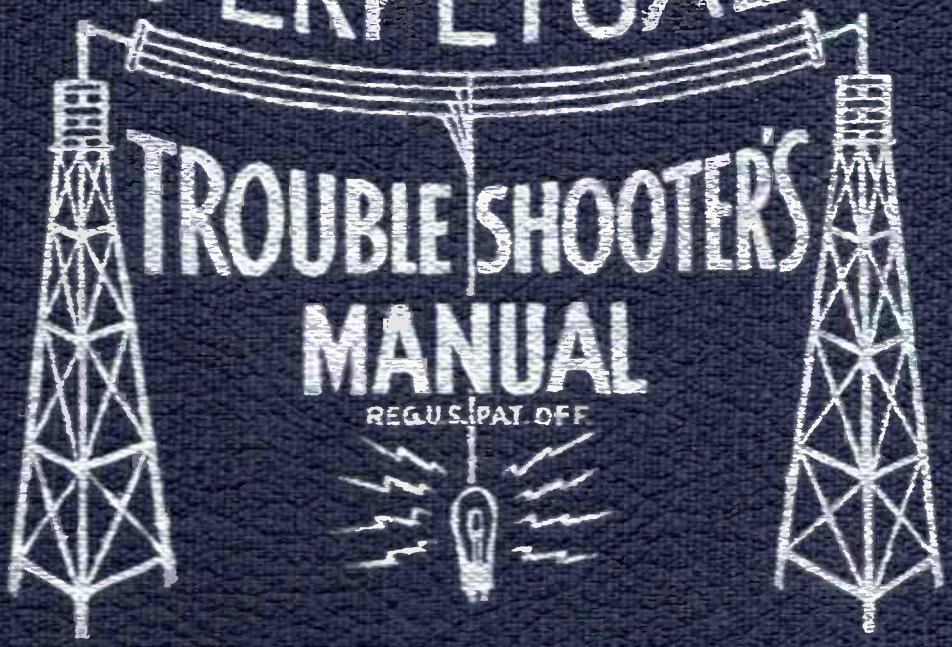
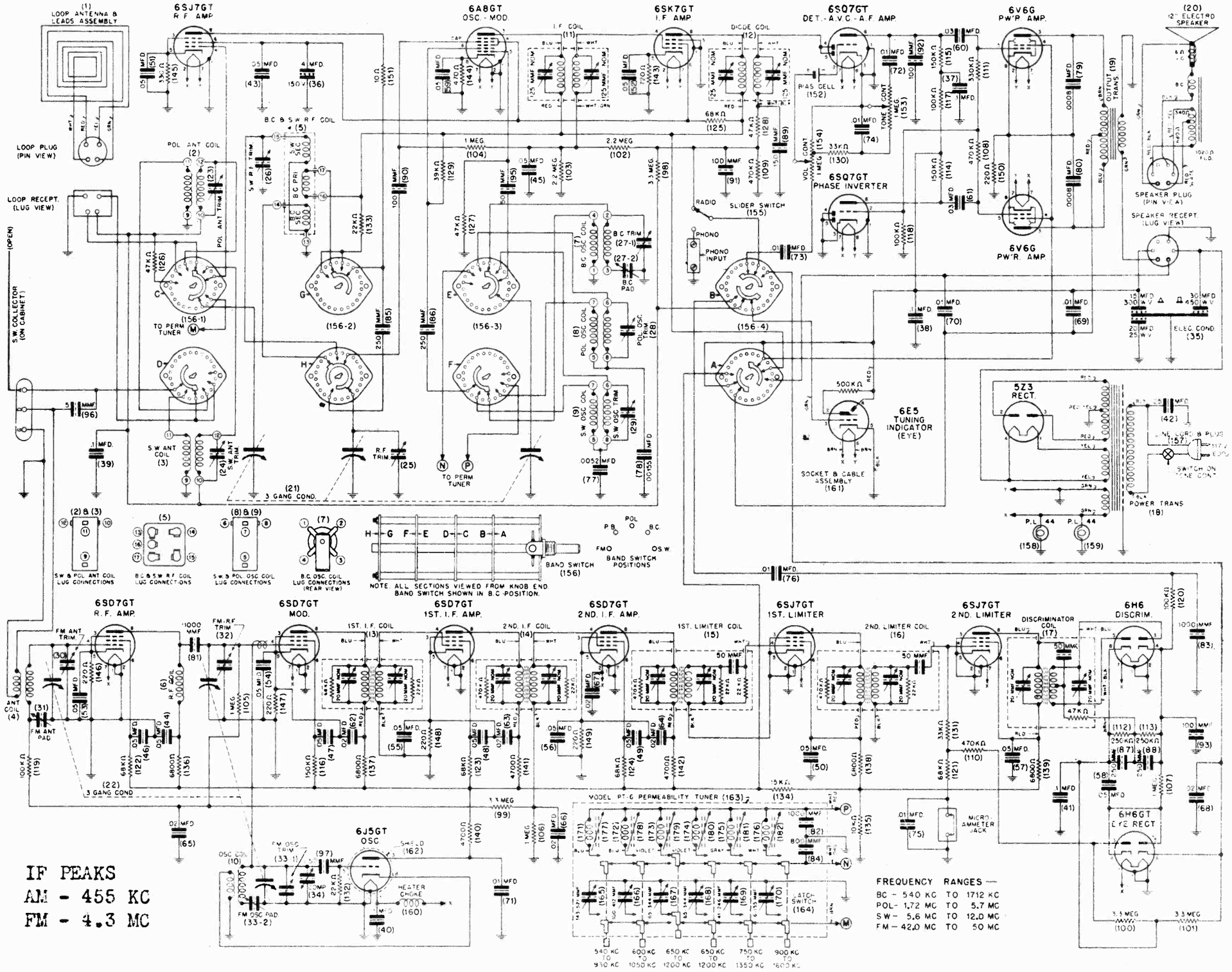
VOLUME XIV

PERPETUAL TROUBLE SHOOTER'S MANUAL



JOHN F. RIDER

GALVIN MFG. CO.



MODEL 17FM41

GALVIN MFG. CO.

ALIGNMENT CHART

F.M. SECTION

Operations in Order	Gang Set at	Dummy Antenna	Generator Connected to	Tunetrimmer Number	Generator Modulated 400 C.P.S.	Generator Unmodulated	Generator Set at	Read Microammeter	Read Output Voltmeter	Band Switch Set at	See Note
1	Min.	1000 M.M.F. With 10,000 Ohms Shunted across output terminals of signal generator.	Grid V-2	1 to Min.	X		4.3 M.C.		X	F.M.	A
2	Min.		Grid V-2	2 to Max.	X		4.3 M.C.		X	F.M.	
3	Min.		Grid V-2	1 to Valley of 2-Peaks	X		4.3 M.C.		X	F.M.	B
4	Min.		Grid V-3	3 to Min.		X	4.3 M.C.	X		F.M.	A
5	Min.		Grid V-3	4 to Max.		X	4.3 M.C.	X		F.M.	
6	Min.		Grid V-3	3 to Max.		X	4.3 M.C.	X		F.M.	
7	Min.		Grid V-4	5 to Min.		X	4.3 M.C.	X		F.M.	A
8	Min.		Grid V-4	6 to Max.		X	4.3 M.C.	X		F.M.	
9	Min.		Grid V-4	5 to Max.		X	4.3 M.C.	X		F.M.	
10	Min.		Grid V-5	7 to Min.		X	4.3 M.C.	X		F.M.	A
11	Min.		Grid V-5	8 to Max.		X	4.3 M.C.	X		F.M.	
12	Min.		Grid V-5	7 to Max.		X	4.3 M.C.	X		F.M.	
13	Min.		Grid V-6	9 to Min.		X	4.3 M.C.	X		F.M.	A
14	Min.		Grid V-6	10 to Max.		X	4.3 M.C.	X		F.M.	
15	Min.		Grid V-6	9 to Max.		X	4.3 M.C.	X		F.M.	
16	Min.	100 ohms	A & G	11 to Max.		X	50 M.C.	X		F.M.	C
17	48 M.C.	100 ohms	A & G	12 to Max.		X	48 M.C.	X		F.M.	C
18	48 M.C.	100 ohms	A & G	13 to Max.		X	48 M.C.	X		F.M.	C
19	42 M.C.	100 ohms	A & G	14 to Max.		X	42 M.C.	X		F.M.	C

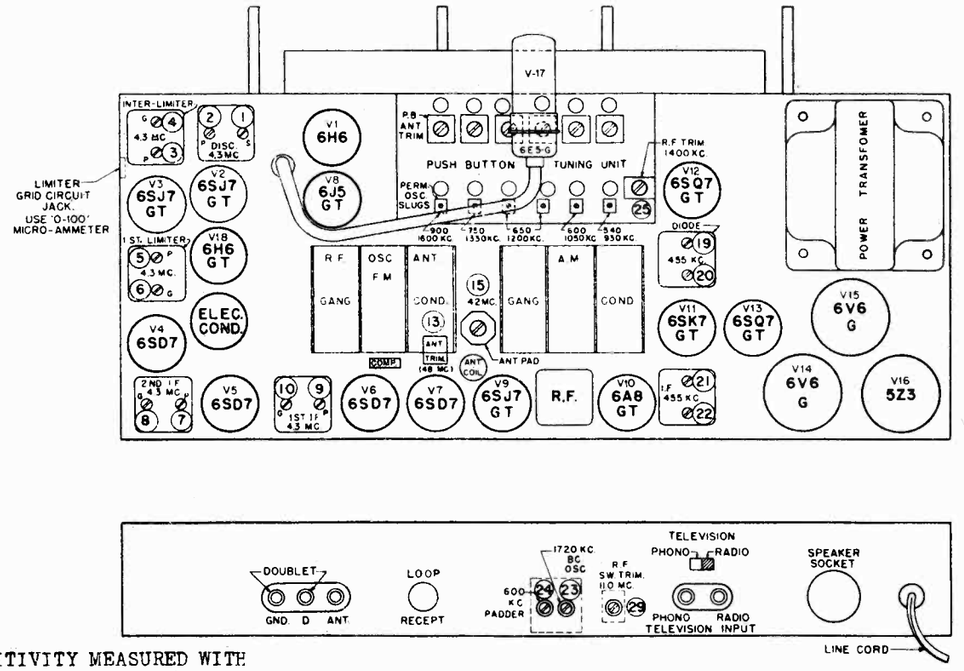
A.M. SECTION

Operations in Order	Gang Set at	Dummy Antenna	Generator Connected to	Tune Trimmer Number	Generator Modulated 400 C.P.S.	Generator Unmodulated	Generator Set at	Read Microammeter	Read Output Voltmeter	Band Switch Set at	See Note
20	Min	1 Mfd.	V-10 Grid	19-20 21-22	X		455 K.C.		X	B.C.	
21	1720 K.C.	1 Mfd.	V-9 Grid	23	X		1720 K.C.		X	B.C.	
22	600 K.C.	1 Mfd.	A & G	25	X		600 K.C.		X	B.C.	
23	1400 K.C.	1 Mfd.	V-9 Grid	24	X		1400 K.C.		X	B.C.	
24	5.7 M.C.	400 Ohms.	V-9 Grid	26	X		5.7 M.C.		X	P01	
25	5.5 M.C.	400 Ohms.	A & G	27	X		5.5 M.C.		X	P01	
26	12.2 M.C.	400 Ohms.	V-9 Grid	28	X		12.2 M.C.		X	S.W.	
27	11.0 M.C.	400 Ohms.	A & G	29	X		11.0 M.C.		X	S.W.	
28	11.0 M.C.	400 Ohms.	A & G	30	X		11.0 M.C.		X	S.W.	

NOTE A: Detune by reducing trimmer capacity. Rotate trimmer adjusting screw counterclockwise one turn. NOTE B: Two peaks will be present; tune to the valley between them. NOTE C: If receiver does not cover frequency range, readjust all trimmers bearing Note C.

MODEL 17FM41

GALVIN MFG. CO.

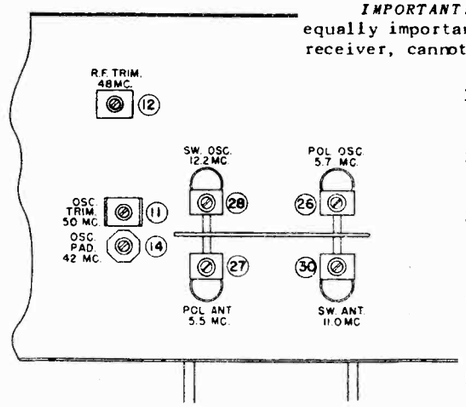


SENSITIVITY MEASURED WITH VOLUME CONTROL SET AT MAXIMUM. OUPUT METER CONNECTED ACROSS VOICE COIL. .38 VOLTS CORRESPONDS WITH .05 WATT.

TRIMMER DETAIL

SENSITIVITY AND STAGE GAIN MEASUREMENTS

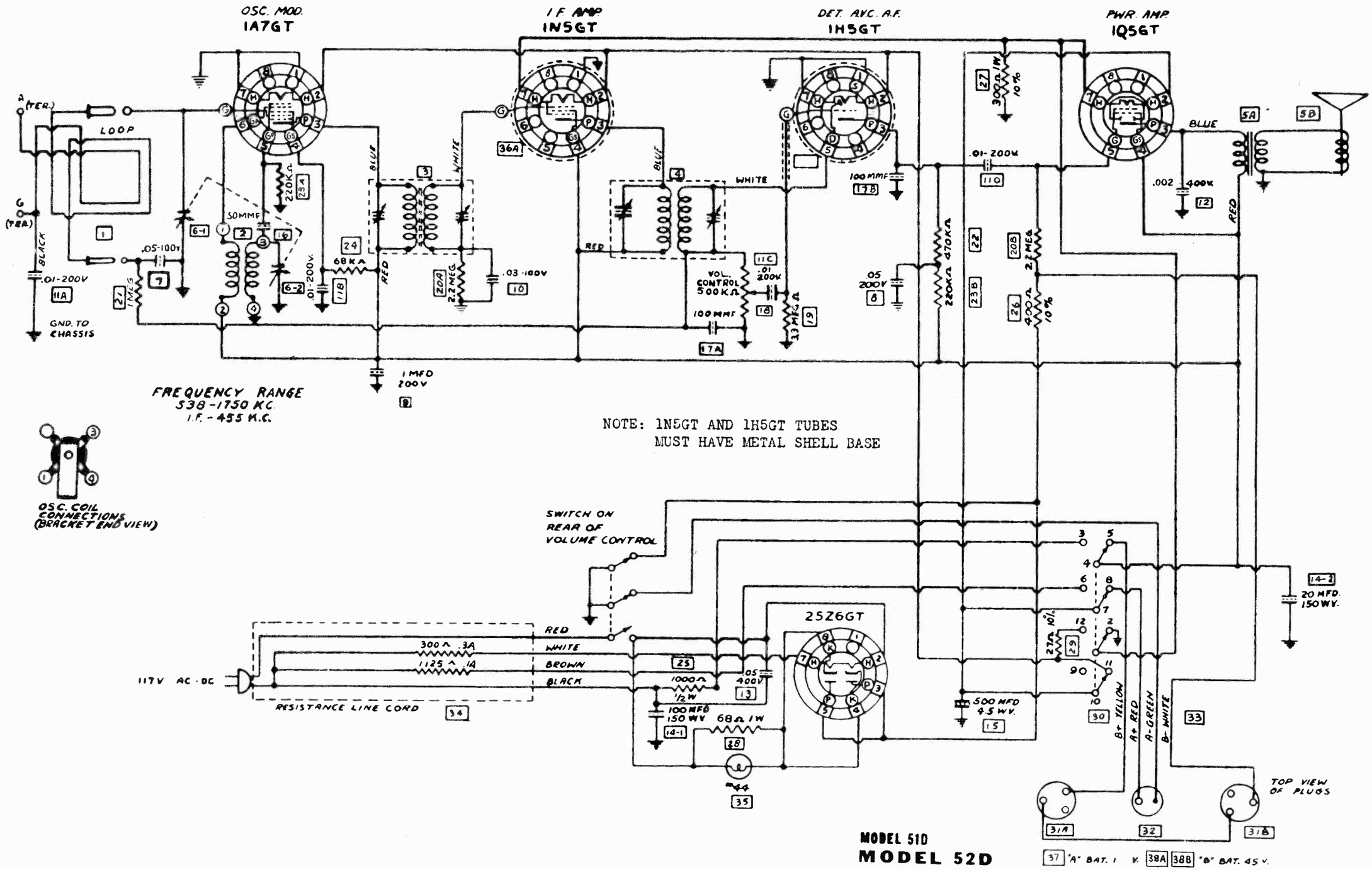
Average Microvolt Input	Generator Set At	Generator Feeder Connected To	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading
3250	455 K.C.	I.F. Grid	.1 Mfd.	.5 Meg.	.38
55	455 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	.38
60	600 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	.38
9	600 K.C.	R.F. Grid	.1 Mfd.	.5 Meg.	.38
8	600 K.C.	Ant.Terminal	200 Mmf.	None	.38



IMPORTANT: The following precautions must be taken; each is equally important, and perfect alignment which is a necessity in an FM receiver, cannot be accomplished unless you follow these instructions:

1. The adjusting screw driver cannot have a metal tip, no matter how small.
2. The chassis should be insulated from ground during alignment.
3. The ground lead of the signal generator must be connected to the cathode return lead of the same tube to which the generator is connected.
4. Clips should not be used on the shielded lead of the generator. It is recommended that the leads be soldered to the tube socket and cathode return.
5. Volume control is set at maximum. Reduce output with signal generator attenuator.

GALVIN MFG. CO.

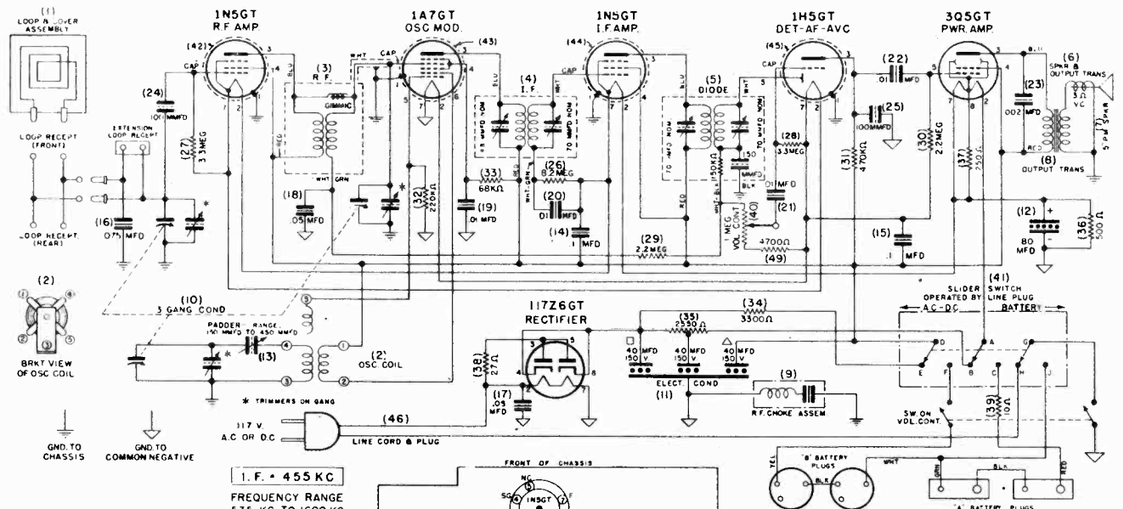


NOTE: 1N5GT AND 1H5GT TUBES
MUST HAVE METAL SHELL BASE

MODEL 51D
MODEL 52D

GALVIN MFG. CO.

MODELS 61L11, 61L12



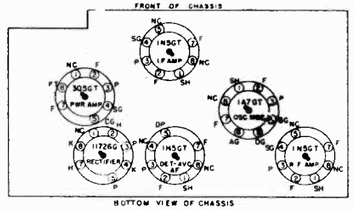
1. F. = 455 KC

FREQUENCY RANGE
535 KC TO 1600 KC

MODELS
61L11
61L12

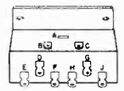
"B" BATTERY
45 VOLT BATTERY (2 REQUIRED) (EVEREADY NO.482 OR EQUIVALENT) (48)

"A" BATTERY
4 1/2 VOLT BATTERY (2 REQUIRED) (EVEREADY NO.746 OR EQUIVALENT) (47)

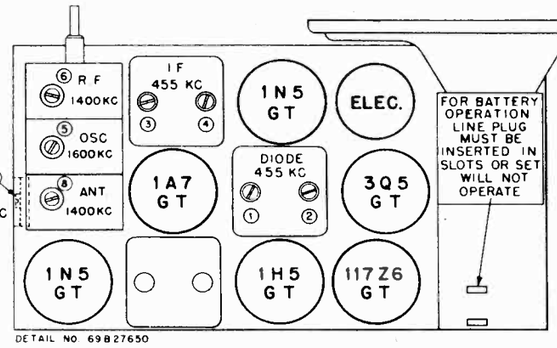


VOLTAGE CHART			
TUBE	PLATE TO B-	SCREEN TO B-	OSC. PLATE TO B-
1N5GT R.F. AMP	85V	85V	—
1A7GT OSC. MOD.	85V	40V	85V
1N5GT I.F. AMP	85V	85V	—
1H5GT DET-AF-AVC	30V	—	—
3Q5 PWR. AMP	80V	85V	—
117Z6G RECT.	LINE VOLTAGE (117V.)	—	125V. AT CATH.

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



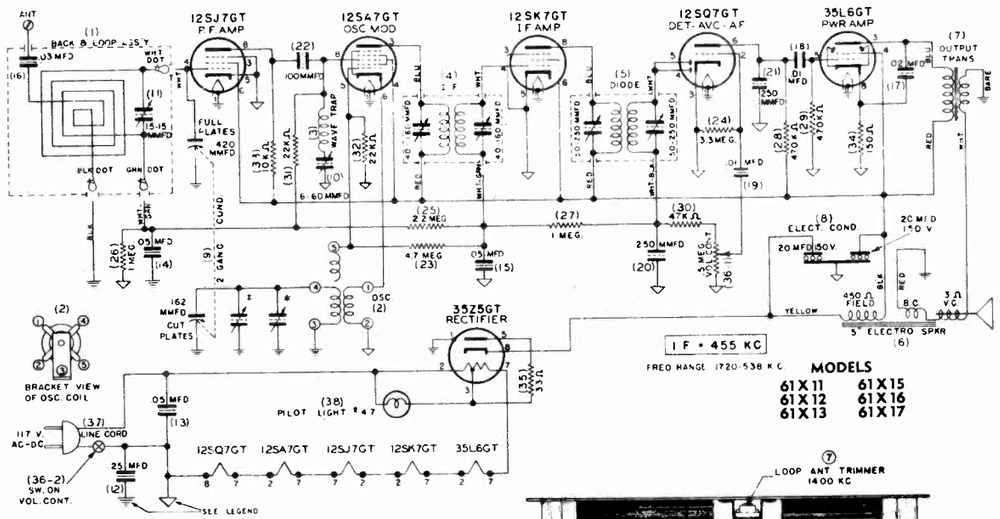
DETAIL NO 69B27650

Models 61L11 & 61L12

1	24X27467	Front Cover & Loop (Model 61L12)
	24X25946	Front Cover & Loop (Model 61L11)
2	24A25936	Oscillator Coil
3	1X25906	R.F. Coil & Shield Assembly
4	1X25904	I.F. Coil & Shield Assembly
5	1X25902	Diode Coil & Shield Assembly
6	50B25891	Speaker & Output Transformer
7	50K25892	Speaker (5" P.M.) Only
8	25K25893	Output Transformer Only
9	1A25935	R.F. Choke Assembly
10	19B25923	Variable Condenser (3 Gang)
11	23A25889	Elect. Condenser (40-20-40 MFD/150V)
12	23A25888	Elect. Condenser & Strap (80 MFD-25V)
13	20A25899	Padder Condenser (Range 150 MMFD To 450 MMFD)
14	8S9806	Tubular Condenser (.1-200V)
15	8S9806	Tubular Condenser (.1-200V)
16	8A25559	Tubular Condenser (.075-200V)
17	8S9816	Tubular Condenser (.05-400V)
18	8S9805	Tubular Condenser (.05-100V)
19	8S9825	Tubular Condenser (.01-200V)
20	8A25939	Tubular Condenser (.01-100V)
21	8S9801	Tubular Condenser (.01-100V)
22	8S9801	Tubular Condenser (.01-100V)
23	8S9824	Tubular Condenser (.002-400V)
24	21B6511	Molded Mica Cond. (100 MMFD) 20%
25	21B6511	Molded Mica Cond. (100 MMFD) 20%
26	6B6310	Carbon Resistor (8.2 Meg-1/3-20) Ins.
27	6B6201	Carbon Resistor (3.3 Meg-1/3-20) Ins.
28	6B6201	Carbon Resistor (3.3 Meg-1/3-20) Ins.
29	6B6202	Carbon Resistor (2.2 Meg-1/3-20) Ins.
30	6B6202	Carbon Resistor (2.2 Meg-1/3-20) Ins.
31	6B6160	Carbon Resistor (470,000-1/3-20) Ins.
32	6B6349	Carbon Resistor (220,000-1/3-10) Ins.
33	6B6256	Carbon Resistor (68,000-1/3-20) Ins.
34	6B6084	Carbon Resistor (3,300-1/3-20) N.I.
35	17A25877	W.W. Resistor (2550-5-5)
36	6B6461	Carbon Resistor (500-1/3-10) Ins.
37	6B6404	Carbon Resistor (250-1/3-10) Ins.
38	6B6241	Carbon Resistor (27-1/2-10) N.I.
39	6B6418	Carbon Resistor (10-1/3-10) Ins.
40	18A25882	Vol. Control & Switch (1 Meg)
41	40A27114	Slider Switch & Bracket
42	26A14760	Tube Shield (Bantam)
43	26A14760	Tube Shield (Bantam)
44	26A14760	Tube Shield (Bantam)
45	26A14760	Tube Shield (Bantam)
46	30B20329	Line Cord & Plug (6 Ft.)
47	48X20379	"A" Battery (4-1/2 Volt) (2 Required) (Eveready #746 or Equivalent)
48	48X16844	"B" Battery (45 Volt) (2 Required) (Eveready #482 or Equivalent)
49	6B6203	Carbon Resistor (4,700-1/3-20) Ins.

MODELS 61X11, 61X12, 61X13
61X15, 61X16, 61X17

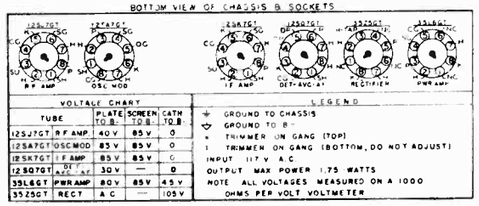
GALVIN MFG. CO.



I F = 455 KC
FREQ. RANGE 1720-538 K.C.

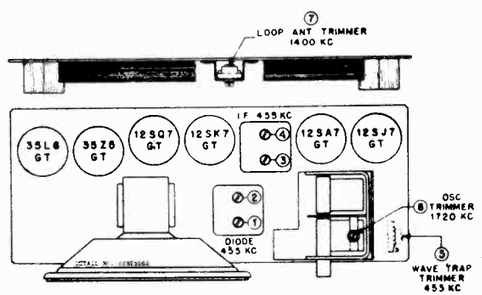
MODELS

61X11	61X15
61X12	61X16
61X13	61X17



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



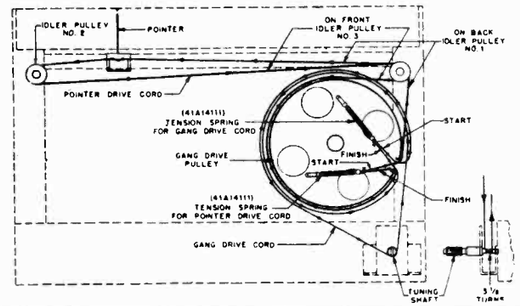
POINTER AND GANG DRIVE CORD RESTRINGING INSTRUCTIONS
GANG DRIVE CORD

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
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

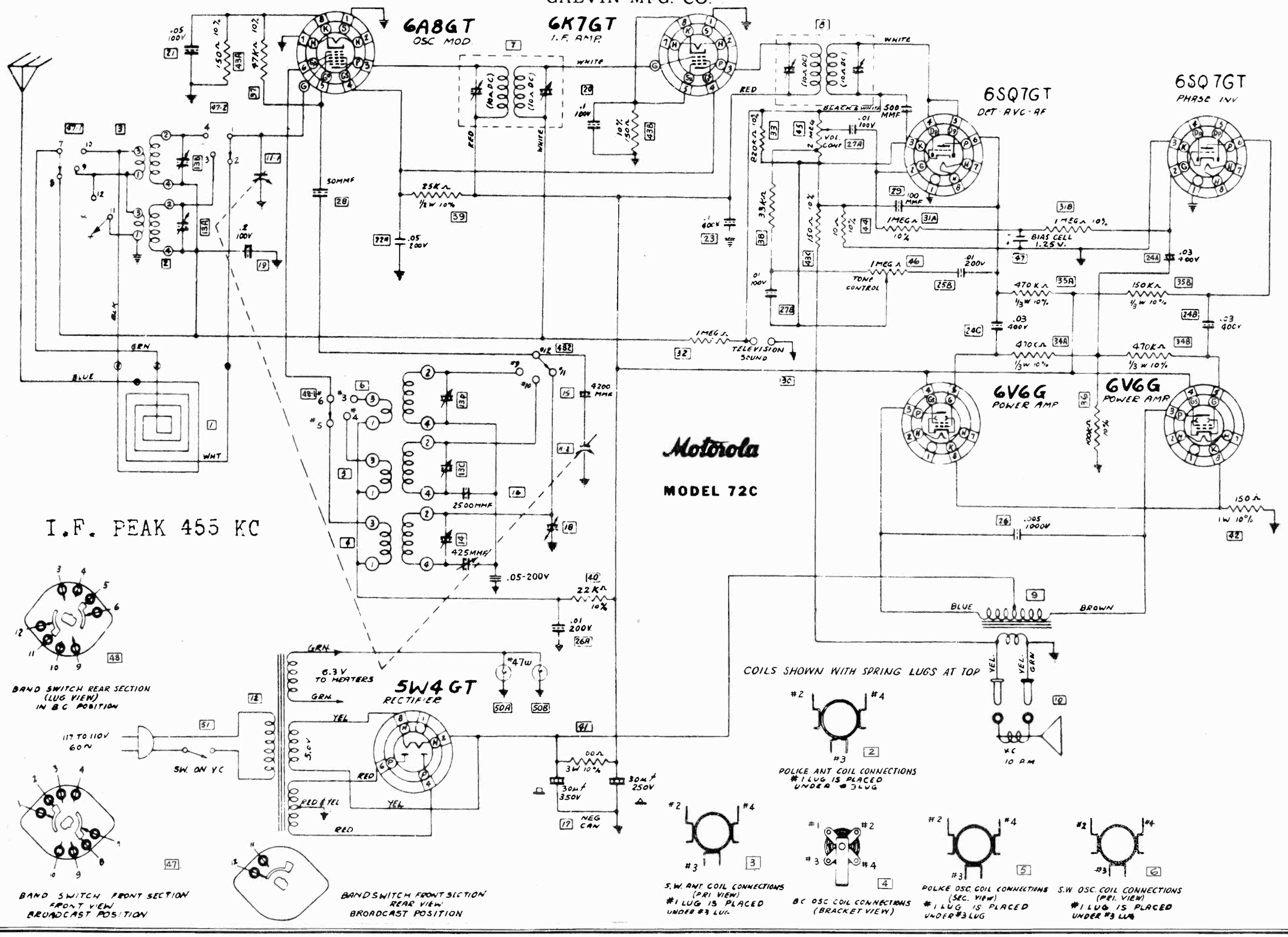
1. Remove the chassis from cabinet.
2. Remove broken string.
3. Turn gang to fully meshed position.
4. Cut a 40" length of 30 lb. silk fish cord.
5. Tie one end of cord to tension spring (Part No.41A14111).
6. Hook other end of spring to gang drive pulley
7. Pass cord through slot in gang drive pulley 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
51 F 12
61 x 11
61 x 12
61 x 13



MODEL 72C

GALVIN MFG. CO.



MODEL 72C

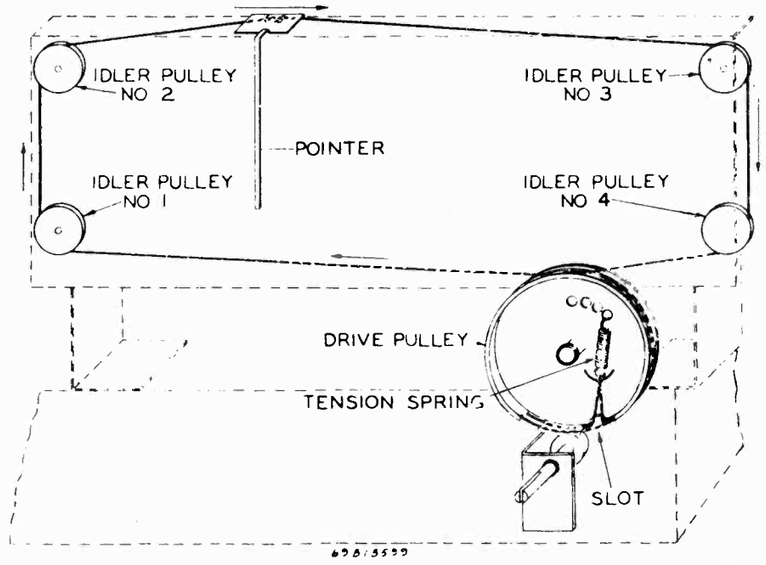
GALVIN MFG. CO.

MODEL 72-C SCHEMATIC DIAGRAM PARTS LIST

Diag. No.	Part No.	Description	Diag. No.	Part No.	Description
1	1B16743	Loop Antenna Assembly	26	8S9808	Tubular Condenser (.005-1000V.)
2	24A16787	Police Ant. Coil ("C" Band)	27	8S9801	Tubular Condenser (.01-100V.)
3	24A16788	S. W. Ant. Coil ("D" Band)	28	21B6503	Molded Mica Cond. (50 mmf) 20%
4	24K17049	B. C. Osc. Coil (Vio-Brn)	29	21B6511	Molded Mica Cond. (100 mmf) 20%
5	24A16789	Police Osc. Coil ("C" Band)	30	21B6500	Molded Mica Cond. (500 mmf) 20%
6	24A16790	S. W. Osc. Coil ("D" Band)	31	6B6252	Carbon Res. (1 meg-1/3-10) N.I.
7	1X17492	I. F. Coil & Shield Assembly	32	6B6071	Carbon Res. (1 meg-1/3-20) N.I.
8	1X17493	Diode Coil & Shield Assembly	33	6B6245	Carbon Res. (820,000-1/3-10) N.I.
9	25A17674	Output Transformer	34	6B6246	Carbon Res. (470,000-1/3-10) N.I.
10	50C17711	Speaker (10" P.M.)	35	6B6130	Carbon Res. (150,000-1/3-10) N.I.
11	1X14887	Tuner, Gang & Pulley	36	6B6030	Carbon Res. (100,000-1/3-10) N.I.
12	25B17423	Power Transformer	37	6B6068	Carbon Res. (47,000-1/3-10) N.I.
13	20K16825	Trimmer & L Brkt. (2-22) L.H.	38	6B6037	Carbon Res. (33,000-1/3-10) N.I.
14	20K10996	B. C. Trimmer & Padder	39	6B6248	Carbon Res. (25,000-1/2-10) N.I.
15	20K17439	S. W. Padder (4200 mmf)	40	6B6251	Carbon Res. (22,000-1/3-10) N.I.
16	20A17438	Police Padder (2500 mmf)	41	6B6250	Carbon Res. (3900-3-10) N.I.
17	23A17422	Electrolytic Condenser (FP)	42	6B6253	Carbon Res. (150-1-10) N.I.
18	20A11047	Compensating Condenser	43	6B6247	Carbon Res. (150-1/3-10) N.I.
19	8S9829	Tubular Condenser (.2-100V.)	44	6B6227	Carbon Res. (10-1/3-10) N.I.
20	8S9814	Tubular Condenser (.1-100V.)	45	18A17425	Vol. Cont. & Switch (2 meg)
21	8S9805	Tubular Condenser (.05-100V.)	46	18A16083	Tone Control (1 meg)
22	8S9821	Tubular Condenser (.05-200V.)	47	40A17424	Band Switch Section (Ant.)
23	8S9807	Tubular Condenser (.1-400V.)	48	40K16797	Band Switch Section (Osc.)
24	8S9804	Tubular Condenser (.03-400V.)	49	48X10089	Bias Cell (1½V)
25	8S9825	Tubular Condenser (.01-200V.)	50	65X17689	Bulb (6.3V-.15A Tub.Bay.) White #47W
			51	30A151	Line Cord & Plug (6 feet)

MODEL 72-C - DIAL CORD INSTRUCTIONS

1. Cut a length of 24 lb. test dial drive cord 44 inches long.
2. Turn gang to fully meshed position.
3. Push dial drive shaft down.
4. Thread end of cord thru slot in drive pulley. See Fig. 24
5. With an ordinary paper clip fasten cord to drive shaft bracket.
6. Wind cord in a counter-clockwise direction one and one half turns around drive pulley and across chassis to idler pulley No.1.
7. Route cord around idler pulley No.1 and up to idler pulley No.2 as shown in diagram.
8. Continue cord across chassis and over to idler pulley No.3.
9. Continue cord down to idler pulley No.4 and around it in a clockwise direction to drive pulley and around it in a counter-clockwise direction to slot.
10. Knot both ends of cord securely together inside the slot.
11. Tie in one end of tension spring.
12. Hook the other end of tension spring into hole in drive pulley.
13. Lace in the dial pointer.
14. To set pointer to correct frequency, tune in a station of known frequency and adjust position of pointer on string.
15. Secure pointer to string with a drop of shellac or good household cement.



MODEL FM82

GALVIN MFG. CO.

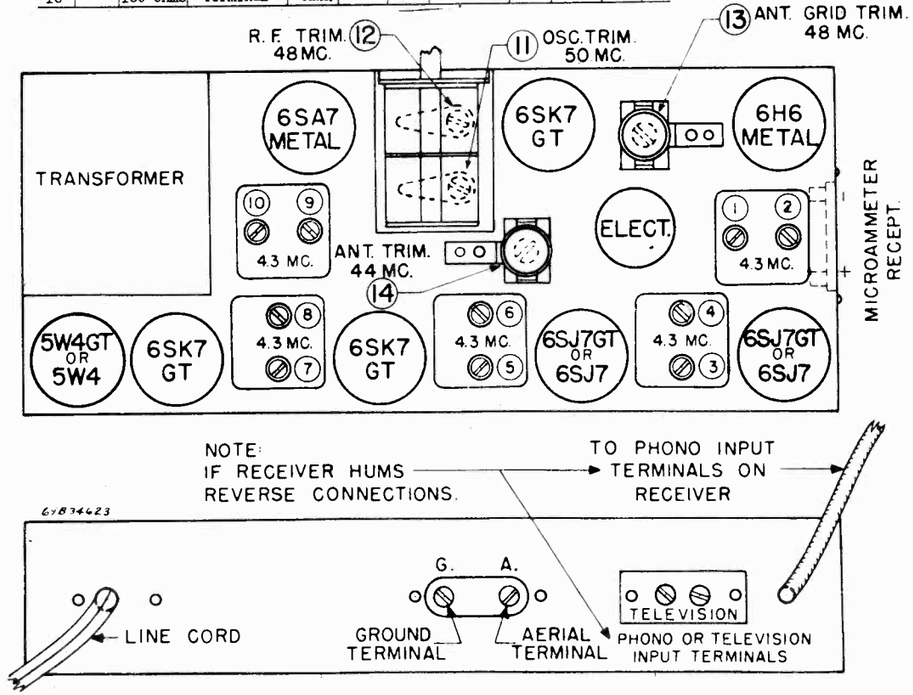
Operations in Order	Gang Set at	Dummy Antenna	Generator Connected to	Tune Trimmer Number	Generator Modulated 400 C.P.S.	Generator Unmodulated	Generator Set at	Read Micrometer	Read Output Voltmeter	See Note
1	Min.	1000 M.M.F. With 10,000 Ohms Shunted across output terminals of signal generator.	2nd Limiter Grid	2 to Min.	X		4.3 M.C.		X	A
2	Min.		2nd Limiter Grid	1 to Max.	X		4.3 M.C.		X	
3	Min.		2nd Limiter Grid	2 to Min.	X		4.3 M.C.		X	
4	Min.		Ant. Terminal	3 to Max.		X	4.3 M.C.	X		
5	Min.		Ant. Terminal	4 to Max.		X	4.3 M.C.	X		
6	Min.		Ant. Terminal	5 to Max.		X	4.3 M.C.	X		
7	Min.		Ant. Terminal	6 to Max.		X	4.3 M.C.	X		
8	Min.		Ant. Terminal	7 to Max.		X	4.3 M.C.	X		
9	Min.		Ant. Terminal	8 to Max.		X	4.3 M.C.	X		
10	Min.		Ant. Terminal	9 to Max.		X	4.3 M.C.	X		
11	Min.		Ant. Terminal	10 to Max.		X	4.3 M.C.	X		
12	Min.	100 Ohms	Ant. Terminal	11 to Max.		X	50.4 M.C.	X		
13		100 Ohms	Ant. Terminal	12 to Max.		X	48 M.C.	X		
14		100 Ohms	Ant. Terminal	14 to Min.		X	48 M.C.	X		A
15		100 Ohms	Ant. Terminal	13 to Max.		X	48 M.C.	X		
16		100 Ohms	Ant. Terminal	14 to Max.		X	44 M.C.	X		

ALIGNMENT

CONNECT AN AMPLIFIER TO THIS UNIT WHEN ALIGNING USE A 0-100 MICROAMMETER

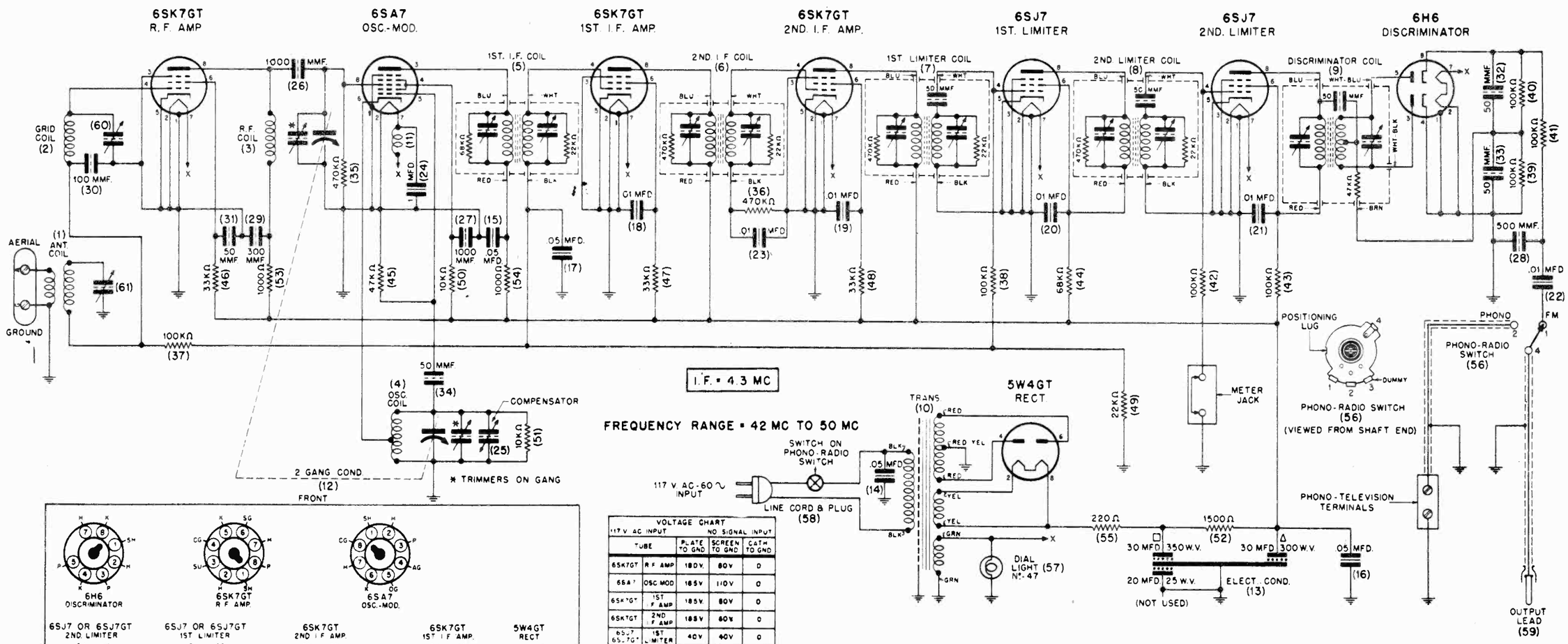
NOTE A

DETUNE BY REDUCING THE TRIMMER CAPACITY. ROTATE THE TRIMMER ADJUSTING SCREW COUNTERCLOCKWISE ONE TURN



GALVIN MFG. CO.

MODEL FM-82



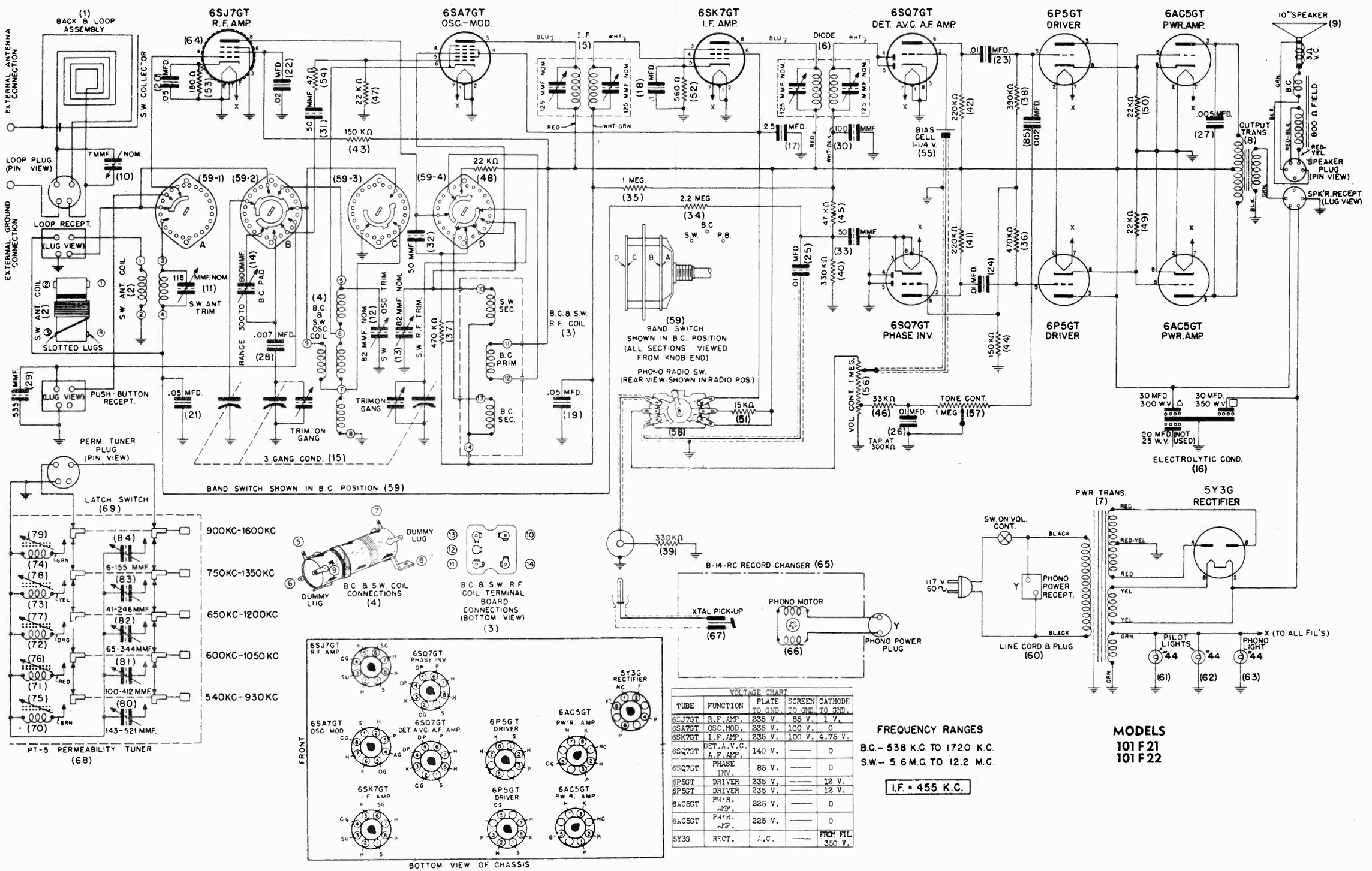
VOLTAGE CHART (117 V. AC INPUT, NO SIGNAL INPUT)				
TUBE		PLATE TO GND	SCREEN TO GND	CATH TO GND
6SK7GT	R.F. AMP	180 V.	80 V	0
6SA7	OSC. MOD	185 V.	110 V	0
6SK7GT	1ST I.F. AMP	185 V.	80 V	0
6SK7GT	2ND I.F. AMP	188 V	60 V	0
6SJ7 6SJ7GT	1ST LIMITER	40 V	40 V	0
6SJ7 6SJ7GT	2ND LIMITER	35 V.	35 V	0
6H6	DISCRIM.		—	
5W4GT	RECT	AC	—	(FROM F) 300 V.

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

1	24A31269	Antenna Coil
2	24A31270	Grid Coil
3	24A31268	R.F. Coil
4	24A31267	Oscillator Coil
5	1X31305	1st I.F. Coil & Shield Assembly
6	1X31307	2nd I.F. Coil & Shield Assembly
7	1X31311	1st Limiter Coil & Shield Assembly
8	1X31313	2nd Limiter Coil & Shield Assembly
9	1X31315	Discriminator Coil & Shield Assembly
10	25B21248	Power Transformer
11	24X28467	Heater Choke
12	1X31337	Gang & Pulley Assembly (2 Gang)
13	23A27718	Elect. Cond. (30 MFD/350W.V.-30 MFD/300W.V. 20 MFD/25W.V.) (25 MFD Section Not Used)
14	8A28966	Tubular Condenser (.05 MFD-600W.V.)
15	8S9816	Tubular Condenser (.05 MFD-400W.V.)
16	8S9816	Tubular Condenser (.05 MFD-400W.V.)
17	8S9805	Tubular Condenser (.05 MFD-100W.V.)
18	8S9809	Tubular Condenser (.01 MFD-400W.V.)
19	8S9809	Tubular Condenser (.01 MFD-400W.V.)
20	8S9809	Tubular Condenser (.01 MFD-400W.V.)
21	8S9809	Tubular Condenser (.01 MFD-400W.V.)
22	8S9809	Tubular Condenser (.01 MFD-400W.V.)
23	8A25939	Tubular Condenser (.01 MFD-100W.V.)
24	8S9814	Tubular Condenser (.1 MFD-100W.V.)
25	20A31711	Compensating Condenser
26	21B6595	Molded Mica Cond. (1000MMF-10%-300W.V.
27	21B6595	Molded Mica Cond. (1000MMF-10%-300W.V.
28	21B6531	Molded Mica Cond. (500MMF-20%-400W.V.)
29	21B6608	Molded Mica Cond. (300MMF-10%-400W.V.)
30	21B6511	Molded Mica Cond. (100MMF-20%-400W.V.)
31	21B6588	Molded Mica Cond. (50 MMF-20%-400W.V.)
32	21B6588	Molded Mica Cond. (50 MMF-20%-400W.V.)
33	21B6588	Molded Mica Cond. (50 MMF-20%-400W.V.)
34	21A26226	Ceramic Tubular Condenser (50 MMF)
35	6B6160	Carbon Resistor (470,000Ω-1/3 Watt-20%) Ins.
36	6B6160	Carbon Resistor (470,000Ω-1/3 Watt-20%) Ins.
37	6B6165	Carbon Resistor (100,000Ω-1/3 Watt-20%) Ins.
38	6B6165	Carbon Resistor (100,000Ω-1/3 Watt-20%) Ins.
39	6B6165	Carbon Resistor (100,000Ω-1/3 Watt-20%) Ins.
40	6B6165	Carbon Resistor (100,000Ω-1/3 Watt-20%) Ins.
41	6B6165	Carbon Resistor (100,000Ω-1/3 Watt-20%) Ins.
42	6B6369	Carbon Resistor (100,000Ω-1/3 Watt-10%) Ins.
43	6B6030	Carbon Resistor (100,000Ω-1/3 Watt-10%) N.I.
44	6B6079	Carbon Resistor (68,000Ω-1/3 Watt-10%) N.I.
45	6B6321	Carbon Resistor (47,000Ω-1/3 Watt-20%) Ins.
46	6B6037	Carbon Resistor (33,000Ω-1/3 Watt-20%) N.I.
47	6B6037	Carbon Resistor (33,000Ω-1/3 Watt-20%) N.I.
48	6B6037	Carbon Resistor (33,000Ω-1/3 Watt-20%) N.I.
49	6B6212	Carbon Resistor (22,000Ω-1/3 Watt-20%) Ins.
50	6B6106	Carbon Resistor (10,000Ω-1 Watt-20%) N.I.
51	6B6255	Carbon Resistor (10,000Ω-1/3 Watt-20%) Ins.
52	17A31304	W.W. Resistor (1500Ω-10 Watt-10%)
53	6B6053	Carbon Resistor (1000Ω-1/3 Watt-20%) N.I.
54	6B6053	Carbon Resistor (1000Ω-1/3 Watt-20%) N.I.
55	6B6152	Carbon Resistor (220Ω-1 Watt-20%) N.I.
56	40A31303	Phono-Radio Switch (2 Position)
57	65X11854	Bulb (6.3V.-.15 Amp. Tub. Bay.) Clear #47
58	30A151	Line Cord & Plug (6 Ft.)
59	1X31329	Output Lead Assembly (6 Ft.)
60	20A31302	Trimmer & "Z" Bracket (15 MMF Nom.)
61	20A31302	Trimmer & "Z" Bracket (15 MMF Nom.)

MODELS 101F21, 101F22

GALVIN MFG. CO.



VOLTAGE CHART				
TUBE	FUNCTION	PLATE TO GND.	SCREEN TO GND.	CATHODE TO GND.
6SJ7GT	R.F. AMP.	235 V.	85 V.	1 V.
6SA7GT	OSC. MOD.	235 V.	100 V.	0
6SK7GT	I.F. AMP.	235 V.	100 V.	4.75 V.
6SQ7GT	DET. A.V.C. A.F. AMP.	140 V.	——	0
6SQ7GT	PHASE INV.	85 V.	——	0
6P5GT	DRIVER	235 V.	——	12 V.
6P5GT	DRIVER	235 V.	——	12 V.
6AC5GT	PW'R. AMP.	225 V.	——	0
6AC5GT	PW'R. AMP.	225 V.	——	0
5Y3G	RECT.	A.C.	——	FROM FIL 350 V.

FREQUENCY RANGES

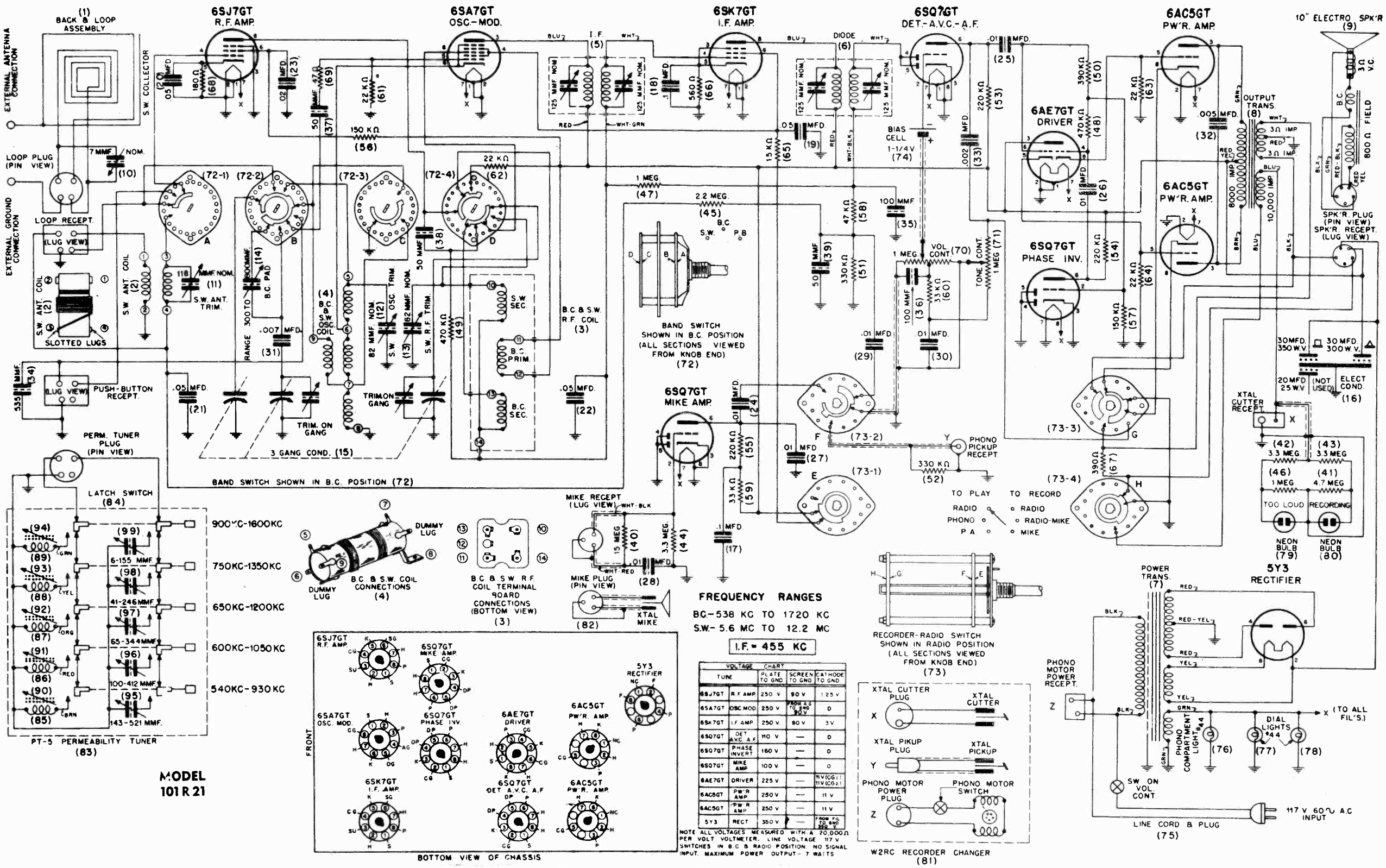
B.C. – 538 K.C. TO 1720 K.C.
S.W. – 5.6 M.C. TO 12.2 M.C.

I.F. = 455 K.C.

MODELS
101 F 21
101 F 22

GALVIN MFG. CO.

MODEL 101R21



1	1X28239	Back & Loop Assembly
2	24A27298	Short Wave Antenna Coil
3	1X27274	B.C. & S.W. R.F. Coil & Shield Assembly
4	24A27297	B.C. & S.W. Oscillator Coil
5	1X28203	I.F. Coil & Shield Assembly
6	1X28232	Diode Coil & Shield Assembly
7	25B28217	Power Transformer
8	25B28215	Output Transformer
9	50B28568	Speaker (10" Electro)
10	20A27340	Trimmer & "U" Bracket (7 MMF Nom.)
11	20A27326	Trimmer & "Z" Bracket (118 MMF Nom.)
12	20A27273	Trimmer & "Z" Bracket (82 MMF Nom.)
13	20A27273	Trimmer & "Z" Bracket (82 MMF Nom.)
14	20A17935	B.C. Padder (Single) (Range 300-800 MMF)
15	19K28219	Variable Condenser (3 Gang) & Pulley Assembly
72	40B27295	Band Switch (3 Pos.)
73	40B28216	Radio-Recorder Switch (6 Pos.)
74	40X10089	Bias Cell (1-1/4V.)
75	30K21859	Line Cord & Plug (9 Ft.)
76	65X10867	Bulb (6.3V-.25 Amp. Tub. Bay) Clear #44
77	65X10867	Bulb (6.3V-.25 Amp. Tub. Bay) Clear #44
78	65X10867	Bulb (6.3V-.25 Amp. Tub. Bay) Clear #44
79	65X22177	Neon Bulb
80	65X22177	Neon Bulb
81	59D28429	Model W2RC Recorder Changer (Complete)
82	1K28991	Microphone & Plug Assembly
83	1X28240	Model PT-5 Perm. Tuner
84	40B27243	Latch Switch (Complete) 5 P.B.
85	24B27311	Perm. Osc. Coil (Brown) #1
86	24K27312	Perm. Osc. Coil (Red) #2
87	24K27313	Perm. Osc. Coil (Orange) #3
88	24K27314	Perm. Osc. Coil (Yellow) #4
89	24K27315	Perm. Osc. Coil (Green) #5
90	67A27283	Iron Core & Adjusting Screw
91	67A27283	Iron Core & Adjusting Screw
92	67A27283	Iron Core & Adjusting Screw
93	67A27283	Iron Core & Adjusting Screw
94	67A27283	Iron Core & Adjusting Screw
95	20A27381	P.B. Antenna Trimmer (143 MMF To 521 MMF) #1
96	20K27382	P.B. Antenna Trimmer (100 MMF To 412 MMF) #2
97	20K27383	P.B. Antenna Trimmer (65 MMF To 344 MMF) #3
98	20K27384	P.B. Antenna Trimmer (41 MMF To 246 MMF) #4
99	20K27385	P.B. Antenna Trimmer (6 MMF To 155 MMF) #5

MODELS 101F21, 101F22

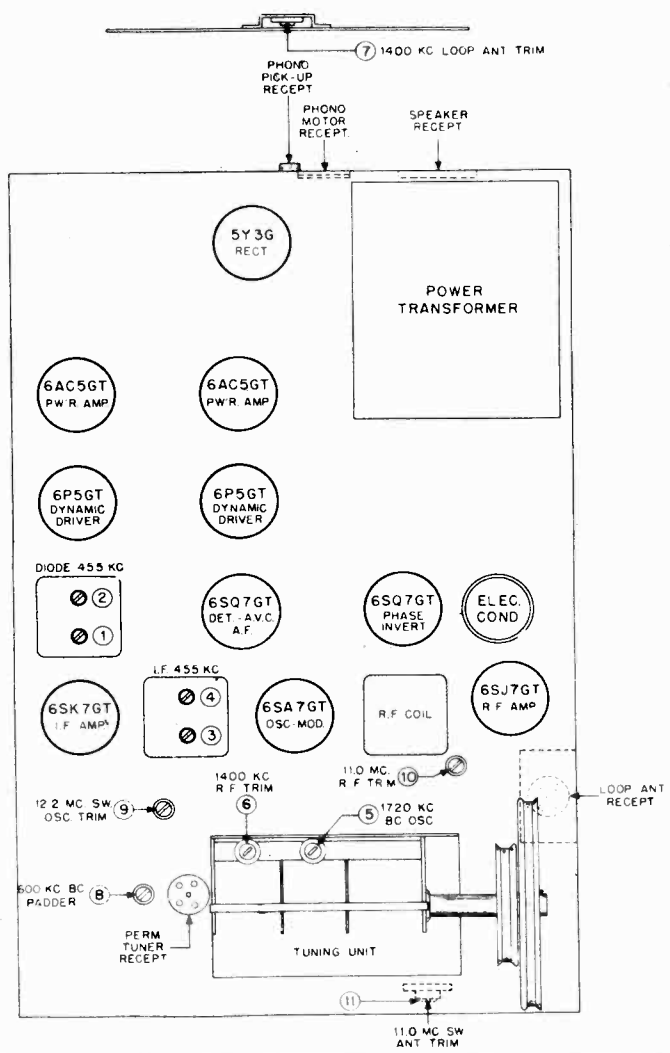
GALVIN MFG. CO.

MODEL 101 F 21 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
45	455 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	.38
50	600 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	.38
2	600 K.C.	R.F. Grid	.1 Mfd.	.5 Meg.	.38
2	600 K.C.	Ant.Terminal	200 Mmf.	None	.38

MODELS 101 F 21 AND 101 F 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.	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.



Models 101F21 & 22

1	1X28239	Back & Loop Assembly (Model 101F21)
	1X30955	Back & Loop Assembly (Model 101F22)
2	24A27298	Short Wave Antenna Coil
3	1X27274	B.C. & S.W. R.F. Coil & Shield Assembly
4	24A27297	B.C. & S.W. Oscillator Coil
5	1X28203	I.F. Coil & Shield Assembly
6	1X28232	Diode Coil & Shield Assembly
7	25B28217	Power Transformer
8	25B27661	Output Transformer
9	50B28568	Speaker (10" Electro)
10	20A18740	Trimmer & "U" Bracket (7 MMF Nom.)
11	20A27326	Trimmer & "Z" Bracket (118 MMF Nom.)
12	20A27273	Trimmer & "Z" Bracket (82 MMF Nom.)
13	20A27273	Trimmer & "Z" Bracket (82 MMF Nom.)
14	20A17935	B.C. Padder (Single) Range 300-800 MMF
15	1X28219	Gang Cond. & Pulley Assembly (3 Gang)
16	23A27718	Elect. Cond. (30 MFD/350W.V.-30 MFD/300W.V.-20 MFD/25W.V.)
29	21A28020	Mica Condenser (535 MMF-3%-500W.V.)
30	21B6511	Molded Mica Cond. (100 MMF-20%-400W.V.) Brn.O
31	21B6503	Molded Mica Cond. (50 MMF-20%-400W.V.) Brn.O
32	21B6503	Molded Mica Cond. (50 MMF-20%-400W.V.) Brn.O
33	21B6503	Molded Mica Cond. (50 MMF-20%-400W.V.) Brn.O
34	6B6202	Carbon Resistor (2.2 Meg-1/3 Watt-20%) Ins.
55	48X10089	Bias Cell
56	18A22065	Volume Control & Switch (1 Meg)
57	18A21481	Tone Control (1 Meg)
58	40A23221	Phono-Radio Switch (D.P.D.T.)
59	40B27295	Band Switch (3 Position)
60	30K21859	Line Cord & Plug (9 Ft.)
61	65X10867	Bulb (6.3V.-.25 Amp. Tub. Bay.) Clear #44
62	65X10867	Bulb (6.3V.-.25 Amp. Tub. Bay.) Clear #44
63	65X10867	Bulb (6.3V.-.25 Amp. Tub. Bay.) Clear #44
64	26A14760	Bantam Tube Shield
65	1X27890	Model B-14-RC Record Changer (Complete)
66	59B27687	Phono Motor & Mtg. Plate Only (117V.-60C)
67	59K27571	Phono Pickup Arm (Complete)
68	1X28240	Model PT-5 Permeability Tuner
69	40B27243	Latch Switch (Complete) 5 P.B.
70	24B27311	Perm. Osc. Coil (Brown) #1
71	24K27312	Perm. Osc. Coil (Red) #2
72	24K27313	Perm. Osc. Coil (Orange) #3
73	24K27314	Perm. Osc. Coil (Yellow) #4
74	24K27315	Perm. Osc. Coil (Green) #5
75	67A27283	Iron Core & Adjusting Screw
76	67A27283	Iron Core & Adjusting Screw
77	67A27283	Iron Core & Adjusting Screw
78	67A27283	Iron Core & Adjusting Screw
79	67A27283	Iron Core & Adjusting Screw
80	20A27381	P.B. Antenna Trimmer (143 MMF To 521 MMF) #1
81	20K27382	P.B. Antenna Trimmer (100 MMF To 412 MMF) #2
82	20K27383	P.B. Antenna Trimmer (65 MMF To 344 MMF) #3
83	20K27384	P.B. Antenna Trimmer (41 MMF To 246 MMF) #4
84	20K27385	P.B. Antenna Trimmer (6 MMF To 155 MMF) #5
85	8S9824	Tubular Condenser (.002 MFD-400W.V.)

MODEL 101F21
MODEL 101R21

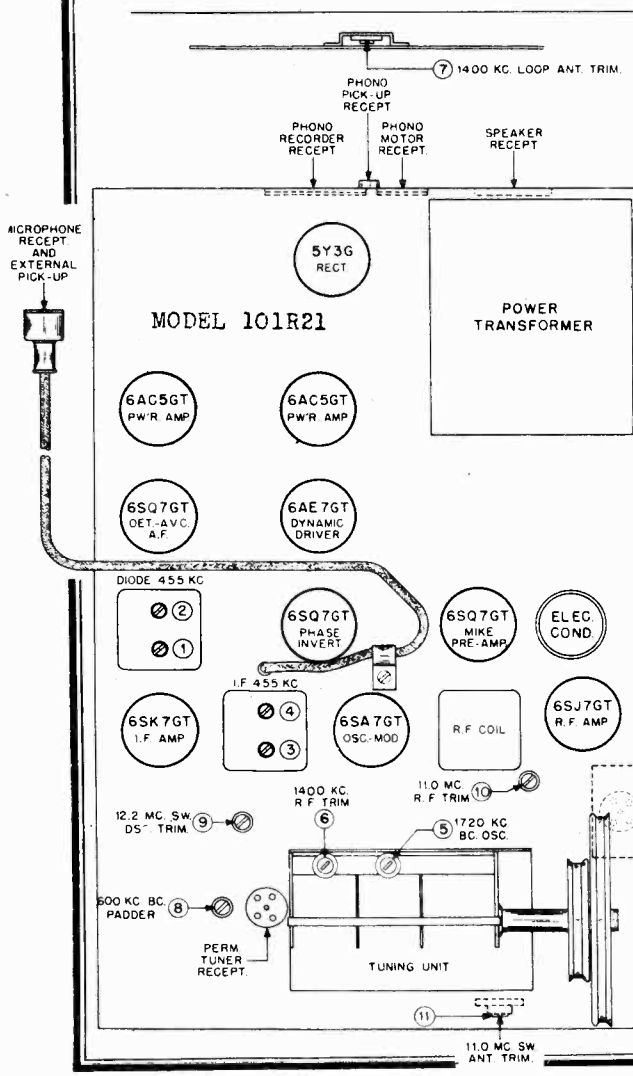
GALVIN MFG. CO.

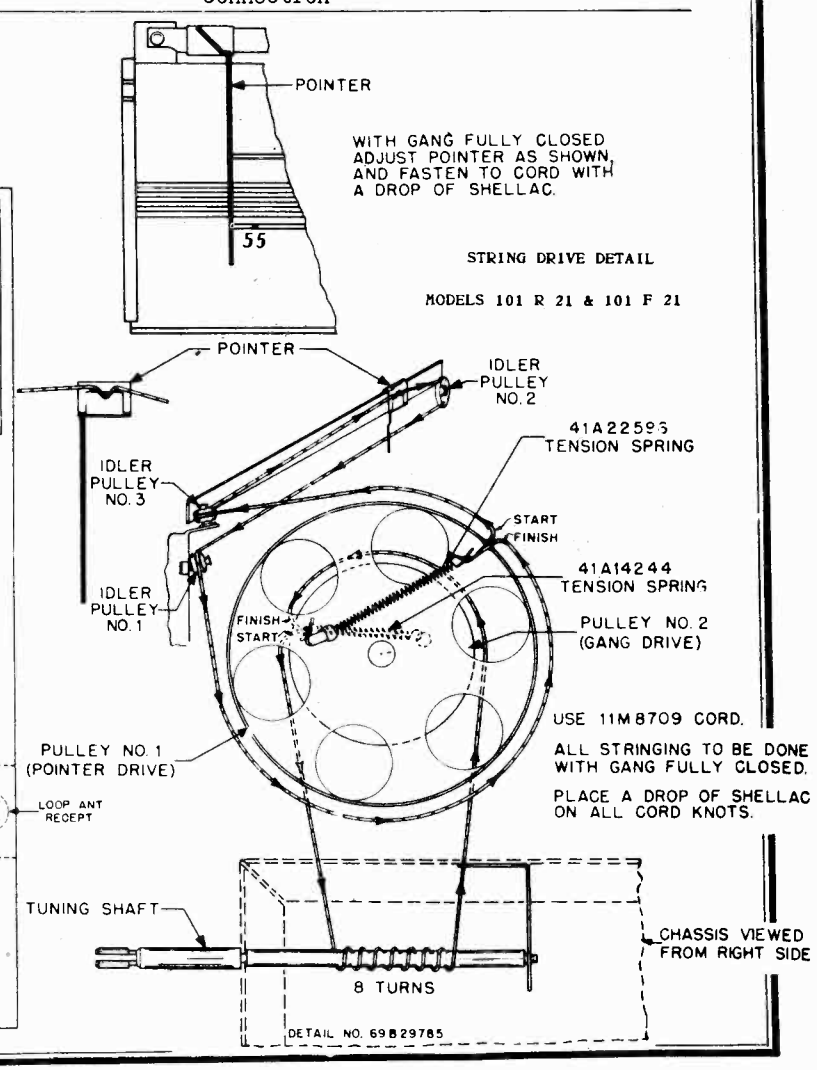
MODEL 101R21 SENSITIVITY AND STAGE GAIN MEASUREMENTS

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
45	455 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	.38
50	600 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	.38
2	600 K.C.	R.F. Grid	.1 Mfd.	.5 Meg.	.38
2	600 K.C.	Ant.Terminal	200 Mmf.		

MODEL 101R21 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.	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.





GALVIN MFG. CO.

MODEL 36C-1
MODEL 36C-2

ALIGNMENT CHART MODEL 36C-1

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	262 K.C.
2	1600 K.C.	.1 Mfd.	Osc.-Mod. Grid	5	1600 K.C.
3	545 K.C.	.1 Mfd.	Osc.-Mod. Grid	6	545 K.C.
4	1400 K.C.	*	To Special Dummy	7	1400 K.C.
5	1400 K.C.	*	To Special Dummy	8	1400 K.C.
6	600 K.C.	*	To Special Dummy	9	600 K.C.

* Use Special Dummy Part No. 26767 or Booster Coil Part No. 24A26751 in series with a 35 Mmf. Condenser.

ALIGNMENT CHART MODEL 36C-2

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	1400 K.C.	.1 Mfd.	Osc.-Mod. Grid	5	1400 K.C.
3	1400 K.C.	*	To Special Dummy	6	1400 K.C.
4	600 K.C.	*	To Special Dummy	7	600 K.C.

* Use Special Dummy Part No. 26767 or Booster Coil Part No. 24A26751 in series with a 35 Mmf. Condenser.

MODEL 36-C1

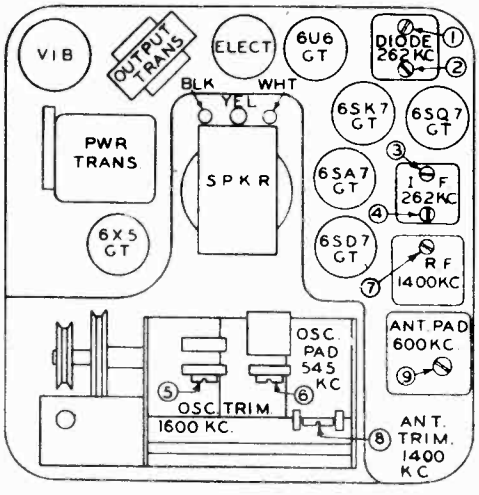


Fig. 1

MODEL 36-C2

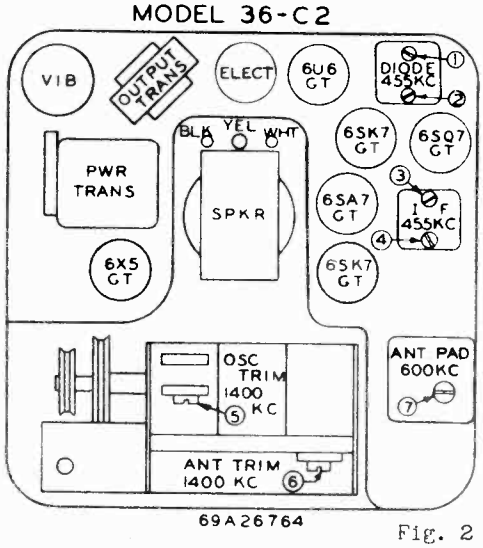


Fig. 2

SENSITIVITY AND STAGE GAIN MEASUREMENT MODEL 36C-1

Average Microvolt Input *	Generator Set At	Generator Feeder Connected To	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
22,250	262 K.C.	I.F. Grid	.1 Mfd.	.5 Meg.	1.74
700	262 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	1.74
710	600 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	1.74
13	600 K.C.	R.F. Grid	.1 Mfd.	.5 Meg.	1.74
3	600 K.C.	Ant. Lead	***	None	1.74

Volume Control Set At Maximum — Tone Control Set At Voice.
* 1 Watt = 1.74 Volts — ** Output meter connected across voice coil.
*** Use Special Dummy Part No. 1X26767 or Booster Coil Part No. 24A26751 in series with a 35 Mmf. Condenser.

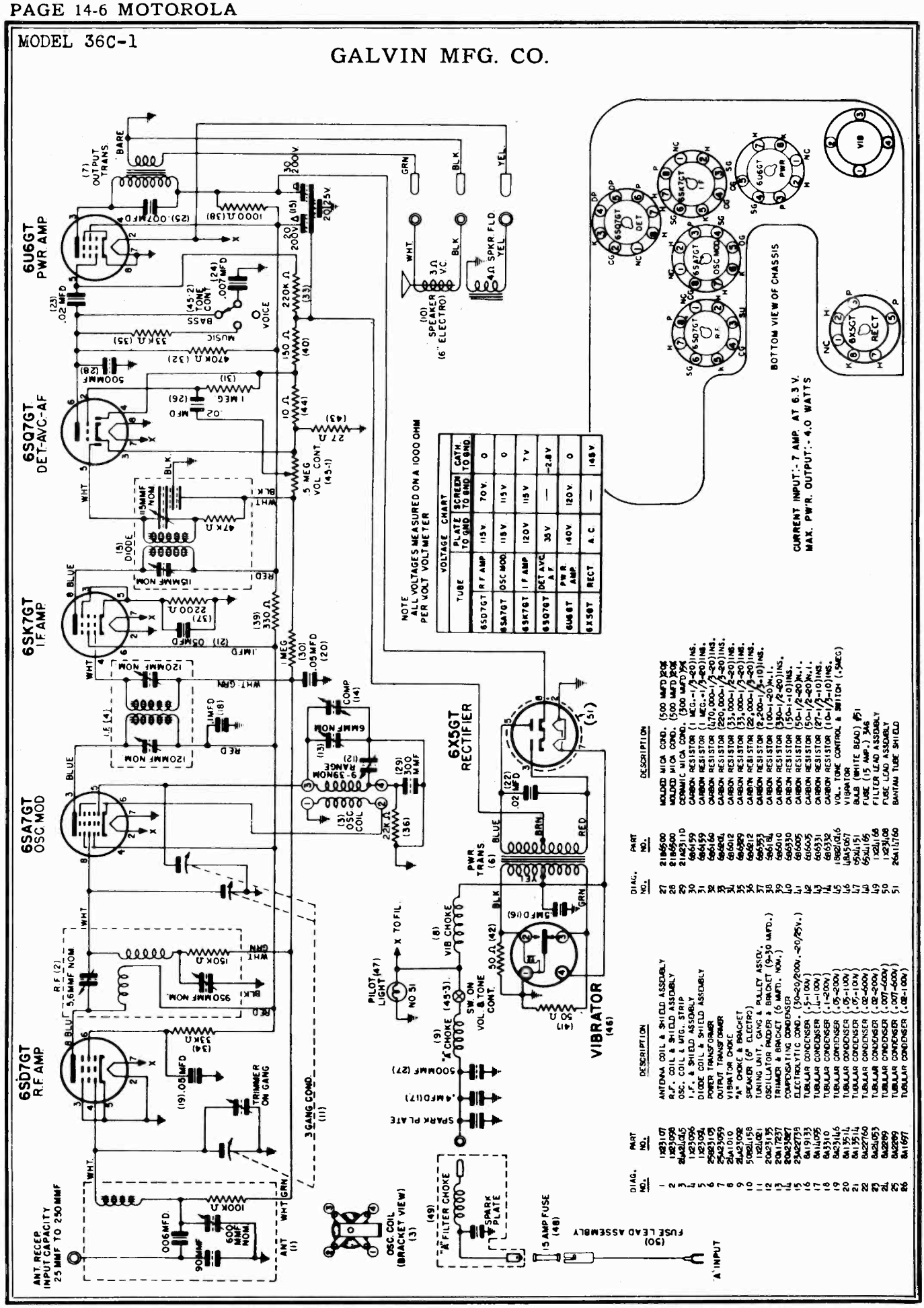
SENSITIVITY AND STAGE GAIN MEASUREMENT MODEL 36C-2

Average Microvolt Input *	Generator Set At	Generator Feeder Connected To	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
10,000	455 K.C.	I.F. Grid	.1 Mfd.	.5 Meg.	1.74
560	455 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	1.74
625	600 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	1.74
90	600 K.C.	R.F. Grid	.1 Mfd.	.5 Meg.	1.74
12	600 K.C.	Ant. Lead	***	None	1.74

Volume Control Set At Maximum — Tone Control Set At Voice.
* 1 Watt = 1.74 Volts — ** Output meter connected across voice coil.
*** Use Special Dummy Part No. 1X26767 or Booster Coil Part No. 24A26751 in series with a 35 Mmf. Condenser.

MODEL 36C-1

GALVIN MFG. CO.



DIAG. NO.	PART NO.	DESCRIPTION
1	1823107	ANTENNA COIL & SHIELD ASSEMBLY
2	1823098	R.F. COIL & SHIELD ASSEMBLY
3	8A23045	OSC. COIL & MTG. STRIP
4	1823096	I.F. & SHIELD ASSEMBLY
5	1823094	DIODE COIL & SHIELD ASSEMBLY
6	25823103	POWER TRANSFORMER
7	25A23059	OUTPUT TRANSFORMER
8	21A1010	VIBRATOR CHOKE
9	21A23092	"A" CHOKE & BRACKET
10	50B21158	SPEAKER (6" ELECTRO)
11	1821021	TUNING UNIT, GANG & PULLEY ASSY.
12	20A23135	OSCILLATOR PADDER & BRACKET (9-30 MMFD.)
13	20A17237	TRIMMER & BRACKET (6 MMFD. NOM.)
14	8002B087	COMPENSATING CONDENSER
15	23A22735	ELECTROLYTIC COND. (30-20/200V.-20/25V.)
16	8A19133	TUBULAR CONDENSER (.5-100V.)
17	8A14095	TUBULAR CONDENSER (.1-100V.)
18	8A3110	TUBULAR CONDENSER (.1-200V.)
19	8A23146	TUBULAR CONDENSER (.05-200V.)
20	8A13514	TUBULAR CONDENSER (.05-100V.)
21	8A13514	TUBULAR CONDENSER (.05-100V.)
22	8A22760	TUBULAR CONDENSER (.02-600V.)
23	8A21053	TUBULAR CONDENSER (.02-200V.)
24	8A2899	TUBULAR CONDENSER (.007-600V.)
25	8A2899	TUBULAR CONDENSER (.007-600V.)
26	8A1697	TUBULAR CONDENSER (.02-100V.)
27	21B6500	MOLDED MICA COND. (500 MMFD 20%)
28	21B6500	MOLDED MICA COND. (500 MMFD 20%)
29	21A23110	CERAMIC MICA COND. (300 MMFD 5%)
30	686159	CARBON RESISTOR (1 MEG.-1/2-20)INS.
31	686159	CARBON RESISTOR (1 MEG.-1/2-20)INS.
32	686160	CARBON RESISTOR (470,000-1/2-20)INS.
33	686804	CARBON RESISTOR (220,000-1/2-20)INS.
34	686012	CARBON RESISTOR (33,000-1/2-20)INS.
35	686389	CARBON RESISTOR (33,000-1/2-20)INS.
36	686812	CARBON RESISTOR (22,000-1/2-20)INS.
37	686953	CARBON RESISTOR (2,200-1/2-10)INS.
38	686184	CARBON RESISTOR (100-1/2-20)W.I.
39	686010	CARBON RESISTOR (330-1/2-20)INS.
40	686330	CARBON RESISTOR (150-1/2-10)INS.
41	686005	CARBON RESISTOR (50-1/2-20)W.I.
42	686005	CARBON RESISTOR (50-1/2-20)W.I.
43	686331	CARBON RESISTOR (27-1/2-10)INS.
44	686332	CARBON RESISTOR (10-1/2-10)INS.
45	1882L06	VOL. TONE CONTROL & SWITCH (.5MEG)
46	4B45057	VIBRATOR
47	9541151	BULB (WHITE BEAD) #51
48	9541166	FUSE (15 AMP.) 3AG
49	1821168	FILTER LEAD ASSEMBLY
50	1823108	FUSE LEAD ASSEMBLY
51	20A13760	BANTAM TUBE SHIELD

MODELS 36-C1, 36-C2 DIAL CORD INSTRUCTIONS TUNING CORD

1. Remove the chassis from the housing,and place on service bench.
2. Remove the broken string.
3. Turn the condenser gang to fully meshed position.
4. Cut a length of 30 lb. silk fish cord 25 inches long.
5. Thread one end of cord through Hole (x) in drive pulley and with an ordinary paper clip fasten to tuning control bracket so that cord will stay in place.
6. In a clockwise direction, wind cord one full turn around drive pulley and up to tuning shaft. (See Fig. 3.)
7. Route cord 7 turns around tuning shaft as shown in Fig. 3 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley and through hole (x).
9. Slip the two cord ends through eyelet (Part No.5S7824) inside of pulley.
10. Knot the two cord ends together and fasten to one end of spring (Part No.41A14759). Hook other end of spring to hole (y) in drive pulley.
11. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.

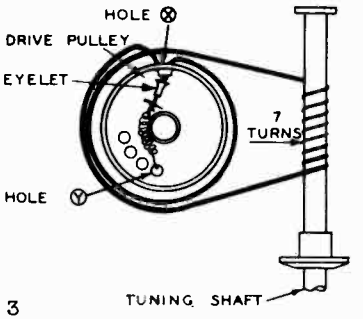


Fig. 3

MODELS 36-C1, 36-C2 POINTER CORD

1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Set condenser gang to fully meshed position.
4. Cut a length of 18 lb. silk fish cord 27 inches long.
5. Thread one end of cord through hole (c) in condenser pulley and with an ordinary paper clip fasten it to the tuning shaft bracket to hold in place. (See Fig. 4.)
6. In a clockwise direction run cord one turn around condenser pulley, under brake shoe and over to idler pulley No. 3 and around it in a counter-clockwise direction.
7. Route string across chassis to idler pulley No. 2, and around it in a counter-clockwise direction.
8. Route cord back across chassis and down over idler pulley No. 1.
9. Route cord down and around condenser pulley turn to hole (c).
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of drive pulley and fasten one end of spring (Part No.41A11091) to cord and the other end to hook in condenser pulley.
11. Cut off surplus cord.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string.
13. Fasten pointer to string with a drop of shellac. Place a drop of shellac on cord knot.

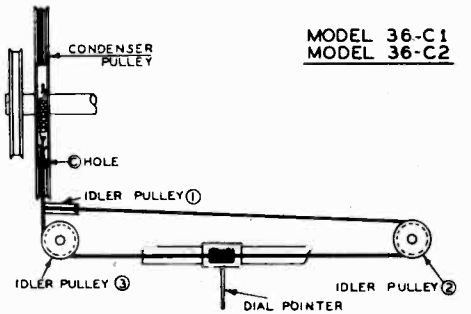


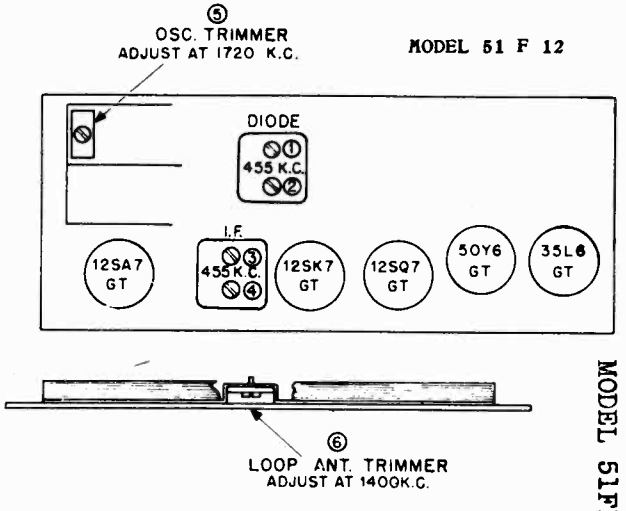
Fig. 4

MODEL 51 F 12 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 K.C.	I.F. Grid	.1 Mfd.	.5 Meg.	.38
25	455 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	.38
30	600 K.C.	Mod. Grid	.1 Mfd.	.5 Meg.	.38
4.5	600 K.C.	Ant.Terminal	200 Mmf.	None	.38

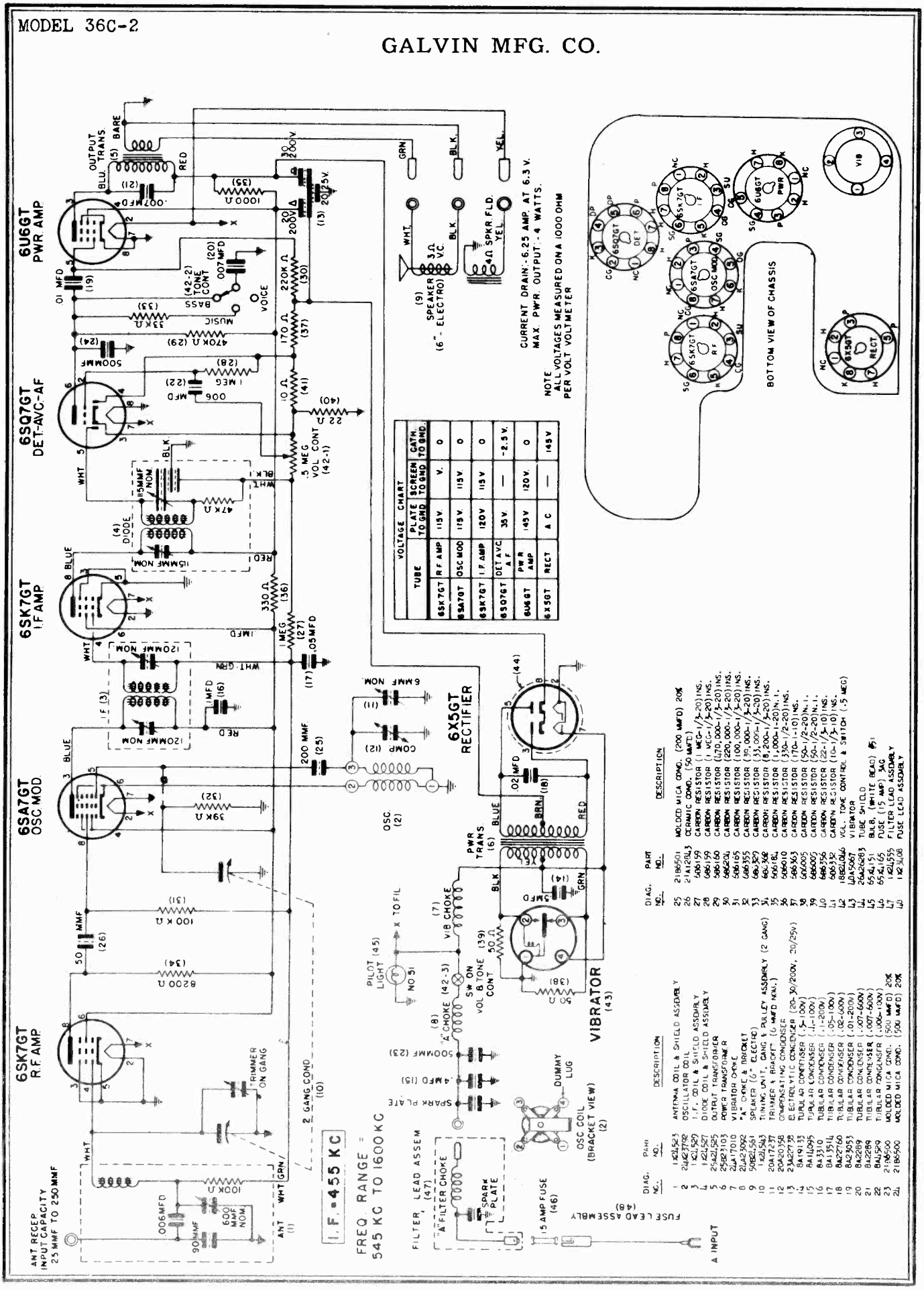
MODEL 51 F 12 ALIGNMENT CHART

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



MODEL 36C-2

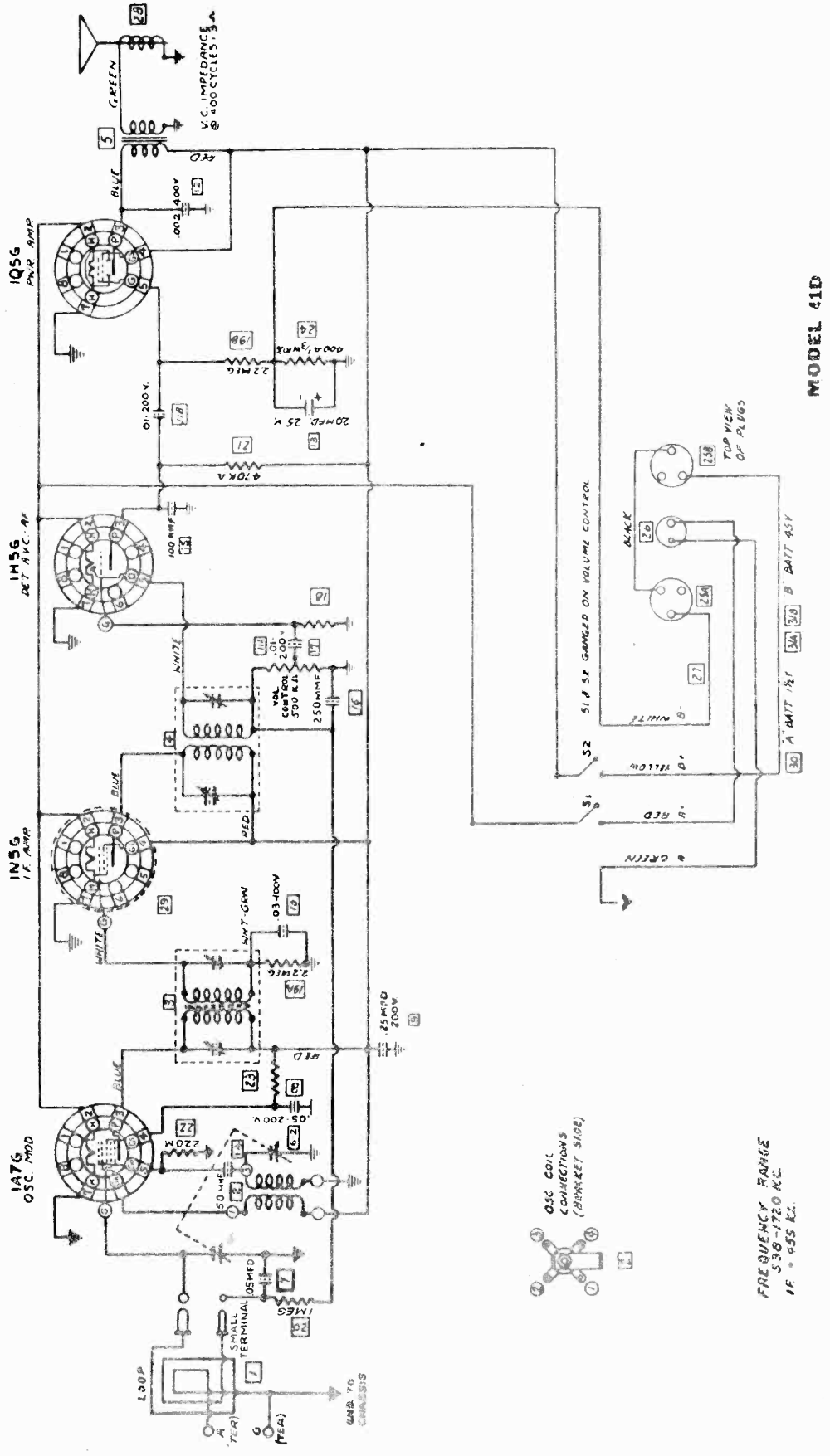
GALVIN MFG. CO.



DIAG. NO.	PART NO.	DESCRIPTION
1	1824523	ANTENNA COIL & SHIELD ASSEMBLY
2	2U427792	OSCILLATOR COIL
3	1821529	I.F. COIL & SHIELD ASSEMBLY
4	1824527	DIODE COIL & SHIELD ASSEMBLY
5	25A21525	OUTPUT TRANSFORMER
6	25B23103	POWER TRANSFORMER
7	2U417010	VIBRATOR CHOKE
8	21A23092	"A" CHOKE & BRACKET
9	50B21561	SPEAKER (6" ELECTRO)
10	1821543	TUNING UNIT, GANG & PULLEY ASSEMBLY (2 GANG)
11	20A17237	TRIMMER & BRACKET (6 MMFD MAX.)
12	20A20358	COMPENSATING CONDENSER
13	23A22738	ELECTROLYTIC CONDENSER (25-30/200V, 20/25V)
14	8419133	TUBULAR CONDENSER (.5-100V)
15	8411045	TUBULAR CONDENSER (.1-100V)
16	8413100	TUBULAR CONDENSER (.1-200V)
17	8413514	TUBULAR CONDENSER (.05-100V)
18	8422760	TUBULAR CONDENSER (.02-600V)
19	8423053	TUBULAR CONDENSER (.01-200V)
20	8422889	TUBULAR CONDENSER (.007-600V)
21	8422889	TUBULAR CONDENSER (.007-600V)
22	8413499	TUBULAR CONDENSER (.006-100V)
23	21B6900	MOLDED MICA COND. (500 MMFD) 20%
24	21B6900	MOLDED MICA COND. (500 MMFD) 20%
25	21B6501	MOLDED MICA COND. (200 MMFD) 20%
26	21A12843	CERAMIC COND. (50 MMFD.)
27	6B6199	CARBON RESISTOR (1 MEG-1/2-20) INS.
28	6B6199	CARBON RESISTOR (1 MEG-1/2-20) INS.
29	6B6168	CARBON RESISTOR (470,000-1/2-20) INS.
30	6B6204	CARBON RESISTOR (220,000-1/2-20) INS.
31	6B6165	CARBON RESISTOR (100,000-1/2-20) INS.
32	6B6355	CARBON RESISTOR (39,000-1/2-20) INS.
33	6B6329	CARBON RESISTOR (33,000-1/2-20) INS.
34	6B6308	CARBON RESISTOR (8,200-1/2-20) INS.
35	5U6184	CARBON RESISTOR (1,000-1-20) IN. 1.
36	5U6010	CARBON RESISTOR (330-1/2-20) INS.
37	6B6363	CARBON RESISTOR (170-1-10) INS.
38	6U6005	CARBON RESISTOR (50-1/2-20) IN. 1.
39	6B6005	CARBON RESISTOR (50-1/2-20) IN. 1.
40	6B6356	CARBON RESISTOR (22-1/2-10) INS.
41	5U6332	CARBON RESISTOR (10-1/2-10) INS.
42	18B21046	VOL. TONE CONTROL & SWITCH (.5 MEG)
43	1U45067	VIBRATOR
44	25A22683	TUBE SHIELD
45	65L4151	BULB, (WHITE BEAD) #51
46	65L4165	FUSE (1.5 AMP) 3AG
47	1824555	FILTER LEAD ASSEMBLY
48	1W2U108	FUSE LEAD ASSEMBLY

MODEL 41D

GALVIN MFG. CO.



MODELS 49BT1, 49BT2
MODEL 41H
MODELS 41D, 51D, 52D

GALVIN MFG. CO.

ALIGNMENT PROCEDURE

MODELS 49BT1 AND 49BT2

1. Connect signal generator to control grid of first detector tube (1A7G) through a .05 MF condenser, and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn condenser gang completely out of mesh.
2. Set signal generator to 455 KC and carefully adjust the two I.F. trimmers and the one diode trimmer to point showing highest reading on output meter.
3. Connect signal generator to antenna and ground leads using a .0002 MF condenser in antenna lead.
4. Set signal generator and receiver dial both at 1700 KC. Adjust osc. trimmer (on condenser gang) until 1700 KC signal is heard.
5. Set signal generator at 1400 KC and turn condenser gang to the signal at 1400 KC. Adjust antenna trimmer (on condenser gang) to point showing highest reading on output meter.

MODEL 41H

ALIGNMENT PROCEDURE

1. Connect signal generator to control grid of first detector tube (1A7GT) through a .05 Mf Condenser, and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn condenser gang completely out of mesh. The loop must be connected to the chassis at all times.

2. Set Signal generator at 455 K.C. and carefully adjust the two I.P. trimmers and the two DIODE trimmers to point showing highest reading on output meter.

3. Turn signal generator to 1720 K.C. and, with condenser gang completely out of mesh adjust OSC. trimmer (on small section of condenser gang) until 1720 K.C. signal is heard.

4. Place chassis in cabinet, connect loop terminals, and fasten back on cabinet.

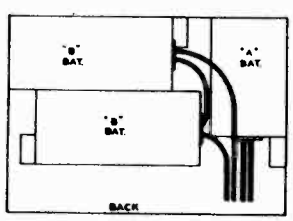
5. Remove plug from side of cabinet to expose ANT. trimmer.

6. Tune in a weak station near 1400 or 1500 K.C. and adjust ANT. trimmer through hole in cabinet for maximum volume.

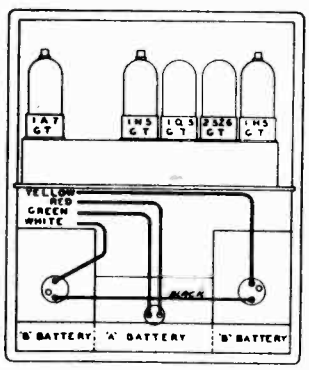
There are no further adjustments.

MODELS 41D, 51D, AND 52D

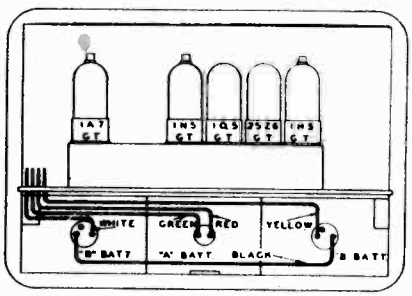
POSITION AND CONNECT BATTERIES AS SHOWN BELOW



MODEL 41D



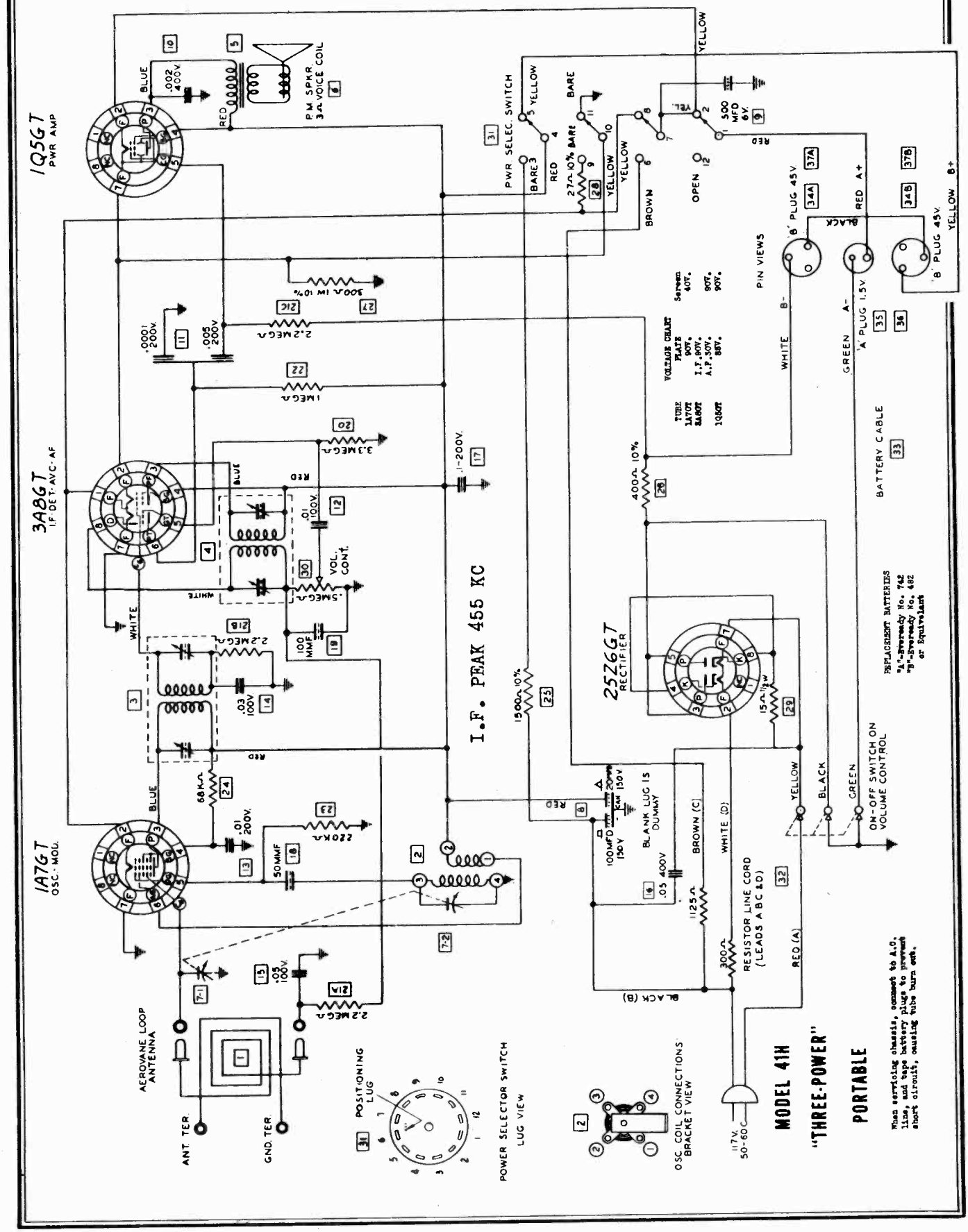
MODEL 51D



MODEL 52D

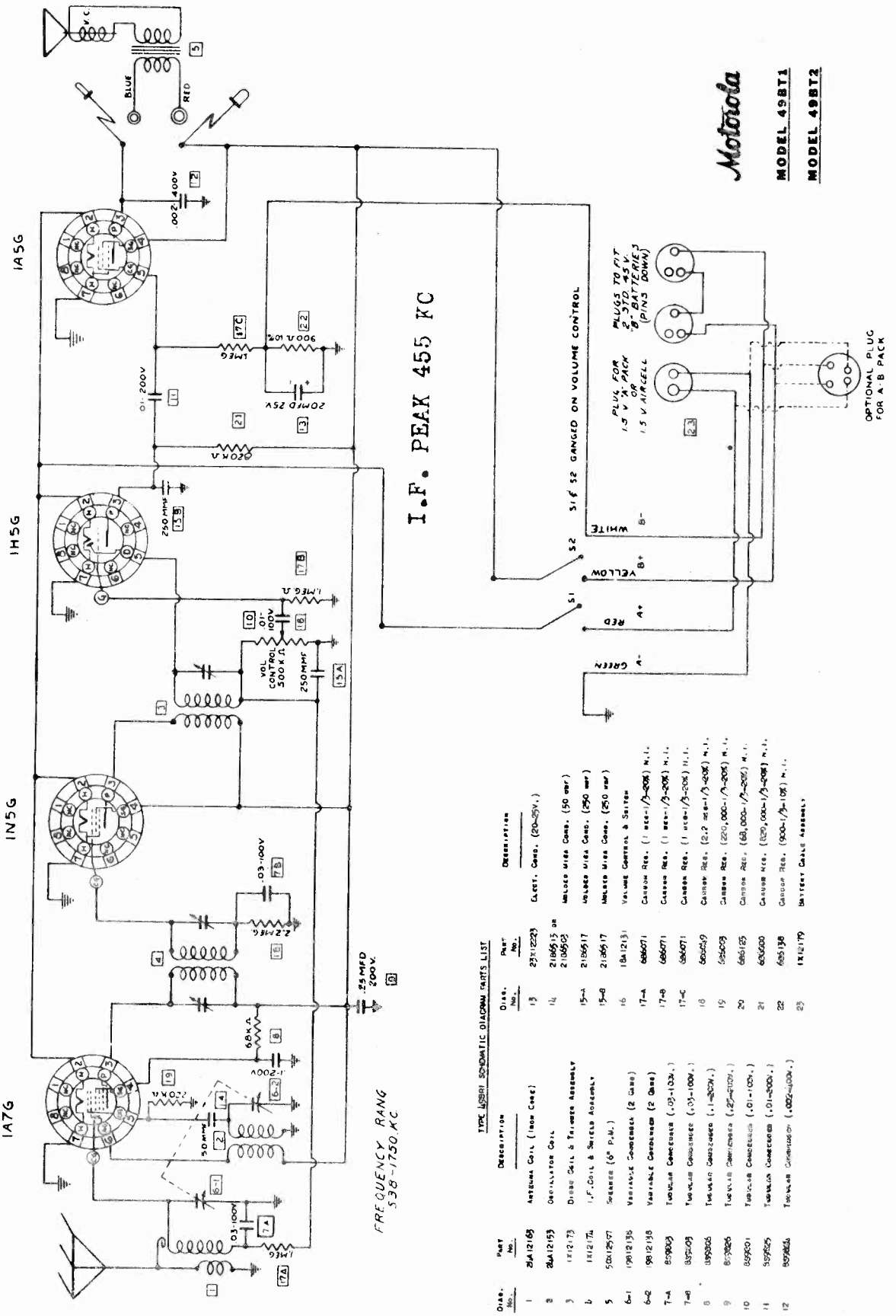
MODEL 41H

GALVIN MFG. CO.



MODELS 49BT1, 49BT2

GALVIN MFG. CO.



TYPE 49BR1 SCHEMATIC DIAGRAM PARTS LIST

Diag. No.	Part No.	Description	Diag. No.	Part No.	Description
1	25A12165	Antenna Coil (Loop Coil)	13	23X12223	Elect. Cond. (20-25V.)
2	25A12153	Oscillator Coil	14	21B6615 or 21B6503	Molded Wire Cond. (.50 mfd)
3	1X12173	Diode Coil & Trimmer Assembly	15-1	21B6517	Molded Wire Cond. (.250 mfd)
4	1X12174	I.F. Coil & Shield Assembly	15-2	21B6617	Molded Wire Cond. (.250 mfd)
5	50X12597	Antenna (6" P.M.)	16	18A12131	Volume Control & Switch
6-1	19B12136	Variable Condenser (2 Gang)	17-1	6B6071	Carbon Res. (1 meg-1/3-20%) M.I.
6-2	98B12138	Variable Condenser (2 Gang)	17-2	6B6071	Carbon Res. (1 meg-1/3-20%) M.I.
7-1	85B9005	Tubular Condenser (.03-100V.)	17-3	6B6071	Carbon Res. (1 meg-1/3-20%) M.I.
7-2	85B9005	Tubular Condenser (.03-100V.)	17-4	6B6071	Carbon Res. (1 meg-1/3-20%) M.I.
8	85B9005	Tubular Condenser (.1-200V.)	18	6B6549	Carbon Res. (2.2 meg-1/3-20%) M.I.
9	85B9205	Tubular Condenser (.25-400V.)	19	6B6059	Carbon Res. (220,000-1/3-20%) M.I.
10	85B9201	Tubular Condenser (.01-400V.)	20	6B6125	Carbon Res. (68,000-1/3-20%) M.I.
11	85B9225	Tubular Condenser (.01-200V.)	21	6B6500	Carbon Res. (820,000-1/3-20%) M.I.
12	85B9255	Tubular Condenser (.002-400V.)	22	6B6138	Carbon Res. (900-1/3-10%) M.I.
			23	1X12179	Battery Cable Assembly

GALVIN MFG. CO.

MODELS 61L11, 61L12
MODELS 61X11, 61X12, 61X13
61X15, 61X16, 61X17

MODELS 61L11, 61L12

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	I.F. 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	R.F. Grid	.1 Mfd.	None	.38

MODELS 61X11, 61X12, 61X13, 61X15, 61X16, 61X17

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

OUTPUT METER CONNECTED ACROSS SPEAKER VOICE COIL; .38 VOLT CORRESPONDS TO AN OUTPUT OF .05 WATT.

MODELS

61 L 11 61 L 12

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.	R.F. Grid	5	1600 K.C.
3	1400 K.C.	.1 Mfd.	R.F. Grid	6	1400 K.C.
4	600 K.C.	.1 Mfd.	R.F. 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.

MODELS

61X11 61X12 61X13 61X14 61X15 61X16 61X17

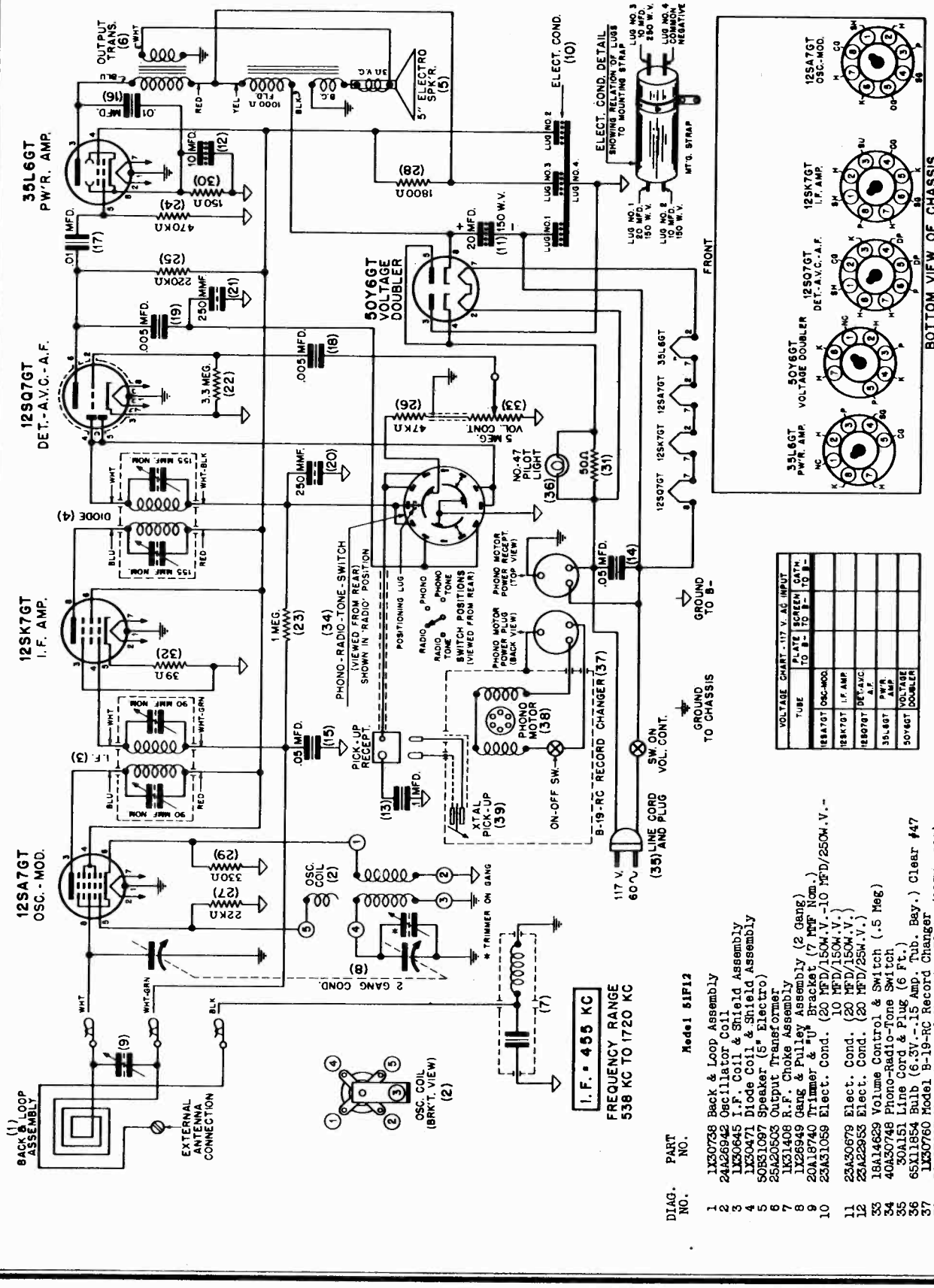
ALIGNMENT CHART

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 K.C.
2	Minimum	.1 Mfd.	R.F. Grid	5*	455 K.C.
3	1720 K.C.	.1 Mfd:	R.F. Grid	6	1720 K.C.
4	1400 K.C.	200 Mmfd.	Ant.Terminal	7	1400 K.C.

