the padding capacitor is adjusted and note the deflection of the tuning meter each time the receiver is tuned in this manner. Leave the padding capacitor at the setting which gives greatest deflection.

Retune the receiver to 1500 kc. and set the test oscillator for this frequency. Check the alignment by again adjusting the Band "B" oscillator, R. F. and antenna trimmers for maximum deflection on the tuning meter.

BAND "C" (1600-5600 KC.)

With the test oscillator connected to the receiver as above, tune the receiver until the pointer is at 5220 on the "C" band scale. Set the test oscillator for operation on this frequency and, with the volume and tone controls set as above adjust the band "C" oscillator, R. F., and antenna trimmers, respectively (see Fig. 4) to give maximum deflection on the output meter.

BAND "D" (5.5-18.2 MC.)

Turn the band switch to Band "D." Set the test oscillator at 18,000 kc. (18.0 mc.) and tune the receiver until the pointer coincides with the 18.0 mark. Adjust the Band "D" oscillator trimmer to give maximum output indication. It will probably be found that there will be two settings of the oscillator trimmer that will give an output response. The lower capacity setting of the trimmer is the one that should be used. To be sure that correct adjustment has been obtained, tune for the image signal at 17.07 mc. with the test oscillator at 18.0 mc. It may be necessary to increase the test oscillator output to obtain response at this point.

Retune the receiver to 18.0 mc. and adjust Band "D" antenna and R. F. trimmers, respectively (C-5 and C-13) for maximum output indication. When adjusting the R. F. trimmer, C-13, rock the tuning condenser back and forth through resonance as in the 580 kc. padding capacitor adjustment.

Alignment of the receiver is now complete as no adjustments are provided on band "E."

4. I. F. Alignment with Output Meter

Although the use of the cathode-ray oscilloscope for alignment purposes is to be preferred, it is possible to make the I. F. trimmer adjustments with reasonable accuracy using a 465 kc. signal generator and output meter.

Place a modulated signal of 465 kc. on the grid of the last I. F. (6K7) tube with the volume control set at maximum and the AFC switch *turned off*. Place a low range A. C. voltmeter or other output indicator across the voice coil of the loud-speaker. Adjust the output of the signal generator so that an indication of not more than two or three volts is obtained on the output meter.

Adjust and readjust the primary trimmer for maximum output and *the secondary for minimum output.* This latter adjustment will be very broad. Apply the signal input to the grid of the 1st I. F. (6K7) tube and adjust both primary and secondary trimmers for maximum output, reducing the input as necessary to obtain approximately the same output indication as before. Apply the signal input to the grid of the converter (6L7) tube and adjust both primary and secondary trimmers for maximum output indication in the same manner.

It is now necessary to make a fine adjustment of the secondary trimmer of the last I. F. (AFC) transformer which is as follows: without changing the frequency of the signal generator, place the input lead on the rubber insulation of the converter (6L7) grid lead. This will provide a small signal input through the capacity between the leads. Increase the attenuator setting if necessary to make the output audible. If the signal generator is provided with a means of removing the modulation, this should be done. However, the adjustment may be carried out satisfactorily even with a modulated generator signal.

Now tune in any broadcast signal in the usual manner and tune the receiver carefully for zero beat between this carrier and the 465 kc. signal generator. It may be necessary to use a short antenna or to remove it entirely if the station is a strong local. Throw the AFC on and adjust the last I. F. secondary (AFC) trimmer to give zero beat. This adjustment is very critical and must be made with great care. When the adjustment is properly made, there will be no appreciable change from zero beat as the AFC switch is thrown off and on. This completes the alignment of the I. F. and AFC circuits.

The alignment of the oscillator and R. F. circuits may be carried out in the usual manner. The AFC switch must remain in the "off" position.

ADJUSTMENT OF DIAL MECHANISM

The dial mechanism (Fig. 7) is rigidly mounted to the "Sentry Box" by means of two brackets and four screws. The dial pointer is operated by means of an "Automatic Vernier" reduction drive unit. Motion imparted to the gang condenser rotor is transmitted through a series of pulleys and an interconnecting cable to the dial pointer slider which is supported on a rail below the dial scale.

To Replace Cables

To replace cord or cable for the pointer or drive, the chassis should be removed from the cabinet and the dial mask (No. 14) removed from the dial scale box (No. 5). The black drive cord (No. 25) should run between the drum (No. 6) on the condenser and the drive pulley without crossing. Both the black cord (No. 25) and the bronze cable (No. 24) fasten on the same hook in the drum (No. 6) which is in front of the single lance on the outside diameter. The springs (21) and (22) are fastened on the ends of the cables after passing through the lances which are close together on the condenser drive drum. The light spring (No. 21) is on the bronze cable (No. 24) and the special spring-loop hooks into the hole in the drum next to the hook for the spring on the black cord (No. 25). The solid end of the cord or cable should be fastened first to the drum, the line should be then strung around the pulleys and drum, and lastly, the spring should be stretched into place.

To Adjust Pointer for Calibration

The pointer (No. 27) is adjustable by removing the escutcheon plate and also the dial mask (No. 14) which is held by four screws. The screw in the center of the pointer (No. 27) can then be loosened and the pointer adjusted as needed.

To Replace Scale

The scale (No. 3) can be removed by taking off the escutcheon and the dial mask (No. 14) as for the adjustment of the pointer. The pointer (No. 27) is moved to the left-hand end, the scale is then pushed to the left and the right-hand end is pulled out with the aid of a small screw driver or a similar tool. When replacing the scale (No. 3) it is advisable to remove the cord (No. 23). The spring (No. 9) is put on the dial shaft and the shaft then inserted into the housing. The scale (No. 3), with the right-hand cap (No. 8) attached, is then inserted into the left-hand cap (No. 7) which is held in position by pulling on the shaft on the outside of the housing. After the scale (No. 3) is inserted it should be rotated from one to two times against the action of the torsion spring (No. 9). The cord (No. 23) is then replaced in the lance provided for it. It is advisable to have the band switch rotated so that the greatest length of cord possible is unwound from the lower pulley (No. 4) on the band switch shaft. It is best that the chassis be removed for the replacement of a scale.

(It is important when replacing the chassis in the cabinet that the rubber grommets should be put in the chassis and not on the wood pins.)

To Adjust Rotation of the Scale

With the chassis out of the cabinet the scale (No. 3) can be adjusted to track properly on the various bands by loosening the set screw and rotating pulley (No. 4) on the band switch shaft

DESCRIPTION OF ELECTRICAL CIRCUIT

Design features built into this receiver include the "Sentry Box"; separate coils for each frequency band; high efficiency converter with a separate oscillator; two stages of IF amplification for high sensitivity and selectivity; automatic volume control; automatic frequency control (AFC), silent tuning, bass and treble compensated volume control, music-speech switch operated in conjunction with a continuously variable tone control, and colorama tuning.

"Sentry Box"

The RF and oscillator sections of the receiver are contained in the "Sentry Box" which consists of a separately contained and shielded, four band, antenna, RF and oscillator tuning unit. Individual coils are employed for each frequency range and are properly selected and connected into the circuit by the range switch. To avoid absorption effects, the range switch shorts all unused coils which might resonate at some frequency in the range being used. The section of the range switch controlling selection of the antenna coil primary also changes the antenna connection to these coils in such a manner as to insure maximum signal transfer in each range. When the G.E. "V" Doublet Antenna System is connected to terminals "A" and "G" at the rear of the "Sentry Box," the range switch provides for true doublet operation in the short wave (D) band where this connection is advantageous, and for operation as a "T" antenna in all other bands. When a doublet antenna providing noise reduction on the broadcast band is used, it is essential that a link be connected between terminals "G" and "GR" at the back of the "Sentry Box" in order to obtain the desired action.

The antenna is coupled to the control grid of the 6K7 RF tube through the tuned antenna transformer selected by the range switch. Likewise, the output of the amplifier tube is coupled to the control grid of the 6L7 converter tube through the properly selected tuned RF transformer. The only exception to this procedure occurs when the receiver is operating on the ultra-short-wave "E" band, in which position the RF tube is disconnected from the circuit and the antenna coupled directly to the 6L7 grid through the tuned antenna transformer.

The oscillator circuit, with the exception of the ultra-short-wave "E" band, employs a 6J7 tube in a conventional tuned grid, plate feedback circuit. In the ultra-short-wave "E" band, the common impedance between the grid and plate circuits provided by the secondary of L12 in the cathode circuit of the 6K7 oscillator tube, is utilized to provide oscillation. An auxiliary feedback circuit composed of the primary of L-12 together with the capacitor, MC-29, is in the plate circuit of the oscillator tubes on the "E" band. These elements resonate slightly below the low frequency end of the "E" band and tend to improve the oscillator excitation at this end of the band. To minimize capacity effects, the tuned "E" band grid coil L-13 remains in the circuit at all times since its resistance is sufficiently low to permit this procedure. The grid coil of the broadcast "B" band oscillator returns to B plus rather than to ground in order to provide plate voltage for the 6J7 APC tube. The 580-kc. padding capacitor, C-20, serves to isolate this voltage from the oscillator tuning condenser section. The oscillator signal which is maintained at a frequency 465 kc. higher than the incoming signal is capacity coupled to the injection grid of the 6L7 converter.

The 6J7 AFC tube is also located on the "Sentry Box" and is associated with the broadcast "B" band oscillator. A complete description of the operation of AFC is given in a later paragraph. The output of the converter is applied to the I.F. amplifier.

I. F. Amplifier

The intermediate frequency amplifier consists of a two-stage cascade section composed of three I.F. transformers and two 6K7 amplifier tubes. Each transformer has two tuned circuits which resonate at 465 kc. The third I.F. transformer is of special construction having the primary capacitive coupled to the midpoint of the secondary in order to provide the differential AFC voltage. The operation of this transformer is discussed in a special chapter on AFC.

Detector and AVC

The plates of the 6H6 twin diode are fed in push-pull by the secondary of the third I.F. transformer. Two balanced diode loads consisting of R-24 and the series resistance of R-21, R-22 and R-23 are provided. The AFC voltage is developed across the sum of all these resistors, while the audio voltage appears across the sum of R-21 and R-22 and R-23. The audio frequency thus provided is transferred to the A.F. system for amplification and reproduction. The direct-current component of the rectified signal produces a voltage drop across the above three resistors. That existing across R-21 and R-22 is employed for operating the 6K7 "Colorama" tuning tube. Switch S-10 permits the application of either full or partial voltage to the tube, thereby permitting control of the color indication in accordance with prevailing receiving conditions. A complete description of "Colorama" tuning is given in a later paragraph. The D.C. voltage developed across R-21 is utilized for automatic volume control action by employing the same to bias the R.F. amplifier, converter, and first I.F. amplifier tubes. Initial bias for these tubes is obtained by returning resistor, R-21, to the minus 3 volt tap of the voltage divider. The second I.F. tube receives no A.V.C. and is self-biased. This minimizes the possibility of non-linear distortion on strong signals.

Audio System

The audio voltage developed across the diode load is applied to the volume control, R-32, through the isolating capacitor, TC-49. This control is compensated by means of dual resistance—capacitance networks to provide the proper balance of high and low frequencies at different volume control settings. The movable arm on the volume control selects the amount of audio signal applied to the control grid of the 6C5 audio amplifier tube and thus regulates the output of the receiver. The output of the 6C5 audio tube is transformer coupled to the control grids of the two 6F6 output tubes which operate in a push-pull connection.

The music-speech control consists of a switch actuated at one extreme of the tone control rotation corresponding to that providing maximum high note response. This provides better speech clarity by decreasing the bass compensation which is accomplished by shunting capacitor TC-53 with TC-52. The bass compensation is removed entirely on the short-wave bands by the switch S-2; hence the music-speech control is only effective in the broadcast "B" band. Continuously variable tone control is provided by capacitor TC-59 and variable resistor R-34 shunting the grids of the push-pull output tubes.)

Silent Tuning

Silent tuning is provided by the switch S-9 which is actuated by the tuning knob of the receiver. Pulling the tuning knob out slightly closes switch S-9 and kills the audio output by grounding the 6C5 grid. The AFC is also removed by this operation which permits a sharp indication of resonance by noting the "Colorama" lights. When a station has been satisfactorily located in this manner, the tuning knob is pushed in to its original position and the switch opened.

Power Supply

D.C. power for operation of the receiver is supplied by a power supply system employing a 5Z4 full-wave rectifier tube which, together with a suitable network of resistors and capacitors, supplies the required voltages and filtering action.

COLORAMA TUNING

These receivers are equipped with Color Tuning, a novel method which indicates approach to resonance by means of a change of color of the light illuminating the tuning scale.

The colored light is produced by a group of four red-stained pilot bulbs and a group of three green-stained bulbs behind the scale. At zero signal strength the red group is at full brilliance and the green invisibly dim. As the signal increases from zero, the red gets dimmer and the green brighter over a broad range until at extreme signal strength the green is fully bright and the red below visibility through the dial. Hence, as a station is tuned-in the color changes smoothly, and the maximum change in the green direction is an indication of resonance.

Weak stations will produce a small color change and strong stations a larger change. The difference in signal strength, between the weakest and the strongest station likely to be listened to, has been found to be so great in different localities that the receivers have been equipped with a two-position sensitivity range switch for "sensitive" and "insensitive" settings of the color tuning. The switch is located near the power transformer on the chassis and may be reached from the rear of the cabinet. In the sensitive position, the weakest station to which the user can listen comfortably, above the general noise level, will shift the color to neutral white at resonance. Stronger stations give resonant points at bright greens. In localities near a relatively large group of high-powered stations and having a high noise level, such as Chicago and New York, the range switch must be thrown to the insensitive position when standard outdoor antennas are used, or else the color will be fixed green over so wide a band that resonance cannot be accurately found. The difference in sensitivity is about twenty to one. On short-wave bands the band switch connects the color tuning to the sensitive setting and the switch on the chassis is inoperative. This is because practically all the short-wave signals are relatively weak. The insensitive setting is used only on the 535-1640 kc. band.

There is a group of four red and a group of three green pilot bulbs behind the scale. These are controlled by a Saturable Reactor in a circuit which is shown in the schematic diagram, Fig. 2. The saturable reactor is controlled by a D.C. coil which decreases its reactance smoothly from a high-value at no D.C. to a very low value at maximum D.C. The saturable reactor acts very much like a dimming rheostat except that it is controlled by the D.C. plate current of a 6K7 tube used solely for that purpose. This tube receives for its bias a portion of the A.V.C. voltage of the set so that at no signal the bias is nearly zero. At this point, the plate current is at maximum; therefore, the red is brightest and the green invisibly dim.

SOME THINGS WHICH MAY AFFECT THE OPERATION OF COLOR TUNING ARE AS FOLLOWS:

Seven colored bulbs are used to give good diffusion of color over the scale; but if one of the seven fails it unbalances the whole group and should be replaced immediately. The lamp socket assembly may be removed by reaching into the rear of the cabinet, pulling the lamp socket assembly up on its guides and drawing it partly out. (A shipping screw, which should be removed when the set is unpacked, may need to be removed the first time.) There is enough slack in connecting wires to allow the assembly to be drawn forward. When the socket assembly has been drawn far enough out for unscrewing the bulbs turn on the power switch and replace the bulbs which do not glow. All will not be bad as each group is in series (green) or series parallel (red). Take care the wires do not foul the tuning mechanism when the assembly is replaced. The colored lamps used for replacement *MUST ALL BE 6.3 VOLTS, 0.15 AMPERE LAMPS.* No other size will work.

If the red is unusually dim on no signal and the colored bulbs are all good, try removing the antenna. Next try replacing the 6K7 "Colorama" tube or replace the rectifier. Sometimes the antenna noise level is so high that it dims the red like a signal. If the tubes in the set become weak, or the set is out of alignment, or for any other reason loses its sensitivity, the color tuning will appear insensitive.

AUTOMATIC FREQUENCY CONTROL

These receivers employ automatic frequency control (AFC) which is a device for automatically controlling the oscillator frequency in such a way that, although the receiver is not exactly tuned to the signal being received, an intermediate frequency of 465 kc. will still be produced. This control of the oscillator frequency is secured by means of a 6J7 tube so connected to the oscillator that it draws a lagging current from the tank circuit and thus gives the effect of a shunt inductance. Variation of the D.C. grid bias on the 6J7 control tube will affect the mutual conductance of the tube, thereby changing the amount of lagging current drawn from the oscillator tank with a consequent effect of variation of the amount of shunt inductance connected across the oscillator coil. This alters the total inductance in the oscillator tuned circuit and changes its resonant frequency.

Grid bias for the 6J7 control tube which will vary in accordance with the amount of detuning of the receiver is obtained from the 6H6 diode rectifier operating in conjunction with its special I.F. transformer. This control voltage is the difference between the drop across resistor R-24, the load resistor for one diode section of the 6H6 diode rectifier, and the drop across resistors R-21, R-22 and R-23, which constitute the load resistance for the other diode section. When the receiver is correctly tuned to the incoming signal, the intermediate frequency produced will be 465 kc. which is the resonant frequency of the tuned circuit feeding the 6H6 diode rectifier. Under this condition each diode plate receives equal signal voltage and the D.C. voltage drops across the load resistors will be equal, giving no change in grid bias on the 6J7 control tube. If the receiver is so tuned that the intermediate frequency produced is above 465 kc. the signal voltage applied to diode plate No. 7 will exceed that applied to diode plate No. 8. In this case, the D.C. voltage drop across load resistor R-21, R-22 and R-23 will be larger than that across load resistor R-24 and a resultant voltage will be produced which will increase the 6J7 control tube grid bias lowering the mutual conductance of the tube and causing it to draw less current from the oscillator tank. This is the same effect that would be produced by increasing the amount of shunt inductance across the oscillator coil and the oscillator frequency is thereby lowered by the amount necessary to compensate for the detuning. The opposite takes place when the receiver is tuned so as to produce an intermediate frequency below 465 kc. Diode plate No. 8 then receives more signal voltage than diode plate No. 7 and the resultant voltage developed across the load resistors is such as to decrease the grid bias on the 6J7 control tube. This causes a larger current to be drawn from the oscillator tank circuit, the effect being the same as a decrease in shunt inductance with a consequent increase in oscillator frequency to overcome the detuning.

REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER CHASSIS ASSEMBLY	
*RB-008	BOARD—Terminal Board, Double-lug	$0.10
*RB-009	BOARD—Terminal Board, Single-lug	.15
*RB-019	BOARD—Terminal Board, Three-lug	.10
*RB-023	BOARD—Terminal Board, Four-lug	.10
RB-046	BOARD—Terminal Board, Five-lug	.15
RB-047	BOARD—Resistor Board on Chassis Shelf	.10
RB-048	BOARD—Fuse Board	.15
*RC-011	CAPACITOR—.002 Mfd., 600 V Paper (TC-61, TC-62, TC-63)	.25
*RC-013	CAPACITOR—.002 Mfd., 200 V Paper (Mtd. on Res. Bd.) (TC-55)	.25
*RC-034	CAPACITOR—.01 Mfd., 200 V Paper (Mtd. on Res. Bd.) (TC-49)	.25
RC-036	CAPACITOR—.008 Mfd., 200 V Paper (TC-53)	.25
*RC-046	CAPACITOR—.02 Mfd., 200 V Paper (TC-52, TC-59, TC-60)	.25
*RC-072	CAPACITOR—.05 Mfd., 200 V Paper (TC-35, TC-39, TC-43, TC-64)	.25
*RC-091	CAPACITOR—.05 Mfd., 400 V Paper (TC-34, TC-38)	.30
*RC-150	CAPACITOR—.25 Mfd., 400 V Paper (TC-58)	.35
RC-200	CAPACITOR—1 Mfd., 100 V Paper (TC-46)	.60
RC-234	CAPACITOR—Plate Coupling Capacitor 3rd I. F. Transformer (MC-40)	.25
RC-235	CAPACITOR—Grid Return Filter Capacitor for 3rd I. F. Transformer (MC-42, MC-48)	.25
RC-235	CAPACITOR—100 mmfd., Mica (Mtd. on Res. Bd.) (MC-54)	.25
RC-235	CAPACITOR—100 mmfd., Mica (MC-45)	.25
*RC-258	CAPACITOR—250 mmfd., Mica (MC-47, MC-56)	.25
RC-290	CAPACITOR—400 mmfd., Mica (Mtd. on Res. Bd.) (MC-50)	.25
*RC-411	CAPACITOR—30 Mfd., 400 V Wet Electrolytic (EC-70)	1.55
*RC-412	CAPACITOR—30 Mfd., 280 V Wet Electrolytic (EC-69)	1.20
RC-426	CAPACITOR—10 Mfd., 100 V Wet Electrolytic (EC-67)	.75
RC-551	CAPACITOR—10 Mfd., 25 V and 4 Mfd., 300 V Dry Electrolytic (EC-57 red; EC-65 gn.)	1.25
RC-558	CAPACITOR—50 Mfd., 50 V and 10 Mfd., 25 V Dry Electrolytic (EC-68 red; EC-66 gn.)	2.15
RC-755	CAPACITOR—Line Capacitor, .01-.01 Mfd., 250 V A. C. Paper (TC-71 & 72)	.40
RC-819	CABLE—Speaker Cable (Complete)	.60
RC-860	CORD—Power Cord	.65
RC-946	CUSHION—Front Chassis Mounting Cushion	.10
RC-947	CUSHION—Side Chassis Mounting Cushion and Support Bracket	.20
RE-013	ESCUTCHEON—Escutcheon Plate (with Mtg. Scws.)	1.75
RF-300	FUSE—2 Amp. Fuse (Pkg. of 10)	1.00
*RG-001	GRID CAP—Control Grid Clip (Pkg. of 5)	.10
RG-104	GUARD—Fuse Board Guard	.15
RG-105	GASKET—Escutcheon Rubber Gasket	.25
RG-106	GASKET—Escutcheon Felt Gasket	.10
*RK-004	KNOB—Control Knob (Push on) (Pkg. of 5)	.40
RK-006	KNOB—Large Control Knob (Push on)	.10
RK-007	KNOB—Large Control Knob (Set Scw.)	.10
RL-312	REACTOR—"Colorama Tuning" Saturable Reactor, 60 Cycles (L-21)	3.00
RL-313	REACTOR—"Colorama Tuning" Saturable Reactor, 25/60 Cycles (L-21)	3.00
RQ-047	RESISTOR—330 ohm, ¼ Watt Carbon (R-18) (Pkg. of 5)	.60
*RQ-059 (RR-014)	RESISTOR—1000 ohm, ¼ Watt Carbon (R-33) (Pkg. of 5)	$0.70
RQ-067	RESISTOR—2200 ohm Plate Resistor for I. F. Trans. (R-13, R-17) (Pkg. of 5)	.60
RQ-075	RESISTOR—4700 ohm, ¼ Watt Carbon (R-39) (Pkg. of 5)	.60
*RQ-083 (RR-021)	RESISTOR—10,000 ohm, ¼ Watt Carbon (Mtd. on Res. Bd.) (R-31) (Pkg. of 5)	.60
RQ-089	RESISTOR—18,000 ohm, ¼ Watt Carbon (R-26) (Pkg. of 5)	.60
RQ-099	RESISTOR—47,000 ohm, Grid Resistor for 3rd I.F. Transformer (R-20) (Pkg. of 5)	.60
RQ-103	RESISTOR—68,000 ohm, ¼ Watt Carbon (R-19, R-35, R-36) (Pkg. of 5)	.60
*RQ-107 (RR-049)	RESISTOR—100,000 ohm, ¼ Watt Carbon (Mtd. on Res. Bd.) (R-25) (Pkg. of 5)	.70
*RQ-107 (RR-049)	RESISTOR—100,000 ohm, ¼ Watt Carbon (R-22) (Pkg. of 5)	.70
*RQ-111 (RR-054)	RESISTOR—150,000 ohm, ¼ Watt Carbon (R-23) (Pkg. of 5)	.70
RQ-115	RESISTOR—220,000 ohm, ¼ Watt Carbon (R-21) (Pkg. of 5)	.70
RQ-123	RESISTOR—470,000 ohm, Grid Resistor for 1st I.F. Transformer (R-14) (Pkg. of 5	.70
RQ-123	RESISTOR—470,000 ohm, ¼ Watt Carbon (R-16, R-24) (Pkg. of 5)	.70
*RQ-131 (RR-067)	RESISTOR—1 Meg., ¼ Watt Carbon (Mtd. on Res. Bd.) (R-30) (Pkg. of 5)	.70
RQ-139	RESISTOR—2.2 Meg., ¼ Watt Carbon (R-27, R-28) (Pkg. of 5)	.70
RQ-143	RESISTOR—3.3 Meg., ¼ Watt Carbon (Mtd. on Res. Bd. (R-29) (Pkg. of 5)	.70
RQ-275	RESISTOR—4700 ohm, ½ Watt Carbon (R-15) (Pkg. of 5)	.70
RQ-277	RESISTOR—5600 ohm, ½ Watt Carbon (R-40) (Pkg. of 5)	.70
*RQ-283 (RR-183)	RESISTOR—10,000 ohm, ½ Watt Carbon (R-37) (Pkg. of 5)	.70
RQ-505	RESISTOR—82,000 ohm, 1 Watt Carbon (R-38) (Pkg. of 5)	.75
RR-330	RESISTOR—15 ohm, 2 Watt Flexible (FR-45) (Pkg. of 5)	.85
RR-331	RESISTOR—15 ohm, 1 Watt Flexible (FR-44) (Pkg. of 5)	.75
*RR-705	RESISTOR—50 ohm, 5 Watt Wire Wound (WR-42, WR-43)	.40
RR-720	RESISTOR—Candohm Tapped Bleeder Resistor (R-41)	1.25
*RS-200	SOCKET—8 Pin Tube Socket (Pkg. of 5)	.75
*RS-204	SOCKET—5 Pin Tube Socket (Pkg. of 5)	.75
RS-325	SWITCH—"Colorama" Sensitivity Switch (S-10)	.50
RS-327	SWITCH—Automatic Frequency Control Switch (S-8)	.50
RS-423	SPRING—Knob Spring (Push on Type) (Pkg. of 10)	.25
RT-121	TRANSFORMER—Power Transformer (T-3) 115 V, 50/60 Cycles	7.75
RT-122	TRANSFORMER—Power Transformer (T-3) 115 V, 25/60 Cycles	12.00
RT-123	TRANSFORMER—Universal Power Transformer (T-3) 105/125 200/250 V, 40/60 Cycles	11.75
RT-225	TRANSFORMER—1st I.F. Transformer (Complete)	2.10
RT-226	TRANSFORMER—2nd I.F. Transformer (Complete)	2.10
RT-227	TRANSFORMER—3rd I.F. Transformer (Complete)	4.15
RT-504	TRANSFORMER—Interstage Transformer (T-1)	5.20
RT-711	TONE CONTROL—Tone Control and Speech Clarifier Switch (R-34) (S-11)	1.00
RV-016	VOLUME CONTROL—Volume Control and Power Switch (R-32) (S-12)	1.00
RW-010	WINDOW—Escutcheon Window	$0.65
RW-101	WASHER—Felt Washer for Control Shafts (Pkg. of ten)	.45
RX-017	CUSHION ASSEMBLY—"Sentry Box" Mounting Cushion, Screw and Washer	.15
	SENTRY BOX ASSEMBLY	
RB-019	BOARD—Terminal Board, Three-lug (Sentry Box)	.10
RB-049	BOARD—Antenna Ground Terminal Board	.10
RB-050	BOARD—Terminal Board, Two-lug (Top of Gang)	.10
RB-141	BRACKET—Condenser Front Mounting Bracket	.50
RB-142	BRACKET—Condenser Rear Mounting Bracket	.15
RB-143	BRACKET—Wave Band Switch Bracket	.10
*RC-046	CAPACITOR—.02 Mfd., 200 V Paper (TC-17)	.25
*RC-072	CAPACITOR—.05 Mfd., 200 V Paper (TC-6, TC-9, TC-10, TC-18, TC-22, TC-73)	.25
*RC-091	CAPACITOR—.05 Mfd., 400 V Paper (TC-16, TC-19)	.30
RC-203	CAPACITOR—12 mmfd., Mica (MC-12)	.35
*RC-205	CAPACITOR—20 mmfd., Mica (MC-15, MC-29)	.35
*RC-210	CAPACITOR—50 mmfd., Mica (MC-24, MC-26, MC-31)	.25
RC-333	CAPACITOR—1000 mmfd., Mica (MC-14)	.30
RC-342	CAPACITOR—1260 mmfd., Mica (MC-23)	.35
RC-360	CAPACITOR—2850 mmfd., Mica (MC-28)	.50
RC-626	CAPACITOR—Triple Trimmers, Ant., R.F. and Oscillator (C-2, C-3, C-5) (C-7, C-8, C-13) (C-21, C-27, C-30)	.60
RC-627	CAPACITOR—Oscillator Padder Capacitor (C-20)	.40
RC-628	CAPACITOR—Wave Trap Trimmer (C-1)	.25
RC-712	CONDENSER—Gang Tuning Condenser (C-4, C-11, C-25)	4.75
RC-996	CUSHION—Condenser Mounting Cushion Assembly	.15
RL-019	COIL—Antenna Coil, Band B (L-2)	.75
RL-020	COIL—Antenna Coil, Band C (L-3)	.70
RL-021	COIL—Antenna Coil, Band D (L-4)	.70
RL-125	COIL—R.F. Coil, Band B (L-5)	.85
RL-126	COIL—R.F. Coil, Band C (L-6)	.75
RL-127	COIL—R.F. Coil, Band D (L-7)	.75
RL-128	COIL—R.F. Coil, Band E (L-8)	.75
RL-229	COIL—Oscillator Coil, Band B (L-9)	.70
RL-230	COIL—Oscillator Coil, Band C (L-10)	.70
RL-231	COIL—Oscillator Coil, Band D (L-11)	.75
RL-232	COIL—Oscillator Coil, Band E (L-12)	.70
RP-054	PULLEY—Wave Band Switch Dial Cord Pulley	.15
RQ-051	RESISTOR—470 ohm, ¼ Watt Carbon (R-8) (Pkg. of 5)	.60
RQ-059 (RR-014)	RESISTOR—1000 ohm, ¼ Watt Carbon (R-7, R-10) (Pkg. of 5)	.70
RQ-067	RESISTOR—2200 ohm, ¼ Watt Carbon (R-2, R-6) (Pkg. of 5)	.60
RQ-076	RESISTOR—5100 ohm, ¼ Watt Carbon (R-9) (Pkg. of 5)	.60
RQ-099	RESISTOR—47,000 ohm, ¼ Watt Carbon (R-12) (Pkg. of 5)	.60
RQ-103	RESISTOR—68,000 ohm, ¼ Watt Carbon (R-4, R-11) (Pkg. of 5)	.60
*RQ-107 (RR-049)	RESISTOR—100,000 ohm, ¼ Watt Carbon (R-3) (Pkg. of 5)	.70
RQ-123	RESISTOR—470,000 ohm, ¼ Watt Carbon (R-1, R-5) (Pkg. of 5)	.70
RS-165	SHIELD—Antenna Compartment Shield Can	1.25
RS-166	SHIELD—Oscillator Compartment Shield Can	1.25
*RS-200	SOCKET—8 Pin Tube Socket (Pkg. of 5)	$0.75
RS-328	SWITCH—Wave Band Switch (S-1, 2, 3, 4, 5, 6)	4.00
RW-402	WAVE TRAP—Wave Trap Coil (L-1)	.65
	SPEAKER ASSEMBLY	
RC-912	CONE—12 in. Type Cone and Voice Coil (Gasket Included) (L-18)	1.45
RC-991	CLAMP—12 in. Cone Spider Clamp and Screw	.05
RP-050	PLUG—Female Speaker Plug	.20
RP-051	PLUG—Male Speaker Plug	.20
RS-037	SPEAKER—12 in. Type Speaker (Complete with Output Transformer) (L-17, L-18, L-19, T-2)	11.00
RS-416	SPRING—Voice Coil Leads Spring	.10
RT-417	TRANSFORMER—Output Transformer (T-2)	3.00
	DIAL DRIVE MECHANISM	
RB-144	BRACKET—Dial Scale Box L.H. Bracket (1)	.15
RB-145	BRACKET—Dial Scale Box R.H. Bracket (2)	.15
RB-146	BRACKET—"Colorama" Dial Lamp Bracket (Less Lamps) (17)	1.10
RB-147	BRACKET—"Personalizer" Dial Lamp Bracket (Less Lamp) (18)	.45
RB-148	BRACKET—Reduction Drive and "Silent Tuning" Switch Support Bracket (20)	.10
RB-513	BOX—Dial Scale Box and Pulley Assembly (5)	1.75
RC-820	CABLE—Dial Pointer Cable (24) (Pkg. of 5)	.40
RC-861	CORD—Condenser Drive Cord (25) (Pkg. of 5)	.60
RC-862	CORD—Band Change Cord (23) (Pkg. of 10)	.50
RC-948	CLAMP—Reduction Drive Friction Clamp (13)	.15
RC-949	COLLAR—Condenser Reduction Drive Assembly Shaft Collar and Spring Washer (30)	.20
RC-997	CAP—Scale Cap (Free End) (8)	.10
RC-998	CAP—Scale Cap (Pulley End) (7)	.10
RC-999	CONTACT—Silent Tuning Switch Contact Assembly (12)	.20
RD-038	DIAL—"Slide-Rule" Dial Scale (3)	.70
RD-039	DRIVE—Tuning Condenser Reduction Drive Assembly (10)	1.15
RL-908	LAMP—"Colorama Tuning" Green Lamp (Pkg. of 10)	1.50
RL-909	LAMP—"Colorama Tuning" Red Lamp (Pkg. of 10)	1.50
RM-003	MASK—Dial Mask and Personalizer Strip Holder	1.00
RP-054	PULLEY—Wave Band Switch Dial Cord Pulley (4)	.15
RP-055	POINTER—Dial Pointer (27) (Pkg of 5)	.40
RP-056	PULLEY—Gang Drive Drum (6)	.35
RS-329	SWITCH—Silent Tuning Switch (Mechanism) (11)	.50
*RS-401	SPRING—Condenser Drive Cord Spring (21) (Pkg. of 5)	.20
RS-419	SPRING—Dial Pointer Cable Spring (22) (Pkg. of 2)	.20
RS-420	SPRING—Dial Scale Tension Spring (9) (Pkg. of 2)	.20
RS-421	SLIDER—Dial Pointer Slider (with screw) (26)	.15
RS-422	STRIP—"Personalizer" Illumination Diffuser (29)	.10
RW-009	WINDOW—"Personalizer Strip" Window (Celluloid)	.15

* Indicates part also used on 1936 "A" line receivers.

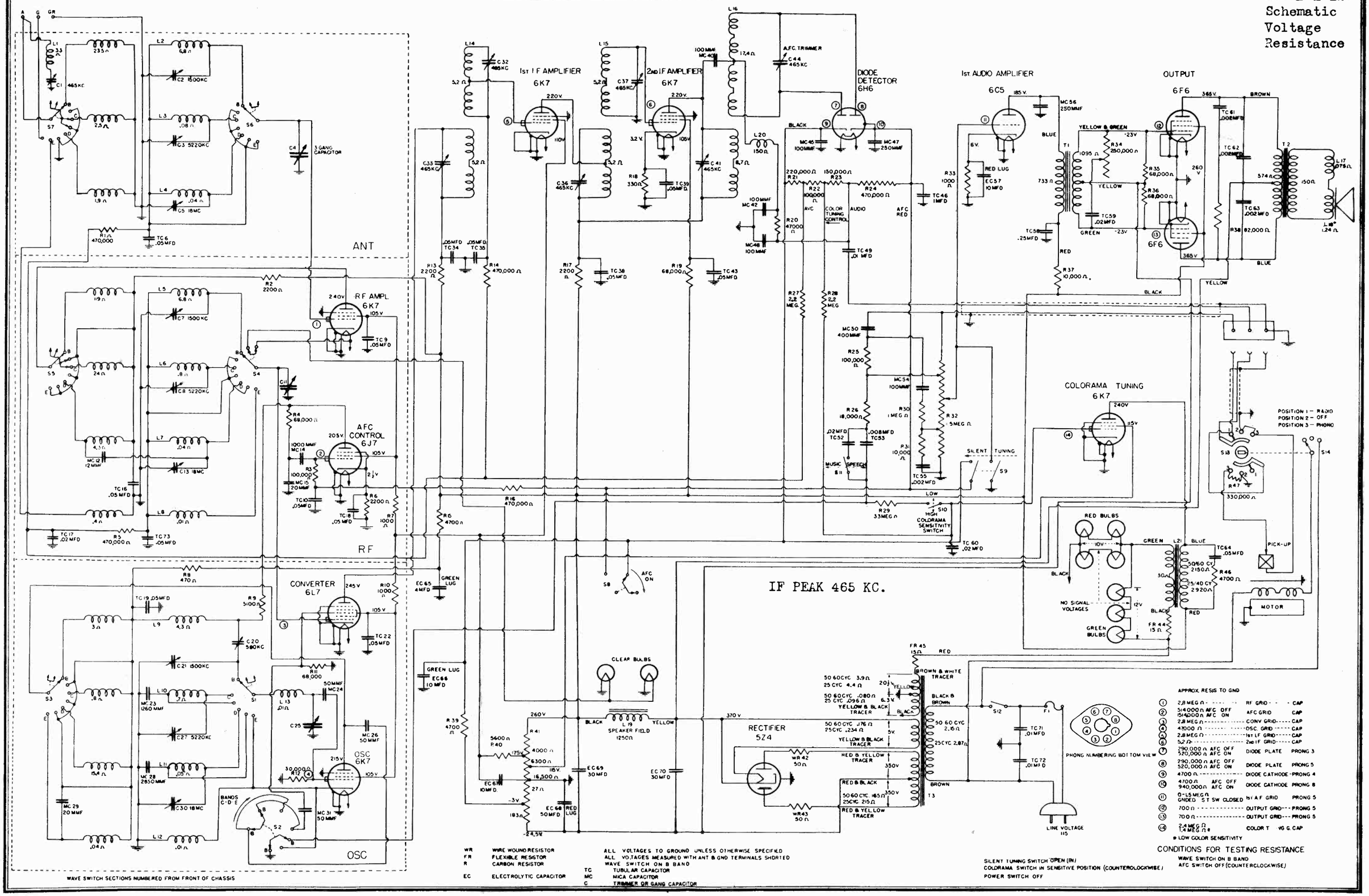
(Prices subject to change without notice)

* Indicates part also used on 1936 "A" line receivers.

(Prices subject to change without notice)

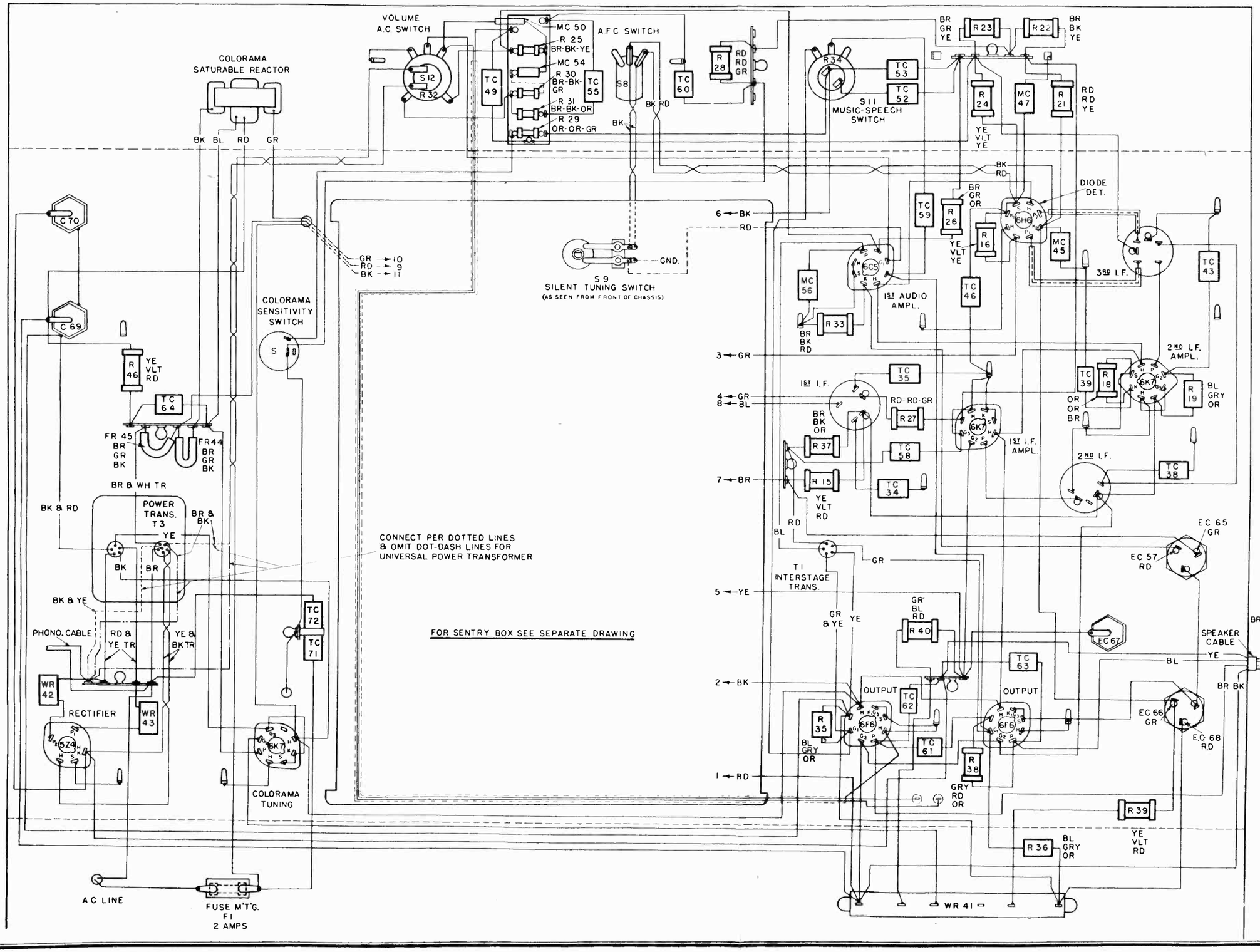
GENERAL ELECTRIC CO.

MODEL E-129
Schematic
Voltage
Resistance



MODEL E-129
Chassis Wiring

GENERAL ELECTRIC CO.



MODEL E-129
SentryBox Wiring

GENERAL ELECTRIC CO.

Electrical Specifications

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A 6	115	60	160
A 5	115	50	160
C 2	115	25	160
V 6	105–130/200–250	60	165
V 5	105–130/200–250	50	165
V 4	105–130/200–250	40	165

NOTE.—Taps on universal transformers (Rating "V") are accessible by removing the cap cover on the top of the transformer.

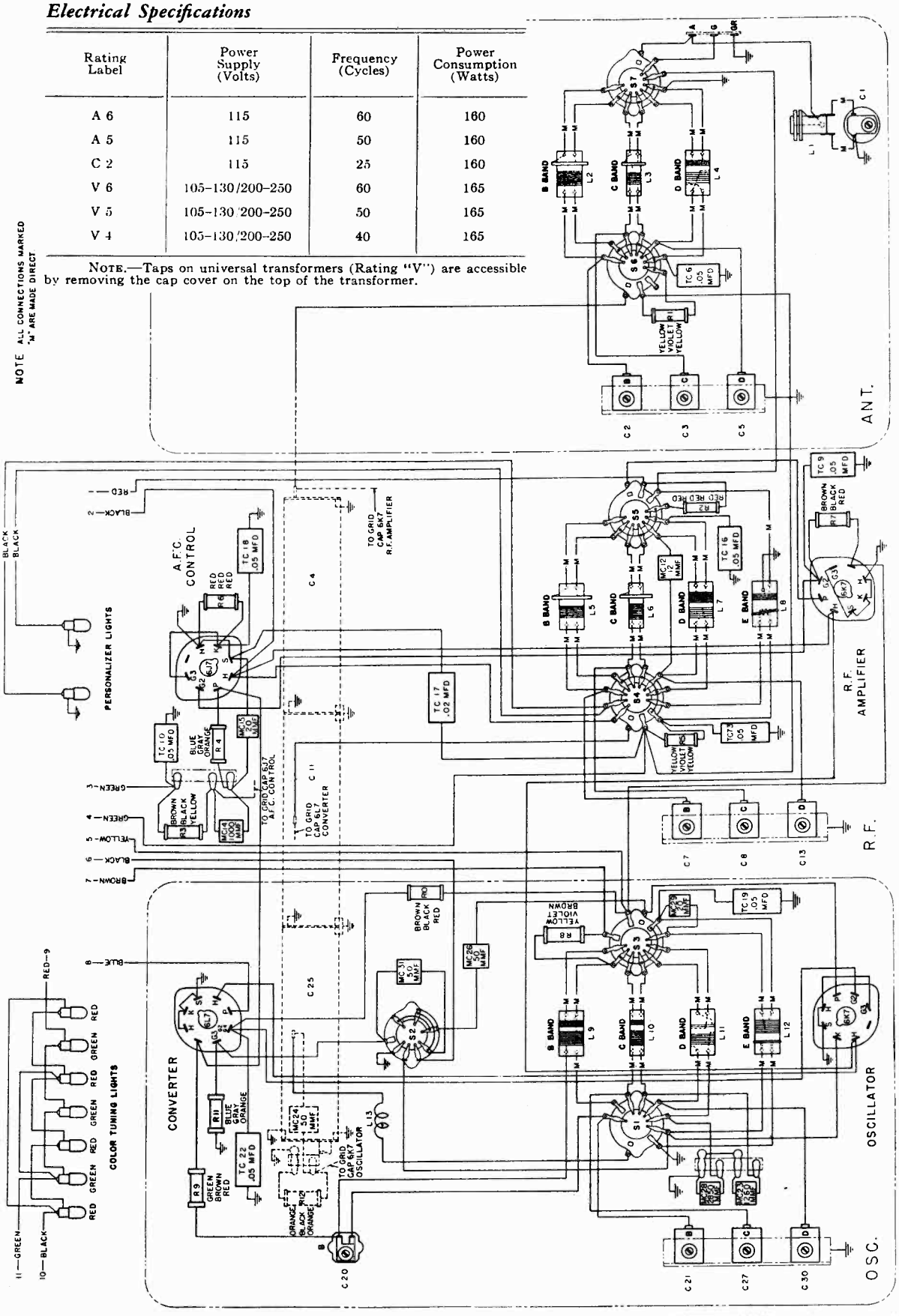


Fig. 1. "Sentry Box" Wiring Diagram

MODEL E-129
Dial Mechanism
Alignment Oscillograms

GENERAL ELECTRIC CO.

Tuning Frequency Range

Band "B"	535–1640 kc.
Band "C"	1600–5600 kc.
Band "D"	5.5–18.2 mc. (5,500–18,200 kc.)
Band "E"	17.5–70 mc. (17,500–70,000 kc.)

Tuning Control Drive Ratio

Fast Tuning	8 to 1
Vernier Tuning	50 to 1

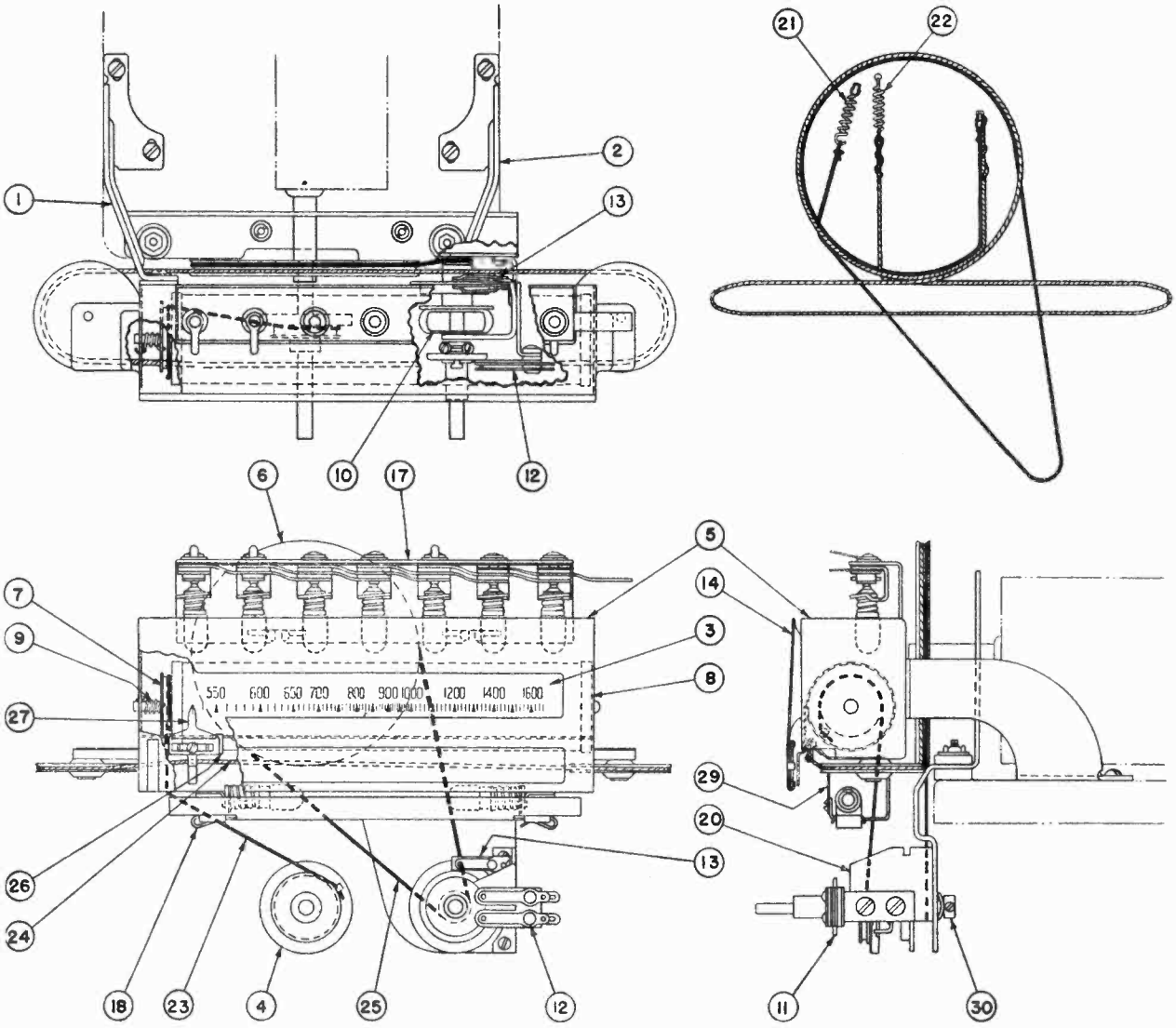


Fig. 7. Dial Drive Mechanism

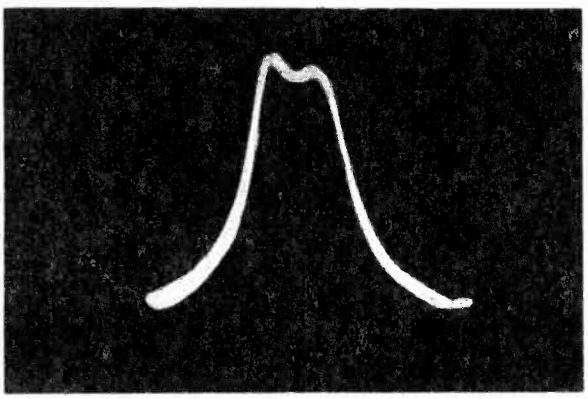


Fig. 5. Overall I. F. Curve

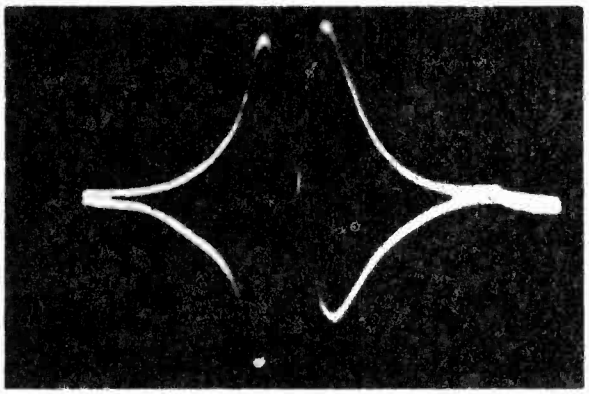


Fig. 6. AFC Trimmer Adjustment Curve

GENERAL ELECTRIC CO.

MODEL E-129
Socket, Trimmers
Voltage

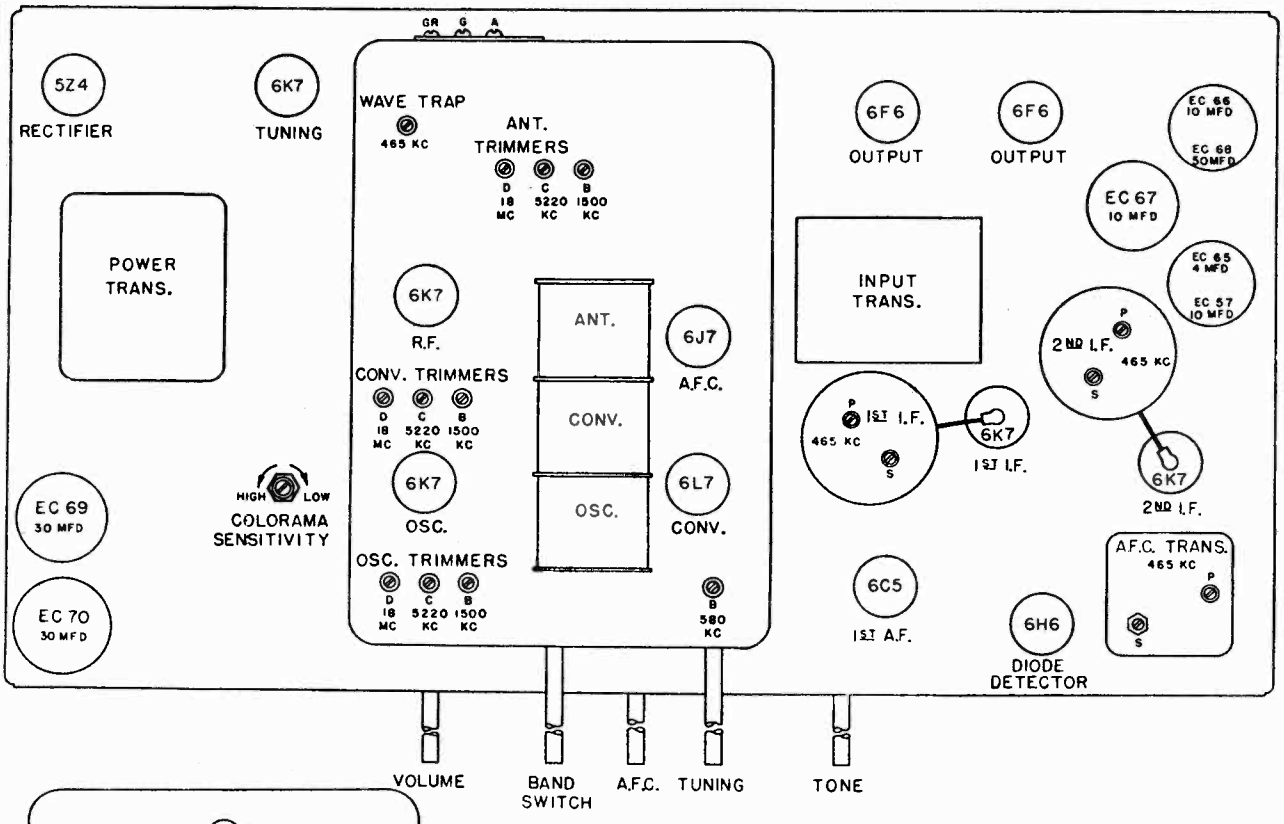


Fig. 4. Parts Layout and Trimmer Location

Electrical Power Output

Undistorted	10.2 watts
Maximum	15.4 watts

Loud-speaker—Electrodynamic

Cone Diameter. . . . . 12 in.
Cone Coil Impedance. . . . . 1.4 ohms at 400 cycles

SOCKET VOLTAGES

Tube No.	Cathode to Ground Volts D.C.	Screen Grid to Ground Volts D.C.	Plate to Ground Volts D.C.	Cathode Current M.A.	Heater Volts A.C.
6K7 R.F. Amp.	†	105	240	8.5	6.3
6L7 Converter	†	105	245	10.0	6.3
6K7 Oscillator	. . .	105	215	7.5	6.3
6K7 1st I. F. Amp.	†	110	220	9.5	6.3
6K7 2nd I. F. Amp.	3.0	105	220	10.0	6.3
6H6 Detector & AVC.	. . .	. . .	. . .	. . .	6.3
6C5 Audio Amplifier	6.0	. . .	185	5.6	6.3
6F6 Output	*	260	365	21.0	6.3
6F6 Output	*	260	365	21.0	6.3
6K7 Colorama Control	. . .	115	240	9.0	6.3
6J7 AFC.	2.5	105	205	1.0	6.3
5Z4 Rectifier	370 D.C.	. . .	700/350 R.M.S.	114.0	5.0

Measured at 115 volts supply. No signal input. Volume control maximum. Voltmeter 1000 ohms per volt. Measurements taken on highest scale giving accurate readable deflection.
† Grid bias at source—3 volts.
* Grid bias at source—23 volts.

ALIGNMENT PROCEDURE

The receiver should first be allowed to run for fifteen minutes in order to reach its approximate normal operating temperature. Before making any adjustments, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal from the test oscillator to the receiver and inserting a "Tuning Wand" into the coil involved. The "Tuning Wand" consists of a rod of insulating material having a ring of nonmagnetic metal attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the metal ring end into the center of a particular coil, the inductance of the coil is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the circuits are in exact alignment, inserting either end of the tuning wand in any coil will result in a decrease in output. When an increase in signal is obtained with the iron-filled end of the wand, a decrease in resonant frequency of that circuit by increasing its trimmer capacity is indicated. When an increase in signal is obtained with the metal ring, a decrease in trimmer capacity is indicated.

Changes Indicated by Wand

Wand	Signal	Trimmer adjustment required
Metal Ring	Decrease	None
Iron filings	Decrease	
Metal Ring	Increase	Decrease capacity
Iron filings	Decrease	
Metal Ring	Decrease	Increase capacity
Iron filings	Increase	

Alignment Frequencies

I.F.	Band "B"	Band "C"	Band "D"	Wave Trap
465 kc.	580 kc.	5220 kc.	18,000 kc.	465 kc.
	1500 kc.			

In order to align this receiver properly, it is necessary to have available the following test equipment:

1. A modulated test oscillator with frequencies available of 465, 580, 1500, 5220 and 18,000 kc.
2. An output indicator, such as a high resistance a-c voltmeter with a maximum scale reading of 3 to 5 volts, or a neon lamp indicator.
3. An alignment tool consisting of an insulating shaft with a small screwdriver blade.
4. A tuning wand.

To realize the full advantage of the performance built into these receivers at the factory, circuit alignment using cathode ray oscilloscope equipment is much to be preferred. The oscilloscopic method is particularly advantageous in aligning the I.F. tuned circuits.

See Fig. 4 for location of all trimmer capacitors.

1. *Visual Alignment of I. F.*

For visual alignment it is necessary to vary the frequency of an unmodulated test oscillator signal over a range extending on both sides of the peak frequency. This variation must take place in synchronism with the horizontal traverse of the cathode ray beam on its screen. The frequency modulator must, therefore, provide means for synchronizing the periodic test frequency variation with the cathode ray horizontal deflection circuit. The test oscillator may advantageously have facilities for audio frequency amplitude modulation of a fixed radio frequency test signal, as well as for frequency modulation. but audio modulation is not required for visual I.F. alignment.

In place of an output meter across the speaker voice coil, the vertical plates of the cathode ray tube are connected across the load resistor of the diode rectifier. With the frequency modulator in operation in conjunction with the test oscillator, the resonance curve of the circuit under test will be then shown on the screen.

Set the tuning dial indicator at the low end of the broadcast band at some point where no signal is received, since an extraneous signal might interfere with the aligning process. The volume control should be in an "off" or nearly off position. Apply a frequency modulated signal to the grid of the 1st I.F. amplifier tube through a 0.05 Mfd. (RC-072) capacitor. Connect the vertical plates of the oscilloscope between ground and the junction point between R-23 and R-24, and with the AFC switch in the "off" position proceed to align the primary and secondary of the 2nd I.F. and the AFC I.F. transformers.

The object should be to make the two curves coincide with each other at the top and throughout their length with the maximum amplitude obtainable. This will require that all four I.F. trimmers be adjusted in the usual manner *excepting the AFC secondary (hexagonal nut) trimmer which must be adjusted for minimum amplitude* before the curves will coincide properly. Fig. 5 gives the appearance of the curve when the alignment adjustments have been completed satisfactorily thus far. Apply the same frequency modulated input to the grid of the converter (6L7) tube through a 0.05 mfd. capacitor as before. Adjust the primary and secondary of the 1st I.F. transformer until the curves coincide and have the appearance of Fig. 5.

A further adjustment of the A.V.C. secondary (hexagonal nut) trimmer is necessary in order to complete the I.F. alignment satisfactorily. Apply the *same* signal to the grid of the second I.F. amplifier tube. Unsolder the ground end of TC-46 and connect the vertical deflecting plates of the oscilloscope between ground and the 6H6 cathode prong K2 (Fig. 3) or to the center terminal of the AFC switch.

Carefully adjust the AFC secondary trimmer until a curve is obtained which is similar to that shown in Fig. 6. Correct adjustment is made when the two sides of the curve are symmetrical and intersect exactly at the horizontal axis. No adjustment of the other I.F. trimmers should be made at this time.

If a metal aligning tool is used, the curve will change when the tool is withdrawn. Therefore, it is advisable to use a fiber hex-headed wrench for this aligning adjustment. At any rate, the final curve should be as shown with aligning tool removed.

2. *I. F. Wave Trap Alignment*

Leave the band switch at Band "B" and tune receiver to about 1000 kc.

With the test oscillator set at 465 kc. apply this signal to the antenna terminal through a dummy antenna consisting of a 400-ohm resistor and 250-mmfd. capacitor in series. With the 465-kc. signal applied to the antenna terminal, adjust the I.F. Wave Trap Trimmer for *minimum* output indication.

3. *R. F. Alignment*

First check the position of the dial pointer by rotating the tuning condenser to maximum capacity position, i.e., plates fully meshed. At this position, the pointer should coincide with the end mark at the left-hand end of the scale. If it does not, it may be set by loosening the pointer set screw and setting the pointer to its correct position. During R.F. alignment the AFC switch *must* be set in its "off" (counter-clockwise) position.

BAND "B" (535-1640 KC.)

Set the test oscillator for operation at 1500 kc. and connect its output to the antenna terminal of the receiver through the dummy antenna described under "I.F. Wave Trap Alignment." Tune the receiver until the pointer is at 1500 on the scale. Set the tone control for minimum high response and reduce the volume control setting so as to avoid excessive noise response. Adjust the Band "B" oscillator, R. F., and antenna trimmers respectively (location shown on Fig. 4) to give maximum deflection on the output meter. Maintain the test oscillator output at the lowest level which will give an easily readable output indication.

Now set the test oscillator at 580 kc. and tune the receiver to resonance with this signal. Adjust the 580 kc. padding capacitor, C-20, rocking the tuning condenser back and forth through resonance as the padding capacitor is adjusted and note the deflection of the tuning meter each time the receiver is tuned in this manner. Leave the padding capacitor at the setting which gives greatest deflection.

Retune the receiver to 1500 kc. and set the test oscillator for this frequency. Check the alignment by again adjusting the Band "B" oscillator, R. F. and antenna trimmers for maximum deflection on the tuning meter.

BAND "C" (1600-5600 KC.)

With the test oscillator connected to the receiver as above, tune the receiver until the pointer is at 5220 on the "C" band scale. Set the test oscillator for operation on this frequency and, with the volume and tone controls set as above adjust the band "C" oscillator, R. F., and antenna trimmers, respectively (see Fig. 4) to give maximum deflection on the output meter.

BAND "D" (5.5-18.2 MC.)

Turn the band switch to Band "D." Set the test oscillator at 18,000 kc. (18.0 mc.) and tune the receiver until the pointer coincides with the 18.0 mark. Adjust the Band "D" oscillator trimmer to give maximum output indication. It will probably be found that there will be two settings of the oscillator trimmer that will give an output response. The lower capacity setting of the trimmer is the one that should be used. To be sure that correct adjustment has been obtained, tune for the image signal at 17.07 mc. with the test oscillator at 18.0 mc. It may be necessary to increase the test oscillator output to obtain response at this point.

Retune the receiver to 18.0 mc. and adjust Band "D" antenna and R. F. trimmers, respectively (C-5 and C-13) for maximum output indication. When adjusting the R. F. trimmer, C-13, rock the tuning condenser back and forth through resonance as in the 580 kc. padding capacitor adjustment.

Alignment of the receiver is now complete as no adjustments are provided on band "E."

4. *I. F. Alignment with Output Meter*

Although the use of the cathode-ray oscilloscope for alignment purposes is to be preferred, it is possible to make the I. F. trimmer adjustments with reasonable accuracy using a 465 kc. signal generator and output meter.

Place a modulated signal of 465 kc. on the grid of the last I. F. (6K7) tube with the volume control set at maximum and the AFC switch *turned off*. Place a low range A. C. voltmeter or other output indicator across the voice coil of the loud-speaker. Adjust the output of the signal generator so that an indication of not more than two or three volts is obtained on the output meter.

Adjust and readjust the primary trimmer for maximum output and *the secondary for minimum output*. This latter adjustment will be very broad. Apply the signal input to the grid of the 1st I. F. (6K7) tube and adjust both primary and secondary trimmers for maximum output, reducing the input as necessary to obtain approximately the same output indication as before. Apply the signal input to the grid of the converter (6L7) tube and adjust both primary and secondary trimmers for maximum output indication in the same manner.

It is now necessary to make a fine adjustment of the secondary trimmer of the last I. F. (AFC) transformer which is as follows: without changing the frequency of the signal generator, place the input lead on the rubber insulation of the converter (6L7) grid lead. This will provide a small signal input through the capacity between the leads. Increase the attenuator setting if necessary to make the output audible. If the signal generator is provided with a means of removing the modulation, this should be done. However, the adjustment may be carried out satisfactorily even with a modulated generator signal.

Now tune in any broadcast signal in the usual manner and tune the receiver carefully for zero beat between this carrier and the 465 kc. signal generator. It may be necessary to use a short antenna or to remove it entirely if the station is a strong local. Throw the AFC on and adjust the last I. F. secondary (AFC) trimmer to give zero beat. This adjustment is very critical and must be made with great care. When the adjustment is properly made, there will be no appreciable change from zero beat as the AFC switch is thrown off and on. This completes the alignment of the I. F. and AFC circuits.

The alignment of the oscillator and R. F. circuits may be carried out in the usual manner. The AFC switch must remain in the "off" position.

ADJUSTMENT OF DIAL MECHANISM

The dial mechanism (Fig. 7) is rigidly mounted to the "Sentry Box" by means of two brackets and four screws. The dial pointer is operated by means of an "Automatic Vernier" reduction drive unit. Motion imparted to the gang condenser rotor is transmitted through a series of pulleys and an interconnecting cable to the dial pointer slider which is supported on a rail below the dial scale.

To Replace Cables

To replace cord or cable for the pointer or drive, the chassis should be removed from the cabinet and the dial mask (No. 14) removed from the dial scale box (No. 5). The black drive cord (No. 25) should run between the drum (No. 6) on the condenser and the drive pulley without crossing. Both the black cord (No. 25) and the bronze cable (No. 24) fasten on the same hook in the drum (No. 6) which is in front of the single lance on the outside diameter. The springs (21) and (22) are fastened on the ends of the cables after passing through the lances which are close together on the condenser drive drum. The light spring (No. 21) is on the bronze cable (No. 24) and the special spring-loop hooks into the hole in the drum next to the hook for the spring on the black cord (No. 25). The solid end of the cord or cable should be fastened first to the drum, the line should be then strung around the pulleys and drum, and lastly, the spring should be stretched into place.

To Adjust Pointer for Calibration

The pointer (No. 27) is adjustable by removing the escutcheon plate and also the dial mask (No. 14) which is held by four screws. The screw in the center of the pointer (No. 27) can then be loosened and the pointer adjusted as needed.

To Replace Scale

The scale (No. 3) can be removed by taking off the escutcheon and the dial mask (No. 14) as for the adjustment of the pointer. The pointer (No. 27) is moved to the left-hand end, the scale is then pushed to the left and the right-hand end is pulled out with the aid of a small screw driver or a similar tool. When replacing the scale (No. 3) it is advisable to remove the cord (No. 23). The spring (No. 9) is put on the dial shaft and the shaft then inserted into the housing. The scale (No. 3), with the right-hand cap (No. 8) attached, is then inserted into the left-hand cap (No. 7) which is held in position by pulling on the shaft on the outside of the housing. After the scale (No. 3) is inserted it should be rotated from one to two times against the action of the torsion spring (No. 9). The cord (No. 23) is then replaced in the lance provided for it. It is advisable to have the band switch rotated so that the greatest length of cord possible is unwound from the lower pulley (No. 4) on the band switch shaft. It is best that the chassis be removed for the replacement of a scale.

(It is important when replacing the chassis in the cabinet hat the rubber grommets should be put in the chassis and not on the wood pins.)

DESCRIPTION OF ELECTRICAL CIRCUIT

Model E-129 is a 12 metal tube receiver using a highly sensitive and selective superheterodyne circuit. In addition to the fundamental requirements of superheterodyne design it incorporates many noteworthy technical improvements which are of definite advantage in improving efficiency of performance and ease of operation.

Design features built into this receiver include the "Sentry Box"; separate coils for each frequency band; high efficiency converter with a separate oscillator; two stages of IF amplification for high sensitivity and selectivity; automatic volume control; automatic frequency control (AFC), silent tuning, bass and treble compensated volume control, music-speech switch operated in conjunction with a continuously variable tone control, and colorama tuning.

"Sentry Box"

The RF and oscillator sections of the receiver are contained in the "Sentry Box" which consists of a separately contained and shielded, four band, antenna, RF and oscillator tuning unit. Individual coils are employed for each frequency range and are properly selected and connected into the circuit by the range switch. To avoid absorption effects, the range switch shorts all unused coils which might resonate at some frequency in the range being used. The section of the range switch controlling selection of the antenna coil primary also changes the antenna connection to these coils in such a manner as to insure maximum signal transfer in each range. When the G.E. "V" Doublet Antenna System is connected to terminals "A" and "G" at the rear of the "Sentry Box," the range switch provides for true doublet operation in the short wave (D) band where this connection is advantageous, and for operation as a "T" antenna in all other bands. When a doublet antenna providing noise reduction on the broadcast band is used, it is essential that a link be connected between terminals "G" and "GR" at the back of the "Sentry Box" in order to obtain the desired action.

The antenna is coupled to the control grid of the 6K7 RF tube through the tuned antenna transformer selected by the range switch. Likewise, the output of the amplifier tube is coupled to the control grid of the 6L7 converter tube through the properly selected tuned RF transformer. The only exception to this procedure occurs when the receiver is operating on the ultra-short-wave "E" band, in which position the RF tube is disconnected from the circuit and the antenna coupled directly to the 6L7 grid through the tuned antenna transformer.

The oscillator circuit, with the exception of the ultra-short-wave "E" band, employs a 6J7 tube in a conventional tuned grid, plate feedback circuit. In the ultra-short-wave "E" band, the common impedance between the grid and plate circuits provided by the secondary of L12 in the cathode circuit of the 6K7 oscillator tube, is utilized to provide oscillation. An auxiliary feedback circuit composed of the primary of L-12 together with the capacitor, MC-29, is in the plate circuit of the oscillator tubes on the "E" band. These elements resonate slightly below the low frequency end of the "E" band and tend to improve the oscillator excitation at this end of the band. To minimize capacity effects, the tuned "E" band grid coil L-13 remains in the circuit at all times since its resistance is sufficiently low to permit this procedure. The grid coil of the broadcast "B" band oscillator returns to B plus rather than to ground in order to provide plate voltage for the 6J7 AFC tube. The 580-kc. padding capacitor, C-20, serves to isolate this voltage from the oscillator tuning condenser section. The oscillator signal which is maintained at a frequency 465 kc. higher than the incoming signal is capacity coupled to the injection grid of the 6L7 converter.

The 6J7 AFC tube is also located on the "Sentry Box" and is associated with the broadcast "B" band oscillator. A complete description of the operation of AFC is given in a later paragraph. The output of the converter is applied to the I.F. amplifier.

I. F. Amplifier

The intermediate frequency amplifier consists of a two-stage cascade section composed of three I.F. transformers and two 6K7 amplifier tubes. Each transformer has two tuned circuits which resonate at 465 kc. The third I.F. transformer is of special construction having the primary capacitive coupled to the midpoint of the secondary in order to provide the differential AFC voltage. The operation of this transformer is discussed in a special chapter on AFC.

Detector and AVC

The plates of the 6H6 twin diode are fed in push-pull by the secondary of the third I.F. transformer. Two balanced diode loads consisting of R-24 and the series resistance of R-21, R-22, and R-23 are provided. The AFC voltage is developed across the sum of all these resistors, while the audio voltage appears across the sum of R-21 and R-22 and R-23. The audio frequency thus provided is transferred to the A.F. system for amplification and reproduction. The direct-current component of the rectified signal produces a voltage drop across the above three resistors. That existing across R-21 and R-22 is employed for operating the 6K7 "Colorama" tuning tube. Switch S-10 permits the application of either full or partial voltage to the tube, thereby permitting control of the color indication in accordance with prevailing receiving conditions. A complete description of "Colorama" tuning is given in a later paragraph. The D.C. voltage developed across R-21 is utilized for automatic volume control action by employing the same to bias the R.F. amplifier, converter, and first I.F. amplifier tubes. Initial bias for these tubes is obtained by returning resistor, R-21, to the minus 3 volt tap of the voltage divider. The second I.F. tube receives no A.V.C. and is self-biased. This minimizes the possibility of non-linear distortion on strong signals.

Audio System

The audio voltage developed across the diode load is applied to the volume control, R-32, through the isolating capacitor, TC-49. This control is compensated by means of dual resistance—capacitance networks to provide the proper balance of high and low frequencies at different volume control settings. The movable arm on the volume control selects the amount of audio signal applied to the control grid of the 6C5 audio amplifier tube and thus regulates the output of the receiver. The output of the 6C5 audio tube is transformer coupled to the control grids of the two 6P6 output tubes which operate in a push-pull connection.

The music-speech control consists of a switch actuated at one extreme of the tone control rotation corresponding to that providing maximum high note response. This provides better speech clarity by decreasing the bass compensation which is accomplished by shunting capacitor TC-53 with TC-52. The bass compensation is removed entirely on the short-wave bands by the switch S-2; hence the music-speech control is only effective in the broadcast "B" band. Continuously variable tone control is provided by capacitor TC-59 and variable resistor R-34 shunting the grids of the push-pull output tubes.

Silent Tuning

Silent tuning is provided by the switch S-9 which is actuated by the tuning knob of the receiver. Pulling the tuning knob out slightly closes switch S-9 and kills the audio output by grounding the 6C5 grid. The AFC is also removed by this operation which permits a sharp indication of resonance by noting the "Colorama" lights. When a station has been satisfactorily located in this manner, the tuning knob is pushed in to its original position and the switch opened.

Power Supply

D.C. power for operation of the receiver is supplied by a power supply system employing a 5Z4 full-wave rectifier tube which, together with a suitable network of resistors and capacitors, supplies the required voltages and filtering action.

COLORAMA TUNING

These receivers are equipped with Color Tuning, a novel method which indicates approach to resonance by means of a change of color of the light illuminating the tuning scale.

The colored light is produced by a group of four red-stained pilot bulbs and a group of three green-stained bulbs behind the scale. At zero signal strength the red group is at full brilliance and the green invisibly dim. As the signal increases from zero, the red gets dimmer and the green brighter over a broad range until at extreme signal strength the green is fully bright and the red below visibility through the dial. Hence, as a station is tuned-in the color changes smoothly, and the maximum change in the green direction is an indication of resonance.

Weak stations will produce a small color change and strong stations a larger change. The difference in signal strength, between the weakest and the strongest station likely to be listened to, has been found to be so great in different localities that the receivers have been equipped with a two-position sensitivity range switch for "sensitive" and "insensitive" settings of the color tuning. The switch is located near the power transformer on the chassis and may be reached from the rear of the cabinet. In the sensitive position, the weakest station to which the user can listen comfortably, above the general noise level, will shift the color to neutral white at resonance. Stronger stations give resonant points at bright greens. In localities near a relatively large group of high-powered stations and having a high noise level, such as Chicago and New York, the range switch must be thrown to the insensitive position when standard outdoor antennas are used, or else the color will be fixed green over so wide a band that resonance cannot be accurately found. The difference in sensitivity is about twenty to one. On short-wave bands the band switch connects the color tuning to the sensitive setting and the switch on the chassis is inoperative. This is because practically all the short-wave signals are relatively weak. The insensitive setting is used only on the 535-1640 kc. band.

There is a group of four red and a group of three green pilot bulbs behind the scale. These are controlled by a Saturable Reactor in a circuit which is shown in the schematic diagram, Fig. 2. The saturable reactor is controlled by a D.C. coil which decreases its reactance smoothly from a high-value at no D.C. to a very low value at maximum D.C. The saturable reactor acts very much like a dimming rheostat except that it is controlled by the D.C. plate current of a 6K7 tube used solely for that purpose. This tube receives for its bias a portion of the A.V.C. voltage of the set so that at no signal the bias is nearly zero. At this point, the plate current is at maximum; therefore, the red is brightest and the green invisibly dim.

SOME THINGS WHICH MAY AFFECT THE OPERATION OF COLOR TUNING ARE AS FOLLOWS:

Seven colored bulbs are used to give good diffusion of color over the scale; but if one of the seven fails it unbalances the whole group and should be replaced immediately. The lamp socket assembly may be removed by reaching into the rear of the cabinet, pulling the lamp socket assembly up on its guides and drawing it partly out. (A shipping screw, which should be removed when the set is unpacked, may need to be removed the first time.) There is enough slack in connecting wires to allow the assembly to be drawn forward. When the socket assembly has been drawn far enough out for unscrewing the bulbs turn on the power switch and replace the bulbs which do not glow. All will not be bad as each group is in series (green) or series parallel (red). Take care the wires do not foul the tuning mechanism when the assembly is replaced. The colored lamps used for replacement *MUST ALL BE 6.3 VOLTS, 0.15 AMPERE LAMPS.* No other size will work.

If the red is unusually dim on no signal and the colored bulbs are all good, try removing the antenna. Next try replacing the 6K7 "Colorama" tube or replace the rectifier. Sometimes the antenna noise level is so high that it dims the red like a signal. If the tubes in the set become weak, or the set is out of alignment, or for any other reason loses its sensitivity, the color tuning will appear insensitive.

AUTOMATIC FREQUENCY CONTROL

These receivers employ automatic frequency control (AFC) which is a device for automatically controlling the oscillator frequency in such a way that, although the receiver is not exactly tuned to the signal being received, an intermediate frequency of 465 kc. will still be produced. This control of the oscillator frequency is secured by means of a 6J7 tube so connected to the oscillator that it draws a lagging current from the tank circuit and thus gives the effect of a shunt inductance. Variation of the D.C. grid bias on the 6J7 control tube will affect the mutual conductance of the tube, thereby changing the amount of lagging current drawn from the oscillator tank with a consequent effect of variation of the amount of shunt inductance connected across the oscillator coil. This alters the total inductance in the oscillator tuned circuit and changes its resonant frequency.

Grid bias for the 6J7 control tube which will vary in accordance with the amount of detuning of the receiver is obtained from the 6H6 diode rectifier operating in conjunction with its special I.F. transformer. This control voltage is the difference between the drop across resistor R-24, the load resistor for one diode section of the 6H6 diode rectifier, and the drop across resistors R-21, R-22 and R-23, which constitute the load resistance for the other diode section. When the receiver is correctly tuned to the incoming signal, the intermediate frequency produced will be 465 kc. which is the resonant frequency of the tuned circuit feeding the 6H6 diode rectifier. Under this condition each diode plate receives equal signal voltage and the D.C. voltage drops across the load resistors will be equal, giving no change in grid bias on the 6J7 control tube. If the receiver is so tuned that the intermediate frequency produced is above 465 kc. the signal voltage applied to diode plate No. 7 will exceed that applied to diode plate No. 8. In this case, the D.C. voltage drop across load resistor R-21, R-22 and R-23 will be larger than that across load resistor R-24 and a resultant voltage will be produced which will increase the 6J7 control tube grid bias lowering the mutual conductance of the tube and causing it to draw less current from the oscillator tank. This is the same effect that would be produced by increasing the amount of shunt inductance across the oscillator coil and the oscillator frequency is thereby lowered by the amount necessary to compensate for the detuning. The opposite takes place when the receiver is tuned so as to produce an intermediate frequency below 465 kc. Diode plate No. 8 then receives more signal voltage than diode plate No. 7 and the resultant voltage developed across the load resistors is such as to decrease the grid bias on the 6J7 control tube. This causes a larger current to be drawn from the oscillator tank circuit, the effect being the same as a decrease in shunt inductance with a consequent increase in oscillator frequency to overcome the detuning.

AUTOMATIC RECORD CHANGER

The record-changing mechanism used in this receiver has been designed to be simple and fool-proof. Under normal operating conditions, service difficulties should be negligible. Occasionally, however, certain adjustments may be required. These adjustments are explained in the following paragraphs. It is important when servicing the automatic record changer to have it placed on a level support. It is also important to refrain from forcing the mechanism if there is a tendency to bind or jam, since bent levers and possibly broken parts may result.

Operating Instructions and Service Adjustments

The record changer is designed to automatically play eight 10-inch or seven 12-inch standard 78 RPM phonograph records on one side. The last record remains on the turntable and repeats until more records are placed on the turntable or the mechanism is stopped.

To play 12-inch records, referring to Figure 8, pull the thumb stop (K) on the right-hand side of the tonearm forward which allows the needle to locate on the edge of the record, also push the knob (D) at the left rear corner of the changer from 10 inch to 12 inch as marked on the base plate. Either 10-inch or 12-inch records may be repeated as often as desired by lifting the record removing arm (A) to an upright position.

To reject a record from the turntable while playing, pull the lever (L) at the right side of the turntable.

Motor Adjustments

The speed of the turntable motor is controlled by a governor which allows correct adjustment of the turntable rotation to 78 revolutions per minute. A pointer is provided under the turntable and the base plate is marked "F" and "S" to indicate direction to move pointer for faster or slower operation. A check of the turntable rotational speed may be made by placing a piece of paper under a record on the turntable and counting the number of times it rotates past a fixed point in one minute.

The motor bearings and gears are properly lubricated for long operation under normal weather conditions. If the motor chatters or runs uneven, place a few drops of light machine oil on the governor felt.

Trip Mechanism

While playing a record, the tonearm lifting mechanism (L) and the record removing arm (A) are held out of engagement with the motor cam by means of a latch which is formed by the vertical square pin in the pointed latch lever (I) and the notch in the side of the tonearm lift lever (L). *This pin should engage the notch approximately one-half its depth*, and is adjusted thus by means of an eccentric washer and screw in the trip lever (B) upon which is mounted the cerrated block (H).

The latch is held closed by means of a spring between the latch bar and the trip lever. Be sure the parts work freely without binding so that they will latch when the latch bar swings back past the notch after a record has been removed.

The record changer is designed to trip on an eccentric trip groove record. The eccentric trip is effected by means of a hardened steel pin which is pressed into the end of the tonearm lift crank. This pin ratchets over the top of the grooves in the cerrated block (H) on the trip lever (B). When the eccentric groove in the record swings the tonearm back and forth it pushes the latch out of engagement. Care should be taken to insure that there is at least $\frac{1}{32}$ in. clearance for the end of the pin to raise over the cerrations to provide the ratchet action, when using a short phonograph needle riding on top of one record on the turntable.

The oval head machine screw, which serves as a pivot at the right-hand end of the left lever (L), should be set at such a height to allow the lift lever to be raised by the latch bar and so the roller is able to pass under the end of the lift lever without binding and also without too much clearance.

Unloading Mechanism

The record changer is intended to be operated with at least one record on the turntable in order to prevent the needle from damaging the turntable covering.

The motor mounting screws (G) should be adjusted so that the *elevation of the turntable from the base plate to the top of one record is one inch.*

The set screw and lock nut on the projecting member under the record removing arm (A) is provided for adjusting the elevation of the record separating and lifting finger. This screw should be adjusted so that the finger will remove the second record on the table but barely rise over, and not remove, the first record.

Record Lift Adjustment

To adjust the lift of a record while removing it from the turntable shaft and table the latch bar (I) should be placed in a position at its farthest throw against the face of the cam mounted on the motor spindle. Place a record between the separating finger and lever (A), the same way as the changer holds it while removing it. Let the other side of the record lie on top of the first record on the table. Adjust the lift by means of the eccentric stud and nut (P) at the left of the record removing assembly until the center hole of the record is off the turntable shaft and swings free of it.

Tone Arm Lowering

To adjust for the proper lowering of the tone arm on the edge of a 10-inch record (the difference for the 12-inch record is adjusted at the factory) the screw above the shelf on the right side of the tone arm is provided for moving the tone arm stop right or left until the needle will lower to approximately $\frac{1}{2}$ in. from the edge of the record.

To adjust the proper vertical clearance of the tonearm vertical pivot bearing, two jam nuts are provided on the end of the pivot sleeve, under the changer base plate. These nuts may be adjusted to take up unnecessary play.

Dash Pot Adjustment

Place the tonearm of the record changer in the position which results when the latch bar (I) is against the turntable motor cam at its furthest operating throw. (This position is the other extreme of the operating cycle as shown on Figure 8.) The tonearm stop should be against the cone-shaped cup of the dash pot while in the 10-inch position.

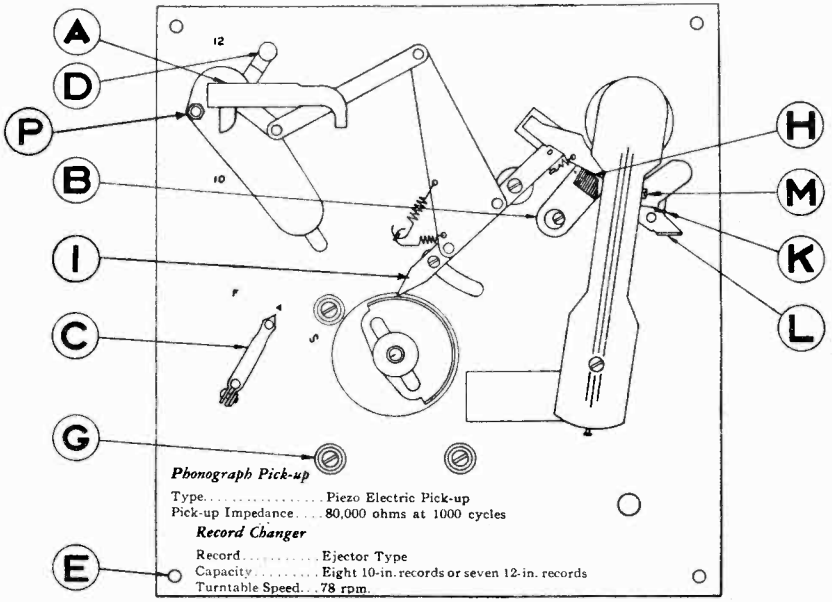
Raise or lower the dash pot plunger by means of the two lock nuts which control the lift of the dash pot lever under the changer base plate. Adjust these two nuts so that there is a clearance of a post card thickness between the dash pot leather tip and the under-side of the tonearm shelf.

Lowering Speed of Dash Pot

The top of the dash pot is provided with a knurled screw cap for adjusting the lowering speed of the dash pot. In case the tone arm descends too fast, put a drop of light machine oil on the plunger above this cap and allow it to work into the felt packing gland. Tighten or loosen the cap to obtain the desired lowering speed.

Crystal Pickup

The pickup used in the phonograph unit is of the piezo electric crystal type. The crystal cartridge (#1 Fig. 9) is a factory sealed unit and no adjustments are provided. The pickup and tonearm assembly should require very little servicing and if treated with reasonable care should perform its function without attention for long periods of time.



Phonograph Pick-up

Type.....Piezo Electric Pick-up
Pick-up Impedance....80,000 ohms at 1000 cycles

Record Changer

Record.....Ejector Type
Capacity.....Eight 10-in. records or seven 12-in. records
Turntable Speed...78 rpm.

