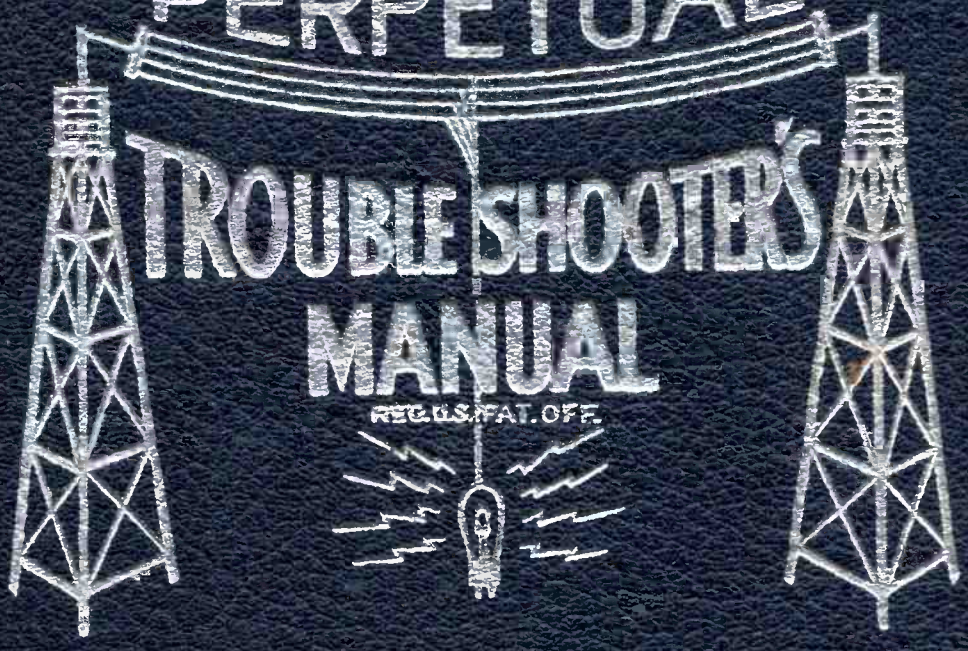
VOLUME XI

PERPETUAL TROUBLESHOOTER'S MANUAL

REG. U.S. PAT. OFF.



JOHN F. RIDER

FIRESTONE TIRE & RUBBER CO.

MODEL S7427-3, Chassis R316
Schematic, Voltage, Socket

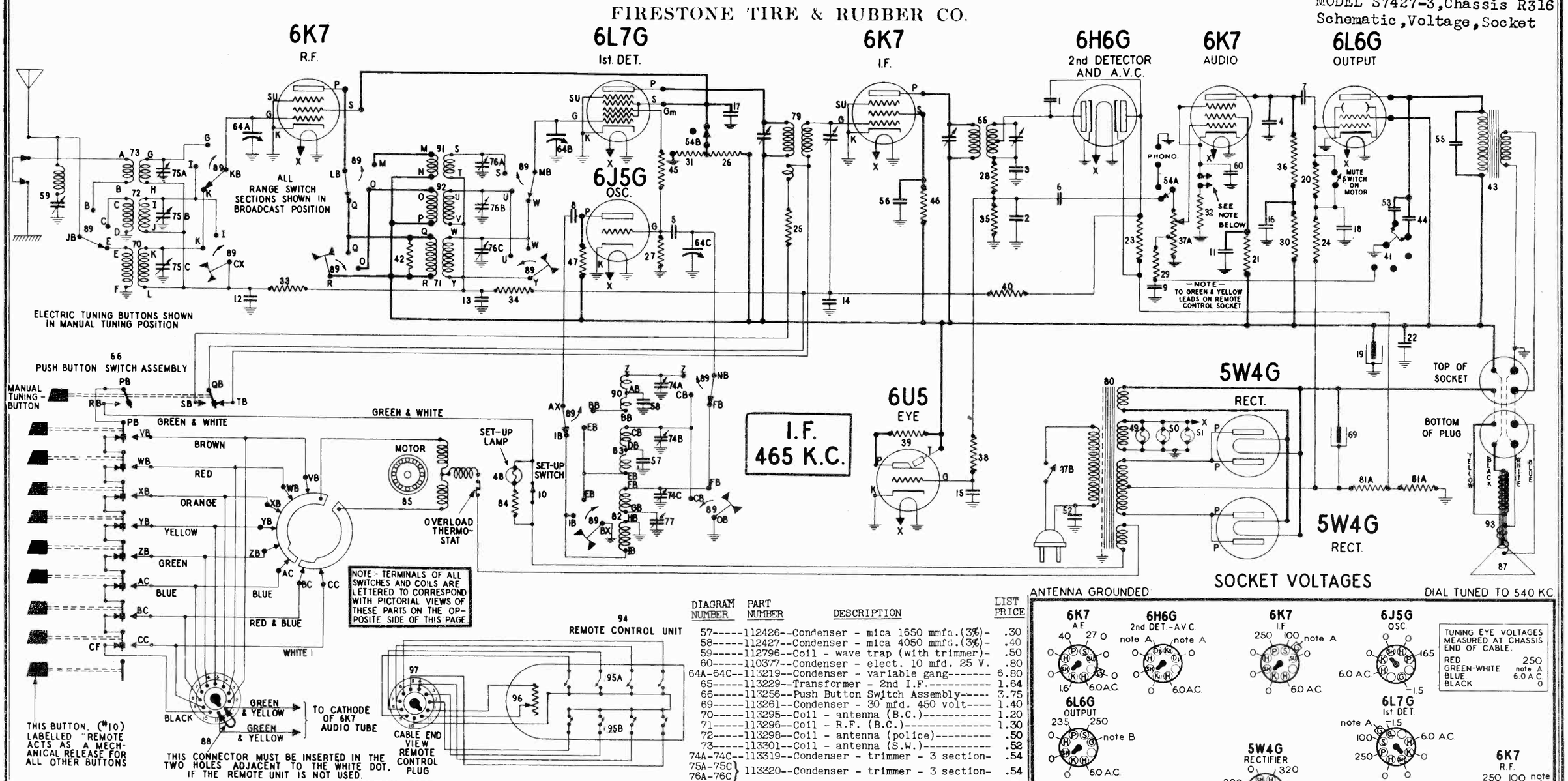


DIAGRAM NUMBER	PART NUMBER	DESCRIPTION	LIST PRICE
1-2-3	83783	Condenser - mica, 110 mmf.	.20
4	85394	Condenser - mica 510 mmf.	.25
5	85061	Condenser - mica 51 mmfd.	.15
6-7	88026	Condenser - .02 mfd. 400 volt	.25
8	86030	Condenser - .01 mfd. 400 volt	.25
9	88030	Condenser - .01 mfd. 400 volt	.25
10	88054	Switch - for set-up	.30
11	88682	Condenser - .1 mfd. 400 volt	.25
12-13-14-15	88189	Condenser - .05 mfd. 200 volt	.25
16	88682	Condenser - .1 mfd. 400 volt	.25
17	89421	Condenser - .1 mfd. 200 volt	.25
18	89532	Condenser - .25 mfd. 200 volt	.32
19	89937	Condenser - elect. 30 mfd. 450 V	1.60
20	110553	Resistor - 220,000 ohms 1/4 watt	.12
21	110554	Resistor - 1 meg. 1/4 watt	.12
22	88682	Condenser - .1 mfd. 400 volt	.25
23	110559	Resistor - 470,000 ohms 1/4 watt	.12
24	110564	Resistor - 100,000 ohms 1/4 watt	.12
25	110975	Resistor - wire 33 ohms 1/2 watt	.12
26	112953	Resistor - 10,000 ohms 3 watts	.25
27-28-29-30	110552	Resistor - 47,000 ohms 1/4 watt	.12
31	112954	Resistor - 10,000 ohms 1 watt	.16
32	112955	Resistor - 1,000 ohm ½ W. (10%)	.12
33-34-35	110553	Resistor - 220,000 ohms 1/4 watt	.12
36	112959	Resistor - 120,000 ohms ½ W.(10%)	.12
37A-37B	113258	Vol.Cont.-1000000 ohm(off-on sw.)	.95
38-39-40	110554	Resistor - 1 megohm 1/4 watt	.12
41	114095	Tone Control switch	.70
42	110557	Resistor - 4,700 ohms 1/4 watt	.12
43	114097	Transformer - output	2.00
44	114106	Condenser - .02 mfd. 750 volt	.25
45	110560	Resistor - 100 ohms 1/4 watt	.12
46	110564	Resistor - 100,000 ohms 1/4 watt	.12
47	110568	Resistor - 15,000 ohms 1 watt	.15
48-49-50-51	110629	Lamp - 6.3 volt - .25 amps.	.15
52	111214	Condenser - .01 mfd. 600 volt	.24
53	114108	Condenser - .03 mfd. 750 volt	.25
54A-54B	114141	Switch - radio-phono(D.P.D.T.)	.44
55	114504	Condenser - .01 mfd. 750 volt	.25
56	111252	Condenser - .05 mfd. 400 volt	.13
57	112426	Condenser - mica 1650 mmfd.(3%)	.30
58	112427	Condenser - mica 4050 mmfd.(3%)	.40
59	112796	Coil - wave trap (with trimmer)	.50
60	110377	Condenser - elect. 10 mfd. 25 V.	.80
64A-64C	113219	Condenser - variable gang	6.80
65	113229	Transformer - 2nd I.F.	1.64
66	113256	Push Button Switch Assembly	3.75
69	113261	Condenser - 30 mfd. 450 volt	1.40
70	113295	Coil - antenna (B.C.)	1.20
71	113296	Coil - R.F. (B.C.)	1.30
72	113298	Coil - antenna (police)	.50
73	113301	Coil - antenna (S.W.)	.52
74A-74C-75A-75C-76A-76C	113319	Condenser - trimmer - 3 section	.54
	113320	Condenser - trimmer - 3 section	.54
77	113346	Condenser - padding	.38
79	114103	Transformer - 1st I.F.	1.90
80	114101	Transformer - 117 volt 60 cycle	9.00
81A-81B	114105	Bias Resistor - Section A-23 ohm, Section B-90 ohm	.38
82	113411	Coil - oscillator (B.C.)	.50
83	113412	Coil - oscillator (police)	1.20
84	113430	Resistor - candohm 90 ohms	.26
85	114092	Motor - for electric tuner	8.00
87	R-114165	Cone - voice coil assembly	2.40
88	113499	Connector Link - for remote control plug	.01
89	113599	Switch - range	2.10
90	113607	Coil - oscillator (S.W.)	.52
91	113608	Coil - R. F. (S.W.)	.60
92	113609	Coil - R.F. (Police)	.50
93	R-115031	Speaker (dynamic) (12 inch)	9.25
94	114200	Remote control unit	
95A-95B	113644	Switch - two section (in remote control unit)	4.20
96	113646	Volume control (35,000 ohms) on remote control unit	.75
	113650	Case for remote control unit	1.20
	113651	Push Button - for remote control unit	.08

SOCKET VOLTAGES

ANTENNA GROUNDED — DIAL TUNED TO 540 KC

REAR OF CHASSIS

Use a high resistance voltmeter of at least 1000 ohms per volt.

NOTE A: The bias for the control grids of the 6L7-G, 6K7-R.F., 6K7-I.F. and the diode plate (D_2) and cathode (K_2) of the 6H6-G tubes is -3.0 volts measured across resistor 81A.

NOTE B: The bias for the control grid of the 6V6-G output tube is -14.5 volts measured across resistors 81A and 81B.

MODEL S7427-3, Chassis R316
Alignment, Socket, Trimmers
Coils, Tuner, Dial Drive

ALIGNMENT EQUIPMENT & PROCEDURE

FOR ALIGNMENT: An output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 20 MC. are required.

1 Connect the output meter across the voice coil or, in series with .1 mfd. condenser, from the plate of the 6L6-G output tube to ground, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

2 Connect the ground lead of the signal generator to the "G" post on the antenna terminal strip at the rear of the chassis, or to the metal chassis.
The ground and doublet terminals on the antenna terminal strip must be connected together throughout the alignment procedure.

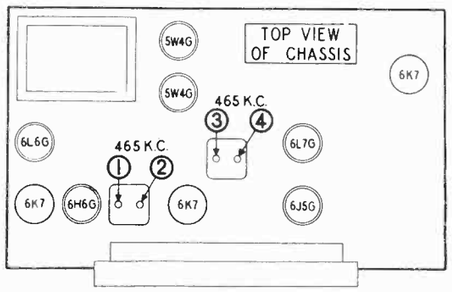
3 With the gang condenser in full mesh set the pointer to the last mark on the left end of the dial scale. If the pointer is incorrectly set, it is only necessary to loosen the set screw on the dial cord drive drum and push the gang condenser to full mesh with the pointer properly set, then retighten the set screw.

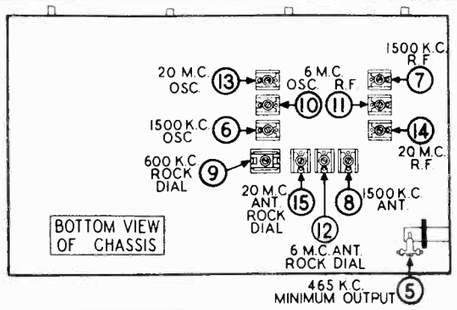
4 Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure. IMPORTANT:- If the remote control unit is plugged in, be sure that its volume control is also in the maximum volume position.

-IMPORTANT-

THE FIRST PUSH-BUTTON ON THE LEFT, LABELLED "MANUAL", MUST BE PUSHED IN WHEN ALIGNING. FAILURE TO PUSH IN THIS BUTTON WILL MAKE CORRECT ALIGNMENT IMPOSSIBLE.

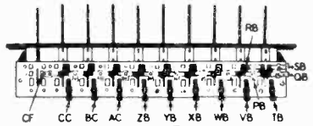
DUMMY ANT IN SERIES WITH SIGNAL GENERATOR	CONNECTION OF SIGNAL GENERATOR OUTPUT TO RECEIVER	SIGNAL GENERATOR FREQUENCY	RANGE SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
1 MFD. CONDENSER	CONTROL GRID OF 6L7-G TUBE	465 KC.	BROADCAST (CLOCKWISE)	ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL	1-2	2ND I.F.	ADJUST FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT.
					3-4	1ST I.F.	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	465 KC.	BROADCAST (CLOCKWISE)	ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL	5	WAVE TRAP	ADJUST FOR MINIMUM OUTPUT USING A STRONG GENERATOR SIGNAL.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	1500 KC.	BROADCAST (CLOCKWISE)	1500 KC.	6	BROADCAST OSCILLATOR (SHUNT)	ADJUST FOR MAXIMUM OUTPUT.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	1500 KC.	BROADCAST (CLOCKWISE)	TUNE TO 1500 KC. GENERATOR SIGNAL	7	BROADCAST R. F.	ADJUST FOR MAXIMUM OUTPUT.
					8	BROADCAST ANTENNA	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	600 KC.	BROADCAST (CLOCKWISE)	TUNE TO 600 KC. GENERATOR SIGNAL	9	BROADCAST OSCILLATOR (SERIES PAD)	ADJUST FOR MAXIMUM OUTPUT. TRY TO INCREASE OUTPUT BY DETUNING TRIMMER AND RETUNING RECEIVER DIAL UNTIL MAXIMUM OUTPUT IS OBTAINED.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	6 MC.	INTERMEDIATE (CENTER)	6 MC.	10	INTERMEDIATE (POLICE) OSCILLATOR (SHUNT)	ADJUST FOR MAXIMUM OUTPUT. CHECK TO SEE IF PROPER PEAK WAS OBTAINED BY TUNING IN IMAGE AT APPROX. 5.1 MC. IF IMAGE DOES NOT APPEAR REALIGN AT 6 MC. WITH TRIMMER SCREW FARTHER OUT. RECHECK IMAGE.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	6 MC.	INTERMEDIATE (CENTER)	TUNE TO 6 MC. GENERATOR SIGNAL	11	INTERMEDIATE R. F.	ADJUST FOR MAXIMUM OUTPUT
					12	INTERMEDIATE ANTENNA	
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	20 MC.	FOREIGN (COUNTER-CLOCKWISE)	20 MC.	13	FOREIGN OSCILLATOR (SHUNT)	ADJUST FOR MAXIMUM OUTPUT. CHECK TO SEE IF PROPER PEAK WAS OBTAINED BY TUNING IN IMAGE AT APPROX. 19.1 MC. IF IMAGE DOES NOT APPEAR REALIGN AT 20 MC. WITH TRIMMER SCREW FARTHER OUT. RECHECK IMAGE.
400 OHM CARBON RESISTOR	ANTENNA TERMINAL	20 MC.	FOREIGN (COUNTER-CLOCKWISE)	TUNE TO 20 MC GENERATOR SIGNAL	14	FOREIGN R. F.	ADJUST FOR MAXIMUM OUTPUT. TRY TO INCREASE OUTPUT BY DETUNING TRIMMER AND RETUNING RECEIVER DIAL UNTIL MAXIMUM OUTPUT IS OBTAINED.
					15	FOREIGN ANTENNA	



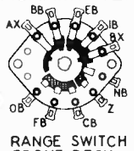


PICTORIAL VIEWS OF COILS AND SWITCHES

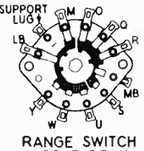
ALL TERMINALS ARE LETTERED TO CORRESPOND WITH THE SIMILARLY LETTERED TERMINALS SHOWN ON THE CIRCUIT DIAGRAM. TERMINALS WHICH ARE CONNECTED TOGETHER CARRY THE SAME LETTERS.



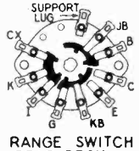
TUNER SWITCH



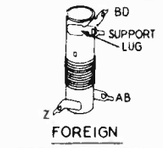
RANGE SWITCH FRONT DECK



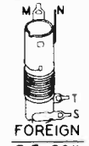
RANGE SWITCH MIDDLE DECK



RANGE SWITCH REAR DECK



FOREIGN OSCILLATOR COIL 113607



FOREIGN R.F. COIL 113608

CHASSIS DESCRIPTION

The R-316 chassis is a 10 tube, Electric Push-Button Tuning Superheterodyne receiver. The tuning ranges are 535 to 1730 KC, 2.2 to 7.0 MC, and 8.8 to 22.5 MC.

Incorporated in eacn chassis is a ruggedly constructed Electric Push-Button Tuner Unit, which was primarily designed to give long-life and consistent accuracy of tuning. Aside from the automatic tuning system this receiver incorporates several features described in the following paragraph which the service man should carefully read as they may aid him in rapidly locating the source of trouble.

CIRCUIT FEATURES

VARIABLE SELECTIVITY: Two degrees of selectivity can be obtained by proper use of the first push-button labelled "Manual". When the button is in the "out" position the tuning of the receiver will be broad. With this button in the "in" position the tuning will be sharp. Broadening is accomplished by inserting a resistor and coil in series with the secondary of the first I. F. transformer. The series coil is mutually coupled into the primary of the same I.F. transformer thereby causing a flattening of the overall selectivity.

AUDIO SYSTEM: The audio voltage developed across the diode load resistor is fed to the volume control which in turn couples, the desired amount of this audio voltage to the control grid of the 6K7 1st audio tube. The output of this stage is coupled to the 6L6-G output tube. A mute switch connected across the control grid load resistor of the 6L6-G output tube is utilized to silence the receiver while the automatic tuning unit is in operation. This is accomplished by placing the mute switch on the back of the tuner motor. When the motor starts to operate the rotor pulls into the magnetic field of the stator, which causes the end of the motor shaft to push against the mute switch and close its contacts.

TUNER MOTOR

Failure of the Tuner Motor to operate will generally be found due to the following causes:

1. The small black set-up switch on the rear of the tuner must be in the left hand position. If this switch is in the right hand position, the set-up lamp is connected in series with the motor, and the motor cannot operate.

2. The overload thermostat on the motor will open when the temperature of the motor reaches a dangerous value (approximately 95° C.) The thermostat will close automatically when the motor cools down.

HOW TO SET UP THE PUSH BUTTONS

1. Be sure that your set is first connected to a good antenna system.
2. Turn on the set and allow it to operate at least one-quarter hour before setting up the push buttons.
3. Make a list of eight nearby stations which you wish to tune in with automatic tuning buttons. Be sure to select nearby powerful stations, since weak stations will generally give better results when tuned manually. Arrange the list so that the lowest frequency station appears first, then the next lowest frequency continuing in this manner until the eight stations are arranged in the numerical order of their frequency. The frequency of your local stations may be obtained from your newspaper or radio call magazine.

Only buttons No. 2 to No. 9 are used for automatic tuning. IT IS IMPERATIVE THAT THESE BUTTONS BE SET-UP IN THE FOLLOWING ORDER: Button No. 2 must be set to tune in the station whose frequency is lowest in your list of eight stations. Button No. 3 must be set to tune in the station next higher in frequency. Continue to follow this procedure until Button No. 9 will be set to tune in the station whose frequency is highest in your list.

The actual setting up of the buttons is done as follows:

4. Push in the "MANUAL" button and use the tuning knob to tune in the station (lowest frequency on your list) that you have selected for Button No. 2. Be sure to tune in the station correctly using the "Tuning Eye". The correct tuning point is indicated when the two open ends of the inverted "V" shaped shadow in the "Tuning Eye" are closest together.
5. Place the small black "set-up switch" button which appears on the back of the chassis in the right hand position. (See label on back of chassis.) LEAVE THIS SWITCH BUTTON IN THIS POSITION UNTIL ALL BUTTONS HAVE BEEN SET-UP.
6. PUSH IN BUTTON No. 2. The lamp mounted on the back of the chassis just to the right of the selector drum will be illuminated when the button is depressed. (See Fig. 1)
NOTE: If the lamp does not light up when the switch is in this position it indicates that Button No. 2 is already correctly set to the desired station and further adjustment need not be made for this button.

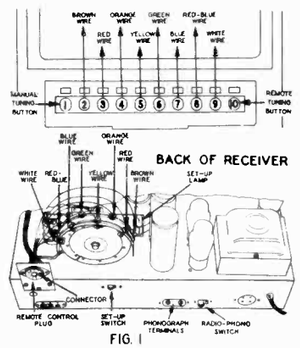


FIG. 1

7. Locate the contactor corresponding to Button No. 2. This contactor has a BROWN lead attached to it (see Fig. 1 or label on back of chassis for the color of the wire associated with each button), and is the extreme right hand contact on the inner circle of the semi-circular bridge, when viewed from rear of chassis. Loosen the knurled nut on this contactor (not more than one-half turn). THEN SLIDE THIS CONTACTOR ALONG THE BRIDGE TO THE POINT INDICATED BY THE WHITE ARROWHEAD ON THE SIDE OF THE ROUND DRUM. When this point is reached, the lamp will go out. If the contactor is moved farther than the point at which the lamp extinguishes, the lamp will again be illuminated. Move the contactor back and forth between the two points at which the lamp extinguishes, and set the contactor midway between these two points. Then tighten the knurled nut as tightly as possible, with the fingers. The lamp should still be out after tightening the contactor. If it is not, the contactor must be reset.
8. Set up for Button No. 2 is now complete.
9. Set up the remaining seven buttons in a similar manner. The contactors for the remaining buttons can be identified as follows: (See Fig. 1 or label on back of chassis.)

Button No. 2 - Brown Lead.
Button No. 3 - Red Lead.
Button No. 4 - Orange Lead.
Button No. 5 - Yellow Lead.
Button No. 6 - Green Lead.
Button No. 7 - Blue Lead.
Button No. 8 - Red-Blue Lead.
Button No. 9 - White Lead.

10. AFTER ALL THE BUTTONS HAVE BEEN SET-UP YOU MUST PLACE THE SMALL BLACK SET-UP SWITCH BUTTON IN THE LEFT HAND POSITION (white dot showing). OTHERWISE THE ELECTRIC TUNER MOTOR WILL NOT OPERATE. (See label on back of chassis just below this switch.) This re-connects the motor and enables you to tune to any of the eight selected stations by pushing the proper button.
11. To use the Push Button Tuner it is only necessary to push the button for the station you desire.
12. The Push Button Tuner buttons may also be used on the Foreign or Intermediate bands. However, on these bands we recommend that rather than setting a button to a station, you set the buttons to some particular location on the dial where foreign, police, aircraft or amateur stations are frequently received. Attempts to set buttons to short-wave stations are not recommended due to the extreme sharpness of tuning on these bands.
13. Label each button with the call letters of the stations you have selected, using the call letter tabs packed with your receiver. These tabs are to be moistened on their gummed side and inserted in the recesses in the escutcheon, directly above the push buttons.

REMOTE CONTROL UNIT

This Air-Chief radio is designed to permit tuning from a remote point such as your armchair or any point within 20 ft. of the receiver cabinet. A special "Remote Tuner Kit" part No. 114200 is available to adapt your receiver for remote control. It can be purchased from any Firestone Store or Dealer. This accessory kit consists of a remote control unit incorporating eight push buttons and a remote volume control. The unit is connected by a flat flexible cable to an eleven prong plug, which fits into a corresponding socket at the left rear of the receiver chassis. Following are the instructions for installation of the remote control unit:

1. Turn off the radio set.
2. Remove the wire connector which joins the two holes adjoining the white dot on the eleven hole socket. IMPORTANT: If at any time you decide to discontinue the use of the remote control unit, remove the plug and reinsert this wire connector in the two holes adjoining the white dot. Failure to replace the connector will make the set inoperative.
3. Insert the remote control plug in its socket and locate the remote control unit at some convenient point within 20 ft. of the set. The connecting cable may be placed beneath the rug, or along the floor.
4. PRESS IN THE "REMOTE" BUTTON (#10) on the Push Button Tuner and the unit is now ready for operation.

REPLACING THE POINTER DRIVE CORD.

1. Tie one end of 53" of special dial cord (part No.111302) to the spring, which is attached to Lug H.

2. Thread the free end of the cord through hole A in drum C (threading from the inside of the drum out) See Fig. 2.

3. After pulling the cord through hole A, make one half turn around the drum C in a clockwise direction (viewed from the front) using the front groove in the drum.

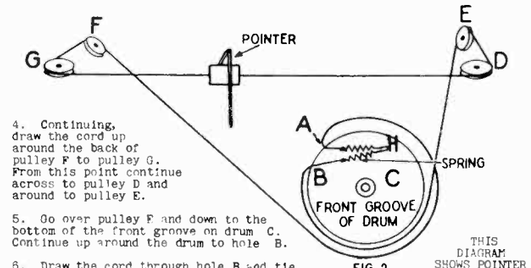


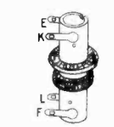
FIG. 2

4. Continuing, draw the cord up around the back of pulley F to pulley G. From this point continue across to pulley D and around to pulley E.

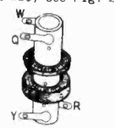
5. Go over pulley F and down to the bottom of the front groove on drum C. Continue up around the drum to hole B.

6. Draw the cord through hole B and tie it to the end of the tension spring in such a manner that when the spring is clipped on to lug H it will be extended to about 14" long.

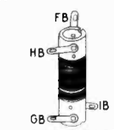
THIS DIAGRAM SHOWS POINTER DRIVE CORD ONLY



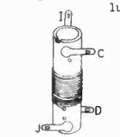
BROADCAST ANTENNA COIL 113295



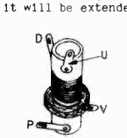
BROADCAST R.F. COIL 113296



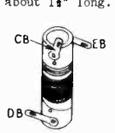
BROADCAST OSCILLATOR COIL 113411



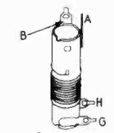
INTERMEDIATE ANTENNA COIL 113298



INTERMEDIATE R.F. COIL 113609



INTERMEDIATE OSCILLATOR COIL 113412



FOREIGN ANTENNA COIL 113301

FIRESTONE TIRE & RUBBER CO.

MODEL S7427-7 Schematic, Voltage

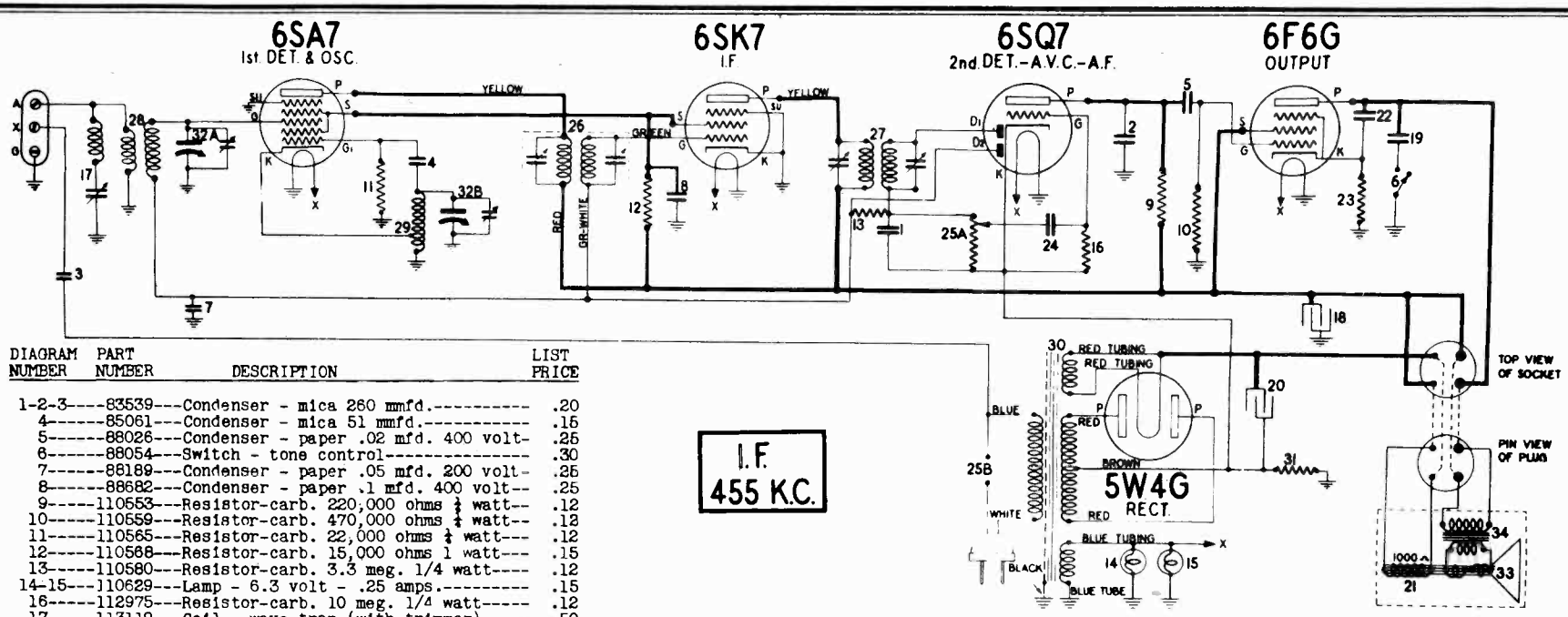


DIAGRAM NUMBER	PART NUMBER	DESCRIPTION	LIST PRICE
1-2-3	83539	Condenser - mica 260 mmfd.	.20
4	85061	Condenser - mica 51 mmfd.	.15
5	88026	Condenser - paper .02 mfd. 400 volt	.25
6	88054	Switch - tone control	.30
7	88189	Condenser - paper .05 mfd. 200 volt	.25
8	88682	Condenser - paper .1 mfd. 400 volt	.25
9	110553	Resistor-carb. 220,000 ohms ½ watt	.12
10	110559	Resistor-carb. 470,000 ohms ½ watt	.12
11	110565	Resistor-carb. 22,000 ohms ½ watt	.12
12	110568	Resistor-carb. 15,000 ohms 1 watt	.15
13	110580	Resistor-carb. 3.3 meg. 1/4 watt	.12
14-15	110629	Lamp - 6.3 volt - .25 amps.	.15
16	112975	Resistor-carb. 10 meg. 1/4 watt	.12
17	113119	Coil - wave trap (with trimmer)	.50
18	113808	Condenser - elect. 8 mfd. 350 volts	.66
19	114108	Condenser - paper .03 mfd. 750 volts	.25
20	114972	Condenser - elect. 16 mfd. 450 volts	.78
21	115062	Speakder - dynamic	4.80
22	116647	Condenser - .004 600 volt	.15
23	116978	Resistor - 420 ohms ½ watt W.W.	.15
24	117022	Condenser - .002 mfd. 600 volt	.15
25A-25B	117086	Volume control with switch	1.25
26	117098	Transformer - 1st I.F.	1.00
27	117100	Transformer - 2nd I.F.	1.00
28	117120	Coil - antenna	.60
29	117121	Coil - oscillator	.30
30	117124	Transformer - power	3.90
31	117148	Resistor - 68 ohms ½ W. Wire wound	.15
32A-32B	117160	Condenser - 2 gang	5.50
33	117190	Cone & voice coil for 115062 speaker	1.70
34	117191	Output transformer for 115062 speaker	2.50
112745		Clip - coil mounting	.01
112798		Clip - for mounting wave trap coil	.01
116009		Clip - for antenna coil mtg.	.01
116948		Cord - dial - in 6 foot lengths	.18
117152		Cup, dial retaining	.05
117166		Dial background	.08
117158		Dial drum & bushing assembly	.42
117155		Dial pulley & cup assembly	.20
117165		Dial scale (glass)	.50
113861		Dial scale retainer	.03
113755		Escutcheon - dial	.40
116975		Knob for tuning	.12
113756		Escutcheon for Push Buttons	.32
117087		Knob for volume	.12
114914		Screw-spec. hd.-for mtg. escut.	Per Dz. .15
85827		Set Screw - 8-32 Square head	.02
85427		Socket - octal base (standard)	.15
110501		Socket - 4 prong (for spkr.)	.16
114027		Socket - dial lamp - with clip	.20
114117		Socket - dial lamp	.18
117185		Spring - compression	.03
117157		Spring - dial cord	.03
114041		Tabs - station call letters	.35
116536		Terminal strip (G.X.A.)	.15
117164		Tuning roller indicator	.60
114254		Washer - "C" washer for tuning shaft	Per Dz. .10
116530		Washer (paper) for back of knobs	.005
113762		Push buttons	.04

ALL D. C. VOLTAGES MEASURED TO CHASSIS
ANTENNA GROUNDED — DIAL TUNED TO 540 KC.

TUBES	FUNCTION OF TUBE	H	P	S	G	G_1	SU	K
6SA7	OSCILLATOR & 1st DET.	6.0 A.C.	220	90	NOTE A	-8		0
6SK7	I.F.	6.0 A.C.	220	90			0	0
6SQ7	2ND DET.AVC & 1ST A.F.	6.0 A.C.	95			DIODE PLATES SEE NOTE B		NOTE A
6F6G	OUTPUT	6.0 A.C.	210	220	0			14
5W4G	RECTIFIER	5.0 A.C.	265 A.C. 265 A.C.					

Use a high resistance voltmeter of at least 1000 ohms per volt.

NOTE A: This voltage is measured across resistor No. 31 and is 3.1 volts.

NOTE B: The voltage on diode plates at no signal is 3.1 volts.

Voltage across speaker field = 52 volts.

CHASSIS R312
CHASSIS R313
CHASSIS R315
Tuner Data
Drive Cord Data

FIRESTONE TIRE & RUBBER CO.

HOW TO SET UP THE PUSH BUTTON TUNER

1. Be sure that your set is connected to a good antenna system.

2. Turn on the set and allow it to operate at least one-quarter hour before setting up the push buttons.

3. Make a list of the frequencies of six nearby stations to which you wish to set up the buttons. Be sure to select nearby, powerful stations, since weak stations will generally give better results when tuned manually. Also BE SURE TO SELECT STATIONS FALLING WITHIN THE TUNING RANGE OF THE INDIVIDUAL BUTTONS. AS INDICATED IN Fig. 1.

Each of the buttons on your Push-Button Tuner has a definite range of frequencies to which it can be tuned as shown in Fig. 1. It is imperative that in setting up the buttons, you select stations whose frequency is in the indicated tuning range of that button. FAILURE TO SELECT THE PROPER BUTTON WILL RESULT IN THE INCORRECT SETTING OF THE TRIMMER ADJUSTING SCREW AND WILL ALSO CAUSE "DRIFTING". The correct frequencies of your local stations may be obtained from your newspaper of radio call magazine. For example, suppose you want to set a button to station WLW whose frequency is 700 kilocycles. Refer to Fig. 1 which shows that this frequency falls within the operating range of buttons No. 3 or No. 4, whose range is 500 to 1000 KC. Therefore either button No. 3 or No. 4 can be used for the automatic tuning of WLW.

4. Remove the escutcheon around the push buttons by taking out the six screws holding it to the cabinet. This will expose to view six pairs of adjusting screws, each pair of which is used to tune in a station that you wish to set-up on a particular button.

5. Turn the band switch (Right hand knob) clockwise until the word "BROADCAST" appears in the lower opening in the dial scale. Then using the tuning knob (Center) tune in the station you desire to set to button No. 3. This is done so that you may identify the station by hearing its program.

6. Now turn the band switch knob to the extreme clockwise position (the word "AUTOMATIC" will now appear in the center dial scale opening). You will note when this switch is turned, the station previously tuned in will not be heard.

7. Now push in the third button from the left (No. 3 in Fig. 10). Using a small screw driver, insert it in the second screw from the left (No. 3a in Fig. 1). Rotate the screw SLOWLY until the program that you have previously tuned in manually is again tuned in. If it cannot be heard, advance the volume control. BE SURE THAT YOU ADJUST THIS PARTICULAR SCREW (3a) UNTIL THE INVERTED "V" SHADOW IN THE "TUNING EYE" IS NARROWEST. It is advisable that you turn the screw in and out so that you will tune across the station several times in order that you may be sure that you have located the correct tuning point.

8. Next insert the screw driver in the first screw on the left (No. 3b, Fig. 1) and turn it until the program is received with maximum volume. The correct position is indicated by the ends of the inverted "V" in the "Tuning Eye" being closest together. Now go back to screw No. 3a and see if any improvement in the reception can be made by adjusting it. Also repeat this adjustment for screw No. 3b.

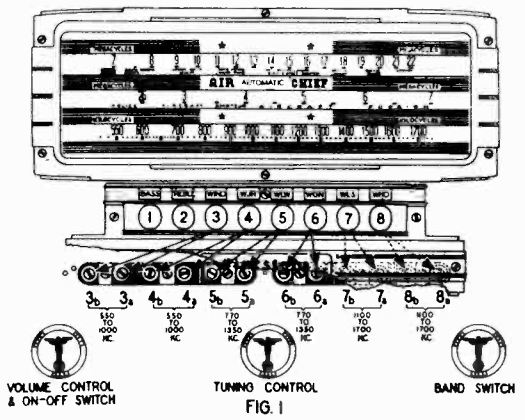


FIG. 1

9. Set up button No. 4 for the selected station in a similar manner, using screws No. 4a and 4b, and proceed to set up the remaining buttons in the same fashion, always tuning in the station initially with the "a" screw for that particular button.

10. Replace the escutcheon with its six retaining screws.

11. Label each button with the call letters of the stations you have selected, using the call letter tabs packed with your receiver. These tabs are to be moistened on their gummed side and inserted in the recesses in the escutcheon, directly above the push buttons.

HOW TO CHANGE THE OPERATING RANGE OF A BUTTON

The operating range of a button may be changed by merely changing the dual trimmer used with that button. Dual trimmers with the ranges indicated below can be obtained from your Firestone Dealer or serviceman under the following part numbers:

Part Number	Tuning Range	List Price
112942	1100 to 1700 KC.	$0.36
114505	770 to 1350 KC.	.45
112944	550 to 1000 KC.	.50

To make the change proceed as follows:

1. Remove the chassis from the cabinet.

2. By referring to Fig. 1, determine the dual trimmer associated with the button whose range you wish to change.

3. Unsolder the lead from the four terminals on the back of this dual trimmer.

4. Remove the 6/32 machine screw holding the dual trimmer to the front of the chassis.

5. From the above list select a dual trimmer which will cover the desired range.

6. Mount it on the front of the chassis with the 6/32 machine screw, and solder the leads to its four terminals. The button is now ready to be set to any strong station whose frequency is within the range of this new trimmer unit.

REPLACING THE DIAL POINTER DRIVE CORD

1. Tie a large knot in one end of about 51" of special dial cord, part No. 111302.

2. Thread the free end of the cord through hole A in drum C (threading from the inside of the drum out) See Fig. 2.

3. After pulling the cord through hole A, make one half turn around the drum C in a clockwise direction (viewed from the front), using the front groove in the drum.

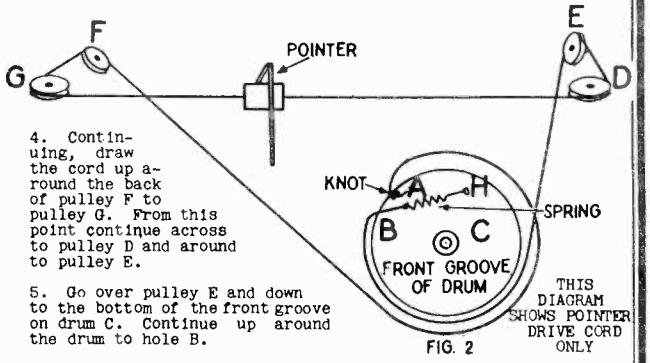


FIG. 2

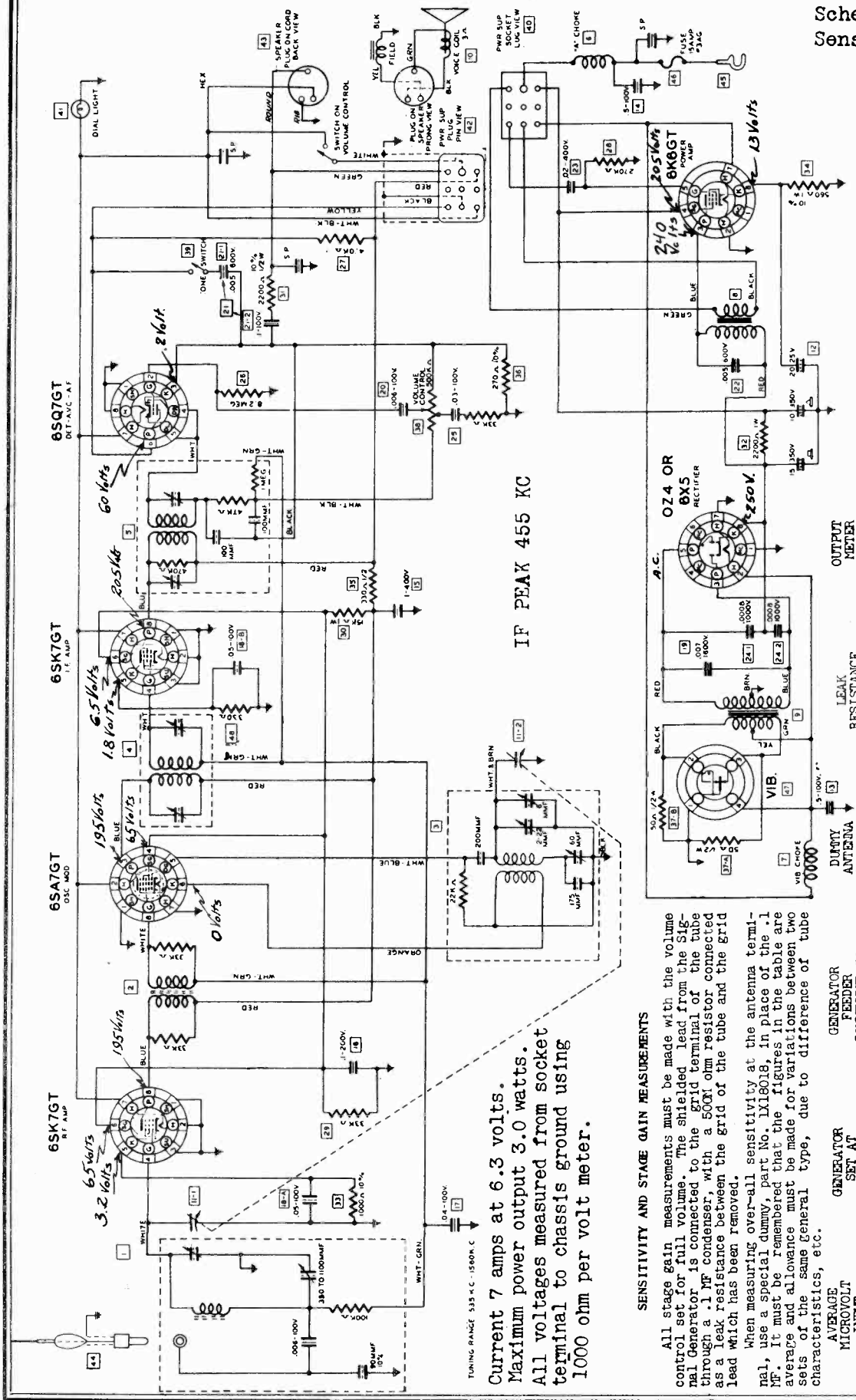
4. Continuing, draw the cord up around the back of pulley F to pulley G. From this point continue across to pulley D and around to pulley E.

5. Go over pulley E and down to the bottom of the front groove on drum C. Continue up around the drum to hole B.

6. Draw the cord through hole B and tie it to the end of the tension spring in such a manner that when the spring is clipped on to lug H it will be extended to about 1¼" long.

GALVIN MFG. CORP.

MODEL 25F
Ford, Mercury
Schematic, Voltage
Sensitivity, Gain



SENSITIVITY AND STAGE GAIN MEASUREMENTS

All stage gain measurements must be made with the volume control set for full volume. The shielded lead from the Signal Generator is connected to the grid terminal of the tube through a .1 MF condenser, with a 500Ω ohm resistor connected as a leak resistance between the grid of the tube and the grid lead which has been removed.

When measuring over-all sensitivity at the antenna terminal, use a special dummy, part No. 1X18018, in place of the .1 MF. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

AVERAGE MICROVOLT INPUT *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READINGS **
10,000	455 K.C.	I.F. Grid	.1	.5 Meg	1.76
200	455 K.C.	MOD. Grid	.1	.5 Meg	1.76
310	600 K.C.	MOD. Grid	.1	.5 Meg	1.76
26	600 K.C.	R.F. Grid	.1	.5 Meg	1.76
5	600 K.C.	Ant. Lead	***	None	1.76

* For one watt output.
1.76 volts equals 1 watt output for 3 ohm voice coil.
** Meter connected across voice coil.
*** Use special dummy part No. 1X18018 or M434B Booster Coil No. 17908 in series with a 25 MMF condenser.
NOTE: If set is not used with a Motorola Booster antenna, substitute a 40 MMF condenser for the Special Dummy.

MODEL 25F
Alignment, Socket
Trimmers, Notes
Dial Assembly

GALVIN MFG. CORP.

ALIGNMENT PROCEDURE

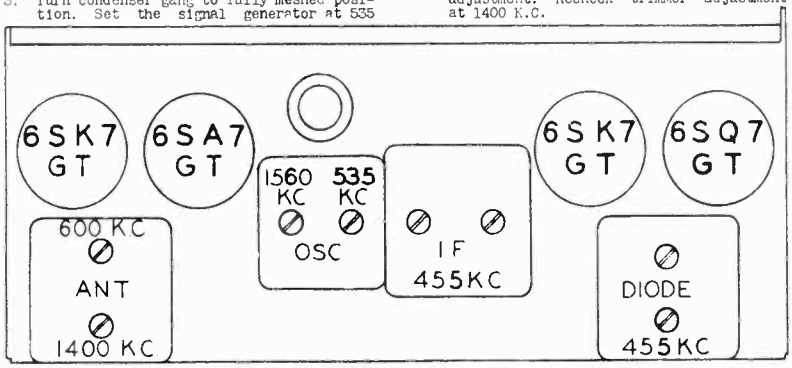
Remove the back cover (D) and place the radio on the service bench. Turn the volume control to maximum and leave it there throughout the alignment, reducing the signal generator output, if necessary.

I. F. ALIGNMENT

1. Connect the signal generator to the control grid, (terminal No. 8) of the 6SA7GT oscillator -- modulator tube and to chassis ground using a .1 MFD. condenser in series with lead. Turn the condenser gang completely out of mesh. Connect an output meter across the speaker voice coil.
2. Set the signal generator at 455 K.C. and carefully adjust the two trimmers in the diode coil can to the point showing the highest reading on the output meter. (Advance the signal generator attenuator, if necessary, to pick up signal.).
3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.
4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

R. F. ALIGNMENT

1. If the radio is to be operated on a Motorola Booster Antenna, a special dummy antenna Motorola part No. 1X18018 should be used in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.
2. Set the signal generator at 1560 K.C. and with the condenser gang still completely out of mesh, adjust the 1560 K.C. trimmer in the oscillator coil can to the point showing the highest output reading.
3. Turn condenser gang to fully meshed position. Set the signal generator at 535 K.C. and adjust the 535 K.C. oscillator pad in the oscillator coil can to point showing highest reading.
4. Set the signal generator at 1400 K.C. and turn the condenser gang to the signal at 1400 K.C. Adjust the 1400 K.C. antenna trimmer in the antenna coil can to point showing highest reading.
5. Set the signal generator at 600 K.C. and turn the condenser gang until the pointer reads 600 K.C. while adjusting the antenna padder to point showing highest output reading. Rock the gang while making this adjustment. Recheck trimmer adjustment at 1400 K.C.



TO REMOVE THE CHASSIS FROM THE HOUSING

1. Place the radio in an upside down position on the service bench. (See Fig. 4)
2. Disconnect the speaker plug.
3. Remove the speaker mounting bracket (C) from the set housing and speaker support bracket (B). (4 screws)
4. Pull the push-buttons off.
5. Remove the chrome medallion plate (2 screws)
6. Remove the celluloid dial background (2 snap-in plugs)
7. Remove the top cover (A) (13 screws). Lift the dial light assembly off of the front cover.
8. Remove the speaker support bracket (B). (2 screws)
9. Turn radio over in an upright position. Remove 11 screws from the back cover (D).
10. Lay set on side and remove the remaining 3 screws on the back cover - (14 screws.)
11. Remove the remaining 8 screws from the housing and unsolder the various leads from the spark plate assembly. (See Fig. 5)

Note: When remounting, the long screw is to be used in position along side the antenna receptacle.

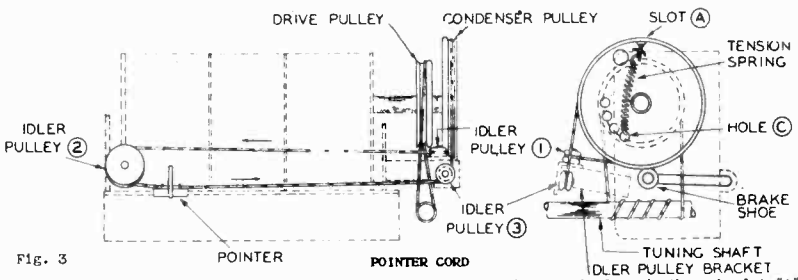


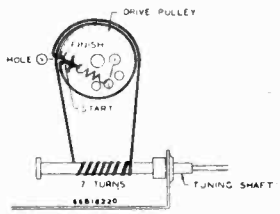
Fig. 3

POINTER CORD

1. Remove the chassis from the housing, and place on service bench.
2. Remove broken string.
3. Set condenser gang to fully closed position.
4. Cut a length of 30 lb. silk fish cord 27 inches long.
5. Thread one end of cord through slot "A" in condenser pulley and with an ordinary paper clip fasten it to the idler pulley bracket to hold in place. (See Fig. 3)
6. In a clock-wise direction run cord around condenser pulley, under brake shoe and over to idler pulley No.1 and around it in a 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 up under idler pulley No. 3.
9. Route cord up and around condenser pulley 1/4 turn to slot "A".
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of drive pulley. Fasten one end of the tension spring (41A 11091) to cord and the other end to hole "C" in the 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.

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 thru 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 clock-wise direction, wind cord one half turn around drive pulley and down to tuning shaft. (See Fig. 2)
7. Route cord 7 turns around tuning shaft as shown in Fig. 2 and up to drive pulley.
8. Continue in a clock-wise direction, one full turn to hole (X).
9. Knot the two ends of cord together inside of drive pulley and fasten one end of spring (41A14759) to cord and the other end to hole (Y) in drive pulley.
10. Cut off surplus cord.



(FIG. 2)

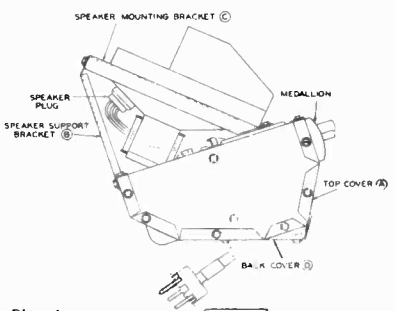


Fig. 4

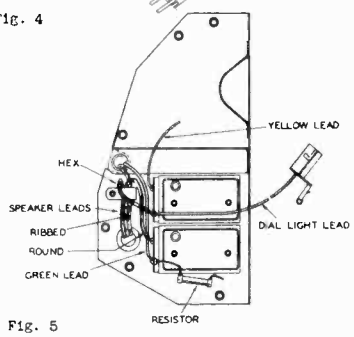
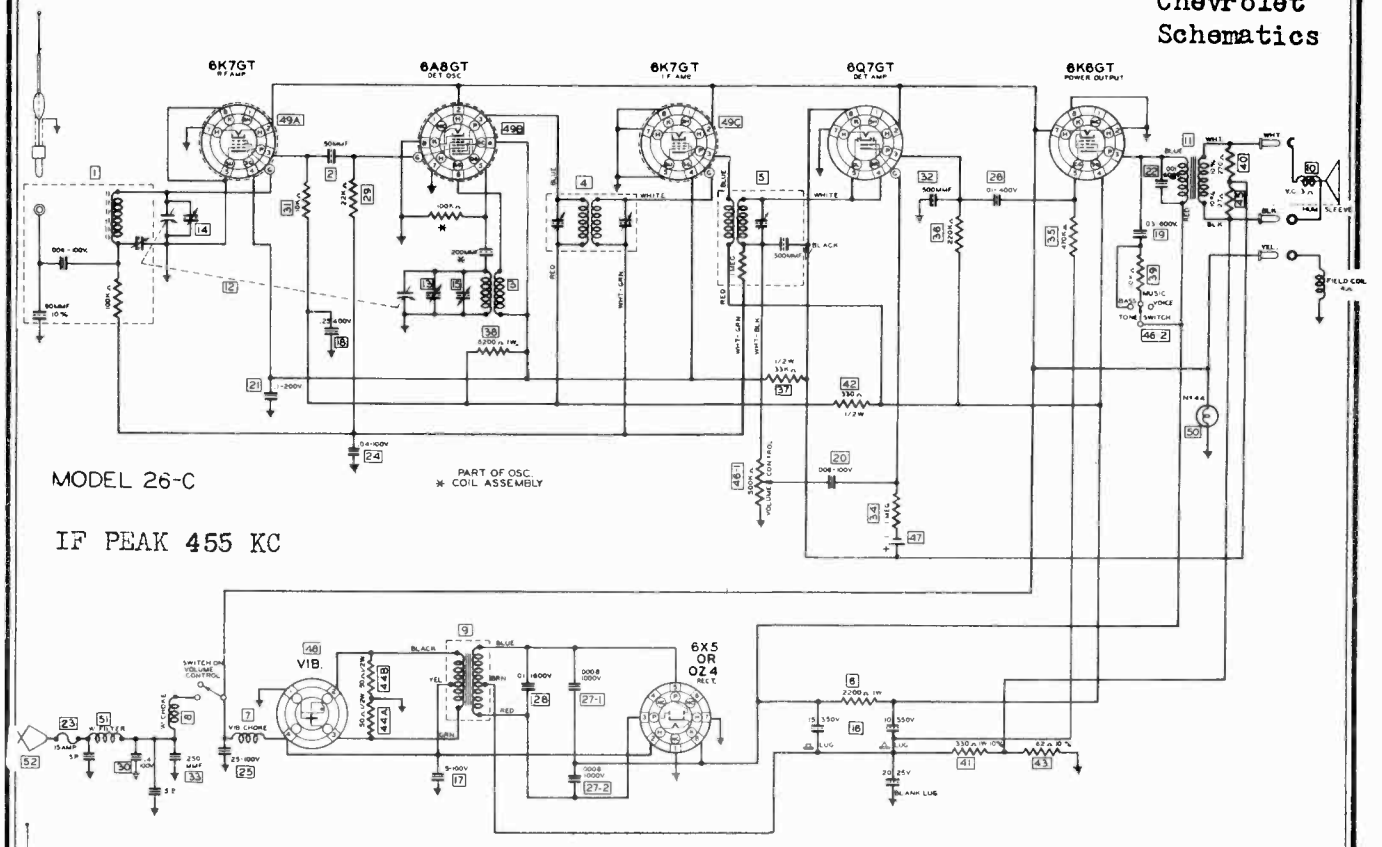
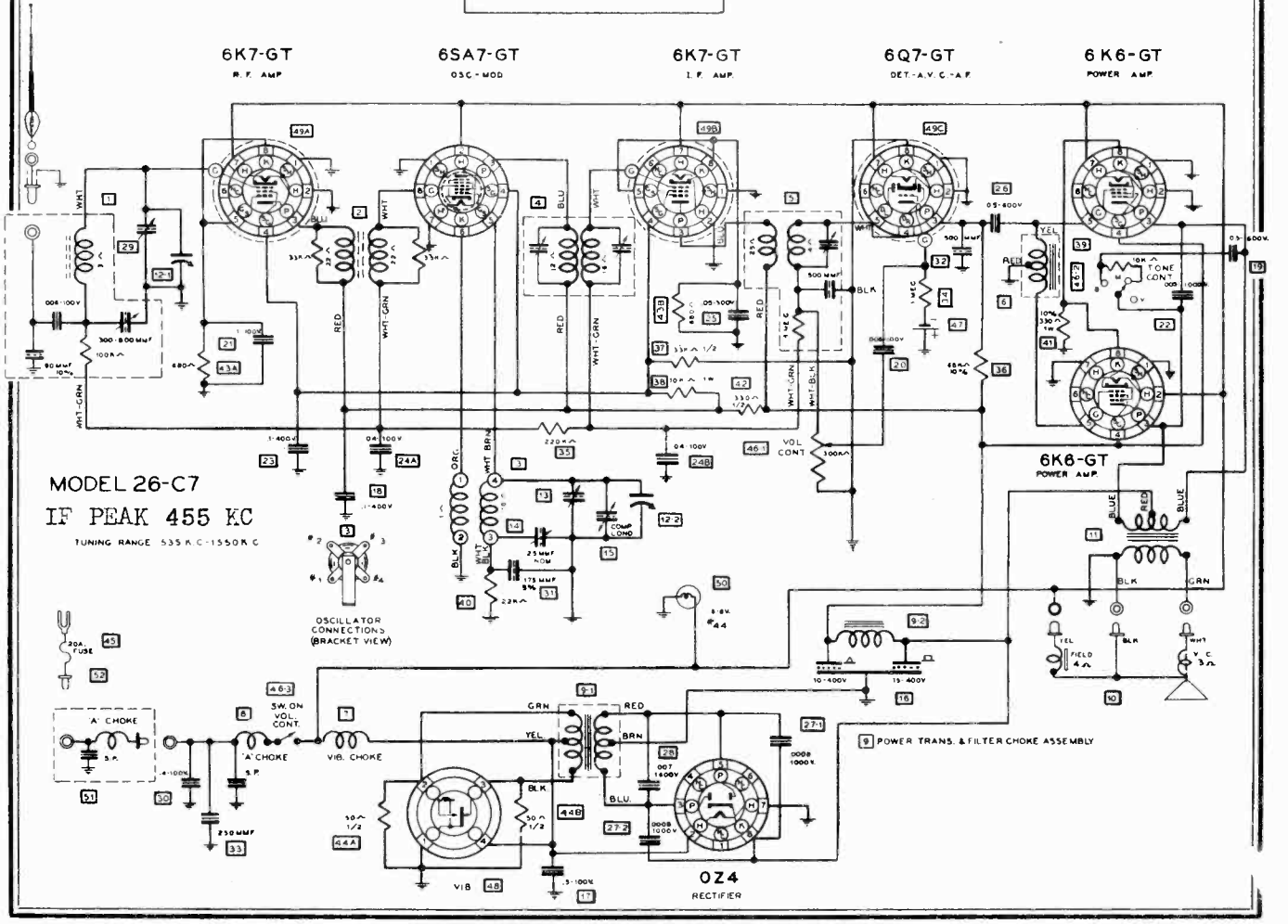


Fig. 5

GALVIN MFG. CORP.

MODEL 26-C
MODEL 26-C7
Chevrolet
Schematics





MODEL 26-C
MODEL 26-C7
Alignment, Trimmers
Voltage, Socket, Gain
Sensitivity, Drive Cord Data

GALVIN MFG. CORP.

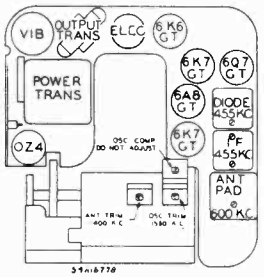
MODELS 28-O, 30-P
Dial Cord Data, Notes

TO REMOVE CHASSIS FROM HOUSING

1. Lay the radio face down on the service bench and remove the back cover by removing the two thumb screws.
2. Remove the rattle clip from the housing which is bonded to the push button assembly, and pull the speaker pin terminals from their receptacles. Also remove the dial light from its mounting bracket.
3. Remove the eliminode assembly (2 screws).
4. Remove the screw along side of the antenna receptacle.
5. Turn the radio over on its back.
6. Pull the push buttons out.
7. Remove the four housing screws located near the medallion plate, but do not remove the four screws that hold the medallion plate to the housing.
8. Remove the 3 screws from each side of the housing (12 screws).
9. Remove the volume control bushing.
10. Turn the set over on its face.
11. Pull the wrap around housing off from the back.
12. Lift the front cover off.

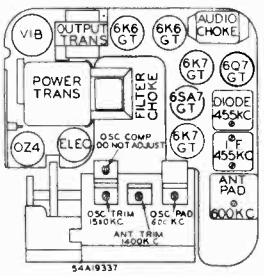
CAUTION: When the front plate is reassembled to the chassis, make sure the tuning shaft does not bind in its bushing, thereby causing the push buttons to work hard.

NOTE: Some screws are longer than others and they must be put back in original positions so that no short circuits will occur.



MODEL 26-C

Figure 1



MODEL 26-C7

Figure 2

ALIGNMENT PROCEDURE

Remove the chassis from its housing and place it on the service bench. Turn the volume control to maximum and leave it there throughout the alignment, reducing the signal generator output, if necessary.

I. F. ALIGNMENT

1. Connect the signal generator to the control grid of the oscillator tube and to chassis ground using a .1 Mfd. condenser in series with lead. Turn the condenser gang completely out of mesh. Connect an output meter across the speaker voice coil.
2. Set the signal generator at 455 K.C. and carefully adjust the trimmer in the diode coil can to the point showing the highest reading on the output meter. (Advance the signal generator attenuator, if necessary, to pick up signal.)
3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.
4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

R. F. ALIGNMENT

1. If the radio is to be operated on a Motorola Booster Antenna, a special dummy antenna Motorola part No. 1X18018 must be used in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.
2. Set the signal generator at 1550 K.C. and with the condenser gang still completely out of mesh, adjust the oscillator trimmer to the point showing the highest output reading.
3. Set the signal generator at 1400 K.C. and turn the condenser gang to the signal at 1400 K.C. Adjust the antenna trimmer on the condenser gang to the point showing the highest output reading.
4. Set the signal generator at 600 K.C. and turn the condenser gang until the dial pointer reads 600 K.C. Adjust the oscillator padder to point giving highest output reading.
5. Adjust the antenna padder located in the copper antenna coil can to the point giving the highest output reading.

NOTE: Step No. 4 is for Model 26-C-7 only. There is no 600 K.C. oscillator padder in the 26-C.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

All stage gain measurements must be made with the volumn control set for full volume. 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 resistance between the grid of the tube and the grid lead which has been removed.

When measuring overall-sensitivity at the antenna terminal, use a special dummy, part No. 1X18018, in place of the .1 MF. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same type, due to difference of tube characteristics, etc.

26-C Average Microvolt Input *	26C-7 Average Microvolt Input *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READINGS **
8200	7000	455 K.C.	I.F. Grid	.1	.5 Meg	1.76
145	190	455 K.C.	MOD. Grid	.1	.5 Meg	1.76
160	215	600 K.C.	MOD. Grid	.1	.5 Meg	1.76
42	35	600 K.C.	R.F. Grid	.1	.5 Meg	1.76
5	3	600 K.C.	Ant. Lead	***	None	1.76

* For one watt output.
** Meter connected across voice coil.
1.76 volts equals 1 watt output for 3 ohm voice coil.
*** Use special dummy part No. 1X18018 or M434B Booster Coil No. 17908 in series with a 25 MMF condenser.
NOTE: If set is not used with a Motorola Booster antenna, substitute a 40 MMF condenser for the Special Dummy.

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 27 inches long.
5. Thread one end of cord thru Slot B in drive pulley and with an ordinary paper clip fasten to tuning control bracket so that cord will stay in place.
6. In a clock-wise 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 clock-wise direction, three quarter turns to slot "B".
9. Knot the two ends of cord together inside of drive pulley and fasten one end of spring to cord and the other end to hole (C) in condenser pulley.
10. Cut off surplus cord.

POINTER CORD

1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Set condenser gang to fully open position.
4. Cut a length of 30 lb. silk fish cord 29 inches long.
5. Thread one end of cord thru slot A 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 clock-wise direction run cord around condenser pulley, under brake shoe and over to idler pulley No. 3 and around it in 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 1/2 turn to slot "A".
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 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.

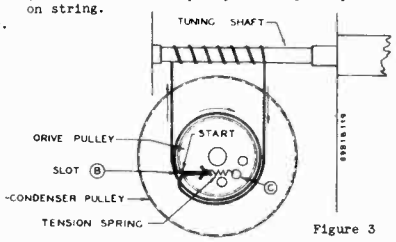


Figure 3

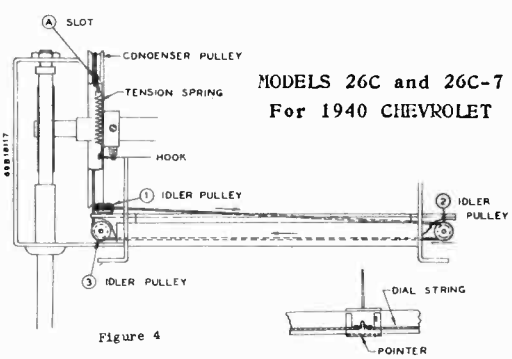


Figure 4

MODELS 26C and 26C-7
For 1940 CHEVROLET

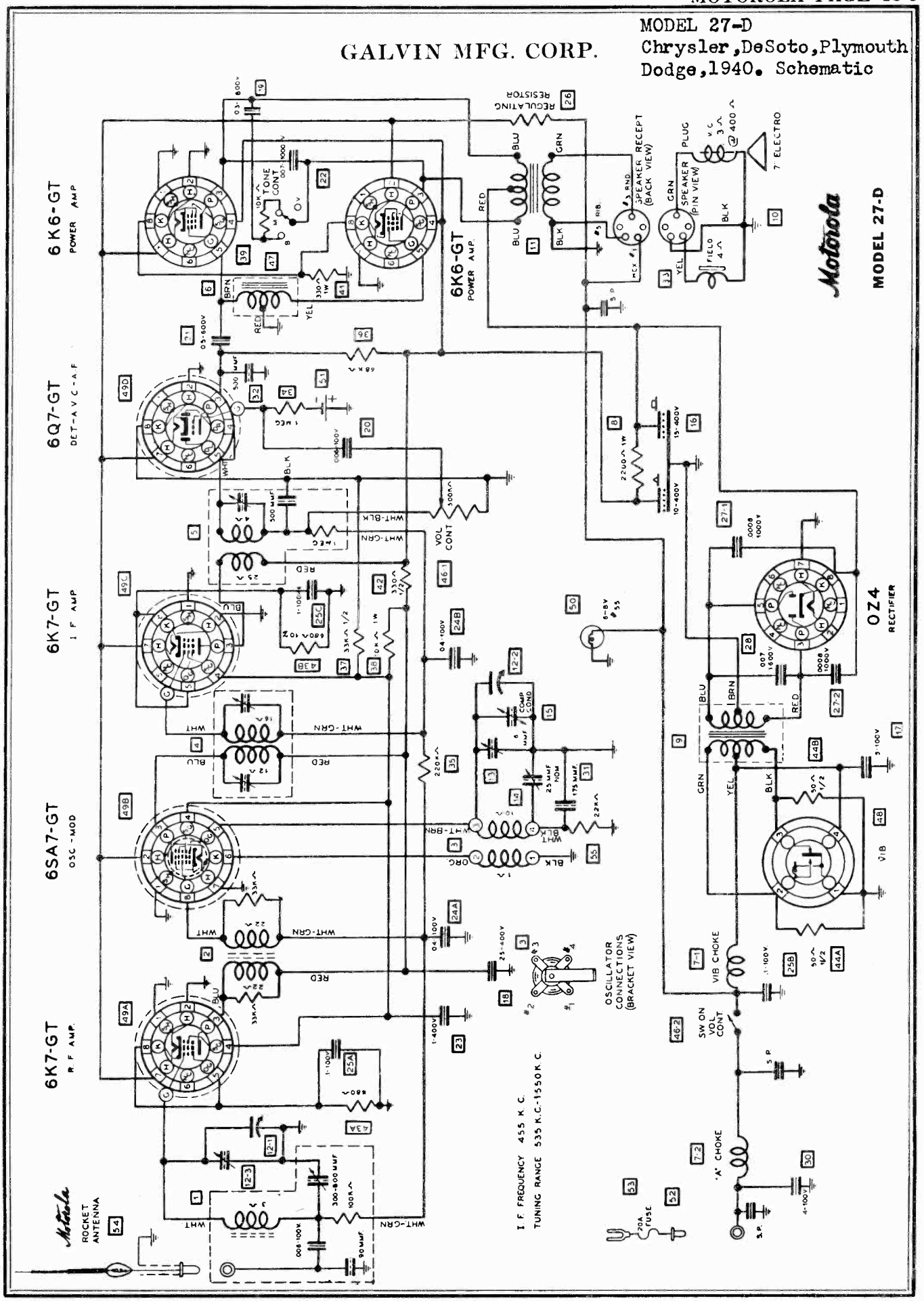
VOLTAGE CHART

TUBE POSITION	26C PLATE	26C SCREEN	26C CATHODE	26C-7 PLATE	26C-7 SCREEN	26C-7 CATHODE
R.F.	115	95	0	200	80	2.75
Osc. Mod.	180	95	0	200	80	0
I.F.	180	95	0	200	80	2.75
Det.AVC A.F.	60	-	2.3	112	-	0
Output	230	180	.6	210	200	13.5
Output	-	-	-	210	200	13.5
Rect.	A.C.	-	235	A.C.	-	210
	Current 6 amps at 6.3 volts. Maximum power output 3.5 watts.			Current 7 amps. at 6.3 volts. Maximum power output 5.5 watts.		

All voltages measured from socket terminal to chassis ground using 1000 Ohms per volt meter.

GALVIN MFG. CORP.

MODEL 27-D
Chrysler, DeSoto, Plymouth
Dodge, 1940. Schematic



MODEL 27-D
Alignment, Trimmers
Voltage, Socket, Gain
Sensitivity, Dial Drive

GALVIN MFG. CORP.

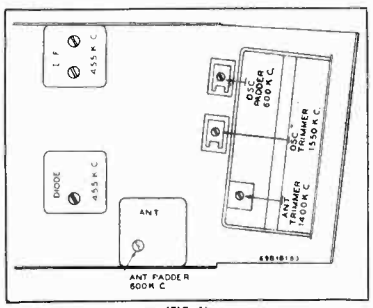
ALIGNMENT PROCEDURE

Remove the chassis from its housing and place it on the service bench.

Turn the volume control to maximum position and leave it there throughout the alignment, reducing the signal generator output if necessary. Fig. 1 shows trimmer locations.

I. F. ALIGNMENT

1. Connect the signal generator to the control grid (terminal No. 8) of the 6SA7GT oscillator-modulator tube thru a .1 MF condenser and to chassis ground. Turn the condenser gang completely out of mesh. Connect an output meter across the speaker voice coil.
2. Set the signal generator at 455 K.C. and carefully adjust the trimmer in the diode coil can to the point showing the highest reading on the output meter. (Advance the signal generator attenuator, if necessary, to pick up signal.)
3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.
4. Repeat the I.F. and diode adjustment several times for maximum accuracy.

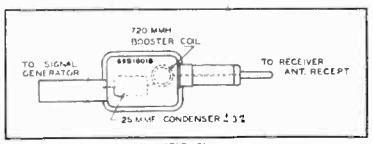


(FIG. 1)

R. F. ALIGNMENT

NOTE:—A special dummy antenna, Motorola part 1X18018 should be used in series with the lead from the signal generator to the antenna receptacle, if the receiver is to be operated on a Motorola Booster antenna. If the car antenna is not Booster equipped, use a 50 MMF condenser instead. See Fig. 2.

1. Change the signal generator connection to the antenna lead, using the special dummy.
2. Set the signal generator at 1550 K.C. and with the condenser gang still completely out of mesh, adjust the oscillator trimmer to the point showing the highest output reading.
3. Set the signal generator at 1400 K.C. and turn the condenser gang to the signal at 1400 K.C. Adjust the antenna trimmer on the condenser gang to the point showing the highest output reading.
4. Set the signal generator at 600 K.C. and turn the condenser gang until the dial pointer reads 600 K.C. Adjust the oscillator padder to point giving highest output reading. Also adjust the antenna padder located in the copper antenna coil can to the point giving the highest output reading. (DO NOT ROCK GANG FOR EITHER ADJUSTMENT).



(FIG. 2)

REMOVING CHASSIS FROM HOUSING

1. Lay the radio on the service bench on its right side.
2. Remove the left hand side of the housing by taking off the thumb nut.
3. Leave the radio in this position.
4. Remove the seven screws on the right hand side of the housing, including the two which hold the "A" lead clips.
5. Now remove the six screws from the other side.
6. Turn the radio over so that it is in an upright position.
7. Remove speaker cable and grommet from slot in housing.
8. Remove right hand side of housing, after removing the hex nut. *Do not remove the two screws in the right hand side of the control head.*
9. Now pull chassis out of housing, guiding "A" lead out carefully.
10. When placing the chassis back in the housing, the long self-tapping screw is to be used in the position along side of the antenna receptacle.
11. Be sure "A" battery wire is routed as it was originally and held securely under the cable clips.

SENSITIVITY AND STAGE GAIN MEASUREMENT

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

When measuring over-all sensitivity at the antenna terminal, use a special dummy part #*1X18018* in place of the .1 MF.*** It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

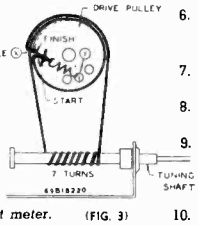
AVERAGE MICROVOLT INPUT *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READING **
13000	455 K.C.	I.F. Grid	.1 MF	.5 Meg	1.76 Volts
350	455 K.C.	Mod. Grid	.1 MF	.5 Meg	1.76 Volts
400	600 K.C.	Mod. Grid	.1 MF	.5 Meg	1.76 Volts
25	600 K.C.	R.F. Grid	.1 MF	.5 Meg	1.76 Volts
3	600 K.C.	Ant. Lead	***	None	1.76 Volts

*For one watt output
**Meter connected across voice coil
1.76 Volts equals 1 watt output for 3 ohm voice coil
***Use special dummy part No. 1X18018, or M434B booster coil Part No. 17908 in series with 25 MMF cond. (See Fig. 2)

VOLTAGE CHART

POSITION	PLATE	SCREEN	CATHODE
R.F.	180	70	2.3
Osc. Mod.	180	70	0
I.F.	180	70	2.3
Det. AVC A.F.	110	.....	0
Output	220	180	12
Output	220	180	12
Rect.	A.C.	.....	225

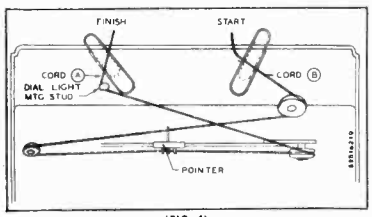
All measurements from chassis ground to socket terminal using 1000 ohms per volt meter.
Current consumption—8 amps. Battery voltage—6.3.
Maximum power output—5 watts.



(FIG. 3)

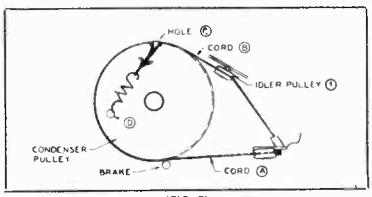
POINTER CORD

1. Remove push buttons and dial light assembly.
2. Cut broken dial cord and remove control head from chassis.
   (This requires removal of 2 self-tapping screws from right hand side of head and removal of "C" washer from volume control shaft.)
3. Cut 30 inch length of 30# test silk fish cord.
4. Lay control head on service bench and route cord around the three idler pulleys exactly as shown in Fig. 4.
5. Adjust cord so both ends are approximately equal length and clip to control head as shown in Fig. 4.
6. Set dial pointer at approximately 550 K.C. on dial scale and interlace cord in pointer clips.
7. Mount control head assembly back on chassis with 2 self tapping screws. Replace "C" washer on volume control shaft.



(FIG. 4)

8. Set gang to fully meshed position. This will place hole in condenser pulley at the top.
9. Remove paper clip from cord "A" and fish end of cord under brake shoe and around condenser pulley ½ turn to hole "C". Thread end of cord thru hole (C) and clip to control head. (See Fig. 5)
10. Remove paper clip from cord "B" and route cord the short distance from idler pulley No. 1 to hole "C" in condenser pulley.
11. Tie both ends of cord together inside pulley, then tie in tension spring (41A11091). Hook other end of spring in hole (D). Cut off surplus cord.
12. Replace dial light.
13. Tune in station of known frequency and adjust dial pointer to correct dial reading.
14. Reassemble in housing.



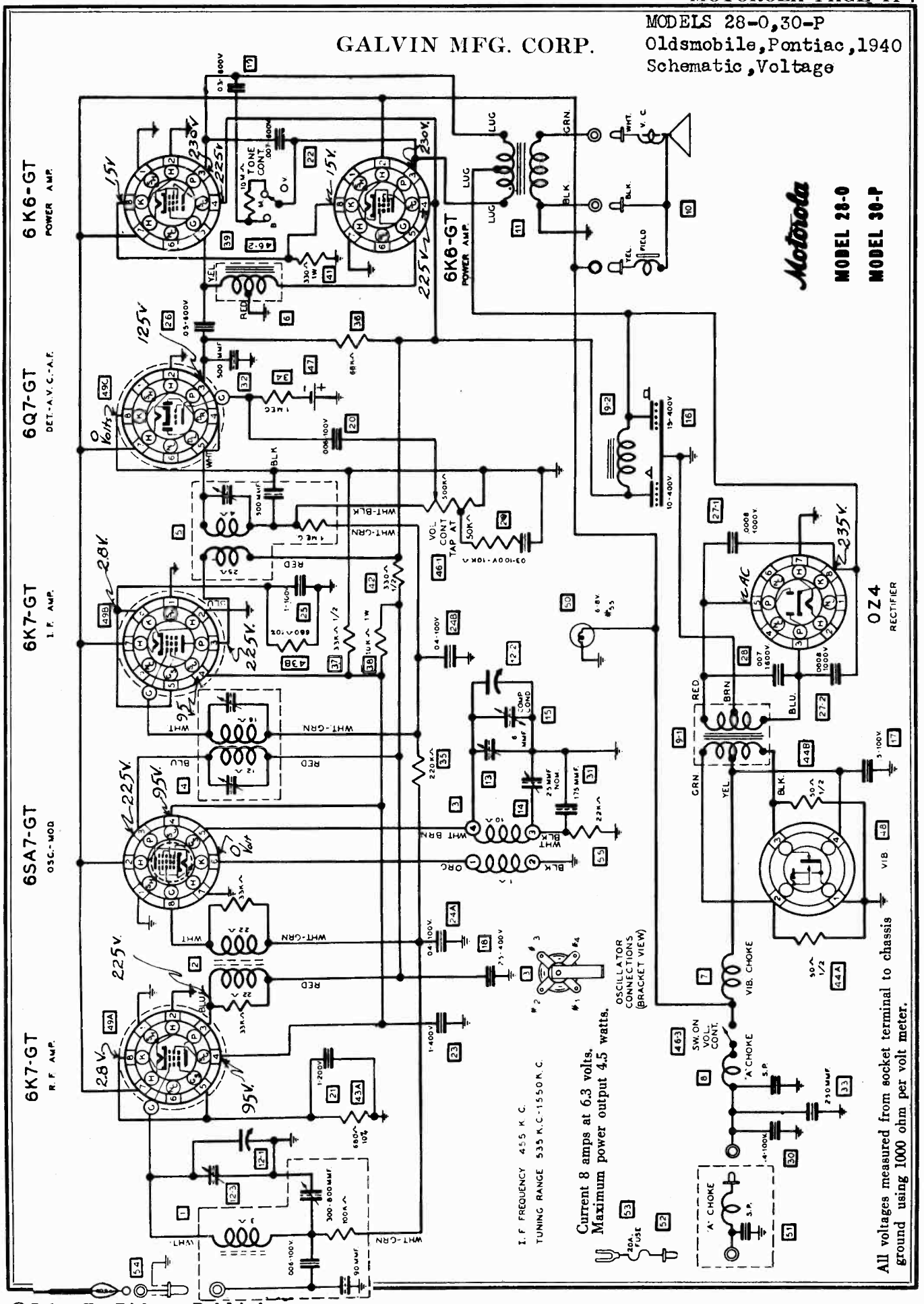
(FIG. 5)

TUNING CORD

1. Remove the chassis from the housing, and place on service bench with the tubes up.
2. Remove the broken string.
3. Turn the condenser gang to fully meshed position.
4. Cut a length of 30# silk fish cord 25 inches long.
5. Thread one end of cord thru hole (x) in drive pulley and with an ordinary paper clip fasten to volume control bracket so that cord will stay in place.
6. In a counter-clockwise direction, wind cord one full turn around drive pulley and down to tuning shaft. (See Fig. 3)
7. Wind cord in clockwise direction 7 turns around tuning shaft and up to drive pulley.
8. Continue in a counter-clockwise direction, three quarter turns to hole (x).
9. Knot the two ends of cord together inside of drive pulley and fasten one end of spring (41A14759) to cord and the other end to hole (Y) in condenser pulley.
10. Cut off surplus cord.

GALVIN MFG. CORP.

MODELS 28-0,30-P
Oldsmobile,Pontiac,1940
Schematic,Voltage



MODEL 28-O FOR 1940 OLDSMOBILE
MODEL 30-P FOR 1940 PONTIAC
ALIGNMENT PROCEDURE

Remove the chassis from its housing and place it on the service bench. Turn the volume control to maximum and leave it there throughout the alignment, reducing the signal generator output, if necessary.