* Adjust for Minimum Response (I.F. Wave Trap)

MODEL 51F12

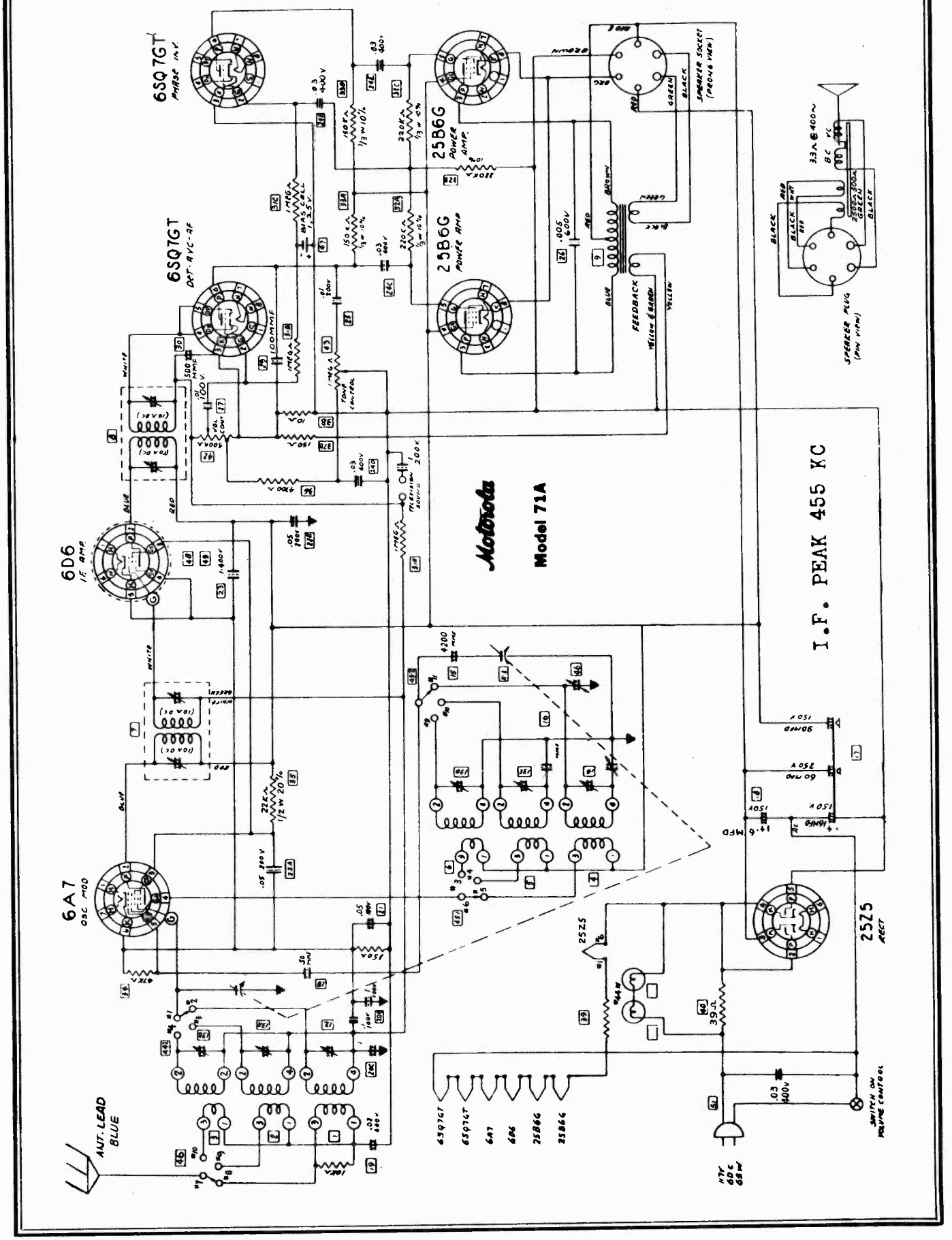
GALVIN MFG. CO.



DIAG. NO.	PART NO.	Model 51F12
1	1X30738	Back & Loop Assembly
2	24A28942	Oscillator Coil
3	1X30645	I.F. Coil & Shield Assembly
4	1X30471	Diode Coil & Shield Assembly
5	50B31097	Speaker (5" Electro)
6	25A20503	Output Transformer
7	1X31408	R.F. Choke Assembly
8	1X26949	Gang & Pulley Assembly (2 Gang)
9	20A18740	Trimmer & "U" Bracket (7 MMF Nom.)
10	23A31059	Elect. Cond. (20 MFD/150W.V.-10 MFD/250W.V.-10 MFD/150W.V.)
11	23A30679	Elect. Cond. (20 MFD/150W.V.)
12	23A29953	Elect. Cond. (20 MFD/25W.V.)
33	18A14629	Volume Control & Switch (.5 Meg)
34	40A30748	Phono-Radio-Tone Switch
35	30A151	Line Cord & Plug (6 Ft.)
36	65X11854	Bulb (6.3V.-.15 Amp. Tub. Bay.) Clear #47
37	1X30760	Model B-19-RC Record Changer
38	59B27687	Phono Motor & Mounting Plate (117V.-60C)
39	59K30759	Crystal Pickup

MODEL 71A

GALVIN MFG. CO.



MODEL 71A

GALVIN MFG. CO.

ALIGNMENT PROCEDURE

MODEL 71-A

1. Connect signal generator to control grid of modulator tube through a .1 MFD. condenser and to chassis ground. Do not remove grid cap. Connect output meter across speaker voice coil. Turn band switch to "Broadcast" position. Turn condenser gang completely out of mesh.

2. Set signal generator at 455 K.C. and carefully adjust the four I.F. trimmers (located in top of I.F. coil cans) to point showing highest reading on output meter.

3. Leave band switch in "Broadcast" position. Connect signal generator to antenna lead and chassis, using a 200 MMF. condenser in antenna lead.

4. Set signal generator and receiver dial both at 1750 K.C. Adjust B.C. Oscillator trimmer until 1750 K.C. signal is heard.

5. Set signal generator at 1400 K.C. and turn condenser gang to the signal at 1400 K.C. Adjust B.C. Antenna trimmer to point showing highest reading on output meter.

6. Set signal generator at 600 K.C. and rock pointer at 600 K.C. position on dial scale while adjusting B.C. padder until combination is found which gives highest output reading.

7. Turn band switch to "Police" position. Connect antenna lead to signal generator through a 400 ohm resistor.

8. Set signal generator and receiver dial both at 5.7 M.C. Adjust police oscillator trimmer until 5.7 M.C. signal is heard.

9. Set signal generator at 5.5 M.C. and turn condenser gang to signal at 5.5 M.C. Adjust Police Antenna trimmer to point giving greatest output reading while slightly rocking condenser gang.

10. Turn band switch to "Short Wave" position, still using 400 ohm carbon resistor in antenna lead to signal generator.

11. Set signal generator and receiver dial both at 18.0.M.C. Adjust S.W. Oscillator trimmer until 18.0.M.C. signal is heard.

12. Set signal generator at 16 M.C. and turn condenser gang to the signal at 16 M.C. Adjust S.W. Ant. trimmer to point giving greatest output reading, while slightly rocking condenser gang.

13. Padders on "Police" and "Short Wave" bands are fixed.

Note: Under no circumstances should "Police" and "Short Wave" padder be adjusted.

MODEL 72-C

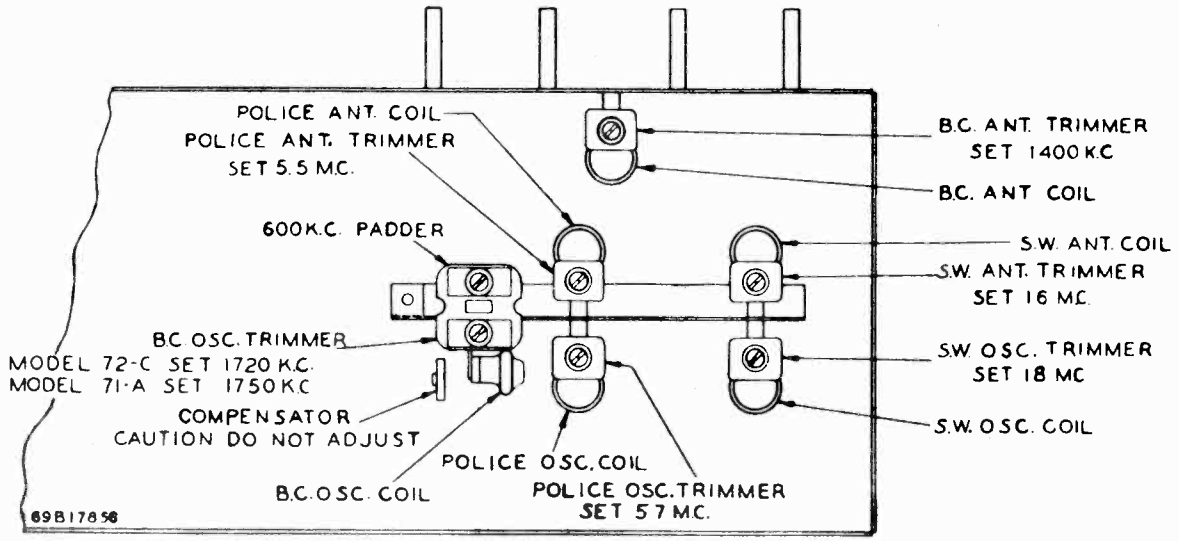
(SAME AS 71-A EXCEPT FOR THE FOLLOWING STEPS:)

1. Loop must be connected to chassis during alignment.

3. Connect signal generator to antenna lead through 400 ohm resistor.

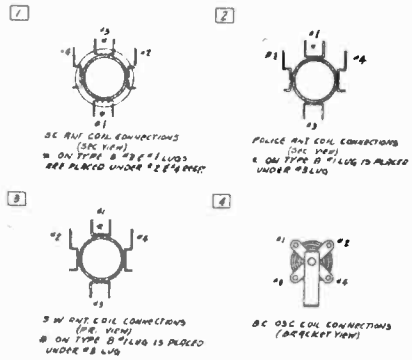
4. Adjust for 1720 K.C. instead of 1750 K.C.

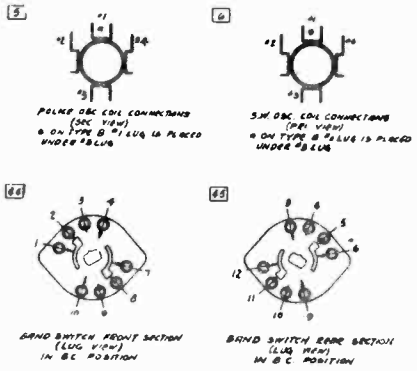
5. Model 72C has no antenna trimmer. Continue alignment as for Model 71-A.



TWO TYPES OF COILS HAVE BEEN USED WHICH ARE IDENTICAL, EXCEPT FOR LUG POSITIONS
COILS SHOWN ARE TYPE A - NOTCH UNDER COIL
SEE TYPE B DIFFERENCES
COILS SHOWN WITH SPRING LUGS AT TOP

MODEL 71-A





MODEL 71A
MODEL 72C

GALVIN MFG. CO.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

71-A AND 72-C

All stage gain measurements must be made with volume control set for full volume and tone control in treble position. The shielded lead from the signal generator is connected to the grid terminal of the tube through a .1 MF condenser with a 500 M ohm resistor connected as a leak resistor between the grid of the tube and the grid lead which has been removed.

To measure overall sensitivity of the Model 72-C, connect the signal generator to the coupling turn in the loop, using a 400 ohm dummy. The lead, including the resistor, should be thoroughly shielded and the receiver must be at least 3 feet away from the signal generator.

MODEL 71-A

Microvolt Input *	Generator Set at	Generator Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter **
2500	455	I.F. Grid	.1 Mfd	.5 Meg	.38 Volt
35	455	Mod. Grid	.1 Mfd	.5 Meg	.38 Volt
40	600	Mod. Grid	.1 Mfd	.5 Meg	.38 Volt
10	600	Ant. Lead	200 mmf.	None	.38 Volt

* For .05 Watts output. ** Output meter connected across voice coil.

MODEL 72-C

Microvolt Input *	Generator Set at	Generator Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
2100	455	I.F. Grid	.1	.5 meg	.38 volts
35	455	Mod. Grid	.1	.5 meg	.38 volts
45	600	Mod. Grid	.1	.5 meg	.38 volts
7	600	Ant. Lead	400 ohms	none	.38 volts

* For .05 Watts output
** Output meter connected across voice coil

VOLTAGE CHART 71-A

TUBE	POSITION	PLATE	SCREEN	CATHODE	OSC. GRID	ANODE GRID
6A7	Mod.-Osc.	165	90	3	12	165
6D6	I.F.	165	90	3	-	-
6SQ7GT	Inverter	105	-	-	-	-
6SQ7GT	Driver	105	-	-	-	-
25B6G	Output	210	170	31	-	-
25B6G	Output	210	170	31	-	-
25Z5	Rect.	117	-	208	-	-

Line Voltage 117 AC 60 Cycle All Reading to B minus Volume control set at Maximum

VOLTAGE CHART 72-C

TUBE	POSITION	PLATE	SCREEN	CATHODE	OSC. PLATE
6A8GT	Mod.-Osc.	185	80	1.3	110
6K7GT	I.F.	185	80	1.2	-
6SQ7GT	Det.-AVC-A.F.	95	-	0	-
6SQ7GT	Phase Inv.	95	-	0	-
6V6G	Output	260	185	8.2	-
6V6G	Output	260	185	8.2	-
5W4GT	Rect.	AC	-	260	-

Line Voltage 117 AC. 60 cycle Measurements are from socket terminal indicated to chassis ground using 1000 ohms per volt meter. Volume control set at maximum

MODEL 71A

GALVIN MFG. CO.

MODEL 71-A SCHEMATIC DIAGRAM PARTS LIST

Diag. No.	Part No.	Description	Diag. No.	Part No.	Description
1	24A17043	B.C.Antenna Coil (Violet & Black Dots)	26	8S9813	Tubular Condenser (.005-600V.)
2	24A16787	Police Antenna Coil	27	8S9801	Tubular Condenser (.01-100V.)
3	24A16788	S. W. Antenna Coil	28	21B6503	Molded Mica Cond. (50 mmf) 20%
4	24K17049	B.C.Osc. Coil (Violet & Brown Dots)	29	21B6511	Molded Mica Cond. (100 mmf) 20%
5	24A16789	Police Oscillator Coil	30	21B6500	Molded Mica Cond. (500 mmf) 20%
6	24A16790	S. W. Oscillator Coil	31	6B6071	Carbon Res. (1 meg-1/3-20) N.I.
7	1X17014	I.F. Coil & Shield Assembly	32	6B6122	Carbon Res. (220,000-1/3-10) N.I.
8	1X17032	Diode Coil & Shield Assembly	33	6B6130	Carbon Res. (150,000-1/3-10) N.I.
9	25A16761	Output Transformer	34	6B6020	Carbon Res. (47,000-1/3-20) N.I.
10	50B16808	Speaker (8" Electro) & Cable	35	6B6088	Carbon Res. (22,000-1/2-20) N.I.
11	1X14887	Tuner, Gang & Pulley	36	6B6101	Carbon Res. (4700-1/3-20) N.I.
12	20A16803	Trimmer & L Brkt. (2-22) R.H.	37	6B6226	Carbon Res. (150-1/3-20) N.I.
13	20K16825	Trimmer & L Brkt. (2-22) L.H.	38	6B6227	Carbon Res. (10-1/3-10) N.I.
14	20K10996	B. C. Trimmer & Padder	39	17X15295	Ins. W. W. Resistor (50-5-10)
15	20K17439	S. W. Padder (4200 mmf)	40	17X15296	Ins. W. W. Resistor (39-5-10)
16	20A17438	Police Padder (2500 mmf)	41	6B6123	Carbon Res. (10,000-1/3-10) N.I.
17	23A16805	Electrolytic Condenser (3 Section)	42	18A17041	Volume Control & Switch (.5 meg)
18	23A15291	Electrolytic Condenser (16-150V.)	43	18A16083	Tone Control (1 meg)
19	8S9802	Tubular Condenser (.02-400V.)	44	40A16796	Band Switch Section (Front)
20	8S9814	Tubular Condenser (.1-100V.)	45	40K16797	Band Switch Section (Rear)
21	8S9805	Tubular Condenser (.05-100V.)	46	20A11047	Compensating Condenser
22	8S9821	Tubular Condenser (.05-200V.)	47	48X10089	Bias Cell
23	8S9807	Tubular Condenser (.1-400V.)	48	26X10881	Tube Shield Shell
24	8S9804	Tubular Condenser (.03-400V.)	49	26X10882	Tube Shield Cap
25	8S9825	Tubular Condenser (.01-200V.)	50	65X12028	Bulb (6.3V-.25 A Tub.Bay.) White
			51	30A151	Line Cord & Plug (6 feet)

MODEL 71-A DIAL CORD INSTRUCTIONS

1. Cut a length of 24# test dial drive cord 34 inches long.
2. Turn gang to fully meshed position.
3. Push dial drive shaft down.
4. Thread end of cord thru slot"G" in drive pulley.
5. With an ordinary paper clip fasted cord to drive disc "H" to hold in place.
6. Wind cord in a clock-wise direction one half turn around the drive pulley and up to the front idler pulley "B".
7. Run cord across dial to idler pulley "B" and around it in a clock-wise direction.
8. Continue cord back across chassis and over rear idler pulley "C".
9. Continue cord down to drive pulley "A" and clockwise around it one and one half turns to the slot "G".
10. Knot both ends of cord securely together inside the slot.
11. Tie in one end of tension spring.
12. Hook the other end of tension spring into hole in drive pulley "A".
13. Replace the dial pointer.
14. To set pointer to correct frequency, tune in a station of known frequency and adjust position of pointer on string.
15. Secure pointer to string with a drop of shellac or good grade household cement.

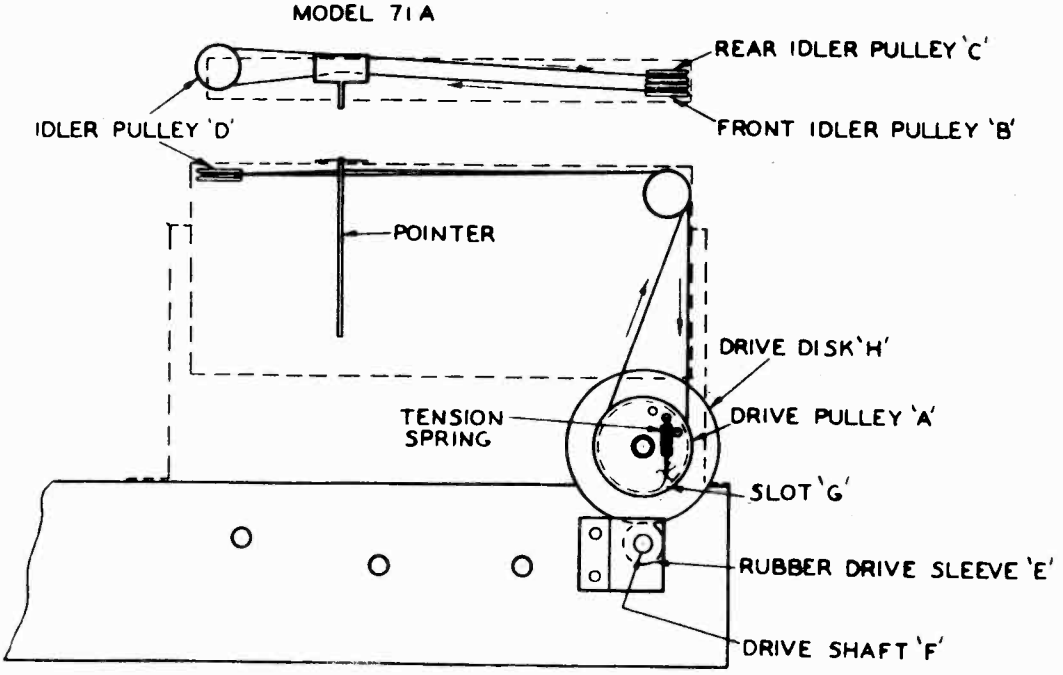
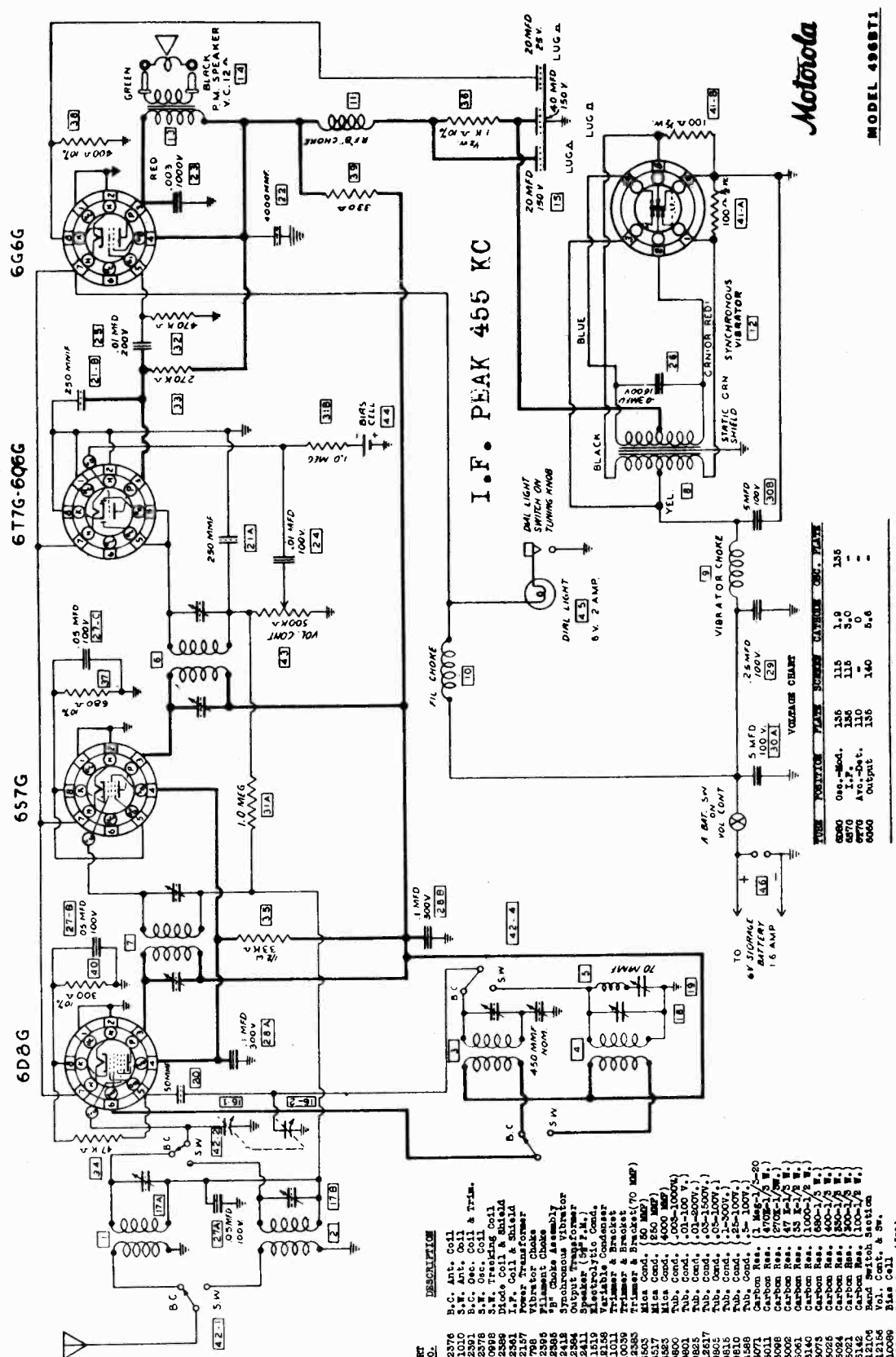


Fig. 21

MODEL 496BT1

GALVIN MFG. CO.



DIAG. NO.	PART NO.	DESCRIPTION
1	24A12376	B.C. Ant. Coil
2	24A11010	S.W. Ant. Coil
3	1A12391	B.C. Osc. Coil & Trim.
4	24A12378	S.W. Osc. Coil
5	24A10988	S.W. Tracking Coil
6	1A12389	Diode Coil & Shield
7	1A12394	I.F. Transformer
8	2A12387	Power Transformer
9	2A4798	Vibrator Choke
10	1A12395	Filament Choke
11	1A12385	"pi" Choke Assembly
12	4M12418	Synchronous Vibrator
13	2A12384	Output Transformer
14	5A12411	Speaker (3" P.M.)
15	2A11519	Electrolytic Cond.
16	2A11518	Electrolytic Cond.
17	2A11011	Trimmer & Bracket
18	2A10039	Trimmer & Bracket
19	2A12383	Trimmer & Bracket(70 MMF)
20	21B6503	Mica Cond. (50 MMF)
21	21B6517	Mica Cond. (880 MMF)
22	21B6583	Mica Cond. (4000 MMF)
23	869800	Tub. Cond. (.005-10000V.)
24	869801	Tub. Cond. (.01-300 V.)
25	869815	Tub. Cond. (.03-1500V.)
26	869817	Tub. Cond. (.05-1500V.)
27	869805	Tub. Cond. (.05-100V.)
28	869816	Tub. Cond. (.1-300V.)
29	869810	Tub. Cond. (.25-100V.)
30	844588	Tub. Cond. (.5- 100V.)
31	686071	Carbon Res. (1 Meg-1/2-20
32	686011	Carbon Res. (470Ω-1/2 W.)
33	686008	Carbon Res. (270Ω-1/2 W.)
34	686002	Carbon Res. (47 Ω-1/2 W.)
35	686143	Carbon Res. (15 K-1/2 W.)
36	686140	Carbon Res. (100Ω-1/2 W.)
37	686073	Carbon Res. (680-1/2 W.)
38	686025	Carbon Res. (400-1/2 W.)
39	686024	Carbon Res. (330-1/2 W.)
40	686021	Carbon Res. (300-1/2 W.)
41	686142	Carbon Res. (100-1/2 W.)
42	40A12106	Band Switch Section
43	1A12156	Vol. Cont. & Sw.
44	4M11009	Dial Lamp (#51)
45	4M11010	Dial Lens
46	60A12215	6-V. Lamp Recept.

MODEL 496BT1

GALVIN MFG. CO.

ALIGNMENT PROCEDURE

MODEL 496BT1

1. Connect signal generator to control grid of Osc.-Mod. tube (6D8G) through a .05 MF. condenser and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn band switch to "Broadcast" position. Turn condenser gang completely out of mesh.

2. Set signal generator at 455 K.C. and carefully adjust the four I.F. trimmers (located in top of I.F. coil cans) to point showing highest reading on output meter.

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

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

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

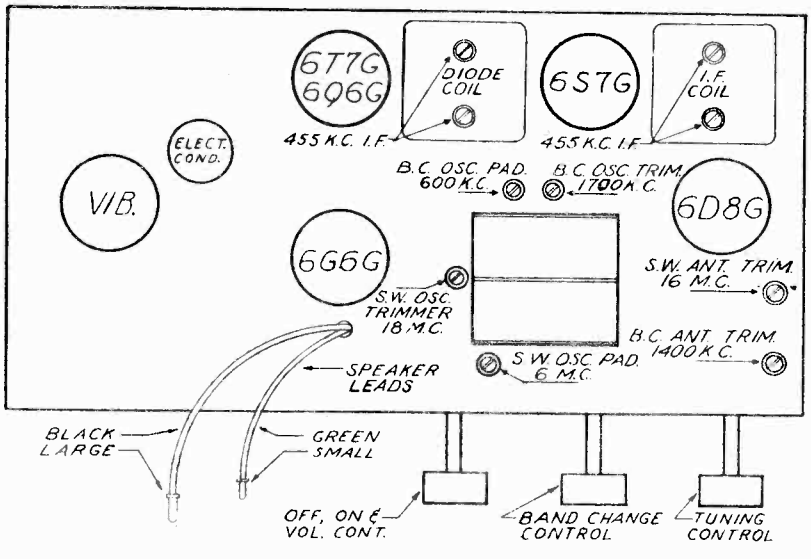
6. Set signal generator at 600 K.C. and rock pointer at 600 K.C. position on dial scale, while adjusting BC padder, until combination is found which gives highest output reading. (NOTE: If there is noise level at 600 K.C., padder can be adjusted to maximum noise without rocking gang and without use of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

7. Turn band switch to "Short Wave" position. Replace .0002 MF condenser in signal generator lead with a 400 ohm carbon resistor.

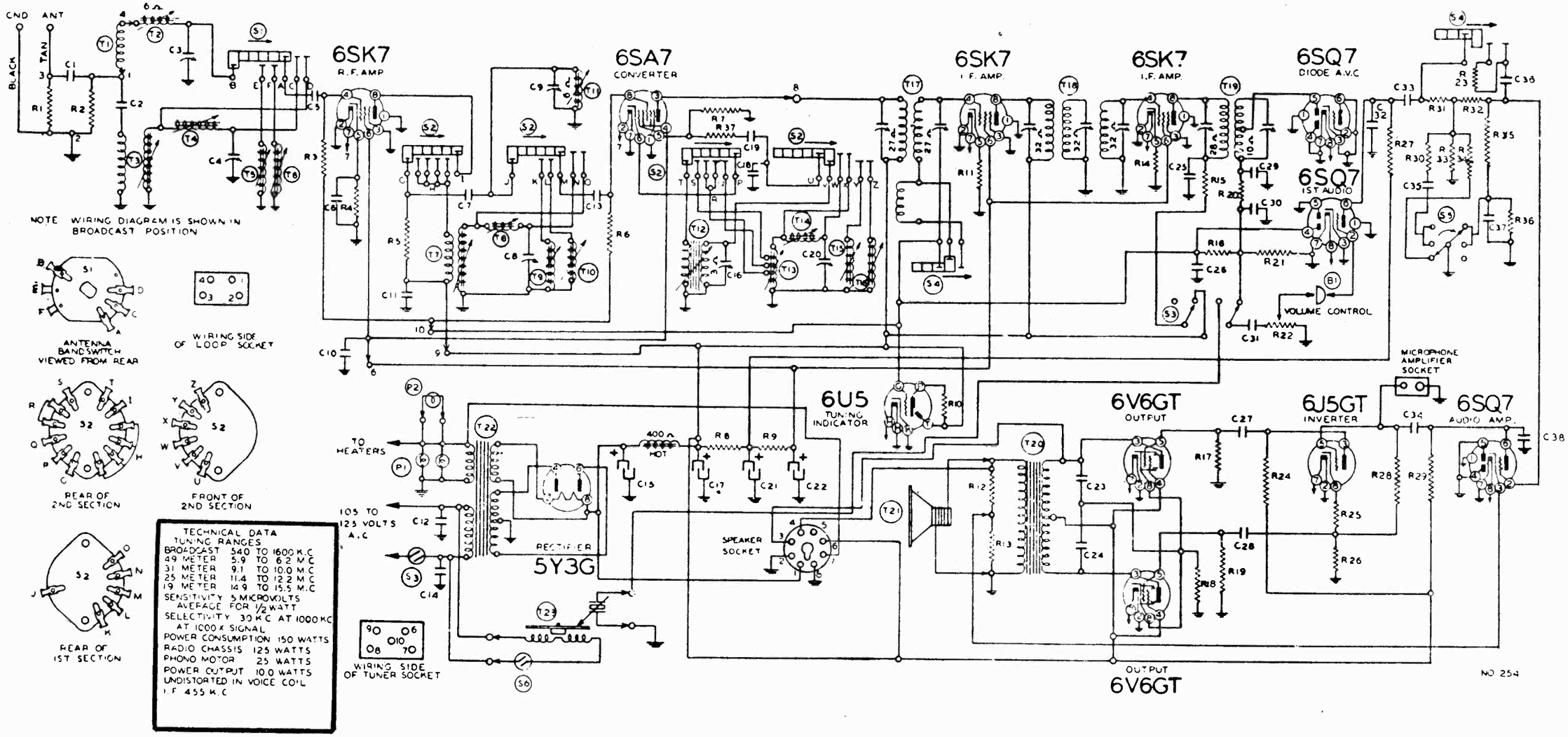
8. Set signal generator and receiver dial both at 18.0 MC. Adjust S.W. OSC. trimmer until 18.0 MC signal is heard.

9. Set signal generator at 16.0 MC and turn condenser gang to signal at 16.0 MC. Adjust S.W. ANT. trimmer to point giving greatest output reading. (Use non-metallic screw driver.)

10. Set signal generator at 6.0 MC and rock pointer at 6.0 MC position on dial scale, while adjusting S.W. padder, until combination is found which gives highest output reading. (NOTE: May also be adjustable to maximum noise.)

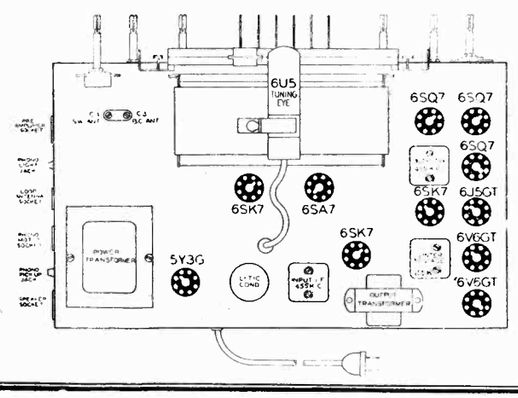


GAMBLE-SKOGMO, INC.

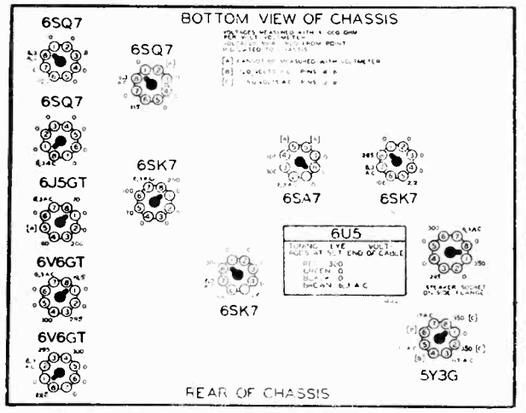


Code No.	Part No.	Description
		RESISTORS
R1	130232	25M ohm—½ w.
R2	130232	25M ohm—½ w.
R3	13019	1 megohm—½ w.
R4	130239	250 ohm—½ w.
R5	130218	5M ohm—½ w.
R6	13019	1 megohm—½ w.
R7	130232	25M ohm—½ w.
R8	130318	6M ohm—2 w.
R9	130319	10M ohm—2 w
R10		1 megohm in tuning indicator cable
R11	13070	500 ohm—½ w.
R12	13082	10M ohm—½ w.
R13	130235	1500 ohm—½ w.
R14	130192	2M ohm—½ w.
R15	130192	2M ohm—½ w.
R16	13019	1 megohm—½ w.
R17	1303	500M ohm—½ w.
R18	130317	250 ohm—2 w.
R19	1303	500M ohm—½ w.
R20	13094	50M ohm—½ w.
R21	130316	120M ohm—½ w.
R22	101229	500M ohm volume control
R23	130191	1.5 megohm—½ w.
R24	13094	50M ohm—½ w.
R25	130218	5M ohm—½ w.
R26	13094	50M ohm—½ w.
R27	130172	250M ohm—½ w.
R28	1303	500M ohm—½ w.
R29	130172	250M ohm—½ w.
R30	130232	25M ohm—½ w.
R31	13080	150M ohm—½ w
R32	130309	350M ohm—½ w.
R33	130266	200M ohm—½ w.
R34	13066	75M ohm—½ w.
R35	13080	150M ohm—½ w.
R36	130146	2 megohm—½ w.
R37	130174	50 ohm—½ w.
		CONDENSERS
C1	1292	.0005 mica
C2	10047	.002 x 600 v.
C3	124143	B.C. antenna trimmer
C4	124143	9 mc. antenna trimmer
C5	1292	.0005 mica
C6	10020	.1 x 200 v. tubular
C7	129168	.00001 mica
C8	124138	9 mc. R. F. trimmer
C9	124139	B.C. R.F. trimmer
C10	10074	.1 x 400 v.
C11	10074	.1 x 400 v.
C12	10061	.02 x 600 v.
C13	1292	.0005 mica
C14	10061	.02 x 600 v.
C15	119112	30.0 mfd. lytic
C16	124144	B.C. oscillator trimmer
C17	119112	30.0 mfd. lytic x 450 w.v.
C18	129167	.0002 silver mica
C19	129165	.00005 mica
C20	124145	9 mc. oscillator trimmer
C21	119112	10.0 mfd. lytic
C22	11969	16 mfd. x 350 w.v.
C23	10065	.015 x 600 v.
C24	10065	.015 x 600 v.
C25	1001	.1 x 400 v.
C26	10020	.1 x 200 v.
C27	10013	.05 x 400 v.
C28	1009	.05 x 200 v.
C29	1295	.0001 mica
C30	1295	.0001 mica
C31	10020	.1 x 200 v.
C32	12912	.00025 mica
C33	1001	.1 x 400 v.
C34	10013	.05 x 400 v.
C35	100118	.008 x 600 v.
C36	129185	.00009 mica
C37	10037	.003 x 600 v.
C38	12912	.00025 mica
		C3 and C4 in same unit
		C15, C17 and C21 in same unit
B1	11622	Bias cell 1.25 volt

I.F. PEAK 455 KC

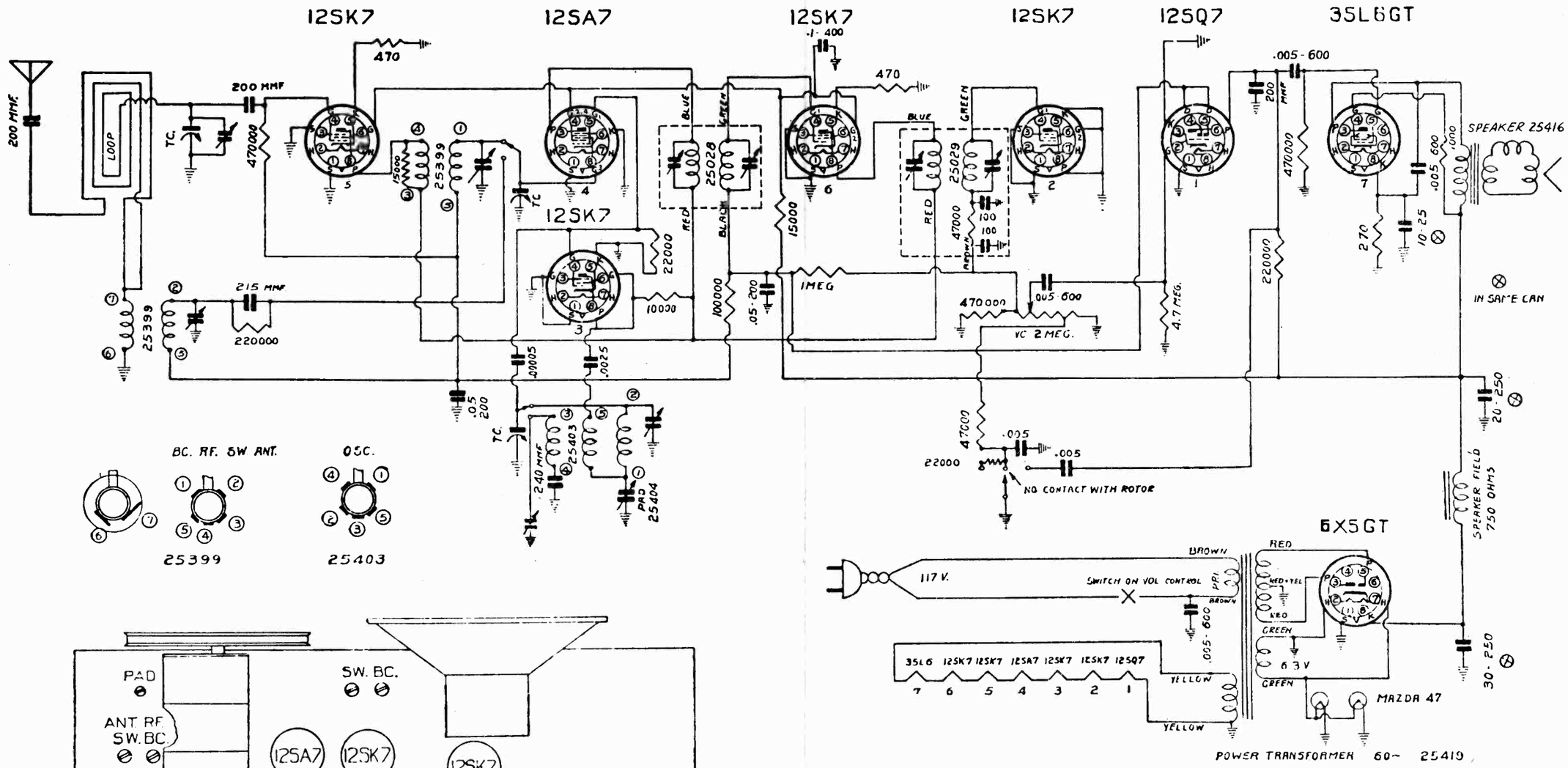


FOR EITHER THE SEEBURG MODEL B OR OAK MODEL RC-1 RECORD CHANGER, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".



MODELS 1128, 1682

GAMBLE-SKOGMO, INC.



TRIMMER LOCATIONS

I.F. PEAK 456 KC

MODELS 1128 + 1682

SPECIFICATIONS

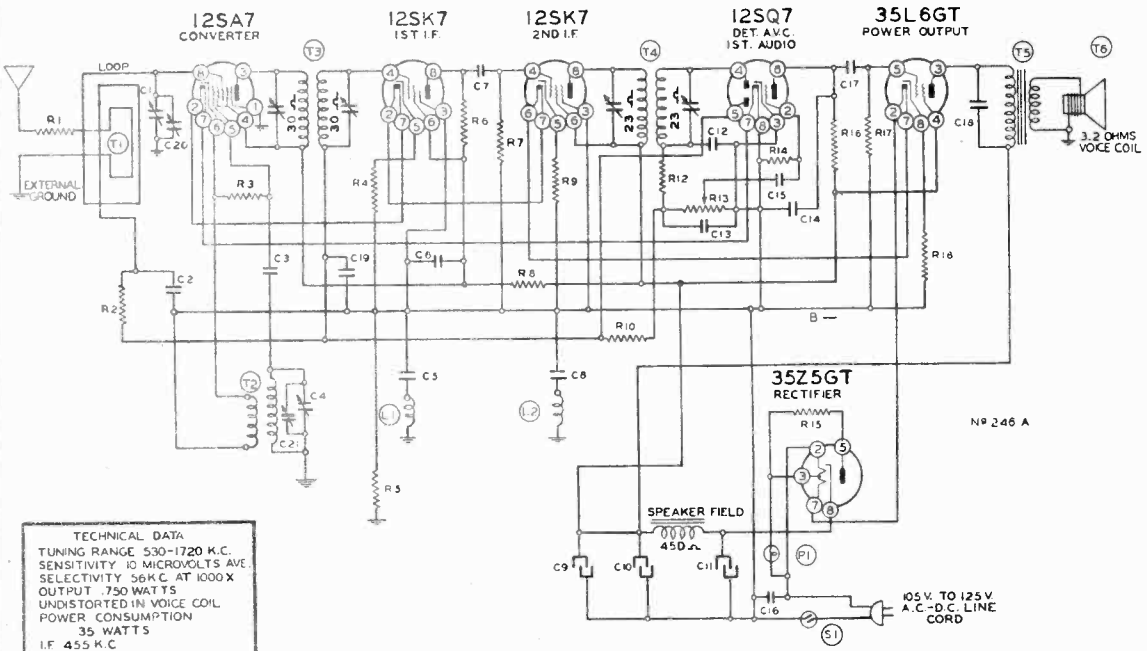
Watts input at 117 V. line: 45 Watts output: 1.7 Undistorted 2.7 Maximum
Selectivity at 1000 times signal — 34kc band width Intermediate frequency 456kc
Speaker 5¼" Electrodynamic, 750 ohm field

I. F. 456kc at 12SA7 grid (Stator of middle section of variable condenser) 50 to 60 Microvolts.

Tube Functions: 12SK7 R. F., 12SA7 first detector, 12SK7 oscillator, 12SK7 IF amplifier, 12SK7 second detector, 12SQ7 first audio, 35L6GT power output. 6X5GT rectifier. Voltages will be found on circuit diagram.

Tuning Ranges:
Broadcast Band 540 to 1650 kc Short Wave Band 9.1 — 12.0 mc

Sensitivity: For .05 watt output:
(Loop)
Broadcast Band 15 to 20 Microvolts S W Band 40 to 60 "



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

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

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—½ Watt Resistor—10%	1	.20
1304	R10	3 Megohm—½ Watt Resistor—20%	1	.20
13021	R3	20M Ohm—½ Watt Resistor—20%	1	.20
130166	R18	150 Ohm—½ Watt Resistor—10%	1	.20
130215	R15	25 Ohm—½ Watt Resistor—10%	1	.20
13019	R17	1 Megohm—½ Watt Resistor—20%	1	.20
130257	R14	5 Megohm—½ Watt Resistor—25%	1	.20
13020	R12	100M Ohm—½ Watt Resistor—20%	1	.20
1309	R16	200M Ohm—½ Watt Resistor—20%	1	.20
130168	R4	100 Ohm—½ Watt Resistor—10%	1	.20
1303	R7	500M Ohm—½ Watt Resistor—20%	1	.20
13097	R9	200 Ohm—½ Watt Resistor—10%	1	.20
130345	R1, R8	1M Ohm —½ Watt Resistor—10%	1	.20
130100	R2, R5	150M Ohm—½ 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

GAMBLE-SKOGMO, INC.

MODEL C6D11, Series B

GAMBLE PAGE 14-1

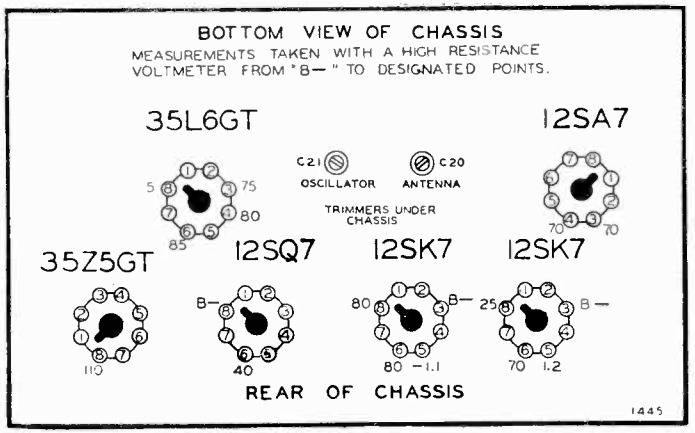
October 1941

ALIGNMENT PROCEDURE

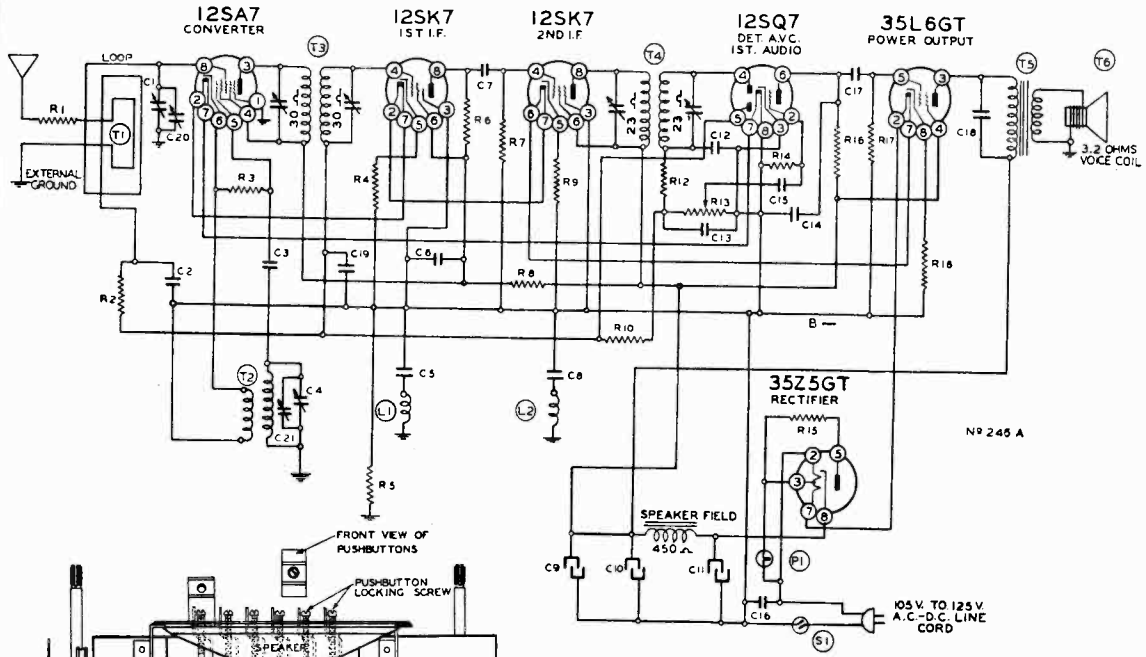
- Volume control—Maximum all adjustments.
- Connect B— of radio chassis to ground post of signal generator through .1 Mfd. condenser.

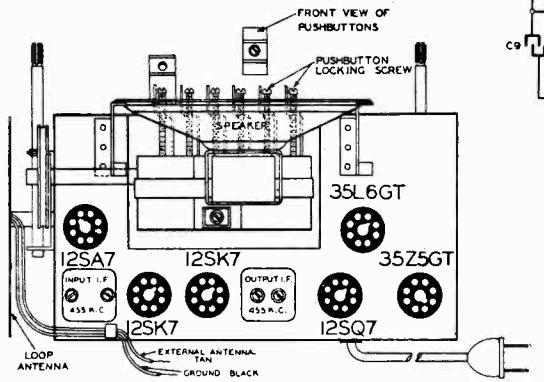
BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted to Maximum
I. F.	455 Kc.	.1 MFD.	Grid of 12SK7 2nd I. F.	Rotor full open (Plates out of mesh)	Two trimmers on top of Output I. F.
	455 Kc.	.1 MFD.	Grid of 12SA7 Converter	Rotor full 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.



VOLTAGE CHART





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

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

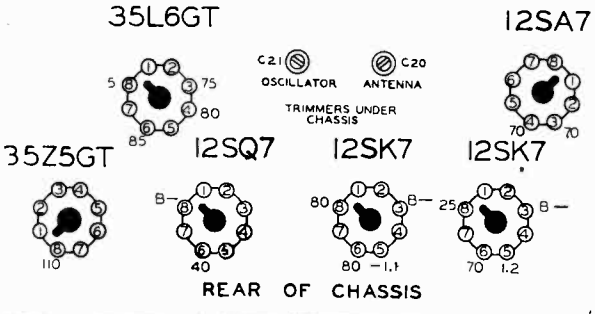
The loop antenna should be connected to the radio and in its proper position when making all adjustments.

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—½ Watt Resistor—10%	1	.20
1304	R10	3 Megohm—½ Watt Resistor—20%	1	.20
13021	R3	20M Ohm—½ Watt Resistor—20%	1	.20
130166	R18	150 Ohm—½ Watt Resistor—10%	1	.20
130215	R15	25 Ohm—½ Watt Resistor—10%	1	.20
13019	R17	1 Megohm—½ Watt Resistor—20%	1	.20
130257	R14	5 Megohm—½ Watt Resistor—25%	1	.20
13020	R12	100M Ohm—½ Watt Resistor—20%	1	.20
1309	R16	200M Ohm—½ Watt Resistor—20%	1	.20
130168	R4	100 Ohm—½ Watt Resistor—10%	1	.20
1303	R7	500M Ohm—½ Watt Resistor—20%	1	.20
13097	R9	200 Ohm—½ Watt Resistor—10%	1	.20
130345	R1, R8	1M Ohm —½ Watt Resistor—10%	1	.20
130100	R2, R5	150M Ohm—½ Watt Resistor—20%	2	.20
		COILS		
108146P	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

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

October 1941

BOTTOM VIEW OF CHASSIS
MEASUREMENTS TAKEN WITH A HIGH RESISTANCE VOLTMETER FROM "B—" TO DESIGNATED POINTS.

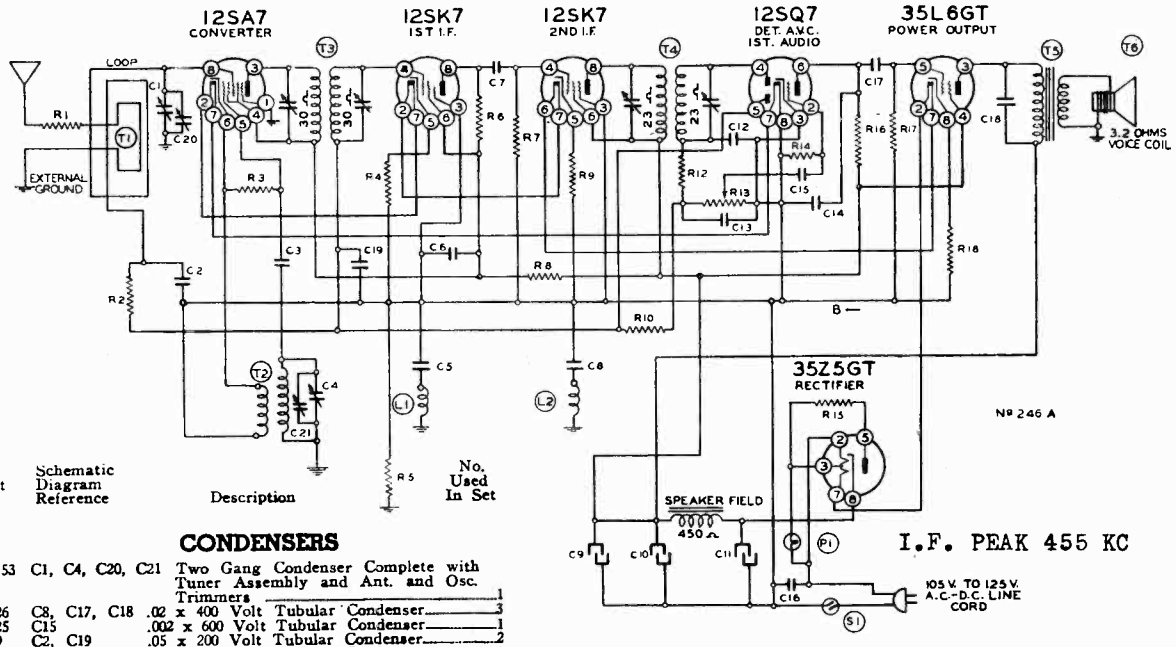


1445

VOLTAGE CHART

GAMBLE-SKOGMO, INC.

MODEL C6D16, Series A



Part No.	Schematic Diagram Reference	Description	No. Used In Set

CONDENSERS

102153	C1, C4, C20, C21	Two Gang Condenser Complete with Tuner Assembly and Ant. and Osc. Trimmers	1
10026	C8, C17, C18	.02 x 400 Volt Tubular Condenser	3
10025	C15	.002 x 600 Volt Tubular Condenser	1
1009	C2, C19	.05 x 200 Volt Tubular Condenser	2
10020	C6	.1 x 200 Volt Tubular Condenser	1
100110	C5	.2 x 400 Volt Tubular Condenser	1
1001	C16	.1 x 400 Volt Tubular Condenser	1
119135	C9, C10, C11	Electrolytic Filter Condenser. 20 Mfd. x 150 V.; 20 Mfd. x 150 V.; 40 Mfd. x 150 V.	1
1295	C3, C7, C12, C13, C14	.0001 Mica Type Condenser—20%	5

RESISTORS

101274	R13, S1	Volume Control and Switch (1 Megohm)	1
13082	R6	10M Ohm—½ Watt Resistor—10%	1
1304	R10	3 Megohm—½ Watt Resistor—20%	1
13021	R3	20M Ohm—½ Watt Resistor—20%	1
130166	R18	150 Ohm—½ Watt Resistor—10%	1
130215	R15	25 Ohm—½ Watt Resistor—10%	1
13019	R17	1 Megohm—½ Watt Resistor—20%	1
130257	R14	5 Megohm—½ Watt Resistor—25%	1
13020	R12	100M Ohm—½ Watt Resistor—20%	1
1309	R16	200M Ohm—½ Watt Resistor—20%	1
130168	R4	100 Ohm—½ Watt Resistor—10%	1
1303	R7	500M Ohm—½ Watt Resistor—20%	1
13097	R9	200 Ohm—½ Watt Resistor—10%	1
130345	R1, R8	1M Ohm —½ Watt Resistor—10%	1
130100	R2, R5	150M Ohm—½ Watt Resistor—20%	2

COILS

108140P	T3	Input I. F. Coil Complete in Can	1
108145G	T4	Output I. F. Coil Complete in Can	1
110146	T2	Oscillator Coil	1
111260	T1	Loop Antenna Assembly—Specify Color	1
105140	L1	I. F. Filter Choke	1
105141	L2	Filter Choke	1

SPEAKER

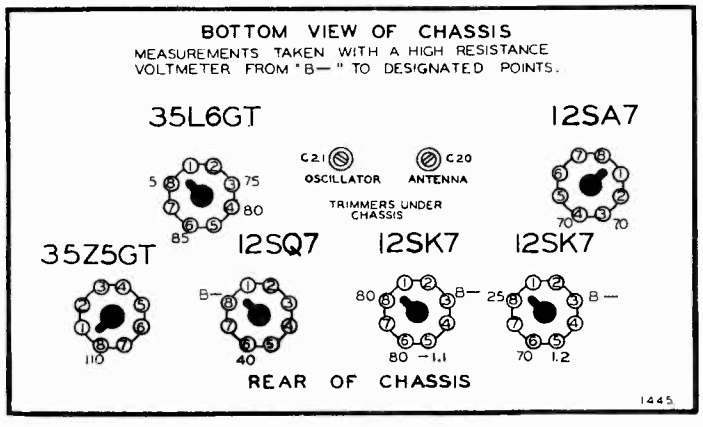
114263	T6	4 x 6 Inch Oval Electrodynamic Speaker (Less Output Transformer)	1
105106C	T5	Output Transformer for Speaker	1

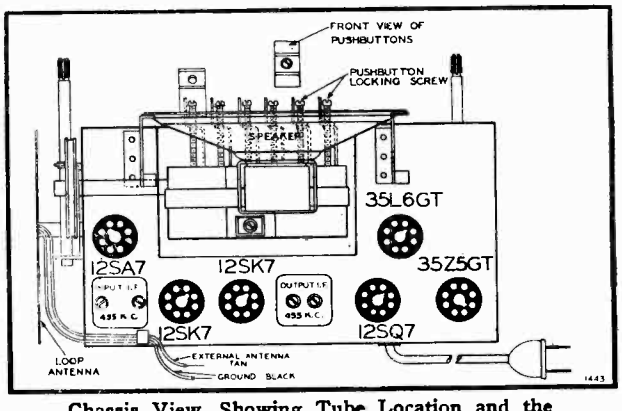
MISCELLANEOUS

107249	P1	6-8 Volt Pilot Lite Bulb. Type T-47	1
107389		Socket Assembly for Pilot Lite	1
10798		Line Cord and Plug	1
121210		8 Prong Molded Octal Sockets	6

DIAL AND TUNING PARTS

1121012	Dial Scale	1
112998	Diffuser	1
131211	Snap-in Rivets to Fasten Dial	2
1121013	Pointer	1
120377	Coiled Tension Spring for Dial String	2
120214	String for Dial	Per Yd.
120424	Spring—On Tuning Shaft	1
1209	String for Tuning Shaft	Per Yd.
117922	Tuning Shaft	1
128699-14	Pushbuttons—Left—Walnut	3
128700-14	Pushbuttons—Right—Walnut	3
131383	Screw Driver	1
128523-14	Knob—Walnut	2
112973	Set of Station Call Letters	1
112979	Set of Tabs for Call Letters	1





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).

MODEL C6D16

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.

ALIGNMENT
MODEL C6D18

Slight adjustments to the oscillator and antenna circuits can be made without removing the chassis from the cabinet through two holes which are provided on the bottom of the cabinet.

The two adjustments on the variable gang condenser can be reached with a long insulated type screw driver through these two holes.

PUSH BUTTON ADJUSTMENT
MODEL C6D18

Insert the call letter tabs in the rectangular openings in each of the automatic tuner push buttons.

Stations may be set up in any sequence desired. Press any one of the automatic tuner push buttons down all the way.

Hold the push button down firmly, and tune set very carefully to station desired, until station is heard clearly and with maximum volume

Release the push button.

Press down another automatic tuner push button. Hold it down FIRMLY and carefully tune in next station desired. Release this push button.

Follow this procedure until you have selected all of your favorite stations.

Now rotate the tuning knob to the right (clockwise) as far as it will turn, and with a coin (quarter), tighten the special locking screw ("C") in the center of the tuning knob, (See Fig. 2).

It is VERY IMPORTANT that this locking screw is turned until it is ABSOLUTELY TIGHT.

This screw will lock in place all the stations you have selected on the automatic tuner push buttons. (Note: Locking screw "C" is loose when radio is shipped from factory.)

ALIGNMENT PROCEDURE

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	1650 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.

It is important during alignment that the same distance between the loop antenna and the chassis be maintained as when the chassis is installed in the cabinet.

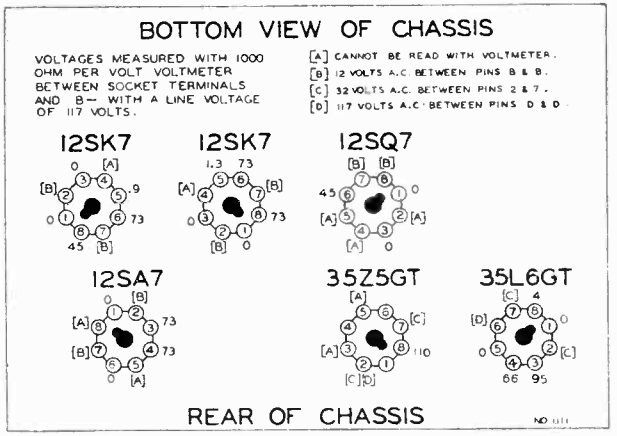
FREQUENCY RANGE
530 to 1650 K.C.

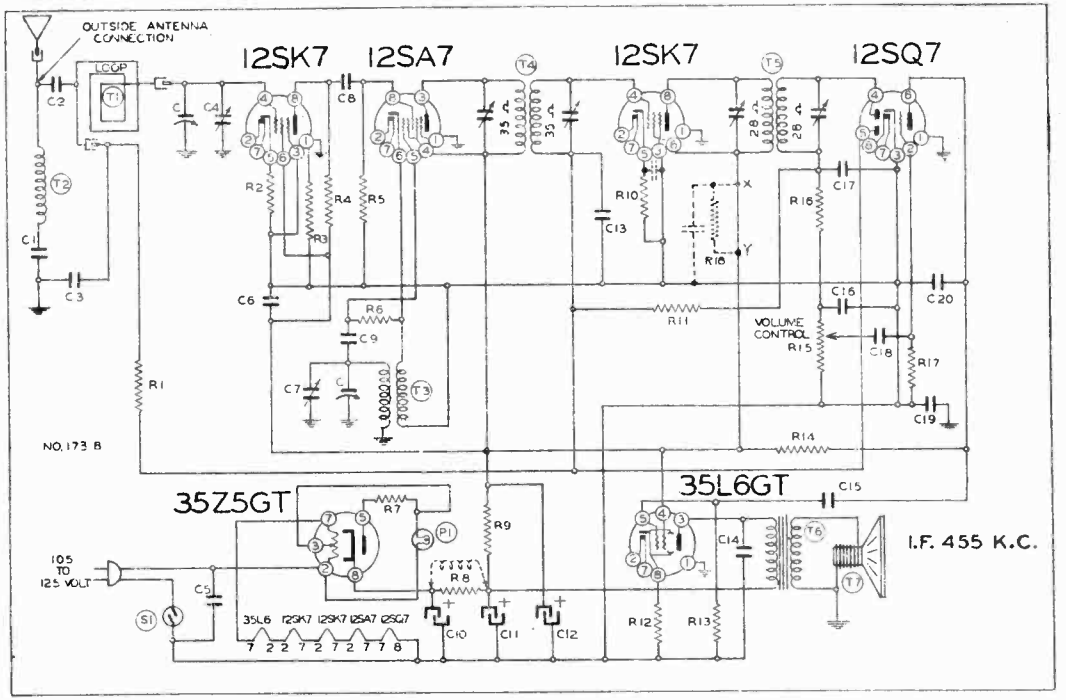
Power Output—1 Watt Undistorted, 1.7 Watts Maximum

Intermediate Frequency—455 K.C.

NOTE: Some sets of this model were made for glass tubes only. Where glass tubes were used items C21—C22—R18 shown in dotted lines, were added to the circuit and the B + Line was opened between points X + 4.

On some sets R8 is replaced by a speaker field; R9 is also eliminated and C11 and C12 are connected in parallel.





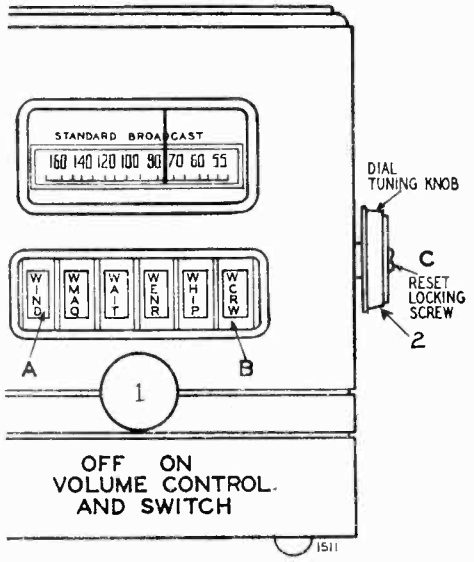


FIG. 2

Circuit Diagram Ref.	Part No.	Description
		RESISTORS
R1	130100	150M ohms—½ w.
R2	130168	100 ohms—½ w.
R3	130100	150M ohms—½ w.
R4	130218	5M ohms—½ w.
R5	13020	100M ohms—½ w.
R6	13094	50M ohms—½ w.
R7	130215	25 ohms—½ w.
R8	130296	200 ohms—1 w.
R9	130287	1200 ohms—1 w.
R10	130166	150 ohms—½ w.
R11	1304	3 megohm—½ w.
R12	130166	150 ohm—½ w.
R13	1303	500M ohm—½ w.
R14	1309	200M ohm—½ w.
R15	101211	1 megohm—volume control
R16	13012	50M ohm—½ w.
R17	130257	5 megohm—½ w.
R18	13064	3500 Ohm—½ w.
		CONDENSERS
C	102116	Two 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		B.C. Oscillator Trimmer
C8	1295	.0001 mica
C9	1295	.0001 mica

Circuit Diagram Ref.	Part No.	Description
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	10026	.02 x 400 v.
C15	100106	.004 x 600 v.
C16	12939	.00005 mica
C17	1295	.0001 mica
C18	10025	.002 x 600 v.
C19	100110	.2 x 400 v.
C20	1295	.0001 mica
C21	10020	.1 x 200 Volt
C22	10020	.1 x 200 Volt
		C10, C11, C12 are in same unit
		PARTS
T1	111145	Loop Antenna Assembly
T2	1237	Loading Coil
T3	110128	Oscillator Coil
T4	108140G	Input I.F. Coil—455 kc.
T5	108145C	Output I.F. Coil—455 kc.
T6	10595B	Output Transformer
T7	114191	5" P.M. Speaker
		or
T7	114265	5" Electrodynamic Speaker
S1		On-off switch
P1	107249	T-47 Pilot light

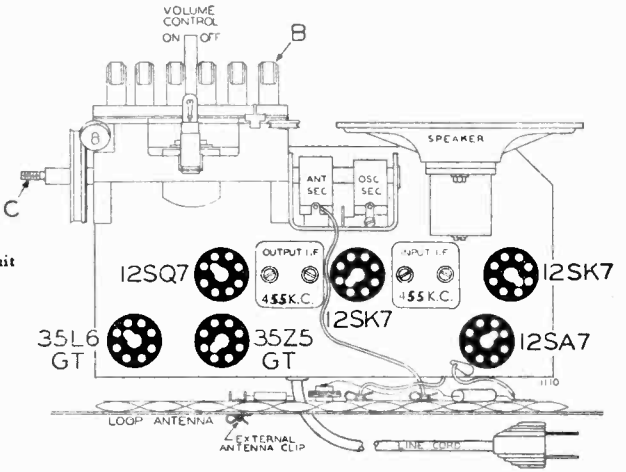
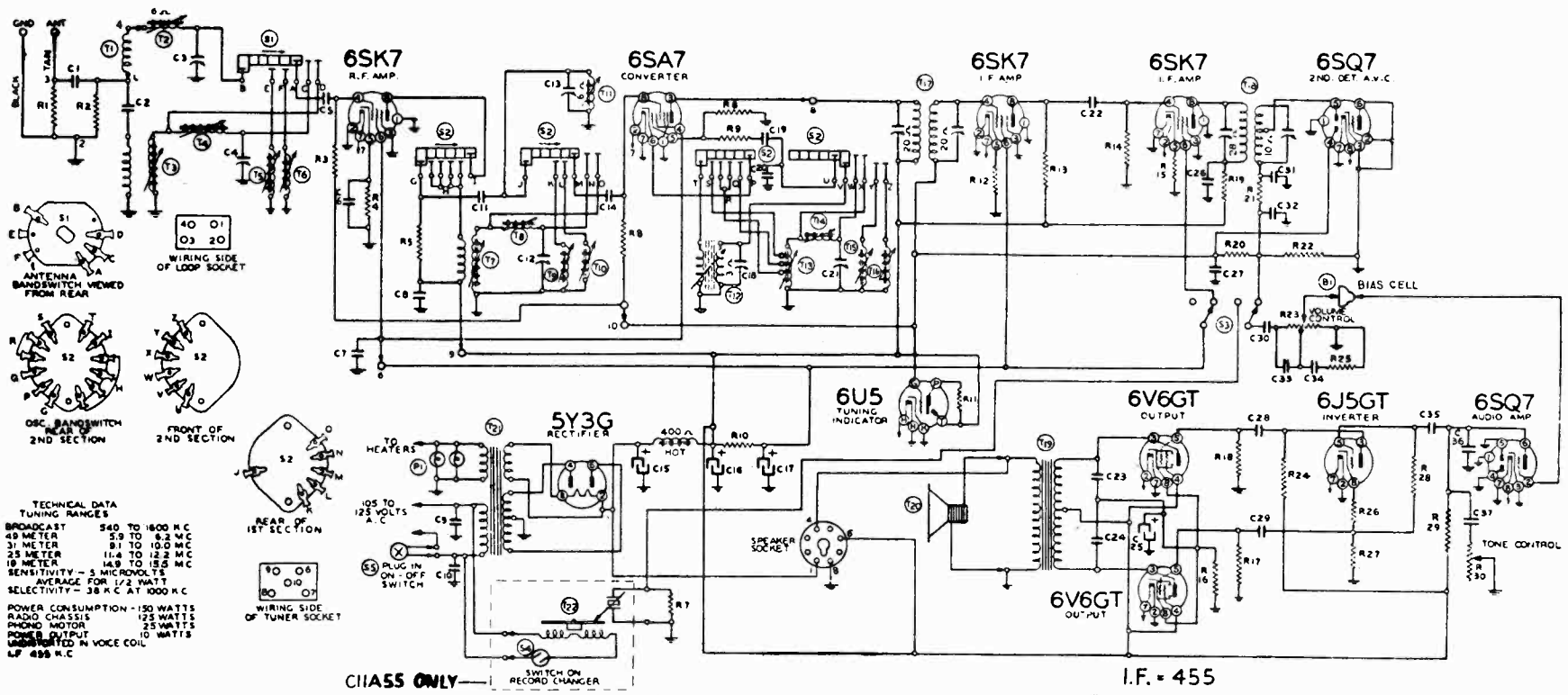


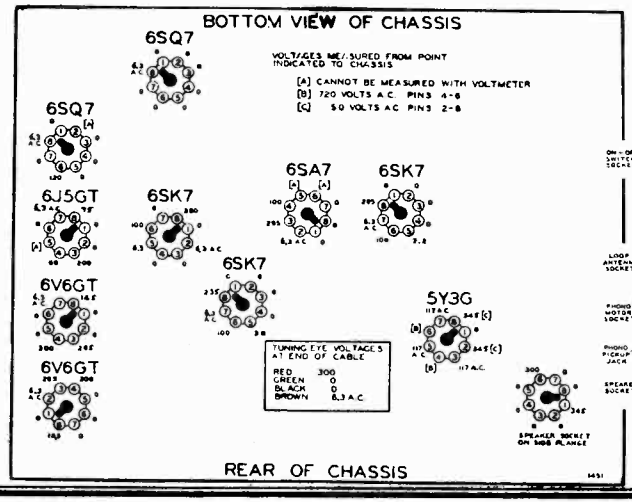
FIG. 1

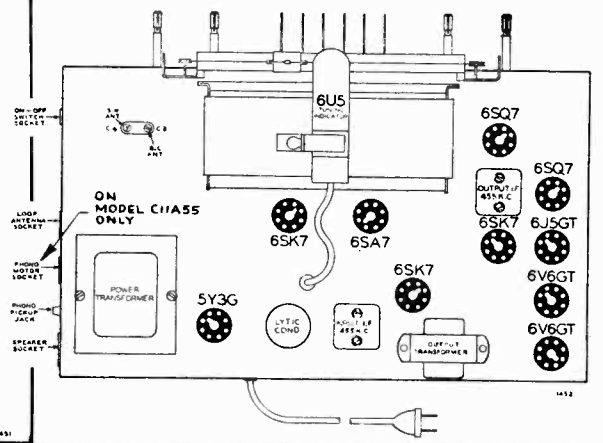


Setting the Pushbuttons

Make a list of your 6 favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the slot on top of each pushbutton.

Next pull one of the pushbuttons all the way out as far as it will come. Now tune in the station you want with the tuning knob—Tune back and forth until the station is clear and distinct. Now push the button **hard** all the way in to lock the station in place. Continue setting each pushbutton in the same way. Pressing the proper button will now tune the station you want. If it does not do so you did not push the button hard **enough** to lock it in place when setting up the station.





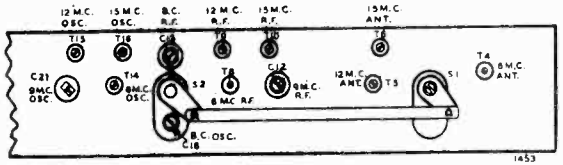
ALIGNMENT FOR MODEL C11A54 SERIES A MODEL C11A55 SERIES A MODEL 12A51 SERIES A

Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

Tune set to high frequency end of dial scale on any band.

Rotate each iron core until the fine score marks are even with the edge of the coil forms.

You are now ready to continue with the trimmer adjustments as shown on the alignment chart.

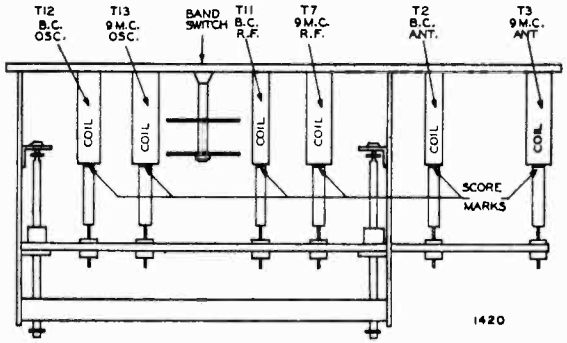


BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Band Switch	Dial Pointer Setting	Trimmers Adjusted To Maximum
I. F.	455 Kc.	.1 MFD.	Grid of 6SK7 (I.F.)	Broadcast	Set Dial at 1600 Kc.	On Top of Output I.F.
	455 Kc.	.1 MFD.	Grid of 6SA7	Broadcast	Set Dial at 1600 Kc.	On Top of Input I.F.
31 METER BAND	9.6 Mc.	400 ohms	Antenna lead	31M	Set Dial at 9.6 Mc.	(See Trimmer View) C21—Osc. (See Trimmer View) C12—R.F. (See Chassis View) C4—Ant.
49 METER BAND	6.1 Mc.	400 ohms	Antenna lead	49M	Set Dial at 6.1 Mc.	(See Trimmer View) T14—Osc. (See Trimmer View) T8—R.F. (See Trimmer View) T4—Ant.
25 METER BAND	11.8 Mc.	400 ohms	Antenna lead	25M	Set Dial at 11.8 Mc.	(See Trimmer View) T15—Osc. (See Trimmer View) T9—R.F. (See Trimmer View) T5—Ant.
19 METER BAND	15.2 Mc.	400 ohms	Antenna lead	19M	Set Dial at 15.2 Mc.	(See Trimmer View) T16—Osc. (See Trimmer View) T10—R.F. (See Trimmer View) T6—Ant.
BROAD-CAST BAND	1600 Kc.	200 mmf.	Antenna lead	Broadcast	Set Dial at 1600 Kc.	(See Trimmer View) C18—Osc. (See Trimmer View) C13—R.F. (See Chassis View) C3—Ant.
	1400 Kc.	200 mmf.	Antenna lead	Broadcast	Set Dial at 1400 Kc.	Rotate Core T11—R.F. Rotate Core T2—Ant. (See Iron Core Adjustment View)

PARTS LIST FOR MODEL C11A54 SERIES A MODEL C11A55 SERIES A

Part No.	Schematic Diagram Reference	Description	No. Used In Set
		RESISTORS	
13019	R3, R6	1 Megohm—½ Watt Resistor—20%	2
130218	R5	5M Ohm—½ Watt Resistor—10%	1
130232	R8	25M Ohm—½ Watt Resistor—10%	1
130239	R4	250 Ohm—½ Watt Resistor—10%	1
	R11	1 Megohm—In Tuning Eye Cable	1
130174	R9	50 Ohm—½ Watt Resistor	1
101275	R23	Volume Control (2.8 Megohm)	1
125180	R30, S3	Tone Control and Phono-Radio Switch (1 Megohm)	1
13070	R12	500 Ohm—½ Watt Resistor—10%	1
13082	R13	10M Ohm—½ Watt Resistor—10%	1
130317	R16	250 Ohm—2 Watt Resistor—10%	1
13094	R21, R24, R27	50M Ohm—½ Watt Resistor—10%	3
130192	R19	2M Ohm—½ Watt Resistor—10%	1
130235	R15	1500 Ohm—½ Watt Resistor—10%	1
130218	R26	5M Ohm—½ Watt Resistor—10%	1
130172	R29	250M Ohm—½ Watt Resistor—10%	1
13019	R20	1 Megohm—½ Watt Resistor—20%	1
13020	R14	100M Ohm—½ Watt Resistor—20%	1
1307	R25	40M Ohm—½ Watt Resistor—10%	1
130238	R22	400M Ohm—½ Watt Resistor—20%	1
1303	R7, R17, R18,	R28 500M Ohm—½ Watt Resistor—20%	4
130232	R1, R2	25M Ohm—½ Watt Resistor—10%	2
10667	R10	16M Ohm—3.5 Watt Resistor—10%	1
		CONDENSERS	
10020	C6	.1 x 200 Volt Tubular Condenser	1
10047	C2	.002 x 600 Volt Tubular Condenser	1
10074	C7, C8	.1 x 400 Volt Tubular Condenser	2
124138	C12	9 Mc., R.F. Adjustable Trimmer Condenser	1
124139	C13	B.C., R.F. Adjustable Trimmer Condenser	1
124143	C3, C4	B.C. and 9 Mc. Dual Adjustable Antenna Trimmer Condenser	1
124144	C18	B.C. Oscillator Adjustable Trimmer Condenser	1
124145	C21	9 Mc. Oscillator Adjustable Trimmer Condenser	1
1292	C5, C14	.0005 Mica Type Condenser—20%	1
129165	C19	.00005 Mica Type Condenser—10%	1
129168	C11	.00001 Mica Type Condenser—20%	1
129167	C20	.0002 Silver Mica Type Condenser—3%	1
1009	C29, C30	.05 x 200 Volt Tubular Condenser	2
10037	C37	.003 x 600 Volt Tubular Condenser	1
10013	C28, C35	.05 x 400 Volt Tubular Condenser	2
1001	C26	.1 x 400 Volt Tubular Condenser	1
10065	C23, C24	.015 x 600 Volt Tubular Condenser	2
10022	C27	.05 x 200 Volt Tubular Condenser	1
100134	C34	.006 x 120 Volt Tubular Condenser	1
10061	C9, C10	.02 x 600 Volt Bakelite Condenser	2
11969	C25	Electrolytic Filter Condenser. 16 Mfd. x 350 Volts	1
119112	C15, C16, C17	Electrolytic Filter Condenser. 30 Mfd.; 30 Mfd.; 10 Mfd. x 450 Volts	1
		or	
119112B	C15, C16, C17	Electrolytic Filter Condenser 30 Mfd.; 30 Mfd.; 10 Mfd. x 450 Volts	1
1292	C1, C22	.0005 Mica Type Condenser—20%	2
12912	C36	.00025 Mica Type Condenser—20%	1
12939	C33	.00005 Mica Type Condenser—20%	1
129161	C31, C32	.0001 Mica Dual Condenser—10%	1
		TRANSFORMERS	
105115B	T19	Output Transformer for Speaker	1
104217	T21	Power Transformer. 50 to 60 Cycles 105-125 Volt Primary	1
104218	T21	Power Transformer. 25 to 60 Cycles 105-125 Volt Primary	
		COILS	
10962	T11	B.C., R.F. Coil with Iron Slug	1
10958	T8	6 Mc. R.F. Coil with Iron Slug	1
10959	T7	9 Mc. R.F. Coil with Iron Slug	1
10960	T9	12 Mc. R.F. Coil with Adjusting Screw	1
10961	T10	15 Mc. R.F. Coil with Adjusting Screw	1
110161	T12	B.C., Osc. Coil with Iron Slug	1
110156	T14	6 Mc. Osc. Coil with Adjusting Screw	1
110157	T13	9 Mc. Osc. Coil with Iron Slug	1
110158	T15	12 Mc. Osc. Coil with Adjusting Screw	1
110159	T16	15 Mc. Osc. Coil with Adjusting Screw	1
111195	T2	B.C., Ant. Coil with Iron Slug	1
111189	T4	6 Mc. Ant. Coil with Iron Slug	1
111190	T3	9 Mc. Ant. Coil with Iron Slug	1
111191	T5	12 Mc. Ant. Coil with Adjusting Screw	1
111192	T6	15 Mc. Ant. Coil with Adjusting Screw	1

COIL DATA MODEL C11A54 SERIES A MODEL C11A55 SERIES A MODEL 12A51 SERIES A



VIEW LOOKING AT BOTTOM OF CHASSIS

MODEL C11A55 SERIES A RECORD CHANGER PARTS LIST Part No. 104267

4316	Motor, 60 Cycle 115 Volt
4422	Motor Mounting Kit consists of rubber grommets, screw sleeves, washers, and nuts
4233	Motor Mounting Grommet
3231	Motor On-Off Switch
4406	Line Cord and Plug
4425	Rubber Idler Wheel with Spring Clip
0-4324	Idler Wheel Tension Spring
0-4319	Turntable
4423	Upper and Lower Shelf Blade Assembly
4426	Pickup Cartridge (N1 or L40) with screws
4428	Pickup Arm Assembly complete less cartridge
4292	Rubber Pickup Rest Bumper
4262	Reject Return Spring
4427	Reject, 10"-12", or Auto-Man Buttons with screws
4424	Needle Screw

Model C11A55 has an Oak RC/1 record changer. See Rider's "Automatic Record Changers and Recorders" book.

ALIGNMENT INSTRUCTIONS

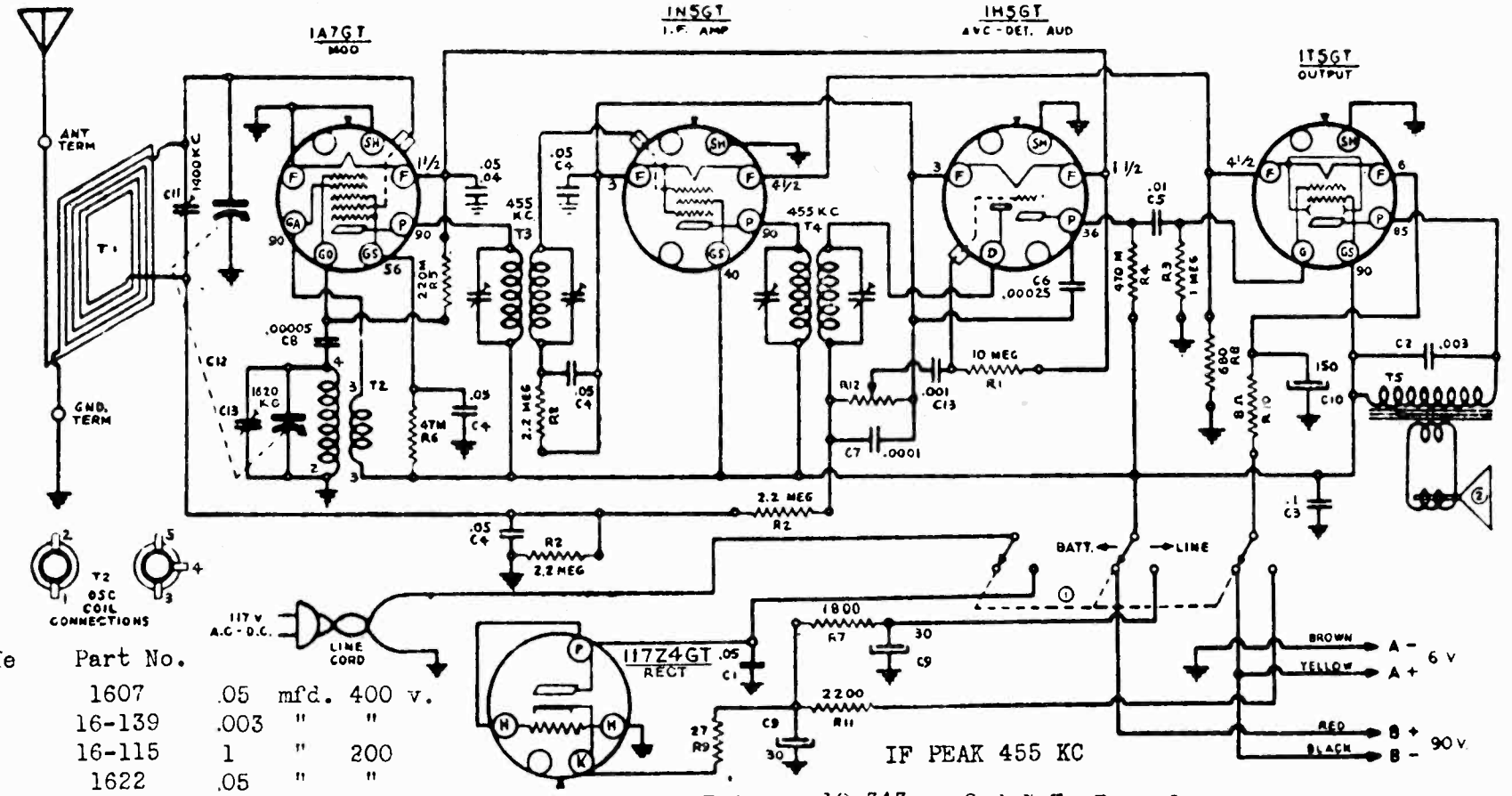
The receiver and generator should be allowed to warm up for a few minutes. The volume control should be set at maximum. The following chart gives connections and operations in their order for proper alignment of this receiver.

SEE CIRCUIT DIAGRAM FOR TRIMMER LOCATIONS

Generator Frequency	Connection at Radio	Dummy Antenna	Range Switch Setting	Dial Setting	Trimmers to Tune	Approx. Sensitivity .05 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. 1650 k.c.	Ant.	200 Mmf.	B. C.	H. F. Limit of Travel	B. C. Osc.	—
1400 k.c.	"	"	"	1400— See Note "A"	B. C. RF. " " Loop Tune to Max.	20 Mv.
600 k.c.	"	"	"	600— Rock Rotor	Padder	15 Mv.
11.6 m.c.	Ant.	400 Ohms	S. W.	11.6 m.c.	S. W. Osc	40 to 50 Mv.
9.6 m.c.	Ant.	400 Ohms	S. W.	Check Dial at 9.6 Mc.		

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 all short wave bands, making sure the lowest frequency signal agrees with the dial setting in frequency and that it is the stronge.. of the two.



Code	Part No.		
C 1	1607	.05 mfd.	400 v.
C 2	16-139	.003 "	"
C 3	16-115	1 "	200
C 4	1622	.05 "	"
C 5	16-121	.01 "	"
C 6	1504	.00025 mfd.	mica
C 7	1501	.0001 "	"
C 8	1503	.00005 "	"
C 9	18-266	30-30 "	150 w.v. Electrolytic
C 10	18-271	150 "	25 w.v.
C 11	20-129	Trimmer on loop	
C 12	19-172	2 gang variable cond. also C 13	
C 13	16-124	.001 mfd. 400 v. Tubular cond.	
T 1	82-25	Loop Antenna	
T 2	10-310	Oscillator Coil	
T 3	10-379	1st I.F. Transformer	
T 4	10-343	2nd I.F. Transformer	
T 5	----	Output Transformer	
1	69-151	Power Switch	
2	79-314 A	5" P.M. Speaker	

R 1	60-193	10 Megohm 1/4 w.
R 2	60-179	2.2 " "
R 3	60-195	1 " "
R 4	60-178	470 M Ohm "
R 5	60-180	220 M " "
R 6	60-177	47 M " "
R 7	60-257	1800 " "
R 8	60-379	680 " "
R 9	60-651	27 Ohms
R10	60-128	8 "
R11	60-652	2200 "
R12	24-150	1 megohm Volume control

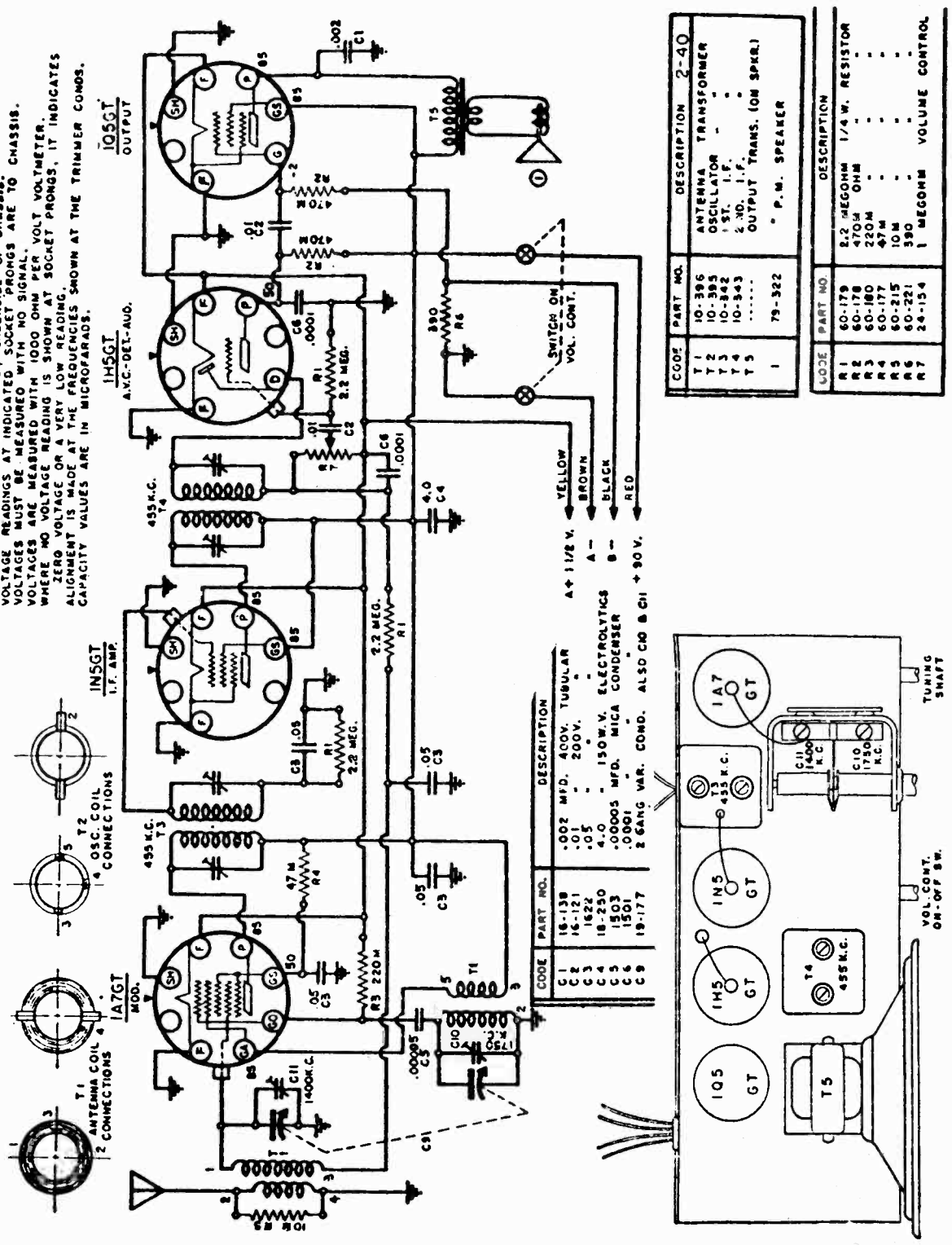
FOR CONVENTIAL ALIGNMENT SEE SPECIAL SECTION VOLUME VIII

GAMBLE-SKOGMO, INC.

MODEL 2543

MODEL 2402

GAMBLE-SKOGMO, INC.



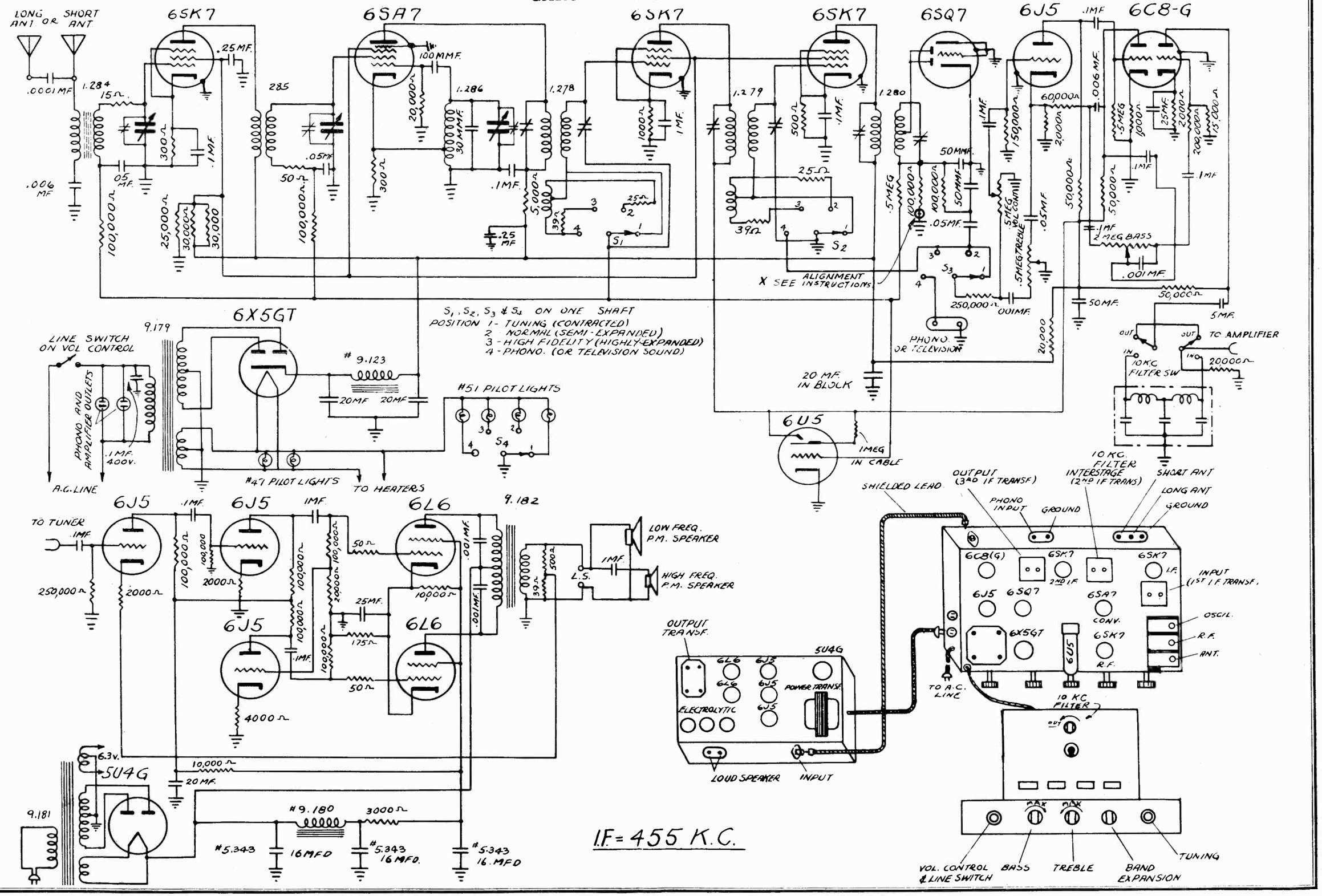
CODE	PART NO.	DESCRIPTION
C1	16-138	.002 MFD. 400V. TUBULAR
C2	16-121	.01 " 200V. "
C3	1622	.05 " " "
C4	18-250	4.0 " 150W.V. ELECTROLYTICS
C5	1503	.00005 MFD. MICA CONDENSER
C6	1501	.0001 " "
C9	19-177	2 GANG VAR. COND. ALSO C10 & C11

CODE	PART NO.	DESCRIPTION 2-40
T1	10-396	ANTENNA TRANSFORMER
T2	10-395	OSCILLATOR " "
T3	10-342	1 ST. I.F. " "
T4	10-343	2 ND. I.F. " "
T5	.....	OUTPUT TRANS. (ON SPKR.)
	1	79-322 * P.M. SPEAKER

CODE	PART NO.	DESCRIPTION
R1	60-179	2.2 MEGOHM 1/4 W. RESISTOR
R2	60-178	4700 OHM " " "
R3	60-180	220M " " "
R4	60-177	47M " " "
R5	60-215	10M " " "
R6	60-221	390 " " "
R7	24-154	1 MEGOHM VOLUME CONTROL

GAROD ELECTRONICS CORP.

HIGH FIDELITY



HIGH FIDELITY

GAROD ELECTRONICS CORP.

ALIGNMENT INSTRUCTIONS

Realignment of this receiver should not be attempted unless all other causes of faulty operation have been carefully investigated. In any event it should be performed only by a competent serviceman. Under no circumstances should alignment be attempted without a generator.

The final results obtained from the receiver will be largely determined by the i.f. alignment. It is therefore essential that the recommended procedure be followed exactly and with the greatest care.

A 0.1 mfd dummy should be connected between the generator and the #8 (control) grid of the 6SA7 converter tube. It will not be necessary to disconnect the coil and condenser leads unless the output of the generator is less than 0.1 volts. If this should be necessary a 0.1 meg resistor should be connected between the grid and ground, after the leads are removed, to provide a d.c. return.

With the power off, connect a 20,000 ohm-per-volt voltmeter across the 100,000 ohm diode load resistor or a 0-100 microammeter in series with the load at the point marked with an "X" on the schematic diagram.

With all connections made as described above, set the generator to 455 kc. Turn the receiver on and allow the tubes to warm up. If the set requires alignment only, no major changes having been necessary, proceed with the alignment as below. Otherwise, align the set roughly to 455 kc with the selector switch in the "TUNING" position. Use low generator output and work back from the diode transformer to the input.

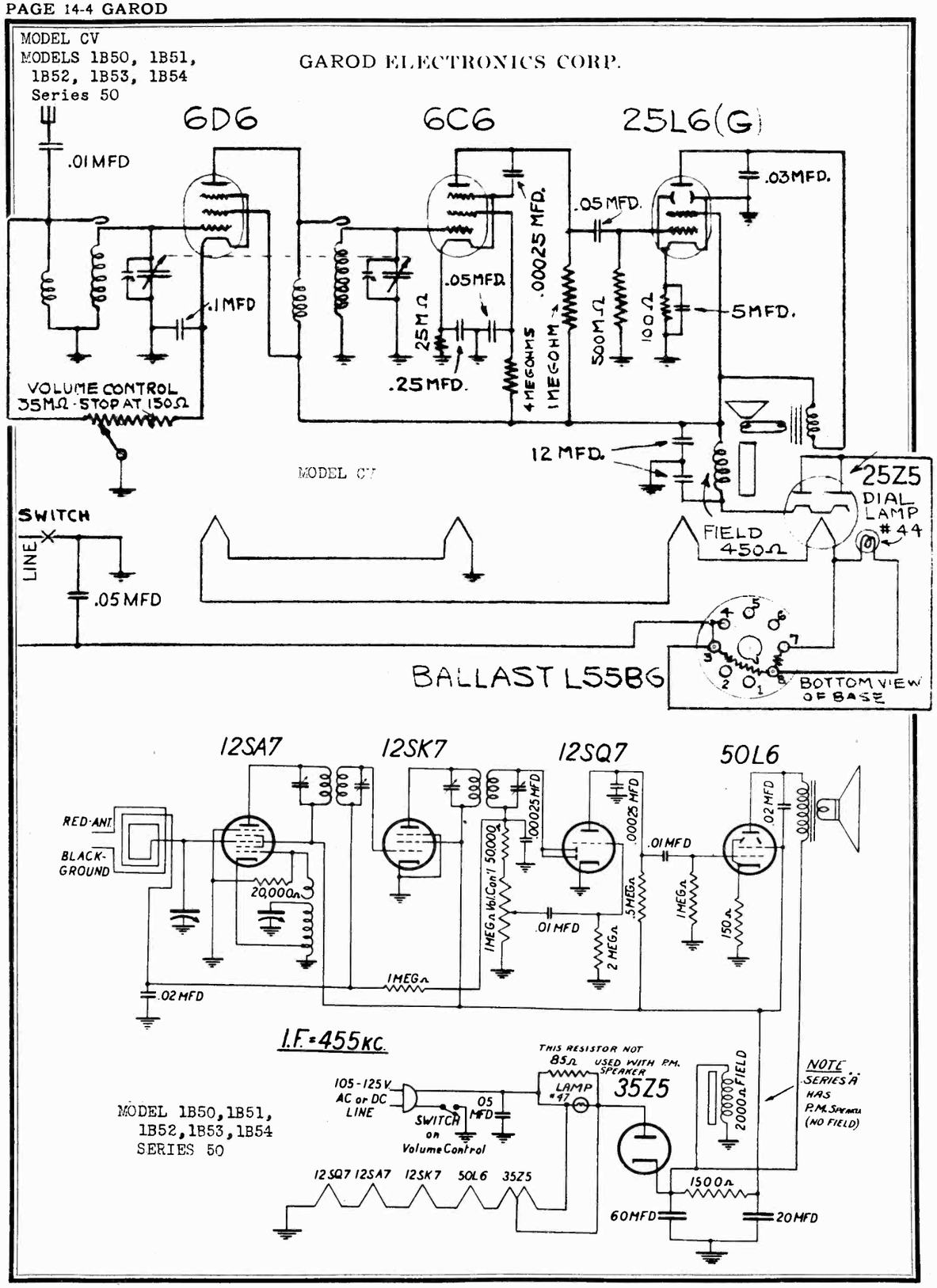
Now increase the generator output to 0.1 volts. About 10 volts will be developed across the load and the current through it will be close to 100 microamperes. Tighten the primary trimmer (marked with red paint) on the diode transformer and adjust the secondary trimmer for maximum response. Then retune the primary trimmer for an exact peak.

Repeat this procedure on the interstage and input transformers in that order. Set the selector switch to "HIGH-FIDELITY" and carefully readjust the diode trimmers for maximum output. These adjustments will be broad and should be made with great care. This will complete the i.f. alignment. NO OTHER ADJUSTMENTS SHOULD BE MADE TO ANY I.F. TRIMMERS.

The i.f. amplifier should now be checked for symmetry by detuning the generator equal amounts each way from 455 kc and comparing the outputs. Up to 15 kc deviation the difference between comparative readings should be 5% or less. Greater differences indicate misalignment and the procedure should be repeated.

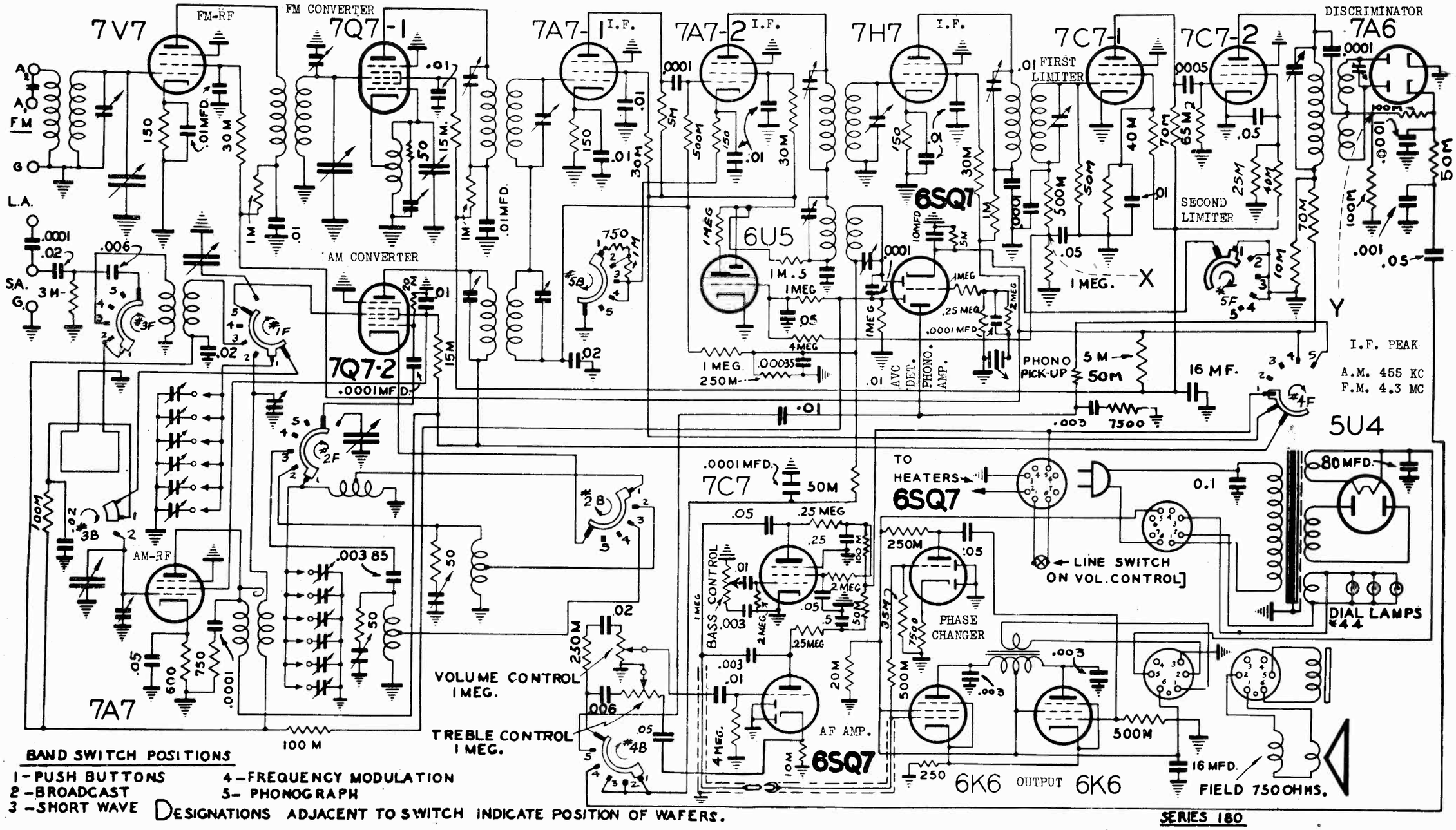
R.F. ALIGNMENT

Connect the generator to the "LONG ANTENNA" binding post through a "standard" dummy antenna, or a 0.00025 mfd mica condenser in series with a 400 ohm carbon resistor. With the variable condenser set at minimum capacity and the generator at 1750 kc, adjust the oscillator trimmer until a response is obtained. Then set the generator to 1500 kc and tune in the signal. Adjust the r.f. and antenna trimmers for maximum response in the order given, keeping the generator output as low as possible.



GAROD ELECTRONICS CORP.

MODEL 3P1312, Series 180



GAROD ELECTRONICS CORP.

FREQUENCY MODULATION, AMPLITUDE MODULATION, RADIO-PHONOGRAPH COMBINATION

ALIGNMENT PROCEDURE

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

During the alignment procedure all adjustments should be made under the following conditions:

1) Line Voltage as indicated on instruction sheet.
2) Volume, Treble and Bass controls at maximum volume positions.
3) Minimum Input from signal generator. (as required to give a sufficient reading on the indicating instrument)

If this procedure is not adhered to, all adjustments will appear very broad and incorrect alignment may result.

AMPLITUDE MODULATION (Broadcast and Short Wave)

I.F. ALIGNMENT - Set the Signal Generator to 455KC and connect to the grid of the 7Q7 A.M. converter tube. Adjust trimmers #1, 2, 3 and 4 (see diagram) of the A.M. I.F. transformers for maximum output as indicated by an output meter connected across the speaker voice coil.

1630KC - Now connect the output of the Signal Generator to the L.A.-Broadcast Antenna terminal, rotate the tuning dial so that the condenser plates are entirely out of mesh. BAND SWITCH is in the BROADCAST position. Set the Signal Generator to 1630KC and adjust the oscillator trimmer (#5, see diagram) for maximum response.

1500KC - Reset the generator to 1500KC and tune in this signal on the receiver. Adjust the B.C. antenna trimmer (#7) and the B.C. interstage trimmer (#6) for maximum output.

600KC - With the generator at 600KC, tune in the signal, then while rocking the dial, align the 600KC padder (#8, on front of chassis).

SHORT WAVE - Set the BAND SWITCH to SHORT WAVE. Signal Generator is still connected as for broadcast. The condenser is opened to minimum capacity and the Short Wave oscillator trimmer (#9) is adjusted so that at this position the receiver tunes to 18.3 Megacycles.

17 M.C. ADJUSTMENT - Now set the generator to 17 M.C., tune in the signal and adjust the Antenna trimmer (#10) for maximum response.

FREQUENCY MODULATION - For the F.M. Band a Signal Generator which will cover the band (40 to 50 megacycles) and a 500 microamp D.C. meter are required.

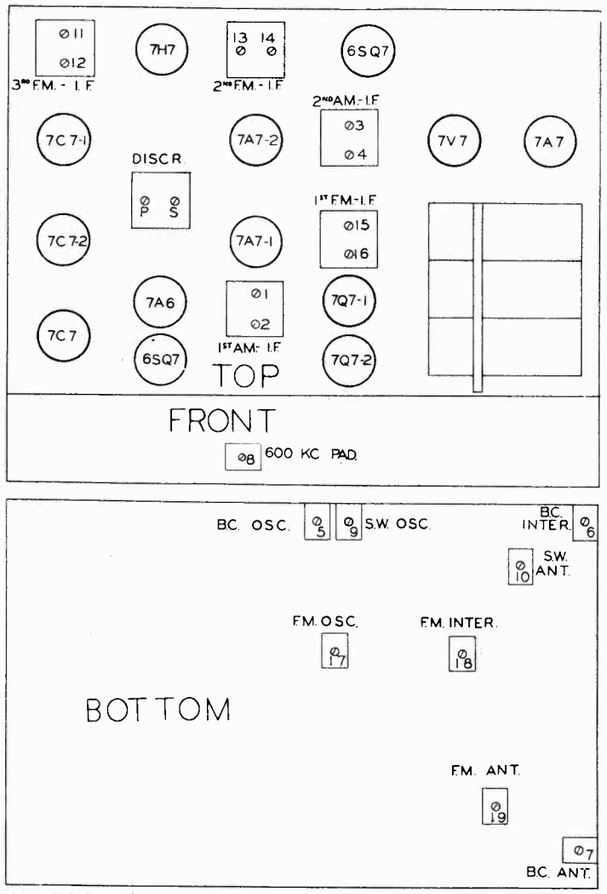
To align the F.M.-I.F. with Modulation OFF, set the Signal Generator to 4.3 M.C., connect to the grid of the first F.M.-I.F. tube. (7A7-1). The microammeter is connected with the Negative side to chassis and the Positive thru a 250,000 ohm resistor to the low side of the 500,000 ohm resistor in the grid return circuit of the 1st limiter tube (7C7-1), (See point "X" on the circuit diagram).

Adjust the primaries and secondaries of the 3rd and 2nd F.M.-I.F. transformers for the highest reading on the microammeter.

Now reconnect the output of the generator to the grid of the F.M. converter (7Q7-1), and realign the 1st, 2nd, and 3rd I.F.'s.

NOTE--Stop the Signal Generator. There should be no reading on the microammeter. If there is, the I.F. amplifier is oscillating. This should be eliminated by checking all by-passes, grounds, and grounding of I.F. shield cans.

GAROD ELECTRONICS CORP.



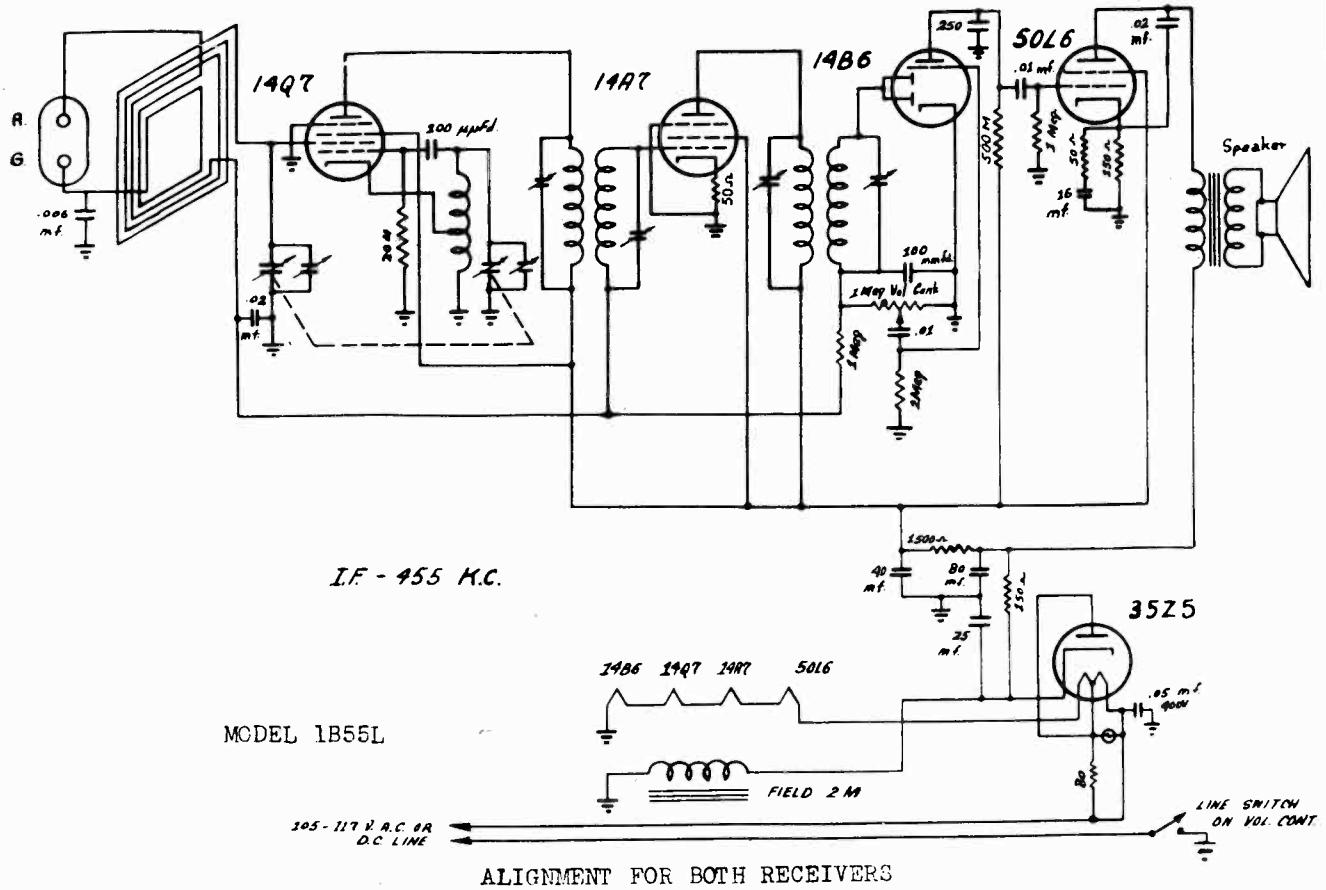
DISCRIMINATOR ALIGNMENT - This is the most critical adjustment on the F.M. band. If improperly done, distortion will result, and general operation will be unsatisfactory. Leave the generator connected to the F.M. converter grid. The microammeter is connected (thru the 250,000 ohm resistor) to the junction of the two 100,000 ohm load resistors of the discriminator diode (6H6). This point is connected to the #4 lug on this socket, which is not connected internally to the tube and is used as a dummy lug only. This is point "Y" on the circuit diagram. Rotate the primary trimmer marked "P" on the discriminator shield can, for maximum reading. Now reconnect the meter across the entire load (both resistors) at the cathode. This is lug #7 on the 6H6 socket. Without disturbing the generator, rotate the secondary trimmer "S" till the most negative reading is obtained, then slowly continue rotation till ZERO current reading is reached.

F.M.-R.F. ALIGNMENT - Connect the Signal Generator to the F.M. Ant terminal (A-2). Set the Generator to approximately 44 M.C. Adjust the antenna trimmer (#19; see trimmer layout diagrams) for maximum output as indicated by a microammeter connected in the limiter, as for the I.F. alignments; or the tuning eye may be used as an indicator. Then align the F.M. interstage trimmer for maximum. Should the F.M. calibration be off, due to drift or aging of components, the correction can be made by resetting the oscillator trimmer (#17).

NOTE - In the absence of a high frequency Signal Generator for F.M. alignment, where powerful local stations operating near this frequency are available, this adjustment can be made by connecting a large antenna to the receiver, and going thru the procedure outlined above.

GAROD ELECTRONICS CORP.