Fig. 8. Automatic Record Changer Mechanism

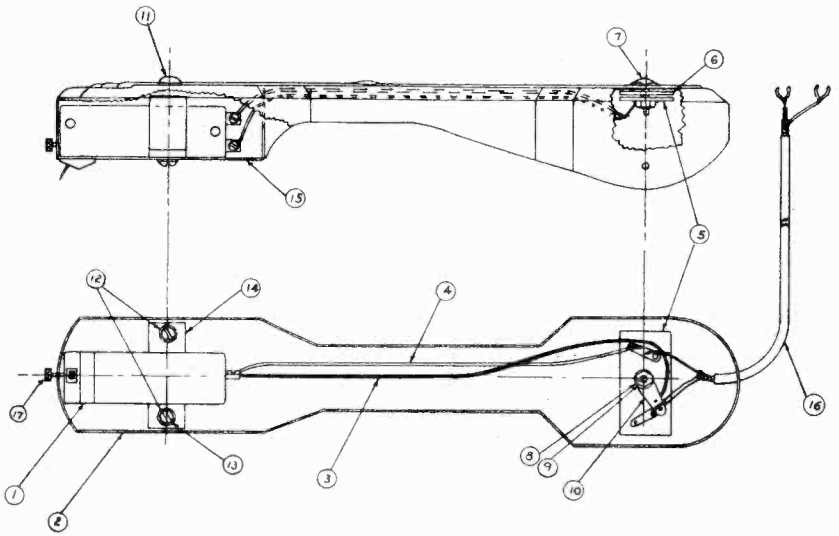


Fig. 9. Piezo Electric Crystal Pickup

REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER CHASSIS ASSEMBLY	
*RB-008	BOARD—Terminal Board, Double-lug	$0.10
*RB-009	BOARD—Terminal Board, Single-lug	.15
*RB-019	BOARD—Terminal Board, Three-lug	.10
*RB-023	BOARD—Terminal Board, Four-lug	.10
RB-046	BOARD—Terminal Board, Five-lug	.15
RB-047	BOARD—Resistor Board on Chassis Shelf	.10
RB-048	BOARD—Fuse Board	.15
*RC-011	CAPACITOR—.002 Mfd., 600 V Paper (TC-61, TC-62, TC-63)	.25
*RC-013	CAPACITOR—.002 Mfd., 200 V Paper (Mtd. on Res. Bd.) (TC-55)	.25
*RC-034	CAPACITOR—.01 Mfd., 200 V Paper (Mtd. on Res. Bd.) (TC-49)	.25
RC-036	CAPACITOR—.008 Mfd., 200 V Paper (TC-53)	.25
*RC-046	CAPACITOR—.02 Mfd., 200 V Paper (TC-52, TC-59, TC-60)	.25
*RC-072	CAPACITOR—.05 Mfd., 200 V Paper (TC-35, TC-39, TC-43, TC-64)	.25
*RC-091	CAPACITOR—.05 Mfd., 400 V Paper (TC-34, TC-38)	.30
*RC-150	CAPACITOR—.25 Mfd., 400 V Paper (TC-58)	.35
RC-200	CAPACITOR—1 Mfd., 100 V Paper (TC-46)	.60
RC-234	CAPACITOR—Plate Coupling Capacitor 3rd I. F. Transformer (MC-40)	.25
RC-235	CAPACITOR—Grid Return Filter Capacitor for 3rd I. F. Transformer (MC-42, MC-48)	.25
RC-235	CAPACITOR—100 mmfd., Mica (Mtd. on Res. Bd.) (MC-54)	.25
RC-235	CAPACITOR—100 mmfd., Mica (MC-45)	.25
*RC-258	CAPACITOR—250 mmfd., Mica (MC-47, MC-56)	.25
RC-290	CAPACITOR—400 mmfd., Mica (Mtd. on Res. Bd.) (MC-50)	.25
*RC-411	CAPACITOR—30 Mfd., 400 V Wet Electrolytic (EC-70)	1.55
*RC-412	CAPACITOR—30 Mfd., 280 V Wet Electrolytic (EC-69)	1.20
RC-426	CAPACITOR—10 Mfd., 100 V Wet Electrolytic (EC-67)	.75
RC-551	CAPACITOR—11 Mfd., 25 V and 4 Mfd., 200 V Dry Electrolytic (E3-57 red; EC-65 gn.)	1.25
RC-558	CAPACITOR—50 Mfd., 50 V and 10 Mfd., 25 V Dry Electrolytic (EC-68 red; EC-66 gn.)	2.15
RC-755	CAPACITOR—Line Capacitor, .01-.01 Mfd., 250 V A. C. Paper (TC-71 & 72)	.40
RC-819	CABLE—Speaker Cable (Complete)	.60
RC-860	CORD—Power Cord	.65
RC-946	CUSHION—Front Chassis Mounting Cushion	.10
RC-947	CUSHION—Side Chassis Mounting Cushion and Support Bracket	.20
RE-013	ESCUTCHEON—Escutcheon Plate (with Mtg. Scws.)	1.75
RF-301	FUSE—30 Amp. Fuse (Pkg. of 10)	1.00
*RG-001	GRID CLIP—Control Grid Clip (Pkg. of 5)	.15
RG-104	GUARD—Fuse Board Guard	.15
RG-105	GASKET—Escutcheon Rubber Gasket	.25
RG-106	GASKET—Escutcheon Felt Gasket	.10
*RK-004	KNOB—Control Knob (Push on) (Pkg. of 5)	.40
RK-006	KNOB—Large Control Knob (Push on)	.10
RK-007	KNOB—Large Control Knob (Set Scw.)	.10
RL-312	REACTOR—"Colorama Tuning" Saturable Reactor, 60 Cycles (L-21)	3.00
RL-313	REACTOR—"Colorama Tuning" Saturable Reactor, 25/60 Cycles (L-21)	3.00
RQ-047	RESISTOR—330 ohm, ½ Watt Carbon (R-18) (Pkg. of 5)	.60
*RQ-059 (RR-014)	RESISTOR—1000 ohm, ½ Watt Carbon (R-33) (Pkg. of 5)	$0.70
RQ-067	RESISTOR—2200 ohm Plate Resistor for 1. F. Trans. (R-13, R-17) (Pkg. of 5)	.60
RQ-076	RESISTOR—4700 ohm, ½ Watt Carbon (R-39) (Pkg. of 5)	.60
*RQ-083 (RR-021)	RESISTOR—10,000 ohm, ½ Watt Carbon (Mtd. on Res. Bd.) (R-31) (Pkg. of 5)	.60
RQ-089	RESISTOR—18,000 ohm, ½ Watt Carbon (R-26) (Pkg. of 5)	.60
RQ-099	RESISTOR—47,000 ohm, Grid Resistor for 3rd I. F. Transformer (R-20) (Pkg. of 5)	.60
RQ-103	RESISTOR—68,000 ohm, ½ Watt Carbon (R-19, R-35, R-36) (Pkg. of 5)	.60
*RQ-107 (RR-049)	RESISTOR—100,000 ohm, ½ Watt Carbon (Mtd. on Res. Bd.) (R-25) (Pkg. of 5)	.70
*RQ-107 (RR-049)	RESISTOR—10,000 ohm, ½ Watt Carbon (R-22) (Pkg. of 5)	.70
*RQ-111 (RR-054)	RESISTOR—150,000 ohm, ½ Watt Carbon (R-23) (Pkg. of 5)	.70
RQ-115	RESISTOR—220,000 ohm, ½ Watt Carbon (R-21) (Pkg. of 5)	.70
RQ-123	RESISTOR—470,000 ohm, Grid Resistor for 1st I. F. Transformer (R-14) (Pkg. of 5)	.70
RQ-123	RESISTOR—470,000 ohm, ½ Watt Carbon (R-16, R-24) (Pkg. of 5)	.70
*RQ-131 (RR-067)	RESISTOR—1 Meg., ½ Watt Carbon (Mtd. on Res. Bd.) (R-30) (Pkg. of 5)	.70
RQ-139	RESISTOR—2.2 Meg., ½ Watt Carbon (R-37, R-38) (Pkg. of 5)	.70
RQ-143	RESISTOR—3.3 Meg., ½ Watt Carbon (Mtd. on Res. Bd.) (R-29) (Pkg. of 5)	.70
RQ-275	RESISTOR—4700 ohm, ½ Watt Carbon (R-15) (Pkg. of 5)	.70
RQ-277	RESISTOR—5600 ohm, ½ Watt Carbon (R-40) (Pkg. of 5)	.70
*RQ-283 (RR-183)	RESISTOR—10,000 ohm, ½ Watt Carbon (R-37) (Pkg. of 5)	.70
RQ-805	RESISTOR—82,000 ohm, 1 Watt Carbon (R-28) (Pkg. of 5)	.75
RR-330	RESISTOR—15 ohm, 2 Watt Flexible (FR-44) (Pkg. of 5)	.85
RR-331	RESISTOR—15 ohm, 1 Watt Flexible (FR-44) (Pkg. of 5)	.75
*RR-705	RESISTOR—50 ohm, 5 Watt Wire Wound (WR-42, WR-43)	.40
RR-720	RESISTOR—Candohm Tapped Bleeder Resistor (R-41)	1.25
*RS-200	SOCKET—8 Pin Tube Socket (Pkg. of 5)	.75
*RS-304	SOCKET—6 Pin Tube Socket (Pkg. of 5)	.75
RS-326	SWITCH—"Colorama" Sensitivity Switch (S-10)	.50
RS-827	SWITCH—Automatic Frequency Control Switch (S-8)	.50
RS-423	SPRING—Knob Spring (Push on Type) (Pkg. of 10)	.25
RT-131	TRANSFORMER—Power Transformer (T-8) 118 V. 50/60 Cycles	7.75
RT-122	TRANSFORMER—Power Transformer (T-3) 118 V. 25/60 Cycles	12.00
RT-123	TRANSFORMER—Universal Power Transformer (T-3) 105/125 200/250 V. 40/60 Cycles	11.75
RT-225	TRANSFORMER—1st I.F. Transformer (Complete)	2.10
RT-226	TRANSFORMER—2nd I.F. Transformer (Complete)	2.10
RT-227	TRANSFORMER—3rd I.F. Transformer (Complete)	4.15
RT-504	TRANSFORMER—Interstage Transformer (T-1)	5.20
RT-711	TONE CONTROL—Tone Control and Speech Clarifier Switch (R-34) (S-11)	1.00
RV-016	VOLUME CONTROL—Volume Control and Power Switch (R-42) (S-12)	1.00
RL-230	COIL—Oscillator Coil, Band C (L-10)	.70
RL-231	COIL—Oscillator Coil, Band D (L-11)	.75
RL-232	COIL—Oscillator Coil, Band E (L-12)	.70
RP-064	PULLEY—Wave Band Switch Dial Cord Pulley	.15
RQ-051	RESISTOR—470 ohm, ½ Watt Carbon (R-8) (Pkg. of 5)	.60
*RQ-059 (RR-014)	RESISTOR—1000 ohm, ½ Watt Carbon (R-7, R-10) (Pkg. of 5)	.70
RQ-067	RESISTOR—2200 ohm, ½ Watt Carbon (R-2, R-6) (Pkg. of 5)	.60
RQ-076	RESISTOR—5100 ohm, ½ Watt Carbon (R-1, R-5) (Pkg. of 5)	.60
RQ-099	RESISTOR—47,000 ohm, ½ Watt Carbon (R-12) (Pkg. of 5)	.60
RQ-103	RESISTOR—68,000 ohm, ½ Watt Carbon (R-4, R-11) (Pkg. of 5)	.60
*RQ-107 (RR-049)	RESISTOR—100,000 ohm, ½ Watt Carbon (R-3) (Pkg. of 5)	.70
RQ-123	RESISTOR—470,000 ohm, ½ Watt Carbon (R-1, R-5) (Pkg. of 5)	.70
RS-165	SHIELD—Antenna Compartment Shield Can	1.25
RS-166	SHIELD—Oscillator Compartment Shield Can	1.25
*RS-300	SOCKET—8 Pin Tube Socket (Pkg. of 5)	.75
RS-828	SWITCH—Wave Band Switch (S-1, 2, 3, 4, 5, 6)	4.00
RW-010	WINDOW—Escutcheon Window	$0.55
RW-101	WASHER—Felt Washer for Control Shafts (Pkg. of ten)	.45
RX-017	CUSHION ASSEMBLY—"Sentry Box" Mounting Cushion, Screw and Washer	.15
	SENTRY BOX ASSEMBLY	
*RB-019	BOARD—Terminal Board, Three-lug (Sentry Box)	.10
RB-049	BOARD—Antenna Ground Terminal Board	.10
RB-050	BOARD—Terminal Board, Two-lug (Top of Gang)	.10
RB-141	BRACKET—Condenser Front Mounting Bracket	.50
RB-142	BRACKET—Condenser Rear Mounting Bracket	.15
RB-143	BRACKET—Wave Band Switch Bracket	.10
*RC-048	CAPACITOR—.02 Mfd., 200 V Paper (TC-17)	.25
*RC-072	CAPACITOR—.05 Mfd., 200 V Paper (TC-6, TC-9, TC-10, TC-18, TC-22, TC-73)	.25
*RC-091	CAPACITOR—.05 Mfd., 400 V Paper (TC-15, TC-19)	.30
RC-203	CAPACITOR—12 mmfd., Mica (MC-12)	.35
*RC-205	CAPACITOR—20 mmfd., Mica (MC-15, MC-29)	.35
*RC-210	CAPACITOR—50 mmfd., Mica (MC-24, MC-25, MC-31)	.25
RC-323	CAPACITOR—1000 mmfd., Mica (MC-14)	.30
RC-342	CAPACITOR—1200 mmfd., Mica (MC-22)	.35
RC-350	CAPACITOR—2950 mmfd., Mica (MC-26)	.50
RC-625	CAPACITOR—Triple Trimmers, Ant., R.F. and Oscillator (C-2, C-3, C-5) (C-7, C-8, C-13) (C-21, C-27, C-30)	.60
RB-627	CAPACITOR—Oscillator Padder Capacitor (C-20)	.40
RC-628	CAPACITOR—Wave Trap Trimmer (C-1)	.25
RC-712	CONDENSER—Gang Tuning Condenser (C-4, C-11, C-29)	4.75
RC-996	CUSHION—Condenser Mounting Cushion Assembly	.15
RL-019	COIL—Antenna Coil, Band B (L-2)	.75
RL-020	COIL—Antenna Coil, Band C (L-3)	.70
RL-021	COIL—Antenna Coil, Band D (L-4)	.70
RL-125	COIL—R.F. Coil, Band B (L-5)	.85
RL-126	COIL—R.F. Coil, Band C (L-6)	.75
RL-127	COIL—R.F. Coil, Band D (L-7)	.75
RL-128	COIL—R.F. Coil, Band E (L-8)	.75
RL-229	COIL—Oscillator Coil, Band B (L-9)	.70
RW-402	WAVE TRAP—Wave Trap (Coil L-1)	$0.55
	SPEAKER ASSEMBLY	
RC-912	CONE—12 in. Type Cone and Voice Coil (Gasket Sold) (L-18)	1.45
RC-991	CLAMP—12 in. Cone Spider Clamp and Screw	.05
RP-050	PLUG—Female Speaker Plug	.20
RP-051	PLUG—Male Speaker Plug	.20
RS-037	SPEAKER—12 in. Type Speaker (Complete with Output Transformer) (L-17, L-18, L-19, T-2)	11.00
RS-416	SPRING—Voice Coil Leads Spring	.10
RT-417	TRANSFORMER—Output Transformer (T-2)	3.00
	DIAL DRIVE MECHANISM	
RB-144	BRACKET—Dial Scale Box L.H. Bracket (1)	.15
RB-145	BRACKET—Dial Scale Box R.H. Bracket (2)	.15
RB-146	BRACKET—"Colorama" Dial Lamp Bracket (Less Lamps) (17)	1.10
RB-147	BRACKET—"Personaliser" Dial Lamp Bracket (Less Lamp) (18)	.45
RB-148	BRACKET—Reduction Drive and "Silent Tuning" Switch Support Bracket (20)	.10
RB-513	BOX—Dial Scale Box and Pulley Assembly (5)	1.75
RC-820	CABLE—Dial Pointer Cable (24) (Pkg. of 5)	.40
RC-861	CORD—Condenser Drive Cord (25) (Pkg. of 5)	.60
RC-862	CORD—Band Change Cord (23) (Pkg. of 10)	.50
RC-948	CLAMP—Reduction Drive Friction Clamp (13)	.15
RC-949	COLLAR—Condenser Reduction Drive Assembly Shaft Collar and Spring Washer (30)	.20
RC-997	CAP—Scale Cap (Free End) (8)	.10
RC-998	CAP—Scale Cap (Pulley End) (7)	.10
RC-999	CONTACT—Silent Tuning Switch Contact (12)	.20
RD-038	DIAL—"Slide-Rule" Dial Scale (3)	.70
RD-039	DRIVE—Tuning Condenser Reduction Drive Assembly (10)	1.15
RL-908	LAMP—"Colorama Tuning" Green Lamp (Pkg. of 10)	1.50
RL-909	LAMP—"Colorama Tuning" Red Lamp (Pkg. of 10)	1.50
RM-003	MASK—Dial Mask and Personaliser Strip Holder	1.00
RP-054	PULLEY—Wave Band Switch Dial Cord Pulley (4)	.15
RP-055	POINTER—Dial Pointer (27) (Pkg. of 5)	.40
RP-056	PULLEY—Gang Drive Drum (6)	.55
RS-329	SWITCH—Silent Tuning Switch (Mechanism) (11)	.50
*RS-401	SPRING—Condenser Drive Cord Spring (21) (Pkg. of 5)	.20
RS-419	SPRING—Dial Pointer Cable Spring (22) (Pkg. of 2)	.20
RS-420	SPRING—Dial Scale Tension Spring (9)	.20
RS-421	SLIDER—Dial Pointer Slider (with screw) (26)	.15
RS-422	STRIP—"Personaliser" Illumination Diffuser (29)	.10
RW-009	WINDOW—"Personaliser Strip" Window (Celluloid)	.15
	RECORD CHANGER MECHANISM ASSEMBLY	
RPA-001	ASSEMBLY—Unloading Arm and Latch Bar Assembly	4.75
RPA-002	ASSEMBLY—Latch Bar Assembly	2.80
RPA-003	ASSEMBLY—Latch Bar and Pawl Assembly (1)	$1.55
RPB-001	BASE PLATE—14" x 15" Base Plate (Brown Enamel Finish)	3.20
RPC-001	CAM—Motor Cam	.85
RPH-001	HANDLE—Mechanism 10 in.-12 in. Change Handle	.75
RPL-001	LEVER—Lift Lever Complete	1.30
RPL-002	LEVER—Motor Speed Regulator Lever	.30
RPL-003	LEVER—Trip Lever Complete	1.00
RPP-001	PIN—Groove Pin for Mounting Unloading Arm	.10
RPP-002	PLATE—Sliding Plate for Mounting Unloading Arm	.85
RPP-003	PLATE—Turntable Drive Plate (metal)	.05
RPR-001	RIVET—Rivet for Fastening Latch Knee to Latch Bar (Pkg. of 10)	.05
RPR-002	ROLLER—Roller Used in Crescent-shaped slot	.10
RPS-001	SCREW—Latch Bar Mounting Screw	.10
RPS-002	SCREW—Lift Lever Screw (Pkg. of 5)	.30
RPS-003	SCREW—Motor Cam Set Screw (Pkg. of 10)	.25
RPS-004	SCREW—Screw Which Holds Unloading Mechanism to Sliding Plate (Pkg. of 10)	.50
RPS-005	SCREW—Sliding Plate Spring Stud (Pkg. of 10)	.10
RPS-006	SCREW—Trip Lever Mounting Screw (Pkg. of 10)	.10
RPS-007	SPRING—Latch Bar Coil Spring	.10
RPS-008	SPRING—Latch Bar Pawl Tension Spring (Pkg. of 5)	.60
RPS-009	SPRING—Lift Lever Spring (Pkg. of 5)	.15
RPS-010	SPRING—Sliding Plate Coil Spring (Pkg. of 5)	.15
RPS-011	SPRING—Speed Regulator Lever Spring (Pkg. of 5)	.25
RPS-012	STUD—Unloading Arm Bumper Stud and Nut (P)	.85
RPT-001	TURNTABLE—12 in. Turntable (Complete)	2.75
RPW-001	WASHER—Eccentric adjustment Washer for Trip Lever	.10
RPW-002	WASHER—Sliding Plate Washer (Pkg. of 5)	.10
RPW-003	WASHER—Sliding Plate Washer (¼ in. Hole) (Pkg. of 5)	.15
RPW-004	WASHER—Star Mounting Washer (¼ in. Hole) (Pkg. of 10)	.20
RPW-005	WASHER—Turntable Drive Washer (Rubber)	.05
RPW-006	WASHER—Washer Used Between Latch Bar and Base Plate (Pkg. of 10)	.25
RPW-007	WASHER—Washer Used Under Star Washer (Pkg. of 10)	.10
RPW-008	WASHER—Star Tension Washer (Pkg. of 10)	.20
RPW-009	WASHER—Trip Lever Mounting Washer (Pkg. of 10)	.10
	MOTOR ASSEMBLIES	
RPM-001	MOTOR—Motor Complete with Cam—78 R.P.M. 115 V. 60 Cycles	17.50
RPM-002	MOTOR—Motor Complete with Cam—78 R.P.M. 115 V. 50 Cycles	17.50
RPM-003	MOTOR—Motor Complete with Cam—78 R.P.M. 115 V. 40 Cycles	19.00
RPM-004	MOTOR—Motor Complete with Cam—78 R.P.M. 115 V. 25 Cycles	19.00
RPX-001	MOUNTING ASSEMBLY—Motor Mounting Spacer, Two Rubber Washers, Plain Washer, and Screw	.15
	PICKUP AND TONEARM ASSEMBLIES	
RPA-004	ARM—Tone Arm (2)	1.10
RPC-002	CRYSTAL—Crystal Cartridge Assembly (1)	6.75
RPC-003	CLAMP—Cartridge Support Clamp (14)	.35
RPC-004	CORD—Pickup Extension Cord (16)	.25
RPK-001	KNOB—Blank Tonearm Knob (Diamond Shape) (7)	.35
RPP-004	PICKUP—Pickup Unit Complete	$11.00
RPP-005	PLATE—Pickup Cartridge Plate (15)	.15
RPS-013	SCREW—Needle Screw (17)	.05
RPS-014	STRIP—Terminal Strip Assembly (5)	.50
RPW-010	WIRE—Lead Wire (Black) (3)	.10
RPW-011	WIRE—Lead Wire (White) (4)	.10
	TONEARM SUPPORT AND OPERATING ASSEMBLIES	
RPA-005	ASSEMBLY—Tonearm Base and Lift Mechanism Complete	4.00
RPB-002	BASE—Tonearm Base Only (with Mtg. Screws)	.55
RPB-003	BRACKET—Bracket Upon Which Tonearm is Mounted	1.00
RPB-004	BUSHING—Tonearm Support Bushing	.15
RPC-005	CRANK—Tonearm Lift Crank	1.75
RPH-002	HOOK—Tonearm Support Hook	.10
RPN-001	NUT—Nut for Holding Pivot in Tonearm Base (Upper)	.10
RPN-002	NUT—Nut for Holding Pivot in Tonearm Base (Lower)	.10
RPP-006	PIN—Lift Crank Cotter Pin (Pkg. of 10)	.05
RPS-015	SCREW—Tonearm Adjusting Screw (M)	.10
RPS-016	SCREW—Tonearm Support Adjusting Screw, Lock Washer, Spring Washer and Nut	.15
RPS-017	SCREW—Tonearm Support Mounting Screw (Pkg. of 10)	.05
RPS-018	SPRING—Lift Crank Spring (Pkg. of 5)	.10
RPS-019	STOP—Adjustable Needle Stop (K)	.10
RPS-020	SUPPORT—Upper Tonearm Support (Bracket)	.30
RPS-021	SUPPORT—Lower Tonearm Support	.50
RPW-012	WASHER—Lift Crank Washer (Pkg. of 10)	.05
RPW-013	WASHER—Washer Used Above and Below Tonearm Bracket Bearing (Pkg. of 10)	.10
	UNLOADING ARM ASSEMBLY	
RPA-006	ASSEMBLY—Unloading Arm Assembly (Complete)	1.75
RPS-022	SCREW—Unloading Arm Adjusting Screw, Nut and Lock Washer	.10
	DASH POT ASSEMBLY	
RPC-006	CAP—Dash Pot Adjusting Cap	.25
RPD-001	DASH POT—Dash Pot Only	1.00
RPP-001	FELT—Dash Pot Adjusting Cap Felt (Pkg. of 10)	.40
RPL-001	LEATHER—Dash Pot Leather (Pkg. of 5)	1.00
RPL-002	LEVER—Dash Pot Lift Lever, Screw and Nut	.20
RPN-003	NUT—Dash Pot Mounting Nut (Pkg. of 5)	.40
RPP-007	PLUNGER—Dash Pot Plunger Assembly	.70
RPS-023	SPACER—Dash Pot Lift Lever Spacer	.15
RPS-024	SPRING—Dash Pot Lift Lever Spring (Pkg. of 5)	.10
RPW-014	WASHER—Dash Pot Felt Washer (Pkg. of 10)	.30
RPW-015	WASHER—Dash Pot Washer (Small) (Pkg. of 5)	.15
RPW-016	WASHER—Dash Pot Washer (Large) (Pkg. of 5)	.25
RPW-017	WASHER—Dash Pot Weight Lock Washer (Pkg. of 10)	.10
RPW-018	WEIGHT—Dash Pot Weight	.10
	MISCELLANEOUS ASSEMBLIES	
RPB-005	BOARD—Terminal Board for Pickup Leads	.15
RPB-006	BOARD—Resistor Board (Chassis Front Center)	.10
RPC-007	CABLE—Phonograph Input Cable	.40
RPC-008	CORD—Phonograph Power Cord (Complete)	.80
RPP-008	PLATE—Radio-Phono Switch Plate	.25
*RPP-009 (RP-025)	PLUG—Two Contact Male Connector Plug—Round	.20
RPR-003 (RQ-119)	RESISTOR—330,000 Ohm ½ Watt Carbon (Pkg. of 5)	.70
RPS-501	SWITCH—Radio-Phono Switch	$1.00
RPX-002	SPRING ASSEMBLY—Suspension Springs, Washer and Bolt Assembly for Motor Board—One Bolt, Two Springs, One Rubber Tubing, One Washer and Two Nuts	.50

* Indicates part also used on 1936 "A" line receivers.

(Prices subject to change without notice)

Tubes

R.F. Amplifier	6K7 Triple-grid Super-control Amplifier
Converter	6L7 Pentagrid Mixer Amplifier
Oscillator	6K7 Triple-grid Super-control Amplifier
1st I.F. Amplifier	6K7 Triple-grid Super-control Amplifier
2nd I.F. Amplifier	6K7 Triple grid Super-control Amplifier
Detector and AVC	6H6 Twin Diode
Audio Amplifier	6C5 Low Gain Triode
Output (Push-pull)	6P6 Power Amplifier Pentodes (2)
AFC Control	6J7 Triple-grid Amplifier
Colorama Control	6K7 Triple-grid Super-control Amplifier
Rectifier	5Z4 Full-wave Rectifier
Lamps	6.3 V.–0.15 A. (4 red and 3 green)

To Change the Dial Lamps

Make certain that the copper-plated hex head shipping screw (which secures the dial lamp bracket during shipment) has been removed before attempting to remove the dial lamp bracket (No. 17). Lift the lamp bracket from the tabs under which it is clipped. Care should be taken that the lamp leads do not put an undue strain upon the drive cable. With the lamp bracket lead laid back horisontally the lamps may be replaced. When the lamp bracket is reinserted care should be exercised to avoid having the lamp leads foul the gang mechanism.

DESCRIPTION OF ELECTRICAL CIRCUIT

Model E-155 is a 15 metal tube receiver using a highly sensitive and selective superheterodyne circuit. In addition to the fundamental requirements of superheterodyne design it incorporates many noteworthy technical improvements which are of definite advantage in improving efficiency of performance and ease of operation.

Design features built into this receiver include the "Sentry Box"; separate coils for each frequency band; high efficiency converter with a separate oscillator; two stages of I. F. amplification for high sensitivity and selectivity; automatic volume control; automatic frequency control (AFC); noise limiter; silent tuning; bass and treble compensated volume control; music-speech switch operated in conjunction with a continuously variable tone control; push-pull beam power tube output; audio degeneration; extra large electrodynamic speaker; and colorama tuning.

"Sentry Box"

The R. F. and oscillator sections of the receiver are contained in the "Sentry Box" which consists of a separately contained and shielded, five band, antenna—R. F.—oscillator tuning unit. Individual coils are employed for each frequency range and are properly selected and connected into the circuit by the range switch. To avoid absorption effects, the range switch shorts all unused coils which might resonate at some frequency in the band being used. The section of the range switch controlling selection of the antenna coil primary also changes the antenna connection to these coils in such a manner as to insure maximum signal transfer in each range. When the G-E "V" Doublet Antenna System is connected to terminals "A" and "G" at the rear of the "Sentry Box," the range switch provides for true doublet operation in the short wave "D" band where this connection is advantageous, and for operation as a "T" antenna in all other bands. When a doublet antenna providing noise reduction on the broadcast band is used, it is essential that a link be connected between terminals "G" and "GR" at the back of the "Sentry Box" in order to obtain the desired action.

The antenna is coupled to the control grid of the 6K7 R. F. tube through the tuned antenna transformer selected by the range switch. Likewise, the output of the R. F. amplifier tube is coupled to the control grid of the 6L7 converter tube through the properly selected tuned R. F. transformer. The only exceptions to this procedure occur when the receiver is operating on the "Long Wave" "A" band or the ultra short wave "E" band, in which positions the R. F. tube is disconnected from the circuit and the antenna coupled directly to the 6L7 grid through the tuned antenna transformer.

The oscillator circuit, with the exception of the ultra short wave "E" band, employs a 6J7 tube in a conventional tuned grid, plate feedback circuit. In the ultra short wave "E" band, the common impedance between the grid and plate circuits provided by the secondary of L-13 in the cathode circuit of the 6K7 oscillator tube is utilized to provide oscillation. An auxiliary feedback circuit, composed of the primary, L-13, together with the capacitor, MC-36, is in the plate circuit of the oscillator tube on the "E" band. These elements resonate slightly below the low frequency end of the "E" band and tend to improve the oscillator excitation at this end of the band. To minimize capacity effects, the tuned "E" band grid coil, L-15, remains in the circuit at all times since its resistance is sufficiently low to permit this procedure. The grid coil of the broadcast "B" band oscillator returns to B plus rather than to ground in order to provide plate voltage for the 6J7 AFC tube. The 580 kc. padding capacitor, C-27, serves to isolate this voltage from the oscillator tuning condenser section. The oscillator signal, which is maintained at a frequency 465 kc. higher than the incoming signal, is capacitor coupled to the injection grid of the 6L7 converter.

The 6J7 AFC tube is also located on the "Sentry Box" and is associated with the broadcast "B" band oscillator. A complete description of the operation of AFC is given in a later paragraph. The output of the converter is applied to the I. F. amplifier.

I. F. Amplifier

The intermediate frequency amplifier consists of a two-stage cascade section composed of three I. F. transformers and two 6K7 amplifier tubes. Each transformer has two tuned circuits which resonate at 465 kc. The third I. F. transformer is of special construction having a primary capacitor coupled to the midpoint of the secondary in order to provide the differential AFC voltage. The operation of this transformer is discussed in a special section on AFC.

Detector and AVC

The plates of the 6H6 twin diode are fed in push-pull by the secondary of the third I. F. transformer. Two diode loads consisting of R-24 and the series resistance of R-21, R-22, and R-23 are provided. The AFC voltage is developed across the sum of all these resistors, while the audio voltage appears across the sum of R-21, R-22, and R-23. A portion of the audio frequency thus provided is transferred to the A.F. system for amplification and reproduction. The direct current component of the rectified signal produces a voltage drop across the above three resistors. This voltage is employed to operate the 6K7 "Colorama" tuning tube. Switch S-11 permits the application of either full or partial voltage to the tube, thereby permitting control of the color indication in accordance with prevailing receiving conditions. A complete description of "Colorama" tuning is given in a later section. The D.C. voltage developed across R-21 and R-22 is utilized for automatic volume control action by employing the same to bias the R. F. amplifier, converter, and first I. F. amplifier tubes.

Initial control grid bias for these tubes is supplied by the delay bias diode under conditions of little or no signal. Under such conditions, this diode draws current through resistors R-21, R-22, and R-25, thereby maintaining the desired operating bias. When signal voltage above the level of the initial bias is applied, this diode ceases to draw current and the AVC diode takes over the biasing function.

The second I. F. tube receives no AVC and is self-biased. This minimizes the possibility of non-linear distortion on strong signals.

Noise Limiter

The other diode section of the auxiliary twin diode is employed as a transient noise-limiting device. This diode is so connected that its normal D. C. plate voltage has a value greater than the peak voltage of the audio signal applied through it to the manual volume control. Any transient signal of high voltage such as a static impulse will drive the plate negative, rendering the diode non-conducting and limiting the amount of transient voltage developed across the volume control.

Audio System

The manual volume control consists of a tapered potentiometer connected between the noise-limiting diode and the control grid of the 6C5 first audio amplifier. This control is tone-compensated by means of a resistance—capacitance network to provide proper balance of high and low notes at different volume control settings.

The output of the 6C5 first audio tube is resistance coupled to the control grid of the 6F6 second audio amplifier which is connected for triode operation. The output of this stage is transformer coupled to the control grids of the two 6L6 output tubes operating in a push-pull connection. The push-pull output stage is coupled to the loud-speaker through an impedance matching output transformer.

Degeneration

Audio degeneration is provided by applying a portion of the voice coil voltage to the cathode circuit of the 6F6 audio driver. This connection tends to flatten out the frequency characteristic of the audio and reproducing systems and decreases hum and non-linear distortion introduced by the audio amplifier.

The music-speech control consists of a switch actuated at one extreme of the tone control rotation corresponding to that providing maximum high note response. This provides better speech clarity by decreasing the bass compensation which is accomplished by shunting capacitor TC-56 with TC-57. The bass compensation is removed entirely on the short-wave and "A" bands by the switch S-2; hence the music-speech control is only effective in the broadcast (B) band. Continuously variable tone control is provided by capacitor TC-63 and variable resistor R-36 shunting the grids of the push-pull output tubes.

Silent Tuning

Silent tuning is provided by the switch S-9 which is actuated by the tuning knob of the receiver. Pulling the tuning knob out closes the switch S-9 and silences the audio output by grounding the 6F6 control grid. The AFC is also removed by this operation which permits a sharp indication of resonance by noting the Colorama lights. When a station has been satisfactorily located in this manner, the tuning knob is pushed into its original position and the switch opened.

Power Supply

D. C. power for operation of the receiver is supplied by two *5Z4* tubes each operating as a half-wave rectifier. The output of the rectifiers is fed through a two-section filter furnishing substantially pure D. C. to the voltage divider system from which taps supply correct voltages to the various receiver circuits.

Colorama Tuning

These receivers are equipped with Colorama Tuning, a novel method which indicates the approach to resonance by means of a change in the color of the light illuminating the tuning scale.

The colored light is produced by a group of four red-stained pilot bulbs and a group of three green-stained bulbs behind the scale. At zero signal strength the red group is at full brilliance and the green invisibly dim. As the signal increases from zero, the red gets dimmer and the green brighter over a broad range until at extreme signal strength the green is fully bright and the red below visibility through the dial. Hence, as a station is tuned in the color changes smoothly, and the maximum change in the green direction is an indication of resonance.

Weak stations will produce a small color change and strong stations a larger change. The difference in signal strength between the weakest and the strongest station likely to be listened to, has been found to be so great in different localities that the receivers have been equipped with a two-position sensitivity range switch for "sensitive" and "insensitive" settings of the color tuning. The switch is located on the chassis near the power transformer and may be reached from the rear of the cabinet. In the sensitive position, the weakest station to which the user can listen comfortably above the general noise level, will shift the color to neutral white at resonance. Stronger stations give bright green indications a resonance. In localities near a relatively large group of high-powered stations and having a high noise level, such as Chicago and New York, the range switch must be thrown to the insensitive position when standard out-door antennas are used, or else the color will be a fixed green over so wide a band that resonance cannot be accurately found. The difference in sensitivity is about twenty to one. On short-wave bands the band switch connects the color tuning to the sensitive setting and the switch on the chassis is inoperative. This is because practically all the short-wave signals are relatively weak. The insensitive setting is used only on the 540-1620 kc. band.

There is a group of four red and a group of three green pilot bulbs behind the scale. These are controlled by a Saturable Reactor, L-22, in a circuit which is shown in the schematic diagram, Fig. 2. The saturable reactor is controlled by a D.C. coil which decreases its reactance smoothly from a high value at no D.C. to a very low value at maximum D.C. The saturable reactor acts very much like a dimming rheostat except that it is controlled by the D.C. plate current of a 6K7 tube used solely for that purpose. At this point the plate current is at maximum; therefore, the red is brightest and the green invisibly dim.

Some things which may affect the operation of color tuning are as follows:

Seven colored bulbs are used to give good diffusion of color over the scale; but if one of the seven fails it unbalances the whole group and should be replaced immediately. The lamp socket assembly may be removed by reaching into the rear of the cabinet, pulling the lamp socket assembly up on its guides and drawing it partly out. A shipping screw, which should be removed when the set is unpacked, may need to be removed the first time. There is enough slack in connecting wires to allow the assembly to be drawn forward. When the socket assembly has been drawn far enough out for unscrewing the bulbs, turn on the power switch and replace the bulbs which do not glow. All will not be bad as each group is in series (green) or series parallel (red). Take care the wires do not foul the tuning mechanism when the assembly is replaced. The colored lamps used for replacement *must all be 6.3 volts 0.15 ampere lamps.* No other size will work.

If the red is unusually dim on no signal and the colored bulbs are all good, try removing the antenna. Next try replacing the 6K7 colorama tube, or replace the rectifier. Sometimes the antenna noise level is so high that it dims the red color like a signal. If the tubes in the set become weak, or the set is out of alignment, or for any other reason loses sensitivity the color tuning will appear insensitive.

Electrical Power Output

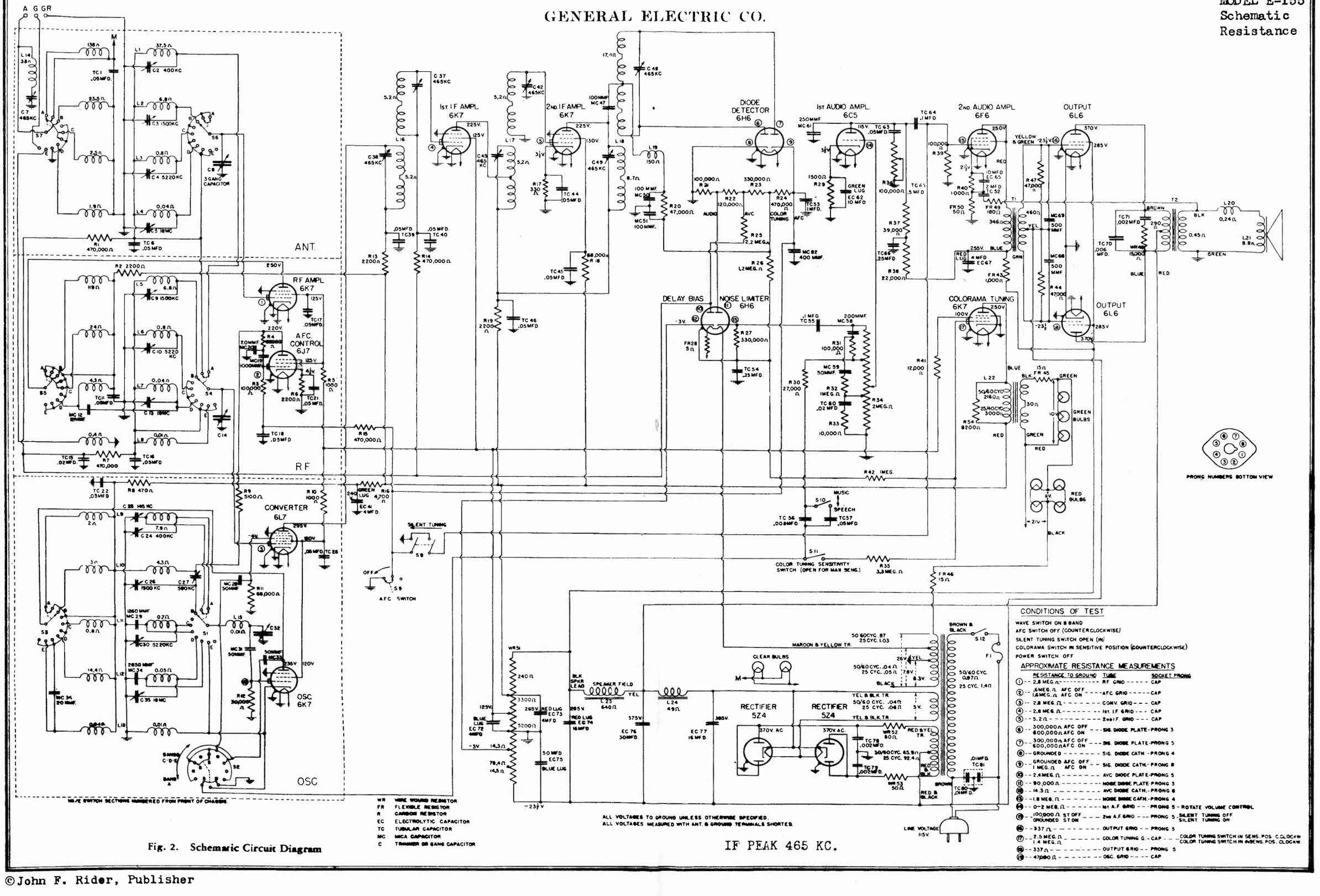
Undistorted.....30 watts
Maximum.....37.5 watts

Loud-speaker—Electrodynamic

Cone Diameter.....15 in.
Cone Coil Impedance 10 ohms at 400 cycles

MODEL E-155
Schematic
Resistance

GENERAL ELECTRIC CO.



WR WIRE WOUND RESISTOR
FR FLEXIBLE RESISTOR
R CARBON RESISTOR
EC ELECTROLYTIC CAPACITOR
TC TUBULAR CAPACITOR
MC MICA CAPACITOR
C TRIMMER OR GANG CAPACITOR

Fig. 2. Schematic Circuit Diagram

CONDITIONS OF TEST

WAVE SWITCH ON B BAND
AFC SWITCH OFF (COUNTERCLOCKWISE)
SILENT TUNING SWITCH OPEN (IN)
COLORAMA SWITCH IN SENSITIVE POSITION (COUNTERCLOCKWISE)
POWER SWITCH OFF

APPROXIMATE RESISTANCE MEASUREMENTS

	RESISTANCE TO GROUND	TUBE	SOCKET PRONG
①	2.8 MEG.Ω	RF GRID	CAP
②	.6MEG.Ω AFC OFF, 1.6MEG.Ω AFC ON	AFC GRID	CAP
③	2.8 MEG.Ω	CONV. GRID	CAP
④	2.8 MEG.Ω	1st I.F. GRID	CAP
⑤	5.2Ω	2nd I.F. GRID	CAP
⑥	300,000Ω AFC OFF, 600,000Ω AFC ON	SIG. DIODE PLATE	PRONG 3
⑦	300,000Ω AFC OFF, 600,000Ω AFC ON	SIG. DIODE PLATE	PRONG 5
⑧	GROUNDED	SIG. DIODE CATH.	PRONG 4
⑨	GROUNDED AFC OFF, 1 MEG.Ω AFC ON	SIG. DIODE CATH.	PRONG 8
⑩	2.4 MEG.Ω	AVC DIODE PLATE	PRONG 5
⑪	90,000Ω	NOISE DIODE PLATE	PRONG 3
⑫	14.3Ω	AVC DIODE CATH.	PRONG 8
⑬	1.8 MEG.Ω	NOISE DIODE CATH.	PRONG 4
⑭	0-2 MEG.Ω	1st A.F. GRID	PRONG 5 - ROTATE VOLUME CONTROL
⑮	100,000Ω ST OFF, GROUNDED ST ON	2nd A.F. GRID	PRONG 5 - SILENT TUNING OFF, SILENT TUNING ON
⑯	337Ω	OUTPUT GRID	PRONG 5
⑰	2.5 MEG.Ω, 1.4 MEG.Ω	COLOR TUNING G.	CAP - COLOR TUNING SWITCH IN SENS. POS. C.CLOCKW, COLOR TUNING SWITCH IN INSENS. POS. CLOCKW.
⑱	337Ω	OUTPUT GRID	PRONG 5
⑲	47,000Ω	OSC. GRID	CAP

MODEL E-155
Chassis Wiring

GENERAL ELECTRIC CO.

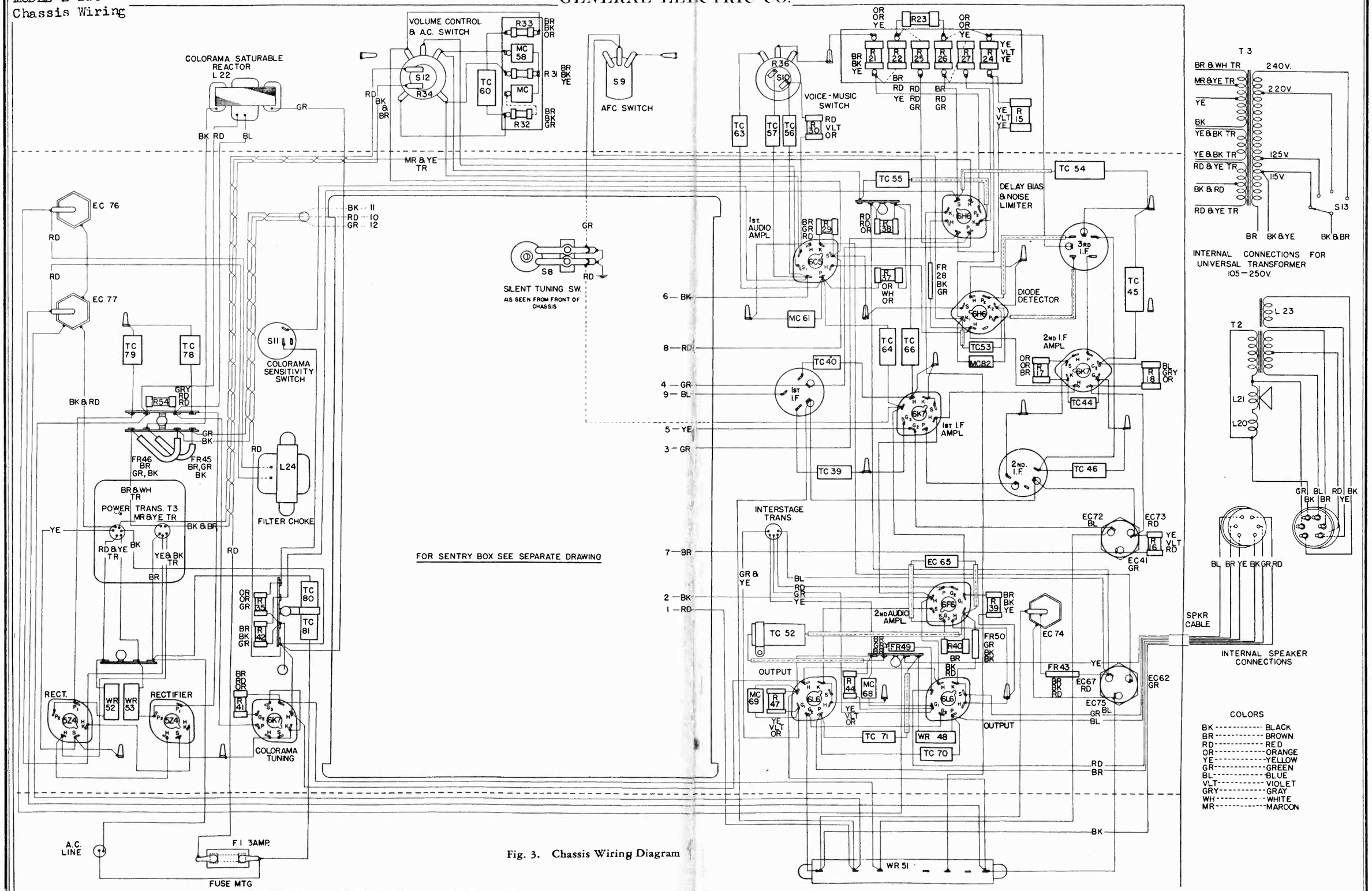


Fig. 3. Chassis Wiring Diagram

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MODEL E-155
SentryBox Wiring

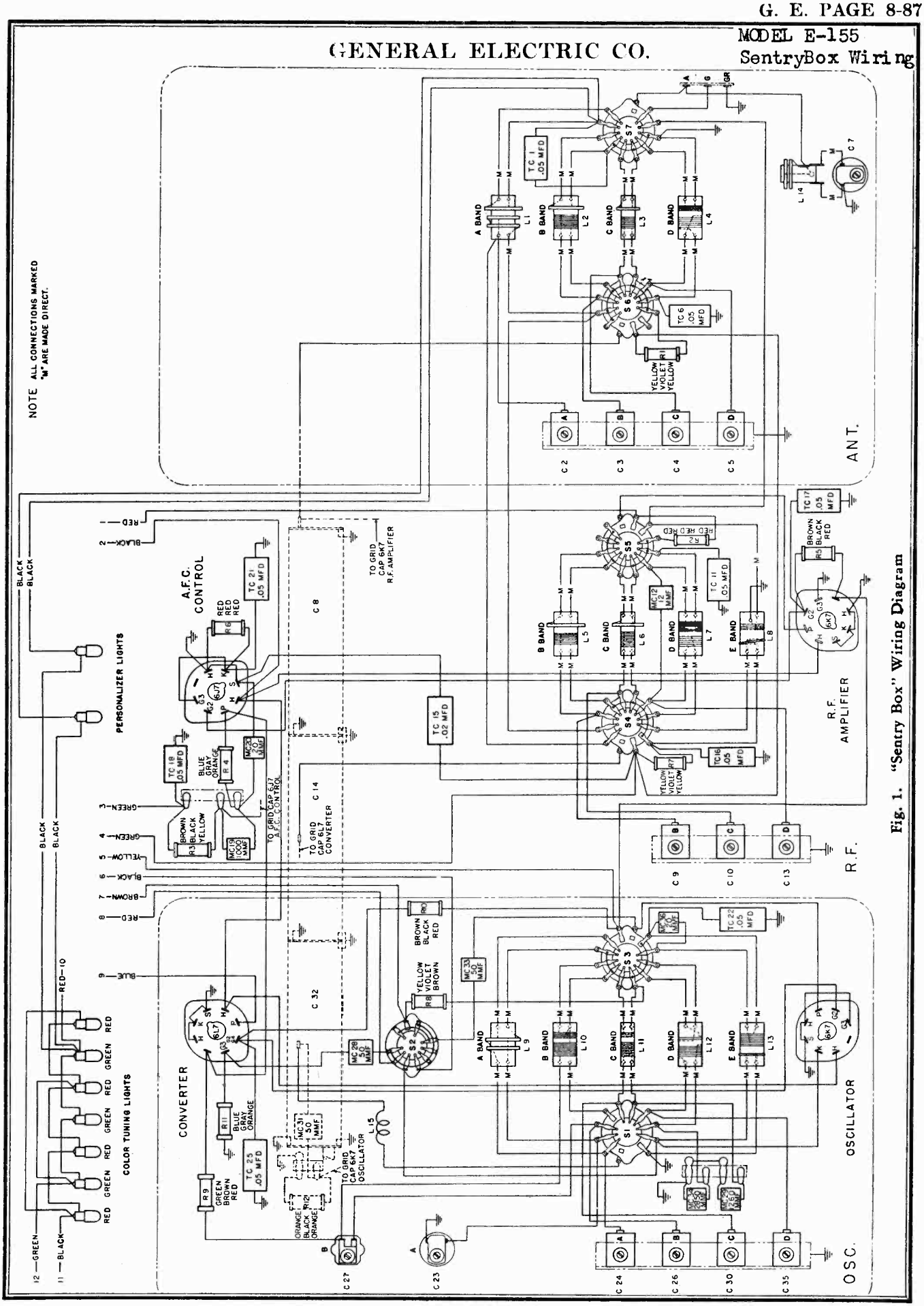


Fig. 1. "Sentry Box" Wiring Diagram

MODEL E-155
Dial Mechanism
Alignment Oscillograms

GENERAL ELECTRIC CO.

Tuning Control Drive Ratio

Fast Tuning.....8 to 1
Vernier Tuning.....50 to 1

Tuning Frequency Range

Band "A".....140—420 kc.
Band "B".....540—1620 kc.
Band "C".....1610—5580 kc.
Band "D".....5.5—18.1 mc. (5500—18,100 kc.)
Band "E".....17.5—70.0 mc. (17,500—70,000 kc.)

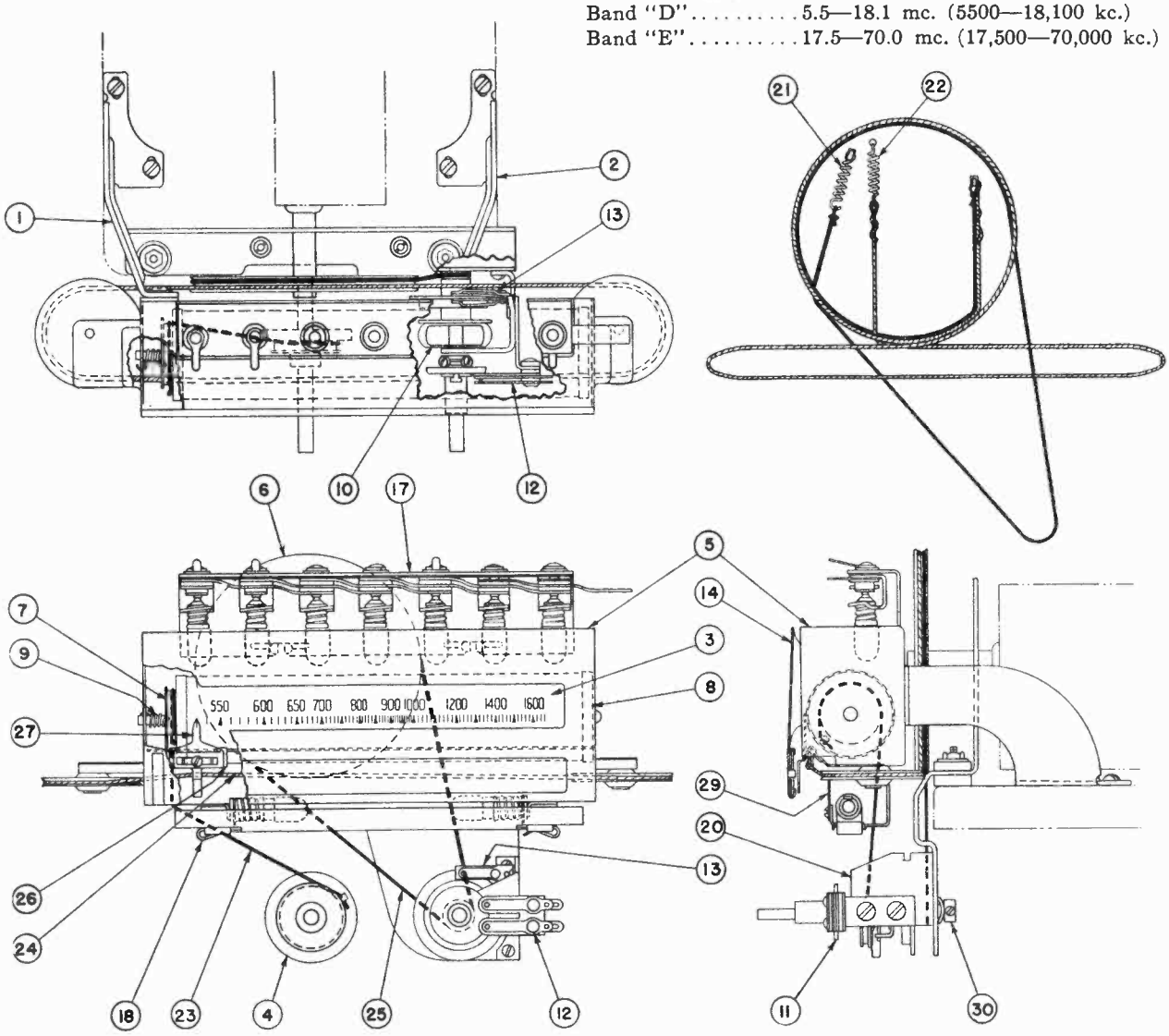


Fig. 7. Dial Mechanism

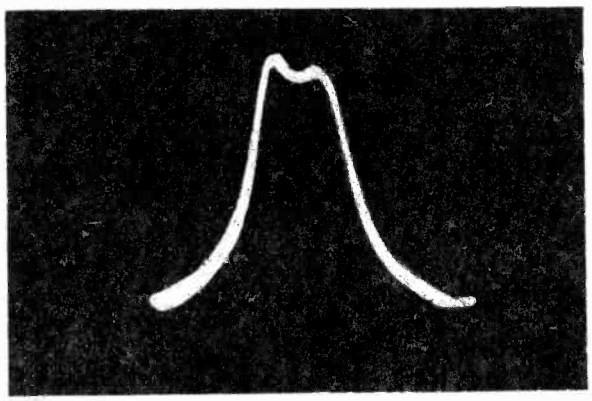


Fig. 5. Overall I.F. Curve

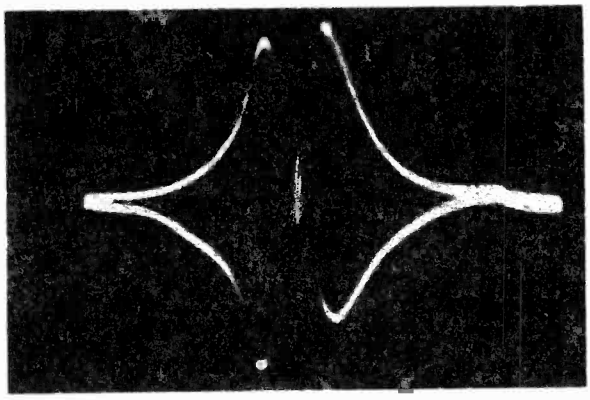


Fig. 6. AFC Adjustment Curve

(Curves taken with RCA Oscillograph Type TMV-122-B)

GENERAL ELECTRIC CO.

MODEL E-155
Socket, Trimmers
Voltage

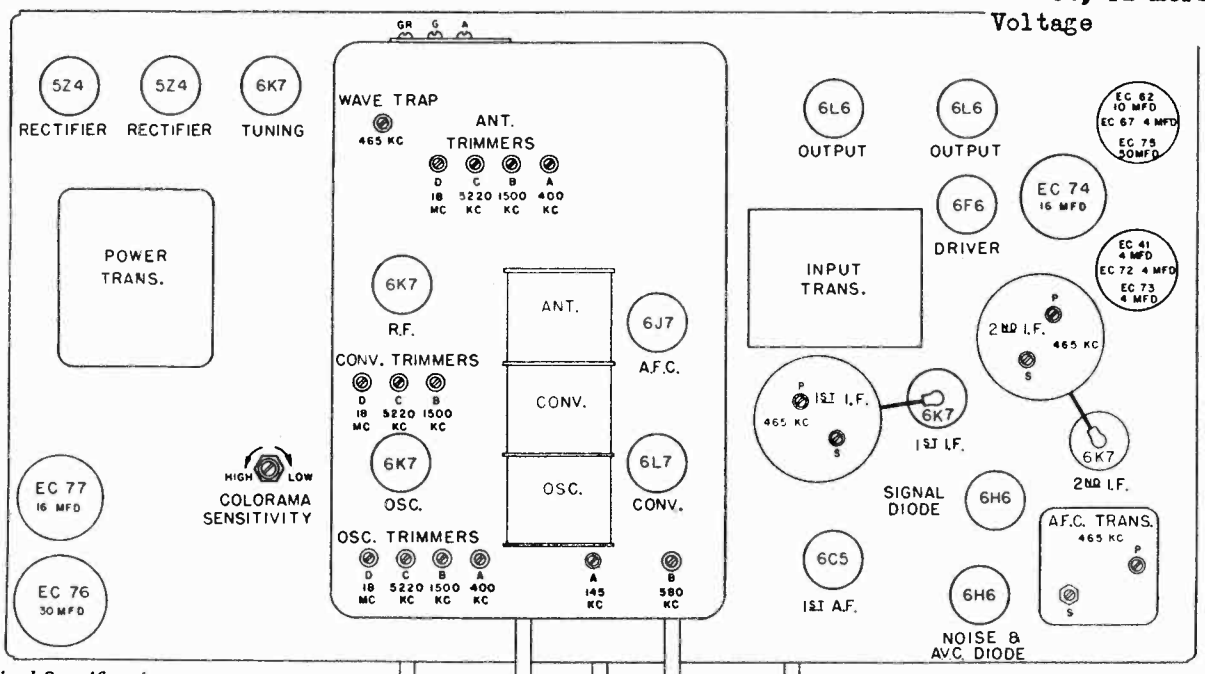
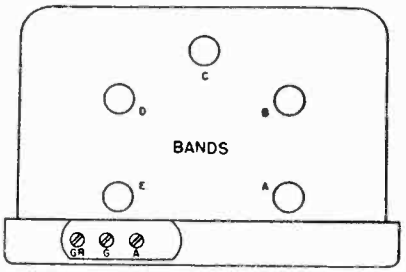


Fig. 4. Chassis Layout and Trimmer Location

Electrical Specifications

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A	115	50–60	195
C	115	25–60	195
V	105–130 and 200–250	40–60	200

Note: Taps on universal transformers (Rating "V") are accessible by removing the cap cover on the top of the transformer.



SOCKET VOLTAGES

Tube No.	Cathode to Ground Volts, D.C.	Screen Grid to Ground Volts, D.C.	Plate to Ground Volts, D.C.	Cathode Current M.A.	Heater Volts A.C.
6K7 R. F. Amp.	†	125	250	10.7	6.3
6L7 Converter	†	120	255	10.6	6.3
6K7 Oscillator	...	120	235	8.1	6.3
6K7 1st I. F.	†	125	225	10.6	6.3
6K7 2nd I. F.	3.5	130	225	10.2	6.3
6H6 Det. & AVC	...	...	...	...	6.3
6C5 1st Audio	3.5	...	*115	2.6	6.3
6F6 2nd Audio	21.5	...	250	25.0	6.3
6L6 Output	**	285	370	46.0	6.3
6L6 Output	**	285	370	46.0	6.3
6J7 AFC	4.5	125	220	2.3	6.3
6K7 Colorama Control	†	100	250	12.6	6.3
6H6 Limiter Control	...	...	...	...	6.3
5Z4 Rectifier	385 D.C.	...	370 RMS	105	5.0
5Z4 Rectifier	385 D.C.	...	370 RMS	105	5.0

Measured at 115 volts supply. No signal input. Volume control maximum. Voltmeter 1000 ohms per volt. Measurements taken on highest scale giving accurate readable deflection.

* Supply voltage minus drop in load resistor.

** Grid bias at source—23.5 volts.

† Grid bias at source—3.0 volts.

MODEL E-155
Alignment

GENERAL ELECTRIC CO.

ALIGNMENT PROCEDURE

The receiver should first be allowed to run for fifteen minutes in order to reach its approximate normal operating temperature. Before making any adjustments, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal to the receiver from the test oscillator at the alignment frequency and inserting a "Tuning Wand" into the coil involved. The tuning wand consists of a rod of insulating material having a ring of non-magnetic metal attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the metal ring end into the center of the R. F. coil, the inductance of this coil is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the R. F. circuits are in exact alignment, inserting either end of the tuning wand into the coil will result in a decrease in output. When an increase of signal is obtained with the iron-filled end of the wand, a decrease in resonant frequency of that circuit by increasing its trimmer capacity is indicated. When an increase of signal is obtained with the metal ring, a decrease in trimmer capacity is indicated.

Changes Indicated by Wand		
Wand	Signal	Trimmer Adjustment Required
Metal Ring Iron Filings	Decrease Decrease	None
Changes Indicated by Wand (Cont.)		
Wand	Signal	Trimmer Adjustment Required
Metal Ring Iron Filings	Increase Decrease	Decrease capacity
Metal Ring Iron Filings	Decrease Increase	Increase capacity

ALIGNMENT FREQUENCIES

I.F.	Band "A"	Band "B"	Band "C"	Band "D"	Wave Trap
465 kc.	145 kc. 400 kc.	580 kc. 1500 kc.	5220 kc.	18,000 kc.	465 kc.

In order to align these receivers properly it is necessary to have available:

1. A modulated test oscillator capable of producing the above alignment frequencies.
2. An output indicator, such as a high resistance a-c voltmeter with a maximum scale reading of 3 to 5 volts, or a neon lamp indicator.
3. An alignment tool consisting of a fiber shaft screwdriver.
4. A tuning wand.

To realize the full advantage of the performance built into these receivers at the factory, circuit alignment using cathode ray oscilloscope equipment is much to be preferred. The oscilloscopic method is particularly advantageous in aligning the I. F. tuned circuits.

The location of all alignment trimmer capacitors, as well as socket voltages, is shown in Fig. 4.

1. *Visual Alignment of I. F.*

For visual alignment it is necessary to vary the frequency of an unmodulated test oscillator signal over a range extending on both sides of the peak frequency. This variation must take place in synchronism with the horizontal traverse of the cathode ray beam on its screen. The frequency modulator must, therefore, provide means for synchronizing the periodic test frequency variation with the cathode ray horizontal deflection circuit. The test oscillator may advantageously have facilities for audio frequency amplitude modulation of a fixed radio frequency test signal, as well as for frequency modulation, but audio modulation is not required for visual I. F. alignment.

Instead of an output meter across the speaker voice coil, the vertical plates of the cathode ray tube are connected across the load resistor of the diode rectifier. With the frequency modulator in operation in conjunction with the test oscillator, the resonance curve of the circuit under test will be then shown on the screen.

Set the tuning dial indicator at the low end of the broadcast band at some point where no signal is received, since an extraneous signal might interfere with the aligning process. The volume control should be in an "off" or nearly off position. Apply a frequency modulated signal to the grid of the 1st I. F. amplifier tube through a .05 Mfd. (RC-072) capacitor, leaving the grid cap in place. Connect the vertical plates of the oscilloscope between ground and the junction point between R-23 and R-24, and with the AFC switch in the "off" position proceed to align the primary and secondary of the 2nd I. F. and the AFC I. F. transformers.

The object should be to make the two curves coincide with each other at the top and throughout their length with the maximum amplitude obtainable. This will require that all four I. F. trimmers be adjusted in the usual manner *excepting the AFC secondary (hexagonal nut) trimmer which must be adjusted for minimum amplitude* before the curves will coincide properly. Fig. 5 gives the appearance of the curve when the alignment adjustments have been completed satisfactorily thus far. Apply the same frequency modulated input to the grid of the converter (6L7) tube through a .05 Mfd. capacitor as before. Adjust the primary and secondary of the 1st I. F. transformer until the curves coincide as before and have the appearance of Fig. 5.

A further adjustment of the AFC secondary (hexagonal nut) trimmer is necessary in order to complete the I. F. alignment satisfactorily. Apply the *same* signal to the grid of the second I. F. amplifier tube. Unsolder the ground end of TC-53 and connect the vertical deflecting plates of the oscilloscope between ground and the 6H6 cathode prong K1 (Fig. 3). Since the cathode prong is inaccessible, this connection can be made at the AFC switch center contact.

Carefully adjust the AFC secondary trimmer until a curve is obtained which is similar to that shown in Fig. 6. Correct adjustment is made when the two sides of the curve are symmetrical and intersect exactly at the horizontal axis. No adjustment of the other I. F. trimmer should be made at this time.

If a metal aligning tool is used, the curve will change when the tool is withdrawn. Therefore, it is advisable to use a fiber hex-headed wrench for this aligning adjustment. At any rate, the final curve should be as shown with aligning tool removed.

2. *I. F. Wave Trap Alignment*

Leave the band switch at Band "B" and tune receiver to about 1000 kc.

With the test oscillator set at 465 kc. apply this signal to the antenna terminal through a dummy antenna consisting of a 400 ohm resistor and 250 mmfd. capacitor in series. With the 465 kc. signal applied to the antenna terminal, adjust the I. F. Wave Trap Trimmer for *minimum* output indication.

3. *R. F. Alignment*

First check the position of the dial pointer by rotating the tuning condenser to maximum capacity position, i.e., plates fully meshed. At this position, the pointer should coincide with the end mark at the left-hand end of the scale. If it does not, it may be set by loosening the pointer set screw and setting the pointer to its correct position. During R.F. alignment the AFC switch *must* be set in its "off" (counter-clockwise) position.

Band "A" (140—420 Kc.)

Set the test oscillator for operation at 400 kc. and connect its output to the antenna terminal of the receiver through the dummy antenna described under I. F. Wave Trap Alignment. Tune the receiver until the pointer is at 400 on the scale. Set the tone control for minimum high response and reduce the volume control setting so as to avoid excessive noise response. Adjust the Band "A" oscillator and antenna trimmers respectively (see Fig. 4) to give maximum deflection on the output meter. Maintain the test oscillator at the lowest level which will give an easily readable output indication.

Now set the test oscillator at 145 kc. and tune the receiver to resonance with this signal. Adjust the 145 kc. padding capacitor rocking the tuning condenser back and forth through resonance as the padding capacitor is adjusted and note the deflection of the tuning meter each time the receiver is tuned in this manner. Leave the padding capacitor at the setting which gives greatest deflection.

Retune the receiver to 400 kc. and set the test oscillator for this frequency. Check the alignment by again adjusting the Band "A" oscillator and antenna trimmers for maximum deflection on the tuning meter

Band "B" (540—1620 Kc.)

Set the test oscillator for operation at 1500 kc. and tune the receiver until the pointer is at 1500 on the scale. Adjust the Band "B" oscillator, R. F., and antenna trimmers respectively (see Fig. 4) to give maximum deflection on the output meter. Maintain the test oscillator output at the lowest level which will give an easily readable output indication.

Now set the test oscillator at 580 kc. and tune the receiver to resonance with this signal. Adjust the 580 kc. padding capacitor, rocking the tuning condenser back and forth thrqugh resonance as the padding capacitor is adjusted and note the deflection of the tuning meter each time the receiver is tuned in this manner. Leave the padding capacitor at the setting which gives greatest deflection.

Retune the receiver to 1500 kc. and set the test oscillator for this frequency. Check the alignment by again adjusting the Band "B" oscillator, R. F. and antenna trimmers for maximum deflection on the tuning meter.

Band "C" (1610-5580 Kc.)

With the test oscillator connected to the receiver as above, tune the receiver until the pointer is at 5220 on the "C" band scale Set the test oscillator for operation on this frequency and, with the volume and tone controls set as above, adjust the band "C" oscillator, R. F , and antenna trimmers, respectively (see Fig. 4) to give maximum deflection on the output meter.

Band "D" (5 5—18.1 Mc.)

Turn the band switch to Band "D." Set the test oscillator at 18,000 kc. (18.0 Mc.) and tune the receiver until the pointer coincides with the 18.0 mark. Adjust the Band "D" oscillator trimmer, C-35, to give maximum output indication. It will probably be found that there will be two settings of the oscillator trimmer that will give an output response. The lower capacity setting of the trimmer is the one that should be used To be sure that correct adjustment has been obtained, tune for the image signal at 17.07 Mc. with the test oscillator at 18.0 Mc. It may be necessary to increase the test oscillator output to obtain response at this point.

Retune the receiver to 18.0 Mc. and adjust Band "D" antenna and R. F. trimmers, respectively (see Fig. 4) for maximum output indication. When adjusting the R. F. trimmer rock the tuning condenser back and forth through resonance as in the 580 kc. padding capacitor adjustment.

Alignment of the receiver is now complete as no adjustments are provided on band "E."

4. *I. F. Alignment with Output Meter*

Although the use of the cathode-ray oscilloscope for alignment purposes is to be preferred, it is possible to make the I. F. trimmer adjustments with reasonable accuracy using a 465 kc. signal generator and output meter.

Place a modulated signal of 465 kc. on the grid of the last I. F. (6K7) tube with the volume control set at maximum and the AFC switch turned off. Place a low range A.C. voltmeter or other output indicator across the voice coil of the loud-speaker. Adjust the output of the signal generator so that an indication of not more than two or three volts is obtained on the output meter.

Adjust and readjust the primary trimmer for maximum output and *the secondary for minimum output.* This latter adjustment will be very broad. Apply the signal input to the grid of the 1st I. F. (6K7) tube and adjust both primary and secondary trimmers for maximum output, reducing the input as necessary to obtain approximately the same output indication as before. Apply the signal input to the grid of the converter (6L7) tube and adjust both primary and secondary trimmers for maximum output indication in the same manner as before.

It is now necessary to make a fine adjustment of the secondary trimmer of the last I. F. (AFC) transformer, which is as follows: without changing the frequency of the signal generator, place the input lead on the rubber insulation of the converter (6L7) grid lead. This will provide a small signal input through the capacity between the leads. Increase the attenuator setting if necessary to make the output audible. If the signal generator is provided with a means of removing the modulation, this should be done. However, the adjustment may be carried out satisfactorily even with a modulated generator signal.

Now tune in any broadcast signal in the usual manner and tune carefully for zero beat between this carrier and the 465 kc. signal generator. It may be necessary to use a short antenna or to remove it entirely if the station is a strong local. Throw the AFC on and adjust the last I. F. secondary (AFC) trimmer to give zero beat. This adjustment is very critical and must be made with great care. When the adjustment is properly made, there will be no appreciable change from zero beat as the AFC switch is thrown off and on. This completes the alignment of the I. F. and AFC circuits.

The alignment of the oscillator and R. F. circuits may be carried out in the usual manner. The AFC switch must remain in the off position.

ADJUSTMENT OF DIAL MECHANISM

The dial mechanism (Fig. 7) is rigidly mounted to the "Sentry Box" by means of two brackets and four screws. The dial pointer is operated by means of an "Automatic Vernier" reduction drive unit. Motion imparted to the gang condenser rotor is transmitted through a series of pulleys and an interconnecting cable to the dial pointer slider which is supported on a rail below the dial scale.

To Replace Cables

To replace cord or cable for the pointer or drive, the chassis should be removed from the cabinet and the dial mask (No. 14) removed from the dial scale box (No. 5). The black drive cord (No. 25) should run between the drum (No. 6) on the condenser and the drive pulley without crossing. Both the black cord (No. 25) and the bronze cable (No. 24) fasten on the same hook in the drum (No. 6) which is in front of the single lance on the outside diameter. The springs (21) and (22) are fastened on the ends of the cables after passing through the lances which are close together on the condenser drive drum. The light spring (No. 21) is on the bronze cable (No. 24) and the special spring loop hooks into the hole in the drum next to the hook for the spring on the black cord (No. 25). The solid end of the cord or cable should be fastened first to the drum, the line should be then strung around the pulleys and drum and lastly, the spring should be stretched into place.

To Adjust Pointer for Calibration

The pointer (No. 27) is adjustable by removing the escutcheon plate and also the dial mask (No. 14) which is held by four screws. The screw in the center of the pointer (No. 27) can then be loosened and the pointer adjusted as needed.

To Replace Scale

The scale (No. 3) can be removed by taking off the escutcheon and the dial mask (No. 14) as for the adjustment of the pointer. The pointer (No. 27) is moved to the left-hand end, the scale is then pushed to the left and the right-hand end is pulled out with the aid of a small screwdriver or a similar tool. When replacing the scale (No. 3) it is advisable to remove the cord (No. 23). The spring (No. 9) is put on the dial shaft and the shaft then inserted into the housing. The scale (No. 3) with the right-hand cap (No. 8) attached is then inserted into the left-hand cap (No. 7) which is held in position by pulling on the shaft on the outside of the housing. After the scale (No. 3) is inserted it should be rotated from one to two turns against the action of the torsion spring (No. 9). The cord (No. 23) is then replaced in the lance provided for it. It is advisable to have the band switch rotated so that the greatest length of cord possible is unwound from the lower pulley (No. 4) on the band switch shaft. It is best that the chassis be removed for the replacement of a scale.

It is important when replacing the chassis in the cabinet that the rubber grommets should be put in the chassis and not on the wood pins.

To Adjust Rotation of the Scale

With the chassis out of the cabinet the scale (No. 3) can be adjusted to track properly on the various bands by loosening the set screw and rotating pulley (No. 4) on the band switch shaft.

To Change the Dial Lamps

Make certain that the copper-plated hex head shipping screw which secures the dial lamp bracket during shipment has been removed before attempting to remove the dial lamp bracket (No. 17). Lift the lamp bracket from the tabs under which it is clipped. Care should be taken that the lamp leads do not put an undue strain upon the drive cable. With the lamp bracket laid back horizontally the lamps may be replaced. When the lamp bracket is reinserted care should be exercised to avoid having the lamp leads foul the gang mechanism.

Automatic Frequency Control

Automatic frequency control (AFC) is a device for automatically controlling the oscillator frequency in such a way that, although the receiver is not exactly tuned to the signal being received, the correct intermediate frequency will still be produced. This control of the oscillator frequency is secured by means of the 6J7 AFC tube, so connected to the oscillator that it draws a lagging current from the tank circuit and thus gives the effect of a shunt inductance. Variation of the D.C. grid bias on the 6J7 control tube will affect the mutual conductance of the tube, thereby changing the amount of lagging current drawn from the oscillator tank with a consequent effect of variation of the amount of shunt inductance connected across the oscillator coil. This alters the total inductance in the oscillator tuned circuit and changes its resonant frequency.

Grid bias for the 6J7 control tube, which will vary in accordance with the amount of detuning of the receiver, is obtained from the 6H6 diode rectifier operating in conjunction with its special I. F. transformer. This control voltage is the difference between the drop across resistor R-24, the load resistance for one diode section of the 6H6 diode rectifier, and the drop across resistors R-21, R-22 and R-23, which constitute the load resistance for the other diode section. When the receiver is correctly tuned to the incoming signal, the intermediate frequency produced will be 465 kc. which is the resonant frequency of the tuned circuit feeding the 6H6 diode rectifier. Under this condition each diode plate receives equal signal voltage and the D.C. voltage drops across the load resistors will be equal, giving no change in grid bias on the 6J7 control tube. If the receiver is so tuned that the intermediate frequency produced is above 465 kc., the signal voltage applied to diode plate No. 6 will exceed that applied to diode plate No. 7. In this case, the D.C. voltage drop across load resistance R-21, R-22 and R-23 will be larger than that across load resistor R-24 and a resultant voltage will be produced which will increase the 6J7 AFC tube grid bias, lowering the mutal conductance of the tube and causing it to draw less lagging current from the oscillator tank. This is the same effect as would be produced by increasing the amount of shunt inductance across the oscillator coil and the oscillator frequency is thereby lowered by the amount necessary to compensate for the detuning. The opposite takes place when the receiver is tuned so as to produce an intermediate frequency below 465 kc. Diode plate No. 7 then receives more signal voltage than diode plate No. 6 and the resultant voltage developed across the load resistance is such as to decrease the grid bias on the 6J7 AFC tube. This causes a larger current to be drawn from the oscillator tank circuit, which in effect is the same as a decrease in shunt inductance with its consequent increase in oscillator frequency to overcome the detuning.

Tubes

R. F. Amplifier	6K7 Triple-grid Super-control Amplifier
Converter	6L7 Pentagrid Converter
Oscillator	6K7 Triple-grid Super-control Amplifier
First I. F.	6K7 Triple-grid Super-control Amplifier
Second I. F.	6K7 Triple-grid Super-control Amplifier
Detector and AVC	6H6 Twin Diode
1st Audio	6C5 Low Gain Triode
2nd Audio	6F6 Power Pentode
Output	(2) 6L6 Beam Amplifier Tetrode
AFC Control	6J7 Triple-grid Amplifier
Colorama Control	6K7 Triple-grid Super-control Amplifier
Limiter Control	6H6 Twin Diode
Rectifier	(2) 5Z4 Full-wave Rectifier
Dial Lamps	6.3 V.—0.15 A. (4 red and 3 green)

REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER CHASSIS ASSEMBLY	
RB-019	BOARD—Terminal Board, Three-lug	$0.10
RB-023	BOARD—Terminal Board, Four-lug	.10
RB-047	BOARD—Small Resistor Board on Chassis Wall	.10
RB-051	BOARD—Large Resistor Board on Chassis Wall	.10
RB-052	BOARD—Fuse Board	.15
*RC-011	CAPACITOR—.002 mfd., 600 V Paper (TC-71)	.25
RC-026	CAPACITOR—.006 mfd., 1000 V Paper (TC-70)	.30
RC-036	CAPACITOR—.008 mfd., 200 V Paper (TC-56)	.25
*RC-046	CAPACITOR—.02 mfd., 200 V Paper (Mtd. on small Res. Bd.) (TC-60)	.25
*RC-072	CAPACITOR—.05 mfd., 200 V Paper (TC-44, TC-45, TC-57)	$0.25
*RC-091	CAPACITOR—.05 mfd., 400 V Paper (TC-39, TC-40, TC-46, TC-63)	.30
*RC-096	CAPACITOR—.1 mfd., 200 V Paper (TC-55)	.30
*RC-123	CAPACITOR—.1 mfd., 400 V Paper (TC-63)	.35
*RC-136	CAPACITOR—.25 mfd., 200 V Paper (TC-54)	.30
*RC-150	CAPACITOR—.25 mfd., 400 V Paper (TC-66)	.35
RC-198	CAPACITOR—.002 mfd., 1000 V Paper (TC-78, TC-79)	.30
RC-199	CAPACITOR—2 mfd., 100 V Paper (TC-52)	.75
RC-200	CAPACITOR—1 mfd., 100 V Paper (TC-53)	$0.60
*RC-210	CAPACITOR—50 mmfd., Mica (Mtd. on small Res. Bd.) (MC-59)	.25
RC-234	CAPACITOR—Plate Coupling Capacitor 3rd I.F. transformer, 100 mmfd., Mica (MC-47)	.25
RC-235	CAPACITOR—100 mmfd., Mica (Mtd. on Res. Bd.) (MC-50, MC-51)	.25
RC-250	CAPACITOR—200 mmfd., Mica (Mtd. on small Res. Bd.) (MC-58)	.25
*RC-258	CAPACITOR—250 mmfd., Mica (MC-61)	.25
*RC-289	CAPACITOR—400 mmfd., Mica (MC-82)	.25
*RC-296	CAPACITOR—500 mmfd., Mica (MC-68, MC-69)	.25
*RC-406	CAPACITOR—16 mfd., 480 V Wet Electrolytic (EC-77)	1.25
*RC-409	CAPACITOR—16 mfd., 390 V Wet Electrolytic (EC-74)	1.25
*RC-411	CAPACITOR—30 mfd., 400 V Wet Electrolytic (EC-76)	1.55
*RC-504	CAPACITOR—10 mfd., 25 V Dry Electrolytic (EC-65)	.70
RC-553	CAPACITOR—4 mfd., 350 V; 10 mfd., 25 V; 50 mfd., 25 V Dry Electrolytic (EC-67, EC-75, EC-82)	1.75
RC-554	CAPACITOR—4 mfd., 350 V; 4 mfd., 350 V 4 mfd., 250 V Dry Electrolytic (EC-41, EC-72, EC-73)	1.90
RC-755	CAPACITOR—Line Capacitor, .01—.01 mfd., 250 V A.C. Paper (TC-80, TC-81)	.40
RC-821	CABLE—Speaker Cable	.60
RC-860	CORD—Power Cord	.65
RC-946	CUSHION—Front Chassis Mounting Cushion	.10
RC-947	CUSHION—Side Chassis Mounting Cushion and Support Bracket	.20
RE-013	ESCUTCHEON—Escutcheon Plate (with mtg. scws.)	1.75
RP-301	FUSE—3 amp. Fuse (Pkg. of 10)	1.00
RG-001	GRID CAP—Control Grid Clip (Pkg. of 6)	.10
RG-104	GUARD—Fuse Board Guard	.15
RG-105	GASKET—Escutcheon Rubber Gasket	.25
RG-106	GASKET—Escutcheon Felt Gasket	.10
*RK-004	KNOB—Control Knob (Push-on) (Pkg. of 5)	.40
RK-006	KNOB—Large Control Knob (Push-on)	.10
RK-007	KNOB—Large Control Knob (Set Scw.)	.10
RL-312	REACTOR—"Colorama Tuning" Saturable Reactor, 60 cycles (L-22)	3.00
RL-313	REACTOR—"Colorama Tuning" Saturable Reactor, 25/60 cycles (L-22)	3.00
RL-314	REACTOR—Filter Reactor (L-24)	1.45
RQ-047	RESISTOR—330 ohm, ½ watt Carbon (R-17) (Pkg. of 5)	.60
*RQ-059 (RR-014)	RESISTOR—1000 ohm, ½ watt Carbon (R-40) (Pkg. of 5)	.70
RQ-063	RESISTOR—1500 ohm, ½ watt Carbon (R-20) (Pkg. of 5)	.60
RQ-067	RESISTOR—2200 ohm, Plate Resistor for 1st and 2nd I.F. (R-13, R-19) (Pkg. of 5)	.60
RQ-081	RESISTOR—8200 ohm, ½ watt Carbon (R-54) (Pkg. of 5)	.60
*RQ-083 (RR-021)	RESISTOR—10,000 ohm, ½ watt Carbon (Mtd. on small Res. Bd.) (R-33) (Pkg. of 5)	.60
RQ-085	RESISTOR—12,000 ohm, ½ watt Carbon (R-41) (Pkg. of 5)	.60
RQ-091	RESISTOR—22,000 ohm, ½ watt Carbon (R-38) (Pkg. of 5)	.60
RQ-095	RESISTOR—27,000 ohm, ½ watt Carbon (R-30) (Pkg. of 5)	.60
RQ-097	RESISTOR—39,000 ohm, ½ watt Carbon (R-37) (Pkg. of 5)	.60
RQ-099	RESISTOR—47,000 ohm, ½ watt Carbon (R-20, R-44, R-47) (Pkg. of 5)	.60
RQ-103	RESISTOR—68,000 ohm, ½ watt Carbon (R-18) (Pkg. of 5)	$0.60
*RQ-107 (RR-049)	RESISTOR—100,000 ohm, ½ watt Carbon (R-39) (Pkg. of 5)	.70
*RQ-107 (RR-049)	RESISTOR—100,000 ohm, ½ watt Carbon (Mtd. on small Res. Bd.) (R-31) (Pkg. of 5)	.70
*RQ-107 (RR-049)	RESISTOR—100,000 ohm, ½ watt Carbon (Mtd. on large Res. Bd.) (R-21) (Pkg. of 5)	.70
RQ-109	RESISTOR—120,000 ohm, ½ watt Carbon (Mtd. on Large Res. Bd.) (R-22) (Pkg. of 5)	.70
RQ-119	RESISTOR—330,000 ohm, ½ watt Carbon (Mtd. on Large Res. Bd.) (R-23, R-27) (Pkg. of 5)	.70
RQ-123	RESISTOR—470,000 ohm, ½ watt Carbon (Mtd. on Large Res. Bd.) (R-24) (Pkg. of 5)	.70
RQ-123	RESISTOR—470,000 ohm, ½ watt Carbon (R-14) (R-15) (Pkg. of 5)	.70
*RQ-131 (RR-067)	RESISTOR—1 megohm, ½ Watt Carbon (Mtd. on small Res. Bd.) (R-32) (Pkg. of 5)	.70
*RQ-131 (RR-067)	RESISTOR—1 megohm, ½ watt Carbon (R-42) (Pkg. of 5)	.70
RQ-133	RESISTOR—1.2 megohm, ½ watt Carbon (Mtd. on Large Res. Bd.) (R-26) (Pkg. of 5)	.70
RQ-139	RESISTOR—2.2 megohm, ½ watt Carbon (Mtd. on Large Res. Bd.) (R-25) (Pkg. of 5)	.70
RQ-143	RESISTOR—3.3 megohm, ½ watt Carbon (R-35) (Pkg. of 5)	.70
RQ-271	RESISTOR—3300 ohm, ½ Watt Carbon (R-16) (Pkg. of 5)	.70
RR-318	RESISTOR—5 ohm, ½ watt Flexible (FR-28) (Pkg. of 5)	.80
RR-319	RESISTOR—50 ohm, ½ watt Flexible (FR-50) (Pkg. of 5)	.80
RR-322	RESISTOR—180 ohm, ½ watt Flexible (PR-49) (Pkg. of 5)	.80
RR-330	RESISTOR—15 ohm, 2 watt Flexible (FR-46) (Pkg. of 5)	.85
RR-331	RESISTOR—15 ohm, 1 watt Flexible (FR-45) (Pkg. of 5)	.75
RR-333	RESISTOR—1000 ohm, 2 watt Flexible (FR-43) (Pkg. of 5)	.85
*RR-705	RESISTOR—50 ohm, Vitreous (WR-52, WR-53)	.40
*RR-711	RESISTOR—15,000 ohm, Vitreous (WR-48)	.50
RR-721	RESISTOR—Candohm Tapped Bleeder Resistor (WR-51)	1.40
*RS-200	SOCKET—8 Pin Tube Socket (Pkg. of 5)	.75
*RS-204	SOCKET—5 Pin Tube Socket (Pkg. of 5)	.75
RS-325	SWITCH—"Colorama" Sensitivity Switch (S-11)	.50
RS-327	SWITCH—Automatic Frequency Control Switch (S-9)	.50
RS-423	SPRING—Knob Spring (Push-on Type) (Pkg. of 10)	.25
RT-151	TRANSFORMER—Power Transformer 115 V, 50/60 cycles	9.50
RT-152	TRANSFORMER—Power Transformer 115 V, 25/60 cycles	15.25
RT-153	TRANSFORMER—Universal Power Transformer 105/130, 200/250 V, 40/60 cycles	14.50
RT-226	TRANSFORMER—2nd I.F. Transformer (Complete) (L-17)	2.10
RT-227	TRANSFORMER—3rd I.F. Transformer (Complete) (L-18)	4.15
RT-228	TRANSFORMER—1st I.F. Transformer (Complete) (L-16)	2.30
RT-505	TRANSFORMER—Interstage Transformer (T-1)	5.60
Rf-712	TONE CONTROL—Tone Control and Speech Clarifier Switch (R-36) (S-10)	$1.10
RV-017	VOLUME CONTROL—Volume Control and Power Switch (R-34) (S-12)	1.15
RW-011	WINDOW—Escutcheon Window	.65
RW-101	WASHER—Felt Washer for Control Shafts (Pkg. of 10)	.45
RX-017	CUSHION ASSEMBLY—"Sentry Box" Mtg. Cushion, Screw and Washer	.15
	SENTRY BOX ASSEMBLY	
RB-019	BOARD—Terminal Board, Three-lug	$0.10
RB-049	BOARD—Antenna Ground Terminal Board	.10
RB-050	BOARD—Terminal Board Two-lug (Top of Gang)	.10
RB-141	BRACKET Tuning Condenser Front Mounting Bracket	.50
RB-142	BRACKET Tuning Condenser Rear Mounting Bracket	.15
RB-143	BRACKET—Wave Band Switch Bracket	.10
*RC-046	CAPACITOR—.02 mfd., 200 V Paper (TC-15)	.25
RC-072	CAPACITOR—.05 mfd., 200 V Paper (TC-16, TC-6, TC-21, TC-25, TC-17, TC-18, TC-1)	.25
RC-091	CAPACITOR—.05 mfd., 400 V Paper (TC-22, TC-11)	.30
RC-203	CAPACITOR—12 mmfd., Mica (MC-12)	.35
RC-205	CAPACITOR—20 mmfd., Mica (MC-20, MC-36)	.35
*RC-210	CAPACITOR—50 mmfd., Mica (MC-28, MC-31, MC-33)	.25
RC-333	CAPACITOR—1000 mmfd., Mica (MC-19)	.30
RC-342	CAPACITOR—1250 mmfd., Mica (MC-29)	.35
RC-360	CAPACITOR—2850 mmfd., Mica (MC-34)	.50
RC-626	CAPACITOR—Triple Trimmers, R.F. (C-9, C-10, C-13)	.60
RC-627	CAPACITOR—Oscillator Padder Capacitor Band B (C-27)	.40
RC-628	CAPACITOR—Wave Trap Trimmer (C-7)	.25
RC-629	CAPACITOR—Quadruple Trimmers, Ant., and Oscillator (C-2, C-3, C-4, C-5; C-24, C-26, C-30, C-35)	.75
RC-630	CAPACITOR—Oscillator Padder Capacitor Band A (C-23)	.40
RC-712	CONDENSER—Gang Tuning Condenser (C-8, C-14, C-32)	4.75
RC-996	CUSHION—Condenser Mounting Cushion Assembly	.15
*RG-001	GRID CAP—Control Grid Clip (Pkg. of 5)	.10
RL-019	COIL—Antenna Coil, Band B (L-2)	.75
RL-020	COIL—Antenna Coil, Band C (L-3)	.70
RL-021	COIL—Antenna Coil, Band D (L-4)	.70
RL-022	COIL—Antenna Coil, Band A (L-1)	.95
RL-125	COIL—R.F. Coil, Band B (L-5)	.85
RL-126	COIL—R.F. Coil, Band C (L-6)	.75
RL-127	COIL—R.F. Coil, Band D (L-7)	.75
RL-128	COIL—R.F. Coil, Band E (L-8)	.75
RL-229	COIL—Oscillator Coil, Band B (L-10)	.70
RL-230	COIL—Oscillator Coil, Band C (L-11)	.70
RL-231	COIL—Oscillator Coil, Band D (L-12)	.75
RL-232	COIL—Oscillator Coil, Band E (L-13)	.70
RL-233	COIL—Oscillator Coil, Band A (L-9)	.80
RP-054	PULLEY—Wave Band Switch Dial Cord Pulley	.15
RQ-051	RESISTOR—470 ohm, ½ watt Carbon (R-8) (Pkg. of 5)	.60
*RQ-059 (RR-014)	RESISTOR—1000 ohm ½ watt Carbon (R-5, R-10) (Pkg. of 5)	.70
RQ-067	RESISTOR—2200 ohm, ½ watt Carbon (R-6, R-2) (Pkg. of 5)	.60
RQ-076	RESISTOR—5100 ohm, ½ watt Carbon (R-9) (Pkg. of 5)	.60
RQ-099	RESISTOR—47,000 ohm, ½ watt Carbon (R-12) (Pkg. of 5)	.60
RQ-103	RESISTOR—68,000 ohm, ½ watt Carbon (R-11, R-4) (Pkg. of 5)	.60
*RQ-107 (RR-049)	RESISTOR—100,000 ohm, ½ watt Carbon (R-3) (Pkg. of 5)	.70
RQ-123	RESISTOR—470,000 ohm, ½ watt Carbon (R-1, R-7) (Pkg. of 5)	$0.70
RS-165	SHIELD—Antenna Compartment Shield Can	1.25
RS-166	SHIELD—Oscillator Compartment Shield Can	1.25
*RS-200	SOCKET—8 Pin Tube Socket (Pkg. of 5)	.75
RS-330	SWITCH—Band Change Switch (S-1, S-2, S-3, S-4, S-5, S-6, S-7)	4.00
RW-402	WAVE TRAP—Wave Trap Coil (L-14)	.65
	DIAL MECHANISM ASSEMBLY	
RB-144	BRACKET—Dial Scale Box L.H. Bracket (1)	$0.15
RB-145	BRACKET—Dial Scale Box R.H. Bracket (2)	.15
RB-146	BRACKET—"Colorama" Dial Lamp Bracket (less lamps) (17)	1.10
RB-148	BRACKET—Reduction Drive and "Silent Tuning" Switch Support Bracket (20)	.10
RB-149	BRACKET—"Personalizer" Dial Lamp Bracket (less lamps) (18)	.45
RB-513	BOX—Dial Scale Box and Pulley Assembly (5)	1.75
RC-820	CABLE—Dial Pointer Cable (24) (Pkg. of 5)	.40
RC-861	CORD—Condenser Drive Cord (25) (Pkg. of 5)	.60
RC-862	CORD—Band Change Cord (23) (Pkg. of 10)	.50
RC-948	CLAMP—Reduction Drive Friction Clamp (13)	.15
RC-949	COLLAR—Condenser Reduction Drive Assembly Shaft Collar and Spring Washer (30)	.20
RC-997	CAP—Scale Cap (Free End) (8)	.10
RC-998	CAP—Scale Cap (Pulley End) (7)	.10
RC-999	CONTACT—Silent Tuning Switch Contact Assembly (12)	.20
RD-039	DRIVE—Tuning Condenser Reduction Drive Assembly (10)	1.15
RD-040	DIAL—"Slide Rule" Dial Scale (3)	.75
RL-908	LAMP—"Colorama Tuning" Green Lamp (Pkg. of 10)	1.50
RL-909	LAMP—"Colorama Tuning" Red Lamp (Pkg. of 10)	1.50
RM-003	MASK—Dial Mask and Personalizer Strip Holder (14)	1.00
RP-054	PULLEY—Wave Band Switch Dial Cord Pulley (4)	.15
RP-055	POINTER—Dial Pointer (27) (Pkg. of 5)	.40
RP-056	PULLEY—Gang Drive Drum (6)	.35
RS-329	SWITCH—Silent Tuning Switch Mechanism (11)	.50
*RS-401	SPRING—Condenser Drive Cord Spring (21) (Pkg. of 2)	.20
RS-419	SPRING—Dial Pointer Cable Spring (22) (Pkg. of 2)	.20
RS-420	SPRING—Dial Scale Tension Spring (9) (Pkg. of 2)	.20
RS-421	SLIDER—Dial Pointer Slider (26)	.15
RS-422	STRIP—"Personalizer" Illumination Diffuser (29)	.10
RW-009	WINDOW—"Personalizer" Strip Window (Celluloid)	.15
	SPEAKER ASSEMBLY E-155	
RC-913	CONE—15-in. Type Cone and Voice Coil Assembly (Gasket Included) (L-20, L-21)	$4.50
RC-961	COVER—Field Magnet Cover	.80
RL-350	COIL—Field Coil	5.20
RL-351	COIL—Hum Buck Coil	.50
RM-200	MAGNET—Field Yoke and Core	2.00
RP-057	PLUG—Female Speaker Plug	.20
RP-058	PLUG—Male Speaker Plug	.20
RS-038	SPEAKER—15-in. Type Speaker (Complete with Output Transformer)	22.00
RT-418	TRANSFORMER—Output Transformer (T-2)	3.50

* Indicates part also used on 1936 "A" line of receivers.

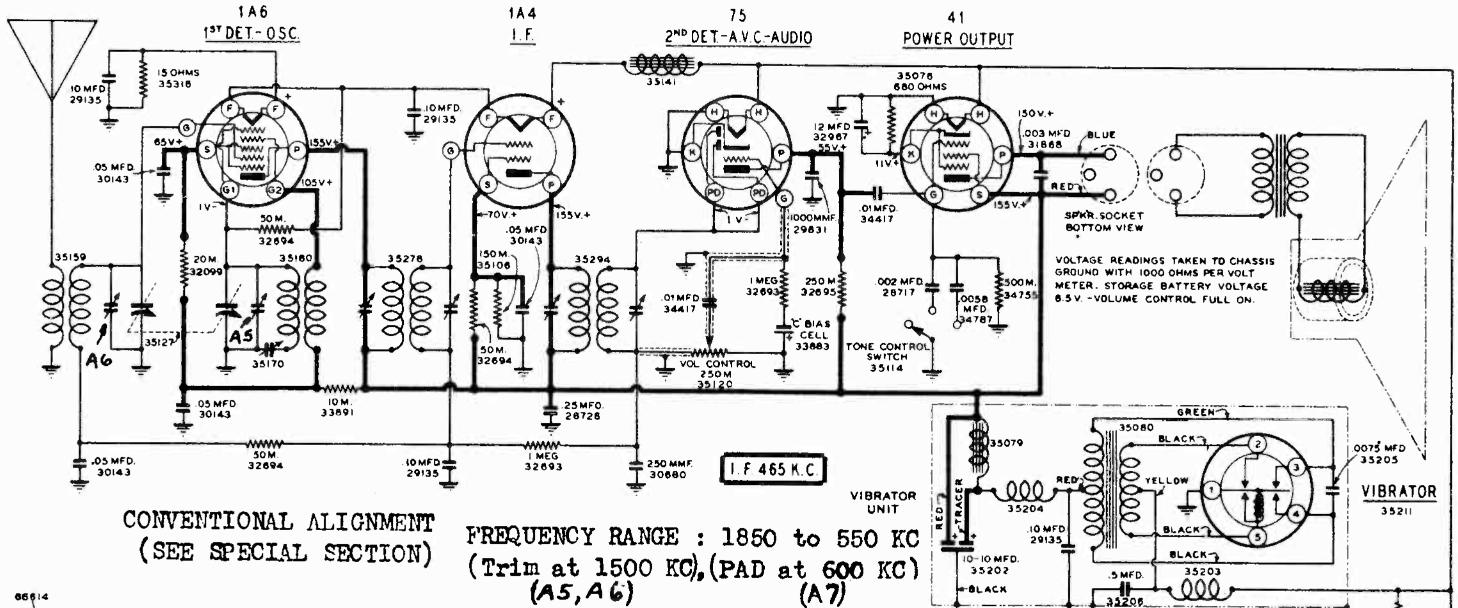
September, 1936 (5m)

(Prices subject to change without notice)

MODELS 410,411
Chassis 4NB
Schematic, Socket
Trimmers, Alignment
Chassis, Parts, Volt.

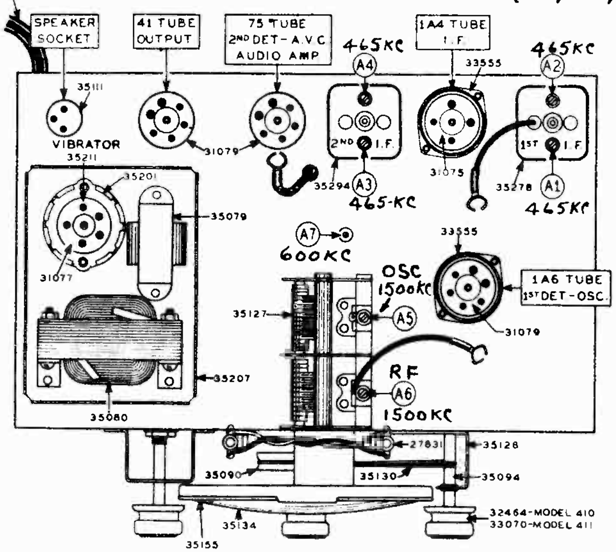
GENERAL HOUSEHOLD UTILITIES CO.

(PRICES SUBJECT TO CHANGE WITHOUT NOTICE)

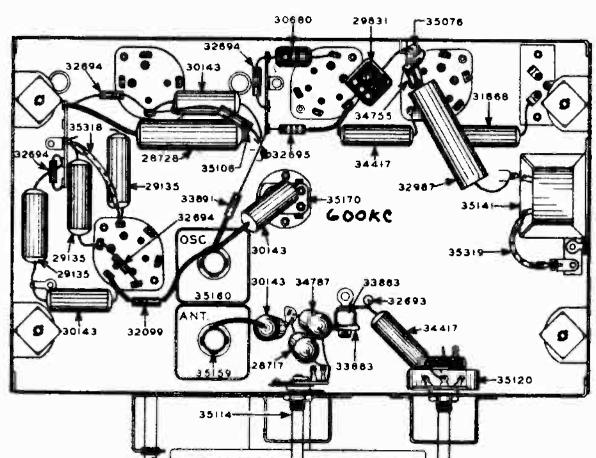


CONVENTIONAL ALIGNMENT
(SEE SPECIAL SECTION)

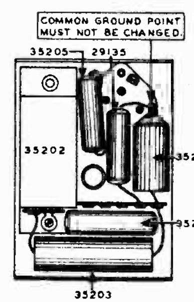
FREQUENCY RANGE : 1850 to 550 KC
(Trim at 1500 KC), (PAD at 600 KC)
(A5, A6) (A7)



CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW



VIBRATOR-UNIT BOTTOM VIEW

COMPLETE VIBRATOR UNIT MAY NOT BE RETURNED FOR CREDIT.

PARTS PRICE LIST

PART NO.	DESCRIPTION	REQ.	PRICE
27831	PILOT LAMP SOCKET	2	.15
28717	CONDENSER-.002 MFD.	1	.30
28728	CONDENSER-.25 MFD.	1	.35
29135	REPLACE WITH 34437		
29818	CONDENSER-.003 MFD.	1	.25
29831	CONDENSER-1000 MMF.	1	.30
30143	REPLACE WITH 34436		
30177	DRIVE SPRING	1	.05
30680	CONDENSER-250 MMF	1	.20
31075	4 PRONG SOCKET	1	.10
31077	VIBRATOR SOCKET	1	.15
31079	6 PRONG SOCKET	3	.15
31868	REPLACE WITH 29818		
32099	RESISTOR-20M OHMS	1	.15
32464	KNOB-MODEL 410	3	.20
32693	RESISTOR-1 MEGOHM	2	.15
32694	RESISTOR-50M OHMS	3	.15
32695	RESISTOR-250M OHMS	1	.15
32987	CONDENSER-12 MFD	1	.75
33070	KNOB-MODEL 411	3	.20
33554	TUBE SHIELD CAP	2	.05
33555	TUBE SHIELD BASE	2	.02
33747	PILOT LAMP	2	.15
33830	BATTERY CLIP	2	.20
33863	BIAS CELL MTG. STRIP	1	.15
33883	'C' BIAS CELL	1	.25
33891	RESISTOR-10M OHMS	1	.15
34417	CONDENSER-.01 MFD	2	.35
34436	CONDENSER-.05 MFD	4	.35
34437	CONDENSER-.10 MFD.	3	.35
34755	RESISTOR-500M OHMS	1	.15
34787	CONDENSER-.0058 MFD	1	.25
34935	HALF TUBE SHIELD	4	.05
35076	RESISTOR-680 OHMS	1	.15
35079	FILTER CHOKE	1	1.25
35080	TRANSFORMER	1	1.75
35090	DRIVE DRUM & HUB	1	.80
35094	DRIVE SHAFT	1	.05
35106	RESISTOR-150M OHMS	1	.15
35111	SPEAKER SOCKET	1	.15
35114	TONE CONTROL SWITCH	1	.80
35120	VOLUME CONTROL	1	1.25
35127	VARIABLE CONDENSER	1	3.00
35128	DIAL MTG. BRACKET	1	1.00
35130	DRIVE STRING	1	.10
35132	DIAL POINTER	1	.10
35133	WINDOW GASKET	1	.10
35134	DIAL WINDOW	1	.15
35141	'A' CHOKE	1	1.50
35155	WINDOW SNAP RING	1	.10
35159	ANTENNA COIL	1	1.00
35160	OSCILLATOR COIL	1	1.00
35170	PADDER CONDENSER	1	.45
35202	10-10 MFD. FILTER COND.	1	1.25
35203	'A' CHOKE	1	.50
35204	R.F. CHOKE	1	.10
35205	CONDENSER-.0075 MFD.	1	.50
35206	CONDENSER-.5 MFD.	1	.50
35211	VIBRATOR	1	4.50
35212	VIBRATOR BOOT	1	.10
35247	DIAL CHART	1	.60
35278	1ST I.F COIL & SHIELD	1	1.25
35294	2ND I.F COIL & SHIELD	1	1.35
35318	RESISTOR-15 OHMS	1	.15
35319	RESISTOR-30 OHMS	1	.15
35328	DIAL ESCUTCHEON	1	.55
35808	RESISTOR-8200 OHMS	1	.15
35870	POINTER SCREW	1	.01
66614	BATTERY CABLE ONLY	48"	.50
8" SPEAKER PARTS			
35125	SPEAKER PLUG	1	.20
35315	COMPLETE SPEAKER	1	9.00
40041	OUTPUT TRANSFORMER	1	2.00
10" SPEAKER PARTS			
35125	SPEAKER PLUG	1	.20
36209	COMPLETE SPEAKER	1	10.50
40023	CONE & VOICE COIL	1	3.00
40038	OUTPUT TRANSFORMER	1	2.00

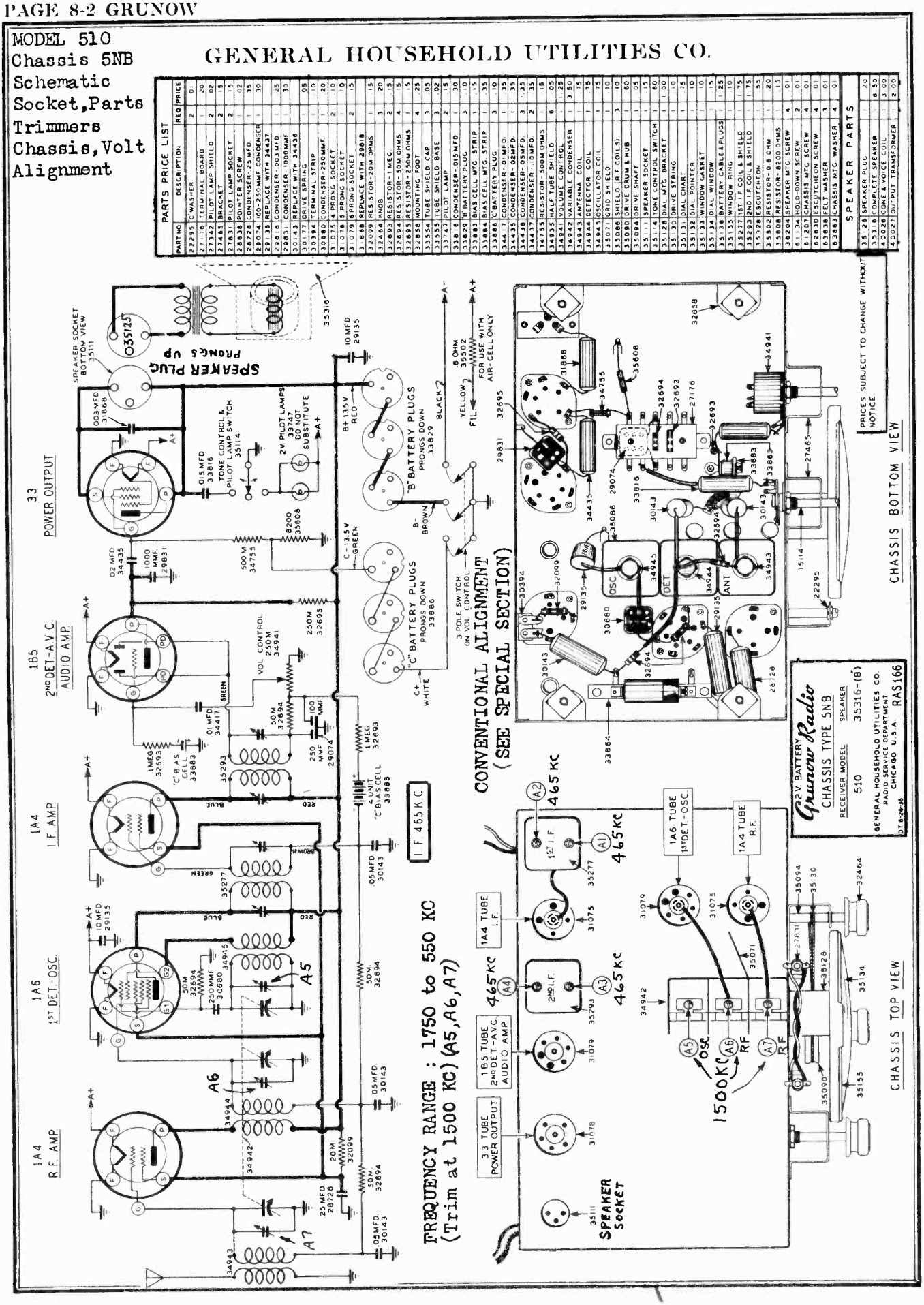
6V. BATTERY
Grunow Radio
CHASSIS TYPE 4NB

RECEIVER MODEL	SPEAKER
410	35315-(8)
411	36209-(10)

GENERAL HOUSEHOLD UTILITIES CO.
RADIO SERVICE DEPARTMENT
CHICAGO U.S.A.
RAS158
DT 5-28-36

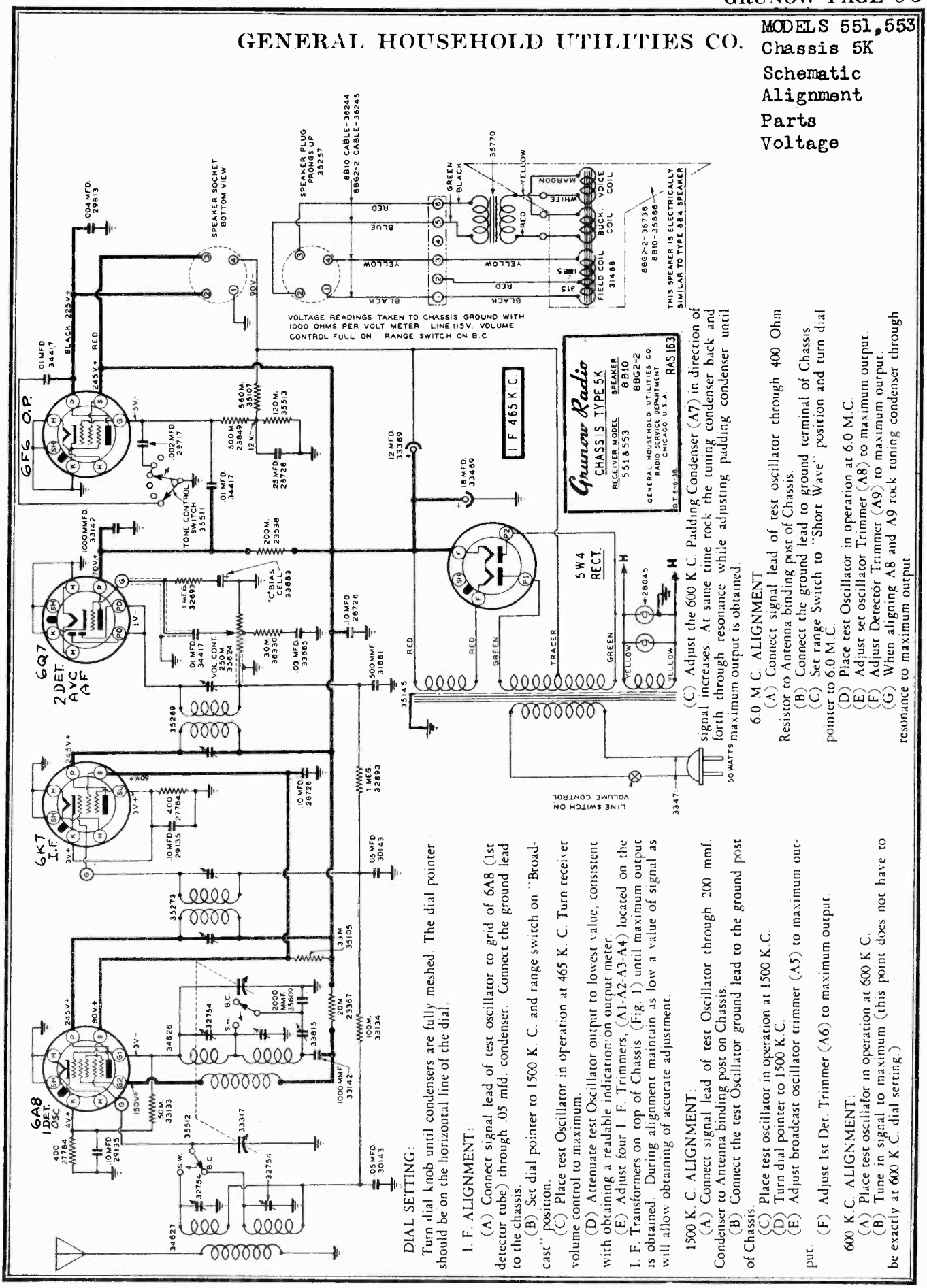
MODEL 510
Chassis 5NB
Schematic
Socket, Parts
Trimmers
Chassis, Volt
Alignment

GENERAL HOUSEHOLD UTILITIES CO.



