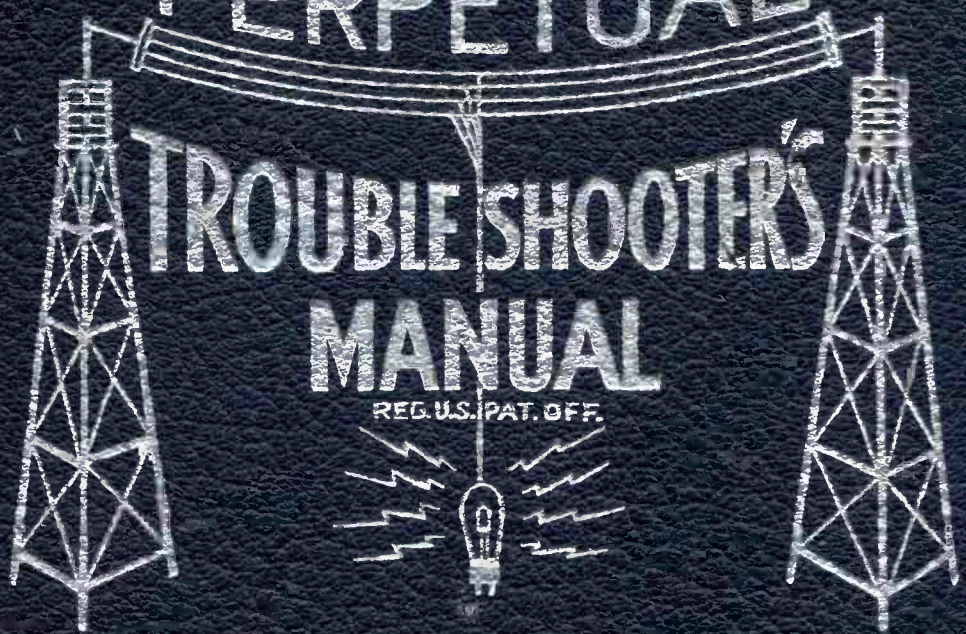
VOLUME XIII

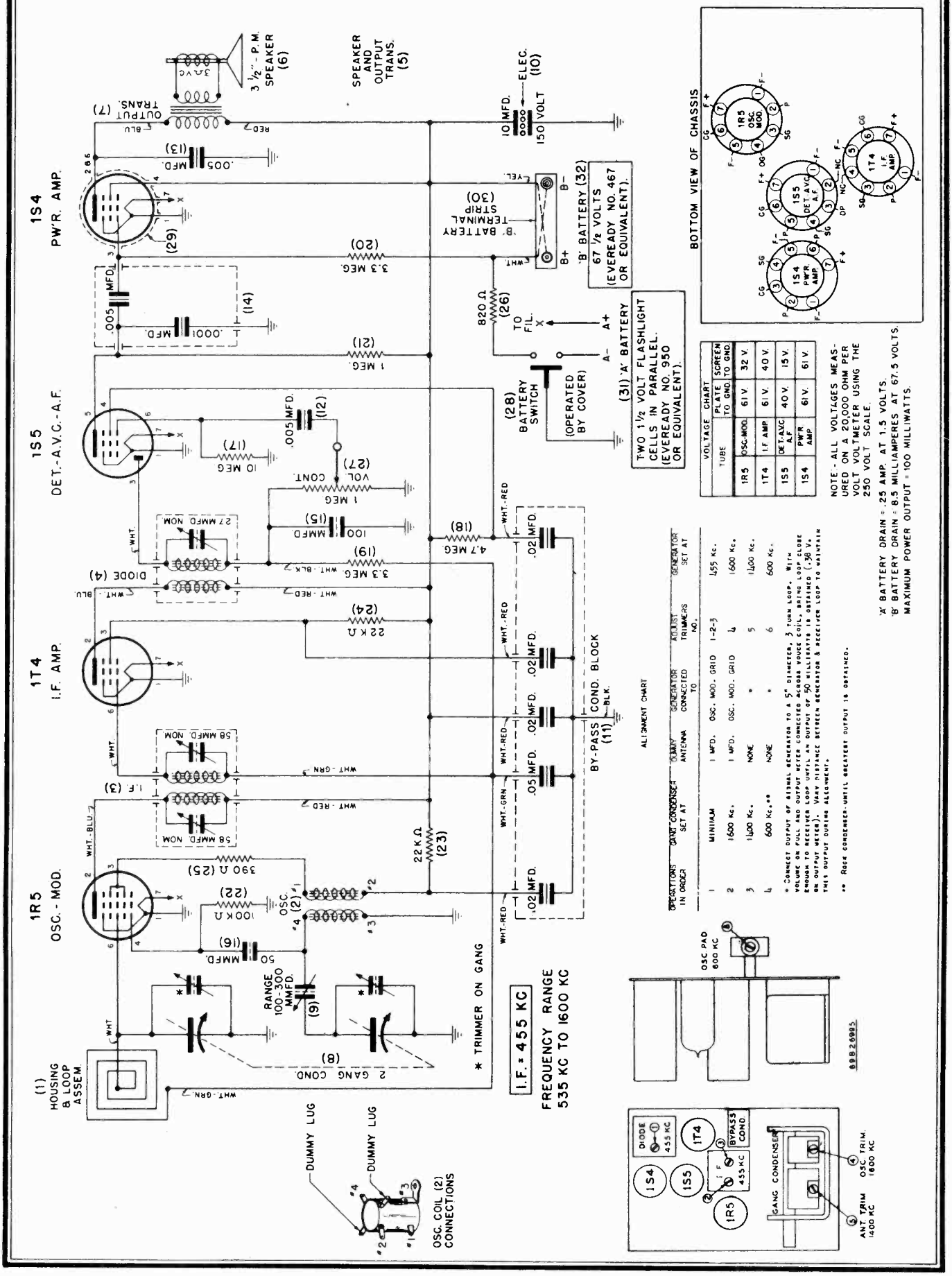
PERPETUAL TROUBLE SHOOTER'S MANUAL

REG. U.S. PAT. OFF.



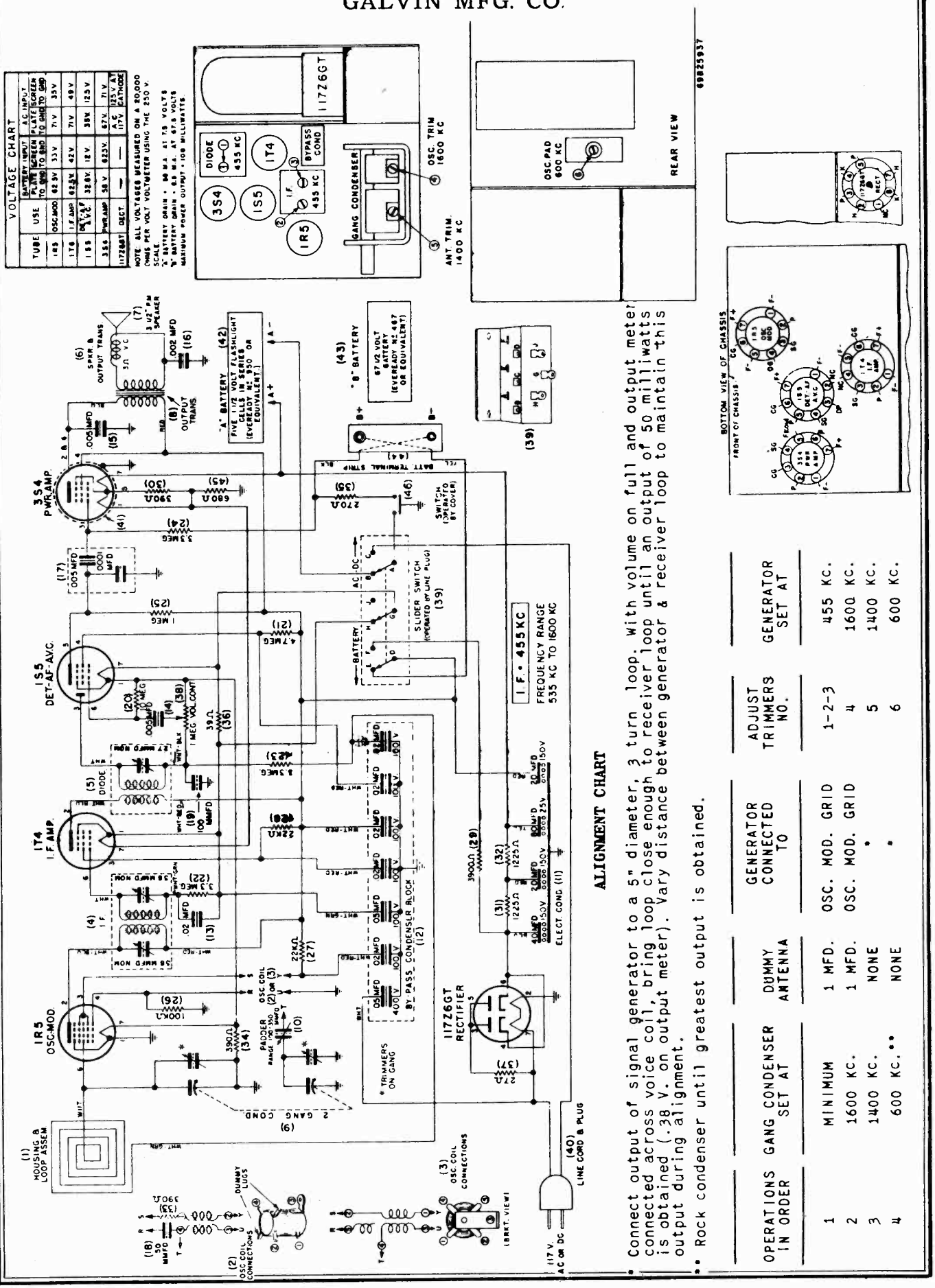
JOHN F. RIDER

GALVIN MFG. CO.



MODEL 3A5

GALVIN MFG. CO.



ALIGNMENT CHART

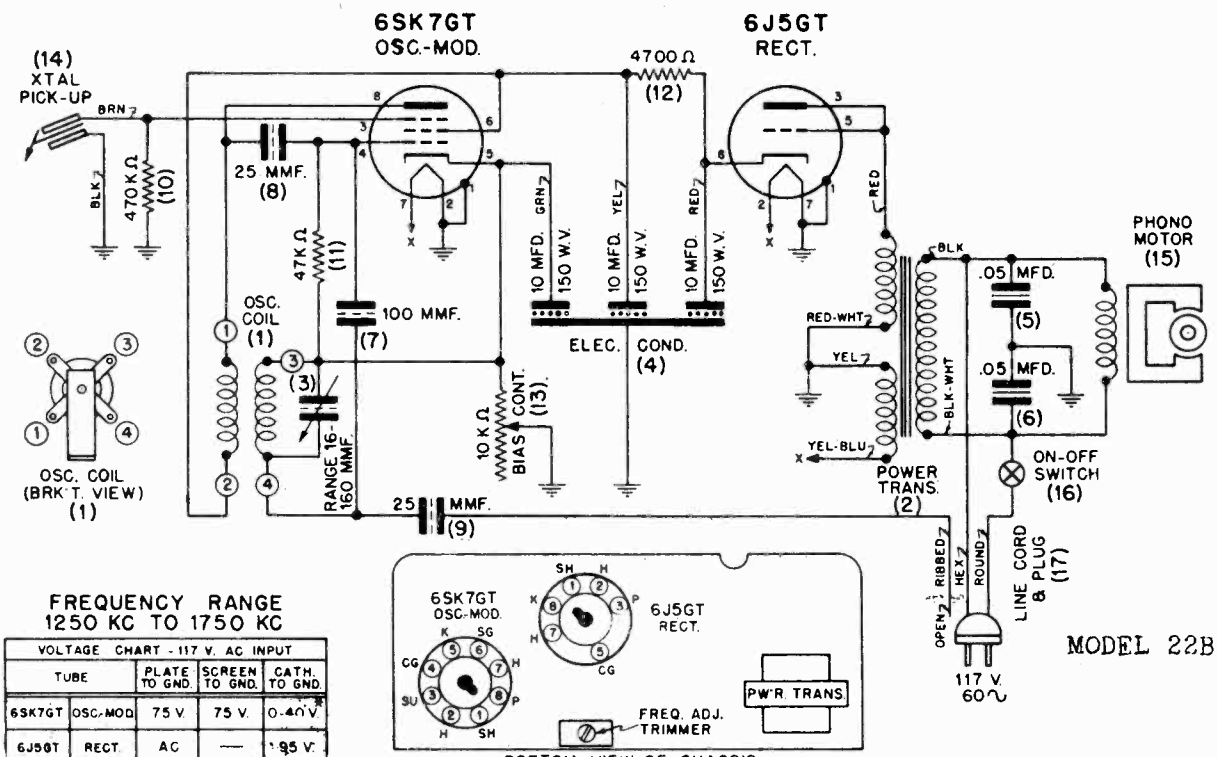
OPERATIONS IN ORDER	GANG CONDENSER SET AT	DUMMY ANTENNA	GENERATOR CONNECTED TO	ADJUST TRIMMERS NO.	GENERATOR SET AT
1	MINIMUM	1 MFD.	OSC. MOD. GRID	1-2-3	455 KC.
2	1600 KC.	1 MFD.	OSC. MOD. GRID	4	1600 KC.
3	1400 KC.	NONE	"	5	1400 KC.
4	600 KC.**	NONE	"	6	600 KC.

* Connect output of signal generator to a 5" diameter, 3 turn loop. With volume on full and output meter connected across voice coil, bring loop close enough to receiver loop until an output of 50 milliwatts is obtained (.38 V. on output meter). Vary distance between generator & receiver loop to maintain this output during alignment.

** Rock condenser until greatest output is obtained.

MODEL 22B Phono.
MODEL 60XW3

GALVIN MFG. CO.



FREQUENCY RANGE
1250 KC TO 1750 KC

VOLTAGE CHART - 117 V. AC INPUT				
TUBE		PLATE TO GND.	SCREEN TO GND.	CATH. TO GND.
6SK7GT	OSC.-MOD.	75 V.	75 V.	0-40 V.
6J5GT	RECT.	AC	—	95 V.

NOTE - ALL VOLTAGES MEASURED WITH A 1,000 OHM PER VOLT VOLTMETER.

* VARIES WITH SETTING OF BIAS CONTROL

BOTTOM VIEW OF CHASSIS

MODEL 22B

MODEL 22B
FOR ADDITIONAL DATA
SEE INDEX

POINTER AND

GANG DRIVE CORD

RESTRINGING

INSTRUCTIONS

MODEL 60XW3

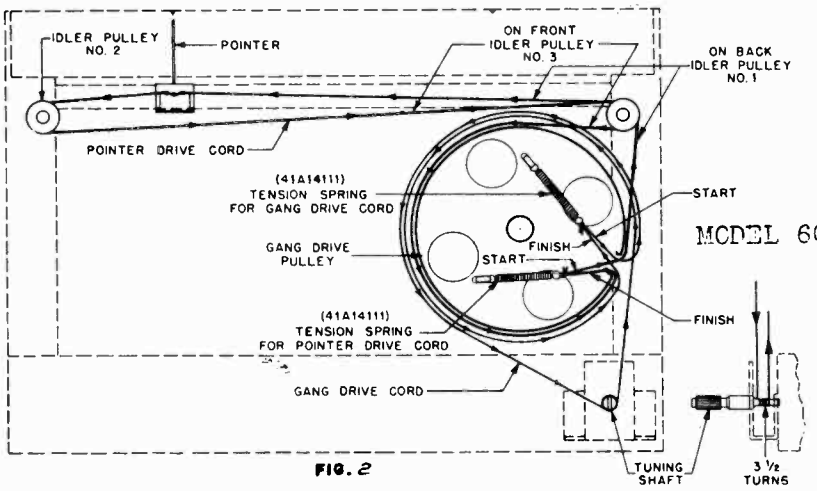


FIG. 2

MODEL 60XW3

GANG DRIVE CORD

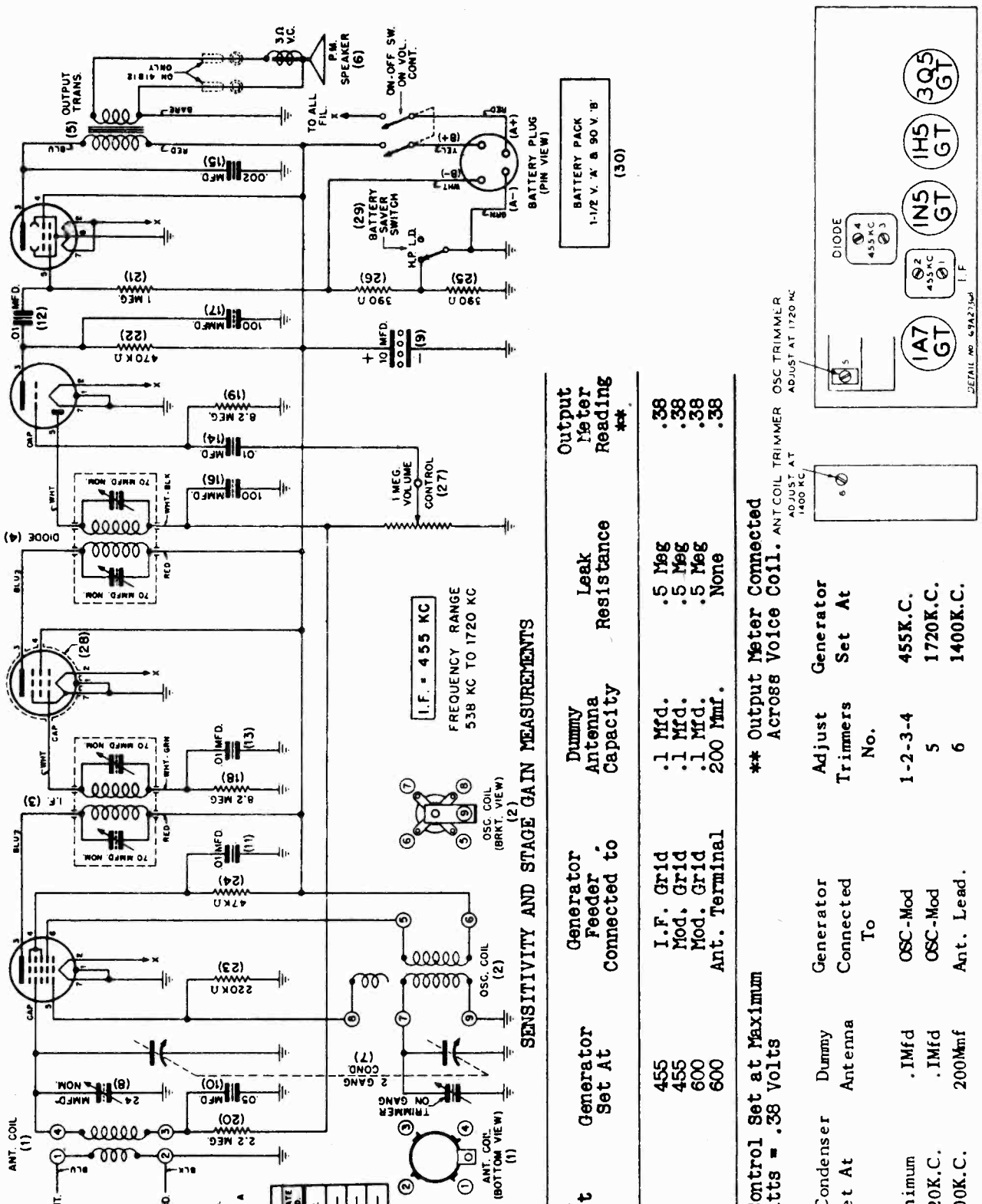
1. Remove the chassis from cabinet.
2. Remove broken string.
3. Turn gang to fully meshed position.
4. Cut a 35" length of 30 lb. silk fish cord.
5. Tie one end of cord to tension spring (Part No. 41A14111).
6. Hook other end of spring to gang drive pulley as shown in Fig. 2.
7. Pass cord through slot in gang drive pulley and wind, in a counter-clockwise direction, around and down to tuning shaft.
8. Wind cord 3-1/2 turns counter-clockwise around tuning shaft exactly as shown in Fig. 2.
9. Route cord up and wind one full turn around gang drive pulley, in a counter clockwise direction, to slot.
10. Pass cord through slot and tie cord to spring.
    NOTE: *Before tying cord, adjust length so that spring will exert a light pull on cord.*
11. Place a drop of shellac on cord knot.

POINTER DRIVE CORD

1. Remove the chassis from cabinet.
2. Remove broken string.
3. Turn gang to fully meshed position.
4. Cut a 40" length of 30 lb. silk fish cord.
5. Tie one end of cord to tension spring (Part No. 41A14111).
6. Hook other end of spring to gang drive pulley as shown in Fig. 2.
7. Pass cord through slot in gang drive pulley and route cord upward to idler pulley No. 1 (Back pulley).
8. Route cord in a counter-clockwise direction around idler pulley No. 1 and across chassis to idler pulley No. 2.
9. Continue in a counter-clockwise direction around idler pulley No. 2 and back across chassis to idler pulley No. 3 (Front Pulley).
10. Continue in a clockwise direction around idler pulley No. 3 and in a counter-clockwise direction around gang drive pulley to slot.
11. Pass cord through slot and tie to spring.
    NOTE: *Before tying cord, adjust length so that spring will exert a light pull on cord.*
12. Replace pointer on cord. To calibrate, tune in a station of known frequency and adjust pointer on cord to indicate station frequency. Fasten to cord with a drop of shellac.
13. Place a drop of shellac on cord knot.

MODELS 41B11, 41B12

GALVIN MFG. CO.



'A' DRAIN - 25 AMP.
'B' DRAIN IN 'L.P.' POSITION - 8 MA
'B' DRAIN IN 'H.P.' POSITION - 12 MA
MAX. PWR. OUTPUT - 300 MILLIWATTS.

NOTE: ALL VOLTAGES MEASURED ON A 1,000 OHM PER VOLT VOLTMETER. BATT. SAVER SW. IN 'H.P.' POSITION.

VOLTAGE CHART

TUBE	PLATE TO GND.	SCREEN TO GND.	OSC. PLATE TO GND.
1A7GT (OSC.-MOD.)	85 V.	40 V.	85 V.
1N5GT (I.F. AMP.)	85 V.	85 V.	——
1H5GT (DET.-A.V.C.-A.F.)	35 V.	——	——
3Q5GT (PWR. AMP.)	80 V.	85 V.	——

SENSITIVITY AND STAGE GAIN MEASUREMENTS

Average Microvolt Input *	Generator Set At	Generator Feeder Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
3600	455	I.F. Grid	.1 Mfd.	.5 Meg	.38
105	455	Mod. Grid	.1 Mfd.	.5 Meg	.38
120	600	Mod. Grid	.1 Mfd.	.5 Meg	.38
22	600	Ant. Terminal	200 Mmf.	None	.38

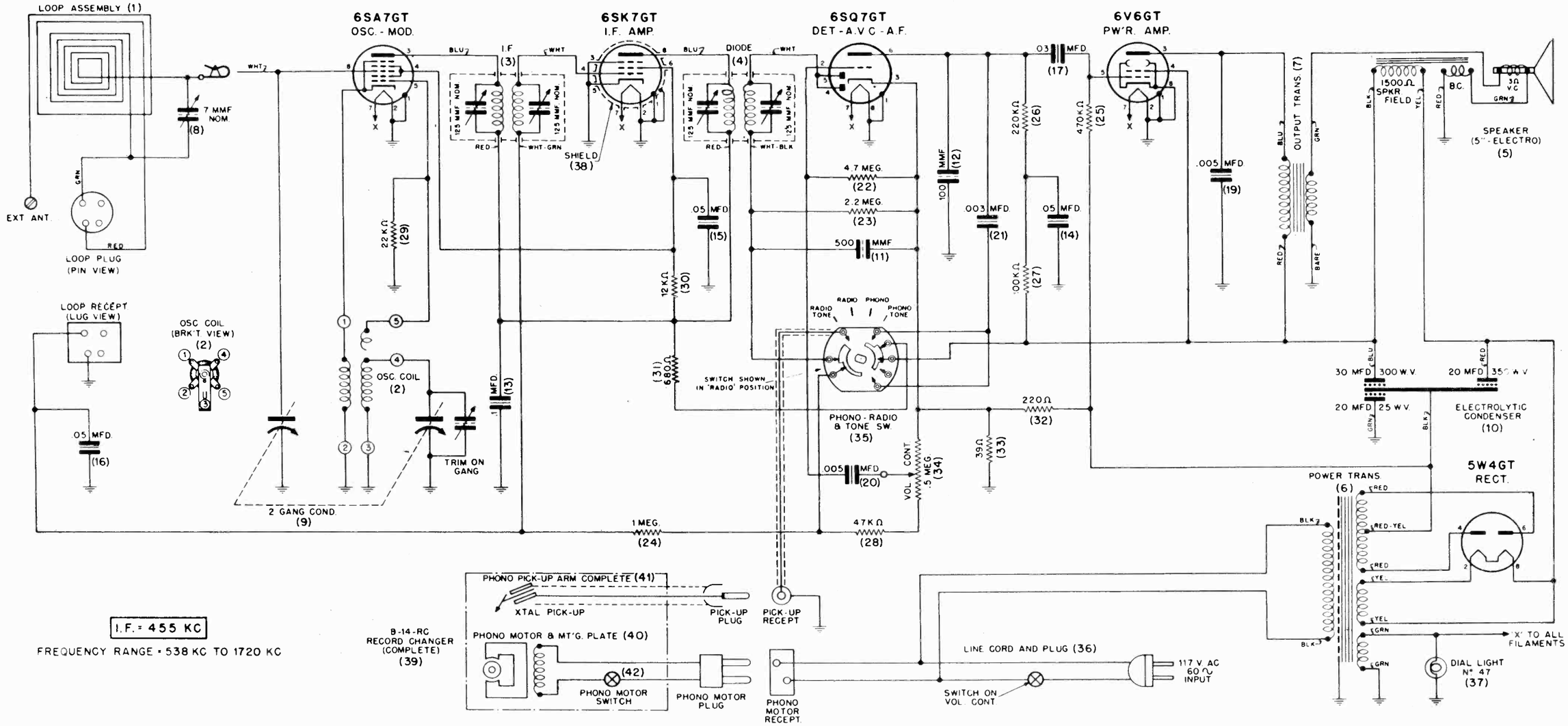
Volume Control Set at Maximum
* .05 Watts = .38 Volts

** Output Meter Connected Across Voice Coil.

Operations In Order	Gang Condenser Set At	Dummy Antenna	Generator Connected To	Adjust Trimmers No.	Generator Set At
1	Minimum	.1Mfd	OSC-Mod	1-2-3-4	455K.C.
2	1720K.C.	.1Mfd	OSC-Mod	5	1720K.C.
3	1400K.C.	200Mmf	Ant. Lead.	6	1400K.C.

MODEL 51F11

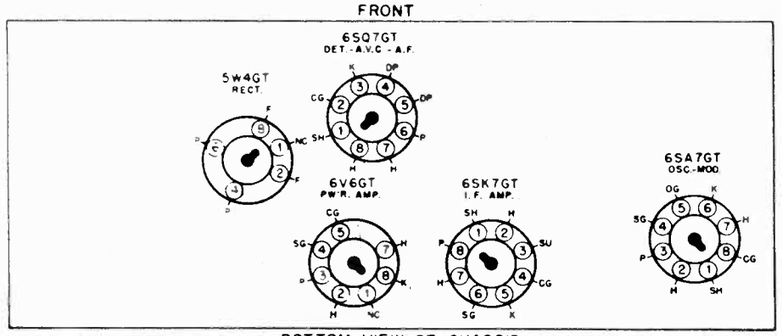
GALVIN MFG. CO.



I.F. = 455 KC

FREQUENCY RANGE = 538 KC TO 1720 KC

FRONT



BOTTOM VIEW OF CHASSIS

VOLTAGE CHART : 117 V. AC INPUT *				
TUBE		PLATE TO GND.	SCREEN TO GND.	CATH TO GND.
6SA7GT	OSC.-MOD.	210 V	100 V	0
6SK7GT	I.F. AMP.	220 V	100 V	0
6SQ7GT	DET.-A.V.C. A.F.	90 V	—	-2.2 V
6V6GT	PW'R AMP.	205 V	220 V	0
5W4GT	RECT.	A.C.	—	300 V FROM FIL.

NOTE: ALL VOLTAGES MEASURED WITH A 20,000 OHM PER VOLT VOLTMETER.

MAX. PWR. OUTPUT - 3.5 WATTS

*PHONO-RADIO-TONE SWITCH IN RADIO POSITION

**BIAS, MEASURED FROM B- TO CHASSIS, -15 VOLTS

Motorola

MODEL

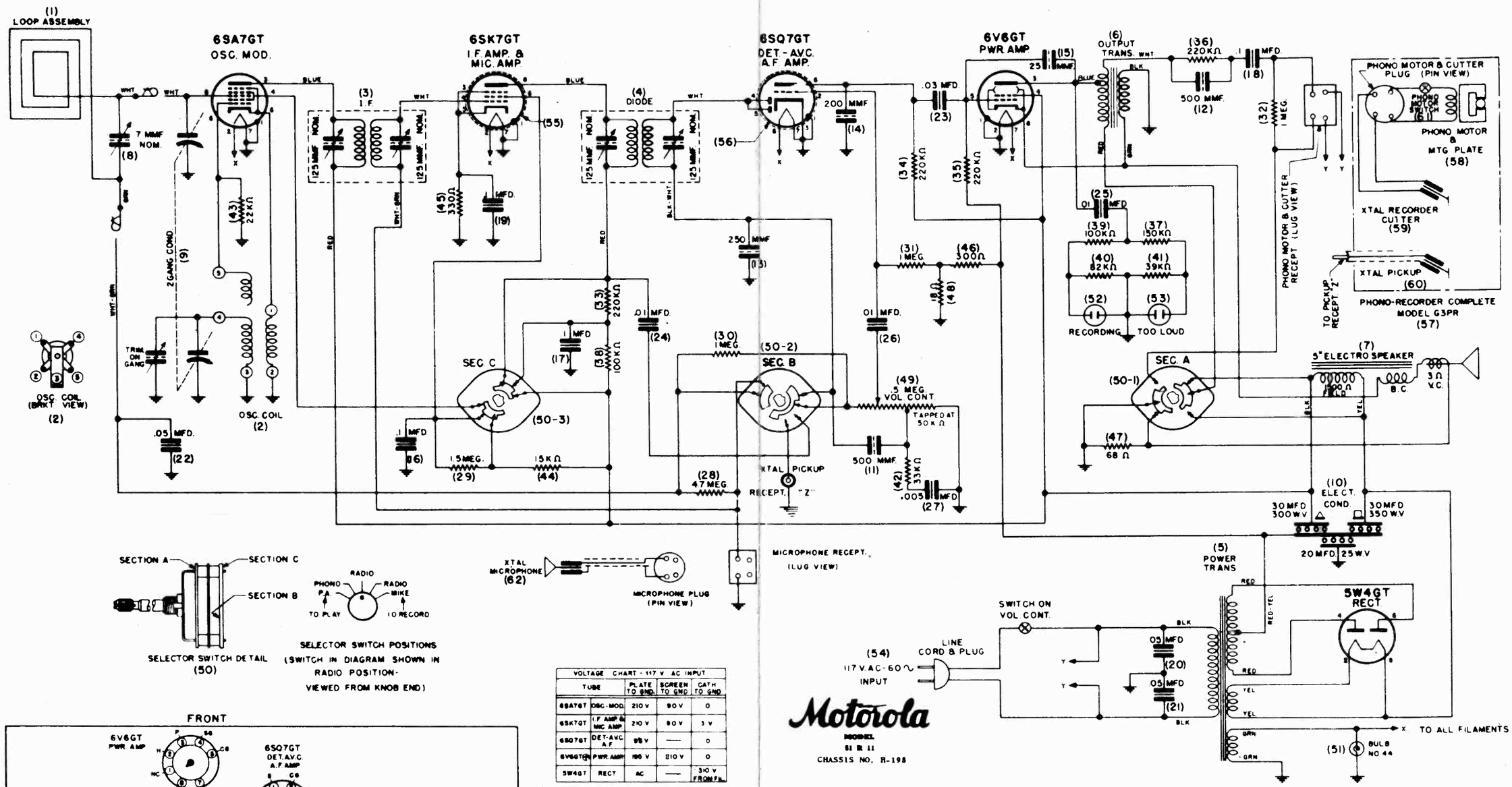
51 F 11

MODEL 51F11 SCHEMATIC DIAGRAM PARTS LIST

DIAG. NO.	PART NO.	DESCRIPTION
1	1X27889	BACK & LOOP ASSEMBLY
2	21A26942	OSCILLATOR COIL
3	1X27860	I.F. COIL & SHIELD ASSEMBLY
4	1X27858	DIODE COIL & SHIELD ASSEMBLY
5	50828307	SPEAKER (5" ELECTRO)
6	25A26302	POWER TRANSFORMER
7	25A19876	OUTPUT TRANSFORMER
8	20A16746	TRIMMER & "U" BRACKET (7 MMF NOM.)
9	19B20507	VARIABLE CONDENSER (2 GANG)
10	23A27681	ELECT. COND. & STRAP (20 MFD/350W.V.-30 MFD/300W.V.-20 MFD/25W.V.)
11	21B6500	MOLDED MICA COND. (500 MMF-20%-300W.V.) BRN "O"
12	21B6511	MOLDED MICA COND. (100MMF-20%-400W.V.) BRN "O"
13	899807	TUBULAR CONDENSER (.1 MFD-400W.V.)
14	899816	TUBULAR CONDENSER (.05 MFD-400W.V.)
15	899821	TUBULAR CONDENSER (.05 MFD-200W.V.)
16	899805	TUBULAR CONDENSER (.05 MFD-100W.V.)
17	899804	TUBULAR CONDENSER (.03 MFD-400W.V.)
18	899833	TUBULAR CONDENSER (.03 MFD-200W.V.)
19	899808	TUBULAR CONDENSER (.005 MFD-1000W.V.)
20	899813	TUBULAR CONDENSER (.005 MFD-600W.V.)
21	899835	TUBULAR CONDENSER (.003 MFD-600W.V.)
22	686368	CARBON RESISTOR (4.7 MEG-1/5WATT-20%) INS.
23	686202	CARBON RESISTOR (2.2 MEG-1/5WATT-20%) INS.
24	686159	CARBON RESISTOR (1 MEG-1/5WATT-20%) INS.
25	696160	CARBON RESISTOR (470,000Ω-1/5WATT-20%) INS.
26	696204	CARBON RESISTOR (220,000Ω-1/5WATT-20%) INS.
27	686165	CARBON RESISTOR (100,000Ω-1/5WATT-20%) INS.
28	686321	CARBON RESISTOR (47,000Ω-1/5WATT-20%) INS.
29	686212	CARBON RESISTOR (22,000Ω-1/5WATT-20%) INS.
30	686045	CARBON RESISTOR (12,000Ω-1WATT-10%) N.I.
31	686026	CARBON RESISTOR (680Ω-1/5WATT-20%) N.I.
32	686282	CARBON RESISTOR (220Ω-1/2WATT-10%) N.I.
33	686203	CARBON RESISTOR (39Ω-1/5WATT-10%) N.I.
34	18K19939	VOL. CONT. & SWITCH (.5 MEG)
35	40K27880	PHONO-RADIO & TONE SWITCH
36	30A151	LINE CORD & PLUG (6 FT.)
37	65X11854	BULB (6.3V-.15A TUB. BAY) CLEAR #47
38	25A14760	BANTAM TUBE SHIELD
39	1X27890	MODEL B-14-RC RECORD CHANGER (COMPLETE)
40	99B27687	PHONO MOTOR & MTG. PLATE (117 VOLT 60 CYCLE)
41	99K27840	PHONO PICKUP ARM (COMPLETE)
	99K27441	CARTRIDGE & LEADS (ONLY)
42	40K21758	SLIDER SWITCH (2 POS.) (S.P.D.T.)

MODEL 51R11

GALVIN MFG. CO.



SELECTOR SWITCH DETAIL (50)

SELECTOR SWITCH POSITIONS (SWITCH IN DIAGRAM SHOWN IN RADIO POSITION- VIEWED FROM KNOB END)

VOLTAGE CHART - 117 V AC INPUT				
TUBE		PLATE TO GND.	SCREEN TO GND	CATH TO GND
6SA7GT	OSC.-MOD.	210 V	80 V	0
6SK7GT	I.F. AMP & MIC. AMP	210 V	80 V	3 V
6SQ7GT	DET.-AVC. A.F.	95 V	——	0
6V6GT	PWR. AMP.	195 V	210 V	0
5W4GT	RECT.	AC	——	310 V FROM FIL.

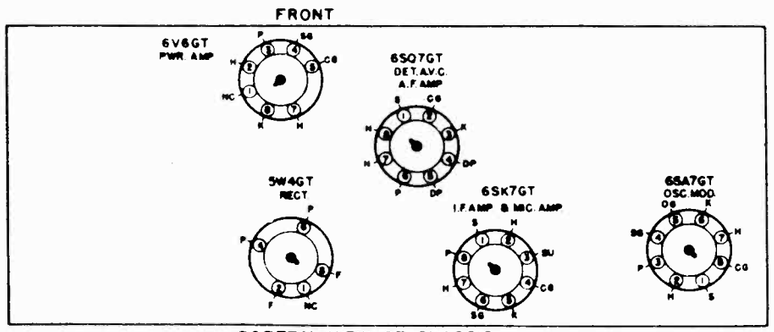
⊕ BIAS MEASURED FROM B- TO CHASSIS - 15 V

ALL MEASUREMENTS MADE WITH A 20,000 OHM PER VOLT VOLTMETER

MAXIMUM POWER OUTPUT - 3.5 WATTS

I.F. = 455 KC

FREQUENCY RANGE = 538 KC TO 1720 KC.



Motorola
MODEL
51 R 11
CHASSIS NO. R-198

MODEL 51 R 11 SCHEMATIC DIAGRAM PARTS LIST

DIAG. NO.	PART NO.	DESCRIPTION
1	21A41755	LOOP ANTENNA & BACK
2	21A26912	OSCILLATOR COIL
3	1X28727	I.F. COIL & SHIELD ASSEMBLY
4	1X28725	DIODE COIL & SHIELD ASSEMBLY
5	29B28202	POWER TRANSFORMER
6	29B28749	OUTPUT TRANSFORMER
7	50B28307	SPEAKER (5" ELECTRO)
8	20A18740	TRIMMER & "U" BRACKET (7 MMF. NOM.)
9	19B20907	VARIABLE CONDENSER (2 GANG)
10	23A27718	ELECT. COND. (30 MFD/300W.V.-30 MFD/300W.V.-20 MFD/25W.V.)
11	2186500	MOLDED MICA COND. (500MMF -20%-400W.V.) BAN "O"
12	2186500	MOLDED MICA COND. (500 MMF -20%-400W.V.) BAN "O"
13	2186517	MOLDED MICA COND. (250 MMF -20%-400W.V.) BAN "O"
14	2186501	MOLDED MICA COND. (200MMF -20%-400W.V.) BAN "O"
15	2186535	MOLDED MICA COND. (25 MMF -20%-400W.V.) BAN "O"
16	869807	TUBULAR CONDENSER (.1 MFD-400W.V.)
17	869807	TUBULAR CONDENSER (.1 MFD-400W.V.)
18	869807	TUBULAR CONDENSER (.1 MFD-400W.V.)
19	19B28716	TUBULAR CONDENSER (.1 MFD-400W.V.)
20	8A28966	TUBULAR CONDENSER (.05 MFD-600W.V.)
21	8A28966	TUBULAR CONDENSER (.05 MFD-600W.V.)
22	869805	TUBULAR CONDENSER (.05 MFD-400W.V.)
23	859804	TUBULAR CONDENSER (.03 MFD-400W.V.)
24	869809	TUBULAR CONDENSER (.01 MFD-400W.V.)
25	869809	TUBULAR CONDENSER (.01 MFD-400W.V.)
26	869809	TUBULAR CONDENSER (.01 MFD-400W.V.)
27	869813	TUBULAR CONDENSER (.005 MFD-600W.V.)
28	686368	CARBON RESISTOR (47 MEG-1/2WATT-20%) INS.
29	859732	TRIMMER & "U" BRACKET (1.5 MEG-1/2WATT-20%) INS.
30	686159	CARBON RESISTOR (1 MEG-1/2WATT-20%) INS.
31	686159	CARBON RESISTOR (1 MEG-1/2WATT-20%) INS.
32	686159	CARBON RESISTOR (1 MEG-1/2WATT-20%) INS.
33	686204	CARBON RESISTOR (220, 000Ω-1/2WATT-20%) INS.
34	686204	CARBON RESISTOR (220, 000Ω-1/2WATT-20%) INS.
35	686204	CARBON RESISTOR (220, 000Ω-1/2WATT-20%) INS.
36	686204	CARBON RESISTOR (220, 000Ω-1/2WATT-20%) INS.
37	695599	CARBON RESISTOR (150, 000Ω-1/2WATT-5%) INS.
38	686165	CARBON RESISTOR (100, 000Ω-1/2WATT-20%) INS.
39	686495	CARBON RESISTOR (100, 000Ω-1/2WATT-5%) INS.
40	686496	CARBON RESISTOR (82, 000Ω-1/2WATT-5%) INS.
41	686496	CARBON RESISTOR (39, 000Ω-1/2WATT-5%) INS.
42	686369	CARBON RESISTOR (33, 000Ω-1/2WATT-20%) INS.
43	686212	CARBON RESISTOR (22, 000Ω-1/2WATT-20%) INS.
44	686013	CARBON RESISTOR (15, 000Ω-1 WATT-20%) N.I.
45	686496	CARBON RESISTOR (330Ω-1/2WATT-20%) INS.
46	686187	CARBON RESISTOR (300Ω-1WATT-10%) N.I.
47	686493	CARBON RESISTOR (68Ω-1/2WATT-10%) INS.
48	686495	CARBON RESISTOR (8Ω-1/2 WATT-10%) N.I.
49	1A28750	VOLUME CONTROL & SWITCH (.5 MEG)
50	40A26721	SELECTOR SWITCH (5 POSITION)
51	65X10867	BULB (6.3V.-.25A TUB. BAY.) CLEAR
52	65X22177	NEON BULB
53	65X22177	NEON BULB
54	30K21859	LINE CORD & PLUG (9 FT.)
55	26A12760	BANTAM TUBE SHIELD
56	26A12760	BANTAM TUBE SHIELD
57	1X28765	MODEL G3PR PHONO-RECORDER (COMPLETE)
58	59X28759	PHONO-RECORDER MOTOR (117V. 60C)
59	59X28766	CUTTER ARM (LESS MOUNTING)
	48X28767	CUTTER CARTRIDGE (ONLY)
60	59X28775	PICKUP ARM (WITH MOUNTING)
	48X28776	PICKUP CARTRIDGE (ONLY)
61	40A11599	SLIDER SWITCH (S.P.S.T.)
62	59X28821	CRYSTAL MICROPHONE (COMPLETE)
	59X28821A	CRYSTAL MICROPHONE CARTRIDGE (ONLY)

MODEL 51 F 11

ALIGNMENT CHART

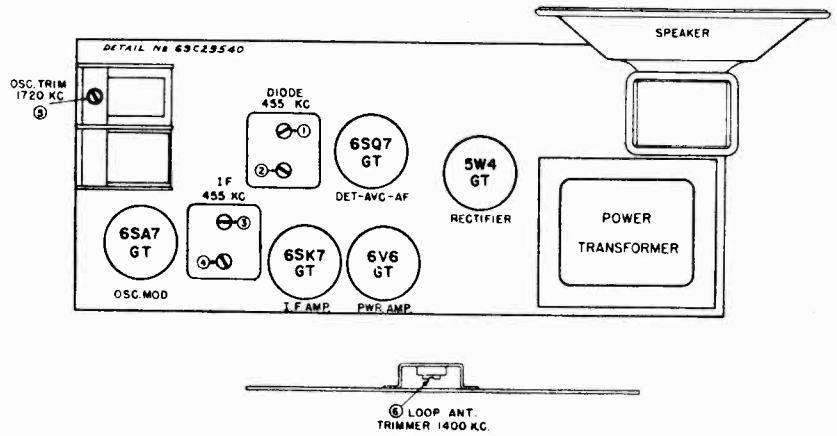
Operations In Order	Gang Condenser Set At	Dummy Antenna	Generator Connected to	Adjust Trimmers No.	Generator Set At
1	1720 K.C.	.1 Mfd.	Osc.Mod.Grid	1-2-3-4	455 K.C.
2	1720 K.C.	200 Mmf	Ext.Ant. Connection	5	1720 K.C.
3	1400 K.C.	200 Mmf	Ext.Ant. Connection	6	1400 K.C.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

Average Microvolt Input *	Generator Set At	Generator Feeder Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
1750	455 K.C.	I.F. Grid	.1 Mfd	.5 Meg.	.38
22	455 K.C.	Mod. Grid	.1 Mfd	.5 Meg.	.38
26	600 K.C.	Mod. Grid	.1 Mfd	.5 Meg.	.38
3	600 K.C.	Ant.Terminal	200 Mmf	None	.38

Volume Control Set at Maximum
* .05 Watts = .38 Volts

Tone Control Set at High Position.
** Output meter connected across voice coil.



TUBE & TRIMMER LAYOUT

CHASSIS Nº M-184 MODEL Nº 51F11

MODEL 61 F 21

ALIGNMENT CHART

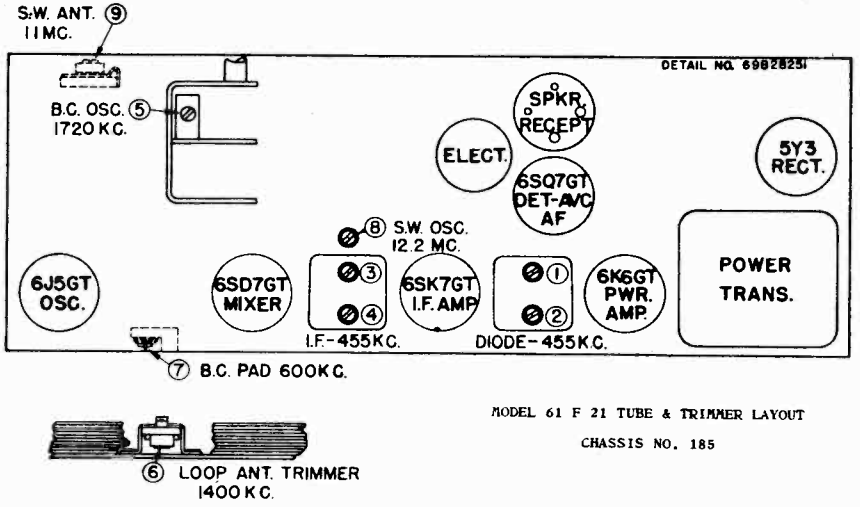
Operations In Order	Gang Condenser Set At	Dummy Antenna	Band Switch Set At	Generator Connected To	Adjust Trimmers No.	Generator Set At
1	1720 K.C.	.1 Mf.	B.C.	Mixer Grid	1-2-3-4	455 K.C.
2	1720 K.C.	200 Mmf.	B.C.	Ext.Ant. Connection	5	1720 K.C.
3	1400 K.C.	200 Mmf.	B.C.	Ext.Ant. Connection	6	1400 K.C.
4	600 K.C.	200 Mmf.	B.C.	Ext.Ant. Connection	7	600 K.C.
5	12.2 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	8	12.2 M.C.
6	11.0 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	9	11.0 M.C.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

Average Microvolt Input *	Generator Set At	Generator Feeder Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
2100	455 K.C.	I.F. Grid	.1 Mfd.	.5 Meg.	.30
10	455 K.C.	Mixer Grid	.1 Mfd.	.5 Meg.	.38
12	600 K.C.	Mixer Grid	.1 Mfd.	.5 Meg.	.38
11	600 K.C.	Ant.Terminal	200 Mmf.	None	.38

Volume Control Set at Maximum
* .05 Watts = .38 Volts

Tone Control Set At High Position.
** Output meter connected across voice coil.

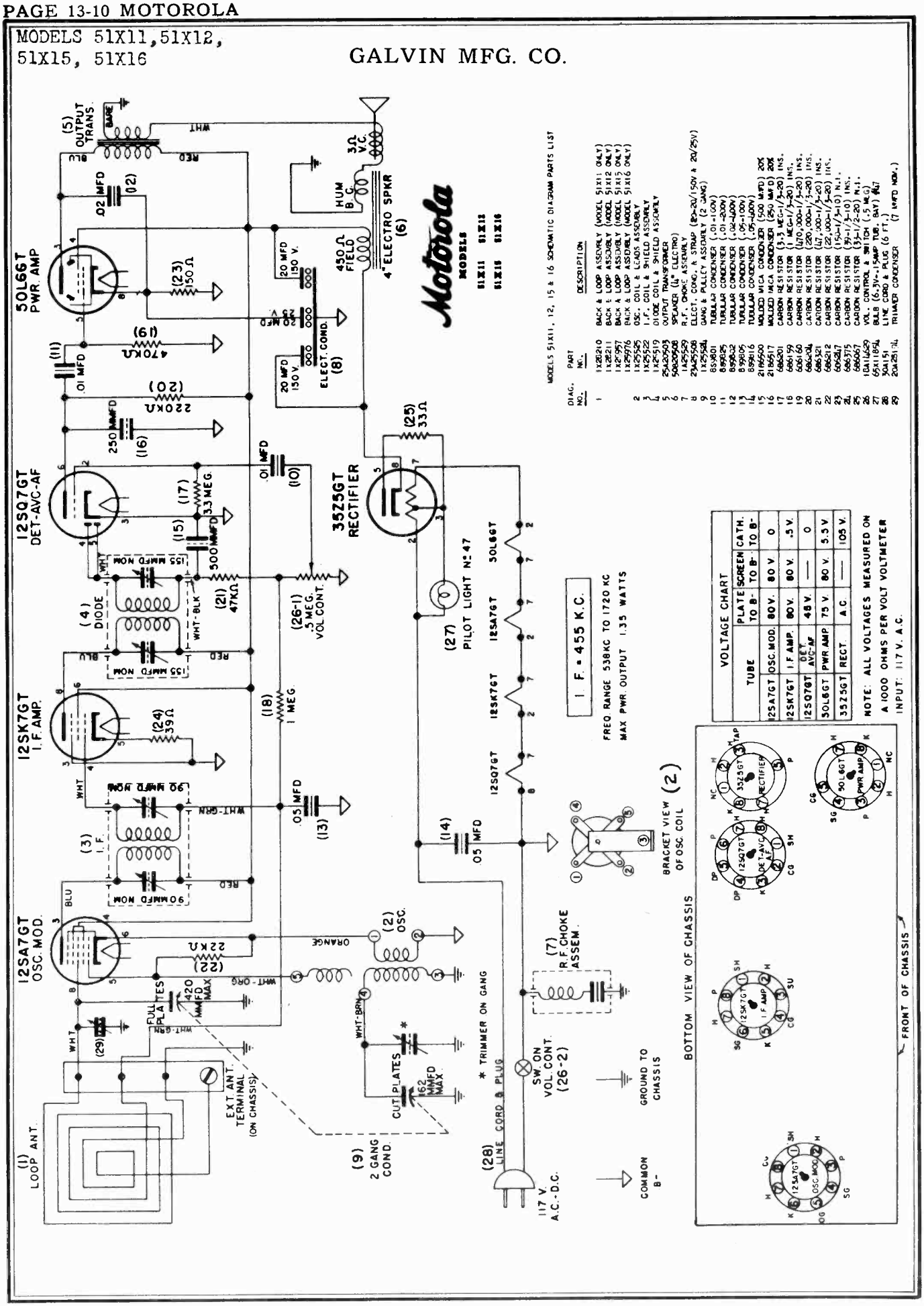


MODEL 61 F 21 TUBE & TRIMMER LAYOUT

CHASSIS NO. 185

MODELS 51X11, 51X12, 51X15, 51X16

GALVIN MFG. CO.



MODELS 51X11, 12, 15 & 16 SCHEMATIC DIAGRAM PARTS LIST

DIAG. NO.	PART NO.	DESCRIPTION
1	1X28210	BACK & LOOP ASSEMBLY (MODEL 51X11 ONLY)
	1X28211	BACK & LOOP ASSEMBLY (MODEL 51X12 ONLY)
	1X29957	BACK & LOOP ASSEMBLY (MODEL 51X15 ONLY)
	1X29976	BACK & LOOP ASSEMBLY (MODEL 51X16 ONLY)
2	1X25525	OSC. COIL & LEADS ASSEMBLY
3	1X25522	I.F. COIL & SHIELD ASSEMBLY
4	1X25519	DIODE COIL & SHIELD ASSEMBLY
5	25A20503	OUTPUT TRANSFORMER
6	50A20508	SPEAKER (4" ELECTRO)
7	1X25529	R.F. CHOKE ASSEMBLY
8	23A25508	ELECT. COND. & STRAP (20-20/150V & 20/25V)
9	1X25524	GANG & PULLEY ASSEMBLY (2 GANG)
10	859801	TUBULAR CONDENSER (.01-400V)
11	859825	TUBULAR CONDENSER (.01-200V)
12	859832	TUBULAR CONDENSER (.002-400V)
13	859805	TUBULAR CONDENSER (.05-400V)
14	859816	TUBULAR CONDENSER (.05-400V)
15	21X6500	MOLDED MICA CONDENSER (500 MMFD) 20%
16	21X6517	MOLDED MICA CONDENSER (250 MMFD) 20%
17	686201	CARBON RESISTOR (3.3 MEG-1/2-20) INS.
18	686159	CARBON RESISTOR (1 MEG-1/2-20) INS.
19	686160	CARBON RESISTOR (470,000-1/2-20) INS.
20	686234	CARBON RESISTOR (220,000-1/2-20) INS.
21	686321	CARBON RESISTOR (47,000-1/2-20) INS.
22	686212	CARBON RESISTOR (22,000-1/2-20) INS.
23	686217	CARBON RESISTOR (15,000-1/2-10) N.I.
24	686315	CARBON RESISTOR (3-1/2-1/2-10) INS.
25	686067	CARBON RESISTOR (33-1/2-20) N.I.
26	12A16629	VOL. CONTROL & SWITCH (.5 MEG.)
27	65X11854	BULB (6.3V-.15AMP TUB. BAY) #47
28	30A151	LINE CORD & PLUG (6 FT.)
29	20A25174	TRIMMER CONDENSER (7 MFD MAX.)

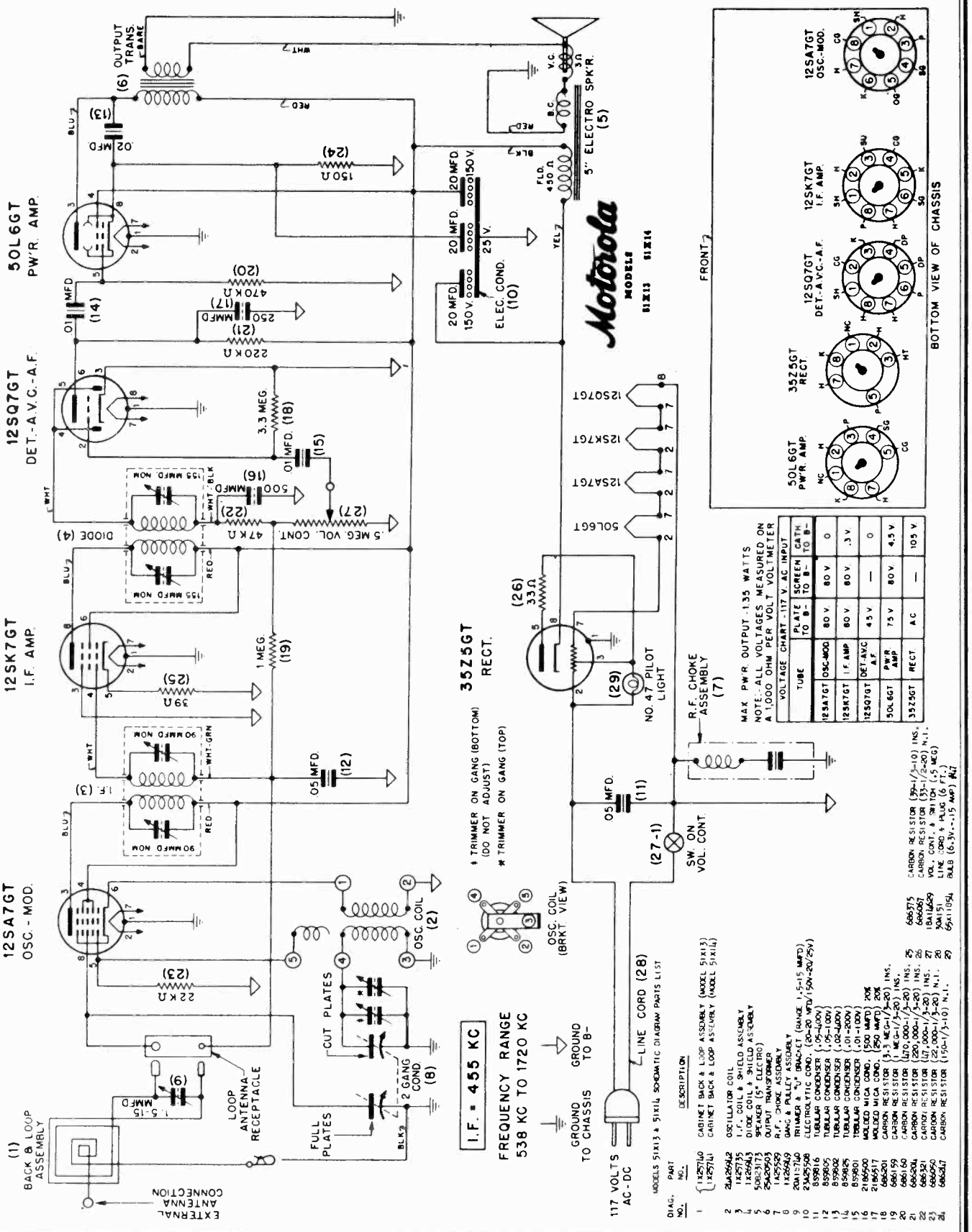
VOLTAGE CHART

TUBE		PLATE TO B-	SCREEN TO B-	CATH. TO B-
12SA7GT	OSC. MOD.	80 V.	80 V	0
12SK7GT	I.F. AMP.	80 V.	80 V.	.5 V.
12SQ7GT	DET. AVC-AF	48 V	—	0
50L6GT	PWR AMP.	75 V	80 V.	5.5 V
3525GT	RECT.	A.C.	—	105 V.

NOTE: ALL VOLTAGES MEASURED ON A 1000 OHMS PER VOLT VOLTMETER
INPUT: 117 V. A.C.

MODELS 51X13, 51X14

GALVIN MFG. CO.



DIAG. NO.	PART NO.	DESCRIPTION
1	1X257140	CABINET BACK & LOOP ASSEMBLY (MODEL 51X13)
	1X257141	CABINET BACK & LOOP ASSEMBLY (MODEL 51X14)
2	2A4259A2	OSCILLATOR COIL
3	1X257135	I.F. COIL & SHIELD ASSEMBLY
4	1X259A43	DIODE COIL & SHIELD ASSEMBLY
5	50B03173	SPEAKER (5" ELECTRO)
6	25A05903	OUTPUT TRANSFORMER
7	1X259A59	R.F. CHOKE ASSEMBLY
8	1X259A69	GANG & PULLEY ASSEMBLY
9	20A13740	TRIMMER & "U" BRACKET (RANGE 1.5-15 MMFD)
10	23A05308	ELECTROLYTIC COND. (20-20 MFD/150V-20/25V)
11	8598016	TUBULAR CONDENSER (.05-400V)
12	8598005	TUBULAR CONDENSER (.05-100V)
13	8598002	TUBULAR CONDENSER (.02-400V)
14	8598025	TUBULAR CONDENSER (.01-200V)
15	8598001	TUBULAR CONDENSER (.01-100V)
16	21B6500	MOLDED MICA COND. (500 MMFD) 20%
17	21B6517	MOLDED MICA COND. (250 MMFD) 20%
18	686201	CARBON RESISTOR (1 MEG-1/2-20) 1 INS.
19	686159	CARBON RESISTOR (.5 MEG-1/2-20) 1 INS.
20	686160	CARBON RESISTOR (470,000-1/2-20) 1 INS.
21	686304	CARBON RESISTOR (220,000-1/2-20) 1 INS.
22	686321	CARBOT RESISTOR (47,000-1/2-20) 1 INS.
23	686050	CARBON RESISTOR (22,000-1/2-20) N.I.
24	686247	CARBON RESISTOR (150-1/2-10) N.I.
25	686575	CARBON RESISTOR (39-1/2-10) 1 INS.
26	686067	CARBON RESISTOR (33-1/2-20) N.I.
27	19A116259	VOL. CONT. & SWITCH (.5 MEG)
28	30A151	LINE CORD & PLUG (6 FT.)
29	6X11054	BULB (6.3V-.15 AMP)

MODELS 51X11 to 51X16
MODEL 62T2

GALVIN MFG. CO.

MODEL 62T2

ALIGNMENT CHART

Operations In Order	Gang Condenser Set At	Dummy Antenna	Band Switch Set At	Generator Connected to	Adjust Trimmers No.	Generator Set At
1	Minimum 1720 K.C.	.1 Mfd.	B.C.	Osc-Mod.Grid	1-2-3-4	455 K.C.
2	Minimum 1720 K.C.	.1 Mfd.	B.C.	Osc-Mod.Grid	5	1720 K.C.
3	538 K.C.	.1 Mfd.	B.C.	Osc-Mod.Grid	6	538 K.C.
4	1400 K.C.	200 Mmf.	B.C.	External Antenna Terminal	7	1400 K.C.
5	18 M.C.	.1 Mfd.	S.W.	Osc-Mod.Grid	8	18 M.C.
6	16 M.C.	400 Ohms	S.W.	External Antenna Terminal	9	16 M.C.
7	1400 K.C.	200 Mmf.	B.C.	External Antenna Terminal	10	1400 K.C.

Volume Control Set at Maximum.

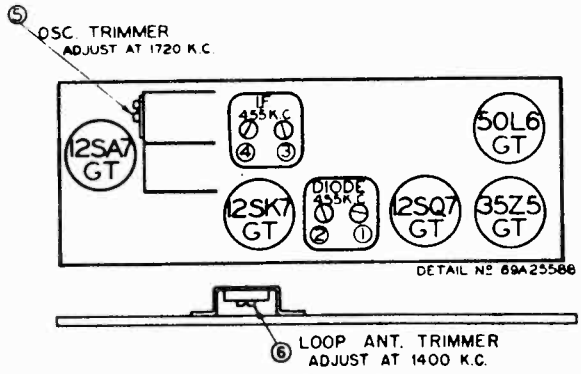
SENSITIVITY AND STAGE GAIN MEASUREMENTS

Average Microvolt Input *	Generator Set At	Generator Feeder Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
2500	455	I.F. Grid	.1.Mfd.	.5 Meg	.38
35	455	Mod. Grid	.1 Mfd.	.5 Meg	.38
40	600	Mod. Grid	.1 Mfd.	.5 Meg	.38
4	600	R.F. Grid	.1 Mfd.	.5 Meg	.38
3	600	Ant. Terminal	200 Mmf.	None	.38

Volume Control Set at Maximum.
* .05 Watts .38 Volts.

Tone Control set in treble position.
** Output meter connected across voice coil.

MODELS
51X11 51X14
51X12 51X15
51X13 51X16



ALIGNMENT CHART

Operations In Order	Gang Condenser Set At	Dummy Antenna	Generator Connected To	Adjust Trimmers No.	Generator Set At
1	Minimum	.1 Mfd.	Osc.Mod.Grid	1-2-3-4	455 K.C.
2	1720 K.C.	.1 Mfd.	Osc.Mod.Grid	5	1720 K.C.
3	1400 K.C.	400 Ohms	External Antenna Terminal	6	1400 K.C.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

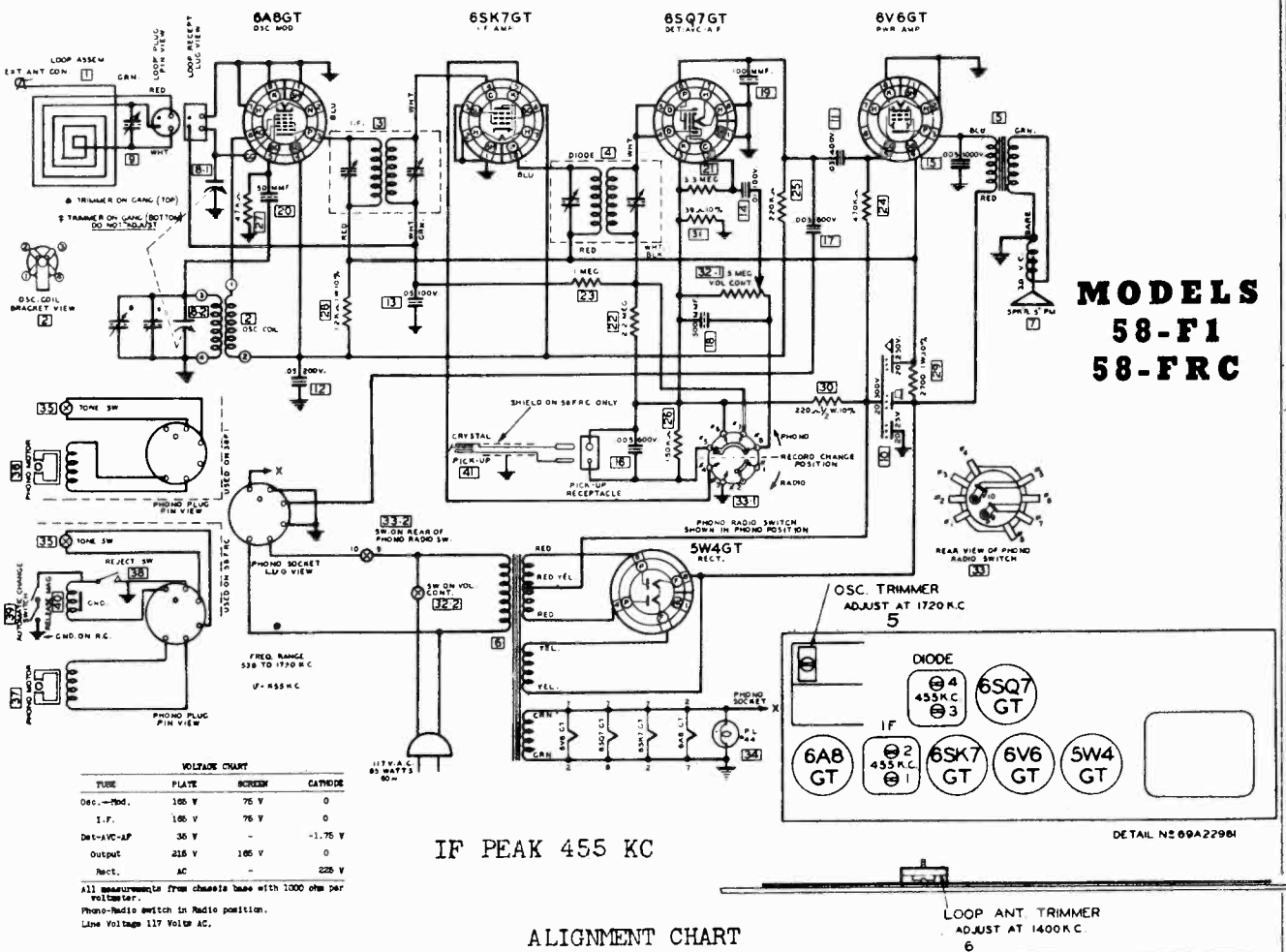
Average Microvolt Input *	Generator Set At	Generator Feeder Connected To	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
2600	455	I.F. Grid	.1 Mfd.	.5 Meg.	.38
25	455	Mod. Grid	.1 Mfd.	.5 Meg.	.38
30	600	Mod. Grid	.1 Mfd.	.5 Meg.	.38
5	600	Ant.Terminal	400 Ohms	None	.38

Volume Control Set at Maximum

** Output meter connected across voice coil.

* .05 Watts = .38 Volts

GALVIN MFG. CO.



VOLTAGE CHART

TUBE	PLATE	SCREEN	CATHODE
Osc.-Mod.	165 V	75 V	0
I.F.	165 V	75 V	0
Det-AVC-AF	35 V	-	-1.75 V
Output	215 V	165 V	0
Rect.	AC	-	225 V

All measurements from chassis base with 1000 ohm per volt meter.
Phono-Radio switch in Radio position.
Line Voltage 117 Volts AC.

ALIGNMENT CHART

Operations In Order	Gang Condenser Set At	Dummy Antenna	Generator Connected To	Adjust Trimmers No.	Generator Set At
1	Minimum 1720 K.C.	400 Ohms	Osc.-Mod. Grid	1-2-3-4	455 K.C.
2	Minimum 1720 K.C.	400 Ohms	External Antenna Terminal	5	1720 K.C.
3	1400 K.C.	400 Ohms	External Antenna Terminal	6	1400 K.C.

Volume Control Set at Maximum.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

Average Microvolt Input *	Generator Set At	Generator Feeder Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
1750	455	I.F. Grid	.1 Mfd.	.5 Meg	.38
22	455	Mod. Grid	.1 Mfd.	.5 Meg	.38
30	600	Mod. Grid	.1 Mfd.	.5 Meg	.38
3	600	Ant. Terminal	400 Ohms	None	.38

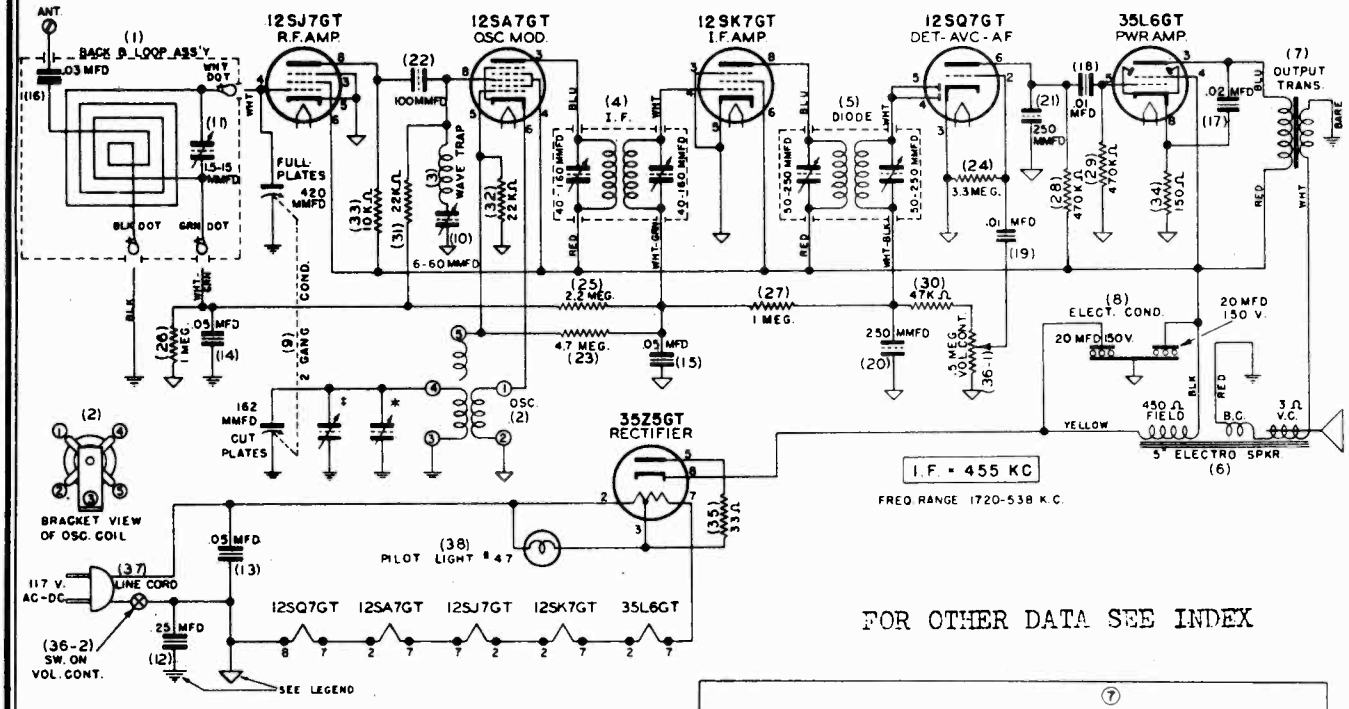
Volume Control Set at Maximum
* .05 Watts = .38 Volts

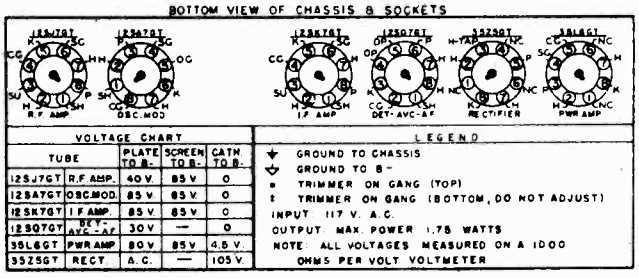
** Output Meter Connected Across Voice Coil.

FOR SERVICE INFORMATION AND PARTS PRICE LIST ON THE AUTOMATIC RECORD CHANGER AND PHONOGRAPH SECTION, REFER TO FORM S-8-E.

MODEL 60XW3

GALVIN MFG. CO.





VOLTAGE CHART				
TUBE		PLATE TO B-	SCREEN TO B-	CATH TO B-
12SJ7GT	R.F. AMP.	40 V	85 V	0
12SA7GT	OSC.MOD.	85 V	85 V	0
12SK7GT	I.F. AMP	85 V	85 V	0
12SQ7GT	DET-AVC-AF	30 V	—	0
35L6GT	PWR.AMP	80 V	85 V	4.5 V.
35Z5GT	RECT	A.C.	—	105 V.

LEGEND

- GROUND TO CHASSIS
- GROUND TO B-
- TRIMMER ON GANG (TOP)
- TRIMMER ON GANG (BOTTOM, DO NOT ADJUST)

INPUT 117 V. A.C.
OUTPUT MAX. POWER 1.75 WATTS
NOTE: ALL VOLTAGES MEASURED ON A 1000 OHMS PER VOLT VOLTMETER

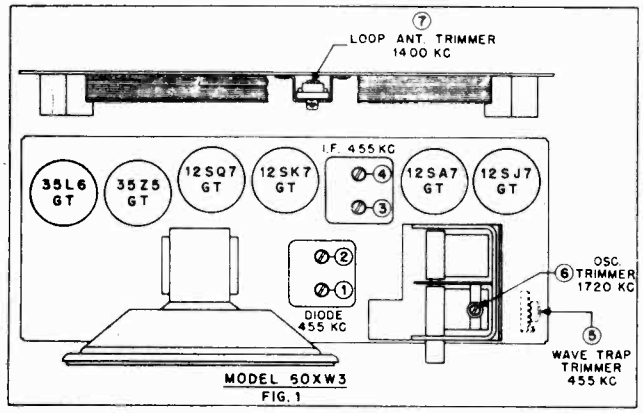


FIG. 1

ALIGNMENT CHART
MODEL 60XW3

OPERATIONS IN ORDER	GANG CONDENSER SET AT	DUMMY ANTENNA	GENERATOR CONNECTED TO	ADJUST TRIMMERS NO	GENERATOR SET AT
1	Minimum	.1 MFD	R.F. Grid	1-2-3-4	455 Kc.
2	Minimum	.1 MFD	R.F. Grid	5*	455 Kc.
3	1720 KC.	.1 MFD	R.F. Grid	6	1720 Kc.
4	1400 KC.	200 MMFD.	Ant. Terminal	7	1400 Kc.

Adjust for Minimum Response (I.F. Wave Trap) See Fig. 1.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

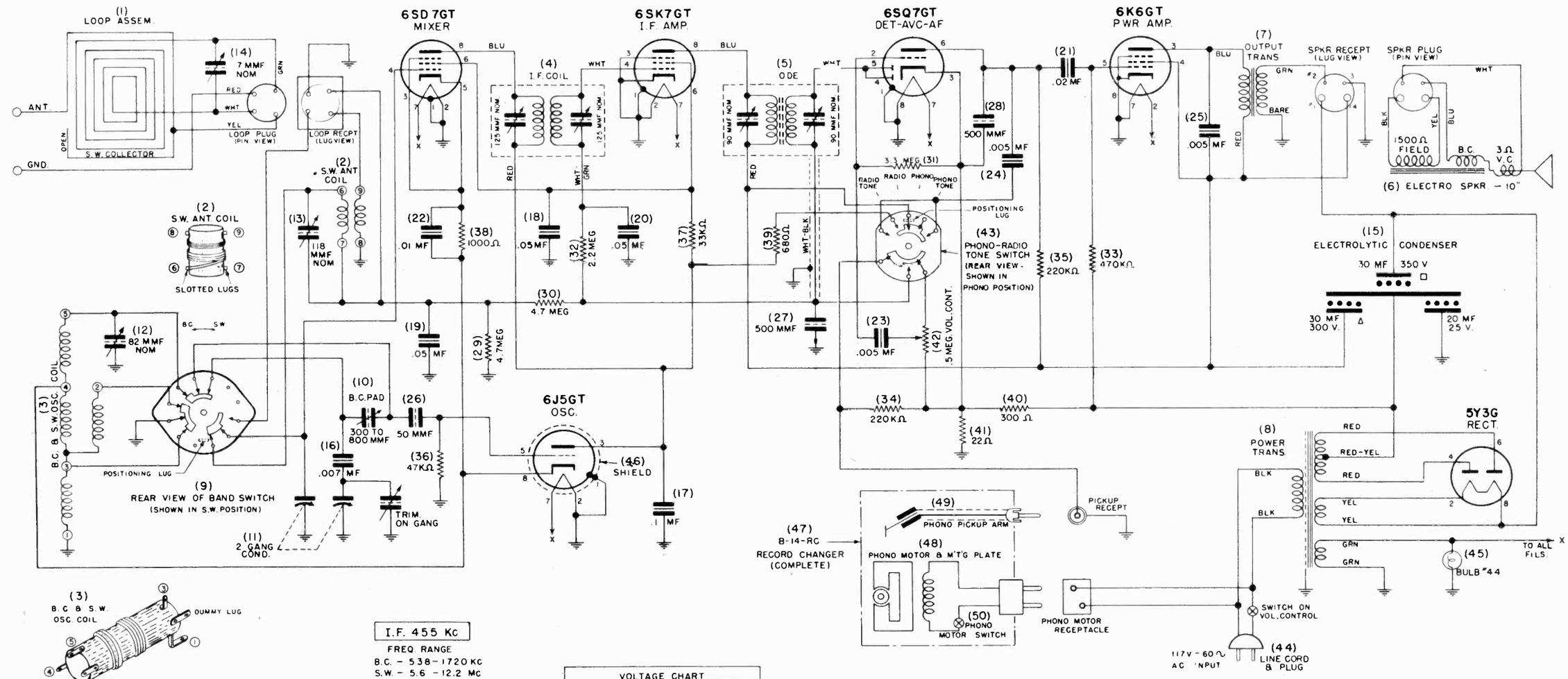
AVERAGE MICROVOLT INPUT	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READING**
4750	455 K.C.	I.F. Grid	.1 Mfd.	.5 Meg.	.38
110	455 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	.38
55	600 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	.38
7	600 K.C.	R.F. Grid	.1 Mfd.	.5 Meg.	.38
6	600 K.C.	Ant. Terminal	200 Mmfd.	None	.38

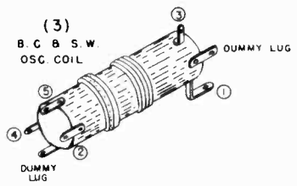
Volume Control Set at Maximum

* *1 Watt=.38 Volts*

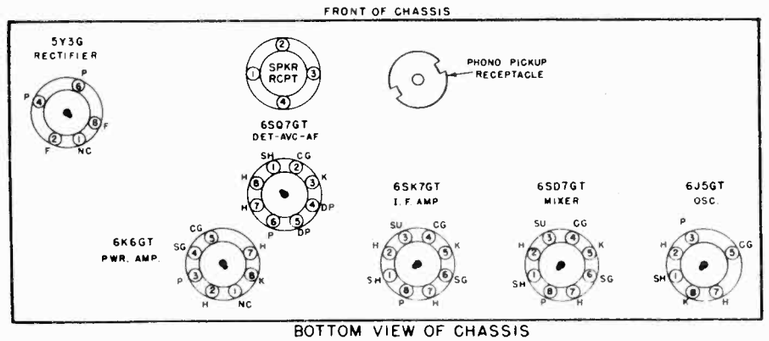
** *Output meter connected across voice coil.*

GALVIN MFG. CO.





I.F. 455 Kc
FREQ. RANGE
B.C. - 538 - 1720 KC
S.W. - 5.6 - 12.2 Mc



VOLTAGE CHART				
TUBE		PLATE TO GND	SCREEN TO GND	CATH TO GND
6SD7GT	MIXER	185 V.	80 V.	3 V.
6SK7GT	I.F. AMP.	200 V.	80 V.	0
6SQ7GT	DET-AVC-AF	65 V.	—	-1.5 V.
*6K6GT	PWR. AMP.	190 V.	200 V.	0
6J5GT	OSC.	185 V.	—	0
5Y3G	RECT.	A.C.	—	290 V. FROM FIL.

*BIAS MEASURED FROM B- TO CHASSIS = 16.5 VOLTS

ALL MEASUREMENTS MADE WITH A 1000 OHMS PER VOLT VOLTMETER

VOLTAGES MEASURED WITH PHONO-RADIO-TONE SWITCH IN PHONO POSITION.

117 VOLT A.C. LINE INPUT

MAX. POWER OUTPUT - 3.5 WATTS

Motorola
MODEL
61 F 21

H-185

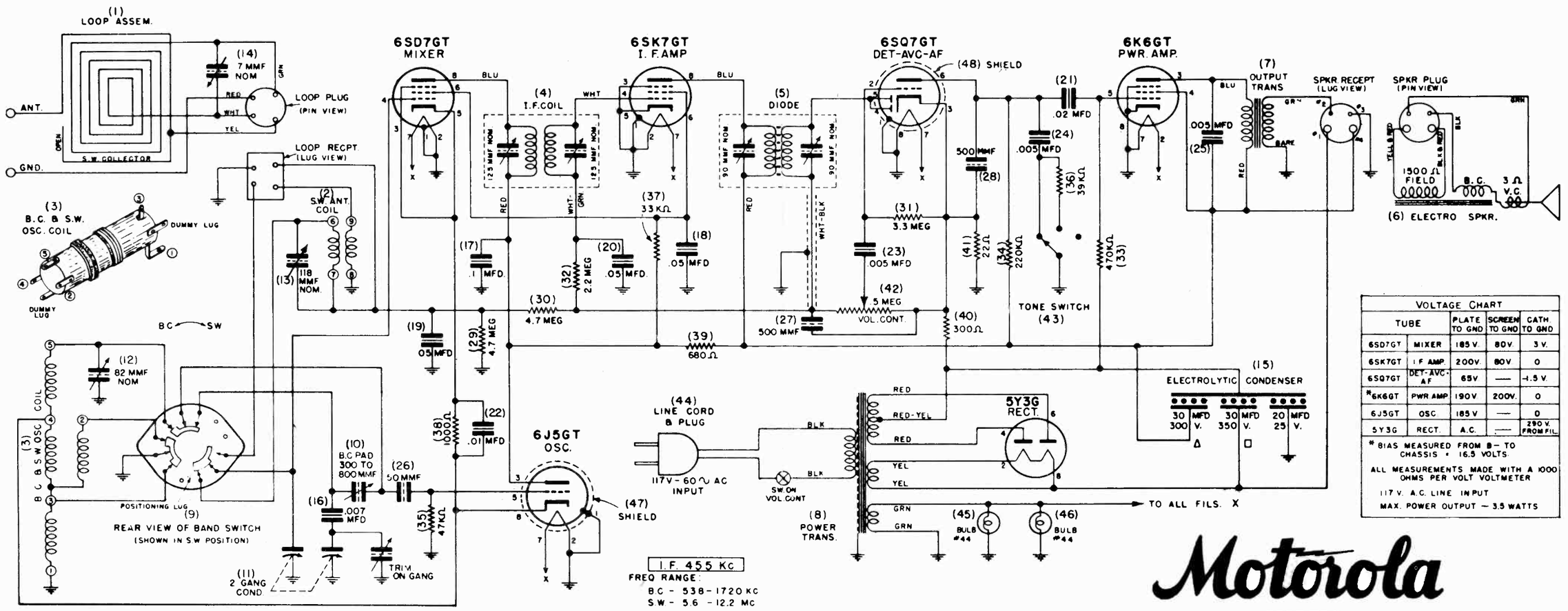
MODEL 61F21 SCHEMATIC DIAGRAM PARTS LIST

DIAG. NO.	PART NO.	DESCRIPTION
1	1X28191	BACK & LOOP ASSEMBLY
2	21A27296	SHORT WAVE ANTENNA COIL
3	21A27297	B.C. & S.W. OSCILLATOR COIL
4	1X28090	I.F. COIL & SHIELD ASSEMBLY
5	1X28038	DIODE COIL & SHIELD ASSEMBLY
6	50B27374	SPEAKER (10" ELECTRO)
7	25A21175	OUTPUT TRANSFORMER
8	25R21218	POWER TRANSFORMER
9	40A28044	BAND SWITCH (2 POSITION)
10	20A17935	B.C. PADDER (RANGE 300 MMF TO 800 MMF)
11	1X28096	GANG & PULLEY ASSEMBLY (2 GANG)
12	21A27273	TRIMMER A "Z" BRACKET (82 MMF NOM)
13	20K27326	TRIMMER A "Z" BRACKET (118 MMF NOM)
14	20A16710	TRIMMER & "U" BRACKET (7 MMF NOM)
15	23A27716	ELECT. COND. (30 MFD/350W.V.-30 MFD/300W.V.) (20 MFD/25W.V.)
16	1A27296	POLYSTYRENE TUN. COND. (.007 MFD-5%-1009.V.)
17	859807	TUBULAR CONDENSER (.1 MFD-400W.V.)
18	859816	TUBULAR CONDENSER (.05 MFD-400W.V.)
19	859805	TUBULAR CONDENSER (.05 MFD-100W.V.)
20	859805	TUBULAR CONDENSER (.05 MFD-100W.V.)
21	859802	TUBULAR CONDENSER (.02 MFD-400. .V.)
22	859801	TUBULAR CONDENSER (.01 MFD-100W.V.)
23	859813	TUBULAR CONDENSER (.005 MFD-600W.V.)
24	859813	TUBULAR CONDENSER (.005 MFD-600W.V.)
25	859813	TUBULAR CONDENSER (.005 MFD-600W.V.)
26	21B6503	MOLDED MICA COND. (50 MMF-20%-400W.V.) BRN "0"
27	21B6500	MOLDED MICA COND. (500 MMF-20%-400W.V.) BRN "0"
28	21B6500	MOLDED MICA COND. (500 MMF-20%-400W.V.) BRN "0"

DIAG. NO.	PART NO.	DESCRIPTION
29	6B6368	CARBON RESISTOR (4.7 MEG-1/2WATT-20%) INS.
30	6B6368	CARBON RESISTOR (4.7 MEG-1/2WATT-20%) INS.
31	6B6201	CARBON RESISTOR (3.3 MEG-1/2WATT-20%) INS.
32	6B6202	CARBON RESISTOR (2.2 MEG-1/2WATT-20%) INS.
33	6B6160	CARBON RESISTOR (470,0009-1/2WATT-20%) INS.
34	6B6149	CARBON RESISTOR (220,0009-1/2WATT-10%) INS.
35	6B6204	CARBON RESISTOR (220,0009-1/2WATT-20%) INS.
36	6B6321	CARBON RESISTOR (47,0009-1/2WATT-20%) INS.
37	6B6398	CARBON RESISTOR (33,0009-1/2WATT-10%) INS.
38	6B6472	CARBON RESISTOR (1,0009-1/2WATT-20%) INS.
39	6B6026	CARBON RESISTOR (680Ω-1/2WATT-20%) N.I.
40	6B6187	CARBON RESISTOR (300Ω-1WATT-10%) N.I.
41	6B6474	CARBON RESISTOR (22Ω-1/2WATT-10%) N.I.
42	18K26678	VOLUME CONTROL & SWITCH (.5 MEG)
43	40K28108	PHONO-RADIO & TONE SWITCH
44	50K28159	LINE CORD & PLUG (9 FT.)
45	65X10867	BULB (6.3V-.25A TUB. BAY) CLEAR #44
46	21A14760	BANTAM TUBE SHIELD
47	1K27900	MODEL B-14-RC RECORD CHANGER (COMPLETE)
48	59B27687	PHONO MOTOR & MTG. PLATE (117V-60 CYCLES)
49	59K28740	PHONO PICKUP ARM (COMPLETE)
50	40A27465	SLIDER SWITCH & SHELL (PHONO MOTOR ON-OFF)

MODEL 61T21

GALVIN MFG. CO.



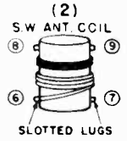
VOLTAGE CHART				
TUBE		PLATE TO GND	SCREEN TO GND	CATH TO GND
6SD7GT	MIXER	185 V.	80 V.	3 V.
6SK7GT	I.F. AMP.	200 V.	80 V.	0
6SQ7GT	DET-AVC-AF	65 V.	—	-1.5 V.
*6K6GT	PWR AMP	190 V.	200 V.	0
6J5GT	OSC.	185 V.	—	0
5Y3G	RECT.	A.C.	—	290 V. FROM FIL.

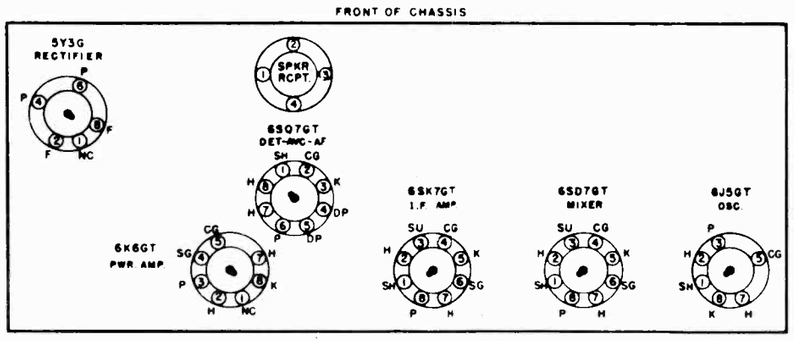
* BIAS MEASURED FROM B- TO CHASSIS = 16.5 VOLTS.

ALL MEASUREMENTS MADE WITH A 1000 OHMS PER VOLT VOLTMETER

117 V. A.C. LINE INPUT

MAX. POWER OUTPUT — 3.5 WATTS





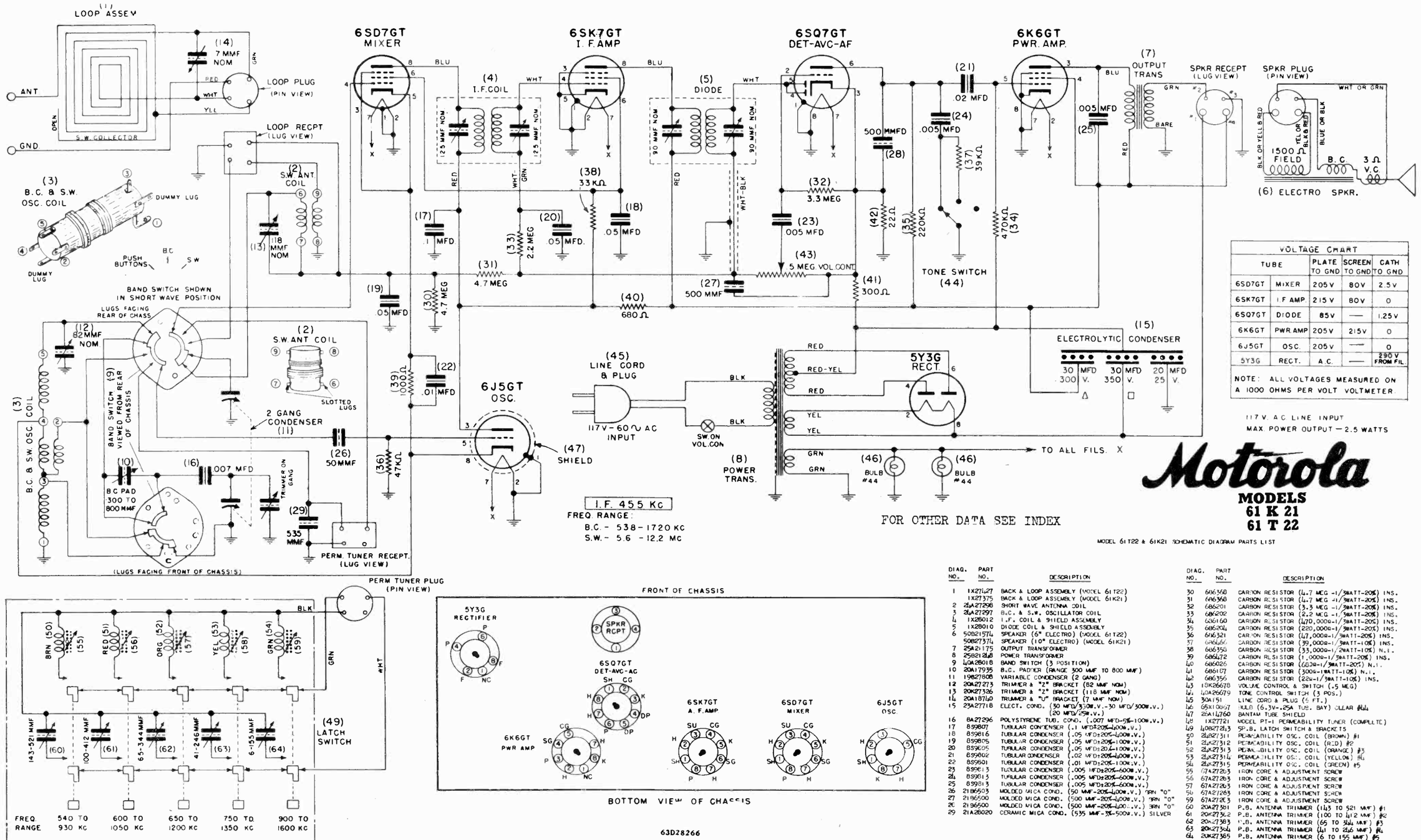
Motorola

MODELS
61 T 21

MODEL 61T21 SCHEMATIC DIAGRAM PARTS LIST

DIAG. NO.	PART NO.	DESCRIPTION
1	1X27482	BACK & LOOP ASSEMBLY
2	21A27298	SHORT WAVE ANTENNA COIL
3	21A27297	B.C. & S.W. OSCILLATOR COIL
4	1X28012	I.F. COIL & SHIELD ASSEMBLY
5	1X28010	DIODE COIL & SHIELD ASSEMBLY
6	50821574	SPEAKER (6" ELECTRO)
7	25A21175	OUTPUT TRANSFORMER
8	25B21248	POWER TRANSFORMER
9	40A28041	BAND SWITCH (2 POSITION)
10	20A17935	B.C. PADDER (RANGE 300 MMF TO 800 MMF)
11	19B27806	VARIABLE CONDENSER (2 GANG)
12	20A27273	TRIMMER & "Z" BRACKET (82 MMF NOM)
13	20K27325	TRIMMER & "Z" BRACKET (118 MMF NOM)
14	20A18760	TRIMMER & "U" BRACKET (7 MMF NOM)
15	23A27718	ELECT. COND. (30 MFD/350#.V.-30 MFD/300#.V.) (20 MFD/25#.V.)
16	8A27296	POLYSTYRENE TUB. COND. (.007 MFD-9%-100#.V.)
17	859807	TUBULAR CONDENSER (.1 MFD-400#.V.)
18	859816	TUBULAR CONDENSER (.05 MFD-400#.V.)
19	859805	TUBULAR CONDENSER (.05 MFD-100#.V.)
20	859605	TUBULAR CONDENSER (.05 MFD-100#.V.)
21	859802	TUBULAR CONDENSER (.02 MFD-400#.V.)
22	859801	TUBULAR CONDENSER (.01 MFD-100#.V.)
23	859813	TUBULAR CONDENSER (.005 MFD-600#.V.)
24	859813	TUBULAR CONDENSER (.005 MFD-600#.V.)
25	859813	TUBULAR CONDENSER (.005 MFD-600#.V.)
26	2186503	MOLDED MICA COND. (50 MMF-20%-400#.V.) BRN "0"
27	2186500	MOLDED MICA COND. (500 MMF-20%-400#.V.) BRN "0"
28	2136500	MOLDED MICA COND. (500 MMF-20%-400#.V.) BRN "0"
29	686368	CARBON RESISTOR (4.7 MEG-1/2WATT-20%) INS.
30	686368	CARBON RESISTOR (4.7 MEG-1/2WATT-20%) INS.
31	686201	CARBON RESISTOR (3.3 MEG-1/2WATT-20%) INS.
32	686282	CARBON RESISTOR (2.2 MEG-1/2WATT-20%) INS.
33	686160	CARBON RESISTOR (470,000Ω-1/2WATT-20%) INS.
34	686224	CARBON RESISTOR (220,000Ω-1/2WATT-20%) INS.
35	686321	CARBON RESISTOR (47,000Ω-1/2WATT-20%) INS.
36	686466	CARBON RESISTOR (39,000Ω-1/2WATT-10%) INS.
37	686358	CARBON RESISTOR (33,000Ω-1/2WATT-10%) INS.
38	686172	CARBON RESISTOR (1,000Ω-1/2WATT-20%) INS.
39	686026	CARBON RESISTOR (680Ω-1/2WATT-20%) N.I.
40	686187	CARBON RESISTOR (300Ω-1WATT-10%) N.I.
41	686356	CARBON RESISTOR (220Ω-1/2WATT-10%) INS.
42	18K26578	VOLUME CONTROL & SWITCH (.5 MEG)
43	40A26679	TONE CONTROL SWITCH (3 POS.)
44	30A151	LINE CORD & PLUG (6 FT.)
45	65X10867	BULB (6.3V-.25A TUB. BAY) CLEAR
46	65X10867	BULB (6.3V-.25A TUB. BAY) CLEAR
47	26A14760	BANTAM TUBE SHIELD
48	26A14760	BANTAM TUBE SHIELD

GALVIN MFG. CO.



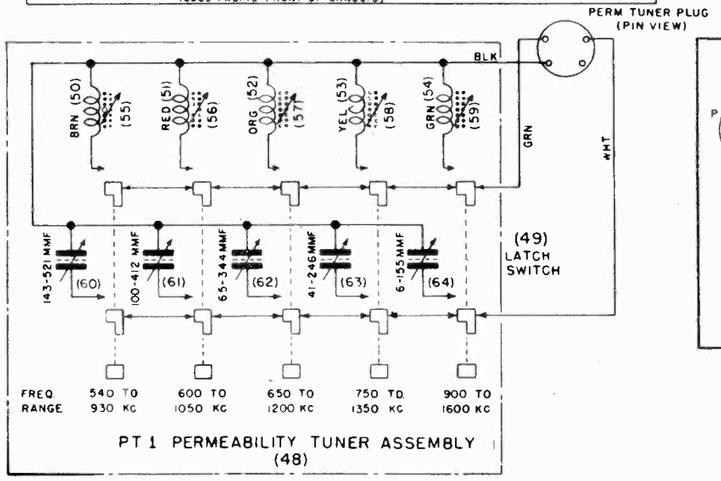
VOLTAGE CHART				
TUBE		PLATE TO GND	SCREEN TO GND	CATH TO GND
6SD7GT	MIXER	205 V	80 V	2.5 V
6SK7GT	I.F. AMP.	215 V	80 V	0
6SQ7GT	DIODE	85 V	—	1.25 V
6K6GT	PWR. AMP	205 V	215 V	0
6J5GT	OSC.	205 V	—	0
5Y3G	RECT.	A.C.	—	280 V FROM FIL.

NOTE: ALL VOLTAGES MEASURED ON A 1000 OHMS PER VOLT VOLTMETER.

117 V. A.C. LINE INPUT
MAX. POWER OUTPUT — 2.5 WATTS

Motorola

MODELS
61 K 21
61 T 22



63D28266

DIAG. NO.	PART NO.	DESCRIPTION
1	1X27127	BACK & LOOP ASSEMBLY (MODEL 61T22)
	1X27375	BACK & LOOP ASSEMBLY (MODEL 61K21)
2	21A27268	SHORT WAVE ANTENNA COIL
3	21A27297	B.C. & S.W. OSCILLATOR COIL
4	1X28012	I.F. COIL & SHIELD ASSEMBLY
5	1X28010	DIODE COIL & SHIELD ASSEMBLY
6	50B21574	SPEAKER (6" ELECTRO) (MODEL 61T22)
	50B27374	SPEAKER (10" ELECTRO) (MODEL 61K21)
7	25A21175	OUTPUT TRANSFORMER
8	25B21248	POWER TRANSFORMER
9	40A28018	BAND SWITCH (3 POSITION)
10	20A17935	B.C. PADDER (RANGE 300 MMF TO 800 MMF)
11	19B27808	VARIABLE CONDENSER (2 GANG)
12	20A27273	TRIMMER & "Z" BRACKET (82 MMF NOM)
13	20K27326	TRIMMER & "Z" BRACKET (18 MMF NOM)
14	20A18740	TRIMMER & "U" BRACKET (7 MMF NOM)
15	23A27718	ELECT. COND. (30 MFD/330W.V.-30 MFD/300W.V.) (20 MFD/25W.V.)
16	8A27296	POLYSTYRENE TUB. COND. (.007 MFD-5%-100W.V.)
17	859807	TUBULAR CONDENSER (.1 MFD±20%-400W.V.)
18	859816	TUBULAR CONDENSER (.05 MFD±20%-400W.V.)
19	859805	TUBULAR CONDENSER (.05 MFD±20%-100W.V.)
20	859805	TUBULAR CONDENSER (.05 MFD±20%-100W.V.)
21	859802	TUBULAR CONDENSER (.02 MFD±20%-400W.V.)
22	859801	TUBULAR CONDENSER (.01 MFD±20%-100W.V.)
23	859813	TUBULAR CONDENSER (.005 MFD±20%-600W.V.)
24	859813	TUBULAR CONDENSER (.005 MFD±20%-600W.V.)
25	859813	TUBULAR CONDENSER (.005 MFD±20%-600W.V.)
26	21B6503	MOLDED MICA COND. (50 MMF-20%-400W.V.) 3RN "O"
27	21B6500	MOLDED MICA COND. (500 MMF-20%-400W.V.) 3RN "O"
28	21B6500	MOLDED MICA COND. (500 MMF-20%-400W.V.) 3RN "O"
29	21A28020	CERAMIC MICA COND. (535 MMF-3%-500W.V.) SILVER

DIAG. NO.	PART NO.	DESCRIPTION
30	6A6368	CARBON RESISTOR (4.7 MEG +1/2WATT-20%) INS.
31	6A6368	CARBON RESISTOR (4.7 MEG +1/2WATT-20%) INS.
32	6A6201	CARBON RESISTOR (3.3 MEG +1/2WATT-20%) INS.
33	6A6202	CARBON RESISTOR (2.2 MEG +1/2WATT-20%) INS.
34	6A6160	CARBON RESISTOR (470,000Ω+1/2WATT-20%) INS.
35	6A6204	CARBON RESISTOR (220,000Ω+1/2WATT-20%) INS.
36	6A6321	CARBON RESISTOR (47,000Ω+1/2WATT-20%) INS.
37	6A6166	CARBON RESISTOR (39,000Ω+1/2WATT-10%) INS.
38	6A6356	CARBON RESISTOR (33,000Ω+1/2WATT-10%) N.I.
39	6A6472	CARBON RESISTOR (1,000Ω+1/2WATT-20%) INS.
40	6A6026	CARBON RESISTOR (680Ω+1/2WATT-20%) N.I.
41	6A6107	CARBON RESISTOR (300Ω+1WATT-10%) N.I.
42	6A6356	CARBON RESISTOR (22Ω+1/2WATT-10%) INS.
43	13K26678	VOLUME CONTROL & SWITCH (.5 MEG)
44	40A26079	TONE CONTROL SWITCH (3 POS.)
45	30A151	LINE CORD & PLUG (6 FT.)
46	6SK10097	HOLD (6.3V-.25A TUB. BAY) OLEAR #44
47	26A11760	BANTAM TUBE SHIELD
48	1X27721	MODEL PT-1 PERMEABILITY TUNER (COMPLETE)
49	40B27213	SP.B. LATCH SWITCH & BRACKETS
50	21A27311	PERMEABILITY OSC. COIL (BROWN) #1
51	21A27312	PERMEABILITY OSC. COIL (RED) #2
52	21A27313	PERMEABILITY OSC. COIL (ORANGE) #3
53	21A27314	PERMEABILITY OSC. COIL (YELLOW) #4
54	21A27315	PERMEABILITY OSC. COIL (GREEN) #5
55	67A27203	IRON CORE & ADJUSTMENT SCREW
56	67A27263	IRON CORE & ADJUSTMENT SCREW
57	67A27263	IRON CORE & ADJUSTMENT SCREW
58	67A27263	IRON CORE & ADJUSTMENT SCREW
59	67A27213	IRON CORE & ADJUSTMENT SCREW
60	20A27381	P.B. ANTENNA TRIMMER (143 TO 521 MMF) #1
61	20K27362	P.B. ANTENNA TRIMMER (100 TO 412 MMF) #2
62	20K27383	P.B. ANTENNA TRIMMER (65 TO 344 MMF) #3
63	20K27364	P.B. ANTENNA TRIMMER (41 TO 246 MMF) #4
64	20K27365	P.B. ANTENNA TRIMMER (6 TO 155 MMF) #5

MODEL 61T22 & 61K21 SCHEMATIC DIAGRAM PARTS LIST

MODELS 61K21, 61T22
MODELS 62L11, 62L12

GALVIN MFG. CO.

MODELS
61 K 21
61 T 22

ALIGNMENT CHART

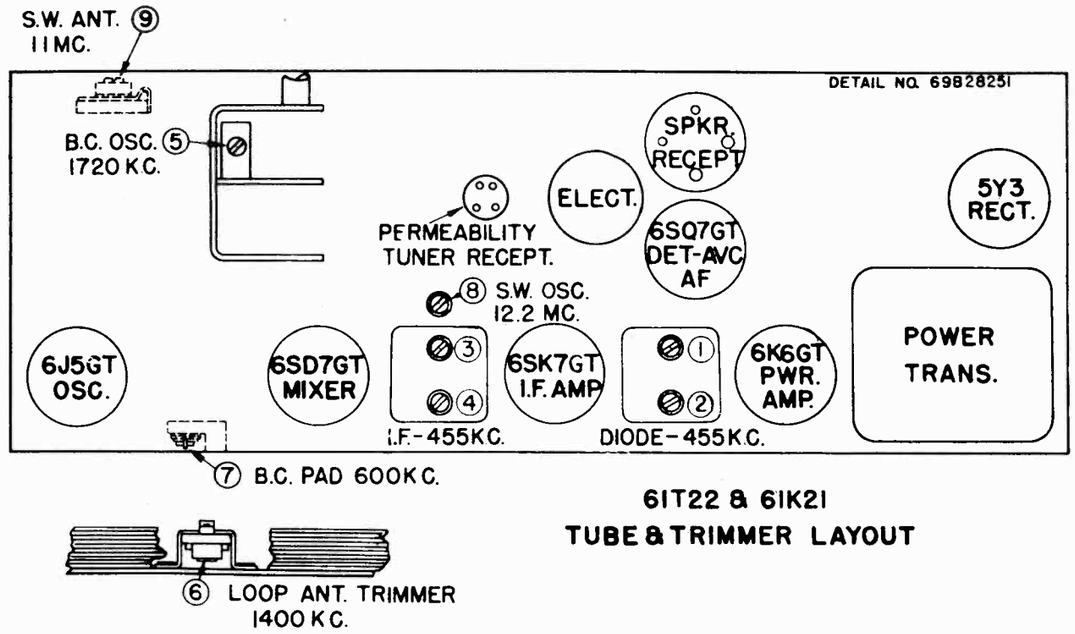
Operations In Order	Gang Condenser Set At	Dummy Antenna	Band Switch Set At	Generator Connected To	Adjust Trimmers No.	Generator Set At
1	1720 K.C.	.1 Mfd.	B.C.	Osc.Mod.Grid	1-2-3-4	455 K.C.
2	1720 K.C.	200 Mmf	B.C.	Ext.Ant. Connection	5	1720 K.C.
3	1400 K.C.	200 Mmf	B.C.	Ext.Ant. Connection	6	1400 K.C.
4	600 K.C.	200 Mmf	B.C.	Ext.Ant. Connection	7	600 K.C.
5	12.2 M.C.	400 Ohms	S.W.	S.W.Collector	8	12.2 M.C.
6	11 M.C.	400 Ohms	S.W.	S.W.Collector	9	11 M.C.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

Average Microvolt Input *	Generator Set At	Generator Feeder Connected To	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
2100	455 K.C.	I.F. Grid	.1 Mmf.	.5 Meg.	.38
10	455 K.C.	Mod. Grid	.1 Mmf.	.5 Meg.	.38
12	600 K.C.	Mod. Grid	.1 Mmf.	.5 Meg.	.38
11	600 K.C.	Ant.Terminal	200 Mmf.	None	.38

Volume Control Set at Maximum
* .05 Watts .38 Volts
Master Switch at B.C. Position

Tone Control Set at High Position.
** Output Meter Connected Across Voice Coil.



6IT22 & 6IK21
TUBE & TRIMMER LAYOUT

MODELS
62L11
62L12

ALIGNMENT CHART

OPERATIONS IN ORDER	GANG CONDENSER SET AT	DUMMY ANTENNA	GENERATOR CONNECTED TO	ADJUST TRIMMERS NO.	GENERATOR SET AT
1	Minimum	.1 Mfd.	Osc.-Mod. Grid	1-2-3-4	455 K.C.
2	Minimum *	.1 Mfd.	RF Grid	5	1600 K.C.
3	1400 K.C.	.1 Mfd.	RF Grid	6	1400 K.C.
4	600 K.C.	.1 Mfd.	RF Grid	7 **	600 K.C.
5	1400 K.C.	None	***	8	1400 K.C.
6	Repeat above steps for maximum accuracy.				

* *Adjust pointer to zero.*

** *Rock condenser until greatest output is obtained.*

*** *Connect output of signal generator to a 5' diameter 3 turn loop. With volume on full and output meter connected across voice coil bring loop close enough to receiver loop (receiver loop should be in front up position) until an output of 50 Milliwatts is obtained. 50 Milliwatts = .38 Volts on output meter.*

Vary distance between generator and receiver loop to maintain this output during alignment.

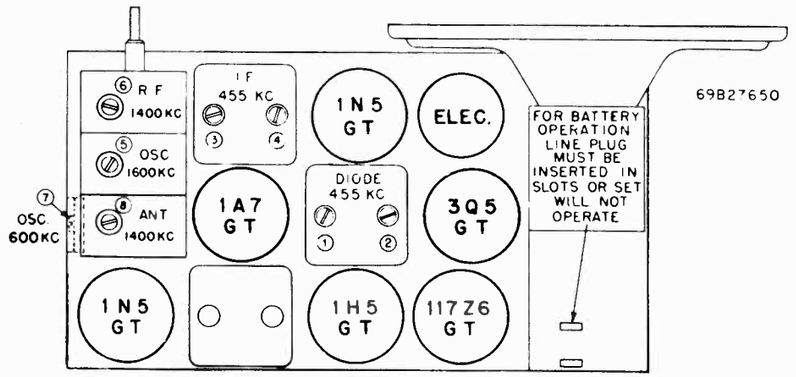
NOTE: *Trimmer No. 8 is adjusted with chassis in cabinet.*

SENSITIVITY AND STAGE GAIN MEASUREMENTS

AVERAGE MICROVOLT INPUT *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READING **
5500	455	IF Grid	.1 Mfd.	.5 Meg.	.38
105	455	Mod. Grid	.1 Mfd.	.5 Meg.	.38
110	600	Mod. Grid	.1 Mfd.	.5 Meg.	.38
6	600	RF Grid	.1 Mfd.	None	.38

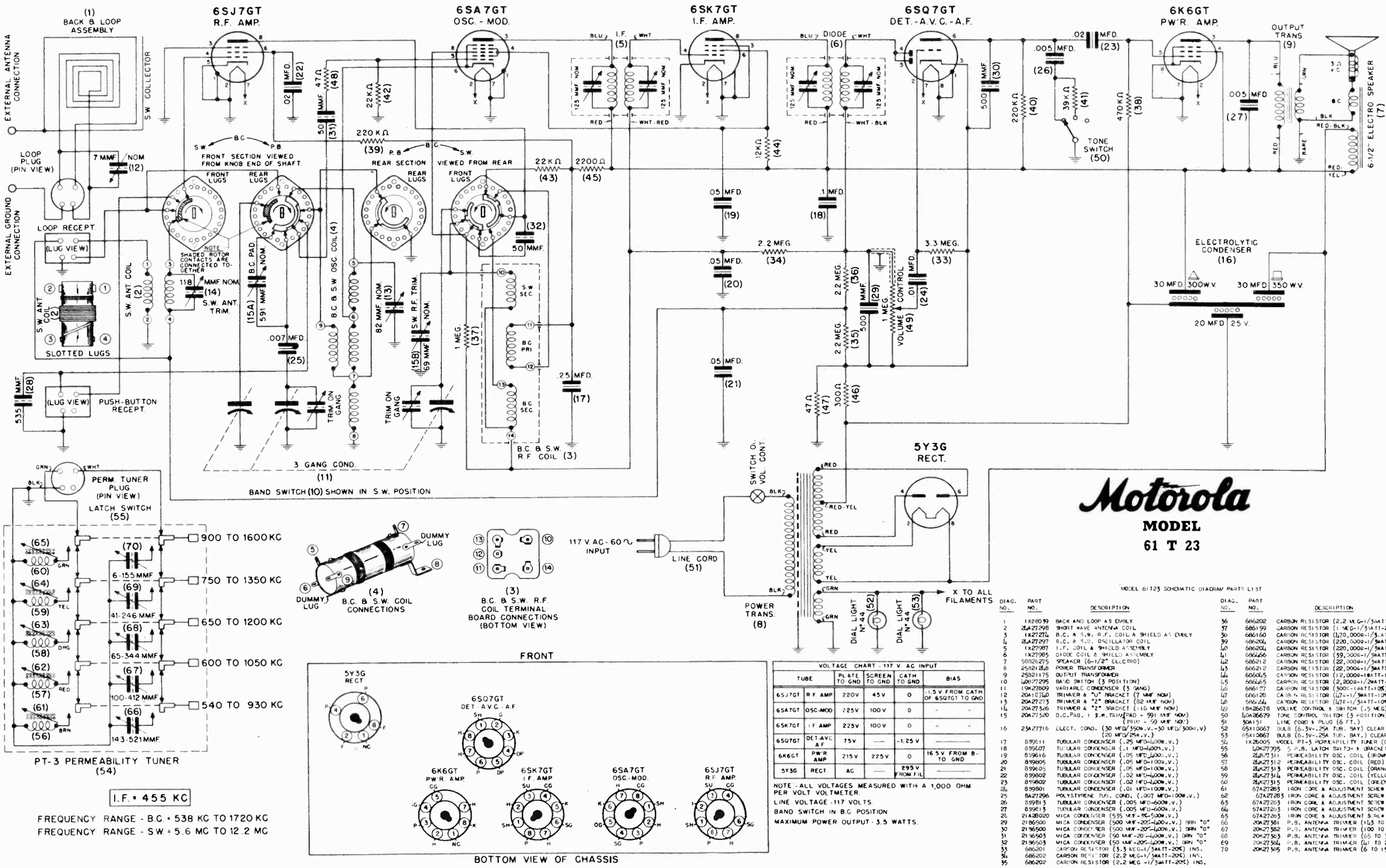
Volume Control Set at Maximum
* .05 Watts = 38 Volts

** *Output meter connected across voice coil.*



MODEL 61T23

GALVIN MFG. CO.



VOLTAGE CHART - 117 V. AC INPUT					
TUBE		PLATE TO GND	SCREEN TO GND	CATH TO GND	BIAS
6SJ7GT	R.F. AMP	220V	45 V	0	-1.5 V FROM CATH OF 6SQ7GT TO GND
6SA7GT	OSC-MOD	225V	100 V	0	" "
6SK7GT	I.F. AMP	225V	100 V	0	" "
6SQ7GT	DET-AVC A.F	75V	—	-1.25 V	—
6K6GT	PW'R AMP	215 V	225 V	0	16.5 V FROM B- TO GND
5Y3G	RECT	AC	—	295 V FROM FIL	—

NOTE - ALL VOLTAGES MEASURED WITH A 1,000 OHM PER VOLT VOLTMETER.
LINE VOLTAGE - 117 VOLTS.
BAND SWITCH IN B.C. POSITION
MAXIMUM POWER OUTPUT - 3.5 WATTS.

Motorola

MODEL

61 T 23

MODEL 61T23 SCHEMATIC DIAGRAM PARTS LIST

DIAG. NO.	PART NO.	DESCRIPTION
1	1X28099	BACK AND LOOP ASSEMBLY
2	2UA27298	SHORT WAVE ANTENNA COIL
3	1X27274	B.C. & S.W. R.F. COILS & SHIELD ASSEMBLY
4	2UA27297	B.C. & S.W. OSCILLATOR COILS
5	1X27987	I.F. COILS & SHIELD ASSEMBLY
6	1X27985	DIODE COILS & SHIELD ASSEMBLY
7	50B26275	SPEAKER (6-1/2" ELECTRO)
8	25B21286	POWER TRANSFORMER
9	25B21175	OUTPUT TRANSFORMER
10	40B27295	BAND SWITCH (3 POSITION)
11	19K27809	VARIABLE CONDENSER (3 GANG)
12	20A18760	TRIMMER & "U" BRACKET (7 MMF NOM)
13	20A27273	TRIMMER & "Z" BRACKET (82 MMF NOM)
14	20A27326	TRIMMER & "Z" BRACKET (115 MMF NOM)
15	20A27320	B.C. PAD. & S.W. TRIM (PAD - 591 MMF NOM) (TRIM - 69 MMF NOM)
16	23A27716	ELECT. COND. (30 MFD/350W.V.-30 MFD/300W.V) (20 MFD/25W.V.)
17	859811	TUBULAR CONDENSER (.25 MFD-400W.V.)
18	859407	TUBULAR CONDENSER (.1 MFD-600W.V.)
19	859616	TUBULAR CONDENSER (.05 MFD-400W.V.)
20	859805	TUBULAR CONDENSER (.05 MFD-400W.V.)
21	859605	TUBULAR CONDENSER (.05 MFD-400W.V.)
22	859802	TUBULAR CONDENSER (.02 MFD-400W.V.)
23	859802	TUBULAR CONDENSER (.02 MFD-400W.V.)
24	859801	TUBULAR CONDENSER (.01 MFD-400W.V.)
25	BA27296	POLYSTYRENE TUB. COND. (.007 MFD-100W.V.)
26	859813	TUBULAR CONDENSER (.005 MFD-600W.V.)
27	859815	TUBULAR CONDENSER (.005 MFD-400W.V.)
28	21A28020	MICA CONDENSER (535 MMF-5%-500W.V.)
29	21B6500	MICA CONDENSER (500 MMF-20%-400W.V.) BRN "0"
30	21B6500	MICA CONDENSER (500 MMF-20%-400W.V.) BRN "0"
31	21B6503	MICA CONDENSER (50 MMF-20%-400W.V.) GRN "0"
32	21B6503	MICA CONDENSER (50 MMF-20%-400W.V.) GRN "0"
33	686201	CARBON RESISTOR (3.3 MEG-1/3WATT-20%) INS.
34	686202	CARBON RESISTOR (2.2 MEG-1/3WATT-20%) INS.
35	686202	CARBON RESISTOR (2.2 MEG -1/3WATT-20%) INS.
36	686202	CARBON RESISTOR (2.2 MEG-1/3WATT-20%) INS.
37	686159	CARBON RESISTOR (1 MEG-1/3WATT-20%) INS.
38	686160	CARBON RESISTOR (470,000Ω-1/3WATT-20%) INS.
39	686204	CARBON RESISTOR (220,000Ω-1/3WATT-20%) INS.
40	686204	CARBON RESISTOR (220,000Ω-1/3WATT-20%) INS.
41	686656	CARBON RESISTOR (39,000Ω-1/3WATT-10%) INS.
42	686212	CARBON RESISTOR (22,000Ω-1/3WATT-20%) INS.
43	686212	CARBON RESISTOR (22,000Ω-1/3WATT-20%) INS.
44	6656L5	CARBON RESISTOR (12,000Ω-1WATT-10%) N.I.
45	6656L5	CARBON RESISTOR (2,200Ω-1/2WATT-20%) N.I.
46	686127	CARBON RESISTOR (300Ω-1WATT-10%) N.I.
47	686128	CARBON RESISTOR (47Ω-1/3WATT-10%) N.I.
48	686126	CARBON RESISTOR (47Ω-1/3WATT-10%) INS.
49	1BA26678	VOLUME CONTROL & SWITCH (.5 MEG)
50	40A26679	TONE CONTROL SWITCH (3 POSITION)
51	30A4151	LINE CORD & PLUG (6 FT.)
52	65X10867	BULB (6.3V-.25A TUB. BAY) CLEAR #44
53	65X10867	BULB (6.3V-.25A TUB. BAY.) CLEAR #44
54	1X26005	MODEL PT-3 PERMEABILITY TUNER (COMPLETE)
55	40K27295	S.P.S.B. LATCH SWITCH BRACKETS
56	2UA27311	PERMEABILITY OSC. COIL (BROWN) #1
57	2UA27312	PERMEABILITY OSC. COIL (RED) #2
58	2UA27313	PERMEABILITY OSC. COIL (ORANGE) #3
59	2UA27314	PERMEABILITY OSC. COIL (YELLOW) #4
60	2UA27315	PERMEABILITY OSC. COIL (GREEN) #5
61	67A27283	IRON CORE & ADJUSTMENT SCREW
62	67A27283	IRON CORE & ADJUSTMENT SCREW
63	67A27203	IRON CORE & ADJUSTMENT SCREW
64	67A27203	IRON CORE & ADJUSTMENT SCREW
65	67A27203	IRON CORE & ADJUSTMENT SCREW
66	20A27381	P.B. ANTENNA TRIMMER (143 TO 521 MMF) #1
67	20K27382	P.B. ANTENNA TRIMMER (100 TO 412 MMF) #2
68	20K27383	P.B. ANTENNA TRIMMER (65 TO 344 MMF) #3
69	20K27384	P.B. ANTENNA TRIMMER (41 TO 246 MMF) #4
70	20K27385	P.B. ANTENNA TRIMMER (6 TO 155 MMF) #5

MODEL 61T23
MODEL 81F21

GALVIN MFG. CO.

MODEL 81 F 21

ALIGNMENT CHART

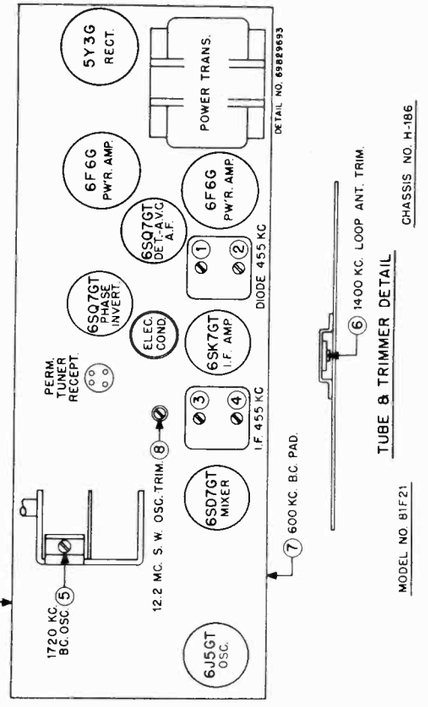
Operations In Order	Gang Condenser Set At	Dummy Antenna	Band Switch Set At	Generator Connected To	Adjust Trimmers No.	Generator Set At
1	1720 K.C.	.1 Mfd.	B.C.	Mixer Grid	1-2-3-4	455 K.C.
2	1720 K.C.	200 Mmf.	B.C.	Ext.Ant. Connection	5	1720 K.C.
3	1400 K.C.	200 Mmf.	B.C	Ext.Ant. Connection	6	1400 K.C.
4	1400 K.C.	200 Mmf.	B.C.	Ext.Ant. Connection	7	1400 K.C.
5	600 K.C.	200 Mmf.	B.C.	Ext.Ant. Connection	8	600 K.C.
5	12.2 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	9	12.2 M.C.
7	11.0 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	10	11.0 M.C.
8	11.0 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	11	11.0 M.C.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

Average Microvolt Input *	Generator Set At	Generator Feeder Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
1900	455 K.C.	I.F. Grid	.1	.5 Meg.	.38
6	455 K.C.	Mixer Grid	.1	.5 Meg.	.38
8	600 K.C.	Mixer Grid	.1	.5 Meg.	.38
7	600 K.C.	Ant.Terminal	200 Mmf.	None	.38

Volume Control Set at Maximum
* .05 Watts = .38 Volts

Tone Control Set At High Position.
** Output meter connected across voice coil.



TUBE & TRIMMER DETAIL

CHASSIS NO. H-186

MODEL NO. 81F21

ALIGNMENT CHART
Model 61T23

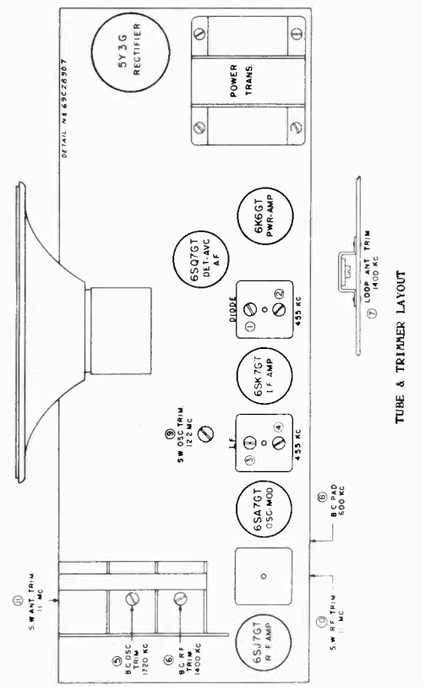
Operations In Order	Gang Condenser Set At	Dummy Antenna	Band Switch Set At	Generator Connected To	Adjust Trimmers No.	Generator Set At
1	1720 K.C.	.1 Mfd.	B.C.	Osc.Mod.Grid	1-2-3-4	455 K.C.
2	1720 K.C.	200 Mmf.	B.C.	R.F.Grid	5	1720 K.C.
3	1400 K.C.	200 Mmf.	B.C.	Ext.Ant. Connection	6	1400 K.C.
4	1400 K.C.	200 Mmf.	B.C.	Ext.Ant. Connection	7	1400 K.C.
5	600 K.C.	200 Mmf.	B.C.	Ext.Ant. Connection	8	600 K.C.
5	12.2 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	9	12.2 M.C.
7	11.0 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	10	11.0 M.C.
8	11.0 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	11	11.0 M.C.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

Average Microvolt Input *	Generator Set At	Generator Feeder Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
2500	455 K.C.	I.F. Grid	.1 Mfd	.5 Meg.	.38
55	455 K.C.	Mod. Grid	.1 Mfd	.5 Meg.	.38
8	600 K.C.	Mod. Grid	.1 Mfd	.5 Meg.	.38
6	600 K.C.	R.F. Grid	.1 Mfd	.5 Meg.	.38
4	600 K.C.	Ant.Terminal	200 Mmf	None	.38

Volume Control Set at Maximum
* .05 Watts = .38 Volts

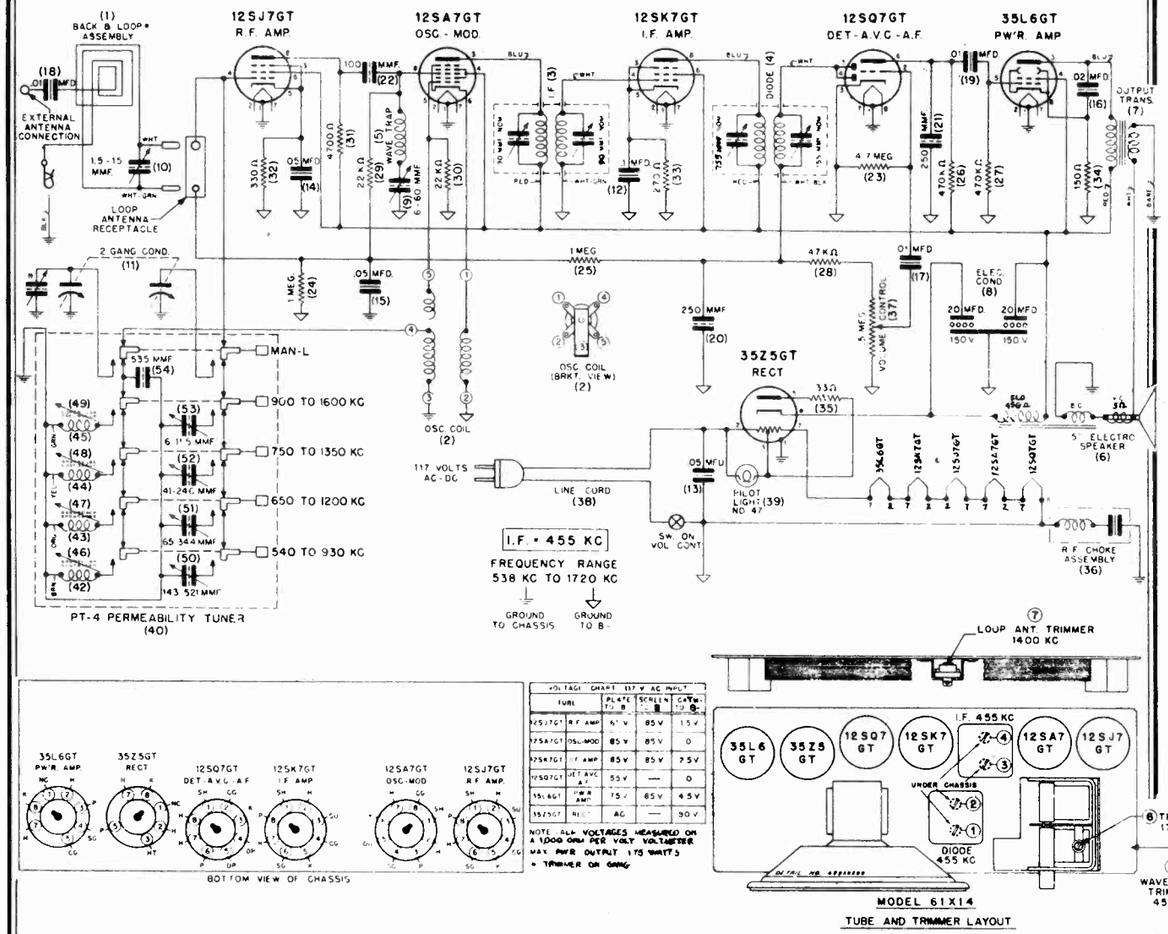
Tone Control Set At High Position.
** Output meter connected across voice coil.



TUBE & TRIMMER LAYOUT

MODEL 61X14

GALVIN MFG. CO.



TUBE	PLATE T2 B	SCREEN T2 B	CATH T2 B
12SJ7GT R.F. AMP	67 V	85 V	1.5 V
12SA7GT OSC-MOD	85 V	85 V	0
12SK7GT I.F. AMP	85 V	85 V	7.5 V
12SQ7GT DET. AVC A.F.	55 V	—	0
35L6GT PWR AMP.	75 V	85 V	4.5 V
35Z5GT RECT.	AC	—	90 V

NOTE: ALL VOLTAGES MEASURED ON A 1000 OHM PER VOLT VOLTMETER
MAX. PWR OUTPUT 1.75 WATTS
* TRIMMER ON GANG

ALIGNMENT CHART

OPERATIONS IN ORDER	GANG CONDENSER SET AT	DUMMY ANTENNA	GENERATOR CONNECTED TO	ADJUST TRIMMERS NO.	GENERATOR SET AT
1	1720 K.C.	.1 Mfd.	Osc. Mod. Grid	1-3-3-4	455 K.C.
2	1720 K.C.	.1 Mfd.	Ant. Terminal	5*	455 K.C.
3	1720 K.C.	200 Mmf.	Ant. Terminal	6	1720 K.C.
4	1400 K.C.	200 Mmf.	Ant. Terminal	7	1400 K.C.

Adjust (wave trap) to minimum reading of output meter – Volume Control set at Maximum.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

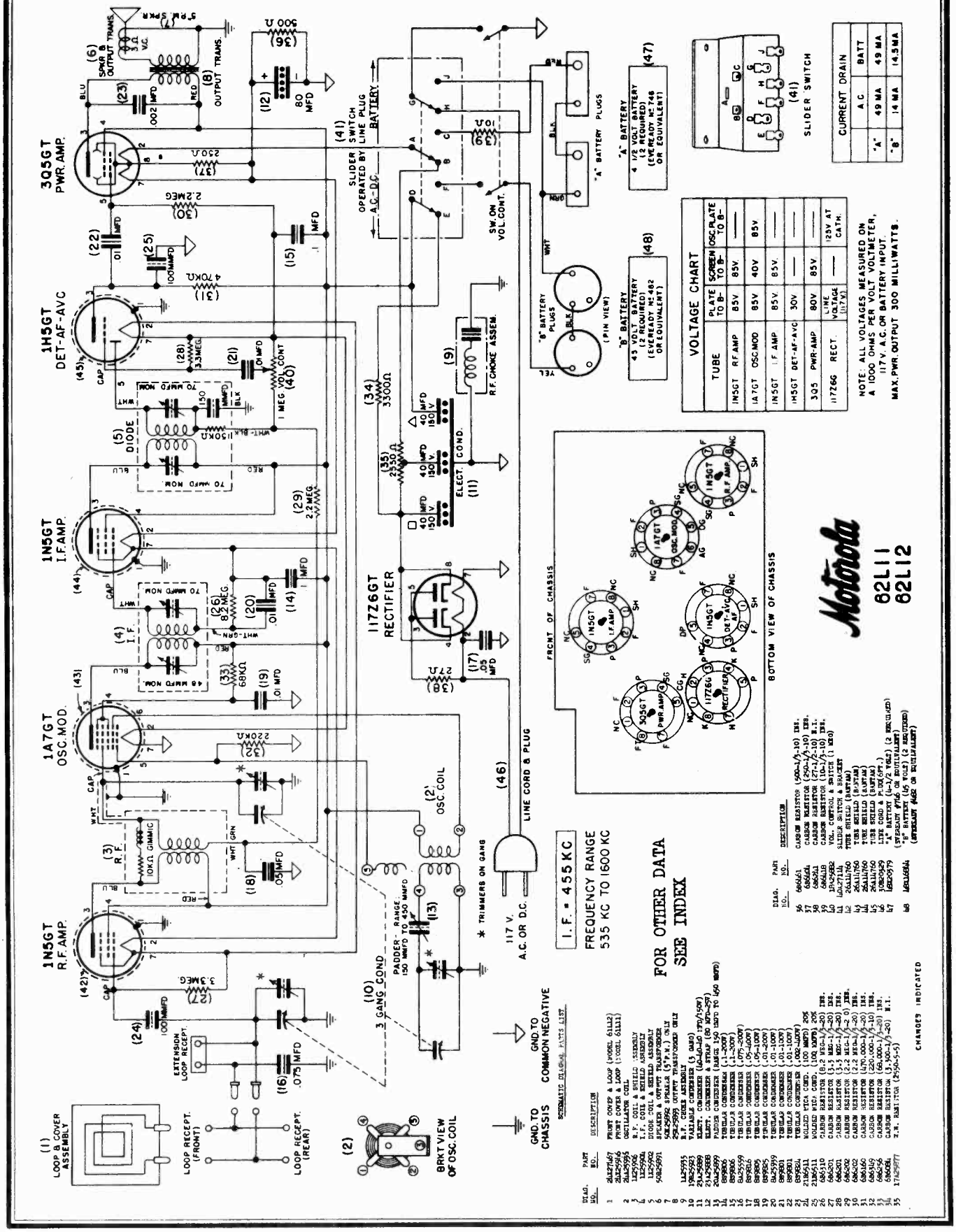
AVERAGE MICROVOLT INPUT *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READING **
4750	455	I.F. Grid	.1 Mfd.	.5 Meg.	.38
55	455	Mod. Grid	.1 Mfd.	.5 Meg.	.38
8	600	Mod. Grid	.1 Mfd.	.5 Meg.	.38
5	600	Ant. Terminal	200 Mmt.	None	.38

Volume Control Set at Maximum
*.05 Watt = .38 Volts

** Output meter connected across voice coil.

MODEL 62L11,62L12

GALVIN MFG. CO.



VOLTAGE CHART				
TUBE	PLATE TO B-	SCREEN TO B-	OSC. PLATE TO B-	
1N5GT R.F.AMP	85V	85V	——	
1A7GT OSC.MOD	85V	40V	85V	
1N5GT I.F.AMP	85V	85V	——	
1H5GT DET-AF-AVC	30V	——	——	
30S PWR-AMP	80V	85V	——	
1I7Z6G RECT.	LINE VOLTAGE (117V)	——	123V AT CATH.	

NOTE: ALL VOLTAGES MEASURED ON A 1000 OHMS PER VOLT VOLTMETER, 117 V. A.C. OR BATTERY INPUT.
MAX. PWR. OUTPUT 300 MILLIWATTS.

CURRENT DRAIN		
	A.C.	BATT
"A"	49 MA	49 MA
"B"	14 MA	14.5MA

SCHEMATIC DIAGRAM PARTS LIST

DIAG. NO.	PART NO.	DESCRIPTION
1	2L27467	FRONT COVER & LOOP (MODEL 61L12)
	2L25946	FRONT COVER & LOOP (MODEL 61L11)
2	2L25935	OSCILLATOR COIL
3	2L25936	R.F. COIL & SHIELD ASSEMBLY
4	1L25900	I.F. COIL & SHIELD ASSEMBLY
5	1L25902	DIODE COIL & SHIELD ASSEMBLY
6	50825691	SPEAKER & OUTPUT TRANSFORMER
7	50825692	SPEAKER (5"P.M.) ONLY
8	2H25995	OUTPUT TRANSFORMER ONLY
9	1L25915	ELECT. CONDENSER (40-40-40 MFD-150V)
10	1H25923	3 GANG CONDENSER (5 GANG)
11	2H25989	ELECT. CONDENSER (40-40-40 MFD-150V)
12	2H25988	ELECT. CONDENSER & STRAP (80 MFD-25V)
13	2H25999	PADDER CONDENSER (RANGE 150 MMFD TO 450 MMFD)
14	8B9806	TUBULAR CONDENSER (.1-200V)
15	8B9805	TUBULAR CONDENSER (.01-200V)
16	8A35599	TUBULAR CONDENSER (.075-200V)
17	8B9812	TUBULAR CONDENSER (.05-400V)
18	8B9805	TUBULAR CONDENSER (.05-400V)
19	8B9805	TUBULAR CONDENSER (.01-200V)
20	8A25999	TUBULAR CONDENSER (.01-400V)
21	8B9801	TUBULAR CONDENSER (.01-400V)
22	8B9801	TUBULAR CONDENSER (.01-400V)
23	8B9804	TUBULAR CONDENSER (.002-400V)
24	2L85511	MOLDED MICA COND. (100 MMFD) 20%
25	2L85511	MOLDED MICA COND. (100 MMFD) 20%
26	6A5110	CARBON RESISTOR (8.2 MEG-1/2-20) IRC.
27	6A5201	CARBON RESISTOR (3.3 MEG-1/2-20) IRC.
28	6A5201	CARBON RESISTOR (3.3 MEG-1/2-20) IRC.
29	6A5202	CARBON RESISTOR (2.2 MEG-1/2-20) IRC.
30	6A5202	CARBON RESISTOR (2.2 MEG-1/2-20) IRC.
31	6A5160	CARBON RESISTOR (470,000-1/2-20) IRC.
32	6A5149	CARBON RESISTOR (220,000-1/2-10) IRC.
33	6A5156	CARBON RESISTOR (68,000-1/2-20) IRC.
34	6A5177	CARBON RESISTOR (33,000-1/2-20) IRC.
35	17A25977	T.R. RESISTOR (2550-5-5)

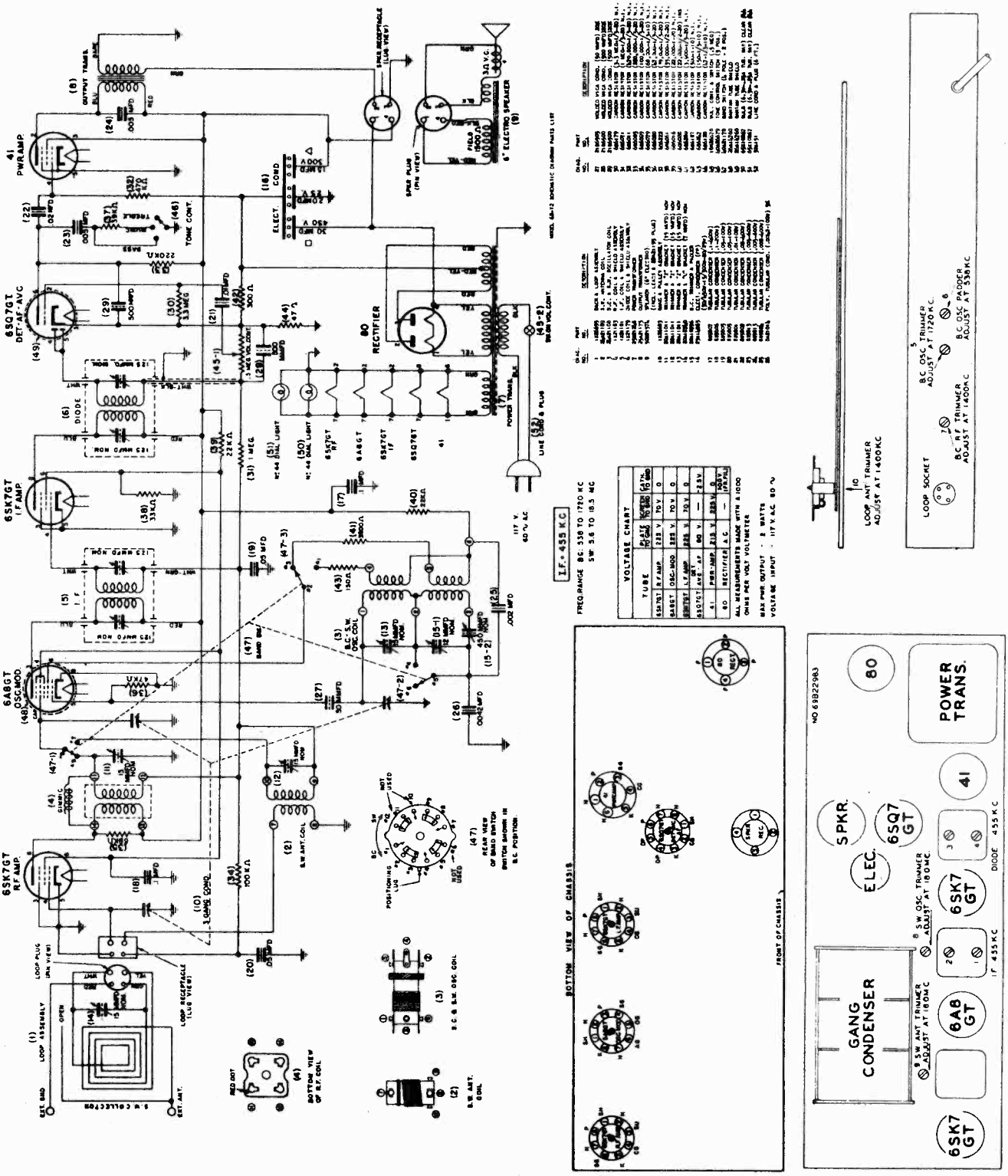
DIAG. NO.	PART NO.	DESCRIPTION
36	6A5451	CARBON RESISTOR (500-1/2-10) IRC.
37	6A5164	CARBON RESISTOR (250-1/2-10) IRC.
38	6A5241	CARBON RESISTOR (27-1/2-10) W.E.
39	6A5218	CARBON RESISTOR (10-1/2-10) IRC.
40	2H25982	VOL. CONTROL & SWITCH
41	2H25983	SLIDER SWITCH ASSEMBLY (1 REQ)
42	2K41760	TUBE SHIELD (BAFFLE)
43	2K41760	TUBE SHIELD (BAFFLE)
44	2K41760	TUBE SHIELD (BAFFLE)
45	2K41760	TUBE SHIELD (BAFFLE)
46	30B25929	LINE CORD & PLUG (6FT.)
47	1B25979	"A" BATTERY (4 1/2 VOLT) (2 REQUIRED) (EVEREADY #746 OR EQUIVALENT)
48	1K41694	"B" BATTERY (45 VOLT) (2 REQUIRED) (EVEREADY #482 OR EQUIVALENT)

CHANGES INDICATED

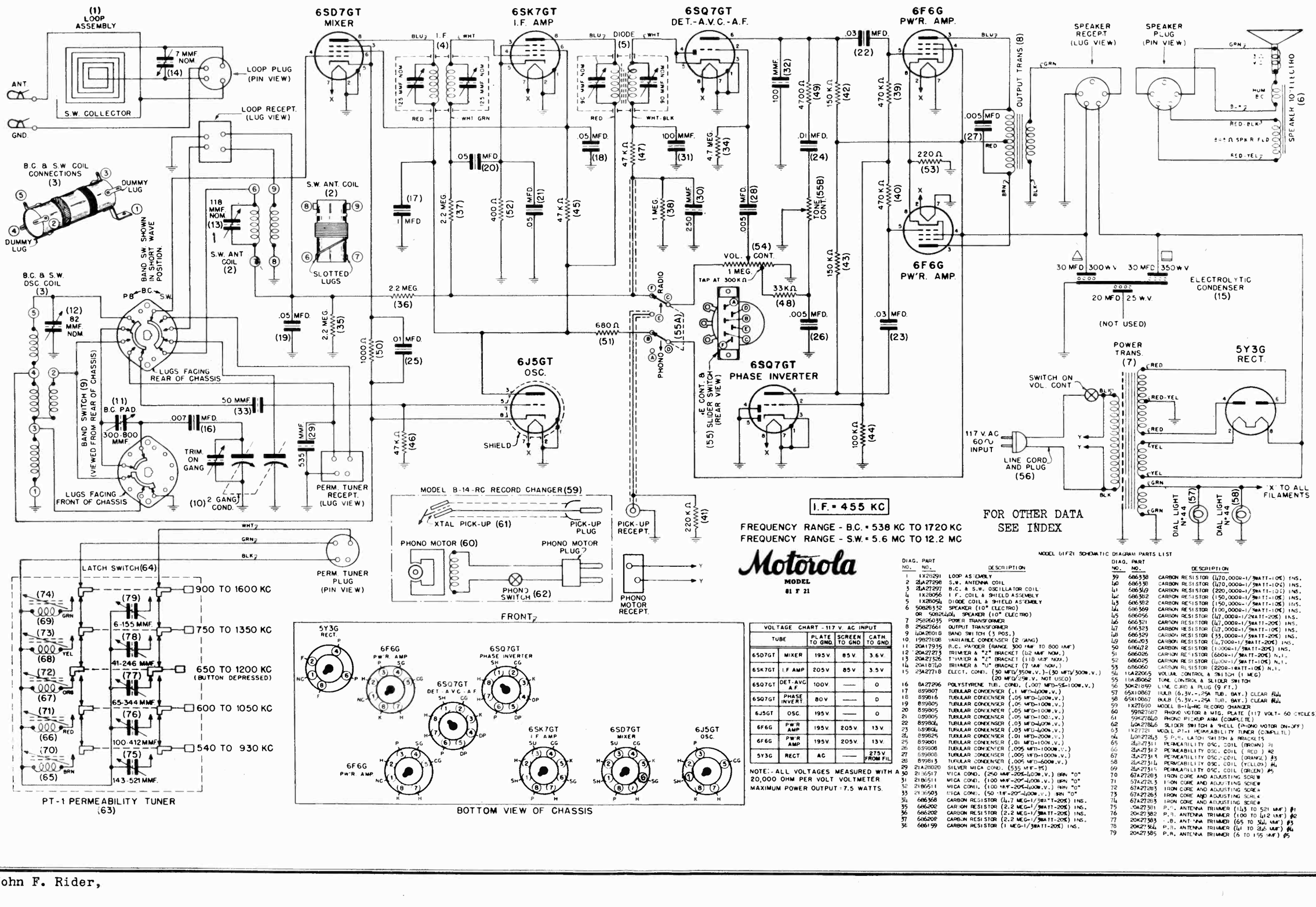
MODEL 62T2

GALVIN MFG. CO.