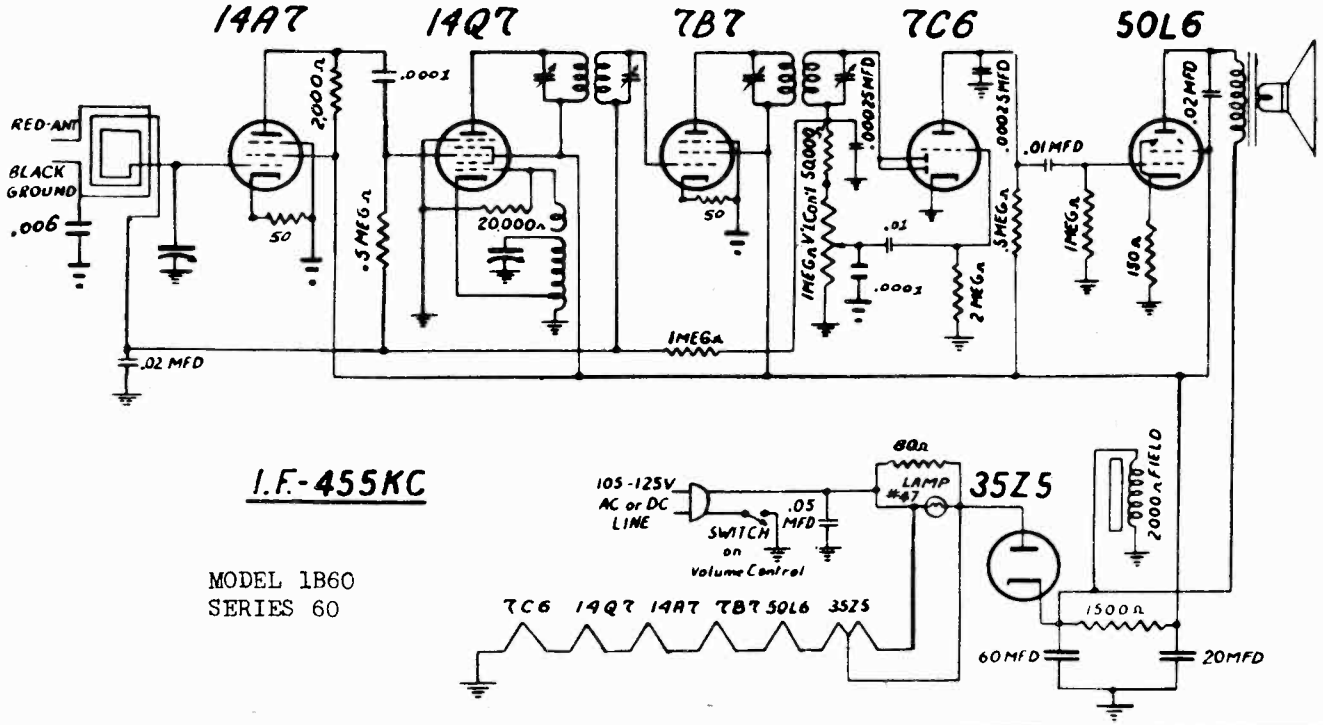
MODEL 1B55L
MODEL 1B60, Series 60



MODEL 1B55L

ALIGNMENT FOR BOTH RECEIVERS

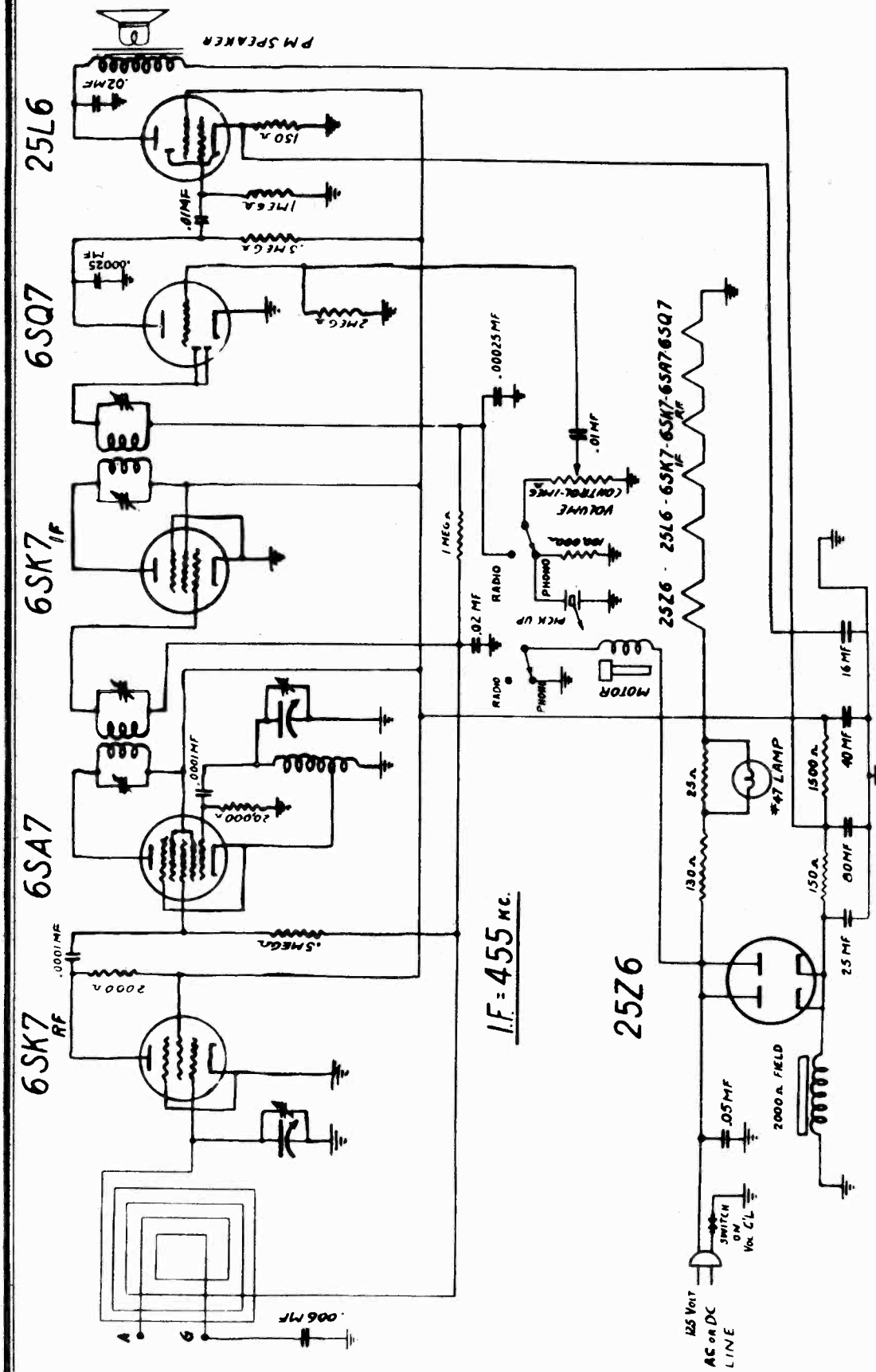
Should it become necessary to realign the receiver at any time, proceed in the usual manner by first adjusting the I.F. transformers, for maximum output as indicated by an output meter connected across the voice coil. Then turn the dial to 1500 KC. Set the signal generator (or 1500 KC local station) 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.



MODEL 1B60
SERIES 60

MODELS 1C611, 1C611D

GAROD ELECTRONICS CORP.

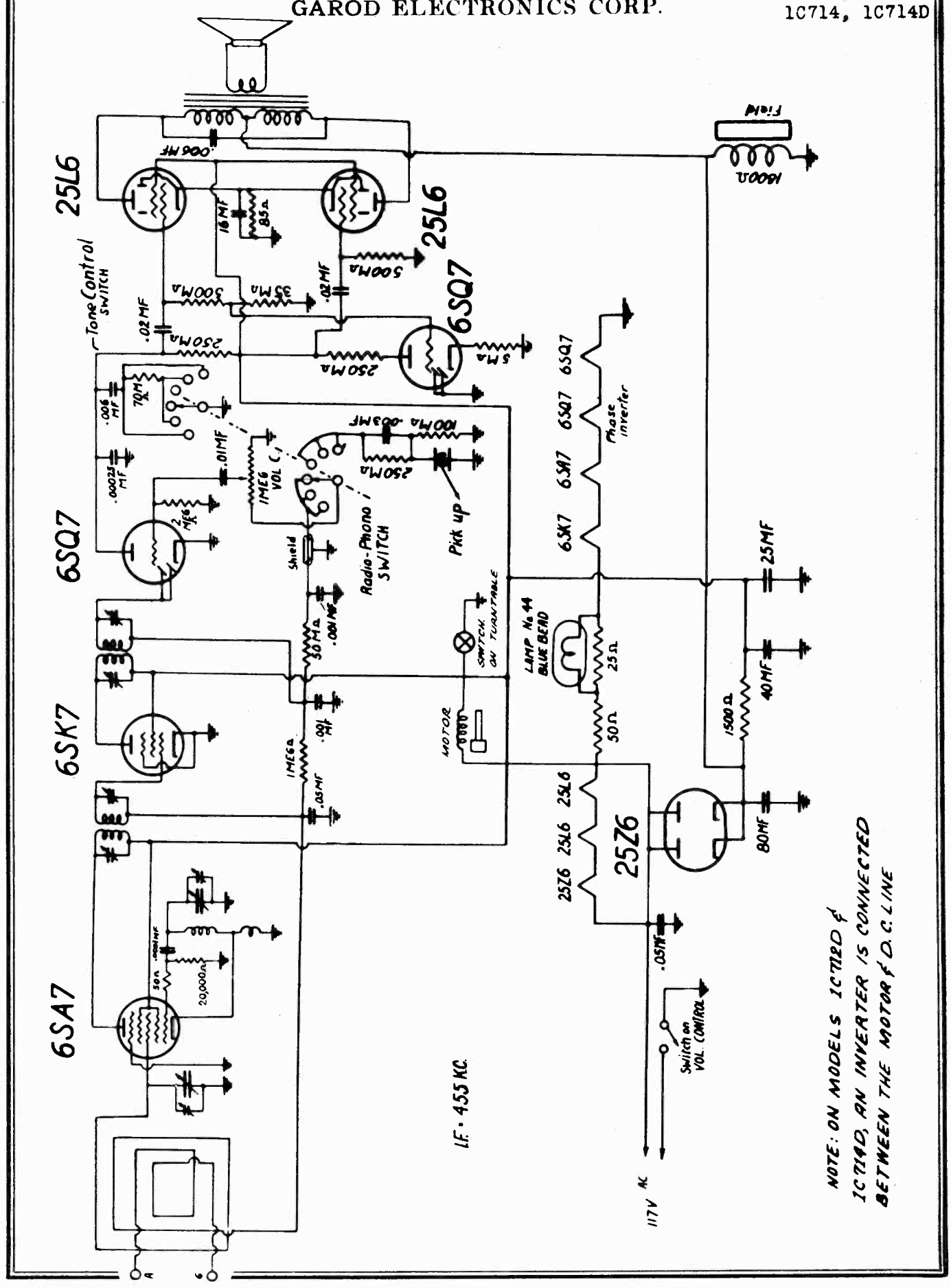


ALIGNMENT - Should it become necessary to re-align the receiver at any time, proceed in the usual manner by first adjusting the I.F.transformers, for maximum output as indicated by an output meter connected across the voice coil. Then turn the dial to approximately 1400KC. Set the signal generator (or 1400KC 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

MODEL 1C611D IS THE SAME EXCEPT AN AC-DC INVERTER IS CONNECTED BETWEEN THE MOTOR AND DC LINE.

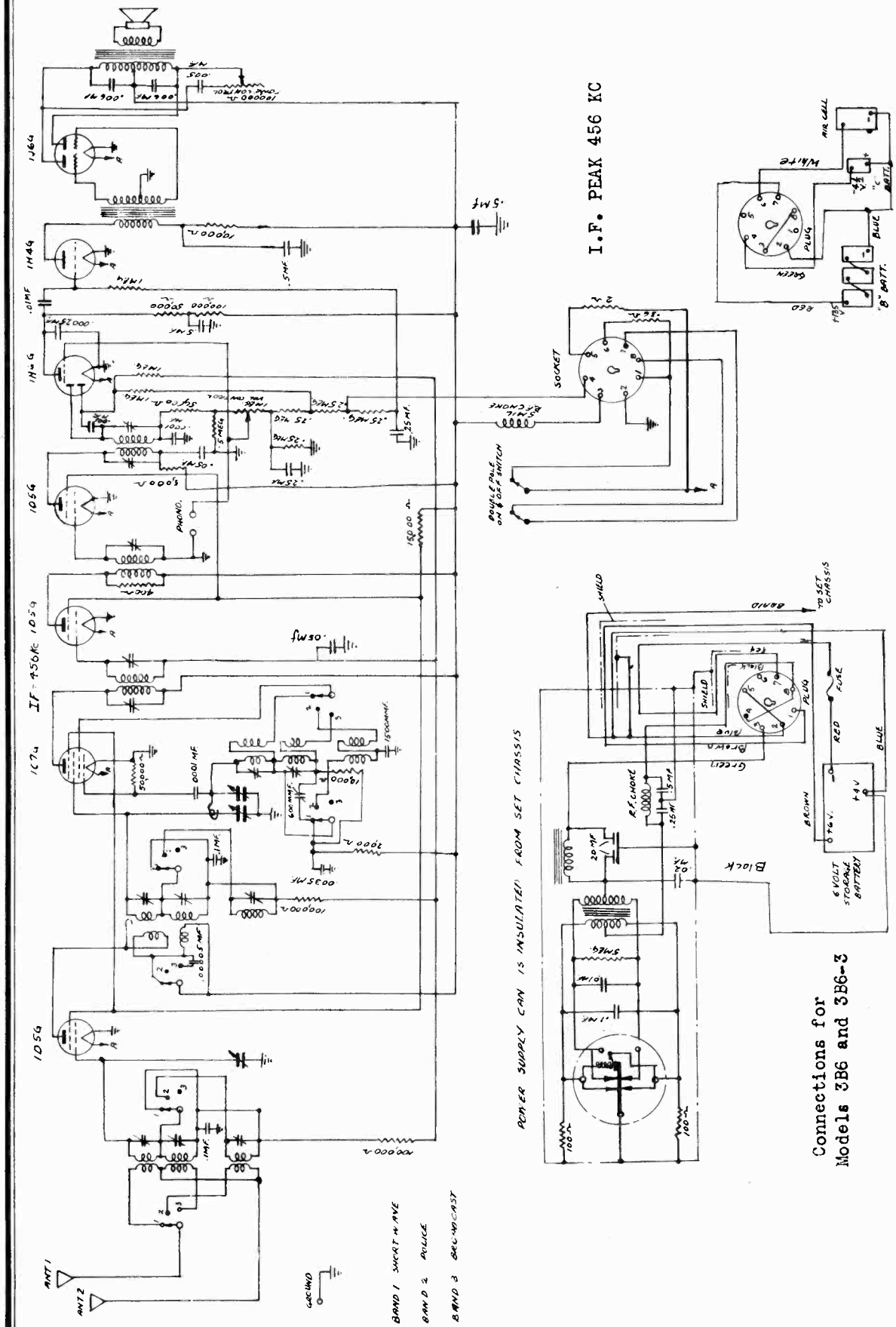
GAROD ELECTRONICS CORP.

MODELS 1C712, 1C712D
1C714, 1C714D



MODELS 3B2, 3B2-3
MODELS 3B6, 3B6-3

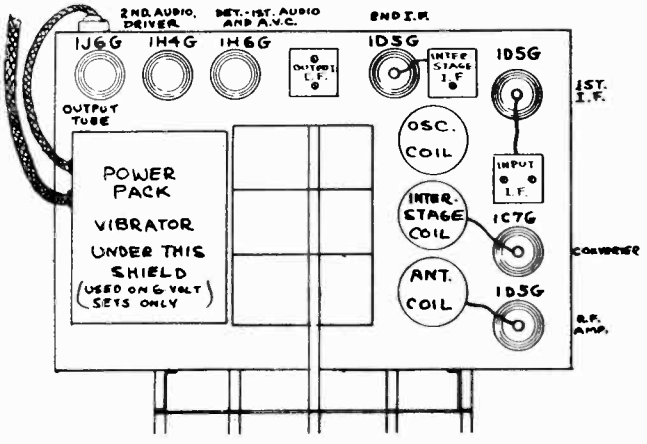
GAROD ELECTRONICS CORP.



GAROD ELECTRONICS CORP.

CAUSES OF FAILURE TO OPERATE

1. First check all connections to batteries.
2. See that polarity is correct.
3. Check voltage of all Batteries across their terminals. "B" batteries should measure more than 35 volts (for a 45-volt Block), the "C" battery over 4 volts. An Air Cell should be replaced when the voltage falls below 2 volts. This also applies to a 2 volt storage cell. A 6 volt storage battery should not drop below 5.8 volts. If a charger has been installed, check by means of a volt meter as to whether the charger is delivering voltage and if an ammeter is available check the charging rate.
4. If all batteries are O.K., see if the fuse has been blown, as a result of a short circuit or excessive current due to a defective vibrator whose contacts are sticking. (For 6 volt operation). The vibrator may be reached by removing the screws holding the power pack can in place. Remove the vibrator from its socket and insert a new fuse. If when the vibrator is plugged in the fuse blows, it will be necessary to obtain a replacement vibrator from your dealer. Screw the cover back on again or noisy reception may result.
5. If the dial lights up with Pilot Light switch turned "ON," and the vibrator operates, as evidenced by a slight buzzing when the ear is placed close to the vibrator, it will be necessary to check all voltages, which should be approximately as indicated above. Exact voltages will be determined by the condition of the batteries.
6. If all voltages are approximately correct, check for alignment as described previously.
7. Short life of the Air Cell may be due to failure to turn the set OFF at night or continuous use of the pilot lights. The water level in the Air Cell must be maintained as indicated by the marker provided for that purpose.



INSTRUCTIONS FOR INSTALLATION AND OPERATION

CURRENT

This receiver may be operated from either of two types of Power Supply as follows:

1. A 6 volt storage battery, which may be an automobile battery, though a battery specially designed for radio use is to be preferred. If a 100 ampere hour battery is used, and the receiver is operated about three hours per day, it will require recharging after about three weeks of use. A preferred arrangement is to use a Wind-Driver generator which may be connected to the battery to automatically keep it fully charged. The only attention necessary in that case is to check the water level in the battery periodically. Where the Wind Velocity is low, a small Gasoline driven generator may be used which will operate about 15 hours on a gallon of gas, but since the charger is not in constant use, the cost of operation of the radio is very low, and besides, one or two small lamps can be operated from the same power source.

2. An "Air Cell," 3 "B" Batteries and a "C" battery will, when used, have a life of approximately 9 months for the air cell and about one year for the "B" and "C" batteries. The air cell can not be recharged but must be replaced by a new one. The exact life will depend upon the discharge rate, thus if it is used less than 3 hours a day, a longer life may be expected, and if used for example 6 hours per day, the life may be reduced to 6 months. Whichever type of power is most suited may be used, although results will be about the same in all cases.

INSTALLATION - Fig. 1 shows the connections to be used when operated from a 6 volt storage battery (and wind driven or gas engine generator).

NOTE THAT 2 OF THE CLIPS CONNECT TO THE SAME TERMINAL. THIS MUST BE DONE EXACTLY AS SHOWN. DO NOT SNAP ONE CLIP ON THE BATTERY LUG AND THE OTHER CLIP ON TO THE FIRST ONE OR CONSIDERABLE BACKGROUND NOISE WILL RESULT. DO NOT CONNECT BOTH WIRES TO THE SAME CLIP, EVEN THOUGH BOTH GO TO THE SAME TERMINAL. DO NOT SHORTEN OR LENGTHEN ANY OF THE BATTERY WIRES.

BE SURE THAT THE POLARITY OF THE BATTERIES IS AS SHOWN, OR THE RECEIVER WILL NOT OPERATE, OR TUBES MAY BE BURNED OUT.

BE SURE THAT THE ON-OFF SWITCH ON THE VOLUME CONTROL IS TURNED TO THE "OFF" POSITION BEFORE MAKING ANY CONNECTIONS AND CHECK THOROUGHLY BEFORE THIS SWITCH IS TURNED ON.

AIR CELL OPERATION

Figure 2 shows the connection when an air cell is to be used with "B" and "C" batteries. The Power Pack is linked to the receiver chassis by a flexible cord and plug. This is needed only for 6 Volt operation. For use with batteries, this plug is removed from the socket on the rear of the chassis. A special cord is inserted and connected as shown in Fig. 2.

A separate switch is provided for the pilot light, which may be turned ON for tuning and turned OFF to save battery drain without, of course, impairing the receiver operation. On storage battery operation, the pilot lights should be left ON, since this equalises the drain on all cells of the battery.

SERVICE NOTES FOR THE MODEL 3B6-3B2
7 TUBE, 3 BAND BATTERY SUPERHETERODYNE RECEIVER
ALIGNMENT PROCEDURE

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

It is important to remember that in receivers of this kind which are equipped with automatic volume control it is necessary to use the minimum possible signal from the signal from the signal generator; otherwise the A.V.C. action will tend to nullify the variations in output as the trimmers are adjusted.

I.F. ADJUSTMENT--The signal generator is set at 456 kc. and is connected to the grid of the first detector (1C7G). With the oscillator section of the tuning condenser short-circuited and the receiver volume control at its maximum position, the I.F. trimmers are adjusted for maximum output. These trimmers may be found on tops of the I.F. transformer shield cans.

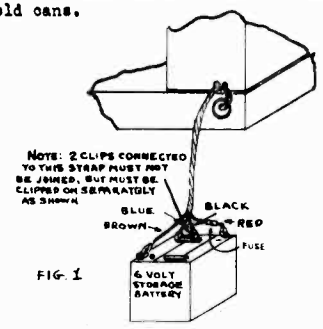


FIG 1

18 MEGACYCLE ADJUSTMENT--The high side of the signal generator is connected to the antenna lead of the receiver and the low side to the ground lead. The receiver and the signal are both tuned to a frequency of 18 mc. with the selector switch in position for short-wave band no. 1. The oscillator trimmer condenser is adjusted so that the 16 mc. signal is tuned in exactly at the 18 mc. calibration point, with the volume control on full and the signal generator adjusted for minimum imput. The antenna pre-selector and first detector trimmers are then adjusted in the order named for maximum output. These trimmers are located on the sides of the shield cans and are opposite the lower openings. This is the only adjustment on Band #1.

1500 K.C. ADJUSTMENT--With the band selector switch in position for operation on the Broadcast band and the receiver and signal generator both set at 1500 K.C. the procedure outlined above is repeated. The oscillator trimmer is found on the rear coil can, and is opposite the upper opening. The antenna preselector and interstage coil trimmers are located in the same positions on the corresponding shield cans.

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

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

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

MODEL 3B6-3B2

TUBE	FUNCTION	FIL.	PLATE	SCREEN	OSC. PL.
1D5G	R. F. Amp.	2.0	135	67.5	
1C7C	Converter	2.0	135	67.5	80
1D5G	1st I.F. Amp.	2.0	135	67.5	
1D5G	2nd I.F. Amp.	2.0	125	67.5	
1H6G	Det. & 1st Audio	2.0	75		
1H4G	Driver	2.0	110		
1J6G	Audio Output	2.0	135		

All voltages are measured from socket terminals to chassis and with a 1000 Ohms per volt voltmeter.
The set must be in operation and the Wave Band Switch in broadcast position with battery fully charged and new "B" batteries.

Filament voltages are taken from filament prong to filament prong at tube socket.

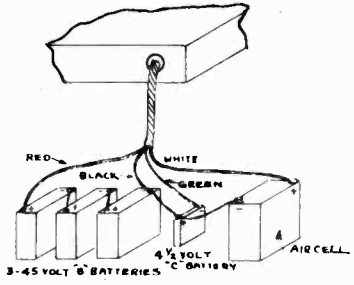
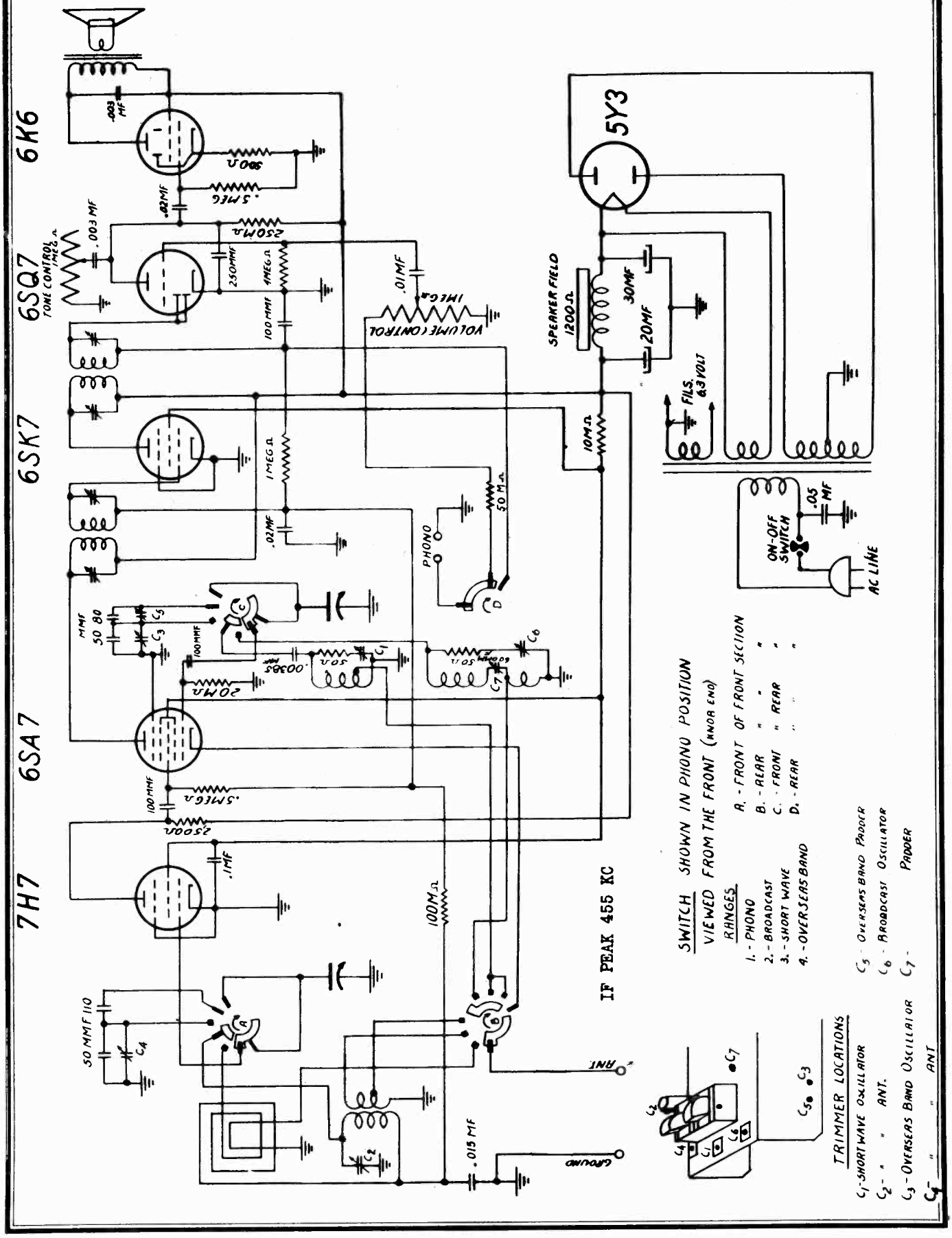


FIG 2

MODEL 3B60

GAROD ELECTRONICS CORP.



MODEL 3B60
MODEL 3B70

GAROD ELECTRONICS CORP.

ALIGNMENT INSTRUCTIONS

Re-alignment of this receiver should not be attempted unless all other possible causes of unsatisfactory performance have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands, and an output meter for indicating the effect of adjustments, are required.

During the alignment procedure all adjustments should be made under the following conditions:

1) Line Voltage as indicated on instruction sheet.
2) Volume & Tone controls at maximum volume positions.
3) Minimum Input from signal generator.

If this procedure is not adhered to, all adjustments will appear very broad. This is due to the action of the automatic volume control.

I.F. Adjustment - Set the signal generator at 455 KC and connect to the grid of the 6SA7 converter tube thru a .1 MFD condenser. It is unnecessary to disconnect the grid from the rest of the circuit. Have the Band Switch in the #2 (Broadcast) position, and dial tuned to 1630 KC (condenser plates fully open). If hum modulation is encountered which is not cleared up by reversing the receiver's line plug, shunt a resistor of about 25000 ohms across the signal generator output.

The Input I.F. Transformer Trimmers - are both adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

The Output I.F. Transformer trimmers - are adjusted for maximum output as indicated on the output meter. The Input I.F. should now be re-checked for maximum output.

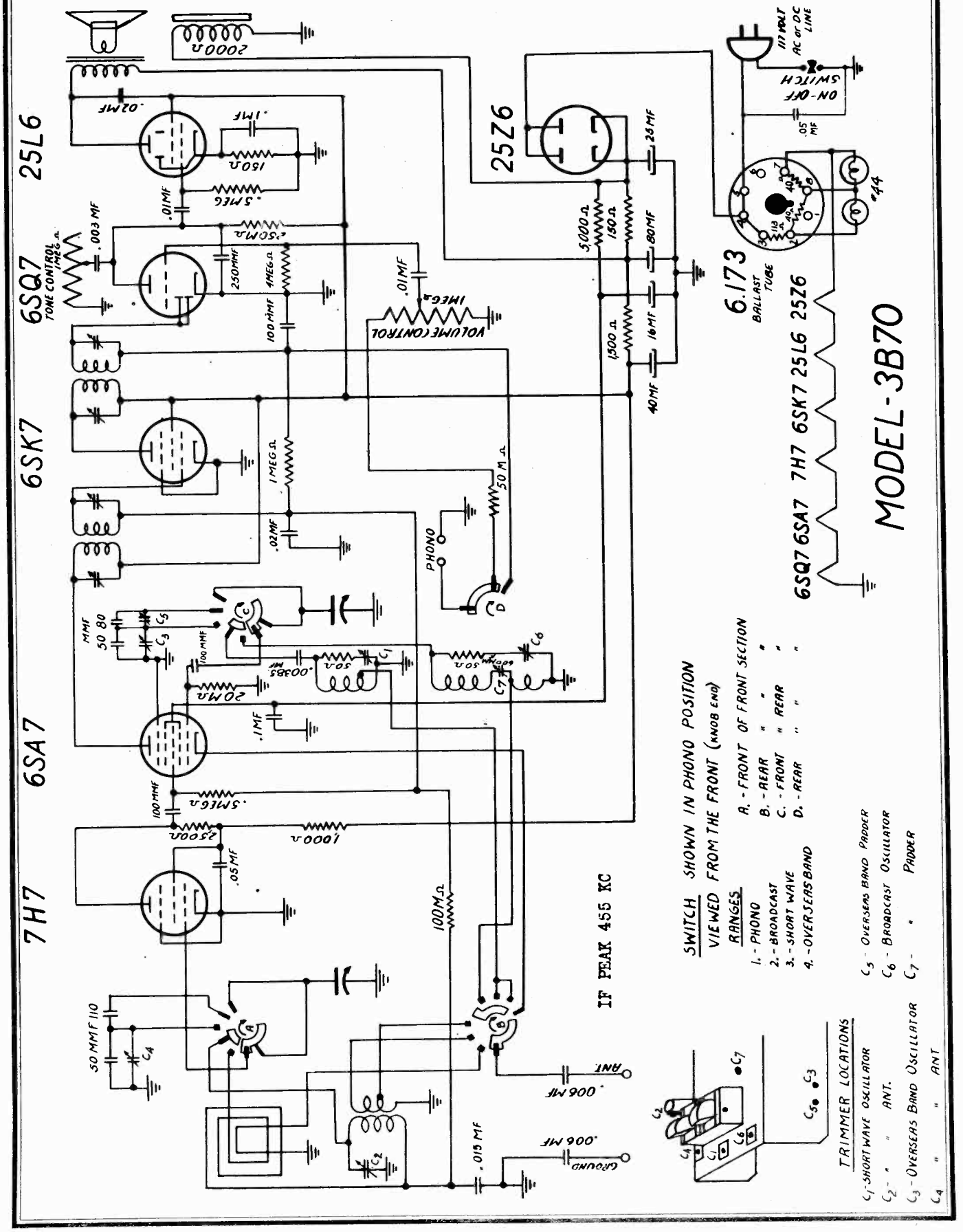
Short Wave Band
Set the band switch to the third position which is the Short Wave Band. Connect the signal generator thru a standard dummy antenna, or thru a 400 ohm resistor to the antenna and ground leads of the receiver. Set the generator at 17.MC. Tune the variable condenser to 17.MC on the dial. Adjust the S.W. osc. trimmer (marked #1 on diagram and on chassis sketch) for maximum response. If response is had at two points on this trimmer, choose the looser setting (higher frequency). Next adjust the S.W. antenna trimmer #2 (mounted on top of S.W. antenna coil) for maximum response, while rocking the tuning condenser slightly from left to right.

Overseas Band - Set the band switch to the fourth position. Turn the dial control knob to the extreme high frequency end so that the condenser plates are entirely out of mesh. The signal generator is left connected as for the short wave band. The generator is set at 12 MC and the corresponding osc. trimmer #3 is adjusted until a response is indicated at the lower capacity setting of the trimmer. Now adjust the antenna trimmer #4 for maximum response. Set the generator at 9.4 MC and turn the variable condenser until the signal is picked up. The padder for this band, trimmer #5, is now adjusted for maximum output while rocking the condenser gang from left to right. The 12 MC adjustment should then be rechecked.

Broadcast Band
It is desirable to align this band on the loop. The signal generator is coupled to the receiver by means of a 2 or 3 turn loop which is placed about a foot from the receiver's loop. Set the Band Switch in the Broadcast position and condenser plates completely out of mesh. Set the signal generator at 1630 KC and adjust the broadcast oscillator trimmer #6 until a response is indicated on the output meter. The generator is now set at 1500 KC. Turn the variable condenser until a response is indicated. The dial pointer should now co-incide with the 1500 KC mark on the dial. Set the generator at 600 KC and turn the variable condenser control until a response is indicated. Adjust the broadcast oscillator padder condenser #7 for maximum response while "rocking" the gang condenser. The high frequency adjustments should now be re-checked.

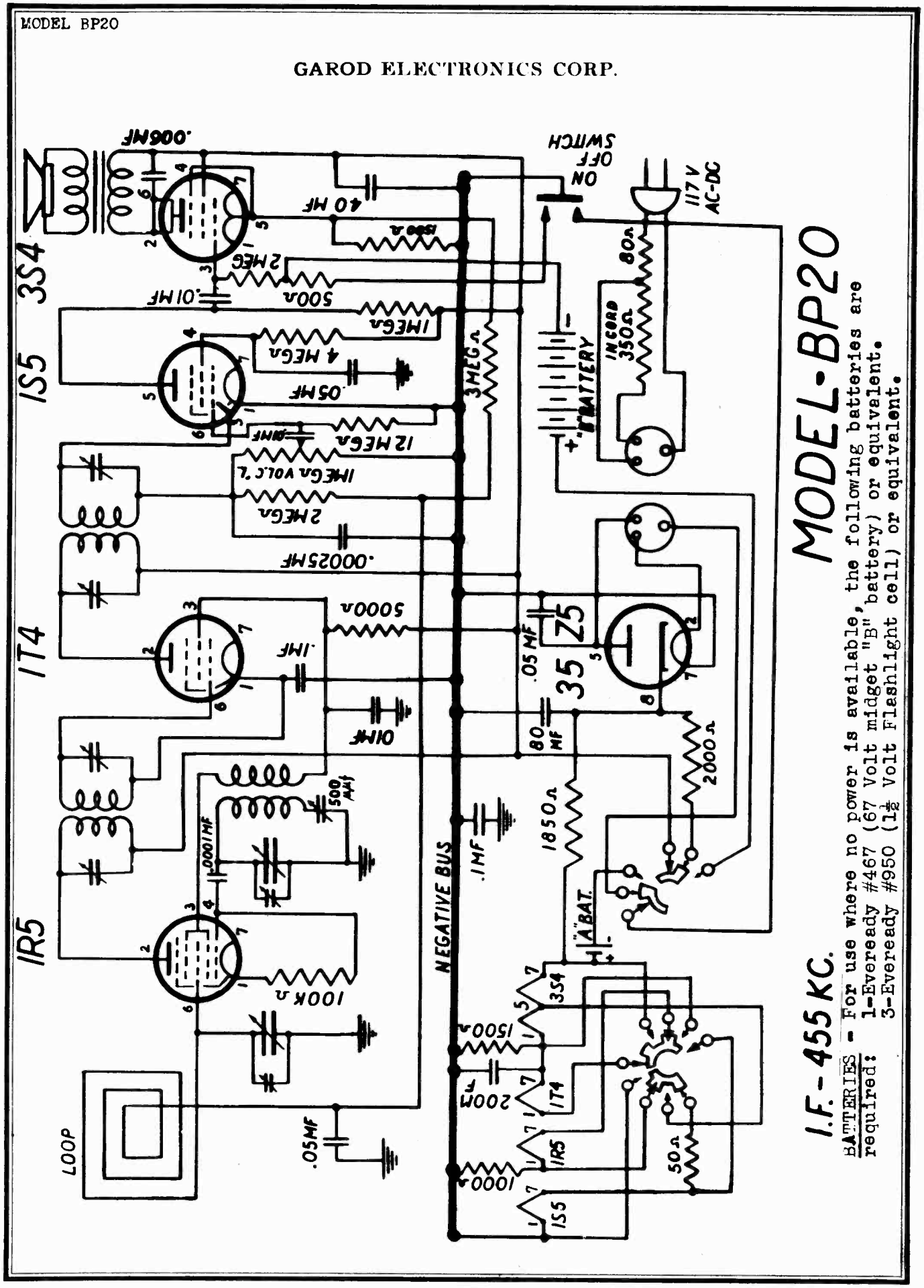
MODEL 3B70

GAROD ELECTRONICS CORP.



MODEL BP20

GAROD ELECTRONICS CORP.



MODEL BP20
MODEL C200

GAROD ELECTRONICS CORP.

ALIGNMENT FOR MODEL BP20

ALIGNMENT - Should it become necessary to align the receiver, the signal generator is connected thru a small condenser to the grid of the First Detector Tube 1R5. The I. F. frequency is 455KC and the I.F. transformers are adjusted for maximum output as indicated on an output meter connected across the voice coil. The signal generator is now set to 1400KC and coupled loosely to the loop antenna by a coupling coil of one or two turns. If the dial pointer does not indicate this frequency, reset the oscillator trimmer (lower section of the Gang Condenser) so that it does. Now adjust the antenna (upper trimmer on Gang Condenser) for maximum output. Change the signal generator frequency to 600KC and tune in the signal. Adjust the 600KC padder to give maximum output while rocking the tuning condenser.

ALIGNMENT FOR MODEL C200

ALIGNMENT INSTRUCTIONS

Re-alignment of this receiver should not be attempted unless all other possible causes have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave band, and an output meter for indicating the effect of adjustments are required.

During the alignment procedure all adjustments should be made under the following conditions:

1) Line Voltage as indicated on instruction sheet.
2) Volume and Tone control at maximum volume positions.
3) Minimum Input from signal generator.

If this procedure is not adhered to, all adjustments will appear very broad. This is due to the action of the automatic volume control.

I. F. Adjustment - The signal generator is set at 455KC and is connected to the grid of the converter tube 6SA7 through a .5 MFD condenser. Be sure to connect a resistor of approximately 25,000 OHMS between the converter grid and ground so that the grid circuit is at ground potential for D.C. The Grid need not be disconnected from the rest of the circuit.

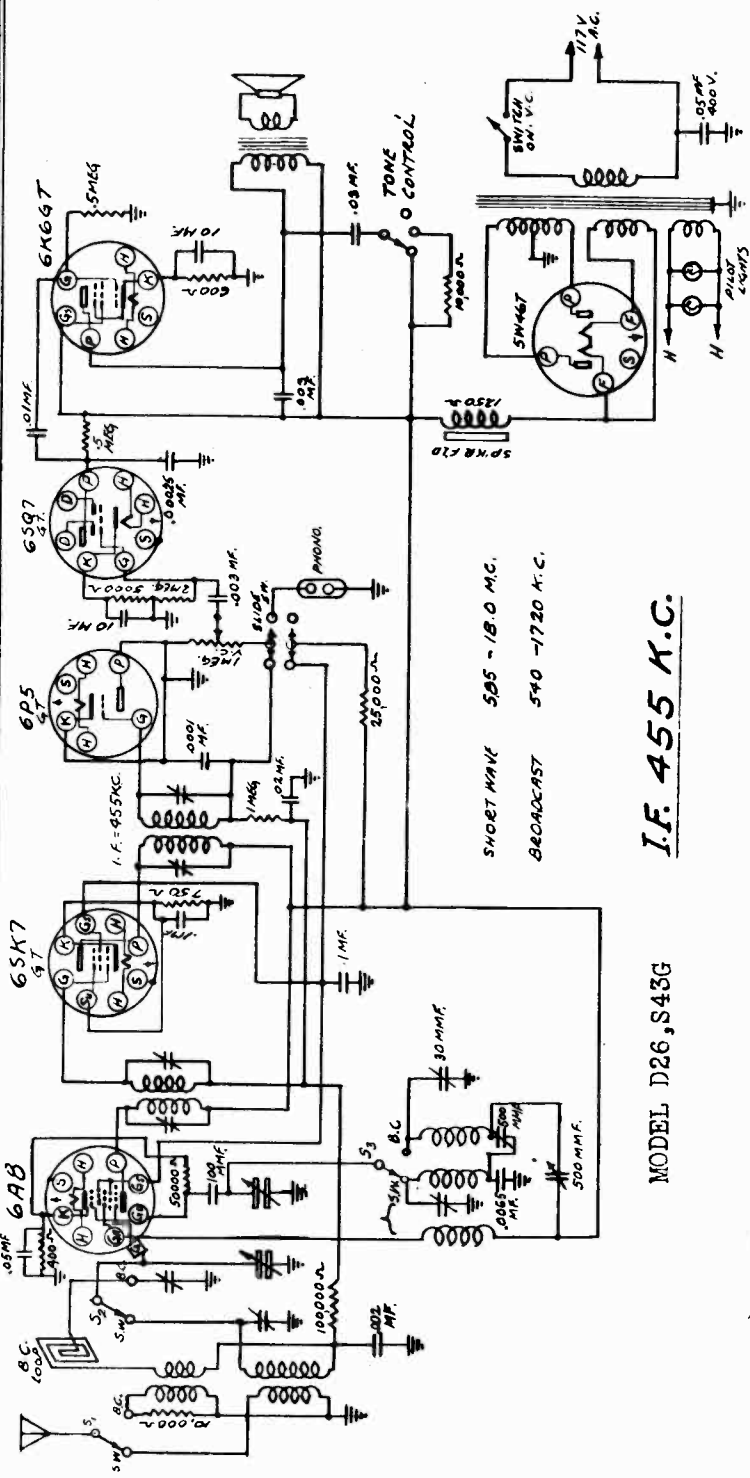
The Input I.F. - Transformer trimmers are both adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

The Output I.F. - Transformer trimmers are adjusted for maximum output as indicated on the output meter. The Input I.F. should now be re-checked for maximum output.

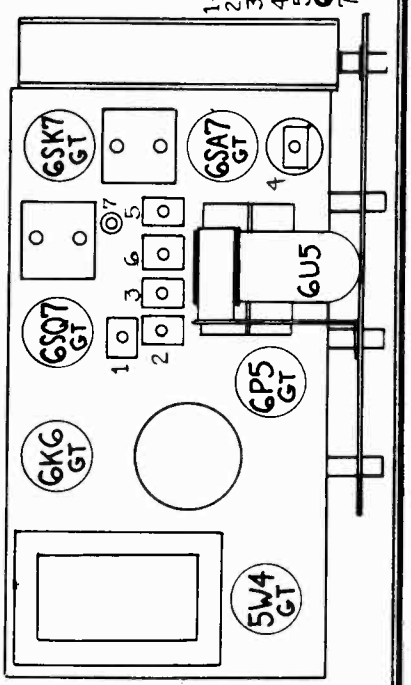
It is desirable to align the RF section on the loop. The signal generator is coupled to the receiver by means of a 2 or 3 turn loop. Set the switch to the RADIO position with condenser plates completely out of mesh. Set the signal generator at 1630KC and adjust the oscillator trimmer (front section of the variable condenser) until a response is indicated on the output meter. The generator is now set at 1500KC. Turn the variable condenser until a response is indicated. The dial pointer should now co-incide with the 1500KC mark on the dial. Now adjust the loop trimmer (rear section of the variable condenser) for maximum response. There are no other adjustments required.

MODELS D26, S43G
MODEL D42

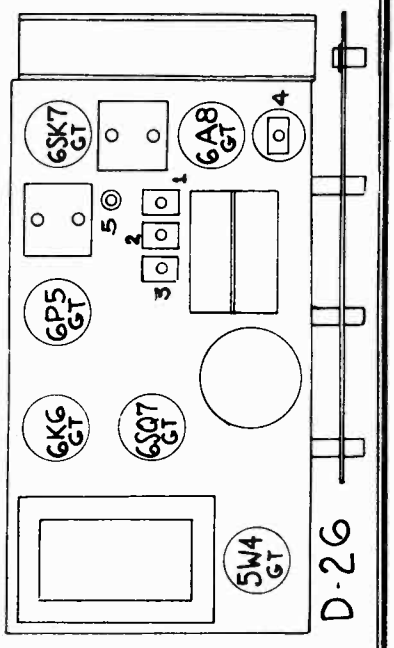
GAROD ELECTRONICS CORP.



MODELS 343G: This model is distinguished from Model #D-26 in that the Phono-Radio attachement is wired thru a cable directly to Phonograph unit. The Phono-Radio switch will therefore be found mounted to the motor board of the phono-graph instead of to the radio chassis

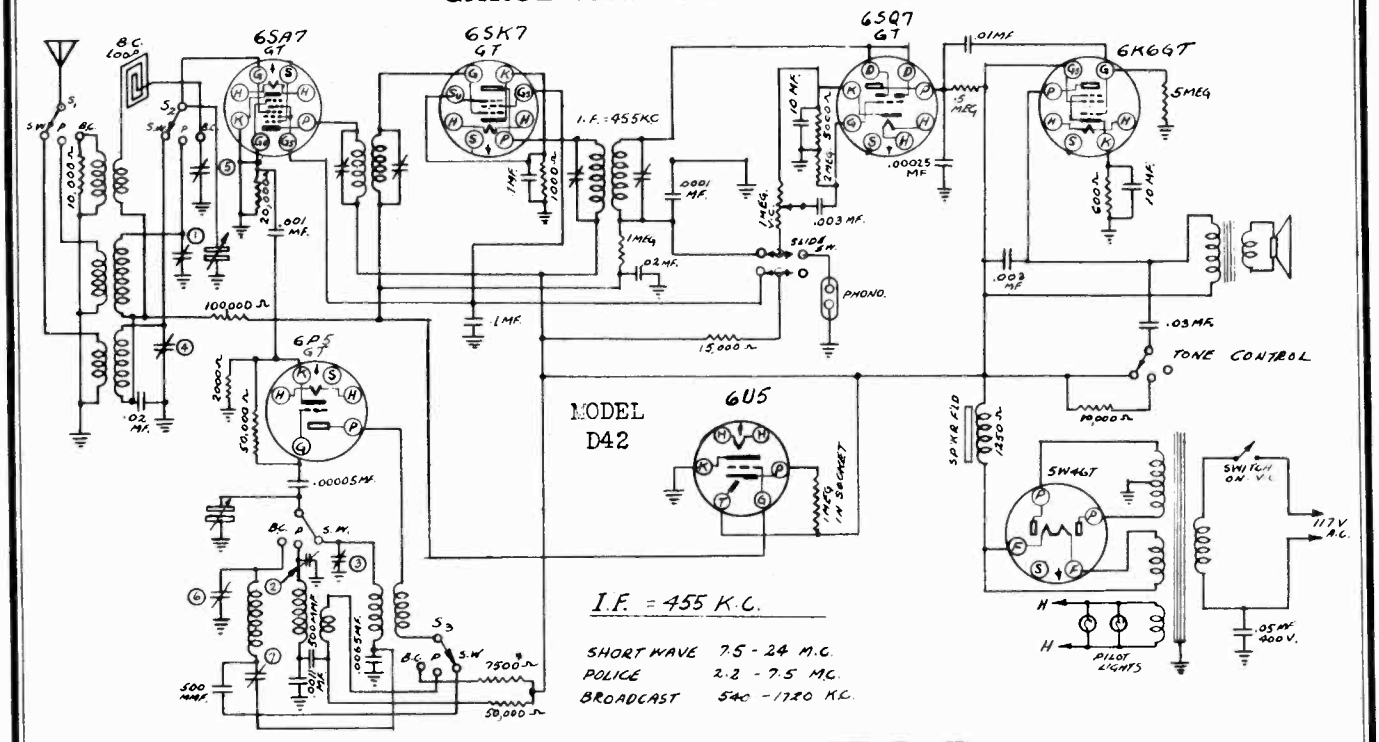


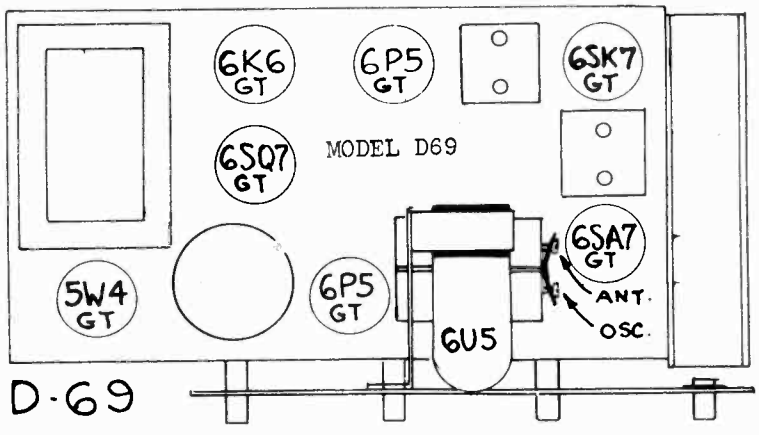
MODEL D26,S43G

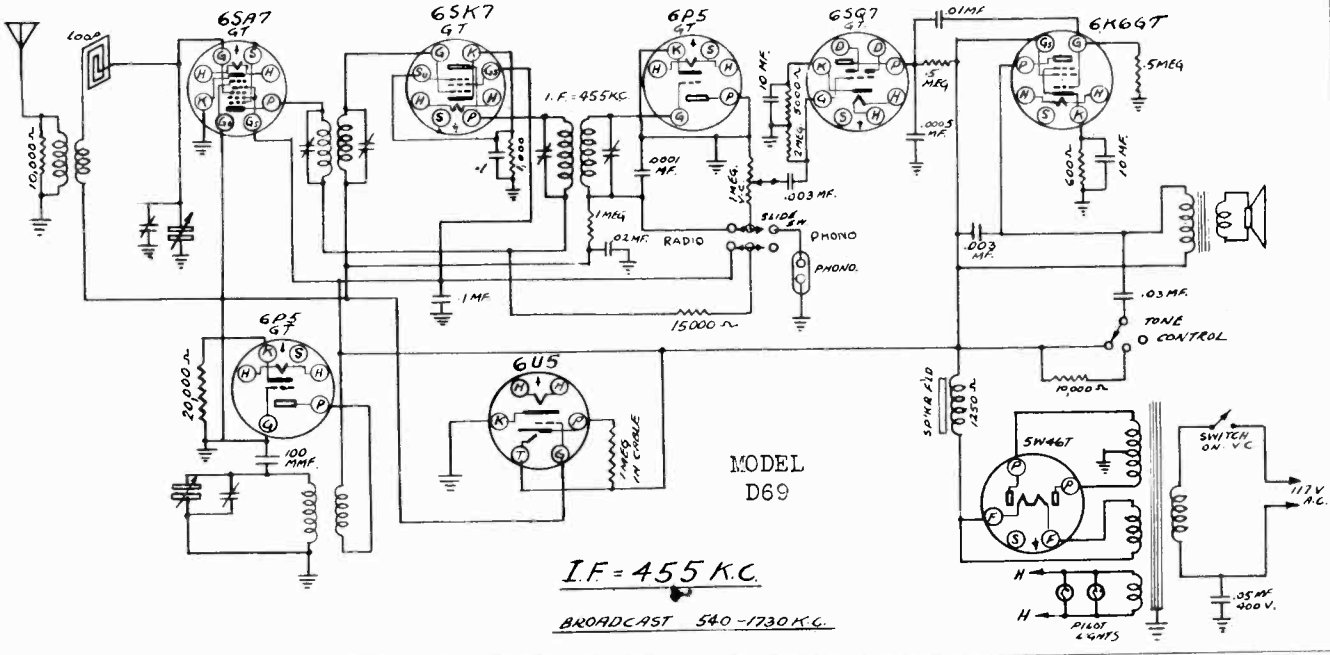


GAROD ELECTRONICS CORP.

MODEL D42
MODEL D69

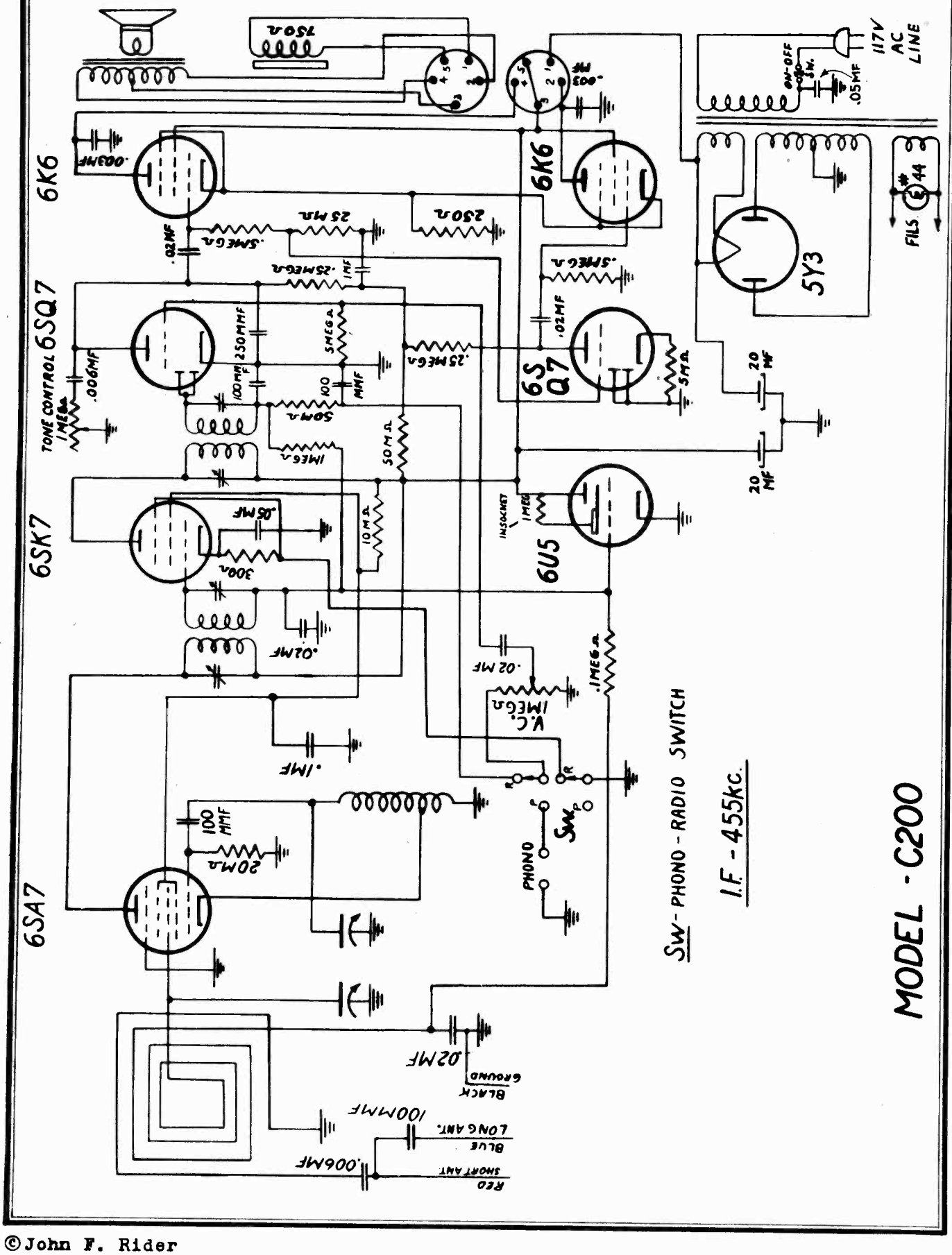






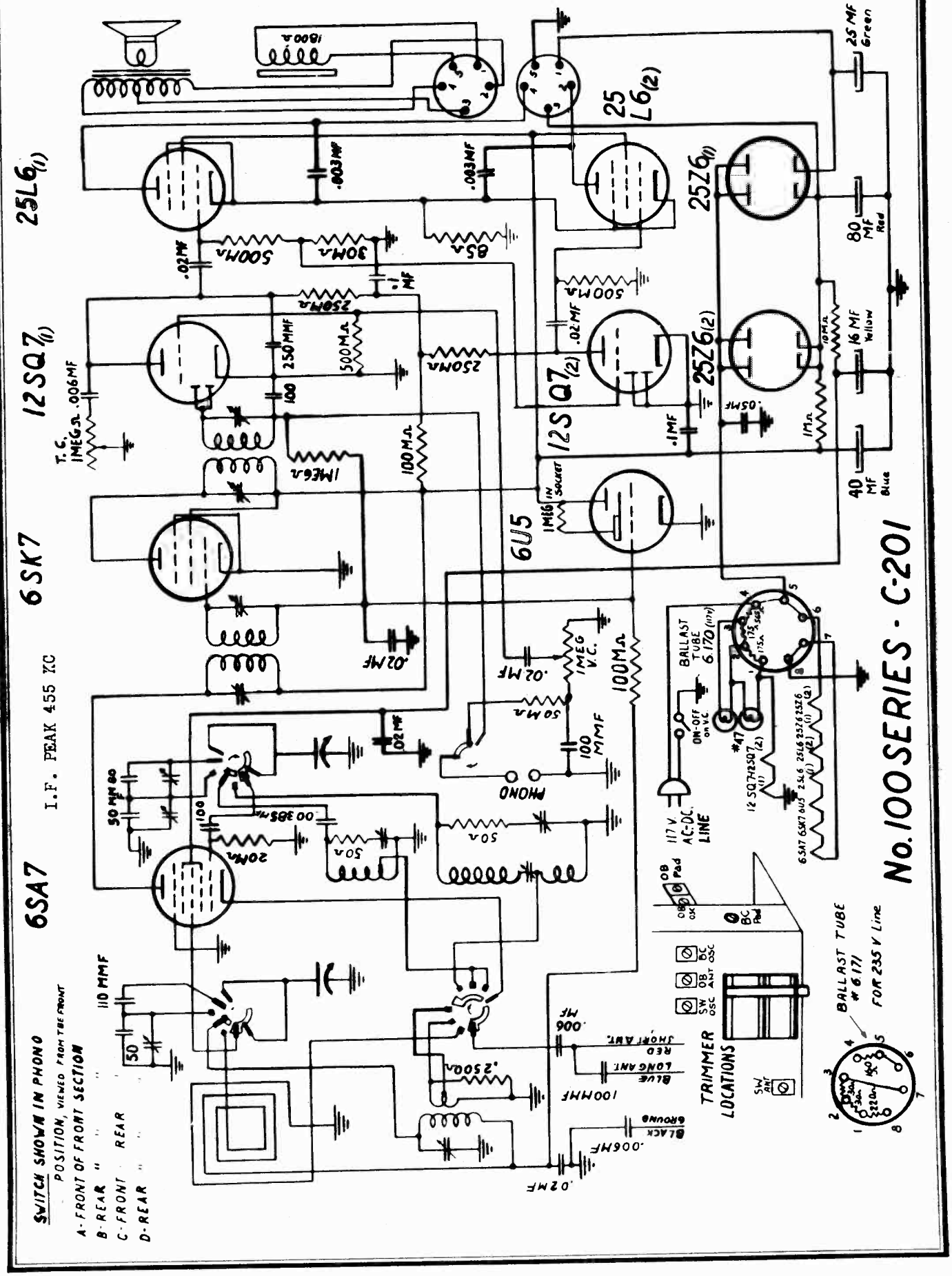
MODEL C200

GAROD ELECTRONICS CORP.



MODEL C201, Series 100

GAROD ELECTRONICS CORP.



MODEL C201, Series 100
MODELS C205, C210,
Series 80

GAROD ELECTRONICS CORP.

ALIGNMENT INSTRUCTIONS

Re-alignment of this receiver should not be attempted unless all other possible cuases have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands, and an output meter for indicating the effect of admustments are required.

During the alignment procedure all adjustments should be made under the following conditions:

1) Line Voltage as indicated on instruction sheet.
2) Volume & Tone control at maximum volume positions.
3) Minimum Input from signal generator.

If this procedure is not adhered to, all adjustments will appear very broad. This is due to the action of the automatic volume control.

I. F. Adjustment - The signal generator is set at 455 KC and is connected to the grid of the converter tube 6SA7 through a .5 MFD condenser. Be sure to connect a resistor of approximately 25,000 OHMS between the converter grid and ground so that the grid circuit is at ground potential for D.C. It is unnecessary to disconnect the grid from the rest of the circuit.

The Input I. F. Transformer trimmers - are both adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

The Output I. F. Transformer trimmers - are adjusted for maximum output as indicated on the output meter. The Input I. F. should now be re-checked for maximum output.

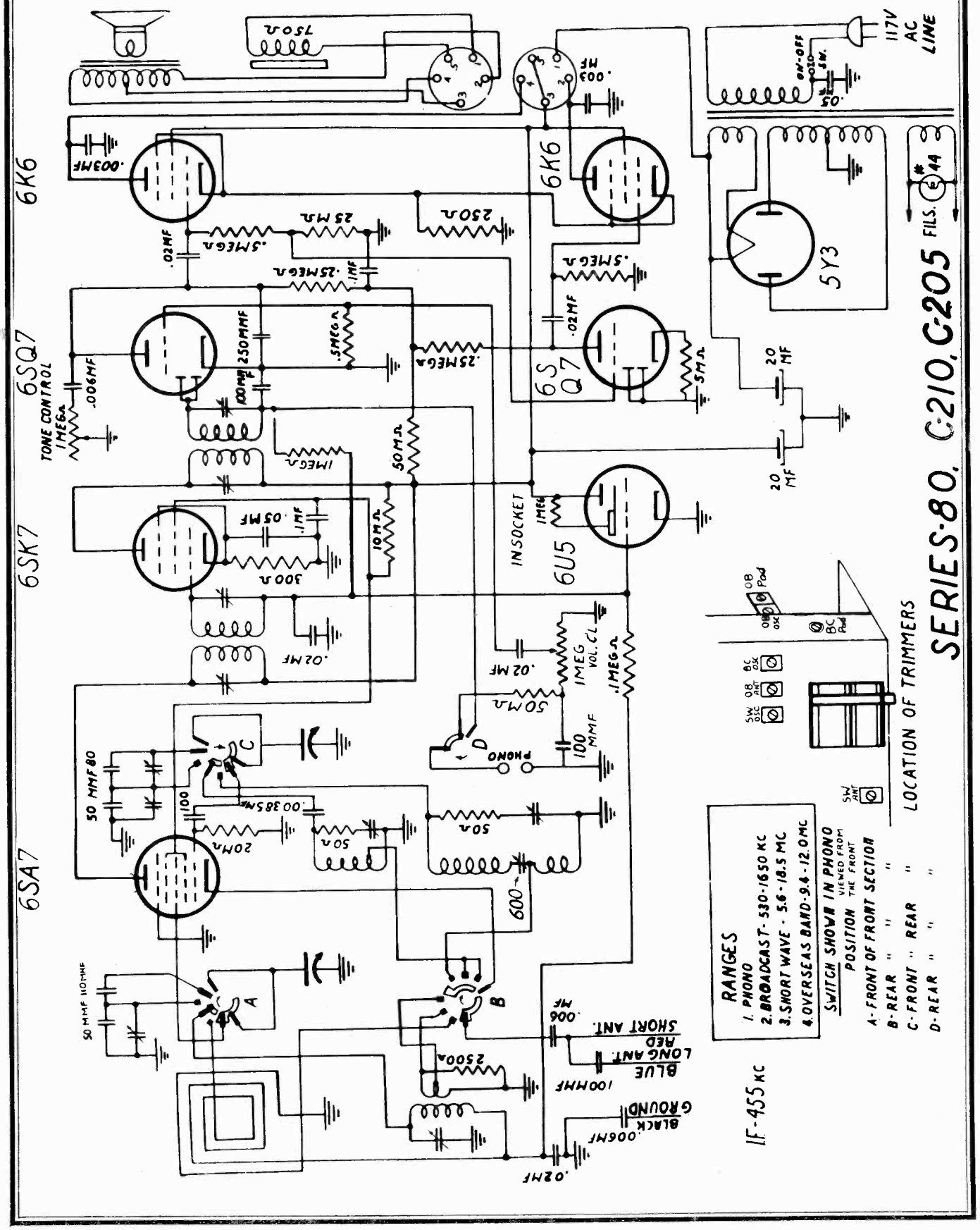
Short Wave Band Adjustment - Set the band switch to the third position which is short wave band #1. Connect the signal generator thru a standard dummy antenna to the antenna and ground leads of the receiver. Set the generator at 17 MC turn the condenser until a response is indicated. The pointer should coincide with the 17 MC mark on the dial. Adjust the antenna trimmer for the short wave band for maximum output while rocking the condenser gang from left to right.

OVERSEAS - Set the band switch to the fourth position. Turn the dial control knob to the extreme high frequency end so that the condenser plates are entirely out of mesh. The signal generator is left connected as for the short wave band. The generator is set at 12 MC and the corresponding osc. trimmer is opened until a response is indicated at the lower capacity setting of the trimmer. Now adjust the antenna trimmer for maximum. Set the generator at 9.4 MC and turn the variable condenser until the signal is picked up. The padder for this band (see sketch) is now adjusted for maximum output while rocking the condenser gang from left to right. The 12 MC adjustment should then be rechecked.

Broadcast Band
It is desirable to align this band on the loop. The signal generator is coupled to the receiver by means of a 2 or 3 turn loop. Set the band Switch in the Broadcast position and condenser plates completely out of mesh. Set the signal generator at 1600 KC and adjust the broadcast oscillator trimmer until a response is indicated on the output meter. The generator is now set at 1500 KC. Turn the variable condenser until a response is indicated. The dial pointer should now co-incide with the 1500 KC mark on the dial. Set the generator at 600 KC and turn the variable condenser control until a response is indicated. Adjust the broadcast oscillator padder condenser for maximum response while "rocking" the gang condenser. The high frequency adjustments should now be re-checked.

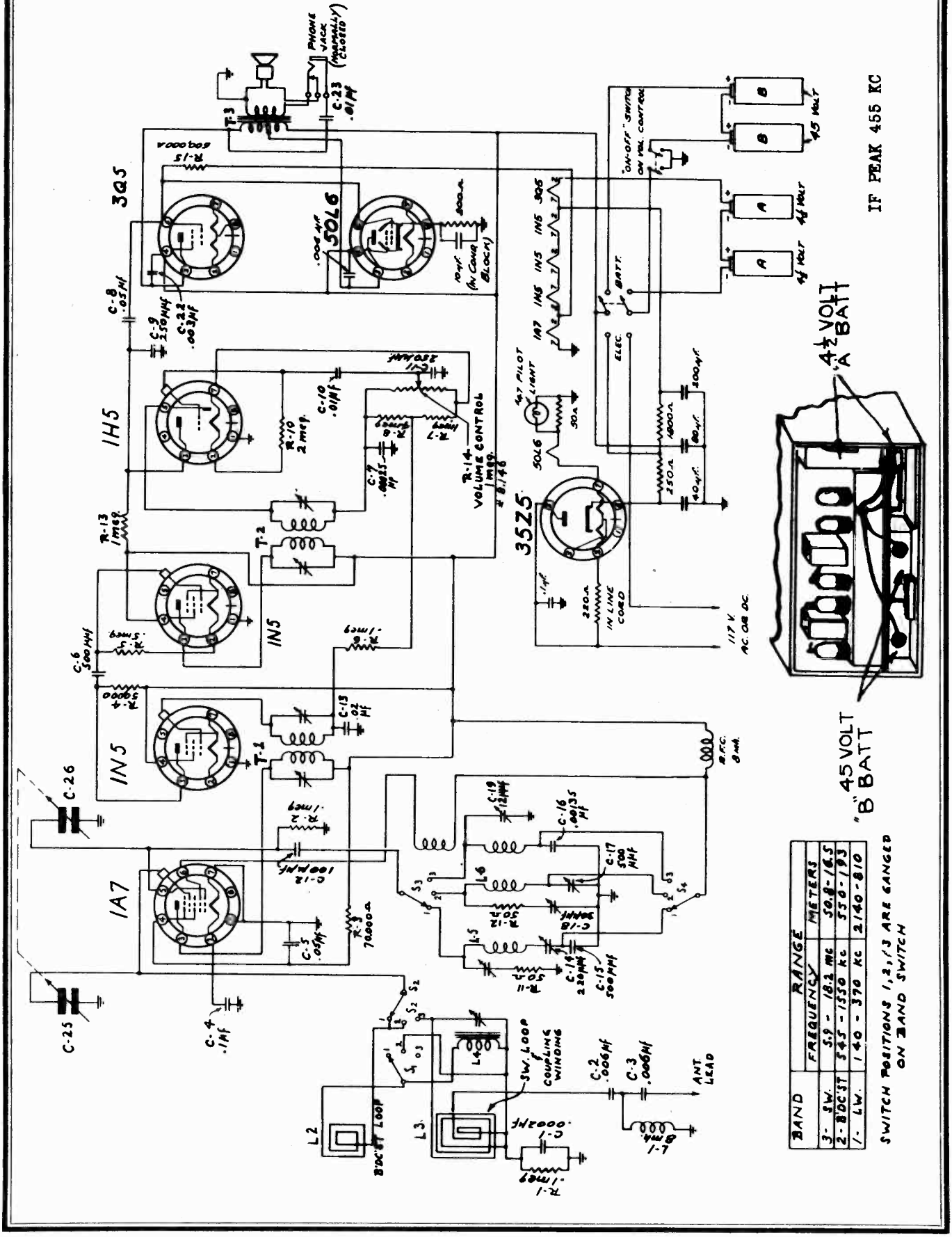
MODELS C205, C210,
Series 80

GAROD ELECTRONICS CORP.



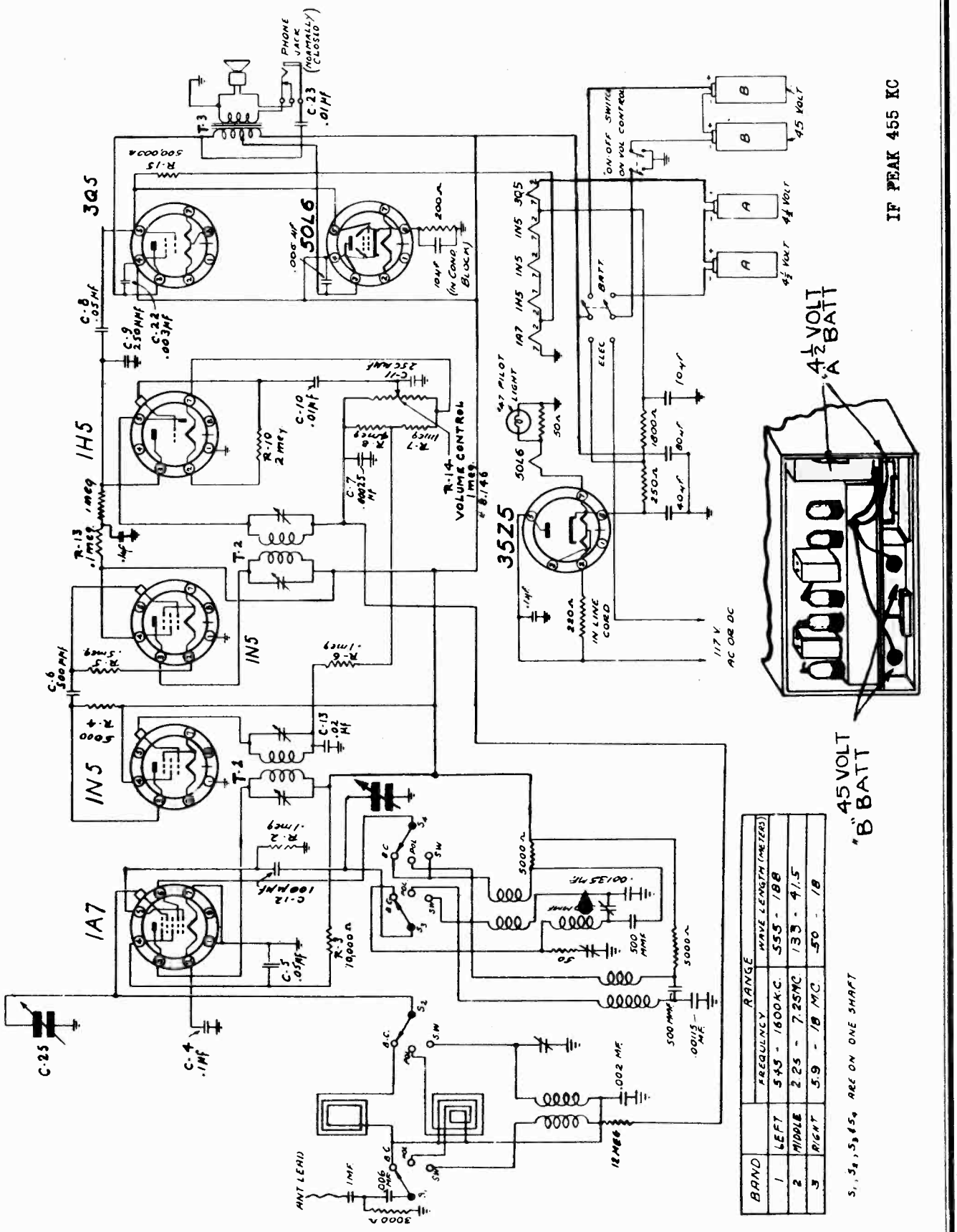
MODEL BP307

GAROD ELECTRONICS CORP.



MODEL BP306

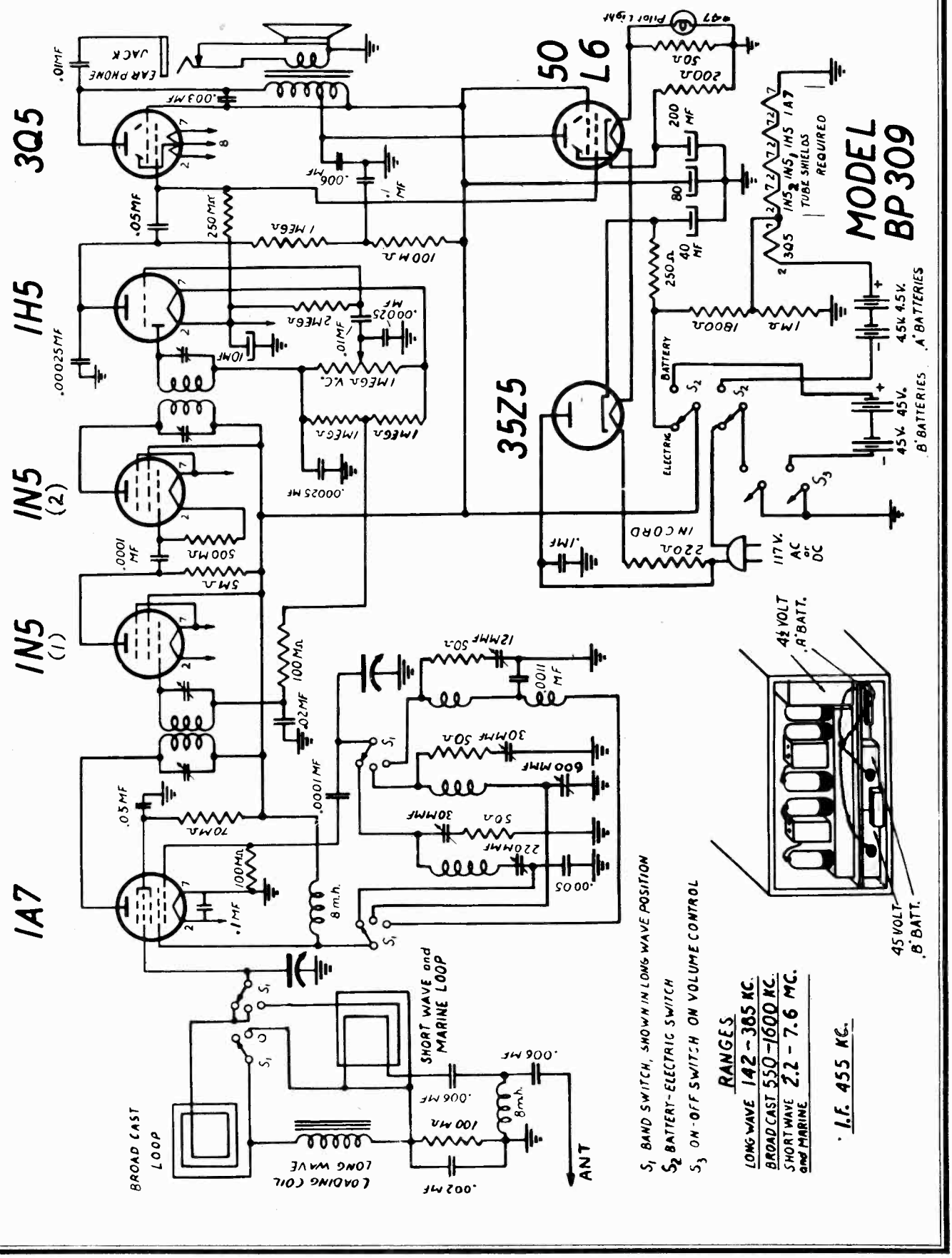
GAROD ELECTRONICS CORP.

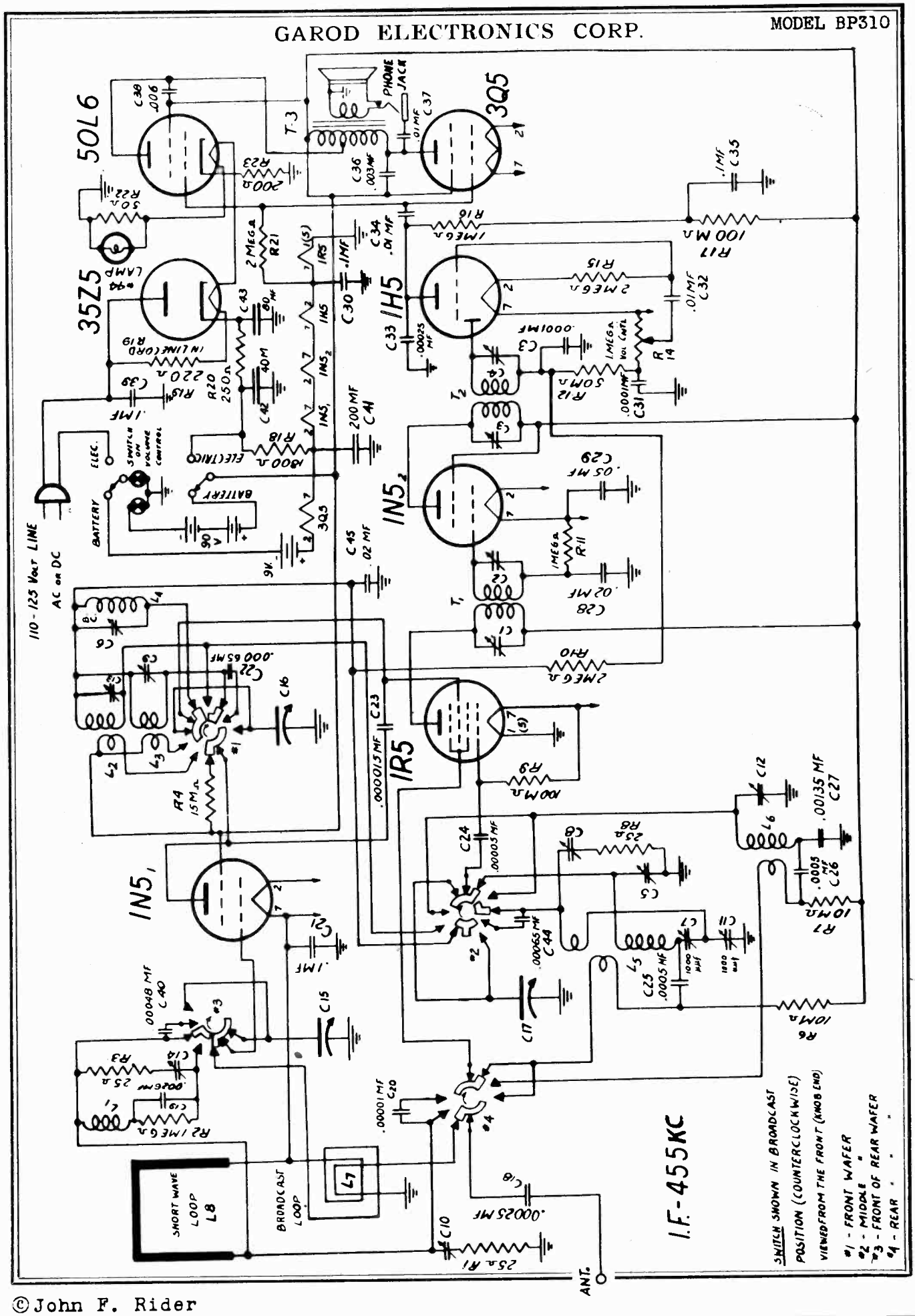


BAND		RANGE	
		FREQUENCY	WAVE LENGTH (METERS)
1	LEFT	545 - 1600 K.C.	555 - 188
2	MIDDLE	2.25 - 7.25 MC	133 - 41.5
3	RIGHT	5.9 - 18 MC	50 - 18

MODEL BP309

GAROD ELECTRONICS CORP.





MODEL BP310

GAROD ELECTRONICS CORP.

ALIGNMENT PROCEDURE

All adjustments except the IF should be made on Loop operation. A loop consisting of two turns of heavy wire about one foot in diameter and placed about two feet from the set loop should be connected to the signal generator. For IF adjustment the "hot" side of the signal generator may be connected to the front section of the Three Gang Variable condenser thru a blocking condenser (.05 mfd). The condenser is set with the plates fully open and the Band Switch in the Broadcast position.

IMPORTANT. In taking the chassis out of the cabinet for servicing, it becomes necessary to disconnect the SHORT WAVE loop. Do not unsolder the lugs from the rod, but instead unsolder the leads from the lugs. If these lugs are moved the Inductance of the loop will be changed and it will be impossible to align the SHORT WAVE Bands properly. Do not lengthen these leads or shorten them. To get at the trimmers for alignment, unsolder the loop leads, take out the chassis and with the chassis outside of the cabinet reconnect them.

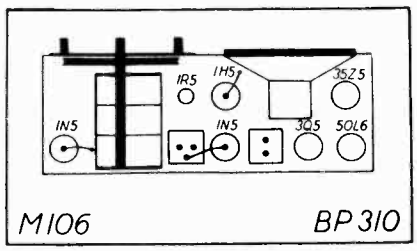
In aligning the series padders at 600KC and 9.5 megacycles, the variable condenser should be rocked back and forth until maximum output is obtained as indicated on the output meter.

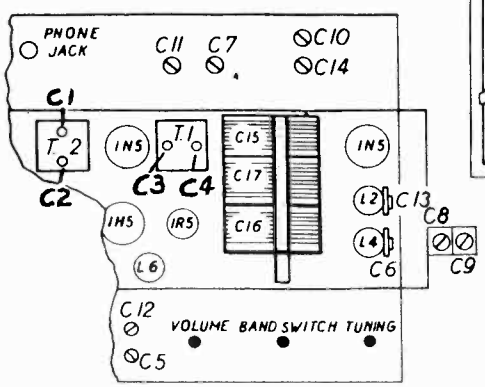
It is also advisable to do this while making the 17MC adjustment since there is some reaction between circuits.

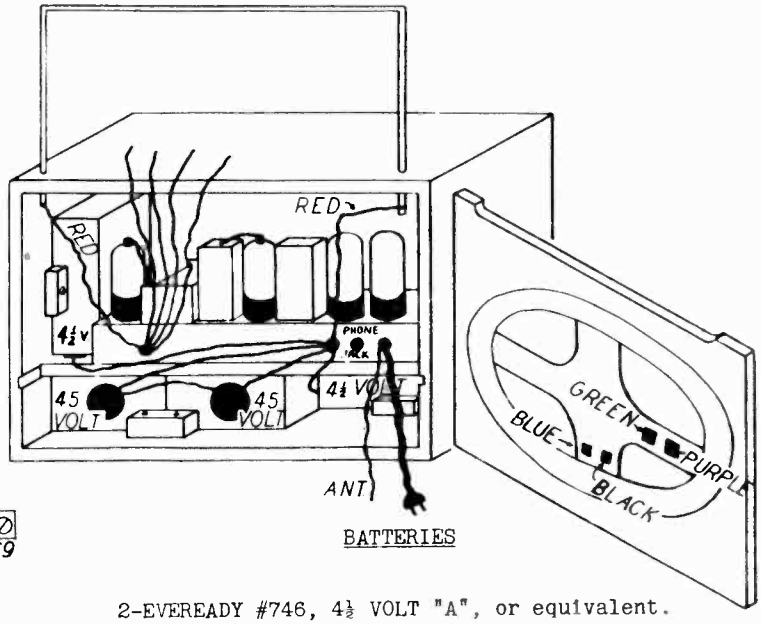
Proceed in accordance with the tabulation on the next page. For location of the trimmers SEE SKETCH. The position of the trimmers in the circuit is indicated in the circuit diagram by a corresponding number.

	SIGNAL GENERATOR FREQUENCY	BAND	ADJUST TRIMMERS FOR MAXIMUM OUTPUT IN SEQUENCE INDICATED (SEE SKETCH)	REMARKS
A	455 MC	I.F.	1--2--3--4	I. F. Trimmers
B	1500 KC	B.C.	5--6	Set dial to 1500 KC
C	600 KC	B.C.	7	Recheck adjustment "B"
D	17 MC	S.W.2	8--9--10	Set dial to 17 MC (rock condenser slightly)
E	9.5 MC	S.W.2	11	Recheck adjustment "D"
F	8.5 MC	S.W.1	12--13--14	

SENSITIVITY BROADCAST-LOOP OPERATION-75 MICROVOLTS PER METER (AVERAGE) FOR 50 MW OUTPUT
ANTENNA - 5 MICROVOLTS (AVERAGE)
SHORT WAVE-LOOP OPERATION 100 MICROVOLTS PER METER (AVERAGE)



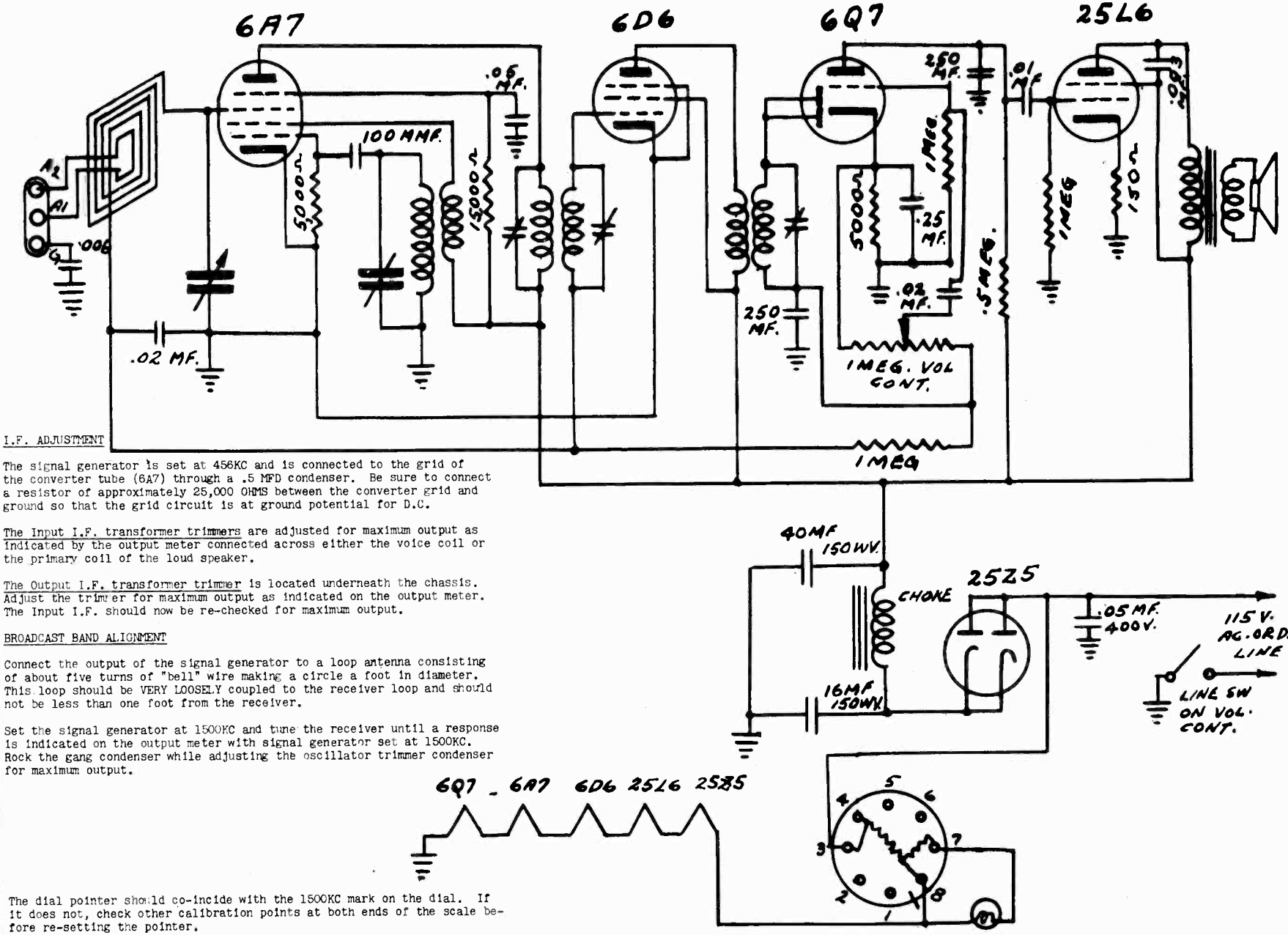




BATTERIES

2-EVEREADY #746, 4½ VOLT "A", or equivalent.

2-EVEREADY #482, 45 VOLT "B", or equivalent.



I.F. ADJUSTMENT

The signal generator is set at 456KC and is connected to the grid of the converter tube (6A7) through a .5 MFD condenser. Be sure to connect a resistor of approximately 25,000 OHMS between the converter grid and ground so that the grid circuit is at ground potential for D.C.

The Input I.F. transformer trimmers are adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

The Output I.F. transformer trimmer is located underneath the chassis. Adjust the trimmer for maximum output as indicated on the output meter. The Input I.F. should now be re-checked for maximum output.

BROADCAST BAND ALIGNMENT

Connect the output of the signal generator to a loop antenna consisting of about five turns of "bell" wire making a circle a foot in diameter. This loop should be VERY LOOSELY coupled to the receiver loop and should not be less than one foot from the receiver.

Set the signal generator at 1500KC and tune the receiver until a response is indicated on the output meter with signal generator set at 1500KC. Rock the gang condenser while adjusting the oscillator trimmer condenser for maximum output.

The dial pointer should co-incide with the 1500KC mark on the dial. If it does not, check other calibration points at both ends of the scale before re-setting the pointer.

GAROD ELECTRONICS CORP.

MODEL 610

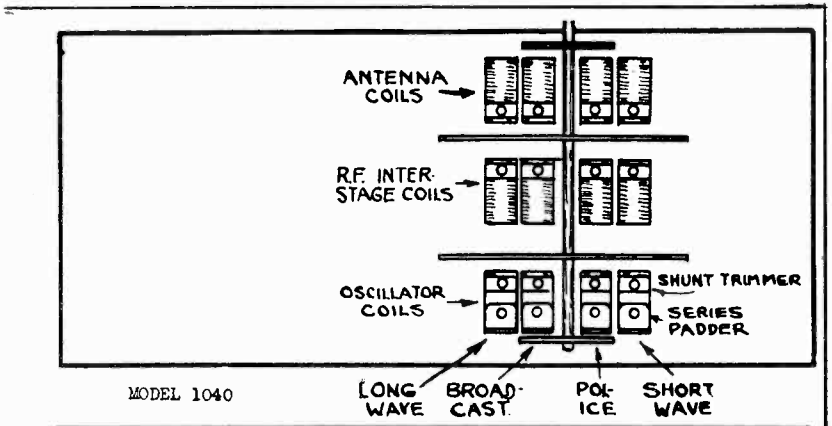
MODEL 3120 ALIGNMENT INSTRUCTIONS

Re-alignment of this receiver should not be attempted unless all other possible causes have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands, and an output meter for indicating the effect of adjustments are required.

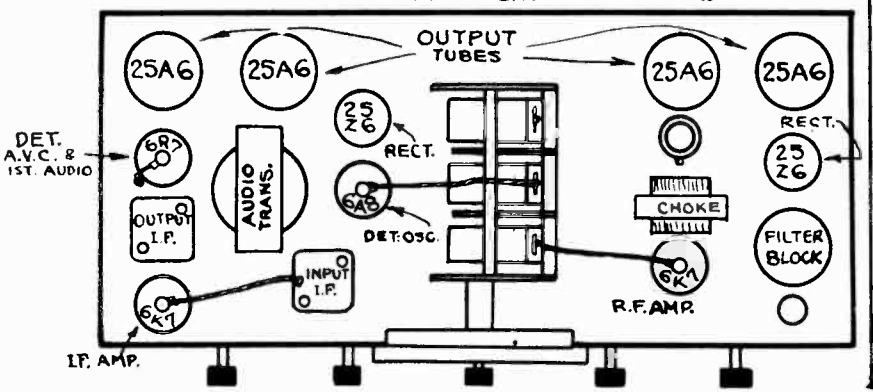
During the alignment procedure all adjustments should be made under the following conditions:

1) Line Voltage as indicated on instruction sheet.
2) Volume & Tone control at maximum volume positions.
3) Minimum Input from signal generator.

If this procedure is not adhered to, all adjustments will appear very broad. This is due to the action of the automatic colume control



MODEL 1040



ALIGNMENT PROCEDURE MODEL 1040

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

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

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

I.F. Adjustment - The signal generator is set at 455 KC and is connected to the grid of the converter tube (6A8) through a .5 MFD condenser. Be sure to connect a resistor of approximately 25,000 OHMS between the converter grid and ground so that the grid circuit is at ground potential for D.C.

The Input I.F. Transformer trimmers - are both adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

The Output I.F. Transformer trimmers - are adjusted for maximum output as indicated on the output meter. The Input I.F. should now be re-checked for maximum output.

Short Wave Band #1 Adjustment - Set the band switch to the third position which is short wave band #1. Connect the signal generator thru a standard dummy antenna to the antenna and ground leads of the receiver. Set the generator at 19MC turn the condenser until a response is indicated. The pointer should coincide with the 19MC mark on the dial. Adjust the antenna trimmer for the short wave band for maximum output while rocking the condenser gang from left to right.

Short Wave Band #2 - Set the band switch to the second position. Turn the dial control knob to the extreme high frequency end so that the condenser plates are entirely out of mesh. The signal generator is left connected as for band #1. The generator is set at 6.25MC and the Band #2 osc. trimmer is opened until a response is indicated, at the lower capacity setting of the trimmer. Set the generator at 6MC and turn the variable condenser until a response is indicated. The pointer should now coincide with the 6.MC mark on the dial. The antenna trimmer is then adjusted for maximum output while the condenser gang is rocked from right to left. Set the generator at 2.4MC and turn the variable condenser knob until a response is indicated. The padder for this band is now adjusted for maximum output while rocking the condenser gang from left to right. The high frequency adjustments should then be re-checked.

Broadcast Band
It is desirable to align this band on the loop. The signal generator is coupled to the receiver by means of a 2 or 3 turn loop. Set the Band Switch in the Broadcast position and condenser plates completely out of mesh. Set the signal generator at 1600 KC and adjust the broadcast oscillator trimmer until a response is indicated on the output meter. The generator is now set at 1400 KC. Turn the variable condenser until a response is indicated. The dial pointer should now co-incide with the 1400KC mark on the dial. Set the generator at 600KC and turn the variable condenser control until a response is indicated. Adjust the broadcast oscillator padder condenser for maximum response while "rocking" the gang condenser. The high frequency adjustments should now be re-checked.

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

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

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

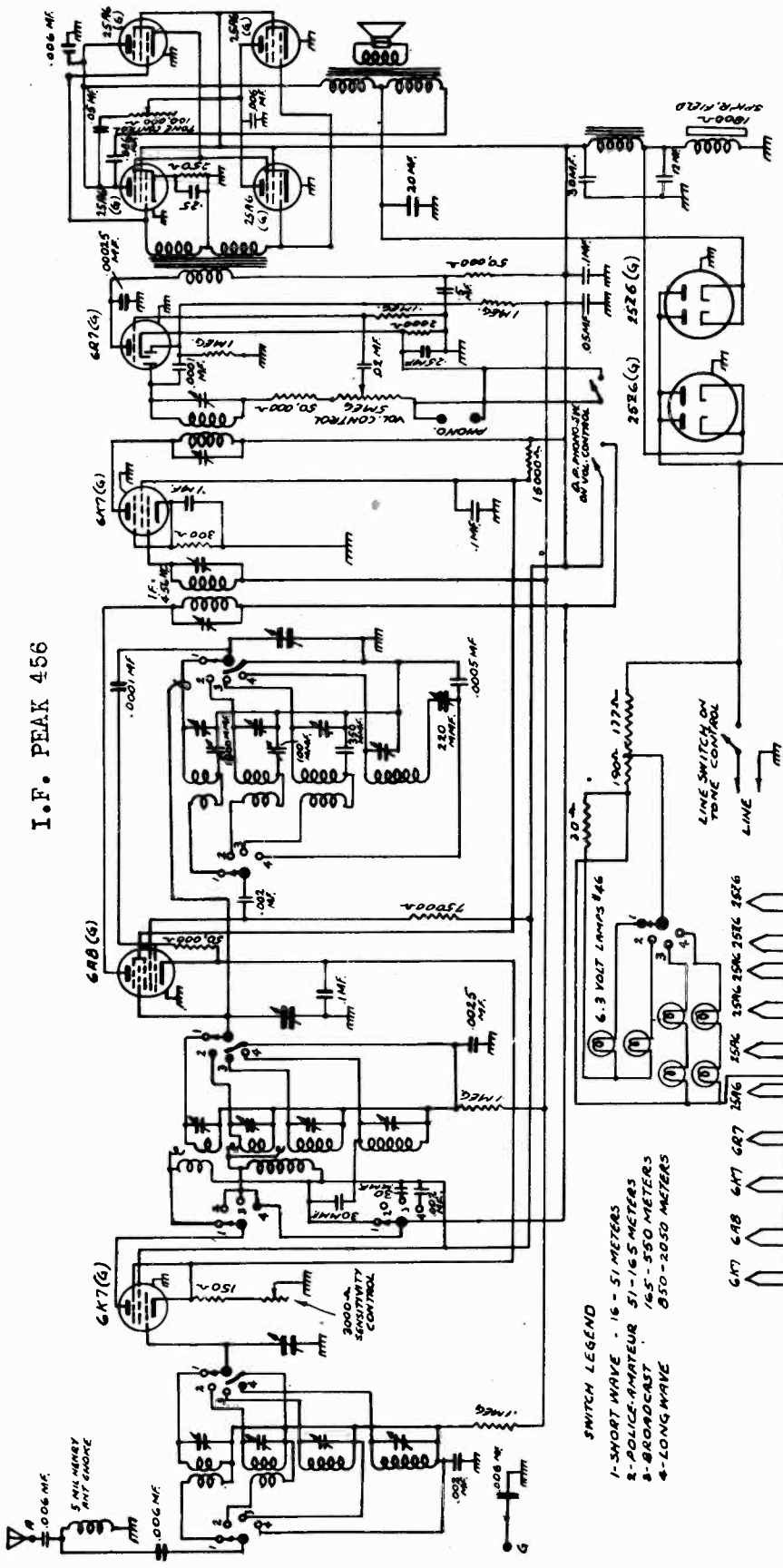
The signal generator is set at 600 kc. and the signal tuned in on the dial. The broadcast padder condenser is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 1500 kc. adjustment should then be rechecked.

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

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

MODEL 1040

GAROD ELECTRONICS CORP.



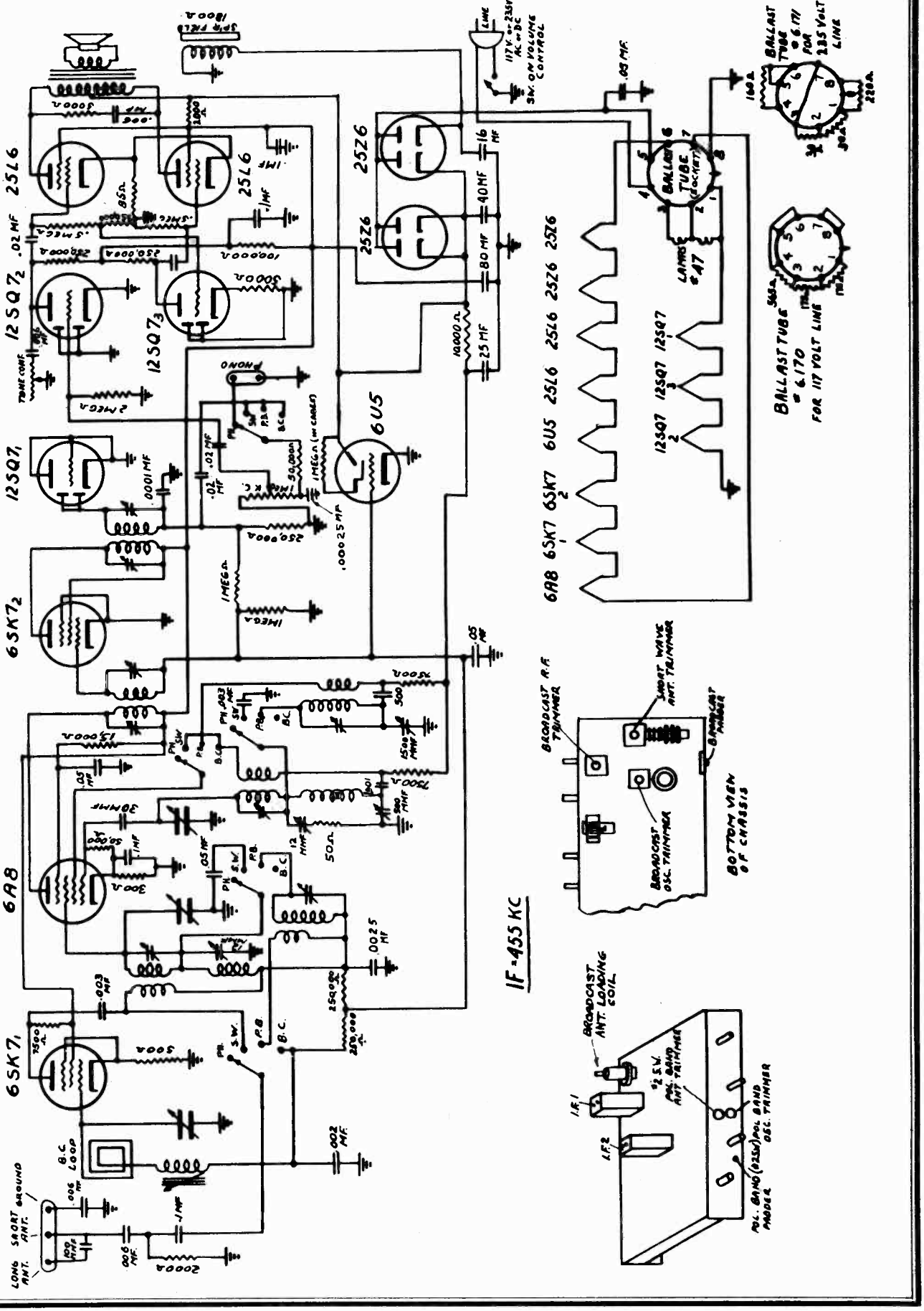
TUBE	FUNCTION	HEATER	PLATE	SC. GR.	CATH	OSC. PL.
6K7 (G)	Preselector	4.5	95	95	1.75	
6A8 (G)	Det. osc.	4.5	95	55	1.75	80
6K7 (G)	I F amp.	4.5	95	55	1.0	
6R7 (G)	2nd det. and 1st audio	4.5	40		2.0	
25A6 (G)	Audio output	21	120		15	
25Z6 (G)	Rectifier	21			120	

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

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

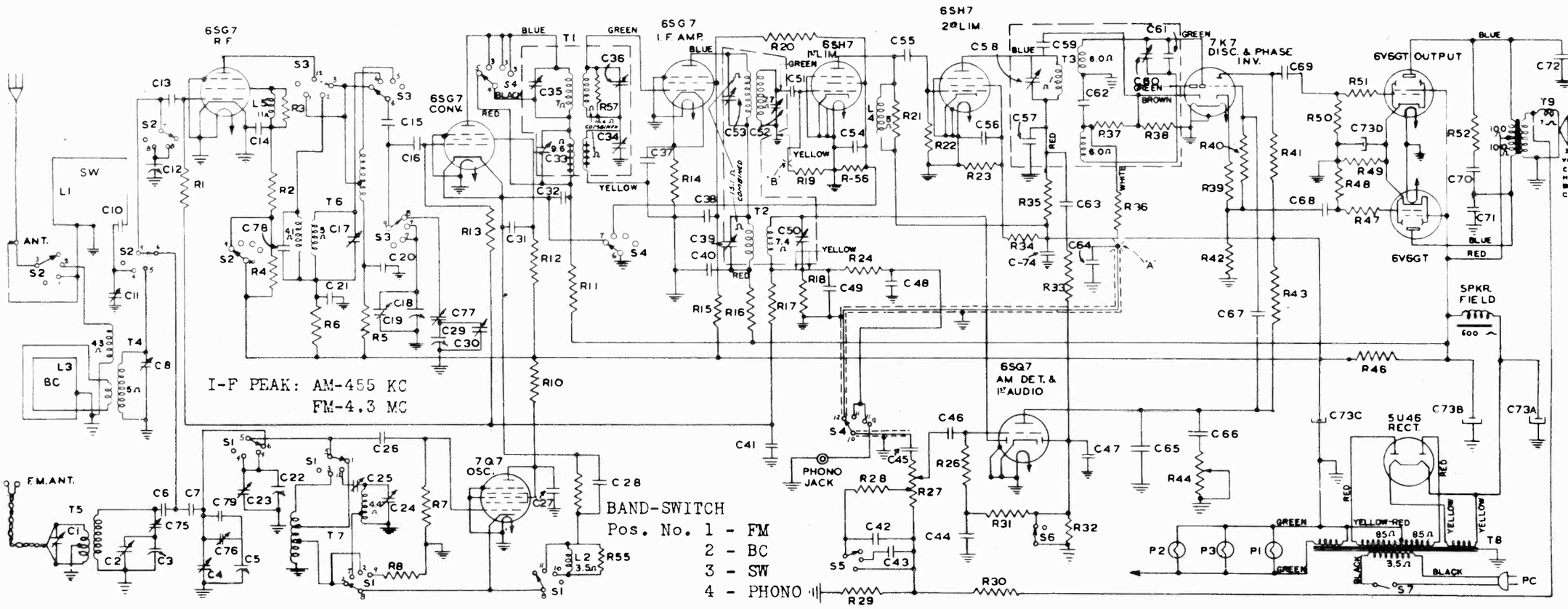
MODEL 3120

GAROD ELECTRONICS CORP.

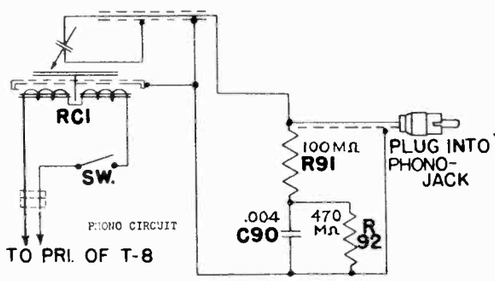


GENERAL ELECTRIC CO.

MODEL 40
MUSAPHONIC



C-1	F.M. Ant Trimmer
C-2	F.M.-RF Trimmer
C-3	Tuning Gang Cond.
C-4	F.M. Osc. Trimmer
C-5	Tuning Gang Cond.
C-6	47 mmfd. Mica
C-7	10 mmfd. Temp. Compensating Cond.
C-8	B.C. Ant. Trimmer
C-10	3000 mmfd. Mica
C-11	S.W. Ant. Trimmer
C-12	Tuning Gang Cond.
C-13	220 mmfd. Mica
C-14	.02 mfd.
C-15	.05 mfd.
C-16	47 mmfd. Mica
C-17	B.C. R.F. Trimmer
C-18	Tuning Gang Cond.
C-19	S.W. R.F. Trimmer
C-20	3600 mmfd. Mica
C-21	.05 mfd.
C-22	Tuning Gang Cond.
C-23	S.W. Osc. Trimmer
C-24	B.C. Osc. Trimmer
C-25	B.C. Osc. Padder
C-26	66 mmfd. Temp. Compensating Cond.
C-27	.05 mfd.
C-28	.005 mfd.
C-29	Tuning Gang Cond.
C-30	F.M.-R.F. Trimmer
C-31,32,	.02 mfd.
C-33,34	A.M.-I.F. Trimmer
C-35,36	F.M. I.F. Trimmer
C-37,38	.05 mfd.
C-39	A.M. I.F. Trimmer
C-40	.02 mfd.
C-41	.05 mfd.
C-42	.003 "
C-43,44,45	.01 "
C-46	.005 "
C-47,48,49	100 mmfd. Mica
C-50	A.M. I.F. Trimmer
C-51	33 mmf., mica capacitor
C-54	.01 mfd., paper 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



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, check 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.

GENERAL ELECTRIC CO.

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	Capacitively Coupled to "FM" Antenna	Unmodulated 46 MC Signal	"FM" Band 46 MC	C1	Using built-in dipole adjust C1 for maximum output with Signal Generator capacitively coupled to it, (place lead about 2 ft. from dipole) or on an outside station.
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

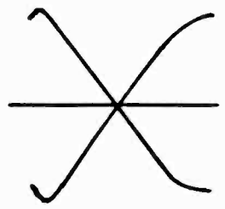


Fig. 4

GENERAL ELECTRIC CO.

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 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.

SERVICE HINTS

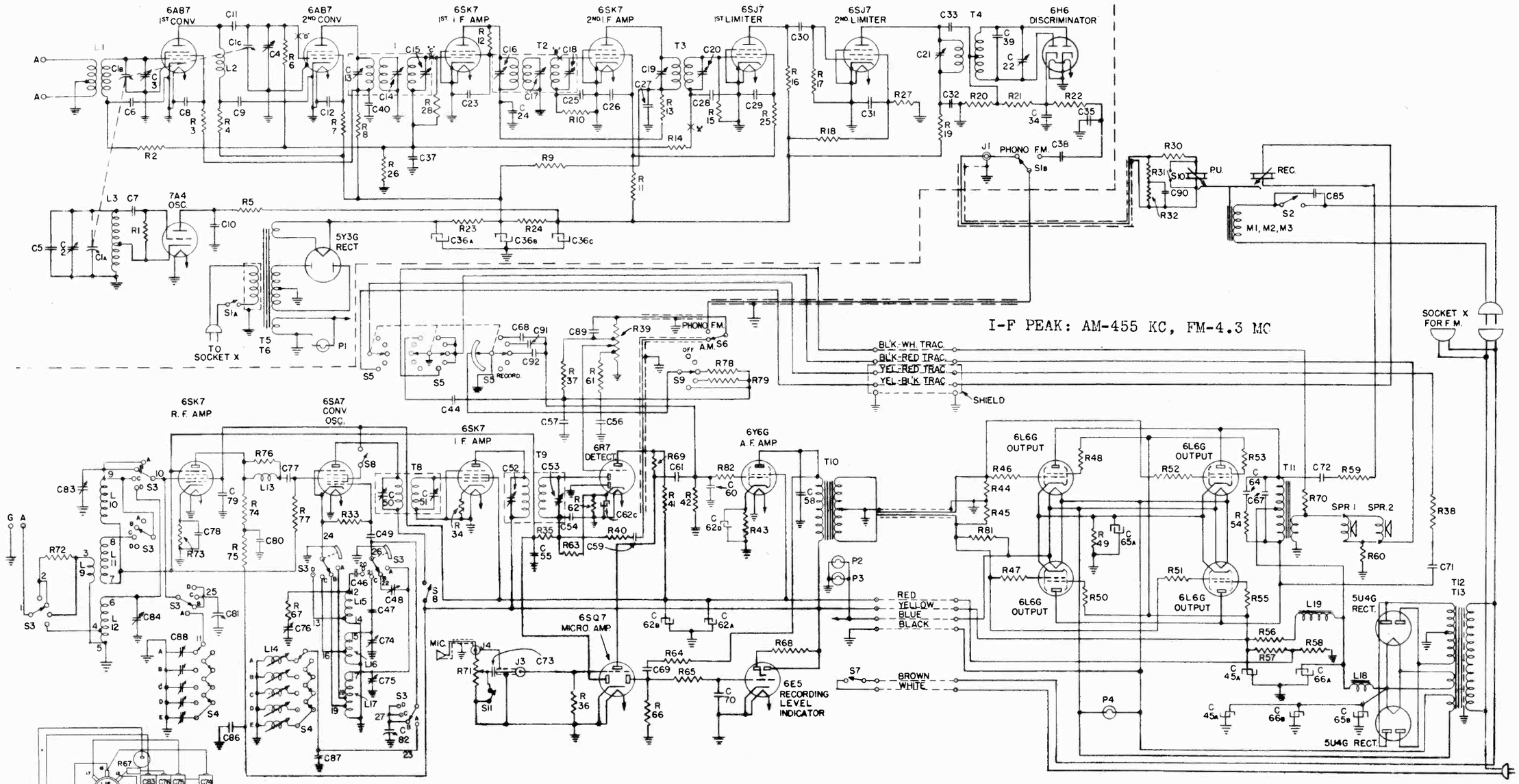
Replacement of Components

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.

GENERAL ELECTRIC CO.



C1a, b, c	Tuning condenser (FM)	C49	47 mmf. mica cap.	C86	.05 mfd. paper cap.	R25	47,000 ohm carbon	R61	56,000 ohm carbon	T1	1st IF trans. (FM)
C2	5-24 mmf. trimmer	C54	220 mmf. mica cap.	C87	750 silvered mica	R26	.47 megohm carbon	R62	4,700 ohm carbon	T2	2nd IF trans. (FM)
C3, 4	Trimmers on cond. C1	C55	.05 mfd. paper cap.	C88	Selector trimmers	R27, 28	47,000 ohm carbon	R63	.15 megohm carbon	T3	3rd IF trans. (FM)
C5	40 mmf. temp. compensated	C56	.008 mfd. paper cap.	C89	270 mmf. mica cap.	R30, 31	.10 megohm carbon	R64	.68 megohm carbon	T4	Discrim. IF trans. (FM)
C6	470 mmf mica cap.	C57	.0025 mfd. paper cap.	C90	.005 mfd. paper cap.	R32	.27 megohm carbon	R65, 66	2.2 megohm carbon	T5, 6	Power trans. (FM)
C7	50 mmf temp. compensated	C58, 59	.005 mfd. paper cap.	C91	.0032 mfd. paper cap.	R33	22,000 ohm carbon	R67	27 ohm carbon	T8	1st IF trans. (AM)
C8, 9, 10, 11	470 mmf. mica cap.	C60	150 mmf. mica cap.	C92	.0015 mfd. paper cap.	R34	150 ohm carbon	R68	1.0 megohm carbon	T9	2nd IF trans. (AM)
C12, 23, 24	.01 mfd. paper cap.	C61	.05 mfd. paper cap.	R1	33,000 ohm carbon	R35	2.2 megohm carbon	R69	.10 megohm carbon	T10	Interstage audio trans.
C25	47 mmf. mica cap.	C62a, b	15 mfd. dry electrolytic	R2	3.3 megohm carbon	R36	4.7 megohm carbon	R70	4.5 ohm W.W.	T11	Output trans.
C26, 27	.01 mfd. paper cap.	C62c, d	40 mfd. dry electrolytic	R3	6,800 ohm carbon	R37, 38	47,000 ohm carbon	R71	2.0 meg. vol. control	T12, 13	Power trans. (AM)
C28, 29	47 mmf. mica cap.	C64	.005 mfd. paper cap.	R4	2,200 ohm carbon	R39	2.0 meg. vol. control	R72	1,000 ohm carbon	P1, 2, 3, 4	Pilot lamps
C30	22 mmf. mica cap.	C65a	20 mfd. dry electrolytic	R5	1,000 ohm carbon	R40, 41	47,000 ohm carbon	R73	47 ohm carbon	M1, 2, 3	Phono motor
C31, 32	47 mmf. mica cap.	C65b	10 mfd. dry electrolytic	R6	3.3 megohm carbon	R42	.47 megohm carbon	R74	3,300 ohm carbon	REC	Recorder unit
C33	50 mmf. temp. compensated	C66a, b	10 mfd. dry electrolytic	R7	12,000 ohm carbon	R43	270 ohm carbon	R75	1,000 ohm carbon	L1	Ant. coil (FM)
C34	47 mmf. mica cap.	C67	.001 mfd. paper cap.	R8, 9	1,000 ohm carbon	R44, 45	680 ohm carbon	R76	10,000 ohm carbon	L2	RF coil (FM)
C35	220 mmf. mica cap.	C68	.0072 mfd. paper cap.	R10	47,000 ohm carbon	R46, 47	1,000 ohm carbon	R77	47,000 ohm carbon	L3	Oscillator coil (FM)
C36a	15 mfd. dry electrolytic	C69	.001 mfd. paper cap.	R11	15,000 ohm carbon	R48	100 ohm carbon	R78	.47 megohm carbon	L9, 10	"BC" loop antenna
C36b	30 mfd. dry electrolytic	C70	.05 mfd. paper cap.	R12	47,000 ohm carbon	R49	110 ohm W.W.	R79	.10 megohm carbon	L11	"SW1" ant. coil
C36c	10 mfd. dry electrolytic	C71, 72	.02 mfd. paper cap.	R13	2,200 ohm carbon	R50	100 ohm carbon	R81	.22 megohm carbon	L12	"SW2" loop antenna
C37	0.1 mfd. paper cap.	C73	.05 mfd. paper cap.	R14	2.2 megohm carbon	R51, 52	1,000 ohm carbon	R82	1000 ohm carbon	L13	RF Choke coil
C38	.02 mfd. paper cap.	C74	7-65 mmf. trimmer	R15	47,000 ohm carbon	R53	100 ohm carbon	S1a, b	Pwr.-FM-Phono Switch	L14	Station selector coils
C39	8 mmf. temp. compensated	C75	5-40 mmf. trimmer	R16	10,000 ohm carbon	R54	10,000 ohm carbon	S2	Phono motor switch	L15	"SW2" Osc. coil
C40	.01 mfd. paper cap.	C76	3-30 mmf. trimmer	R17	.18 megohm carbon	R55	100 ohm carbon	S3	Band switch	L16	"SW1" Osc. coil
C44	.02 mfd. paper cap.	C77	100 mmf. mica cap.	R18	68,000 ohm carbon	R56	390 ohm W.W.	S4, 6, 8	Station selector sw.	L17	"BC" Osc. coil
C45 a, b	10 mfd. dry electrolytic	C78, 79, 80	.01 mfd. paper cap.	R19	22,000 ohm carbon	R57	4,000 ohm carbon	S5	Treble tone control	L18, 19	Filter chokes
C46	.008 mfd. polystyrene cap.	C81, 82	Tuning cond. (AM)	R20, 21, 22	.10 megohm carbon	R58	5,500 ohm W.W.	S7, 9	Pwr-Bass tone control		
C47	2400 mmf. mica cap.	C83, 84	1.8-20 mmf. trimmer	R23	1,200 ohm W.W.	R59	47,000 ohm carbon	S10	Phono silence switch		
C48	"BC" padder	C85	Line capacitor	R24	3,300 ohm carbon	R60	40 ohm W.W.	S11	Microphone switch		

GENERAL ELECTRIC CO.