GENERAL HOUSEHOLD UTILITIES CO.

MODELS 551, 553
Chassis 5K
Schematic
Alignment
Parts
Voltage



DIAL SETTING:

Turn dial knob until condensers are fully meshed. The dial pointer should be on the horizontal line of the dial.

I. F. ALIGNMENT:

(A) Connect signal lead of test oscillator to grid of 6A8 (1st detector tube) through .05 mfd. condenser. Connect the ground lead to the chassis.

(B) Set dial pointer to 1500 K. C. and range switch on "Broadcast" position.

(C) Place test Oscillator in operation at 465 K. C. Turn receiver volume control to maximum.

(D) Attenuate test Oscillator output to lowest value, consistent with obtaining a readable indication on output meter.

(E) Adjust four I. F. Trimmers, (A1-A2-A3-A4) located on the I. F. Transformers on top of Chassis (Fig. 1) until maximum output is obtained. During alignment maintain as low a value of signal as will allow obtaining of accurate adjustment.

1500 K. C. ALIGNMENT

(A) Connect signal lead of test Oscillator through 200 mmf. Condenser to Antenna binding post on Chassis.

(B) Connect the test Oscillator ground lead to the ground post of Chassis.

(C) Place test oscillator in operation at 1500 K.C.

(D) Turn dial pointer to 1500 K.C.

(E) Adjust broadcast oscillator trimmer (A5) to maximum output.

(F) Adjust 1st Det. Trimmer (A6) to maximum output.

600 K.C. ALIGNMENT:

(A) Place test oscillator in operation at 600 K.C.

(B) Tune in signal to maximum (this point does not have to be exactly at 600 K.C. dial setting.)

(C) Adjust the 600 K.C. Padding Condenser (A7) in direction of signal increases. At same time rock the tuning condenser back and forth through resonance while adjusting padding condenser until maximum output is obtained.

6.0 M.C. ALIGNMENT

(A) Connect signal lead of test oscillator through 400 Ohm Resistor to Antenna binding post of Chassis.

(B) Connect the ground lead to ground terminal of Chassis.

(C) Set range Switch to "Short Wave" position and turn dial pointer to 6.0 M.C.

(D) Place test Oscillator in operation at 6.0 M.C.

(E) Adjust set oscillator Trimmer (A8) to maximum output.

(F) Adjust Detector Trimmer (A9) to maximum ourput.

(G) When aligning A8 and A9 rock tuning condenser through resonance to maximum output.

MODELS 551,553
Chassis 5K
Socket,Trimmers
Chassis

GENERAL HOUSEHOLD UTILITIES CO.

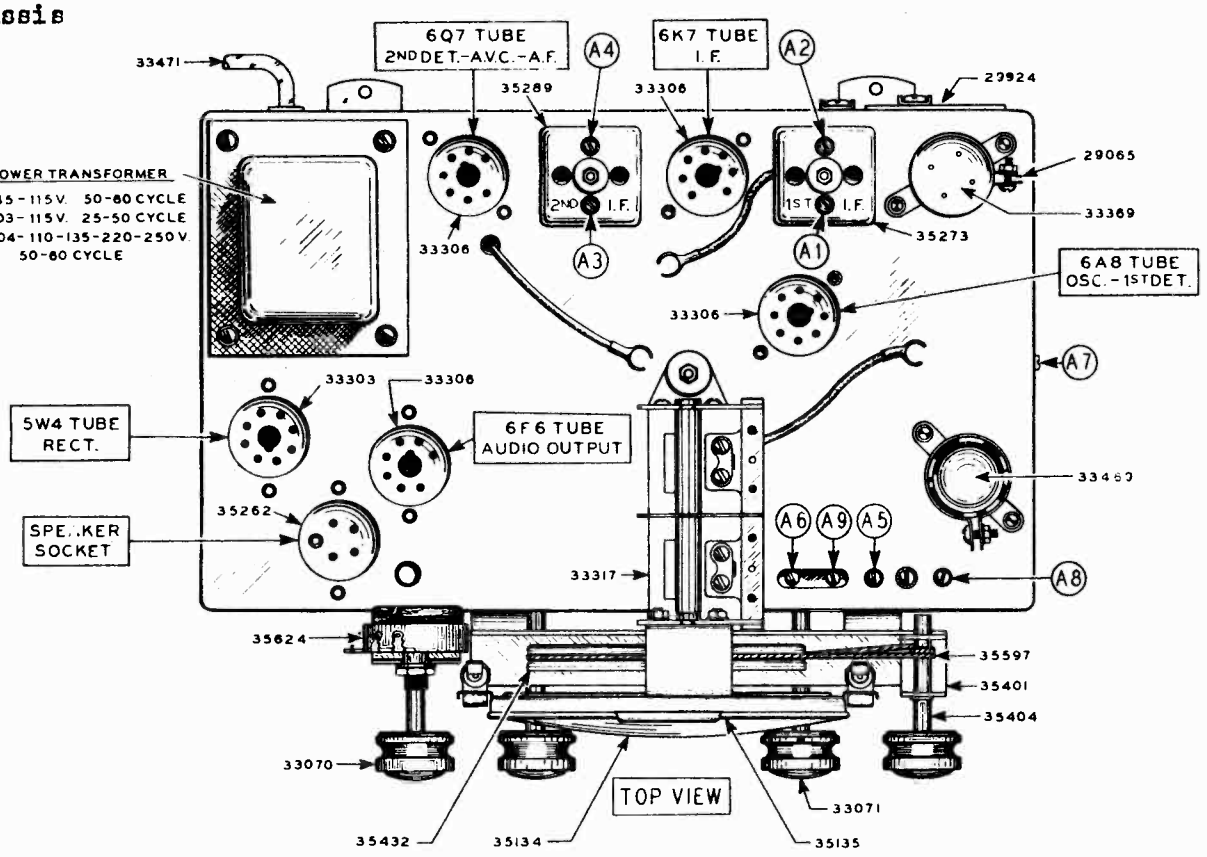


FIG.1

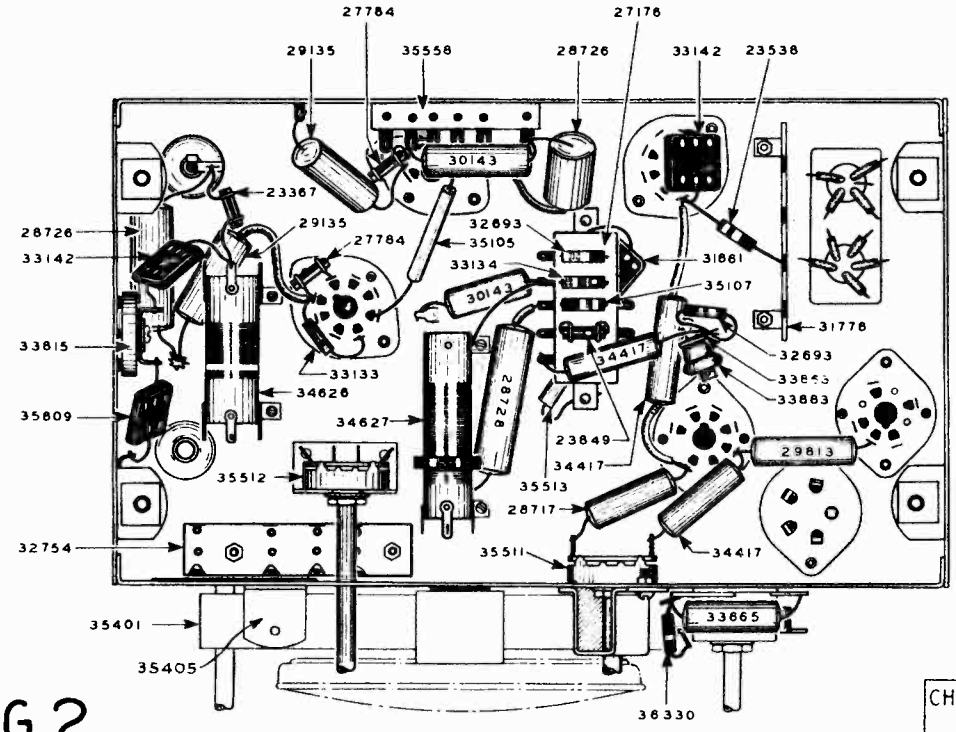
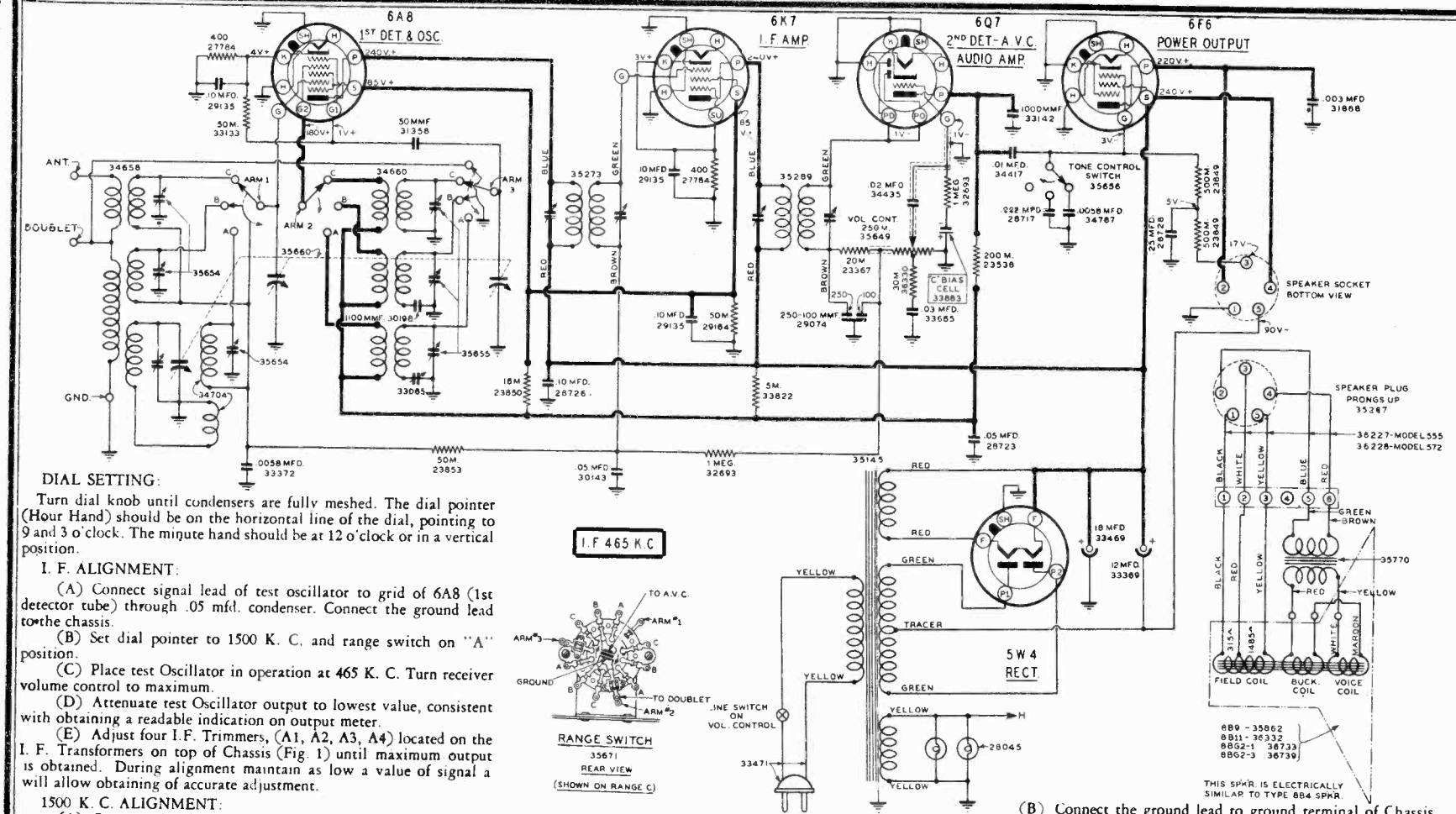


FIG.2

CHASSIS 5K
AUG. 1936.
RAS 182

GENERAL HOUSEHOLD UTILITIES CO.

MODELS 555, 572
Chassis 5L
Schematic, Voltage
Alignment, Parts



DIAL SETTING:

Turn dial knob until condensers are fully meshed. The dial pointer (Hour Hand) should be on the horizontal line of the dial, pointing to 9 and 3 o'clock. The minute hand should be at 12 o'clock or in a vertical position.

I. F. ALIGNMENT:

(A) Connect signal lead of test oscillator to grid of 6A8 (1st detector tube) through .05 mfd. condenser. Connect the ground lead to the chassis.

(B) Set dial pointer to 1500 K. C. and range switch on "A" position.

(C) Place test Oscillator in operation at 465 K. C. Turn receiver volume control to maximum.

(D) Attenuate test Oscillator output to lowest value, consistent with obtaining a readable indication on output meter.

(E) Adjust four I.F. Trimmers, (A1, A2, A3, A4) located on the I. F. Transformers on top of Chassis (Fig. 1) until maximum output is obtained. During alignment maintain as low a value of signal a will allow obtaining of accurate adjustment.

1500 K. C. ALIGNMENT:

(A) Connect signal lead of test Oscillator through 200 mmf. Condenser to Antenna binding post on Chassis.

(B) Connect the test Oscillator ground lead to the ground post of Chassis.

(C) Place test oscillator in operation at 1500 K. C.

(D) Turn dial pointer to 1500 K. C.

(E) Adjust broadcast oscillator trimmer (A5) to maximum output.

(F) Adjust 1st Detector Trimmer (A6) to maximum output.

(G) Adjust Antenna Trimmer (A7) to maximum output.

600 K. C. ALIGNMENT:

(A) Place test oscillator in operation at 600 K.C.

(B) Tune in signal to maximum (this point does not have to be exactly at 600 K. C. dial setting.)

(C) Adjust the 600 K. C. Padding Condenser (A8) in direction of signal increases. At same time rock the tuning condenser back and forth through resonance while adjusting padding condenser until maximum output is obtained.

5000 K. C. ALIGNMENT:

(A) Set Range Switch to "B" position.

(B) Place test Oscillators in operation at 5000 K. C.

(C) Turn Dial Pointer to 5000 K. C.

(D) Adjust Set Oscillator Trimmer (A9) to maximum output.

(E) Adjust Detector Trimmer (A10) to maximum output.

18 M. C. ALIGNMENT:

(A) Connect signal lead of test oscillator through 400 Ohm Resistor to Antenna binding post of Chassis.

(B) Connect the ground lead to ground terminal of Chassis.

(C) Set Range Switch to "C" position and turn dial pointer to 18 M. C.

(D) Place test Oscillator in operation at 18 M. C.

(E) Adjust set oscillator Trimmer (A11) to maximum output.

(F) Adjust Detector Trimmer (A12) to maximum output.

(G) On the 18 M. C. Oscillator Alignment it will be noted that there are two settings at which the signal will be received. Use the lower of the images for alignment point that is the setting giving most capacity or the point at which the trimmer screw is farthest in.

NOTES

1- TUBE SOCKETS SHOWN BOTTOM VIEW.

2- VOLTAGE READINGS TAKEN TO CHASSIS GROUND WITH 1000 OHMS PER VOLT VOLTMETER. LINE-115V. VOLUME CONTROL FULL ON. RANGE SWITCH ON 'A' BAND.

Grunow Radio
CHASSIS TYPE 5L

RECEIVER MODEL	SPEAKER
555	8B11 OR 8BG2-3
572	8B9 OR 8BG2-1

GENERAL HOUSEHOLD UTILITIES CO.
RADIO SERVICE DEPARTMENT
CHICAGO U.S.A. RAS 164

MODELS 555, 572
Chassis 5L
Socket, Trimmers
Chassis

GENERAL HOUSEHOLD UTILITIES CO.

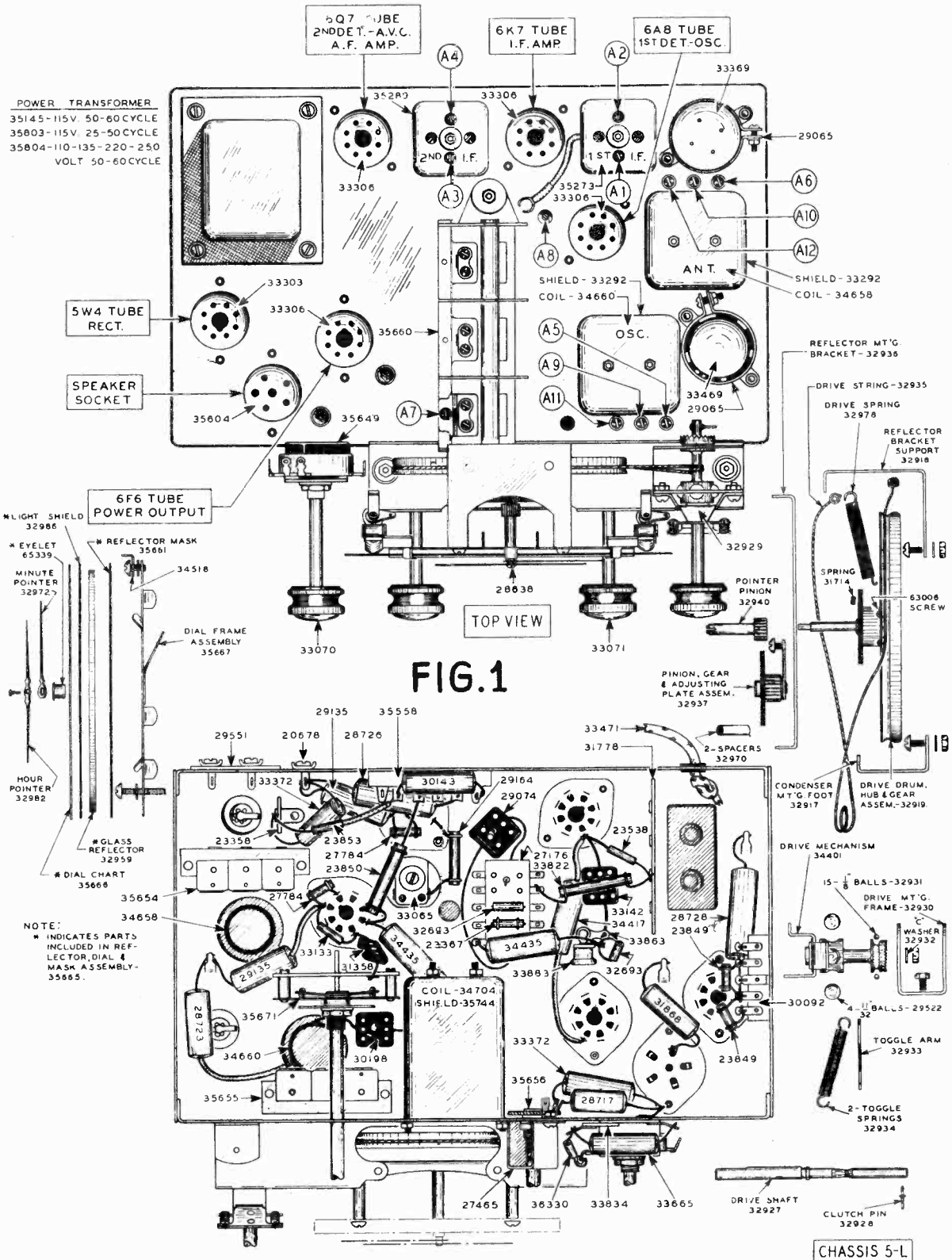


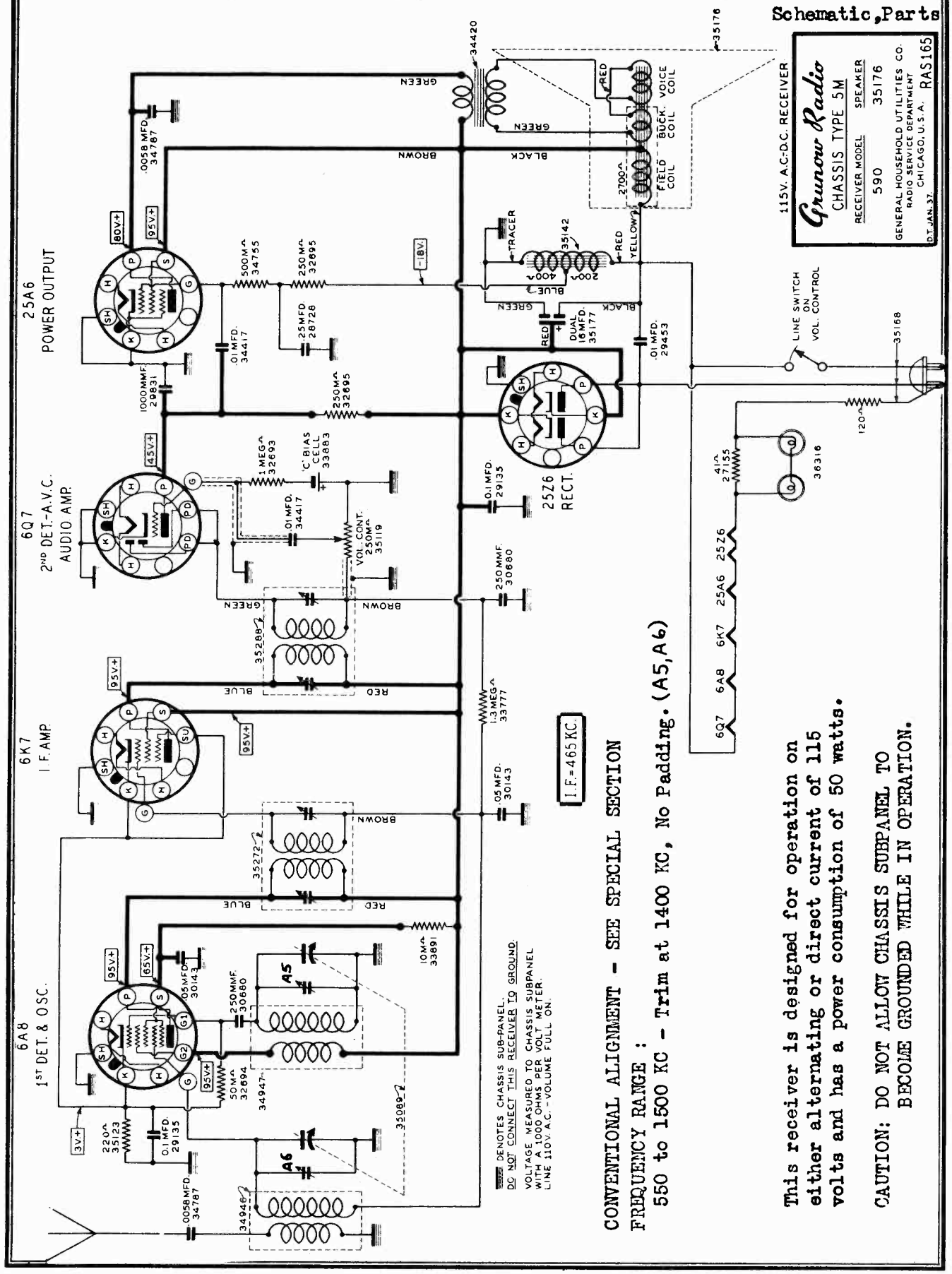
FIG.1

FIG.2

Alignment, Voltage

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 590
Chassis 5M
Schematic, Parts



MODEL 590
Chassis 5M
Socket, Trimmers
Chassis

GENERAL HOUSEHOLD UTILITIES CO.

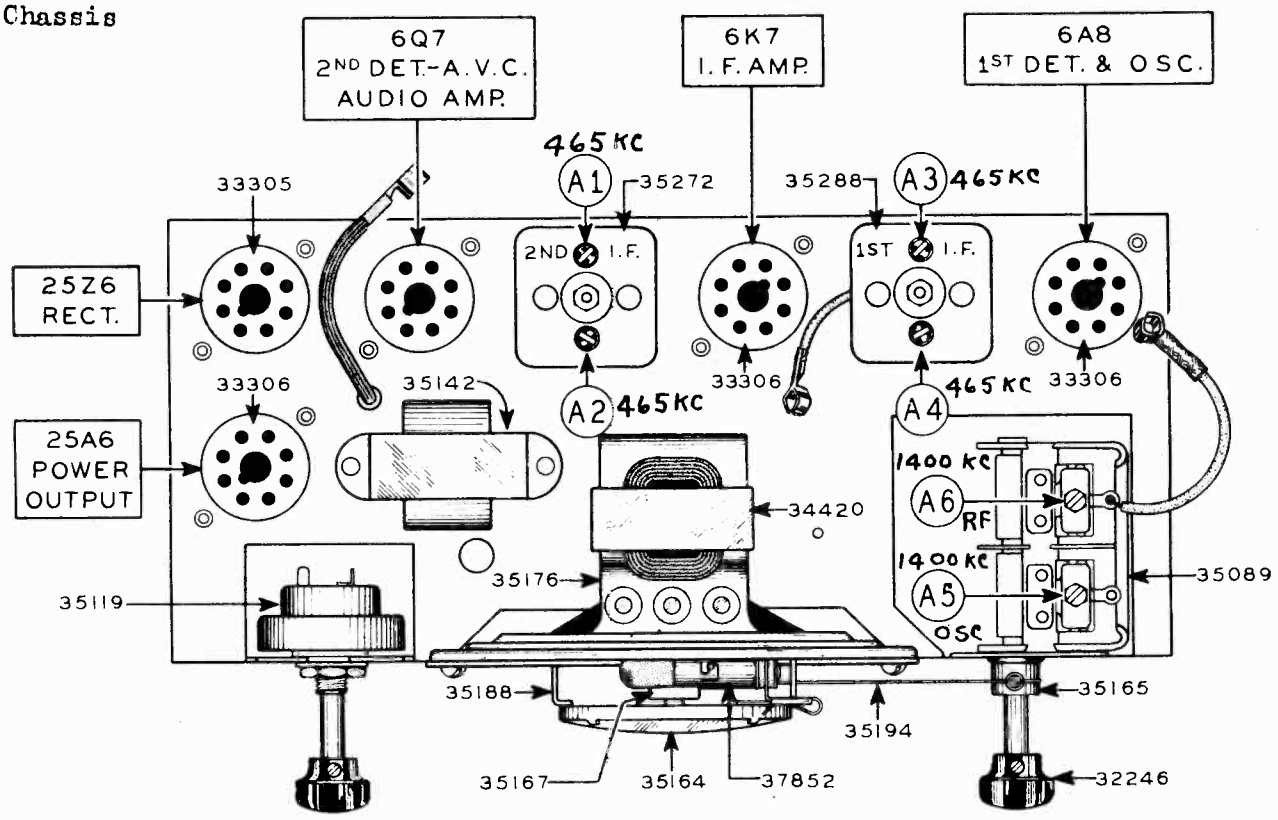


FIG. 1

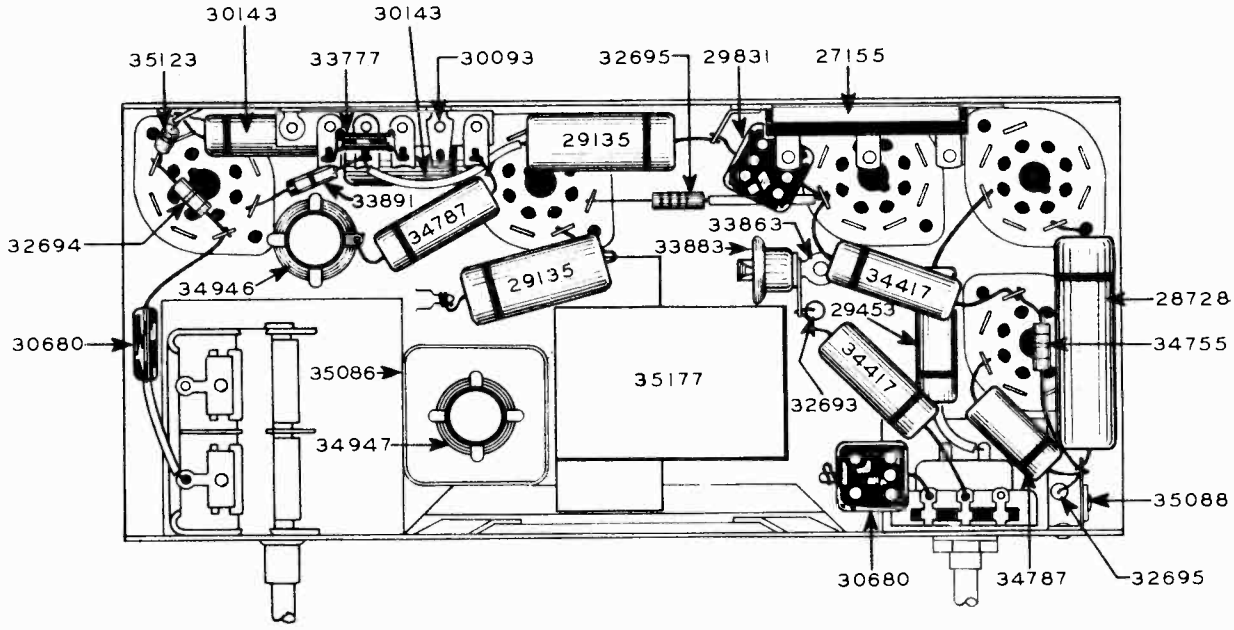


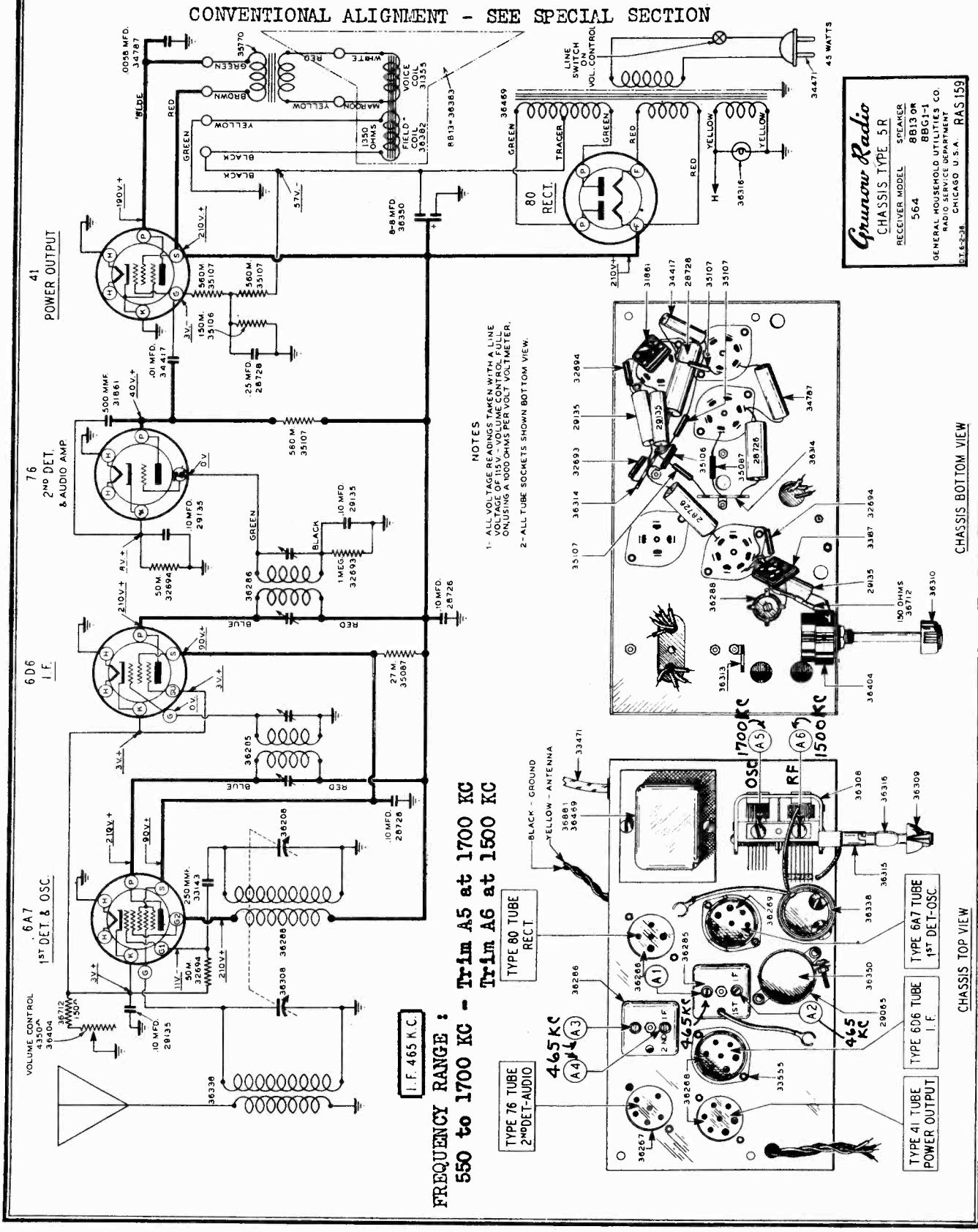
FIG. 2

CHASSIS TYPE 5M

Schematic, Voltage
Socket, Trimmers
Chassis, Parts
Alignment

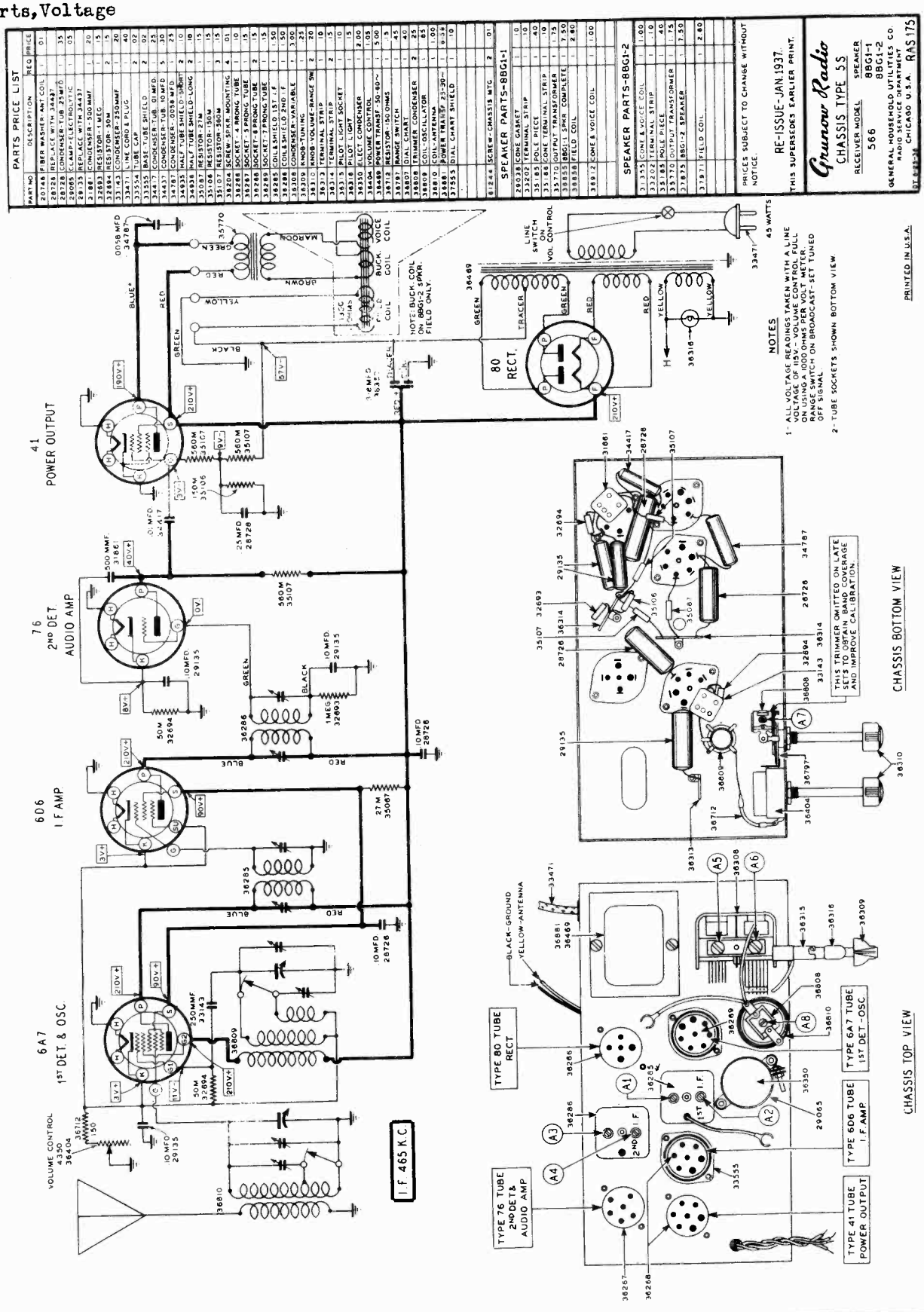
GENERAL HOUSEHOLD UTILITIES CO.

MODEL 564
Chassis 5R



MODEL 566
Chassis 5S
Schematic, Chassis
Socket, Trimmers
Parts, Voltage

GENERAL HOUSEHOLD UTILITIES CO.



RE-ISSUE - JAN. 1937
THIS SUPERSEDES MANUAL OF PREVIOUS DATE.

SERVICE NOTES

Chassis Type 5-S
Receiver Model 566
Speaker Type 8BG1-1—8BG1-2

Grunow Radio

OCTOBER, 1936

SERVICE DATA

Chassis Type 5Q
Receiver Model 573

The following characteristics apply to the GRUNOW Radio—Chassis 5S:

This model is a 5 Tube Super-Heterodyne Dual Wave (540 to 1725 K.C. and 1725 to 4000 K.C.) Receiver, using 1-6A7 tube as 1st Detector and Oscillator, 1-6D6 tube as an I. F. Amplifier, 1-76 tube as 2nd Detector and Audio Amplifier. The 41 output tube is a power amplified pentode and is capable of producing large power output with relatively small signal input. The rectifier tube is an 80, the output of which is well filtered through the action of the speaker field and the two 8 mfd. electrolytic condensers.

SERVICE DATA

CONTINUITY AND VOLTAGE

Continuity and voltage readings should be taken from the underside of the chassis. The values given on the schematic diagram are average and allow the service man to make a quick check of the chassis constants. The socket layouts given on the schematic diagram show each socket from the under side.

ALIGNMENT

1. EQUIPMENT

A—Test Oscillator.

A modulated oscillator capable of producing signals at 465 K. C., 1500 K. C., 1000 K. C., 600 K. C. and 3500 K. C. is necessary for alignment of the 5S Grunow Receiver.

B—Output Meter.

This may be any of the standard output meters on the market, but should be sufficiently sensitive to provide a good deflection at low signal strength.

C—Coupling Means.

Coupling condensers of .05 Mfd. and 200 Mmf. should be used when coupling oscillator to receiver during alignment as specified in following paragraphs.

2. DIAL SETTING.

Turn dial pointer until condensers are fully meshed. The dial pointer should be on the horizontal line of the dial chart.

3. I. F. ALIGNMENT.

A—Connect signal lead of oscillator through .05 Mfd. condenser to grid of 6A7 (1st Detector tube), connect the ground lead to the chassis.

B—Place oscillator in operation of 465 K. C. and turn receiver Volume Control to maximum (Volume Control should remain at maximum during the entire alignment procedure and signal should be attenuated at oscillator to lowest value consistent with obtaining a readable indication on output meter).

C—Align four I. F. trimmers (A1-A2-A3-A4) located on top of I. F. Transformers.

4. 1500 K. C. ALIGNMENT.

A—Connect signal lead of oscillator to antenna lead (the yellow wire) through 200 Mmf. condenser.

B—Set dial pointer at 1500 K. C. and place oscillator in operation at 1500 K. C. Set Range switch on broadcast position. Knob to the left.

C—Align oscillator trimmer (A5), which is the second trimmer on variable condenser as you face the chassis.

D—Align antenna trimmer (A6), which is the first trimmer on Variable Condenser, in direction of signal increase and at the same time rock the tuning condenser back and forth thru resonance. Continue this procedure until maximum signal is obtained on the output meter.

5. 3500 K. C. ALIGNMENT.

A—Set Range Switch to Short Wave Position. Set test oscillator in operation at 3500 K. C. Turn Dial pointer to 3500 K. C. (3.5 M. C.).

B—Adjust Oscillator Trimmer (A7), located on range switch, to maximum output. (Use the higher of the images for alignment point—the setting giving the least capacity—screw farthest out.)(NOT ON LATE SETS)

C—Adjust antenna trimmer (A8), located on top of antenna coil, to maximum output while rocking tuning condenser thru resonance.

D—Check at 1500 K. C.

Note: Best results may be had with this receiver when using a high, long antenna.

The GRUNOW Chassis 5Q is a five tube three band superheterodyne receiver, using 1-6A8 1st Detector and Oscillator, 1-6K7 I. F. Amplifier, 1-6Q7 2nd Detector; A. V. C. and Audio Amplifier, 1-6F6 Power Output and 1-5W4 Rectifier. The tuning range is divided into three divisions or bands covering from 550 K.C. to 1750 K.C. on the "A" or Broadcast Band, 1750 K.C. to 5.5 M.C. on the "B" or Police Amateur Band and 5.5 M.C. to 18.2 M.C. on the "C" or Foreign Broadcast Band.

SERVICE DATA

CONTINUITY AND VOLTAGE

Tube sockets on the schematic diagram (Fig. 3) are shown bottom view, each element being in its actual position in respect to the guide pin. The voltage measurements shown are average and were taken with a line voltage of 115 V., the volume control "full on" and the range switch in position "A" using a 1000 ohms per volt meter.

REPAIRS

When servicing this chassis it is IMPERATIVE that the service man make all parts replacements in EXACTLY the same way as the original part was located and connected. This applies particularly to ground points. All parts replacements in the R. F. end of the circuit must be exact duplicates of the originals, especially so in the case of coils, R. F. by-pass or coupling condensers. Any repairs in the R. F. circuit will make a complete realignment of the tuned circuit necessary.

BIAS CELL

This Chassis uses a "C" bias cell unit in the control grid of the 6Q7 tube. This type bias cell has an exceedingly long life but occasionally may have to be replaced. When replacing the cell note that the carbon or (+) side is connected to the ground side of all terminal clips. To check the bias cell a new cell or a 1½ volt battery must be substituted, as the cell voltage cannot be measured with an ordinary voltmeter due to its low current rating.

CIRCUIT ALIGNMENT EQUIPMENT

Do not attempt to align the 5Q Chassis without the equipment specified below:

1. Signal Generator—A modulated oscillator capable of delivering signals from 465 K.C. to 18.2 M.C.

2. Alignment Tool—A non-metallic screw driver.

3. Dummy Antenna—.05 Mfd. Condenser (I. F. Alignment); 200 Mmfd. Condenser (Broadcast Alignment); 400 Ohm Carbon Resistor (Short Wave Alignment).

4. Output Meter—A meter of sufficient sensitivity to give a good deflection at very low signal input.

Note: The receiver should be aligned in a location free from local interference. A screen room is recommended.

CIRCUIT ALIGNMENT PROCEDURE

1. HEATING

(A) Allow the receiver to heat up for a period of 20 to 30 minutes. This is necessary in order to eliminate possible alignment variations due to the thermal expansion and contraction of the capacitors and inductances.

(B) Allow the signal generator to warm up in order to prevent frequency drift during alignment.

2. DIAL CALIBRATION

Turn the condenser until the plates are fully meshed, set the pointer (Hour Hand) to 9 and 3 on the outer edge of dial chart. Set the vernier pointer (Minute Hand) to the line pointing to 12.

3. SIGNAL GENERATOR ADJUSTMENT

During the entire alignment procedure the signal input from the generator to the receiver must be continually attenuated at the generator as the various trimmers are brought into resonance. This is necessary in order to hold the signal at the lowest intensity so that the A. V. C. Circuit will remain at the most sensitive point.

4. I. F. ALIGNMENT

(A) Set the generator to 465 K.C. and connect the output lead to the control grid of the 6A8 tube through the .05 Mfd. dummy and the generator ground to the chassis ground post.

(B) Set the receiver dial pointer to 600 K.C., the range switch to position "A" and turn the volume control full on.

(C) Connect the output meter across the two primary terminals on the output transformer.

(D) Adjust the I. F. Trimmers A1, A2, A3, and A4 to maximum output.

5. 1500 K.C. ALIGNMENT

(A) Set the generator to 1500 K.C. and connect the output to the antenna post on the chassis through the 200 Mmfd. dummy.

(B) Set the receiver dial pointer to 1500 K.C.

(C) Adjust the trimmers (A5) Oscillator, (A6) Detector and (A7) Antenna to maximum output.

6. 600 K.C. ALIGNMENT

(A) Set generator to 600 K.C.

(B) Set receiver dial pointer to 600 K.C.

(C) Turn trimmer (A8) in direction of signal increase and at the same time rock tuning condenser slowly back and forth through resonance until the exact resonant point on both is obtained.

7. 5 M.C. ALIGNMENT

(A) Set generator to 5 M.C.

(B) Set receiver range switch to position "B" and dial pointer to 5 M.C.

(C) Adjust trimmer (A9) Oscillator and (A10) Antenna to maximum output.

8. 18 M.C. ALIGNMENT

(A) Set generator to 18 M.C. and connect the output to the chassis Antenna post through the 400 Ohm dummy.

(B) Set the receiver range switch to position "C" and the dial pointer to 18 M.C.

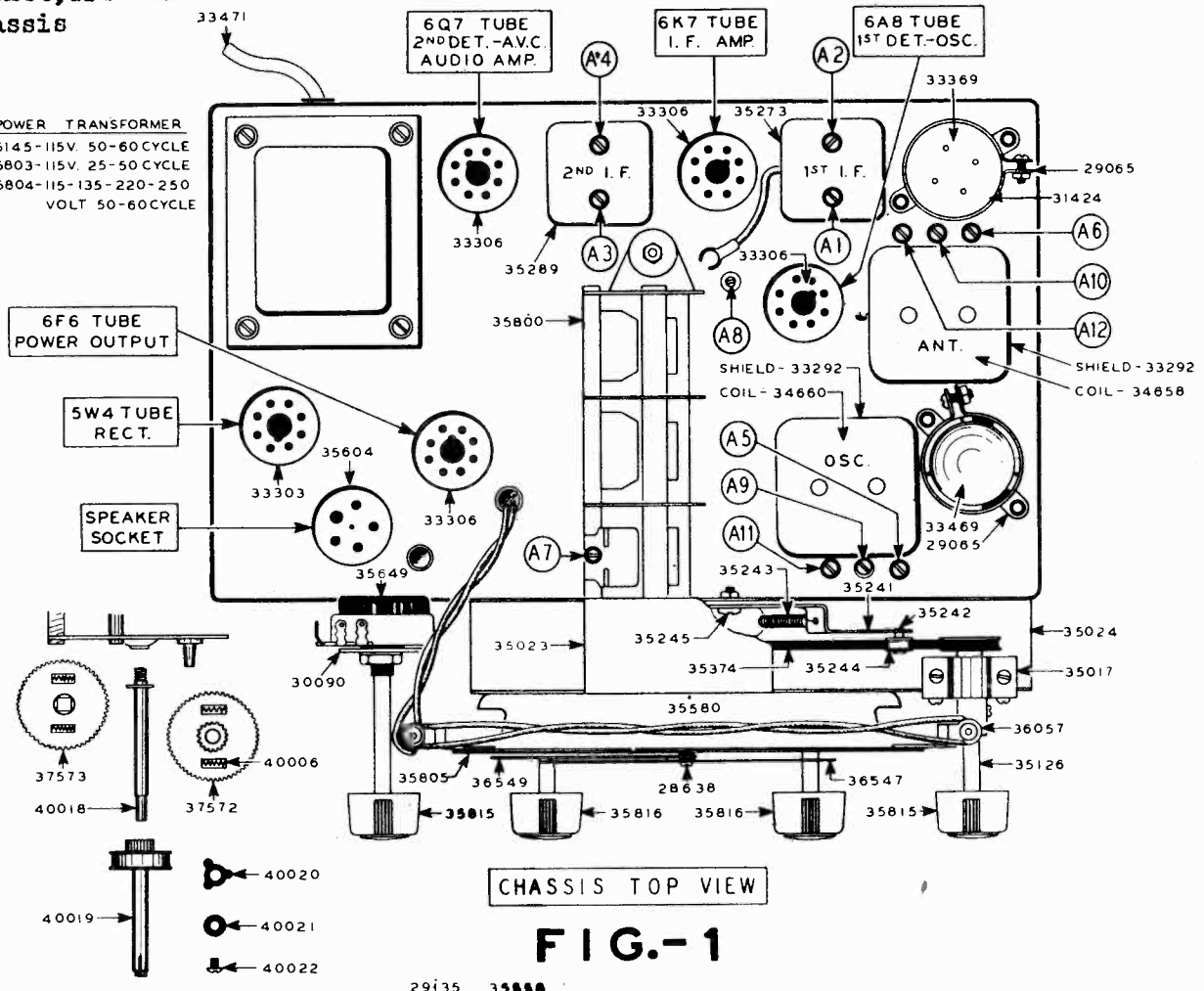
(C) Screw the Oscillator trimmer (A11) down tight and back off until signal is heard, then rock the tuning condenser slowly back and forth through resonance until exact resonant point is determined.

(D) Adjust Antenna trimmer (A12) to maximum output.

(E) Readjust Oscillator trimmer (A11) to maximum output.

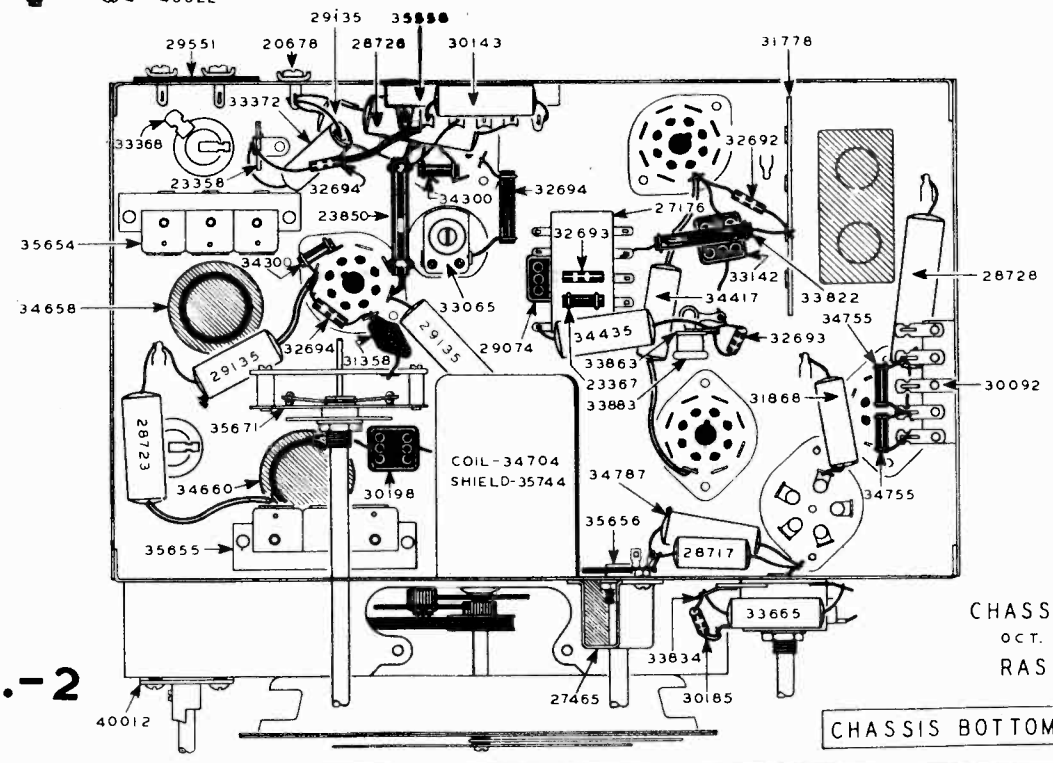
MODEL 573
Chassis 5Q
Socket, Trimmers
Chassis

GENERAL HOUSEHOLD UTILITIES CO.



CHASSIS TOP VIEW

FIG.-1



CHASSIS 5Q
OCT. 1936
RAS 194

CHASSIS BOTTOM VIEW

FIG.-2

MODEL 573
Chassis 5 Q
Schematic
Parts, Voltage

GENERAL HOUSEHOLD UTILITIES CO.

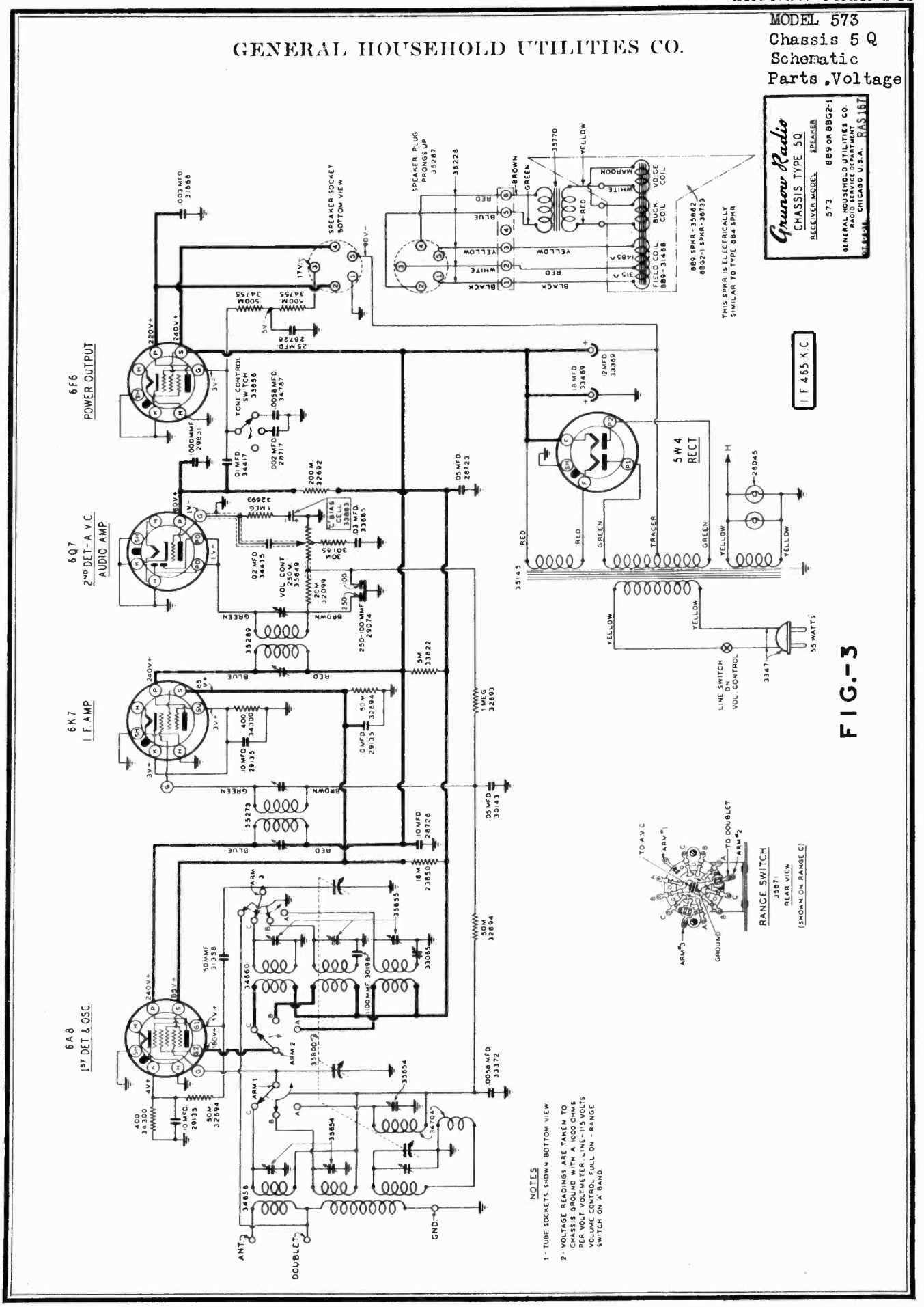


FIG.-3

MODELS 614,618 Auto
Schematic,Parts
Socket,Trimmers
Chassis,Voltage

GENERAL HOUSEHOLD UTILITIES CO.

(PRICES SUBJECT TO CHANGE WITHOUT NOTICE)

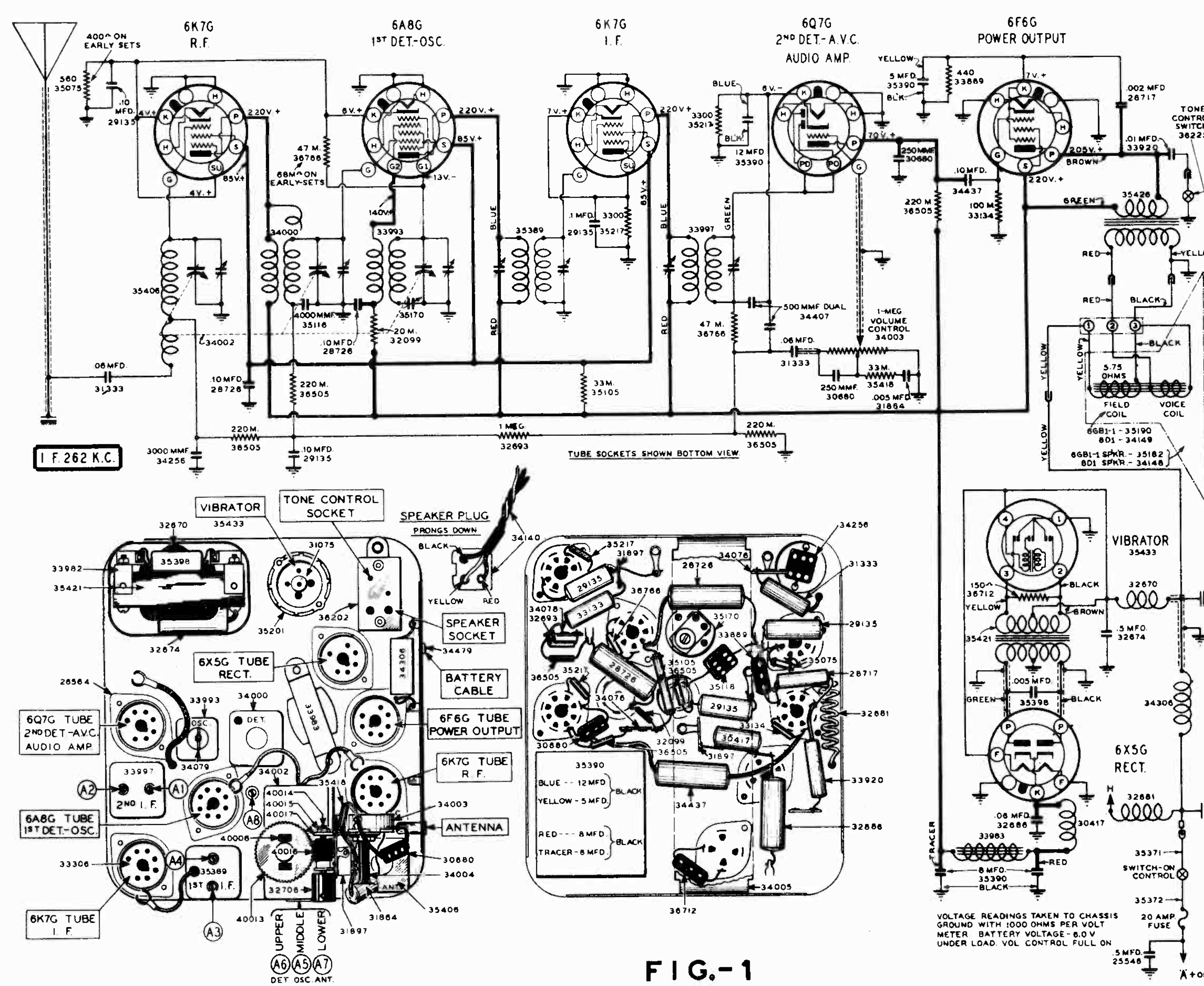


FIG.-1

PARTS PRICE LIST

PART NO.	DESCRIPTION	PRICE
24995	ANT CONNECTOR BUSHING	.03
25549	CONNECTOR SPRING	.02
25550	CONNECTOR WASHER	.02
28564	TUBE SHIELD BASE	.10
28898	TUBE SHIELD-6X5G & 6Q7G	.10
27801	VAR. COND. MTG. GROMMET	.05
27802	VAR. COND. CUP WASHER	.02
28717	CONDENSER-.002 MFD.	.30
28726	REPLACE WITH 34437	
29087	TUBE SHIELD-6K7G & 6A8G	.10
29135	REPLACE WITH 34437	
30092	JUNCTION TERMINAL BOARD	.10
30355	DRIVE COUPLING PIN	.02
30417	'B' CHOKE-R.F.	.40
30680	CONDENSER-250 MMF.	.20
31075	4 PRONG SOCKET	.10
31864	CONDENSER-.005 MFD.	.25
31897	MOUNTING LUG STRIP	.05
32099	RESISTOR-20M OHMS	.15
32670	'A' CHOKE	.40
32674	'A' FILTER COND.-.5 MFD.	.40
32681	FILAMENT CHOKE	.10
32686	CONDENSER-.06 MFD.	.30
32693	RESISTOR-1 MEGOHM	.15
32708	DRIVE COUPLING	.15
33134	RESISTOR-100M OHMS	.15
33306	UNIVERSAL TUBE SOCKET	.15
33863	PLUG BUTTON	.02
33889	RESISTOR-440 OHMS	.15
33891	RESISTOR-10M OHMS	.15
33897	RESISTOR-750 OHMS	.15
33920	CONDENSER-.01 MFD.	.30
33978	CANDOHM-11M OHMS	.35
33982	TRANSFORMER BRACKET	.10
33983	FILTER CHOKE	.90
33993	OSCILLATOR COIL	1.20
33997	2ND I.F. COIL & SHIELD	1.75
34000	DETECTOR COIL & SHIELD	1.30
34002	VARIABLE CONDENSER	4.50
34003	VOLUME CONTROL	1.50
34004	VOLUME CONTROL SLEEVE	.15
34005	CHASSIS MTG. BRACKET	.20
34066	5 PRONG VIB. SOCKET-625	.15
34069	CONDENSER-850 MMF.	.20
34076	TERMINAL STRIP	.10
34078	ANTENNA CONN. LEAD	.10
34117	INPUT TRANSFORMER-625	2.25
34119	ELECT. COND.-(625)	3.75
34137	SPKR. SOCKET MTG. STUD	.10
34242	TONE CONTROL-625	.80
34252	TUBE SHIELD-6F6G TUBE	.10
34256	CONDENSER-3000 MMF.	.30
34306	'A' CHOKE	.10
34407	DUAL MICA COND.-500-500	.30
34435	CONDENSER-.02 MFD.	.35
34436	CONDENSER-.05 MFD.	.35
34437	CONDENSER-.10 MFD.	.35
34479	AMMETER CONN. LEAD	.05
34928	TUBE SHIELD SPRING	.02
34932	TUBE SHIELD SPRING	.02
35075	RESISTOR-560 OHMS	.15
35105	RESISTOR-33M OHMS	.20
35116	CONDENSER-4000 MMF.	.30
35170	PADDER CONDENSER	.45
35201	VIBRATOR GROUND RING	.05
35217	RESISTOR-3300 OHMS	.15
35304	POLARITY TERMINAL STRIP	.15
35305	VIBRATOR GROUND RING	.15
35312	VIBRATOR-625	5.50
35351	SPEAKER SOCKET-625	.20
35389	1ST I.F. COIL & SHIELD-614&618	1.75
35390	ELECTROLYTIC COND. 614&618	2.95
35398	BUFFER CONDENSER	.45
35406	ANTENNA COIL & SHIELD	2.00
35408	TRANSFORMER COVER, 614&618	.55
35418	RESISTOR-33M OHMS	.15
35421	VIBRATOR TRANSFORMER	3.25
35423	OUTPUT TRANSFORMER-625	2.75
35426	OUTPUT TRANSFORM.-614-618	1.75
35433	VIBRATOR-614 & 618	4.50
35438	CASE (NO COVERS) 614-618-625	1.80
35444	FRONT COVER (NO GRILL) 614	.90

auto Grunow Radio

CHASSIS TYPE 614

RECEIVER MODELS	SPEAKER
614	6GB1-1
618	8D1 OR 35808

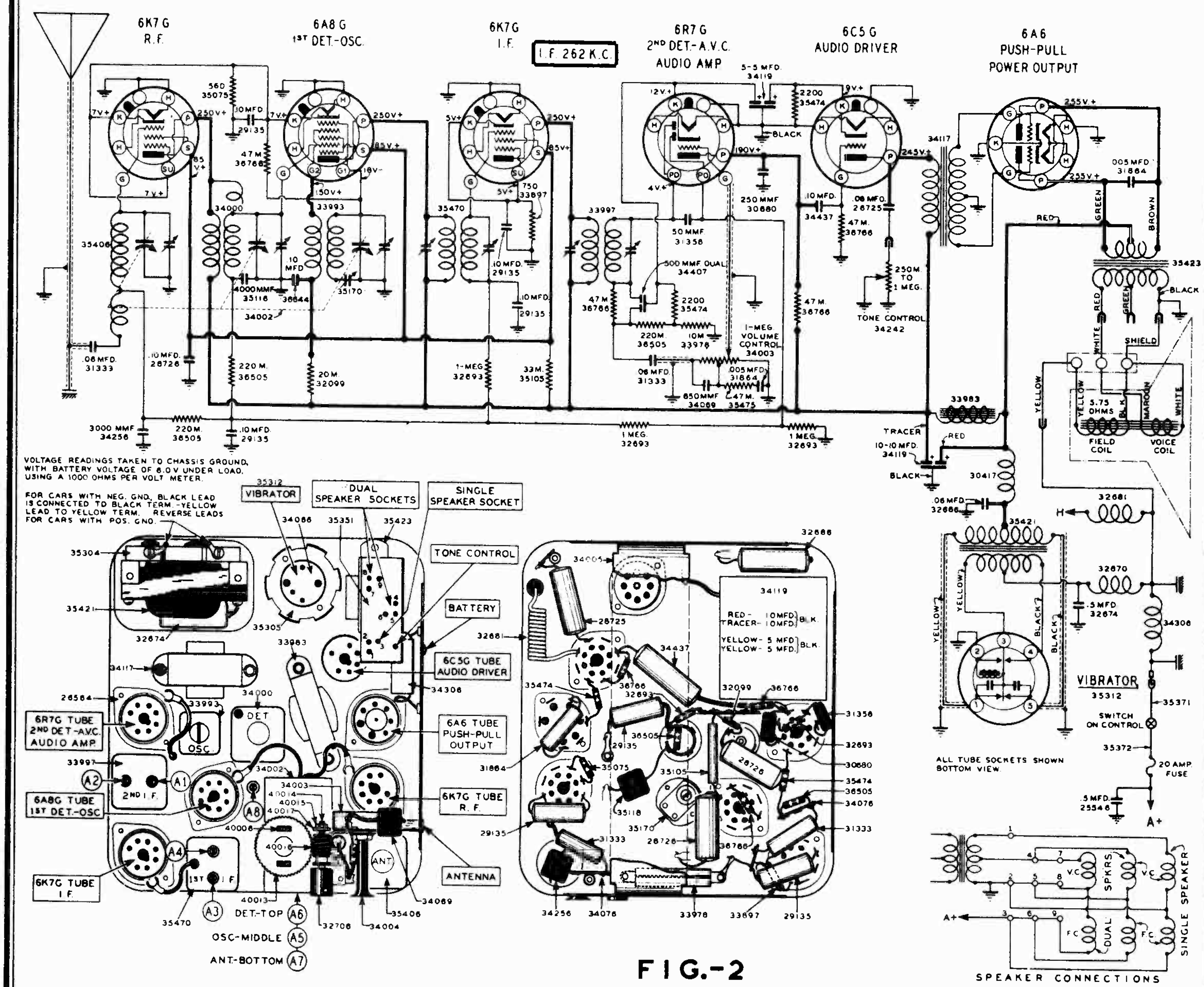
GENERAL HOUSEHOLD UTILITIES CO.
RADIO SERVICE DEPARTMENT
CHICAGO, U.S.A.

D.T. 5-5-36 RAS 153

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 625 Auto
Schematic, Parts
Socket, Trimmers
Voltage, Chassis

(PRICES SUBJECT TO CHANGE WITHOUT NOTICE)



VOLTAGE READINGS TAKEN TO CHASSIS GROUND, WITH BATTERY VOLTAGE OF 6.0 V UNDER LOAD, USING A 1000 OHMS PER VOLT METER.

FOR CARS WITH NEG. GND. BLACK LEAD IS CONNECTED TO BLACK TERM.-YELLOW LEAD TO YELLOW TERM. REVERSE LEADS FOR CARS WITH POS. GND.

FIG.-2

PARTS PRICE LIST

PART NO	DESCRIPTION	PRICE
35446	SCREEN GRILL	.50
35449	TONE CONTROL KNOB	.20
35450	TONE CONTROL LEAD	.15
35470	1ST I.F COIL & SHIELD - 625	2.20
35471	TRANSFORMER COVER - 625	.55
35474	RESISTOR - 2200 OHMS	.15
35481	FRONT COVER - 625	2.25
36198	FRONT COVER - 618	1.80
36202	SPKR. SOCKET - 614 & 618	.15
36225	TONE CONTROL SWITCH	.45
36505	RESISTOR - 220M OHMS	.15
36712	RESISTOR - 150 OHMS	.15
36766	RESISTOR - 47M OHMS	.15
36992	REAR COVER - 614, 618 & 625	.80
40006	GEAR TENSION SPRING	.05
40013	GEAR HUB	.25
40014	ADJ. BEARING SCREW	.10
40015	LOCKNUT	.05
40016	WORM	.50
40017	WORM BRACKET	.20

DASH SPEAKER PARTS

PART NO	DESCRIPTION	PRICE
28724	CONE DUST CAP	.10
34148	SPEAKER LESS CASE	7.00
34149	FIELD COIL	2.25
34171	CONE GASKET	.10
34234	TERMINAL STRIP	.10
[illegible]	[illegible] GRILL	.50
35354	CABLE & PLUG	1.00
35370	COVER MTG. BOLT	.02
35448	GRILL SCREEN	.50
35487	801 SPKR. WITH CASE	8.95
35490	SPEAKER CASE-LESS GRILL	1.35
35493	MOUNTING PARTS PKG.	.25
40007	CONE & VOICE COIL	1.00

OVERHEAD SPEAKER PARTS

PART NO	DESCRIPTION	PRICE
35355	CABLE & PLUG	1.35
35356	SPKR. MOUNTING BRACKET	.40
35823	SCREEN GUARD	.25
35808	SPEAKER & CASE COMPLETE	8.95
35800	SPEAKER ONLY-LESS CASE	6.50
35810	SPEAKER CASE COMPLETE	3.00
37898	MOUNTING PARTS PKG	.20
40042	CONE & VOICE COIL	1.75
40043	FIELD COIL	1.90

BUILT-IN SPEAKER PARTS

PART NO	DESCRIPTION	PRICE
34140	CABLE & PLUG	.25
35182	8GB1-1 SPEAKER COMPLETE	7.00
35190	FIELD COIL	1.25
35446	SCREEN GRILL	.50
35448	SPKR. BAFFLE PLATE	.25
36910	CONE & VOICE COIL	1.00
61255	SPKR. MTG. BOLTS	.02

CONTROL & ACCESSORY PARTS

PART NO	DESCRIPTION	PRICE
24759	GENERATOR CONDENSER	.50
25546	AMMETER CONDENSER	.45
34048	CHASSIS MTG. STUD	.05
35302	VOLUME CONTROL CABLE	1.50
35303	VARIABLE COND. CABLE	1.50
35371	CHASSIS 'A' CABLE	.25
35372	AMMETER FUSE CABLE	.40
35453	ACCESSORY PKG. COMPLETE	1.85
35454	MOUNTING PARTS PKG	.30
35455	DISTRIBUTOR SUPPRESSOR	.40
35456	CONTROL SWITCH-PILOT LAMP-AMMETER LEAD, ETC.	2.20
35460	CONTROL SWITCH ONLY	1.25
35461	PILOT LAMP & SOCKET	.80
35462	CONTROL HEAD PKG.	3.75
36161	KNURLED CABLE RET. NUT	.10
36162	DIAL WINDOW	.30
36163	POINTER SCREW	.02
36164	DIAL POINTER	.15
36165	DIAL CHART	.30
63321	1/4" X 20 HEX. NUT	.02
64335	LOCKWASHER	.05

Auto Grunow Radio
CHASSIS TYPE 625

RECEIVER MODEL	SPEAKERS
625	801 & 35808

GENERAL HOUSEHOLD UTILITIES CO.
RADIO SERVICE DEPARTMENT
CHICAGO. U.S.A.

DT 5-20-36 RAS 136

Grunow Radio

NOVEMBER, 1936
SERVICE DATA

Auto Radio Models 614 - 618 - 625

GENERAL

Model 614 is a single unit remote control superheterodyne receiver using the following tubes: 6K7-G R.F. Amplifier, 6A8-G 1st Det. and Oscillator, 6K7-G I.F. Amplifier, 6Q7-G 2nd Det. A.V.C. and Audio Amplifier, 6F6-G Power Output, 6X5-G Rectifier; Vibrator is a non-synchronous plug-in type.

Model 618 is a double unit, remote control superheterodyne receiver using the same tubes as Model 614, with a separate speaker, either a dash type (8D1) or an overhead speaker. The overhead speaker can also be installed on the back of the front seat.

Model 625 is a double unit, remote control suerheterodyne receiver with provision made for the addition of a second speaker (overhead type). This receiver uses the following tubes: 6K7-G R.F. Amp., 6A8-G 1st Det. and Osc., 6K7-G I.F. Amp., 6R7-G 2nd Det. — A.V.C. and Audio Amp., 6C5-G Audio Driver, 6A6 Push-Pull Power Output. Since this receiver uses a synchronous vibrator, make certain when installing, that polarity of receiver agrees with polarity of car. If it is necessary to reverse polarity, this may be done at the top of the vibrator transformer without removing chassis from its case (see Fig. 2).

CIRCUIT ALIGNMENT

If alignment is found necessary, make all adjustments with the chassis in its case and use a calibrated test oscillator and an output meter. Allow chassis and test oscillator to warm up before making any adjustments.

1. PEAKING I.F. STAGES AT 262 K.C.
   - (a) Connect the ground lead of the test-oscillator to the chassis frame. Connect a .10 mfd. condenser in series with the signal lead and connect this lead to the grid cap of the 6A7 tube (leave grid clip in place.)
   - (b) Set the test-oscillator to exactly 262 K.C.
   - (c) Turn the volume control of the receiver full on.
   - (d) Adjust the I.F. trimmers A1, A2, A3, A4. In order to insure accurate setting of these trimmers, the adjustments should be repeated using the lowest oscillator output that will give a reasonable deflection of the output meter pointer. Make all adjustments for maximum output.
2. ALIGNING GANG CONDENSER AT 1560 AND 1400 K.C.
   - (a) Connect the signal lead of the test-oscillator to the antenna connection of the chassis, substituting a 250 mmf. condenser for the .10 mfd. condenser. Turn the rotor plates of the gang condenser until they are *completely out of mesh.*
   - (b) Change the test-oscillator to 1560 K.C.
   - (c) Adjust the Osc. trimmer A5 *carefully* for maximum output.
   - (d) Change the test-oscillator to 1400 K.C.
   - (e) Turn the condenser rotor plates until the 1400 K.C. signal is tuned in at maximum.
   - (f) Adjust the Det. and Ant. trimmers A6 and A7 for maximum output. Do not disturb Osc. trimmer A5 as this is adjusted at 1560 K.C. only
3. ALIGNING AT 600 K.C.
   - (a) Change the test-oscillator to 600 K.C.
   - (b) Turn the condenser rotor plates until the 600 K.C. signal is tuned in at maximum.
   - (c) Adjust the antenna padding condenser A8 while rocking the condenser gang back and forth slightly until no further improvement in output can be obtained.
   - (d) It is well to return to 1400 K.C. and recheck at this frequency, then recheck 600 K.C. while rocking gang condenser.

Caution—On all of the above operations always use the lowest oscillator output that will give a reasonable deflection of the output meter in order to prevent the A.V.C. from levelling out the output as adjustments are made.

GRUNOW REMOTE CONTROL UNIT KITS

For Use on Grunow Auto Radio Models 614-618 and 625

Make and Year of Car	Kit No.	List Price	Description: Escutcheon	Description: Steering Post
ALL CARS	36100	$1.50		X
AUBURN				
1936-654	36145	2.00	X	
1936-852	36145	2.00	X	
1935 Models	36145	2.00	X	
Older Models	36100	1.50		X
BUICK				
1936-40	36111	2.00	X	
1936-60	36111	2.00	X	
1936-80	36111	2.00	X	
1936-90	36111	2.00	X	
Older Models	36100	1.50		X
CADILLAC				
1936-V8-60	36137	2.50	X	
1936-V8-70-75	36137	2.50	X	
1936-V12	36137	2.50	X	
1936-V16	36137	2.50	X	
1935	36139	2.50	X	
Older Models	36100	1.50		X
CHEVROLET				
1936 Standard	36103	1.50	X	
1936 Master	36103	1.50	X	
1935 Master	36103	1.50	X	
Older Models	36100	1.50		X
CHRYSLER				
1936 Airstream 6	36118	2.00	X	
1936 Airstream 8	36118	2.00	X	
1936 Airflow 8	36119	2.00	X	
1936 Imperial	36119	2.00	X	
1935 Airstream 6	36138	2.00	X	
1935 Airstream 8	36138	2.00	X	
1934 Models	36138	2.00	X	
Older Models	36100	1.50		X
CORD				
1936 8 Cyl.	36100	1.50		X
DE SOTO				
1936 Custom Airstream	36124	2.00	X	
1936 Airstream 6	36124	2.00	X	
1936 Airflow	36125	2.00	X	
1935 Airstream 8	36126	2.00	X	
1935 Airflow	36126	2.00	X	
Older Models	36100	1.50		X
DODGE				
1936	36106	2.00	X	
1935	36107	2.00	X	
1934	36107	2.00	X	
Older Models	36100	1.50		X
FORD				
1936 V-8 DeLuxe	36101	1.50	X	
1936 V-8 Standard	36101	1.50	X	
1935 V-8 Standard	36102	2.00	X	
1935 V-8 DeLuxe	36102	2.00	X	
1934 V-8 DeLuxe	36140	2.00	X	
Older Models	36100	1.50		X
GRAHAM				
1936-80	36100	1.50		X
1936-90	36100	1.50		X
1936-110	36100	1.50		X
1935 Models	36141	2.00	X	
Older Models	36100	1.50		X
HUDSON				
1936 Six Cyl.	36112	2.00	X	
1936 8 Cyl.	36112	2.00	X	
1935 Models	36113	2.00	X	
1934 Models	36113	2.00	X	
Older Models	36100	1.50		X
HUPMOBILE				
1936-618	36142	2.00	X	
1936-621	36142	2.00	X	
1936-35 Eight	36142	2.00	X	
1935 Models	36142	2.00	X	
1934 Models	36142	2.00	X	
Older Models	36100	1.50		X
LAFAYETTE				
1936	36128	2.00	X	
1935	36128	2.00	X	
Older Models	36100	1.50		X

Make and Year of Car	Kit No.	List Price	Description: Escutcheon	Description: Steering Post
LA SALLE				
1936 Models	36137	2.50	X	
1935 Models	36139	2.50	X	
Older Models	36100	1.50		X
LINCOLN				
1936-V-12	36109	1.50		X
Older Models	36100	1.50		X
Zephyr				
1936-V-12	36101	1.50	X	
NASH				
1936-400	36127	2.00	X	
1936 AMB 6	36127	2.00	X	
1936 AMB 8	36127	2.00	X	
1935 Models	36127	2.00	X	
Older Models	36100	1.50		X
OLDSMOBILE				
1936 Six Cyl.	36108	2.00	X	
1936 8 Cyl.	36108	2.00	X	
1935 Models	36109	2.00	X	
Older Models	36100	1.50		X
PACKARD				
1936-120B	36122	2.00	X	
1936-1400	36123	2.50	X	
1935-120	36122	2.00	X	
Older Models	36100	1.50		X
PIERCE-ARROW				
1936 Models	36100	1.50		X
Older Models	36100	1.50		X
PLYMOUTH				
1936 DeLuxe	36105	1.50	X	
1936 Standard	36136	1.50	X	
1935 DeLuxe	36104	2.00	X	
1935 Standard	36136	1.50	X	
1934 Models	36138	2.00	X	
Older Models	36100	1.50		X
PONTIAC				
1936 Master 6	36110	1.50	X	
1936 DeLuxe 6	36110	1.50	X	
1936 DeLuxe 8	36110	1.50	X	
1935 Models	36110	1.50	X	
Older Models	36100	1.50		X
REO				
1936 Fly. Cloud	36143	2.00	X	
1935 Models	36144	2.00	X	
Older Models	36100	1.50		X
STUDEBAKER				
1936 Dictator	36120	2.00	X	
1936 President	36121	2.00	X	
1935 Models	36136	2.00	X	
Older Models	36100	1.50		X
TERRAPLANE				
1936 Models	36114	2.00	X	
1936 Models	36115	2.00	X	
1934 Models	36115	2.00	X	
Older Models	36100	1.50		X
WILLYS				
1936-77	36100	1.50		X
1935-77	36100	1.50		X
Older Models	36100	1.50		X

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Grunow Twin-Type Auto Antenna

No. 35807

This Antenna is of the running board type, to be used with all Grunow Auto Receivers, on cars that do not have a built-in antenna, and cars of all steel or turret-top construction.

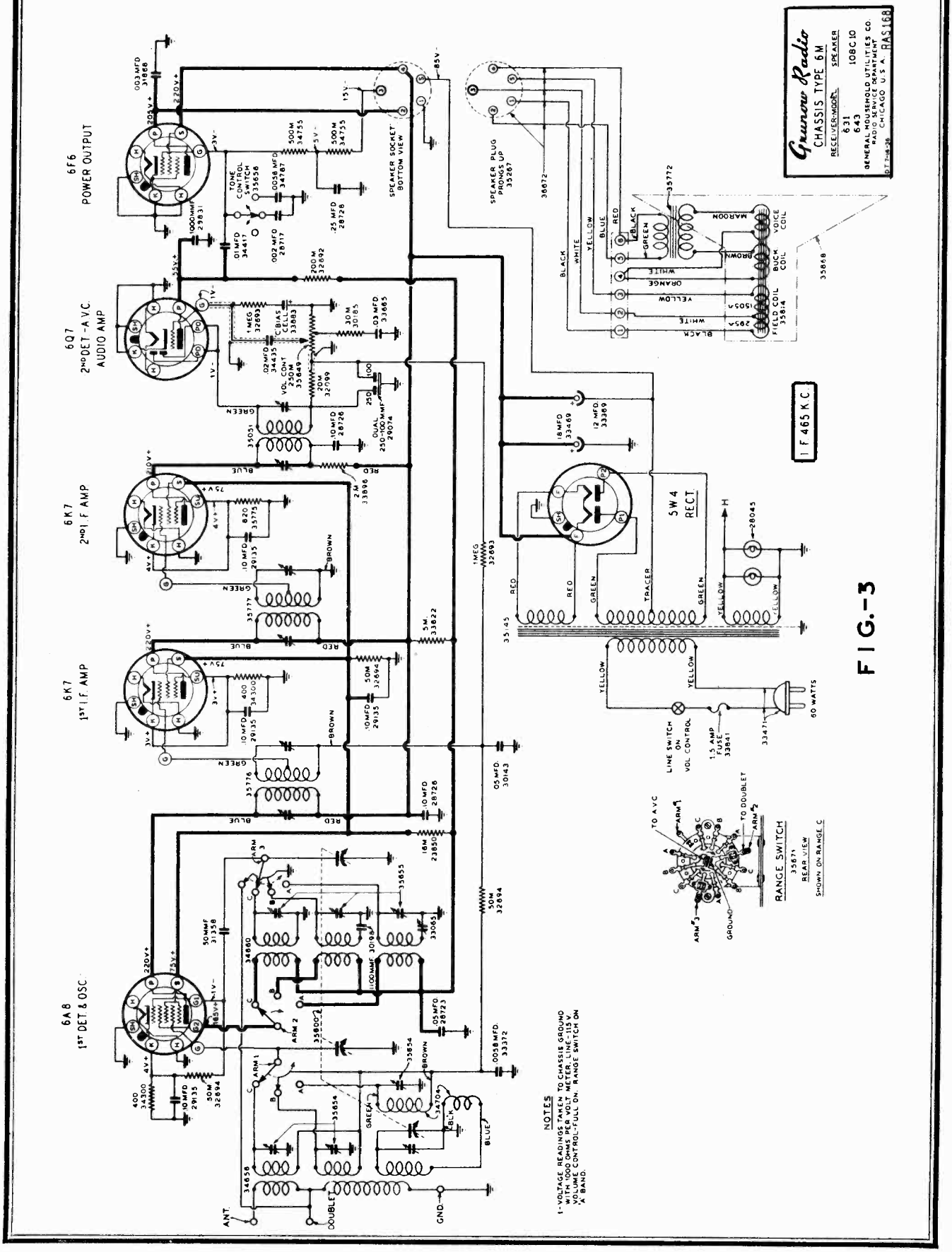
No. 35807 Grunow Auto Antenna....$4.00

NO. 35808-GRUNOW OVERHEAD SPEAKER COMPLETE..... 8.95 LIST

GENERAL HOUSEHOLD UTILITIES CO.

GENERAL HOUSEHOLD UTILITIES CO.

MODELS 631, 643
Chassis 6M
Schematic, Parts
Voltage



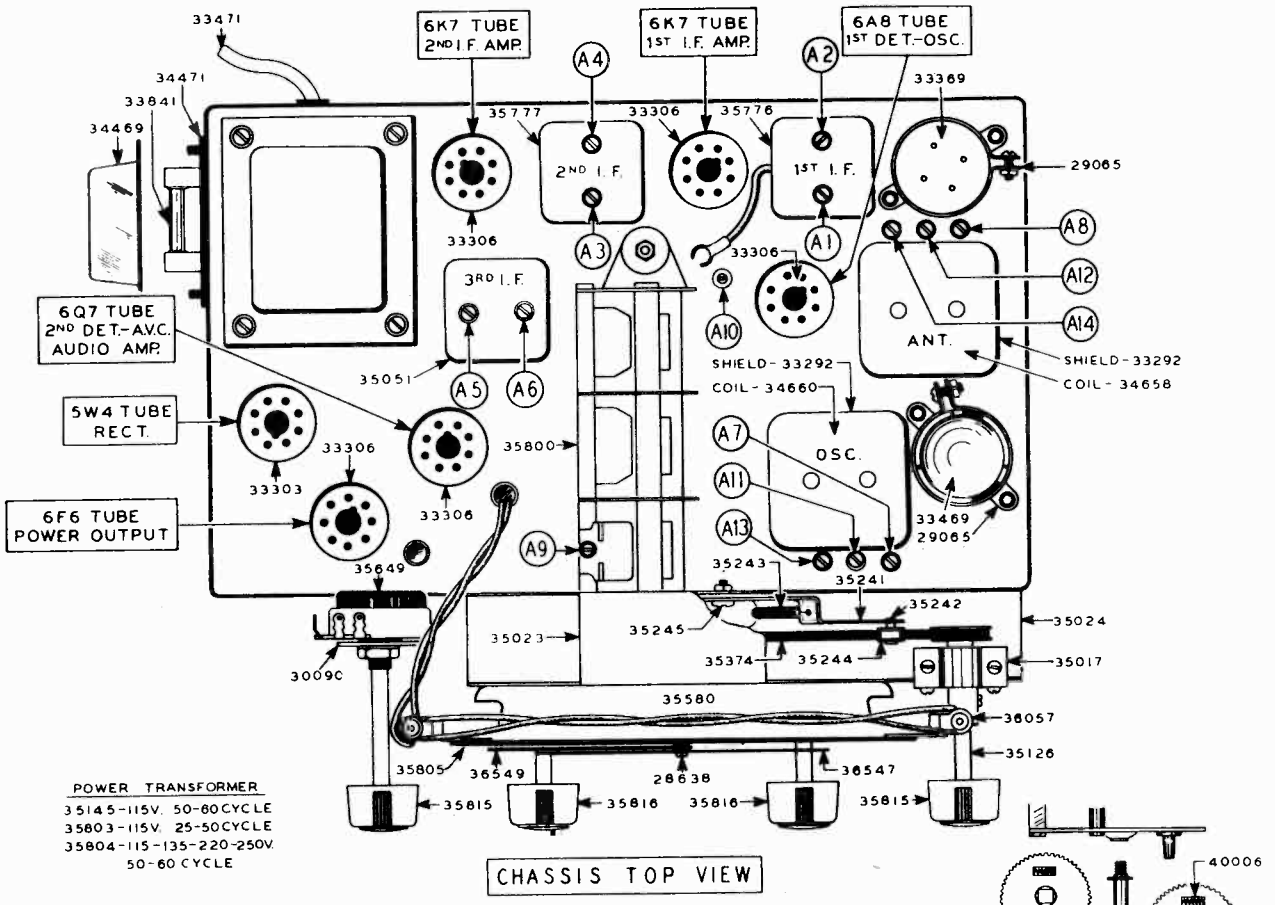
NOTES
1- VOLTAGE READINGS TAKEN TO CHASSIS GROUND WITH 1000 OHMS PER VOLT METER, LINE 115 V. VOLUME CONTROL-FULL ON. RANGE SWITCH ON 'A' BAND.

FIG.-3

MODELS 631,643
Socket,Trimmers
Chassis

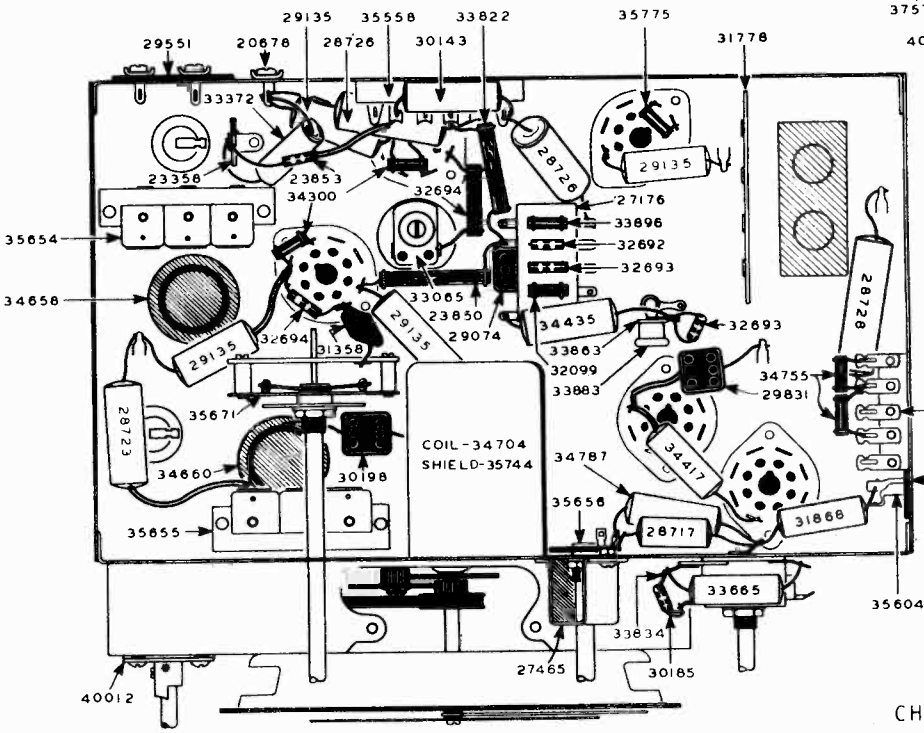
GENERAL HOUSEHOLD UTILITIES CO.