I. F. ALIGNMENT

1. Connect the signal generator to the control grid. (terminal No. 8) of the 6SA7GT oscillator—modulator tube and to chassis ground using a .1 Mfd. condenser in series with lead. Turn the condenser gang completely out of mesh. Connect an output meter across the speaker voice coil.

2. Set the signal generator at 455 K.C. and carefully adjust the trimmer in the diode coil can to the point showing the highest reading on the output meter. (Advance the signal generator attenuator, if necessary, to pick up signal.)

3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

R. F. ALIGNMENT

1. If the radio is to be operated on a Motorola Booster Antenna, a special dummy antenna Motorola part No. 1X18018 must be used in series with the lead from the signal generator to the antenna receptacle. See Fig. 2. Change the signal generator connection to the antenna lead. using the special dummy.

2. Set the signal generator at 1560 K.C. and with the condenser gang still completely out of mesh, adjust the oscillator trimmer to the point showing the highest output reading.

3. Set the signal generator at 1400 K.C. and turn the condenser gang to the signal at 1400 K.C. Adjust the antenna trimmer on the condenser gang to the point showing the highest output reading.

4. Set the signal generator at 600 K.C. and turn the condenser gang until the dial pointer reads 600 K.C. Adjust the oscillator padder to point giving highest output reading. Also adjust the antenna padder located in the copper antenna coil can to the point giving the highest output reading. (Do not rock gang for either adjustment.)

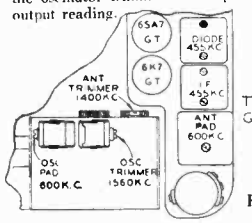


Fig. 1

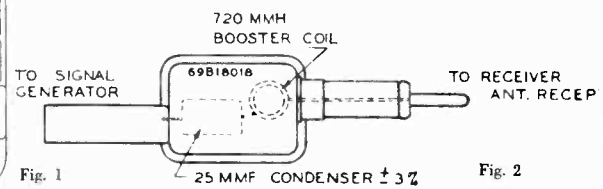


Fig. 2

SENSITIVITY AND STAGE GAIN MEASUREMENTS

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

When measuring over-all sensitivity at the antenna terminal, use a special dummy, part No. 1X18018, in place of the .1 MF. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

AVERAGE MICROVOLT INPUT *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READINGS * *
7000	455 K.C.	I. F. Grid	.1	.5 Meg	1.76
190	455 K.C.	MOD. Grid	.1	.5 Meg	1.76
215	600 K.C.	MOD. Grid	.1	.5 Meg	1.76
35	600 K.C.	R. F. Grid	.1	.5 Meg	1.76
3	600 K.C.	Ant. Lead	***	None	1.76

* For one watt output.
** Meter connected across voice coil.
1.76 volts equals 1 watt output for 3 ohm voice coil.
*** Use special dummy part No. 1X18018 or M434B Booster Coil No. 17908 in series with a 25 MMF condenser.
NOTE: If set is not used with a Motorola Booster antenna, substitute a 50 MMF condenser for the Special Dummy.

TO REMOVE CHASSIS FROM HOUSING AND DIAL CORD INSTRUCTIONS SEE INDEX(MODEL 26-C).

Model 35-N
SPECIFICALLY DESIGNED TO INSTALL IN 1940 NASH

ALIGNMENT PROCEDURE

Remove the chassis from its housing and place it on the service bench. Turn the volume control to maximum and leave it there throughout the alignment, reducing the signal generator output, if necessary.

I. F. ALIGNMENT

1. Connect the signal generator to the control grid (terminal No.8) of the 6SA7GT oscillator—modulator tube and to chassis ground using a .1 Mfd. condenser in series with lead. Turn the condenser gang completely out of mesh. Connect an output meter across the speaker voice coil.

2. Set the signal generator at 455 K.C. and carefully adjust the two trimmers in the diode coil can to the point showing the highest reading on the output meter. See Fig.1 (Advance the signal generator attenuator, if necessary, to pick up signal.)

3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

R. F. ALIGNMENT

1. If the radio is to be operated on a Motorola Booster Antenna, a special dummy antenna Motorola part No.1X18018 must be used in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.

2. Set the signal generator at 1550 K.C. and with the condenser gang still completely out of mesh, adjust the oscillator trimmer to the point showing the highest output reading.

3. Set the signal generator at 1400 K.C. and turn the condenser gang to the signal at 1400 K.C. Adjust the antenna trimmer on the condenser gang to the point showing the highest output reading.

4. Set the signal generator at 600 K.C. and turn the condenser gang until the dial pointer reads 600 K.C. Adjust the oscillator padder to point giving highest output reading. Also adjust the antenna padder located in the copper antenna coil can to the point giving the highest output reading. (Do not rock gang for either adjustment.)

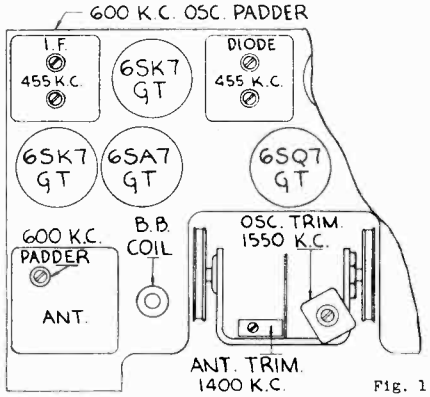


Fig. 1

DIAL CORD INSTRUCTIONS

1. Remove the chassis from the housing.
2. Remove the front cover, after first removing the following items:
   (a) Dial scale (4 self-tapping screws)
   (b) Two self-tapping screws above the volume and tuning shafts.
   (c) Knobs.
   (d) "C" washer on volume control shaft.
   (e) Speaker pin terminals.
3. Remove broken cord.
4. Set gang in 3/4 mesh position.
5. Cut a 26 inch length of silk fish cord and thread through hole "A", temporarily slipping the end to the push-button assembly to hold in place.
6. Wind cord counter-clockwise around condenser pulley and through slot in front of push-button assembly.
7. Run cord around pulley 1, counter-clockwise and across chassis to idler pulley 2. See Fig.2.
8. Continue cord around idler pulley 2, in counter-clockwise direction.
9. Run cord across chassis to idler pulley 3.
10. Continue cord around idler pulley 3, in clockwise direction.
11. Wind cord around condenser pulley in counter-clockwise direction and down to slot "A".
12. Knot both ends of cord together inside of pulley and tie in tension spring.
13. Attach other end of spring to hook and cut off surplus cord.
14. To set pointer to correct frequency, tune in a station of known frequency, and adjust pointer on string to correct dial reading.
15. Reassemble in housing.

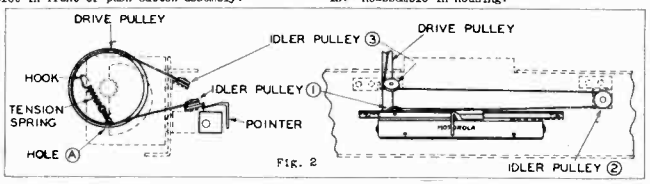
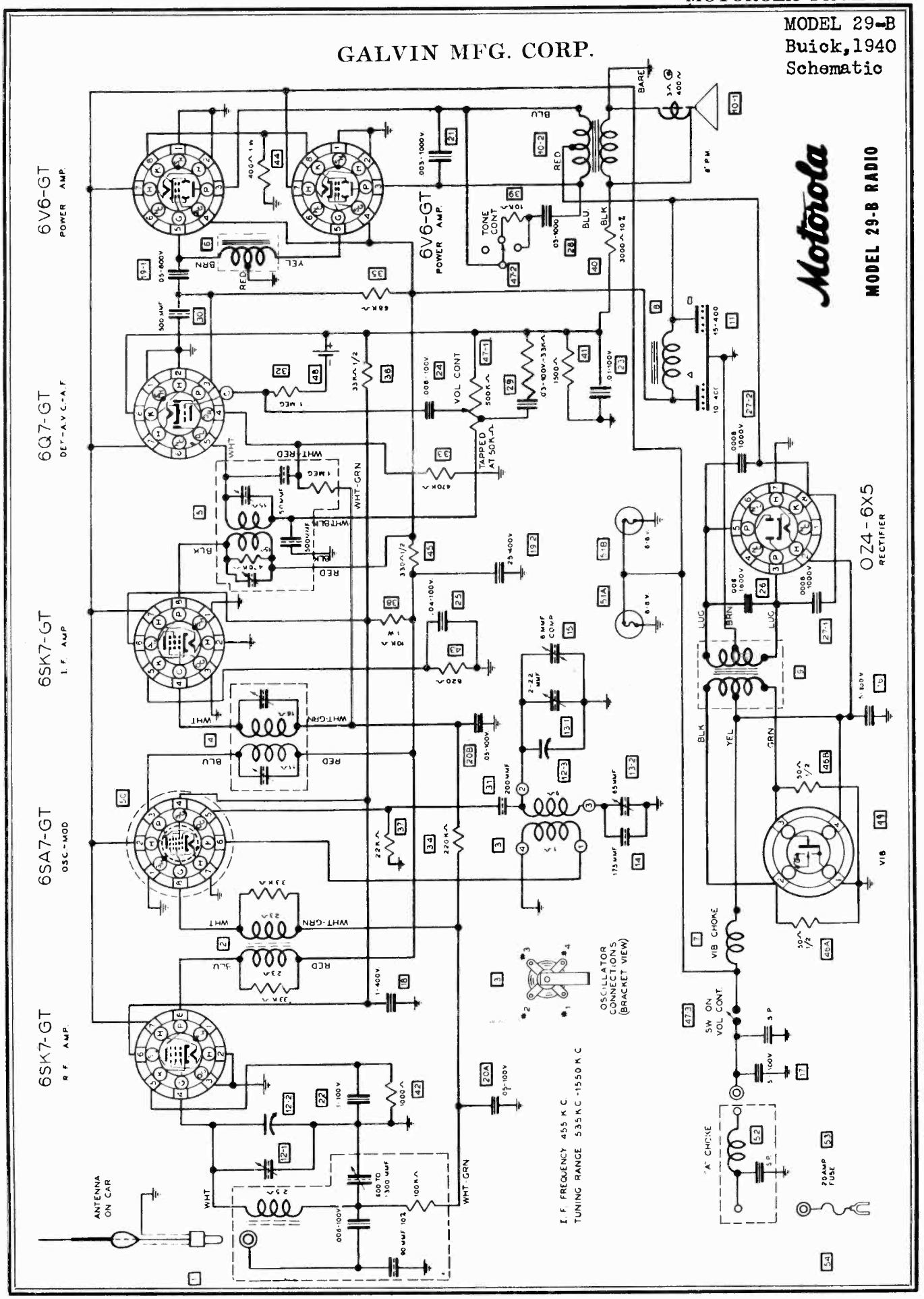


FIG. 2



ALIGNMENT PROCEDURE

Remove the chassis from its housing and place it on the service bench. Turn the volume control to maximum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

I. F. ALIGNMENT

1. Connect the signal generator to the control grid (terminal No. 8) of the 6SA7GT oscillator-modulator tube and to chassis ground. Turn the condenser gang completely out of mesh. Connect and output meter across the speaker voice coil. Use .1 MF condenser in signal generator lead.
2. Set the signal generator at 455 K.C. and carefully adjust the two trimmers in the Diode coil can to the point showing the highest reading on the output meter. (Advance the signal generator attenuator, if necessary, to pick up signal.)
3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.
4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

R. F. ALIGNMENT

1. Change the signal generator connection to the antenna lead, using a 50 MMF condenser in series with it.
2. Set the signal generator at 1550 K.C. and with the condenser gang still completely out of mesh, adjust the oscillator trimmer to the point showing the highest output reading.
3. Set the signal generator at 1400 K.C. and turn the condenser gang to the signal at 1400 K.C. Adjust the antenna trimmer on the condenser gang (Through hole in chassis base) to the point showing the highest output reading.
4. Set the signal generator at 600 K.C. and turn the condenser gang until the dial pointer reads 600 K.C. Adjust the oscillator padder to point giving highest output reading. Also adjust the antenna padder located in the copper antenna coil can to the point giving the highest output reading. (DO NOT ROCK GANG FOR EITHER ADJUSTMENT)

SENSITIVITY AND STAGE GAIN MEASUREMENTS

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

When measuring over-all sensitivity at the antenna terminal, use a 50 MMF condenser in place of .1 MF.

The figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

AVERAGE MICROVOLT INPUT *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO (Model 29-B-6)	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READING **
10,000 12,500⊙	455 K.C.	6SK7GT Grid (IF)	I.F. Grid .1 MF	.5 Meg	1.76 Volts
200	455 K.C.	6SA7GT "	Mod. Grid .1 MF	.5 Meg	1.76 Volts
100 225⊙	600 K.C.	6SA7GT "	Mod. Grid .1 MF	.5 Meg	1.76 Volts
10 16⊙	600 K.C.	6SK7GT " (RF)	R.F. Grid .1 MF	.5 Meg	1.76 Volts
3	600 K.C.	Antenna Lead	Ant. Lead 50 MMF 40 MMF⊙***	None	1.76 Volts

* For 1 Watt output.
** Output meter connected across voice coil. 1.76 volts equals 1 Watt output for 3 ohm voice coil.

⊙ FOR MODEL 29-B-6

*** NOTE: If A Motorola Booster antenna is used substitute a special Motorola dummy part No. 1Y18018.

VOLTAGE CHART

TUBE	POSITION	PLATE	SCREEN	CATHODE
* 6SK7GT	R.F.	230	100	4
6SA7GT	Osc. Mod.	230	100	0
6SK7GT	I.F.	230	100	4
6SQ7GT	Det.-AVC	125	-	4
6V6GT	Power	235	230	16
6V6GT	Power	235	230	16
0Z4 or 6X5	Rect.	AC	-	240

* 7A7 Loctal tube was used in some chassis.

Current 7.1 Amp. at 6.1 Volts

Maximum power output 10 Watts.

TO REMOVE CHASSIS FROM HOUSING

1. Remove the eliminode assembly on the right side of chassis. (2 screws)
2. Remove the bottom cover (4 thumb screws) Then pull back.
3. Remove the 9 screws around the top and 2 sides of the front.
4. Remove the 3 remaining screws on the right side of the housing.
5. Remove the 3 remaining screws on the left side of the housing, including the one adjacent to the antenna receptacle.
6. Remove the 3 screws on the back of the housing.
7. Lay the radio face down on the service bench and lift the housing off.
8. When remounting, the long screw is to be used in position along side of antenna receptacle.
9. The eliminode assembly is to be mounted last.

POINTER CORD

1. Remove the chassis from housing.
2. Pull out the five push-buttons.
3. Remove the four screws which hold the escutcheon and remove same from front cover.
4. Remove broken cord.
5. Rotate condenser gang to fully meshed position.
6. Cut 28 inch length of 30 pound silk fish cord.
7. Thread one end of cord through slot (A). This is the slot nearest the front of chassis when condenser is fully meshed.
8. Run cord up and over rear idler pulley No. 1 in clockwise direction.
9. Continue cord across chassis to idler pulley No. 2 and around it in a clockwise direction.
10. Run cord back across chassis to front idler pulley No. 3 and around it in clockwise direction.
11. Run cord under brake shoe and around condenser pulley to slot (A).
12. Thread through slot (A).
13. Knot both ends of cord securely inside the slot.
14. Tie in one end of tension spring (41A11091) and hook other end of tension spring onto hook in condenser pulley.
15. Lace dial cord through hooks in dial pointer.
16. To set pointer to correct frequency, tune in a station of known frequency and adjust position of pointer on string.
17. Remount escutcheon plate.

Model 29-B

TO INSTALL IN 1940 BUICK

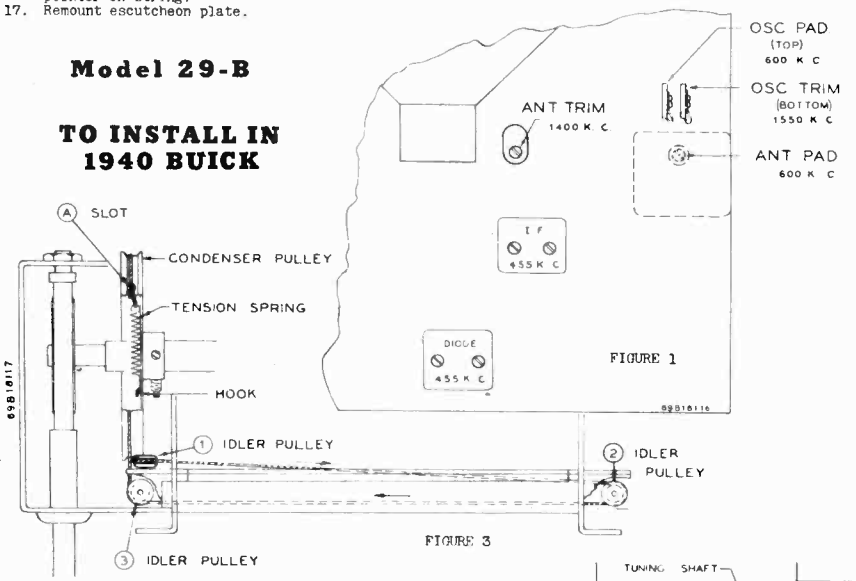


FIGURE 1

FIGURE 3

DIAL DRIVE CORD

1. Remove the chassis from the housing, and place on service bench with the tubes up.
2. Remove the broken string.
3. Turn the condenser gang to fully meshed position.
4. Cut a length of 30# silk fish cord 26 inches long.
5. Thread one end of cord through slot in drive pulley and with an ordinary paper clip fasten to tuning shaft bracket so that cord will stay in place.
6. In a counter clock-wise direction wind cord one full turn around drive pulley and up to tuning shaft.
7. Wind cord in clock-wise direction 7 turns around tuning shaft and down to drive pulley.
8. In a counter clock-wise direction, wind cord around drive pulley to slot (B).
9. Knot the two ends of cord together inside of drive pulley and fasten one end of spring (41A14759) to cord and the other end to hole in condenser pulley.

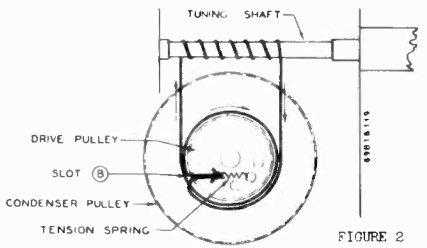
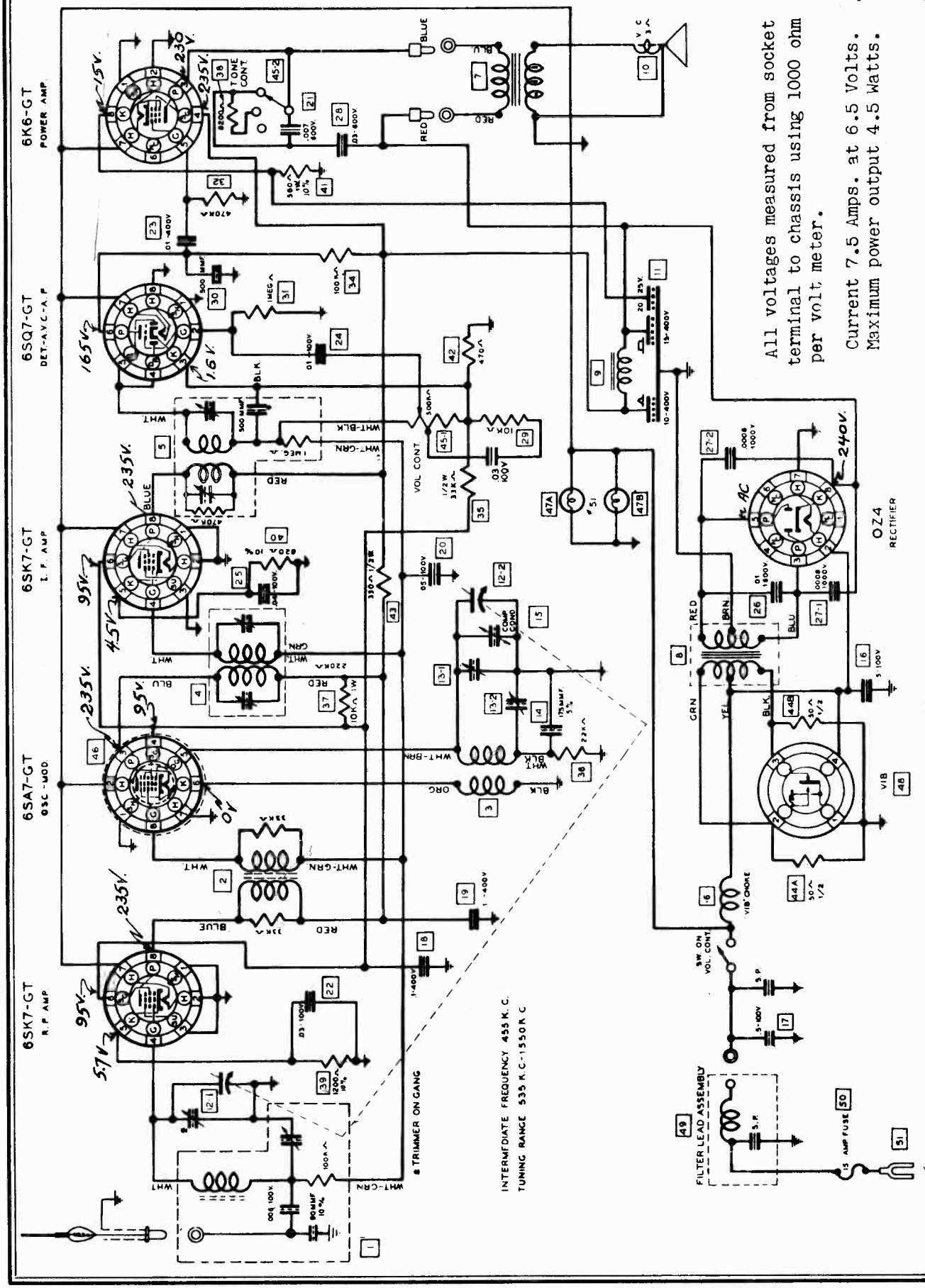


FIGURE 2

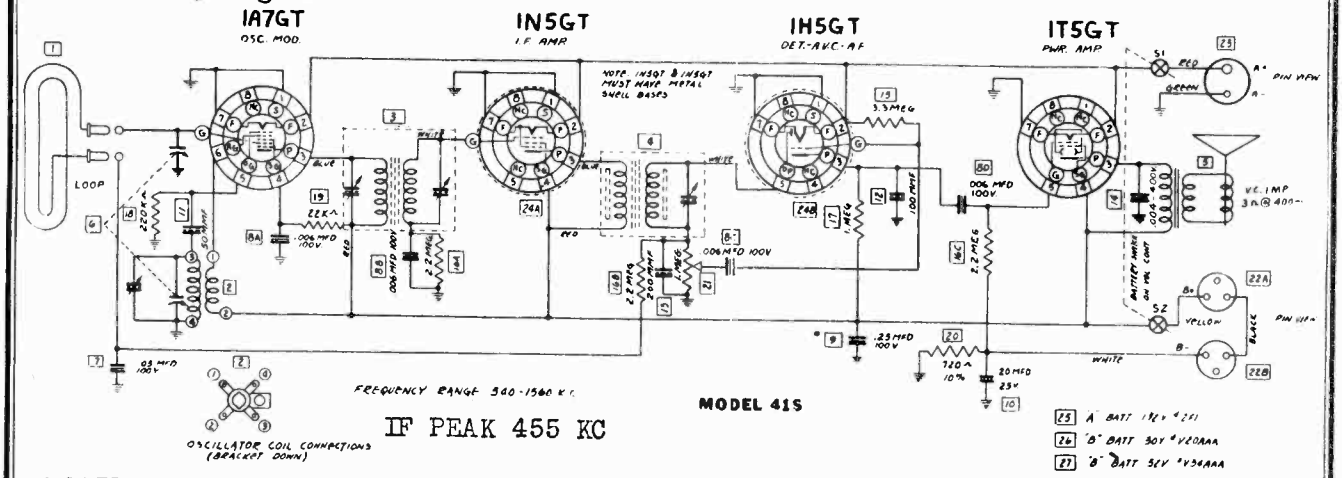
GALVIN MFG. CORP.

MODEL 29-B-6
Buick, 1940
Schematic, Voltage

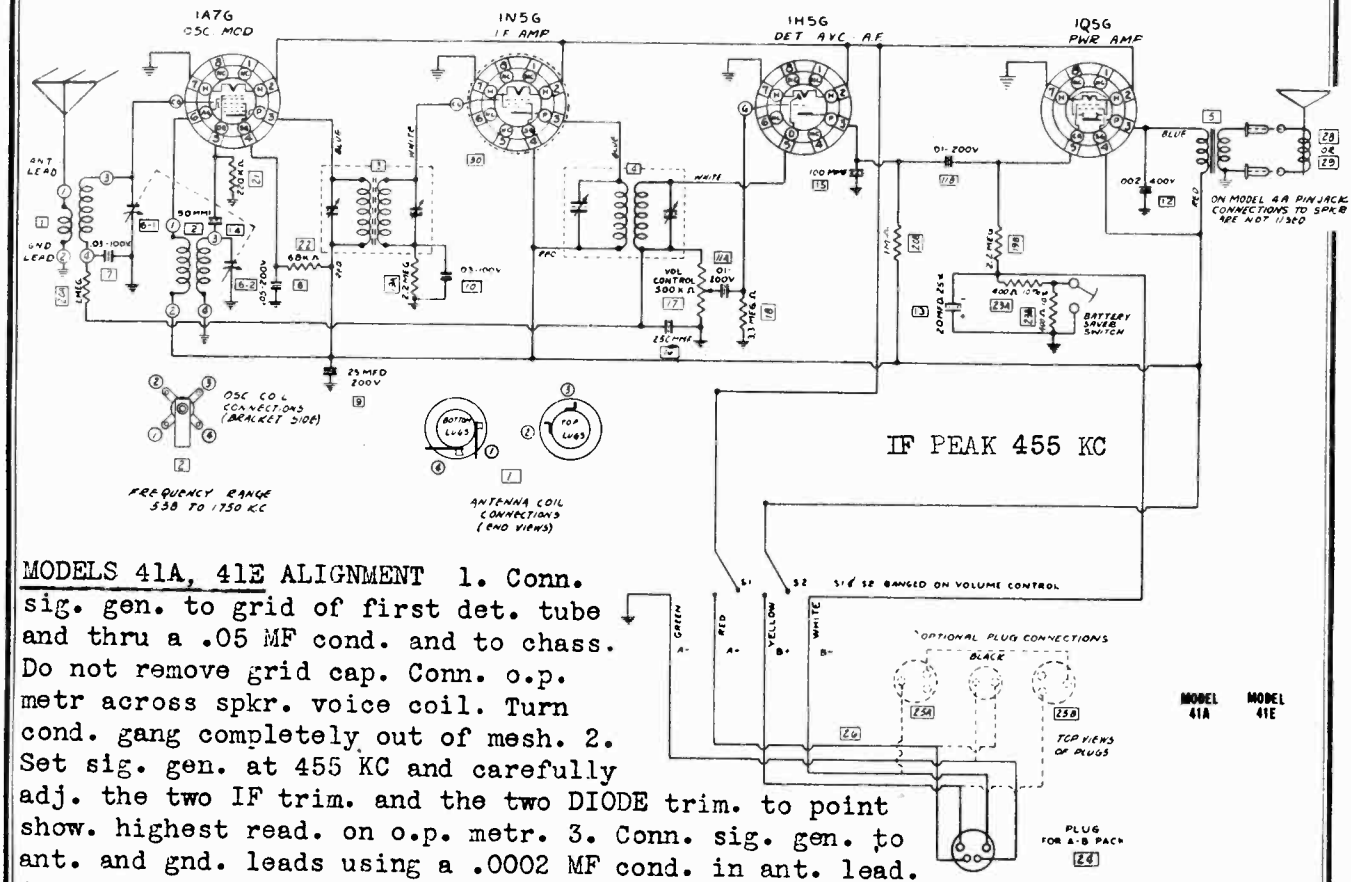


MODELS 41A, 41E
MODEL 41S
Schematics, Alignment

GALVIN MFG. CORP.



MODEL 41S ALIGNMENT 1. Conn. sig. gen. to grid of first det. tube thru a .05 cond. Do not remove grid cap. Conn. o.p. meter across spkr. voice coil. Turn cond. gang completely out of mesh. Loop must be conn. to chass. at all times. 2. Set sig. gen. at 455 K.C.; carefully adj. the two I.F. trim. and the one DIODE trim. to point showing highest read. on o.p. metr. 3. Turn sig. gen to 1560 K.C. and with cond. gang completely out of mesh, adj. OSC. trim. until 1560 K.C. sig. is heard. 4. No further adjustments.

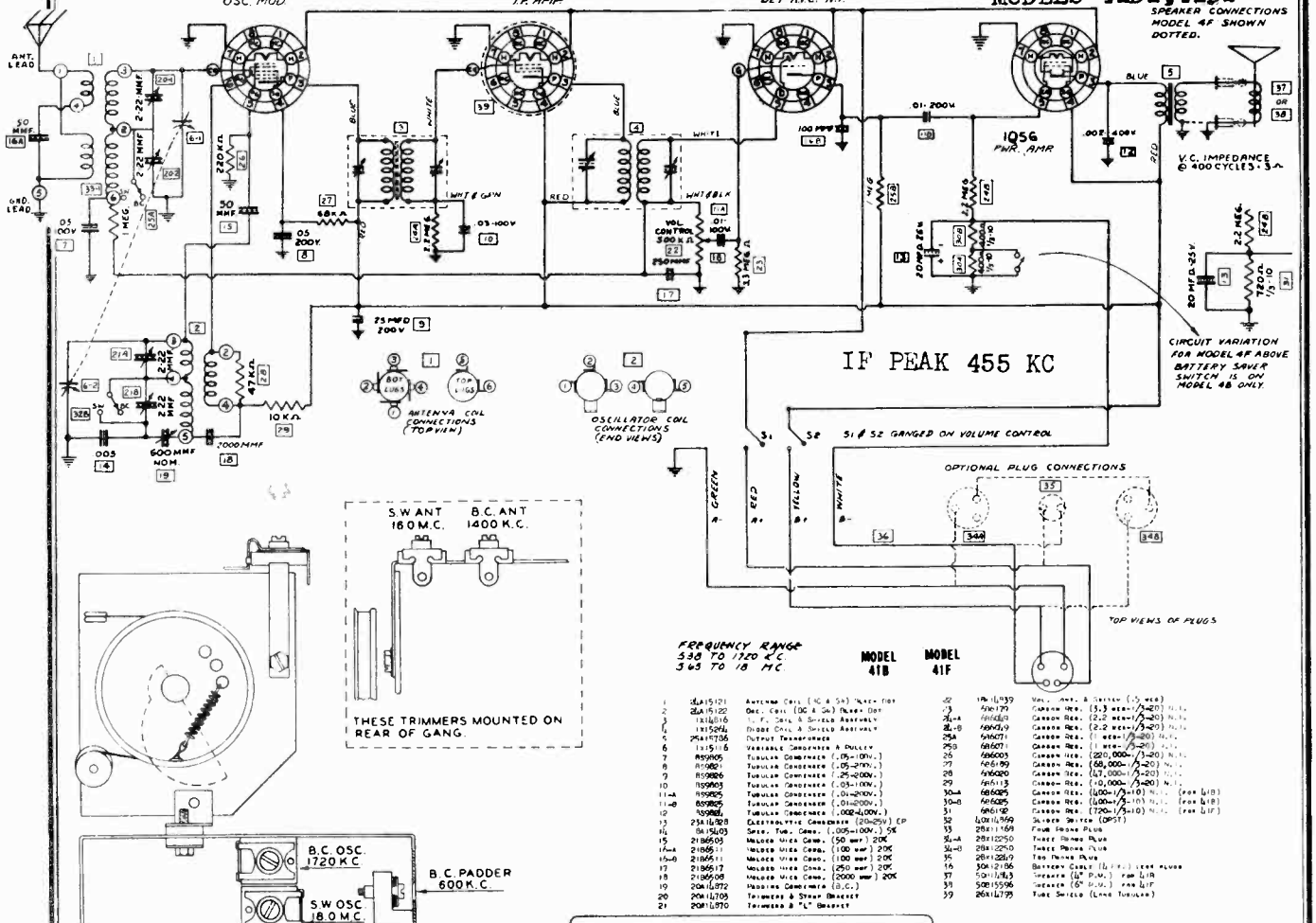


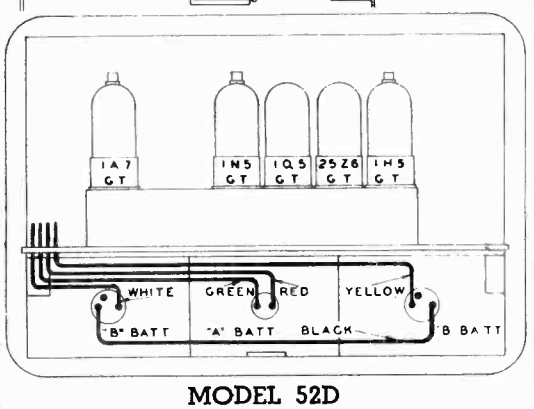
MODELS 41A, 41E ALIGNMENT 1. Conn. sig. gen. to grid of first det. tube and thru a .05 MF cond. and to chass. Do not remove grid cap. Conn. o.p. metr across spkr. voice coil. Turn cond. gang completely out of mesh. 2. Set sig. gen. at 455 KC and carefully adj. the two IF trim. and the two DIODE trim. to point show. highest read. on o.p. metr. 3. Conn. sig. gen. to ant. and gnd. leads using a .0002 MF cond. in ant. lead. 4. Turn sig. gen. to 1750 KC and with cond. gang completely out of mesh adj. OSC. trim. until 1750 KC sig. is heard. 5. Set sig. gen. at 1400 KC and turn cond. gang to the sig. at 1400 KC. Adj. ANT. trim. to point show. highest read. on o.p. metr.

MODELS 51D1, 51D2
Batt. Connections

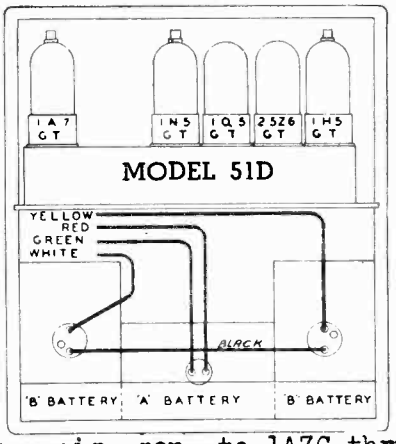
GALVIN MFG. CORP.

MODELS 41B, 41F
Schematic, Alignment
MODELS 41D1, 41D2

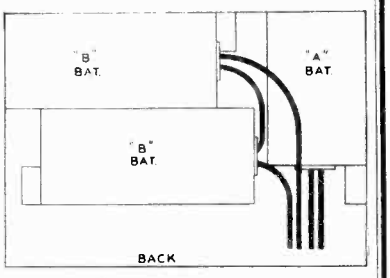




MODEL 52D



POSITION AND CONNECT BATTERIES AS SHOWN

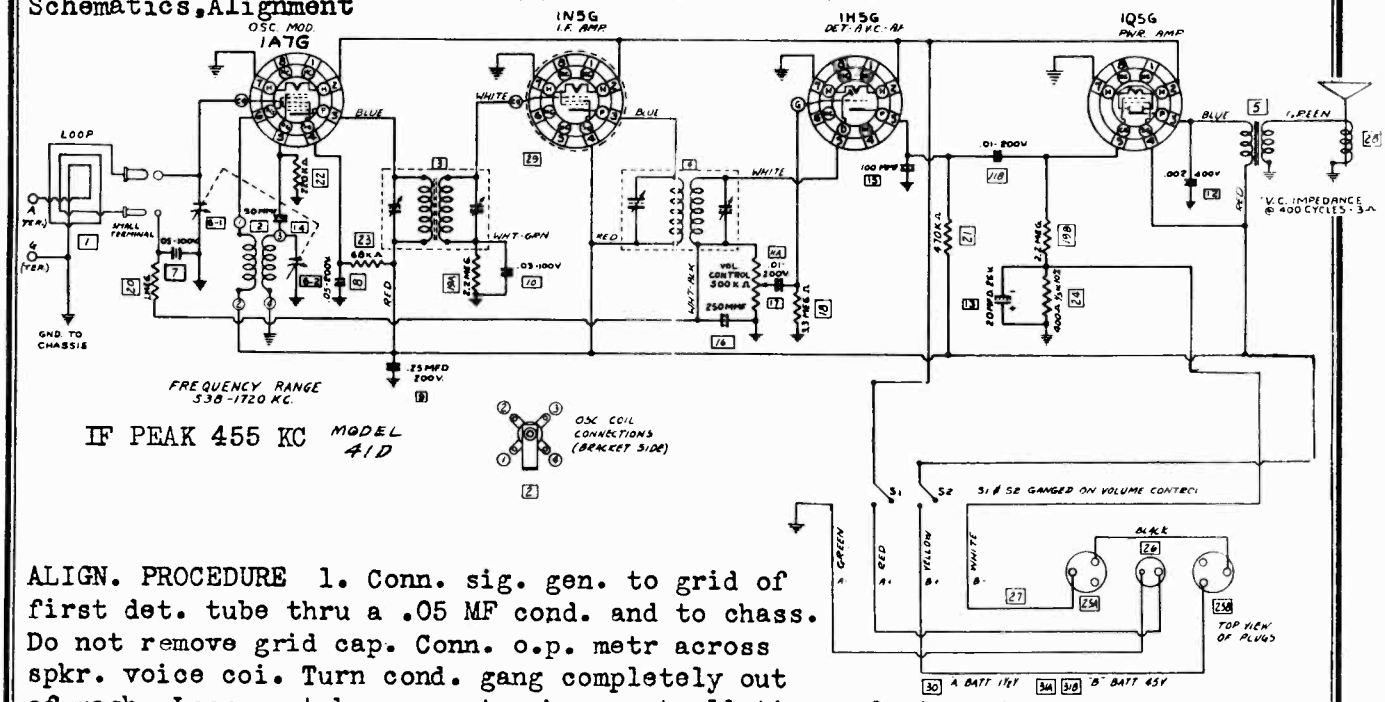


MODEL 41D

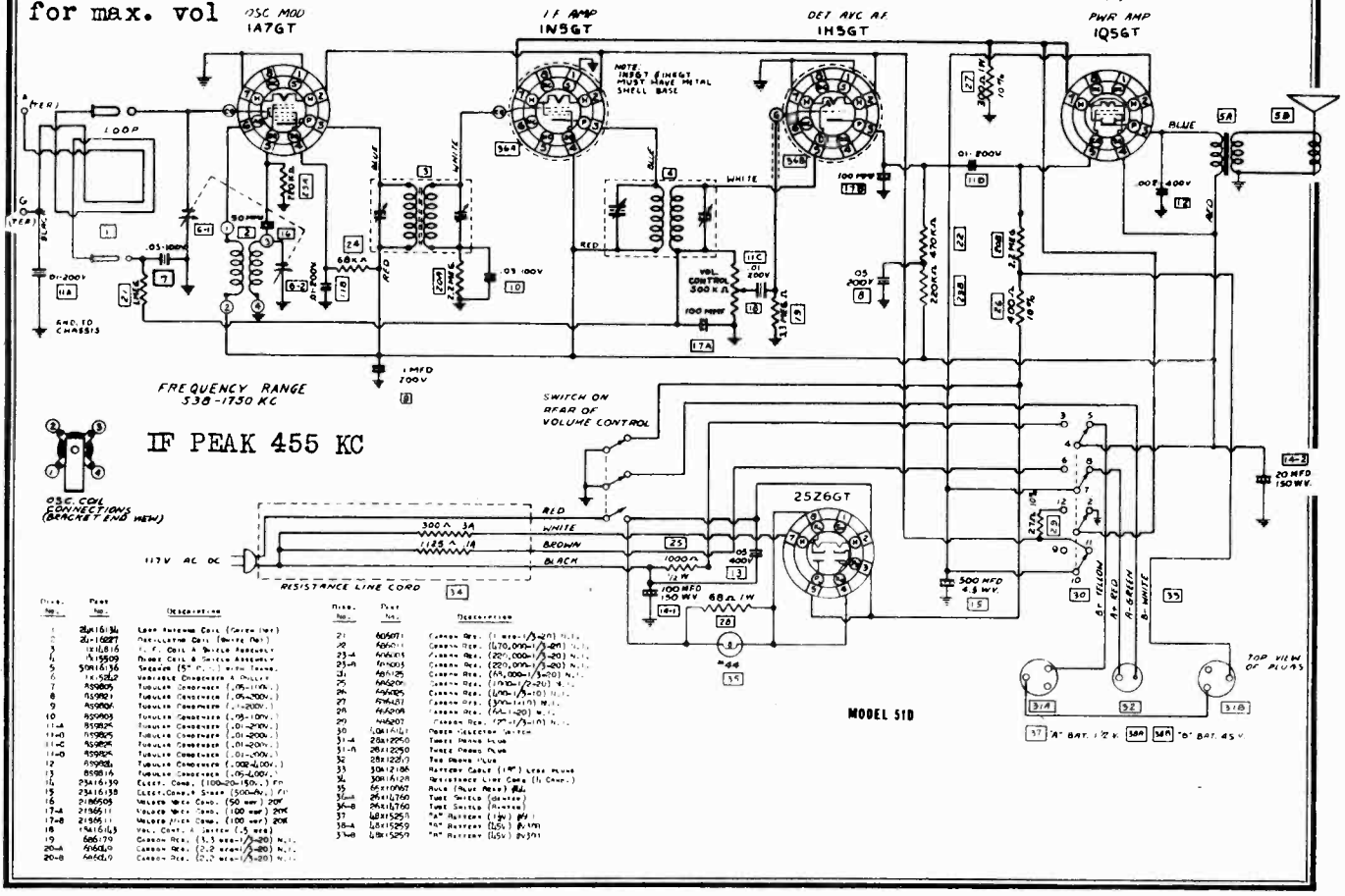
MODELS 41B, 41F ALIGNMENT 1. Conn. sig. gen. to 1A7G thru .05 MF cond. and to chassis. Conn. o.p. meter across spkr. voice coil. Turn cond. gang out of mesh. Set band swi. in B.C. pos. UP pos. is for S.W. DOWN pos. is for B.C. 2. Sig. gen. at 455 KC, adj. 4 I.F. trims. top of I.F. coil cans for max. read. 3. Band swi. in S.W. pos. Sig. gen. to ant. and gnd terms, using 400 ohm carbon res. in ant. lead. 4. Sig. gen. at 18.0 MC, cond. gang out of mesh adj. the S.W. OSC. trim. until the 18.0 MC sig. is heard. 5. Sig. gen. at 16.0 MC, turn cond. gang to sig. at 16.0 MC. Adj. S.W. ANT. for max. read. 6. Band swi. in B.C. pos - replace 400 ohm res. in sig. gen. lead with .0002 MF cond. 7. Sig. gen. at 1720 KC turn cond. gang to out of mesh pos. Adj. B.C. OSC. trim until 1720 KC sig. is heard. 8. Sig. gen. at 600 KC - rock pointer at 600 KC pos. on dial scale, while adj. B,C, padder for highest o.p. read. If noise at 600 KC padder can be adj. to max. noise without rocking gang and without use of sig. gen.

MODELS 41D1,41D2
MODELS 51D1,51D2
Schematics,Alignment

GALVIN MFG. CORP.

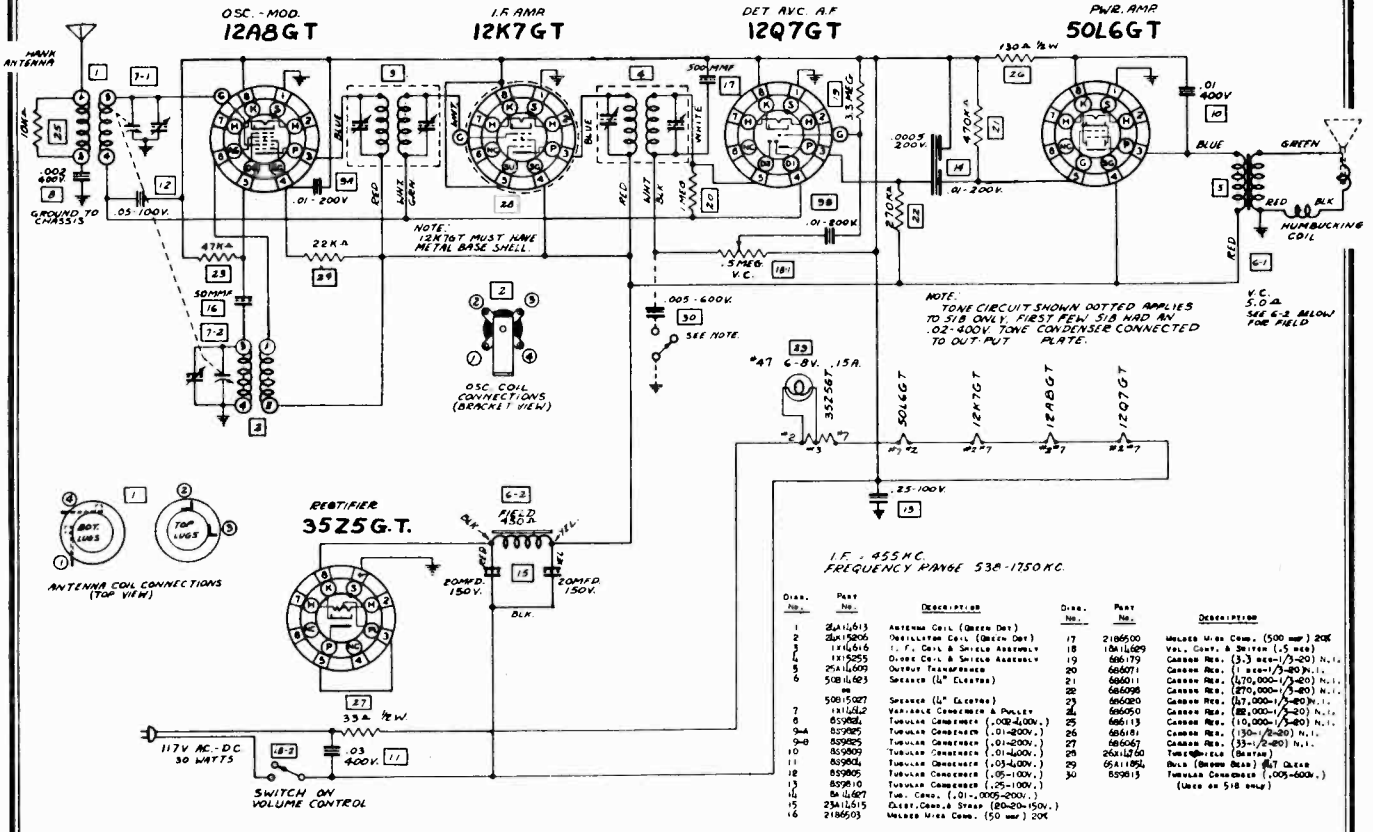


ALIGN. PROCEDURE 1. Conn. sig. gen. to grid of first det. tube thru a .05 MF cond. and to chass. Do not remove grid cap. Conn. o.p. metr across spkr. voice coi. Turn cond. gang completely out of mesh. Loop must be conn. to chass. at all times. 2. Set sig. gen. at 455 KC; carefully adj. the two IF trim. and the two DIODE trim. to point show. highest read. on o.p. meter. 3. Turn sig. gen. to 1720 KC and with cond. gang completely out of mesh adj. OSC. trim until 1720 KC sig. is heard. 4. Place chass. in cab., conn. loop terms. and fasten back on cab. 5. Remove plug butt. from side of cab. to expose ANT. trim.; 6 — Tune in a weak station near 1400 or 1500 KC and adj. ANT. trim. thru hole in cab. for max. vol



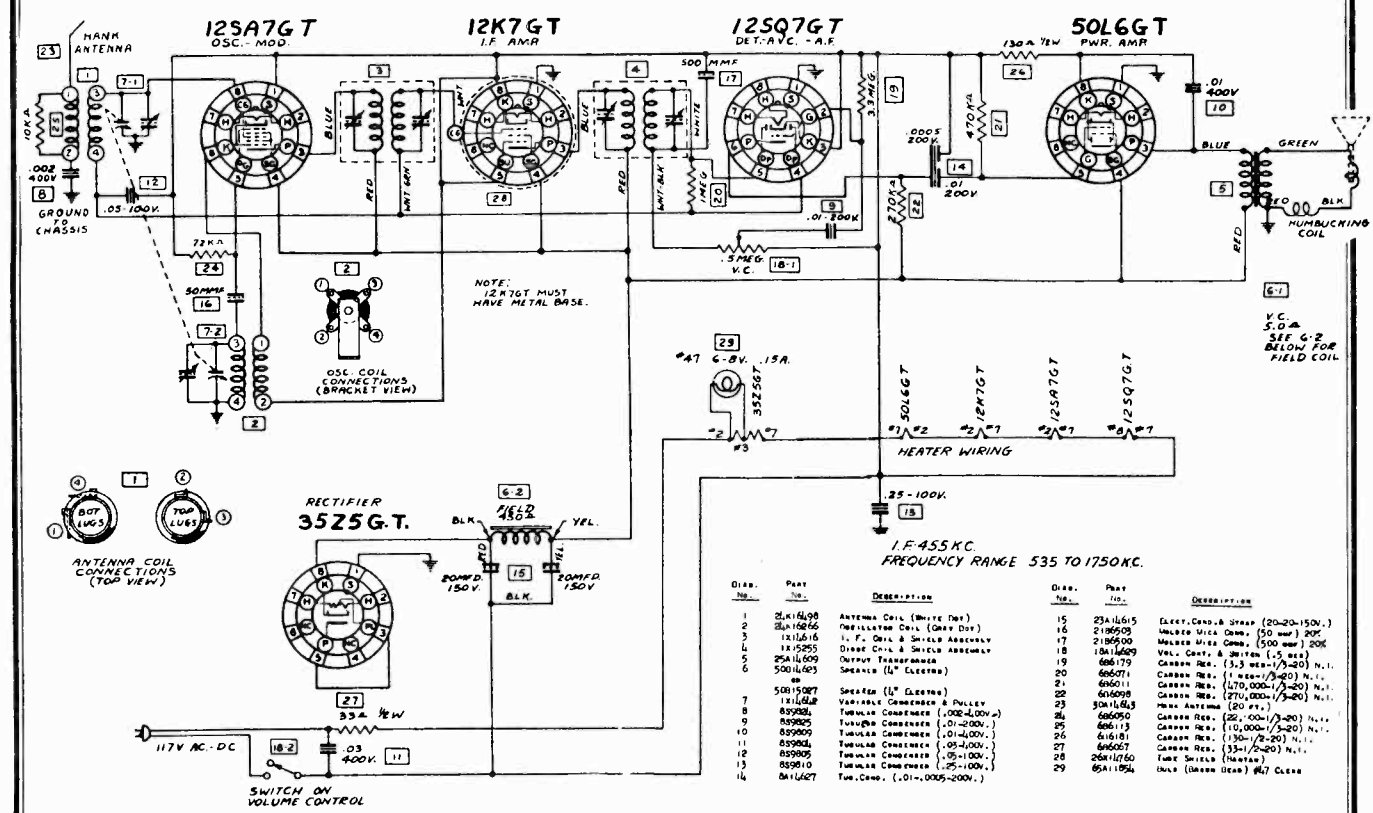
MODELS 51A, 53A, 54A
Chassis 5A, 5AA
Schematics

GALVIN MFG. CORP.



Diag. No.	Part No.	Description
1	25A1L613	Antenna Coil (Green Dot)
2	25A1L5206	Oscillator Coil (Green Dot)
3	1X1L616	I. F. Coil & Shield Assembly
4	1X1L5255	Diode Coil & Shield Assembly
5	25A1L609	Output Transformer
6	50B1L623	Speaker (4" Electro)
	or	
	50B15027	Speaker (4" Electro)
7	1X1L612	Variable Condenser & Pulley
8	859824	Tubular Condenser (.002-400v.)
9-9A	859825	Tubular Condenser (.01-400v.)
9-8	859825	Tubular Condenser (.01-200v.)
10	859809	Tubular Condenser (.01-400v.)
11	859804	Tubular Condenser (.03-400v.)
12	859805	Tubular Condenser (.05-100v.)
13	859810	Tubular Condenser (.25-100v.)
14	8A1L627	Tub. Cond. (.01-.0005-200v.)
15	23A1L615	Elect. Cond. & Strap (20-20-150v.)
16	2186503	Molded Mica Cond. (50 mmf) 20%
17	2186500	Molded Mica Cond. (500 mmf) 20%
18	18A1L629	Vol. Cont. & Switch (.5 meg)
19	686179	Carbon Res. (3.3 meg-1/3-20) N.I.
20	686071	Carbon Res. (1 meg-1/3-20) N.I.
21	686011	Carbon Res. (470,000-1/3-20) N.I.
22	686098	Carbon Res. (270,000-1/3-20) N.I.
23	686020	Carbon Res. (47,000-1/3-20) N.I.
24	686050	Carbon Res. (22,000-1/3-20) N.I.
25	686113	Carbon Res. (10,000-1/3-20) N.I.
26	686181	Carbon Res. (150-1/2-20) N.I.
27	686067	Carbon Res. (33-1/2-20) N.I.
28	26A1L760	Tube Shield (Bantam)
29	65A1L854	Bulb (Green Dear) #47 Clear
30	859813	Tubular Condenser (.005-600v.) (Used on 51B only)

5A Chassis (Models 51A, 53A and 54A)



Diag. No.	Part No.	Description
1	2LK1L698	Antenna Coil (White Dot)
2	2LA1L6266	Oscillator Coil (Grey Dot)
3	1X1L616	I. F. Coil & Shield Assembly
4	1X1L5255	Diode Coil & Shield Assembly
5	25A1L609	Output Transformer
6	50B1L623	Speaker (4" Electro)
	or	
	50B15027	Speaker (4" Electro)
7	1X1L612	Variable Condenser & Pulley
8	859824	Tubular Condenser (.002-400v.)
9	859825	Tubular Condenser (.01-200v.)
10	859809	Tubular Condenser (.01-400v.)
11	859804	Tubular Condenser (.05-400v.)
12	859805	Tubular Condenser (.05-100v.)
13	859810	Tubular Condenser (.25-100v.)
14	8A1L627	Tub. Cond. (.01-.0005-200v.)
15	23A1L615	Elect. Cond. & Strap (20-20-150v.)
16	2186503	Molded Mica Cond. (50 mmf) 20%
17	2186500	Molded Mica Cond. (500 mmf) 20%
18	18A1L629	Vol. Cont. & Switch (.5 meg)
19	686179	Carbon Res. (3.3 meg-1/3-20) N.I.
20	686071	Carbon Res. (1 meg-1/3-20) N.I.
21	686011	Carbon Res. (470,000-1/3-20) N.I.
22	686098	Carbon Res. (270,000-1/3-20) N.I.
23	30A1L643	Hank Antenna (20 ft.)
24	686050	Carbon Res. (22,000-1/3-20) N.I.
25	686113	Carbon Res. (10,000-1/3-20) N.I.
26	686181	Carbon Res. (150-1/2-20) N.I.
27	686067	Carbon Res. (33-1/2-20) N.I.
28	26A1L760	Tube Shield (Bantam)
29	65A1L854	Bulb (Green Dear) #47 Clear

5AA Chassis (Models 51A, 53A and 54A)

CHASSIS 5A, 5AA
CHASSIS 5C
CHASSIS 6A, 6B
CHASSIS 6E

GALVIN MFG. CORP.

Sensitivity, Gain
Voltage, Dial Drive Data
Trimmers

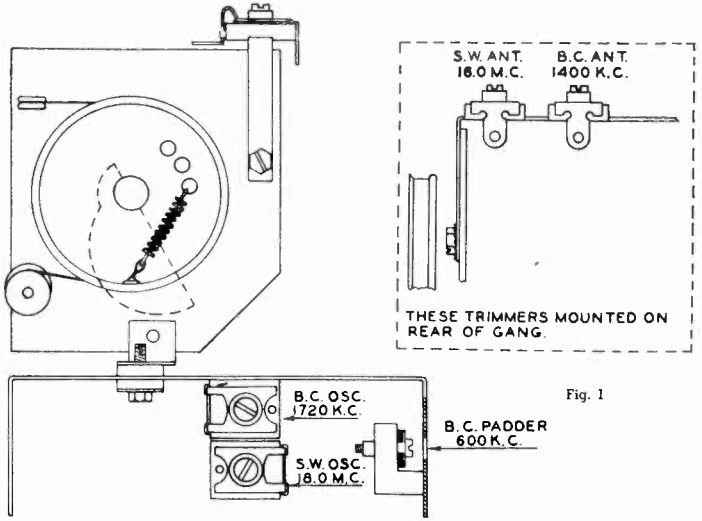


Fig. 1

SENSITIVITY AND STAGE GAIN MEASUREMENTS

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

When measuring over-all sensitivity at the antenna terminal, use a 200 MMF condenser in place of .1 MF.

To measure over-all sensitivity of loop models, 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 ft. away from the signal generator.

The figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

Models 5A and 5AA

Average Microvolt Input *	Generator Set at	Generator Feeder Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
4500	455 K.C.	IF Grid	.1 MF	.5 Meg	.45 Volts
75	455 K.C.	Mod. Grid	.1 MF	.5 Meg	.45 Volts
85	600 K.C.	Mod. Grid	.1 MF	.5 Meg	.45 Volts
25	600 K.C.	Ant. Lead	200 MMF	None	.45 Volts

Model 5C

4500	455 K.C.	IF Grid	.1 MF	.5 Meg	.45 Volts
75	455 K.C.	Mod. Grid	.1 MF	.5 Meg	.45 Volts
85	600 K.C.	Mod. Grid	.1 MF	.5 Meg	.45 Volts
150	600 K.C.	Ant. Lead	400 Ohms	None	.45 Volts

Model 6A and 6B

4500	455 K.C.	IF Grid	.1 MF	.5 Meg	.45 Volts
75	455 K.C.	Mod. Grid	.1 MF	.5 Meg	.45 Volts
85	600 K.C.	Mod. Grid	.1 MF	.5 Meg	.45 Volts
25	600 K.C.	Ant. Lead	200 MMF	None	.45 Volts

Model 6E

4500	455 K.C.	IF Grid	.1 MF	.5 Meg	.45 Volts
75	455 K.C.	Mod. Grid	.1 MF	.5 Meg	.45 Volts
85	600 K.C.	Mod. Grid	.1 MF	.5 Meg	.45 Volts
100	600 K.C.	Ant. Lead	400 Ohms	None	.45 Volts

* For .05 Watt output.
** Output meter connected across voice coil.
.45 Volts equals 1 Watt output.
V.C. resistance — 5 ohms.

6 Tube Chassis

TO RESTRING DIAL DRIVE CORD

1. Remove dial crystal, pointer, dial scale and plate.
2. Cut a length of silk fish cord approximately 24 inches long.
3. Thread one end of cord through hole "A" in condenser pulley and clip it to the chassis with a paper clip.
4. Continue other end of cord over idler pulley "B" and down to tuning shaft. Make two turns counter-clockwise around tuning shaft. (See Fig. 3.)
5. Continue cord up to pointer pulley making one turn around it counter-clockwise.
6. Take cord over idler pulley "C" and around condenser pulley to the hole "A".
7. Tie both ends of cord together inside hole "A".
8. Tie in one end of tension spring and hook the free end of the spring in hole "D". Cut off surplus cord.

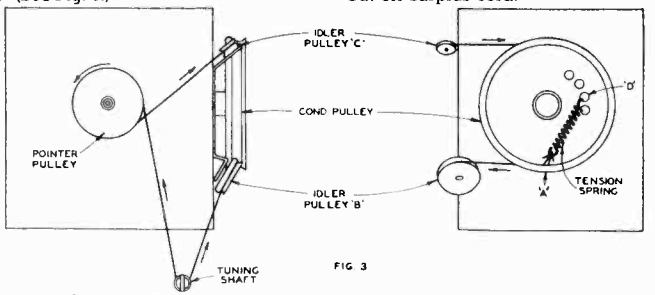


FIG 3

5 Tube Chassis

TO RESTRING DIAL DRIVE CORD

1. Remove dial crystal, pointer, dial scale, and plate.
2. Cut a length of silk fish cord approximately 12 inches long.
3. Make two turns with cord around tuning shaft. (See Fig. 2.)
4. Continue both ends of cord around condenser pulley in opposite directions until they meet at the hole (A) in the rim of the pulley.
5. Thread both ends through the hole and tie them securely together inside the hole.
6. Tie in the dial cord tension spring and hook the free end of the spring in the hole (B). Cut off surplus cord.

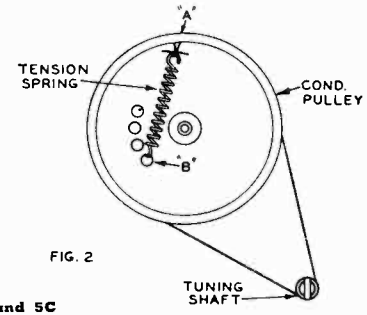


FIG. 2

5A and 5C

TUBE	POSITION	PLATE	SCREEN	CATHODE	OSC. PLATE
12A8GT	Osc.-Mod.	95	65	0	90
12K7GT	IF	95	95	0	—
12Q7GT	Det.-Avc.	55	—	0	—
50L6GT	Output	85	95	5	—
35Z5GT	Rect.	AC	—	120	—

5AA

12SA7GT	Osc.-Mod.	105	65	0	105
12K7GT	IF	105	105	0	—
12SQ7GT	Det.-Avc.	50	—	0	—
50L6GT	Output	95	105	6	—
35Z5GT	Rect.	AC	—	130	—

6A, 6B and 6E

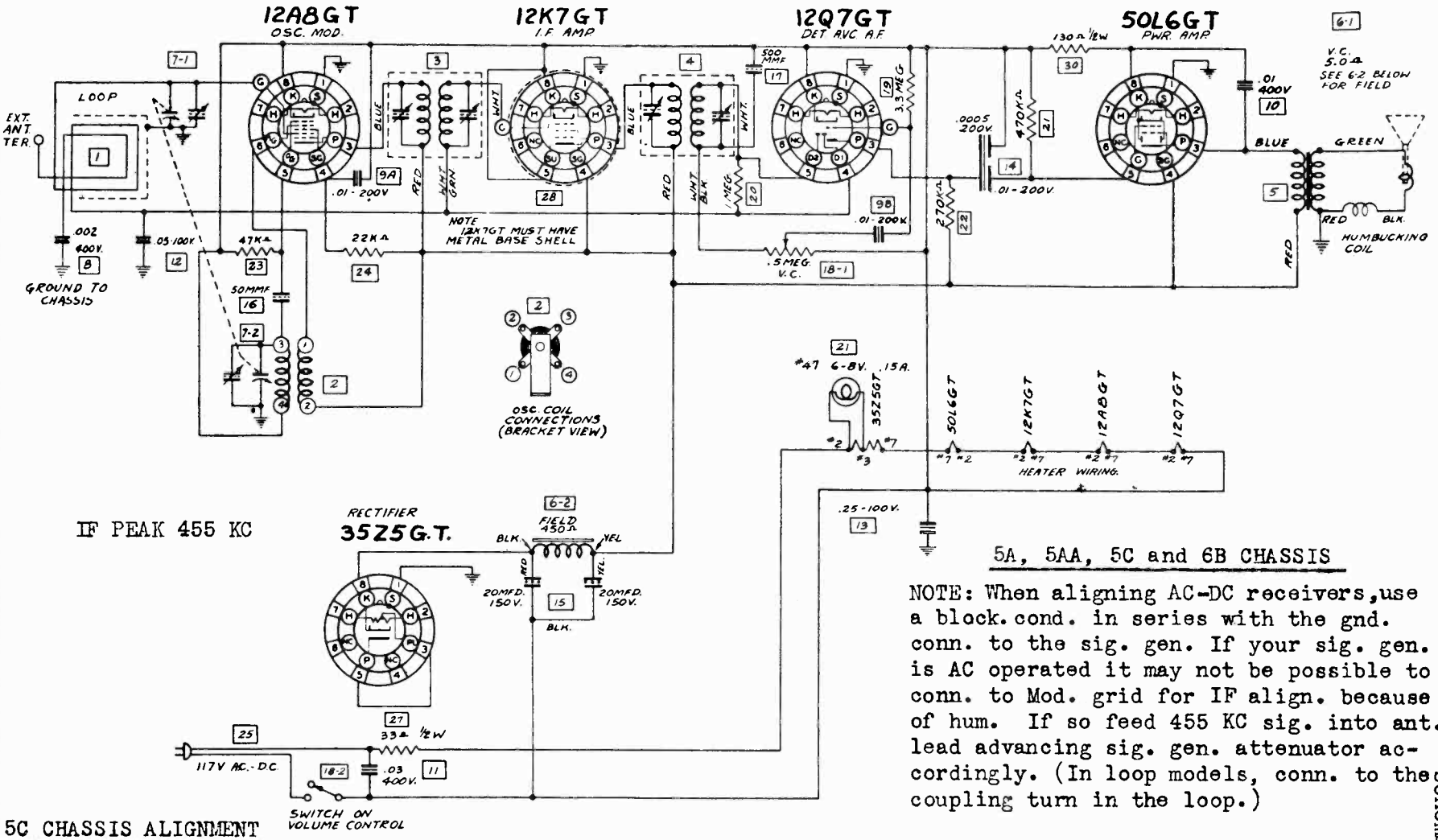
6A7	Osc.-Mod.	105	65	0	105
6D6	IF	105	105	0	—
75**	Det.-Avc.	50	—	0	—
25L6G	Output	95	105	6	—
25Z5	Rect.	AC	—	130	—

All measurements from B— to socket terminal, using 1000 ohms per volt meter.

CHASSIS 5A, 5AA, 6B
Aligning Note

GALVIN MFG. CORP.

MODELS 51C, 52C, 53C
Chassis 5C
Schematic, Alignment



IF PEAK 455 KC

5A, 5AA, 5C and 6B CHASSIS

NOTE: When aligning AC-DC receivers, use a block. cond. in series with the gnd. conn. to the sig. gen. If your sig. gen. is AC operated it may not be possible to conn. to Mod. grid for IF align. because of hum. If so feed 455 KC sig. into ant. lead advancing sig. gen. attenuator accordingly. (In loop models, conn. to the coupling turn in the loop.)

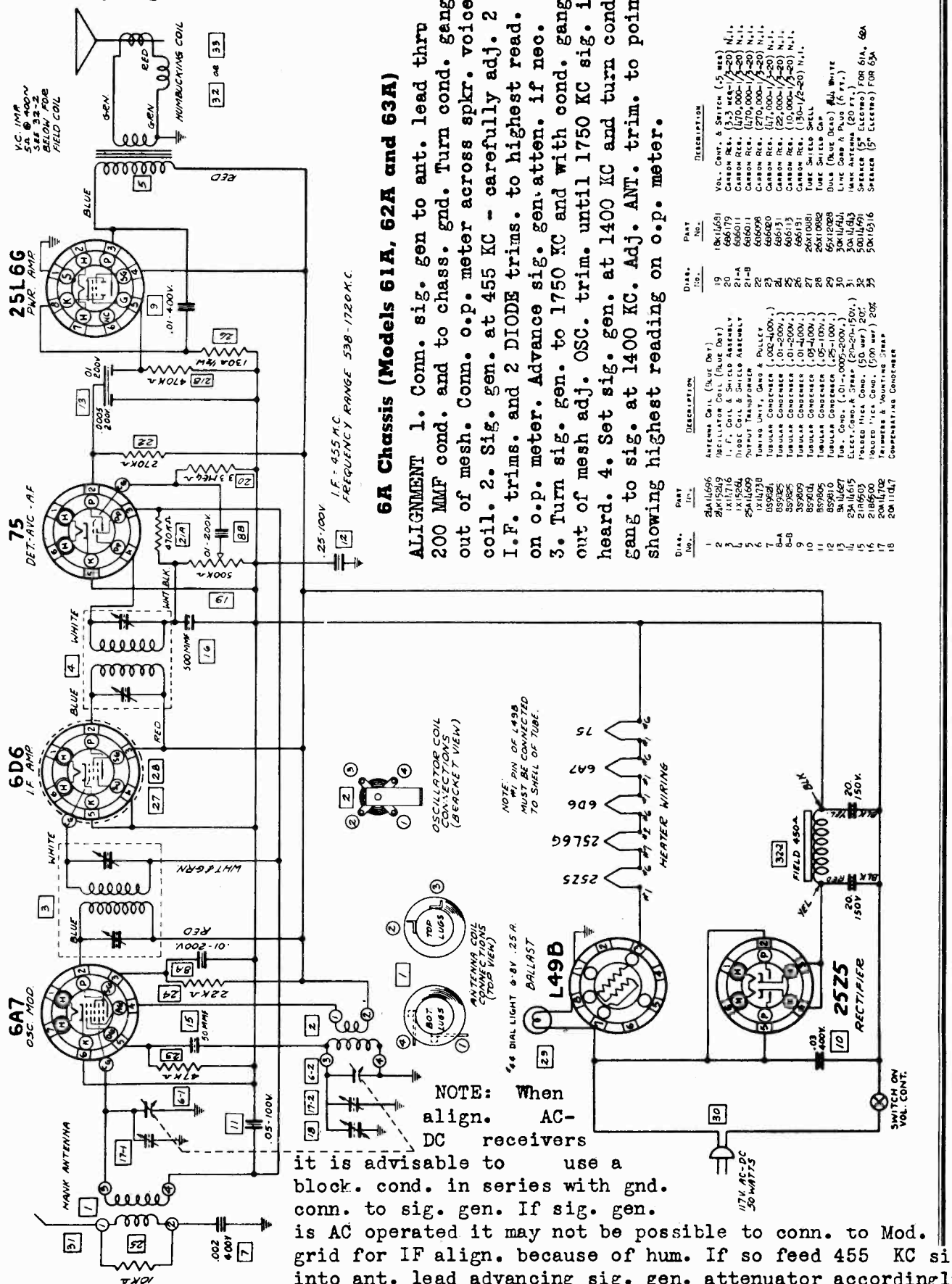
5C CHASSIS ALIGNMENT

1. Conn. sig. gen. to grid of first det. tube thru a .05 MF cond., and to chass. Do not remove grid cap. Conn. o.p. meter across spkr. voice coil. Turn cond. gang completely out of mesh. Loop must be conn. to the chass. at all times. 2. Set sig. gen. at 455 KC and carefully adj. the two IF trims. and the two DIODE trims. to point show. highest read. on o.p. meter. 3. Turn sig. gen. to 1720 KC and, with cond. gang completely out of mesh, adj. OSC. trim. until 1720 KC sig. is heard. 4. Disconn. sig. gen. and tune in weak station near 1400 or 1500 KC. Adj. ANT. trim. for max. volume.

MODELS 61A,62A,63A
Chassis 6A
Schematic,Alignment

GALVIN MFG. CORP.

CHASSIS 5A,5AA
Alignment



6A Chassis (Models 61A, 62A and 63A)

ALIGNMENT 1. Conn. sig. gen to ant. lead thru 200 MMF cond. and to chass. gnd. Turn cond. gang out of mesh. Conn. o.p. meter across spkr. voice coil. 2. Sig. gen. at 455 KC - carefully adj. 2 I.F. trims. and 2 DIODE trims. to highest read. on o.p. meter. Advance sig. gen. atten. if nec. 3. Turn sig. gen. to 1750 KC and with cond. gang out of mesh adj. OSC. trim. until 1750 KC sig. is heard. 4. Set sig. gen. at 1400 KC and turn cond. gang to sig. at 1400 KC. Adj. ANT. trim. to point showing highest reading on o.p. meter.

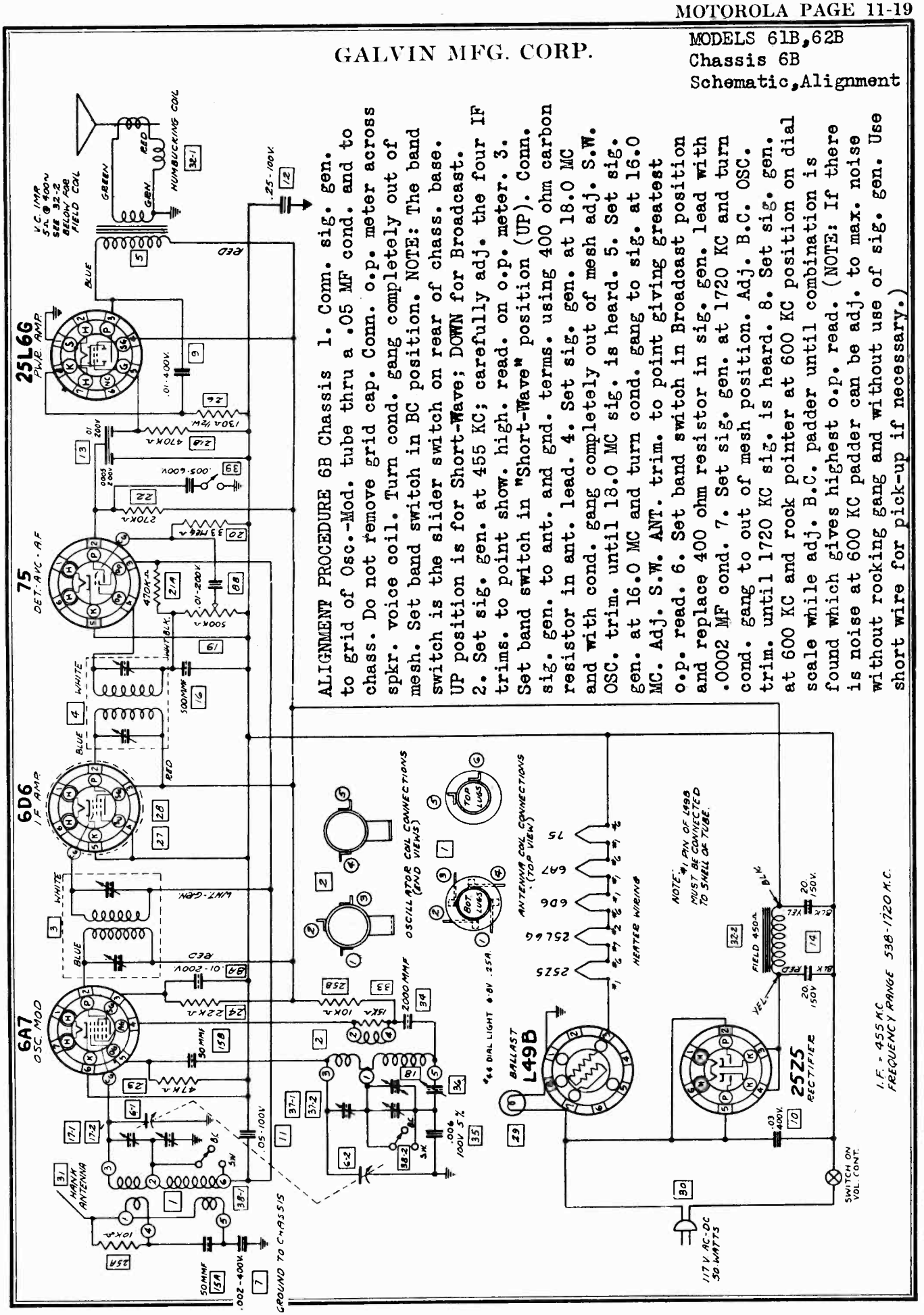
Diag. No.	Part No.	Description
1	2AA14696	Antenna Coil (Blue Dot)
2	2AA15219	Oscillator Coil (Blue Dot)
3	1X11716	I. F. Coil & Shield Assembly
4	1X15264	Diode Coil & Shield Assembly
5	2AA12699	Output Transformer
6	1X14738	Tuning Unit, Gang & Pulley
7	859281	Tubular Condenser (.002-400V.)
8-A	859285	Tubular Condenser (.01-200V.)
8-B	859285	Tubular Condenser (.01-200V.)
9	859809	Tubular Condenser (.01-400V.)
10	859814	Tubular Condenser (.09-400V.)
11	859865	Tubular Condenser (.05-100V.)
12	859810	Tubular Condenser (.25-100V.)
13	3A14627	Tub. Cond. (.01-.0005-200V.)
14	2AA14615	Elect.-Cond.& Strap (20-20-150V.)
15	21A6903	Molded Mica Cond. (50 MMF) 20%
16	2186900	Molded Mica Cond. (500 MMF) 20%
17	20A14702	Trimmer & Mounting Strap
18	20A11047	Compensating Condenser
19	19X11681	Vol. Cont. & Switch (.5 MEG)
20	686179	Carbon Res. (3.3 MEG-1/2-20) N.I.
21-A	686011	Carbon Res. (470,000-1/2-20) N.I.
21-B	686011	Carbon Res. (470,000-1/2-20) N.I.
22	686098	Carbon Res. (270,000-1/2-20) N.I.
23	686420	Carbon Res. (47,000-1/2-20) N.I.
24	686131	Carbon Res. (22,000-1/2-20) N.I.
25	686113	Carbon Res. (10,000-1/2-20) N.I.
26	686131	Carbon Res. (130-1/2-20) N.I.
27	26X10081	Tube Shield Shell
28	26X10082	Tube Shield Cap
29	65X12828	Dials (Blue Dial) ALL WHITE
30	3A11643	Line Cord & Plug (6 FT.)
31	3A11643	Hank Antenna (20 FT.)
32	5A11691	Speaker (5" Elected) FOR 61A, 62A
33	5A11616	Speaker (5" Elected) FOR 63A

NOTE: When align. AC-DC receivers it is advisable to use a block. cond. in series with gnd. conn. to sig. gen. If sig. gen. is AC operated it may not be possible to conn. to Mod. grid for IF align. because of hum. If so feed 455 KC sig. into ant. lead advancing sig. gen. attenuator accordingly.

GALVIN MFG. CORP.

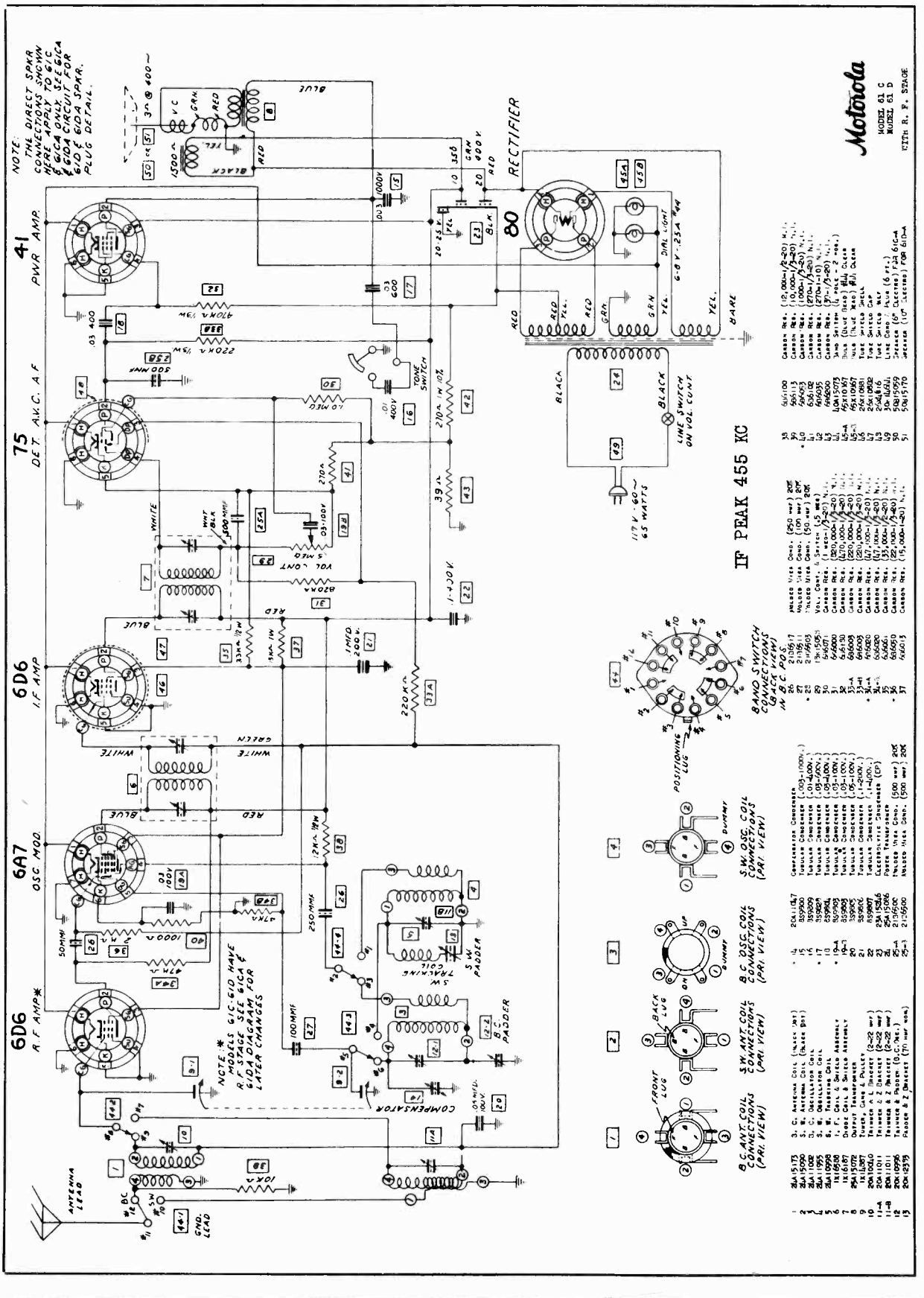
MODELS 61B, 62B
Chassis 6B
Schematic, Alignment

ALIGNMENT PROCEDURE 6B Chassis 1. Conn. sig. gen. to grid of Osc.-Mod. tube thru a .05 MF cond. and to chass. Do not remove grid cap. Conn. o.p. meter across spkr. voice coil. Turn cond. gang completely out of mesh. Set band switch in BC position. NOTE: The band switch is the slider switch on rear of chass. base. UP position is for Short-Wave; DOWN for Broadcast. 2. Set sig. gen. at 455 KC; carefully adj. the four IF trims. to point show. high. read. on o.p. meter. 3. Set band switch in "Short-Wave" position (UP). Conn. sig. gen. to ant. and gnd. terms. using 400 ohm carbon resistor in ant. lead. 4. Set sig. gen. at 18.0 MC and with cond. gang completely out of mesh adj. S.W. OSC. trim. until 18.0 MC sig. is heard. 5. Set sig. gen. at 16.0 MC and turn cond. gang to sig. at 16.0 MC. Adj. S.W. ANT. trim. to point giving greatest o.p. read. 6. Set band switch in Broadcast position and replace 400 ohm resistor in sig. gen. lead with .0002 MF cond. 7. Set sig. gen. at 1720 KC and turn cond. gang to out of mesh position. Adj. B.C. OSC. trim. until 1720 KC sig. is heard. 8. Set sig. gen. at 600 KC and rock pointer at 600 KC position on dial scale while adj. B.C. padder until combination is found which gives highest o.p. read. (NOTE: If there is noise at 600 KC padder can be adj. to max. noise without rocking gang and without use of sig. gen. Use short wire for pick-up if necessary.)