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	C52 and C53
2	6SA7 Conv. Grid in Series with .05 mfd.	455 KC	"BC" Band 550 KC	C50 and C51
3	Use Capacity Coupling	580 KC	"BC" Band 580 KC	C48 **
4	Use Capacity Coupling	1500 KC	"BC" Band 1500 KC	C75 and C83
5	Use Capacity Coupling	580 KC	"BC" Band 580 KC	C48 **
6	Use Capacity Coupling	6.0 MC	"SW1" Band 6.0 MC	C74
7	Use Capacity Coupling	21.0 MC	"SW2" Band 21.0 MC	C76 *
8	Use Capacity Coupling	21.0 MC	"SW2" Band 21.0 MC	C84 **

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

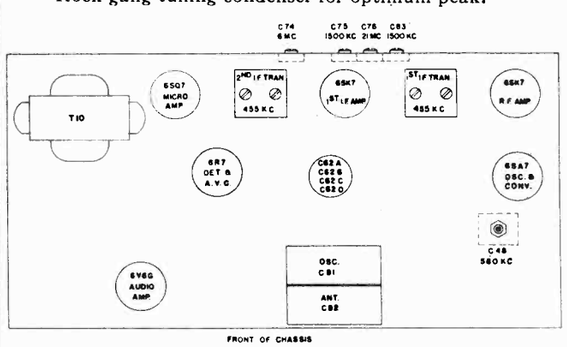


Fig. 3. SW-BC Trimmer Location

Alignment—BC and Short-wave Chassis

The alignment procedure, shown in table form, should be made with the chassis bolted in the cabinet. All RF alignment can be performed by capacity-coupling the test-oscillator signal to the respective built-in loop antenna of the band being aligned. Use a three-foot piece of wire connected as an antenna to the high side of the test-oscillator output. Bring this wire to within three feet of the proper loop antenna of the band in use. Metal objects such as meters, tools, etc., should not be brought in close proximity to the built-in loop antenna.

Before making the RF alignment make sure the pointer is set to the line at the 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.

Alignment—FM Receiver

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.

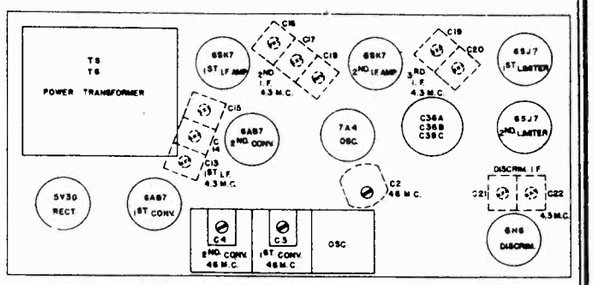


Fig. 4. FM Trimmer Location

GENERAL ELECTRIC CO.

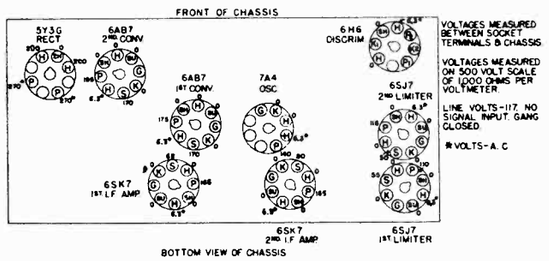
Special Service Information

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

(1) Stage Gains†
  (a) Antenna Post to R.F. Grid at
    1000 KC 5.0
    4000 KC 2.5
    18,000 KC 2.5
  (b) R.F. Grid to Converter Grid at
    1000 KC 5.0
    4000 KC 3.0
    18,000 KC 2.0
  (c) R.F. on Converter Grid to I.F. on 1st I.F. Grid at
    1000 KC 47
    4000 KC 47
    18,000 KC 45
  (d) I.F. on Converter Grid to I.F. on 1st I.F. Grid at
    455 KC 55
  (e) I.F. Amplifier Grid to Detector Plate at
    455 KC 70
(2) Voltage across Volume Control to Give ½-watt Speaker Output‡ at 400 cycles . . . . . .05 volts
(3) DC Voltage Developed across Oscillator Grid Resistor R-33 at
    1000 KC 7.5
    4000 KC 7.5
    18,000 KC 5.0

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

‡½-watt speaker output at 400 cycles is equivalent to a reading of 1.41 volts as measured by a high resistance AC voltmeter across the voice coil leads of the two speakers connected in parallel.



Phono-FM-Television Connection

If a television picture receiver with sound converter, a separate record player, or a frequency modulation translator (Model 60) is desired to be used with either of these models proceed as follows. On Model 80, remove the black shielded plug connection to the rear of the broadcast short-wave receiver rear chassis deck; on Model 60, remove the shielded lead to left of broadcast short-wave receiver rear chassis deck; then make the plug connection to the auxiliary unit. General Electric plug, Stock No. RP-145, fits the pin jack. To switch the receiver from radio to auxiliary unit operation, merely depress the Phono-FM push button selector key.

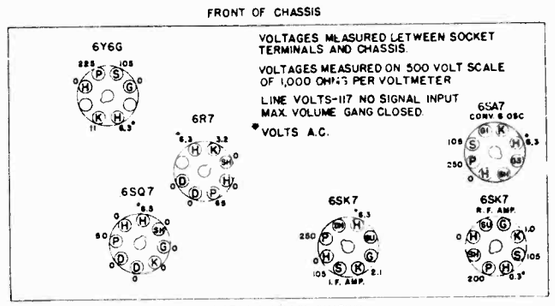
Service Hints

1. Audio howl is traceable usually to the 6Y6G audio driver tube. In making new tube replacements, it may be necessary to try several before a quiet tube is found.
2. A method of setting up broadcast automatic station selector buttons which will assure drift-proof adjustment is to screw the iron core all the way out and then turn slowly inward until the desired station is tuned in.
3. The black speaker lead should be connected to the 10-inch speaker terminal which is grounded to the speaker frames. When replacing a speaker, make sure of the proper phasing. With the speaker terminal boards facing each other, the interconnecting leads should be crossed.

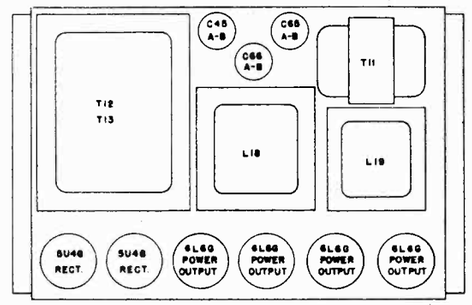
Reproducers

The voice coil is accurately centered at the factory and should seldom give trouble. In case the voice coil needs recentering, loosen the three hex head clamping screws which hold the voice coil spider assembly; remove the voice coil dust cap, and insert four centering shims in the air gap. Tighten the clamping set screws; remove the shims and replace dust cover.

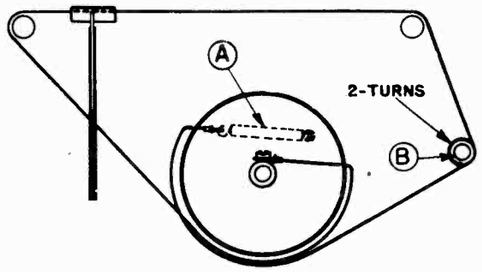
NOTE—In no case should the magnet be loosened or removed from the assembled position.



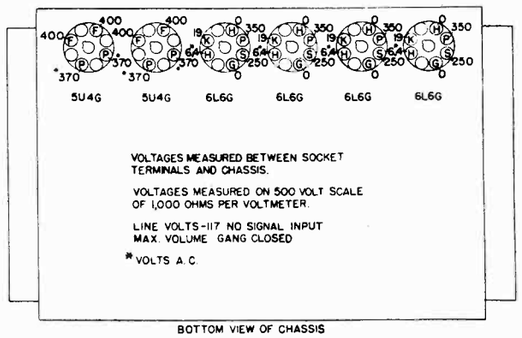
Socket Voltages—AM Chassis



Power Unit Component Layout



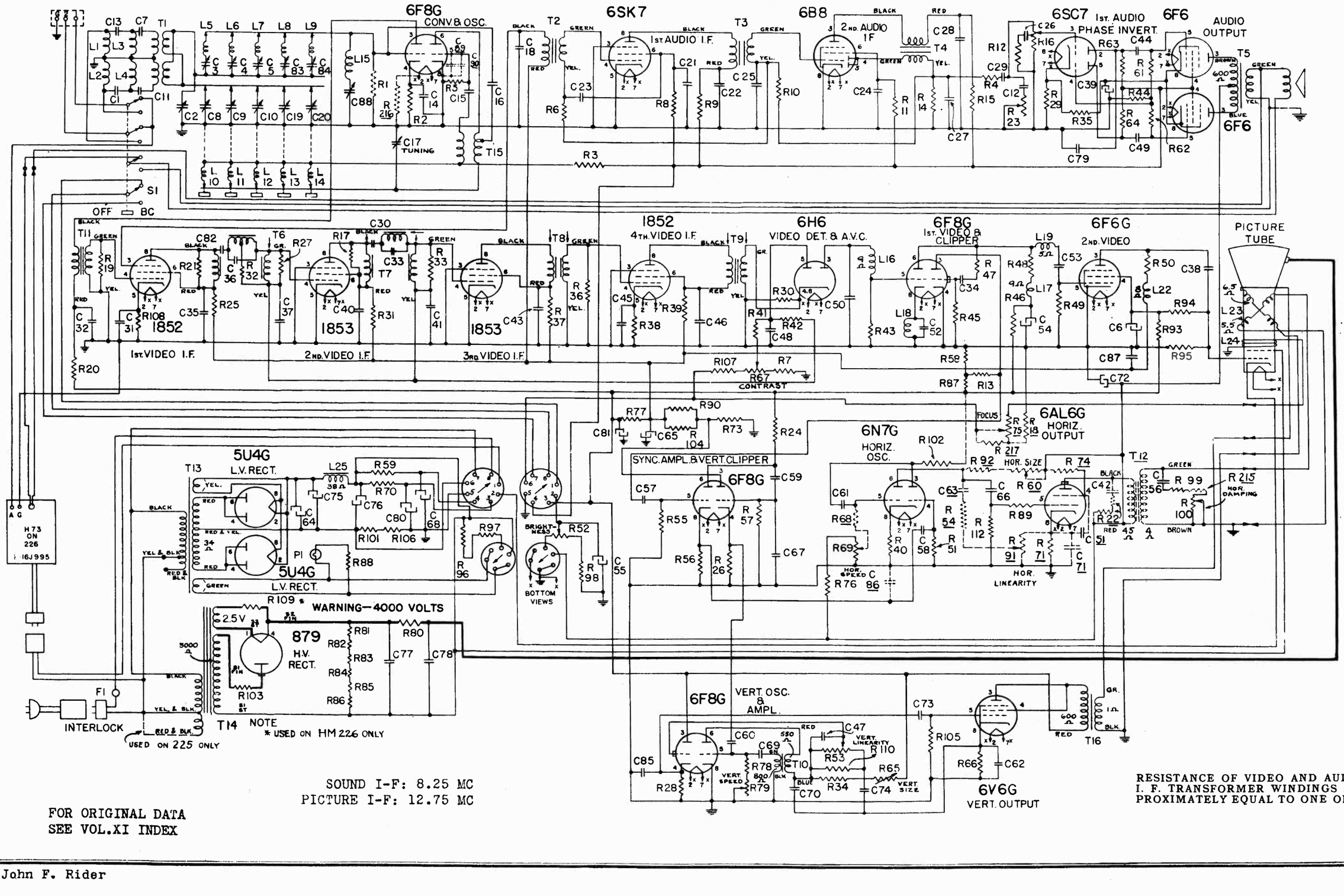
Dial Cord Stringing Diagram



Socket Voltages—Power Unit

MODEL HM-225B
MODEL HM-226B

GENERAL ELECTRIC CO.



MODEL HM-225B
MODEL HM-226B

GENERAL ELECTRIC CO.

IMPORTANT NOTE

COMBINATION TELEVISION AND RADIO RECEIVER MODEL HM-226B CONSISTS OF THE TELEVISION RECEIVER MODEL HM-225B REVISED FOR NEW STANDARDS AND RADIO RECEIVER MODEL HM226-7A.

ALIGNMENT REVISED FOR NEW STANDARDS

TELEVISION ALIGNMENT PROCEDURE

The problem of aligning the several circuits in a television receiver is much more involved and requires more specialized equipment than the alignment of conventional radio receivers. Fortunately, the use of stable components in carefully engineered circuits of wide-band characteristics reduces to a minimum the necessity for alignment under normal operating conditions. Should alignment become necessary the following equipment will be needed:

(A) For Video I.F. Alignment
- (1) Cathode ray oscilloscope
- (2) Wide-band sweep oscillator capable of sweeping from 7.5 to 15 MC.
- (3) Marker system either provided in sweep oscillator or from separate signal generator for locating 12.75 and 9.75 MC points.

(B) Sound I.F. Alignment
- (1) Cathode ray oscilloscope
- (2) Wide band sweep oscillator capable of sweeping from 7.75 to 8.75 MC.

(C) R.F. Alignment
- (1) Cathode ray oscilloscope
- (2) Wide-band sweep oscillator capable of sweeping the following bands.
  - (a) 50 to 56 MC
  - (b) 60 to 66 MC
  - (c) 66 to 72 MC
  - (d) 78 to 84 MC
  - (e) 84 to 90 MC

VIDEO I. F. ALIGNMENT

Input Freq.	Point of Input	Adjustments	Comments
1.			Connect vertical input cable of cathode ray oscilloscope across resistor R-43 of 6H6 video detector.
2. 7.5–15MC Sweep	Control grid of 6AB7 (2nd video I.F.)		Connect low output tap of video I.F. sweep oscillator to control grid of 6AB7 (2nd video I.F.). Connect ground lead to chassis. Turn contrast control (R-67) to about half of maximum or to a point which gives satisfactory vertical deflection without overloading. Set horizontal centering and gain controls on oscilloscope to give suitable horizontal deflection. Adjust sweep phase to give curve similar to Fig. 8, curve 2.

NOTE: If sweep oscillator has marker points internally supplied, steps 3 and 4 may be omitted.

3. Same as in No. 2 plus 12.75 MC	Same as in No. 2		Superimpose an accurately calibrated 12.75 MC signal in parallel with sweep signal. Signal will appear on sweep curve in oscilloscope as a wiggle, the center of which is a thin black line. With a pen or crayon mark this point on the screen of the oscilloscope. (NOTE: Hereafter the horizontal controls on the oscilloscope must not be touched.)
4. Same as in No. 2 plus 9.75 MC	Same as in No. 2		Superimpose an accurately calibrated 9.75 MC signal in parallel with sweep signal. Mark screen at point where signal appears on curve as in No. 2 above.
5. 7.5–15 MC Sweep	Control grid 6AC7 (4th video IF)	Iron cores of detector transformer T-9	Connect high tap of video I.F. sweep oscillator to control grid of 6AC7 (4th video I.F.). (Do not touch horizontal controls of oscilloscope.) Turn sweep phase to give as near a single curve as possible. Adjust iron cores of T-9 until curve appears similar to Fig. 8, curve 1, with relatively flat top, 12.75 MC mark half-way down one side and 9.75 MC mark at corner of other side. These conditions plus maximum amplitude insure correct alignment.
6. 7.5–15 MC Sweep	Control grid 6AB7 (3rd video IF)	Iron cores of 4th video transformer T-8.	Connect low tap of video I.F. sweep oscillator to control grid of 6AB7 (3rd video I.F.). Adjust iron cores for maximum gain, flatness and proper centering between markers as described in step No. 5 and illustrated in Fig. 8, curve 1.
7. 7.5–15 MC Sweep	Control grid 6AB7 (2nd video IF)	Iron cores of 3rd video transformer T-7.	Connect low tap to grid. Adjust primary and secondary iron cores for maximum gain, flatness and proper centering. Adjust series iron core for sharp cut-off on 9.75 MC side of curve. See Fig. 8, curve 3.
8. 7.5–15 MC Sweep	Control grid of 6AC7 (1st video I.F.)	Iron cores of 2nd video transformer T-6	Connect low tap to grid. Adjust primary and secondary iron cores for maximum gain, flatness and proper centering. Adjust series iron core for sharp cut-off on 12.75 MC side of curve. See Fig. 8, curve 3.
9. 7.5–15 MC Sweep	Converter Grid, 6F8G	Iron cores of 1st video transformer T-11	Connect low tap to grid. Adjust iron cores for maximum gain flatness and proper centering. 12.75 MC response must be equal to or slightly greater than 50% of the maximum response as indicated in Fig. 8, curve 4.
10. 14.25 MC	Converter Grid, 6F8G	Series iron core of 2nd video transformer T-6	To check alignment of 14.25 MC trap proceed as follows: Connect low tap to grid. Reduce horizontal gain of oscilloscope to minimum. Adjust iron core for minimum line length.
11. 8.25 MC	Converter Grid, 6F8G	Series iron core of 3rd video transformer T-7	To check alignment of 8.25 MC trap proceed as follows: Connect low tap to grid. Reduce horizontal gain of oscilloscope to minimum. Adjust iron core for minimum line length.

MODEL HM-225B.
MODEL HM-226B

GENERAL ELECTRIC CO

ALIGNMENT REVISED FOR NEW STANDARDS

R. F. ALIGNMENT

Signal Input	Point of Input	Adjustments	Comments
1.		Band width adjustment coupling condenser	Turn (C-2) in until tight, then open approximately ⅛ of a turn. Connect oscilloscope to junction of R-20 and C-32. Open-circuit B+ end of R-3 and short-circuit R-2.
2. 50 to 56 MC sweep	Antenna terminals	(L-10), (C-3), (C-8)	Depress band No. 1 push button. Set tuning control to mid-rotation. Adjust L-10 until curve is centered between maximum horizontal sweep points. Adjust C-3 and C-8 for maximum amplitude. See Fig. 8, curve 4.
3. 60 to 66 MC sweep	Antenna terminals	(L-11), (C-4), (C-9)	Depress band No. 2 push button. Adjust L-11 for centering; C-4 and C-9 for maximum amplitude. See Fig. 8, curve 4.
4. 66 to 72 MC sweep	Antenna terminals	(L-12, (C-5), (C-10)	Depress band No. 3 push button. Adjust L-12 for centering; C-5 and C-10 for maximum amplitude. See Fig. 8, curve 4.
5. 78 to 84 MC sweep	Antenna terminals	(L-13), (C-83), (C-19)	Depress band No. 4 push button. Adjust L-13 for centering; C-83 and C-19 for maximum amplitude. See Fig. 8, curve 4.
6. 84 to 90 MC sweep	Antenna terminals	(L-14), (C-84), (C-20)	Depress band No. 5 push button. Adjust L-14 for centering; C-84 and C-20 for maximum amplitude. See Fig. 8, curve 4.

WAVE TRAP ALIGNMENT

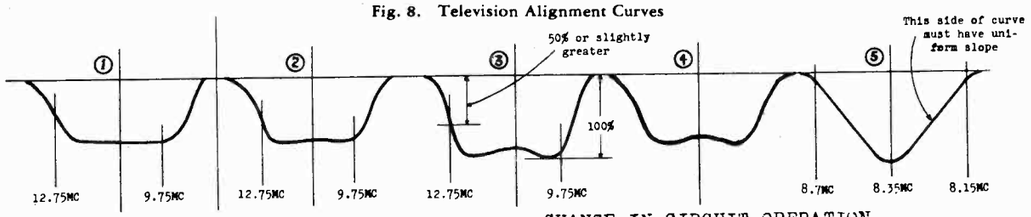
1. 11.75 MC With modulation	Antenna terminals	Wave trap trimmer, C-88	Adjust for maximum dip in oscilloscope curve, with oscilloscope connected to diode load resistor R-43.

AUDIO I.F. ALIGNMENT

NOTE: In order to obtain frequency modulation detection in the sound channel with good fidelity, the audio I.F. amplifiers must be aligned to give a satisfactory selectivity curve for slope detection. For this reason a sweep generator and oscilloscope are necessary to obtain the resultant curve shown in Fig. 8, curve 5.

1.			Connect vertical input cable of cathode ray oscilloscope between junction of R-4 and C-29 chassis.
2. 8.25 MC with 30% tone modulation	Grid of 6F8G converter.	Iron cores of all audio transformers	Align for maximum amplitude
3. 7.75 to 8.75 MC Sweep	Control grid of 6B8		Superimpose an accurately calibrated 8.15 MC signal in parallel with sweep signal and mark center of beat "wiggle" on oscilloscope screen as in step 3 of Video IF alignment. Also obtain an 8.35 MC beat signal mark on the oscilloscope screen. The steep straight portion of the over-all audio IF response curve must extend between these limits.
4. 7.75 to 8.75 MC Sweep	Control grid of converter 6F8G	Iron cores of audio IF transformers T2, T3 and T4.	Adjust iron cores until curve has been shaped as shown by curve 5, Fig. 7. It is important that the steep side be straight between 8.15 and 8.35 MC. The more gradual slope on the other side should extend from 8.35 MC to approximately 8.7 MC. Very few turns of the cores should be required to obtain the desired result. No more than 30% loss in peak over-all response should result from this process.

Fig. 8. Television Alignment Curves



IMPORTANT NOTES

OTHER SERVICE DATA NOT LISTED IS THE SAME AS FOR THE ORIGINAL TELEVISION RECEIVER.

FOR SERVICE DATA ON THE REGULAR RADIO CHASSIS OF THE COMBINATION TELEVISION AND RADIO RECEIVER MODEL HM-226B, SEE MODEL HM226-7A.

CHANGE IN CIRCUIT OPERATION

The horizontal oscillator is a multi-vibrator with speed controlled by varying the small positive grid voltage through R-69. The horizontal pulses are passed through proper wave shaping and amplifier circuits to the horizontal deflection coils of the picture tube. Horizontal linearity is adjustable by varying R-91. Horizontal sweep size is controlled by R-60 in the plate circuit of the 6F8G. The series circuits across the primary and secondary of the 6AL6G output transformer damp the output transient. Damping is adjustable through R-100.

GENERAL ELECTRIC CO.

AUTOMATIC RECORD CHANGER

MODEL LRP-3

GENERAL

This record changer is designed for use on a 110-volt 50-cycle power supply, but can easily be converted for 110-volt 60-cycle use by following the instructions under "Operation on 50- or 60-cycle Power Supplies."

OPERATION

The record changer will play up to eight 12-inch or nine 10-inch records at one loading. It will not play 12-inch and 10-inch records intermixed. The last record will repeat playing until the mechanism is stopped.

To load the record changer, both lower shelf plates of the record supports must be turned inward. This is done by grasping the post just below the shelf plate and rotating until it falls into the proper position. The stack of records rests over the spindle, on the two lower shelf plates.

The turntable switch is located at the front left corner of the motor board.

The Reject button is used to start the changer mechanism and to reject a particular record. To start the mechanism, or to reject a record being played, merely push the Reject button and release it. Rejecting can be done at any time after the needle has come in contact with the record, and will immediately start the mechanism on its change cycle.

The 10-12 button selects the position at which the pickup arm drops onto the record, i.e. for 10-inch or 12-inch records respectively. No repositioning of the support discs is necessary for changing to different record size.

The Auto-Manual button prepares the record changer for either automatic or manual operation. On Manual, the changer is used as an ordinary single-record player.

The mechanism should only be stopped while the needle is riding on the record. After the last record has been played, wait until the pickup arm has gone through the change-cycle and has dropped on to the first grooves of the record, before throwing the power switch "off." Then lift the pickup arm and carry it to the pickup rest. Stopping the mechanism during the change cycle will lock the pickup arm. To avoid damage to the mechanism, the pickup arm should only be handled with the Auto-Manual button in the Manual position.

CAUTIONS

1. Never use force to start or stop the motor or any part of the record-changing mechanism.
2. The use of cracked or chipped records may damage the pickup and needle.
3. Do not leave the records on the record posts or on the turntable, as they may warp, particularly in warm climates. Warped records may slide upon one another and result in unsatisfactory reproduction. Warped records may be flattened by placing them on a flat surface with a heavy flat article placed on top of them for a few days.
4. The use of warped records may also jam the mechanism. When the mechanism jams, turn off the power and rotate the turntable by hand in the reverse direction, for about ten turns.

CABINET LEVELING

For good operation, the record changer must be level. If the cabinet tilts to the left, the records may not drop smoothly and the pickup may drop and slide over the first grooves of the record. If the cabinet tilts to the right, the records may not drop smoothly, and the pickup may fail to enter the starting groove.

NEEDLE

This phonograph is equipped with a semi-permanent type needle and under normal operation should last for about four thousand playings. The needle should be inserted with the flat section to the screw and made secure. DO NOT CHANGE THE POSITION OF THE NEEDLE ONCE IT HAS BEEN IN USE. The needle screw should be tightened periodically.

TURNTABLE SPEED

The maximum allowable turntable speed is 81 rpm. The minimum allowable turntable speed, with the needle in the outside groove of a 12-inch record, is 76.6 rpm.

The number of records in the turntable makes practically no difference in the revolutions per minute (rpm).

OILING

All main moving parts of this record changer have oilless type bearings and should require no additional lubrication. However, a few drops of high-grade machine oil on the main bearings and friction surfaces, and to the oil wicks on both ends of the motor shaft may be applied at long intervals.

OPERATION ON 50- OR 60-CYCLE POWER SUPPLIES

The record changer is shipped from the factory adjusted for operation on a 50-cycle power supply. To change for 60-cycle operation, replace item (8) (Fig. 1) with the spare bushing supplied. (The spare bushing is shipped with each changer, tied to the frame with a piece of wire.) Sixty-cycle operation requires the smaller diameter bushing so as to reduce the turntable speed to 78 rpm. Note that if the mechanism is being operated on a 60-cycle power supply, and the turntable speed is too high, it means that too large a bushing is being used at (8) to drive the idler wheel (4), and that the smaller bushing should be used. Also, if the mechanism is being operated on a 50-cycle power supply, and the turntable speed is too low, it means that too small a bushing is being used at (8). 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.

MODEL LRP-3

GENERAL ELECTRIC CO.

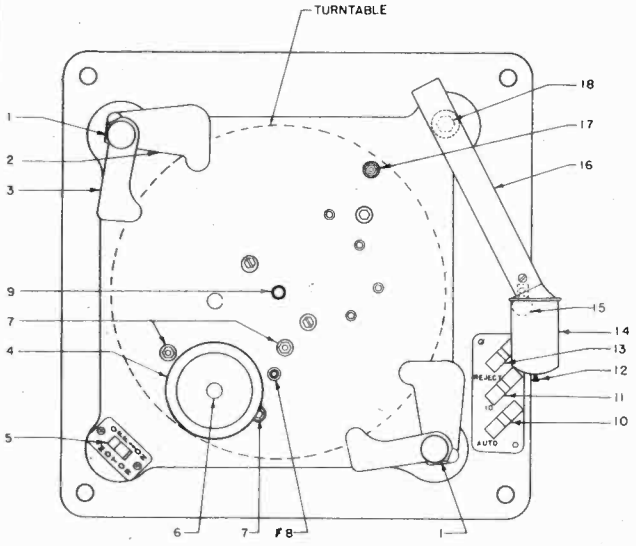


Fig. 1
Top view of record changer with turntable removed

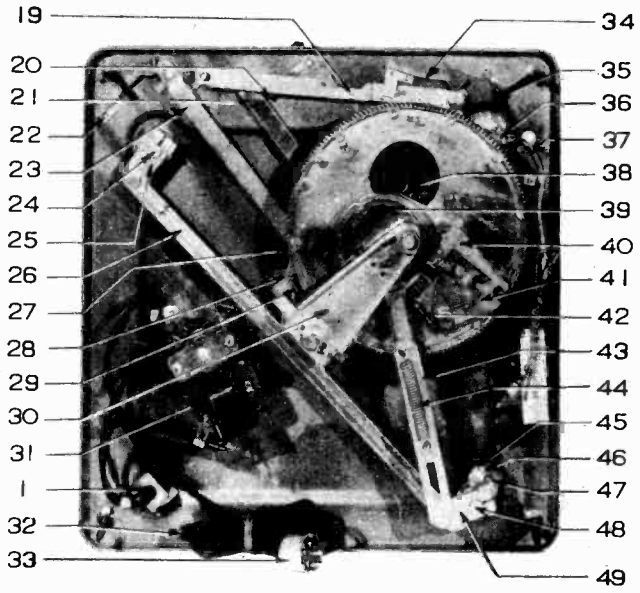


Fig. 2
Bottom view of record changer with mechanism about three fourths of the way through a change cycle

DESCRIPTION OF PRINCIPAL PARTS

Symbol	Function
1	Changer post
2	Lower blade
3	Upper blade
4	Idler wheel
5	Motor switch
6	Spring clip
7	Motor mounting grommet
8	Motor bushing
9	Turntable shaft
10	Auto-Manual button
11	10-12 button
12	Needle setscrew
13	Start-Reject button
14	Pickup
15	Pickup rest
16	Pickup arm
17	Dropping point adjusting screw
18	Pickup lift adjusting screw
19	Index link
20	Reject return spring
21	Reject link
22	Control spring
23	Manual link
24	Short changer blade shaft
25	Driving crank
26	Changer shaft tie bar
27	Large gear
28	Cam stop lever
29	Cam stop spring
30	Sub-frame
31	Motor
32	Line cord
33	Line cord plug
34	Control spring
35	Pickup crank spring
36	Pickup crank
37	Pickup cord
38	Position trip screw
39	Eccentric
40	Pawl latch
41	Starting pawl
42	Starting pawl spring
43	Eccentric arm
44	Eccentric arm spring
45	Post washer
46	Post nut
47	Driving crank
48	Long changer shaft
49	Driving crank
50	Pickup crank roller
51	Pickup lift pin
52	Ratchet pawl spring
53	Ratchet pawl
54	Ratchet latch
55	Ratchet spring
56	Ratchet trip
57	Cam groove
58	Pinion
59	Cam extension spring
60	Cam extension
61	Pawl latch spring
62	Cam rim

CYCLE OF OPERATION*

Pushing reject button (13) moves pawl latch (40) through reject link (21) and releases starting pawl (41) which is moved by starting pawl spring (42). The starting pawl (41) engages with lugs in pinion (58) and rotates the large gear (27) for approximately one revolution until the stop lever (28) rolls into the stop depression on the large gear. This entire movement is one complete turn of the large gear and is one complete change cycle of the record changer. When the large gear turns, the eccentric (39) pushes the eccentric arm (43) through the eccentric arm spring (44). This moves the driving crank (49) and *turns the blades* (2) and (3). The other set of blades are turned simultaneously through driving crank (47), tie bar (26), and driving crank (25).

Pickup Arm

The lateral movement of the pickup arm is controlled during a change cycle by the pickup crank roller (50) on the pickup crank (36), following the cam groove (57) in the large gear (27).

The vertical movement of the pickup arm during a change cycle is controlled by the pickup pin (51) riding on the cam rim (62) on top of the large gear. On records which do not have a starting groove, *the needle is pushed into the first groove* by pickup crank spring (35). The tension of this spring may be adjusted by bending the lug to which it is attached on the base.

Position Trip

When the needle travels to within 1¾ inches from the center post, the pickup crank (36) moves the position trip screw (38) which is fastened to the pawl latch (40), and releases the starting pawl (41), starting the change cycle.

Oscillating Trip

When the needle travels into the eccentric groove on the inside of a record, the ratchet pawl (53) on the pickup crank (36) moves the ratchet latch (54), and releases the ratchet trip (56) which is moved by the ratchet spring (55). The ratchet trip (56) moves the pawl latch (40) which releases the starting pawl (41), and starts the change cycle.

The ratchet pawl (53) has a spring (52) which tends to hold the ratchet pawl (53) straight out from the end of the pickup crank (36).

* The cycle of operation can be studied conveniently by pushing the Reject button, and revolving the turntable by hand.

GENERAL ELECTRIC CO.

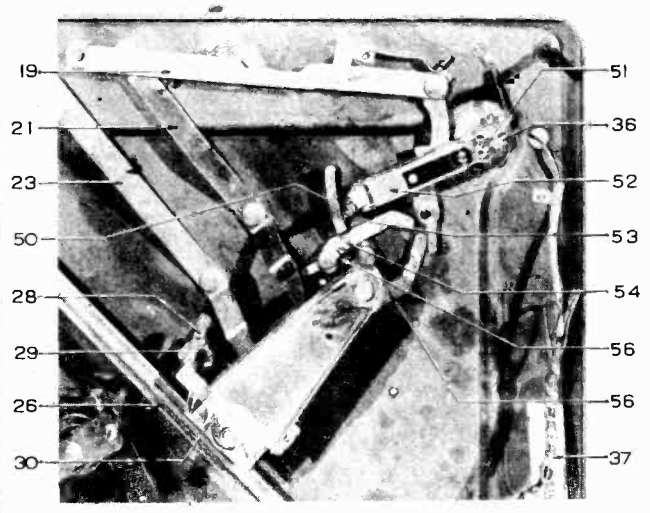


Fig. 3
Bottom section view of record changer, with large gear removed

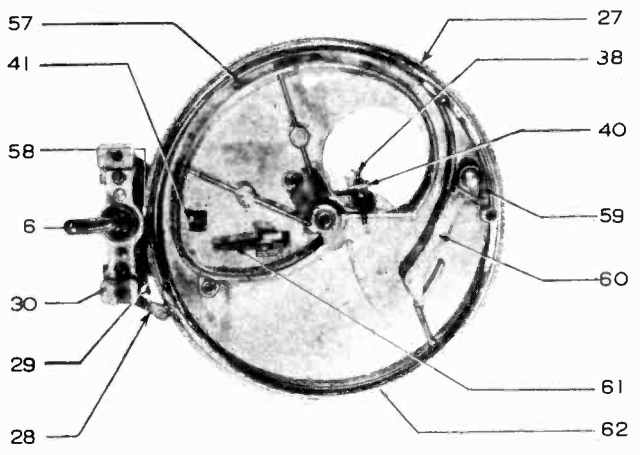


Fig. 4
Top view of the large gear and sub-frame, showing assembly in neutral position (not in change cycle)

SERVICE ADJUSTMENTS

The turntable is driven by means of an eccentric friction drive wheel. The driving power is transferred from the motor bushing (8) to the idler wheel (4) and then to the rim of the turntable. It is important therefore, that the motor bushing (8) and the idler wheel (4) be kept clean of grease, oil, dirt, or any foreign matter. Any quick drying solvent like naphtha is satisfactory for cleaning these parts. Only occasional lubrication is required—see OILING.

A bind or jam in the mechanism can usually be relieved by rotating the turntable in a reverse direction.

Needle Drop Point

With the 10–12 button set for 10-inch records (number 10 showing), the needle should contact the record $4\frac{5}{8}$ inches from the turntable shaft or about $\frac{3}{16}$ inch from the edge of the record. This dropping point is adjusted by the adjustment screw (17) on top of the record changer. Turning this screw clockwise causes the needle to drop farther from the turntable shaft, while turning this screw counterclockwise causes the needle to drop nearer the turntable shaft. Turn the screw only a fraction of a turn at one time, as about one-fourth turn of this adjustment screw changes the dropping point of the needle almost one fourth of an inch. The over-all range of this adjustment is secured in one turn of the adjustment screw.

Pickup Arm Lift

The lift of the pickup arm is adjusted by the adjustment nut (18) underneath the pickup arm. The top of the pickup arm (16) should rise to within about one-fourth inch from the under side of the lower blade. To lower the elevation of the pickup arm, turn the nut clockwise, and to raise the elevation, turn the nut counterclockwise.

Position Trip

The position trip is adjusted by turning the position trip screw (38). The trip should operate when the needle is moved to $1\frac{3}{4}$ inches from the center post. To trip earlier, or farther from the center post, turn the screw clockwise, while to trip later, or nearer the center post, turn the screw counterclockwise.

REPLACEMENT PARTS LIST

Stock Number	Description
	MOTOR ASSEMBLY
RB-211	BRACKET—Motor mounting bracket assembly
RB-655	BUSHING—Motor bushing for 50 cycle operation
RB-656	BUSHING—Motor bushing for 60 cycle operation
RG-310	GROMMET—Motor mounting grommet
RM-162	MOTOR—50-60-cycle motor
	MOTORBOARD ASSEMBLIES
RS-648	SHELF—Upper and lower shelf blades assembly
RB-654	BUTTON—Control button assembly; Reject, 1021-, and Auto-Man. buttons
RP-427	POST—Changer post
RS-649	SHAFT—Turntable shaft
RS-3152	SWITCH—Power switch
RT-948	TURNTABLE—Turntable
	OPERATING MECHANISM
RA-439	ARM—Eccentric arm assembly
RA-440	ARM—Eccentric arm
RB-212	BAR—Changer shaft tie bar
RB-213	BAR—Tie bar assembly
RB-403	BEARING—Upper bearing assembly
RB-657	BUSHING—Index bushing
RC-2080	CAM—Cam extension
RC-2081	CAM—Large gear cam
RC-2082	CRANK—Driving crank
RC-2083	CRANK—Pickup crank
RC-2084	CRANK—Pickup crank assembly
RF-209	FRAME—Sub-frame
RG-311	GEAR—Large gear assembly
RL-991	LATCH—Pawl latch
RL-992	LATCH—Ratchet latch
RL-993	LEVER—Cam stock lever

Stock Number	Description
	OPERATING MECHANISM (Continued)
RL-994	LINK—Index link
RL-995	LINK—Manual link
RL-996	LINK—Reject link
RP-428	PAWL—Starting pawl
RP-429	PAWL—Ratchet pawl
RS-650	SHAFT—Changer blade driving shaft
RS-651	SHAFT—Short changer blade shaft
RS-4079	SPRING—Cam extension spring
RS-4080	SPRING—Control spring
RS-4081	SPRING—Cam stop spring
RS-4082	SPRING—Eccentric arm slide spring
RS-4083	SPRING—Idler and tension spring
RS-4084	SPRING—Mounting spring
RS-4085	SPRING—Pawl latch spring
RS-4086	SPRING—Pickup crank spring
RS-4087	SPRING—Ratchet spring
RS-4088	SPRING—Ratchet pawl spring
RS-4089	SPRING—Reject return spring assembly
RS-4090	SPRING—Starting pawl spring
RS-524	STUD—Index bushing stud
RS-652	SUPPORT—Lower bearing support
RT-949	TRIP—Ratchet trip
RW-926	WHEEL—Idler wheel and clip assembly
	PICKUP ARM ASSEMBLY
RA-437	ARM—Pickup arm only
RC-8240	CORD—Pickup cord
RC-5016	PICKUP—Magnetic pickup head
RA-438	PICKUP—Magnetic pickup—complete
RL-806	COIL—Pickup coil
RS-8040	SCREW—Needle setscrew
RS-4096	SPRING—Pickup arm spring

MODELS LM-13, LM-14
MODELS LM-20, LM-21, LM-25

GENERAL ELECTRIC CO.

GENERAL INFORMATION

When connecting this record player to an AC/DC 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.) These Models are 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 changeover 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.

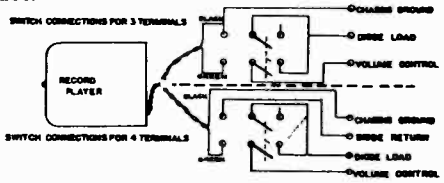
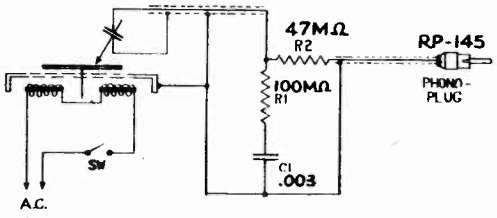
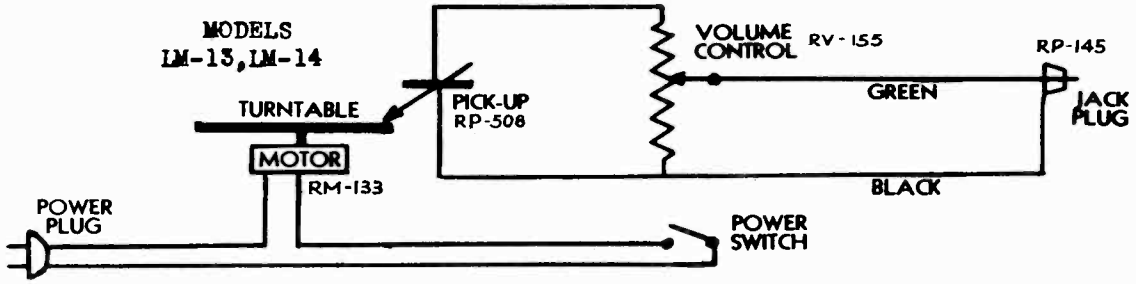


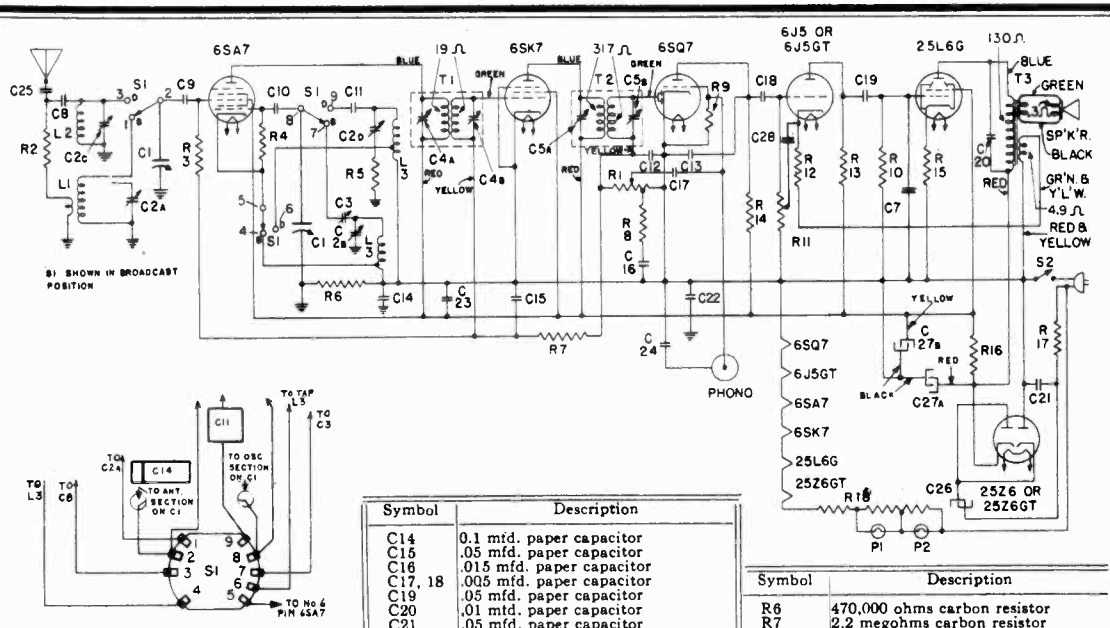
Fig. 1

MODELS LM-20, LM-21, LM-25

FOR SERVICE DATA ON RECORD CHANGER MODEL LRP-170, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS"







Symbol	Description
C1	Tuning condenser
C2A	"B" band antenna trimmer
C2B	"B" band oscillator trimmer
C2C	"D" band antenna trimmer
C2D	"D" band oscillator trimmer
C3	"B" oscillator padder
C7	220 mmf. mica capacitor
C8	6 mmf. mica capacitor
C9	100 mmf. mica capacitor
C10	47 mmf. mica capacitor
C11	3600 mmf. ±5% mica capacitor
C12, 13	220 mmf. mica capacitor

Symbol	Description
C14	0.1 mfd. paper capacitor
C15	.05 mfd. paper capacitor
C16	.015 mfd. paper capacitor
C17, 18	.005 mfd. paper capacitor
C19	.05 mfd. paper capacitor
C20	.01 mfd. paper capacitor
C21	.05 mfd. paper capacitor
C22	0.1 mfd. paper capacitor
C23	.01 mfd. paper capacitor
C24	0.1 mfd. paper capacitor
C25	.01 mfd. paper capacitor
C26	30 mfd. 250 V. dry electrolytic
C27A	40 mfd. 250 V. dry electrolytic
C27B	20 mfd. 250 V. dry electrolytic
C28	.01 mfd. paper capacitor
L1	"B" band Beam-a-Scope
L2	"D" band Beam-a-Scope
L3	Oscillator coil
R1	0.5 megohm volume control
R2	1000 ohms carbon resistor
R3	1.0 megohm carbon resistor
R4	33,000 ohms carbon resistor
R5	27 ohms carbon resistor

Symbol	Description
R6	470,000 ohms carbon resistor
R7	2.2 megohms carbon resistor
R8	22,000 ohms carbon resistor
R9	4.7 megohms carbon resistor
R10	100,000 ohms carbon resistor
R11	1.0 megohm tone control
R12	3300 ohms carbon resistor
R13	39,000 ohms carbon resistor
R14	470,000 ohms carbon resistor
R15	220 ohms carbon resistor
R16	3900 ohms 5 W. wire wound resistor
R17	30 ohms 2 W. wire wound resistor
R18	BL42D ballast resistor
S1	Band switch
S2	Power switch
T1	1st I.F. transformer
T2	2nd I.F. transformer
T3	Output transformer

Alignment Procedure

The location of trimmers is shown in Fig. 2. All RF trimmers are accessible through holes in the back cover or through the bottom 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 bolted 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.

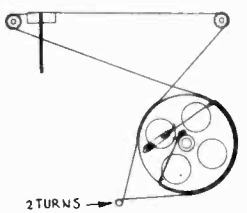


Fig. 1. Dial Stringing Diagram

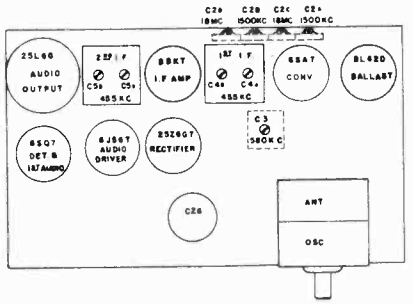


Fig. 2. Trimmer Location

GENERAL INFORMATION

Chassis Removal

Note: Care must be exercised in removing either the cabinet back or chassis to avoid changing the shape of either the short-wave or broadcast loop antenna. Any alteration in the loop will change its inductance and throw the receiver out of alignment.

ALIGNMENT CHART

Step	Connect Test-Osc. to	Test-Osc. Setting	Pointer Setting	Adjust Trimmers for Max. Output
1	6SK7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C5A & C5B
2	6SA7 Conv. grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C4a & C4b
3	Capacity Coupled	580 KC	"BC" Band 580 KC	C3**
4	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C2b (Osc.)
5	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C2a (Ant.)
6	REPEAT STEP 3			
7	Capacity Coupled	18 MC	"SW" Band 18 MC	C2d * (Osc.)
8	Capacity Coupled	18 MC	"SW" Band 18 MC	C2c** (Ant.)

* Use minimum capacity peak.
** Rock gang condenser when making alignment.

Special Service Information

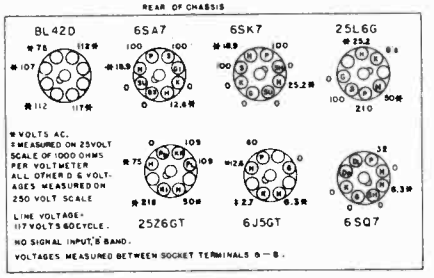
The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

(1) Stage gains
Antenna Post to Converter Grid—4.3 at 1000 KC
Converter Grid to 6SK7 Grid—42 at 455 KC
6SK7 Grid to 6SQ7 Diode Plate—100 at 455 KC

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

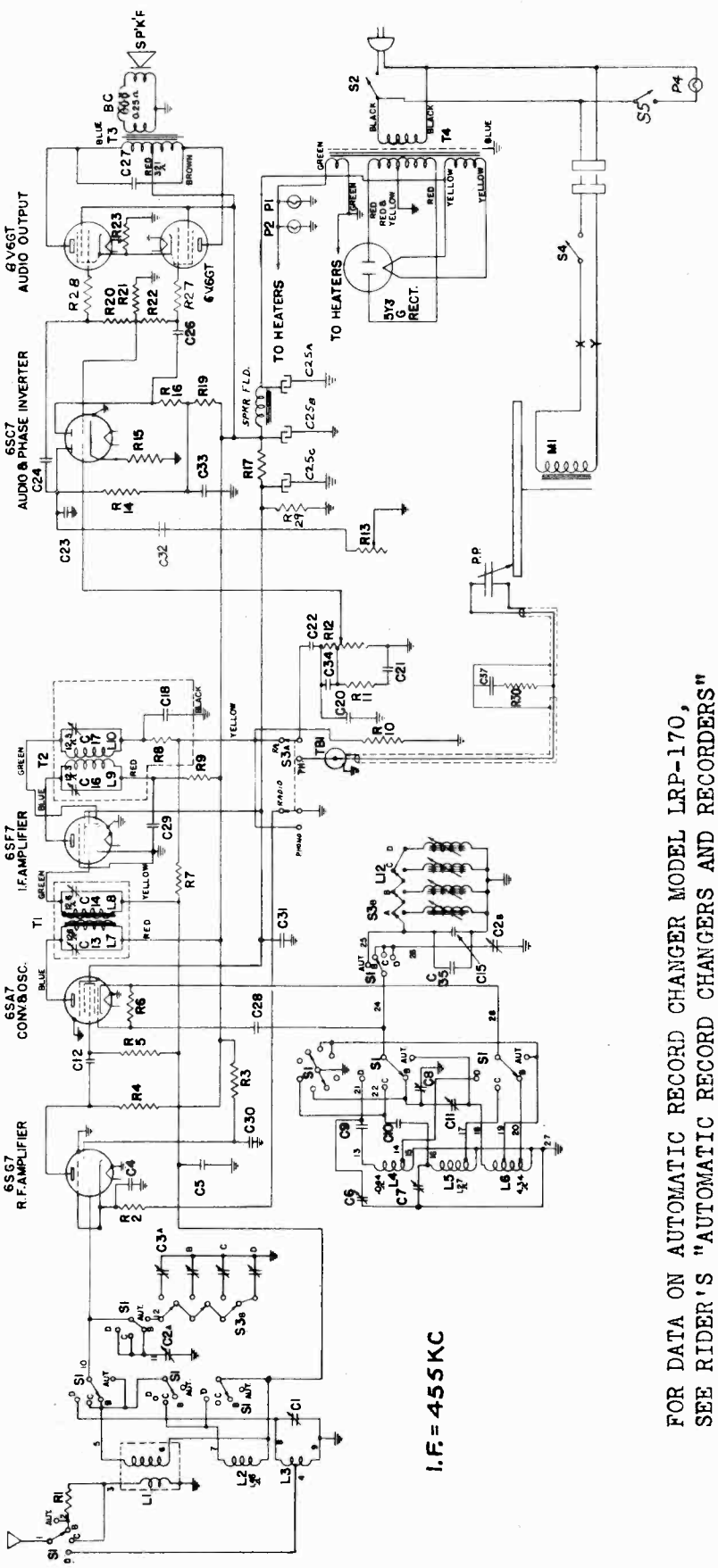
(3) DC voltage developed across oscillator grid resistor (R4) averages 10.5 volts at 1000 KC or 8.0 volts at 10,000 KC.

* Variations of +10 or ±20% permissible.



MODEL 30
MUSAPHONIC

GENERAL ELECTRIC CO.



FOR DATA ON AUTOMATIC RECORD CHANGER MODEL LRP-170,
SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS"

Symbol	Description
C1	"D" Band trimmer
C2a, C2b	Tuning condenser
C3a, C3b, C3c, C3d	Push-button trimmer strip
C4	.01 mfd. 600-V paper
C5	.05 mfd. 600-V paper
C6	"B" Band osc. trimmer
C7	"C" Band osc. trimmer
C8	"D" Band osc. trimmer
C9	4700 mmf. ±5% mica
C10	2000 mmf. ±5% mica
C11	"B" padder
C12	100 mmf. mica
C15	600 mmf. silvered mica
C18	200 mmf. mica
C20	100 mmf. mica
C21	.0042 mfd. 600-V paper
C22	.005 mfd. 600-V paper
C23	220 mmf. mica

Symbol	Description
C24	.02 mfd. 600-V paper
C25a	15 mfd. 450-V
C25b	15 mfd. 400-V
C25c	10 mfd. 350-V
C26	.02 mfd. 600-V paper
C27	.002 mfd. 600-V paper
C28	47 mmf. mica
C29	.01 mfd. 600-V paper
C30	.01 mfd. 600-V paper
C31	.01 mfd. 600-V paper
C32	.005 mfd. 600-V paper
C33	.1 mfd. 600-V paper
C34	100 mmf. mica
C35	150 mmf. temp. compensating
C37	.001 mfd. 600-V paper
L1	"B" band loop
L2	"C" RF coil
L3	"D" Band loop
L4	"D" Band osc. coil
L5	"C" Band osc. coil
L6	"B" Band osc. coil

Symbol	Description
L12a, L12b, L12c, L12d	Push-button coil assembly
R1	1000 ohms, ½-watt carbon
R2	220 ohms, ½-watt carbon
R3	47,000 ohms, ½-watt carbon
R4	4700 ohms, ½-watt carbon
R5	47,000 ohms, ½-watt carbon
R6	22,000 ohms, ½-watt carbon
R7	2.2 meg. ½-watt carbon
R8	47,000 ohms, ½-watt carbon
R9	2700 ohms, ½-watt carbon
R10	470,000 ohms, ½-watt carbon
R11	68,000 ohms, ½-watt carbon
R12	2 meg. tap at 1 meg. (volume control)
R13	2 meg. with switch (tone control)
R14	470,000 ohms, ½-watt carbon
R15	3900 ohms, ½-watt carbon
R16	1 meg. ½-watt carbon
R17	12,000 ohms, ½-watt carbon

Symbol	Description
R19	100,000 ohms, ½-watt carbon
R20	330,000 ohms, ½-watt carbon
R21	100,000 ohms, ½-watt carbon
R22	330,000 ohms, ½-watt carbon
R23	220 ohms, 2-watt carbon
R26	470,000 ohms, ½-watt carbon
R27	1000 ohms, ½-watt carbon
R28	1000 ohms, ½-watt carbon
R29	47,000 ohms, 1-watt carbon
R30	180,000 ohms, ½-watt carbon
S1	Band-change switch
S2	Power switch (on tone control)
S3a, S3b	Push-button switch assembly
T1	1st I.F. transformer
T2	2nd I.F. transformer
T3	Output transformer
T4	50-60-cycle power transformer
TB1	Phono-jack
SPKR	12-inch electrodynamic 400-ohm field

GENERAL ELECTRIC CO.

MODEL 30
MUSAPHONIC

The following data is taken with a vacuum-tube voltmeter or similar 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 plate...110 at 455 KC

(2) Audio Gains

.09 volts, 400-cycle signal across volume control with control set to maximum will give approximately ½-watt output to speaker.

(3) D-C voltage developed across oscillator-grid resistor R6 averages 7 volts at 1000 KC, 9 volts at 4000 KC, or 6 volts at 10,000 KC.

Variations of ±20% permissible. All readings taken with minus 1½-volt fixed bias on AVC bus.

ALIGNMENT CHART

Step	Test Osc. Connection	Test Osc. Setting	Pointer Setting	Adjust Trimmers
1	6SF7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C17 and C16 for Maximum
2	6SA7 Conv. Grid.in series with .05 mfd.	455 KC	"BC" Band 550 KC	C14 and C13 for Maximum
3	Capacity Coupled	580 KC	"BC" Band 580 KC	C11** for Maximum
4	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C8** (Osc.) for Maximum
5	Capacity Coupled	580 KC	"BC" Band 580 KC	C11** for Maximum
6	Capacity Coupled	5 MC	"SW1" Band 5 MC	C7** (Osc.) for Maximum
7	Capacity Coupled	17.8 MC	"SW2" Band 17.8 MC	C6* (Osc.) to signal
8	Capacity Coupled	17.8 MC	"SW2" Band 17.8 MC	C1** (Ant.) for maximum

* Correct peak is at low capacity.

** Rock gang condenser when making alignment.

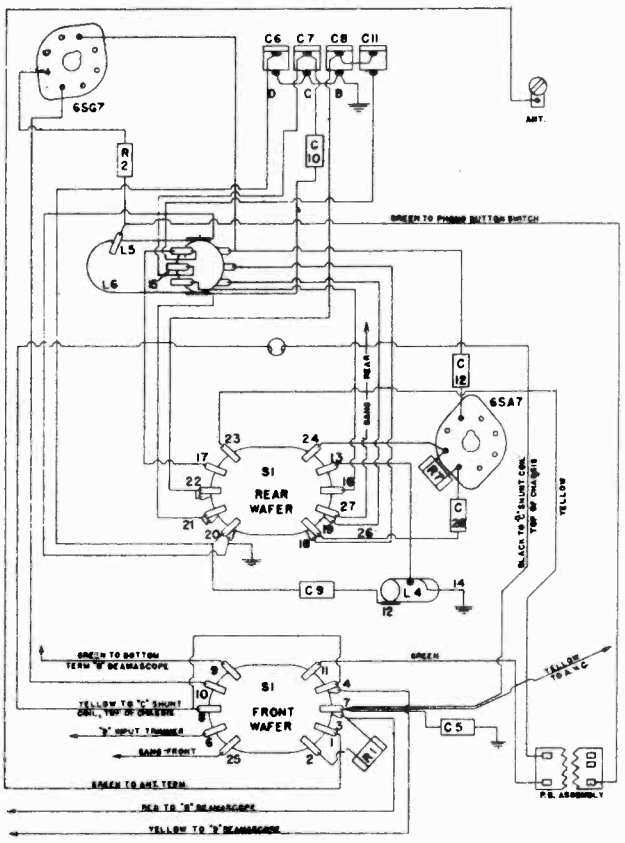
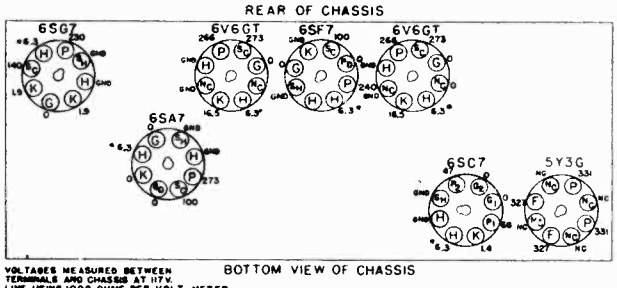


Fig. 2. Switch Wiring



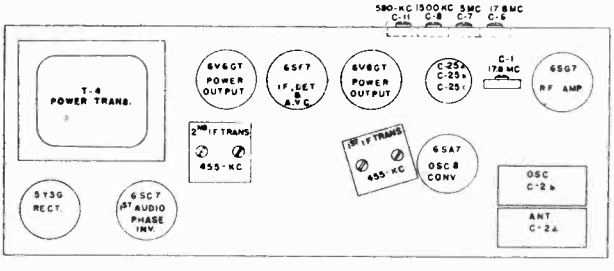


FIG. 5

MODEL LRP-32

GENERAL ELECTRIC CO.

MODEL LRP-32

AUTOMATIC RECORD CHANGER

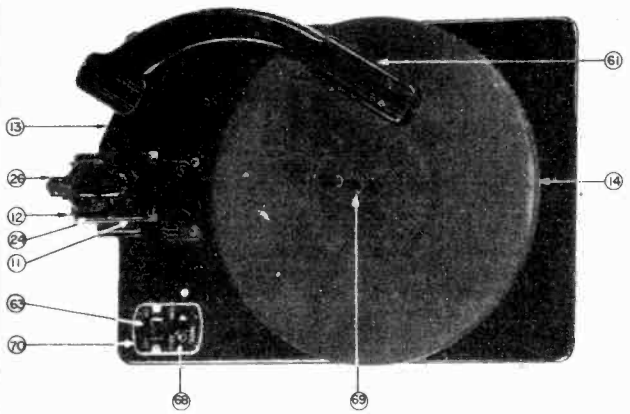


Fig. 1
Top View of Mechanism

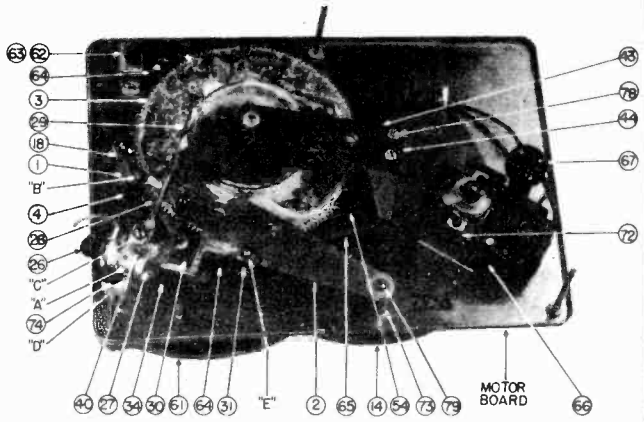


Fig. 2
Bottom View of Mechanism

GENERAL

This record changer is designed for use on a 115-volt 60-cycle power supply. It is of the fully automatic type, handling either 10- or 12-inch records. It will not, however, play 10- and 12-inch records intermixed.

Before checking a record changer in the cabinet, make sure the mounting bolts are released and the cardboard spacers removed; otherwise, the changer will not properly feed records from the magazine and the tone arm will not land correctly on the record. If adjustments are made with the changer bolted down and the mounting bolts then released, the adjustments will have to be remade.

During shipment the master gear may shift and become meshed out of time, so that if the changer is started under these circumstances, it will jam. To prevent this, be certain that the tone arm is free, that is, in the playing position before turning on the motor. If the changer is in "cycle" the motion of the tone arm will be restricted. The turntable should then be rotated backwards until the master gear (3) disengages from the drive shaft pinion gear (47). The foregoing operation is necessary only if out of time and should be an installation check.

AUTOMATIC OPERATION

Before operating the changer, be sure the tone arm is in the rest position, and can be moved freely by hand. If not, a "cycle" must be completed. To do this, push power switch to ON position, push control button to REJECT position and release. The mechanism will turn through the change cycle and after the tone arm is free the unit is ready for loading.

Insert spindle (69) in center post. Adjust record shelf (11) to the position of the size record to be played and flip the "Hold Down" arm (26) away from spindle. Load up to twelve 10-inch or ten 12-inch records. They should be supported by the record spindle at the center and the record shelf at the edge. Return the "Hold Down" arm to the top of the stack of records. Place the control button in "AUTOMATIC" position and turn the power on. Push the control button to "REJECT" if necessary. The mechanism will now operate and play automatically the records loaded on it. When the last record has dropped down, the mechanism will continue to repeat it.

Allow the mechanism to complete the changing cycle, that is, wait until the tone arm has just landed and starts playing the last record. Turn power OFF. Move tone arm off turntable. Remove record spindle and remove records.

MANUAL OPERATION

To operate the changer manually push the control button to the "MANUAL" position and allow it to remain there. When playing records manually do not use the spindle. It is advisable to rotate the record shelf to the 12-inch position and flip the hold down arm out of the way.

CAUTIONS

1. Never use force to stop or start the motor or any part of the record changer mechanism.
2. The use of cracked or chipped records may damage the crystal or sapphire.
3. Records should not be left on the record supports or on the turntable as they may warp, particularly in warm climates.
4. The use of warped records may result in unsatisfactory operation since they tend to slide on one another. Warped records may be flattened by placing them on a flat surface and loading them with a heavy article.
5. Handle the spindle (69) with care since a bent spindle may cause changer to "wow."
6. SEE LUBRICATION.

CABINET LEVELING

For good operation the record changer must be level. If not level the tone arm may land incorrectly and the records may not drop freely.

CRYSTAL AND NEEDLE

The crystal is of the low-pressure type and is equipped with a permanent sapphire stylus which is not replaceable in the field. Because of the low pressure the voltage output is approximately one-half volt. The cartridge is mounted between two viscoloid blocks to reduce noise and vibration.

TURNTABLE SPEED

The motor is of the fixed speed type and cannot be varied. The turntable is driven at the rim through the motor drive mechanism as shown in Fig. 8. Due to commercial tolerance it is impossible to secure motors which will run exactly 78.26 RPM. Limits are from 76.59 to 80.00 RPM.

REMOVAL OF TURNTABLE

The turntable is threaded onto the drive shaft and may be removed by blocking the gears and rotating the turntable in a counterclockwise direction.

GENERAL ELECTRIC CO.

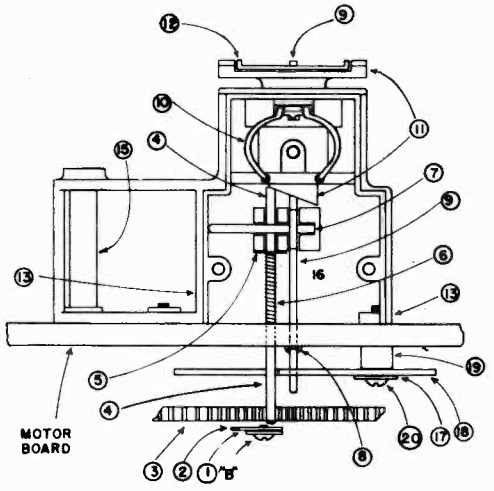


Fig. 3
Record Support Shelf and Post Mechanism

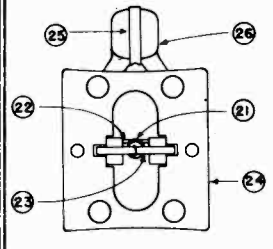


Fig. 4
Shelf Cover

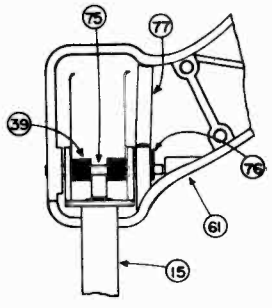


Fig. 5
Tone Arm Base & Support Bkt.

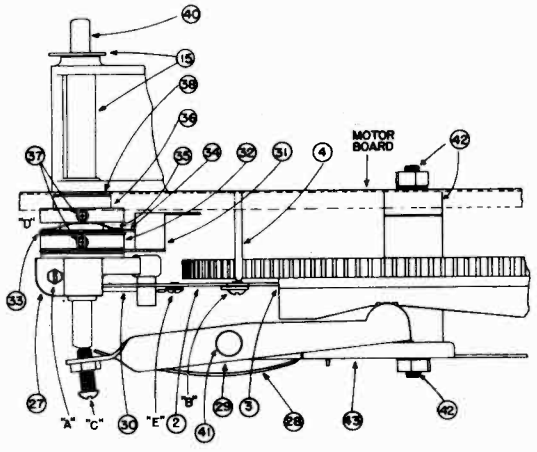


Fig. 6
Tone Arm Control Mechanism

LUBRICATION

CAUTION: ***Do not*** lubricate any of the following parts:

1. Friction trip assembly "D."
2. Tone arm support bracket tube (15).
3. Starting lever (50) and trip lever (54) at overlap.
4. Tone arm hinge pin (75).
5. Contact between trip finger (31) and trip lever (54).
6. Spring on end of trip lever (54).

Use light machine oil on the following parts:

1. Lift lever rivet (41).
2. Turntable drive shaft (48) at felt washer above motorboard and at felt washer (46).
3. Tone arm swing lever bushing (79).
4. Ejector cam bushing (19).
5. Starting lever at bearing pin (56) and at starting lever extension rivet.

Use light grease (Lubriplate or equivalent) on the following parts:

1. Record hold down spring rods upper (22) and lower (23).
2. At contact point between record shelf (11) and hold-down spring (10).
3. Interceptor shaft (4) at bearing point on motorboard.
4. Vertical cam (3A).
5. Horizontal cam (3B).
6. Master gear (3) and stud (42) (55).

CYCLE OF OPERATION

Fig. 9 shows the relative positions of the various levers, which contribute to the change cycle, at rest. Note that the back end of the trip lever (54) is over the back end of the starting lever (50). The distance the trip lever maintains over the starting lever determines to some degree the sensitivity of the tripping operation.

Assuming a record to be playing, the operation is as follows (see Fig. 9): The tone arm (61) moving in on the record causes the friction lever (34) to continually "pull in." The friction between the tone arm and this lever is determined by adjustment "D." As the friction lever (34) "pulls in" it pushes the trip finger (31) causing it to push on the trip lever (54). In the meantime the small extension on the upper part of the rotating drive shaft pinion gear (47) continually strikes the spring on the end of the trip lever causing it to move back. As long as these two operations continue no tripping takes place. But a sudden motion of the tone arm, such as produced by the trip groove at the end of the record, causes the entire mechanism to move in rapidly before the extension on the drive shaft pinion gear can push it back. Under this condition the trip lever moves off the back end of the starting lever allowing it to drop.

In its normal position the starting lever (50) has an extension at the gear end which lies between the starting pin (49) and the drive shaft gear extension (see Fig. 7). When the starting lever drops, as indicated above, the extension engages the starting pin (49) forcing the master cam and gear (3) to turn. The starting pin and starting lever extension engage long enough to allow the teeth to mesh and complete the rotation.

As the master cam and gear (3) rotates the vertical cam operates the lift lever (29) and through the lift rod (40) causes the tone arm to rise. At the same time the swing lever (2) follows the horizontal cam and, through the crank arm (27), causes the tone arm to move out beyond the edge of the record. In the meantime the ejector pin (52) on the master cam and gear has moved through about 100 degrees and engages the ejector cam. This motion transmitted through the rocker arm (9) causes the ejector (12) to move inward and push a record off its supports.

The swing lever (2), because of the tension spring (65), follows the horizontal cam and, through the crank arm (27), pulls the tone arm to its starting position. The vertical cam, in the meantime, lowers the tone arm, through the lift lever (29) and lift rod (40), onto the record. The feed-in spring (30) exerts a gentle pressure until the needle has reached the first record groove. This completes the cycle.

SERVICE ADJUSTMENTS

"A" Adjustment of 10-inch Landing Position. (See Fig. 6)

This adjustment is made by loosening the machine screw on the tone arm crank (27), positioning the tone arm (6)

GENERAL ELECTRIC CO.

and the crank (27) and retightening the screw. It will be noticed that the tone arm, on completing a cycle, does not come straight down on the record edge but curves inward as it comes down. This is due to the action of the feed-in spring (30). Therefore, the adjustment of the landing position is best made by a trial and error method. For example, if the tone arm lands inside the starting edge, estimate the distance and allow mechanism to complete changing cycle. Then holding the crank with one hand, push out on the arm with other. Try the landing by putting the mechanism through a cycle. If not correct, repeat until the correct position is found. The setscrew on the tone arm crank (27) must be loosened each time before adjustment and tightened afterward. Upon completion of the adjustment be sure the machine screw is very tight to avoid possibility of future slippage.

"B" Adjustment of 12-inch Landing Position. (See Figs. 3 and 6)

This adjustment is made by loosening the machine screw at the end of the swing lever (2) and positioning the link. When the support shelf (11) is rotated to the 12-inch position, the interceptor rod (4) moves down and acts as a stop for the swing lever, preventing it from moving in to the base of the horizontal cam (3B). Under this condition the swing lever cannot move the crank arm (27) as far as it did on the 10-inch position. The adjustment "B" should be made by the trial and error method until the arm lands correctly. If the 10-inch landing position must be readjusted for any reason the 12-inch landing position will also have to be readjusted.

"C" Vertical Lift Adjustment. (See Fig. 6)

The hex nut should be loosened and the screw adjusted until the tone arm just clears beneath a stack of records on the supports. The nut must then be tightened to maintain the position.

"D" Friction Trip Adjustment. (See Fig. 6)

A special Bristol setscrew wrench should be available (see parts list) to make this adjustment or a small screwdriver, the blade of which has been ground down, will suffice. The setscrew (37) on the upper collar (36) only need be loosened. The upper collar is threaded onto the lower collar (32) and the friction pressure, maintained by the spring washer (35), may be varied by rotating the upper collar with respect to the lower. Too much pressure on the friction lever may cause early tripping or may even cause the tone arm to be pushed back. On the other hand, too little pressure may cause the mechanism to fail to trip. Care must be used in making this adjustment and the use of oil must be avoided.

"E" Feed-in Spring Adjustment. (See Fig. 6)

The feed-in spring (30) must be adjusted so that it exerts a slight pressure on the tone arm crank (27). If a very small increase or decrease in pressure is required the spring may be bent, being very careful not to break it. Otherwise, the screw holding the feed-in spring to the swing lever (2) should be loosened, the position of the spring changed and the screw tightened.

Miscellaneous Adjustments. (See Fig. 9)

As mentioned under the cycle of operation, the tripping sensitivity is determined by the overlap of the trip lever (54) over the starting lever (50). The greater this overlap the more tripping action is required and conversely, the less the overlap the more sensitive the tripping action becomes. This overlap can be varied by bending the spring on the end of the trip lever (54). If the spring is bent away from the drive shaft pinion gear (47) the overlap will be decreased or if bent toward the drive shaft pinion gear the overlap will be increased. Great care must be exercised when bending this spring as it will break easily. It should be bent as near the outer end as practical, never close to the rivets.

The action of the ejector can be varied somewhat by changing the position of ejector pin (52) on the master cam and gear (3). This is accomplished by loosening the two screws holding the ejector pin to the master gear and positioning the ejector pin as required.

The starting lever (50) should be in such a position in relation to the starting pin (49) that the teeth will mesh properly. In case they do not, the starting lever must be bent accordingly. The starting pin should protrude about $\frac{5}{16}$ inch.

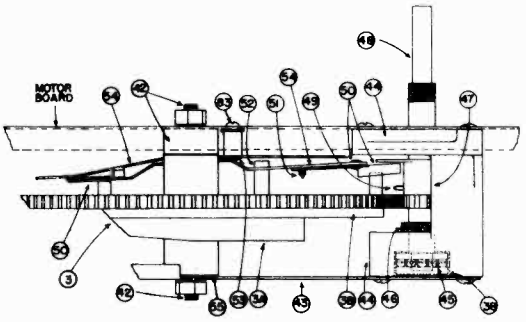


Fig. 7
Changer Drive Mechanism

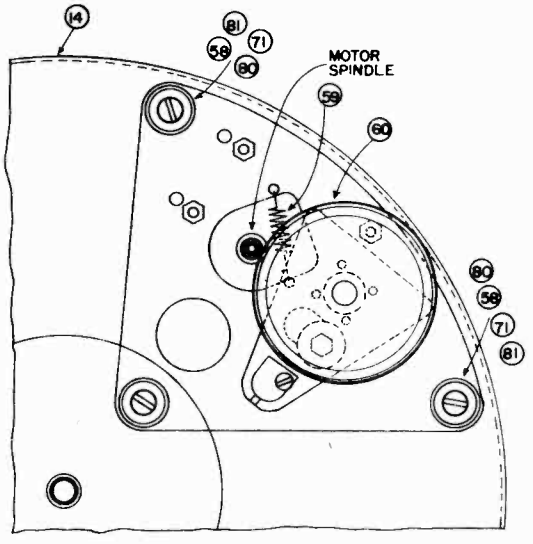


Fig. 8
Motor Drive Mechanism

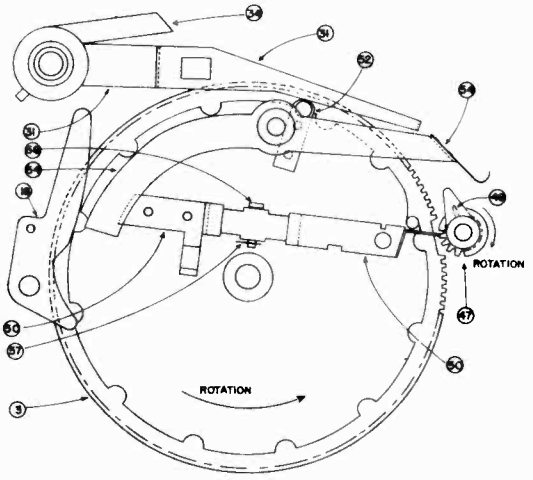


Fig. 9
Drive and Trip Mechanism

GENERAL ELECTRIC CO.

SERVICE HINTS

Mechanism Trips Early

Adjustment "D" may be too tight or there may be too little overlap between the trip lever (54) and the starting lever (50). Bend spring on end of trip lever (54).

Mechanism Fails to Trip

Adjustment "D" may be too loose or there may be **oil on friction washer** (33). Or there may be too much overlap between the trip lever (54) and the starting lever (50). Bend spring on end of starting lever (54).

Mechanism Continues to Cycle

The end of the starting lever (50) may not be rising above starting pin (49). Starting lever (50) or the trip lever (54) may be bent.

Irregular Landing on 10- and 12-inch Records

Check the feed-in Spring (30). May be bent or out of adjustment. The spring may get on the wrong side of the crank arm (27) pin and result in no feed-in action at all.

Mechanism Jams

The end of the starting lever (50) may be bent or the gears may be out of time. The end of the starting lever may rise too high and catch on the pinion gear extension. This could be caused by a bent starting lever or a bent trip lever (54). Any excessive friction or rubbing could cause mechanism to slow down.

Mechanism Fails to Eject Records

The rocker arm (9) may be bent or it may be binding at the motorboard. The ejector pin (52) may need adjustment. Chipped or warped record may also be responsible.

"Wow"

A bent record spindle (69) will usually cause this. It could also be caused by a flat on the motor drive wheel (60).

REPLACEMENT PARTS LIST

Stock Number	Symbol	Description
RL-9011	1	LINK—12 in. landing adjustment link
RL-9012	2	LEVER—Swing lever and adj. link
RG-723	3	GEAR—Master gear and cam
	3A	CAM—Vertical cam (part of 3)
	3B	CAM—Horizontal cam (part of 3)
RS-9053	4	SHAFT—12 in. record interceptor shaft
RH-127	5	COTTER—H.P. cotter
RS-4101	6	SPRING—Interceptor shaft spring
RP-436	7	PIN—Ejector rocker arm pin
RS-4098	8	SPRING—Ejector rocker arm spring
RA-441	9	ARM—Ejector rocker arm
RS-4100	10	SPRING—Record support shelf hold-down spring
RS-656	11	SHELF—Record support shelf
RE-1000	12	EJECTOR—Record ejector
RP-434	13	POST—Record support and tone arm post (plastic)
RT-9002	14	TURNTABLE
RB-214	15	BRACKET—Tone arm bracket and tube assembly
RP-435	16	PLATE—Back cover plate
†	17	WASHER—No. 8 plain washer
RC-2089	18	CAM—Ejector cam
RB-660	19	BUSHING—Ejector cam bushing
†	20	SCREW—8/32 x 1 in. RHMS
RS-4105	21	SPRING—Hold-down arm spring
RP-437	22	PIN—Hold-down spring pin (upper)
RP-438	23	PIN—Hold-down spring pin (lower)
RC-2088	24	COVER—Record support cover (plastic)
RB-703	25	BAND—Rubber band
RA-443	26	ARM—Record hold-down arm
RA-444	27	ARM—Crank arm
RS-4099	28	SPRING—Lift lever spring
RL-9005	29	LEVER—Lift lever
RS-4106	30	SPRING—Feed-in spring
RF-759	31	FINGER—Trip finger
RC-2090	32	COLLAR—Lower collar
RW-141	33	WASHER—Trip lever friction washer (cork)
RL-9004	34	LEVER—Friction lever
RW-139	35	SPRING—Washer spring
RC-2091	36	COLLAR—Upper collar
RS-8041	37	SCREW—6/32 x ¼ in. Bristol setscrew
RW-138	38	WASHER—Cork washer
RS-4103	39	SPRING—Tone arm spring
RR-954	40	ROD—Tone arm lift rod
RR-955	41	RIVET—Lift lever rivet
RS-527	42	STUD—Master gear stud
RP-439	43	PLATE—Tie-plate
RB-218	44	BRACKET—Drive shaft support bracket

* Used on previous changers.

† Purchase locally (not stocked).

Stock Number	Symbol	Description
RB-405	45	BEARING—Thrust (ball) bearing
RW-142	46	WASHER—Felt washer
RG-722	47	GEAR—Drive shaft pinion gear
RS-9054	48	SHAFT—Drive shaft
RP-433	49	PIN—Starting pin
RL-9001	50	LEVER—Starting lever assembly
RS-4104	51	SPRING—Starting lever spring
RP-431	52	PIN—Ejector pin
RB-661	53	BUSHING—Trip lever bushing
RL-9003	54	LEVER—Trip lever
RW-143	55	WASHER—Thrust washer
RP-440	56	PIN—Starting lever pin
RH-127	57	COTTER—H.P. cotter
RG-312	58	GROMMET—Motor mounting grommet
*RS-493	59	SPRING—Motor drive tension spring
*RW-928	60	WHEEL—Motor drive wheel
RA-442	61	ARM—Tone arm (plastic)
RC-2092	62	COVER—Switch cover
RS-3153	63	SWITCH—Power switch
RR-956	64	ROD—Reject rod
RS-4102	65	SPRING—Swing lever spring
RM-164	66	MOTOR—60 cycle motor
*RP-040	67	PLUG—Motor plug (A.C.)
RK-1074	68	KNOB—Control button
RS-966	69	SPINDLE—Record spindle
RE-234	70	ESCUTCHEON—Switch escutcheon
RS-660	71	SPACER—Motor mounting spacer
RS-528	72	SHIM—Viscoloid dampening shim (crystal and motor)
RB-662	73	BUSHING—Swing lever bushing
RG-314	74	GROMMET—Rubber grommet
RP-432	75	PIN—Hinge pin
RH-128	76	COTTER—H.P. cotter
RC-2094	77	CLIP—Spring clip
†	78	SCREW—8/32 x ⅜ in. RHMS
†	79	SCREW—10/32 x 1½ in. RHMS
†	80	SCREW—6/32 x ⅜ in. RHMS
†	81	WASHER—No. 6 plain washer
†	83	SCREW—8/32 x ⅜ in. RHMS

PARTS NOT ILLUSTRATED

RW-144	WASHER—Slotted washer on drive shaft (top of motorboard)
RW-250	WRENCH—6/32 Bristol wrench
*RP-145	PLUG—Phono plug
RS-4112	SPRING—Reject rod spring
*RC-5010	CRYSTAL—Crystal cartridge
*RS-4124	SPRING—Conical Support Spring

MODEL 40
MUSAPHONIC

GENERAL ELECTRIC CO.

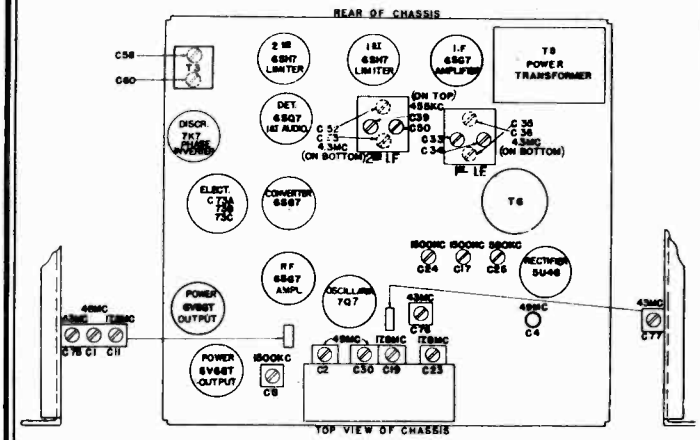


Fig. 2. Trimmer Location

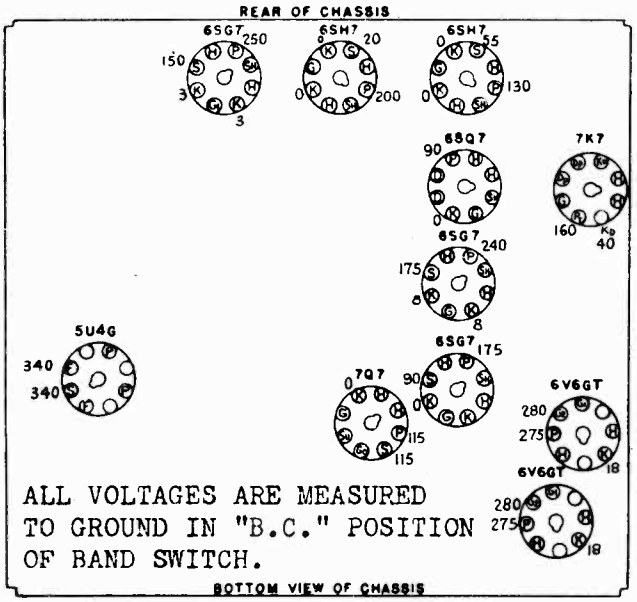


Fig. 1. Socket Voltages

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.

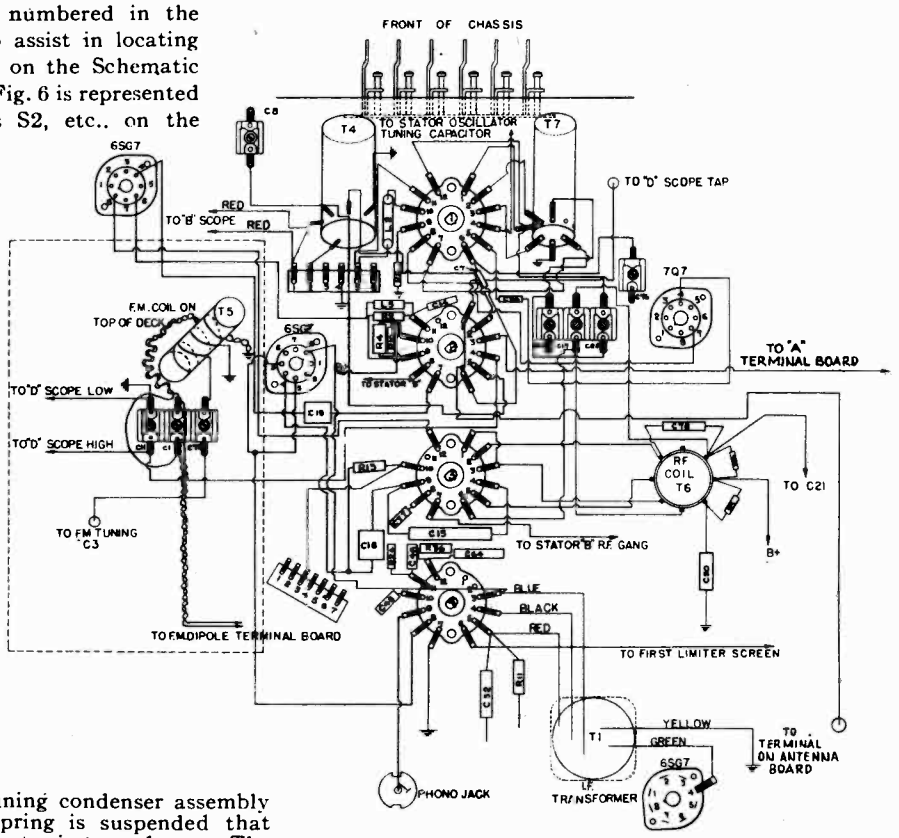


Fig. 6. Switch Wiring

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 the spring must be in the rear notch of wire bracket.

MODELS 60, 80
MODEL JM-1C

GENERAL ELECTRIC CO.

DELUXE AUTOMATIC RECORD CHANGER
and
RECORDING UNIT
USED IN *Musaphonic* MODELS 60 AND 80

RECORD CHANGER MODEL JM-1C

This deluxe automatic record changer and home recording unit is standard equipment in the above model receivers and is designed for operation on a 110-volt alternating-current source. The record changer will play up to fifteen 10-inch and 12-inch records intermixed, while the recording mechanism is designed to record on record blanks which have not been pre-grooved.

OPERATING CONTROLS

Power Controls

To turn power "on," press the red push button (AK) in Fig. 1 until the power switch clicks. To turn power "off" press down on tone arm rest (AH).

Index and Record-reject Control

This control consists of the switch knob (AI) pointer (AJ) and push button (AK). The selector knob provides for either manual or automatic operation of the mechanism. Turn pointer and knob assembly to "A" for automatic operation. Turn pointer and knob assembly to "M" for manual operation.

To reject a record being played, or to start the record changing cycle, push down on the red push button (AK) as far as it will go.

Record Holder Shelf Plates

These three assemblies consist of the selector plate (BA), center plate (BB) and shelf plate (BC). These plates are hinged so that they may be raised to a vertical position for clear access to the turntable.

GENERAL DESCRIPTION OF PHONO CHANGE CYCLE

An automatic record player for records of two sizes has three principal duties to perform. These duties are here performed by three mechanisms inter-connected and built together, but largely separate in their operation. The motion for each is originated in one central cam gear which has three different and individual cam surfaces. The cam gear (FK) is normally at rest while a record is being played, but is put into operation by contact of a latch lever (AD) (located in the cam gear) with the teeth of an intermediate drive gear (CI). This motion takes place only when the unit is put into a change cycle. The cam gear then turns one full revolution to complete the change cycle and stops in a neutral position.

1. THE RECORD CHANGING MECHANISM is brought into operation by a segment (CH) (or lever) with a roller (EJ) at one end which runs in a cam groove in the cam gear (FK) as it turns, which drives with an oscillating motion the three pulleys (FG) by means of a metal tape (DD). The pulleys are fastened to the lower ends of the changer shafts (DL), which in turn transmit their motion to the changer plates (BC) which are fastened with setscrews to the upper ends of the shafts. When the changer plate assembly is revolved, the record resting on the shelf plates (BC) is released to the turntable.

2. THE PICK-UP OPERATING MECHANISM is likewise brought into operation originally by a cam surface on the cam gear (FK) which operates a raising lever (CA) that receives a rocking motion from the cam gear (FK) through a roller (CD) which is part of the raising lever assembly. The flat spring on the opposite end of this lever (CA) is carried upward against a lifter pin (FW) which raises the pick-up (AG), thus lifting the needle from the record. This motion also moves the hollow pick-up shaft (FX) upward, pressing together the locating plate (ES), the cork friction disc, (EV) and swing bracket (FY). While the needle is raised from the record, the swing bracket (FY) receives an angular or swinging motion from the cam gear (FK) to a lever and link assembly (EK) and carries with it the locating plate (ES) which is directly connected to the pick-up. The pick-up (AG) is thus carried out beyond the turntable while the changer plates (BC) drop a record, and is then brought back to the proper position to start playing. If there is no record resting on changer plates (BC) when the cycle starts, the pick-up arm (AG) will then remain out beyond the turntable and descend on the pick-up rest (AH) automatically shutting off the motor after the last record has been played.

3. MECHANISM FOR BRINGING NEEDLE INTO CORRECT STARTING POSITION ON THE RECORD. This mechanism must operate fairly accurately for both 10-inch and 12-inch records. Partly due to this requirement, the starting position is not determined by the cam action, as this cam surface on the cam gear (FK) is so designed that the movement of the lever and link assembly (EK) would normally carry the pick-up arm (AG) farther toward the turntable shaft (BF) than would ever be desirable as a starting adjustment. Therefore, the travel of the pick-up arm (AG) toward the turntable shaft (BF) is stopped at the proper point for lowering onto the record by two eccentric adjusting studs on the locating plate (ES) which comes into contact with the stop arm (EQ) which is automatically pre-set by the record which is about to be released from the changer plates (BC) to the turntable. If a 12-inch record is about to be played, it rests on the center changer plate (BB) of the master changer post (which is located directly behind the pick-up arm (AG), causing same to push downward on center pin (EA) which in turn pushes downward on the center plate lifter lever (DF) which is pivoted on a hinge pin (DH) in the pulley (FG). This brings the upper end of center plate lifter lever (EB) toward the pulley hub. When the pulley is oscillated or driven by the tape (DD), the upper end of this lever (EB) will travel on the inside of the crescent shaped cam (EC). This will move the setting lever (EQ) (which is fastened to the same hub as the stop lever) in such a position that stop lever will contact the 12-inch eccentric adjusting stud on the locating plate which accurately measures the starting point of the needle on a 12-inch record. A 10-inch record which is about to be played will not rest on the center plate (BB), therefore the center plate and center pin (EA) and lever (DF) will be held upward by a spring (DI) on the pulley. The upper end of the center plate lifter lever (EB) will therefore be further away from the pulley hub and will travel on the outside of the crescent shaped cam (EC) moving the setting lever and stop lever (EQ) in such a position that stop lever will touch the 10-inch eccentric adjusting stud (ES) also on the locating plate which accordingly measures the starting point of the needle on a 10-inch record. After the last record has been dropped from the changer plates and played, the lower changer plate (BC) is pushed upward by the no-record control pin. The no-record selecting lever (EP) is also carried up so that when pulley is oscillated the no-record lever sweeps the setting lever and stop lever (EQ) to the position where the stop lever engages with a heel on the locating lever (ES) and holds pick-up (AG) out beyond the turntable. Then when the pick-up (AG) descends, it depresses the pick-up rest (AH), thereby tripping switch (CG) and shutting off the motor.

RECORDING MECHANISM DESCRIPTION

The recording unit which mounts on the main phono motor board by the hex nut (11) and the mounting screw (12), is shown in Fig. 4. This unit is not shown mounted in Figs. 1, 2 and 3 for purposes of clarity.

The gear (10) of the recording unit enmeshes with the main drive pinion gear (CJ). This pinion gear drives the recording arm through a friction clutch drive principle. Since this gearing mechanism is in operation continuously while the turntable is operating, it is important to place the recording arm on its rest when not in use.

MODELS 60, 80
MODEL JM-1C

GENERAL ELECTRIC CO.

SERVICE NOTES AND ADJUSTMENTS

Oiling

The recorder and record changer mechanism should be lubricated once a year with a few drops of good light machine oil at each of the following points:

1. Three oil holes in motor gear housing.
2. Turntable spindle bearings.
3. Recorder pivot arm spindle.
4. All other bearing points.

Caution: Never oil the friction clutch at any time as it will cause slippage.

If squeaks are heard, compare the squeak with and without a load of records, as any stack of records in motion is apt to squeak with a pin through their centers.

This can be corrected by rubbing a little wax on the turntable shaft. See that all three ¼-inch round wicks in the motor frame are in position and are thoroughly saturated with oil (as it may not be if insufficient oil or too heavy oil has been used). Lift out all three motor wicks with tweezers. See if old oil has become "gummy" (commonly due to use of low-grade oil or low viscosity oil). If necessary, clean gummed-up wicks with kerosene. See that each is saturated with a fine oil, then before replacing them, drop a little fine oil into the holes. The gear box of the motor is packed with a semi-fluid grease at the factory, and it should never be necessary to take it apart for lubrication purposes.

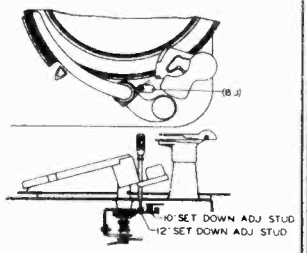
RECORD CHANGER AND RECORDING UNIT ADJUSTMENTS

Adjustments Nos. 1, 2, 3, 15 and 16 can be made from the top of the record player. All adjustments are correctly made at the factory and ordinarily need never be altered. However, should it become necessary to re-adjust due to tampering or accident, proceed as indicated in the following chart.

1

ADJUSTING LANDING POSITION OF NEEDLE ON RECORD

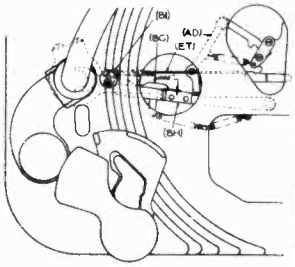
The position at which the needle lowers to the record can be adjusted by inserting a screw driver through hole (BJ) just in back of tone arm. For adjusting the 10-inch set-down, insert screw driver into the inside eccentric adjusting stud. For adjusting the 12-inch set-down, insert screw driver into the outside slotted stud Turn very slightly clockwise or counterclockwise to move needle landing in or out. The proper adjustment for the needle landing is ⅛ inch in from the outer edge of the record.



2

ADJUSTING TRIP CAM FOR CORRECT CLEARANCE BETWEEN TRIP LEVER AND TRIP ARM

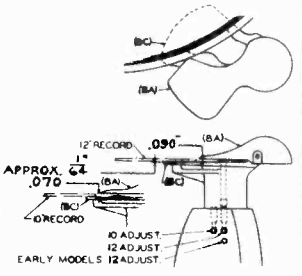
Insert screw driver through hole (BI) in main plate and locate it into slotted stud. Adjust eccentric cam so that the distance between the trip lever (BG) and trip arm (BH) is approximately .005 in. This can best be done by first adjusting the trip eccentric cam at (BI) so that there is no clearance or gap, then back off very slightly until trip lever (BG) is free to pulsate with the clutch motion or action of the release lever (ET). If the clearance is not sufficient between the trip lever (BG) and trip arm (BH) the pulsating motion of the clutch release lever (ET) will gradually cause the trip lever to move the trip arm enough to trip the trigger (AD) and start a change cycle. If gap is too great the trip lever will not move far enough to start a change cycle at the end of a record.



3

ADJUSTMENT FOR CHANGER PLATES

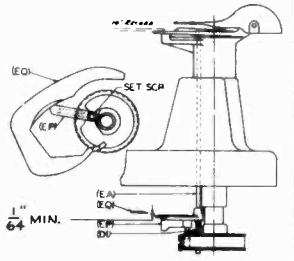
To adjust the distance between the selector plate (BA) and the shelf plate (BC) for 10-inch records, first select a 10-inch record that is approximately .070 in. thick. Then position it on changer and start a change cycle to revolve changer plates. Stop the turntable by hand just as the selector plate (BA) is about to touch the record, and shut off the motor. Then slowly turn the turntable by hand, allowing selector plates to contact edge of record so that it just slides over record, touching the surface lightly. Check all three selector plates and if any adjustment is necessary, it can be done by inserting a No. 10 Allen wrench in the setscrew holes located in the sides of the changer posts. Turn setscrew slightly clockwise to raise the selector plate and counterclockwise to lower it. The setscrew for adjusting the 10-inch record setting, and the one for 12-inch record setting is shown in the adjacent drawing. To adjust for 12-inch records, select a 12-inch record that is approximately .090 in. thick, then follow same procedure as for adjusting 10-inch records.



4

NO-RECORD SELECTING LEVER ADJUSTMENT

First be sure that spring tension on spring (DI) is strong enough to lift the center blade raising pin (EA) properly and fully, but not so strong that one 10-inch record will not fully depress pin and lever. Then with setscrew loose in no-record selecting lever (EP) and pin held down by weight of one 10-inch record, slide no-record selecting lever (EP) into position so that it will just clear under lower edge of the lower cam setting lever (EQ) by approximately 1/64 in. clearance. Then tighten setscrew and check adjustment with and without a record, also be sure that without a record, the fin on no-record selecting lever (EP) swings above cam setting lever (EQ) and portion of lever (EP), indicated by arrow, sweeps stop lever (EQ) on cam setting lever into position shown in upper illustration of adjustments 12 and 13.



GENERAL ELECTRIC CO.

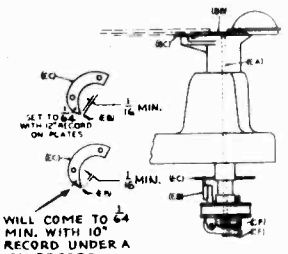
MODELS 60, 80
MODEL JM-1C

ADJUSTMENTS

5

LIFTER LEVER DIFFERENTIAL ADJUSTMENT

Place a 12-inch record over the turntable spindle so that the record rests on the shelf plates. Then check the center plate lifter lever (EB) and see that point of this lever will just slide inside of center arm lifter cam (EC). Then place a 10-inch record under the 12-inch record so that the 10-inch record will rest on shelf plate (BC) and the 12-inch record will then touch center plate (BB) which presses down center pin (EA) and accordingly moves lifter plate (EB) closer to outside face of lifter cam (EC) than it would without the 12-inch record on top of the 10-inch record. The lever (EB) should then follow the outside of the center arm lifter cam (EC). If it is necessary to re-adjust, this can be done by means of adjusting screw (CE) and lock nut (CF) to balance out the contact of lever (EB) on both sides of cam (EC) in relation to starting point of cam.



6

LIFTER LEVER CLEARANCE ADJUSTMENT

Check the distance between the leading edges of the center plate lifter lever (EB) and center arm lifter cam (EC) with a 12-inch record resting on the shelf plates. It should be a minimum of 1/16 in. It should not be necessary to check this adjustment unless the tape clamp screws on the pulley (FG) have been loosened. To re-adjust after screws have been loosened, first set pulley so that when the slack in the tape line is taken up in the direction of forward motion of the tape segment (CH), there will be the necessary 1/16 in. clearance as mentioned above.

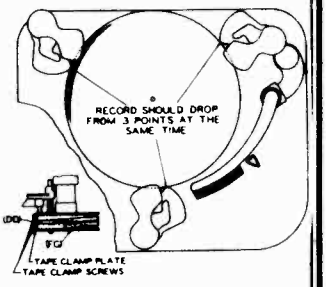
Note: If this adjustment is "OFF" most likely changer plate synchronization will also be off. Check adjustment No. 7.

7

CHANGER PLATE SYNCHRONIZATION

The synchronization of changer plates can be checked by placing one 10-inch record on the shelf plates. Then start a change cycle allowing it to continue until plates are just about ready to release the record. It can then be determined which plate is either slow or fast. This plate can then be adjusted by loosening the screws on the tape clamp which hold the tape (DD) from slipping in the pulley (FG). Then slightly move changer plate whatever is necessary to synchronize it with the other two plates so that record will drop evenly. Then tighten tape clamp screws securely. (Also check adjustment No. 6.)

Note: Tape line should have a very slight amount of slack. Check by grasping tape line with thumb and index finger and moving it in and out approximately 5/8 in. with a moderate pressure.



8

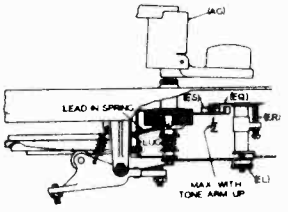
CLUTCH RELEASE LEVER ADJUSTMENT

The fork on clutch release lever (ET) should be adjusted so that it only slightly moves the friction clutch with a sharp kick rather than a wavy movement. To get more or less movement of the clutch, bend the release lever (as shown in upper illustration). Also be sure that both prongs of fork on release lever (ET) contact the pressure release sleeve (EU) simultaneously. At no time should fork ride the pressure release sleeve between impulses, as the clutch would then be held open and changer would not trip.

9

SETTING CAM ADJUSTMENT

By means of the adjusting screw (ER) set stop lever (EQ) so that there will be 1/32 in. maximum overlap on eccentric studs (ES). If there is not enough overlap, the stop lever (EQ) will slide off instead of holding on eccentric studs (ES) on stop lug, while measuring set-down of tone arm (AG).



10

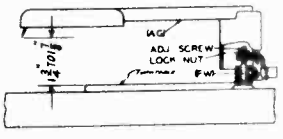
SLIDE-IN ADJUSTMENT

To adjust the power of the tone arm lead-in, bend the lug on lead-in spring to give it more or less tension; too much tension may cause needle to slide in on record. The knurled nut (EL) adjusts the distance tone arm will swing in, before clutch is disengaged. If clutch is still engaged after needle lands on record it may cause slide-in. Turning nut (EL) clockwise should correct slide-in if lead-in spring tension is correct.

11

TONE ARM HEIGHT ADJUSTMENT

This can be adjusted by means of an adjusting screw in the tone arm assembly (AG). The tone arm elevating pin (FW) presses against this screw which should be adjusted so that the distance between the point of needle (in tone arm) and the turntable is 1¾ in. to 1⅞ in., which is the equivalent of approximately seventeen 10-inch records. When correct height adjustment is made, tighten lock nut on adjusting screw securely.



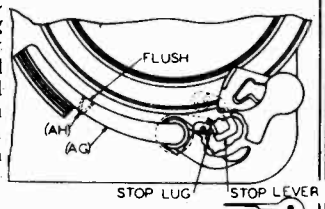
MODELS 60, 80
MODEL JM-1C

GENERAL ELECTRIC CO.

RECORD CHANGER AND RECORDING UNIT ADJUSTMENTS (Cont'd)

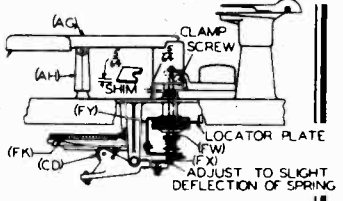
12
TONE ARM SWING ADJUSTMENT

First raise tone arm (AG) by hand and slightly loosen clamp screw on tone arm shaft head. Then start a change cycle and shut off power supply to motor when tone arm (AG) is being held in stop position above the tone arm rest (AH) and stop lever (EQ) (on setting cam assembly) is contacting stop lug on locator plate (which is part of the tone arm shaft assembly). Then insert a $\frac{5}{64}$-in. shim between tone arm shaft head and bearing race to set vertical clearance (which must be approximately $\frac{5}{64}$ in.) so that clutch will be engaged for moving trip lever when tone arm is down on record and align tone arm (AG) flush with tone arm rest (AH) as shown in upper illustration. Tighten clamp screw securely and remove $\frac{5}{64}$ in. shim, then check action of tone arm and adjust needle landing as in adjustment No. 1, if necessary.



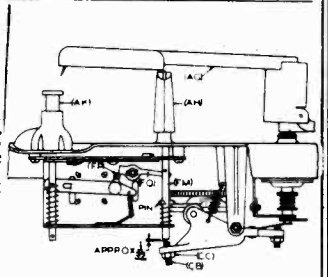
13
RAISING LEVER PRESSURE ADJUSTMENT

To make this adjustment first put unit into change cycle, then stop it when roller (CD) is at the highest point on the cam (FK), then loosen lock nut and turn screw under flat lifter spring clockwise until tone arm elevating pin (FW) and shaft (FX) are completely raised and flat spring contacts the tone arm shaft (FX) holding clutch assembly firmly in the high position against tone arm swing bracket (FY) and only slightly deflecting the flat spring. Then tighten lock nut securely.



14
SWITCH SHUT-OFF ADJUSTMENT

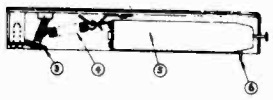
Start a change cycle by pressing push button (AK) so that roller (FP) holds switch latch (FQ) in a loaded position. Then stop turntable by hand when cam gear is in position (shown in illustration) and pin on rest shaft is sliding down decline from shoulder on cam gear, allow the rest shaft (FM) to come down gradually and when switch latch (FQ) trips, hold rest shaft in that position and adjust screw (CB) to within approximately $\frac{1}{32}$ in. from end of shaft (FM), tighten lock nut (CC) securely and check operation.



15
ADJUSTING DEPTH OF RECORDING NEEDLE CUT

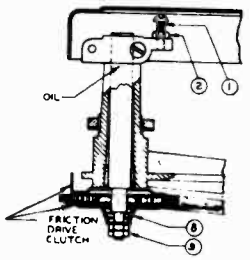
The adjustment for cut of needle pressure is thumbscrew (3) shown in illustration. This adjustment regulates the spring tension of pressure spring (4) on the pivoted cutting head (5), and by turning the thumbscrew to the left or right will increase or decrease the pressure on the needle.

The correct setting is determined by inspecting a cut record under a magnifying glass. The width of the groove should be approximately the same as the width of the uncut record surface between the grooves.



16
ADJUSTING HEIGHT OF RECORDING ARM

The adjusting height screw (1) and lock nut (2) are for adjusting the height of the recording arm above the turntable. The height of the tip of the needle is approximately $\frac{1}{8}$ in. from the record surface when the cartridge (5) is held by the screw (7) in the "UP" position. If it is necessary to adjust the height of arm to provide a final adjustment of the cutting needle pressure, loosen lock nut (2) and with screw driver, turn adjusting screw (1) counterclockwise to raise the arm or clockwise to lower the arm. Then tighten the lock nut.

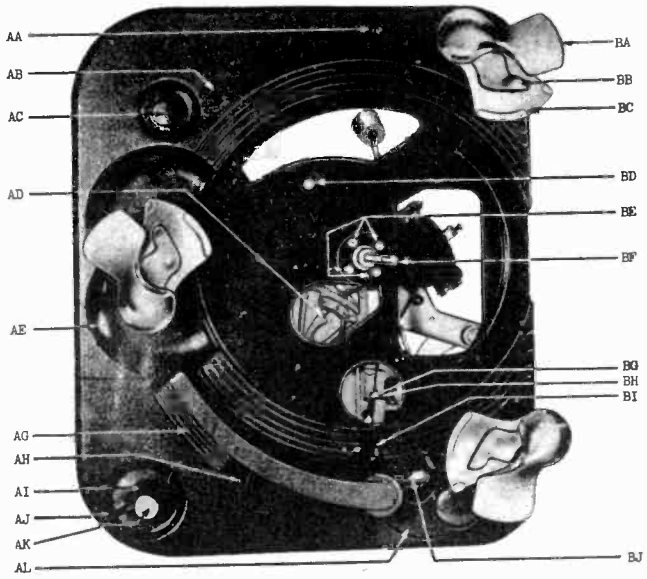


TROUBLE SHOOTING

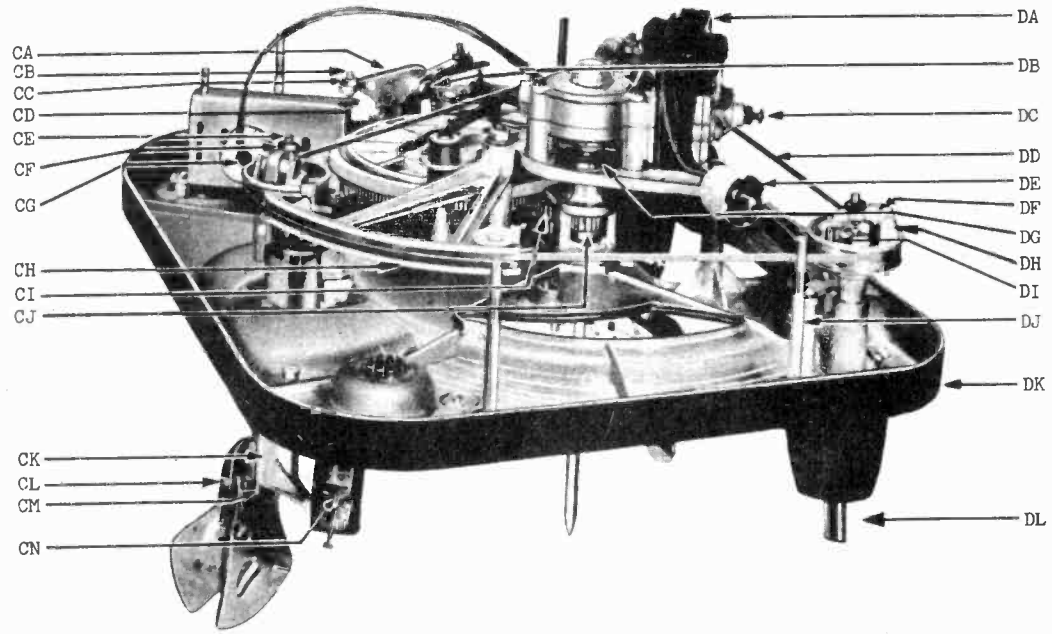
Cases of failure to operate satisfactorily will generally be found due to either neglect of proper lubrication, to tampering with the mechanism after it leaves the factory, or to injuries accidentally sustained as by external vibration or by impact of some heavy object. In addition, there is always the possibility that any kind of spring may "go dead" (cease to operate without any visible breakage), even though the utmost factory precautions are taken against it—or that setscrews may work loose due to external vibration. For tightening setscrews, an Allen (hexagon) wrench is required. Be sure that setscrews are properly seated on the holes or flats provided. Damage from tampering is likely to take the form of bent parts. Never bend any part during examination.

GENERAL ELECTRIC CO.

MODELS 60, 80
MODEL JM-1C



Top View A-B
Fig. 1



Bottom View C-D
Fig. 2

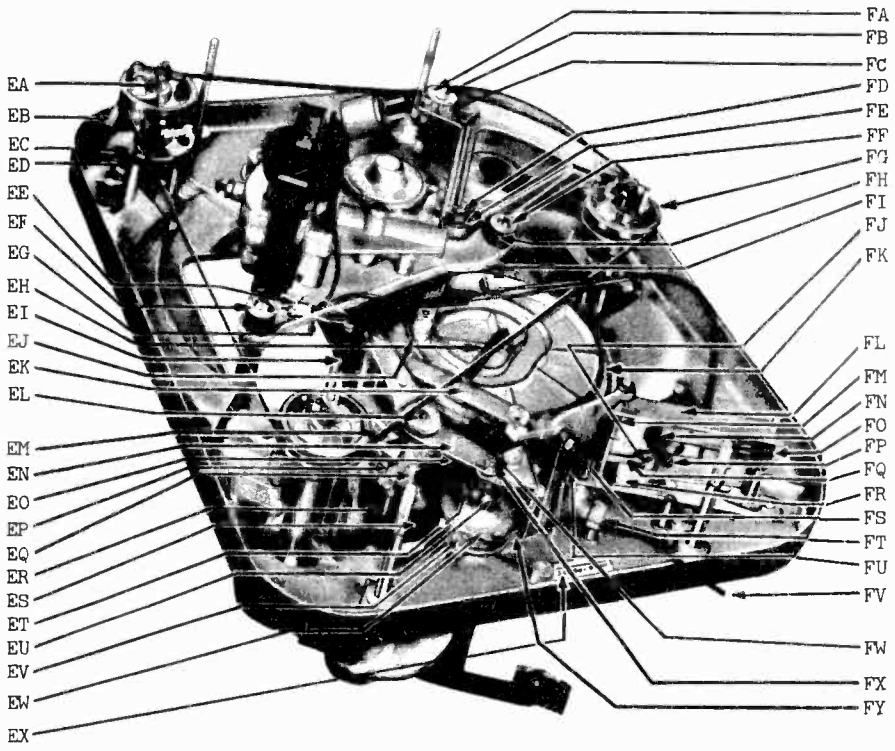
REPLACEMENT PARTS LIST—MODEL JM-1C RECORD PLAYER AND RECORDER

Symbol	Stock No.	Description
		RECORD PLAYER ASSEMBLY
AD	RL-967	LATCH—Cam latch and trigger assembly
AH	RR-854	REST—Phono tone arm rest support
AI	RK-1025	KNOB—Manual-automatic selector knob
AK	RB-643	BUTTON—Reject control button
BA	RP-2012	PLATE—Selector plate
BA, BB, BC	RX-092	ASSEMBLY—Changer plate assembly
BC	RP-2010	PLATE—Shelf plate
BB	RP-2011	PLATE—Center plate
BF	RS-960	SPINDLE—Turntable spindle and housing
BG	RL-968	LEVER—Trip-lever assembly
BH	RA-426	ARM—Trip arm assembly
CA	RX-093	ASSEMBLY—Raising lever assembly
CB, CE	RS-8020	SCREW—Adjusting screw
CD	RR-946	ROLLER—Raising lever arm roller
CG	RS-3106	SWITCH—Phono power switch
CH	RX-094	ASSEMBLY—Tape control segment assembly
CI	RG-718	GEAR—Intermediate gear assembly

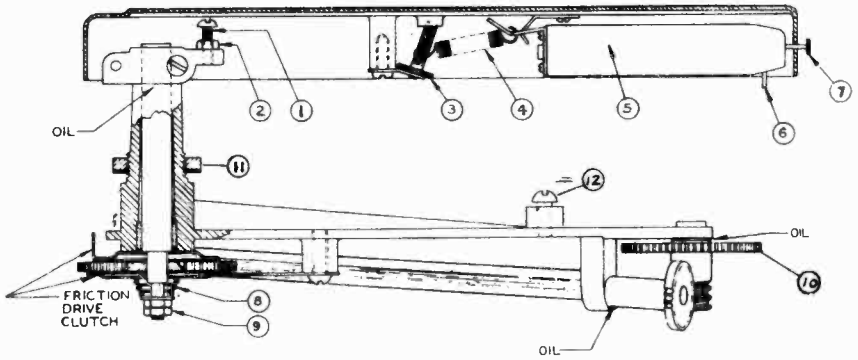
Symbol	Stock No.	Description
CJ	RG-717	GEAR—Drive pinion gear
CK	RB-1127	BRACKET—Changer plate bracket
CL	RP-413	PIN—Plate hinge pin
CM	RP-414	PIN—Plate lifting pin
CN	RC-5010	CRYSTAL—Phono crystal pick-up
DA	RM-150	MOTOR—60 cycle phono motor
DA	RM-151	MOTOR—50 cycle phono motor
DB	RS-8021	SCREW—Raising lever trunion screw
DD	RT-938	TAPE—Cycling control tape
DF	RX-095	ASSEMBLY—Centerplate lifter assembly
DG	RC-2041	COUPLING—Motor coupling assembly
DH	RP-415	PIN—Plate lifter pin
DI	RS-4036	SPRING—Plate lifter spring
DL	RP-416	PIN—Plate post stem
EA	RP-417	PIN—Centerplate raising pin
EC	RC-2042	CAM—Center arm lifter cam
ED	RS-8022	SCREW—Arm lifter cam mounting screw
EG	RC-8211	CONNECTOR—Motor grounding lead
EH	RS-4035	SPRING—Swing lever spring
EI	RS-4034	SPRING—Trip arm spring

MODELS 60, 80
Model JM-1C

GENERAL ELECTRIC CO.