FOR OTHER DATA SEE INDEX



GALVIN MFG. CO.



VOLTAGE CHART - 117 V. AC INPUT				
TUBE		PLATE TO GND.	SCREEN TO GND	CATH. TO GND
6SD7GT	MIXER	195 V.	85 V.	3.6 V.
6SK7GT	I.F. AMP	205 V.	85 V.	3.5 V.
6SQ7GT	DET.-AVC. AF	100 V.	——	0
6SQ7GT	PHASE INVERT	80 V.	——	0
6J5GT	OSC.	195 V.	——	0
6F6G	PW'R AMP	195 V.	205 V.	13 V.
6F6G	PW'R AMP	195 V.	205 V.	13 V.
5Y3G	RECT.	AC	——	275 V. FROM FIL.

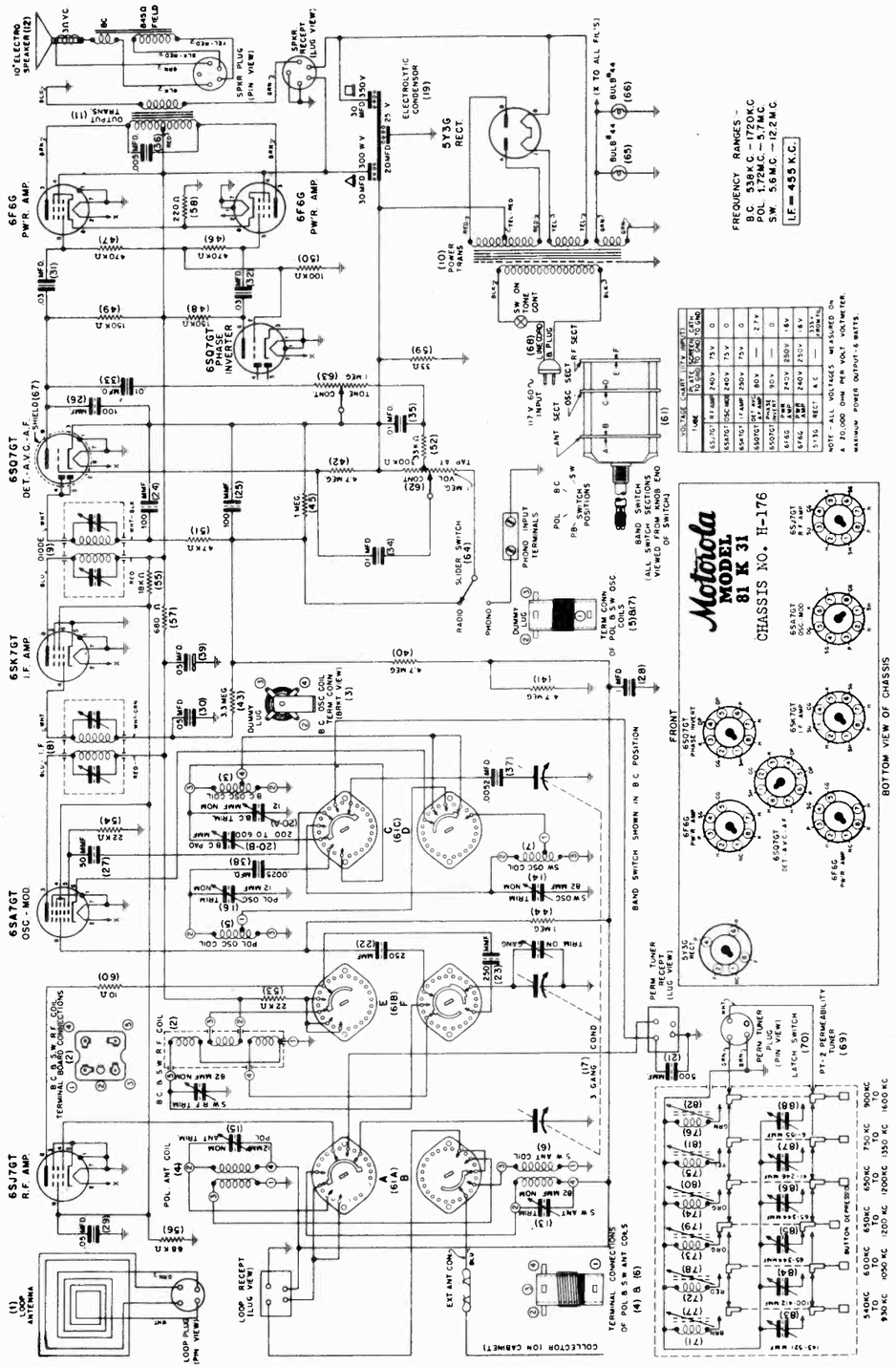
NOTE:- ALL VOLTAGES MEASURED WITH A 20,000 OHM PER VOLT VOLTMETER.
MAXIMUM POWER OUTPUT = 7.5 WATTS.

MODEL 81F21 SCHEMATIC DIAGRAM PARTS LIST

DIAG. NO.	PART NO.	DESCRIPTION
1	1X28291	LOOP ASSEMBLY
2	21A27298	S.W. ANTENNA COIL
3	21A27297	B.C. & S.W. OSCILLATOR COIL
4	1X28056	I.F. COIL & SHIELD ASSEMBLY
5	1X28054	DIODE COIL & SHIELD ASSEMBLY
6	50B26352	SPEAKER (10" ELECTRO)
	OR	50B26401 SPEAKER (10" ELECTRO)
7	25B26035	POWER TRANSFORMER
8	25B27661	OUTPUT TRANSFORMER
9	40A26018	BAND SWITCH (3 POS.)
10	19B27608	VARIABLE CONDENSER (2 GANG)
11	20A17915	B.C. PADDER (RANGE 300 MMF TO 800 MMF)
12	20A27273	TRIMMER & "Z" BRACKET (82 MMF NOM.)
13	20A27326	TRIMMER & "Z" BRACKET (118 MMF NOM.)
14	20A18740	TRIMMER & "U" BRACKET (7 MMF NOM.)
15	25A27718	ELECT. COND. (30 MFD/350W.V.)-(30 MFD/300W.V.) (20 MFD/25W.V. NOT USED)
16	BA27296	POLYSTYRENE TUB. COND. (.007 MFD-5%-100W.V.)
17	859807	TUBULAR CONDENSER (.1 MFD-400W.V.)
18	859816	TUBULAR CONDENSER (.05 MFD-400W.V.)
19	859805	TUBULAR CONDENSER (.05 MFD-100W.V.)
20	859805	TUBULAR CONDENSER (.05 MFD-100W.V.)
21	859805	TUBULAR CONDENSER (.05 MFD-100W.V.)
22	859804	TUBULAR CONDENSER (.03 MFD-400W.V.)
23	859804	TUBULAR CONDENSER (.03 MFD-400W.V.)
24	859825	TUBULAR CONDENSER (.01 MFD-200W.V.)
25	859801	TUBULAR CONDENSER (.01 MFD-100W.V.)
26	859808	TUBULAR CONDENSER (.005 MFD-1000W.V.)
27	859808	TUBULAR CONDENSER (.005 MFD-1000W.V.)
28	859813	TUBULAR CONDENSER (.005 MFD-600W.V.)
29	21A28020	SILVER MICA COND. (535 MFF-5%)
30	2136517	MICA COND. (250 MMF-20%-400W.V.) BRN "O"
31	2186511	MICA COND. (100 MMF-20%-400W.V.) BRN "O"
32	2186511	MICA COND. (100 MMF-20%-400W.V.) BRN "O"
33	2136503	MICA COND. (50 MFF-20%-400W.V.) BRN "O"
34	686368	CARBON RESISTOR (1.7 MEG-1/2WATT-20%) INS.
35	686202	CARBON RESISTOR (2.2 MEG-1/2WATT-20%) INS.
36	686202	CARBON RESISTOR (2.2 MEG-1/2WATT-20%) INS.
37	686202	CARBON RESISTOR (2.2 MEG-1/2WATT-20%) INS.
38	686159	CARBON RESISTOR (1 MEG-1/2WATT-20%) INS.
39	686338	CARBON RESISTOR (470,0008-1/2WATT-10%) INS.
40	686338	CARBON RESISTOR (470,0008-1/2WATT-10%) INS.
41	686359	CARBON RESISTOR (220,0008-1/2WATT-10%) INS.
42	686382	CARBON RESISTOR (150,0008-1/2WATT-10%) INS.
43	686382	CARBON RESISTOR (150,0008-1/2WATT-10%) INS.
44	686369	CARBON RESISTOR (100,0008-1/2WATT-10%) INS.
45	686056	CARBON RESISTOR (47,0008-1/2WATT-20%) INS.
46	686321	CARBON RESISTOR (47,0008-1/2WATT-20%) INS.
47	686323	CARBON RESISTOR (47,0008-1/2WATT-10%) INS.
48	686329	CARBON RESISTOR (33,0008-1/2WATT-20%) INS.
49	686203	CARBON RESISTOR (4,7008-1/2WATT-20%) INS.
50	686272	CARBON RESISTOR (1008-1/2WATT-20%) INS.
51	686025	CARBON RESISTOR (688-1/2WATT-20%) N.I.
52	686025	CARBON RESISTOR (1008-1/2WATT-10%) N.I.
53	686060	CARBON RESISTOR (2208-1WATT-10%) N.I.
54	1A22065	VOLUME CONTROL & SWITCH (1 MEG)
55	1A28062	TONE CONTROL & SLIDER SWITCH
56	30K21899	LINE CORD & PLUG (9 FT.)
57	65X10867	BULB (6.3V.-.25A TUB. BAY.) CLEAR #44
58	65X10867	BULB (6.3V.-.25A TUB. BAY.) CLEAR #44
59	1X27690	MODEL B-14-RC RECORD CHANGER
60	59X27687	PHONO MOTOR & MTG. PLATE (117 VOLT- 60 CYCLES)
61	59K27840	PHONO PICK-UP ARM (COMPLETE)
62	40A27846	SLIDER SWITCH & SHELL (PHONO MOTOR ON-OFF)
63	1X27721	MODEL PT-1 PERMEABILITY TUNER (COMPLETE)
64	40K27263	S.P.S. LATCH SWITCH & BRACKETS
65	21A27311	PERMEABILITY OSC. COIL (BROWN) #1
66	21A27312	PERMEABILITY OSC. COIL (RED) #2
67	21A27313	PERMEABILITY OSC. COIL (ORANGE) #3
68	21A27314	PERMEABILITY OSC. COIL (YELLOW) #4
69	21A27315	PERMEABILITY OSC. COIL (GREEN) #5
70	67A27283	IRON CORE AND ADJUSTING SCREW
71	67A27283	IRON CORE AND ADJUSTING SCREW
72	67A27283	IRON CORE AND ADJUSTING SCREW
73	67A27283	IRON CORE AND ADJUSTING SCREW
74	67A27283	IRON CORE AND ADJUSTING SCREW
75	20A27381	P.T.-1 ANTENNA TRIMMER (143 TO 521 MMF) #1
76	20K27382	P.T.-1 ANTENNA TRIMMER (100 TO 412 MMF) #2
77	20K27383	P.T.-1 ANTENNA TRIMMER (65 TO 344 MMF) #3
78	20K27384	P.T.-1 ANTENNA TRIMMER (41 TO 246 MMF) #4
79	20K27385	P.T.-1 ANTENNA TRIMMER (6 TO 155 MMF) #5

MODEL 81K31

GALVIN MFG. CO.



MODEL 81K31

GALVIN MFG. CO.

ALIGNMENT CHART

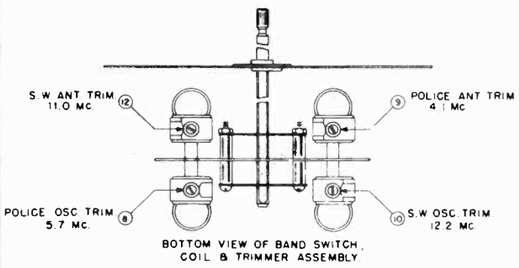
Operations In Order	Gang Condenser Set At	Dummy Antenna	Band Switch Set At	Generator Connected To	Adjust Trimmers No	Generator Set At
1	1720 K.C.	.1 Mfd.	B.C.	Osc.Mod.Grid	1-2-3-4	455 K.C.
2	1720 K.C.	200 Mmf	B.C.	Ext.Ant. Connection	5	1720 K.C.
3	1400 K.C.	200 Mmf	B.C.	Ext.Ant. Connection	6	1400 K.C.
4	600 K.C.	200 Mmf	B.C.	Ext.Ant. Connection	7	600 K.C.
5	5.7 M.C.	400 Ohms	Pol.	Ext.Ant. Connection	8	5.7 M.C.
6	4.1 M.C.	400 Ohms	Pol.	Ext.Ant. Connection	9	4.1 M.C.
7	12.2 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	10	12.2 M.C.
8	11.0 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	11	11.0 M.C.
9	11.0 M.C.	400 Ohms	S.W.	Ext.Ant. Connection	12	11 M.C.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

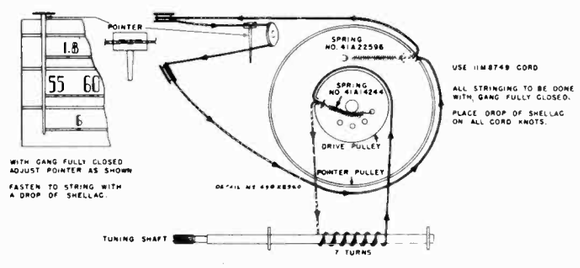
Average Microvolt Input *	Generator Set At	Generator Feeder Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
4000	455 K.C.	I.F. Grid	.1 Mfd.	.5 Meg.	.38
70	455 K.C.	Osc.Mod.Grid	.1 Mfd.	.5 Meg.	.38
75	600 K.C.	Osc.Mod.Grid	.1 Mfd.	.5 Meg.	.38
4	600 K.C.	R.F. Grid	.1 Mfd.	.5 Meg.	.38
3	600 K.C.	Ant.Terminal	200 Mmf.	None	.38

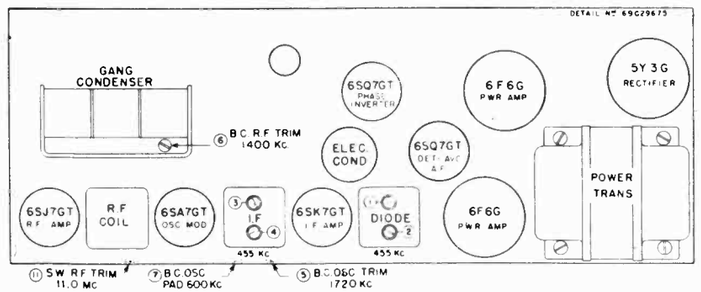
Volume Control Set at Maximum
* .05 Watts = .38 Volts
Band Switch Set at B.C.

Tone Control Set At High
** Output meter connected across voice coil.

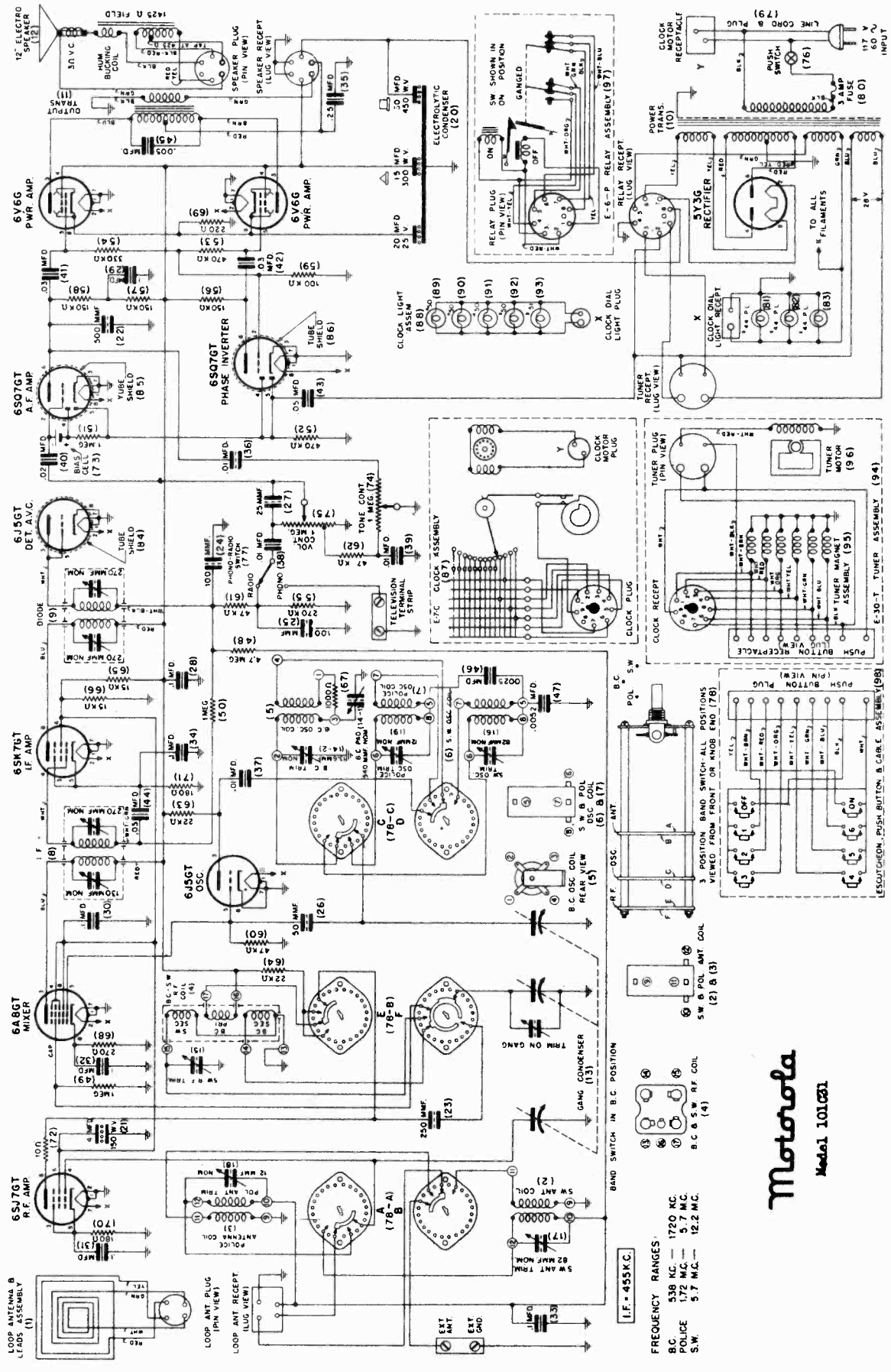


H-176 STRING DRIVE DETAIL





MODEL 101C31



MODEL 101C31

ALIGNMENT CHART

OPERATIONS IN ORDER	GANG CONDENSER SET AT	DUMMY ANTENNA	BAND SWITCH SET AT	GENERATOR CONNECTED TO	ADJUST TRIMMERS NO.	GENERATOR SET AT
1	MINIMUM 1720 K.C.	.1 Mfd.	B. C	Osc. Mod. Grid.	1-2-3-4	455 K. C.
2	1720 K. C.	.1 Mfd.	B. C	Osc. Mod. Grid.	5	1720 K. C.
3	538 K. C.	.1 Mfd.	B. C	Osc. Mod. Grid.	6	538 K. C.
4	1400 K. C.	400 Ohms	B. C	External Antenna Terminal	7	1400 K. C.
5	5.7 MC.	.1 Mfd.	POI	Osc. Mod. Grid.	8	5.7 M. C.
6	4.1 M. C.	400 Ohms	POI	External Antenna Terminal	9	4.1 M. C.
7	12.2 M. C.	.1 Mfd.	S W	Osc. Mod. Grid.	10	12.2 M. C.
8	11.0 M. C.	400 Ohms	S W	External Antenna Terminal	11	11.0 M. C.
9	11.0 M. C.	400 Ohms	S W	External Antenna Terminal	12	11.0 M. C.

Volume Control set at Maximum Tone Control set in Treble Position.

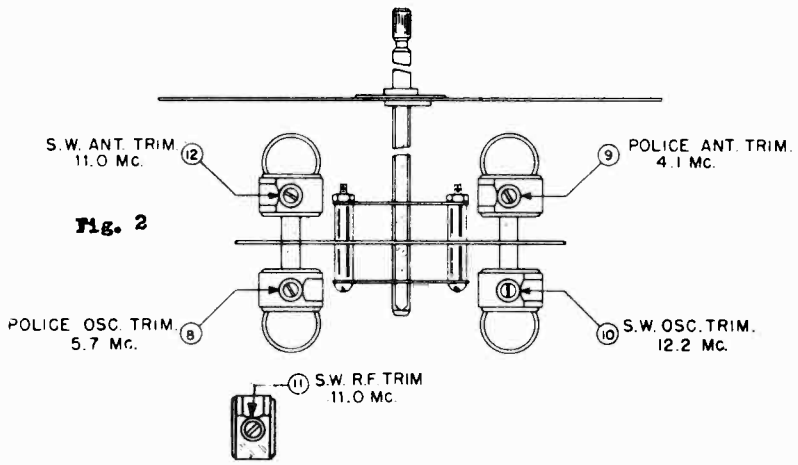


Fig. 2

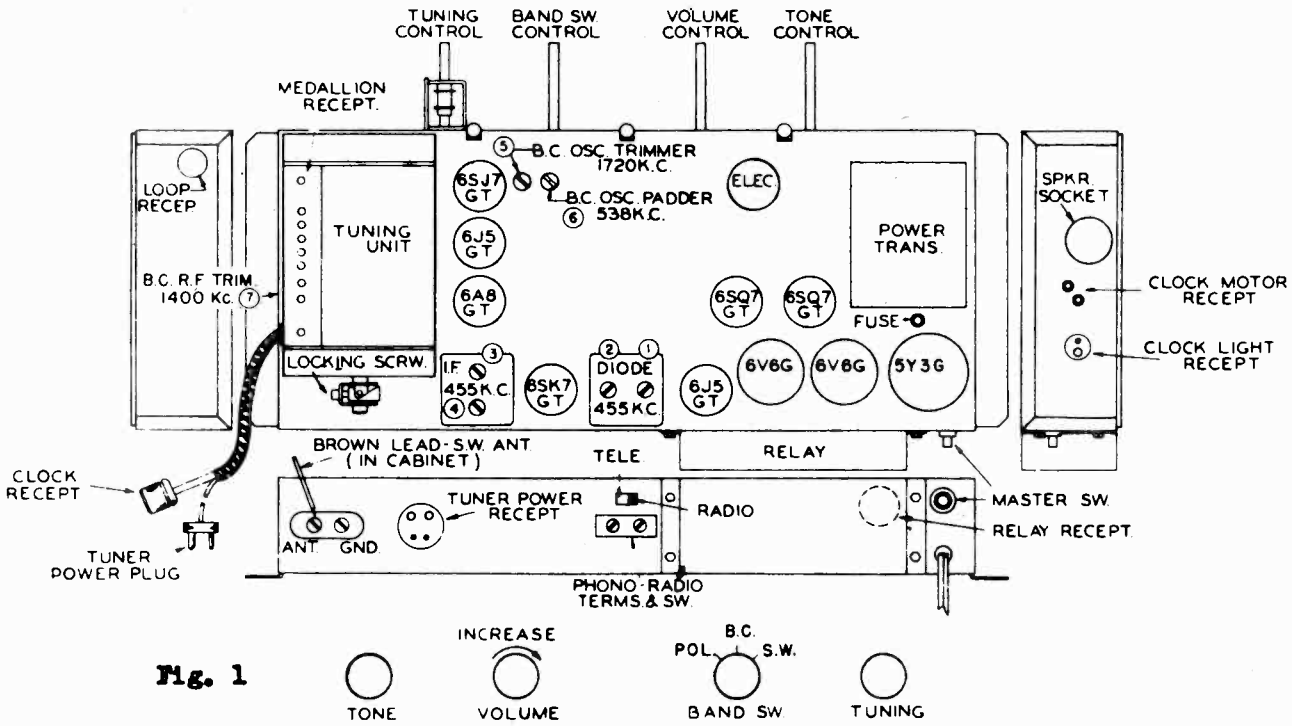


Fig. 1

Code No.	Part No.	Description

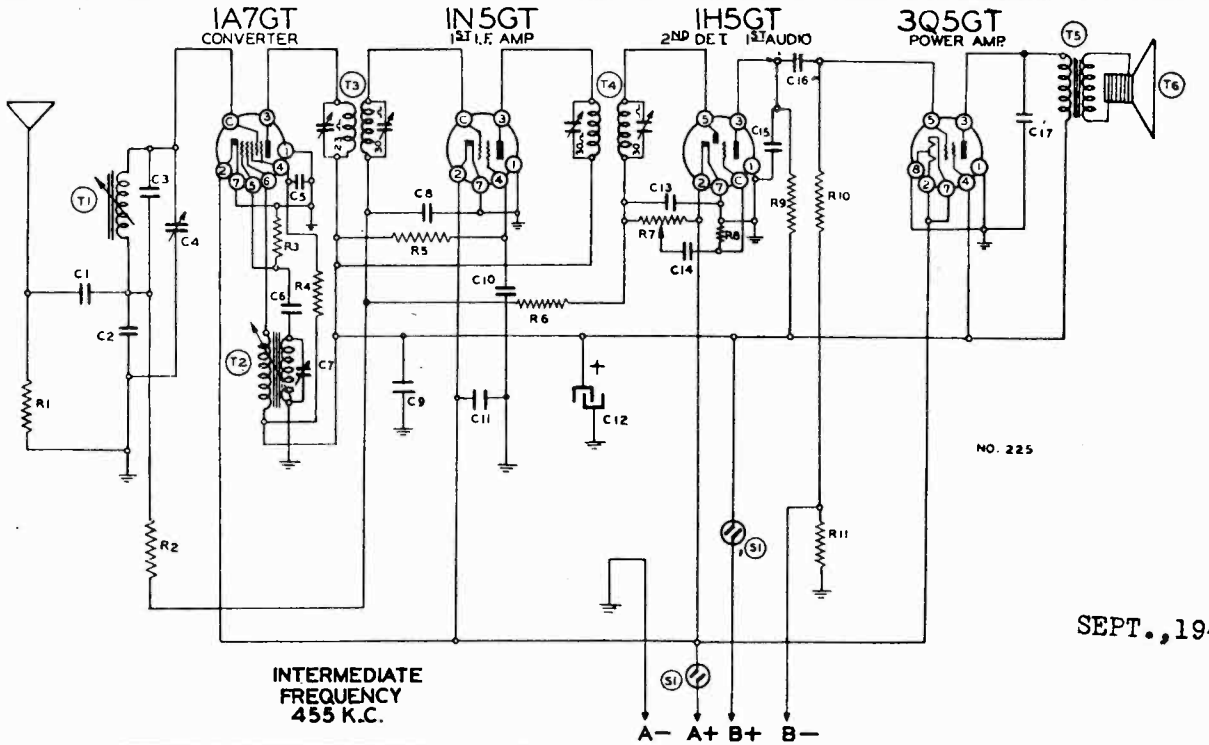
RESISTORS

R1	13017	10M ohm—⅓ w.
R2	1304	3 megohm—⅓ w.
R3	1309	200M ohm—⅓ w.
R4	130194	35M ohm—⅓ w.
R5	13094	50M ohm—⅓ w.
R6	1304	3 megohm—⅓ w.
R7	101250	1 megohm—Volume control and switch ⅓ w.
R8	130257	5 megohm—⅓ w.
R9	13019	1 megohm—⅓ w.
R10	130146	2 megohm—⅓ w.
R11	13079	400 ohm—⅓ w.

CONDENSERS

C1	12936	.0003 mica
C2	100112	.001 x 200 v.
C3	129177	.000045—Ceramicon
C4	124165	Antenna trimmer
C5	1009	.05 x 200 v.—Condenser
C6	12912	.00025 mica
C7	124165	Oscillator trimmer
C8	1009	.05 x 200 v. Condenser
C9	1006	.25 x 200 v. Condenser
C10	10020	.1 x 200 v.
C11	10017	.5 x 120 v.
C12	119117B	10 mfd. x 150 v. lytic
C13	1295	.0001 mica
C14	10012	.003 x 600 v. Condenser
C15	1295	.0001 mica
C16	10026	.02 x 400 v. Condenser
C17	1007	.005 x 600 v.

C4 and C7 are in same unit.

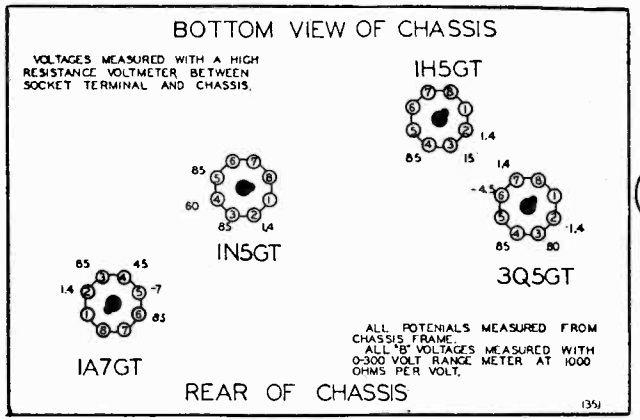


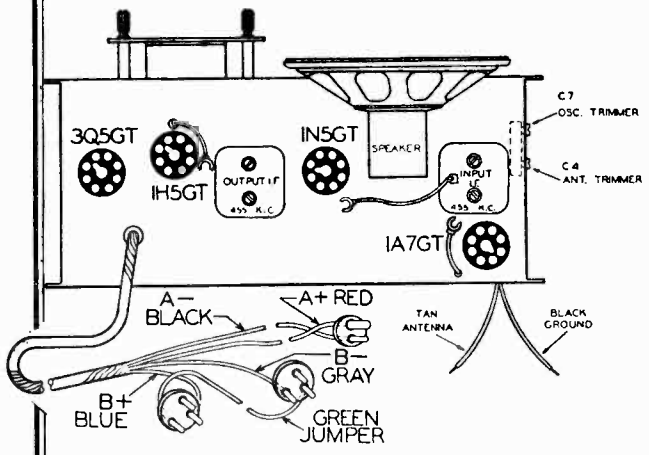
SEPT.,1941

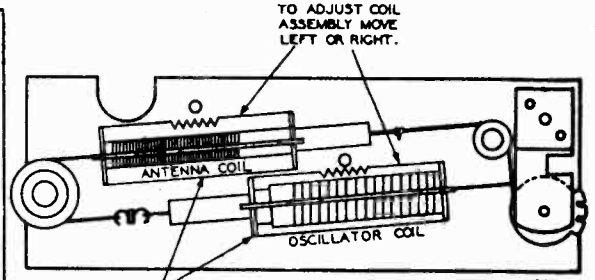
GAMBLE-SKOGMO, INC.

GAMBLE PAGE 13-1

MODELS C4B15, C4B16







NOTE: THE ANTENNA COIL ASSEMBLY IS MADE SO THAT IT IS MOVABLE LEFT OR RIGHT. WHEN MAKING THE ADJUSTMENT AS GIVEN IN THE ALIGNMENT PROCEDURE MOVE COIL ASSEMBLY VERY SLOWLY

COIL ASSEMBLY VIEW

PARTS

T1	1364	Antenna Coil Permeability tuning assem.
T2	1364	Oscillator Coil Complete.
T3	108202	Input I. F. Coil 455 kc.
T4	108153B	Output I. F. Coil 455 kc.
T5	10591B	Output transformer
T6	114215R	6" P.M. speaker
S1		Switch-on Volume control

ALIGNMENT PROCEDURE

MODELS C4B15, C4B16

The following equipment is required for aligning.

- Dummy antenna. 1 mfd. and 200 mmf.
- Volume control—Maximum all adjustments.
- Connect ground lead of radio chassis to ground post of signal generator.

BAND	SIGNAL GENERATOR Frequency Sett.ng	Dummy Antenna	Connection to Radio	Position of Iron Cores (Dial Setting)	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
455 Kc. I. F.	455 Kc.	.1 MFD.	Connect to Grid of 1A7	Iron Cores All the way out	Two trimmers on top of output I. F. can	Output I. F.	maximum output
	455 Kc.	.1 MFD.	Connect to Grid of 1A7	Iron Cores All the way out	Two trimmers on top of input I. F. can	Input I. F.	maximum output
BROAD-CAST BAND	1700 Kc.	.1 MFD.	Connect to Grid of 1A7	Iron Cores All the way out	Trimmer (C7) (See chassis view)	Oscillator	maximum output
	1700 Kc.	200 MMF.	Connect to Antenna Clip	Iron Cores All the way out	Trimmer (C4) (See chassis view)	Antenna	maximum output
	1400 Kc.	200 MMF.	Connect to Antenna Clip	Turn Dial to 1400 Kc.	Adjust position of antenna coil (See coil assembly view)	Antenna Coil Adjustment	maximum output (See Note "A")
	1700 Kc.	200 MMF.	Connect to Antenna Clip	Turn Dial to 1700 Kc.	Adjust trimmer (C4) (See chassis view)	Antenna	Check for tracking (See Note "B")

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

NOTE "B"—After the antenna coil has been tracked at 1400 Kc. it is necessary to check the antenna trimmer (C4) adjustment again at 1700 Kc. If no appreciable change in trimmer adjustment is made the coil is in track, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1700 Kc.

ALIGNMENT PROCEDURE

MODEL C640

IMPORTANT:—See alignment instructions

- Volume control—Maximum all adjustments.
- Connect B - of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 Mfd.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
I. F.	455 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Four Trimmers on Top (See Fig. 1)	Output and Input I. F.	Adjust to maximum output
BROAD-CAST BAND	1600 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Trimmer bottom of rear section of gang. (See bottom of radio)	Broadcast Oscillator	Adjust to maximum output
	1400 Kc.	See Note "A"		Set dial at 1400 Kc.	Trimmer bottom of front section of gang. (See bottom of radio)	Broadcast Antenna	Adjust to maximum output

NOTE "A" Lay the output lead from the generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the generator.

FREQUENCY RANGE
540 to 1600 K.C.

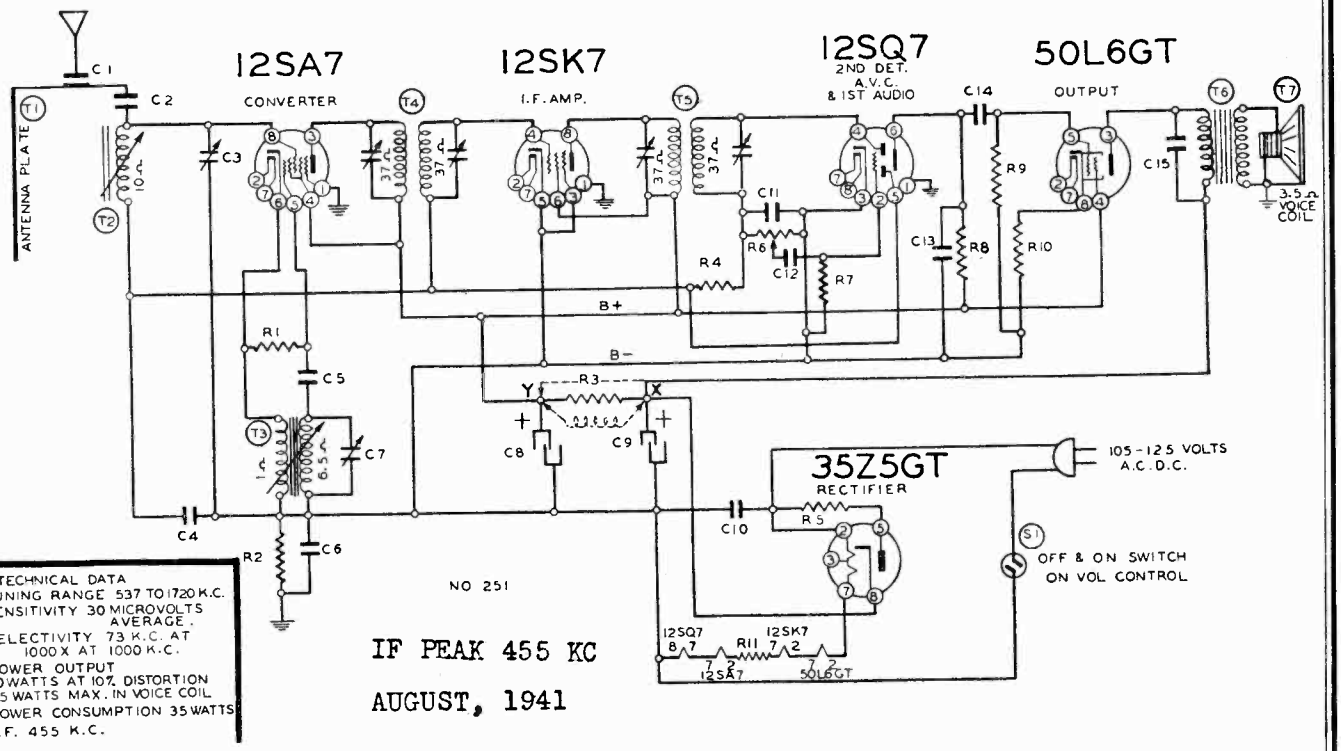
Power Consumption ..... 35 Watts

Power Output ..... 1 Watt Undistorted, 1.5 Watts Maximum

Intermediate Frequency ..... 455 K.C.

FOR SCHEMATIC AND OTHER DATA SEE RIDER'S VOL.XII

GAMBLE-SKOGMO, INC.



On sets which use an electro-dynamic speaker 114260, R3 is replaced by the speaker field and the B+ lead for output transformer is connected to point Y.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

Replacement Parts List

Part No.	Schematic Diagram Reference	Description	No. Used In Set	Selling Price Each
		CONDENSERS		
1009	C4	.05 x 200 Volt Tubular Condenser	1	.25
10011	C14, C15	.01 x 400 Volt Tubular Condenser	2	.25
10013	C10	.05 x 400 Volt Tubular Condenser	1	.25
10025	C12	.002 x 600 Volt Tubular Condenser	1	.25
10091	C6	.15 x 400 Volt Tubular Condenser	1	.25
11992	C8, C9	Electrolytic Filter Condenser. 50 to 60 Cycles. 20 Mfd. x 150 V.; 40 Mfd. x 150 V.	1	1.50
11993	C8, C9	Electrolytic Filter Condenser. 25 Cycles 40 Mfd. x 150 V.; 60 Mfd x 150 V		1.75
124137	C3, C7	Ant. and Osc. Dual Trimmer Condenser	1	.35
129114	C2	.0003 Mica Type Condenser—20%	1	.25
12939	C5	.00005 Mica Type Condenser—20%	1	.25
12912	C11	.00025 Mica Type Condenser—20%	1	.25
1292	C13	.0005 Mica Type Condenser—20%	1	.25
		RESISTORS		
101272	R6, S1	Volume Control and Switch (500M Ohms)	1	1.00
130176	R1	20M Ohm—⅓ Watt Resistor—10%	1	.20
130293	R11	30 Ohm—1 Watt Resistor—20%	1	.20
130100	R2, R8	150M Ohm—⅓ Watt Resistor—20%	2	.20
130240	R5	30 Ohm—⅓ Watt Resistor—10%	1	.20
1304	R4	3 Megohm—⅓ Watt Resistor—20%	1	.20
130257	R7	5 Megohm—⅓ Watt Resistor—25%	1	.20
13011	R9	250M Ohm—⅓ Watt Resistor—20%	1	.20
130166	R10	150 Ohm—⅓ Watt Resistor—10%	1	.20
130287	R3	1200 Ohm—1 Watt Resistor—10% Used only when P. M. Dynamic Speaker is used.	1	.20
114268	T7	**SPEAKER** Four Inch P.M. Dynamic Speaker (Less Output Transformer).	1	2.50
		or		
114260	T7	Four Inch Electrodynamic Speaker. (Less Output Transformer).	1	2.50
105139	T6	Output Transformer for Either Speaker	1	1.00
		COILS		
108157H	T4	Input I.F. Coil Complete in Can	1	1.00
1081570	T5	Output I.F. Coil Complete in Can	1	1.00
13618	T2, T3	Ant. and Osc. Coil Permeability Tuning Unit Complete—Ready to Mount	1	3.50
		MISCELLANEOUS		
128657-36		Bakelite Cabinet—Walnut	1	2.00
128657-9		Bakelite Cabinet—Ivory Color	1	3.00
115779-18	T1	Antenna Plate—Walnut Color	1	.15
115779-9	T1	Antenna Plate—Ivory Color	1	.20
131193		Snap-in Rivets to Fasten Ant. Plate	2	.01
131356		Snap-in Rivets to Fasten Ant. Plate	2	.01
10798E		Line Cord and Plug	1	.50
121171		Eight Prong Octal Wafer Socket	5	.15
		DIAL AND TUNING PARTS		
1121010		Dial Scale	1	.40
1121008		Crystal for Dial Scale	1	.15
13143		Snap-in Rivets to Fasten Crystal	2	.01
1121006		Pointer	1	.15
1209		String for Dial	Yd.	.15
120184		Coiled Tension Spring for Dial String	1	.05
128523-17		Knob—Walnut	2	.10
128523-8		Knob—Ivory	2	.10

MODEL C5D14

GAMBLE-SKOGMO, INC.

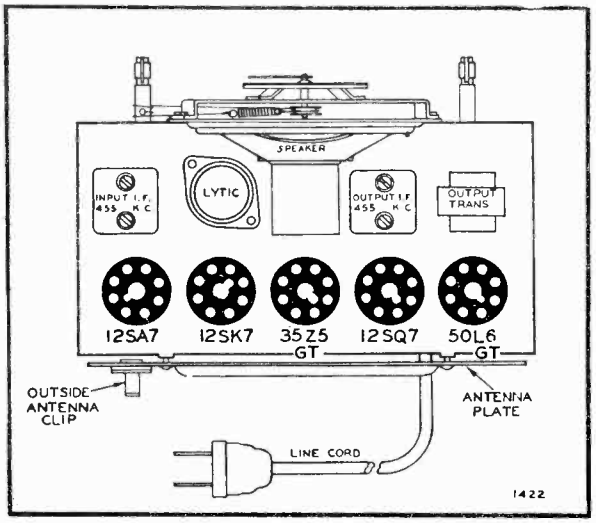
ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect B— of radio chassis to ground post of signal generator through .1 Mfd. condenser.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Iron Cores (Dial Setting)	Adjust Trimmers to Maximum (in Order Shown)
I. F.	455 Kc.	.1 MFD.	Connect to Metal Antenna Backplate	Iron Cores All the way out	Two trimmers on top of output I. F. can
	455 Kc.	.1 MFD.	Connect to Metal Antenna Backplate	Iron Cores All the way out	Two trimmers on top of input I. F. can
BROAD-CAST BAND	1720 Kc.	.1 MFD.	Connect to Metal Antenna Backplate	Iron Cores All the way out	Osc. Trimmer (C7) (See voltage chart)
	1720 Kc.	200 MMF.	Connect to Outside Antenna Clip	Iron Cores All the way out	Ant. Trimmer (C3) (See voltage chart)
	1400 Kc.	200 MMF.	Connect to Outside Antenna Clip	Turn Dial to 1400 Kc.	Adjust position of antenna coil (See coil assembly view)
	1720 Kc.	200 MMF.	Connect to Outside Antenna Clip	Turn Dial to 1720 Kc.	Adjust trimmer (C3) (See voltage chart)

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

NOTE "B"—After the antenna coil has been tracked at 1400 Kc. it is necessary to check the antenna trimmer (C3) adjustment again at 1720 Kc. If no appreciable change in trimmer adjustment is made the coil is in track. If the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1720 Kc.

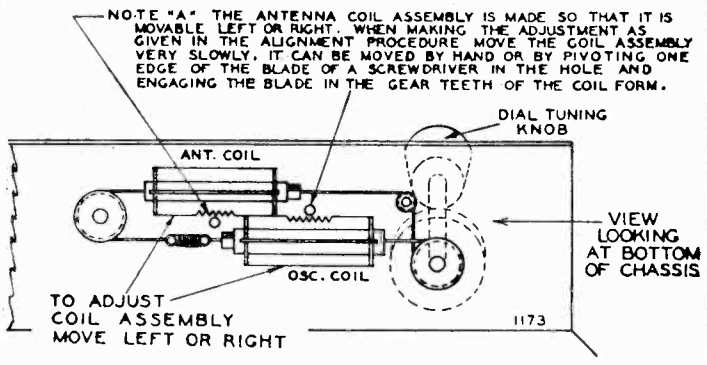


CHASSIS VIEW, showing tube location and the outside antenna clip.

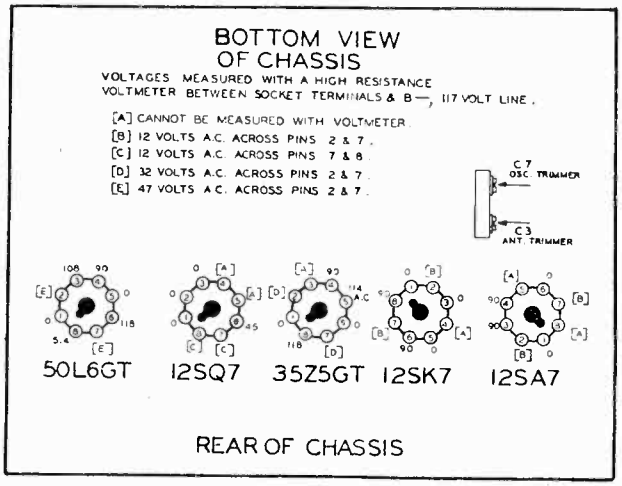
Antenna

This radio is designed to pick up strong local stations without requiring an outside antenna. For best results, however, an outside antenna approximately 50 to 75 feet long including lead-in is recommended. It should be erected as high as possible and as far from surrounding objects as practical. For minimum interference it should be at right angles to street car lines, incoming power lines and other electrical apparatus which may be in the vicinity. A ground is not required.

Periodic inspection of the antenna system is recommended to be sure that all connections are clean and tight, and that the antenna is well insulated from the ground at all points.

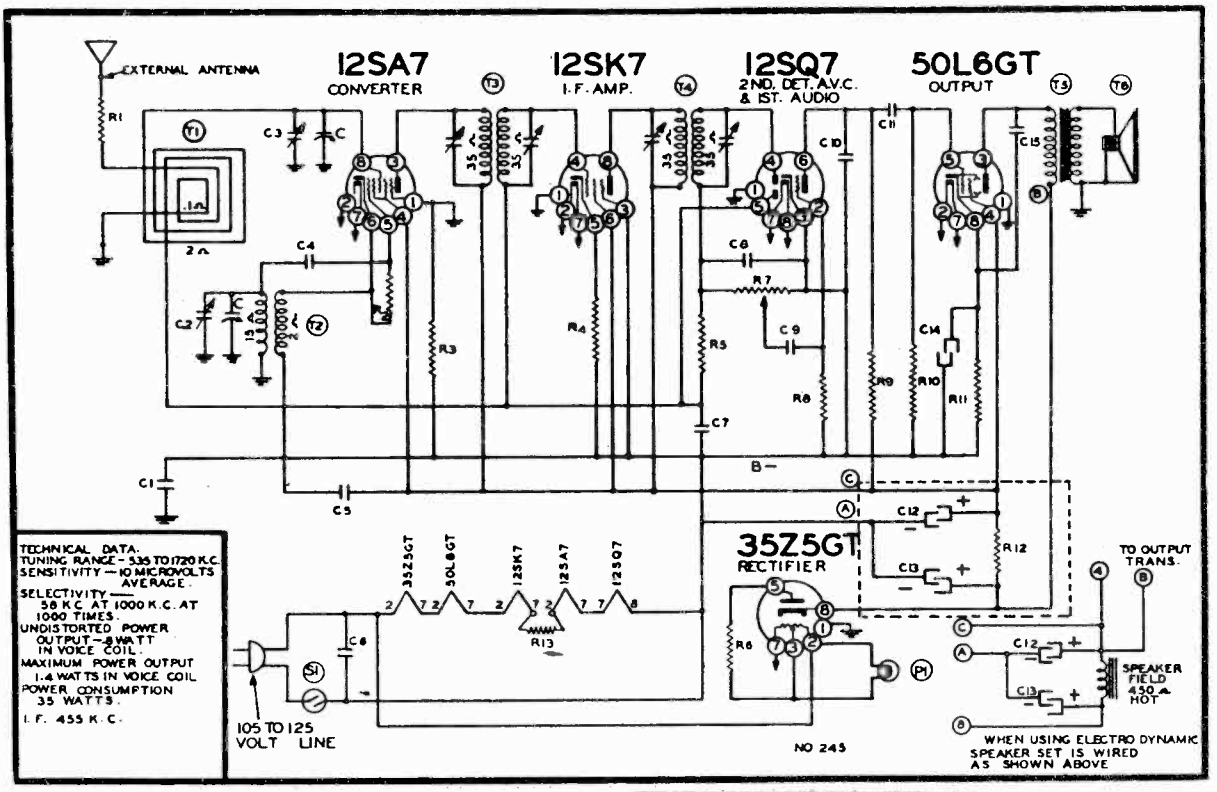


COIL ASSEMBLY VIEW



MODEL C5D15

GAMBLE-SKOGMO, INC.

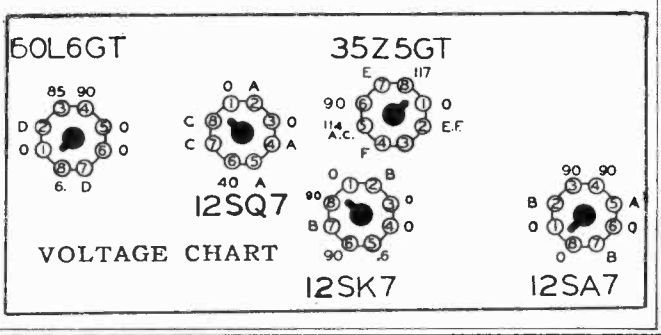


A - CANNOT BE MEASURED WITH VOLTMETER
B - 12 VOLTS A.C. ACROSS PINS 2-7
C - 12 VOLTS A.C. ACROSS PINS 7-8
D - 48 VOLTS A.C. ACROSS PINS 2-7
E - 275 VOLTS A.C. ACROSS PINS 2-7
F - 117 VOLTS A.C. ACROSS PINS 2-4

Part No.	Schematic Diagram Reference	Description	No. Used In Set	Selling Price Each
		CONDENSERS		
102151	C, C2	Two Gang Variable Condenser with Osc. Trimmer Condenser	1	2.50
1001	C6	.1 x 400 Volt Tubular Condenser	1	.25
1009	C5, C7	.05 x 200 Volt Tubular Condenser	2	.25
10025	C9	.002 x 600 Volt Tubular Condenser	1	.25
10091	C1	.15 x 400 Volt Tubular Condenser	1	.25
100106	C11	.004 x 600 Volt Tubular Condenser	1	.25
10026	C15	.02 x 400 Volt Tubular Condenser	1	.25
119134	C12, C13, C14	Electrolytic Filter Condenser. 25 to 60 Cycles. 20 Mfd. x 150 V.; 40 Mfd. x 150 V.; 40 Mfd. x 25 V.	1	1.25
124180	C3	Antenna Trimmer	1	.55
12921	C4	.0002 Mica Type Condenser—20%	1	.25
1295	C8	.0001 Mica Type Condenser—20%	1	.25
12912	C10	.00025 Mica Type Condenser—20%	1	.25
		RESISTORS		
101265	R7, S1	Volume Control and Switch (1 Megohm)	1	1.00
13094	R2	50M Ohm—1/2 Watt Resistor—10%	1	.20
130215	R6	25 Ohm—1/2 Watt Resistor—10%	1	.20
1309	R3	200M Ohm—1/2 Watt Resistor—20%	1	.20
13097	R4	200 Ohm—1/2 Watt Resistor—10%	1	.20
1304	R5	3 Megohm—1/2 Watt Resistor—20%	1	.20
130257	R8	5 Megohm—1/2 Watt Resistor—25%	1	.20
1303	R9	500M Ohm—1/2 Watt Resistor—20%	1	.20
13037	R10	750M Ohm—1/2 Watt Resistor—20%	1	.20
130166	R11	150 Ohm—1/2 Watt Resistor—10%	1	.20
130287	R12	1200 Ohm—1 Watt Resistor—10%	1	.20
130293	R13	30 Ohm—1 Watt Resistor—10%	1	.20
13026	R1	1M Ohm—1/2 Watt Resistor—10%	1	.20
		COILS		
108140N	T3	Input I.F. Coil Complete in Can	1	1.00
108141G	T4	Output I.F. Coil Complete in Can	1	1.00
110187	T2	Oscillator Coil	1	.50
111258	T1	Loop Antenna (Specify Color)	1	1.25
128730		Cardboard Back Only (Specify Color)	1	.10
		SPEAKER		
114251	T6	Five Inch P.M. Dynamic Speaker Less Output Transformer	1	3.50
		or		
114258	T6	Five Inch Electro Dynamic Speaker Less Output Transformer	1	3.50
105108D	T5	Output Transformer	1	1.00
		DIAL AND TUNING PARTS		
107249	P1	6-8 Volt Pilot Lite Bulb, Type T-47	1	.10
107389B		Socket Assembly for Dial Light	1	.10
1121000		Dial Scale	1	1.75
112998		Diffuser for Dial	1	.10
131211		Snap-in Rivets to Fasten Dial Scale	2	.01
112999		Pointer	1	.10
120145		Coiled Tension Spring for Dial String	1	.05
1209		String for Dial	Yard	.15
117919		Tuning Shaft	1	.10
128686-37		Knob—Walnut—"Volume"	1	.20
128687-37		Knob—Walnut—"Tuning"	1	.20
128686-8		Knob—Ivory—"Volume"	1	.20
128687-8		Knob—Ivory—"Tuning"	1	.20

BOTTOM VIEW OF CHASSIS

ALL VOLTAGES MEASURED BETWEEN SOCKET PIN & B-, WITH A 1000 OHMS PER VOLT VOLTMETER. 117 VOLT LINE.



MODEL 534

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect — B of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- 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 Mfd., and 200 Mmf.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Conection to Radio	Variable Condenser Setting	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
I. F.	455 Kc.	.1 MFD.	Grid of 12SK7 I. F. Tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See Top View)	Output I. F.	Adjust to maximum output
	455 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Two trimmers on top (See Top View)	Input I. F.	Adjust to maximum output
BROAD-CAST BAND	1650 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Trimmer—Bottom of gang (See Top View)	Oscillator	Adjust to maximum output
	1400 Kc.		(See Note "A" and "B")	Set dial at 1400 Kc.	Trimmer—Bottom of gang (See Top View)	Antenna	(See Note "A") Adjust to maximum output

Loop aerial should be connected when aligning receiver.

NOTE "A"—Mount the chassis and the loop antenna in the cabinet, connect the loop antenna to the chassis. Adjust the antenna trimmer through hole in bottom of cabinet.

NOTE "B"—Lay the output lead from the signal generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the signal generator.

MODEL C5D15

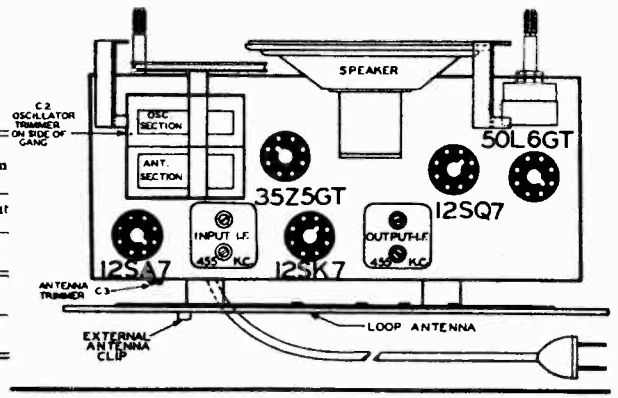
ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect B— to ground post of signal generator.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted to Maximum (in Order Shown)
I. F.	455 Kc.	.1 MFD.	Grid of 12SK7 I. F. Tube	Rotor full open (Plates out of mesh)	Two trimmers on top of Output (See Chassis View)
	455 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Two trimmers on top of Input (See Chassis View)
BROAD-CAST BAND	1720 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Oscillator Trimmer on gang (See Chassis View)
	1400 Kc.		(See Note "A")	Set dial at 1400 Kc.	Antenna Trimmer C3 (See Chassis View)

Loop aerial should be connected when aligning receiver.

NOTE "A"—Lay the output lead from the signal generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the signal generator.

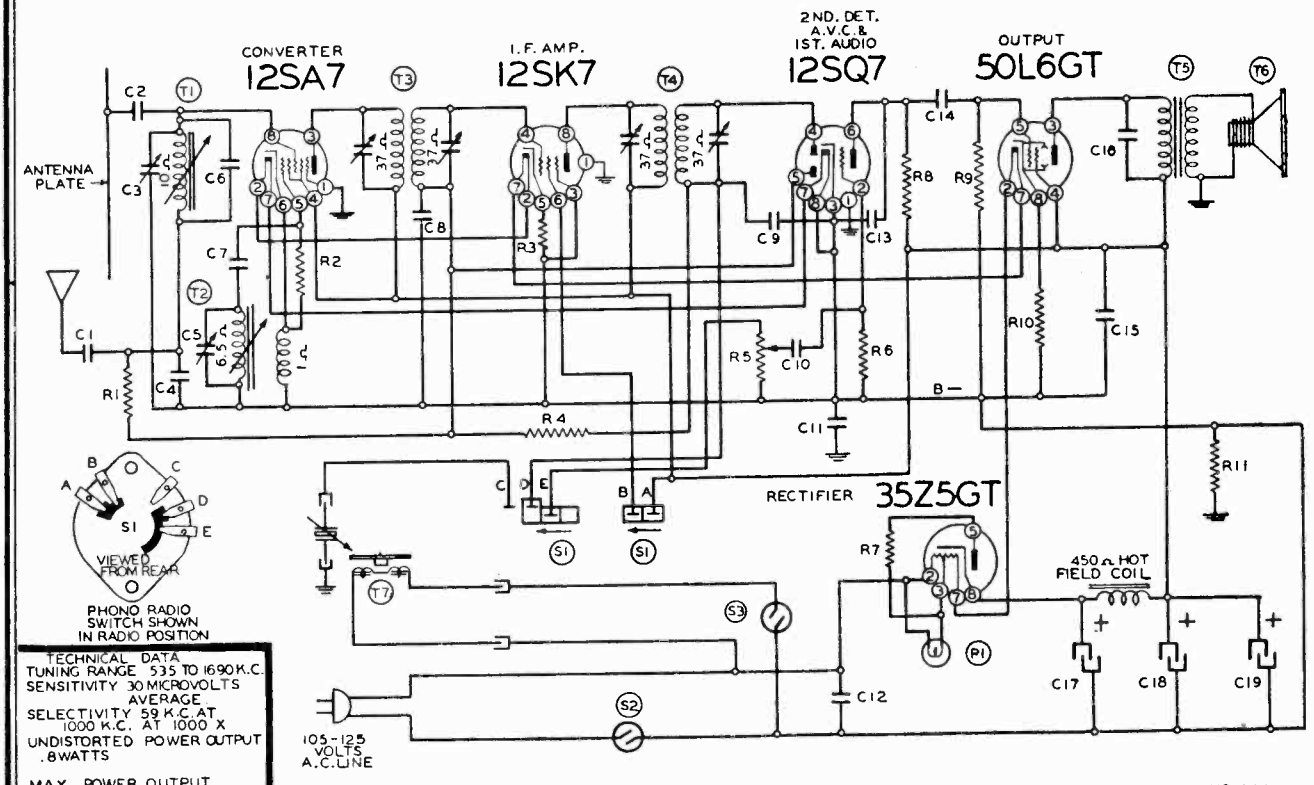


CHASSIS VIEW showing tube location.

NOTE: External Antenna Clip at back of chassis.

MODEL C5D16

GAMBLE-SKOGMO, INC.



TECHNICAL DATA
TUNING RANGE 535 TO 1690 K.C.
SENSITIVITY 30 MICROVOLTS AVERAGE
SELECTIVITY 59 K.C. AT 1000 K.C. AT 1000 X
UNDISTORTED POWER OUTPUT .8 WATTS
MAX. POWER OUTPUT 1.4 WATTS IN VOICE COIL.
POWER CONSUMPTION
RADIO CHASSIS 35 WATTS
PHONO MOTOR 20 WATTS
I.F. 455 K.C.

FOR OAK RECORD CHANGER SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".

Replacement Parts List

Part No.	Schematic Diagram Reference	Description	No. Selling Used Price In Set	Each
CONDENSERS				
1009	C8, C15	.05 x 200 Volt Tubular Condenser	2	.25
100119	C11	.1 x 400 Volt Tubular Condenser	1	.25
10025	C10	.002 x 600 Volt Tubular Condenser	1	.25
10019	C14	.006 x 600 Volt Tubular Condenser	1	.25
10011	C16	.01 x 400 Volt Tubular Condenser	1	.25
1001	C12	.1 x 400 Volt Tubular Condenser	1	.25
11994	C17, C18, C19	Electrolytic Filter Condenser. 50 to 60 Cycles. 40 Mfd. x 150 V.; 20 Mfd. x 150 V.; 20 Mfd. x 150 V.	1	1.50
11995	C17, C18, C19	Electrolytic Filter Condenser. 25 Cycles. 60 Mfd. x 150 V.; 40 Mfd. x 150 V.; 40 Mfd. x 150 V.		2.00
124136	C3, C5	Ant. and Osc. Dual Trimmer Condenser	1	.35
129114	C2	.0003 Mica Type Condenser—20%	1	.25
1295	C1, C7, C9	.0001 Mica Type Condenser—20%	3	.25
129162	C4	.0008 Mica Type Condenser—10%	1	.25
12912	C13	.00025 Mica Type Condenser—20%	1	.25
129183	C6	.00005 Ceramicon Condenser—10%	1	.35
RESISTORS				
101266	R5, S2	Volume Control and Switch (500M Ohms)	1	1.00
1309	R1, R11	200M Ohm—⅓ Watt Resistor—20%	2	.20
130176	R2	20M Ohm—⅓ Watt Resistor—10%	1	.20
130168	R3	100 Ohm—⅓ Watt Resistor—10%	1	.20
1304	R4	3 Megohm—⅓ Watt Resistor—20%	1	.20
13011	R8	250M Ohm—⅓ Watt Resistor—20%	1	.20
130257	R6	5 Megohm—⅓ Watt Resistor—25%	1	.20
130215	R7	25 Ohm—½ Watt Resistor—10%	1	.20
13037	R9	750M Ohm—⅓ Watt Resistor—20%	1	.20
130293	R12	30 Ohm—1 Watt Resistor—20%	1	.20
		Following Resistors Used Only When P.M. Dynamic Speaker is Used:		
130166	R10	150 Ohm—⅓ Watt Resistor—10%	1	.20
13097		200 Ohm—⅓ Watt Resistor—10%	1	.20
130287		1200 Ohm—1 Watt Resistor—10%	1	.20

COILS

108140L	T3	Input I.F. Coil Complete in Can	1	1.00
108145E	T4	Output I.F. Coil Complete in Can	1	1.00
13616	T1, T2	Ant. and Osc. Coil Permeability Unit Complete Ready to Mount	1	3.75

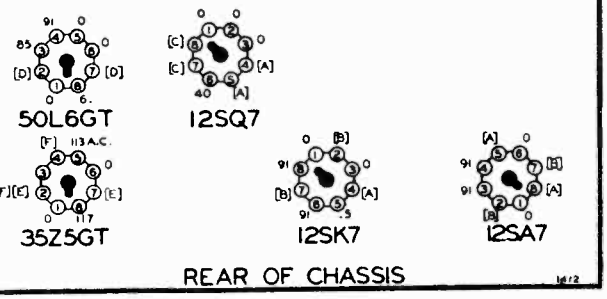
SPEAKER

114257	T6	Five Inch Electrodynamic Speaker (Less Output Transformer)	1	3.50
		OR		
114198B	T6	Five Inch P.M. Dynamic Speaker (Less Output Transformer)	1	3.50
105108C	T5	Output Transformer for Speaker	1	1.00

BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH A HIGH RESISTANCE VOLTMETER BETWEEN SOCKET TERMINALS & 'B' MINUS.
PHONO-RADIO SWITCH TO BE IN RADIO POSITION.
VOLUME CONTROL AT MINIMUM & NO SIGNAL.
117 VOLT LINE.

[A] - CANNOT BE MEASURED WITH VOLTMETER.
[B] - 11 VOLTS A.C. ACROSS PINS 2 & 7.
[C] - 11 VOLTS A.C. ACROSS PINS 7 & 8.
[D] - 47 VOLTS A.C. ACROSS PINS 2 & 7.
[E] - 34 VOLTS A.C. ACROSS PINS 2 & 7.
[F] - 117 VOLTS A.C. ACROSS PINS 2 & 4.

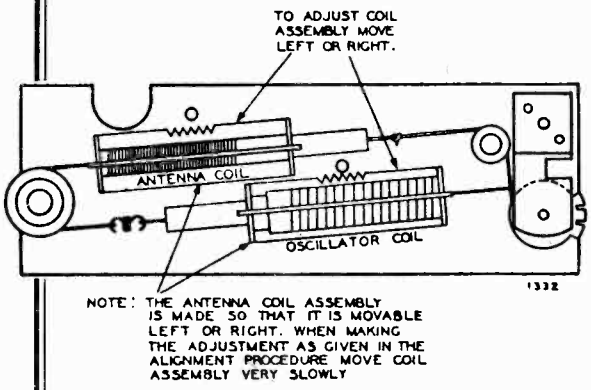


VOLTAGE CHART

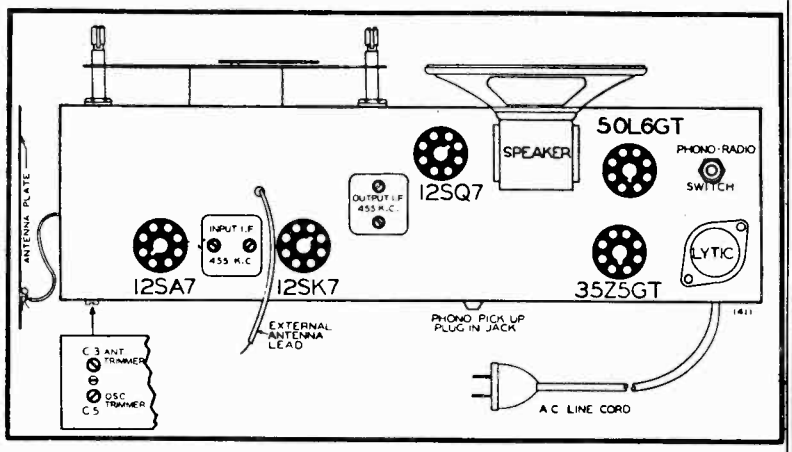
MODEL C5D16

GAMBLE-SKOGMO, INC.

POWER SUPPLY— Unless your radio is marked otherwise, it must be operated from 105 to 125 volts, 60 cycle A.C. If in doubt, phone your electric light company. Receivers of this same model which are for use on special voltages are marked accordingly. Reversing the plug may reduce station hum.



COIL ASSEMBLY VIEW



CHASSIS VIEW—Showing tube location and type. Note External Antenna Lead at back of chassis.

Antenna

This radio is designed to pick up strong local stations without requiring an outside antenna. **For best results, however,** an outside antenna approximately 50 to 75 feet long including lead-in is recommended. It should be erected as high as possible and as far from surrounding objects as practical. For minimum interference it should be at right angles to street car lines, incoming power lines and other electrical apparatus which may be in the vicinity. **A ground is not required.**

Periodic inspection of the antenna system is recommended to be sure that all connections are clean and tight, and that the antenna is well insulated from the ground at all points.

ALIGNMENT PROCEDURE

- Connect B— of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Volume control—Maximum all adjustments.

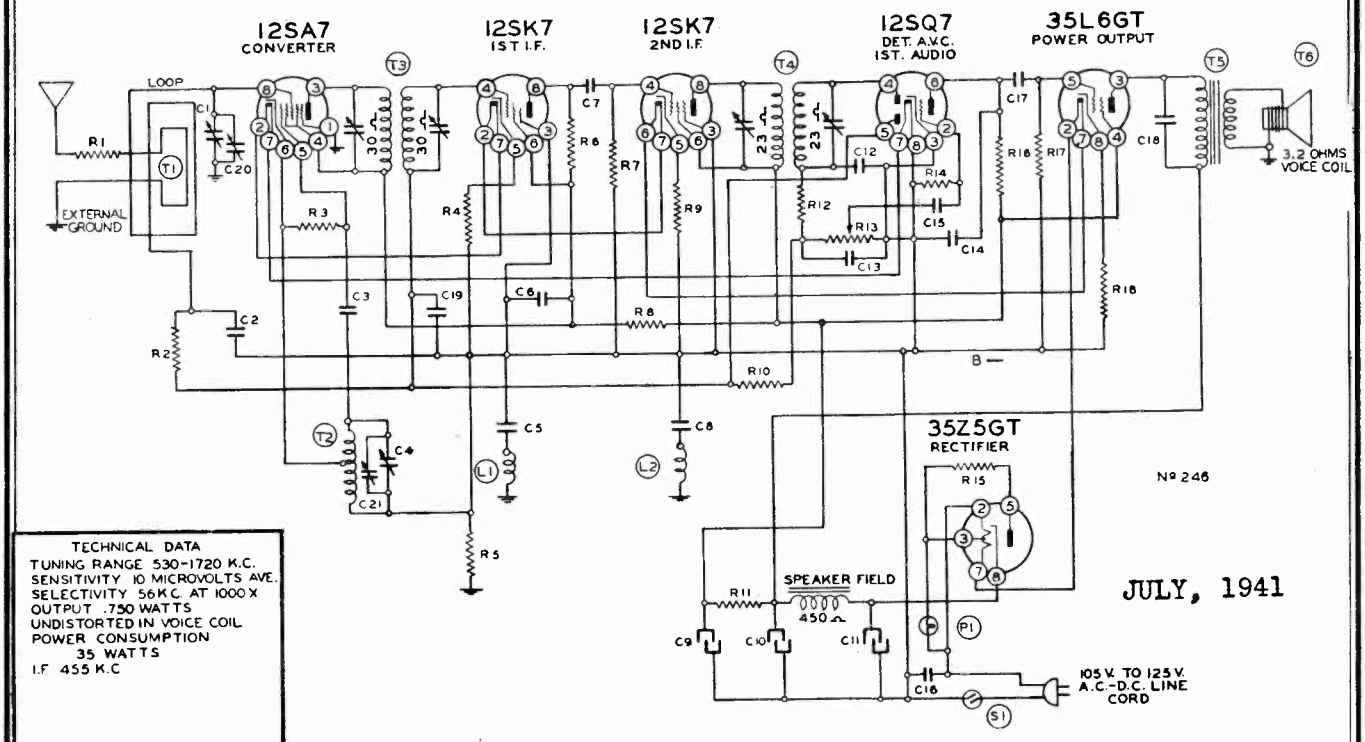
BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Iron Cores (Dial Setting)	Trimmers Adjusted to Maximum (in Order Shown)
I. F.	455 Kc.	.1 MFD.	Connect to Antenna Plate	Iron Cores All the way out	Two trimmers on top of output I.F. (See Chassis View)
	455 Kc.	.1 MFD.	Connect to Antenna Plate	Iron Cores All the way out	Two trimmers on top of input I.F. (See Chassis View)
BROAD-CAST BAND	1690 Kc.	.1 MFD.	Connect to Antenna Plate	Iron Cores All the way out	Oscillator trimmer (C5) (See Chassis View)
	1690 Kc.	200 MMF.	Connect to Antenna Plate	Iron Cores All the way out	Antenna trimmer (C3) (See Chassis View)
	1400 Kc.	200 MMF.	Connect to Antenna Plate	Turn Dial to 1400 Kc.	Adjust position of antenna coil right or left. (See Note "A")
	1690 Kc.	200 MMF.	Connect to Antenna Plate	Turn Dial to 1690 Kc.	Adjust antenna trimmer (C3) (See Chassis View) (See Note "B")

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

NOTE "B"—After the antenna coil has been tracked at 1400 Kc. it is necessary to check the antenna trimmer (C3) adjustment again at 1690 Kc. If no appreciable change in trimmer adjustment is made the coil is in track, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1690 Kc.

MODEL C6D11

GAMBLE-SKOGMO, INC.



TECHNICAL DATA
TUNING RANGE 530-1720 K.C.
SENSITIVITY 10 MICROVOLTS AVE.
SELECTIVITY 56 K.C. AT 1000 X
OUTPUT .750 WATTS
UNDISTORTED IN VOICE COIL
POWER CONSUMPTION
35 WATTS
I.F. 455 K.C.

JULY, 1941

Replacement Parts List

In ordering parts refer to model number on chassis label.

Use Only Genuine Factory Replacement Parts.

Part No.	Schematic Diagram Reference	Description	No. Used In Set	Selling Price Each
CONDENSERS				
102153	C1, C4, C20, C21	Two Gang Condenser Complete with Tuner Assembly and Ant. and Osc. Trimmers	1	6.00
10026	C8, C17, C18	.02 x 400 Volt Tubular Condenser	3	.25
10025	C15	.002 x 600 Volt Tubular Condenser	1	.25
1009	C2, C19	.05 x 200 Volt Tubular Condenser	2	.25
10020	C6	.1 x 200 Volt Tubular Condenser	1	.25
100110	C5	.2 x 400 Volt Tubular Condenser	1	.25
1001	C16	.1 x 400 Volt Tubular Condenser	1	.25
119135	C9, C10, C11	Electrolytic Filter Condenser. 20 Mfd. x 150 V.; 20 Mfd. x 150 V.; 40 Mfd. x 150 V.	1	1.25
1295	C3, C7, C12, C13, C14	.0001 Mica Type Condenser—20%	5	.25
RESISTORS				
101274	R13, S1	Volume Control and Switch (1 Megohm)	1	1.00
13082	R6	10M Ohm—⅓ Watt Resistor—10%	1	.20
1304	R10	3 Megohm—⅓ Watt Resistor—20%	1	.20
13021	R3	20M Ohm—⅓ Watt Resistor—20%	1	.20
130166	R18	150 Ohm—⅓ Watt Resistor—10%	1	.20
13097	R11	200 Ohm—1 Watt Resistor—10%	1	.20
130215	R15	25 Ohm—½ Watt Resistor—10%	1	.20
13019	R17	1 Megohm—⅓ Watt Resistor—20%	1	.20
130257	R14	5 Megohm—⅓ Watt Resistor—25%	1	.20
13020	R12	100M Ohm—⅓ Watt Resistor—20%	1	.20
1309	R16	200M Ohm—⅓ Watt Resistor—20%	1	.20
130168	R4	100 Ohm—⅓ Watt Resistor—10%	1	.20
1303	R7	500M Ohm—⅓ Watt Resistor—20%	1	.20
13097	R9	200 Ohm—⅓ Watt Resistor—10%	1	.20
130345	R1, R8	1M Ohm —⅓ Watt Resistor—10%	1	.20
130100	R2, R5	150M Ohm—⅓ Watt Resistor—20%	2	.20
COILS				
108140P	T3	Input I. F. Coil Complete in Can	1	1.00
108145G	T4	Output I. F. Coil Complete in Can	1	1.00
110146	T2	Oscillator Coil	1	.75
111260	T1	Loop Antenna Assembly—Specify Color	1	1.25
105140	L1	I. F. Filter Choke	1	.05
105141	L2	Filter Choke	1	.05
SPEAKER				
114263	T6	4 x 6 Inch Oval Electrodynamic Speaker (Less Output Transformer)	1	3.50
105106B	T5	Output Transformer for Speaker	1	1.00

Part No.	Schematic Diagram Reference	Description	No. Used In Set	Selling Price Each
MISCELLANEOUS				
107249	P1	6-8 Volt Pilot Lite Bulb. Type T-47	1	.10
107389		Socket Assembly for Pilot Lite	1	.10
10798		Line Cord and Plug	1	.50
121210		8 Prong Molded Octal Sockets	6	.15
128659-36		Bakelite Cabinet—Walnut	1	3.75
128659-9		Bakelite Cabinet—Ivory Color	1	5.00
134123		Rubber Bumpers for Bottom of Cabinet	4	.03
131356		Snap-in Buttons to Fasten Back	4	.01
128740		Back for Cabinet—Brown	1	.10
128740B		Back for Cabinet—Ivory Color	1	.10
DIAL AND TUNING PARTS				
1121012		Dial Scale	1	.90
112998		Diffuser	1	.10
131211		Snap-in Rivets to Fasten Dial	2	.01
1121013		Pointer	1	.15
120377		Coiled Tension Spring for Dial String	2	.03
120214		String for Dial	Per Yd.	.15
120424		Spring—On Tuning Shaft	1	.03
1209		String for Tuning Shaft	Per Yd.	.15
117922		Tuning Shaft	1	.10
128699-18		Pushbuttons—Left—Walnut	3	.10
128700-18		Pushbuttons—Right—Walnut	3	.10
128699-9		Pushbuttons—Left—Ivory	3	.10
128700-9		Pushbuttons—Right—Ivory	3	.10
131383		Screw Driver	1	.10
128523-17		Knob—Walnut	2	.10
128523-8		Knob—Ivory	2	.10
112973		Set of Station Call Letters	1	.15
112979		Set of Tabs for Call Letters	1	.10

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

Shipments are F. O. B. our factory. When remitting in advance, please include postage. Prices subject to change without notice.

WE CANNOT SUPPLY SPEAKER CONES OR FIELDS SEPARATELY, WE CAN REPLACE OR REPAIR A DAMAGED SPEAKER FOR $2.75 IF IT IS RETURNED TO OUR FACTORY, TRANSPORTATION CHARGES PREPAID.

MODEL C6D11

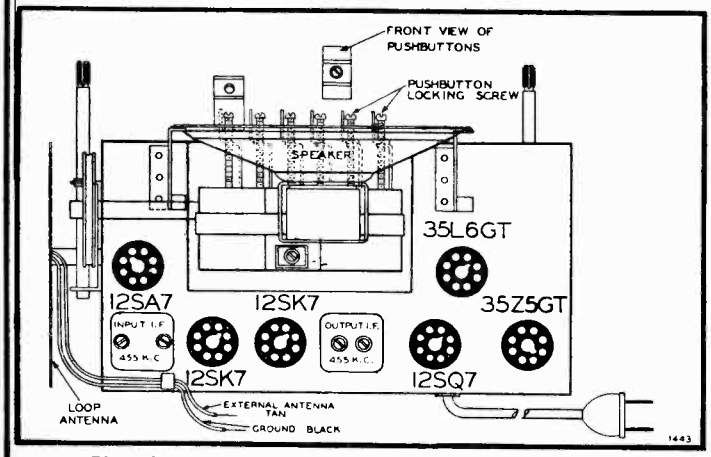
GAMBLE-SKOGMO, INC.

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect B— of radio chassis to ground post of signal generator through .1 Mfd. condenser.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted to Maximum
I. F.	455 Kc.	.1 MFD.	Grid of 12SK7 2nd I. F.	Rotor full open (Plates out of mesh)	Two trimmers on top of Output I. F.
	455 Kc.	.1 MFD.	Grid of 12SA7 Converter	Rotor full open (Plates out of mesh)	Two trimmers on top of Input I. F.
BROAD-CAST BAND	1720 Kc.	.1 mmf.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Osc. trimmer C21 See voltage chart view
	1400 Kc.	200 mmf.	External Antenna and B—	Set Dial at 1400 K. C.	Ant. trimmer C20 See voltage chart view

The loop antenna should be connected to the radio and in its proper position when making all adjustments.



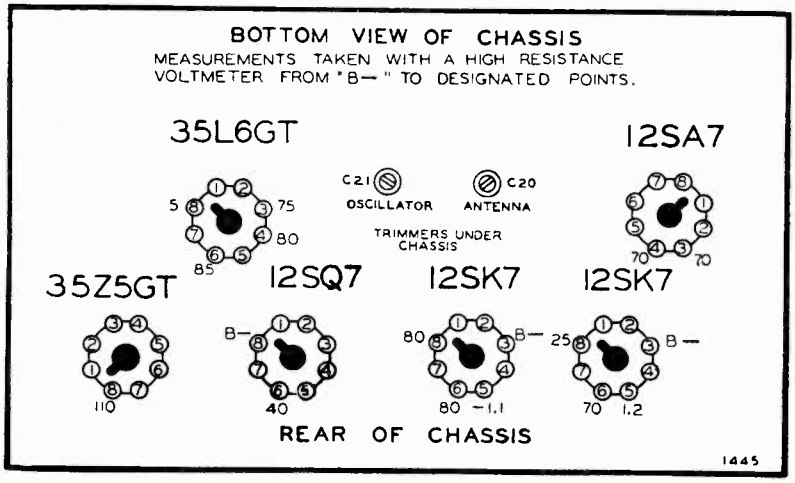
Chassis View, Showing Tube Location and the External Antenna and Ground Leads

Setting the Pushbuttons

Make a list of your 6 favorite stations—push out the call letters of these stations from the call letter sheets supplied. Next insert a long slim screw driver into the hole in front of one of the pushbuttons and unscrew the pushbutton locking screw (to the left) several turns. Now with the screw driver still engaged in the locking screw slot push it all the way in. Hold it in this position and tune in the station you want with the tuning knob. Now tighten up the pushbutton locking screw by turning it to the right. Tighten firmly. Continue setting each button in the same way. When you have set your stations insert the call letter of each station in the front of the proper button and put one of the celluloid tabs over the station call letter.

To change stations simply repeat the above procedure.

If you are unable to set a station on any particular button it is probably because the pushbutton locking screw has not been unloosened (turned to the left).



VOLTAGE CHART

Unless your radio is marked otherwise, it must be operated from 105 to 125 volts, 50 to 60 cycle, or the same D. C. Voltage. If in doubt, phone your electric light company. Receivers of this same model which are for use on special voltages are marked accordingly. When using your radio on A. C., reversing the plug may reduce station hum. If set does not operate in one minute on direct current reverse the plug.

Antenna

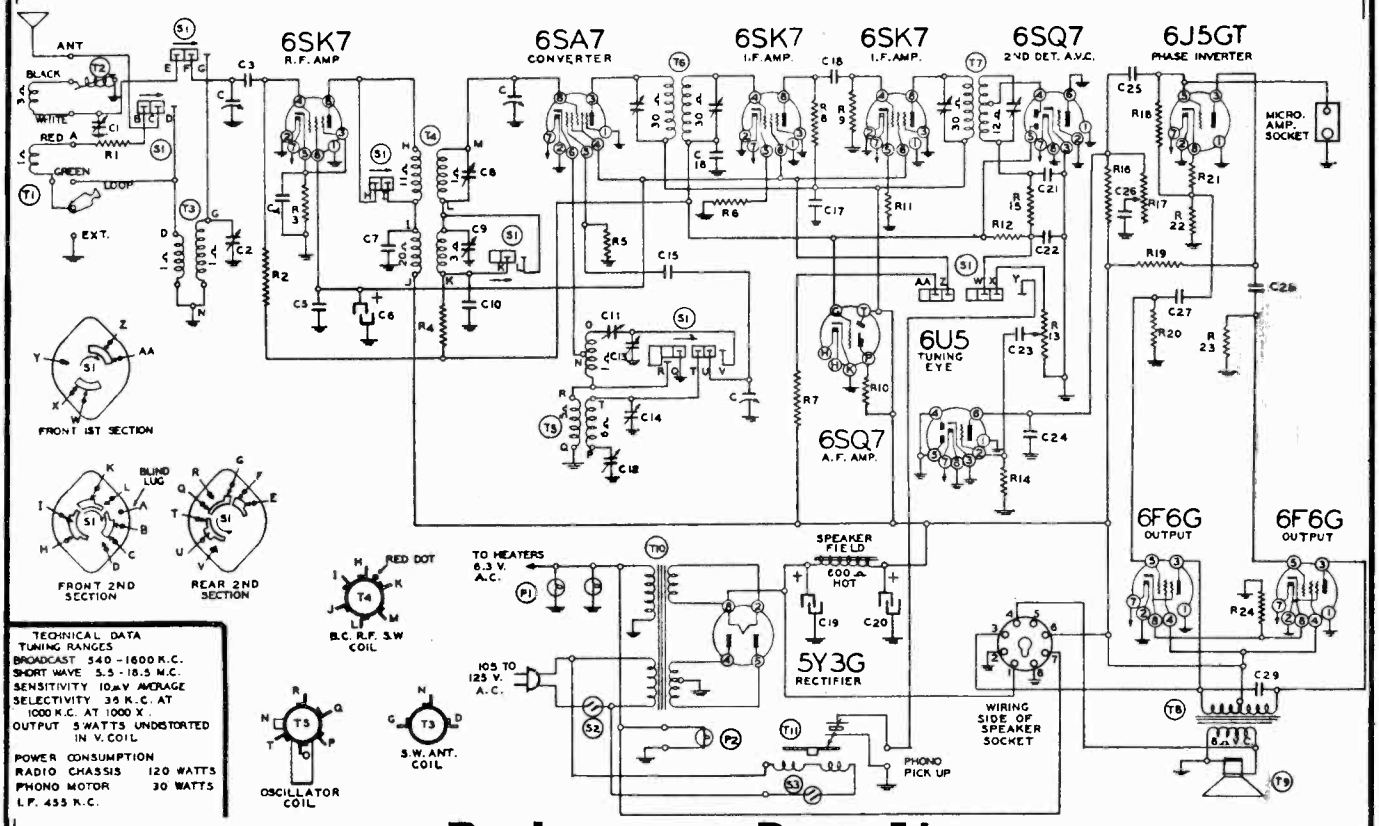
This radio is designed to pick up strong local stations without requiring an outside antenna. The built-in aerial may be somewhat directional therefore try the radio in several positions.

For best results, however, an outside antenna approximately 50 to 75 feet long including lead-in is recommended. It should be erected as high as possible and as far from surrounding objects as practical. For minimum interference it should be at right angles to street car lines, incoming power lines and other electrical apparatus which may be in the vicinity. A ground is advisable. A good ground will often reduce noise. The ground wire should be connected with a clamp to a well cleaned water pipe or to a piece of pipe driven several feet into damp earth.

Periodic inspection of the antenna and ground system is recommended to be sure that all connections are clean and tight, and that the antenna is well insulated from the ground at all points.

MODEL 11A24

GAMBLE-SKOGMO, INC.



TECHNICAL DATA
TUNING RANGES
BROADCAST 540 - 1600 K.C.
SHORT WAVE 5.5 - 18.5 M.C.
SENSITIVITY 10 μV AVERAGE
SELECTIVITY 35 K.C. AT 1000 K.C. AT 1000 X
OUTPUT 5 WATTS UNDISTORTED IN V. COIL

POWER CONSUMPTION
RADIO CHASSIS 120 WATTS
PHONO MOTOR 30 WATTS
I.F. 455 K.C.

Replacement Parts List

In ordering parts or writing refer to the model number

Part No.	Schematic Diagram Reference	Description	No. Used In Set	Price Each
		CONDENSERS		
102152	C	Three Gang Variable Condenser	1	4.00
10020	C4	.1 x 200 Volt Tubular Condenser	1	.25
10026	C10, C16, C25	.02 x 400 Volt Tubular Condenser	3	.25
10025	C23	.002 x 600 Volt Tubular Condenser	1	.25
1009	C27	.05 x 200 Volt Tubular Condenser	1	.25
10013	C28	.05 x 400 Volt Tubular Condenser	1	.25
10011	C26	.01 x 400 Volt Tubular Condenser	1	.25
10071	C29	.004 x 600 Volt Tubular Condenser	1	.25
100117	C5, C17	.25 x 400 Volt Tubular Condenser	2	.35
119124	C6, C19, C20	Electrolytic Filter Condenser—10 Mfd. x 350 V.; 25 Mfd. x 450 V.; 25 Mfd. x 450 V.	1	1.50
124180	C2	S.W. Antenna Trimmer	1	.55
124179	C8, C9	S.W. and B.C. R.F. Trimmer—Dual	1	.45
124181	C13, C14	S.W. and B.C. Osc. Trimmer—Dual	1	.40
124182	C1	B.C. Antenna Trimmer	1	.20
129157	C12	.000525 Compression Cond.—B.C. Pad	1	.35
1292	C3, C18	.0005 Mica Type Condenser—20%	2	.25
129160	C7	.0004 Mica Type Condenser—20%	1	.35
12939	C15	.00005 Mica Type Condenser—20%	1	.25
1295	C21, C22	.0001 Mica Type Condenser—2%	2	.25
129156	C11	.0024 Compression Mica Condenser	1	.50
12912	C24	.00025 Mica Type Condenser—20%	1	.25
		RESISTORS		
101270	R13, S2	Volume Control and Switch (500M Ohms)	1	1.25
101271	R17	Tone Control (1 Megohm)	1	.90
13019	R2, R18	1 Megohm—⅓ Watt Resistor—20%	2	.20
1305	R4	300M Ohm—⅓ Watt Resistor—20%	1	.20
130208	R5	40M Ohm—⅓ Watt Resistor—20%	1	.20
13054	R6, R11	500 Ohm—⅓ Watt Resistor—20%	2	.20
130263	R8	12M Ohm—⅓ Watt Resistor—20%	1	.20
13020	R9, R19, R22	100M Ohm—⅓ Watt Resistor—20%	3	.20
130304	R7	12M Ohm—2 Watt Resistor—10%	1	.20
13012	R15	50M Ohm—⅓ Watt Resistor—20%	1	.20
130170	R12	3 Megohm—⅓ Watt Resistor—25%	1	.20
130225	R14	15 Megohm—⅓ Watt Resistor—30%	1	.20
13043	R21	2500 Ohm—⅓ Watt Resistor—20%	1	.20
1303	R20, R23	500M Ohm—⅓ Watt Resistor—20%	2	.20
13011	R16	250M Ohm—⅓ Watt Resistor—20%	1	.20
130311	R24	300 Ohm—1 Watt Resistor—20%	1	.20
13099	R3	300 Ohm—⅓ Watt Resistor—20%	1	.20
13024	R1	400 Ohm—⅓ Watt Resistor—20%	1	.20
	R10	1 Megohm—In Eye Socket	1	.20
		COILS		
108169J	T6	Input I. F. Coil Complete in Can	1	1.00
108130C	T7	Output I.F. Coil Complete in Can	1	1.25
10957	T4	B.C.—S.W. R.F. Coil Complete in Can	1	1.25
110149	T5	B.C.—S.W. Oscillator Coil	1	.75
111176	T3	S.W. Antenna Coil	1	.50
111153	T2	Loop Adjusting Coil With Iron Slug	1	.50
111257	T1	Loop Antenna Assembly	1	2.00
		SPEAKER		
114261B	T9	Ten Inch Electrodynamic Speaker (Less Output Transformer)	1	6.00
		TRANSFORMERS		
10554F	T8	Output Transformer for Speaker	1	1.50
104202C	T10	Power Transformer, 50 to 60 Cycles 105-125 Volt Primary	1	4.50
104203C		Power Transformer 25 to 60 Cycles 105-125 Volt Primary		
		BANDSWITCH		
125179	S1	Band Switch Complete	1	1.50
		MISCELLANEOUS		
107266		Line Cord and Plug	1	.50
13489		Rubber Cushions to Float Chassis	4	.10
121308		Eight Prong Octal Molded Socket for Speaker	1	.15
121210		Eight Prong Octal Molded Socket	10	.15
107169		Socket and Cable Assembly for Tuning Eye	1	.75
10794	P1	6-8 Volt Pilot Lite Bulb Type T-44	2	.10
107395		Socket Assembly for Pilot Lite	2	.10
11757A		Bracket for Tuning Eye	1	.15
11757B		Clamp for Tuning Eye	1	.15
11757C		Wing Bolt for Above	1	.05
		DIAL AND TUNING PARTS		
1121014		Dial Scale	1	.60
131211		Snap-in Rivets to Fasten Dial Scale		.01
112935-B		Escutcheon and Crystal for Dial	1	1.50
112934B		Pointer	1	.15
128573 F-31		Knob—"Volume"	1	.20
128573C-31		Knob—"Tuning"	1	.20
128573E-31		Knob—"Tone"	1	.20
128572-31		Knob—"Band"	1	.20
117918		Tuning Shaft	1	.10
112826		Pulley with Bushing	1	.25
1209		String for Dial	Yd.	.15
120197		Coiled Tension Spring for Dial String	1	.05

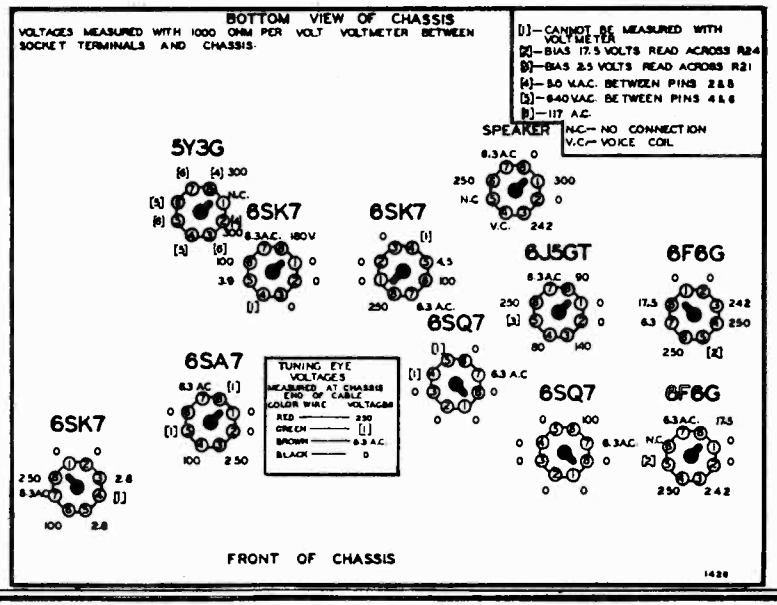
Alignment Procedure

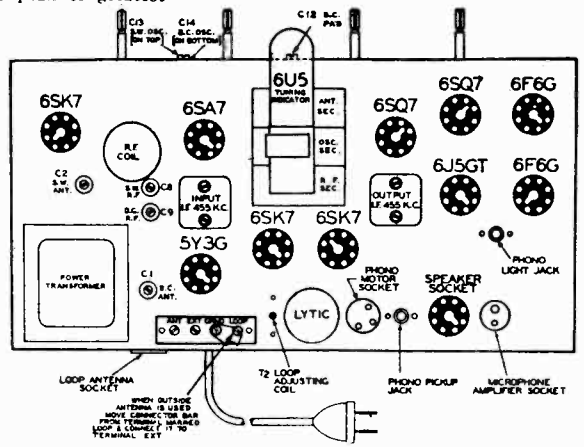
- Volume control—Maximum all adjustments.
- Connect dummy antenna value in series with generator output lead.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connect on to Radio	Position of Band Sw tch	Variable Condenser Setting	Trimmers Adjusted to Maximum (in Order Shown)
I. F.	455 Kc.	.1 MFD.	Grid of 6SK7 I. F.	Broadcast	Rotor full open (Plates out of mesh)	Two trimmers on top Output I. F.
	455 Kc.	.1 MFD.	Grid of 6SA7 Mixer	Broadcast	Rotor full open (Plates out of mesh)	Two trimmers on top Input I. F.
SHORT WAVE BAND	17 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 17 Mc.	C13, S.W. Osc.
	17 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 17 Mc.	C8, S.W. R.F., C2 S.W. Antenna
	6 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 6 Mc.	C11 S.W. Osc. Series Pad See Note "A"
BROAD-CAST BAND	1580 Kc.	200 mmf.	Grid of 6SK7 R. F. Tube	Broadcast	Rotor full open (Plates out of mesh)	C14 B.C. Osc.
	540 Kc.	200 mmf.	Grid of 6SK7 R. F. Tube	Broadcast	Set Dial at 540 Kc. (Plates in Mesh)	C12 B.C. Osc. Series Pad
	1400 Kc.	200 mmf.	Grid of 6SK7 R. F. Tube	Broadcast	Set Dial at 1400 Kc.	C9 B.C. R.F.
LOOP ALIGN-MENT	1400 Kc.	200 mmf.	External Antenna and Ground	Broadcast	Set Dial at 1400 Kc.	C1 B.C. Ant.
	600 Kc.	200 mmf.	External Antenna and Ground	Broadcast	Set Dial at 600 Kc.	T2 Iron Core Tracking Coil

NOTE "A"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

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





CHASSIS VIEW ANTENNA AND GROUND TERMINALS

When using an external antenna and ground, move the metal strap (connector bar) from terminal marked LOOP and connect it to terminal marked EXT.

The antenna and ground wires should then be connected to the terminals marked "Ant."—"Gnd."

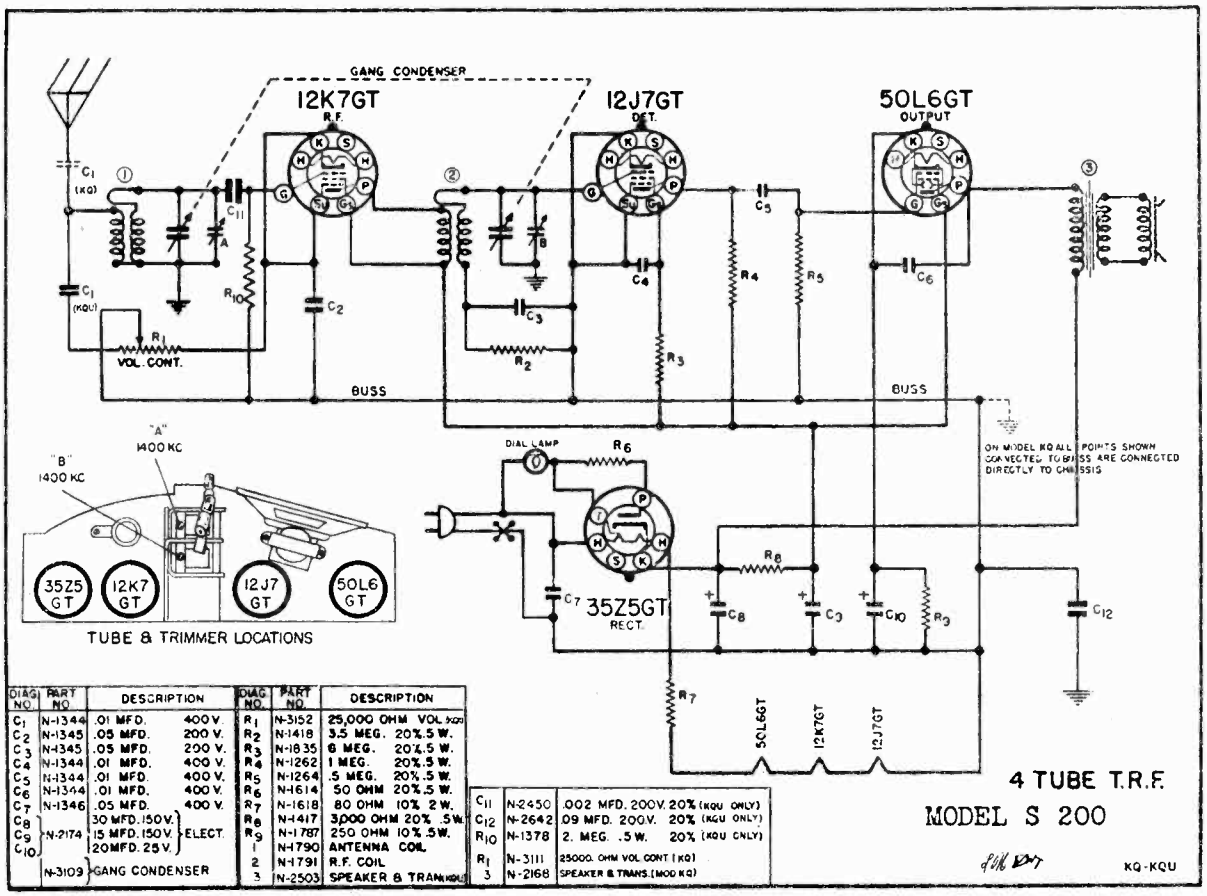
OCTOBER, 1941

FOR DATA ON THE OAK RECORD CHANGER, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".

GAMBLE-SKOGMO, INC.

MODEL S200
MODEL 990B

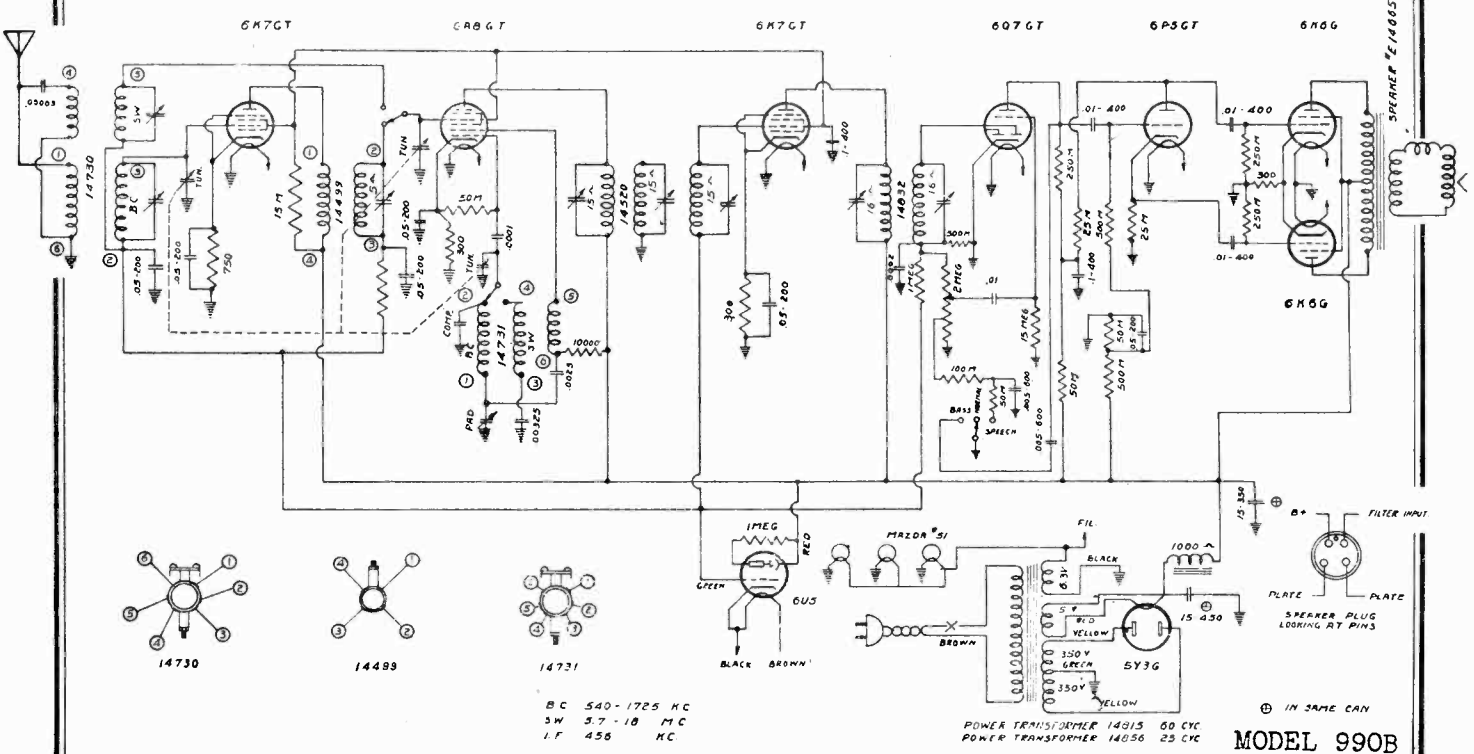
GAMBLE-SKOGMO, INC.



DIAG NO	PART NO	DESCRIPTION		DIAG NO	PART NO	DESCRIPTION
C_1	N-1344	.01 MFD.	400 V.	R_1	N-3152	25,000 OHM VOL (KQU)
C_2	N-1345	.05 MFD.	200 V.	R_2	N-1418	3.5 MEG. 20% .5 W.
C_3	N-1345	.05 MFD.	200 V.	R_3	N-1835	6 MEG. 20% .5 W.
C_4	N-1344	.01 MFD.	400 V.	R_4	N-1262	1 MEG. 20% .5 W.
C_5	N-1344	.01 MFD.	400 V.	R_5	N-1264	.5 MEG. 20% .5 W.
C_6	N-1344	.01 MFD.	400 V.	R_6	N-1614	50 OHM 20% .5 W.
C_7	N-1346	.05 MFD.	400 V.	R_7	N-1618	80 OHM 10% 2 W.
C_8	N-2174	30 MFD. 150 V.	ELECT.	R_8	N-1417	3,000 OHM 20% .5 W.
C_9		15 MFD. 150 V.		R_9	N-1787	250 OHM 10% .5 W.
C_{10}		20 MFD. 25 V.		1	N-1790	ANTENNA COIL
	N-3109	GANG CONDENSER		2	N-1791	R.F. COIL
				3	N-2503	SPEAKER & TRANS. (KQU)

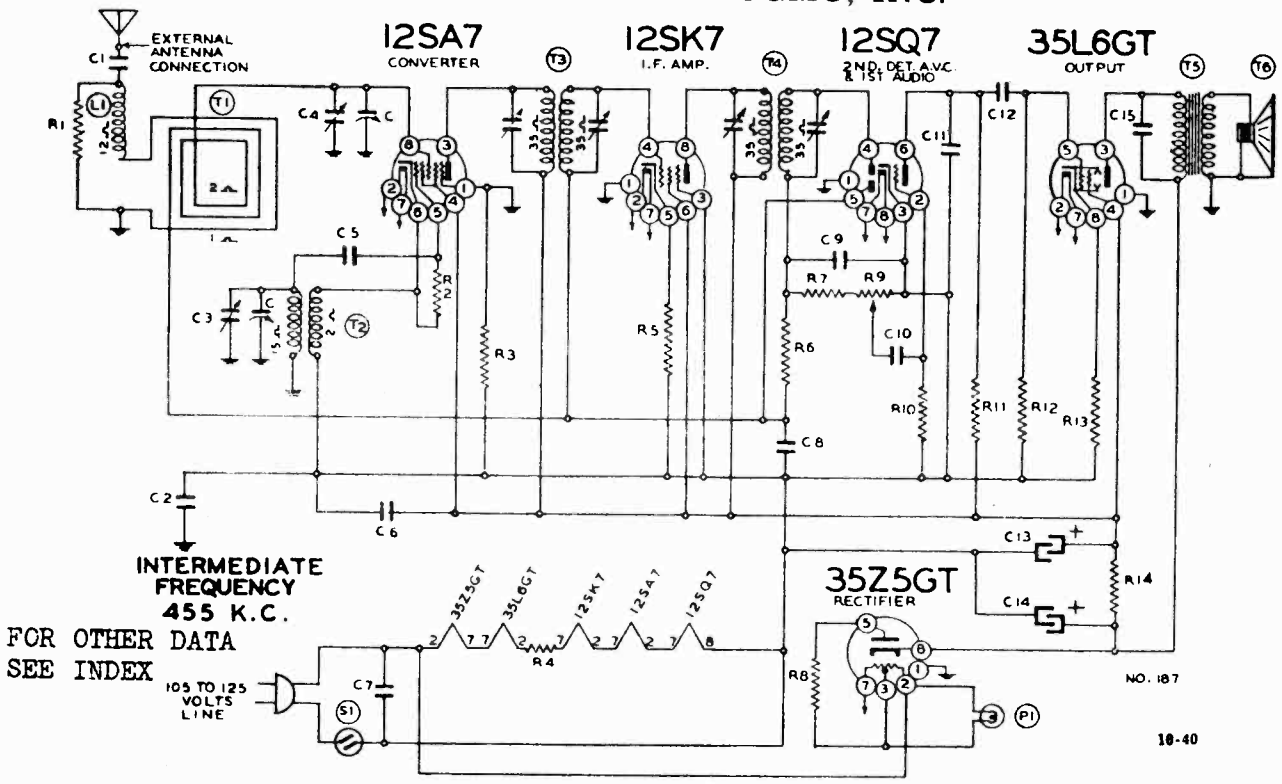
C_{11}	N-2450	.002 MFD. 200 V. 20% (KQU ONLY)
C_{12}	N-2642	.09 MFD. 200 V. 20% (KQU ONLY)
R_{10}	N-1378	2. MEG. .5 W. 20% (KQU ONLY)
R_1	N-3111	25000. OHM VOL CONT (KQ)
3	N-2168	SPEAKER & TRANS. (MOD KQ)

4 TUBE T.R.F.
MODEL S 200
KQ-KQU



MODEL 534

GAMBLE-SKOGMO, INC.



Replacement Parts List

CONDENSERS

C	102132	2 gang variable condenser
C1	10011	.01 x 400 v.
C2	10091	.15 x 400 v.
C3		Oscillator trimmer on gang
C4		Antenna trimmer on gang
C5	12921	.0002 mfd. mica
C6	1009	.05 x 200 v.
C7	1001	.1 x 400 v.
C8	1009	.05 x 200 v.
C9	1295	.0001 mfd. mica
C10	10025	.002 x 600 v.
C11	12912	.00025 mfd. mica
C12	100106	.004 x 600 v.
C13	11992	20 mfd. lytic x 150 w. v.
C14	11992	40 mfd. lytic x 150 w. v.
C15	10026	.02 x 400 v.

C13 and C14 are in same unit

PARTS

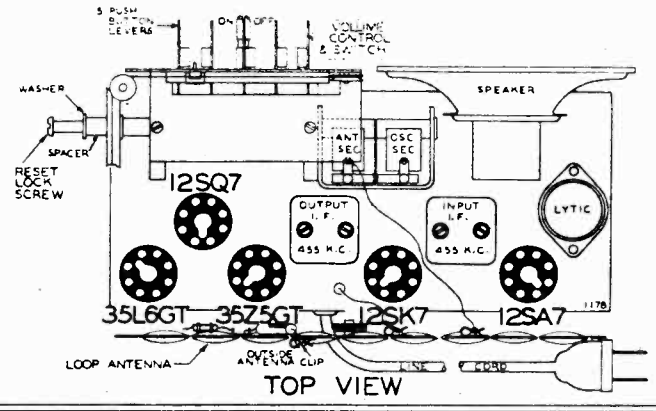
T1	111182	Loop antenna—complete assembly
T2	110145	Oscillator coil
T3	108140I	Input I. F.—455 kc.
T4	108141D	Output I. F.—455 kc.
T5	105104	Output Transformer
T6	114201	5" P. M. Speaker
L1	12311	Loading coil
S1		On-off switch on volume control
P1	107249	Pilot light bulb T47

RESISTORS

R1	130314	2200 ohm—½ w.
R2	13094	50M ohm—½ w.
R3	1309	200M ohm—½ w.
R4	130315	75 ohm—1½ w.
R5	130203	40 ohm—½ w.
R6	1304	3 megohm—½ w.
R7	1301	25M ohm—½ w.
R8	130215	25 ohm—½ w.
R9	101198	1 megohm volume control
R10	130257	5 megohm—½ w.
R11	1303	500M ohm—½ w.
R12	1303	500M ohm—½ w.
R13	130166	150 ohm—½ w.
R14	130287	1200 ohm—1 w.

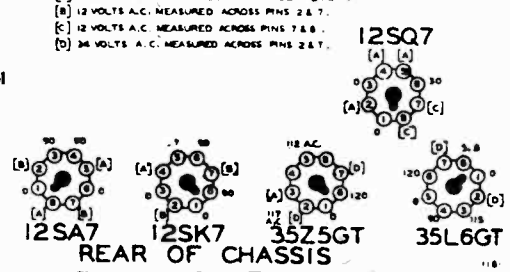
COILS

108140-I	T3	Input I.F. Coil in Can—455 K.C. 1 1.00
108141-D	T4	Output I.F. Coil in Can—455 K.C. 1 1.00
110145	T2	Oscillator Coil ..... 1 .50
111182	T1	Loop Antenna Assembly Complete with Back (Specify Color) 1 1.50



BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOLTMETER BETWEEN SOCKET TERMINALS & B— WITH A LINE VOLTAGE OF 117 V. VOLUME CONTROL AT MAXIMUM.
[A] CANNOT BE MEASURED WITH VOLTMETER.
[B] 12 VOLTS A.C. MEASURED ACROSS PINS 2 & 7.
[C] 12 VOLTS A.C. MEASURED ACROSS PINS 7 & 8.
[D] 34 VOLTS A.C. MEASURED ACROSS PINS 2 & 7.



Setting the Automatic Pushbuttons

Make a list of your 5 favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the front of each pushbutton.

Press one of the buttons all the way down and hold it FIRMLY. Now tune in the station you want with the tuning knob. Tune back and forth until the station is clear, then release the button. **NOTE: If the tuning knob turns quite hard when the button is held down firmly (loosen the reset lock screw several turns with a screwdriver or coin (quarter).**

Continue, setting each of the remaining pushbuttons in the same way. Now turn the tuning knob all the way to the right and tighten the reset lock screw. This screw prevents the pushbuttons from slipping off the stations you have set. To change stations loosen lock screw and proceed as above.

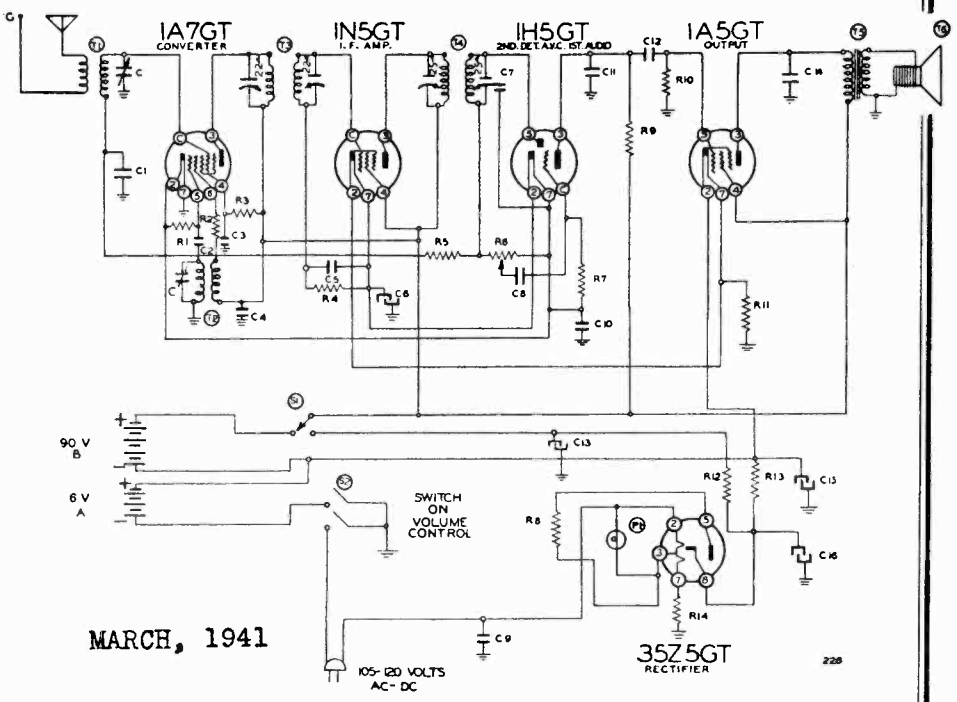
GAMBLE-SKOGMO, INC.

TECHNICAL DATA

A – CURRENT 58 MA.
B – CURRENT 8 MA.
TUNING RANGE 538 KC. TO 1600 KC.

SENSITIVITY 75 MICROVOLTS AVE.
SELECTIVITY AT 1000KC. =
48 K.C. AT 1000 X SIGNAL

OUTPUT 180 MW UNDISTORED 3 OHM VOICE COIL
I.F 455 K.C.



Code No.	Part No.	Description

RESISTORS

R1	1309	200M ohm—⅓ w.
R2	130193	3M ohm—⅓ w.
R3	130305	65M ohm—⅓ w.
R4	130225	15 megohm—⅓ w.
R5	1304	3 megohm—⅓ w.
R6	101252	1 megohm—Volume control
R7	130223	10 megohm—⅓ w.
R8	130197	20 ohm—⅓ w.
R9	13019	1 megohm—⅓ w.
R10	1304	3 megohm—⅓ w.
R11	130345	1M ohm—⅓ w.
R12	130129	2500 ohm—⅓ w.
R13	130344	1975 ohm—6 watt
R14	130343	545 ohm—14 watt

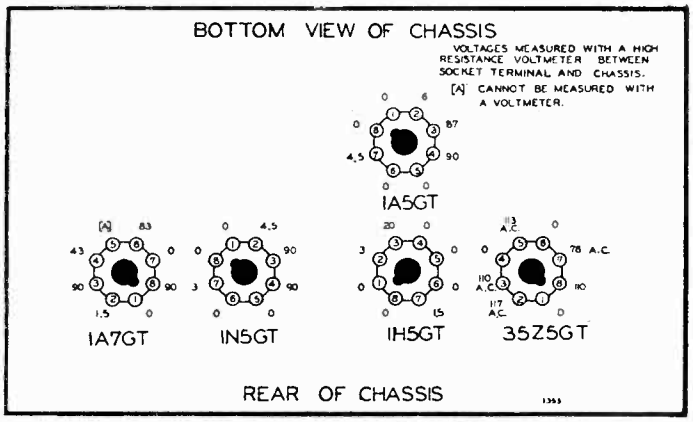
CONDENSERS

C	102141	Gang condenser
C1	1009	.05 x 200 v. condenser
C2	1295	.0001 mica
C3	100128	.05 x 120 v. condenser
C4	100135	.25 x 120 v. condenser
C5	100127	.01 x 120 v. condenser
C6	119123	20.0 mfd.—50 w. v. Lytic
C7		Approximately 100 mfd. in I.F. can
C8	100134	.006 x 120 v. condenser
C9	10013	.05 x 400 v. condenser
C10	100133	.1 x 120 v. condenser
C11	1295	.0001 mica
C12	100127	.01 x 120 v. condenser
C13	119123	40.0 mfd.—150 w. v. Lytic
C14	10025	.002 x 600 v. condenser
C15	119123	200.0 mfd.—10 w. v. Lytic
C16	119123	40.0 mfd.—150 w. v. Lytic

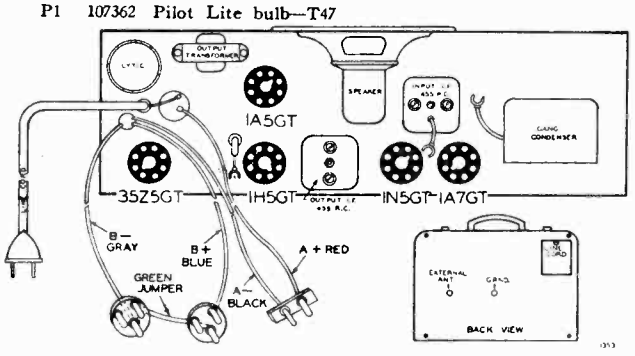
C6, C13, C15 and C16 are in one unit

PARTS

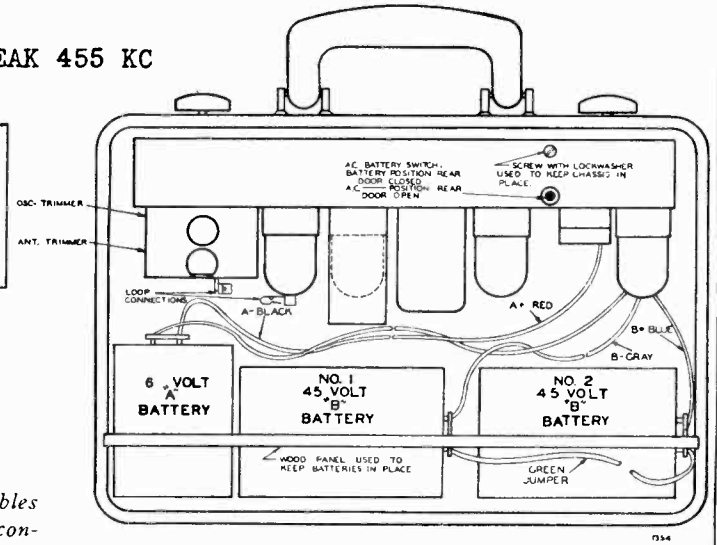
T1	111241	Loop antenna assembly
T2	110179	Oscillator coil
T3	108201	Input I. F. coil
T4	108200	Output I. F. coil
T5	105127	Output transformer
T6	114240	Speaker 5" P.M.
S1	125153	A. C. Battery switch
S2	101252	Switch on Volume control
P1	107362	Pilot Lite bulb—T47



IF PEAK 455 KC



CHASSIS VIEW showing tube location and battery cables —INSET back view, shows external ant. and ground connections.



BATTERY CONNECTIONS—When replacing batteries connect cables as shown above.

ALIGNMENT PROCEDURE MODEL C590

The following equipment is required for aligning.

- Dummy antenna .1 mfd. and 200 mmf.
- Volume control—Maximum all adjustments.
- Connect ground lead of radio chassis to ground post of signal generator.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Iron Cores (Dial Setting)	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
455 Kc. I. F.	455 Kc.	.1 MFD.	Connect to Grid of 1A7	Rotor full open (Plates out of mesh)	Trimmers on top of I. F. cans	Output and input I. F.	maximum output (See Note "A")
BROAD-CAST BAND	1600 Kc.	.1 MFD.	Connect to Grid of 1A7	Rotor full open (Plates out of mesh)	Trimmer on gang (See chassis view)	Oscillator	maximum output (See Note "A")
	1400 Kc.	200 MMF.	Connect to Antenna Clip	Set dial at 1400 Kc.	Trimmer on gang (See chassis view)	Antenna	maximum output (See Note "B")

NOTE "A"—The loop antenna need not be connected to the radio when making these adjustments, but a 1. Meg. Resistor must be substituted across the loop clips. The ground of the signal generator is connected to the chassis and the other lead from the signal generator in series with .1 MFD. dummy to the grid of the 1A7GT tube.

NOTE "B"—This adjustment should be made with the ground lead of the signal generator connected to the external ground terminal. The other lead of the signal generator is connected in series with a 200 Mmf. dummy to the external antenna terminal.

ALIGNMENT PROCEDURE MODEL 642

IMPORTANT:—See alignment instructions

- Volume control—Maximum all adjustments.
- Connect B - of radio chassis to ground post of signal generator through .1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 Mfd.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
I. F.	455 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Four Trimmers on Top (See Fig. 1)	Output and Input I. F.	Adjust to maximum output
BROAD-CAST BAND	1600 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Trimmer rear section of gang.	Broadcast Oscillator	Adjust to maximum output
	1400 Kc.	See Note "A"		Set dial at 1400 Kc.	Trimmer front section of gang	Broadcast Antenna	Adjust to maximum output

NOTE "A" Lay the output lead from the generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the generator.

FREQUENCY RANGE 535 to 1600 K.C.

Power Consumption ..... 35 Watts

Power Output ..... 1 Watt Undistorted, 1.5 Watts Maximum

Intermediate Frequency ..... 455 K.C.

POWER SUPPLY:

Caution:—This radio, unless otherwise marked, must be operated from 105-115 volts, A. C. (50/60 cycles) or D. C. supply only. If you are in doubt as to the voltage rating of the power supply, consult your local power company before inserting plug. Do not insert plug unless all tubes are in their proper sockets.

Receivers of this model which are to be used on voltages other than 105-115 volts A. C. (50/60 cycle), or 105-115 volts D. C. are so marked. The power consumption of this receiver is 35 watts.

FOR DATA ON GENERAL INDUSTRIES R70 RECORD CHANGER, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".

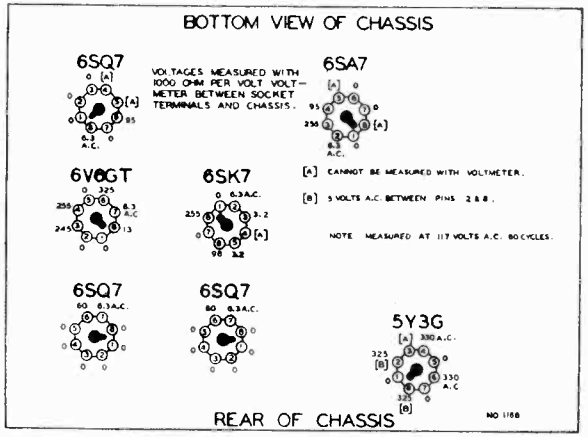
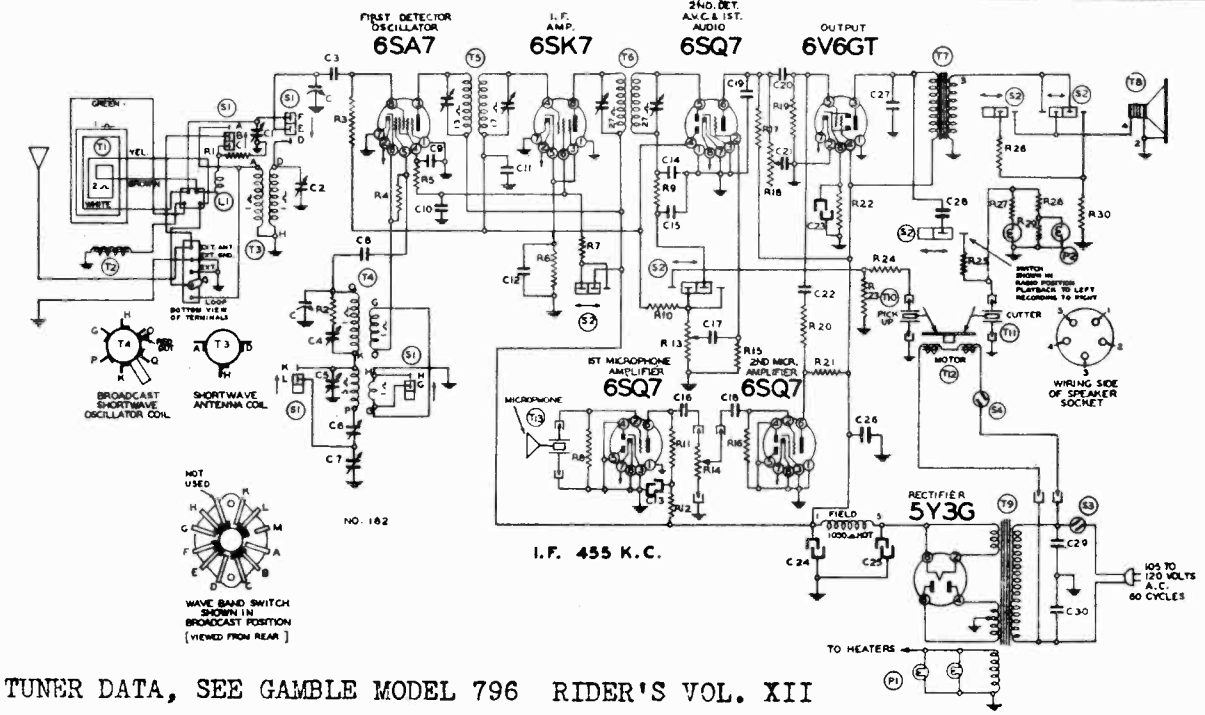


FIG. 6



FOR TUNER DATA, SEE GAMBLE MODEL 796 RIDER'S VOL. XII

Circuit Diagram Ref. No.	Part No.	Description
		RESISTORS
R1	13018	4M ohm—⅓ w.
R2	130197	20 ohm—⅓ w.
R3	1304	3 megohm—⅓ w.
R4	130236	30M ohm—⅓ w.
R5	13092	1M ohm—⅓ w.
R6	13083	300 ohm—⅓ w.
R7	130313	20M ohm—1½ watt
R8	130257	5 megohm—⅓ w.
R9	13012	50M ohm—⅓ w.
R10	1304	3 megohm—⅓ w.
R11	1303	500M ohm—⅓ w.
R12	13012	50M ohm—⅓ w.
R13	101215	1 megohm volume control
R14	101219	1 megohm microphone control
R15	130223	10 megohm—⅓ w.
R16	130223	10 megohm—⅓ w.
R17	13011	250M ohm—⅓ w.
R18	101216	1 megohm tone control
R19	1303	500M ohm—⅓ w.
R20	13020	100M ohm—⅓ w.
R21	1303	500M ohm—⅓ w.
R22	130227	250 ohm—1 watt
R23	13019	1 megohm—⅓ w.
R24	1303	500M ohm—⅓ w.
R25	130194	35M ohm—⅓ w.
R26	130166	150 ohm—⅓ w.
R27	1309	200M ohm—⅓ w.
R28	1309	200M ohm—⅓ w.
R29	1309	200M ohm—⅓ w.
R30	10661	6 ohm—5 watt

Circuit Diagram Ref. No.	Part No.	Description
		CONDENSERS
C	102131	2 gang variable condenser
C1	124117	B.C. Antenna Trimmer
C2	124116	S.W. Antenna Trimmer
C3	1292	.0005 mica
C4	124112	S.W. Oscillator Trimmer
C5	124112	B.C. Oscillator Trimmer
C6	124134	B.C. Series Pad
C7	124134	S.W. Series Pad
C8	12991	.00015 mica
C9	10013	.05 x 400 v.
C10	1001	.1 x 400 v.
C11	1009	.05 x 200 v.
C12	1009	.05 x 200 v.
C13	11967	8 mfd. lytic
C14	129161	.0001 mica
C15	129161	.0001 mica
C16	10026	.02 x 400 volts
C17	10071	.004 x 600 v.
C18	10025	.002 x 600 v.
C19	1292	.0005 mica
C20	10013	.05 x 400 v.
C21	10019	.006 x 600 v.
C22	10013	.05 x 400 v.
C23	119110	40 mfd. lytic
C24	119110	20 mfd. lytic
C25	119110	20 mfd. lytic
C26	1001	.1 x 400 v.
C27	10019	.006 x 600 v.

Circuit Diagram Ref. No.	Part No.	Description
C28	10024	.25 x 400 v.
C29	10061	.02 x 600 v.
C30	10061	.02 x 600 v.

C4 and C5 in same unit—C6 and C7 in same unit
C14 and C15 are in same unit
C23, C24 and C25 are in same unit

		PARTS
T1	111165E	Loop Antenna Assembly
T2	111153	Loop Adjustable Coil
T3	111163	S.W. Antenna Coil
T4	110150	B.C. & S.W. Oscillator Coil
T5	108162B	Input I.F. Coil—455 kc.
T6	108132D	Output I.F. Coil—455 kc.
T7	105109	Output Transformer
T8	114195	10" Dynamic Speaker
T9	104209	Power Transformer
T10	104210	Pickup arm
T11	104210	Record cutter arm
T12	104210	Phono Motor
T13	114196	Microphone Complete
L1	1239	R.F. Choke coil
S1	125114	Wave Band Switch
S2	125115	Radio Recording Switch
S3		On-off switch on Volume Control
S4		Phono Motor Switch
P1	10794	(2) Pilot light bulbs T44
P2	107326	(2) Neon Light Bulbs Type (T2)

ALIGNMENT PROCEDURE

IMPORTANT: See Aligning Instructions.

- Volume control—Maximum all adjustments.
- Connect radio ground to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minute.

The following equipment is requ for aligning:

- An all wave signal generat 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 400 ohms.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Band Switch	Variable Condenser Setting	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
I. F.	455 Kc.	.1 MFD.	Grid of 6SK7 I. F.	Broadcast	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 3)	Output I. F.	Adjust to maximum output
	455 Kc.	.1 MFD.	Grid of 6SA7 Mixer	Broadcast	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 3)	Input I. F.	Adjust to maximum output
SHORT WAVE BAND (See Note A)	17 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 17 Mc.	Trimmer C4 (See Fig. 4)	Short Wave oscillator	Adjust to maximum output
	17 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 17 Mc.	Trimmer C2 (See Fig. 4)	Short Wave antenna	Adjust to maximum output
	6 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 6 Mc.	Trimmer C7 (See Fig. 4)	Short Wave oscillator series pad	Adjust to maximum rock dial. (See note "C")
BROAD-CAST BAND (See Note A)	1570 Kc.	200 mmf.	Grid of 6SA7	Broadcast	Rotor full open (Plates out of mesh)	Trimmer C5 (See Fig. 4)	Broadcast oscillator	Adjust to maximum output
	532 Kc.	200 mmf.	Grid of 6SA7	Broadcast	Set Dial at 532 K. C.	Trimmer C6 (See Fig. 4)	Broadcast oscillator series pad	Adjust to maximum output
LOOP ALIGN-MENT (See Note B)	1400 Kc.	200 mmf.	External Antenna and Ground	Broadcast	Set Dial at 1400 Kc.	Trimmer C1 (See Fig. 5)	Broadcast antenna	Adjust to maximum output
	600 Kc.	200 mmf.	External Antenna and Ground	Broadcast	Set Dial at 600 Kc.	Trimmer T2 (See Fig. 5)	Iron Core Tracking Coil	Adjust to maximum output

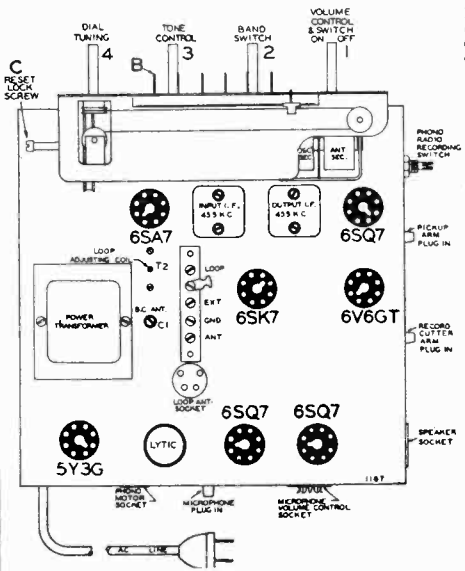


FIG. 3—TOP VIEW

NOTE "A"—The signal generator is connected to the "ANT." and "GND" terminals on the rear of the chassis when aligning the **Short Wave Band** and to the grid of the 6SA7 tube and ground terminal when setting the **Broadcast Band** oscillator end frequencies, (1570 and 532 K. C.).

The loop antenna need not be connected to the radio when making these adjustments.

NOTE "B"—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the "ANT." and "GND." terminals and the jumper on the terminal board connected to "EXT." terminal. (See Fig. 3).

NOTE "C"—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

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

BAND SWITCH	BAND	FREQUENCY RANGE
Extreme Right Rotation	Short Wave	5.4 to 18.3 MC.
Center Position	Broadcast	532 to 1570 KC.

Power Consumption (Radio Chassis only, less Phono Motor)..... 50 Watts

Power Output..... 3.6 Watts Undistorted, 5.4 Watts Maximum

Intermediate Frequency..... 455 K.C.

BAND	DIAL SCALE	FREQUENCY RANGE
Broadcast	Upper	532 to 1570 KC. (Kilocycles)
Short Wave	Lower	5.4 to 18.3 MC. (Megacycles)

POWER SUPPLY:

Caution:—This radio, unless otherwise marked, must be operated from 105-125 volts, 60 cycle A.C. supply only. If you are in doubt as to the voltage and frequency rating of the power supply, consult your local power company before inserting plug. Do not insert plug unless all tubes and speaker plug are in their proper sockets.

Receivers of this model which are to be used on voltages or frequencies other than 105-125 volts, 60 cycles are so marked. The power consumption of this receiver is 60 watts. **UNDER NO CIRCUMSTANCES remove the chassis from the cabinet without first removing plug from light socket.**

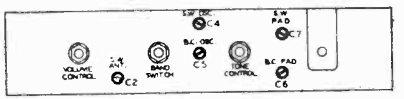


FIG. 4

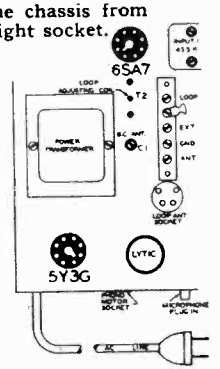
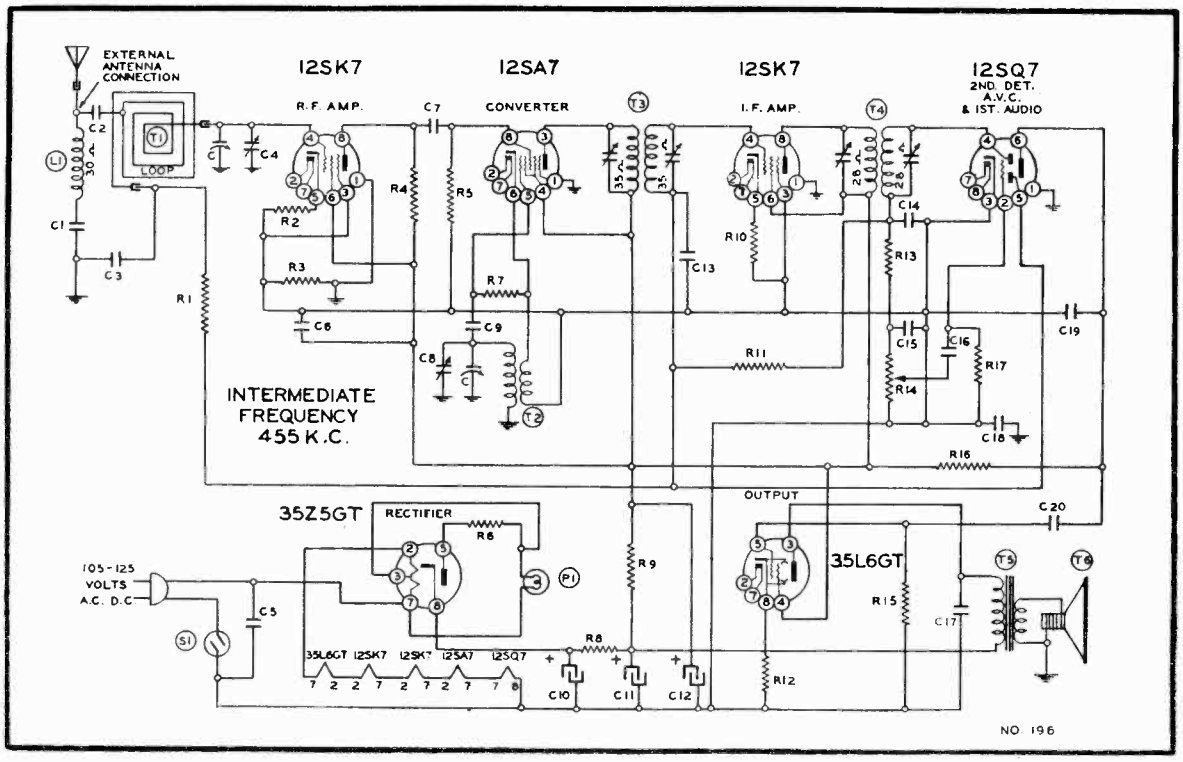


FIG. 5—TOP VIEW

GAMBLE-SKOGMO, INC.



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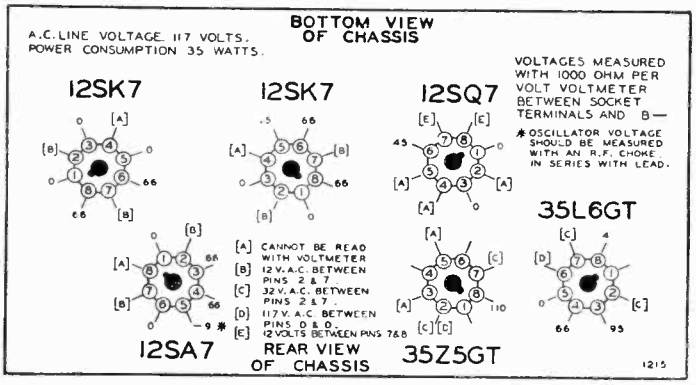
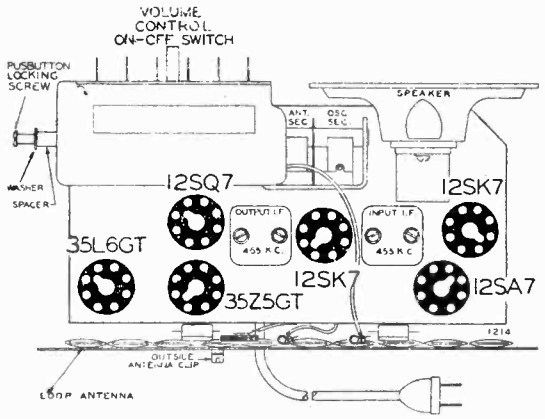


FOR TUNER DATA SEE INDEX



CONDENSERS

Code No.	Part No.	Description
C	102116	2 gang variable condenser
C1	10011	.01 x 400 v.
C2	129132	.000125 mica
C3	10026	.02 x 400 v.
C4		B.C. Antenna Trimmer
C5	1001	.1 x 400 v.
C6	1006	.25 x 200 v.
C7	1295	.0001 mica
C8		B.C. Oscillator Trimmer
C9	1295	.0001 mica
C10	11994	40 mfd.—150 w.v. lytic
C11	11994	20 mfd.—150 w.v. lytic
C12	11994	20 mfd.—150 w.v. lytic
C13	1009	.05 x 200 v.
C14	1295	.0001 mica

RESISTORS

R1	130100	150M ohm—⅓ w.
R2	130168	100 ohm—⅓ w.
R3	130100	150M ohm—⅓ w.
R4	130218	5M ohm—⅓ w.
R5	13020	100M ohm—⅓ w.
R6	130215	25 ohm—½ w.
R7	13094	50M ohm—⅓ w.
R8	130296	200 ohm—1 w.
R9	130287	1200 ohm—1 w.
R10	130248	40 ohm—⅓ w.
R11	1304	3 megohm—⅓ w.
R12	130166	150 ohm—⅓ w.
R13	13012	50M ohm—⅓ w.
R14	101193	1 megohm volume control
R15	1303	500M ohm—⅓ w.
R16	1309	200M ohm—⅓ w.
R17	130257	5 megohm—⅓ w.

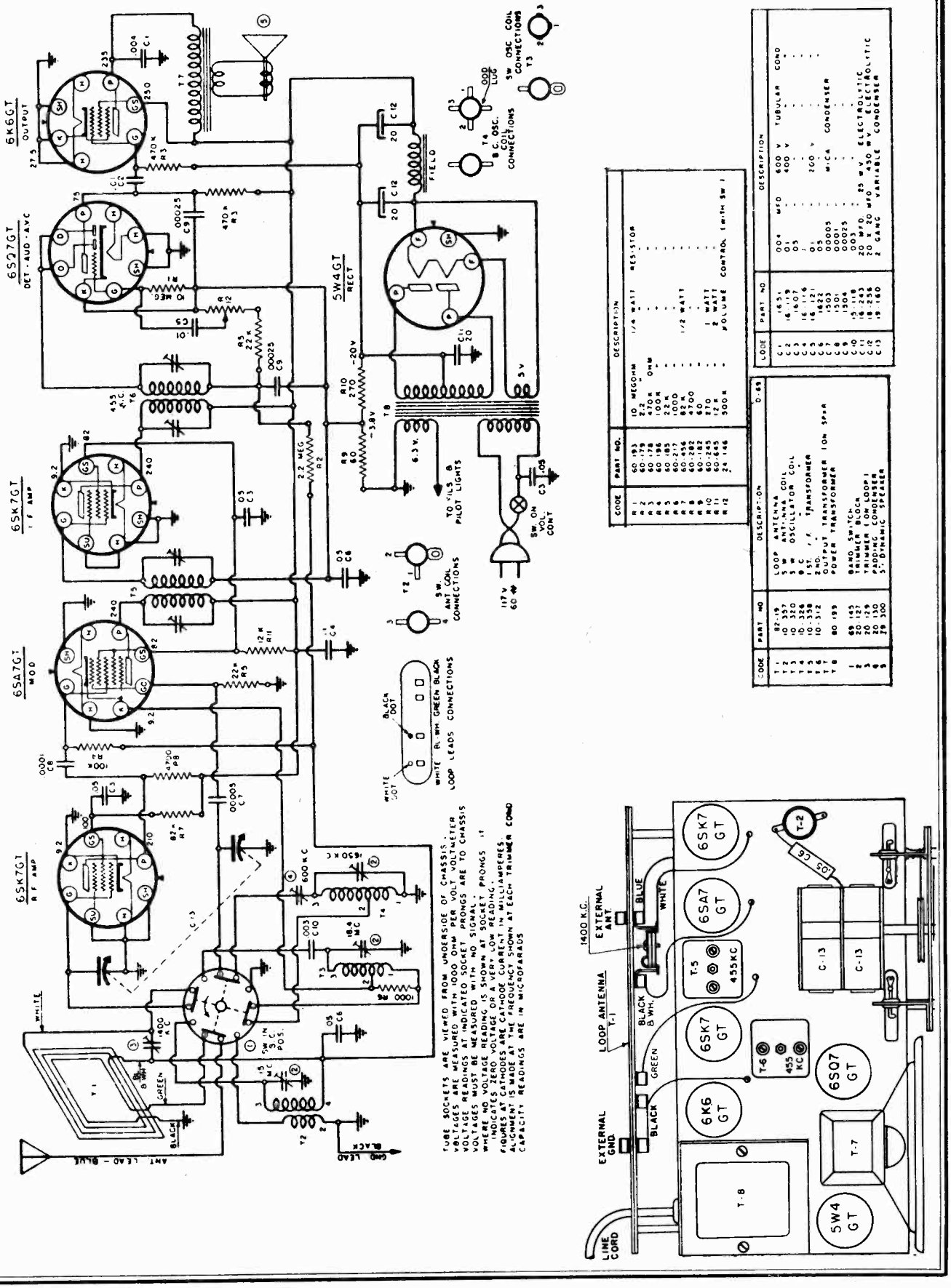
C15	12939	.00005 mica
C16	10025	.002 x 600 v.
C17	10026	.02 x 400 v.
C18	100110	.2 x 400 v.
C19	1295	.0001 mica
C20	100106	.001 x 600 v.