Chassis 6M



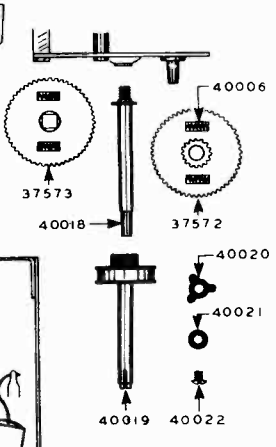
CHASSIS TOP VIEW

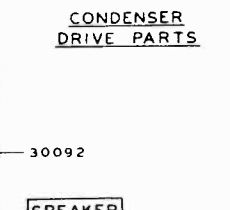
FIG.-1



CHASSIS BOTTOM VIEW

FIG.-2



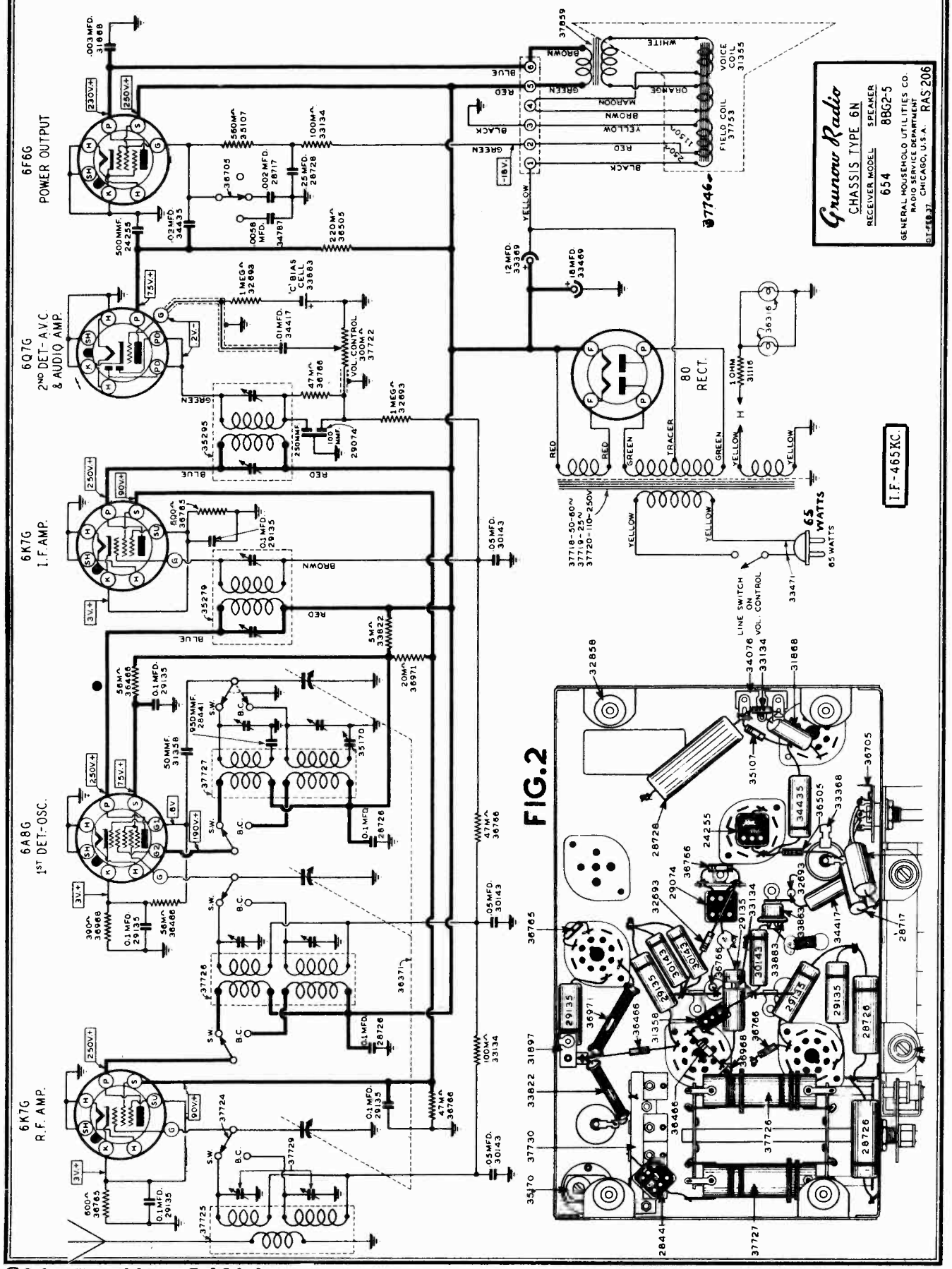


CHASSIS 6M
OCT. 1936
RAS 195

Schematic, Voltage Chassis

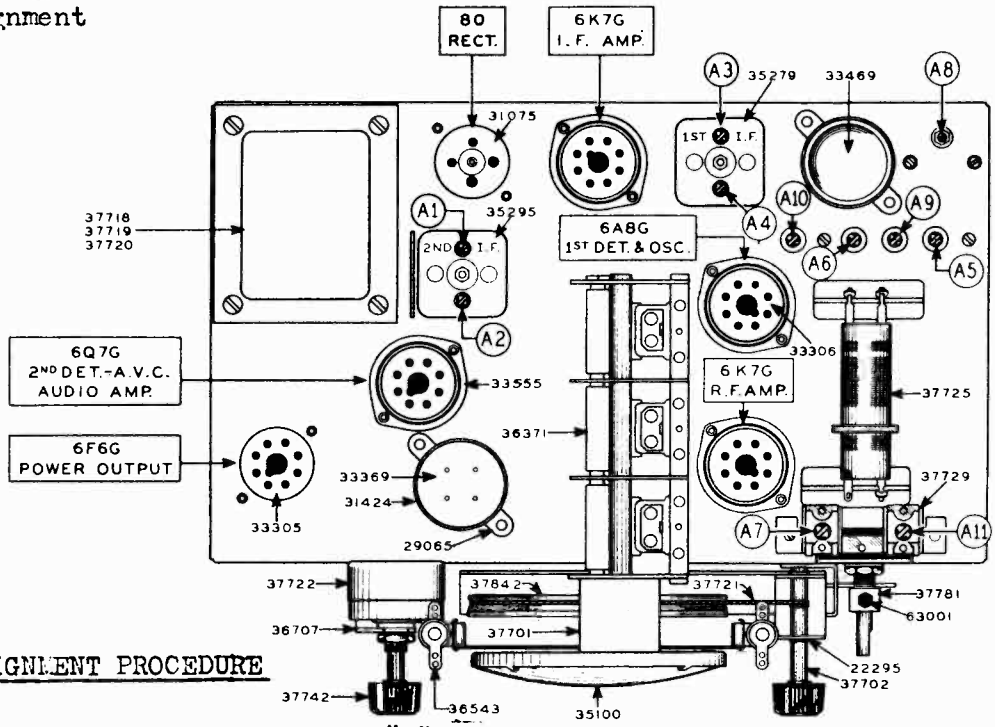
GENERAL HOUSEHOLD UTILITIES CO.

MODEL 654
Chassis 6N



MODEL 654
Chassis 6N
Socket, Trimmers
Alignment

GENERAL HOUSEHOLD UTILITIES CO.



ALIGNMENT PROCEDURE

This chassis utilizes a "C" bias cell in the control grid of the 6Q7 tube. To check the cell, a new one or a 1.5 volt battery must be substituted, as the cell voltage cannot be measured with an ordinary voltmeter due to its low current rating. When replacing the cell note that the carbon (+) side is connected to the ground side of the terminal clip.

ALIGNING I.F. STAGES AT 465 KC.

Connect the ground lead of the signal generator to the chassis sub-panel. Connect an .05 mfd. cond. in series with the signal lead and connect it to the grid clip of the 6A8 tube. Set sig. gen. at 465 KC and turn receiver volume full-on. Adjust I.F. trimmers A1, A2, A3 & A4 to maximum ouput. To insure accurate adjustment repeat the operation, using the lowest sig. gen. ouput that will give a readable deflection of the output meter.

DIAL CALIBRATION

With the condenser fully meshed the dial pointer should coincide with the horizontal line on the dial chart.

1400 KC. ALIGNMENT

Turn range switch knob to left. Connect a 200 mmf. condenser in series with the signal lead and connect the lead to the antenna wire. Set sig. gen. to 1400 KC. Turn condenser to 140 (1400) dial reading and adjust trimmers A5, A6 & A7 to maximum output.

600 KC. ALIGNMENT

Change sig. gen. to 600 KC. and tune in signal to maximum. (This point may not coincide exactly with 600 KC. dial reading) . Adjust the 600 Kc. padder A8 while rocking the condenser gang slowly in direction of signal increase until no further improvement in output can be obtained.

SHORT WAVE ALIGNMENT

Turn range switch knob to right. Remove 200 mmf. condenser from signal lead and connect a 400 ohm carbon resistor in its place. Change signal gen. to 6 mc. dial reading, adjust trimmers A9, A10 & A11 to maximum output.

Note:- On all of the above operations use the lowest sig. gen. output that will give a readable deflection of the output meter in order to prevent the A . V. C. from levelling the output as adjustments are made.

Schematic, Voltage, Parts

GENERAL HOUSEHOLD UTILITIES CO.

MODELS 723, 731, 733, 735
Chassis 7M

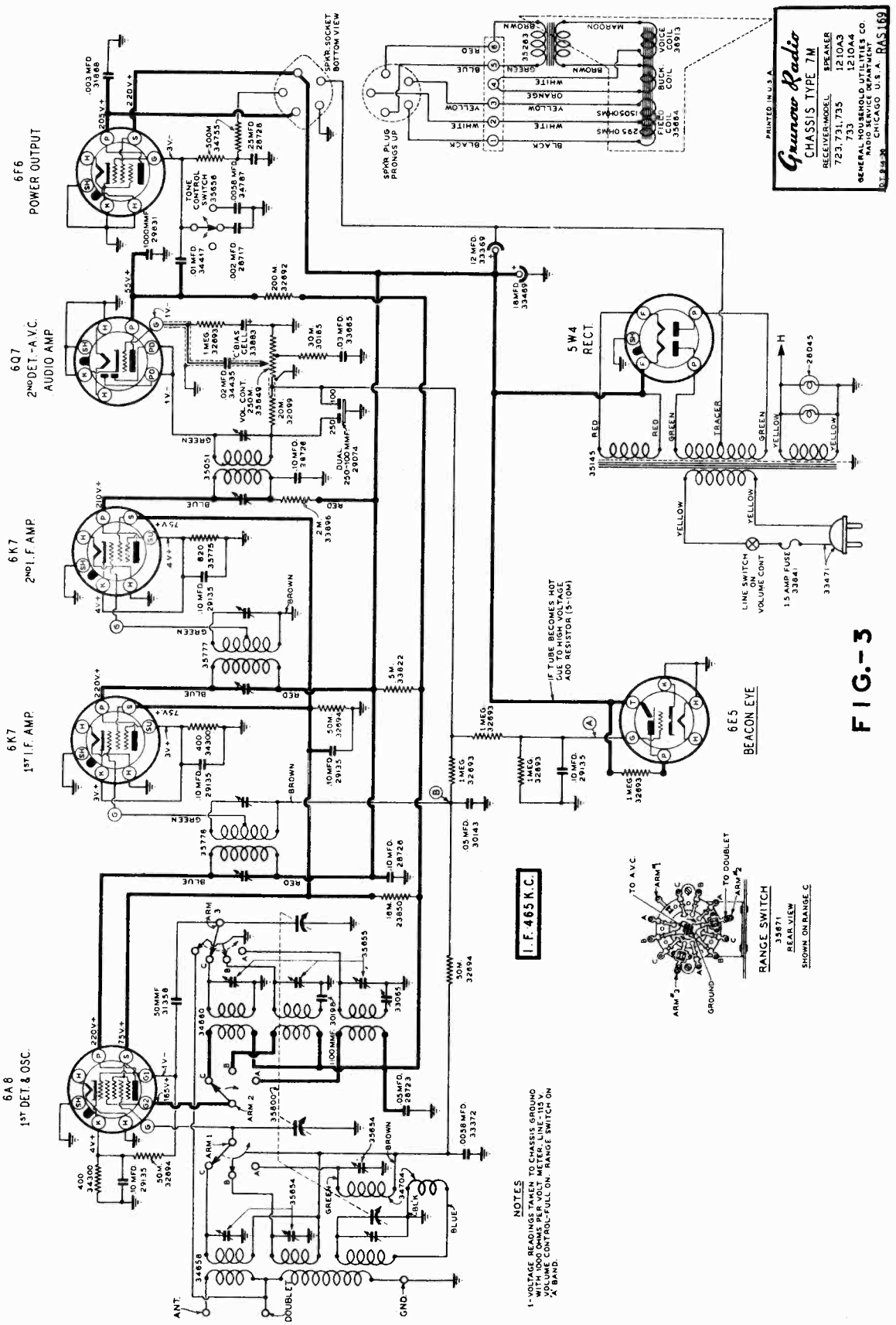


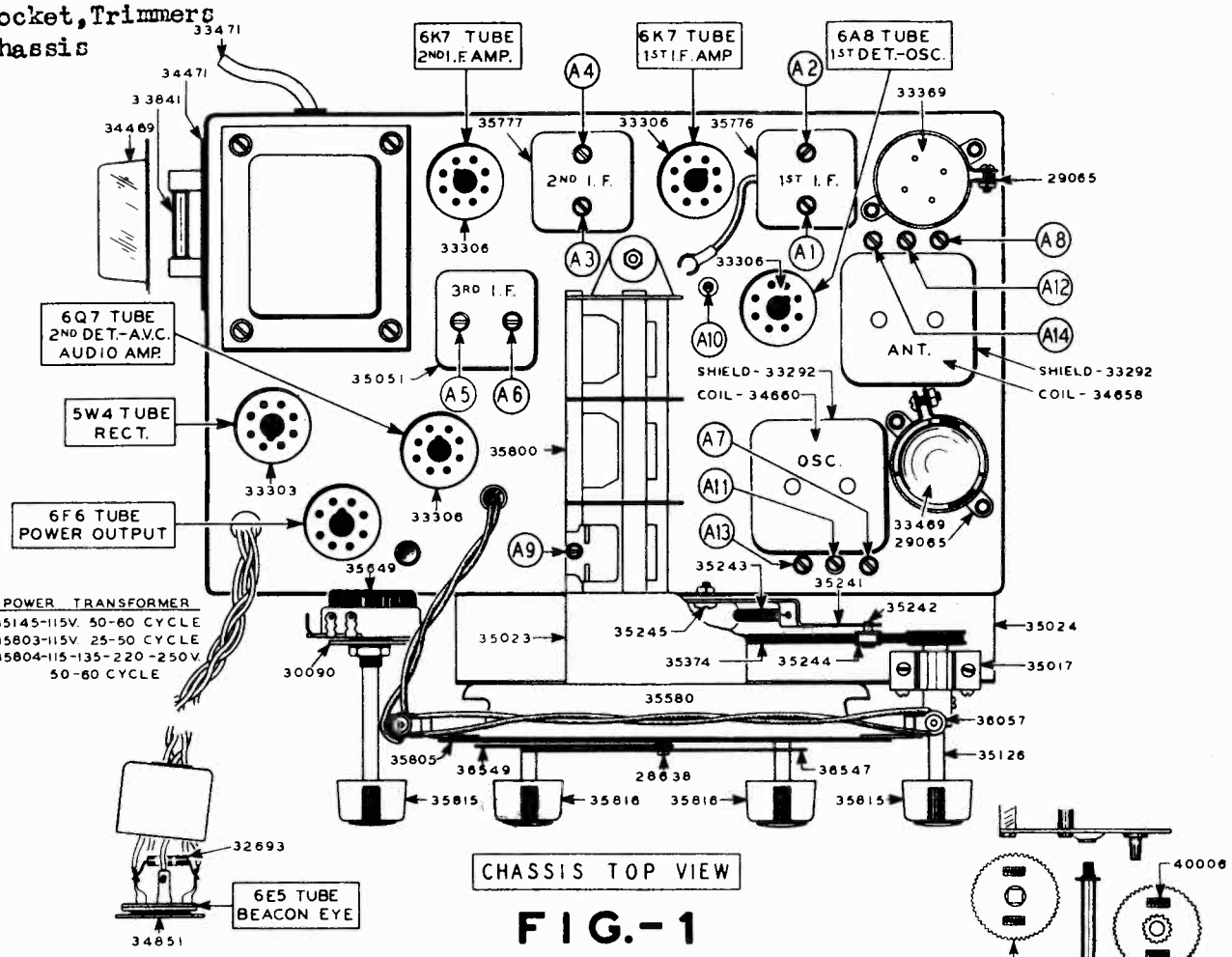
FIG.-3

NOTES
1- VOLTAGE READINGS TAKEN TO CHASSIS GROUND WITH 1000 OHMS PER VOLT METER, LINE 110V VOLUME CONTROL-FULL ON. RANGE SWITCH ON 'A' BAND.

MODELS 723,731
733,735
Socket, Trimmers
Chassis

GENERAL HOUSEHOLD UTILITIES CO.

Chassis 7M



CHASSIS TOP VIEW

FIG.-1

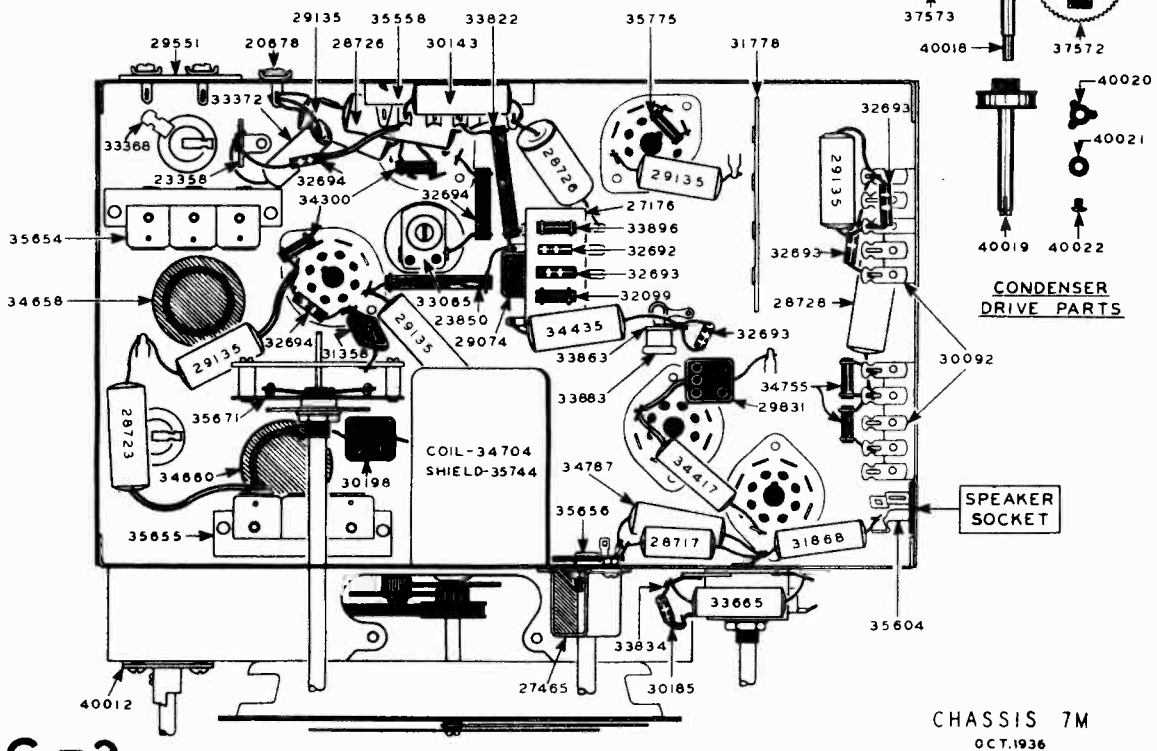


FIG.-2

CHASSIS BOTTOM VIEW

CHASSIS 7M
OCT. 1936
RAS 196

Grunow Radio

OCTOBER, 1936
SERVICE DATA

Chassis Type 6M
Receiver Model 631-643

The Grunow Chassis 6M is a six tube, three band superheterodyne receiver, using 1-6A8 1st Detector and Oscillator, 1-6K7 1st I. F. Amplifier, 1-6K7 2nd I. F. Amplifier, 1-6Q7 2nd Detector, A. V. C. and Audio Amplifier, 1-6F6 Power Output, and 1-5W4 Rectifier. The tuning range is divided into three divisions or bands covering from 550 K. C. to 1750 K. C. on the "A" or Broadcast Band, 1750 K. C. to 5.5 M. C. on the "B" or Police Amateur Band and 5.5 M. C. to 18.2 M. C. on the "C" or Foreign Broadcast Band.

SERVICE DATA

CONTINUITY AND VOLTAGE

Tube sockets on the schematic diagram (Fig. 3) are shown bottom view, each element being in its actual position in respect to the guide pin. The voltage measurements shown are average and were taken with a line voltage of 115 V., the volume control "full on" and the range switch in position "A" using a 1000 ohms per volt meter.

REPAIRS

When servicing this chassis it is IMPERATIVE that the service man make all parts replacements in EXACTLY the same way as the original part was located and connected. This applies particularly to ground points. All parts replacements in the R. F. end of the circuit must be exact duplicates of the originals, especially so in the case of coils, R. F. by-pass or coupling condensers. Any repairs in the R. F. circuit will make a complete realignment of the tuned circuit necessary.

BIAS CELL

This Chassis uses a "C" bias cell unit in the control grid of the 6Q7 tube. This type bias cell has an exceedingly long life but occasionally may have to be replaced. When replacing the cell note that the carbon or (+) side is connected to the ground side of all terminal clips. To check the bias cell a new cell or a 1½ volt battery must be substituted, as the cell voltage cannot be measured with an ordinary voltmeter due to its low current rating.

CIRCUIT ALIGNMENT EQUIPMENT

Do not attempt to align the 6M Chassis without the equipment specified below:

1. Signal Generator—A modulated oscillator capable of delivering signals from 465 K.C. to 18.2 M.C.

2. Alignment Tool—A non-metallic screw driver.

3. Dummy Antenna — .05 Mfd. Condenser (I. F. Alignment); 200 Mmfd. Condenser (Broadcast Alignment); 400 Ohm Carbon Resistor (Short Wave Alignment).

4. Output Meter—A meter of sufficient sensitivity to give a good deflection at very low signal input.

Note: The receiver should be aligned in a location free from local interference. A screen room is recommended.

CIRCUIT ALIGNMENT PROCEDURE

1. HEATING

(A) Allow the receiver to heat up for a period of 20 to 30 minutes. This is necessary in order to eliminate possible alignment variations due to the thermal expansion and contraction of the capacitors and inductances.

(B) Allow the signal generator to warm up in order to prevent frequency drift during alignment.

2. DIAL CALIBRATION

Turn the condenser until the plates are fully meshed, set the pointer (Hour Hand) to 9 and 3 on the outer edge of dial chart. Set the vernier pointer (Minute Hand) to the line pointing to 12.

3. SIGNAL GENERATOR ADJUSTMENT.

During the entire alignment procedure the signal input from the generator to the receiver must be continually attenuated at the generator as the various trimmers are brought into resonance. This is necessary in order to hold the signal at the lowest intensity so that the A. V. C. Circuit will remain at the most sensitive point.

4. I. F. ALIGNMENT

(A) Set the generator to 465 K.C. and connect the output lead to the control grid of the 6A8 tube through the .05 Mfd. dummy and the generator ground to the chassis ground post.

(B) Set the receiver dial pointer to 600 K.C., the range switch to position "A" and turn the volume control full on.

(C) Connect the output meter across the two primary terminals on the output transformer.

(D) Adjust the I. F. Trimmers A1, A2. A3, A4, A5, and A6 to maximum output.

5. 1500 K.C. ALIGNMENT

(A) Set the generator to 1500 K.C. and connect the output to the antenna post on the chassis through the 200 Mmfd. dummy.

(B) Set the receiver dial pointer to 1500 K.C.

(C) Adjust the trimmers (A7) Oscillator, (A8) Detector and (A9) Antenna to maximum output.

6. 600 K.C. ALIGNMENT

(A) Set generator to 600 K.C.

(B) Set receiver dial pointer to 600 K.C.

(C) Turn trimmer (A10) in direction of signal increase and at the same time rock tuning condenser slowly back and forth through resonance until the exact resonant point on both is obtained.

7. 5 M.C. ALIGNMENT

(A) Set generator to 5 M.C.

(B) Set receiver range switch to position "B" and dial pointer to 5 M.C.

(C) Adjust trimmer (A11) Oscillator and (A12) Antenna to maximum output.

8. 18 M.C. ALIGNMENT

(A) Set generator to 18 M.C. and connect the output to the chassis Antenna post through the 400 Ohm dummy.

(B) Set the receiver range switch to position "C" and the dial pointer to 18 M.C.

(C) Screw the Oscillator trimmer (A13) down tight and back off until signal is heard, then rock the tuning condenser slowly back and forth through resonance until exact resonant point is determined.

(D) Adjust Antenna trimmer (A14) to maximum output

(E) Readjust Oscillator trimmer(A13) to maximum output.

OCTOBER, 1936
SERVICE DATA

Chassis Type 7M
Receiver Model 723, 731, 733, 735
Speaker Type 1210A3-1210A4

The Grunow Chassis 7M is a seven tube, three band superheterodyne receiver using 1-6E5 Beacon Eye tuning indicator, 1-6A8 1st Detector and Oscillator, 1-6K7 1st I. F. Amplifier, 1-6K7 2nd I. F. Amplifier, 1-6Q7 2nd Detector, A. V. C. and Audio Amplifier, 1-6F6 Power Output and 1-5W4 Rectifier. The tuning range is divided into three divisions or bands covering from 550 K.C. to 1750 K.C. on "A" Broadcast Band, 1750 K.C. to 5.5 M.C. on the "B" Police Amateur Band, and 5.5 M.C. to 18.2 M.C. on the "C" Foreign Broadcast Band.

SERVICE DATA

CONTINUITY AND VOLTAGE

Tube sockets on the schematic diagram (Fig. 3) are shown bottom view, each element being in its actual position in respect to the guide pin. The voltage measurements shown are average and were taken with a line voltage of 115 V., the volume control "full on" and the range switch in position "A" using a 1000 ohms per volt meter.

REPAIRS

When servicing this chassis it is IMPERATIVE that the service man make all parts replacements in EXACTLY the same way as the original part was located and connected. This applies particularly to ground points. All parts replacements in the R.F. end of the circuit must be exact duplicates of the originals, especially so in the case of coils, R.F. by-pass or coupling condensers. Any repairs in the R.F. circuit will make a complete realignment of the tuned circuit necessary.

BIAS CELL

This Chassis uses a "C" bias cell unit in the control grid of the 6Q7 tube. This type bias cell has an exceedingly long life, but occasionally may have to be replaced. When replacing the cell, note that the carbon or (+) side is connected to the ground side of cell terminal clip. To check the bias cell, a new cell or a 1½ volt battery must be substituted, as the cell voltage cannot be measured with an ordinary voltmeter due to its low current rating.

BEACON EYE SENSITIVITY ADJUSTMENTS

The 6E5 Beacon Eye tube is designed to give the best results with the proper size antenna. However, where a full sized antenna cannot be erected or an inside antenna must be used, a type 6G5 Beacon Eye Tube can be substituted by making the following changes in the wiring of the circuit:

Refer to schematic diagram Fig. 3 and disconnect the "Green" grid wire at point "A" and connect to point "B". This change can be made quickly and will give a maximum sensitivity on the weaker signals.

CIRCUIT ALIGNMENT EQUIPMENT — Do not attempt to align the 7M Chassis without the equipment specified below:

1. Signal Generator—A modulated oscillator capable of delivering signals from 465 K.C. to 18.2 M.C.

2. Alignment Tool—A non-metallic screw driver.

3. Dummy Antenna — .05 Mfd. Condenser (I. F. Alignment); 200 Mmfd. Condenser (Broadcast Alignment); 400 Ohm Carbon Resistor (Short Wave Alignment).

4. Output Meter—A meter of sufficient sensitivity to give a good deflection at very low signal input.

Note: The receiver should be aligned in a location free from local interference. A screen room is recommended.

CIRCUIT ALIGNMENT PROCEDURE

1. HEATING

(A) Allow the receiver to heat up for a period of 20 to 30 minutes. This is necessary in order to eliminate possible alignment variations due to the thermal expansion and contraction of the capacitors and inductances.

(B) Allow the signal generator to warm up in order to prevent frequency drift during alignment.

2. DIAL CALIBRATION

Turn the condenser until the plates are fully meshed, set the pointer (Hour Hand) to 9 and 3 on the outer edge of dial chart. Set the vernier pointer (Minute Hand) to the line pointing to 12.

3. SIGNAL GENERATOR ADJUSTMENT

During the entire alignment procedure the signal input from the generator to the receiver must be continually attenuated at the generator as the various trimmers are brought into resonance. This is necessary in order to hold the signal at the lowest intensity so that the A. V. C. Circuit will remain at the most sensitive point.

4. I. F. ALIGNMENT

(A) Set the generator to 465 K.C. and connect the output lead to the control grid of the 6A8 tube through the .05 Mfd. dummy and the generator ground to the chassis ground post.

(B) Set the receiver dial pointer to 600 K.C. the range switch to position "A" and turn the volume control full on.

(C) Connect the output meter across the two primary terminals on the output transformer.

(D) Adjust the I. F. Trimmers A1, A2, A3, A4, A5, and A6 to maximum output.

5. 1500 K.C. ALIGNMENT

(A) Set the generator to 1500 K.C. and connect the output to the antenna post on the chassis through the 200 Mmfd. dummy.

(B) Set the receiver dial pointer to 1500 K.C.

(C) Adjust the trimmers (A7) Oscillator, (A8) Detector and (A9) Antenna to maximum output.

6. 600 K.C. ALIGNMENT

(A) Set generator to 600 K.C.

(B) Set receiver dial pointer to 600 K.C.

(C) Turn trimmer (A10) in direction of signal increase and at the same time rock tuning condenser slowly back and forth through resonance until the exact resonant point on both is obtained.

7. 5 M.C. ALIGNMENT

(A) Set generator to 5 M.C.

(B) Set receiver range switch to position "B" and dial pointer to 5 M.C.

(C) Adjust trimmer (A11) Oscillator and (A12) Antenna to maximum output.

8. 18 M.C. ALIGNMENT

(A) Set generator to 18 M.C. and connect the output to the chassis Antenna post through the 400 Ohm dummy.

(B) Set the receiver range switch to position "C" and the dial pointer to 18 M.C.

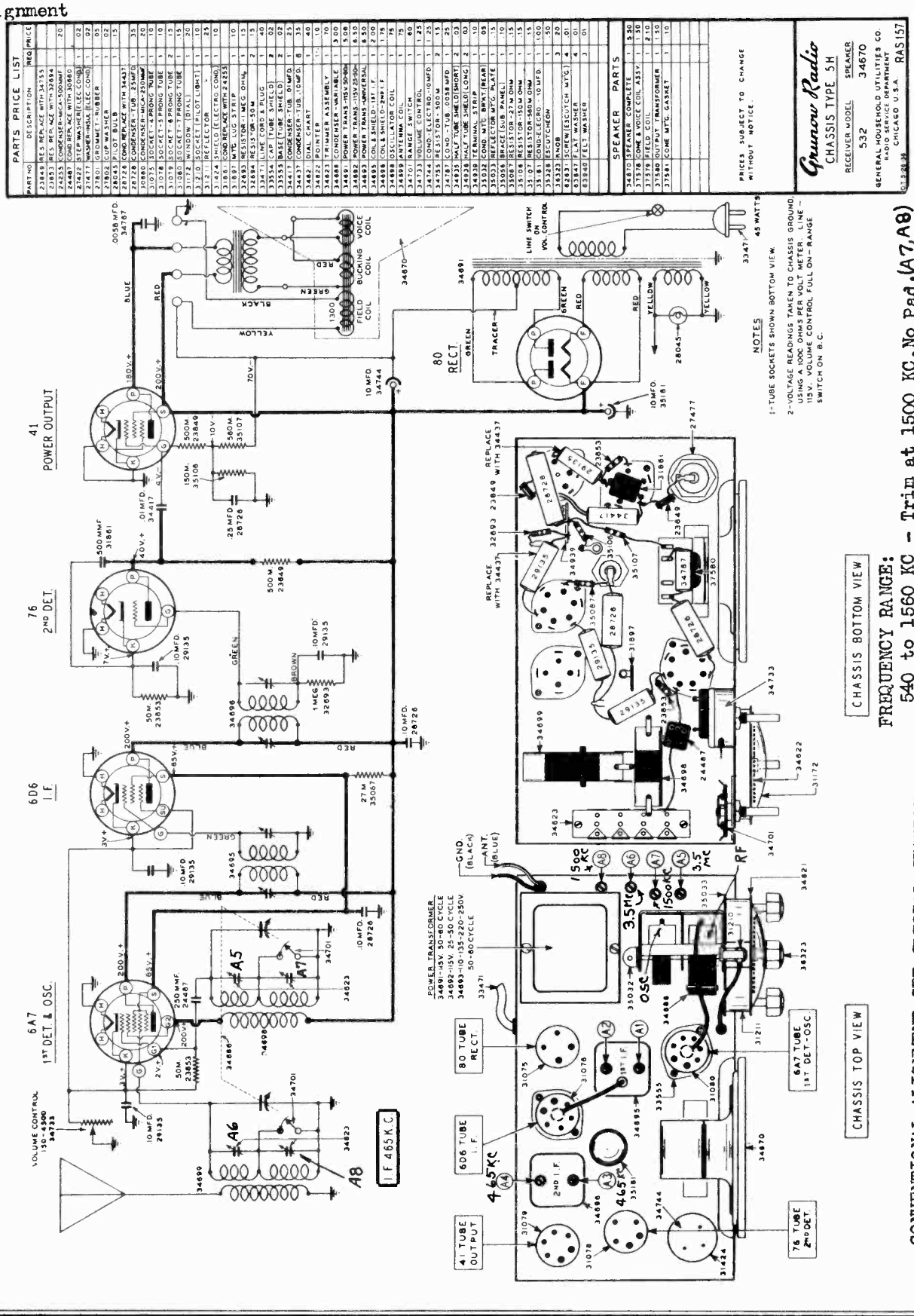
(C) Screw the Oscillator trimmer (A13) down tight and back off until signal is heard, then rock the tuning condenser slowly back and forth through resonance until exact resonant point is determined.

(D) Adjust Antenna trimmer (A14) to maximum output.

(E) Readjust Oscillator trimmer(A13) to maximum output.

MODEL 532
Chassis 5H
Schematic, Voltage
Parts, Chassis
Socket, Trimmers
Alignment

GENERAL HOUSEHOLD UTILITIES CO.



MODEL 711
Chassis 7NB
Schematic, Parts
Voltage

GENERAL HOUSEHOLD UTILITIES CO.

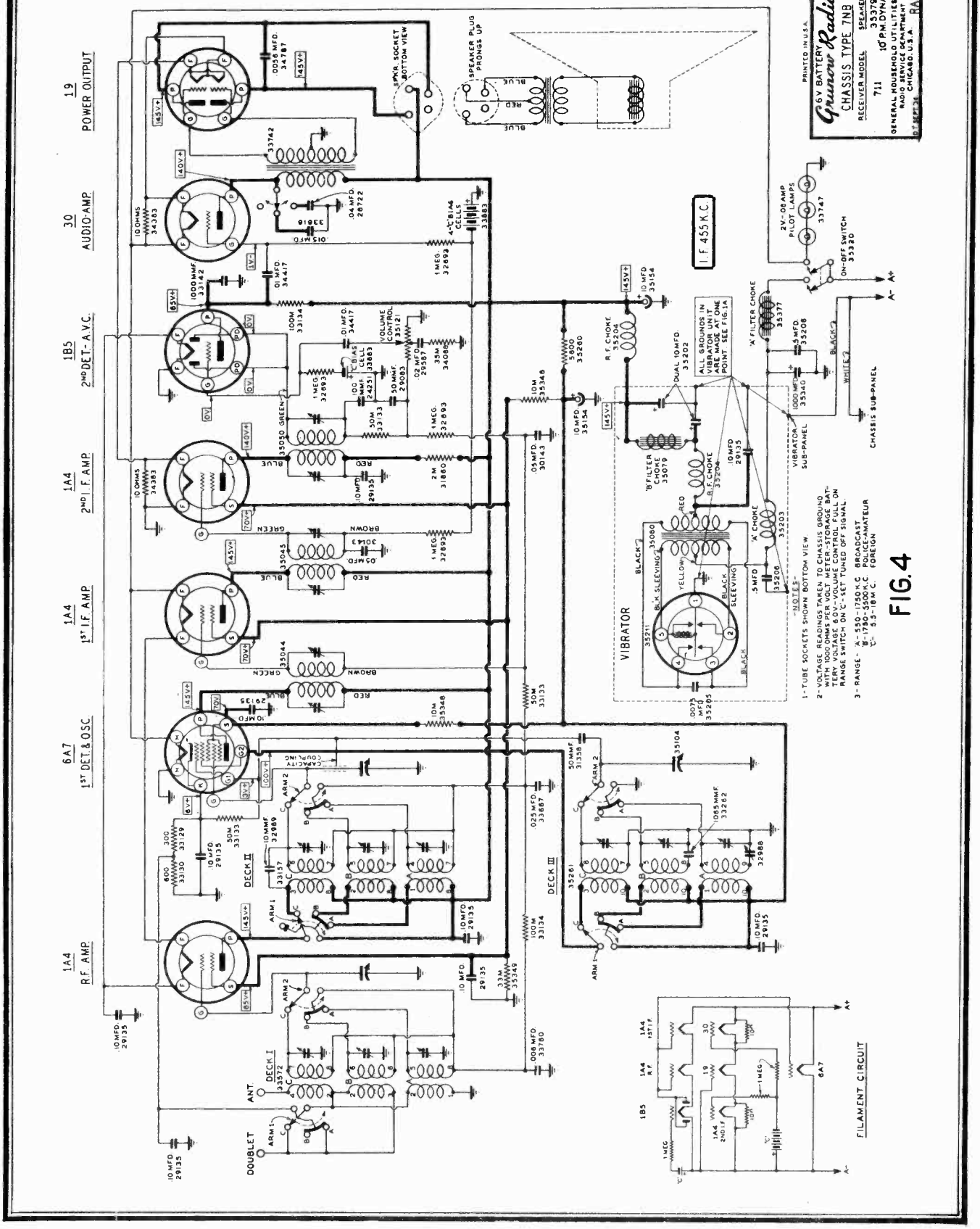
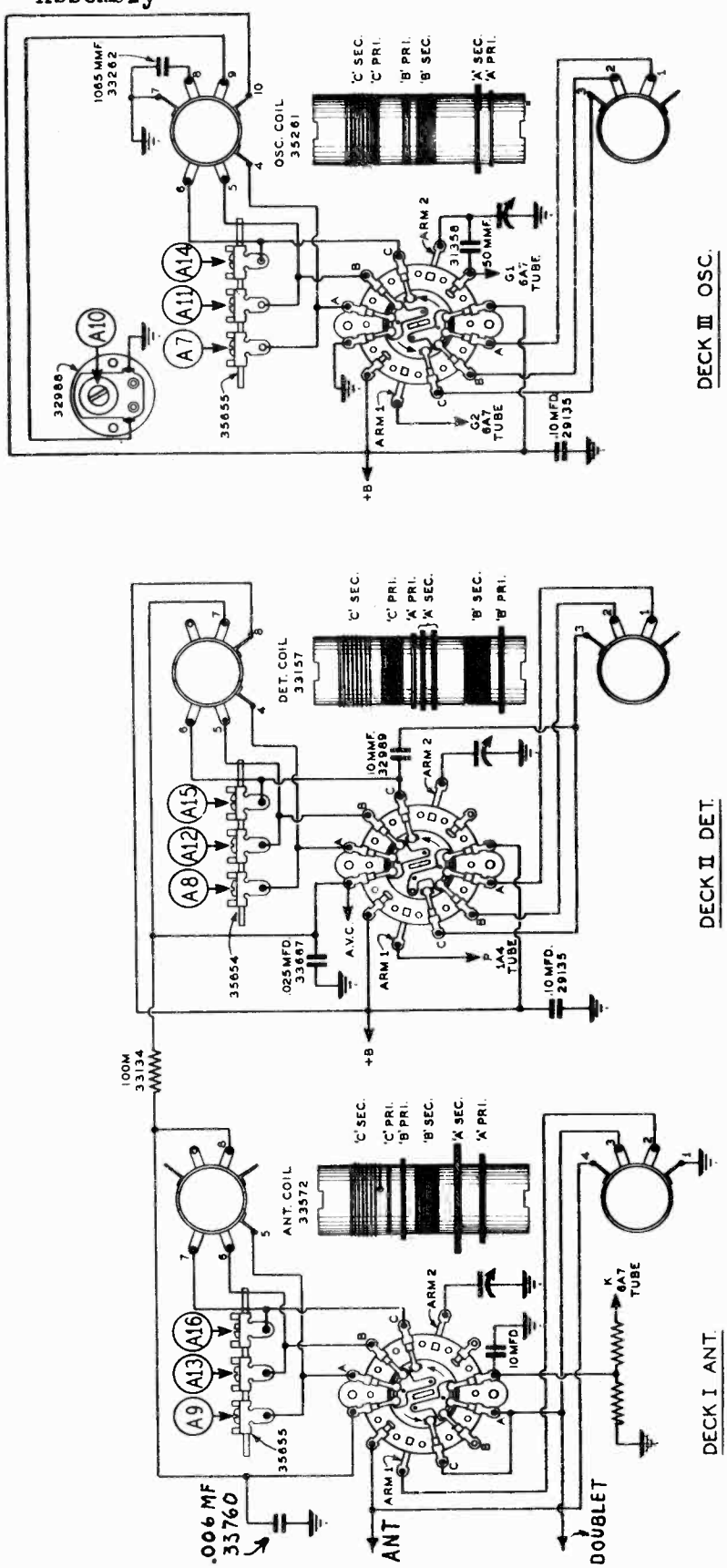


FIG. 4

MODEL 711
Chassis 7NB
Switch and Coil Assembly

GENERAL HOUSEHOLD UTILITIES CO.



THE NUMBERS ON THE COIL LUGS CORRESPOND TO THOSE ON SCHEMATIC DIAGRAM, FIG. 4

SCHEMATIC DIAGRAM RANGE SWITCH & COIL ASSEMBLY

7NB

FIG. 3

RAS 190

9-T SEPT 9, 1936.

MODEL 711
Chassis 7NB
Socket, Trimmers
Chassis, Vibrator

GENERAL HOUSEHOLD UTILITIES CO.

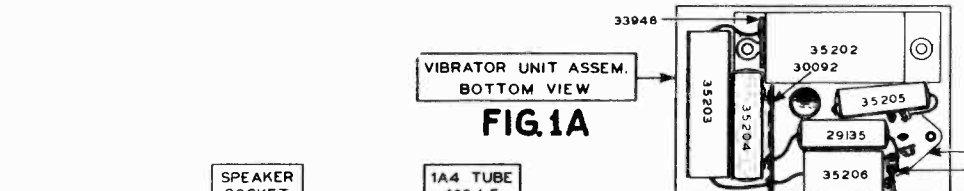


FIG. 1A

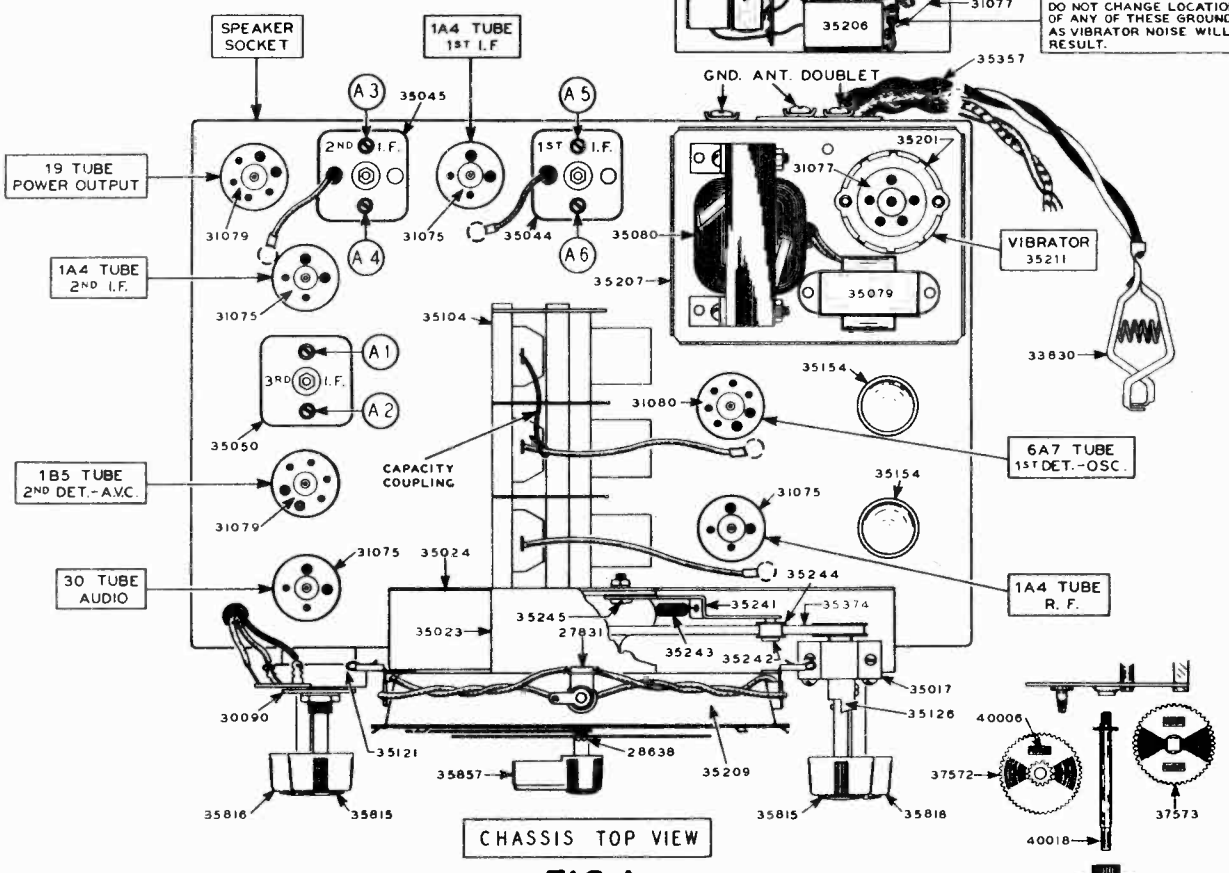


FIG. 1

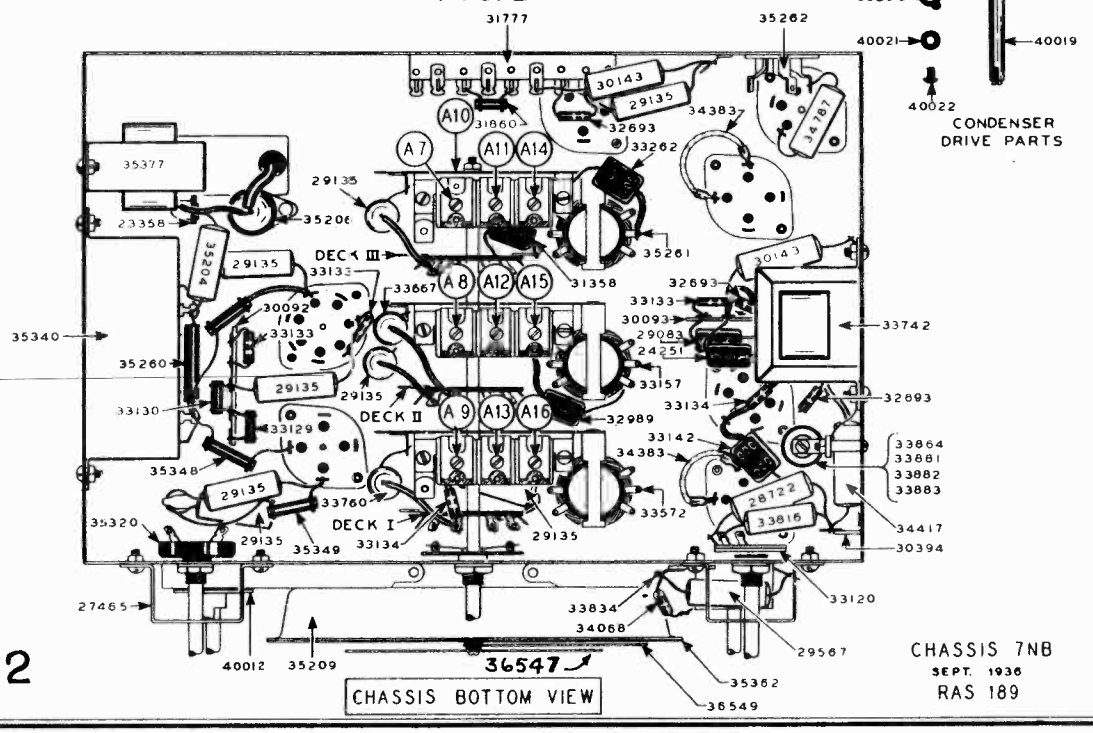


FIG. 2

CHASSIS 7NB
SEPT. 1936
RAS 189

Grunow Radio

SEPTEMBER, 1936

SERVICE NOTES

Chassis Type 7NB
Receiver Model 711
Speaker Type 10" P.M. Dynamic

SERVICE DATA

The GRUNOW 7 NB Chassis is a seven tube superheterodyne receiver, with a vibrator type power supply designed to operate from a 6 volt battery. The major features are three Tuning Ranges, covering Standard Broadcast, Police, Amateur, and Foreign Broadcast bands, A.V.C., a Full Face "Band Spread" Dial and the new Permo-Flux Speaker.

The three tuning ranges of the receiver cover, First, the Standard Broadcast Band (A) from 550 K.C. to 1750 K.C.; Second, the Police Amateur Band (B) from 1750 K.C. to 5500 K.C.; and Third, the Foreign Reception Band (C) from 5.5 M.C. to 18 M.C.

CONTINUITY AND VOLTAGE

Continuity and voltage measurements should be taken from the underside of the chassis. The values shown on the schematic diagram are based on an average and allow the service man to make a quick check of the chassis constants. All tube connections and sockets are shown on the schematic diagram as viewed from the bottom.

RANGE SWITCH

The Range Switch is a three deck multipole low contact resistance switch, used to connect the various coils into their proper circuits, and is designed to entirely isolate the coils, which are not in use, by grounding them. This method makes it possible for the receiver to operate on each of the three tuning ranges at a maximum sensitivity and selectivity.

The Range Switch and Coil Assembly is shown schematically (Fig. 3) with each section and the proper connections to the coil drawn separately so as to enable the service man to check or make necessary repairs with ease. All connection number designations are duplicated on the chassis schematic (Fig. 4).

POWER SUPPLY UNIT

The Power or "B" voltage in this receiver is the popular six volt vibrator type which eliminates the use of "B" batteries and the vibrator is the "plug in" type ordinarily used in automobile receivers. The electrical layout and vibrator socket connections are shown schematically in Fig. 4. UNDER NO CONDITIONS SHALL THE COMMON GROUND POINT BE CHANGED IN THIS UNIT.

BIAS CELLS

The 7 NB Chassis uses "C" bias cell units in both the Detector A.V.C. and Audio Amplification Circuits, one in the Grid of the 1B5 tube and four in the Grid of the 30 tube.

These cells may have to be replaced occasionally, and when doing so, note that the carbon or (+) side is connected to the ground side of the cell terminal clip.

An indication of a faulty cell will be distorted tone quality. This may be checked by the substitution of new cells in place of the old, or for testing purposes a "C" battery may be used—using a 1½ volt tap for a single cell or 4½ volts for the 4 unit cell.

This bias cell has a voltage of 1½ volts, but due to its low current output it cannot be measured by any ordinary volt meter.

REPAIRS

When servicing this chassis it is IMPERATIVE that the service man make all parts replacements in EXACTLY the same way as the original part was connected and located. This applies particularly to all ground points.

All parts replacements in the R.F. end of the circuit must be exact duplicates of the originals, especially so in the case of R.F. Bypass, or Coupling Condensers.

Any repairs in the R.F. circuit will make a complete realignment of the entire tuned circuit necessary.

ALIGNMENT PROCEDURE

Do not attempt to align the 7 NB Chassis without the proper equipment as the calibration, selectivity and sensitivity absolutely depend upon the conformance to the following instructions.

Alignment trimmer screws are plainly shown in the accompanying illustrations and are numbered in the order of procedure.

1. EQUIPMENT:

(A) Test Oscillator.
A modulated oscillator capable of producing signals at the I.F., Broadcast and Short-Wave frequencies.

(B) Insulated Screw Driver—(All bakelite or fibre) about 6" long.

(C) Output Meter.
A meter of sufficient sensitivity to provide a good deflection at low signal strength.

(D) Dummy Antenna.
.05 mfd. condenser (I.F. Alignment).
200 mmfd. condenser (Broadcast Alignment).
400 Ohm carbon resistor (18 M.C. Alignment).

(E) The receiver should be aligned in a location as free from local interference as possible, as static disturbances will cause difficulties in aligning the Short-Wave section. A screen room is recommended in order to obtain the best results.

2. CALIBRATION OF THE DIAL:

Turn tuning knob until condensers are fully meshed. The dial pointer (Hour Hand) at this position must be set on the horizontal line of the dial, pointing to 9 and 3 o'clock.

The Band Spreading Pointer (Minute Hand) must be set to the vertical position, pointing to 12 o'clock.

3. Connect the chassis to a fully charged storage battery and allow the set to heat up for 20 to 30 minutes. This heating period is necessary in order to allow all coils and condensers to reach their normal temperatures so that when the alignment is complete, there will be no inductance or capacity changes due to thermal expansion or contraction.

Note: The above also applies to the oscillator.

4. I.F. ALIGNMENT:

(A) Connect signal lead of the oscillator to the control grid of the 6A7 First Detector Tube through a .05 mfd. condenser. Connect the oscillator ground to the chassis ground post.

(B) Set the dial pointer to 1400 K.C. and the range switch at position "A" (Standard Broadcast). Turn the volume control to maximum and tone control to high.

(C) Set the oscillator to 455 K.C. and adjust the signal to as low a value as can be read efficiently on the output meter.

(D) Adjust the I.F. Trimmers in sequence of numbering (1-2-3-4-5-6) until the maximum signal with the lowest input is obtained.

The signal input must be kept as low as possible in order to prevent any A.V.C. action in the receiver.

5. 1400 K.C. ALIGNMENT:

(A) Set Oscillator to 1400 K.C.

(B) Turn dial pointer to 1400 K.C. and range switch to position "A" (Broadcast Band).

(C) Adjust Broadcast Oscillator Trimmer, (A7) Fig. 2, to maximum output.

(D) Adjust Detector Trimmer, (A8) Fig. 2, to maximum output.

(E) Adjust Antenna Trimmer, (A9) Fig. 2, to maximum output.

6. 600 K.C. ALIGNMENT:

(A) Set oscillator to 600 K.C.

(B) Set chassis dial pointer to 600 K.C.

(C) Adjust the 600 K.C. padding condenser, (A10) Fig. 2, in the direction of signal increase, at the same time rock the tuning condenser back and forth slowly so as to determine the exact point of greatest output.

7. Recheck the 1400 K.C. alignment (Operation 5.) This is necessary because the change in the capacity of the 600 K.C. padder may have slightly unbalanced the 1400 K.C. alignment.

8. 5000 K.C. ALIGNMENT:

(A) Set oscillator to 5000 K.C.

(B) Set the Range Switch to position "B" (Police Amateur Band).

(C) Set the dial pointer to 5000 K.C.

(D) Adjust the Oscillator Trimmer, (A11) Fig. 2, to maximum output.

(E) Adjust the Detector Trimmer, (A12) Fig. 2, to maximum output.

(F) Adjust Antenna Trimmer, (A13) Fig. 2, to maximum output.

9. 18 MEGACYCLE ALIGNMENT:

(A) Set oscillator to 18 M.C. and connect the output lead to the chassis Antenna post through a 400 ohm resistor.

(B) Set Range Switch on position "B" (Foreign Reception band).

(C) Set the dial pointer to 18 M.C.

(D) Adjust the Oscillator Trimmer, (A14) Fig. 2, to maximum output.

(E) Adjust the Detector Trimmer, (A15) Fig. 2, to maximum output.

(F) Adjust the Antenna Trimmer, (A16) Fig. 2, to maximum output.

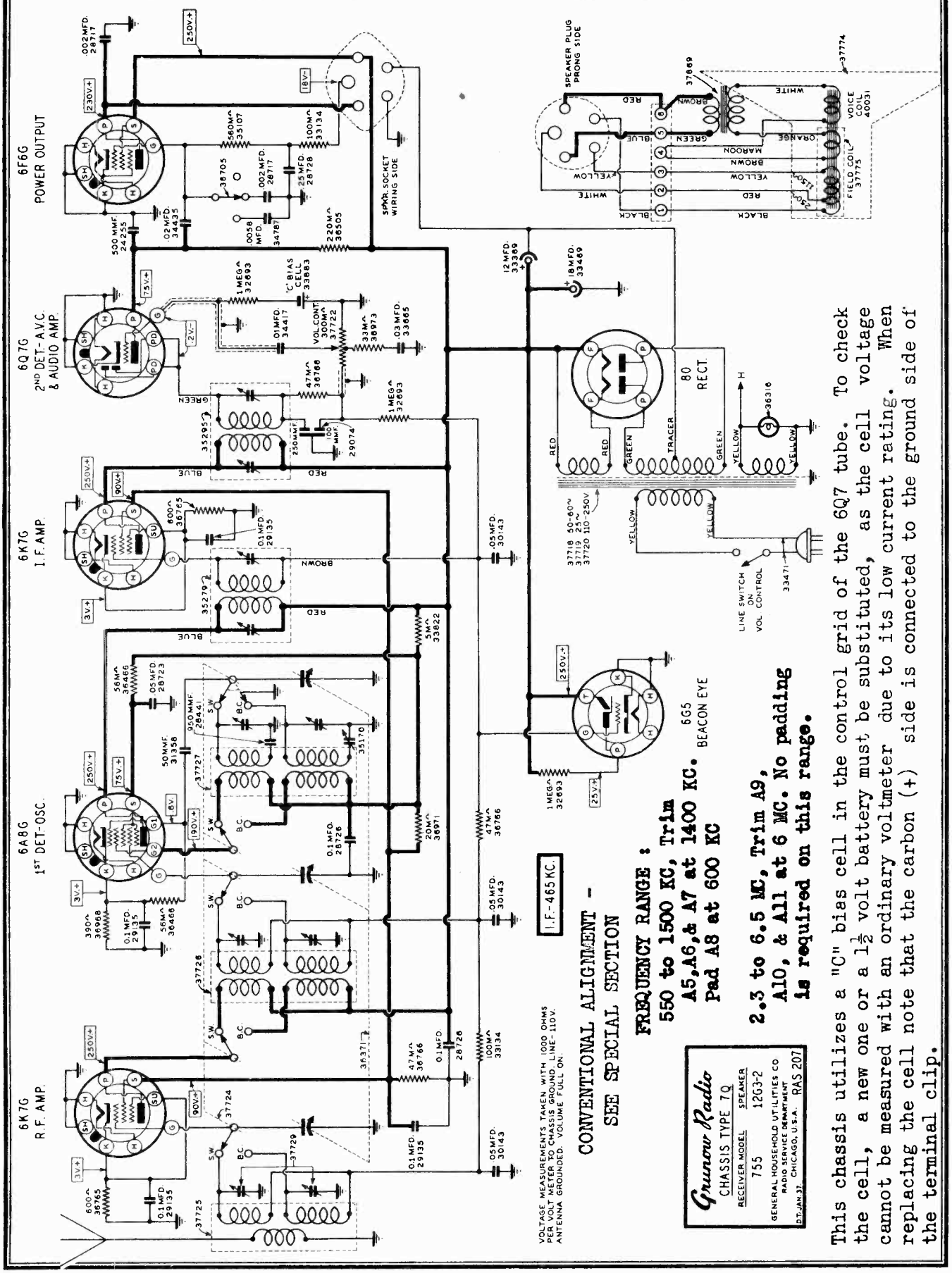
Note: When adjusting the 18 M.C. Oscillator Trimmer, screw down tightly and then back off until signal is heard.

To obtain the utmost sensitivity on the 18 M.C. Band, it is necessary, when adjusting the Detector Trimmer (A15), to rock the tuning condenser slowly through resonance until the point of maximum output is determined. Return to the Oscillator Trimmer and make any necessary re-adjustment.

Schematic, Voltage
Parts, Alignment

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 755
Chassis 7Q



This chassis utilizes a "C" bias cell in the control grid of the 6Q7 tube. To check the cell, a new one or a 1½ volt battery must be substituted, as the cell voltage cannot be measured with an ordinary voltmeter due to its low current rating. When replacing the cell note that the carbon (+) side is connected to the ground side of the terminal clip.

MODEL 755
Chassis 7Q
Socket, Trimmers
Chassis

GENERAL HOUSEHOLD UTILITIES CO.

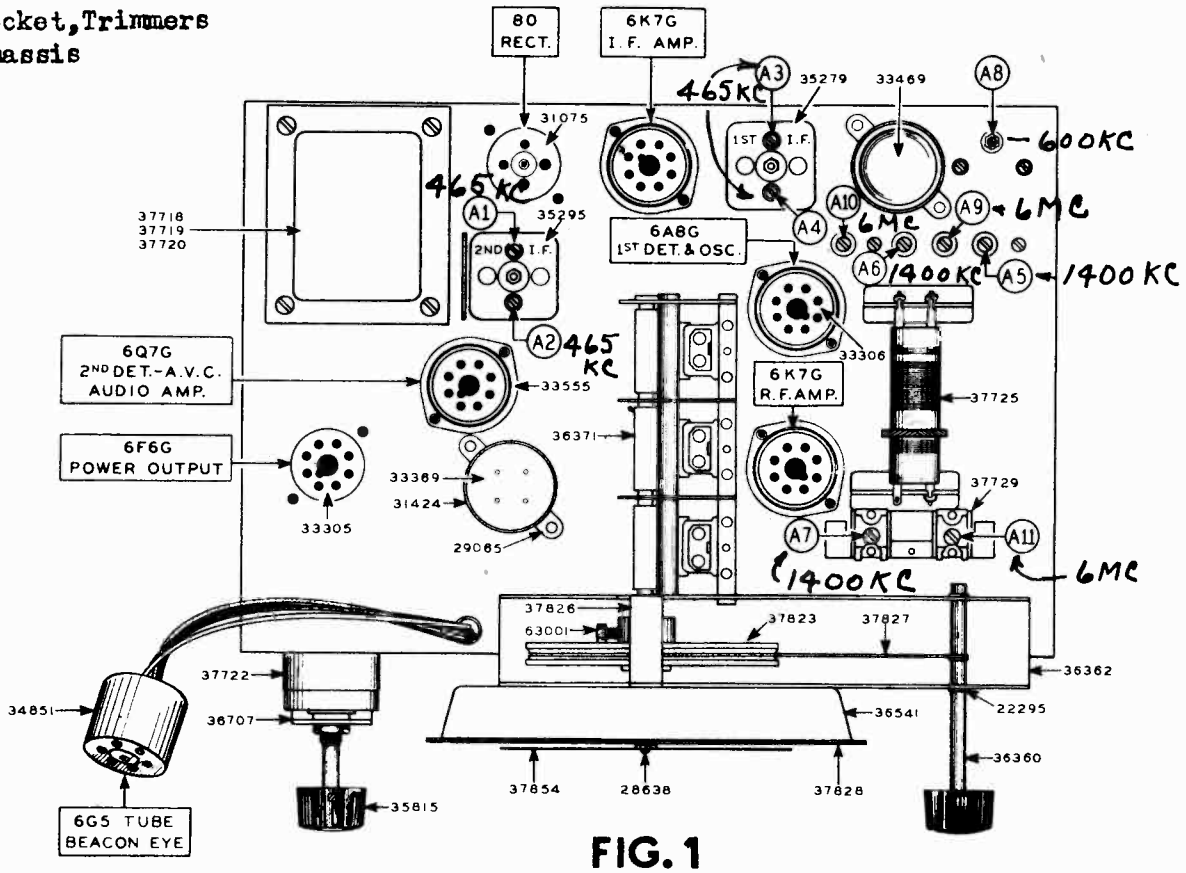


FIG. 1

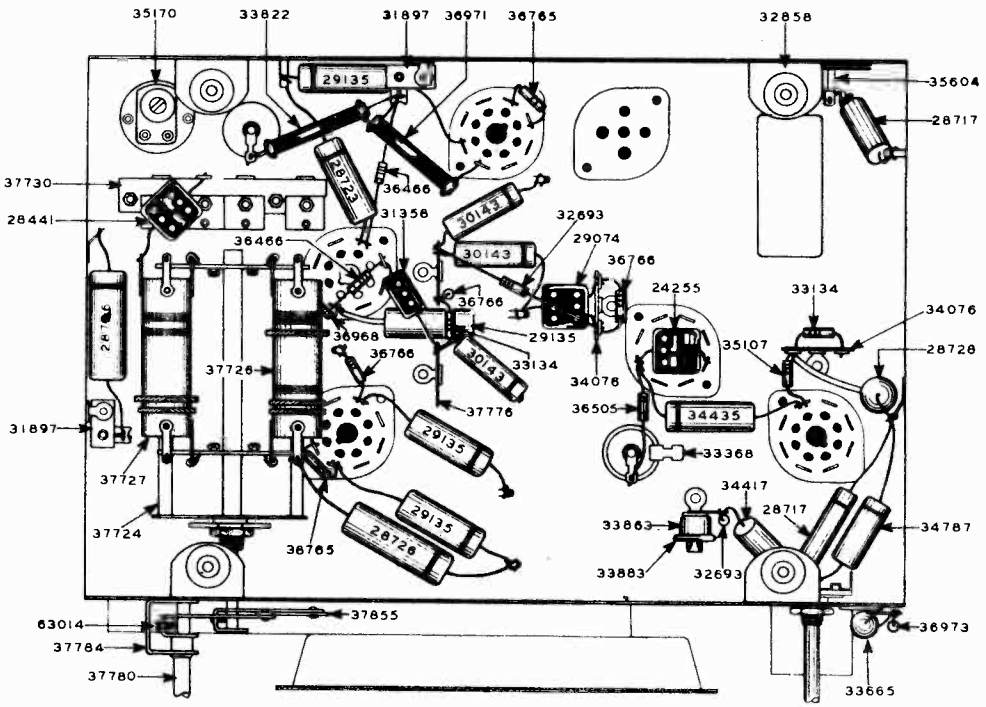


FIG. 2

CHASSIS TYPE 7Q

Schematic, Voltage, Parts

GENERAL HOUSEHOLD UTILITIES CO.

MODELS 823, 831, 833, 835
Chassis 8H

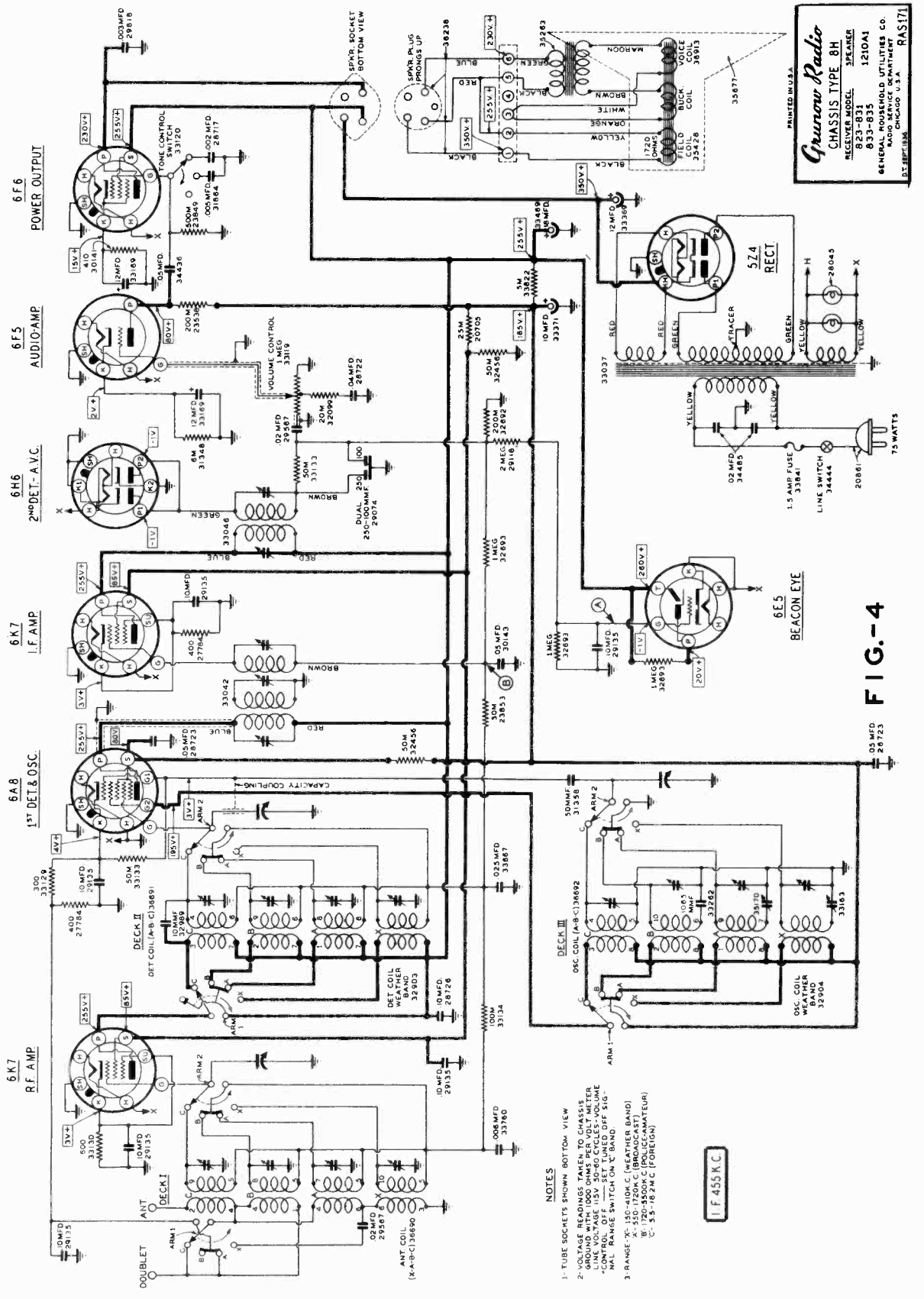


FIG. 4

NOTES

1 - TUBE SOCKETS SHOWN BOTTOM VIEW

2 - VOLTAGE READINGS TAKEN TO CHASSIS GROUND WITH 1000 OHMS PER VOLT METER LINE VOLTAGE 115V 50-60 CYCLES - VOLUME CONTROL OFF - SET TUNED OFF SIGNAL - RANGE SWITCH ON 'C' BAND

3 - RANGE - 'A' - 130-410K.C. (WEATHER BAND)
'A' - 550-1720K.C. (BROADCAST)
'B' - 1715-5500K.C. (SHORT WAVE AMATEUR)
'C' - 5.5-18.2M.C. (FOREIGN)

MODELS 823, 831
833, 835

GENERAL HOUSEHOLD UTILITIES CO.

Chassis 8H
Socket, Trimmers
Chassis

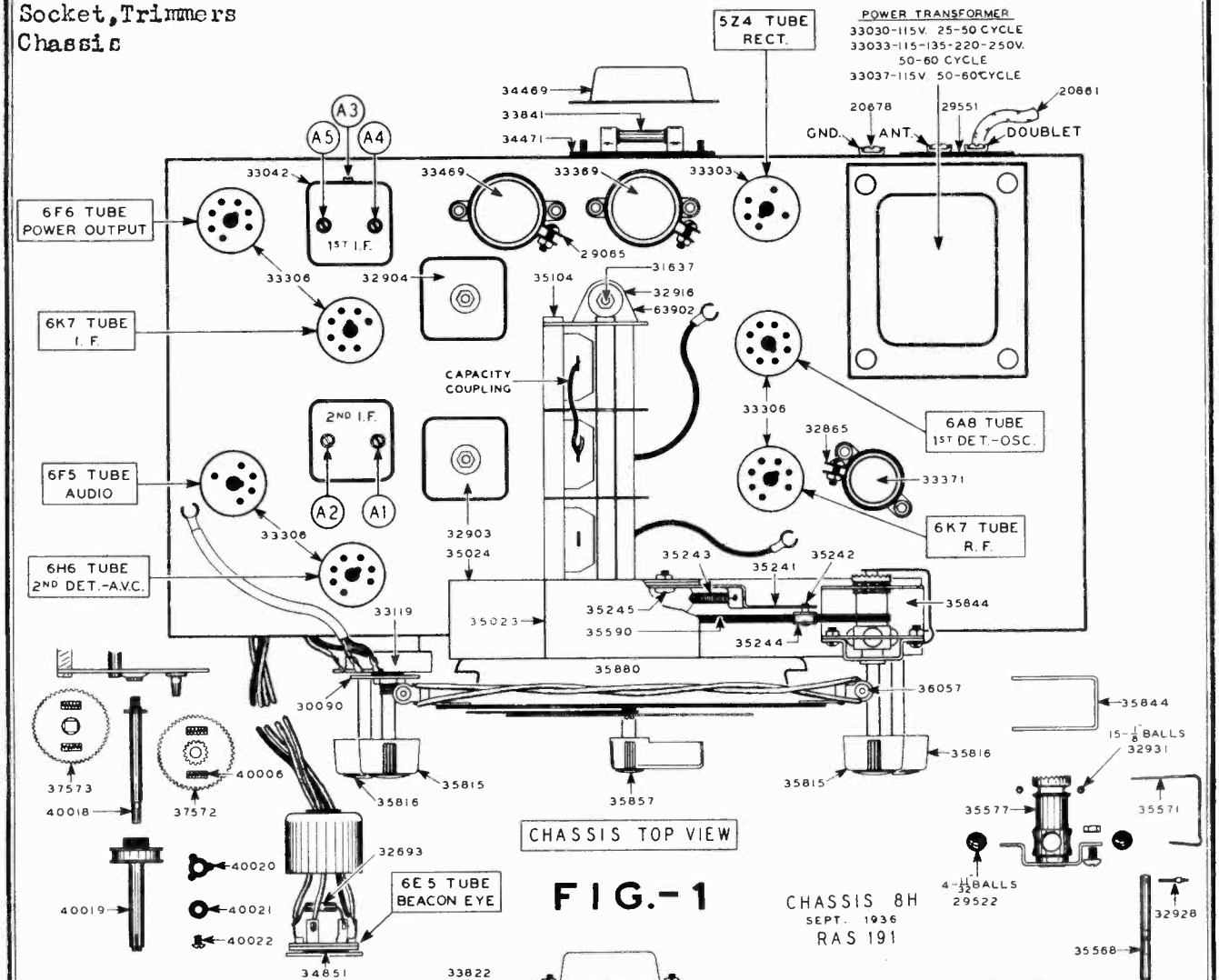


FIG.-1

CHASSIS 8H
SEPT. 1936
RAS 191

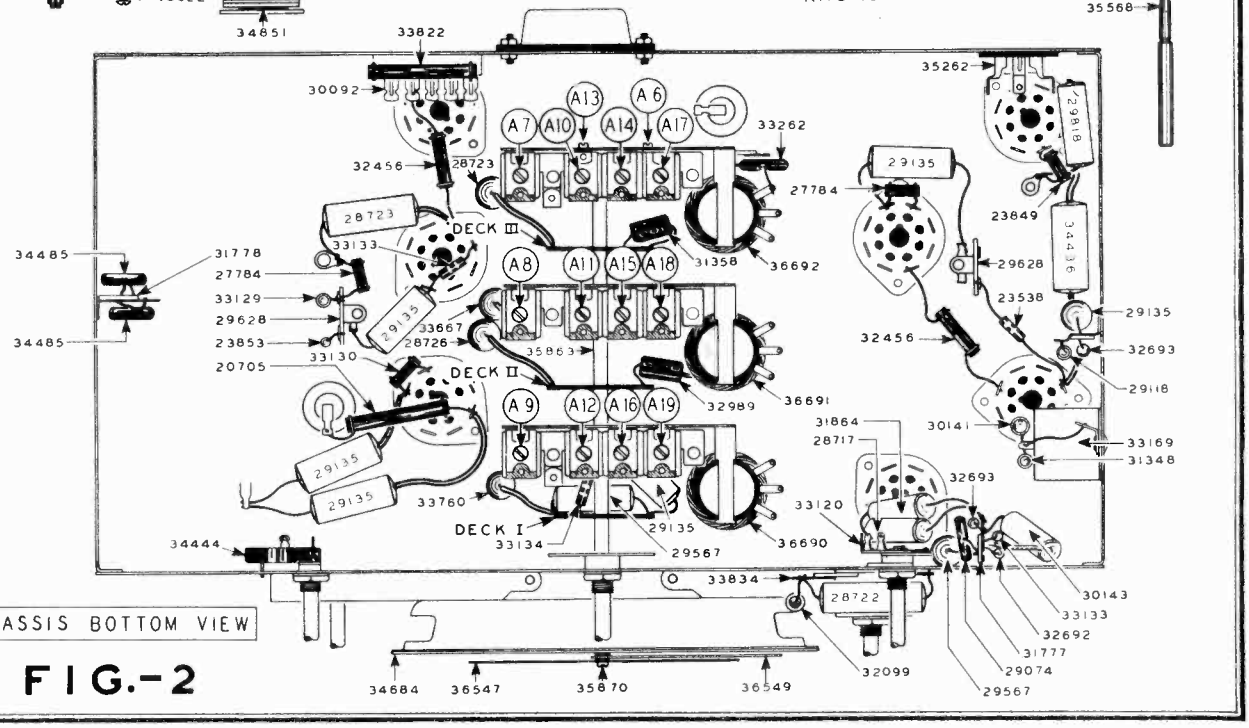


FIG.-2

Grunow Radio

SEPTEMBER, 1936

SERVICE NOTES AND PARTS LIST

Chassis Type 8H
Receiver Model 823-831-833-835
Speaker Type 1210A1

SERVICE DATA

The GRUNOW 8 H Chassis is an eight tube four band superheterodyne receiver using 1—6K7 R. F. amplifier, 1—6A8 first detector and oscillator, 1—6K7 I. F. amplifier, 1—6H6 second detector and A. V. C., 1—6F5 audio amplifier, 1— 6F6 power output, 1—6E5 beacon eye, and 1—5Z4 rectifier.

The frequency coverage is divided into four separate bands, the "X" or weather band 150 to 410 K. C., "A" or Standard Broadcast Band 550 to 1720 K. C., "B" or Police-Amateur Band, 1720 to 5500 K. C., and the Foreign Reception Band 5.5 M. C. to 18.5 M. C.

CONTINUITY AND VOLTAGE

Continuity and voltage measurements should be taken from the underside of the chassis in order to more easily follow the schematic diagram. All sockets are shown on the schematic diagram and have been drawn bottom view. Each element is enumerated and in the exact relationship to the tube guide pin in order to help the service man make a quick and correct check of the chassis constants.

RANGE SWITCH AND COIL ASSEMBLY

The range switch and coil assembly used on the 8H chassis has been designed to allow the receiver to operate on all four bands with maximum sensitivity and selectivity. Each set of coils when not in use is isolated from the coils in use by shorting both ends and grounding through a condenser. This method eliminates all possibilities of open end inductive losses and harmonic pickup.

Schematic diagram Fig. 3 illustrates in detail each section of the range switch with its coil and the proper connections, whose enumerations are duplicated on the chassis schematic diagram.

BEACON EYE SENSITIVITY ADJUSTMENTS

The 6E5 Beacon Eye tube is designed to give the best results with the proper size antenna. However, where a full sized antenna cannot be erected or an inside antenna must be used, a type 6G5 Beacon Eye Tube can be substituted by making the following changes in the wiring of the circuit:

Refer to schematic diagram Fig. 4 and disconnect the "Green" grid wire at point "A" and connect to point "B." This change can be made quickly and will give a maximum sensitivity on the weaker signals.

REPAIRS

When servicing this chassis it is IMPERATIVE that the service man make all parts replacements in EXACTLY the same way as the original part was connected and located. This applies particularly to all ground points.

All parts replacements in the R. F. end of the circuit must be exact duplicates of the originals, especially so in the case of R. F., Bypass, or Coupling Condensers.

Any repairs in the R. F. circuit will make a complete realignment of the entire tuned circuit necessary.

ALIGNMENT PROCEDURE

Do not attempt to align the 8H chassis without the proper equipment as the selectivity, sensitivity, and calibration depend absolutely upon the exact conformance to the following instructions. Each step in the alignment operation is given in its proper sequence and under no conditions should this order be changed.

1. EQUIPMENT:

(A) Signal Generator.

A modulated oscillator capable of generating signals of frequencies from 150 kilocycles to 18 Megacycles.

(B) Non-Metalic screw driver (Alignment Tool).

(C) An output meter of sufficient sensitivity to provide a good deflection at low signal input.

(D) Dummy Antenna.

.05 Mfd. Condenser.
200 Mmfd. Condenser.
400 Ohm Carbon Resistor.

2. HEATING:

(A) Connect the receiver to a 115 V. A. C. source and allow the chassis to warm up for a period of from 20 to 30 minutes. This is necessary in order to eliminate possible alignment variations due to the thermal expansion or contraction of the capacitors and inductances in the various tuned circuits.

(B) The signal generator should also be warmed up before using in order to prevent any frequency changes during the alignment operations.

3. DIAL CALIBRATION:

(A) Turn the tuning knob until the condensers are fully meshed and set the dial pointer (Hour Hand) to horizontal line pointing to 9 and 3 on the outer edge of the dial chart.

(B) Then set the band spreading pointer (Minute Hand) to the vertical line pointing to 12.

4. 455 K.C.—I.F. ALIGNMENT:

(A) Set the generator to a frequency of 455 K. C., connect the output to the control grid of the 6A8 1st Det. & Osc. tube and the ground lead to the ground post on the chassis.

(B) Set the Hour Hand of the chassis to 1500 K. C., turn the volume control full on, set the range switch to the A or Broadcast position and the Tone control to position 1, counter-clockwise.

(C) Connect the output meter across the primary terminals of the output transformer.

(D) Adjust the I. F. Trimmers, located as shown in Fig. 1; in the order of their numbers, A1, A2, A3, A4 and A5, until the maximum sensitivity is obtained.

During this and all following alignment operations the generator must be attenuated as the compensators are brought into resonance until the maximum output is obtained with the lowest possible input. This is necessary in order to hold the A. V. C. tube to its highest sensitivity, at which point only, can precise adjustments of the compensators be obtained.

5. 175 K. C. ALIGNMENT (WEATHER BAND):

(A) Set the generator to a frequency of 175 K. C. and connect the output to the Antenna post of the chassis through a 200 Mmfd. condenser.

(B) Set the chassis range switch to position "X" and the dial pointer to 175 K. C. on the dial chart.

(C) Adjust the 175 K. C. Trimmer A6, as shown on Fig. 2, in the direction of signal increase and at the same time rock the tuning condenser slowly back and forth through resonance until the point of greatest output is obtained.

6. 350 K. C. ALIGNMENT (WEATHER BAND):

(A) Set the generator to 350 K. C.

(B) Set the chassis dial pointer to 350 K. C.

(C) Adjust the Oscillator Trimmer A7—Fig. 2—to maximum output.

(D) Adjust the Detector Trimmer A8—Fig. 2—to maximum ouput.

(E) Adjust the Antenna Trimmer A9—Fig. 2—to maximum output.

7. CHECK 175 K. C. Alignment so as to correct any alignment change which may have occurred due to the slight interaction between the 350 K. C. and 175 K. C. compensators.

8. 1500 K. C. ALIGNMENT (BROADCAST BAND):

(A) Set the Generator to 1500 K. C.

(B) Set the chassis range switch to position "A" and the dial pointer to 1500 K. C.

(C) Adjust the Broadcast Oscillator Trimmer A10—Fig. 2—to maximum output.

(D) Adjust the Broadcast Detector Trimmer A11—Fig. 2—to maximum output.

(E) Adjust the Broadcast Antenna Trimmer A12—Fig. 2—to maximum output.

9. 600 K. C. ALIGNMENT (BROADCAST BAND):

(A) Set the Generator to 600 K. C.

(B) Set the chassis dial pointer to 600 K. C.

(C) Adjust the 600 K. C. Padding Compensator A13—Fig. 2—in the direction of signal increase—at the same time rock the tuning condenser slowly back and forth through resonance until to point of greatest output is obtained on both.

10. Realign 1500 K. C. as instructed in operation No. 8 to correct interaction changes in alignment.

11. 5 M. C. ALIGNMENT (POLICE-AMATEUR BAND):

(A) Set the generator to 5000 K. C. and connect through a 400 Ohm carbon resistor to the antenna post on the chassis.

(B) Set the chassis range switch to position "B" and the dial pointer to 5 M. C.

(C) Adjust the Oscillator Trimmer A14—Fig. 2—to maximum output.

(D) Adjust the Detector Trimmer A15—Fig. 2—to maximum output.

(E) Adjust the Antenna Trimmer A16—Fig. 2—to maximum output.

12. 18 M. C. ALIGNMENT (FOREIGN RECEPTION BAND):

(A) Set the generator to 18 M. C.

(B) Set the chassis range switch to position "C" and the dial pointer to 18 M. C.

(C) Adjust the Oscillator Trimmer A17—Fig. 2—to maximum output.

(D) Adjust the Detector Trimmer A18—Fig. 2—to maximum output.

(E) Adjust the Antenna Trimmer A19—Fig. 2—to maximum output.

Note: To adjust Oscillator Trimmer correctly screw down tightly and then back off until signal is heard.

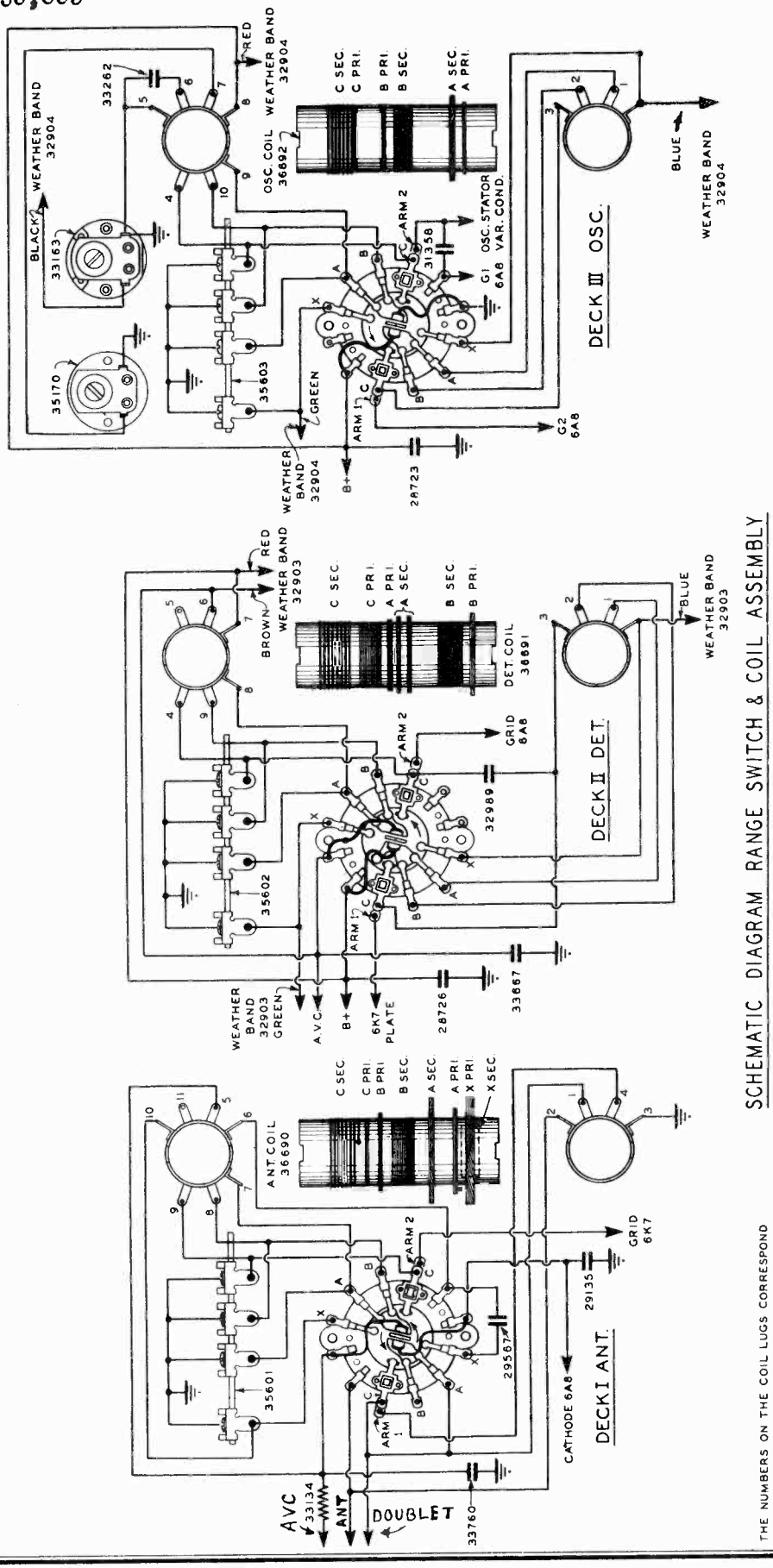
To obtain the utmost sensitivity on the 18 M. C. Band, it is necessary, when adjusting the Detector Trimmer (A18), to rock the tuning condenser slowly through resonance until the point of maximum output is determined Return to the Oscillator Trimmer and make any necessary readjustment.

MODELS 823,831
833,835

MODEL
941

GENERAL HOUSEHOLD UTILITIES CO.

Switch & Coil
Assembly



SCHEMATIC DIAGRAM RANGE SWITCH & COIL ASSEMBLY

FIG.-3

RAS 192

THE NUMBERS ON THE COIL LUGS CORRESPOND TO THOSE SHOWN ON SCHEMATIC DIAGRAM FIG. 4

D.T. SEPT. 28 1936

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 941
Chassis 9E
Schematic, Voltage
Parts

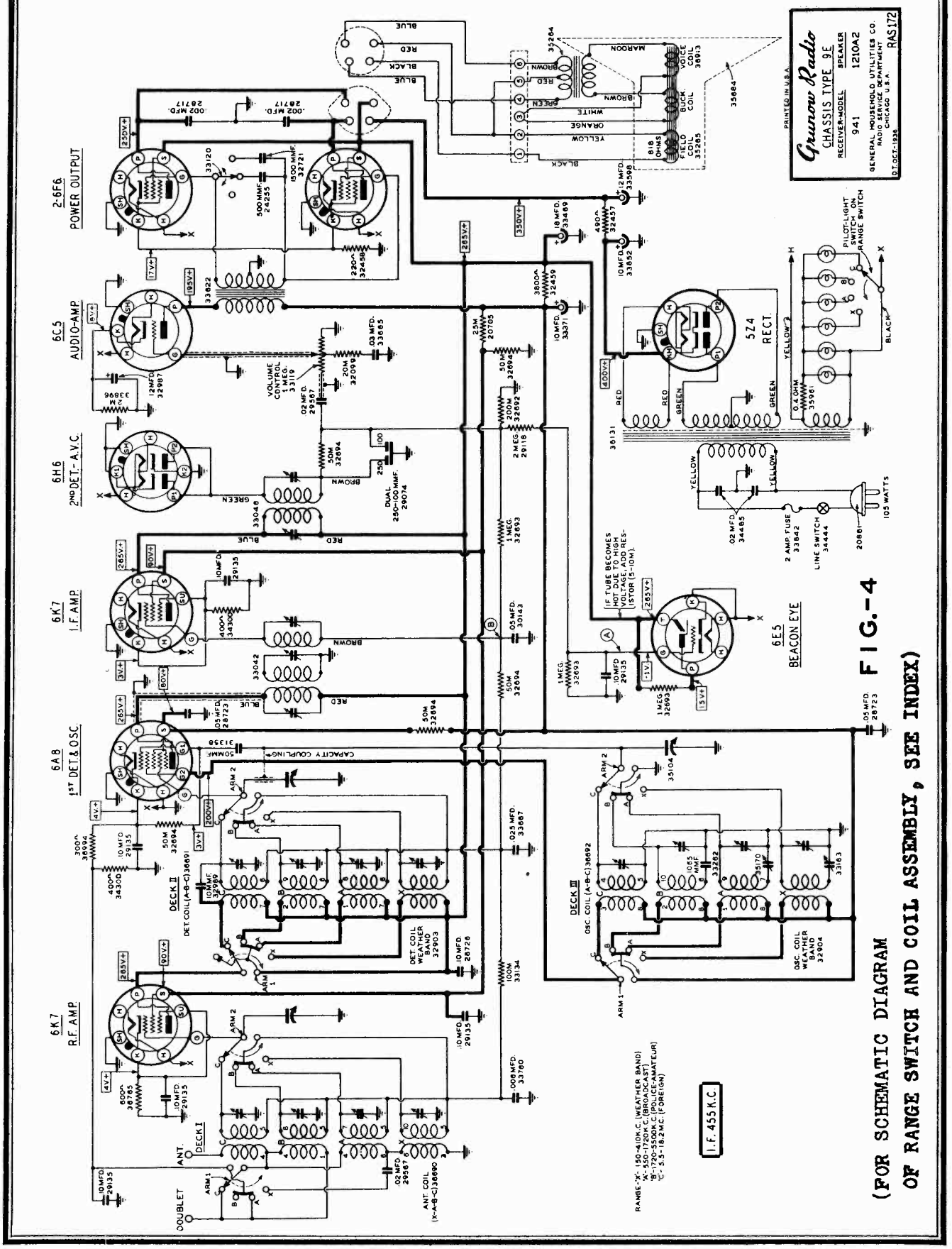


FIG.-4

(FOR SCHEMATIC DIAGRAM OF RANGE SWITCH AND COIL ASSEMBLY, SEE INDEX)

MODEL 941
Chassis 9E
Socket, Trimmers
Chassis

GENERAL HOUSEHOLD UTILITIES CO.

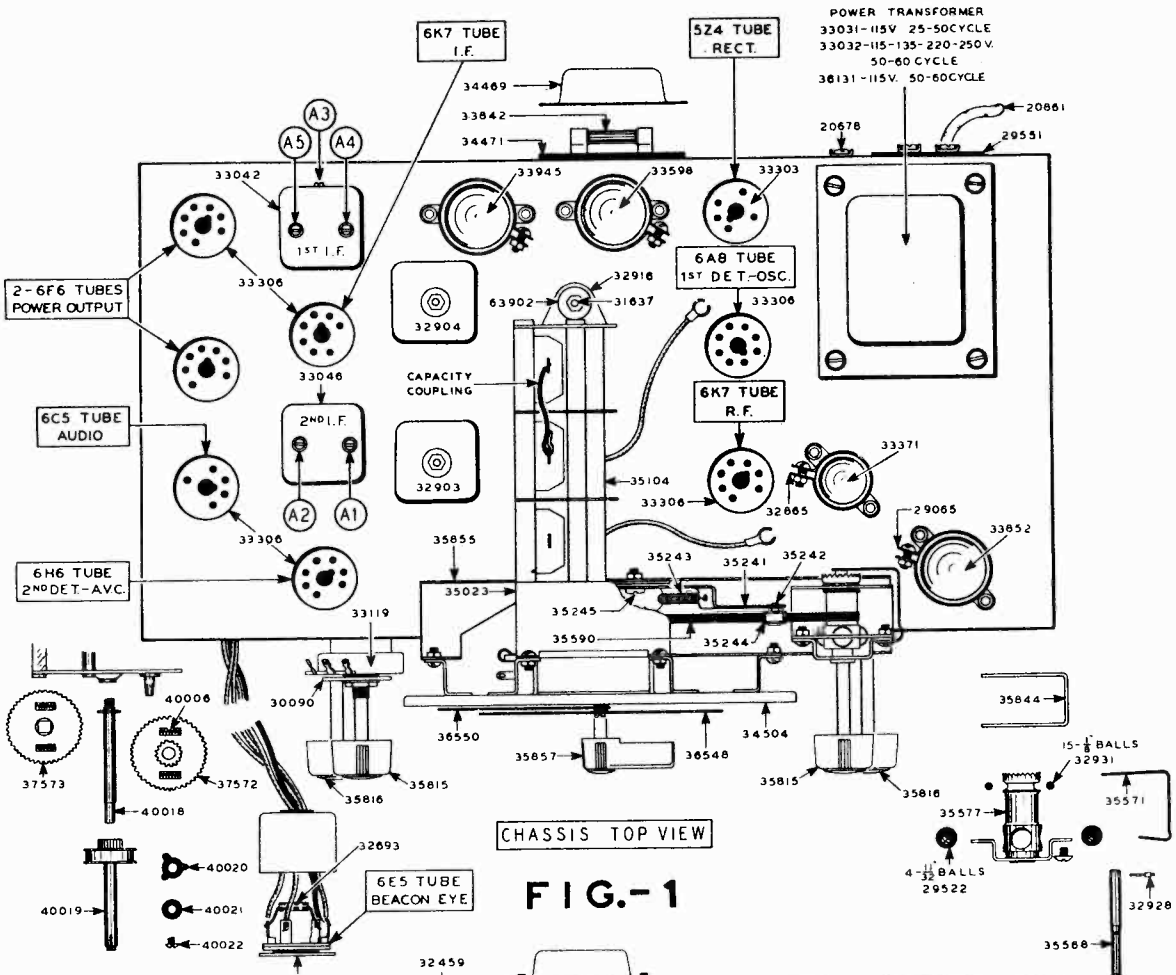


FIG.-1

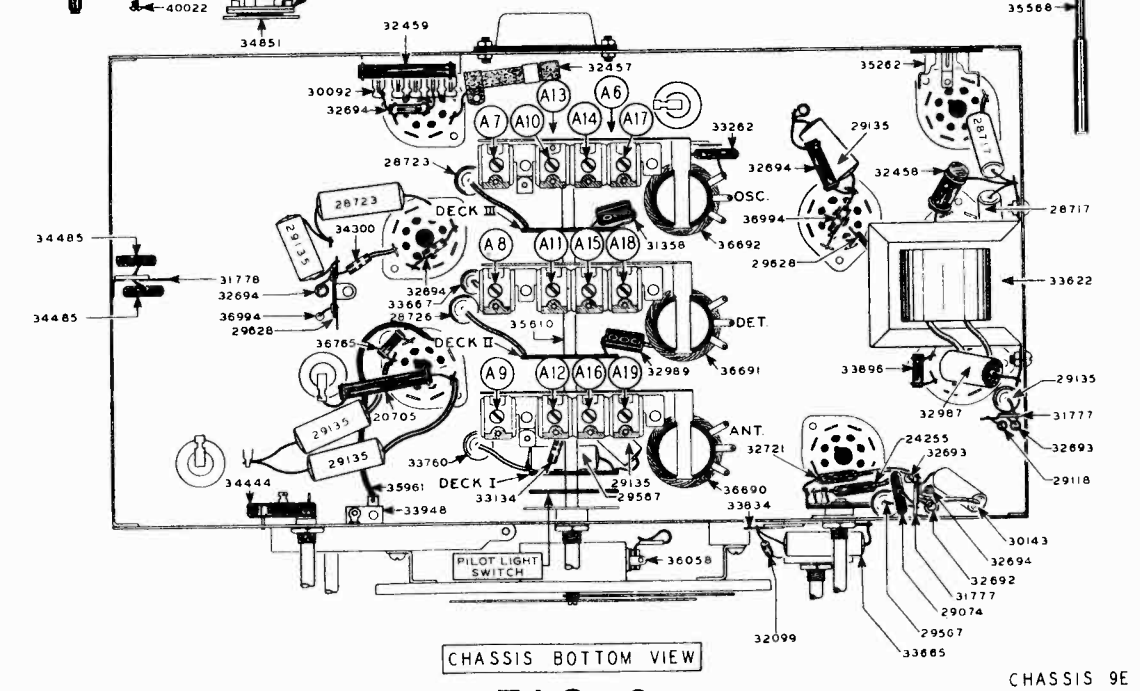


FIG.-2

CHASSIS 9E
OCT. 1936
RAS 193

MODEL 941
Chassis 9E
Alignment, Notes

GENERAL HOUSEHOLD UTILITIES CO.

INTRODUCTION

The Grunow Chassis 9E is a nine tube, four band receiver, using 1—6K7 R.F. Amplifier, 1—6A8 1st Detector and Oscillator, 1—6K7 I.F. Amplifier, 1—6H6 2nd Detector and A.V.C., 1—6C5 Audio Amplifier, 2—6F6 Power Output, 1—5Z4 Rectifier and 1—6E5 "Beacon Eye" Resonance Indicator.

The frequency coverage is divided into four separate tuning ranges or bands; the "X" Weather Band, 150 K.C. to 410 K.C.; "A" Broadcast Band, 550 K.C. to 1720 K.C.; "B" Police-Amateur Band, 1720 K.C. to 5.5 M.C., and the "C" Foreign Broadcast Band, 5.5 M.C. to 18.2 M.C.

Chassis Type 9E
Receiver Model 941
Speaker Type 1210-A-2

SERVICE DATA

CONTINUITY AND VOLTAGE

Tube sockets on the schematic diagram (Fig. 4) are shown bottom view, each element being in its actual position in respect to the guide pin. The voltage measurements shown are average and were taken with a line voltage of 115 V., the volume control "full on" and the range switch in position "C" using a 1000 ohm per volt meter.