Bottom View E-F
Fig. 3



Recorder Unit
Fig. 4

REPLACEMENT PARTS LIST—MODEL JM-1C RECORD PLAYER AND RECORDER (Cont'd)

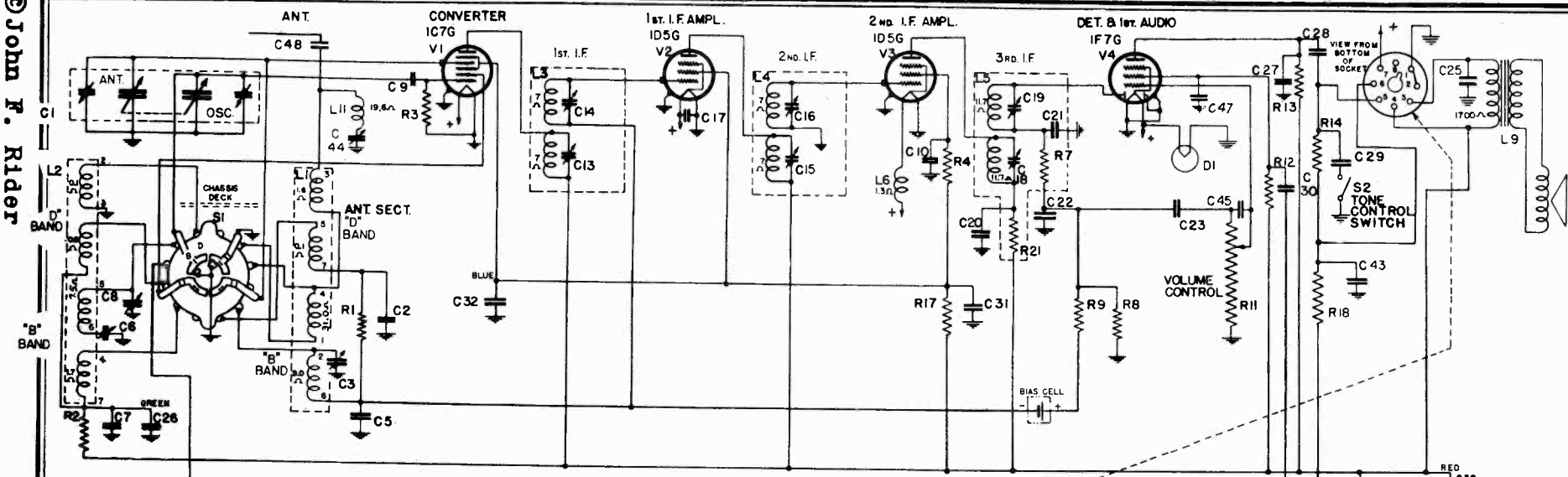
Symbol	Stock No.	Description	List Price
EJ	RR-947	ROLLER—Roller for tape control segment	$0.10
EK	RL-969	LEVER—Swing lever and bracket assembly	1.20
EL	RN-015	NUT—Setting lever thumbnut	.20
EM	RS-4033	SPRING—Trip lever spring	.05
EN	RS-638	SUPPORT—Swing bracket support	.45
EO	RS-4032	SPRING—Clutch brake spring	.05
EP	RL-970	LEVER—No-record selecting lever	.30
EQ	RC-2043	CAM—Setting cam assembly	1.20
ES	RS-9026	SHAFT—Phono tone arm shaft assembly	2.10
ET	RL-971	LEVER—Clutch release lever assembly	.50
EU	RS-959	SLEEVE—Pressure release sleeve	.20
EV	RW-130	WASHER—Cork friction washer	.05—3
EW	RC-2044	CUP—Tone arm bottom friction cup	.10
FA	RW-131	WASHER—Retainer washer	.05—3
FC	RS-8023	SCREW—Binder head screw	.05—4
FG	RP-332	PULLEY—Post pulley	1.05
FH	RG-308	GROMMET—Motor plate mounting grommet	.05
FI	RP-2013	PLATE—Motor mounting plate	.60
FK	RC-2045	CAM—Main cam and gear assembly	
FL	RX-096	ASSEMBLY—Phono motor switch plate assembly	
FM	RS-9025	SHAFT—Phono tone arm rest shaft	
FN	RS-4031	SPRING—Switch latch spring	
FO	RS-9024	SHAFT—Push button control shaft	
FQ	RL-972	LATCH—Switch latch gear	
FU	RS-4030	SPRING—Phono tone arm raising lever spring	
FW	RP-418	PIN—Phono tone arm elevating pin	
FX	RS-9023	SHAFT—Phono tone arm shaft	
	RS-3105	SWITCH—Crystal shorting switch	
	RS-8019	SCREW—Spindle housing mtg. screws	
	RT-939	TURNTABLE—Turntable assembly	
		RECORDER UNIT ASSEMBLY	
	RA-425	ARM—Cutter arm complete	
(5)	RC-5009	CRYSTAL—Crystal cutter head	
	RG-716	GEAR—Recorder assembly less cutting arm and cartridge	
(7)	RS-876	SCREW—Crystal needle screw	
(4)	RS-4029	SPRING—Crystal tension spring	

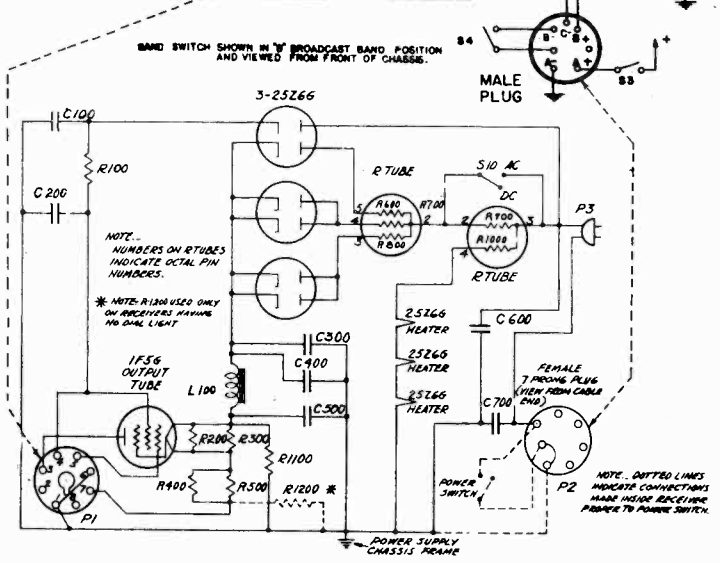
GENERAL ELECTRIC CO.

MODELS 60, 80
MODEL JM-1C

TROUBLE SHOOTING REFERENCE CHART

SYMPTOM	CHECK
1. Mechanism is slow in starting, or motor overheats	a. Lubrication b. For too high or low line voltage c. For motor winding damage
2. Motor is slow starting	a. Lubrication. Old or gummy oil b. Changer may be in too cold place. Give chance to warm before trying other checks
3. Changer is noisy when in cycle	a. Lubrication. Check if any part is loose or bent and is rubbing against moving part
4. Changer fails to trip after playing record while set on "A" automatic	a. Adjustments Nos. 2, 8
5. Changer fails to trip when push button is pressed (pointer set on "A")	a. Adjustment No. 2 b. Switch assembly (FL) for obstruction or a bent or loose part
6. Trips too soon or before record has finished playing	a. Adjustment No. 2 b. For not enough clutch action. Bend forked release lever (ET) slightly to increase
7. Tone arm lifts immediately without playing record or continues cycling	a. Adjustment No. 2 b. For proper operation cam latch and trigger assembly (AD)
8. Tone arm lifts but does not swing out properly	a. Adjustment No. 13
9. Tone arm falls off record or misses record completely	a. Adjustments Nos. 1, 12 b. For too much clearance between cork clutch disc and tone arm switch bracket (FY). Adjust by means of the thumb nut (EL), turn counterclockwise
10. Tone arm slides in several grooves on record	a. Adjustments Nos. 9, 10
11. Tone arm fails to pull in first groove on record properly	a. Adjustment No. 9
12. Tone arm lands too far in or out on record	a. Adjustment No. 1 b. For loose or bent parts
13. Tone arm lands in middle of record	a. Adjustment No. 9
14. Tone arm fails to clear stack of sixteen 10-inch records	a. Adjustment No. 11
15. Tone arm lands for 10-inch record when playing a 12-inch record	a. Adjustments Nos. 5, 6
16. Changer cycles with pointer set on "M" for manual operation	a. Adjustment No. 2 b. For loose setscrew in knob (AI) c. That manual latch (FR) holds trip link rod (FS) from moving
17. Changer jams and stops	a. Adjustments Nos. 7, 14
18. Record jams	a. For off-size record or defective edge b. Adjustment No. 3
19. 12-inch record is not dropped by one of shelves	a. Adjustment No. 5
20. One or more shelves drop 2 records at a time	a. Adjustment No. 3
21. Changer fails to turn off automatically after last record is played	a. Adjustments Nos. 4, 9. 14
22. Records drop unevenly from shelf plates to turntable	a. Adjustment No. 7
23. Tone arm varies when set down on record	a. For loose tone arm shaft head on shaft (FX) b. Adjustment No. 9
24. "WOW" in record reproduction	a. For warped or defective records b. For bent motor mounting plate (FI) c. For motor shaft out of alignment with turntable shaft
25. Record is driven but not heard or not heard with proper volume	a. That pickup cord is plugged in b. Amplifier and speaker connections c. For open pickup crystal
26. Noisy or intermittent noise from speaker during change. cycle	For dust particles or grease on silencing switch contacts. This switch is mounted on the power switch assembly (FL)





I.F. ALIGNMENT WITH OSCILLOSCOPE

Band Switch Setting	Input Frequency	Point of Input	Dummy Ant.	Trimmer	Remarks
1 Band "B"	465 K.C. Sweep	1st I.F. Grid	.05 MFD or Larger	3rd I.F. Sec. (C-19) 3rd I.F. Pri. (C-18)	Gang condenser plates closed—connect audio input of oscilloscope to ground and to the diode load terminal of the 3rd I.F. transformer—Adjust trimmers in order mentioned for a single symmetrical curve of maximum amplitude.
2 Band "B"	465 K.C. Sweep	1st I.F. Grid	.05 MFD or Larger	2nd I.F. Sec. (C-16) 2nd I.F. Pri. (C-15)	
3 Band "B"	465 K.C. Sweep	Converter Grid	.05 MFD or Larger	1st I.F. Sec. (C-14) 1st I.F. Pri (C-13)	
4 Band "B"	465 K.C. Sweep	Antenna Post	250 MMF 400 ohms	Wave Trap Trimmer	Adjust trimmer for minimum amplitude.

I.F. ALIGNMENT WITH OUTPUT METER

1 Band "B"	465 K.C. with modulation	1st I.F. Grid	.05 MFD or Larger	3rd I.F. Sec. (C-19) 3rd I.F. Pri. (C-18)	Adjust trimmer for maximum output
2 Band "B"	465 K.C. with modulation	1st I.F. Grid	.05 MFD or Larger	2nd I.F. Sec. (C-16) 2nd I.F. Pri. (C-15)	
3 Band "B"	465 K.C. with modulation	Converter Grid	.05 MFD or Larger	1st I.F. Sec. (C-14) 1st I.F. Pri. (C-13)	
4 Band "B"	465 with modulation	Antenna Post	250 MMF 400 ohms	Wave Trap Trimmer	Adjust trimmer for minimum output.

R.F. ALIGNMENT WITH OUTPUT METER

1 Band "B"					Close gang plates—adjust pointer to first line at left end of tuning scale (530 K.C.).
2 Band "D"	18 MC with modulation	Antenna Post	250 MMF 400 ohms	Oscillator (18 MC) Antenna (18 MC) See Trimmer Location View	Connect output meter across Loudspeaker—tone control on "Bass" position—set osc. trimmer. While rocking the gang cond., adjust the antenna trimmer for maximum output.
3 Band "B"	1500 K.C. with modulation	Antenna Post	250 MMF 400 ohms	Osc. (C-8) Ant. (C-3)	Peak trimmers for maximum output with a low input signal.
4 Band "B"	580 K.C. with modulation	Antenna Post	250 MMF 400 ohms	Osc. Padder (C-6)	Adjust padder for a maximum output meter indication in vicinity of 580 K.C. while rocking the gang condenser.
5 Band "B"	1500 K.C. with modulation.	Antenna Post	250 MMF 400 ohms	Osc. (C-8)	As in operation No. 3.

In order to align these receivers properly, it is necessary to have the following test equipment:

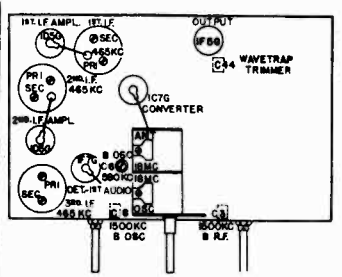
1. A modulated test oscillator.
2. An output indicator such as an A-C. voltmeter with a scale reading of 100 to 150 volts. (Use a condenser to isolate the D.C.)
3. A screwdriver-type alignment tool.

To realize all the performance built into these receivers at the factory, alignment using cathode-ray equipment is to be preferred.

On the "D" Band (5600 to 18,000 K.C.) the oscillator operates on the *low* frequency side of the incoming signal; therefore, adjust the trimmer until the second oscillator peak is reached as the trimmer is *increased* in capacity. When the correct adjustment is made, it will be possible to tune the image of any signal on the "D" band 970 K.C. *higher* than the signal if the input is sufficiently high. Example: The image of 15 M.C. should be heard at 15,970 K.C.

The alignment procedure is given in table form.

The "Dummy Antenna" is the capacitor or capacitor and resistor used in series with the signal generator antenna lead.



Chassis Layout and Trimmer Locations

Symbol	Description
C1	Tuning Capacitor
C2	.0045 mfd., Paper Capacitor
C3	5-45 mmf., Trimmer Capacitor
C5	.1 mfd., Paper Capacitor
C6	300-500 mmf., Padder Capacitor
C7	.05 mfd., Paper Capacitor
C8	5-45 mmf., Trimmer Capacitor
C9	75 mmf., Mica Capacitor
C10	.05 mfd., Paper Capacitor
C17	.5 mfd., Paper Capacitor
C20	.1 mfd., Paper Capacitor
C21,22	250 mmf., Mica Capacitor
C23	.001 mfd., Paper Capacitor
C25	.0045 mfd., Paper Capacitor
C26	4 mfd., Dry Electrolytic Capacitor
C27	250 mmf., Mica Capacitor
C28	.01 mfd., Paper Capacitor
C29	.003 mfd., Paper Capacitor
C30,31	.1 mfd., Paper Capacitor
C32	4 mfd., Dry Electrolytic Capacitor
C36	8 mfd., Dry Electrolytic Capacitor
C47	.003 mfd., Paper Capacitor
C48	.002 mfd., Paper Capacitor
C100	30 mfd., Dry Electrolytic Capacitor
C200	50 mfd., Dry Electrolytic Capacitor
C300	100 mfd., Dry Electrolytic Capacitor
C400	100 mfd., Dry Electrolytic Capacitor
C500	250 mfd., Dry Electrolytic Capacitor
C600	.02 mfd., Paper Capacitor
C700	.05 mfd., Paper Capacitor
R1	100,000 ohm Carbon Resistor
R2	10,000 ohm Carbon Resistor
R3	47,000 ohm Carbon Resistor
R4	10,000 ohm Carbon Resistor
R7	68,000 ohm Carbon Resistor
R8	220,000 ohm Carbon Resistor
R9	2.2 megohm Carbon Resistor
R11	2.0 megohm Volume Control
R12	1.0 megohm Carbon Resistor
R13	270,000 ohm Carbon Resistor
R14	470,000 ohm Carbon Resistor
R17	33,000 ohm Carbon Resistor
R18	100,000 ohm Carbon Resistor
R21	2,200 ohm Carbon Resistor
R100	1,500 ohm Carbon Resistor
R200	22 ohm Carbon Resistor
R300	18 ohm Carbon Resistor
R400,500	15 ohm Carbon Resistor
R600	440 ohm Ballast (Comb.)
R700	220 ohm Ballast
R800	220 ohm Ballast
R900	150 ohm Ballast (Comb.)
R1000	110 ohm Ballast
R1100	220 ohm Carbon Resistor
R1200	33 ohm Carbon Resistor
L6	R.F. Filter Coil
L100	Filter Reactor, 40 ohms (cold)

GENERAL ELECTRIC CO.

MODELS X-105A, X-105V
MODEL X-105VB

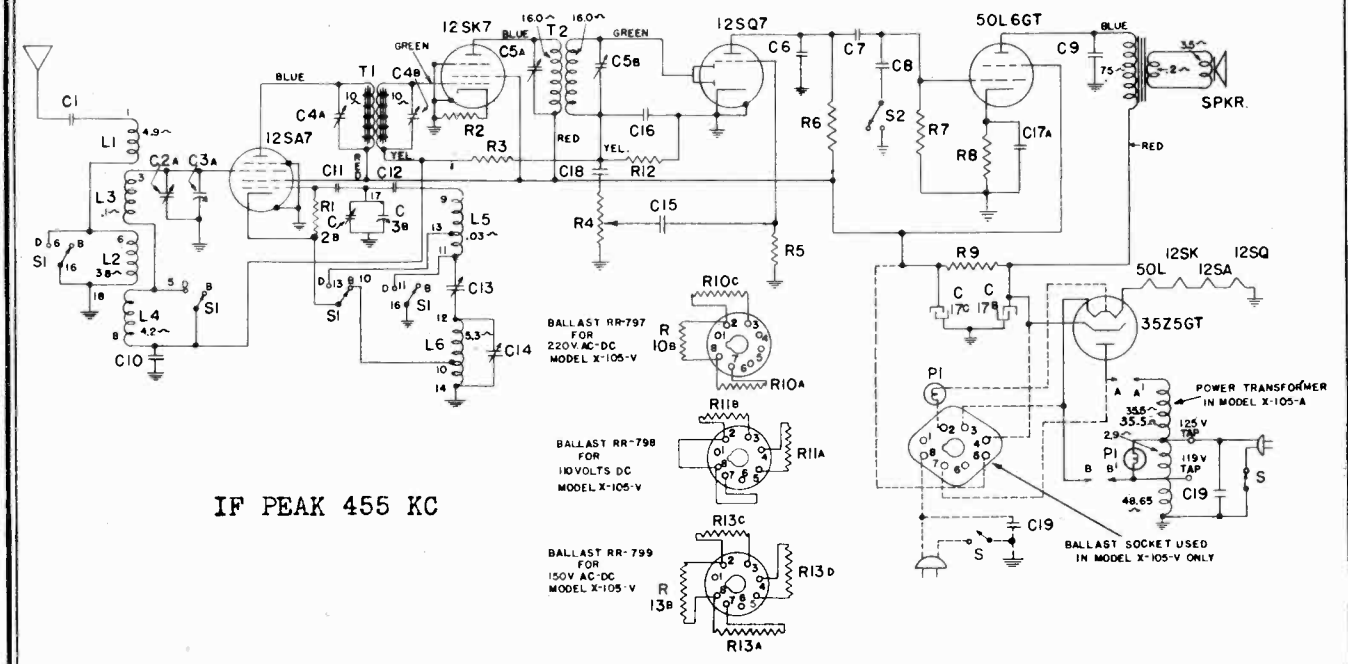


Fig. 1. Schematic Diagram Models X-105A and X-105V

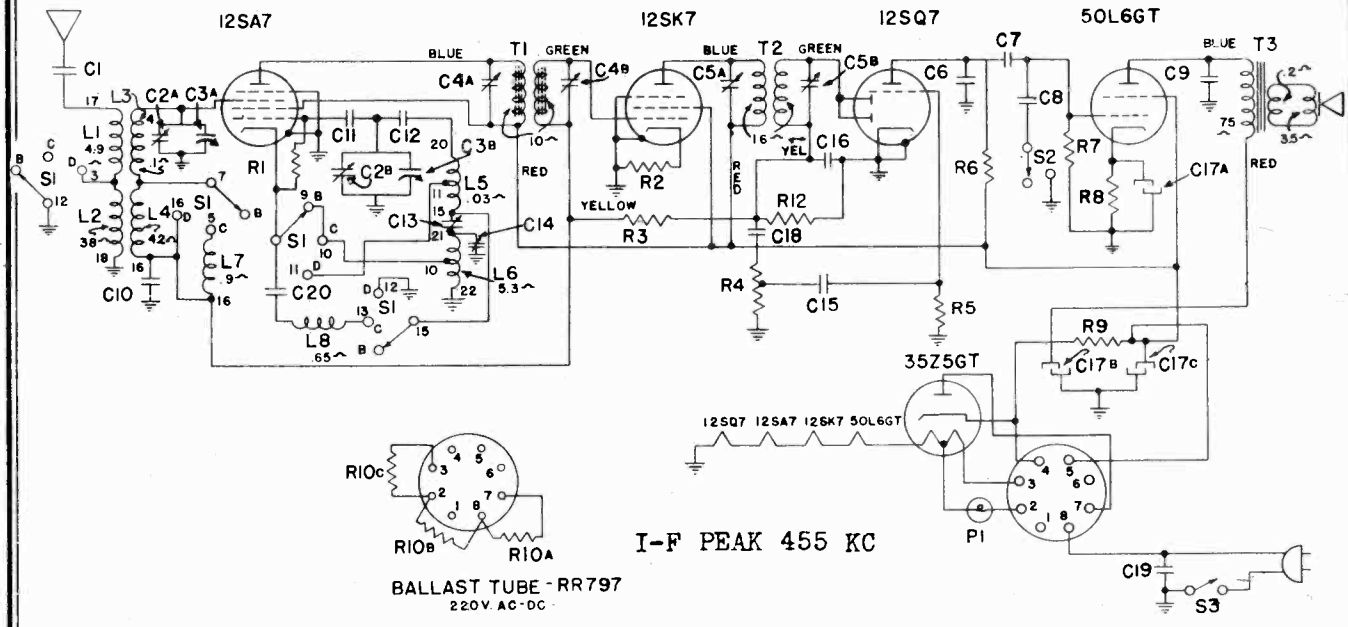
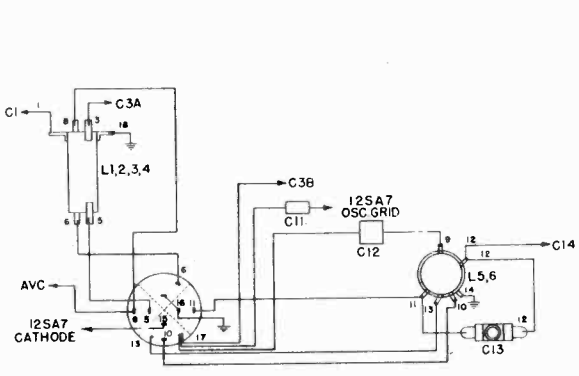
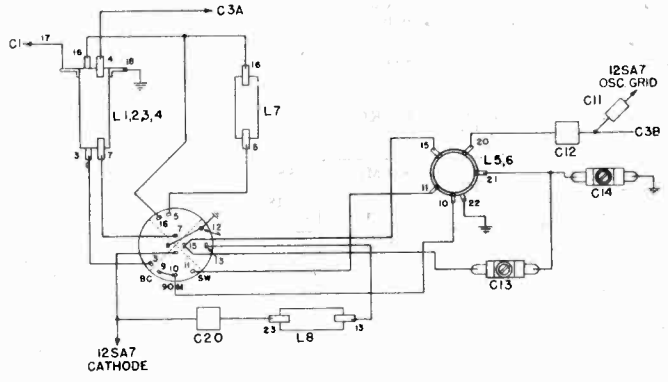


Fig. 2. Schematic Diagram Model X-105VB



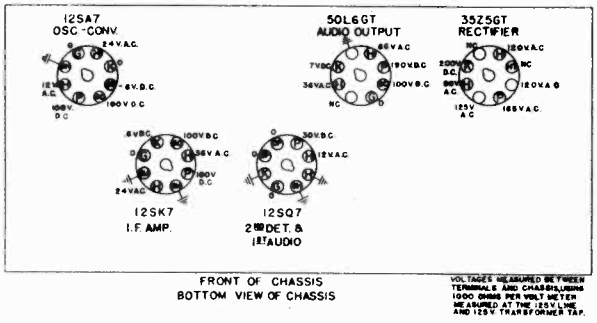
Models X-105A, X-105V



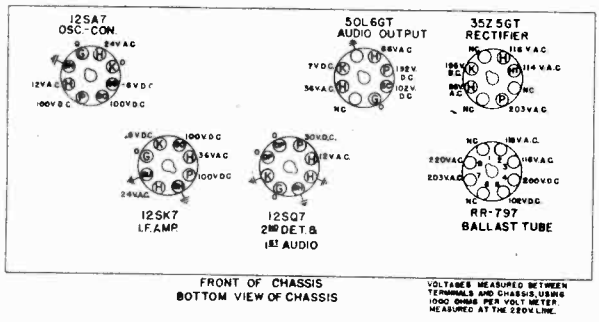
Switch Wiring Model X-105VB

MODELS X-105A, X-105V
MODEL X-105VB

GENERAL ELECTRIC CO.



Model X-105A



Models X-105V, X-105VB

ALIGNMENT PROCEDURE
ALL MODELS

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

Since the dial scale is not a part of the main chassis, it is necessary to use the special alignment scale glued to the back side of dial scale reflector plate. Use can then be made of the rear pointer guide as the tuning reference pointer. Before making the alignment, close the condenser plates completely. Then viewed from the rear, the pointer should be slid along the cord until the left hand edge of the pointer slide corresponds to the first mark on the right side of the rear scale. After making the alignment on this basis, it may be found after reassembly in the cabinet that the gang closed position of the pointer does not correspond to the first mark on the dial. If this is the case, slide the pointer on the drive cord until it is directly behind the first mark on the dial. This will make the calibration correct without further alignment.

Output meter alignment is preferable and the meter may be connected across the voice coil leads, t'.en turn volume control partially up. Keep the signal input as low as possible to avoid AVC action.

The special band on the Model X-105VB does not require alignment.

ALIGNMENT CHART

Step	Test—Osc. Connect to	Osc. Output Frequency	Pointer Setting	Tune Trimmer for Max. Output
1	12SK7 IF Grid in Series with .05 mfd.	455 KC	Standard Band 550 KC	C5A C5B
2	12SA7 Grid in Series with .05 mfd.	455 KC	Standard Band 550 KC	C4A C4B
3	Ant. Post in Series with 200 mmf. and 400 ohms	18.0 MC	Short-wave Band 18.0 MC	(C2B) Osc.* (C2A) Ant.**
4	Ant. Post in Series with 200 mmf. and 400 ohms	580 KC	Standard Band 580 KC	C13**
5	Ant. Post in Series with 200 mmf. and 400 ohms	1500 KC	Standard Band 1500 KC	C14**

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

PARTS LIST ALL MODELS

Stock No.	Symbol	Description
*RC-039	C-1	CAPACITOR—.01 Mfd., 600 V. paper
RC-7055	C-2a, 2b, 3a, 3b	CONDENSER—Tuning condenser and trimmers
*RC-293	C-6	CAPACITOR—470 mmf., mica
*RC-039	C-7	CAPACITOR—.01 Mfd., 600 V. paper
*RC-011	C-8	CAPACITOR—.002 Mfd., 600 V. paper
*RC-193	C-9	CAPACITOR—.008 Mfd., 600 V. paper
*RC-072	C-10	CAPACITOR—.05 Mfd., 200 V. paper
*RC-216	C-11	CAPACITOR—47 mmf., mica
*RC-365	C-12	CAPACITOR—2800 mmf., mica
RC-6550	C-13	CAPACITOR—640-790 mmf., "BC" padder
*RC-6537	C-14	CAPACITOR—2-18 mmf., "B" oscillator trimmer
*RC-039	C-15	CAPACITOR—.01 Mfd., 600 V. paper
*RC-274	C-16	CAPACITOR—330 mmf., mica
RC-5190	C-17a	CAPACITOR—20 Mfd., 25 V. dry electrolytic
	C-17b	CAPACITOR—40 Mfd., 250 V. dry electrolytic
	C-17c	CAPACITOR—30 Mfd., 250 V. dry electrolytic
*RC-023	C-18	CAPACITOR—.005 Mfd., 600 V. paper
RC-116	C-19	CAPACITOR—.02 Mfd., line capacitor
*RC-357	C-20	CAPACITOR—3600 mmf., mica (Model X-105VB)
*RQ-1295	R-1	RESISTOR—33,000 ohm, ½ W. carbon
*RQ-1227	R-2	RESISTOR—47 ohm, ½ W. carbon
*RQ-1343	R-3	RESISTOR—3.3 megohm, ½ W. carbon
RV-126	R-4	VOLUME CONTROL—2.0 megohm control
*RQ-1349	R-5	RESISTOR—5.6 megohm, ½ W. carbon
*RQ-1323	R-6, -7	RESISTOR—470,000 ohm, ½ W. carbon
*RQ-1239	R-8	RESISTOR—150 ohm, ½ W. carbon
*RQ-768	R-9	RESISTOR—3300 ohm, 3 W. carbon
RR-797	R-10a, 10b, 10c	RESISTOR—220 V. ballast tube
RR-798	R-11a, 11b	RESISTOR—110 V. ballast tube
*RQ-1323	R-12	RESISTOR—470,000 ohm, ½ W. carbon
RR-799	R-13a, b, c, d	RESISTOR—150 V. ballast tube

ALL MODELS
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 7.6
3000 KC 2.4
18000 KC 2.7

(b) IF on Converter Grid to IF on 12SK7 Grid:
455 KC 87

(c) IF Amplifier Grid to Diode Plates:
455 KC 66

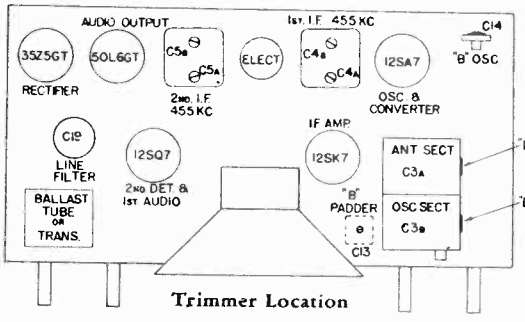
(2) Voltage across the diode load to give ½-volt speaker output at 400 cycles—.06 volts

(3) DC voltage developed across oscillator grid resistor (R1) at:
1000 KC . . . . . 6.8 volts
3000 KC . . . . . 6.0 volts
18000 KC . . . . . 8.0 volts

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.



Trimmer Location

ALL MODELS

GENERAL ELECTRIC CO.

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

SUPPLEMENTARY TECHNICAL INFORMATION

MANUAL TUNING ASSEMBLY

Lock-in Dial Drive

This assembly is added to late production receivers to facilitate easier tuning particularly on the short-wave band. On early production receivers, on which a direct pressure drive was used, this drive may be installed, in most cases without removing the chassis from the cabinet. Fig. 1 shows the parts used in making up this assembly.

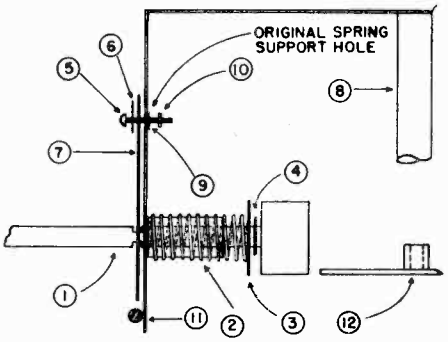


Fig. 1. Lock-in Dial Drive Assembly

The component parts are: (1) Tuning shaft, (2) Coil spring, (3) ¾-inch O.D. Washer, (4) 7/16-inch O.D. Washer, (5) 4-40 5/16-inch screw, (6) Spring mounting lug, (7) Spring cotter, (8) Condenser gang dial drive support post, (9) Lock washer, (10) 4-40 Hex. nut, (11) Gang condenser bracket, (12) Drive wheel.

When it is desired to add this assembly to an early receiver, it will be found helpful if the following steps are observed:

A—Remove Pt. 12 and original drive shaft (1).

B—Assemble parts shown, Fig. 1—Grease Pt. (4) and shaft where it passes through bushing and spring cotter.

C—Assemble short end cotter for clearance of wire welded to bracket.

D—Finger tighten nut (10) placing spring mounting lug (6) in vertical position.

E—**Connect original spring between drive assembly (12) and new spring mounting lug (6).**

F—Bend post (8) **if necessary** to allow approximately ⅛ inch clearance, between rubber drive and part (12)—Bend in direction of arrow to increase clearance.

G—Reassemble part (12) and end supporting bracket.

H—Solder nut (10) to screw (5) to prevent nut coming off after assembly or apply cement (Glyptal or equivalent) for same purpose. DO NOT TIGHTEN NUT (10) WITH A WRENCH. TIGHTEN ONLY LIGHTLY WITH FINGERS.

To engage the tuning control for manual tuning, press inward firmly while rotating the control counterclockwise, then clockwise until the holding clip releases which will be evidenced by a slight "click." The tuning control will now remain engaged and need merely be rotated in either direction until the desired station is tuned in.

To use the Touch Tuning keys the control is disengaged by pulling out on it until a "click" is heard signifying that the spring cotter has engaged. The Touch Tuning keys may now be used in the usual manner.

ELECTRICAL CIRCUIT CHANGES

The 820,000-ohm resistor, R58, connected between terminal 7 on band change switch wafer S2 and junction of R26 and R31, has been removed.

Band change switch wafer S4 has been replaced by an entirely new wafer. Contact 6, on this wafer, is connected to the screen of the 6SH7 1st limiter tube, instead of being grounded as originally shown. This serves the purpose of shorting out the screen during all but FM reception. Contact 7 has been grounded instead of being connected to the 2nd 6SG7 cathode. Contact 8 has been added and is connected to the 2nd 6SG7 cathode.

If replacement of the switch is necessary, it is recommended that the changer indicated be made at the same time. Should it be found desirable to make these changes without replacing the entire switch assembly, a new wafer S4 may be ordered. (See parts list.)

Tubular capacitor C42 may be changed from 0.004 mfd. to 0.003 mfd. and capacitor C54 may be changed from 47 mmf. mica to 0.01 mfd. paper.

ALIGNMENT DATA

In Table III of the original service notes, it was indicated in Step 5, that the Input Signal be fed directly to the "FM" antenna post. It is recommended that this be changed and that the Signal Generator be capacitively coupled to the built-in dipole. This is accomplished by connecting a lead to the output "high" part of the Signal Generator and running it near the built-in dipole. Trimmer C1 should then be peaked for maximum output.

An "FM" broadcast station may be used for this adjustment provided its frequency is near 46 MC (not over 47 MC and not under 45 MC) and provided its signal input is so low that the limiter circuit remains inoperative.

NOTE: The squelch circuit must be inoperative while these adjustments are being made.

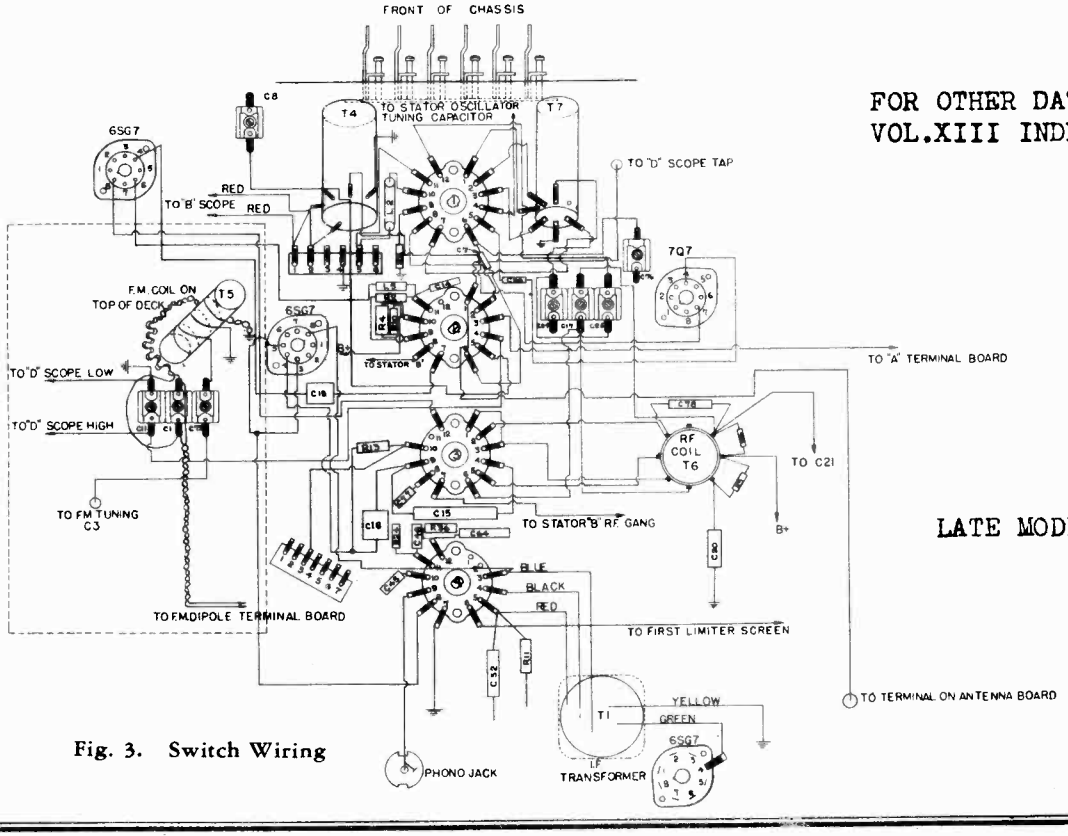


Fig. 3. Switch Wiring

FOR OTHER DATA, SEE VOL. XIII INDEX

LATE MODEL

MODEL HM-171
MODEL HM-185

GENERAL ELECTRIC CO.

TELEVISION RECEIVERS
(REVISED FOR NEW STANDARDS)

FOR ORIGINAL DATA SEE VOL.XI INDEX

CHANGES IN THE SCHEMATIC DIAGRAM

1- A RESISTOR OF 4700 OHMS IS CONNECTED ACROSS THE PRIMARY OF THE I.F. TRANSFORMER T7.
2- THE RESISTOR R123 IS CHANGED FROM 3900 TO 4700 OHMS.
3- A RESISTOR OF 4700 OHMS IS CONNECTED ACROSS THE PRIMARY OF THE I.F. TRANSFORMER T6.
4- A RESISTOR OF 220,000 OHMS IS CONNECTED BETWEEN THE JUNCTION OF R145 AND R146 AND GROUND.
5- A RESISTOR OF 330 OHMS IS INSERTED IN THE CONTROL GRID LEAD OF THE PICTURE TUBE.

REVISED TELEVISION ALIGNMENT PROCEDURE

The problem of aligning the several circuits in a television receiver is much more involved and requires more specialized equipment than the alignment of conventional radio receivers. Fortunately, the use of stable components in carefully engineered circuits of wide-band characteristic reduces to a minimum the necessity for alignment under normal operating conditions. Should alignment become necessary the following equipment will be needed:

(A) For Video I. F. Alignment
  (1) Cathode ray oscilloscope.
  (2) Wide-band sweep oscillator capable of sweeping from 7.5 to 15 MC.
  (3) Marker system either provided in sweep oscillator or from separate signal generator for locating 12.75 and 10.75 MC points.

(B) Sound I.F. Alignment
  (1) Cathode ray oscilloscope.
  (2) Wide-band sweep oscillator capable of sweeping from 7.75 to 8.75 MC.
  (3) Marker system either provided in sweep oscillator or from separate signal generator for locating 8.15 and 8.35 MC points.

(C) R.F. Alignment
  (1) Cathode ray oscilloscope
  (2) Wide-band sweep oscillator capable of sweeping the following bands:
    (a) 50 to 56 MC
    (b) 60 to 66 MC
    (c) 66 to 72 MC
    * (d) 78 to 84 MC

* Those receivers which were aligned at the factory for Band No. 4 must use this r-f sweep frequency.

VIDEO I.F. ALIGNMENT

	Input Freq.	Point of Input	Adjustments	Comments
1.				Connect vertical input cable of cathode ray oscilloscope across resistor R-182 of 6F8G video detector.
2.	7.5–15 MC Sweep	Control grid of 6AB7 (2nd video I.F.)		Connect output tap of video I.F. sweep oscillator to control grid of 6AB7 (2nd video I.F.). Connect ground lead to chassis. Turn contrast control (R-108) to about half of maximum or to a point which gives satisfactory vertical deflection without overloading. Set horizontal centering and gain controls on oscilloscope to give suitable horizontal deflection. Adjust sweep phase to give curve similar to Fig. 7, curve 1.

NOTE: If sweep oscillator has marker points internally supplied, steps 3 and 4 may be omitted.

	Signal Input	Point of Input	Adjustments	Comments
3.	Same as in No. 2 plus 12.75 MC	Same as in No. 2		Superimpose an accurately calibrated 12.75 MC signal in parallel with sweep signal. Signal will appear on sweep curve in oscilloscope as a wiggle, the center of which is a thin black line. With a pen or crayon mark this point on the screen of the oscilloscope. (NOTE: Hereafter the horizontal controls on the oscilloscope must not be touched.)
4.	Same as in No. 2 plus 10.75 MC	Same as in No. 2		Superimpose an accurately calibrated 10.75 MC signal in parallel with sweep signal. Mark screen at point where signal appears on curve as in No. 3 above.
5.	7.5–15 MC Sweep	Control grid 6AC7 (4th video IF)	Iron cores of detector transformer T-6	Do not touch horizontal controls of oscilloscope. Adjust iron cores of T-6 until curve appears similar to Fig. 7, curve 1, with relatively flat top, 12.75 MC mark at corner of one side and 10.75 MC mark at corner of other side. These conditions plus maximum amplitude insure correct alignment.
6.	7.5–15 MC Sweep	Control grid 6AB7-3rd video IF	Iron cores of 4th video transformer T-5	Adjust iron cores for maximum gain, flatness and proper centering between markers as described in step No. 5 and illustrated in Fig. 7, curve 1.
7.	7.5–15 MC Sweep	Control grid 6AB7 (2nd video IF)	Iron cores of 3rd video transformer T-4	Adjust primary and secondary iron cores for maximum gain, flatness and proper centering. See Fig. 7, curve 1.
8.	7.5–15 MC Sweep	Converter grid, 6F8G	Iron cores of 2nd video transformer T-3 & 1st video transformer T-2	Connect low tap to grid (on top of tube). Adjust primary and secondary iron cores for maximum gain, flatness and proper centering. See Fig. 7, curve 1.
9.	14.25 MC	Converter grid, 6F8G	Series iron core of 3rd video transformer T-4	Connect low tap to grid. Reduce horizontal gain to minimum. Adjust iron core for minimum line length.

MODEL HM-171
MODEL HM-185

GENERAL ELECTRIC CO.

REVISED TELEVISION ALIGNMENT PROCEDURE CONT.

AUDIO I.F. ALIGNMENT

NOTE: In order to obtain frequency modulation detection in the sound channel with good fidelity, the audio I.F. amplifiers must be aligned to give a satisfactory selectivity curve for slope detection. For this reason a sweep generator and oscilloscope are necessary to obtain the resultant curve shown in Fig. 7, curve 3.

	Signal Input	Point of Input	Adjustments	Comments
1.	8.25 MC with 30% tone modulation	6F8G converter grid	Tune all audio I.F. iron cores	Use an oscilloscope or high resistance voltmeter across —audio output terminals of HM171 or volume control, R126, of the Model HM185. Set tone control for maximum high frequency response. Peak all trimmers for a maximum output.
2.	7.75 to 8.75 MC sweep	Grid of 2nd audio I.F., 6SK7		Connect oscilloscope input to chassis ground and junction of resistors (R204 and R125 in HM-171) (R125 and R196 in HM185) at diode load. Superimpose an accurately calibrated 8.15 MC signal in parallel with sweep signal. This signal will appear on sweep curve in oscilloscope as a wiggle at the center of which a mark should be made with pen or crayon on oscilloscope screen. (Hereafter the horizontal controls on the oscilloscope must not be adjusted.) Next an 8.35 MC signal mark should similarly be made.

NOTE: If sweep oscillator has marker points internally supplied, omit step 2.

3.	7.75 to 8.75 MC sweep	Converter grid 6F8G	Adjust iron cores of 1st audio I.F. coil L12 and the 2nd audio I.F. transformer T-9	With oscilloscope connected as in step 2, adjust cores until curve appears as in Fig. 7, curve 3 being sure that the steep side of curve lies between the 8.15 and 8.35 MC markers as indicated. NOTE: The shape of the curve between 8.15 and 8.35 MC must be straight, otherwise distortion will result in FM reception.

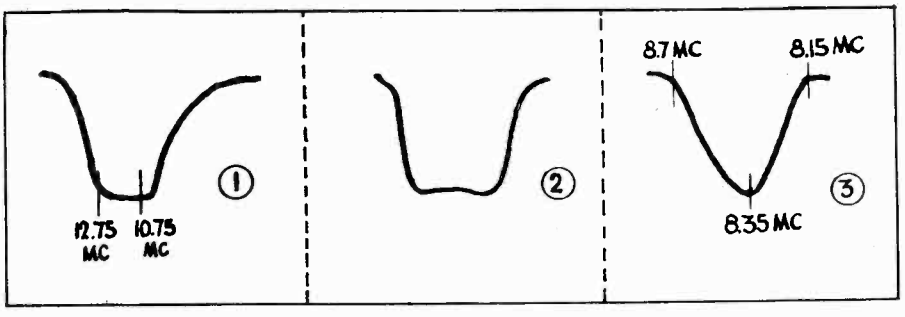


Fig. 7. Television Alignment Curves

TELEVISION ALIGNMENT PROCEDURE

R.F. ALIGNMENT

	Signal Input	Point of Input	Adjustments	Comments
1.			Band width adjustment coupling condenser	Turn C-78 in until tight, then open approximately 1/16 of a turn.
2.	50 to 56 MC Sweep	Antenna terminals	(L-8), (C-70), (C-67)	Connect oscilloscope to junction R124 and C25; open circuit R178, short R102 to ground. Depress No. 1 push button. Set tuning control to mid-rotation. Adjust L-8 until curve is centered between maximum horizontal sweep points. Adjust C-70 and C-67 for maximum amplitude. See Fig. 7, curve 2.
3.	60 to 66 MC Sweep	Antenna terminals	(L-9), (C-71), (C-68)	Depress No. 2 push button. Leave tuning control at mid-rotation point. Adjust L-9 for centering; C-71 and C-68 for maximum amplitude. See Fig. 7, curve 2.
4.	66 to 72 MC Sweep*	Antenna terminals	(L-10), (C-72), (C-69)	Depress No. 3 push button. Adjust L-10 for centering; C-72; C-69 for maximum amplitude. See Fig. 7, curve 2.
5.	Calibrated signal generator 55.75 MC, 65.75 MC, 71.75 MC** with 30% tone modulation.	Antenna terminals	(L8), (L9), (L10)	To align oscillator for various bands, set tuning control (C-3) at mid-rotation; then set brass slugs of coils L8, L9, L10 until maximum audio tone is heard.

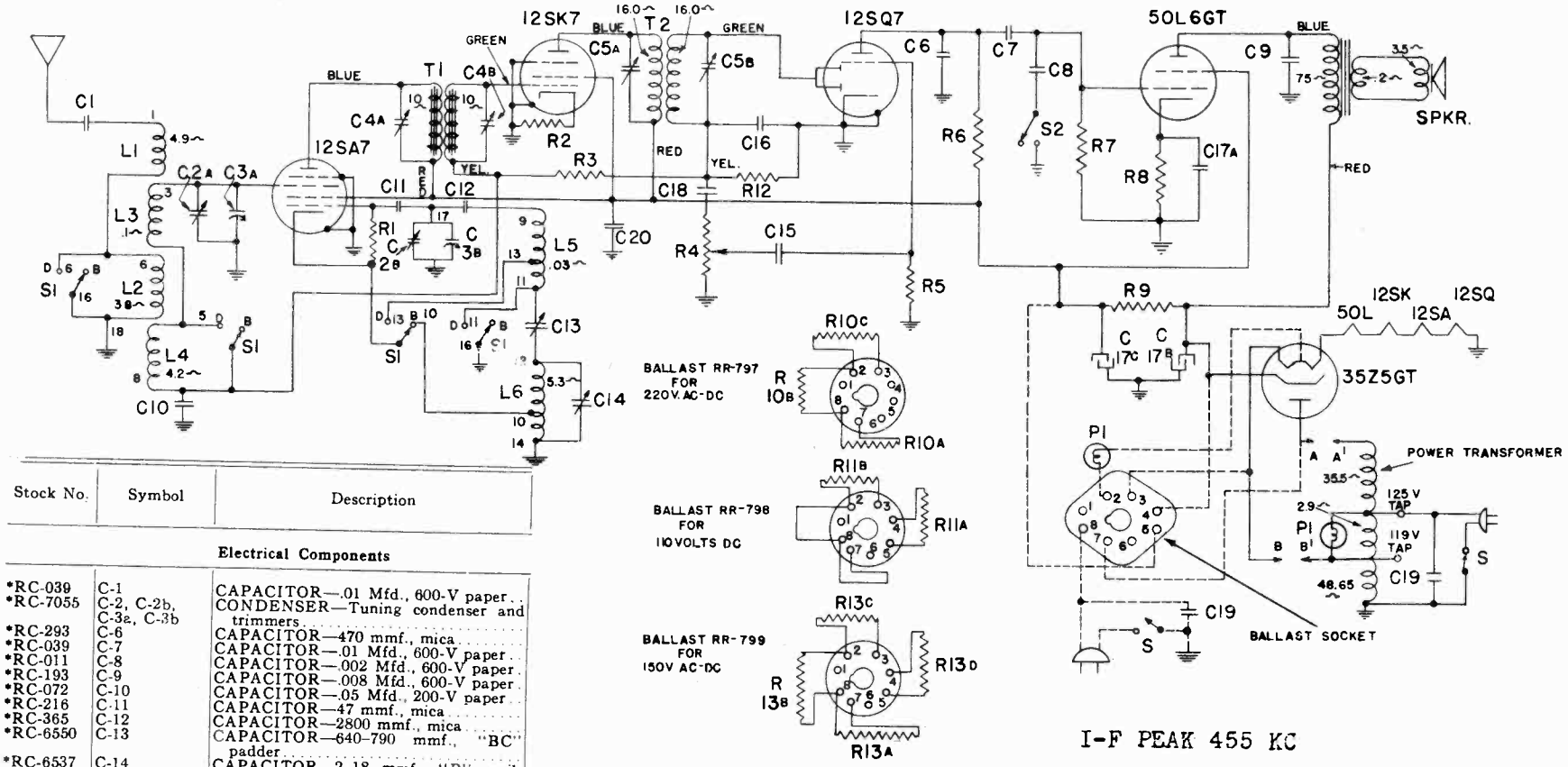
* In some localities this sweep will be 78 to 84 megacycles.

** 83.75 Megacycles when Band No. 4 is set up on the No. 3 key.

WAVE TRAP ALIGNMENT

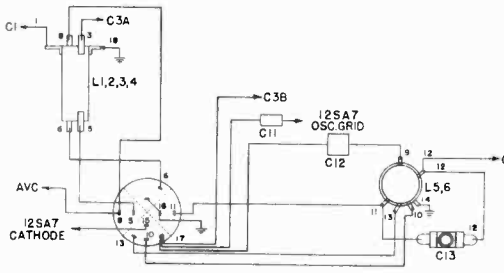
1.	11.75 MC with 400 cycle modulation	Antenna terminals	Wave trap trimmer, C-95	Adjust for minimum signal response as seen on oscilloscope after connections made in Step 2 are re-established; then connect oscilloscope across R182.

OTHER SERVICE DATA SAME AS IN EARLY MODEL

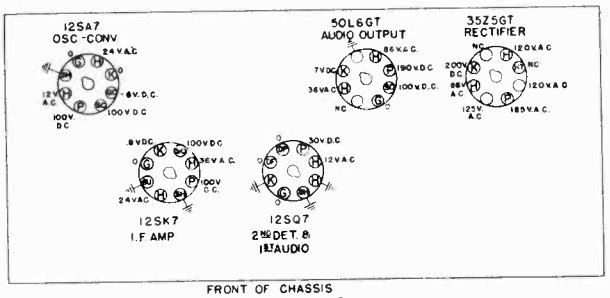


Stock No.	Symbol	Description
		Electrical Components
*RC-039	C-1	CAPACITOR—.01 Mfd., 600-V paper
*RC-7055	C-2, C-2b, C-3a, C-3b	CONDENSER—Tuning condenser and trimmers
*RC-293	C-6	CAPACITOR—470 mmf., mica
*RC-039	C-7	CAPACITOR—.01 Mfd., 600-V paper
*RC-011	C-8	CAPACITOR—.002 Mfd., 600-V paper
*RC-193	C-9	CAPACITOR—.008 Mfd., 600-V paper
*RC-072	C-10	CAPACITOR—.05 Mfd., 200-V paper
*RC-216	C-11	CAPACITOR—47 mmf., mica
*RC-365	C-12	CAPACITOR—2800 mmf., mica
*RC-6550	C-13	CAPACITOR—640-790 mmf., "BC" padder
*RC-6537	C-14	CAPACITOR—2-18 mmf., "B" oscillator trimmer
*RC-039	C-15	CAPACITOR—.01 Mfd., 600-V paper
*RC-274	C-16	CAPACITOR—330 mmf., mica
*RC-5190	C-17a	CAPACITOR—20 Mfd., 25-V dry electrolytic
	C-17b	CAPACITOR—40 Mfd., 250-V dry electrolytic
	C-17C	CAPACITOR—30 Mfd., 250-V dry electrolytic
*RC-023	C-18	CAPACITOR—.005 Mfd., 600-V paper
*RC-116	C-19	CAPACITOR—.02 Mfd., line capacitor
*RC-092	C-20	CAPACITOR—.05 Mfd., 600-V. paper
*RQ-1275	R-1	RESISTOR—33,000 ohms, ½-W carbon
*RQ-1227	R-2	RESISTOR—47 ohm, ½-W Carbon
*RQ-1343	R-3	RESISTOR—3.3 megohm, ½-W carbon
*RV-153	R-4, S-3	VOLUME CONTROL—Volume control and power switch
*RQ-1349	R-5	RESISTOR—5.6 megohm, ½-W carbon
*RQ-1323	R-6, R-7, R12	RESISTOR—470,000 ohm, ½-W carbon
*RQ-1239	R-8	RESISTOR—150 ohm, ½-W carbon
*RQ-768	R-9	RESISTOR—3,300 ohm, 3-W carbon
*RR-797	R-10a, R-10b, R-10c	RESISTOR—220-V ballast tube
*RR-798	R-11a, R-11b	RESISTOR—110-V ballast tube

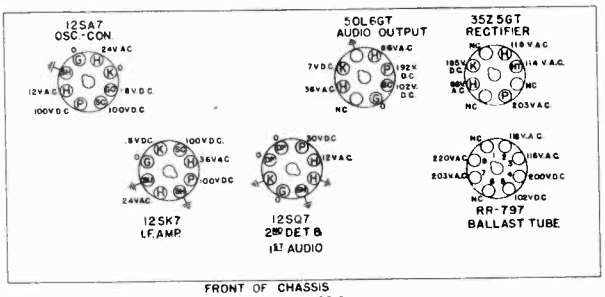
Stock No.	Symbol	Description
*RR-799	R-13a, R-13b R-13c, R-13d	RESISTOR—150-V ballast tube
*RL-1014	L-1, L-2, L-3, L-4	COIL—"B" and "D" Antenna coil
*RL-2057	L-5, L-6	COIL—"B" and "D" oscillator coil
*RS-3159	S-1	SWITCH—Band change switch
*RS-3108	S-2	SWITCH—Tone control switch
*RT-394	T-1	TRANSFORMER—1st I.F. transformer
*RT-395	T-2	TRANSFORMER—2nd I.F. transformer
*RT-4011	T-3	TRANSFORMER—Output transformer
*RT-0526	T-4	TRANSFORMER—Power transformer
*RS-1067	SPKR	SPEAKER—5-inch P.M. speaker



GENERAL ELECTRIC CO.



Model X-225A



Model X-225V

SERVICE DATA FOR BOTH MODELS

Power Supply

Model X-225A transformer has two primary voltage taps which allow operation at the voltages shown on the label. This receiver is connected at the factory to operate on the 125-volt tap (black and red). In localities where the line voltage does not exceed 120 volts, the transformer may be connected to use the 120-volt tap (black and yellow).

The Model X-225V is designed for use with the 220-volt ballast resistor RR-797 so that it may be operated from either an AC or DC power supply. However, this receiver can be converted to operate on the following line voltages as follows:

150-volt AC/DC (range 135-165 volts)

Remove ballast tube RR-797 from socket and substitute ballast tube resistor RR-799.

110-volt DC (range 100-120 volts)

Remove ballast tube RR-797 from socket and substitute ballast tube resistor RR-798.

When operated with these special ballast resistors and lower power supplies than 220 volts, the audio power output and socket voltages will be reduced.

ALIGNMENT PROCEDURE

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

Since the dial scale is not a part of the main chassis, it is necessary to use the special alignment scale glued to the back side of dial scale reflector plate. Use can then be made of the rear pointer guide as the tuning reference pointer. Before making the alignment, close the condenser plates completely. Then viewed from the rear, the pointer should be slid along the cord until the left-hand edge of the pointer slide corresponds to the first mark on the right side of the rear scale. After making the alignment on this basis, it may be found after reassembly in the cabinet that the gang closed position of the pointer does not correspond to the first mark on the dial. If this is the case, slide the pointer on the drive cord until it is directly behind the first mark on the dial. This will make the calibration correct without further 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.

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 7.6
    3000 KC 2.4
    18000 KC 2.7

  (b) 1F on Converter Grid to IF on 12SK7 Grid:
    455 KC 87

  (c) IF Amplifier Grid to Diode Plates:
    455 KC 66

(2) Voltage across the diode load to give ½-volt speaker output at 400 cycles—.06 volts

(3) DC voltage developed across oscillator grid resistor (R1) at:
    1000 KC ..... 6.8 volts
    3000 KC ..... 6.0 volts
    18000 KC ..... 8.0 volts

ALIGNMENT CHART

Step	Test—Osc. Connect to	Osc. Output Frequency	Pointer Setting	Tune Trimmer for Max. Output
1	12SK7 IF Grid in Series with .05 mfd.	455 KC	Standard Band 550 KC	C5A C5B
2	12SA7 Grid in Series with .05 mfd.	455 KC	Standard Band 550 KC	C4A C4B
3	Ant. Post in Series with 200 mmf. and 400 ohms	18.0 MC	Short-wave Band 18.0 MC	(C2B) Osc.* (C2A) Ant.**
4	Ant. Post in Series with 200 mmf. and 400 ohms	580 KC	Standard Band 580 KC	C13*
5	Ant. Post in Series with 200 mmf. and 400 ohms	1500 KC	Standard Band 1500 KC	C14**

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

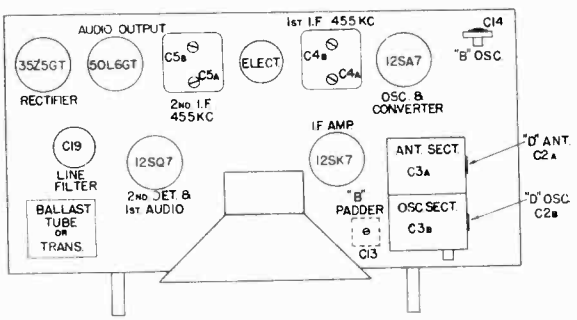


Fig. 3. Trimmer Location

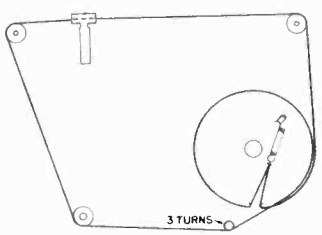


Fig. 4. Dial Stringing Diagram

MODEL HM-225B
MODEL HM-226B

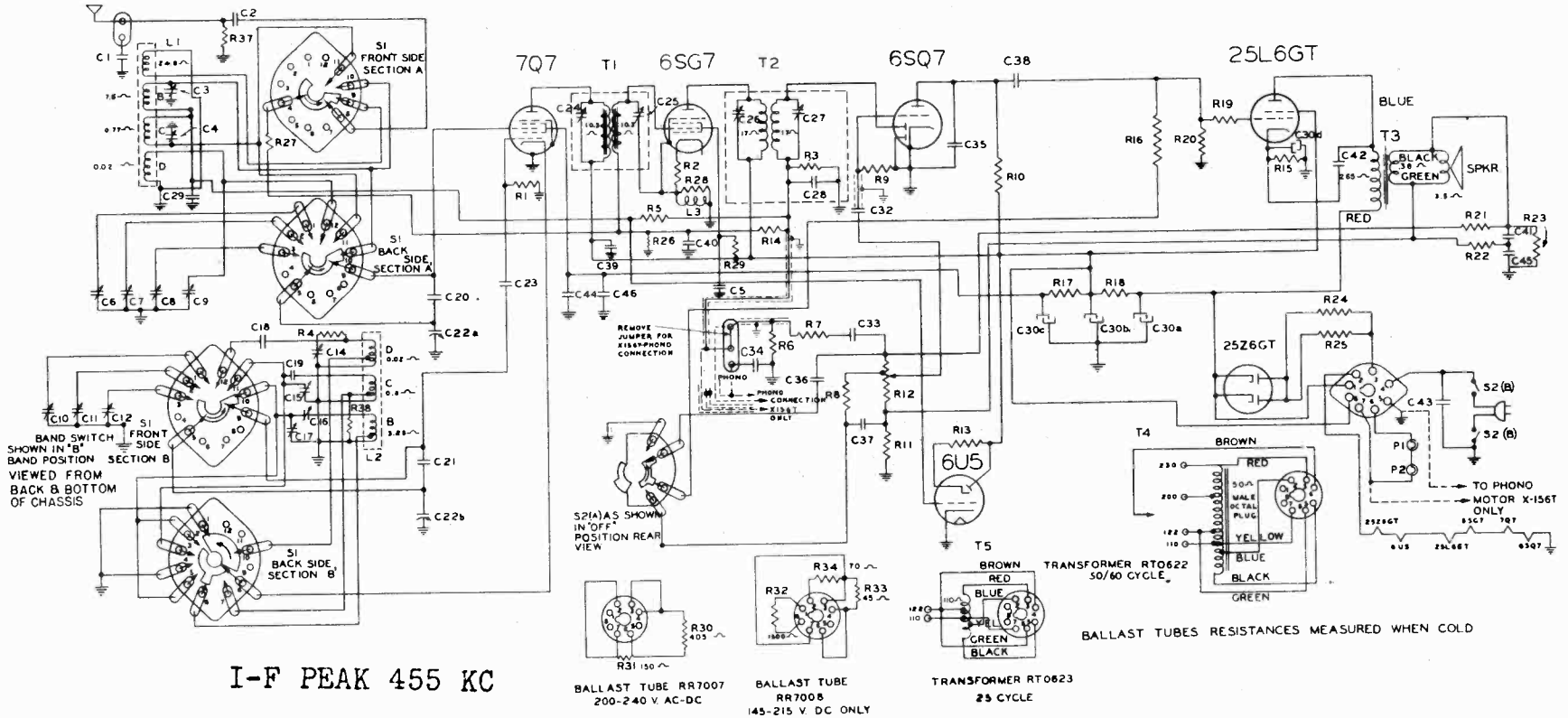
GENERAL ELECTRIC CO.

TELEVISION SCHEMATIC DIAGRAM

PARTS DESCRIPTION LIST REVISED FOR NEW STANDARDS

Models HM-225B and HM-226B

SYMBOL	DESCRIPTION
C-1	47 mmf. mica L.P.F. capacitor
C-2	55-185 mmf. padder
C-3	20-200 mmf. trimmer
C-4	20-200 mmf. trimmer
C-5	20-200 mmf. trimmer
C-6	10 mfd. 450 V. dry electrolytic (See C-54, 81)
C-7	82 mmf. mica L.P.F. capacitor
C-8	20-200 mmf. trimmer
C-9	20-200 mmf. trimmer
C-10	2-12 mmf. trimmer
C-11	82 mmf. mica L.P.F. capacitor
C-12	.005 mfd. paper capacitor
C-13	47 mmf. mica L.P.F. capacitor
C-14	.005 mfd. paper capacitor
C-15	33 mmf. mica capacitor
C-16	4 mmf. mica L.P.F. capacitor
C-17	Air trimmer
C-18	150 mmf. mica capacitor
C-19	2-12 mmf. trimmer
C-20	2-12 mmf. trimmer
C-21	.005 mfd. paper capacitor
C-22	.005 mfd. paper capacitor
C-23	.005 mfd. paper capacitor
C-24	.005 mfd. paper capacitor
C-25	.01 mfd. paper capacitor
C-26	.005 mfd. paper capacitor
C-27	150 mmf. mica capacitor
C-28	.005 mfd. paper capacitor
C-29	.05 mfd. paper capacitor
C-30	330 mmf. mica capacitor
C-31	.005 mfd. paper capacitor
C-32	.005 mfd. paper capacitor
C-33	56 mmf. mica L.P.F. capacitor
C-34	.02 mfd. paper capacitor
C-35	.005 mfd. paper capacitor
C-36	33 mmf. mica L.P.F. capacitor
C-37	.005 mfd. paper capacitor
C-38	.005 mfd. paper capacitor
C-39	20 mfd. 25 V. dry electrolytic (See C-72)
C-40	.005 mfd. paper capacitor
C-41	.005 mfd. paper capacitor
C-42	100 mmf. mica capacitor
C-43	.005 mfd. paper capacitor
C-44	.05 mfd. paper capacitor
C-45	.005 mfd. paper capacitor
C-46	.005 mfd. paper capacitor
C-47	150 mmf. mica capacitor
C-48	0.5 mfd. paper capacitor
C-49	.05 mfd. paper capacitor
C-50	10 mmf. mica capacitor
C-51	0.1 mfd. paper capacitor
C-52	22 mmf. mica capacitor
C-53	0.5 mfd. paper capacitor
C-54	5 mfd. 450 V. dry electrolytic (See C-6, 81)
C-55	5 mfd. 450 V. dry electrolytic (See C-65)
C-56	.04 mfd. paper capacitor
C-57	0.1 mfd. paper capacitor
C-58	150 mmd. mica capacitor
C-59	.05 mfd. paper capacitor
C-60	.002 mfd. paper capacitor
C-61	470 mmf. mica capacitor
C-62	40 mfd. 25 V. dry electrolytic
C-63	470 mmf. mica capacitor
C-64	30 mfd. 450 V. wet electrolytic
C-65	30 mfd. 450 V. dry electrolytic (See C-55)
C-66	.05 mfd. paper capacitor
C-67	.02 mfd. paper capacitor
C-68	30 mfd. 450 V. wet electrolytic
C-69	.02 mfd. paper capacitor
C-70	.02 mfd. paper capacitor
C-71	.05 mfd. paper capacitor
C-72	40 mfd. 450 V. dry electrolytic (See C-39)
C-73	0.5 mfd. paper capacitor
C-74	.01 mfd. paper capacitor
C-75	30 mfd. 450 V. wet electrolytic
C-76	30 mfd. 450 V. wet electrolytic
C-77	.06 mfd. 4000 V. paper capacitor
C-78	.06 mfd. 4000 V. paper capacitor
C-79	.005 mfd. paper capacitor
C-80	30 mfd. 450 V. wet electrolytic
C-81	20 mfd. 450 V. dry electrolytic (See C-6, 54)
C-82	330 mmf. mica L.P.F. capacitor
C-83	20-200 mmf. trimmer
C-84	20-200 mmf. trimmer
C-85	.01 mfd. paper capacitor
C-86	.002 mfd. paper capacitor
C-87	.25 mfd. paper capacitor
C-88	20-200 mmf. trimmer
C-89	7 mmf. Temp. compensating capacitor
C-90	7 mmf. Temp. compensating capacitor
L-1	Wave trap coil
L-2	Wave trap coil
L-3	Wave trap coil
L-4	Wave trap coil
L-5	R.F. coil band No. 1
L-6	R.F. coil band No. 2
L-7	R.F. coil band No. 3
L-8	R.F. coil band No. 4
L-9	R.F. coil band No. 5
L-10	Osc. coil band No. 1
L-11	Osc. coil band No. 2
L-12	Osc. coil band No. 3
L-13	Osc. coil band No. 4
L-14	Osc. coil band No. 5
L-15	Wave trap assembly
L-16	Video diode choke
L-17	Video diode choke
L-18	Video cathode choke
L-19	Video choke
L-22	Video choke
L-23	Deflection yoke coil
L-24	Focus coil
L-25	Filter choke
R-1	1 megohm carbon resistor
R-2	2,200 ohms carbon resistor
R-3	10,000 ohms 1 W. carbon resistor
R-4	47,000 ohms carbon resistor
R-5	27,000 ohms carbon resistor
R-6	1.0 megohm carbon resistor
R-7	1,000 ohms carbon resistor
R-8	100,000 ohms carbon resistor
R-9	2,200 ohms carbon resistor
R-10	1.0 megohm carbon resistor
R-11	220,000 ohms carbon resistor
R-12	47,000 ohms carbon resistor
R-13	180,000 ohms carbon resistor
R-14	100,000 ohms carbon resistor
R-15	2,200 ohms carbon resistor
R-16	500,000 ohms volume control
R-17	2,200 ohms carbon resistor
R-18	150 ohms 7.4 W. wire wound resistor
R-19	1,500 ohms carbon resistor
R-20	2,200 ohms carbon resistor
R-21	2,700 ohms carbon resistor
R 22	82,000 ohms 2 W. carbon resistor
R-23	500,000 ohms tone control
R-24	10,000 ohms 1 W. carbon resistor
R-25	2,200 ohms carbon resistor
R-26	10,000 ohms carbon resistor
R-27	2,700 ohms carbon resistor
R-28	47,000 ohms carbon resistor
R-29	15 ohms wire wound resistor
R-30	3,300 ohms carbon resistor
R-31	2,200 ohms carbon resistor
R-32	6,800 ohms carbon resistor
R-33	1,500 ohms carbon resistor
R-34	1.0 megohm carbon resistor
R-35	270 ohms 2 W. carbon resistor
R-36	2,200 ohms carbon resistor
R-37	2,200 ohms carbon resistor
R-38	180 ohms carbon resistor
R-39	2,200 ohms carbon resistor
R-40	470 ohms carbon resistor
R-41	27,000 ohms carbon resistor
R-42	10,000 ohms carbon resistor
R-43	3,300 ohms carbon resistor
R-44	220,000 ohms carbon resistor
R-45	1.0 megohm carbon resistor
R-46	15,000 ohms 2 W. carbon resistor
R-47	10,000 ohms carbon resistor
R-48	4,700 ohms carbon resistor
R-49	470,000 ohms carbon resistor
R-50	820 ohms 2 W. carbon resistor
R-51	2,200 ohms carbon resistor
R-52	10,000 ohms brightness control
R-53	2.0 megohms vertical linearity control
R-54	10,000 ohms carbon resistor
R-55	1.0 megohm carbon resistor
R-56	1,000 ohms carbon resistor
R-57	2.2 megohm carbon resistor
R-58	10,000 ohms carbon resistor
R-59	1,500 ohms 6 W. wire wound resistor (See R-101)
R-60	2 megohms horizontal size control
R-61	220,000 ohms carbon resistor
R-62	220,000 ohms carbon resistor
R-63	220,000 ohms carbon resistor
R-64	220,000 ohms carbon resistor
R-65	2.0 megohms vertical size control
R-66	820 ohms 1 W. carbon resistor
R-67	10,000 ohms contrast control
R-68	180,000 ohms carbon resistor
R-69	100,000 ohms horizontal speed control
R-70	400 ohms 17.9 W. wire wound resistor
R-71	180 ohms 2 W. carbon resistor
R-73	1,000 ohms carbon resistor
R-74	6,800 ohms 1 W. carbon resistor
R-75	200 ohms 2 W. focus control
R-76	1.0 megohm carbon resistor
R-77	700 ohms 7.4 W. wire wound resistor
R-78	220,000 ohms carbon resistor
R-79	500,000 ohms vertical speed control
R-80	470,000 ohms 1 W. carbon resistor
R-81	2.2 megohms 1 W. carbon resistor
R-82	2.2 megohms 1 W. carbon resistor
R-83	2.2 megohms 1 W. carbon resistor
R-84	2.2 megohms 1 W. carbon resistor
R-85	2.2 megohms 1 W. carbon resistor
R-86	2.2 megohms 1 W. carbon resistor
R-87	220,000 ohms ½ W. carbon resistor
R-88	33 ohms 1 W. wire wound resistor
R-89	330 ohms carbon resistor
R-90	33,000 ohms 2 W. carbon resistor
R-91	1,000 ohms horizontal linearity control
R-92	220,000 ohms carbon resistor
R-93	39,000 ohms 1 W. carbon resistor
R-94	10 megohms carbon resistor
R-95	2.2 megohms carbon resistor
R-96	6,800 ohms carbon resistor
R-97	22,000 ohms 1 W. carbon resistor
R-98	10,000 ohms carbon resistor
R-99	700 ohms 7.4 W. wire wound resistor
R-100	400 ohms damping control
R-101	150 ohms 9 W. wire wound (See R-59)
R-102	100,000 ohms carbon resistor
R-103	100,000 ohms 1 W. carbon resistor
R-104	33,000 ohms 2 W. carbon resistor
R-105	470,000 ohms carbon resistor
R-106	270 ohms 2 W. carbon resistor
R-107	10,000 ohms carbon resistor
R-108	220 ohms carbon resistor
R-109	0.6 ohms carbon (2 in parallel—HM-226-7B only)
R-110	2.2 megohms carbon resistor
R-112	470,000 ohms carbon resistor
R-215	240 ohms 2 W. carbon resistor
R-216	47 ohms 1 W. insulated W.W. resistor
R-217	180 ohms 1 W. carbon resistor
T-1	Antenna transformer
T-2	1st audio I.F. transformer
T-3	2nd audio I.F. transformer
T-4	3rd audio I.F. transformer
T-5	Audio output transformer
T-6	2nd video I.F. transformer
T-7	3rd video I.F. transformer
T-8	4th video I.F. transformer
T-9	5th video I.F. transformer
T-10	Vertical oscillator transformer
T-11	1st video I.F. transformer
T-12	Horizontal output transformer
T-13	Low voltage power transformer
T-14	High voltage power transformer
T-15	Oscillator transformer
T-16	Vertical output transformer



C-1	CAPACITOR—.01 mfd., 600-V paper	C-30d	CAPACITOR—20 mfd., 25-V dry electrolytic	R-6	RESISTOR—470,000 ohm, ½-W carbon	R-28	RESISTOR—100,000 ohm, ½-W carbon
C-2	CAPACITOR—.001 mfd., 600-V paper	C-32	CAPACITOR—.01 mfd., 600-V paper	R-7	RESISTOR—47,000 ohm, ½-W carbon	R-29	RESISTOR—22,000 ohm, ½-W carbon
C-3, 4	CAPACITOR—"B" and "C" antenna trimmer	C-33	CAPACITOR—.005 mfd., 600-V paper	R-8	RESISTOR—180,000 ohm, ½-W carbon	R-30, 31	RESISTOR—200–240 volt ballast
C-5	CAPACITOR—.05 mfd. 600-V	C-34	CAPACITOR—.2 mfd., 400-V paper	R-9	RESISTOR—10 megohm, ½-W carbon	R-32, 33, 34	RESISTOR—145–215-volt ballast
C-6, 7, 8 & 9	TRIMMER—Antenna trimmer strip	C-35	CAPACITOR—220 mmf., mica	R-10	RESISTOR—330,000 ohm, ½-W carbon	R-37	RESISTOR—100,000 ohm, ½-W carbon
C-10, 11, 12, 14, 15, 16, 17	TRIMMER STRIP—Oscillator trimmer strip	C-36	CAPACITOR—.0015 mfd., 600-V paper	R-11	RESISTOR—270 ohm, ½-W carbon	R-38	RESISTOR—470 ohm, ½-W carbon
C-18	CAPACITOR—5600 mmf., mica	C-37	CAPACITOR—.002 mfd. 600 V paper	R-12	VOL. CONTROL—2 meg. volume control	S-1	SWITCH—Band change switch
C-19	CAPACITOR—1800 mmf., mica	C-38, 39	CAPACITOR—.05 mfd. 600-V paper	R-13	RESISTOR—1 megohm, ½-W carbon	S2a, 2b	SWITCH—Tone control and power switch
C-20, 21	CAPACITOR—45 mmf., compensating capacitor	C-40	CAPACITOR—.05 mfd. 200-V paper	R-14	RESISTOR—4.7 meg., ½-W carbon	L-1	COIL—Antenna coil (all bands)
C-22a, 22b	CONDENSER—2-gang tuning condenser	C-41	CAPACITOR—.1 mfd. 200-V paper	R-15	RESISTOR—180 ohm 1-W carbon	L-2	COIL—Oscillator coil (all bands)
C-23	CAPACITOR—40 mmf., compensating capacitor	C-42	CAPACITOR—.008 mfd. 1600-V paper	R-16	RESISTOR—390,000 ohm, ½-W carbon	L-3	COIL—IF neutralizing coil
C-29	CAPACITOR—.05 mfd., 200-V paper	C-43	CAPACITOR—.02 mfd. 600 V.—AC	R-17	RESISTOR—3900 ohm, 1-W carbon	T-1	TRANSFORMER—1st I.F. transformer
C-30a	CAPACITOR—40 mfd., 300-V dry electrolytic	C-44	CAPACITOR—.05 mfd., 600-V paper	R-18	RESISTOR—3300 ohm, 2-W carbon	T-2	TRANSFORMER—2nd I.F. transformer
C-30b	CAPACITOR—50 mfd., 250-V dry electrolytic	C-45	CAPACITOR—.05 mfd. 200-V paper	R-19	RESISTOR—1000 ohm, ½-W carbon		TRANSFORMER—Output transformer
C-30c	CAPACITOR—20 mfd., 250-V dry electrolytic	C-46	CAPACITOR—470 mmf., mica	R-20	RESISTOR—470,000 ohm, ½-W carbon	T-3	TRANSFORMER—50/60 cycle power transformer (Model X-226)
		R-1	RESISTOR—33,000 ohm, ½-W carbon	R-21	RESISTOR—8.2 megohm, ½-W carbon	T-4	TRANSFORMER—25-cycle power transformer (Model X-226C)
		R-2	RESISTOR—100 ohm, ½-W carbon	R-22	RESISTOR—220 ohm, ½-W carbon	T-5	SPEAKER—6½" P.M. speaker
		R-3	RESISTOR—390,000 ohm, ½-W carbon	R-23	RESISTOR—1500 ohm, ½-W carbon		
		R-4	RESISTOR—22 ohm, ½-W carbon	R-24	RESISTOR—330 ohm, 2-W carbon		
		R-5	RESISTOR—2.2 megohm, ½-W carbon	R-25	RESISTOR—270 ohm, 2-W carbon		
				R-26	RESISTOR—3.9 meg., ½-W carbon		
				R-27	RESISTOR—1 megohm, ½-W carbon		

MODEL X-226

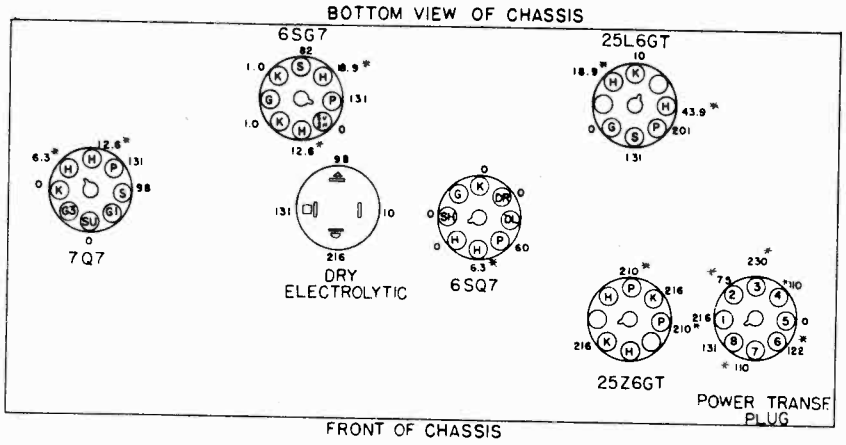
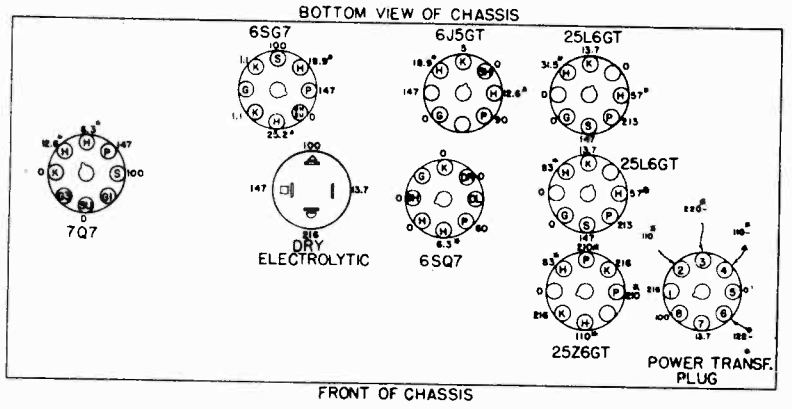


Fig. 3 Socket Voltages

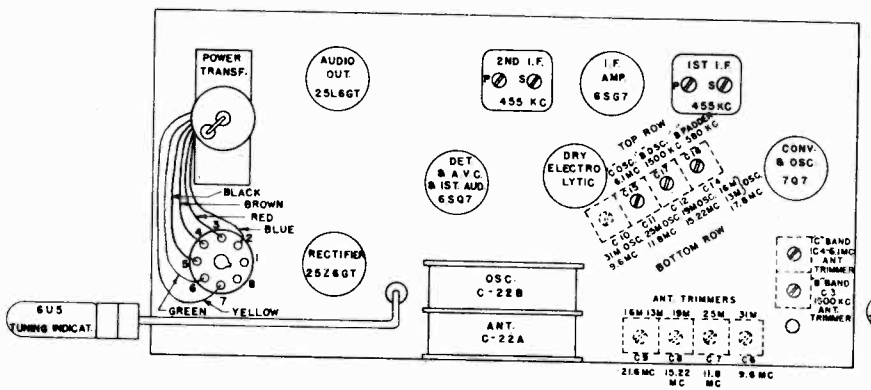
Variations of ±20% permissible. All measurements taken with R-26 shorted across.

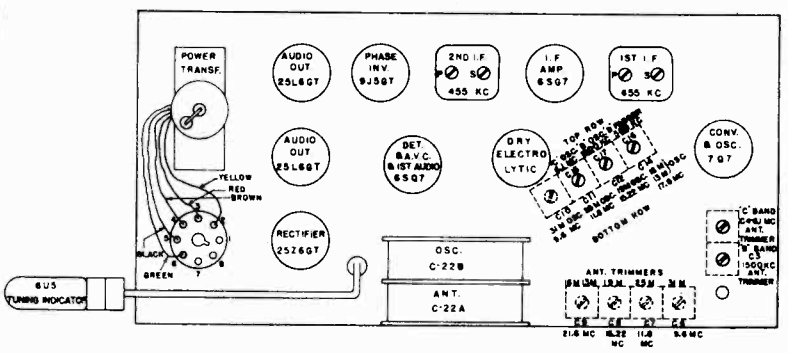
MODEL X-228

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





MODEL X-226 MODEL X-228

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. 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	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 9-10
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

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 1F 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) 1F on Converter Grid to 1F on 6SG7 grid at 455 KC—85

(d) 1F 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 and 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.

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.

MODEL X-226

CONVERSION FOR SPECIAL LINE VOLTAGES

The Model X-226 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-226, insert ballast tube resistor RR-7007, and change rating on label to read 220 volts AC/DC.

180 Volts DC—(Range 160-200 Volts)

Remove transformer from chassis of X-226, insert the ballast tube resistor RR-7008 and change rating on label so that it reads 180 volts DC.

PHONOGRAPH INSTALLATION

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 pickup 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 phonomotor power cord plug in the power supply outlet.

MODEL X-228

CONVERSION FOR SPECIAL LINE VOLTAGES

The Model X-228 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 chasis 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-228, insert ballast tube resistor RR-7003, and note change on label.

180 Volts DC—(Range 160-200 volts)

Remove transformer from chassis of X-228; insert the ballast tube resistor RR-7004 and change the label on the receiver.

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.

MODEL X-228

117 Volts DC—(Range 105-129 Volts)

Remove transformer from chassis of X-228; insert the ballast tube resistor RR-7005 and change the label on the receiver.

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-228 receiver for operation on 25-cycle circuits. Re-mark the label so that it reads Model X-228C. The special duty transformer T6 can be used in the Model X-228 receiver for operation on 50/60 cycle circuits where a 145-volt tap is required. Re-mark the label on the recever so that it reads Model X-228X.

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

MODEL X-228

PHONOGRAPH INSTALLATION

Connect the record player output leads to the terminals marked 1 and 2. The high side of the pickup is connected to terminal No. 1, while the low side or ground is connected to terminal No. 2. With some low-impedance type of pickups, a suitable matching transformer may have to be used. It is very important that the high side phono pickup lead be shielded to prevent hum interference. The shield should be connected to terminal No. 2.

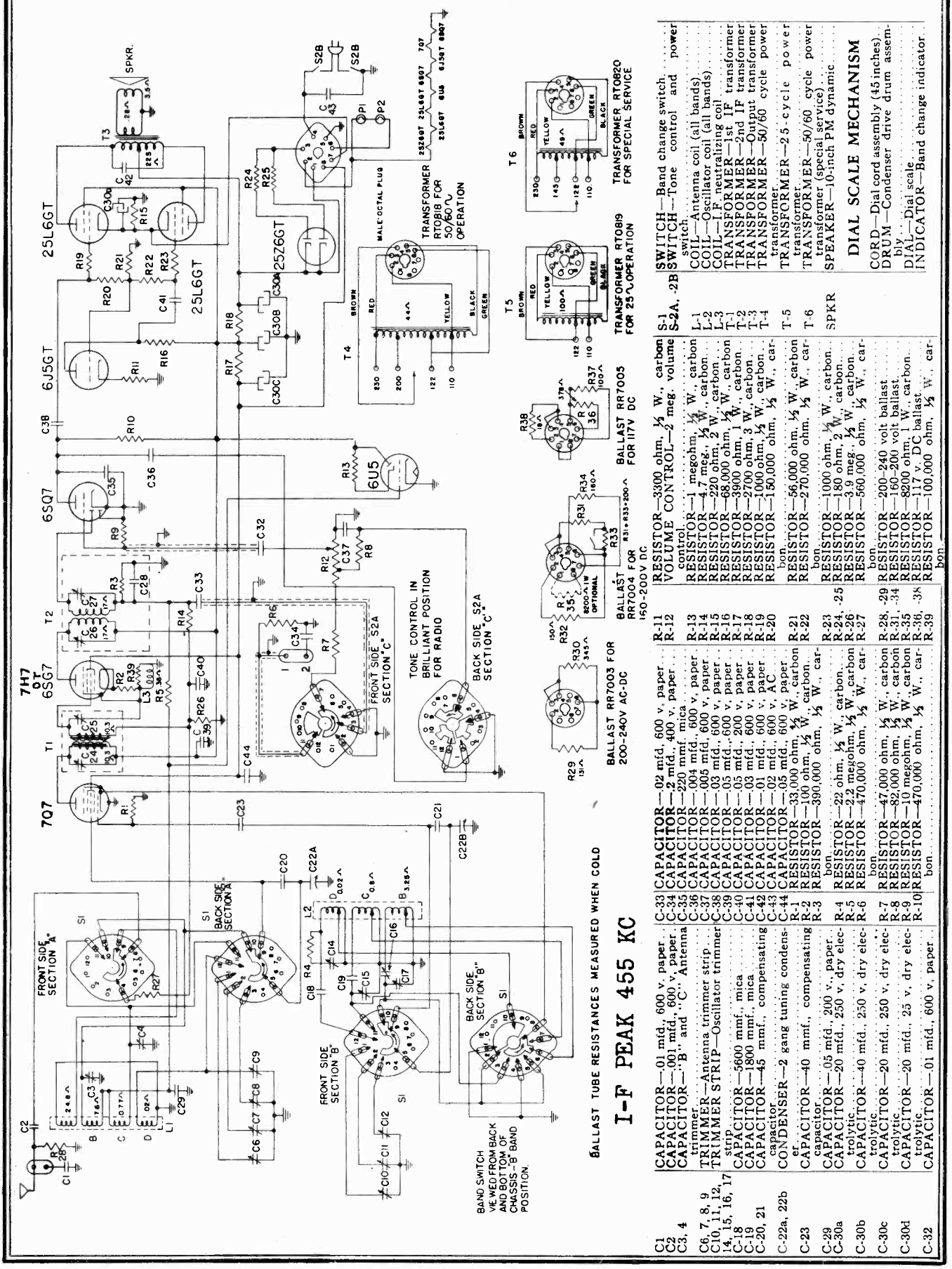
If, in operating the record player, there is appreciable hum interference, reverse the motor power-cord plug in the power-supply outlet.

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

MODEL X-228

GENERAL ELECTRIC CO.



I-F PEAK 455 KC

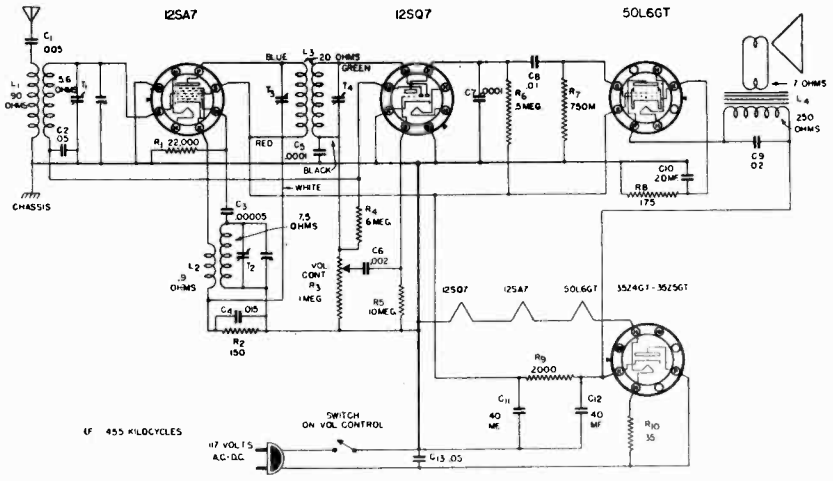
C1	CAPACITOR—.01 mfd., 600 v. paper	C-33	CAPACITOR—.02 mfd. 600 v. paper	R-11	RESISTOR—3300 ohm, ½ W., carbon	S-1	SWITCH—Band change switch
C2	CAPACITOR—.001 mfd., 600 v. paper	C-34	CAPACITOR—.2 mfd., 400 v. paper	R-12	VOLUME CONTROL—2 meg. volume control	S-2A, -2B	SWITCH—Tone control and power switch
C3, 4	CAPACITOR—"B" and "C" Antenna trimmer	C-35	CAPACITOR—220 mmf. mica	R-13	RESISTOR—1 megohm, ½ W., carbon	L-1	COIL—Antenna coil (all bands)
C6, 7, 8, 9	TRIMMER—Antenna trimmer strip	C-36	CAPACITOR—.004 mfd., 600 v. paper	R-14	RESISTOR—4.7 meg., ½ W., carbon	L-2	COIL—Oscillator coil (all bands)
C10, 11, 12, 14, 15, 16, 17	TRIMMER STRIP—Oscillator trimmer strip	C-37	CAPACITOR—.005 mfd. 600 v. paper	R-15	RESISTOR—220 ohm, 2 W., carbon	L-3	COIL—I.F. neutralizing coil
C-18	CAPACITOR—5600 mmf., mica	C-38	CAPACITOR—.03 mfd., 600 v. paper	R-16	RESISTOR—68,000 ohm, ½ W., carbon	T-1	TRANSFORMER—1st IF transformer
C-19	CAPACITOR—1800 mmf., mica	C-39	CAPACITOR—.05 mfd., 600 v. paper	R-17	RESISTOR—3900 ohm, 1 W., carbon	T-2	TRANSFORMER—2nd IF transformer
C-20, 21	CAPACITOR—45 mmf., compensating capacitor	C-40	CAPACITOR—.05 mfd., 200 v. paper	R-18	RESISTOR—2700 ohm, 3 W., carbon	T-3	TRANSFORMER—Output transformer
C-22a, 22b	CONDENSER—2 gang tuning condenser	C-41	CAPACITOR—.03 mfd., 600 v. paper	R-19	RESISTOR—1000 ohm, ½ W., carbon	T-4	TRANSFORMER—50/60 cycle power transformer
C-23	CAPACITOR—40 mmf., compensating capacitor	C-42	CAPACITOR—.01 mfd., 600 v. paper	R-20	RESISTOR—150,000 ohm, ½ W., carbon	T-5	TRANSFORMER—25-cycle power transformer
C-28	CAPACITOR—.05 mfd., 200 v., paper	C-43	CAPACITOR—.02 mfd., 600 v. AC	R-21	RESISTOR—56,000 ohm, ½ W., carbon	T-6	TRANSFORMER—50/60 cycle power transformer (special service)
C-30a	CAPACITOR—20 mfd., 250 v. dry electrolytic	C-44	CAPACITOR—.05 mfd., 600 v. paper	R-22	RESISTOR—270,000 ohm, ½ W., carbon	SPKR	SPEAKER—10-inch PM dynamic
C-30b	CAPACITOR—40 mfd., 250 v. dry electrolytic	C-45	CAPACITOR—.02 mfd., 600 v. paper	R-23	RESISTOR—1000 ohm, ½ W., carbon		
C-30c	CAPACITOR—20 mfd., 250 v. dry electrolytic	C-1	RESISTOR—33,000 ohm, ½ W., carbon	R-24, -25	RESISTOR—180 ohm, 2 W., carbon		
C-30d	CAPACITOR—20 mfd., 25 v. dry electrolytic	R-2	RESISTOR—100 ohm, ½ W., carbon	R-26	RESISTOR—3.9 meg., ½ W., carbon		
C-32	CAPACITOR—.01 mfd., 600 v. paper	R-3	RESISTOR—390,000 ohm, ½ W., carbon	R-27	RESISTOR—560,000 ohm, ½ W., carbon		
		R-4	RESISTOR—22 ohm, ½ W., carbon	R-28, -29	RESISTOR—200-240 volt ballast		
		R-5	RESISTOR—2.2 megohm, ½ W., carbon	R-31, -34	RESISTOR—160-200 volt ballast		
		R-6	RESISTOR—470,000 ohm, ½ W., carbon	R-35	RESISTOR—8200 ohm, 1 W., carbon		
		R-7	RESISTOR—47,000 ohm, ½ W., carbon	R-36, -38	RESISTOR—117 v. DC ballast		
		R-8	RESISTOR—82,000 ohm, ½ W., carbon	R-39	RESISTOR—100,000 ohm, ½ W., carbon		
		R-9	RESISTOR—10 megohm, ½ W., carbon				
		R-10	RESISTOR—470,000 ohm, ½ W., carbon				

DIAL SCALE MECHANISM

CORD—Dial cord assembly (45 inches).
DRUM—Condenser drive drum assembly.
DIAL—Dial scale.
INDICATOR—Band change indicator.

MODEL LCP-401

GENERAL ELECTRIC CO



SERVICE NOTES

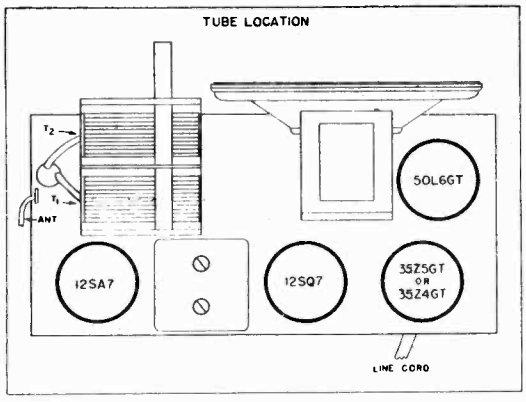
Intermediate Frequency	455 K.C.
Tuning Frequency Range	540-1720 K.C.
Audio, Power Output (Beam Power)	2 Watts
P. M. Speaker	Cone Diameter—3¾ inches
Voice Coil Impedance (400 cycles)	3.5 Ohms

OPERATING VOLTAGES (Approximately)

(Measured with respect to chassis at 117 Volt Line)

TUBES		SCREEN VOLTS*	PLATE VOLTS*
12SA7	Converter Oscillator	90	90
12SQ7	Detector—A.V.C.—1st Audio	—	45
50L6GT	Output	90	112
35Z5GT or 35Z4GT	Rectifier	Voltage at Anode 120	

*300 Volt Range of 1000 Ohm-per-Volt Meter



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 through a .05 Mfd. capacitor to lug on stator of gang condenser to which antenna coil is connected. Align the I. F. transformer trimmers, going over twice. Keep test oscillator output as low as a readable meter reading will permit.

R. F. Alignment

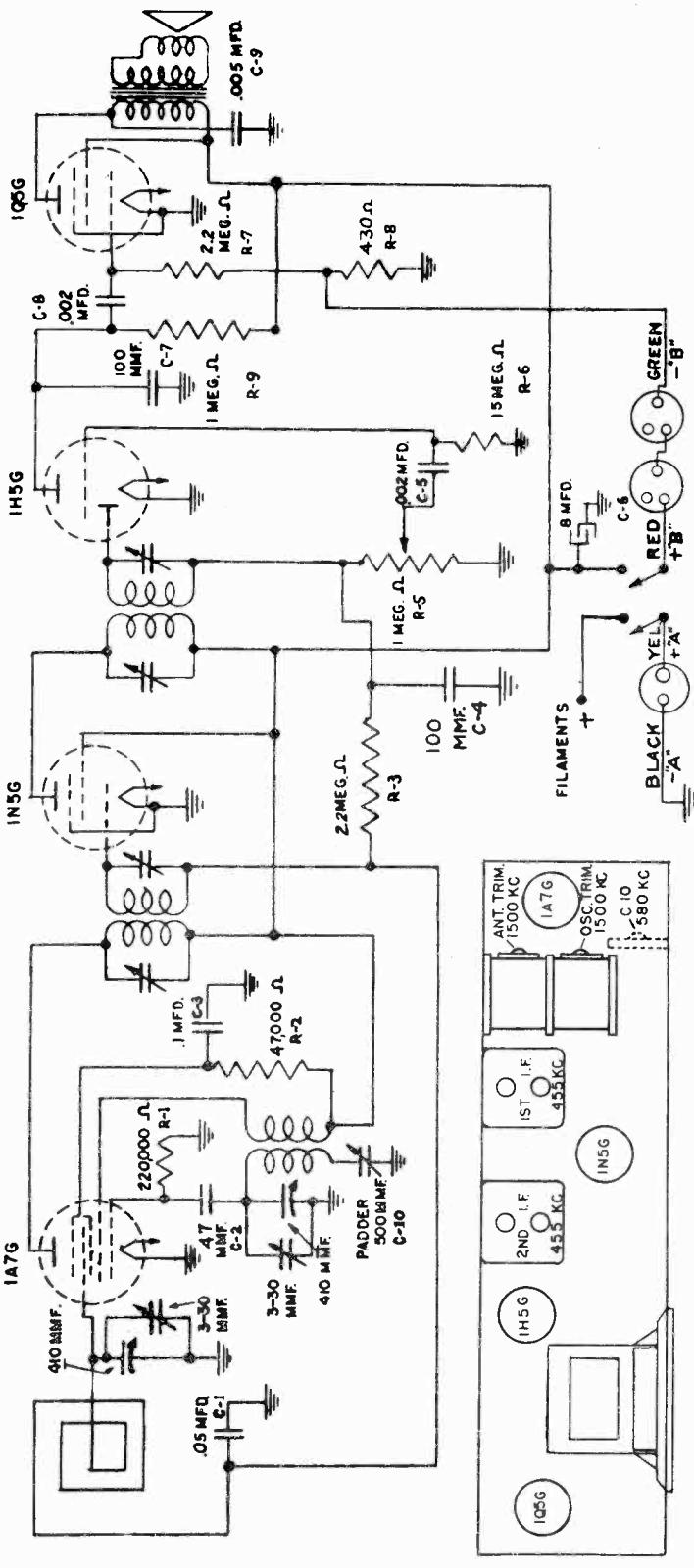
Stretch out antenna hank to its full length. Set the dial pointer and generator at 1500 K.C. Run a wire from the output terminal of the generator, having it come near the antenna wire on the receiver. However, no metallic connection is made between the signal generator and the receiver.

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 HB-410, HB-411

GENERAL ELECTRIC CO.



These receivers are designed to operate with new longer life batteries of the following types:

"A" battery - Eveready #745 or equivalent
"B" batteries - two Eveready Layerbilt #482 or equivalent

These batteries fit easily into the compartment provided with the "A" battery on the bottom and the two "B" batteries resting on the "A" battery. Insert the battery plugs firmly into their respective sockets.

Battery supplies of the following types may be used when the recommended batteries are not available:

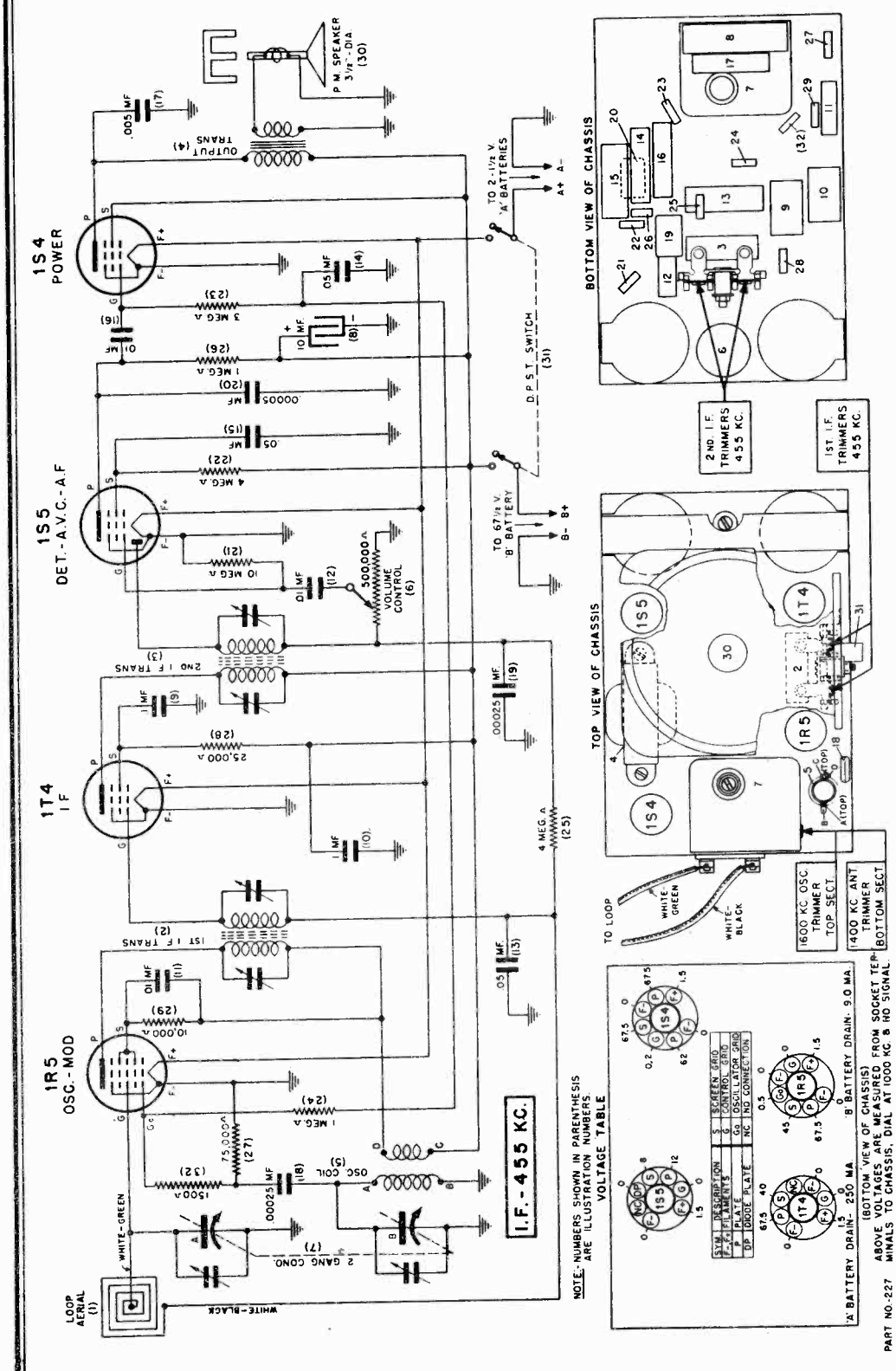
"A" supply - one, General 4-F-1 or Eveready #742 or equivalent
"B" supply - two, General V-30-AA or Eveready #738 or equivalent

Place the batteries in the compartment beneath the chassis. If separate battery supplies are used, place the "A" battery on the right side and the two "B" batteries in the remaining space. Insert the battery plugs firmly into their respective sockets.

Alignment Frequencies...IF- 455 KC
Broadcast ....1500 KC and 580 KC

NOTE:- The chassis must be removed from the carrying case when aligning. Since the location of the back cover, loop, chassis and battery affect alignment considerably, the position of these components when aligning should duplicate that found in the carrying case. A non-metallic object should be used to hold the back cover-loop assembly in position during alignment.

GENERAL ELECTRIC CO.



ALIGNMENT PROCEDURE

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

I.F. Alignment

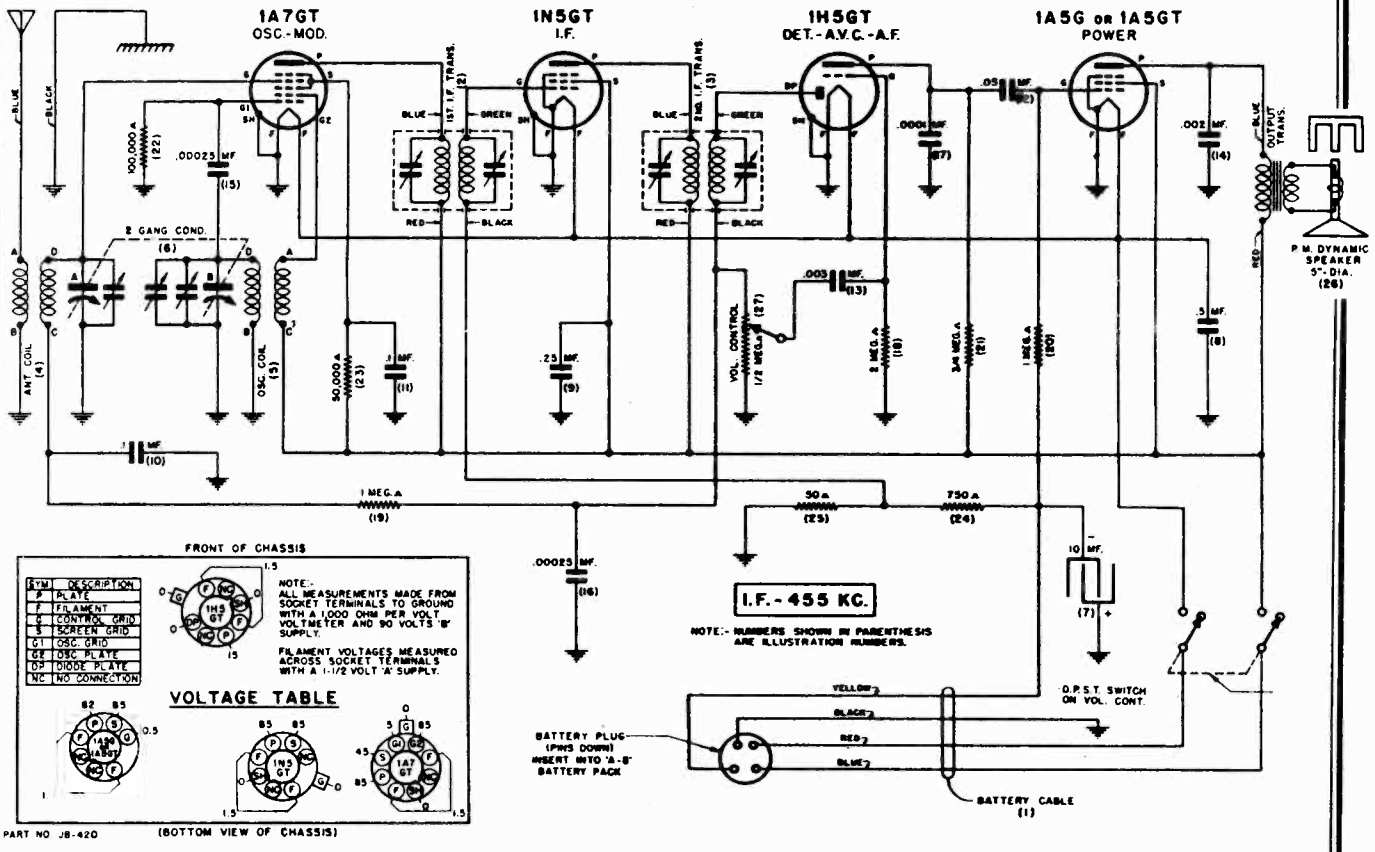
Connect an output meter across the voice coil. Rotate the volume to maximum. Set test oscillator to 455 K.C. and apply signal **to lug on** stator of gang condenser to which loop is connected through a .05 Mfd. capacitor. Align the second I.F. transformer trimmers, next adjust the first I.F. transformer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

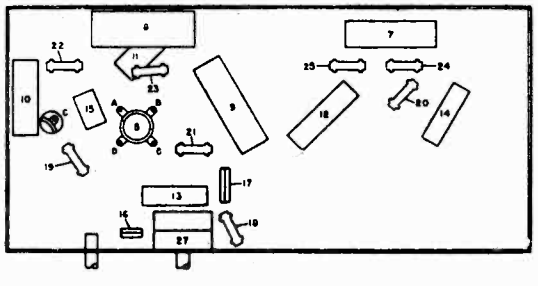
R.F. Alignment

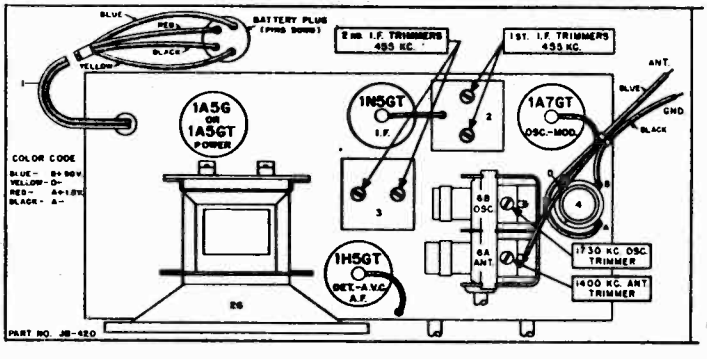
Couple test oscillator output to loop in case cover. Adjust test oscillator and receiver dial to exactly 1600 K.C. Peak 1600 K.C. oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 K.C. Then while rocking gang condenser trim 1400 K.C. antenna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

MODEL JB-420

GENERAL ELECTRIC CO.







SERVICE NOTES

Tuning Control Drive Ratio.....6:1
Battery Specifications.....Eveready No. 748 or equivalent
Intermediate Frequency.....455 K.C.
Tuning Frequency Range.....540-1730 K.C.
Maximum Power Output.....200 Milliwatts
Loud Speaker.....Cone Diameter—5 Inches
Voice Coil Impedance .....(400 Cycles) 5 Ohms
Tubes: Converter-Oscillator 1A7GT, I.F. 1N5GT, Detector A.V.C. 1H5GT, Power Output 1A5G.

ALIGNMENT PROCEDURE

Alignment Frequencies I.F. .....455 K.C.
R.F. .....1730 & 1400 K.C.

I.F. Alignment

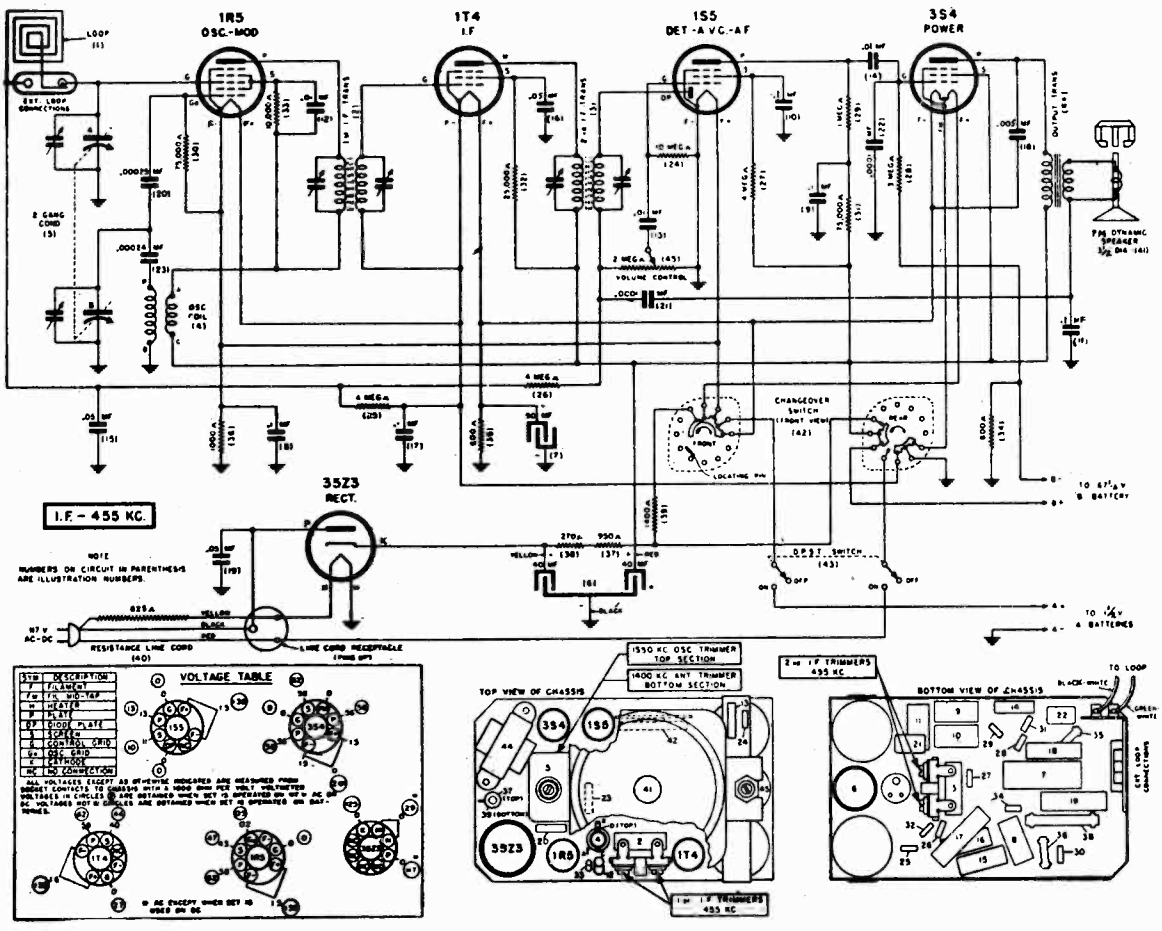
Connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 kilocycles and apply signal to control grid of 1A7GT tube through a .05 Mfd. capacitor. Align the second I.F. transformer trimmers, next adjust the first I.F. transformer trimmers. Do not remove the grid leads from the tube when applying test oscillator signal—keep the test oscillator output as low as a readable meter reading will permit.

R.F. Alignment

Attach high side of test oscillator output to blue antenna receiver lead through a .00025 Mfd. condenser, and low side to black lead. Adjust test oscillator and receiver dial to exactly 1730 kilocycles. Peak 1730 kilocycle oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 kilocycles. Then while rocking gang condenser trim 1400 kilocycle antenna trimmer for maximum output.

MODEL LB-502

GENERAL ELECTRIC CO.



SERVICE NOTES

Tuning Control Drive Ratio	6:1
Battery Specification	2-1½ Volt "A" Eveready No. 950 or Equivalent 1-67½ Volt "B" Eveready No. 647 or Equivalent
Intermediate Frequency	455 K.C.
Tuning Frequency Range	540-1550 K.C.
Maximum Power Output	Battery—120 Milliwatts AC-DC 150 Milliwatts
Loud Speaker	Cone Diameter—3 Inches
Voice Coil Impedance	(400 Cycles) 3.5 Ohms

ALIGNMENT PROCEDURE

Alignment Frequencies I.F. .....455 K.C.
R.F. .....1550 & 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.

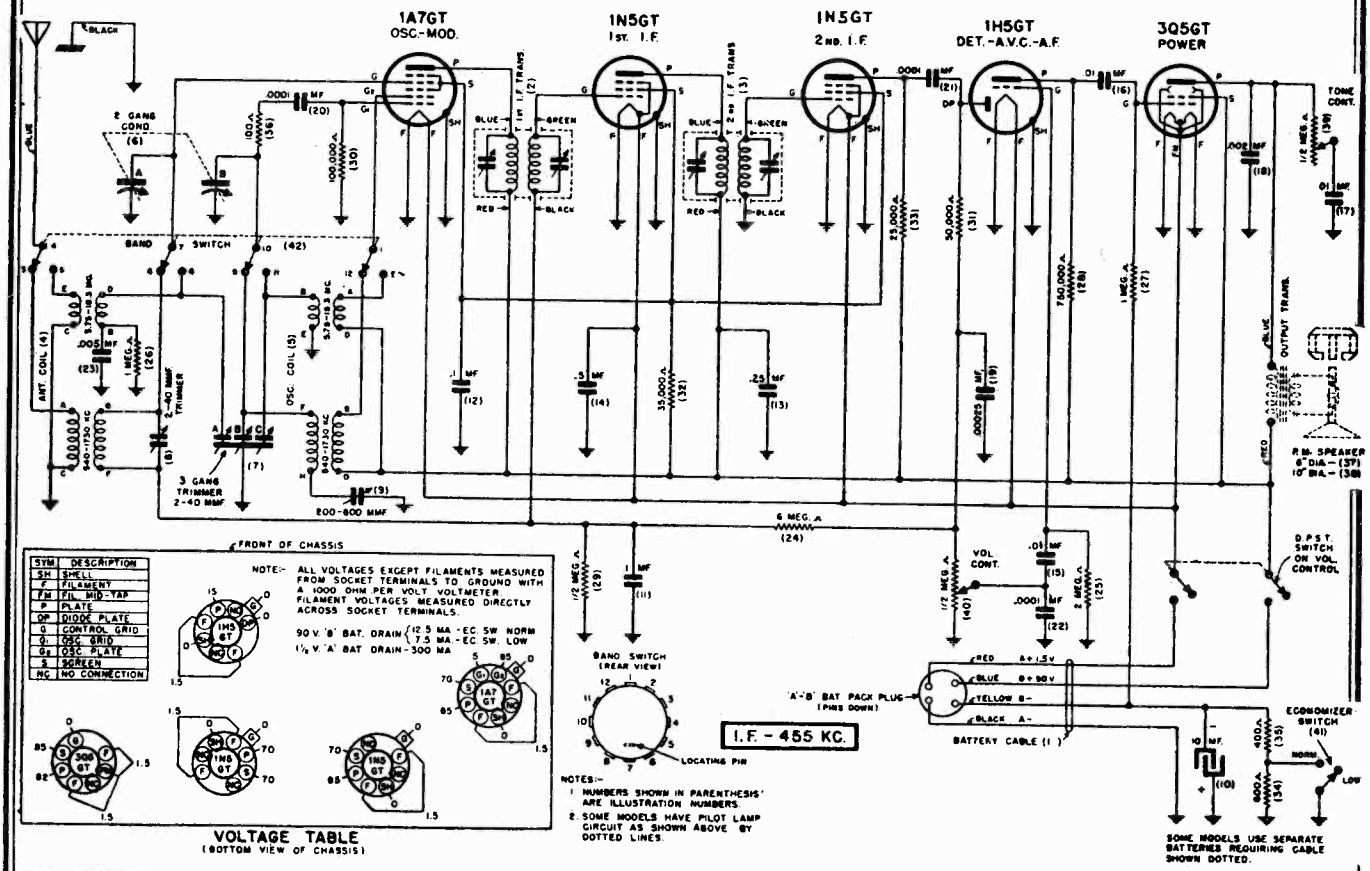
R.F. Alignment Couple test oscillator output to loop in case cover. Adjust test oscillator and receiver dial to exactly 1550 K.C. Peak 1550 K.C. oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 K.C. Then while rocking gang condenser trim 1400 K.C. antenna trimmer for maximum output.