MODELS 61C,61D
(With R-F Stage)
Schematic,Coils

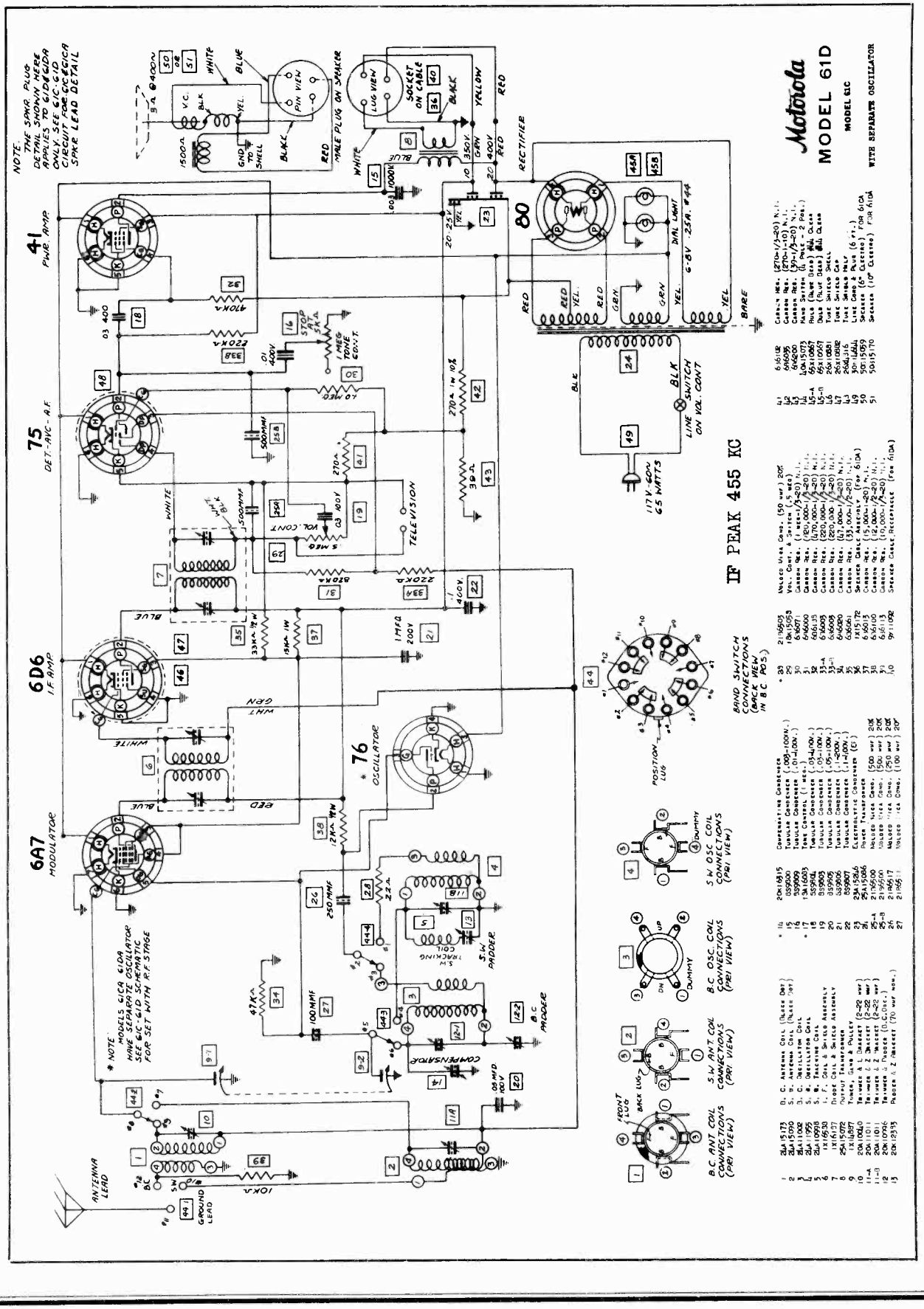
GALVIN MFG. CORP.



MODELS 61C and 61D (with R. F. stage)

GALVIN MFG. CORP.

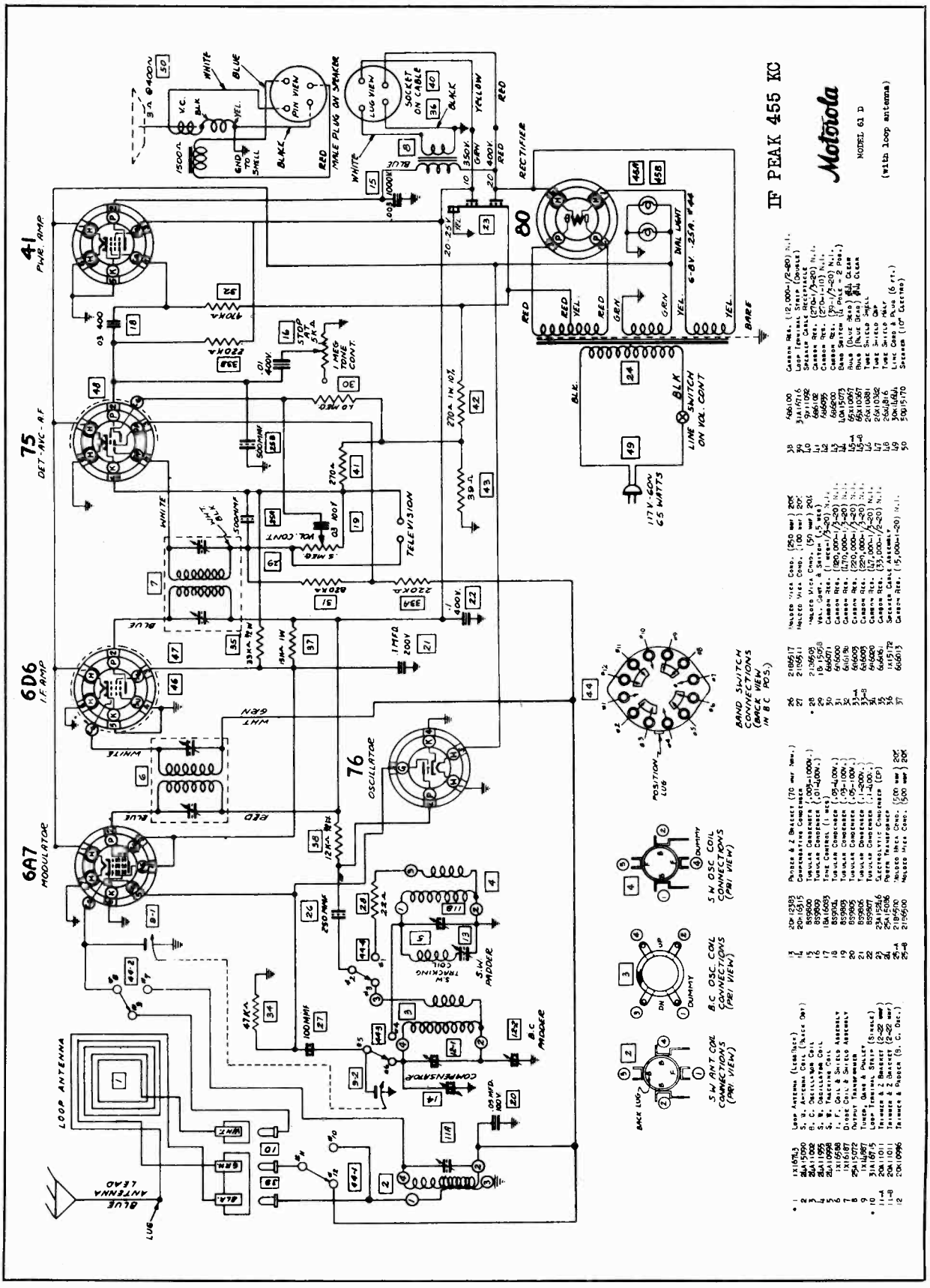
MODELS 61CA, 61DA
(With Separate Osc)
Schematic, Coils



MODELS 61C and 61D (with separate oscillator)

MODEL 61D(With Loop)
Schematic,Coils

GALVIN MFG. CORP.



MODEL 61D (with loop antenna)

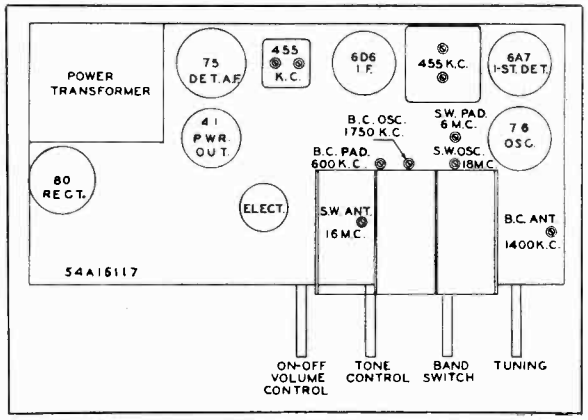


FIG 2 TRIMMERS — 6C and 8C Chassis

SENSITIVITY AND STAGE GAIN MEASUREMENTS

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

When measuring over-all sensitivity at the antenna terminal, use a 200 MMF condenser in place of .1 MF.

To measure over-all sensitivity of loop models, 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 ft. away from the signal generator.

The figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

MODELS 61C AND 61D

Average Microvolt Input	Generator Set at	Generator Feeder Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter Reading **
3000	455 K.C.	IF Grid	.1 MF	.5 Meg	.38 Volts
35	455 K.C.	Mod. Grid	.1 MF	.5 Meg	.38 Volts
45	600 K.C.	Mod. Grid	.1 MF	.5 Meg	.38 Volts
15	600 K.C.	Ant. Grid	200 MMF	None	.38 Volts

MODEL 61D (WITH LOOP)

3000	455 K.C.	IF Grid	.1 MF	.5 Meg	.38 Volts
35	455 K.C.	Mod. Grid	.1 MF	.5 Meg	.38 Volts
45	600 K.C.	Mod. Grid	.1 MF	.5 Meg	.38 Volts
15	600 K.C.	Ant. Lead	400 Ohms	None	.38 Volts

MODEL 81C (SQUARE LOOP)

2500	455 K.C.	IF Grid	.1 MF	.5 Meg	.63 Volts
35	455 K.C.	Mod. Grid	.1 MF	.5 Meg	.63 Volts
40	600 K.C.	Mod. Grid	.1 MF	.5 Meg	.63 Volts
15	600 K.C.	Ant. Lead	400 Ohms	None	.63 Volts

* For .05 Watt output.

** Output meter connected across voice coil.

ALIGNMENT PROCEDURE

MODELS 61C AND 61D (WITHOUT LOOP ANTENNA)

1. Connect signal generator to control grid of 1st Det. tube (6A7) through a .05 MF. condenser. 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. (Antenna — blue wire; ground — black wire.)
4. Set signal generator at 1750 K.C. Adjust BC OSC. trimmer until 1750 K.C. signal is heard.
5. Set signal generator at 1400 K.C. and turn condenser gang to 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.
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 adjusted to maximum noise.)

MODEL 61D WITH LOOP ANTENNA

1. Loop should be connected to chassis during alignment.
2. Alignment procedure is the same as above except for step 5, which should be omitted, as there is no BC ANT. trimmer in the loop version of this model.

MODEL 81C WITH CYLINDRICAL LOOP

1. When the chassis is aligned on the service bench, the loop may be disconnected if the WHITE and BLUE pin terminals are clipped or wired together. See Fig. 2 for trimmer locations.
2. Alignment procedure is the same as for Model 61C, plus the wave trap adjustment which is as follows:
3. Feed 455 KC signal into antenna lead and adjust wave trap trimmer to minimum reading on output meter.

MODEL 81C WITH SQUARE LOOP

1. Loop should be connected to chassis during alignment.
2. Alignment procedure is the same as for Model 61C, except for Step 5, which should be omitted, as there is no BC ANT. trimmer in this model.
3. There is no wave trap adjustment.

VOLTAGE CHARTS

61C AND 61D

Tube	Position	Plate	Screen	Cathode
76	OSC	150	.....	0
6A7	Mod	250	85	0
6D6	I.F.	250	85	0
75*	Det. AVC	100	.....	2
41**	Output	285	250	0
80	Rect.	A. C.	.....	600

* Bias—3.0 volts measured across resistor 43.

** Bias —19.0 volts measured across resistor 43.

81C

Tube	Position	Plate	Screen	Cathode
76	OSC	130	.....	0
8A7*	Mod	260	95	0
6D8*	I.F.	260	95	0
6Q7G**	Det. AVC	65	.....	3
6Q7G**	INV	120	.....	3
41	Output	255	260	19
41	Output	255	260	19
80	Rect.	AC	.....	330

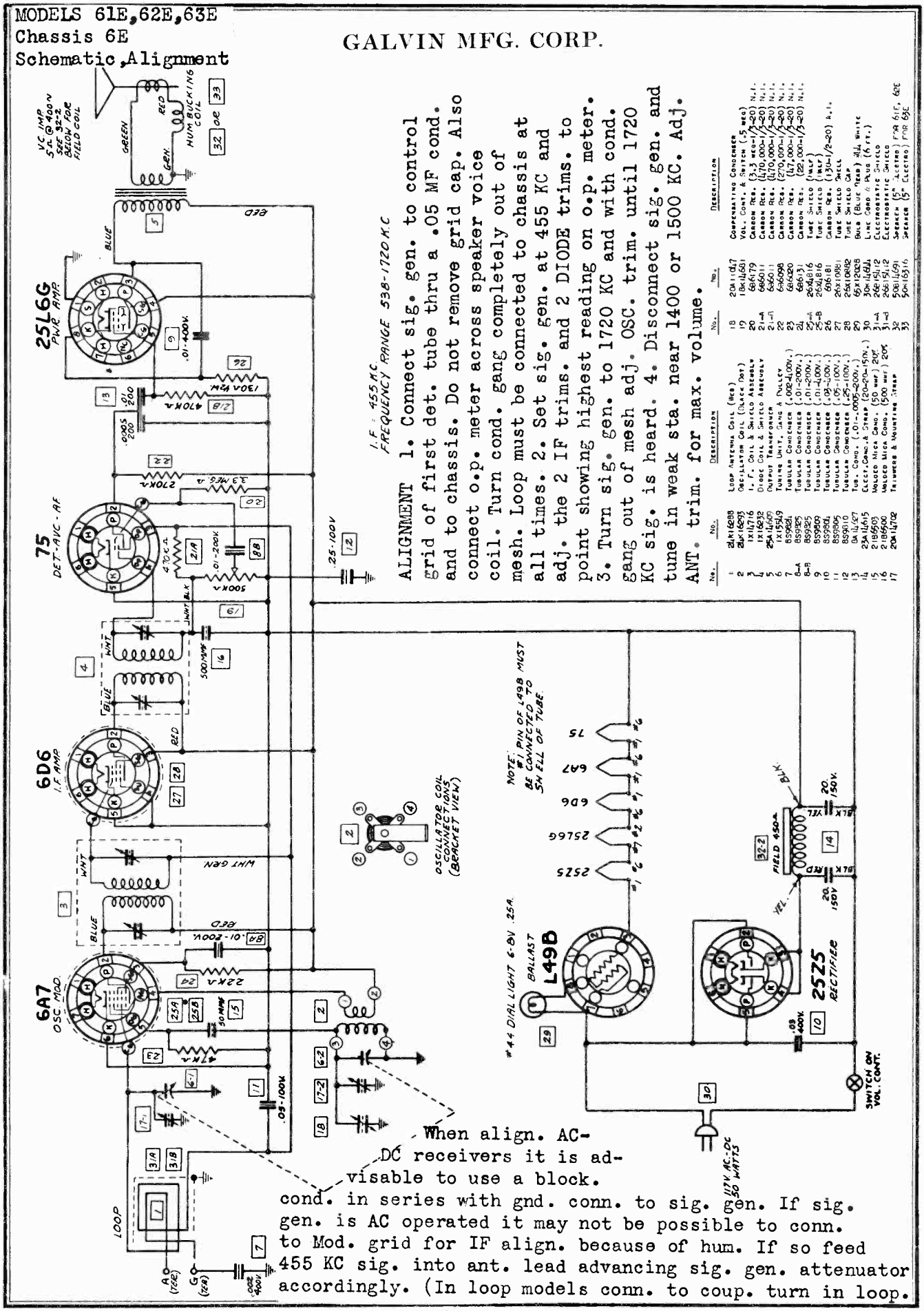
* Bias—3.0 volts measured across resistor 43.

** Bias—1.5 volt measured across resistors 43 and 44.

Measurements from socket terminal to chassis ground using 1000 ohms per volt meter.

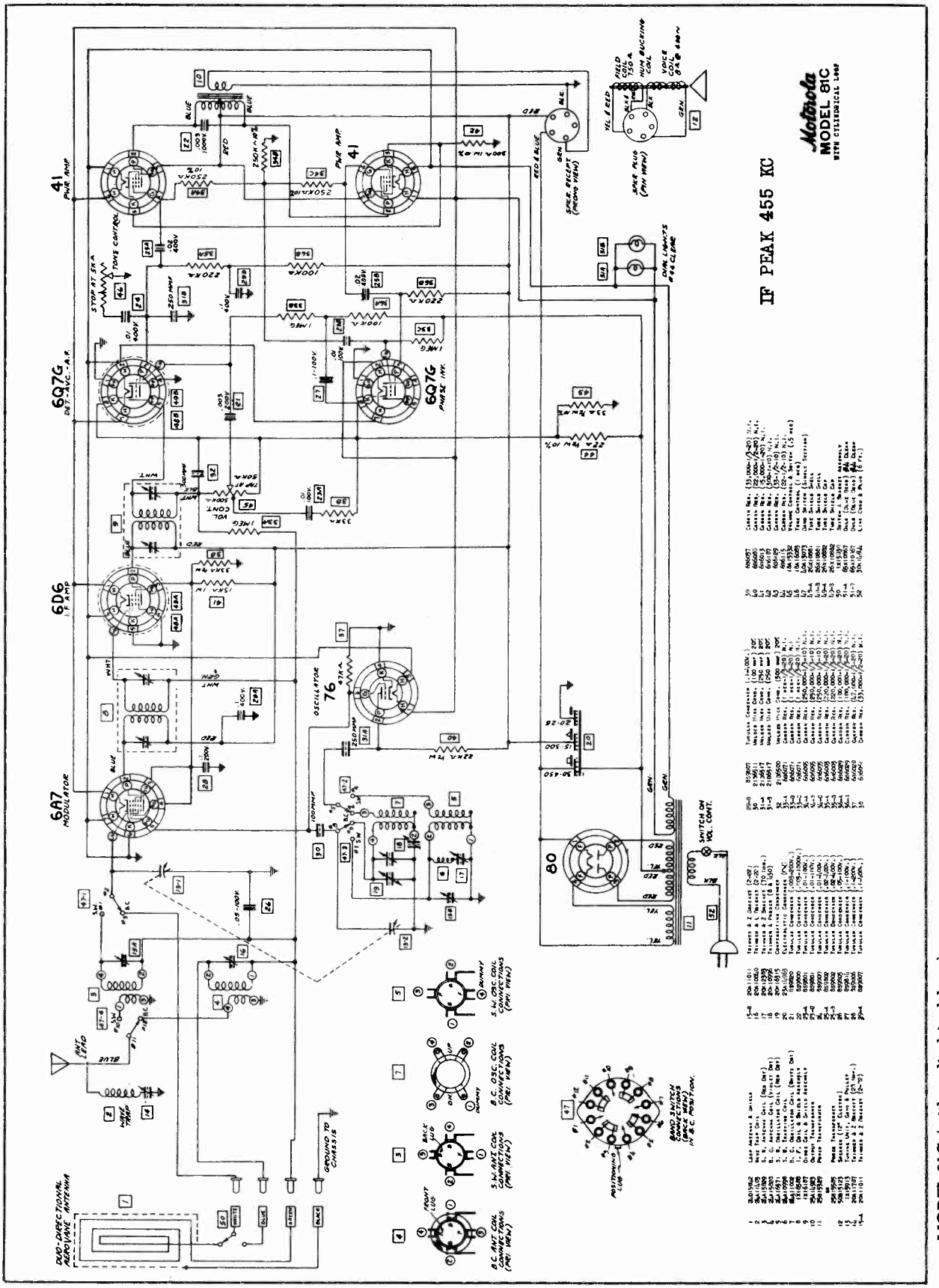
MODELS 61E,62E,63E
Chassis 6E
Schematic,Alignment

GALVIN MFG. CORP.



GALVIN MFG. CORP.

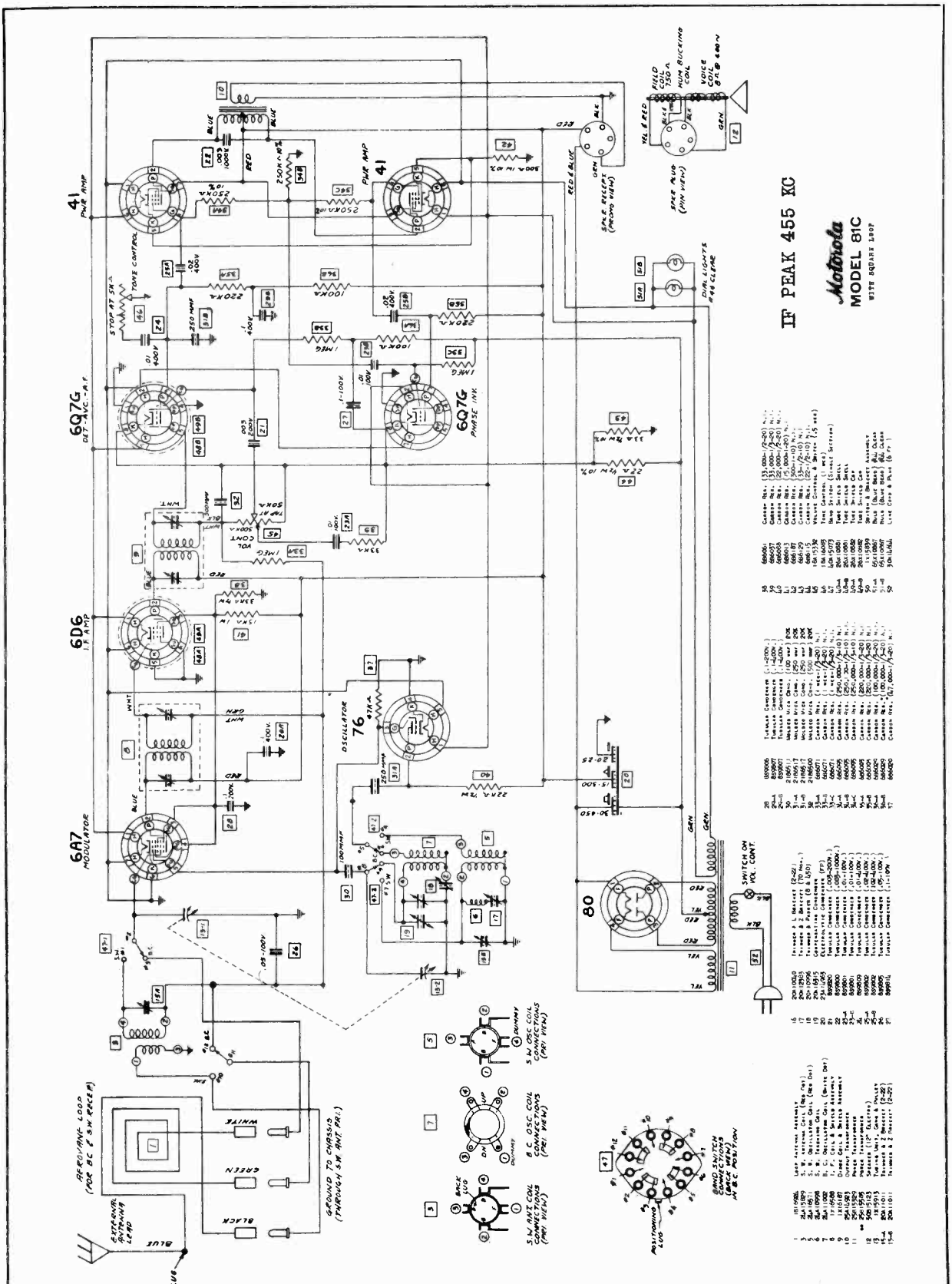
MODEL 81C
(Cylindrical Loop)
Schematic



MODEL 81C (with cylindrical loop)

MODEL 81C
(Square Loop)
Schematic

GALVIN MFG. CORP.



MODEL 82A
Schematic

GALVIN MFG. CORP.

OSC-MOD 6A7 · I.F. AMP 6D6 · DET-AVC-AF 6Q7G · PWR AMP 41 · PHASE INV. 6Q7G · PWR AMP 41

ANTENNA TERMINAL · GROUND TERMINAL · WAVE TRAP · SW · B.C. · TELEVISION · SPKR RECEPT (PRONG VIEW) · SPKR PLUG PIN VIEW · HUM BUCKING COIL · VOICE COIL · DIAL LIGHTS · PUSHBUTTON SET UP SWITCH

BAND SWITCH CONNECTIONS (LUG VIEW) IN B.C. POSITION

B.C. ANT. COIL CONNECTIONS (PRI. VIEW) · B.C. OSC. COIL CONNECTIONS (PRI. VIEW) · S.W. OSC. COIL CONNECTIONS (PRI. VIEW) · S.W. ANT. COIL CONNECTIONS (PRI. VIEW)

CLOCK MOTOR CABLE & PLUG · 15 MIN. SWITCH & CAMS · 24 HOUR CONTACTOR · 60 EGC CLOCK CONTROL · 96 15 MIN. CONTACTS · TIME BUSS · SLIDERS · STATION BUSS · CLOCK & ESCUT. CABLE COLORS SAME AS FOR MAGNET LEADS · CLOCK LIGHT CABLE & PLUG 6.8V. .25 AMP.

54 ESCUTCH. CABLE & PLUG · PUSH BUTTON SWITCH CONNECTIONS (REAR)

TUNER MAGNETS · CLOCK & TUNER RECEPTACLES (PRONG VIEW)

POWER RELAY RECEPT. (PRONG VIEW) · 48 POWER RELAY

CLEAR 84 POWER RECTIFIER · BLACK 84 STANDBY RECTIFIER

51 MOTOR MAGNET 130Ω · 52 REV. SW. · MTR SW · LINE SWITCH ON TONE CONTROL · TUNER MOTOR 49 · LATCH · STATION RING · TUNER MAGNET · E&T TUNER 50

Motorola
MODEL 82A

IF PEAK 455 KC

NOTE. SOME 82A HAVE A RESISTOR CONNECTED ACROSS CONDENSER 20

VOLTAGE CHART

TUBE	POSITION	PLATE	SCREEN	CATHODE	OSC. PLATE
6-A-7*	Osc. Mod.	240	120	0	190
6-D-6*	1. F.	240	120	0	—
6Q7G**	Det.-AVC	100	—	—4.5	—
6Q7G**	Inv.	120	—	—4.5	—
41	Output	240	245	12	—
41	Output	240	245	12	—
84	Standby Rect.	AC	—	410***	—
84	Rect.	AC	—	310	—

*Bias—3.0V. measured across motor magnet.
**Bias—1.5V. measured across resistor 43
***Stand-by voltage without load.
Measurements from socket terminal to chassis ground using 1000 ohms per volt meter.

SENSITIVITY DATA

Microvolt Input *	Generator Set at	Generator Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter **
2500	455 K.C.	6D6 Grid	.1 Mfd	.5 Meg	.65 Volts
30	455 K.C.	6A7 Grid	.1 Mfd	.5 Meg	.65 Volts
40	600 K.C.	6A7 Grid	.1 Mfd	.5 Meg	.65 Volts
12	600 K.C.	Ant. Lead	200 Mfd	None	.65 Volts

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

SETTING THE CLOCK

Since that part of the clock which controls the radio operates on a 24-hour basis, it is not sufficient to set the clock to the exact hour. It must also be set for day or night, as the case may be. Directly below the center of the clock dial is a small peep-hole, through which you can look to determine whether the day or night section is in control. White indicates day (6 A.M. to 6 P.M.), black indicates night (6 P.M. to 6 A.M.).

For example: If it is 12:00 o'clock noon when you set the clock, the clock hands should not only point to 12:00 o'clock, but a white surface should be visible through the peep-hole. If a black surface is seen instead, turn the clock ahead 12 hours.

IN SETTING THE CLOCK, ALWAYS TURN IT FORWARD — NEVER BACKWARDS.

Even though your setting of the clock has been fairly accurate, you will probably need to synchronize it with radio time. To do this, set up a series of programs, following the directions outlined in later paragraphs and watch carefully to see if the clock operates the electric tuner during the short interval in which program changes occur on the radio networks.

If you find that the mechanism operates a few seconds before the change in program should be accomplished, you can slow it by pulling the wall plug of the radio for the exact number of seconds that the clock was fast. If, on the other hand, the change in programs is slow, you should merely set the clock forward a few seconds by means of the time setting knob on the back of the clock. (Fig. 1). Several hours may be required to get the clock exactly synchronized with the change in radio programs. However, once this has been accomplished, it will not need to be done again until such time when you may pull the wall plug, or until your house current fails from some other cause.

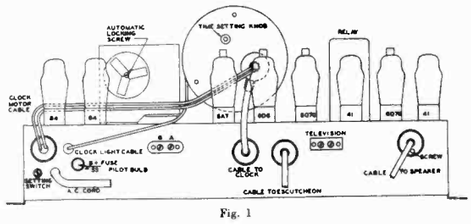


Fig. 1

TO RESTRING DIAL DRIVE CORDS

TUNING CORD

1. Cut a length of 30 lb. test silk fish cord 43 inches long.

2. Turn gang to fully meshed position.

3. Thread end of cord thru slot "A" in condenser pulley.

4. With an ordinary paper clip fasten cord to drive pulley to hold in place.

5. Wind cord in a clock-wise direction one full turn around the condenser pulley and down to the tuning shaft.

6. Wind cord in clock-wise direction three times around the drive shaft, and up to the condenser pulley.

7. Thread end of cord thru slot "A" in condenser pulley.

8. Knot both ends of cord together securely.

9. Hook one end of tension spring to cord.

10. Connect the other end of the spring to the hook "B" on the condenser pulley.

POINTER CORD

1. Cut a length of 30 lb. test silk fish cord 40 inches long and tie a ¾ inch loop in each end. Finished length should be 37 inches.

2. Place loop over front slab head set screw "C".

3. Run cord under idler pulley. No. 1.

4. Continue cord across front of chassis to idler pulley No. 2.

5. Continue cord clockwise around idler pulley No. 2.

6. Run cord under idler pulley No. 3.

7. Wrap string around rear bushing clock-wise six times.

8. Place loop over rear set screw "D".

9. Loosen front set screw and turn in counter-clock-wise direction until you have ½ to ¾ turns of cord around the front bushing and all slack has been taken up. Do not pull cord too tight. Watch back lash spring "J".

10. Replace dial pointer.

11. To set pointer to correct frequency, tune in a station of known frequency and adjust position of pointer on string.

12. Secure pointer to string with a drop of shellac or a good grade of household cement.

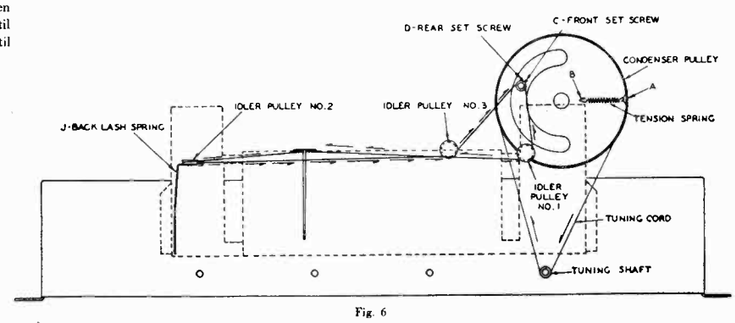


Fig. 6

ALIGNMENT PROCEDURE

1. Connect signal generator to control grid of Modulator tube (6A7) thru 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 I.F. trimmers (located in top of I.F. coil cans) to point showing highest reading on output meter.

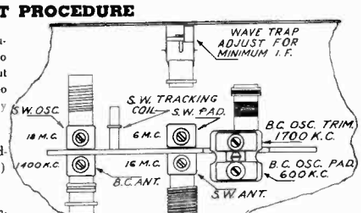
3. Leave band Switch in "Broadcast" position. Connect signal generator to antenna and ground terminals, using a .0002 MF condenser in antenna lead.

4. Set signal generator and receiver dial both at 1700 K.C. Adjust BC 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. and BC RF trimmers 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. Set signal generator at 455 K.C. and adjust wave trap trimmer for minimum deflection of output meter.



8. Turn band switch to "Short Wave" position, substituting a 400 ohm carbon resistor in the antenna lead to signal generator.

9. Set signal generator and receiver dial both at 18 MC. Adjust SW OSC. trimmer until 18 MC signal is heard.

10. Set signal generator at 16 MC and turn condenser gang to the signal at 16 MC. Adjust SW ANT. trimmer to point giving greatest output reading, while slightly rocking condenser gang.

11. Set signal generator at 6.0 MC and rock pointer at 6.0 MC position on dial scale, while adjusting SW padder, until combination is found which gives highest output reading. (NOTE: If there is noise level at 6.0 M.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.)

SETTING THE TIME TUNER

To set up a series of programs requires but a few moments of your time. Proceed as follows:

1. Select and list the programs you wish to hear during the next 24-hour period. Note the time they come on the air and the stations on which they will be heard. (If your daily paper lists the radio programs by 15-minute intervals, as most of them do, all you need is to have the radio column before you as you "set up" your selections.)

2. Insert your finger in the "OFF" position of the clock FINGER DIAL and turn the dial to the LEFT (counter-clockwise) until the stop is reached. Remove your finger and permit the dial to return to its normal position (just like a telephone dial). This operation will clear or cancel any previous setting that may have been made and leave the clock control mechanism in neutral position, ready to receive the new series of programs.

3. By means of the round TIME SELECTING knob at the bottom of the clock, turn the red pointer to the desired quarter hour at which you wish to hear a radio program.

4. Insert your finger in the position of the station you want to hear at that time and turn the dial clockwise until the stop is reached, just as you would if you were dialing a telephone. Remove your finger—the dial will return to its normal position.

5. Turn the red pointer to the time of the next desired program and dial the next station you wish to hear, in the same manner.

6. For those periods throughout the twenty-four hour day when you do not wish to listen to a program, the clock can be made to turn the radio "OFF" by turning the red pointer to the desired quarter hour time, and by dialing the "OFF" position—just the same as you would dial a station position.

Try to think of the clock as doing for you exactly the same thing you do for yourself when you press a button on the front of the radio. Instead of actually pressing the button, the clock closes the same electrical circuit at the proper time, and holds the circuit closed for three seconds—long enough to tune a station or to operate the "ON" or "OFF" relays, after which interval it releases control. It will not take control again until the next quarter hour arrives and will take control then, only if something has been "dialed" for that time.

TO SET AUTOMATIC TUNER

1. Turn the motor switch OFF. This opens the motor circuit so the tuner can be set without running the motor, since a more accurate adjustment is possible.

Two types of motor switches have been used. The first type was adjustable by means of a screw driver inserted through a hole in the chassis base. This type of switch should be turned one-quarter turn to the right.

The other type was a slider switch which should be pushed down for the setting up procedure.

Refer to Fig. 1 for the exact location of the setting switch.

2. Loosen the automatic locking screw, using a screw driver or coin. This screw should be turned counter-clockwise four or five revolutions, far enough to assure plenty of looseness.

3. Turn the dial all the way to the low frequency end (535 K.C.).

4. Press the first button and hold it down. A faint "click" should be heard, indicating that the tuning magnet has attracted the latch bar.

5. Holding the magnet energized, turn the dial manually all the way to the high frequency end (1720 K.C.) and then all the way back to the low frequency end (535 K.C.).

6. Still pressing on the button, tune in the station to be set on that button.

7. Proceed to set the remaining five stations. For each station follow Steps 3, 4, 5, and 6 as outlined above. AT NO TIME IN THE SETTING-UP PROCEDURE SHOULD THE TUNING MOTOR BE PERMITTED TO RUN.

8. Tighten the automatic locking screw very securely. Do not hold the tuning knob while locking the automatic, but allow the mechanism to turn to its natural stop.

9. Turn the motor switch so the motor will run when any tuning button is pressed.

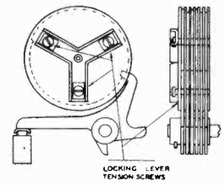


FIG. 2

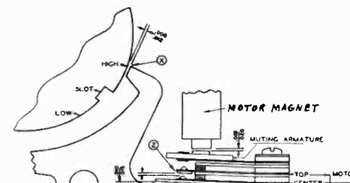


FIG. 3

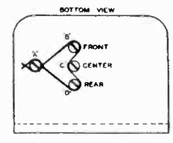


FIG 4.

REVERSING SWITCH AND MOTOR CONTACT ADJUSTMENT

NOTE: Four adjusting screws extend upward through the switch mounting plate, three of them in line, and one set off by itself. (See Fig. 4.)

1. Turn the rotor assembly until the HIGH sides of all latch rings rest opposite the latch tips.

2. Turn screw "A" in until all latch bar tips touch HIGH side of ring and then turn the screw back one-half turn. (Spacing between latch tip and high side of ring at point "X" should be 8 to 12 thousandths of an inch.)

3. Hold any latch bar tip down on HIGH side of ring and adjust screw "C" (center screw) until the bakelite insulator on the center switch leaf just barely misses touching the heel of the latch bar at point "Y". (Check adjustment by pressing other latch bars. The depressed latch bar must not lift the center contact even slightly.)

4. With latch bar at rest position adjust screw "B" (front screw) until top motor contact is lifted from center contact by 12 to 15 thousandths of an inch at point "Z". (15 thousandths = $\frac{15}{1000}$").

5. Turn rotor until LOW side of ring rests under latch tip. Press any latch bar down and make sure switch actually reverses. (Bottom contact must break and top contact make sufficiently to lift the top switch leaf slightly from the bakelite spacer.)

6. Turn screw "D" (rear screw) until contact armature rests 10 to 15 thousandths of an inch from the magnet pole. (Too close spacing will cause intermittent muting due to vibration.) (15 thousandths = $\frac{15}{1000}$").

CHECKING CLOCK CONTINUITY

Although we have sealed the Time Tuning Clock against unauthorized tinkering, and have established a policy of voiding the guarantee if the seal is broken, it is possible to completely check the clock circuit for defects without removing the mechanism from its housing. This can be done by "ear" and by continuity.

The first step in checking a clock is to make sure that the motor runs and that it keeps accurate time. Just plug it into its receptacle on the chassis and check its time-keeping qualities against a known source of accurate time.

If this test indicates that the clock motor is not running, it would be advisable to make certain that the receptacle on the chassis base is "live" and that 110 volts, 60 cycle A.C. is available at that point.

Before attempting to check the clock continuity, it would be helpful to go through a little practice course in listening to the sounds the clock makes. First, remove the clock assembly from its mounting on the control panel of the receiver, and hold it in your hands while you turn the time set knob on the back. While turning the knob, hold the clock up to your ear, listening for the clicks. When the minute hand passes any of the four quarter-hour intervals into which each hour is divided, you will hear two clicks, the second of which falls very closely after the first one. These clicks are caused by the quarter-hour cam switch blades dropping off of the cams.

As you turn the time set knob, you will notice another single click which is a little louder and sounds a trifle more metallic than the double click which you get at the exact quarter-hour intervals. This single click will be heard when the minute hand is passing a point that is approximately half way between the quarter-hour positions. This click is caused by the contact on the twenty-four hour hand as it falls off of one time bar to make contact upon the next time bar.

If you will go through this operation several times, you will soon be able to identify these sounds. Once you are able to recognize them, you will be able to thoroughly check the continuity of the clock control circuit, without the necessity of looking inside the mechanism. Proceed as follows:

1. With the time set knob, turn the clock hands until they read fifteen minutes to twelve on the day cycle. Look through the peep-hole to make sure of this.
2. Slowly turn the time set knob forward until the minute hand indicates approximately two minutes to twelve. In the course of this movement you will hear, unless the clock is defective, a single click which indicates that the twenty-four hour contact has come to rest upon the twelve o'clock noon time bar.
3. Now *very slowly* continue to turn the time set knob forward until you hear the first click, which indicates that the top blade of the twenty-four hour cam switch has fallen off of the large cam, causing the cam switch circuit to close. As soon as you hear this first click, stop turning the time set knob, for if you turn it far enough to hear the second click, the contact will be broken. The trick is to turn it just far enough, but not too far.
4. Clear the clock of all previous settings by inserting a finger in the "OFF" position of the finger dial, and dialing counter-clockwise until the stop is reached.
5. With the round time-selecting knob on the front of the clock, turn the red time selecting pointer to 12:00 o'clock noon.
6. With a continuity meter, check continuity between Terminal No. 9 and all of the other terminals on the plug at the end of the clock cable. You should get no reading. Terminal No. 9 is connected to the common lead.
7. Dial the "OFF" position just as you would if you were setting up the clock to turn the radio off at 12:00 o'clock noon. Check continuity between Terminal No. 9 and Terminal No. 7. You should get a full scale reading indicating a complete circuit. (Terminal No. 7 connects to the off relay when the clock is plugged into the chassis).
8. Dial Station No. 1 and check continuity between Terminal No. 9 and Terminal No. 1 of the clock cable. A full scale reading should result.
9. In their respective order, dial Stations 2, 3, 4, 5, and 6, checking continuity after each dialing between Terminal No. 9 and Terminals 2, 3, 4, 5, and 6, respectively. In each case you should get a full scale deflection of your continuity meter between Terminal No. 9 and the terminal which corresponds in number to the position you have dialed on the finger ring.

The procedure through which you have gone up to this point will, if the proper readings have been obtained, tell you that the slider on the time bar which represents the 12:00 o'clock noon position, is making a proper contact with each of the station rings and the "OFF" ring in the clock.

10. Next turn the clock hands knob to the 12:15 o'clock position, also turn the red time-selecting pointer to the 12:15 o'clock position, and repeat Steps 1 to 9 for the 12:15 o'clock position. To check the clock 100%, it will be necessary to repeat the procedure ninety-six times, one for each fifteen minute interval of the twenty-four hour day.

However, if the test which you have made at the 12:00 o'clock noon position shows the mechanism to be O.K. it should not be necessary to go through the entire operation. A test made at 12:00 o'clock noon and 12:00 o'clock midnight, and tests at 6:00 A.M. and 6:00 P.M. should give you a fairly accurate test. However, it is possible that, due to damage or improper adjustment of one individual time bar or slider, the clock fails to operate at one particular quarter-hour period, although it operates as it should at all other times. In this case, a continuity test would be advisable at the particular time setting at which failure has been noted.

ELECTRIC TUNER SERVICE SUGGESTIONS

Following you will find a list of troubles you may experience with the automatic tuning system.

Each possible failure is followed by suggestions which may aid you in quickly solving your service problems with this model.

MOTOR DOES NOT RUN

1. Burned out 84 Tube (Black). This is a standby tube and should burn at all times.
2. ***Poor Contact at Push-Button Plug.*** Inspect the contacts between the plug and the receptacle on the chassis.
3. ***Open Circuit in Motor.*** Check all connections to motor and check motor winding for continuity.
4. 70 Mfd. motor starting condenser opened.
5. Motor magnet coil opened. (See Fig. 3.)
6. B plus fuse (No. 55 Pilot bulb) burned out. Accessible from rear of chassis base. (See Fig. 1.)
7. ***Magnet Fails To Release.*** If the magnet which has previously been energized, fails to release the latch bar for any reason, the motor cannot turn the mechanism.

MECHANISM RUNS SLUGGISHLY

1. ***Poor Contact Between Push-Button Plug and Receptacle.*** This will also result in voltage drop, and lessened motor power.
2. Tension on motor contact armature too great.
3. ***Gears Not Properly Meshed.*** Check all gears in assembly for binding due to improper meshing.
4. ***Defective Motor.***—Replace.

MOTOR FAILS TO REVERSE

1. ***Reversing Switch Not Properly Adjusted.*** See instructions elsewhere in this book.
2. ***Open Circuit in Motor.*** If one side of motor circuit is open, motor will run in one direction only.
3. ***Open Magnet Winding.*** An open magnet, will not pull latch down; consequently will not cause motor switch to reverse.
4. ***Latch Bar Spring Too Tight.*** If the latch bars operate under too much tension the magnet may not be able to pull the latch down.

FAILS TO RETAIN ORIGINAL SETTING

1. ***Latch Rings Not Locked Securely.*** The locking screw must be pulled down securely, otherwise, the shock of the sudden stopping will tend to slide the rings away from the original setting.
2. ***Original Setting Not Accurate.*** Resetting of magnets may be necessary after several days' use, during which time the mechanism goes thru a "Shaking down" process.
3. Cable assembly from station magnets touching latch bars. Dress cable.

IMPOSSIBLE TO SET UP STATIONS

1. ***Too Much Tension On Locking Levers.*** When the automatic locking screw is loose, the station rings should move freely. If the levers still hold the station rings partially locked, the screws which hold the levers in position should be loosened one-quarter to one-half turn.
2. ***Latch Rings "Out of Range."*** If the loosened latch rings slip on the drum until the notch falls out of reach of the latch bar, they can be brought back to position by following exactly the "setting procedure" outlined elsewhere in this book.

FAILS TO STOP AT STATION

1. ***Open Magnet Winding.*** Check for continuity and replace if necessary. Check latch bar cable assembly. See No. 6 below.
2. ***Latch Bar Defective.*** Inspect latch bar to make sure that it has not been damaged. Replace latch bar, if required.
3. ***Poor Contact at Push-Button Plug.*** A poor contact here means a voltage drop which reduces the pulling power of the magnet.
4. ***Improper Spacing of Magnet.*** Check the spacing between the latch bar armature and the magnet pole. When the tip of the latch bar is seated all the way down in the notch in the latch ring, the armature should not quite touch the magnet pole. A hair line of light should be visible between them.
5. ***Latch Rings Not Locked Securely.*** If the latch rings are very loose the motor will continue to run.
6. Cable assembly from station magnets, touching latch bars. Dress cable.

LATCH BAR STICKS IN NOTCH

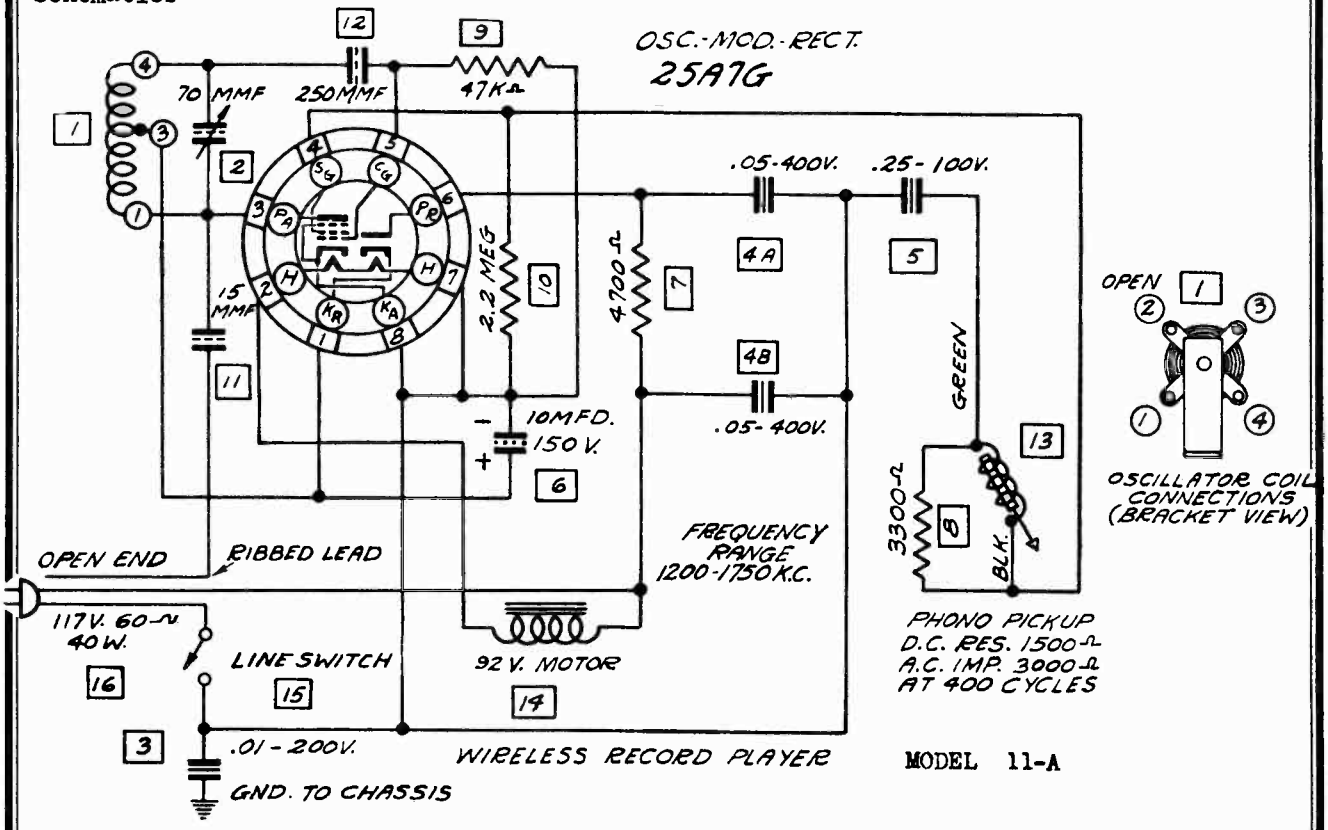
1. ***Latch Bar Spring Weak.*** Check latch bar tension spring to make sure it is pulling away from the magnet with sufficient force. Spring tension is adjustable.
2. ***Armature Rivet Worn.*** There is a brass rivet at the tip of the armature, to prevent the armature freezing to the magnet. If this rivet is worn down, permitting the steel armature to actually touch the magnet pole, it may freeze in that position.
3. ***Burr On Tip of Latch.*** Latch tip should be smooth and shiny.
4. ***Binding in Latch Bearings.*** Latch must move freely but not sloppy.
5. ***Latch Tips Not Centered On Latch Rings.*** Latch tips must not rub bakelite guide rings. The latch bar bearing shaft is adjustable.
6. ***Friction Clutch Too Tight.*** A tension washer between the motor pinion and the brass pinion collar acts as a friction clutch to absorb the shock of stopping the motor quickly when a station is tuned. If the tension is too tight, the torque of the stopped motor will hold the latch bar tip in the notch.

SET DOES NOT TURN ON

1. "B" Fuse burned out (No. 55 Pilot Bulb) See Fig. 1.
2. Standby rectifier (black 84 tube) burned out.
3. Defective relay. See Fig. 1. Return to your Motorola distributor or factory for service. Relay plugs into socket in chassis base.

MODEL 11A
MODEL 21A
Wireless Record Players
Schematics

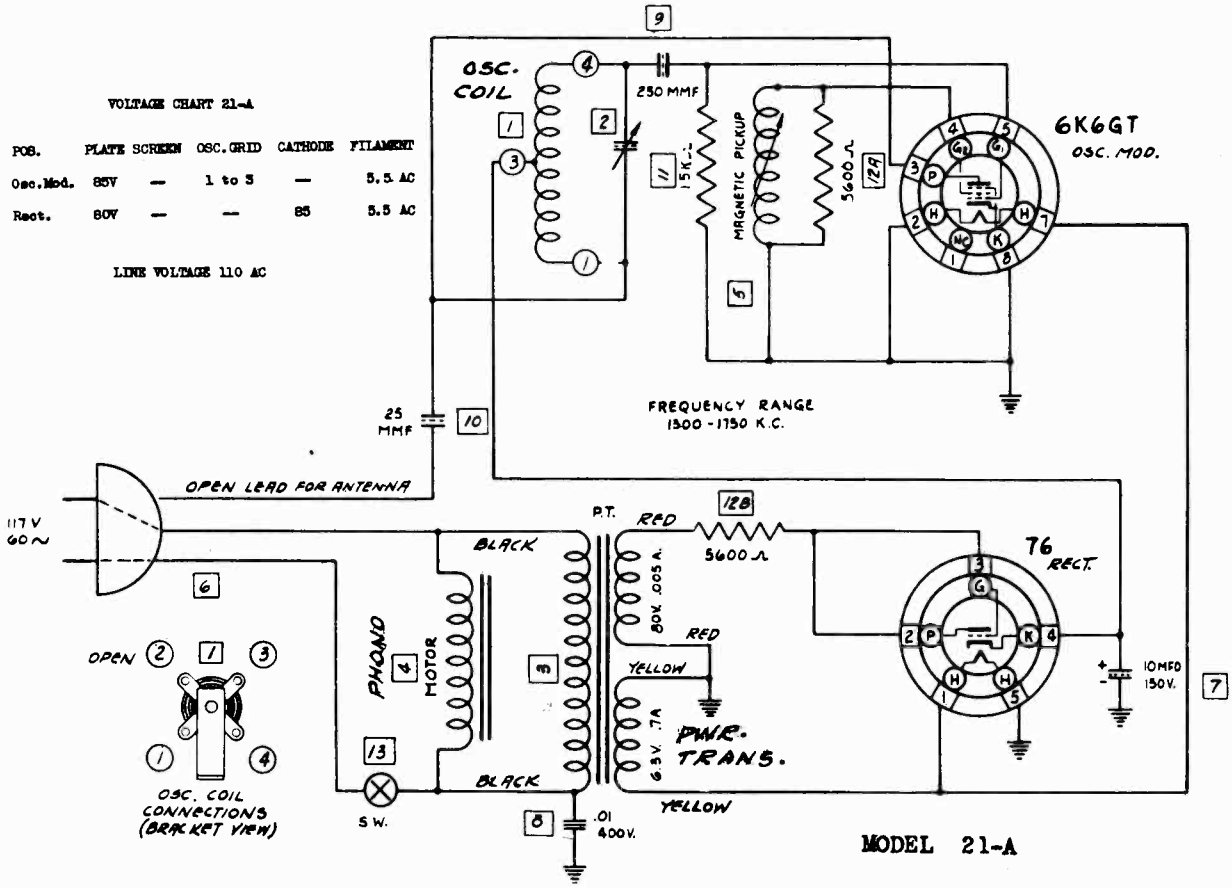
GALVIN MFG. CORP.



VOLTAGE CHART 21-A

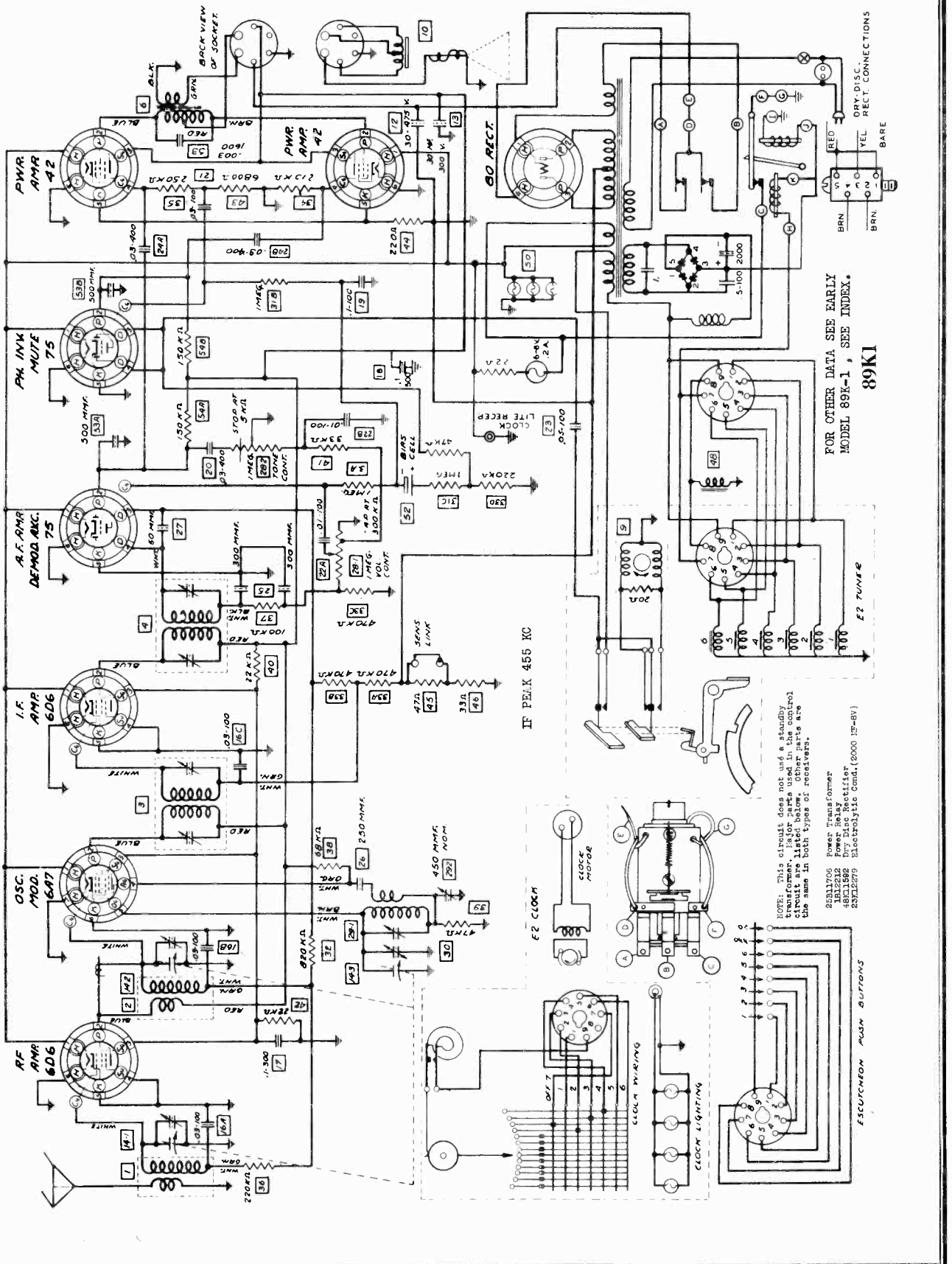
TUBE	POS.	PLATE	SCREEN	OSC. GRID	CATHODE	FILAMENT
6K6GT	Osc.Mod.	85V	—	1 to 3	—	5.5 AC
76	Rect.	80V	—	—	85	5.5 AC

LINE VOLTAGE 110 AC



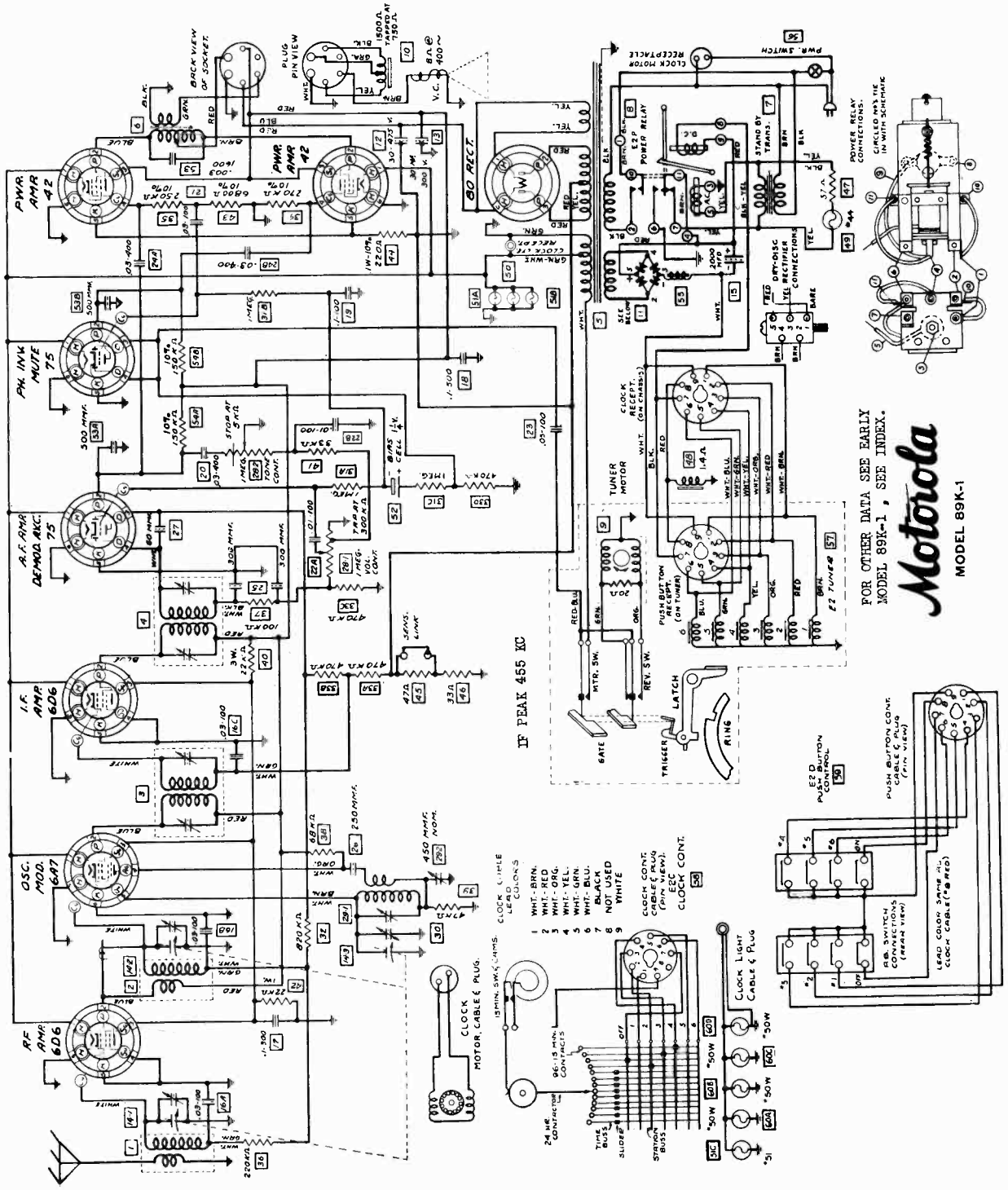
MODEL 89K1, Type 2
Schematic

GALVIN MFG. CORP.



MODEL 89K1,Type 3
Schematic

GALVIN MFG. CORP.

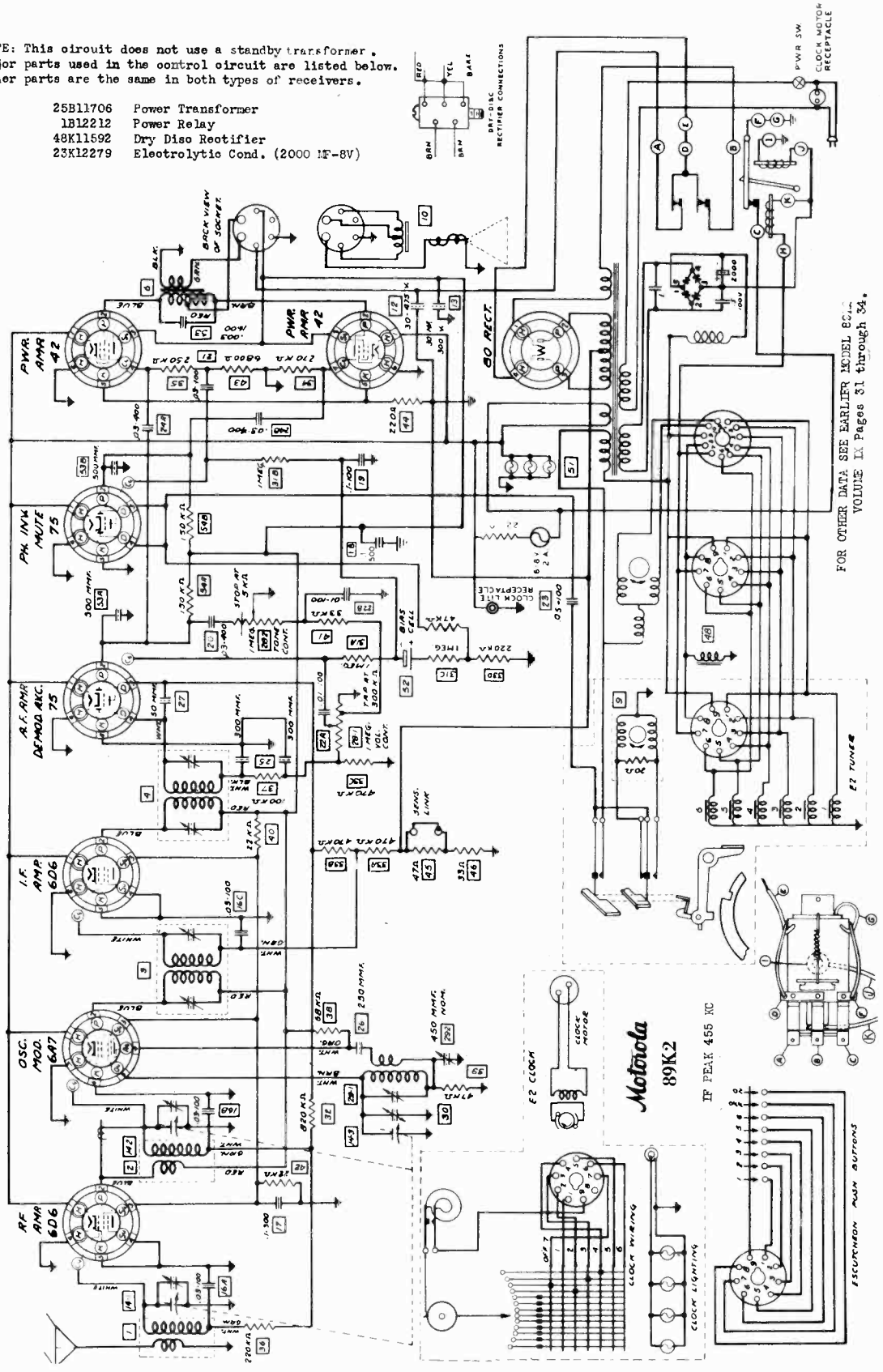


MODEL 89K2, Type 2
Schematic

GALVIN MFG. CORP.

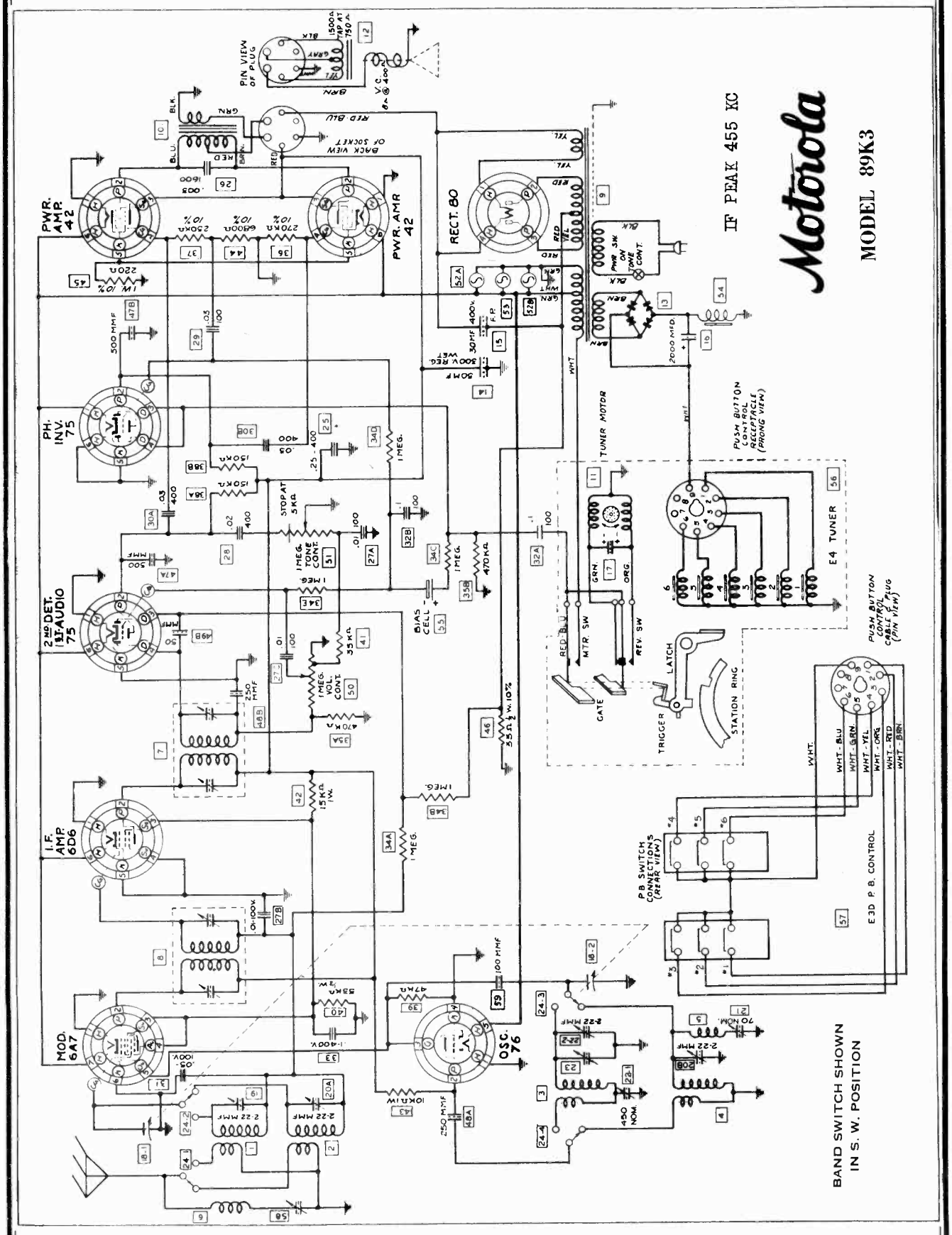
NOTE: This circuit does not use a standby transformer. Major parts used in the control circuit are listed below. Other parts are the same in both types of receivers.

25B11706	Power Transformer
1B12212	Power Relay
48K11592	Dry Diso Rectifier
23K12279	Electrolytic Cond. (2000 MF-8V)



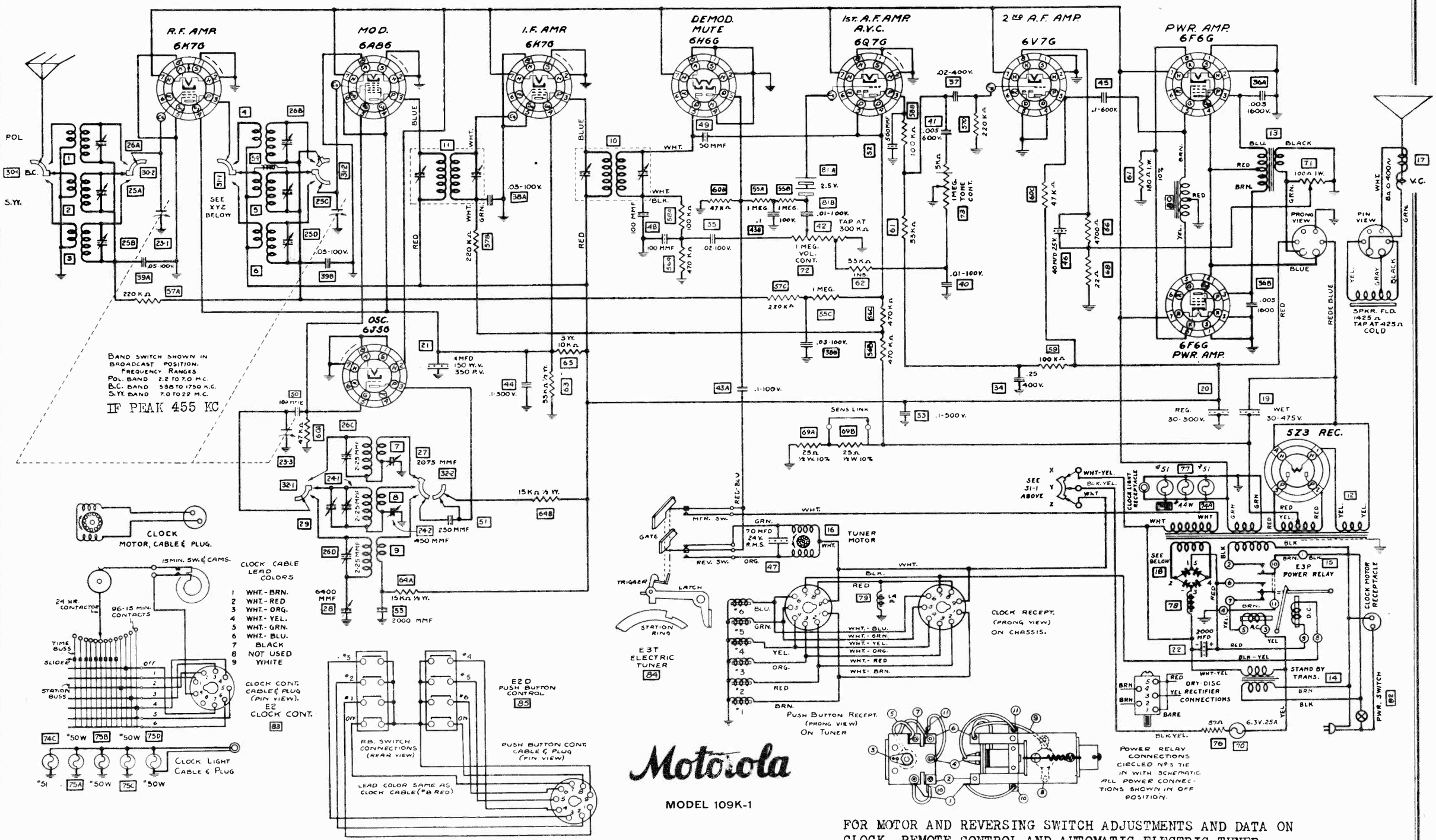
MODEL 89K3
Schematic

GALVIN MFG. CORP.



MODEL 109K1, Type 1
Schematic

GALVIN MFG. CORP.



FOR MOTOR AND REVERSING SWITCH ADJUSTMENTS AND DATA ON CLOCK, REMOTE CONTROL AND AUTOMATIC ELECTRIC TUNER SEE MOTOROLA PAGES 9-33 AND 9-34 (MODELS 89K1 and 89K2) OF VOLUME 1X

MODEL 109K1,Types 1,2
MODEL 109K2,Types 1,2
Alignment,Voltage,Sensitivity,Trimmers

MODEL 109K1,Type 2
Schematic

GALVIN MFG. CORP.

ALIGNMENT PROCEDURE—MODELS 109K1 AND 109K2

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

2. Set signal generator at 455 K.C. and carefully adjust the 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 BC 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. and BC RF trimmers 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 "Police" position. Replace .0002 MF condenser in signal generator lead with a 400 ohm carbon resistor.

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

9. Set signal generator at 6.0 MC and turn condenser gang to signal at 6.0 MC. Adjust POLICE ANT. and POLICE RF trimmers 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 22.0 MC. Adjust SW OSC. trimmer until 22.0 MC signal is heard.

12. Set signal generator at 18 MC and turn condenser gang to the signal at 18 MC. Adjust SW ANT. and SW RF trimmers to point giving greatest output reading, while slightly rocking condenser gang.

13. Padders on "Police" and "Short Wave" bands are fixed. (No adjustment necessary).

SOCKET VOLTAGES—MODELS 109K1 AND 109K2

Numerals refer to socket terminals as indicated on circuit diagram.

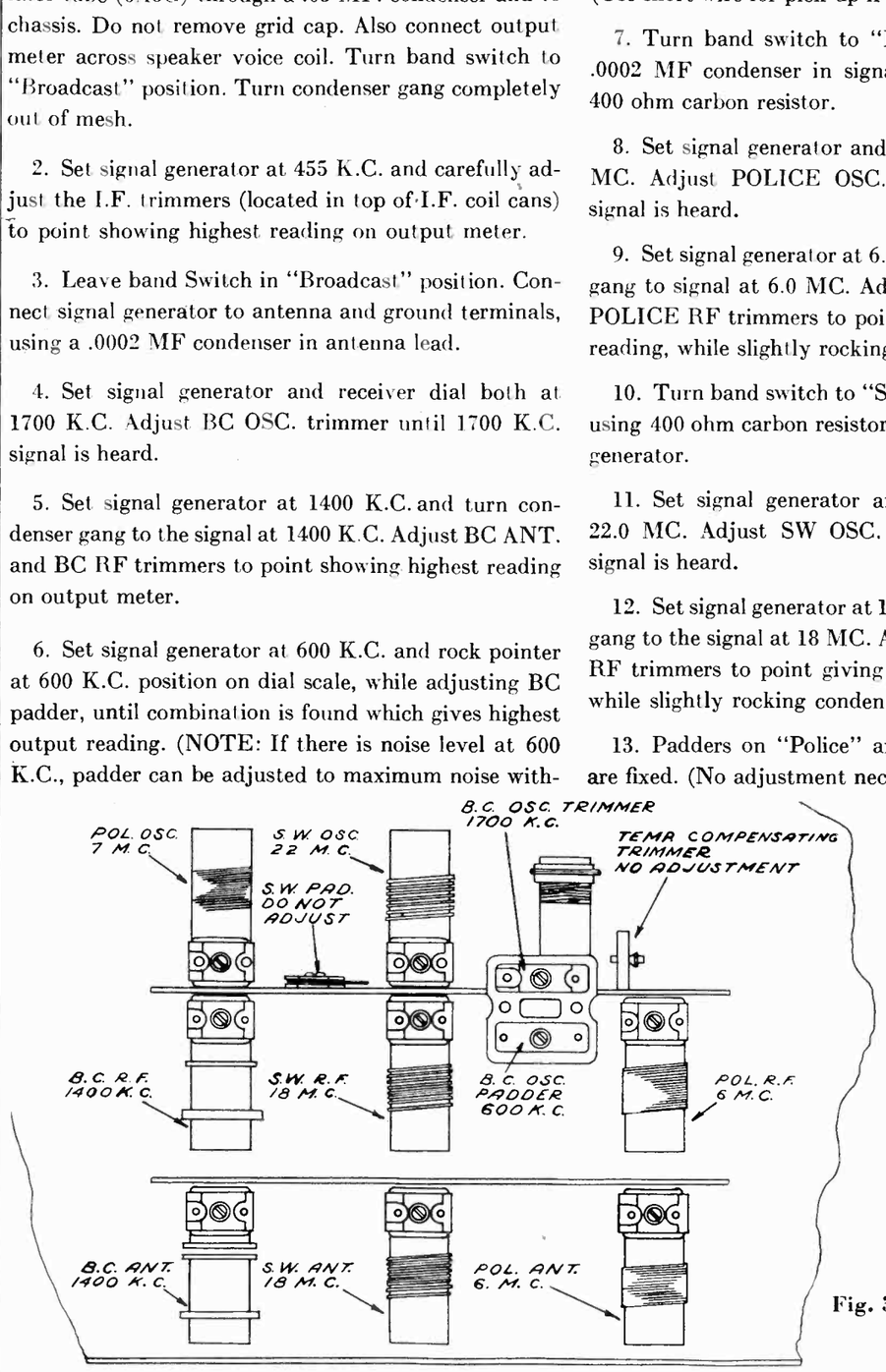
TUBE	POSITION	1	2	3	4	5	6	7	8
6K7G	R.F.	0	6. AC	210	95	0	0	0	0
6J5G	Osc.	0	6. AC	130	0	−25	0	0	0
6A8G	Mod.	0	6. AC	210	95	−25	95	0	0
6K7G	I.F.	0	6. AC	210	95	0	0	0	0
6H6G	Det.-Avc.	0	6. AC	−2	0	0	0	0	0
6Q7G	A.F. Mute	0	6. AC	115	0	0	0	0	0
6V7G	Ph. Inv.	0	0. AC	115	0	0	0	6. AC	10
6E6G	Output	0	6. AC	240	250	0	0	0	10
6F6G	Output	0	6. AC	240	250	0	0	0	10
5Z3	Rect.	310	AC	AC	310				

SENSITIVITY DATA—MODELS 109K1 AND 109K2

Microvolt Input *	Generator Set at	Generator Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter **
20,000	455 K.C.	6K7G Grid (I.F.)	.1 MF	.5 Meg.	2.82 Volts
300	455 K.C.	6A8G Grid	.1 MF	.5 Meg.	2.82 Volts
350	600 K.C.	6A8G Grid	.1 MF	.5 Meg.	2.82 Volts
15	600 K.C.	6K7G Grid (R.F.)	.1 MF	.5 Meg.	2.82 Volts
2	600 K.C.	Ant. Lead	.0002 MF	None	2.82 Volts

*For 1 Watt output.

**Output meter connected across voice coil.

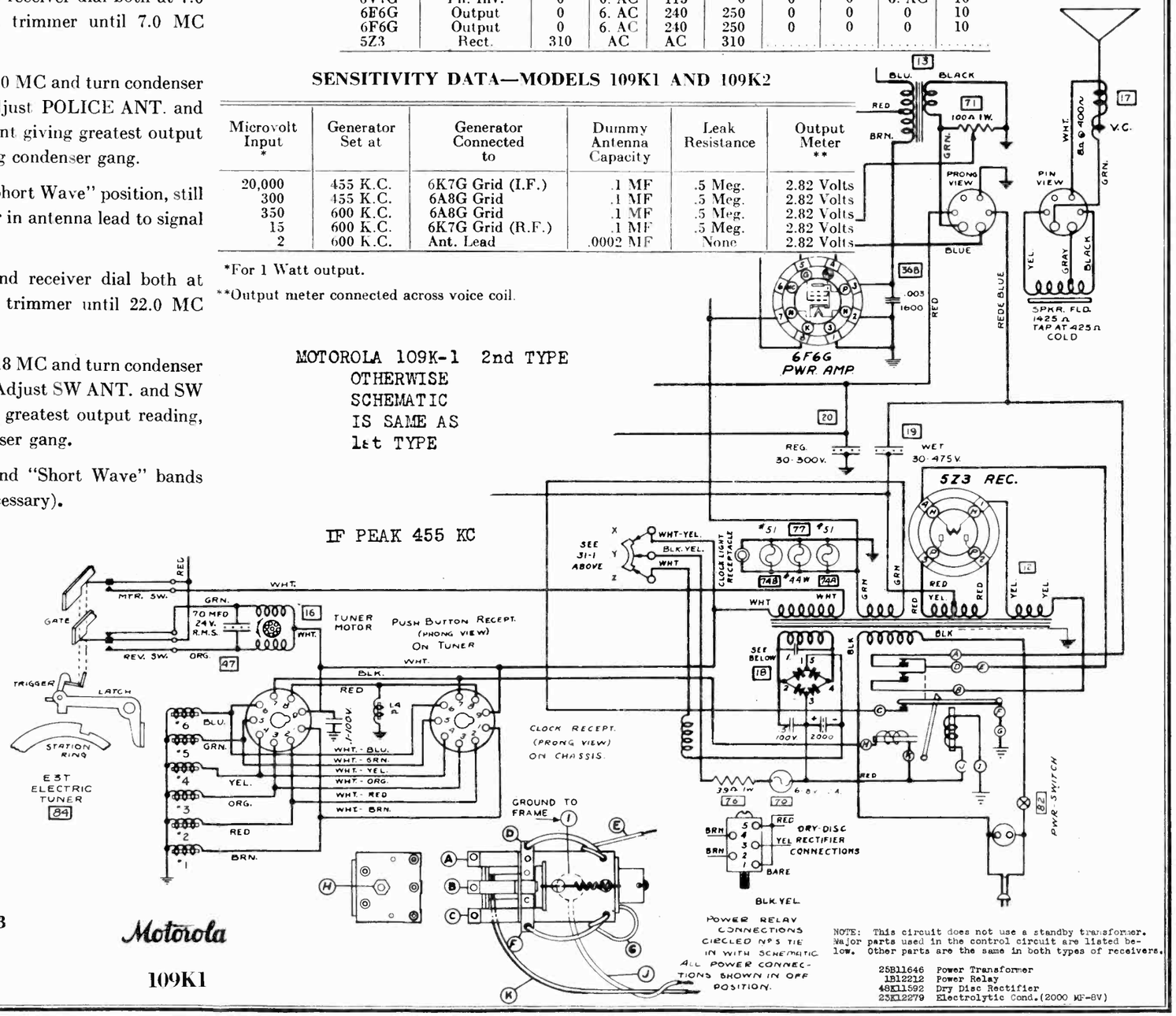


109K1 AND 109K2 TRIMMERS

Fig. 3

MOTOROLA 109K-1 2nd TYPE OTHERWISE SCHEMATIC IS SAME AS 1st TYPE

IF PEAK 455 KC



Motorola

109K1

NOTE: This circuit does not use a standby transformer. Major parts used in the control circuit are listed below. Other parts are the same in both types of receivers.