C10, C11 and C12 are in same unit

PARTS

T1	111145	Loop Antenna Assembly
T2	110128	Oscillator Coil
T3	108140G	Input I.F. Coil—465 kc.
T4	108145C	Output I.F. Coil—465 kc.
T5	10595B	Output Transformer
T6	114174	5" P.M. Speaker
L1	1237	Loading Coil
S1		On-off switch on volume control
P1	107249	Pilot light T47

MODEL 906



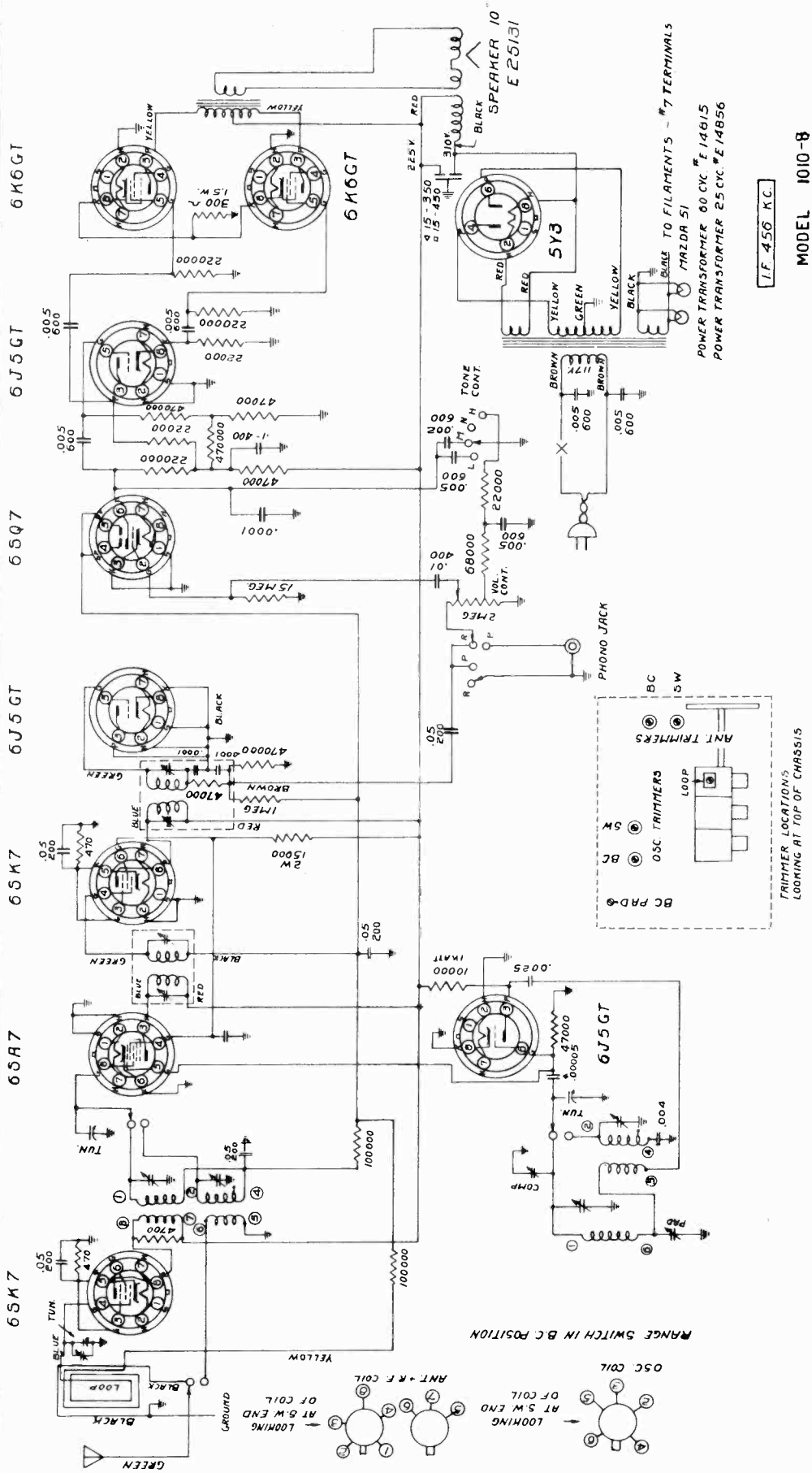
CODE	PART NO.	DESCRIPTION
R 1	60-193	10 MEGOHM 1/4 WATT RESISTOR
R 2	60-179	2.2 " " "
R 3	60-178	470 M Ohm " "
R 4	60-186	100 M " "
R 5	60-185	22 M " "
R 6	60-217	1000 " 1/2 WATT
R 7	60-456	82 M " "
R 8	60-282	4700 " "
R 9	60-182	270 " "
R 10	60-183	470 " 1 WATT
R 11	60-645	12 M 2 WATT
R 12	24-146	500 M VOLUME CONTROL (WITH SW 1)

CODE	PART NO	DESCRIPTION
T-1	82-19	LOOP ANTENNA
T-2	10-357	S W ANTENNA COIL
T-3	10-320	S W OSCILLATOR COIL
T-4	10-358	B C OSC. COIL
T-5	10-338	1ST I F TRANSFORMER
T-6	10-339	2ND " "
T-7	80-193	OUTPUT TRANSFORMER ION SPKR
T-8		POWER TRANSFORMER
1	69-145	BAND SWITCH
2	20-127	TRIMMER BLOCK
3	20-129	TRIMMER (ON LOOP)
4	20-130	PADDING CONDENSER
5	29-300	5" DYNAMIC SPEAKER

CODE	PART NO	DESCRIPTION
C 1	16-51	.004 MFD 600 V TUBULAR COND
C 2	16-119	0.1 " 400 V " "
C 3	16-107	0.5 " " " "
C 4	16-116	1 " " " "
C 5	16-121	0.5 " 250 V " "
C 6	16-122	0.5 " " " "
C 7	1503	.00005 " MICA CONDENSER
C 8	1501	.0001 " " "
C 9	1504	.00025 " " "
C 10	15-118	.003 " " "
C 11	18-255	20 MFD 25 WV ELECTROLYTIC
C 12	18-256	20 X 20 MFD 450 WV ELECTROLYTIC
C 13	19-160	2 GANG VARIABLE CONDENSER

MODEL 1010B

GAMBLE-SKOGMO, INC.



MODEL 1010-B
CIRCUIT DIAGRAM E 25143

I.F. 456 KC.

Watts input at 117 V. line 80. Watts output 3.0 Undistorted 4.5 Maximum.
Selectivity at 1000 times signal 34 kc band width Intermediate frequency 456 kc.
Tuning Ranges: Broadcast 540 to 1725 kc Short-wave 6.0 to 18.0 mc
Sensitivity: Broadcast 5 to 6 Microvolts Short-wave 20 to 45 Microvolts
I.F. 456kc at 6SA7 grid (Stator of center section of variable condenser) 65 to 75 Microvolts.
Tube Functions: 6SK7 R.F. Amplifier, 6SA7 first detector, 6J5GT Oscillator, 6SK7 I.F. Amplifier, 6J5GT Diode Detector, 6SQ7 First Audio Amplifier, 6J5GT Phase Inverter, 2-6K6GT Power Output and 5Y3G Rectifier.
Voltages will be found on circuit diagram.

MODEL 1010B
MODEL 1070A

The following equipment is needed for aligning this receiver:
Model 1010B Signal generator covering Broadcast and short-wave bands, output meter, screw driver, dummy antennas of 200 MMF - 400 Ohms and .1MFD
The receiver and generator should be allowed to warm up for a few minutes. The volume control should be set at maximum and the sensitivities given are for .5 watt output.
The following chart gives connections and operations in their order for proper alignment of this receiver. The trimmer locations will be found on the circuit diagram.

	Generator Frequency	Connection at Radio	Dummy Antenna	Range Switch	Dial Setting	Trimmers to Tune	Approx. Sensitivity
	I.F. 456 K.C.	6SA7 Grid Center Stator of Var. Cond.	.1 MFD.	B.C.	H.F.End	I.F.Trimmers to Max.	65-75 M.V.
	B.C. 1725 K.C.	Antenna	200 MMF.	"	H.F.End Limit of Travel	B. C. Oscillator	
Issue A August, 1940 Serial No. 100001 up	1400 K. C.	"	"	"	1400 K.C. See Note "A"	B.C. Ant. & Loop Tune to Max.	5-6 M.V.
	600 K. C.	"	"	"	Rock Rotor	Padder	5-6 M.V.
	S.W. 15.2 M.C.	"	400 Ohm	S.W.	15.2 M.C.	S.W.Osc. & Ant. to Max.	40 M.V.
	6.0 M.C.	"	"	"	6.0 M.C.	Check	20 M.V.

Note "A" - If the pointer is not at 1400 kc with a 1400 kc signal it may be loosened from the dial cord and moved to correct the calibration. This should be checked across the band to arrive at the optimum condition.

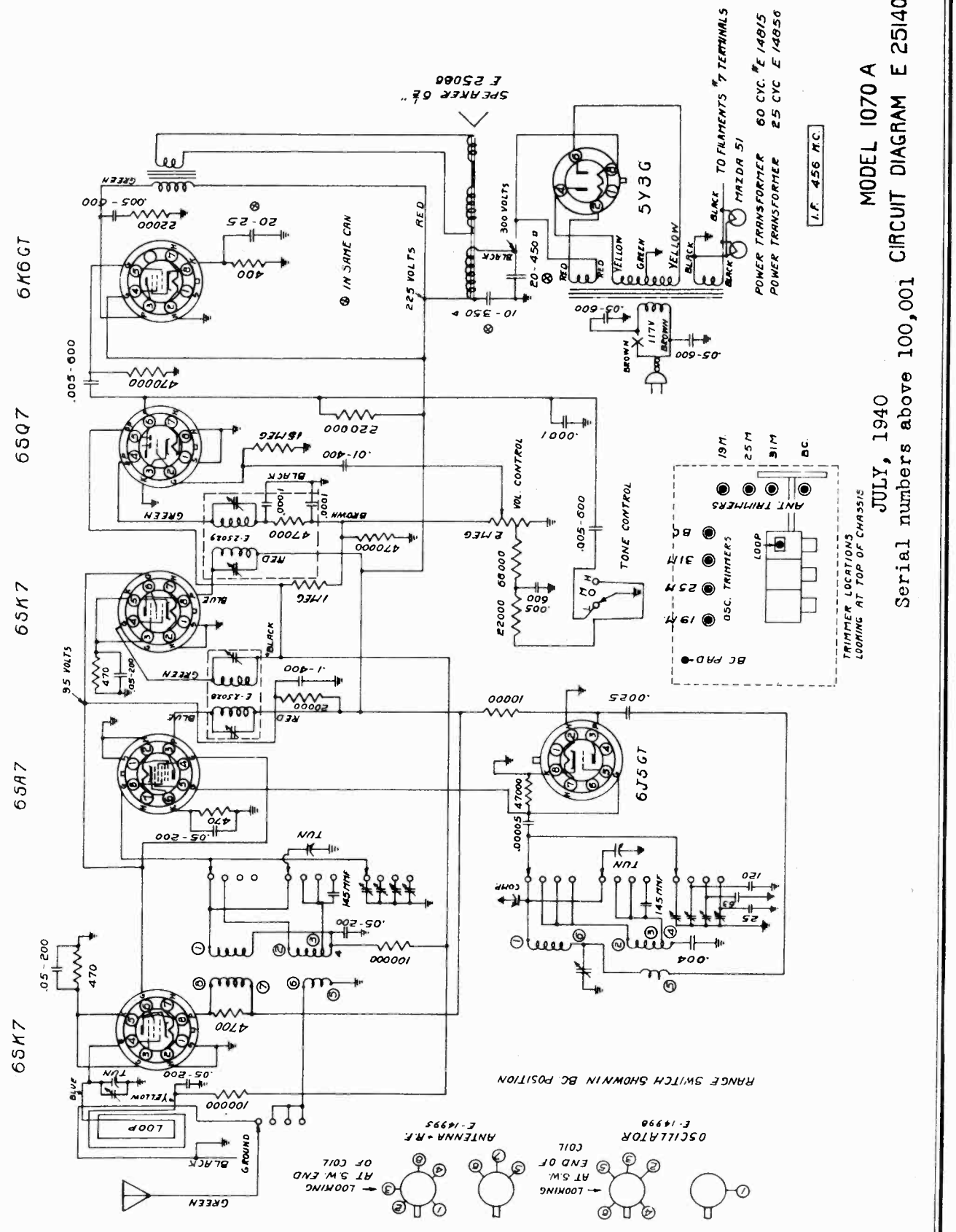
Note "B" - Care should be taken not to align on the image frequency. This may be checked by rotating the dial of the signal generator. Another signal should be heard at dial frequency plus 912 kc. This signal should be checked carefully on the short wave band, making sure the lowest frequency signal agrees with the dial setting in frequency and that it is the strongest of the two.

SPECIFICATIONS 1070-A

Watts input at 117 V. line: 52 Watts output: 1.7 Undistorted 2.7 Maximum
Selectivity at 1000 times signal — 34kc band width Intermediate frequency 456kc
Speaker 6½" Electrodynamic, 1100 ohm field
Tuning Ranges:
Broadcast Band 540 to 1725 kc 25 Meter Band 10.8 to 12.1 mc
31 Meter Band 9.3 to 9.81 mc 19 Meter Band 14.9 to 15.5 mc
Sensitivity: For .5 watt output:
Broadcast Band 3 to 5 Microvolts 25 Meter Band 25 to 30 "
31 Meter Band 20 to 25 " 19 Meter Band 40 to 50 "
I. F. 456kc at 6SA7 grid (Stator of middle section of variable condenser) 65 to 70 Microvolts.
Tube Functions: 6SK7—R. F., 6SA7 first detector, 6J5GT oscillator, 6SK7 I. F. amplifier, 6SQ7 diode detector and first audio amplifier, 6K6GT power output tube, 5Y3G rectifier.

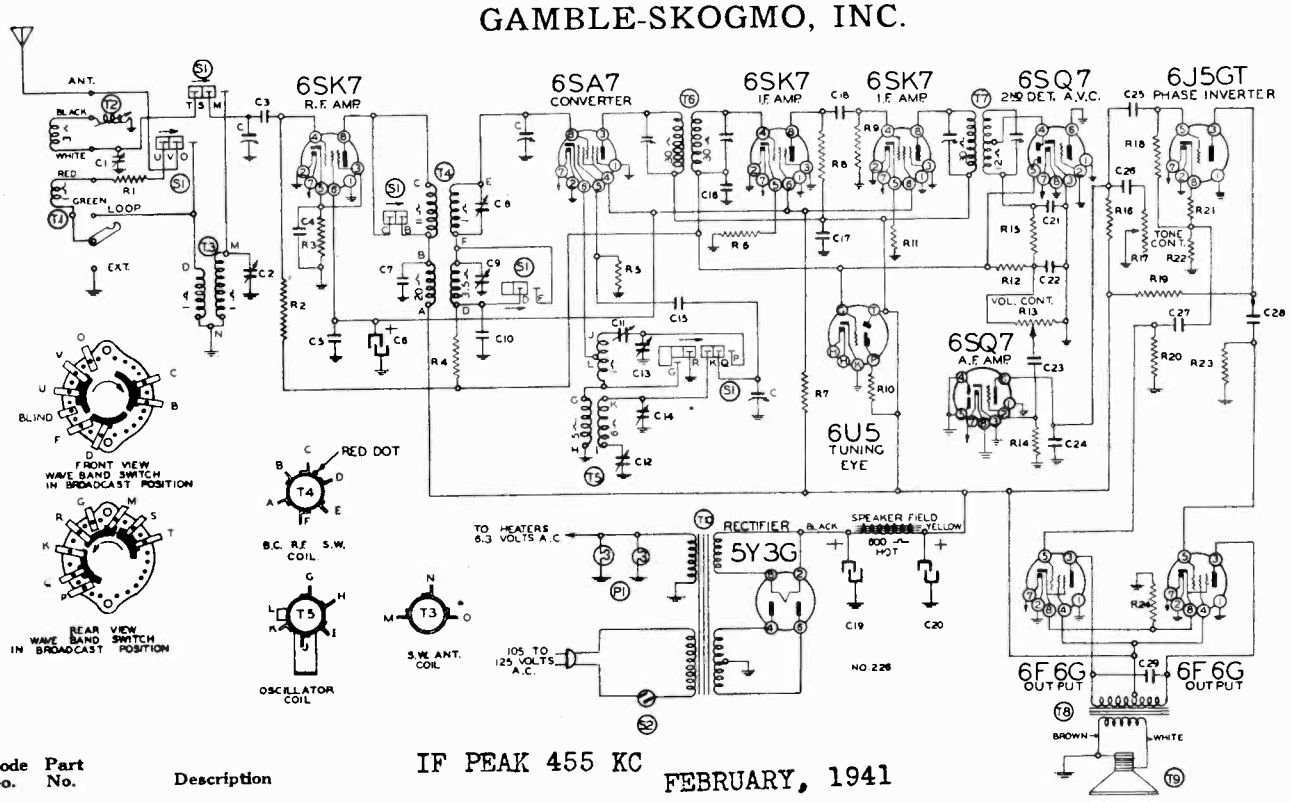
Generator Frequency	Connection at Radio	Dummy Antenna	Range Switch Setting	Dial Setting	Trimmers to Tune	Approx. Sensitivity .5 Watt O. P.
I. F. 456 k.c.	Center Stator of Var. Cond.	.1 Mfd.	B. C.	H. F. End	I. F. Trans. Tune to Max.	65 to 75 Mv.
B. C. 1725 k.c.	Ant.	200 Mmf.	B. C.	H. F. Limit of Travel	B. C. Osc.	—
1400 k.c.	"	"	"	1400— See Note "A"	B. C. Ant. " " Loop Tune to Max.	3-5 Mv.
600 k.c.	"	"	"	600— Rock Rotor	Padder	3-5 Mv.
31 M. Band 9.6 m.c.	"	400 Ohms.	31 M.	9.6 m. c.	31 M. Osc. 31 M. Ant. Tune to Max.	20-25 Mv.
25 M. Band 11.6 m.c.	"	"	25 M.	11.6 m. c.	25 M. Osc. 25 M. Ant. Tune to Max.	25-30 Mv.
19 M. Band 15.2 m.c.	"	"	19 M.	15.2 m. c.	19 M. Osc. 19 M. Ant. Tune to Max.	40-50 Mv.

GAMBLE-SKOGMO, INC.



MODEL C1131

GAMBLE-SKOGMO, INC.



IF PEAK 455 KC

FEBRUARY, 1941

TECHNICAL DATA

Power Consumption - - - - - - 120 Watts

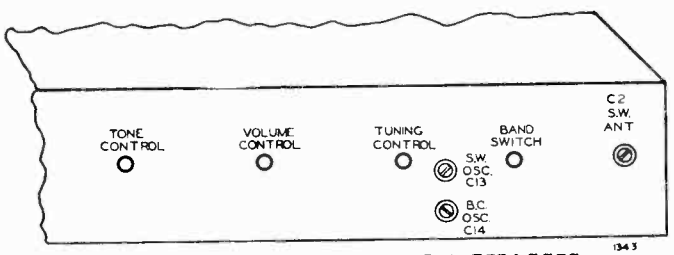
Power Output - - - - - 5 Watts Undistorted

Sensitivity for 500 Milliwatt Output: 6 Microvolts Average

Selectivity - 36 KC Broad at 1000 Times Signal at 1000 KC

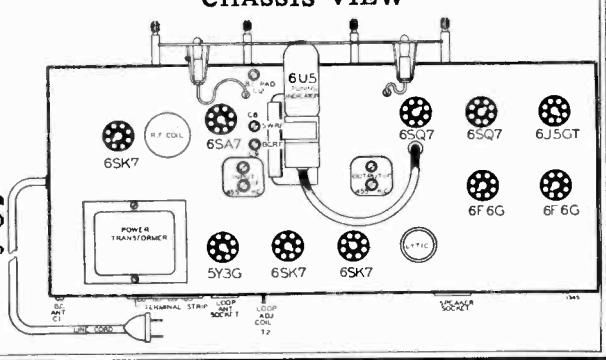
Tuning Frequency Range Broadcast Band - 540 to 1580 KC

Short Wave Band - - 5.5 to 18.5 MC



TRIMMER VIEW—FRONT OF CHASSIS

CHASSIS VIEW



Code No.	Part No.	Description

RESISTORS

R1	13024	400 ohms—⅓ w.
R2	13019	1 megohm—⅓ w.
R3	13099	300 ohms—⅓ w.
R4	1305	300M ohm—⅓ w.
R5	130208	40M ohm—⅓ w.
R6	13054	500 ohm—⅓ w.
R7	130304	12M ohm—2 w.
R8	130263	12M ohm—⅓ w.
R9	13020	100M ohm—⅓ w.
R10		1 megohm—in eye socket
R11	13054	500 ohm—⅓ w.
R12	130170	3 megohm—⅓ w.
R13	101214	Volume control (500M ohm)
R14	130225	15 megohm—½ w.
R15	13012	50M ohm—⅓ w.
R16	13011	250M ohm—⅓ w.
R17	101213	Tone control (1 megohm)
R18	13019	1 megohm—⅓ w.
R19	13020	100M ohm—⅓ w.
R20	1303	500M ohm—⅓ w.
R21	13043	2500 ohm—⅓ w.
R22	13020	100M ohm—⅓ w.
R23	1303	500M ohm—⅓ w.
R24	130311	300 ohm—1 w.

CONDENSERS

C	102129	Three gang variable condenser
C1	124132	B.C. antenna trimmer
C2	124117	S.W. antenna trimmer
C3	1292	.0005 mica
C4	10020	.1 x 200 v.
C5	100117	.25 x 400 v.
C6	119124	10 mfd. lytic—350 w. v.
C7	129160	.0004 mica
C8	124131	S.W. R.F. trimmer
C9	124131	B.C. R.F. trimmers
C10	10026	.02 x 400 v.
C11	129156	.0024 compression S.W. pad
C12	129157	.000525 compression B.C. pad
C13	124130	S.W. oscillator trimmer
C14	124130	B.C. oscillator trimmer
C15	12939	.00005 mica
C16	10026	.02 x 400 v.
C17	100117	.25 x 400 v.
C18	1292	.0005 mica
C19	119124	25 mfd. lytic—450 w. v.
C20	119124	25 mfd. lytic—450 w. v.
C21	1295	.0001 mica
C22	1295	.0001 mica
C23	10025	.002 x 600 v.
C24	12912	.00025 mica
C25	10026	.02 x 400 v.
C26	10011	.01 x 400 v.
C27	1009	.05 x 200 v.
C28	10013	.05 x 400 v.
C29	10071	.004 x 600 v.

PARTS

T1	111240	Loop antenna assembly
T2	111153	Loop adjustable coil
T3	111176	S.W. antenna coil
T4	10957	B.C. S.W.—R.F. coil
T5	110149	B.C. S.W. oscillator coil
T6	108169I	Input I.F. 465 kc.
T7	108130D	Output I.F. 465 kc.
T8	10554B	Output transformer
T9	114192B	10" dynamic speaker (600 ohm field)
T10	104202	Power transformer
S1	125111	Wave band switch
S2		On-off switch on volume contro
P1	10794	(2) pilot light bulbs T-44

C6, C19 and C20 in one unit
C8 and C9 in one unit
C13 and C14 in one unit

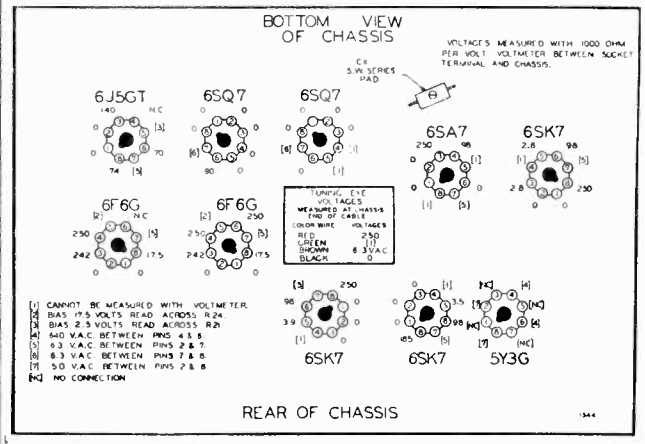
ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio ground to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.

The following equipment is required for aligning.

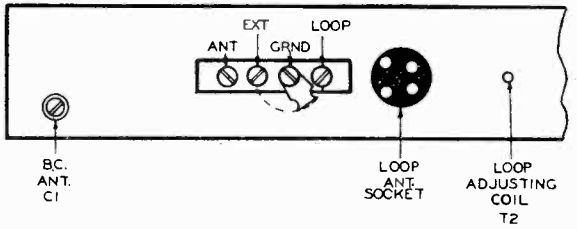
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Dummy antennas—.1 mf., 200 mmf., 400 ohms.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Band Switch	Variable Condenser Setting	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
I. F.	455 Kc.	.1 MFD.	Grid of 6SK7 I. F.	Broadcast	Rotor full open (Plates out of mesh)	Two trimmers on top	Output I. F.	Adjust to maximum output
	455 Kc.	.1 MFD.	Grid of 6SA7 Mixer	Broadcast	Rotor full open (Plates out of mesh)	Two trimmers on top	Input I. F.	Adjust to maximum output
SHORT WAVE BAND (See Note A)	17 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 17 Mc.	Trimmer C13	Short Wave oscillator	Adjust to maximum output
	17 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 17 Mc.	Trimmers C8, C2	Short Wave R. F. and S. W. Antenna	Adjust to maximum output
	6 Mc.	400 Ohms	External Antenna and Ground	Short Wave	Set Dial at 6 Mc.	Trimmer C11 (See voltage chart)	Short Wave oscillator series pad	Adjust to maximum rock dial. (See note "C")
BROAD-CAST BAND (See Note A)	1580 Kc.	200 mmf.	Grid of 6SK7 R. F. Tube	Broadcast	Rotor full open (Plates out of mesh)	Trimmer C14	Broadcast oscillator	Adjust to maximum output
	540 Kc.	200 mmf.	Grid of 6SK7 R. F. Tube	Broadcast	Set Dial at 540 Kc. (Plates in Mesh)	Trimmer C12	Broadcast oscillator series pad	Adjust to maximum output
	1400 Kc.	200 mmf.	Grid of 6SK7 R. F. Tube	Broadcast	Set Dial at 1400 Kc.	Trimmer C9	Broadcast R. F.	Adjust to maximum output
LOOP ALIGN-MENT (See Note B)	1400 Kc.	200 mmf.	External Antenna and Ground	Broadcast	Set Dial at 1400 Kc.	Trimmer C1	Broadcast antenna	Adjust to maximum output
	600 Kc.	200 mmf.	External Antenna and Ground	Broadcast	Set Dial at 600 Kc.	Trimmer T2	Iron Core Tracking Coil	Adjust to maximum output



ANT. & GROUND TERMINALS—When using an external antenna and ground, move the metal strap shown above and fasten it under the screw marked "Ext."

The antenna and ground wires should then be connected to the terminals marked "Ant." — "Grnd."

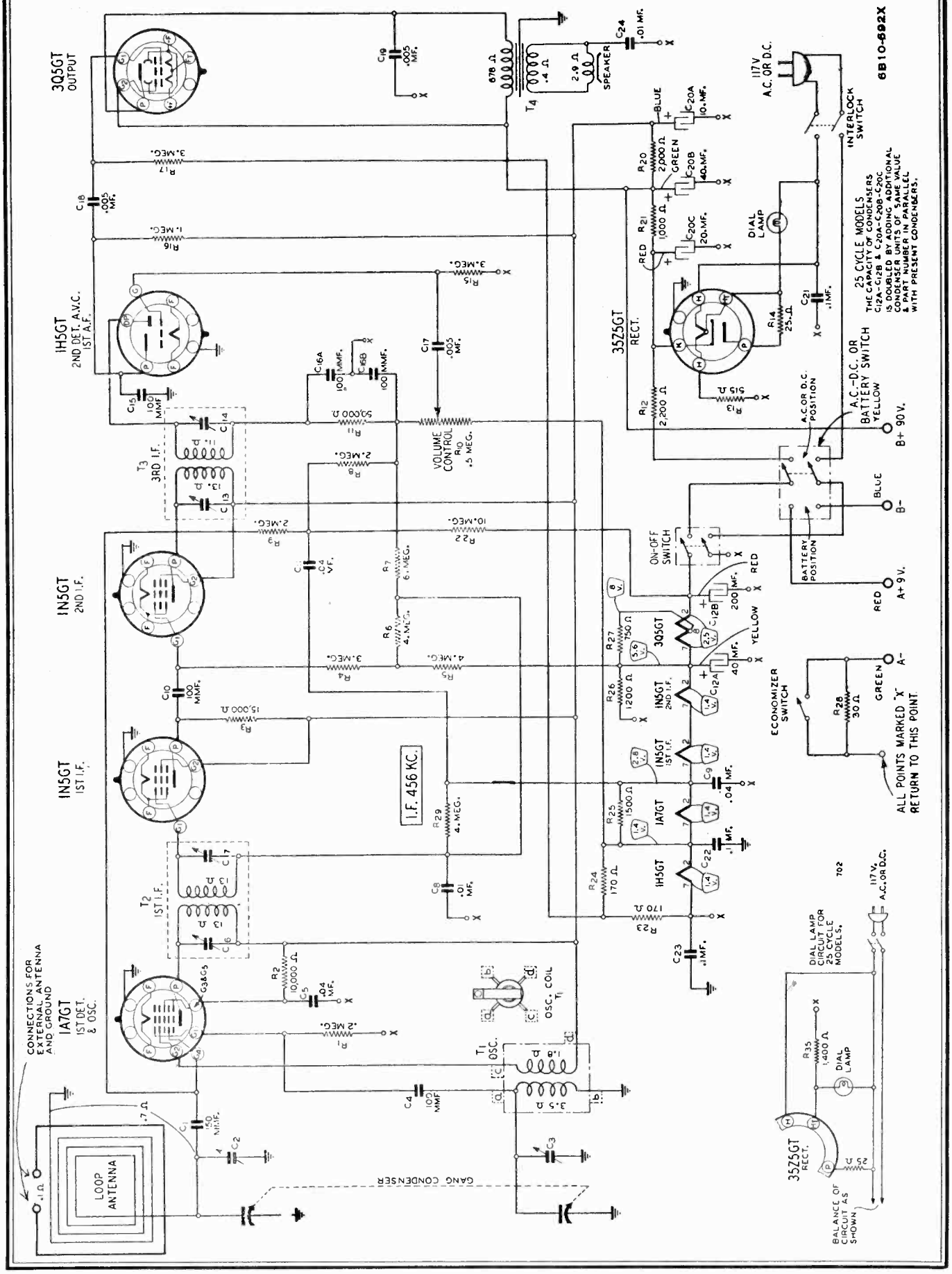


IMPORTANT—Loosen the screws which hold the chassis to the cabinet and pull out the shipping strips under the chassis—The chassis will then rest on its rubber cushions.

POWER SUPPLY—Unless your radio is marked otherwise, it must be operated from 105 to 125 volts, 50 to 60 cycle A.C. current. If in doubt, phone your electric light company. Receivers of this same model which are for use on special voltages are marked accordingly. When using your radio on A.C. current, reversing the plug may reduce station hum.

MODEL 3006

GAMBLE-SKOGMO, INC.



MODEL 3006

GAMBLE-SKOGMO, INC.

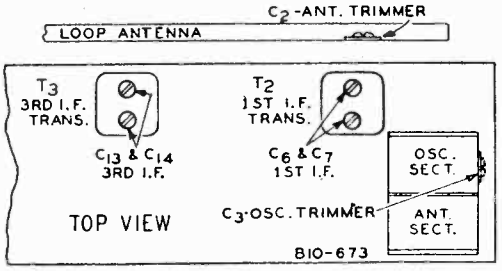
ALIGNMENT PROCEDURE

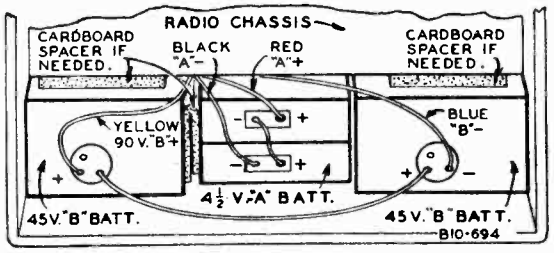
Volume Control—Maximum All Adjustments.

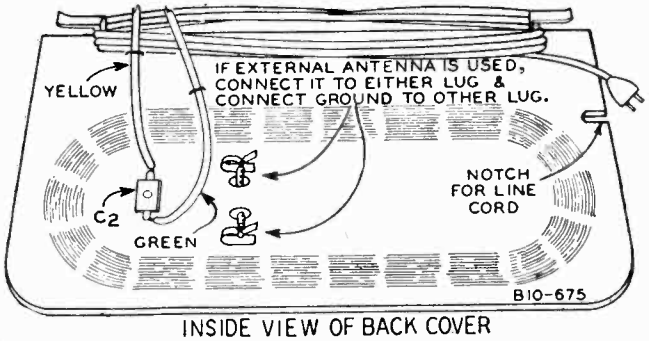
Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning:
A 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.

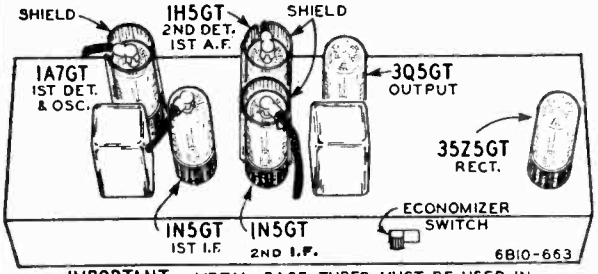
SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR ANTENNA CONNECTION	SIGNAL GENERATOR GROUND CONNECTION	DUMMY ANTENNA	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration below)
456 KC	External Antenna Clip on Loop	External Ground Clip on Loop	.1 mf.	Turn Rotor to full open	1st I.F. (C6) & (C7) 3rd I.F. (C13) & (C14)
1600 KC	External Antenna Clip	External Ground Clip	.1 mf.	Turn Rotor to full open	Oscillator (C3)
1400 KC	External Antenna Clip See Note A	External Ground Clip	200 mmf.	Turn Rotor to max. output	Antenna (C2)







INSIDE VIEW OF BACK COVER



IMPORTANT - METAL BASE TUBES MUST BE USED IN THOSE SOCKETS AT WHICH SHIELDS ARE SHOWN.

SPECIFICATIONS

Input Voltages and Currents—Battery Operation
"A" Batteries..... 9 Volts—50 Ma.
"B" Batteries.....90 Volts—11.5 Ma.

Power Consumption (At 117 volts AC Supply) 28 Watts

Power Output
Battery Operation - - - - 150 Mw Undistorted, 350 Mw Maximum
AC Operation - - - - - 200 Mw Undistorted, 400 Mw Maximum

Selectivity - 50 KC Broad at 1000 Times Signal

Intermediate Frequency - - - - - - 456 KC

Speaker - - - - - - - - - 6" P.M. Dynamic

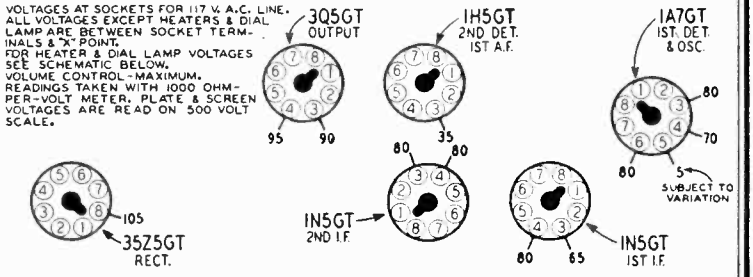
Tuning Frequency Range - - 540 to 1600 KC

Sensitivity (For 05 Watt Output)
External Antenna - - - 10 Microvolts Average

NOTE A—Re-assemble chassis in cabinet. Close back on cabinet.

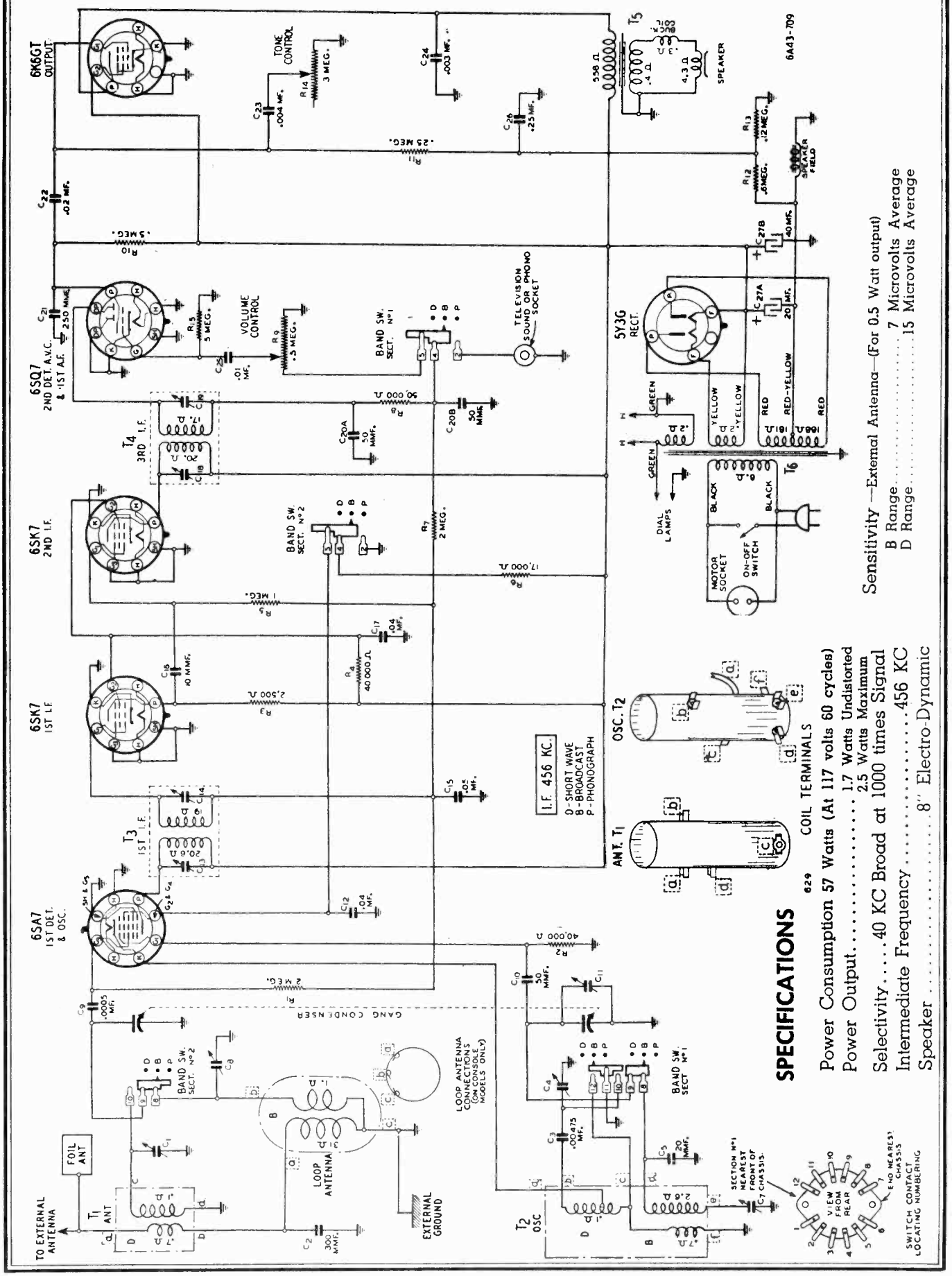
CALIBRATION—To obtain dial scale calibration, tune in an 800 KC signal. The pointer should be at the 800 KC mark on the dial. If it is not, loosen pointer set screw and set the pointer at the 800 KC mark. Retighten set screw.

VOLTAGES AT SOCKETS FOR 117 V. A.C. LINE. ALL VOLTAGES EXCEPT HEATERS & DIAL LAMP ARE BETWEEN SOCKET TERMINALS & "X" POINT. FOR HEATER & DIAL LAMP VOLTAGES SEE SCHEMATIC BELOW. VOLUME CONTROL-MAXIMUM. READINGS TAKEN WITH 1000 OHM-PER-VOLT METER. PLATE & SCREEN VOLTAGES ARE READ ON 500 VOLT SCALE.



MODEL 3058

GAMBLE-SKOGMO, INC.



SPECIFICATIONS

Power Consumption 57 Watts (At 117 volts 60 cycles)
Power Output..... 1.7 Watts Undistorted
2.5 Watts Maximum
Selectivity.....40 KC Broad at 1000 times Signal
Intermediate Frequency.....456 KC
Speaker.....8" Electro-Dynamic

Sensitivity —External Antenna—(For 0.5 Watt output)
B Range..... 7 Microvolts Average
D Range.....15 Microvolts Average

GAMBLE-SKOGMO, INC.

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

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

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

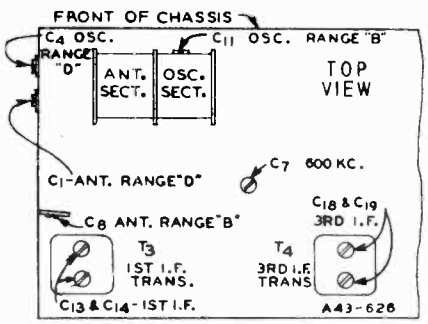
The following equipment is required for aligning:

An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver.

Dummy Antennas—.1 mf., 100 mmf., and 400 ohms.

SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
Console Model—It is not necessary to remove chassis from cabinet. Merely remove chassis mounting screws so that chassis may be turned to reach oscillator trimmer on gang condenser.					
I.F.					
456 KC	Grid of 1st Det.	.1 mf.	B Range	Turn Rotor to Full Open	1st I.F. (C13) & (C14) 3rd I.F. (C18) & (C19)
RANGE B					
1600 KC	External Antenna Clip or Lead	100 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C11)
1400 KC	External Antenna Clip or Lead	100 mmf.	B Range	Turn Rotor to Max. Output Set Indicator to 1400 KC— See Note A	Ant. Range B (C8)
600 KC	External Antenna Clip or Lead See Note B	100 mmf.	B Range	Turn Rotor to Max. Output	600 KC (C7) Rock Rotor—See Note C
RANGE D					
18,300 KC	External Antenna Clip or Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C4)
17.000 KC	External Antenna Clip or Lead	400 Ohm	D Range	Turn Rotor to Max. Output	Ant. Range D (C1) Rock Rotor—See Note C
LOOP RANGE B					
1400 KC	External Antenna Clip or Lead See Note D	100 mmf.	B Range	Turn Rotor to Max. Output	Ant. Range B (C8)



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.

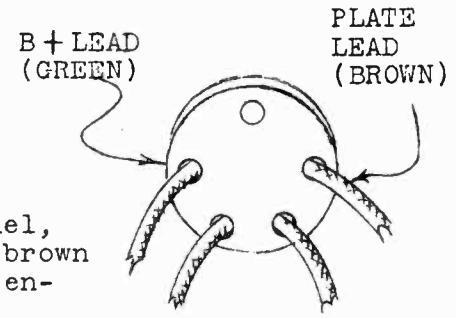
NOTE A—If the pointer is not at 1400 KC on the dial, remove pointer from drive cord. Tune in a 1400 KC signal. Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

NOTE B—(Table Model) By means of wooden blocks, stand the loop aerial assembly upright exactly 4 inches from the back of the chassis.

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

NOTE D—(Table Model) Re-assemble chassis in cabinet. Replace back on cabinet. Connect ground post of signal generator to external ground clip on loop antenna (Table Model) or ground screw on chassis (Console Model).

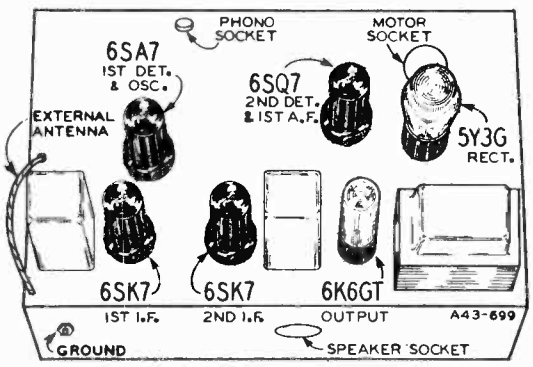
CAUTION—When aligning the short wave band, be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000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

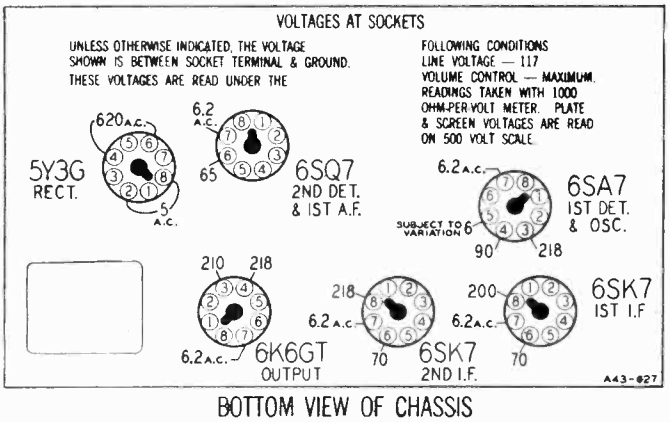


SPEAKER PLUG (Rear View)

In a few cases in the first shipments of this model, some of the speakers had reversed green lead and brown lead connections at the speaker plug. If hum is encountered, check these connections.

The illustrations below show the correct connections for the green (B+) and brown (plate) speaker leads.

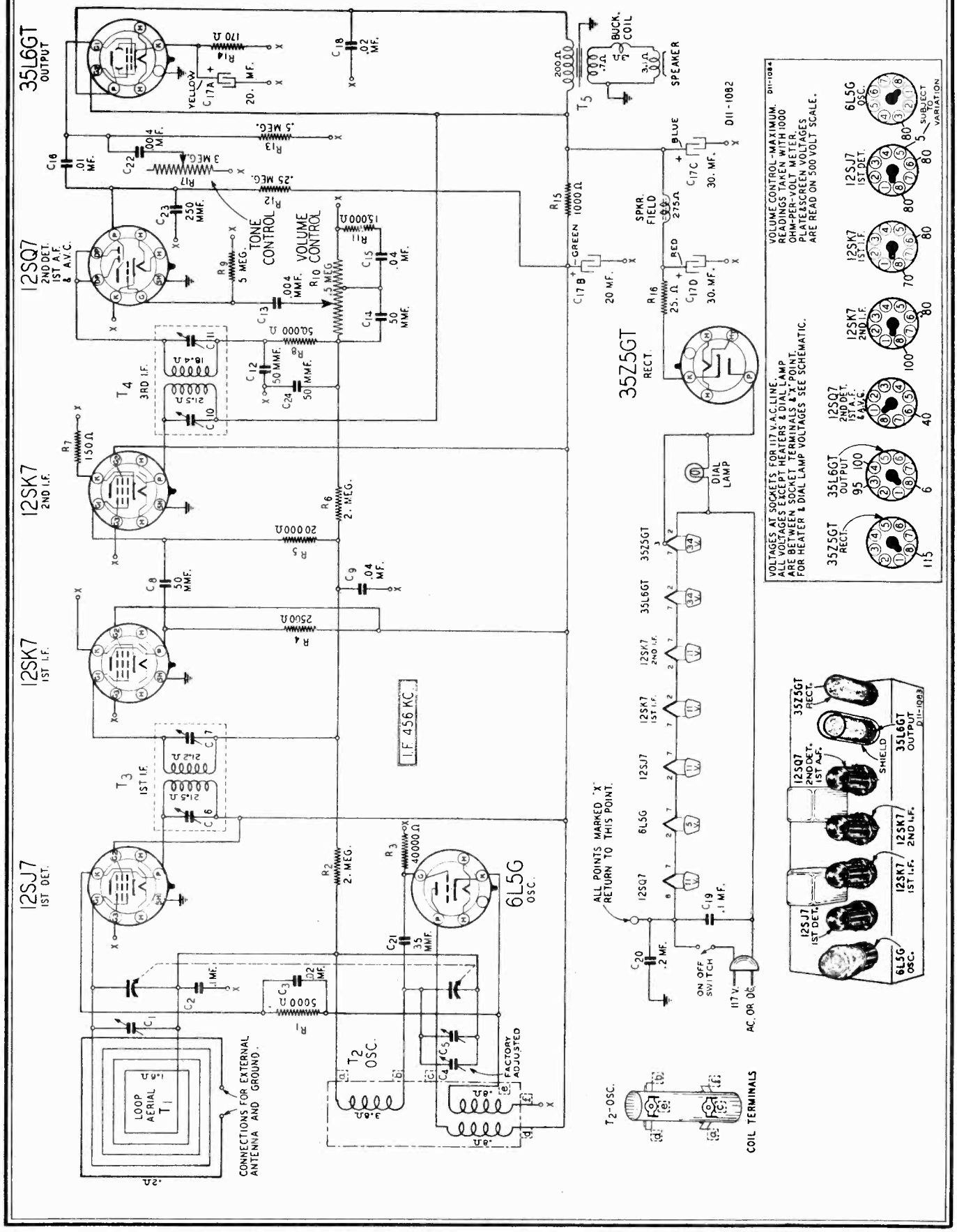




BOTTOM VIEW OF CHASSIS

MODEL 3128, Late

GAMBLE-SKOGMO, INC.



MODEL 3128, Late
MODEL 4132

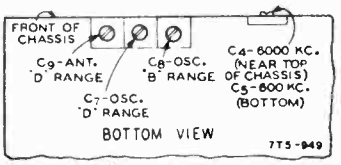
GAMBLE-SKOGMO, INC.

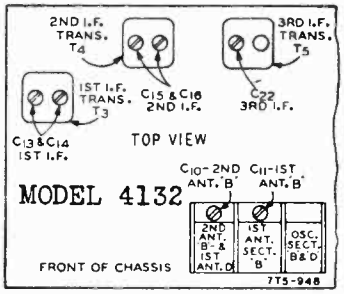
MODEL 4132 ALIGNMENT PROCEDURE

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

The following equipment is required for aligning:
An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter—Non-Metallic Screwdriver.
Dummy Antennas—.1 mf., 200 mmf., and 400 ohms.

	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I. F.	456 KC	Grid of 1st Det.	.1 mf.	B Range	Turn Rotor to Full Open	1st I.F. (C13) & (C14) 2nd I.F. (C15) & (C16) 3rd I.F. (C22)
RANGE B	1610 KC	Antenna Lead	200 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C8)
	1500 KC	Antenna Lead	200 mmf.	B Range	Turn Rotor to Max. Output Set Indicator to 1500 KC—See Note A	1st Ant. Range B (C11) 2nd Ant. Range B (C10)
	600 KC	Antenna Lead	200 mmf.	B Range	Turn Rotor to Max. Output	600 KC (C5) Rock Rotor—See Note B
RANGE D	18,300 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C7)
	16,000 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Max. Output	Ant. Range D (C9) Rock Rotor—See Note B
	6000 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Max. Output	6000 KC (C4) Rock Rotor—See Note B

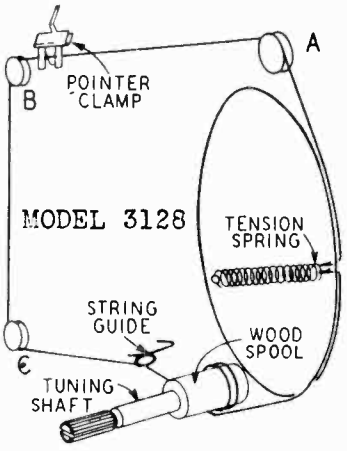


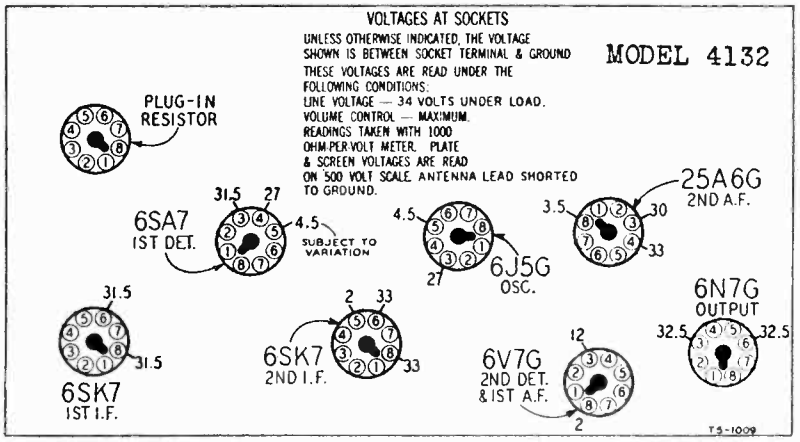


After each range is completed, repeat the procedure as a final check.

NOTE A—If the pointer is not at 1500 KC on the dial, remove pointer from drive cord. Set pointer at the 1500 KC mark on the dial scale. Attach pointer to drive cord.

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

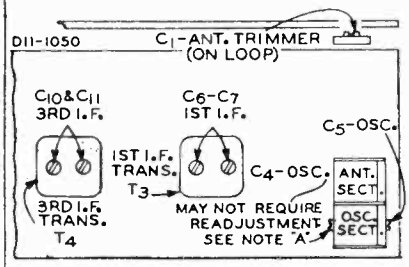




DRIVE CORD REPLACEMENT

Turn gang condenser to full open position. Using a new dirve cord 50" in length, attach one end to tension spring. Fasten other end of tension spring to hook on drive pulley. Pass cord through slot in pulley rim and around idler pulleys A, B and C as shown. Pass cord through string guide.

Wind 2 turns counter-clockwise (from front of chassis) around tuning shaft spool. Turns should progress away from chassis—See illustration. Wind 1¼ turns counter-clockwise (from front of chassis) around drive pulley. This turn should be on the left side of the pulley rim (from gang end of chassis). Continue cord through slot in pulley rim. Stretch tension spring and tie free end of cord to spring.



MODEL 3128 ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat-Up" for several minutes.
The equipment in column at right is required for aligning:

Signal Generator which will provide an accurately calibrated signal at test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antennas—.1 mf., 200 mmf.

SIGNAL GENERATOR FREQUENCY SETTING	ANTENNA CONNECTION	GROUND CONNECTION	DUMMY ANTENNA	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration)
I.F. 456 KC	Signal Grid of 1st Det. Connect at Stator of Large Gang Section.	Point "X" { 12SQ7—1st A.F. Prong No. 3 }	.1 mf.	Turn Rotor to Full Open	1st I.F. (C6) & (C7) 3rd I.F. (C10) & (C11)
1610 KC	Signal Grid of 1st Det.	Point "X"	.1 mf.	Turn Rotor to Full Open	Oscillator (C5) See Note A
1400 KC	External Antenna Clip	Point "X"	200 mmf.	Turn Rotor to Max. Output Set Indicator to 1400 KC—See Note B	Antenna (C1)

SPECIFICATIONS

Power Consumption ..... 28 Watts (At 117 volts AC Supply)
Power Output ..... .75 Watt Undistorted 1.3 Watts Maximum
Selectivity...49 KC Broad at 1000 times Signal
Intermediate Frequency ..... 456 KC
Speaker ..... 5" Electro-Dynamic
Tuning Frequency Range 528 to 1610 KC
Sensitivity (For .05 watt output)—External Ant. 9 Microvolts Average

MODEL 3128

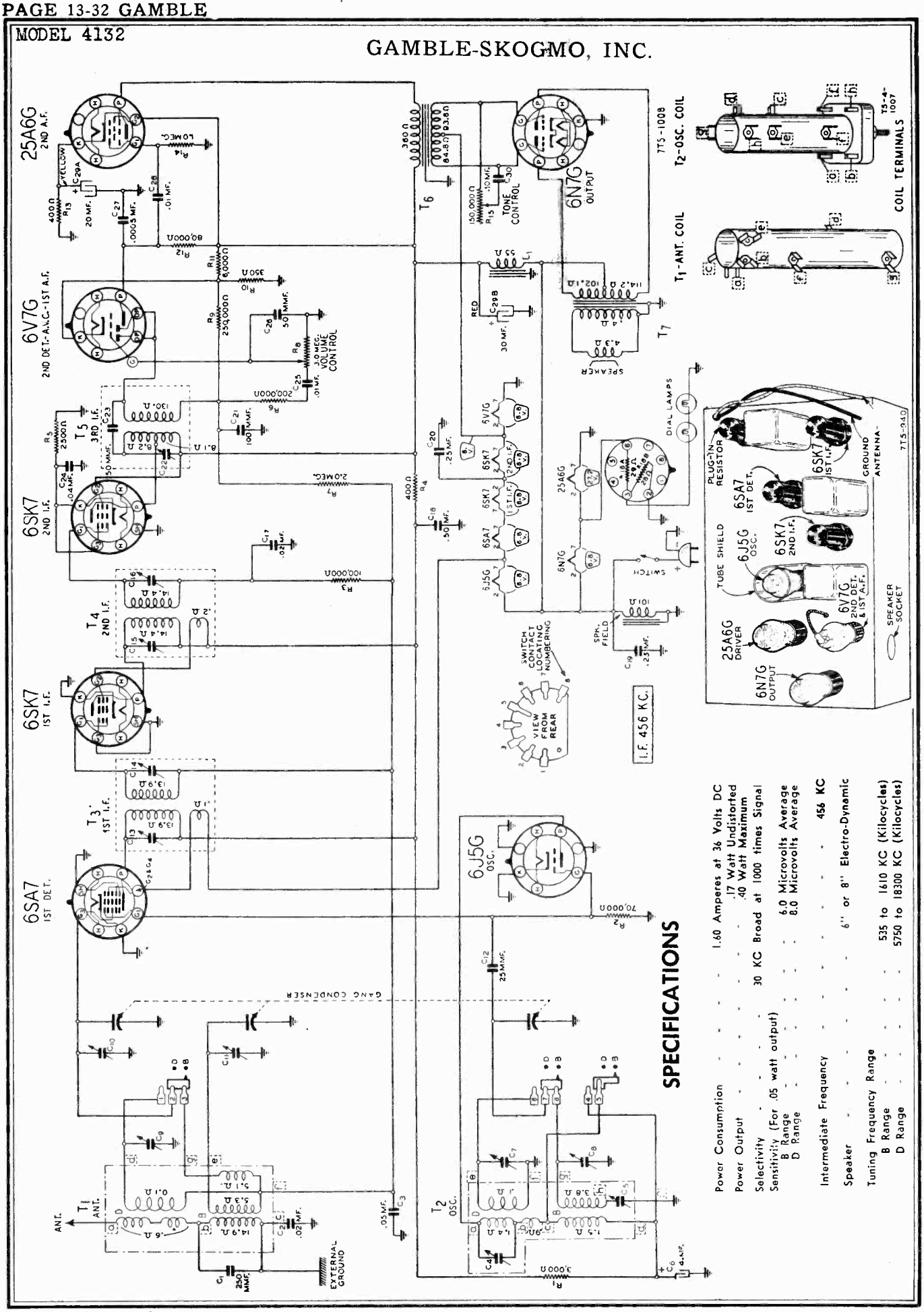
After each range is completed, repeat the procedure as a final check.

NOTE A—Adjust Oscillator (C5) trimmer on gang condenser. Oscillator (C4) auxiliary trimmer on other side of gang is adjusted at factory and ordinarily need not be readjusted in the field.

NOTE B—If the pointer is not at 1400 KC on the dial, set pointer at this mark on the dial scale.

MODEL 4132

GAMBLE-SKOGMO, INC.

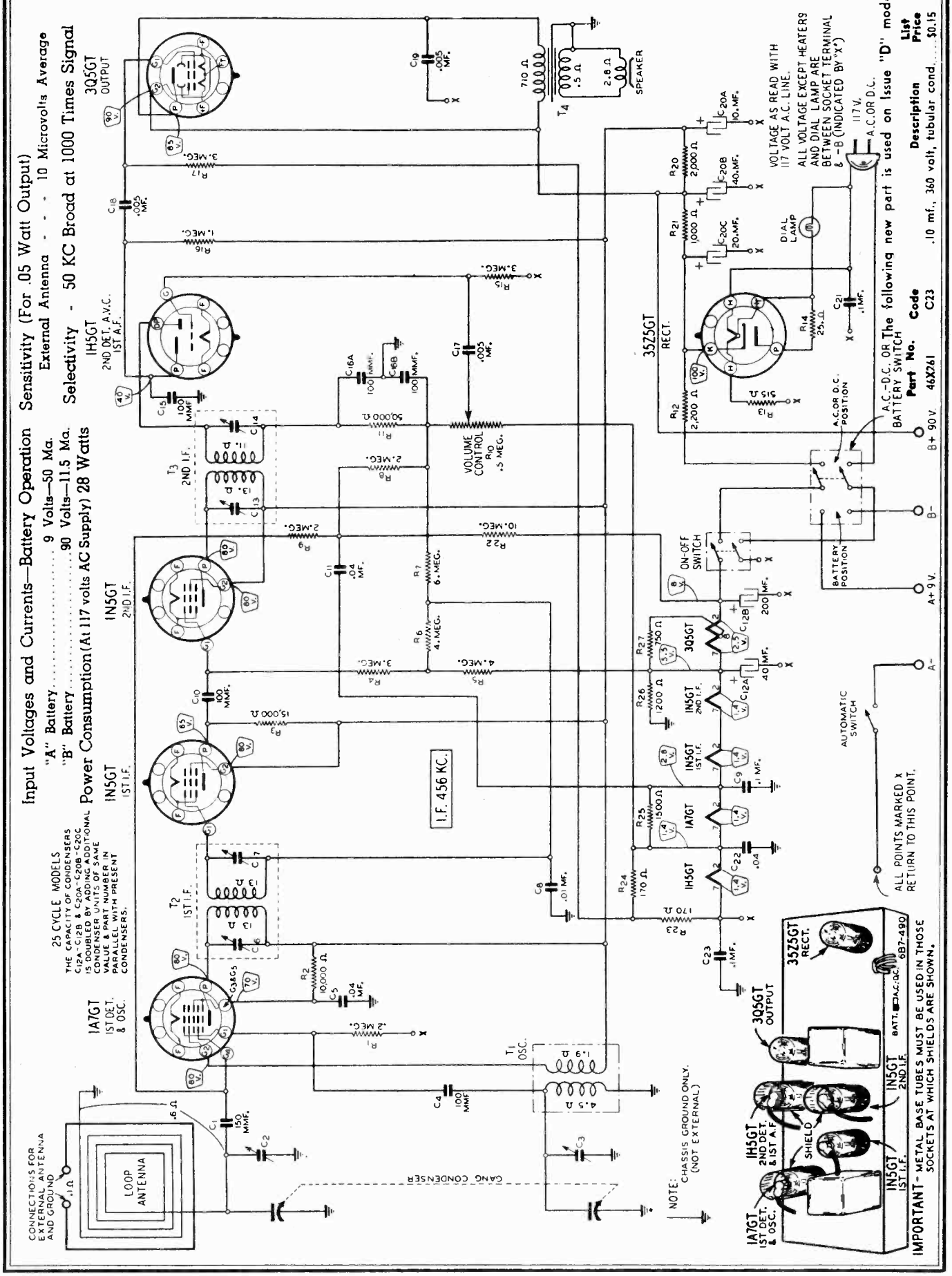


SPECIFICATIONS

Power Consumption	1.60 Amperes at 36 Volts DC
Power Output	.17 Watt Undistorted
	.40 Watt Maximum
Selectivity	30 KC Broad at 1000 times Signal
Sensitivity (For .05 watt output)	
B Range	6.0 Microvolts Average
D Range	8.0 Microvolts Average
Intermediate Frequency	456 KC
Speaker	6" or 8" Electro-Dynamic
Tuning Frequency Range	
B Range	535 to 1610 KC (Kilocycles)
D Range	5750 to 18300 KC (Kilocycles)

GAMBLE-SKOGMO, INC.

MODELS 4002, 4946



The following new part is used on Issue "D" models:

Part No.	Code	Description	List Price
46X261	C23	.10 mf., 360 volt, tubular cond.	$0.15

Removing Chassis from Cabinet

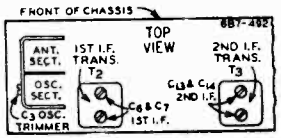
Take out the 2 screws, one at each side on the outside of the cabinet. Grasp the chassis shelf at each rear corner and edge it away from the cabinet front until the chassis shelf and chassis slide easily out of the cabinet.

To remove the shelf from the chassis, take out the bolt and the 2 screws at the bottom of the shelf.

Using Radio Without Batteries—The radio may be used without batteries when it is operated on AC-DC. If this is done, tape the prongs of the battery plugs to prevent them from accidentally touching each other, and place the plugs and cables in the battery compartment.

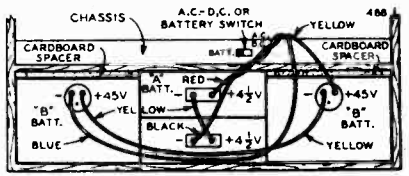
NOTE A—Chassis must be in cabinet. Connect a loop approximately one foot in diameter across the antenna and ground posts of the signal generator. The back of the cabinet must be in place. Place radio approximately 3 feet from loop so as to pick up signal. Radio should not be in proximity to any metal (metal bench, etc.).

CALIBRATION (For models with pointer in front of dial scale)—To obtain dial scale calibration, tune in an 800 KC signal. The pointer should be at the 800 KC mark on the dial. If it is not, hold the pulley at the back of the dial and loosen the pointer screw. Set the pointer at the 800 KC mark. Hold the pointer and retighten the pointer screw.



Two 4½ Volt "A" batteries—Portable Size 4" x 1⅜" x 4⅝" High

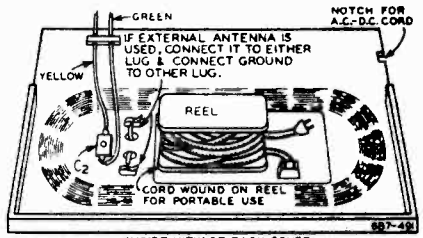
Two 45 Volt "B" batteries—Portable Size 4⅛" x 2½" x 5⅜" High



Caution

The metal chassis is connected to one side of the line through a .10 mfd. condenser. Both AC and DC power lines are generally grounded on one side. If the side of the line not connected to the metal chassis through this condenser is grounded and the metal chassis comes in contact with an external ground, this condenser will be connected across the line and there will be an increase in hum.

Therefore, in any service work on the chassis, keep it on a wood or other insulated surface to avoid contacts with ground. The person working on the set should avoid getting in contact with any ground.



INSIDE VIEW OF BACK COVER

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

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

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

The following equipment is required for aligning:

A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver.

Dummy Antenna—.1 mf.

SIGNAL GENERATOR				
FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration below and Illustration of Back—Page 1)
456 KC	Signal Grid of 1st Det. (Top Cap)	.1 mf.	Turn Rotor to full open	1st I.F. (C6) & (C7) 2nd I.F. (C13) & (C14)
1600 KC	Signal Grid of 1st Det.	.1 mf.	Turn Rotor to full open	Oscillator (C3)
1500 KC	None—See Note A		Turn Rotor to max. output	Antenna (C2)

Series 6B7

CHANGES MADE FOR ISSUE "B" November 28,1939

To satisfy Underwriter's requirements, the chassis issue will become "B" when several changes in the routing of wires and the arrangement of parts in the chassis have been made.

Chassis with these changes have had the 6 lug terminal strip 4A98 removed.

PROLONGING TUBE LIFE
CHANGES FOR ISSUE "C" Jan. 9, 1940

To compensate for variations in tube characteristics as well as high line voltages, the following changes have been made in the filament series circuit to reduce the voltages across the tube filaments and to prolong tube life.

Resistor R12, which is in series with the filament series, has been changed from 1950 ohms to 2200 ohms.

There was unequal emission from the 2 sections of the filament of the 3Q5GT output tube. This caused unequal voltages across the 2 sections of the filament and shortened the tube life. There is now a 750 ohm resistor (R27) across one section which equalizes the currents through both portions.

The four 1½ volt tube filaments were shunted with 1200 ohms - Resistors R19 - 800 ohms and R18 400 ohms (See old schematic). The connecting point between these 2 resistors established the grid (bias) voltage for the output tube. These 4 tubes are now shunted by one 1200 ohm Resistor R26.

The 1A7GT 1st Detector Filament is now shunted with a 1500 ohm resistor - R25.

The 1H5GT 2nd Detector Filament is now shunted with 340 ohms - Resistors R24 and R23 in series. The connecting point between these 2 resistors establishes the grid (bias) voltage for the output tube.

CHANGES MADE FOR ISSUE "D" March 11, 1940

To satisfy additional Underwriters requirements, the chassis has been isolated from the AC-DC line except for a connection through a .1 mf. condenser - See schematic On these models the battery wires are held by a clamp located under the chassis shelf. On previous issues this clamp was above the shelf. The battery compartment cardboard fillers have been made smaller to clear the above mentioned clamp.

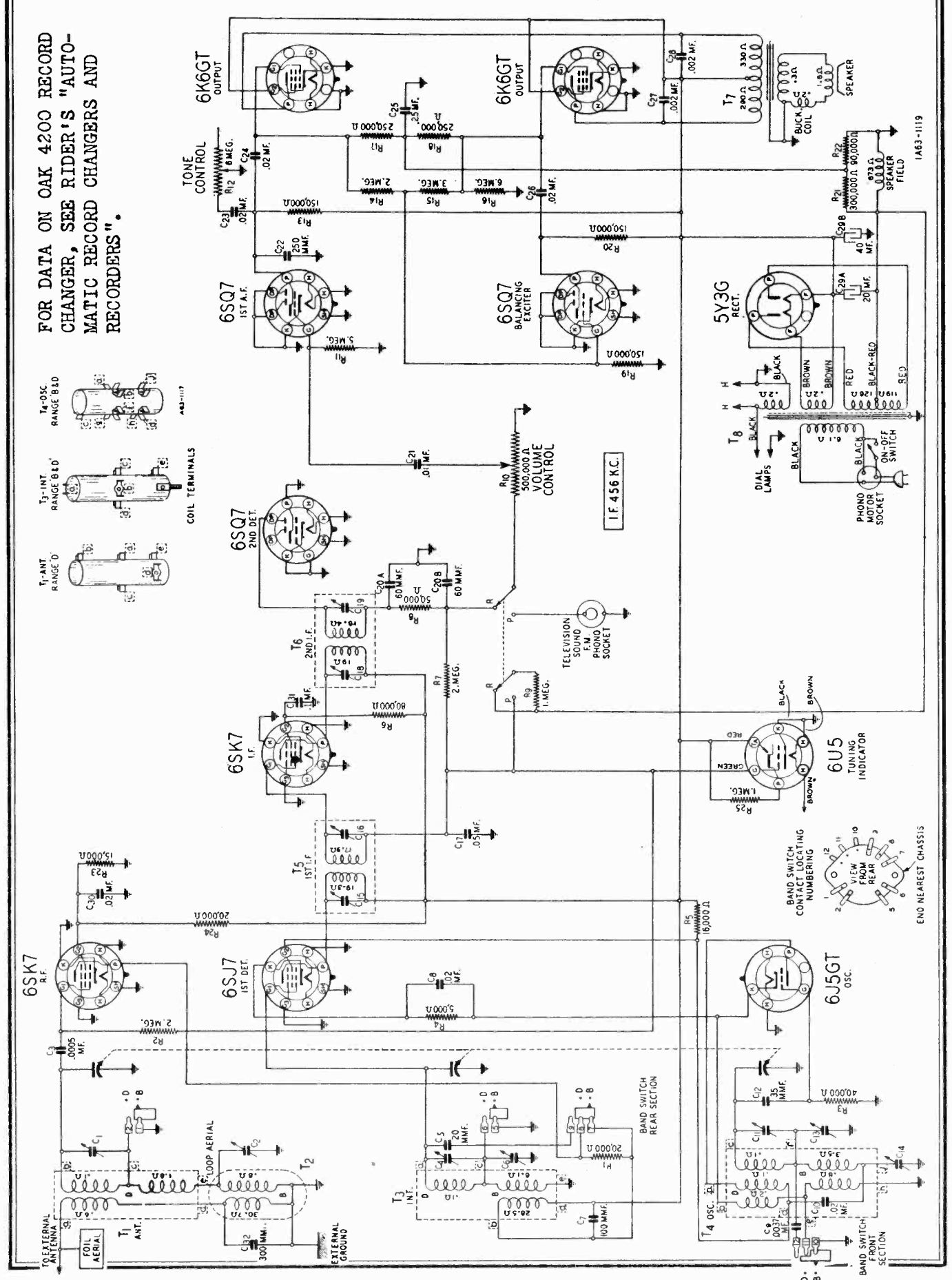
On chassis with the above changes incorporated, the issue letter becomes "D."

All voltages on this issue chassis except the heaters and dial lamp are measured between socket terminal and B- (indicated by "X") - See schematic

MODEL 4164

GAMBLE-SKOGMO, INC.

FOR DATA ON OAK 4200 RECORD CHANGER, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".



MODEL 4164

GAMBLE-SKOGMO, INC.

SPECIFICATIONS

Power Consumption - 85 Watts (At 117 volts 60 cycles)
105 Watts (Phonograph Operating)

Power Output - - - - - - - - - 4 Watts Undistorted
5.5 Watts Maximum

Selectivity - - - 35 KC Broad at 1000 times Signal

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

Speaker - - - - - - - 8", 10" or 12" Electro-Dynamic

Tuning Frequency Range

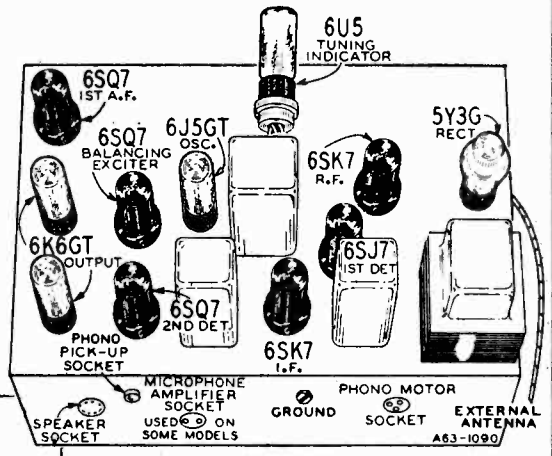
B Range - - - - - - - - - 535 to 1610 KC

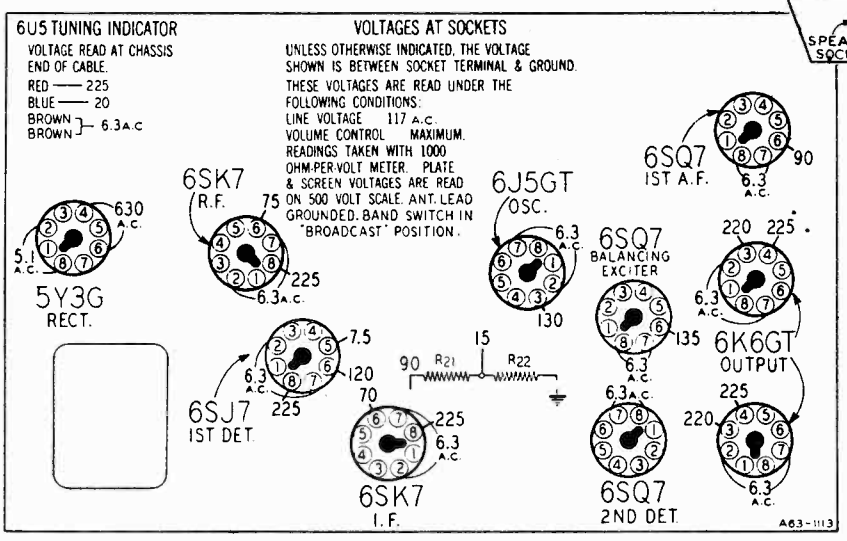
D Range - - - - - - - - - 5.35 to 18.3 MC

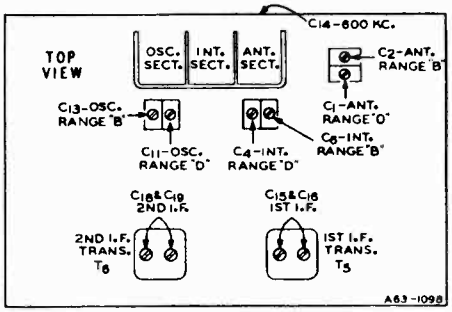
Sensitivity—External Antenna—(For 0.5 Watt output)

B Range - - - - - - - 2.0 Microvolts Average

D Range - - - - - - - 4.0 Microvolts Average







DRIVE CORD REPLACEMENT

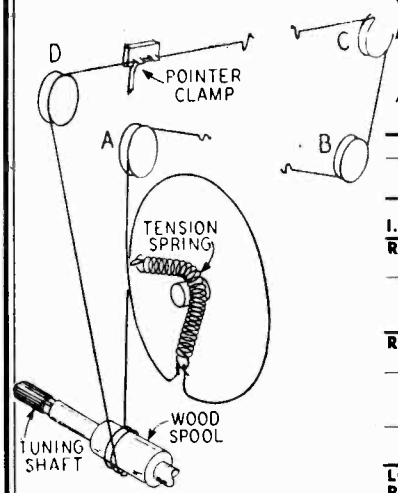
Turn gang condenser to open position. Use new drive cord 55" in length.

Secure one end of tension spring to hook on drive pulley. Bend spring around drive pulley shaft—see illustration. Pass cord through slot in pulley rim. Wind cord ¼ turn clockwise (from drive pulley end of chassis) around drive pulley. Pass cord around idler pulleys A, B, C and D as in illustration. Then wind cord 2½ turns clockwise (from front of chassis) around tuning shaft spool. These turns should progress away from chassis. Pass cord over top of drive pulley for ¾ turn clockwise (from drive pulley end of chassis) and through slot in pulley rim. Fasten cord to tension spring—see illustration.

NOTE A—If the pointer is not at 1400 KC on the dial, remove pointer from drive cord. Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

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

ALIGNMENT PROCEDURE



Volume Control—Maximum All Adjustments.

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

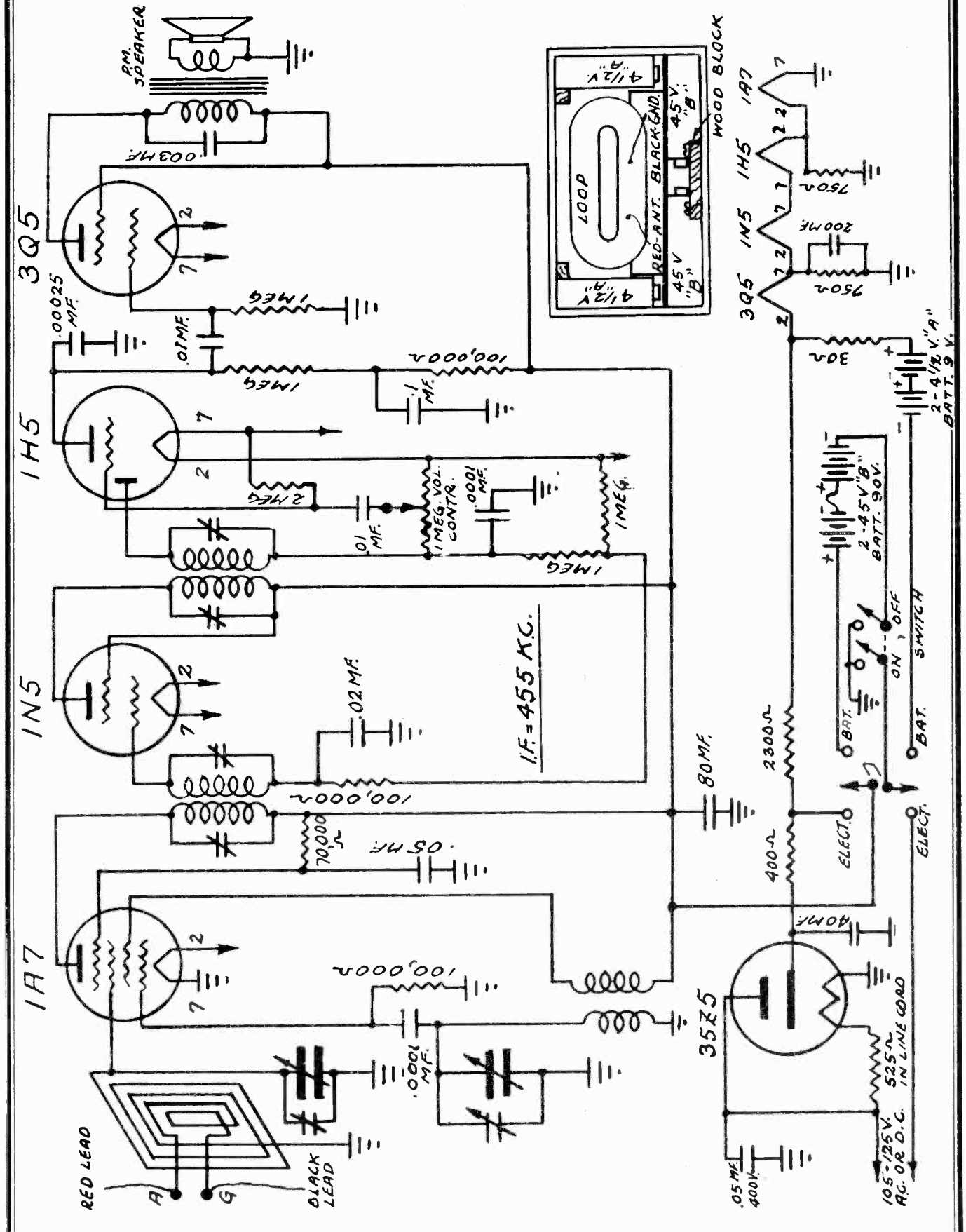
Allow Chassis and Signal Generator to "Heat Up" for several minutes.

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

	SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I.F.	456 KC	Signal Grid of 1st Det.	.1 mf.	B Range	Turn Rotor to Full Open	1st I.F. (C15) & (C16) 2nd I.F. (C18) & (C19)
RANGE D	18,300 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C11
	17,000 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Max. Output	Ant. Range D (C1) Int. Range D (C4) Rock Rotor—See Note B
RANGE B	1610 KC	Antenna Lead	100 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C13)
	1400 KC	Antenna Lead	100 mmf.	B Range	Turn Rotor to Max. Output Set Indicator to 1400 KC— See Note A	Ant. Range B (C2) Int. Range B (C6)
	600 KC	Antenna Lead	100 mmf.	B Range	Turn Rotor to Max. Output	600 KC (C14) Rock Rotor—See Note B
LOOP RANGE B	1400 KC	Antenna Lead	100 mmf.	B Range	Turn Rotor to Max. Output	Ant. Range B (C2)

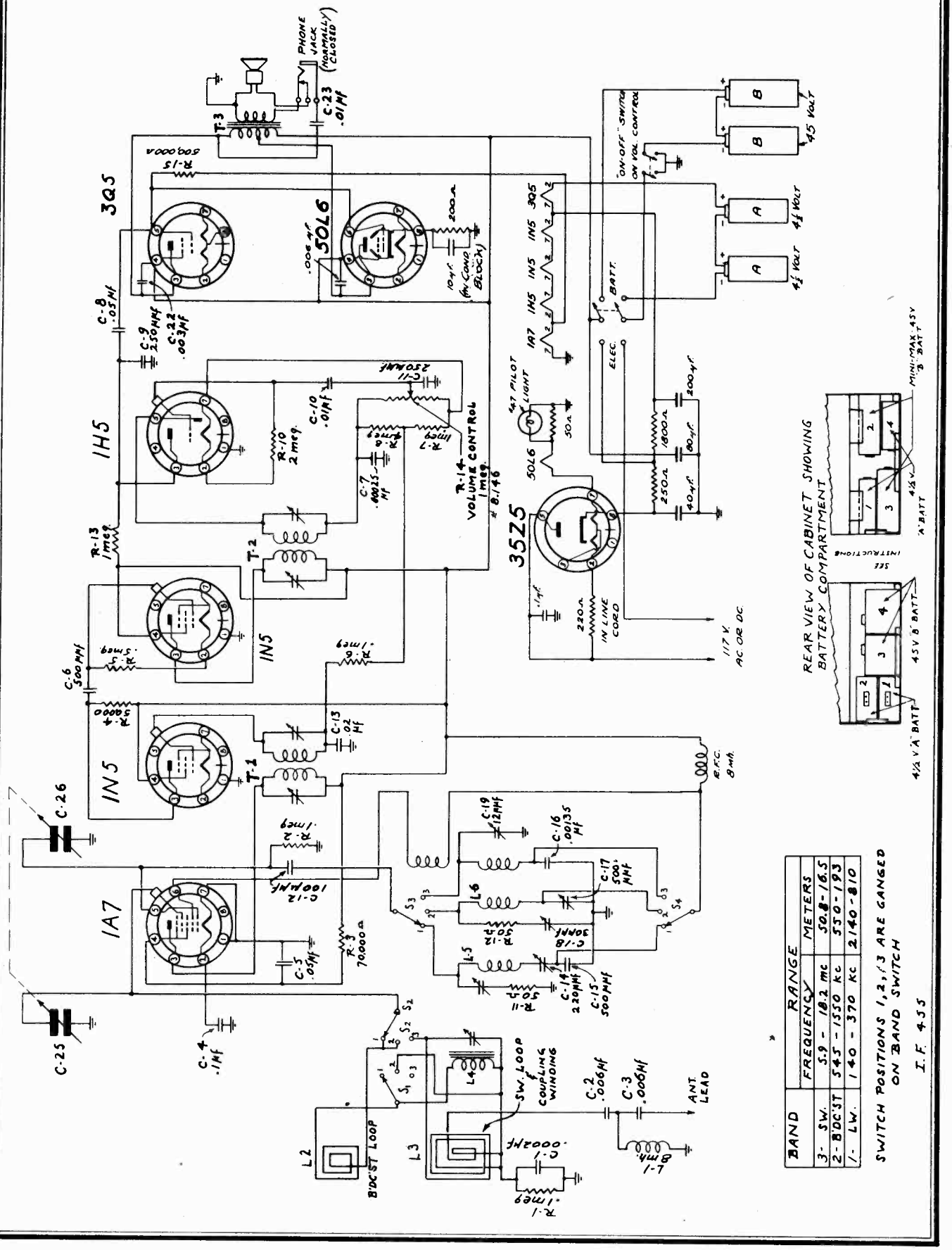
MODEL BP15

GAROD RADIO CORP.



MODEL BP37

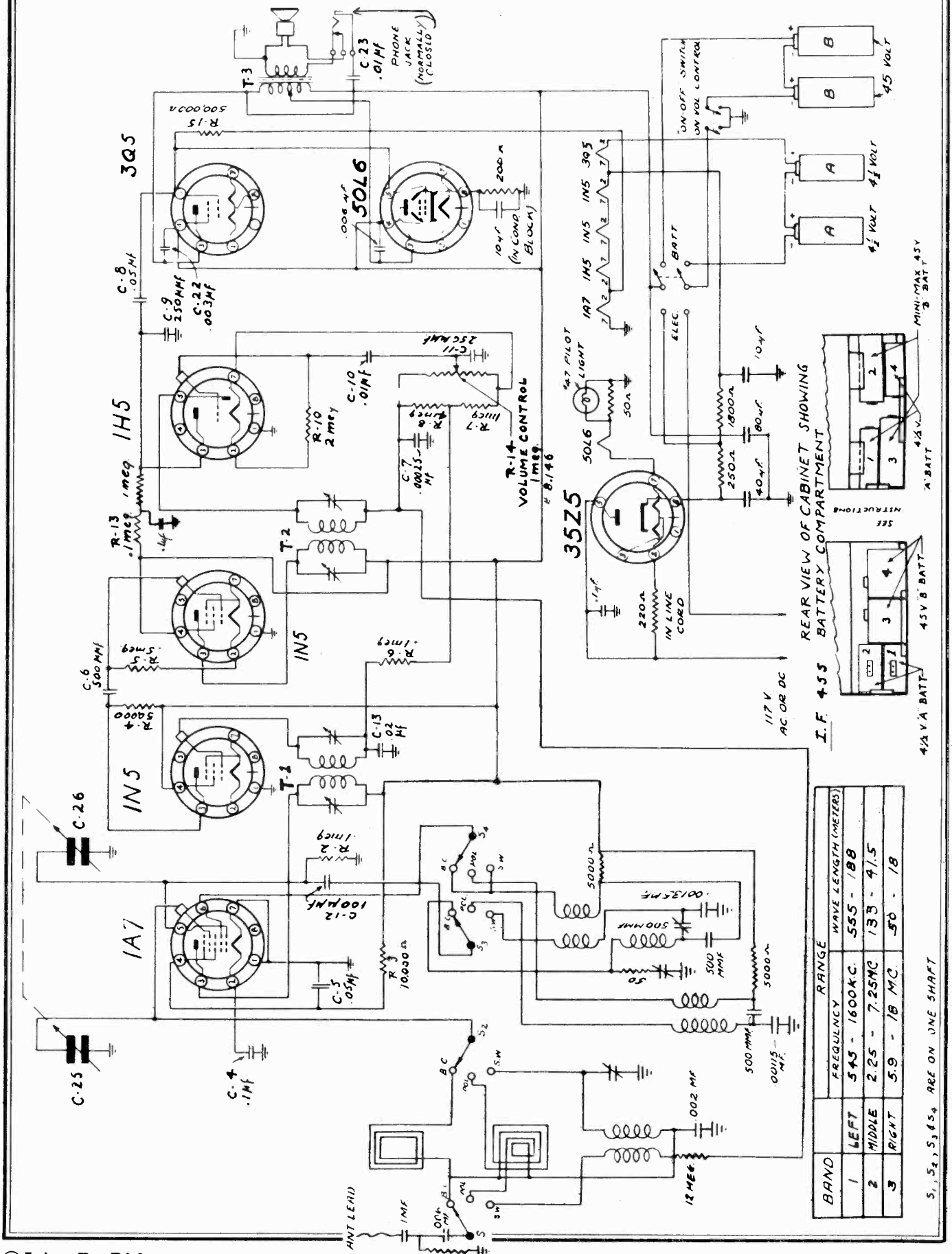
GAROD RADIO CORP.



BAND	RANGE	
	FREQUENCY	METERS
3- SW.	5.9 - 18.2 mc	50.8 - 16.5
2- B'DC'ST	545 - 1550 Kc	550 - 193
1- LW.	140 - 370 Kc	2140 - 810

MODEL BP38

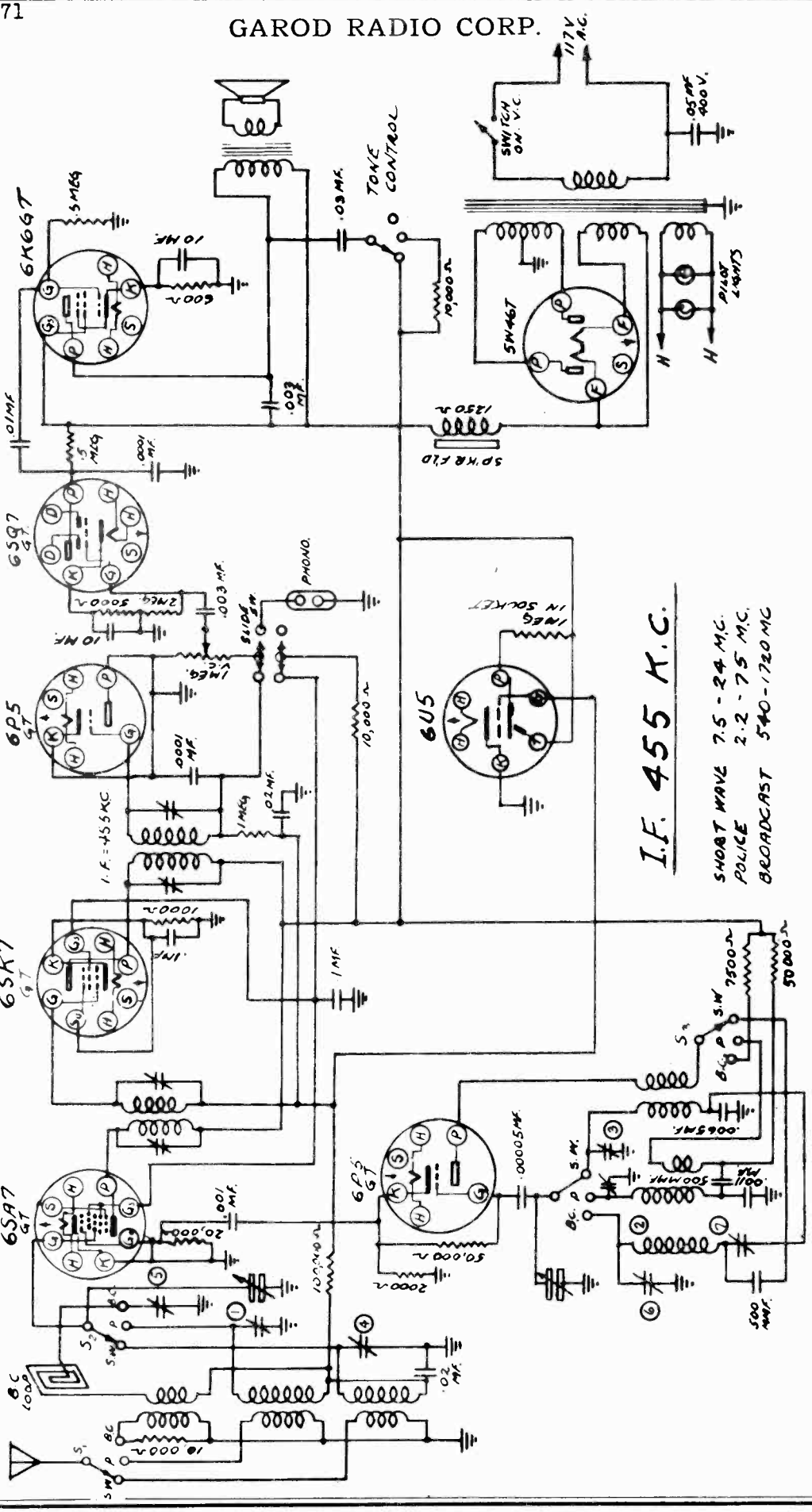
GAROD RADIO CORP.



BAND		FREQUENCY	WAVE LENGTH (METERS)
1	LEFT	545 - 1600 K.C.	555 - 188
2	MIDDLE	2.25 - 7.25 MC	133 - 41.5
3	RIGHT	5.9 - 18 MC	50 - 18

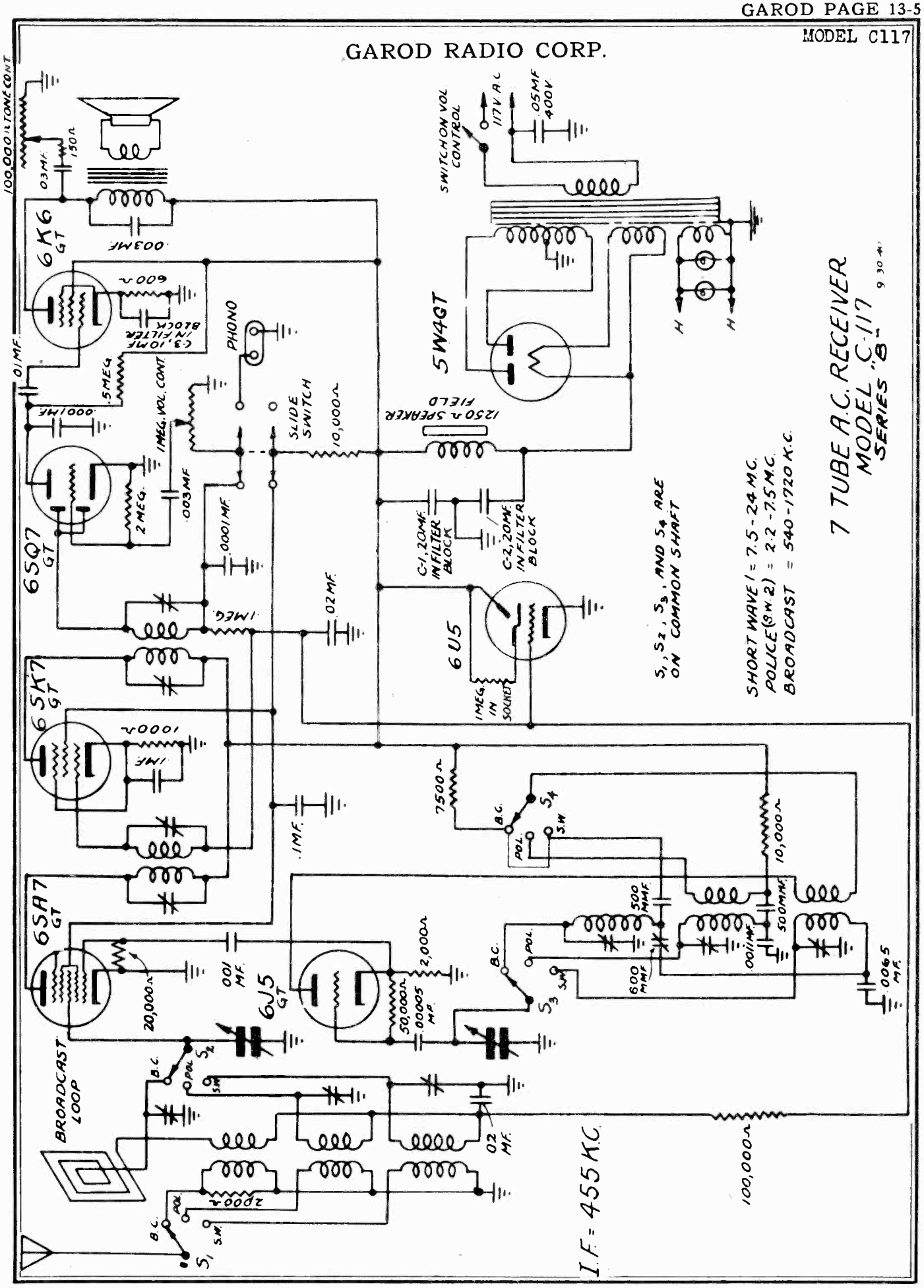
MODEL D71

GAROD RADIO CORP.



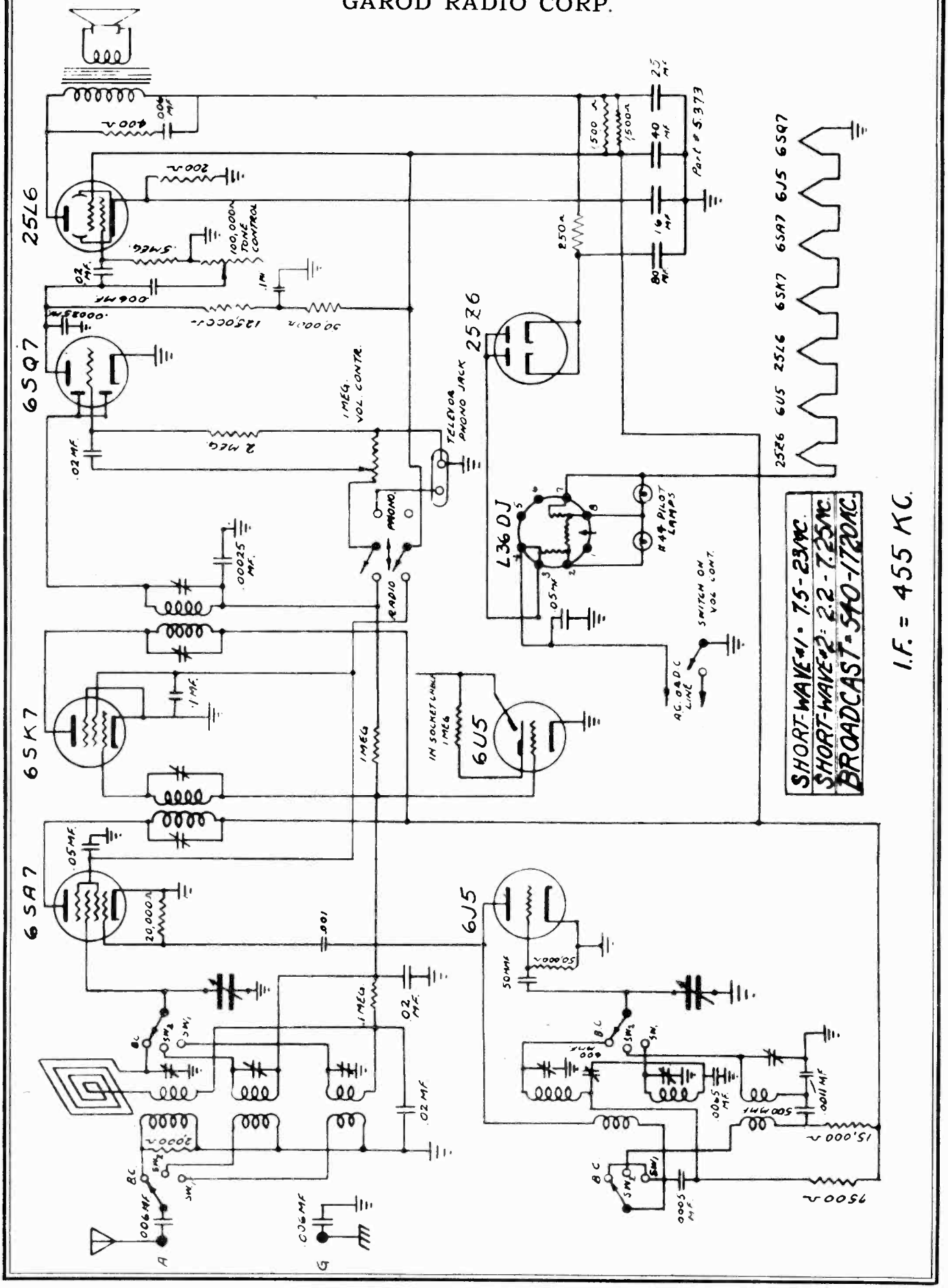
MODEL C117

GAROD RADIO CORP.



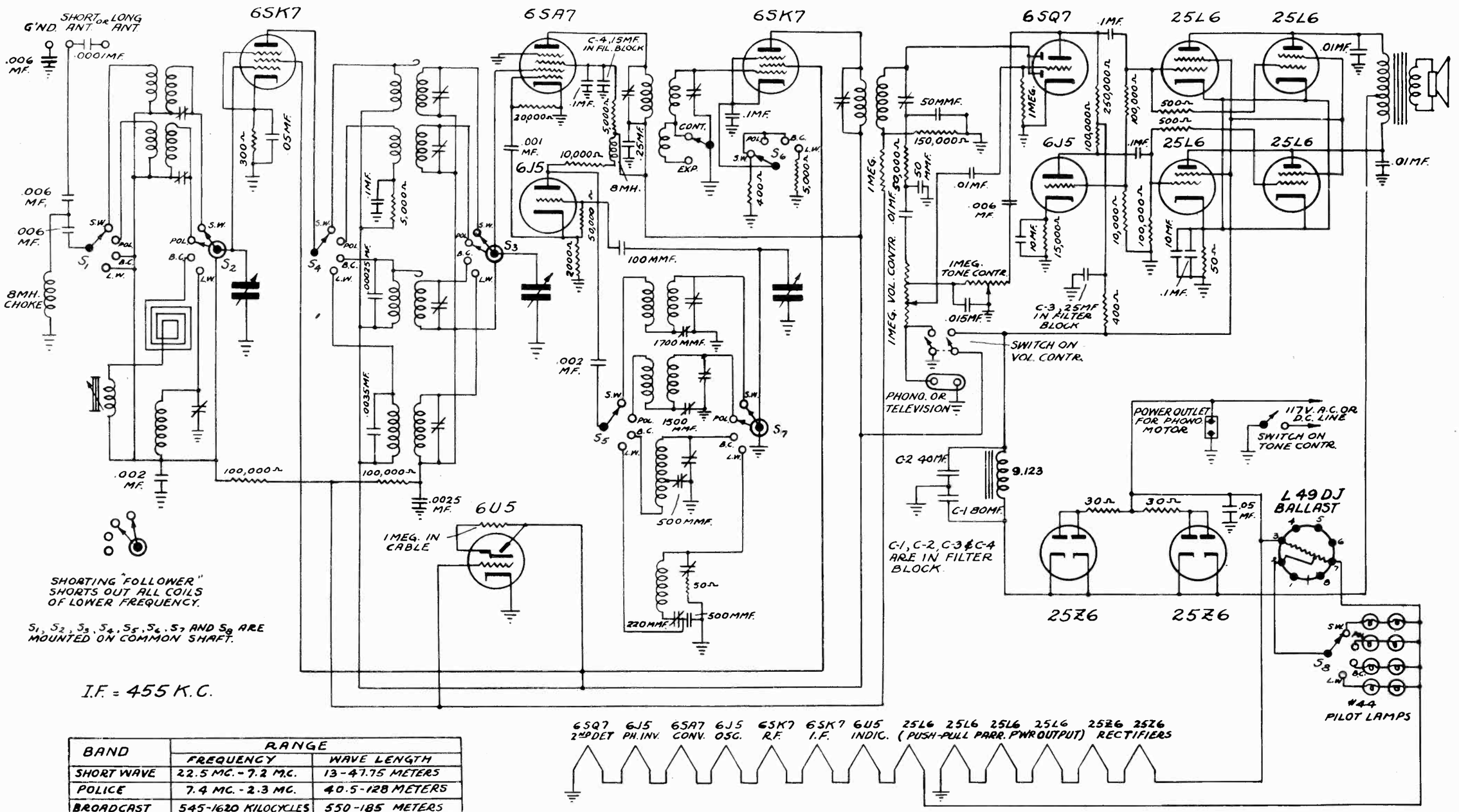
MODELS 'C118, 328

GAROD RADIO CORP.



GAROD RADIO CORP.

MODELS C124, 1444, 1454, 1464
1474, 4014



BAND	RANGE	
	FREQUENCY	WAVE LENGTH
SHORT WAVE	22.5 MC. - 7.2 M.C.	13 - 41.75 METERS
POLICE	7.4 MC. - 2.3 MC.	40.5 - 128 METERS
BROADCAST	545 - 1620 KILOCYCLES	550 - 185 METERS
LONG WAVE	140 - 370 KILOCYCLES	2140 - 813 METERS

13 TUBE A.C. D.C. RECEIVER

GAROD RADIO CORP.

MODELS C124,1444,1454, 1464,1474,4014

This model is a 13-tube (plus ballast) 4-band radio receiver.It is for operation on 105 to 125 volts, DC or AC (50 to 60 cycles).

The frequency coverage is as follows:

Long Wave Band.	142 to 375 Kilocycles.
Broadcast Band.	543 to 1600 Kilocycles.
First Short Wave.	2.35 to 7.6 Megacycles.
Second " "	7.2 to 22.5 Megacycles.

The controls on this receiver are as follows: (from left to right)

(1) Band Switch
(2) Band Expansion (High Fidelity)
(3) Volume & Phono Switch
(4) Tone Control & Line Switch
(5) Tuning.

All packing should be removed before attempting to set up the receiver. The tubes should be examined to make sure that they are mounted firmly in their sockets, as they may be jarred loose in Shipment.

ANTENNA - A highly selective loop antenna is included in the cabinet of this receiver. By turning the cabinet slightly,maximum volume with a minimum of noise may be had.Where conditions do not permit placement of the receiver in a position for best reception,it may be desirable to connect a short antenna to the binding post marked "A" which is located on the Loop Antenna. Where reception from greater distances is desired, it is necessary to install a well-insulated outdoor antenna about 50 feet long.

BROADCAST BAND: The dummy antenna for this band should consist of a 250 mmfd condenser only. The signal generator is set at 1620 kc, the band switch set during this last adjustment. The signal generator should be connected to the short-antenna at broadcast position. The variable condenser should be opened so that the signal generator is set to 7.6 mc and the oscillator trimmer plates are entirely out of mesh. The oscillator trimmer is then adjusted for reading maximum response on that frequency(1620KC).Set the signal generator at 1400Kslightly to the left and tune the receiver until a response is indicated.The dial pointer should coincide with the 1400 kc mark on the dial. Now adjust the interstage trimmer for maximum output.The signal generator is then set at 600 kc and the receiver tuned until a response is indicated. The padder condenser is then adjusted for maximum gain while the tuning gang condenser is rocked slightly to the left and right. The Antenna loading coil is now set for a maximum.This is located on top of the chassis behind the gang condenser. The 1400 kc adjustment should then be rechecked.

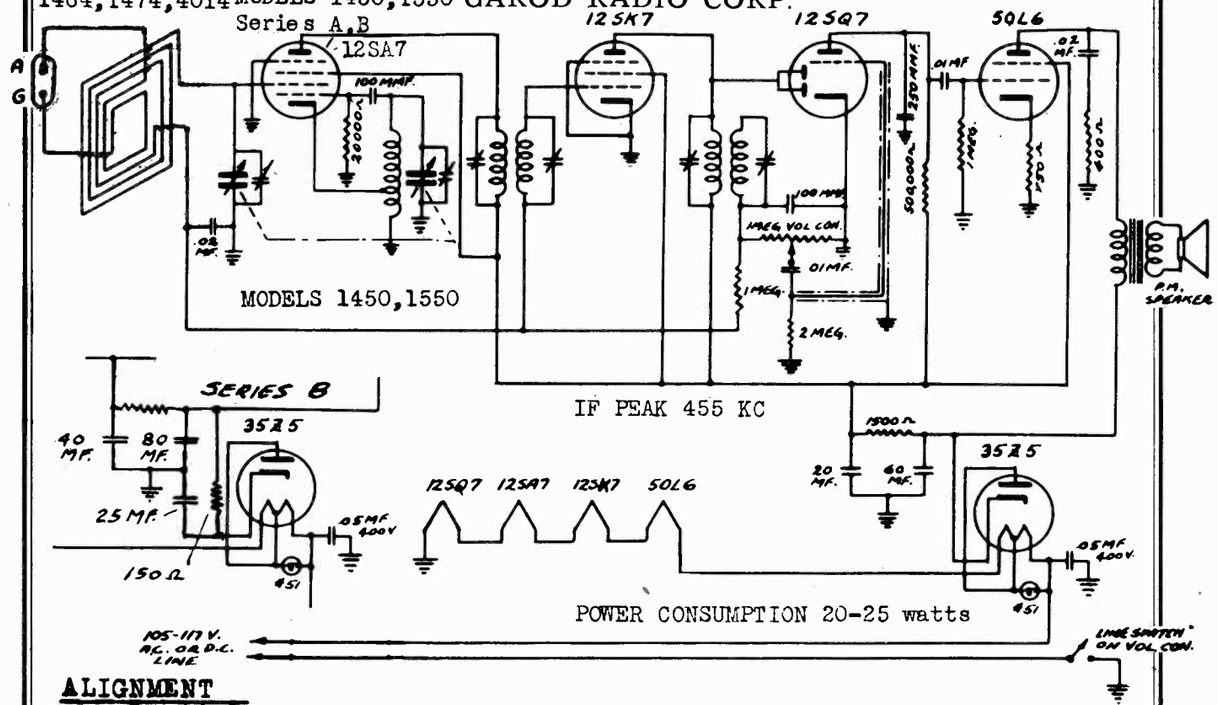
LONG WAVE BAND: The band selector switch is set in position for operation on the long wave band. The receiver and generator are both tuned to 300 kc and should now coincide with the 7 mc marker on the dial. The antenna and first detector trimmers are adjusted in the order named for maximum output. After high frequency adjustments have been made, set the signal generator at 2.5 mc and turn the variable gang condenser until a response is observed. Adjust the padding condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and the left. The higher frequency adjustment should then be rechecked.

I.F. ADJUSTMENT: The signal generator is set at 455 kc and is connected through a .5 mmfd condenser to the grid of the first detector (6SA7). This connection may be made to the stator lug on the middle section of the variable condenser with the band switch set on "Broadcast", the Band Expansion Switch in the Selective position (left), the pointer set at about 600 kc and the receiver volume control at its maximum position,the I.F.trimmers are adjusted for maximum output. These trimmers may be found on top of the I.F. transformer shield cans.

SECOND SHORT WAVE BAND: Turn the dial control knob so that the condenser plates are entirely out of mesh. Set the band switch to the second or higher frequency short wave band. The signal generator should be connected to the short-antenna binding post through the dummy antenna consisting of a 250 mmfd mica condenser and a 400 OHM non-inductive resistor. The oscillator trimmer condenser should be opened to minimum capacity and the signal generator then set to 22.5 megacycles. The antenna preselector and first detector trimmers are then adjusted.in the order named, for maximum output.The variable condenser should be rocked slightly during this last adjustment. The signal generator is now set at 8.mc and the signal generator is then set to 19MC and the variable condenser turned until a response is obtained. The pointer should coincide with the 19MC mark on the dial. The antenna preselector and first detector trimmers are then adjusted.in the order named, for maximum output.The variable condenser should be rocked slightly during this last adjustment. Two responses are possible and it is important that the higher frequency response(oscillator trimmer low capacity) be used. Set the signal generator at 7 mc and turn the tuning control until a response is indicated on the output meter. The pointer should now coincide with the 7 mc marker on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named for maximum output. The signal generator is set to 7.6 mc and the oscillator trimmer condenser is increased in capacity until a response is heard. Two responses are possible and it is important that the higher frequency response(oscillator trimmer low capacity) be used. Set the signal generator at 7 mc and turn the tuning control until a response is indicated on the output meter. The pointer should now coincide with the 7 mc marker on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named for maximum output. After high frequency adjustments have been made, set the signal generator at 2.5 mc and turn the variable gang condenser until a response is observed. Adjust the padding condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and the left. The higher frequency adjustment should then be rechecked.

FIRST SHORT WAVE BAND: The band selector switch is set in position for operation on the first short wave (second from left). The variable condenser is opened so that the plates are completely unmeshed and the oscillator trimmer is opened to minimum capacity. The signal generator is set to 7.6 mc and the oscillator trimmer condenser is increased in capacity until a response is heard. Two responses are possible and it is important that the higher frequency response(oscillator trimmer low capacity) be used. Set the signal generator at 7 mc and turn the tuning control until a response is indicated on the output meter. The pointer should now coincide with the 7 mc marker on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named for maximum output. The signal generator is set to 7.6 mc and the oscillator trimmer condenser is increased in capacity until a response is heard. Two responses are possible and it is important that the higher frequency response(oscillator trimmer low capacity) be used. Set the signal generator at 7 mc and turn the tuning control until a response is indicated on the output meter. The pointer should now coincide with the 7 mc marker on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named for maximum output. After high frequency adjustments have been made, set the signal generator at 2.5 mc and turn the variable gang condenser until a response is observed. Adjust the padding condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and the left. The higher frequency adjustment should then be rechecked.

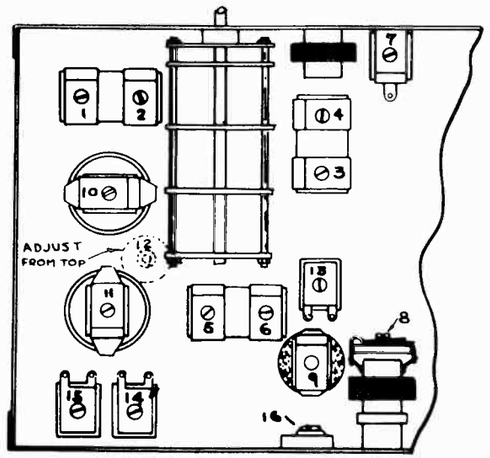
MODELS C124,1444,1454, 1464,1474,4014 MODELS 1450,1550 GAROD RADIO CORP.



ALIGNMENT

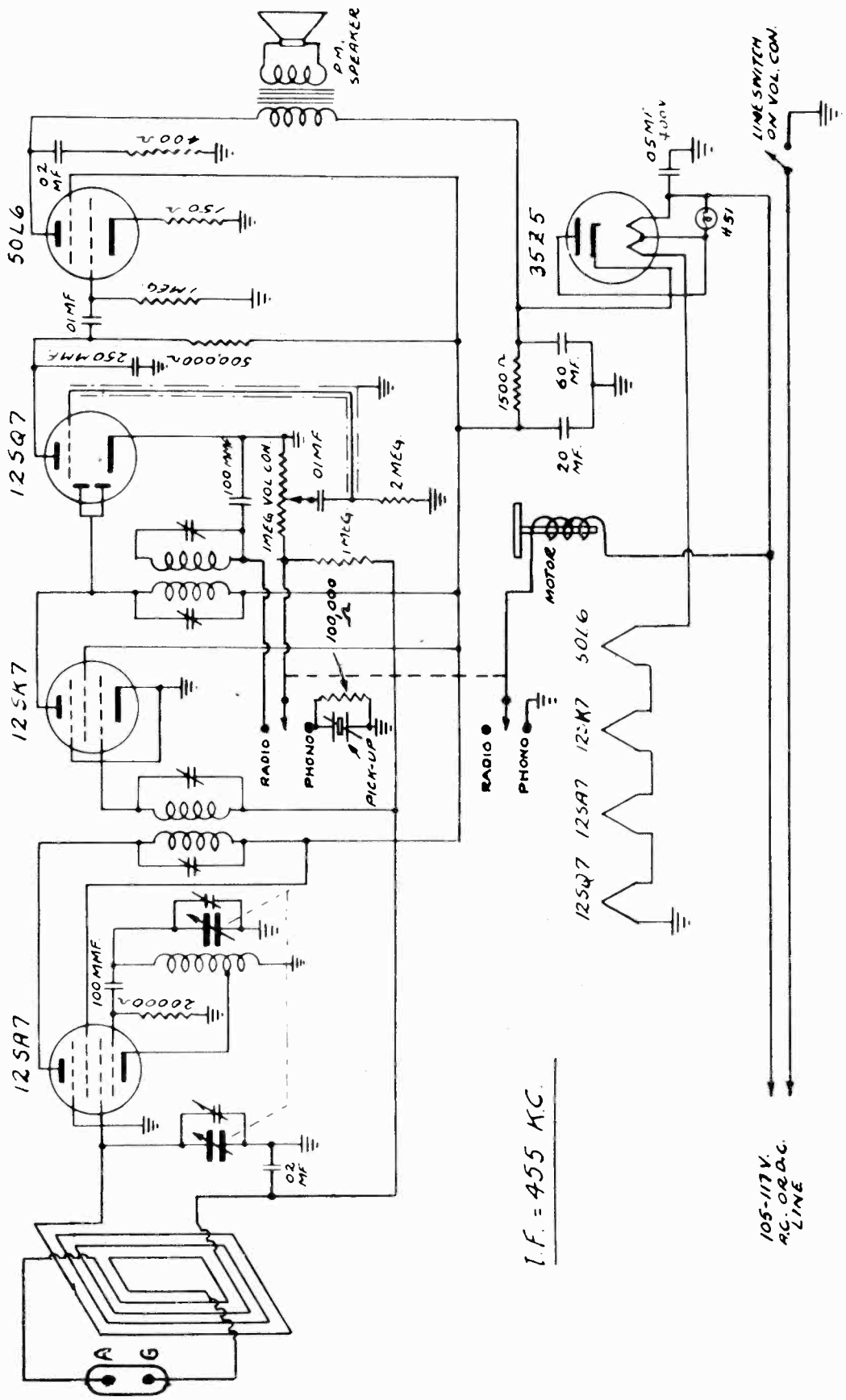
Should it become necessary to realign the receiver at any time, proceed in the usual manner by first adjusting the I.F. transformers, for maximum output as indicated by an output meter connected across the voice coil. Then turn the dial to 1500 KC. Set the signal generator (or 1500KC local station) to this frequency and tune in the signal by means of the oscillator trimmer on the variable condenser, (Front section). Then adjust the antenna trimmer for maximum output. No other adjustments are necessary.

C124, 4014, 1444 1454, 1464, 1474



NUMBER (SEE DIAGRAM)	ALIGNMENT CHART FUNCTION	ALIGNMENT FREQUENCY
1	2ND. S.W. ANT. TRIMMER	19 M.C.
2	1ST. S.W. ANT.	7 M.C.
3	2ND. S.W. INTER. (1ST. DET.)	19 M.C.
4	1ST. S.W. " "	7M.C.
5	2ND. S.W. OSC	22.5M.C.
6	1ST. S.W. "	7.6M.C.
7	L.W. ANT.	300K.C.
8	L.W. INTER (1ST. DET.)	300K.C.
9	L.W. OSC.	300K.C.
10	B.C. INTER. (1ST. DET.)	1400K.C.
11	B.C. OSC	1620K.C.
12	B.C. LOOP PADDER	600K.C.
13	2ND. S.W. "	8 M.C.
14	1ST. S.W. "	2.5M.C.
15	B.C. "	600K.C.
16	L.W. "	150KC
	I.F. FREQUENCY	455K.C.

GAROD RADIO CORP.



GENERAL ELECTRIC CO.

MODEL HM-3 MODEL JM-3

Electrical Specifications

Rating "A"—115–125 volts, 60 cycles, 20 watts.

Rating "V"—115–125 volts, 50 cycles, 20 watts.

Rating "C"—115–125 volts, 25 cycles, 20 watts.

MODEL JM-4

Electrical Specifications

Rating "A6"—115–125 volts, 60 cycles, 20 watts.
Rating "A5"—115–125 volts, 50 cycles, 20 watts.

INFORMATION

When connecting this record player to an a-c/d-c receiver insert a .25 mfd. 400 V. paper capacitor between the black lead of the record player and the chassis ground, and a .005 or .01 mfd., 400 V. paper capacitor between the green lead of the record player and the circuit tapped in the radio.

Radio Receiver Connections

There are several different methods which may be used to connect the record player to the radio receiver depending upon the provisions incorporated in the radio for handling phonograph connections and upon the type of installation desired. Several methods are outlined below for superheterodyne receivers.

The process of changing from radio reception to record-player operation and vice versa requires either the manual insertion of the record-player leads in the radio circuit each time the process is performed or the use of a switch to automatically perform the operation. The convenience of a switching arrangement will so far outweigh the labor involved in manual operation that the slight additional cost of a switch will pass unnoticed.

There follow several general methods of installation which should not be assumed to be comprehensive or all-conclusive.

Method No. 1.—(For radios equipped with phono pin-jack terminals.) The Model HM-3 is equipped with a plug for connecting to radios equipped with a phono pin jack. The green lead of the record player is connected to the pin terminal and the black lead to the shield of the plug. Some radio models automatically switch to record-player operation when the plug is inserted in the terminal; other models require pushing or rotating a switch incorporated on the radio control panel.

Method No. 2.—(For radios equipped with phono terminals.) Consult the instruction pamphlet which was supplied with your radio to determine which phono terminals are for connections to the record player. There may be three or four terminals, depending upon the type of radio. Determine which terminal is connected to the high side of the volume control. For radio operation, there will be a link connection between this volume-control terminal and the radio diode load terminal. On a three-terminal board, the remaining terminal will be chassis ground. On a four-terminal board, one of the remaining terminals will be chassis ground and the other a diode return.

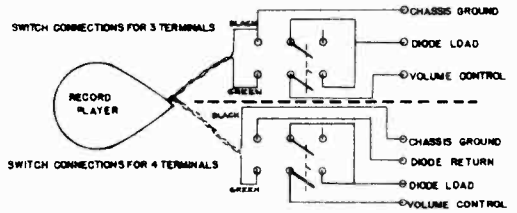
Using manual insertion of the record player into the radio circuits, it is only necessary to remove the link from between the diode load and volume-control terminals and reinsert it between the diode load and chassis ground terminals (on a three-terminal board), or between diode load and diode return (on a four-terminal board). The green lead on the record player is then connected to the volume control terminal and the black lead to the chassis ground terminal. To return to radio operation, merely remove the link and reinsert between the diode load and volume-control terminals. It may not be necessary to disconnect the record-player leads when returning to radio operation depending upon the circuit design in your radio receiver. If the tone quality and volume are impaired when the record player remains connected, then it will be necessary to remove the record-player leads from the radio terminals each time you turn from record-player performance to radio reception.

Using switch operation requires the use of a double-pole, double-throw toggle or rotary switch. The general method of connection is as shown in Fig. 1.

The record player can remain permanently connected when using this method of switch connection.

Some late radio models have the switch already incorporated in the push-button assembly.

Method No. 3.—(For radios not equipped with phono or pin-jack terminals but on which phono terminals are to be located.) First, pull the radio power-cord plug out of the power-supply socket; then remove the radio receiver chassis from the cabinet to allow access to the high side of the volume control. Unsolder the lead from the high side of the volume control and solder it on to one lead of a two-conductor shielded pair. Solder the other conductor of the shielded pair to the high side of the volume control This shielded pair should be long enough to extend to the outside rear of the radio chassis. Solder the shields to the chassis. Procure a three-terminal board and mount it on the shelf of the cabinet at the rear of the chassis. Connect the shield to one outside terminal and the new volume-control conductor to the other outside terminal, leaving the center terminal for the remaining conductor. Connect the record player to the two outside terminals. When record-player operation is desired, interconnect the center terminal and the shield terminal. When radio operation is desired, interconnect the center terminal and the volume-control terminal. It may be necessary, depending upon the circuit in your radio receiver, to remove the record-player leads from the terminals each time radio reception is to be enjoyed. Tone and volume performance will indicate connection requirements. A switch may be inserted to perform the change-over operations by connecting as shown in Fig. 1. (Read descriptive material pertaining to Fig. 1.)



Method No. 4.—Some radio models will permit satisfactory record-player operation with the green lead of the record player connected to grid of the first audio tube and the black lead connected to the chassis ground. This method, however, requires tuning the radio to a dead spot on the band and may, in addition, require shorting the antenna to ground. NOTE.—Do not remove radio grid lead from the first audio tube.

The above instructions apply to the Models JM-3 and JM-4 as well as to Model HM-3.

See Index for Parts Lists of these Models. Note that two different motor assemblies have been used.

MODEL HM-3
MODEL JM-4

GENERAL ELECTRIC CO.

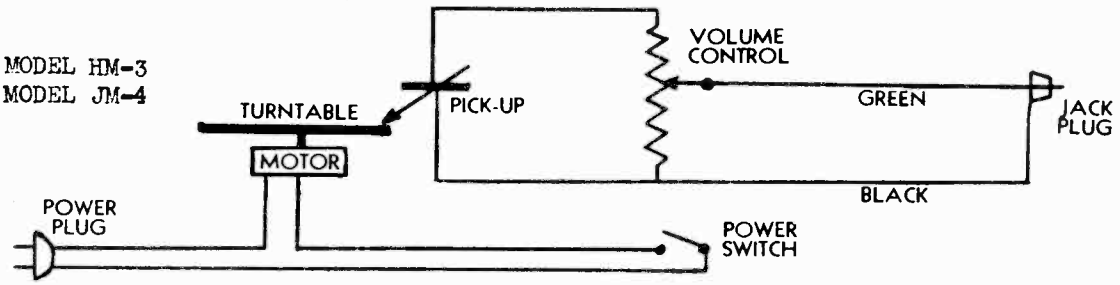


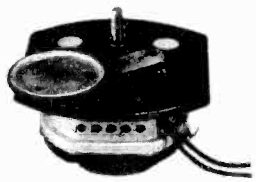
Fig. 2. Schematic Diagram

REPLACEMENT PARTS LIST
Model JM-4

Stock No.	Description	List Price
	CHASSIS ASSEMBLY	
RB-944	BOTTOM COVER—Cabinet bottom cover	$0.30
*RC-2002	CLAMP—Crystal clamp	.10
RC-2017	CATCH—Tone arm catch for securing to rest	.10
RC-8174	CORD—Power cord	.40
*RF-016	FOOT—Rubber foot for cabinet (Pkg. 3)	.05
*RH-114	HAIRPIN COTTER—Swivel retaining cotter	.10
*RK-063	KNOB—Power switch and volume control knob	.10
RN-007	NUT—Speed nut for mounting motor assembly (Pkg. 3)	.10
RN-008	NUT—Power switch clamping nut (Pkg. 5)	.10
*RN-102	NEEDLE CUP—Rubber needle cup	.10
*RP-145	PLUG—Phono plug (Pkg. 5)	.25
*RP-506	PICK-UP—Crystal pick-up	4.75
*RP-801	POST—Tone arm swivel post	.15
*RR-940	REST—Tone arm rest	.15
*RS-888	SCREW—Needle clamping screw	.10
RS-896	SCREW—Crystal clamp and catch screw (Pkg. 5)	.05
*RS-938	SWIVEL—Tone arm swivel assembly	.15
*RT-912	TONE ARM—Crystal tone arm	.65
RV-073	VOLUME CONTROL—Volume control and power switch	.70
*RW-114	WEIGHT—Tone arm weight	.05

MOTOR TURNTABLE ASSEMBLY MODEL NO. 2

RM-133	MOTOR—60-cycle motor assembly complete	6.25
RP-165	PLATE—Main plate and turntable shaft bearing assembly	.90
RP-166	PLATE—Motor mounting plate	.30
RP-167	PLATE—Rubber-edged-wheel movable plate and bearing assembly	.70
RP-316	PULLEY—60-cycle drive pulley and oil throw washer (Pkg.2)	.25
RS-493	SPRING—Movable plate tension spring (Pkg. 2)	.10
RS-943	SPINDLE—Turntable spindle and cotter	.20
RS-953	SPACERS—Rotor spacers between bearings (Pkg. 5)	.15
RT-924	TURNTABLE—8-inch brown flocked turntable	1.60
RW-912	WHEEL—Rubber-edged wheel, washer, oil felt and cotter	1.00
RX-073	ASSEMBLY—Rotor bearing brackets, felts, bearing assembly	.35
RX-074	ASSEMBLY—Motor plate mounting bushing, washers and screws	$0.15
RX-075	ASSEMBLY—Motor field and winding assembly	2.00
RX-076	ASSEMBLY—Movable-plate-guide spacer, washer screw assembly (Pkg. 5)	.10
RX-077	ASSEMBLY—Propeller, cotter, washer assembly	.15
RX-078	ASSEMBLY—Rotor assembly	1.35



MOTOR TURNTABLE ASSEMBLY MODEL NO. 3

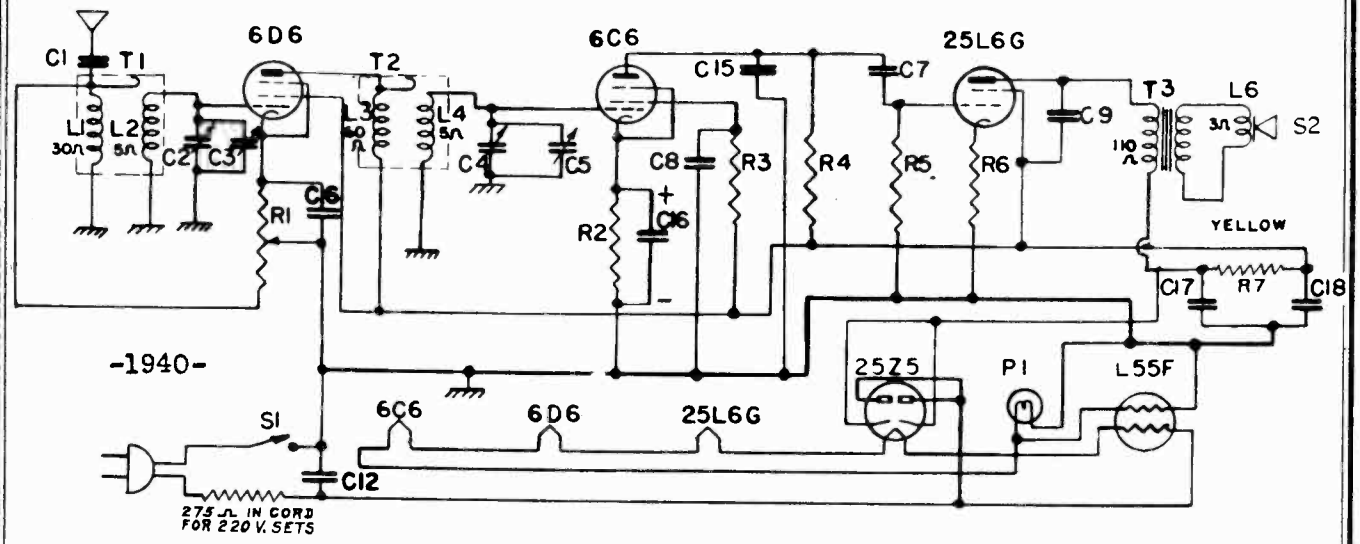
RB-184	BRACKET—Turntable drive wheel bracket assembly	.15
RB-185	BRACKET—Lower motor bearing bracket assembly complete	.40
RF-502	FIELD—60-cycle field stator assembly complete	3.60
RF-503	FIELD—50-cycle field stator assembly complete	3.60
RF-504	FRAME—Upper motor frame assembly	.60
RM-139	MOTOR—60-cycle motor assembly complete less turntable	6.00
RM-140	MOTOR—50-cycle motor assembly complete less turntable	6.40
RP-164	PLATE—Motor mounting plate and bearing assembly	.90
RP-311	PULLEY—60-cycle motor pulley and setscrew	.20
RP-312	PULLEY—50-cycle motor pulley and setscrew	.25
RR-406	ROTOR—Rotor complete	1.55
RS-4008	SPRING—Turntable drive tension spring (Pkg. 2)	.05
RS-875	SETSCREW—Motor pulley setscrew (Pkg. 12)	.25
RS-932	SPINDLE—Turntable spindle and cotter	.30
RT-923	TURNTABLE—8-inch brown flocked turntable	1.60
RW-909	WHEEL—Rubber-edged drive wheel	.50
RX-065	ASSEMBLY—Turntable drive wheel bracket mounting washer, screw and nut assembly (Pkg. 5)	.20
RX-066	ASSEMBLY—Lower bearing bracket screw and nut assembly (Pkg. 3)	.05
RX-067	ASSEMBLY—Motor mounting screw, washer and grommet assembly (Pkg. 3)	.25
RX-068	ASSEMBLY—Drive wheel oil retainer, cotter and thrust washer assembly (Pkg. 5)	.10

*Used on previous receivers.

(Prices subject to change without notice)

GENERAL ELECTRIC CO.

MODELS GDE-41A, GDE-41V
MODELS FE-82, FE-87



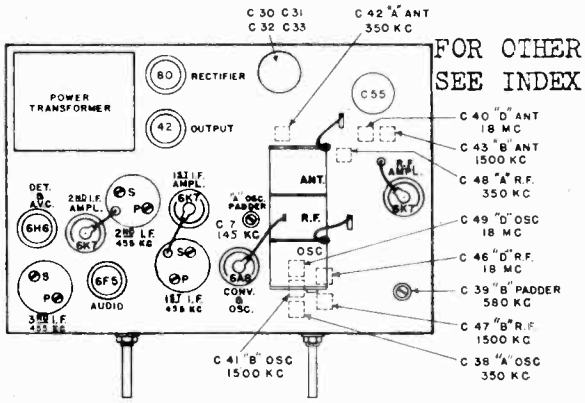
Symbol	Description	Symbol	Description	Symbol	Description
C-1	.01 Mfd. Paper Capacitor	C-16	10 Mfd. Dry Electrolytic	R-4, 5	1.0 Megohm Carbon Resistor
C-2,3,4,5	Tuning Condenser and Trimmers	C-17	30 Mfd. Dry Electrolytic	R-6	150 Ohm Carbon Resistor
C-6	.05 Mfd. Paper Capacitor	C-18	20 Mfd. Dry Electrolytic	R-7	5700 Ohm Carbon Resistor
C-7, 8	.01 Mfd. Paper Capacitor	R-1	25,000 Ohm Volume Control	T-1	Antenna Transformer
C-9	.02 Mfd. Paper Capacitor	R-2	35,000 Ohm Carbon Resistor	T-2	R.F. Transformer
C-12	.05 Mfd. Paper Capacitor	R-3	3.0 Megohm Carbon Resistor	T-3	Output Transformer
C-15	100 Mmf. Mica Capacitor				

POWER CONSUMPTION GDE-41A 48 WATTS, GDE-41V 90 WATTS

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" Rating A.C. or D.C.	"V" Rating A.C. or D.C.	"A" Rating A.C. or D.C.	"V" Rating A.C. or D.C.	"A" Rating A.C. or D.C.	"V" Rating A.C. or D.C.	"A" Rating A.C. or D.C.	"V" Rating A.C. or D.C.	"A" Rating A.C. or D.C.	"V" Rating A.C. or D.C.
6D6	112	104	112	104	15	14.5	0.8	0.75	6.2	6.4
6C6	33*	28*	28	26	2.1	2.0	.05	.05	6.2	6.4
25L6G	126	118	112	104	7.9	7.8	44	43	25.5	26
25Z5	....	....			135	130	48	47	24	24

Line Voltage "A" rating—115. Line Voltage "V" rating—220.
No signal input—Dial pointer at 540.—Volume control at minimum.
* Measured on 250-volt scale.



CHASSIS LAYOUT-FE-82, FE-87

FOR OTHER DATA SEE INDEX

Tuning Frequency Range

Band "B" ..... 540-1800 kc.
Alignment Frequency ..... 1500 kc.

ALIGNMENT

Connect the high side of the signal generator through a 250 mmf. condenser to the antenna lead. The low side of the signal generator output should be connected to the receiver chassis through a .05 mfd. condenser. Connect a suitable output meter across the voice coil leads; then proceed as follows:

1. With gang condenser plates completely closed, the dial pointer should coincide with the horizontal dial line.

2. Tune receiver to the 1500 kc. point on the dial; then align trimmers (C-3 and C-5) on the gang condenser at 1500 kc. for a maximum output meter reading.

Precaution—One side of the power supply is connected to the chassis—Do not connect chassis to any external ground.

MODEL HE-74
MODEL J-629

GENERAL ELECTRIC CO.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F.....455 KC R.F.....1500 and 580 KC
The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the grid of the 6SK7GT through a .05 mfd. capacitor and align the 2nd I.F. transformer. Repeat the procedure, applying the 455 KC signal to the control grid of the 6SA7GT and aligning the 1st I.F. transformer. Finish by over-all adjustments.

R.F. Alignment

With gang condenser plates completely closed, set dial pointer to the first mark at the left end of the scale. Apply a 1500-KC signal either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the generator output which can be magnetically coupled to the receiver Beam-a-Scope. Align (C-2) at 1500 KC and peak (C-1) for maximum output. Peak (C-3) on 580 KC while rocking the gang condenser. Retrim at 1500 KC.

Special Service Information

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

(1) Stage Gains
Antenna Post to Converter Grid—6 at 1000 KC‡
Converter Grid to 6SK7GT Grid—30 at 455 KC‡
6SK7GT Grid to 6Q7GT Det. Plate—100 at 455 KC‡

(2) Audio Gains
.06 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor (R-1) averages 12 volts.

‡ Variations of +10, −20% permissible.

FOR OTHER DATA IN VOL. XII SEE INDEX

ALIGNMENT PROCEDURE

I.F. ALIGNMENT WITH OSCILLOSCOPE

Band Switch Setting	Input Freq.	Point of Input	Dummy Antenna	Trimmer	Comments
1. Band "D"	455 K.C. Sweep	I.F. Grid	.05 Mfd. or Larger	2nd I.F. Sec. (Bottom of Shield Can) 2nd I.F. Pri. (Top of Shield Can)	Gang condenser plates closed—connect audio input of oscilloscope to ground and to the junction of R-10 and R-12. Adjust trimmers in order mentioned for a single symmetrical curve of maximum amplitude. The resulting curve with input at converter grid is shown in Fig. 3.
2. Band "D"	455 K.C. Sweep	Converter Grid	.05 Mfd. or Larger	1st I.F. Sec. (Top of Shield Can) 1st I.F. Pri. (Bottom of Shield Can)	

I.F. ALIGNMENT WITH OUTPUT METER

1. Band "D"	455 K.C. with Modulation	I.F. Grid	.05 Mfd. or Larger	2nd I.F. Sec. (Bottom of Shield Can) 2nd I.F. Pri. (Top of Shield Can)	Gang condenser plates closed—connect output meter across voice coil—keep signal low and volume control on as far as possible. Adjust all trimmers for maximum output.
2. Band "D"	455 K.C. with Modulation	Converter Grid	.05 Mfd. or Larger	1st I.F. Sec. (Top of Shield Can) 1st I.F. Pri. (Bottom of Shield Can)	

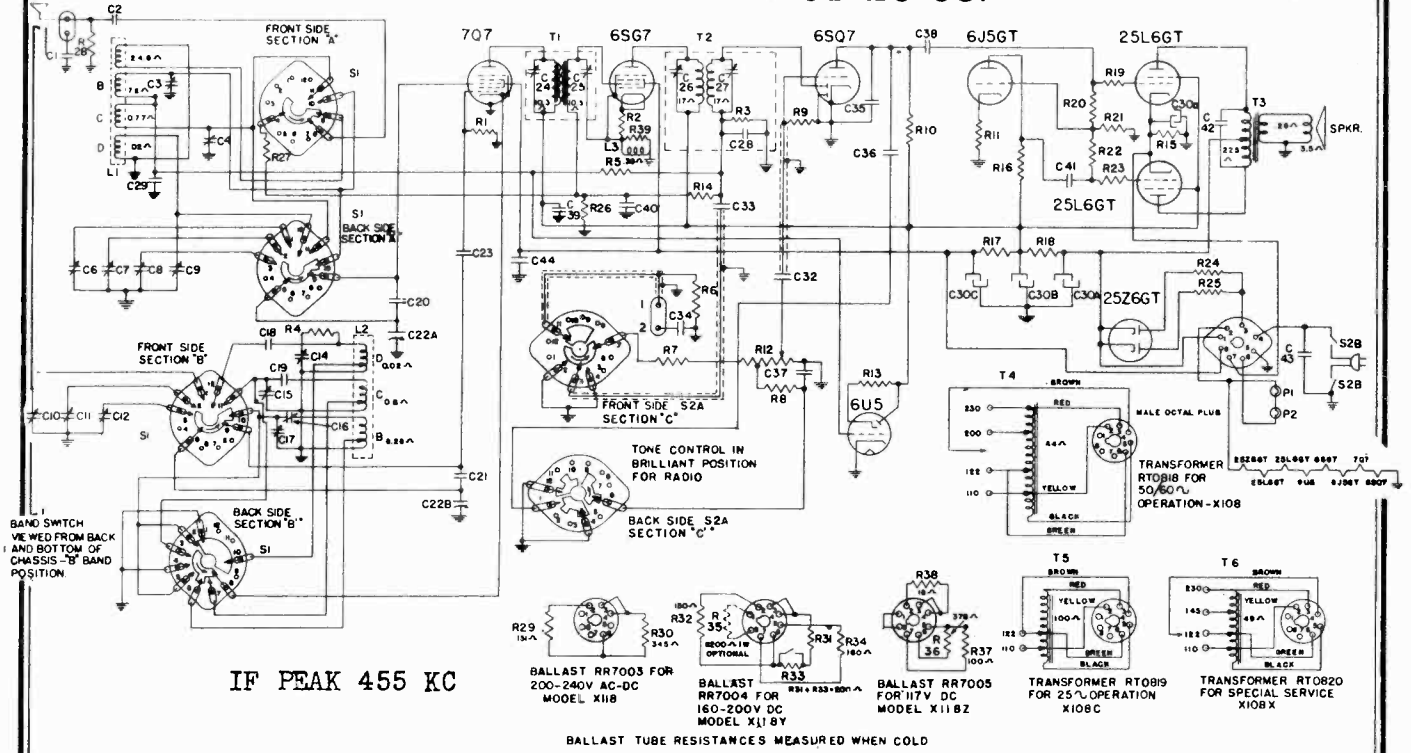
R.F. ALIGNMENT
Models HE-74 and HE-740

1. Band "B"	.....	.....	.....	.....	Close gang condenser plates. Adjust pointer to first line at left end of tuning scale.
2. Band "D"	21 M.C. with Modulation	Antenna Post	I.R.E.	Osc. (C-9) R.F. (C-6) Ant. (C-3)	Connect output meter across voice coil—peak trimmers for maximum output. The image of any "D" band signal should be heard 910 K.C. below the input signal. Example: 18 M.C. image is at 17.09 M.C. Peak (C-6) while rocking the gang condenser.
3. Band "C"	6 M.C. with Modulation	Antenna Post	I.R.E.	Osc. (C-10) R.F. (C-7) Ant. (C-4)	Peak trimmers for maximum output using a low input signal. Peak (C-7) while rocking the gang condenser. Image—910 K.C. below signal.
4. Band "B"	1500 K.C. with Modulation	Antenna Post	I.R.E.	Osc. (C-11) R.F. (C-8) Ant. (C-5)	Peak trimmers for maximum output with a low input signal.
5. Band "B"	580 K.C. with Modulation	Antenna Post	I.R.E.	Osc. padder (C-12)	Adjust padder for maximum output in the vicinity of 580 K.C. while rocking the gang condenser.
6. Band "B"	Repeat Operation 4				

FOR OTHER DATA IN RIDER'S VOL. XII SEE INDEX

GENERAL ELECTRIC CO.