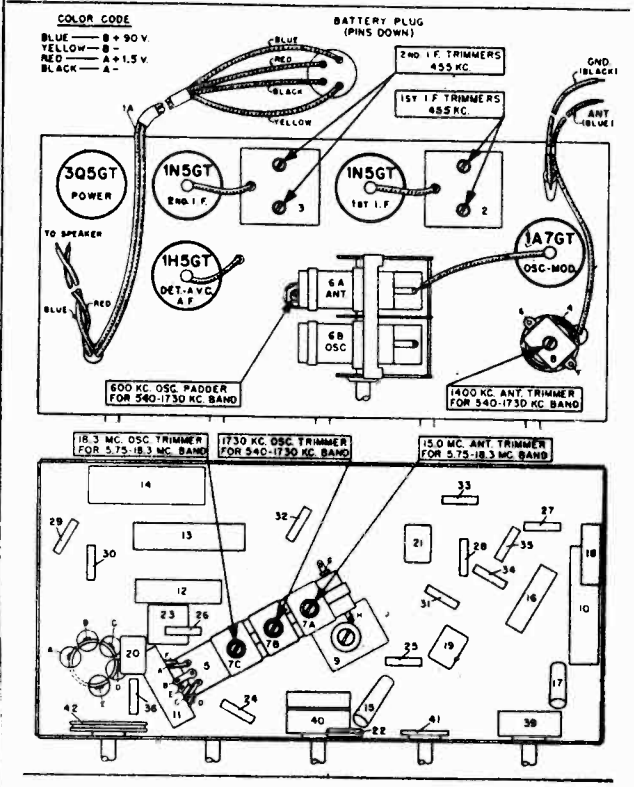
NOTE:- Oscillator coil RL-2052EX and padder condenser RC-257EX replace part No. RL-2052E Oscillator coil and RC-257E mica .00024 Mfd. padder condenser which were used in first production. It is important to remember that the RL-2052E and RL-2052EX oscillator coils and the RC-257E .00024 Mfd. and RC-257EX .000275 Mfd. condensers cannot be interchanged. When RL-2052EX coil is used the .000275 Mfd. padder condenser RC-257EX must be used. With RL-2052E oscillator coil the .00024 Mfd. condenser RC-257E must be used.

Sets having part RL-2052EX oscillator coil and RC-257EX oscillator padder condenser can be identified by the letter "A" which will be found stamped on the back of the chassis.

MODELS JB-520, JB-525

GENERAL ELECTRIC CO.





Tuning Control Drive Ratio	6:1
Battery Specifications	Eveready No. 748 or equivalent
Intermediate Frequency	455 K.C.
Tuning Frequency Range	540-1730 K.C. / 5.75-18.3 M.C.
Maximum Power Output	450 Milliwatts
Loud Speaker	Cone Dia. JB520—6 Inches
Loud Speaker	Cone Dia. JB525—10 Inches

ALIGNMENT PROCEDURE

Alignment Frequencies

I. F.	455 K.C.
R. F. 1730-540 K. C. Band	1730 & 1400 & 600 K.C.
R. F. 5.75-18.3 M. C. Band	18.3 & 15 M.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 1A7GT tube through a .05 Mfd. capacitor.

1730-540 K.C. Band R.F. Alignment

Attach high side of test oscillator output to blue antenna receiver lead through a .00025 Mfd. condenser and low side to black lead. Adjust test oscillator and receiver dial to exactly 1730 kilocycles. Peak 1730 kilocycle oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 kilocycles. Then while rocking gang condenser trim 1400 kilocycle antenna trimmer for maximum output.

Change test oscillator signal and receiver dial to 600 K.C. While rocking gang condenser trim 600 K.C. Osc. padder for maximum output.

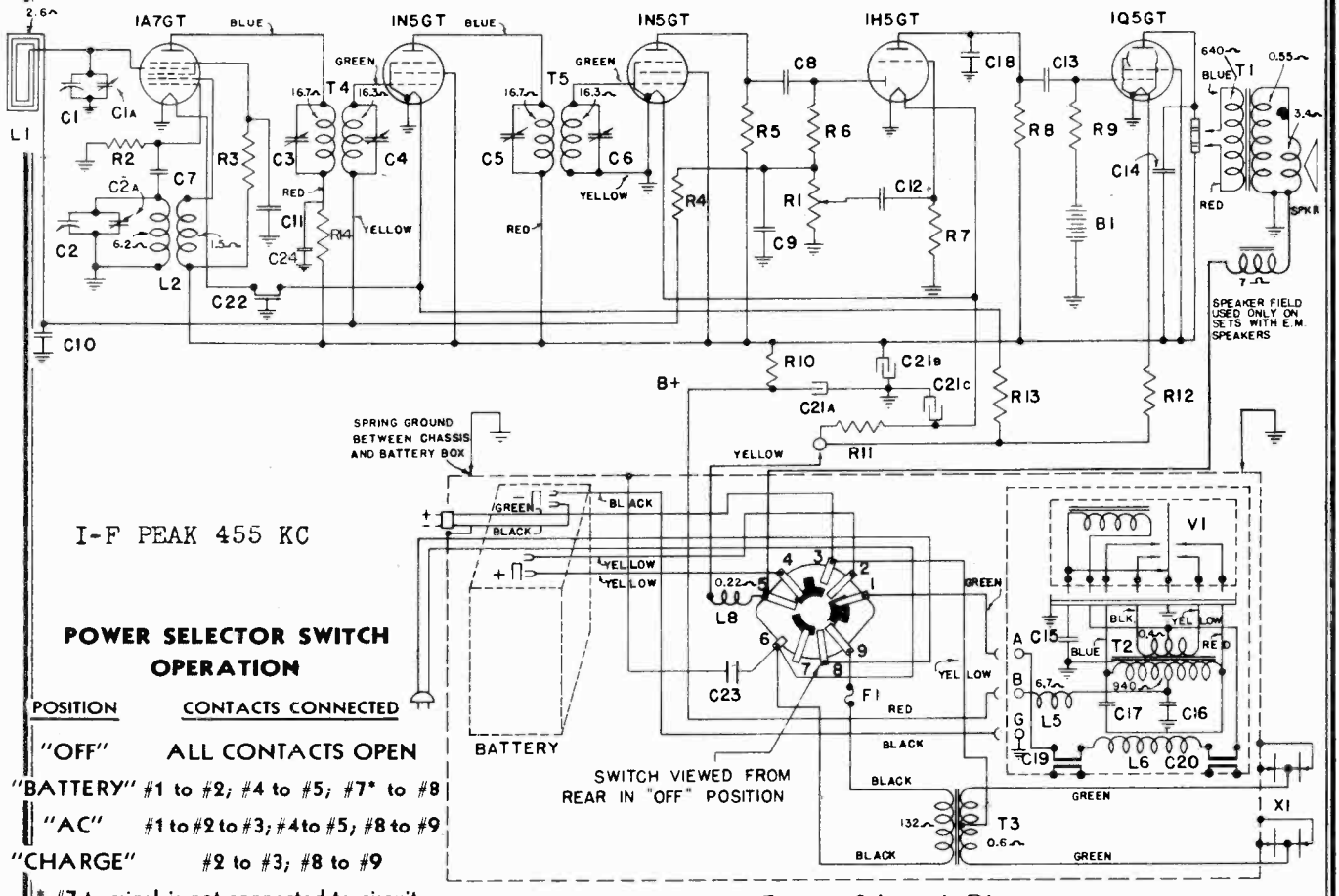
5.75-18.3 M.C. Band R.F. Alignment

Change .00025 Mfd. condenser dummy load in series with blue antenna lead to 400 ohm carbon resistor.

Adjust test oscillator and receiver dial to exactly 18.3 M.C. Peak 18.3 M.C. oscillator trimmer for maximum output. Be sure to use proper peak. If more than one peak is noticed, back off trimmer to minimum capacity, then screw down trimmer (add capacity) until the second peak —which is the proper one—is tuned in. Then while rocking gang condenser adjust 15 M.C. antenna trimmer for maximum output.

GENERAL ELECTRIC CO.

MODEL LB-530X



I-F PEAK 455 KC

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. 1. Schematic Diagram

REPLACEMENT PARTS LIST—MODEL LB-530X

Stock No.	Symbol	Description
*RC-7054	C-1, 2	CONDENSER—Tuning condenser and trimmers
*RC-216	C-7	CAPACITOR—47 mmf., mica
*RC-235	C-8, 9	CAPACITOR—100 mmf., mica
*RC-072	C-10	CAPACITOR—.05 Mfd., 200 V. paper
*RC-096	C-11	CAPACITOR—0.1 Mfd., 200 V. paper
*RC-023	C-12, 13	CAPACITOR—.005 Mfd., 600 V. paper
*RC-039	C-14	CAPACITOR—.01 Mfd., 600 V. paper
*RC-096	C-15	CAPACITOR—0.1 Mfd., 200 V. paper
*RC-072	C-16	CAPACITOR—.05 Mfd., 200 V. paper
*RC-027	C-17	CAPACITOR—.006 Mfd., 100 V. paper
*RC-235	C-18	CAPACITOR—100 mmf., mica
*RC-156A	C-19, 20	CAPACITOR—0.5 Mfd., 120 V.
*RC-5189	C-21A, 21B	CAPACITOR—15 Mfd., 150 V. dry electrolytic
	C-21C	CAPACITOR—1200 Mfd., 2 V. dry electrolytic
*RC-156A	C-22	CAPACITOR—0.5 Mfd., 120 V. paper
*RC-092	C-23	CAPACITOR—.05 Mfd., 600 V. paper
*RC-092	C-24	CAPACITOR—.05 Mfd., 600 V. paper
*RV-125	R-1	VOLUME CONTROL—0.5 megohm volume control
*RQ-1315	R-2	RESISTOR—220,000 ohm, ½ W. carbon
*RQ-1299	R-3	RESISTOR—47,000 ohm, ½ W. carbon
*RQ-1339	R-4	RESISTOR—2.2 megohm, ½ W. carbon
*RQ-1293	R-5	RESISTOR—27,000 ohm, ½ W. carbon
*RQ-1299	R-6	RESISTOR—47,000 ohm, ½ W. carbon
*RQ-1347	R-7	RESISTOR—4.7 megohm, ½ W. carbon
*RQ-1331	R-8	RESISTOR—1.0 megohm, ½ W. carbon
*RQ-1339	R-9	RESISTOR—2.2 megohm, ½ W. carbon

Stock No.	Symbol	Description
*RQ-1259	R-10	RESISTOR—1,000 ohm, ½ W. carbon
*RQ-1208	R-11, 12, 13	RESISTOR—8.2 ohm, ½ W. carbon
*RQ-1271	R-14	RESISTOR—3,300 ohm, ½ W. carbon
*RC-2056	B-1	CELL—5.0 V. bias cell assembly
*RL-5005	L-1	LOOP—Loop antenna and cover assembly
*RL-2055	L-2	COIL—Oscillator coil
*RL-367	L-5	CHOKE—B choke
*RL-366	L-6	CHOKE—Vibrator choke
*RL-365	L-8	CHOKE—Filament supply choke
*RS-3115	SW1	SWITCH—Power selector switch
*RT-4010	T-1	TRANSFORMER—Output transformer (Used with PM speaker only)
RT-4029	T-1	TRANSFORMER—Output transformer
*RT-0525	T-2	VIBRATOR—Vibrator power transformer
*RT-0528	T-3	TRANSFORMER—50-60 cycle rectifier step-down transformer
*RT-0527	T-3	TRANSFORMER—25 cycle rectifier step-down transformer (Available with PM speaker only)
*RT-393	T-4	TRANSFORMER—1st I.F. transformer
*RT-392	T-5	TRANSFORMER—2nd I.F. transformer
*RV-204	V-1	VIBRATOR—Power supply synchronous vibrator
*RR-802	X-1	RECTIFIER—Copper oxide rectifier disc
RS-1066	Spkr	SPEAKER—PM speaker
RS-1094	Spkr	SPEAKER—EM speaker

(CONT'D)

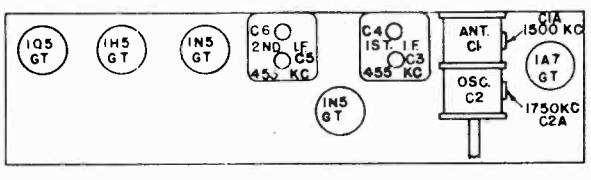


Fig. 3. Trimmer Location

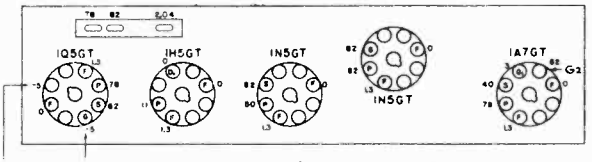


Fig. 2.

Socket Voltages

BIAS BATTERY - MEASURE WITH ZERO CURRENT VOLTMETER ONLY

POWER SWITCH ON "AC" WITH CHARGER OPERATING
BATTERY VOLTAGE - 8.1
VIBRATOR +"B" VOLTAGE - 85
DIAL AT 1000 KC., ZERO SIGNAL, ZERO VOLUME.
ALL MEASUREMENTS EXCEPT BIAS BATTERY AND FILAMENT MADE WITH 1000 OHMS PER VOLT VOLTMETER, 150 VOLT SCALE.

MODEL LB-530X
MODELS L-540, L-541, L-542
L-543, L-542M,
L-543M, L-580

GENERAL ELECTRIC CO.

MODEL LB-530X

MISCELLANEOUS PARTS (CONT'D)

*RB-1032	BOARD—External loop terminal board
*RB-1039	BOARD—2-prong male connector for LM-1 charging cable
*RB-1040	BOARD—Terminal board (located on vibrator box)
*RB-1041	BOARD—Filament and speaker lead terminal board (on chassis)
*RC-863	CORD—Power cord
*RC-2016	CLIP—Osc. coil clip
*RC-2057	CLAMP—Bias cell clamp
*RC-8217	CORD—Pointer drive cord
*RC-9039	CONE—PM speaker cone
*RC-9051	CONE—EM speaker cone
*RD-198	DIAL—Dial scale
*RE-222	ESCUTCHEON—Selector switch escutcheon
*RG-016	GRID CAP—Control grid clip
*RG-436	GRILLE—Cabinet speaker grille
*RH-124	COTTER—Hairpin cotter
*RK-1039	KNOB—Selector switch knob
*RK-1040	KNOB—Volume or tuning control knob
*RP-1019	POINTER—Dial scale pointer
*RS-219	SOCKET—Vibrator socket
*RS-238	SOCKET—Octal base tube socket
*RS-463	SPRING—Drive cord tension spring
*RS-9033	SHAFT—Tuning shaft and cotter
*RT-941	TUBE—Vent tube
*RX-101	ASSEMBLY—Fuse container assembly

* Used on previous receivers.

ALIGNMENT PROCEDURE

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

With loop swung upright to its normal operating position, 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.

SPECIFICATIONS

Physical Dimensions

Height	11¾ inches
Width	13¼ inches
Depth	4¾ inches
Weight (with battery)	16 pounds

Electrical Rating

Charging from AC Line—PM Speaker
110-125 Volts AC—50-60 cycles—6 watts
110-125 Volts AC—25-60 cycles—10 watts

Charging from AC Line—EM Speaker
110-125 Volts AC—50-60 cycles—8 watts

Receiver Power Consumption
PM Speaker—2.1 Volts DC, 1.3 amperes—2.7 watts
EM Speaker—2.1 Volts DC, 1.6 amperes—3.4 watts

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

Charging from Storage Battery (using LM-1 Charging Cable):
6.3 Volts DC ..... 1.4 amperes
Fuse: GE No. 2548—¼-ampere rating.

Tuning Frequency Range ..... 550-1750 KC

Electrical Power Output

Maximum ..... 225 milliwatts

Loud-speaker—PM Dynamic—EM Dynamic

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

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

GENERAL INFORMATION

For information regarding the rectifier and battery operation, refer to the Model LB-530 service note.

On receivers using an EM speaker an additional spliced wire runs to the speaker for the field supply. This spliced wire should be well taped at all times.

MODELS L-540, L-541, L-542, L-543, L-542M, L-543M, L-580

SPECIFICATIONS

Physical Dimensions

	Height	Width	Depth
L-540, L-541	7 5/16"	10 1/8"	6 9/16"
L-542, L-543, L-542M, L-543M	7 3/16"	10 3/8"	6 5/8"
L-580	7 5/16"	9 11/16"	6 3/16"

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 or GT
IF Amplifier	GE-12SK7 or GT
Detector, AVC, audio	GE-12SQ7 or GT
Power output	GE-50L6GT
Rectifier	GE-35Z5GT
Dial Lamp	MAZDA No. 47

GENERAL INFORMATION

All models are five-tube AC-DC superheterodyne receivers. The Models L-541, L-543, L-543M and L-580 are Underwriters' approval version of Models L-540, L-542 and L-542M.

Cabinet Description:

L-540	Non UL	Walnut wood
L-541	UL	Walnut wood
L-542	Non UL	Walnut wood
L-543	UL	Walnut wood
L-542M	Non UL	Maple wood
L-543M	UL	Maple wood
L-580	UL	Ivory Catalin with blue grille and handle.

ALIGNMENT PROCEDURE

Alignment Frequencies

IF ..... 455 KC
RF ..... 1500 KC
The location 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.

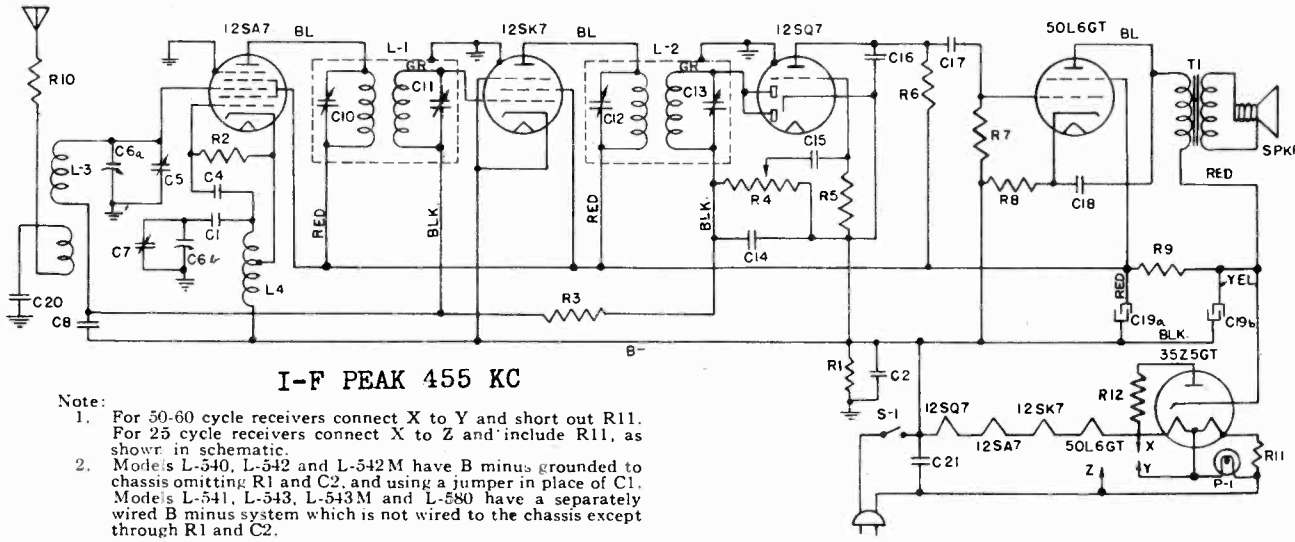
Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st IF transformers.

RF 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.)

GENERAL ELECTRIC CO.

MODELS L-540, L-541, L-542, L-543, L-542M, L-543M, L-580



I-F PEAK 455 KC

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 L-540, L-542 and L-542M have B minus grounded to chassis omitting R1 and C2, and using a jumper in place of C1. Models L-541, L-543, L-543M and L-580 have a separately wired B minus system which is not wired to the chassis except through R1 and C2.

REPLACEMENT PARTS LIST

Models L-540, L-541, L-542, L-543, L-542-M, L-543-M, L-580

Stock Number	Symbol	Description
*RC-072	C-1	CAPACITOR—.05 mfd. 200-V paper
*RC-130	C-2	CAPACITOR—0.2 mfd. 400-V paper
*RC-235	C-4	CAPACITOR—100 mmf. mica
*RC-7039	C-6a, b	CONDENSER—Tuning condenser (Includes trimmers C-5, C-7)
*RC-072	C-8	CAPACITOR—.05 mfd. 200-V paper
*RC-274	C-14	CAPACITOR—330 mmf. mica
*RC-023	C-15	CAPACITOR—.005 mfd. 600-V paper
*RC-274	C-16	CAPACITOR—330 mmf. mica
*RC-039	C-17	CAPACITOR—.01 mfd. 600-V paper
*RC-048	C-18	CAPACITOR—.02 mfd. 600-V paper
*RC-5174	C-19a C-19b	CAPACITOR—20 mfd. 150-V dry electrolytic, 30 mfd. 150-V dry electrolytic
*RC-039	C-20	CAPACITOR—.01 mfd. 600-V paper
*RC-092	C-21	CAPACITOR—.05 mfd. 500-V paper
*RQ-1319	R-1	RESISTOR—330,000 ohms, ½-W carbon
*RQ-1291	R-2	RESISTOR—22,000 ohms, ½-W carbon
*RQ-1339	R-3	RESISTOR—2.2 megohms, ½-W carbon
*RV-108	R-4, S-1	VOL. CONTROL—0.5 megohm Volume Control and power switch
*RQ-1347	R-5	RESISTOR—4.7 megohms, ½-W carbon
*RQ-1317	R-6	RESISTOR—270,000 ohms, ½-W carbon
*RQ-1323	R-7	RESISTOR—470,000 ohms, ½-W carbon
*RQ-1239	R-8	RESISTOR—150 ohms, ½-W carbon
RQ-1461	R-9	RESISTOR—1500 ohms, 1-W carbon
*RQ-1255	R-10	RESISTOR—680 ohm, ½-W carbon
*RQ-1214	R-11	RESISTOR—13 ohm, ¼-W carbon
*RQ-1365	R-12	RESISTOR—15 ohm, ¼-W carbon
*RT-3015	L-1	TRANSFORMER—1st I.F. Transformer
*RT-376	L-2	TRANSFORMER—2nd I.F. Transformer
*RL-584	L-3	BEAM-A-SCOPE—Loop antenna assembly
*RL-2068	L-4	COIL—Oscillator coil
*RS-1059	SPKR	SPEAKER—4 in. PM Speaker with transformer
*RT-4004	T1	TRANSFORMER—Output speaker transformer

Stock Number	Description
	MISCELLANEOUS PARTS
*RB-023	BOARD—4-lug terminal board
*RB-971	BACK COVER—Cabinet back cover (Model L-580)
RB-982	BACK COVER—Cabinet back cover (Models L-540, L-541)
RB-983	BACK COVER—Cabinet back cover (Models L-542, L-543, L-542M, L-543M)
*RB-1128	BRACKET—Dial lamp bracket assembly
*RC-8154	CORD—Power cord
*RC-8196	CABLE—Tuning condenser drive cable (32 inches)
*RC-9015	CONE—4-inch Speaker cone assembly
*RD-770	DIAL—Dial scale
*RF-205	FASTENER—Back cover fastener (Model L-580)
RF-207	FASTENER—Back cover fasteners (Models L-540, L-541, L-542, L-543, L-542M, L-543M)
*RF-206	FASTENER—Window fasteners
*RH-124	HAIRPIN COTTER—Tuning shaft retaining cotter
RH-806	HANDLE—Blue cabinet handle (Model L-580)
*RK-092	KNOB—Control knob (Models L-540, L-541, L-542, L-543, L-542M, L-543M)
RK-1071	KNOB—Control knob (Model L-580)
*RTN-001	NUT—Control mounting pal nut
*RP-1003	POINTER—Dial scale pointer
*RS-238	SOCKET—Octal tube socket
*RS-295	SOCKET—Dial lamp socket assembly
*RS-444	SPRING—Knob spring
*RS-463	SPRING—Drive cable tension spring
*RS-1821	SHIELD—50L6GT tube shield
*RS-9027	SHAFT—Drive shaft
*RW-053	WINDOW—Dial scale window
*RW-101	WASHER—Felt washer
RZ-294	CABINET—Ivory Catalin cabinet less back (Model L-580)

* Used on previous receivers.

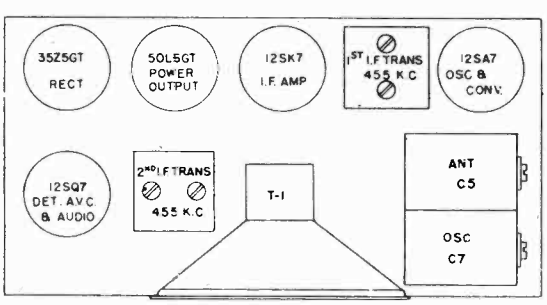


Fig. 1. Tube and Trimmer Location

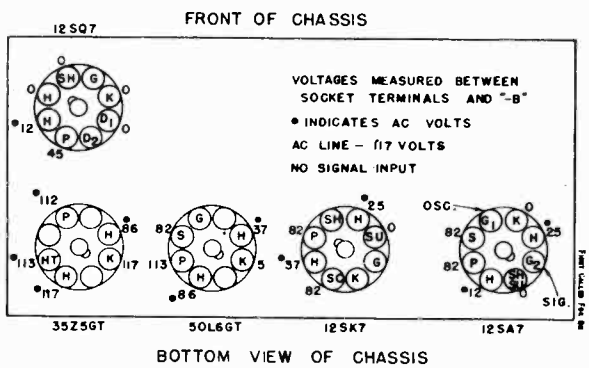
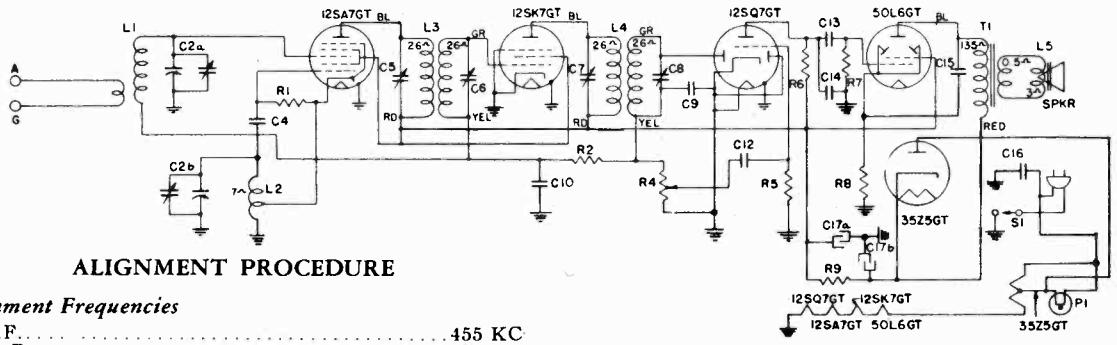


Fig. 2. Socket Voltages

MODEL JCP-562

GENERAL ELECTRIC CO.



ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ..... 455 KC
R.F. ..... 1650 and 1500 KC

The location of all trimmers is shown in Figure 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 of the 12SA7GT through a 0.05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans. Do not remove the grid lead from the 12SA7GT.

R.F. Alignment

To insert the R.F. signal use either a standard I.R.E. dummy between the signal generator and the receiver antenna post or a loop connected across the generator output which can be magnetically coupled to the receiver Beam-a-Scope. When using an I.R.E. dummy antenna for R.F. alignment, the ground lead from the signal generator to the receiver ground post should be omitted.

With the gang condenser wide open, align oscillator trimmer (C-2b) to 1650 KC. Change generator signal to 1500 KC, tune receiver to the signal and peak antenna trimmer (C-2a) 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 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 12SK7GT grid. . . . . 50 at 455 KC‡
12SK7GT 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.

The glass tubes used in the I.F. amplifier and 2nd detector stages are interchangeable with metal tubes.

Tuning Control Drive Ratio 4.5:1

Tuning Frequency Range . . . . . 540–1600 KC

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

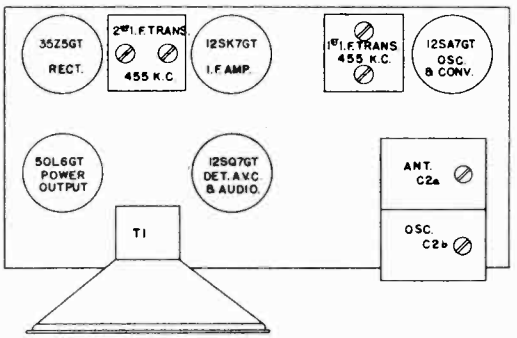


Fig. 1. Trimmer Location

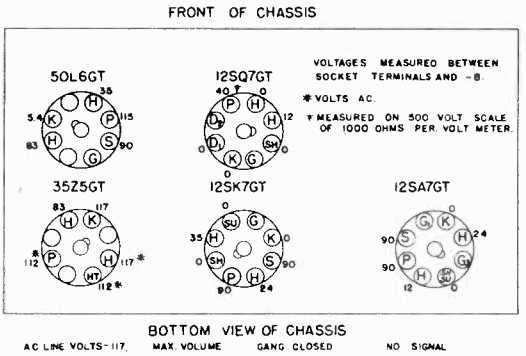


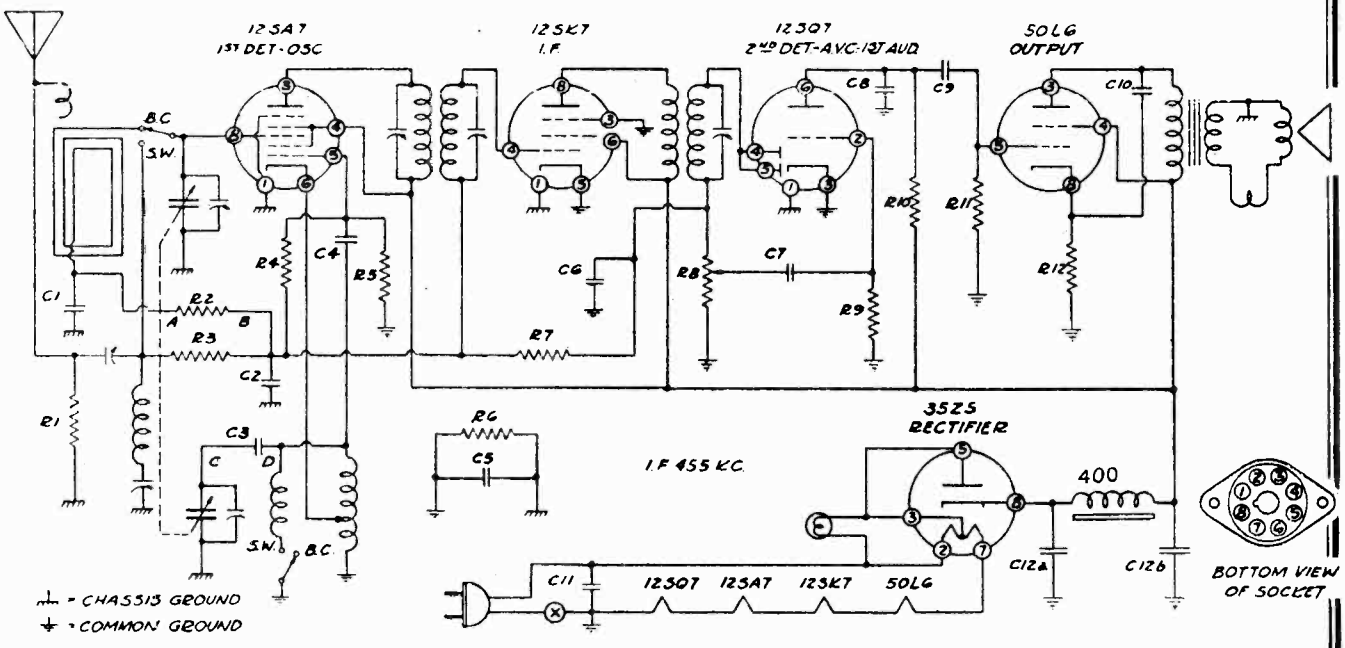
Fig. 3. Socket Voltages

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	25-140 mmf. I.F. trimmer	C-16	.05 mfd. paper capacitor	R-4	0.5 megohm volume control
C-6	25-140 mmf. I.F. trimmer	C-17a	30 mfd. 150 V. dry electrolytic	R-5	4.7 megohms carbon resistor
C-7	25-140 mmf. I.F. trimmer	C-17b	40 mfd. 150 V. dry electrolytic	R-6	470,000 ohms carbon resistor
C-8	25-140 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	.03 mfd. paper capacitor	L-4	2nd I.F. transformer		

MODEL JCP-596

GENERAL ELECTRIC CO.



RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	250,000	1/4	R8	500,000	V.C.
R3	250,000	1/4	R9	5,000,000	1/4
R4	10,000,000	1/2	R10	250,000	1/4
R5	25,000	1/4	R11	500,000	1/4
R7	2,000,000	1/4	R12	150—10%	1/4

CONDENSERS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)	Volts
C2	.05	200	C9	.01	400
C4	.0001	Mica	C10	.02	400
C6	.00025	Mica	C11	.05	400
C7	.005	400	C12a	30. Elec.	150
C8	.0005	Mica	C12b	20. Elec.	150

All common grounds become chassis grounds, C1, C3, C5, R2, and R6 are omitted.
Point "A" is connected to point "B" and point "C" to point "D."

SERVICE INFORMATION

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.....90 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" Dynamic.

Field Resistance .....400 ohms
Voice coil impedance at 400 cycles.....4.0 ohms

Oscillator and Short Wave Antenna Coil

Looking at the five terminal connection end in a clockwise direction starting at the mounting bracket, the connections are: No. 1, ground; No. 2, grid; No. 3, B.C. osc. tap; No. 4, open; No. 5, open. Looking at the other end in a clockwise direction starting at the mounting bracket, the connections are: No. 6, pad; No. 7, open; No. 8, switch; No. 9, ant.

No. 1 and No. 2—Resistance.....6.9 ohms
No. 1 and No. 3—Resistance..... .4 ohm
No. 3 and No. 2—Resistance.....6.5 ohms
No. 6 and No. 9—Resistance..... .3 ohm
No. 8 and No. 2—Resistance..... .3 ohm

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.

ALIGNMENT PROCEDURE

General Data

The alignment of this receiver requires the use of a signal generator that will cover the frequencies of 455, 600, 1400, 1630, 3000 and 6000 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

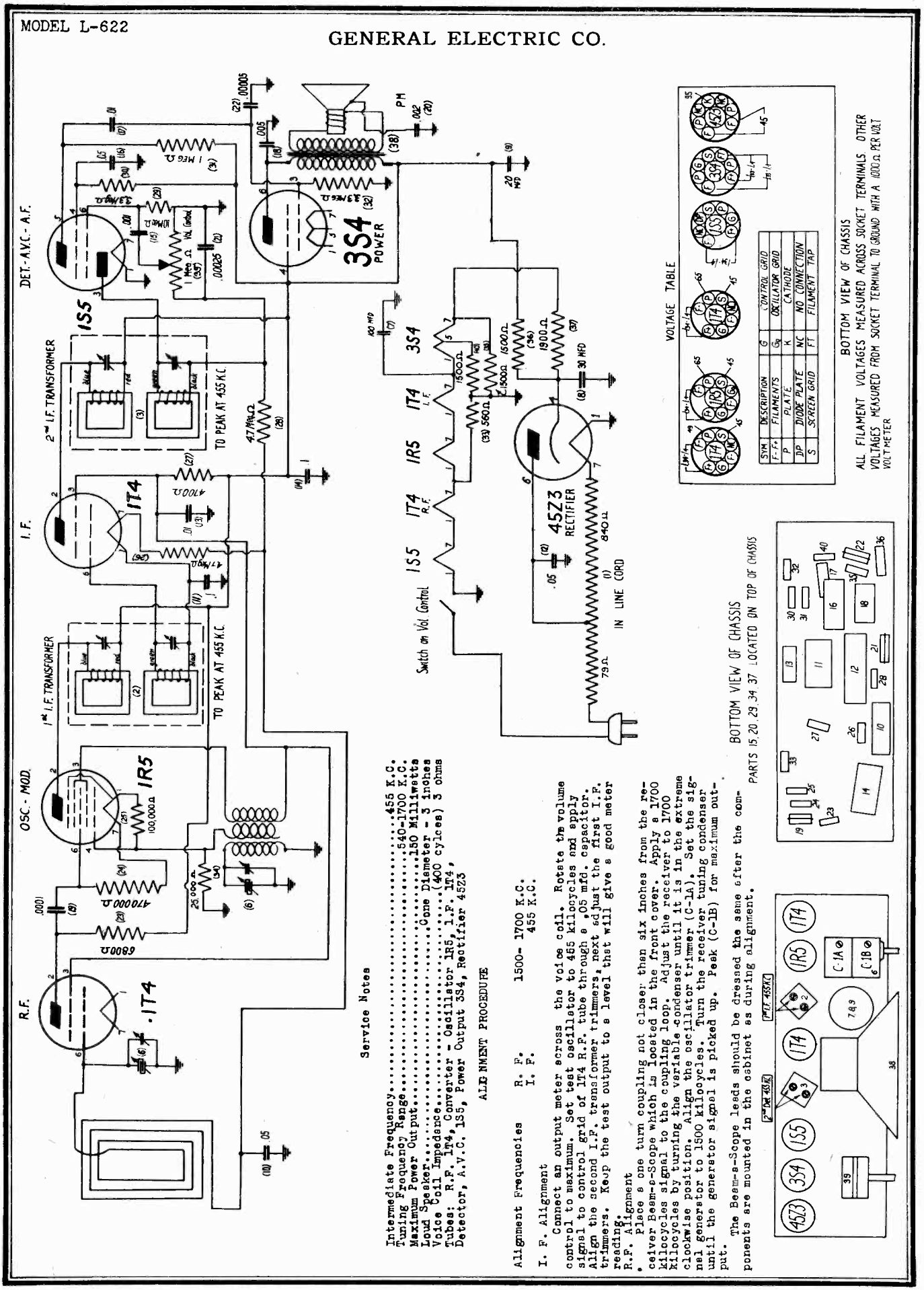
Adjust the signal generator to 1630 K.C. and connect the output to the antenna lead, through a .0002 mfd. mica condenser. Set the gang condenser to minimum capacity and adjust the oscillator trimmer to receive this signal. After this has been carefully done, the next step is to set the signal generator 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.

Short Wave Band Alignment

Set the signal generator to 6000 K.C., tune the signal and adjust the short wave antenna trimmer to give maximum output. Set the signal generator to 3000 K.C., tune the signal and then slowly increase or decrease the short wave antenna padding condenser and at the same time continuously tune back and forth across the signal with the receiver until the maximum reading is obtained on the output meter.

MODEL L-622

GENERAL ELECTRIC CO.



Service Notes

Intermediate Frequency.....455 K.C.
Tuning Frequency Range.....540-1700 K.C.
Maximum Power Output.....150 Milliwatts
Loud Speaker.....Cone Diameter - 3 inches
Voice Coil Impedance.....(400 cycles) 3 ohms
Tubes: R.F. 1T4, Converter - Oscillator 1R5, I.F. 1T4,
Detector, A.V.C. 1S5, Power Output 3S4, Rectifier 4523

ALIGNMENT PROCEDURE

Alignment Frequencies		
	R. F.	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.

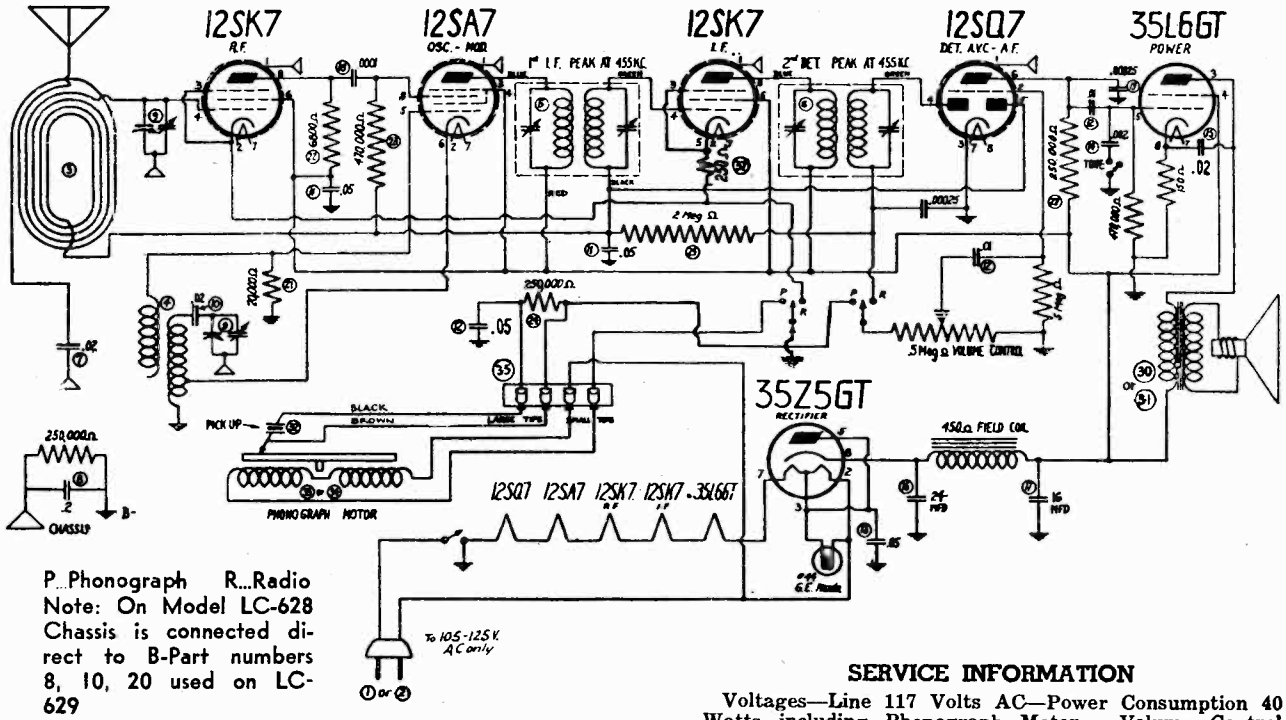
R.F. Alignment

Place a one turn coupling not closer than six inches from the receiver Beam-o-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.

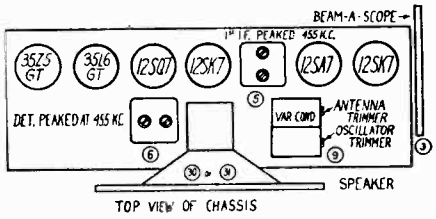
The Beam-o-Scope leads should be dressed the same after the components are mounted in the cabinet as during alignment.

GENERAL ELECTRIC CO.

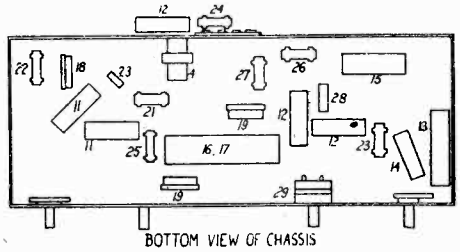
MODELS LC-628, LC-629
LC-638



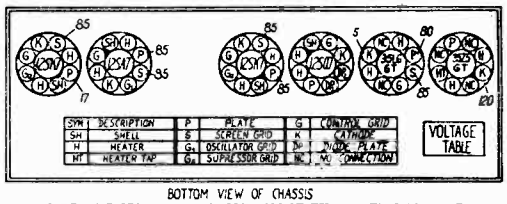
P...Phonograph R...Radio
Note: On Model LC-628 Chassis is connected direct to B-Part numbers 8, 10, 20 used on LC-629



TOP VIEW OF CHASSIS



BOTTOM VIEW OF CHASSIS



BOTTOM VIEW OF CHASSIS

ALL ABOVE VOLTAGES MEASURED FROM SOCKET TERMINAL TO CHASSIS WITH A 1000 Ω PER VOLT VOLTMETER

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 ground	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 (8) 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

SERVICE NOTES

Tuning Control Drive Radio	12:1
Power Consumption (with phono)	40 watts
Intermediate Frequency	455 K.C.
Tuning Frequency Range	540-1700 K.C.
Maximum Power Output	0.9 watts
Loud Speaker	Cone Diameter—5 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.

ALIGNMENT PROCEDURE

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

I. F. Alignment

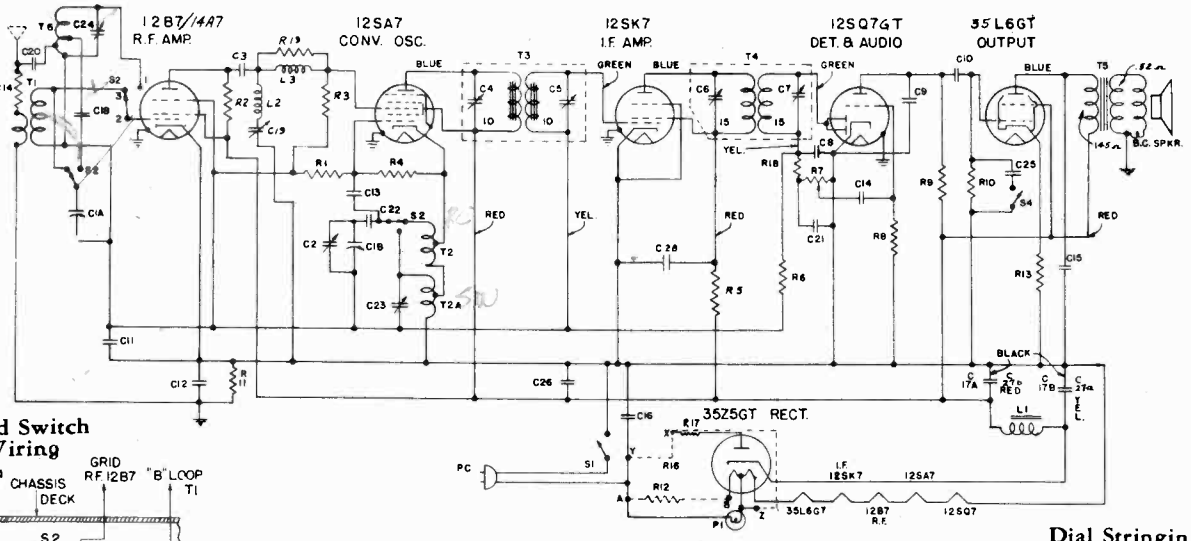
Connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 kilocycles and apply signal to control grid of 12SK7 R. F. through a .05 mfd. capacitor. Align the second I. F. transformer trimmers, next adjust the first I. F. transformer trimmers. Keep the test oscillator output to a level that will give a good meter reading.

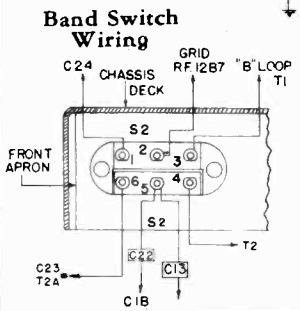
R. F. Alignment

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.

MODELS L-631, L-642, L-674

GENERAL ELECTRIC CO.



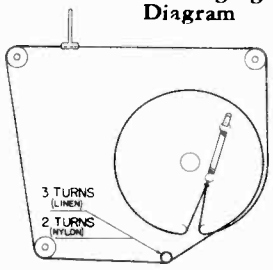


I-F PEAK 455 KC

NOTE:
On 40–60 cycle receivers, omit R12 and connect A to B and X to Z.
On 25-cycle receivers, add R12 and connect X to Y.

Fig. 3. Schematic Diagram

Dial Stringing Diagram



Stock No.	Symbol	Description
RC-7067	C1a, 1b	CONDENSER—Tuning condenser
RT-892	C2, 24	TRIMMER—"B" band oscillator and "D" band ant. trimmers
*RC-235	C3	CAPACITOR—100 mmf., mica
*RC-274	C8	CAPACITOR—330 mmf., mica
*RC-242	C9	CAPACITOR—150 mmf., mica
*RC-039	C10, 15, 26, C28	CAPACITOR—.01 mfd., 600-V paper
*RC-092	C11, 16	CAPACITOR—.05 mfd., 600-V paper
*RC-104	C12	CAPACITOR—.1 mfd., 600-V paper
*RC-216	C13	CAPACITOR—47 mmf., mica
*RC-023	C14	CAPACITOR—.005 mfd., 600-V paper
RC-5206	C17a, C17b	CAPACITOR—30 mfd., 30 mfd. 150-V electrolytic
*RC-259	C18	CAPACITOR—250 mmf., mica
RC-6569	C19	CAPACITOR—Wave trap trimmer
*RC-209	C20	CAPACITOR—39 mmf., mica
*RC-235	C21	CAPACITOR—100 mmf., mica
*RC-048	C22	CAPACITOR—.02 mfd., 600-V paper
RC-6560	C23	CAPACITOR—"D" Band oscillator trimmer
*RC-053	C25	CAPACITOR—.0032 mfd., 600-V paper
*RC-5183	C27a, C27b	CAPACITOR—60 mfd., 50 mfd., 150-V Electrolytic (25-cycle only)
*RQ-1365	R1	RESISTOR—15 megohm, ½-W carbon
*RQ-1275	R2	RESISTOR—4700 ohm, ½-W carbon
*RQ-1299	R3, 18	RESISTOR—47,000 ohm, ½-W carbon
*RQ-1295	R4	RESISTOR—33,000 ohm, ½-W carbon
*RQ-1251	R5	RESISTOR—470 ohm, ½-W carbon
*RQ-1339	R6	RESISTOR—2.2 megohm, ½-W carbon
*RV-120	R7, S1	VOL. CONTROL—0.5 megohm with power switch (Model L-674)
*RV-131	R7, S1	VOL. CONTROL—0.5 megohm with power switch (Models L-631, L-642)
*RQ-1349	R8	RESISTOR—5.6 megohm, ½-W carbon
*RQ-1315	R9	RESISTOR—220,000 ohm, ½-W carbon
*RQ-1323	R10, 11	RESISTOR—470,000 ohm, ½-W carbon
*RQ-1213	R12	RESISTOR—12 ohm, ½-W carbon
*RQ-1237	R13	RESISTOR—120 ohm, ½-W carbon
*RQ-1255	R14	RESISTOR—680 ohm, ½-W carbon
*RQ-1215	R17	RESISTOR—15 ohm, ½-W carbon
*RQ-1307	R19	RESISTOR—100,000 ohm, ½-W carbon
*RL-608	L2	COIL—Wave trap coil
RL-177	L3	COIL—Choke coil
RL-5000	T1	LOOP—"B" band loop and cabinet back assembly
RL-2077	T2	COIL—"B" band oscillator coil
RL-2078	T2A	COIL—"D" band oscillator coil
*RT-385	T3	TRANSFORMER—1st IF transformer
RT-3022	T4	TRANSFORMER—2nd IF transformer
RT-4026	T5	TRANSFORMER—Output transformer
RL-5002	T6	LOOP—"SW" band loop antenna (Model L-674)
RL-5003	T6	LOOP—"SW" band loop antenna (Models L-631, 642)
RS-1090	SPKR	SPEAKER—Electro-dynamic speaker (450 ohm field)
RS-3151	S2	SWITCH—Band change switch
*RS-3108	S4	SWITCH—Tone control switch

* Used on previous receivers.

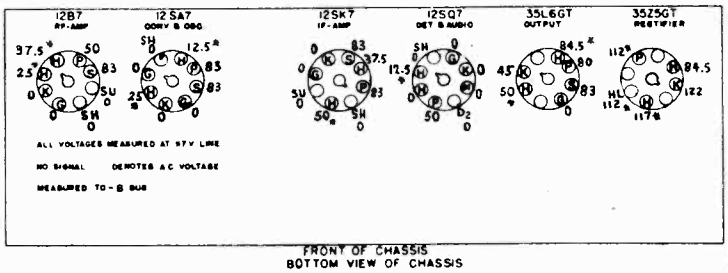


Fig. 2. Socket Voltages

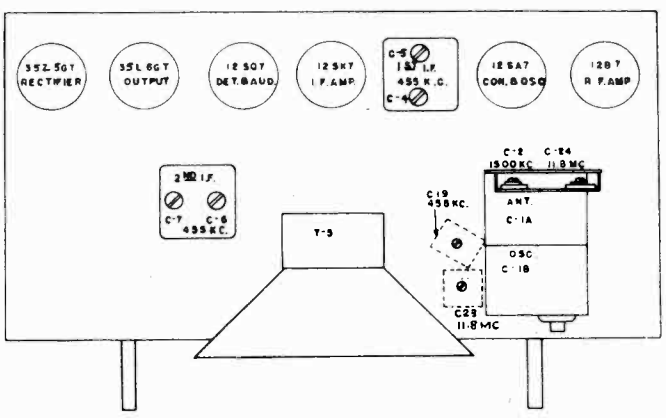


Fig. 1. Trimmer Location

SPECIFICATIONS

Models L-631, L-642 and L-674

Intermediate Frequency	455 KC
Electrical Power Output	
Undistorted	0.6 watts
Maximum	1.3 watts
Loud-speaker Electro-dynamic	
Outside cone diameter	5 inches
Voice coil impedance	3.5 ohms
Field coil resistance	450 ohms
Tubes	
RF Amplifier	G.E.–12B7/14A7
Converter, Oscillator	G.E.–12SA7
IF Amplifier	G.E.–12SK7
Demodulator, Audio, and AVC	G.E.–12SQ7GT
Audio output	G.E.–35L6GT
Rectifier	G.E.–35Z5GT
Pilot Lamp	MAZDA 51

GENERAL INFORMATION

Models L-631, L-642 and L-674 are six-tube AC-DC superheterodyne receivers which have full Underwriters' approval.

ALIGNMENT CHART

Step	Test-Osc. Connection	Test-Osc. Setting	Pointer Setting	Adjust Trimmers
1	12SK7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C6 and C7 for maximum
2	6SA7 Converter Grid in series with .05	455 KC	"BC" Band 550 KC	C4 and C5 for maximum
3	12B7 RF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C19 for minimum
4	Capacity Coupled	580 KC	"BC" Band 580 KC	C22 ** for maximum
5	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C2 **(Osc.) for maximum
6	Capacity Coupled	580 KC	"BC" Band 580 KC	C22 ** for maximum
7	Capacity Coupled	11.8 MC	"SW" Band 11.8 MC	C23 * (Osc.) to signal
8	Capacity Coupled	11.8 MC	"SW" Band 11.8 MC	C24 ** (Ant.) for maximum

* Correct peak is at low capacity.
** Rock gang condenser when making alignment.
Caution: Always use an isolating transformer in the power supply line.

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 1. All RF Trimmers are accessible through holes in the back cover or bottom of the cabinet. The alignment procedure is given in table form. All IF adjustments may be made with the chassis removed from the cabinet. However, the RF Adjustments should be 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 effects 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 the 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 will be very useful to servicemen who have available, vacuum-tube voltmeters or similar voltage-measuring instruments:

(1) Stage Gains
Antenna Post to RF Grid—5 at 1000 KC; 2.5 at 10 MC
RF Grid to Converter Grid—8 at 1000 KC, 1.8 at 10 MC
Converter Grid to IF Grid—45 at 455 KC
IF Grid to Diode Plates—75 at 455 KC

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

(3) DC voltage developed across oscillator grid resistor R4, averages 9 volts at 1000 KC or 8 volts at 10,000 KC.

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

SPECIFICATIONS

MODEL L-641

Intermediate Frequency	455 KC
Electrical Power Output	
Undistorted	3 watts
Maximum	5 watts
Loud-speaker—Electro-dynamic	
Outside Cone Diameter	5½ inches
Voice Coil Impedance (40 cycles)	3.5 ohms
Tubes	
RF Amplifier	GE-6SG7
Converter, Oscillator	GE-6SA7
IF Amplifier	GE-6SK7
Detector, 1st Audio and AVC	GE-6SQ7
Power Output	GE-6V6GT
Rectifier	GE-5Y3G
Dial Lamps	(2) MAZDA No. 44

GENERAL INFORMATION

Model L-641 is a six-tube superheterodyne receiver bearing Underwriters' Approval. In late production receivers some tubes may be supplied in glass with a metal shield instead of all metal. When it is found necessary to replace metal tubes with glass a check on alignment will be advisable. Very little change in gain will be apparent with either type provided the set is properly aligned.

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 1. All oscillator and RF trimmers are accessible through a slot in 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	5 at 1000 KC
RF Grid to Converter Grid	9 at 1000 KC
Converter Grid to IF Grid	40 at 1000 KC
Converter Grid to IF Grid	60 at 455 KC
IF Grid to diode plates	90 at 455 KC

(2) Audio Gains
.14 volts, 4000 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 volts at 10,000 KC.

Variations of ±20% permissible. All readings taken with AVC shorted out.

ALIGNMENT CHART

Step	Test-Osc. Connection	Test-Osc. Setting	Pointer Setting	Adjust Trimmers
1	6SK7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C6 & C7 for maximum
2	6SA7 Conv. Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C4 & C5 for maximum
3	6SG7 RF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C16 Wave trap for minimum
4	Capacity Coupled	580 KC	"BC" Band 580 KC	C22** (Osc.) for maximum
5	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C2** for maximum
6	Capacity Coupled	580 KC	"BC" Band 580 KC	C22** (Osc.) for maximum
7	Capacity Coupled	18 MC	"SW" Band 18 MC	C23* (Osc.) to signal
8	Capacity Coupled	18 MC	"SW" Band 18 MC	C24** (Ant.) for maximum

* Use minimum capacity peak.
** Rock gang condenser when making alignment.

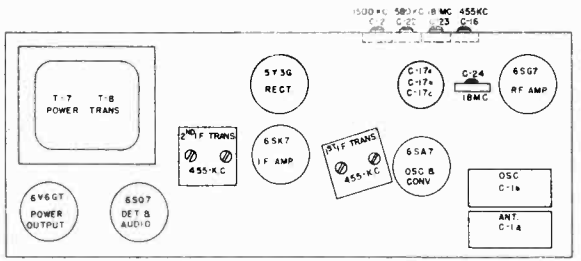


Fig. 1. Trimmer Location

← MODEL L-641 →

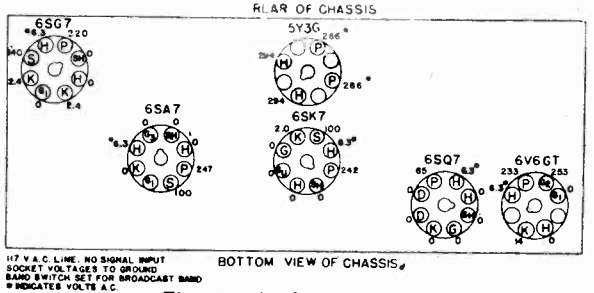
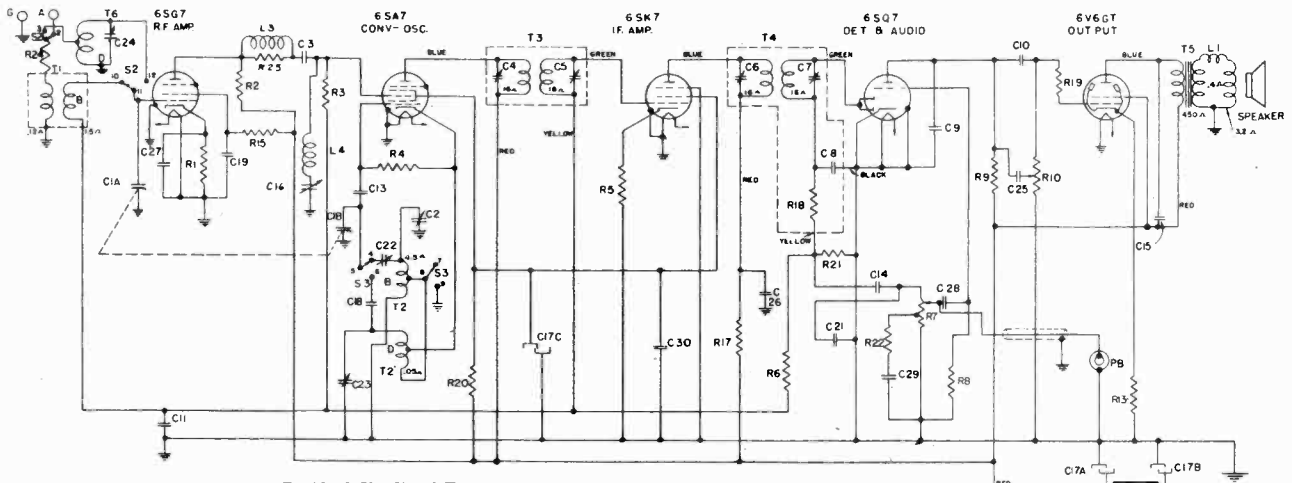


Fig. 2. Socket Voltages

MODEL L-641

GENERAL ELECTRIC CO.



I-F PEAK 455 Kc

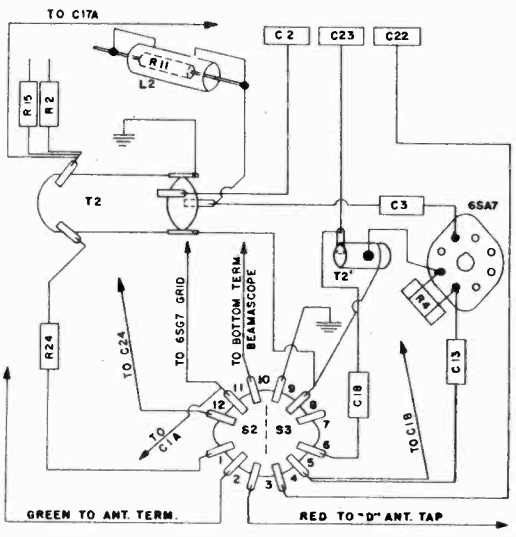


Fig. 4. Switch Wiring Diagram

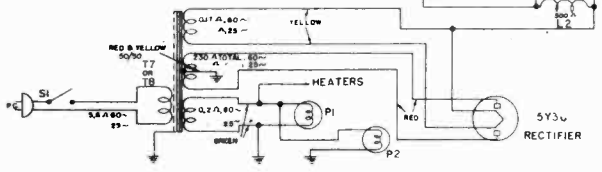


Fig. 3. Schematic

Stock No.	Symbol	Description
RC-7065	C1A, 1B	CONDENSER—Tuning condenser
*RC-6570	C2, 16, 22, 23	CAPACITOR—"B" Oscillator trimmer, Wave trap trimmer, "B"padder, and "D" oscillator trimmer
*RC-235	C3	CAPACITOR—100 mmf., mica
*RC-252	C8	CAPACITOR—200 mmf., mica
*RC-242	C9	CAPACITOR—150 mmf., mica
*RC-048	C10	CAPACITOR—.02 mfd., 600 V, paper
*RC-072	C11	CAPACITOR—.05 mfd., 200 V, paper
*RC-216	C13	CAPACITOR—47 mmf., mica
*RC-023	C14	CAPACITOR—.005 mfd., 600 V, paper
*RC-055	C15	CAPACITOR—.003 mfd., 600 V, paper
RC-5205	C17a,17b 17c	CAPACITOR—10 mfd., 350 V, 15 mfd., 350V. —10 mfd., 250 V, dry electrolytic
*RC-390	C18	CAPACITOR—3900 mmf., mica
*RC-039	C19	CAPACITOR—.01 mfd., 600 V, paper
*RC-235	C21	CAPACITOR—100 mmf., mica
*RC-6553	C24	CAPACITOR—"D" antenna trimmer
*RC-023	C25	CAPACITOR—.005 mfd., 600 V, paper
*RC-047	C26, 27, 28	CAPACITOR—.01 mfd., 400 V, paper
*RC-017	C29	CAPACITOR—.0042 mfd., 600 V, paper
*RC-039	C30	CAPACITOR—.01 mfd., 600 V, paper
*RQ-1245	R1	RESISTOR—270 ohm, ½-W, Carbon
*RQ-1275	R2	RESISTOR—4700 ohm, ½-W, Carbon
*RQ-1299	R3	RESISTOR—47,000 ohm, ½-W, Carbon
*RQ-1291	R4	RESISTOR—22,000 ohm, ½-W, Carbon
*RQ-1239	R5	RESISTOR—150 ohm, ½-W, carbon
*RQ-1339	R6	RESISTOR—2.2 megohm, ½-W carbon
RV-141	R7	VOL. CONTROL—2 meg. volume control
*RQ-1355	R8	RESISTOR—10 megohm, ½-W, Carbon
*RQ-1323	R9	RESISTOR—470,000 ohm, ½-W Carbon

* Used on previous receivers.

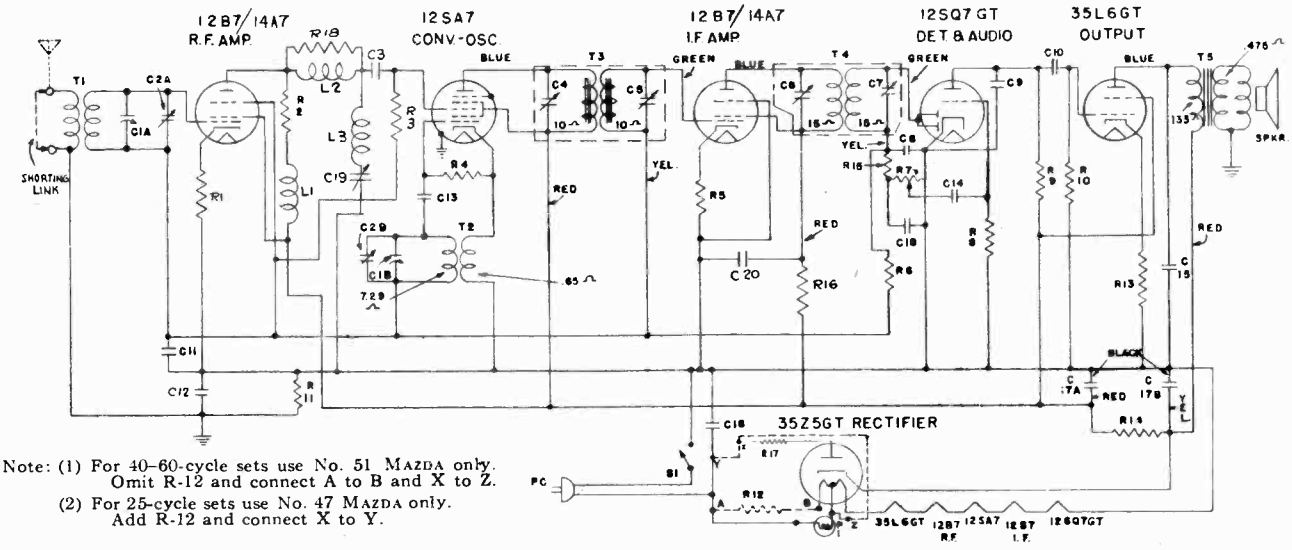
Stock No.	Symbol	Description
RT-726	R10, S1	TONE CONTROL—0.5 meg. control and power switch
*RQ-1247	R13	RESISTOR—330 ohm, ½-W, Carbon
*RQ-1299	R15	RESISTOR—47,000 ohm, ½-W, Carbon.
*RQ-1259	R17	RESISTOR—1000 ohm, ½-W, Carbon
*RQ-1299	R18	RESISTOR—47,000 ohm, ½-W, Carbon.
*RQ-1259	R19	RESISTOR—1000 ohm, ½-W, Carbon
*RQ-687	R20	RESISTOR—15,000 ohm, 2-W, Carbon
*RQ-1315	R21	RESISTOR—220,000 ohm, ½-W, Carbon
*RQ-1308	R22	RESISTOR—100,000 ohm, ½-W, Carbon
*RQ-1251	R24	RESISTOR—470 ohm, ½-W, Carbon
*RQ-1283	R25	RESISTOR—10,000 ohm, ½-W, Carbon
RL-176	L3	COIL—Peaking coil
RL-608	L4	COIL—Wave trap
RL-577	T1	BEAM-A-SCOPE—"B" band loop and cabinet back assembly
*RL-2062	T2	COIL—Osc. coil band "B"
RL-2075	T2	COIL—Osc. coil "D" band
*RT-3005	T3	TRANSFORMER—1st I.F. Transformer
*RT-3006	T4	TRANSFORMER—2nd I.F. Transformer
RT-4024	T5	TRANSFORMER—Output transformer
RL-598	T6	BEAM-A-SCOPE—"D" band loop
RT-0626	T7	TRANSFORMER—60 cycle power transformer
RT-0627	T8	TRANSFORMER—25 cycle power transformer
RS-3148	S2, S3	SWITCH—Band change switch
RS-1088	SPKR	SPEAKER—5 in. dynamic speaker

MISCELLANEOUS PARTS

*RB-009		BOARD—Single lug terminal board
*RB-013		BOARD—Two lug terminal board
*RB-026		BOARD—Antenna terminal board
*RB-093		BOARD—Six lug terminal board
*RB-209		BRACKET—Pilot lamp bracket
*RB-1030		BOARD—Phono jack board
*RC-865		CORD—Power cord
*RC-1989		CUSHION—Tuning condenser mtg. cushion
RC-8236		CORD—50-foot drive cord spool
RC-8238		CABLE—Speaker cable and plug
RC-9046		CONE—Speaker cone and voice coil assem.
*RD-426		DRUM—Condenser drive drum
RD-780		DIAL—Dial scale
*RF-207		FASTENER—Back cover fastener
RG-456		GRILLE—Cabinet grille cloth
*RK-091		KNOB—Volume or tuning knob
*RK-092		KNOB—Tone or band change knob
*RL-784		LAMP—MAZDA No. 44 pilot lamp
*RP-1027		POINTER—Dial pointer assembly
RS-2023		SOCKET—Octal tube socket
*RS-257		SOCKET—Electrolytic mtg. socket
*RS-444		SPRING—Volume or tuning knob spring
*RS-463		SPRING—Drive cord tension spring
*RS-511		SPACER—Tuning condenser mtg. spacer
*RS-265		SOCKET—Pilot lamp socket
*RS-4012		SPRING—Tone or band knob spring
RS-9047		SHAFT—Tuning shaft and clip
*RT-952		TERMINAL—SW loop tap terminal
*RW-101		WASHER—Felt washer for knobs

GENERAL ELECTRIC CO.

MODELS L-643, L-653, L-663, L-673



Note: (1) For 40–60-cycle sets use No. 51 MAZDA only. Omit R-12 and connect A to B and X to Z.

(2) For 25-cycle sets use No. 47 MAZDA only. Add R-12 and connect X to Y.

I-F PEAK 455 KC

Stock No.	Symbol	Description
*RC-7039	C1a, C1b, C2a, C2b	CONDENSER—Tuning condenser
*RC-226	C3	CAPACITOR—100 mmf., mica
*RC-242	C8	CAPACITOR—330 mmf., mica
*RC-274	C9	CAPACITOR—150 mmf., mica
*RC-039	C10, C20	CAPACITOR—.01 mfd., 600 V. paper
*RC-072	C11	CAPACITOR—.05 mfd., 200 V. paper
*RC-104	C12	CAPACITOR—0.1 mfd., 600 V., paper
*RC-216	C13	CAPACITOR—47 mmf., mica
*RC-023	C14	CAPACITOR—.005 mfd., 600 V. paper
*RC-048	C15	CAPACITOR—.02 mfd., 600 V. paper
*RC-092	C16	CAPACITOR—.05 mfd., 600 V. paper
*RC-5183	C17a, C17b	CAPACITOR—50 mfd., 60 mfd., 150 V. dry electrolytic
*RC-235	C18	CAPACITOR—100 mmf., mica
RC-6573	C19	CAPACITOR—Wave trap trimmer
*RQ-1215	R1	RESISTOR—47 ohm, ½ Watt carbon
*RQ-1275	R2	RESISTOR—4,700 ohm, ½ Watt carbon
*RQ-1299	R3	RESISTOR—47,000 ohm, ½ Watt carbon
*RQ-1295	R4	RESISTOR—33,000 ohm, ½ Watt carbon
*RQ-1235	R5	RESISTOR—100 ohm, ½ Watt carbon
*RQ-1339	R6	RESISTOR—2.2 megohm, ½ Watt carbon
*RV-120	R7, S1	VOLUME CONTROL—0.5 megohm, combined with power switch
*RQ-1349	R8	RESISTOR—5.6 megohm, ½ Watt carbon
*RQ-1323	R9, R10, R11	RESISTOR—470,000 ohm, ½ Watt carbon
*RQ-1213	R12	RESISTOR—12 ohms, ½ Watt carbon
*RQ-1239	R13, R17	RESISTOR—150 ohms, ½ Watt carbon
*RQ-651	R14	RESISTOR—1000 ohms, 2 Watt carbon
*RQ-1299	R15	RESISTOR—47,000 ohms, ½ Watt carbon
*RQ-1251	R16	RESISTOR—470 ohms, ½ Watt carbon

Stock No.	Symbol	Description
RQ-1317	R18	RESISTOR—270,000 ohm, ½ Watt carbon
RL-178	L1	COIL—Plate choke coil
RL-179	L2	COIL—Series choke coil
RL-609	L3	COIL—Wave trap coil
RL-597	T1	LOOP ANTENNA—"BC" loop and cabinet back assembly
*RL-2048	T2	COIL—Oscillator coil
*RT-385	T3	TRANSFORMER—1st I.F. transformer
*RT-386	T4	TRANSFORMER—2nd I.F. transformer
*RT-4005	T5	TRANSFORMER—Output transformer
RS-1087	SPKR	SPEAKER—5-in. PM dynamic speaker

MISCELLANEOUS PARTS

*RB-008		BOARD—2-lug terminal
*RB-013		BOARD—2-lug terminal
RB-984		BACK—Cabinet back
*RC-8081		CORD—Power cord
*RC-8224		CORD—Drive cord assembly (39-in.)
RC-9057		CONE—5-in. cone assembly
*RD-761		SCALE—Dial scale
*RF-207		FASTENER—Cabinet back fastener
*RK-091		KNOB—Control knob and spring
*RP-334		PULLEY—Dial cord pulley on speaker frame
*RP-1026		POINTER—Dial pointer
*RS-238		SOCKET—Octal base tube socket
*RS-258		SOCKET—Pilot lamp socket
*RS-2015		SOCKET—12B7 tube socket
*RS-463		SPRING—Drive cord tension spring
*RS-444		SPRING—Knob springs
*RS-9029		SHAFT—Tuning shaft and cotter
*RW-101		WASHER—Felt washer for knobs

*Used in previous receivers.

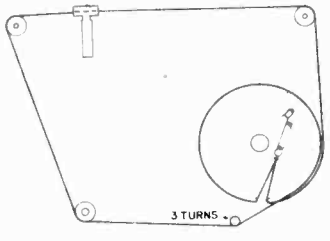


Fig. 1. Dial Stringing Diagram

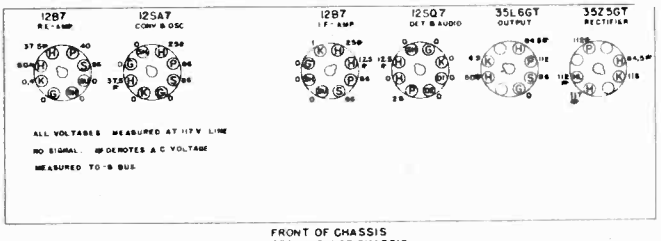


Fig. 3. Socket Voltages

MODELS L-643, L-653,
L-663, L-673
MODEL L-651

GENERAL ELECTRIC CO.

Models L-643, L-653, L-663, L-673

SPECIFICATIONS

Over-all Dimensions

	L-643 or L-663	L-653 or L-673
Height	7⅞ inches	8⅞ inches
Width	13 inches	13⅛ inches
Depth	7⅛ inches	7 inches

Electrical Rating

Rating "A"—105–125 volts AC/DC, 40–60 cycles AC, 35 watts
Rating "C"—105–125 volts AC/DC, 25 cycles AC, 35 watts

Tuning Frequency Range.....540–1720 KC.

Intermediate Frequency.....455 KC.

Electrical Power Output (117 volt line)

Undistorted.....1.0 watt
Maximum.....1.5 watts

Loudspeaker—PM Dynamic

Outside cone diameter.....5 inches
Voice coil impedance (400 cycles)..3.5 ohms

Tubes

RF Amplifier	GE-12B7/14A7
Converter-Oscillator	GE-12SA7
IF Amplifier	GE-12B7/14A7
Demodulator, Audio, and AVC	GE-12SQ7GT
Power Output	GE-35L6GT
Rectifier	GE-35Z5GT
Dial Lamp (See paragraph below)	MAZDA #47 or 51

GENERAL INFORMATION

Models L-643, L-653, L-663 and L-673 are six-tube, table model superheterodyne receivers, which are designed to operate from either an AC or DC power supply as specified on the label.

Models L-663 and L-673 are fully approved by Underwriters' Laboratories.

Use MAZDA No. 47 lamp only on 25-cycle receiver. Use MAZDA No. 51 in the 40–60-cycle receivers.

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.

Wave-trap Alignment

Apply the 455 KC signal to the grid of the 12B7/14A7 RF amplifier through a .05 mfd. capacitor. Adjust the Wave-trap trimmer C-19 for minimum output.

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—5 at 1000 KC
RF grid to converter grid—15 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.

MODEL L-651

SPECIFICATIONS

Over-all Dimensions

Height	8¾ inches
Width	13⅜ inches
Depth	7¼ inches

Electrical Rating

105–125 volts AC/DC, 50–60 cycles AC, 30 watts.

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

Intermediate Frequency.....455 KC

Electrical Power Output (117 volts)

Undistorted.....1.1 watts
Maximum.....1.6 watts

Loudspeaker—ELECTRODYNAMIC

Outside cone diameter.....5 inches
Voice coil impedance (400 cycles).....3.5 ohms
Field coil resistance.....450 ohms

Tubes

RF Amplifier	GE-12SK7
Converter-Oscillator	GE-12SA7
IF Amplifier	GE-12SK7
Detector, Audio, AVC	GE-12SQ7
Power Output	GE-35L6GT
Rectifier	GE-35Z5GT

Dial Lamp 110–125 volt, C-7 bulb, candelabra screw base

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 is 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.

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 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.

Wave Trap

Apply 455 KC signal to the grid of the 12SK7 RF Amplifier through a .05 mfd. capacitor. Adjust trimmer C29 for minimum output.

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.

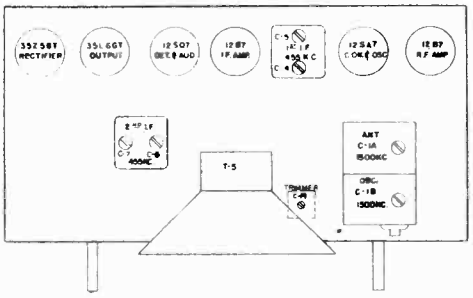


Fig. 2. Trimmer Location

MODELS L-643, L-653, L-663, L-673

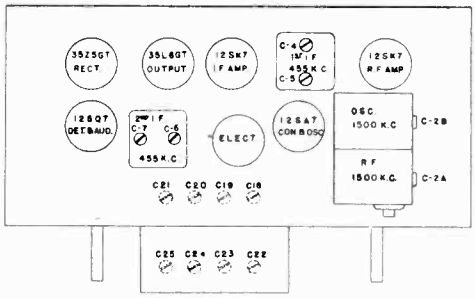
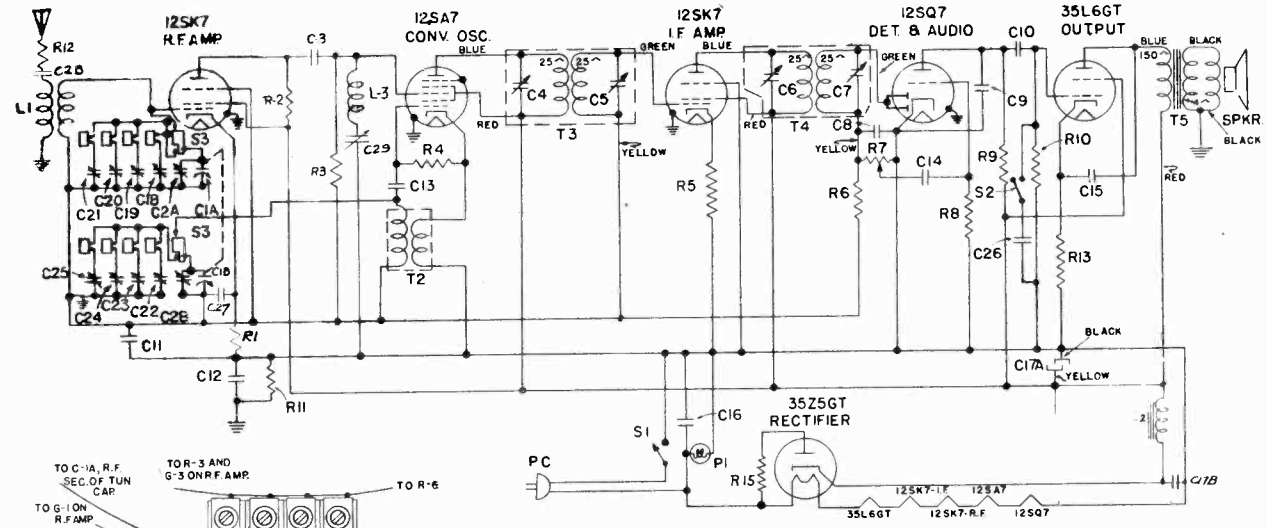
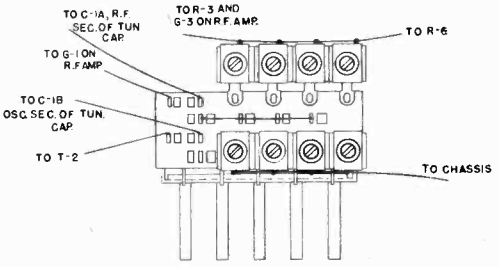


Fig. 1. Trimmer Location

MODEL L-651

GENERAL ELECTRIC CO.



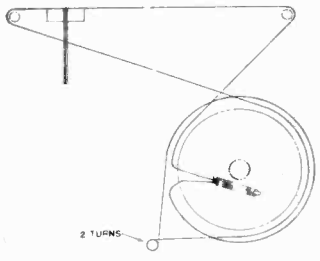


Selector Switch Wiring

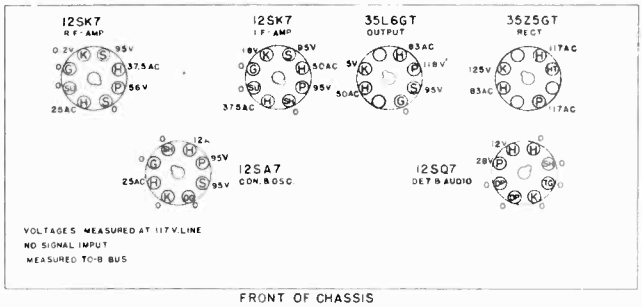
I-F PEAK 455 KC

Stock Number	Symbol	Description
*RC-7059	C1a, 1b	CONDENSER—Tuning condenser (with trimmer 2a, 2b mounted)
*RC-235	C3	CAPACITOR—100 mmf. mica
*RC-274	C8, C9	CAPACITOR—330 mmf. mica
*RC-039	C10	CAPACITOR—.01 mfd. 600-V paper
*RC-072	C11	CAPACITOR—.05 mfd. 200-V paper
*RC-104	C12	CAPACITOR—.1 mfd. 400-V paper
*RC-216	C13	CAPACITOR—47 mmf. mica
*RC-039	C14	CAPACITOR—.01 mfd. 600-V paper
*RC-048	C15	CAPACITOR—.02 mfd. 600-V paper
*RC-092	C16	CAPACITOR—.05 mfd. 600-V paper
*RC-5194	C17a, C17b	CAPACITOR—60 mfd., 50 mfd. 150-V dry electrolytic
*RT-881	C18, C19, C20, C21	TRIMMER STRIP—Station key adjustments (RF section)
*RT-882	C22, C23, C24, C25	TRIMMER STRIP—Station key adjustments (Osc. section)
*RC-016	C26	CAPACITOR—.002 mfd. 600-V paper
*RC-048	C27	CAPACITOR—.02 mfd. 600-V paper
*RC-039	C28	CAPACITOR—.01 mfd. 600-V paper
RC-6572	C29	CAPACITOR—Wave trap trimmer
*RQ-1231	R1	RESISTOR—68 ohm, ½-W carbon
*RQ-1279	R2	RESISTOR—6800 ohm, ½-W carbon
*RQ-1299	R3	RESISTOR—47,000 ohm, ½-W carbon
*RQ-1295	R4	RESISTOR—33,000 ohm, ½-W carbon
*RQ-1227	R5	RESISTOR—47 ohm, ½-W carbon
*RQ-1339	R6	RESISTOR—2.2 meg. ½-W carbon
*RV-123	R7, S1	VOL. CONTROL—0.5 meg. control and power switch
*RQ-1349	R8	RESISTOR—5.6 meg. ½-W Carbon
*RQ-1323	R9, 10, 11	RESISTOR—470,000 ohm, ½-W carbon
*RQ-1259	R12	RESISTOR—1,000 ohm, ½-W carbon
*RQ-1239	R13	RESISTOR—150 ohm, ½-W carbon
RQ-1414	R15	RESISTOR—15 ohm, 1-watt carbon
*RS-3108	S2	SWITCH—Tone control switch
*RS-3114	S3	SWITCH—Automatic tuning switch (less trimmers)
RL-596	L1	BEAM-A-SCOPE—Cabinet back and loop assembly

* Used on previous receivers.



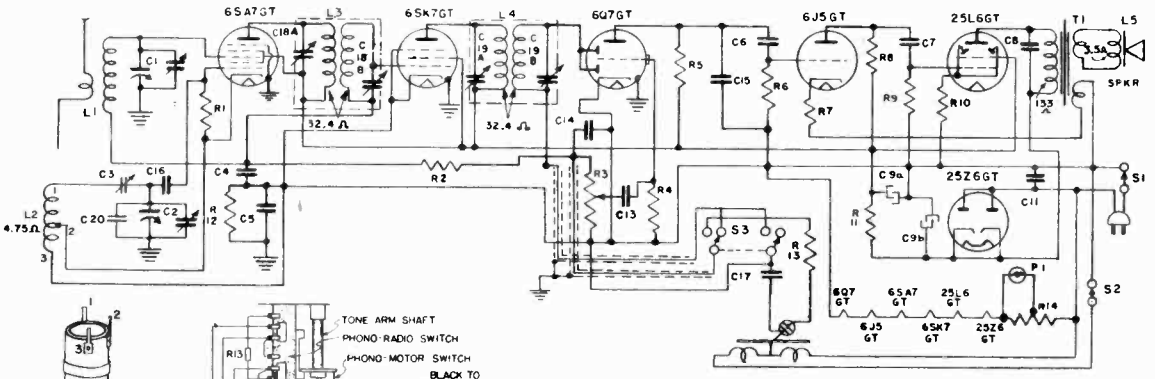
Stock Number	Symbol	Description
RL-608	L3	COIL—Wave trap coil
*RL-2053	T2	COIL—Oscillator coil and clip
*RT-3002	T3	TRANSFORMER—1st IF transformer
*RT-3003	T4	TRANSFORMER—2nd IF transformer
*RT-4008	T5	TRANSFORMER—Output transformer
RS-1086	SPKR	SPEAKER—5" Electrodynamic speaker (450 ohm field)
		MISCELLANEOUS PARTS
*RC-2047		CAM—Tone switch control cam and links
*RC-2054		CLAMP—Electrolytic capacitor mounting clamp
*RC-8081		CORD—Power cord
*RC-8215		CORD—Drive cord assembly
*RC-8531		CARDS—Station call letter cards (set)
RC-9061		CONE—Speaker cone assembly
RD-779		DIAL—Dial scale
*RF-207		FASTENER—Back cover snap fastener
RG-455		GRILLE CLOTH—Cabinet grille cloth
*RH-123		HAIRPIN COTTER—Tuning shaft retaining cotter
*RK-228		KEY—Automatic station selector key
*RK-1053		KNOB—Tone control wafer knob
*RK-091		KNOB—Volume or tuning control knob
*RM-516		MASK—Dial scale reflector flocked mask
*RP-012		PLUG—Female speaker plug
*RP-189		POINTER—Dial pointer
*RP-2016		PLATE—Dial reflector plate assembly
*RS-238		SOCKET—Octal base tube socket
*RS-444		SPRING—Control knob spring
*RS-463		SPRING—Drive cord tension spring
*RS-1821		SHIELD—Tube shield
RS-1824		SHIELD—Pilot lamp shield
*RS-2008		SOCKET—Pilot lamp socket
*RS-4012		SPRING—Station selector
*RS-9040		SHAFT—Tuning shaft and cotter
*RW-101		WASHER—Felt knob washer
*RX-099		ASSEMBLY—Chassis mounting assembly
RZ-286		CABINET—L651 cabinet (less back)

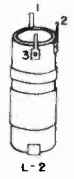


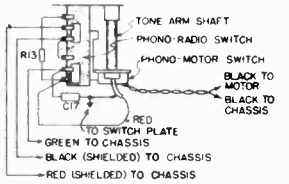
FRONT OF CHASSIS
BOTTOM VIEW OF CHASSIS

MODEL LC-679

GENERAL ELECTRIC CO.







Stock No.	Symbol	Description
*RC-7017	C-1, -2	CONDENSER—Tuning condenser
*RC-6515	C-3	CAPACITOR—Oscillator padder
*RC-072	C-4	CAPACITOR—.05 Mfd., 200 V. paper
*RC-130	C-5	CAPACITOR—0.2 Mfd., 400 V. paper
*RC-023	C-6, -7	CAPACITOR—.005 Mfd., 600 V. paper
*RC-039	C-8	CAPACITOR—.01 Mfd., 600 V. paper
*RC-5145	C-9a	CAPACITOR—30 Mfd., 150 V.
*RC-5145	C-9b	CAPACITOR—50 Mfd., 150 V.
*RC-092	C-11	CAPACITOR—.05 Mfd., 600 V. paper
*RC-060	C-13	CAPACITOR—.03 Mfd., 600 V. paper
*RC-293	C-14	CAPACITOR—470 Mmf., mica
*RC-250	C-15	CAPACITOR—220 Mmf., mica
*RC-216	C-16	CAPACITOR—47 Mmf., mica
*RC-104	C-17	CAPACITOR—0.1 Mfd., 400 V. paper
*RC-226	C-20	CAPACITOR—10 Mmf., mica
*RQ-1295	R-1	CAPACITOR—33,000 ohms, ½ W. carbon
*RQ-1339	R-2	RESISTOR—2.2 megohm, ½ W. carbon
RV-119	R-3, S-1	VOLUME CONTROL—0.5 megohm potentiometer
*RQ-1365	R-4	RESISTOR—15 megohm, ½ W. carbon
*RQ 1323	R-5	RESISTOR—470,000 ohms, ½ W. carbon
*RQ-1331	R-6	RESISTOR—1.0 megohm, ½ W. carbon
*RQ-1271	R-7	RESISTOR—3,300 ohms, ½ W. carbon
*RQ-1297	R-8	RESISTOR—39,000 ohms, ½ W. carbon
*RQ-1323	R-9	RESISTOR—470,000 ohms, ½ W. carbon
*RQ-1239	R-10	RESISTOR—150 ohms, ½ W. carbon
*RQ-1459	R-11	RESISTOR—1,000 ohms, 1 W. carbon
*RQ-1323	R-12	RESISTOR—470,000 ohms, ½ W. carbon
*RQ-1307	R-13	RESISTOR—100,000 ohms, ½ W. carbon
*RR-773	R-14	RESISTOR—BL42B ballast resistor
*RL-528	L-1	LOOP—Built-in antenna and back cover assembly
*RL-2016	L-2	COIL—Oscillator coil
*RT-341	L-3	TRANSFORMER—1st I.F. transformer
*RT-342	L-4	TRANSFORMER—2nd I.F. transformer
*RT-475	T-1	TRANSFORMER—Output transformer

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

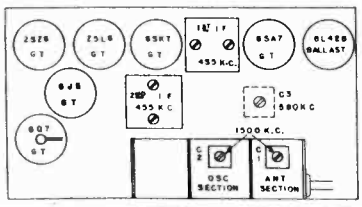
Loud-speaker—PM Dynamic

Outside cone diameter.....6.5 inches
Voice coil impedance (400 cycles).....3.5 ohms

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.

Precaution

If the signal generator is A-C 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 A-C 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.

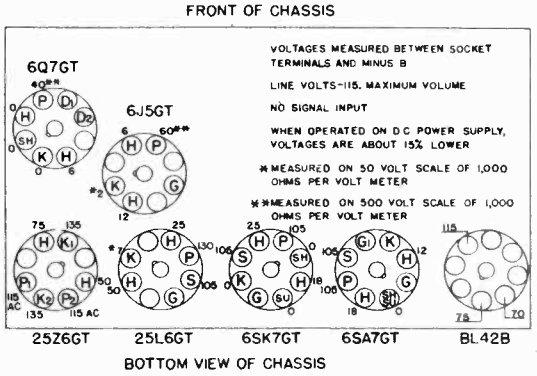
(3) D-C voltage developed across oscillator grid resistor (R-1) averages 12 volts.

* Variations of ±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 L-740
(REVISED)

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 inches
Voice Coil Impedance (400 cycles) ..... 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

GENERAL INFORMATION

These service notes contain data on both early (†) and late (‡) productions of this receiver, replacing and correcting any preceding data. The main difference is that the late production contains a wave trap and peaking coil between the RF and converter stages. For early production receivers eliminate step 3 in alignment chart and use Fig. 1. For alignment of late production receivers, use Fig. 2. In all cases the symbol designations remain the same but the physical locations of trimmers are changed.

ALIGNMENT PROCEDURE

The location of trimmers is shown below. All oscillator and RF trimmers are accessible through a slot through the back cover of the cabinet.

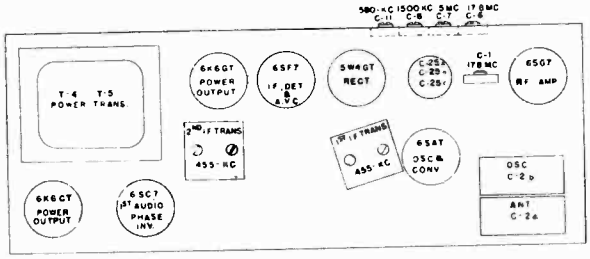


Fig. 1 Trimmer Location (†)

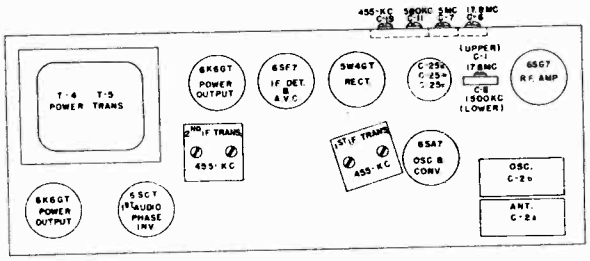


Fig. 2 Trimmer Location (‡)

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	Test-Osc. Connection	Test-Osc. Setting	Pointer Setting	Adjust Trimmers
1	6SK7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C17 and C16 for maximum
2	6SA7 Conv. Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C14 and C13 for maximum
‡3	6SG7 RF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C19 Wave trap for minimum
4	Capacity coupled	580 KC	"BC" Band 580 KC	C11 ** for maximum
5	Capacity coupled	1500 KC	"BC" Band 1500 KC	C8 ** (Osc.) for maximum
6	Capacity coupled	580 KC	"BC" Band 580 KC	C11 ** for maximum
7	Capacity coupled	5 MC	"SW1" Band 5MC	C7 ** (Osc.) for maximum
8	Capacity coupled	18 MC	"SW2" Band 18 MC	C6 * (Osc.) to signal
9	Capacity coupled	18 MC	"SW2" Band 18 MC	C1 ** (Ant.) for maximum

*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	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.

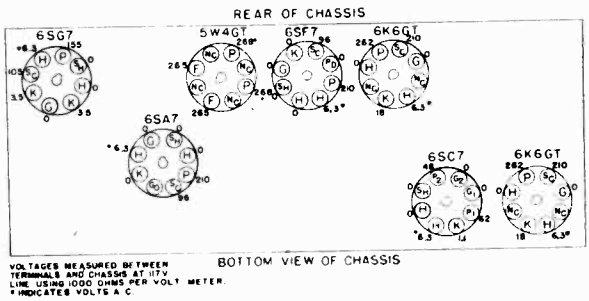
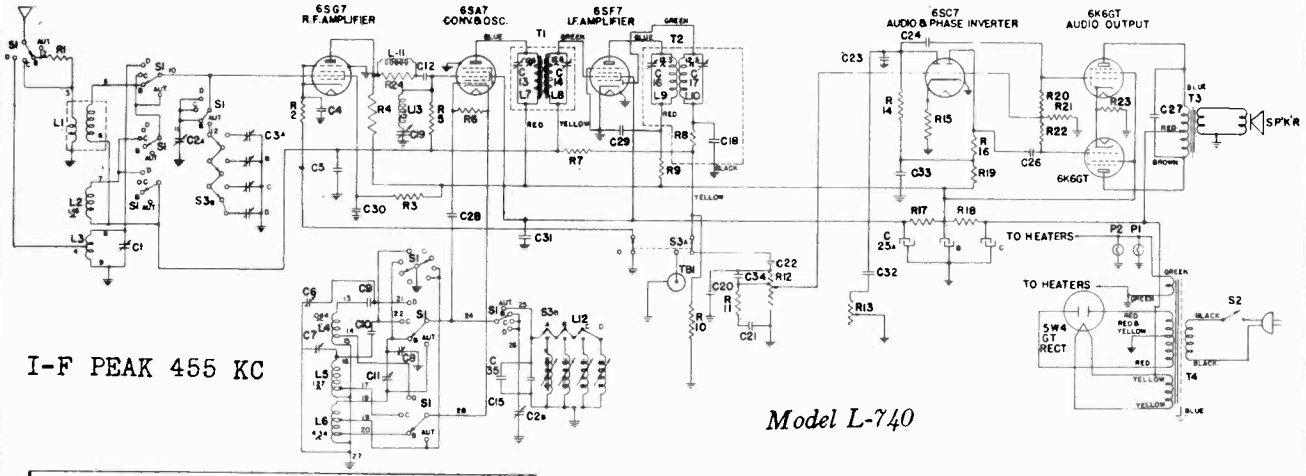


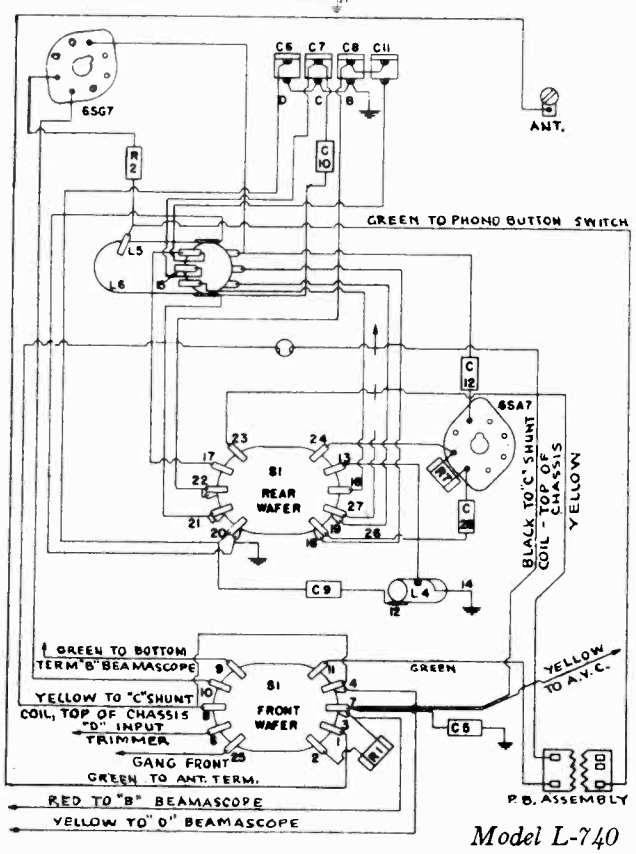
Fig. 3 Socket Voltages († and ‡)

MODEL L-740
(REVISED)

GENERAL ELECTRIC CO.



Model L-740



Model L-740

Models LC-759, LC-759B and LC-768

MODEL L-740

Stock No.	Symbol	Description
†RC-6553	C-1	CAPACITOR—"D" Band Ant. Trimmer
‡RC-6565	C-1, 8	CAPACITOR—"D" Ant. and "B" Osc. trimmers
RC-7061	C-2a, C-2b	CONDENSER—2 gang condenser
RT-885	C-3a, b, c and d	TRIMMER STRIP—Push button trimmer strip
*RC-039	C-4	CAPACITOR—.01 mfd. 600 volt paper
*RC-072	C-5	CAPACITOR—.05 mfd. 200 volt paper
†RC-6555	C-6, 7, 8, 11	CAPACITOR—"B", "C" and "D" osc. trimmer and "B" padder
‡RC-6566	C-6, 7, 11, 19	CAPACITOR—"D" and "C" Osc. trimmer, "B" padder and wave trap trimmer

* Used on previous receivers.
† Early production only.
‡ Late production only.

Stock No.	Symbol	Description
*RC-393	C-9	CAPACITOR—4700 mmf., mica
*RC-349	C-10	CAPACITOR—2000 mmf., mica
*RC-235	C-12	CAPACITOR—100 mmf., mica
RC-305	C-15	CAPACITOR—600 mmf., silvered mica
*RC-252	C-18	CAPACITOR—200 mmf., mica
*RC-235	C-20	CAPACITOR—100 mmf., mica
*RC-049	C-21	CAPACITOR—.004 mfd., 600 V, paper
*RC-023	C-22	CAPACITOR—.005 mfd., 600 V, paper
*RC-249	C-23	CAPACITOR—220 mmf., mica, 500 V.
*RC-048	C-24	CAPACITOR—.02 mfd., 600 V, paper
RC-5198	C-25a	CAPACITOR—10 mfd., 250 V, dry electrolytic
	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
*RC-011	C-27	CAPACITOR—.002 mfd., 600 V, paper
*RC-216	C-28	CAPACITOR—47 mmf., mica
*RC-039	C-29, 30, 31	CAPACITOR—.01 mfd., 600 V, paper
*RC-023	C-32	CAPACITOR—.005 mfd., 600 V, paper
*RC-104	C-33	CAPACITOR—0.1 mfd., 600 V, paper
*RC-216	C-34	CAPACITOR—47 mmf., mica
*RC-329	C-35	CAPACITOR—150 mmf., compensating cap
*RQ-1251	R-1	RESISTOR—470 ohm, ½-W. carbon
*RQ-1243	R-2	RESISTOR—220 ohm, ½-W. carbon
*RQ-1293	R-3	RESISTOR—27,000 ohm, ½-W. carbon
*RQ-1275	R-4, 8	RESISTOR—4,700 ohm, ½-W. carbon
*RQ-1299	R-5, 10	RESISTOR—47,000 ohm, ½-W. carbon
*RQ-1291	R-6	RESISTOR—22,000 ohm, ½-W. carbon
*RQ-1339	R-7	RESISTOR—2.2 megohm, ½-W. carbon
*RQ-1269	R-9	RESISTOR—2,700 ohm, ½-W. carbon
*RQ-1308	R-11, 19, 21	RESISTOR—100,000 ohm, ½-W. carbon
*RV-135	R-12	VOL. CONTROL—2 megohm
RT-723	R-13, S-2	TONE CONTROL—2 megohm with power switch
*RQ-1323	R-14	RESISTOR—470,000 ohm, ½-W. carbon
*RQ-1273	R-15	RESISTOR—3900 ohm, ½-W. carbon
*RQ-1331	R-16	RESISTOR—1 megohm, ½-W. carbon
*RQ-683	R-17	RESISTOR—10,000 ohm 2-W. carbon
*RR-357	R-18	RESISTOR—1,200 ohm, 7.4 watt, W.W.
*RQ-1319	R-20, 22	RESISTOR—330,000 ohm, ½-W. carbon
*RQ-1451	R-23	RESISTOR—470 ohm, 1-W. carbon
‡*RQ-1283	R-24	RESISTOR—10,000 ohm, ½-W. carbon
RL-580	L-1	BEAM-A-SCOPE—"B" band loop and cabinet back assembly
*RL-167	L-2	COIL—"C" band R.F. coil
RL-581	L-3	BEAM-A-SCOPE—"D" band loop assembly
*RL-2065	L-4	COIL—"D" band oscillator coil
*RL-2066	L-5, -6	COIL—"B" and "C" band osc. coil
‡*RL-176	L-11	COIL—Peaking coil
*RL-9530	L-12a, b, c, and d	COIL—Push button coil assembly
‡*RL-608	L-13	COIL—Wave trap
*RS-3129	S-1	SWITCH—Band change switch
*RS-3130	S-3a, b	SWITCH—Push button switch
RT-3011	T-1	TRANSFORMER—1st I.F. transformer
RT-3012	T-2	TRANSFORMER—2nd I.F. transformer
RT-4015	T-3	TRANSFORMER—Speaker output transformer
RT-0724	T-4	TRANSFORMER—50/60 cycle power transformer
RT-0725	T-5	TRANSFORMER—25-cycle power transformer
*RS-1012	SPKR	SPEAKER—6½ in. P.M. speaker

GENERAL ELECTRIC CO.

MODELS LC-759, LC-759B LC-768

Cabinet Specifications

Model	Cabinet	Height	Width	Depth
LC-759	Mahogany Veneer	36"	34 7/8"	16 3/8"
LC-759B	Blonde Mahogany	36"	34 7/8"	16 3/8"
LC-768	Walnut Veneer	38"	28"	14 13/16"

Electrical Rating

Rating "A6" 110–125 volts, 60 cycles, 130 watts.
Rating "A5" 110–125 volts, 50 cycles, 130 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 ..... 7.5 watts
Maximum ..... 12 watts

Loud-speaker—Electrodynamic

Outside cone diameter ..... 11½ inches
Voice coil impedance (400 cycles) .. 5 ohms
Field resistance ..... 400 ohms

Phonograph Mechanism

Type changer ..... Model LRP-170
Type pick-up ..... Crystal
Turntable speed ..... 78 RPM

Tubes

RF Amplifier GE-6SG7
Converter-Oscillator GE-6SA7
IF Amplifier, Demodulator, AVC .. GE-6SF7
Audio Amplifier, Phase Inverter .. GE-6SC7
Audio Output ..... (2) GE-6V6GT
Rectifier GE-5Y3G
Dial Lamps ..... MAZDA No. 44

GENERAL INFORMATION

These models are seven-tube three-band superheterodyne receivers of conventional design using in combination an Automatic Record Changer. The service data on the Record Changer is contained in service notes LRPS-170.

Phonograph Tone Compensation

The schematic diagram as shown in Fig. 1, is as used in Model LC-768, with the tone compensation built into the changer. Models LC-759 and LC-759B have no compensation on the changer but it is built into the chassis as indicated in Fig. 3, otherwise the schematic is identical for all three receivers.

ALIGNMENT PROCEDURE

The location of trimmers is shown in Fig. 5. All oscillator and RF trimmers are accessible from the rear of the cabinet.

The alignment procedure is given in table form. All IF adjustments may be made with the chassis removed from the cabinet. However, the RF adjustments should be 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 alignment. The RF signal should be capacity-coupled to the receiver loop by connecting a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more away 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 is taken with a vacuum-tube voltmeter or similar 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 plate .. 110 at 455 KC

(2) Audio Gains

.09 volts, 400-cycle signal across volume control with control set to maximum will give approximately ½-watt output to speaker.

(3) D-C voltage developed across oscillator grid resistor R6 averages 7 volts at 1000 KC, 9 volts at 4000 KC, or 6 volts at 10,000 KC.

Variations of ±20% permissible. All readings taken with minus 1½-volt fixed bias on AVC bus.

ALIGNMENT CHART

Step	Test Osc. Connection	Test Osc. Setting	Pointer Setting	Adjust Trimmers
1	6SF7 IF Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C17 and C16 for Maximum
2	6SA7 Conv. Grid in series with .05 mfd.	455 KC	"BC" Band 550 KC	C14 and C13 for Maximum
3	Capacity Coupled	580 KC	"BC" Band 580 KC	C11** for Maximum
4	Capacity Coupled	1500 KC	"BC" Band 1500 KC	C8** (Osc.) for Maximum
5	Capacity Coupled	580 KC	"BC" Band 580 KC	C11** for Maximum
6	Capacity Coupled	5 MC	"SW1" Band 5 MC	C7** (Osc.) for Maximum
7	Capacity Coupled	17.8 MC	"SW2" Band 17.8 MC	C6* (Osc.) to signal
8	Capacity Coupled	17.8 MC	"SW2" Band 17.8 MC	C1** (Ant.) for Maximum

* Correct peak is at low capacity.
** Rock gang condenser when making alignment.

FOR DATA ON AUTOMATIC RECORD CHANGER MODEL LRP-170, SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".

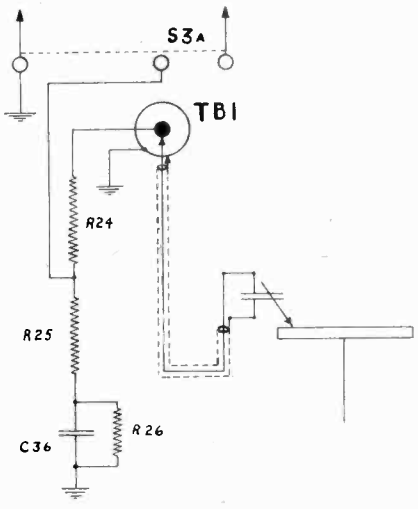


Fig. 3 Phonograph Tone Compensation
(LC-759 and LC-759B)

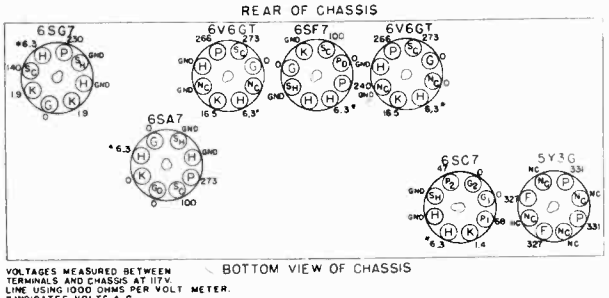


Fig. 4 Socket Voltages

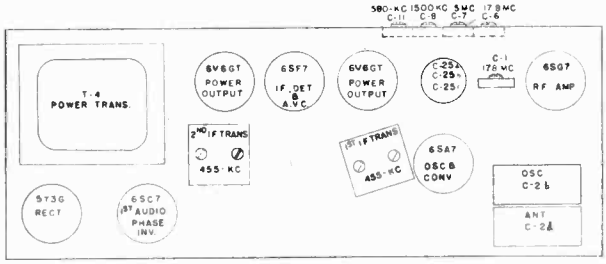
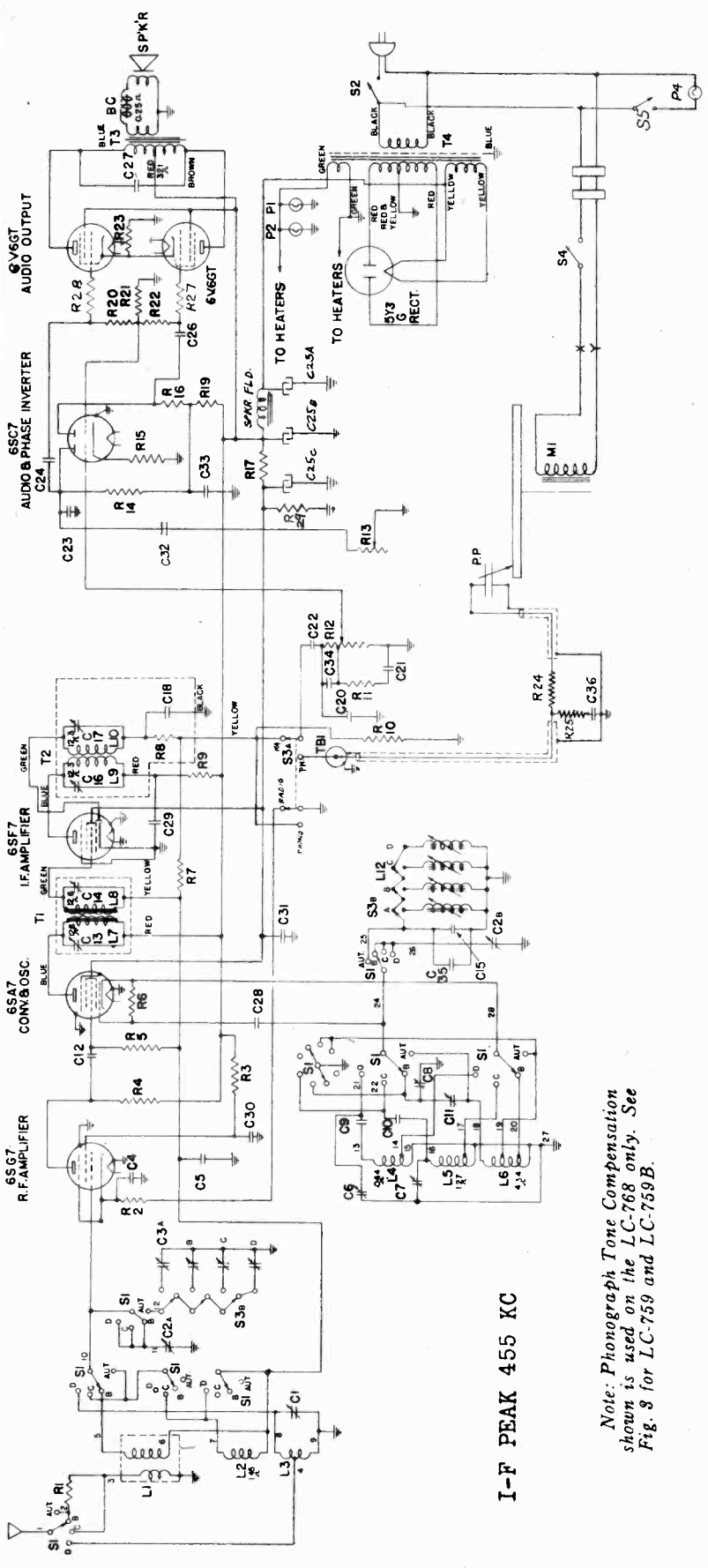


Fig. 5 Trimmer Location

MODELS LC-759, LC-759B,
LC-768

GENERAL ELECTRIC CO.



Note: Phonograph Tone Compensation shown is used on the LC-768 only. See Fig. 8 for LC-759 and LC-759B.

PARTS DESCRIPTION LIST

Symbol	Description	Symbol	Description	Symbol	Description	Symbol	Description
C1	"D" Band trimmer	C24	.02 mfd. 600-V paper	L6	"B" Band osc. coil	R19	100,000 ohms, ½-watt carbon
C2a	Tuning condenser	C25a	.15 mfd. 450 V	L12a		R20	330,000 ohms, ½-watt carbon
C2b		C25b	.15 mfd. 400 V	L12b		R21	100,000 ohms, ½-watt carbon
C3a		C25c	.10 mfd. 350 V	L12c	Push button coil assembly	R22	330,000 ohms, ½-watt carbon
C3b	Push-button trimmer strip	C26	.02 mfd. 600-V paper	L12d		R23	220 ohms, 2-watt carbon
C3c		C27	.002 mfd. 1000-V paper	R1	1000 ohms, ½-watt carbon	R24	47,000 ohms, ½-watt, carbon (Fig. 3)
C3d		C28	47 mmf. Mica	R2	220 ohms, ½-watt carbon	R25	100,000 ohms, ½-watt carbon (Fig. 3)
C4	.01 mfd. 600-V paper	C29	.01 mfd. 600-V paper	R3	47,000 ohms, ½-watt carbon	R26	470,000 ohms, ½-watt, carbon (Fig. 3)
C5	.05 mfd. 600-V paper	C30	.01 mfd. 600-V paper	R4	47000 ohms, ½-watt carbon	R27	1000 ohms, ½-watt carbon
C6	"B" Band osc. trimmer	C31	.01 mfd. 600-V paper	R5	47,000 ohms, ½-watt carbon	R28	1000 ohms, ½-watt, carbon
C7	"C" Band osc. trimmer	C32	.005 mfd. 600-V paper	R6	22,000 ohms, ½-watt carbon	R29	47,000 ohms, 1-watt, carbon
C8	"D" Band osc. trimmer	C33	.1 mfd. 600-V paper	R7	2.2 meg. ½-watt carbon	S1	Band-change switch
C9	4700 mmf. ±5% mica	C34	100 mmf. Mica	R8	47,000 ohms, ½-watt carbon	S2	Power switch (on tone control)
C10	2000 mmf. ±5% mica	C35	150 mmf. Temp. Compensating	R9	2700 ohms, ½-watt carbon	S3a	Push-button switch assembly
C11	"B" padder	C36	.002 mfd. 600-V paper	R10	470,000 ohms, ½-watt carbon	S3b	
C12	100 mmf. Mica	L1	"B" Band loop	R11	68,000 ohms, ½-watt carbon	S5	Phono.-comp. switch
C15	600 mmf. Silvered Mica	L2	"C" RF Coil	R12	2 meg. tap at 1 meg. (volume control)	T1	1st IF Transformer
C18	200 mmf. Mica	L3	"D" Band loop (LC-759 and LC-759B)	R13	2 meg. tone control	T2	2nd IF Transformer
C20	100 mmf. Mica			R14	470,000 ohms, ½-watt carbon	T3	Output transformer
C21	.0042 mfd. 600-V paper	L3	"D" Band loop (LC-768 only)	R15	3900 ohms, ½-watt carbon	T4	50-60-cycle power transformer
C22	.005 mfd. 600-V paper	L4	"D" Band osc. coil	R16	1 meg. ½-watt carbon	TB1	Phono jack
C23	220 mmf. Mica	L5	"C" Band osc. coil	R17	12,000 ohms, ½-watt carbon	SPKR	14" Electro-dynamic 400 ohm field

GENERAL ELECTRIC CO.