25B11646	Power Transformer
1B12212	Power Relay
48K11592	Dry Disc Rectifier
25K12279	Electrolytic Cond.(2000 MF-8V)

MODEL 109K2, Type 1
Schematic

GALVIN MFG. CORP.

FOR MOTOR AND REVERSING SWITCH ADJUSTMENTS AND DATA FOR CLOCK, REMOTE CONTROL, AND AUTOMATIC ELECTRIC TUNER, SEE MOTOROLA PAGES 9-33 AND 9-34 (MODELS 89K1, 89K2) VOL. 1X

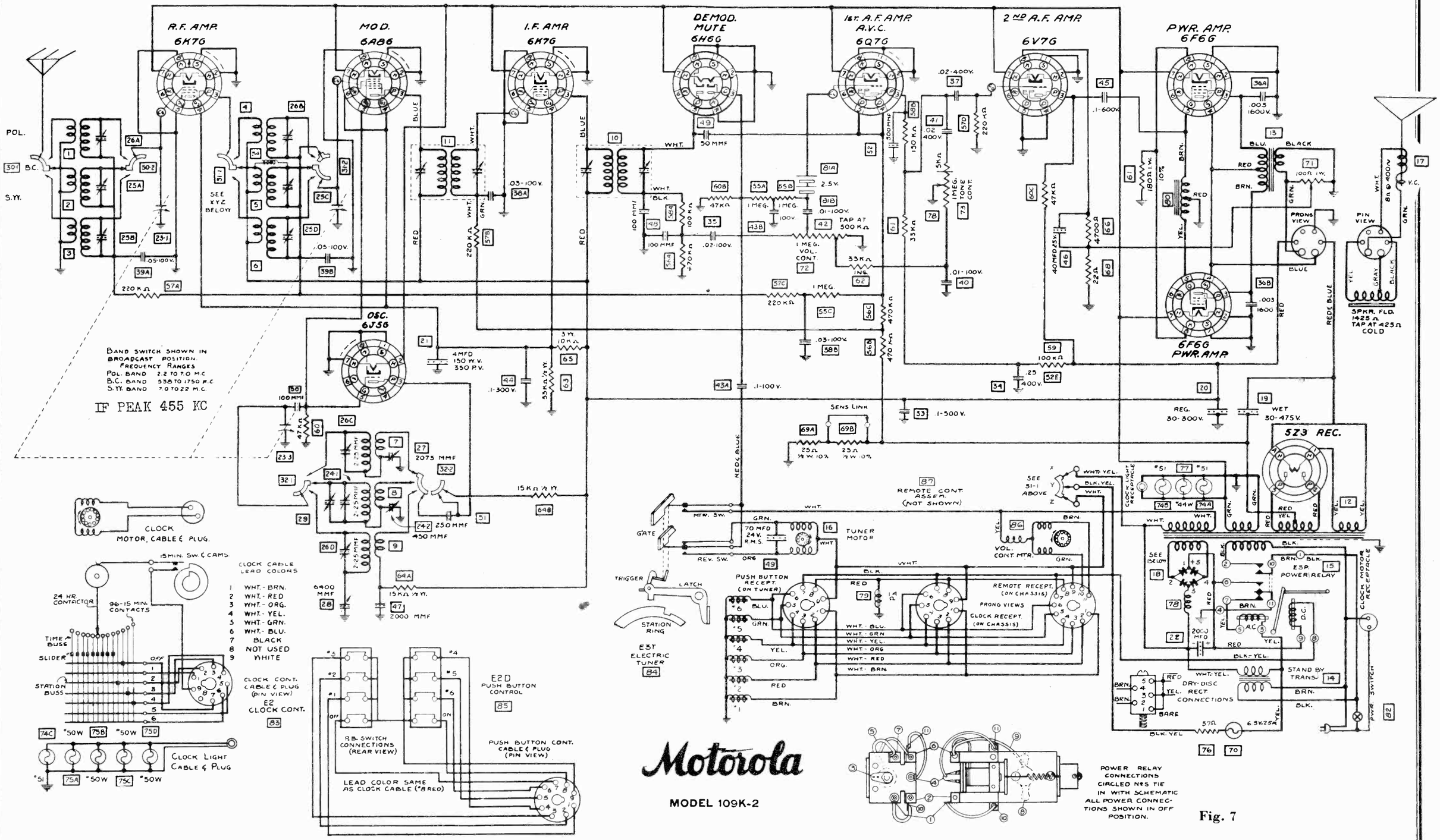


Fig. 7

MODEL 89K3
Alignment, Trimmers, Voltage
Sensitivity, Switch Data
MODEL 109K2, Type 2
Schematic
Switch
Data

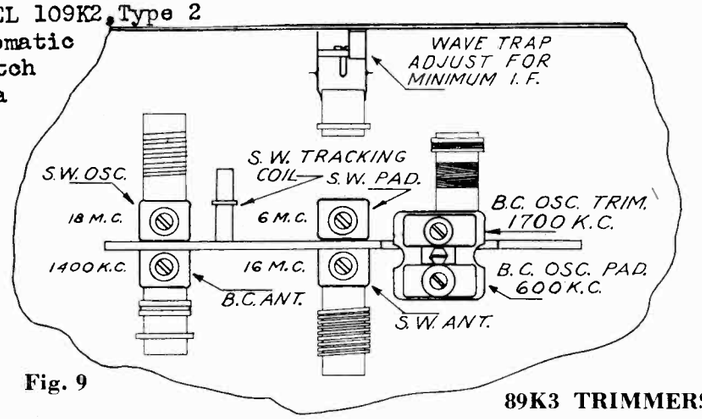


Fig. 9

89K3 TRIMMERS

SENSITIVITY DATA—MODEL 89K3

Microvolt Input *	Generator Set at	Generator Connected to	Dummy Antenna Capacity	Leak Resistance	Output Meter **
2800	455 K.C.	6D6 Grid	.1 MF	.5 Meg.	.65 Volts
20	455 K.C.	6A7 Grid	.1 MF	.5 Meg.	.65 Volts
25	600 K.C.	6A7 Grid	.1 MF	.5 Meg.	.65 Volts
5	600 K.C.	Ant. Lead	.0002 MF	None	.65 Volts

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

SOCKET VOLTAGES—MODEL 89K3

Numerals refer to socket terminals as indicated on circuit diagram.

TUBE	POSITION	1	2	3	4	5	6	7
6A7	Modulator	6. V.	220	80	80	0	0	0
6D6	I.F. Amp.	6. V.	220	80	0	0	0	.....
75	Diode Det. Avc-AF	6. V.	125	0	-.5	0	0	.....
75	Phase Inv.	6. V.	125	0	0	0	0	.....
76	Oscillator	6. V.	155	0	0	0	.....	.....
42	Pwr. Audio Amp.	6. V.	250	220	0	13.	0	.....
42	Pwr. Audio Amp.	0. V.	250	220	0	13.	6	.....
80	Rectifier	340	AC	AC	DC	.....	.....	.....

MODELS 89K3 AND 109K2

MOTOR AND REVERSING SWITCH ADJUSTMENTS

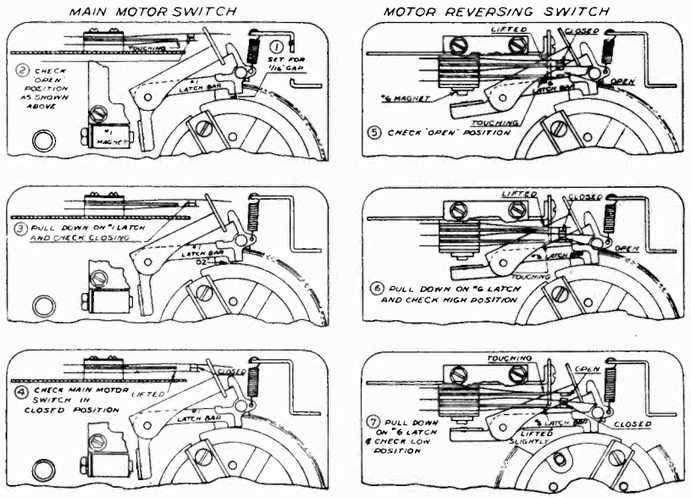


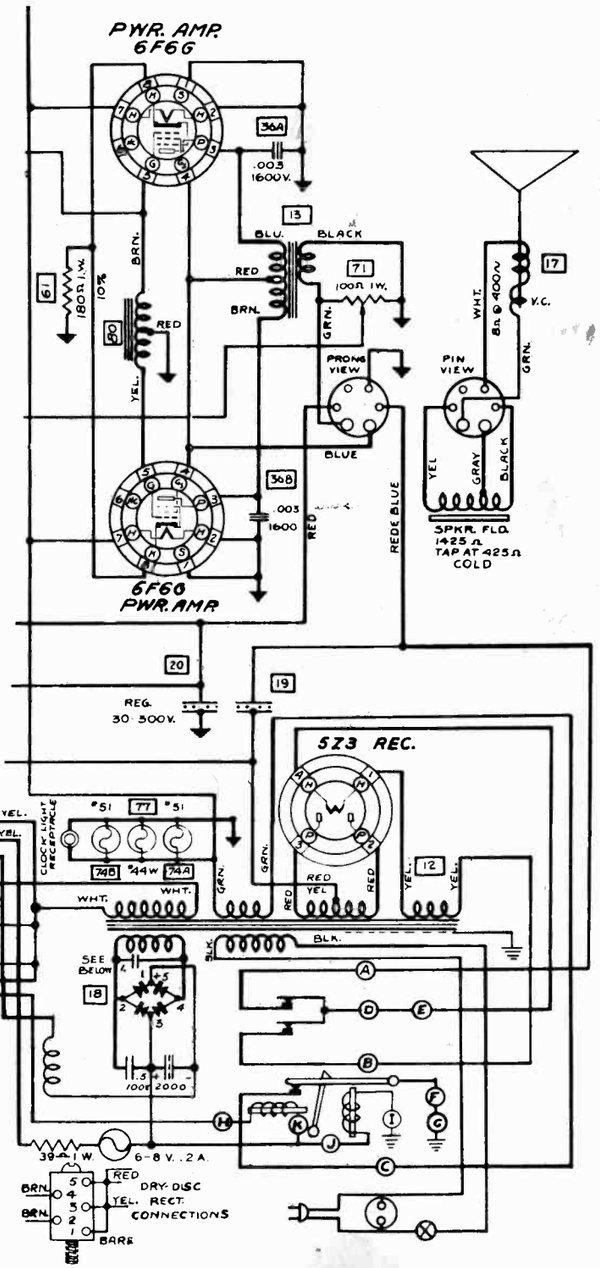
Fig. 1

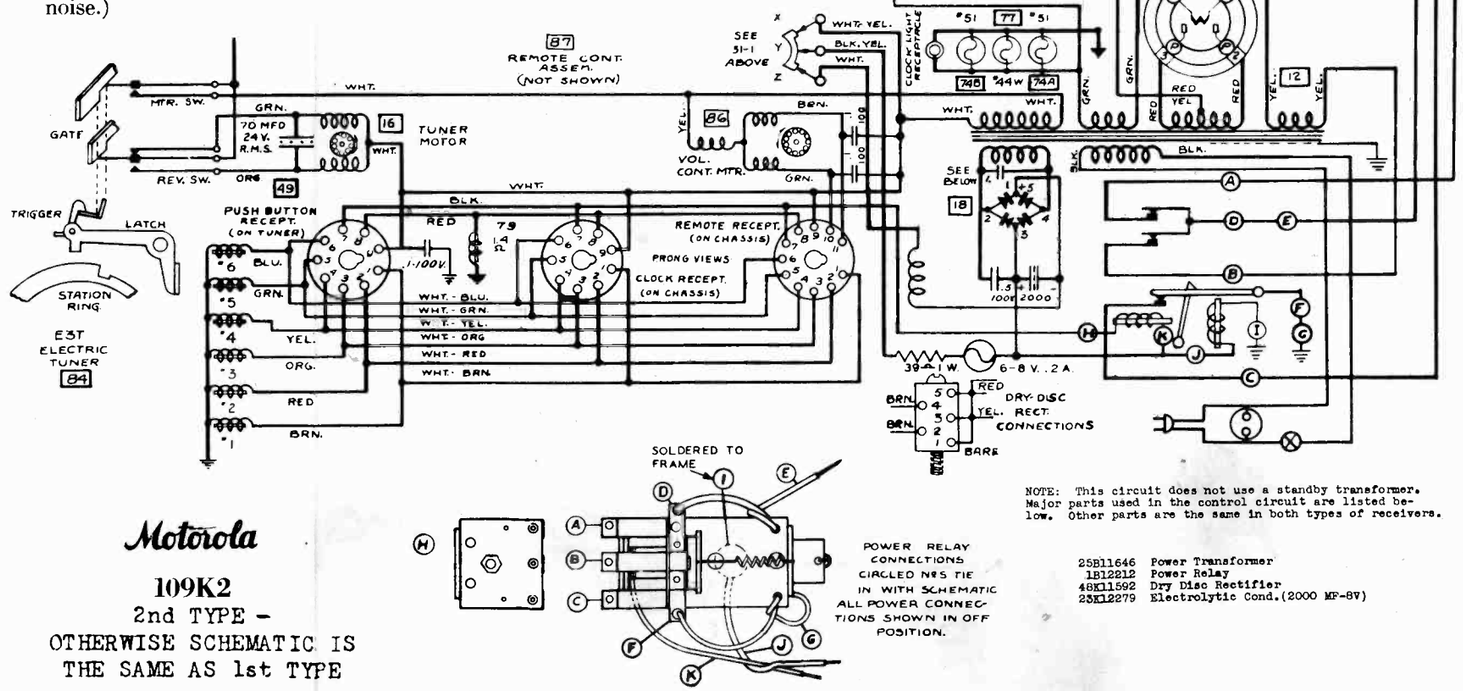
FOR CLOCK, REMOTE CONTROL, AUTOMATIC ELECTRIC TUNER, MOTOR AND REVERSING SWITCH ADJUSTMENTS AND NOTES SEE MOTOROLA PAGES 9-33 AND 9-34 IN VOLUME 1X

GALVIN MFG. CORP.

ALIGNMENT PROCEDURE—MODEL 89K3

1. Connect signal generator to control grid of Mod. tube (6A7) through a .05 MF. condenser and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn band switch to "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 at 455 K.C. and adjust wave trap trimmer for minimum deflection of output meter.
5. Set signal generator and receiver dial both at 1700 K.C. Adjust BC OSC. trimmer until 1700 K.C. signal is heard.
6. Set signal generator at 1400 K.C. and turn condenser gang to the signal at 1400 K.C. Adjust BC ANT. trimmer to point showing highest reading on output meter.
7. Set signal generator at 600 K.C. and rock pointer at 600 K.C. position on dial scale, while adjusting BC padder, until combination is found which gives highest output reading. (NOTE: If there is noise level at 600 K.C., padder can be adjusted to maximum noise without rocking gang and without use of signal generator. Use short wire for pick-up if necessary.
8. Turn band switch to "Short Wave" position. Replace .0002 MF condenser in signal generator lead with a 400 ohm carbon resistor.
9. Set signal generator and receiver dial both at 18.0 MC. Adjust S.W. OSC. trimmer until 18.0 MC signal is heard.
10. 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.)
11. 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 adjusted to maximum noise.)





Motorola

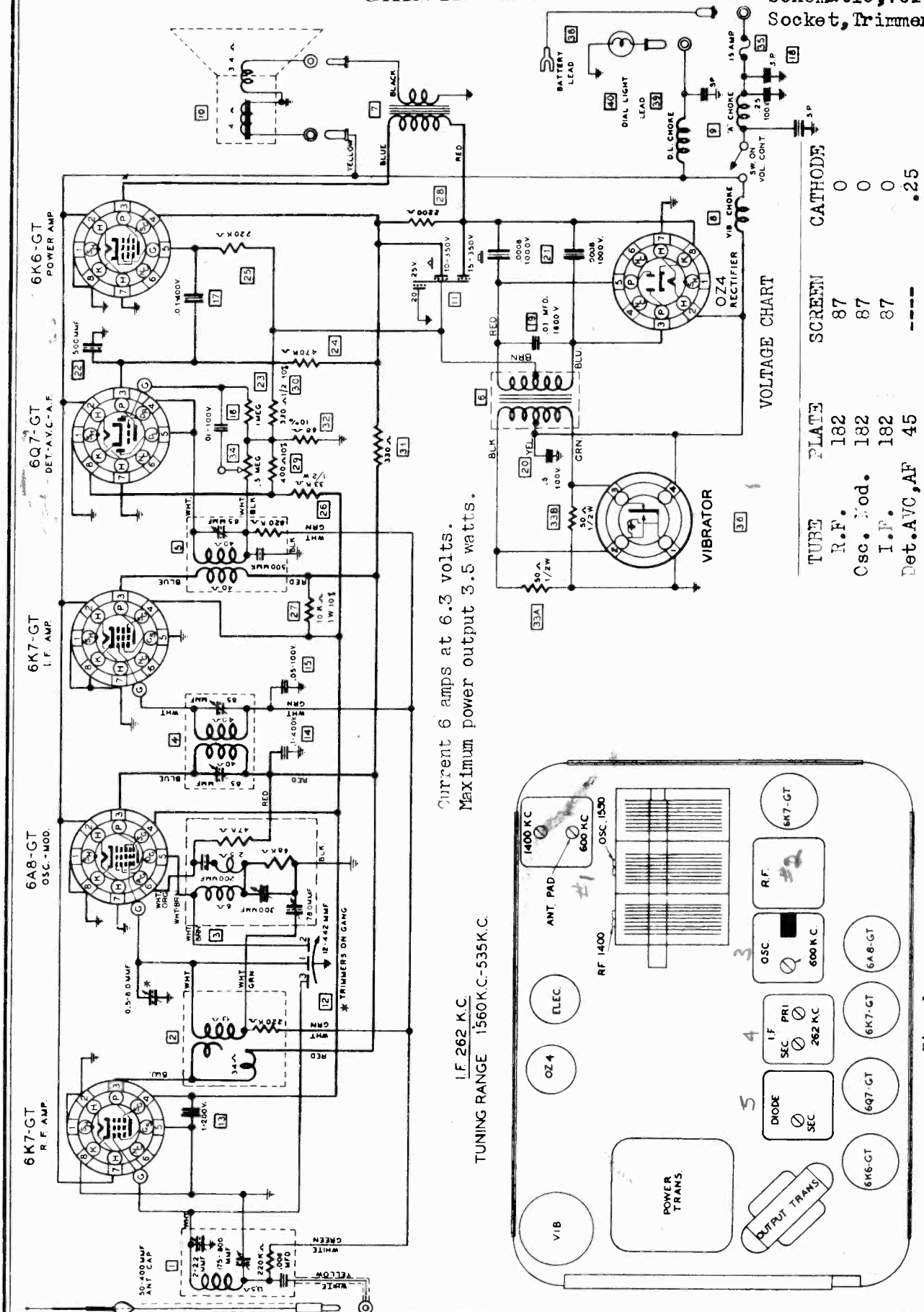
109K2
2nd TYPE -
OTHERWISE SCHEMATIC IS THE SAME AS 1st TYPE

NOTE: This circuit does not use a standby transformer. Major parts used in the control circuit are listed below. Other parts are the same in both types of receivers.

25B11646	Power Transformer
1B12212	Power Relay
48K11592	Dry Disc Rectifier
25K12279	Electrolytic Cond.(2000 MF-8V)

GALVIN MFG. CORP.

MODEL 300
Schematic, Voltage
Socket, Trimmers



VOLTAGE CHART

TUBE	PLATE	SCREEN	CATHODE
R.F.	182	87	0
Osc. Mod.	182	87	0
I.F.	182	87	0
Det.AVC,AF	45	----	.25
Output	237	192	0
Rect.	AC	-----	250

Fig. 1

All voltages measured from socket terminal to chassis ground using 1000 ohm per volt meter.

MODEL 350
Schematic, Socket
Trimmers, Voltage

GALVIN MFG. CORP.

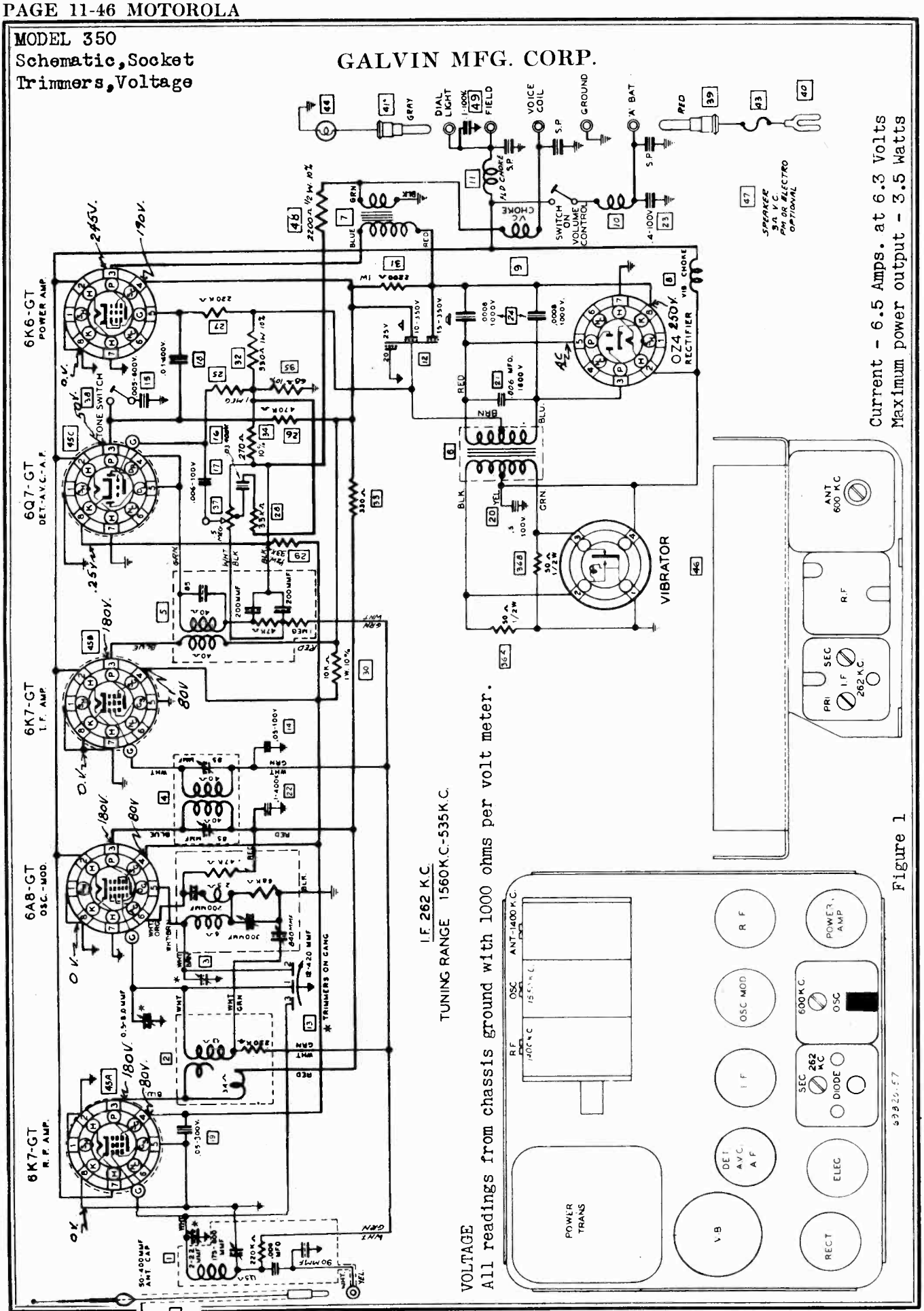


Figure 1

GALVIN MFG. CORP.

MODEL 300
MODEL 350
Alignment, Sensitivity

Model 300

ALIGNMENT PROCEDURE

Place the chassis on the service bench with the speaker and battery connected to it.

Turn the volume control to maximum position and leave it there throughout the alignment, reducing the signal generator output if necessary. NOTE: Do not adjust the trimmer in the Osc. coil can that is covered with Scotch Tape. The original adjustment, made in the factory should not be tampered with. (Fig. 1/below, shows all trimmer locations.)

I. F. ALIGNMENT

1. Connect the signal generator to the control grid of the Osc.- Mod. tube (6A8GT) through a .1 MF condenser, having first removed the grid cap from the top of the tube. Connect a 500,000 ohm leak resistor from the grid of the tube to the grid cap just removed from the tube. Turn the condenser gang completely out of mesh. Connect an output meter across speaker voice coil.

2. Set the signal generator at 262 K.C. and carefully adjust the single trimmer in the Diode coil can to the point showing the highest reading on the output meter.

3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

SETTING THE RANGE

1. Connect the signal generator to the control grid of the R.F. tube (6K7GT) using the same .1 MF condenser.

2. Set the signal generator at 1550 K.C. and with the condenser gang completely out of mesh adjust the 1550 K.C. oscillator trimmer to the point showing the highest output reading.

3. Set the signal generator at 535 K.C. Turn the condenser gang completely in mesh and adjust the 600 K.C. oscillator padder for the highest output reading.

NOTE: The adjustments above set the range so the receiver will track with the calibrations in the control head.

R. F. AND ANTENNA ALIGNMENT

NOTE: If the radio is to be operated on a Motorola Booster Antenna, a special dummy antenna Motorola part No. 1X18018 must be used in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.

1. Set the signal generator at 1400 K.C. Turn the condenser gang until the signal is heard. Adjust the 1400 K.C. antenna trimmer in the antenna coil can for maximum output reading.

2. Adjust the 1400 K.C.R.F. trimmer on the condenser gang for maximum output reading.

3. Set the signal generator at 600 K.C. and turn the condenser gang until the signal is heard. Adjust the 600 K.C. padder in the antenna coil can for the maximum output reading.

4. Recheck steps 1, 2, and 3, for accuracy.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

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

When measuring over-all sensitivity at the antenna terminal, use a special dummy, part No. 1X18018, in place of the .1MF. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

AVERAGE MICROVOLT INPUT *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READINGS **
38,000	262 K.C.	I.F. Grid	.1	.5 Meg	1.76
1,200	262 K.C.	Mod. Grid	.1	.5 Meg	1.76
1,200	600 K.C.	Mod. Grid	.1	.5 Meg	1.76
60	600 K.C.	R.F. Grid	.1	.5 Meg	1.76
11	600 K.C.	Ant. Lead	***	None	1.76

* For one watt output.
** Meter connected across voice coil.
1.76 volts equals 1 watt output for 3 ohm voice coil.
*** Use special dummy part No. 1X18018.
NOTE: If set is not used with a Motorola Booster antenna, substitute a 40 MMF condenser for the Special Dummy.

Model 350

Place the chassis on the service bench with the speaker and battery connected to it.

Turn the volume control to maximum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

NOTE: Do not adjust the trimmer in the Osc. coil can that is covered with Scotch Tape. The original adjustment, made in the factory should not be tampered with. (Fig. 1 below, shows all trimmer locations.)

I. F. ALIGNMENT

1. Connect the signal generator to the control grid of the Osc.-Mod. tube (6A8GT) through a .1 MF condenser, having first removed the grid cap from the top of the tube. Connect a 500,000 ohm leak resistor from the grid of the tube to the grid cap just removed from the tube. Turn the condenser gang completely out of mesh. Connect an output meter across speaker voice coil.

2. Set the signal generator at 262 K.C. and carefully adjust the single trimmer in the Diode coil can to the point showing the highest reading on the output meter.

3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

SETTING THE RANGE

1. Connect the signal generator to the control grid of the R.F. tube (6K7GT) using the same .1 MF condenser.

2. Set the signal generator at 1550 K.C. and with the condenser gang completely out of mesh adjust the 1550 K.C. oscillator trimmer to the point showing the highest output reading.

3. Set the signal generator at 535 K.C. Turn the condenser gang completely in mesh and adjust the 600 K.C. oscillator padder for the highest output reading.

NOTE: The adjustments above set the range so the receiver will track with the calibrations in the control head.

R.F. AND ANTENNA ALIGNMENT

NOTE: If the radio is to be operated on a Motorola Booster Antenna, a special dummy antenna Motorola part No. 1X18018 must be used in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.

1. Set the signal generator at 1400 K.C. Turn the condenser gang until the signal is heard. Adjust the 1400 K.C. antenna trimmer on the condenser gang for maximum output reading.

2. Adjust the 1400 K.C. R.F. trimmer on the condenser gang for maximum output reading.

3. Set the signal generator at 600 K.C. and turn the condenser gang until the signal is heard. Adjust the 600 K.C. padder on the antenna coil can for the maximum output reading.

4. Recheck steps 1, 2, and 3, for accuracy.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

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

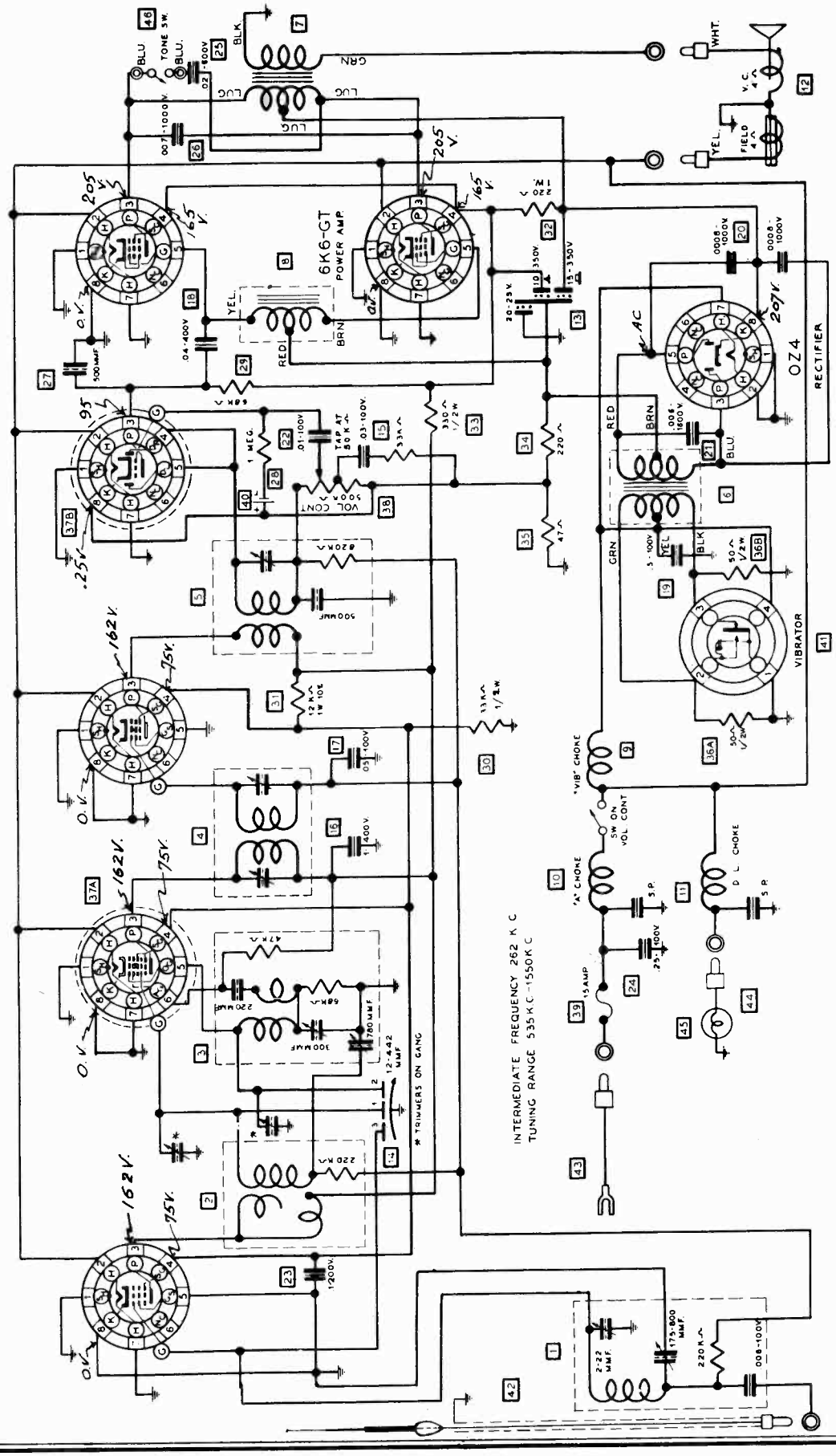
When measuring over-all sensitivity at the antenna terminal, use a special dummy part #1X18018 in place of the .1 MF.*** It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

AVERAGE MICROVOLT INPUT *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READING **
26,000	455 K.C.	I.F. Grid	.1 MF	.5 Meg	1.76 Volts
535	455 K.C.	Mod. Grid	.1 MF	.5 Meg	1.76 Volts
615	600 K.C.	Mod. Grid	.1 MF	.5 Meg	1.76 Volts
30	600 K.C.	R.F. Grid	.1 MF	.5 Meg	1.76 Volts
7	600 K.C.	Ant. Lead	40 MMF ***	None	1.76 Volts

*For one watt output
**Meter connected across voice coil
1.76 Volts equals 1 watt output for 3 ohm voice coil
***Use special dummy part No. 1X18018, or M434B booster coil Part No. 17908 in series with 25 MMF cond. if a Motorola Booster antenna is used.

MODEL 400
Schematic, Voltage

GALVIN MFG. CORP.



All voltages measured from socket terminal to chassis ground using 1000 ohm per volt-meter.
Current 6 amps. at 6.3 volts.

Maximum power output 4.25 watts.

GALVIN MFG. CORP.

MODEL 450
Schematic, Voltage Socket, Trimmers

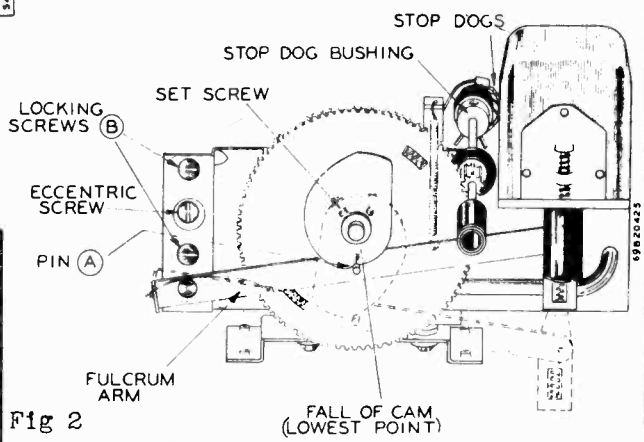


Fig 2

IF PEAK 262 KC

6K6GT POWER AMP

6K6GT POWER AMP

6SQ7GT DET-AVC -AF.

6K7GT I.F AMP

6SA7GT OSC. MOD.

6SK7GT R.F. AMP

0Z4 OR 6X5 RECT.

V1B.

VOLTAGE CHART

TUBE	POSITION	PLATE	SCREEN	CATHODE
	R.F.	215	72	4.6
	Osc.-Mod.	216	72	.25
	I.F.	215	72	3.2
	Det. AVC - A.F.	126	---	3.8
	Output	225	220	14.8
	Output	226	220	14.2
	Rect.	AC	---	290

All voltages measured from socket terminal to chassis ground using 1000 ohm per volt meter.

Maximum power output 4.5 watts.

Current 6.8 amps at 6.3 volts.

Accustimator set at "Olly" and "Voice" position.

Model 450

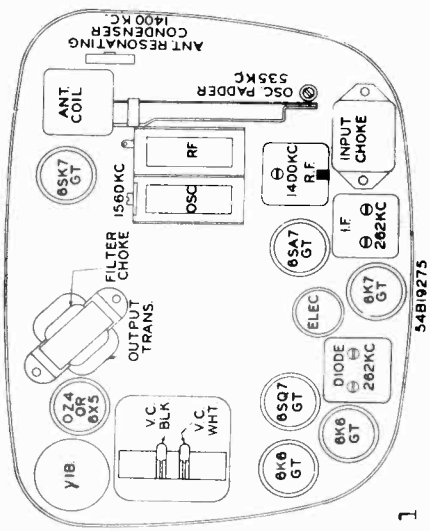


Fig 1

Model 400

ALIGNMENT PROCEDURE

Place the chassis on the service bench with the speaker and battery connected to it.

Turn the volume control to maximum position and leave it there throughout the alignment, reducing the signal generator output if necessary. NOTE: Do not adjust the trimmer in the Osc. coil can that is covered with Scotch Tape. The original adjustment, made in the factory should not be tampered with. (Fig. 1 below, shows all trimmer locations.)

I. F. 1. Connect the signal generator to the control grid of the Osc.-Mod. tube (6A8GT) through a .1 MF condenser, having first removed the grid cap from the top of the tube. Connect a 500,000 ohm leak resistor from the grid of the tube to the grid cap just removed from the tube. Turn the condenser gang completely out of mesh. Connect an output meter across speaker voice coil.

2. Set the signal generator at 262 K.C. and carefully adjust the single trimmer in the Diode coil can to the point showing the highest reading on the output meter.

3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

SETTING THE RANGE

1. Connect the signal generator to the control grid of the R.F. tube (6K7GT) using the same .1 MF condenser.

2. Set the signal generator at 1550 K.C. and with the condenser gang completely out of mesh adjust the 1550 K.C. oscillator trimmer to the point showing the highest output reading.

3. Set the signal generator at 535 K.C. Turn the condenser gang completely in mesh and adjust the 600 K.C. oscillator padder for the highest output reading.

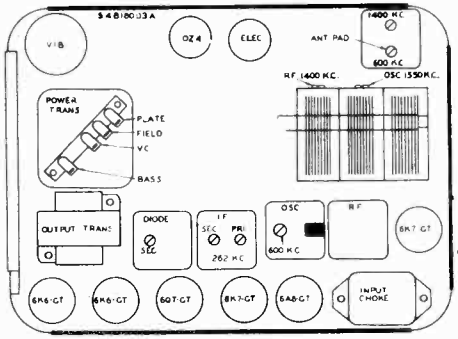


Fig. 1

NOTE: The adjustments above set the range so the receiver will track with the calibrations in the control head.

R. F. NOTE: If the radio is to be operated on a Motorola Booster Antenna, a special dummy antenna Motorola part No. 1X18018 must be used in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.

1. Set the signal generator at 1400 K.C. Turn the condenser gang until the signal is heard. Adjust the 1400 K.C. antenna trimmer in the antenna coil can for maximum output reading.

2. Adjust the 1400 K.C.R.F. trimmer on the condenser gang for maximum output reading.

3. Set the signal generator at 600 K.C. and turn the condenser gang until the signal is heard. Adjust the 600 K.C. padder on the antenna coil can for the maximum output reading.

4. Recheck steps 1, 2, and 3, for accuracy.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

All stage gain measurements must be made with the volume control set for full volume. The shielded lead from the Signal Generator is connected to the grid terminal of the tube through a .1 MF condenser, with a 500M ohm resistor connected as a leak resistance between the grid of the tube and the grid lead which had been removed.

When measuring over-all sensitivity at the antenna terminal, use a special dummy, part No. 1X18018, in place of the .1 MF. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

AVERAGE MICROVOLT INPUT *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	LEAK RESISTANCE	OUTPUT METER READINGS **
32,500	262 K.C.	I.F. Grid	.1	.5 Meg	1.76
500	262 K.C.	MOD. Grid	.1	.5 Meg	1.76
550	600 K.C.	MOD. Grid	.1	.5 Meg	1.76
30	600 K.C.	R.F. Grid	.1	.5 Meg	1.76
7	600 K.C.	Ant. Lead	***	None	1.76

* For one watt output.
** Meter connected across voice coil.
1.76 volts equals 1 watt output for 3 ohm voice coil.
*** Use special dummy part No.1X18018.
NOTE: If set is not used with a Motorola Booster antenna, substitute a 40 MMF condenser for the Special Dummy.

Model 450

ALIGNMENT PROCEDURE

Place the chassis on the service bench with the speaker, acoustinator, and battery connected to it. The acoustinator is to be set in the "City" and "Voice" position.
Turn the volume control to maximum position and leave it there throughout the alignment, reducing the signal generator output, if necessary. NOTE: Do not adjust the trimmer in the R.F. coil can that is covered with scotch tape. The original adjustment made at the factory should not be tampered with.
Fig. 1 shows all trimmer locations.

I. F. ALIGNMENT

1. Connect the signal generator to the control grid of the modulator tube through a .1 Mfd. condenser. Connection may be made to the lug on the R.F. section of the gang condenser. Connect an output meter across the speaker voice coil.
2. Set the signal generator at 262 K.C. and carefully adjust the trimmers in the diode coil can to the point showing the highest reading on the output meter.
3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.
4. Recheck the I.F. and diode adjustment several times for maximum accuracy.

SETTING THE RANGE

1. Turn gang to fully meshed position.
2. Check the pin "A" on the fulcrum arm to make sure that it rests in the fall of the cam (absolute lowest point) when the condenser gang is in fully meshed position. See Fig. 2.
NOTE: Adjustment of the pin is made by revolving the cam on the condenser gang shaft.
CAUTION: Care should be taken so that the stop dogs allow the condenser gang to be turned to fully meshed position and fully opened position.
3. Set the signal generator at 1560 K.C. and connect it to the antenna receptacle through a 40 MMF condenser.
4. With the condenser gang completely out of mesh, adjust the 1560 K.C. oscillator trimmer on the gang condenser to point showing highest output reading.
5. Leaving the generator set at 1560 K.C. and the condenser gang completely out of mesh, adjust the antenna resonating condenser to maximum output.

R. F. AND ANTENNA ALIGNMENT

1. Still using the same 40 MMF condenser in the antenna lead, set the signal generator at 1400 K.C. and turn condenser gang until the signal is heard.
2. Adjust the 1400 K.C. trimmer in the R.F. coil can for highest output.
NOTE: The two locking screws "B" are to be loosened just the least bit so that the tension is released which will allow the eccentric screw to be turned but not loosened enough to allow the fulcrum arm to be moved.
3. Adjust the eccentric screw "A" to maximum output at 1400 K.C. and tighten the locking screws "B" securely.
4. Set the signal generator at 600 K.C. Turn the condenser gang until the signal is heard, and adjust the oscillator padder which is accessible through the hole in the chassis base, to maximum output.
5. Recheck steps 1, 2, 3, and 4.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

All stage gain measurements must be made with the volume control set for full volume, and the acoustinator set at city and voice position. The shielded lead from the signal generator is connected to the grid terminal of the tube through a .1 MF condenser.

When measuring over-all sensitivity at the antenna terminal, use a 40 MMF in place of the .1 MF. It must be remembered that the figures in the table are average and allowance must be made for the variations between two sets of the same general type, due to difference of tube characteristics, etc.

AVERAGE MICROVOLT INPUT *	GENERATOR SET AT	GENERATOR FEEDER CONNECTED TO	DUMMY ANTENNA CAPACITY	OUTPUT METER READING **
10,500	262 K.C.	I.F. Grid	.1 MF	1.76 Volts
150	262 K.C.	Mod. Grid	.1 MF	1.76 Volts
175	600 K.C.	Mod. Grid	.1 MF	1.76 Volts
10	600 K.C.	R.F. Grid	.1 MF	1.76 Volts
6	600 K.C.	Ant. Lead	40 MMF	1.76 Volts

* For one watt output
** Meter connected across voice coil
1.76 volts equals 1 watt output for 3 ohm voice coil

GAMBLE-SKOGMO INC.

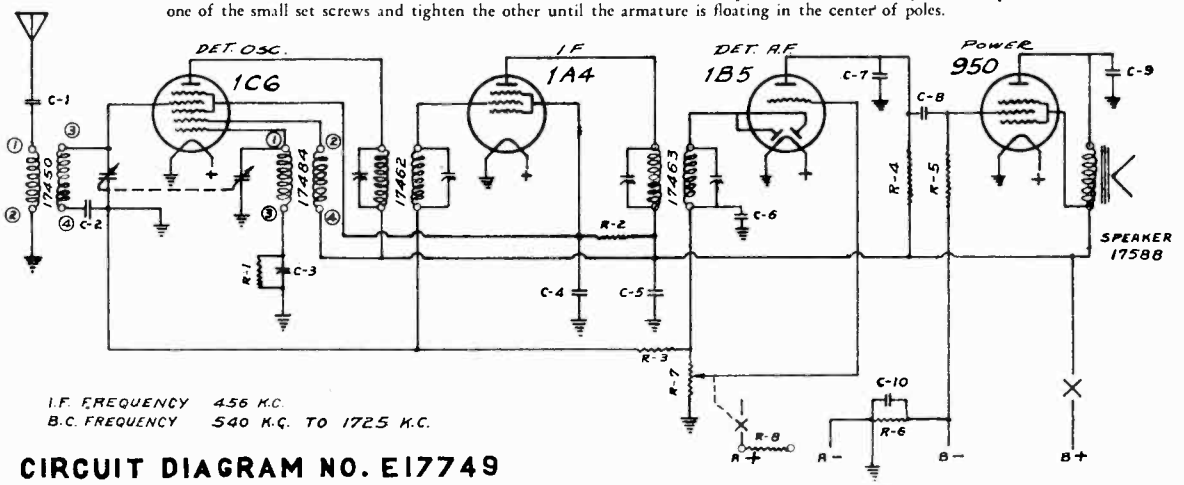
MODEL 6B Power Converter
MODEL 540, Late
Schematics

K.R.C. 8-18-36

SPEAKER. This model is equipped with a balanced armature magnetic speaker. Should the armature "strike", causing a rattle or distortion, proceed as follows:

QUAM TYPES (used on early production). Bend bracket holding armature snubber cup up or down until armature centers. This bracket is located on bottom of magnet housing.

WRIGHT DECOSTER TYPE. To center armature: remove small aluminum plate on bottom of magnet housing, loosen one of the small set screws and tighten the other until the armature is floating in the center of poles.

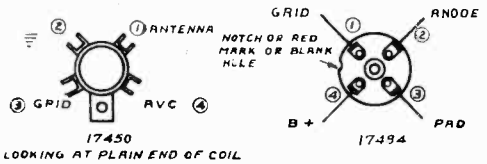


I.F. FREQUENCY 456 K.C.
B.C. FREQUENCY 540 K.C. TO 1725 K.C.

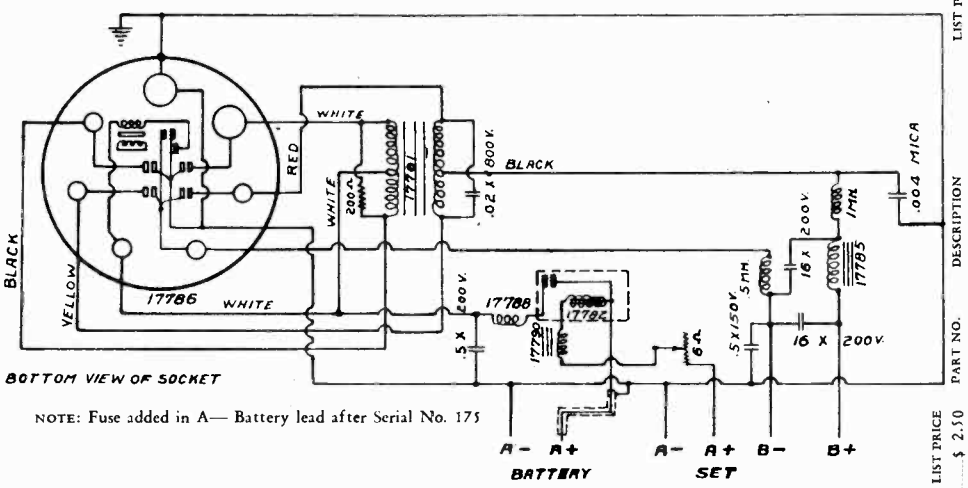
CIRCUIT DIAGRAM NO. E17749

MODEL 540 LATE

C-1	.01	200V.	R-1	50000	OHMS
C-2	.05	200V.	R-2	15 000	OHMS
C-3	500 MMF.	PAD	R-3	2000 000	OHMS
C-4	.05	200V.	R-4	250 000	OHMS
C-5	.25	200V.	R-5	1000000	OHMS
C-6	.0005	600V.	R-6	400	OHMS
C-7	.0005	600V.	R-7	500 000	OHMS VOL. CONT. #17589
C-8	.01	200V.	R-8	2.5 V. WIRE WOUND USE WHEN SET IS USED WITH 3V. A BATTERY OR 4 DRY CELLS CONNECTED SERIES PARALLEL	
C-9	.002	600V.			
C-10	10 x 25V.	ELECTROLYTIC			



LOOKING AT PLAIN END OF COIL



BOTTOM VIEW OF SOCKET

NOTE: Fuse added in A— Battery lead after Serial No. 175

PART NO.	DESCRIPTION	LIST PRICE
17785	Assb.—"A" Choke	$ 2.50
17825	Assb.—Cable & Markers	1.50
17828	Assb.—Wire Battery "A" Plus	.70
17829	Assb.—Wire Battery "A" Minus	.50
17790	Choke—Filter "B"	.90
17788	Choke—R. F. "A"	.30
17794	Choke—.5 M. H.	.30
17795	Choke—1 M. H.	.30
17806	Clip—Battery "Plus"	.18
17807	Clip—Battery "Minus"	.18
4925	Clip—Fuse	.04
17808	Condenser—Electrolytic 16 x 200 R. H.	.90
17809	Condenser—Electrolytic 16 x 200 L. H.	.90
17093	Condenser—Mica .004	.30
17811	Condenser—Tubular .02 x 800	.20
17813	Condenser—Tubular (Braid) .5 x 150	.40
17303	Condenser—Tubular .5 x 200	.30
17832	Fuse—Auto 5-Amp. Low Resistance	.06
17796	Knob—Control	.20
17782	Relay	1.60
17787	Resistor—Carbon 1 Watt 200 Ohm	.20
17757	Rheostat	.60
17789	Socket—Plain 7-Prong	.20
17781	Transformer	2.50
17786	Vibrator—Unit	3.50

CIRCUIT DIAGRAM 6 VOLT POWER UNIT

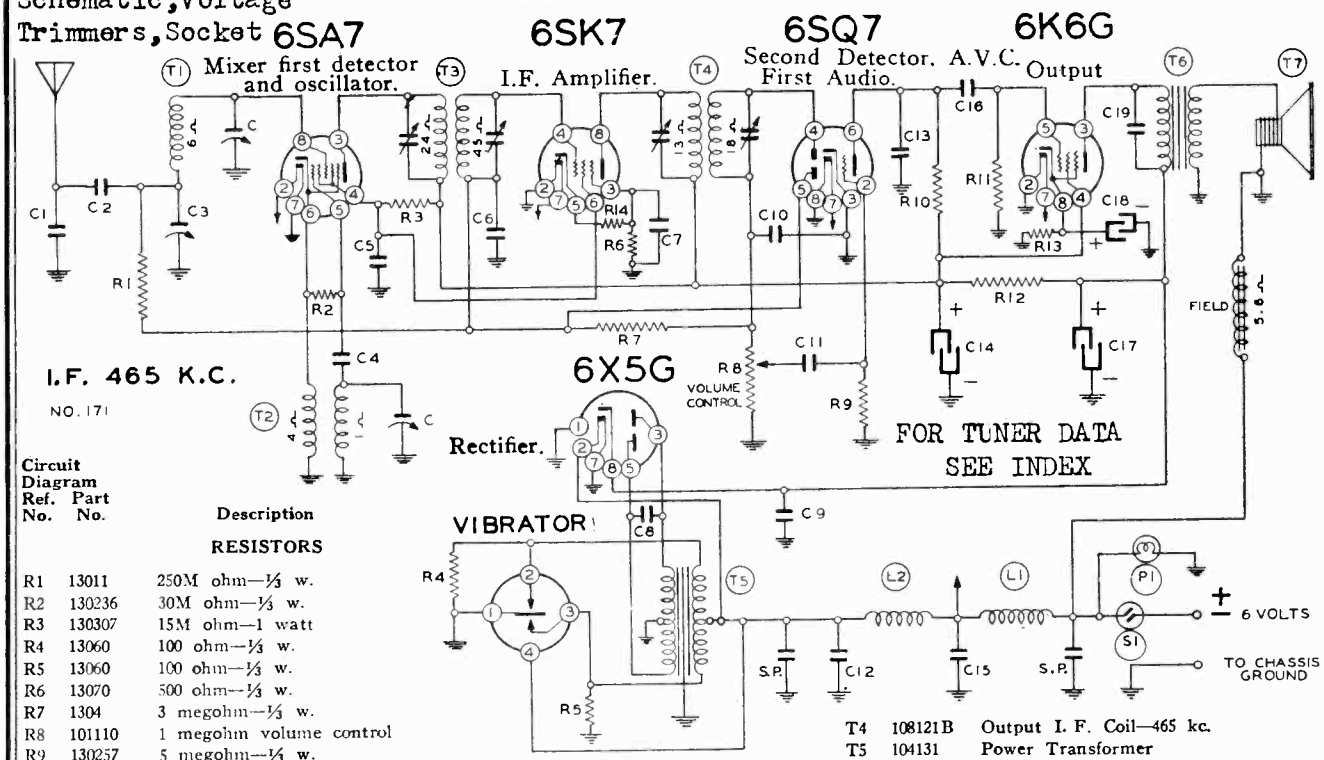
Diagnosis of Troubles

6-B POWER CONVERTER

EFFECT	CAUSE
Does not operate	Storage Battery run-down. Battery connections loose. Relay not closing—heavy red or black battery wires may be twisted inside unit and holding relay armature open. "Blown" fuse—check all wiring before inserting new fuse. A defective vibrator will also "blow" the fuse. A good vibrator will have a smooth "hum" when holding your ear close to the unit; a worn vibrator will "sputter".
R. F. "Hash" noise in set, usually a frying-buzzing sound	A good antenna and ground must be used on the set. Power unit should be located away from the set by the length of the cable. On sets having short wave bands, noise may always be noticed on some parts of the band but is usually not objctionable.
High battery drain	The total drain on the six volt battery should be approximately one ampere plus the normal "A" drain of the set. Example: with model 650, 1 amp. plus .5 amp. total 1.5 amps. Excessive drain may be caused by defective transformer, vibrator, or filter condenser in the power unit or defective switch or by pass condenser in the set.

MODEL 577D
Serial 214845 up
Schematic, Voltage
Trimmers, Socket

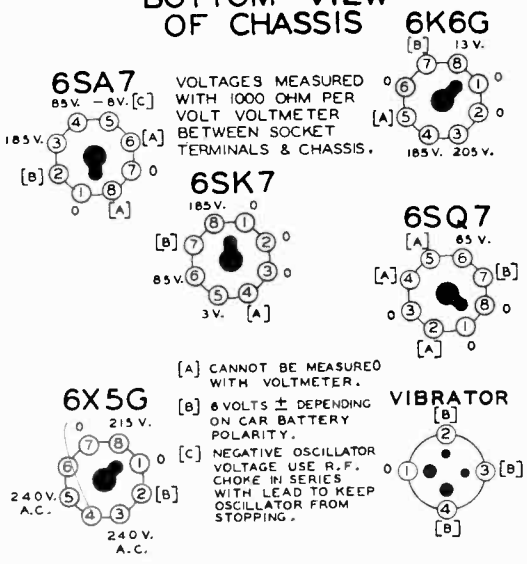
GAMBLE-SKOGMO INC.



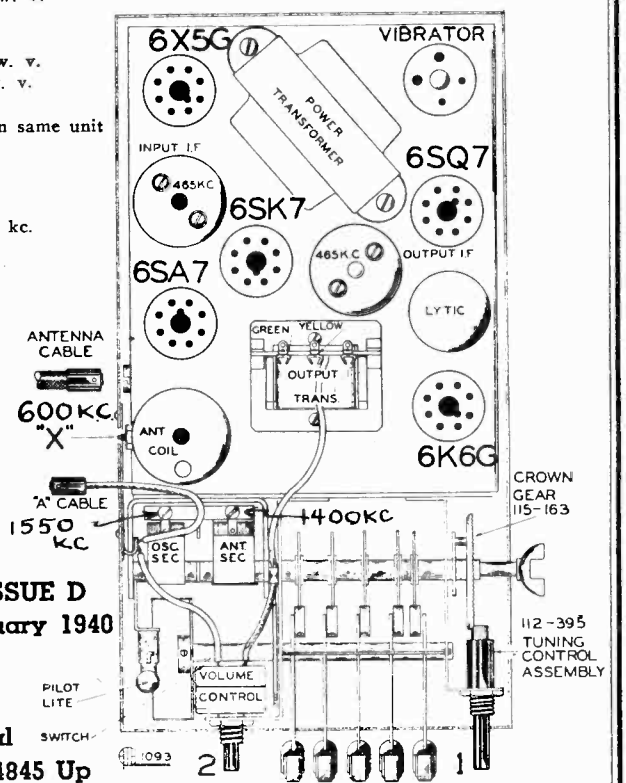
Circuit Ref.	Part No.	Description
		RESISTORS
R1	13011	250M ohm—⅓ w.
R2	130236	30M ohm—⅓ w.
R3	130307	15M ohm—1 watt
R4	13060	100 ohm—⅓ w.
R5	13060	100 ohm—⅓ w.
R6	13070	500 ohm—⅓ w.
R7	1304	3 megohm—⅓ w.
R8	101110	1 megohm volume control
R9	130257	5 megohm—⅓ w.
R10	13011	250M ohm—⅓ w.
R11	1303	500M ohm—⅓ w.
R12	130199	1500 ohm—1 watt
R13	130308	750 ohm—1 watt
R14	130174	50 ohm—⅓ w.
		CONDENSERS
C	10269	2 gang variable condenser
C1	1293	.00002 mica
C2	10055	.01 x 400 volts
C3	12434	Adj. Antenna Trimmer
C4	12921	.0002 mica
C5	100115	.05 x 400 v.
C6	1009	.05 x 200 v.
C7	10020	.1 x 200 v.
C8	10034	.005 x 1200 v.
C9	12912	.00025 mica
C10	1295	.0001 mica
C11	10025	.002 x 600 v.
C12	10031	.5 x 120 v.
C13	1292	.0005 mica
C14	119105	15 ufd. lytic x 350 w. v.
C15	10031	.5 x 120 v.
C16	10078	.01 x 200 v.
C17	119105	15 ufd. lytic x 350 w. v.
C18	119105	20 ufd. lytic x 25 w. v.
C19	10087	.01 x 600 v.
		C14, C17 and C18 in same unit
		PARTS
T1	11195B	Antenna Coil
T2	110146	Oscillator Coil
T3	108139	Input I. F. Coil—465 kc.
T4	108121B	Output I. F. Coil—465 kc.
T5	104131	Power Transformer
T6	10567	Output Transformer
T7	114114-R	5" Dynamic Speaker (5.6 ohm field)
L1	10568	"A" Choke
L2	10566	"A" Choke
S1		Switch on volume control
P1	10797	Pilot light (T51) 6-8 volts
S.P.	11749	(2) Spark Plates

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION
VOLUME VIII

BOTTOM VIEW OF CHASSIS



REAR OF CHASSIS



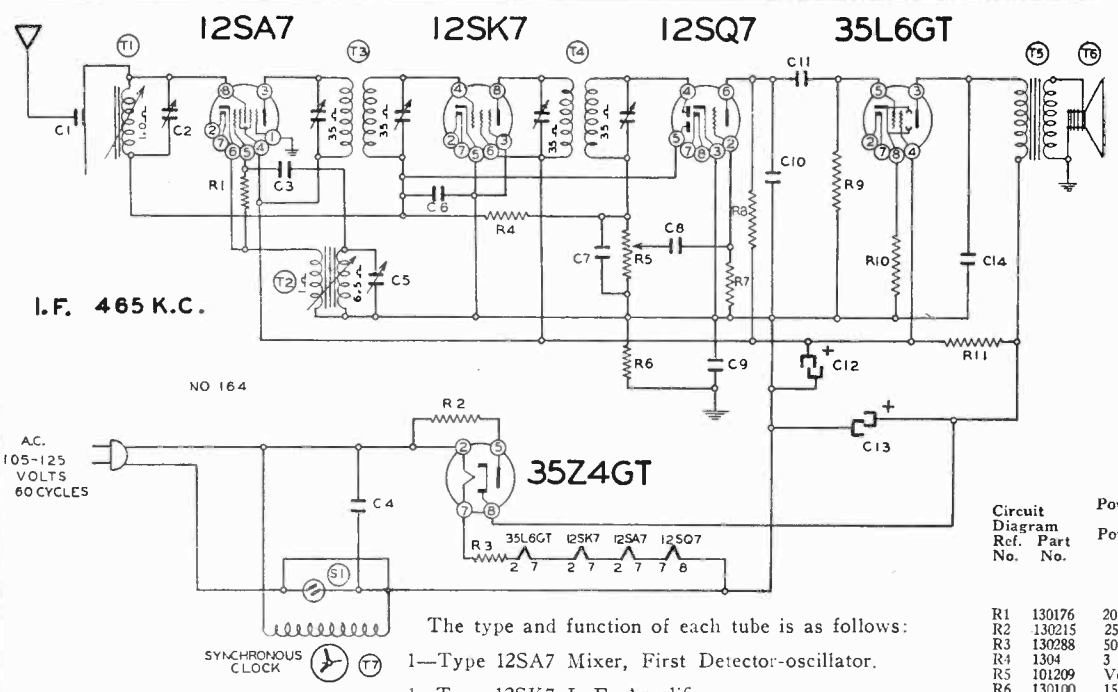
577 ISSUE D
January 1940

Serial No. 214845 Up

ADJUST ANTENNA TRIMMER

FIG. 3—TOP VIEW

Tune in a weak signal at approximately 600 K.C. with volume control about three-fourths on. Adjust trimmer screw "X" until maximum output is obtained.



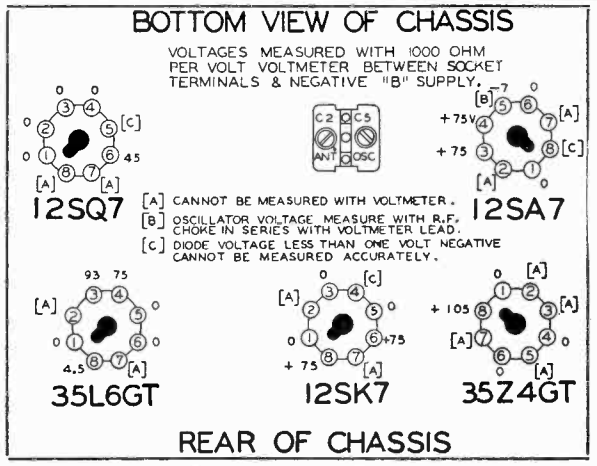


FIG. 3—BOTTOM VIEW

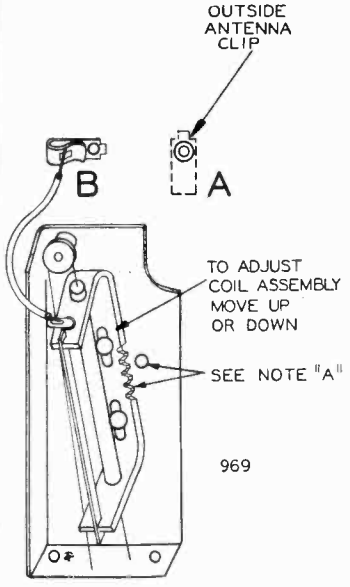


FIG. 4

The type and function of each tube is as follows:

1—Type 12SA7 Mixer, First Detector-oscillator.

1—Type 12SK7 I. F. Amplifier.

1—Type 12SQ7 Second Detector, A.V.C. and First Audio.

1—Type 35L6GT Beam Output Amplifier.

1—Type 35Z4GT Rectifier.

SERVICE NOTES:

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

All voltages as indicated on the voltage chart are measured with 117 volt A.C. line.

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

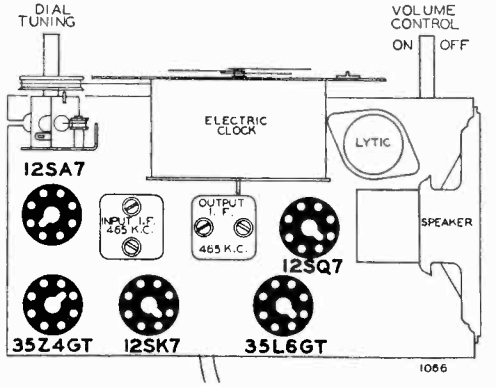
To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

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

Power Consumption.....35 Watts

Power Output.....800 Milliwatts Undistorted, 1.2 Watts Maximum

Circuit Diagram Ref. No.	Part No.	Description
RESISTORS		
R1	130176	20M ohm—⅓ w.
R2	130215	25 ohm—½ w.
R3	130288	50 ohm—1½ w.
R4	1304	3 Megohm—⅓ w.
R5	101209	Volume Control—½ Meg.
R6	130100	150M ohm—⅓ w.
R7	130257	5 Megohm—⅓ w.
R8	130100	150M ohm—⅓ w.
R9	13011	250M ohm—⅓ w.
R10	130166	150 ohm—⅓ w.
R11	130199	1500 ohm—1 w.
CONDENSERS		
C1	131262	.0002 Washer Condenser (Ant. Clip on Ant. Plate)
C2	124100	Ant. Section Dual Trimmer
C3	12939	.00005 Mica
C4	1001	.1 x 400 v.
C5	124100	Osc. Section Dual Trimmer
C6	10013	.05 x 400 v.
C7	1295	.0001 Mica
C8	10025	.002 x 600 v.
C9	10091	.15 x 400 v.
C10	1292	.0005 Mica
C11	10071	.004 x 600 v.
C12	11992	20 Mfd. 'Lytic
C13	11992	40 Mfd. 'Lytic.
C14	10011	.01 x 400 v.
		C2 and C5 in one unit.
		C12 and C13 in one unit.
PARTS		
T1	111136	Antenna Coil Complete
T2	110126	Oscillator Coil
T3	108157D	Input I. F. Coil—465 Kc.
T4	108157E	Output I. F. Coil—465 Kc.
T5	105106	Output Transformer
T6	114187	4" Speaker—PM.
T7	104188	Electric Clock Complete
S1		On-Off Switch on Volume Control



MODEL 577D

PROCEDURE FOR SETTING THE AUTOMATIC LEVERS

There are five levers on the dial by means of which five stations may be selected, (See "B" Fig. 2).

Make a list of local stations you tune in regularly; any number up to and including five.

Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

On the front of each automatic tuner lever an opening is provided for inserting the call letter tabs, (See "A" Fig. 2).

Insert the call letter tabs in the rectangular openings of each of the automatic tuner levers. One of the small celluloid tabs supplied should be snapped into place over each of the station call letter tabs.

Press DOWN ALL THE WAY any one of the automatic tuner levers. Holding it down FIRMLY, tune in by means of the tuning knob (No. 1) the station you have assigned to this lever. Turn the tuning knob very slowly back and forth (while still holding lever in downward position) until the signal is clearest. The station will then be accurately tuned in. Release the lever.

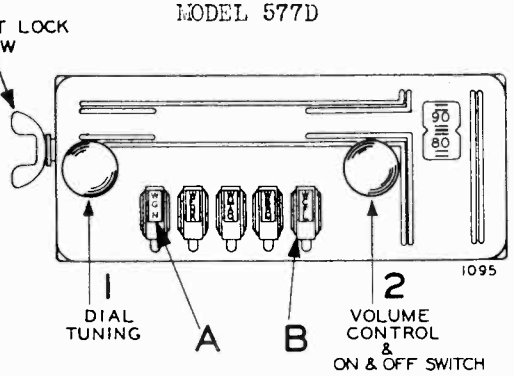


FIG. 2—FRONT VIEW

Press down another automatic tuner lever. Holding it down FIRMLY, carefully tune in the station assigned to this lever. Release this lever.

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

Now rotate the tuning knob (No. 1) to the right (clockwise) as far as it will turn, and tighten the special locking screw ("C") located on left side of tuner dial assembly (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 levers. (Note: Locking screw "C" is loose when radio is shipped from factory).

If you should desire to change any station you selected to another, loosen the locking screw "C" one or two turns, select the new station as explained. Be sure to retighten the locking screw, otherwise the stations you have selected will not stay adjusted to the levers.

The automatic dial is now set up for quick tuning. Press down on the lever and your favorite station is selected.

MODEL 571

ALIGNMENT PROCEDURE

IMPORTANT: See Aligning Instructions on Page 4.

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

The following equipment is required for aligning:

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

BAND	SIGNAL GENERATOR Frequency Setting	SIGNAL GENERATOR Dummy Antenna	Connection to Radio	Position of Iron Cores (Dial Setting)	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
I. F.	465 Kc.	.1 MFD.	Connect to Terminal "B" (See Fig. 4)	Iron Cores All the way out	Two trimmers on top (See Fig. 1)	Output I. F.	Adjust to maximum output
	465 Kc.	.1 MFD.	Connect to Terminal "B" (See Fig. 4)	Iron Cores All the way out	Two trimmers on top (See Fig. 1)	Input I. F.	Adjust to maximum output
BROAD-CAST BAND	1720 Kc.	.1 MFD.	Connect to Terminal "B" (See Fig. 4)	Iron Cores All the way out	Trimmer (C5) (See bottom of Radio, Fig. 3)	Oscillator	Adjust to maximum output
	1720 Kc.	200 MMF.	Connect to Terminal "A" (See Fig. 4)	Iron Cores All the way out	Trimmer (C2) (See bottom of Radio, Fig. 3)	Antenna	Adjust to maximum output
	1400 Kc.	200 MMF.	Connect to Terminal "A" (See Fig. 4)	Turn Dial to 1400 Kc.	Adjust position of antenna coil up or down (see Fig. 4)	Antenna Coil Adjustment	Adjust to maximum output (See Note "A")
	1720 Kc.	200 MMF.	Connect to Terminal "A" (See Fig. 4)	Turn Dial to 1720 Kc.	Adjust trimmer (C2) (See Fig. 3)	Antenna	Check for tracking (See Note "B")

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

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

GAMBLE-SKOGMO INC.

MODEL 577C
Schematic, Voltage
Battery Notes

GENERATOR INTERFERENCE

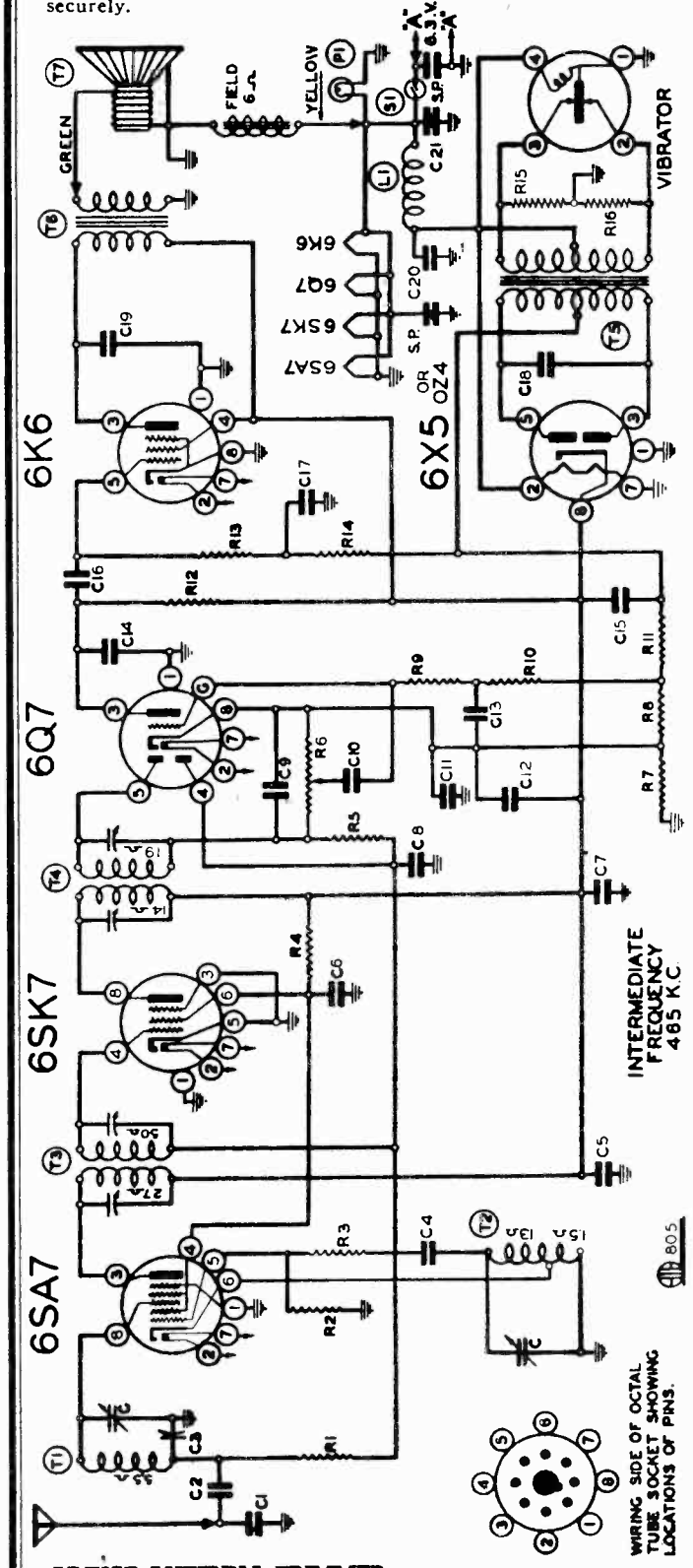
Remove the generator cutout mounting screw and fasten the condenser (100-81) bracket on the generator cutout mounting lug. Replace the cutout mounting screw and tighten down securely.

Connect the condenser lead to the battery terminal of the cutout. The generator condenser is absolutely necessary as it is used to eliminate a high pitched whining noise which would otherwise be heard as the motor is accelerated

CONNECTIONS TO BATTERY

The battery cable, number 107-82, (red wire with fuse receptacle at one end and terminal lug at other end) must be connected to battery terminal of ammeter. At the same time connect ammeter capacitor, number 100-82, to battery terminal of ammeter, other end of condenser to any convenient grounded screw on back of instrument panel. Make certain that insulating sleeve is slipped over fuse when fuse is placed in receptacle, before connecting to short battery cable from receiver.

When connected properly, the discharge due to current drawn by the receiver should not indicate on the ammeter. This is important, since if improperly connected, as shown by the deflection of ammeter, additional motor interference may be encountered.



ADJUST ANTENNA TRIMMER

Tune in a weak signal at approximately 600 K.C. with volume control about three-fourths on. Adjust trimmer screw "X" until maximum output is obtained. (See Fig. 1, Adjustment "X" on right side of radio)

Code No.	Part No.	Description
		RESISTORS
R1	13011	250M ohm - ½ w. 20%
R2	130176	20M ohm - ½ w. 10%
R3	130272	10 ohm - ½ w. 10%
R4	130245	10M ohm - 1 w. 10%
R5	1304	3 megohm - ½ w. 20%
R6	101110	1 megohm volume control
R7	130174	50 ohm - ½ w. 10%
R8	130211	30 ohm - ½ w. 10%
R9	130209	2 megohm - ½ w. 20%
R10	130210	1 megohm - ½ w. 20%
R11	130212	250 ohm - 1 watt 10%
R12	13011	250M ohm - ½ w. 20%
R13	13011	250M ohm - ½ w. 20%
R14	13011	250M ohm - ½ w. 20%
R15	13060	100 ohm - ½ w. 10%
R16	13060	100 ohm - ½ w. 10%
		CONDENSERS
C	10269	2 gang variable condenser
C1	1293	.00002 Mica 20%
C2	10055	.01 x 400 v. 25%
C3	12434	Antenna Trimmer
C4	12912	.00025 Mica 20%
C5	1001	.1 x 400 v. 25%
C6	10020	.1 x 200 v. 25%
C7	1295	.0001 Mica
C8	1009	.05 x 200 v. 25%
C9	1295	.0001 Mica 20%
C10	10078	.01 x 200 v. 25%
C11	10020	.1 x 200 v.
C12	11950	8 mid. lytic
C13	10078	.01 x 200 v.
C14	1292	.0005 Mica
C15	11950	8 mid. lytic
C16	10055	.01 x 400 v. 25%
C17	10019	.006 x 600 v.
C18	10034	.005 x 1200 v.
C19	10087	.01 x 600 v.
C20	10031	.5 x 120 v. + 50-10%
C21	10031	.5 x 120 v. + 50-10% C12 and C15 in same unit.
		PARTS
T1	11195B	Antenna coil complete
T2	110107	Oscillator coil complete
T3	108139	Input I.F. 465 kc. - complete
T4	108121	Output I.F. 465 kc. - complete
T5	104131	Power Transformer
T6	10567	Output Transformer
T7	114114	5" Dynamic Speaker
L1	10568	"A" Filter Choke
P1	10797	6.8 v. pilot light
S1		Off-on Switch on Volume Control
SP		Spark Plates

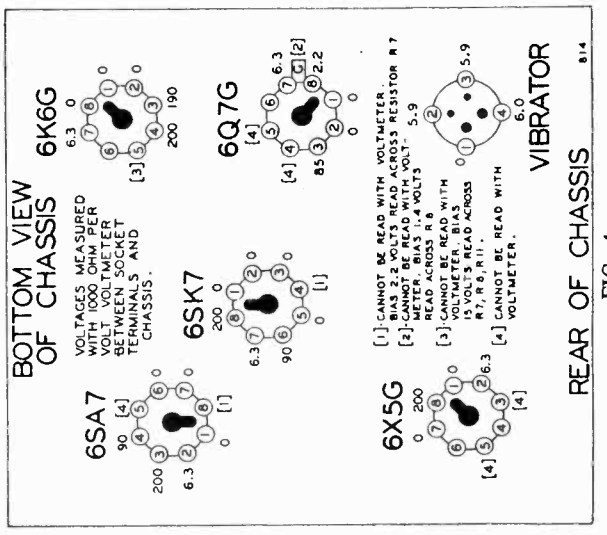


FIG. 4

January 1939
Serial No. 203070 Up

MODEL 577C
Alignment, Trimmers
Socket, Tuner

GAMBLE-SKOGMO INC.

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

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

All voltages are to be measured with 6.3 volts input to receiver. Resistances of coils and transformer windings are indicated in ohms on schematic circuit diagram.

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

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. If fuse blows out frequently and insulating sleeve has been properly placed over fuse, the trouble is probably in the vibrator, it should be replaced. Do not attempt to make any adjustments on the vibrators.

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 test oscillator, as well as an output meter, must be used.

DUMMY ANTENNAS

The dummy antennas referred to in the following instructions are:

"I.F. Dummy" —A .5 mfd. condenser connected in series with the test oscillator output lead.

"Broadcast Dummy"—A 125 mmfd. condenser connected in series with the output lead of the test oscillator.

RESONANCE INDICATOR

Use as a resonance indicator an output meter connected across the primary of the speaker input transformer, or by means of an adapter between the plate and screen terminals of the type 6K6 output tube. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of a multi-range meter should be used.

I.F. ALIGNMENT: (465 K.C.)

1. With variable condenser in its minimum capacity position (plates entirely out of mesh) and with volume control full on, connect test oscillator set at 465 K.C. in series with I.F. dummy antenna, to grid of 6SK7 I.F. tube.
2. Adjust trimmer condensers of output I.F. transformer No. 108121 to resonance with oscillator.
3. Move test oscillator connection to grid of 6SA7 tube and adjust trimmer condensers of input I.F. transformer No. 108139 to resonance with oscillator. There are two adjustments on each and they are accessible from the top of the transformer shield and should be adjusted with an insulated screw driver. (See Fig. 3—top view, page 3.)

BROADCAST ALIGNMENT

1. With variable condenser in its minimum capacity position, connect test oscillator set at 1550 K.C. in series with broadcast dummy to the antenna lead of receiver.
2. Adjust oscillator trimmer of variable condenser to resonance. (This adjustment is the rear section of the two-gang condenser—see top view, Fig. 3).
3. Shift test oscillator to 1400 K.C. and pick up signal by rotating condenser and adjust antenna trimmer (front section of gang condenser) to resonance (see top view, Fig. 3).
4. Re-set test oscillator to 600 K.C. and rotate variable condenser to 600 K.C. Adjust series pad in the antenna circuit for maximum gain. This pad is mounted on the side of the antenna can, adjustment "X."
5. Go back and check 1400 K.C. If adjustment is made here, check 600 K.C. again.
6. Check for sensitivity at 1000 K.C. by setting test oscillator to this frequency and picking up the signal by rotating variable condenser. Under no circumstances bend plates of variable condenser sections to correct tracking.

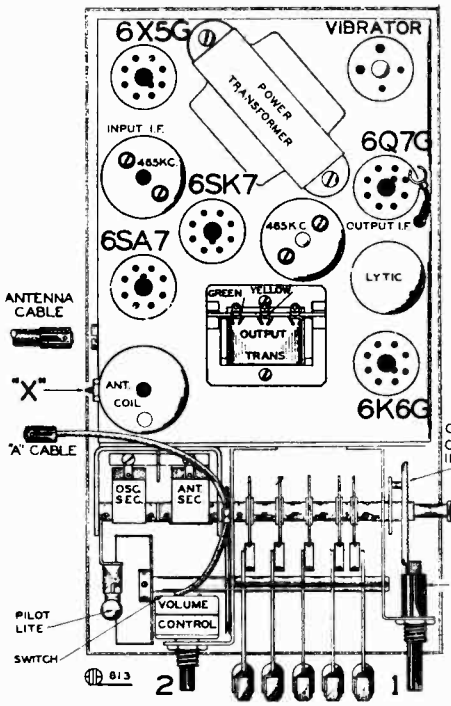


FIG. 3—TOP VIEW

PROCEDURE FOR SETTING THE AUTOMATIC LEVERS

There are five levers on the dial by means of which five stations may be selected, (See "B" Fig. 2).