MODELS X108, X118



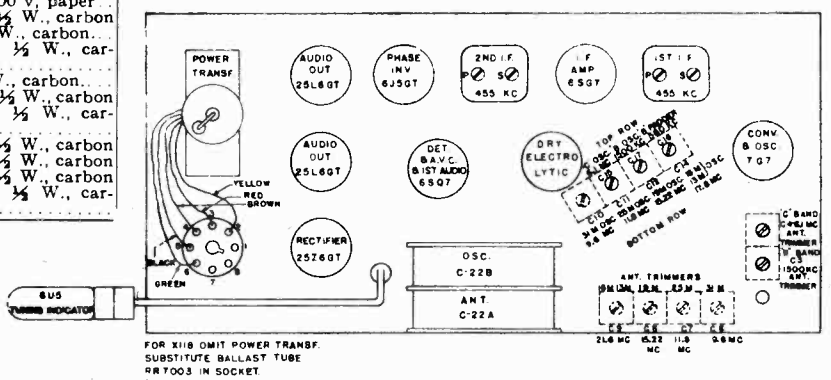
IF PEAK 455 KC

BALLAST TUBE RESISTANCES MEASURED WHEN COLD

RADIO REPLACEMENT PARTS LIST

Our Cat. No.	Symbol	Description	List Price
*RC-039	C1	CAPACITOR—.01 mfd., 600 v. paper	$0.25
*RC-009	C2	CAPACITOR—.001 mfd., 600 v, paper	.30
RC-6554	C3, 4	CAPACITOR—"B" and "C" Antenna trimmer	.35
RT-883	C6, 7, 8, 9	TRIMMER—Antenna trimmer strip	.70
RT-884	C10, 11, 12, 14, 15, 16, 17	TRIMMER STRIP—Oscillator trimmer strip	1.25
*RC-396	C-18	CAPACITOR—5600 mmf., mica	.45
*RC-347	C-19	CAPACITOR—1800 mmf., mica	.35
RC-325	C-20, 21	CAPACITOR—45 mmf., compensating capacitor	.40
RC-7062	C-22a, 22b	CONDENSER—2 gang tuning condenser	1.10
RC-326	C-23	CAPACITOR—40 mmf., compensating capacitor	.25
*RC-072	C-29	CAPACITOR—.05 mfd., 200 v., paper	.25
RC-5197	C-30a	CAPACITOR—20 mfd., 250 v, dry electrolytic	1.40
	C-30b	CAPACITOR—40 mfd., 250 v, dry electrolytic	
	C-30c	CAPACITOR—20 mfd., 250 v, dry electrolytic	
	C-30d	CAPACITOR—20 mfd., 25 v, dry electrolytic	
*RC-039	C-32	CAPACITOR—.01 mfd., 600 v, paper	.25
*RC-048	C-33	CAPACITOR—.02 mfd, 600 v, paper	.30
*RC-130	C-34	CAPACITOR—.2 mfd., 400 v, paper	.30
*RC-249	C-35	CAPACITOR—220 mmf. mica	.25
*RC-049	C-36	CAPACITOR—.004 mfd., 600 v, paper	.35
*RC-023	C-37	CAPACITOR—.005 mfd, 600 v, paper	.25
*RC-060	C-38	CAPACITOR—.03 mfd., 600 v, paper	.25
*RC-092	C-39	CAPACITOR—.05 mfd., 600 v, paper	.30
*RC-072	C-40	CAPACITOR—.05 mfd., 200 v, paper	.25
*RC-060	C-41	CAPACITOR—.03 mfd., 600 v, paper	.25
*RC-039	C-42	CAPACITOR—.01 mfd., 600 v, paper	.25
*RC-117	C-43	CAPACITOR—.02 mfd., 600 v, AC	.30
*RC-092	C-44	CAPACITOR—.05 mfd., 600 v, paper	.30
*RQ-1295	R-1	RESISTOR—33,000 ohm, ½ W., carbon	$0.70-5
*RQ-1235	R-2	RESISTOR—100 ohm, ½ W., carbon	.70-5
*RQ-1321	R-3	RESISTOR—390,000 ohm, ½ W., carbon	.70-5
*RQ-1219	R-4	RESISTOR—22 ohm, ½ W., carbon	.70-5
*RQ-1339	R-5	RESISTOR—2.2 megohm, ½ W., carbon	.70-5
*RQ-1323	R-6	RESISTOR—470,000 ohm, ½ W., carbon	.70-5
*RQ-1299	R-7	RESISTOR—47,000 ohm, ½ W., carbon	.70-5
*RQ-1305	R-8	RESISTOR—82,000 ohm, ½ W., carbon	.70-5
*RQ-1355	R-9	RESISTOR—10 megohm, ½ W., carbon	.70-5
*RQ-1323	R-10	RESISTOR—470,000 ohm, ½ W., carbon	.70-5
*RQ-1271	R-11	RESISTOR—3,300 ohm, ½ W., carbon	$0.70-5
RV-136	R-12	VOLUME CONTROL—2 meg. volume control	.95
*RQ-1331	R-13	RESISTOR—1 megohm, ½ W., carbon	.70-5
*RQ-1347	R-14	RESISTOR—4.7 meg., ½ W., carbon	.70
*RQ-642	R-15	RESISTOR—220 ohm, 2 W., carbon	.20
*RQ-1303	R-16	RESISTOR—68,000 ohm, ½ W., carbon	.70-5
*RQ-1473	R-17	RESISTOR—3,900 ohm, 1 W., carbon	.20
*RQ-669	R-18	RESISTOR—2700 ohm, 2 W., carbon	.20
*RQ-1259	R-19	RESISTOR—1000 ohm, ½ W., carbon	.70-5
*RQ-1311	R-20	RESISTOR—150,000 ohm, ½ W., carbon	.70-5
*RQ-1301	R-21	RESISTOR—56,000 ohm, ½ W., carbon	.70-5
*RQ-1317	R-22	RESISTOR—270,000 ohm, ½ W, carbon	.70-5
*RQ-1259	R-23	RESISTOR—1,000 ohm, ½ W, carbon	.70-5
*RQ-641	R-24 25	RESISTOR—180 ohm, 2 W., carbon	.30
*RQ-1345	R-26	RESISTOR—3.9 meg., ½ W., carbon	.70-5
*RQ-1325	R-27	RESISTOR—560,000 ohm, ½ W. carbon	.70-5
RR-7003	R-28,-29	RESISTOR—200-240 volt ballast	1.90
RR-7004	R-31-34	RESISTOR—160-200 volt ballast	
*RQ-1481	R-35	RESISTOR—8200 ohm, 1 W., carbon	.20
RR-7005	R-36-38	RESISTOR—117 v. DC ballast	
*RQ-1211	R-39	RESISTOR—10 ohm, ½ W., carbon	.70-5
RS-3127	S-1	SWITCH—Band change switch	1.25
RS-3128	S-2A, 2B	SWITCH—Tone control and power switch	1.45
RL-1016	L-1	COIL—Antenna coil (all bands)	1.10
RL-2064	L-2	COIL—Oscillator coil (all bands)	1.10
RL-371	L-3	COIL—I.F. Neutralizing coil	.25
RT-3007	T-1	TRANSFORMER—1st IF transformer	1.15
RT-3008	T-2	TRANSFORMER—2nd IF transformer	1.15
RT-4014	T-3	TRANSFORMER—Output transformer	1.55

* Used on previous receivers.



FOR X118 OMIT POWER TRANSF. SUBSTITUTE BALLAST TUBE RR7003 IN SOCKET

FOR OTHER DATA SEE INDEX

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

MODELS X-108, X-118

GENERAL ELECTRIC CO.

TONE CONTROL SWITCH CONNECTIONS

Position in Use	Section "C1" Back Side	Section "C" Front Side
Radio-Brilliant	Open	3-7
Radio-Bass	1-12	3-7
Radio-Treble	4-6	3-7
Radio-Mellow	1-12 4-6	3-7
Phono-Brilliant	Open	7-11 2-3
Phono-Bass	1-12	7-11 2-3
Phono-Treble	4-6	7-11 2-3
Phono-Mellow	1-12 4-6	7-11 3-4

SPECIAL SERVICE INFORMATION

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

NOTE—Connection to converter grid must be made directly to tube grid and not to gang condenser on spread bands.

(1) Stage gains

(a) Antenna Post to Converter Grid, three 400 ohms and 200 mmfd. in series, at

Stand.	1000 KC....5.4	31 M.....9.6 MC....1.8
SW1	4000 KC....3.7	25 M....11.8 MC....1.6
SW2	18000 KC....1.1	19 M....15.22 MC....1.4
		16-13 M....17.8 MC....1.0

(b) RF on Converter Grid to IF on 6SG7 grid at

Stand.	1000 KC.....61	31 M.....9.6 MC.....65
SW1	4000 KC.....63	25 M....11.8 MC.....68
SW2	18000 KC.....71	19 M....15.22 MC....71
		16-13 M....17.8 MC.....71

(c) IF on Converter Grid to IF on 6SG7 grid at 455 KC—85

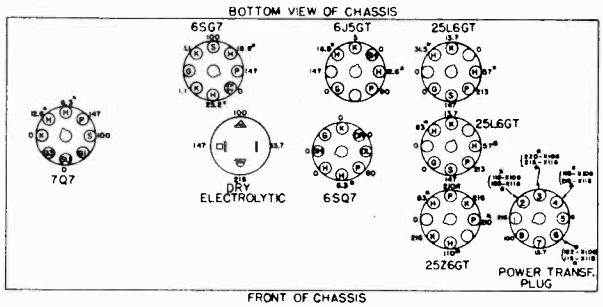
(d) IF Grid to diode plate at 455 KC—160

(2) Voltage across the diode load to give ½-watt speaker output at 400 cycles—.046 V.

(3) DC voltage developed across oscillator grid resistor (R1) at

Stand.	1000 KC.8.3 V.	31 M.....4.4 V.
SW1	4000 KC.7.7 V.	25 M.....4.8 V.
SW2	18000 KC.5.0 V.	19 M.....4.4 V.
		16-13 M.....3.7 V.

Variations of ±20% permissible. All measurements taken with R-26 shorted across.



VOLTAGES INDICATED BY ASTERISK (*) ARE AC VOLTAGES.
VOLTAGES READ WITH 1000 OHMS/VOLT METER ON 250-VOLT SCALE

BAND CHANGE AND TONE CONTROL SWITCHING

The following charts show the switch points connected for any one position of either the wave change or tone control switches. The numbers shown in each box indicate the switch points connected together in the section of the switch for each position of the switch. As for example: the numbers 5-9-10 indicate these switch points are all connected together for this particular position of the switch.

BAND SWITCH CONNECTIONS

Band in Use	Section "A" Front side	Section "A1" Back Side	Section "B" Front Side	Section "B1" Back Side
BC	4-8-9	5-9-10	5-9-10	1-10 6-8
SW1	4-8-10	5-9-11	5-9-11	1-2-10 7-8
SW2	4-8-11	5-9-12	5-9-12	1-2-3 8-10
31 METER	8-11	9-12-1	9-12-1	1-2-3-4 8-10
25 METER	8-11	9-12-2	9-12-2	1-2-3-4-5 8-10
19 METER	8-11	9-12-3	9-12-3	2-3-4-5-6 8-10
16 and 13 METER	8-11	9-12	9-12	3-4-5-6-7 8-10

Tubes

Converter-Oscillator		GE-7Q7
IF Amplifier		GE-6SG7
Detector, AVC, 1st Audio		GE-6SQ7
Phase Inverter		GE-6J5GT
Power Output	(2)	GE-25L6GT
Rectifier		GE-25Z6GT
Tuning Indicator		GE-6U5
Pilot Lamps	(2)	MAZDA No. 44

CONVERSION FOR SPECIAL LINE VOLTAGES

The Models X-108 and X-118 can be converted for operation on the following line voltages. In all cases where the power transformer is replaced with a ballast resistor, the power transformer must be removed from the chassis as the radiant heat from the ballast resistor is likely to injure the transformer insulation. When operated with these special resistors and lower power supplies than 220 volts, the audio power output and socket voltages will be reduced.

220 Volts AC/DC—(Range 200-240 Volts)

Remove transformer from chassis of X-108, insert ballast tube resistor RR-7003, and change label to read X-118.

180 Volts DC—(Range 160-200 volts)

Remove transformer from chassis of X-108 or ballast RR-7003 from X-118; insert the ballast tube resistor RR-7004 and change the label on the receiver so that it reads Model X-118Y.

NOTE—The 8200 ohm, 1 watt resistor (R-35) shown in dotted lines for the RR-7004 ballast tube schematic is not a part of the ballast tube. In order to increase the sensitivity and power output of this receiver when operating in this voltage range, this resistor may be installed externally across the terminals 1 and 8 of the ballast tube socket.

117 Volts DC—(Range 105-129 Volts)

Remove transformer from chassis of X-108 or ballast RR-7003 from X-118; insert the ballast tube resistor RR-7005 and change the label on the receiver so that it reads Model X-118Z.

NOTE—The power output on this receiver can be raised if the resistors R-18, R-24 and R-25 are shorted across.

Two other transformers are available for AC operation. The transformer T5 can be substituted in the Model X-108 receiver for operation on 25-cycle circuits. Remark the label so that it reads Model X-108C. The special duty transformer T6 can be used in the Model X-108 receiver for operation on 50/60 cycle circuits where a 145-volt tap is required. Remark the label on the receiver so that it reads Model X-108X.

The cold resistance of all ballast tubes is shown directly on the schematic diagram, Fig. 2.

GENERAL ELECTRIC CO.

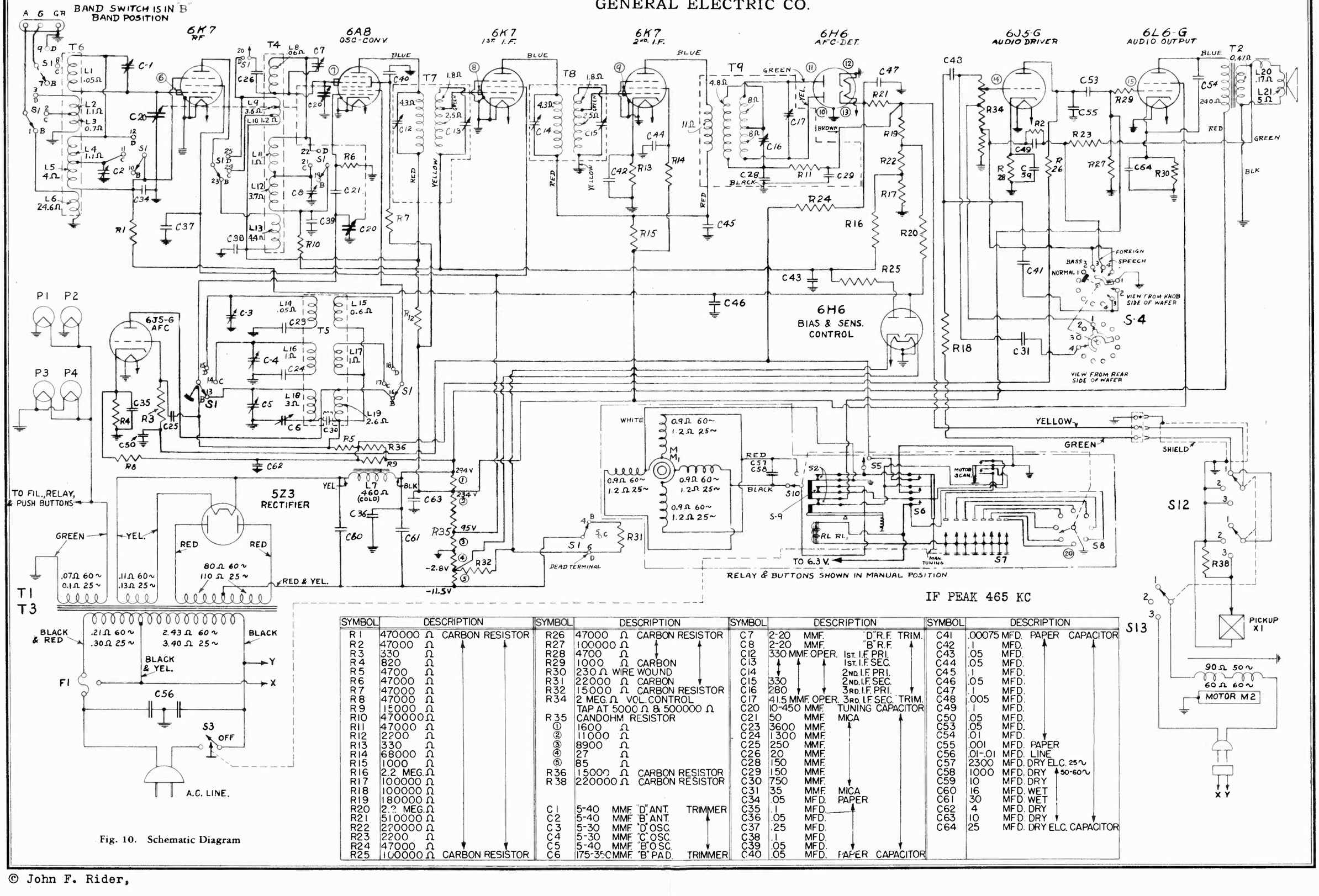


Fig. 10. Schematic Diagram

SYMBOL	DESCRIPTION
R1	470000 Ω CARBON RESISTOR
R2	47000 Ω
R3	330 Ω
R4	820 Ω
R5	4700 Ω
R6	47000 Ω
R7	47000 Ω
R8	47000 Ω
R9	15000 Ω
R10	470000 Ω
R11	47000 Ω
R12	2200 Ω
R13	330 Ω
R14	68000 Ω
R15	1000 Ω
R16	2.2 MEG. Ω
R17	100000 Ω
R18	100000 Ω
R19	180000 Ω
R20	2.2 MEG. Ω
R21	510000 Ω
R22	220000 Ω
R23	2200 Ω
R24	47000 Ω
R25	100000 Ω CARBON RESISTOR

SYMBOL	DESCRIPTION
R26	47000 Ω CARBON RESISTOR
R27	100000 Ω
R28	4700 Ω
R29	1000 Ω CARBON
R30	230 Ω WIRE WOUND
R31	22000 Ω CARBON
R32	15000 Ω CARBON RESISTOR
R34	2 MEG. Ω VOL. CONTROL
	TAP AT 5000 Ω & 500000 Ω
R35	CANDOHM RESISTOR
①	1600 Ω
②	11000 Ω
③	8900 Ω
④	27 Ω
⑤	85 Ω
R36	15000 Ω CARBON RESISTOR
R38	220000 Ω CARBON RESISTOR
C1	5-40 MMF. "D" ANT. TRIMMER
C2	5-40 MMF. "B" ANT.
C3	5-30 MMF. "D" OSC.
C4	5-30 MMF. "C" OSC.
C5	5-40 MMF. "B" OSC.
C6	175-350 MMF. "B" P.A.D. TRIMMER

SYMBOL	DESCRIPTION
C7	2-20 MMF. "D" R.F. TRIM.
C8	2-20 MMF. "B" R.F.
C12	330 MMF. OPER. 1ST. I.F. PRI.
C13	1ST. I.F. SEC.
C14	2ND. I.F. PRI.
C15	330 2ND. I.F. SEC.
C16	280 3RD. I.F. PRI.
C17	415 MMF. OPER. 3RD. I.F. SEC. TRIM.
C20	10-450 MMF. TUNING CAPACITOR
C21	50 MMF. MICA
C23	3600 MMF.
C24	1300 MMF.
C25	250 MMF.
C26	20 MMF.
C28	150 MMF.
C29	150 MMF.
C30	750 MMF.
C31	35 MMF. MICA
C34	.05 MFD. PAPER
C35	.1 MFD.
C36	.05 MFD.
C37	.25 MFD.
C38	.1 MFD.
C39	.05 MFD.
C40	.05 MFD. PAPER CAPACITOR

SYMBOL	DESCRIPTION
C41	.00075 MFD. PAPER CAPACITOR
C42	.1 MFD.
C43	.05 MFD.
C44	.05 MFD.
C45	.1 MFD.
C46	.05 MFD.
C47	.1 MFD.
C48	.005 MFD.
C49	.1 MFD.
C50	.05 MFD.
C53	.05 MFD.
C54	.01 MFD.
C55	.001 MFD. PAPER
C56	.01-.01 MFD. LINE
C57	2300 MFD. DRY ELC. 25~
C58	1000 MFD. DRY 50-60~
C59	10 MFD. DRY
C60	16 MFD. WET
C61	30 MFD. WET
C62	4 MFD. DRY
C63	10 MFD. DRY
C64	25 MFD. DRY ELC. CAPACITOR

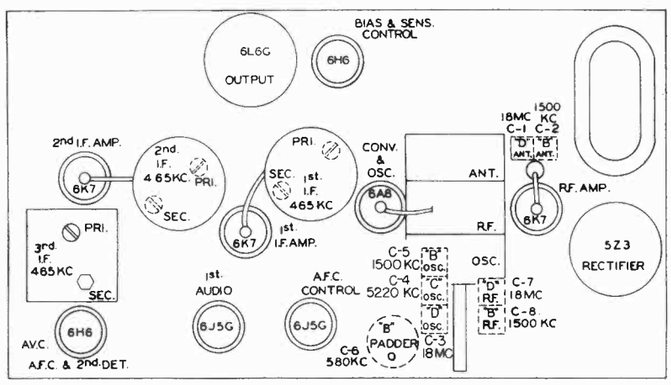


Fig. 2. Chassis Layout and Trimmer Location

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 an AC voltmeter with a scale reading of 3 to 5 volts. A cathode ray oscilloscope is preferred for I.F. alignment.
3. A screw-driver type alignment tool.

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 I.F. as this would remove the grid bias from the tube.

Automatic Frequency Control Adjustments

After I.F. alignment is completed with output meter and without disturbing the generator setting, remove the signal generator lead from the grid of the 6A8 converter. Apply the 465 kc. signal, to the 6A8 grid capacitively through the insulation of the grid lead.

Tune in a weak broadcast station at about 1000 kc. and, with the A.F.C. switch "off," tune the receiver carefully for "Zero" beat between this carrier and the 465 kc. generator signal. Throw the A.F.C. switch on and adjust the 3rd I.F. secondary trimmer (C-17) to zero beat. This adjustment is very critical and must be made with great care. When the alignment is correctly done, there will be no appreciable difference in the beat note with the A.F.C. switch "on" or "off."

Another method of A.F.C. adjustment after I.F. alignment with an output meter is to connect a low range voltmeter between the cathodes of the 6H6 discriminator. Leave the signal generator connected to the 6A8 grid and without disturbing its setting adjust C-17. It will be noticed that the meter reads plus when C-17 is tuned off resonance on one side and negative when tuned on the opposite side of resonance. The correct adjustment of C-17 is between these positions, when the voltmeter reads zero.

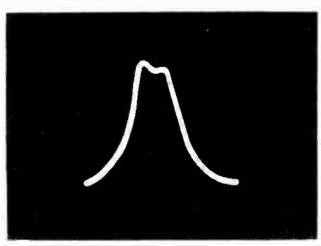


Fig. 3. Over-all I.F. Curve

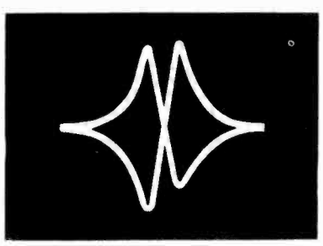


Fig. 4. AFC Adjustment Curve

Tuning Frequency Range	
Band "B"	540–1680 kc.
Band "C"	1600–5000 kc.
Band "D"	5400–18,000 kc.
Intermediate Frequency	465 kc.
Electrical Power Output	
Undistorted	5½ watts
Maximum	10 watts
Tuning Control Drive Ratio Manual	90–1
Tone Control	4-point control
Loud-speaker—Electrodynamic	
Cone diameter	12-inch
Voice coil impedance	5.5 ohm at 400 cycles

ALIGNMENT PROCEDURE

I.F. Alignment with Oscilloscope

Band Switch Setting	Input Frequency	Point of Input	Dummy Ant.	Trimmer (See Fig. (9)	Remarks
1. Band "B"	465 kc. Sweep	2nd I.F. Grid	.05 Mfd.	3rd I.F. Pri. (C-16)	A.F.C. switch "off"—Condenser gang at minimum capacity—vertical input ground and the junction of R-18, R-19, R-21 and brown lead from the 3rd I.F. trans. Adjust trimmers in order listed for a single curve of maximum amplitude. The resulting curve with input at converter grid is shown in Fig. 3.
2. Band "B"	465 kc. Sweep	1st I.F. Grid	.05 Mfd.	2nd I.F. Sec. (C-15) Pri. (C-14)	
3. Band "B"	465 kc. Sweep	Converter Grid	.05 Mfd.	1st I.F. Sec. (C-13) Pri. (C-12)	
4. Band "B"	465 kc. Sweep	Converter Grid	.05 Mfd.	3rd I.F. Sec. (C-17)	Disconnect one end of C-47—Turn A.F.C. switch "on"—Vertical input of oscilloscope to ground and discriminator cathode, prong No. 8 on 6H6.—Adjust trimmer for cross on horizontal axis. Fig. 4.

I.F. Alignment with Output Meter

1. Band "B"	465 kc. Modulated	2nd I.F. Grid	.05 Mfd.	3rd I.F. Pri. (C-16)	A.F.C. switch "off"—Condenser gang at minimum capacity—output meter connected across the voice coil—volume control at maximum—input as low as practical. Adjust all trimmers in order listed for maximum output. Do not attempt an over-all re-alignment once a stage alignment has been completed.
2. Band "B"	465 kc. Modulated	1st I.F. Grid	.05 Mfd.	2nd I.F. Sec. (C-15) Pri. (C-14)	
3. Band "B"	465 kc. Modulated	Converter Grid	.05 Mfd.	1st I.F. Sec. (C-13) Pri. (C-12)	
4. Band "B"	.....	.....	.....	3rd I.F. Sec. (C-17)	See paragraph on A.F.C. adjustment.

R.F. Alignment

1. Band "B"					Turn A.F.C. switch "off"—Set dial pointer to first line at left-hand end of dial scale with condenser gang fully meshed.
2. Band "D"	18 mc. Modulated	Antenna post	250 Mmf. 400 ohms	Osc. (C-3) R.F. (C-7) Ant. (C-1)	Connect output meter across voice coil—Turn tone control to bass. D band image should be 930 kc. below input signal when oscillator trimmer (C-3) is peaked properly. Example: 15 mc.—image 14.07 mc. Peak C-7 and C-1 while rocking gang condenser.
3. Band "C"	5220 kc. Modulated	Antenna post	250 Mmf. 400 ohms	Osc. (C-4)	Adjust trimmer for greatest output with dial pointer at 5,220 kc.
4. Band "B"	1500 kc. Modulated	Antenna post	250 Mmf. 400 Ohms	Osc. (C-5) R.F. (C-8) Ant. (C-2)	Adjust trimmers, in order listed, for greatest output at 1500 kc.
5. Band "B"	580 kc. Modulated	Antenna post	250 Mmf. 400 Ohms	Osc. padder (C-6)	Adjust padder for maximum output in vicinity of 580 kc. while rocking gang condenser.
6. Band "B"	Repeat operation No. 4				

Electrical Specifications

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A6	110–120 (120–130)*	60	175
A5	110–120 (120–130)*	50	175
C2	110–120 (120–130)*	25	180

* The receivers, as shipped from the factory, have the fuse clipped to the 120–130-volt tap of the transformer, marked 125 on the fuse board. If the normal voltage of your power supply is always below 115 volts, the fuse should be removed from this tap and placed in the lower voltage clip marked 115.

Tubes

RF Amplifier	6K7 Triple-grid, super control amplifier
Oscillator and Converter	6A8 Pentagrid Converter
1st I.F. Amplifier	6K7 Triple-grid, super control amplifier
2nd I.F. Amplifier	6K7 Triple-grid, super control amplifier
APC Discriminator and Detector	6H6 Twin diode
Bias and Sensitivity Control	6H6 Twin diode
APC Control	6J5-G Detector amplifier triode
1st Audio	6J5-G Detector amplifier triode
Audio Output	6L6-G Beam power amplifier
Rectifier	5Z3 Full wave rectifier
Dial lamps	MAZDA No. 46—6.3 volt, 0.25 amps.

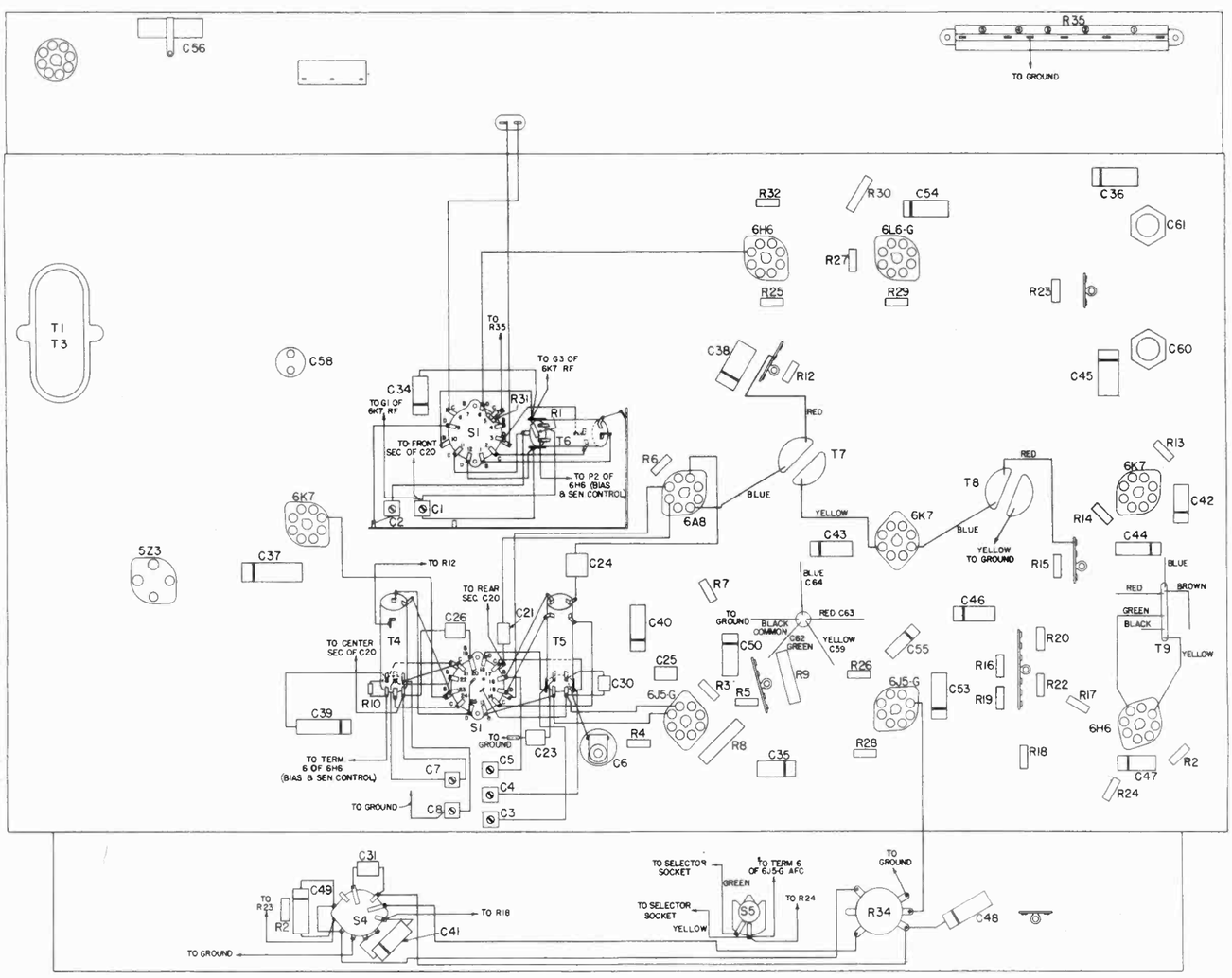


Fig. 11. Chassis Parts Layout

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	220	95	....	6.0	6.3
6A8	Oscillator	150	....	....	10	6.3
	Converter	220	90			
6J5-G	A.F.C. Control	150	....	6.1	3.5	6.3
6K7	1st I.F. Amplifier	236	92	....	7.0	6.3
6K7	2nd I.F. Amplifier	225	102	3.0	8.6	6.3
6J5-G	Audio	130	....	5.5	1.3	6.3
6L6-G	Output	280	234	13.5	57	6.3
5Z3	Rectifier	600/330 RMS	....	360 d-c	110	5.0

A-C line voltage—120 volts with fuse clipped in the 125-volt tap—no signal input—1000 ohms per-volt-meter—dial pointer at 530 kc. on broadcast band.

GENERAL INFORMATION

The Model F-109 is a three-band a-c operated receiver employing ten General Electric Pretested Tubes in a superheterodyne circuit. This receiver incorporates automatic "Touch Tuning" with thirteen station buttons, electric finger-tip dial drive control, R.F. amplifier, two stages of I.F. amplification, four-point tone control and other features of design as described in the following paragraphs. The phonograph equipment is designed to play records on one side automatically.

Receiver Operation

The antenna transformer T-6 used in conjunction with a 6K7 tube and the R.F. transformer T-4 are the essential elements of the R.F. amplifier. After the conversion to 465 kc. by means of the combination oscillator converter tube 6A8, the signal is amplified by the I.F. amplifier which consists of three tuned transformers and two 6K7 tubes. The primary and secondary coils of these transformers are carefully adjusted midway between the points of critical and overcoupling so as to give the I.F. amplifier a broadened band width with a subsequent better fidelity of the received program.

The output of the I.F. amplifier is applied to a 6H6 diode rectifier, which is a combination detector, automatic volume control, and bias source for the automatic frequency control tube. A detailed explanation of the A.F.C. will be found in a following paragraph. A second 6H6 diode is used to supply minimum bias to all tubes controlled by the avc. One of the plates (16) of this diode supplies initial bias to the R.F. stage, while the other plate (17) supplies the 6A8 converter and 1st I.F. amplifier with the proper bias. Since the cathodes of the 6H6 are connected to a 2.8-volt point on the bleeder resistance R-35, this allows the avc controlled tubes to have a constant —2.8-volt bias with no signal input. This bias will remain constant until the point at which the avc voltage developed, becomes greater than this —2.8 volts, at which time the bias on these tubes will then be dependent upon the avc developed by the strength of the carrier. When operating in the "B" band, the minimum bias is automatically raised on the 6A8 converter and 6K7 1st I.F. tubes by means of a section of the wave change switch (S-1, terminal 4). This places R-31 in parallel with R-32 and the lower section of the bleeder resistance (R-5), which increases the fixed bias source applied to this avc controlled circuit through a section of the 6H6 diode. This reduces between station noise considerably on the "B" band but does not effect a reduction of sensitivity when a station carrier is tuned in.

Volume is controlled by the variable potentiometer (R-34) in the grid circuit of the 6J5-G audio amplifier tube. The output of the 6J5-G is resistance coupled to the 6L6-G Beam Power Output tube which gives ample undistorted power output to a 12-inch dynamic speaker

TONE CONTROL

Negative feed back is used to control the quality and tone of reproduction. The frequency response of the audio circuit is varied by the tone control switch and its associated network as follows:

In the "normal" position, voltage from the voice coil is fed back through R-23, R-2, and C-49 to a tap on the volume control. C-31 serves to inject high frequencies into a tap higher up on the volume control. This arrangement gives an extended high frequency response, holds down the "boom" caused by pentode output and speaker resonance, and at the same time improves the quality and response to an extended range of both high and low frequencies.

In the "bass" position, the high frequency input to the audio system is limited by the addition of C-41 across the volume control and its coupling condenser; and, also, by the omission of the high frequency injector capacitor C-31. This permits the true reproduction of a wide range of low frequencies without the "boom" at speaker resonance.

In the "foreign" position R-2 and C-49 are shorted out of the network used for "bass." This permits more degeneration of the lower frequencies, and provides a tone range most suited for foreign reception. This position may be used to reduce noise and also to reduce bass on programs which predominate in low frequency tones.

C-41 is removed from the circuit in the "speech" position, R-2 and C-49 are shorted out leaving only R-23 in the circuit thus allowing flat degeneration of all frequencies. This arrangement has been found to give the best response for programs predominating in speech.

COIL SYSTEM

The coils for the three bands are wound a single form. The antenna transformer is designated as T-6, the R.F. transformer as T-4 and the oscillator transformer is marked T-3. All contacts on the band switch are numbered in Fig. 10 and Fig. 11 to facilitate tracing the coil circuits.

The band switch connects the coils to operate as follows:

Ant.	Primary	Secondary	Remarks
"B"	L-6	L-4 & L-5	
"C"	L-3	L-4	L-5 shorted
"D"	L-2 & L-3	L-1	L-4 & L-5 shorted
RF			
"B"	L-13	L-11 & L-12	
"C"	L-10	L-11	L-12 shorted
"D"	L-9 & L-10	L-8	L-11 & L-12 shorted
Osc.			
"B"	L-19	L-18	
"C"	L-17	L-16	Connects C-30 across L-18
"D"	L-15	L-14	Connects C-30 across L-16

On "D" band contact No. 9 is used to provide a ground for the General Electric noise reducing antenna systems, KV-300 and FT-40.

RESISTANCE MEASUREMENTS

No.	Resis. to Ground	Tube	Socket Prong
6	3 megs.	RF Grid	Cap
7	2.8 megs.	6A8 Conv.	Cap
8	2.8 megs.	1st IF Grid	Cap
9	3 ohms	2nd IF Grid	Cap
10	340,000 ohms	Diode Plate	Prong 3 AFC sw. closed
11	340,000 ohms	Diode Plate	Prong 5 AFC sw. closed
12	Grounded	Diode Cath.	Prong 4
13	1 meg. AFC sw. open 47,000 ohms AFC sw. closed	Diode Cath.	Prong 8
14	0-2 megs. vol.con.	1st Audio Grid	" 5
15	100,000 ohms	6L6 Grid	Prong 5
16	2.5 megs.	Diode Plate	Prong 3
17	2.7 megs.	Diode Plate	Prong 5
18	10,000 ohms	Diode Cath.	Prong 8
19	27 ohms	Diode Cath.	Prong 4
20	2.2 ohms pin on cantactor (Corresponding button pressed)		

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AUTOMATIC FREQUENCY CONTROL

The Automatic Frequency Control used in this receiver shifts the oscillator frequency so that the correct intermediate frequency is very closely produced even when the receiver is mistuned several kilocycles.

The essential elements are the discriminator transformer T-9, the twin diode 6H6 with its balanced discriminator network, and the 6J5-G control tube connected across the broadcast oscillator plate coil.

The discriminator transformer is designed to deliver (when properly tuned to 465 kc.) equal voltages to each section of the 6H6 when the receiver is correctly tuned to give an I.F. frequency of 465 kc. Under this condition the voltage drop across R-21 is equal and opposite to the voltage across the total resistance of R-19, R-22 and R-17; thus no discriminator voltage is produced to control the 6J5-G tube.

However, if the signal frequency is increased above 465 kc., unequal voltages are applied to the diodes and the voltage over R-21 is greater than the voltage over the combined resistance of R-19, R-22 and R-17. The difference of these two voltages is positive and is applied to the 6J5-G control tube.

When the signal frequency is decreased below 465 kc., the result is less voltage over R-21 and a greater voltage over the combined resistances R-19, R-22 and R-17. The difference of these two voltages, as applied to the 6J5-G control tube, is negative.

Thus three conditions arise:

On resonance: no discriminator voltage developed
Above 465 kc.: a positive control voltage
Below 465 kc.: a negative control voltage

The 6J5-G A.F.C. control tube has a combination of self and fixed bias, the latter being the result of the current supplied through R-8 to the cathode resistor R-4. The R.F. voltage applied to the control grid of the 6J5-G is obtained from the drop across the C-6 series padder and C-30. The vector sum of these two voltages is applied to the phase shifting network C-25 and R-3 and, in turn, to the control grid. This phase shifting network causes the control tube to appear as a reactance in parallel with the oscillator coil. The value of the apparent reactance depends upon the control voltage produced by the discriminator.

When the set is mistuned above the incoming signal, the converter output is above the 465 kc. required. A positive discriminator voltage is produced as explained above. This causes the 6J5-G tube to act as more capacitive reactance and thus lower the oscillator frequency; this gives a lower converter output frequency, approximately 465 kc.

When the set is mistuned below the incoming signal, the converter output is below the 465 kc. required. A negative discriminator voltage is produced as explained above. This causes the 6J5-G to act as less capacitive reactance thus increasing the oscillator frequency. This in turn gives a higher converter output frequency, approximately 465 kc.

A decided A.F.C. action is apparent on short waves. The discriminator voltage is produced in the same manner as above. However, the action of the 6J5-G tube is different. The 6A8 oscillator plate voltage and 6J5-G plate voltage are supplied through the same resistor (R-5). A positive discriminator voltage allows the 6J5-G plate current to increase, thus reducing the 6A8 oscillator plate voltage. This causes a lower oscillator frequency with the resultant lower converter output frequency, approximately 465 kc.

With a negative discriminator voltage the 6J5-G plate current is less, thus increasing the 6A8 oscillator plate voltage. This causes a higher oscillator frequency with the resultant higher converter output frequency, approximately 465 kc.

DIAL MECHANISM

(A) Manual drive leather-faced bevel gear
(B) Beveled idler gear
(C) Tuning shaft gear
(D) Volume control drive cord pulley
(E) Band switch drive cord pulley
(F) Tone control drive cord pulley
(G) Belt driven spiral rod drive pulley
(1) Spiral drive rod rider
(2) Pointer slider guide rod
(3) Tuning pointer spiral drive rod
(4) Motor belt
(5) Spiral rod bracket with bearing
(6) Motor shaft collar
(7) Clutch tension spring
(8) Pulley dog
(9) Motor shaft collar
(10) Tone control pointer
(11) Tone control cord pulley stud
(12) Band switch indicator
(13) Band switch indicator cord pulley stud
(14) Long dial drive cord
(15) Dial scale pointer
(16) Volume control pointer
(19) Short dial drive cord
(20) Stationary spring support
(23) Relay armature extension } Fig. 7
(24) Armature back stop

Tuning mechanism diagram (Fig. 1) is self-explanatory. The tuning condenser drive cord can be easily replaced without removing *any* part of the chassis while all dial indicating control cords are made readily accessible for servicing by merely removing the seven small screws holding the dial reflector assembly.

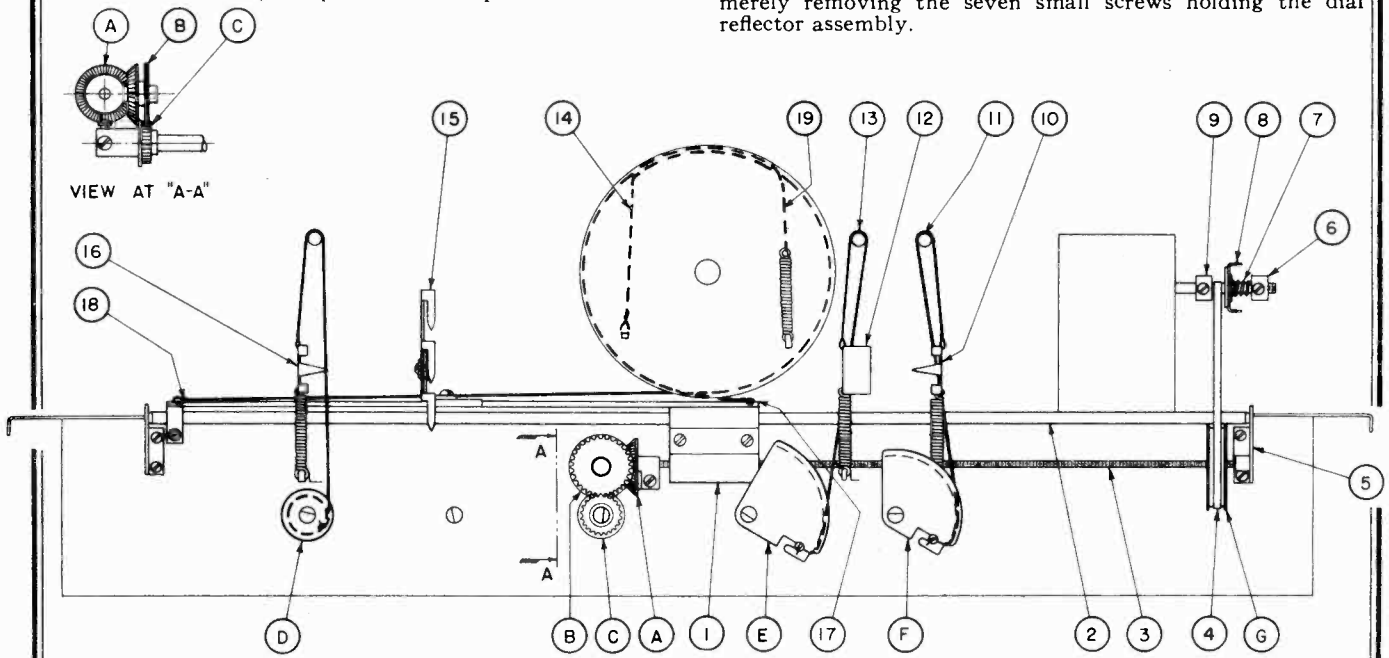

Fig. 1. Dial Mechanism

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RELAY ADJUSTMENTS

The following adjustments should be made with relay assembled on the motor bracket, Fig. 7.

(1) Make sure contacts are adjusted to open in correct sequence: center contacts (motor) first, contacts farthest from armature (AFC) second, contacts nearest armature (silent tuning) last. *It is very important that the silent tuning switch open last.*

(2) Adjust backstop (24) so that the armature snaps closed when the relay coil is energized with 4.5 volts A.C. The backstop must make a positive contact with the back of the armature in the open position; otherwise sluggish operation of the relay will result which will cause the motor drive to skip buttons. If the relay will not close at 4.5 volts and still maintain proper travel and sequence, weaken the spring on the rear of the armature plate by bending the stationary spring support (20).

(3) Loosen the setscrew on the motor shaft collar nearest motor (9) and adjust collar so that the pulley dog (8) misses the relay armature extension by .001 in. (relay not energized). All contacts must be closed when the relay armature touches the end of the motor dog; if the motor contacts open in this position the armature will chatter.

(4) Spring adjustment (7) on slip clutch should be just tight enough so as not to allow slippage of motor when driving the dial mechanism. Loosen setscrew on outside shaft collar (6) and screw the collar on the shaft to tighten slip clutch.

(5) The pole piece of the relay coil is divided in two semicircles. The relay armature should only touch the pole segments toward the motor shaft. There should be a .001 in. clearance between the back segment (21) and the armature when closed; otherwise a buzzing will be heard. Sometimes a front pole segment that is not perfectly flat will cause the same trouble. File off the offending bump.

(6) Backstop setting should be such that the distance (22) is 26/32 in. with the relay closed and 29/32 in. with the relay open.

(7) Spacing between relay contact points when open should be .015 to .018 inches for contact No. 1 and .008 to .010 inches for contact No. 2 and No. 3.

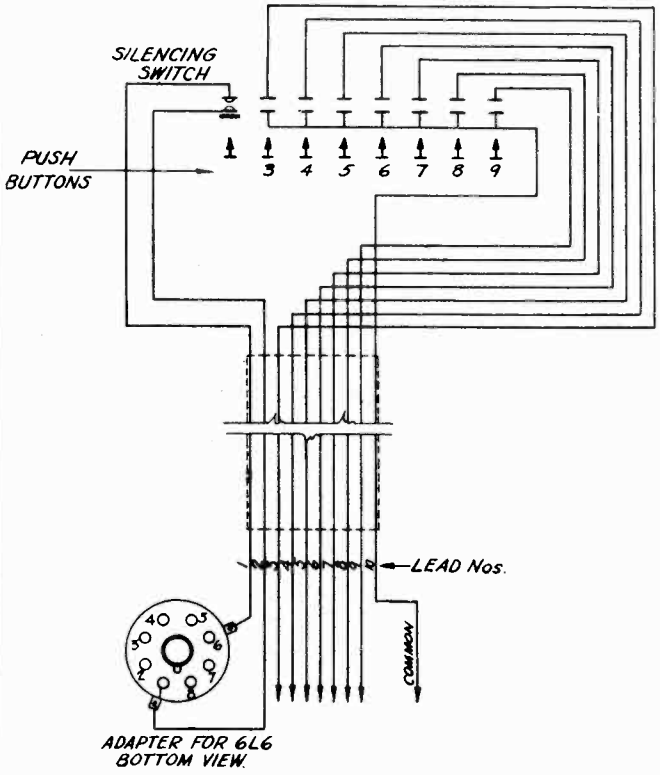

Fig. 6. Schematic of Remote Control

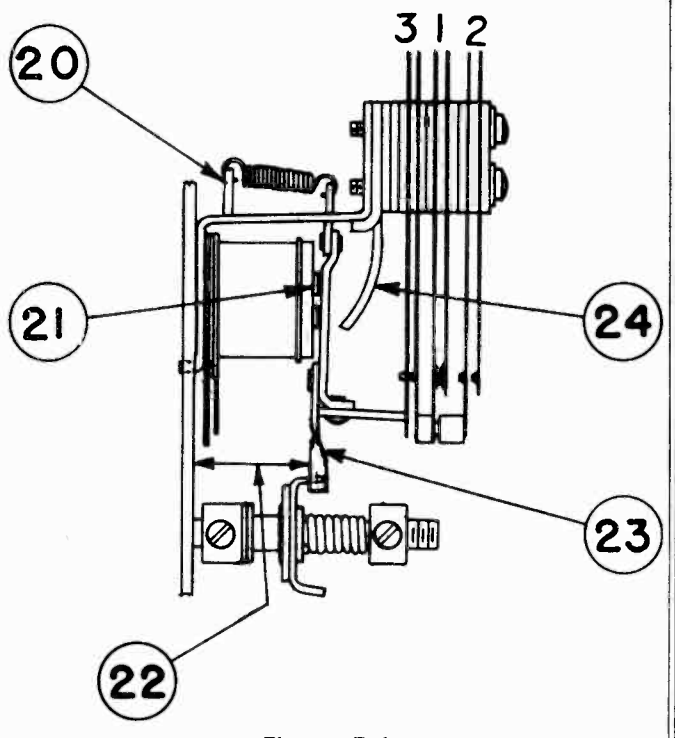

Fig. 7. Relay

INCORRECT OPERATION AND SUGGESTED REMEDIES

Skipping of Stations

(a) "Touch Tuning" button leads not making good contact to adjustable contact pins. Clean contacts and re-insert.

(b) Sliding contactor blade either covered by thin piece of bakelite or dirty. Carefully run fine file over top of sliding contactor, making sure not to leave any sharp corners. Sliding contactor should have a small amount of vaseline on beveled surface to prevent chattering.

(c) Nipple too sharp on adjustable contacts will cause sliding contactor blade to jump across. Smooth off with fine sandpaper.

(d) Relay armature out of adjustment causing sluggish operation of relay switch. See paragraph 2 under Relay Adjustments.

(e) Excessive side play in sliding contactor. Loosen the setscrew on the back of the sliding contactor and slide holder together. Final adjustment should allow sliding contactor to rock freely.

(f) Not enough tension on sliding contactor arm. Loosen collar on shaft in rear of contact segment and move sliding contactor arm towards the contact segment; then tighten collar on shaft.

(g) If the contacts at the rear of the "Touch Tuning" button assembly shafts do not close or make good contact, the motor will continue to scan the dial without stopping at the desired station.

(h) Contact segment may be bent out of shape. This should be perpendicular to chassis deck and parallel to rear chassis apron in order to allow the contactor arm to wipe the adjustable contacts evenly.

No Action When Station Button Is Pressed

(a) Relay remains energized and audio continues to function—push button escutcheon grounded. Be sure dial and push button escutcheons are insulated from each other or from the control shafts.

(b) "Off" switch contacts do not close.

(c) If set does not tune automatically unless scan button is also depressed, contacts No. 6, Fig. 5, require closer spacing.

(d) Open or shorted motor capacitor—Characterized by motor armature humming but no torque. Replace 1000 mfd. capacitor C58.

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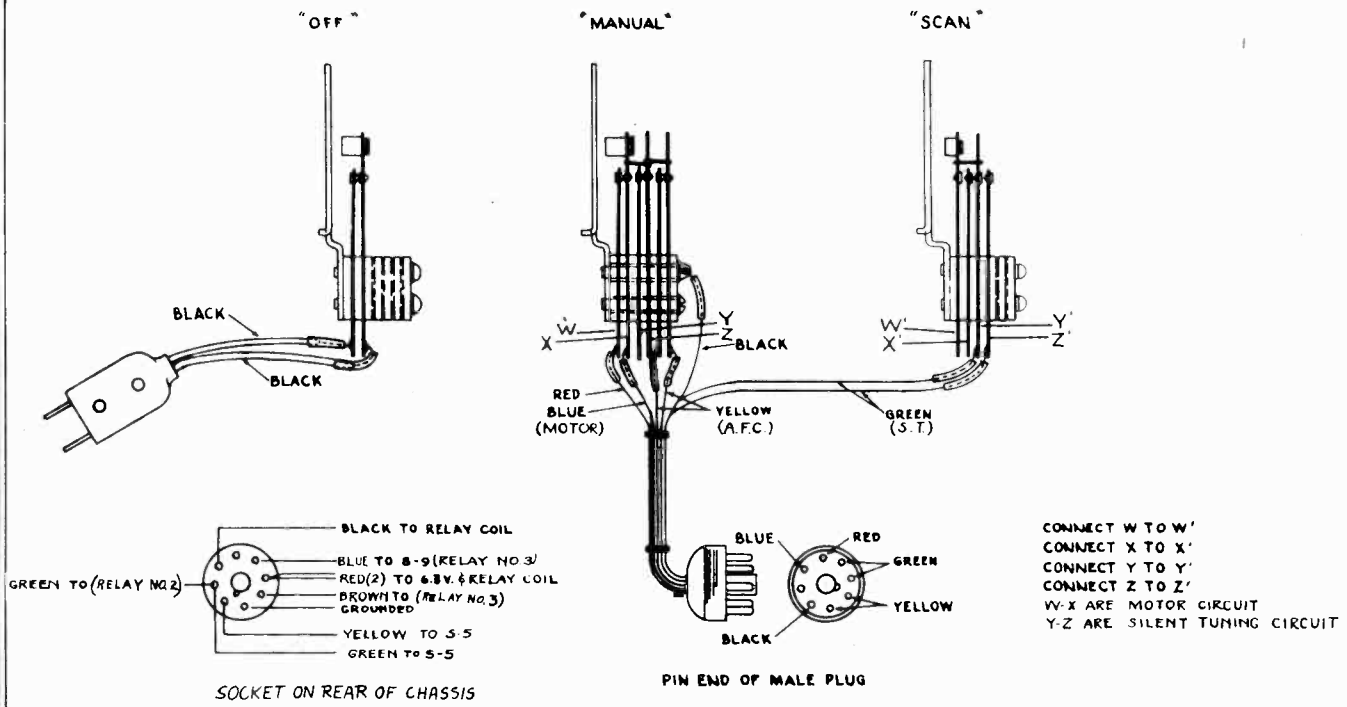


Fig. 8. Wiring Diagram of "Off," "Manual" and "Scan"

(e) Open or shorted coil in motor—Characterized by no torque or low torque in one direction. Replace motor or repair coil.

(f) Drive mechanism bound, or too tight for motor to drive.

(g) Not enough friction in slip pulley—The friction of the slip pulley is adjusted by tightening the collar on the end of the motor shaft. Care should be exercised that the setscrew does not hit the relay armature.

(h) Belt slippage—The tension of the belt may be increased by raising the motor on the relay bracket. If the belt still slips, reverse belt and use other surface or use belt dressing.

Noise in Audio Output While "Touch Tuning"

(a) Improper sequence—If the relay switch contacts open in improper sequence, audio output will be available too soon, and the break in the motor switch will be heard in the speaker. Correct as described in (1) under Relay Adjustments.

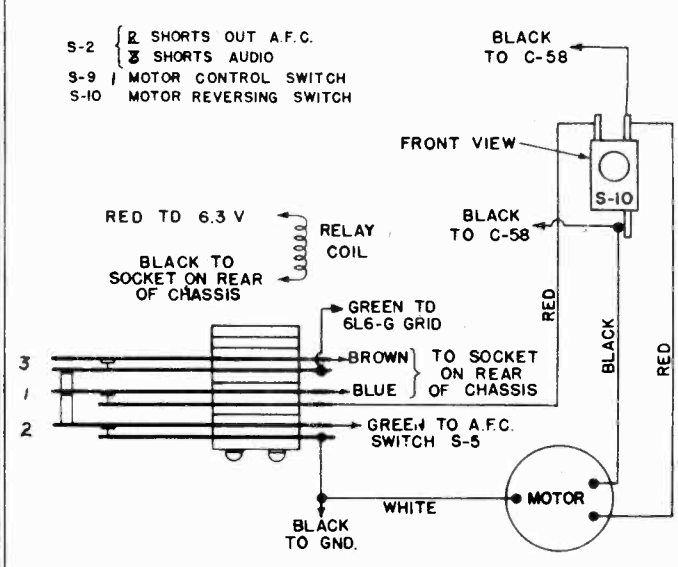


Fig. 9. Motor Relay Wiring Diagram

(b) Dressing of silent tuning lead—Early production receivers had silencing lead from 6L6 grid run to connector socket on rear apron, up to "Push Button" switch, and return through socket connector to the relay switch where the ground wires of AFC, motor and silent tuning contacts were connected together and grounded to chassis. Reconnect as follows: Ground A.F.C. and motor contacts to a point of the chassis directly underneath the motor. The green grid lead from the 6L6 should be rewired over the top of the chassis deck to the silencing contact, Fig. 9, of the relay switch; the lead from the other relay silencing contact should be connected to a prong of the connector plug, Fig. 8, from this point, connection is made to the silencing portion of the "Touch Tuning" switch, and a return to ground from this point is made through the connector plug to the chassis near the connector plug socket.

(c) Noise through filter circuit—The "blurp" in the speaker on early production due to the sudden application of audio may be reduced by placing a .05 mfd., 600-volt capacitor (RC-092) across the output filter capacitor (C-61).

Miscellaneous Adjustments

(a) When a "Touch Tuning" button will not remain in a locked position, it usually indicates that the springs at each end of the latch bar are not in proper adjustment. They should exert an equal pull on each end.

(b) The fork on the tuning condenser should be adjusted so that the motor reversing switch clicks over when the pointer approximately reaches the 540 and 1620 kc. markings on the dial scale. With the pointer at the extreme end of calibrations when tuning manually, the reversing switch lever should be set so there is not more than 1/16 in. nor less than 1/32 in. clearance between the lever and the switch trigger after the switch has snapped.

(c) The motor and relay mounting plate should rest parallel to the chassis deck. Do not adjust the spring tension foot; raise or lower motor on bracket, as required. Make sure that there is no electrical connection between the motor frame and the chassis.

(d) The "Off" switch on the "Touch Tuning" assembly should stay closed for at least one-half the movement of the key, opening only on the final click. If firm contact does not exist between the points, vibration of the set may cause an intermittent noise.

(e) The silent tuning contacts of the "Manual" and "Scan" switches should open last to permit quiet operation.

GENERAL ELECTRIC CO.

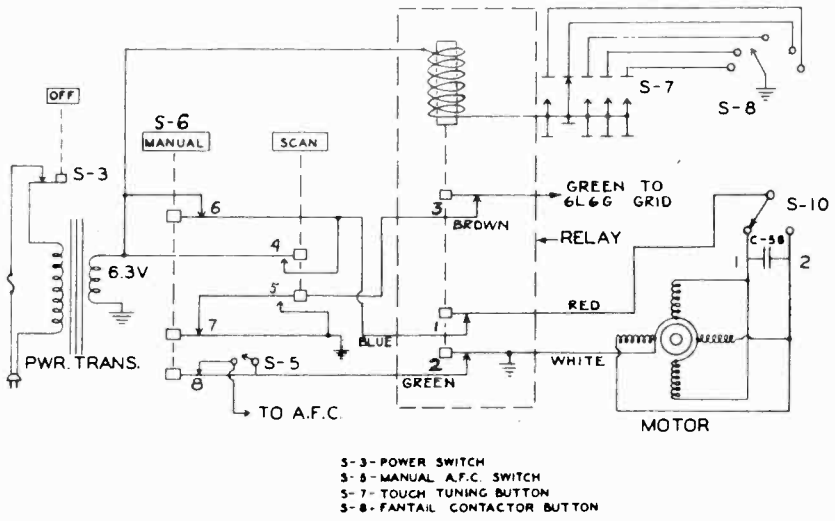


Fig. 5. Schematic of "Touch Tuning" System

TOUCH TUNING

General Electric "Touch Tuning" consists of three essential units; the push-button assembly of sixteen buttons, used by the operator for control; the motor and relay assembly, operating in conjunction with the buttons to provide fast and accurate tuning; and the contact segment with its sliding contactor and adjustable contacts enabling selection of thirteen different stations to be tuned automatically.

Of the sixteen push-buttons, thirteen are used for station selection. The other buttons are used for "Manual" control (No. 8), "Scanning" (No. 15 and) "Off" (No. 16). Depression of any button except No. 15 will lock the depressed button and release any other that may be in the circuit. Thus the selection of any station button or of "Manual" will release the "Off" switch turning the set on.

The tuning motor is operated as a capacitor type squirrel-cage induction motor, with capacitor. C-58 as the phase-shifting device. By tracing the motor circuit it will be seen that C-58 is in series with one set of poles when the motor reversing the switch is in position shown in Fig. 5. When the switch S-10 is reversed the capacitor C-58 is in series with the opposite set of poles. This causes the motor field to rotate in the opposite direction with the resultant change in motor rotation.

The motor power is supplied from the tube heater circuit through "Manual" switch (contact No. 6), Fig. 5, the relay (contact No. 1) and the motor reversing switch (S-10) with the chassis as common return. It will continue to run until the sliding contactor (S-8) contacts the stud on the contact segment which is connected to the button in the circuit. When this contact is made, the relay field coil is energized, causing the relay to open the motor circuit (contact No. 1). At the same time the relay arm also engages the motor clutch, causing instantaneous stopping of tuning mechanism travel. Depression of another station button causes another similar cycle.

Pressing the "Manual" button (S-6) releases any depressed button. Thus S-7 is opened and the relay field coil can not be energized. Contact No. 6 opens the motor circuit. Contacts No. 7 and No. 8 remove the ground from the grid of the 6L6-G and from the A.F.C. circuit respectively.

With the receiver set for "Manual" operation, depression of the "Scan" button closes the motor circuit by the shunting of contact No. 6 on the "Manual" switch allowing continuous motor operation and dial travel. As the motor drives to the dial limits on either end, S-10 is automatically thrown, causing reversal of motor rotation.

During periods of motor operation, either for automatic station selection or for scanning, the grid of the 6L6-G is shorted to ground. This "silent tuning," accomplished by relay contact No. 3, in the former case or scan button contact (No. 5) in the latter, avoids reception of unwanted stations or inter-station noise when tuning automatically or by means of the "Scan" button.

The use of automatic frequency control on "Manual" is made optional by the A.F.C. switch (S-5). When any one of the thirteen "Touch Tuning" buttons is depressed, circuit is made through contact No. 8 on S-6 and is completed through relay contact No. 2, thus removing A.F.C. while the motor is in operation. When the station is reached the relay opens contact No. 2, thus removing the ground on the A.F.C. circuit. *The A.F.C. is automatically turned on when "Touch Tuning" is being used.*

REMOTE CONTROL

There are ten leads in the "Remote Touch Tuning Control" cable. These leads serve the following functions:

The No. 1 and No. 2 leads are connected to the octal base adapter and serve to connect the silencing button to the output tube.

The No. 3 to No. 9 leads correspond to the button numbers and with the No. 10 lead, provide the selection of stations from the remote control unit. These leads are to be connected to pins on the contact segment on the rear of the chassis.

Remove the least desirable station's letters from one of the "Touch Tuning" buttons of the receiver and insert the "Remote" tab. Note the number of this button as marked on the escutcheon.

Remove from a pin on the contact segment on the receiver, the lead which bears this number, and connect it to the No. 10 lead from the remote control cable, Fig. 6.

(The pin on the contact segment from which this lead was removed is left vacant.)

Now note the number of a receiver push button which bears the same call letters as a remote unit button. Remove the lead with this number from the pin on the contact segment. Connect to this pin the lead from the remote cable which corresponds to the above-mentioned remote unit button. Fasten the lead with a hex nut and tighten lightly with a pair of pliers or small wrench. Now re-connect the original lead to the pin. Proceed in the same manner until the seven remote button leads are connected.

Remove the 6L6G tube and place in the 6L6G tube socket the adapter which is connected to leads No. 1 and No. 2. Insert the 6L6G tube in this adapter.

When the "Remote Touch Tuning Control" unit is connected, as explained above, the action is identical with that of the regular station selection circuit. The remote button unit is in series with the "Remote" button lead on the receiver through lead No. 10 of the remote unit cable. The relay field coil circuit is completed through the set "Remote" button (S-7); the common (No. 10) lead; the depressed control button; its lead to a pin on the contact segment, and to ground through the sliding contactor. *The "Silent" button must be in the released position when operating the receiver from either the remote control unit or from the receiver controls otherwise no audio output will be obtained.*

MODELS FE-112, FE-116, FE-119

GENERAL ELECTRIC CO.

ALIGNMENT PROCEDURE

I.F. Alignment with Oscilloscope

Band Switch Setting	Input Frequency	Point of Input	Dummy Ant.	Trimmer	Remarks
1. Band "B	455 kc. Sweep	2nd I.F. Grid	.05 Mfd.	3rd I.F. Sec. (C-30) Pri. (C-29)	Gang condenser plates wide open—connect vertical input of oscilloscope to ground and the junction of R-18 and R-36 and 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	455 kc. Sweep	1st I.F. Grid	.05 Mfd.	2nd I.F. Sec. (C-28) Pri. (C-27)	
3. Band "B	455 kc. Sweep	Converter Grid	.05 Mfd.	1st. I.F. Sec. (C-26) Pri. (C-25)	
4. Band "B	455 kc. Sweep	Antenna Post	250 Mmf. 400 ohms	Wave trap Trimmer C-31	Adjust trimmer for minimum amplitude.

I.F. Alignment with Output Meter

1. Band "B	455 kc. with Modulation	2nd I.F. Grid	.05 Mfd.	3rd. I.F. Sec. (C-30) Pri. (C-29)	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	455 kc. with Modulation	1st I.F Grid	.05 Mfd.	2nd I.F. Sec. (C-28) Pri. (C-27)	
3. Band "B	455 kc. with Modulation	Converter Grid	.05 Mfd.	1st I.F. Sec. (C-26) Pri. (C-27)	
4. Band "B	455 kc. with Modulation	Antenna Post	250 Mmf. 400 ohms	Wave trap Trimmer C-31	Adjust trimmer for minimum output.

R.F. Alignment

1. Band "B					Close gang plates. Adjust pointer to first mark at left end of tuning scale.
2. Band "A	350 kc. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. (C-14) R.F. (C-8) Ant. (C-23)	Connect output meter across voice coil. Set tone control to "Bass" position. Volume control maximum. Adjust trimmers for maximum output with a low input signal.
3. Band "A	145 kc with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. Padder (C-18)	Adjust padder for maximum output in the vicinity of 145 kc. while rocking the gang condenser.
4. Band "A	Repeat operation 2				
5. Band "B	1500 kc. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. (C-13) R.F. (C-7) Ant. (C-22)	Adjust trimmers for maximum output with a low input signal.
6. Band "B	580 kc. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. Padder (C-17)	Adjust padder for maximum output in the vicinity of 580 kc. while rocking the gang condenser.
7. Band "B	Repeat operation 4				
8. Band "D-1"	12 Mc. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. (C-16) R.F. (C-10) Ant. (C-4)	Peak C-10 for maximum output while rocking the gang. Peak C-4 for maximum output. The image of any signal on "D-1" band should be heard 910 kc. below the input signal when osc. trimmer C-16 is set properly. Example: 12 Mc. image is at 11.09 Mc.
9. Band "D-2"	15 Mc. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. (C-19) R.F. (C-11) Ant. (C-5)	Set these padders for maximum output. The image of any signal on "D-2" band should be heard 910 kc. above the input signal. Example: 21 Mc. image is at 21.91 Mc.
10. Band "D-2"	21 Mc. with Modulation	Antenna Post	250 Mmf. 400 ohms	Osc. (C-15) R.F. (C-9) Ant. (C-3)	Peak C-9 for maximum output while rocking the gang condenser peak C-3 for maximum output.
11. Band "D-2"	Repeat operation 8				
12. Band "D-2"	Repeat operation 9				FOR OTHER DATA SEE INDEX

GENERAL ELECTRIC CO.

MODELS LF-115, LF-116, LFC-1118, LFC-1128, LFC-1228

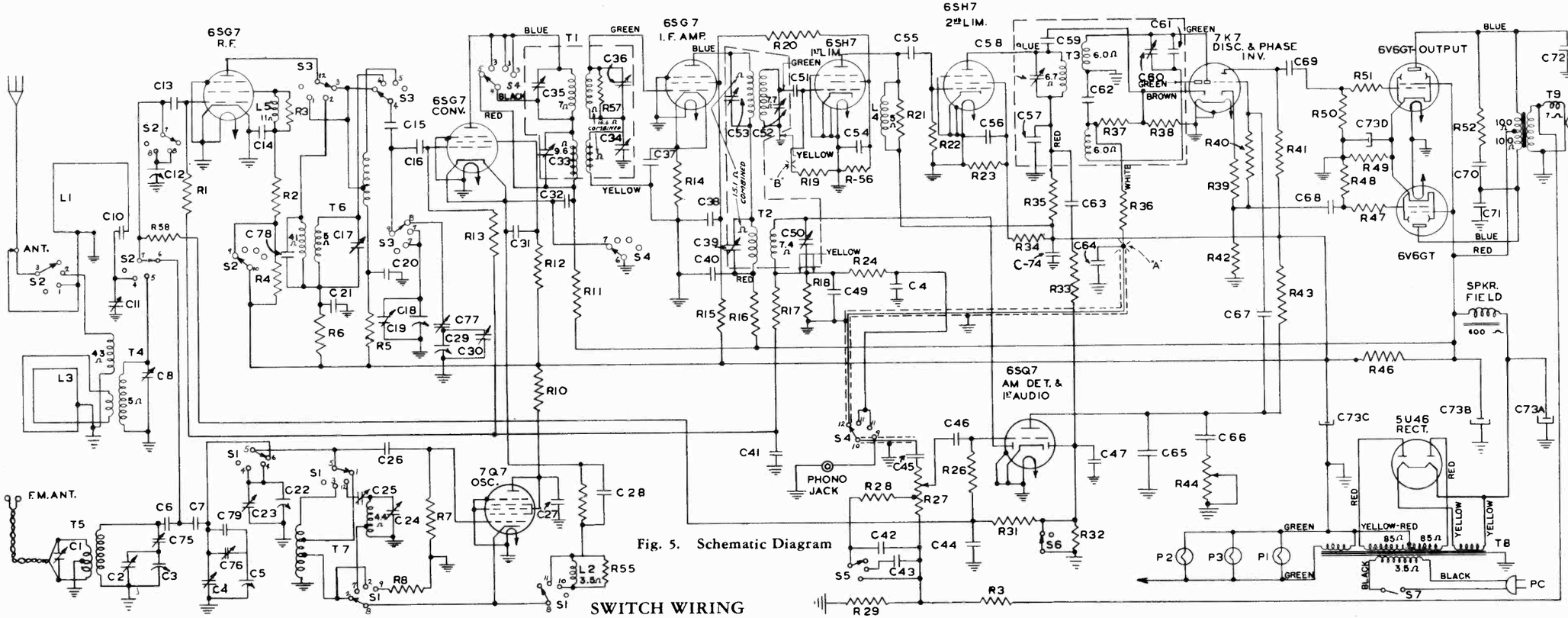


Fig. 5. Schematic Diagram

SWITCH WIRING

The band switch terminals are numbered in the Switch Wiring Diagram, Fig. 6, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 5. Switch section 1 in Fig. 6 is represented as S1, section 2 is represented as S2, etc. on the Schematic Diagram, Fig. 5.

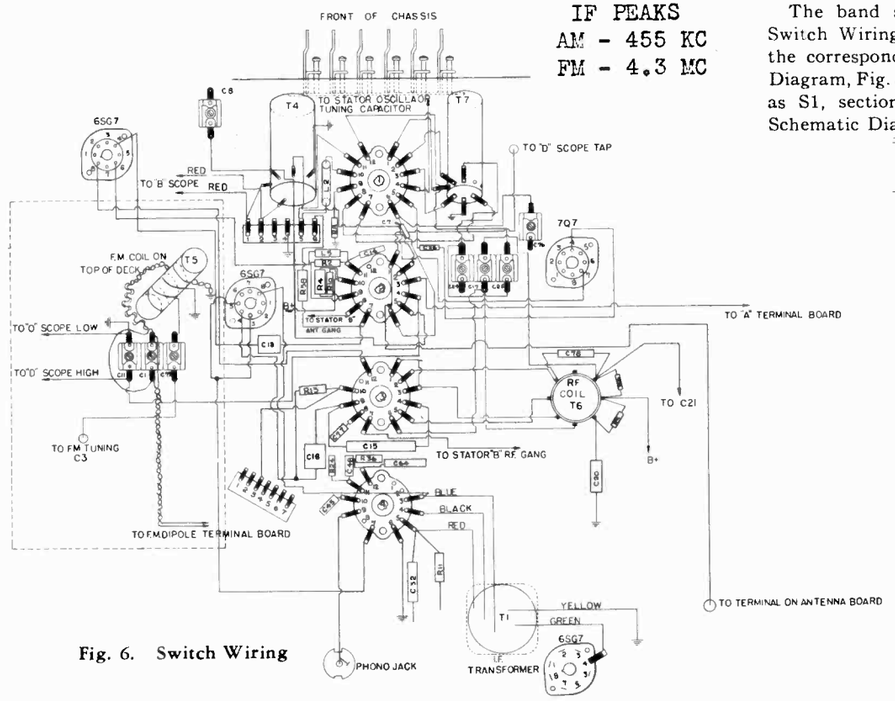


Fig. 6. Switch Wiring

Symbol	Description
C-1	"FM" antenna trimmer
C-2	"FM" RF trimmer
C-3	"FM" Tuning condenser—RF
C-4	"FM" oscillator trimmer
C-5	"FM" tuning condenser—oscillator
C-6	47 mmf., mica capacitor
C-7	10 mmf., compensating capacitor
C-8	"BC" band mmf., RF trimmer
C-10	3000 mmf., mica capacitor
C-11	"SW" band RF trimmer
C-12	"AM" tuning condenser—RF
C-13	220 mmf., mica capacitor
C-14	.02 mfd., paper capacitor
C-15	.05 mfd., paper capacitor
C-16	47 mmf., mica capacitor
C-17	"B" Band trimmer
C-18	"AM" Tuning condenser—converter
C-19	"D" Band trimmer
C-20	3600 mmf., mica capacitor
C-21	.05 mfd., paper capacitor
C-22	"AM" Tuning condenser—oscillator
C-23	"D" band trimmer
C-24	"B" band trimmer
C-25	560 mmf., padder
C-26	65 mmf., compensating capacitor
C-27	.05 mfd., paper capacitor
C-28	.005 mfd., paper capacitor
C-29	"FM" Tuning condenser—converter
C-30	"FM" converter trimmer
C-31, -32	.02 mfd., paper capacitor
C-37, -38	.05 mfd., paper capacitor
C-40	.02 mfd., paper capacitor
C-41	.05 mfd., paper capacitor
C-42	.004 mfd., paper capacitor
C-43, -44, -45	.01 mfd., paper capacitor
C-46	.005 mfd., paper capacitor
C-47, -48, -49	100 mmf., mica capacitor
C-51	33 mmf., mica capacitor
C-54	47 mmf., mica capacitor
C-55	22 mmf., mica capacitor
C-56	.02 mfd., paper capacitor
C-57, -59	47 mmf., mica capacitor
C-61	8 mmf., compensating capacitor
C-62	220 mmf., mica capacitor
C-63	.01 mfd., paper capacitor
C-64	220 mmf., mica capacitor
C-65	100 mmf., mica capacitor
C-66	.01 mfd., paper capacitor
C-67, -68, -69	.05 mfd., paper capacitor
C-70	.005 mfd., paper capacitor
C-71, -72	.002 mfd., paper capacitor
C-73a	30 mfd., dry electrolytic
C-73b	15 mfd., dry electrolytic
C-73c	10 mfd., dry electrolytic
C-73d	20 mfd., dry electrolytic
C-74	.05 mfd., paper capacitor
C-75	"FM" RF padder
C-76	"FM" Oscillator padder
C-77	"FM" Converter padder
C-78	270 mmf., mica capacitor
C-79	65 mmf., compensating capacitor
R-1	1.5 megohm, carbon resistor
R-2	3,900 ohm, carbon resistor
R-3	100,000 ohm, carbon resistor
R-4	33,000 ohm, carbon resistor
R-5, -6	2,200 ohm, carbon resistor
R-7	33,000 ohm, carbon resistor
R-8	330 ohm, carbon resistor
R-9	1,200 ohm, carbon resistor
R-10	10,000 ohm, carbon resistor
R-11	2,200 ohm, carbon resistor
R-12	22,000 ohm, carbon resistor
R-13	1.5 megohm, carbon resistor
R-14	330 ohm, carbon resistor
R-15	15,000 ohm, carbon resistor
R-16	2,200 ohm, carbon resistor
R-17	2.2 megohm, carbon resistor
R-18	150,000 ohm, carbon resistor
R-19	100,000 ohm, carbon resistor
R-20	220,000 ohm, carbon resistor
R-21	8,200 ohm, carbon resistor
R-22	180,000 ohm, carbon resistor
R-23, -24	47,000 ohm, carbon resistor
R-26	6.8 megohm, carbon resistor
R-27	2 megohm, volume control
R-28	68,000 ohm, carbon resistor
R-29	22 ohm, carbon resistor
R-30	470 ohm, carbon resistor
R-31	2.2 megohm, carbon resistor
R-32	1.0 megohm, carbon resistor
R-33	10,000 ohm, carbon resistor
R-34	68,000 ohm, carbon resistor
R-35	22,000 ohm, carbon resistor
R-36	68,000 ohm, carbon resistor
R-37, -38	100,000 ohm, carbon resistor
R-39	3,300 ohm, carbon resistor
R-40	470,000 ohm, carbon resistor
R-41, -42	82,000 ohm, carbon resistor
R-43	220,000 ohm, carbon resistor
R-44	0.5 megohm treble-tone control
R-46	2,500 ohm, wire wound resistor
R-47	1,000 ohm, carbon resistor
R-48	220,000 ohm, carbon resistor
R-49	270 ohm, carbon resistor
R-50	220,000 ohm, carbon resistor
R-51	1,000 ohm, carbon resistor
R-52	8,200 ohm, carbon resistor
R-55	100,000 ohm, carbon resistor
R-56	47,000 ohm, carbon resistor
R-57	220,000 ohm, carbon resistor
R-58	820,000 ohm, carbon resistor
S-1, -2, -3, -4	Band switch
S-5	Bass tone switch
S-6	Squelch switch
S-7	Power switch (combined R-44)
T-1	1st IF transformer
T-2	2nd IF transformer
T-3	Discriminator IF transformer
T-4	"BC" Band antenna transformer
T-5	"FM" band antenna transformer
T-6	"BC," "SW" and "FM" converter transformer
T-7	"BC," "SW" and "FM" oscillator transformer
T-8	Power transformer
T-9	Output transformer
L-1	"SW" Beam-a-Scope
L-2	Cathode choke
L-3	"BC" Beam-a-Scope
L-4	Limiter plate choke
L-5	Screen choke

GENERAL ELECTRIC CO.

MODELS LF-115, LF-116, LFC-1118, LFC1128, LFC-1228

SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS" FOR DATA COVERING THE RECORD CHANGERS INCORPORATED IN THE FOLLOWING G.E. COMBINATIONS:

MODEL LFC-1118 HAS THE RCA RP-162 RECORD CHANGER
MODEL LFC-1128 " " " RP-158 " "
MODEL LFC-1228 " " " RP-160 " "

GENERAL INFORMATION

Models LF-115 and LF-116 are combination AM and FM superheterodyne receivers using eleven tubes. The LF-116 differs from the LF-115 by the use of a special 10-inch speaker and an enclosed and lined tone chamber which provide superior acoustic qualities.

The Model LFC-1118 uses the Model LF-115 AM and FM chassis in conjunction with an automatic record changer.

The Model LFC-1228 is a de luxe phonograph and A-FM receiver using the LF-115 chassis and the 10-inch speaker and padded sound chamber as used in Model LF-116 receiver. The

The Model LFC-1128 is very similar to the Model LFC-1118 phono combination except for the automatic record player.

A detailed description of the FM portion of these receivers is given in the following paragraphs.

Oscillator-converter Circuit

The first 6SG7 tube acts as a conventional RF amplifier when operating in the Short-wave or Broadcast bands. However, in order to obtain optimum gain, the above tube becomes the first converter of a double or cascade converter system when operating in the FM band.

This cascade converter system consists of the two 6SG7 converter tubes and an oscillator tube 7Q7 with their associated circuits. The tuning condensers for the two converters and oscillator are low capacity sections and ganged together as usual. The antenna tuning circuit consisting of T5 and C3 tunes the FM band from 42 to 50 megacycles; the second converter tuned circuit consisting of a portion of T6 and C29 tunes from 23.15 to 27.15 megacycles; while the oscillator tuned circuit consisting of C5 and a portion of T7 tunes from 18.85 to 22.85 megacycles. The oscillator voltage is capacity coupled to the grid of the first converter tube through C-7. This produces, by heterodyne action, a signal to which the plate circuit of this first converter is tuned. The first converter tube also provides a gain of unity for the oscillator frequency. Accordingly, oscillator voltage is also applied to the grid of the second 6SG7 converter tube which produces in its plate circuit the IF frequency of 4.3 megacycles.

To illustrate the action consider an FM signal of 42 MC to which the receiver is tuned. The oscillator frequency for this setting of the tuning control is 18.85 MC and it heterodynes in the 1st converter tube with the 42 MC signal to

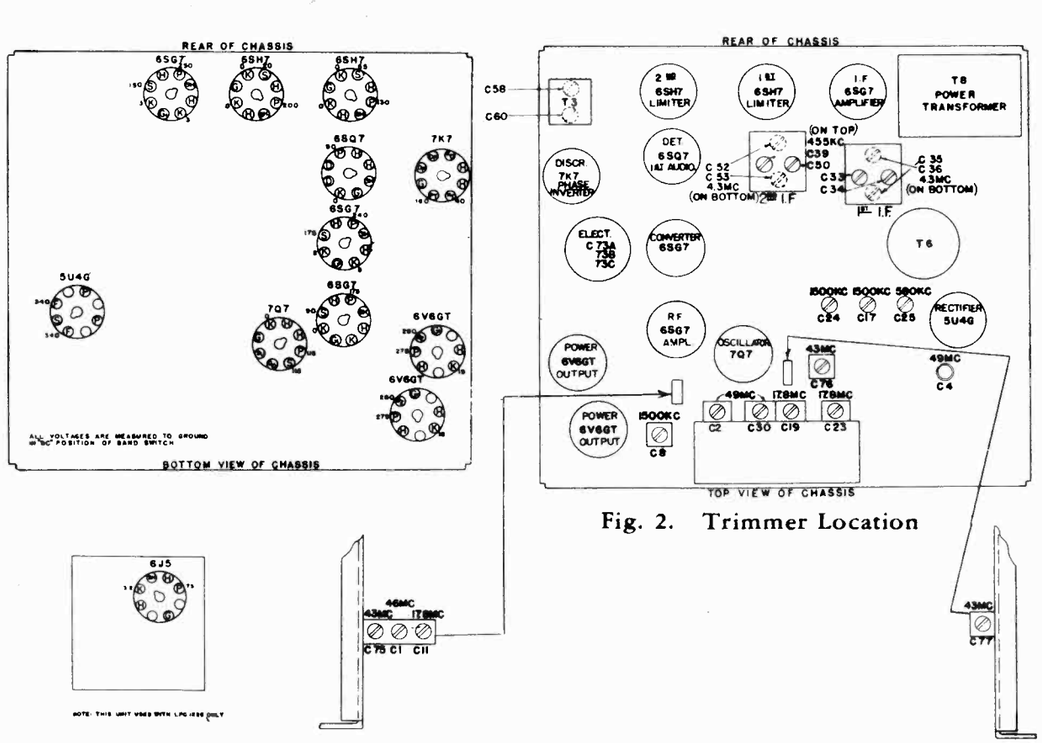


Fig. 2. Trimmer Location

form 23.15 MC (42–18.85). The 23.15 MC signal, in turn, beats with oscillator signal in the 2nd converter to produce the 4.3 MC intermediate frequency.

IF Amplifier

The IF amplifier operates as a dual amplifier in that it will operate either at the 455 KC required for the Broadcast and SW bands or at 4.3 MC required for the FM band, without the need of switching transformers except at the primary of the 1st IF. When the IF is operating at 455 KC, the primary and secondary coils of the 4.3 MC section of T1 and T2 are such a low impedance that they can be considered as shorted across while when operating at 4.3 MC, the primary and secondary trimmers of the 455 KC section of T1 and T2 are such a low impedance that they effectively short out this portion of the transformer. Thus the frequency at which the IF is operating is applied across the proper section of the dual transformers and is amplified by the IF tubes.

Cascade Limiter Circuit

The limiter circuit consists of two resistance coupled 6SH7 tubes in series. Each limiter operates at zero initial bias and low screen voltage. Both grid circuits are designed for self-biasing and the use of capacity-resistance networks provides enough time delay to retain the grid bias between signal peaks. The action of the limiter is such that as soon as a signal is applied to the grid of the tube the grid draws current. This grid current charges up the capacitor across the grid resistor and at the same time establishes a bias through current drain in the resistor. The circuit is so designed that negative signal swings are all beyond plate current cutoff and positive signal peaks are cut off by plate current saturation. The value of the 1st limiter capacity-resistance network is so chosen as to limit noise amplitudes This arrangement leaves the 2nd limiter with the very much simplified task of reducing the remaining noise to the desired level.

FM Station Silencer

This circuit operates on amplitude modulated signals to produce squelch or quieting of the audio amplifier. Since the noise limiter circuits only operate when an FM carrier is present, noise between stations will ride through with undiminished amplitude. This amplitude modulation appears in the last noise limiter plate circuit and develops a voltage across R35. This voltage is rectified by one diode of the 6SQ7 tube and then applied to the 1st audio grid circuit of this tube provided the switch S6 is open. This rectified DC voltage is sufficient to completely bias off this audio tube so that no signal is passed. When a sufficiently strong FM signal is received so that the noise limiters operate with satisfactory signal strength, the noise or amplitude signal is reduced so low that the proper bias is restored to the 6SQ7 audio amplifier and the audio signal is then passed through to the output and phase inverter circuits. This squelch voltage can be manually removed by closing switch S6 so that weak FM stations that have considerable noise present can be received if desired.

FM CHANNEL ALIGNMENT

Due to good stability of components and the wide band characteristics of the IF amplifier circuits, alignment should be unnecessary under normal conditions. However, if alignment is necessary, the procedure is given in table form on page 3 with the location of all trimmers shown in Fig. 2.

IF Alignment

It is preferable to align the IF amplifier by means of a cathode ray oscilloscope and a 4.3 megacycle signal generator with a superimposed 200 KC sweep frequency. Many signal generators and mechanical frequency wobblers are available wherein the above requirements are fulfilled. As for example: G-E Model TMV-97-C Test Oscillator used in conjunction with the G-E Frequency Modulator TMV-128A will give a sufficient sweep of 200 KC when operated in the "Hi" position in conjunction with the 3100–6800 KC band of the Test Oscillator. When the Frequency Modulator is added to the Test Oscillator, the Test Oscillator calibration no longer is accurate, thus making necessary a recalibration. The following procedure may be followed. With a factory aligned receiver where the IF alignment can be assumed to be accurate, connect the above equipment to show the IF selectivity curve as described in Table I. When the two curves are brought together (by tuning Test Oscillator rather than receiver IF trimmers) so that they coincide, take the reading of the signal generator as being the proper point for 4.3 MC with 200 KC sweep alignment. As a further check on the accuracy, another signal generator where the 4.3 MC calibration is accurately known can be coupled to the same point of input as the Test Oscillator and Modulator are coupled and then when the 2nd single frequency generator (4.3 MC) is turned ON, a beat note should be observed at the peak of the resonance curve on the oscilloscope. If this beat note is not at the peak retune the Test Oscillator-Modulator until it does appear at this point.

Where the above equipment is not available, satisfactory alignment can be accomplished by using the equipment and procedure given in Table II. This makes use of an unmodulated RF signal of 4.3 MC and a high resistance (20,000 ohm per volt) voltmeter. The calibration of the signal generator must be accurately known.

A dummy antenna of 50 mmf. or less should be used in series with the signal generator input to the receiver when all IF alignments are made.

RF Alignment

Make all Frequency Modulation RF alignments with the chassis in the cabinet. The alignment procedure is given in Table III on page 3. The image signal should be below 46 MC when the oscillator is properly set.

AM CHANNEL ALIGNMENT

The Amplitude Modulation Channel of the receiver is aligned by following the procedure as outlined in Table IV. All IF alignment may be made with the chassis either installed in or removed from the cabinet. The RF alignment, however, must be made with the chassis and loop antennas securely fastened into their respective places in the cabinet as their relative position in respect to each other affects the alignment. The RF signal should be capacity coupled to the loop antennas by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loops will generally insure freedom from too much coupling.

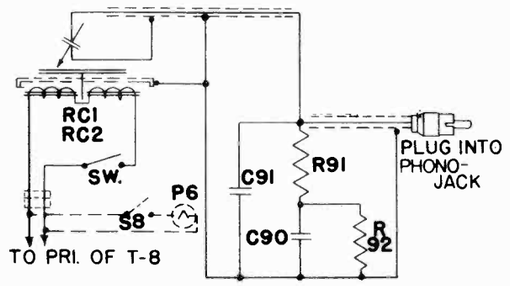


Fig. 9. **Phono Compensation Circuit (Models LFC-1118 and LFC-1128)**

Symbol	Description
C90	.0025 mfd. paper capacitor
C91	180 mmf. mica capacitor
R91	130,000 ohm carbon resistor
R92	430,000 ohm carbon resistor
S8	Compartment lamp switch
P6	Compartment lamp

GENERAL ELECTRIC CO

MODELS LF-115, LF-116, LFC-1218, LFC-1128, LFC-1228

Table I — IF ALIGNMENT WITH OSCILLOSCOPE—"FM" CHANNEL

Step	Input Signal Connected to	Input Frequency	Band and Pointer Setting	Trimmer Adjustment	Comments
1	6SG7 converter grid in series with 22 mmf.	4.3 MC & ±200 KC Sweep	"FM" Band 42 MC	C52 C53	Connect high side of oscilloscope in series with 470,000 ohm resistor to R19 at point "B." Connect low side to chassis ground. Peak trimmers for resultant curve shown in Fig. 3.
2	6SG7 converter grid in series with 22 mmf.	4.3 KC & ±200 KC Sweep	"FM" Band 42 MC	C35 C36	
3	Repeat Step 1				
4	Repeat Step 2				
5	6SG7 converter grid in series with 22 mmf.	4.3 MC & ±200 KC Sweep	"FM" Band 42 MC	C60 C58	Connect high side of oscilloscope in series with 470,000 ohm resistor to R36, point "A." Connect low side to chassis ground. Peak trimmers for resultant curve shown in Fig. 4. C60 is aligned when curve crosses midway in vertical plane. Proper alignment of C58 gives straightest sides to curve near crossover point.

Table II — IF ALIGNMENT WITH METER—"FM" CHANNEL

Step	Input Signal Connected to	Input Frequency	Band and Pointer Setting	Trimmer Adjustment	Comments
1	6SG7 converter grid in series with 22 mmf.	Unmodulated 4.3 MC signal	"FM" Band 42 MC	C52 C53 C35 C36	Connect the 10-volt scale of a 20,000 ohm per volt voltmeter in series with a 470,000 ohm resistor between point "B" and ground. Peak all trimmers for maximum output using just enough input signal to give a satisfactory output reading.
2	Repeat Step 1				
3	6SG7 converter grid in series with 22 mmf.	Unmodulated 4.3 MC signal	"FM" Band 42 MC	C60 C58	Connect the 10-volt scale of a 20,000 ohm per volt voltmeter in series with a 470,000-ohm resistor between points "A" and ground. *With C60 purposely detuned,* peak C58 for maximum meter reading. Align C60 for the 0 voltage point where the meter reading changes from a positive to negative value. Use as low a signal input as necessary to give a satisfactory meter reading.

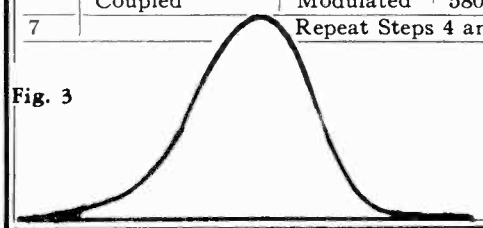
Table III — RF ALIGNMENT—"FM" CHANNEL

Step	Input Signal Connected to	Input Frequency	Band and Pointer Setting	Trimmer Adjustment	Comments
1	Direct to "FM" Antenna Post	Unmodulated 49 MC signal	"FM" Band 49 MC	C4 (Osc.)	Connect the 10-volt range of a 20,000 ohm per volt voltmeter in series with a 470,000-ohm resistor to point "B." The other side of the voltmeter lead connects to chassis ground. Peak trimmers for maximum meter reading using just enough signal input to give satisfactory meter reading.
2	Direct to "FM" Antenna Post	Unmodulated 49 MC Signal	"FM" Band 49 MC	C2 C30	
3	Direct to "FM" Antenna Post	Unmodulated 43 MC Signal	"FM" Band 43 MC	C76 (Osc.)	
4	Direct to "FM" Antenna Post	Unmodulated 43 MC Signal	"FM" Band 43 MC	C75 C77	
5	Direct to "FM" Antenna Post	Unmodulated 46 MC Signal	"FM" Band 46 MC	C1	
6	Repeat Step 1				
7	Repeat Step 2				

Table IV — IF, "BC," and "SW" ALIGNMENT—"AM" CHANNEL

Step	Input Signal Connected to	Input Frequency	Band and Pointer Setting	Trimmer Adjustment	Comments
1	6SG7 converter grid in series with .05 mfd.	455 KC Modulated	"BC" Band 550 KC	C50 C39 C34 C33	Connect 5.0-volt AC voltmeter across the voice coil of the speaker. Peak all trimmers for maximum output. All RF alignments must be made with the chassis in the cabinet.
2	Capacity Coupled	17.8 MC Modulated	"SW" Band 17.8 MC	C23*	*When aligning the SW oscillator trimmer, use maximum capacity peak. The image frequency should appear at 18,710 KC.
3	Capacity Coupled	17.8 MC Modulated	"SW" Band 17.8 MC	C19** C11	**Rock gang condenser when making alignment.
4	Capacity Coupled	1500 KC Modulated	"BC" Band 1500 KC	C24	
5	Capacity Coupled	1500 KC Modulated	"BC" Band 1500 KC	C17 C8	
6	Capacity Coupled	580 KC Modulated	"BC" Band 580 KC	C25**	
7	Repeat Steps 4 and 5				

Fig. 3



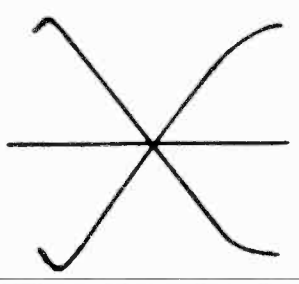


Fig. 4

MODELS LF-115, LF-116, LFC-1118, LFC-1128, LFC-1228

Tuning Frequency Range

"BC" Band	550–1700 KC
"SW" Band	5.8–18.0 MC
"FM" Band	42–50 MC

Intermediate Frequency

FM Channel	4.3 MC
AM Channel	455 KC

Electrical Power Output

Undistorted	10 watts
Maximum	12 watts

Loud-speaker—Electrodynamic

Over-all Dimensions (inches)

Model	LF-115	LF-116	LFC-1118	LFC-1128	LFC-1228
Height	40¼	41	37	35½	36½
Width	31	31	32½	35	35⅝
Depth	15¼	15½	16⅞	16⅝	16½

SERVICE HINTS

Replacement of Components

When servicing the FM portion of this receiver and especially when replacing parts, care should be exercised to return all components including wiring to the original position occupied in the chassis. The positioning of parts and wiring is very critical. When replacing coils or IF transformers, maintain the lead lengths provided and use the same terminals to which the original coil or transformer was connected.

Pointer Focusing

The focusing of the pointer on the dial scale is accomplished by increasing or decreasing the pointer distance from the dial scale. This is a rather critical adjustment and can be varied enough by loosening the mounting bolts and moving the chassis either back or forward in the cabinet until properly focused and then tightening mounting bolts.

Rotor Balance Spring

On the right-hand side of the tuning condenser assembly is a wire bracket from which a spring is suspended that connects to the drive drum of the tuning condenser. The proper adjustment of this spring counterbalances the weight of the condenser drive assembly and prevents backlash. For chassis mounted horizontally, as in Models LFC-1118, LFC-1128 and LFC-1228, the spring must be in the rear notch of wire bracket. For the Model LF-115 which has a 20° slope mounting, the spring is fastened in the center notch of the bracket while on LF-116 mounting (30° slope) the spring is in the bracket notch nearest front of chassis.

Loudspeaker - Electrodynamic

Model	LF-115	LF-116
Cone Diameter	12-inch	10-inch
Voice Coil Impedance (400 cycles)	7.8	8.4 ohms
Field Resistance	600 ohms	600 ohms

Model	LFC-1118, LFC-1128	LFC-1228
Cone Diameter	12-inch	10-inch
Voice Coil Impedance (400 cycles)	7.8	8.4 ohms
Field Resistance	600 ohms	600 ohms

Electrical Rating

Rating	Power Supply (Volts)	Frequency (Cycles per Second)	Power Consumption (Watts)
	(Models LF-115, LF-116)		
A	105–125	50–60	115
C	105–125	25	120
	(Models LFC-1118, LFC-1128, LFC-1228)		
	105–125	60	130

Drive Control Stringing

When replacing a drive cord, the stringing is accomplished as shown in Fig. 7. Before soldering the cord to the two drums as shown, eheck the pointer location as being at the last mark on the left-hand end of the scale when the gang condenser plates are completely closed; then solder.

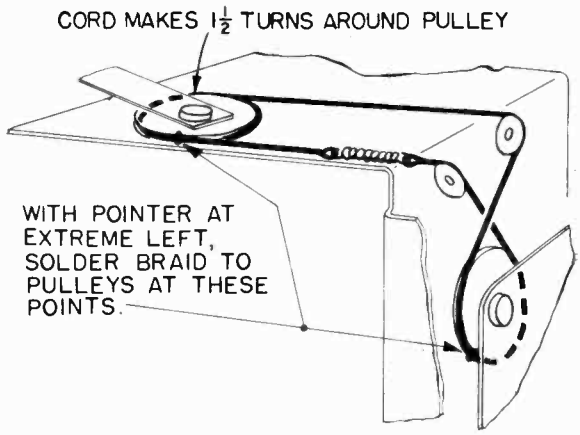


Fig. 7. Drive Cord Stringing

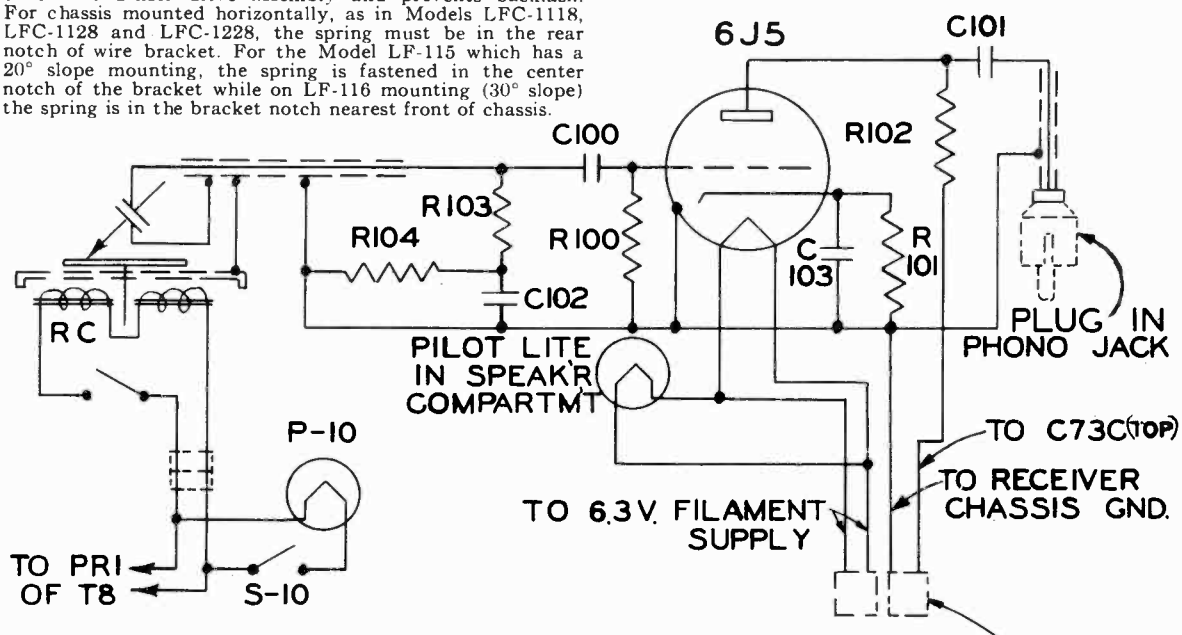
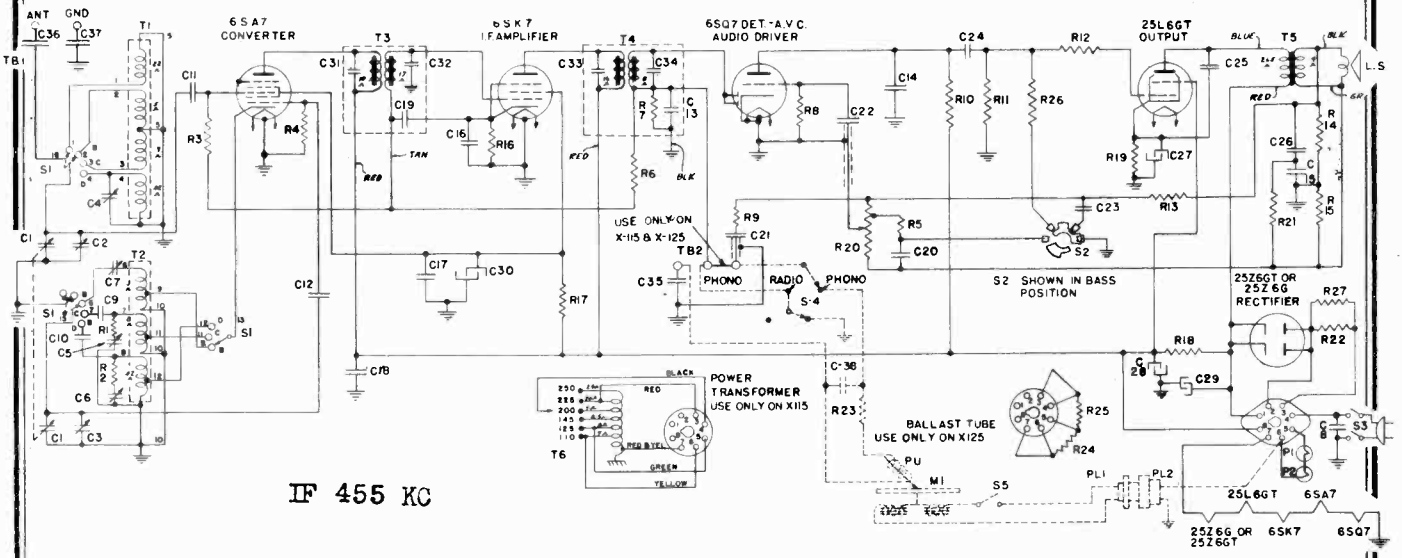


Fig. 8. Phono Pre-amplifier (Model LFC-1228 only)

Symbol	Description	Symbol	Description
C100, 101	.005 mfd., paper capacitor	R102	220,000 ohm carbon resistor
C102	.01 mfd., paper capacitor	R103	33,000 ohm carbon resistor
C103	14 mfd. electrolytic cap.	R104	220,000 ohm carbon resistor
R100	1.0 megohm carbon resistor	S10	Compartment lamp switch
R101	8,200 ohm carbon resistor	P10	Compartment lamp

MODELS X-115, X-125, X-145

GENERAL ELECTRIC CO.



NOTE—PARTS AND WIRING SHOWN DOTTED FOR MODEL X-145 ONLY

Symbol	Description	Symbol	Description	Symbol	Description
C1, 2, 3	Tuning condenser and trimmers	C29	40 mfd 300 V dry electrolytic	R18	3,300 ohm carbon resistor
C4	3–30 mmf "SW2" ant. trimmer	C30	20 mfd. 250 V dry electrolytic	R19	220 ohm carbon resistor
C5	3–30 mmf "SW1" osc. trimmer	C35	.25 mfd paper capacitor	R20, S3	2.0 megohm volume control
C6	3–30 mmf "SW2" osc. trimmer	C36, 37, 38	.01 mfd paper capacitor	R21	220 ohm carbon resistor
C7	435–535 mmf "BC" padder	R1	330 ohm carbon resistor	R22	330 ohm carbon resistor
C8	.02 mfd paper capacitor	R2	39 ohm carbon resistor	R23	15,000 ohm carbon resistor
C9	1800 mmf mica capacitor	R3	680,000 ohm carbon resistor	R24, 25	Ballast resistor RR-783
C10	5600 mmf mica capacitor	R4	22,000 ohm carbon resistor	R26	390,000 ohm carbon resistor
C11	470 mmf mica capacitor	R5	180,000 ohm carbon resistor	R27	330 ohm carbon resistor
C12	47 mmf mica capacitor	R6	2.2 megohm carbon resistor	T1	Antenna transformer
C13	100 mmf mica capacitor	R7	330,000 ohm carbon resistor	T2	Oscillator transformer
C14	220 mmf mica capacitor	R8	4.7 megohm carbon resistor	T3	1st IF transformer
C15–C19	.05 mfd paper capacitor	R9	47,000 ohm carbon resistor	T4	2nd IF transformer
C20, 21	.002 mfd paper capacitor	R10	330,000 ohm carbon resistor	T5	Output transformer
C22	.02 mfd paper capacitor	R11	470,000 ohm carbon resistor	T6	Power transformer
C23	.0015 mfd paper capacitor	R12	1,000 ohm carbon resistor	S1	Band switch
C24	.05 mfd paper capacitor	R13	5.6 megohm carbon resistor	S2	Tone control switch
C25	.008 mfd paper capacitor	R14	1,500 ohm carbon resistor	S3	Power switch on R20
C26	.1 mfd paper capacitor	R15	270 ohm carbon resistor	S4	Phono-Radio switch
C27	20 mfd 25 V. dry electrolytic	R16	330 ohm carbon resistor	S5	Automatic stop switch
C28	50 mfd. 250 V. dry electrolytic	R17	3,900 ohm carbon resistor		

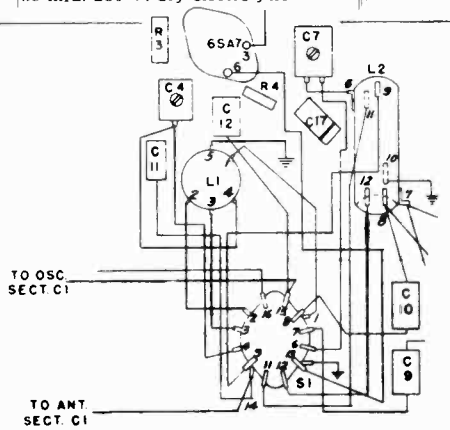


Fig. 5. Switch Wiring

MAGNETIC PICKUP (MODEL X-145)

To Replace Pickup Coil

Service operations which may be necessary on the pickup unit can be carried out by carefully observing the following disassembly procedure:

1. The cover is removed from the pickup head by removing the wax from the hole immediately to the rear of the needle holder. This will expose the slotted end of the cover screw which can be backed out with a small screwdriver. *Extreme care should be exercised so as not to burr or break the slot.*

2. Remove the magnet by placing an iron bar (keeper) of approximately the same cross-section area, above the armature block assembly so that the magnet can be slid upon the keeper without breaking the magnetic circuit. The magnet is held in place by a spring at the elbow of the magnet. If the magnetic circuit is broken the magnetism may be permanently impaired.

3. The rubber damping blocks are held in a frame which fastens to the two armature blocks by means of setscrews. Remove the screws, rubber blocks and holder.

4. Unsolder the two leads from the pickup coil which fasten to the terminal board at the top of the magnet.

5. Remove the armature blocks from the back plate of the pickup by removing the two large head screws which hold them in place. The coil, armature and blocks can now be removed and a new coil substituted. Before removing this assembly, it is advisable to measure the distance across the face of the assembled armature and blocks and when you replace this assembly the same dimension should be maintained.

To assemble the unit, the reverse procedure should be followed. To maintain the correct assembled dimension of the coil, armature, and blocks; loosely fasten the assembly to the back plate by the screws, then clamp the assembly in a vise to the desired dimension, and tighten screws. Next assemble the rubber damping block and frame to the armature blocks. When tightening the assembly the armature vane is centered between the armature block pole pieces by the damping block; then tighten the two screws. The coil leads are soldered to the terminal strip being careful not to break or burn off the leads with too hot an iron. Replace the magnet (without breaking magnetic circuit), cover, and cover screw. Seal the cover screw with a bit of wax.

PHONOGRAPH OR TELEVISION SOUND CONNECTION

Fig. 1 shows a simple method for connecting a crystal or high impedance magnetic pick-up into the receiver circuit of the Models X-115 and X-125. The phono switch is a double-pole, double-throw type with a phono motor power switch attached such as General Electric Stock No. RS-366. This should be mounted in close proximity to the rear chassis terminal board. It is important that the pick-up leads be shielded with copper braid to prevent hum interference. Connect the shield braid to the chassis ground.

When making the connections in Fig. 1, remove the jumper between terminals 1 and 2.

A television sound channel or FM converter may be connected in place of the pick-up.

When the connections are made as shown the regular radio volume and tone controls control the external unit the same as when operating the radio.

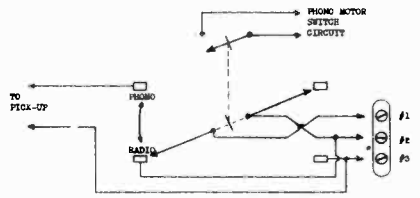


Fig. 1. Pick-up Connections

SPECIAL SERVICE INFORMATION

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage gains.
- (a) Antenna Post to Converter Grid at
  - 1000 KC 4.0
  - 4000 KC 3.2
  - 18,000 KC 2.4
- (b) R.F. on Converter Grid to I.F. on 6SK7 Grid at
  - 1000 KC 36
  - 4000 KC 30
  - 18,000 KC 28
- (c) I.F. on Converter Grid to I.F. on 6SK7 Grid at 455 KC 55

(2) Voltage across the diode load to give ½-watt speaker output at 400 cycles ..... .07 volts.

(3) DC voltage developed across oscillator grid resistor (R4) at
- 1000 KC 8.6
- 4000 KC 9.7
- 18,000 KC 7.7

Variations of +10, −20% are permissible.

ALIGNMENT PROCEDURE

The alignment procedure, shown in table form, is made with the chassis removed from the cabinet.

Since the dial scale and pointer are not a part of the main chassis, it is necessary to use the special alignment scale glued to the back side of the pulley frame adjacent to the pointer cord and make a temporary pointer. To make the pointer, close the gang condenser plates, then with paper clip or drop of paint mark point on cord which is in line with last thin line on right side of scale (viewed from rear of chassis). The selected edge of the paper clip or the drop of paint then will serve as a pointer for performing the R.F. alignment.

Output meter alignment is preferable and the meter may be connected across the voice coil leads, then turn volume control partially up. Keep the signal input as low as possible to avoid AVC action.

I.F. transformers are double, permeability-tuned with adjusting shafts at top and bottom of shield cans.

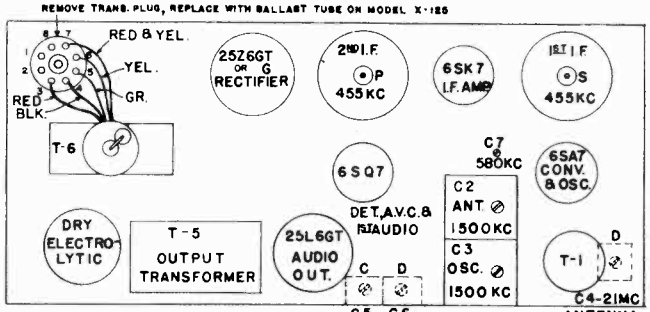


Fig. 2. Trimmer Location

ALIGNMENT CHART

Step	Test-Osc. Connect to	Test-Osc. Setting	Pointer Setting	Tune Trimmer for Max. Output
1	6SK7 IF grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	2nd IF trans. inductors
2	6SA7 Conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	1st IF trans. inductors
3	Ant. post in series with 200 mmf and 400 ohms	580 KC	"BC" Band 580 KC	C7**
4	Ant. post in series with 200 mmf and 400 ohms	1500 KC	"BC" Band 1500 KC	(C3) osc. (C2) ant.
5	REPEAT STEP NO. 3			
6	Ant. post in series with 200 mmf and 400 ohms	6.0 MC	"SW1" Band 6.0 MC	(C5) osc. **
7	Ant. post in series with 200 mmf and 400 ohms	21.0 MC	"SW2" Band 21 MC	(C6) osc.* (C4) ant.**

* Use minimum capacity peak.
** Rock gang condenser for optimum peak.

PHONO MOTOR FREQUENCY CONVERSION (MODEL X-145)

The Model X-145 can be operated from either a 50- or 60-cycle source of power by a slight alteration in the phono motor.

The phono motor leaves the factory for operation on 50 cycles. To convert to 60-cycle operation, it is merely necessary to remove the conversion spring from the rotor drive pulley, shown in Fig. 3. This can be easily accomplished by grasping the end of the spring with a pair of pointed pliers and pulling, using an unwinding motion to aid in loosening.

If at any time the motor is desired to be reconverted for 50-cycle operation, a new conversion spring, Stock No. RS-4037, may be put on the motor drive pulley by hand in the following manner. Hold the conversion spring in the right hand with the extension on the top side, then hook spring over the edge of drive pulley pressing down over same with a twisting effort in the direction to unwind or enlarge the inside diameter of the spring. The rotor should be held stationary during this procedure with fingers of left hand. After completely seating the spring over the pulley, the extension which is provided to facilitate assembly should be sprung out away from pulley sufficiently so that it may be clipped off, allowing no protrusion to remain.

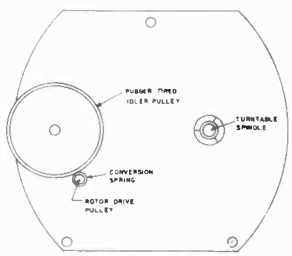


Fig. 3

GENERAL ELECTRIC CO.

MODELS X-115, X-125
X-145
MODEL X-127

MODEL X-127
BAND SWITCH CONNECTIONS

Band in Use	Section "A" Front Side	Section "A" Back Side	Section "B" Front Side	Section "B" Back Side
BC	4–8–9	5–9–10	5–9–10	1–10 6–8
SW1	4–8–10	5–9–11	5–9–11	1–2–10 7–8
SW2	4–8–11	5–9–12	5–9–12	1–2–3 8–10
31 METER	8–11	9–12–1	9–12–1	1–2–3–4 8–10
25 METER	8–11	9–12–2	9–12–2	1–2–3–4–5 8–10
19 METER	8–11	9–12–3	9–12–3	2–3–4–5–6 8–10
16 and 13 METER	8–11	9–12	9–12	3–4–5–6–7 8–10

MODEL X-127
TONE CONTROL SWITCH CONNECTIONS

Position in Use	Section "C" Back Side	Section "C" Front Side
Radio-Brilliant	Open	3–7
Radio-Bass	1–12	3–7
Radio-Treble	4–6	3–7
Radio-Mellow	1–12 4–6	3–7
Phono-Brilliant	Open	7–11 2–3
Phono-Bass	1–12	7–11 2–3
Phono-Treble	4–6	7–11 2–3
Phono-Mellow	1–12 4–6	7–11 3–4

CONVERSION FOR SPECIAL LINE VOLTAGES

MODELS X-115, X-125
X-145

The Models X-115 and X-125 can be converted for operation on the following line voltages. In all cases where the power transformer is replaced with a ballast resistor, the power transformer must be removed from the chassis as the radiant heat from the ballast resistor is likely to injure the transformer insulation. When operated with these special resistors and lower power supplies than 220 volts the audio power output and socket voltages will be reduced.

220 Volts AC/DC—(Range 200-240 volts)

Remove transformer from chassis of X-115 and substitute ballast resistor RR-783 in socket previously occupied by transformer plug. Change label so that it reads Model X-125.

115 Volts DC—(range 105-129 volts)

Remove transformer from chassis of X-115 or ballast RR-783 from X-125; insert the ballast tube resistor RR-785 and change label so that it reads Model X-125Z.

180 Volts DC (range 145-215 volts)

Remove transformer from chassis of X-115 or ballast RR-783 from X-125; insert the ballast tube resistor RR-784 and change the label on the receiver so that it reads Model X-125Y.

Loud-speaker

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. In case a voice coil needs recentering, it will be necessary to replace the entire cone and voice coil assembly. Assembly instructions accompany each replacement cone.

NOTE: In no case should the magnet be removed from the assembly position as it will lose magnetism.

Electrical Rating

Model	Rating	Power Supply: Voltage Tap	Power Supply: Voltage Range	Frequency Cycles AC	Power Consumption (Watts)
X-115	V	110 125	103–117 118–133	50–60	65
X-145		145 200 225 250	134–156 188–212 213–237 238–262		80
X-125			200–240 AC or DC	25–100	100

MODELS X-115, X-125, X-145

Tuning Frequency Range

Band "BC" ..... 540–1600 KC
Band "SW1" ..... 2200–7000 KC
Band "SW2" ..... 7000–22000 KC

Electrical Power Output

Undistorted ..... 2.7 watts
Maximum ..... 5.0 watts

Loud-speaker—PM Dynamic

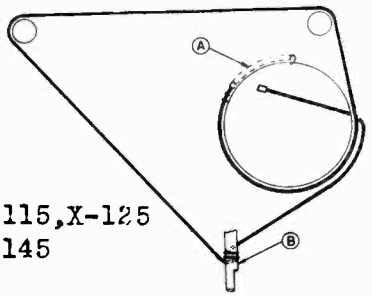
Cone Diameter ..... 6½ inches
Voice Coil Impedance (400 cycles) ..... 3.5 ohms

Phonograph Mechanism

Type Mechanism ..... Manual
Type Pick-up ..... Magnetic
Turntable Speed ..... 78 RPM

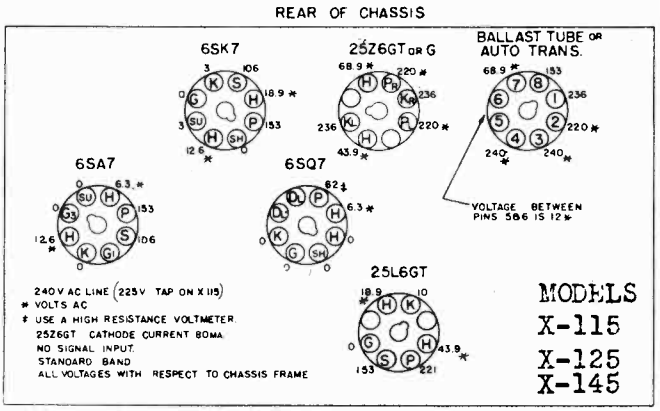
Tubes

Converter-Oscillator GE-6SA7
IF Amplifier GE-6SK7
Detector, Audio, AVC GE-6SQ7
Power Output GE-25L6GT
Rectifier ..... GE-25Z6G or GT
Dial Lamp ..... (2) MAZDA No. 44



MODELS X-115, X-125
X-145

Fig. 7. Drive Arrangement



MODEL X-127

GENERAL ELECTRIC CO.

REPLACEMENT PARTS LIST

Our Cat. No.	Symbol	Description	List Price
*RC-039	C-1	CAPACITOR—.01 mfd., 600-V paper	$0.25
*RC-009	C-2	CAPACITOR—.001 mfd. 600-V paper	.30
*RC-6554	C-3, 4	CAPACITOR—"B" and "C" antenna trimmer	.35
*RC-092	C-5	CAPACITOR—.05 mfd. 600-V	.30
*RT-883	C-6, 7, 8, 9	TRIMMER—Antenna trimmer strip	.70
*RT-884	C-10, 11, 12, 14, 15, 16, 17	TRIMMER STRIP—Oscillator trimmer strip	1.25
*RC-396	C-18	CAPACITOR—5600 mmf., mica	.45
*RC-347	C-19	CAPACITOR—1800 mmf., mica	.35
*RC-325	C-20, 21	CAPACITOR—45 mmf., compensating cap.	.40
*RC-7062	C-22a, 22b	CONDENSER—2 gang tuning condenser	1.10
*RC-326	C-23	CAPACITOR—40 mmf., compensating cap.	.25
*RC-252	C-28	CAPACITOR—200 mmf., mica	.30
*RC-072	C-29	CAPACITOR—.05 mfd., 200-V paper	.25
	C-30a	CAPACITOR—40 mfd., 300-V dry electrolytic	
	C-30b	CAPACITOR—50 mfd., 250-V dry electrolytic	
*RC-5132	C-30c	CAPACITOR—20 mfd., 250-V dry electrolytic	2.10
	C-30d	CAPACITOR—20 mfd., 25-V dry electrolytic	
*RC-039	C-32	CAPACITOR—.01 mfd., 600-V paper	.25
*RC-048	C-33	CAPACITOR—.02 mfd., 600 V paper	.30
*RC-092	C-34	CAPACITOR—.05 mfd., 600 V paper	.30
*RC-249	C-35	CAPACITOR—220 mmf., mica	.25
*RC-049	C-36	CAPACITOR—.004 mfd., 600-V paper	.35
*RC-023	C-37	CAPACITOR—.005 mfd., 600-V paper	.25
*RC-060	C-38	CAPACITOR—.03 mfd., 600-V paper	.25
*RC-092	C-39	CAPACITOR—.05 mfd., 600-V paper	.30
*RC-072	C-40	CAPACITOR—.05 mfd., 200-V paper	.25
*RC-060	C-41	CAPACITOR—.03 mfd., 600-V paper	.25
*RC-055	C-42	CAPACITOR—.003 mfd. 600-V paper	.25
*RC-104	C-43	CAPACITOR—.1 mfd. 600-V paper	.30
*RC-092	C-44	CAPACITOR—.05 mfd. 600-V paper	.30
*RC-263	C-45	CAPACITOR—270 mmf. mica	.25
RC-124	C-46	CAPACITOR—.0055 mfd. 1500 V paper	.25
*RC-156A	C-47 48	CAPACITOR—0.5 mfd. 120 V paper	.45
*RC-095	C-49	CAPACITOR—.05 mfd. 200 V paper	.20
*RC-293	C-50	CAPACITOR—470 mmf., mica	.30

Our Cat. No.	Symbol	Description	List Price
*RQ-1295	R-1	RESISTOR—33,000 ohm ½ watt carbon	$0.70–5
*RQ-1235	R-2	RESISTOR—100 ohm ½ watt carbon	.70–5
*RQ-1321	R-3	RESISTOR—390,000 ohm ½ watt carbon	.70–5
*RQ-1219	R-4	RESISTOR—22 ohm ½ watt carbon	.70–5
*RQ-1339	R-5	RESISTOR—2.2 megohm ½ watt carbon	.70–5
*RQ-1323	R-6	RESISTOR—470,000 ohm ½ watt carbon	.70–5
*RQ-1299	R-7	RESISTOR—47,000 ohm ½ watt carbon	.70–5
*RQ-1305	R-8	RESISTOR—82,000 ohm ½ watt carbon	.70–5
*RQ-1355	R-9	RESISTOR—10 megohm ½ watt carbon	.70–5
*RQ-1323	R-10	RESISTOR—470,000 ohm ½ watt carbon	.70–5
*RQ-1275	R-11	RESISTOR—4,700 ohm ½ watt carbon	.70–5
*RV-136	R-12	VOLUME CONTROL—2 meg. volume control	.95
*RQ-1331	R-13	RESISTOR—1 megohm ½ watt carbon	.70–5
*RQ-1347	R-14	RESISTOR—4.7 meg. ½ watt carbon	.70–5
*RQ-1257	R-15	RESISTOR—820 ohm ½ watt carbon	.70–5
*RQ-1323	R-16	RESISTOR—470,000 ohm ½ watt carbon	.70–5
*RQ-1483	R-17	RESISTOR—10,000 ohm, 1 watt carbon	.20
*RQ-1235	R-18	RESISTOR—100 ohm ½ watt carbon	.70–5
*RQ-1259	R-19	RESISTOR—1000 ohm ½ watt carbon	.70–5
*RQ-1317	R-20	RESISTOR—270,000 ohm ½ watt carbon	.70–5
*RQ-1293	R-21	RESISTOR—27,000 ohm ½ watt carbon	.70–5
*RQ-1323	R-22	RESISTOR—470,000 ohm ½ watt carbon	.70–5
*RQ-1259	R-23	RESISTOR—1000 ohm ½ watt carbon	.70–5
*RQ-1251	R-24	RESISTOR—470 ohm ½ watt carbon	.70–5
*RQ-1347	R-26	RESISTOR—4.7 meg. ½ watt carbon	.70–5
*RQ-1325	R-27	RESISTOR—560,000 ohm ½ watt carbon	.70–5
*RQ-1261	R-28	RESISTOR—1,200 ohm ½ watt carbon	.70–5
*RQ-1295	R-29	RESISTOR—33,000 ohm ½ watt carbon	.70–5
*RQ-1211	R-30	RESISTOR—10 ohm ½ watt carbon	.70–5
*RL-1016	L-1	ANTENNA COIL—Antenna coil	1.10
*RL-2064	L-2	COIL—Oscillator coil	1.10
*RL-371	L-3	COIL—I.F. Neutralizing coil	.25
RL-376	L-4	CHOKE—RF Choke	.50
RL-377	L-5	CHOKE—B+ and RF Choke	.25
*RS-3127	S-1	SWITCH—Band change switch	1.25
*RS-3128	S-2a, 2b	SWITCH—Tone control and power switch	1.45
RS-3145	S-3	SWITCH—Current saver switch	.45
RS-1082	SPKR	SPEAKER—9" oval speaker	4.20
*RT-3007	T-1	TRANSFORMER—First IF transformer	1.15
*RT-3008	T-2	TRANSFORMER—Second IF transformer	1.15
RT-4021	T-3	TRANSFORMER—Output transformer	1.55
RT-0822	T-4	TRANSFORMER—Power transformer	3.45
RV-205	V	VIBRATOR—6-volt vibrator, power supply	3.80

* Used on previous receivers.

Prices subject to change without notice

ALIGNMENT PROCEDURE

There are two 17.8 reference points on the paper scale on the rear of the dial reflector plate. The one towards the lower frequency end of the dial is the proper one to use for the 16-meter spread-band alignment; while the other is used for a reference point on the SW2 band.

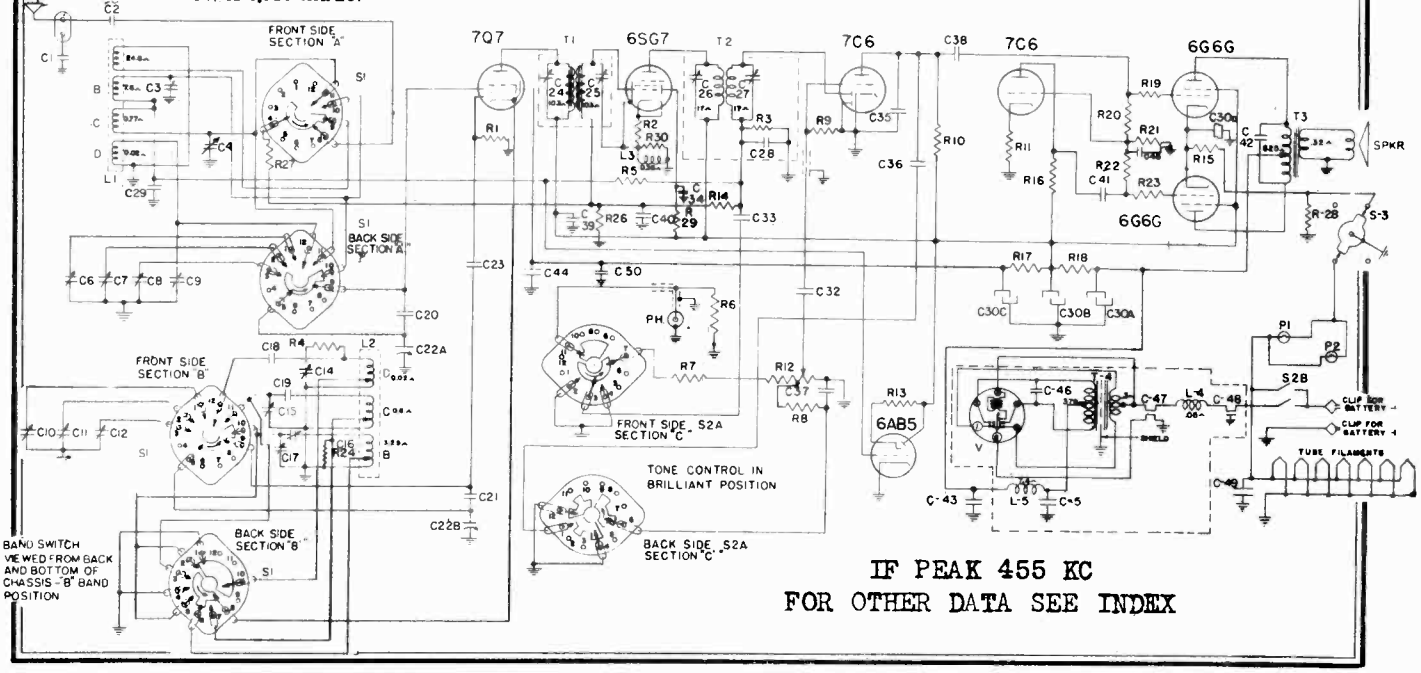
The SW2 band does not require alignment. This band is taken care of when the 16-meter spread band is aligned.

Spread-band Alignment

Since accuracy in frequency calibration is very essential for proper alignment of the spread bands, it is impractical to use the standard test oscillator for this purpose unless a special calibration is first made.

The actual reception of short-wave stations of known frequency in the band to be checked is probably the most satisfactory method for determining the proper setting of the oscillator trimmers in these bands. The oscillator trimmer should be adjusted so that the station appears at the correct position on the dial. RF alignment can be made with the test oscillator.

The calibration of the test oscillator may be checked by zero beating the test oscillator with a short-wave station of known frequency. By taking several of these calibration points, it will afford a calibration of a high degree of accuracy in case you wish to use the test oscillator for alignment in these bands.



IF PEAK 455 KC

FOR OTHER DATA SEE INDEX

GENERAL ELECTRIC CO.

SPECIAL SERVICE INFORMATION

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

NOTE—Connection to converter grid must be made directly to tube grid and not to gang condenser on spread bands.

(1) Stage gains

(a) Antenna Post to Converter Grid, through 400 ohms and 200 mmfd. in series, at

Stand.	1000 KC...5.4	31 M.....9.6 MC....1.8
SW-1	4000 KC...3.7	25 M....11.8 MC....1.6
SW-2	18000 KC...1.1	19 M....15.22 MC...1.4
		16-13 M....17.8 MC....1.0

(b) RF on Converter Grid to IF on 6SG7 grid at

Stand.	1000 KC...61	31 M.....9.6 MC....65
SW-1	4000 KC...63	25 M....11.8 MC....68
SW-2	18000 KC...71	19 M....15.22 MC...71
		16-13 M....17.8 MC....71

(c) IF on Converter Grid to IF on 6SG7 grid at 455 KC—85

(d) IF Grid to diode plate at 455 KC—160

(2) Voltage across the diode load to give ½-watt speaker output at 400 cycles—.08 V.

(3) DC voltage developed across oscillator grid resistor (R1) at

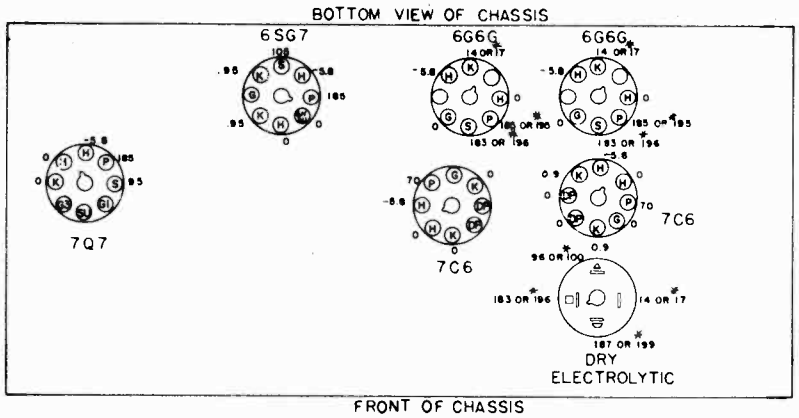
Stand.	1000 KC. 8.3 V.	31 M.....4.4 V.
SW1	4000 KC. 7.7 V.	25 M.....4.8 V.
SW2	18000 KC. 5.0 V.	19 M.....4.4 V.
		16-13 M.....3.7 V.

Variations of ±20% permissible. All measurements taken with R-26 shorted across.

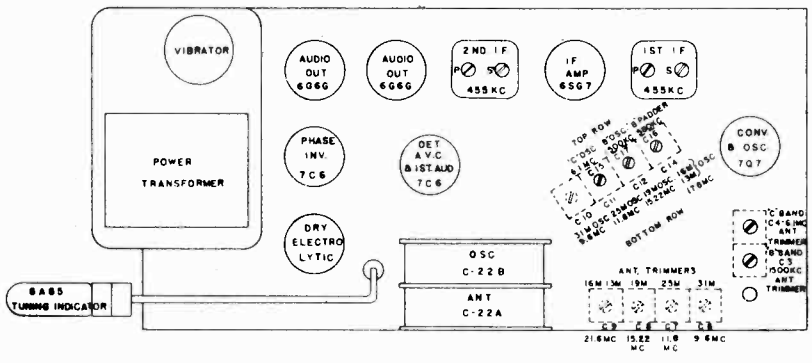
ALIGNMENT CHART

Step	Test Osc. Connected to	Test-osc. Setting	Band and Pointer Setting	Tune Trimmer for Max. Output
1	6SG7 I.F. grid in series with .05 mfd. cap.	455 KC	"BC" BAND 550 KC	C26 and C27
2	7Q7 CONV. grid in series with .05 mfd. cap.	455 KC	"BC" BAND 550 KC	C24 and C25
3	ANT. POST in series with 200 mmf. and 400 ohms	580 KC	"BC" BAND 580 KC	C16**
4	ANT. POST in series with 200 mmf. and 400 ohms	1500 KC	"BC" BAND 1500 KC	C17 (osc.) C3 (ant.)
5	REPEAT STEP 3			
6	ANT. POST in series with 200 mmf. and 400 ohms	6.1 MC	"SW-1" BAND 6.1 MC	C15 (osc.) C4 (ant.)
7	ANT. POST in series with 200 mmf. and 400 ohms	17.8 MC	16 METER 17.8 MC	C14* (osc.)
8	ANT. POST in series with 200 mmf. and 400 ohms	21.6 MC	16 METER 21.6 MC	C9*** (ant.)
9	ANT. POST in series with 200 mmf. and 400 ohms	15.22 MC	19 METER 15.22 MC	C10* (osc.) C6*** (ant.)
10	ANT. POST in series with 200 mmf. and 400 ohms	11.8 MC	25 METER 11.8 MC	C11* (osc.) C7*** (ant.)
11	ANT. POST in series with 200 mmf. and 400 ohms	9.6 MC	31 METER 9.6 MC	C12* (osc.) C8*** (ant.)

*Use minimum capacity peak if two are obtainable.
**Rock gang condenser for optimum peak.
***Use maximum capacity peak if two are obtainable.



VOLTAGES READ WITH 1000 OHMS VOLT VOLTMETER ON 250VOLT SCALE
BATTERY SAVER SWITCH IN NORMAL POSITION
6.0 VOLTS AT BATTERY



MODELS X-156, X-166

GENERAL ELECTRIC CO.

SPECIAL SERVICE INFORMATION

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

NOTE—Connection to converter grid must be made directly to tube grid and not to gang condenser on spread bands.

(1) Stage gains

(a) Antenna Post to Converter Grid, through 400 ohms and 200 mmfd. in series, at

Stand.	1000 KC	5.4	31 M	9.6 MC	1.8
SW1	4000 KC	3.7	25 M	11.8 MC	1.6
SW2	18000 KC	1.1	19 M	15.22 MC	1.4
			16–13 M	17.8 MC	1.0

(b) RF on Converter Grid to IF on 6SG7 grid at

Stand.	1000 KC	61	31 M	9.6 MC	65
SW1	4000 KC	63	25 M	11.8 MC	68
SW2	18000 KC	71	19 M	15.22 MC	71
			16–13 M	17.8 MC	71

(c) IF on Converter Grid to IF on 6SG7 grid at 455 KC—85

(d) IF Grid to diode plate at 455 KC—160

(2) Voltage across the diode load to give ½-watt speaker output at 400 cycles—.046 V.

(3) DC voltage developed across oscillator grid resistor (R1) at

Stand.	1000 KC	8.3 V.	31 M	4.4 V.
SW1	4000 KC	7.7 V.	25 M	4.8 V.
SW2	18000 KC	5.0 V.	19 M	4.4 V.
			16–13 M	3.7 V.

Variations of ±20% permissible. All measurements taken with R-26 shorted across.

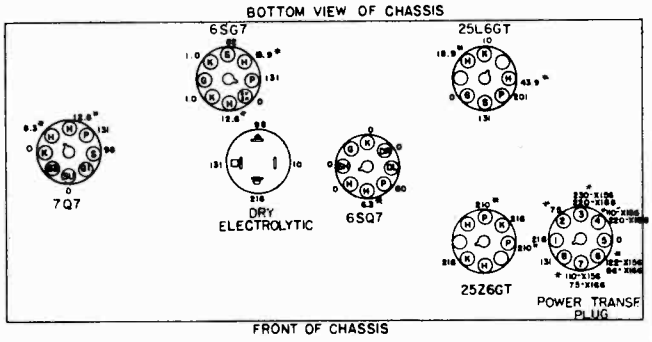


Fig. 3 Socket Voltages

Electrical Rating

Model	Rating	Power Supply: Tap	Power Supply: Voltage Range	Frequency Cycles AC	Power Consumption (Watts)
X-156	C	110 125	103–117 117–133	25–60	60
	V	110 125 200 230	103–117 117–133 185–215 215–250	50–60	60
X-166			200–240 V AC or DC	25–100	100

Tuning Frequency Range

"BC" Band	540–1700 KC
"SW1" Band	2.2–6.8 MC
"SW2" Band	6.8–21.0 MC
31 Meter Band	9.36–9.8 MC
25 Meter Band	11.6–12.5 MC
19 Meter Band	14.9–17.3 MC
16 and 13 Meter Band	17.7–22.2 MC

Electrical Power Output

Undistorted with proper voltage at tap on power transformer—3 watts.

Maximum with proper voltage at tap on power transformer—5 watts.

Loud-speaker—DM Dynamic

Cone Diameter	6½ inches
Voice Coil Impedance (400 cycles)	3.5 ohms

Tubes

Converter-Oscillator	GE-7Q7
IF Amplifier	GE-6SG7
Detector, AVC, 1st Audio	GE-6SQ7
Power Output	GE-25L6GT
Rectifier	GE-25Z6GT
Tuning Indicator	GE-6U5
Pilot Lamps	(2) MAZDA No. 44

Power Supply

The Model X-156 is equipped with a plug-in type power supply which permits practically instantaneous conversion to DC operation. Simply remove the power transformer and replace with a plug-in type ballast resistor. Refer to the data given under "Conversion for Special Line Voltages."

The power transformer in the Model X-156 is provided with four voltage taps. Instant tap switching is made by a simple pin plug and jack device. For correct operation, measure the power supply voltage. Note which voltage range covers this voltage (see Electrical Specifications) and using the corresponding tap, insert the plug in the jack.

CONVERSION FOR SPECIAL LINE VOLTAGES

The Models X-156 and X-166 can be converted for operation on the following line voltages. In all cases where the power transformer is replaced with a ballast resistor, the power transformer must be removed from the chassis as the radiant heat from the ballast resistor is likely to injure the transformer insulation. When operated with these special resistors and lower power supplies than 220 volts, the audio power output and socket voltages will be reduced.

220 Volts AC/DC—(Range 200-240 Volts)

Remove transformer from chassis of X-156, insert ballast tube resistor RR-7007, and change label to read X-166.

180 Volts DC—(Range 160-200 Volts)

Remove transformer from chassis of X-156 or ballast RR-7007 from X-166; insert the ballast tube resistor RR-7008 and change the label on the receiver so that it reads Model X-166Y.

Miscellaneous

The transformer T5 can be substituted in the Model X-156 receiver for operation on 25-cycle circuits. Remark the label so that it reads Model X-156C.

The cold resistance of all ballast tubes is shown directly on the schematic diagram, Fig. 2.

GENERAL ELECTRIC CO.

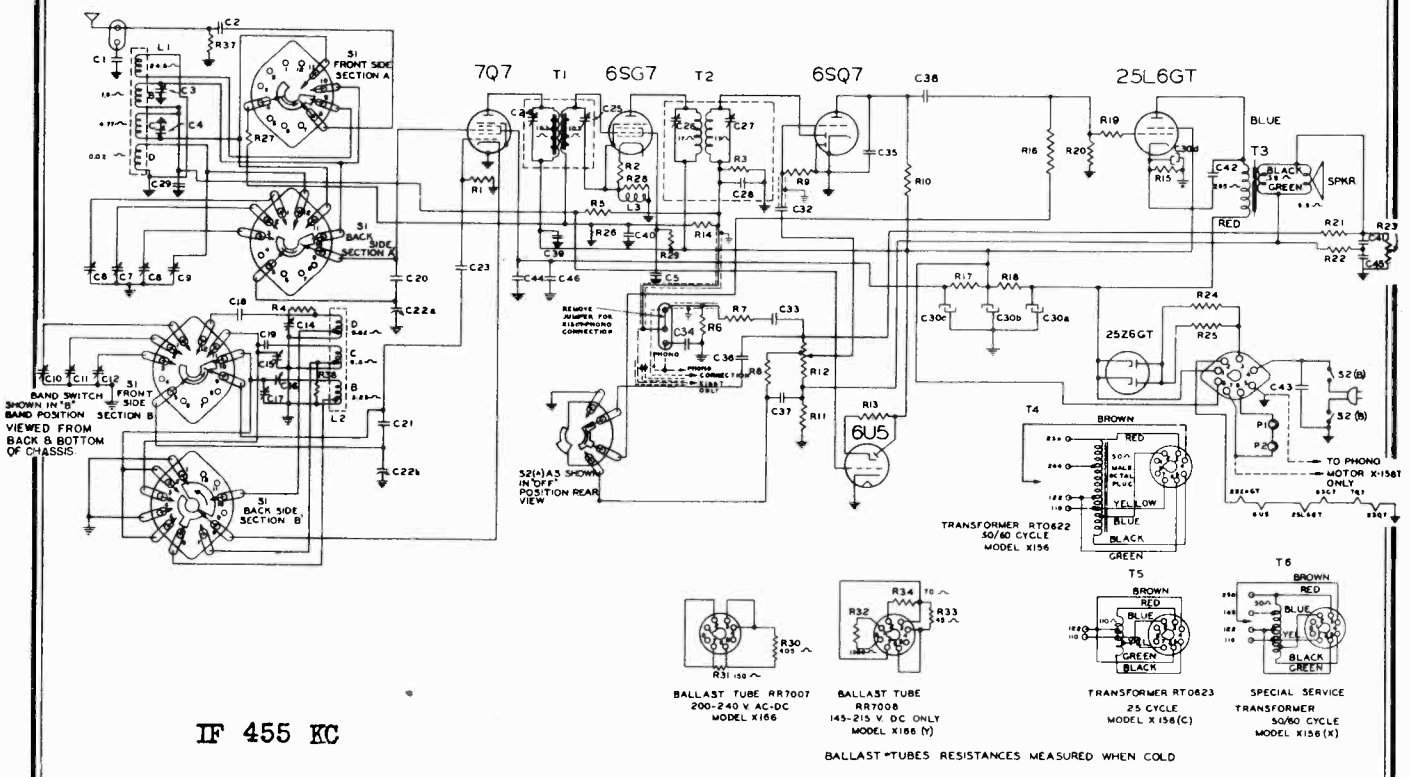


Fig. 2 Schematic Diagram

RADIO REPLACEMENT PARTS LIST
MODELS X-156 AND X-166

Stock No.	Symbol	Description	List Price
*RC-039	C-1	CAPACITOR—.01 mfd., 600-V paper	$0.25
*RC-009	C-2	CAPACITOR—.001 mfd., 600-V paper	.30
*RC-6554	C-3, 4	CAPACITOR—"B" and "C" antenna trimmer	.35
*RC-092	C-5	CAPACITOR—.05 mfd. 600-V	.30
*RT-883	C-6, 7, 8 & 9	TRIMMER—Antenna trimmer strip	.70
*RT-884	C-10, 11, 12, 14, 15, 16, 17	TRIMMER STRIP—Oscillator trimmer strip	1.25
*RC-396	C-18	CAPACITOR—5600 mmf., mica	.45
*RC-347	C-19	CAPACITOR—1800 mmf., mica	.35
*RC-325	C-20, 21	CAPACITOR—45 mmf., compensating capacitor	.40
*RC-7062	C-22a, 22b	CONDENSER—2-gang tuning condenser	1.10
*RC-326	C-23	CAPACITOR—40 mmf., compensating capacitor	.25
*RC-072	C-29	CAPACITOR—.05 mfd., 200-V paper	.25
*RC-5132	C-30a	CAPACITOR—40 mfd., 300-V dry electrolytic	2.10
	C-30b	CAPACITOR—50 mfd., 250-V dry electrolytic	
	C-30c	CAPACITOR—20 mfd., 250-V dry electrolytic	
	C-30d	CAPACITOR—20 mfd., 25-V dry electrolytic	
*RC-039	C-32	CAPACITOR—.01 mfd., 600-V paper	.25
*RC-023	C-33	CAPACITOR—.005 mfd., 600-V paper	.25
*RC-130	C-34	CAPACITOR—2 mfd., 400-V paper	.30
*RC-249	C-35	CAPACITOR—220 mmf., mica	.25
*RC-006	C-36	CAPACITOR—.0015 mfd., 600-V paper	.25
*RC-016	C-37	CAPACITOR—.002 mfd. 600 V paper	.25
*RC-092	C-38, 39	CAPACITOR—.05 mfd 600-V paper	.30
*RC-072	C-40	CAPACITOR—.05 mfd. 200-V paper	.25
*RC-096	C-41	CAPACITOR—.1 mfd. 200 V paper	.30
*RC-031	C-42	CAPACITOR—.008 mfd. 1600-V paper	.25
*RC-117	C-43	CAPACITOR—.02 mfd. 600 V.—AC	.30
*RC-092	C-44	CAPACITOR—.05 mfd., 600-V paper	.30
*RC-095	C-45	CAPACITOR—.05 mfd. 200-V paper	.20
*RC-293	C-46	CAPACITOR—470 mmf., mica	.30
*RQ-1295	R-1	RESISTOR—33,000 ohm, ½-W carbon	.70–5
*RQ-1235	R-2	RESISTOR—100 ohm, ½-W carbon	.70–5
*RQ-1321	R-3	RESISTOR—390,000 ohm, ½-W carbon	.70–5
*RQ-1219	R-4	RESISTOR—22 ohm, ½-W carbon	.70–5
*RQ-1339	R-5	RESISTOR—2.2 megohm, ½-W carbon	.70–5
*RQ-1323	R-6	RESISTOR—470,000 ohm, ½-W carbon	.70–5
*RQ-1299	R-7	RESISTOR—47,000 ohm, ½ W carbon	$0.70–5
*RQ-1313	R-8	RESISTOR—180,000 ohm, ½ W carbon	.70–5
*RQ-1355	R-9	RESISTOR—10 megohm, ½-W carbon	.70–5
*RQ-1321	R-10	RESISTOR—330,000 ohm, ½-W carbon	.70–5
*RQ-1245	R-11	RESISTOR—270 ohm, ½-W carbon	.70–5
RV-140	R-12	VOL. CONTROL—2 meg. volume control	.95
*RQ-1331	R-13	RESISTOR—1 megohm, ½-W carbon	.70–5
*RQ-1347	R-14	RESISTOR—4.7 meg., ½-W. carbon	.70–5
*RQ-1433	R-15	RESISTOR—180 ohm 1-W carbon	.20
*RQ-1321	R-16	RESISTOR—390,000 ohm, ½-W carbon	.70–5
*RQ-1473	R-17	RESISTOR—3,900 ohm, 1-W carbon	.20
*RQ-670	R-18	RESISTOR—3,300 ohm, 2-W carbon	.35
*RQ-1259	R-19	RESISTOR—1,000 ohm, ½-W carbon	.70–5
*RQ-1323	R-20	RESISTOR—470,000 ohm, ½-W carbon	.70–5
*RQ-1353	R-21	RESISTOR—8.2 megohm, ½-W carbon	.70–5
*RQ-1243	R-22	RESISTOR—220 ohm, ½-W carbon	.70–5
*RQ-1263	R-23	RESISTOR—1,500 ohm, ½-W carbon	.70–5
*RQ-646	R-24	RESISTOR—330 ohm, 2-W carbon	.20
*RQ-643	R-25	RESISTOR—270 ohm, 2-W carbon	.30
*RQ-1345	R-26	RESISTOR—3.9 meg., ½-W carbon	.70–5
*RQ-1331	R-27	RESISTOR—1 megohm, ½-W-carbon	.70–5
*RQ-1211	R-28	RESISTOR—10 ohm, ½-W carbon	.70–5
*RQ-1291	R-29	RESISTOR—22,000 ohm ½-W carbon	.70–5
RR-7007	R-30, 31	RESISTOR—200-240 volt ballast	2.00
RR-7008	R-32, 33, 34	RESISTOR—145-215-volt ballast	3.00
*RQ-1307	R-37	RESISTOR—100,000 ohm, ½-W carbon	.70–5
*RQ-1251	R-38	RESISTOR—470 ohm, ½-W carbon	.70–5
RS-3143	S-1	SWITCH—Band change switch	1.40
RS-3144	S2a, 2b	SWITCH—Tone control and power switch	1.45
*RL-1016	L-1	COIL—Antenna coil (all bands)	1.10
*RL-2064	L-2	COIL—Oscillator coil (all bands)	1.10
*RL-371	L-3	COIL—IF neutralizing coil	.25
RL-380	L-3	COIL—IF neutralizing coil (used with chassis stamped Rev. 1 only)	.25
*RT-3007	T-1	TRANSFORMER—1st I.F. transformer	1.15
*RT-3008	T-2	TRANSFORMER—2nd I.F. transformer	1.15
RT-4020	T-3	TRANSFORMER—Output transformer	1.30
RT-0622	T-4	TRANSFORMER—50/60 cycle power transformer (Model X-156)	4.20
RT-0623	T-5	TRANSFORMER—25-cycle power transformer (Model X-156C)	4.75
*RS-1061		SPEAKER—6½" P.M. speaker	2.70

* Used on previous receivers.