REPAIRS

When servicing this chassis it is IMPERATIVE that parts replacements are made in EXACTLY the same way as the original parts were located, and connected. This applies particularly to ground points.

All parts replacements in the R.F. end of the circuit must be exact duplicates of the originals, especially so in the case of coils, R.F. by-pass or coupling condensers.

Any repairs in the R.F. circuit will make a complete realignment of the tuned circuit necessary.

BEACON EYE SENSITIVITY ADJUSTMENTS

The 6E5 "Beacon Eye" tube is designed to give the best results with the proper size antenna. However, where a full size antenna cannot be erected or an inside antenna must be used, a type 6G5 tube can be substituted by making the following changes in the wiring of the circuit:

Refer to schematic diagram Fig. 4 and disconnect the "green" grid wire at point "A" and connect to point "B." This change can be made quickly and will give a maximum sensitivity on weaker signals.

HIGH LINE VOLTAGE

For use in localities having consistent high line voltage (120-130 V.) an extra primary lead has been provided on the Power Transformer. To make this change, merely remove the green lead from the terminal strip and connect the taped yellow lead to its place.

CIRCUIT ALIGNMENT EQUIPMENT

Do not attempt to align this chassis without the equipment specified below:

1. Signal Generator—
A modulated oscillator capable of delivering frequencies from 175 K.C. to 18.2 M.C.
2. Alignment Tool—
A non-metallic screw driver.
3. Dummy Antenna—
.05 Mfd. Condenser (I.F. Alignment).
200 Mmfd. Condenser (Broadcast Alignment).
400 Ohm Carbon Resistor (Short Wave Alignment).
4. Output Meter—
A meter of sufficient sensitivity to give a good deflection at very low signal input.

Note: The receiver should be aligned in a location free from local interference. A screen room is recommended.

ALIGNMENT PROCEDURE

1. HEATING:

(A) Allow the receiver to heat up for a period of 20 to 30 minutes. This is necessary in order to eliminate possible alignment variations due to thermal expansion and contraction of capacitors and inductances.

(B) Allow the signal generator to warm up in order to prevent frequency drift during alignment.

2. DIAL CALIBRATION:

Turn the condenser until the plates are fully meshed, set the pointer (Hour Hand) to 9 and 3 on the outer edge of dial chart. Set the vernier pointer (Minute Hand) to the line pointing to 12.

3. SIGNAL GENERATOR ADJUSTMENT:

During the entire alignment procedure, the signal input from the generator to the receiver must be continually attenuated at the generator, as the various trimmers are brought into resonance. This is necessary in order to hold the signal at the lowest intensity so that the A.V.C. circuit will remain at the most sensitive point.

4. 455 K.C.—I.F. ALIGNMENT:

(A) Set the generator to a frequency of 455 K.C., connect the output to the control grid of the 6A8 1st Detector and Oscillator tube thru .05 mfd. dummy and the ground lead to the ground post on the chassis.

(B) Set the dial pointer to 600 K.C., turn the volume control full on, set the range switch to the "A" or Broadcast position and the tone control to position 3 clockwise.

(C) Connect the output meter across the primary terminals of the output transformer.

(D) Adjust the I.F. trimmers, located as shown in Fig. 1, in the order of their numbers, A1, A2, A3, A4 and A5, until maximum sensitivity is obtained.

5. 175 K.C. ALIGNMENT (Weather Band):

(A) Set the generator to a frequency of 175 K.C. and connect the output to the Antenna post of the chassis thru a 200 mmfd. dummy.

(B) Set the chassis range switch to position "X" and the dial pointer to 175 K.C. on the dial chart.

(C) Adjust the 175 K.C. trimmer A6, as shown on Fig. 2, in the direction of signal increase and at the same time rock the tuning condenser slowly back and forth thru resonance until the point of greatest output is obtained.

6. 350 K.C. ALIGNMENT (Weather Band):

(A) Set the generator to 350 K.C.

(B) Set the chassis dial pointer to 350 K.C.

(C) Adjust Oscillator trimmer A7, Detector trimmer A8, and Antenna trimmer A9 to maximum output.

7. Check 175 K.C. Alignment so as to correct any alignment change which may have occurred due to the slight inter-action between the 350 and 175 K.C. trimmers.

8. 1500 K.C. ALIGNMENT (Broadcast Band):

(A) Set the generator to 1500 K.C.

(B) Set the chassis range switch to position "A" and the dial pointer to 1500 K.C.

(C) Adjust Oscillator trimmer A10, Detector trimmer A11, and Antenna trimmer A12 to maximum output.

9. 600 K.C. ALIGNMENT (Broadcast Band):

(A) Set the generator to 600 K.C.

(B) Set the dial pointer to 600 K.C.

(C) Adjust the 600 K.C. padding compensator A13 in the direction of the signal increase—at the same time rock the tuning condenser slowly back and forth thru resonance until the point of greatest output is obtained.

10. Realign 1500 K.C. as instructed in operation No. 8 to correct inter-action changes in alignment.

11. 5 M.C. ALIGNMENT (Police-Amateur Band):

(A) Set the generator to 5 M.C. and connect thru a 400 ohm carbon resistor to the antenna post on the chassis.

(B) Set the chassis range switch to position "B" and the dial pointer to 5 M.C.

(C) Adjust Oscillator trimmer A14, Detector trimmer A15 and Antenna trimmer A16 to maximum output.

To adjust Oscillator trimmer correctly, back trimmer A14 out as far as it will go (minimum capacity) then adjust until signal is heard.

12. 18 M.C. ALIGNMENT (Foreign Broadcast Band):

(A) Set the generator to 18 M.C.

(B) Set the chassis range switch to position "C" and the dial pointer to 18 M.C.

(C) Adjust Oscillator trimmer A17, Detector trimmer A18 and Antenna trimmer A19 to maximum output.

Note: To adjust Oscillator trimmer correctly, screw down tightly and then back off until signal is heard. To obtain the utmost sensitivity on the 18 M.C. Band, it is necessary, when adjusting the Detector trimmer (A18) to rock the tuning condenser slowly thru resonance until the point of maximum output is determined. Return to the Oscillator trimmer and make any necessary readjustment.

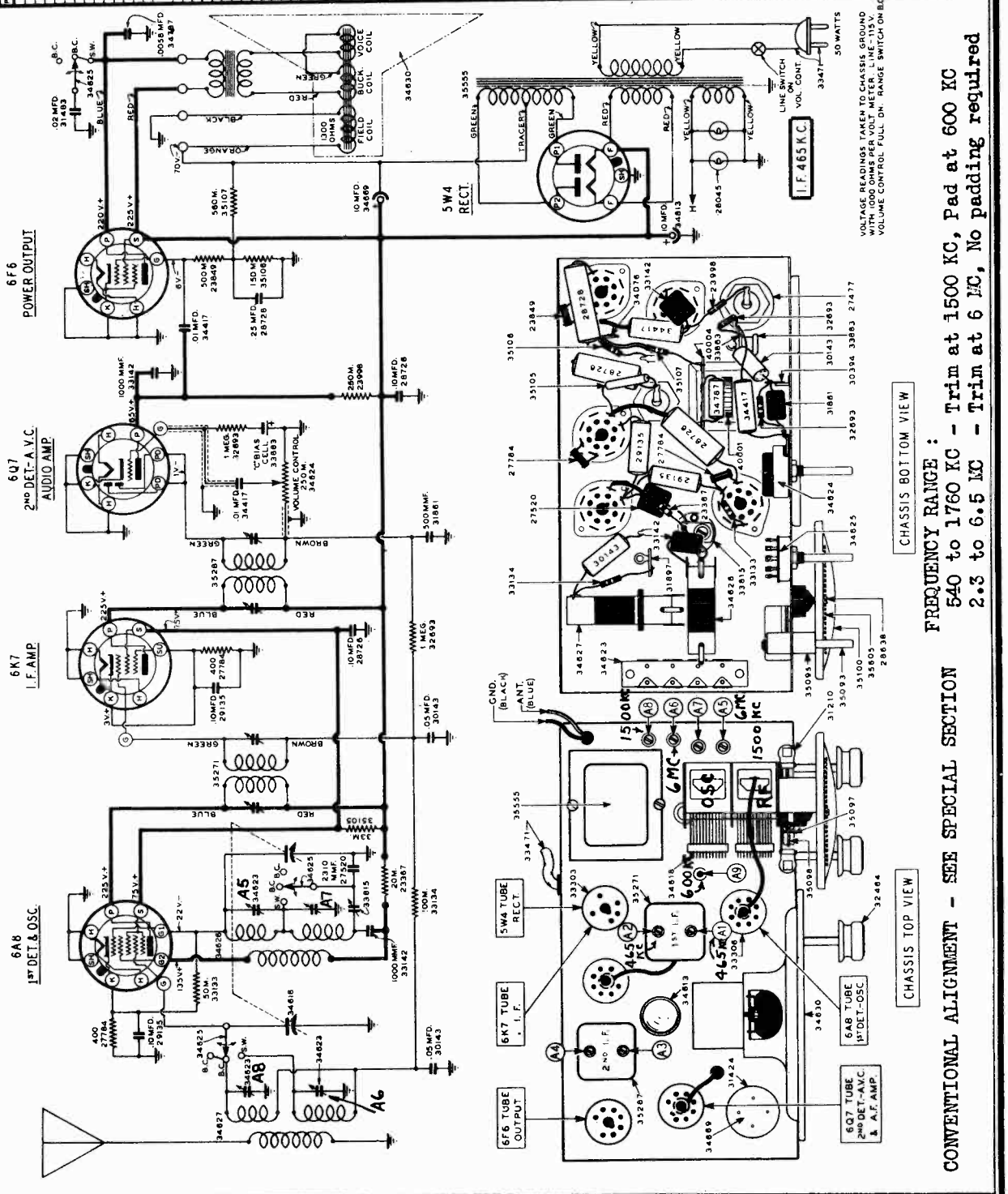
MODEL 542
Chassis 5J
Schematic, Voltage
Socket, Trimmers, Parts
Alignment, Chassis

GENERAL HOUSEHOLD UTILITIES CO.

(PRICES SUBJECT TO CHANGE WITHOUT NOTICE)

PARTS PRICE LIST			
PART NO	DESCRIPTION	REQ	PRICE
22295	DRIVE SHAFT-"C" WASHER	2	.01
23988	RESISTOR (USE 32058)		
23648	RESISTOR (USE 34755)		
23998	RESISTOR (USE 32895)		
27422	ELECT. COND. STEP WASHER	1	.02
27477	ELECT. COND. DBLE WASHER	1	.02
27520	COND-MICA-2310 MMFD	1	.50
27784	RESISTOR (USE 34350)		
27801	ECCENTRIC WASHER	3	.05
28045	PILOT LIGHT BULB	2	.15
28038	POINTER SCREW		.02
28123	COND. (USE 34438)		
28728	COND. (USE 34437)		
28793	JUNCTION BOX CONNECT		1.00
29135	ASSEMBLY (5-PIECE CHASSIS)		
30143	COND. (USE 34438)		
30177	DRIVE SPRING	1	.05
30394	MTG. LUG STRIP	1	.10
31210	PILOT LIGHT SOCKET	2	.10
31426	ELECT. COND. MTG. SHIELD	1	.25
31683	CONDENSER-TUB.-.02 MFD	1	.10
31881	COND-MICA-500 MMFD	1	.20
32058	RESISTOR-1 MEG. OHM	1	.20
32095	RESISTOR-20 M OHMS	2	.15
32466	KNOB	3	.20
32893	RESISTOR-1 MEG. OHM	2	.15
32894	RESISTOR-50 M OHMS	1	.15
32895	RESISTOR-250M OHMS	1	.15
33133	RESISTOR (USE 34894)		
33134	RESISTOR-100M OHMS	1	.20
33303	SOCKET-6 PRONG TUBE	1	.15
33306	SOCKET-8 PRONG-DRIVER	4	.15
33471	LINE CORD & PLUG	1	.40
33815	OSC. PADDER CONDENSER	1	.45
33883	BIAS CELL MTG. STRIP	1	.15
33884	GRID BIAS CELL	1	.25
33920	RESISTOR-400 OHMS	2	.15
34417	COND. (USE 33820)		
34438	CONDENSER-TUB.-.05MFD.	2	.35
34437	CONDENSER-TUB.-.10MFD.	2	.35
34618	VARIABLE GANG COND	1	.90
34620	DIAL CHART	1	.10
34622	TRIMMER ASSEMBLY	1	.75
34625	ROTOR SWITCH	1	.10
34626	POWER SWITCH	1	.25
34628	OSCILLATOR COIL	1	.75
34627	ANTENNA COIL	1	1.00
34669	ELECTRO COND-10 MFD.	1	1.25
34755	RESISTOR-500 M OHMS	1	.15
34787	COND-TUB-.005 MFD	1	.25
34813	COND ELECTRO-10MFD	1	1.00
35093	DRIVE SHAFT-MTG. BRKT	1	.45
35097	DRIVE DRUM & HUB	1	.80
35098	DRIVE STRING	1	.10
35099	DIAL GASKET	1	.05
35100	DIAL WINDOW	1	.20
35105	RESISTOR-33M OHMS	1	.20
35106	RESISTOR-50M OHMS	1	.15
35107	RESISTOR-250M OHMS	1	.15
35287	COIL & SHIELD-2ND I.F.	1	2.00
35327	COIL & SHIELD-1ST I.F.	1	1.75
35527	DIAL ESCUTCHEON	1	1.00
35553	POWER TRANS.-115 V 50-60~	1	3.00
35605	DIAL POINTER	1	.10
82831	ESCUTCH. MTG. SCREWS	4	.01
83014	HUB SET SCREW	1	.01
83838	FELT WASHER	3	.01
34630	SPEAKER COMPLETE	1	7.00
40000	CONE & VOICE COIL ASST	1	1.80
40001	OUTPUT TRANSFORMER	1	1.20
40002	FIELD COIL	1	.10
40003	CONE & VOICE COIL ASST	1	1.80
40004	TERMINAL STRIP	1	.30
	SPEAKER PARTS		

Grunow Radio
CHASSIS TYPE 5J
RECEIVER MODEL 542 SPEAKER 34630
GENERAL HOUSEHOLD UTILITIES CO.
RADIO SERVICE DEPARTMENT
CHICAGO U.S.A. RAS162

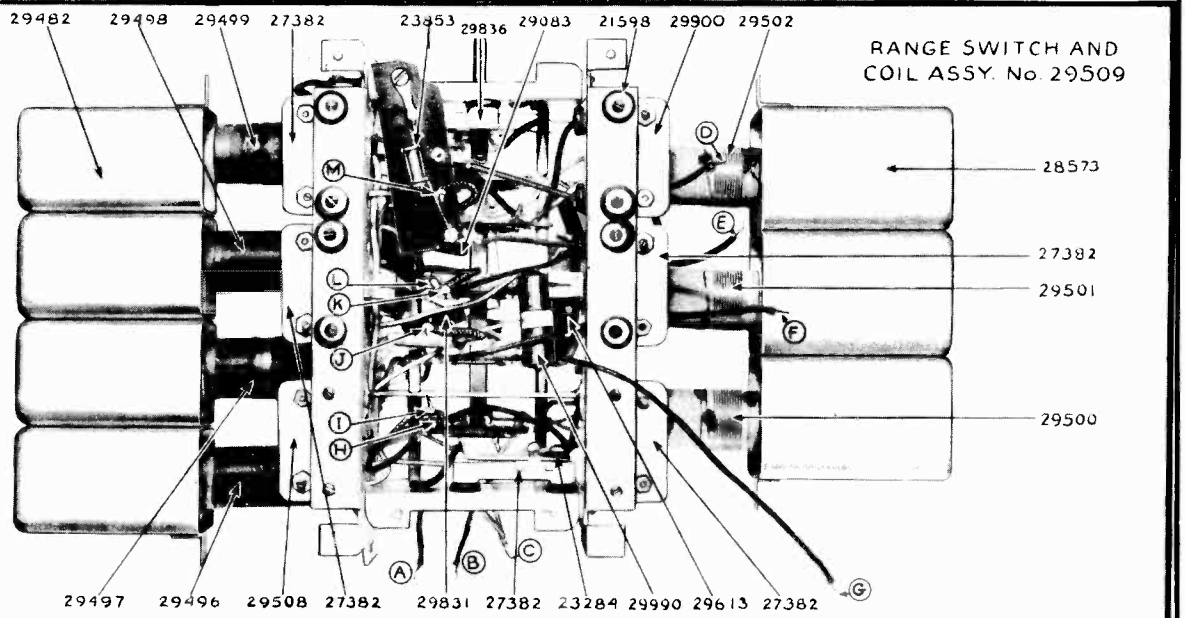


Switch & Coil Assembly

MODELS 1151,1152
Chassis 11A

GENERAL HOUSEHOLD UTILITIES CO.

FIGURE 7



INTRODUCTION

The following characteristics apply to the Grunow Radio—Chassis Type 11A:

This model is an 11 tube superhetrodyne All Wave (540 to 21,500 K.C.) Receiver using 1-6D6 tube as an R.F. Amplifier, 1-6A7 tube as a 1st Detector or mixer, being electronicly coupled to a 76 oscillator tube. 1-6D6 tube as an I.F. amplifier with a frequency of 262 K.C., 1-85 tube (double diode triode) used as a diode detector or signal rectifier, delayed automatic volume control (AVC) and audio amplifier. The 85 tube feeds a pair of 76 tubes, connected in parallel, these tubes act as a driver stage, driving a pair of 45 tubes in class A prime push pull, delivering an undistorted output of approximately 9 watts. The 76 driver tubes receive their bias through the 164 ohm section of the candohm resistor. Oscillation in the driver stage is prevented by the 100,000 ohm resistor in the grid of the second 76 tube. The 45 tubes receive their bias through the voltage drop in the speaker field. A separate 76 tube is used as the Signal Beacon or Beat Oscillator, plate voltage of the Signal Beacon being applied by closing the switch on the tone control. The rectifier tube is a 5Z3, the output of which is well filtered through the choke action of the speaker field, the tuned filter choke, and the 4-8 mfd. electrolytic condensers.

The broadcast section of the receiver consists of the following 4 tuned circuits: R.F. input, bi-selector, mixer input and oscillator. These circuits are tuned with a 4-gang variable condenser of rugged construction.

The short wave section of the receiver consists of 3 tuned circuits, the bi-selector being cut out to prevent losses when the receiver is working at the higher frequencies.

The Signal Beacon is a beat oscillator using a 76 tube, and is a feature of the 11A Chassis. When this tube is brought into operation it acts as a local oscillator and beats against the incoming signal. The presence of a station's signal will be indicated by a high pitched "whistle", becoming lower in pitch as "resonance", or exact tuning, is approached. The Signal Beacon note becomes very low and finally reaches zero; at this point the receiver is said to be tuned to "zero beat", which indicates that it is tuned exactly to the station. The Signal Beacon is also used to receive telegraph or continuous wave signals.

The remainder of the circuit is typical and has been designed along the lines of what is considered the best engineering practice to date. Parts are all oversize and of the finest quality.

MODELS 1151,1152
Chassis 11A

GENERAL HOUSEHOLD UTILITIES CO.

Socket,Trimmers
Chassis

FIGURE 5

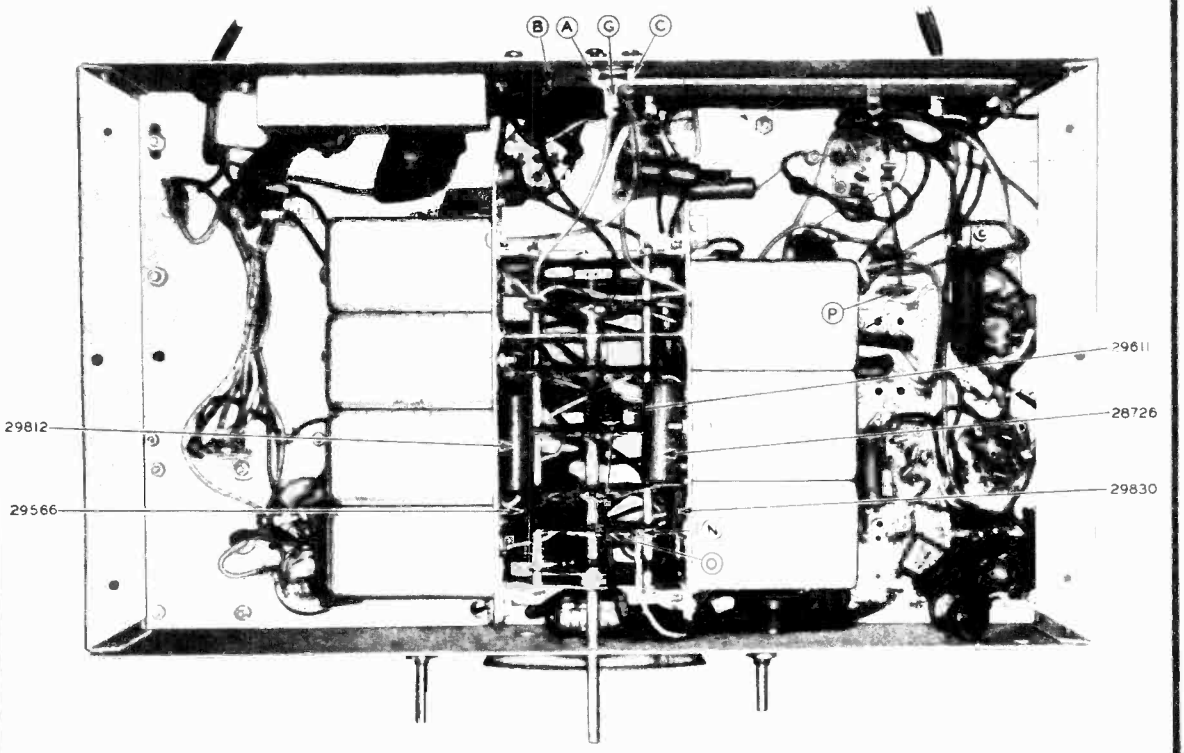
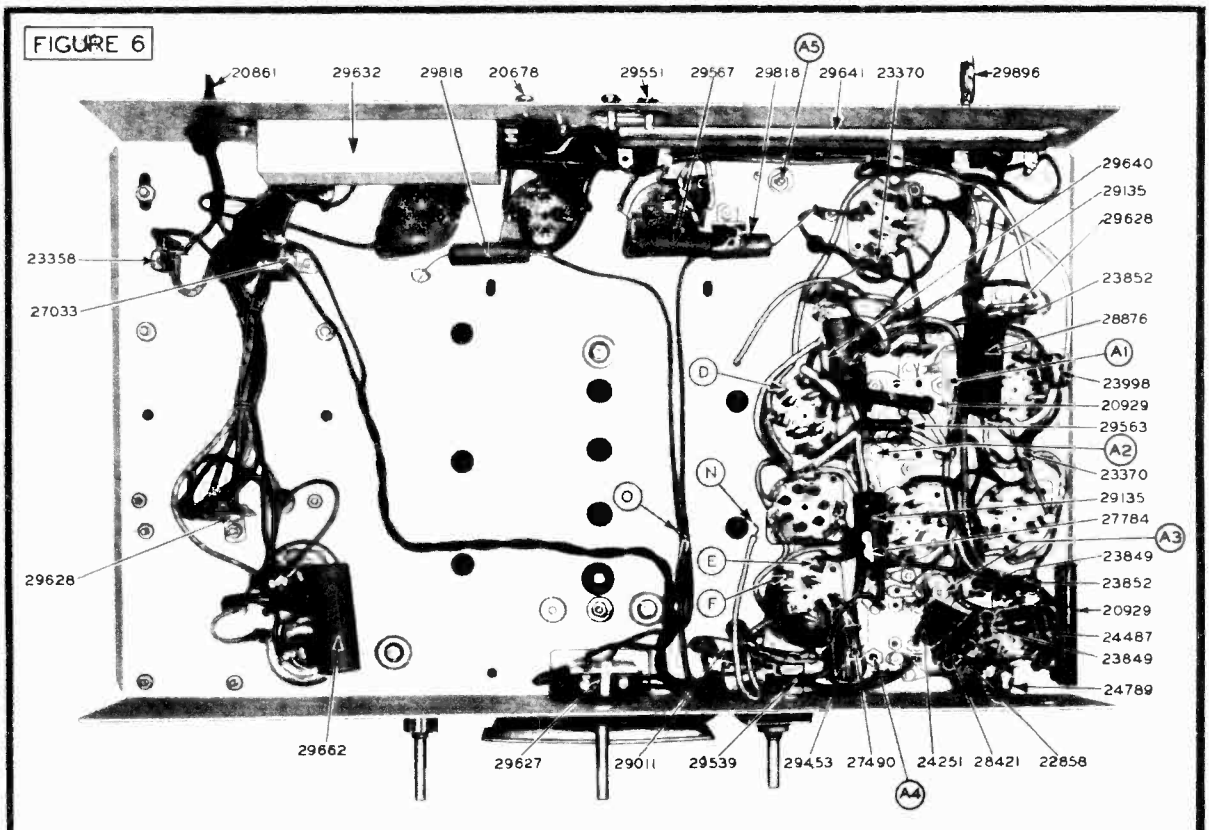


FIGURE 6



MODELS 1191, 1191B
Chassis 11G
Schematic, Voltage
Parts

GENERAL HOUSEHOLD UTILITIES CO.

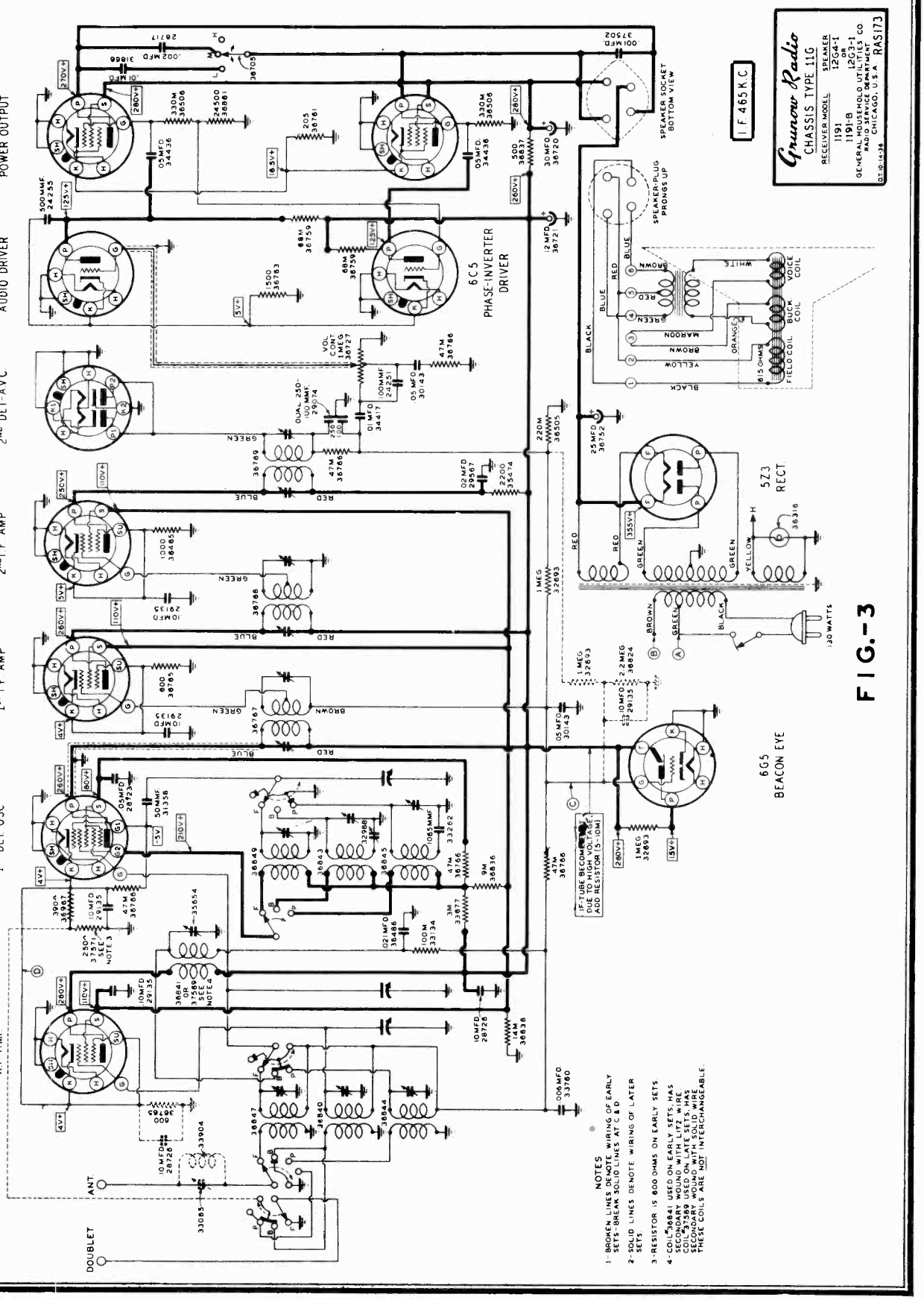


FIG.-3

MODELS 1191,1191B
Chassis 11G
Socket,Trimmers
Chassis

GENERAL HOUSEHOLD UTILITIES CO.

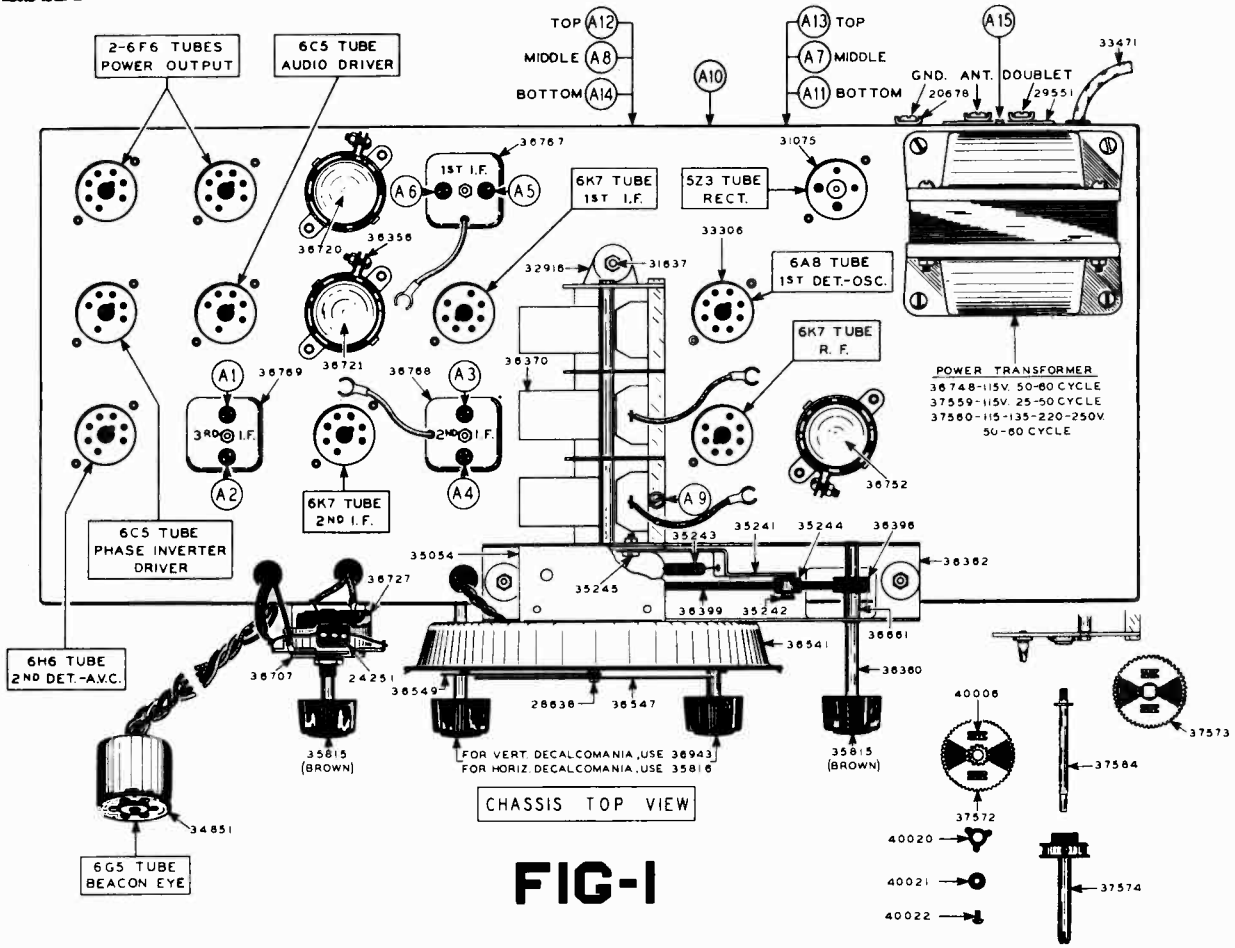


FIG-1

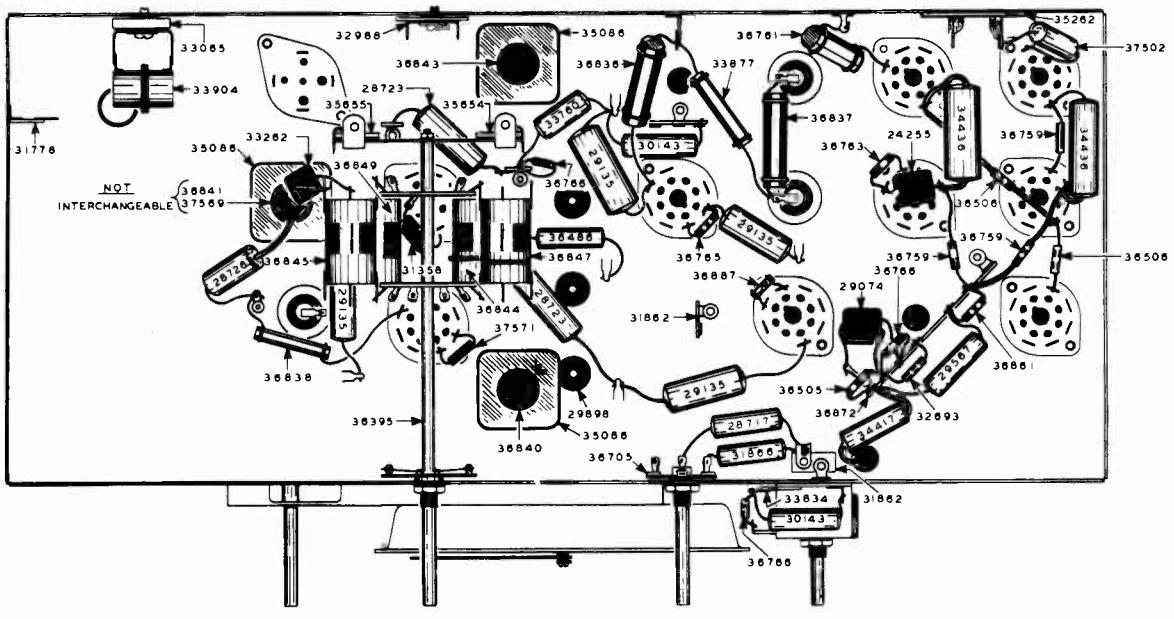


FIG-2

CHASSIS 11G
AUG. 1936
RAS 188

OCTOBER, 1936

SERVICE DATA

Grunow Radio

Chassis Type 11G—Receiver Model 1191 and 1191-B—Speaker Type 12G4-1 or 12G3-1

GENERAL HOUSEHOLD UTILITIES COMPANY

FORM 36905-2 PRINTED IN U. S. A. CHICAGO, ILLINOIS

INTRODUCTION

The Grunow Chassis 11G is an eleven tube, three band superheterodyne receiver with a full face band spread dial and a Beacon Eye tuning indicator.

CIRCUIT DESCRIPTION

The circuit and tube complement of the Grunow 11G Chassis is as follows: 1-6K7 R. F. Amplifier, 1-6A8 1st Detector and Oscillator, 1-6K7 1st I.F. Amplifier, 1-6K7 2nd I.F. Amplifier, 1-6H6 2nd Detector and A.V.C., 1-6C5 Phase Inverter Driver, 1-6C5 Audio Driver, 2-6F6 Power Output, 1-6G5 Beacon Eye and 1-5Z3 Rectifier.

Separate coils are used in the Antenna and Oscillator circuits for each tuning range and have a continuous frequency coverage from 545 K.C. to 1750 K.C. on the "B" Broadcast Band, 1750 K. C. to 5.8 M. C. on the "P" Police Amateur Band and 5.5 M. C. to 18.2 M. C. on the "F" Foreign Broadcast Band.

CONTINUITY AND VOLTAGE

Tube sockets on the schmetic diagram (Fig. 3) are shown bottom view, each element being in its actual position in respect to the guide pin. The voltage measurements shown are average and were taken with a line voltage of exactly 115V. the volume control full on and the range switch on position "B" using a 1000 ohms per volt meter.

REPAIRS

When servicing this chassis it is IMPERATIVE that the service man make all parts replacements in EXACTLY the same way as the original part was located and connected. This applies in particular to all ground points. All parts replacements in the R. F. end of the circuit must be exact duplicates of the originals especially so in the case of coils, R. F. by-pass or coupling condensers. Any repairs in the R. F. circuit will make a complete realignment of the entire tuned circuit necessary.

POWER TRANSFORMER

For use in localities having consistent high voltage (120-130 V.) an extra primary lead has been provided on the Power Transformer. Remove the one line switch lead which is soldered to the green transformer lead (A) and solder to the dummy lug (B) on which the brown transformer lead is soldered. The connections (A) and (B) are shown on the schematic diagram (Fig. 3).

CIRCUIT ALIGNMENT PROCEDURE

Do not attempt to align this chassis without the proper equipment as the sensitivity, selectivity, and calibration absolutely depend on the exact conformance to the following instructions. Each step in the alignment operation is given in its proper sequence and under no conditions should this order be changed. The chassis should be aligned in a location free from local interference (motors, flashers, automobile ignition, etc.) as high frequency disturbances will cause difficulty when the short wave section is adjusted. A screen room is recommended

1. EQUIPMENT

(A) Signal Generator.

A modulated oscillator capable of generating signals from 465 K. C. to 18 megacycles.

(B) Non-metallic screw-driver (Alignment Tool).

(C) Output Meter.

A standard type output meter with sufficient sensitivity to give a good deflection with a small signal input.

(D) Dummy Antenna.

.05 Mfd. condenser—(I. F. Alignment)
200 Mmfd. condenser—(Broadcast Alignment)
400 Ohm carbon resistor (Short Wave Alignment)
.002 Mfd. condenser (I. F. Rejector Filter Alignment)

2. HEATING

(A) Connect the receiver to a 115 V. source and allow the chassis to warm up to a period of 20 to 30 minutes. This is necessary to eliminate possible alignment variations due to thermal expansion and contraction of the capacitors and inductances in the various tuned circuits.

(B) The signal generator should be warmed up also in order to prevent any frequency changes during alignment.

3. DIAL CALIBRATION

(A) Turn the tuning knob until the condensers are fully meshed and set the dial pointer (Hour Hand) to the horizontal line pointing to 9 and 3 on the outer dial scale.

(B) Set the band spreading pointer (Minute Hand) to the vertical line pointing to 12.

Note: During all of the following alignment operations the signal generator must be attenuated as the compensators are brought into resonance until the maximum output is obtained with the lowest possible input. This is necessary in order to hold the A.V.C. tube to its highest sensitivity at which point only can precise adjustment of the trimmers be had.

4. I. F. ALIGNMENT

(A) Connect the Output Meter across the primary terminals of the output transformer.

(B) Set the signal generator to 465 K. C. and connect the output to the grid of the 6A8 oscillator tube through a .05 mfd. condenser Connect the generator ground lead to the ground post on the receiver.

(C) Set the receiver range switch to position "B" the dial pointer to 600 K. C. and the volume control full on.

(D) Adjust the I. F. Trimmers A1, A2, A3, A4, A5, and A6 to maximum output.

5. 1500 K. C. ALIGNMENT

(A) Set the generator to 1500 K. C. and connect the output to the antenna post on the chassis through a 200 Mmfd. condenser.

(B) Set the receiver dial pointer to 1500 K. C.

(C) Adjust the trimmers A7-Oscillator, A8-Detector and A9-Antenna to maximum output.

6. 600 K.C. ALIGNMENT

(A) Set the generator to 600 K.C.

(B) Set the receiver dial to 600 K.C.

(C) Adjust the trimmer A10 to maximum output and at the same time rock the tuning condenser slowly back and forth through resonance until the exact resonant point is determined.

7. 5000 K.C. ALIGNMENT

(A) Set the generator to 5000 K.C. and connect the output to the Antenna post on the chassis through a 400 Ohm carbon resistor.

(B) Set the receiver dial pointer to 5000 K.C. and the range switch to position "P"

(C) Adjust the trimmers A11-Oscillator and A12-Detector to maximum output.

8. 18 M.C. ALIGNMENT

(A) Set generator to 18 M.C.

(B) Set receiver dial pointer to 18 M.C. and the range switch to position "F."

(C) Screw the Oscillator trimmer (A13) down tightly and slowly back off until signal is heard.

(D) Adjust the Antenna trimmer (A14) to maximum output and at the same time rock the tuning condenser slowly back and forth through resonance until the exact resonant point is determined.

(E) Return to Oscillator trimmer (A13) and repeat operations C. & D.

9. REJECTOR FILTER ALIGNMENT

(A) On 11G chassis having the I.F. Rejector Filter the trimmer will be found on the rear of the chassis near the antenna post.

(B) This filter is aligned at a frequency of 465 K.C. and must NOT be peaked until the rest of the circuit has been completely aligned.

(C) Set generator to 465 K.C. and connect the output to the antenna binding post on the receiver through a .002 mfd. condenser.

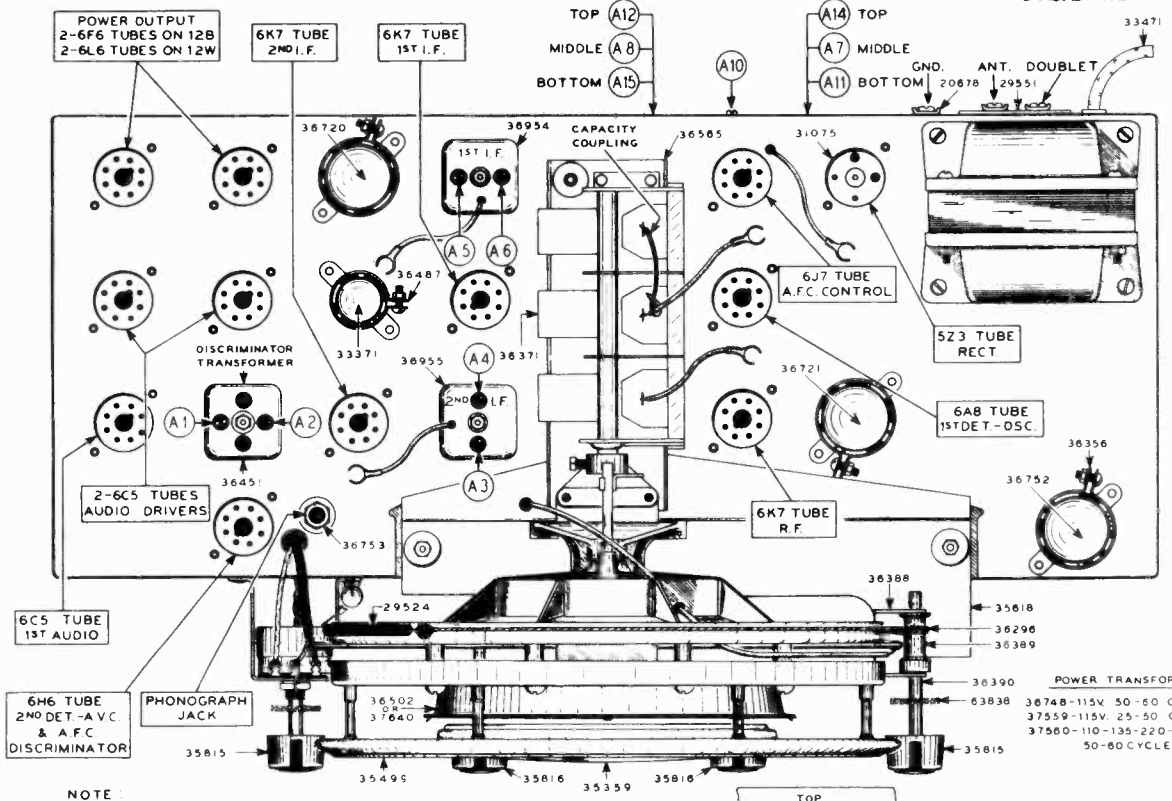
(D) Set the receiver dial pointer to 600 K.C. and the range switch to position "B."

(E) With a strong signal input adjust the trimmer to a *minimum* reading on the output meter.

MODEL 1291
Chassis 12B
MODEL 1297

GENERAL HOUSEHOLD UTILITIES CO.

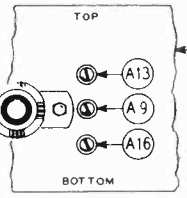
Chassis 12W
Socket, Trimmers
Chassis



NOTE
ALL TUBE SOCKETS ARE #33306 - EXCEPT RECT TUBE

CHASSIS TOP VIEW

FIG.-1



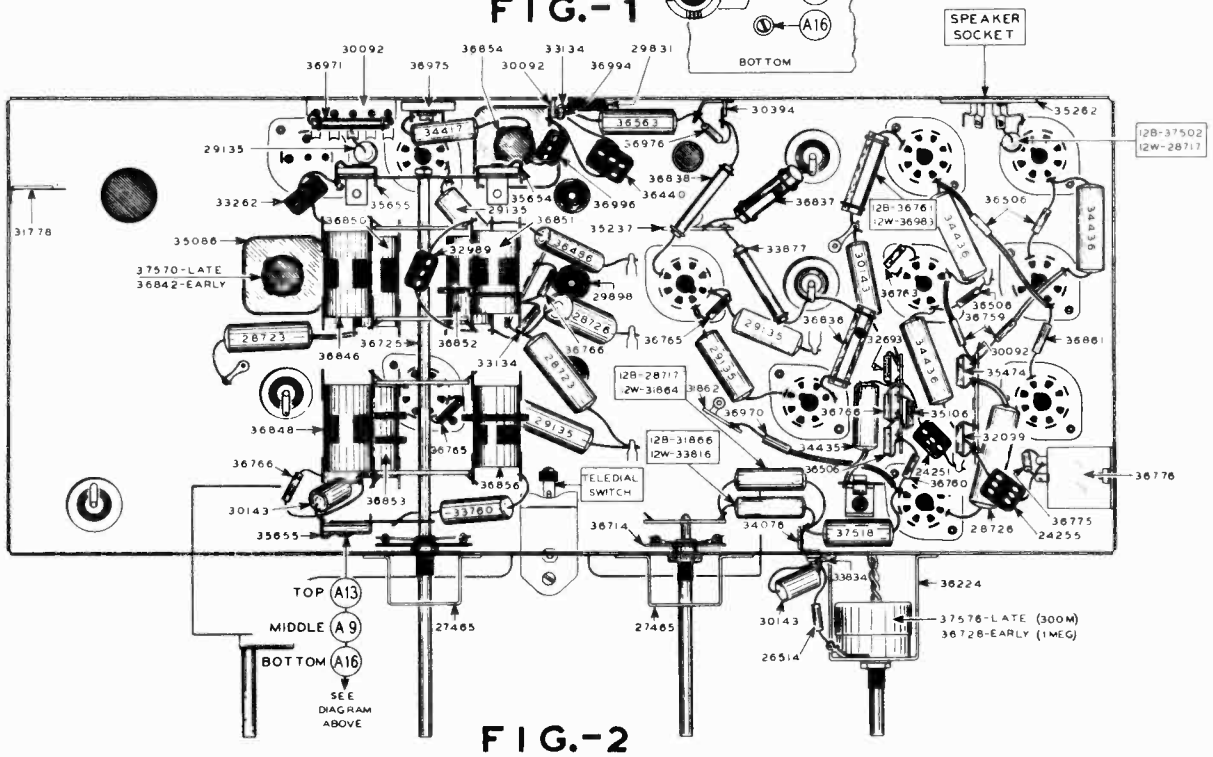


FIG.-2

CHASSIS BOTTOM VIEW

CHASSIS 12B & 12W
AUGUST - 1936
RAS 187

Schematic, Parts
Voltage

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 1291
Chassis 12B
MODEL 1297
Chassis 12W

The GRUNOW Chassis 12B and 12W are twelve tube, three band superheterodyne receivers, incorporating a combination mechanical and automatic tuning system.

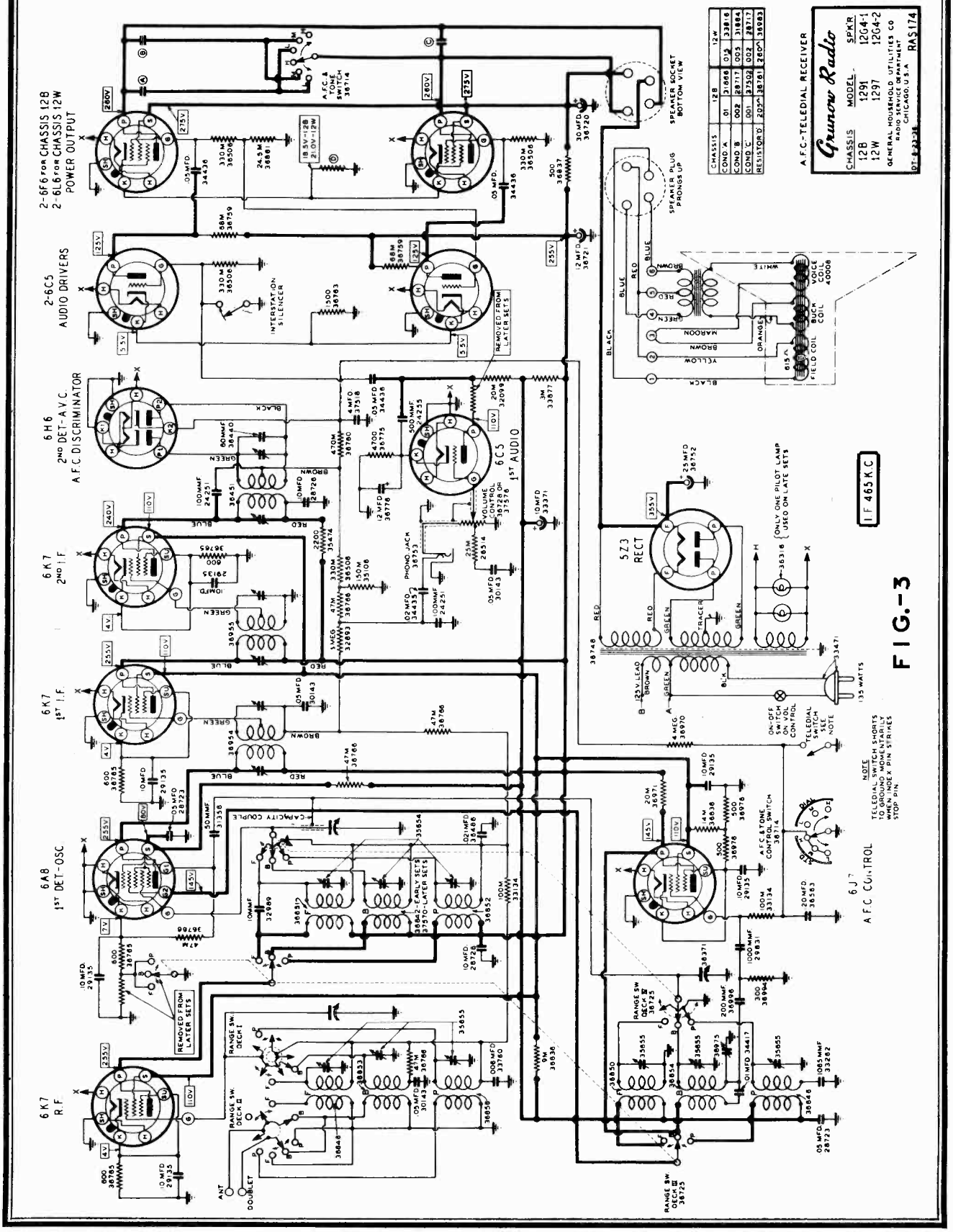


FIG.-3

CIRCUIT ALIGNMENT PROCEDURE

Do not attempt to align this chassis without the proper equipment as the sensitivity, selectivity, and calibration absolutely depend on the exact conformance to the following instructions. Each step in the alignment operation is given in its proper sequence and under no conditions should this order be changed. The chassis should be aligned in a location free from local interference (motors, flashers, automobile ignition, etc.) as high frequency disturbances will cause difficulty when the short wave section is adjusted. A screen room is recommended.

1. EQUIPMENT.

(A) Signal Generator.

A modulated oscillator capable of generating signals from 465 K.C. to 18 Megacycles, having an output of at least .10 volt.

(B) Non-metallic screw-driver (Alignment Tool).

(C) Output Meter.

A standard type output meter with sufficient sensitivity to give a good deflection with a small signal input.

(D) Discriminator Meter.

A galvanometer with sufficient sensitivity to read the current swing of the discriminator circuit. A type No. 699 Weston Galvanometer or equivalent is recommended. It is also suggested that a variable shunt of approximately 200 Ohms (wire wound rheostat) be connected across the galvanometer until approximate balance is reached. The shunt will also act as a safety device and "keeper" when the meter is not in use.

(E) Dummy Antenna.

.05 Mfd. condenser (I.F. Alignment).
200 Mmfd. condenser (Broadcast Alignment).
400 Ohm carbon resistor (Short Wave Alignment).

2. HEATING.

(A) Connect the receiver to a 115 V. A.C. source and allow the chassis to warm up for a period of 20 to 30 minutes. This is necessary to eliminate possible alignment variations due to thermal expansion or contraction of the capacitors and inductances in the various tuned circuits.

(B) The signal generator should be warmed up also, in order to prevent any frequency changes during alignment.

3. DIAL CALIBRATION.

(A) Turn the tuning knob until the condensers are fully meshed and set the dial pointer (Hour Hand) to the horizontal line pointing to 9 and 3 on the outer dial scale.

(B) Set the band spreading pointer (Minute Hand) to the vertical line, pointing to 12.

4. DISCRIMINATOR ALIGNMENT.

(A) Set the signal-generator to a frequency of 465 K.C., connect the output through an .05 mfd. condenser to the control grid of the 6K7—2nd I. F. tube. Connect the ground lead to the ground post on the chassis.

(B) Turn range switch to broadcast position (B), turn volume control full off and set dial pointer to 600 K.C.

(G) Adjust Discriminator primary (A1 or A2) to maximum swing on galvanometer (either positive or negative).

(H) Re-align secondary trimmer to position of zero current. Check signal-generator to be sure frequency has not changed. Do not re-adjust primary unless the entire operation above is repeated.

(I) Vary the frequency of the signal-generator to be certain that discriminator pointer rests at zero at exactly 465 K.C. Check to determine the maximum current on both sides of resonance—maximum positive current should equal maximum negative current.

Note: Discriminator alignment as outlined above is the accepted and most satisfactory method of obtaining an accurate adjustment. However, if a signal-generator of at least .10 volt output is not available, fair results can be obtained by introducing the signal through the grid of the 6A8 tube. If this method is used, the A.F.C. switch must be on "STD." position (A.F.C. circuit inoperative). This method is not recommended for best results.

5. I.F. ALIGNMENT—465 K.C.

(A) Set the signal-generator to a frequency of 465 K.C., connect the output through an .05 Mfd. condenser to the control grid of the 6A8—1st Detector-Oscillator tube and the ground lead to the ground post on the chassis.

(B) Adjust the I.F. Trimmers A3, A4, A5 and A6 to maximum output and at the same time attenuate the signal at the generator so as to have a minimum signal input to the receiver at all times during this and the following operations.

6. 1500 K.C. ALIGNMENT.

(A) Connect the output of the generator to the antenna post of the receiver through a 200 Mmfd. condenser and set the frequency at 1500 K.C.

(B) Set the dial pointer of the receiver to 1500 K.C.

(C) Adjust broadcast trimmers (A7) Oscillator, (A8) Detector and (A9) Antenna to maximum output.

(C) Connect the galvanometer to the two cathodes of the 6H6 Discriminator Tube.

(D) Attenuate signal-generator to *maximum* output, being certain that the frequency remains at 465 K.C.

(E) Determine primary and secondary of Discriminator transformer (A1 or A2) by touching the trimmer screws with a metal screw driver. When the metal comes in contact with the screw on the secondary trimmer, the galvanometer will fluctuate.

(F) With alignment tool back off trimmer screw of Discriminator secondary (A1 or A2) until trimmer is wide open.

7. 600 K.C. ALIGNMENT.

(A) Set the generator frequency to 600 K.C.

(B) Set the receiver dial pointer to 600 K.C.

(C) Adjust the 600 K.C. padder (A10) in direction of signal increase and at the same time rock tuning condenser back and forth through resonance, until the point of exact resonance is determined. This point does not have to be exactly 600 K.C. dial setting.

8. Repeat 1500 K.C. alignment operation No. 6, to correct any slight change which may have occurred due to the variation of the 600 K.C. padder.

9. 5000 K.C. ALIGNMENT.

(A) Set the generator to 5000 K.C. and connect the output to the antenna post of the receiver through a 400 Ohm carbon resistor.

(B) Set the receiver range switch to the Police-Amateur position and the dial pointer to 5000 K.C.

(C) Adjust the trimmers (All) Oscillator, (A12) Detector and (A13) Antenna to maximum output. When adjusting (A11) use signal with least capacity—trimmer farthest open.

10. 18 M.C. ALIGNMENT.

(A) Set generator to 18 M.C.

(B) Set the receiver range switch to the Foreign Broadcast position and the dial pointer to 18 M.C.

(C) Screw Oscillator Trimmer (A14) down tightly and then back off until signal is heard. Adjust to maximum output.

(D) Adjust the Detector Trimmer (A15) and at the same time rock the tuning condenser slowly back and forth through resonance until the point of maximum output is determined.

(E) Return to Oscillator Trimmer (A14) and readjust, if calibration has changed.

(F) Adjust Antenna Trimmer (A16) until maximum output is obtained.

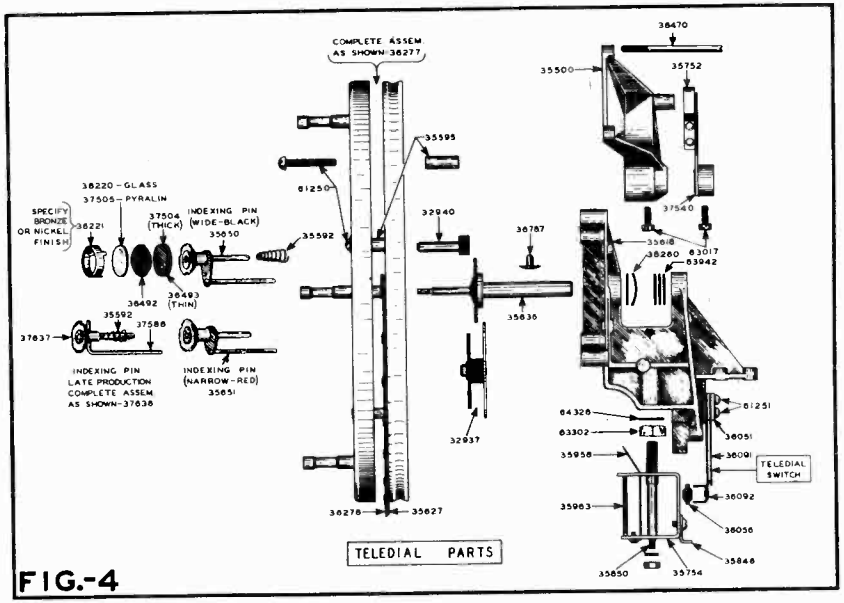
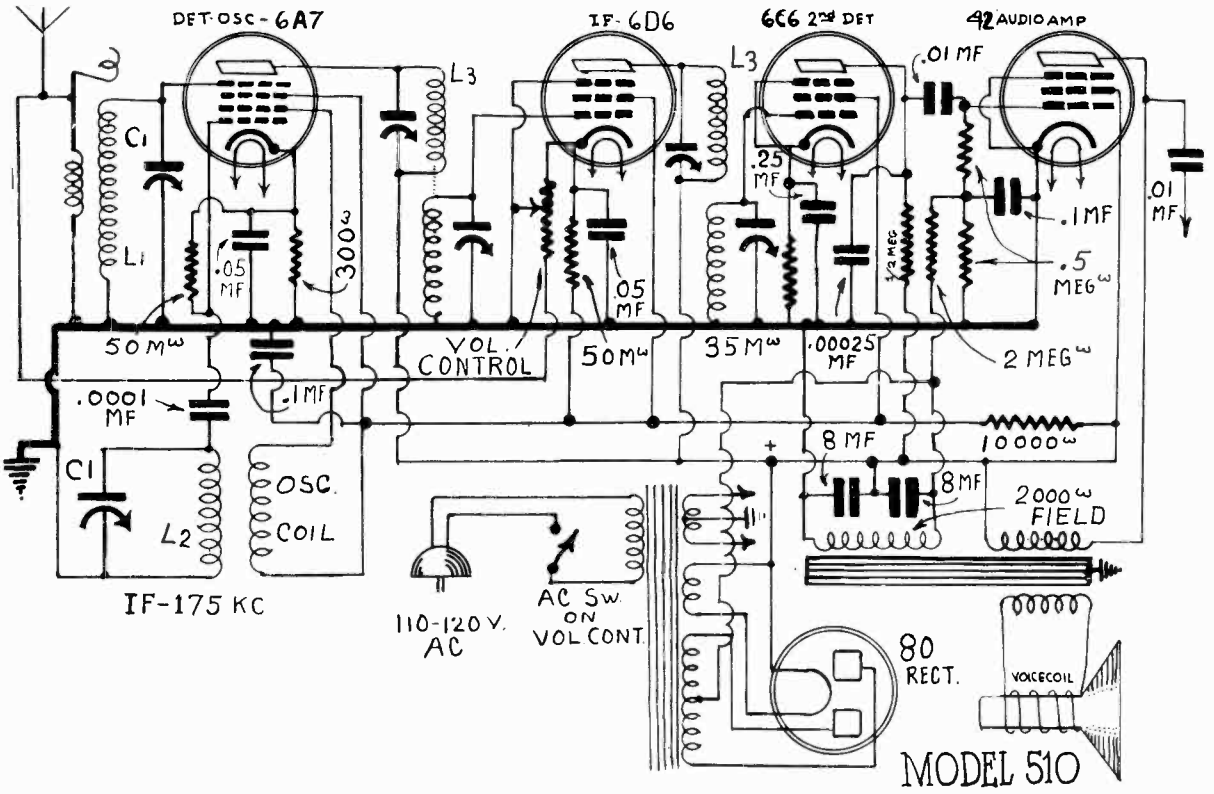
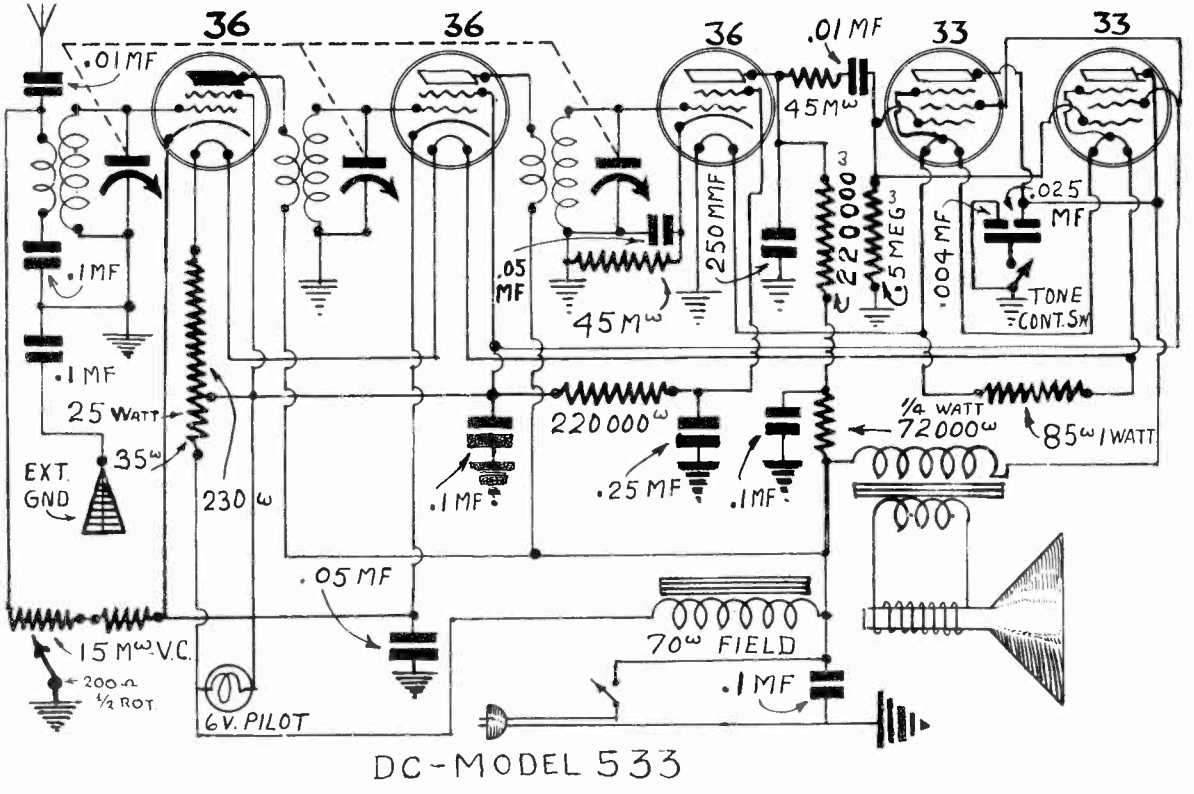


FIG.-4

MODEL 510
MODEL 533
Schematics

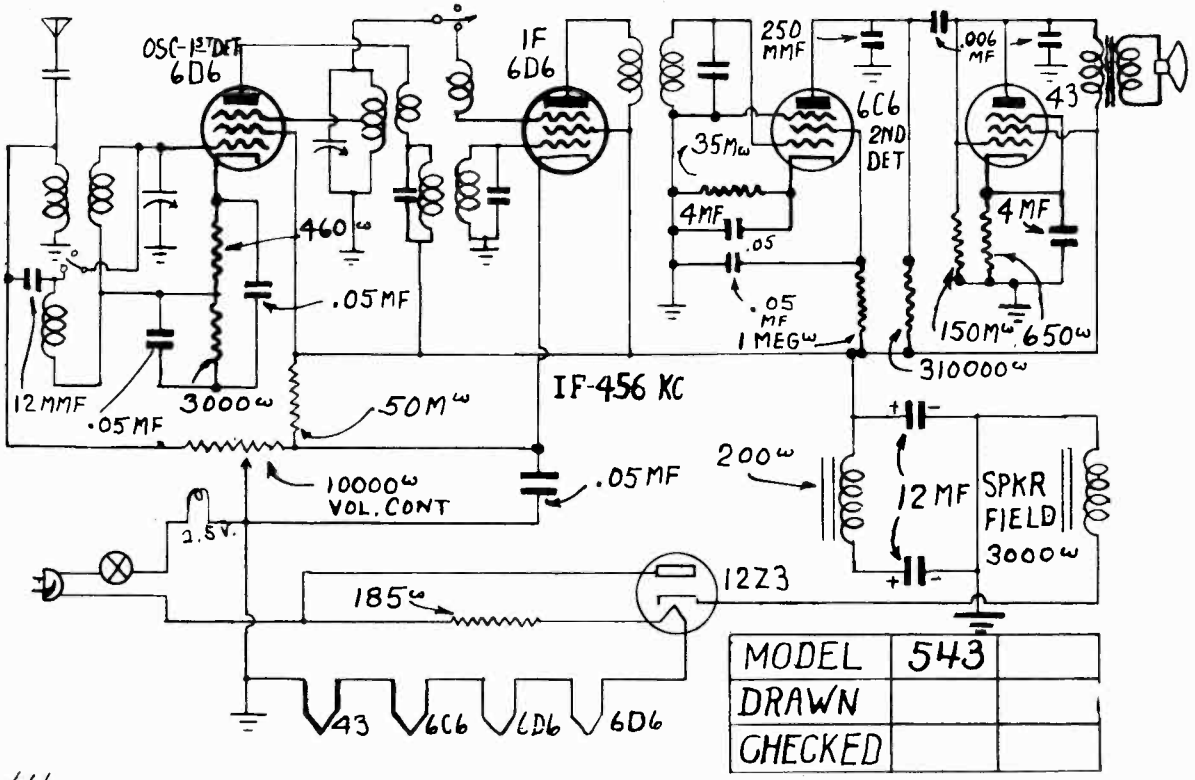
GENERAL TELEV. & RADIO CORP.



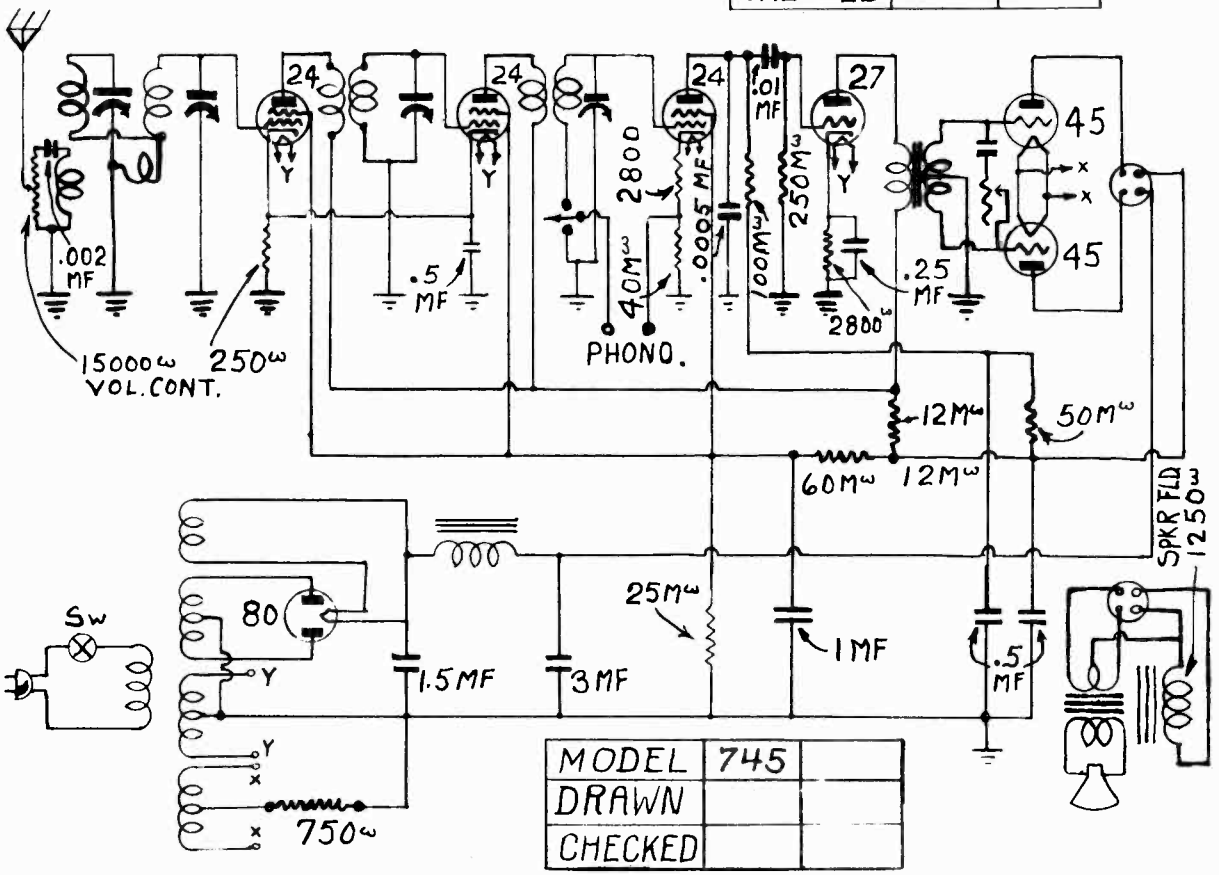


MODEL 543
MODEL 745
Schematics

GENERAL TELEV. & RADIO CORP.



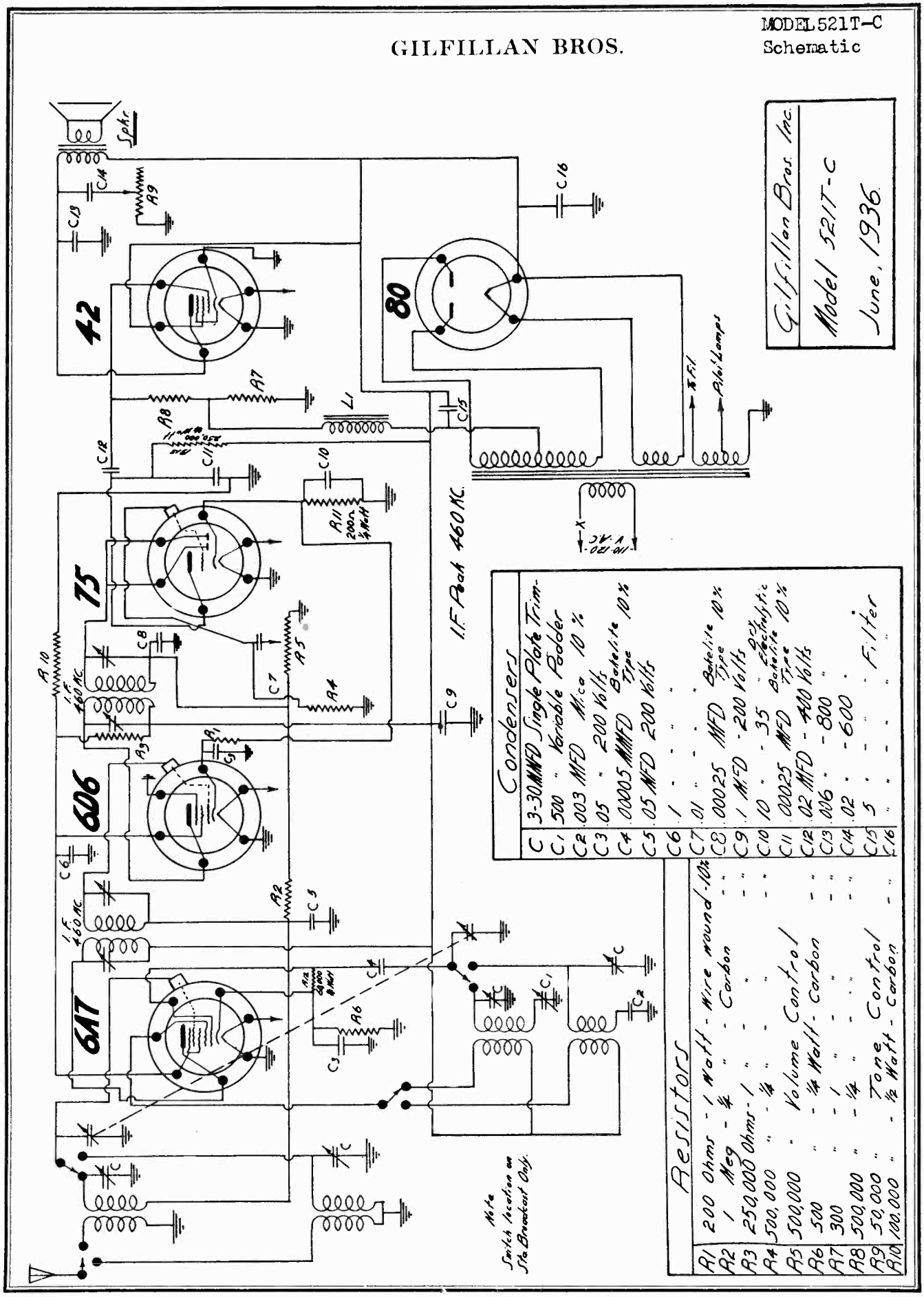
MODEL	543	
DRAWN		
CHECKED		



MODEL	745	
DRAWN		
CHECKED		

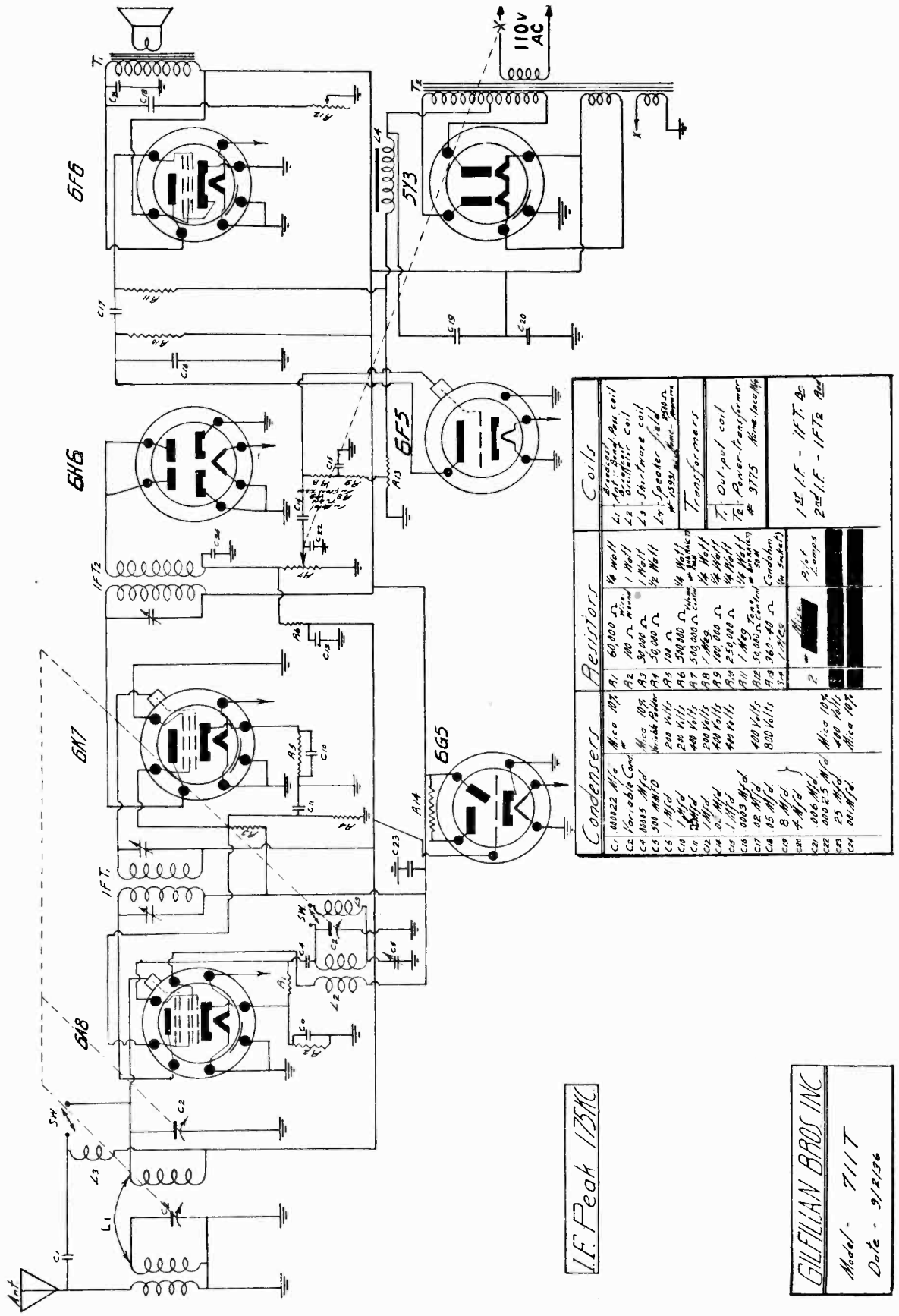
GILFILLAN BROS.

MODEL 521T-C
Schematic



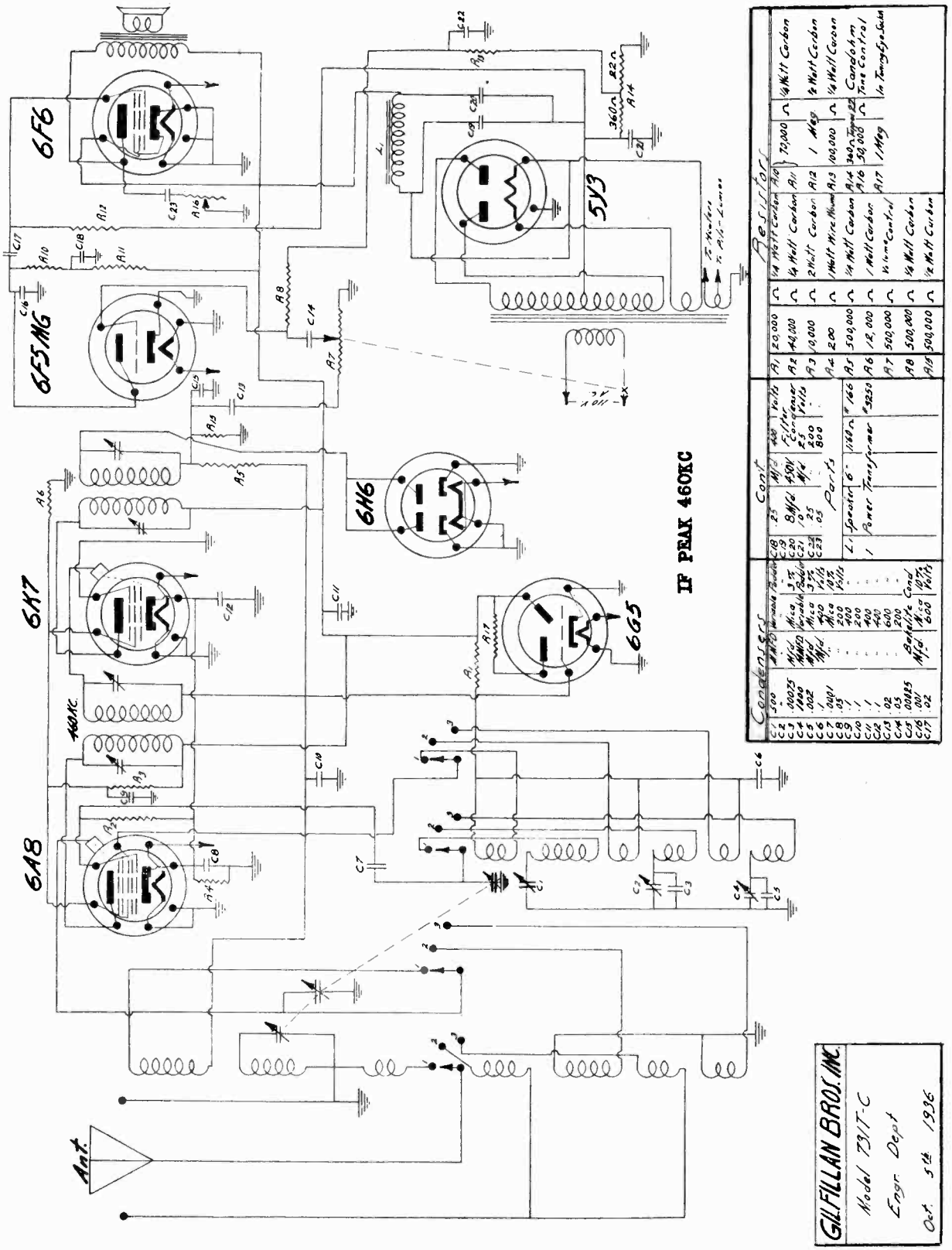
MODEL 711T
Schematic

GILFILLAN BROS.



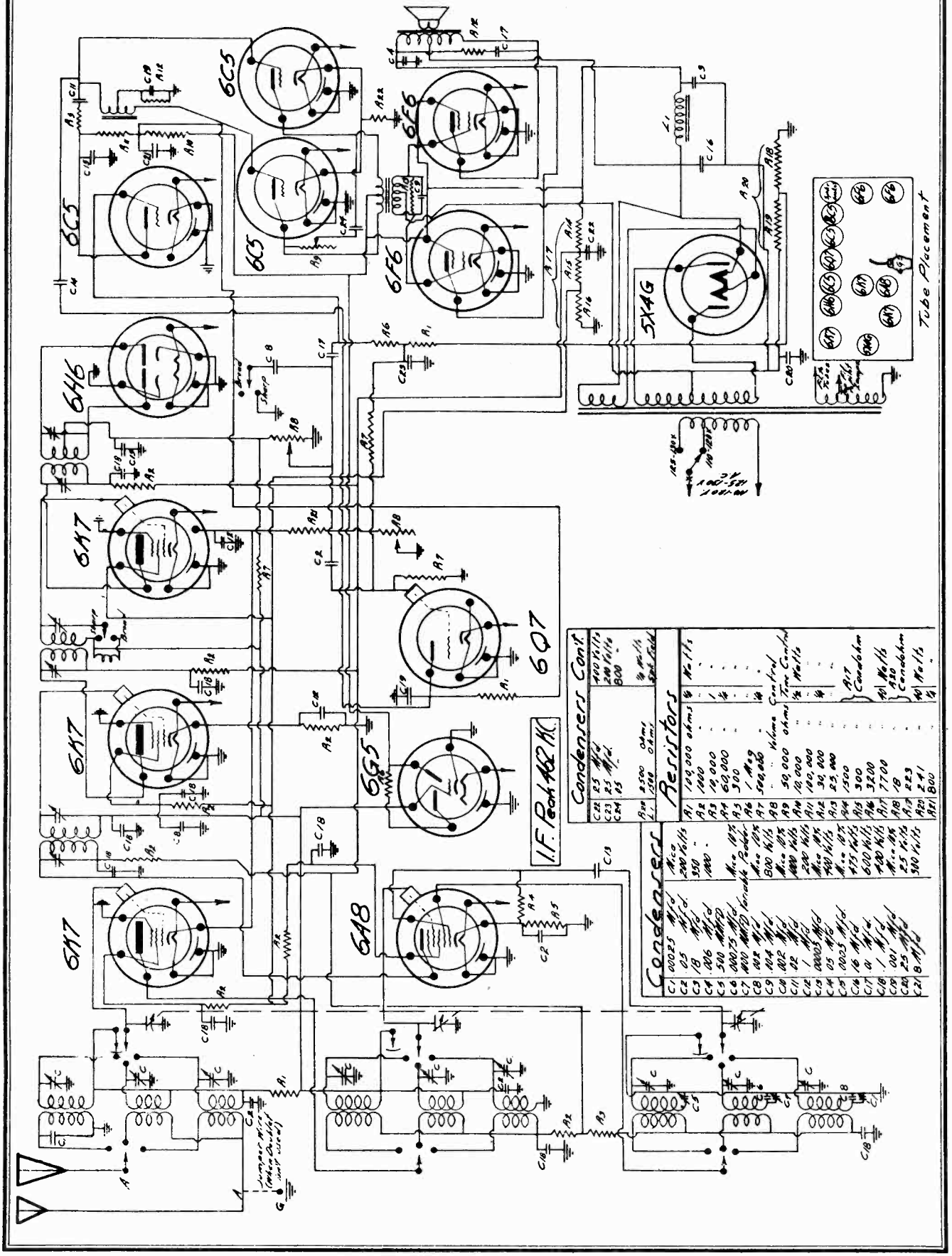
MODEL 731T-C
Schematic

GILFILLAN BROS.



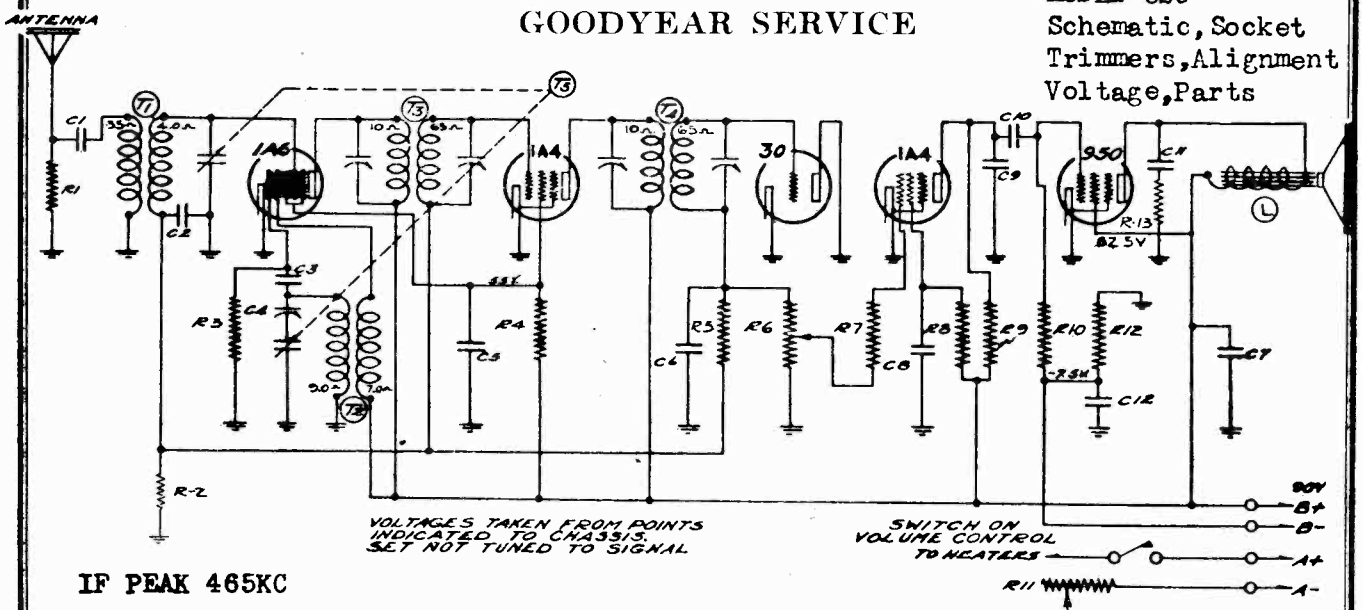
MODEL 1331C
Schematic

GILFILLAN BROS.



GOODYEAR SERVICE

MODEL 523
Schematic, Socket
Trimmers, Alignment
Voltage, Parts



IF PEAK 465KC

No.	Part No.	Description
		RESISTORS
R1	130-17	10M Ohm - 1/3 W. - 20% - Carbon
R2	130-38	2 meg " - 1/3 W. - 20% - Carbon
R3	130-52	50M " - 1/3 W. - 20% - Carbon
R4	130-17	10M " - 1/3 W. - 20% - Carbon
R5	130-38	2 meg " - 1/3 W. - 20% - Carbon
R6	101-69	1 meg " - Volume Control - and Switch
R7	130-52	50M " - 1/3 W. - 20% - Carbon
R8	130-19	1 meg " - 1/3 W. - 20% - Carbon
R9	130-9	200M ohm 1/3 W. - 20% - Carbon
R10	130-19	1 meg " - 1/3 W. - 20% - Carbon
R11	101-44	4.75 " - Rheostat
R12	130-93	450 " - 1/3 W. - 10% - Carbon
R13	130-52	50M " - 1/3 W. - 20% - Carbon
		CONDENSERS
C1	100-11	.01 x 400 v. - 25%
C2	100-22	.05 x 200 v. - 25%
C3	129-12	.00025 Mica - MT - 20%
C4	124-14	Series Pad
C5	100-9	.05 x 200 v. - 25%
C6	129-5	.0001 Mica - MT - 20%
C7	100-48	.25 x 200 v.
C8	100-9	.05 x 200 v. - 25%
C9	129-2	.0005 Mica - MT - 20%
C10	100-11	.01 x 400 v. - 25%
C11	100-11	.01 x 400 v. - 25%
C12	119-22	10.0 mfd. x 25 v. - Working Voltage
		PARTS
T1	111-46	Antenna Coil
T2	110-36	Oscillator Coil
T3	108-67	Input I. F. Coil - 46 kc.
T4	108-68	Output I. F. Coil - 465 kc.
T5	102-42	Two Gang Condenser
L	114-71	Eight Inch Magnetic Speaker

DESCRIPTION

TUBES:

The tube complement of this chassis is as follows:

1 Type 1A6—first detector oscillator.
1 Type 1A4—I.F. amplifier. 465 K. C.
1 Type 30—second detector. A. V. C.
1 Type 1A4—audio.
1 Type 950—output.

FOR BEST OPERATION THIS RECEIVER MUST HAVE AN OUTSIDE AERIAL NOT OVER FIFTY FEET LONG INCLUDING THE LEAD IN.

The following batteries are needed.

2——45 volt "B" Batteries.

1——3 Volt Dry "A" Battery or 2 Volt Storage Battery.

ALIGNING I.F. TRANSFORMERS: (465 K.C.)

1. With volume control full on and with variable condenser at its minimum capacity position, plates entirely out of mesh, and wth external oscillator set at 465 K.C. connected in series with a .1 mfd. condenser, to the grid of the 1A6 tube (cap at top of tube), adjust I.F. transformers, parts number 108-67 and 108-68, to resonance. Both of these transformers have two (2) adjustments each, they are accessible from the tops of the cans (for location see top view).

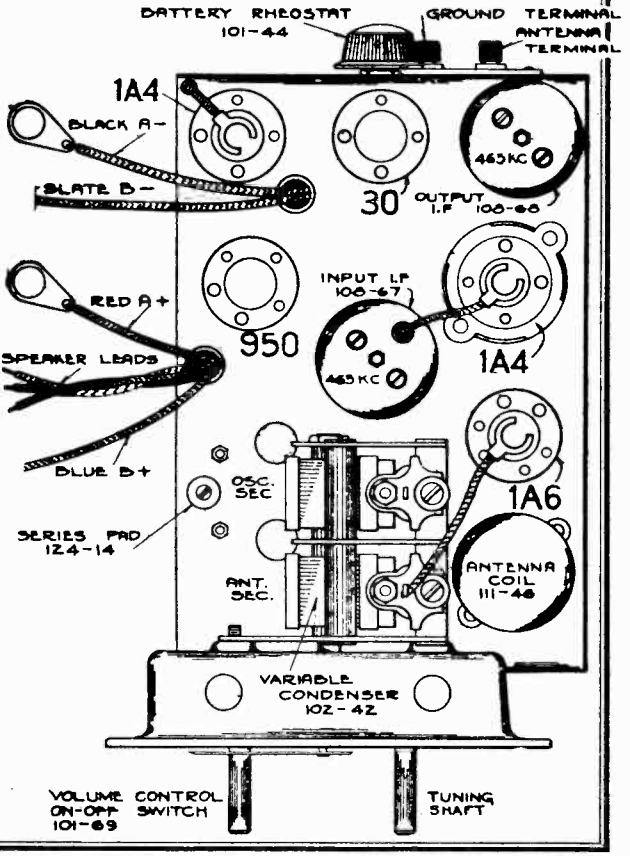
   Use as a resonance indicator an output meter connected across the outside terminals of the speaker or by means of an adapter to the plate and screen of the type 950 output tube. Maximum deflection of the volt meter indicates resonance.

   Use only enough signal to get a readily readable output.

   A low range output meter or the low scale of a multi-range meter should be used.

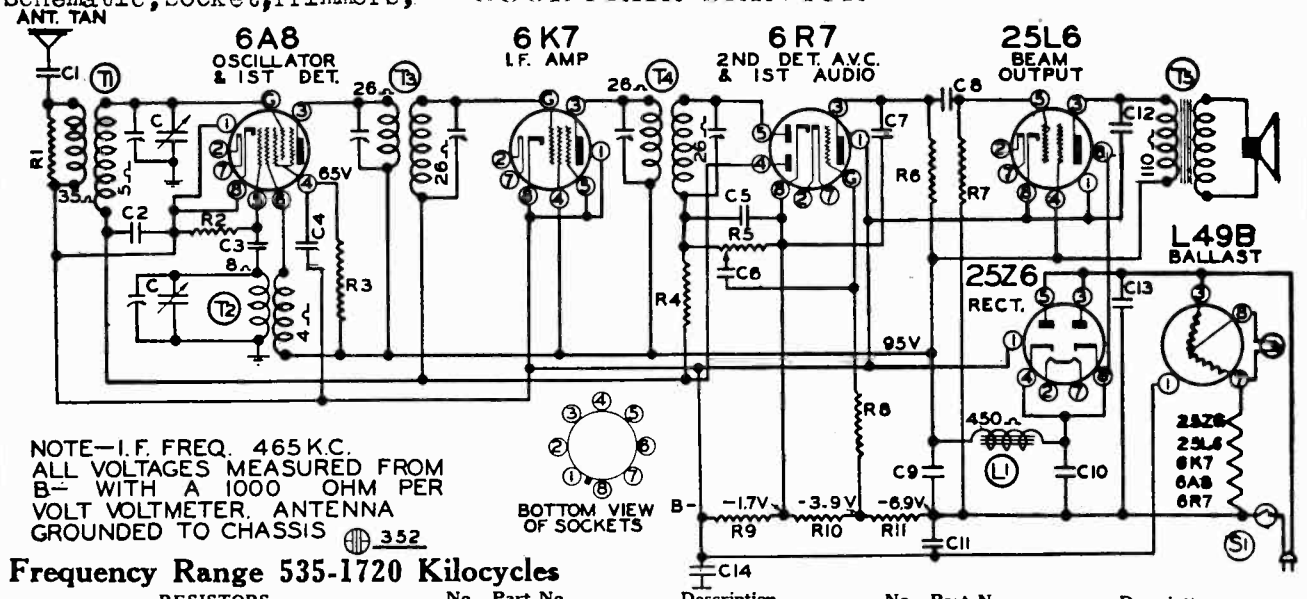
BROADCAST BAND ALIGNMENT:

1. Set external oscillator to 1720 K.C. and connect it in series with a 200 mmfd. condenser to the antenna and ground posts.
   (a) With variable condenser in its minimum capacity position, plates entirely out of mesh, adjust oscillator trimmer (rear section of variable condenser) to resonance.
   (b) Re-set external oscillator to 1400 K.C. Rotate variable condenser, pick up signal and adjust antenna trimmer (front section of variable condenser) to resonance.
   (c) Re -set external oscillator to 600 K.C., move dial pointer to 600 K.C., and adjust series pad, part number 124-14 (see top view), to resonance. While making this adjustment, slowly rock variable condenser to and fro until maximum output is obtained.
   (d) Check for sensitivity at 1400, 1000, 600 K.C. DO NOT BEND PLATES.