TECHNICAL AND SERVICE INFORMATION

Since the Model JFM-165 consists of the Model J-718 radio chassis used in conjunction with the Model JFM-90 Frequency Modulation Translator, reference should be made to the service notes (RJS-718 and RJFMS-90) on these receivers for all technical and service information. When ordering replacement parts, for the standard radio chassis, refer to the parts list on the J-718 receiver and make the removals as shown under the J-718 parts list below. When ordering parts for the FM chassis, refer to the parts list on the JFM-90 receiver and make additions and removals as in the JFM-90 parts list below. The additional parts listed are only common to the Model JFM-165 receiver.

Electrical Rating

Rating	Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption AM and FM Receiver
A-6	105–125	60	145
A-5	105–125	50	145
C-2	105–125	25	155

Tuning Frequency Range

Broadcast Band ..... 540–1600 KC
Short-wave Band No. 1 ..... 2300–6900 KC
Short-wave Band No. 2 ..... 6900–22000 KC
Frequency Modulation Band ..... 42.0–50.0 MC

Intermediate Frequency

Broadcast and Short-wave Receiver ..... 455 KC
Frequency Modulation Receiver ..... 4.3 MC

Electrical Power Output

Undistorted ..... 4 watts
Maximum ..... 5.5 watts

Loud-speaker—"Alnico" Magnet Dynamic

Outside Speaker Diameter ..... 14 inches
Voice Coil Impedance ..... 3.5 ohms

Tubes

Frequency Modulation Chassis
1st Converter GE-6AB7
2nd Converter GE-6AB7
Oscillator GE-7A4
I.F. Amplifier ..... (2) GE-6SK7
1st Limiter GE-6SJ7
2nd Limiter GE-6SJ7
Discriminator GE-6H6
Rectifier GE-5Y3G
Broadcast and Short-wave Chassis
R.F. Amplifier GE-6SK7
Converter and Oscillator GE-6SA7
I.F. Amplifier GE-6SK7
Det. Audio and AVC GE-6SQ7
Audio Driver ..... GE-6J5G or GT
Audio Output GE-6Y6G
Rectifier GE-5Y3G
Pilot Lamps ..... (5) MAZDA No. 44

REPLACEMENT PARTS LIST

(For complete list of replacements refer to J-718 and JFM-90 service notes)
SEE VOLUMES XII AND XIII FOR ORIGINAL DATA OF J-718 & JFM 90
Additions and substitutions

MODEL JFM-165

Stock No.	Description	List Price
	J-718 Parts List	
	Remove resistors R-2, R-27, and R-28	
*RQ-1307	RESISTOR—100,000 ohm, ½ W. carbon (R-2) (Pkg. 5)	$0.70
*RQ-1317	RESISTOR—270,000 ohm, ½ W. carbon (R-28) (Pkg. 5)	.70
*RQ-1327	RESISTOR—680,000 ohm, ½ W. carbon (R-27) (Pkg. 5)	.70
	Remove Capacitor C-27	
*RC-039	CAPACITOR—.01 mfd., 600 V. paper (C-27)	.25
	JFM-90 Parts List	
	Remove C-1	
RC-7041	CONDENSER—Tuning condenser and station selector assembly (C-1a, 1b, 1c)	5.00
	Substitute C-1	
RC-7044	CONDENSER—Tuning condenser assembly (C-1a, 1b, 1c)	5.00
	Remove R-22	
*RQ-1307	RESISTOR—100,000 ohm, ½ W. carbon (R-22) (Pkg. 5)	$0.70
	Substitute R-22	
*RQ-1299	RESISTOR—47,000 ohm, ½ W. carbon (R-22) (Pkg. 5)	.70
	Additional Parts JFM-165	
RB-206	BOARD—FM chassis mounting boards	1.00
RB-1037	BOARD—FM antenna terminal board	.10
RG-423	GRILLE CLOTH—Cabinet grille cloth	1.10
RC-8204	CABLE—FM output connector cable and plug assembly	.35
RC-8527	CARD—FM key tab card	.05
RD-173	DIAL—Dial scale and escutcheon assembly—FM	.70
RL-550	BEAM-A-SCOPE—Cylindrical Beam-a-Scope assembly	2.10
RS-629	SUPPORT—Cylindrical Beam-a-Scope bottom support	1.00

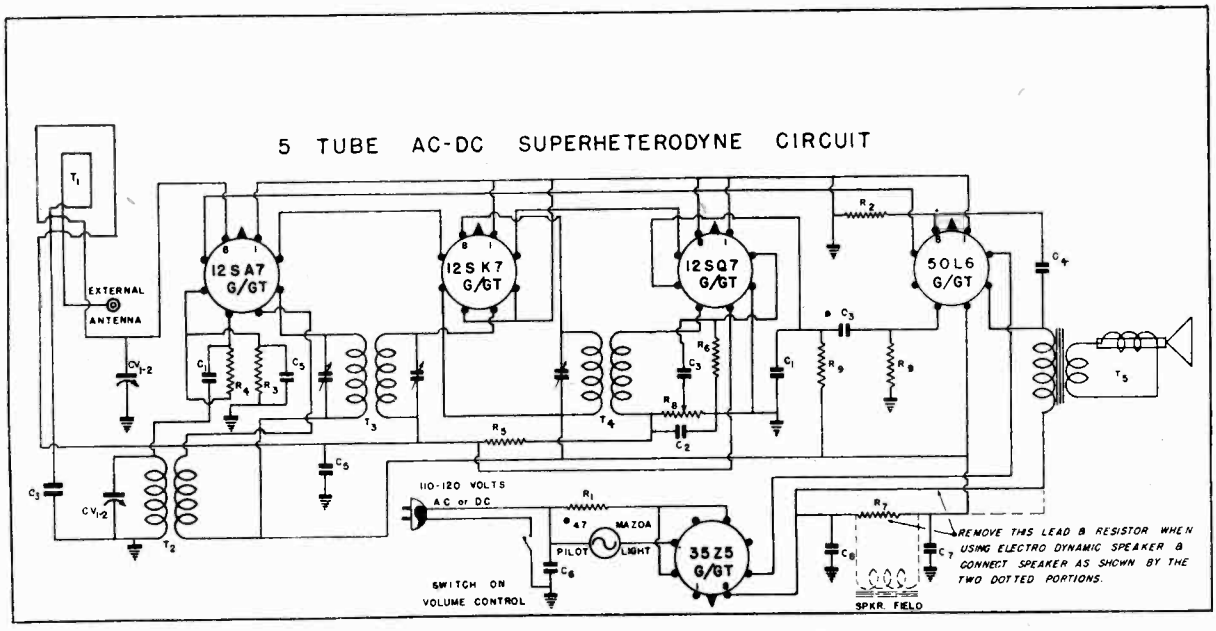
*Used on previous production receivers.

(Prices subject to change without notice)

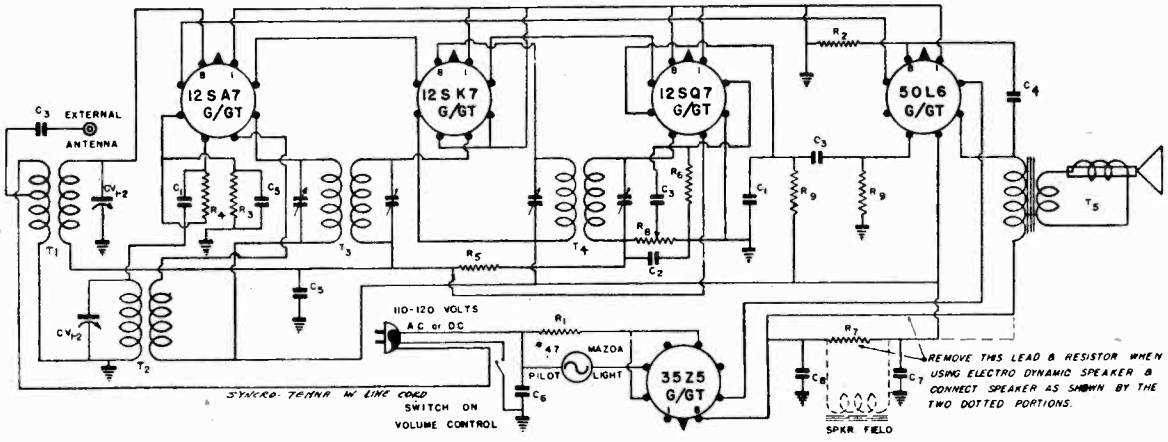
Single End Tubes

GENERAL TELEVISION & RADIO CO.

MODELS 19, 51, 57
MODELS 26, 34, 47, 49, 57, 88, 91.



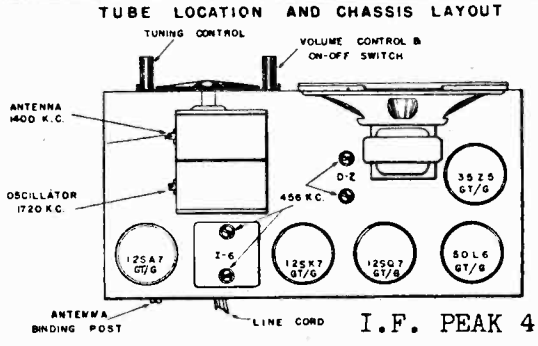
MODELS 19, 51 and 57



MODELS 26, 34, 47, 49, 57, 88 and 91

C_1	—	.00025	MFD. 600 V. PAPER CONDENSER
C_2	—	.0005	MFD. 600 V. " "
C_3	—	.01	MFD. 400 V. " "
C_4	—	.02	MFD. 400 V. " "
C_5	—	.05	MFD. 200 V. " "
C_6	—	.1	MFD. 400 V. " "
C_7	346	2D	MFD. 150 W.V. ELECTROLYTIC CONDENSER
C_8	346	4D	MFD. 150 W.V. " "
CV_{1-2}	64858	TWO GANG VARIABLE CONDENSER	
R_1	—	10	OHM 1/4 WATT CARBON RESISTOR
R_2	—	150	OHM 1/4 " " "
R_3	—	800	OHM 1/4 " " " ± 10%
R_4	—	50000	OHM 1/4 " " "
R_5	—	2	MEGOHM 1/4 " " "
R_6	—	6	MEGOHM 1/4 " " "
R_7	—	2500	OHM 1/2 " " "
R_8	2009x	1/2	MEGOHM VOLUME CONTROL
R_9	—	1/2	MEGOHM 1/4 WATT CARBON RESISTOR
T_1	A-8	ANTENNA COIL	
T_2	O-8	OSCILLATOR COIL	
T_3	1-6	1st. I.F. TRANSFORMER	
T_4	O-2	DIODE I.F. TRANSFORMER	
T_5	838W	5" P.M. SPEAKER	

TUBE LOCATION AND CHASSIS LAYOUT

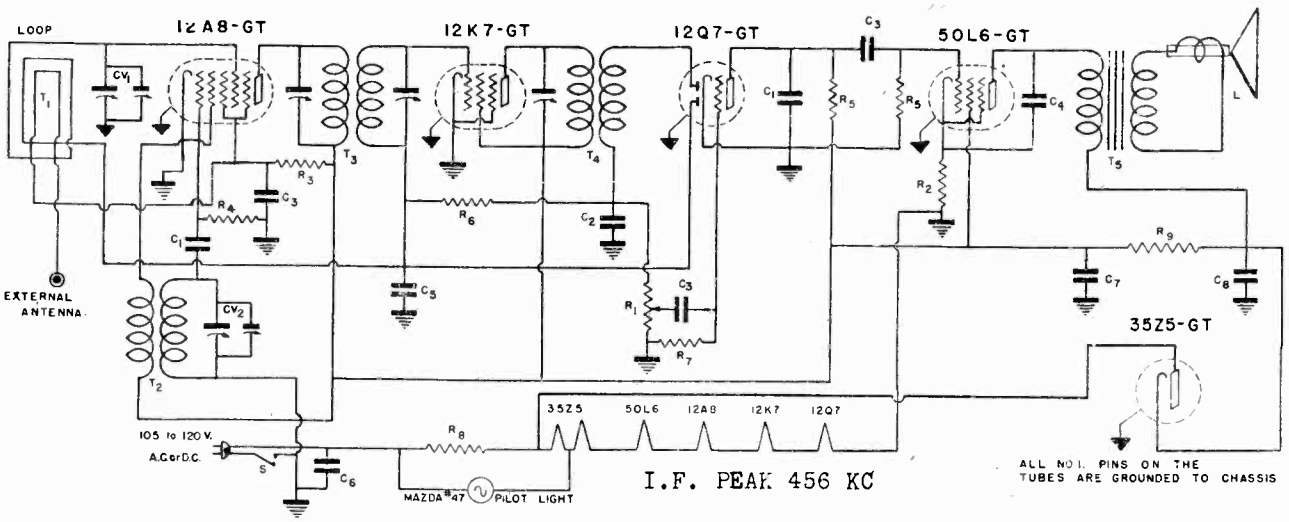


I.F. PEAK 456 KC

MODELS 19, 26, 34, 47, 49, 51, 57, 88 AND 91

MODELS 19, 51
Double End Tubes
MODEL 530

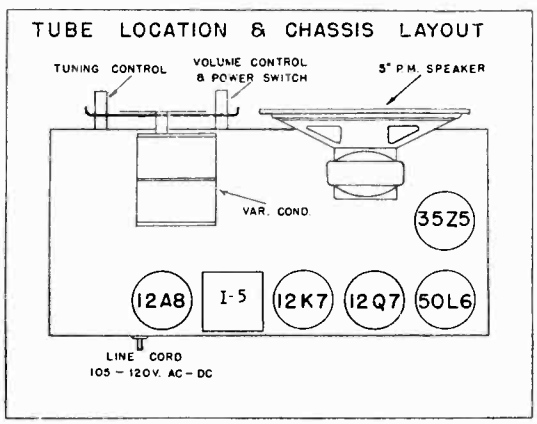
GENERAL TELEVISION & RADIO CO.

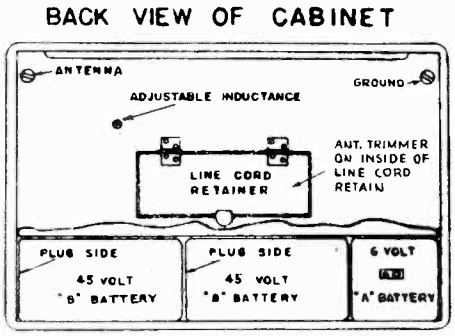


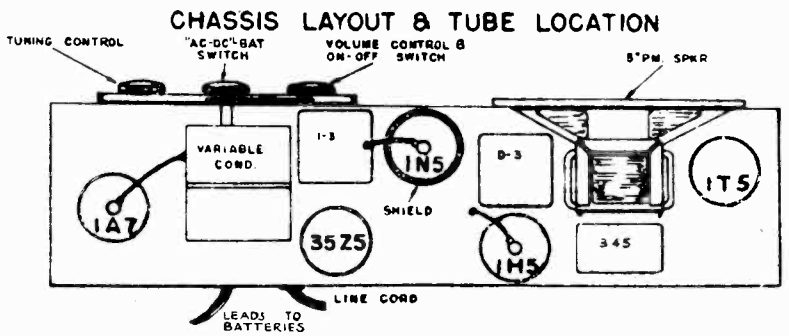
MODELS 19 and 51

DIA. NO.	PART NO.	DESCRIPTION
C_1	—	.00025 MFD. 600 V. TUBULAR CONDENSER
C_2	—	.0005 MFD. 200 V. TUBULAR CONDENSER
C_3	—	.01 MFD. 400 V. TUBULAR CONDENSER
C_4	—	.02 MFD. 400 V. TUBULAR CONDENSER
C_5	—	.05 MFD. 200 V. TUBULAR CONDENSER
C_6	—	.1 MFD. 400 V. TUBULAR CONDENSER
C_7	IN 346	20 MFD. 150 W.V. ELECTROLYTIC COND.
C_8	IN 346	40 MFD. 150 W.V. ELECTROLYTIC COND.
CV_{1-2}	648	2 GANG VARIABLE CONDENSER
R_9	—	2500 OHM $\frac{1}{2}$ W. CARBON RESISTOR
L	838	P. M. SPEAKER
S	—	LINE SWITCH ON VOLUME CONTROL

DIA NO.	PART NO.	DESCRIPTION
R_1	2009F	500,000 OHM VOLUME CONTROL
R_2	—	150 OHM $\frac{1}{4}$ WATT CARBON RESISTOR-10%
R_3	—	50000 OHM $\frac{1}{4}$ WATT CARBON RESISTOR
R_4	—	50000 OHM $\frac{1}{4}$ WATT CARBON RESISTOR
R_5	—	500,000 OHM $\frac{1}{4}$ WATT CARBON RESISTOR
R_6	—	2 MEGOHM $\frac{1}{4}$ WATT CARBON RESISTOR
R_7	—	6 MEGOHM $\frac{1}{4}$ WATT CARBON RESISTOR
R_8	—	10 OHM $\frac{1}{4}$ WATT CARBON RESISTOR
T_1	3553	LOOP
T_2	O-5	OSCILLATOR COIL
T_3	I-5	INPUT I.F. TRANSFORMER
T_4	O-5	OUTPUT I.F. TRANSFORMER
T_5	IN 838	SPEAKER TRANSFORMER







MODEL 530

BATTERY REPLACEMENT

If, when these batteries are to be replaced, longer service (200 hours or more) is desired, you may replace this pack with one (1) 4F4 "A" battery and two (2) V30B "B" batteries made by the same company, or their equivalent in another make.

MODEL F56W

GENERAL TELEVISION & RADIO CO.

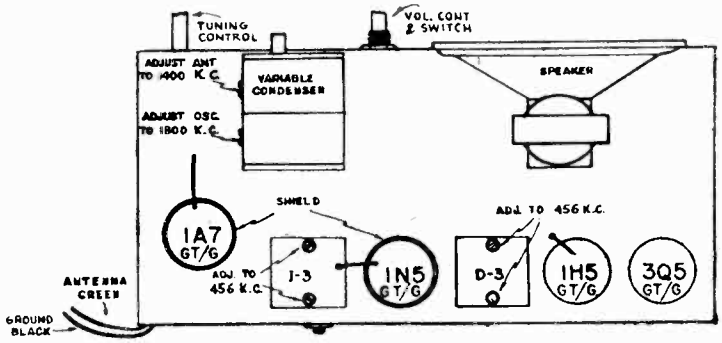


Fig. 1—Top View

SERVICE NOTES

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

In order to prevent the signal from acting upon the AVC and affecting accuracy of voltage measurements, aerial and ground leads should be short circuited while making measurements.

All voltages should be measured with a new battery or one that gives 94½ volts under load. Resistance and actual connections of coils and transformers and speaker data are given under Service Information.

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

Failure to operate, noisy or weak reception is usually due to defective tubes, the tubes making poor contact with sockets or grid clips making poor contact with the caps of the tubes. Tubes may be checked very easily by replacing with other tubes which are known to be good.

ALIGNING INSTRUCTIONS

All of the adjustments have been very carefully set with signal generators at the factory and require no further adjustment, unless it becomes necessary to replace a coil or transformer, or if the adjustments have been tampered with in the field. Under no circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been checked and found to be normal. To properly re-align this receiver, a signal generator as well as an output meter, must be used.

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio chassis 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 minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide as accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 mf., 200 mmf.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I.F.	456 KC.	.1 MFD.	Grid of 1N5G tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See I3 Fig. 1)	Output I.F.	Adjust to Maximum output
	456 KC.	.1 MFD.	Grid of 1A7G tube	Rotor full open (Plates out of mesh)	Two trimmers on top (See D3 Fig. 1)	Input I.F.	Adjust to Maximum output
BROAD-CAST	1600 KC.	200 mmf.	Antenna lead	Rotor full open (Plates out of mesh)	Trimmer— (See Fig. 1)		Adjust to Maximum output
	1400 KC.	200 mmf.	Antenna lead	Set dial at 1400 KC.	Trimmer— (See Fig. 1)		Adjust to Maximum output

This is all that is necessary for the alignment unless the plates of the gang have been bent out of shape. In case of bent plates, set the signal generator and receiver to 600KC and bend the plates into the position for maximum output.

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.

Frequency Range

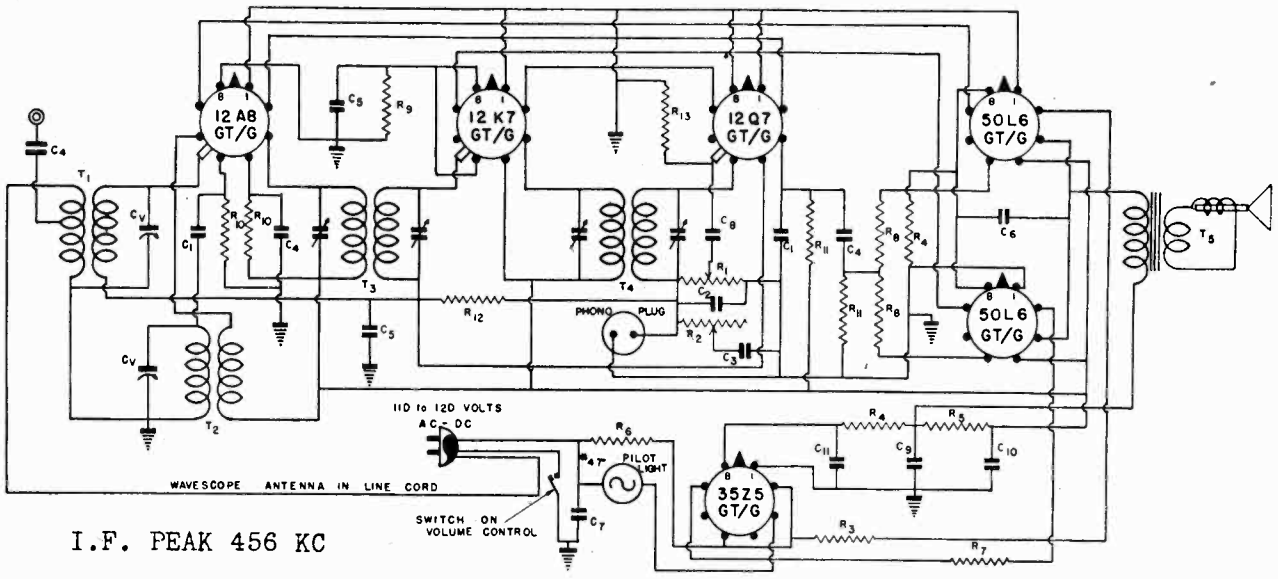
535 to 1730 K.C.

Power output .27 watt undistorted—.35 watt maximum

Intermediate Frequency 456 K.C.

MODELS 54, 616
MODEL F56W

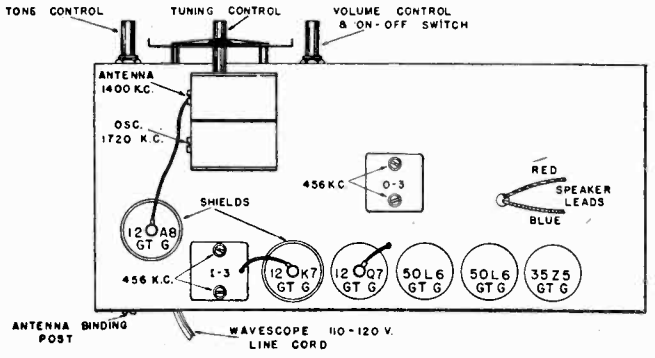
GENERAL TELEVISION & RADIO CO.

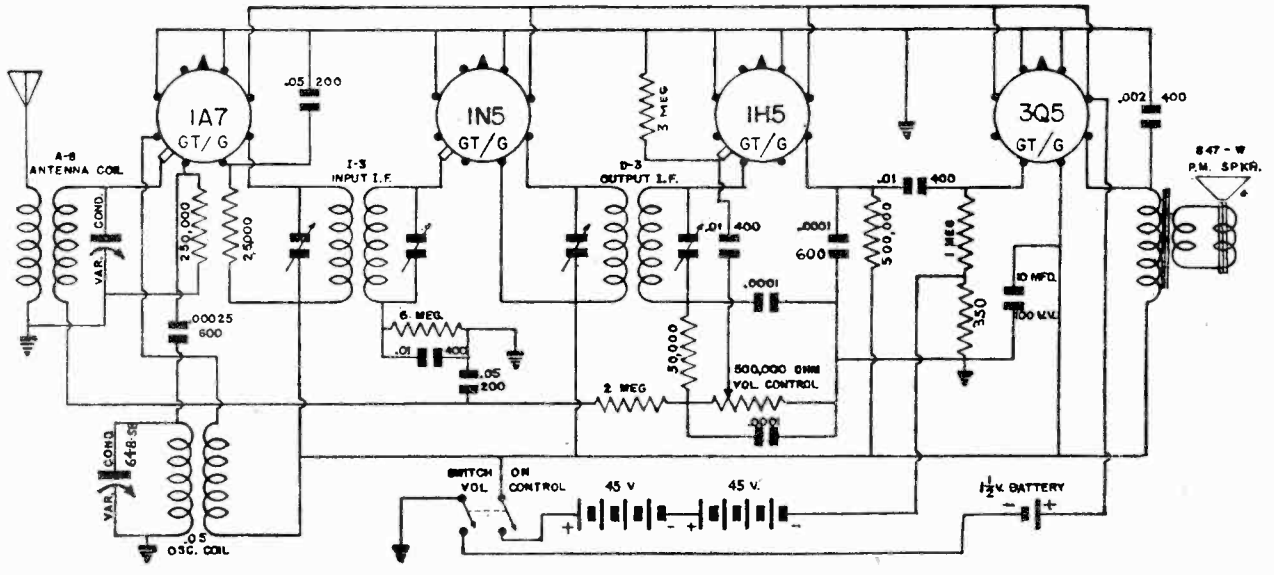


I.F. PEAK 456 KC

MODELS 616 and 54

C_1	——	.00025	MFD. 600 V. PAPER CONDENSER
C_2	——	.0005	MFD. 600 V. " "
C_3	——	.005	MFD. 400 V. " "
C_4	——	.01	MFD. 400 V. " "
C_5	——	.05	MFD. 200 V. " "
C_6	——	.05	MFD. 600 V. " "
C_7	——	.1	MFD. 400 V. " "
C_8	——	.02	MFD. 400 V. " "
C_9	348	15	MFD. 150 W.V. ELECTROLYTIC CONDENSER
C_{10}	348	20	MFD. 150 W.V. " "
C_{11}	348	40	MFD. 150 W.V. " "
C_V	648-SB	TWO GANG VARIABLE CONDENSER	
R_1	2009X	1/2 MEGOHM VOLUME CONTROL	
R_2	2036X	250,000 OHM TONE CONTROL	
R_3	157	360 OHM 8 WATT WIRE WOUND RESISTOR	
R_4	——	80 OHM 1/2 WATT CARBON RESISTOR	
R_5	——	2500 OHM 1/2 " " "	
R_6	——	5 OHM 1/2 " " "	
R_7	——	46 OHM 1 " " "	
R_8	——	1000 OHM 1/4 " " "	
R_9	——	1500 OHM 1/4 " " "	
R_{10}	——	50000 OHM 1/4 " " "	
R_{11}	——	1/2 MEGOHM 1/4 " " "	
R_{12}	——	2 MEGOHM 1/4 " " "	
R_{13}	——	6 MEGOHM 1/4 " " "	
T_1	A-8	ANTENNA COIL	
T_2	O-5	OSCILLATOR COIL	
T_3	I-3	I st. I. F. TRANSFORMER	
T_4	D-3	DIODE I.F. TRANSFORMER	
T_5	643	6 1/2" P.M. SPEAKER	





I.F. PEAK 456 KC

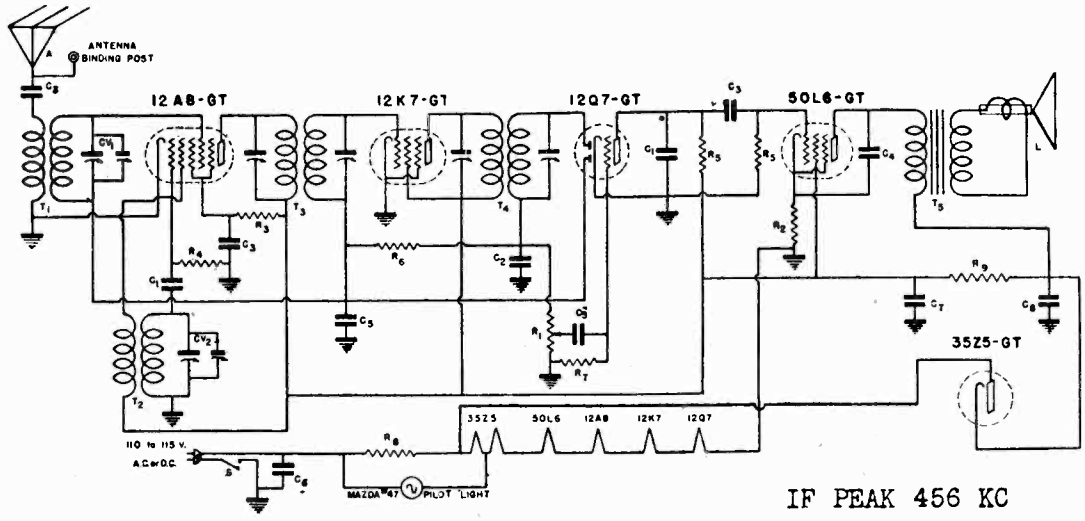
MODEL F56W

1½ VOLT FARM BATTERY SET

GENERAL TELEVISION & RADIO CO.

MODEL 520
MODELS 411, 421

MODEL 520

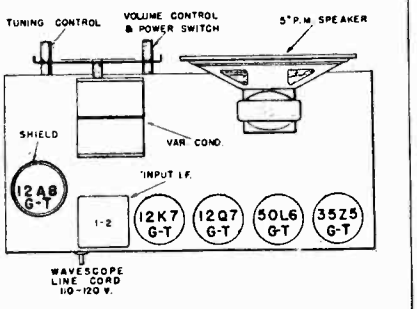


IF PEAK 456 KC

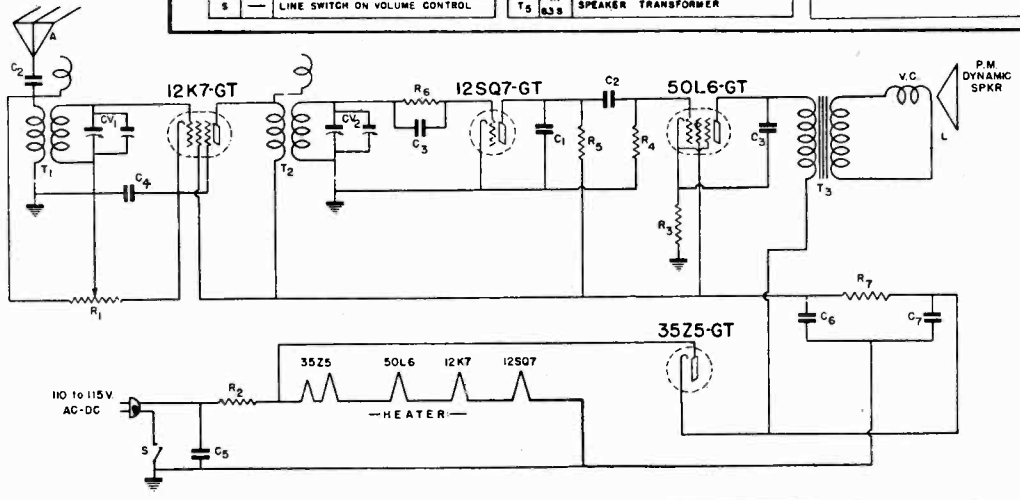
DIA. NO.	PART NO.	DESCRIPTION
C_1	—	.00025 MFD. 600 V. TUBULAR CONDENSER
C_2	—	.0005 MFD. 200 V. TUBULAR CONDENSER
C_3	—	.01 MFD. 400 V. TUBULAR CONDENSER
C_4	—	.02 MFD. 400 V. TUBULAR CONDENSER
C_5	—	.05 MFD. 200 V. TUBULAR CONDENSER
C_6	—	.1 MFD. 400 V. TUBULAR CONDENSER
C_7	IN 346	20 MFD. 150 W.V. ELECTROLYTIC COND.
C_8	IN 346	40 MFD. 150 W.V. ELECTROLYTIC COND.
CV_{1-2}	648	2 GANG VARIABLE CONDENSER
R_9	—	2500 OHM ½ W. CARBON RESISTOR
A	—	WAVESCOPE AERIAL
L	036	P.M. SPEAKER
S	—	LINE SWITCH ON VOLUME CONTROL

DIA. NO.	PART NO.	DESCRIPTION
R_1	2008F	500,000 OHM VOLUME CONTROL
R_2	—	150 OHM ¼ WATT CARBON RESISTOR-10%
R_3	—	50000 OHM ¼ WATT CARBON RESISTOR
R_4	—	50000 OHM ¼ WATT CARBON RESISTOR
R_5	—	500,000 OHM ¼ WATT CARBON RESISTOR
R_6	—	2 MEGOHM ¼ WATT CARBON RESISTOR
R_7	—	6 MEGOHM ¼ WATT CARBON RESISTOR
R_8	—	10 OHM ¼ WATT CARBON RESISTOR
T_1	A-5-A	ANTENNA COIL
T_2	O-5	OSCILLATOR COIL
T_3	I-2	INPUT I.F. TRANSFORMER
T_4	O-2	OUTPUT I.F. TRANSFORMER
T_5	IN 63S	SPEAKER TRANSFORMER

TUBE LOCATION & CHASSIS LAYOUT



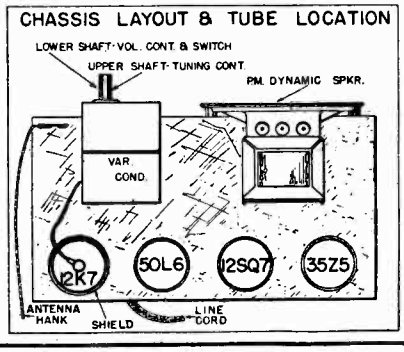
MODELS 411 AND 421



DIA. NO.	PART NO.	DESCRIPTION
C_1	—	.00025 MFD. 600 V. TUB. COND.
C_2	—	.01 MFD. 400 V. TUBULAR COND.
C_3	—	.02 MFD. 400 V. TUBULAR COND.
C_4	—	.05 MFD. 200 V. TUBULAR COND.
C_5	—	.05 MFD. 400 V. TUBULAR COND.
C_6	IN 343	10 MFD. 150 V. TUBULAR COND.
C_7	IN 343	30 MFD. 150 V. TUBULAR COND.
CV_{1-2}	656	2 GANG VARIABLE COND.
T_1	A-10	ANTENNA COIL
T_2	R-10	R.F. COIL
T_3	844	SPEAKER TRANSFORMER

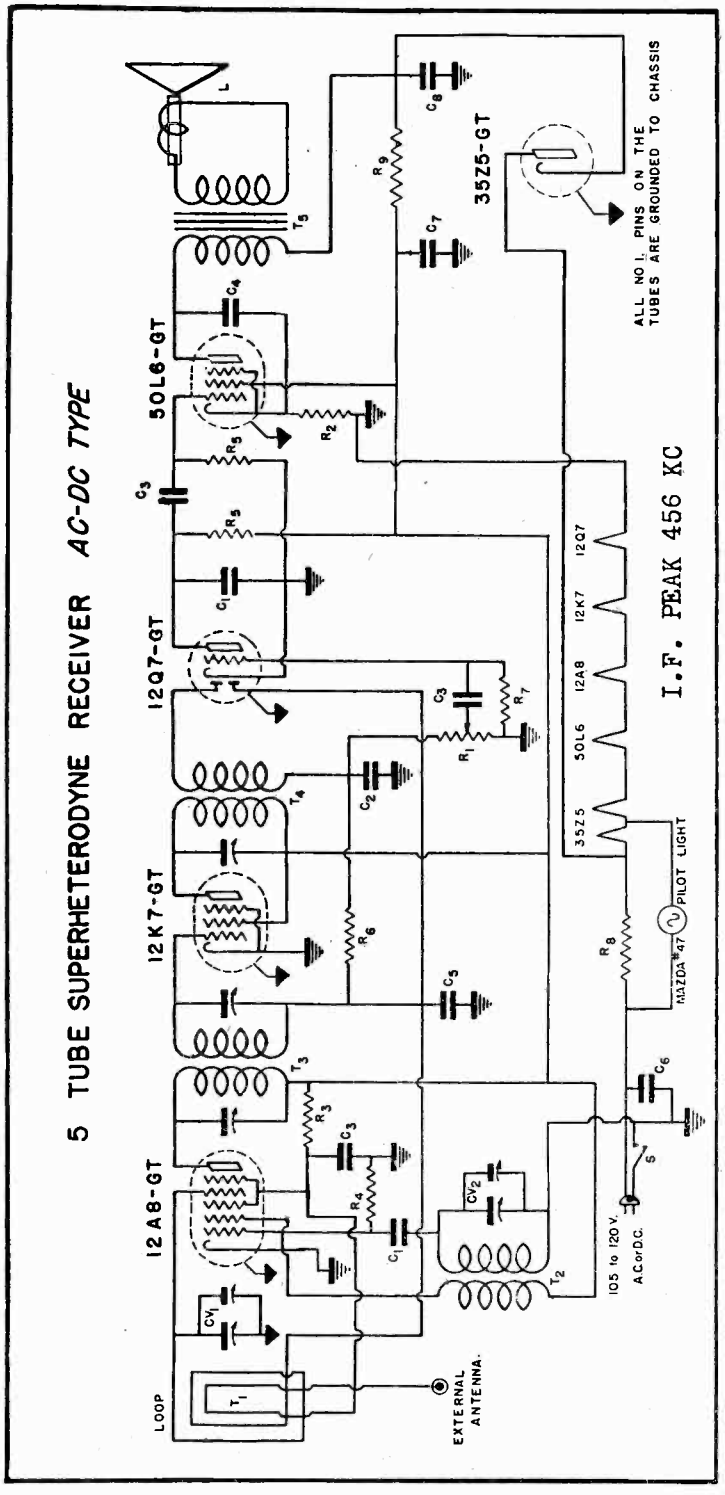
DIA. NO.	PART NO.	DESCRIPTION
R_1	2042	10,000 OHM VOLUME CONTROL
R_2	—	40 OHM 1 WATT CARBON RESIST.
R_3	—	150 OHM ¼ WATT CARBON RESIST.
R_4	—	½ MEGOHM ¼ WATT CAR. RESIST.
R_5	—	1 MEGOHM ¼ WATT CARBON RESIST.
R_6	—	3 MEGOHM ¼ WATT CAR. RESIST.
R_7	—	5,000 OHM ¼ WATT CAR RESIST.
S	—	LINE SWITCH ON VOLUME CONT.
A	—	ANTENNA WIRE
L	844	DYNAMIC SPEAKER P.M.

CHASSIS LAYOUT & TUBE LOCATION



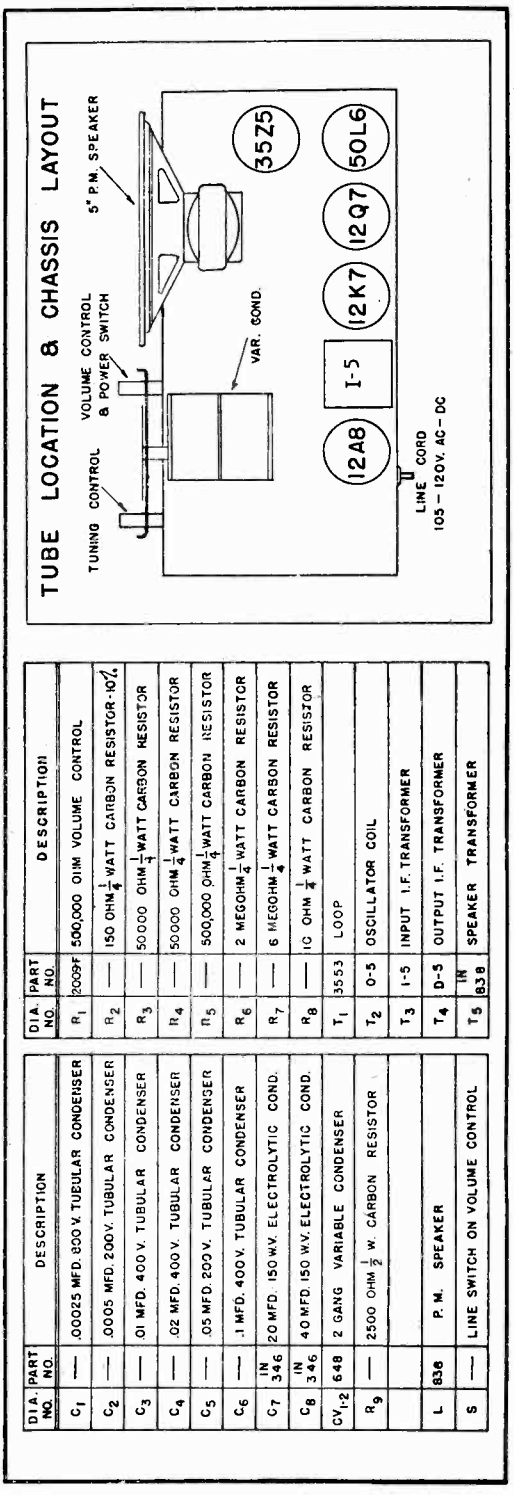
MODELS 511A, 521

GENERAL TELEVISION & RADIO CO.



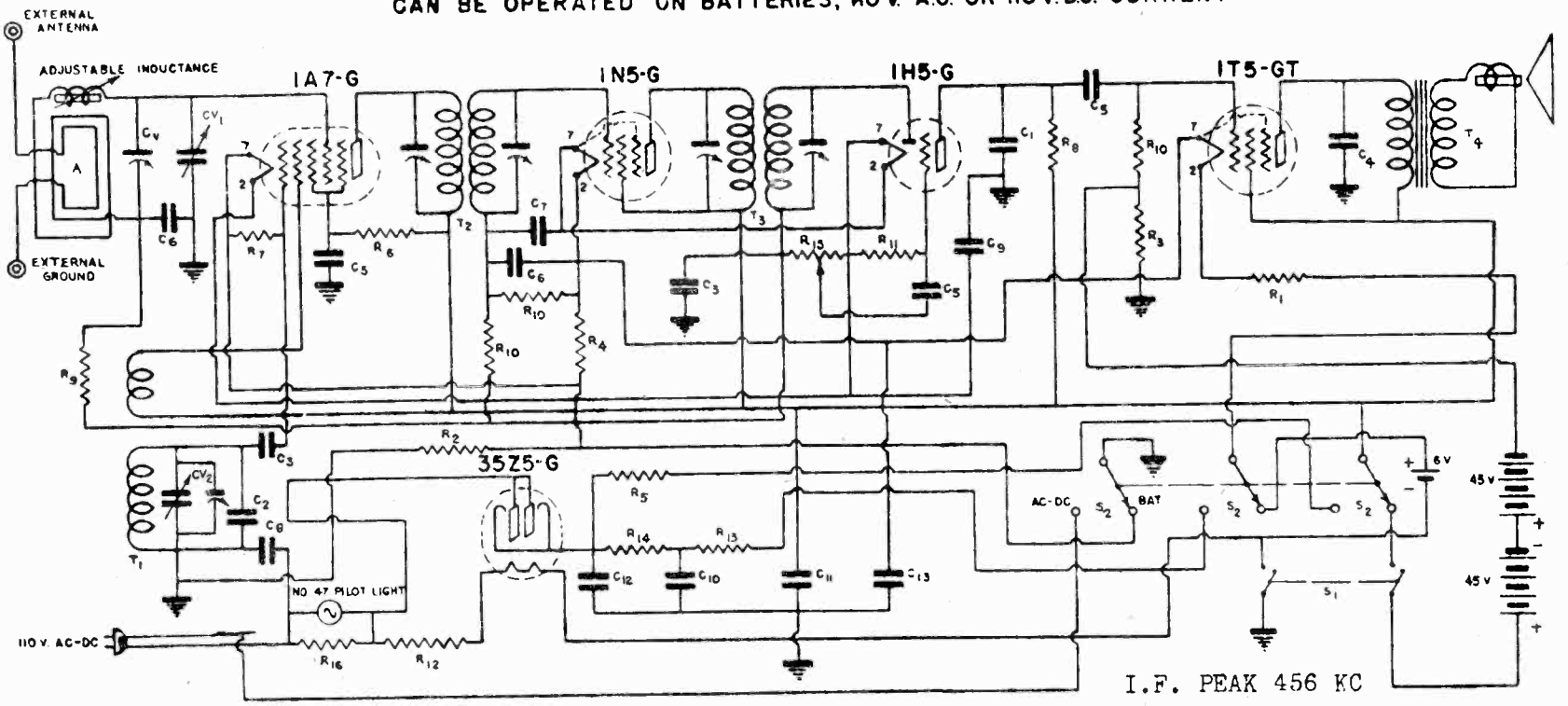
DIA. NO.	PART NO.	DESCRIPTION
C_1	—	.00025 MFD. 800 V. TUBULAR CONDENSER
C_2	—	.0005 MFD. 200 V. TUBULAR CONDENSER
C_3	—	.01 MFD. 400 V. TUBULAR CONDENSER
C_4	—	.02 MFD. 400 V. TUBULAR CONDENSER
C_5	—	.05 MFD. 200 V. TUBULAR CONDENSER
C_6	—	.1 MFD. 400 V. TUBULAR CONDENSER
C_7	IN 346	20 MFD. 150 W.V. ELECTROLYTIC COND.
C_8	IN 346	40 MFD. 150 W.V. ELECTROLYTIC COND.
CV_{1-2}	648	2 GANG VARIABLE CONDENSER
R_9	—	2500 OHM $\frac{1}{2}$ W. CARBON RESISTOR
L	836	P.M. SPEAKER
S	—	LINE SWITCH ON VOLUME CONTROL

DIA. NO.	PART NO.	DESCRIPTION
R_1	2009F	500,000 OHM VOLUME CONTROL
R_2	—	150 OHM $\frac{1}{4}$ WATT CARBON RESISTOR-10%
R_3	—	50000 OHM $\frac{1}{4}$ WATT CARBON RESISTOR
R_4	—	50000 OHM $\frac{1}{4}$ WATT CARBON RESISTOR
R_5	—	500,000 OHM $\frac{1}{4}$ WATT CARBON RESISTOR
R_6	—	2 MEGOHM $\frac{1}{4}$ WATT CARBON RESISTOR
R_7	—	6 MEGOHM $\frac{1}{4}$ WATT CARBON RESISTOR
R_8	—	10 OHM $\frac{1}{4}$ WATT CARBON RESISTOR
T_1	3553	LOOP
T_2	O-5	OSCILLATOR COIL
T_3	I-5	INPUT I.F. TRANSFORMER
T_4	D-5	OUTPUT I.F. TRANSFORMER
T_5	IN 838	SPEAKER TRANSFORMER



5 TUBE SUPERHETERODYNE RECEIVER

CAN BE OPERATED ON BATTERIES, 110 V.-A.C. OR 110 V.-D.C. CURRENT



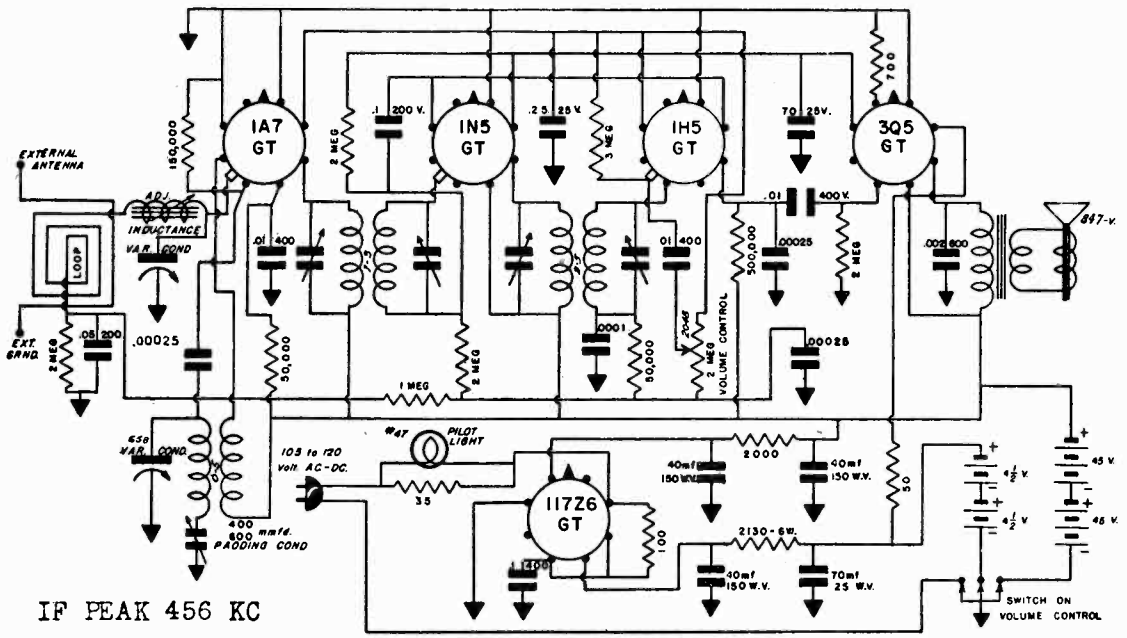
DIAG. NO.	DESCRIPTION
C1	.0001 MICA CONDENSER
C2	.00002 MICA CONDENSER 10%
C3	.00025 MFD. 600 V. TUBULAR COND.
C4	.002 MFD. 600 VOLT TUBULAR COND.
C5	.01 MFD. 400 V. TUBULAR COND.
C6	.05 MFD. 200 V. TUBULAR COND.
C7	.1 MFD. 200 V. TUBULAR COND.
C8	.1 MFD. 400 V. TUBULAR COND.
C9	.25 MFD. 25 V. TUBULAR COND.
C10	10 MFD. 35 V. ELECTROLYTIC COND.
C11	20 MFD. 150 V. " "
C12	40 MFD. 150 V. " "
C13	70 MFD. 6 V. " "
Cv	2 TO 40 MMFD. TRIMMER COND.
Cv1-2	2 GANG VARIABLE CONDENSER
A	LOOP ANTENNA
T1	OSCILLATOR COIL
T2	INPUT I.F. TRANSFORMER
T3	OUTPUT I.F. TRANSFORMER
T4	P.M. SPEAKER
R1	10 OHM 1/4 W. CARBON RESIST. 10%
R2	30 OHM 1/4 W. " "
R3	100 OHM 1/4 W. " "
R4	700 OHM 1/4 W. " "
S1	SWITCH ON VOLUME CONTROL
S2	3-POLE TWO POSITION SWITCH
R5	3000 OHM 1/4 W. CARBON RESISTOR
R6	50,000 OHM 1/4 W. CARBON RESISTOR
R7	150,000 OHM 1/4 W. " "
R8	1/2 MEGOHM 1/4 W. " "
R9	1 MEGOHM 1/4 W. " "
R10	2 MEGOHM 1/4 W. " "
R11	3 MEGOHM 1/4 W. " "
R12	520 OHM 12 WATT WIRE WOUND
R13	400 OHM 1 WATT " " "
R14	2200 OHM 5 WATT " " "
R15	VOLUME CONTROL
R16	30 OHM 1.2 WATT " " "

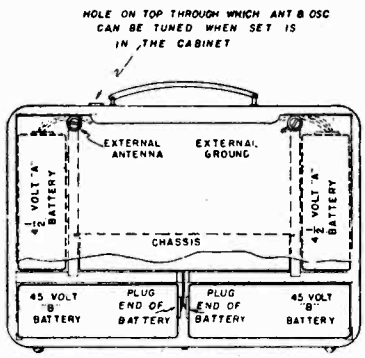
GENERAL TELEVISION & RADIO CO.

MODEL 530

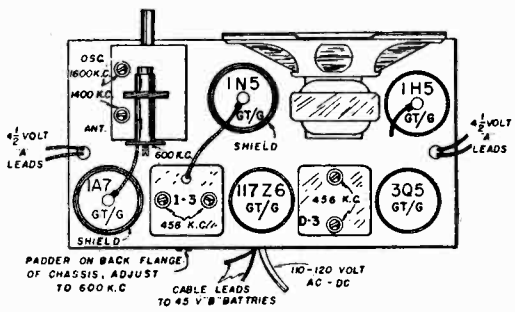
MODEL 536

GENERAL TELEVISION & RADIO CO.





CHASSIS LAYOUT & TUBE LOCATION



BATTERIES

When the 45 volt B-batteries are tested and measure 30 volts or less, they should be replaced. The 4 1/2 volt A-batteries should be replaced when the reading is 3 volts or less.

The following kits of batteries can be used for replacement:

2 RAY-O-VAC 45 volt "B" No. 7830.
2 RAY-O-VAC 4 1/2 volt "A" No. P83A.

2 USALITE 45 volt "B" No. 640
2 USALITE 4 1/2 volt "A" No. 683.

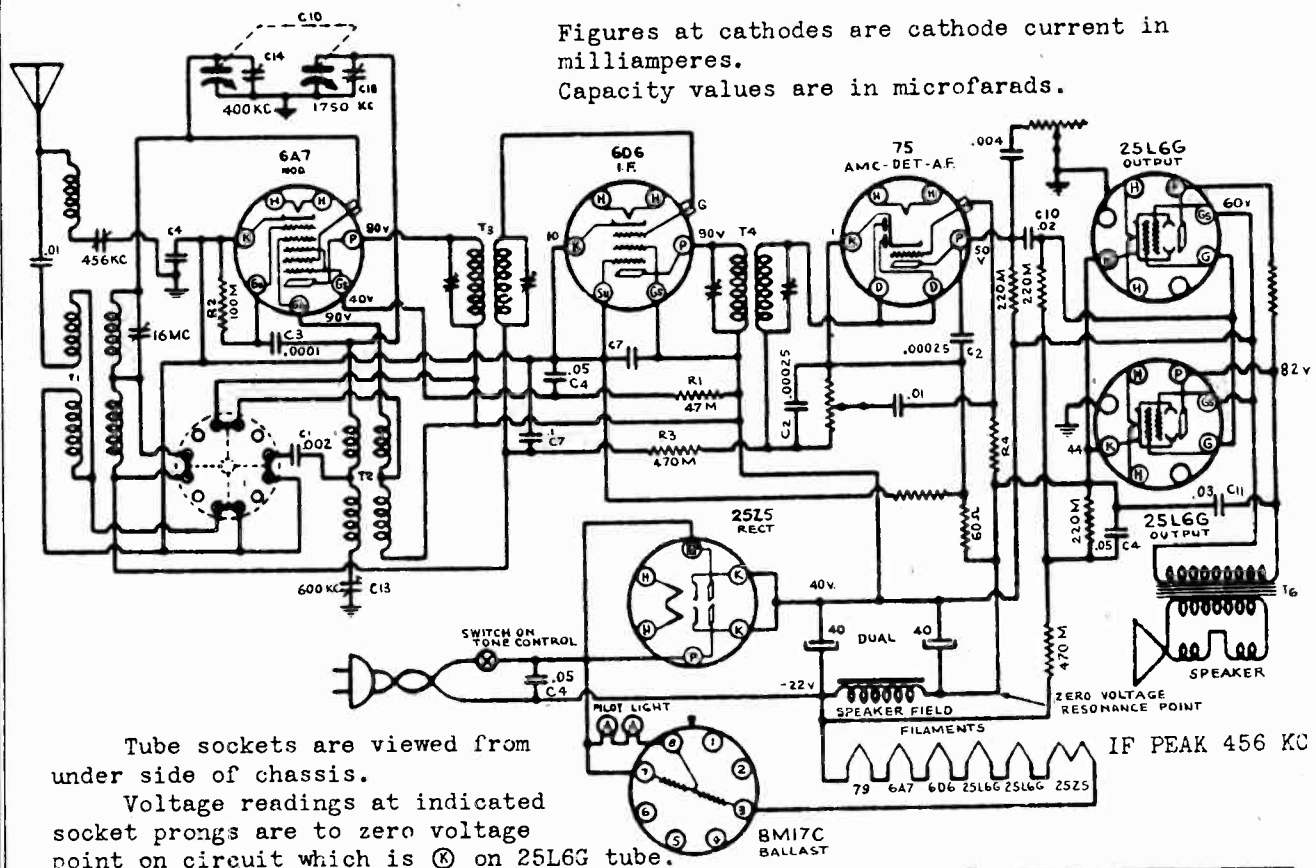
2 BURGESS 45 volt "B" No. M30.
2 BURGESS 4 1/2 volt "A" No. G3.

2 EVEREADY MINIMAX No. 482
2 EVEREADY MINIMAX 4 1/2 volt "A" No. 746.

GOODYEAR TIRE & RUBBER CO., INC.

MODEL 015070
Chassis 543

Figures at cathodes are cathode current in milliamperes.
Capacity values are in microfarads.



IF PEAK 456 KC

Tube sockets are viewed from under side of chassis.

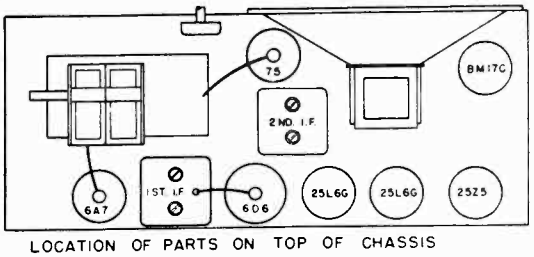
Voltage readings at indicated socket prongs are to zero voltage point on circuit which is Ⓚ on 25L6G tube.

Voltages must be measured with no signal.

Alignment is to be made at the frequencies shown at the trimmer condensers.

Wave trap adjustment at 456 KC input is made to provide maximum reduction of signal.

Where no voltage reading is shown at socket prong, it indicates zero voltage or a very low reading.



LOCATION OF PARTS ON TOP OF CHASSIS

FOR CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOL.VIII

SETTING PUSH-BUTTONS

1. By means of the Station Selector Knob, tune in WITH THE RIGHT HAND AS ACCURATELY AS POSSIBLE the station having the lowest frequency—that is, your selected station which is tuned in nearest the right-hand side of the dial.

2. After the station has been tuned in accurately with the right hand, continue to hold it in its exact position firmly, and with the left hand loosen the Push-Button to be set up for that station by unscrewing the Push-Button about one turn to the left (counter-clockwise).

3. Continuing to hold the Station Selector Knob in its exact position, PUSH THE PUSH-BUTTON IN ALL THE WAY with the left hand.

4. After the Push-Button has been depressed all the way, tighten it gently toward the right (clockwise). Release Push-Button slowly and when in normal position grip button and tighten firmly.

The Push-Button tuning system is now correctly set up for your first selected station of lowest frequency and the Call Letter Tab for this station should be at the extreme right of the Call Letter Holder.

Follow through with this same procedure, setting up the other 5 stations in the order of their frequency—that is, the second station set up will be second lowest in frequency and the third station set up will be third lowest in frequency.

Carefully check each Push-Button for the accuracy of its setting. If, when tuning in any station with its Automatic Push-Button it does not have equal volume or clarity to that obtained with manual tuning, this may indicate the automatic adjustment for that station was not made accurately. Should there be any inaccuracy in any one of the Push-Button adjustments, correction can be made by repeating the above procedure for that button only. Do not reset those Push-Buttons that are accurately adjusted.

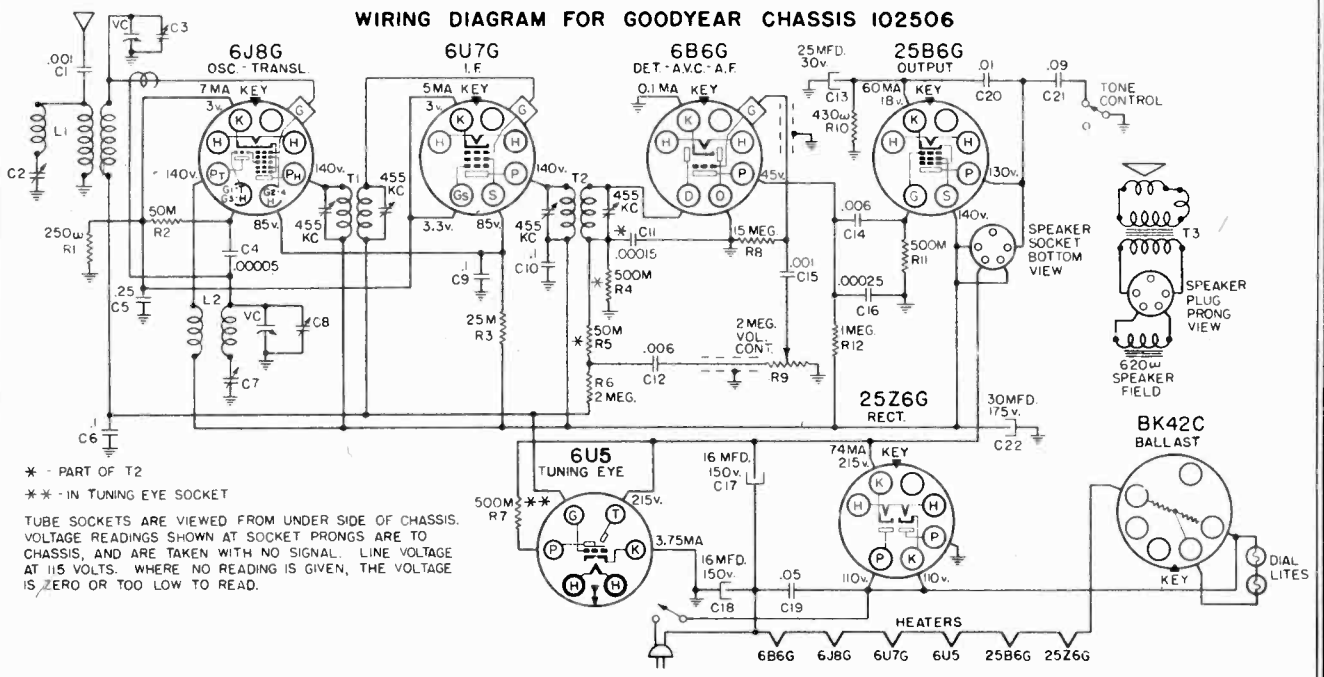
No further adjustments are necessary to operate your radio automatically or manually. To receive any one of your six selected stations for automatic operation, merely push in ALL THE WAY the Button set up for that station.

To receive all other stations in the regular manner, push in the Station Selector Knob and turn it to the frequency of the station desired.

MODEL 102506

GOODYEAR TIRE & RUBBER CO., INC.

WIRING DIAGRAM FOR GOODYEAR CHASSIS 102506



* - PART OF T2

** - IN TUNING EYE SOCKET

TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS, AND ARE TAKEN WITH NO SIGNAL. LINE VOLTAGE AT 115 VOLTS. WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ.

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection . . . . . Across loud speaker voice coil

Output meter reading to indicate 500 milliwatts . . . . . 1.18 volts

Dummy antenna value to be in series with generator output . . . . . See chart below

Connection of generator output lead . . . . . See chart below

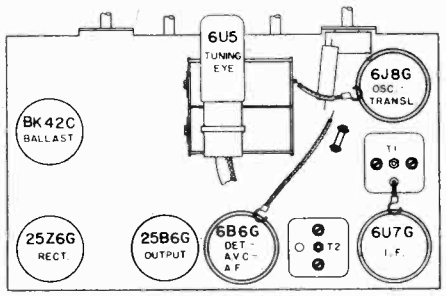
Generator modulation . . . . . 30%, 400 cycles

Position of Volume Control . . . . . Fully clockwise

Position of Tone Control . . . . . HI

Position of Dial Pointer with variable fully closed . . . . . To fall on dot below 550 kc calibration mark.

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMERS ADJUSTED (IN ORDER SHOWN)	TRIMMER FUNCTION
Closed	455 kc	.1 mfd.	6J8G Grid	T2, T1	IF Output IF Input
1400 kc	1400 kc	.0002 mfd.	Ant. Clip	C2	Translator
600 kc (rock)	600 kc	.0002 mfd.	Ant. Clip	C7	Padder



LOCATION OF PARTS ON TOP OF CHASSIS

IMPORTANT ALIGNMENT NOTES

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.

PUSH BUTTON TUNING

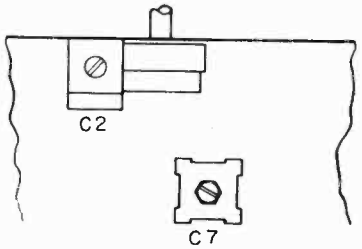
SETTING UP:

Unscrew (turn counter-clockwise) the push button two or three turns. (Use a token or screwdriver in the button slot to unscrew it, if necessary.) Push the button all the way in. Hold it in firmly and at the same time tune in your desired station. With your station tuned in, lock the adjustment by securely tightening (turn clockwise) the push button knob, using token or screwdriver. Hold the button in while tightening it. Unless the button is tightened securely, the adjustments may slip. Punch out the station's call letters from the sheet supplied and insert the call letters in the recess in the button. Then cover the call letters with one of the clear celluloid discs supplied.

Proceed in the same manner for the remaining buttons. If a change in selection of stations is desired, the old call letters can be removed with a pin inserted in the slot under the call letters.

OPERATION:

"Push button stations" will be tuned in by pushing the button all the way in.

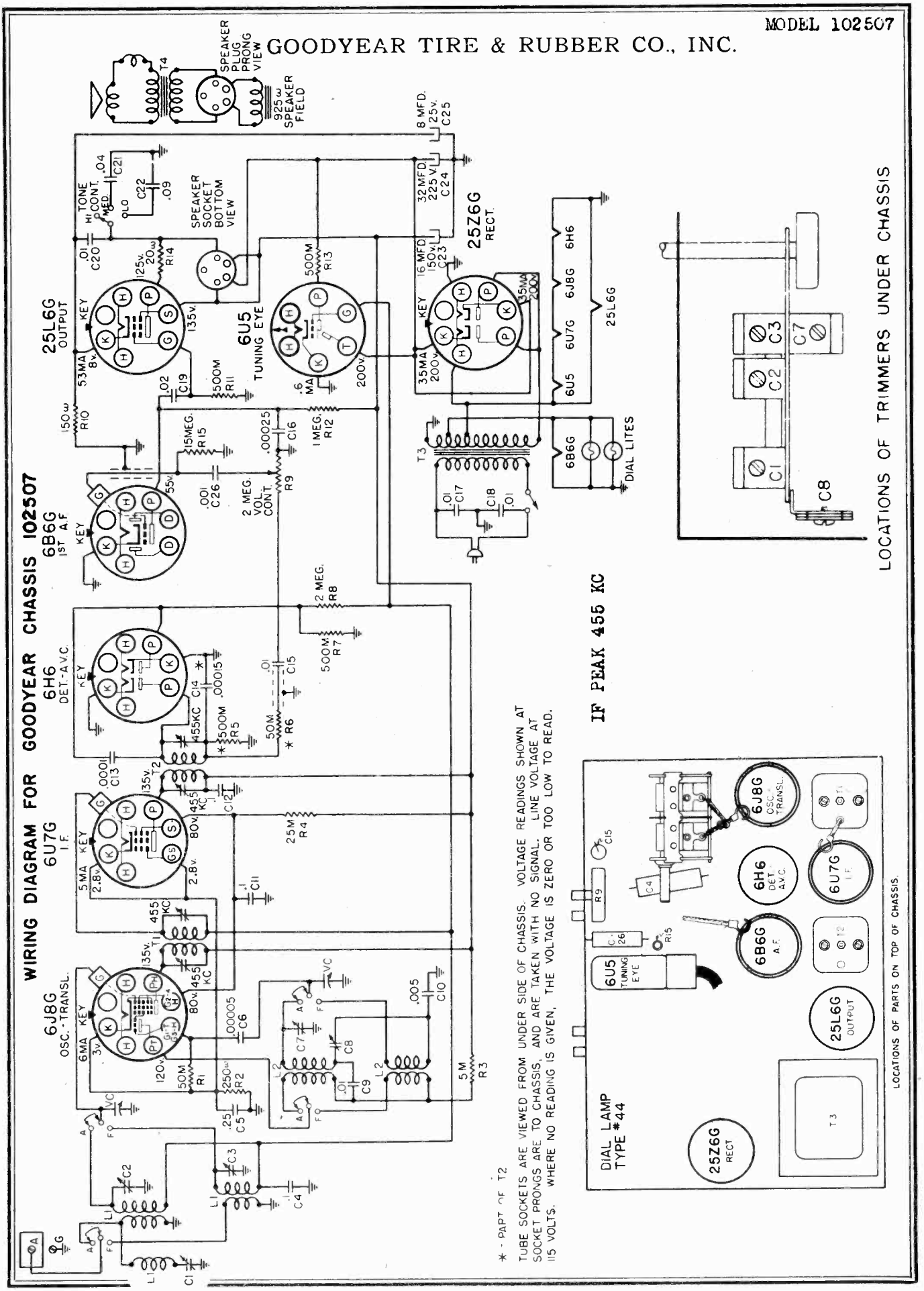


LOCATION OF TRIMMERS UNDER CHASSIS

MODEL 102507

GOODYEAR TIRE & RUBBER CO., INC.

WIRING DIAGRAM FOR GOODYEAR CHASSIS 102507



* - PART OF T2

TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS, AND ARE TAKEN WITH NO SIGNAL. LINE VOLTAGE AT 115 VOLTS. WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ.

MODEL 102507
MODEL 102508

GOODYEAR TIRE & RUBBER CO., INC.

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection . . . . . Across loud speaker voice coil

Output meter reading to indicate 500 milliwatts Ch. 102508 . . . . . 0.96 volts

Output meter reading to indicate 500 milliwatts Ch. 102507 . . . . . 1.32 volts

Generator ground lead connection . . . . . Receiver chassis

Dummy antenna value to be in series with generator output . . . . . See chart below

Connection of generator output lead . . . . . See chart below

Generator modulation . . . . . 30%, 400 cycles

Position of Volume Control . . . . . Fully clockwise

Position of Tone Control . . . . . HI

Position of Dial Pointer with variable fully closed Ch. 102508 Center of block to left of 550 kc calibration mark.

Position of Dial Pointer with variable fully closed Ch. 102507 Center of first mark to left of 550 kc calibration mark.

Ch. 102507

WAVE BAND SWITCH POSITION	POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMERS ADJUSTED (IN ORDER SHOWN)	TRIMMER FUNCTION
"AM"	Closed	455 kc	.1 mfd.	6J8G Grid	T3, T1	IF Output IF Input
"AM"	600 kc	455 kc*	.0003 mfd.	Ant. Term.	C1*	Wave Trap
"AM"	Fully open	1730 kc	.0003 mfd.	Ant. Term.	C7	Oscillator
"AM"	1400 kc	1400 kc	.0003 mfd.	Ant. Term.	C3	Translator
"AM"	600 kc (rock)	600 kc	.0003 mfd.	Ant. Term.	C8	Padder
"SW"	15 mc (rock)	15 mc	400 ohms	Ant. Term.	C3	Translator

IMPORTANT ALIGNMENT NOTES

* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.

Ch. 102508

WAVE BAND SWITCH POSITION	POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMERS ADJUSTED (IN ORDER SHOWN)	TRIMMER FUNCTION
"AM"	Closed	455 kc	.1 mfd.	6A8G Grid	T3, T1	IF Output IF Input
"SW"	15 mc(rock)	15 mc	400 ohms	Ant. Term.	C5	Translator
"9MC"	9.55 mc	9.55 mc	400 ohms	Ant. Term.	C7* C6	Oscillator Translator
"AM"	1400 kc	1400 kc	.0003 mfd.	Ant. Term.	C8,C3,C2	Osc.,Trans,Ant.
"AM"	600 kc(rock)	600 kc	.0003 mfd.	Ant. Term.	C9	Padder

IMPORTANT ALIGNMENT NOTES

The alignment must be done in the order given.

*Two peaks can be had, one with the trimmer screwed further out than the other. The correct adjustment is with the trimmer screwed further out. The other peak is the image.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.

MODEL 102507

PUSH BUTTON TUNING

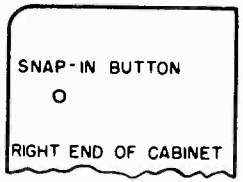


FIG. 1

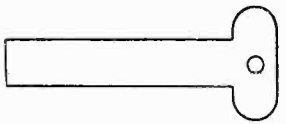


FIG. 2

SETTING UP:

Leave the radio turned on for about 15 minutes before adjusting the push buttons. This "warming up" period will insure permanent and accurate settings.

1. Make a list of the stations that you want to set up for push button tuning. It is advisable, but not necessary, to arrange the stations in the order of their frequency (kilocycles); that is, the station of lowest frequency will be #1, the station of next higher frequency #2, etc. The top left push button can be used for station #1, the lower left one for station #2, the next upper one for station #3, etc. If you wish, short wave stations can be set up for approximate push button tuning and then tuned accurately with the tuning knob. The stations selected must give strong and reliable reception.

2. Remove the four screws that hold the plate through which the push buttons protrude, and remove the plate. (This plate is called the "escutcheon".) If your radio is a table model (not a console), remove the snap-in button at the right side of the cabinet. See Fig 1.

3. Push the tuning knob in and turn it so that the dial pointer comes to the right end of the dial. If your radio is a table model, a key, illustrated in Fig. 2, will be found in the Instruction Leaflet envelope. Insert this key in the hole in the side of the cabinet from which the snap-in button was removed and engage the key with the slot at the end of the push button locking mechanism. Unscrew (turn counter-clockwise) the key a few turns, unlocking the mechanism. (A screw driver can be used for unlocking the mechanism instead of the key supplied.)

If yours is a console model, the mechanism can be unlocked by reaching in from the back of the cabinet and unscrewing (turning counter-clockwise) the wing nut, at the end of the mechanism, a few turns. (This can be done by hand.)

4. Push the button that you wish to use for your #1 station, all the way in and hold it in firmly. Push the tuning knob in and turn it until your #1 station is tuned in exactly. Then let go of the push button, making sure not to turn the tuning knob until you have let go of the button. (Turning the knob while the button is pushed in would spoil the accuracy of the adjustment.) Be as exact as possible in tuning your station since this will determine how accurately your station will be tuned whenever you use the push button.

5. Push in your #2 button. Hold it in firmly and tune in your #2 station accurately. Then let go of the push button and then the tuning knob. Proceed in the same manner for the other stations on your list.

6. When all of the stations have been set up, push the tuning knob in and turn it so that the dial pointer comes to the left end of the dial. Then lock the mechanism by tightening (turning clockwise) the wing nut for console models or by using the key for table models. If yours is a table model, replace the snap-in button in the side of the cabinet.

7. Punch out the call letters of your desired stations from the call letter sheets supplied. Insert the call letters in the celluloid holders at the back of the escutcheon. Be sure to insert the call letters so that they are opposite their respective push buttons. Then replace the escutcheon.

8. You may change your choice of stations at any time by unlocking the mechanism as described in Step 3 and adjusting the button to the new station, as described in Step 4. Then relock the mechanism as described in Step 6. The call letters of the new station should be inserted in the call letter holder in their proper position.

Chassis 102508, 102509

PUSH BUTTON TUNING

SETTING UP:

Leave the radio turned on for about 15 minutes before adjusting the push buttons. This "warming up" period will insure permanent and accurate settings.

1. Make a list of the stations that you want to set up for push button tuning. It is helpful to arrange the stations in the order of their frequency (kilocycles); that is, the station of lowest frequency will be #1, the station of next higher frequency #2, etc. The top left push button can be used for station #1, the lower left one for station #2, the next upper one for station #3, etc. If you wish, short wave stations that can be tuned in on a SPREAD BAND scale can be set up for push button tuning. The stations selected must give strong and reliable reception.

2. Remove the four screws that hold the plate through which the push buttons protrude, and remove the plate. (This plate is called the "escutcheon".)

3. Push the tuning knob in and turn it so that the dial pointer comes to the left end of the dial. Engage the small screw driver, supplied, with the slotted shaft that is between the tuning knob and the push buttons. Unlock the mechanism by pushing the shaft in and unscrewing it (turn counter-clockwise) about four turns. Then remove the screw driver.

4. Push the button that you wish to use for your #1 station, all the way in and hold it in firmly. Push the tuning knob in and turn it until your #1 station is tuned in exactly, as indicated by the tuning eye. Be as exact as possible in tuning your station since this will determine how accurately your station will be tuned whenever you use the push button. Then let go of the push button before turning the tuning knob again. If properly done, the tuning eye indication will not change when you let go of the push button.

5. Push in your #2 button. Hold it in firmly and tune in your #2 station accurately. Then let go of the push button; then the tuning knob. Proceed in the same manner for the other stations on your list.

CAUTION: Use the small screw driver supplied for performing the next operation. Use of a larger screw driver than the one supplied will result in too much force being applied. The locking mechanism must not be turned too far to the right. Otherwise it may be impossible to obtain proper operation of the push buttons and the mechanism is liable to be permanently damaged.

6. After the last station has been set up, lock the mechanism by pushing the slotted shaft in and securely tightening it (turn clockwise), using the small screw driver, supplied (Pushing the slotted shaft in will release the last push button. The dial pointer will move to the right end of the dial as the slotted shaft is turned.) Then remove the screw driver. If the slotted shaft remains pushed in when the screw driver is removed, turning it back and forth very slightly will release it.

After locking the mechanism, test the setting of each button by pushing it in. Then see if the station can be tuned still more accurately by using the tuning knob. Increased accuracy of tuning with the knob will be indicated by a narrower shadow of the tuning eye. If you find any stations that have not been correctly set up, unlock the mechanism, as described in Step 3, and readjust the setting. Be sure to look the mechanism again before tuning any stations.

7. Punch out the call letters of your desired stations from the call letter sheets supplied. Insert the call letters in the recesses in the front of the push buttons. Cover the call letters with the clear celluloid tabs supplied. Replace the escutcheon.

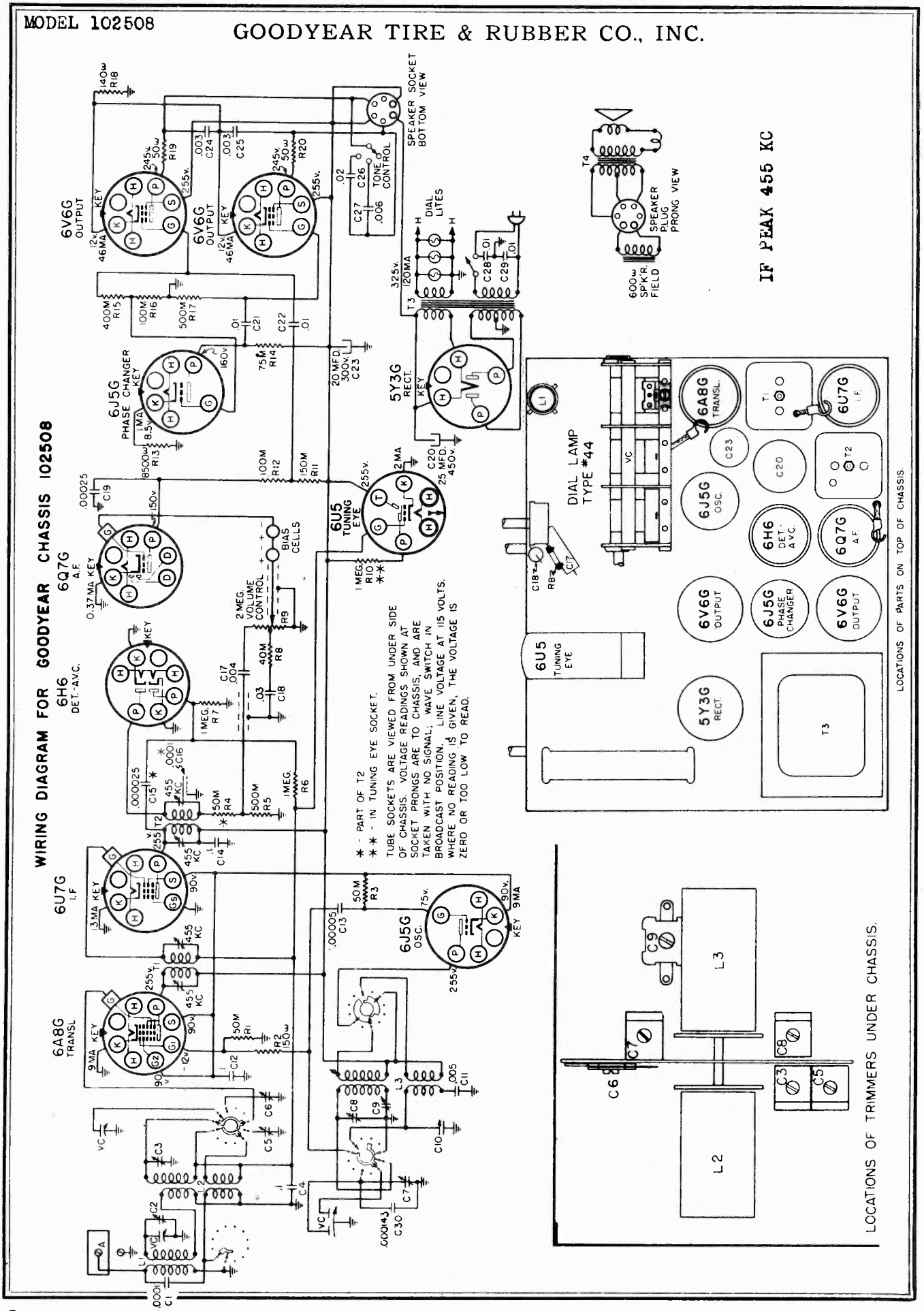
8. You may change your choice of stations at any time by unlocking the mechanism as described in Step 3 and adjusting the button to the new station, as described in Step 4. Then relock the mechanism as described in Step 6. The call letters of the new station should be inserted in the proper push button.

GOODYEAR TIRE & RUBBER CO., INC.
MODEL 102507
MODEL 102508
MODEL 102509

MODEL 102508

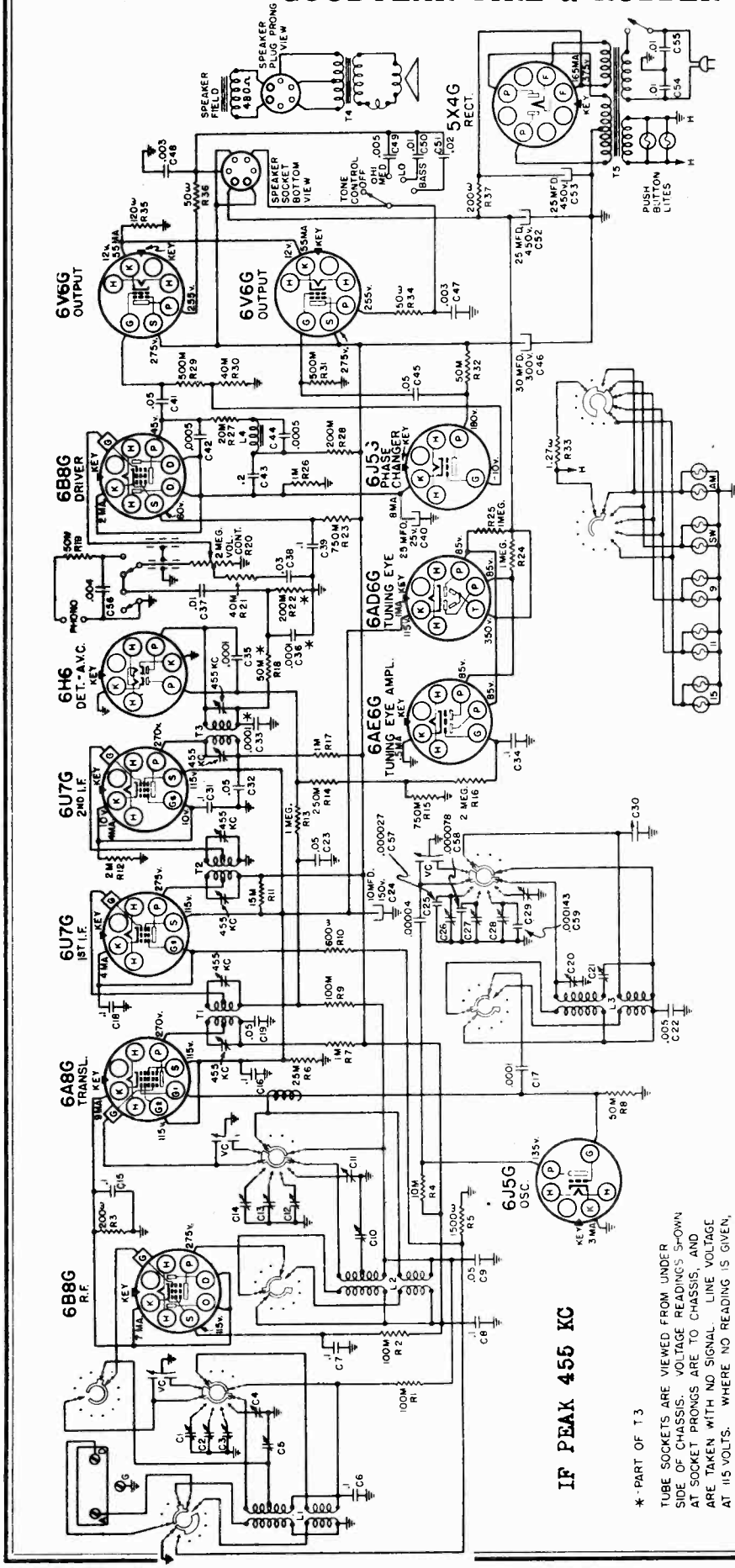
GOODYEAR TIRE & RUBBER CO., INC.

WIRING DIAGRAM FOR GOODYEAR CHASSIS 102508



GOODYEAR TIRE & RUBBER CO., INC.

MODEL 102509



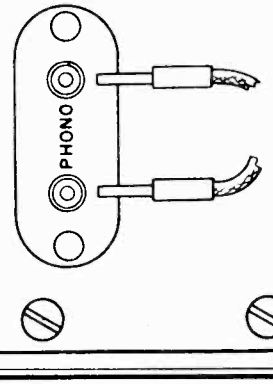
WIRING DIAGRAM FOR GOODYEAR CHASSIS 102509

PHONOGRAPH OPERATION

Provision is made so that your radio can be used to give high quality reproduction from phonograph records. The phonograph "pick up" must be of modern high impedance electric type. The Goodyear catalog #0110 record player is especially recommended.

Push the two pin plugs, that will be found at the end of the cord attached to the record player, into the holes in the connection board provided at the rear of the radio. Try the plugs in both possible positions in the connection board, and leave them in the position giving better reproduction.

The knob at the back of the radio must be in the position marked "PHONO" for phonograph operation and in the position marked "RADIO" for radio reception. The radio volume and tone controls will also function for phono reproduction.



MODEL 102509

GOODYEAR TIRE & RUBBER CO., INC.

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection . . . . . Across loud speaker voice coil

Output meter reading to indicate 500 milliwatts . . . . . 1.06 volts

Generator ground lead connection . . . . . Receiver chassis

Dummy antenna value to be in series with generator output . . . . . See chart below

Connection of generator output lead . . . . . See chart below

Generator modulation . . . . . 30%, 400 cycles

Position of Volume Control . . . . . Fully clockwise

Position of Tone Control . . . . . HI

Position of Dial Pointer with variable fully closed . . . . . Center of block to left of 550 kc calibration mark.

WAVE BAND SWITCH POSITION	POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMERS ADJUSTED (IN ORDER SHOWN)	TRIMMER FUNCTION
"AM"	Closed	455 kc	.1 mfd.	6A8G Grid	T3, T2, T1	IF Output, IF Interstage, IF Input.
"SW"	18 mc	18 mc	400 ohms	Ant. Term.	C39*	Oscillator
"SW"	15 mc (rock)	15 mc	400 ohms	Ant. Term.	C11, C4	Translator, RF
"9"	9.55 mc	9.55 mc	400 ohms	Ant. Term.	C38* C12 C3	Oscillator Translator RF
"11"	11.7 mc	11.7 mc	400 ohms	Ant. Term.	C37* C13 C2	Oscillator Translator RF
"15"	14.9 mc	14.9 mc	400 ohms	Ant. Term.	C36* C14 C1	Oscillator Translator RF
"AM"	1400 kc	1400 kc	.0002 mfd.	Ant. Term.	C20 C10 C5	Oscillator Translator RF
"AM"	600 kc (rock)	600 kc	.0002 mfd.	Ant. Term.	C21	Padder

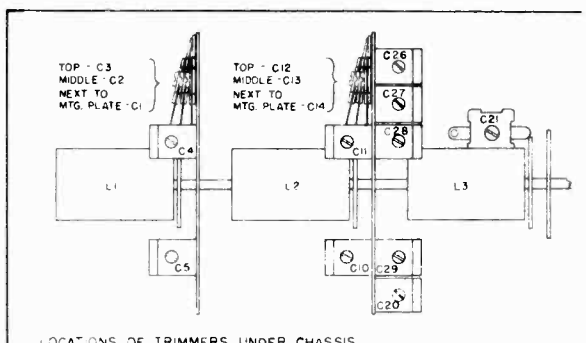
IMPORTANT ALIGNMENT NOTES

The alignment must be done in the order given.

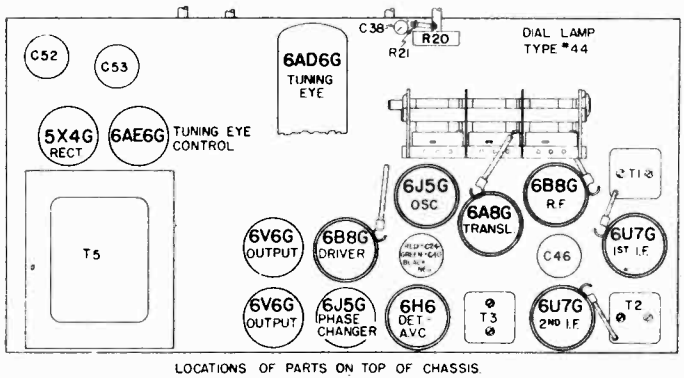
*Two peaks can be had, one with the trimmer screwed further out than the other. The correct adjustment is with the trimmer screwed further out. The other peak is the image.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.



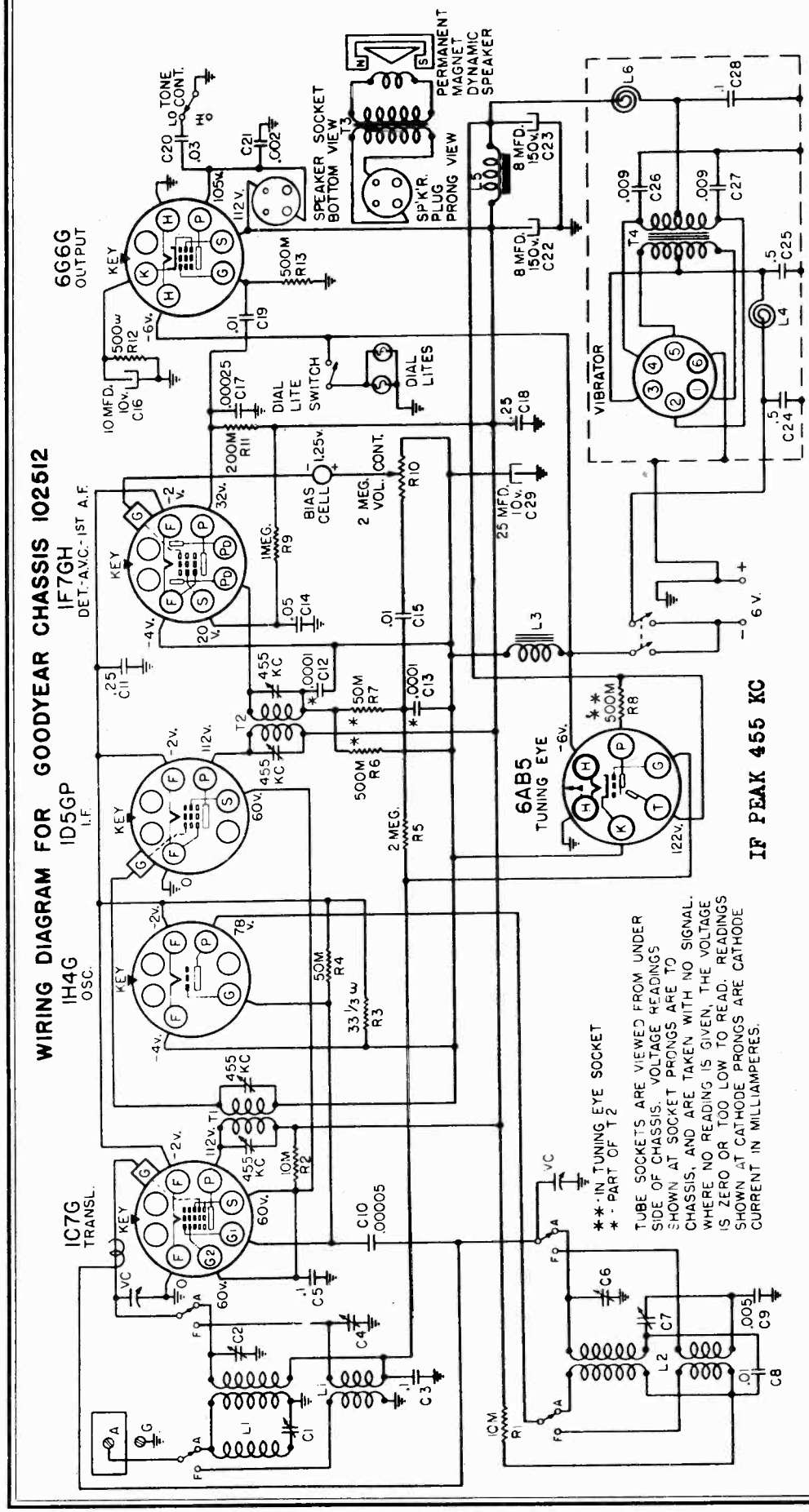
LOCATIONS OF TRIMMERS UNDER CHASSIS.



LOCATIONS OF PARTS ON TOP OF CHASSIS.

GOODYEAR TIRE & RUBBER CO., INC.

MODEL 102512
MODEL 102513



PUSH BUTTON TUNING

Ch. 102512, 102513

SETTING UP:

Unscrew (turn counter-clockwise) the push button two or three turns. (Use a penny in the button slot to unscrew it, if necessary.) Push the button all the way in. Hold it in firmly and at the same time tune in your desired station. With your station tuned in, lock the adjustment by tightening the push button knob (turn clockwise). Hold the button in while tightening it. Punch out the station's call letters from the sheet supplied and insert the call letters in the recess in the button. Then cover the call letters with one of the clear celluloid discs supplied.

Proceed in the same manner for the remaining buttons. If a change in selection of stations is desired, the old call letters can be removed with a pin inserted in the slot under the call letters.

MODEL 102512 .

GOODYEAR TIRE & RUBBER CO., INC.

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection . . . . . Across loud speaker voice coil

Output meter reading to indicate 50 milliwatts . . . . . 0.37 volts

Generator ground lead connection . . . . . Receiver chassis

Dummy antenna value to be in series with generator output . . . . . See chart below

Connection of generator output lead . . . . . See chart below

Generator modulation . . . . . 30%, 400 cycles

Position of Volume Control . . . . . Fully clockwise

Position of Tone Control . . . . . HI

Position of Dial Pointer with variable fully closed . . . . . Horizontal

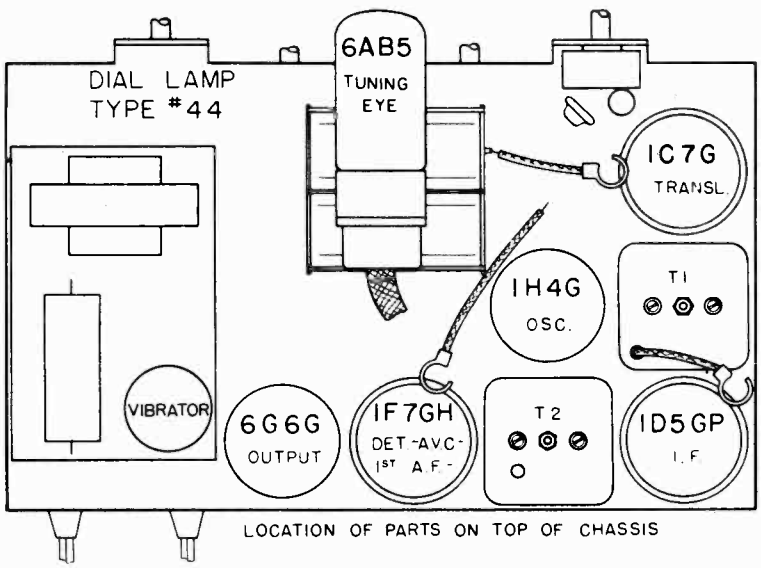
WAVE BAND SWITCH POSITION	POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMERS ADJUSTED (IN ORDER SHOWN)	TRIMMER FUNCTION
"AM"	Closed	455 kc	.1 mfd.	1C7G Grid	T2, T1	IF Output IF Input
"AM"	600 kc	455 kc*	.0002 mfd.	Ant. Term.	C1*	Wave Trap
"AM"	1400 kc	1400 kc	.0002 mfd.	Ant. Term.	C6, C2	Osc., Transl.
"AM"	600 kc(rock)	600 kc	.0002 mfd.	Ant. Term.	C7	Padder
"SW"	16 mc(rock)	16 mc	400 ohms	Ant. Term.	C4	Transl.

IMPORTANT ALIGNMENT NOTES

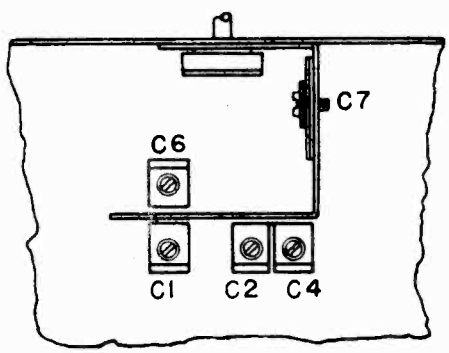
* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.



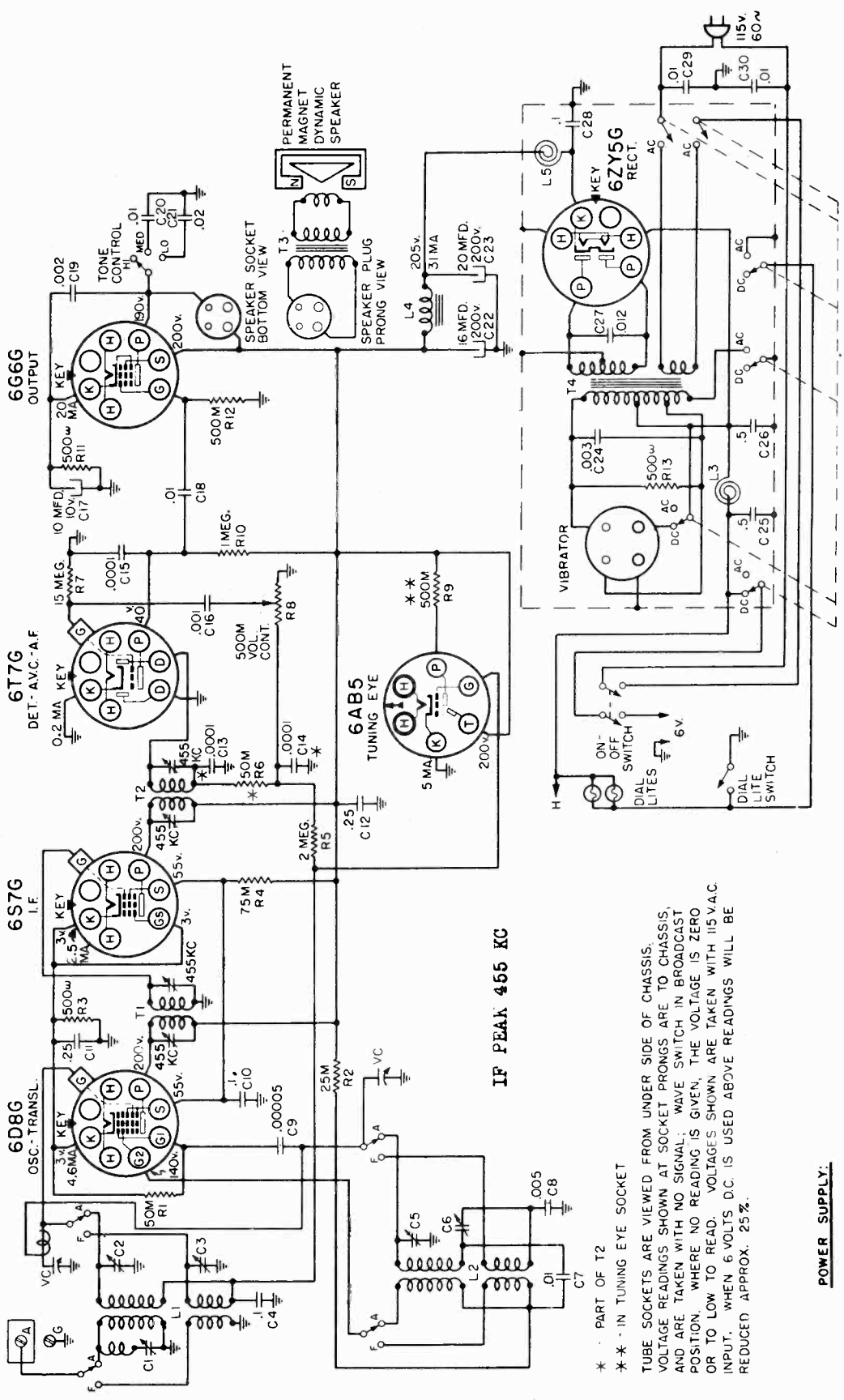
LOCATION OF PARTS ON TOP OF CHASSIS



LOCATIONS OF TRIMMERS UNDER CHASSIS

MODEL 102513

GOODYEAR TIRE & RUBBER CO., INC.



WIRING DIAGRAM FOR GOODYEAR CHASSIS 102513

POWER SUPPLY:

Either a 6 volt storage battery or a 115 volt, 50-60 cycle alternating current(AC)power supply may be used.

If a 6 volt storage battery is used,connect the clips at the ends of the flexible wires, at the rear of the receiver,to the terminals of the storage battery. Either clip may be connected to either terminal. If AC supply is to be used, insert the power cord plug into a convenient receptacle. The storage battery connection clips will then be left unconnected. There is a knob at the rear of the receiver to be turned to the marking "6 volt" or "115 volt, depending upon the type of power supply used. No damage will result if the knob is turned to the wrong position although the receiver will not operate until the knob is turned to the position that corresponds with the type of power supply used.

MODEL 102513

GOODYEAR TIRE & RUBBER CO., INC.

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection . . . . . Across Loud speaker voice coil

Output meter reading to indicate 50 milliwatts . . . . . 0.32 volts

Generator ground lead connection . . . . . Receiver chassis

Dummy antenna value to be in series with generator output . . . . . See chart below

Connection of generator output lead . . . . . See chart below

Generator modulation . . . . . 30%, 400 cycles

Position of Volume Control . . . . . Fully clockwise

Position of Tone Control . . . . . HI

Position of Dial Pointer with variable fully closed . . . . . Horizontal. To be along first heavy line below 550 kc

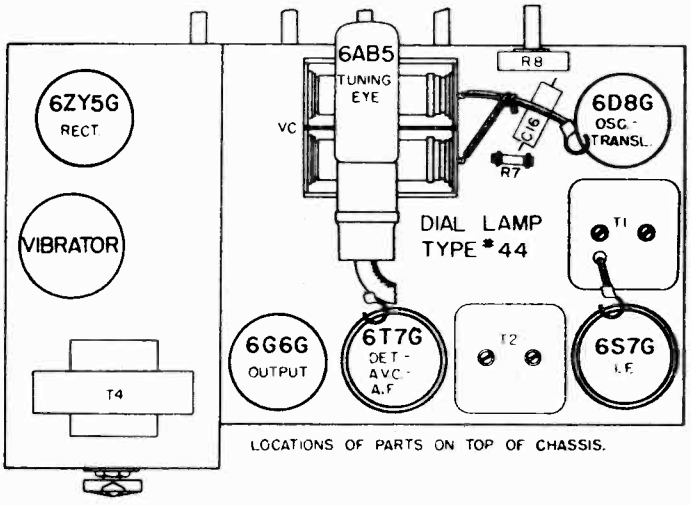
WAVE BAND SWITCH POSITION	POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMERS ADJUSTED (IN ORDER SHOWN)	TRIMMER FUNCTION
"AM"	Closed	455 kc	.1 mfd.	6D8G Grid	T3, T1	IF Output IF Input
"AM"	600 kc	455 kc*	.0003 mfd.	Ant. Term.	C1*	Wave Trap
"AM"	1500 kc	1500 kc	.0003 mfd.	Ant. Term.	C5, C2	Os.,Transl.
"AM"	600 kc(rock)	600 kc	.0003 mfd.	Ant. Term.	C6	Padder
"SW"	15 mc(rock)	15 mc	400 ohms	Ant. Term.	C3	Transl.

IMPORTANT ALIGNMENT NOTES

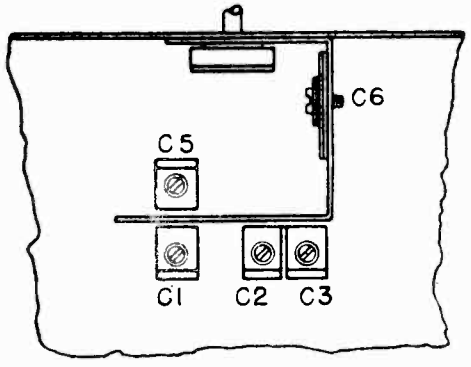
* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.



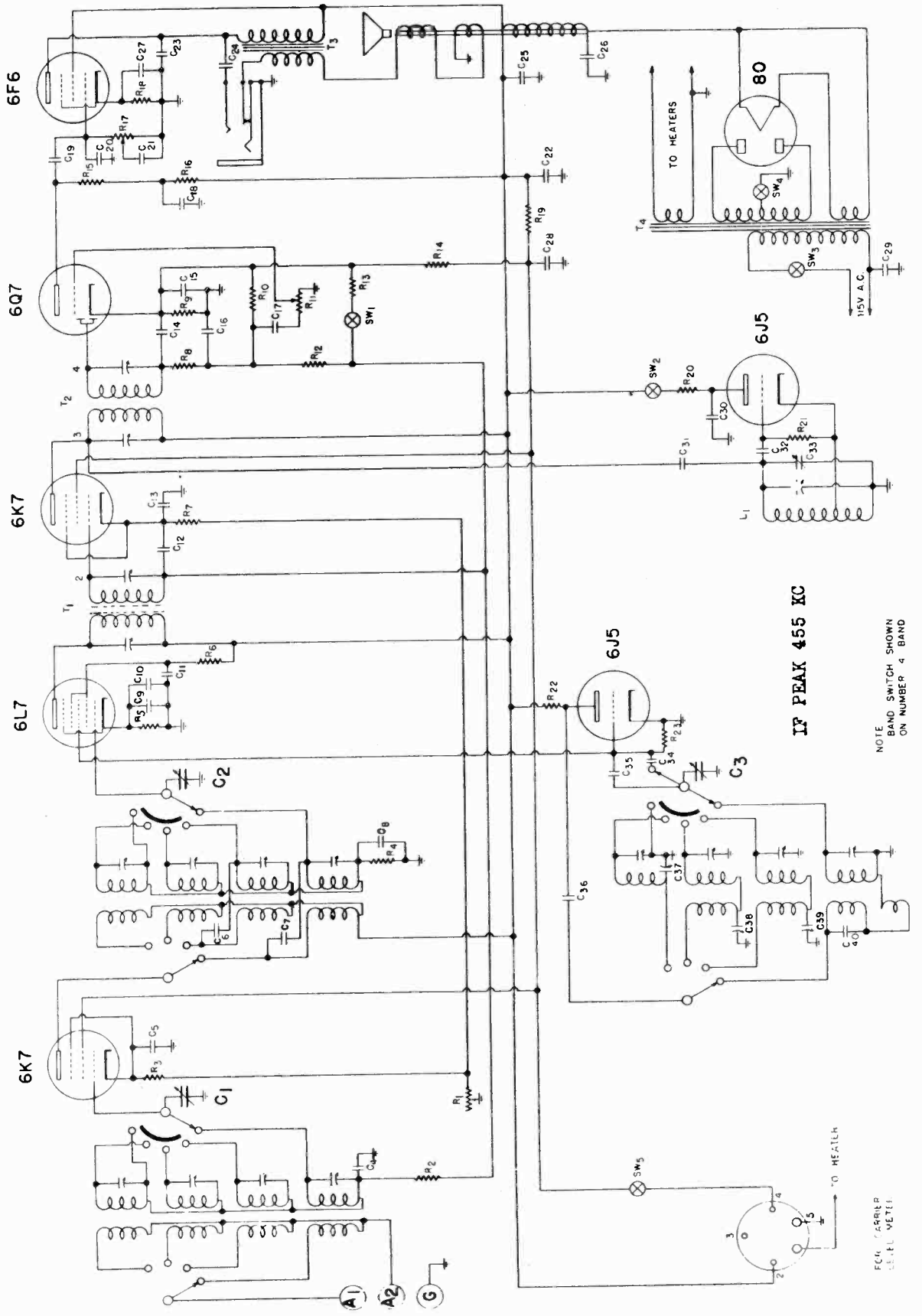
LOCATIONS OF PARTS ON TOP OF CHASSIS.



LOCATIONS OF TRIMMERS UNDER CHASSIS

THE HALLICRAFTERS CO.

SCHEMATIC DIAGRAM — SKY CHAMPION — MODEL S-20



THE SEND-RECEIVE SWITCH ENABLES THE OPERATOR TO MAKE THE RECEIVER INOPERATIVE TEMPORARILY DURING STAND-BY PERIODS. SHOULD THE RECEIVER BE USED IN CONJUNCTION WITH A TRANSMITTER THIS FEATURE WILL PROVE VALUABLE.

ANTENNA: ON THE BACK OF THE CHASSIS WILL BE FOUND THE ANTENNA, DOUBLET AND GROUND TERMINAL STRIP. A CONVENTIONAL SINGLE WIRE ANTENNA SHOULD BE CONNECTED TO A1, AND THE JUMPER BETWEEN A2 AND G LEFT CONNECTED. A 75 FOOT PIECE OF #14 ENAMELED WIRE INSULATED AND SUSPENDED IN THE CLEAR IS RECOMMENDED FOR THIS TYPE OF ANTENNA. IF A DOUBLET ANTENNA IS USED THE TWO WIRES OF THE LEAD-IN ARE CONNECTED TO A1 AND A2 AND THE JUMPER BETWEEN A2 AND G REMOVED. A GROUND CAN BE CONNECTED TO THE G TERMINAL WITH EITHER TYPE OF ANTENNA. IT IS SUGGESTED THAT A GROUND BE LEFT OFF THE RECEIVER ONLY IF IN SO DOING THE PERFORMANCE OF THE RECEIVER IS IMPROVED. THERE ARE SO MANY DIFFERENT VERSIONS OF ANTENNA SYSTEMS THAT WE SUGGEST TO THE USER WHO WISHES TO EXPERIMENT WITH THE VARIOUS TYPES THAT HE FIRST FAMILIARIZE HIMSELF WITH THE ANTENNA SECTION OF THE A.R.R.L. HANDBOOK.

THE A.V.C. OR AUTOMATIC VOLUME CONTROL SWITCH PROVIDES OPTIONAL USE OF A.V.C. WHEN RECEIVING MUSIC OR VOICE SIGNALS IT IS ADVISABLE THAT THE SWITCH BE IN THE "ON" POSITION. WHEN RECEIVING CODE TRANSMISSIONS THE SWITCH SHOULD ALWAYS BE IN THE "OFF" POSITION.
THE B.F.O. SWITCH MUST BE IN THE "ON" POSITION TO OBTAIN THE NECESSARY BEAT NOTE FOR THE RECEPTION OF CODE SIGNALS. USING THE B.F.O. WILL BE HELPFUL IN LOCATING THE CARRIERS OF DISTANT AND POSSIBLY WEAK BROADCASTING STATIONS. ONCE LOCATED, THE B.F.O. SHOULD BE TURNED OFF OR THE WHISTLE WILL INTERFERE WITH RECEPTION.
THE PITCH CONTROL - WHEN THE B.F.O. IS "ON" - WILL ALLOW YOU TO VARY THE FREQUENCY OF THE RESULTANT BEAT NOTE TO ONE THAT IS MOST PLEASING TO YOU. A HEAD-PHONE JACK IS MOUNTED IN AN ACCESSIBLE POSITION ON THE FRONT PANEL OF THE SKY-CHAMPION. ANY TYPE OF HEADPHONES CAN BE USED BECAUSE NO DIRECT CURRENT FLOWS IN THE HEADPHONE CIRCUIT. WHEN THE PHONES ARE PLUGGED IN THE LOUD SPEAKER IS AUTOMATICALLY DISCONNECTED.

ON THE BACK OF THE CHASSIS YOU WILL FIND A SOCKET INTO WHICH YOU CAN PLUG A TYPE SM-18 CARRIER LEVEL INDICATOR. WHEN THIS METER IS USED IT WILL BE NECESSARY TO ADVANCE THE R.F. GAIN CONTROL ON THE RECEIVER AS FAR AS IT WILL GO TO THE RIGHT. DOING THIS WILL OPERATE THE SWITCH WHICH IS MOUNTED ON THE BACK OF THIS CONTROL. ADDITIONALLY THE A.V.C. SWITCH SHOULD BE IN THE "ON" POSITION TO PROPERLY CONNECT THE METER IN THE CIRCUIT. THIS METER IS AVAILABLE THROUGH THE DEALER FROM WHOM YOU PURCHASED YOUR RECEIVER.

THE TUBE-LINE-UP OF THE S-20 SKY-CHAMPION IS AS FOLLOWS:

6K7	R.F. STAGE
6L7	1ST DETECTOR - MIXER
6J5G	H. F. OSCILLATOR
6K7	I. F. AMPLIFIER
6Q7G	2ND DETECTOR, A.V.C., 1ST STAGE OF AUDIO
6F6G	AUDIO OUTPUT STAGE
6J5G	BEAT FREQUENCY OSCILLATOR
80	RECTIFIER

No.	OHMS	WATTAGE	PARTS No.
R1	10,000	R. F. GAIN	25-029
2	100,000	1/3	20-093
3	350	"	20-120
4	100,000	"	20-093
5	600	"	22-125
6	30,000	1	22-075
7	300	1/3	20-021
8	20,000	"	20-072
9	300	"	20-021
10	250,000	"	20-099
11	500,000	A. F. GAIN	25-031
12	1,000,000	1/3	20-108
13	100	"	20-009
14	25,000	1	20-073
15	100,000	1/3	20-093
16	50,000	"	20-084
17	500,000	TONE CONTROL	25-018
18	500	1	20-025
19	20,000	"	20-070
20	25,000	"	20-073
21	100,000	1/3	20-093
22	10,000	1	20-061
23	50,000	1/3	20-084

SW	SWITCHES
1	A. V. C. SPST
2	B. F. O. SPST
3	AC ON-OFF (ON TONE CONTROL)
4	SEND - RECEIVE SPST
5	EXT "S" METER (ON RF GAIN)

No.	CAPACITY	TYPE	VOLTAGE	PARTS No.
C1		MAIN TUNING		48-022
2	408 MMFD			
3				
4	.05 MFD		200	41-004
5	.05 "		200	41-004
6	10 MMFD	MICA		40-021
7	25 "	"		40-024
8	.05 MFD		200	41-004
9	.002 "	"		40-013
10	.05 "		200	41-004
11	.05 "		400	41-005
12	.05 "		200	41-004
13	.02 "		200	41-002
14	100 MMFD	"		40-007
15	.1 MFD		200	41-006
16	100 MMFD	"		40-007
17	.05 MFD		200	41-004
18	.1 "		400	41-007
19	.05 "		400	41-005
20	.00025"	"		40-024
21	.01 "		200	41-000
22	.1 "		400	41-007
23	.01 "		600	45-002
24	.01 "		600	45-002
25	8 "		450	
26	8 "		450	42-021
27	10 "		25	
28	.1 "		400	41-007
29	.01 "		400	41-001
30	.01 "		400	41-001
31	1 MMFD	TWISTED PAIR		
32	250 "	MICA		40-024
33	25 "	PITCH CONTROL		48-021
34	100 "	MICA		40-007
35	25 "	"		40-024
36	.002 MFD	"		40-013
37	430 MMFD	PAD		44-025
38	1,300 "	"		44-024
39	2,100 "	"		44-025
40	100 "	MICA		40-007

THE SKY-CHAMPION IS AN 8 TUBE 4 BAND SUPERHETERODYNE RECEIVER COVERING THE FOLLOWING FREQUENCIES:

BAND	COVERAGE
1	540 KC TO 1,800 KC
2	1.70 MC TO 5.75 MC
3	5.62 MC TO 18.40 MC
4	17.00 MC TO 44.00 MC

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 COIL IN THE CIRCUIT. THE UNUSED COILS ARE SHORTED. THE CALIBRATION ON THE MAIN DIAL IS IN KILOCYCLES ON BAND #1 AND IN MEGACYCLES ON BANDS # 2,3 AND 4.

MODEL S-20

THE HALLICRAFTERS CO.

ALIGNMENT

Set the controls as follows:
AVC and BFO switches to "OFF"; A-F and R-F gain controls to maximum volume; band switch on No. 1 band; main dial at 1800 kc or minimum capacity position.

Remove 6L7 grid cap. Connect signal generator through 0.1-mf condenser to grid of 6L7, and signal generator ground to chassis of set. Set signal generator to 455 kc. Adjust trimmers on T1 and T2 for exact resonance.