Prices subject to change without notice

MODELS X-156, X-166

GENERAL ELECTRIC CO.

PRODUCTION CHANGE

During the production of these receivers, the Type 6SG7 tube was altered so that its suppressor grid element which formerly was connected directly to the shield, now connects to the cathode element of the tube instead.

Due to circuit usage, this new type will cause oscillation if used in a chassis that was designed for the early style tube, and vice versa, without first changing the neutralizing coil, L-3. The early type 6SG7 tube mut be used with neutralizing coil RL-371; while the late production tube must be used in conjunction with neutralizing coil RL-380.

For identification, the early production 6SG7 has either a X marked on the tube or tube carton while the late production tube is unmarked except for the tube symbol. All chassis with the new neutralizing coils (RL-380) and new production 6SG7 tubes are serial numbered 8750 and over and are stamped as REV. 1.

The schematic diagram, Fig. 2, illustrates the connections to the earlier type 6SG7 tube.

PHONOGRAPH INSTALLATION

This receiver is provided with a phonograph terminal board on the rear of the back cover of the receiver for the connection of a record player. The following connection procedure should be observed.

1. Remove the link from terminals 1 and 2, and replace it between terminals 2 and 3.
2. Connect the record player to terminals 1 and 3. If the record player does not have a high-impedance pick-up a matching transformer may have to be used. It is very important that the high side pick-up lead has a shield to prevent hum interference. This shield should be connected to terminal No. 3 and the high side pick-up lead to terminal No. 1.

If, on operating the record player, external radio signals leak through, turn the tuning control to a position where no radio signals would be received. Complete silencing of the external radio signals can be obtained by grounding the antenna terminal while operating the record player.

If, in operating the record player, there is appreciable hum interference, reverse the record player phono motor power cord plug in the power supply outlet.

Alignment Procedure

The alignment procedure shown in table form is made either with the chassis in or removed from the cabinet.

If the chassis is removed from the cabinet to make the RF alignment, the dial which is fastened to the cabinet cannot be used for calibration reference. Use must be made, therefore, of the paper scale fastened on the rear of the dial reflector plate. With the gang condenser completely closed, one of the edges of the pointer rider should be lined up with the first marking to the right of the scale on the rear of the dial reflector plate. This can be accomplished by sliding the pointer on the cord until it does. The selected edge of the pointer rider may now serve as a pointer for the RF alignment. There are two 17.8 reference points on the paper scale on the rear of the dial reflector plate. The one towards the lower frequency end of the dial is the proper one to use for the 16-meter spread-band alignment; while the other is used for a reference point on the SW2 band.

The SW2 band does not require alignment. This band is taken care of when the 16 meter spread-band is aligned.

Spread-band Alignment

Since accuracy in frequency calibration is very essential for proper alignment of the spread-bands, it is impractical to use the standard test oscillator for this purpose unless a special calibration is first made.

The actual reception of short-wave stations of known frequency in the band to be checked is probably the most satisfactory method of determining the proper setting of the oscillator trimmers in these bands. The oscillator trimmer should be adjusted so that the station appears at the correct position on the dial. R.F. alignment can be made with the test oscillator.

The calibration of the test oscillator may be checked by zero beating the test oscillator with a short-wave station of known frequency. By taking several of these calibration points, it will afford a calibration of a high degree of accuracy in case you wish to use the test oscillator for alignment in these bands.

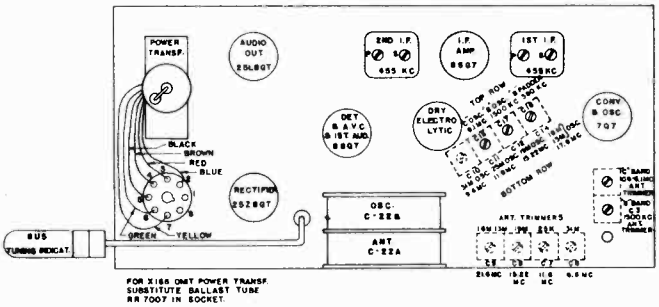


Fig. 1. Trimmer Location

ALIGNMENT CHART

Step	Test Osc. Connected to	Test-osc. Setting	Band and Pointer Setting	Tune Trimmer for Max. Output
1	6SG7 I.F. grid in series with .05 mfd. cap.	455 KC	"BC" BAND 550 KC	C26 and C27
2	7Q7 CONV. grid in series with .05 mfd. cap	455 KC	"BC" BAND 550 KC	C24 and C25
3	ANT. POST in series with 200 mmf. and 400 ohms	580 KC	"BC" BAND 580 KC	C16**
4	ANT. POST in series with 200 mmf and 400 ohms	1500KC	"BC" BAND 1500 KC	C17 (osc.) C3 (ant.)
5	REPEAT STEP 3			
6	ANT. POST in series with 200 mmf. and 400 ohms	6.1 MC	"SW-1" BAND 6.1 MC	C15 (osc.) C4 (ant.)
7	ANT. POST in series with 200 mmf. and 400 ohms	17.8 MC	16 METER 17.8 MC	C14* (osc.)
8	ANT. POST in series with 200 mmf. and 400 ohms	21.6 MC	16 METER 21.6 MC	C9*** (ant.)
9	ANT. POST in series with 200 mmf. and 400 ohms	15.22 MC	19 METER 15.22 MC	C10* (osc.) C6*** (ant.)
10	ANT POST in series with 200 mmf. and 400 ohms	11.8 MC	25 METER 11.8 MC	C11* (osc.) C7*** (ant.)
11	ANT POST in series with 200 mmf. and 400 ohms	9.6 MC	31 METER 9.6 MC	C12* (osc.) C8*** (ant.)

*Use minimum capacity peak if two are obtainable.
**Rock gang condenser for optimum peak.
***Use maximum capacity peak if two are obtainable.

BAND CHANGE SWITCHING

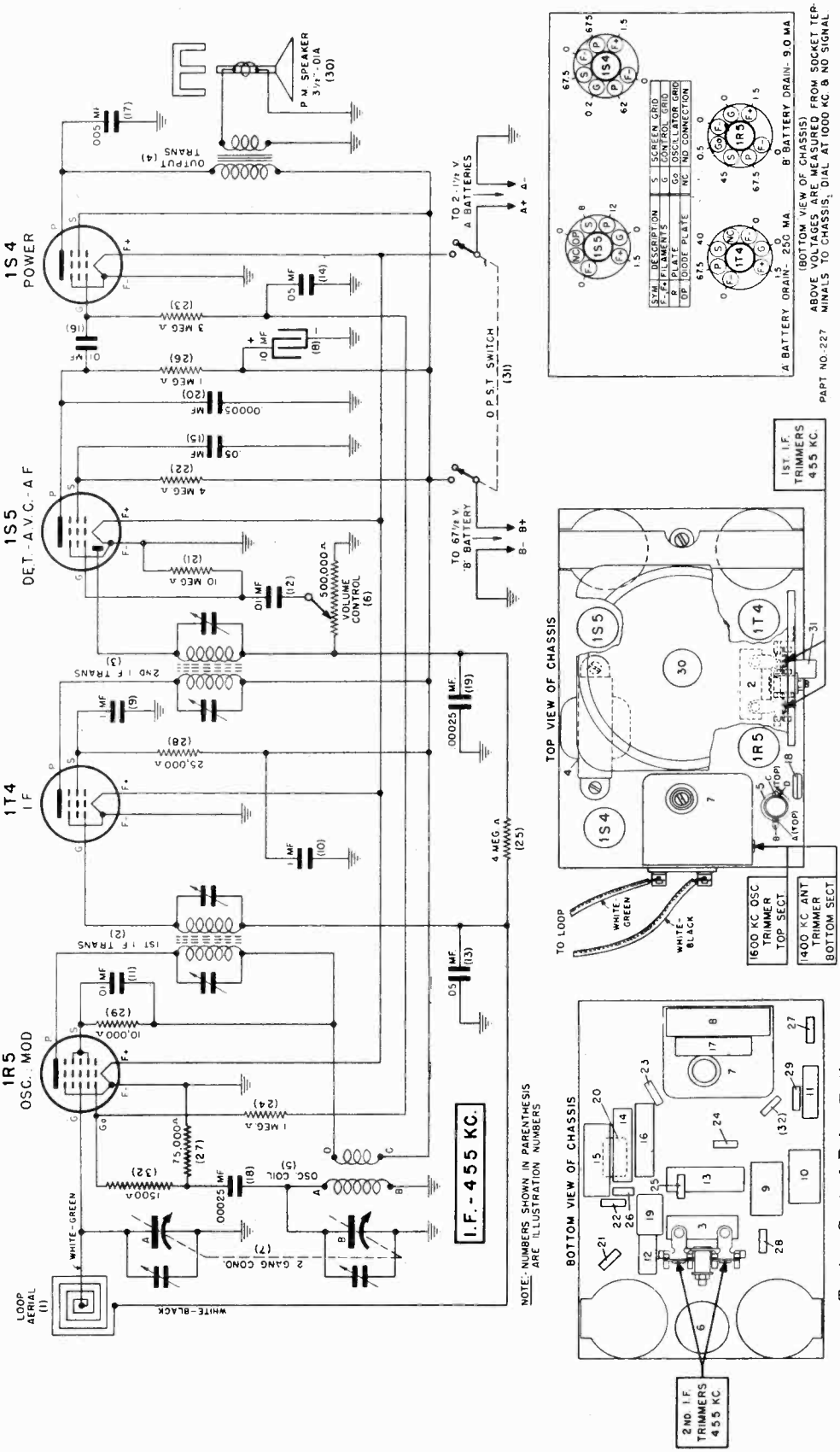
The following charts show the switch points connected for any one position of the wave change switch. The numbers shown in each box indicate the switch points connected together in the section of the switch for each position of the switch. As for example: the numbers 5–9–10 indicate these switch points are all connected together for this particular position of the switch.

BAND SWITCH CONNECTIONS

Band in Use	Section "A" Front Side	Section "A" Back Side	Section "B" Front Side	Section "B" Back Side
BC	4–8–9	5–9–10	5–9–10	1–10 6–8
SW1	4–8–10	5–9–11	5–9–11	1–2–10 7–8
SW2	4–8–11	5–9–12	5–9–12	1–2–3 8–10
31 METER	8–11	9–12–1	9–12–1	1–2–3–4 8–10
25 METER	8–11	9–12–2	9–12–2	1–2–3–4–5 8–10
19 METER	8–11	9–12–3	9–12–3	2–3–4–5–6 8–10
16 and 13 METER	8–11	9–12	9–12	3–4–5–6–7 8–10

MODEL LB-412

GENERAL ELECTRIC CO.



Tuning Control Drive Ratio.....6:1
Battery Specification.....2-1½ Volt "A" Eveready No. 950 or Equivalent 1-67½ Volt "B" Eveready No. 467 or Equivalent
Intermediate Frequency.....455 K.C.
Tuning Frequency Range.....540-1600 K.C.
Maximum Power Output.....175 Milliwatts
Loud Speaker.....Cone Diameter—3 Inches
Voice Coil Impedance.....(400 Cycles) 3.5 Ohms
Tubes: Converter-Oscillator 1R5, I.F. 1T4, Detector A.V.C. 1S5, Power Output 1S4.

ALIGNMENT PROCEDURE

Alignment Frequencies I.F. .....455 K.C.
R.F. .....1600 & 1400 K.C.

I.F. Alignment Connect an output meter across the voice coil. Rotate the volume to maximum. Set test oscillator to 455 K.C. and apply signal to lug on stator of gang condenser to which loop is connected through a .05 Mfd. capacitor. Align the second I.F. transformer trimmers, next adjust the first I.F. transformer trimmers. Keep test oscillator output as low as a readable meter reading will permit.

R.F. Alignment Couple test oscillator output to loop in case cover. Adjust test oscillator and receiver dial to exactly 1600 K.C. Peak 1600 K.C. oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 K.C. Then while rocking gang condenser trim 1400 K.C. antenna trimmer for maximum output.

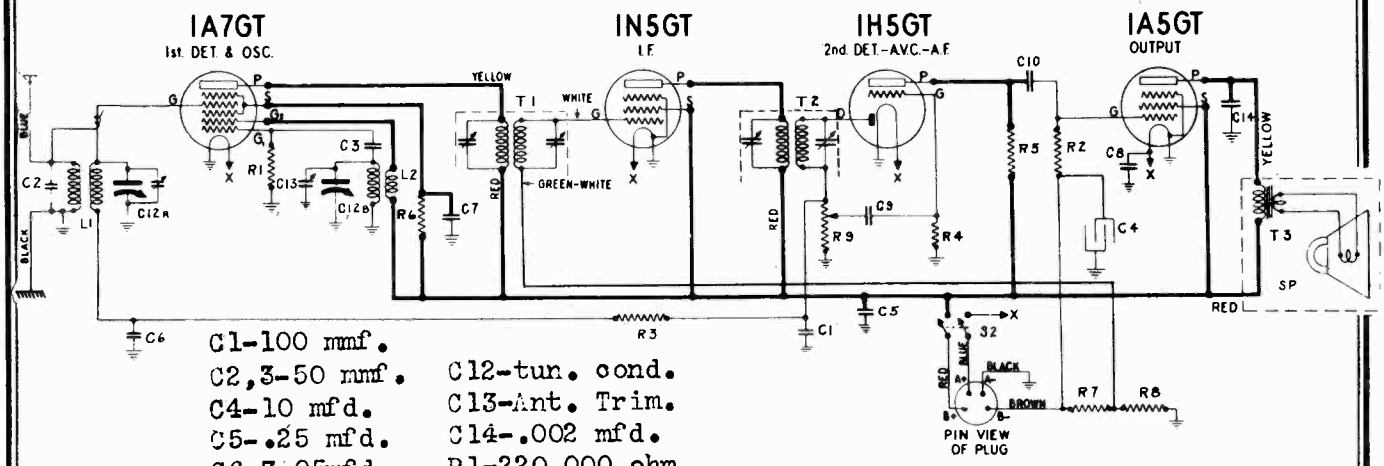
MODEL LB-424

GENERAL ELECTRIC CO.

STAGE GAINS

ANT. - GRID — 5X — 1000 KC
1A7GT GRID — *30X — 1000 KC - 455 KC — IN5GT GRID
IF GRID — *70X — 455 KC — DET. PLATE
1H5GT GRID — 330X — 400 CYCLES — 1A5GT PLATE

* WITH AVC SHORTED OUT

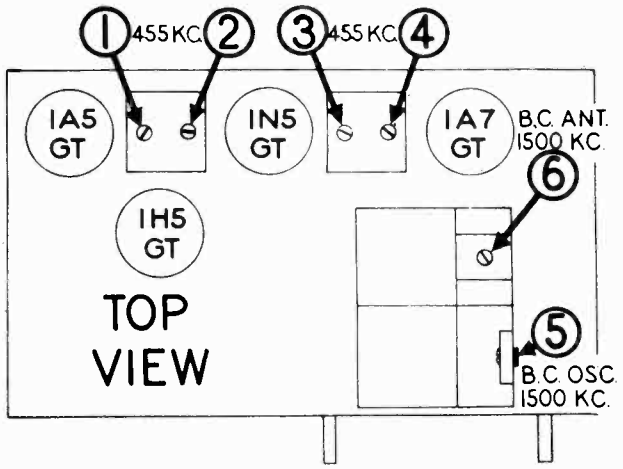


C1-100 mmf.
C2,3-50 mmf.
C4-10 mfd.
C5-.25 mfd.
C6,7-.05mfd.
C8-.25 mfd.
C9-.004 mfd.
C10-.01 mfd.
C12-tun. cond.
C13-Ant. Trim.
C14-.002 mfd.
R1-220,000 ohm.
R2-1 megohm.
R3,4-3.3 megohm.
R5-680,000 ohm.
R6-15,000 ohm.
R7-560 ohm.
R8-47 ohm.
RV143S-Vol. Cont.
L1-Ant. Coil
L2-Osc. Coil
T1-1st IF Trans.
T2-2nd. IF Trans.
T3-Out.Spk. Trans.
SP-6in. PM Spk.

REPLACEMENT PARTS LIST

Stock Number	Description	List Price
	ELECTRICAL PARTS	
*RC-235	CAPACITOR—100 mmf., mica	$0.25
*RC-206	CAPACITOR—50 mmf., mica	.35
*RC-5105	CAPACITOR—10 mfd., 35 V, electrolytic	.60
*RC-148	CAPACITOR—.25 mfd., 600 V, paper	.35
*RC-092	CAPACITOR—.05 mfd., 600 V, paper	.30
*RC-136	CAPACITOR—.25 mfd., 200 V, paper	.30
*RC-025	CAPACITOR—.004 mfd., 600 V, paper	.20
*RC-039	CAPACITOR—.01 mfd., 600 V, paper	.25
RC-7068-S	CONDENSER—Tuning condenser (with drum)	3.30
RC-6561-S	CAPACITOR—Antenna trimmer	.20
*RC-016	CAPACITOR—.002 mfd., 600 V, paper	.25
*RQ-1315	RESISTOR—220,000 ohm, ½-W carbon	.70-5
*RQ-1331	RESISTOR—1 megohm, ½-W carbon	.70-5
*RQ-1343	RESISTOR—3.3 megohm, ½-W carbon	.70-5
*RQ-1327	RESISTOR—680,000 ohm, ½-W carbon	.70-5
*RQ-1287	RESISTOR—15,000 ohm, ½-W carbon	.70-5
*RQ-1253	RESISTOR—560 ohm, ½-W carbon	.70-5
*RQ-1227	RESISTOR—47 ohm, ½-W carbon	.70-5
RV-143-S	VOLUME CONTROL—Volume control and power switch	1.45
RL-169-S	COIL—Antenna coil	$1.20
RL-2079-S	COIL—Oscillator coil	.45
RT-3023-S	TRANSFORMER—1st IF transformer	1.20
RT-3026-S	TRANSFORMER—2nd IF transformer	1.20
RT-4027-S	TRANSFORMER—Output speaker transformer	1.80
RS-1091-S	SPEAKER—6-inch PM speaker	8.75

Prices Subject to Change without Notice.



Electrical Specifications

1. Battery Power Supply
   1.5 Volt "A" supply, 90 volts "B" supply.
   Eveready No. 748, Burgess No. 17G-D60 or equivalent.
2. Battery drain
   "A" Supply—approximately .2 amp.
   "B" supply—approximately 7.8 ma.

Alignment Frequencies

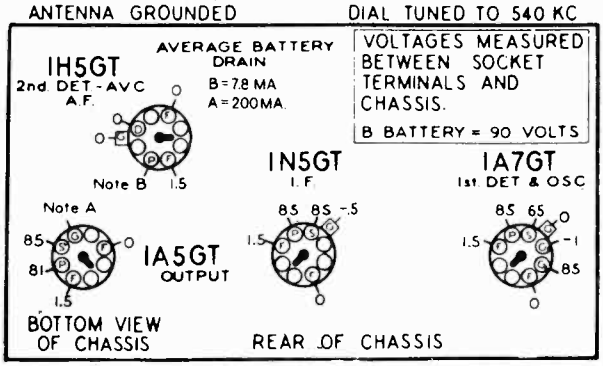
IF . . . . . 455 KC
RF . . . . . 1500 KC
The location of all trimmers is shown in Fig. 2.

Alignment Procedure

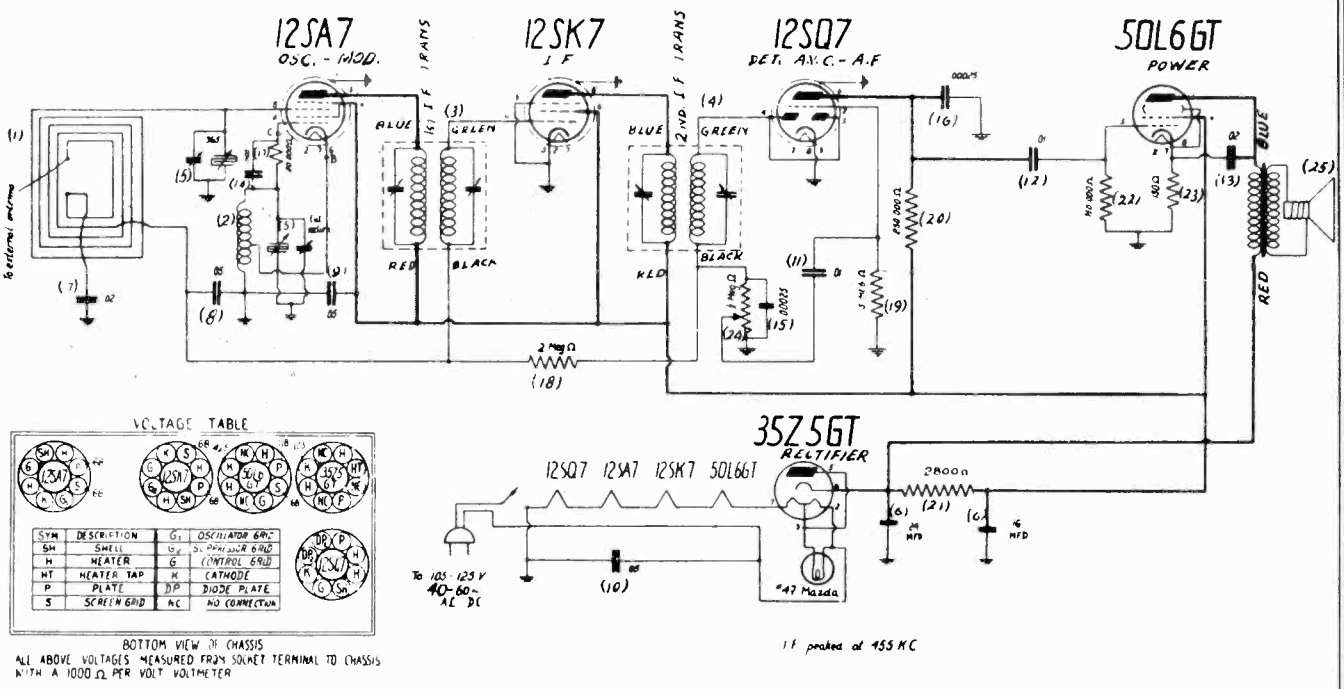
Connect an output meter across the speaker voice coil. Turn volume control to maximum and in all cases keep test-oscillator output as low as a readable output meter reading will permit. Proceed with alignment as given in the following table.

Step	Connect Test-osc. to	Test-osc. Setting	Pointer Setting	Adjust Trimmers for Max. Output
1	1A7GT conv. grid in series with .05 mfd.	455 KC	540 KC	1, 2, 3 and 4
2	Antenna lead (blue)	1500 KC	1500 KC	5
3	Antenna lead (blue)	1500 KC	1500 KC	6

ANTENNA GROUNDED — DIAL TUNED TO 540 KC



GENERAL ELECTRIC CO.



SERVICE INFORMATION

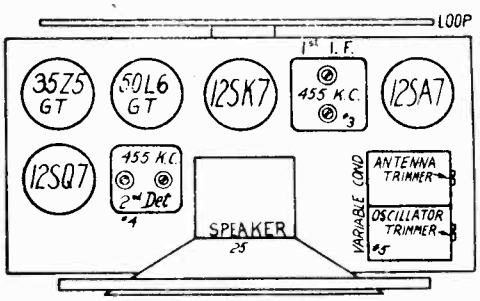
Voltages—Line 117 Volts AC—Power Consumption 27 Watts. Volume Control maximum. Meter 1000 ohms per volt, 250 volt scale.

Plate (3) of 12SA7 tube to common ground	68 volts
Screen (4) of 12SA7 tube to common ground	68 volts
Plate (8) of 12SK7 tube to common ground	68 volts
Screen (6) of 12SK7 tube to common ground	68 volts
Plate (3) of 50L6GT tube to common ground	118 volts
Screen (4) of 50L6GT tube to common ground	68 volts
Cathode (8) of 50L6GT tube to common ground	4.25 volts
Cathode (8) of 35Z5GT tube to common ground	125 volts
Heater (2) and (7) of 12SA7 tube	12.4 volts AC
Heater (2) and (7) of 12SK7 tube	12.4 volts AC
Heater (7) and (8) of 12SQ7 tube	12.4 volts AC
Heater (2) and (7) of 50L6GT tube	48 volts AC
Heater (2) and (7) of 35Z5GT tube	34 volts AC

SERVICE NOTES

Turning Control Drive Ratio	6½:1
Power Consumption	30 watts
Intermediate Frequency	455 K.C.
Tuning Frequency Range	540-1700 K.C.
Maximum Power Output	1.25 watts
Loud Speaker	Cone Diameter-4 inches
Voice Coil Impedance	(at 400 cycles) 3 ohms

Tubes: Converter-Oscillator 12SA7, I. F. 12SK7, Detector, A. V. C. 12SQ7, Power Output 50L6GT, Rectifier 35Z5GT.



ALIGNMENT PROCEDURE

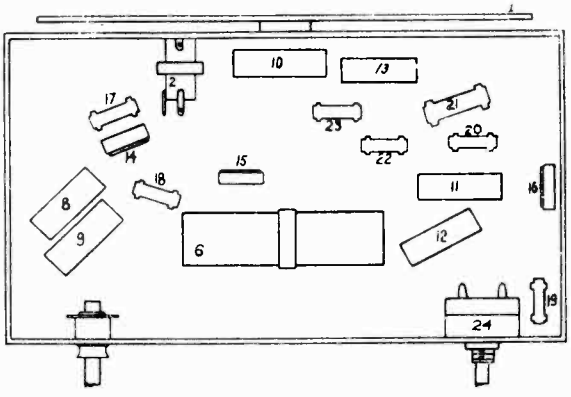
Alignment Frequencies	I.F.	455 K.C.
	R.F.	1700 & 1400 K.C.

I.F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 kilocycles and apply signal to control grid of 12SA7 tube through a .05 mfd. capacitor. Align the second I.F. transformer trimmers, next adjust the first I.F. transformer trimmers. Keep the test oscillator output to a level that will give a good meter reading.

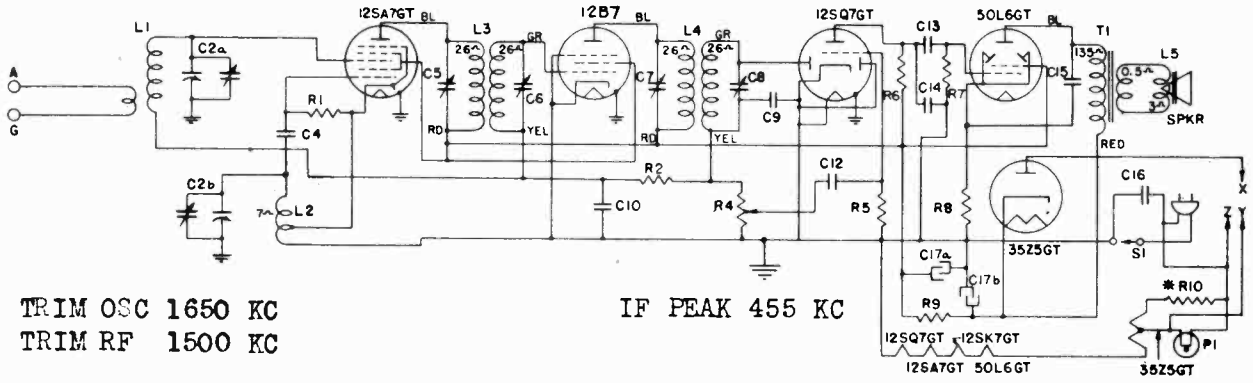
R.F. Alignment

Attach high side of test oscillator to flexible lead extending from rear of chassis through a .00025 mfd. condenser. Connect the low side to the receiver chassis Adjust the test oscillator and receiver to 1700 kilocycles. Peak 1700 kilocycles oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 kilocycles. Then while rocking gang condenser, trim 1400 kilocycles antenna trimmer for maximum output.



MODEL J-512

GENERAL ELECTRIC CO.



TRIM OSC 1650 KC
TRIM RF 1500 KC

IF PEAK 455 KC

"A" rated receivers have "X" connected to "Y" and R-10 is shorted out
"C" rated receivers have "X" connected to "Z"

-1940-

Parts Description List

Sym.	Description	Sym.	Description	Sym.	Description
C-2a	Antenna Section Tuning Condenser	C-13	.005 mfd. paper capacitor	P-1	Dial lamp, MAZDA No. 47
C-2b	Oscillator Section Tuning Condenser	C-14	330 mmf. mica capacitor	R-1	33,000 ohms carbon resistor
C-4	47 mmf. mica capacitor	C-15	.01 mfd. paper capacitor	R-2	2.2 megohms carbon resistor
C-5	60–140 mmf. I.F. trimmer	C-16	.05 mfd. paper capacitor	R-4	0.5 megohm volume control
C-6	60–140 mmf. I.F. trimmer	C-17a	30 mfd. 150 V. dry electrolytic	R-5	4.7 megohms carbon resistor
C-7	60–140 mmf. I.F. trimmer	C-17b	40 mfd. 150 V. dry electrolytic	R-6	470,000 ohms carbon resistor
C-8	60–140 mmf. I.F. trimmer	L-1	Beam-a-Scope	R-7	470,000 ohms carbon resistor
C-9	470 mmf. mica capacitor	L-2	Oscillator coil	R-8	150 ohms carbon resistor
C-10	.05 mfd. paper capacitor	L-3	1st I.F. transformer	R-9	1200 ohms 1 W. carbon resistor
C-12	.005 mfd. paper capacitor	L-4	2nd I.F. transformer	R-10	13 ohms carbon resistor ±5%

Electrical Specifications

Rating	Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
A	115—AC or DC	40–60	30
C	115—AC or DC	25	30

Special Service Information

The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains — Gain

Antenna to 12SA7GT grid . . . 3 to 3.5 at 1000 KC‡
12SA7GT grid to 12B7 grid . . 50 at 455 KC ‡
12B7 grid to 12SQ7GT detector plate . . . . . 50 at 455 KC ‡

Gains shown in the first two stages do not contain the conversion gain which amounts to 1.1 at 1000 KC.

(2) 0.15 volt, 400 cycle signal across the volume control will give ½ watt speaker output. (Volume control turned to maximum.)

(3) Average DC voltage developed across oscillator grid leak . . . . . 15 volts

‡ Variations of +10%, −20% permissible.

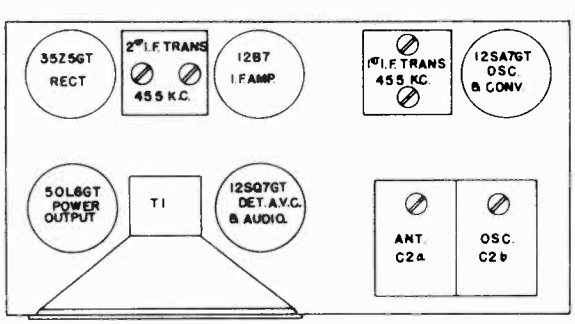


Fig. 1. Trimmer Location

ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL. VIII

Intermediate Frequency . . . . . 455 KC

Electrical Power Output (117-line volts)

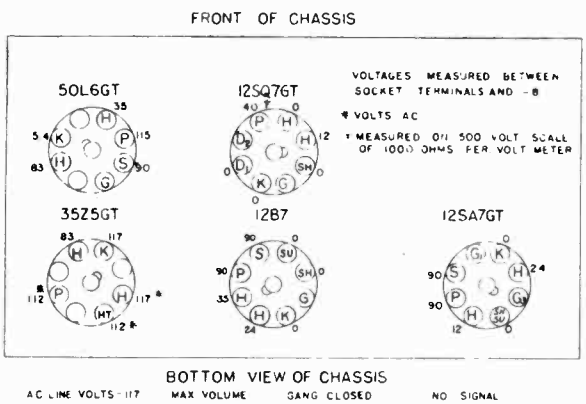
Undistorted . . . . . 1.3 watts
Maximum . . . . . 1.9 watts

Loud-speaker—"Alnico" Magnetic Dynamic

Outside Cone Diameter . . . . . 4 inches
Voice Coil Impedance (400 cycles) . . . . . 3.5 ohms

Tubes

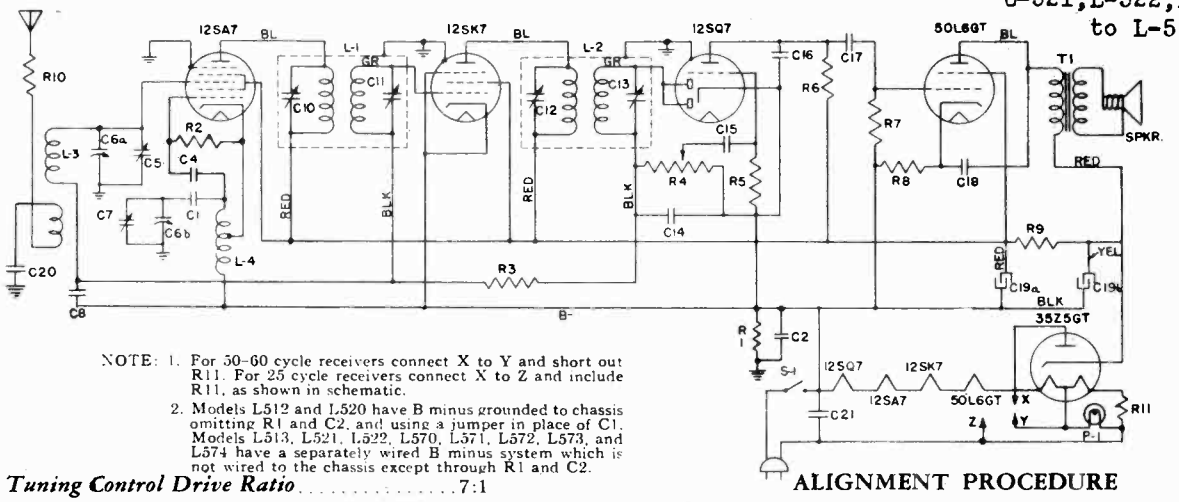
Converter-Oscillator GE-12SA7GT
I.F. Amplifier GE-12B7
Det., Aud., AVC GE-12SQ7GT
Power Output GE-50L6GT
Rectifier GE-35Z5GT



Socket Voltages

GENERAL ELECTRIC CO.

MODELS L-512, L-513, L-520, L-521, L-522, L-570 to L-574 inc



NOTE: 1. For 50-60 cycle receivers connect X to Y and short out R11. For 25 cycle receivers connect X to Z and include R11, as shown in schematic.

2. Models L512 and L520 have B minus grounded to chassis omitting R1 and C2, and using a jumper in place of C1. Models L513, L521, L522, L570, L571, L572, L573, and L574 have a separately wired B minus system which is not wired to the chassis except through R1 and C2.

Tuning Control Drive Ratio 7:1

Electrical Specifications

Rating A-6....105-117 volts, 50-60 cycles or 105-117 volts D-C; 30 watts

Rating C-2....105-117 volts, 25 cycles or 105-117 volts D-C; 30 watts

Tuning Frequency Range ..... 550–1720 KC

Intermediate Frequency ..... 455 KC

Maximum Power Output ..... 1.5 watts

Loud-speaker—PM Dynamic

Outside Cone Diameter..... 4 inches
Voice Coil Impedance (400 Cycles)..... 3.5 ohms

Tubes

Converter and Oscillator..... GE-12SA7
I.F. Amplifier..... GE-12SK7
Detector, AVC, Audio..... GE-12SQ7
Power Output..... GE-50L6GT
Rectifier..... GE-35Z5GT
Dial Lamp..... MAZDA No.47

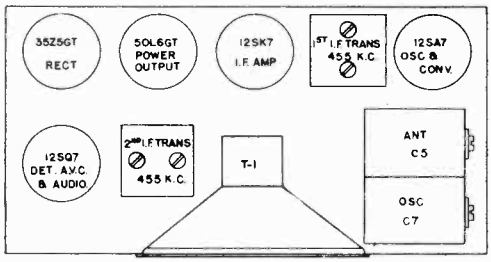


Fig. 1. Tube and Trimmer Location

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F..... 455 KC
R.F..... 1500 KC

The location of all trimmers is shown in Fig. 1.

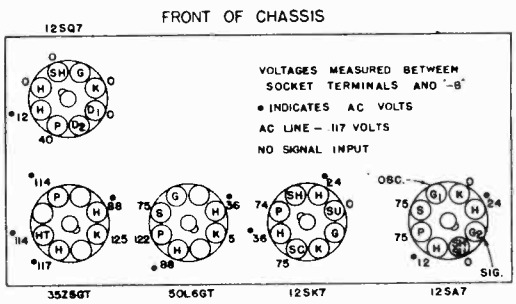
I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment

Close the gang condenser by rotating the tuning control. Slide the pointer along the cord until it lines up with the first dial marking on the left. Now rotate the tuning control until the pointer is over the 1500 KC dial mark. Apply a 1500 KC signal to the receiver by means of a standard loop antenna. Align the oscillator trimmer (C-7) to bring in the signal and peak the signal by adjusting the antenna trimmer (C-5). (See Fig. 1 for trimmer locations.)



BOTTOM VIEW OF CHASSIS

Fig. 2. Socket Voltages

REPLACEMENT PARTS LIST

Stock No.	Symbol	Description	List Price
*RC-072	C-1	CAPACITOR—.05 mfd. 200-V paper	$0.25
*RC-130	C-2	CAPACITOR—0.2 mfd. 400-V paper	.30
*RC-235	C-4	CAPACITOR—100 mmf. mica	.25
*RC-7039	C-6a, b	CONDENSER—Tuning condenser (includes trimmers C-5, C-7)	1.70
*RC-072	C-8	CAPACITOR—.05 mfd., 200-V. paper	.25
*RC-274	C-14	CAPACITOR—330 mmf. mica	.30
*RC-023	C-15	CAPACITOR—.005 mfd. 600 V. paper	.25
*RC-274	C-16	CAPACITOR—330 mmf. mica	.30
*RC-039	C-17	CAPACITOR—.01 mfd., 600 V. paper	.25
*RC-048	C-18	CAPACITOR—.02 mfd., 600 V. paper	.30
*RC-5174	C-19a C19-b	CAPACITOR—20 mfd., 150 V. dry electrolytic CAPACITOR—30 mfd. 150 V. dry electrolytic	.60
*RC-039	C-20	CAPACITOR—.01 mfd., 600 V. paper	.25
*RC-092	C-21	CAPACITOR—.05 mfd., 600 V. paper	.30
*RQ-1319	R-1	RESISTOR—330,000 ohms, ½ W. carbon	.70–5
*RQ-1291	R-2	RESISTOR—22,000 ohms, ½ W. carbon	.70–5
*RQ-1339	R-3	RESISTOR—2.2 megohms, ½ W. carbon	.70–5
*RV-108	R-4, S-1	VOL. CONTROL—0.5 megohm volume control and power switch	.95
*RQ-1347	R-5	RESISTOR—4.7 megohms, ½ W. carbon	.70–5
*RQ-1317	R-6	RESISTOR—270,000 ohms, ½ W. carbon	.70–5
*RQ-1323	R-7	RESISTOR—470,000 ohms, ½ W. carbon	.70–5
*RQ-1239	R-8	RESISTOR—150 ohms, ½ W. carbon	.70–5
*RQ-1469	R-9	RESISTOR—2700 ohms, 1 W. carbon	.20
*RQ-1255	R-10	RESISTOR—680 ohm, ½ W. carbon	.70–5
*RQ-1214	R-11	RESISTOR—13 ohms, ¼ W. carbon	.70–5

Precaution

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

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains*
Antenna Post to Converter Grid.....3.0 at 1000 KC
I.F. on Converter Grid to I.F. on I.F. Amplifier Grid.....60 at 455 KC
I.F. Amplifier Grid to Diode Plate...45 at 455 KC

(2) 0.20-volt, 400-cycle signal across the volume control will give ½-watt speaker output.* (Volume control turned to maximum.)

(3) Average DC voltage developed across oscillator grid leak.....6 volts

* Variations of ±20% permissible. All readings obtained with enough signal input to give ½-watt speaker output.

GENERAL ELECTRIC CO.

To Charge Battery

The battery is charged by merely plugging the receiver power cord in the rated AC power outlet and turning the selector switch to "charge." Frequent check should be taken of the charge indicator and when all indicator balls are visible, the battery is fully charged. Charging the battery after all indicator balls are visible will not harm the battery except that it will evaporate the water faster. A completely discharged battery will be restored usually within 20 to 30 hours.

When operating the receiver from the AC house current, the battery is being charged at a slow rate. Thus if you wish to operate the receiver at the same time that you are charging even a fully discharged battery, plug the power cord in the AC receptacle and turn the power selector switch to the AC position. Prolonged and repeated operation on this position will assure that the battery is always maintained in a nearly fully charged condition.

Battery Operating Instructions

1. Add distilled or tap water in the filter cap at sufficiently frequent intervals to keep liquid level at indicator mark as viewed through opening in a battery case. DO NOT OVERFILL. The battery is available by removing the thumb screw on the left side of the battery case and removing the cover of the case. If any water is spilled in receiver when filling battery, remove with absorbent tissue.

Tap or drinking water is satisfactory as long as it does not contain large quantities of iron or chlorine dissolved in it.

2. If battery is discharged (only one or two indicators showing), water should be added to the level line before starting the recharge.

3. A fully charged battery will operate the radio in "Battery" position about 15 hours before recharging is required. Whenever possible, it is best not to allow the battery to become discharged to the extent that all three indicators disappear.

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

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

BATTERY INSTALLATION

The following instructions should be carefully followed in installing battery:

1. Remove battery from packing carton.

2. If needed, add water to bring liquid level to indicator mark on battery container. Do not overfill.

3. Remove back cover from radio, also battery case cover. The latter is removed by taking out the thumb screw and pulling the left side of the cover away from the battery case.

4. Turn battery with ball indicators faced to left, and then connect the two black leads with spade terminals onto the extreme right or negative (−) terminal of the battery. Note that the leads when connected to the terminal come away from the terminal on the side of battery toward you.

5. Turn battery so that the indicators face the front, then slide the battery part way into the case. Connect the two yellow leads with the spade terminals to the front or positive (+) terminal of the battery. The leads when connected will come away from the terminal on the right-hand side of the battery.

6. Connect the rubber vent tube over the vent located in middle of battery.

7. Slide battery as far as it will go into battery case.

8. Replace battery case cover.

9. Place battery on charge, if necessary, as described in a previous paragraph, until all three indicators are showing in the opening in the case cover.

Charger Characteristics

A ¼-ampere fuse is used in series with the primary of the charger transformer. If the battery, after being placed on charge, does not show any signs of becoming charged after a reasonable length of time, the fuse should be checked. Replace only with a ¼-amp GE Cat. No. 2548 fuse or its equivalent.

If one or more of the copper oxide discs of the rectifier unit are defective, the charger will not operate properly. To test the rectifier unit operation, proceed as follows: Remove the two black leads from the negative terminal of the battery and connect a DC ammeter which will read two amperes, in series with these leads to the negative terminal of the battery. Plug the power cord into an AC supply and turn the power selector switch to the "Charge" position. With the AC line voltage at 117 volts, the average charging current should read about 1.35 amperes at 2.1 volts battery. If line voltage is greater or battery voltage is lower than 2.1 volts the charging current will be greater. If the current is much less than this value at the rated line of 117 volts, one or more of the copper oxide discs may be defective.

To check individual discs, the following tests are suggested. In the conducting direction, the rectifier disc should pass 0.5 ampere or more when ½ volt is impressed across the disc. Note: The copper oxide rectifier disc conducts when the positive potential is applied to the copper oxide surface. The copper oxide is a dark blue coating and is plated with nickel to afford a good surface contact to the oxide. If a DC ammeter is not available for measuring currents as high as 0.5 ampere, the circuit shown in Fig. 2 can be used for this check. This method requires that the resistance of 2.75 ohms be made fairly accurate and is placed in series with the rectifier disc and placed across the two volt storage battery. The voltage should always read 0.5 volt or less; if the voltage exceeds 0.5 volt across the disc in this circuit, it indicates a defective disc.

The reverse current flow is as important as the above test and is made as follows: Reverse the battery polarity in the above test circuit and place a milliammeter that will read 10 milliamps in series with a lead to one of the battery terminals. This reverse current should not exceed 2½ milliamperes at the applied voltage of 2.0 volts. If the current is considerably above this value the disc should be discarded. Precaution—A suitable meter fuse should be used in series with the milliammeter to prevent damage to the meter in case the disc under test is shorted. A rough check, if a milliammeter is not available, is to measure the resistance of the disc in the non-conducting direction on the low-resistance tap (1½ volt) of the ohmmeter. The resistance should measure at least 750 ohms.

BATTERY INFORMATION

The receiver uses a 2-volt Willard Radio Battery No. 20-2 or equivalent. It has a twenty ampere-hour capacity and should be cared for in the same manner as any other storage battery.

Charge Indicator

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

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

1. Green indicator sinks when approximately 10 per cent of battery capacity has been discharged.

2. White ball sinks when 50 per cent capacity has been discharged.

3. The red ball sinks when battery is 90 per cent discharged.

On charge, the balls rise or float in the reverse order and the charge is complete and may be stopped when all three balls appear in the opening.

MODEL LB-530

GENERAL ELECTRIC CO.

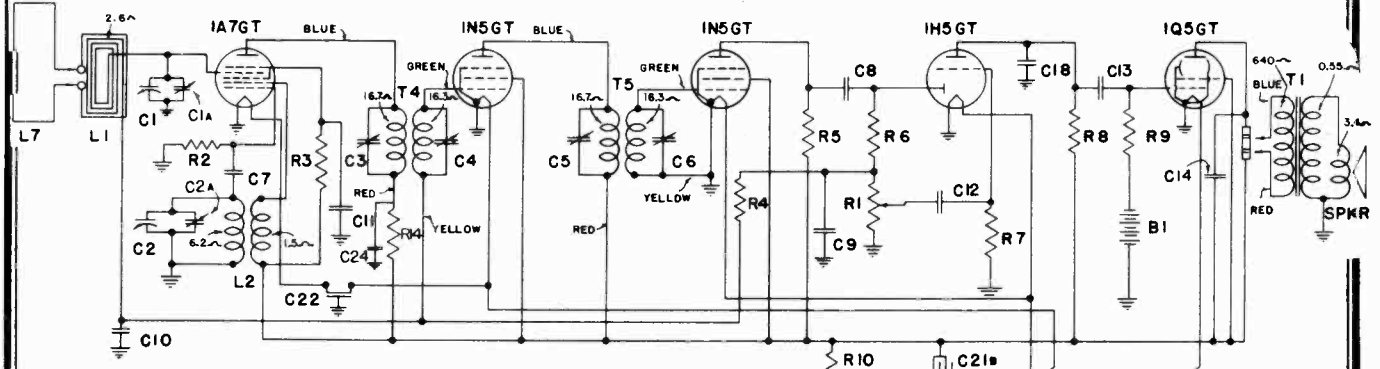
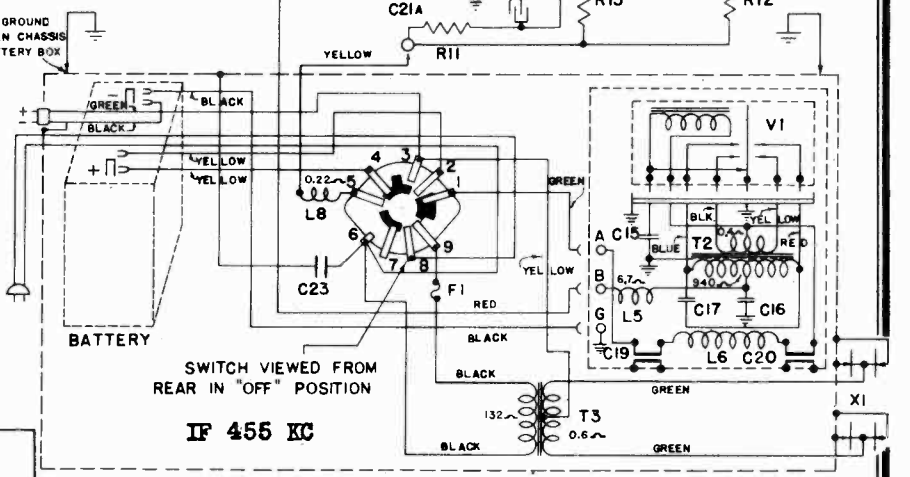


Fig. 5. Schematic Diagram



POWER SELECTOR SWITCH OPERATION

POSITION	CONTACTS CONNECTED
"OFF"	ALL CONTACTS OPEN
"BATTERY"	#1 to #2; #4 to #5; #7* to #8
"AC"	#1 to #2 to #3; #4 to #5; #8 to #9
"CHARGE"	#2 to #3; #8 to #9

* #7 terminal is not connected to circuit

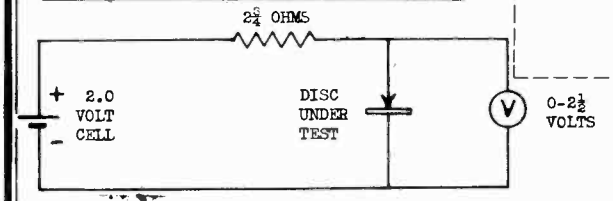


Fig. 2. Charger Disc Test

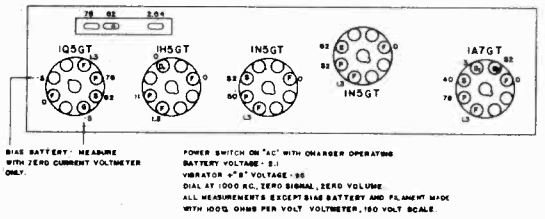


Fig. 1. Socket Voltage Diagram

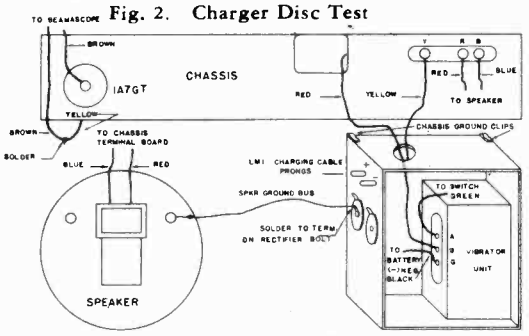


Fig. 3. Assembly Wiring

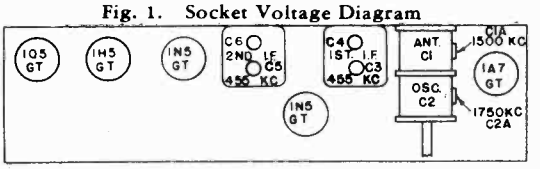


Fig. 4. Trimmer Location

Prices subject to change without notice.

Stock No.	Symbol	Description	List Price
RC-7054	C-1, 2	CONDENSER—Tuning condenser and trimmers	$1.55
*RC-216	C-7	CAPACITOR—47 mmf., mica	.25
*RC-235	C-8, 9	CAPACITOR—100 mmf., mica	.25
*RC-072	C-10	CAPACITOR—.05 Mfd., 200 V. paper	.25
*RC-096	C-11	CAPACITOR—0.1 Mfd., 200 V. paper	.30
*RC-023	C-12, 13	CAPACITOR—.005 Mfd., 600 V. paper	.25
*RC-039	C-14	CAPACITOR—.01 Mfd., 600 V. paper	.25
*RC-096	C-15	CAPACITOR—0.1 Mfd., 200 V. paper	.30
*RC-072	C-16	CAPACITOR—.05 Mfd., 200 V. paper	.25
*RC-027	C-17	CAPACITOR—.006 Mfd., 100 V. paper	.30
*RC-235	C-18	CAPACITOR—100 mmf., mica	.25
*RC-156A	C-19, 20	CAPACITOR—0.5 Mfd., 120 V.	.45
RC-5189	C-21A, 21B	CAPACITOR—15 Mfd., 150 V. dry electrolytic	.75
	C-21C	CAPACITOR—1200 Mfd., 2 V. dry electrolytic	
*RC-156A	C-22	CAPACITOR—0.5 Mfd., 120 V. paper	.45
*RC-092	C-23	CAPACITOR—.05 Mfd., 600 V. paper	.30
RV-125	R-1	VOLUME CONTROL—0.5 megohm volume control	.95
*RQ-1315	R-2	RESISTOR—220,000 ohm, ½ W. carbon	.70—5
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½ W. carbon	.70—5
*RQ-1339	R-4	RESISTOR—2.2 megohm, ½ W. carbon	.70—5
*RQ-1293	R-5	RESISTOR—27,000 ohm, ½ W. carbon	.70—5
*RQ-1299	R-6	RESISTOR—47,000 ohm, ½ W. carbon	.70—5
*RQ-1347	R-7	RESISTOR—4.7 megohm, ½ W. carbon	.70—5
*RQ-1331	R-8	RESISTOR—1.0 megohm, ½ W. carbon	$0.70—5
*RQ-1339	R-9	RESISTOR—2.2 megohm, ½ W. carbon	.70—5
*RQ-1259	R-10	RESISTOR—1,000 ohm, ½ W. carbon	.70—5
RQ-1208	R-11, 12, 13	RESISTOR—8.2 ohm, ½ W. carbon	.70—5
RC-2056	B-1	CELL—5.0 V. bias cell assembly	.55
RL-568	L-1	BEAM-A-SCOPE—Loop antenna assembly (inside cover)	.90
RL-2055	L-2	COIL—Oscillator coil	.30
RL-367	L-5	CHOKE—B choke	.20
RL-366	L-6	CHOKE—Vibrator choke	.55
RL-567	L-7	BEAM-A-SCOPE—External loop antenna	.45
RL-365	L-8	CHOKE—Filament supply choke	.20
RS-3115	SW1	SWITCH—Power selector switch	.70
RT-4010	T-1	TRANSFORMER—Output transformer	.90
RT-0525	T-2	VIBRATOR—Vibrator power transformer	1.80
RT-0524	T-3	TRANSFORMER—50-60 cycle rectifier step-down transformer	1.20
RT-0527	T-3	TRANSFORMER—25 cycle rectifier step-down transformer	
RT-393	T-4	TRANSFORMER—1st I.F. transformer	.90
RT-392	T-5	TRANSFORMER—2nd I.F. transformer	.90
RV-204	V-1	VIBRATOR—Power supply synchronous vibrator	3.60
RR-802	X-1	RECTIFIER—Copper oxide rectifier	.25
RS-1066	Spkr	SPEAKER—PM speaker	4.60

MODEL LB-530

GENERAL ELECTRIC CO.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ..... 455 KC

R.F. ..... 1500 KC

The location of all trimmers is shown in Fig. 4.

I.F. Alignment

Connect an output meter across the voice coil. Turn volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to 1A7GT converter grid through .05 Mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment

Adjust the signal generator to 1750 KC and loosely couple a wire from the output terminal of the signal generator so that the receiver loop will pick up the signal. Set the gang condenser to minimum capacity and adjust the oscillator trimmer (C2A) to receive the signal. After this has been done set the signal generator to 1500 KC and tune the receiver until this signal is tuned in. Adjust the R.F. trimmer (1A) for maximum output. In case of bent plates in the condenser, set the signal generator and the receiver to 600 KC and bend plates into the position for maximum output.

Tubes

Converter-Oscillator	GE-1A7GT
1st I.F. Amplifier	GE-1N5GT
2nd I.F. Amplifier	GE-1N5GT
Detector & 1st Audio	GE-1H5GT
Power Output	GE-1Q5GT

SPECIFICATIONS

Physical Dimensions

Height	13 inches
Width	13 inches
Depth	4¾ inches
Weight (with Battery)	16 pounds

Special Service Information

The following service information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains

1A7GT grid to 1st IF grid	40 at 1,000 KC
1A7GT grid to 1st IF grid	57 at 455 KC
1st IF grid to 2nd IF grid	95 at 455 KC
2nd IF grid to 1H5GT diode plate	8.5 at 455 KC

(2) Audio Gain

0.08 volts, 400 cycle signal across volume control with control set at maximum, will give approximately 50 milliwatts speaker output.

(3) DC voltage developed across oscillator grid resistor (R2) averages 6.5 volts at 1,000 KC.

Variations of 20 per cent permissible. All readings obtained are with AVC shorted to chassis ground.

Electrical Rating

Charging from AC line:
110–125 volts AC. ..... 50–60 cycles ..... 6 watts
110–125 volts AC. ..... 25–60 cycles ..... 10 watts

Charging from storage battery (using LM-1 Charging Cable):
6.3 volts DC. ..... 1.4 amperes

Receiver power consumption:
2.1 volts DC. ..... 1.3 amperes ..... 2.7 watts

Receiver battery requirement:
Willard 2.0 volts No. 20-2 or equivalent rechargeable battery.

Fuse: G-E No. 2548 ¼-ampere rating.

Tuning Frequency Range

Broadcast Band ..... 550–1750 KC

Electrical Power Output

Maximum ..... 225 milliwatts

Loudspeaker—PM Dynamic

Cone Diameter ..... 5 inches
Voice Coil Impedance ..... 3.5 ohms (400 cycles)

GENERAL INFORMATION

Power Supply

All power necessary for the operation of the receiver is supplied by the 2-volt built-in rechargeable battery. The tube filaments are heated directly by the two volts from the battery while the necessary high voltage for the screen and plates of the tubes is furnished by a synchronous vibrator used in conjunction with a step-up power transformer and its associated filter circuit. The synchronous vibrator operates on the two volts from the battery.

Provision has been made to charge the battery directly from the house current without removing the battery from the receiver circuit. Two charging positions are provided on the four-position power selector switch. The "Charge" position of this switch allows the battery to be charged at the rate of approximately 1.35 amperes from the house current during the period that the receiver is not being operated. The "AC" position of the switch allows the receiver to be operated at the same time that the battery is being charged. Under this condition, however, it takes a considerably longer period for a partially discharged battery to be fully restored due to the fact that current is taken from the battery to operate the receiver.

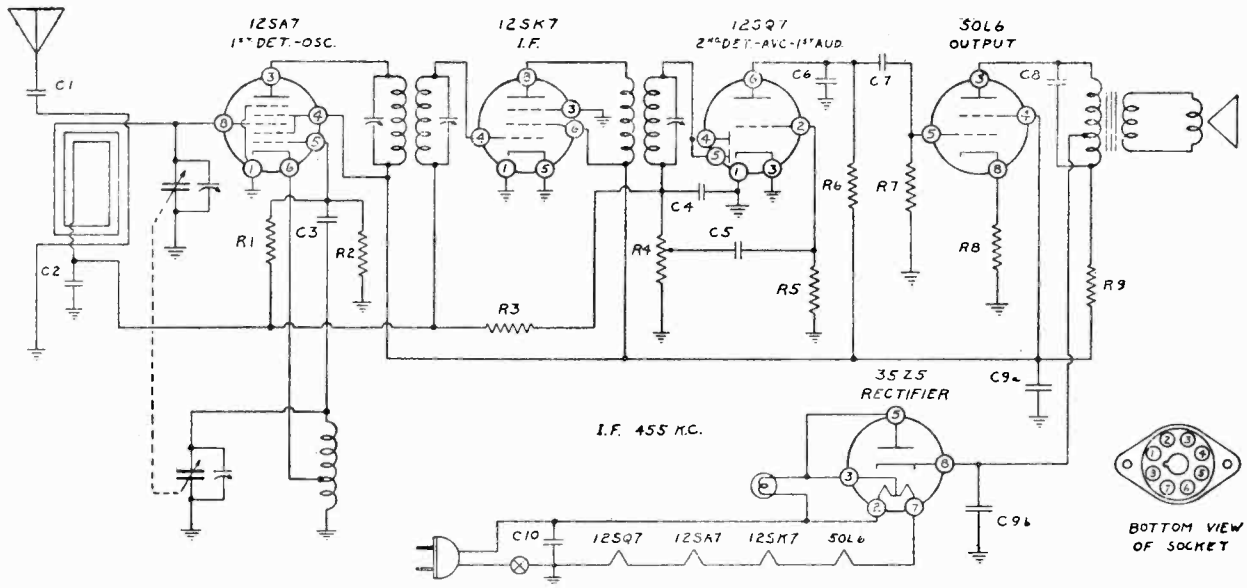
The battery charging unit consists of a step-down transformer which converts the house current to approximately 5.5 volts on 50–60 cycle models; on 25–60 cycle models the voltage is 6.6 volts. This low voltage is then applied to a copper oxide rectifier in a full wave rectifier circuit which supplies the battery with a DC charging current.

A charging cable, Stock LM-1, is available, which provides a convenient means of charging the radio battery from an automobile or 6-volt storage battery. The cable plug is inserted over the two prongs on the left side of the metal battery case and the plug and socket on the other end of the cable is provided with terminals for connection to a 6-volt supply. Full installation instructions are provided with each cable.

Before the receiver chassis can be removed from the cabinet, it is necessary to first remove the battery-vibrator case. The battery case is held in place by four screws available from the bottom of the cabinet. The radio chassis is held by two Phillips head screws located on the control panel. Fig. 3 shows the various connectors used to interconnect the units.

GENERAL ELECTRIC CO.

MODEL LCP-596



RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	10,000,000	¼	R6	250,000	¼
R2	25,000	¼	R7	500,000	¼
R3	2,000,000	¼	R8	150-10%	¼
R4	500,000	V.C.	R9	1,000	½
R5	5,000,000	¼			

CONDENSERS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)		Volts
C1	.001	600	C7	.01		400
C2	.05	200	C8	.02		400
C3	.00005	Mica	C9a	50.	Elect.	150
C4	.00025	Mica	C9b	30.	Elect.	150
C5	.005	600	C10	.05		400
C6	.0005	Mica				

Part No.	Part Name	Description	Price List
*RB-641R	Button	Snap button for back cover (Pkg. 6)	$ .10
*RB-642R	Button	Snap button for dial scale	.05
*RB-956R	Back	Cardboard back cover	.20
*RC-009	Capacitor	.001 Mfd., 600 V. paper (C-1)	.30
*RC-023	Capacitor	.005 Mfd., 600 V. paper (C-5)	.25
*RC-047	Capacitor	.01 Mfd., 400 V. paper (C-7)	.20
*RC-048	Capacitor	.02 Mfd., 600 V. paper (C-8)	.30
*RC-072	Capacitor	.05 Mfd., 200 V. paper (C-2)	.25
*RC-092	Capacitor	.05 Mfd., 600 V. paper (C-10)	.30
*RC-216	Capacitor	50 Mmf. Mica (C-3)	.25
*RC-259	Capacitor	250 Mmf. Mica (C-4)	.30
*RC-296	Capacitor	500 Mmf. Mica (C-6)	.25
RC-5184R	Capacitor	30 Mfd., 50 Mfd., 150 Volt Electrolytic (C-9A), (C-9B)	1.50
*RC-7046R	Condenser	2-gang tuning condenser	2.30
*RC-863	Cord	Power line cord	.65
RD-194R	Dial	Dial scale	.40
*RH-905R	Handle	Cabinet handle	.35
*RK-1013R	Knob	Control knob	.15
RL-562R	Antenna	Loop antenna assembly	1.75
RL-2051R	Coil	Oscillator coil	.40
RP-1015R	Pointer	Dial pointer	.15
*RQ-1239	Resistor	150-ohm, ½ W. carbon (R-8) (Pkg. 5)	.70
*RQ-1259	Resistor	1,000-ohm, ½ W. carbon (R-9) (Pkg. 5)	.70
*RQ-1292	Resistor	25,000-ohm, ½ W. carbon (R-2) (Pkg. 5)	.70
*RQ-1317	Resistor	250,000-ohm, ½ W. carbon (R-6) (Pkg. 5)	.70
*RQ-1324	Resistor	500,000-ohm, ½ W. carbon (R-7) (Pkg. 5)	.70
*RQ-1339	Resistor	2.0 megohm, ½ W. carbon (R-3) (Pkg. 5)	.70
*RQ-1348	Resistor	5.0 megohm, ½ W. carbon (R-5) (Pkg. 5)	.70
*RQ-1355	Resistor	10.0 megohm, ½ W. carbon (R-1) (Pkg. 5)	.70
*RS-299R	Socket	Pilot lamp socket	.30
*RS-488R	Spring	Dial drive cord spring	.05
RS-1062R	Speaker	5" PM speaker	3.20
RT-4007R	Transformer	Output transformer	1.00
*RS-252	Socket	Tube socket	.15
*RS-8018R	Screws	Chassis mounting screws (Pkg. 6)	.10
*RS-9020R	Shaft	Drive Shaft	.10
*RT-380R	Transformer	1st I. F. transformer	1.15
*RT-381R	Transformer	2nd I. F. transformer	.80
*RV-113R	Volume Control	0.5 megohm volume control (R-4)	.95
RW-058R	Window	Dial window	.35
*RW-129R	Washer	Horseshoe drive shaft washer	.05
RW-132R	Washer	Spring drive shaft washer	.05
RZ-203R	Cabinet	Model LCP-596 cabinet	4.20

* Used on previous receivers.

(PRICES SUBJECT TO CHANGE WITHOUT NOTICE)

General Data

The alignment of this receiver requires the use of a signal generator that will cover the frequencies of 455, 600, 1400 and 1730 K.C., and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the signal generator output as low as possible, to prevent the AVC from operating and giving false readings.

I.F. Alignment

Adjust the signal generator to 455 K.C. and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mfd. condenser. Connect ground of signal generator to chassis ground through a .1 mfd. condenser. Align all I.F. trimmers to peak or maximum reading on the output meter.

Broadcast Band Alignment

Adjust the signal generator to 1730 K.C. and connect the output to the antenna lead, through a .0002 mfd. mica condenser. Set the gang condenser to minimum capacity and adjust the oscillator trimmer to receive this signal. After this has been carefully done, the next step is to set the signal generator to 1400 K.C. and after tuning in the signal adjust the B.C. antenna trimmer to peak. In case of bent plates, set the signal generator and the receiver to 600 K.C. and bend the plates into the position for maximum output.

Voltages—Line 117 Volts AC—Power Consumption 30 Watts. Volume Control maximum. Meter 1000 ohms per volt, 150 volt scale.

Plate (3) of 12SA7 tube to common ground..... 93 volts
Screen (4) of 12SA7 tube to common ground..... 95 volts
Plate (8) of 12SK7 tube to common ground..... 93 volts
Screen (6) of 12SK7 tube to common ground..... 95 volts
Plate (3) of 50L6 tube to common ground.....118 volts
Screen (4) of 50L6 tube to common ground..... 95 volts
Cathode (8) of 50L6 tube to common ground..... 5.5 volts
Cathode (8) of 35Z5 tube to common ground....122 volts

Speaker—5" PM Type
Voice coil impedance at 400 cycles..... 3.8 ohms

Oscillator Coil

Looking at the connection end in a clockwise direction starting at the chassis the terminals are No. 1, end of winding; No. 2, start of winding; No. 3, tap.
No. 2 and No. 1—Resistance 4.9 ohms.
No. 3 and No. 1—Resistance 4.3 ohms.

First I.F. Transformer

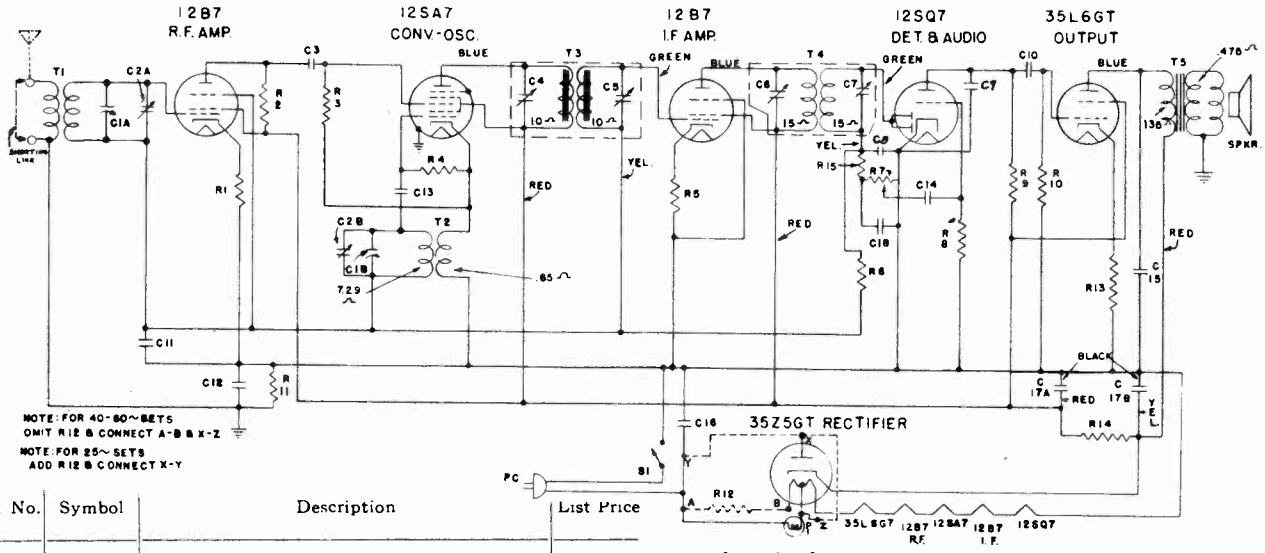
Primary—Blue, plate, red, B+—Resistance 20.4 ohms.
Secondary—White, grid; Black, AVC—Resistance 20.3 ohms.

Second I.F. Transformer

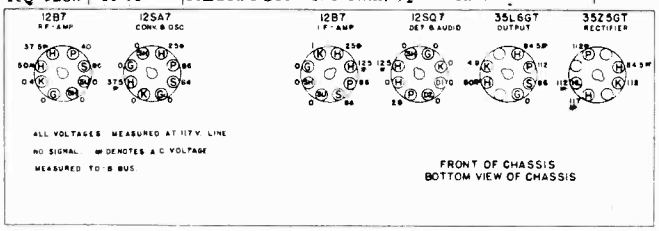
Primary—Blue, plate; red B+—Resistance 22.2 ohms.
Secondary—White, diode; Black, AVC—Resistance 22.1 ohms.

MODELS L-600, L-601, L-610, L-611

GENERAL ELECTRIC CO.



Stock No.	Symbol	Description	List Price
*RC-7049	C-1a, 1b, 2a, 2b	CONDENSER—Tuning condenser	$1.70
*RC-235	C-3	CAPACITOR—100 Mmf., mica	.25
*RC-242	C-8	CAPACITOR—150 Mmf., mica	.25
*RC-274	C-9	CAPACITOR—330 Mmf., mica	.30
*RC-039	C-10	CAPACITOR—.01 Mfd., 600 V. paper	.25
*RC-072	C-11	CAPACITOR—.05 Mfd., 200 V. paper	.25
*RC-104	C-12	CAPACITOR—0.1 Mfd., 600 V. paper	.30
*RC-216	C-13	CAPACITOR—47 Mmf., mica	.25
*RC-023	C-14	CAPACITOR—.005 Mfd., 600 V. paper	.25
*RC-048	C-15	CAPACITOR—.02 Mfd., 600 V. paper	.25
*RC-092	C-16	CAPACITOR—.05 Mfd., 600 V. paper	.30
*RC-5183	C-17a, 17b	CAPACITOR—50 Mfd., 60 Mfd., electrolytic	.80
*RC-235	C-18	CAPACITOR—100 Mmf., mica	.25
*RQ-1227	R-1	RESISTOR—47 ohm, ½ W. carbon	.70—5
*RQ-1275	R-2	RESISTOR—4700 ohm, ½ W. carbon	.70—5
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½ W. carbon	.70—5
*RQ-1295	R-4	RESISTOR—33,000 ohm, ½ W. carbon	.70—5
*RQ-1235	R-5	RESISTOR—100 ohm, ½ W. carbon	.70—5
*RQ-1339	R-6	RESISTOR—2.2 megohm, ½ W. carbon	.70—5
*RV-120	R-7, S-1	VOLUME CONTROL—0.5 megohm, combined with power switch	1.45
*RQ-1349	R-8	RESISTOR—5.6 megohm, ½ W. carbon	.70—5
*RQ-1323	R-9, 10, 11	RESISTOR—470,000 ohm, ½ W. carbon	.70—5
*RQ-1213	R-12	RESISTOR—12 ohm, ½ W. carbon	.70—5
*RQ-1239	R-13	RESISTOR—150 ohm, ½ W. carbon	.70—5
*RQ-651	R-14	RESISTOR—1000 ohm, 2 W. carbon	.20
*RQ-1299	R-15	RESISTOR—47,000 ohm, ½ W. carbon	.70—5
*RQ-1255	R-16	RESISTOR—680 ohm, ½ W. carbon	.70—5



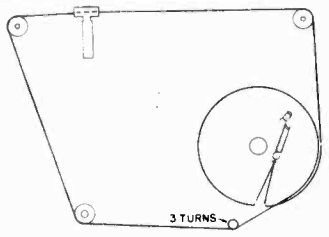
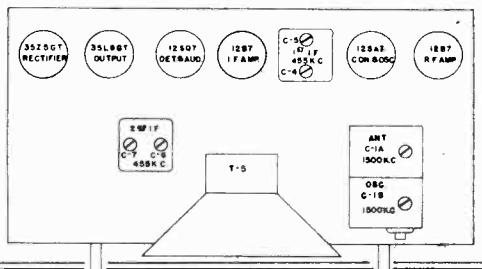


Fig. 1. Dial Stringing Diagram



Electrical Power Output (117 line volts)

Undistorted. . . . . 1.0 watts
Maximum . . . . . 1.5 watts

ALIGNMENT PROCEDURE

Alignment Frequencies

RF . . . . . 1500 KC
IF . . . . . 455 KC

The chassis must be removed from the cabinet to make the following alignment. The location of all trimmers is shown in Fig. 2.

IF Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the 12SA7 converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st IF transformers.

RF Alignment

When making the following alignment the loop antenna must be bolted to the chassis by the screw and spacer mounting. The RF signal should be capacity coupled to the receiver loop by placing a two-foot piece of wire for an antenna on the test oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed in close proximity to the loop when making this alignment.

With the gang condenser plates completely closed, the pointer should line up with the first mark on the left of the scale. Set the signal generator to 1500 KC. Align (C-1b) to the signal while the pointer is on the 1500 KC mark. Peak (C-1a) for maximum output.

Special Service Information

The following information will be very useful to servicemen equipped with vacuum tube voltmeters or similar voltage measuring instruments.

(1) Stage Gains
Antenna post to RF grid—3.8 at 1000 KC
RF grid to converter grid—6.0 at 1000 KC
Converter grid to IF grid—46 at 455 KC
IF grid to 12SQ7 diode plate—75 at 455 KC

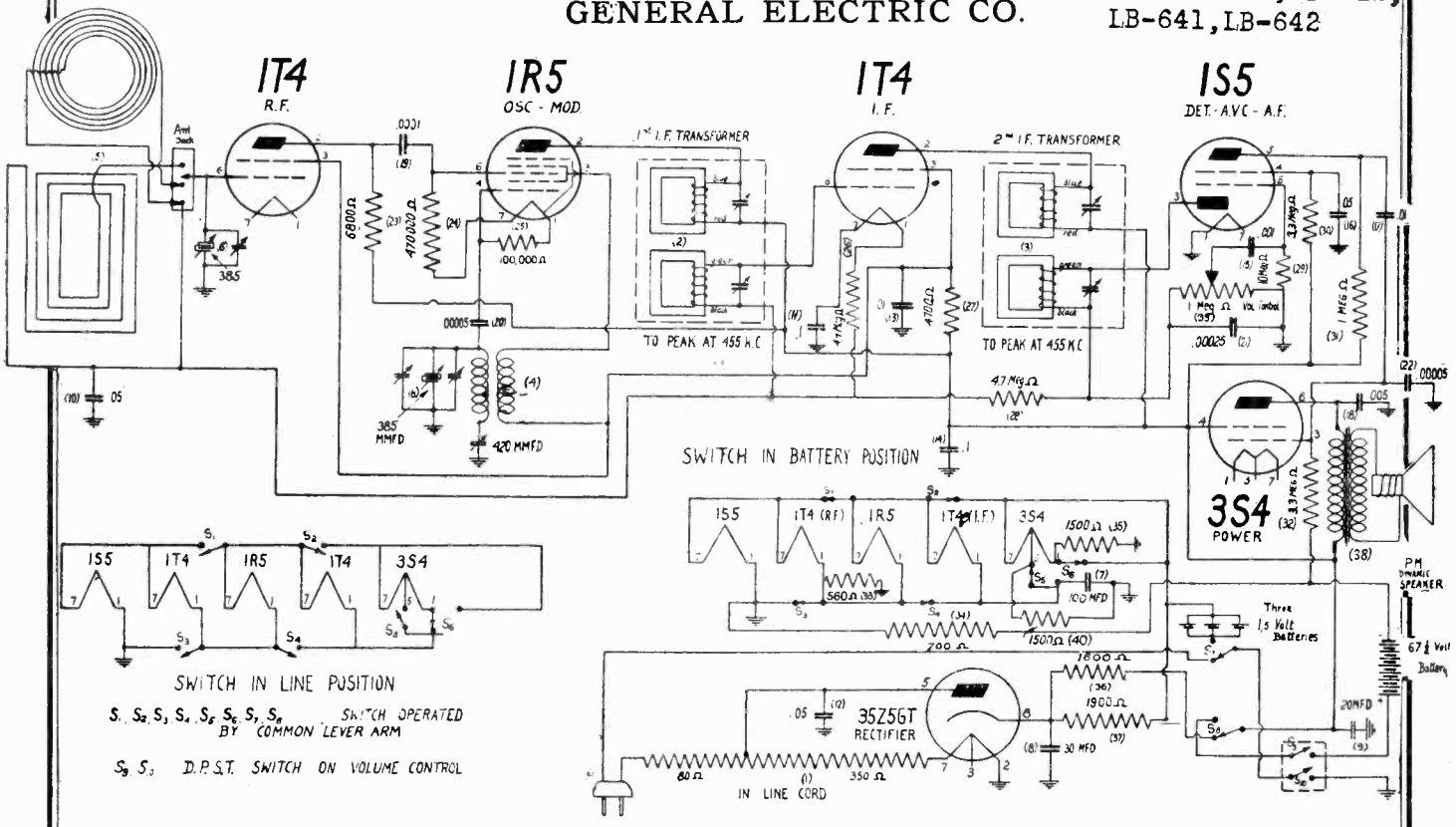
(2) Audio Gain
.14 volts, 400 cycles signal across volume control with control set at maximum, will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor (R4) averages 10.0 volts at 1000 KC.
Variations of ±20% permissible. All readings obtained with enough signal input to give ½-watt speaker output.

(PRICES SUBJECT TO CHANGE WITHOUT NOTICE)

GENERAL ELECTRIC CO.

MODELS LB-603, IB-612, LB-641, LB-642



SERVICE NOTES

Battery Specifications ..... Three Eveready No. 950, Burgess No. 2 or equivalent. One Eveready No. 467 Burgess No. XX45 or equivalent.

Intermediate Frequency	455 K.C.
Tuning Frequency range	540-1700 K.C.
Maximum Power Output	150 Milliwatts
Loud Speaker	Cone Diameter-4 inches
Voice Coil Impedance	(400 cycles) 3½ ohms

Tubes: R. F. 1T4, Converter-Oscillator 1R5, I. F. 1T4, Detector, A. V. C. 1S5, Power Output 3S4, Rectifier 35Z5GT

ALIGNMENT PROCEDURE

Alignment Frequencies R. F. ..... 600-1500-1700 K. C.
I. F. ..... 455 K. C.

I. F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 kilocycles and apply signal to control grid of 1T4 R. F. tube through a .05 mfd. capacitor. Align the second I. F. transformer trimmers, next adjust the first I. F. trimmers. Keep the test output to a level that will give a good meter reading.

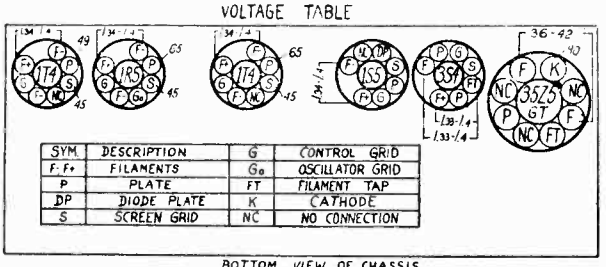
R. F. Alignment

Place a one turn loop not closer than six inches from the receiver Beam-a-Scope which is located in the front cover. Apply a 1700 kilocycles signal to the coupling loop. Adjust the receiver to 1700 kilocycles by turning the variable condenser until it is in the extreme clockwise position. Align the oscillator trimmer (C-1A). Set the signal generator to 1500 kilocycles. Turn the receiver tuning condenser until the generator signal is picked up. Peak (C-1B) for maximum output. Change the test signal to 600 kilocycles and turn the condenser until signal is heard. Peak (C-2) while rocking the gang variable.

The Beam-a-Scope leads should be dressed the same after the components are mounted in the cabinet as during alignment.

2. The batteries are easily installed or replaced. When the back of the cabinet is opened, the battery compartment is accessible. Place the dry cell batteries on the right side with brass terminal toward the outside. Snap the red lead terminal to the positive (+) terminal of the "B" battery. The blue lead should be snapped to the negative (-) terminal. Place the "B" battery on the left side of the compartment with the terminals toward the center. The sketch inside the cabinet will be found an aid in connecting the batteries properly.

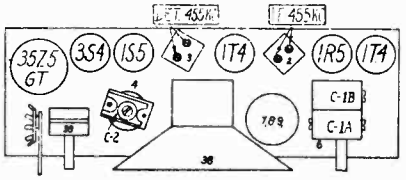
VOLTAGE TABLE

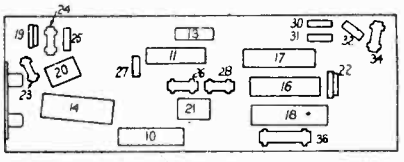


SYM	DESCRIPTION	G	CONTROL GRID
F, F+	FILAMENTS	G0	OSCILLATOR GRID
P	PLATE	FT	FILAMENT TAP
DP	DIODE PLATE	K	CATHODE
S	SCREEN GRID	NC	NO CONNECTION

BOTTOM VIEW OF CHASSIS

ALL FILAMENT VOLTAGES MEASURED ACROSS SOCKET TERMINALS, OTHER VOLTAGES MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 1000 Ω PER VOLT VOLTMETER



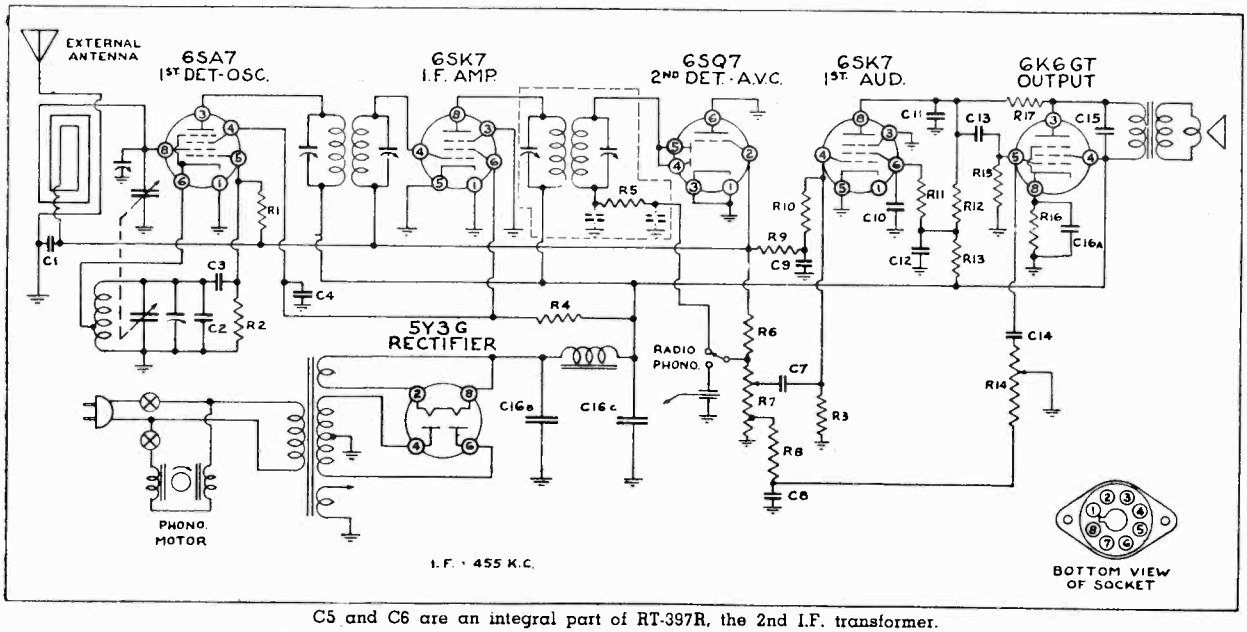


BOTTOM VIEW OF CHASSIS

PARTS 12 15 29 33 35 40 LOCATED ON TOP OF CHASSIS

MODEL LC-608

GENERAL ELECTRIC CO.



C5 and C6 are an integral part of RT-397R, the 2nd I.F. transformer.

No.	Ohms	Watts	No.	Ohms	Watts
R1	10,000,000	½	R10	5,000,000	½
R2	20,000	½	R11	1,000,000	½
R3	5,000,000	½	R12	250,000	½
R4	15,000—10%	2	R13	50,000	½
R5	70,000	½	R14	500,000	T.C.
R6	2,000,000	½	R15	500,000	½
R7	500,000	V.C.	R16	600—10%	½
R8	20,000	½	R17	3,000,000	½
R9	1,000,000	½			

RESISTORS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)	Volts
C1	.05	200	C10	.05	400
C2	.000025—10%	Mica	C11	.00025	Mica
C3	.00005	Mica	C12	.1	400
C4	.05	400	C13	.01	400
C5	.0001	Mica	C14	.005	600
C6	.0001	Mica	C15	.002	600
C7	.01	400	C16a	20.	25
C8	.02	200	C16b	20.	350
C9	.05	200	C16c	20.	350

CONDENSERS

ALIGNMENT DATA

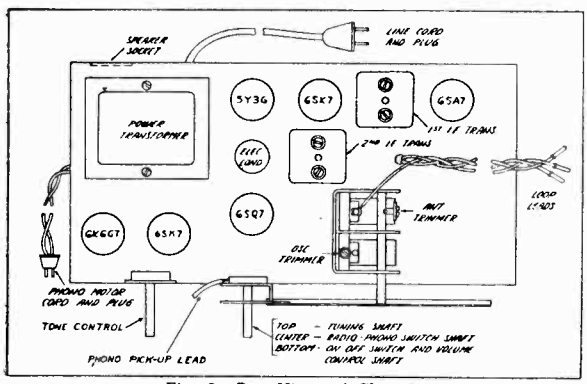


Fig. 2—Top View of Chassis

For Radio Products RC-50 Record Changer see Riders "Automatic Record Changers and Recorders."

The alignment of this receiver requires the use of a signal generator that will cover the frequencies of 455, 600, 1400 and 1630 kc., and an output meter to be connected across the primary or secondary of the output transformer. All alignments should be made with the volume control in the maximum position, to prevent the AVC from operating and giving false readings.

I.F. ALIGNMENT

Adjust the signal generator to 455KC and connect the output to the grid of the first detector tube (6SA7) through a .05 or .1 mfd. condenser. Align all I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Adjust the signal generator to 1630 KC. and connect the output to a shielded loop radiator and place this loop about two feet from the loop antenna. If no loop radiator is available the output of the signal generator should be connected to the blue lead extending from the loop antenna through a .0002 mfd. mica condenser. Set the gang condenser to minimum capacity and adjust the oscillator trimmer (See Fig. 2) to receive this signal. After this has been carefully done, the next step is to set the signal generator to 1400 K.C. and after tuning in the signal adjust the antenna trimmer to peak. This is all that is necessary for the alignment unless the plates of the gang condenser have been bent out of shape. In case of bent plates, set the signal generator and the receiver to 600 K.C. and bend the plates into the position for maximum sensitivity over the tuning range.

SERVICE INFORMATION

Speaker (RS-1068R) 6½" P.M. Type.
D.C. voice coil resistance.....2.8 ohms
Voice coil impedance at 400 cycles.....3.1 ohms
Oscillator Coil (RL-2058R)
Looking at the connection end in a clockwise direction starting at the chassis the terminals are: No. 1, end of winding; No. 2, start of winding; No. 3, tap.
No. 1 and No. 2—Resistance.....4.5 ohms
No. 1 and No. 3—Resistance.....4.05 ohms
No. 2 and No. 3—Resistance.....45 ohm

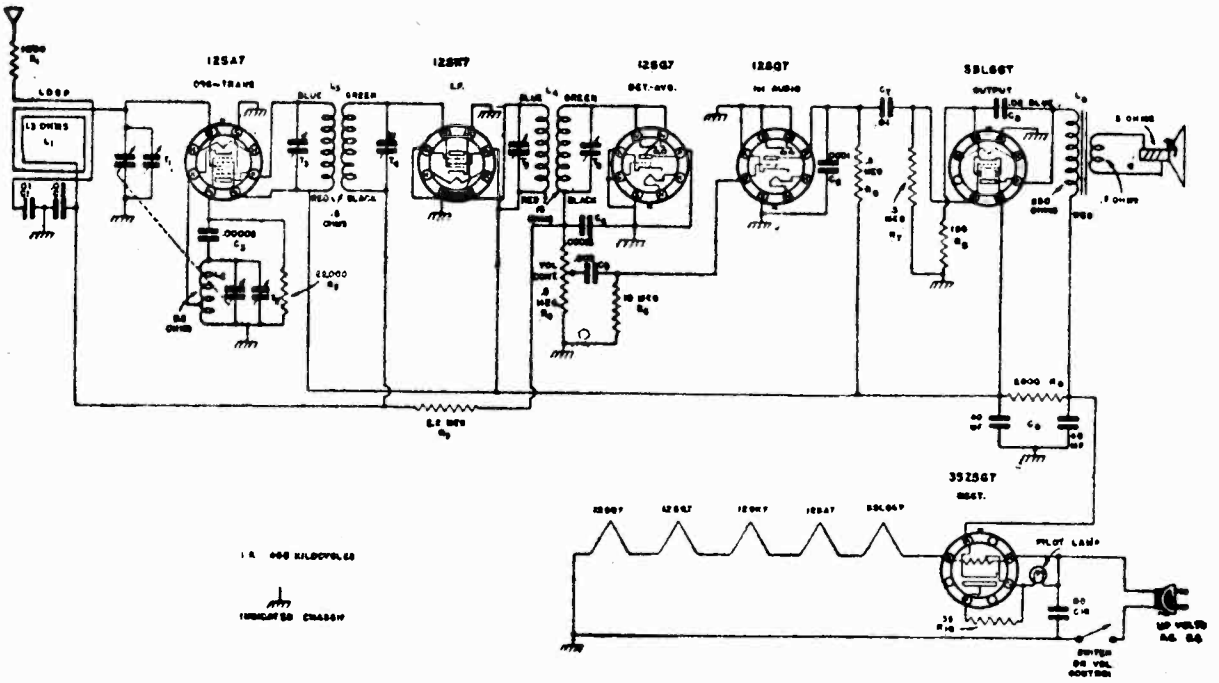
First I.F. Transformer (RT-396R)
Primary—Blue, plate; red, B+
Resistance.....18.2 ohms
Secondary—White, grid; black, AVC
Resistance.....15.1 ohms
Second I.F. Transformer (RT-397R)
Primary—Blue, plate; red, B+
Resistance.....20.8 ohms
Secondary—White, diode; black, AVC
Resistance.....17.4 ohms

VOLTAGE CHART

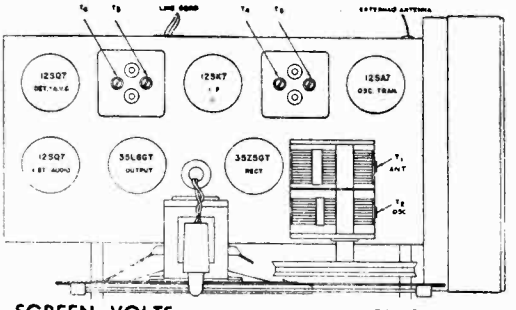
All voltages measured with a 1,000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in. Power consumption 75 watts.

6SA7 TUBE	Volts
Plate (3) to ground	255
Screen (4) to ground	93
6SK7 (I. F.) TUBE	**Volts**
Plate (8) to ground	255
Screen (6) to ground	93
6K6G TUBE	
Plate (3) to ground	240
Screen (4) to ground	258
Cathode (8) to ground	18
5Y3G TUBE	
Filament (8) to ground	266

GENERAL ELECTRIC CO.



Intermediate Frequency	455 K.C.
Tuning Frequency Range	540-1720 K.C.
Audio, Power Output (Beam Power)	1.7 Watts
P. M. Speaker	Cone Diameter—4 Inches
Voice Coil Impedance (400 cycles)	3.5 Ohms



OPERATING VOLTAGES (Approximately)

(Measured with respect to chassis at 117 Volt Line)

TUBES		SCREEN VOLTS	PLATE VOLTS
12SA7	Converter Oscillator	75	75
12SK7	I-F	75	75
12SQ7	Detector - A. V. C.	—	—
12SQ7	1st Audio	—	30*
35L6GT	Output	75	108
35Z5GT	Rectifier	Voltage at Anode .115	

*300 Volt Range of 1000 Ohm-per-Volt Meter

ALIGNMENT PROCEDURE

Alignment Frequencies:

I. F.	455 K.C.
R. F.	1500 K.C.

I. F. Alignment

Connect an output meter across the voice coil. Rotate the volume to maximum. Set test oscillator to 455 K.C. and apply signal to lug on stator of gang condenser to which loop is connected through a .05 Mfd. capacitor. Align the second I. F. transformer trimmers, next adjust the first I. F. transformer trimmers. Keep test oscillator output as low as a readable meter reading will permit.

R. F. Alignment

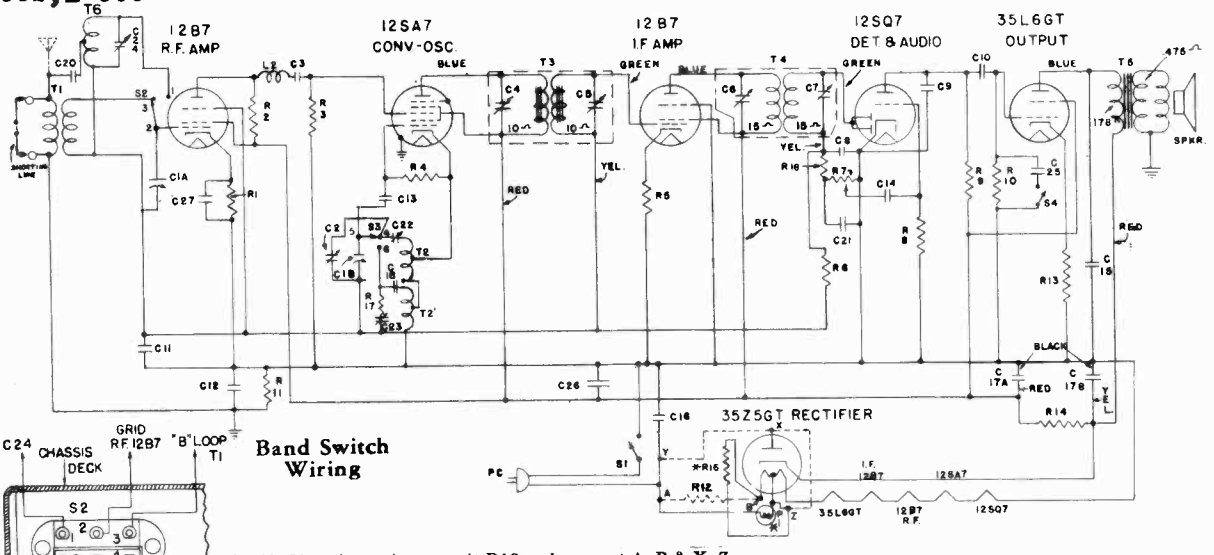
Set the dial pointer and generator at 1500 K.C. Run a wire from the output terminal of the generator, having it come near the receiver. However, no metallic connection is made between the signal generator and the receiver.

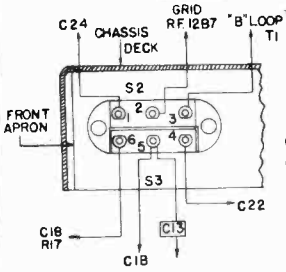
Peak the oscillator trimmer for maximum output and then the antenna trimmer.

If the variable condenser plates have become bent or damaged, it may be necessary to adjust them for tracking, at 600 K.C. The oscillator plates are adjusted first, then the antenna plates are adjusted for maximum output at 600 K.C.

MODELS L-613, L-621, L-624, L-632, L-633

GENERAL ELECTRIC CO.





Band Switch Wiring

On 40–60 cycle receivers, omit R12 and connect A–B & X–Z.
On 25-cycle receivers, add R12 and connect X–Y.
R16 used only when No. 47 pilot lamp is used.

IF PEAK 455 KC

ALIGNMENT CHART

Step	Connect Test-Osc. to	Test-Osc. Setting	Pointer Setting	Adjust Trimmers for Max. Output
1	12B7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C6 & C7
2	6SA7 Conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C4 & C5
3	Capacity Coupled	580 KC	"BC" Band 580 KC	C22**
4	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C2** (Osc.)
5	REPEAT STEP 3			
6	Capacity Coupled	18 MC	"SW" Band 18 MC	C23* (Osc.)
7	Capacity Coupled	18 MC	"SW" Band 18 MC	C24** (Ant.)

* Use minimum capacity peak.
** Rock gang condenser when making alignment.

Special Service Information

(1) Stage gains

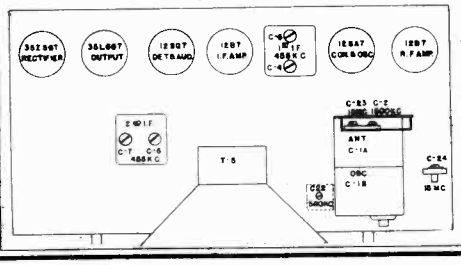
Antenna post to RF grid—3.0 at 1000 KC
RF grid to converter grid—6.0 at 1000 KC
Converter grid to IF grid—50 at 455 KC
IF grid to 12SQ7 diode plate—75 at 455 KC

(2) Audio gains

.14 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor (R4) averages 9.0 volts at 1000 KC or 8.0 volts at 10,000 KC.

* Variations of ±20% permissible. All readings obtained with enough signal input to give ½-watt speaker output.



PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Electrical Power Output (117 line volts)

Undistorted . . . . . 1.1 watts
Maximum . . . . . 1.6 watts

Loud-speaker—PM Dynamic

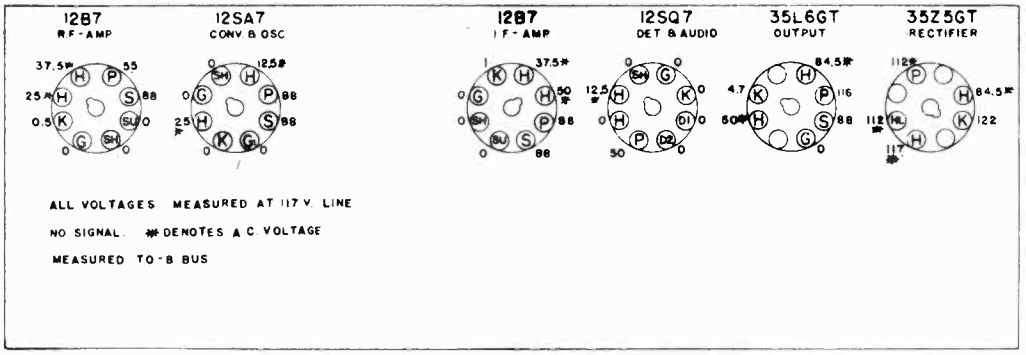
Outside Cone Diameter . . . . . 5 inches
Voice Coil Impedance (400 cycles) . . . 3.5 ohms

REPLACEMENT PARTS LIST

Stock No.	Symbol	Description	List Price
*RC-7050	C1a, 1b	CONDENSER—Tuning condenser	$1.95
*RC-6547	C2	CAPACITOR—"BC" and "SW" Osc. trimmer assembly	.30
*RC-235	C3	CAPACITOR—100 mmf., mica	.25
*RC-274	C8	CAPACITOR—330 mmf., mica	.30
*RC-242	C9	CAPACITOR—150 mmf., mica	.25
*RC-039	C10	CAPACITOR—.01 mfd., 600 V paper	.25
*RC-072	C11	CAPACITOR—.05 mfd. 200 V paper	.25
*RC-104	C12	CAPACITOR—0.1 mfd. 600 V paper	.30
*RC-216	C13	CAPACITOR—47 mmf. mica	.25
*RC-023	C14	CAPACITOR—.005 mfd. 600 V paper	.25
*RC-039	C15	CAPACITOR—.01 mfd. 600 V. paper	.25
*RC-092	C16	CAPACITOR—.05 mfd. 600 V. paper	.30
*RC-5183	C17a, 17b	CAPACITOR—50 mfd. 60 mfd. 150 V. Electrolytic	.80
*RC-391	C18	CAPACITOR—4300 mmf. mica	.35
*RC-209	C20	CAPACITOR—39 mmf. mica	.25
*RC-235	C21	CAPACITOR—100 mmf. mica	.25
*RC-6548	C22	CAPACITOR—"B" padder	.35
*RC-6547	C23	CAPACITOR—"SW" and "BC" Osc. Trimmer Assembly	.30
*RC-6546	C24	CAPACITOR—"SW" band ant. trimmer	.20
*RC-053	C25	CAPACITOR—.0032 mfd 600 V. paper	.25
*RC-039	C-26, 27	CAPACITOR—.01 mfd. 600-V paper	.25
*RQ-1227	R-1	RESISTOR—47 ohm, ½-W. carbon	.70–5
*RQ-1275	R-2	RESISTOR—4700 ohm, ½-W carbon	.70–5
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½-W carbon	.70–5
*RQ-1295	R-4	RESISTOR—33,000 ohm, ½-W carbon	.70–5
*RQ-1235	R-5	RESISTOR—100 ohm, ½-W carbon	.70–5
*RQ-1339	R-6	RESISTOR—2.2 megohm, ½-W carbon	.70–5
*RV-120	R-7, S-1	VOL. CONTROL—0.5 megohm with power switch (Models L-621, 624, 632, 633)	1.45
RV-131	R-7, S-1	VOL. CONTROL—0.5 megohm with power switch (Model L-613 only)	1.45
*RQ-1349	R-8	RESISTOR—5.6 megohm, ½-W. carbon	.70–5
*RQ-1315	R-9	RESISTOR—220,000 ohm, ½-W carbon	.70–5
*RQ-1323	R-10, 11	RESISTOR—470,000 ohm ½-W carbon	.70–5
*RQ-1213	R-12	RESISTOR—12 ohm, ½-W. carbon	.70–5
*RQ-1239	R-13	RESISTOR—150 ohm, ½-W. carbon	.70–5
*RQ-651	R-14	RESISTOR—1000 ohm, 2-W. carbon	.20
*RQ-1255	R-16	RESISTOR—680 ohm, ½-W. carbon	.70–5
*RQ-1231	R-17	RESISTOR—68 ohm, ½-W. carbon	.70–5
*RQ-1299	R-18	RESISTOR—47,000 ohm, ½-W. carbon	.70–5
*RL-1012	L-2	COIL—R.F. Choke coil	.20

MODEL LC-619

GENERAL ELECTRIC CO. MODELS L-613, L-621, L-624, L-632, L-633



FRONT OF CHASSIS
BOTTOM VIEW OF CHASSIS

G.E. Models L-613, L-621, L-624, L-632, L-633.

GENERAL INFORMATION

Two different types of record changers were used during the production of the Model LC-619 phonograph combination.

The Model LRP-170 record changer is identified by the single record post and the eccentric turntable spindle, whereas the LRP-162 changers make use of a two-post record holder. Different pickup compensation is used for the two changers as noted at the bottom of the schematic diagram and the change in value of resistors, R12 and R16, as given in the replacement parts list.

Special Service Information

The following data are taken with a vacuum tube voltmeter or similar voltage measuring device.

(1) Stage Gains

Antenna Post to RF Grid	5 at 1000 KC
RF Grid to Converter Grid	5 at 1000 KC

(2) Audio Gains
.14 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

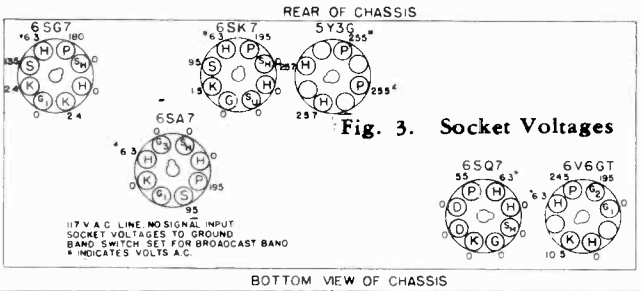
(3) DC voltage developed across oscillator grid resistor R4 averages 10 volts at 1000 KC or 8.0 volts at 10,000 KC.

Variations of ±20% permissible. All readings taken with AVC shorted out.

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 4. All oscillator and RF trimmers are accessible through a slot through the back cover of the cabinet.

The alignment procedure is given in table form. All IF alignments may be made with the chassis removed from the cabinet. However, the RF alignments are made with the chassis and loop antennas securely fastened in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects it. The RF signal should be capacity coupled by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet.



BOTTOM VIEW OF CHASSIS

Fig. 3. Socket Voltages

Model LC 619 ALIGNMENT CHART

Step	Connect Test-Osc. to	Test-Osc. Setting	Pointer Setting	Adjust Trimmers for Maximum Output
1	6SK7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C6 & C7
2	6SA7 Conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C4 & C5
3	Repeat Step 1			
4	Capacity Coupled	580 KC	"BC" Band 580 KC	C22**
5	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C2** (Osc.)
6	Repeat Step 4			
7	Capacity Coupled	18 MC	"SW" Band 18 MC	C23* (Osc.)
8	Capacity Coupled	18 MC	"SW" Band 18 MC	C24** (Ant.)

* Use minimum capacity peak.
** Rock gang condenser when making alignment.

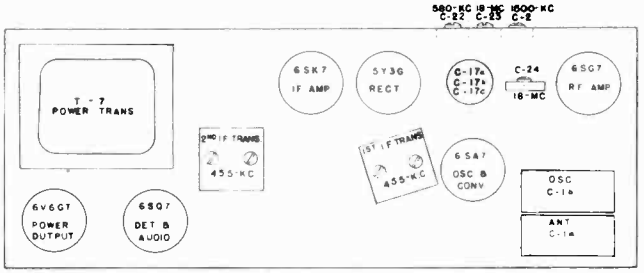


Fig. 4. Trimmer Location

Electrical Rating

Rating "A6"—110-125 volts, 60 cycles, 80 watts.
Rating "A5"—110-125 volts, 50 cycles, 80 watts.

Tuning Frequency Range

"BC" Band	540–1720 KC
"SW" Band	5.3–18.0 MC

Intermediate Frequency ..... 455 KC

Electrical Power Output

Undistorted	2.5 watts
Maximum	4.5 watts

Loud-speaker—PM Dynamic

Outside Cone diameter	12 inches
Voice Coil Impedance (400 cycles)	3.5 ohms

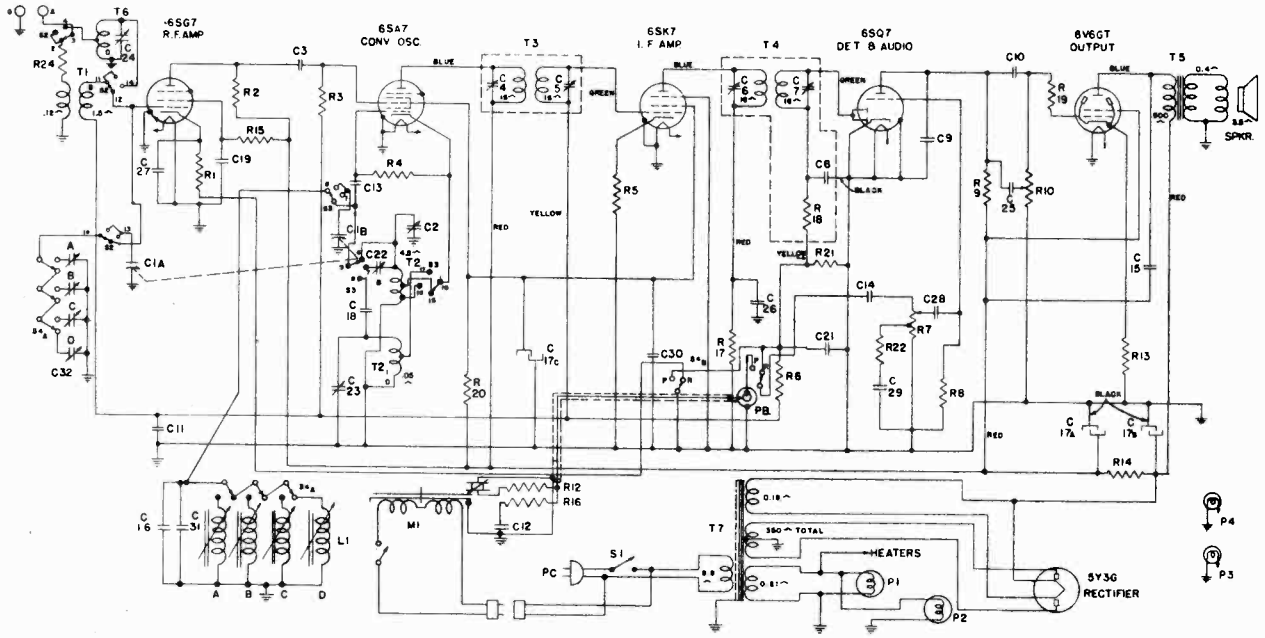
Phonograph Mechanism

Type changer	Models LRP-162 or LRP-170
Type pickup	Crystal
Turntable speed	78 Rpm

MODEL LC-619

GENERAL ELECTRIC CO.

For Modified General Industries 201 Record Changer or RCA RP-162 Record Changer see Riders "Automatic Record Changers, and Recorders.



NOTE—C12 IS OMITTED WHEN RECORD CHANGER RP-162 IS USED IF PEAK 455 KC

Fig. 1. Schematic Diagram

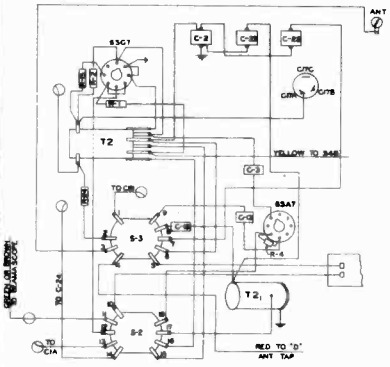


Fig. 2.

Switch Wiring

RADIO REPLACEMENT PARTS LIST

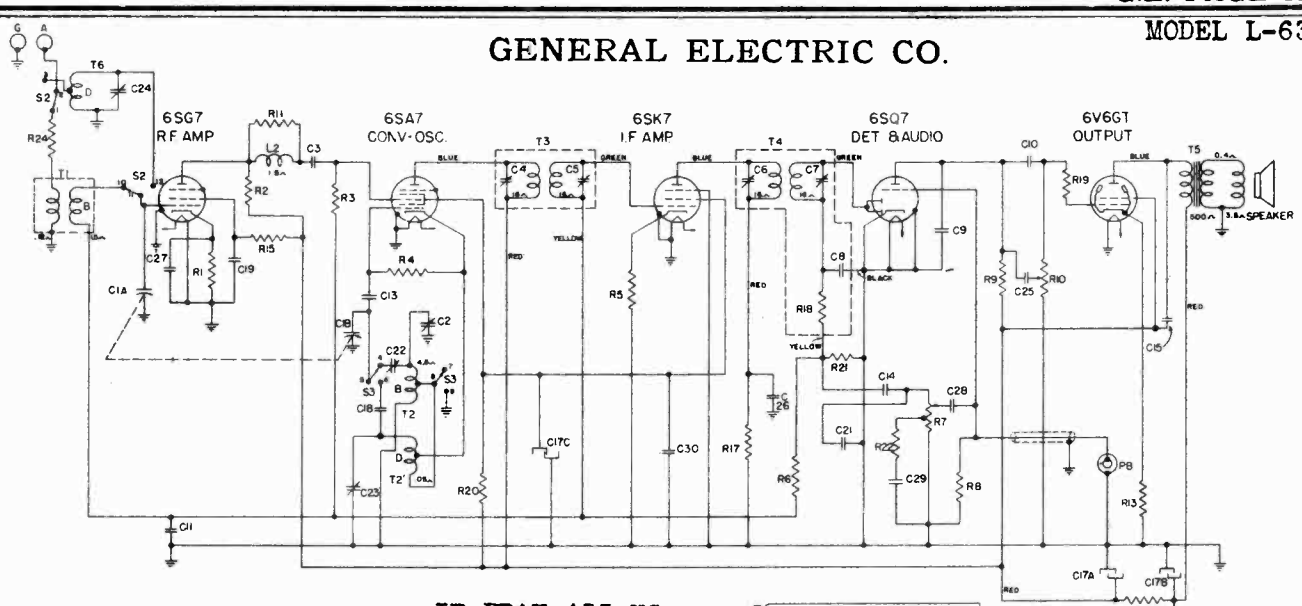
Our Cat. Number	Symbol	Description	List Price
*RC-7061	C1a, C1b	CONDENSER—2 gang tuning condenser	$2.00
*RC-6552	C-2	CAPACITOR—"B" band trimmer (Part of C22, 23)	.55
*RC-235	C-3	CAPACITOR—100 mmf., mica	.25
*RC-252	C-8	CAPACITOR—200 mmf., mica	.30
*RC-242	C-9	CAPACITOR—150 mmf., mica	.25
*RC-048	C-10	CAPACITOR—.02 mfd. 600-V paper	.30
*RC-072	C-11	CAPACITOR—.05 mfd. 200-V paper	.25
*RC-011	C-12	CAPACITOR—.002 mfd. 600-V paper (Used with Model LRP-170 record player only)	.25
*RC-216	C-13	CAPACITOR—47 mmf., mica	.25
*RC-023	C-14	CAPACITOR—.005 mfd. 600-V paper	.25
*RC-055	C-15	CAPACITOR—.003 mfd. 600-V paper	.25
*RC-329	C-16	CAPACITOR—150 mmf., compensating capacitor	.25
*RC-5201	C-17a	CAPACITOR—30 mfd. 250-V dry electrolytic	.95
	C-17b	CAPACITOR—30 mfd. 300 volt dry electrolytic	
	C-17c	CAPACITOR—10 mfd. 250 volt dry electrolytic	
*RC-390	C-18	CAPACITOR—3900 mmf. mica	.35
*RC-039	C-19	CAPACITOR—.01 mfd. 600-V paper	.25
*RC-235	C-21	CAPACITOR—100 mmf., mica	.25
*RC-6552	C-22	CAPACITOR—"B" padder (Part of C2, 23)	.55
*RC-6552	C-23	CAPACITOR—"D" Osc. trimmer (Part of C2, 22)	.55
*RC-6553	C-24	CAPACITOR—"D" antenna trimmer	$0.25
*RC-023	C-25	CAPACITOR—.005 mfd. 600-V paper	.25
*RC-039	C-26, 27, 28	CAPACITOR—.01 mfd. 600-V paper	.25
*RC-049	C-29	CAPACITOR—.0042 mfd. 600-V paper	.35
*RC-039	C-30	CAPACITOR—.01 mfd. 600-V paper	.25
*RC-305	C-31	CAPACITOR—600 mmf., silvered mica	.25
*RT-885	C-32a, b, c, d	TRIMMER STRIP—Push button trimmer strip	.70
*RQ-1247	R-1	RESISTOR—330 ohm, ½-W carbon	.70-5
*RQ-1271	R-2	RESISTOR—3300 ohm, ½-W carbon	.70-5
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1291	R-4	RESISTOR—22,000 ohm, ½-W carbon	.70-5
*RQ-1239	R-5	RESISTOR—150 ohm, ½-W carbon	.70-5
*RQ-1339	R-6	RESISTOR—2.2 megohm, ½-W carbon	.70-5
*RV-135	R-7	VOL. CONTROL—2 meg. volume control	.95
*RQ-1355	R-8	RESISTOR—10 megohm, ½-W carbon	.70-5
*RQ-1323	R-9	RESISTOR—470,000 ohm, ½-W carbon	.70-5
*RT-722	R-10, S1	TONE CONTROL—0.5 meg. tone control	1.45
*RQ-1299	R-12	RESISTOR—47,000 ohm, ½-W carbon (Used only with Model LRP-170 record player)	.70-5
*RQ-1315	R-12	RESISTOR—220,000 ohm, ½-W carbon (Used only with Model LRP-162 record player)	.70-5
*RQ-1247	R-13	RESISTOR—330 ohm, ½-W carbon	.70-5
*RQ-665	R-14	RESISTOR—1800 ohm, 2-W carbon	.20
*RQ-1293	R-15	RESISTOR—27,000 ohm, ½-W carbon	.70-5
*RQ-1299	R-16	RESISTOR—47,000 ohm, ½-W carbon (Used only with Model LRP-170 record player)	.70-5
*RQ-1313	R-16	RESISTOR—180,000 ohm, ½-W carbon (Used only with Model LRP-162 record player)	.70-5
*RQ-1259	R-17	RESISTOR—1000 ohm, ½-W carbon	.70-5
*RQ-1299	R-18	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1259	R-19	RESISTOR—1000 ohm, ½-W carbon	.70-5
*RQ-683	R-20	RESISTOR—10,000 ohm, 2-W carbon	.35
*RQ-1323	R-21	RESISTOR—470,000 ohm, ½-W carbon	.70-5
*RQ-1303	R-22	RESISTOR—68,000 ohm, ½-W carbon	.70-5
*RQ-1259	R-24	RESISTOR—1000 ohm, ½-W carbon	.70-5
*RL-9530	L1-a, b, c, and d	COIL—Push button coil assembly	.85
RS-3142	S-2, S-3	SWITCH—Band switch	1.10
*RS-3130	S4a, 4b	SWITCH—Touch tuning switch	4.00
RL-591	T-1	BEAM-A-SCOPE—"B" band loop	1.20
RL-2073	T-2	COIL—"B" band oscillator coil	.50
RL-2074	T-2'	COIL—"D" band oscillator coil	.30
*RT-3005	T-3	TRANSFORMER—1st IF transformer	.90
RT-3010	T-4	TRANSFORMER—2nd IF transformer	1.20
*RT-4013	T-5	TRANSFORMER—Output transformer	1.25
RL-592	T-6	BEAM-A-SCOPE—"D" band loop	.50
*RT-0621	T-7	TRANSFORMER—50 or 60 cycle power transformer	4.25
*RS-1081	SPKR	SPEAKER—12 inch PM speaker	5.50

Prices subject to change without notice.

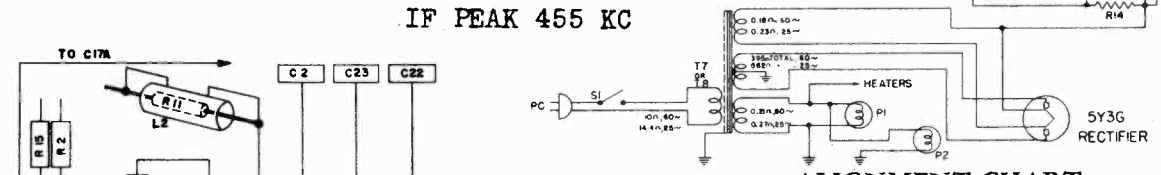
* Used on previous receivers.

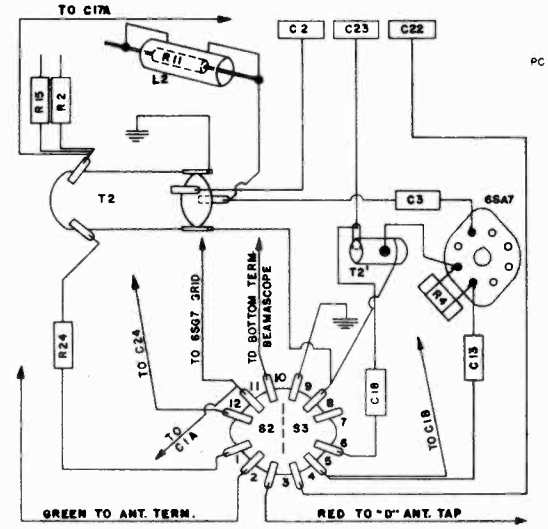
GENERAL ELECTRIC CO.

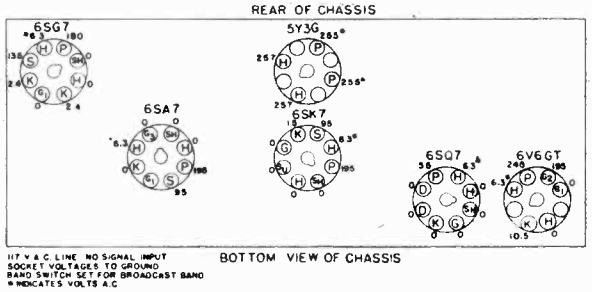
MODEL L-630



IF PEAK 455 KC







117 V A.C. LINE NO SIGNAL INPUT
SOCKET VOLTAGES TO GROUND
BAND SWITCH SET FOR BROADCAST BAND
* INDICATES VOLTS A.C

Fig. 2. Socket Voltages

ALIGNMENT CHART

Step	Connect Test-Osc. to	Test-Osc. Setting	Pointer Setting	Adjust Trimmers for Maximum Output
1	6SK7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C6 & C7
2	6SA7 Conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C4 & C5
3	Capacity Coupled	580 KC	"BC" Band 580 KC	C22**
4	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C2** (Osc.)
5	Repeat Step 3			
6	Capacity Coupled	18 MC	"SW" Band 18 MC	C23* (Osc.)
7	Capacity Coupled	18 MC	"SW" Band 18 MC	C24** (Ant.)

* Use minimum capacity peak.
** Rock gang condenser when making alignment.

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 1. All oscillator and RF trimmers are accessible through a slot through the back cover of the cabinet.

The alignment procedure is given in table form. All IF alignments may be made with the chassis removed from the cabinet. However, the RF alignments are made with the chassis and loop antennas securely fastened in the cabinet as the relative position of the loop antenna with respect to the chassis materially affects it. The RF signal should be capacity coupled by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet.

Special Service Information

The following data are taken with a vacuum tube voltmeter similar voltage measuring device.

(1) Stage Gains

Antenna Post to RF Grid	5 at 1000 KC
RF Grid to Converter Grid	5 at 1000 KC
Converter Grid to IF Grid	40 at 1000 KC
Converter Grid to IF Grid	60 at 455 KC
IF Grid to 6SQ7 diode plates	90 at 455 KC

(2) Audio Gains
.14 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor R4 averages 10 volts at 1000 KC or 8.0 volts at 10,000 KC.

Variations of ±20% permissible. All readings taken with AVC shorted out.

MODEL L-630
MODEL LC-648

GENERAL ELECTRIC CO.

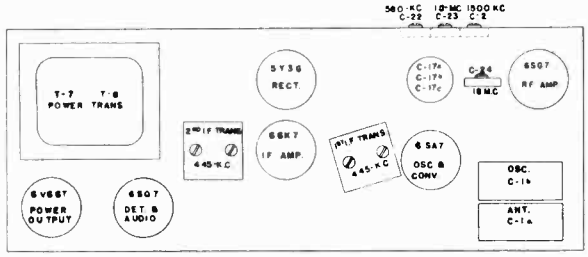


Fig. 1. Trimmer Location

Electrical Power Output

Undistorted ..... 2.5 watts
Maximum ..... 4.5 watts

Loudspeaker—PM Dynamic

Outside Cone Diameter ..... 5 inches
Voice Coil Impedance (400 cycles) ..... 3.5 ohms

REPLACEMENT PARTS LIST MODEL L-630

Our Stock No.	Symbol	Description	List Price
RC-7061	C1A, 1B	CONDENSER—Tuning condenser	$2.00
RC-6552	C2	CAPACITOR—"B" osc. trimmer strip (Combined with C22, 23)	.55
*RC-235	C3	CAPACITOR—100 mmf., mica	.25
*RC-252	C8	CAPACITOR—200 mmf., mica	.30
*RC-242	C9	CAPACITOR—150 mmf., mica	.25
*RC-048	C10	CAPACITOR—.02 mfd., 600 V, paper	.30
*RC-072	C11	CAPACITOR—.05 mfd., 200 V, paper	.25
*RC-216	C13	CAPACITOR—47 mmf., mica	.25
*RC-023	C14	CAPACITOR—.005 mfd., 600 V, paper	.25
*RC-055	C15	CAPACITOR—.003 mfd., 600 V, paper	.25
*RC-5164	C17a, 17b, 17c	CAPACITOR—15 mfd., 250 V, 30 mfd., 300 V., 10 mfd., 250 V, dry electrolytic	1.00
*RC-390	C18	CAPACITOR—3900 mmf., mica	.35
*RC-039	C19	CAPACITOR—.01 mfd., 600 V, paper	.25
*RC-235	C21	CAPACITOR—100 mmf., mica	.25
RC-6552	C-22	CAPACITOR—"B" band padder (Combined with C2, 23)	.55
RC-6552	C-23	CAPACITOR—"D" osc. trimmer (Combined with C2, 22)	.55
RC-6553	C-24	CAPACITOR—"D" antenna trimmer	.15
*RC-023	C25	CAPACITOR—.005 mfd., 600 V, paper	.25
*RC-092	C26	CAPACITOR—.05 mfd., 600 V, paper	.30
*RC-047	C27, 28	CAPACITOR—.01 mfd., 400 V, paper	.20
*RC-017	C29	CAPACITOR—.0042 mfd., 600 V, paper	.25
*RC-039	C30	CAPACITOR—.01 mfd., 600 V, paper	.25
*RQ-1247	R1	RESISTOR—330 ohm, ½-W. carbon	.70-5
*RQ-1271	R-2	RESISTOR—3300 ohm, ½-W. carbon	.70-5
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½-W. carbon	.70-5
*RQ-1291	R-4	RESISTOR—22,000 ohm, ½-W. carbon	.70-5
*RQ-1239	R-5	RESISTOR—150 ohm, ½-W. carbon	.70-5
*RQ-1339	R-6	RESISTOR—2.2 megohm, ½-W. carbon	.70-5
RV-135	R-7	VOLUME CONTROL—2 meg. volume control	.95
*RQ-1347	R-8	RESISTOR—4.7 megohms, ½-W., carbon	.70-5
*RQ-1323	R-9	RESISTOR—470,000 ohm, ½-W., carbon	.70-5
RT-722	R-10, S-1	TONE CONTROL—0.5 meg. control and power switch	$1.45
*RQ-1283	R-11	RESISTOR—10,000 ohm, ½-W., carbon	.70-5
*RQ-1247	R-13	RESISTOR—330 ohm, ½-W., carbon	.70-5
*RQ-665	R-14	RESISTOR—1800 ohm, 2-W., carbon	.20
*RQ-1293	R-15	RESISTOR—27,000 ohm, ½-W., carbon	.70-5
*RQ-1259	R-17	RESISTOR—1000 ohm, ½-W., carbon	.70-5
*RQ-1299	R-18	RESISTOR—47,000 ohm, ½-W. carbon	.70-5
*RQ-1259	R-19	RESISTOR—1000 ohm, ½-W., carbon	.70-5
*RQ-683	R-20	RESISTOR—10,000 ohm, 2-W., carbon	.35
*RQ-1323	R-21	RESISTOR—470,000 ohm, ½-W., carbon	.70-5
*RQ-1308	R-22	RESISTOR—100,000 ohm, ½-W., carbon	.70-5
*RQ-1251	R-24	RESISTOR—470 ohm, ½-W., carbon	.70-5
RL-370	L-2	CHOKE—R.F. interstage choke	.30
RL-577	T-1	BEAM-A-SCOPE—"B" band loop and cabinet back assembly	1.60
RL-2062	T-2	COIL—Osc. coil band "B"	.35
RL-2063	T-2	COIL—Osc. coil "D" band	.30
RT-3005	T-3	TRANSFORMER—1st I.F. transformer	.90
RT-3006	T-4	TRANSFORMER—2nd I.F. transformer	1.15
RT-4013	T-5	TRANSFORMER—Output transformer	2.25
RL-578	T-6	BEAM-A-SCOPE—"D" band loop	.60
RT-0619	T-7	TRANSFORMER—60 cycle power transformer	4.00
RT-0620	T-8	TRANSFORMER—25 cycle power transformer	6.80
RS-3126	S-2, S-3	SWITCH—Band change switch	.70
RS-1071	SPKR.	SPEAKER—5-in. PM speaker	2.25

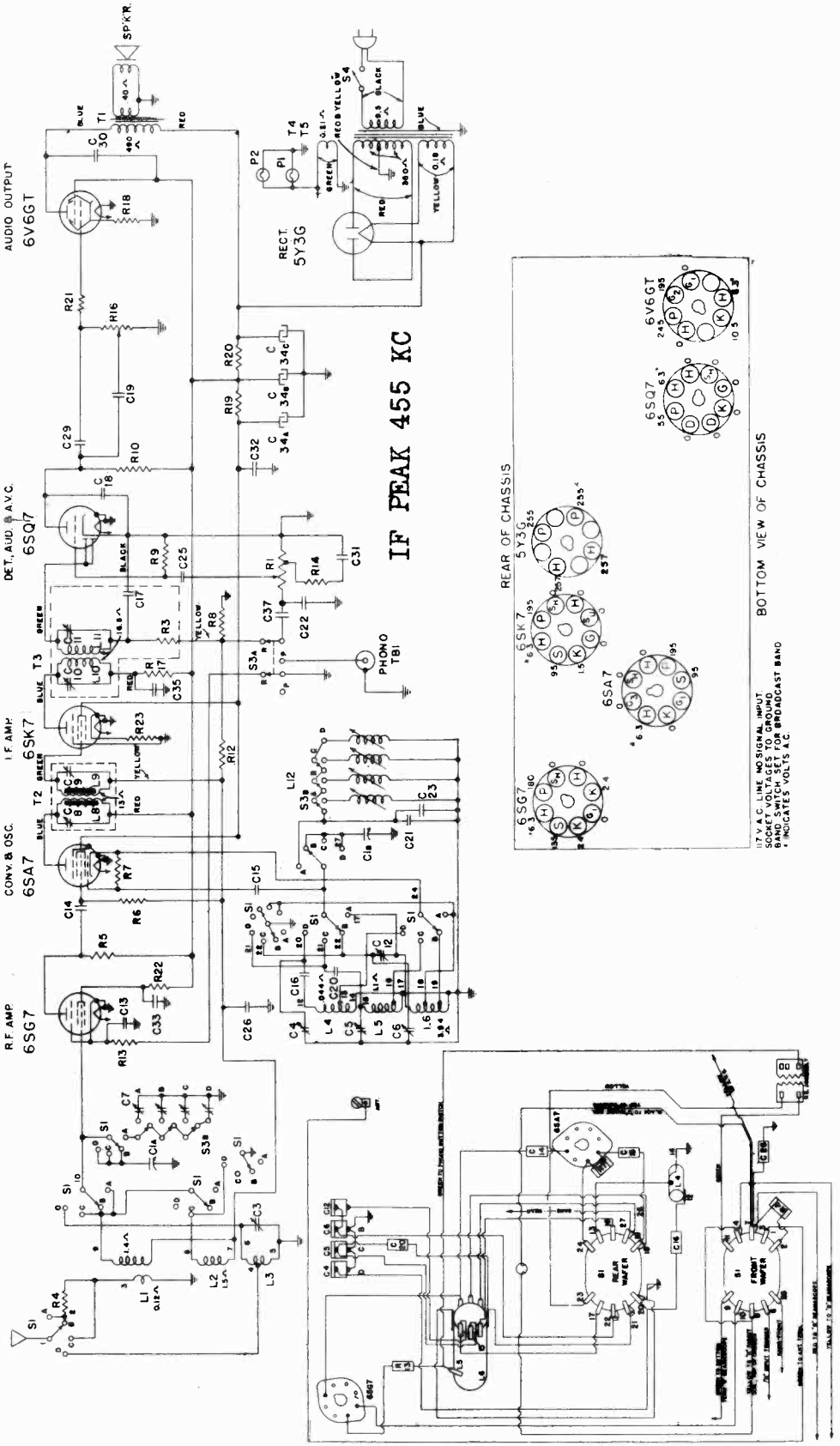
*Used on previous receivers.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

REPLACEMENT PARTS LIST—MODEL LC-648

Our Cat. No.	Symbol	Description	List Price
*RC-7061	C-1a, 1b	CONDENSER—Tuning condenser	$2.00
RT-891	C-2	TRIMMER STRIP—"B" Osc. Trimmer strip (combined with C-16, 22)	.55
*RC-235	C-3	CAPACITOR—100 mmf. mica	.25
*RC-252	C-8	CAPACITOR—200 mmf. mica	.30
*RC-242	C-9	CAPACITOR—150 mmf. mica	.25
*RC-048	C-10	CAPACITOR—.02 mfd. 600 V paper	.30
*RC-072	C-11	CAPACITOR—.05 mfd. 200 V paper	.25
*RC-011	C-12	CAPACITOR—.002 mfd. 600 V paper (Used only with RLP-170 record player)	.25
*RC-216	C-13	CAPACITOR—47 mmf., mica	.25
*RC-023	C-14	CAPACITOR—.005 mfd. 600 V paper	.25
*RC-055	C-15	CAPACITOR—.003 mfd. 600 V paper	.25
RT-891	C-16	TRIMMER STRIP—Ant. trimmer (Part of C-2, 22)	.55
RC-5201	C17a, 17b, 17C	CAPACITOR—30 mfd. 250 V, 30 mfd. 300 V., 10 mfd. 250 V. dry electrolytic	.95
*RC-039	C-19	CAPACITOR—.01 mfd. 600 V paper	.25
*RC-235	C-21	CAPACITOR—100 mmf., mica	.25
RT-891	C-22	TRIMMER STRIP—"B" Band padder (Combined with C 2, C-16)	.55
*RC-023	C-25	CAPACITOR—.005 mfd. 600 V paper	.25
*RC-047	C-26, 27 28	CAPACITOR—.01 mfd. 400 V paper	.20
*RC-017	C-29	CAPACITOR—.0042 mfd. 600 V paper	.25
*RQ-1247	R-1	RESISTOR—330 ohm, ½-W carbon	.70-5
*RQ-1271	R-2	RESISTOR—3300 ohm, ½-W carbon	.70-5
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1291	R-4	RESISTOR—22,000 ohm, ½-W carbon	.70-5
*RQ-1239	R-5	RESISTOR—150 ohm, ½-W carbon	.70-5
*RQ-1339	R-6	RESISTOR—2.2 megohm, ½-W carbon	.70-5
*RV-135	R-7	VOL. CONTROL—2 meg. volume control	.95
*RQ-1355	R-8	RESISTOR—10.0 megohm, ½-W carbon	.70-5
*RQ-1323	R-9	RESISTOR—470,000 ohm, ½-W carbon	.70-5
*RT-722	R-10, S1	TONE CONTROL—0.5 meg. control and power switch	1.45
*RQ-1299	R-11, 12	RESISTOR—47,000 ohm, ½-W carbon (Used only with record player LRP-170)	.70-5
*RQ-1313	R-11	RESISTOR—180,000 ohm, ½-W carbon (Used only with record player LRP-162)	.70-5
*RQ-1315	R-12	RESISTOR—220,000 ohm, ½-W carbon (Used only with record player LRP-162)	.70-5
*RQ-1247	R-13	RESISTOR—330 ohm, ½-W carbon	.70-5
*RQ-665	R-14	RESISTOR—1800 ohm, 2-W carbon	.20
*RQ-1293	R-15	RESISTOR—27,000 ohm, ½-W carbon	.70-5
*RQ-1259	R-17	RESISTOR—1000 ohm, ½-W carbon	.70-5
*RQ-1299	R-18	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1259	R-19	RESISTOR—1000 ohm, ½-W carbon	.70-5
*RQ-683	R-20	RESISTOR—10,000 ohm, 2-W carbon	.35
*RQ-1323	R-21	RESISTOR—470,000 ohm, ½-W carbon	.70-5
*RQ-1303	R-22	RESISTOR—68,000 ohm ½-W carbon	$0.70-5
*RQ-1259	R-24	RESISTOR—1000 ohm, ½-W carbon	.70-5
RL-590	T-1	BEAM-A-SCOPE—Built-in loop antenna	1.25
*RL-2072	T-2	COIL—Osc. coil, Band "B"	.30
*RT-3005	T-3	TRANSFORMER—1st IF transformer	.90
*RT-3006	T-4	TRANSFORMER—2nd IF transformer	1.15
*RT-4013	T-5	TRANSFORMER—Output transformer	1.25
RT-0621	T-7	TRANSFORMER—60-cycle power transformer	4.25
RS-3141	S-3	SWITCH—Phono-radio switch	.55
RS 1081	SPKR	SPEAKER—12-in. PM-speaker	5.50
*RB-009		BOARD—Single lug terminal board	.15
*RB-013		BOARD—Two lug terminal board	.10
*RB-026		BOARD—Antenna terminal board	.10
*RB-093		BOARD—Six lug terminal board	.10
*RB-636		BEZEL—Pilot lamp bezel	.15
*RB-1030		BOARD—Phono-jack board	.10
*RB-1046		BOARD—3-lug terminal board	.10
*RC-865		CORD—Power cord	.45
*RC-1989		CUSHION—Tuning condenser mtg. cushion	.05-5
*RC-2015		CLAMP—Dial scale clamp	.10-5
*RC-9009		CONE—Speaker cone	.95
RD-774		DIAL—Dial scale assembly	.80
RG-448		GRILLE CLOTH—Cabinet grille cloth	1.20
*RL-916		LAMP—Mazda No. 44 pilot lamp	1.50-10
*RK-091		KNOB—Vol. or tuning control knob	.10
*RK-092		KNOB—Tone or phono-radio knob	.10
RP-1031		POINTER—Dial pointer assembly	.25
*RS-238		SOCKET—Octal tube socket	.15
*RS-257		SOCKET—Electrolytic mtg. socket	.05
*RS-266		SOCKET—Dial lamp socket	.15
*RS-292		SOCKET—Pilot lamp socket, (bottom of cabinet)	.25
*RS-298		SOCKET—Phono compartment lamp socket	.20
*RS-444		SPRING—Volume or tuning knob spring	.10-10
*RS-463		SPRING—Drive cord tension spring	.10-5
*RS-511		SPACER—Tuning condenser mounting spacer	.15-10
*RS-4012		SPRING—Tone or phono knob spring	.10-10
*RS-9042		SHAFT—Tuning shaft and clip	.10
*RT-959		TERMINAL—Speaker and loop lead terminal	.05-5
RW-061		WINDOW—Phono-compartment lamp window	.15
*RW-101		WASHER—Felt washer for knobs	.05-10

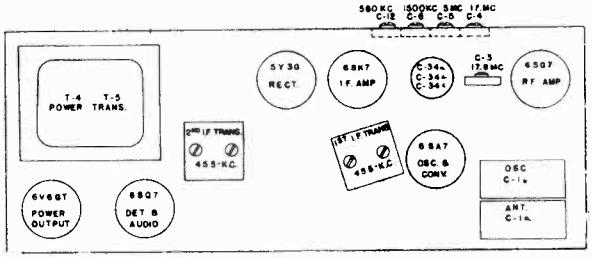
GENERAL ELECTRIC CO.



MODEL L-640

GENERAL ELECTRIC CO.

Our Cat. No	Symbol	Description	List Price
RC-7061	C1a, C1b	CONDENSER—2-gang tuning condenser	$2.00
RC-6553	C-3	CAPACITOR—1.8-20 mmf., "D" band trimmer	.25
RC-6555	C4, 5, 6	CAPACITOR STRIP—"B" "C" and "D" osc. trimmers	.65
RT-885	C7a, b, c, d	TRIMMER STRIP—Push button trimmer strip	.70
RC-6555	C-12	CAPACITOR—"B" padder (Part of C4, 5, 6)	.70
*RC-039	C-13	CAPACITOR—.01 mfd., 600 V. paper	.25
*RC-235	C-14	CAPACITOR—100 mmf., mica	.25
*RC-216	C-15	CAPACITOR—47 mmf., mica	.25
*RC-393	C-16	CAPACITOR—4700 mmf., mica	.50
*RC-242	C-18	CAPACITOR—150 mmf., mica	.25
*RC-023	C-19	CAPACITOR—.005 mfd., 600 V. paper	.25
*RC-349	C-20	CAPACITOR—2000 mmf., mica	.30
RC-305	C-21	CAPACITOR—600 mmf., silvered mica	.25
*RC-235	C-22	CAPACITOR—100 mmf., mica	.25
RC-329	C-23	CAPACITOR—150 mmf., temp comp. cap.	.25
*RC-039	C-25	CAPACITOR—.01 mfd. 600 V. paper	.25
*RC-072	C-26	CAPACITOR—.05 mfd. 200 V. paper	.25
*RC-048	C-29	CAPACITOR—.02 mfd. 600 V. paper	.30
*RC-055	C-30	CAPACITOR—.003 mfd. 600 V. paper	.25
*RC-049	C-31	CAPACITOR—.004 mfd., 600 V. paper	.35
*RC-039	C-32, 33	CAPACITOR—.01 mfd., 600 V. paper	.25
	C-34A	CAPACITOR—10 mfd., 250 V. dry electrolytic	
*RC-5164	C-34B	CAPACITOR—15 mfd., 250 V. dry electrolytic	1.00
	C-34C	CAPACITOR—30 mfd., 300 V. dry electrolytic	
*RC-039	C-35	CAPACITOR—.01 mfd., 600 V. paper	.25
*RC-023	C-37	CAPACITOR—.005 mfd., 600 V. paper	.25
*RV-135	R-1	VOLUME CONTROL—2 meg. volume control	.95
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½-W. carbon	.70–5
*RQ-1251	R-4	RESISTOR—470 ohm, ½-W. carbon	.70–5
*RQ-1275	R-5	RESISTOR—4,700 ohm, ½-W. carbon	.70–5
*RQ-1299	R-6	RESISTOR—47,000 ohm, ½-W. carbon	.70–5
*RQ-1291	R-7	RESISTOR—22,000 ohm, ½-W. carbon	.70–5
*RQ-1323	R-8	RESISTOR—470,000 ohm, ½-W. carbon	.70–5
*RQ-1355	R-9	RESISTOR—10 megohm, ½-W. carbon	.70–5
*RQ-1331	R-10	RESISTOR—1 megohm, ½-W. carbon	.70–5
*RQ-1339	R-12	RESISTOR—2.2 megohm, ½-W. carbon	$0.70–5
*RQ-1247	R-13	RESISTOR—330 ohm, ½-W. carbon	.70–5
*RQ-1308	R-14	RESISTOR—100,000 ohm, ½-W. carbon	.70–5
*RT-722	R-16, S-4	TONE CONTROL—.5 megohm tone control and power switch	1.45
*RQ-1267	R-17	RESISTOR—2200 ohm, ½-W. carbon	.70–5
*RQ-1247	R-18	RESISTOR—330 ohm, ½-W. carbon	.70–5
*RQ-633	R-19	RESISTOR—10,000 ohm, 2-W. carbon	.35
*RQ-665	R-20	RESISTOR—1,800 ohm, 2-W. carbon	.20
*RQ-1259	R-21	RESISTOR—1,000 ohm, ½-W. carbon	.70–5
*RQ-1293	R-22	RESISTOR—27,000 ohm, ½-W. carbon	.70–5
*RQ-1239	R-23	RESISTOR—150 ohm, ½-W. carbon	.70–5
RL-579	L-1	BEAM-A-SCOPE—"B" Band loop and cabinet back assembly	1.60
RL-167	L-2	COIL—"C" band R.F. coil	.25
*RL-578	L-3	BEAM-A-SCOPE—"D" band loop assembly	.60
RL-2065	L-4	COIL—"D" band oscillator coil	.25
RL-2066	L5, 6	COIL—"B" and "C" band osc. coil	.85
RL-9530	L12a, b, c, d	COIL—Push button coil assembly	.85
RS-3129	S-1	SWITCH—Band change switch	1.30
RS-3130	S-3a, b	SWITCH—Push button switch	4.00
*RT-4013	T-1	TRANSFORMER—Output transformer	1.25
RT-3009	T-2	TRANSFORMER—1st I.F. transformer	1.20
RT-3010	T-3	TRANSFORMER—2nd I.F. transformer	1.20
*RT-0619	T-4	TRANSFORMER—60-cycle power transformer	4.00
*RT-0620	T-5	TRANSFORMER—25-cycle power transformer	6.80
RS-1073	SPKR	SPEAKER—5-inch PM speaker	2.40



*Used on previous receivers.

Tuning Frequency Range

"BC" Band ..... 550–1720 KC
"SW-1" Band ..... 1.7–5.2 MC
"SW2" Band ..... 5.2–18.1 MC

Intermediate Frequency ..... 455 KC

Electrical Power Output

Undistorted ..... 2.7 watts
Maximum ..... 4.6 watts

ALIGNMENT CHART

Step	Connect Test-Osc. to	Test-Osc. Setting	Pointer Setting	Adjust Trimmers for Maximum Output
1	6SK7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C10 & C11
2	6SA7 Conv. grid in series with .05 mfd	455 KC	"BC" Band 550 KC	C8 & C9
3	Capacity Coupled	580 KC	"BC" Band 580 KC	C12**
4	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C6** (Osc.)
5	Repeat Step 3			
6	Capacity Coupled	5 MC	"SW1" Band	C5 (Osc.)
7	Capacity Coupled	18 MC	"SW2" Band	C4* (Osc.)
8	Capacity Coupled	18 MC	"SW2" Band	C3** (Ant.)

Some production receivers have C-30 connected from the 6V6GT plate to chassis ground. Late production receivers have C-30 connected as shown in the schematic diagram.

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 1. All oscillator and RF trimmers are accessible through a slot through the back cover of the cabinet.