MODEL 602 — Alignment, Voltage, Parts

Schematic, Socket, Trimmers, — GOODYEAR SERVICE



NOTE—I.F. FREQ. 465 K.C.
ALL VOLTAGES MEASURED FROM B— WITH A 1000 OHM PER VOLT VOLTMETER. ANTENNA GROUNDED TO CHASSIS ⊕ 352

Frequency Range 535-1720 Kilocycles

RESISTORS

No.	Part No.	Description	
R1	130-17	10M ohm - 1/3 w.	20%
R2	130-12	50M ohm - 1/3 w.	20%
R3	130-149	15M ohm - 1/3 w.	20%
R4	130-4	3 meg ohm - 1/3 w.	20%
R5	101-77	Volume Control (1 Meg)	
R6	130-12	50M ohm - 1/3 w.	20%
R7	130-20	100M ohm - 1/3 w.	20%
R8	130-19	1 megohm - 1/3 w.	20%
R9	106-38	30 ohm	
R10	106-38	40 ohm	
R11	106-38	55 ohm	
		R9, R10, and R11 in one unit	

CONDENSERS

No.	Part No.	Description	
C	102-48	2 gang variable	
C1	100-25	.002 x 600	25%
C2	100-9	.05 x 200	25%
C3	129-12	.00025 Mica	20%
C4	100-22	.05 x 200	25%
C5	129-5	.0001 Mica	20%
C6	100-11	.01 x 400	25%
C7	129-2	.0005 Mica	20%
C8	100-22	.05 x 200	25%
C9	119-39	20 mfd. lytic - 100 w.v.	
C10	119-39	15 mfd. lytic - 100 w.v.	
C11	100-20	.1 x 200	25%
C12	100-13	.05 x 400	25%
C13	100-39	.1 x 400	20%
C14	100-53	.25x400	20%

PARTS

T1	111-58B	Antenna Coil Complete
T2	110-46	Oscillator Coil Complete
T3	108-82B	Input I. F. Complete
T4	108-83B	Output I. F. Complete
T5	114-71	Dynamic Speaker
L1		450 ohm speaker field
S1		Switch on Volume Control

ALIGNING I.F. TRANSFORMERS: (465 K. C.):

Part No. 108-83B Output I.F. Transformer

Part No. 108-82B Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see Fig. 1).

1. With volume control full on (the extreme right of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with .1 mfd. condenser, to the control grid cap of the type 6K7G tube, and adjust the output I.F. transformer (No. 108-83B) to resonance.
   (b) Move oscillator output clip from grid of 6K7G to grid of 6A8G and adjust input I.F. transformer (No. 108-82B) to resonance.
   (c) With oscillator still connected to 6A8G, readjust output I.F. transformer (108-83B) if necessary.

R.F. ALIGNMENT: (535-1720 K.C.)

1. With gang condenser in its minimum capacity position, plates entirely out of mesh, connect an external oscillator in series with a 200 mmf. condenser to the antenna lead and chassis ground and make the following adjustments:
   (a) With external oscillator set at 1720 kilocycles, adjust oscillator trimmer to resonance. This adjustment is on the top of rear section of variable gang condenser. (See Fig. 1).
   (b) Re-set external oscillator to 1400 kilocycles, rotate condenser, pick up oscillator signal and adjust antenna trimmer to resonance. (Top of front section of gang condenser).
   (c) Check sensitivity at 600 and 1000 kilocycles.

The type and function of each tube is as follows:

Type 6A8G Pentagrid Mixer, First Detector-oscillator.

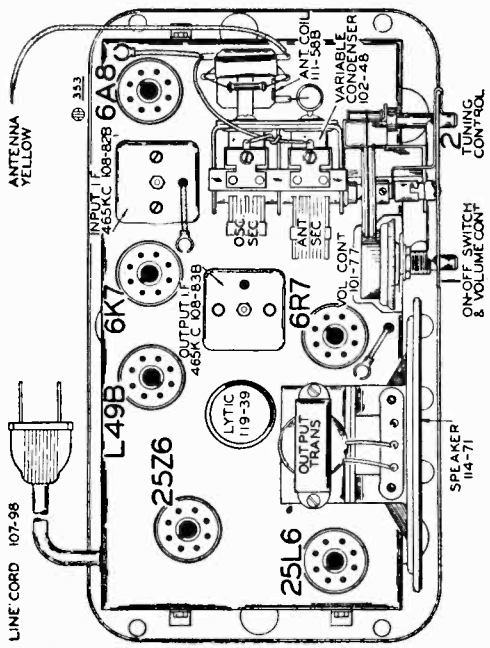
Type 6K7G Remote Cut-Off Pentode, I.F. Amplifier K.C.)

Type 6R7G. Duplex Diode Triode Second Detector, and First Audio.

Type 25L6G Beam Output Amplifier.

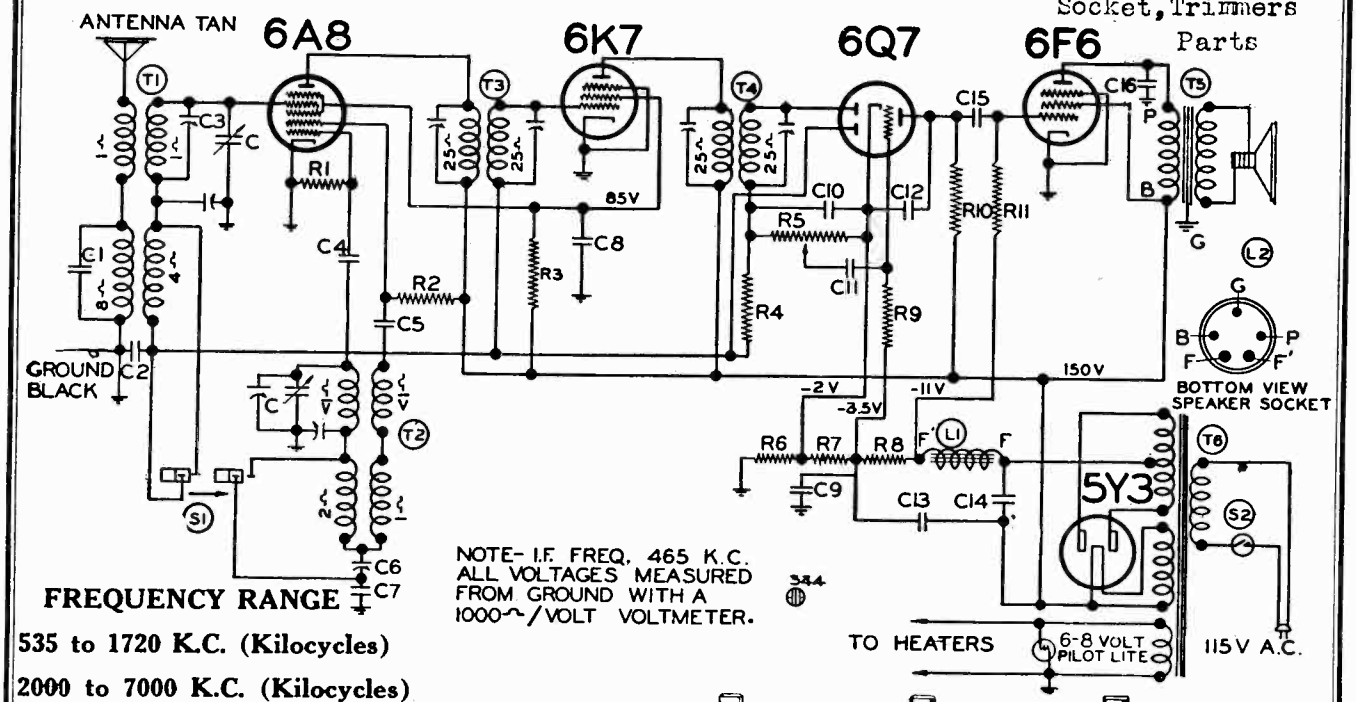
Type 25Z6G High Vacuum Rectifier.

Type L49B Ballast Tube.



GOODYEAR SERVICE

MODEL 588
Schematic, Voltage
Socket, Trimmers
Parts



FREQUENCY RANGE

535 to 1720 K.C. (Kilocycles)

2000 to 7000 K.C. (Kilocycles)

No.	Part No.	Description
		CONDENSERS
C1	129-12	.00025 - Mica 20%
C2	100-22	.05 x 200 25%
C3	124-39	Adjustable Condenser 2-20 mmf.
C4	129-5	.0001 - Mica 20%
C5	100-37	.003 x 600 v. 10%
C6	124-38	Series Pad - 600 mmf.
C7	129-74	.0015 Mica 2½%
C8	100-1	.1 x 400 v. 50% - 10%
C9	100-20	.1 x 200 v. 25%
C10	129-5	.0001 Mica 20%
C11	100-11	.01 x 400 v. 25%
C12	129-2	.0005 Mica 20%
C13	119-38	5 mfd. 200 w. v. Black
C14	119-38	5 mfd. 250 w. v. Brown
C15	100-11	.01 x 400 v. 25%
C16	100-19	.006 x 600 v. 25%
		C13 and C14 - in one unit.
		RESISTORS
R1	130-12	50M ohm - 1/3 w. 20%
R2	130-17	10M ohm - 1/3 w. 20%
R3	130-149	15M ohm - 1/3 w. 20%
R4	130-4	3 megohm - 1/3 w. 20%
R5	101-71	1 megohm - Volume control
R6	106-35	65 ohm - Muter
R7	106-35	45 ohm - Muter
R8	106-35	220 ohm - Muter
R9	130-4	3 megohm - 1/3 w. 20%
R10	130-9	200M ohm - 1/3 w. 20%
R11	130-3	500M ohm - 1/3 w. 20%
		R6, R7 and R8 in one unit
		PARTS
T1	111-75	Antenna coil complete
T2	110-60	Oscillator coil complete
T3	108-104	Input I.F. Assembly complete
T4	108-103	Output I.F. Assembly complete
T5		Output Transformer
T6	104-60B	Power Transformer
L1		2000 ohm - speaker field
L2	114-61	Dynamic speaker
S1	125-27	Wave change switch
S2		Switch on Volume Control

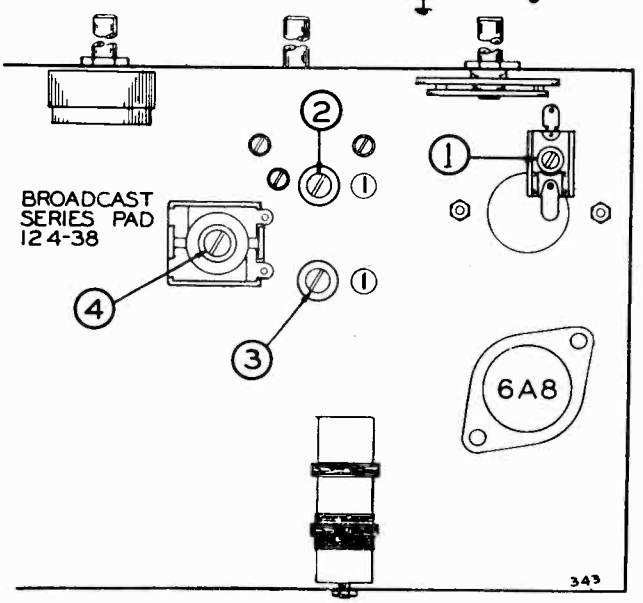
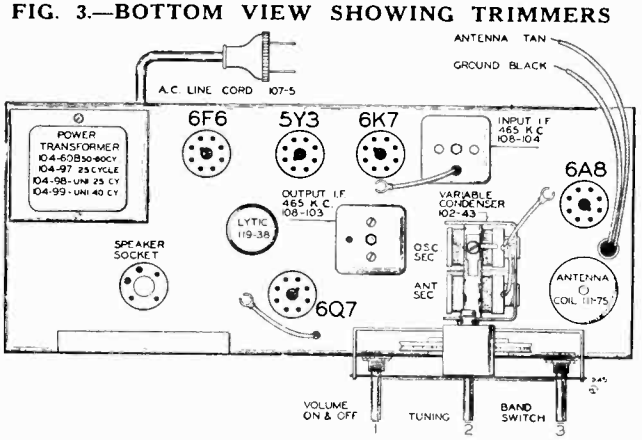


FIG. 3.—BOTTOM VIEW SHOWING TRIMMERS



Vol. Control On-Off Switch | Tuning Control | Band Switch

MODEL 588
Alignment, Notes

GOODYEAR SERVICE

RESONANCE INDICATOR:

Use as a resonance indicator an output meter connected across the primary of the speaker input transformer or by means of an adapter between the plate and screen terminals of the type 6F6G output tube. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of a multi-range meter should be used.

DUMMY ANTENNAS:

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1", "Dummy 2", and "Dummy 3".

Dummy 1: (I.F.)—Consists of a .1 mfd. condenser connected in series with the external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 mmfd. condenser and a 20 ohm resistor connected in series with each other and in series with the external oscillator.

Dummy 3: (Short Wave)—Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

ALIGNING I.F. TRANSFORMERS: (465 K.C.):

Part No. 108-103 Output I.F. Transformer
Part No. 108-104 Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With volume control full on, (the extreme right of its rotation), the band changing switch in the broadcast position, (extreme left of its rotation), and with the variable condenser in its minimum capacity position, plates entirely out of mesh, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1", to the control grid cap of the type 6K7G tube, and adjust the output I.F. transformer (No. 108-103) to resonance.
   (b) With "Dummy 1" still connected, move oscillator output clip from grid of 6K7G to grid cap of 6A8G and adjust input I.F. transformer (No. 108-104) to resonance.

SHORT WAVE BAND ALIGNMENT:

2000 to 7000 Kilocycles

1 With band changing switch in the short wave position, extreme right of its rotation, and with external oscillator set at 6 megacycles and connected in series with "Dummy 3" to the antenna and ground leads, make the following adjustments:
   (a) Move dial pointer to 6 megacycles and adjust short wave oscillator trimmer to resonance.
   This adjustment is the trimmer mounted on the top of rear section of the variable gang condenser (see Fig. 1, top view).
   (b) Adjust short wave antenna trimmer (Adjustment Number 1), to resonance (see Fig. 3, bottom view).

BROADCAST BAND ALIGNMENT:

535 to 1720 Kilocycles

1. With band changing switch in the broadcast position, extreme left of its rotation, and with gang condenser in its minimum capacity position, plates entirely out of mesh, and with external oscillator connected in series with "Dummy 2" to antenna and ground leads make following adjustments:
   (a) Set external oscillator to 1720 K.C. and adjust broadcast oscillator trimmer to resonance. (Adjustment number 3, see bottom view of chassis, Fig. 3).
   (b) Re-set external oscillator to 1400 K.C., rotate variable gang condenser and pick up signal. Adjust broadcast antenna trimmer (adjustment number 2), to resonance.
   (c) Re-set external oscillator to 600 K.C., and adjust broadcast series pad (adjustment number 4), to resonance by rotating condenser to approximately 600 K.C., rocking it slowly to and fro until by adjusting series pad maximum output is attained. This adjustment is located on the bottom of the chassis directly under the variable gang condenser. (See bottom view of chassis, Fig. 3).
   (d) Repeat adjustments "a" and "b" until sensitivity is at its maximum.
   (e) Check for tracking and sensitivity at 1400, 1000, and 600 kilocycles. **Under no circumstances bend plates of variable condenser sections to correct tracking.**

ANTENNA AND GROUND LEADS:

For the best results an outside antenna approximately 75-100 feet long including the lead-in should be used. It should be erected as high as possible and as far from surrounding objects as practical. Both the antenna and lead-in should be placed at right angles to street car lines and incoming power lines and as far from any electrical apparatus which may be in the vicinity (such as elevator motors) as practical.

An inside antenna is not recommended, although it occasionally may serve as a temporary installation especially near powerful broadcasting stations. This type of antenna, however, will not be satisfactory in buildings of steel construction.

Reception on the short wave band can be sometimes improved by means of an approved doublet antenna.

This radio will operate without a ground; however, a good ground by means of an approved clamp to water or steam (not gas) pipes or to a pipe driven in the ground will often reduce noise pick-up.

IN ORDER TO PREVENT SIGNAL FROM ACTING UPON AVC AND AFFECTING ACCURACY OF VOLTAGE MEASUREMENTS, AERIAL AND GROUND LEADS SHOULD BE SHORT CIRCUITED WHILE MAKING MEASUREMENTS.

DESCRIPTION:

The tube complement of this chassis consists of the following octal base glass tubes which are interchangeable with metal tubes:

1—Type 6A8G Pentagrid mixer, first detector-oscillator.
1—Type 6K7G Remote cut-off pentode I.F. amplifier (465 K.C.)
1—Type 6Q7G duplex diode triode second detector, A.V.C. and audio.
1—Type 6F6G—pentode output amplifier.
1—Type 5Y3G or 5W4—high vacuum rectifier.

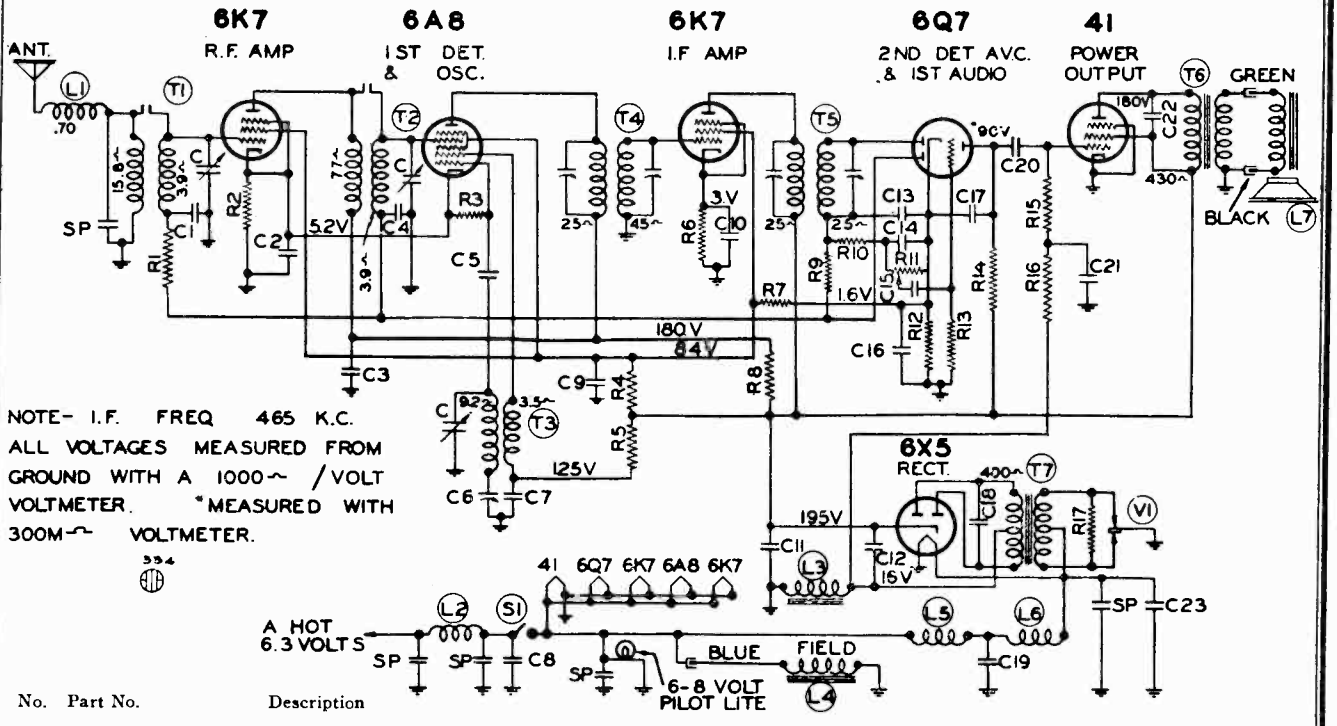
Transformers are available and chassis are sometimes equipped with universal transformers for operation on 25, 40 and 60 cycles and with primary taps for 108, 127, 150, 225, and 260 volts, (see instructions) and also sometimes equipped with 25 cycle transformers with 105-115 volt or 220 volt primaries, not universals.

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the circuit diagram.

Socket, Trimmers
Alignment, Parts

GOODYEAR SERVICE

MODEL 661
Schematic, Voltage



No.	Part No.	Description
		CONDENSERS
C	102-26	3 Gang Variable Condenser
C1	100-63	.05 x 200v. 50 - 10%
C2	100-63	.1 x 200v. 50 - 10%
C3	100-13	.05 x 400v. 25%
C4	100-22	.05 x 200v. 25%
C5	129-12	.00025 Mica - 20%
C6	124-37	Series Pad
C7	100-20	.1 x 200 v. 25%
C8	100-31	.5 x 120 v. 10 50%
C9	100-62	.25 x 200 v. 50 - 10%
C10	100-20	.1 x 200 v. 25%
C11	119-37	8 mfd. lytic 300 wv.
C12	119-37	4 mfd. lytic 300 wv.
C13	129-5	.0001 Mica 20%
C14	129-5	.0001 Mica 20%
C15	100-11	.01 x 400 v. 25%
C16	100-11	.01 x 400 v. 25%
C17	129-5	.0001 Mica 20%
C18	100-58	.005 x 1200 v. 20 - 10%
C19	100-31	.5 x 120 v. - 10 50%
C20	100-11	.01 x 400 v. 25%
C21	100-62	.25 x 200 v. 50 - 10%
C22	100-54	.006 x 600 v. 25%
C23	100-31	.5 x 120 v. - 10 50%
SP		Spark Plate

C1, C2 in same block
C11 and C12 in same block
C9 and C21 in same block

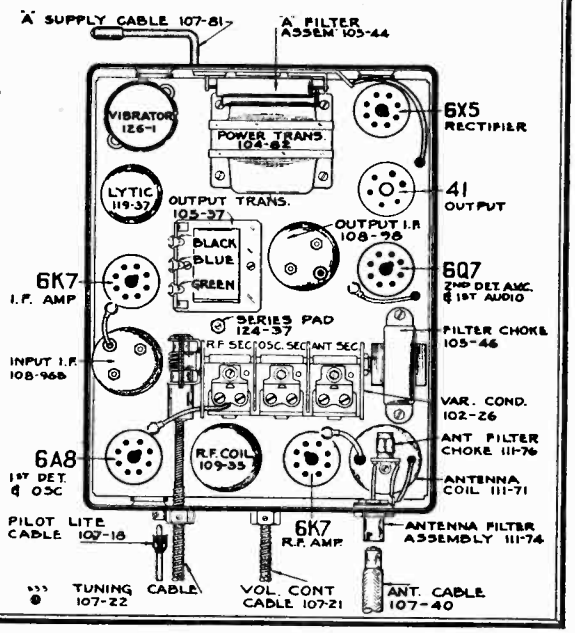
No.	Part No.	Description
		RESISTORS
R1	130-20	100M - 1/3 w. - 20%
R2	130-54	500 ohm - 1/3 w. - 20%
R3	130-12A	50M ohm - 1/3 w. insulated 20%
R4	130-165	15M ohm - 1 w. - 20%
R5	130-131A	20M ohm - 1/2 w. - insulated - 10%
R6	130-24	400 ohm - 1/3 w. - 20%
R7	130-139A	40M ohm - 1/3 w. Insulated - 20%
R8	130-31A	1500 ohm - 1/3 w. insulated - 20%
R9	130-19	1 megohm - 1/3 w. - 20%
R10	130-52	50M ohm - 1/3 w. - 20%
R11	101-41	500M ohm - Volume Control
R12	130-153	700 ohm - 1/3 w. - 20%
R13	130-19	1 megohm - 1/3 w - 20%
R14	130-11A	250M - 1/3 w. Insulated - 20%
R15	130-5A	300M ohm - 1/3 w. insulated - 20%
R16	130-11A	250M ohm - 1/3 w. insulated - 20%
R17	130-84	200 ohm - 1/3 w. insulated - 20%

No.	Part No.	Description
		PARTS
T1	111-71	Antenna Coil Complete
T2	109-35	R.F. Coil Complete
T3	110-57	Oscillator Coil Complete
T4	108-96B	Input I.F. Complete
T5	108-98	Output I. F. Complete
T6	105-37	Output Transformer
T7	104-82	Power Transformer
L1	111-76	Antenna Filter Choke
L2	105-26	"A" Choke
L3	105-46	"B" Filter Choke, 335 ohm
L4		Speaker Field, 4 ohm
L5	105-24	"A" Choke
L6	105-19	"A" Choke
L7	114-59	Dynamic Speaker
S1		Switch on Volume Control
V1	126-1	Vibrator

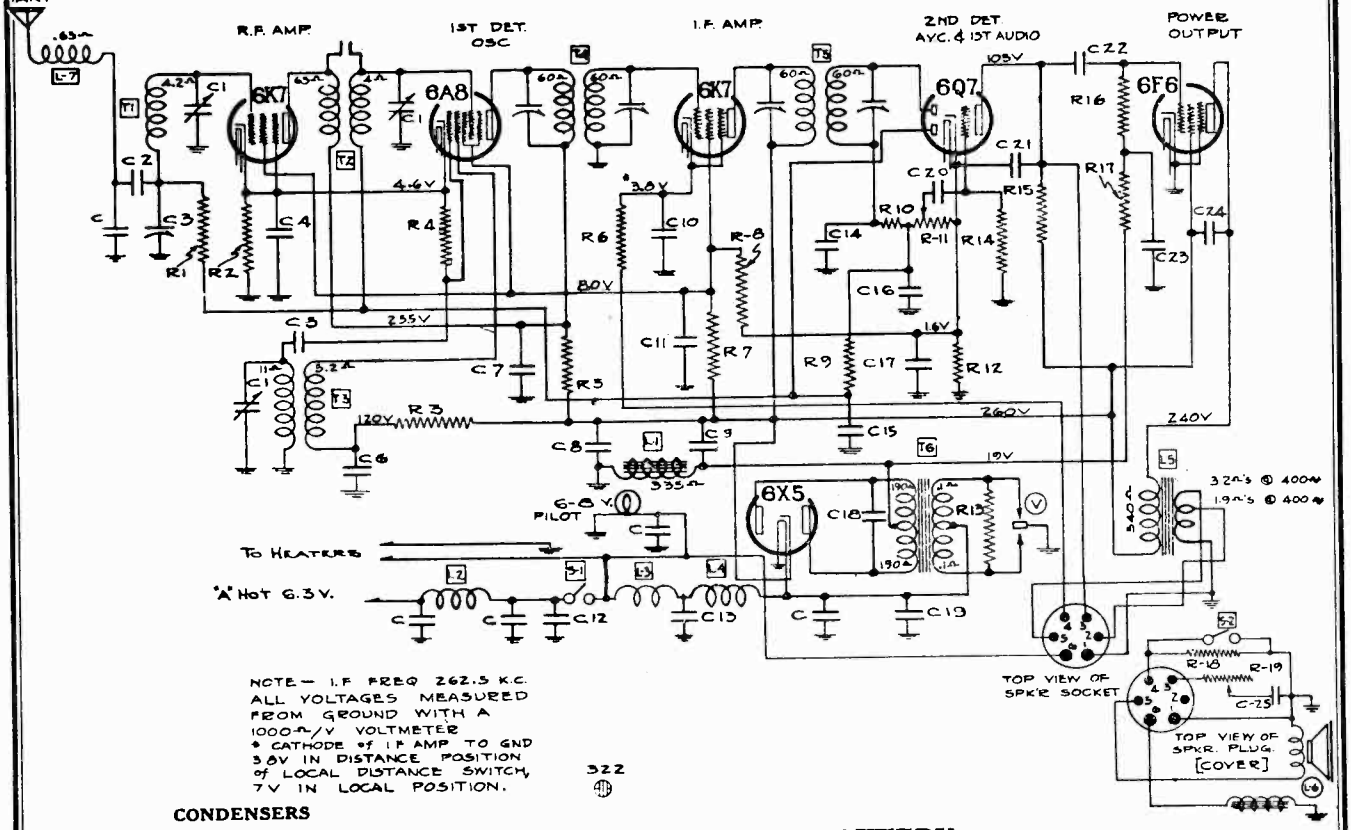
BROADCAST ALIGNMENT

1. With variable condenser in its minimum capacity position, connect test oscillator set at 1550 K.C. in series with broadcast dummy to the antenna lead of receiver.
2. Adjust oscillator trimmer of variable condenser to resonance. (This adjustment is on the middle section of the three-gang condenser—see top view, Fig. 2).
3. Shift test oscillator to 1400 K.C. and pick up signal by rotating condenser and adjust R.F. and antenna trimmers to resonance (see top view, Fig. 2).
4. Re-set test oscillator to 600 K.C. and rotate variable condenser to 600 K.C. Adjust series pad, rocking gang condenser to and fro, at the same time adjusting series pad for maximum gain. This adjustment is accessible from the top of chassis—see top view.
5. Go back and check 1400 K.C. If adjustment is made here, check 600 K.C. again. Check for sensitivity at 1000 K.C.

CONVENTIONAL ALIGNMENT- (see special section)



MODEL 667 — Schematic, Voltage — GOODYEAR SERVICE — Socket, Trimmers — Parts



NOTE— I.F. FREQ 262.5 K.C.
ALL VOLTAGES MEASURED FROM GROUND WITH A 1000-Ω/V VOLTMETER
* CATHODE of I.F. AMP TO GND
30V IN DISTANCE POSITION of LOCAL DISTANCE SWITCH,
7V IN LOCAL POSITION.

322

CONDENSERS

C		Spark Plate
C1	102-45	3 Gang Condenser
C2	129-73	.002 Mica - MW-W - 10%
C3	124-36	Series Pad
C4	116-20	.1 x 200 v. - 20%
C5	129-12	.00025 Mica - MT - 20%
C6	116-19	.1 x 400 - 20%
C7	116-19	.1 x 400 - 20%
C8	119-34	8. mfd. - 350 W v.
C9	119-34	4 mfd. 350 W v.
C10	116-19	.05 x 200 v. - 20%
C11	116-20	.25 x 200 v. - 20%
C12	100-31	.5 x 120 v. - 10-50% - Braid leads
C13	100-31	.5 x 120 v. - 10-50%
C14	129-5	.0001 Ceramicon - 20%
C15	116-19	.05 x 200 v. - 20%
C16	129-5	.0001 Ceramicon - 20%
C17	116-20	.02 x 200 - 20%
C18	100-36	.01 x 1400 v. - 20% - 10% "A"
C19	100-31	.5 x 120 v. - 10% - 50%
C20	116-20	.02 x 200 - 20%
C21	129-5	.0001 Ceramicon - 20%
C22	100-55	.01 x 400 - 25%
C23	100-48	.25 x 200 - 20%
C24	100-54	.006 x 600 - 25%
C25	100-11	.01 x 400 - 25%

C4, C11, C17, C20 All in Block 116-20
C7, C6, C10, C15 All in Block 116-19

RESISTORS

R1	130-141	250M ohm - 1/3 w. Insulated
R2	130-54	500 ohm - 1/3 w.
R3	130-138	50M ohm - 1/2 w. Insulated
R4	130-52	50M ohm - 1/3 w.
R5	130-137	1500 ohm - 1/3 w. Insulated
R6	130-154	1000 ohm - 1/3 w. Insulated
R7	130-143	30M ohm - 1.2 w.
R8	130-139	40M ohm - 1/3 w. Insulated
R9	130-19	1 meg - 1/3 w.
R10	130-162	50M ohm - 1/3 w. Insulated
R11	101-73	250M ohm - Volume Control
R12	130-153	700 ohm - 1/3 w.
R13	130-84	200 ohm - 1/3 w.
R14	130-19	1 meg ohm - 1/3 w.
R15	130-11	250M ohm - 1/3 w.
R16	130-5	300M ohm - 1/3 w.
R17	130-11	250M ohm - 1/3 w.
R18	130-161	4000 ohm - 1/3 w. Insulated
R19	101-45	Tone Control 1 Meg ohm.

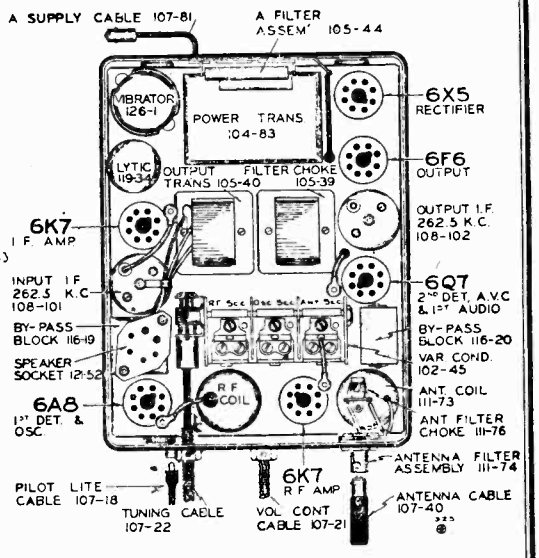
PARTS

L7	111-76	Antenna Filter Choke Assembly
T1	111-73	Antenna Coil Complete
T2	109-36	R.F. Coil Complete
T3	110-59	Oscillator Coil Complete
T4	108-101	I.F. Input
T5	108-102	I.F. Output
T6	104-83	Power Transformer
L1	105-39	Filter Choke (335 ohms)
L2	105-26	"A" Choke
L3	105-24	"A" Choke
L4	105-19	"A" Choke
L5	105-40	Output transformer
L6	114-62	Speaker. Dynamic
S1		Switch on Volume Control
S2	125-28	Sensitivity switch.

CONNECTIONS TO BATTERY

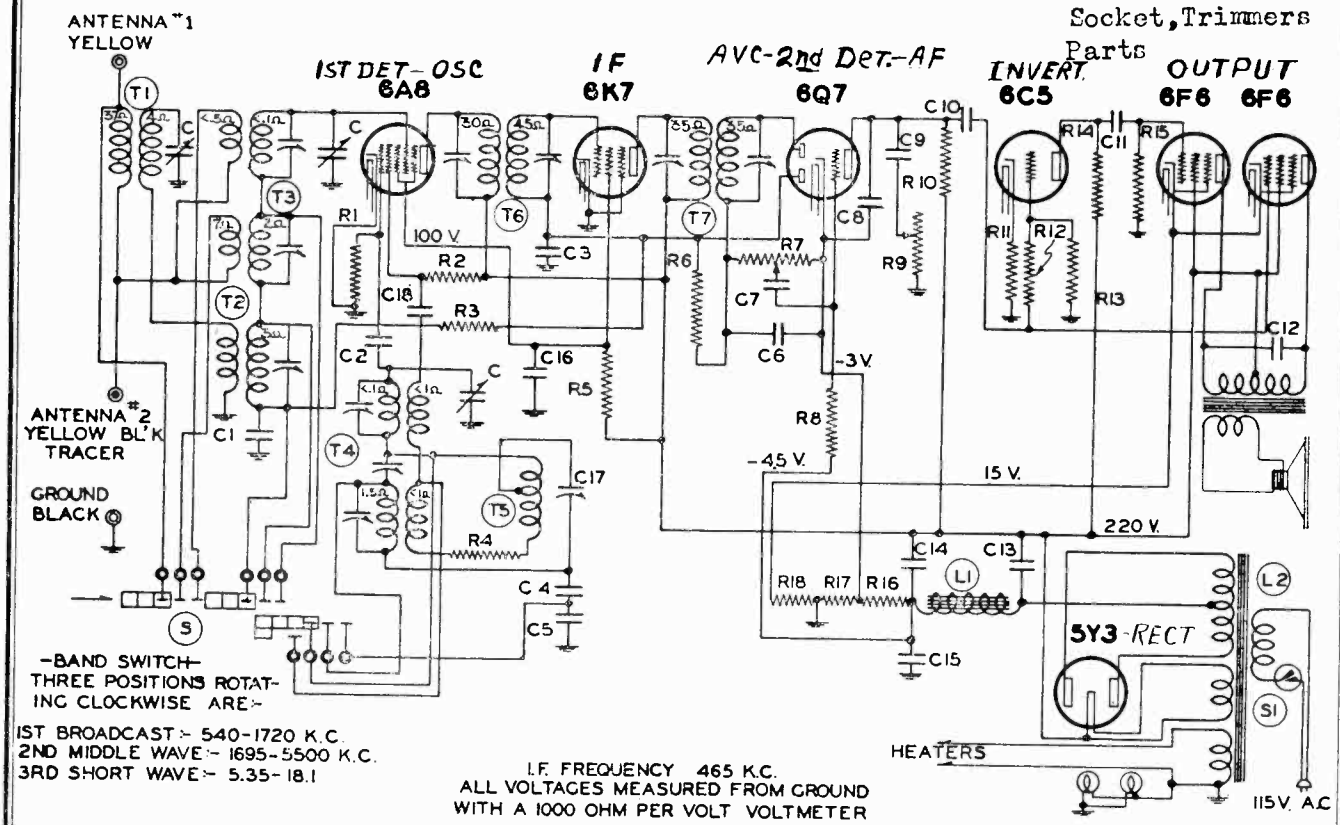
The battery cable, number 107-82, (red wire with fuse receptacle at one end and terminal lug at other end) must be connected to battery terminal of ammeter. At the same time connect ammeter capacitor, number 148-3, to battery terminal of ammeter, other end of condenser to any convenient grounded screw on back of instrument panel. Make certain that insulating sleeve is slipped over fuse when fuse is placed in receptacle, before connecting to short battery cable from receiver.

When connected properly, the discharge due to current drawn by the receiver should not indicate on the ammeter. This is important, since if improperly connected, as shown by the deflection of ammeter, additional motor interference may be encountered.



GOODYEAR SERVICE

MODEL 741
Schematic, Voltage
Socket, Trimmers
Parts

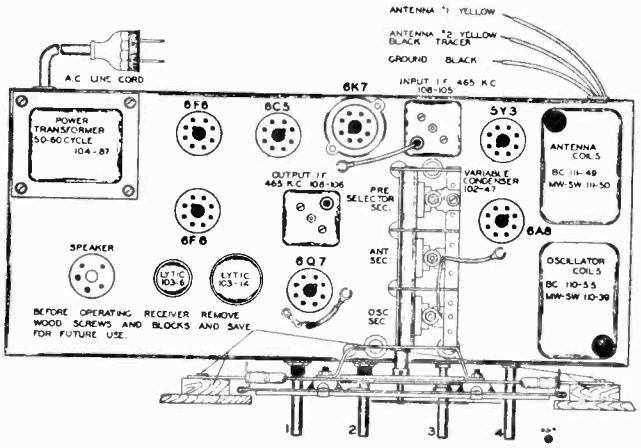


I.F. FREQUENCY 465 K.C.
ALL VOLTAGES MEASURED FROM GROUND WITH A 1000 OHM PER VOLT VOLTMETER

BAND	FREQUENCY RANGE
Broadcast	540 to 1720 K.C. (Kilocycles)
Middle Wave	1690 to 5500 K.C. (Kilocycles)
Short Wave	5.35 to 18.1 M.C. (Megacycles)

No.	Part No.	Description
		RESISTORS
R1	130-12	50M ohms - 1/3 w.
R2	130-48	15M ohms - 1/3 w.
R3	130-103	100M ohms - 1/3 w.
R4	130-27	50 ohms - 1/3 w.
R5	130-96	25M ohms - 1/2 w.
R6	130-4	3 megohm - 1/3 w.
R7	101-74	1 megohm - Volume Control
R8	130-4	3 megohm - 1/3 w.
R9	101-75	300M ohms - Tone Control
R10	130-100	150M ohms - 1/3 w.
R11	130-22	5M ohms - 1/3 w.
R12	130-163	400M ohms - 1/3 w.
R13	130-103	100M ohms - 1/3 w.
R14	130-12	50M ohms - 1/3 w.
R15	130-100	150M ohms - 1/3 w.
R16	106-37	20 ohms - Muter
R17	106-37	42 ohms - Muter
R18	106-37	250 ohms - Muter
		NOTE: R16, R17 and R18 in one unit, No. 106-37
		CONDENSERS
C1	100-22	.05 x 200 v.
C2	129-39	.00005 Mica
C3	100-22	.05 x 200 v.
C4	129-55	.0034 Mica
C5	129-54	.003 Mica
C6	129-5	.0001 Mica
C7	100-11	.01 x 400 v.
C8	129-2	.0005 Mica
C9	100-57	.006 x 600 v.
C10	100-26	.02 x 400 v.
C11	100-26	.02 x 400 v.
C12	100-12	.003 x 600 v.
C13	103-6	8 mfd. x 350 v.
C14	103-14	16 mfd. x 250 v.
C15	100-20	.1 x 200 v.
C16	100-39	.1 x 400 v.
C17	124-35	Adjustable Padder - Working Capacity 740 mmf.
C18	100-12	.003 x 600 v.

		PARTS
C	102-46	One section of three gang condenser
T1	111-51	B.C. Pre-Selector
T2	111-49	B.C. Antenna Coil Assembly
T3	111-50	MW - SW Antenna Coil Assembly
T4	110-39	MW - SW Oscillator Coil Assembly
T5	110-55	B.C. Oscillator Coil Assembly
T6	108-105	Input I.F. - 465 kc.
T7	108-106	Output I.F. - 465 kc.
L1	114-66	6" Speaker (Field Resistance 900 ohms)
L2	104-87	Power Transformer (60 cycle) 115 volts
S	125-17	Band Switch
S1	101-74	On-off Switch on volume control.



Vol. Control On-Off Switch | Tone Control | Tuning Control | Band Switch

FIG. 1—TOP VIEW

MODEL 741
Alignment, Trimmers

GOODYEAR SERVICE

RESONANCE INDICATOR:

Use as a resonance indicator an output meter connected across the primary of the speaker input transformer or by means of an adapter between the plate and cathode terminals of the 5 prong speaker socket. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of a multi-range meter should be used.

DUMMY ANTENNAS:

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1", "Dummy 2", and "Dummy 3".

Dummy 1: (I.F.)—Consists of a .1 mfd. condenser connected in series with the external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 mmfd. condenser and a 20 ohm resistor connected in series with each other and in series with the external oscillator.

Dummy 3: (Middle and Short Wave)—Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

ALIGNING I.F. TRANSFORMERS: (465 K.C.):

Part No. 108-106 Output I.F. Transformer
Part No. 108-105 Input I.F Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With volume control full on, (the extreme right of its rotation), the band changing switch in the broadcast position, (extreme left of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1", to the control grid cap of the type 6K7 tube, and adjust the output I.F. transformer (No. 108-106) to resonance.
   (b) With "Dummy 1" still connected, move oscillator output clip from grid of 6K7 to grid cap of 6A8G and adjust input I.F. transformer (No. 108-105) to resonance.

BROADCAST BAND ALIGNMENT:
540 to 1720 Kilocycles

1. With band changing switch in the broadcast position, extreme left of its rotation, and with gang condenser in its minimum capacity position, plates entirely out of mesh, and with external oscillator connected in series with "Dummy 2" to tan antenna lead and black ground lead, make following adjustments:
   (a) Set external oscillator to 1720 K.C. and adjust broadcast oscillator trimmer to resonance (adjustment number 1; see bottom view of coil assembly. Fig. 3.)
   (b) Re-set external oscillator to 1550 K.C., rotate variable gang condenser and pick up signal. Adjust broadcast antenna trimmer (Adjustment number 4) to resonance; also adjust preselector trimmer which is mounted on the top of the rear section of the three gang variable tuning condenser to resonance. (See top view of chassis, Fig. 1, for location of this adjustment.)
   (c) Re-set external oscillator to 600 K.C., and adjust broadcast series pad to resonance by rotating condenser to approximately 600 K.C., rocking it slowly to and fro until by adjusting series pad maximum output is attained. This adjustment is located on the bottom of the chassis directly under the variable gang condenser. (See bottom view of chassis, Fig. 3.)
   (d) Repeat adjustments "a" and "b" until sensitivity is at its maximum.
   (e) Check for tracking and sensitivity at 1000 kilocycles. **Under no circumstances bend plates of variable condenser sections to correct tracking.**

SHORT WAVE BAND ALIGNMENT:
5.35 to 18.1 Megacycles

1. With band changing switch in the short wave position, extreme right of its rotation, and with external oscillator set at 17 megacycles and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:
   (a) Move dial pointer to 17 megacycles and adjust short wave oscillator (Adjustment number 3) and short wave antenna (Adjustment number 6) to resonance.
   (b) Re-set external oscillator to 6 megacycles and pick up signal by rotating variable condenser and check sensitivity.
   (c) Re-set external oscillator and check set at 18.1 megacycles and 5.3 megacycles for band coverage.

NOTE: It is extremely necessary in making all of these adjustments that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental. An example of this is an image of a fundamental 18.3 megacycle signal appears near 17.4 megacycles.

MIDDLE WAVE BAND ALIGNMENT:
1690 to 5500 Kilocycles

1. With band changing switch in the middle wave position, center of its rotation, and with external oscillator set at 5000 kilocycles and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:
   (a) Move dial pointer to 5000 kilocycles and adjust middle wave oscillator (Adjustment number 2) and middle wave antenna (Adjustment number 5) to resonance.
   (b) Re-set external oscillator to 1800 kilocycles and pick up signal by rotating variable condenser and check sensitivity.
   (c) Re-set external oscillator and check set at 5400 kilocycles and 1700 kilocycles for band coverage.
   (d) Recheck broadcast band alignment.

ANTENNA AND GROUND LEADS:

You will notice three wires coming out of the back of the chassis, — the **yellow** wire and the **black with yellow tracer wire are used** for doublet antenna connections. The **black** wire is the ground connection.

For conventional types of antennas connect the **yellow** wire to the antenna lead and the **yellow with black tracer** and the **black** wire together to the ground lead.

When a doublet antenna is used connect the **yellow** wire and **the yellow with black tracer** wire to the doublet antenna and the solid **black** wire to the ground lead. (See Fig. 1—Top View, page 2).

ANTENNA:

For the best results an outside antenna approximately 75-100 feet long including the lead-in should be used. It should be erected as high as possible and as far from surrounding objects as practical. Both the antenna and lead-in should be placed at right angles to street car lines and incoming power lines and as far from any electrical apparatus which may be in the vicinity (such as elevator motors) as practical.

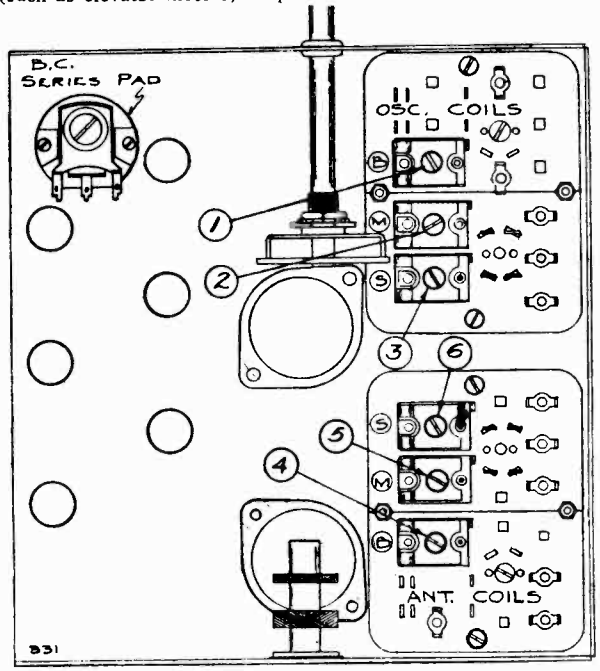
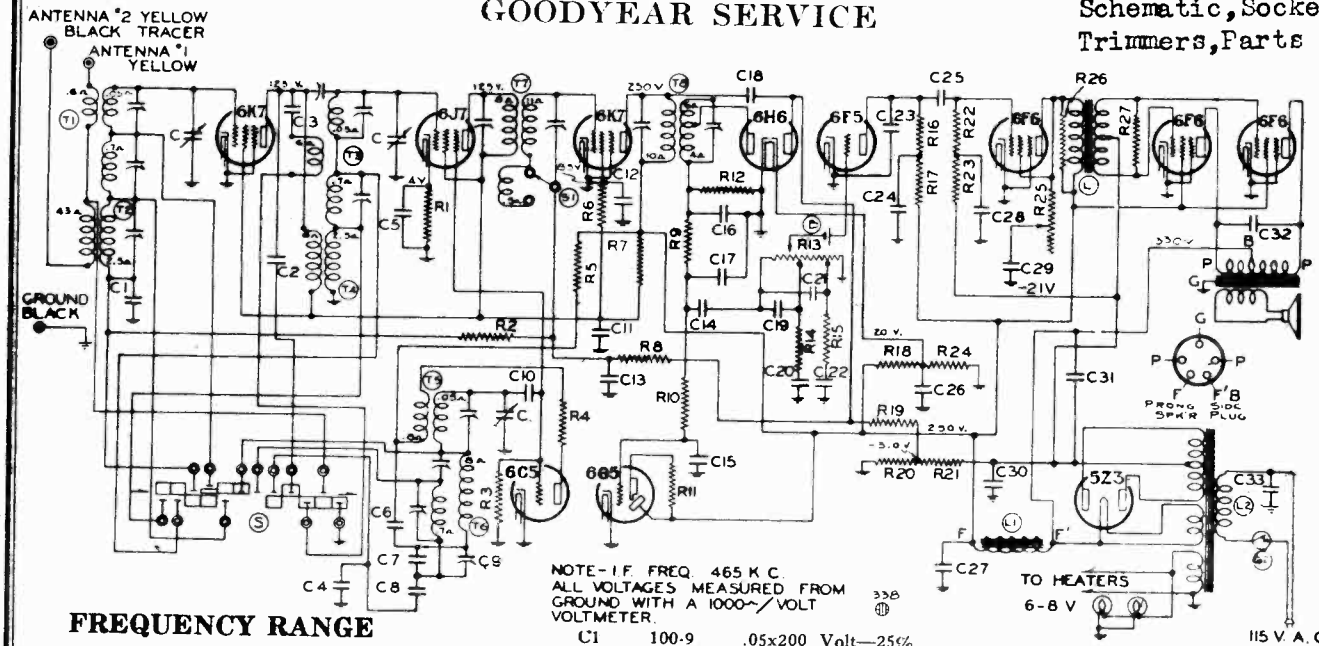


FIG. 3.—BOTTOM VIEW SHOWING TRIMMERS

GOODYEAR SERVICE

MODEL 1173
Schematic, Socket
Trimmers, Parts



NOTE—I.F. FREQ. 465 K.C.
ALL VOLTAGES MEASURED FROM GROUND WITH A 1000~/VOLT VOLTMETER.

FREQUENCY RANGE

535 to 1720 K.C. (Kilocycles)
1690 to 5300 K.C. (Kilocycles)
5.3 to 18.1 M.C. (Megacycles)

R1	130-129	2500 Ohm—1/3 Watt—10%—Carbon
R2	130-20	100M Ohm—1/3 Watt—20%—Carbon
R3	130-12	50M Ohm—1/3 Watt—20%—Carbon
R4	130-60	100 Ohm—1/3 Watt—20%—Carbon
R5	130-77	10M Ohm—1 Watt—20%—Carbon
R6	130-76	30M Ohm—1/3 Watt—20%—Carbon
R7	130-88	10M Ohm—2 Watt—20%—Wire Wound
R8	130-19	1 Megohm—1/3 Watt—20%—Carbon
R9	130-20	100M Ohm—1/3 Watt—20%—Carbon
R10	130-4	3 Megohm—1/3 Watt—20%—Carbon
R11	130-110	1 Megohm—1/10 Watt—10%—Carbon
R12	130-20	100M Ohm—1/3 Watt—20%—Carbon
R13	101-76	1 Megohm—Volume Control
R14	130-22	5M Ohm—1/3 Watt—20%—Carbon
R15	130-85	3M Ohm—1/3 Watt—20%—Carbon
R16	130-20	100M Ohm—1/3 Watt—20%—Carbon
R17	130-20	100M Ohm—1/3 Watt—20%—Carbon
R18	130-130	100M Ohm—½ Watt—10%—Carbon
R19	130-3	500M Ohm—1/3 Watt—20%—Carbon
R20	106-31	30 Ohm—Muter
R21	106-31	175 Ohm—Muter
R22	130-45	250M Ohm—1/3 Watt—20%—Carbon
R23	130-45	250M Ohm—1/3 Watt—20%—Carbon
R24	130-82	10M Ohm—1/3 Watt—10%—Carbon
R25	101-62	5000 Ohm—Tone Control
R26	130-131	20M Ohm—½ Watt—10%—Carbon
R27	130-21	20M Ohm—1/3 Watt—20%—Carbon

Note—R-20 and R21 in one unit No. 106-31.

C1	100-9	.05x200 Volt—25%
C2	129-59	.0003 Mica—5%—MT-O
C3	129-39	.00005 Mica—20%—MT-O
C4	129-69	.0023 Mica—2½%—MT-O
C5	100-9	.05x200 Volt—25%
C6	100-13	.05x400 Volt—25%
C7	129-57	.0005 Mica—5%—MT-O
C8	129-55	.0034 Mica—2½%—MT-O
C9	124-34	200 Mmf. Working Cap. Adju
C10	129-31	.000025 Mica—15%—MT-O
C11	100-41	.25x400 Volt—20%
C12	100-11	.01x400 Volt—25%
C13	100-9	.05x200 Volt—25%
C14	100-22	.05x200 Volt—25%
C15	100-11	.01x400 Volt—25%
C16	129-60	.00015 Mica—20%—MT-O
C17	129-60	.00015 Mica—20%—MT-O
C18	129-3	.00002 Mica—20%—MT-O
C19	129-2	.0005 Mica—20%—MT-O
C20	100-22	.05x200 Volt—25%
C21	129-60	.00015 Mica—20%—MT-O
C22	100-22	.05x200 Volt—25%
C23	129.5	.0001 Mica—20%—MT-O
C24	100-20	.1x200 Volt—25%
C25	100-13	.05x400 Volt—25%
C26	100-19	.006x600 Volt—25%
C27	103-8	14 Mfd.—400 Volt—Elecrolytic
C28	100-20	.1x200 Volt—25%
C29	100-45	.1x600 Volt—25%
C30	100-20	.1x200 Volt—25%
C31	103-10	30 Mfd. — 450 Volt — Electrolytic
C32	100-32	.0005x1000 Volt—20%
C33	100-61	.02x600 Volt—Bakelite Micamold

PARTS

B1	116-22	Bias Cell
C	102-37	One Section of Three Gang Condenser.
T1	111-54	MW and SW Antenna Coil Assem.
T2	111-55	Broadcast Antenna Coil Assem.
T3	109-29	MW and SW R.F. Coil Assem.
T4	109-30	Broadcast R.F. Coil
T5	110-42	MW and SW Osc. Coil Assem.
T6	110-43	Broadcast Osc. Coil Assem.
T7	108-64	Input I.F. Coil—465 KC.
T8	108-63	Output I.F. Coil—465 KC.
L	105-33	Audio Transformer
L1	114-47	Speaker (Field Resistance 1225 Ohm)
L2	104-72	Power Transformer (50-60 Cycle)
S	125-24	Band Switch
S1		Fidelity Switch on Tone Control
S2		On-Off Switch on Volume Control

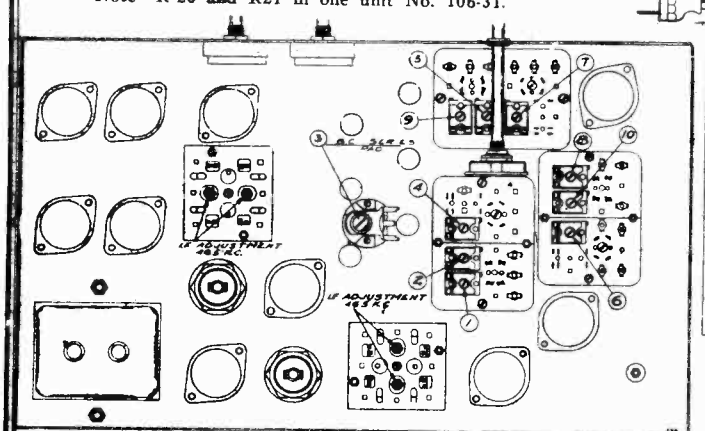
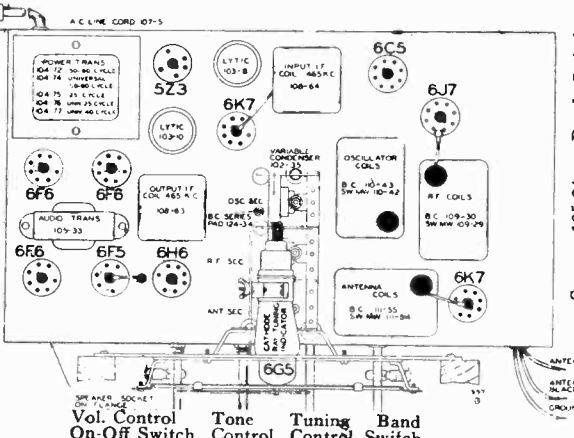


FIG. 3.—BOTTOM VIEW SHOWING TRIMMERS



Vol. Control On-Off Switch | Tone Control and High Fidelity Sw. | Tuning Control | Band Switch

MODEL 1173
Alignment, Notes

GOODYEAR SERVICE

RESONANCE INDICATOR:

Use as a resonance indicator an output meter connected across the primary of the speaker input transformer or by means of an adapter between the plate and cathode terminals of the 5 prong speaker socket. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of the multi-range meter should be used.

DUMMY ANTENNAS:

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1," "Dummy 2," and "Dummy 3."

Dummy 1: (I.F.)—Consists of a .1 mfd. condenser connected in series with the external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 mmfd. condenser and a 20 ohm resistor connected in series with each other and in series with the external oscillator.

Dummy 3: (Middle and Short Wave)—Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

ALIGNING I.F. TRANSFORMERS (465 K.C.)

Part No. 108-63 Output I.F. Transformer
Part No. 108-64 Input I. F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the underside of chassis (see bottom view Fig. 3).

1. With volume control full on, (the extreme right of its rotation), the band changing switch in the broadcast position, (extreme left of its rotation), the tone control on "Hi" part of the sharp position (as much right rotation as possible without operating the Hi Fidelity switch), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:

   (a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1," to the control grid cap of the type 6K7 tube, located between the two I.F. transformers, and adjust the output I.F. transformer 108-63 to resonance.

   (b) With "Dummy 1" still connected, move oscillator output clip from grid of 6K7 to grid cap to 6J7 and adjust input I.F. transformer (108-64) to resonance.

   (c) With oscillator still connected to 6J7, re-adjust output I.F. transformer if necessary.

BROADCAST BAND ALIGNMENT:
535 to 1720 Kilocycles

1. With band changing switch in the broadcast position, extreme left of its rotation, and with external oscillator set at 600 kilocycles and connected in series with "Dummy 2" to the tan antenna and black ground lead, make the following adjustments:

   (a) Adjust broadcast series pad (adjustment number 3) to resonance with oscillator. Keep set in tune with oscillator by slowly rocking to and fro the variable condenser until maximum output is obtained. Note: This adjustment is accessible from the top of the chassis and is located between the variable condenser and the 108-63 output I.F. transformer. See top view, Fig. 1.

   (b) Re-set external oscillator to 1400 K.C., move dial pointer to 1400 K.C. and adjust oscillator (adjustment number 4), R.F. (adjustment number 6) and antenna (adjustment number 7) to resonance. See bottom view for location of these adjustments, Fig. 3.

   (c) Repeat adjustments "a" and "b" until sensitivity is at its maximum.

   (d) Check for tracking and sensitivity at 1000 kilocycles. Under no circumstances bend plates of variable condenser to correct tracking.

SHORT WAVE BAND ALIGNMENT:
5.3 to 18.1 Megacycles

1. With band changing switch in the short wave position, extreme right of its rotation, and with external oscillator set at 17 megacycles and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:

   (a) Move dial pointer to 17 megacycles and adjust short wave oscillator (adjustment number 1), short wave R.F. (adjustment number 8) and short wave antenna (adjustment number 9) to resonance.

   (b) Re-set external oscillator to 6 megacycles and pick up signal by rotating variable condenser and check for sensitivity.

NOTE: It is extremely necessary in making all of these adjustments that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental on the receiver dial. As an example of this a fundamental 18.3 megacycle can be tuned in not only at 18.3 on the dial, but also at approximately 17.4 megacycles.

MIDDLE WAVE BAND ALIGNMENT:
1690 to 5300 Kilocycles

1. With band changing switch in the middle wave position, center of its rotation, and with external oscillator set at 5 M.C. and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:

   (a) Rotate condenser, pick up signal and adjust middle wave R.F. (adjustment number 10), middle wave antenna (adjustment number 5) and middle wave oscillator (adjustment number 2) to resonance.

   (b) Re-check broadcast alignment and if it is found necessary to re-adjust either R.F. or antenna trimmers, repeat the 17 M.C. short wave and 5 M.C. middle wave adjustments.

ANTENNA AND GROUND LEADS:

You will notice three wires coming out of the back of the chassis, — the **yellow** wire and the **yellow with black tracer** wire are used for doublet antenna connections. The **black** wire is the ground connection.

For conventional types of antennas connect the **yellow** wire to the antenna lead and the **yellow with black tracer** and the **black** wire together to the ground lead.

When a doublet antenna is used connect the **yellow** wire and the **yellow with black tracer** wire to the doublet antenna and the solid **black** wire to the ground lead. (See Fig. 1—Top View, page 2).

ANTENNA:

For the best results an outside antenna approximately 75-100 feet long including the lead-in should be used. It should be erected as high as possible and as far from surrounding objects as practical. Both the antenna and lead-in should be placed at right angles to street car lines and incoming power lines and as far from any electrical apparatus which may be in the vicinity (such as elevator motors) as practical.

DESCRIPTION:

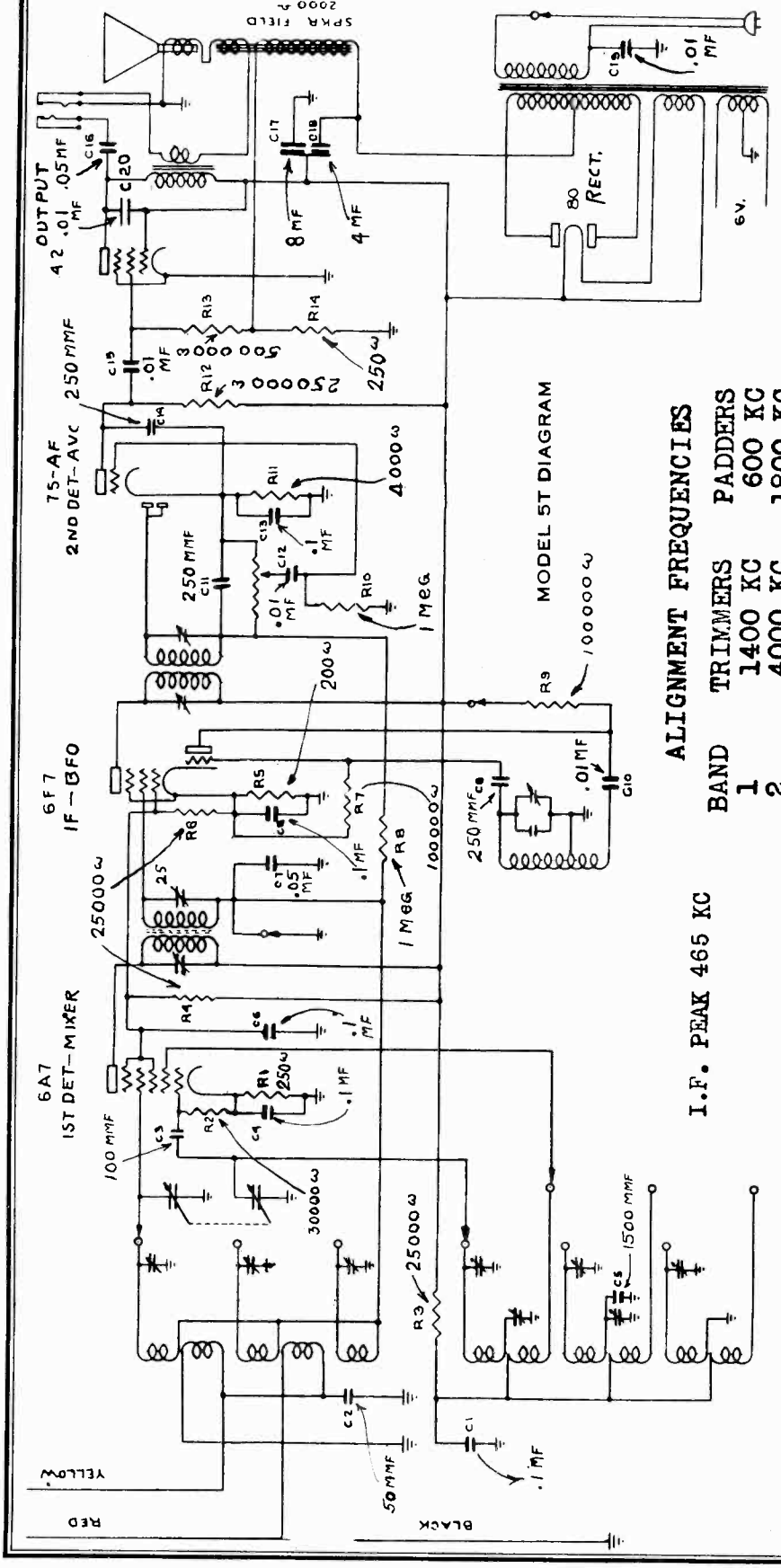
The tube complement of this chassis consists of the following metal and octal base glass tubes which are interchangeable with metal tubes:

1—Type 6K7 Remote cut-off pentode R.F. amplifier
1—Type 6J7 Pentode first detector
1—Type 6C5 Oscillator
1—Type 6K7 Remote cut-off pentode I.F. amplifier (465 K.C.)
1—Type 6H6 Duplex diode second detector and A.V.C.
1—Type 6F5 First audio amplifier
1—Type 6F6 Triode driver stage
2—Type 6F6 Class AB Output pentodes in push-pull
1—Type 5Z3 High vacuum rectifier
1—Type 6G5 Cathode Ray Tuning Indicator.

Transformers are available and chassis are sometimes equipped with universal transformers for operation on 25, 40 and 60 cycles and with primary taps for 108, 127, 150, 225, and 260 volts, (see instructions) and also sometimes equipped with 25 cycle transformers with 105-115 volt or 220 volt primaries, not universals.

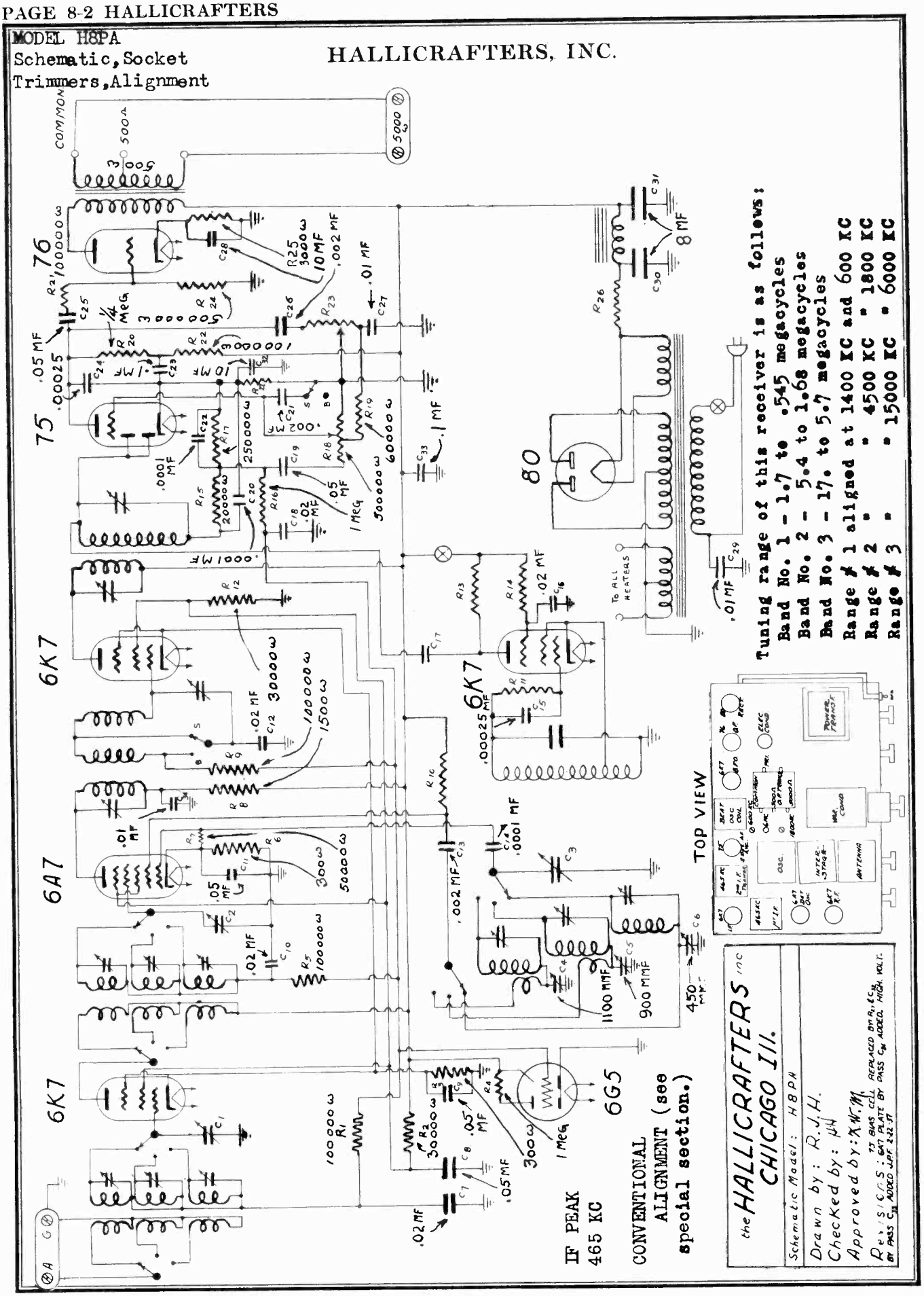
HALLICRAFTERS, INC.

MODEL 5T, Sky Buddy
Schematic, Alignment
Trimmers



MODEL H8PA
Schematic, Socket
Trimmers, Alignment

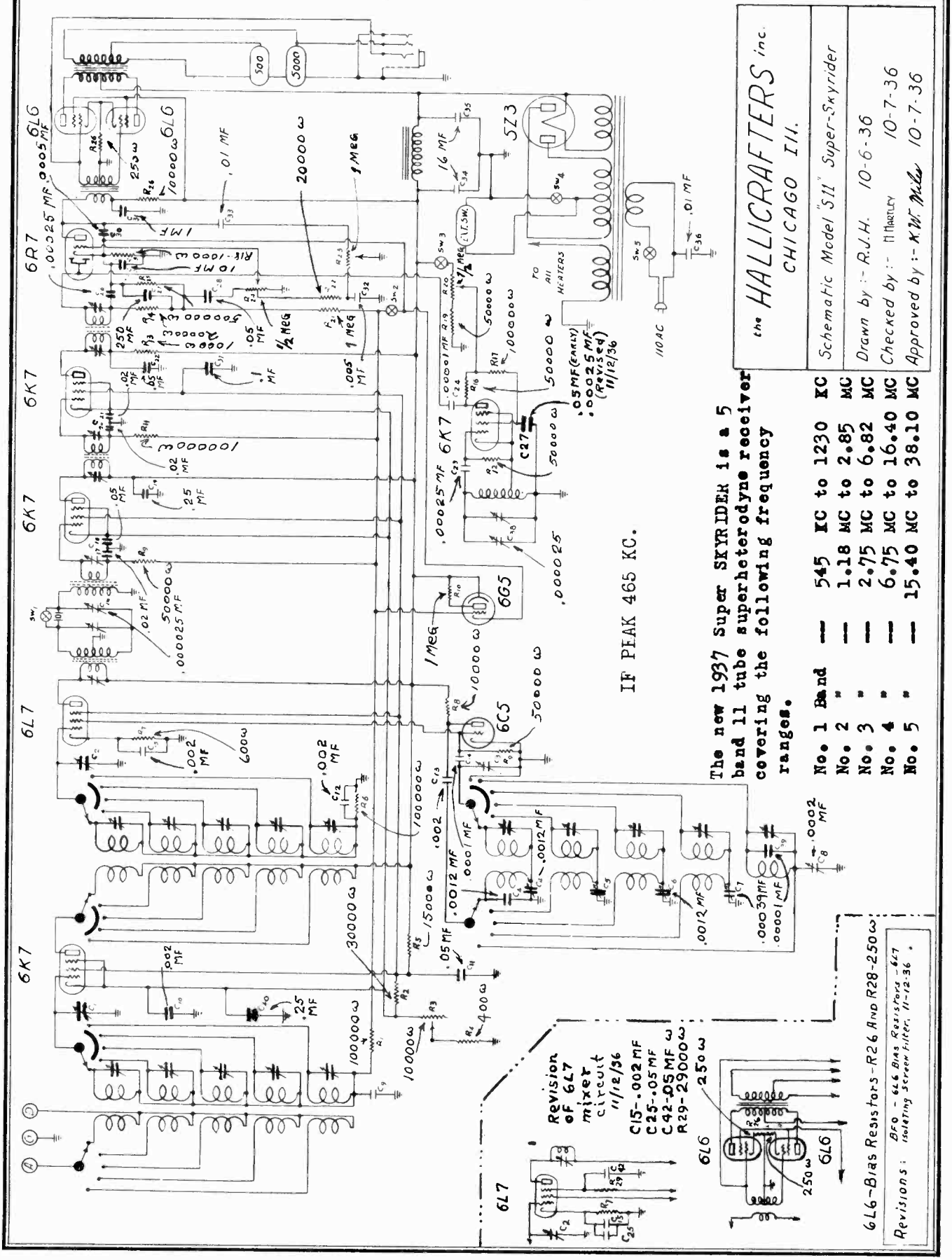
HALLICRAFTERS, INC.



Schematics, Changes

MODEL S11, Super Sky Rider 1937
Early and Late

HALLICRAFTERS, INC.



ALIGNMENT FOR MODELS S11 (SUPER-SKY-RIDER 1937) and MODEL S15 (SKY CHALLENGER)

INTERMEDIATE FREQUENCY ALIGNMENT

If the receiver is equipped with a crystal, use the crystal in a separate oscillator.

If the receiver is used without a crystal set the signal generator at 465 KC

Before alignment, turn off the AVC, BFO, and Crystal switches. Set the RF and Audio gain controls at maximum. Set Crystal phasing condenser for maximum noise level. Do not remove bottom plate from the chassis.

Remove 6C5 Oscillator tube from socket, and connect the signal generator out put directly to grid of 6L7 1st detector.

Adjust all IF transformers for maximum output.

RF ALIGNMENT

Check dial- at maximum capacity of gang condenser the dial should stop so that "0" on the main tuning dial should be opposite "0" on the vernier scale.

Set band spread condenser at minimum capacity or so that it reads 200 degrees.

Replace 6C5 oscillator tube and connect signal generator output through 400 ohm resistor to antenna and ground posts on receiver.(Leave Jumper connected.)

Set dial of receiver to 600 KC of Band #1, and set signal generator to 600 KC. Now adjust .6 MC pad on top of chassis until signal is resonated.

Reset dial and signal generator to 1100 KC. Adjust 1.1 MC Osc. trimmer condenser beneath the chassis until this signal is properly resonated. Now adjust RF and Detector trimmers for maximum gain. Now reset dial and signal generator to 600 KC and re-pad. It may be necessary to pad and trim at 600 KC and 1100 KC a few times as a change of capacity at one end will affect the other end. Re-check on RF and Detector trimmers and peak for maximum gain.

BAND #2

Follow same procedure as on Band #1 except pad (above chassis) at 1.3 MC. Trim at 2.6 MC

BAND #3

Same procedure as before except pad oscillator at 3 MC. Trim at 6 MC. Rock the gang condenser when making these adjustments.

BAND #4

Pad oscillator at 7 MC. Trim at 14 MC. Rock gang condenser during adjustment

BAND #5

Pad oscillator at 17 MC and Trim at 34 MC. Rock gang condenser as before.

It may be necessary to go through the above procedure several times before maximum performance is secured. A small change at each end of each Band will affect the other end.

When making adjustments on this receiver back off on RF gain leaving the AF gain at maximum at all times.

Be sure and turn the trimmers all the way in (clock-wise) except as noted below, and back off to find the signal. On air-dielectric trimmers, capacity is reduced when turning the screws in a clock-wise direction.

Detector trimmers on Band #4 and #5 should be backed out all the way and screwed clockwise to find the signal. This will assist in eliminating phasing in the wrong direction or side.

Be sure to check images on Bands #3,#4, and #5. These Images will fall approximately 1.0 MC lower in frequency on all Bands.

ALIGNMENT FOR MODEL S12 (COMMERCIAL-SKY-RIDER)

INTERMEDIATE FREQUENCY ALIGNMENT

If the receiver is equipped with a crystal, use the crystal in a separate oscillator. If the receiver is not an SX12 model, set the generator for 1600 KC.

Before alignment, turn off the AVC, BFO, and Crystal Switches. Set the RF and Audio controls at maximum. Set crystal phasing condenser for maximum noise level. Do not remove the bottom plate from the chassis.

Remove 6C5 oscillator tube from the chassis, and connect the signal generator output directly to the grid of the 6L7 1st detector.

Adjust all IF transformers for maximum output.

RF ALIGNMENT -BAND #1

Check dial- at maximum capacity of gang condenser the dial should stop so that "0" on the main tuning dial should be opposite "0" on the vernier scale.

Set Band Spread condenser at minimum capacity or so that it reads 200 degrees.

Replace 6C5 oscillator tube in receiver, and connect signal generator output through 400 ohm resistance to antenna and ground posts on receiver. (Jumper should remain connected.)

Set signal generator for 115 KC, put receiver on Band #1 and set dial to a reading of 115 KC.

Adjust the 115 KC pad on top of chassis until signal is resonated.

NOTE: On Band #1 and #2 it is necessary to adjust detector and RF trimmers each time oscillator trimmer is changed.

Reset dial to 230 KC and reset signal generator to same frequency.

Adjust 230 KC Osc. trimmer condenser beneath the chassis until the signal is properly resonated. Now adjust RF and detector trimmers for maximum gain. Now reset dial and signal generator to 115 KC and re-pad above chassis.

It may be necessary to pad and trim at 115 KC and 230 KC a few times as a change of capacity at one end will affect the other end. Re-check on RF and the detector trimmers and peak for maximum gain.

Rock main tuning condenser during the course of these adjustments.

BAND #2

Follow same procedure as on Band #1 except pad (above chassis) at 275 KC and set signal generator at 275 KC. Peak RF and trim at 550 KC. Rock main condenser.

BAND #3

Same procedure as before except pad oscillator at 700 KC, trim at 1400 KC, with signal generator set at 700 KC. Rock main tuning condenser during procedure.

BAND #4

Same procedure as before except pad oscillator at 1.9 MC, with signal generator set at 1.9 MC. Peak RF and detector trimmers for maximum gain. Trim at 3.8 MC. Rock main tuning condenser when making the adjustments.

BAND #5

Same procedure as before. Pad oscillator at 5 MC with signal generator set at 5 MC. Adjust RF and detector trimmers for maximum gain, rocking the gang condenser while adjusting. Trim at 10 MC

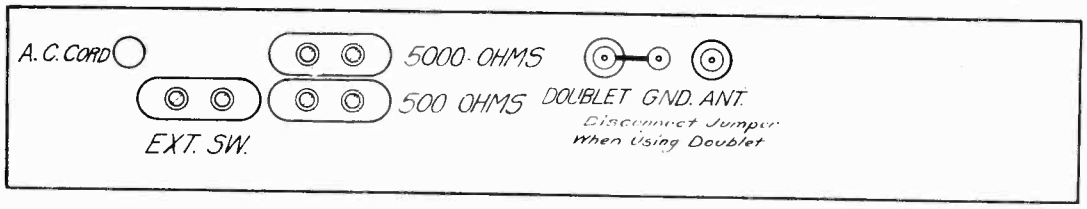
It may be necessary to repeat the above adjustments several times before maximum performance is obtained. When making adjustments on this receiver back off on RF gain leaving AF gain at maximum at all times.

Be sure and turn trimmers all the way in (clockwise) (except as noted below) and back out to find the signal. On these air-dielectric trimmers, capacity is reduced in clockwise direction. Check for Images on Band #5, 3600 KC lower.

MODEL S11, Super Sky Rider 1937

HALLICRAFTERS, INC.

Socket, Trimmers



MODEL S-11

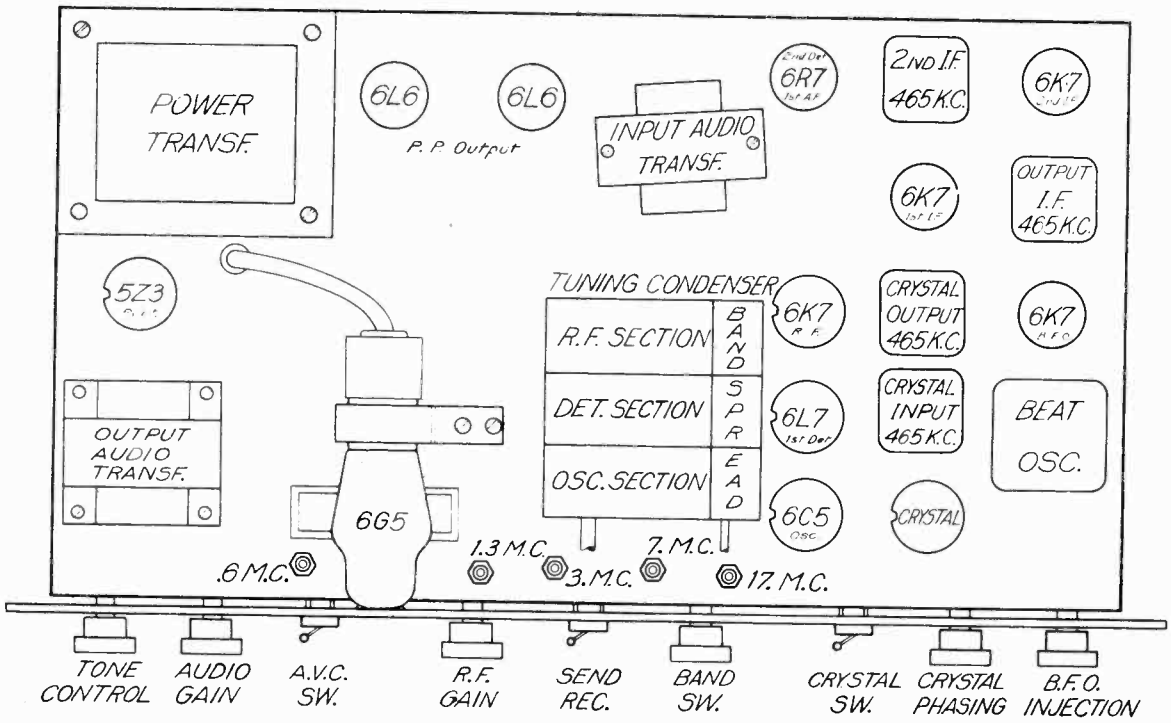


Fig. 1

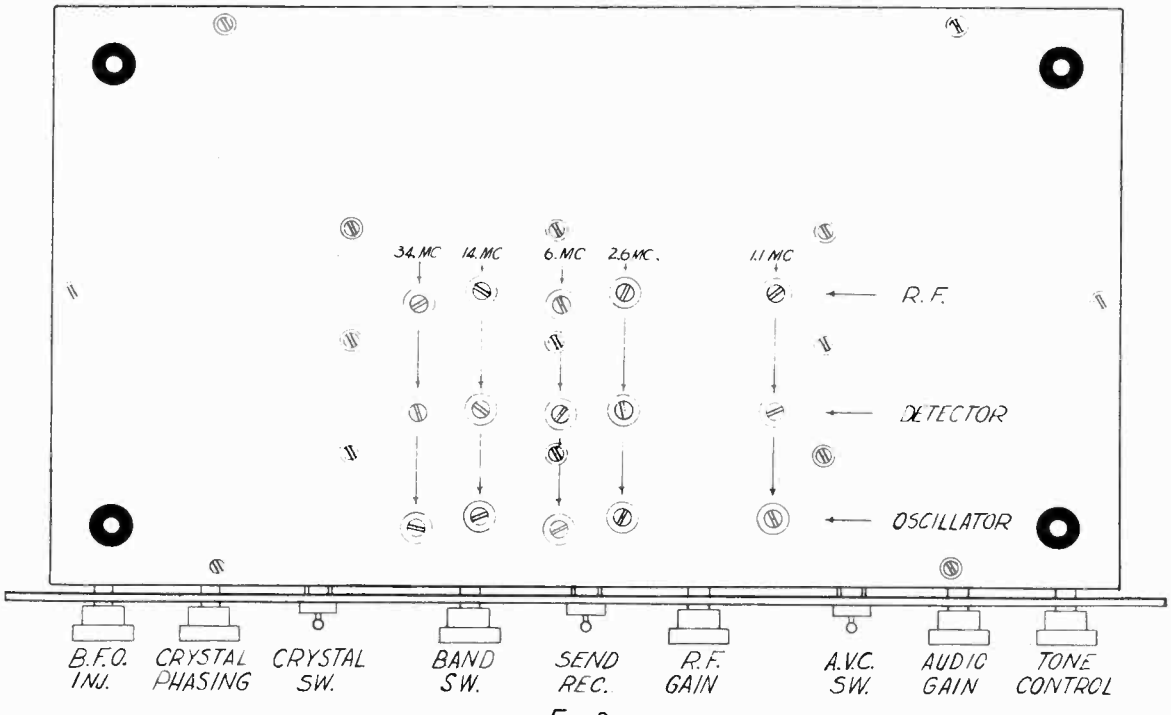
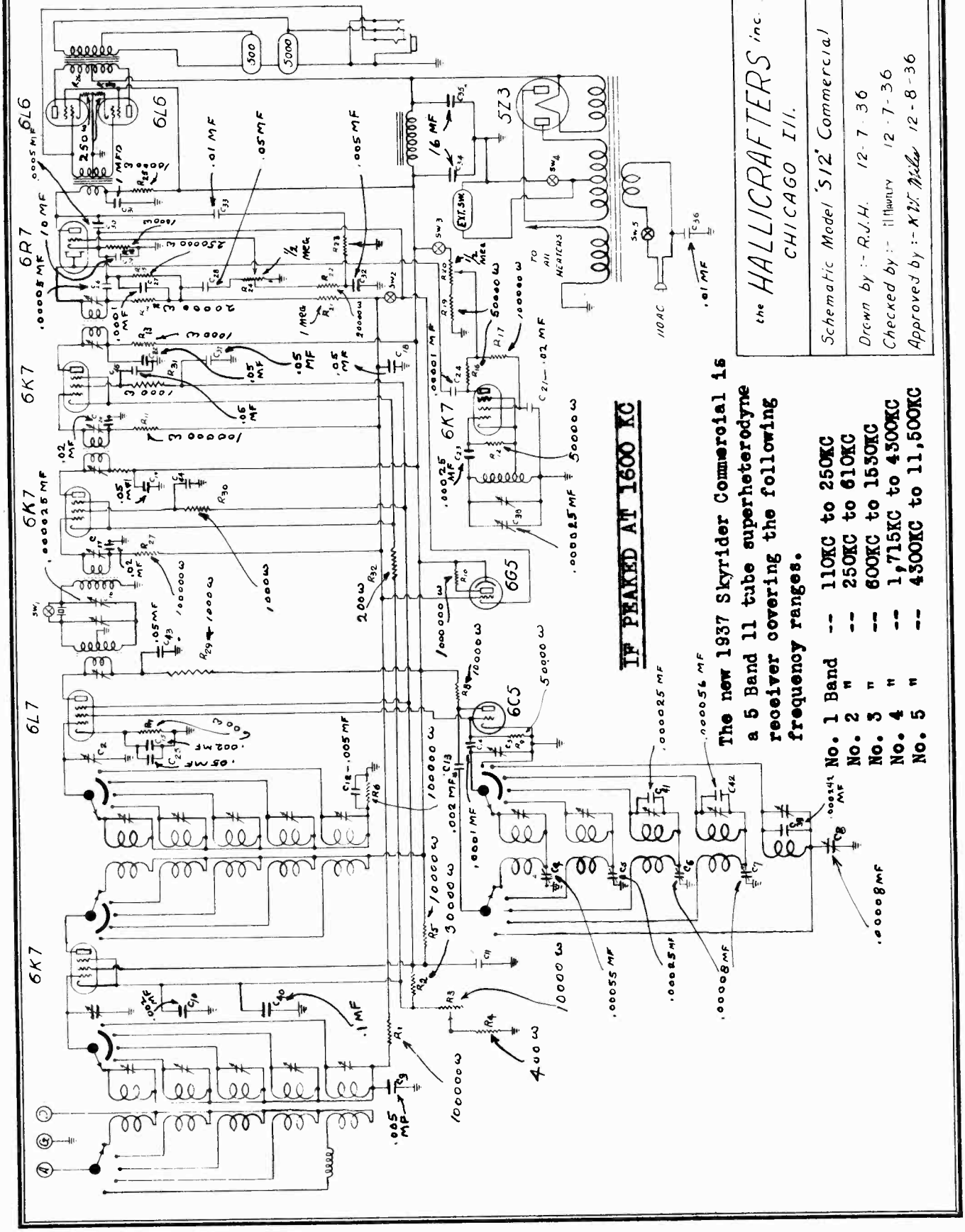


Fig. 2

MODEL S12, Commercial Sky Rider
Schematic

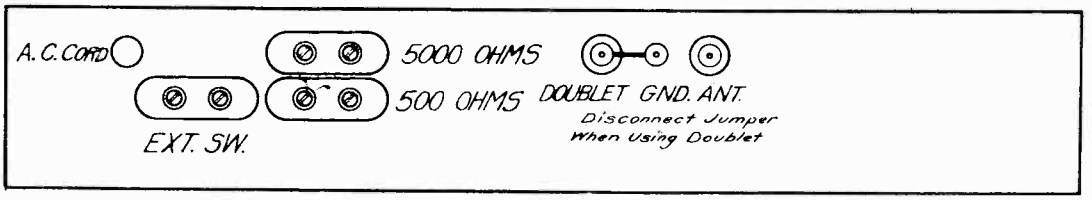
HALLICRAFTERS, INC.



Socket, Trimmers

MODEL S12, Commercial Sky Rider

HALLICRAFTERS. INC.



MODEL S-12

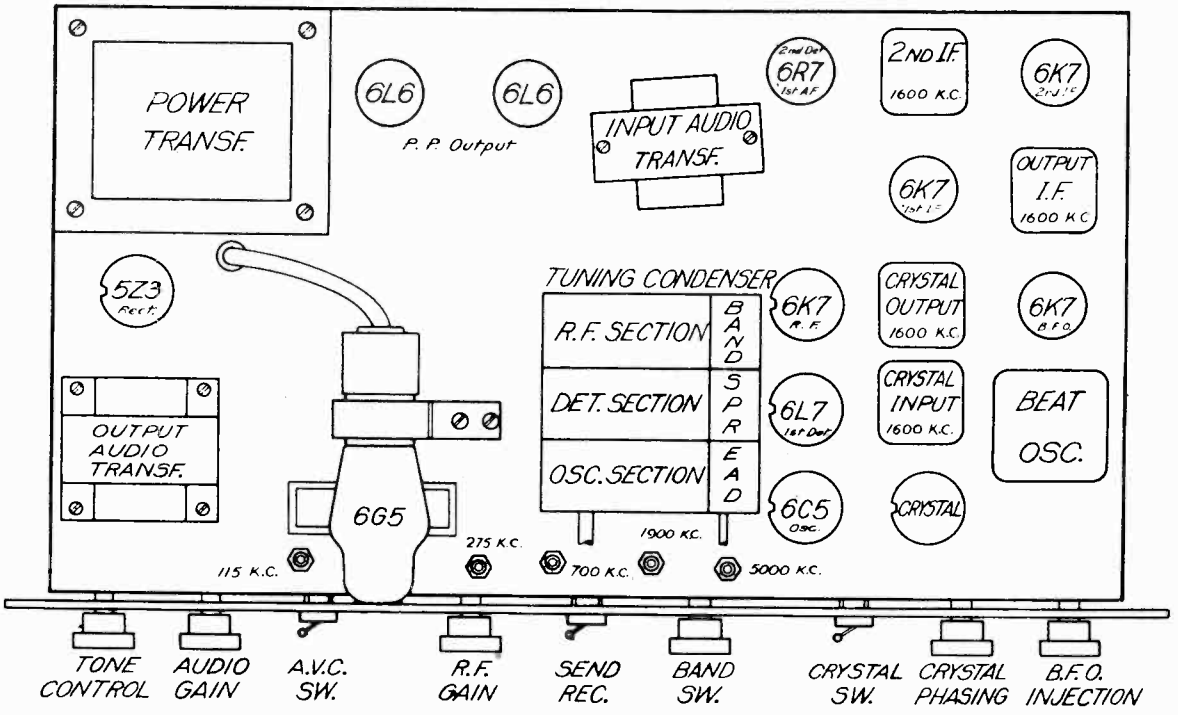


Fig. 1

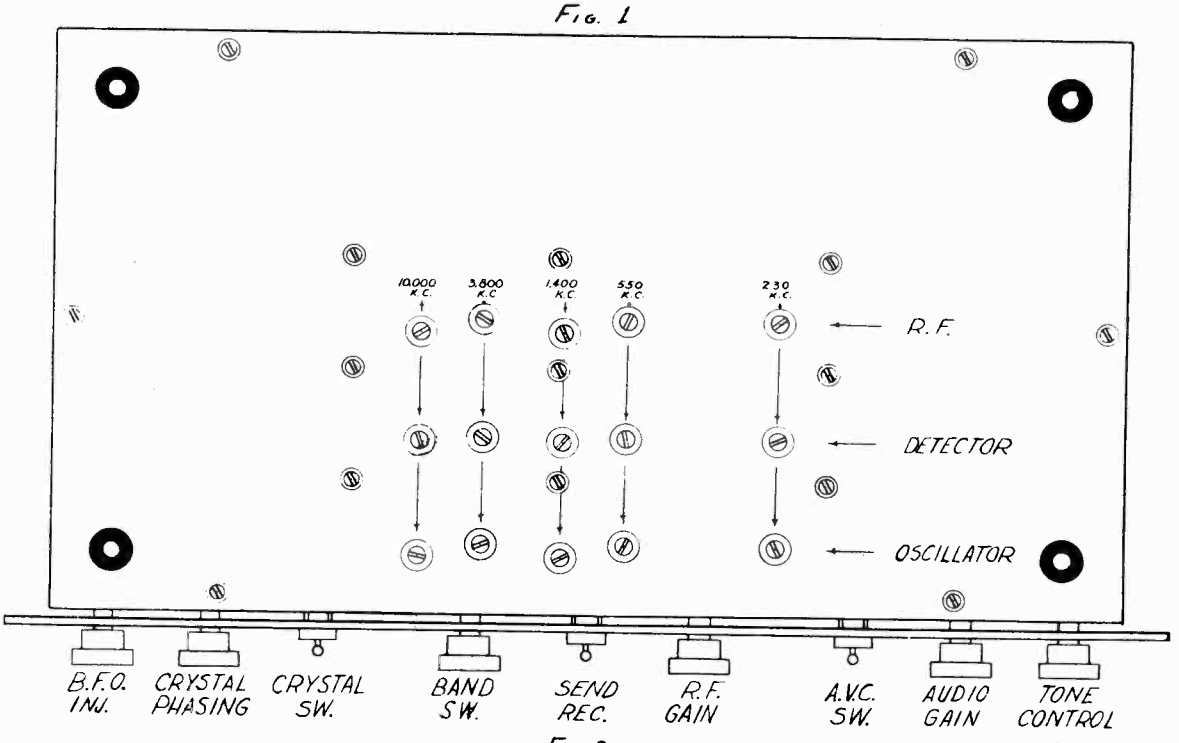


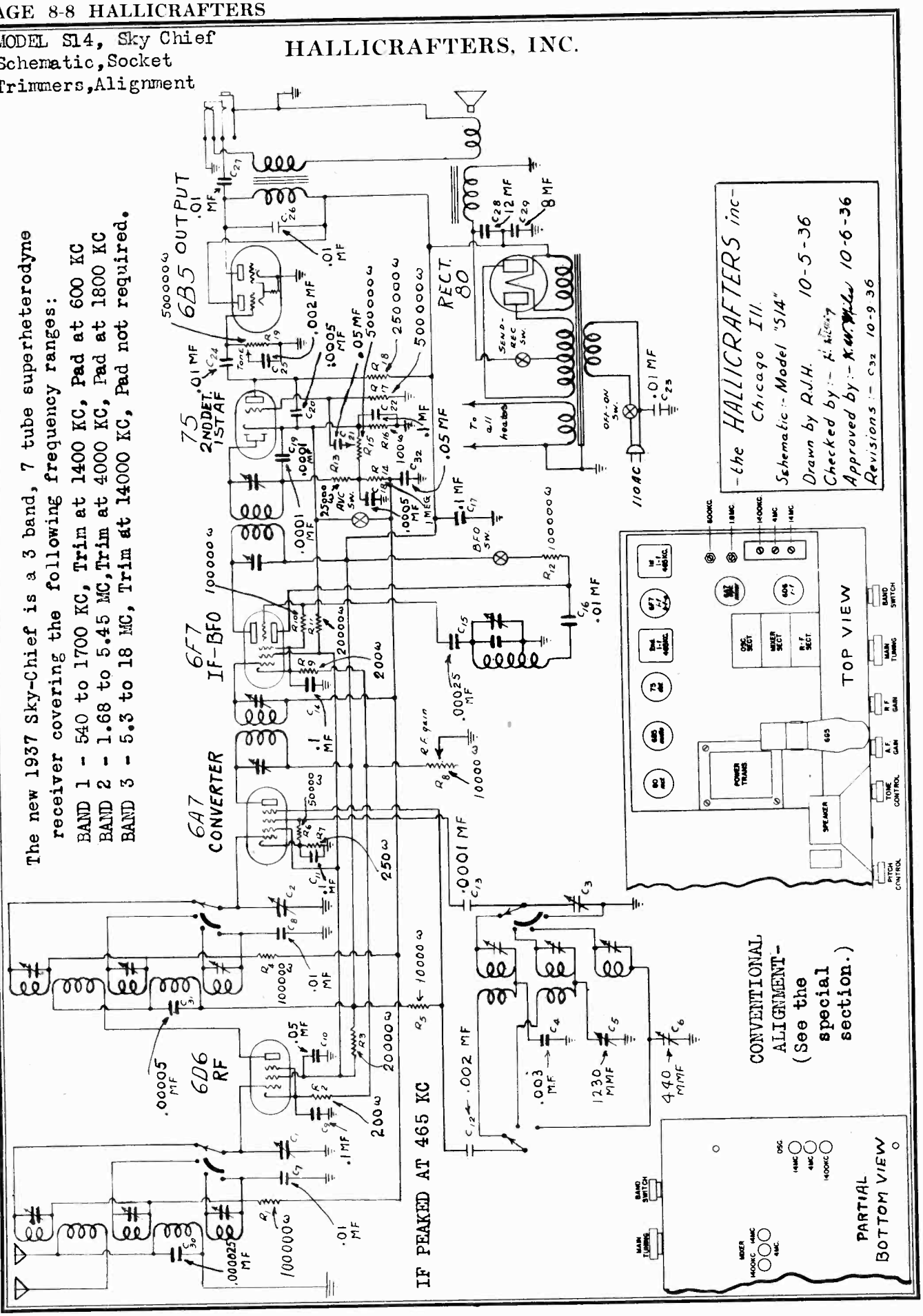
Fig. 2

MODEL S14, Sky Chief
Schematic, Socket
Trimmers, Alignment

HALLICRAFTERS, INC.