Make a list of local stations you tune in regularly; any number up to and including five.

Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

On the front of each automatic tuner lever an opening is provided for inserting the call letter tabs, (See "A" Fig. 2).

Insert the call letter tabs in the rectangular openings of each of the automatic tuner levers. One of the small celluloid tabs supplied should be snapped into place over each of the station call letter tabs.

Press DOWN ALL THE WAY any one of the automatic tuner levers. Holding it down FIRMLY, tune in by means of the tuning knob (No. 1) the station you have assigned to this lever. Turn the tuning knob very slowly back and forth (while still holding lever in downward position) until the signal is clearest. The station will then be accurately tuned in Release the lever.

Press down another automatic tuner lever. Holding it down FIRMLY, carefully tune in the station assigned to this lever. Release this lever.

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

Now rotate the tuning knob (No. 1) to the right (clockwise) as far as it will turn, and tighten the special locking screw ("C") located on left side of tuner dial assembly (See Fig. 2).

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

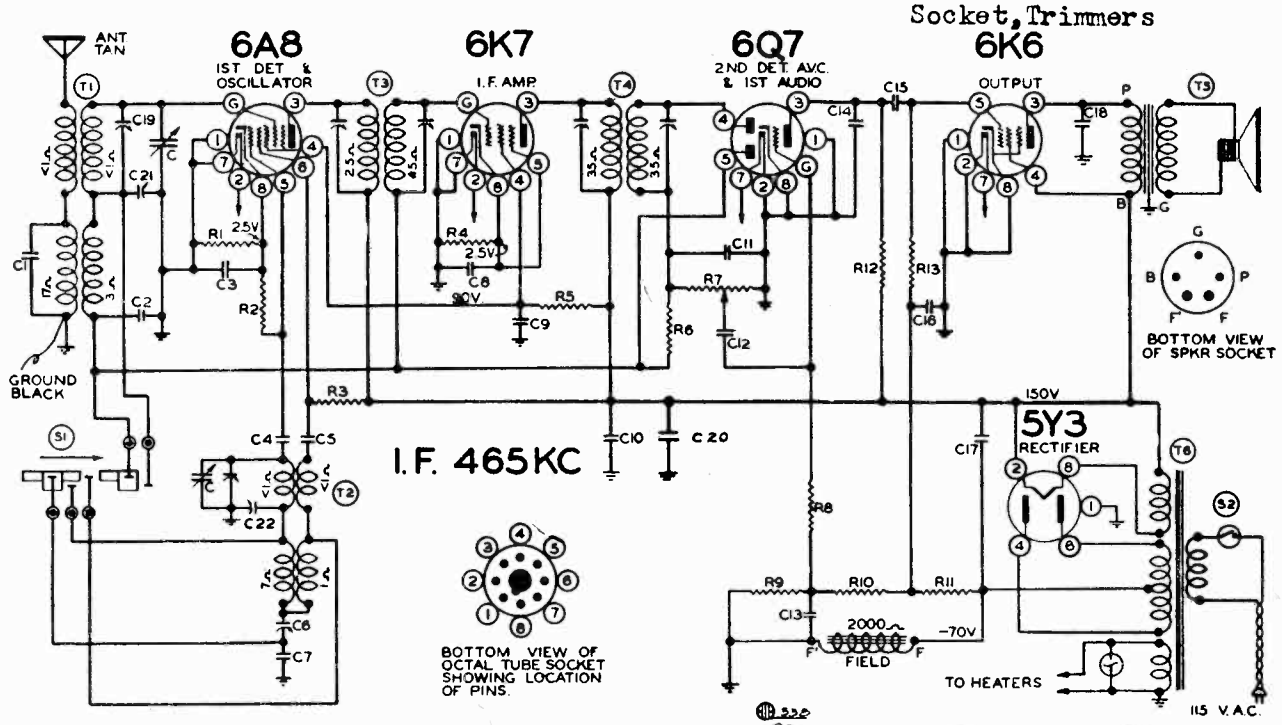
This screw will lock in place all the stations you have selected on the automatic tuner levers. (Note: Locking screw "C" is loose when radio is shipped from factory).

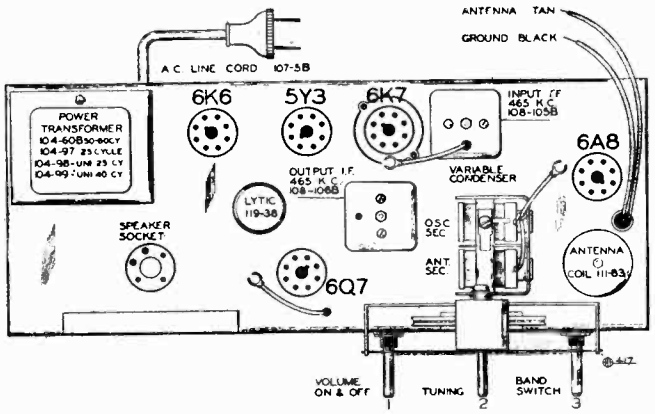
If you should desire to change any station you selected to another, loosen the locking screw "C" one or two turns, select the new station as explained. Be sure to retighten the locking screw, otherwise the stations you have selected will not stay adjusted to the levers.

The automatic dial is now set up for quick tuning. Press down on the lever and your favorite station is selected.

GAMBLE-SKOGMO INC.

MODEL 589, Series A, Iss. B
Schematic, Alignment
Socket, Trimmers





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

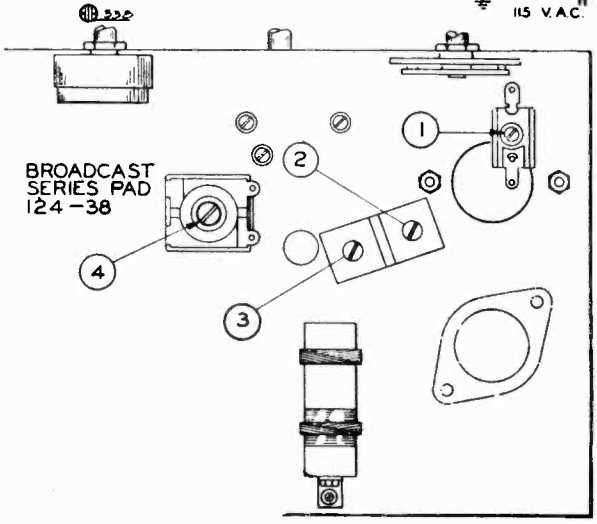


FIG. 3.—BOTTOM VIEW SHOWING TRIMMERS

RESISTORS

R1	130-83	300 ohm - 1/3 w. 10%
R2	130-12	50M ohm - 1/3 w. 20%
R3	130-17	10M ohm - 1/3 w. 20%
R4	130-93	450 ohm - 1/3 w. 10%
R5	130-149	15M ohm - 1/3 w. 20%
R6	130-4	3 megohm - 1/3 w. 20%
R7	101-71	1 megohm Volume control
R8	130-4	3 megohm - 1/3 w. 20%
R9	130-176	20M ohm - 1/3 w. 10%
R10	130-80	150M ohm - 1/3 w. 10%
R11	130-46	800M ohm - 1/3 w. 10%
R12	130-9	200M ohm - 1/3 w. 20%
R13	130-3	500M ohm - 1/3 w. 20%

CONDENSERS

C	102-43B	2 gang variable Condenser
C1	129-5	.0001 Mica
C2	100-22	.05 x 200 v. - 25%
C3	100-20	.1 x 200 v. - 25%
C4	129-39	.00005 - 20% - Mica
C5	100-25	.002 x 600 v. - 20%
C6	124-38	600 mmf. Series Pad. Adj.
C7	129-54	.003 - 2½% Mica
C8	100-20	.1 x 200 v. - 25%
C9	100-1	.1 x 400 v. - 50 - 10%
C10	119-38	5.0 mfd. - 250 w. v. 'Lytic
C11	129-5	.0001 - 20% Mica
C12	100-11	.01 x 400 v. - 25%
C13	100-20	.1 x 200 v. - 25%
C14	129-2	.0005 - 20% Mica
C15	100-26	.02 x 400 v. - 25%
C16	100-20	.1 x 200 v. - 25%
C17	119-38	5.0 mfd. - 250 w.v. 'Lytic
C18	100-37	.003 x 600 v. - 10%
C19	124-39B	2 - 25 mmf. Adj. Cond.
C20	100-13	.05 x 400 v. - 25%
C21	124-30C	Adj. Trimmer 1 - 10 mmf.
C22	124-30C	Adj. Trimmer 2 - 20 mmf.
		C21 - C22 in same unit.

PARTS

T1	111-83	Ant. Coil
T2	110-66	Osc. Coil
T3	108-105B	Input I.F. - 465 kc.
T4	108-106B	Output I.F. - 465 kc.
T5	114-61	6" Dynamic speaker (2000 OHM FIELD)
T6	104-60B	Power Transformer
S1	125-37	Wave Band Switch
S2		On-off switch on volume control

ALIGNMENT

IF adj. 465 KC thru .1mf cond.

SW Osc. adj. - 17 MC thru .1 mf cond.- trim. located on top of rear gang sect.

SW Ant. adj.- 17 MC
See Fig. 3, Adj. 1

BC Osc. adj. 1720 KC thru 200 mmf and 20 ohm res.
See Fig. 3, Adj. 3

BC Ant. adj. 1400 KC thru 200 mmf and 20 ohm res.
See Fig. 3, Adj. 2

PADDER adj. 600 KC
See Fig. 3, Adj. 4

MODEL 601, Series A, B, C
Schematic, Voltage
Alignment, Trimmers
Socket, Notes

GAMBLE-SKOGMO INC.

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

Part No. 108-83 Output I.F. Transformer
Part No. 108-82 Input I.F. Transformer

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

1. With volume control full on (the extreme right of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments

(a) Connect external oscillator set at 465 kilocycles, in series with .1 mfd. condenser, to the control grid cap of the type 78 tube, and adjust the output I.F. transformer (No. 108-83) to resonance.

(b) Move oscillator output clip from grid of 78 grid cap of 6A7 and adjust input I.F. transformer (No. 108-82) to resonance.

(c) With oscillator still connected to 6A7, readjust output I.F. transformer (108-83) if necessary.

R.F. ALIGNMENT: (535-1720 K.C.)

1. Unsolder the antenna wire from its terminal on the antenna coil and with gang condenser in its minimum capacity position, plates entirely out of mesh, connect an external oscillator in series with a 50 mmf. condenser to the antenna terminal on the antenna coil and chassis ground and make the following adjustments:

(a) With external oscillator set at 1720 kilocycles, adjust oscillator trimmer (rear of gang condenser).

(b) Re-set external oscillator to 1550 kilocycles, rotate condenser, pick up oscillator signal and adjust antenna trimmer to resonance (front section of gang condenser).

(c) Check sensitivity at 600 and 1000 kilocycles.

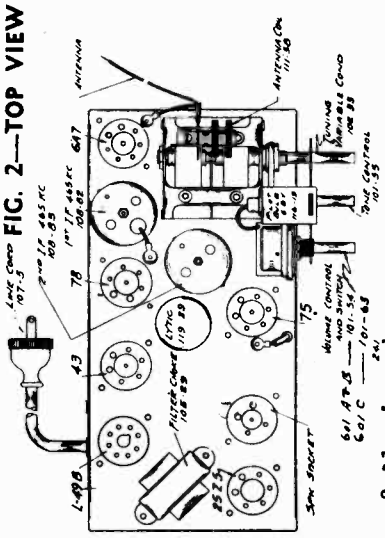
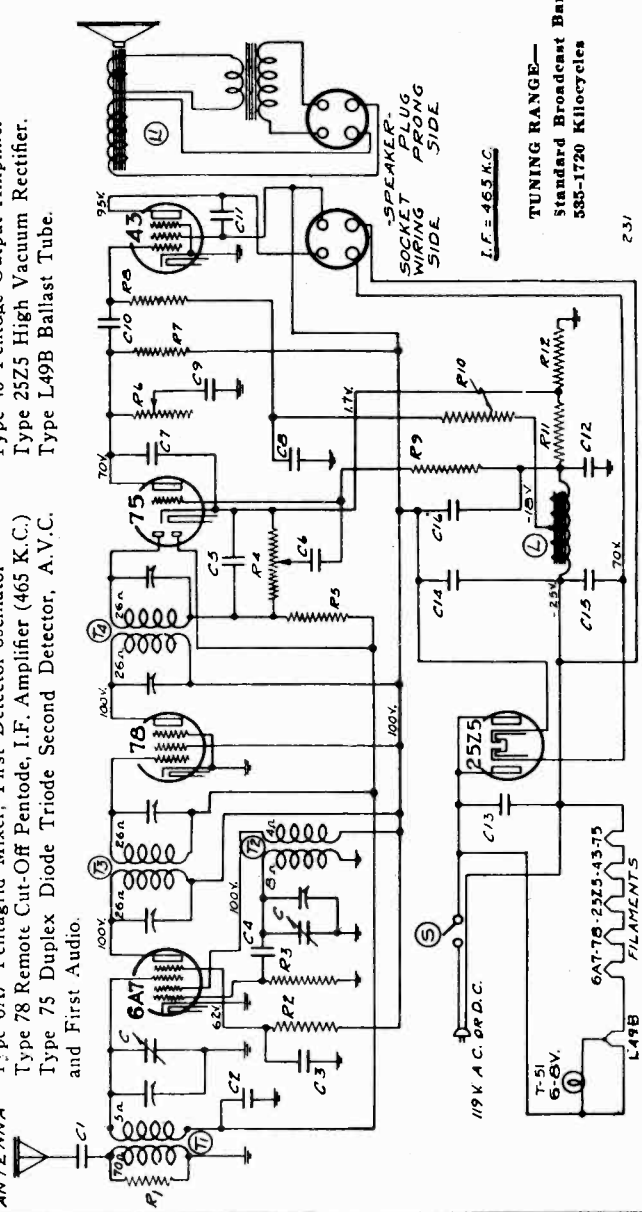


FIG. 2—TOP VIEW



No.	Part No.	Description
R1	130-12	50M Ohm—½W—20%—20V—Carbon
R2	130-21	20M Ohm—½W—20%—20V—Carbon
R3	130-12	50M Ohm—½W—20%—20V—Carbon
R4	101-54	1 meg Ohm—Volume Control
R5	130-119	3 meg Ohm—½W—20%—100V—Carbon
R6	101-55	1 meg Ohm—Tone Control
R7	130-120	100M Ohm—½W—20%—50V—Carbon
R8	130-5	300M Ohm—½W—20%—100V—Carbon
R9	130-38	2 meg Ohm—½W—20%—100V—Carbon
R10	130-9	200M Ohm—½W—20%—20V—Carbon
R11	106-28	35 Ohm—Muter Strip
R12	106-28	50 Ohm—Muter Strip
		NOTE: R11 and R12 in one unit—No. 106-28.
T4	108-83	Output I.F. Coil—465 Kc.
L	105-29	Filter Choke (Resistance 600 Ohms)
L1	114-43	Five Inch Speaker (Field resistance 3000 Ohms)
S	101-54	On and off switch on Volume Control

C1	100-23	.002 x600 Volt—25%
C2	100-22	.05 x200 Volt—25%
C3	100-22	.05 x200 Volt—25%
C4	129-12	.00025 Mica—MT—20%
C5	129-12	.00025 Mica—MT—20%
C6	100-11	.01 x400 Volt—20%
C7	129-2	.0005 Mica—MT—20%
C8	100-20	.1 x200 Volt—25%
C9	100-11	.01 x400 Volt—25%
C10	100-11	.01 x400 Volt—25%
C11	100-25	.002 x600 Volt—25%
C12	100-6	.25 x200 Volt—20%
C13	100-30	.1 x400 Volt—20%
C14	119-25	16 mfd. x100 Volt—Working Voltage
C15	119-25	5 mfd. x100 Volt—Working Voltage
C16	119-25	8 mfd. x100 Volt—Working Voltage
		NOTE: C14, C15, and C16 in one unit—No. 119-25
C	102-33	One section of two gang condenser
T1	111-57	Antenna Coil
T2	110-46	Oscillator Coil
T3	108-82	Input I.F. Coil—465 Kc.

MODEL 601—SERIES A See schematic and parts above.

MODEL 601—SERIES B is the same as Series A, except for the following changes:-
1 - The C15 condenser was eliminated.
2 - The C14 condenser was replaced by a C15 (Part #119-29) 30 mfd. capacity, and the C16 was replaced by a C14 (Part #119-29) 8 mfd. capacity.

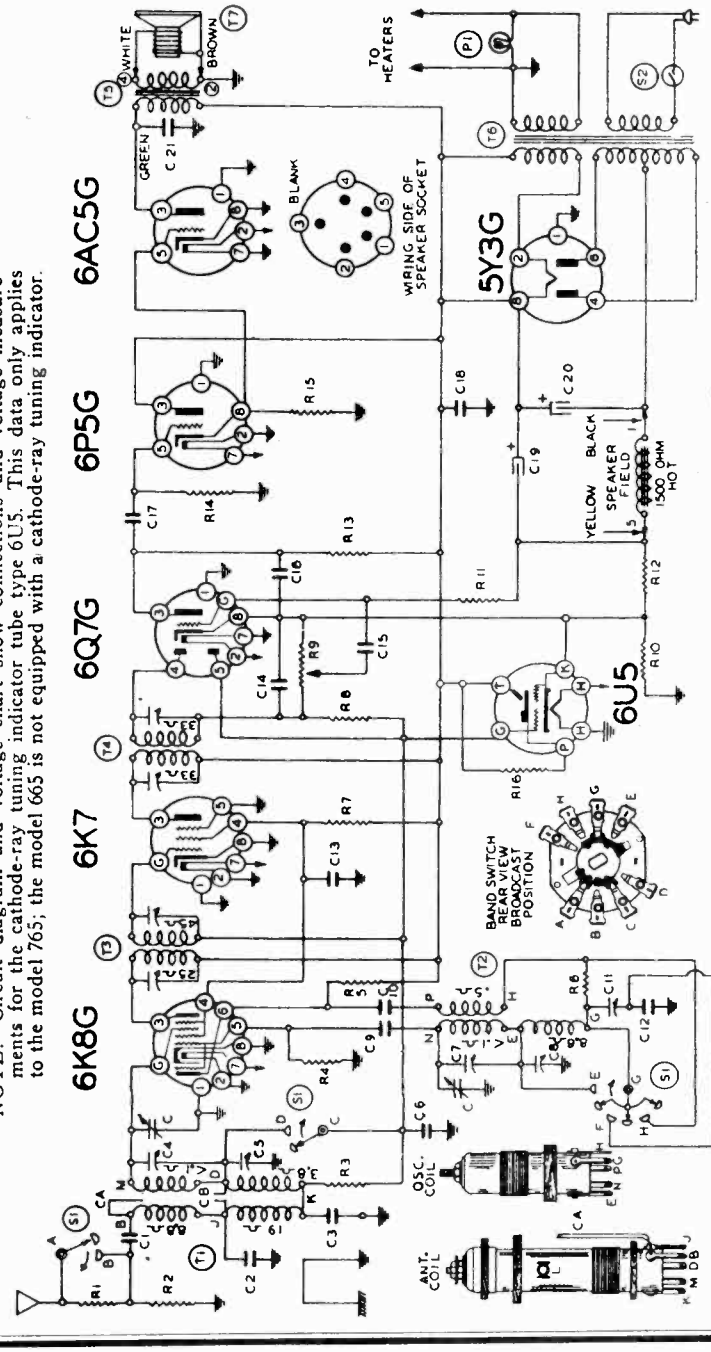
MODEL 601—SERIES C is the same as Series B (see above changes) except for the substitution of the following parts:

R4	101-63	500M Ohm Volume Control	C7	129-5	.0001 Mica—MT—20%
R7	130-102	500M Ohm—½W—20%—100V—Carbon			
R9	130-102	500M Ohm—½W—20%—100V—Carbon	S	101-63	On and off switch on Volume Control

GAMBLE-SKOGMO INC.

MODELS 665,765,Series A Schematic,Voltage Trimmers,Socket

NOTE: Circuit diagram and voltage chart show connections and voltage measurements for the cathode-ray tuning indicator tube type 6U5. This data only applies to the model 765; the model 665 is not equipped with a cathode-ray tuning indicator.



RESISTORS

R1	13041	800 ohm—½ w.
R2	13017	10M ohm—½ w.
R3	13020	100M ohm—½ w.
R4	13012	50M ohm—½ w.
R5	13017	10M ohm—½ w.
R6	13031	1500 ohm—½ w.
R7	13042	20M ohm—½ w.
R8	1304	3 megohm—½ w
R9	101126	1 megohm control (volume)
R10	130233	60 ohm—½ w.
R11	1304	3 megohm—½ w.
R12	130203	40 ohm—½ w.
R13	1309	200M ohm—½ w.
R14	13019	1 megohm—½ w.
R15	130232	25M ohm—½ w.
R16	130110	1 Megohm (in Tuning Indicator Socket)

CONDENSERS

CA		Adjustable Capacitor
CB		Adjustable Capacitor
C1	10274	2 gang variable condenser
C2	12987	.000105 Mica
C3	12949	.00009 Mica
C4	10077	.00304 x 600 v.
C5	12439	SW. Antenna Trimmer 2-25 mmfd.
C6	12453	BC. Antenna Trimmer 1-10 mmfd.
C7	10022	.05 x 400 v.
C8	12439	SW. Oscillator Trimmer 2-25 mmfd.
C9	12453	BC. Oscillator Trimmer 2-25 mmfd.
C10	12938	.00005 Mica
C11	10025	.002 x 600 v.
C12	12451B	350 mmfd. W.C. B.C. Series Pad
C13	129112	.0041 Compression Type
C14	10053	.25 x 400 v.
C15	12939	.00005 Mica
C16	10011	.01 x 400 v.
C17	1292	.006 Mica
C18	10011	.01 x 400 v.
C19	10013	.05 x 400 v.
C20	11963B	8 mfd.—350 w. v. lytic
C21	11963B	12 mfd.—350 w. v. lytic
C5 and C8 in same unit.	10089	.008 x 800 v. C18 and C19 in same unit.

PARTS

T1	11193C	SW. B. C. Antenna Coil Complete
T2	11089	SW. B. C. Oscillator Coil Complete
T3	108105G	Input I. F.—465 kc.
T4	108106D	Output I. F.—465 kc.
T5	10575	Output Transformer
T6	104124B	Power Transformer
T7	114125	6" Speaker Dynamic (1500 ohm field)
S1	12554	Band Switch
S2	101126	Off-on Switch on volume control
P1	10794	6.3 v. Pilot Light T-44

FOR SIMILAR TUNER ADJUSTMENTS SEE MODEL 761A GAMBLE PAGE 10-6 VOL. X

FOR ALIGNMENT SEE INDEX

BAND	DIAL SCALE FREQUENCY RANGE
Broadcast	Upper 540 to 1720 K.C. (Kilocycles)
Short Wave	Lower 5.45 to 18.3 M.C. (Megacycles)

MODELS 665 & 765 SERIES A

DESCRIPTION

TUBES:

The tube complement of this chassis consists of the following octal base glass and metal tubes:

The type and function of each tube is as follows:

1—Type 6K8G Triode Hexode, First Detector-oscillator.

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

1—Type 6Q7G Duplex Diode Triode Second Detector, A. V. C. and First Audio.

1—Type 6P5G Driver Stage.

1—Type 6AC5G Positive Grid Triode Output Amplifier.

1—Type 5Y3G High Vacuum Rectifier.

1—Type 6U5 Cathode-Ray Tuning Indicator Tube (for Model 765).

Transformers are available and chassis are sometimes equipped with universal transformers for operation on 25, 40 and 60 cycles and with primary taps for 110, 130, and 230 volts, (see parts list).

SERVICE NOTES:

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

All voltages as indicated on the voltage chart are measured with 115 volts on the primary of the power transformer.

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

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

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

ALIGNING INSTRUCTIONS:

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

TO REMOVE CHASSIS FROM THE CABINET:

Remove the four bolts which are used to fasten the chassis to the cabinet shelf; pull the knob off their shafts and pull off the six button lever keys on front of dial.

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 an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 mf., 200 mmf., and 400 ohms.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Band Switch	Variable Condenser Setting	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
I. F.	465 Kc.	.1 MFD.	Grid of 6K7	Broadcast (Extreme left rotation)	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Output I. F.	Adjust to maximum output
	465 Kc.	.1 MFD.	Grid of 6K8	Broadcast (Extreme left rotation)	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Input I. F.	Adjust to maximum output
SHORT WAVE BAND	17 Mc.	400 ohms	Antenna lead	Short wave (Extreme right rotation)	Set dial at 17 MC	Trimmer (C 7) (See Fig. 3)	Short wave Oscillator	Adjust to maximum output
	17 Mc.	400 ohms	Antenna lead	Short wave (Extreme right rotation)	Dial set at 17 MC	Trimmer (C 4) (See Fig. 3)	Short wave Antenna	Adjust to maximum output
BROAD-CAST BAND	1720 Kc.	200 mmf.	Antenna lead	Broadcast (Extreme left rotation)	Rotor full open (Plates out of mesh)	Trimmer (C 8) (See Fig. 3)	Broadcast Oscillator	Adjust to maximum output
	1400 Kc.	200 mmf.	Antenna lead	Broadcast (Extreme left rotation)	Set dial at 1400 Kc.	Trimmer (C 5) (See Fig. 3)	Broadcast Antenna	Adjust to maximum output
	600 Kc.	200 mmf.	Antenna lead	Broadcast (Extreme left rotation)	Set dial at 600 Kc.	Trimmer (C 11) (See Fig. 3)	Broadcast oscillator series pad	Adjust to maximum rock dial. (See note "A")
IMAGE REJECTION ADJUST-MENTS	2100 Kc.	200 mmf.	Antenna lead	Broadcast (Extreme left rotation)	Pick up signal at 1170 Kc. on dial	Wire capacitor (CB) (See circuit diagram)	Image rejection	Adjust by twisting for minimum output. (See note "B")
	2630 Kc.	200 mmf.	Antenna lead	Broadcast (Extreme left rotation)	Pick up signal at 1700 Kc. on dial	Wire capacitor (CA) (See circuit diagram)	Image rejection	Adjust by moving for minimum output. (See note "C")

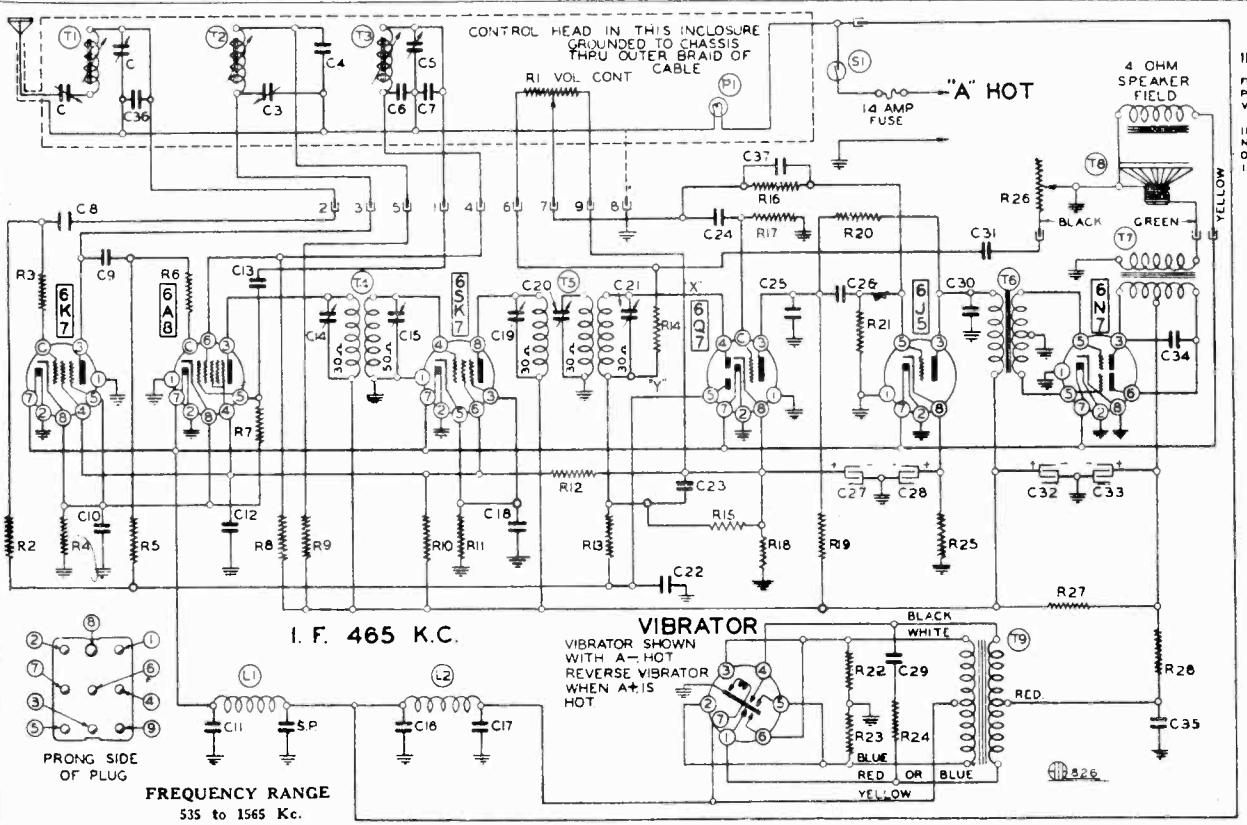
NOTE "A" Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

NOTE "B" 2100KC is the image frequency of 1170 KC. Adjust wire capacity (CB) by twisting the two wires until a **minimum** output is obtained.

NOTE "C" 2630KC is the image frequency of 1700KC. Adjust wire capacity (CA) by moving the wire either toward or away from the antenna coil winding until a **minimum** output is obtained on the output meter.

- 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.

MODEL 678, Issue A Schematic, Voltage Socket, Trimmers



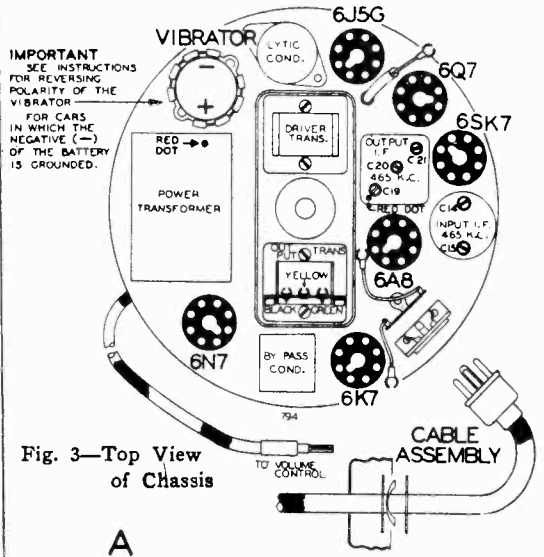
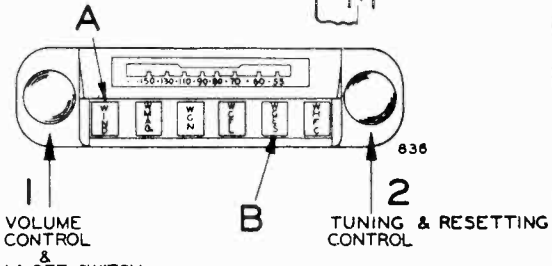


Fig. 3—Top View of Chassis



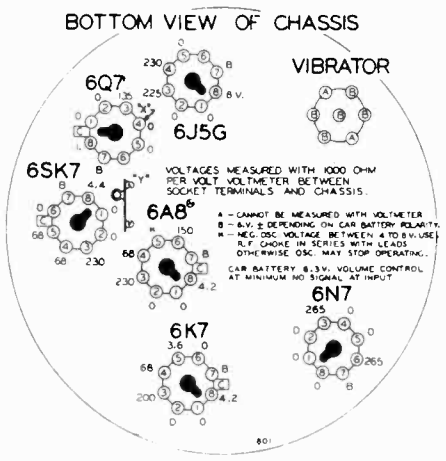


FIG. 5

MODEL 678, Issue A MARCH 1939 Serial No. 50,001 UP

Fig. 2—Front View of Remote Tuner Unit

Circuit Diagram Ref. No.	Part No.	Description
		RESISTORS
R1	101161	1.2 megohm volume control
R2	13019	1 megohm—½ w.
R3	130275	500 ohm—½ w.
R4	13079	400 ohm—½ w.
R5	13019	1 megohm—½ w.
R6	130275	500 ohm—½ w.
R7	13012	50M ohm—½ w.
R8	13012	50M ohm—½ w.
R9	13021	20M ohm—½ w.
R10	130196	30M ohm—1 watt
R11	130235	1500 ohm—½ w.
R12	1307	40M ohm—½ w.
R13	13019	1 megohm—½ w.
R14	13020	100M ohm—½ w.
R15	130118	600M ohm—½ w.
R16	130257	5 megohm—½ w.
R17	13019	1 megohm—½ w.
R18	130101	600 ohm—½ w.
R19	13011	250M ohm—½ w.
R20	13038	2 megohm—½ w.
R21	1303	500M ohm—½ w.
R22	130269	100 ohm—½ w.
R23	130269	100 ohm—½ w.
R24	13071	4M ohm—½ w.
R25	13092	1M ohm—½ w.
R26	101162	1 megohm tone control
R27	130199	1500 ohm Resistor—1 watt
R28	130231	75 ohm—½ w.
		CONDENSERS
C1	12480	Antenna Shunt Trimmer
C2	12481	Antenna Series Trimmer
C3	12480	R. F. Shunt Trimmer
C4	100102	.15 x 400 v.
C5	12480	Oscillator Shunt Trimmer
C6	129137	.0005 Mica
C7	129136	.00017 Mica
C8	12997	.00005 Mica—5%
C9	1292	.0005 Mica
C10	11625	.05 x 200 v.
C11	1296	.002 Mica
C12	11625	.25 x 400 v.
C13	12912	.00025 Mica
C14		Plate Trimmer on Input I.F. Trans.
C15		Grid Trimmer on Input I.F. Trans.
C16	10031	.5 x 120 v.
C17	10031	.5 x 120 v.
C18	1009	.05 x 200 v.
C19		Plate Trimmer on Output I.F. Trans.
C20		Tertiary Trimmer on Output I.F. Trans.
C21		Grid Trimmer on Output I.F. Trans.
C22	11625	.05 x 200 v.
C23	1295	.0001 Mica
C24	10011	.01 x 400 v.
C25	1295	.0001 Mica
C26	10011	.01 x 400 v.
C27	11978	20 mfd.—25 w. v. lytic
C28	11978	20 mfd.—25 w. v. lytic
C29	100101	.0055 x 1600
C30	129114	.0003 Mica
C31	10047	.002 x 600 v.
C32	11978	15 mfd.—450 w. v. lytic
C33	11978	15 mfd.—450 w. v. lytic
C34	100103	.004 x 800 v.
C35	1001	.1 x 400 volt
C36	12997	.00005 Mica—5%
C37	12967	.00004 Mica
		PARTS
T1	111118	P. B. Antenna Coil Assembly Complete
T2	10949	P. B. R. F. Coil Assembly Complete
T3	110109	P.B. Oscillator Coil
T4	108120B	Input I.F. Coil—465 kc.
T5	108115B	Output I.F. Coil—465 kc.
T6	10584	Audio Driver Transformer
T7	10583	Output Transformer
T8	114155	8" Dynamic Speaker
T9	104158	Power Transformer
L1	10566	"A" Choke
L2	10519	"A' Choke
P1	10794	6-8 v. Pilot Light
S1		Off-on Switch on volume control
	1269	Vibrator (130 cycle synchronous)

Power Output.....7 Watts Undistorted, 9 Watts Maximum

Power Consumption.....7.7 Amperes at 6.3 Volts

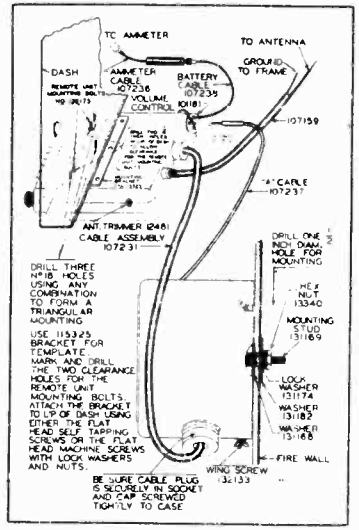


Fig. 1A—General Installation View

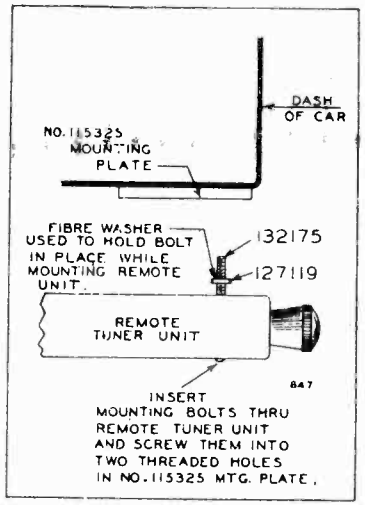


Fig. 1B—Remote Mounting

CONNECTIONS TO BATTERY:

CAUTION: Before making any battery connections, check the polarity of the vibrator unit (contained in radio unit) to determine whether it corresponds with the polarity of the storage battery in the car.

The radio is shipped from the factory with the vibrator inserted in its socket so that it will operate in cars in which the positive (+) post of the storage battery is grounded to the frame of the car.

In cars in which the negative (—) post of the storage battery is grounded to the frame of the car, the vibrator must be pulled out of its socket and rotated and reinserted into its socket so that the (—) sign on the top of the vibrator is opposite the red dot on the top of the transformer cover; (see Fig. 3, top view of radio chassis).

Check the polarity of the storage battery in car either by checking the actual wire connections on the battery or by using a voltmeter.

The ammeter cable, number 107236 (red wire with fuse receptacle at one end and terminal lug at other end), must be connected to battery terminal of ammeter. At the same time connect ammeter capacitor, number 10082 to battery terminal of ammeter, other end of capacitor to any convenient grounded screw on back of instrument dash panel.

Make certain the fuse is in the receptacle and the ammeter cable is properly connected to the short cable (number 107238), coming from the Remote Tuner Unit. (See Fig. 1A.)

In some installations it is advisable to connect the ammeter cable to the terminal on the ammeter which will not allow the current drawn by the radio to indicate on the ammeter, as additional motor interference may be encountered.

GENERATOR INTERFERENCE:

Remove the generator cutout mounting screw and fasten the condenser (10081) bracket on the generator cutout mounting lug. Replace the cutout mounting screw and tighten down securely.

Connect the condenser lead to the battery terminal of the cutout. The generator condenser is absolutely necessary as it is used to eliminate a high pitched whining noise which would otherwise be heard as the motor is accelerated.

ANTENNA CONNECTION:

Insert the antenna plug in cable into the back of the remote tuner unit (see Fig. 1A). The wire at the other end of the antenna cable is connected to the lead-in wire from the antenna. Keep the antenna cable as far away from car wiring as possible and ground the pigtail of the antenna cable shield at the antenna end.

A 36 inch shielded antenna cable is regularly supplied. If a roof or door hinge type antenna is used, this cable will be long enough in practically all cases to reach the corner post or column at which the antenna lead comes down. The shielded cable should be pushed up into the column as far as possible. The reason for this is that ignition interference may be picked up by any unshielded portion of the antenna cable.

If an under car or running board antenna is used, the shielding must be extended to the antenna in all cases. The pigtail on the end of the antenna cable shield must be well grounded at the extreme antenna end. If it is necessary to extend the antenna cable, be sure that a pigtail is put on the end of the shielded extension and that it is well grounded at the extreme antenna end.

To extend the antenna cable shielding, the antenna lead wire should be covered with heavy insulation, such as loom, to properly separate the shielding from the wire. Then connect the two wires together and connect the two shields together, care being taken that no strand of the shield touches the antenna wire.

Aerials suitable for steel roof and convertible cars can be purchased from your dealer.

The majority of 1937, 1938 and 1939 cars have steel roofs, and a running board or other car antenna such as the fish pole, door hinge or over the top types must be used. The 1936 Chrysler Motors cars (except Plymouth—but including Chrysler, Dodge and De-Soto) have a steel roof, separated from the body proper, which is used as an antenna.

PROCEDURE FOR SETTING THE AUTOMATIC PUSHBUTTONS:

There are six pushbuttons on the Remote Tuner Unit by means of which six stations may be set up for automatic tuning (see B, Fig. 2).

Make a list of local stations you tune in regularly; any number up to and including six.

Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

On the top of each pushbutton a slot is provided for inserting the call letter tabs, (see A, Fig. 2).

Insert the call letter tabs.

NOW, PROCEED AS FOLLOWS:—

1. Push the dial tuning knob in hard enough to make it latch in.
2. Rotate the dial tuning knob to the left (counter-clockwise), until the knob can not be turned any further without forcing.

   You will note that as the knob is rotated it will turn easily until the pointer reaches the end of the dial scale and then a slight amount of force will be required to actually start unlocking the tuner mechanism. Beyond this point the knob will turn quite easily again until the tuner mechanism is completely unlocked. At this point do not force the knob any further. The tuner mechanism is now unlocked.

   (NOTE:—Automatic tuner mechanism is locked tight when radio is shipped from the factory.)
3. Push in all the way any one of the pushbuttons and at the same time hold in firmly the dial tuning knob. Both the dial tuning knob and the pushbutton should be pushed hard enough to make them stay latched in. The reason for holding the dial tuning knob in firmly when the pushbutton is pressed in is due to the latching mechanism in the Remote Tuner unit which is so constructed to release the dial tuning knob entirely when a pushbutton is pressed in. When setting up stations for automatic tuning, however, it is necessary that both the dial tuning knob and the pushbutton be latched in together.
4. Press in on the pushbutton which is latched in. Holding it in firmly, tune in by means of the dial tuning knob the station indicated on the station call letter tab on this pushbutton. Turn the dial tuning knob very slowly back and forth (while still pressing in firmly on the pushbutton), until the station is clearest. The station will then be accurately tuned in.
5. Push in all the way another pushbutton, at the same time holding the dial tuning knob in so that both the pushbutton and the dial tuning knob are latched in together. Holding the pushbutton in firmly, tune in the station indicated on the call letter tab on this pushbutton.
6. Follow this procedure until you have tuned in all of your favorite stations.
7. When the last pushbutton has been properly set up it is necessary to release it from the latched-in position before the tuner mechanism can be locked. To release this pushbutton, press in very slightly any one of the other pushbuttons. This will trip the latching mechanism and all the pushbuttons will be released to out position.
8. Now, Press on the dial tuning knob hard enough to make it latch in. Rotate the dial tuning knob to the right (clockwise) until the knob can not be turned any further without forcing it.
   This will lock the tuner mechanism and all the stations that have been set up on the pushbuttons will be locked in place for automatic tuning.
9. Press in any one of the pushbuttons and—YOUR FAVORITE STATION IS SELECTED.

The important steps to remember when setting up stations on the pushbuttons for automatic tuning are:

1. To unlock the tuner mechanism press on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the left (counterclockwise) until the knob cannot be turned any further without forcing it.
2. To set a pushbutton, Push in all the way and hold in firmly both the pushbutton and the dial tuning knob so that both latch in. Hold in firmly the pushbutton and tune in the station by means of the dial tuning knob. Set all the pushbuttons in the same manner.
3. To release the last pushbutton push in very slightly any one of the other pushbuttons. This will trip the latching mechanism.
4. To lock the tuner mechanism push on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the right (clockwise) until the knob can not be turned any further without forcing it. (NOTE: All the pushbuttons must be in out position when locking the tuner mechanism.)

RADIO LOCATION AND MOUNTING:

Determine the most satisfactory mounting position.

Lift the radio case up and temporarily hold it in the proposed position. The case should be mounted high enough to avoid interference with car controls and the location of the Remote Tuner unit in respect to the radio case should be considered. The limiting factor being the length of special connector cable which connects the Remote Tuner unit to the radio case. (This cable should not be altered in any manner).

Mark location for the mounting bolt, drill one one-half inch (½") hole, making certain that the paint around the hole on the engine side of the fire wall is scraped clean to insure a good ground connection between receiver and the frame of the car.

CAUTION: Before fastening the radio unit read very carefully the paragraph on "CONNECTIONS TO BATTERY." This concerns the polarity of the vibrator unit and must be thoroughly understood as the radio will not operate unless the polarity of the vibrator unit corresponds with the polarity of the storage battery in the car.

TUNER UNIT MOUNTING: It may be necessary in some instances to move dash panel light switches or car heater control switches, however, in the majority of cases the Remote Tuner Unit will mount very satisfactorily under the dash panel to the left of the steering column. Mount the unit as close to the steering column as possible to allow clearance for the emergency brake which is mounted on the extreme left hand side of some makes of cars.

Details for mounting are shown in Fig. 1A and Fig. 1B, General Installation view.

The bracket No. 115325 for mounting the Remote Tuner Unit has three rows of holes to facilitate the best mounting in all makes of cars.

Use the bracket as a template, marking the lip of the dash for three mounting holes for the bracket and two clearance holes for the Remote Tuner unit mounting bolts. (See Fig. 1A.)

Mount the bracket using either the flat head self-tapping screws or the flat head machine screws, lockwashers and nuts supplied.

Insert the two Remote Tuner Unit mounting bolts through the holes in the unit using the two fibre washers to hold the bolts in place while mounting the unit to the bracket (see Fig. 1B). Screw the mounting bolts into the threaded holes in the mounting bracket (eight threaded holes are provided so that the remote unit can be mounted forward or further back as desired). Fasten the unit securely.

Connect the battery cable, number 107237 coming from the radio case to the pin on the volume control assembly on the rear of the Remote Tuner Unit.

Connect the R. F. cable assembly (cable number 107231) by inserting the plug of the cable into the receptacle socket on the side of the radio unit case. Screw the threaded cap of the cable assembly to the threaded fitting on the radio case securely. (See Fig. 1A.)

Important: This cable should not be altered in any manner.

This unit has been carefully designed to facilitate servicing, the entire case can be removed by loosening three wing head screws, exposing all tubes, vibrator and receiver circuits.

All adjustments are accessible being located on the side and bottom of the Remote Tuner unit (See Fig. 4), a full eight inch electro dynamic speaker is used.

The output of the receiver is 9 watts.

DESCRIPTION:

Model 678 is a six tube superheterodyne receiver having a tuning range of 535 K. C. to 1565 K. C.; operates from a six volt storage battery and uses the automotive type 6.3 volt tubes. The "B" supply is obtained from a synchronous type vibrator.

The I. F. frequency used is 465 K. C. The output I. F. coil has three tuned circuits giving superior band pass qualities and selectivity as compared to the conventional two tuned circuit coils. Antenna, R. F. and oscillator circuits are permeability tuned, offering automatic tuning applications that are both accurate and stable. The entire coil assembly is mounted in the Remote Tuner control head being connected to the oscillator and R. F. circuits by an R. F. transmission cable.

The R. F. oscillator, I. F. and audio amplifier including the power supply is contained in the speaker case.

SERVICE NOTES:

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

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

All voltages are to be measured with 6.3 volts input to receiver. Resistances of coils and transformer windings are indicated in ohms on schematic circuit diagram.

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

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. If fuse blows out frequently, the trouble is probably in the vibrator, it should be replaced. Do not attempt to make any adjustments on the vibrators.

ALIGNMENT PROCEDURE

GAMBLE-SKOGMO INC. Alignment, Tuner Trimmers

MODEL 678, Issue A

IMPORTANT—ADJUSTING ANTENNA TRIMMER:

Tune in any weak station between 600 and 800 kc.

Make sure that the antenna shunt trimmer on the Bottom of the Remote Tuner is turned all the way out (counter clockwise), (see adjustment "C1," Fig. 4,).

Adjust antenna series trimmer on the side of the remote Tuner Unit. For maximum output. (See adjustment "C2," Fig. 4,).

NOTE: If resonance (maximum output) cannot be obtained within the range of the antenna series trimmer "C2," turn the adjustment screw all the way out (counter clockwise) and then adjust the antenna shunt trimmer "C1" on the bottom of the remote tuner unit for a peak of maximum output.

The above arrangement will cover any antenna capacity that is now in use.

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 test oscillator, as well as an output meter, must be used.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 mf., 125 mmf.

- 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.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Remote Tuner Dial Setting	Trimmers Adjusted (in Order Shown)	Trimmer Function	Adjustment
I. F.	465 Kc.	.1 MFD.	Grid of 6SK7 I. F. Tube	Set dial at 1400 Kc.	Trimmers C19, C20 (See Fig. 3)	Output I. F.	See note "A" Adjust to maximum output
	465 Kc.	.1 MFD.	Grid of 6SK7	Set dial at 1400 Kc.	Trimmer C21 (See Fig. 3)	Output, I. F.	See note "B" Adjust to maximum output
	465 Kc.	.1 MFD.	Grid of 6A8	Set dial at 1400 Kc.	Trimmers C14, C15 (See Fig. 2)	Input I. F.	Adjust to maximum output
BROADCAST BAND	1565 Kc.	125 mmf.	Antenna lead	Set dial at 1565 Kc.	Trimmer C5 (See Fig. 4)	Oscillator	Adjust to maximum output
	1400 Kc.	125 mmf.	Antenna lead	Set dial at 1400 Kc.	Trimmers C1, C3 (See Fig. 4)	Antenna and R. F.	Adjust to maximum output
	600 Kc.	125 mmf.	Antenna lead	Set dial at 600 Kc.	Trimmer C2 (See Fig. 4)	Antenna series adj.	See note "C"

NOTE "A" IMPORTANT: To align the output I. F. transformer without using a cathode ray oscillograph a 10M ohm resistor must be shunted across the diode tuned circuit. Connect the resistor as indicated by points "X" and "Y" on the circuit diagram and the bottom view of the radio chassis Fig. 5. A red dot on top of output I. F. can designates location of trimmer "C19."

NOTE "B" Before adjusting trimmer C21 disconnect the 10M ohm resistor. Under no circumstances re-adjust trimmers C19 or C20 after the 10M ohm resistor has been removed.

For alignment of the output I. F. transformer using a cathode ray oscillograph the 10M ohm resistor is not used.

NOTE "C" Maximum gain for this adjustment depends on the capacity of the antenna system of the car in which the radio is installed. For the proper alignment of this adjustment see "Adjusting Antenna Trimmer."

ALIGNMENT OF THE IRON CORES

The iron cores for the antenna, R. F. and oscillator permeability coils have been very carefully adjusted at the factory and require no further adjustment, unless it becomes necessary to replace a coil, or if the adjustments have been tampered with.

The procedure for aligning the iron cores will be supplied with replacement coils when ordered.

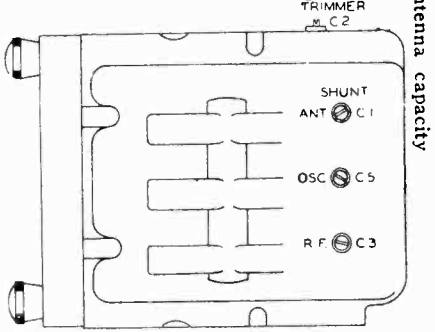


Fig. 4.—Bottom View of Remote Tuner

TUBE COMPLEMENT:

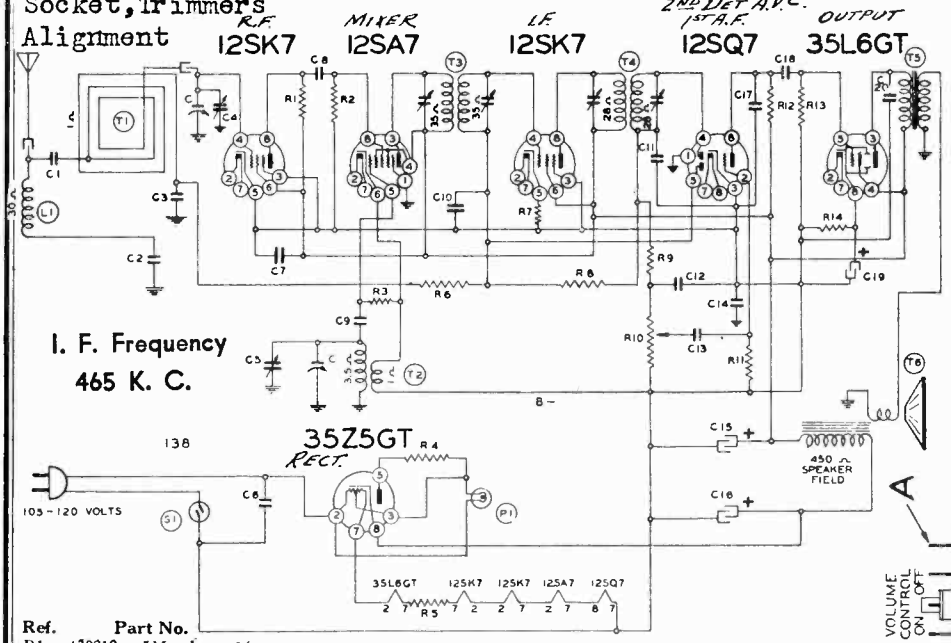
The tube complement of this chassis consists of the following metal and octal base glass tubes which are interchangeable with metal tubes.

1—Type No. 6K7 R. F. Amplifier.
1—Type No. 6A8—Pentagrid Converter (composite first detector and oscillator).
1—Type No. 6SK7—Remote Cut-off Pentode as an I. F. Amplifier.
1—Type No. 6Q7—Duplex Diode Triode Second Detector, A.V.C. and First Audio.
1—Type No. 6J5G—Driver Amplifier.
1—Type No. 6N7—Push-Pull Output Amplifier.

MODEL 678, Issue A

MODEL 636
Schematic, Voltage
Socket, Trimmers
Alignment

GAMBLE-SKOGMO INC.



FOR TUNER ADJUSTMENT SEE MODEL 677A VOL. X GAMBLE PAGE 10 - 20.

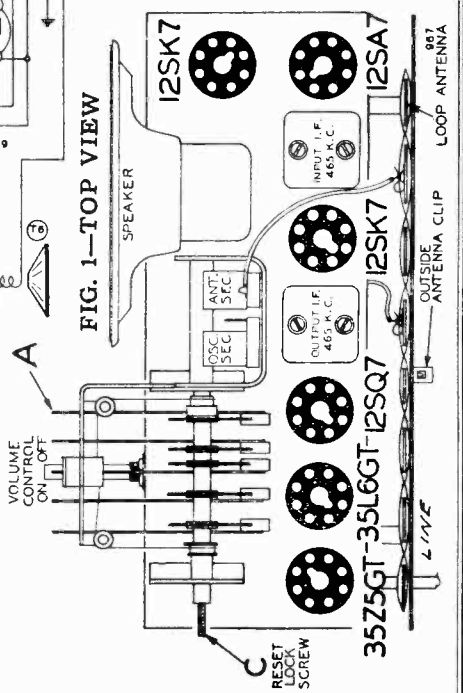


FIG. 1—TOP VIEW

Ref.	Part No.	
R1	130218	5M ohm—⅓ w.
R2	13020	100M ohm—⅓ w.
R3	130176	20M ohm—⅓ w.
R4	130295	25 ohm—1 watt
R5	130295	25 ohm—1 watt
R6	130100	150M ohm—⅓ w.
R7	130203	40 ohm—⅓ w.
R8	1304	3 megohm—⅓ w.
R9	13012	50M ohm—⅓ w.
R10	101127	1 megohm volume control
R11	130257	5 megohm—⅓ w.
R12	13011	250M ohm—⅓ w.
R13	1303	500M ohm—⅓ w.
R14	130166	150 ohm—⅓ w.
C	102104B	2 gang variable condenser
C1	12951	.000125 Mica
C2	12912	.00025 Mica
C3	10026	.02 x 400 v.
C4		Antenna Trimmer on gang
C5		Oscillator trimmer on gang
C6	1001	.1 x 400 v.
C7	1006	.25 x 200 v.
C8	1295	.0001 Mica
C9	1295	.0001 Mica
C10	1009	.05 x 200 v.
C11	1295	.0001 Mica
C12	1295	.0001 Mica
C13	10012	.003 x 600 v.
C14	100110	.2 x 400 v.
C15	11953E	30 mfd. lytic—150 w. v.
C16	11953E	30 mfd. lytic—150 w. v.
C17	1295	.0001 Mica
C18	10078	.01 x 200 v.
C19	11953E	40 mfd.—25 w. v. lytic
C20	10026	.02 x 400 v.
		C15, C16, and C19 in same unit

PARTS

T1	111139	Loop Antenna
T2	110128	Oscillator Coil
T3	108140F	Input I. F. Coil
T4	108145B	Output I. F. Coil
T5	10588B	Output Transformer
T6	114116G	5" Dynamic Speaker (450 ohm field)
L1	1237	Antenna Loading Coil
P1	107249	6-8 volt, Pilot light - T-47
S1		Off-on Switch on Volume Control

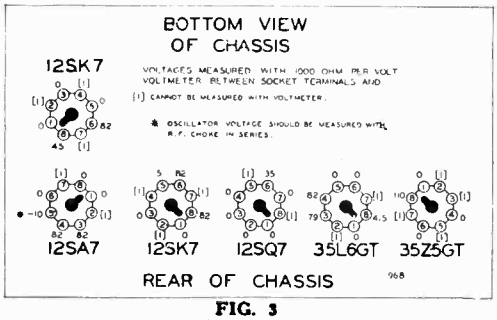


FIG. 3

ALIGNING INSTRUCTIONS:

Do not remove the back cover of the radio which contains the loop antenna from the chassis. 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.

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.

ALIGNMENT PROCEDURE

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

The following equipment is required for aligning:

- An all wave signal generator.
- 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.	465 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
BROADCAST BAND	1650 Kc.	.1 MFD.	Grid of 12SA7	Rotor full open (Plates out of mesh)	Trimmer bottom of Front section of gang. (See bottom of radio)	Oscillator	Adjust to maximum output
	1400 Kc.	See Note "A"		Set dial at 1400 Kc.	Trimmer bottom of Rear section of gang. (See bottom of radio)	Antenna	Adjust to maximum output

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

FREQUENCY RANGE 540 to 1650 K.C.

Power Consumption.....40 Watts
Power Output.....800 Milliwatts Undistorted, 1.5 Watts Maximum
Intermediate Frequency.....465 K.C.

7-39

GAMBLE-SKOGMO INC.

MODEL 767, Series A
Schematic, Socket
Trimmers

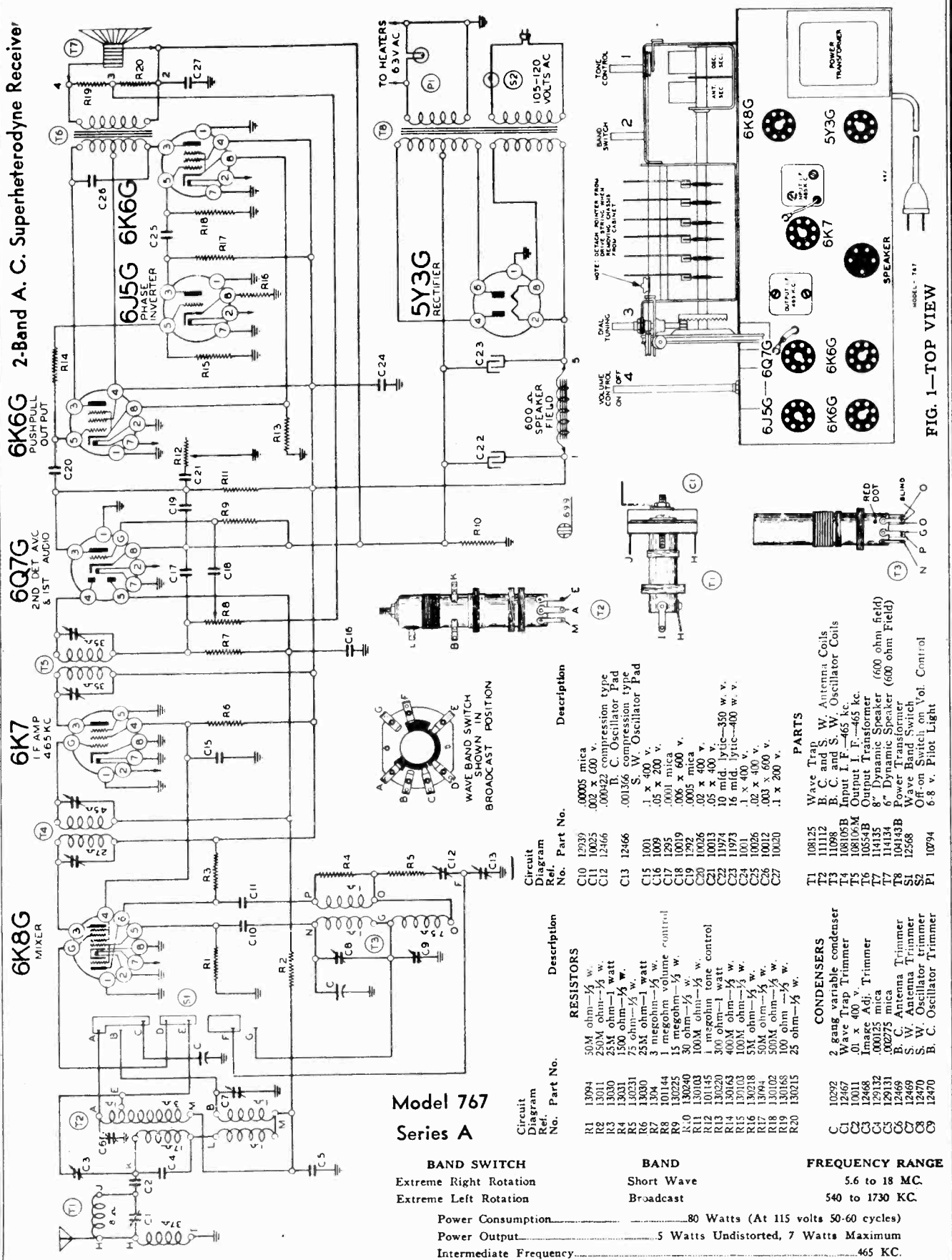


FIG. 1—TOP VIEW

Circuit Diagram Rel. No.	Part No.	Description
		RESISTORS
R1	13094	50M ohm—½ w.
R2	13011	250M ohm—½ w.
R3	13030	25M ohm—1 watt
R4	13031	1500 ohm—½ w.
R5	130231	75 ohm—½ w.
R6	13030	25M ohm—1 watt
R7	1304	3 megohm—½ w.
R8	101144	1 megohm volume control
R9	130225	15 megohm—½ w.
R10	130240	30 ohm—½ w.
R11	130103	100M ohm—½ w.
R12	101145	1 megohm tone control
R13	130220	300 ohm—1 watt
R14	130163	400M ohm—½ w.
R15	130103	100M ohm—½ w.
R16	130218	5M ohm—½ w.
R17	13094	50M ohm—½ w.
R18	130102	500M ohm—½ w.
R19	130168	100 ohm—½ w.
R20	130215	25 ohm—½ w.
		CONDENSERS
C	10292	2 gang variable condenser
C1	12467	Wave Trap Trimmer
C2	10011	.01 x 400 v. Trimmer
C3	12468	Image Adj. Trimmer
C4	129132	.000125 mica
C5	129131	.002725 mica
C6	12469	B. C. Antenna Trimmer
C7	12469	S. W. Antenna Trimmer
C8	12470	S. W. Oscillator trimmer
C9	12470	B. C. Oscillator Trimmer
C10	12939	.00005 mica
C11	10025	.002 x 600 v.
C12	12466	.00022 compression type B. C. Oscillator Pad
C13	12466	.001366 compression type S. W. Oscillator Pad
C15	1001	.1 x 400 v.
C16	1009	.05 x 200 v.
C17	1295	.0001 mica
C18	10019	.006 x 600 v.
C19	1292	.0005 mica
C20	11026	.02 x 400 v.
C21	10013	.05 x 400 v.
C22	11974	10 mid. lytic—350 w. v.
C23	11973	16 mid. lytic—400 w. v.
C24	1001	.1 x 400 v.
C25	11026	.02 x 400 v.
C26	10012	.003 x 600 v.
C27	10020	.1 x 200 v.
		PARTS
T1	108125	Wave Trap
T2	111112	B. C. and S. W. Antenna Coils
T3	11098	B. C. and S. W. Oscillator Coils
T4	108105B	Input I. F.—465 kc.
T5	108106M	Output I. F.—465 kc.
T6	10554B	Output Transformer
T7	114135	8" Dynamic Speaker (600 ohm field)
T7	114134	6" Dynamic Speaker (600 ohm Field)
T8	104143B	Power Transformer
S1	12568	Wave Band Switch
S2		Off-on Switch on Vol. Control
P1	10794	6.8 v. Pilot Light

BAND SWITCH	BAND	FREQUENCY RANGE
Extreme Right Rotation	Short Wave	5.6 to 18 MC.
Extreme Left Rotation	Broadcast	540 to 1730 KC.

Power Consumption ..... 80 Watts (At 115 volts 50-60 cycles)
Power Output ..... 5 Watts Undistorted, 7 Watts Maximum
Intermediate Frequency ..... 465 KC.

MODEL 767, Series A
Tuner Data

GAMBLE-SKOGMO INC.

SERVICE NOTES:

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

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

All voltages are to be measured with 115 volts A.C. line or a fully charged 6 volt storage battery.

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

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

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

SETTING THE AUTOMATIC TUNER LEVERS:

IMPORTANT—Read carefully before setting the automatic levers.

There are six levers by means of which six stations may be selected. Make a list of local stations or stations you tune in regularly; any number up to and including six.

Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

On the front of each automatic tuner lever button an opening is provided for inserting the call letter tabs.

Insert the call letter tabs in the rectangular openings of each of the automatic tuner buttons. One of the small celluloid tabs supplied should be inserted into place over each of the station call letter tabs.

NOW. PROCEED AS FOLLOWS:—

1. Pull the dial tuning knob **all the way out** (See Illus. "B," Fig 3), and rotate the tuning knob to the **left** (counterclockwise) until it cannot be turned any further (See Illus. "D," Fig. 3). This will unlock the automatic tuner mechanism. (NOTE:—Automatic tuner mechanism is locked tight when radio is shipped from the factory.)

2. Press down **all the way** any one of the automatic tuner levers. Holding it down **firmly**, press in on the dial tuning knob No. 3 and tune in the station indicated on the station call letter tab on this lever. You will note that in order to tune the station, the dial tuning knob will have to be **pressed in** (See Illus. "E," Fig. 3). Turn the dial tuning knob very slowly back and forth **(while still holding the automatic tuner lever in downward position)**, noting the width of the shadow on the screen of the cathode-ray tuning indicator. **Minimum** width on the tuning indicator indicates the ideal tuning position (resonance). The station will then be clearest and accurately tuned in.

3. Press down another automatic tuner lever. Holding it down **firmly**, press in on the dial tuning knob and carefully tune in the station indicated on the call letter tab on this lever.

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

5. Pull the dial tuning knob **all the way out** (See Illus. "B," Fig. 3) and rotate the tuning knob to the **right** (clockwise) until it cannot be turned any further (See Illus. "C," Fig. 3). This will lock the automatic tuner mechanism and the stations you have set up for automatic tuning will be locked in place. After you have locked the tuner mechanism, push the dial tuning knob **in.**

6. If you should desire to change any station you selected to another, pull the dial tuning knob all the way out and rotate the knob to the left (counterclockwise) and unlock the tuner mechanism. Select the new station as explained.

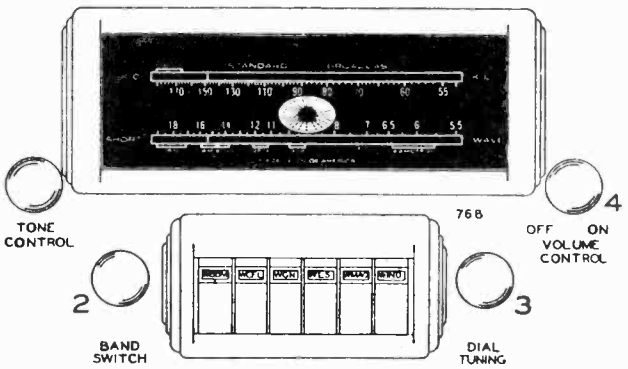


FIG. 2—FRONT VIEW

(NOTE:—If the dial mechanism works hard when setting up a new station for one of the automatic tuner levers, it is due to the tuner mechanism not being unlocked all the way. Pull the dial tuning knob out all the way and rotate the knob to the left (counterclockwise) until it will turn no further. The dial mechanism should work freely with the tuner lever pressed down).

7. After you have selected the new station, pull the dial tuning knob all the way out and rotate the knob to the **right** (clockwise) to lock the tuner mechanism. Be sure the knob is turned until it will turn no further, then press the dial tuning knob in.

8. The automatic tuner levers are now set up for quick tuning. Press down the lever key and—YOUR FAVORITE STATION IS SELECTED!

The **important** steps to remember when setting up stations on the tuner levers for automatic tuning are:

1. **To unlock** the tuner mechanism pull the **dial tuning knob all the way out.** You may find it necessary to rotate the knob slightly when pulling it out to make certain that the gears mesh properly. Rotate the dial tuning knob to the left (counterclockwise) as far as it will turn without forcing.

2. **To set a lever,** press down all the way and hold in this position while tuning in by means of the dial tuning knob the station you want this lever to be tuned to. (NOTE:—you will notice that it will be necessary to keep pressing in on the dial tuning knob while tuning in the station as a spring tends to push the knob out.) Set all the levers in the same manner before locking the mechanism.

3. To lock the tuner mechanism pull the dial tuning knob all the way out. Rotate the dial tuning knob to the right as far as it will turn making certain that it is tight, but it is not necessary to use force.

4. After locking or unlocking the tuner mechanism always return the dial tuning knob to its normal position (pushed in).

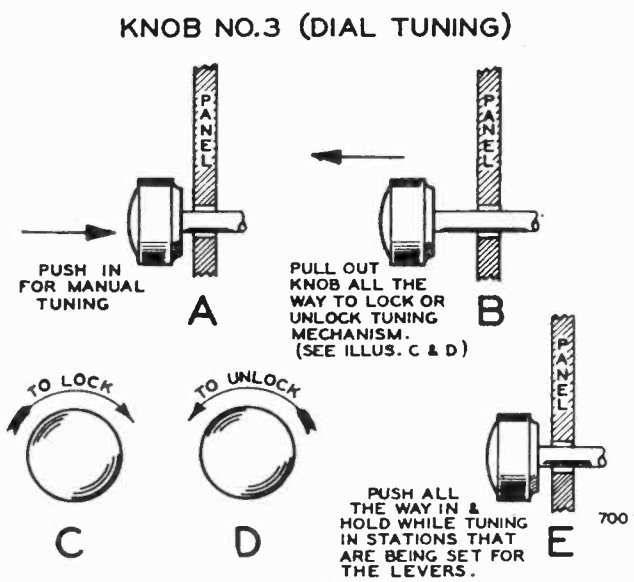


FIG. 3

GAMBLE-SKOGMO INC.

MODEL 767, Series A Alignment, Voltage Trimmers

ALIGNMENT PROCEDURE

Model 767 Series A

- 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 an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—.1 mf., 200 mmf. and 400 ohms.

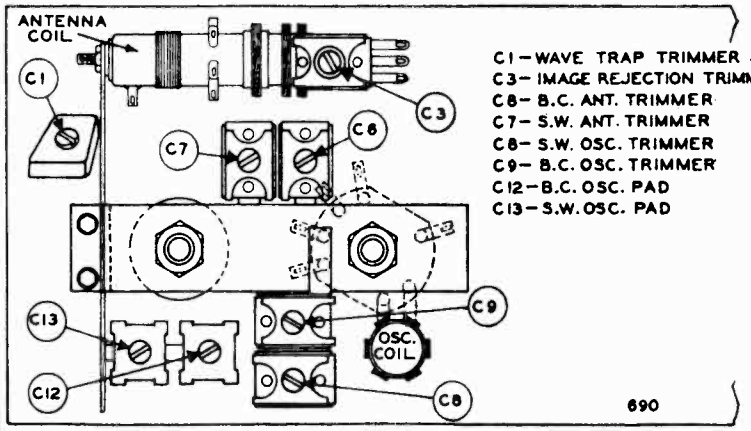
BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Position of Band Switch	Variable Condenser Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Adjustment
I. F.	465 Kc.	.1 MFD.	Grid of 6K7	Broadcast (Extreme left rotation)	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Output I. F.	Adjust to maximum output
	465 Kc.	.1 MFD.	Grid of 6K8G	Broadcast (Extreme left rotation)	Rotor full open (Plates out of mesh)	Two trimmers on top (See Fig. 1)	Input I. F.	Adjust to maximum output
BROAD-CAST BAND	1730 Kc.	200 mmf.	Antenna lead	Broadcast (Extreme left rotation)	Rotor full open (Plates out of mesh)	Trimmer (C9) (See Fig. 4)	Broadcast oscillator	Adjust to maximum output
	1500 Kc.	200 mmf.	Antenna lead	Broadcast (Extreme left rotation)	Set Dial at 1500 Kc.	Trimmer (C6) (See Fig. 4)	Broadcast antenna	Adjust to maximum output
	600 Kc.	200 mmf.	Antenna lead	Broadcast (Extreme left rotation)	Set Dial at 600 Kc.	Trimmer (C12C) (See Fig. 4)	Broadcast oscillator series pad	Adjust to maximum rock dial. (See note "A")
	465 Kc.	200 mmf.	Antenna lead	Broadcast (Extreme left rotation)	Set Dial at 600 Kc.	Trimmer (C1) (See Fig. 4)	I. F. Wave Trap	Adjust for minimum output
IMAGE REJECTION ADJUST-MENTS	2330 Kc.	200 mmf.	Antenna lead	Broadcast (Extreme left rotation)	Pick up signal at 1400 Kc. on dial	Trimmer (C3) (See Fig. 4)	Image rejection	Adjust for minimum output (See note "B")
SHORT WAVE BAND	17 Mc.	400 ohms	Antenna lead	Short Wave (Extreme right rotation)	Set Dial at 17 Mc.	Trimmer (C8) (See Fig. 4)	Short Wave oscillator	Adjust to maximum output
	17 Mc.	400 ohms	Antenna lead	Short Wave (Extreme right rotation)	Dial Set at 17 Mc.	Trimmer (C7) (See Fig. 4)	Short Wave antenna	Adjust to maximum output
	6 Mc.	400 ohms	Antenna lead	Short Wave (Extreme right rotation)	Set Dial at 6 Mc.	Trimmer (C13) (See Fig. 4)	Short Wave oscillator series pad	Adjust to maximum rock dial. (See note "A")

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

NOTE "B" 1400KC is the image frequency of 2330KC. Adjust Trimmer (C3) until a minimum output is obtained.

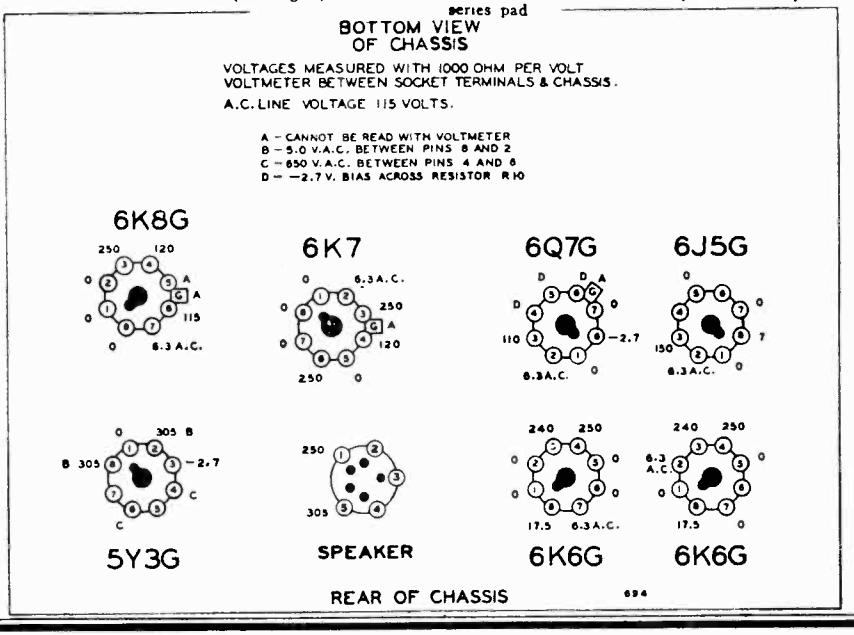
Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

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



C1—WAVE TRAP TRIMMER 465 K.C.
C3—IMAGE REJECTION TRIMMER
C6—B.C. ANT. TRIMMER
C7—S.W. ANT. TRIMMER
C8—S.W. OSC. TRIMMER
C9—B.C. OSC. TRIMMER
C12—B.C. OSC. PAD
C13—S.W. OSC. PAD

FIG. 4



MODELS 802,804
Schematic, Voltage
Alignment, Trimmers
Socket

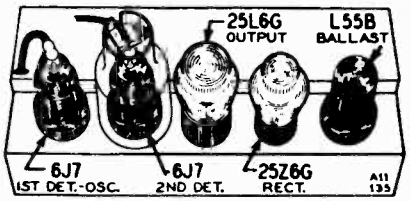
GAMBLE-SKOGMO INC.

MAY, 1938

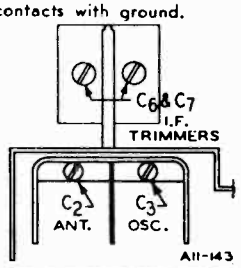
Power Consumption - 48 Watts (At 117 volts AC Supply)
Power Output - - - - - - - .8 Watts Undistorted
Selectivity - - 30 KC Broad at 100 times Signal

Tuning Frequency Range - - - - - 530 to 1730 KC
Sensitivity - - - - - - - 180 Microvolts Average

DC OPERATION—Filament and ballast tube voltages will be the same as AC (for 117 volt line). The plate, screen and bias voltages will be slightly lower than those shown above. When operated on DC, the rectifier tube acts as a low resistance series resistor with a drop of approximately 6 volts between plate and cathode.



CAUTION—In any service work on the AC-DC chassis, keep it on a wood or other insulated surface to avoid contacts with ground.



VOLTAGES AT SOCKETS FOR 117 VOLT AC LINE

See Note Below Regarding Voltages when Operated on DC
Volume Control Maximum—Antenna Lead Grounded—Readings taken with 1000 Ohm-per-volt Meter.

TUBE	FUNCTION	Voltage Between Socket Prong and Ground (Unless Otherwise Indicated)							
		Prong No. 1	Prong No. 2	Prong No. 3	Prong No. 4	Prong No. 5	Prong No. 6	Prong No. 7	Prong No. 8
6J7	1st Det. & Osc.		6.3(1)	98	98			6.3(1)	6.0
6J7	2nd Det.		6.3(1)	10	13			6.3(1)	
25L6G	Output		24(1)	92	98			24(1)	5
25Z6G	Rectifier		24(1)	117(2)	125	117(2)		24(1)	125
L55B	Ballast			56.6(3)				56.6(3)	4.5(4)

(1) AC voltage across terminals 2 and 7.
(2) AC voltage to ground.
(3) AC voltage across terminals 3 and 7.
(4) AC voltage across terminals 7 and 8.