The alignment procedure is given in table form. All IF alignments may be made with the chassis removed from the cabinet. However, the RF alignments are made with the chassis and loop antennas securely fastened in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects it. The RF signal should be capacity coupled by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet.

*Use minimum capacity peak.
**Rock gang condenser when making alignment.

Special Service Information

The following data are taken with a vacuum tube voltmeter or similar voltage measuring device.

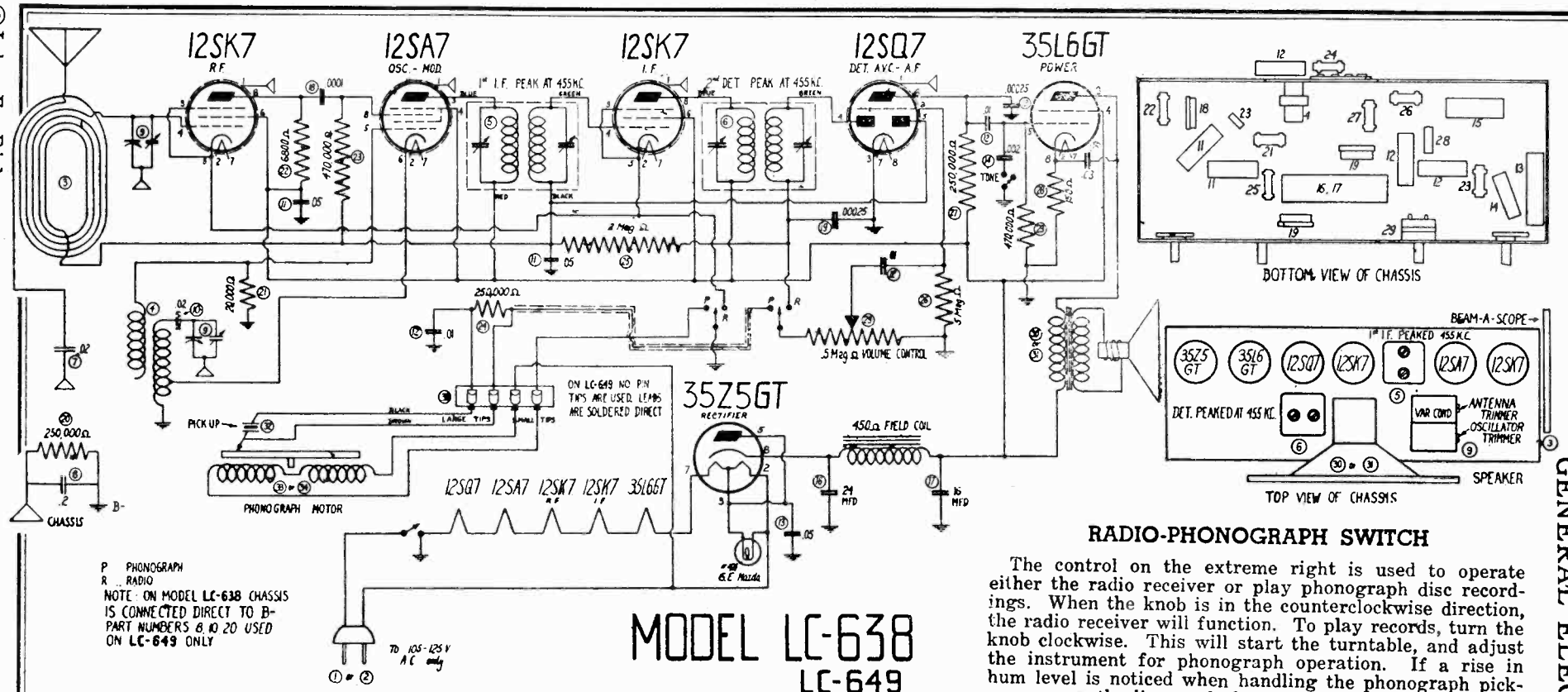
(1) Stage Gains

Antenna Post to RF Grid	6.5 at 1000 KC
RF Grid to Converter Grid	7.0 at 1000 KC
Converter Grid to IF Grid	45 at 1000 KC
Converter Grid to IF Grid	63 at 455 KC
IF Grid to 6SQ7 diode plates	70 at 455 KC

(2) Audio Gains
.14 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor R7 averages 10 volts at 1000 KC or 8.0 volts, at 10,000 KC.

Variations of ±20% permissible. All readings taken with AVC shorted out.



MODEL LC-638
LC-649

RADIO-PHONOGRAPH SWITCH

The control on the extreme right is used to operate either the radio receiver or play phonograph disc recordings. When the knob is in the counterclockwise direction, the radio receiver will function. To play records, turn the knob clockwise. This will start the turntable, and adjust the instrument for phonograph operation. If a rise in hum level is noticed when handling the phonograph pick-up, reverse the line cord plug in the electric outlet.

ALIGNMENT PROCEDURE

Alignment Frequencies I. F. ..... 455 K. C.
R. F. ..... 1700 & 1400 K. C.

I. F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 kilocycles and apply signal to control grid of 12SK7 R. F. through a .05 mfd. capacitor. Align the second I. F. transformer trimmers, next adjust the first I. F. transformer trimmers. Keep the test oscillator output to a level that will give a good meter reading.

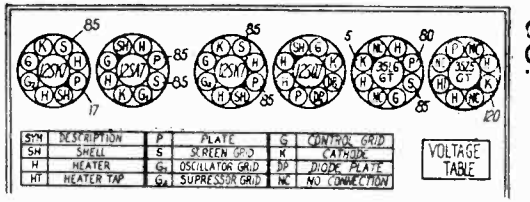
R. F. Alignment

Attach high side of test oscillator to flexible lead extending from rear of chassis through a .00025 mfd. condenser. Connect the low side to the receiver chassis. Adjust the test oscillator and receiver to 1700 kilocycles. Peak 1700 kilocycles oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 kilocycles. Then while rocking gang condenser, trim 1400 kilocycles antenna trimmer for maximum output.

SERVICE INFORMATION

Voltages—Line 117 Volts AC—Power Consumption 40 Watts including Phonograph Motor. Volume Control maximum. Meter 1000 ohms per volt, 250 volt scale.

Plate (8) of 12SK7 R. F. tube to common ground	17 volts
Screen (6) of 12SK7 R. F. tube to common ground	85 volts
Plate (3) of 12SA7 tube to common ground	85 volts
Screen (4) of 12SA7 tube to common ground	85 volts
Plate (8) of 12SK7 I. F. tube to common ground	85 volts
Screen (6) of 12SK7 I. F. tube to common ground	85 volts
Plate (3) of 35L6GT tube to common ground	80 volts
Screen (4) 35L6GT tube to common ground	85 volts
Cathode (8) of 35L6GT tube to common gronud	5.0 volts
Cathode (8) of 35Z5GT tube to common ground	120 volts
heater (2) and (7) of 12SA7 tube	12.4 volts AC
Heater (2) and (7) of 12SK7 R. F. tube	12.4 volts AC
Heater (2) and (7) of 12SK7 I. F. tube	12.4 volts AC
Heater (2) and (7) of 12SQ7 tube	12.4 volts AC
Heater (2) and (7) of 35L6GT tube	35.0 volts AC
Heater (2) and (7) of 35Z5GT tube	35.0 volts AC

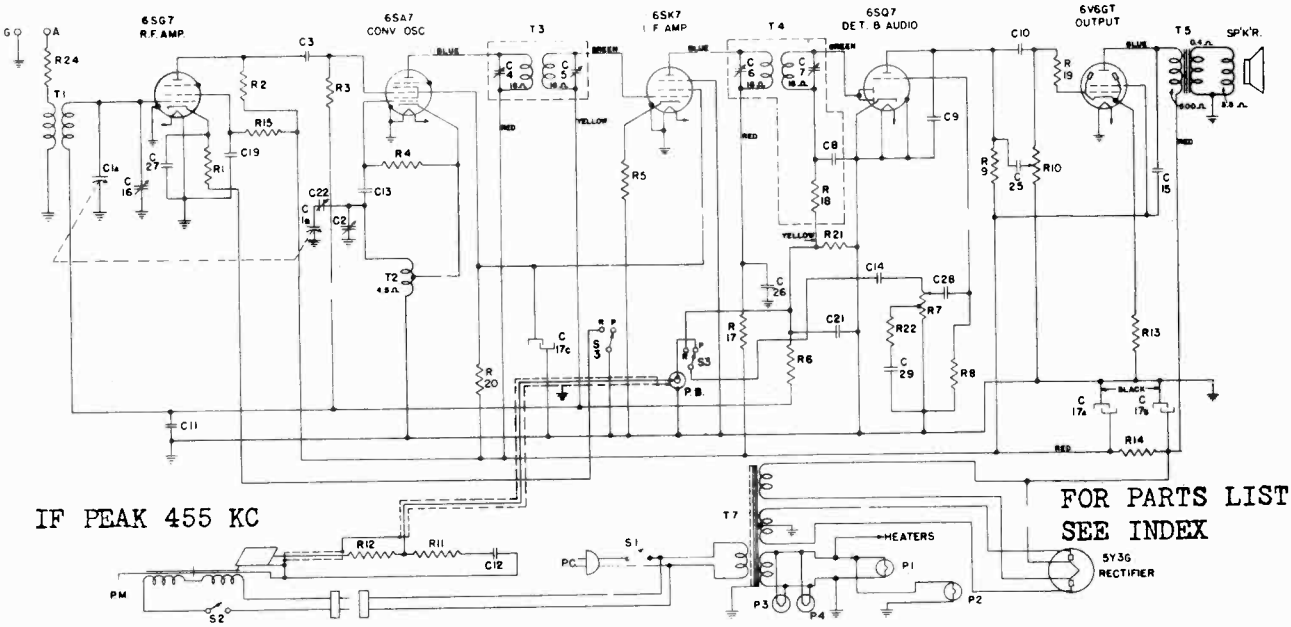


BOTTOM VIEW OF CHASSIS

All above voltages measured from socket terminal to chassis with a 1000 Ω per volt voltmeter.

MODEL LC-648

GENERAL ELECTRIC CO.



Electrical Rating

Rating "A6"—110–125 volts, 60 cycles, 80 watts.
Rating "A5"—110–125 volts, 50 cycles, 80 watts.

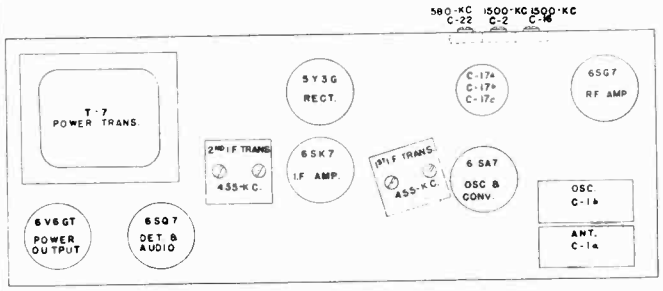
Electrical Power Output

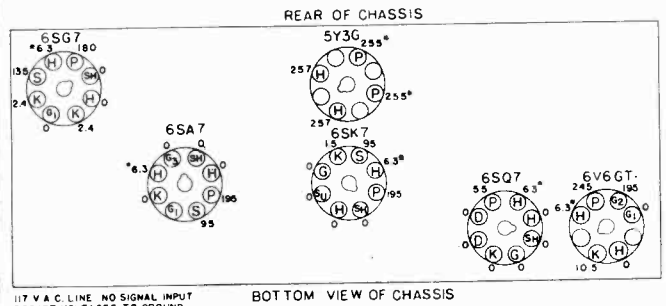
Undistorted	2.5 watts
Maximum	4.5 watts

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 1. All oscillator and RF trimmers are accessible through a slot through the back cover of the cabinet.

The alignment procedure is given in table form. All IF alignments may be made with the chassis removed from the cabinet. However, the RF alignments are made with the chassis and loop antennas securely fastened in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects it. The RF signal should be capacity-coupled by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed near the receiver loop.





117 V A.C. LINE. NO SIGNAL INPUT
SOCKET VOLTAGES TO GROUND
BAND SWITCH SET FOR BROADCAST BAND
* INDICATES VOLTS A.C.

ALIGNMENT CHART

Step	Connect Test-Osc. to	Test-Osc. Setting	Pointer Setting	Adjust Trimmers for Maximum Output
1	6SK7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C6 & C7
2	6SA7 Conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C4 & C5
3	Repeat step 1.			
4	Capacity Coupled	580 KC	"BC" Band 580 KC	C22*
5	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C2 (Osc.)
6	Capacity Coupled	1500 KC	"B" Band 1500 KC	C16 (RF)
7	Repeat step 4.			

* Rock gang condenser when making alignment.

Special Service Information

The following data are taken with a vacuum tube voltmeter or similar voltage measuring device.

(1) Stage Gains

Antenna Post to RF Grid	5 at 1000 KC
RF Grid to Converter Grid	5 at 1000 KC
Converter Grid to IF Grid	40 at 1000 KC
Converter Grid to IF Grid	60 at 455 KC
IF Grid to 6SQ7 diode plates	90 at 455 KC

(2) Audio Gains
.14 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor R4 averages 10 volts at 1000 KC.

Variations of ±20% permissible. All readings taken with AVC shorted out.

FOR RCA RP-162 or G.E. LRP-170 RECORD CHANGERS, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".

MODELS L-650, L-652

GENERAL ELECTRIC CO.

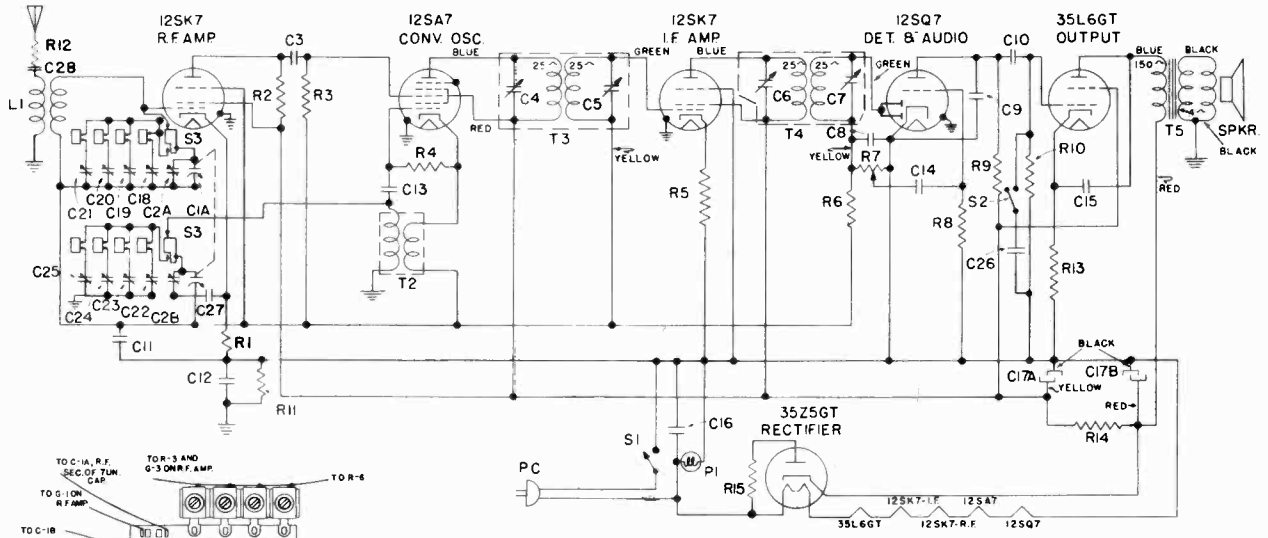
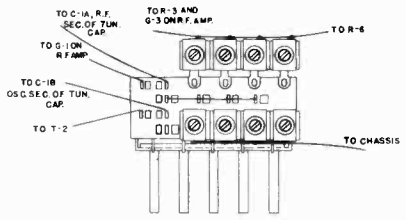


Fig. 2. Schematic Diagram



Selector Switch Wiring

IF PEAK 455 KC

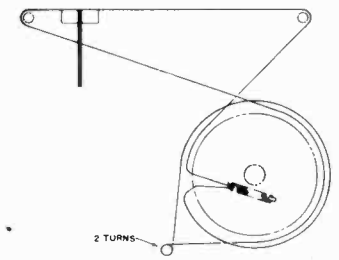
FOR OTHER DATA SEE INDEX

REPLACEMENT PARTS LIST

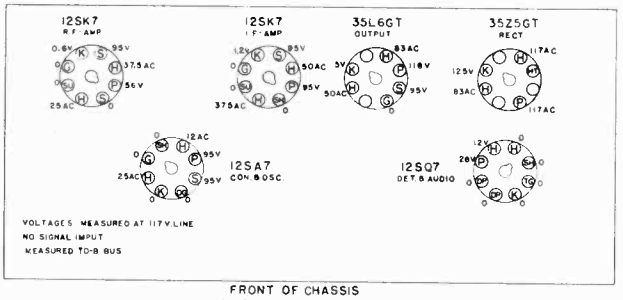
Cat. No.	Symbol	Description	List Price
RC-7059	C1A, 1B	CONDENSER—Tuning condenser (with trimmers 2A, 2B mounted)	$2.05
*RC-235	C3	CAPACITOR—100 mmf. mica	.25
*RC-274	C8	CAPACITOR—330 mmf., mica	.30
*RC-242	C9	CAPACITOR—150 mmf., mica	.25
*RC-039	C10	CAPACITOR—.01 mfd., 600 V., paper	.25
*RC-072	C11	CAPACITOR—.05 mfd., 200 V., paper	.25
*RC-092	C12	CAPACITOR—.05 mfd., 600 V., paper	.30
*RC-216	C13	CAPACITOR—47 mmf., mica	.25
*RC-039	C14	CAPACITOR—.01 mfd., 600 V., paper	.25
*RC-048	C15	CAPACITOR—.02 mfd., 600 V., paper	.30
*RC-092	C16	CAPACITOR—.05 mfd., 600 V., paper	.30
RC-5194	C17A	CAPACITOR—60 mfd., 150 V., dry electrolytic	.70
	C17B	CAPACITOR—50 mfd., 150 V., dry electrolytic	
*RT-881	C18-C21	TRIMMER STRIP—Station key adjustments (RF section)	.70
*RT-882	C22-C25	TRIMMER STRIP—Station key adjustments (Osc. section)	.60
*RC-016	C26	CAPACITOR—.002 mfd., 600 V. paper	.25
*RC-048	C27	CAPACITOR—.02 mfd., 600 V., paper	.30
*RC-039	C28	CAPACITOR—.01 mfd., 600 V., paper	.25
*RQ-1231	R1	RESISTOR—68 ohm, ½-W carbon	.70-5
*RQ-1279	R2	RESISTOR—6800 ohm, ½-W carbon	.70-5
*RQ-1299	R3	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1295	R4	RESISTOR—33,000 ohm, ½-W carbon	.70-5
*RQ-1227	R5	RESISTOR—47 ohm, ½-W carbon	.70-5
*RQ-1339	R6	RESISTOR—2.2 meg., ½-W carbon	.70-5
*RV-123	R7, S1	VOLUME CONTROL—0.5 meg. control and power switch (Model L-652)	1.45
RV-132	R7, S1	VOLUME CONTROL—0.5 meg. control and power switch (Model L-650)	1.45
*RQ-1349	R8	RESISTOR—5.6 meg., ½-W carbon	.70-5
*RQ-1323	R9, 10, 11	RESISTOR—470,000 ohm, ½-W carbon	.70-5
*RQ-1259	R12	RESISTOR—1000 ohm, ½-W, carbon	.70-5
*RQ-1239	R13	RESISTOR—150 ohm, ½-W, carbon	.70-5
*RQ-651	R14	RESISTOR—1000 ohm, 2-W carbon	.20
*RQ-1227	R15	RESISTOR—47 ohm, 2-watt carbon	.70-5
*RS-3108	S2	SWITCH—Tone control switch	.20
*RS-3114	S3	SWITCH—Automatic tuning switch (less trimmers) (Model L-652 only)	1.25
RS-3125	S3	SWITCH—Automatic tuning switch (less trimmers) (Model L-650)	1.25
RL-575	L1	BEAM-A-SCOPE—Cabinet back and loop assembly (Model L-650 only)	1.00
RL-576	L1	BEAM-A-SCOPE—Cabinet back and loop assembly (Model L-652 only)	1.00
*RL-2053	T2	COIL—Oscillator coil and clip	.35
RT-3002	T3	TRANSFORMER—1st I.F. transformer	.80
RT-3003	T4	TRANSFORMER—2nd I.F. transformer	.80
*RT-4008	T5	TRANSFORMER—Output transformer	.70

*Used on previous receivers.

(Prices Subject to Change without Notice)



Dial Stringing Diagram



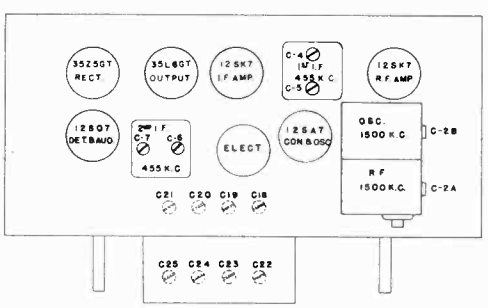


Fig. 1. Trimmer Location

MODELS L-650,L-652
MODELS X-108,X-118

GENERAL ELECTRIC CO.

MODELS L-650,L-652

Alignment Frequencies

RF ..... 1500 KC
IF ..... 455 KC

The chassis must be removed from the cabinet as described above to make the following alignments. The locations of all trimmers are shown in Fig. 1.

IF Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the 12SA7 converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st IF transformers.

RF Alignment

When making the following alignment the loop antenna must be bolted to the chassis by the two mounting screws. Since the glass dial scale is fastened to the cabinet, it cannot be used for reference during the alignment of the chassis outside the cabinet. Use must be made therefore of the four calibration marks at the bottom flange of the dial scale reflector plate (immediately below end of dial scale pointer). These marks referring from left to right are as follows: Reference point, 580 KC, 1000 KC, and 1500 KC.

The RF signal should be capacity coupled to the receiver loop by placing a two foot piece of wire for an antenna on the test oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc. should not be placed in close proximity to the loop when making the alignment.

With the gang condenser plates completely closed, the end of the pointer should line up with the first mark to the left of the dial reflector plate. If it doesn't the pointer can be moved on the dial cord until it does. Set the signal generator to 1500 KC. Set pointer to the 1500 KC mark (extreme right flange mark) and align (C2B) to the signal. Peak (C2A) for maximum output.

Special Service Information

The following information will be useful to servicemen equipped with vacuum tube voltmeters or similar voltage measuring instruments. When making the Stage Gain measurements in (1), the AVC bus should be shorted to B—.

(1) Stage Gains
Antenna post to converter grid.....26 at 1000 KC
RF grid to converter grid.....5.6 at 1000 KC
Converter grid to IF grid.....25 at 455 KC
IF grid to 12SQ7 diode plate.....53 at 455 KC

(2) Audio Gain
0.14 volts, 400 cycle signal across volume control with control set at maximum, will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor (R4) averages 5.0 volts at 1000 KC.

Variations of 20 per cent permissible. All readings obtained with enough signal input to give ½-watt speaker output.

Alignment Procedure MODELS X-108,X-118

The alignment procedure shown in table form is made either with the chassis in or removed from the cabinet.

If the chassis is removed from the cabinet to make the RF alignment, the dial which is fastened to the cabinet cannot be used for calibration reference. Use must be made, therefore, of the paper scale fastened on the rear of the dial reflector plate. With the gang condenser completely closed, one of the edges of the pointer rider should be lined up with the first marking to the right of the scale on the rear of the dial reflector plate. This can be accomplished by sliding the pointer on the cord until it does. The selected edge of the pointer rider may now serve as a pointer for the RF alignment. There are two 17.8 reference points on the paper scale on the rear of the dial reflector plate. The one towards the lower frequency end of the dial is the proper one to use for the 16-meter spread-band alignment; while the other is used for a reference point on the SW2 band.

The SW2 band does not require alignment. This band is taken care of when the 16 meter spread-band is aligned.

Since accuracy in frequency calibration is very essential for proper alignment of the spread-bands, it is impractical to use the standard test oscillator for this purpose unless a special calibration is first made.

The actual reception of short-wave stations of known frequency in the band to be checked is probably the most satisfactory method or determining the proper setting of the oscillator trimmers in these bands. The oscillator trimmer should be adjusted so that the station appears at the correct position on the dial. R.F. alignment can be made with the test oscillator.

The calibration of the test oscillator may be checked by zero beating the test oscillator with a short-wave station of known frequency. By taking several of these calibration points, it will afford a calibration of a high degree of accuracy in case you wish to use the test oscillator for alignment in these bands.

ALIGNMENT CHART MODELS X-108,X-118

Step	Test Osc. Connected to	Test-osc. Setting	Band and Pointer Setting	Tune Trimmer for Max. Output
1	6SG7 I.F. grid in series with .05 mfd. cap.	455 KC	"BC" BAND 550 KC	C26 and C27
2	7Q7 CONV. grid in series with .05 mfd. cap.	455 KC	"BC" BAND 550 KC	C24 and C25
3	ANT. POST in series with 200 mmf. and 400 ohms	580 KC	"BC" BAND 580 KC	C16**
4	ANT. POST in series with 200 mmf and 400 ohms	1500 KC	"BC" BAND 1500 KC	C17 (osc.) C3 (ant.)
5	REPEAT STEP 3			
6	ANT. POST in series with 200 mmf. and 400 ohms	6.1 MC	"SW-1" BAND 6.1 MC	C15 (osc.) C4 (ant.)
7	ANT. POST in series with 200 mmf. and 400 ohms	17.8 MC	16 METER 17.8 MC	C14* (osc.)
8	ANT. POST in series with 200 mmf. and 400 ohms	21.6 MC	16 METER 21.6 MC	C9*** (ant.)
9	ANT. POST in series with 200 mmf. and 400 ohms	15.22 MC	19 METER 15.22 MC	C10* (osc.) C6*** (ant.)
10	ANT. POST in series with 200 mmf. and 400 ohms	11.8 MC	25 METER 11.8 MC	C11* (osc.) C7*** (ant.)
11	ANT. POST in series with 200 mmf. and 400 ohms	9.6 MC	31 METER 9.6 MC	C12* (osc.) C8*** (ant.)

*Use minimum capacity peak if two are obtainable.
**Rock gang condenser for optimum peak.
***Use maximum capacity peak if two are obtainable.

Electrical Rating

Model	Rating	Power Supply: Tap	Power Supply: Voltage Range	Frequency Cycles AC	Power Consumption (Watts)
X-108	C	110 125	103–117 117–133	25–60	70
	V	110 125 200 230	103–117 117–133 185–215 215–250	50–60	70
X-118			200–240V AC or DC	25–100	100

Tuning Frequency Range

"BC" Band.....540–1700 KC
"SW1" Band.....2.2–6.8 MC
"SW2" Band.....6.8–21.0 MC
31 Meter Band.....9.36–9.8 MC
25 Meter Band.....11.6–12.5 MC
19 Meter Band.....14.9–17.3 MC
16 and 13 Meter Band.....17.7–22.2 MC

Electrical Power Output

Undistorted with proper voltage at tap on power transformer—6 watts.

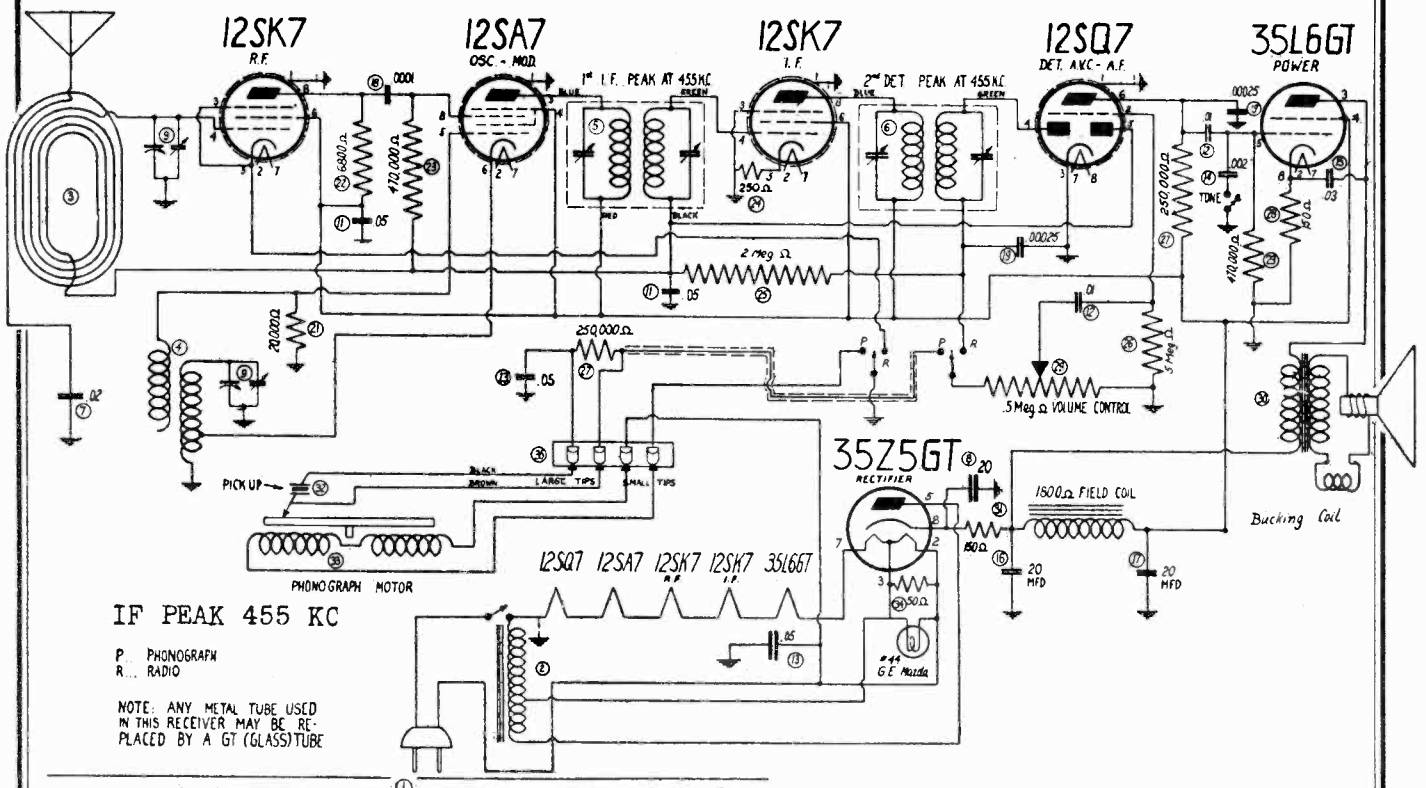
Maximum with proper voltage at tap on power transformer—6.5 watts.

Loud-speaker—PM Dynamic

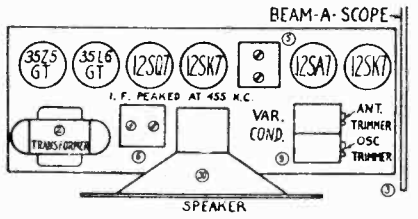
Cone Diameter.....8 inches
Voice Coil Impedance (400 cycles).....3.5 ohms

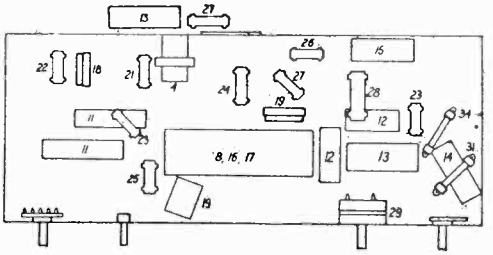
MODEL LC-658

GENERAL ELECTRIC CO.

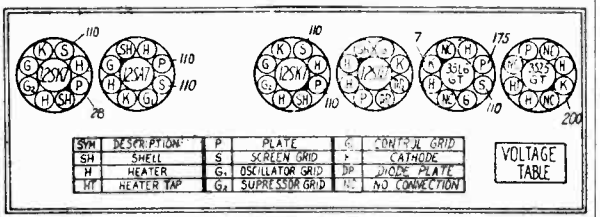


Part No.	Symbol		Description	Price List
RT-0625-W	2	Transformer	Auto Transformer	$3.00
*RT-367-W	5	Transformer	1st I. F. Transformer	1.10
*RT-3016-W	6	Transformer	2nd Detector	1.10
*RL-585-W	3	Beamascope		1.10
*RL-2069-W	4	Coil	Oscillator	.50
*RC-7036-W	9	Condenser	Tuning (2 gang) & drive pulley	2.50
RC5202W	8,16,17	Condenser	20+20+20 mfd. 250 v.	2.00
*RC-039	12	Condenser	Tubular .01 md. 400v	.25
*RC-048	7	Condenser	Tubular .02 mfd. 400v	.30
*RC-072	11	Condenser	Tubular .05 mfd. 200v	.25
*RC-092	13	Condenser	Tubular .05 mfd. 400v	.30
*RC-060	15	Condenser	Tubular .03 mfd. 400v	.25
*RC-011	14	Condenser	Tubular .002 mfd. 400v	.25
*RC-259	19	Condenser	Mica 250 mmfd.	.30
*RC-235	18	Condenser	Mica 100 mmfd.	.25
*RV-138-W	29		Volume Control & Switch	1.25
*RQ-1239	28	Resistor	Carbon 150 Ohm 1/4 W. (Pkg.5)	.70
*RQ-1316-W	27	Resistor	" 250,000 Ohm 1/4 W. (Pkg.5)	.70
*RQ-1339	25	Resistor	" 2 Meg. Ohm 1/4 W. (Pkg.5)	.70
*RQ-1348	26	Resistor	" 5 Meg. Ohm 1/4 W. (Pkg.5)	.70
*RQ-1291	21	Resistor	" 20,000 Ohm 1/4 W. (Pkg.5)	.70
*RQ-1323	23	Resistor	" 470,000 Ohm 1/4 W. (Pkg.5)	.70
*RQ-1279	22	Resistor	" 6,800 Ohm 1/4 W. (Pkg.5)	.70
RQ-1245	24	Resistor	" 250 Ohm 1/4 W. (Pkg.5)	.70
RR-7011-W	34	Resistor	Wire Wound 50 Ohm	.50
RR-7012-W	31	Resistor	Wire Wound 150 Ohm	.60
*RC-865	1		Line Cord	.45
RB-978-W			Cabinet Back Cover	.30
RX-110-W			Dial Frame & Pulley Assembly	1.00
RD-777-W			Glass Dial Scale	1.30
RS-1083-W	30		5" Electro-Dynamic with Trans.	5.00
*RS-238		Tube Socket	8 Prong Octal 1 5/16"	.15
*RS-2018-W			Pilot Lamp Socket	.35
*RK-1043-W			Knob (walnut) Pkg. 2	.40
*RK-1064-W			Knob (walnut with white dot)	.25
*RS-3133-W		Switch	Tone Control Switch	.50
*RS-3134-W		Switch	Phonograph Switch	1.00
RP-1033-W		Pointer	Dial Pointer	.35
*RC-8062-W			Drive Spring & Cord	.25
*RF-208-W			Fastener for Cabinet back cover	.10
RT-4022-W			Output Transformer for Speaker	2.50
RC-9056-W			Cone for Speaker	1.75
*RC-2065-W	35	Contact strip for motor & pickup pin tips		.25





BOTTOM VIEW OF CHASSIS



BOTTOM VIEW OF CHASSIS

ALL ABOVE VOLTAGES MEASURED FROM SOCKET TERMINAL TO CHASSIS WITH A 1000 Ω PER VOLT VOLTMETER

FOR OTHER DATA SEE INDEX

MODEL LC-658
MODEL L-678

GENERAL ELECTRIC CO.

SPECIFICATIONS MODEL L-678

Over-all Dimensions

Height	9 1/8 inches
Width	16 3/16 inches
Depth	11 1/8 inches

Electrical Rating

A-6 Rating	115 volts, 60 cycles AC, 75 watts
A-5 Rating	115 volts, 50 cycles AC, 75 watts

Tuning Frequency Range ..... 550-1600 KC.

Intermediate Frequency ..... 455 KC.

Electrical Power Output

Undistorted	2.0 watts
Maximum	2.5 watts

Loud-speaker—PM Dynamic

Outside cone diameter	6.5 inches
Voice coil impedance (400 cycles)	3.5 ohms

Phonograph Mechanism

Type mechanism	Manual
Type pick-up	Crystal
Turntable speed	78 R.P.M.

Tubes

Converter-oscillator	GE-6SA7GT
I.F. Amplifier	GE-6SK7GT
Det., A.V.C., 1st Audio	GE-6Q7GT
2nd Audio	GE-6J5GT
Power output	GE-25L6GT
Rectifier	GE-25Z6GT
Dial lamp	MAZDA No. 44

TO SET-UP PUSH BUTTONS

1. Make a list of stations desired on push buttons and arrange in order, from low to highest frequency; insert tabs of the call letters of the stations in the keys in the order listed.
2. Allow the receiver to run five minutes before making the following adjustments. Manually tune in first station, lift key upward and loosen adjusting bolt. Hold the tuning control to the exact tune position and with a screwdriver push in the adjusting bolt as far as it will go, then tighten the adjusting bolt.
3. Adjust for each of the five remaining stations in a similar manner.

MODEL LC-658

SERVICE NOTES

Tuning Control Drive Ratio	**12:1**
Power Consumption (with phono)	**68 watts**
Power Consumption (radio only)	**46 watts**
Intermediate Frequency	**455 K.C.**
Tuning Frequency Range	**540-1700 K.C**
Maximum Power Output	**3 watts**
Loud Speaker	**Cone diameter—8 inches**
Voice Coil Impedance	**(at 400 Cycles) 3 ohms**

Tubes: R. F. amplifier 12SK7 Converter—Oscillator 12SA7, I. F. 12SK7, Detector, A. V. C. 12SQ7, Power Output 35L6GT, Rectifier 35Z5GT.

SERVICE INFORMATION

Voltages—Line 117 Volts AC—Power Consumption 68 Watts including Phonograph Motor. Volume Control maximum. Meter 1000 ohms per volt, 250 volt scale.

Plate (8) of 12SK7 R. F. tube to common ground	28	volts
Screen (6) of 12SK7 R.F. tube to common ground	110	volts
Plate (3) of 12SA7 tube to common ground	110	volts
Screen (4) of 12SA7 tube to common ground	110	volts
Plate (8) of 12SK7 I. F. tube to common ground	110	volts
Screen (6) of 12SK7 I.F. tube to common ground	110	volts
Plate (3) of 35L6GT tube to common ground	175	volts
Screen (4) of 35L6GT tube to common ground	110	volts
Cathode (8) of 35L6GT tube to common ground	7	volts
Cathode (8) of 35Z5GT tube to common ground	200	volts
Heater (2) and (7) of 12SA7 tube	12.6	volts AC
Heater (2) and (7) of 12SK7 R. F. tube	12.6	volts AC
Heater (2) and (7) of 12SK7 I. F. tube	12.6	volts AC
Heater (2) and (7) of 12SQ7 tube	12.6	volts AC
Heater (2) and (7) of 35L6GT tube	35	volts AC
Heater (2) and (7) of 35Z5GT tube	33	volts AC

MODEL L-678

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ..... 455 KC R.F. ..... 1500 and 580 KC
The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the grid of the 6SK7GT through a .05-mfd. capacitor and align the 2nd IF transformer. Repeat the procedure, applying the 455-Kc signal to the control grid of the 6SA7GT and aligning the 1st I.F. transformer. Finish by over-all adjustments.

R.F. Alignment

With gang condenser plates completely closed, set dial pointer to the first mark at the left end of the scale. Apply a 1500-Kc signal either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the generator output which can be magnetically coupled to the receiver Beam-a-Scope. Align (C-2) at 1500 KC and peak (C-1) for maximum output. Peak (C-3) on 580 KC while rocking the gang condenser. Retrim at 1500 KC.

Precaution

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

Special Service Information

The following data will be very useful to servicemen equipped with vacuum tube voltmeters or similar voltage measuring instruments.

(1) Stage Gains*

Antenna post to 6SA7GT grid	4 at 1000 KC
6SA7GT grid to 6SK7GT grid	30 at 455 KC
6SK7GT grid to 6Q7GT det. plate	100 at 455 KC

(2) Audio Gains
.06 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½ watt speaker output.

(3) DC voltage developed across oscillator grid resistor (R-1) averages 12 volts.

* Variations of +10%, −20% permissible.

Loud-speaker

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. In case a voice coil needs recentering it will be necessary to replace the entire cone and voice-coil assembly.

NOTE.—In no case should the magnet be removed from the assembled position without remagnetizing after replacing it.

MODEL LC-658

ALIGNMENT PROCEDURE

Alignment Frequencies I. F. ..... **455 K.C.**
R. F. ..... **1700 & 1400 K.C.**

I. F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 kilocycles and apply signal to control grid of 12SK7 R. F. through a .05 mfd. capacitor. Align the second I. F. transformer trimmers, next adjust the first I. F. transformer trimmers. Keep the test oscillator output to a level that will give a good meter reading.

R. F. Alignment

Attach high side of test oscillator to flexible lead extending from rear of chassis through a .00025 mfd. condenser. Connect the low side to the receiver chassis. Adjust the test oscillator and receiver to 1700 kilocycles. Peak 1700 kilocycles oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 kilocycles. Then adjust 1400 kilocycles antenna trimmer for maximum output.

FOR OTHER DATA SEE INDEX

GENERAL ELECTRIC CO.

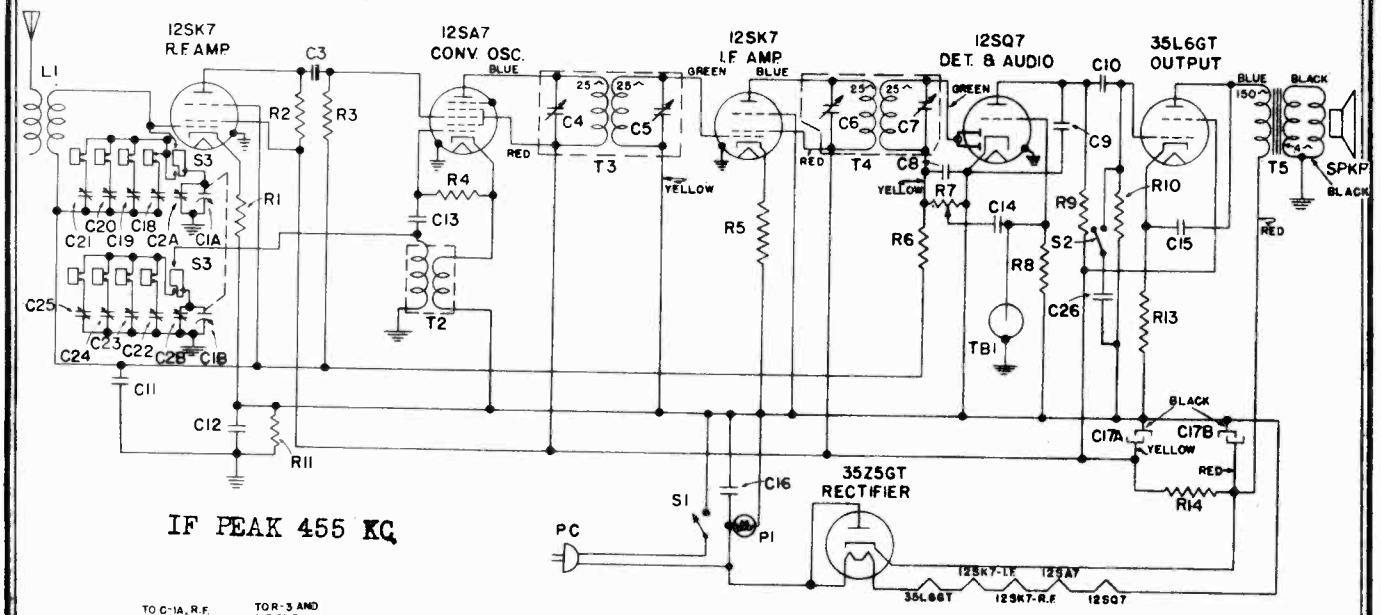
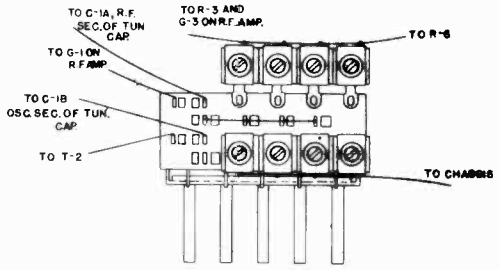


Fig. 2. Schematic Diagram



Selector Switch Wiring

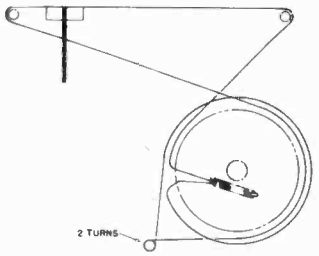


Fig. 3. Dial Stringing Diagram

Part No.	Symbol	Description	List Price
RC-7052	C1A, 1B	CONDENSER—Tuning Condenser (with trimmers 2A, 2B mounted)	$1.60
*RC-235	C3	CAPACITOR—100 Mmf., mica	.25
*RC-274	C8	CAPACITOR—330 Mmf., mica	.30
*RC-242	C9	CAPACITOR—150 Mmf., mica	.25
*RC-039	C10	CAPACITOR—.01 Mfd., 600 V. paper	.25
*RC-072	C11	CAPACITOR—.05 Mfd., 200 V. paper	.25
*RC-130	C12	CAPACITOR—0.2 Mfd., 400 V. paper	.30
*RC-216	C13	CAPACITOR—47 Mmf., mica	.25
*RC-039	C14, 15	CAPACITOR—.01 Mfd., 600 V. paper	.25
*RC-092	C16	CAPACITOR—.05 Mfd., 600 V. paper	.30
RC-5187	C17A	CAPACITOR—40 Mfd., 150 V. dry electrolytic	.60
	C17B	CAPACITOR—30 Mfd., 150 V. dry electrolytic	
RT-881	C18-C21	TRIMMER STRIP—Station key adjustments (R.F. section)	.70
RT-882	C22-C25	TRIMMER STRIP—Station key adjustments (Osc. section)	.60
*RC-016	C26	CAPACITOR—.002 Mfd., 600 V. paper	.25
*RQ-1219	R1	RESISTOR—22 ohm, ½ W. carbon	.70-5
*RQ-1281	R2	RESISTOR—8200 ohm, ½ W. carbon	.70-5
*RQ-1299	R3	RESISTOR—47,000 ohm, ½ W. carbon	.70-5
*RQ-1295	R4	RESISTOR—33,000 ohm, ½ W. carbon	.70-5
*RQ-1239	R5	RESISTOR—150 ohm, ½ W. carbon	.70-5
*RQ-1339	R6	RESISTOR—2.2 megohms, ½ W. carbon	.70-5
RV-123	R7, S1	VOLUME CONTROL—0.5 megohm control and power switch	1.45
*RQ-1349	R8	RESISTOR—5.6 megohm, ½ W. carbon	.70-5
*RQ-1323	R9, 10, 11	RESISTOR—470,000 ohm, ½ W. carbon	.70-5
*RQ-1239	R13	RESISTOR—150 ohm, ½ W. carbon	.70-5
*RQ-651	R14	RESISTOR—1,000 ohm, 2 W. carbon	.20
*RS-3108	S2	SWITCH—Tone control switch	.20
RS-3114	S3	SWITCH—Automatic tuning switch (less trimmers)	1.25
RL-565	L1	BEAM-A-SCOPE—Loop antenna and cabinet back assembly	.90
RL-2053	T2	COIL—Oscillator coil and clip	.35
RT-388	T3	TRANSFORMER—1st I.F. transformer	$0.65
RT-389	T4	TRANSFORMER—2nd I.F. transformer	.65
RT-4008	T5	TRANSFORMER—Output transformer	.70
RS-1064	Spkr.	SPEAKER—5-inch P.M. speaker	2.10

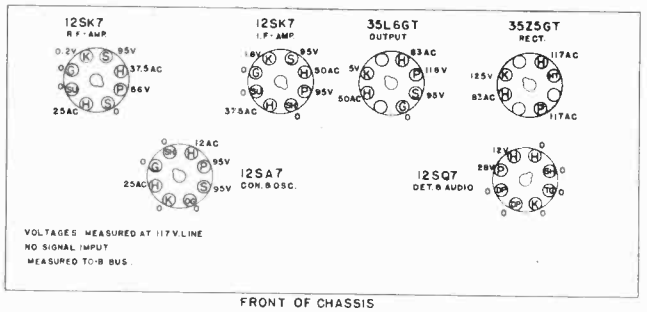


Fig. 4. Socket Voltages

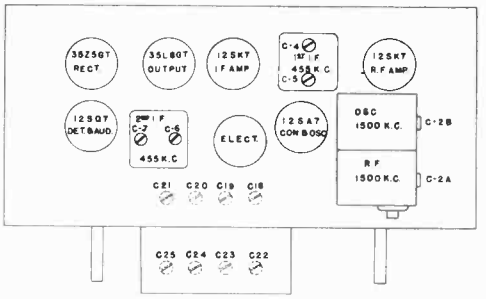


Fig. 1. Trimmer Location

MODEL L-660

MODELS J-644, J-644W, J-654, J-654W

GENERAL ELECTRIC CO.

MODEL 660

ALIGNMENT PROCEDURE

Alignment Frequencies

RF	1500 KC
IF	455 KC

The chassis must be removed from the cabinet as described above to make the following alignments. The locations of all trimmers is shown in Fig. 1.

IF Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the 12SA7 converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st IF transformers.

RF Alignment

When making the following alignment the loop antenna must be bolted to the chassis by the two mounting screws. Since the glass dial scale is fastened to the cabinet, it cannot be used for reference during the alignment of the chassis outside the cabinet. Use must be made therefore of the four calibration marks at the botton flange of the dial scale reflector plate (immediately below end of dial scale pointer). These marks referring from left to right are as follows: Reference point, 580 KC, 1000 KC, and 1500 KC.

The RF signal should be capacity coupled to the receiver loop by placing a two foot piece of wire for an antenna on the test oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc. should not be placed in close proximity to the loop when making the alignment.

With the gang condenser plates completely closed, the end of the pointer should line up with the first mark to the left of the dial reflector plate. If it doesn't the pointer can be moved on the dial cord until it does. Set the signal generator to 1500 KC. Set pointer to the 1500 KC mark (extreme right flange mark) and align (C2B) to the signal. Peak (C2A) for maximum output.

Loudspeaker—PM DYNAMIC

Outside cone diameter	5 inches
Voice coil impedance (400 cycles)	3.5 ohms

SPECIFICATIONS

Over-all Dimensions:

Height	8⅝ inches
Width	13 inches
Depth	8 inches

Electrical Rating

105–125 volts AC/DC, 50–60 cycles AC.

Tuning Frequency Range	550–1720 KC
Intermediate Frequency	455 KC

Electrical Power Output (117 volts)

Undistorted	1.1 watts
Maximum	1.6 watts

GENERAL INFORMATION

Station Key Adjustments

The station key adjustments are located on the bottom of the cabinet through the slots designated as "Osc." and "RF." The extreme left trimmer in rows "Osc." and "RF" are corresponding adjustments for the first or extreme left station key. The second set of adjustment trimmers are for the No. 2 or second key from left; correspondingly the remaining sets of trimmers are for the station keys No. 3 and No. 4. All receivers to run for 15 minutes before making the following adjustments.

1. List desired station on key, then manually tune in station desired for this key.
2. Push in station key to be set-up, to its depressed position.
3. Adjust its corresponding "Osc." adjustment for the station signal which you tuned manually above and which is listed for the key. Peak adjustment for clearest reception.
4. Adjust corresponding "RF" adjustment for maximum signal strength.
5. Proceed in like manner for adjustment of remaining keys.

NOTE.—Clockwise rotation of adjustment screws lowers the frequency.

Special Service Information

The following information will be useful to servicemen equipped with vacuum tube voltmeters or similar voltage measuring instruments. When making the Stage Gain measurements in (1), the AVC bus should be shorted to B —.

(1) Stage Gains

Antenna post to converter grid	3.8 at 1000 KC
Converter grid to IF grid	30 at 455 KC
IF grid to 12SQ7 diode plate	53 at 455 KC

(2) Audio Gain

0.14 volts, 400 cycle signal across volume control with control set at maximum, will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor (R4) averages 5.0 volts at 1000 KC.

Variations of 20 per cent permissible. All readings obtained with enough signal input to give ½-watt speaker output.

J644, J644W, J654, J654W

These receivers incorporate the following features: Single-ended tubes, automatic volume control, built-in antenna, dynapower speaker and beam power output.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F.	455 KC
R.F.	1650 and 1500 KC

The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment

To insert the R.F. signal use either a standard I.R.E. dummy antenna between the signal generator and the receiver antenna post, or loop-couple the generator signal to the receiver Beam-a-Scope. A distance of two feet between generator loop and receiver Beam-a-Scope will insure freedom from over-coupling. When using an I.R.E. dummy antenna for R.F. alignment, do not connect the signal generator ground to the receiver chassis

With the gang condenser wide open, align oscillator trimmer (C-3b) to 1650 KC. Change generator signal to 1500 KC, tune receiver to the signal and peak antenna trimmer (C-3a) for maximum output.

Precaution

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

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains

	Gain*
Antenna Post to Converter Grid	4.0 at 1000 KC
I.F. on Converter Grid to I.F. on I.F. Amplifier Grid	35 at 455 KC
I.F. Amplifier Grid to Diode Plate	60 at 455 KC

(2) 0.05-volt, 400-cycle signal across the volume control will give ½-watt speaker output.* (Volume control turned to maximum.)

(3) Average RF voltage developed from oscillator cathode to B — 1.5 volts

* Variations of ± 20% permissible. All readings obtained with enough signal input to give ½-watt speaker output.

GENERAL ELECTRIC CO.

MODELS LB-700, LB-701
LB-702, LB-703

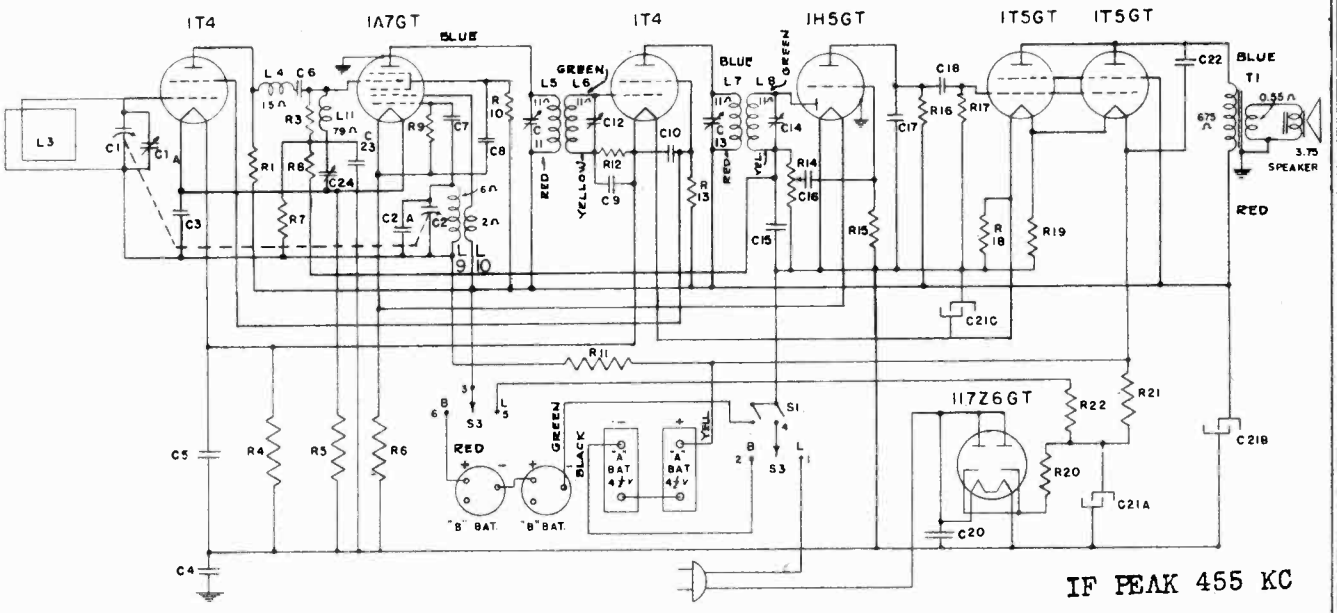


Fig. 2. Schematic Diagram Models LB-700 and LB-702

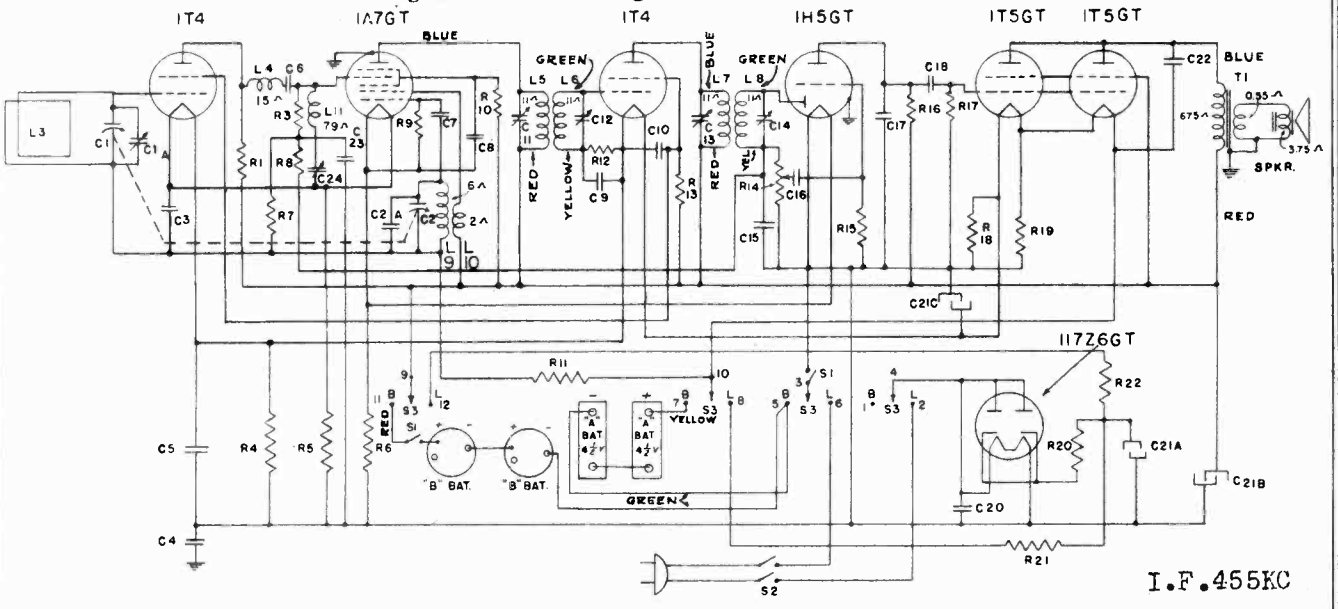


Fig. 3. Schematic Diagram Models LB-701 and LB-703

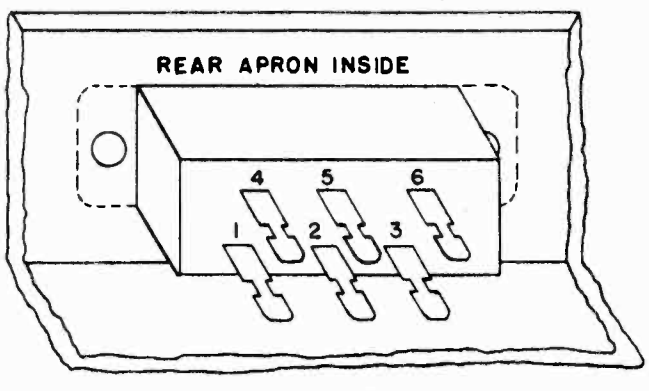


Fig. 4. Switch Wiring
Models LB-700 and LB-702

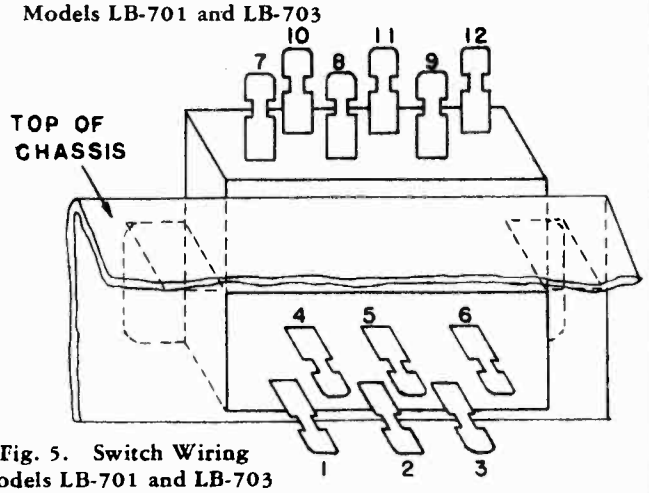


Fig. 5. Switch Wiring
Models LB-701 and LB-703

MODELS LB-700, LB701, LB-702, LB-703

GENERAL ELECTRIC CO.

Stock No.	Symbol	Description	List Price
RC-7058	C-1, 1A, C2 and C2A	CONDENSER—Tuning condenser & trimmers	$1.80
*RC-071	C-3	CAPACITOR—.05 mfd., 120 V paper	.25
*RC-092	C-4	CAPACITOR—.05 mfd., 600 V paper	.30
*RC-130	C-5	CAPACITOR—0.2 mfd., 200 V paper	.30
*RC-293	C-6	CAPACITOR—470 mmf., mica	.30
*RC-216	C-7	CAPACITOR—47 mmf., mica	.25
*RC-107	C-8-9-10	CAPACITOR—.1 mfd., 120 V paper	.25
*RC-249	C-15	CAPACITOR—220 mmf. mica	.25
*RC-023	C-16	CAPACITOR—.005 mfd., 600 V paper	.25
*RC-235	C-17	CAPACITOR—100 mmf., mica	.25
*RC-039	C-18	CAPACITOR—.01 mfd., 600 V, paper	.25
*RC-092	C-20	CAPACITOR—.05 mfd., 600 V, paper	.30
RC-5196	C-21A	CAPACITOR—40 mfd., 150 V, electrolytic	.60
RC-5193	C-21B, C	CAPACITOR—60 mfd., 150 V.; 100 mfd., 15 V, electrolytic	.80
*RC-039	C-22	CAPACITOR—.01 mfd., 600 V, paper	.25
*RC-071	C-23	CAPACITOR—.05 mfd., 120 V, paper	.25
*RC-672	C-24	CAPACITOR—5-35 mmf., trimmer	.15
*RQ-1287	R-1	RESISTOR—15,000 ohm, ½ W. carbon	.70-5
*RQ-1323	R-3	RESISTOR—470,000 ohm, ½ W. carbon	.70-5
*RQ-1263	R-4	RESISTOR—1,500 ohm, ½ W. carbon	.70-5
*RQ-1259	R-5	RESISTOR—1,000 ohm, ½ W. carbon	.70-5
*RQ-1253	R-6	RESISTOR—560 ohm ½ W. carbon	.70-5
*RQ-1341	R-7	RESISTOR—2.7 megohms, ½ W. carbon	.70-5
*RQ-1339	R-8	RESISTOR—2.2 megohms, ½ W. carbon	.70-5
*RQ-1315	R-9	RESISTOR—220,000 ohm, ½ W. carbon	.70-5
*RQ-1299	R-10	RESISTOR—47,000 ohm, ½ W. carbon	.70-5
*RQ-1355	R-11	RESISTOR—10 megohm, ½ W. carbon	.70-5
*RQ-1323	R-12	RESISTOR—470,000 ohm, ½ W. carbon	$0.70-5
*RQ-1295	R-13	RESISTOR—30,000 ohm, ½ W. carbon	.70-5
RV-130	R-14, S-1	VOLUME CONTROL—1.0 meg. vol. control & power switch (Models LB702, LB703)	1.45
RV-134	R14, S-1	VOLUME CONTROL—1.0 meg. vol. control and power switch (Models LB700, LB701)	1.45
*RQ-1349	R-15	RESISTOR—5.6 megohm, ½ W. carbon	.70-5
*RQ-1331	R-16, 17	RESISTOR—1.0 megohm, ½ W carbon	.70-5
*RQ-1257	R-18	RESISTOR—820 ohm, ½ W. carbon	.70-5
*RQ-1261	R-19	RESISTOR—1200 ohm, ½ W. carbon	.70-5
RQ-621	R-20	RESISTOR—91 ohm, 2 watt	.20
RR-366	R-21	RESISTOR—2200 ohm, 7 watt "wirewound"	.30
*RQ-1261	R-22	RESISTOR—1200 ohm, ½ watt, carbon	.70-5

Electrical Rating

1. AC or DC Power Supply
   105–125 volts, 25–60 cycles on AC, 25 watts
2. Battery Power Supply
   9 volt "A" Supply
   90 volt "B" Supply

Loudspeaker—"Alnico" Magnet Dynamic

Outside Cone Diameter . . . . . 5 inches
Voice Coil Impedance (400 cycles) . . . . . 3.5 ohms

Maximum Power Output . . . . . 440 milliwatts

Special Service Information

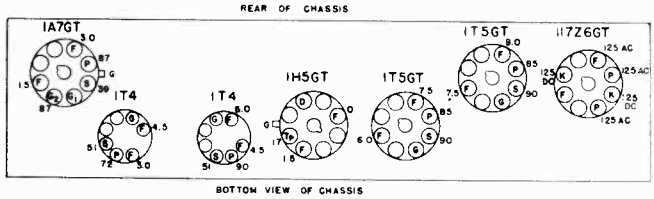
The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available:

(1) Stage Gains
RF Grid to Converter Grid . . . . . 5.0 to 1000 KC
Converter Grid to 1F Grid . . . . . 40 at 1000 KC
Converter Grid to 1F Grid . . . . . 50 at 455 KC
1F Grid to 1H5GT diode plate . . . . . 90 at 455 KC

(2) 0.07 volts, 400 cycle signal across the volume control will give 50 milliwatts speaker output. With volume control set at maximum.

(3) Average DC voltage developed across the oscillator grid resistor (R9)—10 volts

Variations of ±20 o/o permissible. All readings are obtained with the AVC shorted out.



Line-Battery Switch Wiring

Figures 4 and 5 show the line-battery switch for the Models LB700-LB702 and LB701-LB703 respectively. The switch terminals are numbered from 1–6 and 1–12 to facilitate the tracing of the circuit when referring to the schematic diagram in changing or servicing a switch.

ALIGNMENT PROCEDURE

Alignment Frequencies

IF–455 KC . . . . . RF–1750 and 1500 KC

General Alignment Notes

The chassis must be removed from the carrying case in order to perform the alignment of the IF, wavetrap and oscillator trimmers. For alignment of the RF trimmer, the chassis should be assembled in the cabinet. Special care must be exercised in making alignments outside the cabinet so as to place the batteries, Beam-a-Scope and chassis in the same relative positions with respect to one another as these components occupy in the cabinet; otherwise alignment will not be satisfactory.

IF Alignment

Connect an output meter across the voice coil of speaker and rotate volume control to maximum. Tighten wave trap trimmer (C24), then loosen this trimmer screw about two turns. Set test oscillator to 455 KC and capacity couple this test oscillator signal to the loop antenna. This can be done by using a three foot piece of wire connected to the high side of the signal generator and bring this wire to within a foot or two of the receiver loop antenna. Keep oscillator signal as low as a readable meter reading will permit and align all IF trimmers (C14, 13, 12, 11) for maximum output.

Wave Trap Alignment

With test oscillator set at 455 KC and with same input as described under "IF Alignment," adjust wave trap trimmer (C24) for a minimum output-meter reading.

RF Alignment

Adjust test oscillator to 1750 KC and loosely couple a wire from the output terminal of the signal generator so that the receiver loop will pick up the signal. Set the gang condenser to minimum capacity and adjust the oscillator trimmer (C2A) to receive the signal. After this has been done return the chassis to the cabinet, replace the back cover and set test oscillator to 1500 KC. Tune the receiver until this signal is heard, then with a thin insulated screw driver, peak the RF trimmer C1A for maximum output. This trimmer is available through the hole in the side of the cabinet.

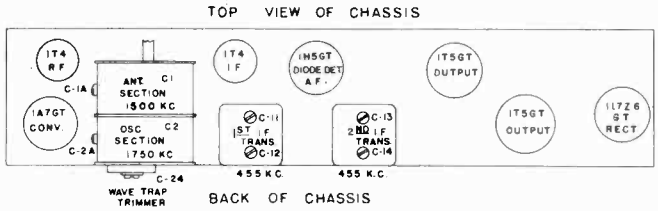
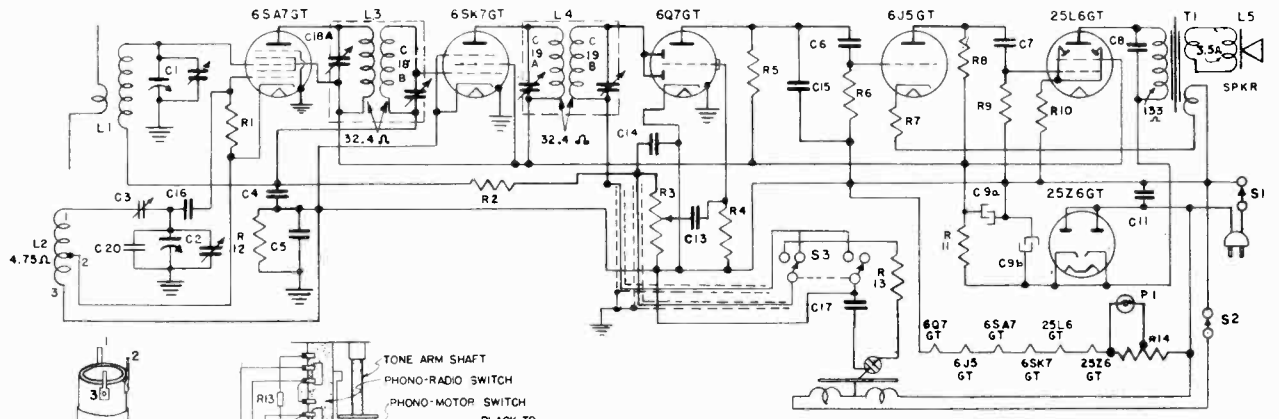
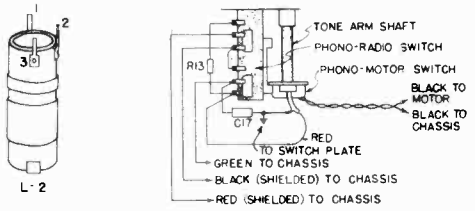


Fig. 1. Trimmer Location

GENERAL ELECTRIC CO.

MODEL L-678



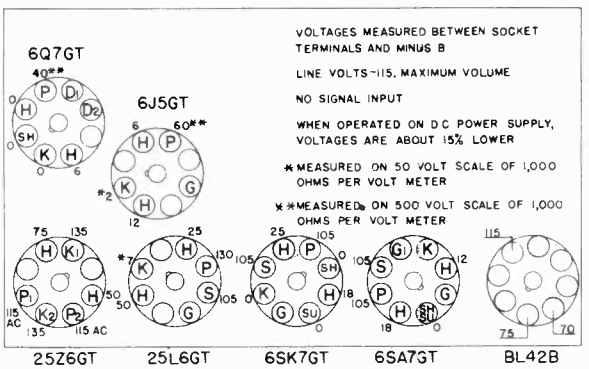


IF PEAK 455 KC

Stock No	Symbol	Description	List Price
*RC-7017	C-1, -2	CONDENSER—Tuning Condenser	$5.80
*RC-6515	C-3	CAPACITOR—Oscillator padder	.30
*RC-072	C-4	CAPACITOR—.05 Mfd., 200 V. paper	.25
*RC-130	C-5	CAPACITOR—0.2 Mfd., 400 V. paper	.30
*RC-023	C-6, 7	CAPACITOR—.005 Mfd., 600 V. paper	.25
*RC-039	C-8	CAPACITOR—.01 Mfd., 600 V. paper	.25
*RC-5145	C-9a	CAPACITOR—30 Mfd., 150 V.	.75
*RC-5145	C-9b	CAPACITOR—50 Mfd., 150 V.	
*RC-092	C-11	CAPACITOR—.05 Mfd., 600 V. paper	.30
*RC-060	C-13	CAPACITOR—.03 Mfd., 600 V. paper	.25
*RC-293	C-14	CAPACITOR—470 Mmf., mica	.30
*RC-250	C-15	CAPACITOR—220 Mmf., mica	.25
*RC-216	C-16	CAPACITOR—47 Mmf., mica	.25
*RC-104	C-17	CAPACITOR—0.1 Mfd., 400 V. paper	.30
*RC-226	C-20	CAPACITOR—10 Mmf., mica	.25
*RQ-1295	R-1	CAPACITOR—33,000 ohms, ½ W. carbon	.70–5
*RQ-1339	R-2	RESISTOR—2.2 megohm, ½ W. carbon	.70–5
RV-119	R-3, S-1	VOLUME CONTROL—0.5 megohm potentiometer	1.45
*RQ-1365	R-4	RESISTOR—15 megohm, ½ W. carbon	.70–5
*RQ-1323	R-5	RESISTOR—470,000 ohms, ½ W. carbon	.70–5
*RQ-1331	R-6	RESISTOR—1.0 megohm, ½ W. carbon	.70–5
*RQ-1271	R-7	RESISTOR—3,300 ohms, ½ W. carbon	.70–5
*RQ-1297	R-8	RESISTOR—39,000 ohms, ½ W. carbon	.70–5
*RQ-1323	R-9	RESISTOR—470,000 ohms, ½ W. carbon	.70–5
*RQ-1239	R-10	RESISTOR—150 ohms, ½ W. carbon	.70–5
*RQ-1459	R-11	RESISTOR—1,000 ohms, 1 W. carbon	.20
*RQ-1323	R-12	RESISTOR—470,000 ohms, ½ W. carbon	.70–5
*RQ-1307	R-13	RESISTOR—100,000 ohms, ½ W. carbon	.70–5
*RR-773	R-14	RESISTOR—BL42B Ballast resistor	.40
*RL-528	L-1	LOOP—Built-in antenna and back cover assembly	1.00
*RL-2016	L-2	COIL—Oscillator coil	.25
*RT-341	L-3	TRANSFORMER—1st I.F. transformer	.80
*RT-342	L-4	TRANSFORMER—2nd I.F. transformer	.80
*RT-475	T-1	TRANSFORMER—Output transformer	1.00

FOR OTHER DATA SEE INDEX

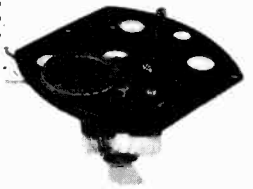
FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS

MOTOR ASSEMBLY MODEL 1 (60-cycle only)

*RB-187	BRACKET—Rubber-edged drive wheel bracket assembly	$0.20
*RB-188	BRACKET—Rubber edged idler wheel bracket assembly	.20
*RB-627	BUSHING—Motor mtg. rubber bushing	.20–5
*RC-5146	CAPACITOR—Motor capacitor	1.00
*RH-112	HAIRPIN COTTER—Rubber wheel hairpin cotter	.10–10
*RM-129	MOTOR—60-cycle motor complete	4.50
*RP-157	PLATE—Motor mounting plate and spindle bearing assembly	.90
*RS-471	SPRING—Idler wheel bracket tension spring	.30–5
*RS-934	SPINDLE—Turntable spindle and snap ring	.30
*RT-916	TURNTABLE—8-inch flocked turntable	1.60
*RW-910	WHEEL—Rubber-edged wheel	.35



MOTOR ASSEMBLY—MODEL 2 (60-cycle and 50-cycle)

*RM-133	MOTOR—60-cycle motor assembly complete	$4.75
RM-152	MOTOR—50-cycle motor assembly complete	5.25
*RP-165	PLATE—Main plate and turntable shaft bearing assembly	1.00
*RP-166	PLATE—Motor mounting plate	.35
*RP-167	PLATE—Rubber-edged wheel movable plate and bearing assembly	.80
*RP-316	PULLEY—60-cycle drive pulley	.15
RP-333	PULLEY—50-cycle drive pulley	.35–2
*RS-493	SPRING—Movable plate tension spring	.10
*RS-943	SPINDLE—Turntable spindle and cotter	.25
*RS-953	SPACERS—Rotor spacers between bearings	.15–5
*RT-924	TURNTABLE—8-inch turntable	1.50
*RW-912	WHEEL—Rubber-edged wheel, washer, oil felt and cotter	1.50

(PRICES SUBJECT TO CHANGE WITHOUT NOTICE)

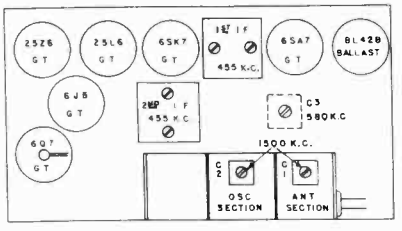


Fig. 1. Trimmer Location

MODELS HE-74, HE-74L,
HE-740, HE-740L

GENERAL ELECTRIC CO.

REPLACEMENT PARTS LIST

Models HE-74, HE-74L, HE-740, and HE-740L

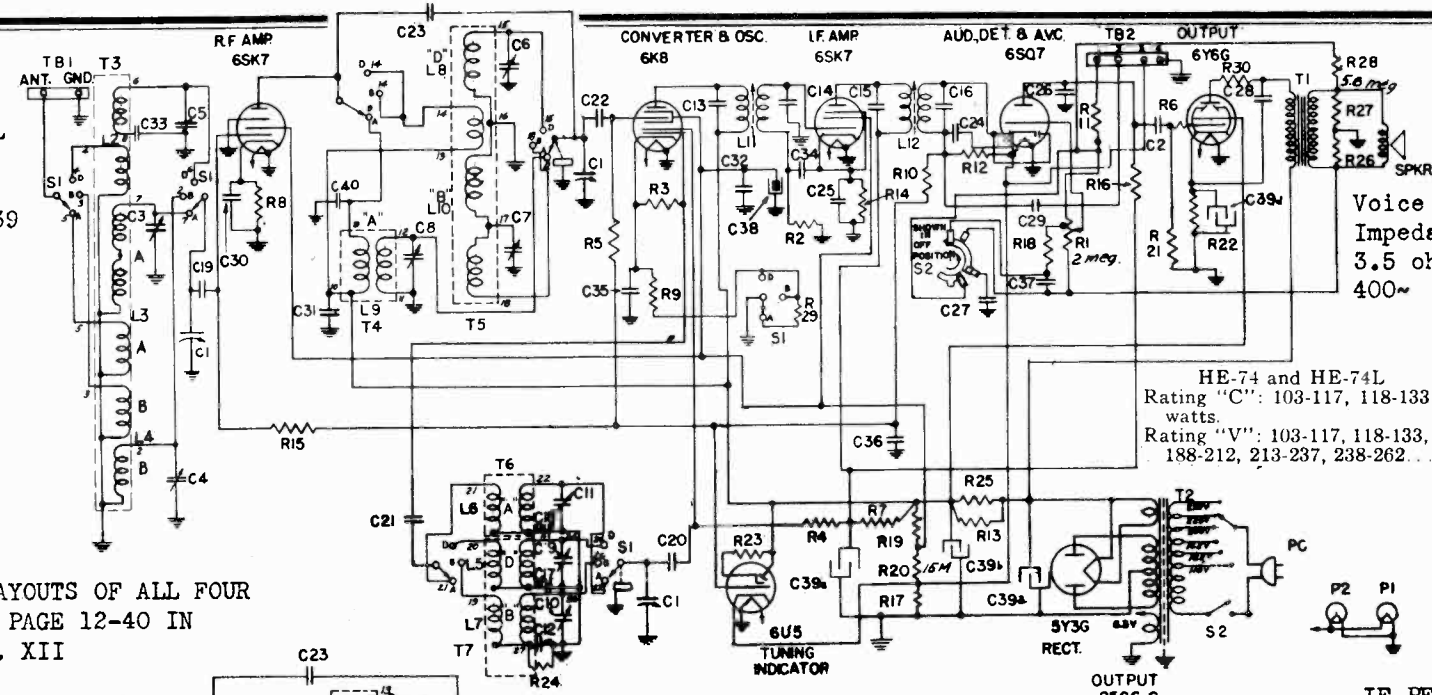
Stock No.	Description	List Price
*RB-095	BOARD—Terminal board (2 lugs)	$0.10
RB-911	BACK COVER—Cabinet back cover (Model HE-740, 740L)	.30
RB-1002	BOARD—Ant-Gnd. terminal board (Model HE-74, 74L)	.10
RB-1004	BOARD—Terminal board (2 lugs and mounting post)	.10
RB-1005	BOARD—Terminal board (4 lugs)	.10
RB-1006	BOARD—Terminal board (5 lugs)	.10
RB-1007	BOARD—Terminal board (3 lugs) (Model HE-74, 740)	.10
RB-1011	BOARD—Ant-Gnd. terminal board (Model HE-740, 740L)	.10
RB-1012	BOARD—Phono-terminal board	.15
RB-1023	BOARD—Terminal board (5 lugs) (Model HE-74L, 740L)	.10
RC-004	CAPACITOR—.00075 mfd. 600 V. paper (C-27)	.25
*RC-011	CAPACITOR—.002 mfd. 600 V. paper (C 29)	.25
RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-40, 41)	.25
*RC-054	CAPACITOR—.03 mfd. 1500 V. paper (C-28)	.35
*RC-055	CAPACITOR—.003 mfd. 600 V. paper (C-37)	.25
RC-056	CAPACITOR—.006 mfd. 600 V. paper (C-33)	.25
RC-072	CAPACITOR—.05 mfd. 200 V. paper (C-30, 34, 35, 36)	.25
RC-074	CAPACITOR—.05 mfd. 600 V. AC line (C-43)	.40
RC-090	CAPACITOR—.04 mfd. 600 V. paper (C-25)	.30
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-2, 31, 32)	.30
RC-148	CAPACITOR—.25 mfd. 600 V. paper (C-42)	.35
*RC-206	CAPACITOR—50 mmf. mica (C-21)	.35
RC-231	CAPACITOR—10 mmf. mica (C-23)	.25
RC-235	CAPACITOR—100 mmf. mica (C-24)	.25
*RC-250	CAPACITOR—220 mmf. mica (C-26)	.25
RC-293	CAPACITOR—470 mmf. mica (C-19, 20, 22)	.30
*RC-348	CAPACITOR—1600 mmf. mica (C-18)	.35
*RC-359	CAPACITOR—2800 mmf. mica (C-17)	.50
*RC-676	CAPACITOR—300-650 mmf. "B" band padder (C-12)	.35
*RC-684	CAPACITOR—5-40 mmf. 3-30 mmf. 2-20 mmf. "D," "C," "B" band antenna trimmer assembly (C-3, 4, 5)	.45
*RC-685	CAPACITOR—3-30 mmf. 3-30 mmf. 3-30 mmf. "D," "C," "B" band R.F. trimmer assembly (C-6, 7, 8)	.45
*RC-686	CAPACITOR—3-30 mmf. 3-30 mmf. 5-45 mmf. "D," "C," "B" band oscillator trimmer assembly (C-9, 10, 11)	.45
*RC-863	CORD—Power cord (Model HE-74, 74L)	.65
*RC-1981	CLAMP—Tuning indicator clamp	.10
*RC-5100	CAPACITOR—8 mfd. 250 V. dry electrolytic (C-38)	.50
RC-5130	CAPACITOR—40 mfd. 350 V.; 20 mfd. 300 V.; 20 mfd. 300 V.; 20 mfd. 25 V.; dry electrolytic (C39a, 39b, 39c, 39d) (Model HE-74, 74L)	2.10
RC-5132	CAPACITOR—40 mfd. 300 V.; 50 mfd. 250 V.; 20 mfd. 250 V.; 20 mfd. 25 V.; dry electrolytic (C-39a, 39b, 39c, 39d) (Model HE-740, 740L)	2.10
RC-6518	CAPACITOR—75-175 mmf. "A" band padder	.25
RC-7010	CONDENSER—Tuning condenser (C-1)	4.95
RC-8085	CABLE—Tuning indicator cable assembly (Model HE-740, 740L)	.50
RC-8118	CABLE—Tuning indicator cable assembly (Model HE-74, 74L)	$0.50
RC-8126	CORD—Power cord (Model HE-740, 740L)	.40
RD-106	DIAL—Dial scale (Model HE-74, 740)	1.15
RD-118	DIAL—Dial scale (Model HE-74L, 740L)	1.35
RE-054	ESCUTCHEON—Dial scale escutcheon	1.90
RE-055	ESCUTCHEON—Tuning indicator escutcheon	.20
*RF-012	FOOT—Mounting foot assembly	.40
*RG-016	GRID CLIP—Grid clip for metal tube (Pkg. 5)	.10
RK-045	KNOB—Control knobs (Pkg. 5) (Model HE-740, 740L)	.60
RK-047	KNOB—Control knobs (Model HE-74, 74L) (Pkg. 5)	.40
RL-082	COIL—Ant. coil, band "D," "C" and "B" (L-2, 3, 4) (HE-74, 740)	1.50
RL-091	COIL—Ant. coil, band "D," "A" and "B" (L-2, 3, 4) (Model HE-74L, 740L)	2.50
RL-157	COIL—RF coil, band "D" and "B" (L8, 10) (Model HE-74, 740)	1.00
RL-158	COIL—RF coil, band "C" (L-9) (HE-74, 740)	.60
RL-160	COIL—RF coil, band "D" and "B" (L8, 10) (Model HE-74L, 740L)	1.00
RL-161	COIL—RF coil, band "A" (L-9) (Model HE-74L, 740L)	1.15
RL-284	COIL—Osc. coil, band "D" and "B" (L-5, 7) (Model HE-74, 740)	.85
RL-285	COIL—Osc. coil, band "C" (L-6) (Model HE-74, 740)	.50
RL-298	COIL—Osc. coil, band "D" & "B" (L-5, 7) (Model HE-74L, 740L)	.90
RL-299	COIL—Osc. coil, band "A" (L-6) (Model HE-74L, 740L)	.75
RQ-642	RESISTOR—220 ohms, 2-W. carbon (R-22)	.20
RQ-669	RESISTOR—2700 ohms, 2-W. carbon (R-19)	.20
RQ-672	RESISTOR—3900 ohms, 2-W. carbon (R-13, 25)	.20
*RQ-1219	RESISTOR—22 ohms, ½-W. carbon (R-26) (Pkg. 5)	.70
*RQ-1235	RESISTOR—100 ohms, ½-W. carbon (R-27) (Pkg. 5)	.70
*RQ-1239	RESISTOR—150 ohms, ½-W. carbon (R-17) (Pkg. 5)	.70
*RQ-1243	RESISTOR—220 ohms, ½-W. carbon (R-9) (Pkg. 5)	.70
*RQ-1247	RESISTOR—330 ohms, ½-W. carbon (R-14) (Pkg. 5)	.70
*RQ-1253	RESISTOR—560 ohms, ½-W. carbon (R-8) (Pkg. 5)	.70
*RQ-1259	RESISTOR—1000 ohms, ½-W. carbon (R-6, 7) (Pkg. 5)	.70
*RQ-1277	RESISTOR—5600 ohms, ½-W. carbon (R-24) (Pkg. 5)	.70
*RQ-1287	RESISTOR—15,000 ohms, ½-W. carbon (R-4) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms, ½-W. carbon (R-3) (Pkg. 5)	.70
*RQ-1299	RESISTOR—47,000 ohms, ½-W. carbon (R-11) (Pkg. 5)	.70
*RQ-1315	RESISTOR—220,000 ohms, ½-W. carbon (R-18) (Pkg. 5)	.70
*RQ-1319	RESISTOR—330,000 ohms, ½-W. carbon (R-2, 12, 16) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms, ½-W. carbon (R-21) (Pkg. 5)	.70
*RQ-1325	RESISTOR—560,000 ohms, ½-W. carbon (R-5, 15) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 meg. ½-W. carbon (R-10) (Pkg. 5)	.70

*Used on previous receivers.

(Prices subject to change without notice)

GENERAL ELECTRIC CO.

MODELS HE-74L, HE-740, HE-740L



Model HE-74L
Similar to
HE-74, see
GE page 12-39
except for
wave bands.

Voice Coil
Impedance
3.5 ohms at
400~

HE-74 and HE-74L
Rating "C": 103-117, 118-133 volts, 25-60 cycles, 85 watts.
Rating "V": 103-117, 118-133, 134-155, 188-212, 213-237, 238-262 ..... { volts, 50-60 cycles, 85 watts.

FOR PARTS LAYOUTS OF ALL FOUR
MODELS, SEE PAGE 12-40 IN
RIDER'S VOL. XII

IF PEAK 455 KC

Model HE-740

Tuning Frequency Range

Models HE-74 and HE-740
Band B: 540–1600 K.C.
Band C: 2200–7000 K.C.
Band D: 7000–22,000 K.C.
Models HE-74L and HE-740L
Band A: 140-400 K.C.
Band B: 540–1600 K.C.
Band D: 5700–18,000 K.C.

Model HE-740L. Similar to HE-740 except for wave bands, for which see Model HE-74L above

Models HE-740 and HE-740L
Rating: 200-240 volts AC or DC, 25-100 cycles, 105 watts.

MODEL L-740

GENERAL ELECTRIC CO.

SPECIFICATIONS

Over-all Dimensions

Height ..... 11⅝ inches
Width ..... 17 inches
Depth ..... 11 inches

Electrical Rating

"A" rating, 110–125 volts, 50–60 cycles, 70 watts.
"C" rating, 110–125 volts, 25 cycles, 70 watts.

Tuning Frequency Range

"BC" Band ..... 550–1720 KC
"SW1" Band ..... 1.7–5.2 MC
"SW2" Band ..... 5.2–18.1 MC

Intermediate Frequency ..... 455 KC

Electrical Power Output

Undistorted ..... 3.5 watts
Maximum ..... 5.5 watts

Loud-speaker—PM Dynamic

Outside Cone Diameter ..... 6½ inch
Voice Coil Impedance ..... 3.5 ohms

Tubes

RF Amplifier GE-6SG7
Converter, Oscillator GE-6SA7
IF Amplifier, Detector, AVC. GE-6SF7
Audio Amplifier, Phase Inverter GE-6SC7
Power Output. ..... (2) GE-6K6GT
Rectifier GE-5W4GT
Dial Lamps ..... (2) MAZDA No. 44

ALIGNMENT CHART

Step	Connect Test-Osc. to	Test-Osc. Setting	Pointer Setting	Adjust Trimmers for Maximum Output
1	6SF7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C17 & C16
2	6SA7 Conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C14 & C13
3	Capacity Coupled	580 KC	"BC" Band 580 KC	C11**
4	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C8** (Osc.)
5	Repeat Step 3			
6	Capacity Coupled	5 MC	"SW1" Band	C7** (Osc.)
7	Capacity Coupled	18 MC	"SW2" Band 18 MC	C6* (Osc.)
8	Capacity Coupled	18 MC	"SW2" Band 18 MC	C1** (Ant.)

*Use minimum capacity peak.
**Rock gang condenser when making alignment.

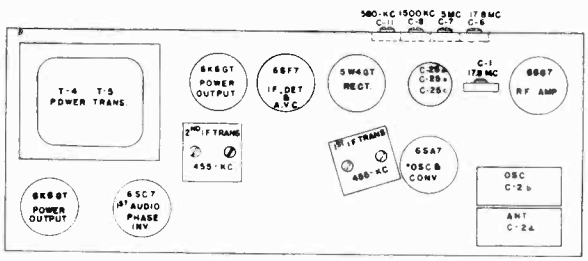


Fig. 1. Trimmer Location

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 1. All oscillator and RF trimmers are accessible through a slot through the back cover of the cabinet.

The alignment procedure is given in table form. All IF alignments may be made with the chassis removed from the cabinet. However, the RF alignments are made with the chassis and loop antennas securely fastened in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects it. The RF signal should be capacity coupled by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet.

Special Service Information

The following data are taken with a vacuum tube voltmeter or similar voltage measuring device.

(1) Stage Gains

Antenna Post to RF Grid	6.5 at 1000 KC
RF Grid to Converter Grid	10 at 1000 KC
Converter Grid to IF Grid	45 at 1000 KC
Converter Grid to IF Grid	60 at 455 KC
IF Grid to 6SF7 diode plates	110 at 455 KC

(2) Audio Gains
.16 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor R4 averages 10 volts at 1000 KC or 8.0 volts at 10,000 KC.

Variations of ±20% permissible. All readings taken with −1½-volt fixed bias on AVC bus.

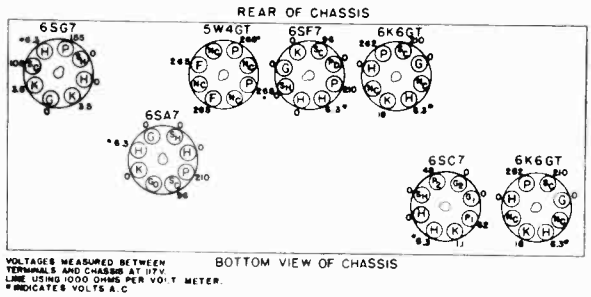
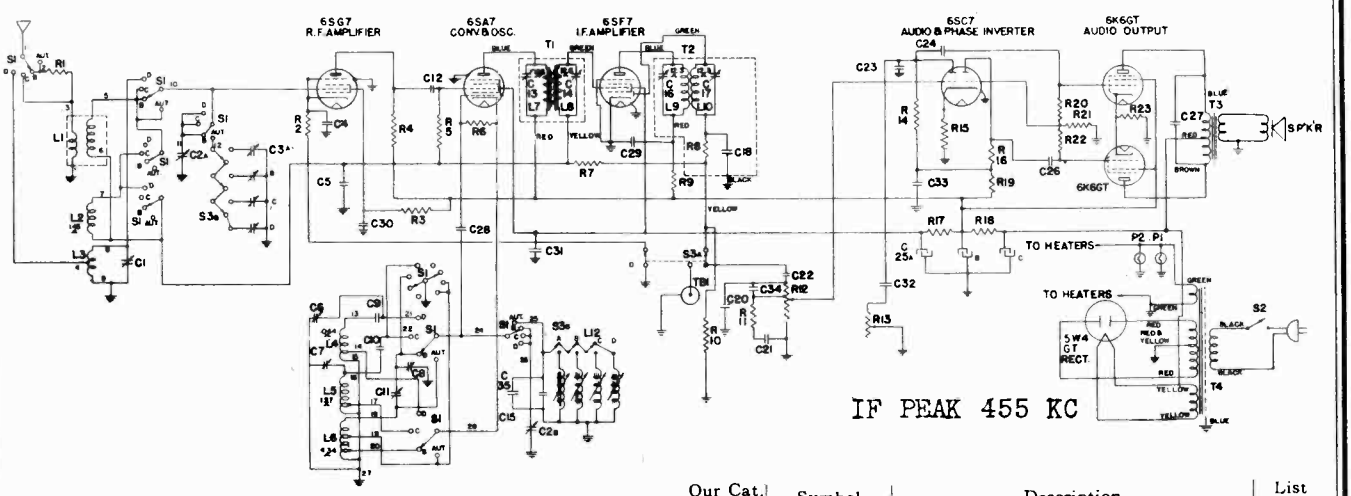
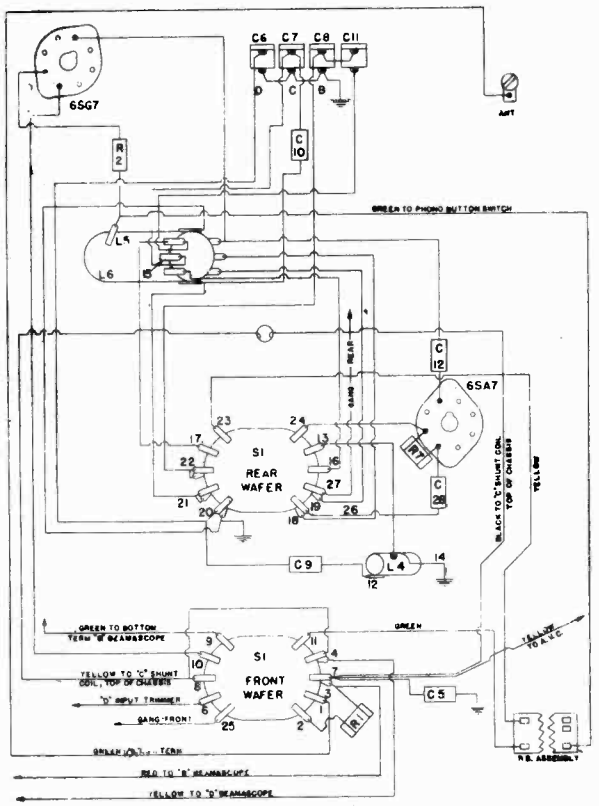


Fig. 2. Socket Voltages

MODEL L-740

GENERAL ELECTRIC CO.





Our Cat. Number	Symbol	Description	List Price
RC-6553	C-1	CAPACITOR—1.8-20 mmf., "D" band trimmer	$0.25
RC-7061	C-2a, C-2b	CONDENSER—2 gang condenser	2.00
RT-885	C-3a, b, c, and d	TRIMMER STRIP—Push button trimmer strip	.70
*RC-039	C-4	CAPACITOR—.01 mfd. 600 volt paper	.25
*RC-072	C-5	CAPACITOR—.05 mfd. 200 volt paper	.25
RC-6555	C-6, 7, 8	CAPACITOR STRIP—"B," "C" and "D" osc. trimmers	.70
*RC-393	C-9	CAPACITOR—4700 mmf., mica	.50
*RC-349	C-10	CAPACITOR—2000 mmf., mica	.30
RC-6555	C-11	CAPACITOR—"B" padder (part of C-4, -5, -6)	.65

Our Cat. Number	Symbol	Description	List Price
*RC-235	C-12	CAPACITOR—100 mmf., mica	.25
RC-305	C-15	CAPACITOR—600 mmf., silvered mica	.25
*RC-252	C-18	CAPACITOR—200 mmf., mica	.30
*RC-235	C-20	CAPACITOR—100 mmf., mica	.25
*RC-049	C-21	CAPACITOR—.004 mfd., 600 V, paper	.35
*RC-023	C-22	CAPACITOR—.005 mfd., 600 V, paper	.25
*RC-249	C-23	CAPACITOR—220 mmf., mica, 500 V	.25
*RC-048	C-24	CAPACITOR—.02 mfd., 600 V, paper	.30
RC-5198	C-25a	CAPACITOR—10 mfd., 250 V, dry electrolytic	1.10
	C-25b	CAPACITOR—15 mfd., 300 V, dry electrolytic	
	C-25c	CAPACITOR—30 mfd., 350 V, dry electrolytic	
*RC-048	C-26	CAPACITOR—.02 mfd. 600 V, paper	.30
*RC-011	C-27	CAPACITOR—.002 mfd. 600 V, paper	.25
*RC-216	C-28	CAPACITOR—47 mmf., mica	.25
*RC-039	C-29, 30, 31	CAPACITOR—.01 mfd. 600 V, paper	.25
*RC-023	C-32	CAPACITOR—.005 mfd. 600 V, paper	.25
*RC-104	C-33	CAPACITOR—0.1 mfd. 600 V, paper	.30
*RC-216	C-34	CAPACITOR—47 mmf., mica	.25
*RC-329	C-35	CAPACITOR—150 mmf, compensating cap	.25
*RQ-1251	R-1	RESISTOR—470 ohm, ½-W. carbon	.70-5
*RQ-1243	R-2	RESISTOR—220 ohm, ½-W. carbon	.70-5
*RQ-1275	R-3	RESISTOR—4700 ohm, ½-W. carbon	.70-5
*RQ-1299	R-6	RESISTOR—47,000 ohm, ½-W. carbon	.70-5
*RQ-1291	R-7	RESISTOR—22,000 ohm, ½-W. carbon	.70-5
*RQ-1339	R-8	RESISTOR—2.2 megohm, ½-W. carbcn.	.70-5
*RQ-1299	R-10	RESISTOR—47,000 ohm, ½-W. carbon	.70-5
*RQ-1308	R-11	RESISTOR—100,000 ohm, ½-W. carbon	$0.70-5
*RV-135	R-12	VOLUME CONTROL—2 meg. volume control	.95
*RQ-1323	R-14	RESISTOR—470,000 ohm, ½-W. carbon	.70-5
*RQ-1273	R-15	RESISTOR—3900 ohm, ½-W. carbon	.70-5
*RQ-1331	R-16	RESISTOR—1 megohm, ½-W. carbon	.70-5
*RQ-683	R-17	RESISTOR—10,000 ohm 2-W. carbon	.35
*RR-357	R-18	RESISTOR—12,000 ohm, 7.4 watt, W. W.	.30
*RQ-1293	R-19	RESISTOR—27,000 ohm, ½-W. carbon	.70-5
*RQ-1319	R-20	RESISTOR—330,000 ohm, ½-W. carbon	.70-5
*RQ-1308	R-21	RESISTOR—100,000 ohm, ½-W. carbon	.70-5
*RQ-1319	R-22	RESISTOR—330,000 ohm, ½-W. carbon	.70-5
*RQ-1451	R-25	RESISTOR—470 ohm, 1-W. carbon	.20
*RQ-1323	R-26	RESISTOR—470,000 ohm, ½-Watt carbon	.70-5
*RQ-1269	R-27	RESISTOR—2600 ohm, ½-Watt carbon	.70-5
RT-723	R-28, S-2	TONE CONTROL—2 megohm tone control and power switch	1.45
*RQ-1308	R-29	RESISTOR—100,000 ohm, ½-W. carbon	.70-5
RL-580	L-1	BEAM-A-SCOPE—"B" band loop and cabinet back assembly	1.60
*RL-167	L-2	COIL—"C" band R.F. coil	.25
RL-581	L-3	BEAM-A-SCOPE—"D" band loop assembly	.60
*RL-2065	L-4	COIL—"D" band oscillator coil	.25
*RL-2066	L-5, -6	COIL—"B" and "C" band osc. coil	.85
*RL-9530	L-12a, b, c, and d	COIL—Push button coil assembly	.85
*RS-3129	S-1	SWITCH—Band change switch	1.30
*RS-3130	S-3a, b	SWITCH—Push button switch	4.00
RT-3011	T-1	TRANSFORMER—1st I.F. transformer	1.20
RT-3012	T-2	TRANSFORMER—2nd I.F. transformer	1.20
RT-4015	T-3	TRANSFORMER—Speaker output transformer	1.40
RT-0724	T-4	TRANSFORMER—50/60 cycle power transformer	4.15
RT-0725	T-5	TRANSFORMER—25-cycle power transformer	9.90
*RS-1012	SPKR	SPEAKER—6½ in. P.M. speaker	3.25

* Used on previous receivers.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

MODEL LC-758

GENERAL ELECTRIC CO.

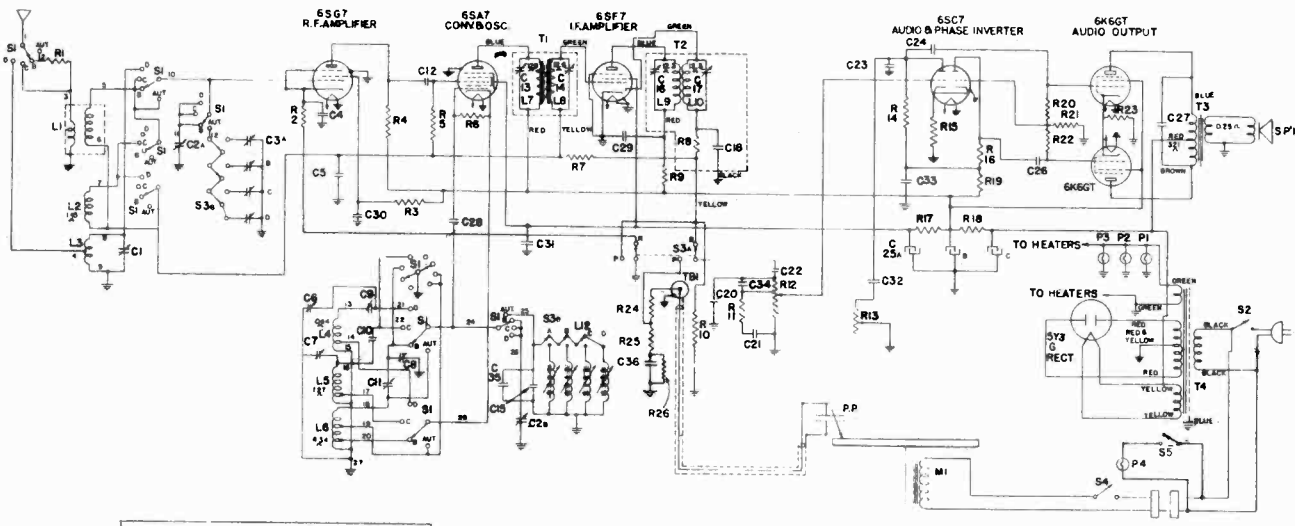


Fig. 1. Schematic Diagram

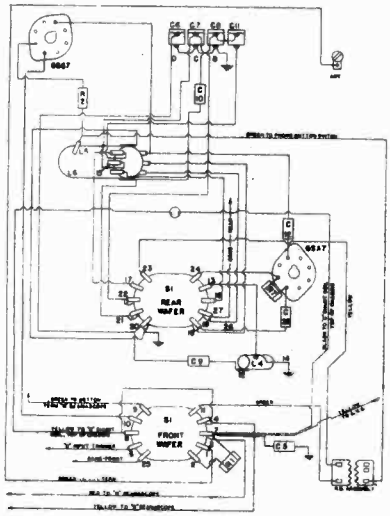


Fig. 2. Switch Wiring

I.F. 455KC

RADIO REPLACEMENT PARTS LIST

Our Cat. Number	Symbol	Description	List Price
	C-25a	CAPACITOR—10 mfd., 350 V dry electrolytic	
RC-5199	C-25b	CAPACITOR—15 mfd., 400 V dry electrolytic	$1.30
	C-25c	CAPACITOR—30 mfd., 450 V dry electrolytic	
*RC-048	C-26	CAPACITOR—.02 mfd., 600 V paper	.30
*RC-191	C-27	CAPACITOR—.002 mfd., 1000 V paper	.35
*RC-216	C-28	CAPACITOR—47 mmf., mica	.25
*RC-039	C-29, 30, 31	CAPACITOR—.01 mfd., 600 V paper	.25
*RC-023	C-32	CAPACITOR—.005 mfd., 600 V paper	.25
*RC-104	C-33	CAPACITOR—0.1 mfd., 600 V paper	.30
*RC-235	C-34	CAPACITOR—100 mmf., mica	.25
*RC-329	C-35	CAPACITOR—150 mmf. compensating	.25
*RC-016	C-36	CAPACITOR—.002 mfd., 600 V paper	.25
*RQ-1259	R-1	RESISTOR—1000 ohm, ½-W carbon	.70–5
*RQ-1243	R-2	RESISTOR—220 ohm, ½-W carbon	.70–5
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½-W carbon	.70–5
*RQ-1275	R-4	RESISTOR—4700 ohm, ½-W carbon	.70–5
*RQ-1299	R-5	RESISTOR—47,000 ohm, ½-W carbon	.70–5
*RQ-1291	R-6	RESISTOR—22,000 ohm, ½-W carbon	.70–5
*RQ-1339	R-7	RESISTOR—2.2 megohm, ½-W carbon	.70–5
*RQ-1299	R-8	RESISTOR—47,000 ohm, ½-W carbon	.70–5
*RQ-1269	R-9	RESISTOR—2700 ohm, ½-W carbon	.70–5
*RQ-1323	R-10	RESISTOR—470,000 ohm, ½-W carbon	.70–5
*RQ-1303	R-11	RESISTOR—68,000 ohm, ½-W carbon	.70–5
*RV-135	R-12	VOL. CONTROL—2 meg. volume control	.95
RT-723	R-13, S-2	TONE CONTROL—2 meg. tone control	1.45
*RQ-1323	R-14	RESISTOR—470,000 ohm, ½-W carbon	.70–5
*RQ-1273	R-15	RESISTOR—3,900 ohm, ½-W carbon	.70–5
*RQ-1331	R-16	RESISTOR—1 megohm, ½-W carbon	.70–5
*RQ-687	R-17	RESISTOR—15,000 ohm, 2-W carbon	.35
*RR-357	R-18	RESISTOR—1,200 ohm, 5.6 watt, w.w.	.30
*RQ-1308	R-19	RESISTOR—100,000 ohm, ½-W carbon	.70–5
*RQ-1319	R-20	RESISTOR—330,000 ohm, ½-W carbon	.70–5
*RQ-1308	R-21	RESISTOR—100,000 ohm, ½-W carbon	.70–5
*RQ-1319	R-22	RESISTOR—330,000 ohm, ½-W carbon	.70–5
*RQ-646	R-23	RESISTOR—330 ohm, 2-W carbon	.20
*RQ-1315	R-24, 25, 26	RESISTOR—220,000 ohm, ½-W carbon	.70–5
RL-586	L-1	BEAM-A-SCOPE—"B" band loop	2.75
*RL-167	L-2	COIL—"C" band R.F. coil	.25
RL-587	L-3	BEAM-A-SCOPE—"D" band loop assembly	.55
*RL-2065	L-4	COIL—"D" band oscillator coil	.25
RL-2070	L-5-6	COIL—"B" and "C" band oscillator coil	.80
*RL-9530	L-12a, b, c, d	COIL—Push-button coil assembly	.85
*RS-3129	S-1	SWITCH—Band change switch	1.30
*RS-3130	S-3a, b	SWITCH—Push-button switch	4.00
RS-3137	S-5	SWITCH—PHONO compartment lamp switch	.40
RT-3017	T-1	TRANSFORMER—1st IF transformer	1.20

RADIO REPLACEMENT PARTS LIST

Our Cat. Number	Symbol	Description	List Price
*RC-6537	C-1	CAPACITOR—1.8-20 mmf. "D" band trimmer	$0.25
*RC-7061	C-2a, 2b	CONDENSER—2-gang tuning condenser	2.00
*RT-885	C-3a, b, c, d	TRIMMER STRIP—Push button trimmer strip	.70
*RC-039	C-4	CAPACITOR—.01 mfd., 600 V paper	.25
*RC-072	C-5	CAPACITOR—.05 mfd., 200 V paper	.25
*RC-6555	C-6, 7, 8	CAPACITOR STRIP—"B," "C" and "D" osc. trimmers	.65
*RC-393	C-9	CAPACITOR—4700 mmf., mica	.50
*RC-349	C-10	CAPACITOR—2000 mmf., mica	.30
*RC-6555	C-11	CAPACITOR—"B" padder (Part of C6, 7, 8)	.65
*RC-235	C-12	CAPACITOR—100 mmf., mica	.25
*RC-305	C-15	CAPACITOR—600 mmf., silvered mica	.25
*RC-252	C-18	CAPACITOR—200 mmf., mica	.30
*RC-235	C-20	CAPACITOR—100 mmf., mica	.25
*RC-049	C-21	CAPACITOR—.0042 mfd., 600 V paper	.35
*RC-023	C-22	CAPACITOR—.005 mfd., 600 V paper	.25
*RC-249	C-23	CAPACITOR—220 mmf., mica	.25
*RC-048	C-24	CAPACITOR—.02 mfd., 600 V paper	.30

* Used on previous receivers.

Prices subject to change without notice.

GENERAL ELECTRIC CO.

SPECIFICATIONS

Over-all Dimensions

Height ..... 36 inches
Width ..... 34 7/16 inches
Depth ..... 16 5/8 inches

Electrical Rating

Rating "A6"—110–125 volts, 60 cycles, 85 watts
Rating "A5"—110–125 volts, 50 cycles, 85 watts

Tuning Frequency Range

"BC" Band ..... 550–1720 KC
"SW1" Band ..... 1.7–5.2 MC
"SW2" Band ..... 5.2–18.1 MC

Intermediate Frequency ..... 455 KC

For RCA RP 158 Record Changer, see Rider's "Automatic Record Changers and Recorders".

Special Service Information

The following data are taken with a vacuum tube voltmeter or similar voltage measuring device.

(1) Stage Gains

Antenna Post to RF Grid	6.5 at 1000 KC
RF Grid to Converter Grid	10 at 1000 KC
Converter Grid to IF Grid	45 at 1000 KC
Converter Grid to IF Grid	60 at 455 KC
IF Grid to 6SF7 diode plates	110 at 455 KC

(2) Audio Gains
.16 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor R4 averages 10 volts at 1000 KC or 8.0 volts at 10,000 KC.

Variations of ±20% permissible. All readings taken with minus 1½-volt fixed bias on AVC bus.

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 4. All oscillator and RF trimmers are accessible through a slot through the back cover of the cabinet.

The alignment procedure is given in table form. All IF alignments may be made with the chassis removed from the cabinet. However, the RF alignments are made with the chassis and loop antennas securely fastened in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects it. The RF signal should be capacity coupled by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet.

ALIGNMENT CHART

Step	Connect Test-Osc. to	Test-Osc. Setting	Pointer Setting	Adjust Trimmers for Maximum Output
1	6SF7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C17 & C16
2	6SA7 Conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C14 & C13
3	Capacity Coupled	580 KC	"BC" Band 580 KC	C11**
4	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C8** (Osc.)
5	Repeat Step 3			
6	Capacity Coupled	5 MC	"SW1" Band	C7** (Osc.)
7	Capacity Coupled	17.8 MC	"SW2" Band 18 MC	C6* (Osc.)
8	Capacity Coupled	17.8 MC	"SW2" Band 18 MC	C1** (Ant.)

* Use minimum capacity peak.
** Rock gang condenser when making alignment.

Electrical Power Output

Undistorted ..... 8.5 watts
Maximum ..... 14 watts

Loud-speaker—PM Dynamic

Outside Cone Diameter ..... 12 inches
Voice Coil Impedance (400 cycles) ..... 3.5 ohms

Phonograph Mechanism

Type Changer ..... Model LRP-158 or LRP-170
Type Pickup ..... Crystal
Turntable Speed ..... 78 RPM

Tubes

RF Amplifier GE-6SG7
Converter-Oscillator GE-6SA7
IF Amplifier, AVC, Detector GE-6SF7
Audio Amplifier, Phase Inverter GE-6SC7
Audio Output ..... (2) GE-6K6GT
Rectifier GE-5Y3G
Dial Lamps ..... (2) MAZDA No. 44

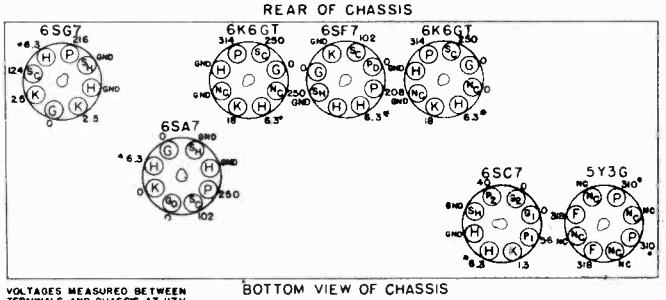


Fig. 3. Socket Voltages

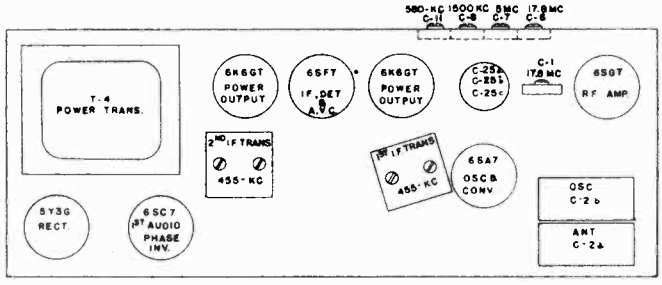
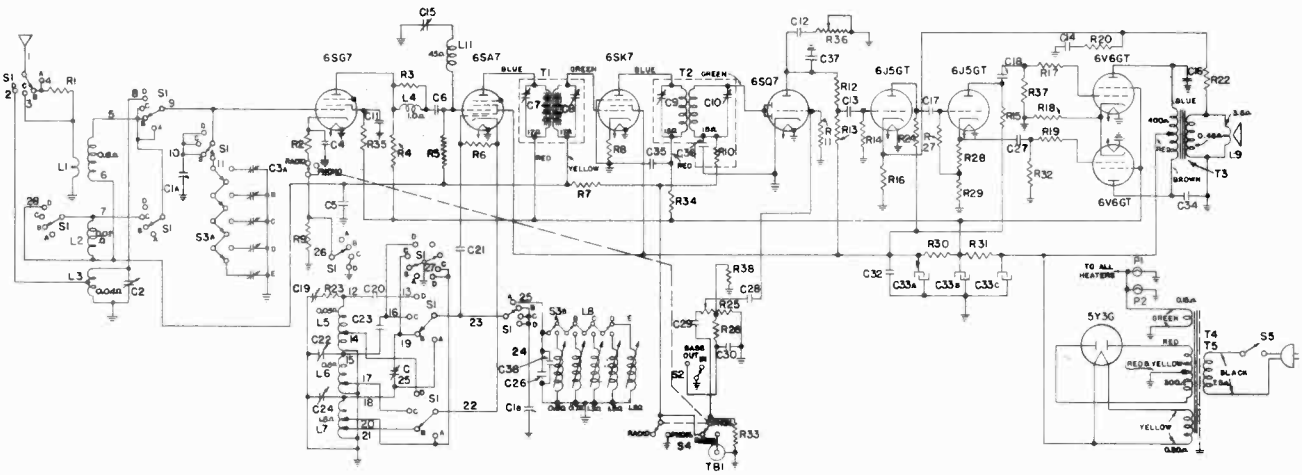


Fig. 4. Trimmer Location

MODEL L-915

GENERAL ELECTRIC CO.



RADIO REPLACEMENT PARTS LIST

Our Cat. Number	Symbol	Description	List Price
*RC-5165	C-33a	CAPACITOR—10 mfd. 300-V. dry electrolytic.	$1.10
	C-33b	CAPACITOR—15 mfd. 300-V. dry electrolytic	
	C-33c	CAPACITOR—300 mfd. 350-V dry electrolytic	
*RC-191	C-34	CAPACITOR—.002 mfd. 1000-V paper.	.35
*RC-039	C-35	CAPACITOR—.01 mfd. 600-V paper.	.25
*RC-252	C-36	CAPACITOR—200 mmf., mica	.30
*RC-249	C-37	CAPACITOR—220 mmf., mica	.25
RC-327	C-38	CAPACITOR—82 mmf., compensating cap.	.25
*RQ-1259	R-1	RESISTOR—1000 ohm ½-W carbon	.70-5
*RQ-1243	R-2	RESISTOR—220 ohm ½-W carbon	.70-5
*RQ-1283	R-3	RESISTOR—10,000 ohm ½-W carbon	.70-5
*RQ-1275	R-4	RESISTOR—4700 ohm ½-W carbon	.70-5
*RQ-1299	R-5	RESISTOR—47,000 ohm ½-W carbon	.70-5
*RQ-1291	R-6	RESISTOR—22,000 ohm ½-W carbon	.70-5
*RQ-1339	R-7	RESISTOR—2.2 megohms ½-W carbon	.70-5
*RQ-1239	R-8	RESISTOR—150 ohm ½-W carbon	.70-5
*RQ-1251	R-9	RESISTOR—470 ohm ½-W carbon	.70-5
*RQ-1299	R-10	RESISTOR—47,000 ohm ½-W carbon	.70-5
*RQ-1355	R-11	RESISTOR—10 megohm ½-W carbon	.70-5
*RQ-1308	R-12	RESISTOR—100,000 ohm ½-W carbon	.70-5
*RQ-1317	R-13	RESISTOR—270,000 ohm ½-W carbon	.70-5
*RQ-1323	R-14	RESISTOR—470,000 ohm ½-W carbon	.70-5
*RQ-1295	R-15	RESISTOR—33,000 ohm ½-W carbon	.70-5
*RQ-1283	R-16	RESISTOR—10,000 ohm ½-W carbon	.70-5
*RQ-1259	R-17	RESISTOR—1000 ohm ½-W carbon	.70-5
*RQ-1433	R-18	RESISTOR—180 ohm 1-W carbon	.20
*RQ-1259	R-19	RESISTOR—1000 ohm ½-W carbon	.70-5
*RQ-1265	R-20	RESISTOR—1800 ohm ½-W carbon	.70-5
*RQ-1283	R-22	RESISTOR—10,000 ohm ½-W carbon	.70-5
*RQ-1221	R-23	RESISTOR—27 ohm ½-W carbon	.70-5
*RQ-1309	R-24	RESISTOR—120,000 ohm ½-W carbon	.70-5
RV-137	R-25	VOLUME CONTROL—2 meg. volume control	.95
*RQ-1311	R-26	RESISTOR—150,000 ohm ½-W carbon	.70-5
*RQ-1323	R-27	RESISTOR—470,000 ohm ½-W carbon	.70-5
*RQ-1269	R-28	RESISTOR—2700 ohm ½-W carbon	.70-5
*RQ-1295	R-29	RESISTOR—30,000 ohm ½-W carbon	.70-5
*RQ-673	R-30	RESISTOR—8200 ohm 2-W carbon	.20
*RQ-765	R-31	RESISTOR—1800 ohm 3-W carbon	.20
*RQ-1323	R-32	RESISTOR—470,000 ohm ½-W carbon	.70-5
*RQ-1315	R-33	RESISTOR—220,000 ohm ½-W carbon	.70-5
*RQ-1259	R-34	RESISTOR—1000 ohm ½-W carbon	.70-5
*RQ-1293	R-35	RESISTOR—27,000 ohm ½-W carbon	.70-5
RT-724	R-36, S5	TONE CONTROL—Treble tone control and power switch	1.45
*RQ-1323	R-37, 38	RESISTOR—470,000 ohm ½-W carbon	.70-5
RL-582	L-1	BEAM-A-SCOPE—"B" band loop assembly	3.25
RL-1017	L-2	COIL—"C" band antenna coil	.20
RL-583	L-3	BEAM-A-SCOPE—"D" band loop assembly	.45
RL-372	L-4	CHOKE—RF interstage choke	.20
RL-2067	L5, 6, 7	COIL—"D," "C" and "B" bands osc. coil	1.05
*RL-9528	L-8a, b, c, d, e	COIL—Station selector trimmer coil assembly	4.80
RS-3131	S-1	SWITCH—Band change switch	1.35
*RS-3108	S-2	SWITCH—Bass-tone control switch	.20

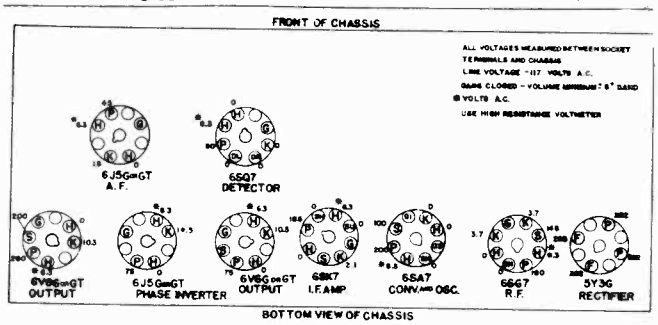
Prices subject to change without notice.

RADIO REPLACEMENT PARTS LIST

Our Cat. Number	Symbol	Description	List Price
RC-7063	C1a, 1b	CONDENSER—Tuning condenser	$2.00
*RC-6537	C2	CAPACITOR—"D" band trimmer	.25
RT-886	C-3 a, b, c, d, e	TRIMMER STRIP—Station selector trimmer strip	.95
*RC-072	C-4	CAPACITOR—.05 mfd. 200 V paper.	.25
*RC-096	C-5	CAPACITOR—0.1 mfd. 200-V paper.	.30
*RC-235	C-6	CAPACITOR—100 mmf. mica	.25
*RC-048	C-11	CAPACITOR—.02 mfd. 600-V paper	.30
*RC-023	C-12	CAPACITOR—.005 mfd. 600-V paper.	.25
*RC-048	C-13, 14	CAPACITOR—.02 mfd. 600-V paper	.30
*RC-191	C-16	CAPACITOR—.002 mfd. 1000-V paper.	.35
*RC-060	C-17, 18	CAPACITOR—.03 mfd. 600-V paper.	.25
RT-887	C-19	TRIMMER STRIP—"D" band osc. trimmer. (Part of C-22, 24)	.40
*RC-396	C-20	CAPACITOR—5600 mmf., mica	.45
*RC-216	C-21	CAPACITOR—47 mmf. mica	.25
RT-887	C-22	TRIMMER STRIP—"C" band osc. trimmer. (Part of C-19, 24)	.40
*RC-349	C-23	CAPACITOR—2000 mmf., mica	.30
RT-887	C-24	TRIMMER STRIP—"B" band osc. trimmer. (Part of C-19, 22)	.40
RC-6556	C-25	CAPACITOR—"B" band padder	.30
RC-304	C-26	CAPACITOR—720 mmf., silvered mica	.30
*RC-060	C-27	CAPACITOR—.03 mfd. 600-V paper.	.25
*RC-048	C-28	CAPACITOR—.02 mfd. 600-V paper	.30
*RC-023	C-29	CAPACITOR—.005 mfd. 600-V paper.	.25
*RC-011	C-30	CAPACITOR—.002 mfd. 600-V paper.	.25
*RC-039	C-32	CAPACITOR—.01 mfd. 600-V paper.	.25

* Used on previous receivers.

Our Cat. Number	Symbol	Description	List Price
RS-3132	S-3a, b, and c	SWITCH—Push button switch (switch only)	$1.80
RT-3013	T-1	TRANSFORMER—1st I.F. transformer	1.20
RT-3014	T-2	TRANSFORMER—2nd I.F. transformer	1.25
*RT-485	T-3	TRANSFORMER—Output transformer.	1.10
*RT-0813	T-4	TRANSFORMER—50-60 cycle power transformer	3.10
*RT-0815	T-5	TRANSFORMER—25-cycle power transformer	7.80
RS-1075	L-9	SPEAKER—14 inch dynapower speaker.	5.30
RM-409	L-11, C-15	WAVE TRAP—Wave-trap assembly	.50



Loud-speaker-PM Dynamic

Outside Cone Diameter ..... 14 inches
Voice Coil Impedance (400 cycles) ..... 3.5 ohms

Electrical Rating

Rating "A"—110-125 volts AC, 50-60 cycles, 90 watts
Rating "C"—110-125 volts AC, 25 cycles, 90 watts

MODEL L-915
MODELS L-915W, L-916

GENERAL ELECTRIC CO.

Stock No.	Symbol	Description	List Price
*RQ-1323	R-37, 38	RESISTOR—470,000 ohm ½-W carbon	$0.70-5
*RL-582	L-1	BEAM-A-SCOPE—"B" band loop assembly	3.25
*RL-1017	L-2	COIL—"C" band antenna coil	.20
*RL-583	L-3	BEAM-A-SCOPE—"D" band loop assembly	.45
*RL-372	L-4	CHOKE—RF interstage choke	.20
*RL-2067	L-5-6-7	COIL—"D" "C" and "B" bands oscillator coil	1.05
*RL-9528	L-8a, b, c, d, e	COIL—Station selector trimmer coil assembly	4.80
*RS-3131	S-1	SWITCH—Band change switch	1.35
*RS-3108	S-2	SWITCH—Bass-tone control switch	.20
*RS-3132	S-3a, b, and c	SWITCH—Push button switch (switch only)	1.80
*RT 3013	T-1	TRANSFORMER—1st I.F. transformer	1.20
*RT-3014	T-2	TRANSFORMER—2nd I.F. transformer	1.25
RT-4023	T-3	TRANSFORMER—Output transformer	1.50
RT-0911	T-4	TRANSFORMER—50-60 cycle power transformer	5.25
RS-1085	L-10	SPEAKER—14 inch dynamic speaker	6.50
RW-409	L-11 C-15	WAVE TRAP—Wave trap assembly	.50

MISCELLANEOUS PARTS

*RB-026	BOARD—Antenna terminal board	$0.10
*RB-094	BOARD—7 lug terminal board	.10
*RB-096	BOARD—3 lug terminal board	.10
*RB-1030	BOARD—Phono terminal board	.10
*RB-1046	BOARD—3 lug terminal board	.10
*RC-863	CORD—Power cord	.75
*RC-1987	CLAMP—Oscillator coil clamp	.05-2
*RC-2015	CLAMP—Dial scale mtg. clamp	.10-5
*RC-2021	CORE—Station coil tuning core	.10

* Used on previous receivers.

Cabinet Dimensions

	L915W	L916
Model		
Height	40 in.	40 in.
Width	29¼ in.	29¼ in.
Depth	13⅞ in.	14⅛ in.

Electrical Rating

Rating "A"—110-125 volts, a-c, 50-60 cycles, 100 watts.
Rating "C"—110-125 volts, a-c, 25 cycles, 100 watts.

Tuning Frequency Range

"BC" Band . . . 550-1700 KC
"SW1" Band . . . 1.7-5.5 MC
"SW2" Band . . . 5.5-18.0 MC

Intermediate Frequency . . . 455 KC

Electrical Power Output

Undistorted . . . 6 watts
Maximum . . . 9 watts

Loudspeaker—Electrodynamic

Outside cone diameter . . . 14 inches
Voice coil impedance (400 cycles) . . . 5.0 ohms

Tubes

RF Amplifier . . . GE-6SG7
Converter-Oscillator . . . GE-6SA7
IF Amplifier . . . GE-6SK7
Detector, AVC & 1st Audio . . . GE-6SQ7
2nd Audio . . . GE-6J5GT
Phase Inverter . . . GE-6J5GT
Power Output . . . (2) GE-6V6GT
Rectifier . . . GE-5Y3G
Pilot Lamp . . . (2) MAZDA No. 44

GENERAL INFORMATION

Models L915W and L916 are electrically identical and only vary in cabinet and dial scale treatment.

In Model L915W, electrodynamic speaker RS1092 (marked K33J371) was substituted for a portion of the production in place of the speaker listed in the parts list (marked K-33J365). Since this substitute speaker has a field coil resistance of 400 ohms instead of 500 ohms as shown on the schematic diagram, a 100 ohm resistor, RQ621, is added in series with the speaker field coil to maintain proper socket voltages whenever this substitute speaker is used. When replacing the cone for either speaker, use Stock No. RC9045.

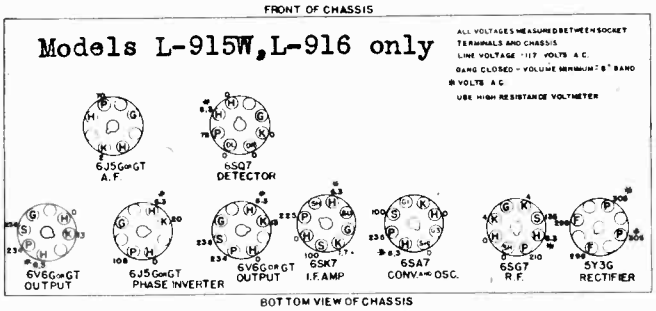


Fig. 3. Socket Voltages

ALIGNMENT PROCEDURE

The location of all trimmers is shown in Fig. 4. All oscillator and RF trimmers are accessible from the back of the receiver.

The alignment procedure is given in table form. All IF alignment may be made with the chassis removed from the cabinet. However, the RF alignments are made with the chassis and loop antennas securely bolted in the cabinet, as the relative position of the loop antennas with respect to the chassis materially affects the alignment. The RF signal should be capacity coupled by placing a two-foot wire for an antenna on the test oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally assure freedom from too much coupling.

ALIGNMENT CHART

Step	Connect Test-Osc. To	Test Osc. Setting	Pointer Setting	Adjust Trimmers for Maximum Output
1	6SK7 1F grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C10 & C9
2	6SA7 converter grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C8 & C7
3	6SG7 RF grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C15***
4	Capacity Coupled	580 KC	"BC" Band 580 KC	C25**
5	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C24** (Osc.)
6	Repeat Step 4			
7	Capacity Coupled	5 MC	"SW1" Band 5.0 MC	C22** (Osc.)
8	Capacity Coupled	18 MC	"SW2" Band 18.0 MC	C19* (Osc.)
9	Capacity Coupled	18 MC	"SW2" Band 18.0 MC	C2** (Ant.)

* Use minimum capacity peak.
** Rock gang condenser when making alignment.
*** Peak for minimum output.

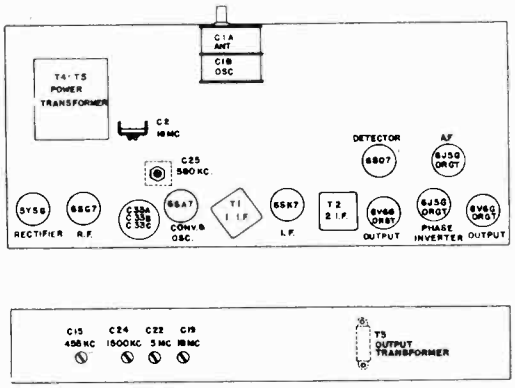


Fig. 4. Trimmer Location

GENERAL ELECTRIC CO.

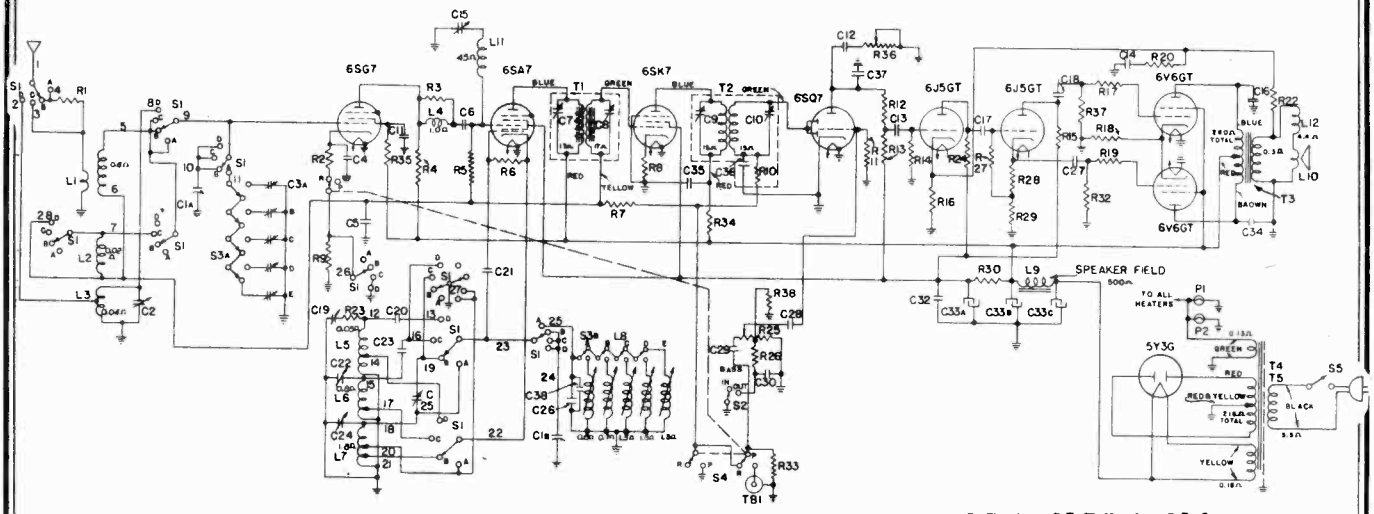


Fig. 1. Schematic Diagram MODELS L-915W, L-916

IF 455 K.C.

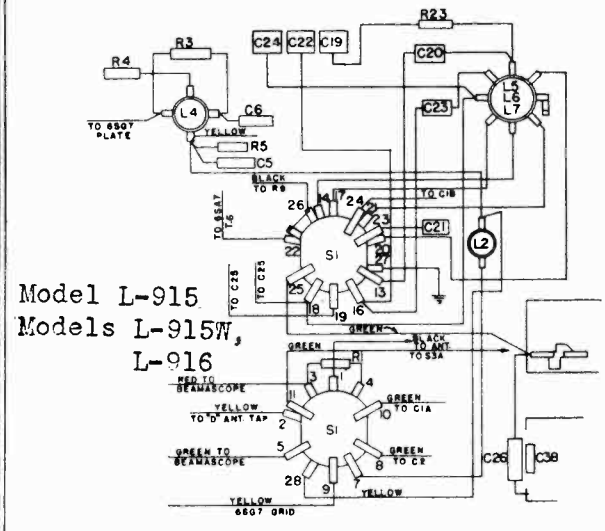


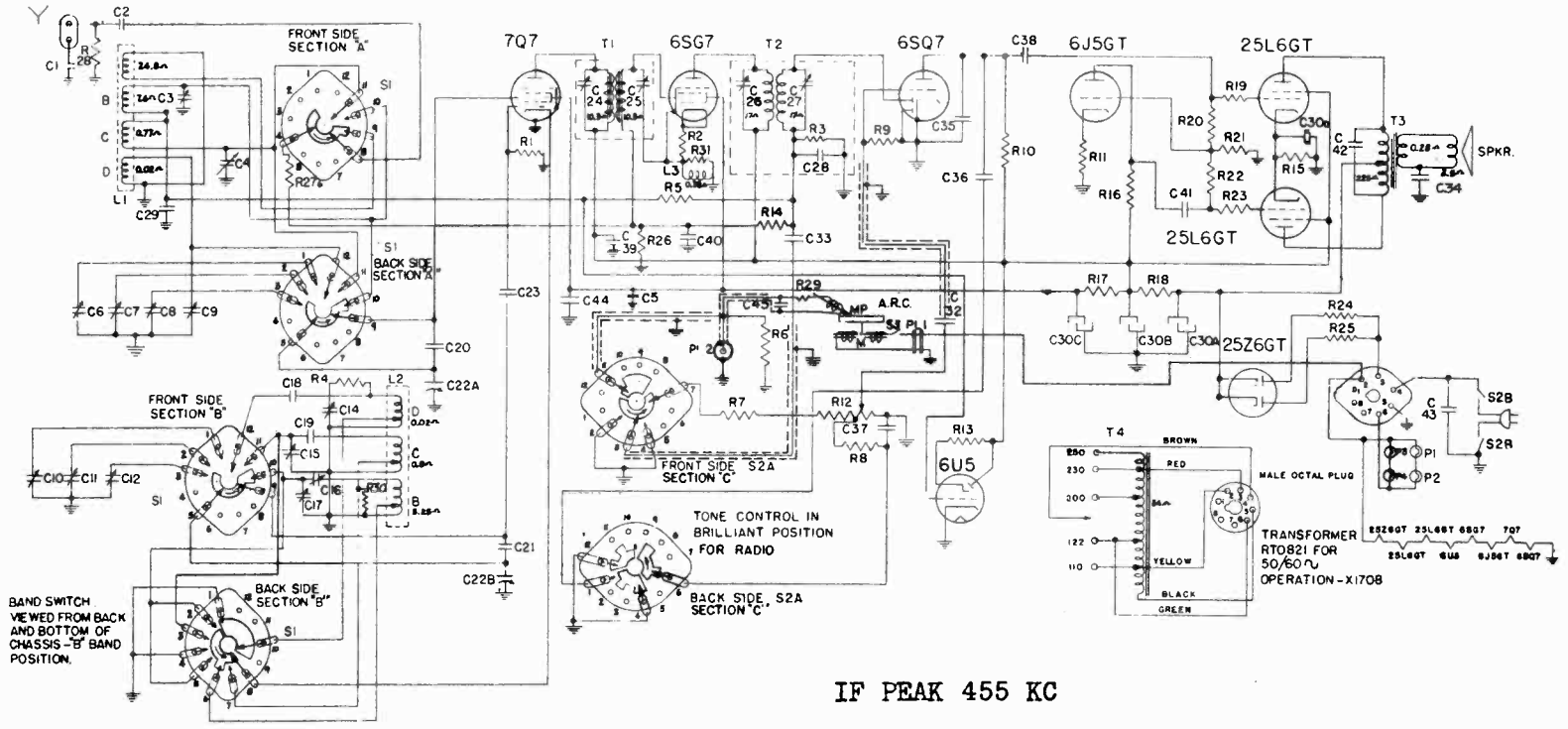
Fig. 2. Switch Wiring

Stock No.	Symbol	Description	List Price
*RC-7063	C1a, 1b	CONDENSER—Tuning condenser	$2.00
*RC-6537	C2	CAPACITOR—"D" band trimmer	.25
*RT-886	C-3a, b, c, d, e	TRIMMER STRIP—Station selector trimmer strip	.95
*RC-092	C-4	CAPACITOR—.05 mfd. 600V paper	.30
*RC-096	C-5	CAPACITOR—0.1 mfd. 200-V paper	.30
*RC-235	C-6	CAPACITOR—100 mmf. mica	.25
*RC-048	C-11	CAPACITOR—.02 mfd. 600-V paper	.30
*RC-023	C-12	CAPACITOR—.005 mfd. 600-V paper	.25
*RC-048	C-13, 14	CAPACITOR—.02 mfd. 600-V paper	.30
*RC-191	C-16	CAPACITOR—.002 mfd. 1000-V paper	.35
*RC-060	C-17, 18	CAPACITOR—.03 mfd. 600-V paper	.25
*RT-887	C-19	TRIMMER STRIP—"D" band osc. trimmer (Part of C-22, 24)	.40
*RC-396	C-20	CAPACITOR—5600 mmf., mica	.45
*RC-216	C-21	CAPACITOR—47 mmf. mica	.25
*RT-887	C-22	TRIMMER STRIP—"C" band osc. trimmer (Part of C-19, 24)	.40
*RC-349	C-23	CAPACITOR—2000 mmf., mica	.30
*RT-887	C-24	TRIMMER STRIP—"B" band osc. trimmer (Part of C-19, 22)	.40
*RC-6556	C-25	CAPACITOR—"B" band padder	.30
*RC-304	C-26	CAPACITOR—720 mmf., silvered mica	.30
*RC-060	C-27	CAPACITOR—.03 mfd. 600-V paper	.25
*RC-048	C-28	CAPACITOR—.02 mfd. 600-V paper	.30

* Used on previous receivers.

Stock No.	Symbol	Description	List Price
*RC-023	C-29	CAPACITOR—.005 mfd. 600-V paper	$0.25
*RC-011	C-30	CAPACITOR—.002 mfd. 600-V paper	.25
*RC-039	C-32	CAPACITOR—.01 mfd. 600-V paper	.25
RC-5204	C-33a	CAPACITOR—10 mfd. 300 V dry electrolytic	1.30
	C-33b	CAPACITOR—15 mfd. 400 V dry electrolytic	
	C-33c	CAPACITOR—15 mfd. 400 V dry electrolytic	
*RC-191	C-34	CAPACITOR—.002 mfd. 1000-V paper	.35
*RC-039	C-35	CAPACITOR—.01 mfd. 600-V paper	.25
*RC-252	C-36	CAPACITOR—200 mmf., mica	.30
*RC-249	C-37	CAPACITOR—220 mmf., mica	.25
*RC-327	C-38	CAPACITOR—82 mmf., compensating cap.	.25
*RQ-1259	R-1	RESISTOR—1000 ohm ½-W carbon	.70-5
*RQ-1243	R-2	RESISTOR—220 ohm ½-W carbon	.70-5
*RQ-1283	R-3	RESISTOR—10,000 ohm ½-W carbon	.70-5
*RQ-1275	R-4	RESISTOR—4700 ohm ½-W carbon	.70-5
*RQ-1299	R-5	RESISTOR—47,000 ohm ½-W carbon	.70-5
*RQ-1291	R-6	RESISTOR—22,000 ohm ½-W carbon	.70-5
*RQ-1339	R-7	RESISTOR—2.2 megohms ½-W carbon	.70-5
*RQ-1239	R-8	RESISTOR—150 ohm ½-W carbon	.70-5
*RQ-1251	R-9	RESISTOR—470 ohm ½-W carbon	.70-5
*RQ-1299	R-10	RESISTOR—47,000 ohm ½-W carbon	.70-5
*RQ-1355	R-11	RESISTOR—10 megohm ½-W carbon	.70-5
*RQ-1308	R-12	RESISTOR—100,000 ohm ½-W carbon	.70-5
*RQ-1317	R-13	RESISTOR—270,000 ohm ½-W carbon	.70-5
*RQ-1323	R-14	RESISTOR—470,000 ohm ½-W carbon	.70-5
*RQ-1295	R-15	RESISTOR—33,000 ohm ½-W carbon	.70-5
*RQ-1283	R-16	RESISTOR—10,000 ohm ½-W carbon	.70-5
*RQ-1259	R-17	RESISTOR—1000 ohm ½-W carbon	.70-5
*RQ-1435	R-18	RESISTOR—200 ohm 1-W carbon	.15
*RQ-1259	R-19	RESISTOR—1000 ohm ½-W carbon	.70-5
*RQ-1265	R-20	RESISTOR—1800 ohm ½-W carbon	.70-5
*RQ-1283	R-22	RESISTOR—10,000 ohm ½-W carbon	.70-5
*RQ-1221	R-23	RESISTOR—27 ohm ½-W carbon	.70-5
*RQ-1309	R-24	RESISTOR—120,000 ohm ½-W carbon	.70-5
*RV-137	R-25	VOLUME CONTROL—2 meg. volume control	.95
*RQ-1311	R-26	RESISTOR—150,000 ohm ½-W carbon	.70-5
*RQ-1323	R-27	RESISTOR—470,000 ohm ½-W carbon	.70-5
*RQ-1269	R-28	RESISTOR—2700 ohm, ½-W carbon	.70-5
*RQ-1295	R-29	RESISTOR—30,000 ohm, ½-W carbon	.70-5
*RQ-685	R-30	RESISTOR—12,000 ohm 2-W carbon	.25
*RQ-1323	R-32	RESISTOR—470,000 ohm ½-W carbon	.70-5
*RQ-1315	R-33	RESISTOR—220,000 ohm ½-W carbon	.70-5
*RQ-1259	R-34	RESISTOR—1000 ohm ½-W carbon	.70-5
*RQ-1299	R-35	RESISTOR—47,000 ohm ½-W carbon	.70-5
*RT-724	R-36, S5	TONE CONTROL—Treble tone control and power switch	1.45

Prices subject to change without notice.