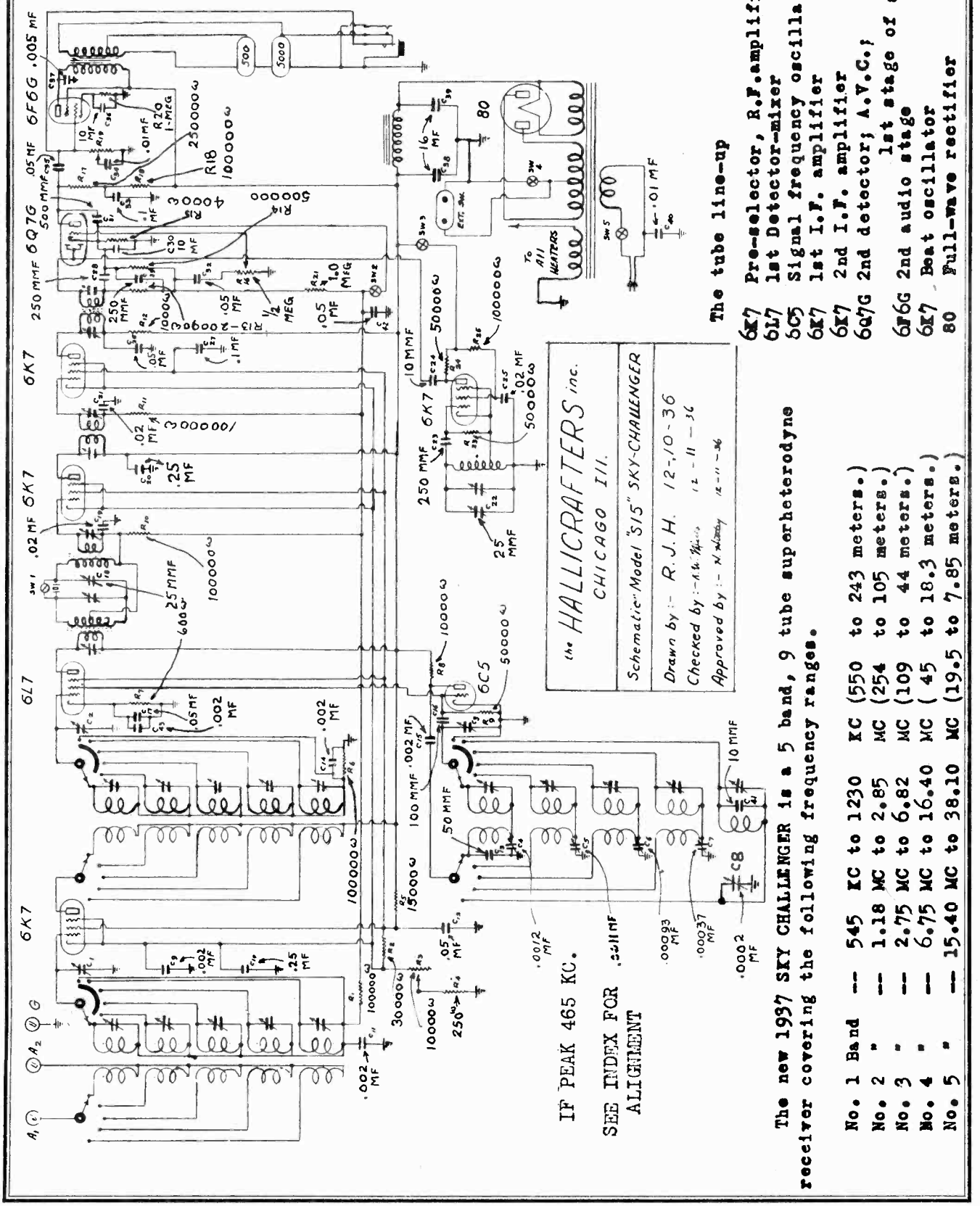
The new 1937 Sky-Chief is a 3 band, 7 tube superheterodyne receiver covering the following frequency ranges:

BAND 1 - 540 to 1700 KC, Trim at 1400 KC, Pad at 600 KC
BAND 2 - 1.68 to 5.45 MC, Trim at 4000 KC, Pad at 1800 KC
BAND 3 - 5.3 to 18 MC, Trim at 14000 KC, Pad not required.



MODEL S15, Sky Challenger
Schematic

HALLICRAFTERS, INC.



The tube line-up

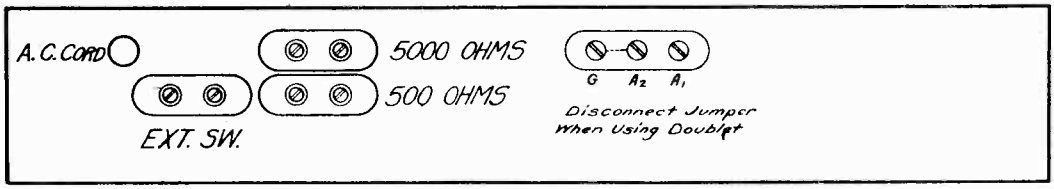
6K7	Pre-selector, R.F.amplifier
6L7	1st Detector-mixer
6C5	Signal frequency oscillator
6K7	1st I.F. amplifier
6K7	2nd I.F. amplifier
6Q7G	2nd detector; A.V.C.; 1st stage of audio
6F6G	2nd audio stage
6K7	Beat oscillator
80	Full-wave rectifier

The new 1937 SKY CHALLENGER is a 5 band, 9 tube superheterodyne receiver covering the following frequency ranges.

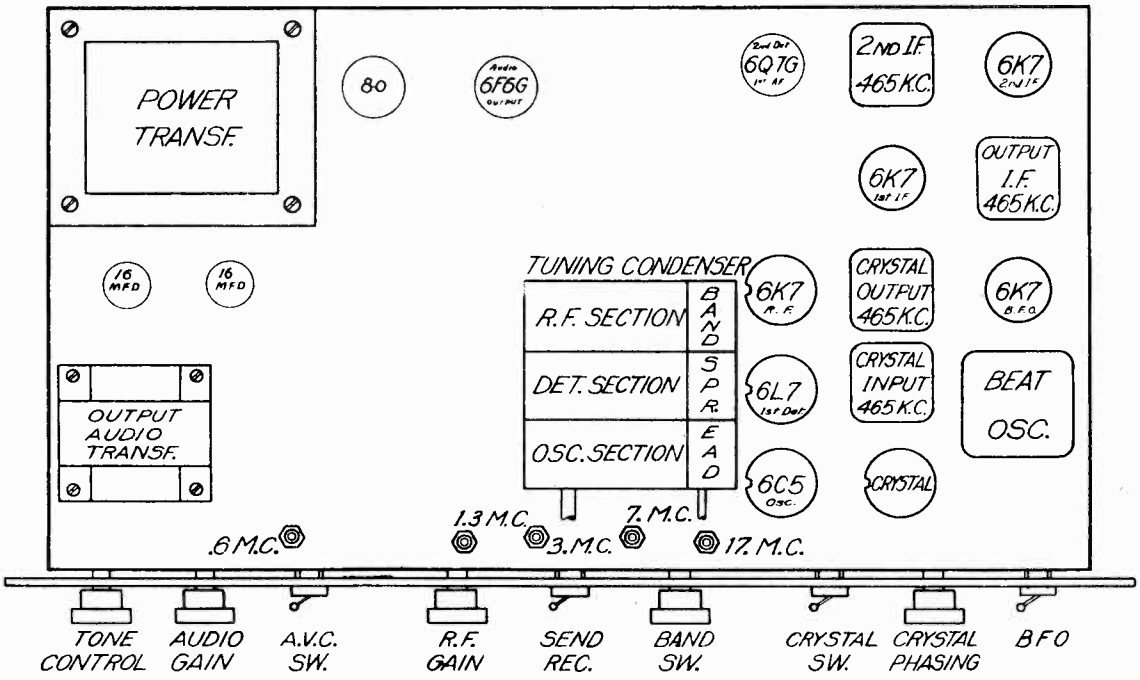
No. 1 Band	--	545 KC to 1230 KC	(550 to 243 meters.)
No. 2 "	--	1.18 MC to 2.85 MC	(254 to 105 meters.)
No. 3 "	--	2.75 MC to 6.82 MC	(109 to 44 meters.)
No. 4 "	--	6.75 MC to 16.40 MC	(45 to 18.3 meters.)
No. 5 "	--	15.40 MC to 38.10 MC	(19.5 to 7.85 meters.)

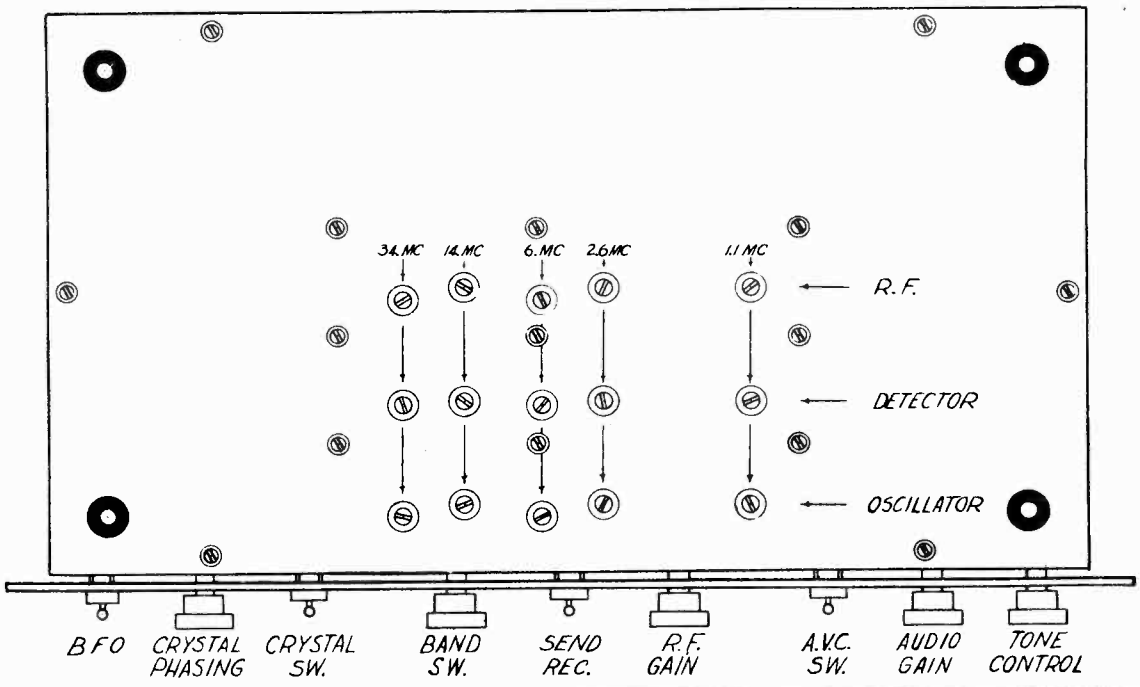
MODEL S15, Sky Challenger
Socket, Trimmers

HALLICRAFTERS, INC.



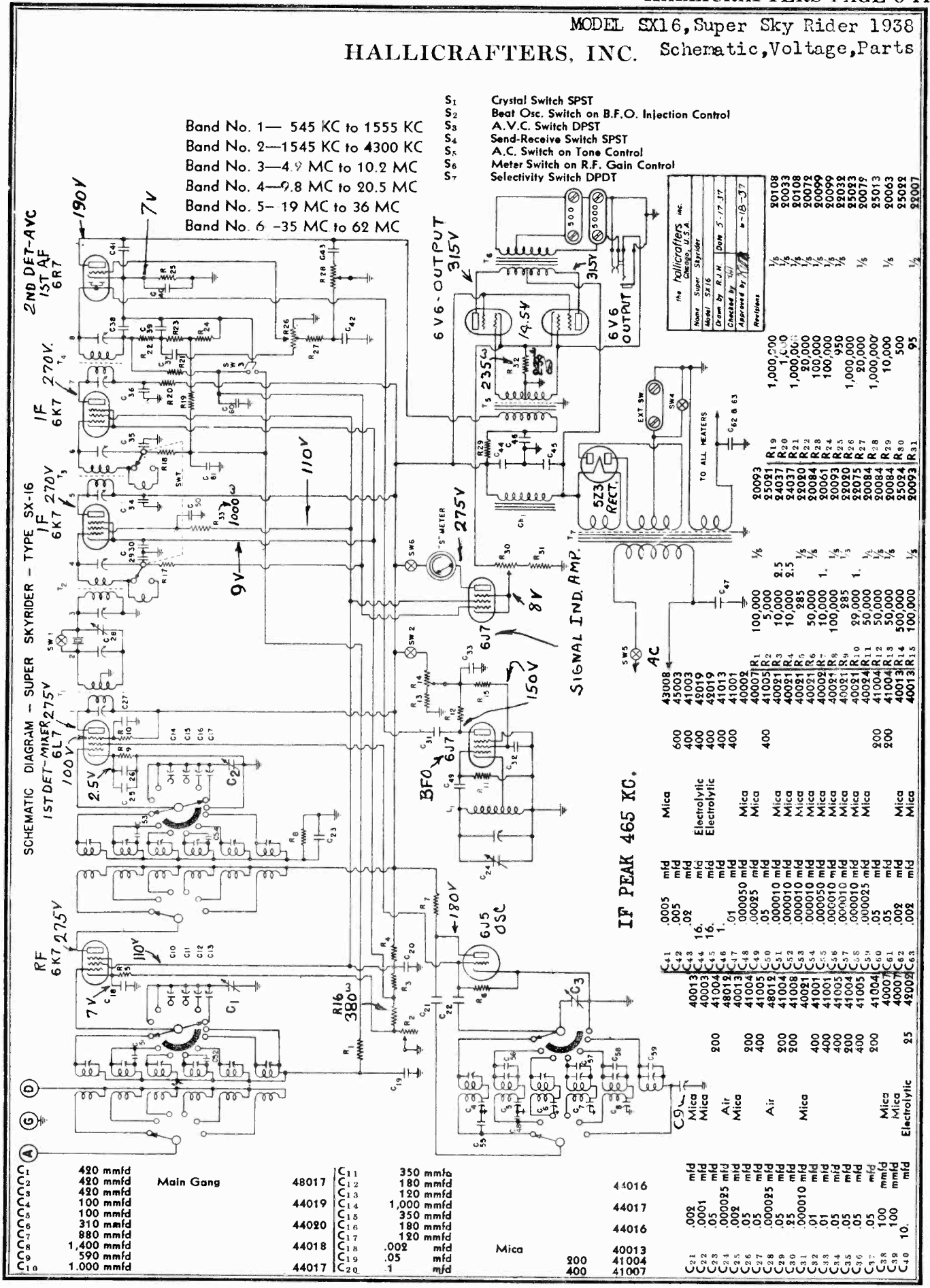
MODEL S-15





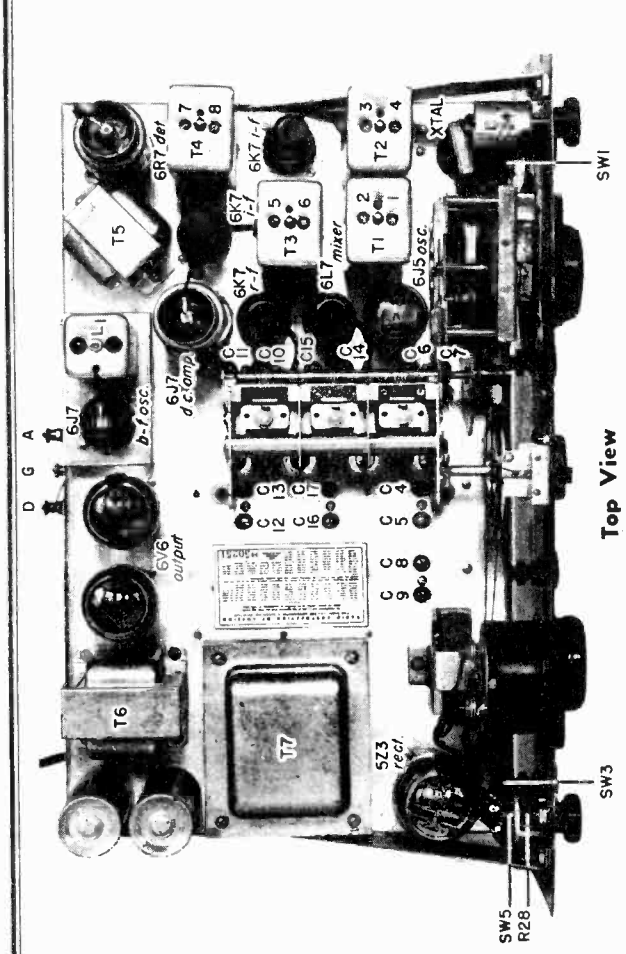
MODEL SX16, Super Sky Rider 1938

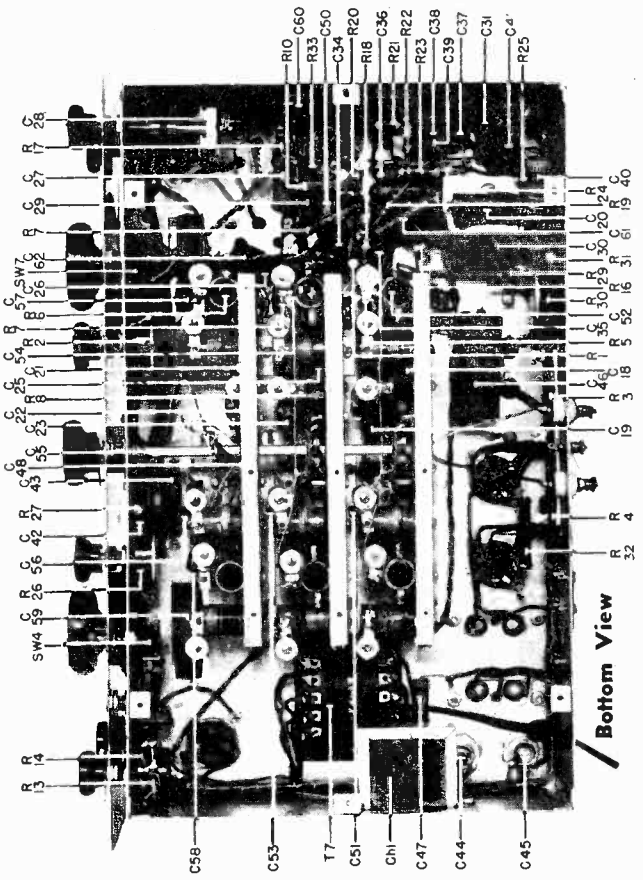
HALLICRAFTERS, INC. Schematic, Voltage, Parts



MODEL SX16, Super Sky Rider 1938
Socket, Trimmers, Alignment

HALLICRAFTERS, INC.



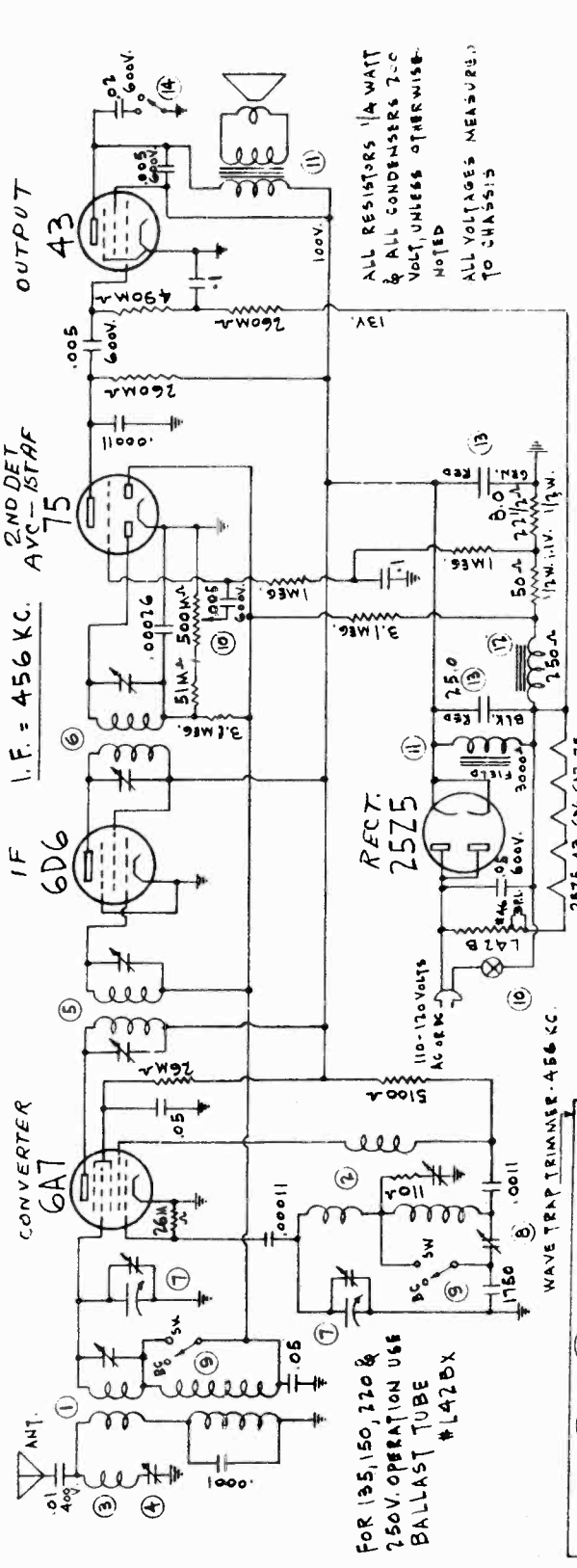


R. F. ALIGNMENT

OPR.	BAND	RECEIVER DIAL SETTING	SIGNAL GENERATOR FREQUENCY	ADJUST OSC. WITH	TRIMMERS ADJ. FOR MAX GAIN	ADJUST OSC. WITH	PADDERS ADJ. FOR MAX GAIN
1	1	600KC	600KC	------	--------	C9	--------
2	1	1400KC	1400KC	CA	CB - CC	------	--------
3	2	1800KC	1800KC	------	--------	C8	--------
4	2	4000KC	4000KC	CD	CE - CF	------	--------
5	3	5000KC	5000KC	------	--------	C6	C14 - C10
6	3	9000KC	9000KC	CG	CH - CI	------	--------
7	4	10,000KC	10,000KC	------	--------	C7	C15 - C11
8	4	18,000KC	18,000KC	CJ	CK - CL	------	--------
9	5	20,000KC	10,000KC	------	--------	C5	C16 - C12
10	5	30,000KC	10,000KC	CM	CN - CO	------	--------
11	6	40,000KC	20,000KC	------	--------	C4	C17 - C13
12	6	60,000KC	20,000KC	CP	CQ - CR	------	--------

HALSON RADIO MFG. CORP.

MODEL 25
Schematic, Socket
Trimmers, Alignment
Parts, Voltage



LINE VOLTAGE — 110 to 120 Volts, A C or D C, Alternating or direct current.

TUNING RANGES — Broadcast and State Police Band - 545 Kilocycles (540 Meters) to 1750 Kilocycles (170 Meters).
Short Wave, Municipal Police, Aviation, Amateur and Foreign Broadcast Band - 2.3 Megacycles (130 M.) to 7.5 Megacycles (40 M)

1 = 2226-3	ANTENNA Coil
2 = 2240-3	OSCILLATOR Coil
3 = 2191-1	WAVE TRAP Coil
4 = 2231-1	" " TRIMMER } 456 KC.
5 = 1900F	1ST I.F. TRANS.
6 = 1848K	2ND " "
7 = 2335	VARIABLE COND. 420 MMFD.
8 = 1621-1	PADDER CONDENSER
9 = 2154-2	RANGE SWITCH
10 = 1908D-2	VOLUME CONTROL & SWITCH - 500 Ω
11 = 2159	SPEAKER ASSEMBLY
12 = 1976B	FILTER CHOKE - 250 Ω
13 = 2163	ELECTROLYTIC COND. 25-8 MFD-150V.
14 = 1439B-1	TONE CONTROL SWITCH

MODEL 25

ALIGNMENT PROCEDURE

1) Set service oscillator to 456 kilocycles and connect the output lead to the top grid of the 6A7. Adjust the intermediate frequency trimmers for maximum response.

2) Connect oscillator set at 456 kc. to the antenna lead through a .0002 mfd. condenser band switch in the broadcast position, and adjust the wave trap trimmer for minimum signal.

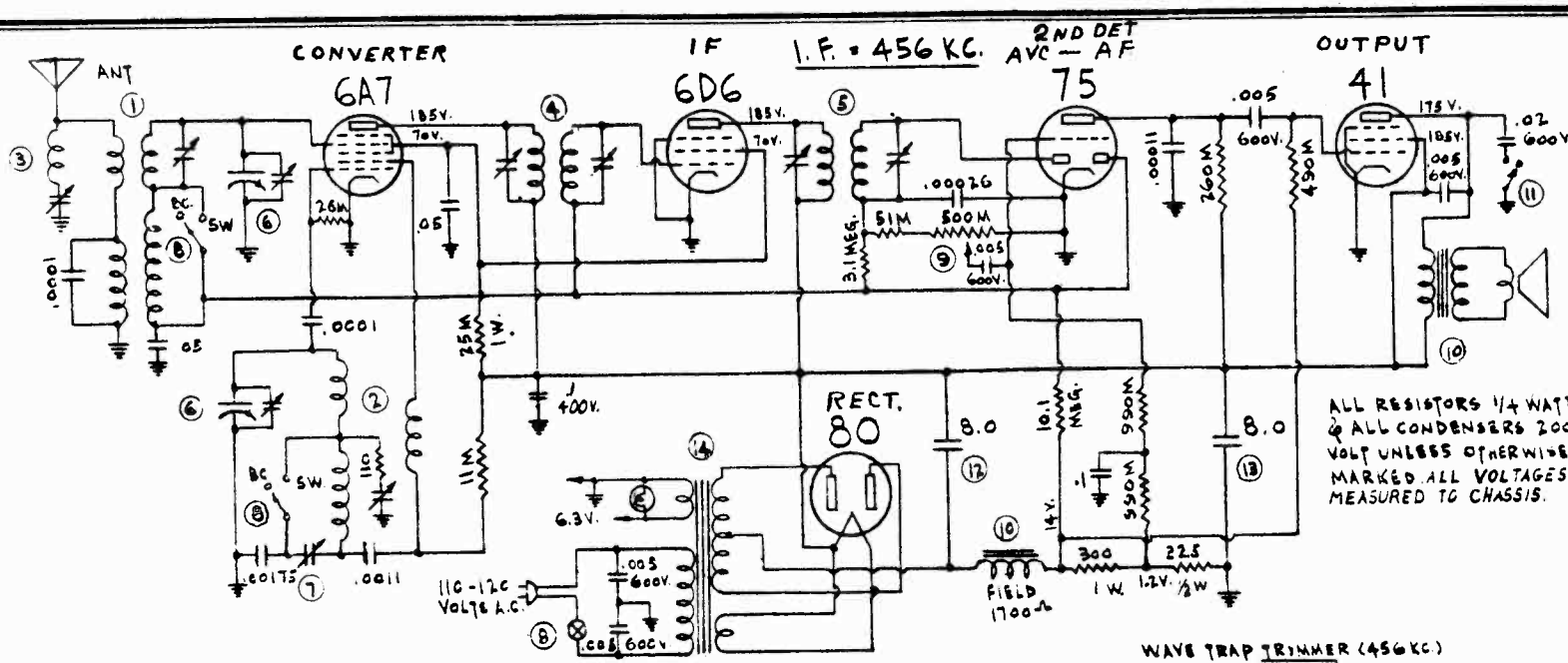
3) Set the oscillator for 6 megacycles (6000 kc.), band switch in the short wave position, dial pointer set for 6 mc. calibration and adjust the short wave oscillator trimmer until the signal is heard.

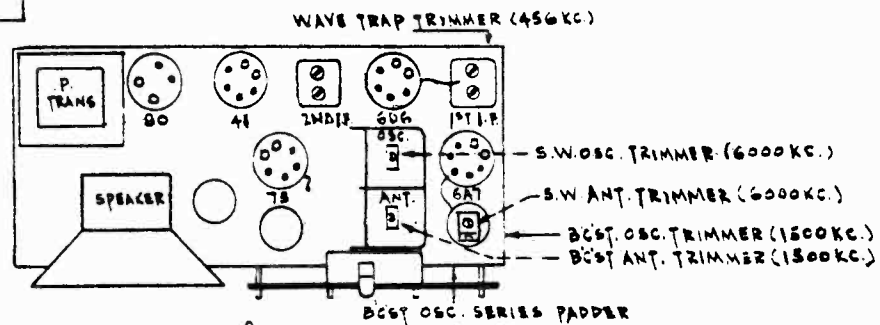
4) Turn the band switch to the broadcast band, set the dial to 1500 kc. calibration. Feed a 1500 kc. signal from the test oscillator through the antenna, and adjust the broadcast osc. trimmer until the signal is heard, then adjust the broadcast ant. trimmer for maximum response.

5) Set the test oscillator to 600 kc. and adjust the broadcast osc. series padder for maximum response by simultaneously adjusting the padder and rocking the tuning dial.

6) Repeat procedure numbers 4 and 5 for greater accuracy.

7) Turn the set to the S. W. band, set the test oscillator to 6000 kc., tune in the signal with the set and adjust the S. W. antenna trimmer for maximum response.





LINE VOLTAGE 110 to 120 Volts alternating current only.

TUNING RANGES Broadcast and State Police Band - 545 Kilocycles (540 Meters) to 1750 Kilocycles (170 Meters).
Short Wave, Municipal Police, Aviation, Amateur and Foreign Broadcast Band - 2.3 Megacycles (130 M.) to 7.5 Megacycles (40 M.).

ALIGNMENT PROCEDURE

1) Set service oscillator to 456 kilocycles and connect the output lead to the top grid of the 6A7. Adjust the intermediate frequency trimmers for maximum response.

2) Connect oscillator, set at 456 kc. to the antenna lead through a .0002 mfd. condenser, band switch in the broadcast position, and adjust the wave trap trimmer for minimum signal.

3) Set the oscillator for 6 megacycles (6000 kc.), band switch in the short wave position, dial pointer set for 6 mc. calibration and adjust the short wave oscillator trimmer until the signal is heard.

4) Turn the band switch to the broadcast band, set the dial to 1500 kc. calibration. Feed a 1500 kc. signal from the test oscillator through the antenna, and adjust the broadcast osc. trimmer until the signal is heard, then adjust the broadcast ant. trimmer for maximum response.

5) Set the test oscillator to 600 kc. and adjust the broadcast osc. series padder for maximum response by simultaneously adjusting the padder and rocking the tuning dial.

6) Repeat procedure numbers 4 and 5 for greater accuracy.

7) Turn the set to the S. W. band, set the test oscillator to 6000 kc., tune in the signal with the set and adjust the S. W. antenna trimmer for maximum response.

1 = 2226-3 ANTENNA COIL
2 = 2240-3 OSCILLATOR COIL
3 = 2297-1 WAVE TRAP = 456 KC.
4 = 1900 F 1ST I.F. TRANS. 456 KC.

TUBE LAYOUT & TRIMMER LOCATIONS

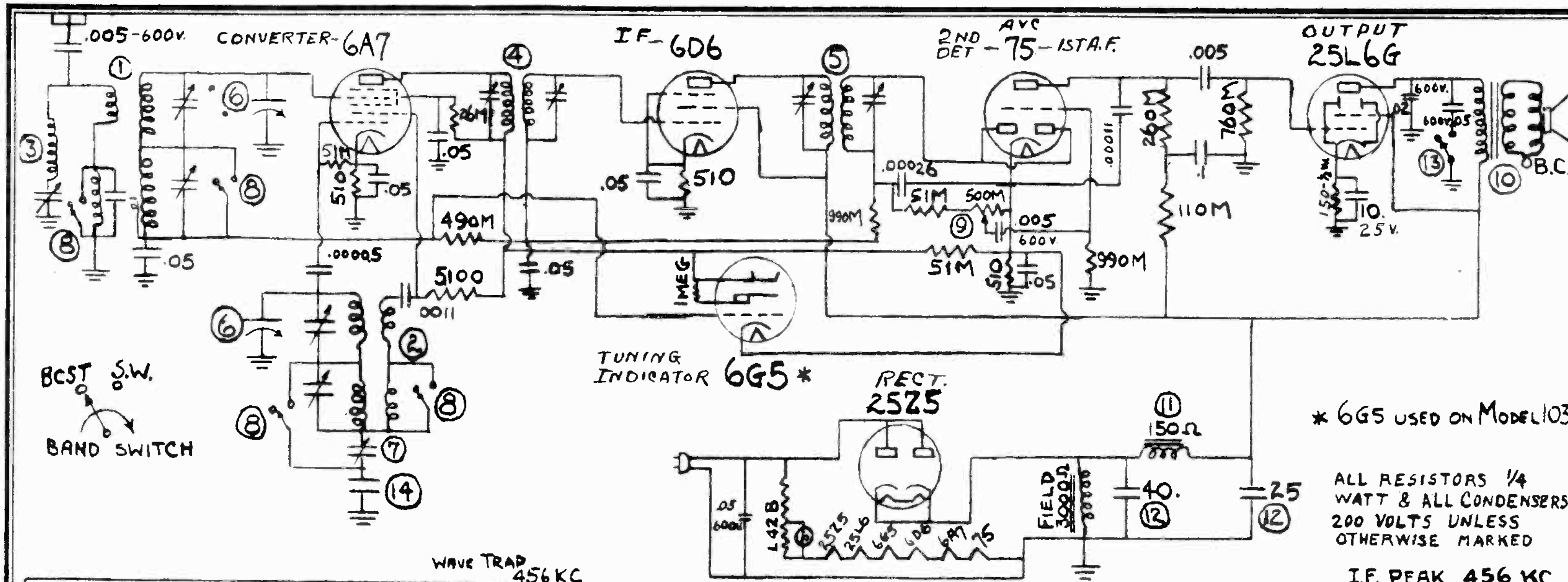
7-20-37 Ep

5 = 1848K 2ND I.F. TRANS.
6 = 2335 VARIABLE CONDENSER 420 MMFD.
7 = 1621-1 PADDER CONDENSER
8 = 2254-2 RANGE SWITCH
9 = 1908D-2 VOLUME CONTROL & SWITCH
10 = 2272 SPEAKER ASSEMBLY
11 = 1439B-1 TONE CONTROL SWITCH
12 = 2270 ELECTROLYTIC COND (WET) 8 MFD. 350 V.
13 = 2271 " " " " 250 V.
14 = 2274 POWER TRANSFORMER - 60 CYCLE

MODEL 35

MODELS 102, 103
Schematic, Socket
Alignment, Trimmers
Parts

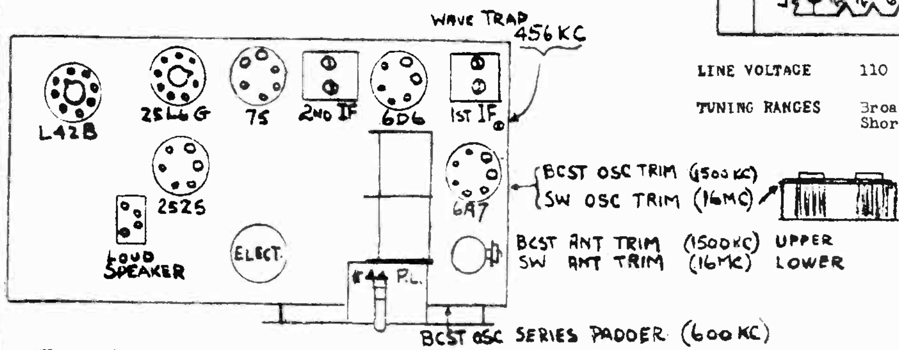
HALSON RADIO MFG. CORP.



* 6G5 USED ON MODEL 103

ALL RESISTORS 1/4 WATT & ALL CONDENSERS 200 VOLTS UNLESS OTHERWISE MARKED

I.F. PEAK 456 KC



TUBE LAYOUT AND TRIMMER • LOCATION

LINE VOLTAGE 110 to 120 Volts, AC or DC, Alternating or Direct current.

TUNING RANGES Broadcast and State Police Band - 545 KC (540 Meters) to 1750 KC (170 Meters)
Short Wave, Foreign Broadcast - 5.75 MC (52 Meters) to 19 MC (16 Meters)

1-2295 - ANTENNA COIL ASSEMBLY
2-2296 - OSCILLATOR COIL ASSEMBLY
3-2297-1 WAVE TRAP - 456 KC
4-1900G 1ST I.F. TRANSFORMER
5-1848L 2ND I.F. TRANSFORMER
6-2290-3 2 GANG VARIABLE COND.
7-1621-1 PADDER CONDENSER
8-2294-1 RANGE SWITCH
9-1908D-2 VOLUME CONTROL - SWITCH
10-2299-1 SPEAKER ASSEMBLY
11-2301 FILTER CHOKE
12-2302 ELECTOLYTIC COND. -150 V.
13-1439B4 TONE CONTROL SWITCH
14-2320 MICA COND. 3200 MMF ±5%

FOR 135, 150, 220, 250 VOLT OPERATION USE BALLAST TUBE NO L42BX

ALIGNMENT PROCEDURE -

(1) Set service oscillator to 456 KC and connect the output lead to the top grid of 6A7. Adjust the I.F. trimmers for maximum response.

(2) Connect oscillator set at 456 KC to the antenna lead through a .0002 MFD condenser, band switch in the broadcast position, and adjust the wave trap for minimum response.

(3) Set oscillator for 16 MC, band switch in the short wave position, dial pointer set for 16 MC calibration, and adjust the short wave oscillator trimmer until the signal is heard.

(4) Turn the band switch to the broadcast position, set dial to 1500 KC calibration and feed a 1500 KC signal from the oscillator through the antenna. Adjust the broadcast oscillator trimmer until the signal is heard, then adjust the broadcast antenna trimmer for maximum response.

(5) Set the test oscillator to 600 KC and adjust the broadcast osc. series padder for max. response by simultaneously adjusting the padder and rocking the tuning dial.

(6) Repeat procedure numbers 4 and 5 for greater accuracy.

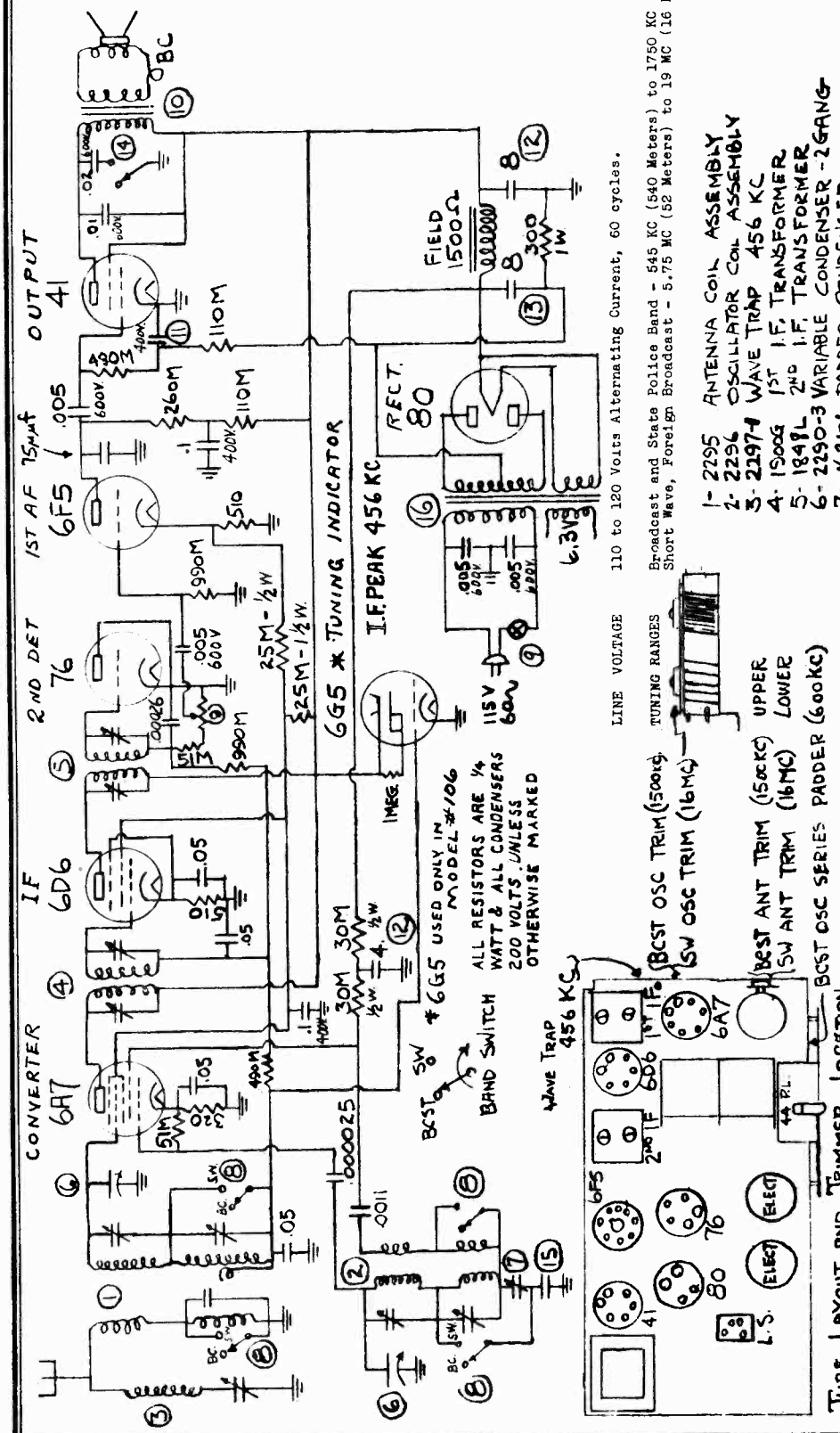
(7) Turn the set to the S.W. band, set the test oscillator to 16 MC, tune in signal with the set and adjust the S.W. antenna trimmer for maximum response. Use 400 ohm dummy antenna.

6-21-37 Eo

MODEL 102-103

MODELS 104,106
Schematic, Socket
Trimmers, Alignment
Parts

HALSON RADIO MFG. CORP.



LINE VOLTAGE 110 to 120 Volts Alternating Current, 60 cycles.

TUNING RANGES Broadcast and State Police Band - 545 KC (540 Meters) to 1750 KC (170 Meters)
Short Wave, Foreign Broadcast - 5.75 MC (52 Meters) to 19 MC (16 Meters)

1- 2295	ANTENNA COIL ASSEMBLY
2- 2296	OSCILLATOR COIL ASSEMBLY
3- 2297-A	WAVE TRAP 456 KC
4- 1500A	1ST I.F. TRANSFORMER
5- 1849L	2ND I.F. TRANSFORMER
6- 2290-3	VARIABLE CONDENSER - 2 GANG
7- 1621-1	PADDER CONDENSER
8- 2294-2	RANGE SWITCH
9- 1906D-3	VOL. CONTROL (500M) - SWITCH
10- 2306-1	SPEAKER ASSEMBLY
11- 2317	.04 MF +10% -20% PAPER COND.
12- 2308-2	8-4 MF - 350V ELECT. COND.
13- 1652	8MF - 450V ELECT. COND.
14- 1439B-2	TONE CONTROL SWITCH
15- 2320	MICA COND. 3200MMF ±5%
16- 2311	POWER TRANSFORMER 60~ - 115V

7-21-37

MODEL 104 - 106

TUBE LAYOUT AND TRIMMER LOCATION

ALIGNMENT PROCEDURE

(1) Set service oscillator to 456 KC and connect the output lead to the top grid of 6A7. Adjust the I.F. trimmers for maximum response.

(2) Connect oscillator set at 456 KC to the antenna lead through a .0002 MFD condenser, band switch in the broadcast position, and adjust the wave trap for minimum response.

(3) Set oscillator for 16 MC, band switch in the short wave position, dial pointer set for 16 MC calibration, and adjust the short wave oscillator trimmer until the signal is heard.

(4) Turn the band switch to the broadcast position, set dial to 1500 KC calibration and feed a 1500 KC signal from the oscillator through the antenna. Adjust the broadcast oscillator trimmer until the signal is heard, then adjust the broadcast antenna trimmer for maximum response.

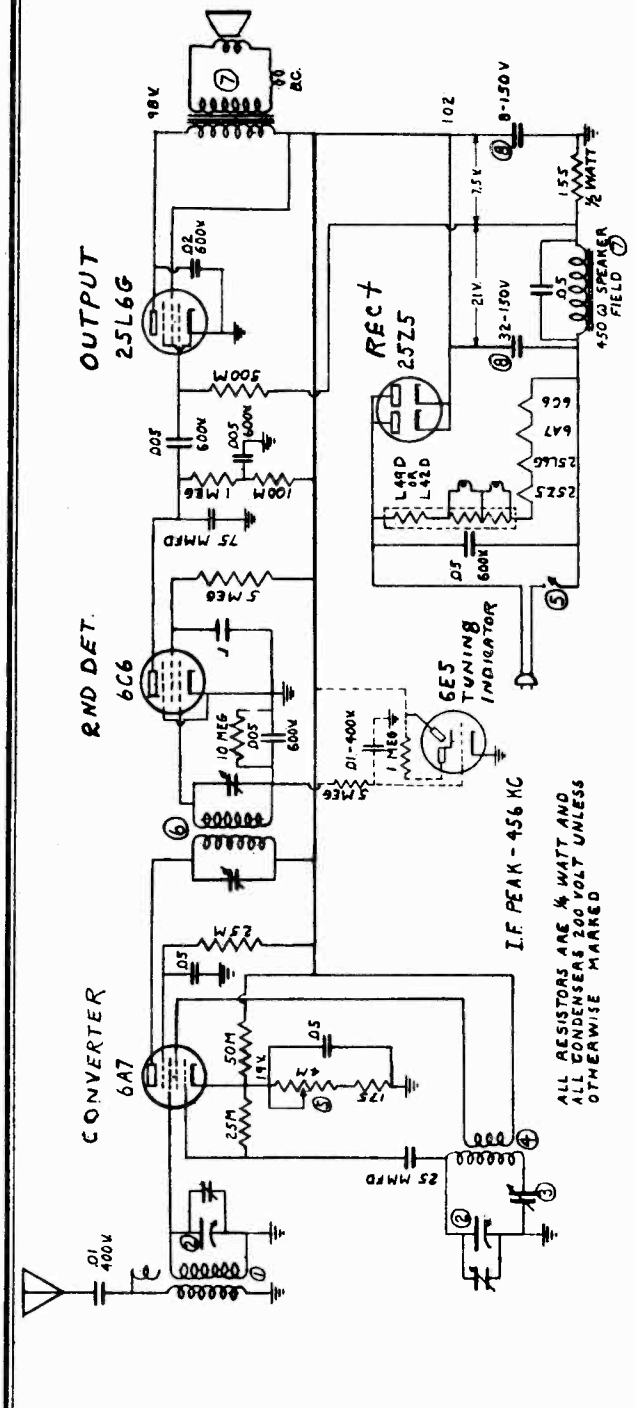
(5) Set the test oscillator to 600 KC and adjust the broadcast osc. series padder for max. response by simultaneously adjusting the padder and rocking the tuning dial.

(6) Repeat procedure numbers 4 and 5 for greater accuracy.

(7) Turn the set to the S.W. band, set the oscillator to 16 MC, tune in signal with the set and adjust the S.W. antenna trimmer for maximum response. Use 400 ohm dummy antenna.

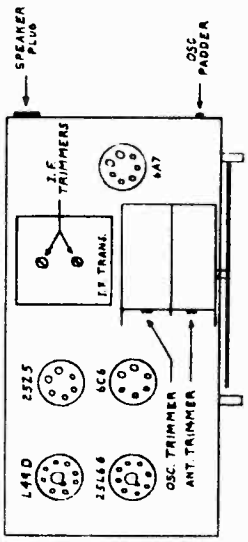
HALSON RADIO MFG. CORP.

MODELS 161,162
Schematic, Socket
Trimmers, Alignment
Parts, Voltage



LINE VOLTAGE 110 to 120 Volts, A C or D C, Alternating or Direct Current.

TUNING RANGES Broadcast Band - 545 Kilocycles (540 Meters) to 1550 Kilocycles (195 Meters).
Police Band - State and Municipal Police - 1600 Kilocycles (190 Meters) to 1750 Kilocycles (170 Meters).



TUBE LAYOUT AND TRIMMER LOCATION

PARTS LIST

1 - 2387-1	ANTENNA COIL
2 - 2422	VARIABLE CONDENSER
3 - 1421-1	PADDER CONDENSER
4 - 2388-1	OSCILLATOR COIL
5 - 2202-2A	VOLUME CONTROL & SWITCH
6 - 2410	I.F. TRANSFORMER
7 - 2366	SPEAKER ASSEMBLY
8 - 2412	ELECTROLYTIC CONDENSER

DOTTED LINES ARE 6E5 CONNECTIONS IN MODEL 162 ONLY

MODEL 161-162

ALIGNMENT PROCEDURE

1) Turn the volume control to the full on position and tune the receiver so that no signal is received. Connect the service oscillator output through a .1 mfd. isolating condenser to the top grid cap of the 6A7 and set to 456 kilocycles. Adjust the intermediate frequency trimmers for the maximum response. As the set is brought into line and the signal becomes stronger, attenuate the service oscillator.

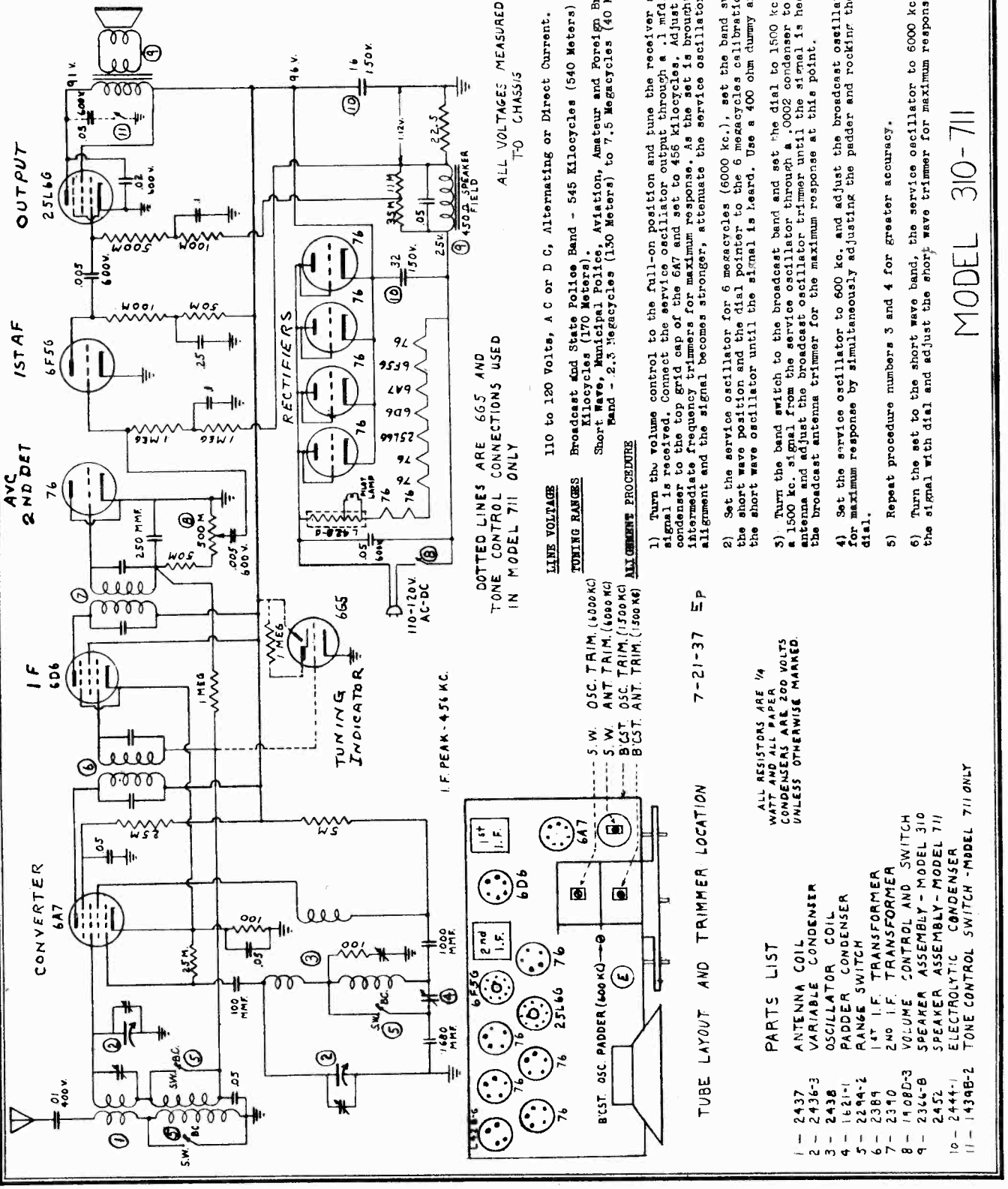
2) Set the dial pointer to the 1500 kilocycle calibration. Feed a 1500 kilocycle signal from the service oscillator through a .0002 condenser to the antenna. Adjust the oscillator trimmer until the signal is heard, then adjust the antenna condenser trimmer for maximum response.

3) Set the service oscillator to 600 kilocycles and adjust the oscillator series padder for maximum response by simultaneously adjusting the padder and rocking the tuning control.

4) Repeat the procedure of numbers 4 and 5 for greater accuracy.

MODELS 310, 711
Schematic, Socket
Trimmers, Alignment
Voltage, Parts

HALSON RADIO MFG. CORP.



LINE VOLTAGE — 110 to 120 Volts, A C or D C, Alternating or Direct Current.

TUNING RANGES — Broadcast and State Police Band - 545 Kilocycles (540 Meters) to 1750 Kilocycles (170 Meters).
Short Wave, Municipal Police, Aviation, Amateur and Foreign Broadcast Band - 2.3 Megacycles (130 Meters) to 7.5 Megacycles (40 Meters)

ALIGNMENT PROCEDURE

1) Turn the volume control to the full-on position and tune the receiver so that no signal is received. Connect the service oscillator output through a .1 mfd. isolating condenser to the top grid cap of the 6A7 and set to 456 Kilocycles. Adjust the intermediate frequency trimmers for maximum response. As the set is brought into alignment and the signal becomes stronger, attenuate the service oscillator.

2) Set the service oscillator for 6 megacycles (6000 kc.), set the band switch in the short wave position and the dial pointer to the 6 megacycles calibration. Adjust the short wave oscillator until the signal is heard. Use a 400 ohm dummy antenna.

3) Turn the band switch to the broadcast band and set the dial to 1500 kc.. Feed a 1500 kc. signal from the service oscillator through a .0002 condenser to the antenna and adjust the broadcast oscillator trimmer until the signal is heard. Adjust the broadcast antenna trimmer for the maximum response at this point.

4) Set the service oscillator to 600 kc. and adjust the broadcast oscillator padder for maximum response by simultaneously adjusting the padder and rocking the tuning dial.

5) Repeat procedure numbers 3 and 4 for greater accuracy.

6) Turn the set to the short wave band, the service oscillator to 6000 kc.. Tune in the signal with dial and adjust the short wave trimmer for maximum response.

ALL RESISTORS ARE 1/4 WATT AND ALL PAPER CONDENSERS ARE 200 VOLTS UNLESS OTHERWISE MARKED.

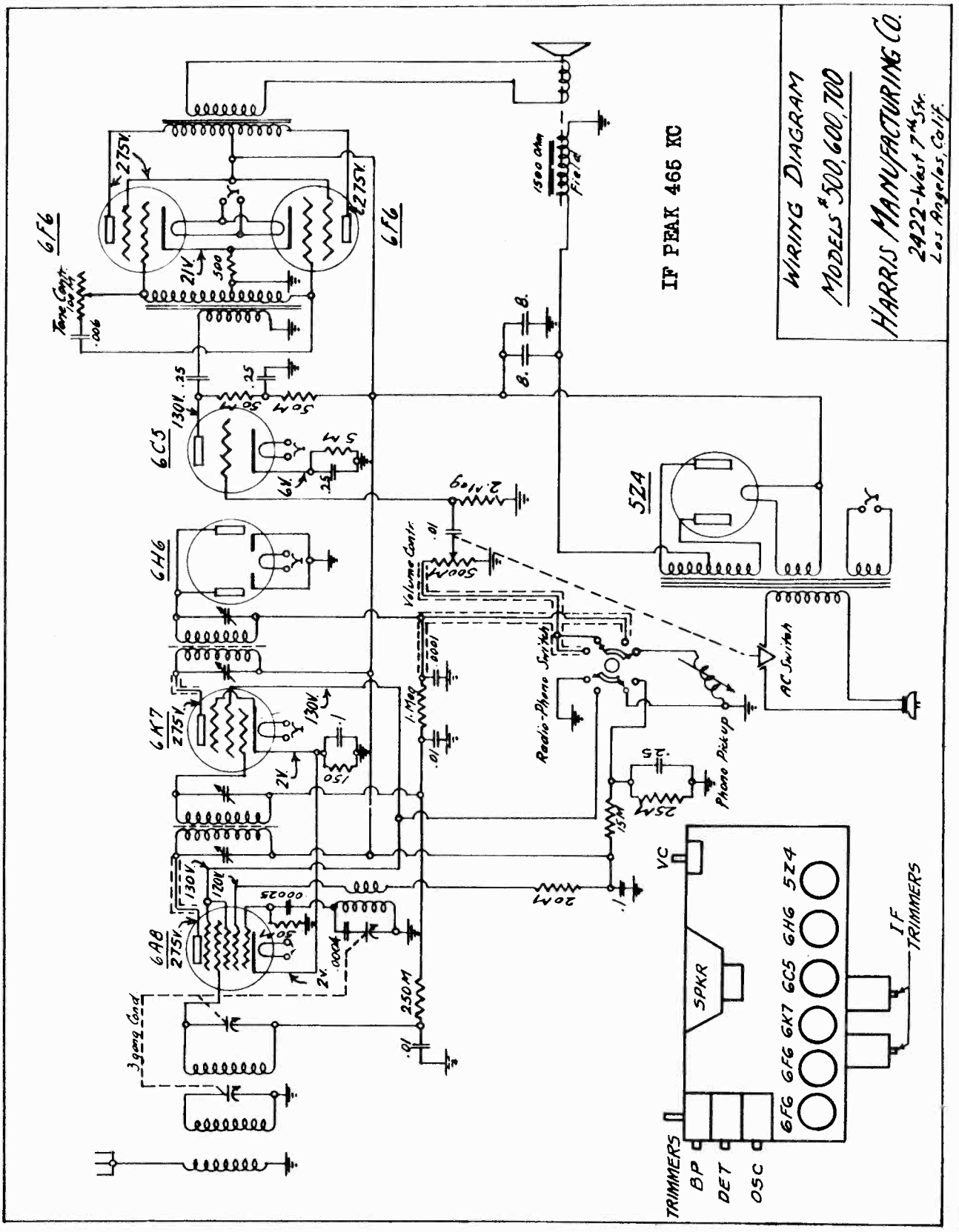
PARTS LIST

1 -	2437	ANTENNA COIL
2 -	2436-3	VARIABLE CONDENSER
3 -	2438	OSCILLATOR COIL
4 -	1621-1	PADDER CONDENSER
5 -	2294-2	RANGE SWITCH
6 -	2389	1ST I.F. TRANSFORMER
7 -	2390	2ND I.F. TRANSFORMER
8 -	1908D-3	VOLUME CONTROL AND SWITCH
9 -	2364-B	SPEAKER ASSEMBLY - MODEL 310
	2452	SPEAKER ASSEMBLY - MODEL 711
10 -	2444-1	ELECTROLYTIC CONDENSER
11 -	1439B-2	TONE CONTROL SWITCH - MODEL 711 ONLY

MODEL 310-711

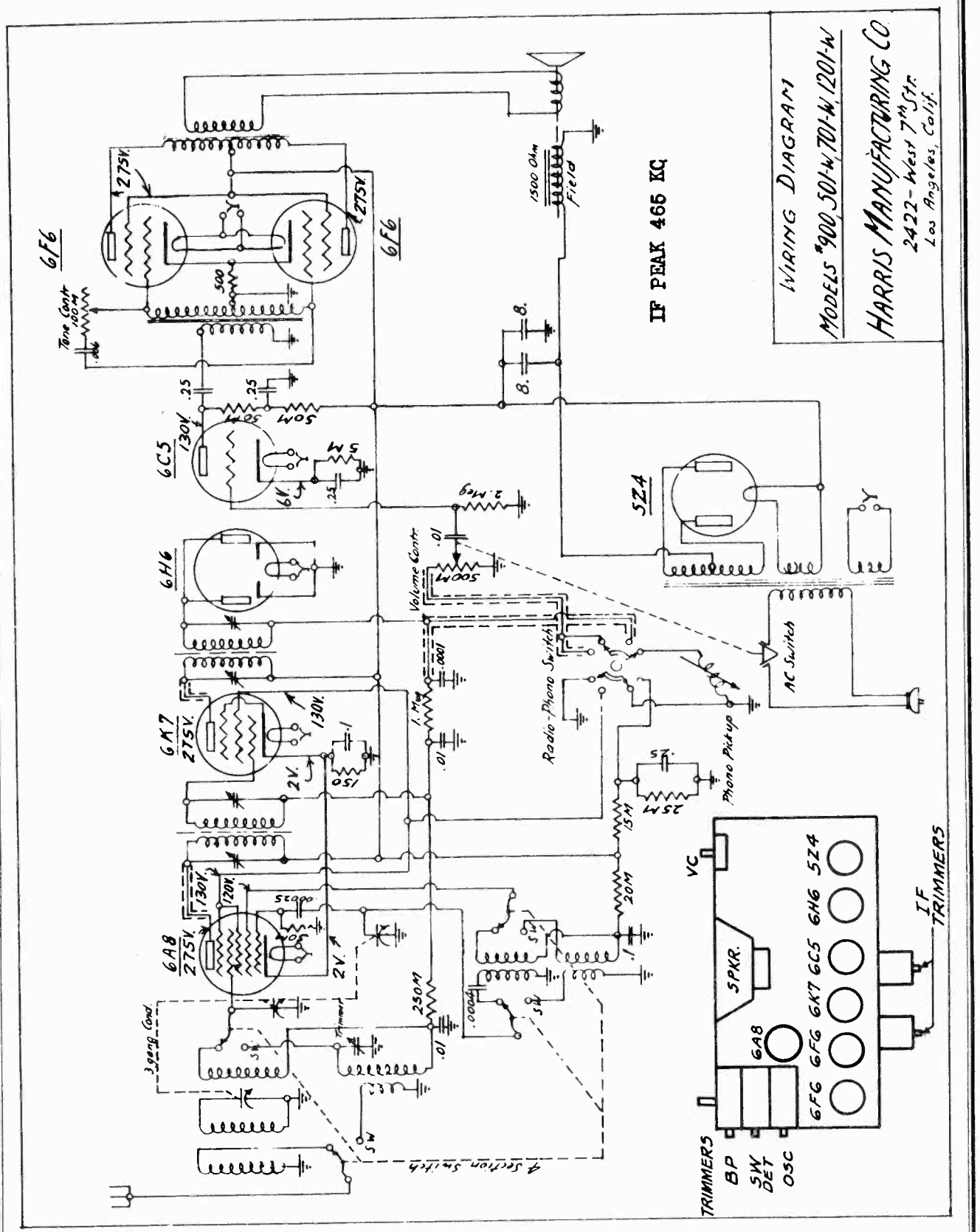
HARRIS MFG. CO.

MODELS 500, 600, 700
Schematic, Socket
Trimmers, Voltage



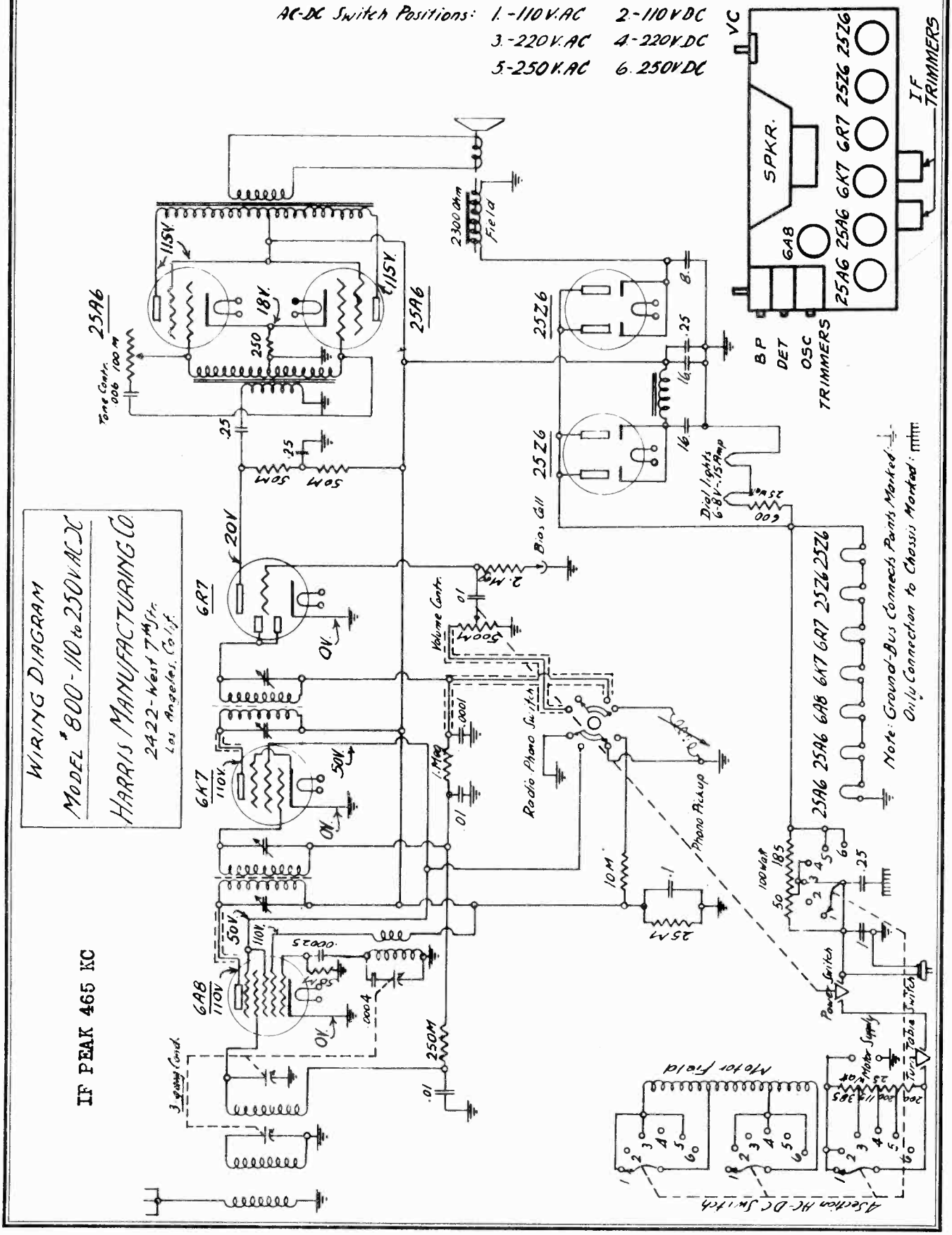
MODELS 501W,701W,900
1201W
Schematic,Socket
Trimmers,Voltage

HARRIS MFG. CO.



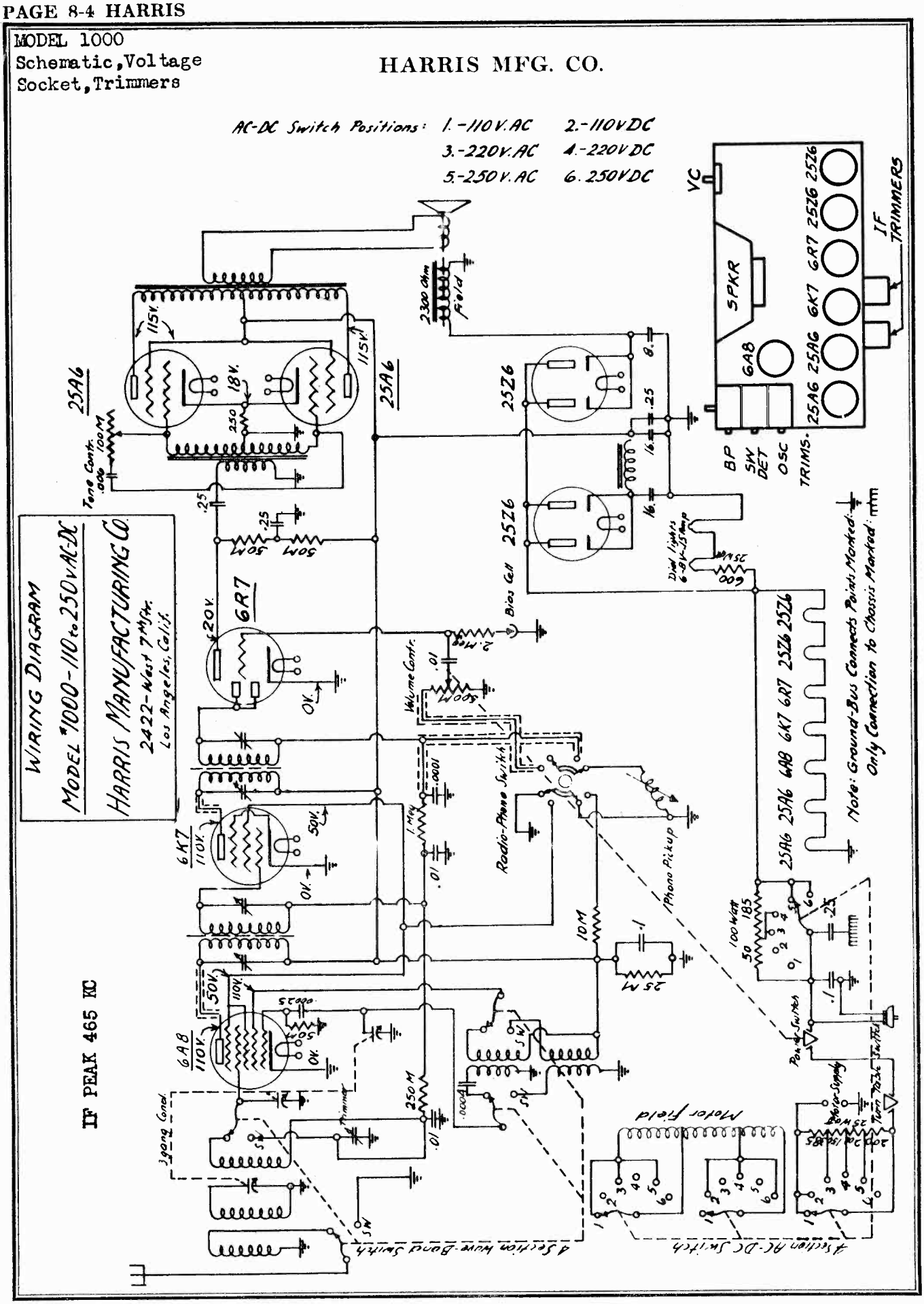
MODEL 800
Schematic, Socket
Trimmers, Voltage

HARRIS MFG. CO.



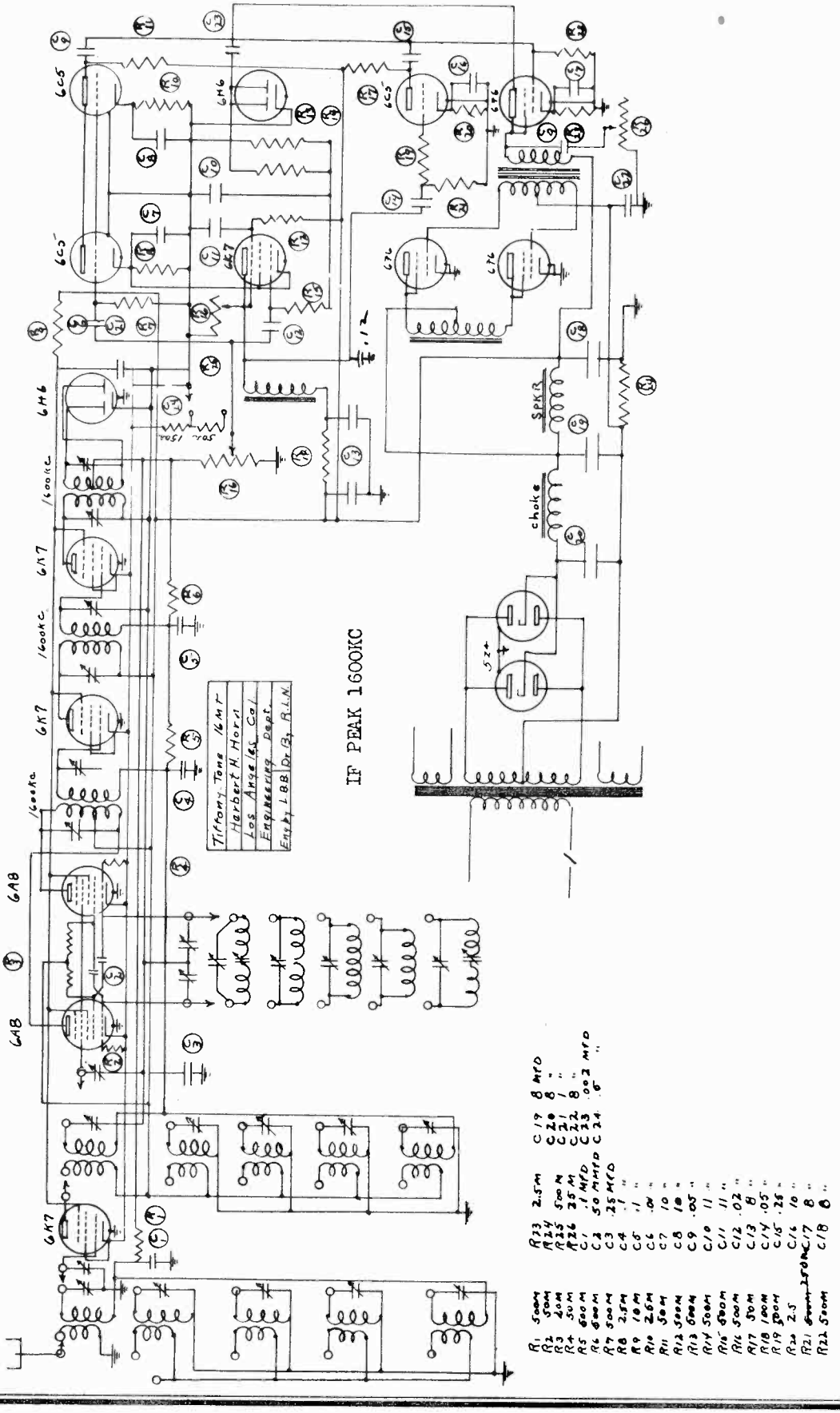
MODEL 1000
Schematic, Voltage
Socket, Trimmers

HARRIS MFG. CO.



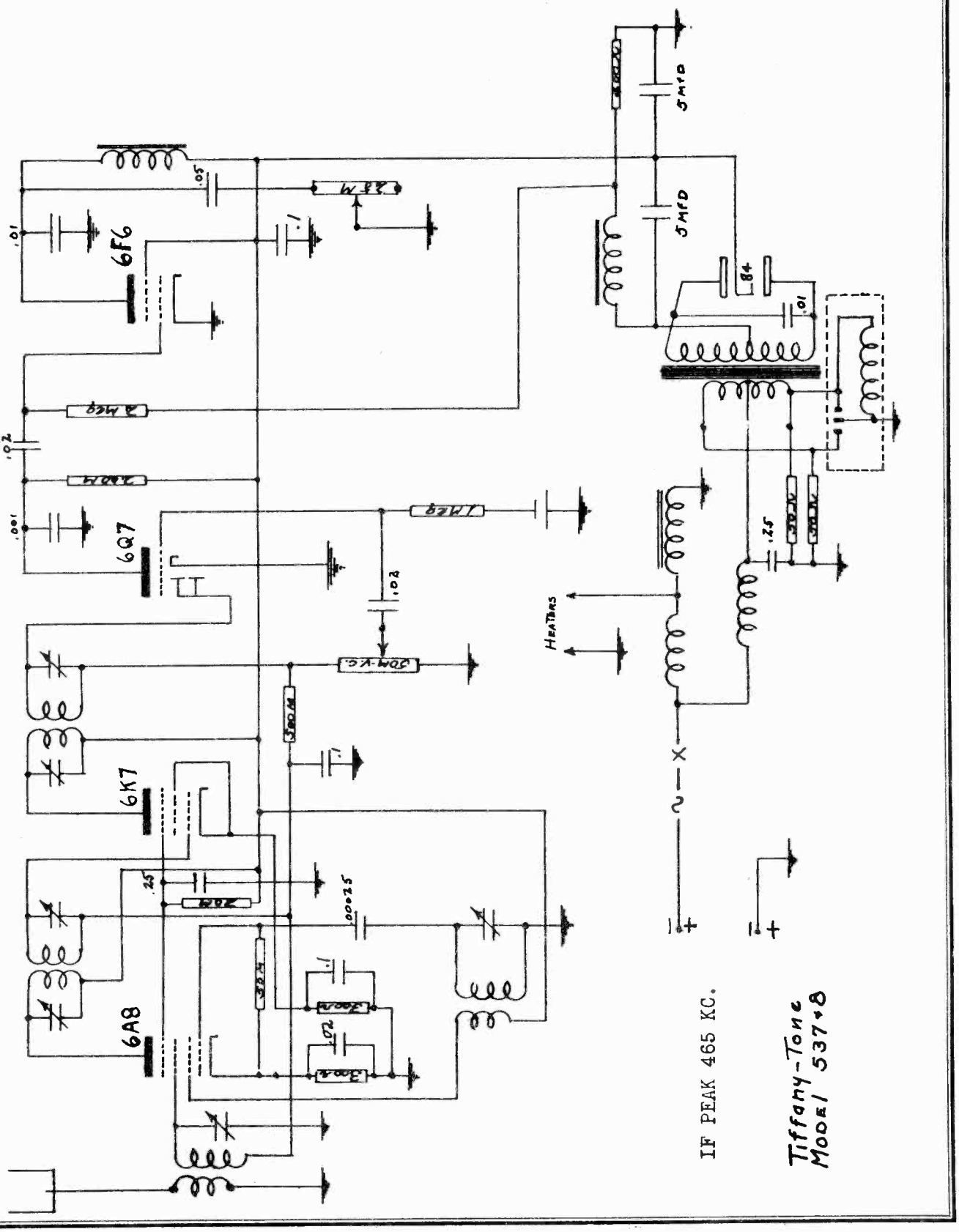
HERBERT H. HORN

MODEL 16MT
Schematic



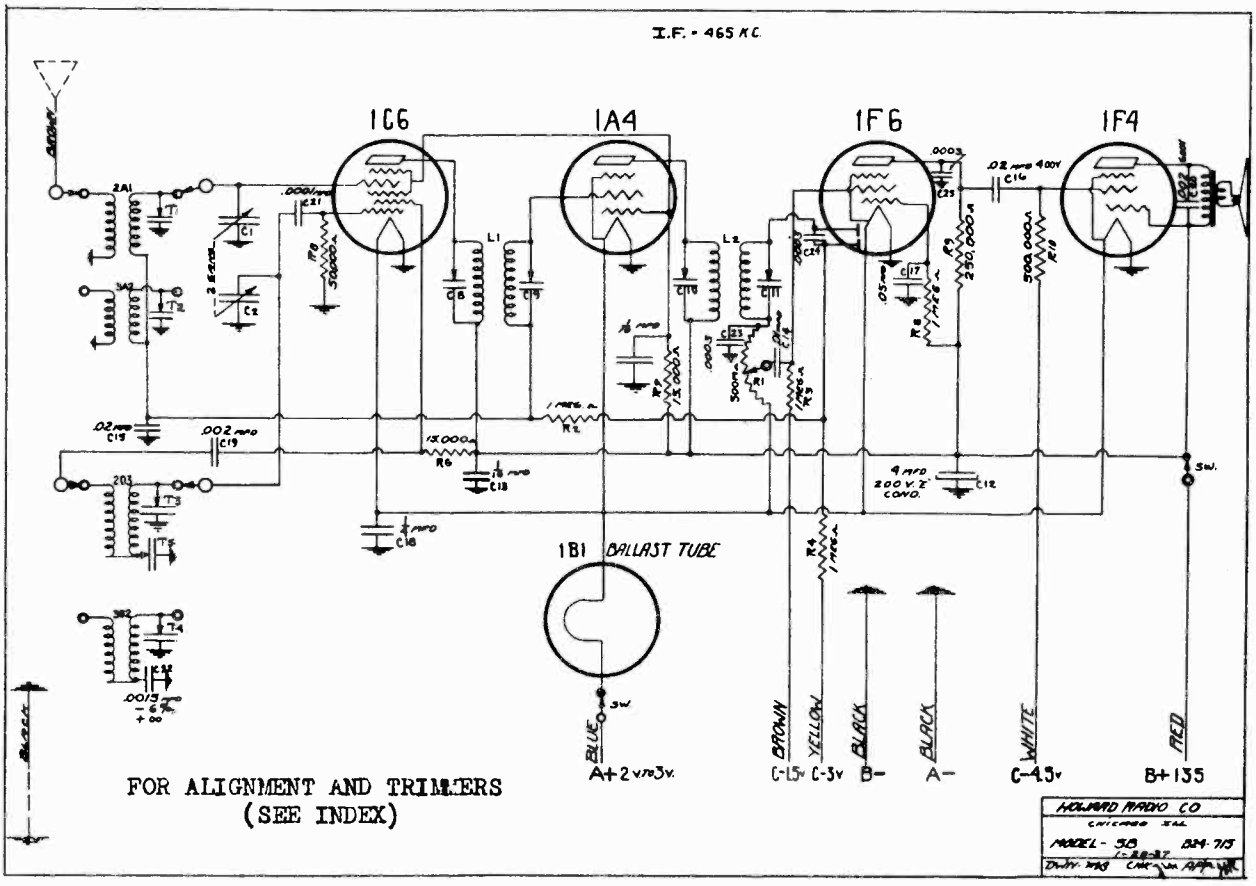
MODELS 537,538
Schematic

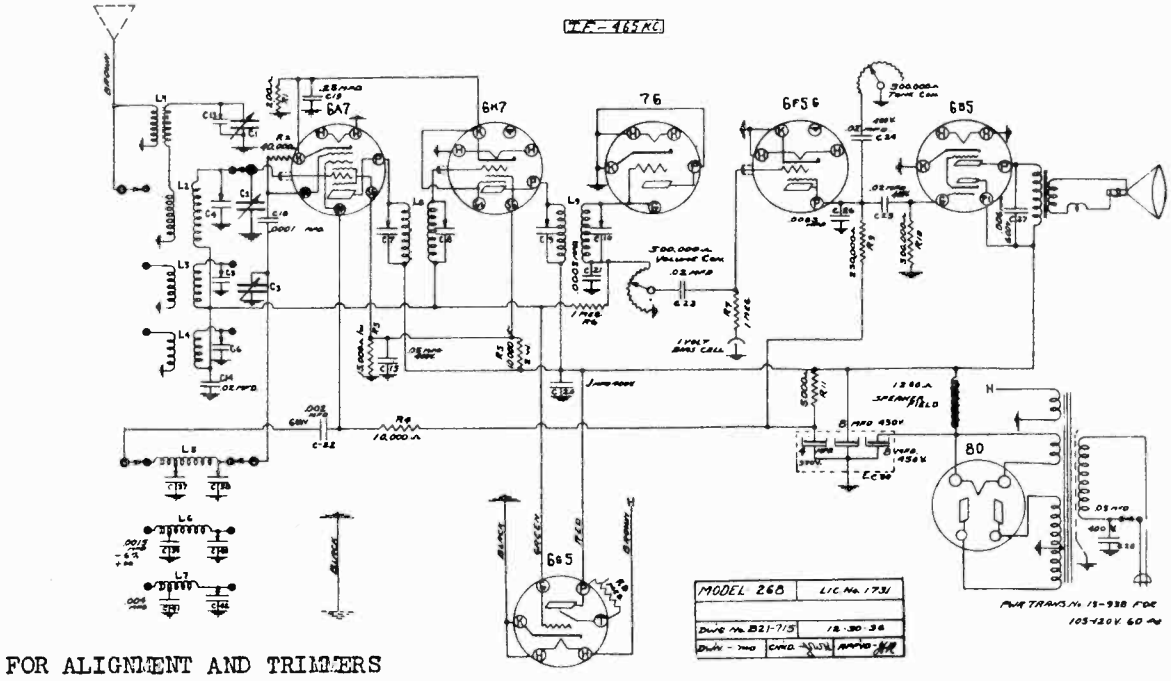
HERBERT H. HORN



MODEL 5B
MODEL 268
Schematic

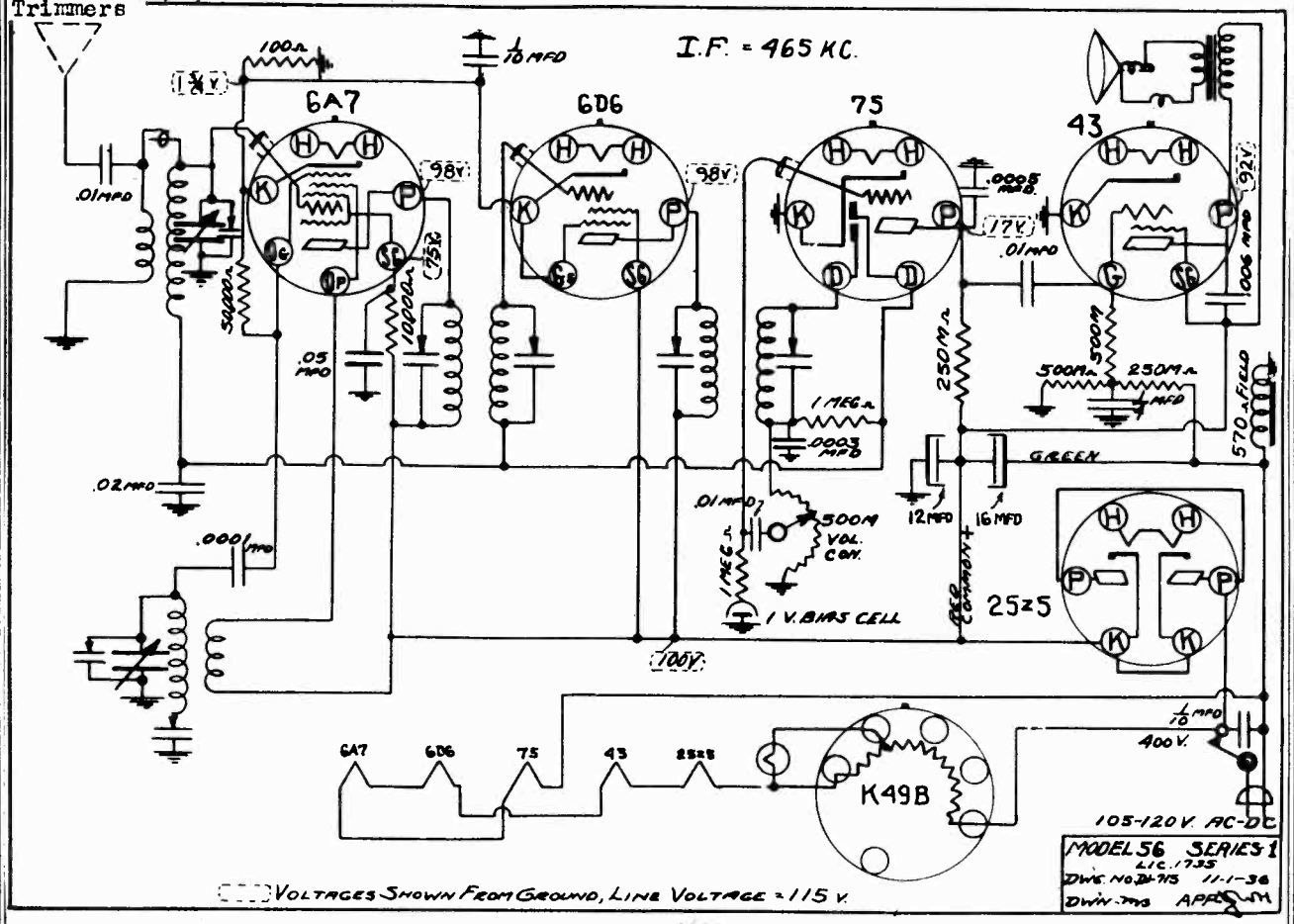
HOWARD RADIO CO.

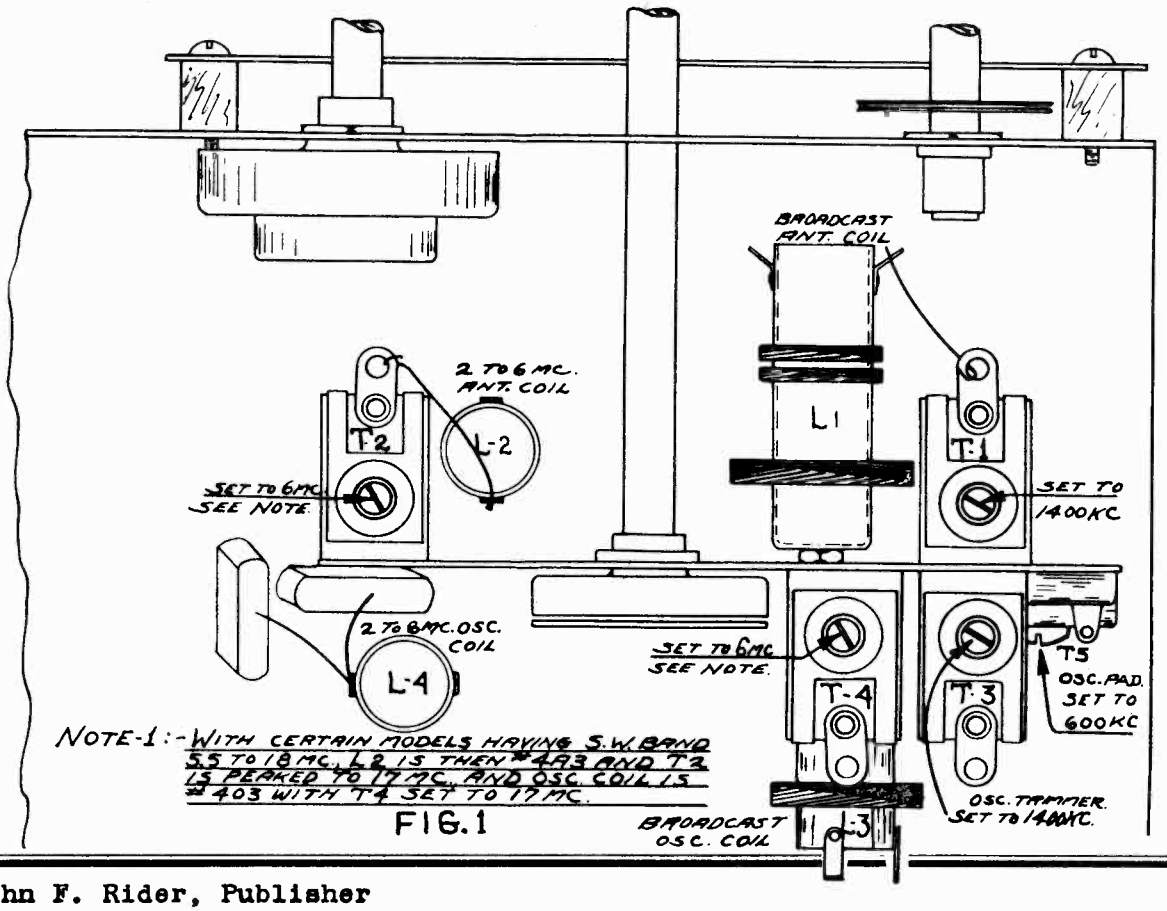




MODEL 56
Schematic, Voltage
MODELS 5B, 256, 259, S256, S259
Trimmers

HOWARD RADIO CO.





NOTE-1:- WITH CERTAIN MODELS HAVING S.W. BAND 5.5 TO 18 MC, L2 IS THEN #4A3 AND T2 IS PEAKED TO 17 MC. AND OSC. COIL IS #403 WITH T4 SET TO 17 MC.

FIG. 1

THE ALIGNMENT PROCEDURE

MODELS 256, 259, S256, S259 AND 5B

The following alignment instructions are given with the assumption that the Service Station has a signal generator capable of accurately covering the range of the receiver.

The only other apparatus necessary is a meter connected, in the output stage to indicate resonance. This can be an 0 to 3 volt AC meter connected across the voice coil of the speaker of preferably an output meter connected in the plate circuit of the power tube in series with an 8 Mfd. paper condenser.

I. THE I.F. STAGES

The intermediate frequency stages are aligned in the usual manner on Models 259, S259 and 5B by feeding 465 KC into the grid of the mixer tube after removing grid cap, placing a series resistor of 500,000 ohms from tube grid to the cap and a series condenser from the tube grid to the hot lead from the signal generator. NOTE WITH MODELS 256 AND S256 LEAVE GRID CAP ON THE MIXER TUBE, TURN BAND SWITCH TO BROADCAST BAND POSITION AND VARIABLE CONDENSER ALL THE WAY OUT TO MINIMUM CAPACITY.

The sensitivity of the I. F. system alone for Models 256, S256, 259 and S259 will be about 25 to 50 Microvolts for a 50 Milliwatt output, and about 125 Microvolts for Model 5B.

The two trimmers in each of the I. F. Cans should be very carefully peaked to resonance as they are very critical and will greatly affect the performance of the set.

Always use as low an output as possible from the signal generator when making the various adjustments.

II. THE S. W. BAND 2 TO 6 MEGACYCLES

SEE SECTION IV FOR MODELS WITH A 5.5 TO 18 MC BAND

First check the position of the dial hand by rotating the condenser plates to full capacity. At this point the dial hand should be straight across in line with the lines dividing the scale in half. If the hand is off position, remove dial glass to get at the screw holding the hand.

With the dial hand set to 6 megacycles and the band switch in the short wave position, (all the way to the right) see Figure 1 and peak trimmer T4 of the oscillator circuit to 6 megacycles.

After adjustment of the oscillator trimmer, peak trimmer T2 to 6 megacycles from the generator.

III. THE BROADCAST BAND

Turn wave band switch all the way to left and dial hand set to 1400 KC (the top scale). The signal generator may be coupled direct to the antenna lead on this band, through a standard 200 MMFD condenser.

Peak oscillator trimmer T3 to 1400 KC from the signal generator.

Peak antenna trimmer T1 to 1400 KC after adjusting oscillator.

Set dial hand to 600 KC and adjust oscillator padding condenser T5 to 600 KC.

IV. MODELS S259 AND S256 WITH A 5.5 TO 18 MC BAND ALIGN AS FOLLOWS:

Tune dial hand to 17 megacycles.

NOTE: FOR ADJUSTMENT AT 17 MEGACYCLES THE OUTPUT FROM THE SIGNAL GENERATOR MUST NOT BE COUPLED DIRECT TO THE ANTENNA LEAD OF THE SET. FOR TRUE ALIGNMENT STRETCH OUT THE RADIO ANTENNA LEAD IN SUCH A MANNER THAT IT WILL PICK UP THE SO CALLED "WILD" SIGNAL OF 17 MEGACYCLES EMITTING FROM THE GENERATOR. IT IS ALSO IMPORTANT THAT THIS SIGNAL ONLY BE STRONG ENOUGH TO JUST BE HEARD.

When the above set-up is arranged peak oscillator T4 to the 17 megacycle weak signal.

After adjusting the oscillator trimmer, peak the S.W. antenna condenser T2 to 17 megacycles.

NOTE: After adjusting the short wave band at 17 megacycles, the signal generator output to antenna should be increased and receiver dial advanced to .9 megacycle lower and note if test oscillator signal is heard.

In case there is no response the oscillator trimmers have been pulled down too tightly. The trimmers should be released until this condition exists then go back to original point of alignment - reduce antenna input voltage and correct the trimmer adjustment.

EXAMPLE: The receiver has been adjusted to 17 megacycles. Tune receiver to approximately 16.9 MC.

Increase oscillator signal by "opening up" the attenuator. Move the dial back and forth at 16.9 MC.

If no signal is heard, let oscillator trimmer off until it is heard at 16.9 MC.

Reduce signal voltage from generator, go back to 17 MC and slightly correct this last trimmer adjustment.

V. SERVICE NOTES

Seal all trimmers after their final adjustment.

The normal voltage readings of the circuits are shown on the schematic diagram of the set.

In any instance when microphonism is present, first check the dial frame and do not let it or any part of the dial touch the inside of the front panel.

Should the calibrated dial card on Models S-256 and S-259 be moved at any time, be sure and relocate it far enough to the right (when facing the front of the set) otherwise the calibration lines will not be true at various points on the dial.

Be sure that the trimmer settings are made to the true fundamental signal from the generator and not to a harmonic or image frequency.

MODELS 68 Revised
268,266
Socket,Trimmers

HOWARD RADIO CO.