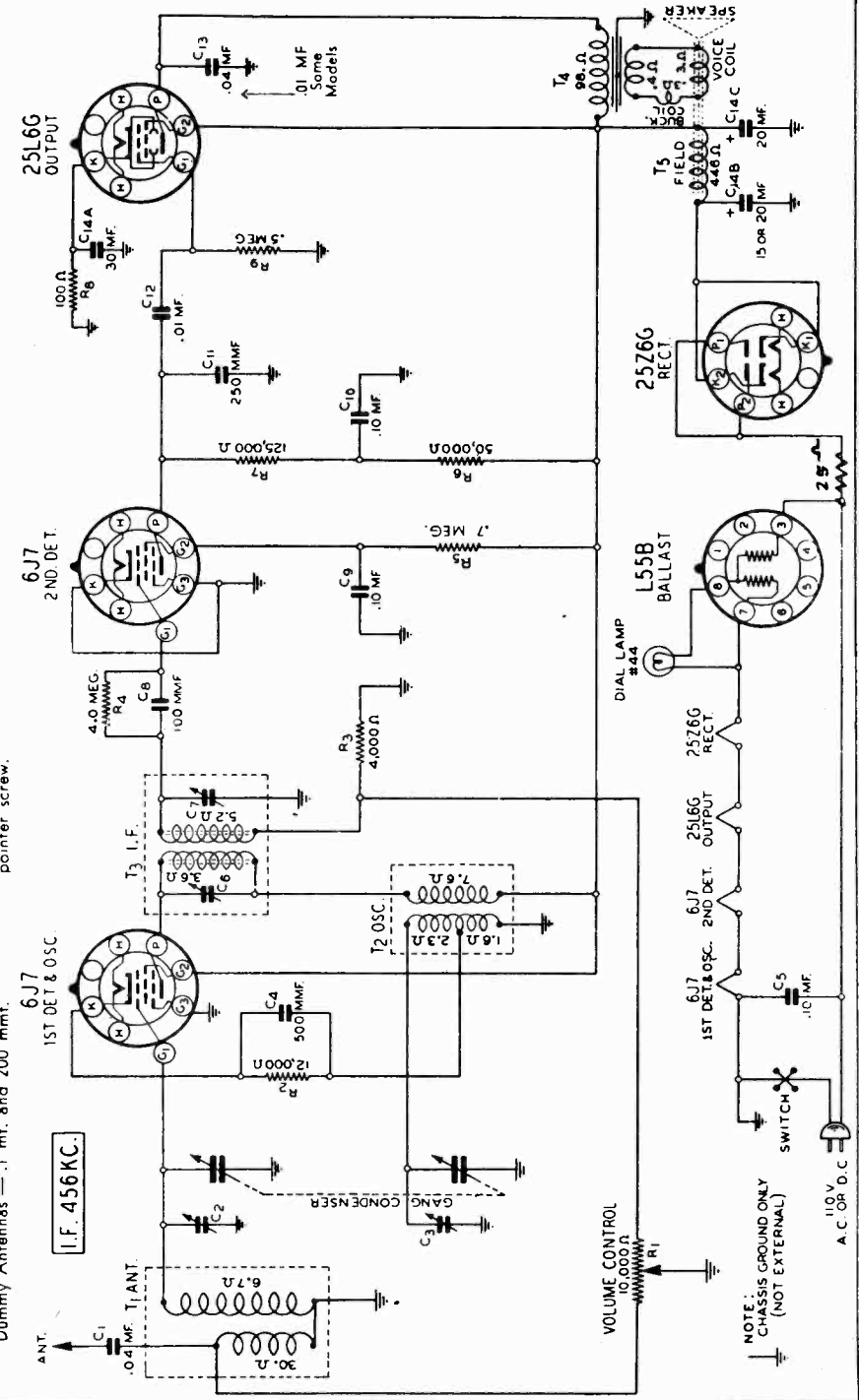
ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments. Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (See Illustration)
456 KC	Grid of 1st Det.	.1 mf.	Turn rotor to full open	I.F. (C6) & (C7)
1730 KC	Antenna Lead	200 mmf.	Turn rotor to full open	Oscillator (C3)
1500 KC	Antenna Lead	200 mmf.	Turn rotor to max. output	Antenna (C2)

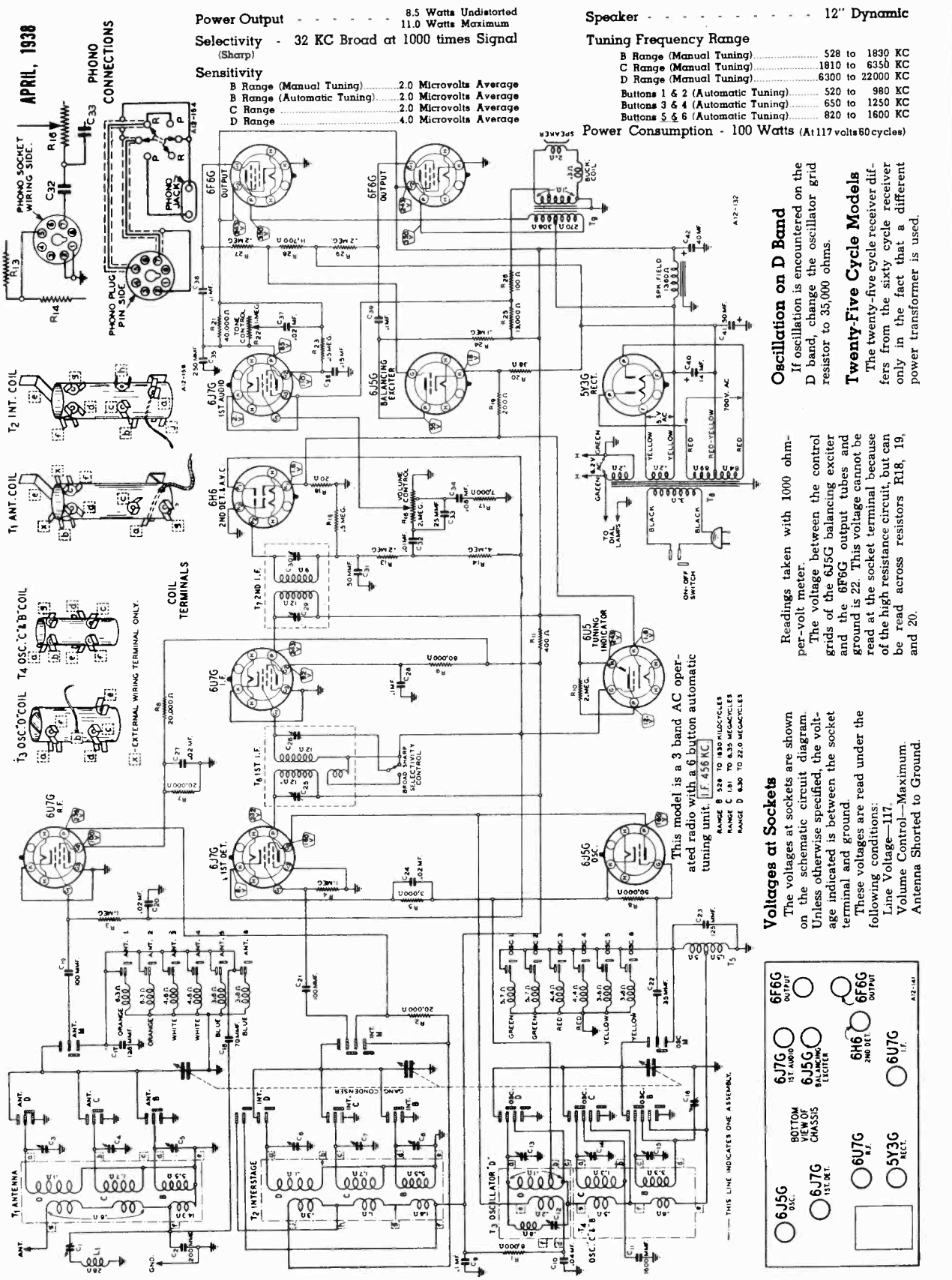
The following equipment is required for aligning:
Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antennas — .1 mf. and 200 mmf.

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



GAMBLE-SKOGMO INC.

MODEL 864
Schematic, Voltage Socket, Sensitivity



Oscillation on D Band

If oscillation is encountered on the D band, change the oscillator grid resistor to 35,000 ohms.

Twenty-Five Cycle Models

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

Voltages at Sockets

The voltages at sockets are shown on the schematic circuit diagram. Unless otherwise specified, the voltage indicated is between the socket terminal and ground.

These voltages are read under the following conditions:

Line Voltage—117.
Volume Control—Maximum.
Antenna Shorted to Ground.

Readings taken with 1000 ohm-per-volt meter.

The voltage between the control grids of the 6J5G balancing exciter and the 6F6G output tubes and ground is 22. This voltage cannot be read at the socket terminal because of the high resistance circuit, but can be read across resistors R18, 19, and 20.

MODEL 864
Alignment, Trimmers
Drive Cord Data

GAMBLE-SKOGMO INC.

ALIGNMENT PROCEDURE

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

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

SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	BUTTON DEPRESSED	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (Unless otherwise specified)
I. F.					
456 KC	Grid of I F. Tube	.1 mf.	B Range	Turn Rotor to Full Open	2nd I.F. (C29) & (C30)
456 KC	Grid of 1st Det.	.1 mf.	B Range	Turn Rotor to Full Open	1st I.F. (C25) & (C26)
RANGE B					
1830 KC	Antenna Lead	200 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C15)
1500 KC	Antenna Lead	200 mmf.	B Range	Turn Rotor to Max. Output Set Indicator to 1500 KC—See Note A	Ant. Range B (C5) Int. Range B (C8)
600 KC	Antenna Lead	200 mmf.	B Range	Turn Rotor to Max. Output	600 KC (C16) Rock Rotor—See Note B
WAVE TRAP					
456 KC	Antenna Lead	200 mmf.	B Range	Turn Rotor to 600 KC Adjust Sig. Gen.—See Note C	Wave Trap (C1) Adjust for MINIMUM Output
RANGE C					
6350 KC	Antenna Lead	400 Ohm	C Range	Turn Rotor to Full Open	Oscillator Range C (C14)
6000 KC	Antenna Lead	400 Ohm	C Range	Turn Rotor to Max. Output	Antenna Range C (C4) Int. Range C (C7)
RANGE D					
22,000 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C13)
20,000 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Max. Output	Ant. Range D (C3) Int. Range D (C6) Rock Rotor—See Note B
7000 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Max. Output	7000 KC (C12) Rock Rotor—See Note B
PERMEABILITY TUNING UNIT				TURN SETTING SCREW TO MAXIMUM OUTPUT —See Instruction Book	ADJUST COIL POSITION TO MAXIMUM OUTPUT —See Note D
700 KC	Antenna Lead	200 mmf.	No. 1	Setting Screw No. 1	Antenna Coil No. 1
700 KC	Antenna Lead	200 mmf.	No. 2	Setting Screw No. 2	Antenna Coil No. 2
850 KC	Antenna Lead	200 mmf.	No. 3	Setting Screw No. 3	Antenna Coil No. 3
850 KC	Antenna Lead	200 mmf.	No. 4	Setting Screw No. 4	Antenna Coil No. 4
1100 KC	Antenna Lead	200 mmf.	No. 5	Setting Screw No. 5	Antenna Coil No. 5
1100 KC	Antenna Lead	200 mmf.	No. 6	Setting Screw No. 6	Antenna Coil No. 6

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

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

NOTE A—If the pointer is not at 1500 KC on the dial, loosen the 2 clamps which hold the pointer assembly on the cord, move the pointer to the 1500 KC mark, and tighten the clamps.

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

NOTE C—Leave condenser rotor at the 600 KC setting and adjust the signal generator until maximum output is obtained at or near 456 KC.

NOTE D—At the bottom of the permeability tuning unit can be seen six "W" openings. Insert the end of a pair of long nose pliers or a screwdriver in the "W" opening of the proper button and adjust the position of the antenna (rear) coil by twisting the pliers or screwdriver until maximum output is obtained.

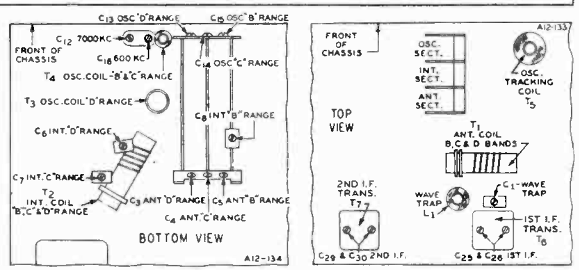


Fig. 1—Location of Trimmers

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

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

DISTORTION AFTER RADIO IS TURNED ON FOR ABOUT TEN MINUTES: - If mushy reproduction is encountered, change 4 megohm resistor to a 2 megohm resistor and if this does not clear up the reproduction, replace the 6U7G R.F. tube or the I.F. tube or both. (Distortion due to grid current of these tubes)

Drive Cord Replacement

LATE MODELS—Tie a knot with a small loop at one end of the new drive cord. Slide a 1¾ inch length of fabric tubing on the cord. The free end of the drive cord should be tied to the tension spring in such a manner that there is a distance of 56⅝ inches between the knots.

Turn the gang condenser to full open position.

Place the looped end of the drive cord over the hook on condenser drive drum A—See Fig. 2. Bring the cord up through the slot in the drum rim and pass to the right (from back of chassis) and around pulley B. Then bring the cord to the left and over pulley C. See that the fabric tubing is now between pulleys B and C. Continue cord down to control shaft D and wind 3½ turns counter-clockwise (from back of chassis) on shaft D. Bring cord up to and over pulley E. Bring cord down to top of drive drum A and wind one turn clockwise around the drum rim.

Pass the remaining drive cord and tension spring through the slot in the drum. Place free end of spring over the hook on the condenser drive drum.

EARLY MODELS—The procedure is the same as for the late models with the following exceptions:

The distance between the knots on the drive cord should be 49¼ inches.

Leaving shaft D (Fig. 3), the drive cord is brought directly to the top of drive drum A and then continued as in late models.

Permeability Tuning and Band Switch Assemblies—Differences in Early Models

A few of the first models used a station button plunger 6[13]/16 inches long. These models may be identified by a red paint mark on the front bracket of the tuning unit at the upper right corner. On later models, this length was changed to 6⁵⁄₁₆ inches. These models have an orange paint mark in place of the red mark. It is important, therefore, that the length be noted when ordering this part and the correct part number, as shown in the parts list, be specified.

The plungers are replaceable only on the permeability (6 button) tuning unit. In the case of the band switch unit, if any parts require replacing, the entire assembly must be ordered. Two of these assemblies are listed, one using the early short shaft and the other using the later long shaft. The short shaft (early unit) has no paint mark on it. The long shaft (late unit) has an orange paint mark on it.

A change was also made on the tuning rod assembly (Rod on which 2 iron cores are mounted). The rod used on early models was 3¾ inches long and the back end of the rod rested in a small cup in the end of the compression spring. The rod used on late models is 4¾ inches long, extends through the compression spring and projects beyond the rear bracket of the tuning assembly. Only the later type rod complete with the compression spring and a small washer is being furnished for replacement. This complete assembly is interchangeable with the early type.

ATTACHING DIAL POINTER—Tune in a 1500 KC signal. Move the pointer to the 1500 KC mark on the dial and clamp it tightly over the fabric tubing on the cord.

Phonograph Connections

Phonograph connections are made as shown in the schematic circuit diagram. On the back panel of the chassis base is a round knockout 1⁹⁄₆₄ inches in diameter. An octal base socket is then mounted in this knockout opening. In the case of the early models a 1⁹⁄₆₄ inch hole must be drilled in the back panel.

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

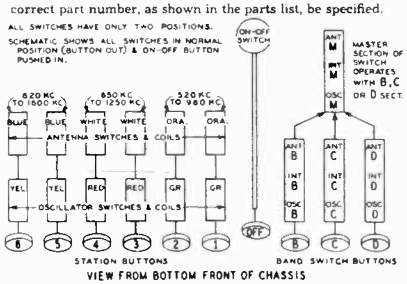


Fig. 5—Permeability Tuning Unit and Band Switch Arrangement

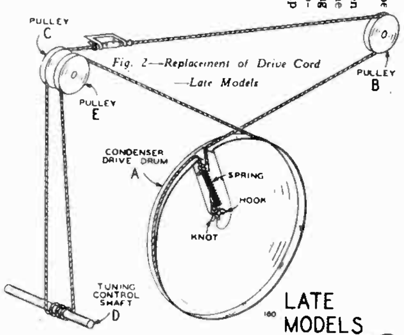


Fig. 2—Replacement of Drive Cord —Late Models

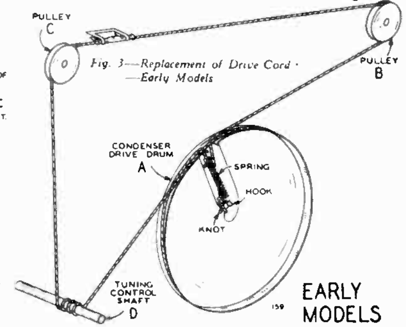
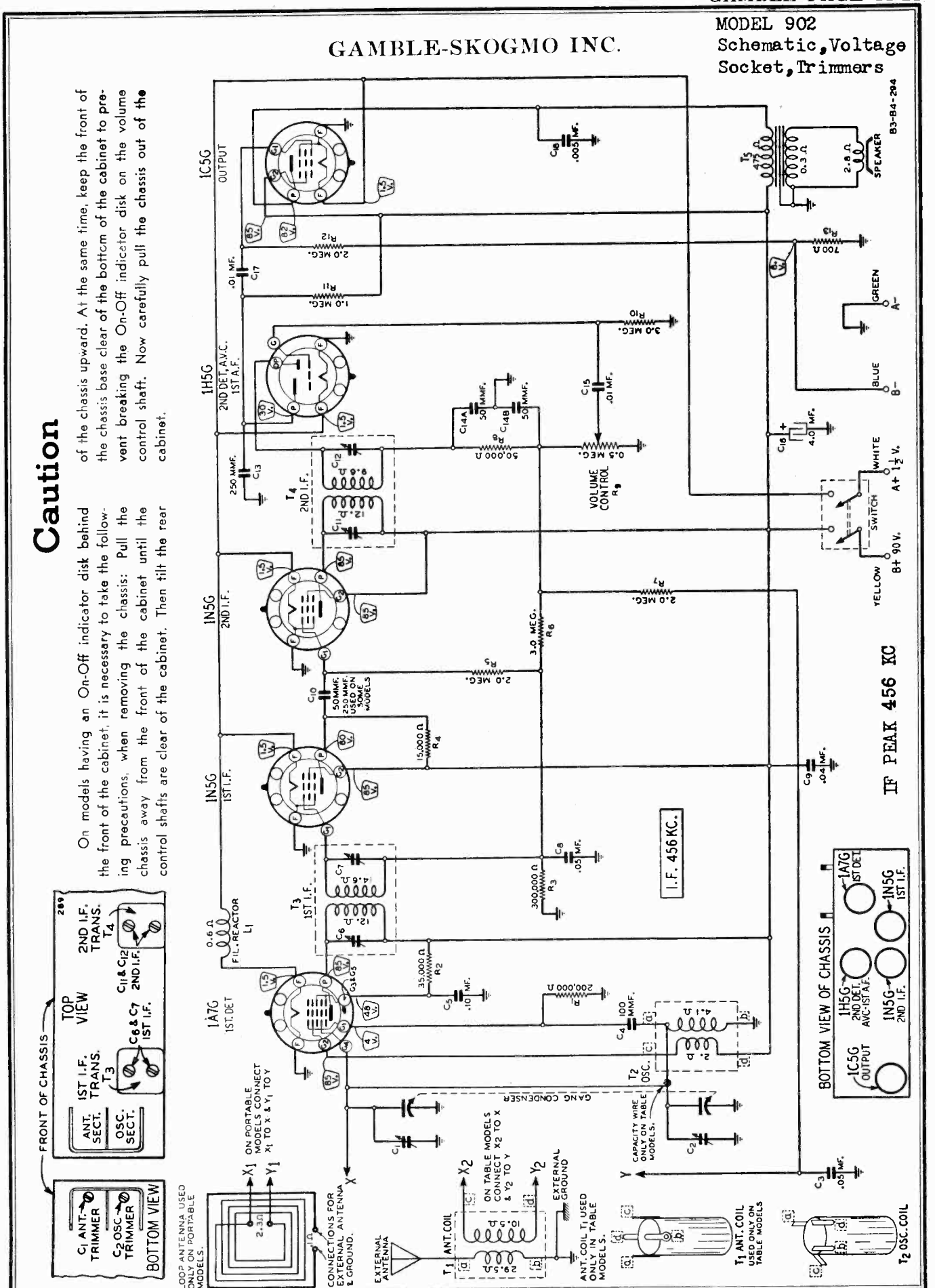


Fig. 3—Replacement of Drive Cord —Early Models

GAMBLE-SKOGMO INC.

MODEL 902
Schematic, Voltage
Socket, Trimmers



MODEL 902

SPECIFICATIONS

Input Voltages and Currents
"A" Battery.....1.5 Volts—.30 Amperes
"B" Battery.....90 Volts—12 to 15 Ma.

Power Output - - - 140 Milliwatts Undistorted

Selectivity - - 41 KC Broad at 1000 Times Signal

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

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

Tuning Frequency Range - - - 540 to 1600 KC.

Sensitivity (For .05 Watt Output)
Portable Model.....20 Microvolts Per Meter Average

ALIGNMENT PROCEDURE

Volume Control—Maximum Ali Adjustments. Allow Chassis and Signal Generator to "Heat Up" for several Minutes.

SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration)
456 KC	Grid of 1st Det.	.1 mf.	Turn rotor to full open	1st I.F. (C6) & (C7) 2nd I.F. (C11) & (C12)
1600 KC	Grid of 1st Det.	.1 mf.	Turn rotor to full open	Oscillator (C2)
1500 KC	None—See Note		Turn rotor to max. output	Antenna (C1)

The following equipment is required for aligning:
Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antenna—.1 mf.

NOTE—Connect a loop approximately one foot in diameter across the antenna and ground posts of the signal generator. Secure the bact in place on the cabinet. Connections for the output meter may be made through the opening for the outside antenna and ground connecting posts. This opening is at the bottom of the cabinet near the back. Place radio approximately 3 feet from loop so as to pick up signal. Radio should not be in proximity to any metal (metal bench, etc.).

CALIBRATION (For model with pointer in back of celluloid dial scale)—To obtain dial scale calibration, tune in an 800 KC signal. The pointer should be at the 800 KC mark on the dial. IF THE POINTER IS AT A HIGHER KC MARK THAN 800 KC, grasp the drive cord below the tension spring. Hold the tuning control shaft motionless and slowly pull the drive cord down until the pointer is at the 800 KC mark. IF THE POINTER IS AT A LOWER KC MARK THAN 800 KC, grasp the drive cord above the tension spring. Hold the tuning control shaft motionless and slowly pull the drive cord up until the pointer is at the 800 KC mark.

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

Antenna

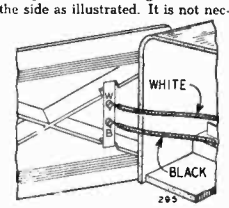
An outside antenna and ground are not required for this radio.

A loop antenna is built on the back cover of the cabinet. This makes the radio suitable for portable use.

If the radio is installed in a permanent location, a long outside antenna (50 to 100 feet) and a ground may be used. At the bottom of the cabinet near the back is an opening through which will be seen two connecting posts marked "A" and "G" for the outside antenna and ground connections respectively.

Batteries

Taking Off Back of Cabinet—To take off the back of the cabinet, first remove the wood screws which hold it in place. Then swing the back to the side as illustrated. It is not necessary to disconnect the two wires to the loop terminal strip. DO NOT TOUCH THE LOOP ANTENNA WIRES AS THEY MUST NOT BE MOVED.



Installing Batteries—To install the batteries, take off the back of the cabinet as explained above.

The following batteries are required:
Two 45 volt "B" batteries—Portable Size 4⅛" x 2½" x 5⅞" High
One 1½ volt "A" battery—Portable Size 3¾" x 2¼" x 5⅞" High

These are connected and placed in the cabinet as shown on the label in the cabinet. Note the position of the prongs on the plugs and the holes in the sockets on the batteries. Bring the battery wires over the wood bar as shown. Then insert the plugs in the sockets. The "A" battery plug has two prongs and the "B" battery plugs have three prongs.

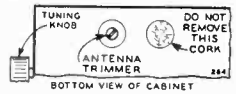
Cardboard in Back of Batteries—After the batteries are in place in the cabinet, the cardboard should be placed in back of them in order to make them fit snugly. If there is sufficient space, fold the cardboard at the score mark and use it double thickness. If this thickness is not required, cut the cardboard at the score mark and use one piece only. Then replace the back of the cabinet.

Adjusting Antenna Trimmer

After the batteries are installed and the back of the cabinet is in place, adjust the antenna trimmer.

Accurately tune in a weak station signal between 1400 and 1500 KC on the dial. With a screwdriver turn the adjusting screw of the antenna trimmer up or down until maximum output is obtained. This trimmer is reached through an opening in the bottom of the cabinet—see illustration. CAUTION: Do not remove the cork from the other opening at the bottom of the cabinet.

Readjust the antenna trimmer when a new set of batteries is installed.



Tubes

The tube types and position of the tubes are shown on the label in the cabinet. To replace a tube, it will be necessary to remove the wood bar in back of the chassis by taking out the 2 screws which hold it in place.

MODELS 4912 and 4914

SPECIFICATIONS

Power Consumption - 28 Watts (At 117 volts AC Supply)

Power Output - - - - - - - .8 Watt Undistorted

Selectivity - - - 60 KC Broad at 1000 times Signal

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

Speaker - - - - - - - - - - 5" Electro Dynamic

Tuning Frequency Range - - - 528 to 1730 KC

Sensitivity - - 35 Microvolts per Meter Average (For .05 Watt Output)

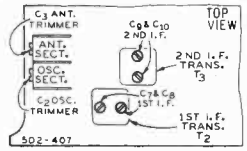
ALIGNMENT PROCEDURE

Volume Control—Maximum Ali Adjustments. Allow Chassis and Signal Generator to "Heat Up" for several Minutes. Connect Ground Post of Signal Generator to 8—(12SK7—Prong No. 3) in Chassis.

SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration)
456 KC	Signal Grid of 1st Det. Connect at Stator of Large Gang Section.	.1 mf.	Turn Rotor to full open	1st I.F. (C7) & (C8) 2nd I.F. (C9) & (C10)
1730 KC	Antenna Clip	200 mmf.	Turn Rotor to full open	Oscillator (C2)
1500 KC	Antenna Clip	200 mmf.	Turn Rotor to max. output	Antenna (C3)

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

NOTE—To obtain dial scale calibration, tune in an 800 KC signal. The pointer should be at the 800 KC mark on the dial. If it is not, first remove the celluloid crystal by taking out the 4 buttons at the corner. Hold the tuning knob and shift the pointer to the 800 KC mark.



Caution

The metal chassis is connected to one side of the line through a .25 mfd. condenser. Both AC and DC power lines are generally grounded on one side. If the side of the line not connected to the metal chassis through this condenser is grounded and the metal chassis comes in contact with an external ground, this condenser will be connected across the line and there will be an increase in hum.

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

Antenna

A loop antenna is mounted on the back of the chassis base. For reception of local or powerful nearby stations no other antenna or ground is usually required.

However, more stations will be heard and noise will often be reduced by using an external antenna. This should preferably be on the outside of the building. For locations in the city or close to the broadcasting stations, the antenna should be 20 to 35 feet in length while for locations in the country or at a distance from the broadcasting stations, use a 35 to 60 foot antenna.

A GROUND CONNECTION IS REQUIRED if an external antenna is used. A ground connection may be obtained by connecting to a water pipe, radiator, or a pipe driven into the ground.

The antenna and ground connections are made at the clips marked "A" and "G" respectively on the back of the cabinet.

Location of Radio

Place radio preferably where it gets air circulation. Do not put it in a place where it will get too hot such as on a radiator.

Power Supply

This radio will operate on a power supply of 117 volts AC, 50 to 60 cycles only, or 117 volts DC.

When using the radio on AC, if there appears to be excessive hum, reverse the plug. Leave the plug inserted the way which gives the least hum.

Radios for 25 to 60 cycle AC operation are so marked.

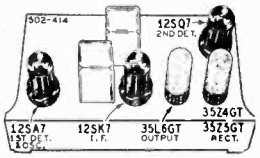
CAUTION—110 Volt DC Operation—when used on a DC line, if the set does not operate after one minute, reverse the plug.

Tubes

The type and position of the tubes are shown in the illustration.

All tubes must be in the sockets to operate the radio.

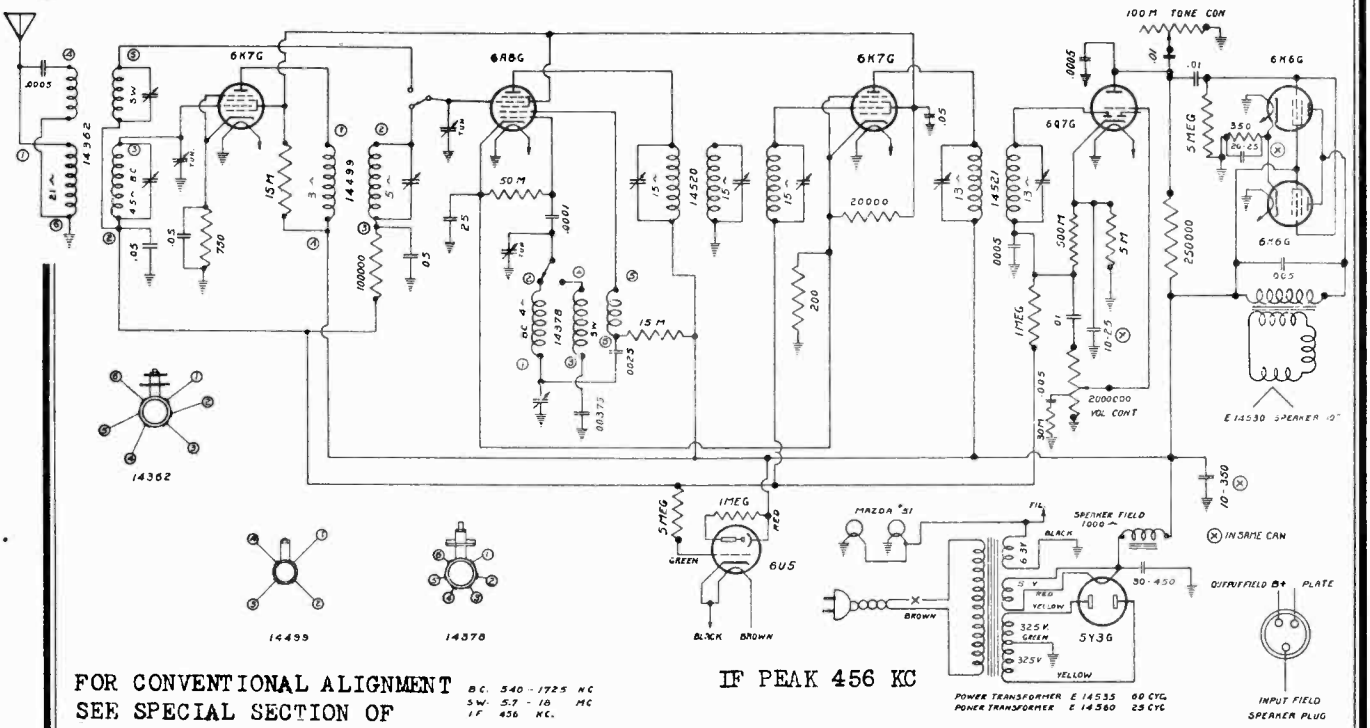
To replace tubes, first remove the back cover. Then take out the 2 screws holding the loop antenna to the mounting brackets. Move the loop antenna to one side as far as connecting wires will permit.



GAMBLE-SKOGMO INC.

MODELS 816,816B
MODEL 990
Schematics,Alignment

MODEL 816 ,816B
CIRCUIT DIAGRAM NO.14561



FOR CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION OF VOLUME V111

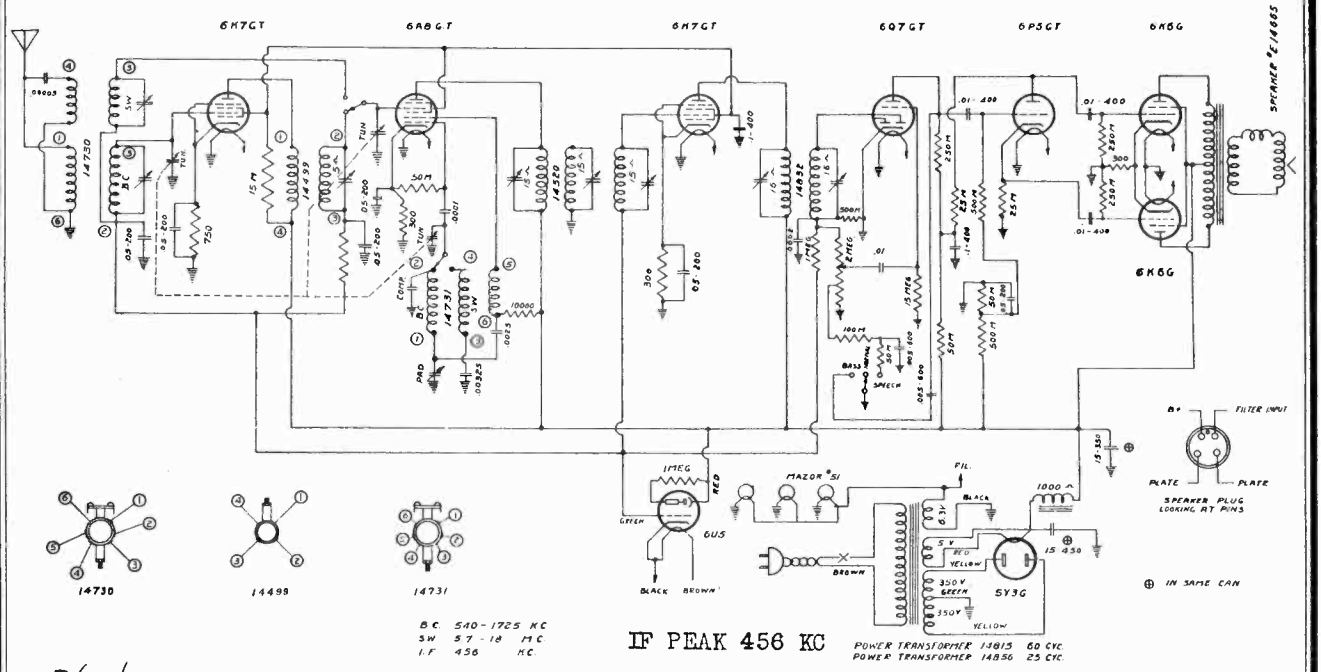
B.C. 540 - 1725 KC
S.W. 5.7 - 18 MC
I.F. 456 KC.

IF PEAK 456 KC

MODEL 990
CIRCUIT DIAGRAM NO.14855

TELEVISION AND PHONOGRAPH JACK

The jack on the back of the chassis may be used to connect a Television "Video Adaptor", or phonograph pick up. A standard phone plug fits this jack. A crystal pick up is recommended for phonograph use.



B.C. 540-1725 KC
SW 5.7 - 18 MC
I.F. 456 KC.

IF PEAK 456 KC

7/10/39

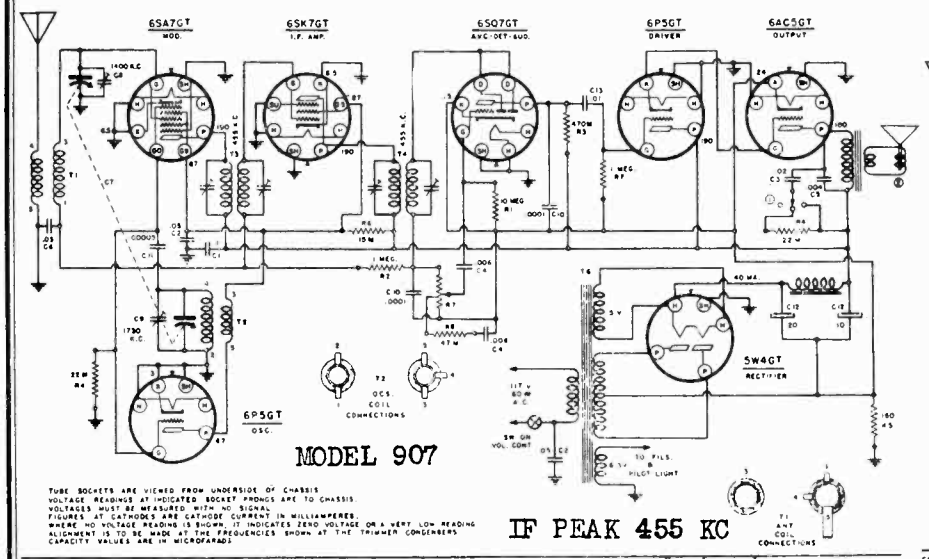
FOR SIMILAR TUNER ADJUSTMENTS SEE GAMBLE-SKOGMO MODEL 761A , PAGE 10-6.

FOR CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION OF VOLUME V111.

MODEL 907
MODEL 908

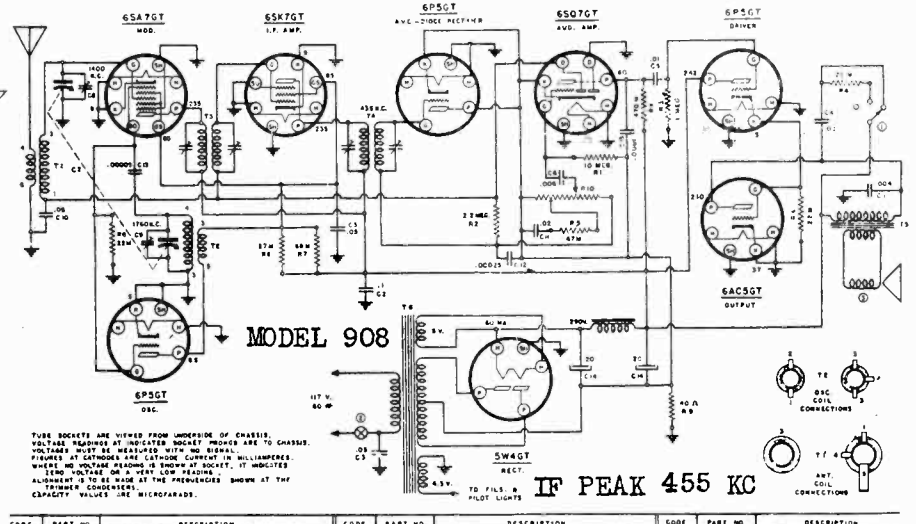
GAMBLE-SKOGMO INC.

Schematics, Voltage Alignment, Trimmers Socket



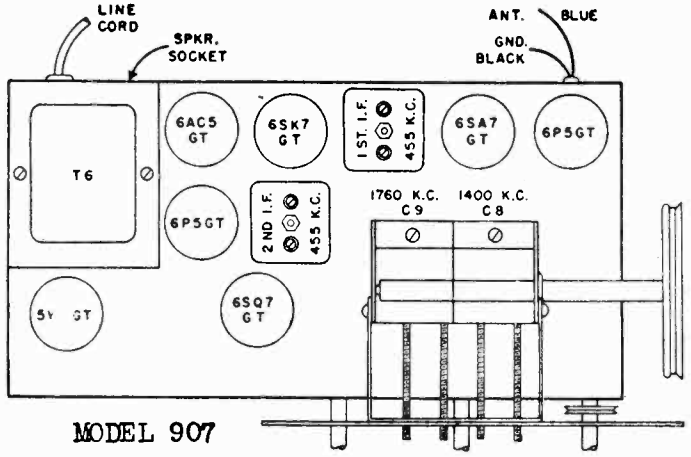
TUBE SOCKETS ARE VIEWED FROM UNDERSIDE OF CHASSIS.
VOLTAGE READINGS AT INDICATED SOCKET PRONGS ARE TO CHASSIS.
VOLTAGES MUST BE MEASURED WITH NO SIGNAL.
FIGURES AT CATHODES ARE CATHODE CURRENT IN MILLIAMPERES.
WHERE NO VOLTAGE READING IS SHOWN AT SOCKET, IT INDICATES ZERO VOLTAGE OR A VERY LOW READING.
ALIGNMENT IS TO BE MADE AT THE FREQUENCIES SHOWN AT THE TRIMMER CONDENSERS.
CAPACITY VALUES ARE IN MICROFARADS.

CODE	PART NO.	DESCRIPTION
C1	18-116	.1 MFD. 400 V. TUBULAR CONDENSER
C2	1607	.05 " " " "
C3	1605	.02 " " " "
C4	18-114	.004 " " " "
C5	16-123	.004 " " " "
C6	1822	.01 " 200 V. " "
C7	99-9	8 GANG VARIABLE CONDENSER ALSO C8 & C9
C10	1501	.0001 MFD. MICA CONDENSER
C11	1503	.00005 " " "
C12	18-284	20 X 10 " 350 WK. ELECTROLYTIC COND
C13	18-119	.01 MFD. 400 V. TUBULAR CONDENSER
R1	60-193	10 MEGOHM 1/4 W. RESISTOR
R2	60-195	1 " " " "
R3	60-178	470 M OHM " " "
R4	60-185	22 M " " "
R5	60-230	150 " " "
R6	60-236	10 M " 1 W. "
R7	24-147	500 M " VOLUME CONTROL
R8	60-177	47 M " 1/4 W. RESISTOR
T1	C-235	ANTENNA COIL
T2	10-318	OSCILLATOR COIL
T3	10-315	1ST I.F. TRANSFORMER
T4	10-312	2 ND " "
T5		OUTPUT TRANS. (ON SPKR)
T6	80-171	POWER TRANSFORMER
S1	69-137	TONE CONTROL SWITCH
S2	79-279	6 1/2 DYNAMIC SPEAKER



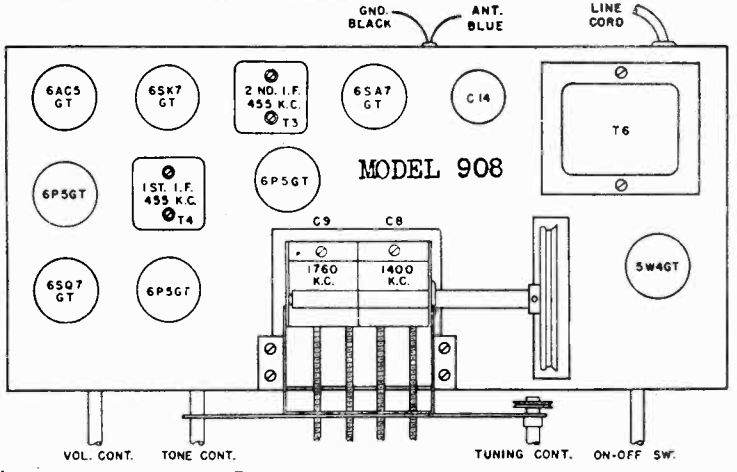
TUBE SOCKETS ARE VIEWED FROM UNDERSIDE OF CHASSIS.
VOLTAGE READINGS AT INDICATED SOCKET PRONGS ARE TO CHASSIS.
VOLTAGES MUST BE MEASURED WITH NO SIGNAL.
FIGURES AT CATHODES ARE CATHODE CURRENT IN MILLIAMPERES.
WHERE NO VOLTAGE READING IS SHOWN AT SOCKET, IT INDICATES ZERO VOLTAGE OR A VERY LOW READING.
ALIGNMENT IS TO BE MADE AT THE FREQUENCIES SHOWN AT THE TRIMMER CONDENSERS.
CAPACITY VALUES ARE MICROFARADS.

CODE	PART NO.	DESCRIPTION
C1	18-125	.004 MFD. 600 V. TUBULAR CONDENSER
C2	18-114	.1 " 400 V. " "
C3	1607	.05 " " " "
C4	1605	.02 " " " "
C5		.01 " " " "
C6	18-119	.01 " " " "
C7	16-110	.006 " " " "
C8	99-10	8 GANG VARIABLE CONDENSER (ALSO C9 & C9)
C10	1822	.03 MFD. 200 V. TUBULAR CONDENSER
C11	16-123	.02 " " " "
C12	1504	.00025 MFD. MICA CONDENSER
C13	1503	.00005 " " "
C14	18-288	20 X 20 " 450 V. ELECTROLYTIC
C15	1501	.0001 " MICA CONDENSER
R1	60-193	10 MEGOHM 1/4 W. CARBON RESISTOR
R2	60-179	2.2 " " " "
R3	60-195	1 " " " "
R4	60-178	470 M OHM " " "
R5	60-177	47 M " " "
R6	60-185	22 M " " "
R7	60-248	2.2 M " 1/2 W. "
R8	60-249	27 M " 1 W. "
R9	60-233	40 " 1/2 W. WIRE WOUND RESISTOR
R10	24-151	500 M " VOLUME CONTROL
T1	C-238	ANTENNA COIL
T2	10-316	OSCILLATOR COIL
T3	10-315	1ST I.F. TRANSFORMER
T4	10-313	2 ND " "
T5		OUTPUT TRANSFORMER
T6	80-180	POWER TRANSFORMER
S	69-137	TONE CONTROL
	69-138	A.C. SWITCH
	79-279	6" DYNAMIC SPEAKER



TUNER DATA

FOR SIMILAR PUSH BUTTON ADJUSTMENTS SEE GAMBLE*SKOGMO MODEL 761A page 10-6



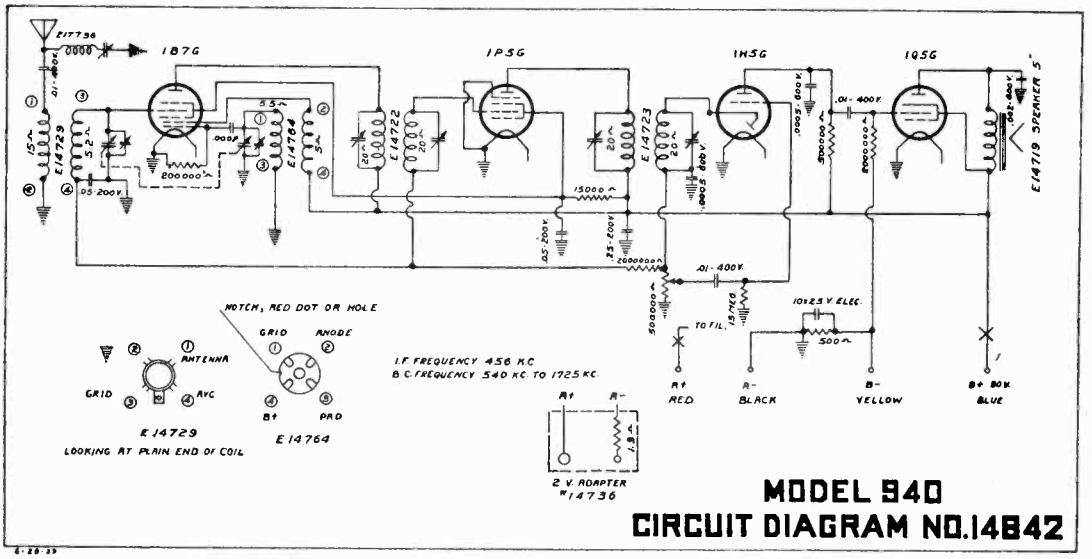
Position of Variable	Generator Freq.	Dummy Antenna Mfd.	Generator Connections	Trimmer Adjustments	Trimmer Function
Closed	455 K. C.	.1	6SA7 (Grid)	T4 — T3	I. F.
Fully Open	1730 K. C.	.0002	Antenna	C9	Osc.
1400 K. C.	1400 K. C.	.0002	Antenna	C8	Ant.

Position of Variable	Generator Freq.	Dummy Antenna Mfd.	Generator Connections	Trimmer Adjustments	Trimmer Function
Closed	455 K. C.	.1	6SA7 (Grid)	T4 — T3	I. F.
Fully Open	1730 K. C.	.0002	Antenna	C9	Osc.
1400 K. C.	1400 K. C.	.0002	Antenna	C8	Ant.

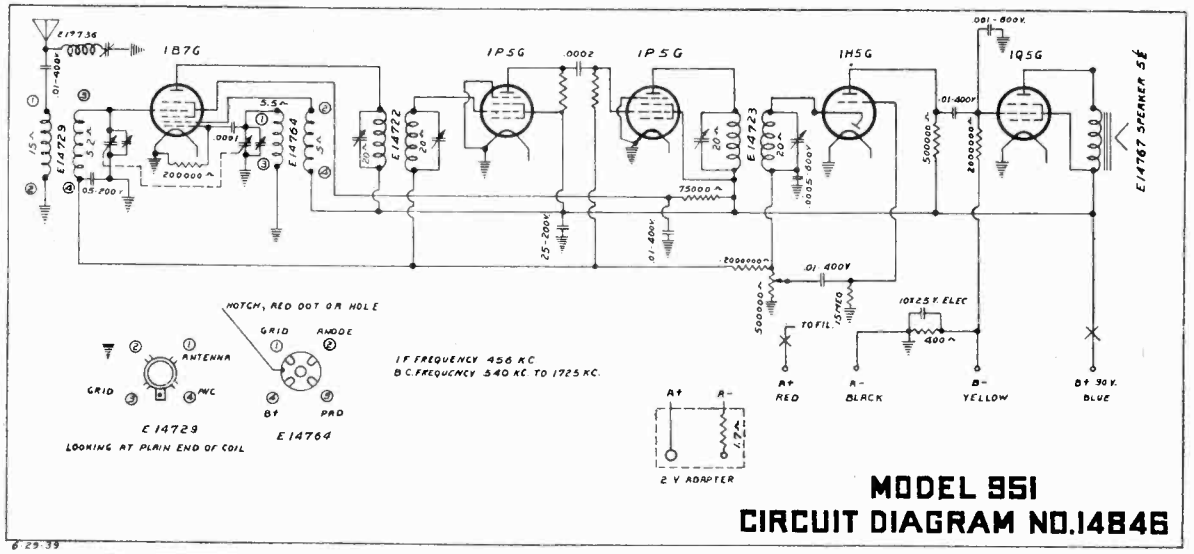
MODEL 953
Schematic, Tuner

GAMBLE-SKOGMO INC.

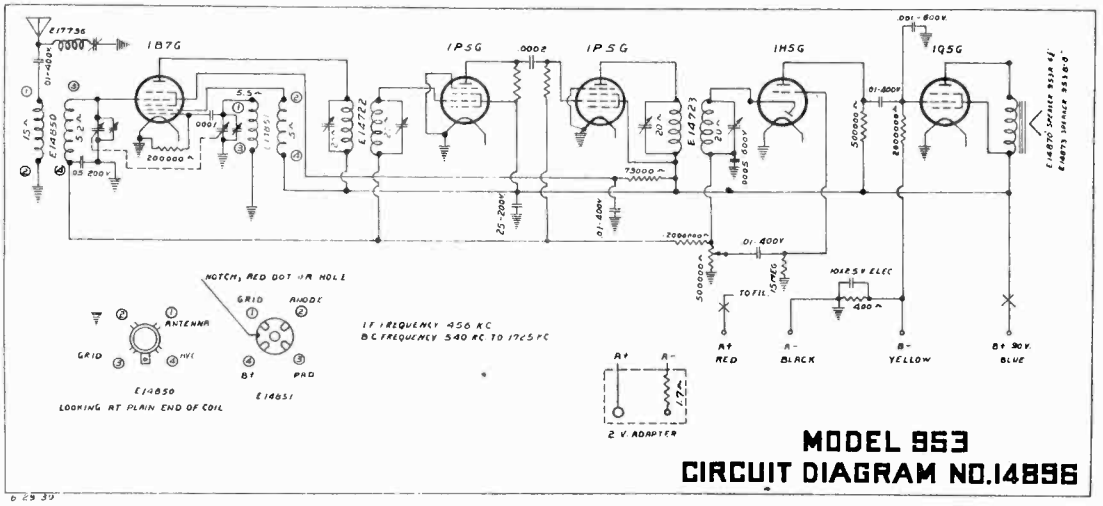
MODELS 940, 940A
MODELS 951, 951A
Schematics



MODEL 940
CIRCUIT DIAGRAM NO.14842



MODEL 951
CIRCUIT DIAGRAM NO.14846



MODEL 953
CIRCUIT DIAGRAM NO.14856

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOLUME VIII

GENERAL: This receiver is equipped with the new type high efficiency battery operated tubes. Their use makes for greater economy of operation than has ever been possible before. They are designed to operate directly from a 1½ volt dry "A" battery or from a 2 volt storage battery — by properly connecting the adaptor socket #14824 which contains proper resistor. (SOCKET # 14736 FOR MODEL 940A)

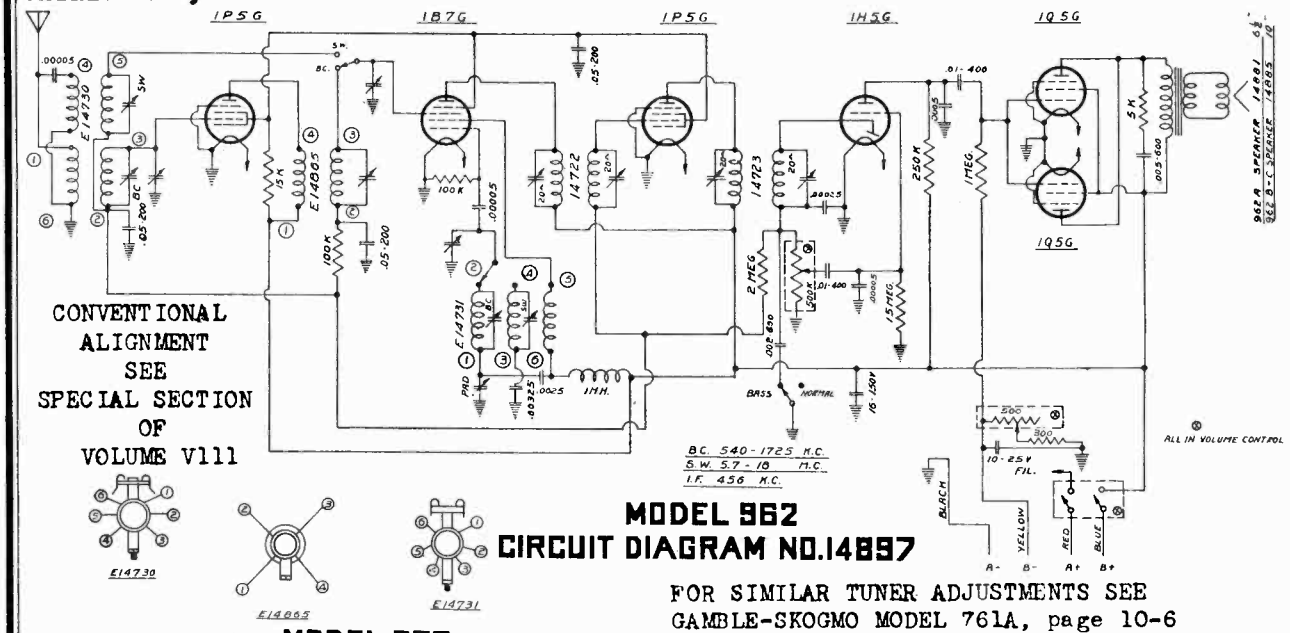
TUNER DATA MODEL 953

FOR SIMILAR PUSH BUTTON ADJUSTMENTS SEE MODEL 761A,
GAMBLE - SKOGMO PAGE 10-6

MODEL 962
MODELS 970B, 970BX
MODELS 980B, 980BX

GAMBLE-SKOGMO INC.

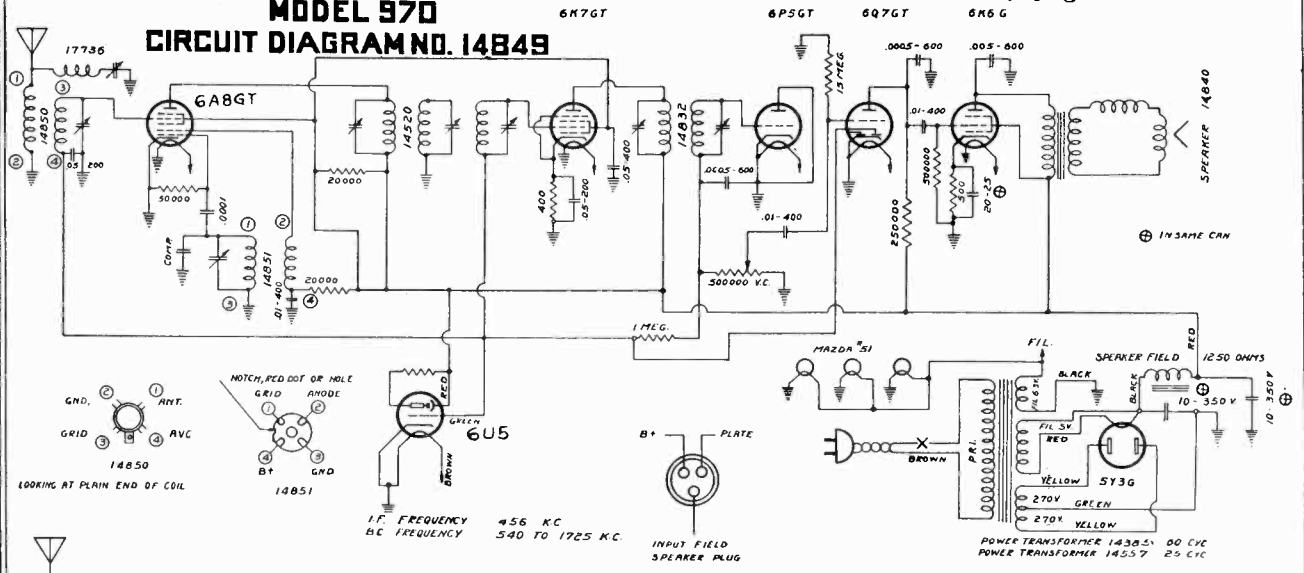
Schematics, Tuner

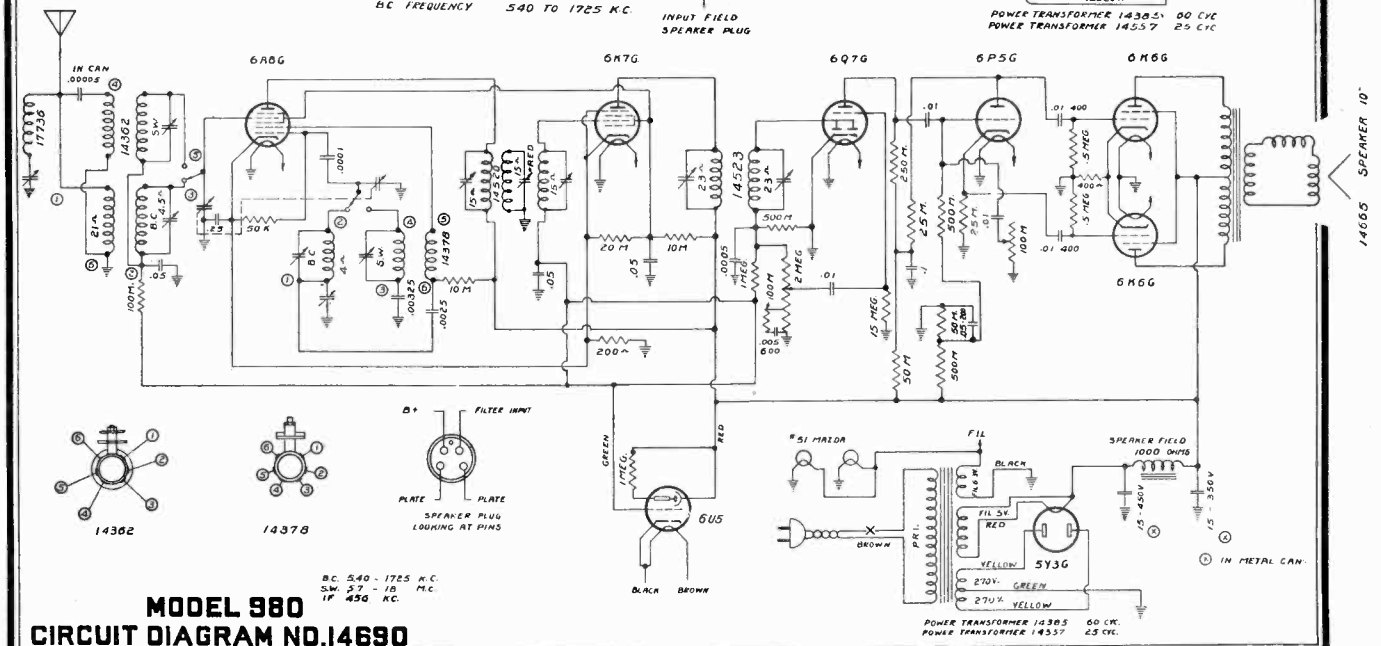


MODEL 962
CIRCUIT DIAGRAM NO.14897

FOR SIMILAR TUNER ADJUSTMENTS SEE GAMBLE-SKOGMO MODEL 761A, page 10-6

MODEL 970
CIRCUIT DIAGRAM NO. 14849

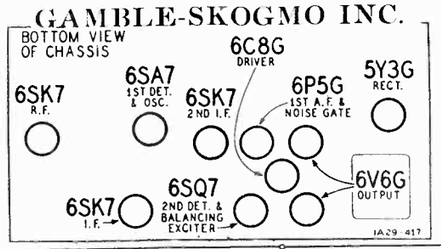




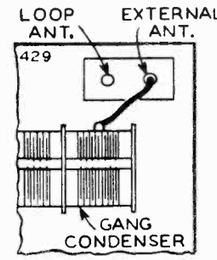
MODEL 980
CIRCUIT DIAGRAM NO.14690

MODEL 4954
Schematic, Voltage, Socket Coils, Notes

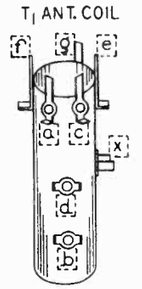
GAMBLE-SKOGMO INC.

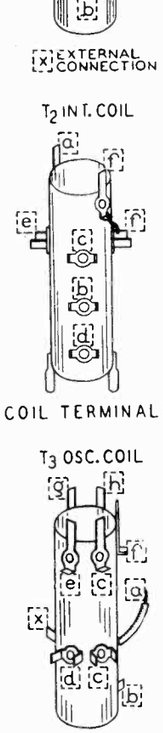


ANTENNA SELECTION SOCKET—At the right front corner of the chassis base (from back of cabinet) is a 2 hole pin tip socket—See illustration. If it is desired to operate the radio using the loop antennas, the pin tip should be inserted in the hole farthest from the side of the chassis. If it is desired to operate the radio using an external antenna, insert the pin tip in the hole nearest the side of the chassis.



ANTENNA SELECTION SOCKET





FOR TUNER DATA SEE INDEX

SPECIFICATIONS

Power Consumption - 100 Watts (At 117 volts 60 cycles)
Power Output - - - - - - - 9 Watts Undistorted, 10 Watts Maximum
Selectivity - 26 KC Broad at 1000 times Signal (Sharp)
Intermediate Frequency - - - - - - 456 KC
Speaker - - - - - - - 12" Electro-Dynamic

Tuning Frequency Range
B Range..... 528 to 1730 KC
C Range..... 2200 to 7000 KC
D Range..... 7000 to 22000 KC

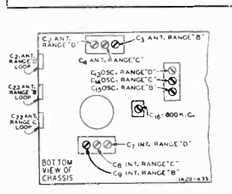
Sensitivity (For 0.5 Watt output)
B Range..... 1.0 Microvolt Average
C Range..... 1.0 Microvolt Average
D Range..... 3.0 Microvolts Average

ALIGNMENT PROCEDURE

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

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

SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I. F.					1st I.F. (C19) & (C20) 2nd I.F. (C24) & (C25) 3rd I.F. (C28) & (C29)
456 KC	Grid of 1st Det.	.1 mf.	B Range See Note A	Turn Rotor to Full Open	
RANGE B					
1730 KC	Antenna Lead	200 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C15)
1500 KC	Antenna Lead	200 mmf.	B Range	Turn Rotor to Max. Output Set Indicator to 1500 KC—See Note B	Ant. Range B (C4) Int. Range B (C9)
600 KC	Antenna Lead	200 mmf.	B Range	Turn Rotor to Max. Output	600 KC (C16) Rock Rotor—See Note C
RANGE C					
7000 KC	Antenna Lead	400 Ohm	C Range	Turn Rotor to Full Open	Oscillator Range C (C14)
6000 KC	Antenna Lead	400 Ohm	C Range	Turn Rotor to Max. Output	Antenna Range C (C3) Int. Range C (C8)
RANGE D					
22,000 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C13)
21,000 KC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Max. Output	Ant. Range D (C2) Int. Range D (C7) Rock Rotor—See Note C
LOOP RANGE B					
1500 KC See Note D	None—See Note D		B Range	Turn Rotor to Max. Output	Loop Trimmer (C23) See Note E
LOOP RANGE C					
6000 KC See Note D	None—See Note D		C Range	Turn Rotor to Max. Output	Loop Trimmer (C22) See Note E
LOOP RANGE D					
21,000 KC See Note D	None—See Note D		D Range	Turn Rotor to Max. Output	Loop Trimmer (C21) Rock Rotor—See Note C

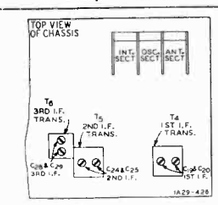


Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

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

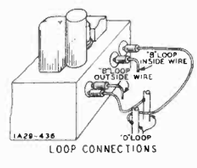
NOTE A—For all adjustments, with the exception of the 3 loop range adjustments, the pin tip should be in the external antenna hole of the Antenna Selection Socket—See illustration on page one.

NOTE B—If the pointer is not at 1500 KC on the dial, remove pointer from drive cord. Tune in a 1500 KC signal. Set pointer at the 1500 KC mark on the dial scale. Attach pointer to drive cord.



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

NOTE D—Re-install set in cabinet. Connect a loop approximately one foot in diameter across the antenna and ground posts of the signal generator. Place signal generator so that this loop is between 3 and 10 feet from loop in cabinet. Insert pin tip in loop antenna hole of Antenna Selection Socket—See illustration on page one.



NOTE E—Turn knob of loop until output is maximum.

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

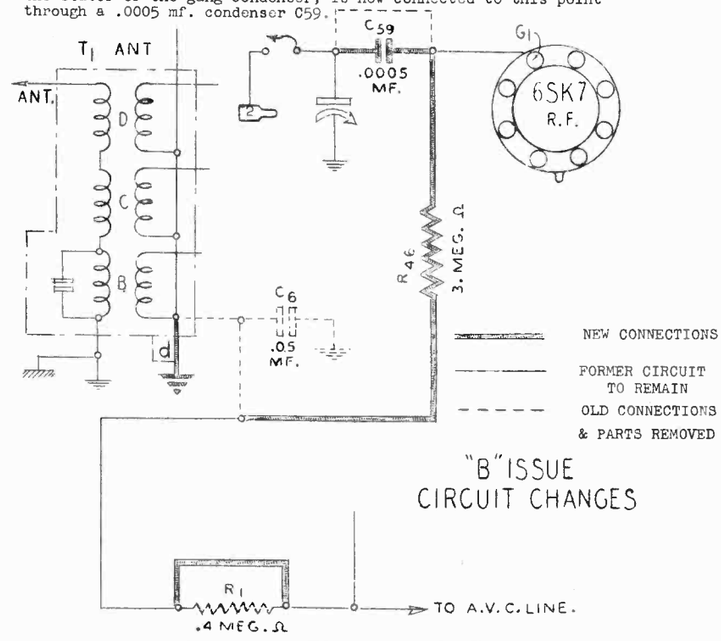
Subject CHANGES MADE FOR "B" ISSUE SETS TO REDUCE HUM MODULATION. **Date** Sept. 8, 1939

Resistor R1, 400,000 Ohms, in series with the AVC connection to the antenna coil, has been removed from the circuit.

The AVC line is no longer connected to the antenna coil at terminal "D." Instead, this terminal is connected to ground. The bypass condenser C6, .05 mf., formerly connected between the same terminal and ground, has been removed from the circuit.

The AVC line which formerly connected to the "D" terminal of the antenna coil and C6, is now connected through a 3 megohm resistor R46 to G1 of the 6SK7 R.F. tube.

G1 of the 6SK7 R.F. tube, which was formerly connected directly to the stator of the gang condenser, is now connected to this point through a .0005 mf. condenser C59.



Television Sound or Phonograph Connections

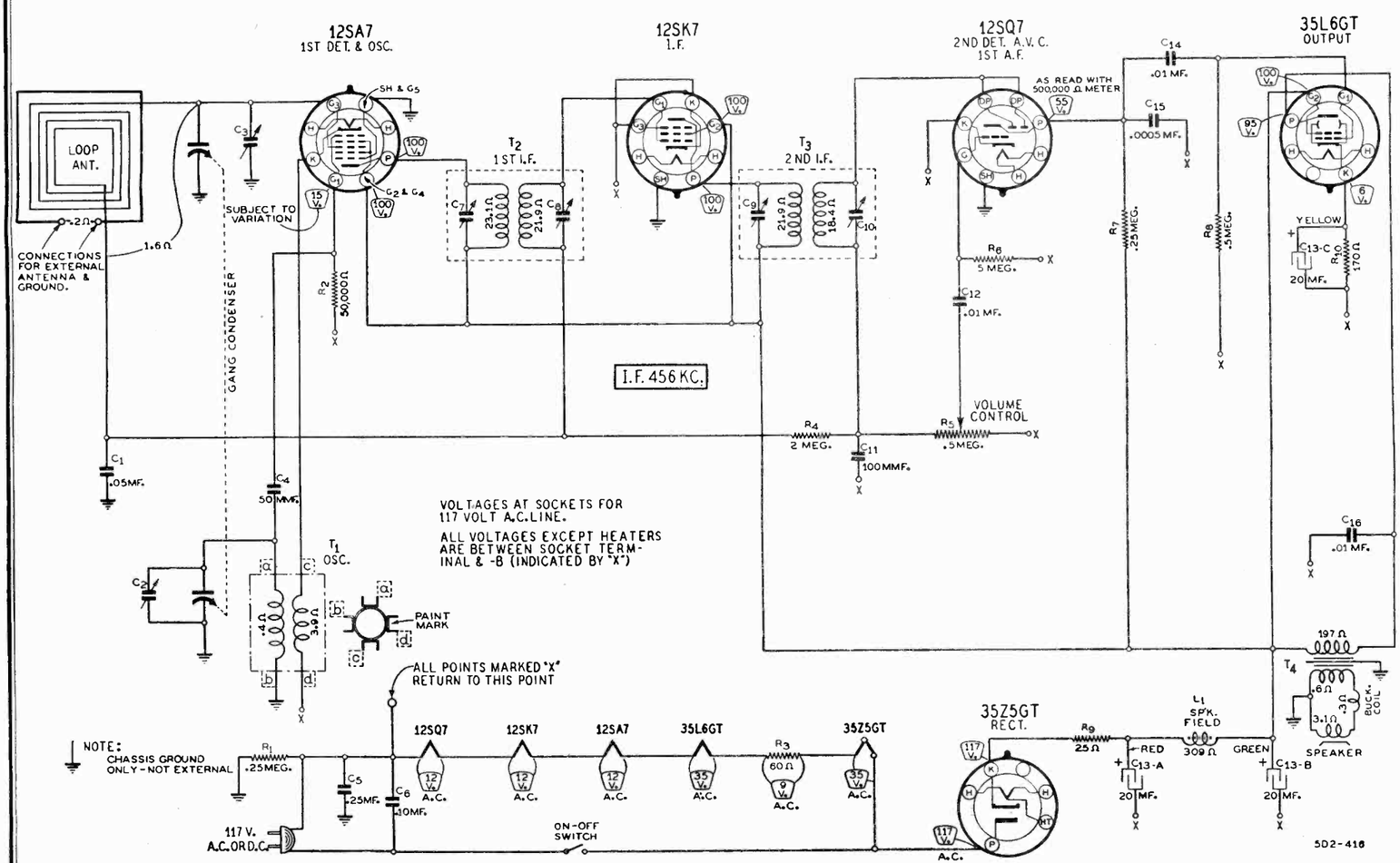
If Television programs ever become available in your community, the audio amplifier and speaker of this radio may be used to reproduce Television sound in conjunction with any "Television Picture Receiver and Sound Converter." Phonograph records may also be played through the radio.

On the back panel of the chassis base is a switch knob and a socket for a single shielded pin tip at which connections are made. The connector on the cable from a television receiver or from a phono pickup can be inserted in the socket. (The cable connector must be a single shielded pin tip type, Part No. M93.)

When phonograph or television sound reproduction is desired, the knob should be turned to the "Phono-Television Sound" position. For radio reception, the knob should be in the "Radio" position.

5 TUBE AC-DC RADIO WITH SELF CONTAINED LOOP ANTENNA

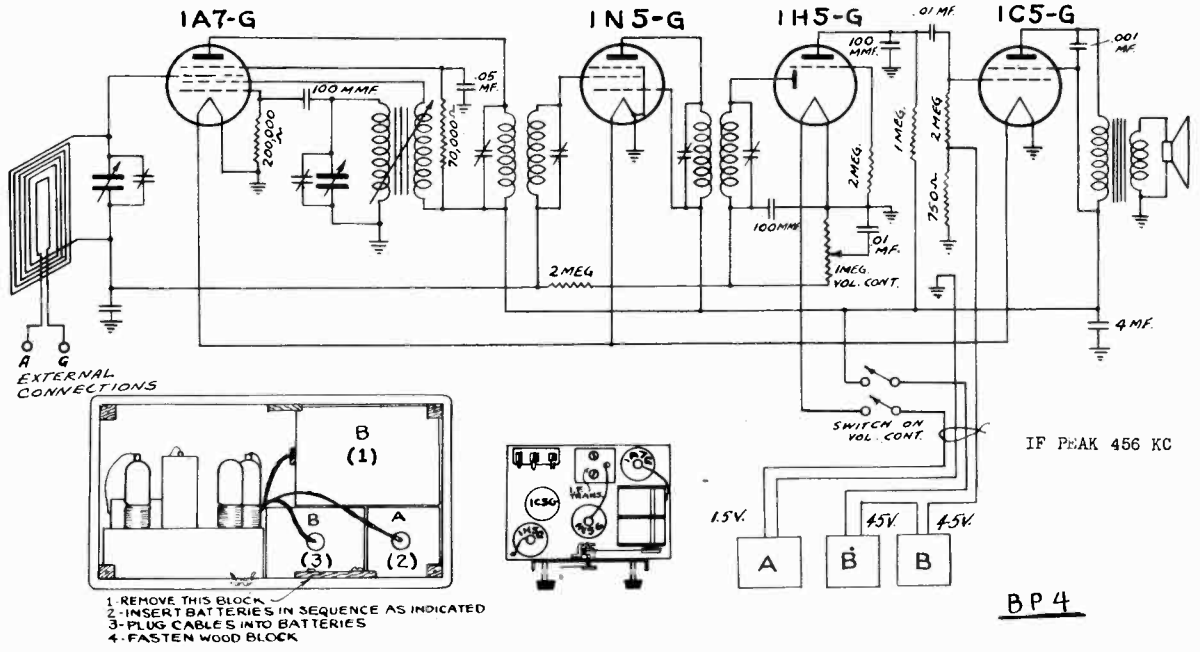
BROADCAST BAND

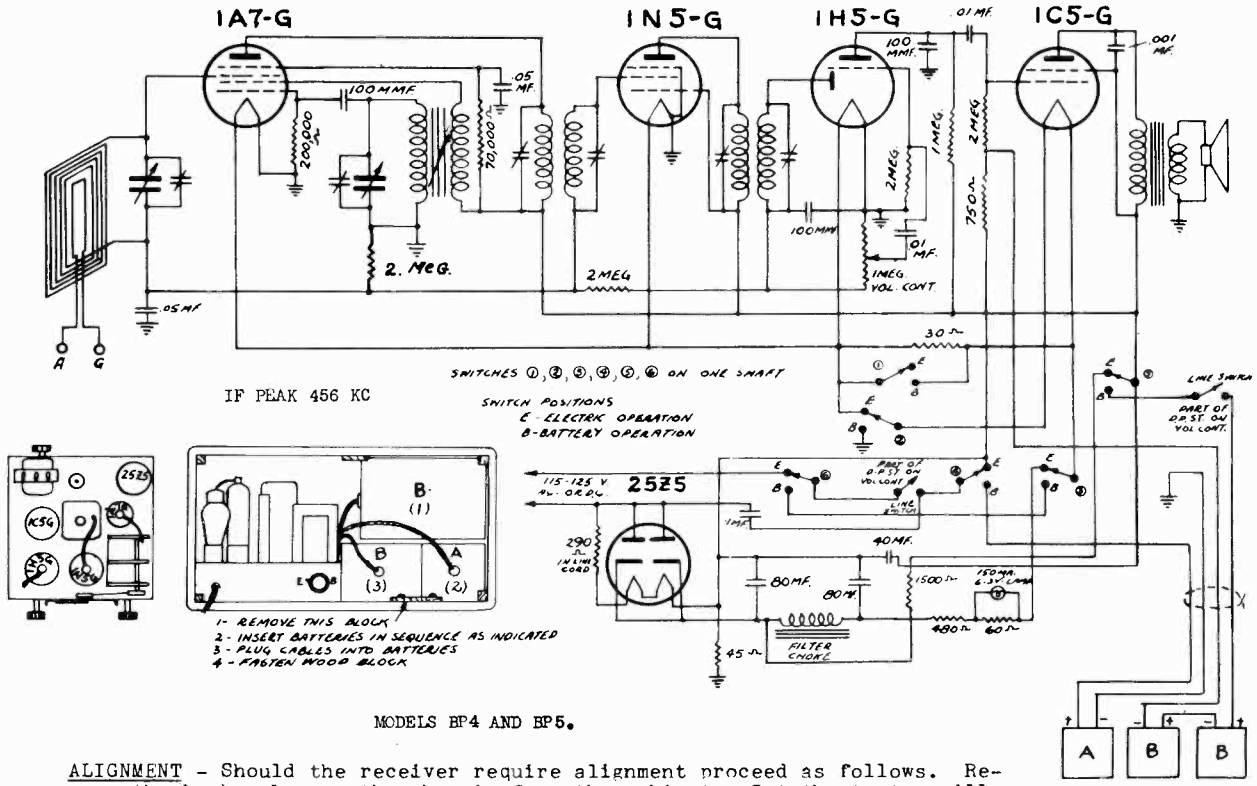


5D2-416

GAROD RADIO CORP.

MODEL BP4
MODEL BP5
Schematics, Socket
Alignment, Chassis





MODELS BP4 AND BP5.

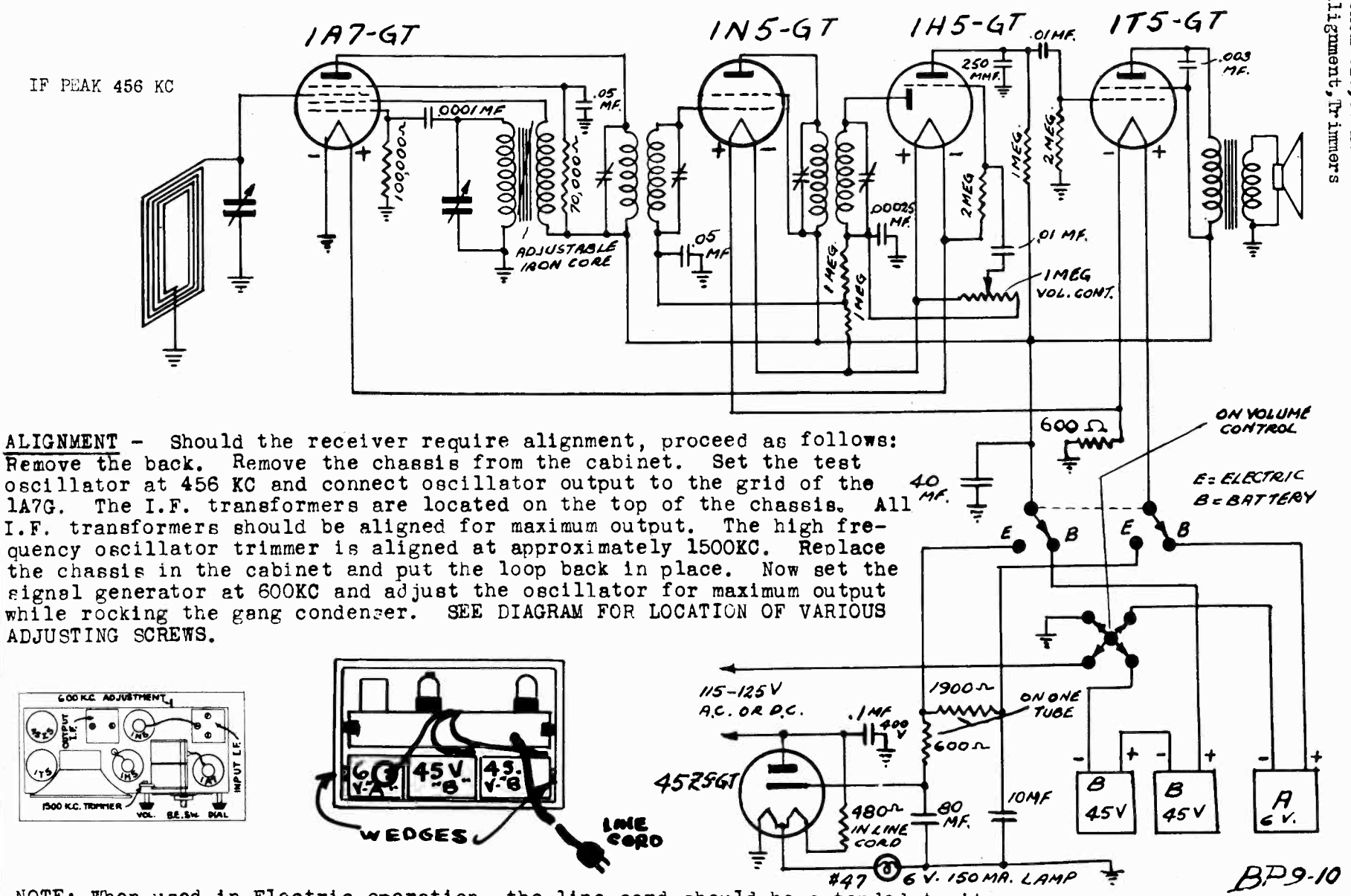
ALIGNMENT - Should the receiver require alignment proceed as follows. Remove the back. Remove the chassis from the cabinet. Set the test oscillator at 456KC and connect it to the grid of the 1A7G. The first I.F. Transformer is located on top of the chassis, the second I.F. is on the front apron, directly under the dial. All I.F. trimmers are aligned for maximum output.

The high frequency antenna trimmer is aligned at approximately 1500 KC. Replace chassis in cabinet, and put the back in place. Now tune in a station at approximately 600 KC and adjust the OSCILLATOR through the hole in the bottom of the cabinet for maximum signal, while rocking the dial back and forth.

REV 4-27-39

MODELS BP9, BP10
Schematic, Socket
Alignment, Trimmers

GAROD RADIO CORP.



ALIGNMENT - Should the receiver require alignment, proceed as follows: Remove the back. Remove the chassis from the cabinet. Set the test oscillator at 456 KC and connect oscillator output to the grid of the 1A7G. The I.F. transformers are located on the top of the chassis. All I.F. transformers should be aligned for maximum output. The high frequency oscillator trimmer is aligned at approximately 1500KC. Replace the chassis in the cabinet and put the loop back in place. Now set the signal generator at 600KC and adjust the oscillator for maximum output while rocking the gang condenser. SEE DIAGRAM FOR LOCATION OF VARIOUS ADJUSTING SCREWS.

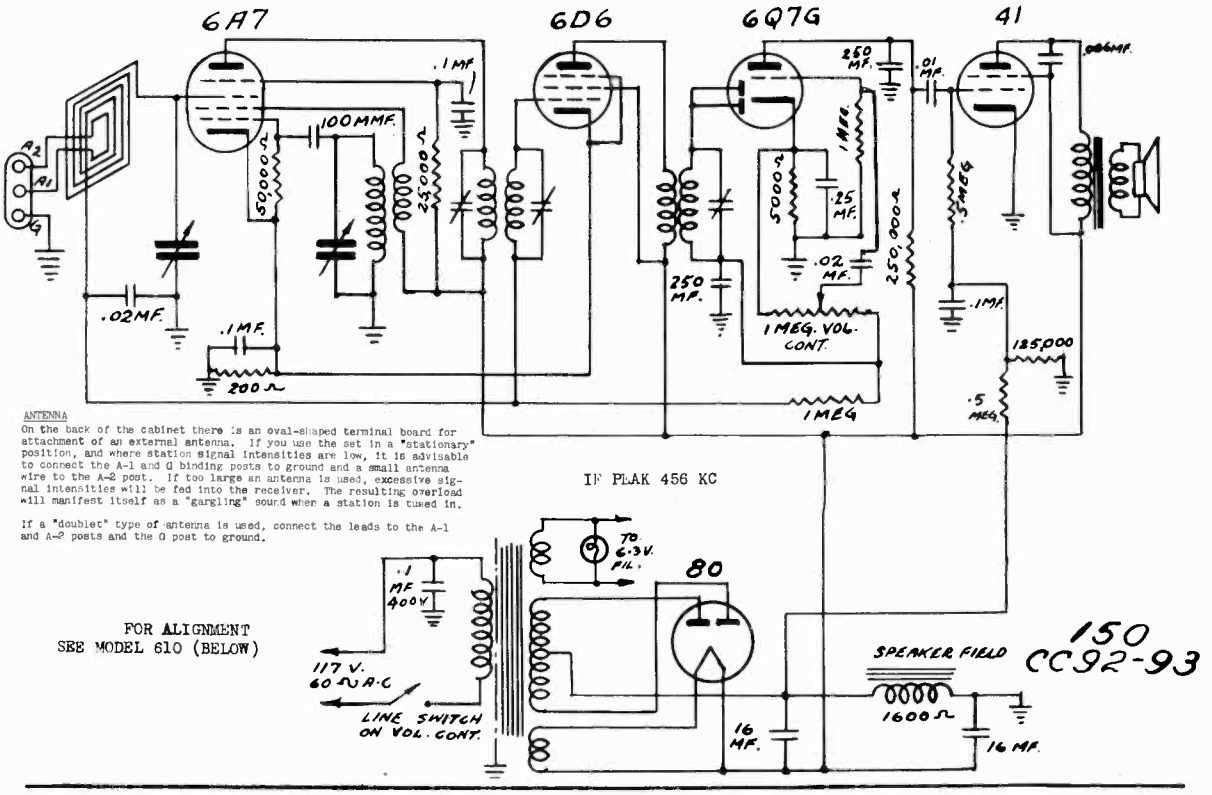
BP9-10

NOTE: When used in Electric operation, the line cord should be extended to its full length. If it is left closely folded while operating from the light line, the concentrated heat may damage the cord.