IF PEAK 455 KC

ELECTRICAL PARTS DESCRIPTION

Symbol	Description
	CAPACITORS
C1	.01 mfd. 400 V paper
C2	.001 mfd. 600 V paper
C3, 4	"B" and "C" antenna trimmer
C6, 7, 8, 9	Antenna trimmer strip
C10, 11, 12, 14, 15, 16, 17	Oscillator trimmer strip
C18	5600 mmf., mica
C19	1800 mmf., mica
C20, 21	45 mmf., compensating capacitor
C22a, 22b	2-gang tuning condenser
C23	40 mmf., compensating capacitor
C29	.05 mfd. 200 V paper
C30a	40 mfd. 300 V dry electrolytic
C30b	50 mfd. 250 V dry electrolytic
C30c	20 mfd. 250 V dry electrolytic
C30d	20 mfd. 25 V dry electrolytic
C32	.01 mfd. 200 V paper
C33	.02 mfd. 200 V paper
C34	.05 mfd. 200 V paper
C35	220 mmf. mica
C36	.004 mfd. 600 V paper
C37	.005 mfd. 200 V paper
C38	.03 mfd. 600 V paper
C39	.05 mfd. 200 V paper
C40	.05 mfd. 200 V paper
C41	.03 mfd. 600 V paper
C42	.005 mfd. 600 V paper
C43	.02 mfd. 600 V AC
C44	.05 mfd. 400 V paper
C45	.01 mfd. 400 V paper
	RESISTORS
R1	33,000 ohm, ½-W carbon
R2	100 ohm, ½-W carbon
R3	390,000 ohm, ½-W carbon
R4	22 ohm, ½-W carbon
R5	2.2 megohm, ½-W carbon
R6	470,000 ohm, ½-W carbon
R7	47,000 ohm, ½-W carbon
R8	82,000 ohm, ½-W carbon
R9	10 megohm, ½-W carbon
R10	470,000 ohm, ½-W carbon
R11	3300 ohm, ½-W carbon
R12	2 meg. volume control
R13	1 megohm, ½-W carbon
R14	4.7 meg., ½-W carbon
R15	220 ohm, 2-W carbon
R16	68,000 ohm, ½-W carbon
R17	3900 ohm, 1-W carbon
R18	2700 ohm, 2-W carbon
R19	1000 ohm, ½-W carbon
R20	150,000 ohm, ½-W carbon
R21	56,000 ohm, ½-W carbon
R22	270,000 ohm, ½-W carbon
R23	1000 ohm, ½-W carbon
R24, 25	220 ohm, 2-W carbon
R26	3.9 meg, ½-W carbon
R27	560,000 ohm, ½-W carbon
R28	100,000 ohm, ½-W carbon
R29	15,000 ohm, ½-W carbon
R30	470 ohm, ½-W carbon
	MISCELLANEOUS
PL-2	Male phono plug
PL-1	Phono motor connector
S1	Band change switch
S2a, 2b	Tone control and power switch
L1	Antenna coil (all bands)
L2	Oscillator coil (all bands)
L3	I.F. neutralizing coil
T1	1st I.F. transformer
T2	2nd I.F. transformer
T3	Output transformer
T4	50/60-cycle power transformer
SPKR	12-inch PM speaker

Fig. 3. Schematic Wiring Diagram

MODEL X-1708

GENERAL ELECTRIC CO.

FOR OAK RECORD CHANGER DATA
SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".

Power Requirements

Power Supply		Frequency Cycles AC	Power Consumption (Watts)
Tap	Voltage Range		
110	103–117	50–60	90
125	117–133		
200	185–215		
230	215–240		
250	240–260		

The power transformer is provided with five voltage taps. Instant tap switching is made by a simple pin plug and jack device. For correct operation, measure the power supply voltage, note which voltage range covers this voltage and using the corresponding tap, insert the plug in the jack.

SPECIAL SERVICE INFORMATION

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

NOTE—Connection to converter grid must be made directly to tube grid and not to gang condenser on spread bands.

(1) Stage gains

(a) Antenna Post to Converter Grid, through 400 ohms and 200 mmfd. in series, at

Stand.	1000 KC.....5.4	31 M....9.6 MC....1.8	
SW1	4000 KC.....3.7	25 M....11.8 MC....1.6	
SW2	18000 KC.....1.1	19 M....15.22 MC....1.4	
		16–13 M....17.8 MC....1.0	

(b) RF on Converter Grid to IF on 6SG7 grid at

Stand.	1000 KC....61	31 M....9.6 MC....65	
SW1	4000 KC....63	25 M....11.8 MC....68	
SW2	18000 KC....71	19 M....15.22 MC....71	
		16–13 M....17.8 MC....71	

(c) IF on Converter Grid to IF on 6SG7 grid at 455 KC—85

(d) IF Grid to diode plate at 455 KC—160

(2) Voltage across the diode load to give ½-watt speaker output at 400 cycles—.046 V.

(3) DC voltage developed across oscillator grid resistor (R1) at

Stand.	1000 KC..8.3 V.	31 M.....4.4 V.	
SW1	4000 KC..7.7 V.	25 M.....4.8 V.	
SW2	18000 KC..5.0 V.	19 M.....4.4 V.	
		16–13 M.....3.7 V.	

Variations of ±20% permissible. All measurements taken with R-26 shorted across.

Electrical Power Output

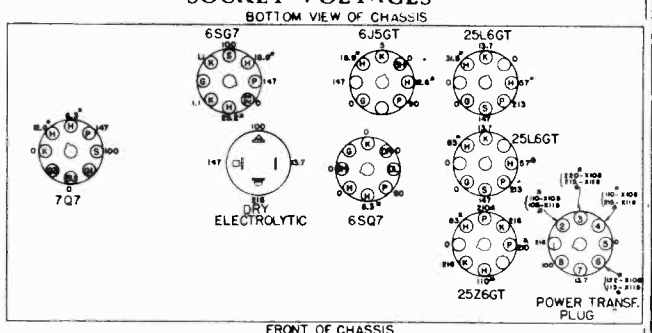
Undistorted with proper voltage at tap on power transformer—6 watts.

Maximum with proper voltage at tap on power transformer—6.5 watts.

Loud-speaker

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. In case a voice coil needs recentering, it will be necessary to replace the entire cone and voice coil assembly. In no case should you attempt to move the magnet in the assembly.

SOCKET VOLTAGES



Voltages indicated by asterisk (*) are AC voltages
DC voltages measured between socket terminals and chassis
Voltages measured on 1000 ohms/volt meter on 500 volt scale
Gang closed, no signal input
Band switch turned to standard broadcast band

Fig. 2

Loud-speaker—PM Dynamic

Cone Diameter.....12 inches

Voice Coil Impedance (400 cycles).....3.5 onms

Tubes

Converter-Oscillator	GE-7Q7
IF Amplifier	GE-6SG7
Detector, AVC, 1st Audio	GE-6SQ7
Phase Inverter	GE-6J5GT
Power Output	(2)GE-25L6GT
Rectifier	GE-25Z6GT
Tuning Indicator	GE-6U5
Pilot Lamps	(2)MAZDA No. 44

GENERAL INFORMATION

The Model X-1708 is a seven-band receiver employing eight tubes in a superheterodyne circuit. Four of these bands are spread bands which allow taking the most important portions of the "SW2" band and expanding them for ease in tuning the short-wave stations.

It is designed for operation on 50 or 60 cycle AC sources ranging from 103 to 260 volts. See ***Power Requirements***.

Automatic Record Changer

The record changer will automatically play seven 12-inch or eight 10-inch records at one loading. It is shipped for operation on a 110-volt 50-cycle power supply but can be converted for use on a 110-volt 60-cycle power supply by changing the motor spindle bushing. The 60-cycle bushing is slightly smaller in diameter than the 50-cycle bushing, and is tied to the underside of the record changer frame. To replace, unscrew the setscrew on the motor spindle bushing (which drives the turntable drive wheel), and replace with the bushing for 60-cycle operation. Be sure the setscrew matches with the depression on the motor shaft, and is securely tightened. When properly installed, the top of the bushing should be just a fraction below the top of the motor shaft.

NOTE: Regardless of choice of tap on the power transformer, the phonograph motor is fed 110 volts.

GENERAL ELECTRIC CO.

Alignment Procedure

The alignment procedure shown in table form is made either with the chassis in or removed from the cabinet.

If the chassis is removed from the cabinet to make the RF alignment, the dial which is fastened to the cabinet cannot be used for calibration reference. Use must be made, therefore, of the paper scale fastened on the rear of the dial reflector plate. With the gang condenser completely closed, one of the edges of the pointer rider should be lined up with the first marking to the right of the scale on the rear of the dial reflector plate. This can be accomplished by sliding the pointer on the cord until it does. The selected edge of the pointer rider may now serve as a pointer for the RF alignment. There are two 17.8 reference points on the paper scale on the rear of the dial reflector plate. The one towards the lower frequency end of the dial is the proper one to use for the 16-meter spread-band alignment; while the other is used for a reference point on the SW2 band.

The SW2 band does not require alignment. This band is taken care of when the 16-meter spread-band is aligned.

Spread-band Alignment

Since accuracy in frequency calibration is very essential for proper alignment of the spread bands, it is impractical to use the standard test oscillator for this purpose unless a special calibration is first made.

The actual reception of short-wave stations of known frequency in the band to be checked is probably the most satisfactory method for determining the proper setting of the oscillator trimmers in these bands. The oscillator trimmer should be adjusted so that the station appears at the correct position on the dial. RF alignment can be made with the test oscillator.

The calibration of the test oscillator may be checked by zero beating the test oscillator with a short-wave station of known frequency. By taking several of these calibration points, it will afford a calibration of a high degree of accuracy in case you wish to use the test oscillator for alignment in these bands.

ALIGNMENT CHART

Step	Test Osc. Connected to	Test-osc. Setting	Band and Pointer Setting	Tune Trimmer for Max. Output
1	6SG7 I.F. grid in series with .05 mfd. cap.	455 KC	"BC" BAND 550 KC	C26 and C27
2	7Q7 CONV. grid in series with .05 mfd. cap.	455 KC	"BC" BAND 550 KC	C24 and C25
3	ANT. POST in series with 200 mmf. and 400 ohms	580 KC	"BC" BAND 580 KC	C16**
4	ANT. POST in series with 200 mmf. and 400 ohms	1500 KC	"BC" BAND 1500 KC	C17 (osc.) C3 (ant.)
5	R E P E A T		S T E P	3
6	ANT. POST in series with 200 mmf. and 400 ohms	6.1 MC	"SW1" BAND 6.1 MC	C15 (osc.) C4 (ant.)
7	ANT. POST in series with 200 mmf. and 400 ohms	17.8 MC	16 METER 17.8 MC	C14* (osc.)
8	ANT. POST in series with 200 mmf. and 400 ohms	21.6 MC	16 METER 21.6 MC	C9*** (ant.)
9	ANT. POST in series with 200 mmf. and 400 ohms	15.22 MC	19 METER 15.22 MC	C10* (osc.) C6*** (ant.)
10	ANT. POST in series with 200 mmf. and 400 ohms	11.8 MC	25 METER 11.8 MC	C11* (osc.) C7*** (ant.)
11	ANT. POST in series with 200 mmf. and 400 ohms	9.6 MC	31 METER 9.6 MC	C12* (osc.) C8*** (ant.)

* Use minimum capacity peak if two are obtainable.
** Rock gang condenser for optimum peak.
*** Use maximum capacity peak if two are obtainable.

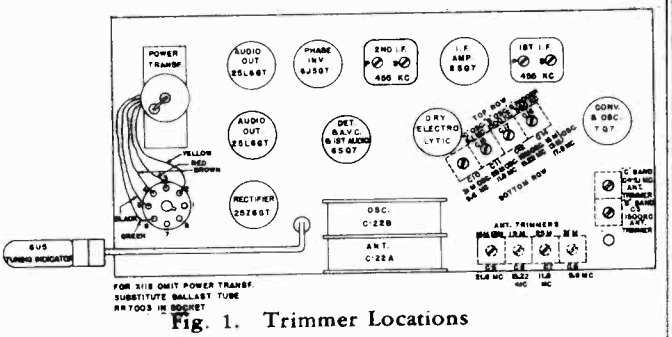


Fig. 1. Trimmer Locations

BAND CHANGE AND TONE CONTROL SWITCHING

The following charts show the switch points connected for any one position of either the wave change or tone control switches. The numbers shown in each box indicate the switch points connected together in the section of the switch for each position of the switch. As for example: the numbers 5–9–10 indicate these switch points are all connected together for this particular position of the switch.

BAND SWITCH CONNECTIONS

Band in Use	Section "A" Front Side	Section "A1" Back Side	Section "B" Front Side	Section "B1" Back Side
BC	4–8–9	5–9–10	5–9–10	1–10 6–8
SW1	4–8–10	5–9–11	5–9–11	1–2–10 7–8
SW2	4–8–11	5–9–12	5–9–12	1–2–3 8–10
31 METER	8–11	9–12–1	9–12–1	1–2–3–4 8–10
25 METER	8–11	9–12–2	9–12–2	1–2–3–4–5 8–10
19 METER	8–11	9–12–3	9–12–3	2–3–4–5–6 8–10
16 and 13 METER	8–11	9–12	9–12	3–4–5–6–7 8–10

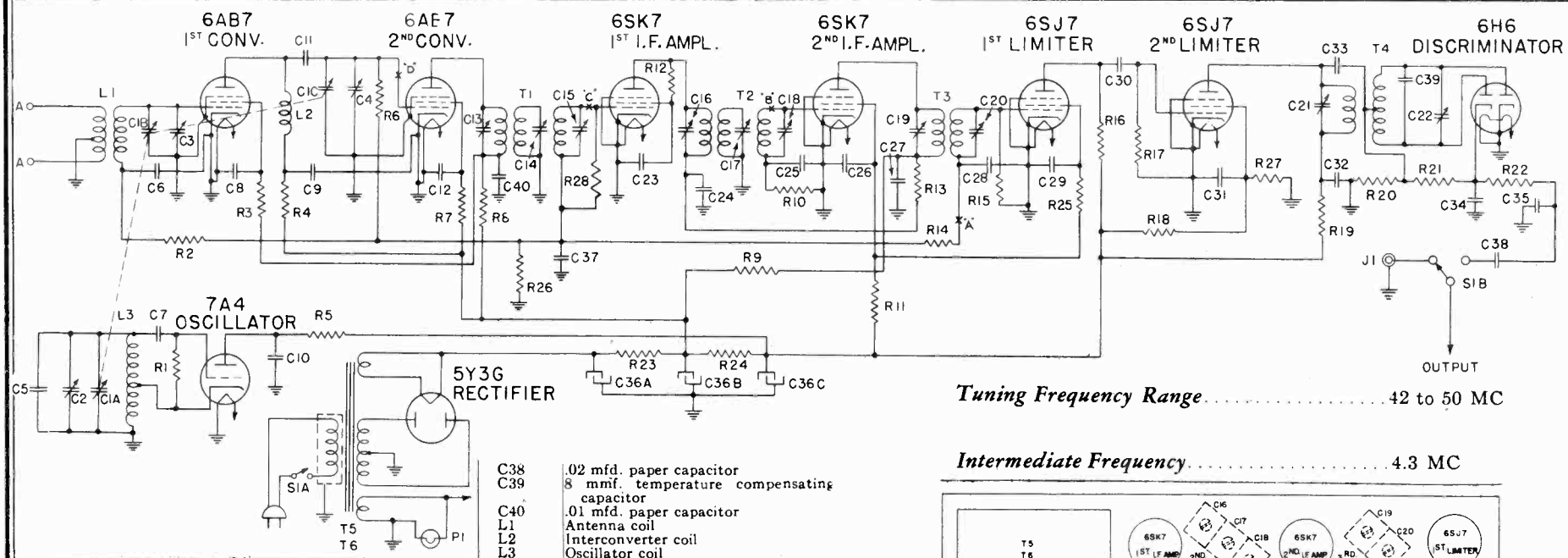
TONE CONTROL SWITCH CONNECTIONS

Position in Use	Section "C1" Back Side	Section "C" Front Side
Radio-Brilliant	Open	3–7
Radio-Bass	1–12	3–7
Radio-Treble	4–6	3–7
Radio-Mellow	1–12 4–6	3–7
Phono-Brilliant	Open	7–11 2–3
Phono-Bass	1–12	7–11 2–3
Phono-Treble	4–6	7–11 2–3
Phono-Mellow	1–12 4–6	7–11 3–4

Intermediate Frequency ..... 455 KC

Tuning Frequency Range

"BC" Band ..... 540–1700 KC
"SW1" Band ..... 2.2–6.8 MC
"SW2" Band ..... 6.8–21.0 MC
31 Meter Band ..... 9.36–9.8 MC
25 Meter Band ..... 11.6–12.5 MC
19 Meter Band ..... 14.9–17.3 MC
16 and 13 Meter Band ..... 17.7–22.2 MC



Tuning Frequency Range ..... 42 to 50 MC

Intermediate Frequency ..... 4.3 MC

Symbol	Description
C1a	Oscillator section of tuning condenser
C1b	1st converter section of tuning condenser
C1c	2nd converter section of tuning condenser
C2	5–24 mmf. oscillator air trimmer
C3	2–20 mmf. 1st converter trimmer
C4	2–20 mmf. 2nd converter trimmer
C5	40 mmf. temperature compensating capacitor
C6	470 mmf. mica capacitor
C7	50 mmf. temperature compensating capacitor
C8	470 mmf. mica capacitor
C9	470 mmf. mica capacitor
C10	470 mmf. mica capacitor
C11	470 mmf. mica capacitor
C12	.01 mfd. paper capacitor
C23	.01 mfd. paper capacitor
C24	.01 mfd. paper capacitor
C25	47 mmf. mica capacitor
C26	.01 mfd. paper capacitor
C27	.01 mfd. paper capacitor
C28	47 mmf. mica capacitor
C29	47 mmf. mica capacitor
C30	22 mmf. mica capacitor
C31	47 mmf. mica capacitor
C32	47 mmf. mica capacitor
C33	50 mmf. temperature compensating capacitor
C34	47 mmf. mica capacitor
C35	220 mmf. mica capacitor
C36a	15 mfd. dry electrolytic
C36b	30 mfd. dry electrolytic
C36c	10 mfd. dry electrolytic
C37	0.1 mfd. paper capacitor
C38	.02 mfd. paper capacitor
C39	8 mmf. temperature compensating capacitor
C40	.01 mfd. paper capacitor
L1	Antenna coil
L2	Interconverter coil
L3	Oscillator coil
P1	Dial lamp, MAZDA No. 44
R1	33,000 ohms carbon resistor
R2	3.3 megohms carbon resistor
R3	6800 ohms carbon resistor
R4	2200 ohms carbon resistor
R5	1000 ohms carbon resistor
R6	3.3 megohms carbon resistor
R7	12,000 ohms carbon resistor
R8	1000 ohms carbon resistor
R9	1000 ohms carbon resistor
R10	47,000 ohms carbon resistor
R11	15,000 ohms carbon resistor
R12	47,000 ohms carbon resistor
R13	2200 ohms carbon resistor
R14	2.2 megohms carbon resistor
R15	47,000 ohms carbon resistor
R16	10,000 ohms carbon resistor
R17	180,000 ohms carbon resistor
R18	68,000 ohms carbon resistor
R19	22,000 ohms carbon resistor
R20	100,000 ohms carbon resistor
R21	100,000 ohms carbon resistor
R22	100,000 ohms carbon resistor
R23	1200 ohms 7.4 W. wire wound resistor
R24	3300 ohms 1 W. carbon resistor
R25	47,000 ohms carbon resistor
R26	470,000 ohms carbon resistor
R27	47,000 ohms carbon resistor
R28	47,000 ohms carbon resistor
S1a	Power switch
S1b	FM-Phono switch
T1	1st I.F. transformer
T2	2nd I.F. transformer
T3	3rd I.F. transformer
T4	Discriminator I.F. transformer
T5	Power transformer for 50–60 cycles
T6	Power transformer for 25 cycles

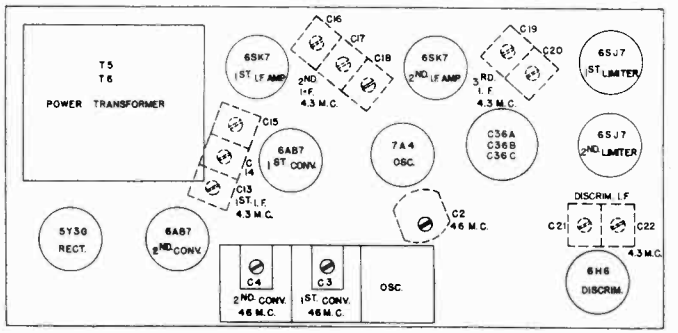


Fig. 1. Tube and Trimmer Location

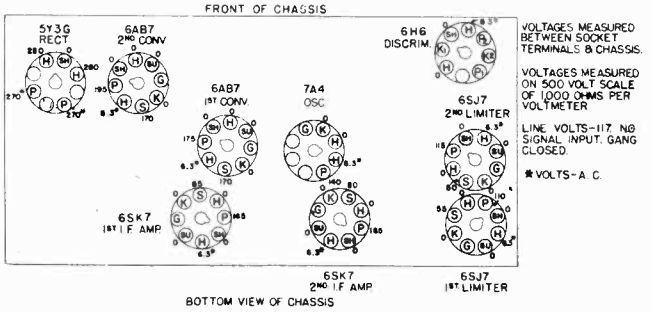


Fig. 2. Socket Voltages

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Amplitude modulation, as the name implies, is a method of superimposing the audio frequencies on a constant amplitude radio frequency carrier so as to vary the carrier amplitude at the audio frequency rate. To illustrate: Suppose we amplitude-modulate a radio frequency carrier with a 400 cycle audio tone. When the audio tone is going through the positive portion of its cycle, its voltage will add to the carrier voltage. When the audio tone goes through the negative portion of its cycle, its voltage will subtract from the carrier voltage. The resultant voltage will be equal to the carrier voltage plus or minus the varying audio voltage and will swing from a maximum to a minimum and back to a maximum every 1/400 of a second. The frequency of the carrier remains fixed.

With frequency modulated signals the carrier amplitude remains fixed and the carrier frequency is varied—just the reverse of amplitude modulation. To illustrate: Suppose we frequency-modulate a 50 megacycle radio frequency carrier with a 400 cycle audio tone of one volt. The one volt audio tone, we shall assume, will vary the 50 megacycle carrier by 25 kilocycles. When the audio tone is going through the positive portion of its cycle, the carrier frequency will increase from 50 megacycles to 50 megacycles plus 25 kilocycles or 50.025 megacycles when the cycle is at a maximum. When the audio tone is going through the negative portion of its cycle, the carrier frequency will decrease from 50 megacycles to 50 megacycles minus 25 kilocycles or 49.975 megacycles when the cycle is at a minimum. The resultant carrier frequency will thus be varying back and forth between 49.975 and 50.025 megacycles at the rate of 400 times per second. Now if the voltage (volume) of the audio tone increases to two volts, the frequency swing will increase to 50 kilocycles above and below 50 megacycles. Thus, the audio tone is transmitted as the rate of the carrier frequency variations and audio volume is transmitted as the magnitude of the carrier frequency variations. It should be noted that the amplitude of the carrier remains constant during the modulation with audio.

Oscillator-Converter Circuit

If the full noise reducing properties of frequency modulation are to be realized the sensitivity of the Translator must be good enough to insure proper limiter operation. The gain through the intermediate frequency circuits is limited to that point beyond which lies instability. Hence, a considerable amount of gain must be realized through the R.F. amplifier and converter circuits in order to insure adequate receiver sensitivity.

To secure this required gain the double superheterodyne or cascade converter circuit is employed. It consists of two converter tubes, 6AB7's, and an oscillator tube, 7A4, with their associated circuits. The antenna circuit tunes the band from 42 to 50 MC. The circuit between the two converters tunes from 23.15 to 27.15 MC. The oscillator voltage is inductively coupled to the grid of the first converter tube. This produces by heterodyne action a signal to which the interconverter circuit is tuned. The first converter also conducts the oscillator signal through to the interconverter circuit. Accordingly, the oscillator signal heterodynes with the tuned signal in the interconverter circuit to produce an I.F. frequency of 4.3 MC at the output of the second converter.

To illustrate the action consider an FM signal of 42 MC to which the Translator is tuned. The oscillator frequency for this setting of the tuning control is 18.85 MC and it heterodynes in the 1st converter tube with the 42 MC signal to form 23.15 MC (42-18.85). This 23.15 MC signal, in turn, beats with oscillator signal in the 2nd converter to produce the 4.3 MC intermediate frequency.

Cascade Limiter Circuit

The limiter circuit consists of two resistance coupled 6SJ7 tubes in series. Each limiter operates at zero initial bias and low plate voltage. Both grid circuits are designed for self-biasing and the use of capacity-resistance networks provides enough time delay to retain the grid bias between signal peaks. The action of the limiter is such that as soon as a signal is applied to the grid of the tube the grid draws current. This grid current charges up the capacitor across the grid resistor and at the same time establishes a bias through current drain in the resistor. Between positive signal peaks the capacitor discharges through the resistor maintaining the grid bias. The circuit is so designed that negative signal swings are all beyond plate current cutoff and positive signal peaks are cut off by plate current saturation. The value of the 1st limiter capacity-resistance network is so chosen as to limit noise amplitudes. This arrangement leaves the 2nd limiter with the very much simplified task of reducing the remaining noise to the desired level.

Servicing

When servicing this Translator and especially when replacing parts care should be exercised to return all components including wiring to the original positions occupied. The positioning of parts and wiring is very critical. When replacing coils and I.F. transformers, maintain the lead lengths provided and use the same terminals to which the original coil or transformer was connected.

Stock No.	Description	List Price
*RB-008	BOARD—Terminal board (2 lug)	$0.10
*RB-060	BOARD—Antenna terminal board	.10
*RB-096	BOARD—Terminal board (3 lug)	.10
RB-1030	BOARD—Phono terminal jack	.10
*RC-039	CAPACITOR—.01 Mfd., 600 V. paper (C-12, 23, 24, 26, 27, 40)	.25
*RC-048	CAPACITOR—.02 Mfd., 600 V. paper (C-38)	.30
*RC-096	CAPACITOR—0.1 Mfd., 200 V. paper (C-37)	.30
*RC-216	CAPACITOR—47 Mmf. mica (C-25, 28, 29, 31, 32, 34)	.25
*RC-224	CAPACITOR—22 Mmf. mica (C-30)	.25
*RC-249	CAPACITOR—220 Mmf. mica (C-35)	.25
*RC-293	CAPACITOR—470 Mmf. mica (C-6, 8, 9, 10, 11)	.30
RC-322	CAPACITOR—40 Mmf. temperature compensating capacitor (C-5)	.30
RC-323	CAPACITOR—50 Mmf. temperature compensating capacitor (C-7, 33)	.25
RC-324	CAPACITOR—8 Mmf. temperature compensating capacitor (C-39)	.30
*RC-863	CORD—Power cord	.65
RC-5169	CAPACITOR—15 Mfd., 400 V.; 30 Mfd., 400 V.; 10 Mfd., 350 V. dry electrolytic (C-36a, 36b, 36c)	1.25
RC-6540	CAPACITOR—Air trimmer capacitor (C-2)	.95
RC-6541	CAPACITOR—2-20 Mmf. converter trimmers (C-3, 4)	.25
RC-7041	CONDENSER—Tuning condenser and station selector assembly (C-1a, 1b, 1c)	5.00
RC-8198	CABLE—Output connector cable and plug assembly	.55
RC-8199	CABLE—Condenser drive cable assembly	.10
RC-8526	CARD—Station tab card set	.15
RD-424	DRUM—Condenser drive drum assembly	.15
RE-096	ESCUTCHEON—Scale and escutcheon assembly	2.70
RG-306	GROMMET—Rubber grommet for protecting condenser leads (Pkg. 5)	.10
RK-091	KNOB—Control knob	.10
*RK-214	KEY—Left-hand station key	.10
*RK-223	KEY—All except left station keys	.15
RL-166	COIL—R.F. coil assembly (L-2)	.40
RL-952	LOCK—Cam lock (adjusting screw and lug)(Pkg. 10)	.10
RL-1010	COIL—Antenna and oscillator coil assemhly (L1, L3)	.40
RM-514	MASK—Dial back plate mask	.05
*RP-145	PLUG—Radio chassis connector plug (Pkg. 5)	.25
*RP-154	PIN—Station key mounting pin (Pkg. 10)	.10
*RP-314	PULLEY—Pointer drive pulley and "C" washer	.15
RP-325	PULLEY—Drive cord wooden pulley (Pkg. 5)	.10
RP-1005	POINTER—Dial pointer	$0.10
RP-2003	PLATE—Dial scale backplate	.10
*RQ-1259	RESISTOR—1000 ohms, ½ W. carbon (R-5, 8, 9) (Pkg. 5)	.70
*RQ-1267	RESISTOR—2200 ohms, ½ W. carbon (R-4, 13) (Pkg. 5)	.70
*RQ-1279	RESISTOR—6800 ohms, ½ W. carbon (R-3) (Pkg. 5)	.70
*RQ-1283	RESISTOR—10,000 ohms, ½ W. carbon (R-16) (Pkg. 5)	.70
*RQ-1285	RESISTOR—12,000 ohms, ½ W. carbon (R-7) (Pkg. 5)	.70
*RQ-1287	RESISTOR—15,000 ohms, ½ W. carbon (R-11) (Pkg. 5)	.70
*RQ-1291	RESISTOR—22,000 ohms, ½ W. carbon (R-19) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms, ½ W. carbon (R-1) (Pkg. 5)	.70
*RQ-1299	RESISTOR—47,000 ohms, ½ W. carbon (R-10, 12, 15, 25, 27) (Pkg. 5)	.70
*RQ-1303	RESISTOR—68,000 ohms, ½ W. carbon (R-18) (Pkg. 5)	.70
*RQ-1307	RESISTOR—100,000 ohms, ½ W. carbon (R-20, 21, 22) (Pkg. 5)	.70
*RQ-1313	RESISTOR—180,000 ohms, ½ W. carbon (R-17) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms, ½ W. carbon (R-26) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohms, ½ W. carbon (R-14) (Pkg. 5)	.70
*RQ-1343	RESISTOR—3.3 megohms, ½ W. carbon (R-2, 6) (Pkg. 5)	.70
*RQ-1471	RESISTOR—3300 ohms, 1 W. carbon (R-24)	.20
RR-357	RESISTOR—1200 ohms, 7.4 W. wire wound (R-23)	.30
*RS-223	SOCKET—Octal tube socket (Pkg. 5)	.80
*RS-253	SOCKET—Electrolytic mounting socket	.10
*RS-265	SOCKET—Dial lamp socket assembly	.15
RS-296	SOCKET—7A4 tube socket	.25
RS-297	SOCKET—6H6 tube socket	.15
*RS-444	SPRING—Knob retaining spring (Pkg. 10)	.10
RS-624	SUPPORT—Power switch support	.25
RS-625	SUPPORT—Tuning shaft support	.40
RS-898	SCREW—Escutcheon mounting screw (Pkg. 10)	.10
RS-958	SPACER—Station key spacer on pin (Pkg. 3)	.05
RS-1813	SHIELD—Dial lamp shield (Pkg. 3)	.10
RS-3095	SWITCH—Power and FM-Phono switch (S-1)	1.00
RS-9019	SHAFT—Tuning shaft assembly	.15
RT-0813	TRANSFORMER—50-60 cycle power transformer (T-5)	3.10
RT-0815	TRANSFORMER—25 cycle power transformer (T-6)	7.80
RT-2007	TRANSFORMER—1st I.F. transformer (T-1)	1.55
RT-2008	TRANSFORMER—2nd I.F. transformer (T-2)	1.60
RT-2009	TRANSFORMER—3rd I.F. transformer (T-3)	1.30
RT-2010	TRANSFORMER—Discriminator transformer (T-4)	1.60
*RW-101	WASHER—Control shaft felt washer (Pkg. 10)	.05
RW-124	WASHER—Tuning shaft retaining washer (Pkg. 10)	.05
*RX-079	ASSEMBLY—Chassis mounting foot assembly	.40

*Used on previous receivers.

(PRICES SUBJECT TO CHANGE WITHOUT NOTICE)

GENERAL ELECTRIC CO.

MODEL JFM90
MODEL LC648W

MODEL JFM-90

Rating	Power Supply (Volts)	Frequency (Cycles Per Second)	Power Consumption (Watts)
A6	105–125	50–60	65
C2	105–125	25	65

ALIGNMENT PROCEDURE

Equipment

In order to perform the necessary alignment operations on this Translator the following equipment is recommended:

(1) A good signal generator capable of giving a 46 MC signal with adjustable output voltage.
(2) A wide band signal generator covering 4.3 MC with a sweep circuit of plus or minus 200 KC.
(3) A cathode ray oscilloscope.
(4) A 0–100 microammeter.

I.F. Alignment

Alignment of the I.F. transformers must be performed stage by stage and no over-all adjustments should be made after completing the stage by stage adjustments.

Connect the high side of the oscilloscope input through a 470,000 ohm carbon resistor to point "A" on the 1st limiter 6SJ7 load circuit. The ground side of the oscilloscope input connects to the chassis. Progressively apply a wide band signal generator output of 4.3 MC to points "B," "C" and "D" of the 2nd I.F., 1st I.F. and 2nd converter grids. Use a .05 mfd. capacitor between the generator output and points "B" and "C." Use a 22 mmf. capacitor between the generator output and point "D." Connect the ground lead of the wide band signal generator output to the chassis at the same point to which the oscilloscope ground is connected. Align the primary and secondary I.F. transformer trimmers for maximum vertical deflection of the oscilloscope curve. The third circuit trimmers (C14 and C17) of the 1st and 2nd I.F. transformers should be adjusted to give maximum broadness to the peak of the oscilloscope curve consistent with maximum vertical deflection. The I.F. curve should not be broadened beyond that point where the vertical deflection of the oscilloscope curve is reduced.

Discriminator Alignment

Remove the oscilloscope input connections from the limiter load and connect the high lead directly to the audio output. Connect the ground lead to the chassis using the same point to which the generator ground is connected. Apply the wide band generator signal of 4.3 MC through a 22 mmf. capacitor to point "D" on the 2nd converter grid. Adjust the discriminator transformer (T4) primary trimmer (C21) for maximum vertical deflection on the oscilloscope. Align the secondary trimmer (C22) for center crossover of the two curves. Retrim the primary trimmer (C21) for straight crossover lines if necessary.

R.F. Alignment

Connect a 0–100 microammeter in series with a 470,000 ohm resistor between chassis and point "A" on the load circuit of the 1st limiter tube, 6SJ7. The resistor should be between the meter and point "A." Apply a 46 MC generator signal to the antenna input terminals of the Translator. Set dial pointer to 46 MC and align oscillator trimmer (C2). The image signal should be below 46 MC when the oscillator is properly set. Peak the converter trimmers (C3 and C4) for maximum output.

NOTE. If oscillations develop in the I.F. circuits during alignment it is probably due to the generator and oscilloscope ground connections. Be sure these ground connections are made to the same point on the chassis. Changing ground points will generally assist in eliminating instability.

MODEL LC-648W

GENERAL INFORMATION

Two different types of record changers were used during the production of the Model LC648W phonograph combination.

The Model LRP-170 record changer is identified by the single record post and the eccentric turntable spindle, whereas the LRP-162 changers make use of a two-post record holder. Different pickup compensation is used for the two changers as noted at the bottom of the schematic diagram and the change in value of resistors R-11 and R-12 as given in the parts list.

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 1. All oscillator and RF trimmers are accessible through a slot through the back cover of the cabinet.

The alignment procedure is given in table form. All IF alignments may be made with the chassis removed from the cabinet. However, the RF alignments are made with the chassis and loop antennas securely fastened in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects it. The RF signal should be capacity-coupled by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed near the receiver loop.

ALIGNMENT CHART

Step	Connect Test-Osc. to	Test-Osc. Setting	Pointer Setting	Adjust Trimmers for Maximum Output
1	6SK7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C6 & C7
2	6SA7 Conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C4 & C5
3	With input on 6SA7 conv., repeat step 1.			
4	Capacity Coupled	580 KC	"BC" Band 580 KC	C22*
5	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C2 (Osc.)
6	Capacity Coupled	1500 KC	"B" Band 1500 KC	C16 (RF)
7	Repeat step 4.			

* Rock gang condenser when making alignment.

Special Service Information

The following data are taken with a vacuum tube voltmeter or similar voltage measuring device.

(1) Stage Gains

Antenna Post to RF Grid	5 at 1000 KC
RF Grid to Converter Grid	5 at 1000 KC
Converter Grid to IF Grid	40 at 1000 KC
Converter Grid to IF Grid	60 at 455 KC
IF Grid to 6SQ7 diode plates	90 at 455 KC

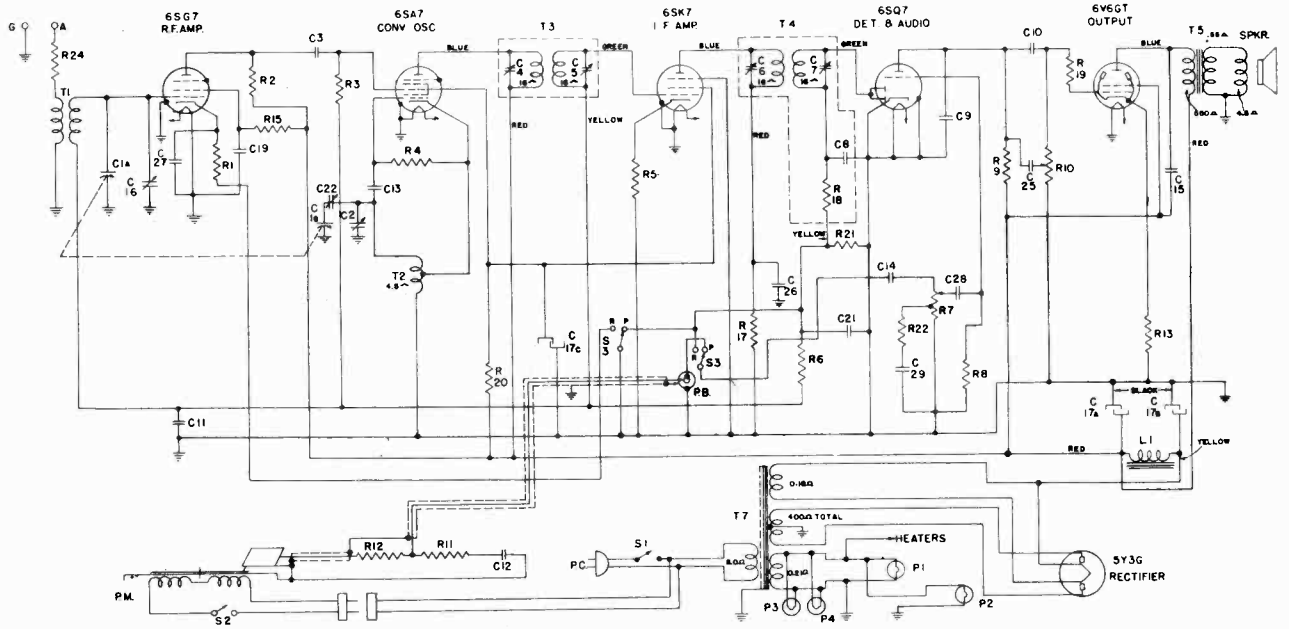
(2) Audio Gains
.14 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor R4 averages 10 volts at 1000 KC.

Variations of ±20% permissible. All readings taken with AVC shorted out.

MODEL LC648W

GENERAL ELECTRIC CO.



FOR G.E. LRP-162 and LRP-170 RECORD CHANGERS, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS"

Our Cat. No.	Symbol	Description	List Price
*RC-7061	C-1a, 1b	CONDENSER—Tuning condenser	$2.00
RT-891	C-2	TRIMMER STRIP—"B" Osc. Trimmer strip (combined with C-16, 22)	.55
*RC-235	C-3	CAPACITOR—100 mmf. mica	.25
*RC-252	C-8	CAPACITOR—200 mmf. mica	.30
*RC-242	C-9	CAPACITOR—150 mmf. mica	.25
*RC-048	C-10	CAPACITOR—.02 mfd. 600 V paper	.30
*RC-072	C-11	CAPACITOR—.05 mfd. 200 V paper	.25
*RC-011	C-12	CAPACITOR—.002 mfd. 600 V paper (Used only with RLP-170 record player)	.25
*RC-216	C-13	CAPACITOR—47 mmf., mica	.25
*RC-023	C-14	CAPACITOR—.005 mfd. 600 V paper	.25
*RC-055	C-15	CAPACITOR—.003 mfd. 600 V paper	.25
*RT-891	C-16	TRIMMER STRIP—Ant. trimmer (Part of C-2, 22)	.55
RC-5212	C17a, 17b, 17c	CAPACITOR—10-15-10 mfd., electrolytic	1.10
*RC-039	C-19	CAPACITOR—.01 mfd. 600 V paper	.25
*RC-235	C-21	CAPACITOR—100 mmf., mica	.25
*RT-891	C-22	TRIMMER STRIP—"B" Band padder (Combined with C 2, C-16)	.55
*RC-023	C-25	CAPACITOR—.005 mfd. 600 V paper	.25
*RC-047	C-26, 27, 28	CAPACITOR—.01 mfd. 400 V paper	.20
*RC-017	C-29	CAPACITOR—.0042 mfd. 600 V paper	.25
*RQ-1247	R-1	RESISTOR—330 ohm, ½-W carbon	.70-5
*RQ-1271	R-2	RESISTOR—3300 ohm, ½-W carbon	.70-5
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1291	R-4	RESISTOR—22,000 ohm, ½-W carbon	.70-5
*RQ-1239	R-5	RESISTOR—150 ohm, ½-W carbon	.70-5
*RQ-1339	R-6	RESISTOR—2.2 megohm, ½-W carbon	.70-5
*RV-135	R-7	VOL. CONTROL—2 meg. volume control	.95
*RQ-1355	R-8	RESISTOR—10.0 megohm, ½-W carbon	.70-5
*RQ-1323	R-9	RESISTOR—470,000 ohm, ½-W carbon	.70-5
*RT-722	R-10, S1	TONE CONTROL—0.5 meg. control and power switch	1.45
*RQ-1299	R-11, 12	RESISTOR—47,000 ohm, ½-W carbon (Used only with record player LRP-170)	.70-5
*RQ-1313	R-11	RESISTOR—180,000 ohm, ½-W carbon (Used only with record player LRP-162)	.70-5
*RQ-1315	R-12	RESISTOR—220,000 ohm, ½-W carbon (Used only with record player LRP-162)	.70-5
*RQ-1247	R-13	RESISTOR—330 ohm, ½-W carbon	.70-5
*RQ-1299	R-15	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1259	R-17	RESISTOR—1000 ohm, ½-W carbon	.70-5
*RQ-1299	R-18	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1259	R-19	RESISTOR—1000 ohm, ½-W carbon	.70-5
*RQ-687	R-20	RESISTOR—15,000 ohm, 2-W carbon	.35
*RQ-1323	R-21	RESISTOR—470,000 ohm, ½-W carbon	.70-5
*RQ-1303	R-22	RESISTOR—68,000 ohm ½-W carbon	.70-5
*RQ-1259	R-24	RESISTOR—1000 ohm, ½-W carbon	$0.70-5
*RL-590	T-1	BEAM-A-SCOPE—Built-in loop antenna	1.25
*RL-2072	T-2	COIL—Osc. coil, Band "B"	.30
*RT-3005	T-3	TRANSFORMER—1st IF transformer	.90
*RT-3006	T-4	TRANSFORMER—2nd IF transformer	1.15
RT-4033	T-5	TRANSFORMER—Output transformer	1.25
RT-0629	T-7	TRANSFORMER—60-cycle power transformer	5.05
*RS-3141	S-3	SWITCH—Phono-radio switch	.55
RS-1096	SPKR	SPEAKER—12-in. EM speaker	8.05

* Used on previous receiver. —— **Prices subject to change without notice**

Electrical Rating

Rating "A6"—110–125 volts, 60 cycles, 80 watts.
Rating "A5"—110–125 volts, 50 cycles, 80 watts.

Tuning Frequency Range

"BC" Band ..... 540–1720 KC

Intermediate Frequency ..... 455 KC

Electrical Power Output

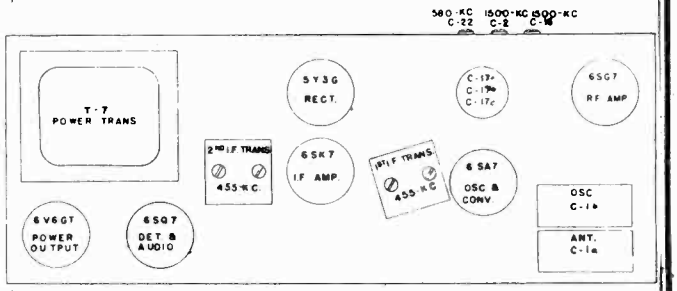
Undistorted ..... 2.5 watts
Maximum ..... 4.5 watts

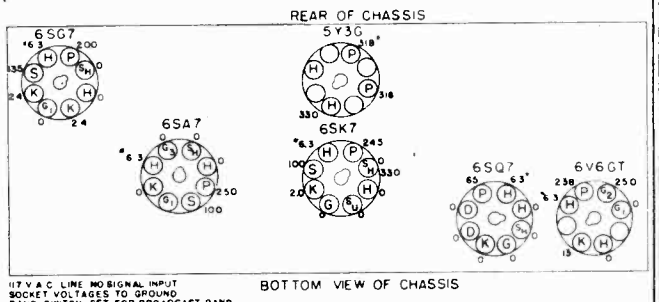
Loudspeaker—EM Dynamic

Outside cone diameter ..... 12 inches
Voice coil impedance (400 cycles) ..... 5.0 ohms

Phonograph Mechanism

Type changer ..... Models LRP-162 or LRP-170
Type pickup ..... Crystal
Turntable speed ..... 78 R.P.M.

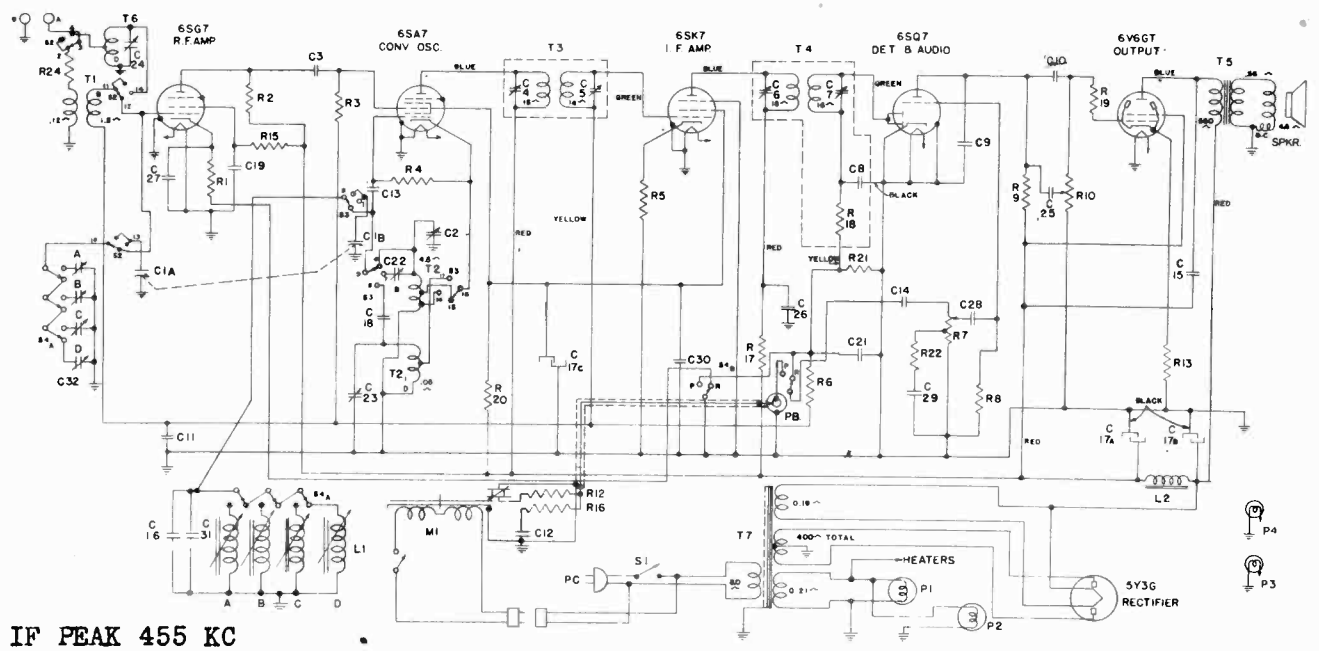




117 V A C LINE NO SIGNAL INPUT
SOCKET VOLTAGES TO GROUND
BAND SWITCH SET FOR BROADCAST BAND
* INDICATES VOLTS A.C.

GENERAL ELECTRIC CO.

MODEL LC619W



IF PEAK 455 KC

NOTE—C12 IS OMITTED WHEN RECORD CHANGER LRP-162 IS USED

FOR G.E. RECORD CHANGERS LRP-162 AND LRP-170, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".

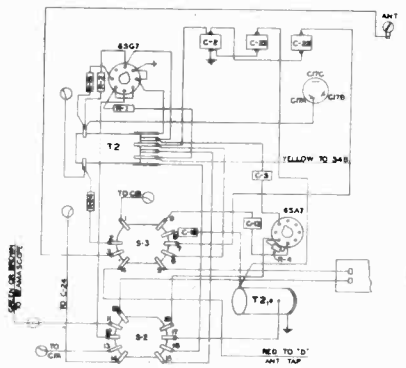


Fig. 2. Switch Wiring

RADIO REPLACEMENT PARTS LIST

Our Cat. Number	Symbol	Description	List Price
*RC-7061	C1a, C1b	CONDENSER—2 gang tuning condenser	$2.00
*RC-6552	C-2	CAPACITOR—"B" band trimmer (Part of C22, 23)	.55
*RC-235	C-3	CAPACITOR—100 mmf., mica	.25
*RC-242	C-9	CAPACITOR—150 mmf., mica	.25
*RC-048	C-10	CAPACITOR—.02 mfd. 600-V paper	.30
*RC-072	C-11	CAPACITOR—.05 mfd. 200-V paper	.25
*RC-011	C-12	CAPACITOR—.002 mfd. 600-V paper (Used with Model LRP-170 record player only)	.25
*RC-216	C-13	CAPACITOR—47 mmf., mica	.25
*RC-023	C-14	CAPACITOR—.005 mfd. 600-V paper	.25
*RC-055	C-15	CAPACITOR—.003 mfd. 600-V paper	.25
*RC-329	C-16	CAPACITOR—150 mmf., compensating capacitor	.25
RC-5212	C-17a, 17b 17c	CAPACITOR—10-15-10 mfd., electrolytic	1.10
*RC-390	C-18	CAPACITOR—3900 mmf. mica	.35
*RC-039	C-19	CAPACITOR—.01 mfd. 600-V paper	.25
*RC-235	C-21	CAPACITOR—100 mmf., mica	.25
*RC-6552	C-22	CAPACITOR—"B" padder (Part of C2, 23)	.55
*RC-6552	C-23	CAPACITOR—"D" Osc. trimmer (Part of C2, 22)	.55

* Used on previous receivers.

Our Cat. Number	Symbol	Description	List Price
*RC-6553	C-24	CAPACITOR—"D" antenna trimmer	$0.25
*RC-023	C-25	CAPACITOR—.005 mfd. 600-V paper	.25
*RC-039	C-26, 27, 28	CAPACITOR—.01 mfd. 600-V paper	.25
*RC-049	C-29	CAPACITOR—.0042 mfd. 600-V paper	.35
*RC-039	C-30	CAPACITOR—.01 mfd. 600-V paper	.25
*RC-305	C-31	CAPACITOR—600 mmf., silvered mica	.25
*RT-885	C-32a, b, c, d	TRIMMER STRIP—Push button trimmer strip	.70
*RQ-1247	R-1	RESISTOR—330 ohm, ½-W carbon	.70-5
*RQ-1271	R-2	RESISTOR—3300 ohm, ½-W carbon	.70-5
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1291	R-4	RESISTOR—22,000 ohm, ½-W carbon	.70-5
*RQ-1239	R-5	RESISTOR—150 ohm, ½-W carbon	.70-5
*RQ-1339	R-6	RESISTOR—2.2 megohm, ½-W carbon	.70-5
*RV-135	R-7	VOL. CONTROL—2 meg. volume control	.95
*RQ-1355	R-8	RESISTOR—10 megohm, ½-W carbon	.70-5
*RQ-1323	R-9	RESISTOR—470,000 ohm, ½-W carbon	.70-5
*RT-722	R-10, S1	TONE CONTROL—0.5 meg. tone control	1.45
*RQ-1299	R-12	RESISTOR—47,000 ohm, ½-W carbon (Used only with Model LRP-170 record player)	.70-5
*RQ-1315	R-12	RESISTOR—220,000 ohm, ½-W carbon (Used only with Model LRP-162 record player)	.70-5
*RQ-1247	R-13	RESISTOR—330 ohm, ½-W carbon	.70-5
*RQ-1299	R-15	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1299	R-16	RESISTOR—47,000 ohm, ½-W carbon (Used only with Model LRP-170 record player)	.70-5
*RQ-1313	R-16	RESISTOR—180,000 ohm, ½-W carbon (Used only with Model LRP-162 record player)	.70-5
*RQ-1259	R-17	RESISTOR—1000 ohm, ½-W carbon	.70-5
*RQ-1299	R-18	RESISTOR—47,000 ohm, ½-W carbon	.70-5
*RQ-1259	R-19	RESISTOR—1000 ohm, ½-W carbon	.70-5
*RQ-687	R-20	RESISTOR—15,000 ohm, 2-W carbon	.35
*RQ-1323	R-21	RESISTOR—470,000 ohm, ½-W carbon	.70-5
*RQ-1303	R-22	RESISTOR—68,000 ohm, ½-W carbon	.70-5
*RQ-1259	R-24	RESISTOR—1000 ohm, ½-W carbon	.70-5
*RL-9530	L1-a, b, c, and d	COIL—Push button coil assembly	.85
*RS-3142	S-2, S-3	SWITCH—Band switch	1.10
*RS-3130	S4a, 4b	SWITCH—Touch tuning switch	4.00
*RL-591	T-1	BEAM-A-SCOPE—"B" band loop	1.20
*RL-2073	T-2	COIL—"B" band oscillator coil	.50
*RL-2074	T-2	COIL—"D" band oscillator coil	.30
*RT-3005	T-3	TRANSFORMER—1st IF transformer	.90
*RT-3010	T-4	TRANSFORMER—2nd IF transformer	1.20
RT-4033	T-5	TRANSFORMER—Output transformer	1.25
*RL-592	T-6	BEAM-A-SCOPE—"D" band loop	.50
RT-0629	T-7	TRANSFORMER—50 or 60 cycle power transformer	5.05
RS-1096	SPKR	SPEAKER—12-inch EM speaker	8.05

Prices subject to change without notice.

MODEL LC619W

GENERAL ELECTRIC CO.

Our Cat. Number	Description	List Price
*RB-013	BOARD—2 lug terminal board	$0.10
*RB-023	BOARD—4 lug terminal board	.10
*RB-093	BOARD—6 lug terminal board	.10
*RB-026	BOARD—Antenna terminal board	.10
*RB-636	BEZEL—Pilot lamp bezel (bottom of cab.)	.15
*RB-646	BEZEL—Phono compartment lamp bezel	.20
*RB-1030	BOARD—Phono terminal board	.10
*RC-1989	CUSHION—Tuning condenser mtg. cushion	.05-5
*RC-8154	CORD—Power cord	.40
*RC-8500	CARDS—Station letter cards (set)	.20
RC-9052	CONE—12 in. speaker cone	1.50
*RC-8231	CABLE—Speaker cable and plug	.50
*RD-426	DRUM—Condenser drive drum assembly	.20
*RD-775	DIAL—Dial scale assembly	.85
*RG-449	GRILLE—Cabinet grille cloth	1.05
*RK-091	KNOB—Volume and tuning control knob	.10
*RK-092	KNOB—Tone or band control knob	$0.10
*RK-229	KEY—Push button key	.20
*RP-1032	POINTER—Dial pointer assembly	.25
*RS-238	SOCKET—Octal base tube socket	.15
*RS-257	SOCKET—Electrolytic mtg. socket	.05
*RS-266	SOCKET—Dial scale lamp socket	.15
*RS-292	SOCKET—Pilot lamp socket (bottom of cabinet)	.25
*RS-298	SOCKET—Phono compartment lamp socket	.20
*RS-444	SPRING—Volume, tuning or push button control springs	.10-10
*RS-463	SPRING—Drive cord tension spring	.10-5
*RS-511	SLEEVE—Tuning condenser mtg. spacer sleeve	.15-10
*RS-4012	SPRING—Tone or band control spring	.10-10
*RS-9042	SHAFT—Tuning shaft	.10
*RT-959	TERMINAL—Speaker and loop lead terminal	.05-5
*RW-101	WASHER—Felt washer for knobs	.05-10

* Used on previous receivers.

Prices subject to change without notice.

SPECIFICATIONS

Height	36 inches
Width	32 5/8 inches
Depth	16 3/8 inches

Electrical Rating

Rating "A6"—110-125 volts, 60 cycles, 80 watts.
Rating "A5"—110-125 volts, 50 cycles, 80 watts.

Tuning Frequency Range

"BC" Band	540–1720 KC
"SW" Band	5.3–18.0 MC

Intermediate Frequency 455 KC

Electrical Power Output

Undistorted	2.5 watts
Maximum	4.5 watts

Loud-speaker—EM Dynamic

Outside Cone diameter	12 inches
Voice Coil Impedance (400 cycles)	5.0 ohms

Phonograph Mechanism

Type changer	Models LRP-162 or LRP-170
Type pickup	Crystal
Turntable speed	78 Rpm

Tubes

RF Amplifier	GE-6SG7
Converter-Oscillator	GE-6SA7
IF Amplifier	GE-6SK7
Detector, 1st Audio, AVC	GE-6SQ7
Power Output	GE-6V6GT
Rectifier	GE-5Y3G
Dial Lamps	(2) Mazda No. 44

GENERAL INFORMATION

Two different types of record changers were used during the production of the Model LC-619W phonograph combination.

The Model LRP-170 record changer is identified by the single record post and the eccentric turntable spindle, whereas the LRP-162 changers make use of a two-post record holder. Different pickup compensation is used for the two changers as noted at the bottom of the schematic diagram and the change in value of resistors, R12 and R16, as given in the replacement parts list.

Special Service Information

The following data are taken with a vacuum tube voltmeter or similar voltage measuring device.

(1) Stage Gains

Antenna Post to RF Grid	5 at 1000 KC
RF Grid to Converter Grid	5 at 1000 KC
Converter Grid to IF Grid	40 at 1000 KC
Converter Grid to IF Grid	60 at 455 KC
IF Grid to 6SQ7 diode plates	90 at 455 KC

(2) Audio Gains
.14 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½-watt speaker output.

(3) DC voltage developed across oscillator grid resistor R4 averages 10 volts at 1000 KC or 8.0 volts at 10,000 KC.

Variations of ±20% permissible. All readings taken with AVC shorted out.

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 4. All oscillator and RF trimmers are accessible through a slot through the back cover of the cabinet.

The alignment procedure is given in table form. All IF alignments may be made with the chassis removed from the cabinet. However, the RF alignments are made with the chassis and loop antennas securely fastened in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects it. The RF signal should be capacity coupled by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet.

ALIGNMENT CHART

Step	Connect Test-Osc. to	Test-Osc. Setting	Pointer Setting	Adjust Trimmers for Maximum Output
1	6SK7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C6 & C7
2	6SA7 Conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C4 & C5
3	With input on 6SA7 Conv., repeat step 1			
4	Capacity Coupled	580 KC	"BC" Band 580 KC	C22**
5	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C2** (Osc.)
6	Repeat Step 4			
7	Capacity Coupled	18 MC	"SW" Band 18 MC	C23* (Osc.)
8	Capacity Coupled	18 MC	"SW" Band 18 MC	C24** (Ant.)

* Use minimum capacity peak.
** Rock gang condenser when making alignment.

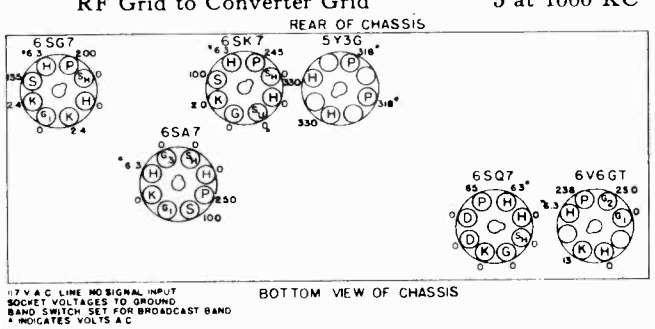


Fig. 3. Socket Voltages

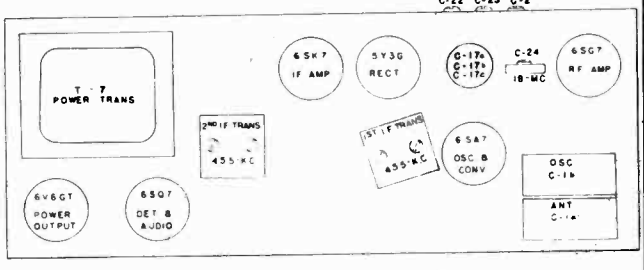
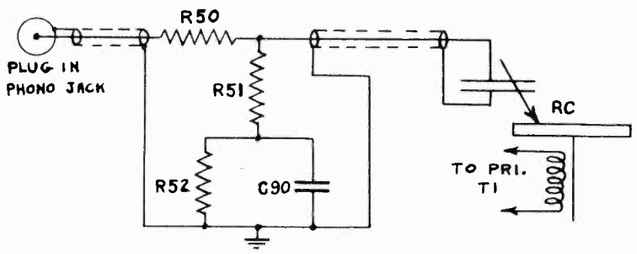


Fig. 4. Trimmer Location

GENERAL ELECTRIC CO.



Symbol	Description	Symbol	Description
R50	100,000 ohms, carbon	R52	220,000 ohms, carbon
R51	150,000 ohms, carbon	C90	.002 mfd., paper

Fig. 4. Phonograph Schematic

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 3 and alignment procedure is given in table form below.

Before making the R.F. alignment make sure the pointer is set to the line at the extreme low frequency end of the dial scale when the gang condenser plates are closed. Output meter alignment is preferable and the meter may be connected across the voice coil leads, then turn volume control partially up. Keep the signal input as low as possible to avoid AVC action. NOTE—the wave trap trimmer C-12 is aligned to give minimum output.

Alignment Chart

Step	Connect Test—Osc. to	Test—Osc. Setting	Pointer Setting	Adjust Trimmers for Max. Output
1	IF grid in series with .05 mfd.	455 KC	Band "B" 550 KC	2nd IF primary and secondary
2	Conv. grid in series with .05 mfd.	455 KC	Band "B" 550 KC	1st IF primary and secondary
3	Ant. post in series with 200 mmf.	455 KC	Band "B" 550 KC	C-12 *
4	Ant. post in series with 200 mmf.	21 MC	Band "D" 21 MC	Osc. (C-8)** RF. (C-5)*** Ant. (C-2)
5	Ant. post in series with 200 mmf.	6 MC	Band "C" 6 MC	Osc. (C-9)** RF. (C-6) Ant. (C-3)
6	Ant. post in series with 200 mmf.	1500 KC	Band "B" 1500 KC	Osc. (C-10) RF. (C-7) Ant. (C-4)
7	Ant. post in series with 200 mmf.	580 KC	Band "B" 580 KC	Osc. padder (C-11)***
8	Repeat operation 6.			

* Peak for minimum output.
** Use minimum capacity peak.
*** Rock gang condenser when making alignment.

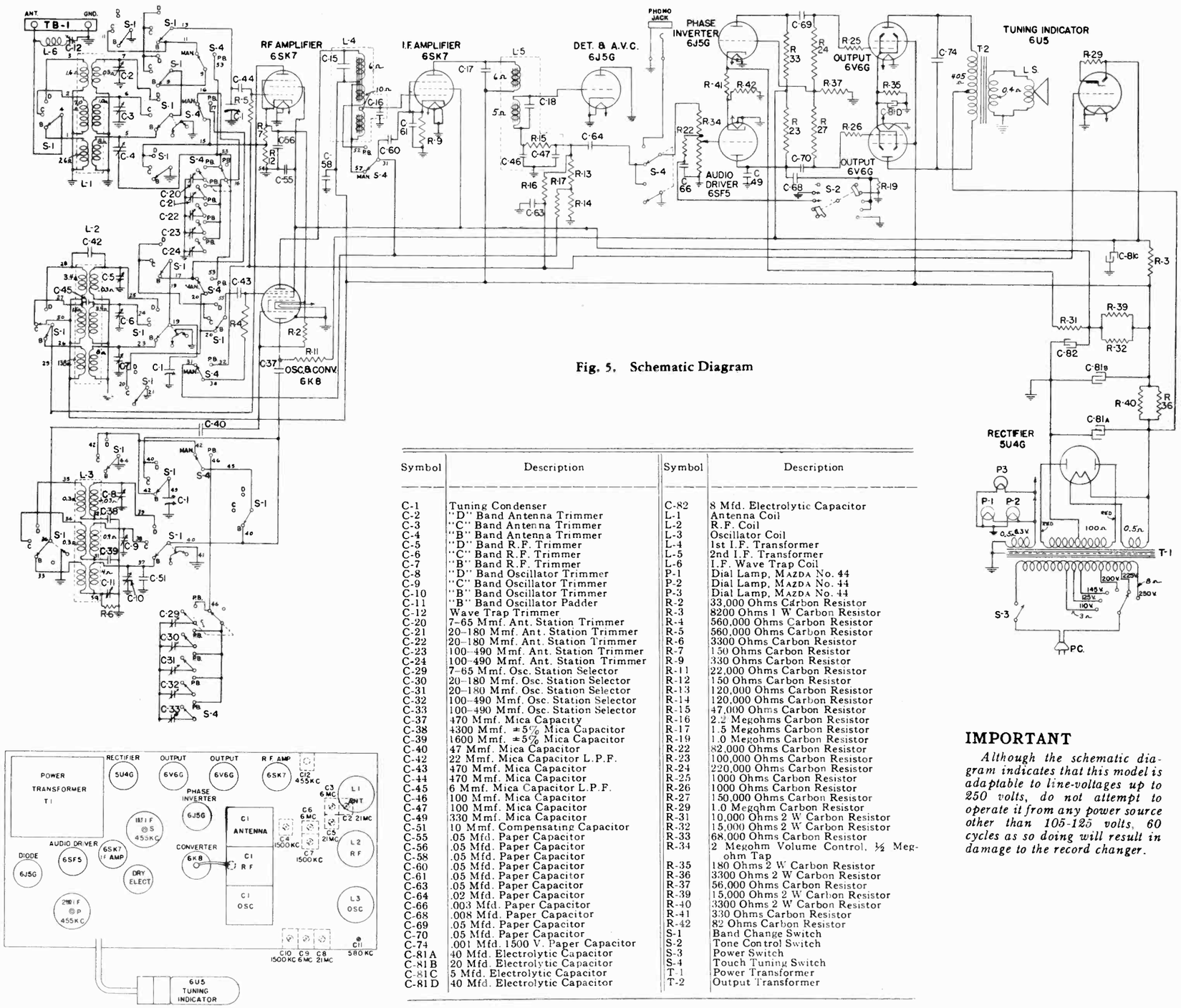


Fig. 5. Schematic Diagram

Fig. 3. Trimmer Location

Symbol	Description	Symbol	Description
C-1	Tuning Condenser	C-82	8 Mfd. Electrolytic Capacitor
C-2	"D" Band Antenna Trimmer	L-1	Antenna Coil
C-3	"C" Band Antenna Trimmer	L-2	R.F. Coil
C-4	"B" Band Antenna Trimmer	L-3	Oscillator Coil
C-5	"D" Band R.F. Trimmer	L-4	1st I.F. Transformer
C-6	"C" Band R.F. Trimmer	L-5	2nd I.F. Transformer
C-7	"B" Band R.F. Trimmer	L-6	I.F. Wave Trap Coil
C-8	"D" Band Oscillator Trimmer	P-1	Dial Lamp, MAZDA No. 44
C-9	"C" Band Oscillator Trimmer	P-2	Dial Lamp, MAZDA No. 44
C-10	"B" Band Oscillator Trimmer	P-3	Dial Lamp, MAZDA No. 44
C-11	"B" Band Oscillator Padder	R-2	33,000 Ohms Carbon Resistor
C-12	Wave Trap Trimmer	R-3	8200 Ohms 1 W Carbon Resistor
C-20	7-65 Mmf. Ant. Station Trimmer	R-4	560,000 Ohms Carbon Resistor
C-21	20-180 Mmf. Ant. Station Trimmer	R-5	560,000 Ohms Carbon Resistor
C-22	20-180 Mmf. Ant. Station Trimmer	R-6	3300 Ohms Carbon Resistor
C-23	100-490 Mmf. Ant. Station Trimmer	R-7	150 Ohms Carbon Resistor
C-24	100-490 Mmf. Ant. Station Trimmer	R-9	330 Ohms Carbon Resistor
C-29	7-65 Mmf. Osc. Station Selector	R-11	22,000 Ohms Carbon Resistor
C-30	20-180 Mmf. Osc. Station Selector	R-12	150 Ohms Carbon Resistor
C-31	20-180 Mmf. Osc. Station Selector	R-13	120,000 Ohms Carbon Resistor
C-32	100-490 Mmf. Osc. Station Selector	R-14	120,000 Ohms Carbon Resistor
C-33	100-490 Mmf. Osc. Station Selector	R-15	47,000 Ohms Carbon Resistor
C-37	470 Mmf. Mica Capacity	R-16	2.2 Megohms Carbon Resistor
C-38	4300 Mmf. ±5% Mica Capacitor	R-17	1.5 Megohms Carbon Resistor
C-39	1600 Mmf. ±5% Mica Capacitor	R-19	1.0 Megohms Carbon Resistor
C-40	47 Mmf. Mica Capacitor	R-22	82,000 Ohms Carbon Resistor
C-42	22 Mmf. Mica Capacitor L.P.F.	R-23	100,000 Ohms Carbon Resistor
C-43	470 Mmf. Mica Capacitor	R-24	220,000 Ohms Carbon Resistor
C-44	470 Mmf. Mica Capacitor	R-25	1000 Ohms Carbon Resistor
C-45	6 Mmf. Mica Capacitor L.P.F.	R-26	1000 Ohms Carbon Resistor
C-46	100 Mmf. Mica Capacitor	R-27	150,000 Ohms Carbon Resistor
C-47	100 Mmf. Mica Capacitor	R-29	1.0 Megohm Carbon Resistor
C-49	330 Mmf. Mica Capacitor	R-31	10,000 Ohms 2 W Carbon Resistor
C-51	10 Mmf. Compensating Capacitor	R-32	15,000 Ohms 2 W Carbon Resistor
C-55	.05 Mfd. Paper Capacitor	R-33	68,000 Ohms Carbon Resistor
C-56	.05 Mfd. Paper Capacitor	R-34	2 Megohm Volume Control, ½ Megohm Tap
C-58	.05 Mfd. Paper Capacitor	R-35	180 Ohms 2 W Carbon Resistor
C-60	.05 Mfd. Paper Capacitor	R-36	3300 Ohms 2 W Carbon Resistor
C-61	.05 Mfd. Paper Capacitor	R-37	56,000 Ohms Carbon Resistor
C-63	.05 Mfd. Paper Capacitor	R-39	15,000 Ohms 2 W Carbon Resistor
C-64	.02 Mfd. Paper Capacitor	R-40	3300 Ohms 2 W Carbon Resistor
C-66	.003 Mfd. Paper Capacitor	R-41	330 Ohms Carbon Resistor
C-68	.008 Mfd. Paper Capacitor	R-42	82 Ohms Carbon Resistor
C-69	.05 Mfd. Paper Capacitor	S-1	Band Change Switch
C-70	.05 Mfd. Paper Capacitor	S-2	Tone Control Switch
C-74	.001 Mfd. 1500 V. Paper Capacitor	S-3	Power Switch
C-81A	40 Mfd. Electrolytic Capacitor	S-4	Touch Tuning Switch
C-81B	20 Mfd. Electrolytic Capacitor	T-1	Power Transformer
C-81C	5 Mfd. Electrolytic Capacitor	T-2	Output Transformer
C-81D	40 Mfd. Electrolytic Capacitor		

IMPORTANT

Although the schematic diagram indicates that this model is adaptable to line-voltages up to 250 volts, do not attempt to operate it from any power source other than 105-125 volts, 60 cycles as so doing will result in damage to the record changer.

MODEL 35

GENERAL ELECTRIC CO.

Musaphonic

RADIO-PHONOGRAPH COMBINATION

MODEL 35

SERVICE DATA

Cabinet Dimensions

Height ..... 41¾ in
Depth ..... 18 in.
Width ..... 23½ in.

Electrical Rating

Rating "A-6"—105–125 volts, 60 cycles, AC, 125 watts

Tuning Frequency Range

Band "B" ..... 540–1600 KC
Band "C" ..... 2200–7000 KC
Bnad "D" ..... 7000–22,000 KC

Intermediate Frequency ..... 455 KC

Electrical Power Output

Undistorted ..... 8 watts
Maximum ..... 12 watts

Loud-speaker—Permanent Magnet

Cone Diameter ..... 14 inches
Voice Coil Impedance (400 cycles) ..... 3.5 ohms

Tubes

R.F. Amplifier GE-6SK7
Converter-Oscillator GE-6K8
I.F. Amplifier GE-6SK7
Detector-AVC GE-6J5G/6J5GT
Audio Driver GE-6SF5
Audio Phase Inverter GE-6J5G/6J5GT
Power Output ..... (2) GE-6V6G
Rectifier GE-5U4G
Tuning Indicator GE-6U5
Dial Lamp ..... (3) MAZDA No. 44

FOR DATA COVERING RECORD CHANGER SIMILAR TO G.E. LRP-158, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS"

All antenna, R.F. and oscillator transformer switch terminals are numbered in the chassis parts layout drawing to facilitate the location of these common points on the schematic diagram.

Loud-speaker

The voice coil on the speaker is accurately and permanently centered at the factory and should seldom give trouble. In case a voice coil needs recentering it will be necessary to replace the entire cone and voice coil assembly. Assembly instructions accompany each replacement cone.

NOTE: In no case should the magnet be removed from the assembled position as it will lose magnetism.

SPECIAL SERVICE INFORMATION

The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. Stage Gains *
   a. Antenna Post to R.F. Amplifier Grid at
      1000 KC 5.0
      4000 KC 3.7
      18,000 KC 2.6
   b. R.F. Amplifier Grid to Converter Grid at
      1000 KC 14.0
      4000 KC 10.0
      18,000 KC ..... 10.0 **
   c. R.F. on Converter Grid to I.F. on 1st I.F. Grid at
      1000 KC ("B" Manual) 16.0
      4000 KC 30.0
      18,000 KC 34.0
   d. I.F. on Converter Grid to I.F. on 1st I.F. Grid at
      455 KC ("B" Manual—Gang Closed) 24.0
   e. I.F. Amplifier Grid to Detector Grid at
      455 KC 112.0
2. Voltage Across Volume Control to Give ½-watt Speaker Output at
   400 Cycles 0.05*
3. D.C. Voltage Developed Across Oscillator Grid Resistor (R-2) with gang closed
   "B" Band 6.2*
   "C" Band 7.8*
   "D" Band 4.8*

* Variations of +10%, −20% are permissible.
** On "D" band, stray oscillator voltage may upset reading.

VOLTAGE CHART

Tubes	Plate to Gnd. Volts	Screen to Gnd Volts	Cathode to Gnd. Volts	Filament Volts
6SK7 (R.F.)	235	95	4.7	6.3
6K8	Con.–235 Osc.–105	95	4.7	6.3
6SK7 (I.F.)	235	95	3	6.3
6J5G (Det.)	0		0	6.3
6SF5	120		1	6.3
6J5G (Inverter)	90		4	6.3
6V6G	290	230	12.5	6.3
5U4G	277 a.c.		300	5.1
6U5	170			6.3

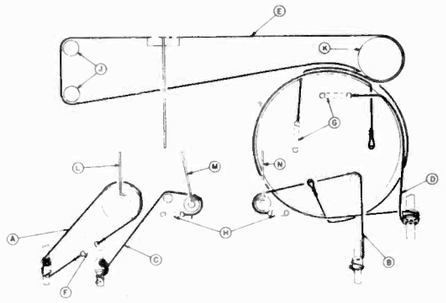


Fig. 1. Stringing Diagram

MODEL 35

GENERAL ELECTRIC CO.

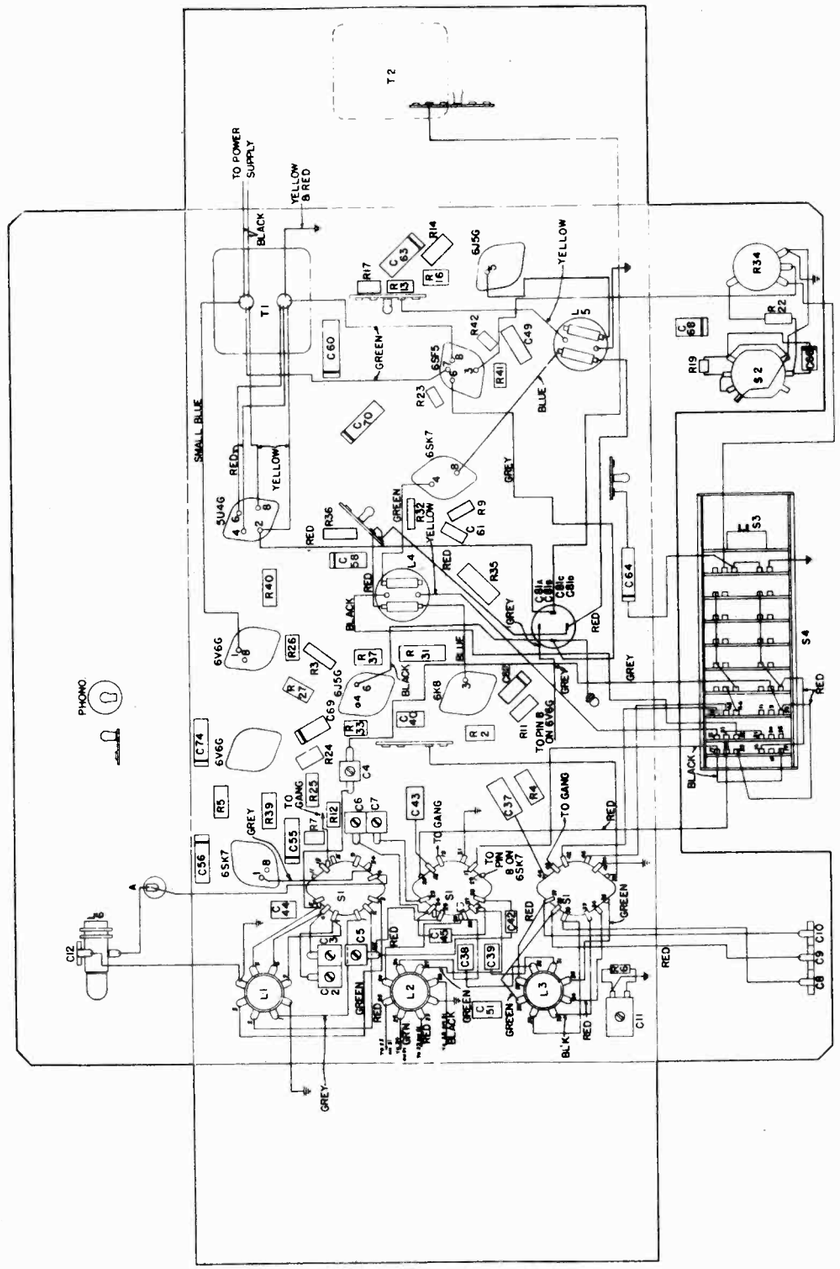
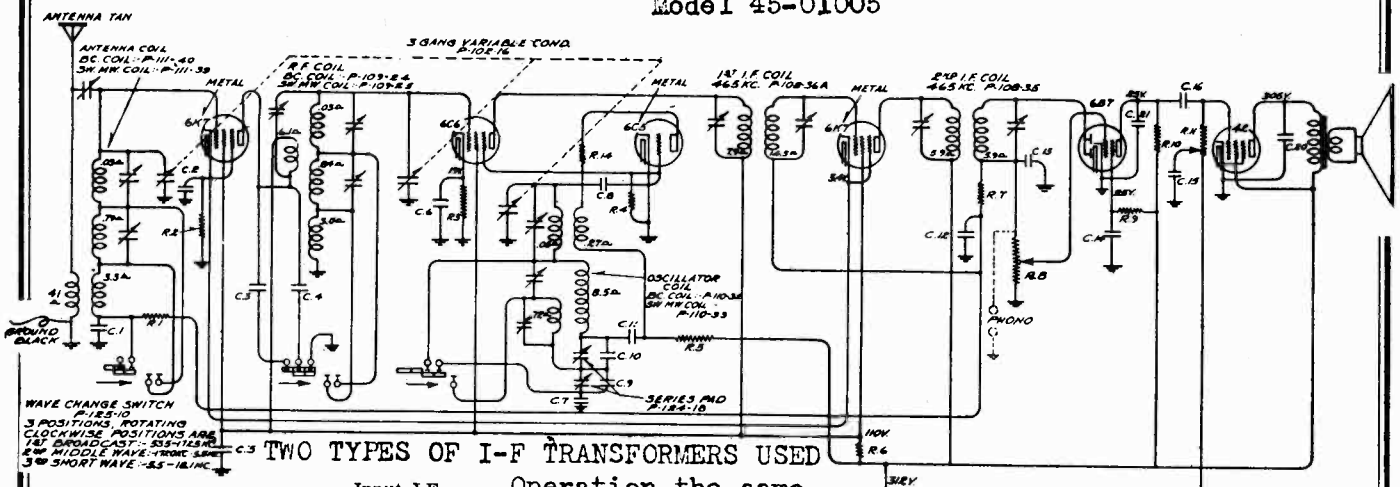


Fig. 2. Chassis Parts Layout

GOODYEAR TIRE & RUBBER CO., INC.

MODEL 45-01005
Series A.B

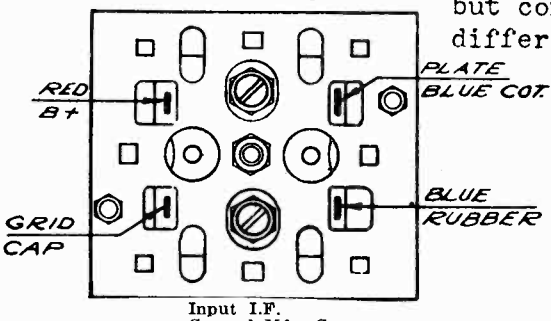
Model 45-01005



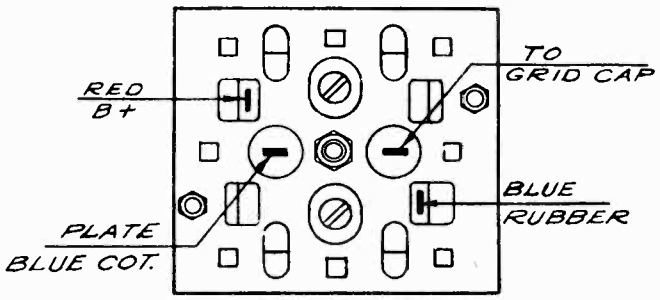
TWO TYPES OF I-F TRANSFORMERS USED

Operation the same, but connected differently.

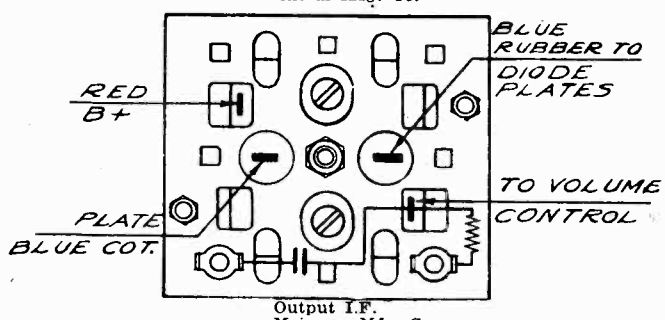
Input I.F.
Meissner Mfg. Co.



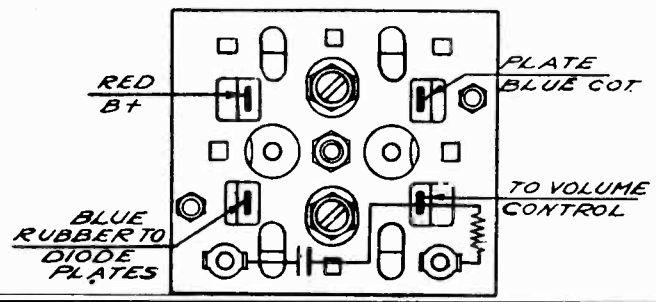
Input I.F.
General Mfg. Co.



Output I.F.
General Mfg. Co.



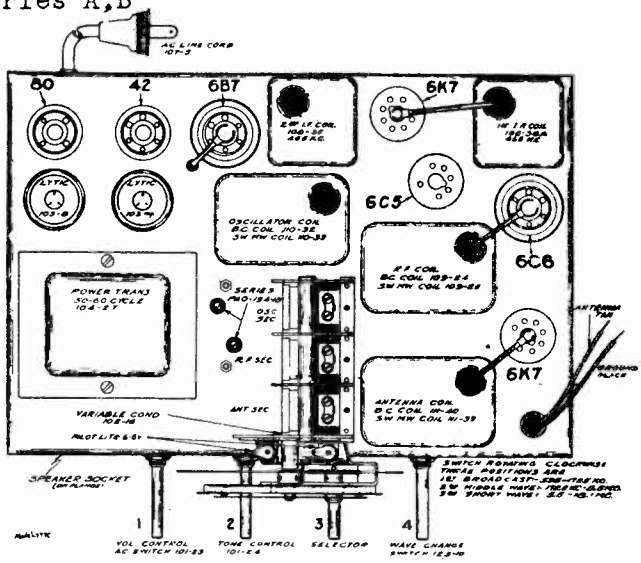
Output I.F.
Meissner Mfg. Co.



No.	Part No.	Description
		RESISTORS
R1.	130—20	100M Ohms—⅛ Watt—20%—50 V.
R2.	130—53	180 Ohms—½ Watt—10%—10 V.
R3.	130—54	500 Ohms—⅛ Watt—20%—10 V.
R4.	130—52	50M Ohms—⅛ Watt—20%—10 V.
R5.	130—49	12M Ohms—1 Watt—20%—150 V.
R6.	130—61	15M Ohms—2 Watt—20%—180 V.
R7.	130—3	500M Ohms—⅛ Watt—20%—100 V.
R8.	101—23	1 meg ohm—Volume Control
R9.	130—19	1 meg ohm—⅛ Watt—20%—100 V.
R10.	130—62	250M Ohms—½ Watt—20%—50 V.
R11.	101—24	300M Ohms—Tone Control
R12.	130—11	250M Ohms—⅛ Watt—20%—50 V.
R13.	130—37	750M Ohms—⅛ Watt—20%—50 V.
R14.	130—60	100 Ohms—⅛ Watt—20%—10 V.
		CONDENSERS
C1.	100—9	.05 x 200 V.—25%
C2.	100—6	.25 x 200 V.—25%
C3.	129—30	.0014 Mica—MW.—20%
C4.	129—21	.0002 Mica—MT—20%
C5.	100—24	.25 x 400 V.—25%
C6.	100—20	.1 x 200 V.—25%
C7.	129—29	.0038 Mica—MW—2½%
C8.	129—31	.000025 Mica—MT—15%
C9.	129—25	.0012 Mica—MW.—5%
C10.	129—28	.00064 Mica—MT—5%
C11.	100—13	.05 x 400 V.—25%
C12.	100—13	.05 x 400 V.—25%
C13.	129—32	.00003 Mica—MT—30%
C14.	113—12	.1 x 200 V.—25%
C15.	100—11	.01 x 400 V.—25%
C16.	100—13	.05 x 400 V.—25%
C17.	103—4	16 mfd. x 350 V. Electrolytic
C18.	118—12	.25 x 200 V.—20%
C19.	103—8	14 mfd. x 400 V.
C20.	100—19	.006 x 600 V.—25%
C21.	129—5	.0001 Mica—MT—20%
		MISCELLANEOUS
111—40		B.C. Coil
111—39		S.W.—MW. Coil
		R.F. Coil
109—24		B.C. Coil
109—25		S.W. M.W. Coil
		Oscillator
110—32		B. C. Coil
110—33		S.W. M.W. Coil
108—36A		Input I.F. Coil 465 Kc.
108—35		Output I.F. Coil 465 Kc.
124—18		Dual Series Pad
125—10		Wave change switch
114—13		Speaker 6 in. Field 1250 ohms
114—27		Speaker 8 in. Field 1250 ohms
104—27		Power Transformer 50-60 Cycle
104—28		Power Transformer 25 Cycle
104—29		Power Transformer 25 Cycle Universal
104—30		Power Transformer 40 Cycle Universal

MODEL 45-01005
Series A,B

GOODYEAR TIRE & RUBBER CO., INC.



NOTE: IN SERIES B THE TYPE 75 WAS REPLACED BY TYPE 6B7, DUPLEX DIODE PENTODE AS A SECOND DETECTOR, A.V.C. AND AUDIO.

Series A and B chassis are serially numbered on the back flange of the chassis, series A beginning with number "5B104021A" and up, series B chassis beginning with number "5D114175B" and up. Series A and B may be identified by the letter "A" and "B" at the end of the serial numbers.

Transformers are available and chassis are sometimes equipped with universal transformers for operation on 40 and 60 cycles and with primary taps for 108, 125, 150, 220 and 250 volts (see instructions) and also sometimes equipped with 25 cycle transformers with 105-115 volt or 220 volt primaries, not universals.

ALIGNING INSTRUCTIONS

Dummy Antennas

The following dummy antennas are used in aligning both series A and B 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.

ALIGNMENT PROCEDURE SERIES A ONLY

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

BROADCAST BAND ALIGNMENT:

1. With wave changing switch in the broadcast position, extreme left of its rotation, and with external oscillator set at 550 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 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 electrolytic condenser. See top view.
   (b) Re-set external oscillator to 1500 K.C., move dial pointer to 1500 K.C. and adjust oscillator (adjustment number 3), R.F. (adjustment number 2) and antenna (adjustment number 1) to resonance. See bottom view for location of these adjustments.
   (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 wave 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 8), short wave R.F. (adjustment number 7) 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 for sensitivity.

INTERMEDIATE BAND ALIGNMENT:

1. With wave changing switch in the intermediate position center of its rotation, and with external oscillator set at 5 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 5 megacycles and adjust intermediate wave oscillator (adjustment number 9), intermediate wave R.F. (adjustment number 5) and intermediate antenna (adjustment number 4) to resonance.
   (b) Re-set external oscillator to 1800 K.C. and pick up signal by rotating variable condenser and check for sensitivity.
   (c) Re-check broadcast sensitivity as outlined under "Broadcast Band Alignment".

Series "A" chassis have no intermediate band series oscillator pad adjustment.

ALIGNMENT PROCEDURE SERIES B ONLY

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

BROADCAST BAND ALIGNMENT:

1. With wave 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 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 electrolytic condenser. See top view.
   (b) Re-set external oscillator to 1400 K.C., move dial pointer to 1400 K.C. and adjust oscillator (adjustment number 3), R.F. (adjustment number 2) and antenna (adjustment number 1) to resonance. See bottom view for location of these adjustments.
   (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 wave 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 8), short wave R.F. (adjustment number 7) 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 for sensitivity.

INTERMEDIATE BAND ALIGNMENT:

1. With wave changing switch in the intermediate wave position, center of its rotation, and with external oscillator set at 1800 K.C. and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:
   (a) Rotate variable condenser to approximately 1800 K.C., tune in oscillator signal and adjust M.W. series pad (see top view) to resonance. Slowly rock condenser to and fro while making this adjustment to be sure maximum output is obtained.
   (b) Set external oscillator at 5 M.C., rotate condenser, pick up signal and adjust intermediate wave R.F. (adjustment number 5), intermediate wave antenna (adjustment number 4) and intermediate wave oscillator (adjustment number 9) to resonance.
   (c) 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. intermediate wave adjustments.

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

Series A and B.

Series A—Part No. 108-35 Output I.F. Transformer
Series A—Part No. 108-36 Input I.F. Transformer
Series B—Part No. 108-35 Output I.F. Transformer
Series B—Part No. 108-36 Input I.F. Transformer

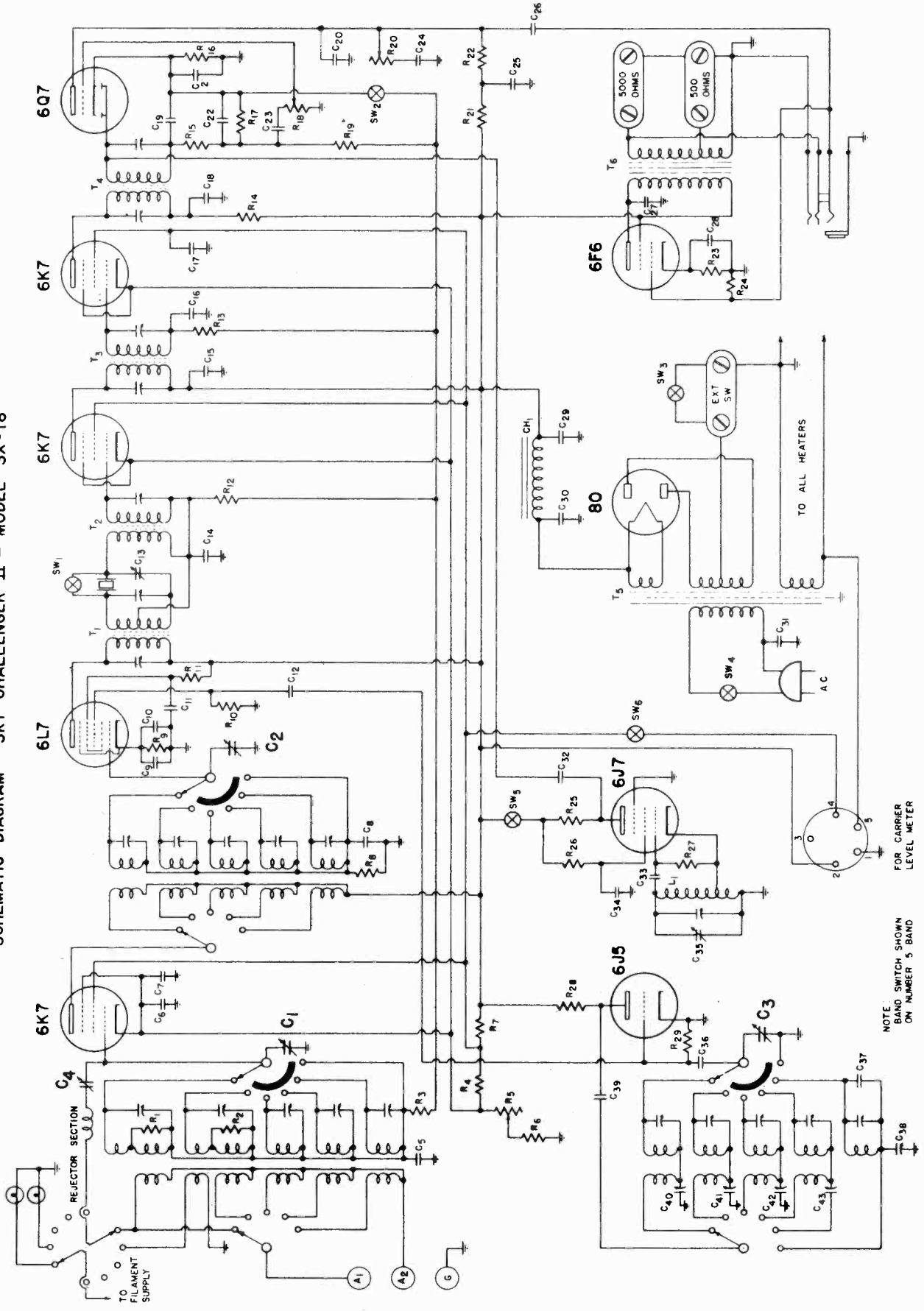
These I.F. transformers have two adjustments, both of which are accessible from the underside of chassis (see bottom view).

1. With volume control full on, the extreme right of its rotation, and with wave changing switch in the broadcast position, extreme left of its rotation, and with 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 6D6 tube, located between the two I.F. transformers, and adjust the output I.F. transformer to resonance.
   (b) With "Dummy 1" still connected, move oscillator output clip from grid of 6D6 to grid cap to 6C6 and adjust input I.F. transformer to resonance.
   (c) With oscillator still connected to 6C6, re-adjust output I.F. transformer.

THE HALLICRAFTERS INC.

MODELS S-18, SX-18
Sky Challenger II

SCHEMATIC DIAGRAM - SKY CHALLENGER II - MODEL SX-18



MODELS S-16, SX-16
Sky Challenger II

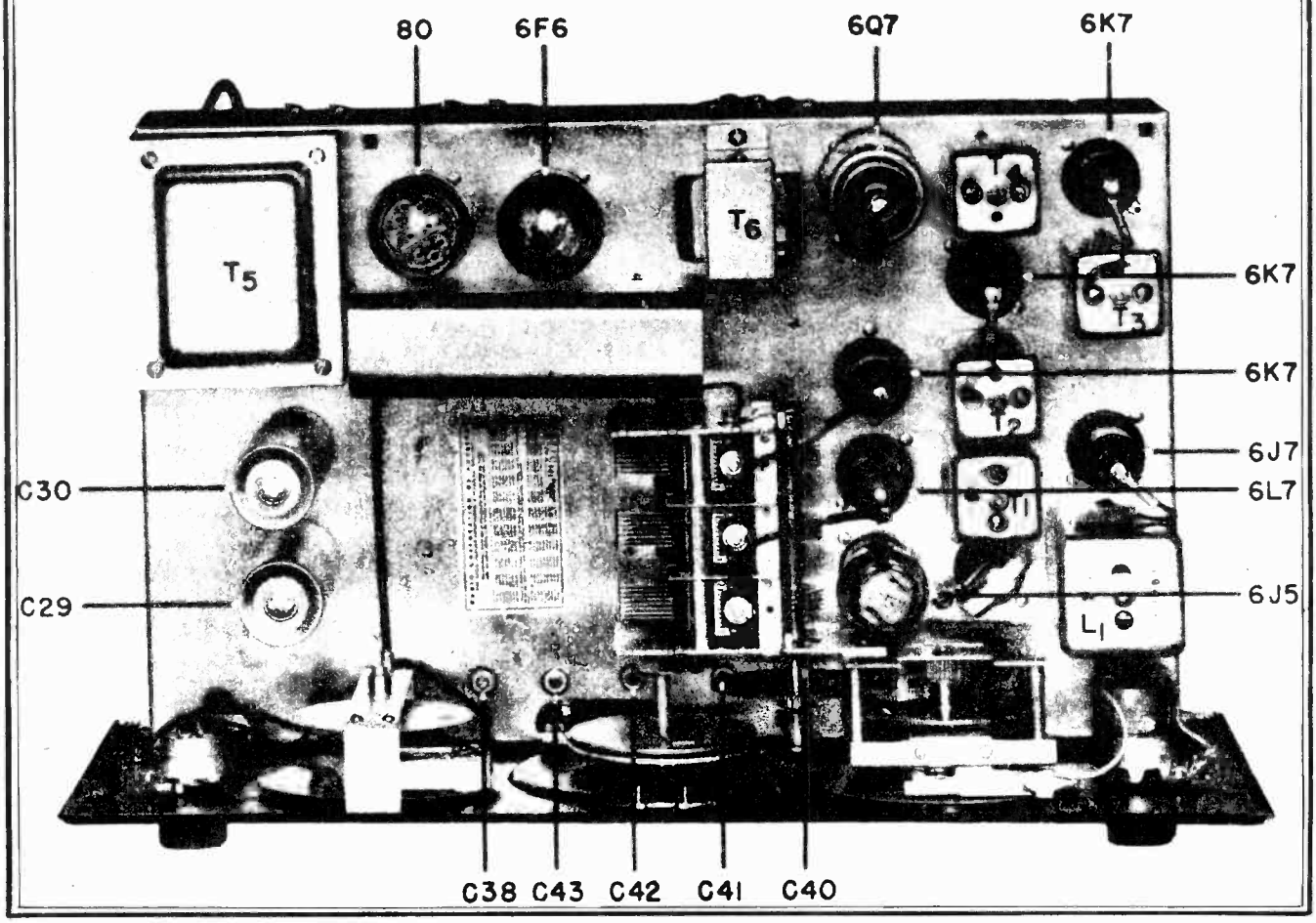
THE HALLICRAFTERS INC.

CONDENSERS

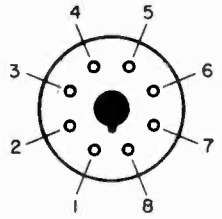
C1	250	MMFD	
C2	250	"	
C3	250	"	
C4	15	"	AIR VARIABLE
C5	.002	MFD	
C6	.002	MFD	400 VOLT MICA
C7	.25	"	200 "
C8	.002	"	"
C9-	.05	"	" "
C10	.002	"	"
C11	.05	"	400 "
C12	50	MMFD	"
C13	25	"	AIR VARIABLE
C14	.02	MFD	200 VOLT
C15	.25	"	400 "
C16	.02	"	200 "
C17	.1	"	400 "
C18	.05	"	" "
C19	250	MMFD	
C20	500	"	
C21	10	MFD	25 " ELECTROLYTIC
C22	250	MMFD	
C23	.05	MFD	200 "
C24	.005	"	400 "
C25	.1	"	" "
C26	.05	"	" "
C27	.003	"	
C28	10	"	25 " "
C29	16	"	400 " " WET
C30	16	"	" " " "
C31	.01	"	"
C32	10	MMFD	
C33	250	"	
C34	.02	MFD	" "
C35	25	MMFD	AIR VARIABLE
C36	25	"	
C37	10	"	
C38	200	"	VARIABLE PAD
C39	25	"	MICA
C40	.0012	MFD	VARIABLE PAD
C41	.0011	"	" "
C42	.00093	"	" "
C43	.00039	"	" "

RESISTORS

No.	OHMS	
R1	250	
R2	125	
R3	100,000	
R4	30,000	
R5	10,000	R. F. GAIN CONTROL
R6	250	
R7	15,000	
R8	100,000	
R9	600	
R10	100,000	
R11	30,000	
R12	100,000	
R13	100,000	
R14	1,000	
R15	20,000	
R16	4,000	
R17	500,000	
R18	500,000	VOLUME CONTROL
R19	1,000,000	
R20	500,000	TONE CONTROL
R21	100,000	
R22	250,000	
R23	500	
R24	250,000	
R25	100,000	
R26	100,000	
R27	50,000	
R28	10,000	
R29	50,000	



THE FOLLOWING MEASUREMENTS MADE WITH 1000 OHMS PER VOLT METER AND TAKEN FROM THE POINT INDICATED TO GROUND WITH THE AVC SWITCH IN THE "ON" POSITION. ANTENNA AND GROUND DISCONNECTED AND R. F. AND A. F. GAIN CONTROLS SET AT MAXIMUM. LINE VOLTAGE OF 115 AT THE TIME THESE MEASUREMENTS WERE TAKEN. NORMAL TOLERANCE ALLOWS VARIATIONS OF PLUS OR MINUS 10% FROM THE VALUES INDICATED. "DL" INDICATES A DEAD LUG BUT WILL INDICATE VOLTAGE WHEN USED AS A TIE.



BOTTOM VIEW OF SOCKET

TUBE	FUNCTION	1	2	3	4	5	6	7	8
6K7	R. F. AMP.			260	125	5	DL	6.3	5
6L7	MIXER			260	105	-6	DL	6.3	4.5
6J5G	OSC.			168	DL	-19	DL	6.3	0
6K7	IF AMP (1)			265	125	5	DL	6.3	5
6K7	IF AMP (2)			250	125	5	260DL	6.3	5
6Q7G	2ND DET. A.V.C. 1ST AUDIO			75	1	1		6.3	2
6F6G	2ND AUDIO			245	260	0	16DL	6.3	16
6J7	BEAT OSC.			105	105	0	0DL	6.3	0

INTERMEDIATE FREQUENCY ALIGNMENT (465 KC)

HAVE THE CONTROLS SET IN THE FOLLOWING POSITIONS:

B.F.O. SWITCH "OFF"
A. F. AND R. F. GAIN CONTROLS ON FULL.
CRYSTAL PHASING CONDENSER MIDWAY (POINTER STRAIGHT UP).
A.V.C. SWITCH "OFF".
CRYSTAL SWITCH "IN".
BAND SWITCH ON #1 BAND - TUNING GANG OPEN (MINIMUM CAPACITY).
REMOVE 6J5G OSCILLATOR TUBE FROM ITS SOCKET.
REMOVE THE 6L7 GRID CAP.

CONNECT THE SIGNAL GENERATOR TO GRID OF THE 6L7 TUBE THROUGH A .1 MFD CONDENSER. TUNE THE SIGNAL GENERATOR TO 465 KC AND THEN ADJUST THE CONDENSERS ON THE INTERMEDIATE FREQUENCY TRANSFORMERS T1, T2, T3, T4, RESPECTIVELY. NOW THROW THE CRYSTAL SWITCH TO THE "OUT" POSITION AND READJUST T1 FOR MAXIMUM OUTPUT. AS AN OUTPUT INDICATOR IT IS SUGGESTED THAT A RECTIFIER TYPE METER BE USED.

ALIGNMENT USING A 465 KC CRYSTAL

SHOULD THE RECEIVER BE A CRYSTAL MODEL IT IS NECESSARY THAT THE CRYSTAL BE USED IN AN EXTERNAL OSCILLATOR IN PLACE OF A SIGNAL GENERATOR SUCH AS THE ABOVE. THE OUTPUT OF THIS CRYSTAL CONTROLLED OSCILLATOR IS THEN FED TO THE GRID OF THE 6L7 TUBE AND THE ABOVE PROCEDURE FOLLOWED. WHEN THE IF AMPLIFIER HAS BEEN ALIGNED FROM THE CRYSTAL OSCILLATOR'S OUTPUT, RE-INSERTING THE CRYSTAL IN ITS SOCKET IN THE RECEIVER WILL SHOW LITTLE DIFFERENCE IN OUTPUT WHETHER THE CRYSTAL IS "IN" OR "OUT" OF THE CIRCUIT AS INDICATED BY THE CRYSTAL SWITCH.

R. F. ALIGNMENT PROCEDURE

ON BAND #1, OR BROADCAST, USE A .0002 MFD CONDENSER IN SERIES WITH THE OUTPUT LEAD FROM THE GENERATOR TO A1 ON THE RECEIVER. ON THE OTHER BANDS A 400 OHM RESISTOR SHOULD BE USED. BE SURE THE JUMPER FROM THE DOUBLET, OR A2 POST, TO GROUND REMAINS CONNECTED WHEN ALIGNING THE RECEIVER.
ALL PAD ADJUSTMENTS (LOCATED ON THE TOP OF THE CHASSIS) ARE FOR THE LOW FREQUENCY ENDS OF THE BANDS.
ALL TRIMMER ADJUSTMENTS (LOCATED ON THE BOTTOM OF THE CHASSIS) ARE FOR THE HIGH FREQUENCY ENDS OF THE BANDS.
REDUCE R.F. GAIN CONTROL BELOW THE POINT OF BLOCKING OR OVERLOADING; ALSO BE SURE THAT THE CRYSTAL SWITCH IS IN THE "OUT" POSITION AND THE AVC SWITCH IS IN THE "OFF" POSITION.
BE SURE TO CHECK IMAGES - IMAGES WILL FALL A LITTLE LESS THAN 1 MC LOWER IN FREQUENCY ON BANDS 1 TO 4 INCLUSIVE. ON BAND 5 THE IMAGE WILL FALL ABOUT 1 MC HIGHER IN FREQUENCY THAN THE FUNDAMENTAL.
REJECTOR ADJUSTMENT - ON BANDS 1, 2 AND 3 THE REJECTOR CIRCUIT SHOULD BE LEFT AT 34 MC. ON BANDS 4 AND 5 THE REJECTOR IS IN THE CIRCUIT. CARE SHOULD BE EXERCISED TO SEE THAT THE REJECTOR CIRCUIT IS NOT ADJUSTED SO THAT IT WILL REJECT THE SIGNAL FREQUENCY. IF THIS OCCURS VERY LOW SENSITIVITY WILL RESULT WHICH CAN BE CURED BY DETUNING THE REJECTOR ABOUT 1 MC.
WHEN ALIGNING THE R.F. END OF THE RECEIVER THE TUNING GANG SHOULD BE ROCKED BACK AND FORTH ACROSS THE SIGNAL SO THAT YOU ARE SURE YOUR ADJUSTMENTS ARE SUCH THAT YOU HAVE OBTAINED MAXIMUM GAIN AND ACCURATE TRACKING.

NOTE #1 HARMONICS OF SUITABLE FREQUENCIES MAY BE USED IF THE FOLLOWING FREQUENCIES SUGGESTED ARE NOT AVAILABLE.

NOTE #2 IT IS NECESSARY TO REPEAT EACH PAIR OF OPERATIONS SEVERAL TIMES UNTIL NO CHANGE IS NOTED.

MODELS S-18, SX-18
Sky Challenger II

THE HALLICRAFTERS INC.

Opr.	Band	Receiver Dial Setting	Signal Generator Frequency	Adjust Osc. with	Trimmers R. F. & mixer with	Adjust Osc. pad with	Set Rejector dial at
1	1	600Kc	600Kc	------	--------	C38	-------
2	1	1100Kc	1100Kc	CA	Cc - CB	------	-------
3	2	1300Kc	1300Kc	------	--------	C43	-------
4	2	2600Kc	2600Kc	CD	CF - CE	------	-------
5	3	3000Kc	3000Kc	------	--------	C42	-------
6	3	6000Kc	6000Kc	Cg	CI - CH	------	-------
7	4	7000Kc	7000Kc	------	--------	C41	9 Mc
8	4	14000Kc	14000Kc	CJ	CL - CK	------	14Mc
9	5	17000Kc	17000Kc	------	--------	C40	24Mc
10	5	34000Kc	34000Kc	CM	Co - CN	------	34Mc

IT IS HELPFUL TO REMEMBER THAT THE CARTRIDGE TYPE AIR TRIMMING CONDENSERS WILL SHOW AN INCREASE OF CAPACITY WHEN THE SCREW IS ROTATED COUNTER-CLOCKWISE.

WHEN MAKING ADJUSTMENTS ON THIS RECEIVER IT IS SUGGESTED THAT GAIN BE CONTROLLED BY USING THE R.F. GAIN CONTROL ONLY. LEAVE THE A.F. GAIN CONTROL ON FULL AT ALL TIMES.

TO MAKE A RAPID CHECK OF THE RECEIVER REMOVE THE GRID CAP OF THE 6Q7 TUBE AND TOUCH THE GRID OF THE TUBE WITH YOUR FINGER. IF A LOUD HUM IS HEARD THE AUDIO END OF THE RECEIVER IS OK.

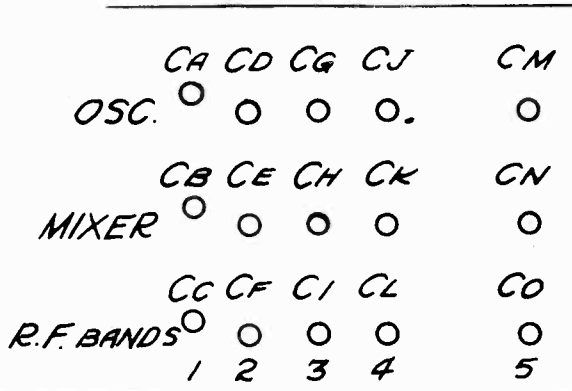
DEAD SET. CHECK BIAS ON THE R. F. TUBES. IF THIS BIAS IS TOO HIGH CHECK THE R.F. GAIN CONTROL FOR AN OPEN CIRCUIT. ADDITIONALLY, CHECK THE PLATE AND SCREEN VOLTAGE OF THE R.F. TUBES - (SEE CHART). CHECK B PLUS FOR A SHORT TO GROUND - IF SO CHECK ALL TUBES.

IF THE TUNING GANG IS NOISY WHEN THE SET IS JARRED, INCREASE THE TENSION ON THE GANG WIPERS.

NOISY COIL ASSEMBLY - CHECK SWITCH CONTACTS. ALSO CHECK THE TRIMMERS ON THE PARTICULAR BAND IN WHICH NOISE OCCURS. IT IS POSSIBLE THAT THE TRIMMER HAS DEVELOPED A PARTIAL SHORT.

IF LOW SIGNAL AND HIGH NOISE LEVEL DEVELOPS, REPLACE THE 6L7 TUBE.

DEAD BEAT OSCILLATOR - IF THE 6J7 SHOULD SHORT TO GROUND THE BEAT OSCILLATOR WILL BE DEFECTIVE. CHECK B PLUS TO BO COIL FOR A GROUND. IN MOST CASES A NEW 6J7 WILL CORRECT A DEAD BO.



BOTTOM VIEW SHOWING ADJUSTMENT SCREWS

SPEAKER - HEADPHONES ETC.

ON THE LOWER RIGHT HAND CORNER OF THE BACK OF THE CHASSIS YOU WILL FIND A TERMINAL STRIP MARKED 5000 OHMS. TO THIS STRIP SHOULD BE CONNECTED THE HALLICRAFTERS PERMANENT MAGNET DYNAMIC SPEAKER. THE TERMINAL STRIP DIRECTLY ABOVE THE 5000 OHM STRIP AND MARKED 500 OHMS CAN BE CONNECTED TO A LOAD OF THAT IMPEDANCE VALUE. THE OTHER TERMINAL STRIP TO THE RIGHT OF THESE TWO, AND MARKED "EXT SW", IS USED TO MAKE THE RECEIVER TEMPORARILY INOPERATIVE FOR STAND-BY DURING TRANSMISSION PERIODS. THESE TWO TERMINALS SHOULD BE CONNECTED TO ANEXTERNAL SWITCH WITHER IN CONJUNCTION WITH THE POWER SWITCH ON YOUR TRANSMITTER OR A MANUALLY OPERATED SWITCH AT YOUR OPERATING POSITION. WHEN USING AN EXTERNAL SWITCH THE SEND RECEIVE SWITCH ON THE RECEIVER SHOULD BE IN THE SEND POSITION.

IN THIS RECEIVER THE SPEAKER IS NOT A PORTION OF THE FILTER SYSTEM. THIS ALLOWS THE RECEIVER TO BE OPERATED INDEPENDENTLY OF THE SPEAKER. FOR MOST SATISFACTORY RESULTS AN 8 INCH HALLICRAFTERS SPEAKER SHOULD BE USED WITH THE SKY CHALLENGER II .

THE HEADPHONE JACK IS CONNECTED TO THE PLATE OF THE 6Q7 TUBE THROUGH A CONDENSER. THE POSSIBILITY OF SHOCK TO THE OPERATOR IS ELIMINATED BY HAVING NO DIRECT CURRENT FLOWING THROUGH THE HEADPHONES. CRYSTAL TYPE HEADPHONES CAN BE USED WITH THIS RECEIVER WITHOUT USING A SPECIAL COUPLING TRANSFORMER.

CRYSTAL OPERATION

TO PROPERLY ADJUST THE CRYSTAL CIRCUIT FOR BEST PERFORMANCE THE FOLLOWING PROCEDURE SHOULD BE CAREFULLY FOLLOWED:

TUNE IN SOME STATION TRANSMITTING CONTINUOUSLY. BE VERY CAREFUL TO GET THE SIGNAL RIGHT ON THE NOSE. AFTER YOU ARE SURE THAT YOU HAVE THE SIGNAL RESONATED PERFECTLY, SNAP THE "BFO" SWITCH TO THE "ON" POSITION. YOU SHOULD HEAR A WHISTLE, OR BEAT NOTE. AFTER THE BFO IS ON ROTATION OF THE "PITCH CONTROL" WILL CHANGE THE TONE OF THE BEAT NOTE. PROPER OPERATION OF THIS CONTROL WILL BE INDICATED BY HEARING THE SIGNAL TWICE IN ONE COMPLETE ROTATION OF THE KNOB; THERE BEING TWO POSITIONS AT WHICH NO SIGNAL, OR WHISTLE, WILL BE HEARD. THESE TWO POSITIONS ARE KNOWN AS THE "ZERO BEAT" POSITIONS.

NOW SNAP THE "CRYSTAL SWITCH" TO THE "ON" POSITION. YOU WILL NOTICE A GREAT REDUCTION IN NOISE. CAREFULLY RETUNE THE SIGNAL ON THE BAND SPREAD DIAL. NOTICE HOW SHARPLY THE SIGNAL PEAKS. NOW TUNE THROUGH THE SIGNAL AND FIND WHICH SIDE OF THE SIGNAL IS THE WEAKER. TUNE IN THE WEAKER SIDE AND THEN CAREFULLY ADJUST THE "CRYSTAL PHASING" CONTROL UNTIL THE SIGNAL IS INAUDIBLE. GOING BACK TO THE OTHER SIDE OF THE SIGNAL SHOULD FIND NO CHANGE IN ITS VOLUME, AND KNIFE-LIKE SELECTIVITY RESULTING. USE WHICHEVER SIDE OF ZERO-BEAT ADJUSTMENT OF THE PITCH CONTROL, IN CONJUNCTION WITH CRITICAL ADJUSTMENT OF THE PHASING CONTROL GIVES THE GREATER REJECTION OF THE INTERFERING SIGNAL.

THE PHASING CONTROL AFFECTS THE SENSITIVITY AND SELECTIVITY OF THE RECEIVER WHETHER THE CRYSTAL IS IN THE CIRCUIT OR NOT. THE CRYSTAL MAY BE USED WHEN RECEIVING TELEPHONE SIGNALS WITH SOME SACRIFICE IN THEIR QUALITY DUE TO THE EXTREME SELECTIVITY DEVELOPED.

THE IMAGE REJECTOR

THE REJECTOR CIRCUIT INCORPORATED IN THE SKY CHALLENGER II REPRESENTS A NOTEWORTHY CONTRIBUTION BY THE HALLICRAFTERS TO IMAGE-FREE HIGH-FREQUENCY RECEPTION. IT HAS LONG BEEN APPRECIATED THAT ADDITIONAL STAGES OF RADIO FREQUENCY AMPLIFICATION WAS NOT THE CORRECT ANSWER TO IMAGE SUPPRESSION. THROUGH THE USE OF THE "INFINITE IMAGE REJECTOR" IN THE SKY CHALLENGER II ALL PREVIOUS IMAGE RATIOS ARE OUT-MODED. IMAGE REJECTION OF INFINITY/1 IS NOW POSSIBLE.

THE REJECTOR IS UNIQUE. BECAUSE OF THAT YOUR ATTENTION IS CLOSELY DRAWN TO THE PROPER OPERATION OF THE CONTROL AS WELL AS WHAT TO EXPECT FROM ITS USE.

THE REJECTOR IS SWITCHED INTO THE CIRCUIT ONLY WHEN THE RECEIVER IS OPERATED ON BANDS #4 AND #5. YOU WILL NOTICE A LIGHT APPEAR BEHIND THE PARTICULAR CALIBRATED SCALE THAT SHOULD BE USED.

LET US OPERATE THE RECEIVER ON THE 14 MC, OR 20 METER AMATEUR BAND. IN TUNING ACROSS THE BAND YOU RUN ACROSS THE IMAGE OF SOME COMMERCIAL STATION, THE FUNDAMENTAL OF THIS STATION AS WE ALL KNOW IS REMOVED FROM THE 20 METER BAND BY DOUBLE THE FREQUENCY TO WHICH THE I. F. AMPLIFIER OF THE RECEIVER IS TUNED. NOW ADJUST THE REJECTOR CONTROL CAREFULLY IN THE VICINITY OF 14 MC ON THE CALIBRATED REJECTOR DIAL. WHEN PROPERLY ADJUSTED THE IMAGE WILL BE COMPLETELY ELIMINATED WITHOUT SERIOUSLY AFFECTING THE SENSITIVITY OF THE RECEIVER ON THE FREQUENCY TO WHICH IT HAD BEEN TUNED.

SHOULD YOU BE LISTENING AT A FREQUENCY NOT BEING BOTHERED WITH IMAGES, AND YOU DO NOT WISH TO USE THE REJECTOR LEAVE THE CONTROL AS FOLLOWS FOR THE TWO AMATEUR BANDS COVERED BY THE REJECTOR CIRCUIT.

20 METERS - LEAVE THE REJECTOR AT APPROXIMATELY 15 MC. (ON THIS BAND THE
14 MC HIGH FREQUENCY OSCILLATOR IS ON THE HIGH-FREQUENCY SIDE).
NOTE: THE 7 MC OR 40 METER BAND IS ALSO ON BAND #4 OF THE RECEIVER. WHEN RECEIVING ON 40 METERS THE REJECTOR CONTROL SHOULD BE LEFT 9 MC. USE OF THE REJECTOR CIRCUIT ON THIS BAND IS NOT NECESSARY.

10 METERS - LEAVE THE REJECTOR AT APPROXIMATELY 27 MC. (THE OSCILLATOR
28 MC IS ON THE LOW FREQUENCY SIDE ON THIS BAND).

CAUTION: SHOULD YOU NOT BE ABLE TO GET SIGNALS THROUGH AT ALL CHECK THESETTING OF THE REJECTOR CONTROL. IT IS POSSIBLE THAT YOU HAVE THE REJECTOR CONTROL AT A POINT WHERE THE FREQUENCY TO WHICH YOU WISH TO LISTEN IS BEING REJECTED, OR "BEING DROPPED IN THE SLOT".

ALWAYS REMEMBER TO KEEP THE REJECTOR CONTROL SET AT APPROXIMATELY THE SAME FREQUENCY AS THAT TO WHICH YOU ARE LISTENING. WHEN YOU MOVE THE MAIN TUNING CONTROL FOLLOW UP WITH THE REJECTOR OR OTHERWISE YOU WILL RUN INTO THE POSSIBILITY OF LEAVING YOUR MAIN TUNING DIAL AT A GROUP OF FREQUENCIES BEING REJECTED.

THE TOTAL POWER CONSUMPTION OF THE SKY CHALLENGER II IS 75 WATTS AT 115 VOLTS 60 CYCLE ALTERNATING CURRENT.

OPERATING INSTRUCTIONS - SKY CHALLENGER II MODELS S-18, SX-18

THE SKY CHALLENGER II IS A 5 BAND 9 TUBE SUPERHETERODYNE RECEIVER COVERING THE FOLLOWING FREQUENCIES:

BANDS	COVERAGE							
1	545	TO	1230	KC	(550	TO	243	METERS)
2	1.18	TO	2.85	MC	(254	TO	105	METERS)
3	2.75	TO	6.82	MC	(109	TO	44	METERS)
4	6.75	TO	16.40	MC	(45	TO	18.3	METERS)
5	15.40	TO	38.10	MC	(19.5	TO	7.85	METERS)

SEPARATE COILS ARE USED TO COVER EACH BAND. INDUCTIVE COUPLING TO THE ANTENNA PERMITS THE MAXIMUM TRANSFER OF SIGNAL ENERGY FROM EACH SEPARATE PRIMARY TO THE PARTICULAR SECONDARY SOIL IN THE CIRCUIT. THE UNUSED SOILS ARE SHORTED.

THE MAIN DIAL IS CALIBRATED IN KILOCYCLES ON BAND #1 AND IN MEGACYCLES ON THE REMAINING FOUR BANDS. THE CALIBRATION OF THE MAIN DIAL WILL HOLD ACCURACY ONLY WHEN THE BAND-SPREAD DIAL IS SET AT "0", WHICH IS THE POSITION OF MINIMUM CAPACITY OF THE BAND-SPREAD SECTION.

ANTENNA

IN THE BACK OF THE CHASSIS WILL BE FOUND THE ANTENNA, DOUBLET AND GROUND TERMINAL STRIP. WHEN A CONVENTIONAL ANTENNA IS USED IT SHOULD BE CONNECTED TO A1. WHEN USING THIS TYPE OF ANTENNA BE SURE THE JUMPER REMAINS CONNECTED TO A2 AND G. IF A DOUBLET ANTENNA IS USED THE JUMPER SHOULD BE REMOVED AND THE TWO WIRES OF THE DOUBLET LEAD-IN CONNECTED TO A1 AND A2 RESPECTIVELY. PLEASE REMEMBER THAT THE NORMAL SHORT WAVE DOUBLET ANTENNA IS DESIGNED TO WORK BEST ON THE SHORT WAVE BROADCAST FREQUENCIES. IT WILL NOT PERFORM EQUALLY WELL ON THE AMATEUR BANDS, OR FREQUENCIES IN BETWEEN THE SHORT WAVE BROADCAST CHANNELS. ANTENNA LOCATION, LENGTH AND TYPE PLAY A MOST IMPORTANT PART IN THE SUCCESSFUL OPERATION OF THE RECEIVER. ON THE HIGHER FREQUENCIES COVERED BY THIS UNIT IT IS PARTICULARLY IMPORTANT TO USE THE PROPER TYPE OF ANTENNA. FOR MOST EFFICIENT ANTENNA SYSTEMS YOU ARE REFERRED TO THE ANTENNA DESIGN SECTION OF THE A.R.R.L. HANDBOOK, AS WELL AS CURRENT RADIO PERIODICALS. IT IS SUGGESTED THAT A LITTLE EXPERIMENTING BE DONE WITH ANTENNAE SO THAT YOU WILL EXPERIENCE THE MAXIMUM IN PERFORMANCE FROM YOUR RECEIVER.

OPERATION

PLUG THE CORD ON THE RECEIVER INTO THE POWER SOCKET. (UNLESS OTHERWISE SPECIFIED THE RECEIVER OPERATES ON 60 CYCLE 110-120 VOLT ALTERNATING CURRENT.) TURN THE CONTROL MARKED "TONE" TO THE RIGHT. THIS WILL TURN THE RECEIVER ON. DURING THE TIME THE RECEIVER IS WARMING UP ALSO TURN THE "R.F. GAIN" AND "A.F.GAIN" KNOBS TO THE RIGHT. THE RECEIVER IS SHIPPED WITH THE BAND CHANGE SWITCH IN THEHIGHEST FREQUENCY POSITION. ADJUST THE "BANDS" SWITCH UNTIL THE POINTER ON THE KNOB INDICATES THAT YOU HAVE THE BAND YOU WISH TO TUNE IN THE CIRCUIT. WHEN LISTENING FOR DISTANT OR POSSIBLY WEAK STATIONS, IT IS RECOMMENDED THAT THE CONTROL MARKED "BFO" BE USED BY SNAPPING THE SWITCH TO THE "ON" POSITION. ONCE THE TELEPHONE SIGNALS HAVE BEEN LOCATED THE BFO SHOULD BE TURNED OFF OR A CONTINUOUS WHISTLE WILL RESULT. WHEN LISTENING FOR OR TO CW CODE TRANSMISSIONS THE BFO MUST BE LEFT ON. THE "PITCH CONTROL" WILL PROVE MOST HELPFUL IN CHANGING THE BEAT NOTE TO ONE MOST PLEASING TO THE OPERATOR. IT IS ADVISABLE TO HAVE THE "AVC" SWITCH IN THE OFF POSITION WHENEVER THE BFO SWITCH IS ON.

THE TUBE LINE-UP

6K7 PRE-SELECTOR, R.F. AMPLIFIER

6L7 1ST DETECTOR-MIXER

6J5 SIGNAL FREQUENCY OSCILLATOR

6K7 1ST I. F. AMPLIFIER

6K7 2ND I. F. AMPLIFIER

6Q7 2ND DETECTOR, AVC, 1ST STAGE OF AUDIO

6F6 2ND AUDIO STAGE

6J7 BEAT FREQUENCY OSCILLATOR

80 FULL WAVE RECTIFIER

THE 6K7 R. F. STAGE GIVES MAXIMUM GAIN IN INVERSE RELATION TO FREQUENCY AND PROVIDES INCREASED SELECTIVITY.

THE FIRST DETECTOR-MIXER IS A 6L7. THE OUTPUT OF THE 6J5 SIGNAL FREQUENCY OSCILLATOR IS ELECTRON COUPLED TO THE INJECTOR, OR # 3 GRID, OF THE 6L7. BECAUSE NO OSCILLATOR PLATE CURRENT FLOWS IN THE 1ST DETECTOR THE RATIO OF SIGNAL TO NOISE IS MORE FAVORABLE THAN THAT OBTAINED IN A COMPOSITE TUBE, OR IN CIRCUITS WHERE THE CATHODES OF TWO TUBES ARE TIED TOGETHER.

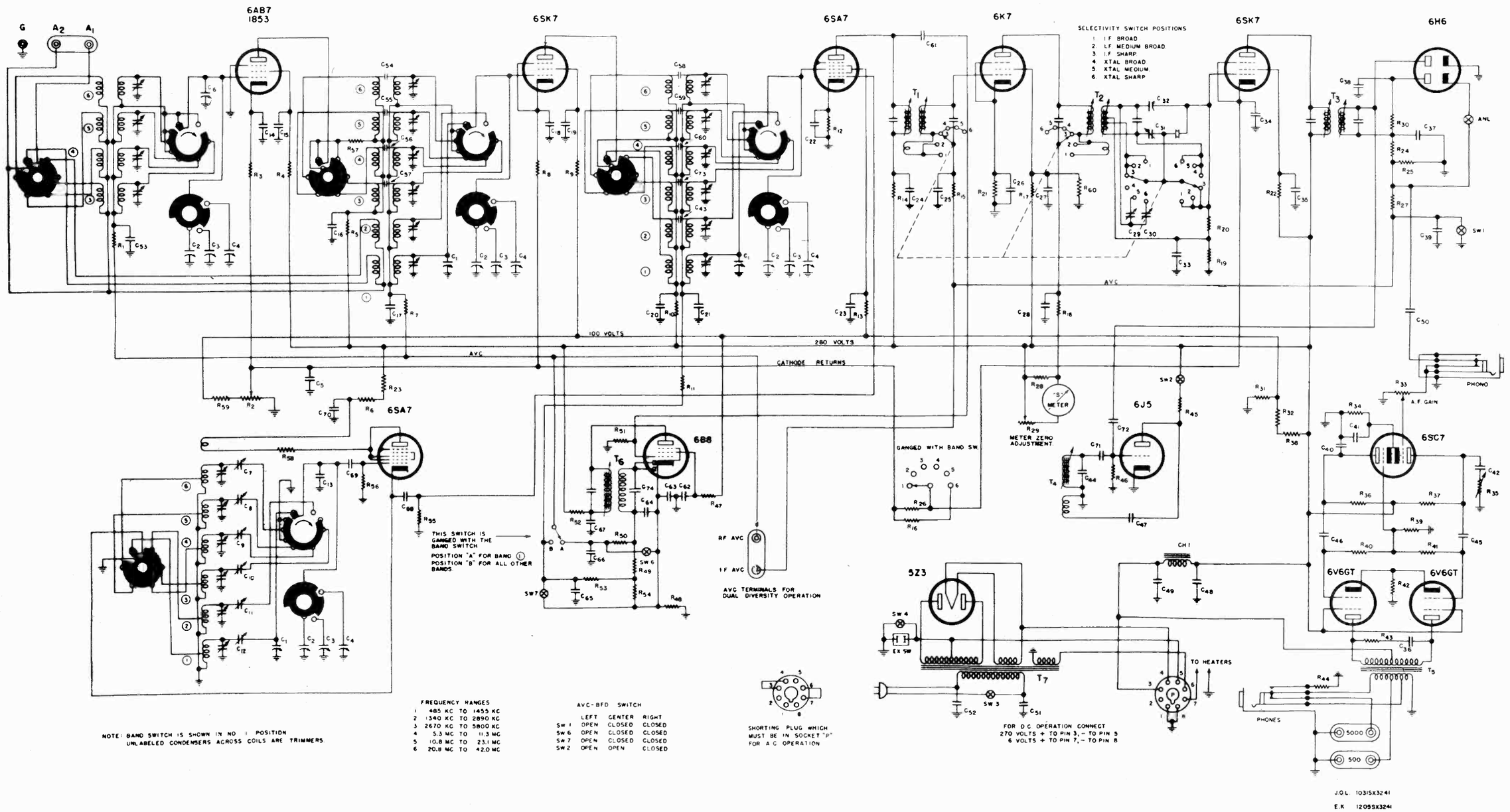
THE 6J5 OSCILLATOR HAS SEPARATE COILS FOR EACH BAND. SUPERIOR OVERALL PERFORMANCE OF THE SKY CHALLENGER II IS IN PART DUE TO THE DESIGN OF THE SIGNAL FREQUENCY OSCILLATOR. NO HARMONICS OF THE OSCILLATOR ARE USED ON ANY OF THE BANDS COVERED BY THIS RECEIVER.

THE TWO 6K7 I. F. AMPLIFIER STAGES USE IRON-CORE TRANSFORMERS WHICH RESONATE AT 465 KC. THIS TYPE OF TRANSFORMER HAS SO DEFINITELY SHOWN ITS SUPERIORITY OVER THE AIR CORE TYPE AS TO WARRANT ITS USE IN THE SKY CHALLENGER II. TREMENDOUS GAIN, AND A BETTER SIGNAL TO NOISE RATIO ARE BUT TWO OF THE MANY ADVANTAGES OF THE IRON-CORE SYSTEM.

THE 6J7 BEAT OSCILLATOR OUTPUT IS COUPLED TO THE DIODE PLATES OF THE 6Q7 SECOND DETECTOR. THE 6J7 OSCILLATOR IS ELECTRON COUPLED.

THE 6F6 AUDIO OUTPUT STAGE IS CAPABLE OF DELIVERING 3.5 WATTS OF AUDIO.

THE HALLICRAFTERS INC.



MODEL SX-32, Sky Rider

THE HALLICRAFTERS INC.
MODEL SX-32 SKYRIDER CONDENSERS

No.	Value	Voltage or Purpose	Type
C 1	Band No. 1	tuning condenser	....
C 2	Main	tuning condenser	....
C 3	3 plate	band spread cond.	....
C 4	5 plate	band spread cond.	....
C 5	.25 mfd	200	tubular
C 6	50 mmf	condenser	Variable Air
C 7	1550 mmf	Band No. 6 pad	mica
C 8	3160 mmf	Band No. 5 pad	mica
C 9	2830 mmf	Band No. 4 pad	mica
C10	1430 mmf	Band No. 3 pad	mica
C11	790 mmf	Band No. 2 pad	mica
C12	380 mmf	Band No. 1 pad	mica
C13	temperature	Compensated condenser	....
C14	.02 mfd	400	tubular
C15	.02 mfd	400	tubular
C16	.02 mfd	400	tubular
C17	.05 mfd	200	tubular
C18	.02 mfd	400	tubular
C19	.02 mfd	400	tubular
C20	.02 mfd	400	tubular
C21	.05 mfd	200	tubular
C22	.02 mfd	400	tubular
C23	.02 mfd	400	tubular
C24	.02 mfd	400	tubular
C25	2000 mmf	....	mica
C26	.02 mfd	400	tubular
C27	.02 mfd	400	tubular
C28	.02 mfd	400	tubular
C29	20 mmf	trimming condenser	....
C30	20 mmf	trimming condenser	....
C31	20 mmf	trimming condenser	....
C32	20 mmf	crystal phasing	air
C33	.02 mfd	400	tubular
C34	.02 mfd	400	tubular
C35	.05 mfd	200	tubular
C36	2000 mmf	....	mica
C37	50 mmf	....	mica
C38	.05 mfd	200	tubular
C39	.01 mfd	400	tubular
C40	500 mmf	....	mica
C41	30 mfd	25	electrolytic
C42	.02 mfd	400	tubular
C43	2 mmf	....	twisted leads
C44	500 mmf	10%	mica
C45	.05 mfd	400	tubular
C46	.05 mfd	400	tubular
C47	2000 mmf	....	mica
C48	30 mfd	450	electrolytic
C49	30 mfd	450	electrolytic
C50	.02 mfd	400	tubular
C51	.01 mfd	600	tubular
C52	.01 mfd	600	tubular
C53	.05 mfd	200	tubular
C54	10 mmf	....	ceramic
C55	5 mmf	....	ceramic
C56	5 mmf	....	ceramic
C57	2 mmf	twisted leads	....
C58	10 mmf	....	ceramic
C59	5 mmf	....	ceramic
C60	2 mmf	twisted leads	....
C61	250 mmf	....	mica IN-T1
C62	.02 mfd	400	tubular
C63	.05 mfd	200	tubular
C64	100 mmf	....	mica
C65	.02 mfd	400	tubular
C66	.05 mfd	200	tubular
C67	.02 mfd	400	tubular
C68	50 mmf	....	mica
C69	50 mmf	....	mica
C70	2000 mmf	....	mica
C71	100 mmf	....	mica
C72	2 mmf	twisted leads	....
C73	2 mmf	twisted leads	....
C74	25 mmf	....	mica

MODEL SX-32 SKYRIDER RESISTORS

No.	Value in Ohms	Wattage or Purpose
R 1	100,000	1/3
R 2	10,000	RF Gain
R 3	300	1/3
R 4	25,000	1/2
R 5	1,000	1/3
R 6	7,000	2
R 7	100,000	1/3
R 8	300	1/3
R 9	1,000	1/3
R10	3,000	1/3
R11	100,000	1/3
R12	400	1/3
R13	1,000	1/3
R14	3,000	1/3
R15	100,000	1/3
R16	3,000	1/3
R17	30,000	—1 watt
R18	3,000	1/3
R19	100,000	1/3
R20	500,000	1/3
R21	250	1/3
R22	60,000	1/2
R23	5,000	1/2
R24	100,000	1/3
R25	250,000	1/3
R26	5,000	1/3
R27	2. meg	1/3
R28	100	1/3
R29	500	S Meter Control
R30	1. meg	1/3
R31	11,000	Candohm 1-1/2 Watts
R32	4,000	Candohm 7 Watts
R33	500,000	Audio Gain
R34	1,000	1/3
R35	500,000	Tone Control
R36	100,000	1/3
R37	100,000	1/3
R38	2,500	2
R39	200,000	1/3
R40	250,000	1/3
R41	250,000	1/3
R42	200	2 10%
R43	20,000	1
R44	5,000	10
R45	20,000	1
R46	50,000	1/3
R47	1,000	1/3
R48	200	1/3
R49	250,000	1/3
R50	500,000	1/3
R51	500,000	1/3 Inside of T1
R52	3,000	1/3
R53	500,000	1/3
R54	50,000	1/3
R55	50,000	1/3
R56	50,000	1/3
R57	500	1/3
R58	8	1/3
R59	15,000	1/2
R60	50,000	1/3

MODEL SX-32, Sky Rider

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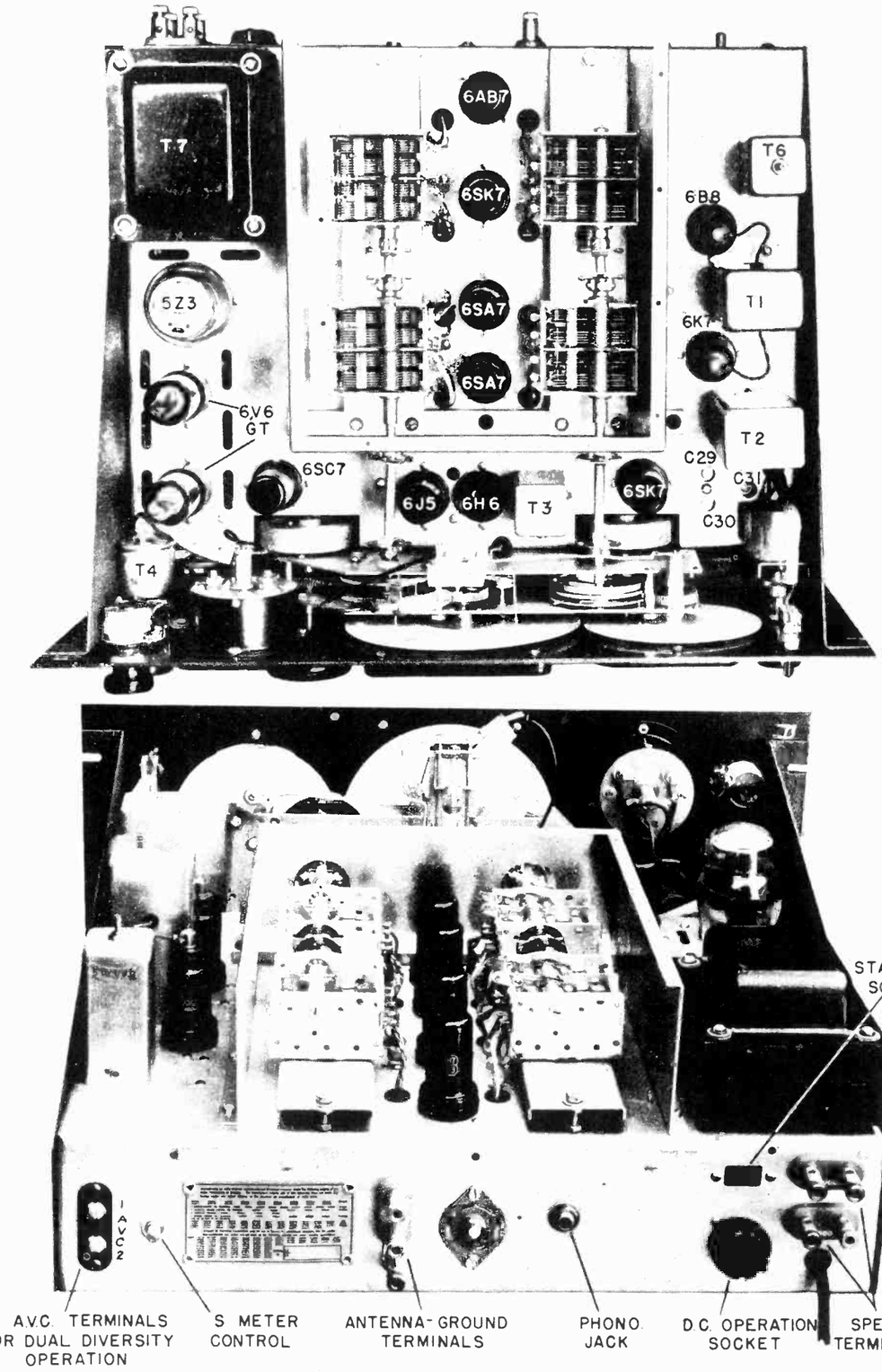

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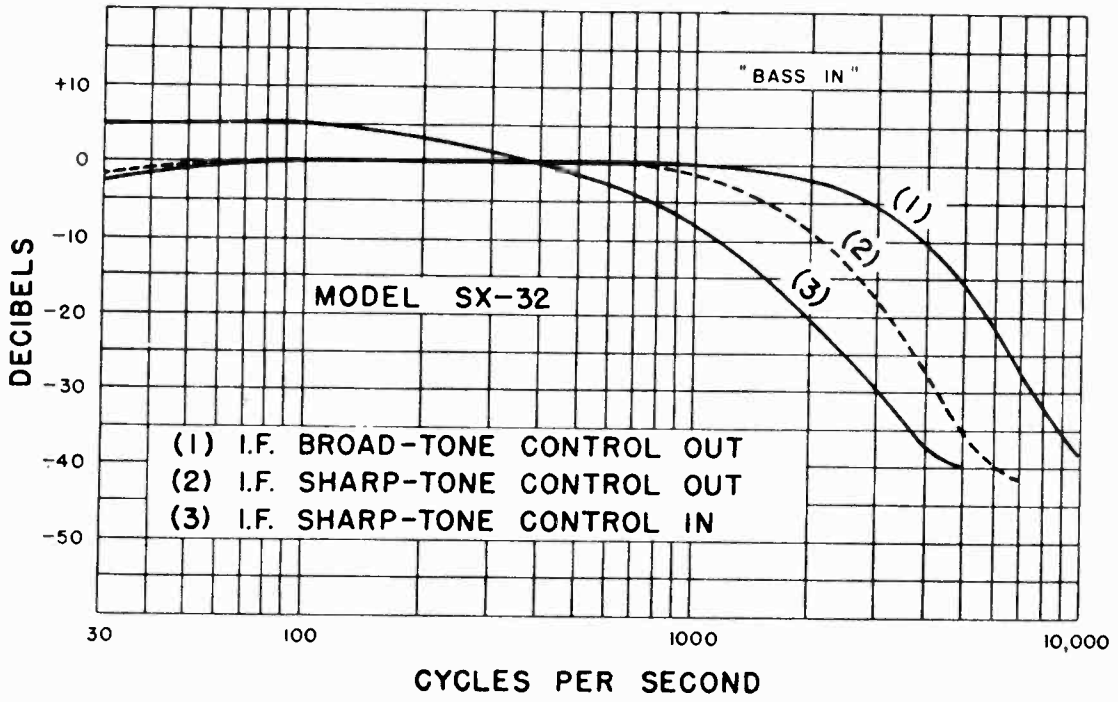
AUDIO FIDELITY CURVE



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

TUBE	FUNCTION	SOCKET TERMINALS								
		1	2	3	4	5	6	7	8	Cap.
6AB7	RF Amp. (1)	...	...	...	...	4.5	180	6.3	245	.....
6SK7	RF Amp. (2)	...	...	4.35	0.1	4.35	120	6.3	230	.....
6SA7	Mixer	...	...	250	100	...	3.7	6.3	...	.....
6SA7	HF Osc.	...	...	120	120	0.3	...	6.3	120	.....
6K7	IF Amp. (1)	...	...	280	120	...	...	6.3	4	—.075
6SK7	IF Amp. 2	...	...	4	...	4	120	6.3	280	.....
6B8	AVC Amp.	...	...	230	0.2	0.2	120	6.3	2	.....
6H6	ANL and DET.	...	...	...	...	...	...	6.3	...	.....
6J5	Beat Osc.	...	...	130	...	—7	...	6.3	...	BFO ON ONLY FOR TEST
6SC7	1st Audio Amp.	...	140	...	...	137	1.4	6.3	...	.....
6V6GT	P.P. Audio Amp.	...	...	290	265	...	...	6.3	17	.....
6V6GT	P.P. Audio Amp.	...	...	290	265	...	...	6.3	17	.....
5Z3	Rectifier	320	340 AC	340 AC	320	...	...	...	...	.....

THE 1942 MODEL SX-32 SKYRIDER RECEIVER

INSTRUCTIONS FOR INSTALLATION, OPERATION AND SERVICE

INSTALLATION

It is recommended that, upon receipt, the carton and then the receiver be carefully examined for any damage which might have occurred in transit. Should any sign of damage be apparent immediately file claim with the carrier stating the extent of the damage.

Important: Unless otherwise marked, this receiver is to be operated from 110-125 volts of 50/60 cycle alternating current. A universal 110-220 volt model is obtainable on order. This model can be operated at either of those two voltages with 25/60 cycle current. If the voltages are higher than indicated an external stepdown transformer must be used. A switch, mounted on the top of the universal transformer case, will allow convenient 110-220 voltage change.

The standard model SX-32 receiver comes equipped with a cabinet for table mounting. The standard 8¾" x 19" panel dimension with holes suitably spaced make it possible for the chassis to be mounted in a standard relay rack. Maximum overall chassis length is 17⅜" and depth 13½". When the model SX-32 is so mounted the table cabinet is replaced with a dust cover. The maximum over-all length of the receiver will then allow it to be mounted in a rack with upright channel clearance of 17½"

TERMINALS AND CONNECTIONS ON REAR OF RECEIVER

SPEAKER

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

ANTENNA

To the terminals marked A1-A2 and G should be connected the antenna you have chosen to use with the model SX-32 receiver.

Very satisfactory results throughout the tuning range of the SX-32 will be obtained with a conventional inverted "L" Marconi type of antenna 75 to 100 feet long including lead-in. This antenna should be erected as high as possible and removed from surrounding objects. Be sure that the antenna is insulated from the ground at all points. When this type of antenna is used it is connected to terminal A-1. The Jumper between A-2 and G should remain connected.

In the event a doublet antenna is used with the model SX-32 SKYRIDER receiver, the two wires of the doublet lead-in should be connected to terminals A1 and A2. The Jumper between A2 and G can remain connected or removed, depending upon its effect on favorable reception.

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

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

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

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

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

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

STAND-BY SOCKET

The Send-Receive switch on the front panel makes the receiver inoperative by removing the plate voltage from the tubes when the switch is in the SEND position. Connected in parallel with this switch is the standard 110 volt receptacle on the rear chassis edge. Should you wish to make the receiver inoperative by using a remote relay or switch, connect the contacts of the relay to a standard plug, insert it in the STAND-BY switch socket and the external relay or switch will close and open the circuit so long as the SEND-RECEIVE switch on the front panel is in the SEND position.