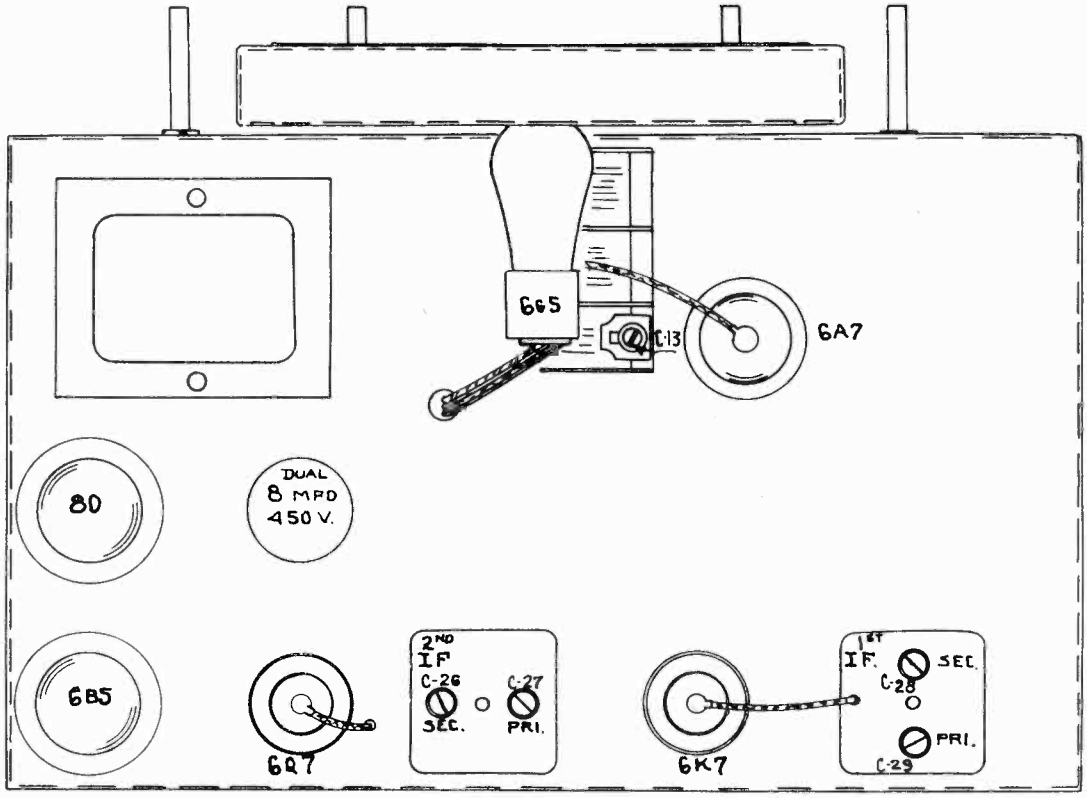


FIG. 2

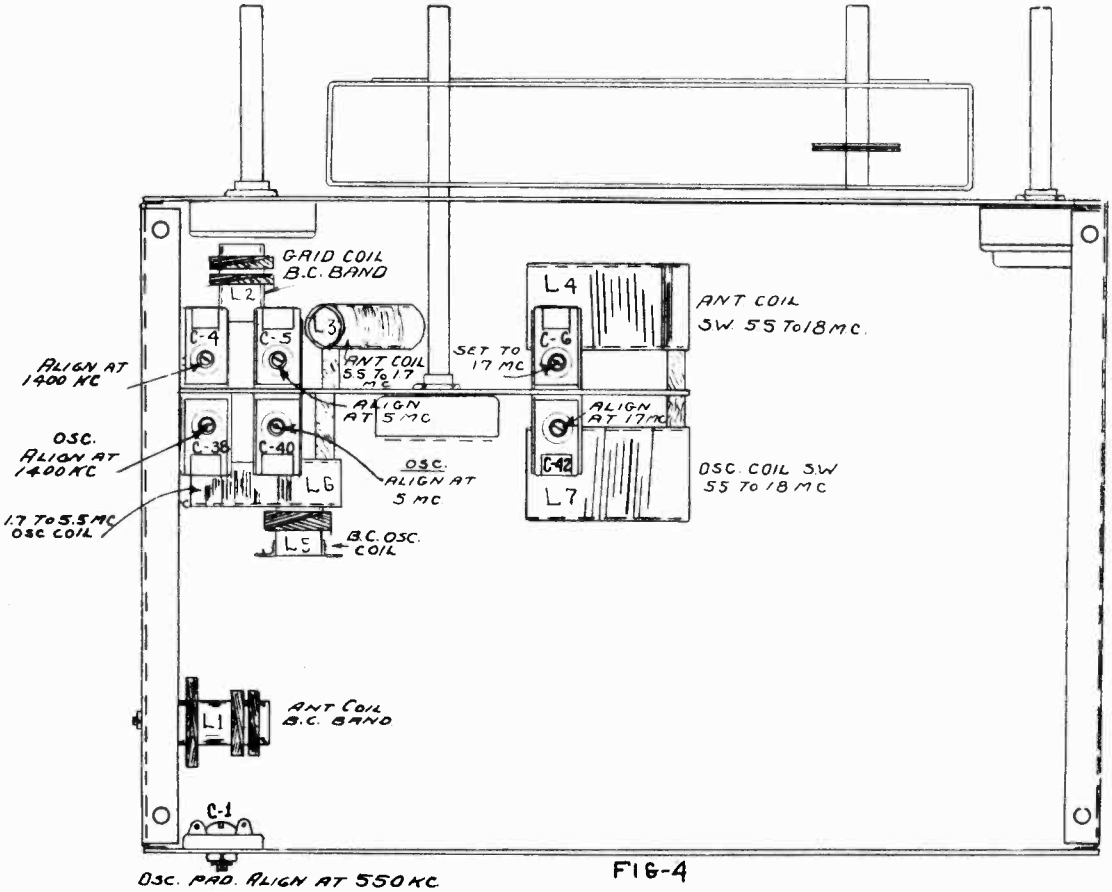
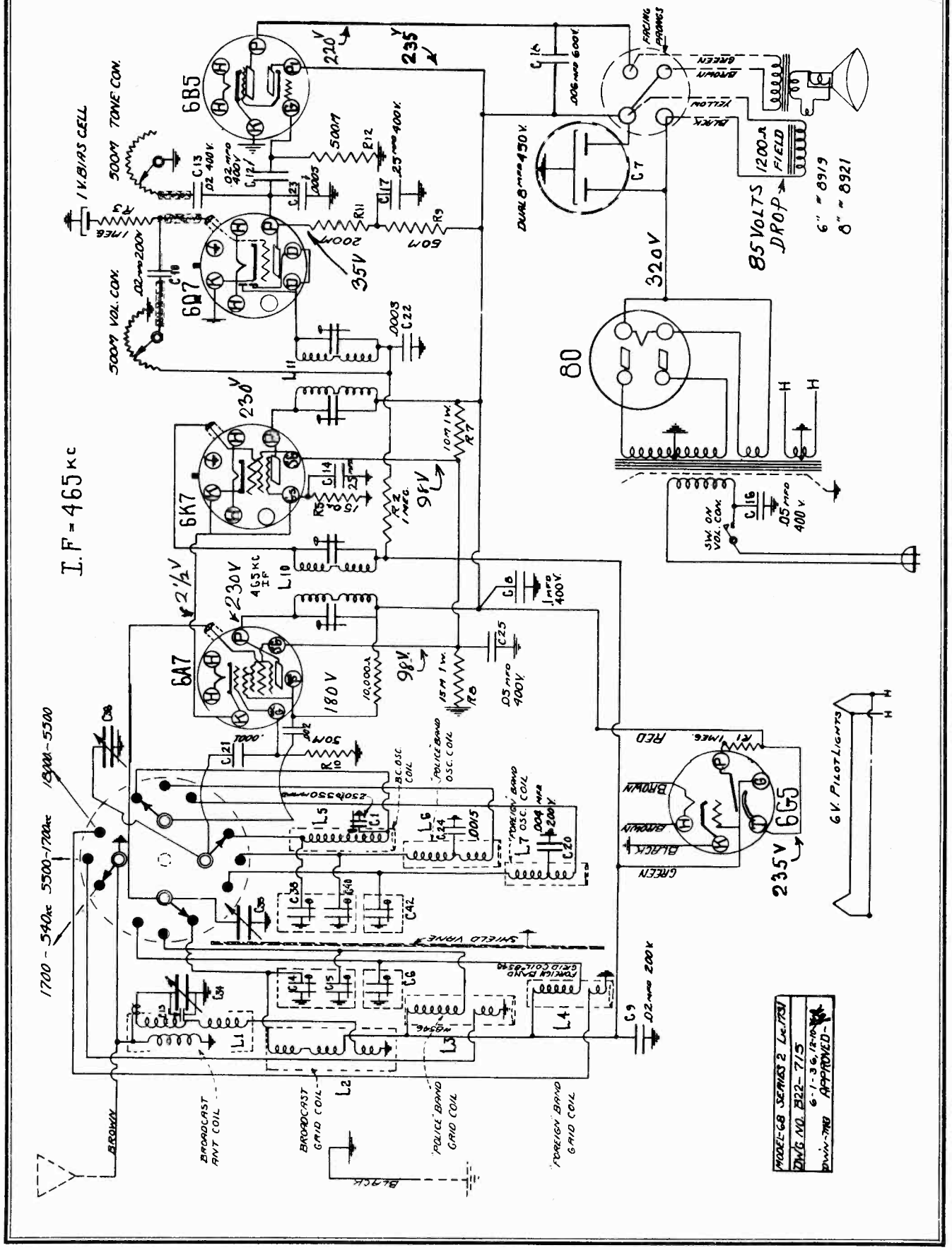


FIG-4

MODEL 68 Revised
Schematic, Voltage

HOWARD RADIO CO.



THE ALIGNMENT PROCEDURE

The following alignment instructions are given with the assumption that the Service Station has a signal generator capable of accurately covering the range of the receiver.

The only other apparatus necessary is a meter connected in the output stage to indicate resonance. This can be an 0 to 3 Volt AC meter connected across the voice coil of the speaker of preferably an output meter connected in the plate circuit of the power tube in series with an 8 Mfd. paper condenser.

I. THE I.F. STAGES

The intermediate frequency stages are aligned in the usual manner by feeding 465 K.C. into the grid of the mixer tube 6A7.

The two trimmers in each of the I.F. cans should be very carefully peaked to resonance as they are very critical and will greatly affect the performance of the set. These are trimmers Nos. C-26,27, 28, 29 on Figure 2.

Always use as low an output as possible from the signal generator when making the various adjustments.

The sensitivity of the I.F. system alone will be found to be between 15 and 20 Microvolts.

II. ALIGNMENT OF THE SHORT WAVE BAND 5.5 TO 18 M.C.

First check the position of the dial hand by rotating the variable condenser to full capacity. The hand then should be in line with the lines that divide the dial in half. If the hand is off position it can be lined up by loosening the center screw.

1. Turn band switch all the way to the right for the 5.5 to 18 M.C. Band (Yellow), and set dial hand to 17 M.C.
2. Refer to Figure 3 and with a 17 M.C. signal from the generator, peak oscillator, trimmer condenser C-42 to 17 M.C.
3. Adjust trimmer C-6 of the antenna circuit to 17 M.C. after the above mentioned oscillator trimmer has been set.

III. ALIGNMENT OF SHORT WAVE BAND 1.7 TO 5.5 M.C.

1. With the band switch in the middle position, (Blue) and the dial hand set to 5 M.C., peak trimmer C-40 of the oscillator circuit to 5 M.C.
2. Adjust Antenna stage trimmer C-5 to 5 M.C. after the above oscillator trimmer has been set.

NOTE: After adjusting the two high bands at 17 megacycles and 5 megacycles the test oscillator input to antenna should be increased and receiver dial advanced to .9 megacycle lower and note if test oscillator signal is heard.

In case there is no response, the oscillator trimmers have been pulled down too tightly. The trimmers should be released until this condition exists, then go back to original point of alignment - reduce antenna input voltage and correct the trimmer adjustment.

EXAMPLE: The receiver has been adjusted to 17 megacycles. Tune receiver to approximately 16.9 M.C.

Increase oscillator signal by "opening up" the attenuator. Move the dial back and forth at 16.9 M.C.

If no signal is heard, let oscillator trimmer off until it is heard at 16.9 M.C.

Reduce signal voltage from generator, go back to 17 M.C. and slightly correct this last trimmer adjustment.

The same thing applies to the 5 M.C. adjustment.

IV. THE ALIGNMENT OF THE BROADCAST BAND

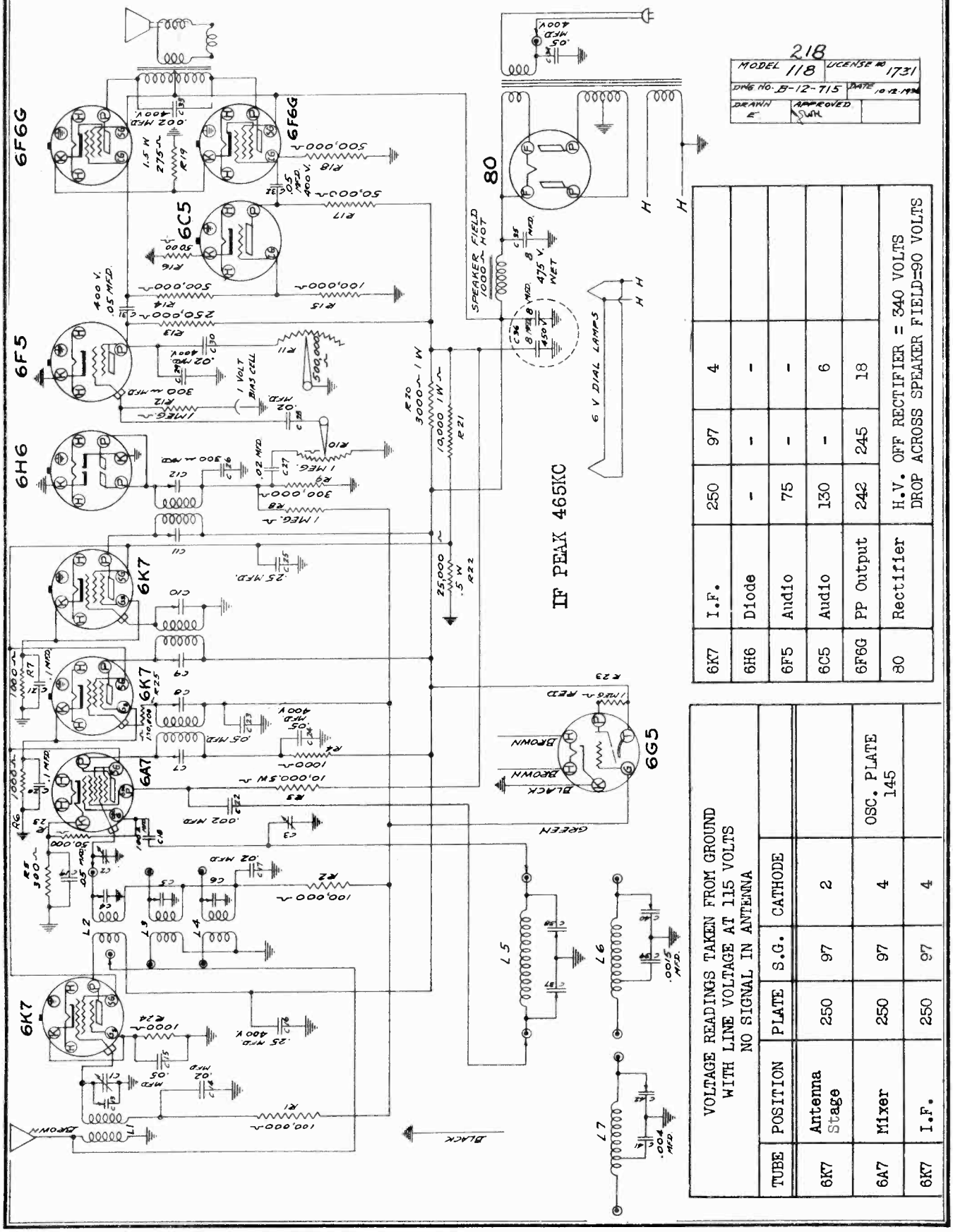
1. Set Band Switch to the 550-1700 K.C. band, and the hand to 1400 K.C.
2. Peak oscillator trimmer C-38 to 1400 K.C., then the R.F. Trimmer C-4 and the antenna stage trimmer C-13 on the variable condenser to 1400 K.C.
3. Rotate dial hand to 550 K.C. and adjust padding condenser C-37 to 550 K.C.
4. Re-check dial at 1400 K.C. as mentioned in (1) and (2).
5. Points in the middle of the dial may be checked and if necessary the plates of the oscillator section of the variable condenser (back section) may be bent for alignment.

V. NOTES

1. Seal all trimmers after their final adjustment.
2. Be sure that the settings are being made to the true fundamental signal from the oscillator and not on a harmonic or image frequency.
3. The normal voltage readings at the sockets are given in a separate chart on the following pages.
4. It is advisable to check the position of the tuning eye tube to make certain that it is not pushed against the inside of the dial card. With the adjustment screw on the bracket, allow a small amount of clearance between the end of the tube and the dial to avoid any possibility of the heat from the tube affecting the dial card.

MODELS 118,218
Schematic,Voltage

HOWARD RADIO CO.



6K7	I.F.	250	97	4			
6H6	Diode	-	-	-			
6F5	Audio	75	-	-			
6C5	Audio	130	-	6			
6F6G	PP Output	242	245	18			
80	Rectifier	H.V. OFF RECTIFIER = 340 VOLTS DROP ACROSS SPEAKER FIELD=90 VOLTS					

VOLTAGE READINGS TAKEN FROM GROUND
WITH LINE VOLTAGE AT 115 VOLTS
NO SIGNAL IN ANTENNA

TUBE	POSITION	PLATE	S.G.	CATHODE	
6K7	Antenna Stage	250	97	2	
6A7	Mixer	250	97	4	OSC. PLATE 145
6K7	I.F.	250	97	4	

MODELS 118,218
Socket, Trimmers

HOWARD RADIO CO.

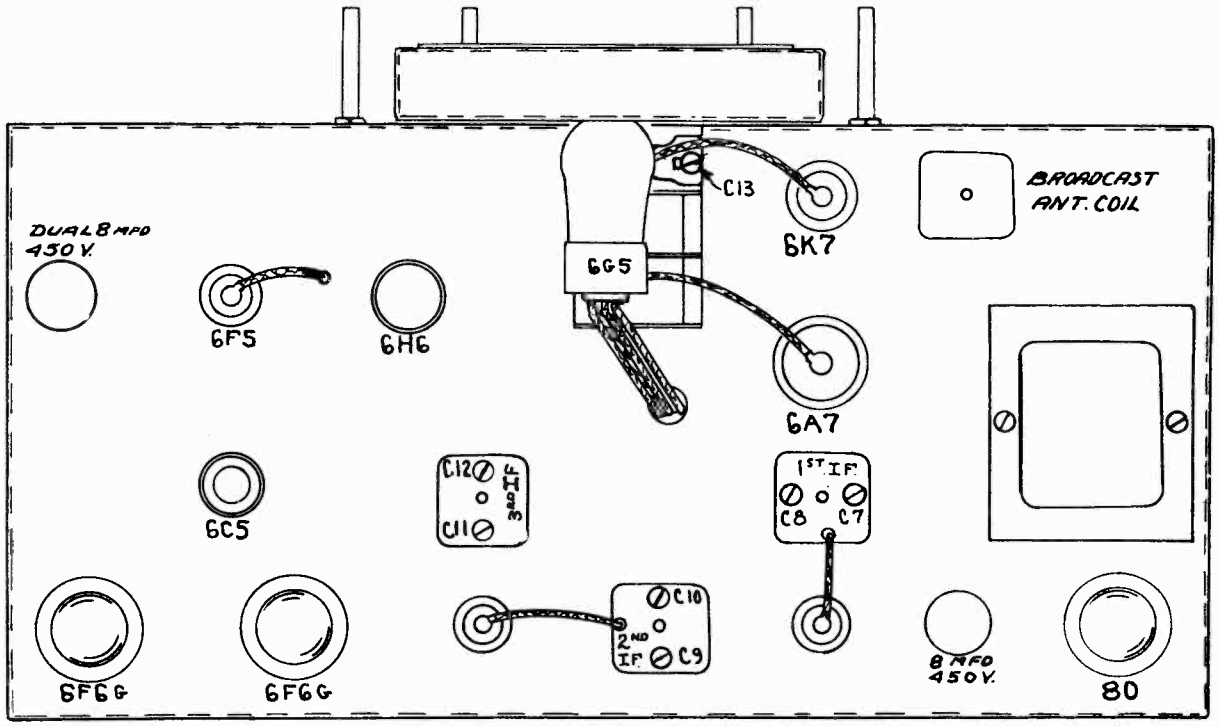


FIG. 1

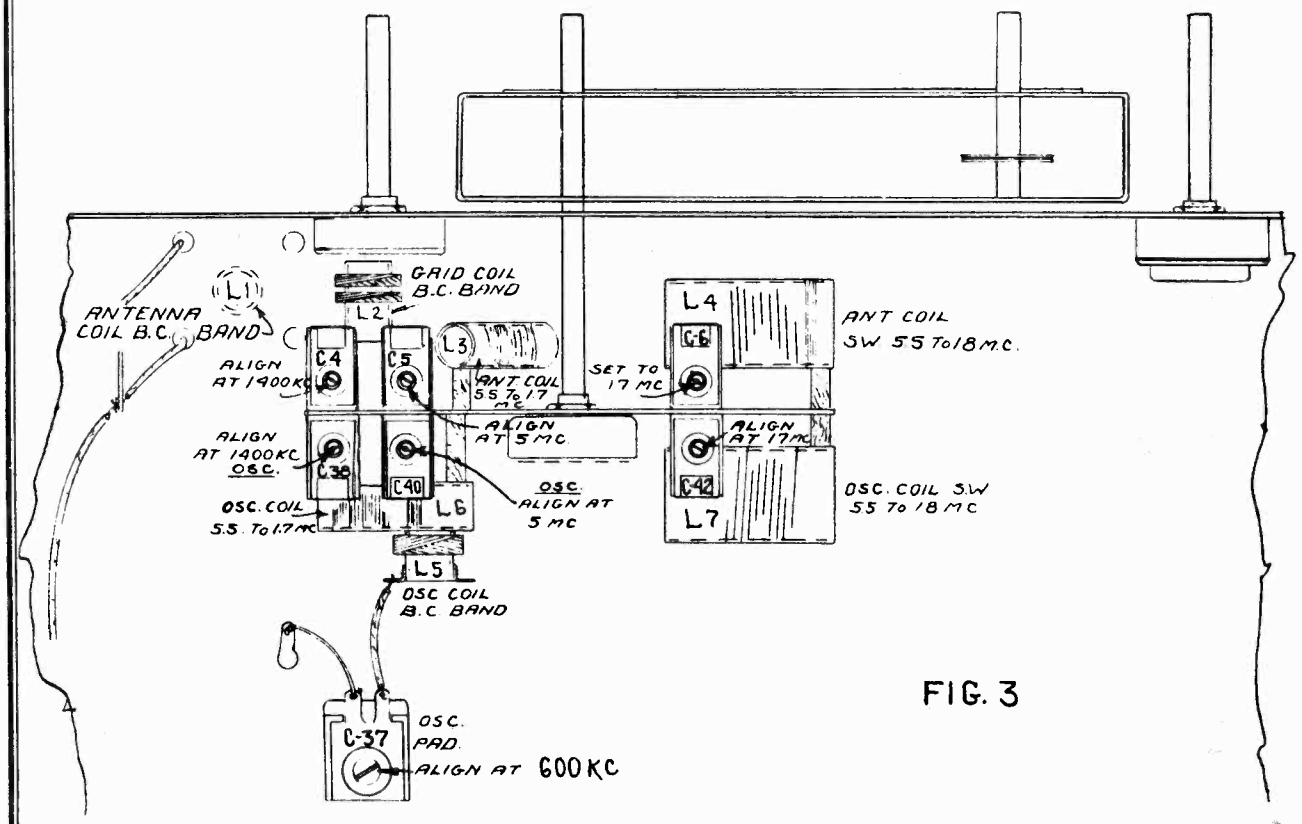


FIG. 3

THE ALIGNMENT PROCEDURE

The following alignment instructions are given with the assumption that the Service Station has a signal generator capable of accurately covering the range of the receiver.

The only other apparatus necessary is a meter connected in the output stage to indicate resonance. This can be an 0 to 3 Volt AC meter connected across the voice coil of the speaker of preferably an output meter connected in the plate circuit of the power tube in series with an 8 Mfd. paper condenser.

I. THE I.F. STAGES

The intermediate frequency stages are aligned in the usual manner by feeding 465 K.C. into the grid of the mixer tube 6A7. Remove grid cap, place series resistor of 500,000 ohms from the tube grid to the cap and a series condenser from the tube grid to the "hot" lead from the signal generator.

The two trimmers in each of the I.F. cans should be very carefully peaked to resonance as they are very critical and will greatly affect the performance of the set. These are trimmers Nos. C-7, C-8, C-9, C-10, C-11 and C-12 (See Fig.1)

Always use as low an output as possible from the signal generator when making the various adjustments.

The sensitivity of the I.F. system alone will be found to be between 15 and 20 Microvolts.

II. ALIGNMENT OF THE SHORT WAVE BAND 5.5 TO 18 M.C.

First check the position of the dial hand by rotating the variable condenser to full capacity. The hand then should be in line with the lines that divide the dial in half. If the hand is off position it can be lined up by loosening the center screw.

1. Turn band switch all the way to the right for the 5.5 to 18 M.C. Band (Yellow), and set dial hand to 17 M.C.
2. Refer to Figure 3 and with a 17 M.C. signal from the generator, peak oscillator, trimmer condenser C-42 to 17 M.C.
3. Adjust trimmer C-6 of the antenna circuit to 17 M.C. after the above mentioned oscillator trimmer has been set. Watch this adjustment that it will not "drag" the oscillator.

III. ALIGNMENT OF SHORT WAVE BAND 1.7 to 5.5 M.C.

1. With the band switch in the middle position, (Blue) and the dial hand set to 5 M.C., peak trimmer C-40 of the oscillator circuit to 5 M.C.
2. Adjust Antenna Stage trimmer C-5 to 5 M.C. after the above oscillator trimmer has been set.

NOTE: After adjusting the two high bands at 17 megacycles and 5 megacycles the test oscillator input to antenna should be increased and receiver dial advanced to .9 megacycle lower and note if test oscillator signal is heard.

In case there is no response, the oscillator trimmers have been pulled down too tightly. The trimmers should be released until this condition exists, then go back to original point of alignment - reduce antenna input voltage and correct the trimmer adjustment.

EXAMPLE: The receiver has been adjusted to 17 megacycles. Tune receiver to approximately 16.9 M.C.

Increase oscillator signal by "opening up" the attenuator. Move the dial back and forth at 16.9 M.C.

If no signal is heard, let oscillator trimmer off until it is heard at 16.9 M.C.

Reduce signal voltage from generator, go back to 17 M.C. and slightly correct this last trimmer adjustment.

The same thing applies to the 5 M.C. adjustment.

IV. THE ALIGNMENT OF THE BROADCAST BAND

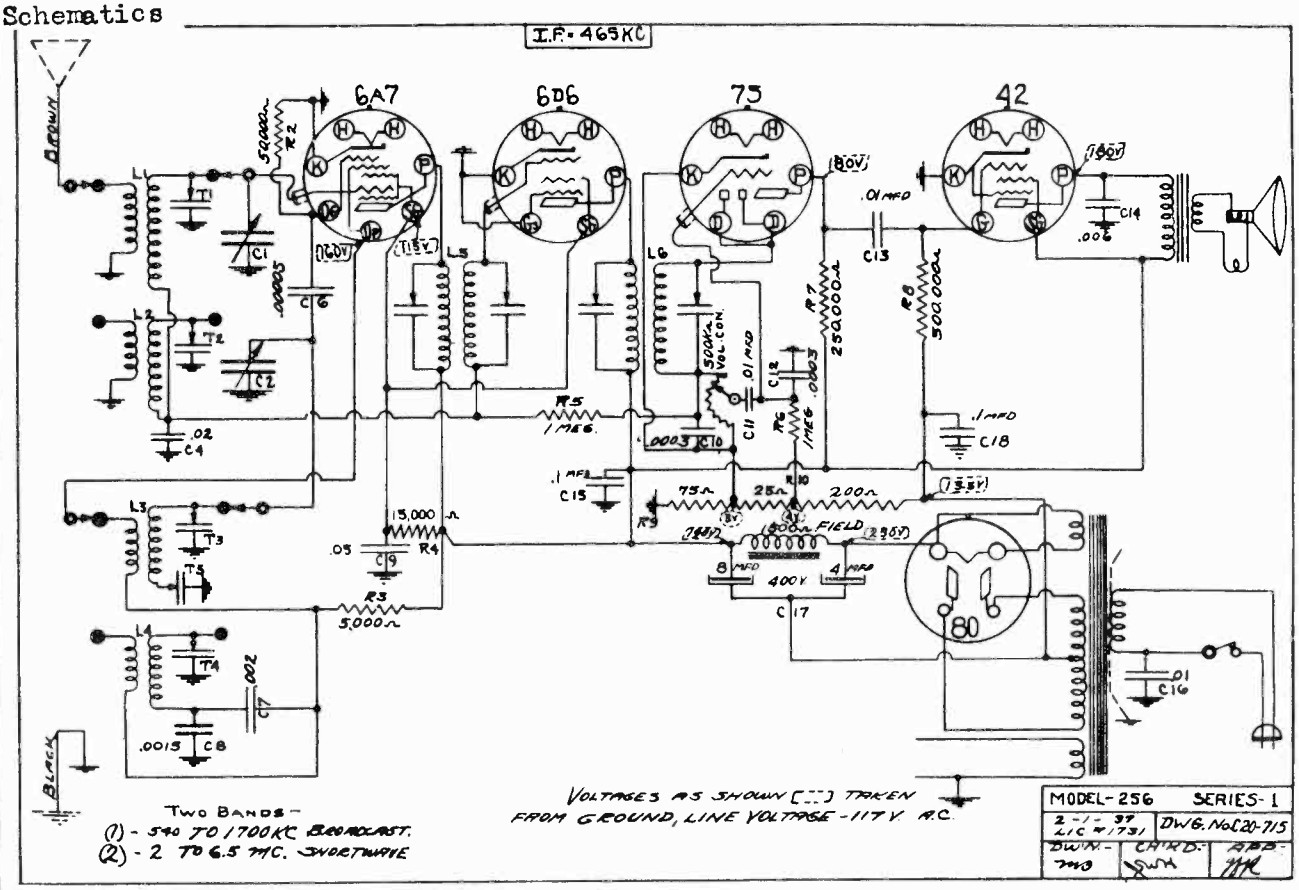
1. Set Band Switch to the 550-1700 K.C. band, and the hand to 1400 K.C.
2. Peak oscillator trimmer C-38 to 1400 K.C., then the R.F. Trimmer C-4 and the antenna stage trimmer C-13 on the variable condenser to 1400 K.C.
3. Rotate dial hand to 600 K.C. and adjust padding condenser C-37 to 600 K.C.
4. Re-Check dial at 1400 K.C. as mentioned in (1) and (2).
5. Points in the middle of the dial may be checked and if necessary the plates of the oscillator section of the variable condenser (back section) may be bent for alignment.

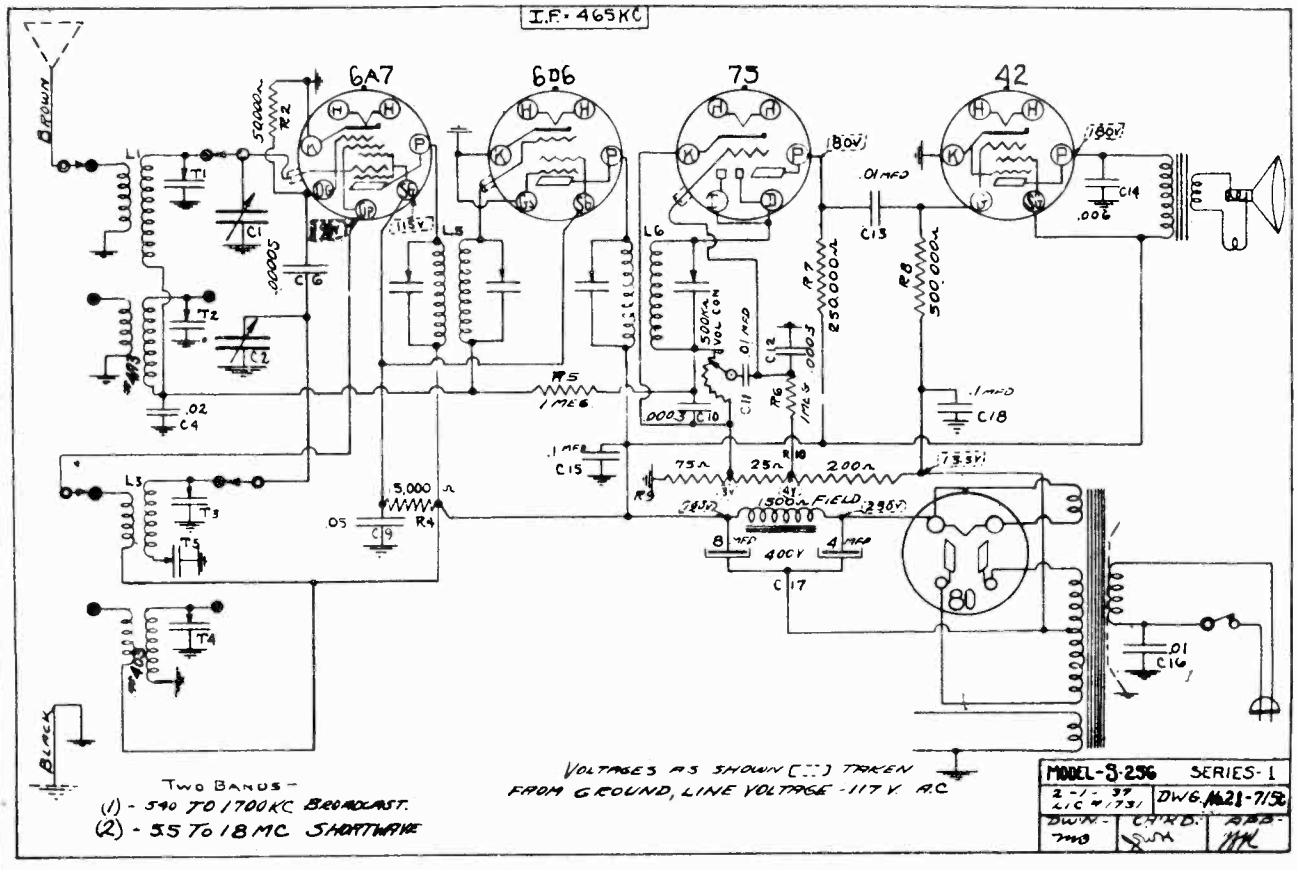
V. NOTES

1. With certain Model 118's a 40,000 ohm resistor will be found located from oscillator grid to cathode of the 6A7 in place of 50,000.
2. Be sure that the settings are being made to the true fundamental signal from the oscillator and not on a harmonic or image frequency.
3. The normal voltage readings at the sockets are given in a separate chart on the following pages.
4. It is advisable to check the position of the tuning eye tube to make certain that it is not pushed against the inside of the dial card. With the adjustment screw on the bracket, allow a small amount of clearance between the end of the tube and the dial to avoid any possibility of the heat from the tube affecting the dial card.

MODEL 256
MODEL S-256
Schematics

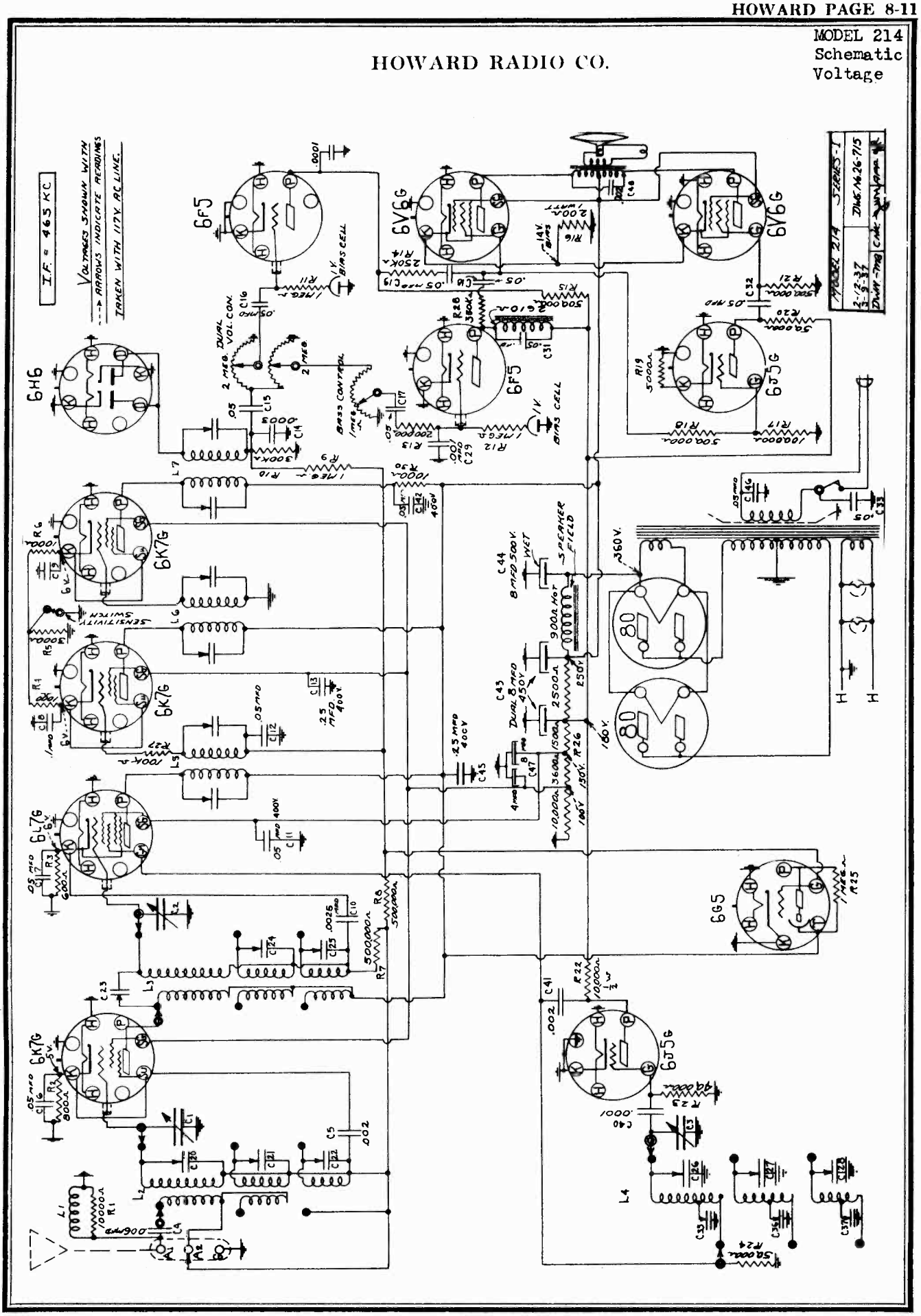
HOWARD RADIO CO.

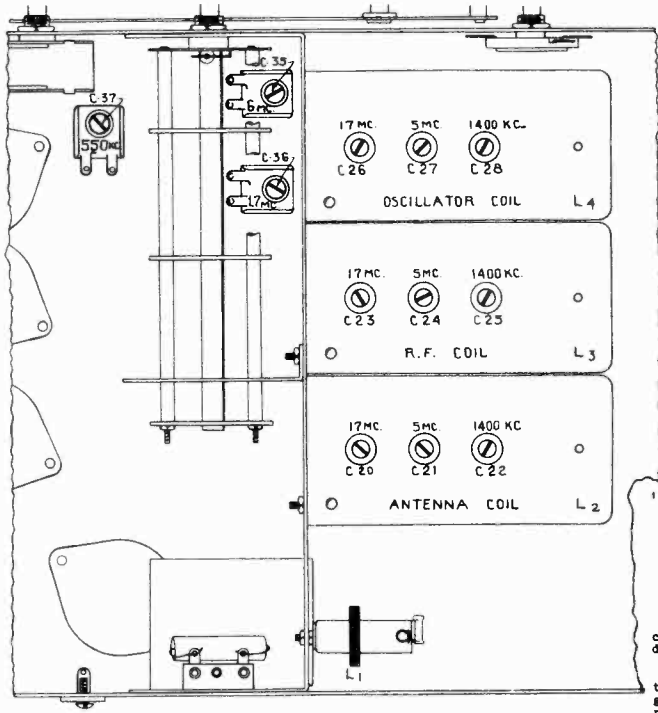


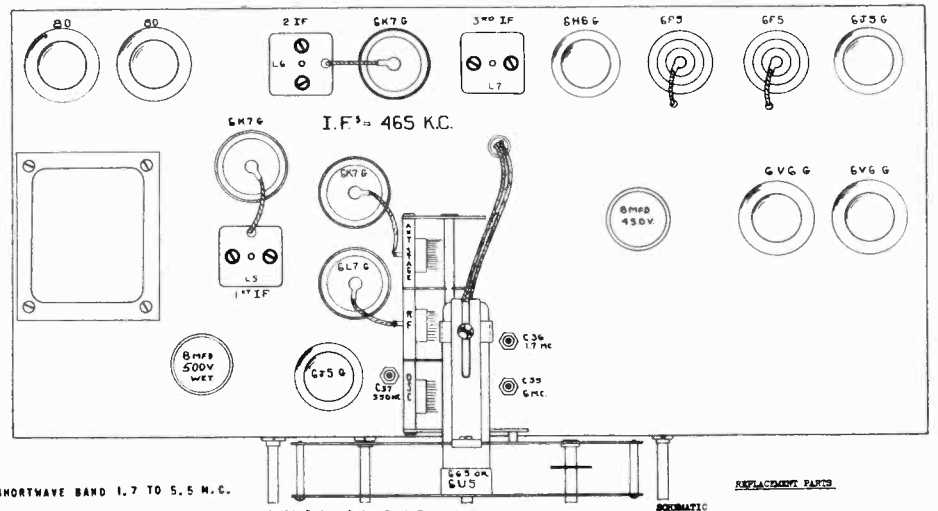


MODEL 214
Schematic
Voltage

HOWARD RADIO CO.







I THE I.F. STAGES

The I.F.'s are aligned by the usual system of feeding the intermediate frequency of 465KC into the grid of the 6L7G tube.

THE SENSITIVITY SWITCH changes the bias on the two 6K7G tubes of the I. F. stages and should be set to LOW sensitivity position when aligning the set.

The sensitivity of the I. F. stages alone with the switch in the high position should be about 15 microvolts.

II ALIGNMENT OF SHORTWAVE BAND 5.5 TO 18 M.C.

First check the position of the dial hand by rotating the condenser shaft to the left to full capacity. At this point the dial hand should be straight across in line with the lines dividing the scale in half. If the hand is off position it can be lined up by removing dial glass and setting hand with screw in center of dial.

1. Set the test oscillator to 17 megacycles.

2. Turn wave band switch all the way to right for highest S.W. band, and set dial hand to 17 M.C.

3. Peak trimmer condenser C 26 of the oscillator coil (See pictorial) to resonance with 17 M.C. fed into antenna.

4. Adjust antenna and R.F. coil trimmers C 20 and C 23 to same frequency after the above mentioned oscillator trimmer has been set.

5. Turn dial hand to 6 M.C. on same band and peak padding condenser C 35 to 6 M.C.

III SHORTWAVE BAND 1.7 TO 5.5 M.C.

1. Set band switch to this band and dial hand to 5 M.C.

2. Peak trimmer C 27 to 5 M.C.

3. Peak antenna and R.F. trimmers C-21 and C-24 to 5 M.C.

4. Rotate dial to 1.7 M.C. and adjust Padding Condenser C 36 to 1.7 M.C.

NOTE: After adjusting the two high bands at 17 megacycles and 5 megacycles the test oscillator input to antenna should be increased and receiver dial advanced to .9 megacycle lower and note if test oscillator signal is heard.

In case there is no response the oscillator trimmers have been pulled down too tightly. The trimmers should be released until this condition exists then go back to original point of alignment - reduce antenna input voltage and correct the trimmer adjustment.

EXAMPLE: The receiver has been adjusted to 17 megacycles. Tune receiver to approximatly 16.9 M.C.

Increase oscillator signal by "opening up" the attenuator. Move the dial back and forth at 16.9 M.C.

If no signal is heard, let oscillator trimmer off until it is heard at 16.9 M.C.

Reduce signal voltage from generator, go back to 17 M.C. and slightly correct this last trimmer adjustment.

The same thing applies to the 5 M.C. adjustment.

IV THE BROADCAST BAND

1. Turn wave band switch all the way to left and dial hand set to 1400KC (the top scale).

2. Peak oscillator trimmer C 28 to 1400 KC and R.F. circuit trimmers C-22 and C-25 to same frequency.

3. Set dial hand to 550 KC and adjust oscillator padding condenser C 37 to 550 KC.

4. Recheck dial at 1400 KC as in number (1) and (2).

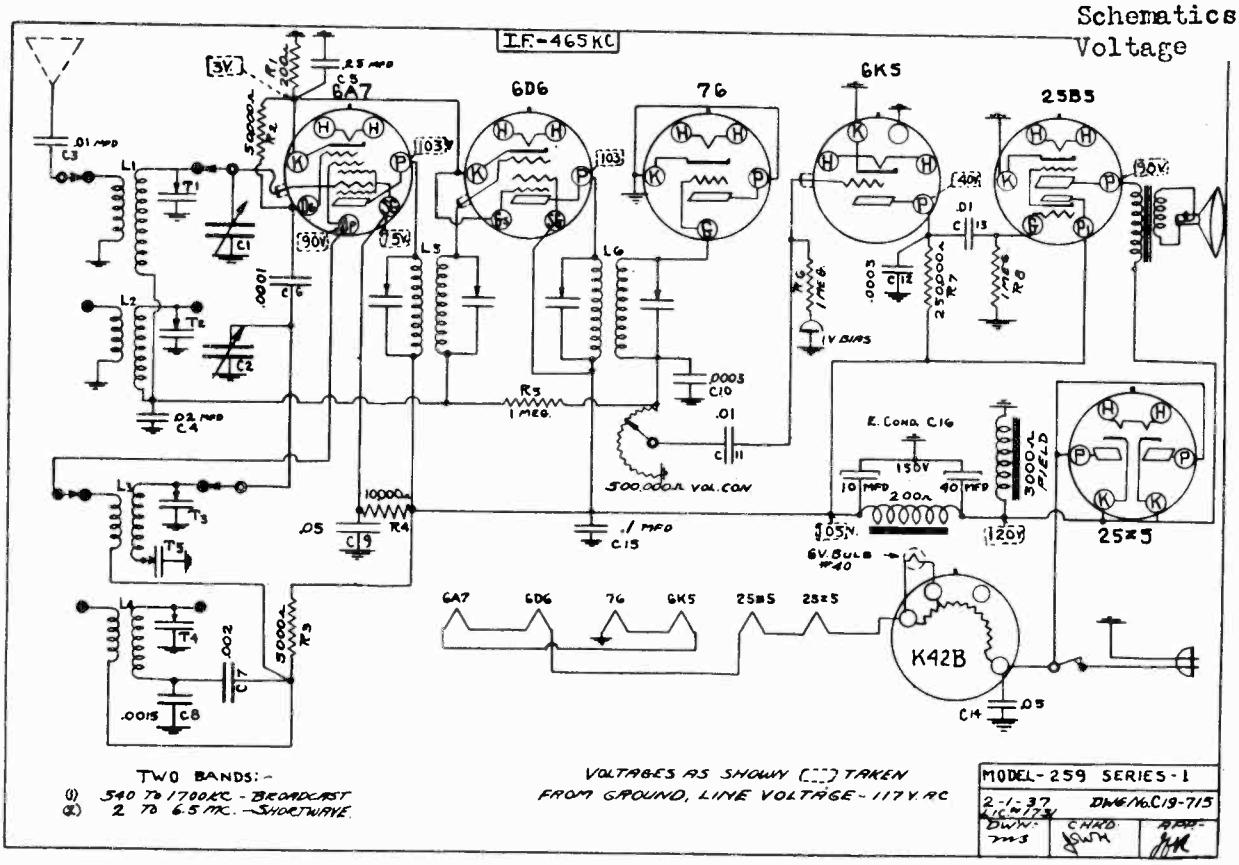
5. Points in the middle of the dial may be checked and if necessary the plates of the front section of variable condenser may be bent for alignment.

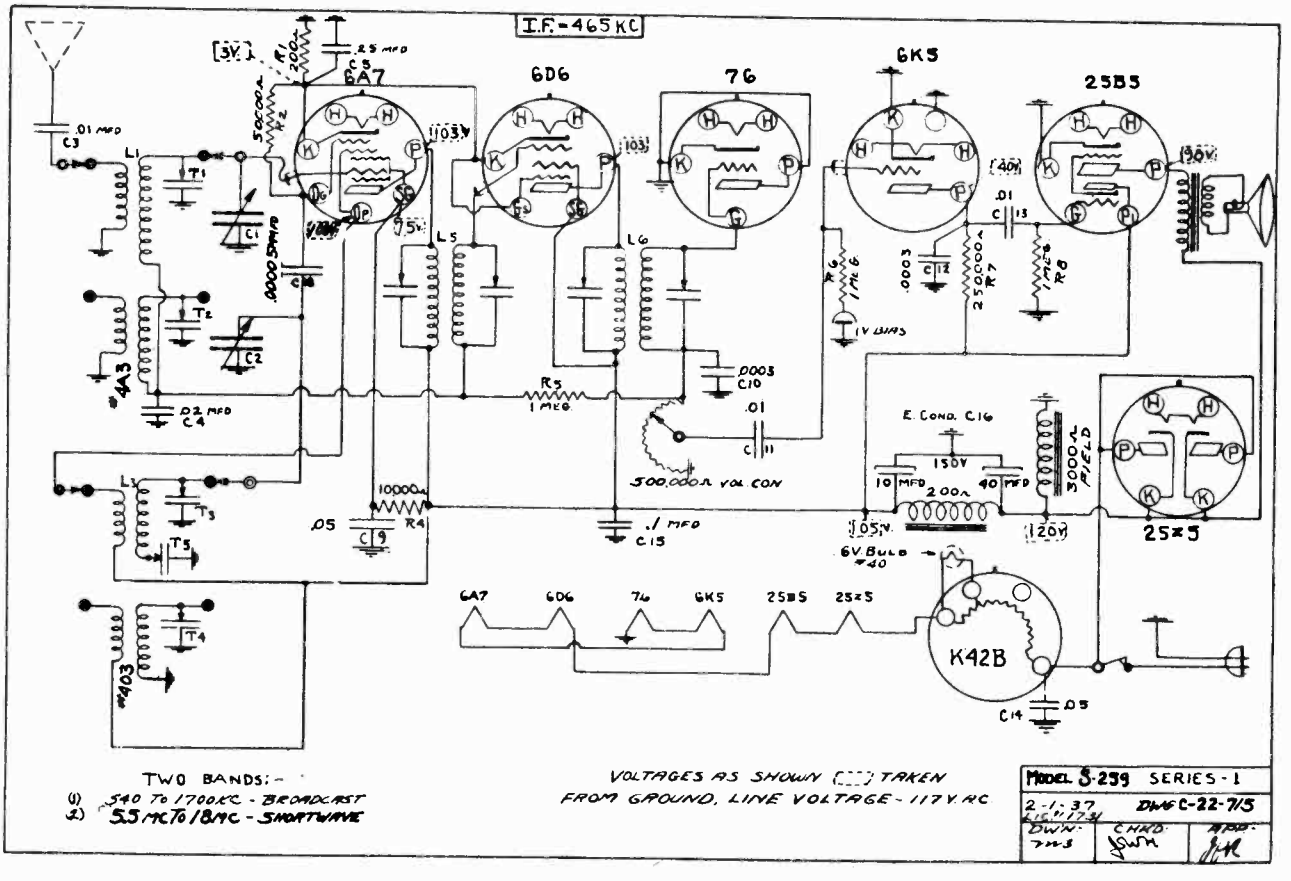
REPLACEMENT PARTS

PART NO.	SCHEMATIC LOCATION	DESCRIPTION
7601		Bias Cell - 1 Volt
3-835		Ohmdohm - 4 Section
14-812		Choke - Audio
80-836	L5	Coil - 1st. I. F. Assembly
82-836	L6	Coil - 2nd. I. F. Assembly
83-836	L7	Coil - 3rd. I. F. Assembly
3681	L3	Coil - Antenna, Complete
3682	L5	Coil - Mixer, Complete
3683	L4	Coil - Oscillator, Complete
19-870	C1,C2,C5	Condenser - Variable, 3 Gang
8686-5	C43	Condenser - 8-8 Mfd. 450 Volt Elect
17-866	C44	Condenser - 6 Mfd. 300 Volt (Wet)
6813	C31 to C38	Condenser - Trimmer, 3 Section
81-868	C35,C36,C37	Condenser - Padding, 3 Section
8319	C8,C9	Condenser - .1 Mfd. 800 Volt
8185	C6,C7,C18,C13	
	C16,C17,C31	Condenser - .05 Mfd. 800 Volt
8757	C11,C15,C19	
	C32,C33,C42	Condenser - .05 Mfd. 400 Volt
8756	C13,C45	Condenser - .25 Mfd. 400 Volt
3616	C41	Condenser - .008 Mfd. 400 Volt
3630	C4	Condenser - .006 Mfd. 400 Volt
1801	C29	Condenser - .001 Mfd. Mica
8897	C5	Condenser - .002 Mfd. Mica
3566	C40	Condenser - .0001 Mfd. Mica
8905	C10	Condenser - .0085 Mfd. Mica
8904	C14	Condenser - .0003 Mfd. Mica
81-881		Control - Dual Volume
8-878		Control - Bass with Switch
1552		Cord - A.C. Line and Plug
88-810		Dial Glass - Calibrated
88-810		Band Indicator Pan - 3 Color
19184		Lamp - Dial - 6 Volt
3378	R16	Resistor - 200 Ohm 1 Watt
3331	R3	Resistor - 600 Ohm 1/3 Watt
3334	R2	Resistor - 800 Ohm 1/3 Watt
3361	R4,R6,R30	Resistor - 1000 Ohm 1/3 Watt
1855	R5	Resistor - 2000 Ohm 1/3 Watt
3374	R18	Resistor - 8000 Ohm 1/3 Watt
3347	R1,R22	Resistor - 10M Ohm 1/2 Watt
3376	R23	Resistor - 4M Ohm 1/3 Watt
1865	R20,R24	Resistor - 5M Ohm 1/3 Watt
8897	R27	Resistor - 10M Ohm 1/3 Watt
1864	R17	Resistor - 10M Ohm 1/3 Watt
3350	R14,R28	Resistor - 350M Ohm 1/3 Watt
3773	R10,R13	Resistor - 30M Ohm 1/3 Watt
3386	R7,R8,R15	
	R19,R21	Resistor - 80M Ohm 1/3 Watt
3358	R9,R11,R12	Resistor - 1 Megohm 1/3 Watt
6-817		Switch - 2 Position - Sensitivity
18-814		Switch - 3 Band, All Wave
18-838		Transformer - Power
8801		Tube Shield
60ESA		Tuning Eye Cable and Socket
8515-8		Wing Screw - Cabinet mounting
30-810		Speaker - 15 inch

HOWARD RADIO CO.

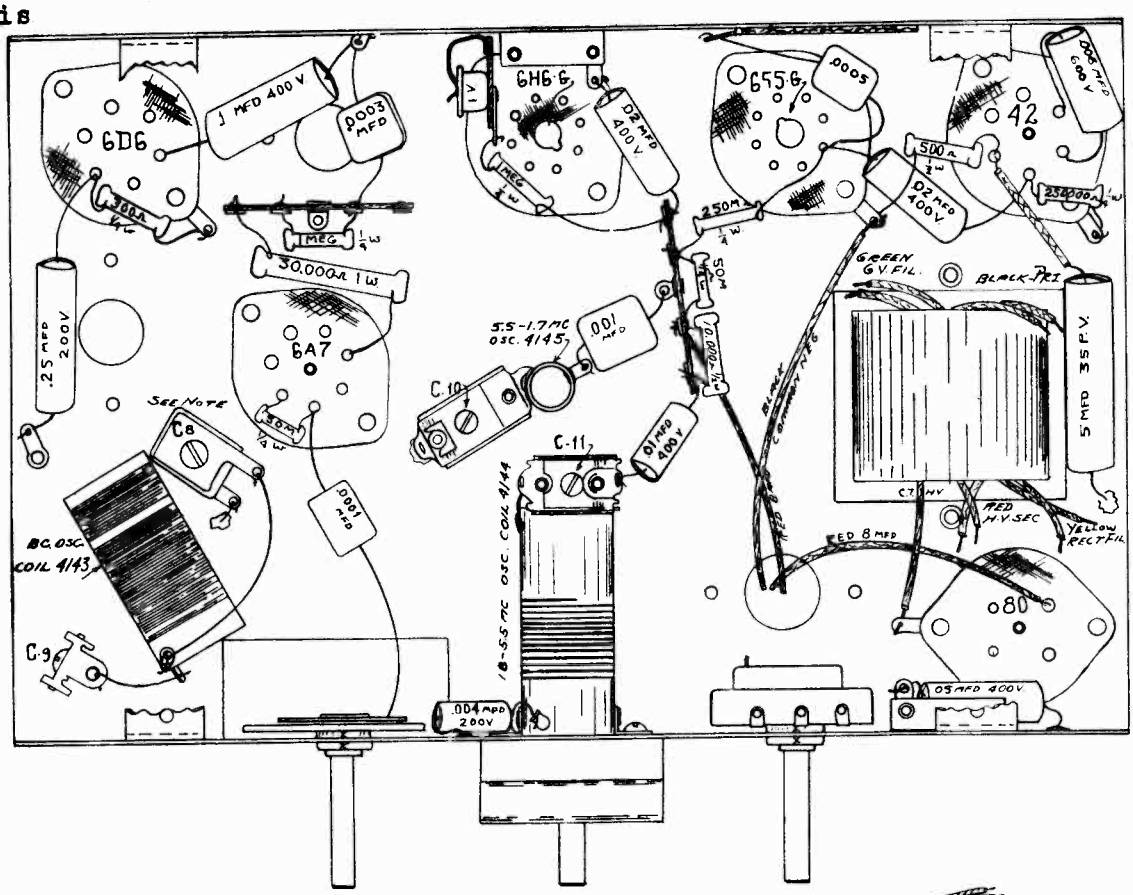
MODEL 259
MODEL S-259
Schematics
Voltage

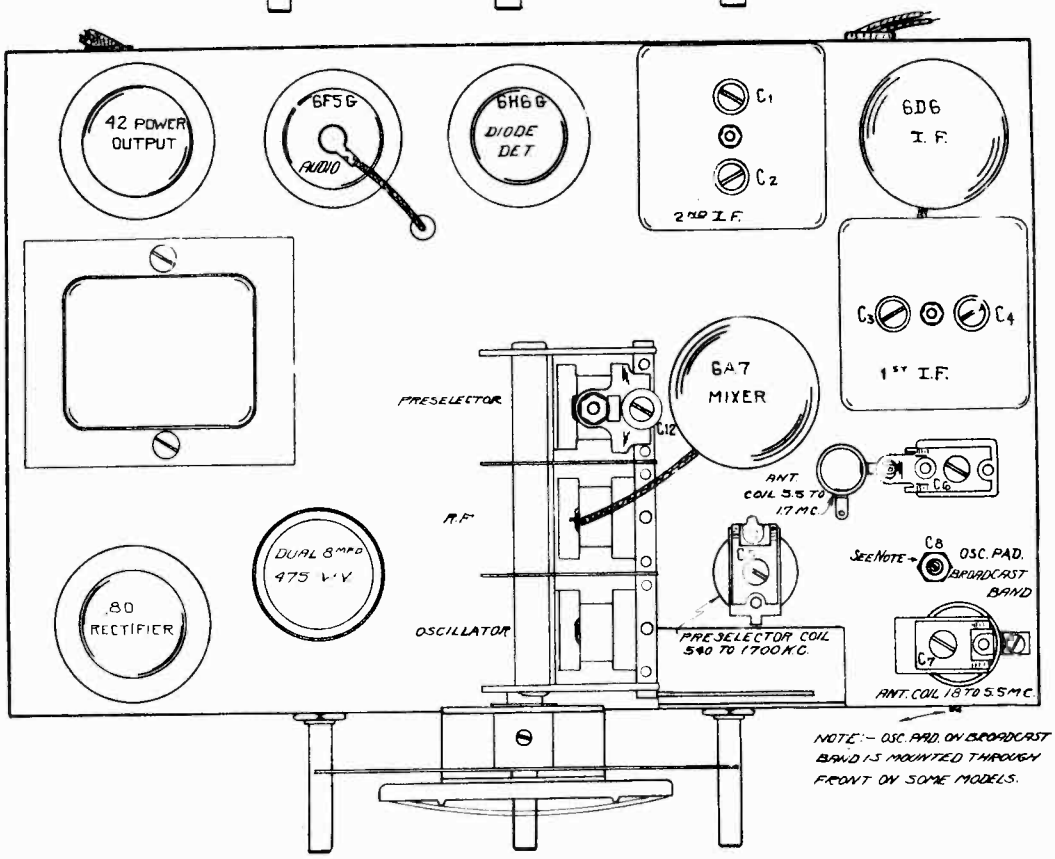




MODELS 626,1626
67C,67T
Socket,Trimmers
Chassis

HOWARD RADIO CO.



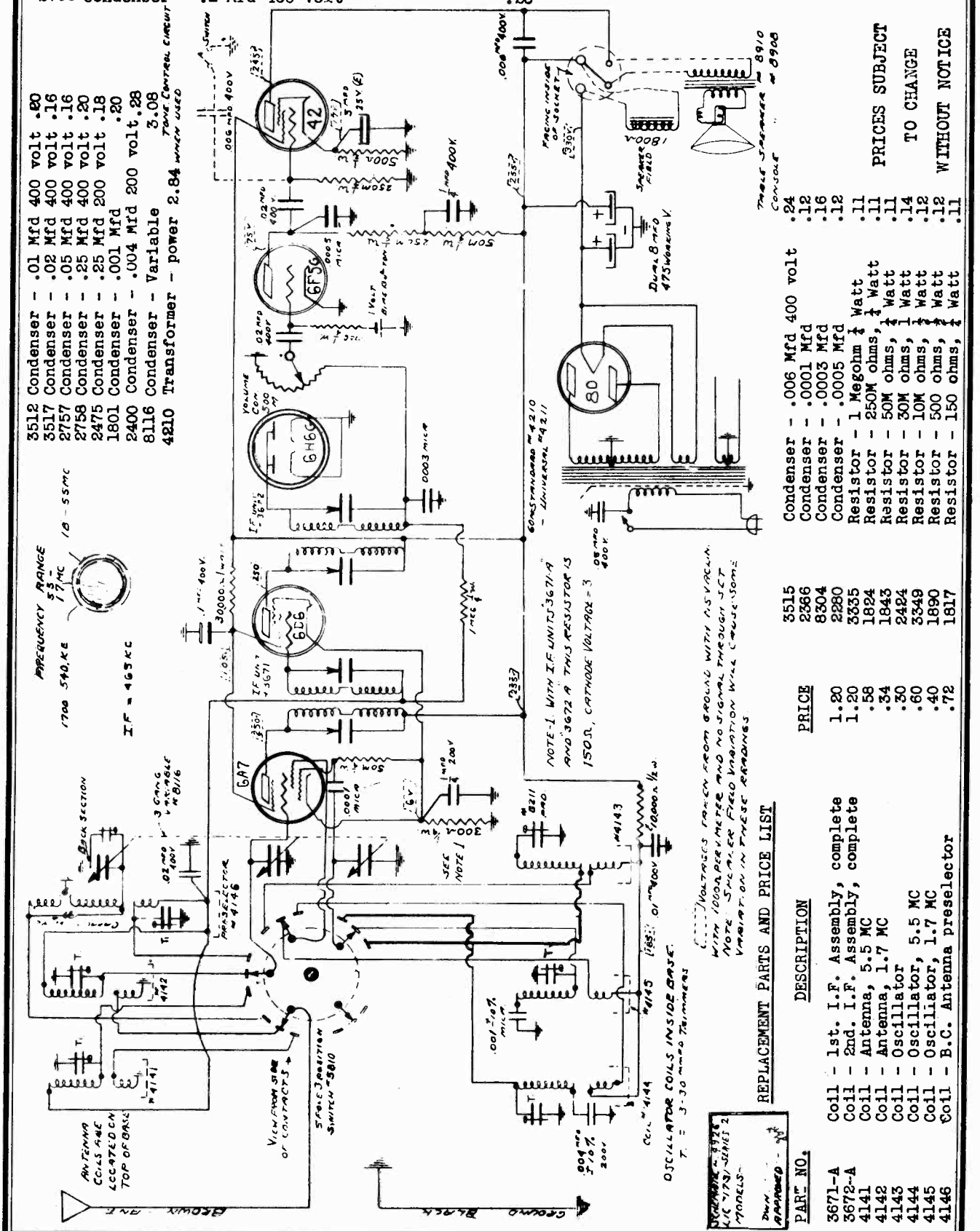


HOWARD RADIO CO.

MODELS 626,1626
67C,67T
Schematic
Voltage,Parts

8817 Condenser - Dual 8-475 Volt Electrolytic 1.28
8211 Condenser - Trimmer 5 Plate .40
3127 Condenser - Single Trimmer 3-30 MMFD .12
3003 Condenser - 5 Mfd. Electrolytic .40
2756 Condenser - .1 Mfd 400 volt .20

3512 Condenser - .01 Mfd 400 volt .20
3517 Condenser - .02 Mfd 400 volt .16
2757 Condenser - .05 Mfd 400 volt .16
2758 Condenser - .25 Mfd 400 volt .20
2475 Condenser - .25 Mfd 200 volt .18
1801 Condenser - .001 Mfd .20
2400 Condenser - .004 Mfd 200 volt .28
8116 Condenser - Variable 3.08
4210 Transformer - power 2.84 when used



REPLACEMENT PARTS AND PRICE LIST

PART NO.	DESCRIPTION	PRICE		
3671-A	Coil - 1st. I.F. Assembly, complete	1.20	3515	
3672-A	Coil - 2nd. I.F. Assembly, complete	1.20	2366	
4141	Coil - Antenna, 5.5 MC	.58	8304	
4142	Coil - Antenna, 1.7 MC	.34	2280	
4143	Coil - Oscillator	.30	3335	
4144	Coil - Oscillator, 5.5 MC	.60	1824	
4145	Coil - Oscillator, 1.7 MC	.40	1843	
4146	Coil - B.C. Antenna preselector	.72	2424	
			3549	
			1890	
			1817	

THE ALIGNMENT PROCEEDURE

The following alignment instructions are given with the assumption that the service station has an oscillator capable of accurately covering the range of the receiver.

The only other apparatus necessary is a meter connected in the output stage to indicate resonance. This can be 0 to 3 volt AC meter connected across the voice coil of the speaker or preferably an output meter connected in the plate circuit of the 42 power tube in series with an 8 MFD paper condenser.

I THE I.F. STAGES

The I.F's are aligned by the usual system of feeding the intermediate frequency of 465KC into the grid of the 6A7 tube.

The two trimmers in each of the I.F. cans should be very carefully peaked to resonance as they are very critical and will greatly affect the performance of the set. These are trimmers number C1, C2, C3, C4. (See pictorial diagram).

The sensitivity of the I.F. stages will be 40 microvolts or better.

Always use as low an output as possible from the test oscillator in making the various adjustments.

II ALIGNMENT OF SHORTWAVE BAND 5.5 TO 18 M.C.

First check the position of the dial hand by rotating the condenser shaft to the left to full capacity. At this point the dial hand should be straight across in line with the lines dividing the scale in half. If the hand is off position it can be easily lined up by loosening the set screw behind the dial card in the drive hub.

1. Set the test oscillator to 17 megacycles.

2. Turn wave band switch all the way to right for highest S.W. band, and set dial hand to 17 M.C.

3. Peak trimmer condenser C-11 of the oscillator coil (See pictorial 6-2) to resonance with 17 M.C. fed into antenna.

4. Peak Ant. coil trimmer C-7 at same setting to 17 M.C.

III SHORT WAVE BAND 1.7 TO 5.5 M.C.

1. Turn wave switch to middle position.

2. Set dial hand to 5 megacycles on the 1.7 to 5.5 M.C. inner scale.

Peak oscillator trimmer C-10 to 5 M.C. from test oscillator. And Ant. coil trimmer C-6 to same frequency.

NOTE: After adjusting the two high bands at 17 megacycles and 5 megacycles the test oscillator input to antenna should be increased and receiver dial advanced to .9 megacycle lower and note if test oscillator signal is heard.

In case there is no response the oscillator trimmers have been pulled down too tightly. The trimmers should be released until this condition exists then go back to original point of alignment - reduce antenna input voltage and correct the trimmer adjustment.

EXAMPLE: The receiver has been adjusted to 17 megacycles. Tune receiver to approximately 16.9 M.C.

Increase oscillator signal by "opening up" the alternator. Move the dial back and forth at 16.9 M.C.

If no signal is heard, let oscillator trimmer off until it is heard at 16.9 M.C.

Reduce signal voltage from generator, go back to 17 M.C. and slightly correct this last trimmer adjustment.

The same thing applies to the 5 M.C. adjustment.

IV THE BROADCAST BAND

1. Turn wave band switch all the way to left and dial hand set to 1400 KC (the top scale).

2. Peak oscillator trimmer C-9 to 1400 KC., the Antenna preselector C-12 (variable condenser trimmer) to 1400 KC, and trimmer C-5 to 1400 KC.

3. Set dial hand to 550 KC and adjust oscillator padding condenser C-8 to 550 KC.

4. Recheck dial at 1400 KC as in number (1) and (2).

5. Points in the middle of the dial may be checked and if necessary the plates of the front section of variable condenser may be bent for alignment.

V NOTES.

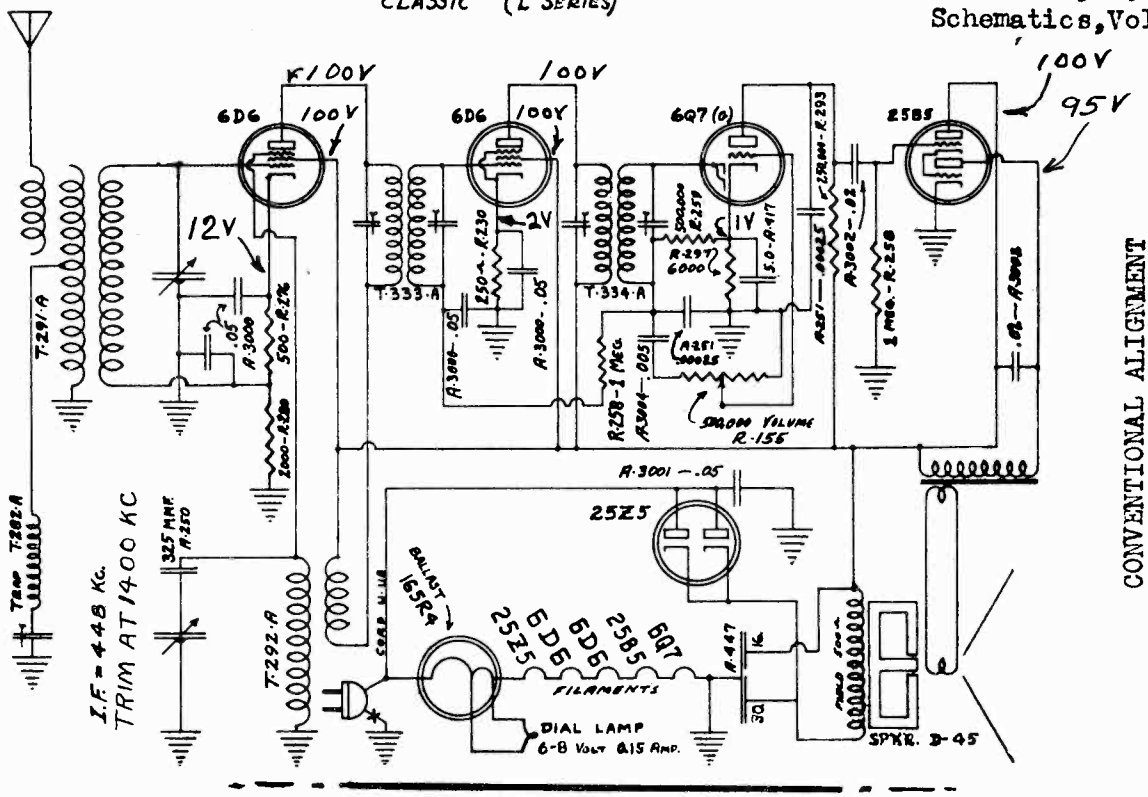
1. Seal all trimmers after their final adjustment.

2. Be sure that the settings are being made to the true fundamental signal from the oscillator and not on a harmonic or image frequency.

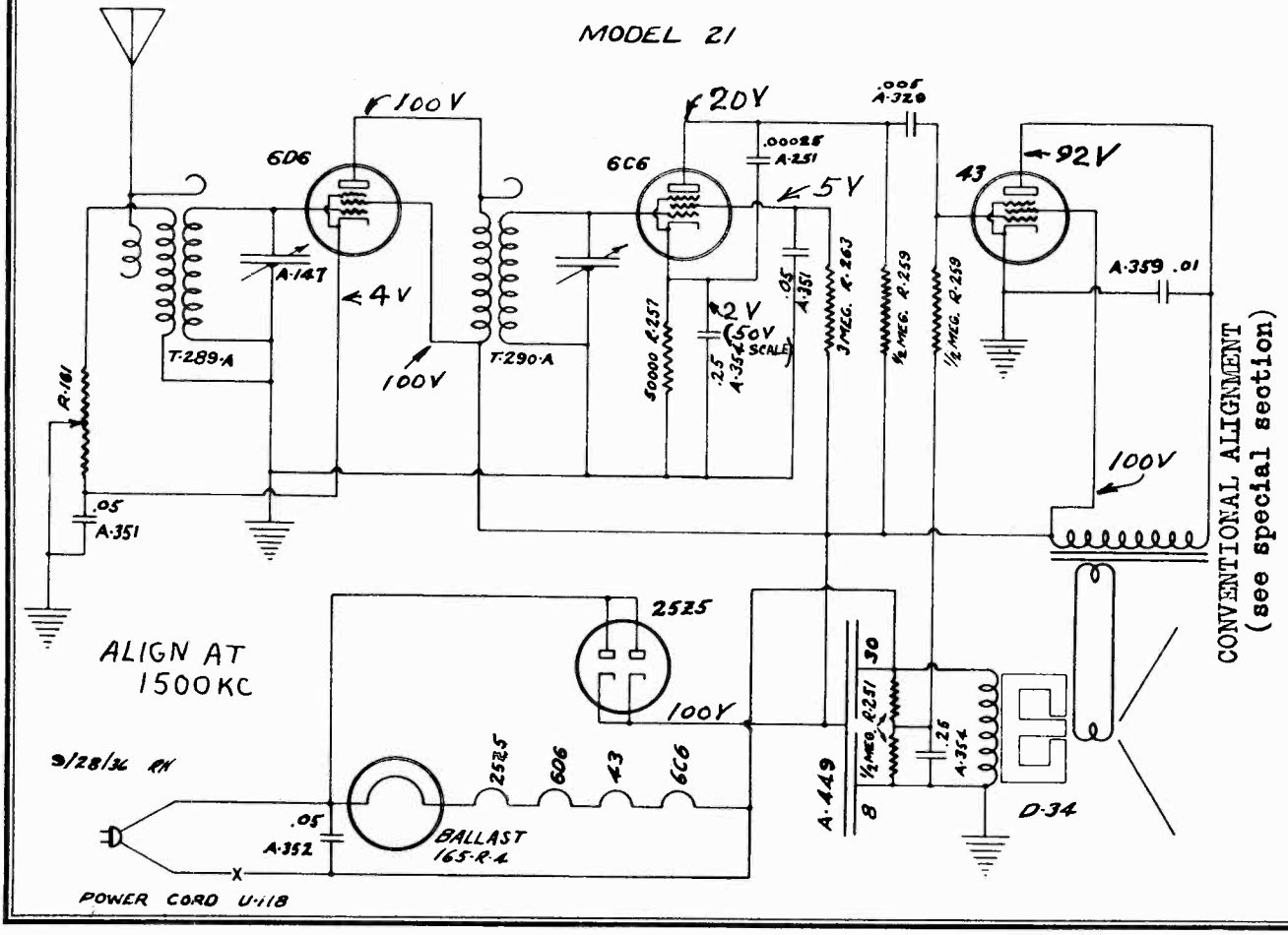
3. Refer to the schematic for the voltages at the tube sockets.

INTERNATIONAL RADIO CORP.

MODELS 10,11,12,13
14,15,16
Chassis L, "Classic"
MODELS 21,22,23
Schematics, Voltage

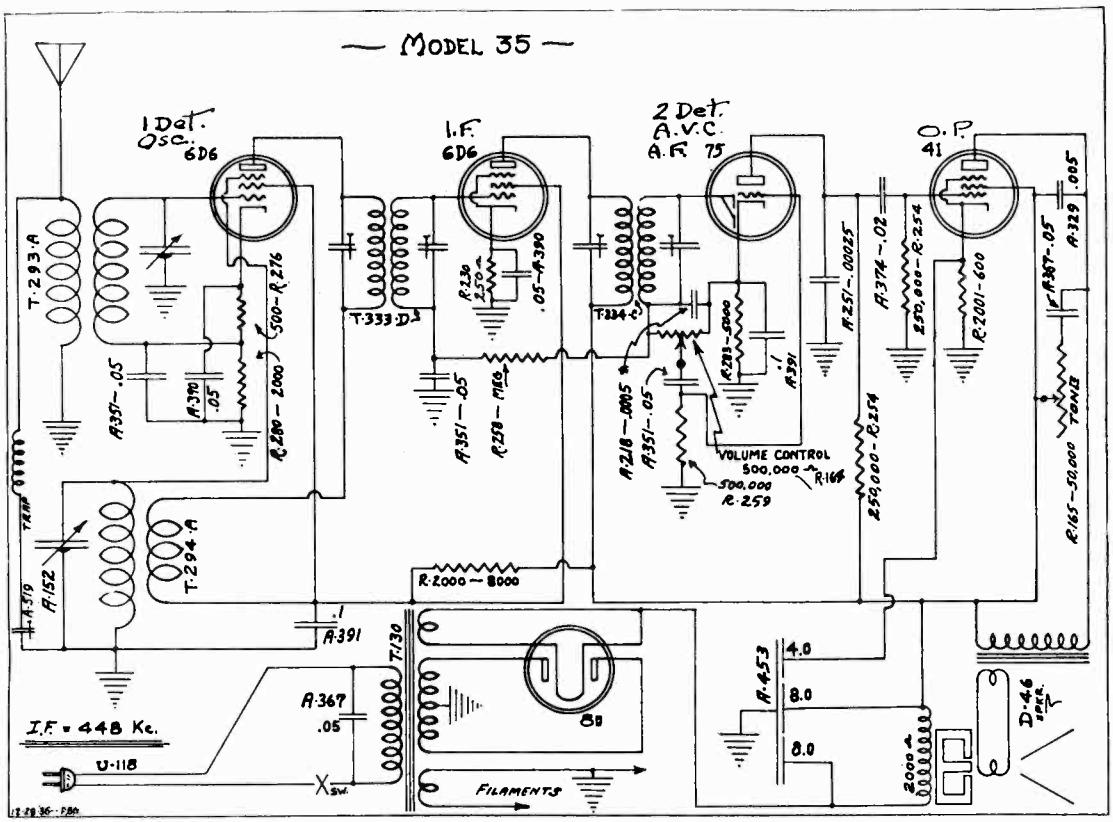


MODEL 21



MODEL 35
Schematic
Voltage, Alignment

INTERNATIONAL RADIO CORP.



ESSENTIAL DATA: The intermediate frequency employed is 448 Kc. The oscillator frequency is 448 kilocycles higher than the signal frequency Aligning should be done on the following frequencies: 1,400, 1,000, and 600 Kc.

INTERMEDIATES: To align the I.F. circuits, set the signal generator to 448 Kc. and feed its modulated signal direct to the antenna. Adjust the first I.F. transformer trimmers for maximum meter reading. Go over both adjustments at least three or four times for accuracy. Repeat this process on the second I.F. transformer. If adjustments are not made accurately, selectivity will be poor and I.F. oscillation may result. Finally, adjust the trimmer on the tuned wave trap for minimum meter reading.

BROADCAST BAND: Turn the dial to 1400 Kc. and feed a *very weak* 1400 Kc. modulated signal from your signal generator to the antenna. Adjust the Broadcast oscillator trimmer for maximum reading. Then peak Broadcast antenna trimmer to this oscillator setting.

There is no adjustable padder condenser in this model so resonance on lower frequencies is accomplished by bending plates on tuning condensers.

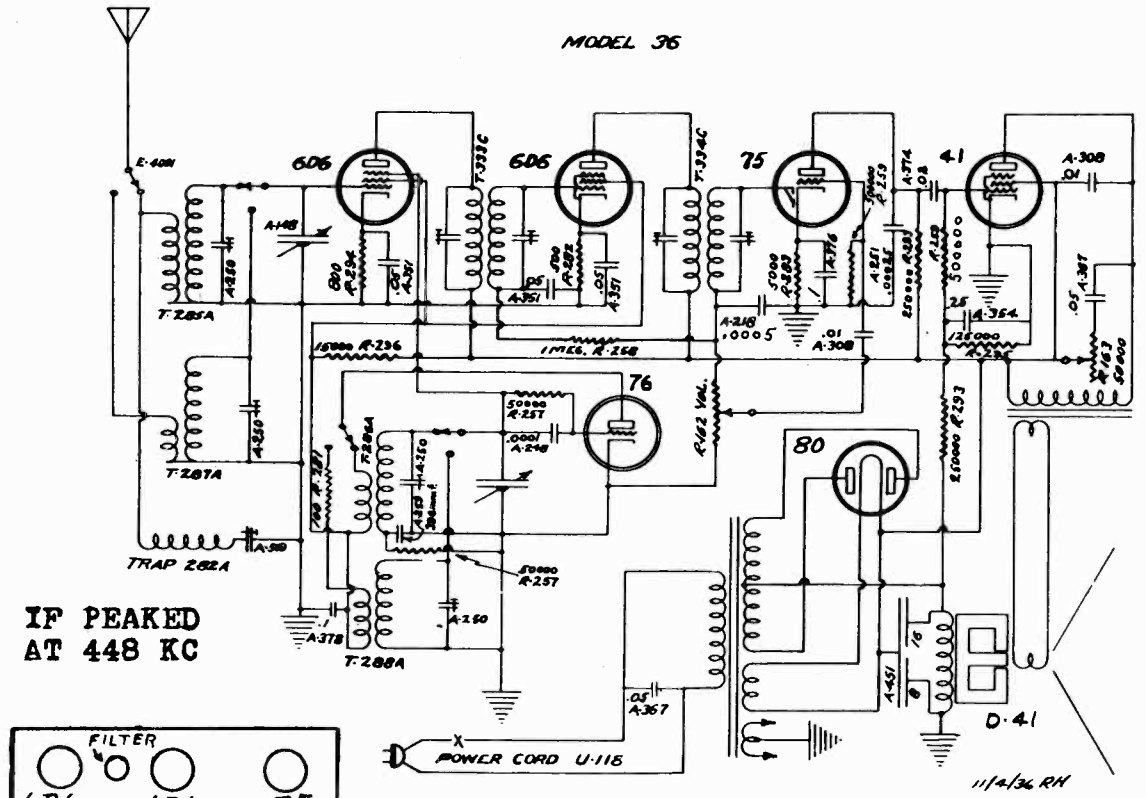
AVERAGE SOCKET VOLTAGES

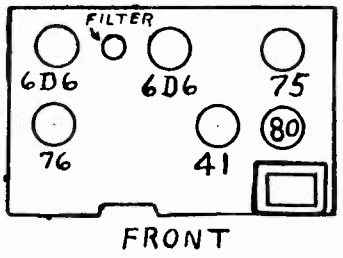
Tube	Position	Ek	Eg_8	Eg_2	Ep
6D6	Det-Osc.	18	0	110	110
6D6	I.F.	1.7*	1.7*	110	180
75	2nd Det. A.V.C.—A.F.	1*	—	—	90
41	Output	10	—	180	170
80	Rectifier	—	—	—	250 A.C.

Line 118 volts 10% variation allowable. Measurements made from tube prongs to circuit ground and made with 1,000 ohms per volt instrument on 500 volt scale, except figures with * which are on 5 volt.

INTERNATIONAL RADIO CORP.

MODEL 36
Schematic, Socket
Alignment, Voltage





ALIGNMENT FREQUENCIES -

BROADCAST BAND - 1400 KC Trim.-600 Kc Pad.
SHORT WAVE BAND - 15 MC Trim.- 8 MC Pad.

ALIGNMENT

The four trimmers on the bottom of the chassis are, reading from the side of the chassis by switch toward the center, Short wave antenna, Broadcast antenna, Short wave oscillator and Broadcast oscillator.

INTERMEDIATES: To align the I.F. circuits, set the signal generator to 448 Kc. and feed its modulated signal direct to the antenna. Adjust the first I.F. transformer trimmers for maximum meter reading. Go over both adjustments at least three or four times for accuracy. Repeat this process on the second I.F. transformer. If adjustments are not made accurately, selectivity will be poor and I.F. oscillation may result. Finally, adjust the trimmer on the tuned wave trap for minimum meter reading.

BROADCAST BAND: Place the band change switch on Broadcast position. Turn the dial to 1400 Kc. and feed a very weak 1400 Kc. modulated signal from your signal generator to the antenna. Adjust the Broadcast oscillator trimmer for maximum reading. Then peak Broadcast antenna trimmer to this oscillator setting.

Turn dial and signal generator to 600 Kc. and rock the padder into correct adjustment. This is accomplished by very slowly adjusting the padder condenser and at the same time turning the dial slightly back and forth across 600 Kc. until an adjustment is obtained producing maximum output. Go back to 1400 Kc. and readjust the oscillator trimmer slightly if necessary. Then recheck padder at 600 Kc.

SHORT WAVE BAND: Place the band change switch on the Short Wave position. Turn the dial to 15 megacycles and feed a very weak 15 megacycle modulated signal from your signal generator to the antenna. Adjust the S.W. oscillator trimmer for maximum reading on the output meter. This trimmer should not be touched again when checking alignment on other frequencies. Then peak S.W. antenna trimmer to this oscillator setting.

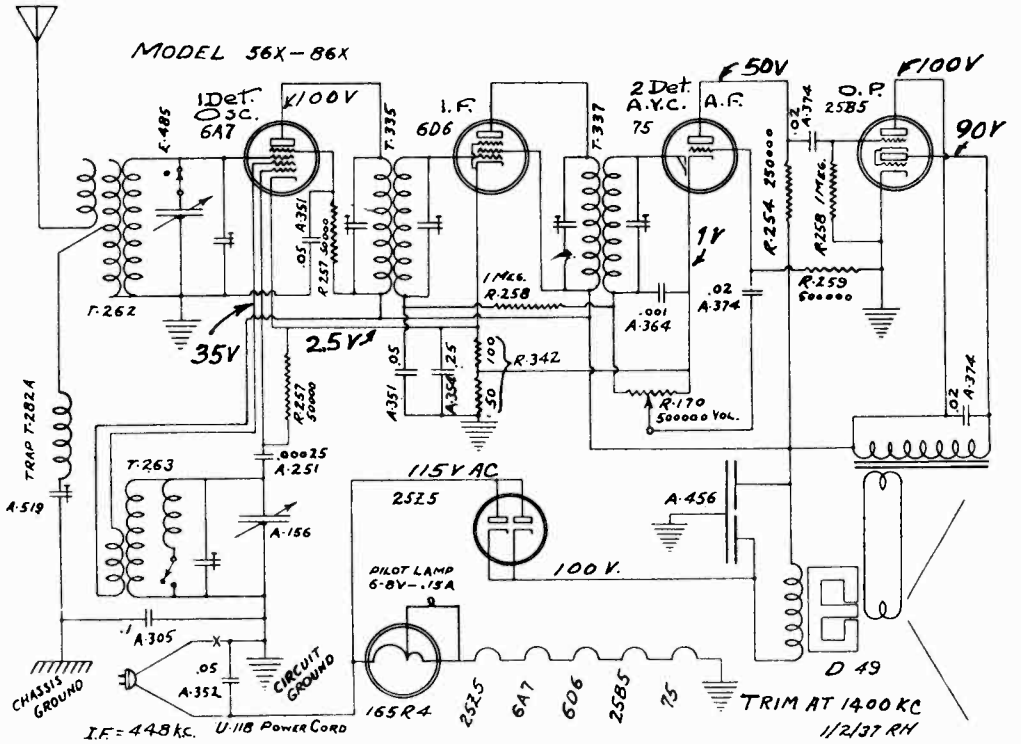
Instead of bending condenser plates at 8 megacycles alignment is accomplished by spreading or crowding turns on the S.W. detector coil. If much crowding or spreading is necessary it is advisable to go back and recheck at 15 megacycles.

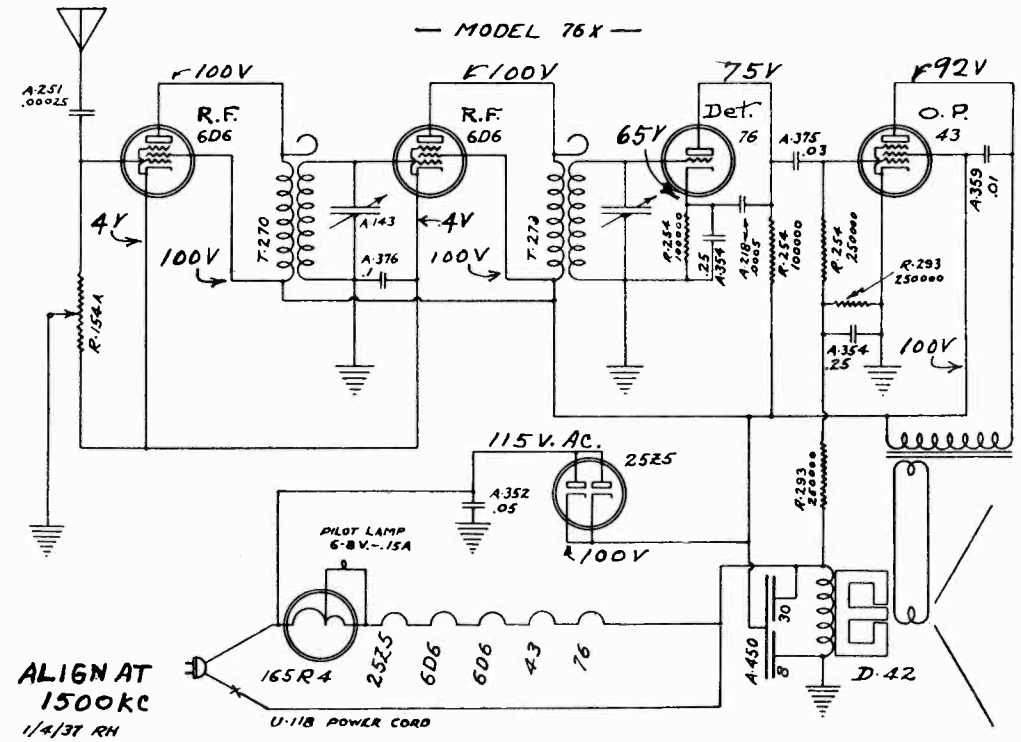
AVERAGE SOCKET VOLTAGES

Tube	Position	E_K	E_{g_3}	E_{g_2}	E_p
76	Oscillator	0	-	-	100
6D6	Detector	4	0	100	230
6D6	I.F.	4.5	4.5	100	230
75	2nd Det. A.V.C.-A.F.	1	-	-	100
41	Output	0	-	230	225
80	Rectifier	-	-	-	118 AC

MODELS 56X, 86X
MODELS 76X, 676X
Schematics, Voltage

INTERNATIONAL RADIO CORP.

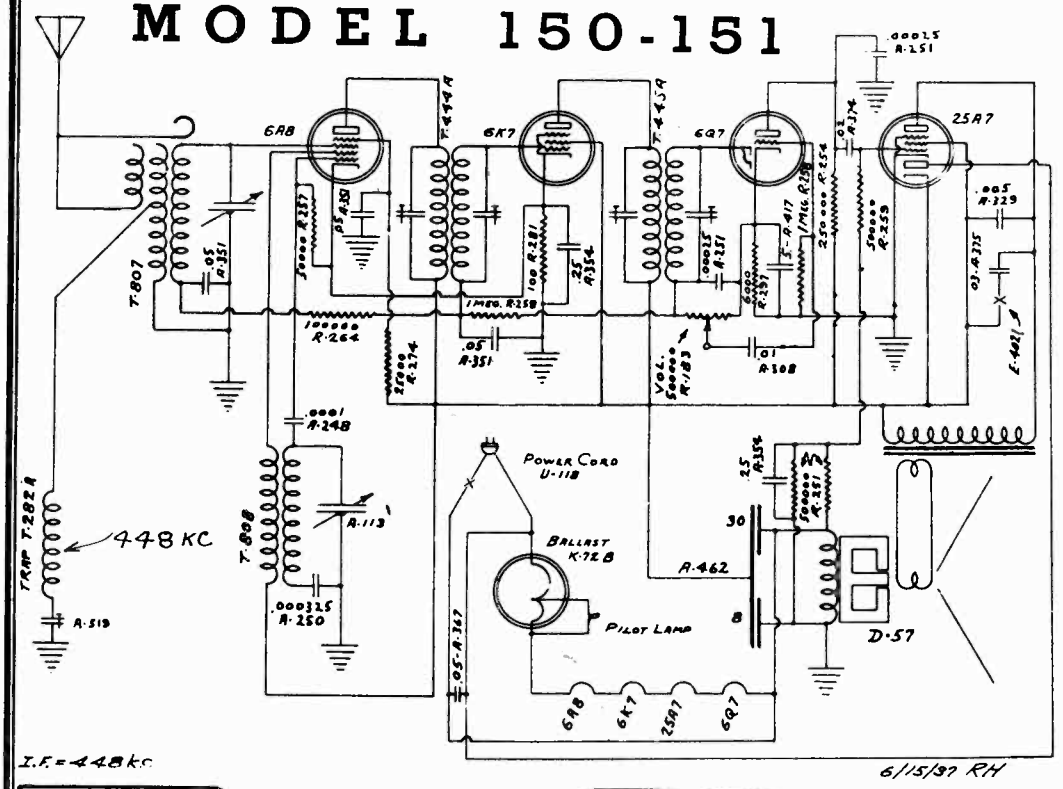




INTERNATIONAL RADIO CORP.

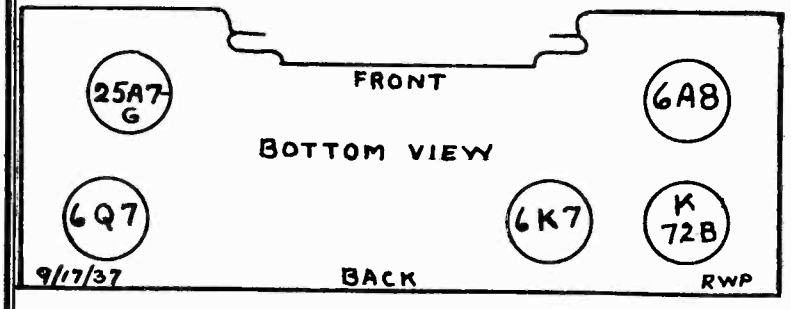
MODELS 150,151
Schematic, Socket
Voltage, Alignment

MODEL 150-151



The following tubes are employed:

6A8 —1st Detector-Oscillator
6K7 —I.F. Amplifier
6Q7 —2nd Detector—A.V.C.—A.F.
K72B —Ballast
25A7G—Pentode Output and Rectifier



CONVENTIONAL ALIGNMENT SEE THE SPECIAL SECTION

FREQUENCY RANGE - BROADCAST BAND Trim OSC and ANT trimmers at 1400 KC. Resonance at 600 KC (padding) is accomplished by bending the rotor plates of the gang condenser.

AVERAGE SOCKET VOLTAGES

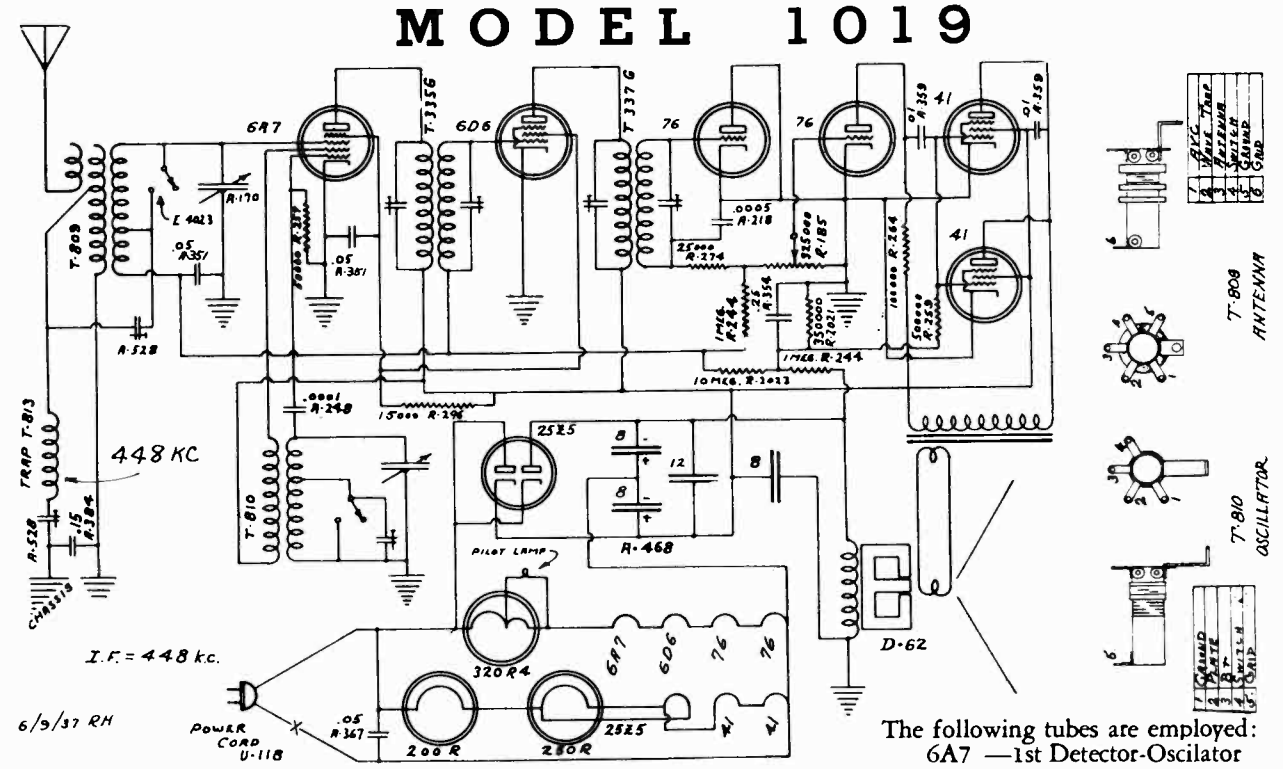
Tube	Position	Ek	Eg	Ega	Egs	Esu	Ep	Rectifier Ep	Rectifier Ek
6A8	Det.-Osc.	1.5	0	100	50	—	100	—	—
6K7	I.F.	1.5	0	—	100	1.5	100	—	—
6Q7	2nd Det. A.V.C. 1st audio	1	0	—	—	—	*35	—	—
25A7G	Output Rectifier	0	13	—	100	—	100	118 A.C.	100

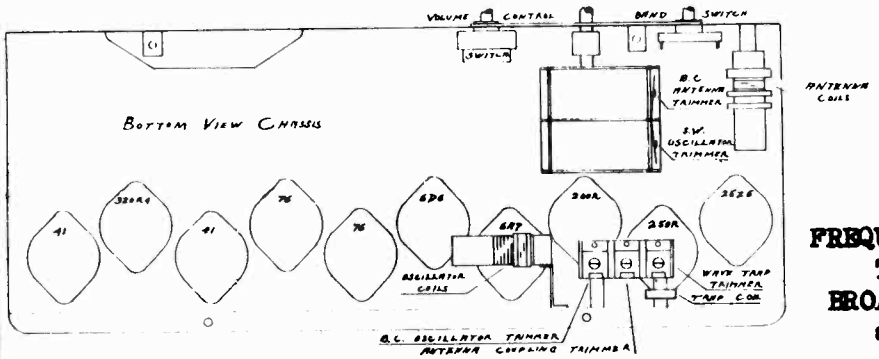
Line voltage 118 volts, 10% variation allowable. Measurements made from tube prongs to circuit ground and made with 1000 ohms per volt instrument on 250 volt scale.
* through .25 megohm

MODEL 1019
Schematic, Socket
Trimmers, Voltage
Alignment

INTERNATIONAL RADIO CORP.

MODEL 1019





The following tubes are employed:

6A7 —1st Detector-Oscilator
6D6 —I.F. Amplifier
76 —2nd Detector
76 —1st Audio
41 —Audio Output
200R —Ballast tube
25Z5 —Rectifier
250R —Ballast tube
320R4—Regulator tube

FREQUENCY RANGES - SHORT WAVE- Trim OSC and ANT at 6 MC BROADCAST - Trim OSC and ANT at 1400 KC, pad at 600 KC by bending plates of gang condenser.

AVERAGE SOCKET VOLTAGES

Tube	Position	Ek	Eg	Ega	Egs	Esu	Ep
6A7	Det.-Osc.	0	*-1.5	165	90	—	165
6D6	I.F.	0	*-1.5	—	90	0	165
76	2nd Det.	0	*-.45	—	—	—	0
76	1st Audio	0	‡	—	—	—	†35
41	Output	0	*-12.5	—	165	—	160
41	Output	0	*-12.5	—	165	—	160
25Z5	Rect.	165	—	—	—	—	AC

Line voltage 118 volts, 10% variation allowable. Measurements made from tube prong to circuit ground with 1000 ohms per volt instrument on 250 volt scale.

* Not measureable-calculate from 50 volt drop across speaker field.

† Through .1 megohm ‡ Diode biased

CONVENTIONAL ALIGNMENT - SEE THE SPECIAL SECTION.