7-18-39

GAROD RADIO CORP.

MODEL 150
MODEL 610
Schematics
Alignment



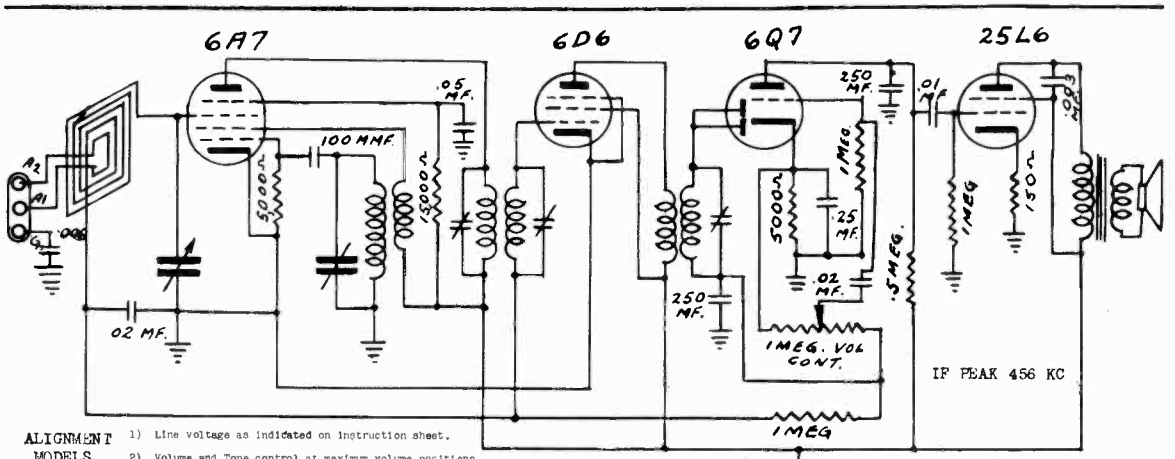
ANTENNA

On the back of the cabinet there is an oval-shaped terminal board for attachment of an external antenna. If you use the set in a "stationary" position, and where station signal intensities are low, it is advisable to connect the A-1 and G binding posts to ground and a small antenna wire to the A-2 post. If too large an antenna is used, excessive signal intensities will be fed into the receiver. The resulting overload will manifest itself as a "gargling" sound when a station is tuned in.

If a "doublet" type of antenna is used, connect the leads to the A-1 and A-2 posts and the G post to ground.

FOR ALIGNMENT SEE MODEL 610 (BELOW)

150
CC92-93



ALIGNMENT MODELS
150
610

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

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.

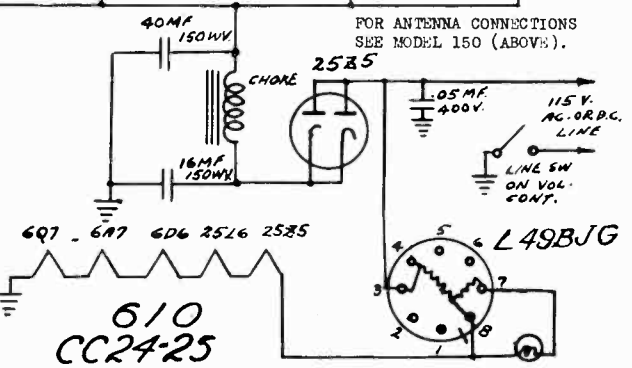
The Input I.F. transformer trimmers are adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

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.

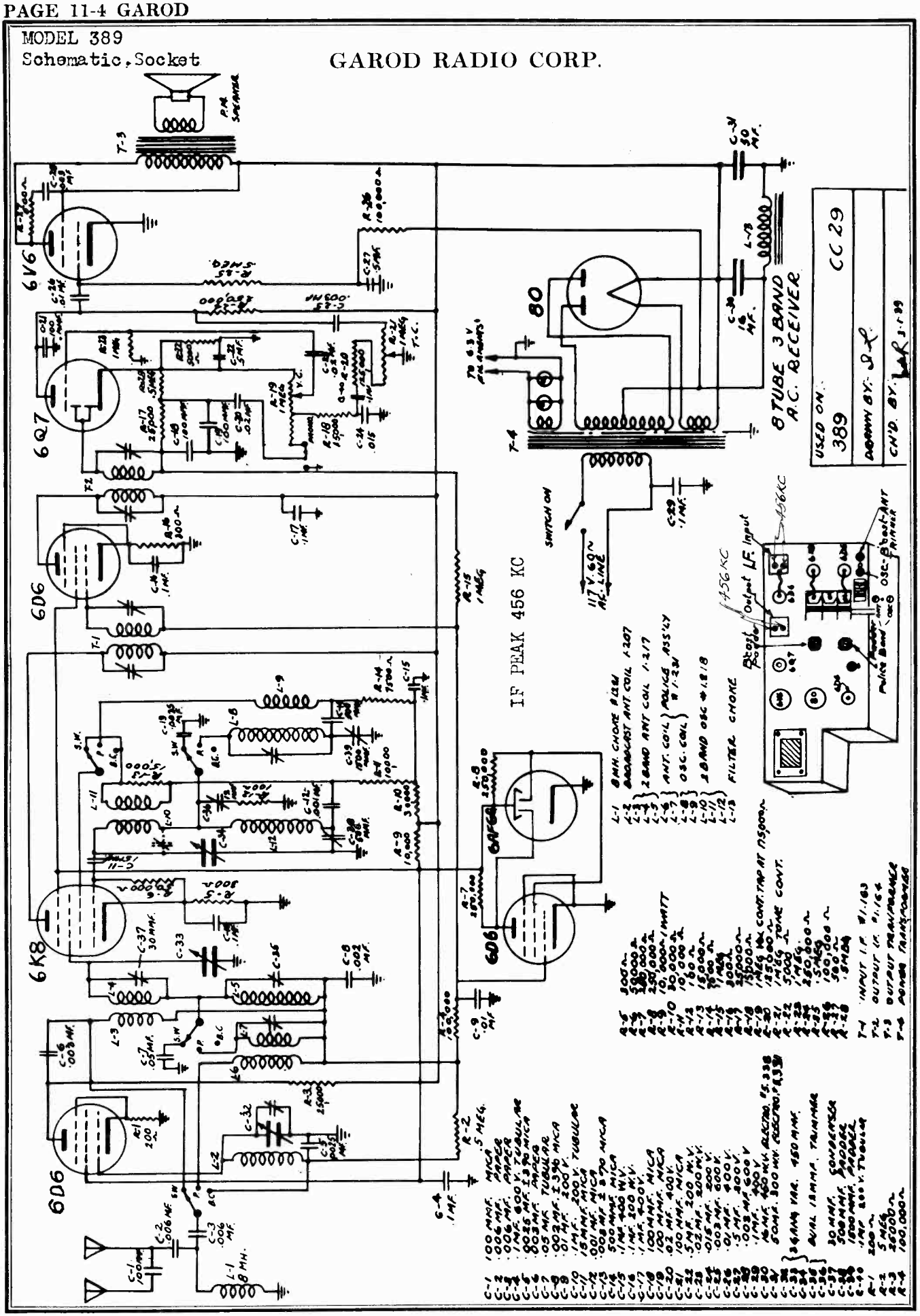
FOR ANTENNA CONNECTIONS SEE MODEL 150 (ABOVE).



610
CC24-25

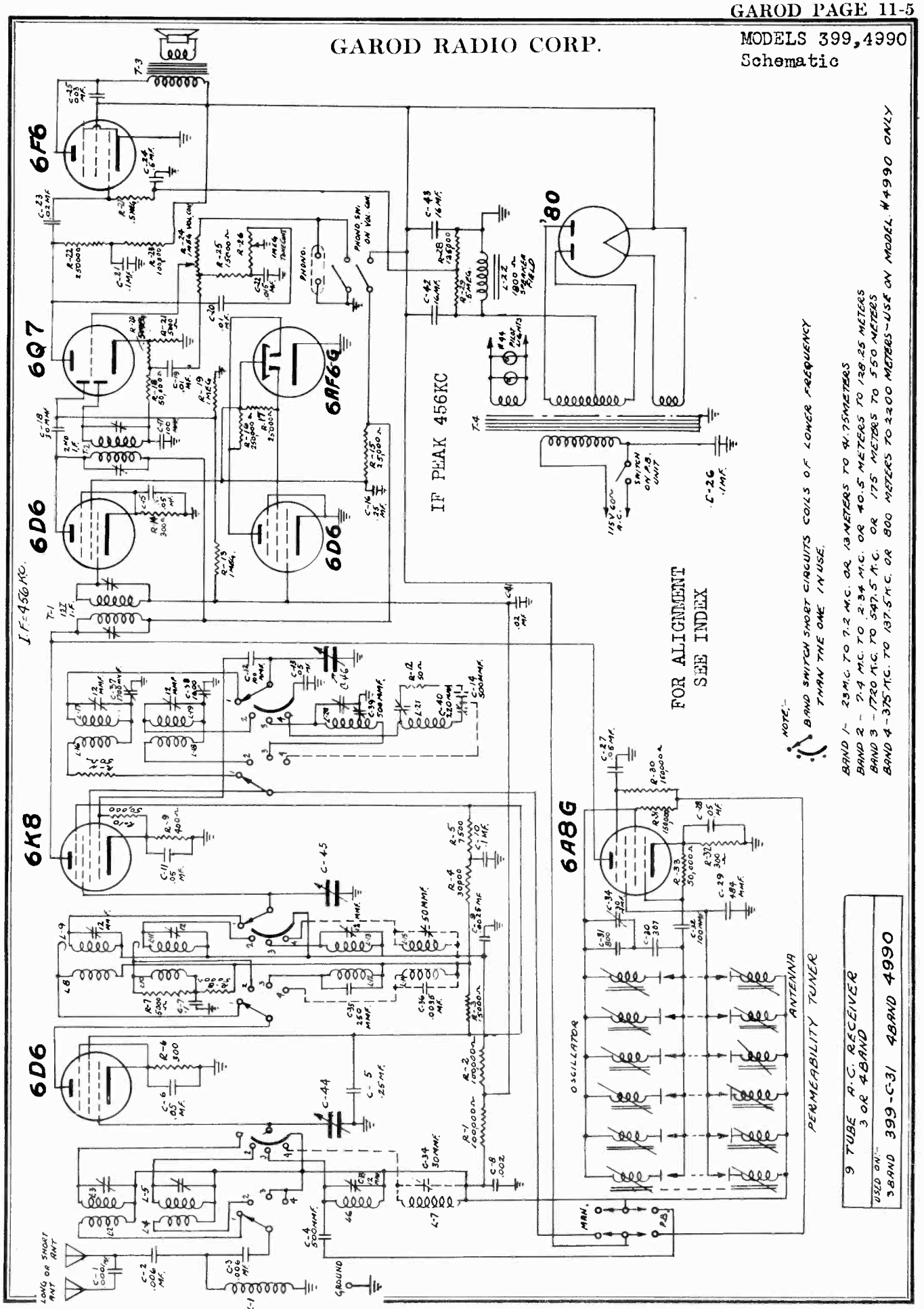
MODEL 389
Schematic, Socket

GAROD RADIO CORP.



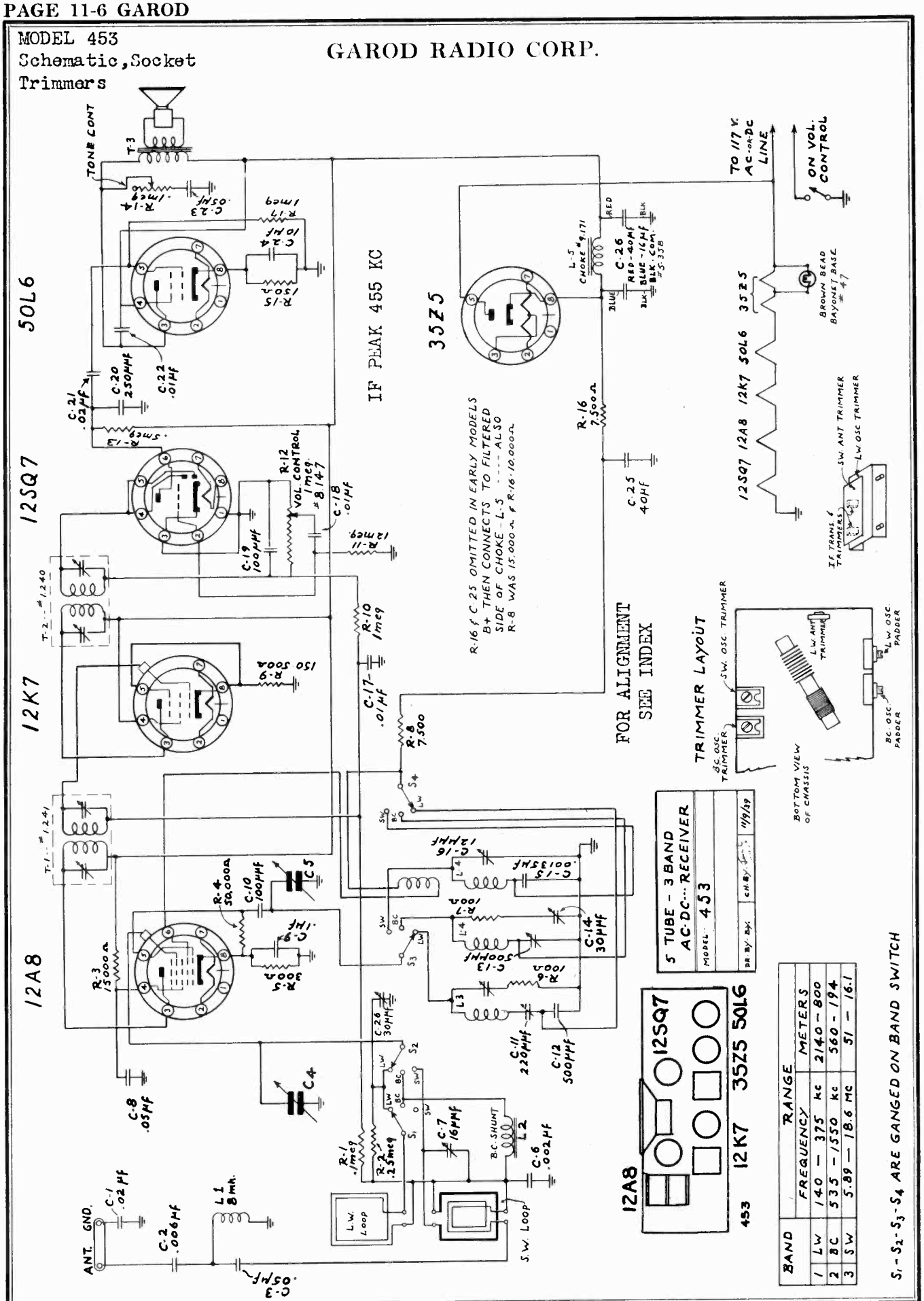
GAROD RADIO CORP.

MODELS 399,4990
Schematic

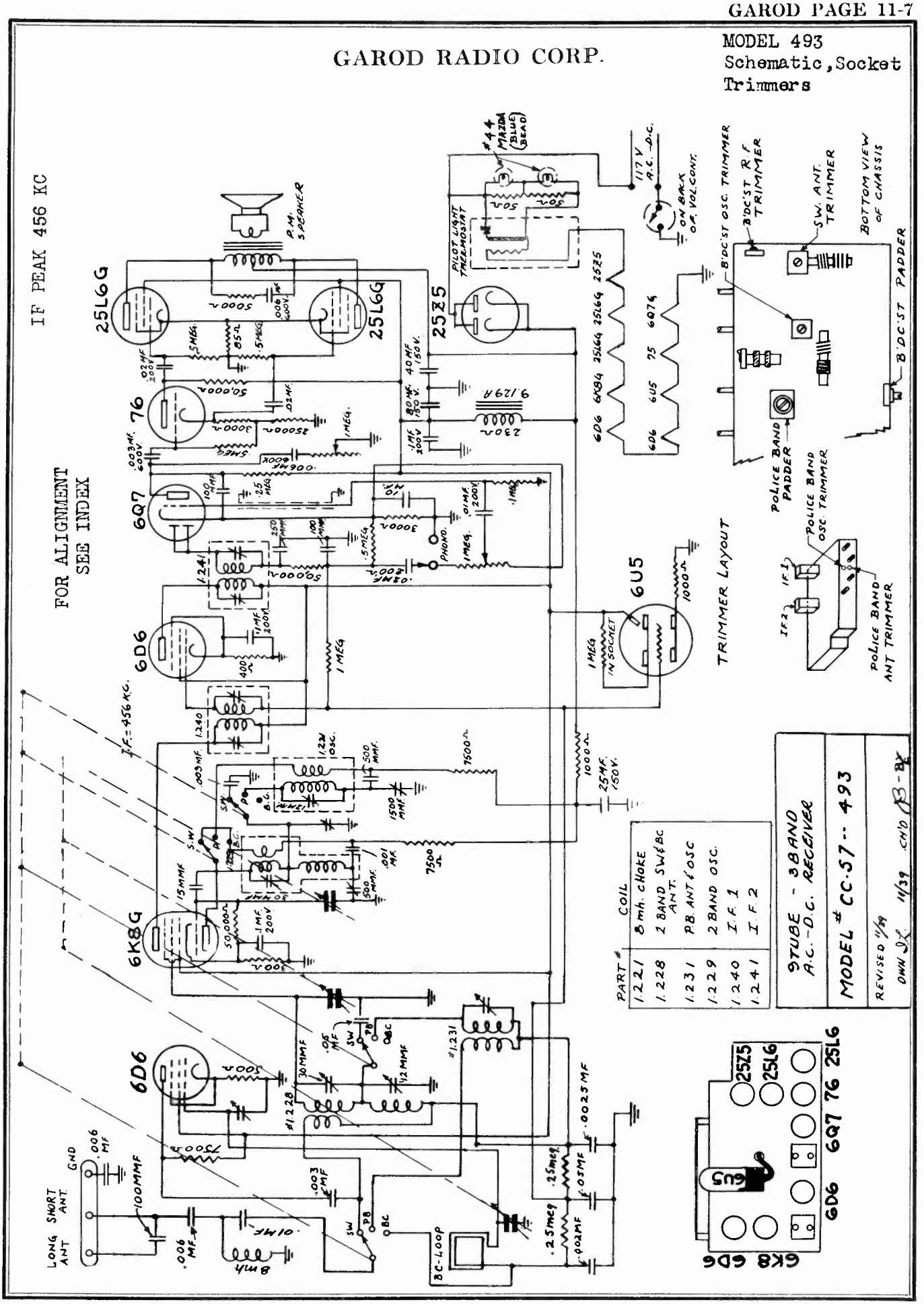


MODEL 453
Schematic, Socket
Trimmers

GAROD RADIO CORP.

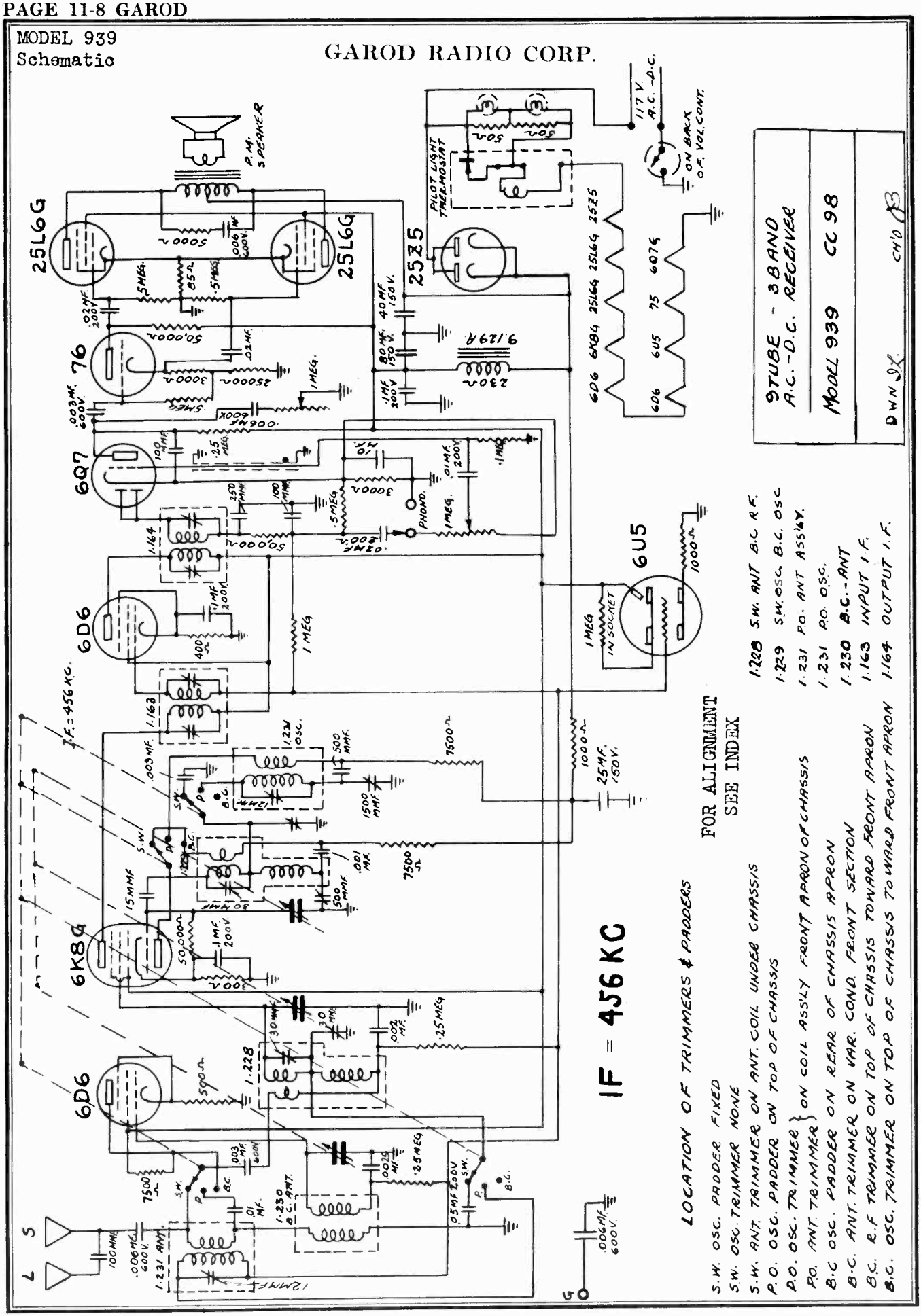


BAND		RANGE FREQUENCY	METERS
1	LW	140 — 375 kc	2140 — 800
2	BC	535 — 1550 kc	560 — 194
3	SW	5.89 — 18.6 mc	51 — 16.1



MODEL 939
Schematic

GAROD RADIO CORP.

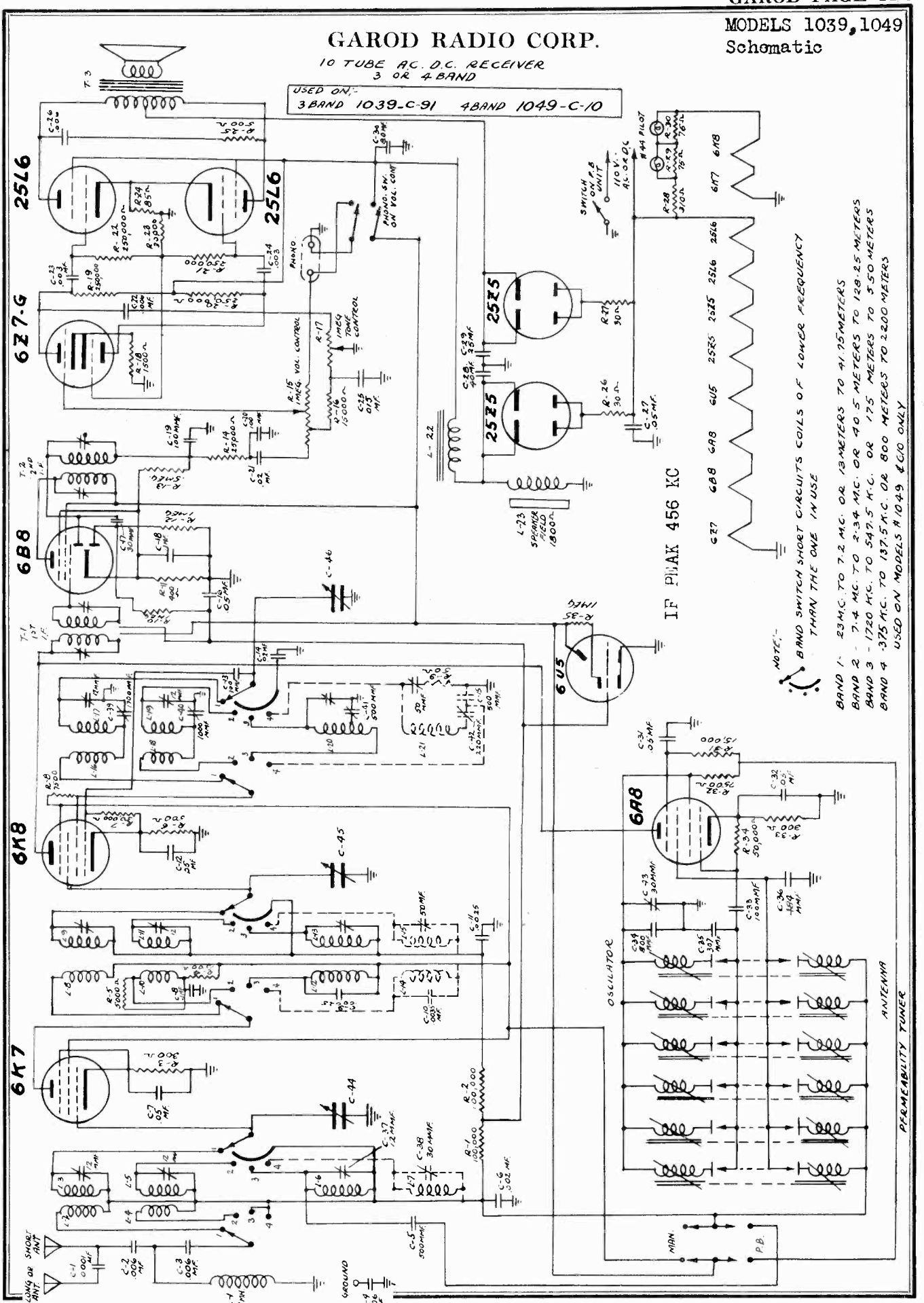


GAROD RADIO CORP.

10 TUBE AC. D.C. RECEIVER
3 OR 4 BAND

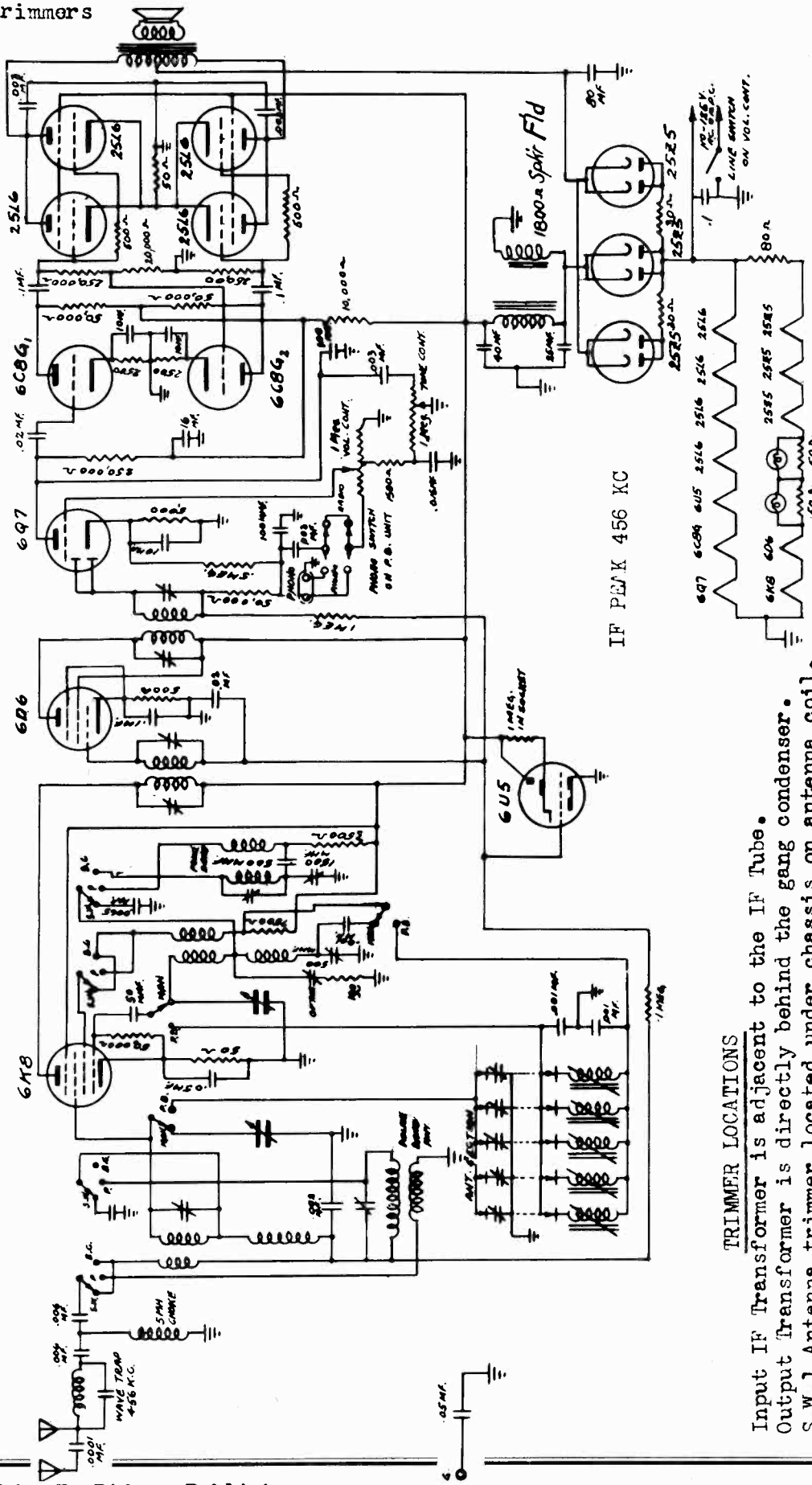
MODELS 1039, 1049
Schematic

USED ON:- 3 BAND 1039-C-91 4 BAND 1049-C-10



MODEL 1239
Schematic
Trimmers

GAROD RADIO CORP.



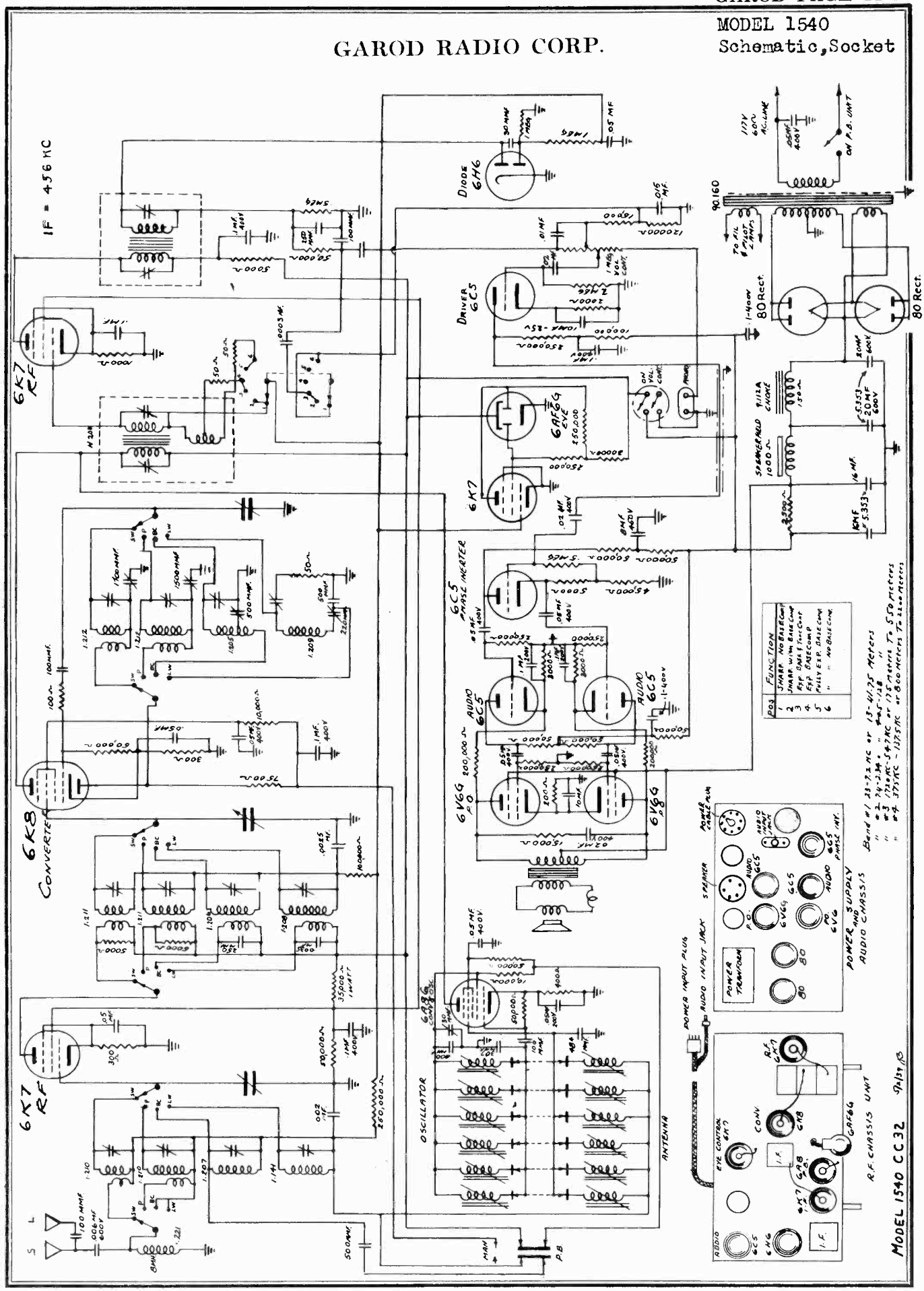
12 TUBE 3 BAND
AC.-DC. RECEIVER

CC-97 1239

FOR ALIGNMENT
SEE INDEX

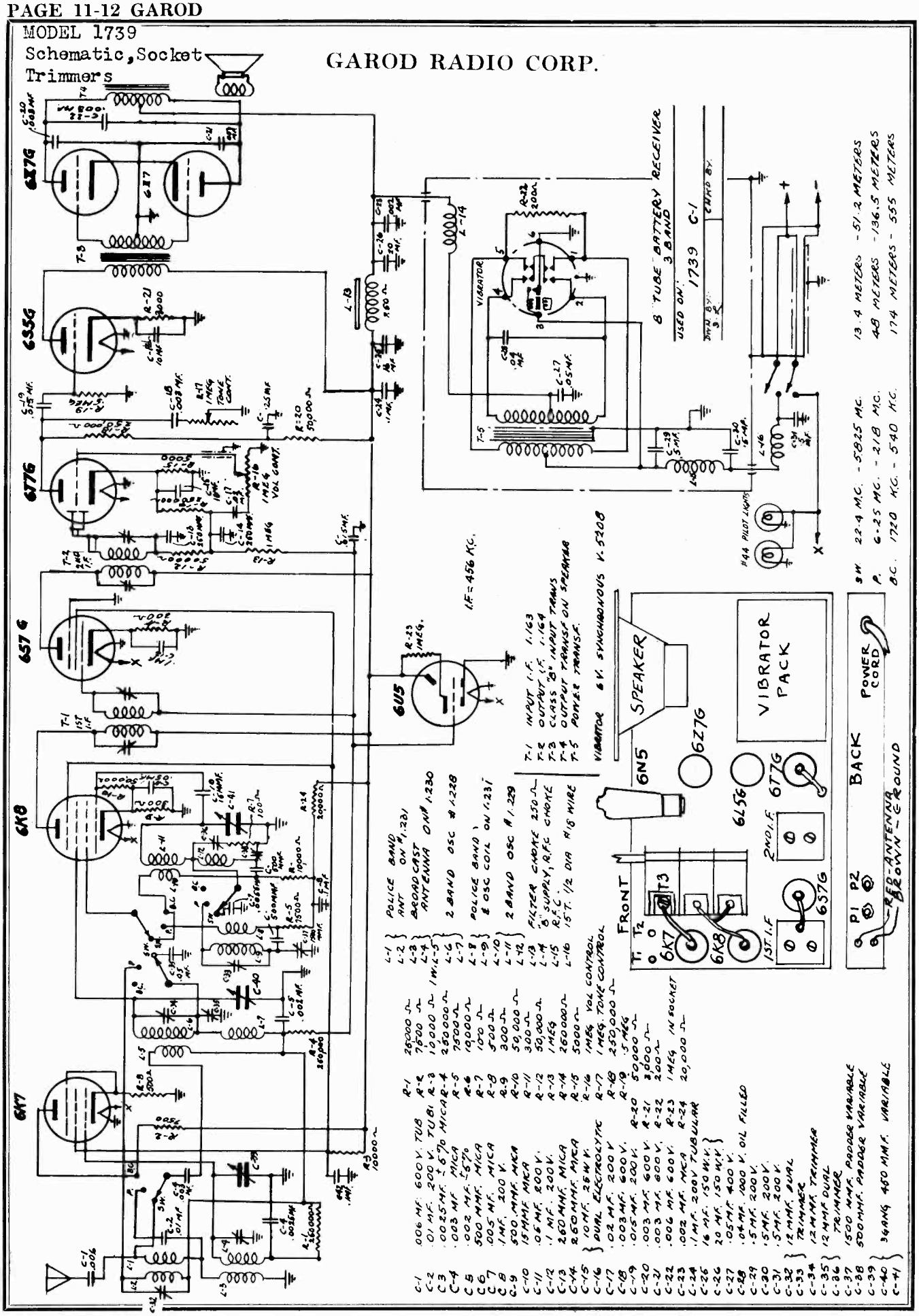
TRIMMER LOCATIONS

Input IF Transformer is adjacent to the IF Tube.
Output Transformer is directly behind the gang condenser.
S.W.1 Antenna trimmer located under chassis on antenna coil.
L.W. Osc. Trimmer under chassis on L.W. condenser which is between the band switch and padder condenser.
L.W. Padder under chassis on front apron adjacent to L.W. Oscillator coil.



MODEL 1739
Schematic, Socket
Trimmers

GAROD RADIO CORP.



C-1	.006 MF. 600 V. TUB	R-1	25000 Ω
C-2	.01 MF. 200 V. TUBL	R-2	7500 Ω
C-3	.0025 MF. 1.5% MICA	R-3	10,000 Ω 1W.
C-4	.003 MF. MICA	R-4	250000 Ω
C-5	.002 MF. 5%	R-5	75000 Ω
C-6	500 MMF. MICA	R-6	190000 Ω
C-7	.005 MF. MICA	R-7	100 Ω
C-8	.1 MF. 200 V.	R-8	500 Ω
C-9	500 MMF. MICA	R-9	300 Ω
C-10	15 MMF MICA	R-10	50,000 Ω
C-11	.05 MF. 200 V.	R-11	300 Ω
C-12	.1 MF. 200 V.	R-12	50,000 Ω
C-13	260 MMF. MICA	R-13	1 MEG
C-14	260 MMF. MICA	R-14	260000 Ω
C-15	2.5 MMF. MICA	R-15	5000 Ω
C-16	10 MF. 25 W V. DUAL ELECTROLYTIC	R-16	1 MEG. VOL CONTROL
C-17	.02 MF. 200 V	R-17	1 MEG. TONE CONTROL
C-18	.003 MF. 600 V.	R-18	250,000 Ω
C-19	.015 MF. 200 V.	R-19	.5 MEG
C-20	.003 MF. 600 V.	R-20	50000 Ω
C-21	.003 MF. 600 V.	R-21	3,000 Ω
C-22	.006 MF. 600 V.	R-22	200 Ω
C-23	.002 MF. MICA	R-23	1 MEG IN SOCKET
C-24	1 MF. 200V TUBULAR	R-24	20,000 Ω
C-25	16 MF. 150 W.V. }		
C-26	20 MF. 150 W.V. }		
C-27	.05 MF. 400 V.		
C-28	.04 MF. 1000 V. OIL FILLED		
C-29	.5 MF. 200 V.		
C-30	.5 MF. 200 V.		
C-31	.5 MF. 200 V.		
C-32	12 MMF. DUAL		
C-33	TRIMMER		
C-34	12 MMF TRIMMER		
C-35	12 MMF DUAL		
C-36	TRIMMER		
C-37	1500 MMF. PADDER VARIABLE		
C-38	500 MMF. PADDER VARIABLE		
C-39	3 GANG 460 MMF. VARIABLE		
C-40			
C-41			

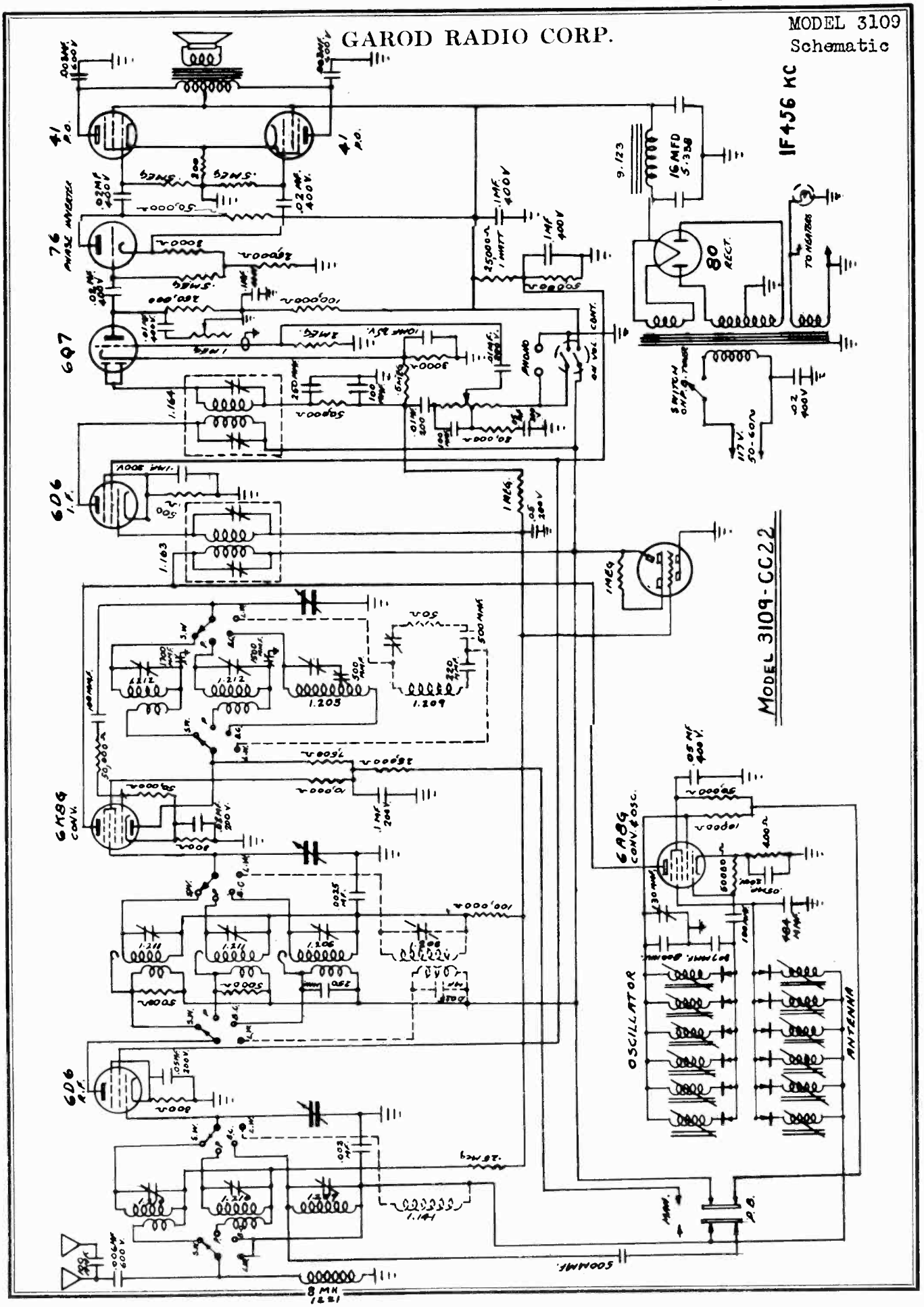
L-1	POLICE BAND ANT ON #1,231
L-2	BROADCAST ANTENNA ON #1,230
L-3	
L-4	
L-5	2 BAND OSC #1,228
L-6	
L-7	
L-8	POLICE BAND OSC COIL ON #1,231
L-9	
L-10	
L-11	2 BAND OSC #1,229
L-12	
L-13	FILTER CHOKE 250 Ω
L-14	B+ SUPPLY, R.F.C. CHOKE
L-15	R.F.C. 1.5T. 1/2 DIA #18 WIRE
L-16	

T-1	INPUT I.F. #1,163
T-2	OUTPUT I.F. #1,164
T-3	CLASS 'B' INPUT TRANS
T-4	OUTPUT TRANSF ON SPEAKER
T-5	POWER TRANSF.

VIBRATOR 6 V. SYNCHRONOUS V. #208

GAROD RADIO CORP.

MODEL 3109
Schematic



MODEL 389
MODEL 453
MODEL 493

GAROD RADIO CORP.

MODEL 939
MODEL 1239
Alignment

GAROD MODELS 389; 453; 493; 939, 1239.

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 (1) KC and is connected to the grid of the converter tube (12A8) (2) 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 MODELS 453, 493, 939 (ONLY) - Set the band switch to the extreme left-hand position which is short-wave band #1. Set the generator at 15.5 (3) MC, turn the condenser until a response is indicated. The pointer should co-incide with the 15.5MC 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 #1 MODEL 389 (ONLY) - Set the band switch to the extreme right hand position which is short wave band #1. 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 connected to the "short-antenna" lead through a dummy antenna, consisting of a 250 MMFD condenser and a 400 OHM non-inductive resistor in series. Set the generator at 19MC, turn the condenser until a response is indicated. The pointer should co-incide with the 19MC mark on the dial. Adjust the antenna trimmer for the short-wave band located under the chassis on the antenna coils for maximum output while rocking the condenser gang from left to right.

BROADCAST BAND MODEL 1239 (ONLY) The dummy antenna for this band consists of only a 250 MMFD condenser. Set the Band Switch in the middle position and condenser plates completely out of mesh. Set the generator 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. Adjust the 1500KC Antenna trimmer (located under the chassis near the band switch) for maximum output. Set the generator at 600KC and turn the variable condenser control until a response is indicated. Adjust the broadcast oscillator padder condenser (located on top of the chassis between the variable condenser and the output I.F. transformer) for maximum response while "rocking" the gang condenser. The high frequency adjustments should now be re-checked.

BROADCAST BAND MODELS 389, 453, 493, 939. The dummy antenna for this band consists of only a 250 MMFD condenser. Set the Band Switch in the Broadcast position and condenser plates completely out of mesh. Set the signal generator at 1550KC (4) and adjust the broadcast oscillator trimmer 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. (6) 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.

SHORT-WAVE BAND #2 MODELS 389,493,939. - Set the band switch to the middle 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 6.25 MC 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 co-incide 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. (5)

Set the generator at 2.4 MC 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 rechecked.

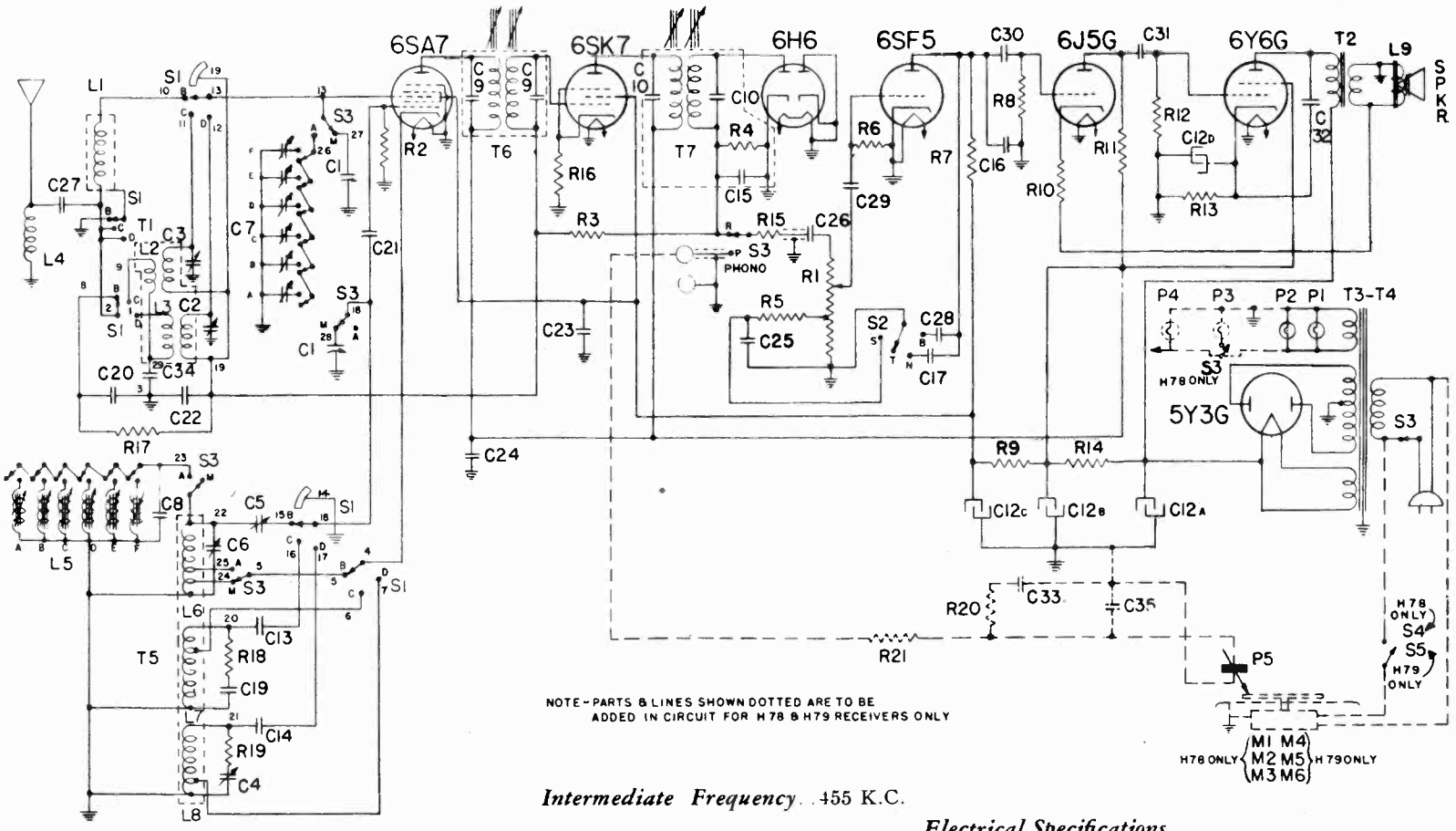
Long Wave Band: MODELS 453. 1239, The band selector switch is set in position for operation on the long wave band (extreme right hand position). The receiver and generator are both tuned to 300 kc and the oscillator trimmer is adjusted for maximum response. The antenna and first detector trimmers are adjusted in the order named for maximum output.

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

(1). 456 KC FOR MODELS 389, 493, 939, 1239.
(2). 6K8 TUBE .. ..
(3). 19 MC FOR MODELS 493, 939.
(4). 1720 KC FOR MODELS 389, 939.
(5). 23 MC .. .. 493, 939.
(6). MODEL 389-ADJUST ANTENNA TRIMMER AT 1500 KC for MAXIMUM.

GENERAL ELECTRIC CO.

MODELS H73, H77, H78
H79 (Final)
Schematic, Data



NOTE - PARTS & LINES SHOWN DOTTED ARE TO BE ADDED IN CIRCUIT FOR H78 & H79 RECEIVERS ONLY

Fig. 3. Schematic Diagram

Loud-speaker—"Alnico" Magnet Dynamic

Model	H-73	H-77, H-78, H-79
Outside Cone Diameter	6½ in.	12 in.
Voice Coil Impedance	3.5 ohms at 400 cycles	

Phonograph

Model	H-78	H-79
Type	Manual	Automatic
Record Capacity		
10-inch	One	Twelve
12-inch	One	Ten
Type Pick-up	Crystal	Crystal
Turntable Speed	78 R.P.M.	78 R.P.M.

Intermediate Frequency . . 455 K.C.

Electrical Power Output

Undistorted . . . . 3.7 watts
Maximum . . . . . 5.0 watts

Tone Control 4-position

Electrical Specifications

Model	Rating	Power Supply Volts	Frequency (Cycles per Second)	Power Consumption (Watts)
H-73	A	115–125	50–60	75
	C	115–125	25–60	80
H-77	V	103–117 118–133 134–155 188–212 213–237 238–262	50–60	75
H-78	A6	115–125	60	95
H-79	A5	115–125	50	95
	A2	115–125	25	100

MODELS H73,H77,H78
H79 (Final)
Chassis Wiring,Voltage
Socket,Dial Drive Data

GENERAL ELECTRIC CO.

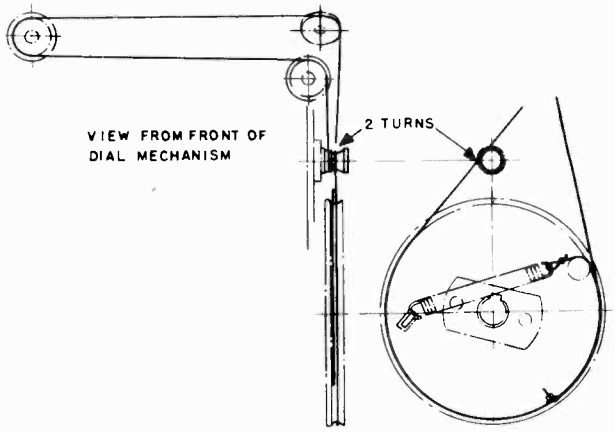
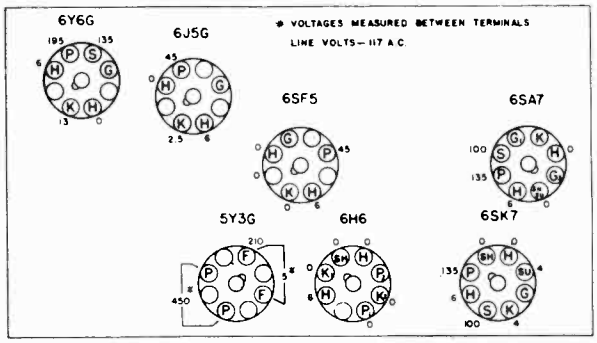


Fig. 6. Dial Drive Stringing Diagram



VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS.
No signal input—Max. Volume—Band "B."

Fig. 5. Socket Voltages

Models H-73, H-77, H-78, and H-79 employ three-band a-c receivers of the superheterodyne type using seven General Electric Pre-tested Tubes. Features of design include the new "Alnico" dynapower speaker, nine Feathertouch Tuning keys, six of which may be set up for favorite stations, a television audio or phonograph key, Visualux dial, iron-core I.F. transformers, iron-core oscillator trimmer coils for station keys and automatic volume control. In addition Model H-73 is equipped with the built-in "Beam-a-Scope" while Models H-77, H-78, and H-79 are equipped with the built-in "*Super* Beam-a-scope."

Models H-78 and H-79 each contain a phonograph mechanism for reproducing records. Model H-78 phonograph manually plays 10-inch or 12-inch records. Model H-79 phonograph incorporates an automatic record changer which will play either 10-inch or 12-inch records. Both mechanisms contain high-quality crystal pick-ups and constant speed, self-starting, silent electric motors.

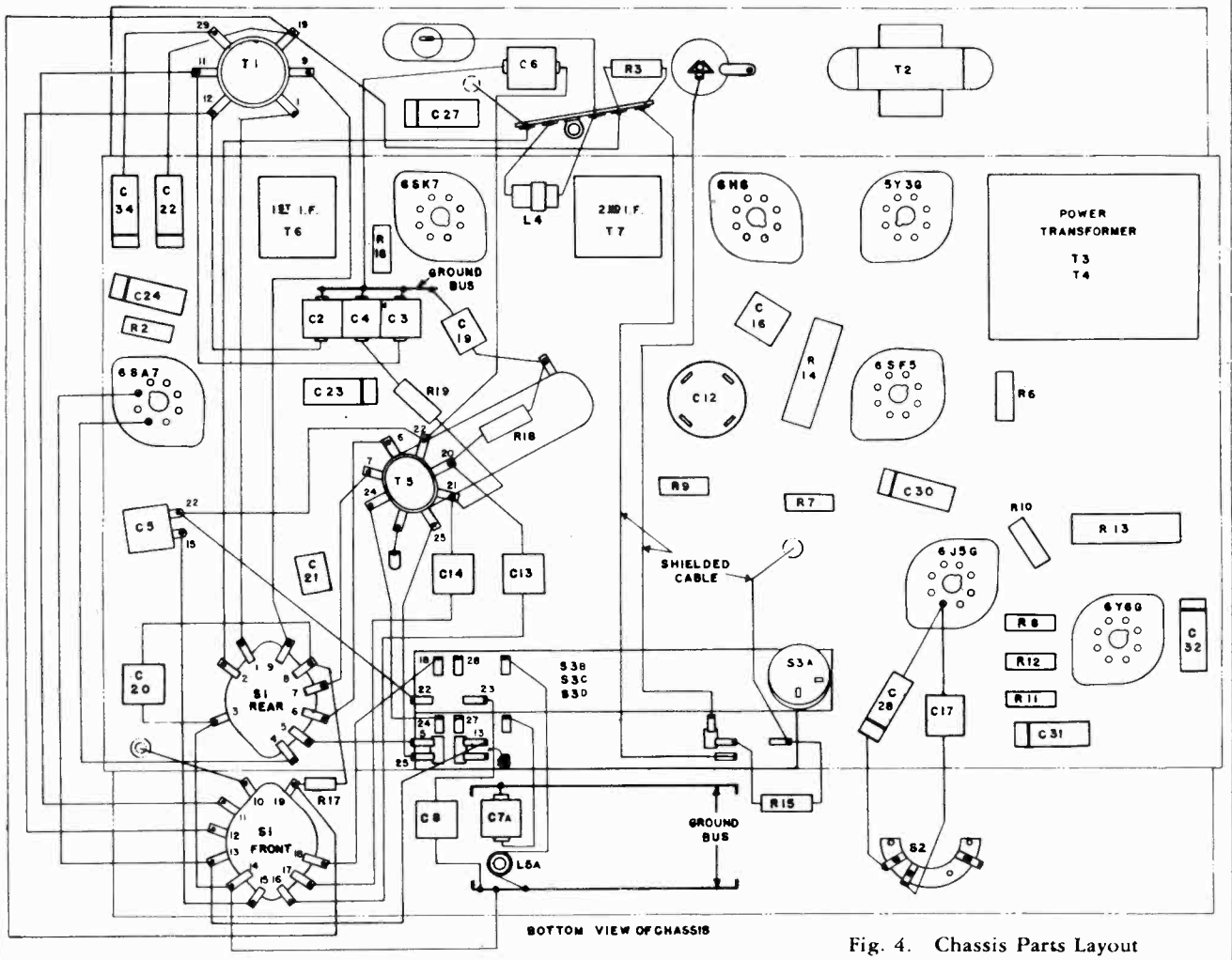


Fig. 4. Chassis Parts Layout

GENERAL INFORMATION

Super Beam-a-scope

The *Super* Beam-a-scope is essentially a tuned coil antenna wound on a frame and shielded by a Faraday screen against electrostatic disturbances. This construction favors the desired signal over a local man-made noise source in three ways. First, since any noise source is composed of two components—electrostatic and electromagnetic fields—the *Super* Beam-a-scope may be revolved so that a null point is found where no voltage is produced from these two components. Due to the fact that this null point is very sharp, it is very unusual that any desired station will be in a direct line with the rejected noise signal and thereby have its signal strength reduced appreciably. In the second place, the *Super* Beam-a-scope eliminates local man-made noise sources in much the same way as a shielded antenna lead-in does in an ordinary antenna installation. In the third place the *Super* Beam-a-scope discriminates against the electrostatic component of an incoming wave in comparison with the electromagnetic component, because of the Faraday shield. Since the electrostatic component of a local noise source is a great deal larger than the electromagnetic component, this rejection property brings about an enormous increase in signal-to-noise ratio.

The above operation is only available on the broadcast band and in this position the *Super* Beam-a-scope is also the first tuned grid circuit. On the "C" and "D" bands, the *Super* Beam-a-scope is grounded at the grid end thus preventing absorption spots due to loop resonance.

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 before replacing it.

Coil System

L-1 is the Beam-a-Scope. T-1 is the "C" and "D" band antenna transformer while T-5 is the oscillator transformer for all bands. All band switch and coil terminals are numbered in Fig. 3 and Fig. 4 to facilitate in locating common points.

The following table shows the coils in use for the various positions of the band and manual-automatic switch:

Band Switch Position	Antenna Primary	Antenna Secondary	Oscillator Grid	Oscillator Cathode	Remarks
Band "B" Manual Position		L-1	L-6	24 to Gnd. of L-6	C-1 tuning condenser in circuit
Band "B" Automatic Tuning		L-1	L-6	25 to Gnd. of L-6	C-7 and L-5 trimmers and coils in circuit.
Band "C"	L-2	L-2	L-7	6 to Gnd. of L-7	L-1 and L-6 effectively grounded through C-22 and C-5 respectively.
Band "D"	L-3	L-3	L-8	7 to Gnd. of L-8	L-1, L-2 secondary grounded through C-22. L-6, L-7 grounded through C-5 and C-13 respectively.

Phonograph or Television Audio Connections

These models are equipped with a phono-terminal (pin jack) to allow the convenient connection of record players or television audio channels. General Electric plug, Stock No. RP-145, fits the pin jack. Models H-78, and H-79 use the plug connection from phonograph to radio and this plug may be readily removed to allow use of other record players, sound equipment or television sound converters.

NOTE.—A suitable load consisting of a 100,000-ohm resistor in series with .01 mfd. capacitor should be connected across the pick-up leads when using a crystal-type unit.

Alignment Procedure

The alignment procedure is given in table form
Use a standard I.R.E. "dummy" antenna, Fig. 7, in making all R.F. alignments. The relative position of the Beam-a-Scope with respect to the chassis materially affects R.F. alignment on "B" band; therefore, final alignment on "B band should be made after the chassis and Beam-a-Scope are mounted in the cabinet.

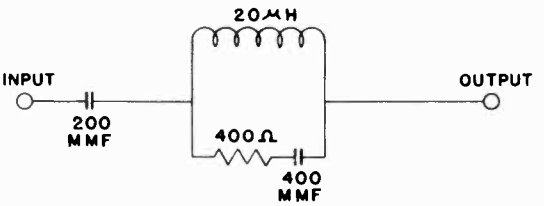


Fig. 7. I. R. E Dummy Antenna

PHONOGRAPH MECHANISM (H-78)

The phonograph mechanism used in this receiver has been designed to be as simple as possible and give long and trouble-free performance. Under normal operating conditions service difficulties should be negligible. Occasionally, however, certain adjustments may be required.

Trip Mechanism

The trip mechanism is of simple design and consists of a latch bar connected to the motor switch and a trip lever. The latch is held closed by means of a spring between the latch bar and the trip lever. The motor switch is mechanically connected to the latch bar so that when the trip mechanism is released, the motor switch is in the "Off" position. Be sure this latch bar mechanism works freely without binding.

The trip is actuated by an adjustable arm on the trip lever. When the eccentric groove in the record swings the tone arm back and forth, it pushes the latch out of engagement.

Crystal Pick-up

The crystal pick-up employs a crystal element which is coupled to a light needle chuck. The needle movement bends the crystal element thus generating voltage by the piezo-electric effect. The voltage developed is dependent upon the needle movement amplitude and the load resistance.

The crystal cartridge is a factory-sealed unit and no adjustments are provided. The cartridge is held in the tone arm by means of two screws. The pick-up and tone-arm assembly should require very little servicing and if treated with reasonable care should perform its function without attention for long periods of time.

Special Service Information

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

(1) Stage Gains
- (a) Antenna Post to Converter Grid
  - Band "B" ..... 6 to 9
  - Band "C" ..... 3 to 4
  - Band "D" ..... 1.5 to 3
- (b) Converter Grid to 6SK7 Grid ..... 45 at 455 K.C. ‡
- (c) 6SK7 Grid to 6H6 Det. Plate ..... 45 at 455 K.C. ‡

(2) A 400-cycle signal of .04 volts across the volume control will give ½ watt speaker output.‡ (Volume control turned to maximum.)

(3) Average d-c voltage developed across oscillator grid resistor (R-2)
- Band "B" ..... 6 to 8 volts
- Band "C" ..... 5 to 7 volts
- Band "D" ..... 2.5 to 5 volts

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

FOR RECORD CHANGER DATA SEE INDEX

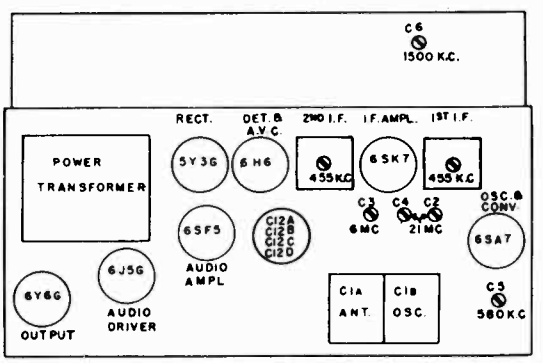


Fig. 2. Trimmer Location

MODELS H73,H77,H78
H79 (Final)
Alignment,Parts

GENERAL ELECTRIC CO.

ALIGNMENT PROCEDURE

I. F. ALIGNMENT WITH OSCILLOSCOPE

Band Switch Setting	Input Freq.	Point of Input	Dummy Antenna	Trimmer	Comments
1. Band "B"	455 K.C. Sweep	I.F. Grid	.05 Mfd. or Larger	2nd I.F. Sec. 2nd I.F. Pri. (T-7)	Gang condenser plates closed—"Manual" key depressed—connect audio input of oscilloscope to chassis and to junction of R-3 and R-15. Adjust trimmers in order mentioned for a single symmetrical curve of maximum amplitude. The resultant curve is shown in Fig. 1.
2. Band "B"	455 K.C. Sweep	Converter Grid	.05 Mfd. or Larger	1st I.F. Sec. 1st I.F. Pri. (T-6)	

I. F. ALIGNMENT WITH OUTPUT METER

1. Band "B"	455 K.C. Sweep	I.F. Grid	.05 Mfd. or Larger	2nd I.F. Sec. 2nd I.F. Pri. (T-7)	Gang condenser plates closed—connect output meter across voice coil—keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output.
2. Band "B"	455 K.C. Sweep	Converter Grid	.05 Mfd. or Larger	1st I.F. Sec. 1st I.F. Pri. (T-6)	

R. F. ALIGNMENT

1. Band "B"					Close gang plates—adjust pointer to first line at left end of tuning scale. Connect output meter across voice coil—tone control on "Bass" position.
2. Band "D"	21 M.C. with Modulation	Antenna Post	I.R.E.	Osc. (C-4) Ant. (C-2)	The image of any "D" band signal should be heard 910 K.C. below signal input when (C-4) is on proper peak. Example: 18 M.C. image 17.09 M.C. Peak (C-2) while rocking the gang condenser.
3. Band "C"	6 M.C. with Modulation	Antenna Post	I.R.E.	Ant. (C-3)	Peak for maximum output with a low input signal.
4. Band "B"	580 K.C. with Modulation	Antenna Post	I.R.E.	Osc. Padder (C-5)	Set dial pointer to 580 K.C. and tune in signal with (C-5) while rocking gang condenser.
5. Band "B"	1500 K.C. with Modulation	Antenna Post	I.R.E.	Osc. (C-6)	Peak trimmer for maximum output while rocking the gang condenser.
6. Band "B"	580 K.C. with Modulation	Antenna Post	I.R.E.	Osc. Padder (C-5)	Retrim for maximum output with a low input signal, rocking gang condenser.

Stock No.	Description	List Price
	PHONOGRAPH ASSEMBLY (H-78)	
	Tone Arm Assembly	
RA-414	ARM—Tone arm	1.20
RC-8152	CORD—Tone arm lamp cord	.40
RP-505	PICK-UP—Crystal cartridge	5.40
RP-800	PIVOT—Tone arm pivot	1.20
RS-272	SOCKET—Lamp socket assembly	.50
RS-876	SCREW—Needle clamping screw (Pkg. 10)	.10
RT-915	TONE ARM—Tone arm assembly (complete)	$6.70
RX-069	ASSEMBLY—Pilot light connector assembly)	.20
	Automatic Stop Assembly	
RA-411	ARM—Trip arm tension washer and screw assembly	.25
RS-469	SPRING—Automatic stop locking spring (Pkg. 3)	.25
RX-064	ASSEMBLY—Automatic stop assembly	1.85
	Motor Turntable Assembly	
RB-184	BRACKET—Turntable drive wheel bracket assembly	.15
RB-185	BRACKET—Lower motor bearing bracket assembly complete	.40
RF-502	FIELD—60-cycle field stator assembly complete	3.60
RF-503	FIELD—50-cycle field stator assembly complete	3.60
RF-504	FRAME—Upper motor frame assembly	.60
RM-127	MOTOR—60-cycle motor assembly complete less turntable	5.85
RM-128	MOTOR—50-cycle motor assembly complete less turntable	6.40
RN-101	NEEDLE CUP—Needle cup (Model H-78)	.10
RP-151	PLATE—Motor mounting plate assembly	.45
RP-152	PLUG—Phono motor power connector plug	.25
RP-311	PULLEY—60-cycle motor pulley and setscrew	.20
RP-312	PULLEY—50-cycle motor pulley and setscrew	.25
RR-406	ROTOR—Rotor complete	1.55
RS-467	SPRING—Turntable drive tension spring	.10
RS-875	SETSCREW—Motor pulley setscrew (Pkg. 12)	.25
RS-932	SPINDLE—Turntable spindle and cotter	.30
RT-913	TURNTABLE—10-inch turntable	1.20
RW-909	WHEEL—Rubber edged drive wheel	.50
RX-065	ASSEMBLY—Turntable drive wheel bracket mounting washer, screw and nut assembly (Pkg. 5)	.20
RX-066	ASSEMBLY—Lower bearing bracket screw and nut assembly (Pkg. 3)	.05
RX-067	ASSEMBLY—Motor mounting screw, washer and grommet assembly (Pkg. 3)	.25
RX-068	ASSEMBLY—Drive wheel oil retainer, cotter and thrust washer assembly (Pkg. 5)	.10

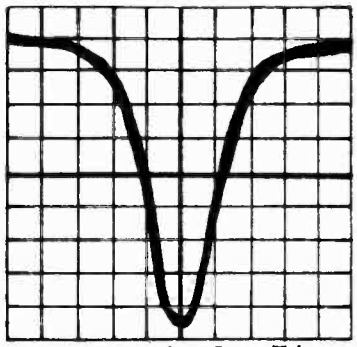


Fig. 1. Over-all I. F. Curve Taken on G-E Oscilloscope OFM-1

(Prices Subject to Change without Notice)

GENERAL ELECTRIC CO.

MODELS H73,H77,H78
H79 (Final)
Parts List
MODELS H622,H623
Dial Drive Data,Parts

REPLACEMENT PARTS LIST
MODELS H-73, H-77, H-78 AND H-79

Stock No.	Description	List Price
	CHASSIS ASSEMBLY	
*RB-008	BOARD—Terminal board (2 lug)	$0.10
*RB-009	BOARD—Terminal board (1 lug—end mounted)	.10
*RB-026	BOARD—Antenna terminal board	.10
*RB-046	BOARD—Terminal board (5 lug)	.15
*RB-096	BOARD—Terminal board (3 lug)	.10
*RB-621	BEZEL—Pilot lamp bezel (Model H-79)	.20
RB-910	BACK COVER—Cabinet back cover (Model H-73)	.30
RB-929	BACK COVER—Cabinet back cover (Model H-77)	.45
RB-1009	BOARD—Phono terminal board	.10
RB-1010	BOARD—Beam-a-Scope terminal board (Model H-77)	.10
*RC-009	CAPACITOR—.001 mfd. 600 V. paper (C-35)	.30
RC-016	CAPACITOR—.002 mfd. 600 V. paper (C-28)	.25
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-26, 30)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-29, 32, 33)	.25
*RC-048	CAPACITOR—.02 mfd. 600 V paper (C-31)	.30
RC-057	CAPACITOR—.0072 mfd. 600 V. paper (C-25)	.25
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-22, 23, 24, 34)	.30
*RC-096	CAPACITOR—0.1 mfd. 200 V. paper (C-27)	.30
*RC-206	CAPACITOR—50 mmf. mica (C-21)	.35
RC-233	CAPACITOR—22 mmf. mica (C-19)	.25
*RC-235	CAPACITOR—100 mmf. mica (C-15, 16)	.25
RC-301	CAPACITOR—680 mmf. mica (C-17)	.25
RC-307	CAPACITOR—750 mmf. silvered mica (C-8)	.35
RC-358	CAPACITOR—2000 mmf. mica (C-13)	.30
RC-394	CAPACITOR—4700 mmf. mica (C-20)	.40
RC-390	CAPACITOR—5600 mmf. mica (C-14)	.45
RC-875	CORD—Power cord	.40
RC-1987	CLAMP—Clamp for osc. or ant. coil (Pkg. 2)	.05
RC-1989	CUSHION—Tuning condenser cushion (Pkg. 5)	.05
RC-5148	CAPACITOR—40 mfd., 250 V., 20 mfd., 250 V.; 20 mfd., 250 V.; 20 mfd., 25 V.; dry electrolytic (C-12a, 12b, 12c, 12d)	1.75
RC-6509	CAPACITOR—"B" band padder capacitor (C-5)	.35
RC-6510	CAPACITOR—"B" band osc. trimmer (C-6)	.20
RC-6526	CAPACITOR—7-65 mmf. trimmer (C-7F)	.35
RC-6527	CAPACITOR—20-180 mmf. trimmer (C-7D, 7E)	.35
RC-6528	CAPACITOR—100-490 mmf. trimmer (C-7A, 7B, 7C)	.35
RC-7011	CONDENSER—Tuning condenser (C-1a, 1b)	2.15
RC-8500	CARDS—Station letter cards (set)	.20
RC-8505	CARDS—"Manual" tabs (Pkg. 10)	.05
RC-8506	CARDS—"Phono-Tele" tabs (Pkg. 10)	.05
RC-8507	CARDS—"Off" tabs (Pkg. 10)	.05
RD-108	DIAL—Dial scale	.70
RE-056	ESCUTCHEON—Dial scale escutcheon	1.25
RE-057	ESCUTCHEON—Touch Tuning key escutcheon	1.15
RE-208	ESCUTCHEON ASSEMBLY—Dial scale escutcheon complete	2.25
RF-017	FOOT—Chassis mounting foot (Pkg. 5)	.10
RK-044	KNOB—Tone control and band-change knob (Pkg. 2)	$0.40
RK-204	KEY—Touch Tuning key	.10
RL-083	COIL—Antenna coil "C," "D" bands (T-1)	.85
RL-287	COIL—Oscillator coil "B," "C," "D" bands (T-5)	1.15
RL-345	CHOKE—1½ mhy, antenna choke (L-4)	.30
RL-504	BEAM-A-SCOPE—Beam-a-Scope assembly (Model H-73)	1.80
RL-505	BEAM-A-SCOPE—Beam-a-Scope assembly (Model H-77)	5.85
RL-515	BEAM-A-SCOPE—Beam-a-Scope assembly (Model H-78, 79)	6.60
RL-9510	COIL—Touch Tuning trimmer coil assembly (L-5)	1.80
RL-9513	COIL—Touch Tuning trimmer coil (Range: 1200-1500 K.C.) (Code—None) (L-5F)	.15
RL-9514	COIL—Touch Tuning trimmer coil (Range: 850-1400 K.C.) (Code—Red) (L-5D, 5E)	.15
RL-9515	COIL—Touch Tuning trimmer coil (Range: 540-900 K.C.) (Code—Blue) (L-5A, 5B, 5C)	.15
RP-133	PLUG—Loop terminal plug (Models H-77, 78, 79)	.05
*RQ-642	RESISTOR—220 ohm, 2 W. carbon (R-13)	.20
RQ-670	RESISTOR—3300 ohm, 2 W. carbon (R-14) (Pkg. 5)	.70
*RQ-1231	RESISTOR—68 ohm, ½ W. carbon (R-19) (Pkg. 5)	.70
*RQ-1239	RESISTOR—150 ohm, ½ W. carbon (R-18) (Pkg. 5)	.70
*RQ-1251	RESISTOR—470 ohm, ½ W. carbon (R-16) (Pkg. 5)	.70
*RQ-1271	RESISTOR—3300 ohm, ½ W. carbon (R-10) (Pkg. 5)	.70
*RQ-1273	RESISTOR—3900 ohms, ½ W. carbon (R-9) (Pkg. 5)	.70
*RQ-1291	RESISTOR—22,000 ohms, ½ W. carbon (R-2) (Pkg. 5)	.70
*RQ-1299	RESISTOR—7,000 ohms, ½ W. carbon (R-15, 17) (Pkg. 5)	.70
*RQ-1301	RESISTOR—56,000 ohms, ½ W. carbon (R-5) (Pkg. 5)	.70
*RQ-1307	RESISTOR—100,000 ohms, ½ W. carbon (R-11, 20) (Pkg. 5)	.70
*RQ-1315	RESISTOR—220,000 ohms, ½ W. carbon (R-7) (Pkg. 5)	.70
*RQ-1319	RESISTOR—330,000 ohms, ½ W. carbon (R-12) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms, ½ W. carbon (R-4) (Pkg. 5)	.70
*RQ-1331	RESISTOR—1.0 megohm, ½ W. carbon (R-8, 21) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohm, ½ W. carbon (R-3) (Pkg. 5)	.70
*RQ-1365	RESISTOR—15 megohm, ¼ W. carbon (R-6) (Pkg. 5)	.70
*RS-236	SOCKET—Pilot lamp socket	.10
RS-252	SOCKET—Octal tube socket	.15
RS-253	SOCKET—Electrolytic mounting socket	.10
RS-270	SOCKET—Phono motor connector socket	.25
RS-423	SPRING—Knob spring (Pkg. 10)	.25
RS-464	SPRING—Tuning and volume wheel spring (Pkg. 10)	.05
RS-1805	SHIELD — Beam-a-Scope electrostatic shield (Models H-78, 79)	1.10
RS-1808	SHIELD — Beam-a-Scope electrostatic shield (Model H-77)	1.10
RS-3022	SWITCH—Touch Tuning switch assembly (S-3)	7.60
RS-3023	SWITCH—Tone control switch (S-2)	.50
RS-3024	SWITCH—Band-change switch (S-1)	$1.00
RS-3055	SWITCH—Power switch on key assembly (S-3a)	.40
RT-0520	TRANSFORMER—60 cycle power transformer (T-3)	4.35
RT-0521	TRANSFORMER—25 cycle power transformer (T-4)	7.90
RT-313	TRANSFORMER—1st I.F. transformer (T-6)	1.70
RT-314	TRANSFORMER—2nd I.F. transformer (T-7)	1.90
RT-462	TRANSFORMER—Output transformer (T-2)	1.40
RT-862	TRIMMER STRIP—Ant. Touch Tuning trimmer strip (C-7)	1.20
RT-863	TRIMMER STRIP—"C," "D" band ant., "D" band osc. trimmers (C-2, 3, 4)	.45
*RT-952	TERMINAL—Beam-a-Scope pin terminal (Pkg. 10)	.05
RT-954	TERMINAL—Speaker lead terminal (Pkg. 10)	.10
RV-067	VOLUME CONTROL—2 megohm volume control (150,000 ohm tap) (R-1)	.65
*RW-101	WASHERS—Felt washers for knobs (Pkg. 10)	.05
RW-908	WHEEL—Tuning or volume control wheel	.30
	SPEAKER ASSEMBLY	
RC-9009	CONE ASSEMBLY—Cone assembly (Models H-77, 78, 79)	.95
RC-9010	CONE ASSEMBLY—Cone assembly Model H-73)	.90
RP-128	PLUG—Speaker plug (Model H-73)	.10
RP-129	PLUG—Speaker plug (Model H-77)	.10
RS-1011	SPEAKER—12 inch P.M. speaker (Models H-77, 78, 79)	4.80
RS-1012	SPEAKER—6½ inch P.M. speaker (Model H-73)	3.25
	POINTER DRIVE ASSEMBLY	
RB-177	BRACKET—Pulley assembly mounting bracket (L.H.) (Models H-78, 79)	.15
RB-178	BRACKET—Pulley bracket assembly	.60
RB-195	BRACKET—Pulley assembly mounting bracket (L.H.) (Models H-73, 77)	.20
RB-196	BRACKET—Pulley assembly mounting bracket (R.H.) (Models H-73, 77)	.30
RB-197	BRACKET—Pulley assembly mounting bracket (R.H.) (Models H-78, 79)	.30
RB-625	BUSHING—Tuning control shaft bushing	.10
RC-8125	CORD—Tuning drive cord assembly	.20
RD-407	DRUM—Condenser tuning drum assembly	.40
RH-006	HAIRPIN COTTER—Tuning drive shaft hairpin cotter (Pkg. 10)	.10
RM-501	MASK—Reflector mask (Pkg. 10)	.05
RP-12"	POINTER—Dial scale pointer (Pkg. 5)	.25
*RP-303	PULLEY—Tuning drive pulley and pins (Pkg. 2)	.10
RS-463	SPRING—Tuning drive cord spring (Pkg. 5)	.10
RS-924	SHAFT—Tuning control shaft	.10

*Used on previous receivers.