PHONO-JACK

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

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

6 VOLT DC SOCKET

The DC Operation Socket can be used when it is necessary to furnish power to the receiver from a direct current source. For conventional AC operation, the shorting plug must remain in the DC Operation socket. This plug should be removed for battery or vibrapack operation. A similar plug to the shorting plug should be wired as shown on the Schematic diagram and connected to the external source of DC power. The DC operation plug is then inserted in the socket and operation from batteries or a vibrapack is secured.

270 volts of plate voltage, or B supply, at 150 milliamperes current are necessary for successful operation of the receiver, should it be operated in this manner.

"S" METER ZERO SET

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

The large calibrated main dial shows the frequencies covered throughout the 6 band, 500 K.C. to 42 m.c. frequency range of the reciever. They are as follows:

Band 1—	500	to	1400	kilocycles
Band 2—	1.4	to	2.7	megacycles
Band 3—	2.7	to	5.3	megacycles
Band 4—	5.3	to	11	megacycles
Band 5—	11	to	21	megacycles
Band 6—	21	to	42	megacycles

ALIGNMENT PROCEDURE MODEL SX-32 SKYRIDER

Equipment Needed for Aligning:

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

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

3—Non-metallic screw driver.

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

Setting of controls prior to alignment—IF and RF.

Tone control at maximum high frequency position (#9)—BFO at 0—AF Gain at #9—RF Gain at #9—Band switch—IF alignment position ..5 to 1.4 band. 1—RF alignment depending on band aligned.

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

Important: Have bandspread control so logging scale reads 100.

Antenna trimmer adjusted for Maximum gain at each RF alignment point on Bands 3-4-5-6.

Note: Antenna trimmer not in circuit on bands 1 and 2.

455 KC—IF Alignment: Tune main dial to 1400 kc on .5 to 1.4 m.c. band. Connect the hot lead from the signal generator to 6SA7 mixer terminal #8—Ground to chassis. Roughly adjust the aligning screws of T1, the lower screw of which is accessible through hole in right mounting bracket, for maximum gain. Now adjust lower screw on T2 (do not adjust upper screw). Also adjust C31 and the trimmer screws at the top of T3 for maximum gain.

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

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

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

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

Beat Frequency Oscillator Adjustment:—In the center of the "Pitch Control" shaft, after the knob has been removed, you will find a recessed screw for the adjustment of the Beat Frequency Oscillator. Before rotating this screw with a suitable screw driver, loosen the set screw on this shaft. This set screw can be reached with a spintite wrench from the top. With the signal generator connected to the 6SA7 mixer terminal #8 as above, the generator set to the frequency of the crystal, and the BFO switch on, adjust the screw in the center of the pitch control till zero beat is heard. Tighten the set screw and assemble the knob so that this zero beat position will occur in the center of the total angular rotation of the pitch control knob.

AVC Amplifier Adjustment:—Connect a high resistance voltmeter across resistors R-49 and R-54. With the signal generator tuned to the crystal frequency as above, adjust the trimming screw on top of T-6 till the voltmeter reads maximum.

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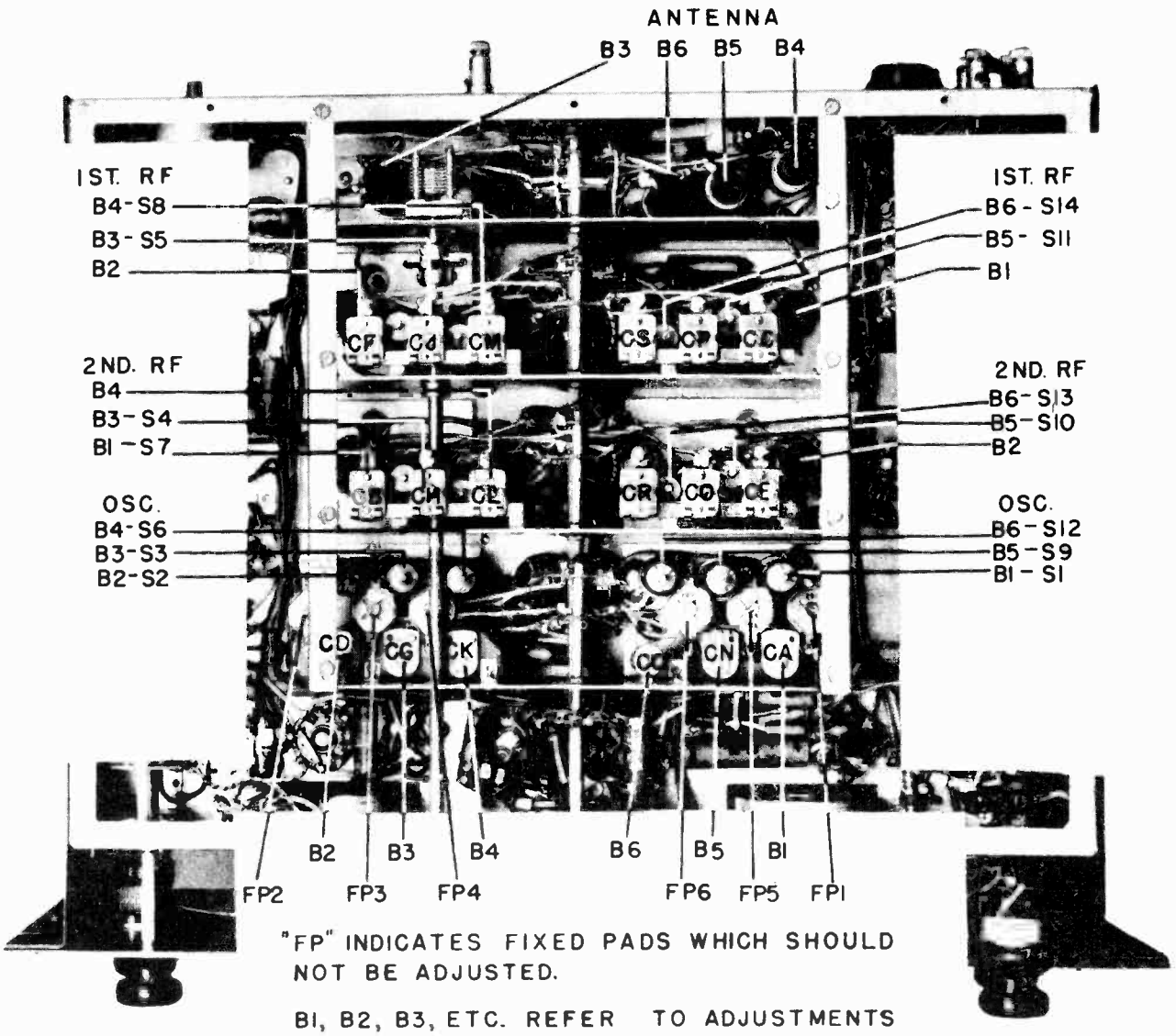
MODEL SX-32, Sky Rider



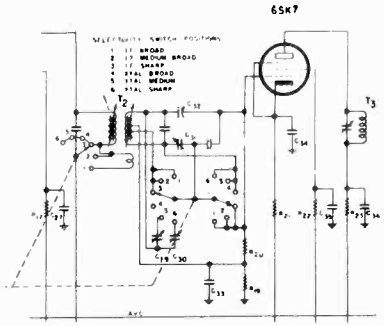
"FP" INDICATES FIXED PADS WHICH SHOULD NOT BE ADJUSTED.

B1, B2, B3, ETC. REFER TO ADJUSTMENTS ON BAND 1, BAND 2, BAND 3, ETC.

RF ALIGNMENT

Connect hot lead of signal generator to A_1—through dummy antenna shown in table. Leave jumper connected between A_2 and G. Ground of Generator to Chassis.

Band	Rec. Dial Setting	Sig. Gen. Freq.	Dummy Antenna	HIGH FREQUENCY END		LOW FREQUENCY END	
				Adjust Osc. With	Adjust Trimmers for Max. Gain	Adjust Osc. With	Permeability Tuned By
1	1.2 mc	1.2 mc	200 mmf	C_A	C_B C_C	....	.....
1	.6	.6	200 mmf	....	.....	S_1	.....
2	2.6	2.6	400 ohms	C_D	C_E C_F	....	.....
2	1.5	1.5	400 ohms	....	.....	S_2	.....
3	5	5	400 ohms	C_G	C_H C_J	....	.....
3	3.0	3	400 ohms	....	.....	S_3	S_4 S_5
4	10	10	400 ohms	C_K	C_L C_M	....	.....
4	5.6	5.6	400 ohms	....	.....	S_6	S_7 S_8
5	20	20	400 ohms	C_N	C_O C_P	....	.....
5	11	11	400 ohms	....	.....	S_9	S_{10} S_{11}
6	38	38	400 ohms	C_Q	C_R C_S	....	.....
6	22	22	400 ohms	....	.....	S_{12}	S_{13} S_{14}



CRYSTAL FILTER CIRCUIT

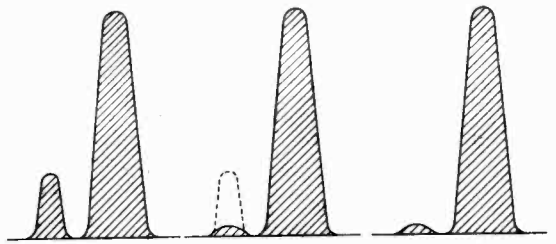
In positions 1, 2, 3 the crystal is short circuited. In position 4 the short across the crystal is opened and the iron core in the secondary of the transformer is adjusted for Broad Crystal Action and at this point is accurately tuned to the crystal frequency. Due to the close coupling of the secondary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

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

SINGLE SIGNAL ADJUSTMENT

It is extremely simple to attain single signal reception with the SX-32. First, turn on the BFO to the desired Beat Note and turn the selectivity switch to the XTAL SHARP position. Pick a good solid CW signal, preferably a commercial station because a commercial is likely to stay on long enough for you to complete the phasing adjustment for single signal reception.

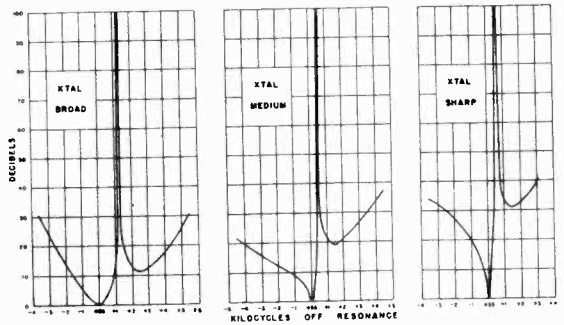
You will find on tuning across this signal that it has two amplitudes. Tune first to the weaker of these two amplitudes. Now, turn the PHASING control until this weaker of the two amplitudes is reduced to a minimum. (If the weaker amplitude appears on the right the above procedure still holds.) Then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



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

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

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



CRYSTAL FILTER CURVES

NOTE: The CRYSTAL FILTER and holder are wired directly into the receiver and do not plug in as heretofore. In this manner exceptional crystal filter action is obtained because of the elimination of the capacity and losses of a socket. So mounting the crystal prevents possible change in polarity which would occur if the crystal were improperly inserted in the circuit. The size of the crystal has been carefully determined to allow the BROAD CRYSTAL position to tune as broadly as possible. The capacity of the crystal holder has been reduced to a minimum through the use of a specially designed polystyrene holder.

AVC ACTION

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

"S" OR SIGNAL INTENSITY METER

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

THE SECOND DETECTOR

As will be noted, a diode type of second detector is used in the Model SX-32. Its choice was prompted by the fact that such a detector is capable of handling large percentages of modulation with very little distortion. This is due to the output of the diode being easily filtered (IF Removed). In addition, the rectified output contains a DC component which can be used for AVC purposes.

THE BEAT FREQUENCY OSCILLATOR

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

Proper location of the Beat Oscillator tube and its associated components plus excellent shielding and mechanical rigidity do much to keep stray fields from being established. Little BFO leakage is to be expected in the Model SX-32 so "tweets" or BFO harmonics will not prove to be bothersome.

THE AUDIO AMPLIFIER

The second or output stage of the audio amplifier in the Model SX-32 receiver uses two 6V6GT tubes connected in push-pull. These tubes are driven by the 6SC7 double triode. One of the triode sections of the 6SC7 tube is used as the inverter to the 6V6GT tubes. A portion of the signal from the plate circuit of the first 6SC7 triode is fed to the grid of the other 6SC7 triode Section, thereby giving two output voltages in opposite phase suitable for exciting the push-pull 6V6GT output amplifier.

THE POWER SUPPLY

The power supply in the Model SX-32 is quite normal except that it supplies voltage for the 6V6GT output tubes directly from the rectifier or before the filter system. Voltage fluctuations in the receiver are greatly reduced—increasing the audio output of the receiver and stabilizing the operation of all circuits.

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

SPECIFICATIONS

Tubes:

1—6AB7	1st RF Amplifier
1—6SK7	2nd RF Amplifier
1—6SA7	Mixer
1—6SA7	HF Oscillator
1—6K7	1st IF Amplifier
1—6SK7	2nd IF Amplifier
1—6B8	AVC Amplifier
1—6H6	2nd Detector and A.N.L. Tube
1—6J5	Beat Oscillator
1—6SC7	1st Audio Amplifier
2—6V6GT	Push-Pull Output Amplifiers
1—5Z3	Rectifier

Power Consumption—at 117 volts—60 cycles—138 watts
Power Consumption—DC operation—18 amp. at 6 volts or 108 watts
Power Output—8 watts undistorted
Sensitivity—(for .05 watts output) Bands 1 to 5—2 MV and under; 6th band 4 MV

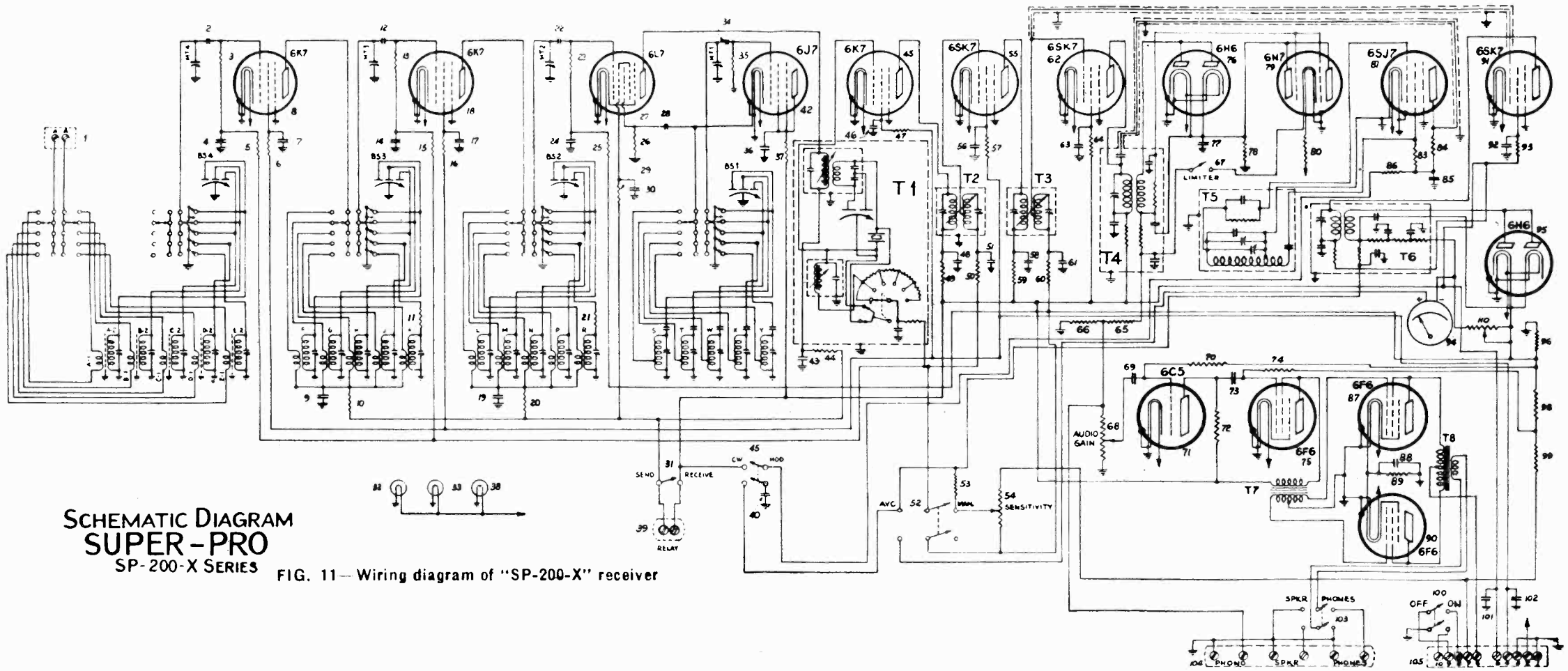
	2 x	1000 x
Selectivity—IF broad (high fidelity)	12 kc	36 kc
IF Sharp	4.1 kc	22 kc

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

500	to 1450	kilocycles
1.4	to 2.8	megacycles
2.7	to 5.4	megacycles
5.2	to 11	megacycles
10.5	to 22	megacycles
21	to 42	megacycles

Frequency response AF broad IF—tone control high-70 to 3000 cycles ± 2½ DB
Speaker Output Impedances—5000 and 500 ohms
Intermediate Frequency—455 kc
Table cabinet dimensions—20½" long x 10" high x 14¾" deep
Relay Rack dust cover dimensions—14¾" deep x 17⅜" long x 8¾" high
Panel dimensions—19" x 8¾"
Chassis dimensions—17⅜" x 13½"
Weight—(unpacked)—75 lbs.—packed 87 lbs.

HAMMARLUND MFG. CO., INC.



SCHEMATIC DIAGRAM
SUPER-PRO
SP-200-X SERIES

FIG. 11—Wiring diagram of "SP-200-X" receiver

FOR OTHER DATA SEE THAT OF MODEL SP-200X, Early, IN INDEX

"SUPER-PRO" MODEL SP-200-SX PARTS LIST
(This parts list should be used to identify parts shown in the illustrations)

Schematic Designation	*DESCRIPTION — RECEIVER PARTS*	*Part No.*
A1	Antenna Input Coil Assembly 10.0 to 20.0 m.c.	SA-46
A2	Antenna Output Coil Assembly 10.0 to 20.0 m.c.	SA-110
B1	Antenna Input Coil Assembly 5.0 to 10.0 m.c.	SA-47
B2	Antenna Output Coil Assembly 5.0 to 10.0 m.c.	SA-113
C1	Antenna Input Coil Assembly 20.0 to 40.0 m.c.	SA-46
C2	Antenna Output Coil Assembly 20.0 to 40.0 m.c.	SA-130
D1	Antenna Input Coil Assembly 2.5 to 5.0 m.c.	SA-48
D2	Antenna Output Coil Assembly 2.5 to 5.0 m.c.	SA-116
E1	Antenna Input Coil Assembly 1250 to 2500 k.c.	SA-49
E2	Antenna Output Coil Assembly 1250 to 2500 k.c.	SA-136
F	1st R.F. Coil Assembly 10.0 to 20.0 m.c.	SA-111
G	1st R.F. Coil Assembly 5.0 to 10.0 m.c.	SA-114
H	1st R.F. Coil Assembly 20.0 to 40.0 m.c.	SA-131
J	1st R.F. Coil Assembly 2.5 to 5.0 m.c.	SA-117
K	1st R.F. Coil Assembly 1250 to 1160 k.c.	SA-137
L	2nd R.F. Coil Assembly 10.0 to 20.0 m.c.	SA-111
M	2nd R.F. Coil Assembly 5.0 to 10.0 m.c.	SA-114
N	2nd R.F. Coil Assembly 20.0 to 40.0 m.c.	SA-131
P	2nd R.F. Coil Assembly 2.5 to 5.0 m.c.	SA-117
R	2nd R.F. Coil Assembly 1250 to 2500 k.c.	SA-137
S	High Frequency Osc. Coil Assembly 10.0 to 20.0 m.c.	SA-112
T	High Frequency Osc. Coil Assembly 5.0 to 10.0 m.c.	SA-115
W	High Frequency Osc. Coil Assembly 20.0 to 40.0 m.c.	SA-132
X	High Frequency Osc. Coil Assembly 2.5 to 5.0 m.c.	SA-118
Y	High Frequency Osc. Coil Assembly 1250 to 2500 k.c.	SA-138
T-1	Crystal filter assembly (465 kc.)	SA-178
T-2, T-3	1st and 2nd, I.F. Transformer Coil Assembly	SA-166
T-4	Detector plate coil assembly	SA-167
T-5	Beat oscillator coil assembly	SA-169
T-6	A.V.C. Plate coil assembly	SA-168
T-7	Push-Pull Input Transformer	4827
T-8	Push-Pull Output Transformer	4828
1	Antenna terminal strip	3842
2-12-22	Capacitor Fixed Mica type 600 mmf	6073
28	Capacitor Fixed Silver type 95 mmf.	6195
34	Capacitor Fixed Silver type 50 mmf.	6074
77	Capacitor Fixed Mica type 50 mmf.	6199
69	Capacitor Fixed Tubular type .02 mf. 500 V.	6176
4-14-24	Capacitor Fixed Tubular type .01 mf. 500 V.	6175
7-17-30-36-43-46-48-51-56-58-61-63-73-85-92	Capacitor Fixed Tubular type .05 mf. 500 V.	6174
40-101-102	Capacitor Fixed Tubular type .25 mf. 400 V.	3820
88	Capacitor Dry Electrolytic 40 mf. 150 V.	6171
80	Resistor 4 ohms wire wound 5 watt	4921
89	Resistor 750 ohms wire wound 10 watt	3836
11-21	Resistor 20 ohms wire wound ½ watt	3987
96	Resistor 300 ohms metallized ½ watt	6169
98	Resistor 1,700 ohms metallized ½ watt	4947
10-20-44-6-47-49-57-59-16	Resistor 2,000 ohms metallized ½ watt	6160
99	Resistor 3,000 ohms metallized 1 watt	3809
86	Resistor 5,000 ohms metallized ½ watt	4814
5-15-25-50-60	Resistor 10,000 ohms metallized ½ watt	6165
37	Resistor 12,000 ohms metallized 2 watt	4840
29	Resistor 25,000 ohms metallized 2 watt	3999
35-26	Resistor 25,000 ohms metallized ⅓ watt	4960
66-84	Resistor 50,000 ohms metallized ½ watt	6075
64-72-93	Resistor 50,000 ohms metallized 1 watt	6166
32-33	Dial lamps 6.3 volt .15 amp.	3920
38	Meter lamp 6.3 volt .15 amp. Bayonet type	6036
94	Tuning meter	4903
100	Off-on Switch	2983
52-103	AVC-MANUAL and SPEAKER-PHONES Switch	2990
41	CW-MOD Switch	4915
31	Send-Receive Switch	4917
67	Limiter switch	4916
54	Sensitivity control 50,000 ohm	4918
68	Audio Gain Control 250,000 ohm	4919
39	Relay terminal strip	4904
104	Phono-Speaker-Phones terminal strip	4905
105	Connecting terminal strip	3838
110	Meter adjusting potentiometer 1,000 W wire wound	4932
	POWER SUPPLY	
1	Power transformer 110 volts 60 cycle A.C.	4801
2	Filter choke	2981
3	A.C. input Cord and Plug	3900
4	Fuse Block for 2A. fuse	3859
5	Line Voltage Adjusting Strip	3858
6	Speaker Field Terminal Strip	3840
7	Connecting Terminal Strip	3838
8-9-10	Filter Condenser 16 mfd. electrolytic 450 volts	3832
11	Filter Condenser 8-8-8 mfd. electrolytic 450 volts	3834
12	Resistor 18,000 ohms (2 taps)	3997
13	Resistor 18,000 ohms (1 tap)	4946
14	Tube socket 80	4807
15	Tube socket 5Z3	3828
16	1 mf. paper filter condenser	4945
65	Resistor 75,000 ohms metallized ½ watt	4914
78	Resistor 250,000 ohms metallized ½ watt	4912
3-13-23	Resistor 250,000 ohms metallized ⅓ watt	4959
70-74-83	Resistor 500,000 ohms metallized ½ watt	6076
53	Resistor 2,000,000 ohms metallized ½ watt	4920

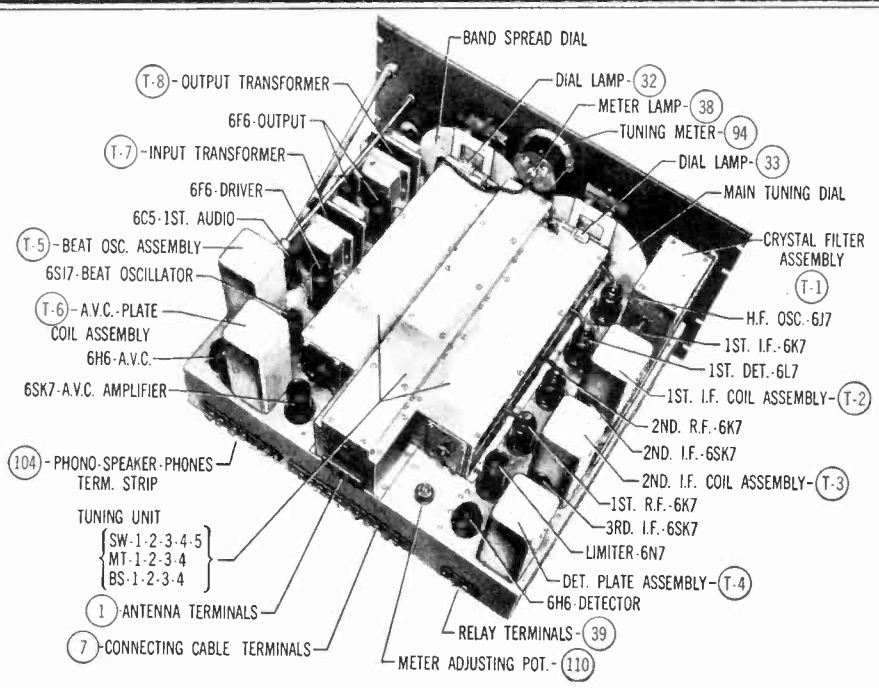


FIG. 7—Top view of "SP-200-X" receiver showing the general layout of parts. All important parts are labeled. Encircled numbers correspond to numbers appearing in the circuit diagram.

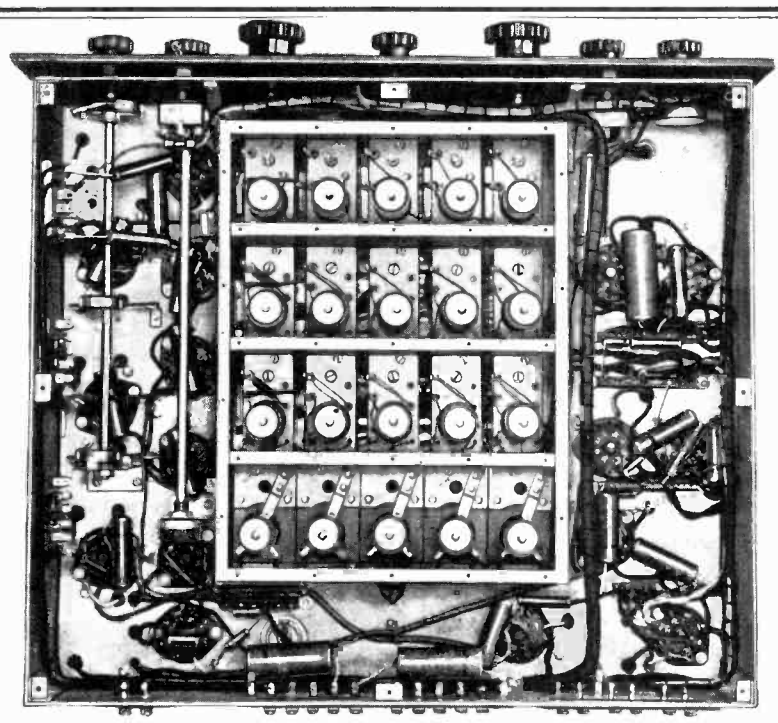


FIG. 9—Bottom view of the "SP-200-X" showing the coil assembly and general lay-out of parts.

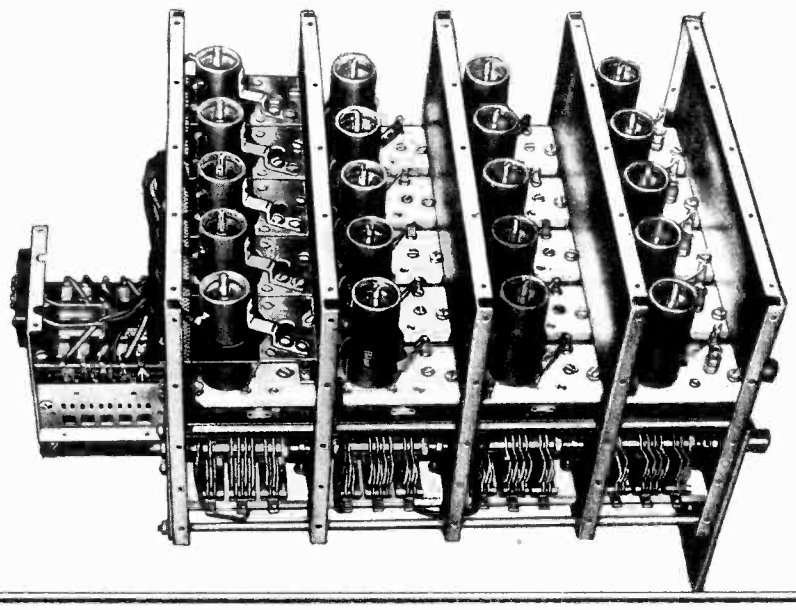
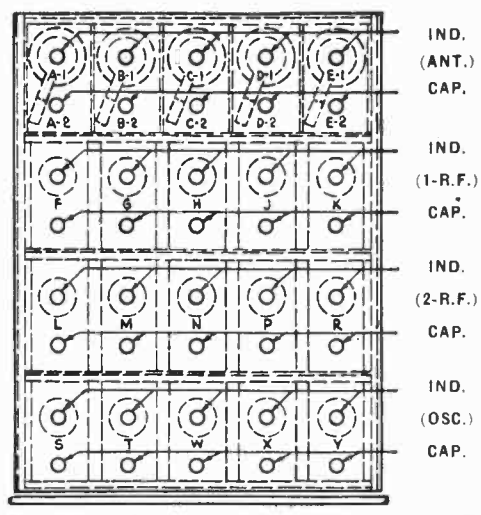


FIG. 10—Complete tuning unit used in all "Super-Pro" receivers. Includes all tuning condensers, coils, and band change switch. Each coil is mounted on an Isolantite base with its associated trimmer condenser.

H.F. OSCILLATOR AND R.F. ALIGNMENT

(FOR OTHER DATA SEE INDEX)



The "Super-Pro" is available to cover several frequency ranges. Such information as is given will pertain to all models. The two standard models have the following tuning ranges:

SP-200	SP-200-S
540 – 1160 kc.	1250 – 2500 kc.
1160 – 2500 kc.	2.5 – 5 mc.
2.5 – 5 mc.	5 – 10 mc.
5 – 10 mc.	10 – 20 mc.
10 – 20 mc.	20 – 40 mc.

The sensitivity of the new "Super-Pro" is truly remarkable. By careful circuit design, the overall set noise has been held down to a minimum, thus making it possible to receive extremely weak signals with favorable signal-to-noise ratio. The variable selectivity feature of the "Super-Pro" permits the operator to make full use of the extreme sensitivity even under most severe conditions of interference. Selectivity can be adjusted to cut down interference within very close limits. The advantages of variable selectivity are tremendous when one considers that conditions of interference are not always the same. Under certain conditions, it may be possible to use quite a wide band width and thus enjoy improved tone, as well as easier tuning. Under other conditions, where interference is quite bad, the band width can be narrowed just enough to eliminate interference and in that case, the best possible fidelity that can be obtained without too much interference, is available. In a case where there is practically no interference from other stations, the band width can be adjusted to its widest point and high fidelity reception can be enjoyed.

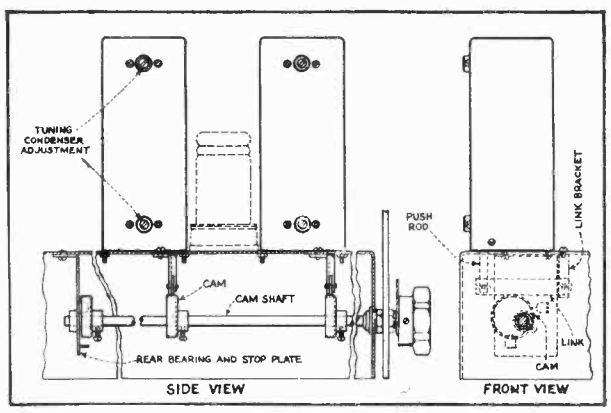


FIG. 1—Band width control which varies selectivity and permits the operator to adjust the receiver for best quality obtainable with minimum interference.

TUBE LINE-UP

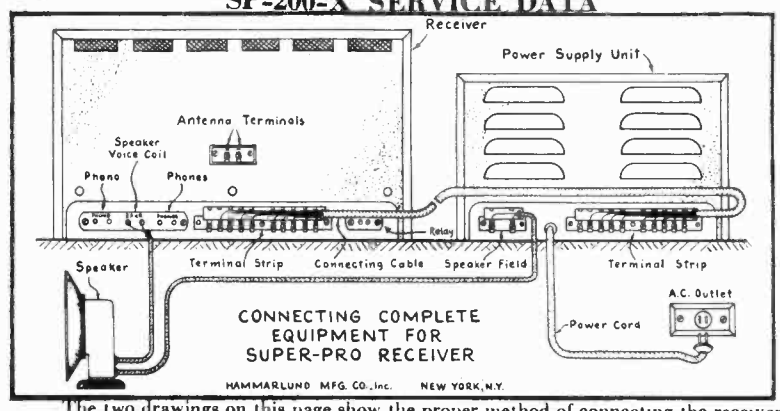
6K7 — First tuned R.F.	6N7 — Noise limiter
6K7 — Second tuned R.F.	6SK7 — AVC driver
6L7 — Mixer	6H6 — AVC Diode
6J7 — H.F. Oscillator	6SJ7 — B.F. Oscillator
6K7 — First I.F. Amplifier	6C5 — First A.F. Amplifier
6SK7 — Second I.F. Amplifier	6F6 — Second A.F. Amplifier
6SK7 — Third I.F. Amplifier	2-6F6 — Third A.F. Amplifier (Push-Pull)
6H6 — Second Detector	5Z3 — High Voltage Rectifier

80 — C-Bias Rectifier

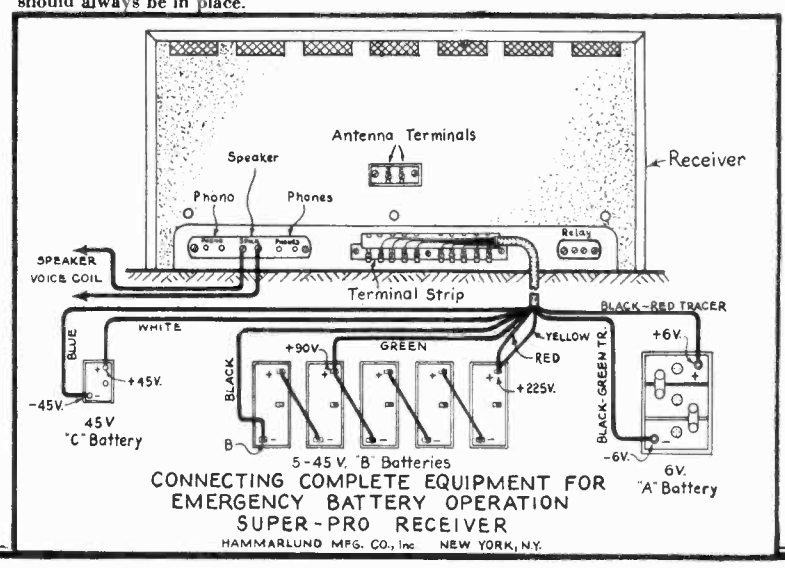
ANTENNA REQUIREMENTS

The input of the Series 200 "Super-Pro" is approximately 112 ohms. This means that for best results, the antenna should be coupled to the receiver by means of a low impedance transmission line. The doublet type antenna produces best results. Any well-known low impedance lead-in cable can be used with satisfaction. The use of low impedance lead-ins provides less chance for the lead-in itself to pick up extraneous noises. The low impedance lead-in, together with the electrostatic shield built into the antenna coil of the receiver, reduces noise to a minimum. It must be remembered that every antenna has a period of resonance and works best at that frequency. When erecting a doublet antenna, it is advisable to arrange its physical dimensions so that it will resonate in the band of frequencies where most sensitivity is desired. Care taken in designing and erecting an antenna will pay for itself many times in superior results.

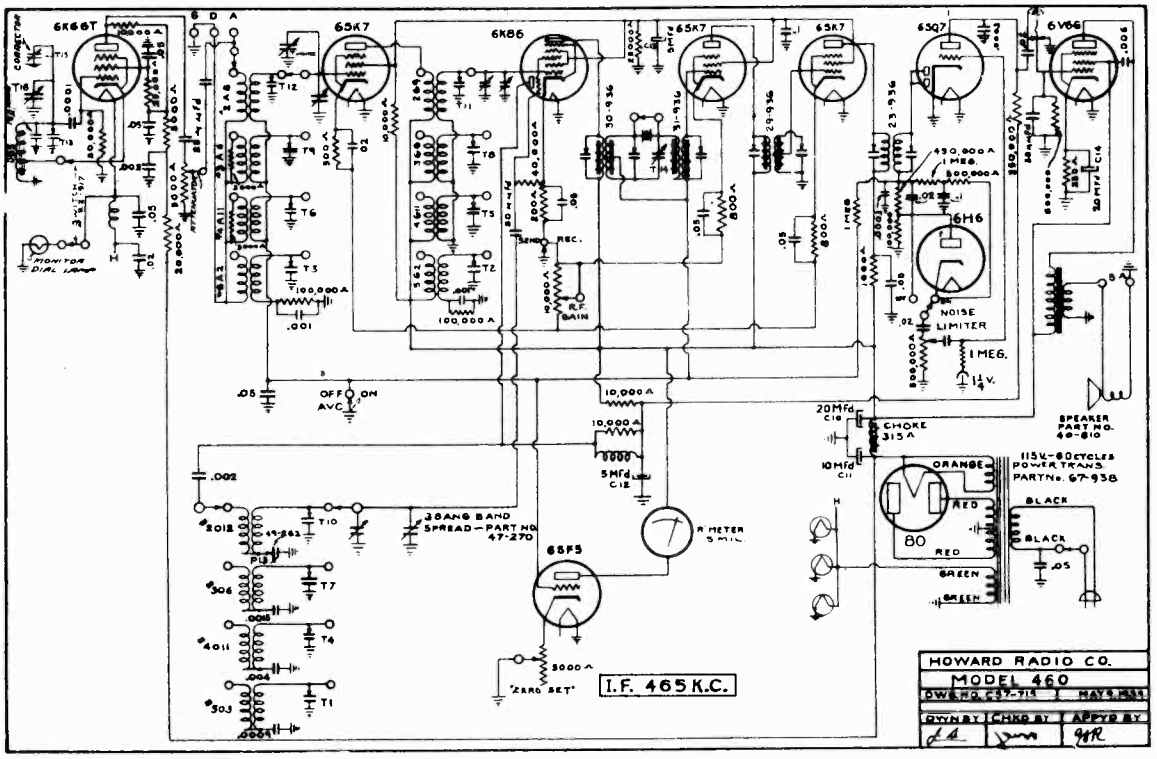
SP-200-X SERVICE DATA



The two drawings on this page show the proper method of connecting the receiver, power supply, and speaker together. The drawing above shows a standard installation, while the diagram below indicates receiver connections when batteries furnish the power. Protective covers are furnished for all important terminal strips and they should always be in place.



HOWARD RADIO CO.



ALIGNMENT CHART

BAND MC	GENERATOR FREQUENCY	GENERATOR CONNECTION	TRIMMER LOCATION	TRIMMER ADJUSTMENTS	TRIMMER FUNCTION	APPROX. MICROVOLTS
IF	465 KC	Grid of 6K8G	See Fig. 6	C1, C2, C3, C4, C5, C6, C7	IF	15
42-16	32 MC	A and DG	See Fig. 5	T1, T2, T3	OSC. RF. ANT.	8
18- 5.5	17 MC	A and DG	See Fig. 5	T4, T5, T6	OSC. RF. ANT.	3
5.5- 1.7	5 MC	A and DG	See Fig. 6	T7, T8, T9	OSC. RF. ANT.	1
1.6- 5.5	1400 KC	A and DG	See Fig. 6	T10, T11, T12	OSC. RF. ANT.	1
1.6- 5.5	600 KC	A and DG	See Fig. 6	P13	OSC. PAD.	1

ALIGNMENT INSTRUCTIONS - FOR RECEIVERS EQUIPPED WITH CRYSTALS

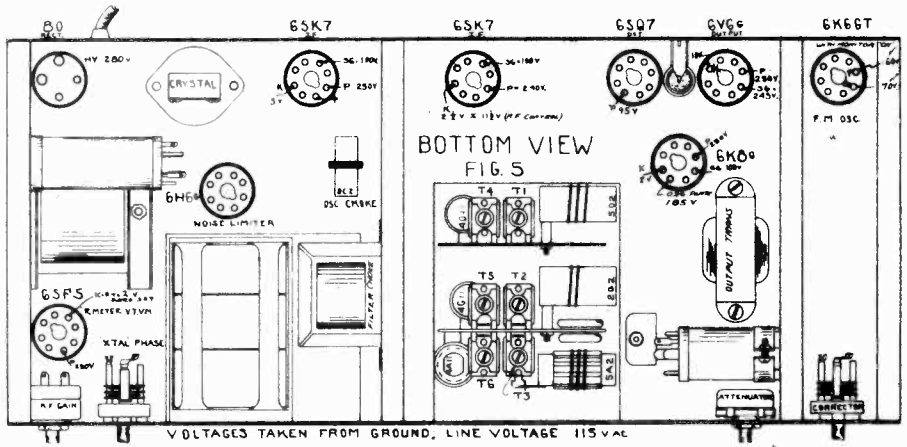
(1) REMOVE CRYSTAL, set crystal phasing condenser to almost minimum capacity and throw "XTAL" switch to "IN" position.

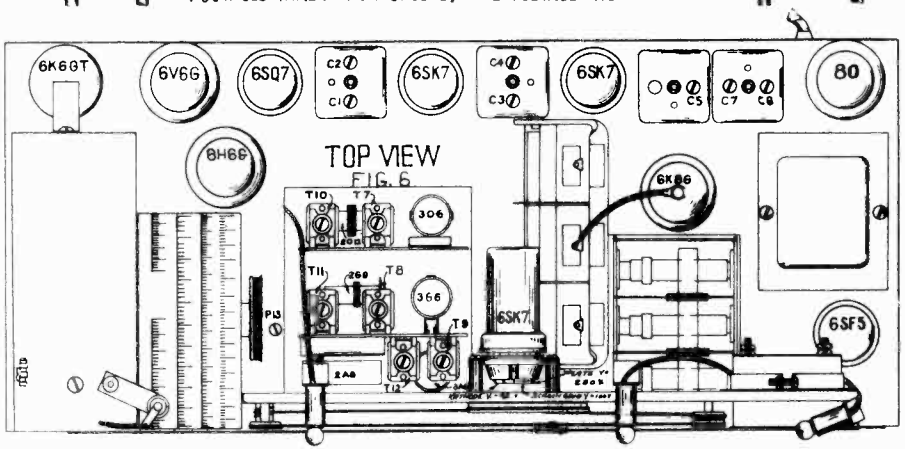
(2) With the 465 KC signal, re-adjust the I.F. Trimmer C-6 by turning the screw counterclockwise. The signal now may be slightly weaker than before and sound "off-side". This, however, is a normal condition.

(3) REPLACE THE CRYSTAL - A very noticeable drop in signal strength may be noted due to the filtering action of the crystal and the frequency control of the signal generator must be "rocked" slowly back and forth until the increase in signal strength indicates the exact frequency of the crystal being used. Now re-align the entire I.F. system to this frequency.

(4) Adjust "XTAL" phasing condenser for the lowest pitched note possible and re-adjust signal generator frequency. Repeat and continue to repeat this alignment procedure until no further improvement in the alignment can be accomplished.

NOTE: If the "XTAL" switch should now be thrown to another position, an apparent rise in gain will be noticed, which is caused by the addition of higher frequencies and background noise, so it does not mean that the sensitivity of this set is impaired in any way by use of the crystal.





NOTE 1: When aligning the I.F. channel, a condenser of .05 MFD may be used in series with the generator lead.

NOTE 2: When aligning the broadcast band, a 250 MMFD condenser may be used in series with the signal generator.

NOTE 3: When aligning the short wave bands, a 400 ohm resistor may be used in series with the signal generator.

NOTE 4: When using a CRYSTAL, set PHASING CONTROL to almost minimum capacity. See special alignment instructions below for Crystal.

BAND SPREADING THE RELAY BANDS

The following table shows the amount of spread obtained by the Band Spread Needle after the exact setting and re-setting of the main tuning hand is made on the LOG SCALE in even divisions. Make the first setting at the left end of the band, further settings are towards the right since the Band Spread Needle is tuning to lower frequencies as it approaches zero.

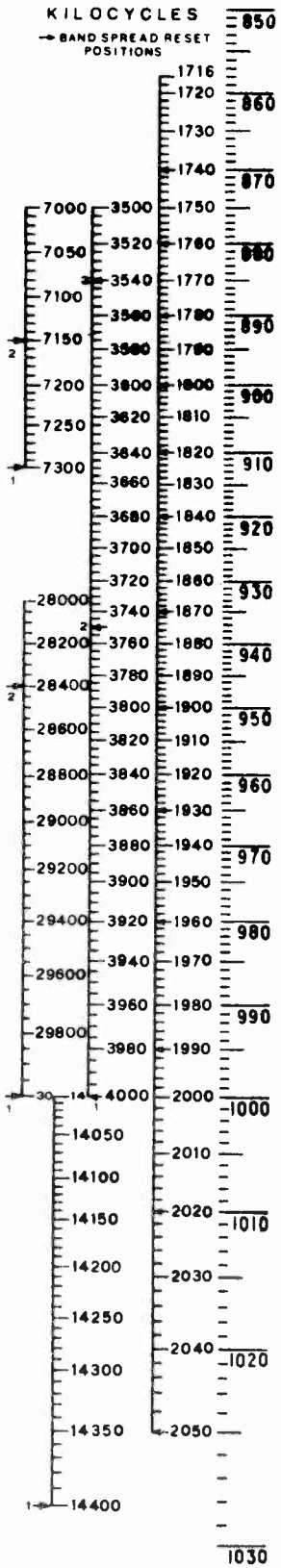
The Band Spread of the regular amateur bands has been covered in the regular instructions in conjunction with the Frequency Monitor.

RELAY BANDS

MAIN TUNING HAND SET TO LOG SCALE AT	FREQ. MC	BAND SPREAD NEEDLE TRAVEL FROM	ACTUAL SPREAD TO
2	17.90	100 to 41	17.22
15	15.79	100 to 30	14.80
32	12.29	100 to 8	11.59
36	11.59	100 to 32	11.20
45	9.9	100 to 21	9.60
47	9.60	100 to 16	9.30
49	9.30	100 to 19	9.00
82	6.25	100 to 33	6.17
83	6.17	100 to 34	6.10
84	6.10	100 to 33	6.04
85	6.04	100 to 33	5.98
86	5.98	100 to 36	5.95
87	5.95	100 to 2	5.88
75	18.10	100 to 2	17.81
77	17.81	100 to 31	17.68
78	17.68	100 to 30	17.55
79	17.55	100 to 30	17.40
80	17.40	100 to 36	17.30
54	22.25	100 to 11	21.80
56	21.80	100 to 11	21.33
58	21.33	100 to 10	20.80

NOTE 5: Check for an image signal about .9 mc. lower in frequency. For example:- If a peak has been made at 6 mc. an image should be heard at about 5.1 mc. Otherwise the original setting was not correct.

HOWARD RADIO CO.



FOR USE WITH ALTERNATING CURRENT ONLY
105-120 V. 60 Cycles, Power consumption 80 W.
(Unless otherwise specified on set)

The Model 460 is designed as an efficient communications type receiver. Although it will cover the regular broadcast band, it is built primarily for Amateur short wave work and for those interested in short wave reception at its best.

The frequency coverage from .55 to 43 megacycles is divided into four bands. The left-hand pointer indicates the band in operation. For correct tuning calibration, the band spread pointer must be set at 100. The lower scale 0 to 100 is for additional help in logging. SEE INSTALLATION INSTRUCTIONS ON FOLLOWING PAGES, SEC. VII.

I - THE FREQUENCY MONITOR

For successful results with the HOWARD FREQUENCY MONITOR SYSTEM the following rules must be followed:

(1) Turn on the set but wait at least fifteen minutes until the circuits reach their normal operating conditions before using the Frequency Monitor. This will maintain uniformity in dial settings.

(2) Turn Monitor Switch to "ON" position, set the fundamental frequency calibration (the scale at the right side of the Monitor Dial), to the known frequency of a nearby broadcast station. (Between 850 & 1030 KC).

(3) With the BAND SWITCH in the broadcast band position and the BAND SPREAD HAND SET TO 100, tune in the same station as selected on the Monitor Dial to exact resonance.

(4) Adjust the "CORRECTOR" to "Zero Beat" with the broadcast station, keeping the "ATTENUATOR" to as low an output as possible (with knob toward the left); otherwise spurious oscillations will be present, with the possibility of zero-beating to a wrong signal near the fundamental with confusing results.

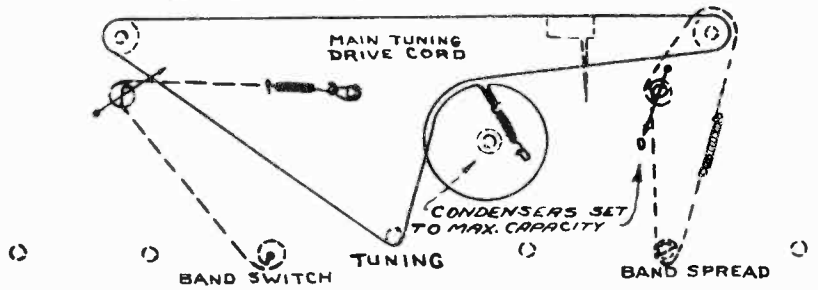
"Zero Beat" refers to the position of the "Corrector" knob, causing the contained oscillator to beat against the incoming signal exactly. A movement of the knob in either direction from this point causes a frequency difference that falls in the Audio range.

(5) The adjacent calibrated scales to the left of the fundamental scale just used are harmonics that fall in the amateur bands and therefore can be depended upon as an accurate means of pre-tuning, checking and logging the stations. Read Section II showing how these harmonics are derived and how other harmonics are possible which can be ignored. The accuracy of this system is without question.

(6) To determine the exact frequency of an incoming signal, merely set the monitor to zero beat with the station and read the frequency direct on the monitor scale. Take note of course the scale position of the band switch and read the correct harmonic scale.

CAUTION: TAKE SPECIAL CARE NOT TO MOVE THE "CORRECTOR" KNOB ACCIDENTALLY OR OTHERWISE AFTER IT HAS ONCE BEEN SET FOR A CERTAIN FREQUENCY.

FOLLOW DIAGRAM BELOW FOR REPLACEMENT OF DRIVE CORDS



II THEORY OF OPERATION

The Frequency Monitor in the Howard Model 460 receiver consists of a highly stabilized oscillator covering the fundamental frequency range of 850 to 1030 kilocycles. The RF output of this oscillator is loosely coupled to the antenna circuit of the receiver and the voltage applied to the receiver is controlled by a variable resistance attenuator.

The Oscillator is tuned by a precision ceramic insulated variable condenser carrying an extremely accurate frequency scale covering the 10, 20, 40, 80, and 160 meter amateur bands as well as the fundamental range. The range is so selected that harmonics cover the entire length of all amateur bands and these are calibrated so that frequency can be read within one kilocycle on the lower frequency bands and several kilocycles on the highest band.

The accuracy of the oscillator is established by setting its dial so that the fundamental frequency shown exactly corresponds to that of some known broadcast station within range. This station is then tuned in on the receiver and the frequency monitor corrector set to zero beat with this station. This establishes the oscillator frequency as exactly the same as that of the broadcast station. The Federal Communications Commission requires all broadcast stations to operate within 50 cycles of their assigned frequency and most of them are within a very few cycles. With the accuracy of the frequency monitor dial established at any one point, it may be depended on to be accurate throughout its range.

Harmonics of the oscillator may be tuned directly on the receiver and exact receiver frequency established in this way or the monitor can be set to zero beat with any station heard and that station's frequency read directly on the monitor dial. The 160 meter band is covered by the second harmonic of the oscillator fundamental; the 80 meter band the fourth harmonic; the 40 meter band the ninth harmonic; the 20 meter band the fourteenth harmonic; the 10 meter band the thirtieth harmonic. These harmonics bear a mathematical relationship of exactly 2, 4, 9, 14, and 30 times the fundamental frequency covered. There are of course other harmonic frequencies present in the oscillator output but the one desired is easily found by tuning the receiver to the approximate frequency as indicated by the receiver dial as this will always be approximately correct. The exactly correct frequency will be found near this point. Harmonics heard at frequencies not corresponding to monitor dial are ignored. Harmonics that fall outside the amateur bands may be used if there is any reason to use them.

THE ATTENUATOR

The Attenuator will be found of invaluable aid in controlling the Frequency Monitor Output. The circuits leading from the monitor have been completely filtered and the shielding is complete, in order that the greatest percentage of output from monitor is controlled by attenuator.

Advancing attenuator to right increases the R.F. Output from monitor.

No fixed rules can be set down as to the proper use of the attenuator. The operator will find after practice just what positions give best results for the various applications of Frequency Monitor.

IN GENERAL THE ATTENUATOR SHOULD BE ADVANCED, MAKING MONITOR SIGNAL EASY TO LOCATE. AFTER SIGNAL HAS BEEN LOCATED THE ATTENUATOR SHOULD BE TURNED BACK TO LEFT AS FAR AS POSSIBLE, WITH THE SIGNAL JUST AUDIBLE. The practice of using as weak a monitor signal as possible will avoid making mistakes on "spurious" beats.

The attenuator will also be found very convenient in controlling voltage in BFO code reception. The perfect control afforded by the attenuator enables the injection voltage to be held very close to the threshold level, which makes for better CW reception.

III BAND SPREAD - USING FREQUENCY MONITOR FOR ESTABLISHING BAND SPREAD STARTING POSITIONS

The following procedure should be followed for band spreading, using frequency reference:

(1) ESTABLISH FREQUENCY CORRECTION OF MONITOR AS OUTLINED IN SECTION I.

(2) SET BAND SPREAD POINTER AT 100.

(3) SET MONITOR DIAL TO POINT WHERE SPREAD IS TO START, CORRESPONDING TO THE POSITION OF THE MAIN DIAL HAND THAT HAS BEEN SET TO THE HIGH FREQUENCY END OF THE PARTICULAR ALLOTTED BAND. TUNE THIS SIGNAL FOR EXACT RESONANCE WITH MAIN TUNING CONTROL, WATCHING "R" METER. USE THE ATTENUATOR TO INCREASE MONITOR SIGNAL IF NECESSARY, DECREASE OUTPUT OF ATTENUATOR IF RESONANCE PEAK IS BEYOND "R" METER SCALE READING.

NOTE 2: The frequency monitor signal can be identified from other signals in that it is slightly modulated at 120 cycles per second. Only enough modulation is used (approximately five per cent) to make the signal easily identified, while the carrier is sufficiently clean to give good beat note performance.

Turn Monitor off and band spread over the limits of band spread for the particular step chosen.

Any one of the reset positions may be chosen at will. However, if band spreading the entire band is desired the steps should be chosen consecutively, as 1, 2, etc.

It is good practice to get in the habit of following the operations as outlined above. By so doing, all records or logs of stations heard can be accurately logged BY FREQUENCY and CAN ALWAYS BE FOUND IN THE SAME POSITION.

STATION FREQUENCY MEASUREMENT

It is quite simple to measure the frequency of any signal being heard while covering the range with band spread. Turn Monitor on and zero beat signal by tuning monitor dial, using attenuator if necessary to get correct monitor signal strength for proper zero beating. READ STATION FREQUENCY DIRECTLY ON MONITOR SCALE. Special care must be taken in checking frequencies in 10 meter band in that the image frequency can be mistaken for the true signal frequency. In other words, it is possible to hear the monitor in two spots on signals in this band -- rotate monitor dial until the LOWEST frequency is heard. This is the true signal frequency.

FREQUENCY CHECK OF OWN TRANSMITTER as required by the FCC is possible by the method explained above providing a reasonable amount of isolation is maintained between the transmitter and the receiver.

The following explanation of band spread starting positions may be of help in a better understanding of BAND SPREADING BY FREQUENCY REFERENCE:

It has always been known that if the starting positions of band spread can be established to be exactly the same in FREQUENCY, each time band spreading is started the signal positions and logging can be repeated accurately.

In establishing these starting positions in the past it has been customary to set the main tuning indicator as close as possible to the original or logging position. This naturally leaves much to be desired in accuracy because a slight error, even smaller than the eye can detect, would make a tremendous difference in repeating the band spread dial reading. Also, the oscillator in any receiver drifts somewhat over a period of time. The visual mechanical methods of setting band spread of course never corrected for these things.

The frequency reference method as used in the Howard 460 does correct for these discrepancies and enables an accurate log to be kept either by frequency or by actual band spread indicator position.

It will be noticed that on the Frequency Monitor dial there are positions indicated by an arrow and in some cases these arrows are numbered as 1, 2, etc; these arrows indicate the limits of frequency span of band spread and should be used as the starting positions.

It is customary not to band spread the 160 meter band. However, it can be done quite accurately by using the starting positions as shown on monitor scale.

The positions for each of the amateur bands are as follows:

The 20 meter band starts at 14,000 KC. Band spread covers the entire band. Band spread scale will read from 100 to 50 for this band.

The 10 meter band starts at 30,000 KC and goes to 28,400 KC in first step; therefore, the second reset position is at 28,400 KC. The balance of the band is covered in the second setting of band spread.

The 40 meter band starts at 7,300 KC and goes to 7,150 KC in first step. 7,150 KC is start of second position. The balance of this band to 7,000 KC is covered in second setting.

The 80 meter band is covered in three steps, starting at 4,000 KC, going to 3,750 KC, then to 3,540 KC, and finish band to 3,500 in a short step.

The 160 meter band is covered in thirteen steps, starting at 2,050 and going to 2020, 1990, 1960, 1930, 1900, 1870, 1840, 1820, 1800, 1780, 1760, 1740, and finishes at 1716 KC.

IV C.W. RECEPTION

Use the Frequency Monitor to zero beat the received signal on its fundamental frequency. The customary intermediate frequency beat system is not used, thus eliminating certain unnecessary harmonics that would fall in the amateur band. Throw AVC Switch to "OFF" position.

V THE NOISE LIMITER

The Noise Limiter (with switch in the "ON" position) is so designed to help receive signals that might not come through certain types of interference such as automobile ignition noise, and a high percentage of static impulses from various sources. The noise limiter must not be considered as a "noise eliminator"; such an arrangement would impair the sensitivity of the receiver.

VI THE USE OF THE CRYSTAL

NOTE THAT THE "XTAL PHASE" CONTROL AFFECTS THE SELECTIVITY AND SENSITIVITY OF THE RECEIVER EVEN THOUGH THE CRYSTAL IS NOT BEING USED.

(1) Set the BAND SPREAD to about 50 on its dial, tune in a station on the main dial to exact resonance, watching the meter deflection.

(2) Turn Frequency Monitor "ON" and set to same frequency as incoming signal, beat to null point with "Corrector".

(3) Snap XTAL Switch "IN" and rock Band Spread hand back and fourth, which will show two "sides" of the signal,

HOWARD RADIO CO.

one of which is weaker than the other. Set Band Spread hand to the weaker position.

(4) Now "Phase Out" the weaker side with the XTAL phase control.

(5) Retune back to the strong side, which will be found to be free from noise and very selective.

THE SUCCESS OF THE CRYSTAL OPERATION WILL DEPEND UPON TUNING THE SIGNAL TO EXACT RESONANCE.

VII EXTERNAL CONNECTIONS

From the SPEAKER UNIT extends a two lug cable which must be connected to the "5 Ohm" terminal strip on the back of the chassis. No other connections are necessary to the speaker.

The terminals A, D, and G are for antenna and ground connections. Connect the conventional antenna lead-in to terminal "A" and the ground lead to "G"; leave shorting jumper between "G" and "D" unless a Doublet system is used.

For a Doublet system, remove jumper between "G" and "D" and connect doublet wires to "D" and "A". The ground connection can remain.

Due to varied conditions in different localities, it is not possible to give definite recommendations regarding the antenna structure. It is suggested that a little experimenting be done and to follow information given by current radio periodicals, also the A.R.R.L. Handbook.

Special consideration must be taken for reception on the higher frequency bands. There will be periods within a short space of time when no reception is possible. Since the set is designed to meet the conditions for satisfactory short wave reception, there should be no question as to the sensitivity of the set itself, and the receiver should be given a fair chance to produce the required results.

THE MODEL 460 IS DESIGNED TO BE USED EITHER WITH OR WITHOUT THE CRYSTAL. IF THE SET IS NOT EQUIPPED WITH THE CRYSTAL BE SURE TO LEAVE XTAL SWITCH IN THE "OUT" POSITION. TO LOCATE OR INSERT THE 465 KC CRYSTAL, TURN SET BOTTOM SIDE UP AND REMOVE THE TWO SCREWS HOLDING THE SMALL FLAT COVER.

METER ZERO SET With the Antenna terminal grounded (or the AVC switch in the "OFF" position) turn this control until the "R" Meter hand rests at the 0 point. This will establish accurate readings on this meter.

THE RF GAIN varies the sensitivity of the receiver and under certain conditions is used in conjunction with THE AF GAIN Control to obtain a suitable "signal to noise" ratio.

THE HEADPHONE JACK at the back of the chassis cuts out the regular speaker from the circuit when the plug is inserted.

THE SEND-RECEIVE SWITCH opens the cathode circuits of the RF and IF stages for "standing by".

THE AVC SWITCH should be in the OFF position for reception of C.W.

THE POWER OUTPUT will be about 4.2 watts, undistorted.

GENERAL INFORMATION

For each band there is a Radio Frequency stage with individual coils for the RF Oscillator and Mixer stages for each band.

Ceramic coil forms are used on the high frequency band. Ceramic trimmers are used throughout. The unused coil secondaries of the lower frequency bands are shorted as the band switch is shifted to the higher bands.

The tubes are accessible by removing two screws holding screen to back of cabinet.

The Intermediate Frequency is 465 KC. The Crystal input, Crystal output, and the 2nd IF consist of windings wound on iron cores.

The chassis dimensions are such that the model is adaptable to a standard panel rack.

THE FREQUENCY MONITOR ADJUSTMENTS

The electrical alignment of this circuit has been set at the factory and under no circumstances should any changes be attempted since there will be no necessity for any change.

For correct calibration see that the Frequency Monitor Dial, when rotated to the lower frequency, stops at the last line above 850 with the condenser at full capacity. If necessary, adjust scale by shifting drum on condenser shaft by loosening hub set screws.

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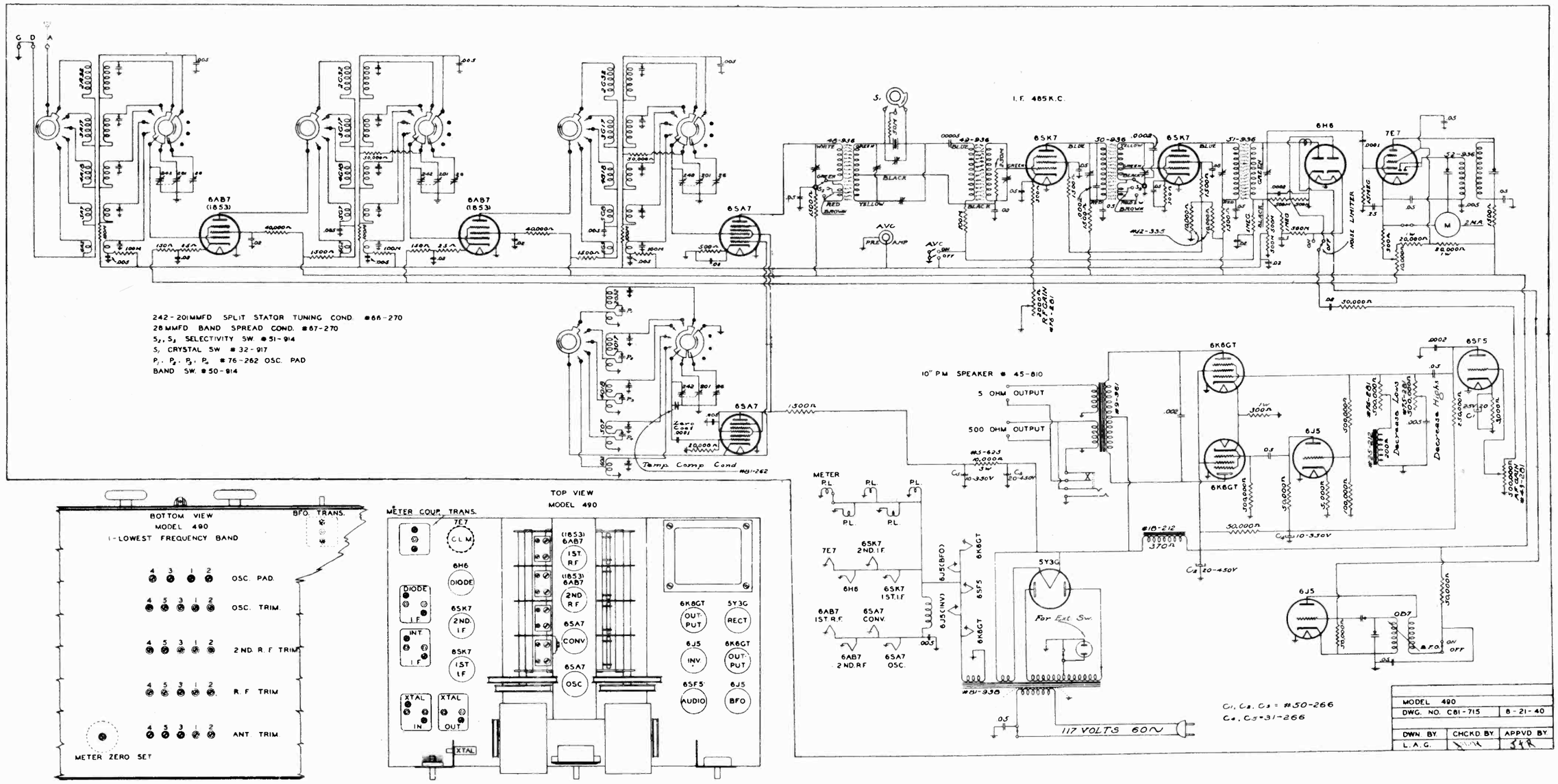

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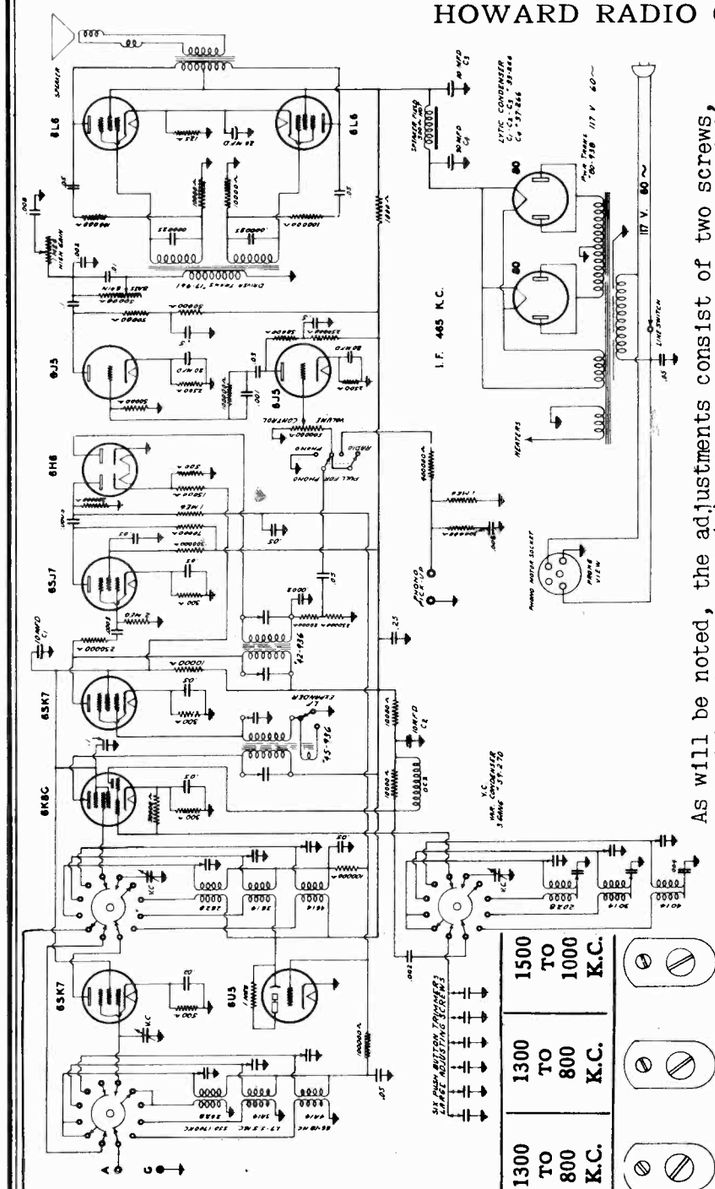
MODEL 528
MODEL 700



PRE-ADJUSTMENTS FOR PUSH BUTTON OPERATION

MODEL 700. SEE INDEX FOR OTHER DATA

700 KC.	900 TO 600 K.C.	1300 TO 800 K.C.	1300 TO 800 K.C.	1300 TO 800 K.C.	1500 TO 1000 K.C.

As will be noted, the adjustments consist of two screws, one with a large head (A) and one with a small head (B). With a small screw driver, turn screw "A" back and forth until you locate the station. It is suggested that you switch back to manual tuning if necessary to recognize the particular type program to help you find it when you again turn the adjusting screw.

After the "A" Screw has been set to exact resonance by watching the tuning eye deflection, turn the small screw "B" for the maximum deflection of the tuning eye. Now recheck screw "B". When all six buttons have been set, repeat the process for accuracy.

IT WILL BE OF IMPORTANCE TO NOTE THAT IF THE STATION CANNOT AT FIRST BE LOCATED BY MOVING SCREW "A" IN AND OUT, PERHAPS YOU WILL FIND ADJUSTMENT "B" TOO FAR IN OR TOO FAR OUT. In such a case, check its position by turning it in all the way (to the right) then reverse it about a turn or two and try screw "B" again.

(1) Leave set turned on at least twenty minutes allowing receiver circuits to reach their normal operating condition before starting push button adjustment.

(2) Remove screws holding escutcheon plate for push buttons.

(3) Note the ranges shown on label above adjusting screws. For example: 700 to 540 KC means you should adjust this set of screws for any station having a frequency between 700 and 540 KC. This rule applies for the other five ranges. There is, of course, some overlapping of range coverage.

(4) Selecta station by manual tuning in the regular way. Assuming it is within the 700 to 540 KC range, turn Band Switch to "Push Button" position and push in on button covering the range.

MODEL 700

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Align the Intermediate frequency stages at 465 KC.
Reach trimmer through top of shield cans.
Set dial at 1400 KC and adjust oscillator trimmer which is located on front section of variable condenser inside chassis, then peak antenna stage trimmer on back section of variable condenser to 1400 KC.
No adjustment is required at the low frequency end of the dial other than the conventional bending of the split condenser plates.
The tubes are connected in series in the order as shown by the schematic diagram.
The dual section filter condenser has a common negative, but note that it does not return to ground as the can is insulated from the chassis.

SOCKET BOLTAGE READINGS:

Voltage taken from ground with line voltage at - 117 V. AC.
High voltage reading off rectifier = 115 V.
Drop across speaker field = 20 V.
Voltage taken with 1,000 Ohm per volt meter, from cathode return to points as given.

TUBE	FUNCTION	CATHODE	SCR. GRID	PLATE	OSC. PLATE
12SA7	Mixer		95	95	95
12SK7	I.F.Amp.	3.5	95	95	
12SQ7	Det.			45	
50L6GT	Output	6	9	82	

POWER SUPPLY-- (Standard Models) = 105-125 V. AC-DC CONSUMPTION 30 WATTS

SEE LABEL ON BACK OF CHASSIS

ANTENNA SYSTEM = Built-in loop on back of cabinet. Available connection (BROWN lead) for outside antenna.

TUNING RANGES = 540-1720 KC (178-550 Meters)

I.F.= 465 KC TYPE = Conventional POWER OUTPUT = (MAX.) = 1 W. UPO .5 W.

CONTROLS - Tuning, Volume with Power Switch.

TUNING SYSTEM =

String Drive, Airplane dial

SPEAKER = Electro-dynamic SIZE = 5" V.C.IMP.(400CPS) = 5 Ohms FIELD = 450 Ohms

REPLACEMENT PARTS LIST

Part No.	DESCRIPTION	Part No.	DESCRIPTION
	CONTROLS		DIAL & CONTROL PARTS--Continued
69-281	Volume	28-427	Dial Window
	CONDENSERS	39-829	Spring for drive cord tension
62-270	Tuning	35-448	Tuning hand
47-266	Filter,20-30 mfd.150,150 Volt	60-720	Shaft - Tuning
	COIL ASSEMBLIES		KNOBS
L-21	Ant. Loop	48-490	Tuning Hand Control
2030	Osc.Coil 175-555 Meters (1700-540 KC)	1-290	LINE CORDS Standard
22-936-3	1st I.F. Assembly Complete		MISCELLANEOUS
23-936	Last I.F.Assembly Complete	6-167	Rubber Drive Washers
	CABINETS		SOCKETS, JACKS, CONNECTORS
79-188	Plastic	23-771	Tube Sockets (Octal moulded)
	DIAL & CONTROL PARTS	18-768	Dial Lamp Socket-Bayonet type
129-310	Calibrated Dial Plate or Scale		SPEAKERS (Specify Manufacturer)
		11-805	Table Model Speaker
1-288	Drive string	11-805T	Transformer for above
4-498	Dial Lamp-Bayonet type	11-805C	Cone for above

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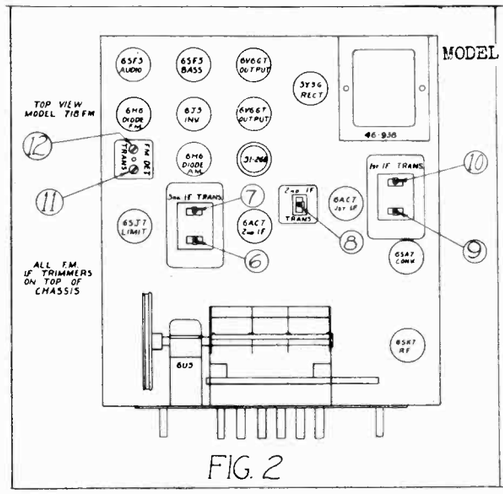
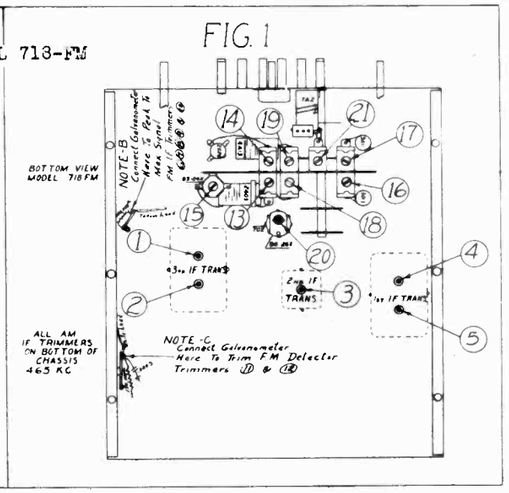
MODEL 718-FM
MODEL 718-FM, Series X

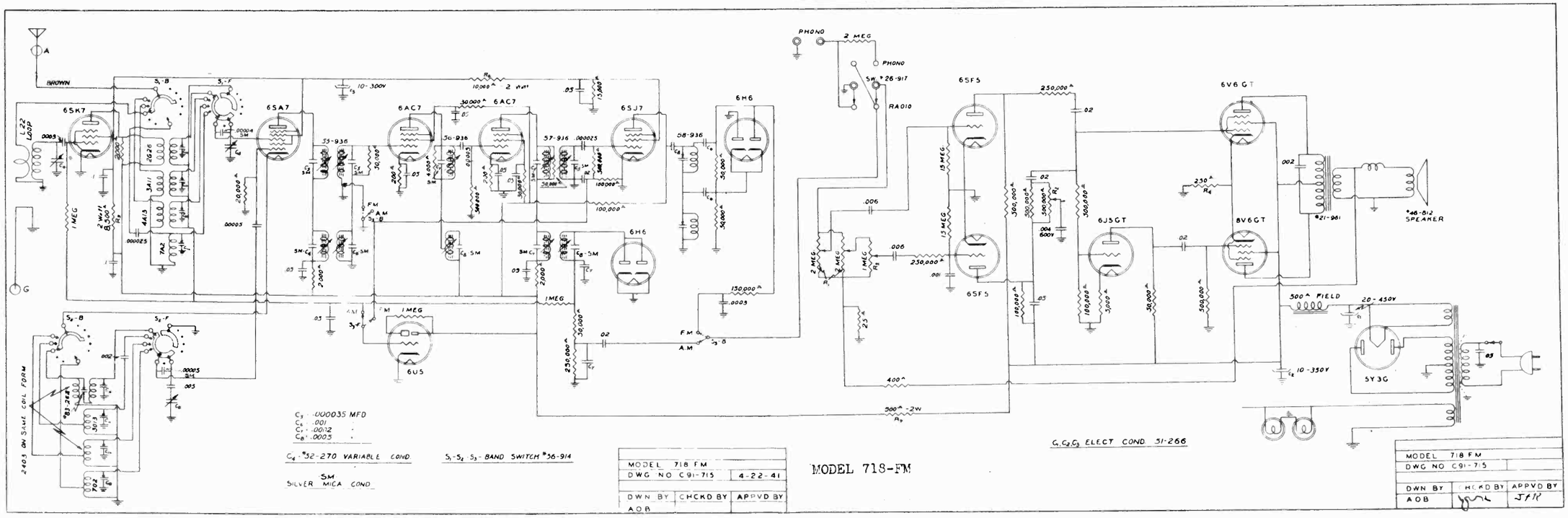
DUMMY ANTENNA	SIG.GEN. CONNECTION TO	GEN. FREQ.	BAND SW. POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION	SEE NOTE
.05 Mfd.	Grid of 6SA7	465 KC	BC	Off Station	See Fig. 1 ①②③④⑤	AM I.F. peak to Max. Output	A
"	Grid of 6SA7 Remove tuned circuit	4.3 MC Unmod.	FM	"	See Fig. 2 ⑥⑦⑧⑨⑩	FM I.F. - See Fig. 1 Galvanometer Position	B
"	"	4.4 MC Unmod.	FM	"	Turn ⑪ down tight - then adjust ⑫	See Fig. 2 FM Detector	C
"	"	4.3 MC Unmod.	FM	"	After ⑫, adjust ⑪ for zero deflection	See Fig. 2 FM Detector	D
400 OHM Resistor	"A" Antenna Post	1400 KC	BC	1400 KC	See Fig. 1 ⑬ then ⑭	BC Osc. and RF	E
"	"	600 KC	BC	600 KC	⑮ Rock Dial	BC Osc. Pad	E
"	"	5 MC	Police	5 MC	⑯ then ⑰	Osc. - Ant. Check image at 4.1	E
"	"	16 MC	SW	16 MC	⑱ then ⑲	Osc. - Ant. Check image at 15.1	E
"	"	48 MC 8th Har. of 6 MC	FM	48 MC	⑳ then ㉑	FM Osc. - Ant.	E





Alignment for 718 FM series X same as for 718 FM except for these trimmer nos. 16 to 24.

400 ohm Res.	"A" Ant. Post	5 MC	Police	5 MC	⑯ ⑰ ⑱	Osc. - RF - Ant. Check image at 4.1	E
"	"	16 MC	S.W.	16 MC	⑲ ⑳ ㉑	Osc. - RF - Ant. Check image at 15.1	E
"	"	48 MC 8th Har. of 6 MC	FM	48 MC	㉒ ㉓ ㉔	FM Osc.- RF - Ant	E



HOWARD RADIO CO.

MODEL 718-FM
MODEL 718-FM Series X

GENERAL SPECIFICATIONS

14 Tube, 4 Band, Frequency Modulation, R.F. Stage and Loop for Broadcast band only, Mechanical Push-Button Tuning with declutching system, Built-in Phono Switch, Bass Boost, Treble Control, Beam Power Output, Inverse Feed-Back, 6 Ohm Voice Coil, Power Consumption 115 Watts, Alternating Current only.

THIS SHEET INCLUDES:

- Socket voltage chart (also indicates tube function).
- Alignment chart with pictorials showing trimmer and tube locations.
- Replacement parts list with list prices.
- Schematic diagram.
- SEE FORM 31-480 for dial mechanism.

SOCKET VOLTAGE READINGS FOR MODEL 718-FM

* Socket Terminal Number

Voltage taken from ground with voltage at 117 Volts AC. Drop across speaker field 65 V. Use at least a 1000 Ohm per Volt Meter. High voltage reading off rectifier 315 V. DC.

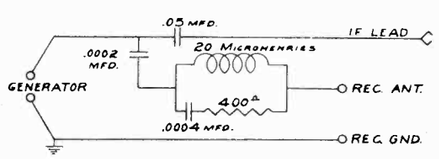
TUBE	FUNCTION (FOR 718 FM Series X only)	CATH.		SG.		PLATE			
			*						
6SK7	R. F. Amp.	2	5	92	6	230	8		
6SA7	Converter		6	92	4	220	3		
6AC7	1st I. F.	2	5	155	6	225	8		
6AC7	2nd I. F.	2	5	155	6	210	8		
6SJ7	Limiter		5	55	6	95	8		
6H6	FM Des-Det.								
6H6	AM Det.								

TUBE	FUNCTION	CATH.		SG.		PLATE			
6SF5	A. F.					55	5		
6SF5	Bass Boost					115	5		
6U5	Tuning eye					230			
6J5	Inverter	8	8			160	3		
6V6GT	Output	16	8	250	4	245	3		
6V6GT	Output	16	8	250	4	245	3		
5Y3G	Rectifier								

ALIGNMENT PROCEDURE FOR 718 FM

EQUIPMENT REQUIRED:

1. SIGNAL GENERATOR to accurately cover the alignment frequencies as shown below.
2. GALVANOMETER 75 microamperes center "0" (Such as Simpson Type 25) USE SERIES RESISTOR of 100,000 Ohms in positive lead. Leads from meter to set to be as short as possible.
3. OUTPUT METER (0 to 3 V. AC if used in voice coil circuit).
4. DUMMY ANTENNA. Although the values as shown in below table for antenna load may be satisfactory, we urgently recommend the circuit as shown at the right to properly take care of the various frequencies to accomplish the correct alignment.



START ALIGNMENT WITH:

Treble and Bass controls turned toward left, Volume Control full ON to right and Band Switch in Broadcast position. After checking for pointer travel to last line above 550, set dial to point where there is no interference with generator signal and proceed with AM-IF alignment.

NOTE A: When a re-alignment is made of either the AM I.F. or FM I.F. it should not be necessary to turn the adjustments very far in either direction. The AM I.F. adjustments are reached through holes in the base from underside of chassis. Should the screws be turned too far in, they might fall out of position which would require that the coil be re-assembled. At the other extreme, if the screws are forced too far out, there is danger of breaking the iron cores.

NOTE B: Connect Galvanometer from tap of limiter grid load circuit to ground. See Fig. 1. Adjust for max. current. Normal gain should give deflection (with meter as specified) of 22 with 2,000 to 3,000 microvolt input. Now shift generator frequency each side of 4.3; that is, to 4.2 and 4.4. The drop-in meter deflection should be approximately proportional to change in frequency. If not, recheck alignment.

NOTE C: With Galvanometer connected to FM Detector output (See Fig.1) and Trimmer 11 turned all the way in temporarily, adjust Trimmer 12 for max. deflection at 4.4 M.C. Normal gain should give deflection of 9 with 2,000 to 3,000 microvolts input.

NOTE D: After Trimmer 12 is adjusted to 4.4, adjust Trimmer 11 to zero deflection at 4.3. Then shift generator to 4.2 MC. Meter should then show deflection approximately same as at 4.4 at reverse polarity. If the I.F. circuits are ever readjusted, always recheck detector afterwards.

NOTE E: Peak for greatest deflection of output meter.

MODEL 718-FM Series X

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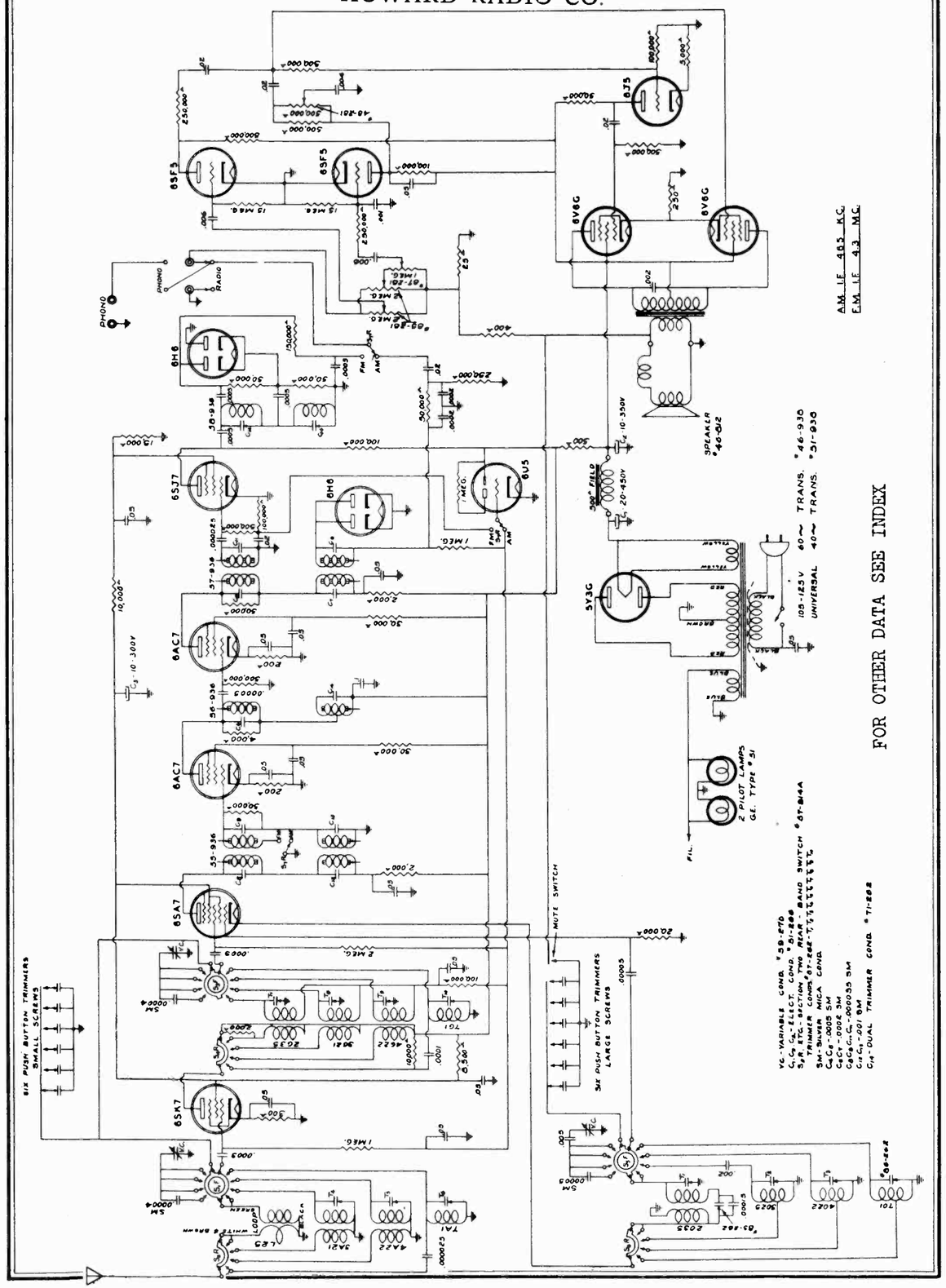

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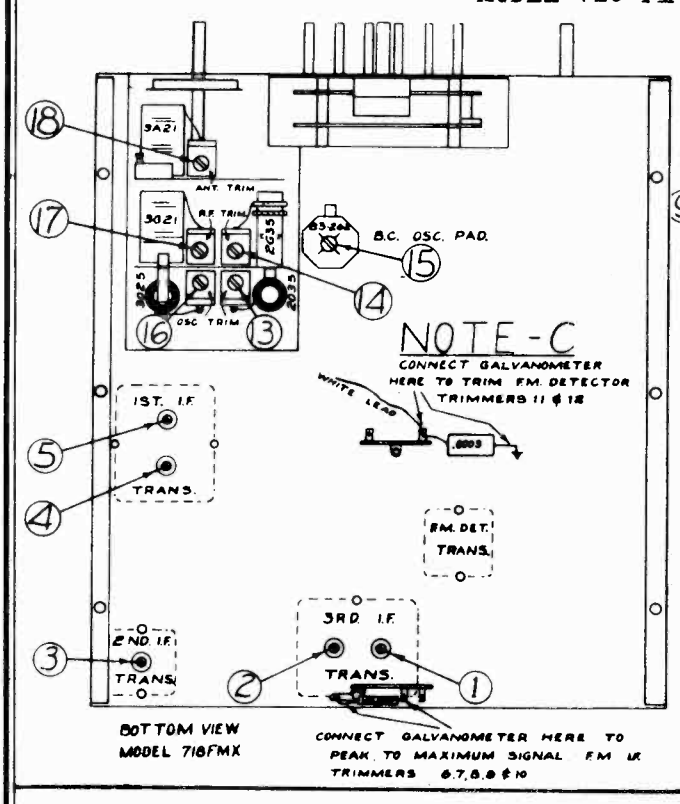
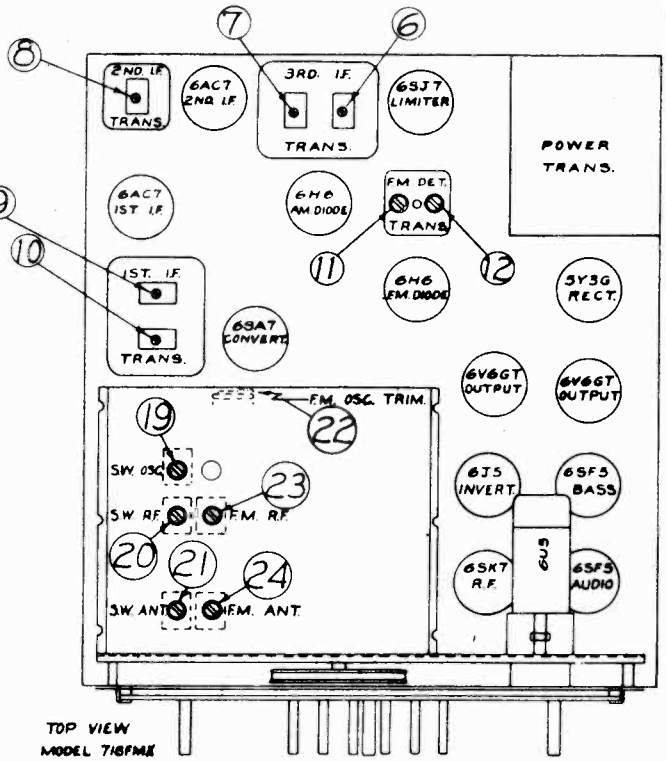
MODEL 718-FM Series X
MODEL 806
MODEL 808 Spread Band

MODEL 718-FM SERIES X



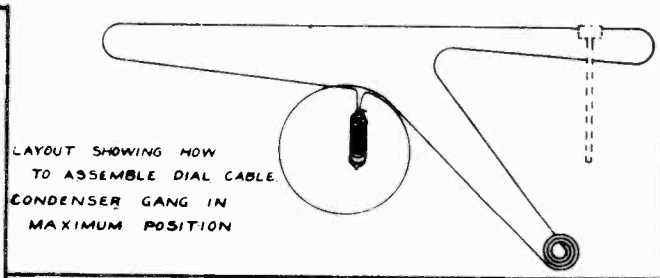


MODEL 308 SPREAD BAND

Voltage taken at 117 Volts A.C. Drop across speaker field 55V. Use 100 ohms per Volt meter. High Voltage of rect. 320VDC.

TUBE	FUNCTION	CATH.		SG.		PLATE			
6SD7GT	R.F.	2 & 5	* 5	108	* 6	260	* 8		*
6SA7	Converter		6	108	4	260	3		
6SK7	I.F.	3	5	108	6	250	8		
6SQ7	Det.					92	6		

TUBE	FUNCTION	CATH.		SG.		PLATE			
6J5	Inverter	8	* 8		*	170	* 3		*
6K6GT	Output	18	8	265	4	255	3		
6K6GT	Output	18	8	265	4	255	3		
5Y3GT	Rectifier								



TUBE	FUNCTION	CATH.		SG.		PLATE	
6SD7	R.F.	2 & 4.2	* 5	90	* 6	235	* 8
6SA7	Converter	-	6	90	4	270	3
6SK7	I.F.	3	5	90	6	260	8

TUBE	FUNCTION	CATH.		SG.		PLATE	
6SQ7	Det.		*		*	90	* 6
6V6GT	Output	13	8	270	4	258	3
5Y3GT	Rectifier						

MODEL 806

SOCKET VOLTAGE READINGS FOR MODEL 806

* Socket Terminal Number

Voltage taken from ground with voltage at 117 Volts AC. Drop across speaker field 44 V. Use at least a 1000 ohm per Volt Meter. High Voltage reading off rectifier 314 V. DC.

MODEL 806
MODEL 808

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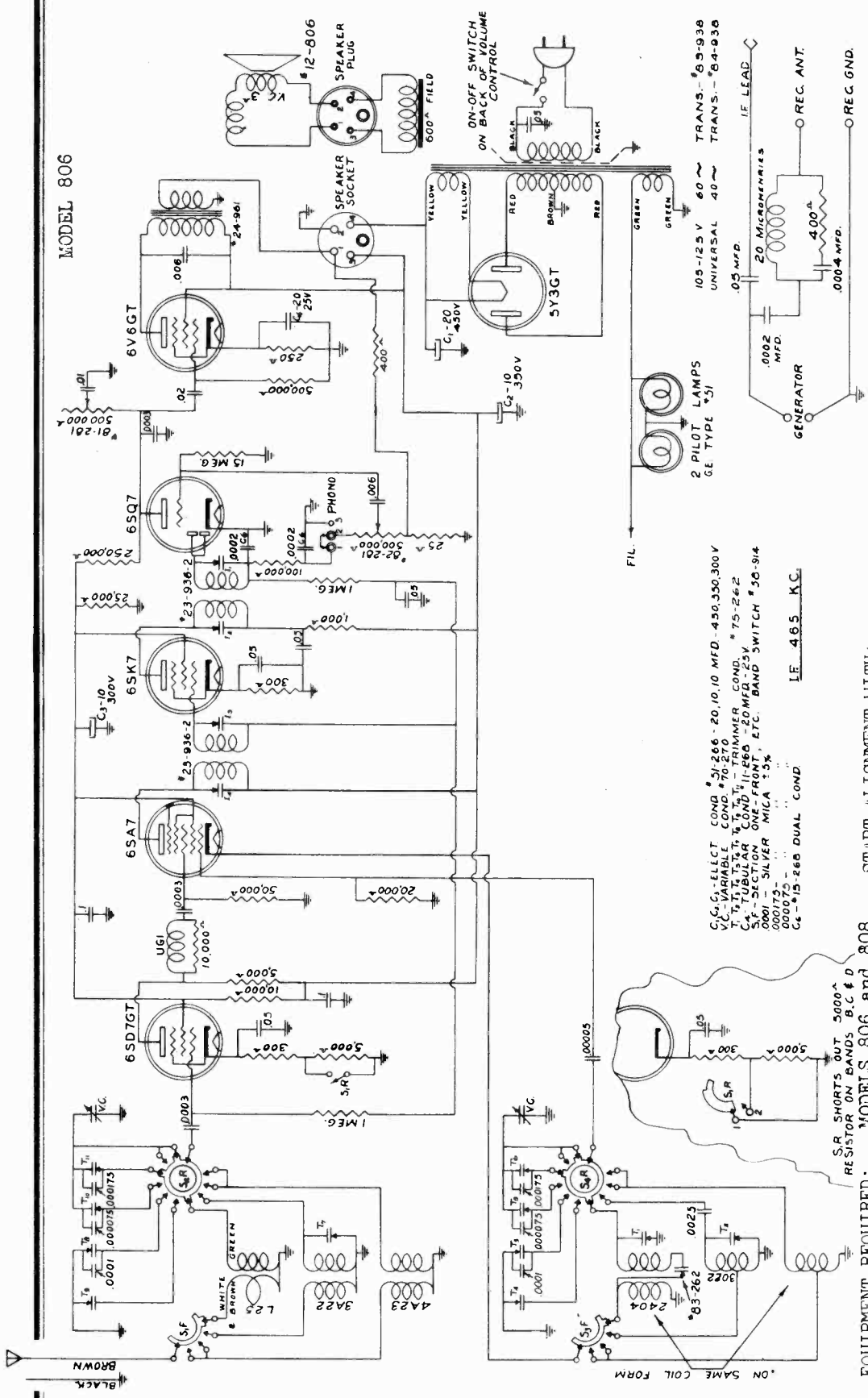


START ALIGNMENT WITH:
Volume control full ON to right and Band Switch in "A" Band position. After checking for pointer travel to last line above 550, set dial to point where there is no interference with generator signal and proceed with I.F. alignment.

NOTE THAT THIS IS A SPREAD BAND RECEIVER, AND THE ALIGNMENT PROCEDURE IS NOT CONVENTIONAL. ONE SET OF COILS COVERS TWO SHORT WAVE BANDS WHICH ARE SPREAD BY MEANS OF PADDING CIRCUITS.

NOTE ALSO THAT A SETTING POINT FOR THE DIAL HAND POSITION IS GIVEN ON A DIFFERENT BAND OTHER THAN THE BAND BEING ALIGNED AND THE FREQUENCY SETTING OF THE GENERATOR. THIS IS NECESSARY TO OBTAIN THE PROPER BAND-SPREAD.

EQUIPMENT REQUIRED: MODELS 806 and 808

1. Signal Generator to accurately cover the alignment frequencies as shown below.
2. Output Meter (0 to 3 V. AC, if used in voice coil circuit).
3. Dummy Antenna. Although the values as shown in table below for antenna load may be satisfactory, we urgently recommend the circuit as shown at right to properly take care of the various frequencies for correct alignment.

HOWARD RADIO CO

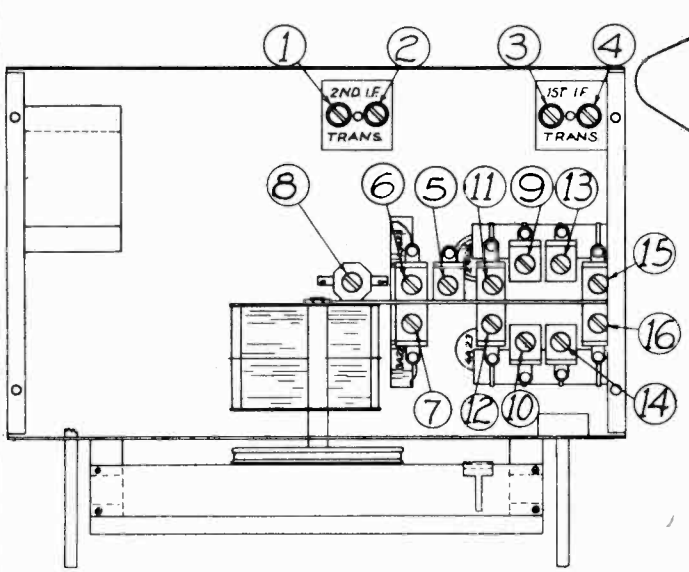
MODEL 806
MODEL 808 Spread Band

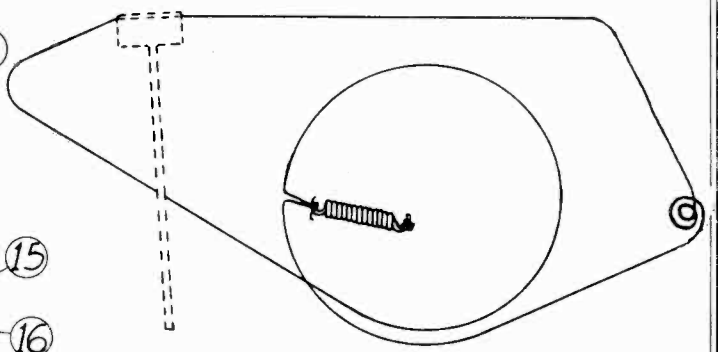
DUMMY ANTENNA	SIG. GEN. CONNECTION TO	GEN. FREQ.	BAND SW. POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION	SEE NOTE
.05 Mfd.	Grid of 6SA7	465 KC	"A" Band	Off Station	See Pictorial ① ② ③ ④	I. F. peak to max. output	
400 Ohm Resistor	Ant.	1400 KC	"A" Band	1400 KC	See Pictorial ⑤	BC Osc.	
"	"	600 KC	"A" Band	600 KC	⑧ Rock Dial	BC Osc. Pad.	
"	"	5 MC	"B" Band	5 MC	⑥ then ⑦	Pol. Band Osc. - Ant. Check Image at 4.1	
"	"	10 MC	"C" Band	15.6 MC on "D" Band	⑨ then ⑩	⑨ Osc. Pad. ⑩ Ant. Pad.	
"	"	12 MC	"C" Band	12 MC	⑪ then ⑫	⑪ Osc. Trimmer ⑫ Ant. Trimmer	
"	"	16 MC	"D" Band	2.4 MC on "B" Band	⑬ then ⑭	⑬ Osc. Pad. ⑭ Ant. Pad.	
"	"	20 MC	"D" Band	20 MC	⑮ then ⑯	⑮ Osc. Trimmer ⑯ Ant. Trimmer	

NOTE 1: The I.F. adjustments are reached through holes in top of cans on under side of chassis.

NOTE 2: Trimmers 11 and 12 set to minimum capacity temporarily; peak 9 and 10. Then peak 11 and 12. Check dial calibration at 9, 10, and 12 MC.

NOTE 3: Trimmers 15 and 16 set to minimum capacity temporarily; peak 13 and 14. Then peak 15 and 16. Check dial calibration at 15, 16, 18, and 20 MC.



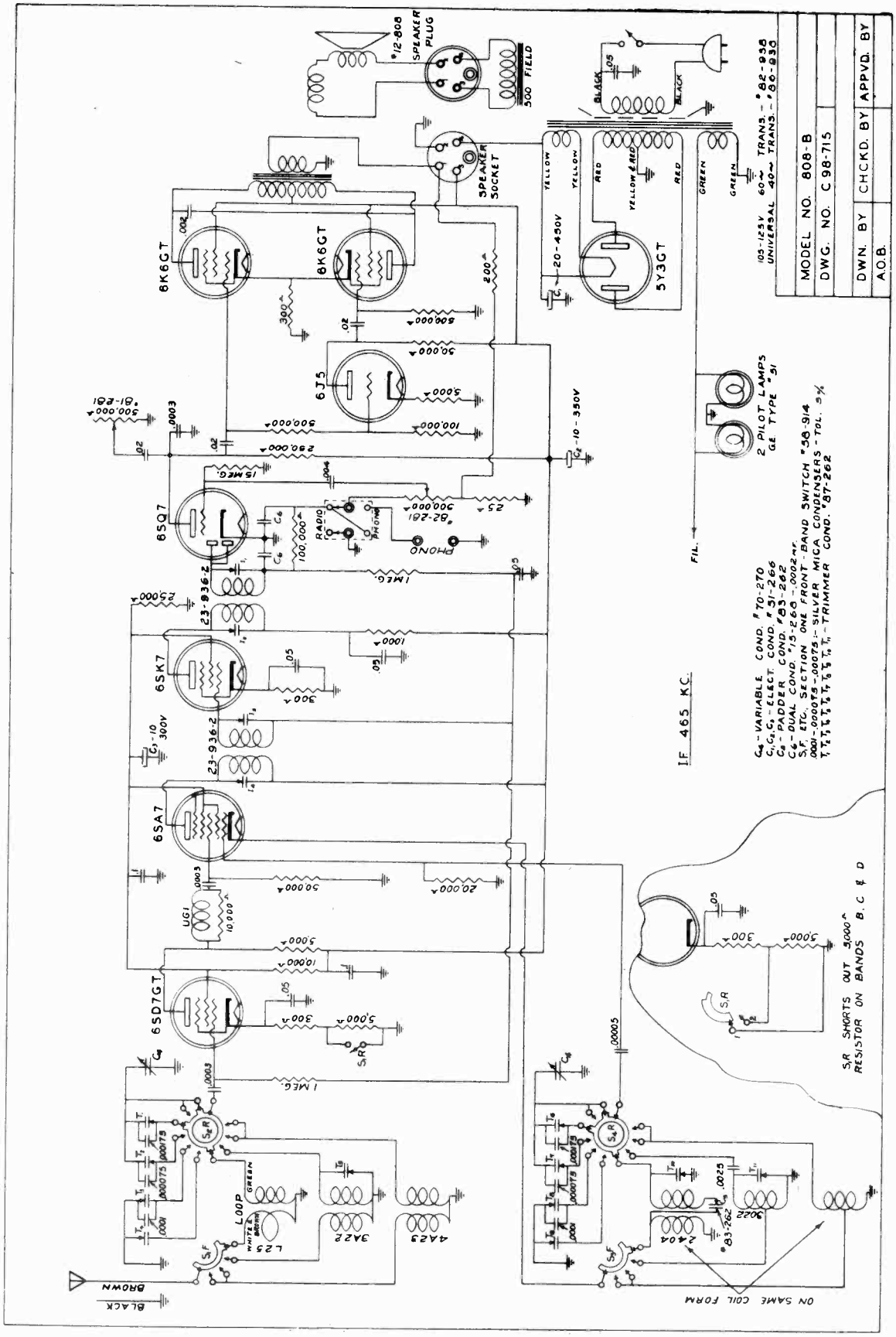


CONDENSER GANG IN MAXIMUM POSITION

LAYOUT SHOWING HOW TO ASSEMBLE DIAL CABLE ON MODEL 806-808 ETC, VERTICAL MOUNTING.

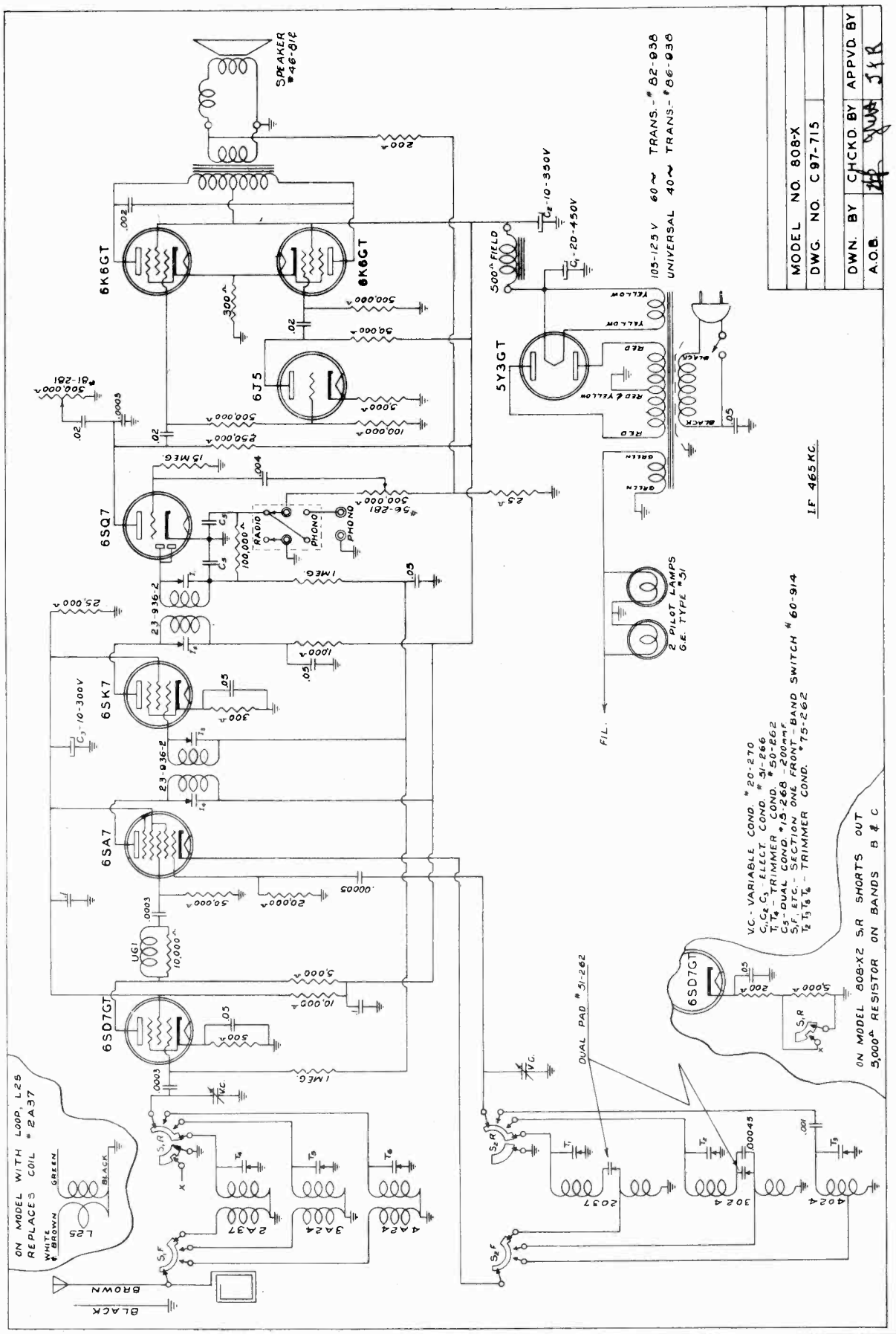
MODEL 808 Spread Band

HOWARD RADIO CO.



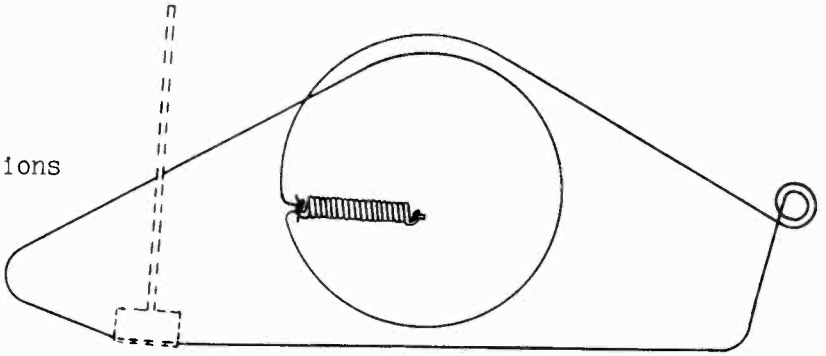
MODEL 808 Series X

HOWARD RADIO CO.



THIS SHEET INCLUDES:

- Socket voltage chart (also indicates tube function).
- Alignment chart with pictorials showing trimmer and tube locations
- Replacement Parts list with list prices.
- Schematic diagram.



SOCKET VOLTAGE READINGS FOR MODEL 808-X
*Socket Terminal Number

Voltage taken from ground with voltage at 117 Volts AC. Drop across speaker field 50V. Use at least a 1000 Ohm per Volt Meter. High voltage reading off rectifier 310 V. DC.

TUBE	FUNCTION	CATH.	*	SG.	*	PLATE.	*	. .	*
6SD7GT	R.F.	2.5	5	110	6	250	8		
6SA7	Converter		6	110	4	260	3		
6SK7	I.F.	2	5	110	6	255	8		
6SQ7	Det.					85	6		

TUBE	FUNCTION	CATH.	*	SG.	*	PLATE.	*	. .	*
6J5	Inverter	8	8		*	175	3		
6K6GT	Output	19	8	260	4	252	3		
6K6GT	Output	19	8	260	4	252	3		
5Y3GT	Rectifier								

Condenser gang in maximum position.

Layout showing how to assemble dial cable on model 808-X-A horizontal mounting.

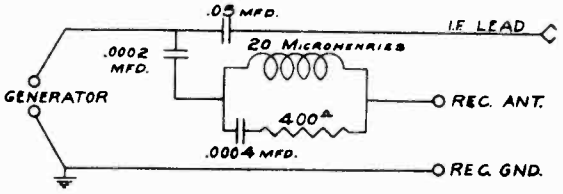
MODEL 808 SERIES X

HOWARD RADIO CO.

ALIGNMENT PROCEDURE FOR 808-X SERIES

Before starting alignment see that the tuning hand falls exactly on the last line above 550 when the condenser is at full capacity.

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

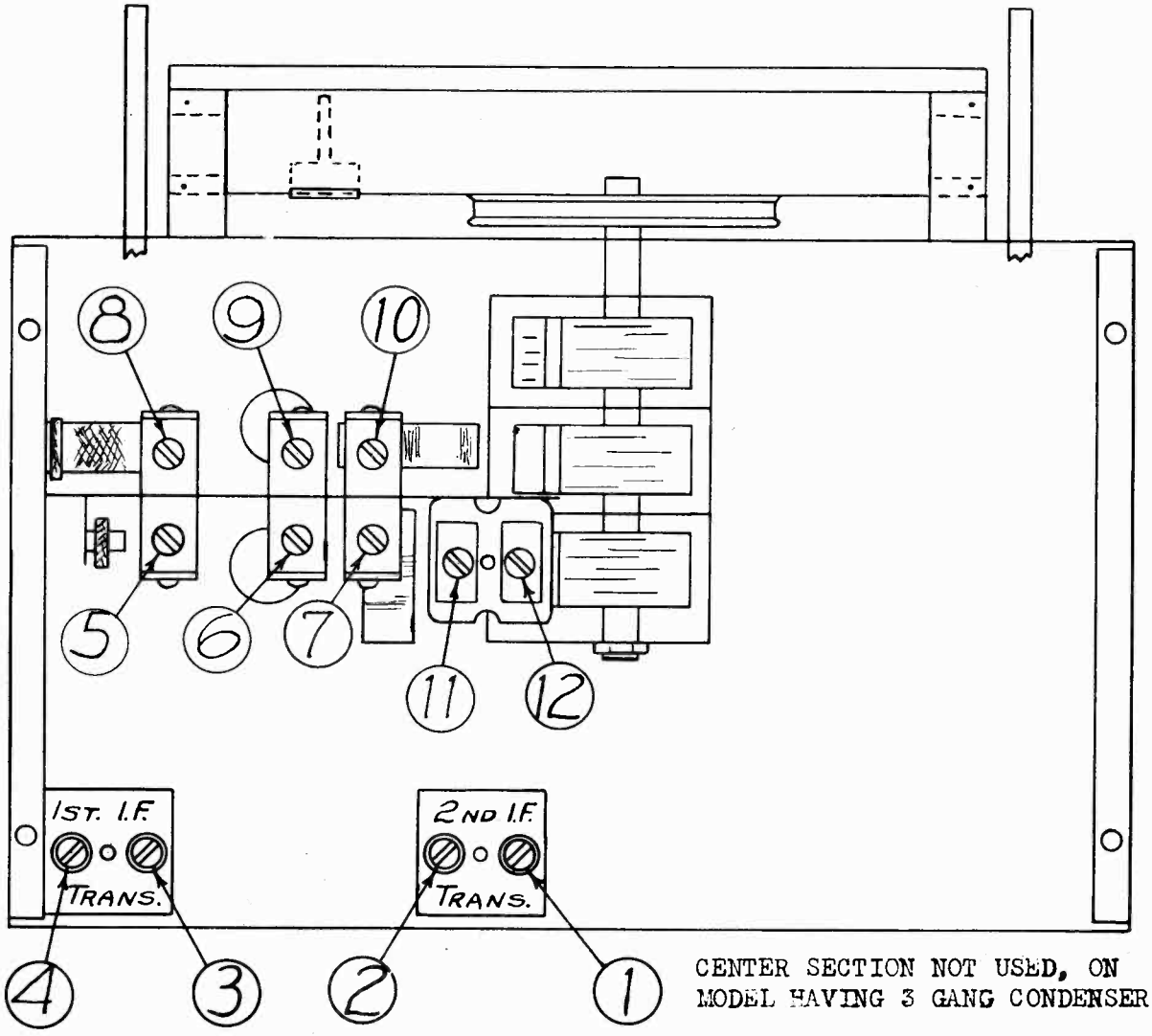


Note 1: The IF adjustments are reached through holes in top of cans on underside of chassis.

Note 2: Peak for greatest deflection of output meter

HOWARD RADIO CO.

DUMMY ANTENNA	SIG;GEN. CONNECTION TO	GEN. FREQ.	BAND SW. POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION	SEE NOTE
.05 Mfd.	Grid of 6SA7	465 KC	A	Off Station	See Pictorial ①②③④	I. F. Peak to Max. Output	1
400 Ohm Resistor	Brown Lead	1400 KC	A	1400 KC	See Pictorial ⑤ then ⑧	BC Osc. and Ant.	2
"	"	600 KC	A	600 KC	See Pictorial ⑪ Rock Dial	BC Osc. Pad.	2
"	"	6 MC	B	6 MC	See Pictorial ⑦ then ⑩	Pol. Band Osc. & Ant. Check Image at 5.1	2
"	"	3 MC	B	3 MC	See Pictorial ⑫ Rock Dial	Pol. Band. Osc. Pad	2
"	"	21 MC	C	21 MC	See Pictorial ⑥ then ⑨	SW Osc. and Ant. Check Image at 20.1	2



CENTER SECTION NOT USED, ON MODEL HAVING 3 GANG CONDENSER

GENERAL SPECIFICATIONS

8 Tube, Three Band, Untuned R. F. Stage, Built-in Phono Switch, Treble Control, Inverse Feed-Back, 6 Ohm Voice Coil, 500 Ohm Field. Power Consumption, 80 Watts, Alternating Current Only.

MODEL 14 ACB

HOWARD RADIO CO.

TUNING RANGES = 540 to 1700 KC		BATTERY OUTPUT = Max. = 300 MW. UPO = 260 MW.
I. F. = 465 KC	TYPE = Conventional	POWER OUTPUT - (MAX.) = 500 MW. UPO = 300 MW.

CONTROLS - Tuning, Volume with Power Switch, Line cord plugs in back of chassis to close circuit for battery operation.

TUNING SYSTEM = Conventional string drive, airplane type dial.

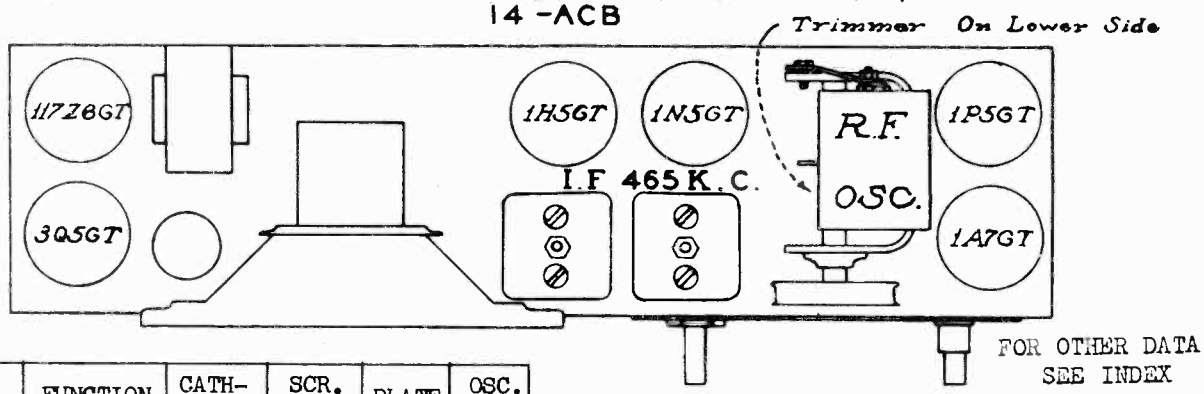
SPEAKER = Permanent Magnet	SIZE = 5"	V.C.IMP.(400CPS) = 3 OHMS	FIELD =

REPLACEMENT PARTS LIST

Part No.	DESCRIPTION
	CHOKE
24-212	"B" filter
	CONTROLS
70-281	Volume
	CONDENSERS
61-270	Tuning
50-262	Single trimmer
47-266	Filter,20-30 mfd. 150,150 V.
48-266	Tubular Electrolytic, 50 mfd. 25 V.
	COIL ASSEMBLIES
L-20	Ant. Loop
2029	Osc. Coil 1700-540 KC.
2G29	R.F. Coil 1700-540 KC.
22-936	1st. I.F. Assembly Complete
23-936	Last I.F. Assembly Complete
	CABINET
77-188	Portable
	DIAL & CONTROL PARTS
130-310	Calibrated Dial Plate
1-288	Drive string
20-427	Dial Window
39-829	Spring for drive cord tension

Part No.	DESCRIPTION
	DIAL & CONTROL PARTS
35-448	Tuning hand
42-720	Shaft - Tuning
	GRILL WORK
9-655	Speaker Screen
	KNOBS
49-490	Tuning Hand Control
	LINE CORDS
1-290	Standard
	RESISTORS
5-335	Candohm Type, 50 Ohm
	SOCKETS, JACKS, CONNECTORS
23-771	Tube sockets (Octal moulded)
22-602	Plug - 2 prong for "A" battery
17-602	Plug - 3 prong for "B" battery
	SPEAKERS (Specify Manufacturer)
P9-805	Table Model Speaker
P9-805T	Transformer for above
P9-805C	Cone for above
	SWITCHES
29-917	Change-Over AC-DC Battery
7-758	TUBE SHIELDS
	MISCELLANEOUS
6-167	Rubber Drive Washers

14 -ACB



FOR OTHER DATA SEE INDEX

TUBE	FUNCTION	CATH-ODE	SCR. GRID	PLATE	OSC. PLATE
1P5GT	RF	--	98	98	
1A7GT	Mixer	—	54	98	98
1N5GT	IF	—	98	98	
1H5GT	2nd Det.	--		30	
3Q5GT	Output	—	98	94	

High Voltage off Rect. - 114 V.
Drop across choke - 16 V.
Voltages taken from ground with line voltage of 177 V. AC.

"B" drain at 90 Volts - .0125 A.
"A" drain at 9 Volts - .050 A.

* * * * * * * * * *

All of the tube filaments are connected in series with the exception of the rectifier which has a 117 Volt filament.

A filament current equalizing system is employed using a 2,000 Ohm resistor from the power tube filament to ground and a 600 Ohm in the mixer tube filament circuit. See diagram.

The alignment of this receiver is conventional, the Intermediate Frequency being 465 KC.

The Loop and Oscillator circuits are aligned at 1400 KC. If necessary, the condenser cut plates can be varied at the lower frequencies.

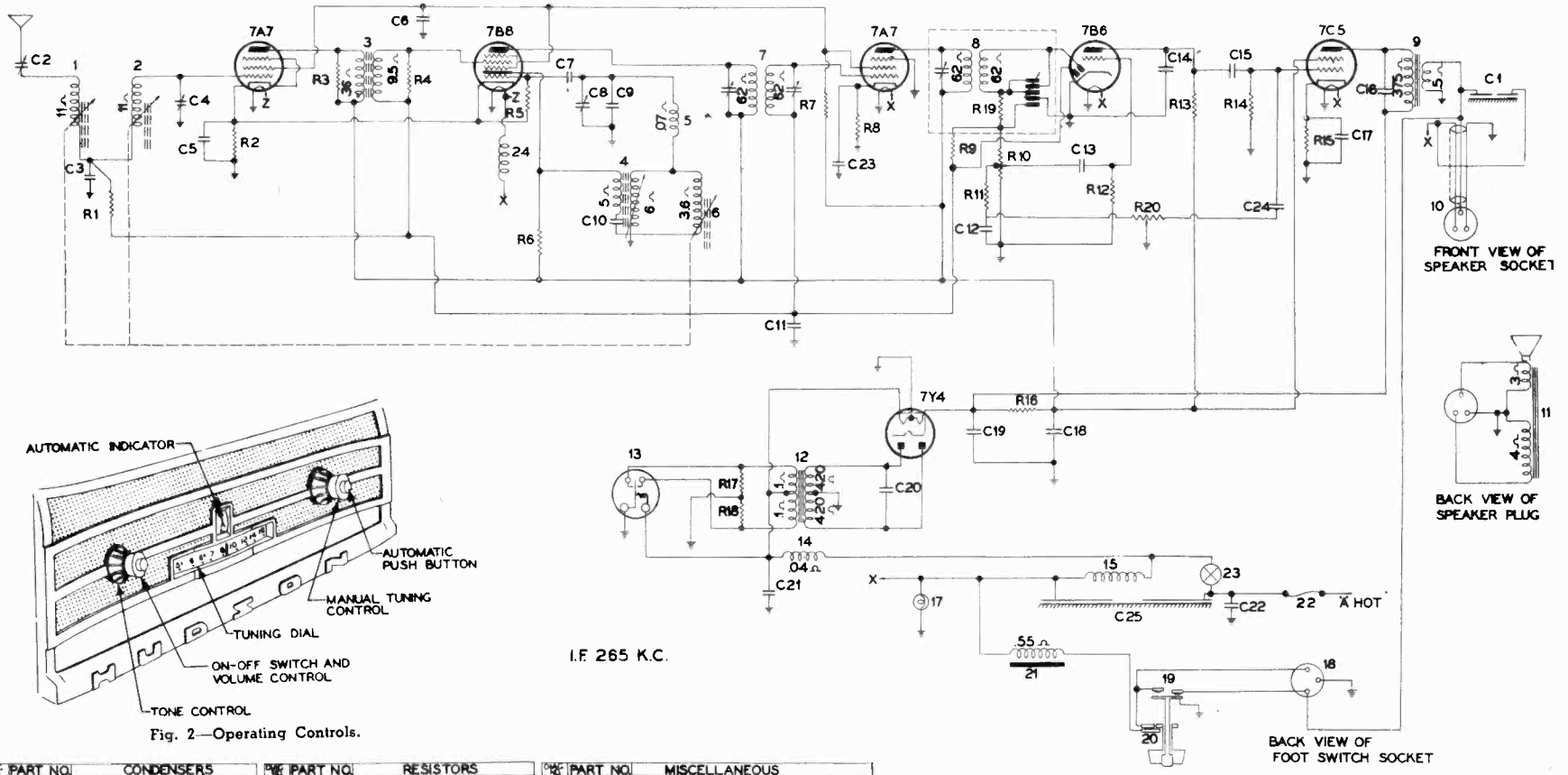


Fig. 2—Operating Controls.

SYM	PART NO.	CONDENSERS
C1	22-1076	LOW REACTOR
C2	22-1249	ANT TRIM 8 PLATE 250 MMF
C3	22-1244	.004 MFD ± 10% MICA
C4	22-1236	R.F. TRIM 3 PLATE 50 MMF
C5	22-190	.1 MFD +50% -10% 200V
C6	22-170	.1 MFD +50% -10% 400V
C7	22-182	100 MMF +50-20 MICA
C8	22-1248	350 MMF ±2½ COMPENSATOR
C9	22-182	100 MMF +50-20 MICA
C10	22-250	.05 MFD +50 -10 200V
C11	22-908	.005 MFD ± 20% 200V
C12	22-908	.005 MFD ± 20% 200V
C13	22-182	250 MMF +50 -10% MICA
C14	22-170	.01 MFD +50 -10% 600V
C15	22-838	.005 MFD +50 -10 600V
C16		20 MFD 25 WV
C17	22-1233	10 MFD 300 WV
C18		20 MFD 350 WV
C19	22-1247	.008 MFD -20 -10% 1600V
C20	22-1238	.5 MFD +50 -10% 120V
C21	22-908	.5 MFD +50 -10% 120V
C22	22-250	.05 MFD +50 -10% 200V
C23	22-1075	.007 MFD ± 20% 200V
C24	22-1076	LOW REACTOR (DUAL 250 MMFD)
C25		

SYM	PART NO.	RESISTORS
R1	63-596	330,000 OHMS 1/4 W ± 20%
R2	63-265	220 OHMS 1/4 W ± 10%
R3	63-645	27,000 OHMS 1/4 W ± 10%
R4	63-646	33,000 OHMS 1/4 W ± 10%
R5	63-564	68,000 OHMS 1/4 W ± 20%
R6	63-607	15,000 OHMS 1/2 W ± 20%
R7	63-957	33,000 OHMS 1 W ± 10%
R8	63-294	100 OHMS 1/4 W ± 10%
R9	63-271	.1 MEG 1/4 W ± 20%
R10	63-1248	250000 VC TAP AT 75,000 ^
R11	63-783	22,000 OHMS 1/4 W ± 10%
R12	63-976	.15 MEG 1/4 W ± 20%
R13	63-596	330000 OHMS 1/4 W ± 20%
R14	63-596	330000 OHMS 1/4 W ± 20%
R15	63-941	390 OHMS 1 W ± 10%
R16	63-968	1800 OHMS 2 W ± 10%
R17	63-1197	82 OHMS 1/2 W ± 20%
R18	63-1197	82 OHMS 1/2 W ± 20%
R19	63-712	33,000 OHMS 1/4 W ± 10%
R20	63-1248	1 MEG TONE CONTROL

SYM	PART NO.	MISCELLANEOUS
1	S-10064	ANTENNA COIL
2	S-10084	R.F. GRID COIL
3	S-9762	UNTUNED R.F. TRANSFORMER
4	S-10095	OSC. SHUNT COIL
5	20-242	OSC. SERIES COIL
6	S-10083	OSC. TUNING COIL
7	95-819	1st I.F. TRANSFORMER
8	95-820	DIODE TRANSFORMER
9	95-837	OUTPUT TRANSFORMER
10	52-228	SPEAKER CABLE & SOCKET
11	49-47	SPEAKER & PLUG
12	95-832	VIBRATOR POWER TRANSFORMER
13	190-19	VIBRATOR
14	20-213	HASH CHOKE
15	S-5844	MOTOR NOISE CHOKE
16		
17	100-32	DIAL LIGHT
18	78-406	FOOT SWITCH SOCKET
19	S-10115	SILENCING AND SELECTOR SWITCH
20	S-10115	SAFETY SWITCH-AUTO'M. SET UP
21	S-10127	SOLENOID
22	136-12	FUSE - 20 AMPS
23	63-1248	ON OFF SWITCH ON VOL. CONTROL
24	S-9841	HEATER LINE CHOKE

1942 HUDSON AUTOMOBILE RECEIVER

MODEL DB-42 PART No. HA-204800

HUDSON MOTOR CAR CO.

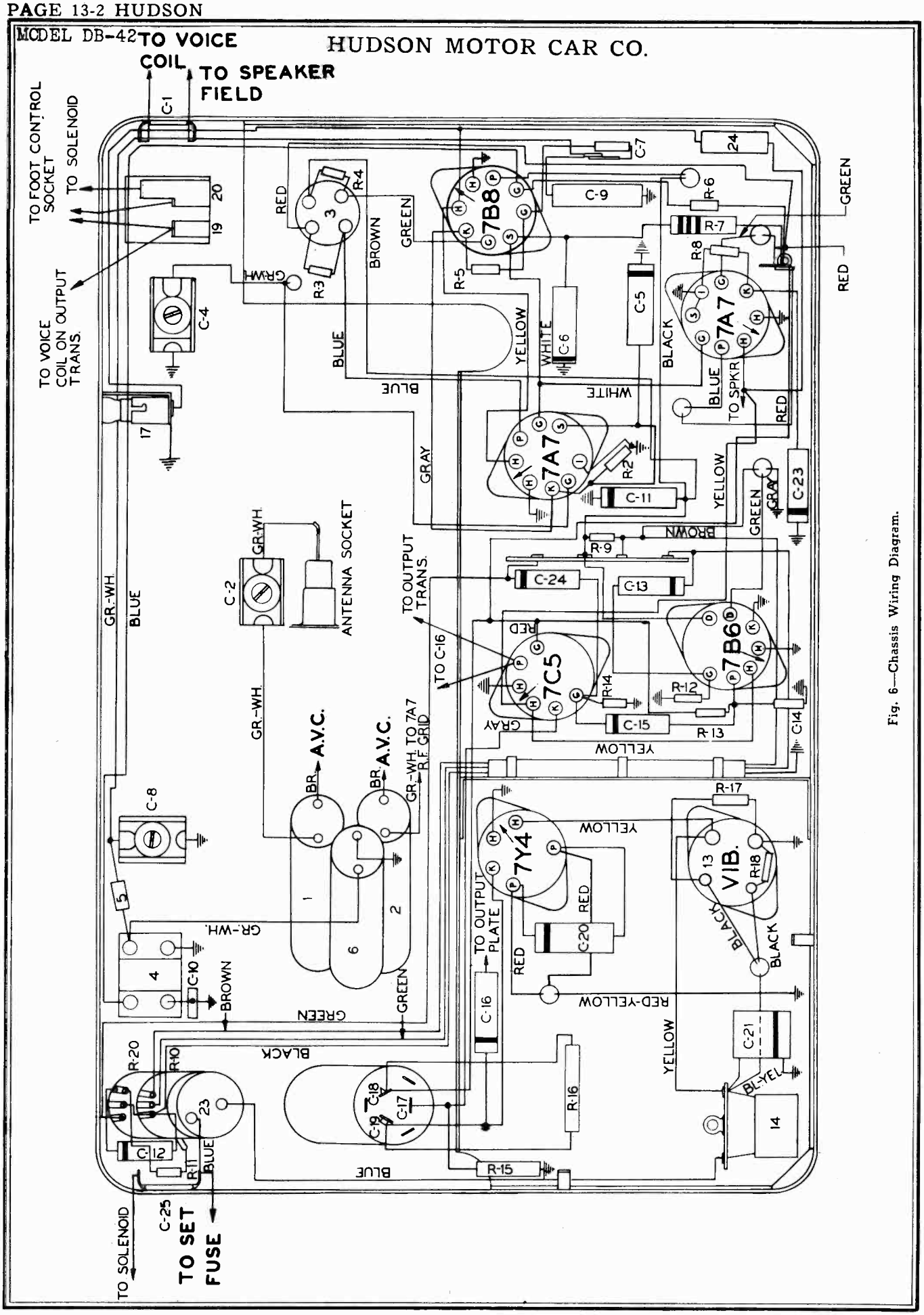


Fig. 6—Chassis Wiring Diagram.

HUDSON MOTOR CAR CO.

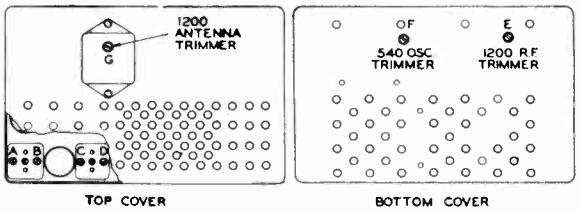


Fig. 4—Trimmer Positions.

ALIGNMENT

CAUTION—Care should be taken while making all adjustments on the receiver to have the volume control turned full on. The signal fed to the receiver through a 30 mmfd. series and 30 mmfd. shunt dummy to the antenna socket of the receiver. The intensity of the signal should be reduced only at the signal generator. Let receiver warm up a while before making adjustments.

I. F.

1. Set signal generator to 265 K.C.
2. Place set in manual tuning position and set dial pointer at 600 K.C.
3. Adjust screws D, C, B and A in sequence for maximum response on the output meter.

R. F.

1. Set signal generator to 540 K.C.
2. Place set in manual tuning position and tune set to the extremity of the dial scale at 540 K.C.
3. Adjust trimmer F, Fig. 4, for maximum response.
4. Set signal generator to 1200 K.C.
5. Tune set to 1200 K.C.
6. Adjust E, Fig. 4, for maximum response.

WARNING: The following adjustments are to be made only if a core or coil is replaced.

OSCILLATOR CORE OR COIL REPLACEMENT ONLY

On all adjustments give set sufficient time to warm up.

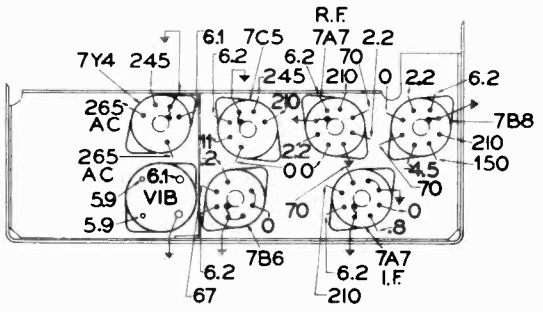
1. Replace coil or core.
2. Set signal generator to 540 K.C.
3. Tune the set to the 540 K.C. end of the dial scale.
4. Adjust core for maximum peak.
5. Back off trimmer F, Fig. 4, to 1/3 of output reading.
6. Repeat operations 4 and 5 until no further gain can be reached by adjusting core.
7. Re-cement core screw with speaker cement.
8. Follow instructions given under general R.F. alignment.

R. F. CORE OR COIL REPLACEMENT ONLY

On all adjustments give set sufficient time to warm up.

1. Replace coil or core.
2. Set the signal generator to 540 K.C.
3. Tune set all the way to low end of 540 K.C. dial scale.
4. Adjust core for maximum response.
5. Back off trimmer (E if R.F. or trimmer G if antenna stage) until output is reduced by approximately one third.
6. Repeat 4 and 5 until no further gain is obtained from core adjustment.
7. Set signal generator to 600 K.C.
8. Tune set to 600 K.C.
9. Adjust trimmer (E if R.F.—G if antenna stage) Fig. 5 for maximum response.
10. Set signal generator to 1400 K.C.
11. Tune set to 1400 K.C.
12. Adjust core for maximum output.
13. Re-cement core screw with speaker cement.
14. Peak set following general instruction given under R.F., alignment.

SOCKET VOLTAGES AS MEASURED WITH 1000 OHM PER VOLT METER TO CHASSIS, VOLUME CONTROL AT MAXIMUM WITH NO SIGNAL. BATTERY 6.3 VOLTS.



BOTTOM VIEW OF CHASSIS

NORMAL CURRENT CONSUMPTION-7.0 AMP.

MOMENTARY CURRENT CONSUMPTION OF AUTOMATIC-9.0 AMP.

Fig. 5—Socket Voltages.

MODEL DB-42

HUDSON MOTOR CAR CO.

CIRCUIT: 6 Tube Superheterodyne.
TUBE COMPLEMENT: 7A7 R.F., 7B8 Converter, 7A7 I.F., 7B6 Detector, A.V.C., 1st Audio, 7C5 Beam Power Output, 7Y4 Rectifier. Fig. 1.
TUNING RANGE: 540 to 1600 Kilocycles.
AUTOMATIC POSITIONS: 5 plus "Dial."
SPEAKER: 6" Dynamic externally mounted behind instrument panel. Voice coil impedance 3.2 ohms at 400 cycles. Field resistance 4 ohms cold.
TONE CONTROL: Variable with bass, high fidelity and voice positions.
POWER OUTPUT: Maximum 4.5 watts. Undistorted 1.5 watts.
VIBRATOR: Non-synchronous.
POWER RATING: Current drain 7.5 amperes. Fuse—20 amperes.
TUNING RATIO: 15 to 1.
SENSITIVITY: 5 microvolts overall.
I. F. FREQUENCY: 265 K.C.

TUBE LAYOUT

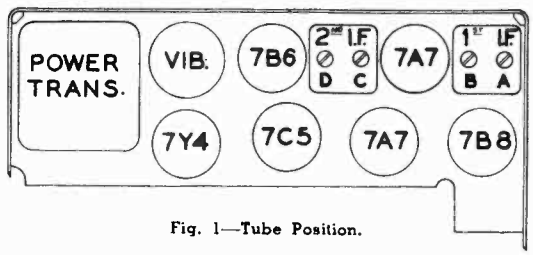


Fig. 1—Tube Position.

Turn receiver on and tune to a weak station near 1200 K.C. (see instruction card.) Adjust antenna trimmer on top of receiver through ash tray opening for maximum volume. Place ash tray back into instrument panel.

SUPPRESSION

Attach condenser, part No. 22-1262 to rear of generator with machine screw and lockwasher provided. Connect condenser lead to generator "A" terminal, Fig. 3-D.

Install suppressor in center hole of distributor cap being sure to make good contact. Place distributor lead in top of suppressor Fig. 3-E.

Mount ignition lock condenser part No. 22-1263 under rear left nut holding ventilator handle guide assembly. Connect the other lead to the "AM" terminal of the ignition lock Fig. 3.

Attach condenser part No. 22-1260 to the upper rear cap screw on the engine water manifold plate and attach the condenser lead to the heat indicator terminal, Fig. 3-F.

Install bonnet grounding spring under hood lacing 23½" to left of center line of car as shown, using no. 8 sheet metal screw Fig. 3-G.

Remove tape from special hole in dash and install flat ground strap from rear cylinder head stud to dash. Fasten it to dash with sheet metal screw and shake proof washer. The ground strap is mounted under the regular stud nut on the eight cylinder cars. The ground strap is placed on top of the regular stud nut on the six cylinder cars and held in place by special nut furnished in kit. Fig. 3-F.

1942 OPERATING INSTRUCTIONS

This radio incorporates the new Hudson Automatic Touch Tuning with Foot Control.

1. TO TURN RADIO ON—Rotate left control knob in a clockwise direction and allow receiver to reach operating temperature. (Approximately 60 seconds.)
2. Press the Automatic Push Button several times or until the word DIAL appears on the Automatic Indicator.
3. MANUAL TUNING — Turn right hand control knob to tune in stations on the tuning dial. Be sure to tune to point where tone is deepest.
4. TONE CONTROL — The tone control knob is located behind the volume control knob. Turn in either direction to most pleasing tone position.
5. VOLUME — Adjust volume control knob to desired level.

AUTOMATIC TUNING

If not previously set up for Automatic operation by the dealer, proceed as follows:

1. Press the Automatic button in the center of the right hand knob, until Number 1 position appears on the Automatic Indicator.
2. Pull the tuning knob OUT to engage the Automatic mechanism.
3. Select the station desired and tune to its corresponding frequency by rotating the tuning knob. Tune very carefully for deepest and clearest reception.
4. Push the tuning knob IN to its original position. Automatic push button and Foot Control will not operate if tuning knob is left in the OUT position.
5. Follow above procedure in setting automatic positions (i.e. 2, 3, 4 and 5.)

HUDSON MOTOR CAR CO.

When the five automatic positions have been adjusted to the five desired stations as instructed, it is only necessary to press the Automatic button to return to Dial tuning, or any one of the stations selected on the Automatic.

FOOT CONTROL

The foot control button provides a convenient means of automatically tuning the receiver from the floor board, thus avoiding the necessity of removing the hands from the wheel, or the eyes from the road. Its function is identical to that of the automatic push button in the center of the right hand knob, and therefore requires no set-up or other adjustment.

Press the foot control button all the way down to change stations.

Press lightly to silence radio during conversation.

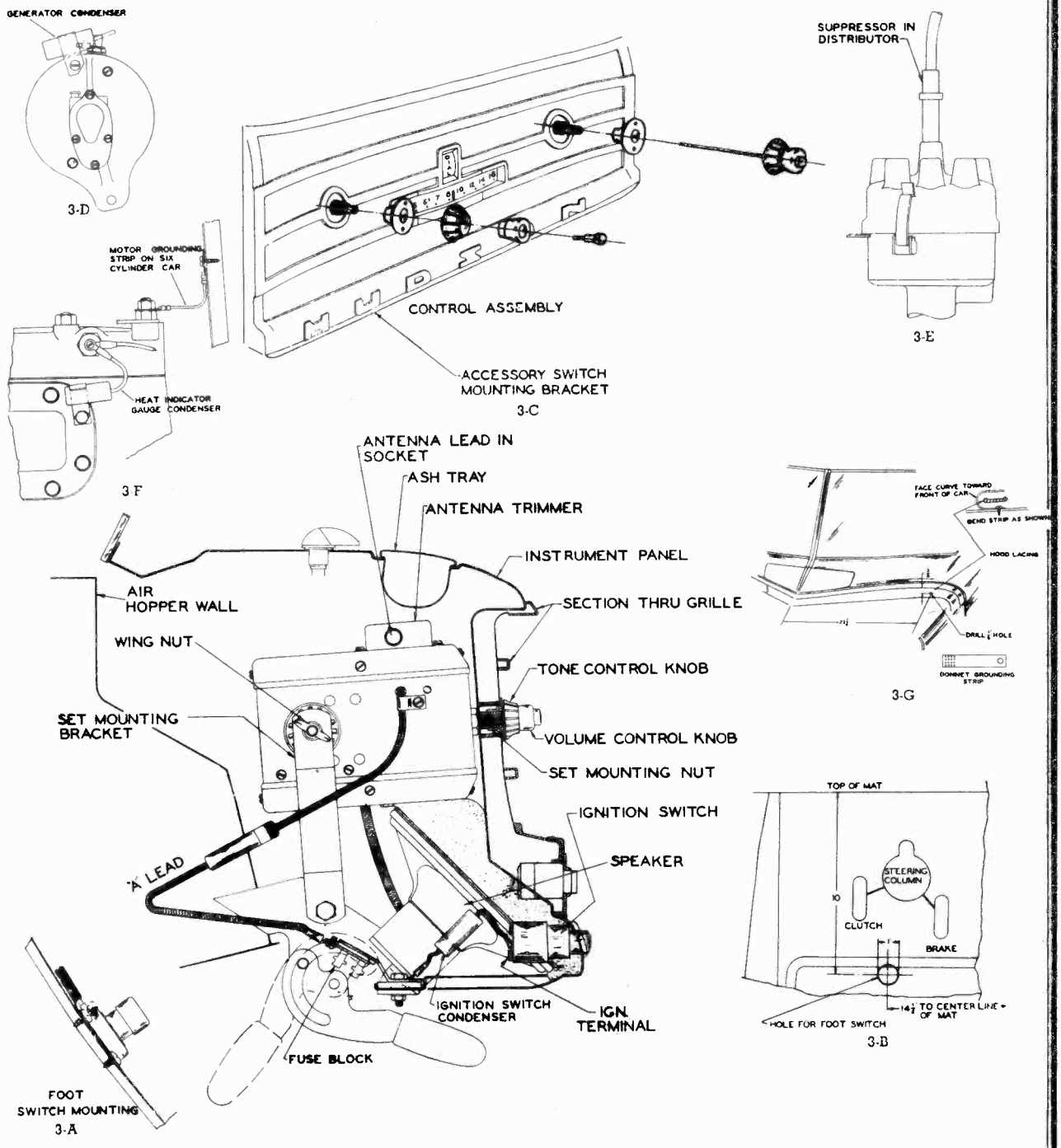


Fig. 3—Mounting Details and Connections.