R-F Alignment

Replace the condenser in the signal generator lead with a 400-ohm resistor, connecting it to the A1 terminal on the rear of the chassis. Leave jumper between A2 and G terminals connected.

Band No. 1

Place band switch on No. 1 or broadcast band.
Set generator to 1400 kc and adjust main dial to that frequency.
Adjust the following trimmers for maximum signal:

Oscillator	CA
Mixer	CB
Antenna	CC

Reset generator and receiver to 600 kc and adjust the following padder for maximum signal: C37

Band No. 2

Place band switch on No.2 band.
Set generator and receiver to 4 mc and adjust the following trimmers for maximum signal:
CJ CK CL
Reset generator and receiver to 1.8 mc and resonate padder C38 for maximum signal.

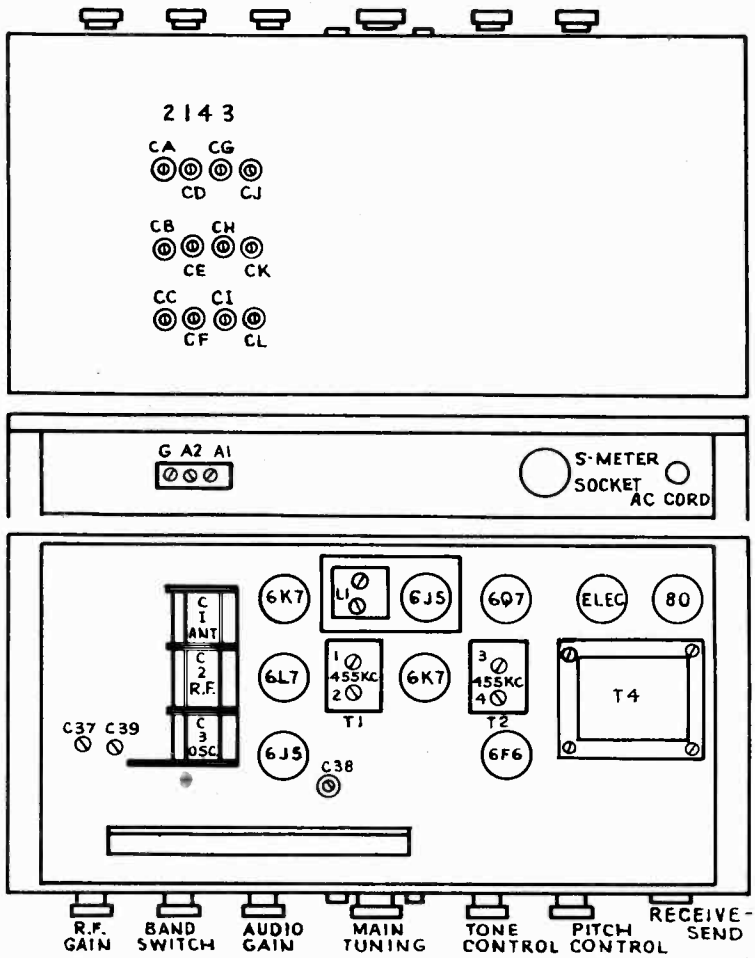
Band No. 3

Place band switch on No. 3 band.
Adjust generator and receiver to 14 mc and trim with CG, CH, and CL.
Reset generator and receiver to 7 mc and adjust padder C39.

Band No. 4

Place band switch on No.4 band.
Set generator and receiver to 40 mc and adjust CD, CE, and CF.
Reset generator and receiver to 18 mc. There is no padder on the 4th band, but 18 mc should fall within 1 division with no other adjustments.

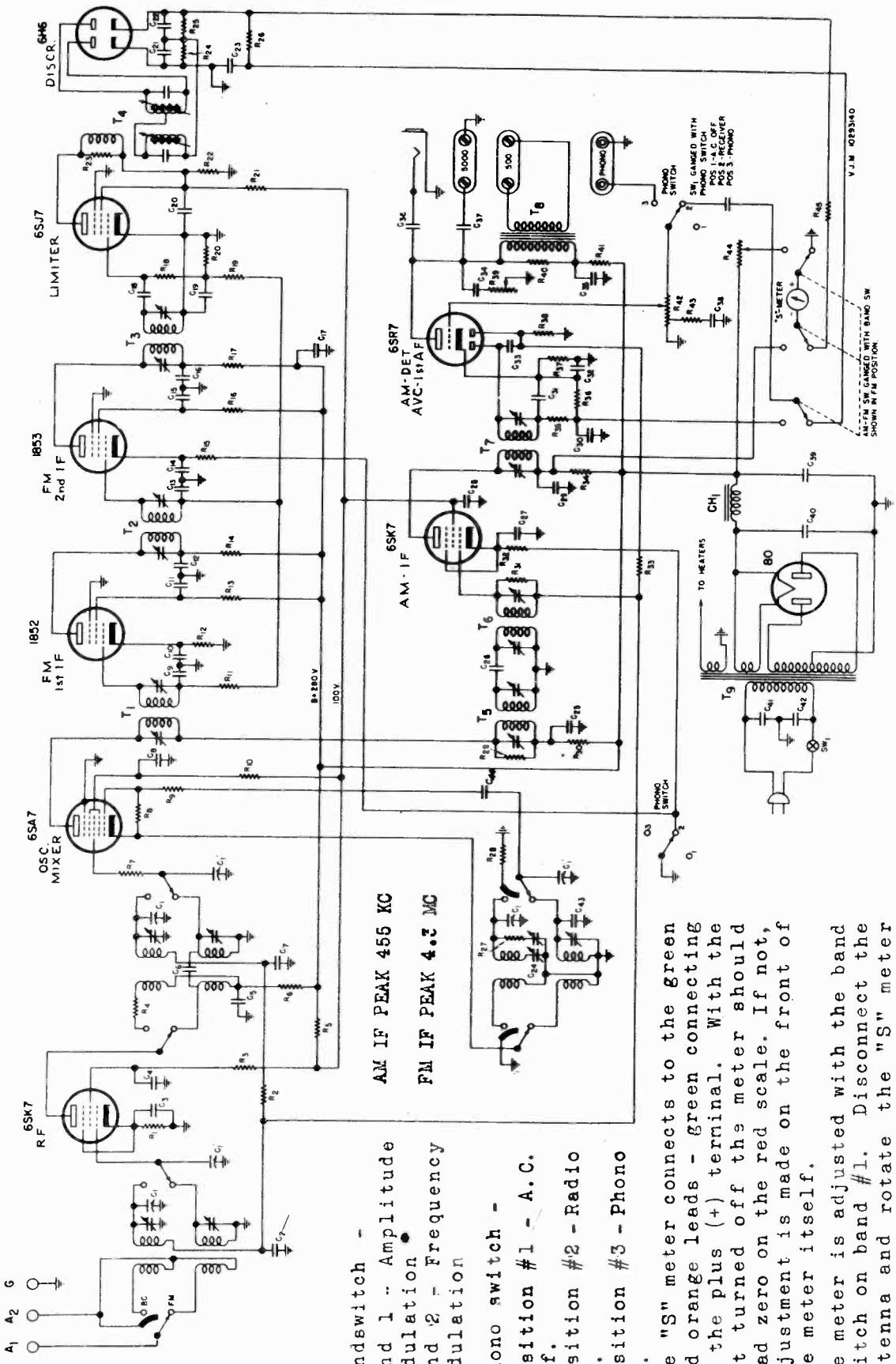
While making the above adjustments, rock the main condenser.



MODEL S-31

THE HALLICRAFTERS CO.

SCHEMATIC DIAGRAM-HIGH FREQUENCY F.M-BROADCAST AM TUNER-MODEL S-31



Bandswitch -
Band 1 - Amplitude modulation
Band 2 - Frequency modulation

Phono switch -
Position #1 - A.C. Off.
Position #2 - Radio On.
Position #3 - Phono On.

The "S" meter connects to the green and orange leads - green connecting to the plus (+) terminal. With the set turned off the meter should read zero on the red scale. If not, adjustment is made on the front of the meter itself.

The meter is adjusted with the band switch on band #1. Disconnect the antenna and rotate the "S" meter adjustment on the rear of the chassis until the meter reads zero on the left side of the scale.

Note: Unground A_2 when using a doublet. Antenna should be erected as high as possible.

ALIGNMENT PROCEDURE

Equipment needed and preliminary adjustments:

An all wave signal generator which will provide an accurately calibrated signal at test frequencies listed.
Output indicating meter.
Non-metallic screw driver.
Dummy antennas 100 ohm, and 0.1 mfd.
Volume control - Maximum all adjustments.
Tone control - Extreme clockwise position.
Connect output meter across primary of output transformer.
Allow chassis and signal generator to "heat up" for several minutes.
Connect low side of generator to chassis (Gnd)
Set gang condenser at minimum capacity for all I.F. adjustments.
1 - 100,000 ohm resistor.
1 - .002 mfd condenser.
1 - 100 mmf condenser.

A.M. BROADCAST (BAND #1) ALIGNMENT. INTERMEDIATE FREQUENCY, (455 KC.)

1 - Tune signal generator to 455 kc.
2 - Connect signal generator thru 0.1 condenser to 6SK7 I.F. (455 kc.) tube.
3 - Align T_7 for maximum output.
4 - Connect generator to either stator lug on center section of gang condenser thru a 0.1 mfd. condenser.
5 - Align T_5 and T_6 for maximum output. (Do not realign T_7).

R.F. STAGES.

1 - Tune signal generator to 1400 kc.
2 - Connect signal generator thru 100 ohms to A_1 - Ground A_2.
3 - Set receiver dial at 1400 kc (140)
4 - Adjust C_A C_B and C_C for maximum output.
5 - Set generator at 600 kc.
6 - Set dial at 600 kc. (60)
7 - Adjust C_D for maximum output.
8 - Repeat steps 3 and 4.

F.M. BROADCAST (Band #2) ALIGNMENT.

1 - Disconnect lead from high side of volume control.
2 - Set bandswitch on #2 (FM) band.
3 - Disconnect discriminator plate lead (white blue tracer) from plate (pin #8) of 6SJ7 limiter tube.
4 - Connect a 100,000 ohm resistor and an .002 mf. condenser in series from plate (pin #8) of limiter to grid (pin #2) of 6SR7 audio amplifier.
5 - Connect 100 mmf from (pin #2) grid of 6SR7 to chassis.
6 - The 6SJ7 will now operate as an amplitude modulation detector.
7 - Set signal generator at 4.3 mc.
8 - Connect signal generator thru 0.1 mf. condenser to lug on small stator center section of gang condenser.
9 - Adjust T_1, T_2 and T_3 for maximum output keeping the signal generator at as low an output possible.
10 - Connect signal generator thru 100 ohm resistor to A_1 - ground A_2.
11 - Tune signal generator to 49 megacycles.
12 - Set receiver dial at 49 megacycles.
13 - Adjust C_E, C_F, and C_G for maximum output. NOTE: The oscillator tunes to the low frequency side of the signal.
14 - Tune signal generator to 43 megacycles.
15 - Set dial at 43 mc.
16 - Adjust positions of coil leads for maximum output.
17 - Repeat steps 11, 12 and 13.
18 - Replace the wire on the volume control. Remove the resistor-condenser combination from limiter, and connect the wires as they were.
19 - Reconnect signal generator as for I.F. alignment and tune to 4.3 mc.
20 - Set signal generator for strong output signal.
21 - Adjust S_1 on T_4 until a null is obtained as indicated both by the meter and aurally.
22 - Detune signal generator 100 kilocycles.
23 - Tune S_2 for maximum output.
24 - Tune signal generator back thru resonance and 100 kc to the other side of the I.F. frequency. The output should first drop and then rise to a value equal on both sides of the dip.
25 - If the output is not equal on both sides of resonance, readjust S_2.
26 - If the output is still not equal on either side of resonance a slight shift of the null point obtained with S_1 may be necessary.

NO.	CAPACITY	VOLTAGE	TYPE
C_1	Tuning Condenser 6 Section.		
2	.05 mfd	200	Paper
3	.05 mfd	200	Paper
4	.02 mfd	400	Paper
5	.02 mfd	400	Paper
6	25 mmf		Mica
7	.05 mfd	200	Paper
8	.02 mfd	400	Paper
9	.01 mfd	400	Paper
10	.05 mfd	200	Paper
11	.02 mfd	400	Paper
12	.02 mfd	400	Paper
13	.01 mfd	400	Paper
14	.05 mfd	200	Paper
15	.02 mfd	400	Paper
16	.02 mfd	400	Paper
17	.1 mfd	400	Paper
18	50. mmf		Mica
19	2000. mmf		Mica
20	.02 mfd	400	Paper
21	75 mmf		Mica
22	100 mmf		Mica
23	500 mmf		Mica
24	Pad Band #1		
25	.02 mfd	400	Paper
26	2.5 mmf		Twisted Pair
27	.05 mfd	200	Paper
28	.1	400	Paper
29	.02	400	Paper
30	25 mmf		Mica
31	25 mmf		Mica
32	10 mfd	25	Elect.
33	25 mmf		Mica
34	.05 mfd	400	Paper
35	10 mfd	350	Elect.
36	.02 mfd	400	Paper
37	.1 mfd	400	Paper
38	.05 mfd	200	Paper
39	10 mfd	350	Elect.
40	30 mfd	350	Elect.
41	.01 mfd	600	Paper
42	.01 mfd	600	Paper
43	Oscillator drift compensator		
44	50 mmf		

NO.	OHMS	WATTAGE
R_1	150	1/3
2	100,000	1/3
3	1,000	1/3
4	500	1/3
5	7,500	1/3
6	1,000	1/3
7	35	1/3
8	20,000	1/3
9	8	1/3
10	1,000	1/3
11	100,000	1/3
12	150	1/3
13	40,000	1/2
14	500	1/3
15	150	1/3
16	25,000	1/2
17	500	1/3
18	50,000	1/3
19	100,000	1/3
20	200,000	1/3
21	4,000	1/2
22	15,000	1/2
23	15,000	1/3

NO.	OHMS	WATTAGE
R_{24}	100,000	1/3
25	100,000	1/3
26	200,000	1/3
27	300	1/3
28	8	1/3
29	200,000	1/3
30	1,000	1/3
31	200,000	1/3
32	300	1/3
33	2,000,000	1/3
34	35	1/3
35	50,000	1/3
36	250,000	1/3
37	1,000	1/3
38	1,000,000	1/3
39	100,000	Tone Control
40	100,000	1/3
41	2,000	1/3
42	1,000,000	Vol.Cont.tap at 20,000 Ohms
43	4,000	1/3
44	1,500	"S" meter adjustment Band #1
45	250,000	1/3

ANTENNA: For best results an antenna should be cut to resonate at the high frequency end of the FM band. Probably the simplest and most effective antenna would be a half wave dipole consisting of two quarter wave (4-1/2 feet) rods placed end to end with a few inches space between them. Connect a twisted pair to the ends of the rods closest each other. A wire one half wave (9 feet) length long may be cut at the center and an insulator inserted between the halves. The feeders then connect to the wires at either side of the insulator. The advantage of using rods rather than wire for the antenna is that they may more easily be mounted vertically, removing all directional properties and producing polarization corresponding to that used by FM stations. If the antenna must be horizontal it should be placed broadside to the direction of the weakest received signal.

FREQUENCY RANGE:
Band No. 1 - 540-1650 Kilocycles
Band No. 2 - 40- 51 megacycles

POWER OUTPUT:
130 Milliwatts undistorted

POWER CONSUMPTION:
50 watts

POWER SOURCE:
115 volts 60 cycle A.C.

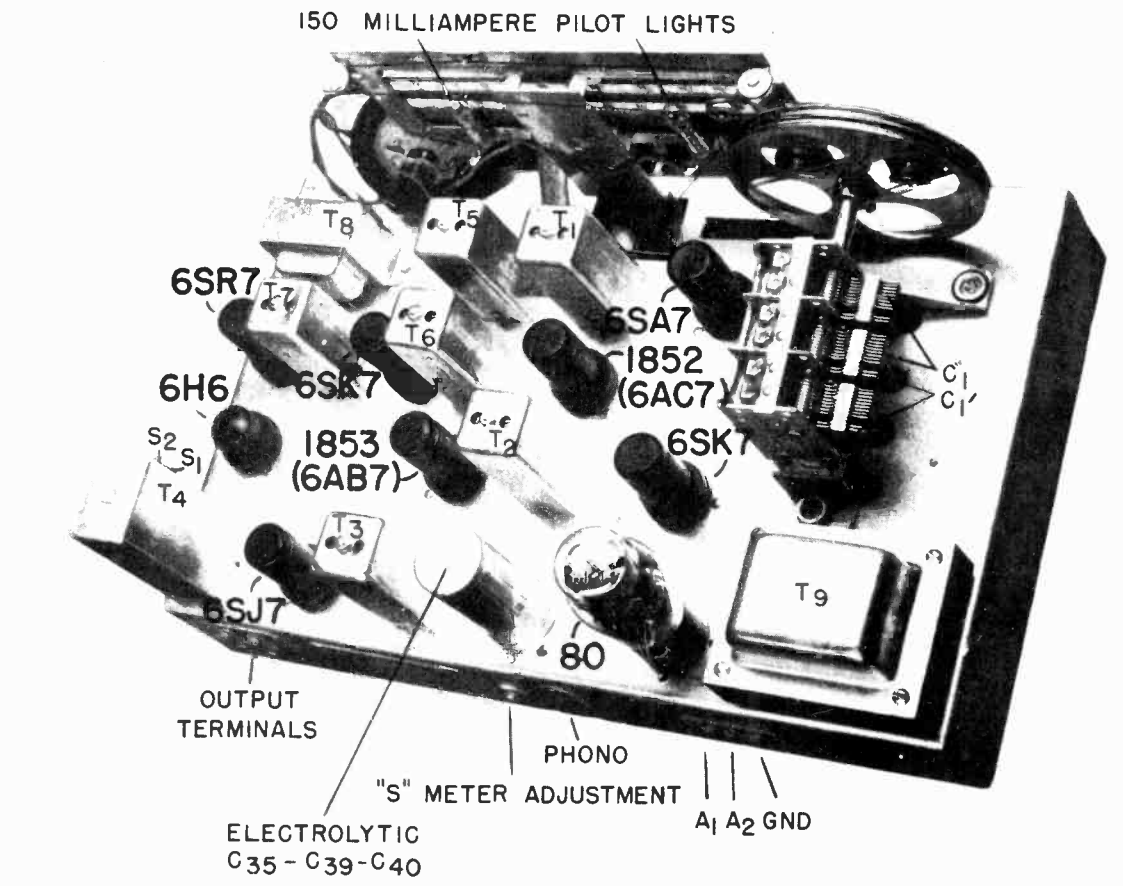
CHASSIS DIMENSIONS:
Length 16-3/4", Depth 10-3/4", Height 8-3/8"

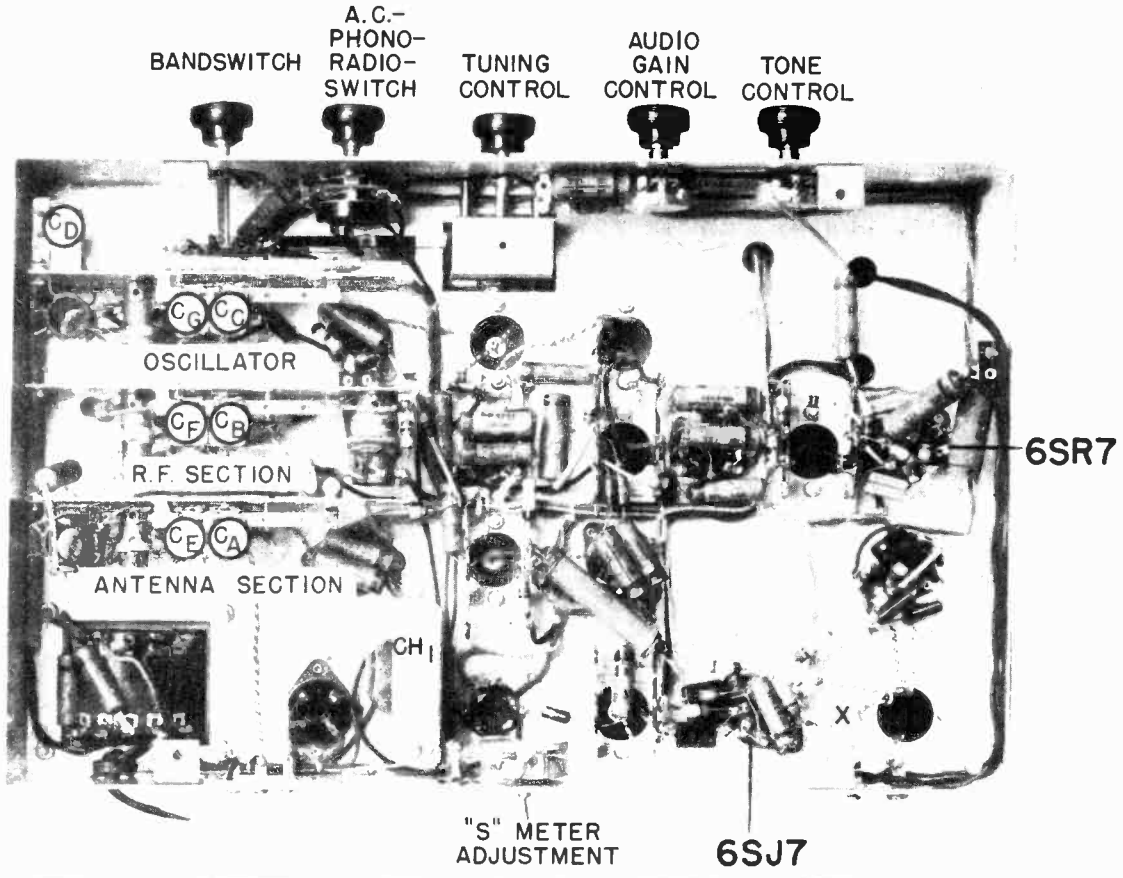
SENSITIVITY:
Band 1 (AM) 40 microvolts at 6 milliwatts output.
Band 2 (FM) 60 microvolts for full limiter action.

SELECTIVITY:
25 kc at 1000 times down at 1000 kc.
150 kc on #2 band (40-51 mc)

MODEL S-31

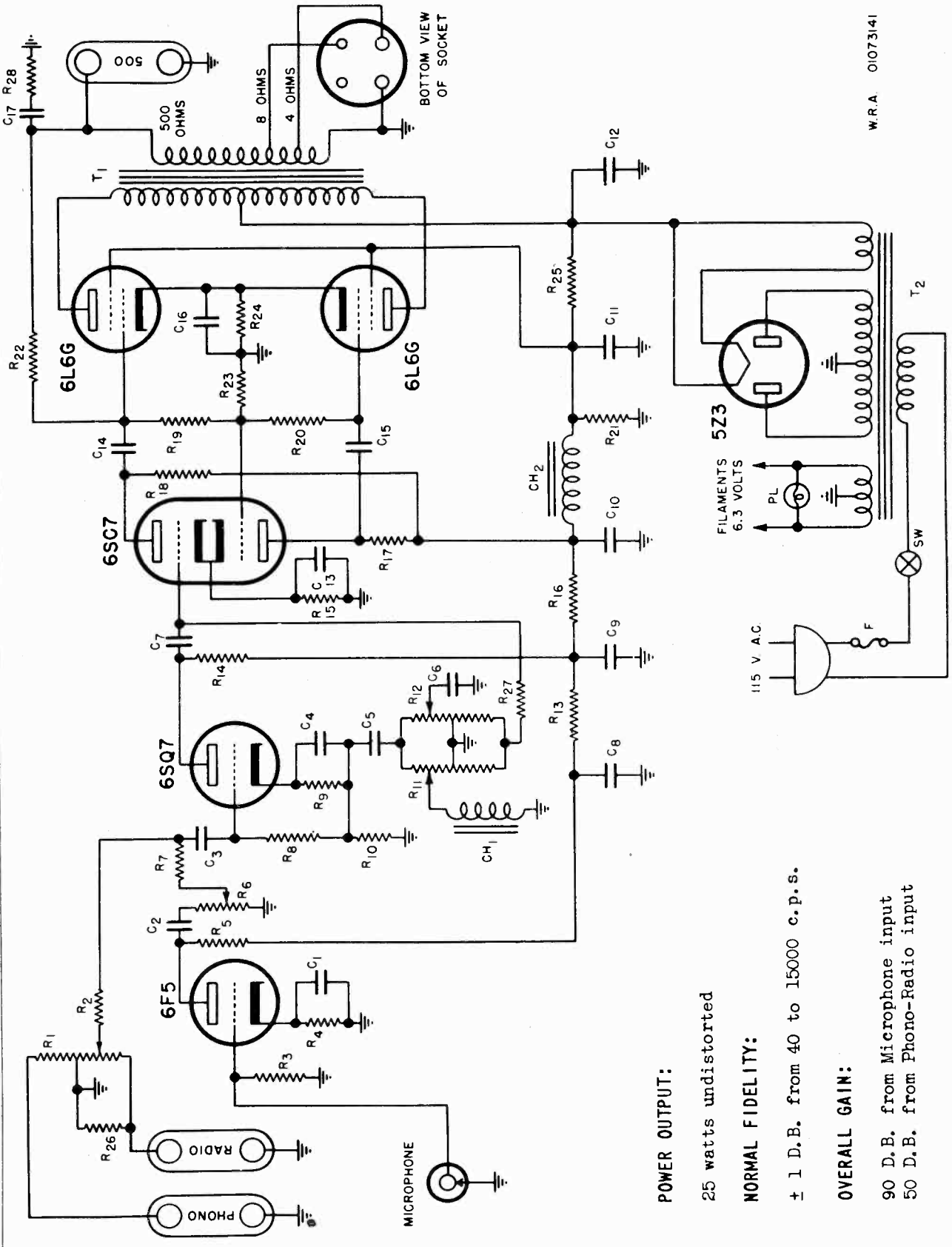
THE HALLICRAFTERS CO.





MODEL S-31-A

THE HALLICRAFTERS CO.



POWER OUTPUT:

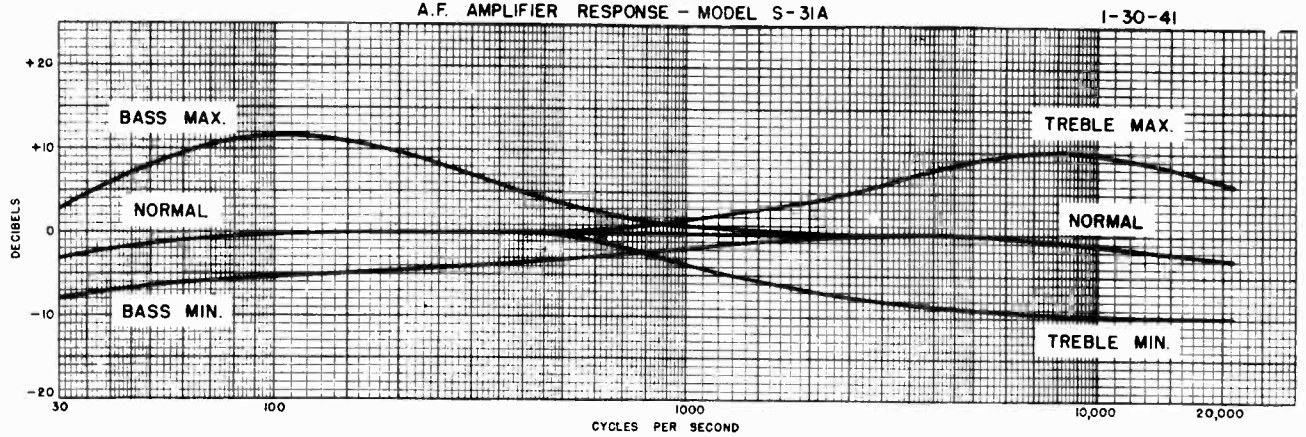
25 watts undistorted

NORMAL FIDELITY:

± 1 D.B. from 40 to 15000 c.p.s.

OVERALL GAIN:

90 D.B. from Microphone input
50 D.B. from Phono-Radio input



R1	- 500,000- 500,000 vol. control 425-084		R14	- 100,000 ohm,	1/2 watt
R2	- 500,000	1/2 watt	R15	- 1000 ohm	"
R3	- 1 meg.	"	R16	- 50,000 ohm	1 watt
R4	- 3000 ohm	"	R17	- 100,000	1/2 watt
R5	- 250,000	"	R18	- 100,000	1/2 watt
R6	- 500,000 vol. control #25-083		R19	- 250,000	"
R7	- 500,000	1/2 watt	R20	- 250,000	"
R8	- 1.0 meg.	"	R21	- 30,000 ohm	20 watt
R9	- 2000 ohm	"	R22	- 250,000	1/2 watt
R10	- 10,000 ohm	"	R23	- 250,000	"
R11	- 500,000- 500,000 Bass Control #25-082		R24	- 250 ohm	10 watt
R12	- 500,000- 500,000 Treble Control #25-082		R25	- 3500 ohm	10 watt
R13	- 50,000 ohm	1 watt	R26	- 500 ohm	1/2 watt
			R27	- 15,000 ohm	1/2 watt
			R28	- 3000 ohm	1/2 watt

C1	- 30 Mfd.- 25 volt	Electrolytic
C2	- 0.1 Mfd. 600 V.	Paper
C3	- 0.05 Mfd. - 200 V.	Paper
C4	- 30 Mfd. - 25 V.	Electrolytic
C5	- 1.0 Mfd. - 200 V.	Paper
C6	- 0.01 Mfd. - 600 V.	Paper
C7	- 0.1 Mfd. - 600 V.	Paper
C8-C9	- 8- 8 Mfd. - 475 V.	Electrolytic
C10-C11	- 8- 8 Mfd. - 475 V.	Electrolytic
C12	- 8- 8 Mfd. - 475 V.	Electrolytic
C13	- 30 Mfd. - 25 V.	Electrolytic
C14	- 0.1 Mfd. - 600 V.	Paper
C15	- 0.1 Mfd. - 600 V.	Paper
C16	- 0.01 Mfd. - 600 V.	Paper
C17	- 0.01 Mfd. - 600 V.	Paper

T1	- Output transformer	A5349
T2	- Power "	P5229
CH1	- Bass Choke #55-010	
CH2	- Filter Choke C1003	
PL	- 6.3 v. - 0.15 amp. pilot lite	
F	- 2 amp. fuse	

IMPORTANT: This amplifier, unless otherwise marked must be operated from 115-125 volts, 60 cycles, alternating current. If you are in doubt, 'phone your electric light company. Be sure all tubes are in their sockets before inserting plug in receptacle.

RADIO: Although the S31A was designated as a companion unit to our MODEL S-31 Tuner for Frequency Modulated and Amplitude Modulated Broadcast Reception, any suitable tuner having an output impedance of 500 ohms may be connected to the RADIO input strip. The upper terminal is grounded.

PHONO: Any high impedance phonograph pickup may be used in conjunction with the S31A by connecting to it the PHONO strip. Again, the top terminal is grounded.

MICROPHONE: The microphone circuit is designed for high impedance microphones such as the crystal and dynamic types. The microphone receptacle is located on the rear apron of the chassis.

SPEAKER: The full high fidelity capabilities of the S31A amplifier will not be realized unless a speaker system is used which is capable of reproducing the full range of the amplifier. The frequency range offered by high fidelity FM extends from 40 to 15,000 cycles per second.

It is recommended that P.M. dynamic speakers be used to eliminate the necessity of obtaining external field supplies. The S-31A was not designed to supply field excitation.

Additional speakers may either be connected in series or in parallel, depending upon their impedances - parallel connection being preferred when possible. Since the available output impedances are 4, 8, and 500 ohms, it will be necessary to find a combination matching these values as close as possible. Ohm's law follows in that 2- 8 ohm speakers in parallel gives 4 ohms, 2- 4 ohm speakers in series gives 8 ohms, 4- 8 ohm speakers in series parallel gives 8 ohms, etc.

When the speaker is located remotely from the amplifier the output line between it and the amplifier should be of sufficient cross section to minimize power loss. If speakers are to be located much more than 100 feet from the amplifier, the 500 ohm winding should be used with a matching transformer at the speaker end.

All speakers should have ample baffling both for fidelity and as a protection to the speaker cone.

A WORD OF CAUTION - Do not operate the amplifier without a speaker load, otherwise the output tubes may be damaged.

GROUND CONNECTION: To reduce the possibility of hum and noise pickup in the high gain input stage from extraneous sources the S31A chassis should be connected to a good ground.

POWER CONSUMPTION:

100 watts

POWER SOURCE:

115 volts 60 cycle A.C.

PANEL DIMENSIONS:

19" x 8-3/4"

CHASSIS DIMENSIONS:

16-3/4" long - 9½" wide

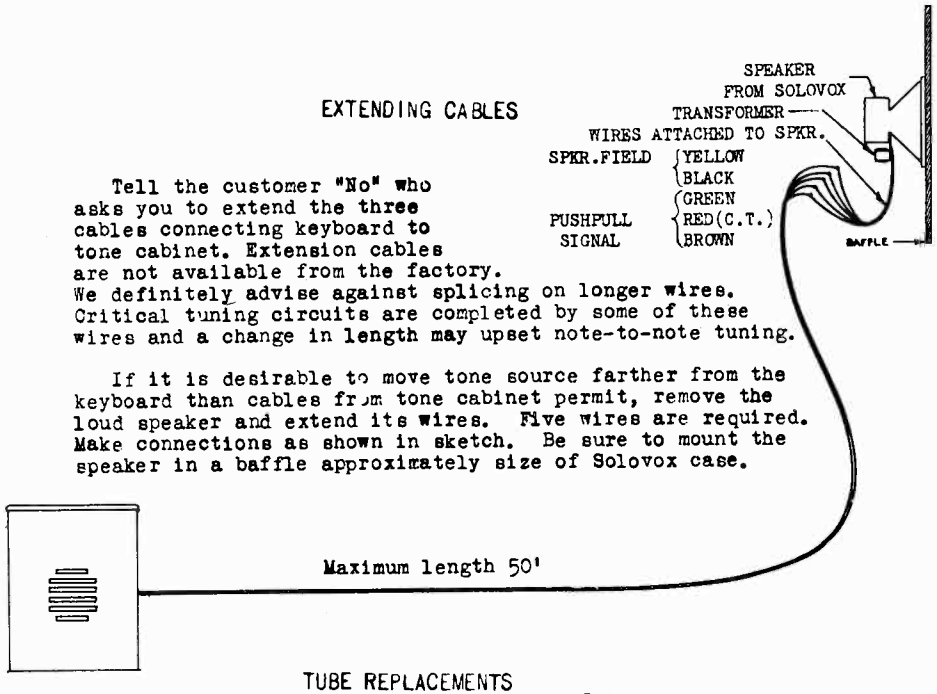
OUTPUT:

500 ohms
8 ohms and 4 ohms

EXTENDING CABLES

Tell the customer "No" who asks you to extend the three cables connecting keyboard to tone cabinet. Extension cables are not available from the factory. We definitely advise against splicing on longer wires. Critical tuning circuits are completed by some of these wires and a change in length may upset note-to-note tuning.

If it is desirable to move tone source farther from the keyboard than cables from tone cabinet permit, remove the loud speaker and extend its wires. Five wires are required. Make connections as shown in sketch. Be sure to mount the speaker in a baffle approximately size of Solovox case.



TUBE REPLACEMENTS

Solovox tubes are excluded from 1 year guarantee which goes with each instrument. Tube manufacturer's regular guarantee applies. Tubes may be returned for replacement thru jobber or to us.

Free replacements are allowed only if tubes are not broken or damaged, actually test bad, and code marking shows them in guarantee. Obsolescence schedule is shown here for your guidance. Tubes with code dates other than those shown are obsolete and not subject to adjustment.

Tubes Coded	Obsolete date
T-1	Jan. 1, 1942
N-1	Apr. 1, 1942
Z-1	July 1, 1942
V-1	Oct. 1, 1942
T-2	Jan. 1, 1943
N-2	Apr. 1, 1943

ADJUSTMENT OF OSCILLATORS

The service man should have a thorough knowledge of oscillator adjustment because he will most likely be called upon to perform this service more frequently than any other. A change in setting of the master tuning knob, a change of keyboards or installation of a new oscillator tube will necessitate readjustment of the oscillators. It is often advisable for the service man to give instructions on oscillator adjustment to the Solovox owner. The following is a detailed explanation of oscillator adjustment.

The master oscillator is tuned by the condensers in the keyboard and supplies frequencies for the highest octave of the six octave tonal range. The buffer oscillator, which is considered as a controlled oscillator although it has no adjustment potentiometer, is used as an electronic link between the master oscillator and the rest of the controlled oscillators and has its circuit constants predetermined so as to oscillate at the same frequency as the master oscillator. Each of the remaining controlled oscillators when supplied with the proper amount of locking signal should oscillate at one half the frequency of the preceding oscillator. This locking signal is the same signal that is generated by the preceding oscillator but the amplitude is regulated by the adjustment potentiometer and then impressed upon the grid of the following oscillator tube.

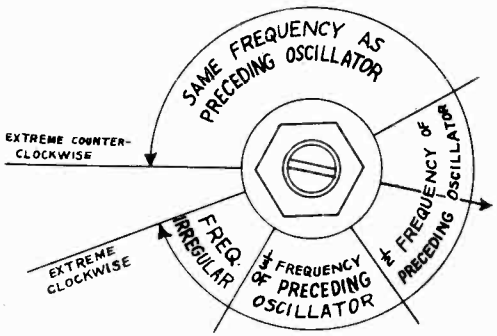


FIG. I COMPLETE ROTATION OF OSCILLATOR ADJUSTMENT POTENTIOMETER ARM

NOTE--Position of slot shown here does not necessarily mean that every slot will assume this position when correctly adjusted.

Assuming that the master and preceding oscillator are operating correctly, the following is an explanation of what happens in a complete rotation of an adjustment potentiometer. See figure #I. Turning the potentiometer to its extreme counter clockwise position the oscillator will operate at the same frequency as the preceding oscillator because the amplitude of the locking signal is too great. Now, turning the potentiometer clockwise, a point is reached where the oscillator locks-in at one-half the frequency of the preceding oscillator because the amplitude of the locking signal is of proper intensity to cause this condition. It is then operating exactly one octave below the preceding oscillator and for correct adjustment the potentiometer arm should be set midway between the top and bottom limits of this 1/2 frequency range. Turning the potentiometer further clockwise, a point will be reached where it will either lock-in at one-third the frequency (this is an octave and a fifth below musically speaking) or, it may refuse to lock-in and will start to hunt a frequency of its own which bears no definite mathematical relation to the frequency of the preceding oscillator. A "gurgle" is usually present at the point where the oscillator starts to change to a different frequency.

Conditions that may make oscillator adjustment difficult or impossible are the following: I. Improper operating voltages at the grid, plate or cathode of an oscillator tube. 2. Defective oscillator tube. 3. Inoperative master or buffer oscillator. 4. Defective parts associated with the oscillator circuits.

PROCEDURE FOR ADJUSTMENT OF OSCILLATORS. The primary requisites for adjusting oscillatore are that the master and buffer are operating correctly and that you must start by adjusting the 2nd oscillator and then progressively adjust each succeeding oscillator. After you have become familiar with the method of adjustment as described in "To The Solovox Owner" you may try the following method which is somewhat quicker. Push "on" the "Soprano" only and adjust the 2nd and 3rd oscillator by depressing F key in the middle and lowest octave respectively. Then, push "on" the "Bass" only and adjust the 4th, 5th and 6th oscillator by depressing F key in the highest, middle and lowest octave respectively. You may check adjustment of the six octave tonal range by running down the scale, first with the "Soprano" only "on" and then with the "Bass" only "on". Of course, in this check the low C key with the "Soprano" "on" should be chromatically related to the high B key with the "Bass" "on."

If the adjustment potentiometers should get so far out of adjustment that you become confused, the following hint may prove helpful. Turn all potentiometers to their extreme counter clockwise positions and then follow the normal oscillator adjustment procedure.

IMPROVEMENTS WHICH CAN BE ADDED TO EARLY MODELS.

KEY TENSION

Lower key springs (control contacts) were increased in thickness effective with keyboard #18936. This change eliminates contact tip breakage and slightly increases key tension.

We suggest this improvement be added to early keyboards if trouble is experienced with broken contacts or customer complains of light key tension. Material required: 12 AO-18538-0 contact spring assemblies (furnished with small tin of rocker arm grease) - $1.20 per set, list. Time required: 1 hour. Replacement procedure is as follows:

1. Remove keyboard cover plate by taking out screws underneath and in back of key action. Slide metal screw strip at bottom of keyboard out and remove contact springs with a small screw driver.

2. Set keyboard on blocks to relieve pressure on keys and install new contact springs by manipulating bakelite key actuator into proper position. Make sure small anti-rattle spring is also threaded thru hole.

3. Apply a small amount of rocker arm grease at junction of actuator and contact arm. This will eliminate key squeaks sometimes noticeable. Be sure to use lubricant sparingly so none of it touches contacts.

4. Test to make sure contact is made when each key is depressed. If some contacts seem to make too lightly, bend tip down slightly - don't kink.

5. Now reassemble and test for normal operation.

VIBRATO OPERATION

The vibrato effect is produced by a magnetically driven reed having a piece of powdered iron core attached to it in such a way as to move in and out of an inductance coil mounted near the reed thereby causing the inductance of the coil to vary periodically. This coil is connected to a tap on the master oscillator tuning coil and causes the oscillator frequency to vary. The reed, which has to be started mechanically, is given a "kick" by the vibrato starter spring when the volume control lever is pulled forward in turning "on" the instrument. After the reed is once started, the magnetic drive keeps it in motion as long as the instrument is "on" regardless of whether the vibrato tablet is "on" or "off".

The action of the reed may be described as follows: When the reed is moving towards the driving coil, L2, the vibrato driving contact is closed thus producing a strong magnetic field which pulls the reed towards the driving coil. When the reed reaches the end of its swing and starts to move away from the driving coil, the vibrato driving contact is open thus causing a collapse of the magnetic field. Then, when the reed reaches the end of its swing in this direction and starts moving towards the driving coil again, the cycle of action is repeated. The 175 ohm resistor is in series with the coil to prevent sparking of the contacts.

VIBRATO CHANGES - Several changes have been made in the vibrato assembly pertaining to the size and amount of the reed weight washers and the spacing between the reed and the driving magnet coil. The changes, with the serial number of the keyboard in which the change was made, are the following:

KBD Serial #15612 - The original 3 weight washers of 5/8" diameter were replaced with 3 weight washers of 3/4" diameter in order to decrease the vibrato speed. See Service letter S2.

KBD Serial #44000 - The vibrato driving coil mounting bracket was moved back away from the reed 9/64" and only one 3/4" weight washer was used. This was done to reduce the vibrato mechanical noise to a minimum.

KBD Serial #52825 - The Vibrato driving coil mounting bracket was moved 1/16" closer to the reed and two 3/4" weight washers were used. This was done to insure reliable operation with an unobjectionable amount of noise and is the happy medium between the two previous changes.

VIBRATO TROUBLES

VIBRATO NOISE - If a customer objects strongly to the vibrato mechanical noise in keyboards with serial numbers below 44000 it may be reduced by incorporating the following change: Move the driving coil back 1/16" and use only two 3/4" weight washers. By removing the coil from the mounting bracket and using long nose pliers the mounting bracket can be bent back to the required 1/16". A convenient way to assure the proper position of the driving coil is to measure the distance from the end of the brass coil mounting bracket to the inside edge of the flange

at the back of the chassis. For a two weight washer vibrato assembly the distance should be 5/16" as shown in figure #1. Then readjust the position of the reed to the mid-point of the felt cushions as outlined in section 3 of Service Letter S-2. It should be noted that in certain installations the vibrato noise may be accentuated by the keyboard construction of the piano.

VIBRATO STOPPING - A few cases of unreliable vibrato operation have been reported in keyboards using the single weight washers (Keyboard serial numbers between 44000 and 52824). The vibratos in this serial number group, while being very quiet, are more susceptable to stopping on account of low line voltage and slight imperfections of parts. Any slight drag on the vibrato driving contact will be transmitted to the reed and may cause slowing down or stopping of the reed. Driving contact drag may be caused by the following: 1- A burr on the light colored bakelite washer which causes friction between the washer and the brass stud. 2- Solder rosin deposits on the bakelite washers. 3- Spring tension on the bakelite washers too great.

If the vibrato in one of the keyboards listed in the above serial number group shows signs of being unreliable, we suggest the following remedy: Move the driving coil 1/16" nearer the reed and use two 3/4" weight washers instead of one. As mentioned previously, a convenient way to assure the proper position of the driving coil is to measure the distance from the end of the brass coil mounting bracket to the inside edge of the flange at the back of the chassis. For a two weight washer vibrato assembly the distance should be 5/16" as shown in figure #1. Adjust the reed to the mid-point between the stop felt cushions.

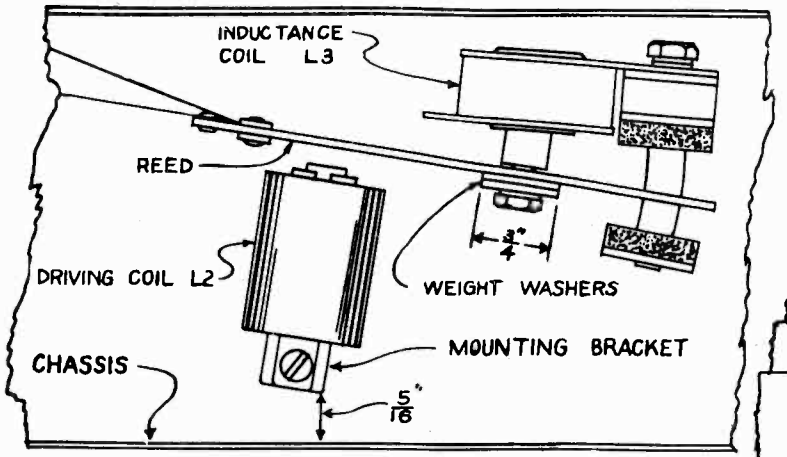


Fig. 1. Showing position of vibrato driving coil and vibrato reed using two weight washers - first used in Solovox Keyboard starting with serial #52825. This change may be incorporated in any keyboard to insure reliable operation of the reed and to reduce mechanical noise.

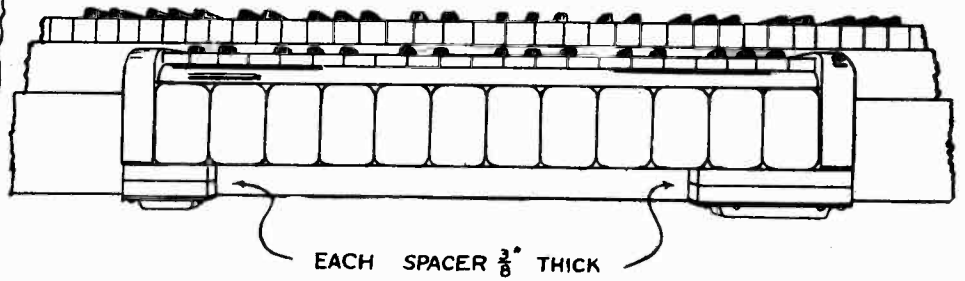
Another cause of vibrato stopping which applies to all keyboards regardless of serial number is grounding of the driving contact by a piece of foreign metal lodging between the contact arm and the chassis.

Also in shipment, the spring coil, which is used only as a flexible lead between the driving contact and the terminal lug, may change position and ground out against the chassis. This may result in intermittent operation.

KEYBOARD SPACERS

The Solovox keyboard should be so located that the distance between the surfaces of the piano white keys and the Solovox white keys is more than one and less than two inches. Occasionally the dimensions of a piano are such that the Solovox keyboard will not naturally fit within this range. For such instances special bakelite bracket spacers which will raise the keyboard 3/8 inch are available at the factory. As many as three sets may be attached to the instrument, raising the keyboard 3/8, 3/4 or 1-1/8 inches as desired. The sketch below illustrates an installation requiring two sets of spacers.

It is important however, to pre-determine exactly how many spacers are to be used and to order exactly that amount so that the proper length screws will be received. Screws must not enter the bottom surface of the instrument more than 1/8 inch otherwise serious damage will result. When ordering please specify PO-18626-1 and PO-18627-1 spacers. Available in black only.



SPECIAL SOLOVOX SERVICE NOTES

TROUBLE:- Difficult or impossible to adjust oscillators-- some tones "gargle" or play wrong notes.

A survey in the field shows that 80% of all the Solovox service problems are confined to trouble experienced with a single fixed carbon resistor of critical value which makes it impossible to properly adjust the oscillators and causes the tones to "gargle" or play wrong notes when this resistor changes in value due to dampness.

This resistor is of the fixed carbon type having a value of 200,000 ohms (250,000 ohms for some models) and is connected in the voltage divider circuit for the bias on the controlled oscillators (shown at the upper left in the figure 1 wiring diagram supplied with each instrument). The physical location of this resistor in the Solovox tone cabinet is shown on the reverse side of this sheet. If the tones "gargle" or play wrong notes, connect a DC meter across the 8000 ohm wire wound resistor also shown on the reverse side of this sheet using a 1000 ohms per volt meter on the 10 volt scale. The meter should read approximately 2 volts with no keys depressed, and smoothly drops to zero and then to a slightly positive voltage as the top seven white keys are progressively played starting from the top key (key farthest to the right). If this voltage is low, remove the resistor and replace with a new one (such as an I.R.C. metallized resistor or Centralab resistor). If possible, use a 2 watt resistor as they are more stable than the 1 watt size. After replacing this resistor, be sure to readjust the oscillators as described on page 2 in "To Solovox Owners".

TROUBLE:- Volume low.

Ten percent of all Solovox service trouble lies with another fixed carbon resistor which increases in resistance due to humidity and thereby causes the maximum volume attainable to go down.

This resistor is also of the fixed carbon type, having a value of 330,000 ohms (370,000 ohms in some models) and is connected in the volume control voltage divider circuit shown at the lower right in the figure 1 wiring diagram. The physical location of this resistor is also shown on the reverse side of this sheet. If the volume is low even when the "maximum value control" is turned for maximum volume, remove it and replace with a new 300,000 or 250,000 ohm resistor (such as an I.R.C. metallized resistor or Centralab resistor). If possible, use a 2 watt resistor as they are more stable than the 1 watt size.

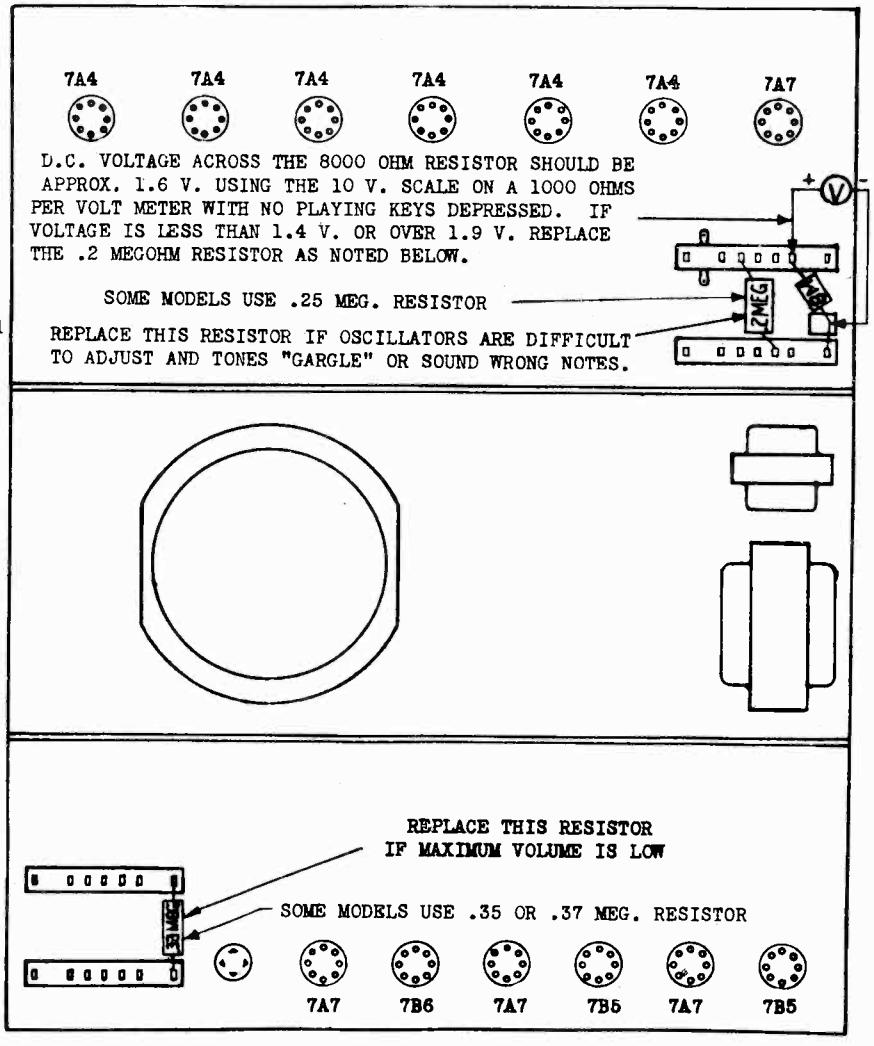
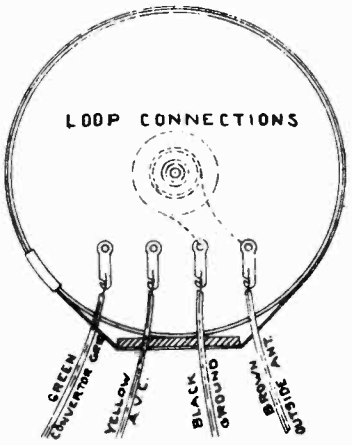


FIGURE 1

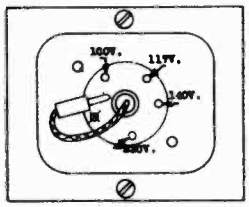
HOWARD RADIO CO.

MODELS 307-4, 307TP-2



The above diagram is shown for use should the loop ever be replaced or the connections broken.

Universal Type Transformer.



ROTATE TRANSPARENT DISC UNTIL HOLE IS IN LINE WITH DESIRED VOLTAGE TAP AND THEN INSERT PLUG. DO NOT TOUCH OR CHANGE VOLTAGE PLUG WHILE SET IS CONNECTED TO ELECTRIC CURRENT.

Voltages	Insert in
90-110 V.	100 V.
110-125 V.	117 V.
125-150 V.	140 V.
200-250 V.	230 V.

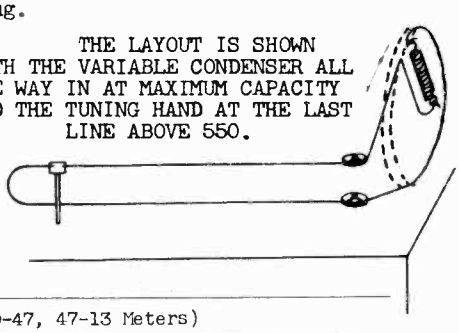
Dial Cord Layout - 300 Series

THE STRING TENSION of the drive string is maintained by the coil spring mounted on the large drive pulley. Too much tension will cause an extra load in tuning. Lack of tension will naturally cause backlash.

See that dial light sockets do not touch top edge of tuning hand as it moves across dial plate.

Since the pull against the large pulley is quite great, see that the set screws in the pulley hub to the condenser shaft are tight to avoid slipping.

THE LAYOUT IS SHOWN WITH THE VARIABLE CONDENSER ALL THE WAY IN AT MAXIMUM CAPACITY AND THE TUNING HAND AT THE LAST LINE ABOVE 550.



CONSUMPTION 50 WATTS

TUNING RANGES - 540 to 1700 KC, 2.2 to 7 MC, 7 to 22 MC, (555-175, 140-47, 47-13 Meters)

I. F. - 465 KC | TYPE - Conventional | POWER OUTPUT - (MAX.) - 2.7 WATTS; UPO 1.5 W.

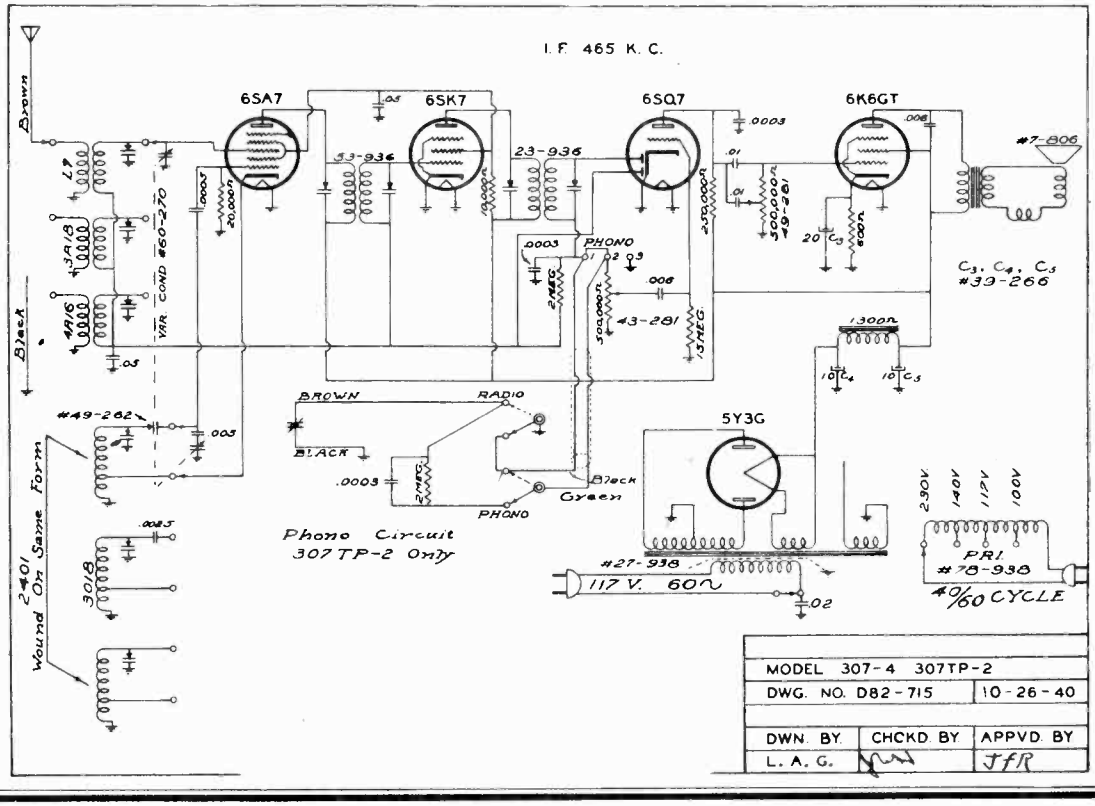
CONTROLS - Upper left - Volume; Upper right - TUNING; Lower left - TONE and POWER SWITCH;

Lower right - BAND SWITCH, Clockwise movement shifts to higher frequency bands.

TUNING SYSTEM:-

String driven horizontal movement hand, rubber tip friction tuning shaft -- Ratio 7 to 1.

SPEAKER = Electro-Dynamic | SIZE = 6" | V.C.IMP.(400CPS) = 4 Ohms | FIELD = 1300 Ohms



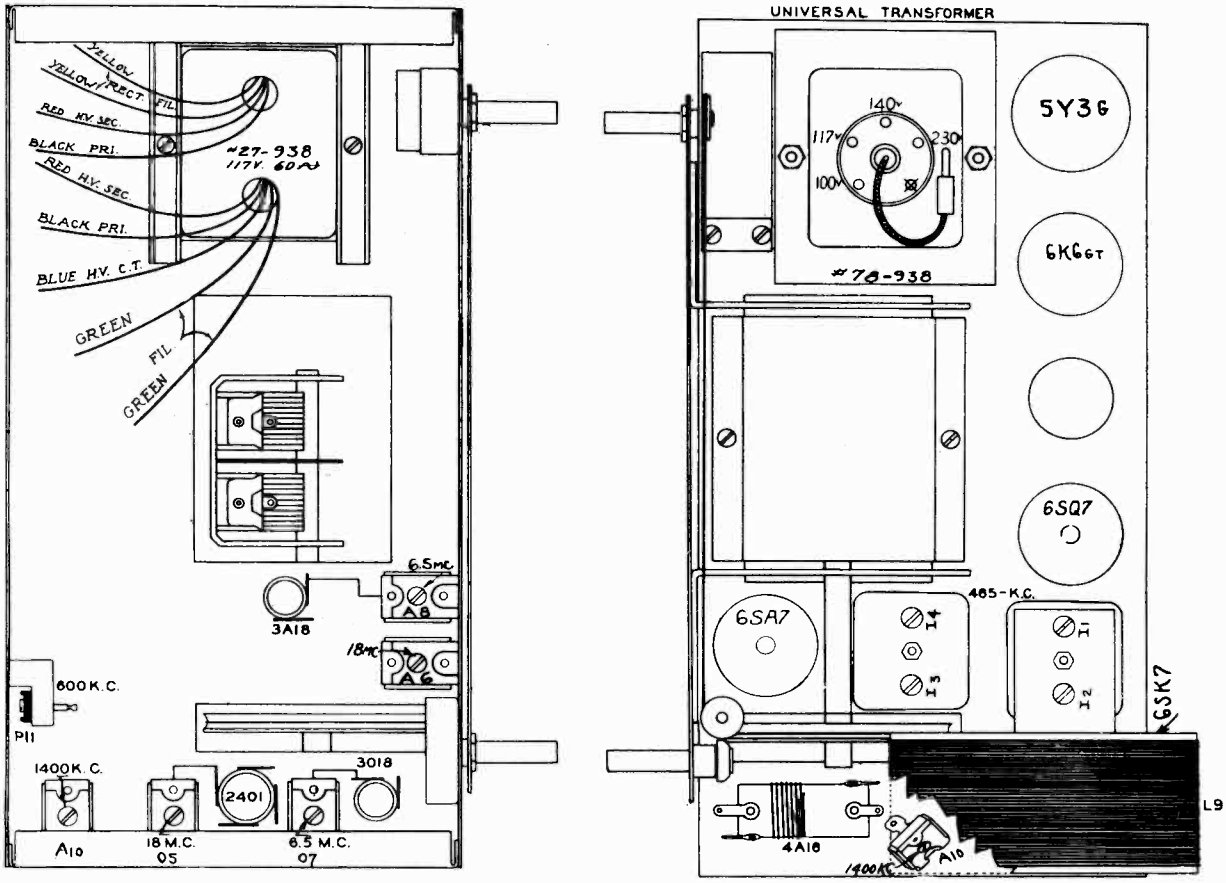
MODELS 307-4
307TP-2

HOWARD RADIO CO.

SOCKET VOLTAGE READINGS:

Voltage taken from ground with line voltage at - 117 AC
High Voltage reading off rectifier - 300 V.
Drop across speaker field - 65 V.
Voltage taken with 1,000 Ohm per volt meter.

TUBE	FUNCTION	CATH-ODE	SCR. GRID	PLATE	OSC. PLATE
6SA7	Mixer		105	245	105
6SK7	IF		105	245	
6SQ7	Det.			60	
6K6GT	Output	16	245	235	



NOTES

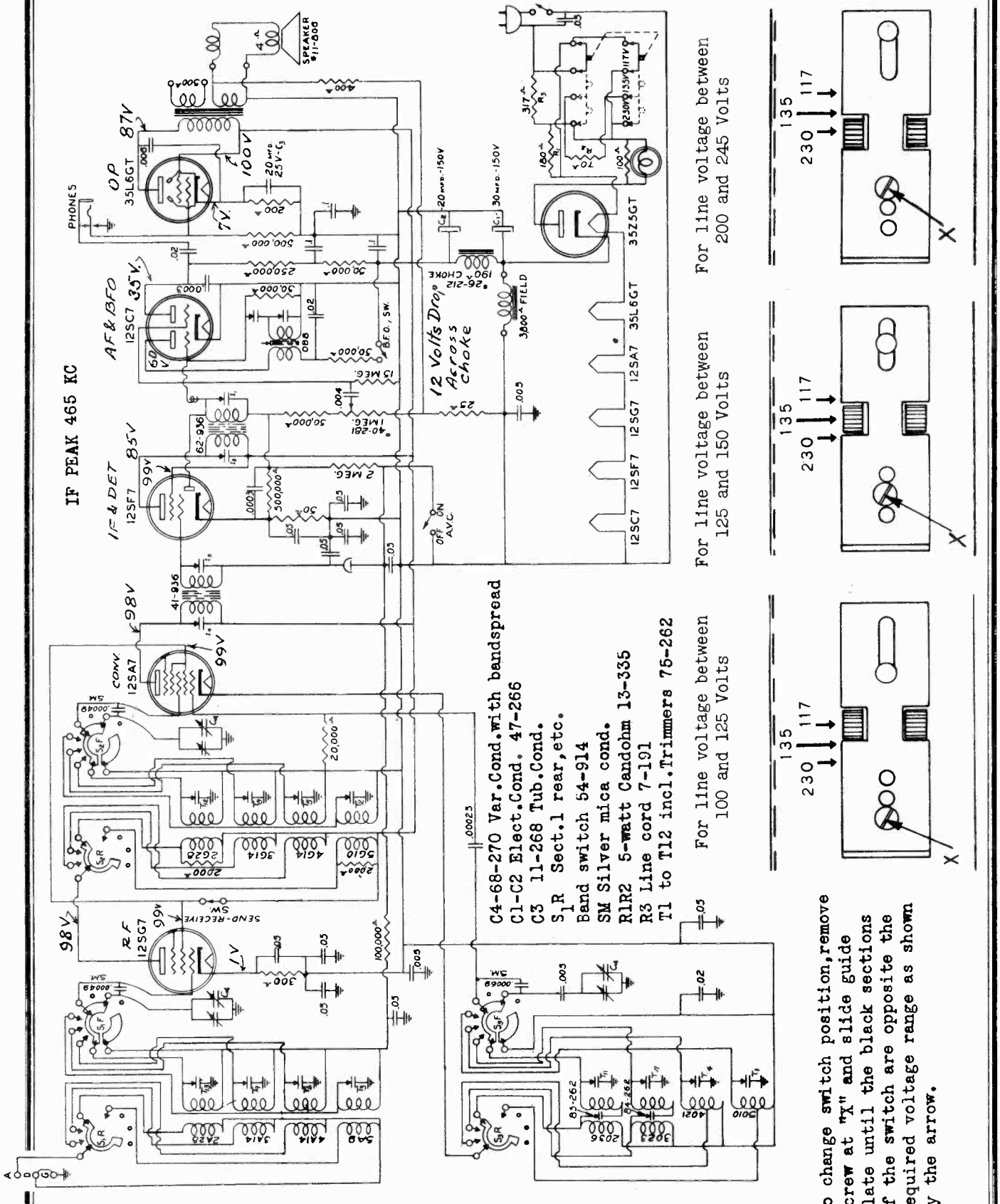
A - Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B - When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 18 MC, then a weaker image will be heard at 17,070 KC, in other words 930 KC less on the dial.
C - When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.
D - See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.
E - Check for oscillator cross-over between 18 and 22 MC. If necessary for stability, turn the antenna trimmer "IN" slightly.

ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Signal Generator Frequency	Signal Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
BC	Min.Cap.	465 KC	6SA7 Grid	A	I_1, I_2, I_3, I_4	IF
SW	18 MC	18 MC	Brown lead	B,D,E	O_5, A_6	Osc. Ant.
Int.	6.5 MC	6.5 MC	Brown lead		O_7, A_8	Osc. Ant.
BC	1400 KC	1400 KC	Brown lead		O_9, A_{10}	Osc. Ant.
BC	600 KC	600 KC	Brown lead	C	P_{11}	Osc. Pad.

MODEL 445

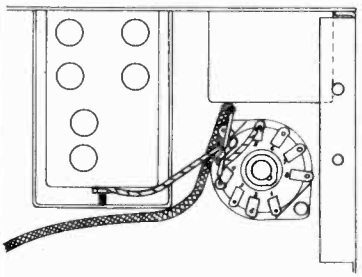
HOWARD RADIO CO.



To change switch position, remove screw at "X" and slide guide plate until the black sections of the switch are opposite the required voltage range as shown by the arrow.

MODEL 445

HOWARD RADIO CO.



THE BEAT FREQUENCY OSCILLATOR

The adjacent figure shows an underneath view of the socket for the BFO 6J5 tube and its associated coil unit. The means of coupling this oscillator with the incoming signal is the conventional method of allowing small capacity between the BFO grid lead and the diode circuit. The shielded lead shown comes from the diode of the 2nd detector and is anchored on a dummy terminal of the BFO socket. The oscillator grid (green) lead is capacity coupled to this lead by one or more turns wrapped around the unshielded portion of the diode lead. THE AMOUNT OF THIS COUPLING IS CRITICAL.

INSUFFICIENT CAPACITY results in a weak beat oscillator or no apparent oscillator at all with weak incoming signals.

TOO MUCH CAPACITY COUPLING causes severe repeat BFO harmonics which appear all over the bands.

To increase or decrease the BFO action, remove the bottom from the cabinet and vary this coupling to suit. Keep in mind that should the turns be increased, there may be too much coupling if the turns are wound too TIGHT around the diode lead.

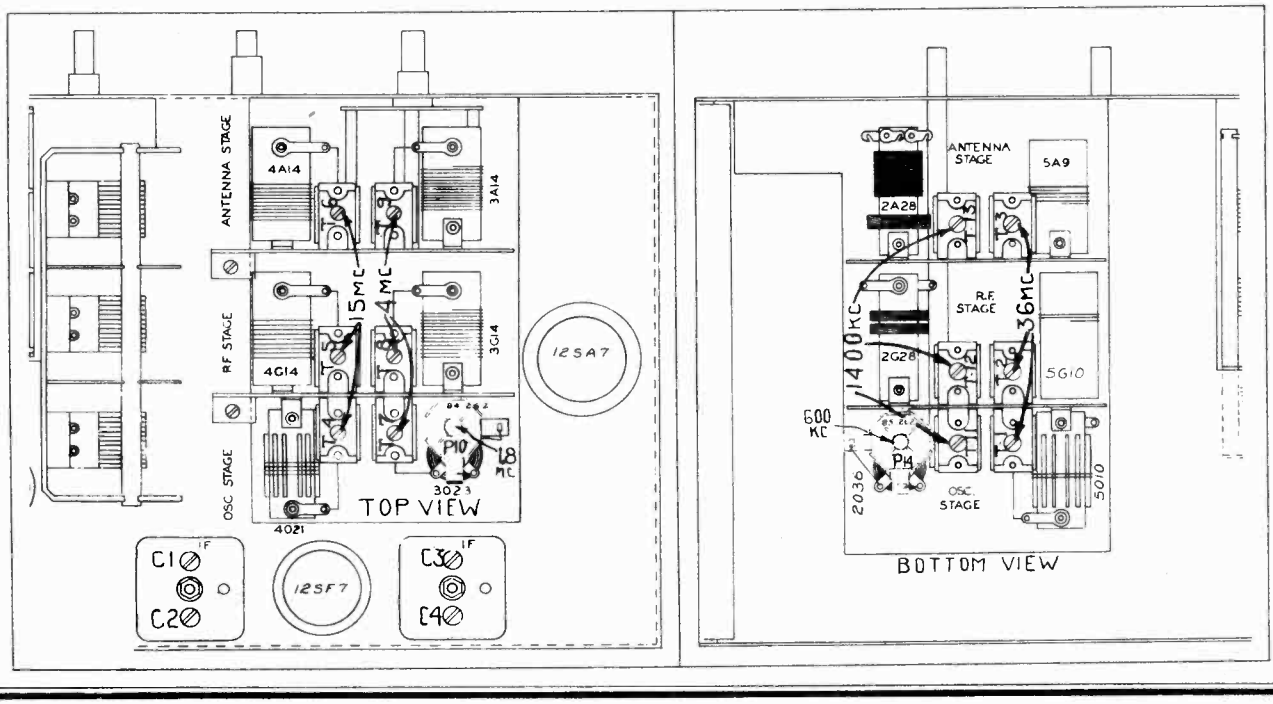
FOR TRIMMER LOCATIONS, SEE CHART BELOW

The alignment is made with the BFO Off, the AVC Off, and the Band Spread set to 100.
The main dial hand must stop EXACTLY ON the last line at the end of the scale when the condenser is fully closed without force on the tuning control.
There will be an overload effect on powerful broadcast stations when the AVC is OFF.
NOTE 1: After the alignment of the I.F. stages is completed, align the BFO system as follows:
1. Set pitch control 3 turns back from the "IN" position and turn on the BFO Switch.
2. Adjust the trimmer in the BFO can to obtain maximum sound which will be a hissing noise. Turn tuning knob to be sure this sound is not some tunable frequency that is causing it.
3. Check beats against some broadcast station to determine if the strength of the beat is normal.

NOTE 2: In this band (17 to 43 MC) only the oscillator follows the received signal 465 KC lower in frequency. Therefore when checking for the image, if the alignment has been made at 36 MC, it will be found at about 37 MC. This will determine if the alignment was correctly made at 36 MC.
NOTE 3: Check for image on all bands except that 17 to 43 MC band at a point 930 KC lower on the dial.
NOTE 4: Rock main dial slightly for point of maximum signal as the padding condenser is being adjusted.

ALIGNMENT PROCEDURE

DUMMY ANTENNA	SIG. GEN. CONNECTION TO	GEN. FREQ.	BAND SW. POSITION	DIAL SETTING	SEE NOTE	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION
.05 mfd.	Grid of 12SA7	465 KC	1.7-.55	Off Station	1	C_1, C_2, C_3, C_4	I.F.-peak
400 Res.	A & DG	1400 KC	1.7-.55	1.4		T_{11}, T_{12}, T_{13}	Osc-RF-Ant.
"	"	600 KC	1.7-.55	.60	4	P_{14}	Osc. Pad.
"	"	5 MC	5.5-1.7	5	3	T_7, T_8, T_9	Osc-RF-Ant.
"	"	1.8 MC	5.5-1.7	1.8	4	P_{10}	Osc. Pad.
"	"	16 MC	18-5.6	16 MC	3	T_4, T_5, T_6	Osc-RF-Ant.
"	"	36 MC	43-17	36 MC	2	T_1, T_2, T_3	Osc-RF-Ant.



HOWARD RADIO CO.

MODEL 718-X RADIO PHONO COMBINATION - NEW PRODUCTS MODEL 200 RECORD CHANGER

DESCRIPTION OF OPERATION

To load the instrument with records, turn the changer blades AJ to the position as shown in the top view (counter-clockwise) and place a stack of ten 12" or twelve 10" records on the center spindle, allowing them to rest upon the lower changer blades.

The operation of the changer mechanism is controlled by means of the single button AG on the base plate AK. Turn the button to point to automatic. Then press down, to start cycle. The changer will then automatically play all records in the order stacked.

To remove records, after all have been played, lift slightly each set of changer blades AJ, and pivot clockwise approximately a half of a complete turn. (180°). There will then be no obstructions to prevent removing the records.

To change records any time when the needle is on the record, merely press down momentarily on the control button.

To play records singly, turn changer blades AJ away from center of table (clockwise), and turn the control button to Manual.

DESCRIPTION OF CHANGE CYCLE

The change cycle consists of automatically removing the pickup arm from last played record, releasing the next record, and placing the pickup arm in the playing position. There are three conditions which cause the mechanism of the instrument to start and proceed through the change cycle.

1. Pressing down control button AG rotates reject rod BD. The bent end of BD (which is same as DC) strikes the ratchet casting DF, which is fastened to trip rod DE (BE in bottom view), rotating rod BE. This pivots the bent end of BE away from the end of follower CL, allowing the heavy end of follower CL to drop, pivoting about its axis (which extends through follower arm BJ and drive arm CJ) and engaging it in the worm CN. The worm CN has a left and right thread which carries the follower CL to the opposite end of CN and returns it. This action through the axis pin of follower CL causes the pivoting of drive arm CJ and clutch arm CK about their common axis.

The construction of drive arm CJ and clutch arm CK together with the clutch spring CG, provides protection against breakage of the instrument or records in case of jamming.

The clutch arm CK thrusts the drive link BL, actuating the blade bell crank BM, and in turn the blade crank CE through tie bar CF which is riveted to the blade bell crank BM. This action operates the changer blades AJ.

2. When a record has been played and the pickup arm has reached a definite distance from the center spindle following the spiral groove towards the center of the record, the stop adjusting screw DV in the pickup crank strikes the ratchet casting DF, which in turn rotates the trip rod DE, causing the engagement of the follower CL, etc.

3. Records that have an eccentric groove inside of the playing or modulated grooves will give the pickup arm AC an oscillatory movement. This oscillation is transmitted to the pickup crank DT, which, when in the playing position, drags the pawl DU across the ratchet DF, with the pawl spring DS tending to hold the pawl DU straight out, and any back movement of the arm DA and crank DT causes the pawl DU to catch on the ratchet DF, pushing it away against the tension of ratchet spring DG and rotating trip rod DE. DE in turn releases follower CL, engaging it in worm CN, etc.

The operation of the pickup arm DA (AC in top view) is controlled by the cam DW which is synchronized with the changer blades AJ. The rack link BH transmits action from the blade bell crank BM, through the rack DD (BC in bottom view), to cam pinion DH.

The determination of the set down position of the pickup arm AC originates at the selector AA. As the changer blades AJ pivot in operation, the selector AA is intercepted by the edge of a record. This stops the rotation of the selector crank CC fastened to the selector (CD in bottom view), and in turn the axial movement of selector rod CB (same as DP), said axial movement being caused by selector spring DM.

The rod CB interferes with the arcial movement of the pickup crank DT, in accordance with the size of the record passing through the blades AJ, causing the cam follower DR to follow the outer groove or to be allowed to ride into the inner groove in the face of cam DW. The outer groove controls the set-down position for 12" records, and the inner controls the 10" records.

ADJUSTMENTS

Should the changer blades AJ be forceably turned out of proper adjustment, loosen the clamping screws in the blade crank CE and or the blade bell crank BM, and with the machine in neutral at the end of a cycle or in the playing position, turn the blades so that the upper blades are equi-distant and within 1/8" of the edge of a 12" record. Then clamp screws securely.

To adjust the setdown position of tone arm, turn off the machine during cycle just before the pickup arm descends to a record, loosen the set screw in crank DT, and while holding the crank DT in place, turn the pickup arm AC until it is straight above the outside groove of the record. Then retighten the set screw.

The adjustment of the ratchet DF on rod DE (BE in bottom view); the selector crank CC on the switch button shaft; the small casting on the straight end of DC (BD in bottom view); and the selector crank CC on the selector CD are limited and obvious to the authorized repair man, from the description of cycle.

REPLACING MOTOR

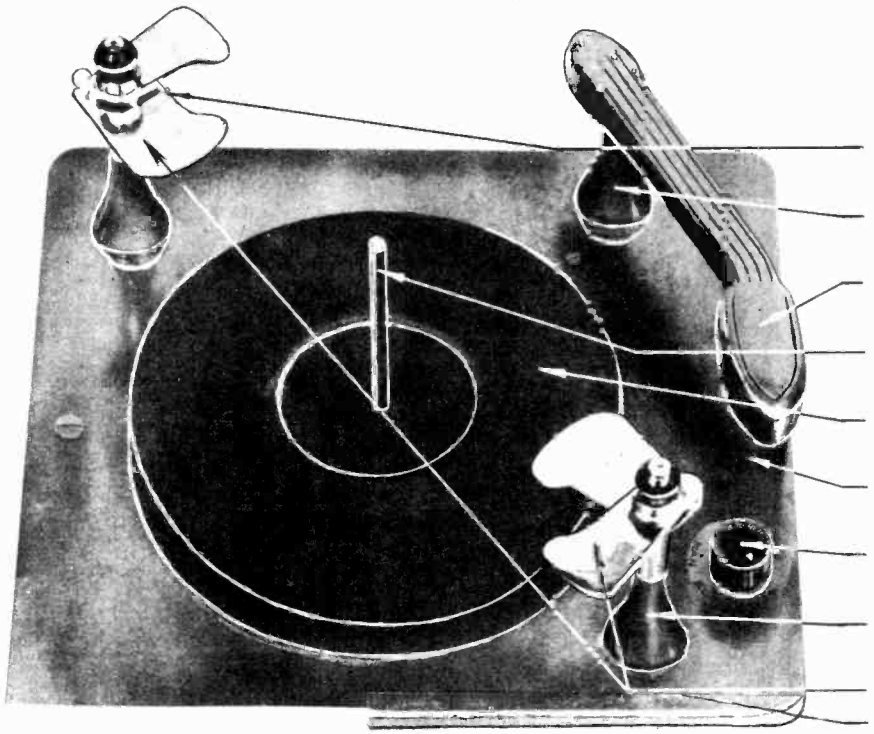
Remove idler wheel and the three motor mounting screws. Be sure to save metal bushing spacers, which slip inside of rubber grommets. These prevent rubber from being squeezed out of shape which would prevent proper cushioning of motor. Place motor of proper rating in same position as present motor and replace spacers, washers and screws as before.

LUBRICATION

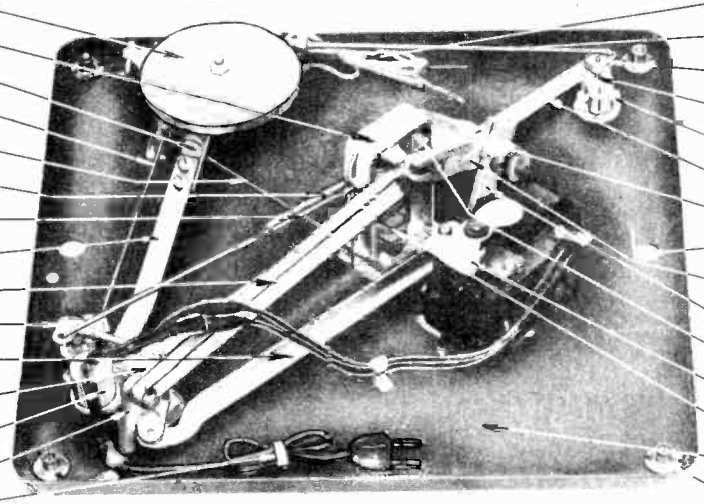
No lubrication should be necessary. However, in case of squeaks or stiffness of operation a drop of any good light machine oil on each of the bearings on the spindle worm, motor, and at other pivot points should be applied. Also, a light application of grease to the worm itself might help.

MODEL 718-X

HOWARD RADIO CO.

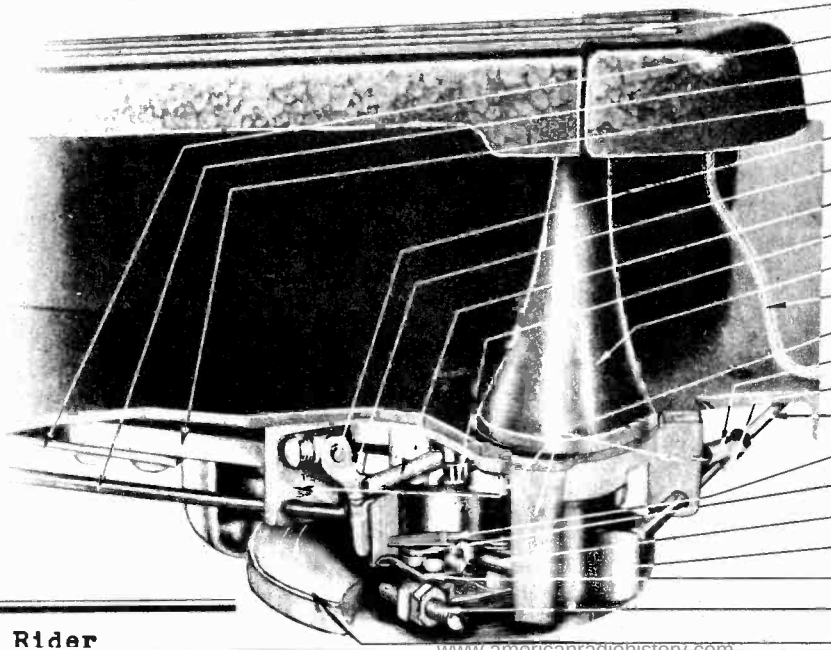


AA SELECTOR R-422
AB PICKUP POST R-615
AC PICKUP ARM R-474
AD TURNTABLE SHAFT R-614
AE TURNTABLE R-608
AF PICKUP ARM REST R-5
AG CONTROL KNOB R-476
AH CHANGER POSTS R-612 or R-408
AJ CHANGER BLADES R-172 or R-172A
AK BASE PLATE



R-403 CAM BA
R-413 SUB FRAME BB
R-438 CAM RACK BC
R-451 REJECT ROD BD
R-426 TRIP ROD BE
R-133 MANUAL SP. BF
R-629 MANUAL ROD BG
RACK LINK BH
R-616 FOLLOWER ARM BJ
R-420 SWITCH CRANK BK
DRIVE LINK BL
BLADE BELL CRANK BM
R-467 SWITCH BN
R-418 SWITCH BRACKET BP
R-319 CORD & PLUG BQ

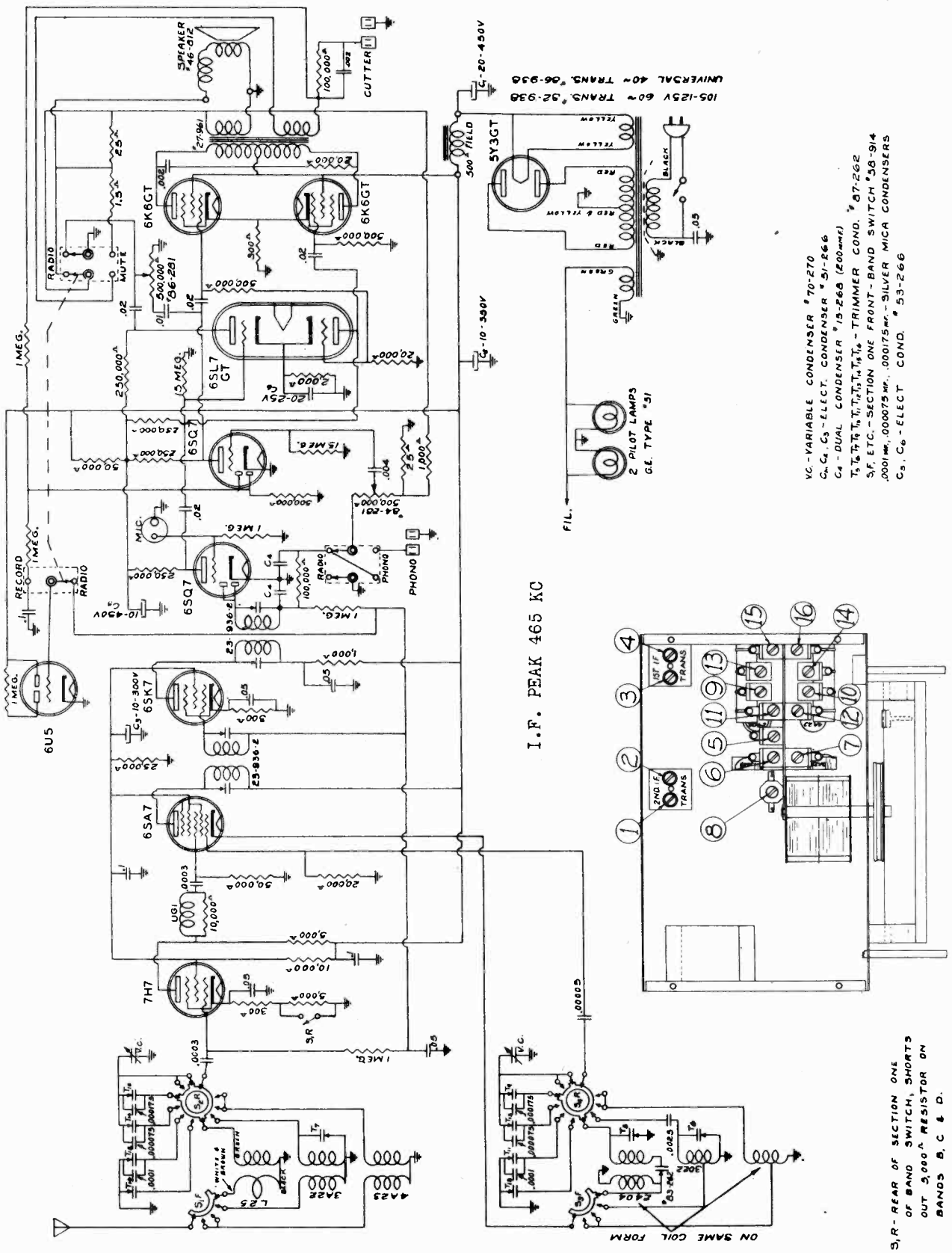
CA PICKUP CORD R-560
CB SELECTOR ROD R-424
CC SELECTOR CRANK R-425
CD SELECTOR R-422
CE BLADE CRANK
CF TIE BAR
CG CLUTCH SPRING R-432
CH MOUNTING HOLES
CJ DRIVE ARM R-414
CK CLUTCH ARM R-621
CL FOLLOWER R-407
CM MOTOR R-480
CN WORM R-404
CP BASE PLATE
CQ "TEE" NUTS



DA PICKUP ARM R-474
DB RACK LINK
DC REJECT ROD R-451
DD CAM RACK R-438
DE TRIP ROD R-426
DF RATCHET R-440
DG RATCHET SPRING R-775
DH CAM PINION R-410
DJ PICKUP ARM POST R-615
DK PICKUP CORD R-560
DL CAM BRACKET R-427
DM SELECTOR SPRING R-419
DN SELECTOR STUD
DP SELECTOR ROD R-424
DQ CAM FOLLOWER SPRING R-423
DR CAM FOLLOWER R-415
DS PAWL SPRING R-461
DT PICKUP CRANK R-416
DU PAWL R-205
DV STOP ADJUSTING SCREW R-443
DW CAM R-403

MODEL 810

HOWARD RADIO CO.



SOCKET VOLTAGE READINGS FOR MODEL 810

* Socket Terminal Number

Voltage taken from ground with voltage at 117 Volts AC. Drop across speaker field 55 V. Use at least a 1000 Ohm per Volt Meter. High voltage reading off rectifier 315 V.

TUBE	FUNCTION	CATH.	SG.	PLATE
6SD7GT	R.F.	1&4 5	100 6	255 8
6SA7GT	Converter		100 4	260 3
6SK7GT	I.F.	3 5	100 6	255 8
6SQ7	Det.			85 6
6SQ7	Mic.Amp.			75 6

TUBE	FUNCTION	CATH.	SG.	PLATE
6U5	Tuning eye			260
6SL7GT	Inverter	1.5 3		80 2
	A.F.	1.5 6		80 5
6K6GT	Output	18 8	260 4	250 3
6K6GT	Output	18 8	260 4	250 3

ALIGNMENT PRECEDURE FOR MODEL 810 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	1
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.	2
"	"	12 MC	"C" Band	12 MC	⑪ then ⑫	⑪ Osc. Trimmer ⑫ Ant. Trimmer	2
"	"	16 MC	"D" Band	2.4 MC on "B" Band	⑬ then ⑭	⑬ Osc. Pad. ⑭ Ant. Pad.	3
"	"	20 MC	"D" Band	20 MC	⑮ then ⑯	⑮ Osc. Trimmer ⑯ Ant. Trimmer	3

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.

EQUIPMENT REQUIRED:

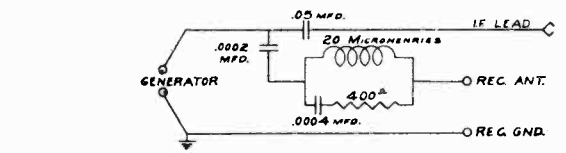
1. Signal generator to accurately cover the alignment frequencies shown in the table.
2. Output Meter (0 to 3 V. AC, if used in voice coil circuit).
3. Dummy Antenna. Although the values as shown in the table for antenna load may be satisfactory, we urgently recommend the circuit below to properly take care of the frequencies for correct alignment.

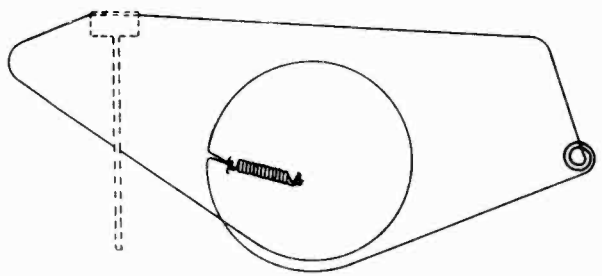
START ALIGNMENT WITH:

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.



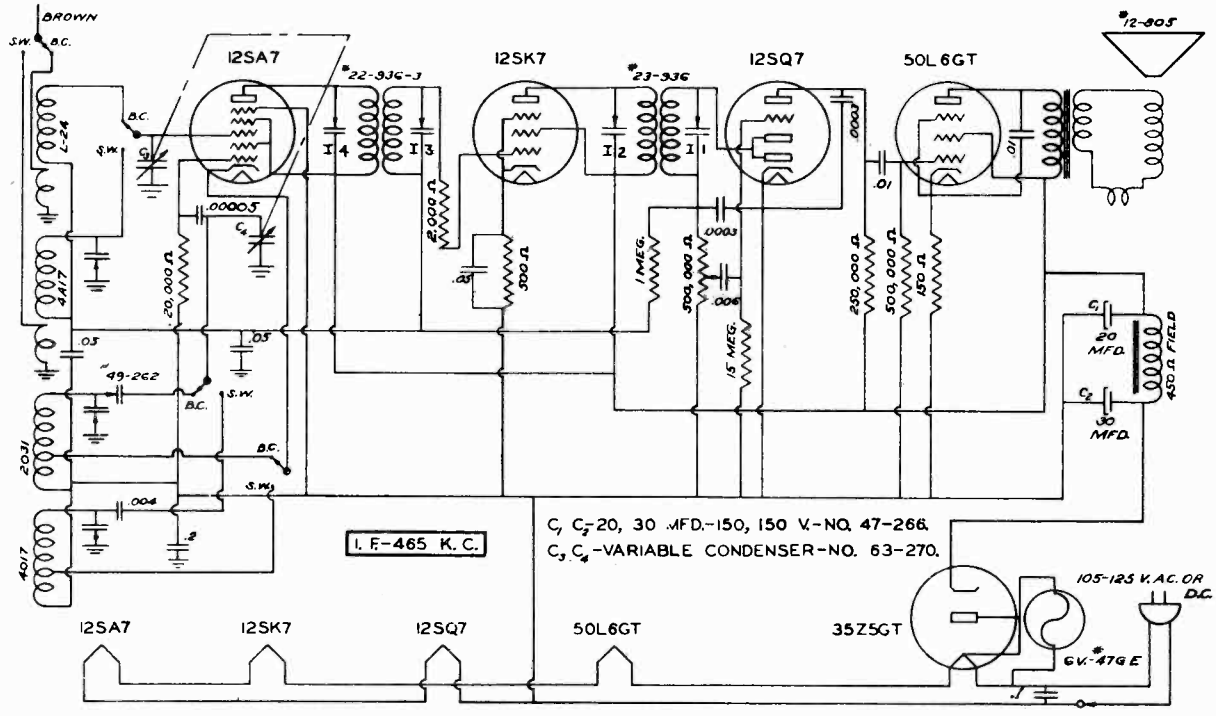


CONDENSER GANG IN MAXIMUM POSITION

LAYOUT SHOWING HOW TO ASSEMBLE DIAL CABLE ON MODEL 806-808 ETC, VERTICAL MOUNTING.

MODEL 802

HOWARD RADIO CO.



TUNING RANGES = 540 to 1720 KC and 4.6 to 16 MC (178-550 and 18-65 Meters)

I. F. 465 KC	TYPE Conventional	POWER OUTPUT - (MAX.) 1 Watt	UPO .5 W.
SPEAKER = Electro-dynamic	SIZE = 5"	V.C. IMP.(400CPS) = 5 Ohms	FIELD =450 Ohms

ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Signal Generator Frequency	Signal Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function	Check for Image at
KC	540	465	Grid of 12SA7	A	I_1, I_2, I_3, I_4	IF	
MC	14 MC	14 MC	Ant. (Brown)	B	O_5, A_6	Osc. Ant.	13 MC
KC	1400 KC	1400 KC	Ant. (Brown)		O_7	Osc.	

A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.

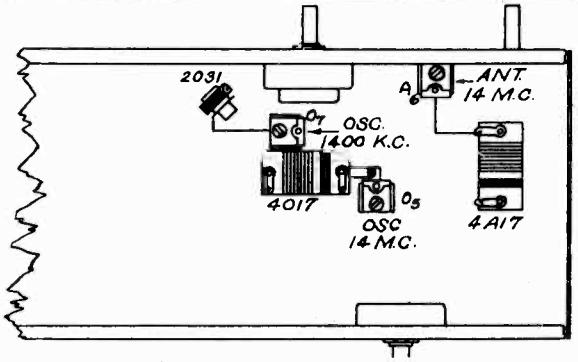
B- When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 14 MC, then a weaker image will be heard at 13,070 KC, in other words 930 KC less on the dial.

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.

TUBE	FUNCTION	CATH.		SG.		PLATE	
12SA7	Mixer		*	92	4	92	3
12SK7	I.F.Amp	2.1	5	92	6	92	8
12SQ7	Det.					42	6
50L6GT	Output	6	8	92	4	82	3
35Z5GT	Rectifier	121	8				

* Socket Terminal Number.

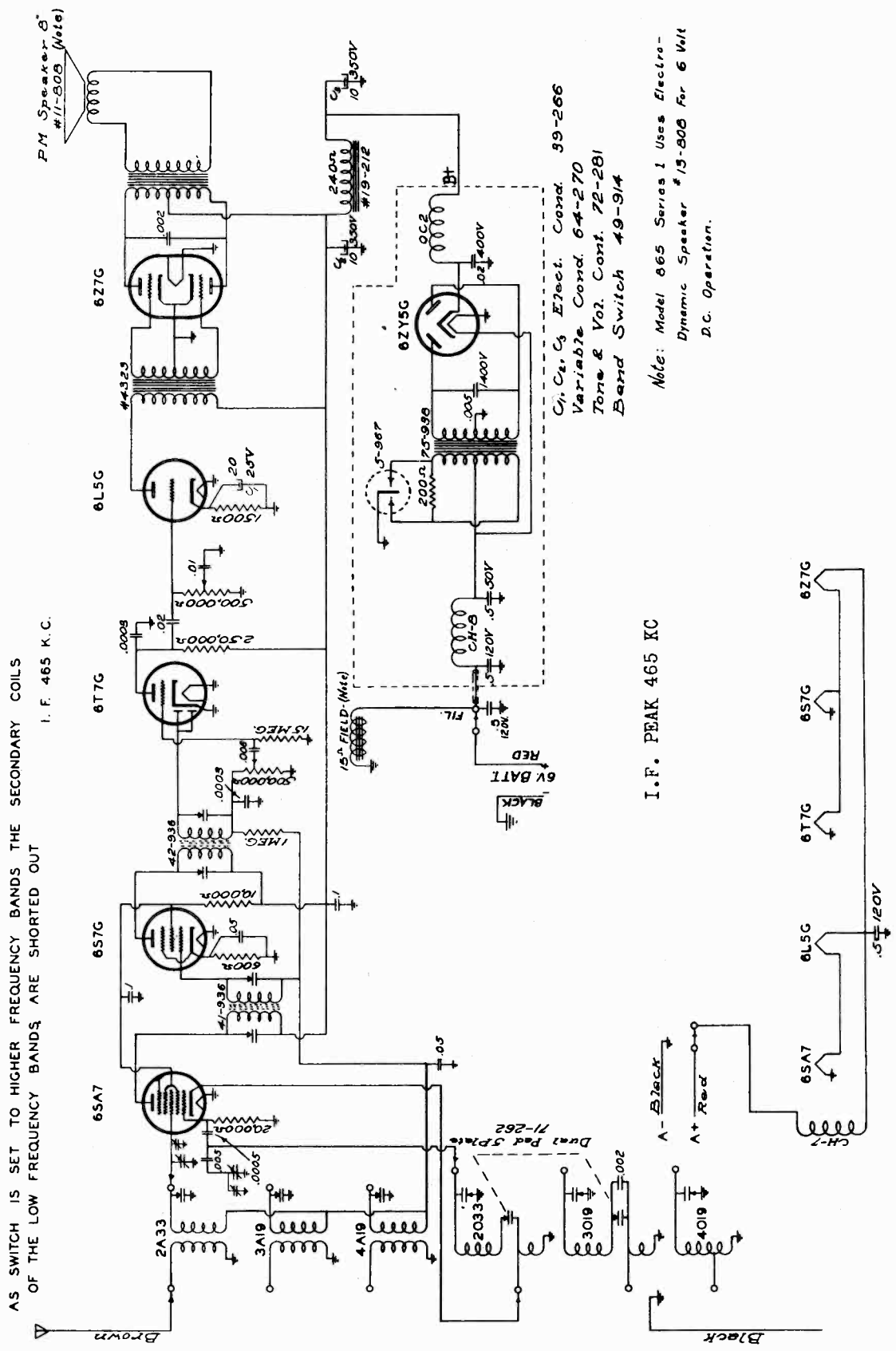


SOCKET VOLTAGE READINGS

Voltage taken from B- with line voltage at 117 V. A.C.
High voltage reading off rectifier = 115V.
Drop across speaker field = 29V.
Use at least a 1000 Ohm per volt meter.
High voltage reading off rectifier = 121V.

MODEL 865

HOWARD RADIO CO.



HOWARD RADIO CO.

MODEL 865
MODEL 868

MODEL 865

POWER SUPPLY = 6 Volt Battery Supply — DRAIN = 2.6 Amps.

ANTENNA SYSTEM = Conventional. Connect Antenna to BROWN lead. Connect Ground to BLACK lead.

TUNING RANGES = 540 to 1700 KC, 2.2 to 7 MC, 7 to 22 MC.

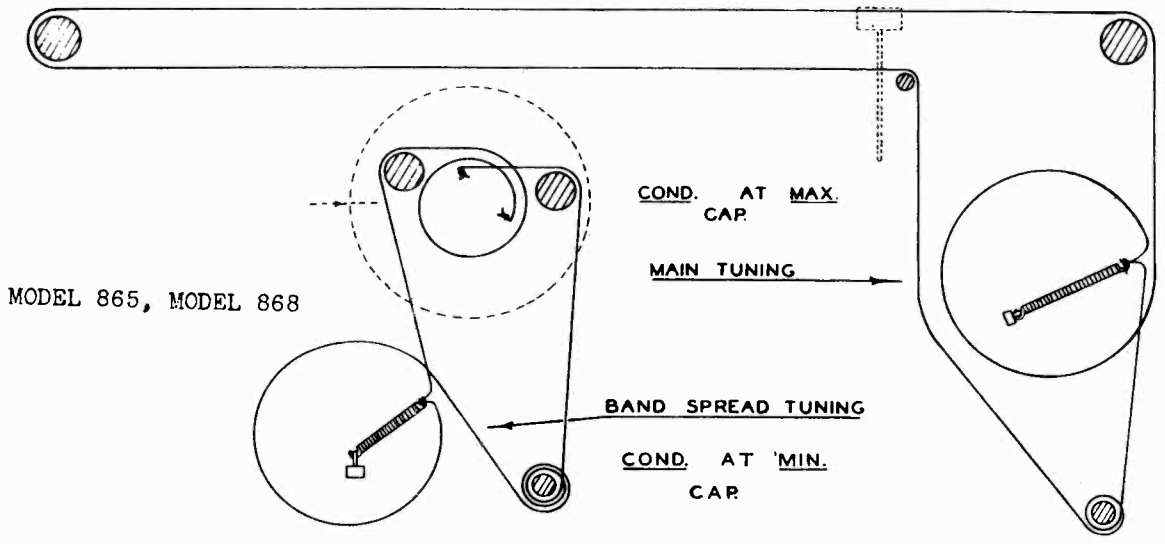
I.F. = 465 KC. TYPE = Iron Core | POWER OUTPUT = (MAX.) = 2 WATTS.

CONTROLS: Lower Left, Volume; Middle left, Tone; Upper left, On-Off;
Lower Right, Band Switch; Middle Right, Tuning; Upper right, Band Spread.

TUNING SYSTEM:
Horizontal dial, string drive, fly wheel tuning. Band Spread with 320 degree disc indicator.

SPEAKER = Electro dynamic	SIZE = 8"	VOICE COIL = 3 OHMS (400 CPS)	FIELD = 15 OHMS

STRING LAYOUT INTERNATIONAL SERIES



MODEL 865
ALIGNMENT PROCEDURE

See Fig. 1 and Fig. 2.

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
Broadcast	Max. Cap.	465 KC	Converter Grid	A,D	I_1, I_2, I_3, I_4	IF
7-22 MC	21	21 MC	Ant. (Brown)	B	O_5, A_6	Osc., Ant.
2.2-7 MC	6	6 MC	" " "		O_7, A_8	Osc., Ant.
2.2-7 MC	2.2	2.2 MC	" "	C	P_9	Osc. Pad.
Broadcast	1400	1400 KC	" "		O_{10}, A_{11}	Osc., Ant.
Broadcast	600	600 KC	" "	C	P_{12}	Osc. Pad.

A--Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B--When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 21 MC, then a weaker image will be heard at 21,000 KC less 930 KC, or about 20,070 KC on the dial.
C--When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.
D--See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.

SOCKET VOLTAGES
MODEL 865, 6 Volt

TUBE	FUNCTION	CATHODE	SCR. GRID	PLATE
6SA7	Mixer	3	70	145
6S7G	IF	3	70	145
6T7G	Det.	x	x	50
6L5G	Audio	6 V. Bias	x	145
6Z7G	PP Output	x	x	140

MODEL 865
MODEL 868

HOWARD RADIO CO.

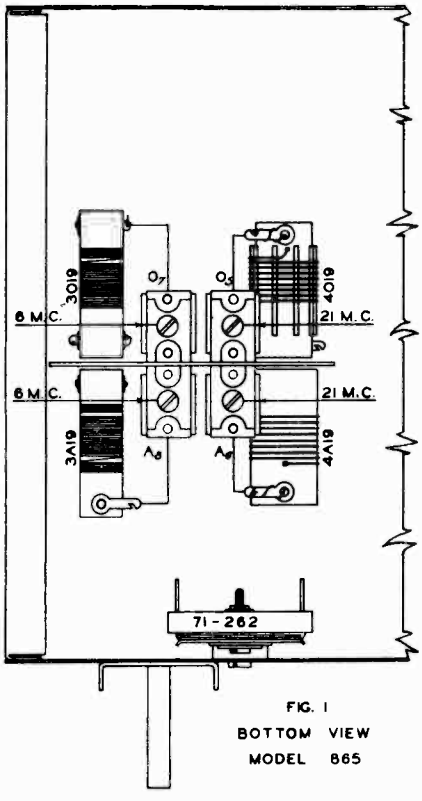


FIG. 1
BOTTOM VIEW
MODEL 865

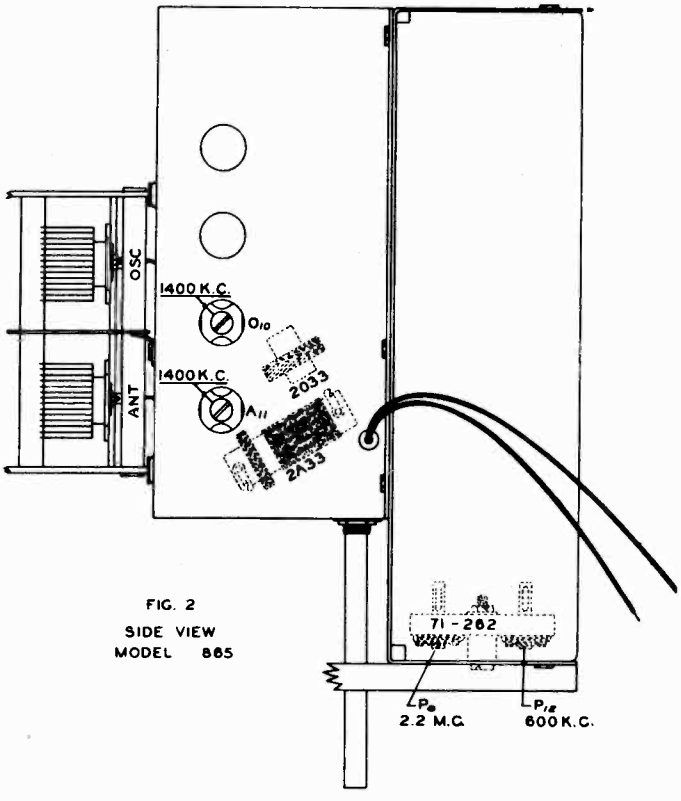


FIG. 2
SIDE VIEW
MODEL 865

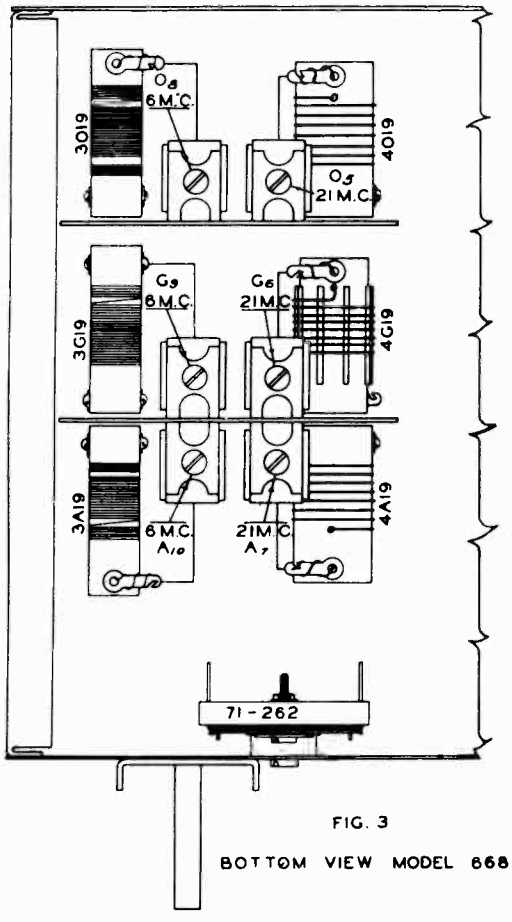


FIG. 3
BOTTOM VIEW MODEL 868

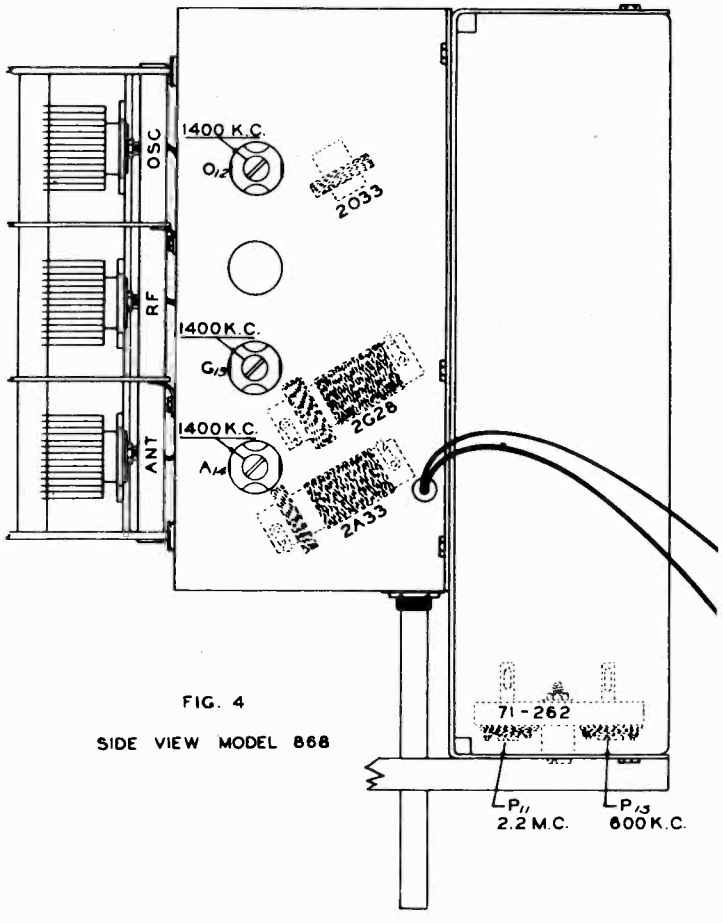
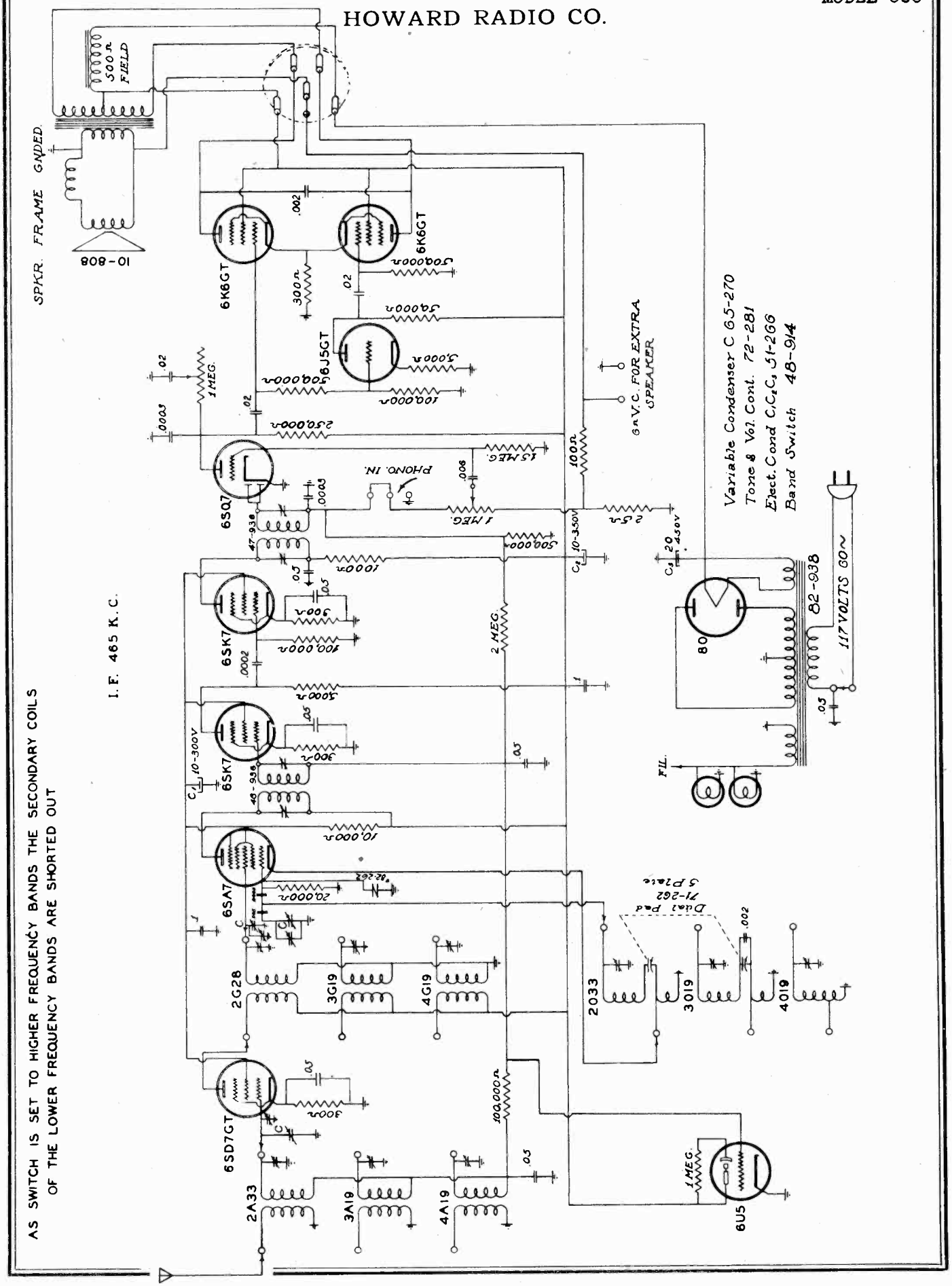


FIG. 4
SIDE VIEW MODEL 868

MODEL 868



MODEL 868

HOWARD RADIO CO.

POWER SUPPLY-(Standard Models) = 105-125 V. 60 Cycle CONSUMPTION - 95 WATTS

ANTENNA SYSTEM = Conventional. Connect Antenna to BROWN lead. Connect Ground to BLACK lead.

TUNING RANGES = 540 to 1700 KC, 2.2 to 7 MC, 7 to 22 MC.

I. F. = 465 KC. Two tuned stages and one resistance coupled stage.

POWER OUTPUT = (MAX.) 6 WATTS UPO = 4 W.

CONTROLS: Lower Left: Volume; Middle Left; Tone; Upper Left: Power Off-On;
Lower Right: Band Switch; Middle Right: Tuning; Upper Right: Band Spread.

TUNING SYSTEM:
Horizontal dial, string drive, fly wheel tuning. Band Spread with 320 degree disc indicator.

SPEAKER = Electro dynamic	SIZE = 8"	VOICE COIL = 3 OHMS (400 CPS)	FIELD = 500 OHMS

MODEL 868
ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
Broadcast	Max. Cap.	465 KC	Converter Grid	A,D	I_1, I_2, I_3, I_4	IF
7-22 MC	21	21 MC	Ant. (Brown)	B	O_5, G_6, A_7	Osc,RF,Ant.
2.2-7 MC	6	6 MC	" "		O_8, G_9, A_{10}	Osc,RF,Ant.
2.2-7 MC	2.2	2.2 MC	" "	C	P_{11}	Osc,Pad.
Broadcast	1400	1400 KC	" "		O_{12}, G_{13}, A_{14}	Osc,RF,Ant.
Broadcast	600	600 KC	" "	C	P_{15}	Osc,Pad.

A--Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B--When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 21 MC, then a weaker image will be heard at 21,000 KC less 930 KC, or about 20,070 KC on the dial.
C--When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.
D--See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.

MODEL 868
SOCKET VOLTAGE READINGS

Voltage taken from ground with line voltage at - 120 V.
High voltage reading off rectifier - 300 V.
Drop across speaker field - 65 V.
Voltage taken with 1,000 Ohm per volt meter.

TUBE	FUNCTION	CATH-ODE	SCR. GRID	PLATE	OSC. PLATE
6SD7GT	R.F.	2.5	95	235	
6SA7	Mixer		95	235	95
6SK7	I.F.Amp.	3	95	195	
6SK7	I.F.Amp.	3	95	215	
6SQ7	Diode-AVC			47	

TUBE	FUNCTION	CATH-ODE	SCR. GRID	PLATE	OSC. PLATE
6K6GT	Output	17	235	225	
6K6GT	Output	17	235	225	
6J5GT	Inverter	7.5		145	
80	Rect.				
6U5	Tuning Eye			235	