(Prices Subject to Change Without Notice)

MODELS H-622 AND H-623

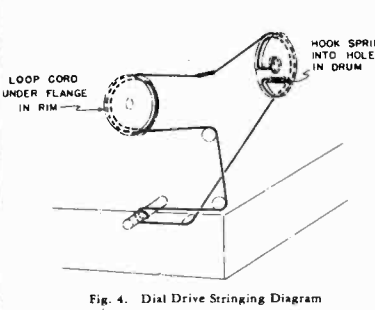


Fig. 4. Dial Drive Stringing Diagram

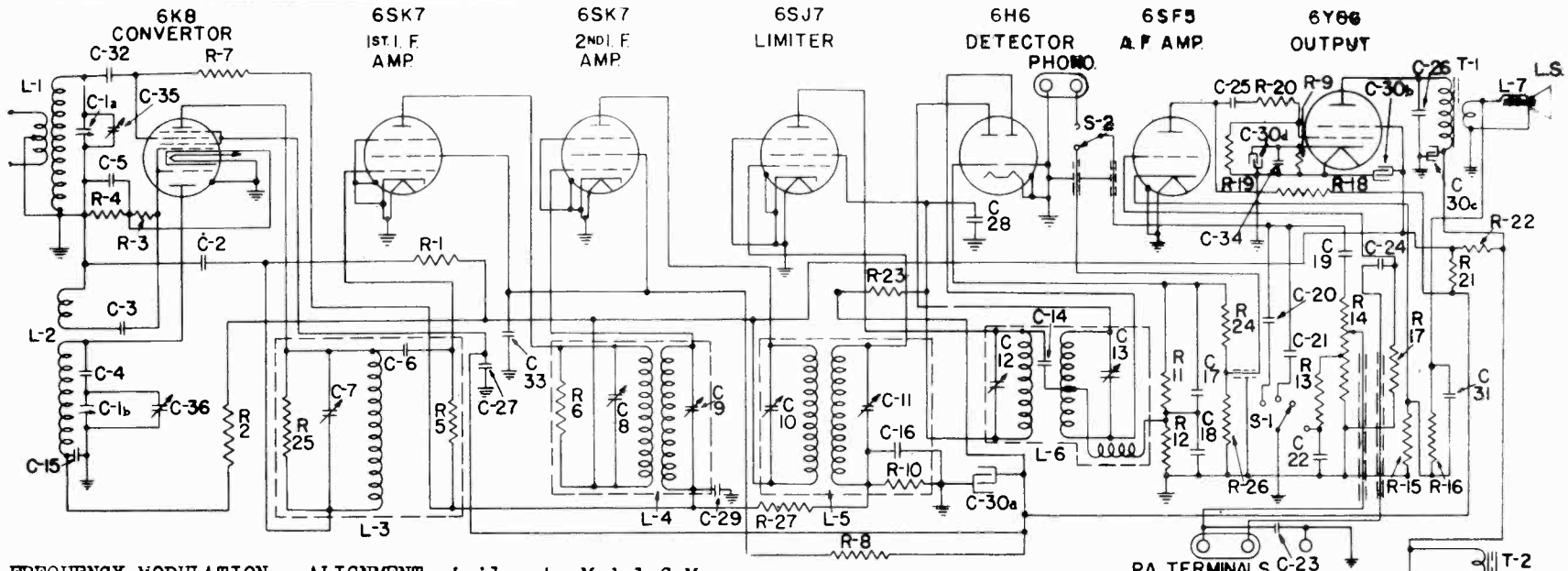
REPLACEMENT PARTS LIST
Models H-622 and H-623

Stock No.	Description	List Price
	CHASSIS ASSEMBLY	
RA-315	CONDENSER ASSEMBLY—Tuning condenser and drive unit complete	$5.75
*RB-023	BOARD—Terminal board (4 lugs)	.10
RB-041	BOARD—Terminal board (2 lugs)	.10
RB-182	BRACKET—Beam-a-Scope bracket	.10
RB-936	BACK COVER—Cardboard cabinet back	.15
RB-1018	BOARD—Antenna terminal board	.10
*RC-011	CAPACITOR—.002 mfd. 600 V. paper (C-14)	.25
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-18, 19)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-10, 20, 25)	.25
*RC-048	CAPACITOR—.02 mfd. 600 V. paper (C-16)	.30
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-7, 24)	.30
*RC-123	CAPACITOR—0.1 mfd. 400 V. paper (C-8, 28)	.35
*RC-246	CAPACITOR—47 mmf. mica (C-26)	.25
*RC-250	CAPACITOR—220 mmf. mica (C-17)	.25
*RC-293	CAPACITOR—470 mmf. mica (C-13)	.30
*RC-390	CAPACITOR—3900 mmf. mica (C-4)	.35
*RC-645	CAPACITOR—Beam-a-Scope and "B" band osc. trimmers (C-9, 21)	.15
RC-749	CONDENSER—Tuning condenser (C-1, 2)	4.15
*RC-863	CORD—Power cord	.65
RC-1995	CLAMP—Oscillator coil clamp (Pkg. 5)	.10
RC-5136	CAPACITOR—50 mfd. 150 V.; 30 mfd. 150 V. dry electrolytic (C-22a, 22b)	1.15
RC-6516	CAPACITOR—"B" band padder (C-3)	.30
RC-6517	CAPACITOR—"D" band ant. and osc. trimmers (C-5, 6)	.30
RC-8130	CABLE—Tuning drive cable assembly	.15
RC-8500	CARD—Station letter card (1 set) (Used on keys of both models)	.20
RC-8517	CARD—Station tab card (1 set) (Model H-623) (Used on escutcheon)	.60
RC-9010	CONE ASSEMBLY—6.5 inch speaker cone assembly	.90
RD-116	DIAL—Dial scale	1.00
RG-302	GROMMET—Tuning shaft drive cord grommet (Pkg. 10)	.10
RK-055	KNOB—Light oak control knob (Pkg. 5)	.50
RK-209	KEY—Light oak station selector key	.15
RK-217	KEY—Green station selector key (Model H-623)	.15
RL-098	COIL—"D" band antenna coil (Code—Orange) (L-2)	.65
RL-296	COIL—Oscillator coil (L-3)	.70
RL-346	CHOKE—Antenna choke (L-8)	.30
RL-522	BEAM-A-SCOPE—Beam-a-Scope antenna (L-1)	.85
RL-937	LUG—Key pin binding lug (Pkg. 10)	.10
RM-503	MASK—Dial scale mask (Pkg. 10)	.10
RN-200	NAMEPLATE—Dial scale metal nameplate (Model H-622)	.20
RN-201	NAMEPLATE—Dial scale metal nameplate (Model H-623)	.25
RP-134	PIN—Station selector key pin (Pkg. 10)	.05
RP-144	POINTER—Dial scale pointer (Pkg. 5)	$0.25
RP-307	PULLEY—Condenser drive cord pulley (Pkg. 5)	.25
RP-308	PULLEY—½ inch drive cord idler pulley (Pkg. 5)	.10
RP-309	PULLEY—¾ inch drive cord idler pulley (Pkg. 5)	.10
*RQ-1235	RESISTOR—100 ohms, ½ W. carbon (R-16) (Pkg. 5)	.70
*RQ-1239	RESISTOR—150 ohms, ½ W. carbon (R-12) (Pkg. 5)	.70
*RQ-1259	RESISTOR—1000 ohms, ½ W. carbon (R-13) (Pkg. 5)	.70
*RQ-1271	RESISTOR—3300 ohms, ½ W. carbon (R-9) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms, ½ W. carbon (R-1) (Pkg. 5)	.70
*RQ-1297	RESISTOR—39,000 ohms ½ W. carbon (R-10) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms, ½ W. carbon (R-5, 7, 11, 15) (Pkg. 5)	.70
*RQ-1331	RESISTOR—1.0 megohm, ½ W. carbon (R-8) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohms, ½ W. carbon (R-2) (Pkg. 5)	.70
*RQ-1365	RESISTOR—15 megohms, ¼ W. carbon (R-6) (Pkg. 5)	.70
RR-772	RESISTOR—BL42D ballast resistor (R-14)	.45
RR-941	REPLECTOR—Dial scale reflector	.30
*RS-200	SOCKET—Octal tube socket (Pkg. 5)	.75
RS-256	SOCKET—Electrolytic mounting socket (Pkg. 5)	.25
RS-261	SOCKET—Pilot lamp socket	.20
*RS-426	SPRING—Condenser drive cord spring (Pkg. 5)	.10
RS-510	SPACER—Station key spacer (Pkg. 10)	.10
RS-511	SLEEVE—Condenser bracket spacer sleeve (Pkg. 10)	.15
RS-929	SHAFT—Tuning shaft	.10
RS-1012	SPEAKER—6.5 inch P.M. speaker	3.25
RS-3036	SWITCH—Band change switch	.60
RT-328	TRANSFORMER—1st I.F. transformer (L-5)	1.00
RT-329	TRANSFORMER—2nd I.F. transformer (L-6)	1.20
RT-469	TRANSFORMER—Output transformer (T-1)	1.25
RT-954	TERMINAL—Speaker lead terminal (Pkg. 10)	.10
RV-072	VOLUME CONTROL—2.0 megohms volume control (R-4)	.80
RW-039	WINDOW—Celluloid station letter window (Pkg. 25)	.10
*RW-101	WASHER—Control shaft felt washer (Pkg. 10)	.05
*RX-035	ASSEMBLY—Condenser mounting foot assembly	.15
RX-061	ASSEMBLY—Chassis mounting assembly	.10
RX-062	ASSEMBLY—Speaker mounting assembly	.10

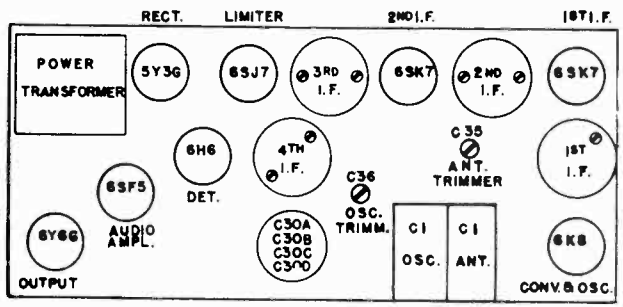
*Used on previous receivers

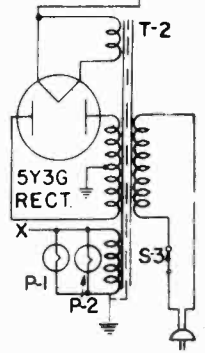
(Prices subject to change without notice)

GENERAL ELECTRIC CO.



FREQUENCY MODULATION - ALIGNMENT similar to Model G.M. 125 as explained on page 54 of the "How It Works" Section of Volume X. IF PEAK 2.1 MC.





Symbol	Description	Symbol	Description
C-1	- 20 mmf.	C-26	- .005 mfd.
C-2	- .02 mfd.	C-27	- .005 mfd.
C-3	- 47 mmf.	C-28	- .05 mfd.
C-4	- 1200 mmf.	C-29	- .05 mfd.
C-5	- .05 mfd.	C-30a	- 20 mfd.
C-6	- 500 mmf.	C-30b	- 20 mfd.
C-14	- 47 mmf.	C-30c	- 40 mfd.
C-15	- 470 mmf.	C-30d	- 20 mfd.
C-16	- 22 mmf.	C-31	- 0.1 mfd.
C-17	- 100 mmf.	C-32	- 470 mmf.
C-18	- 100 mmf.	C-33	- 0.1 mfd.
C-19	- .005 mfd.	C-34	- .05 mfd.
C-20	- .002 mfd.	C-35	- 2-15 mmf.
C-21	- 470 mmf.	C-36	- 7-23 mmf.
C-22	- .002 mfd.	R-1	- 2200 ohms
C-23	- 220 mmf.	R-2	- 6000 ohms
C-24	- .005 mfd.	R-3	- 47000 ohms
C-25	- .05 mfd.	R-4	- 330 ohms

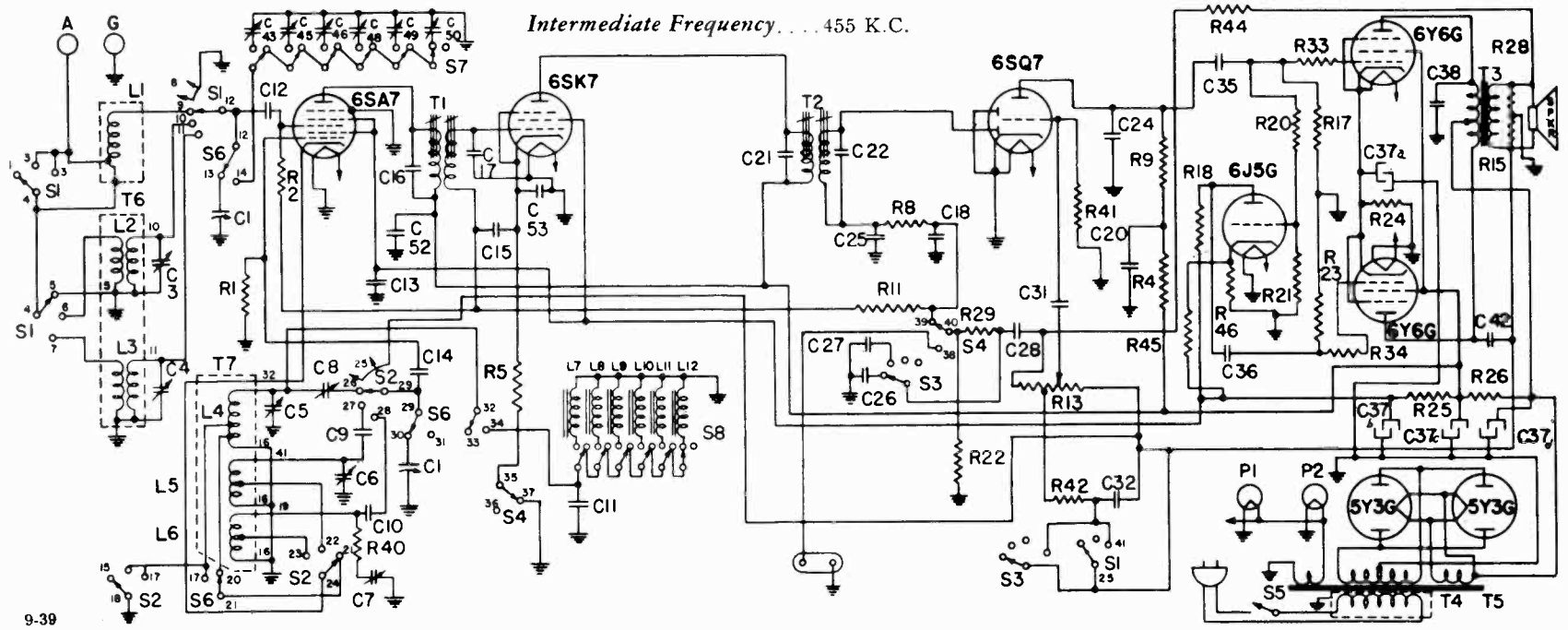
Symbol	Description	Symbol	Description	Symbol	Description
R-5	- 470 000 ohms	R-15	- 82 ohms	R-25	- 33 000 ohms
R-6	- 47 000 ohms	R-16	- 220 ohms	R-26	- 220 000 ohms
R-7	- 470 000 ohms	R-17	- 15 megohms	R-27	- 2.2 megohms
R-8	- 4 700 ohms	R-18	- 220 000 ohms		
R-9	- 220 ohms	R-19	- 470 000 ohms		
R-10	- 330 000 ohms	R-20	- 1500 ohms		
R-11	- 100 000 ohms	R-21	- 2200 ohms		
R-12	- 100 000 ohms	R-22	- 1600 ohms		
R-13	- 120 000 ohms	R-23	- 2200 ohms		
R-14	- 2 megohm v. c.	R-24	- 100 000 ohms		

IF PEAK 2.1 MC

GENERAL ELECTRIC CO.

MODEL H87

Schematic, Socket Trimmers



Symbol	Description
C-1	Tuning Capacitor
C-3	"C" Band Antenna Trimmer
C-4	"D" Band Antenna Trimmer
C-5	"B" Band Oscillator Trimmer
C-6	"C" Band Oscillator Trimmer
C-7	"D" Band Oscillator Trimmer
C-8	"B" Band Padder
C-9	1600 mmf., Mica Capacitor ±5%
C-10	4300 mmf., Mica Capacitor ±5%
C-11	750 mmf., Silvered Mica Capacitor ±5%
C-12	150 mmf., Mica Capacitor
C-13	0.1 mfd., Paper Capacitor
C-14	47 mmf., Mica Capacitor
C-15	0.1 mfd., Paper Capacitor
C-18	47 mmf., Mica Capacitor
C-20	.25 mfd., Paper Capacitor
C-24	100 mmf., Mica Capacitor
C-25	47 mmf., Mica Capacitor
C-26	.0015 mfd., Paper Capacitor
C-27	470 mmf., Mica Capacitor
C-28	.01 mfd., Paper Capacitor
C-31	.01 mfd., Paper Capacitor
C-32	.003 mfd., Paper Capacitor
C-35	.05 mfd., Paper Capacitor
C-36	.05 mfd., Paper Capacitor
C-37a	20 mfd., 25 V. Dry Electrolytic
C-37b	20 mfd., 250 V. Dry Electrolytic
C-37c	20 mfd., 250 V. Dry Electrolytic
C-37d	40 mfd., 250 V. Dry Electrolytic
C-38	.02 mfd., Paper Capacitor

Symbol	Description
C-42	.01 mfd., Paper Capacitor
C-43	7-65 mmf., Antenna Trimmer
C-45	20-180 mmf., Antenna Trimmer
C-46	20-180 mmf., Antenna Trimmer
C-48	100-490 mmf., Antenna Trimmer
C-49	100-490 mmf., Antenna Trimmer
C-50	100-490 mmf., Antenna Trimmer
C-52	.25 mfd., Paper Capacitor
C-53	.08 mfd., Paper Capacitor
L-1	Beam-a-Scope
L-2	"C" Band Antenna Coil
L-3	"D" Band Antenna Coil
L-4	"B" Band Oscillator Coil
L-5	"C" Band Oscillator Coil
L-6	"D" Band Oscillator Coil
L-7	Tuning Coil (Code—None)
L-8, 9	Tuning Coil (Code—Red)
L-10, 11, 12	Tuning Coil (Code—Blue)
R-1	22,000 ohms, Carbon Resistor
R-2	1.0 megohm, Carbon Resistor
R-4	47,000 ohms, Carbon Resistor
R-5	330 ohms, Carbon Resistor
R-8	47,000 ohms, Carbon Resistor
R-9	220,00 ohms, Carbon Resistor
R-11	2.2 megohms, Carbon Resistor
R-13	2 megohms, Volume Control
R-15	15 ohms, Carbon Resistor
R-17	330,000 ohms, Carbon Resistor
R-18	68,000 ohms, Carbon Resistor

Symbol	Description
R-20	3.3 megohms, Carbon Resistor
R-21	270,000 ohms, Carbon Resistor
R-22	220,000 ohms, Carbon Resistor
R-23	150,000 ohms, Carbon Resistor
R-24	100 ohms, 3.4-W, Wire Wound
R-25	2400 ohms, 2-W, Carbon Resistor
R-26	2200 ohms, 2.6-W Wire Wound
R-28	68 ohms, Carbon Resistor
R-29	47,000 ohms, Carbon Resistor
R-33	1000 ohms, Carbon Resistor
R-34	1000 ohms, Carbon Resistor
R-40	33 ohms, Carbon Resistor
R-41	4.7 megohms, Carbon Resistor
R-42	100,000 ohms, Carbon Resistor
R-44	4.7 megohms, Carbon Resistor
R-45	15,000 ohms, 1-W, Carbon Resistor
R-46	270 ohms, Carbon Resistor
P-1	Pilot Light, MAZDA No. 44
P-2	Pilot Light, MAZDA No. 44
S-1	Antenna Band Switch
S-2	Oscillator Band Switch
S-3	Tone Switch
S-4	Phono. Switch
S-5	Power Switch
S-6	Manual Switch
S-7	Antenna Section, Touch Tuning Switch
S-8	Oscillator Section, Touch Tuning Switch

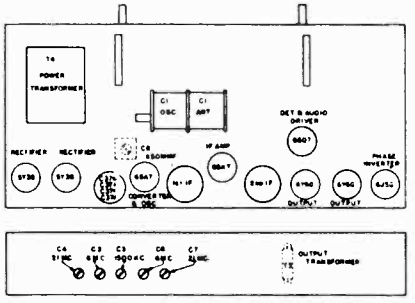


Fig. 1. Trimmer Location

Tubes

Converter and Osc.	GE-6SA7
I.F. Amplifier	GE-6SK7
Det., Aud., AVC	GE-6SQ7
Phase Inverter	GE-6J5G
Power Output	(2) GE-6Y6G
Rectifier	(2) GE-5Y3G

MODEL H87
Chassis Wiring

GENERAL ELECTRIC CO.

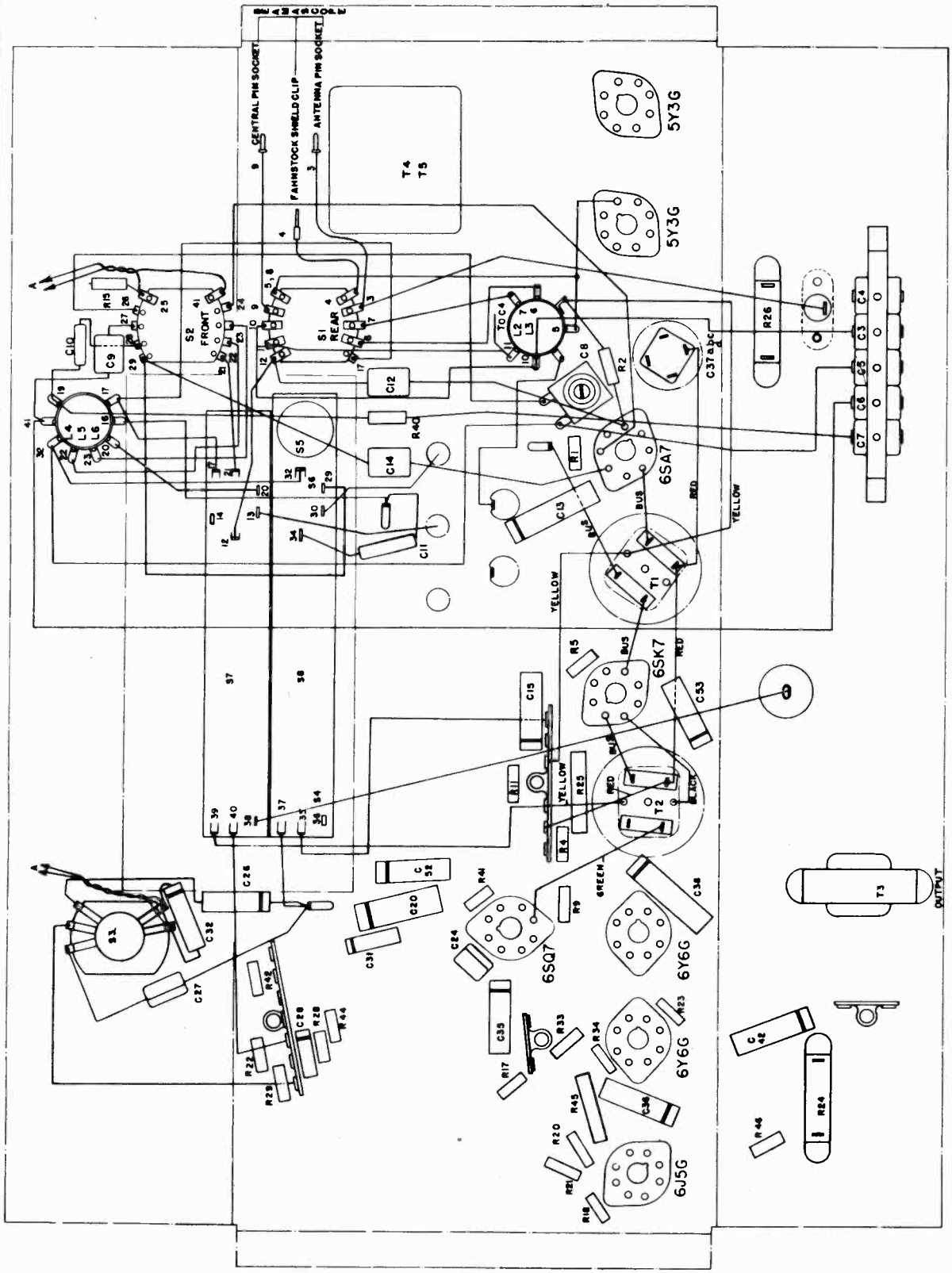
Tuning Frequency Range

Band "B".....540–1600 K.C.
Band "C".....2300–7000 K.C.
Band "D".....7000–22,000 K.C.

Manual Tuning Drive Ratio.....7:1

Electrical Specifications

Rating "A"—110–125 volts, 50–60 cycles, 125 watts
Rating "C"—110–125 volts, 25–60 cycles, 125 watts



Loud-speaker—"Alnico" Magnetic Dynamic

Outside Cone Diameter.....12-inch
Voice Coil Impedance.....3.5 ohms

Tone Control.....4-position

Electrical Power Output

Undistorted.....8.5 watts
Maximum.....10 watts

GENERAL INFORMATION

MODEL H87

The Model H-87 is a three-band a-c operated receiver employing eight General Electric Pre-tested Tubes in a superheterodyne circuit. This receiver is equipped with nine Feathertouch Tuning Keys, six of which, may be set up for favorite stations. The three remaining keys allow power control, manual tuning and phonograph or television audio reception. The new *Super* Beam-a-scope, which is a highly efficient self-contained antenna circuit, is standard equipment on this model. Other features of design include: "Alnico" dynapower speaker, floodlighted station key finder, visualux dial, iron core I.F. transformers, automatic tone compensation, automatic volume control and push-pull output.

SUPER BEAM-A-SCOPE

MODELS H-87; HJ1005

The *Super* Beam-a-scope is essentially a tuned coil antenna wound on a frame and shielded by a Faraday screen against electrostatic disturbances. This construction favors the desired signal over a local man-made noise source in three ways. First, since any noise source is composed of two components—electrostatic and electromagnetic fields—the *Super* Beam-a-scope may be revolved so that a null point is found where no voltage is produced from these two components. Due to the fact that this null point is very sharp, it is very unusual that any desired station will be in a direct line with the rejected noise signal and thereby have its signal strength reduced appreciably. In the second place the *Super* Beam-a-scope eliminates the external return path to ground present in the case of an unshielded antenna. This reduces or eliminates local man-made noise sources in much the same way as a shielded antenna lead-in does in an ordinary antenna installation. In the third place the *Super* Beam-a-scope discriminates against the electrostatic component of an incoming wave in comparison with the electromagnetic component because of the Faraday shield. Since the electrostatic component of a local noise source is a great deal larger than the electromagnetic component, this rejection property brings about an enormous increase in signal-to-noise ratio.

The above operation is only available on the broadcast band and in this position the *Super* Beam-a-scope is also the first tuned grid circuit. On the "C" and "D" bands, the *Super* Beam-a-scope is grounded at the grid end thus preventing absorption spots due to loop resonance.

Loud-speaker MODELS H87; HJ1005

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 before replacing it.

Coil System MODELS H87; HJ1005

The "C" and "D" band antenna coils are wound on a single coil form T-6 as shown (Schematic) T-7 is the oscillator transformer for the "B," "C" and "D" bands. All switch points are numbered to facilitate in locating these switch points on the pictorial wiring diagram.

The following table gives the coils in use for the various positions of the band switch.

Band-switch Position	Antenna Primary	Antenna Secondary	Oscillator Primary	Oscillator Secondary
Band "B"	Lower portion of L-1	Upper portion of L-1	Lower portion of L-4	Upper portion of L-4
Band "C"	L-2 Primary (L-1 Primary shorted)	L-2 Secondary (Grid end of L-1 to ground)	Lower portion of L-5	Upper portion of L-5 (High side of L-4 to gnd. thru R-15. Mid tap of L-4 to gnd.)
Band "D"	L-3 Primary (L-1 Primary shorted)	L-3 Secondary (Grid end of L-1 to ground. L-2 secondary grounded)	Lower portion of L-6	Upper portion of L-6 (High side of L-4 and L-5 to gnd. thru R-15. Mid tap of L-4 to gnd.)

Alignment Procedure MODELS H87; HJ1005

The alignment procedure is given in table form on the opposite page. Use the designated "dummy" antenna in making each individual alignment. I.F. alignment may be performed with the chassis removed from the cabinet and the Beam-a-Scope disconnected. R.F. alignment on "C" and "D" bands should be performed with the Beam-a-Scope disconnected and a 70 mmf. mica capacitor between the signal generator and the point of input. R.F. alignment on "B" band should be performed with the chassis and Beam-a-Scope mounted in the cabinet and properly connected.

ALIGNMENT PROCEDURE

MODEL H-87 — I.F. Alignment with Oscilloscope* — MODEL HJ-1005

Band-switch Setting	Input Frequency	Tone Control Position	Point of Input*	Trimmer	Comments
1. Band B	455 K.C. and 30 K.C. sweep	Bass	I.F. 6SK7 Grid	2nd I.F. Sec. 2nd I.F. Pri.	Condenser gang at minimum capacity—Manual key depressed—vertical input to ground and junction of R-29, R-11, and R-22. Adjust trimmers in order mentioned for a single curve of maximum amplitude.
2. Band B	455 K.C. and 30 K.C. sweep	Bass	Converter 6SA7 Grid	1st I.F. Sec. 1st I.F. Pri.	
3. Band B	455 K.C. and 30 K.C. sweep	Bass	Converter 6SA7 Grid	All I.F. Trimmers	

I.F. Alignment with Output Meter*

Band-switch Setting	Input Frequency	Tone Control Position	Point of Input*	Trimmer	Comments
1. Band B	455 K.C. modulated	Bass	I.F. 6SK7 Grid	2nd I.F. Sec. 2nd I.F. Pri.	Condenser gang at minimum capacity—manual key depressed—output meter connected across voice coil—volume control at maximum—input as low as practical. Adjust all trimmers in order listed for maximum output.
2. Band B	455 K.C. modulated	Bass	Converter 6SA7 Grid	1st I.F. Sec. 1st I.F. Pri.	
3. Band B	455 K.C. modulated	Bass	Converter 6SA7 Grid	All I.F. Trimmers	

R.F. Alignment

Band-switch Setting	Input Frequency	Tone Control Position	Point of Input	Trimmer	Comments
1. Band B					Mechanically adjust dial pointer to first line at left-hand end of dial scale with condenser gang fully meshed. Connect output meter across voice coil.
2. Band C	6 MC modulated	Bass	Antenna Post**	Osc. (C-6) Ant. (C-3)	Set pointer to 6 M.C. mark and align (C-6). Peak (C-3) for maximum output.
3. Band D	21 M.C. modulated	Bass	Antenna Post**	Osc. (C-7) Ant. (C-4)	Set pointer to 21 M.C. mark and align (C-7). Peak C-4 while rocking gang condenser. The image of any signal on the D band should be 910 K.C. below input signal. Example: 15 M.C. image 14.09 M.C.
4. Band B	580 K.C. modulated	Bass	Antenna Post***	Osc. Padder (C-8)	Set dial pointer to 580 K.C. mark and tune in signal with (C-8).
5. Band B	1500 K.C. modulated	Bass	Antenna Post***	Osc. (C-5)	Adjust C-5 for maximum output in vicinity of 1500 K.C. while rocking gang condenser.
6. Band B	580 K.C. modulated	Bass	Antenna Post***	Osc. Padder (C-8)	Retrim (C-8).
7. Band B	1500 K.C. modulated	Bass	Antenna Post***	Osc. (C-5)	Repeak (C-5).

* Use "dummy" antenna consisting of .05 mfd. capacitor between signal generator and point of input.
** Use a "dummy" antenna consisting of 70 mmf. capacitor between signal generator and point of input with Beam-a-Scope disconnected.
*** Use an I.R.E. "dummy" antenna as shown in Fig. 2 between the signal generator and the point of input.

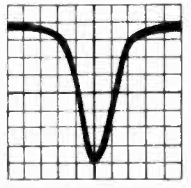


Fig. 3. I.F. Curve taken on G-E Oscilloscope OFM-1

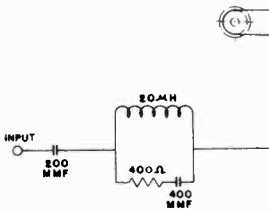
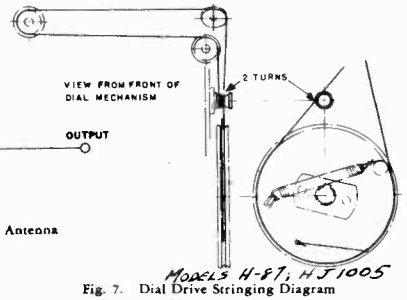
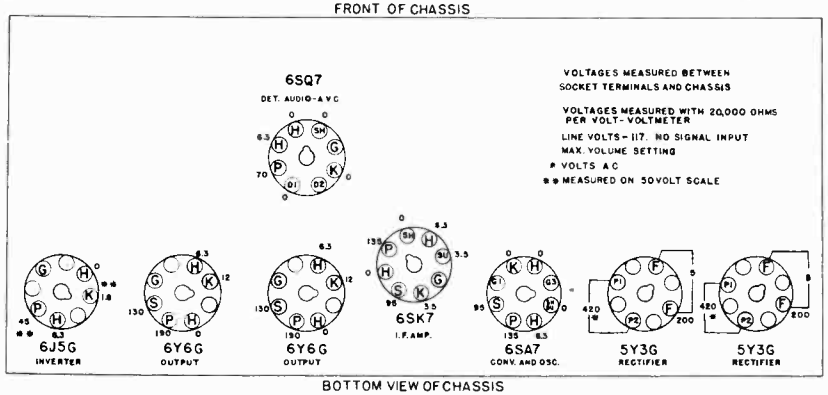


Fig. 2. I.R.E. Dummy Antenna



MODELS H-87; HJ1005

Fig. 7. Dial Drive Stringing Diagram



D1—Diode Plate No. 1
D2—Diode Plate No. 2
F —Filament
G —Control Grid
G1—Oscillator Grid
G2—Converter Grid
H —Heater
K—Cathode
P—Plate
P1, P2—Rectifier Plates
S—Screen
SH—Shell
SU—Suppressor

MODEL H-87 (ONLY)

Fig. 6. Socket Voltages

SPECIAL SERVICE INFORMATION

MODELS H-87; HJ1005

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

(1) Stage Gains‡

(a) Antenna Post to Converter Grid
Band "B" (Beam-a-Scope connected)*—3 at 1000 K.C.
Band "C" (Beam-a-Scope disconnected)**—3 at 4 M.C.
Band "D" (Beam-a-Scope disconnected)**—3 at 18 M.C.

(b) Converter Grid to 6SK7 Grid.....65 at 455 K.C.

(c) 6SK7 Grid to 6SQ7 Det. Plate.....100 at 455 K.C.

(2) A 400-cycle signal of .05 volts across volume control will give ½-watt speaker output.‡ (Volume Control turned to maximum.)

(3) Average DC voltage developed across oscillator grid resistor (R1) with gang closed.

Band "B".....6.5 volts
Band "C".....7 volts
Band "D".....2.8 volts

*Use I.R.E. "dummy" antenna.
**Use 70 mmf. capacitor between signal generator and antenna post with Beam-a-Scope disconnected.
‡Variations of + 10%, −20% permissible.

REPLACEMENT PARTS LIST MODELS H-500U, H-510U AND H-520U (W and X Models Included)

(For Models Using 12SA7GT Tube and 500,000 Ohm Volume Control)

Symbol	Description	List Price
*RB-008	BOARD—Terminal board (2 lug)	$0.10
*RB-013	BOARD—Terminal board (2 lug for Models H-500U, 510U)	.10
RB-179	BRACKET—Beam-a-Scope bracket	.10
RB-193	BRACKET—Dial lamp bracket	.05
RB-915	BACK COVER—Plastic cabinet back for Model H-520U	1.00
RB-916	BACK COVER—Plastic cabinet back for Model H-520UW	1.60
RB-917	BACK COVER—Plastic cabinet back for Model H-520UX	1.60
RB-934	BACK COVER—Cabinet back for Models H-500U, 510U (W and X inc.)	.15
RC-016	CAPACITOR—.002 mfd. 600 V. paper (C-1)	.25
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-13)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-15)	.25
*RC-072	CAPACITOR—.05 mfd. 200 V. paper (C-10)	.25
*RC-060	CAPACITOR—.03 mfd. 600 V. paper (C-12)	.25
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-16)	.30
*RC-130	CAPACITOR—.2 mfd. 400 V paper (C-19)	.30
*RC-216	CAPACITOR—47 mmf. mica (C-4)	.25
*RC-274	CAPACITOR—330 mmf. mica (C-14)	.30
*RC-294	CAPACITOR—470 mmf. mica (C-9)	.30
*RC-676	CAPACITOR—B band padder (C-20)	.35
*RC-863	CORD—Power cord	.65
RC-1990	CLAMP—Antenna coil clamp for Models H-500U, 510U (Pkg. 5)	.10
RC-5135	CAPACITOR—30 mfd. 150 V.; 40 mfd. 150 V.; 20 mfd. 25 V.; dry electrolytic (C-17a, 17b, 17c)	$1.15
RC-7019	CONDENSER—Tuning condenser for Model H-500U (C-2a, 2b)	2.05
RC-7023	CONDENSER—Tuning condenser for Models H-510U, 520U (C-2a, 2b)	4.10
RC-8508	CARDS—Station letter cards for Models H-510U, 520U (W and X inc.)	.30
RC-9013	CONE ASSEMBLY—Speaker cone assembly for all models	.80
RD-111	DIAL—Dial scale for Models H-500U, 510U (W and X inc.)	.20
RD-140	DIAL—Dial scale for Model H-520U (W and X inc.)	.20
RD-410	DRUM—Tuning condenser drive assembly for all models in brown	.20
RD-411	DRUM—Tuning condenser drive drum assembly for all models in ivory and H-510UX	.60
RD-414	DRUM—Tuning condenser drive drum assembly for all models in onyx except H-510UX	.60
RH-007	HANK—Antenna hank for Models H-500U, 510U (W & X inc.)	.20
RK-048	KNOB—Control knob for all models in ivory	.15
RK-051	KNOB—Control knob for all Models in brown and H-510UX	.15
RK-065	KNOB—Control knob for all models in onyx except H-510UX	.15
RK-206	KEY—Station selector key for Models H-510U, 510UW, 520U, 520UW (Pkg. 5)	.50
RK-208	KEY—Station selector key for Models H-510UX, 520UX (Pkg. 5)	$0.70
RL-085	COIL—Antenna coil for Models H-500U, 510U (L-1)	.50
RL-518	LOOP—Beam-a-Scope antenna for Model H-520U	.80
RL-2018	COIL—Oscillator coil for all Models	.40
RP-134	PIN—Key pin for all Models with keys (Pkg. 10)	.05
*RQ-1219	RESISTOR—22 ohms, ½-W. carbon (R-11) (Pkg. 5)	.70
*RQ-1239	RESISTOR—150 ohms, ½-W. carbon (R-8) (Pkg. 5)	.70
*RQ-1261	RESISTOR—1200 ohms, ½-W. carbon (R-9) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms, ½-W. carbon (R-1) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms, ½-W. carbon (R-6, 7) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohms, ½-W. carbon (R-2) (Pkg. 5)	.70
*RQ-1365	RESISTOR—15 megohms, ½-W. carbon (R-5) (Pkg. 5)	.70
RR-351	RESISTOR—100 ohms, 3.4 W., wire wound (R-10)	.20
*RS-238	SOCKET—Octal tube socket	.15
RS-256	SOCKET—Electrolytic mounting socket	$0.05
RS-258	SOCKET—Dial lamp socket	.25
RS-951	SPACER—Speaker cabinet spacer (Pkg. 10)	.05
RS-1016	SPEAKER—4-inch speaker (L-5)	3.35
RT-321	TRANSFORMER—1st I.F. transformer for Model H-520U (L-3)	.95
RT-322	TRANSFORMER—2nd I.F. transformer for all models (L-4)	1.00
RT-323	TRANSFORMER—1st I.F. transformer for Models H-500U, 510U (L-3)	.90
RT-465	TRANSFORMER—Output transformer (T-1)	1.00
RV-086	VOLUME CONTROL—0.5 megohm volume control (R-4)	.80
RW-039	WINDOW—Celluloid station letter window for all Models with keys (Pkg. 25)	.10
RZ-152	CABINET—Cabinet for H-510U, 520U	2.90
RZ-153	CABINET—Cabinet for H-510UW, 520UW	4.25
RZ-154	CABINET—Cabinet for H-510UX, 520UX	4.60
RZ-155	CABINET—Cabinet for H-500U	2.90
RZ-156	CABINET—Cabinet for H-500UW	4.25
RZ-157	CABINET—Cabinet for H-500UX	4.60

SPECIAL REPLACEMENT PARTS

(For Models H-500U, 510U, and H-520U Provided with 2.0 Megohm Volume Control)

RC-016	CAPACITOR—.002 mfd. 600 V. paper (C-11)	$0.25
RQ-1324	RESISTOR—500,000 ohms ½-W. carbon (R-3) (Pkg. 5)	.70
RV-070	VOLUME CONTROL—2 megohm volume control (R-4)	$0.70

(For Models H-500U and H-510U Provided with 12A8GT Converter-Oscillator Tube)

Symbol	Description	List Price
*RC-072	CAPACITOR—.05 mfd. 200 V. paper (C-18)	$0.25
RC-7013	CONDENSER—Tuning condenser (C-2a, 2b)	2.00
*RG-016	GRID CLIP—Tube control grid clip (Pkg. 5)	.10
RL-290	COIL—Oscillator coil (L-2)	$0.50
*RQ-1281	RESISTOR—8200 ohms, ½-W. carbon (R-12) (Pkg. 5)	.70
*RQ-1299	RESISTOR—47,000 ohms, ½-W. carbon (R-1) (Pkg. 5)	.70

* Used on previous receivers.

(Prices Subject to Change without Notice)

ALIGNMENT PROCEDURE

I.F. 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 12SK7 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 (12A8GT) 12SA7GT and aligning the 1st I.F. transformer. Do not remove the grid lead from the converter tube. Finish alignment by over-all adjustments.

R.F. On Models H-500U and H-510U (W and X inc.) apply a 1500 KC signal through a 100 mmf. mica condenser to the antenna terminal. Rotate the gang condenser to the 1500 KC dial mark and align (C-2b). Peak (C-2a) for maximum output.

An additional alignment step is required on the Models H-500U and H-510U which use a 12SA7GT converter-oscillator tube. Tune these Models to a 580 KC signal after aligning at 1500 KC and peak (C-2b) oscillator padder for maximum output while rocking the gang condenser.

On Models H-520U (W and X inc.) 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 signal generator output which can be magnetically coupled to the receiver Beam-a-Scope. Rotate the gang condenser to the 1500 KC dial mark and align (C-2b) Peak (C-2a) for maximum output. Retune receiver to 580 KC signal and peak (C-2b) while rocking the gang condenser.

GENERAL INFORMATION

These models are compact superheterodyne receivers using five General Electric Pre-tested Tubes and operating from either a DC or AC source of power. Features of design include the new "Alnico" Dynapower speaker, single-ended and high filament-voltage tubes, and automatic volume control. Models H-510U and H-520U (W and X inc.) have four "Feathertouch Tuning" Keys. Models H-500U and H-510U (W and X inc.) have attached antennas while Model H-520 (W and X inc.) is equipped with the built-in "Beam-a-Scope." All models are fully approved by Underwriters' Laboratories.

REPLACEMENT PARTS LIST MODEL H-87

Stock No.	Description	List Price
	CHASSIS ASSEMBLY	
*RB-008	BOARD—Terminal board (2 lugs)	$0.10
*RB-026	BOARD—Antenna terminal board	.10
*RB-062	BOARD—Terminal board (6 terminals)	.10
*RB-093	BOARD—Terminal board (6 lugs)	.10
RB-1009	BOARD—Phono-terminal board	.10
RB-1010	BOARD—Loop terminal board	.10
*RC-006	CAPACITOR—.0015 mfd., 600 V. paper (C-26)	.30
*RC-039	CAPACITOR—.01 mfd., 600 V. paper (C-28, 31)	.25
*RC-042	CAPACITOR—.01 mfd., 1000 V. paper (C-42)	.30
*RC-051	CAPACITOR—.02 mfd., 1500 V. paper (C-38)	.30
*RC-055	CAPACITOR—.003 mfd., 600 V. paper (C-32)	.25
*RC-092	CAPACITOR—.05 mfd., 600 V. paper (C-35, 36)	.30
*RC-094	CAPACITOR—.08 mfd., 400 V. paper (C-53)	.25
*RC-096	CAPACITOR—0.1 mfd., 200 V. paper (C-15)	.30
*RC-104	CAPACITOR—0.1 mfd., 600 V. paper (C-13)	.30
*RC-148	CAPACITOR—.25 mfd., 600 V. paper (C-52) (C-20)	.35
RC-206	CAPACITOR—47 mmf. mica (C-14)	.35
*RC-216	CAPACITOR—47 mmf. mica (C-18, 25)	.25
*RC-235	CAPACITOR—100 mmf. mica (C-24)	.25
RC-242	CAPACITOR—150 mmf. mica (C-12)	.25
*RC-293	CAPACITOR—470 mmf. mica (C-27)	.30
RC-307	CAPACITOR—750 mmf. silvered mica (C-11)	.40
RC-337	CAPACITOR—1600 mmf. mica (C-9)	.25
RC-389	CAPACITOR—4300 mmf. mica (C-10)	.40
RC-745	CONDENSER—Tuning condenser (C-1)	3.00
RC-863	CORD—Power cord	.65
*RC-992	CUSHION—Tuning condenser cushion (Pkg. 3)	.10
RC-1987	CLAMP—Ant.-Osc. coil clamp (Pkg. 2)	.05
RC-2001	CORE—Touch Tuning coil tuning core	.15
RC-5148	CAPACITOR—20 mfd. 25 V.; 20 mfd. 250 V; 20 mfd. 250 V; 40 mfd. 250 V.; dry electrolytic (C-37a, 37b, 37c, 37d)	1.75
RC-6512	CAPACITOR—B band padder capacitor (C-8)	.35
RC-6526	CAPACITOR—7-65 mmf. trimmer (C-43)	.35
RC-6527	CAPACITOR—20-180 mmf. trimmer (C-45, 46)	.35
RC-6528	CAPACITOR—100-490 mmf. trimmer (C-48, 49, 50)	.35
RF-015	FOOT—Rubber-mounting foot for chassis	.05
RK-044	KNOB—Control knob (Pkg. 2)	.40
RK-205	KEY—Feathertouch Tuning key (Pkg. 5)	.25
RL-084	COIL—C and D band antenna coil (L-2, 3)	.75
RL-289	COIL—B, C and D band osc. coil (L-4, 5, 6)	1.10
RL-507	LOOP—Beam-a-Scope antenna (L-1)	6.60
RL-9510	COIL—Touch Tuning trimmer coil assembly (L-7 to L-12)	1.80
RL-9513	COIL—Touch Tuning trimmer coil (Range: 1200-1550 K.C.) (Code—None) (L-7)	.15
RL-9514	COIL—Touch Tuning trimmer coil (Range: 850-1400 K.C.) (Code—Red) (L-8, 9)	.15
RL-9515	COIL—Touch Tuning trimmer coil (Range: 540-900 K.C.) (Code—Blue) (L-10, 11, 12)	$0.15
RP-133	PLUG—Loop terminal plug	.05
RQ-667	RESISTOR—2400 ohms, 2-W. carbon (R-25)	.20
*RQ-1215	RESISTOR—15 ohms, ½-W. carbon (R-15) (Pkg. 5)	.70
*RQ-1223	RESISTOR—33 ohms, ½-W. carbon (R-40) (Pkg. 5)	.70
*RQ-1231	RESISTOR—68 ohms, ½-W. carbon (R-28) (Pkg. 5)	.70
*RQ-1245	RESISTOR—270 ohms, ½-W. carbon (R-46) (Pkg. 5)	.70
*RQ-1247	RESISTOR—330 ohms, ½-W. carbon (R-5) (Pkg. 5)	.70
*RQ-1259	RESISTOR—1000 ohms, ½-W. carbon (R-33, 34) (Pkg. 5)	.70
*RQ-1291	RESISTOR—22,000 ohms, ½-W. carbon (R-1) (Pkg. 5)	.70
*RQ-1299	RESISTOR—47,000 ohms, ½-W. carbon (R-4, 8, 29,) (Pkg. 5)	.70
*RQ-1303	RESISTOR—68,000 ohms, ½-W. carbon (R-18) (Pkg. 5)	.70
*RQ-1307	RESISTOR—100,000 ohms, ½-W. carbon (R-42) (Pkg. 5)	.70
*RQ-1311	RESISTOR—150,000 ohms, ½-W. carbon (R-17, 23) (Pkg. 5)	.70
*RQ-1315	RESISTOR—220,000 ohms, ½-W. carbon (R-9, 22) (Pkg. 5)	.70
*RQ-1317	RESISTOR—270,000 ohms, ½-W. carbon (R-21) (Pkg. 5)	.70
*RQ-1331	RESISTOR—1.0 megohm, ½-W. carbon (R-2) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohm, ½-W. carbon (R-11) (Pkg. 5)	.70
*RQ-1343	RESISTOR—3.3 megohm, ½-W. carbon (R-20) (Pkg. 5)	.70
*RQ-1347	RESISTOR—4.7 megohm, ½-W. carbon (R-41, 44) (Pkg. 5)	.70
*RQ-1487	RESISTOR—15,000 ohms, 1-W. carbon (R-15)	.20
RR-351	RESISTOR—100 ohms, 3.4-W. wire wound (R-24)	.20
RR-352	RESISTOR—2200 ohms, 2.6-W. wire wound (R-26)	.20
*RS-236	SOCKET—Pilot lamp socket assembly	.10
*RS-252	SOCKET—Tube socket	.15
RS-255	SOCKET—Electrolytic mounting socket	.05
*RS-423	SPRING—Knob spring (Pkg. 10)	.25
RS-1807	SHIELD—Beam-a-Scope electrostatic shield	1.10
RS-3027	SWITCH—Band-change switch (S-1, 2)	1.10
RS-3032	SWITCH—Tone control switch (S-3)	.45
RS-3033	SWITCH—Feathertouch Tuning switch (S-7, 8)	3.40
RS-3055	SWITCH—Power switch on key assembly	.40
RT-112	TRANSFORMER—Power transformer, 50-60 cycles (T-4)	6.40
RT-113	TRANSFORMER—Power transformer, 25 cycles (T-5)	10.60
RT-324	TRANSFORMER—1st IF transformer assembly (T-1)	1.90
RT-325	TRANSFORMER—2nd IF transformer assembly (T-2)	2.20
RT-463	TRANSFORMER—Output transformer	1.50
RT-866	TRIMMER STRIP—B, C and D osc. and C and D ant. trimmers (C-3, 4, 5, 6, 7)	.70
RT-868	TRIMMER STRIP—Ant. tuning trimmer strip (C-43 to C-50)	$1.20
RV-069	VOLUME CONTROL—2 megohm volume control (R-13)	.60
	SPEAKER ASSEMBLY	
RC-9009	CONE ASSEMBLY—Speaker cone assembly for H-87	.95
RP-129	PLUG—Speaker plug for Model H-87	.10
RS-1014	SPEAKER—14-in. P.M. speaker (complete)	6.00
	DIAL SCALE AND DRIVE ASSEMBLY	
RB-172	BRACKET—Volume control bracket	.05
RB-173	BRACKET—Tuning shaft bracket	.20
RB-175	BRACKET—Reflector and pulley bracket assembly (R.H.)	.45
RB-176	BRACKET—Reflector and pulley bracket assembly (L.H.)	.40
RC-8127	CORD—Drive cord assembly	.20
RC-8501	CARDS—Station letter cards (1 set)	.25
RC-8502	CARD—"Off" tab card (Pkg. 10)	.10
RC-8503	CARD—"Manual" tab card (Pkg. 10)	.10
RC-8504	CARD—"Phono-Tele" tab card (Pkg. 10)	.10
RD-110	DIAL—Dial scale	$2.20
RD-409	DRUM—Drum and hub assembly	.30
RD-510	DIFFUSER—Large diffuser strip	.05
RD-511	DIFFUSER—Small diffuser strip	.10
RE-200	ESCUTCHEON BAND—Escutcheon band—tuning	.20
RE-201	ESCUTCHEON BAND—Escutcheon band—volume	.20
RE-202	ESCUTCHEON—Main dial escutcheon	2.00
RE-207	ESCUTCHEON ASSEMBLY—Main dial escutcheon assembly	4.50
RH-008	HAIRPIN COTTER—Tuning drive shaft hairpin cotter (Pkg. 10)	.05
RM-502	MASK—Reflector cover mask	.05
RP-132	POINTER—Tuning pointer-slider assembly	.25
*RP-303	PULLEY—Pulley and "C" clip assembly (Pkg. 2)	.10
RR-927	REFLECTOR—Dial scale reflector	.15
RS-463	SPRING—Drive cord spring (Pkg. 5)	.10
RS-464	SPRING—Dial wheel spring (Pkg. 10)	.05
RS-925	SHAFT—Tuning control shaft	.05
RS-1801	SHIELD—Pilot light shield	.10
RW-038	WINDOW—Celluloid station letter window (Pkg. 25)	.10
RW-908	WHEEL—Dial wheel assembly	.30

* Used on previous receivers. Prices Subject to Change without Notice

GENERAL ELECTRIC CO.

MODELS H116,H118,HJ119 (Final)
Schematic,Socket,Trimmers,Dial Drive

GENERAL ELECTRIC CO.

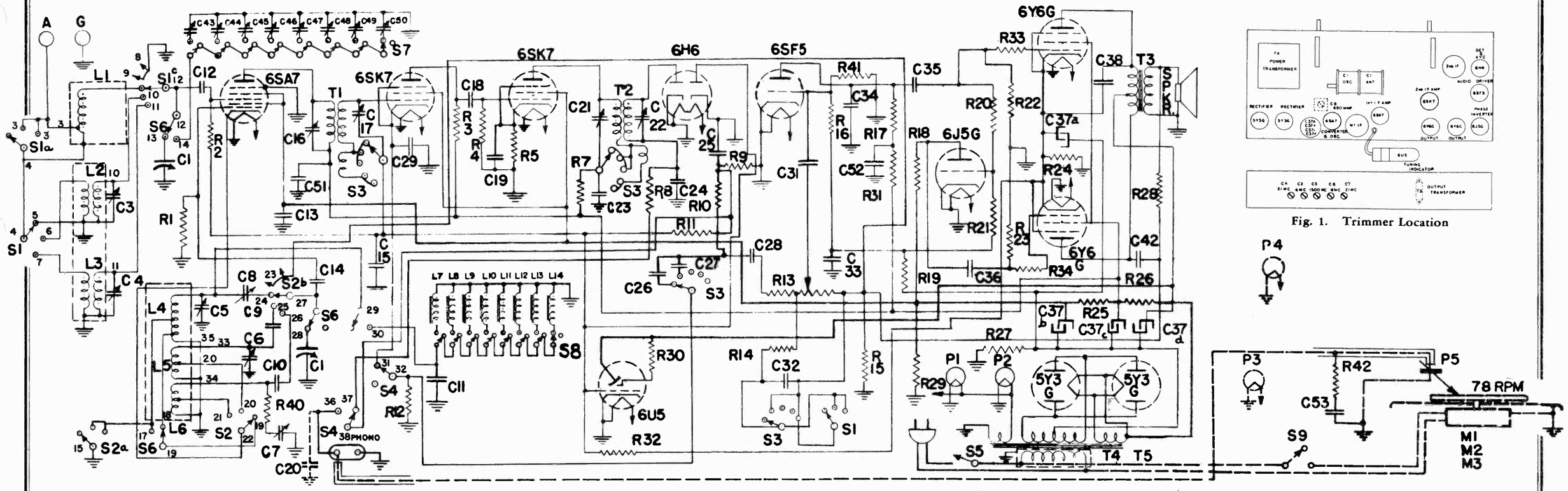


Fig. 1. Trimmer Location

Symbol	Description	Symbol	Description	Symbol	Description	Symbol	Description
C-1	Tuning Capacitor	C-33	0.1 mfd. Paper Capacitor	L-6	"D" Band Oscillator Coil	R-23	220,000 ohms, Carbon Resistor
C-3	"C" Band Antenna Trimmer	C-34	47 mmf. Mica Capacitor	L-7, -8	Tuning Coils (No code)	R-24	100 ohms, 3.4 W. Wire Wound
C-4	"D" Band Antenna Trimmer	C-35	.05 mfd. Paper Capacitor	L-9, -10, -11	Tuning Coils (Code—Red)	R-25	2400 ohms, 2 W. Carbon Resistor
C-5	"B" Band Oscillator Trimmer	C-36	.05 mfd. Paper Capacitor	L-12, -13, -14	Tuning Coils (Code—Blue)	R-26	2200 ohms, 2.6 W. Wire Wound
C-6	"C" Band Oscillator Trimmer	C-37a	20 mfd. 25 V. Dry Electrolytic	R-1	22,000 ohms, Carbon Resistor	R-27	12 ohms, Carbon Resistor
C-7	"D" Band Oscillator Trimmer	C-37b	20 mfd. 300 V. Dry Electrolytic	R-2	1.0 megohm, Carbon Resistor	R-28	68 ohms, Carbon Resistor
C-8	"B" Band Padder	C-37c	20 mfd. 300 V. Dry Electrolytic	R-3	6800 ohms, Carbon Resistor	R-29	47,000 ohms, Carbon Resistor
C-9	1600 mmf. Mica Capacitor ±5%	C-37d	40 mfd. 350 V. Dry Electrolytic	R-4	47,000 ohms, Carbon Resistor	R-30	1.0 megohm, Carbon Resistor
C-10	4300 mmf. Mica Capacitor ±5%	C-38	.02 mfd. Paper Capacitor	R-5	330 ohms, Carbon Resistor	R-31	47,000 ohms, Carbon Resistor
C-11	750 mmf. Silvered Mica Capacitor ±5%	C-42	.01 mfd. Paper Capacitor	R-7	1000 ohms, Carbon Resistor	R-32	5.6 megohms, Carbon Resistor
C-12	150 mmf. Mica Capacitor	C-43	7-65 mmf. Antenna Trimmer	R-8	47,000 ohms, Carbon Resistor	R-33	1000 ohms, Carbon Resistor
C-13	0.1 mfd. Paper Capacitor	C-44	7-65 mmf. Antenna Trimmer	R-9	220,000 ohms, Carbon Resistor	R-34	1000 ohms, Carbon Resistor
C-14	47 mmf. Mica Capacitor	C-45	20-180 mmf. Antenna Trimmer	R-10	47,000 ohms, Carbon Resistor	R-40	33 ohms, Carbon Resistor
C-15	0.1 mfd. Paper Capacitor	C-46	20-180 mmf. Antenna Trimmer	R-11	2.2 megohms, Carbon Resistor	R-41	4.7 megohms, Carbon Resistor
C-18	47 mmf. Mica Capacitor	C-47	20-180 mmf. Antenna Trimmer	R-12	470 ohms, Carbon Resistor	R-42	18,000 ohms, Carbon Resistor
C-19	.05 mfd. Paper Capacitor	C-48	100-490 mmf. Antenna Trimmer	R-13	2 megohm Volume Control	P-1, -2, -3, -4	Pilot Lights, MAZDA No. 44
C-20	.002 mfd. Paper Capacitor	C-49	100-490 mmf. Antenna Trimmer	R-14	150,000 ohms, Carbon Resistor	S-1	Antenna Band Switch
C-23	.05 mfd. Paper Capacitor	C-50	100-490 mmf. Antenna Trimmer	R-15	15 ohms, Carbon Resistor	S-2	Oscillator Band Switch
C-24	100 mmf. Mica Capacitor	C-51	0.1 mfd. Paper Capacitor	R-16	4.7 megohms, Carbon Resistor	S-3	Tone Switch
C-25	47 mmf. Mica Capacitor	C-52	.25 mfd. Paper Capacitor	R-17	150,000 ohms, Carbon Resistor	S-4	Phono Switch
C-26	.001 mfd. Paper Capacitor	C-53	.01 mfd. Paper Capacitor	R-18	47,000 ohms, Carbon Resistor	S-5	Power Switch
C-27	470 mmf. Mica Capacitor	L-1	Beam-a-Scope	R-19	1.0 megohms, Carbon Resistor	S-6	Manual Switch
C-28	.01 mfd. Paper Capacitor	L-2	"C" Band Antenna Coil	R-20	3.3 megohms, Carbon Resistor	S-7	Antenna Section Touch Tuning Switch
C-29	.05 mfd. Paper Capacitor	L-3	"D" Band Antenna Coil	R-21	270,000 ohms, Carbon Resistor	S-8	Oscillator Section Touch Tuning Switch
C-31	.01 mfd. Paper Capacitor	L-4	"B" Band Oscillator Coil	R-22	220,000 ohms, Carbon Resistor	S-9	Phono Motor Power Switch
C-32	.003 mfd. Paper Capacitor	L-5	"C" Band Oscillator Coil				

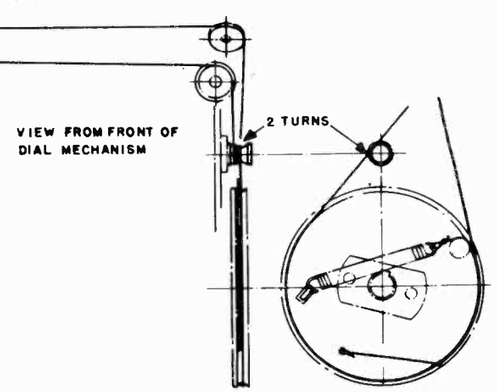


Fig 6. Dial Drive Stringing Diagram

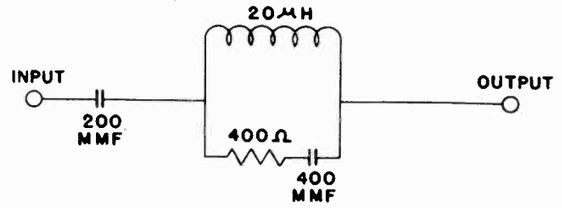


Fig. 7. I.R.E. Dummy Antenna

Electrical Specifications

Model H-116

Rating "A"—110–125 volts, 50–60 cycles, 130 watts
Rating "C"—110–125 volts, 25–60 cycles, 130 watts

Model H-118

Rating "A6"—110–125 volts, 60 cycles, 150 watts
Rating "A5"—110–125 volts, 50 cycles, 150 watts
Rating "C2"—110–125 volts, 25 cycles, 150 watts

Tuning Frequency Range

Band "B" ..... 540–1600 KC
Band "C" ..... 2300–7000 KC
Band "D" ..... 7000–22,000 KC

Intermediate Frequency ..... 455 KC

Electric Power Output

Undistorted ..... 8.5 watts
Maximum ..... 10 watts

Tone Control 5-position

Loud-speaker—"Alnico" Magnetic Dynamic

Outside Cone Diameter ..... 12 inches
Voice Coil Impedance ..... 3.5 ohms

Tubes

Converter and Oscillator GE-6SA7
1st I.F. Amplifier GE-6SK7
2nd I.F. Amplifier GE-6SK7
Detector and A.V.C. GE-6H6
Audio Driver GE-6SF5
Audio Inverter GE-6J5G
Audio Power Amplifier ..... (2)GE-6Y6G
Tuning Indicator GE-6U5
Rectifier ..... (2)GE-5Y3G
Dial Lamp ..... (4)MAZDA No. 44

GENERAL ELECTRIC CO.

MODELS H116,H118,HJ119
Chassis Wiring,Coils

Coil System

The "C" and "D" band antenna coils, L-2 and L-3 are wound on a single coil form as shown in Fig. 4. L-4, L-5 and L-6 compose the oscillator transformer for the "B" "C" and "D" bands. All switch points are numbered in Fig. 4 to facilitate in locating these switch points on the pictorial wiring diagram, Fig. 3.
The following table gives the coils in usé for the various positions of the band switch:

Band-switch Position	Antenna Primary	Antenna Secondary	Oscillator Primary	Oscillator Secondary
Band "B"	Lower portion of L1	Upper portion of L1	Lower portion of L4	Upper portion of L4
Band "C"	L2 Primary (L1 Primary shorted)	L2 Secondary (Grid end of L1 to ground)	Lower portion of L5	Upper portion of L5 (High side of L4 to ground through R15. Mid tap of L4 to ground)
Band "D"	L3 Primary (L1 Primary shorted)	L3 Secondary (Grid end of L1 to ground. L2 secondary to ground)	Lower portion of L6	Upper portion of L6 (High side of L4 and L5 to ground through R15. Mid tap of L4 to ground)

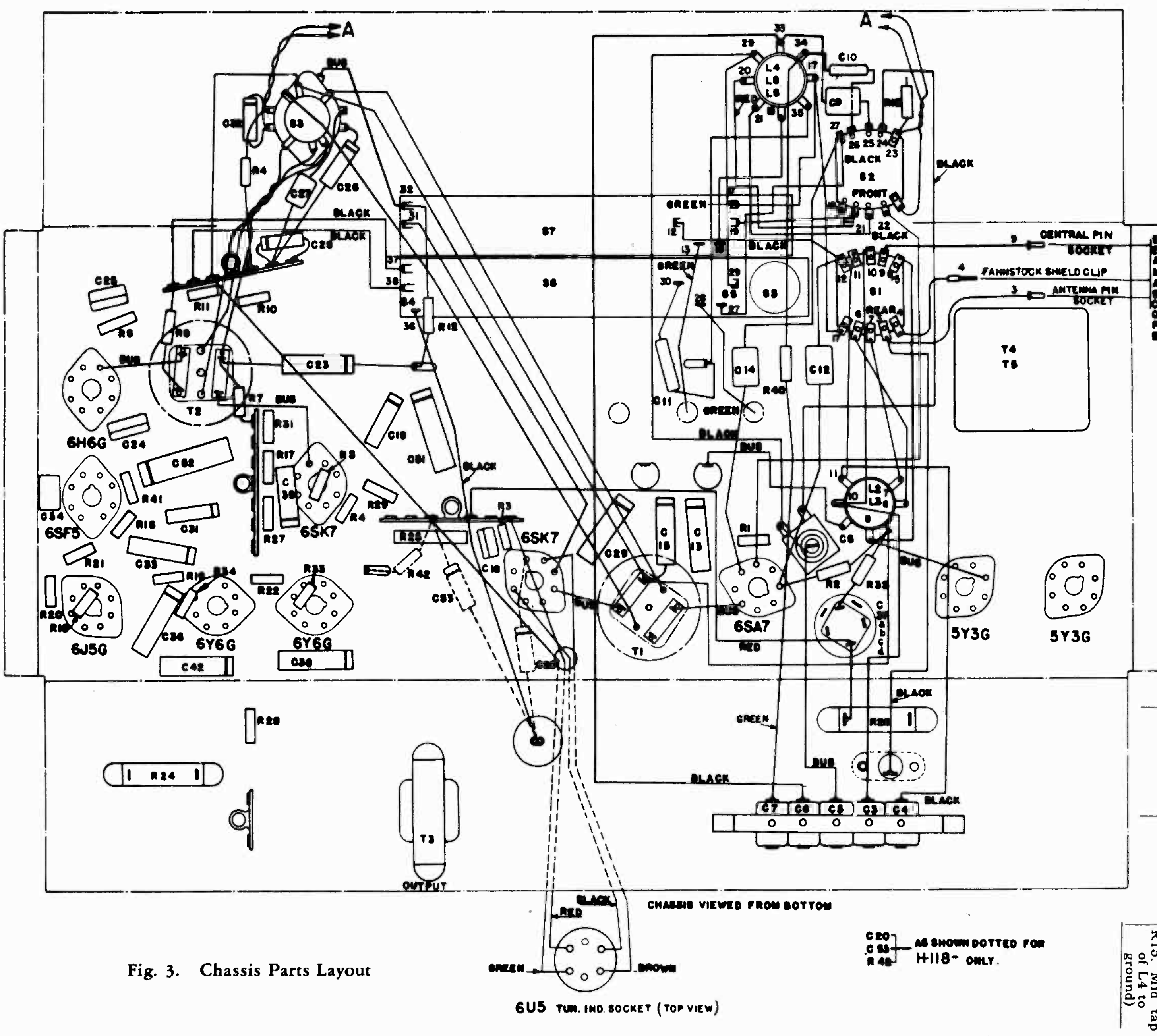


Fig. 3. Chassis Parts Layout

MODELS H116,H118,HJ119
Alignment,Gain,Voltage
Socket,Record Changer

GENERAL ELECTRIC CO.

MODEL H79
Record Changer Data

Super *Beam-a-scope*

The *Super* Beam-a-scope is essentially a tuned coil antenna wound on a frame and shielded by a Faraday screen against electrostatic disturbances. This construction favors the desired signal over a local man-made noise source in three ways. First, since any noise source is composed of two components—electrostatic and electromagnetic fields—the *Super* Beam-a-scope may be revolved so that a null point is found where no voltage is produced from these two components. Due to the fact that this null point is very sharp, it is very unusual that any desired station will be in a direct line with the rejected noise signal and thereby have its signal strength reduced appreciably. In the second place, the *Super* Beam-a-scope eliminates the external return path to ground present in the case of an unshielded antenna. This reduces or eliminates local man-made noise sources in much the same way as a shielded antenna lead-in does in an ordinary antenna installation. In the third place the *Super* Beam-a-scope discriminates against the electrostatic component of an incoming wave in comparison with the electromagnetic component, because of the Faraday shield. Since the electrostatic component of a local noise source is a great deal larger than the electromagnetic component, this rejection property brings about an enormous increase in signal-to-noise ratio.

The above operation is only available on the broadcast band and in this position the *Super* Beam-a-scope is also the first tuned grid circuit. On the "C" and "D" bands, the *Super* Beam-a-scope is grounded at the grid end thus preventing absorption spots due to loop resonance.

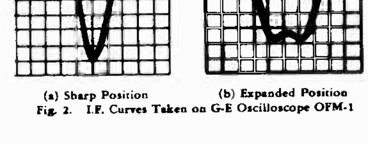
ALIGNMENT PROCEDURE

	Band-switch Setting	Input Frequency	Tone Control Position	Point of Input	Trimmer	Comments
	I.F. ALIGNMENT WITH OSCILLOSCOPE*					
1	Band B	455 KC and 30 KC Sweep	Bass	1st I.F. 6SK7 Grid	2nd I.F. Sec. 2nd I.F. Pri.	Condenser gang at minimum capacity—vertical input to ground and junction at R-8, R-9, and R-10. Adjust trimmers in order mentioned for a single curve of maximum amplitude. The resulting curve on the "Bass" position is shown in Fig. 2a.
2	Band B	455 KC and 30 KC Sweep	Bass	Converter 6SA7 Grid	1st I.F. Sec. 1st I.F. Pri.	
3	Band B	455 KC and 30 KC Sweep	Bass	Converter 6SA7 Grid	All I.F. Trimmers	
4	Band B	455 KC and 30 KC Sweep	Treble I	Converter 6SA7 Grid		The expanded curve taken with tone control at "Treble I" is shown in Fig. 2b. Excess sensitivity over "Bass" tone position indicates regeneration.
	I.F. ALIGNMENT WITH OUTPUT METER*					
1	Band B	455 KC Modulated	Bass	1st I.F. 6SK7 Grid	2nd I.F. Sec. 2nd I.F. Pri.	Condenser gang at minimum capacity—manual key depressed—output meter connected across voice coil—volume control at maximum—input as low as practical. Adjust all trimmers in order listed for maximum output. Note.—Do not attempt alignment in the expanded position.
2	Band B	455 KC Modulated	Bass	Converter 6SA7 Grid	1st I.F. Sec. 1st I.F. Pri.	
3	Band B	455 KC Modulated	Bass	Converter 6SA7 Grid	All I.F. Trimmers	
	R.F. ALIGNMENT					
1	Band B					Mechanically adjust dial pointer to first line at left-hand end of dial scale with condenser gang fully meshed. Connect output meter across voice coil.
2	Band C	6 MC Modulated	Bass	Antenna Post**	Osc. (C-6) Ant. (C-3)	Set pointer to 6 MC mark and align (C-6). Peak (C-3) for maximum output.
3	Band D	21 MC Modulated	Bass	Antenna Post**	Osc. (C-7) Ant. (C-4)	Set pointer to 21 MC mark and align (C-7). Peak C-4 while rocking gang condenser. The image of any signal on the "D" band should be 910 KC below input signal. Example: 15 MC image 14.09 MC.
4	Band B	580 KC Modulated	Bass	Antenna Post***	Osc. Padder (C-8)	Set dial pointer to 580 KC mark and tune in signal with (C-8).
5	Band B	1500 KC Modulated	Bass	Antenna Post***	Osc. (C-5)	Adjust (C-5) for maximum output in vicinity of 1500 KC while rocking gang condenser.
6	Band B	580 KC Modulated	Bass	Antenna Post***	Osc. Padder (C-8)	Retrim (C-8).
7	Band B	1500 KC Modulated	Bass	Antenna Post***	Osc. (C-5)	Repeak (C-5).

* Use "dummy" antenna consisting of .05-mfd. capacitor between signal generator and point of input.
** Use a "dummy" antenna consisting of 70-mmf. capacitor between signal generator and point of input with "Beam-a-Scope" disconnected.
*** Use an I.R.E. "dummy" antenna as shown in Fig. 7 between signal generator and the point of input.

Alignment Procedure

The alignment procedure is given in table form
Use the designated "dummy" antenna in making each individual alignment. I.F. alignment may be performed with the chassis removed from the cabinet and the Beam-a-Scope disconnected. R.F. alignment on "C" and "D" bands should be performed with the Beam-a-Scope disconnected and a 70 mmf. mica capacitor between the signal generator and the point of output. R.F. alignment on "B" band should be performed with the chassis and Beam-a-Scope mounted in the cabinet and properly connected.



(a) Sharp Position (b) Expanded Position
Fig. 2. I.F. Curves Taken on G-E Oscilloscope OFM-1

SPECIAL SERVICE INFORMATION

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

(1) Stage Gains ‡
(a) Antenna Post to Converter Grid
Band "B" (Beam-a-Scope connected)*—3 at 1000 KC
Band "C" (Beam-a-Scope disconnected)**—3 at 4 MC
Band "D" (Beam-a-Scope disconnected)**—3 at 18 MC
(b) Converter Grid to 1st 6SK7 Grid . . 30 at 455 KC
(c) 1st 6SK7 Grid to 2nd 6SK7 Grid . . 6 at 455 KC
(d) 2nd 6SK7 Grid to 6H6 Det. Plate . . 70 at 455 KC

(2) A 400 cycle signal of .05 volts across volume control will give ½ W. speaker output.‡ (Volume Control turned to maximum.)

(3) Average DC voltage developed across oscillator grid resistor (R1) with gang closed.
Band "B" . . . . . . 6.5 volts
Band "C" . . . . . . 7 volts
Band "D" . . . . . . 2.8 volts

‡ Variations of +10%, −20% permissible.
* Use I.R.E. dummy antenna
** Use 70 mmf. capacitor between signal generator and antenna post.

AUTOMATIC PHONOGRAPHS

The {Model H-79 / Model H-118} automatic phonograph mechanism plays up to twelve 10-inch records or ten 12-inch records. The record-changing mechanism is equipped with a cycle switch which during a record-changing cycle prevents power interruption, by pressing the turntable switch to "Off," until the tone arm is in the starting position.

OPERATION

Phono Key

To change from radio to phonograph reproduction press the "Phono-Tele" key. This operation likewise turns the power on if the radio has not been operating previously.

Phono Switch

This switch is located on the forward left-hand corner of the motorboard and starts or stops turntable operation.

Push-button Controls

On the forward right-hand corner of the motorboard are located four push-buttons which control the operation of the automatic record changer.
The forward button, marked "R" is the reject control. To reject a record being played or to start the record-changing cycle after the records have been placed on the holders, simply press this button down and then release.
The second button from the front, marked "M" is the manual button. When records are to be played manually, this button should be pressed down until it locks in the depressed position. The record mechanism now operates as any manual record player.
The third button, marked "12," when pressed, sets the mechanism to play automatically a series of 12-inch records.
The fourth button, marked "10," when pressed sets the mechanism to play automatically a series of 10-inch records.

Record Holder and Release Lever

Located in rear left-hand corner and in the forward right-hand corner are the record-holder posts supporting the record holders and release levers. The record holder is underneath the release lever on either post.
To load the holder with 10-inch records, clasp one of the record holders with the left hand and with the right hand lift the release-lever knob turning the release lever until the figure "10" is opposite the index. Do the same with the other record holder and release lever. Now rotate the entire record holder and release lever assembly until the holder is pointed in toward the center of the turntable. It may be necessary to raise the assembly slightly to start rotation. A certain position will be found when the holder is pointed toward the center where the assembly will settle into a recess. This is the correct position of the holder for loading.
To load the holder with 12-inch records, follow the above procedure except the release levers must be rotated with respect to the holders until the "12" markings are opposite their respective indices.
To remove records from the turntable, lift the holder assemblies and rotate the record holders until they clear the turntable area.

SERVICING

Oiling

The record-changer mechanism should be lubricated once a year with about a dozen drops of a good light machine oil at each of the following six points. All points can be reached from above, through holes in the mounting plate, as follows:

No. 1, No. 2, No. 3 — Three oil holes on motor gear housing. Reach all three through two holes marked "A" on drawing.
No. 4 — Through hole marked "B," drop the oil upon flat surface of cam. It will distribute itself to proper points.
No. 5 — Through holes marked "C," see felt wick, and drop the oil directly upon it.
No. 6 — Through hole marked "D," see felt wick, and drop the oil directly upon it.

If squeaks are heard compare the squeak with and without a load of records, stacked records themselves sometimes squeak against a center pin. See that all five wicks are in position, including three ¼-in. wicks in frame of Motor. See that each wick is thoroughly saturated (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) If necessary, **clean gummed-up wicks with kerosene.** See that each is saturated with good oil; then, before replacing them, **drop a little good oil into the holes.**

(CONT.)

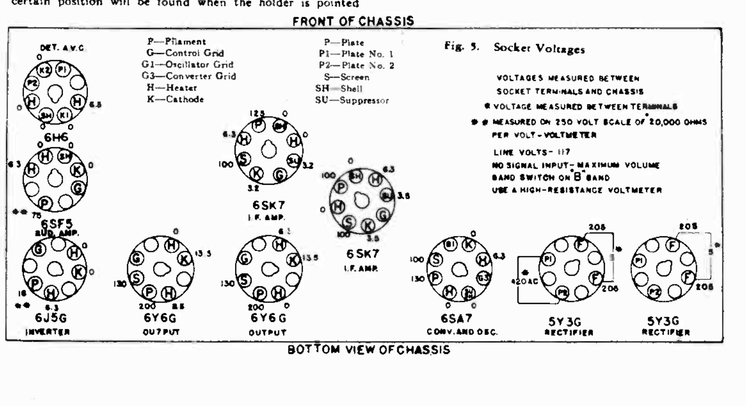


Fig. 5. Socket Voltages

Adjustments

There are three adjustments that can be made. All are correctly made at the factory, and ordinarily need never be altered. Should it become necessary to remake any of these adjustments, due to accident or tampering, proceed as follows:

A. Adjusting Landing Position of Needle on the Record. (See Fig. 8.) This adjustment is made with a screwdriver from above—does not require removing Record Changer from cabinet. If needle comes down too far from edge of record, playing of records will not start at their beginning. **Turn Needle-drop Adjustment Screw very slightly counterclockwise.** If needle comes down too close to edge of record, needle may slip off edge of record. **Turn the adjusting screw clockwise.**

Compare also Paragraph 12 on page 11.

B. Adjusting Distance from Record Pin at Which Trigger Will Trip and Change-Cycle Will Begin. Turn Trip Adjusting Screw 18, **toward** the trigger for **earlier** tripping, or away from it for later tripping. This Record Changer does not depend, for automatic tripping, on the records being provided with any special grooves at end; it trips whenever needle comes within a certain distance of Record Pin. The factory adjustment is for 1⅞ in. from **center** of Record Pin. This is the most generally satisfactory distance; no modern record will then be cut off before playing is finished, and none will fail to trip at end. For certain records of early manufacture, it may not be possible to find an adjustment that will always trip and never cut off.

C. Adjusting Height to Which Tone Arm Rises. The arm should rise, during the change-cycle, high enough so that it clears by only ⅛ in. the record above it, next to be played. (Be careful, before deciding that adjustment is necessary, to see that the record at bottom of stack is not a warped one.) To make this adjustment, **loosen the lock nut** on **Pickup Sleeve 22** (see Fig. 10) and **turn the sleeve to lengthen or shorten Pickup Plunger 21.** When correct adjustment is found, **tighten lock nut** again.

Motor Replacement

The service mechanic may be called upon to adapt the Record Changer to a different power supply. For this purpose, or in case of any service fault within Motor, remove entire Motor (with Record Pin and connecting gear drive) from the Record Changer, and replace it with a suitable new Motor. (In ordering a replacement Motor, specify the power supply.)

When mounting replacement Motor, it is most important to see that Record Pin is centered between the two posts of the Record Changer, that it stands perpendicular to Main Plate 53, and that it has not become bent so as to wobble. Even though the Posts are stout and not easy to bend, it is well to check them also, with a 12-in. combination square laid clear across the concave upper surface of Main Plate. When the new Motor has been attached, with three screws through Grommet Sleeves 51 (spacers) into its frame, and Record Pin is seen to revolve without appreciable wobble (a wobble would indicate that it has been bent in transit from factory) the correct position of Pin midway between the Posts can be accurately checked in this way: Place a single 12-in. record on the Record Holder, press "R" button, and turn turntable forward by hand. Immediately after the Record Holders open and let it fall, **turn Turntable slightly backward,** and with other hand **support the record between the Record Holders;** it can then be readily seen whether Record Pin is off center. If it is, **remove the record and Turntable,** and **loosen slightly the screw or screws nearest** the Record Holder to which record appeared **closest.** This should improve evenness of operation. However, unless the unevenness was very slight, it will be necessary for a permanent repair to **insert a shim** or **two** on one or more of the three screws (or change shims from one screw to another). The shims used are shaped like an ordinary washer, cut out at one side (see cut-away view at 52 in Fig. 11 showing a shim in place upon one of the Grommet Sleeves). Shims can readily be cut out with shears and punch from thin metal or cardboard. They should be inserted, around proper screws (when screws have been sufficiently loosened) between Motor Frame and metal Grommet Sleeve. **Do not insert shims next to rubber grommet.** In wiring up, consult schematic diagram for particular installation. Use only Underwriters' approved wire.

Trouble Shooting

Cases of failure to operate satisfactorily will generally be found due either to neglect of proper lubrication, or 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 some external vibration. Damage from tampering is likely to take the form of bent parts; never bend any part during examination. Be careful, especially, **never to push upward** from below on Cam Connecting Rod Lift 37 while mechanism is operating; bending may result, and even slight bending here might interfere with correct timing of the cycle operations.

Among the principal trouble symptoms to which such causes may give rise, are the following:

1. Mechanism Is Slow in Starting, or Stalls During a Change-cycle, But a Slight Forward Push With the Hand Starts It Again. May be caused by

a. Failure to lubricate properly. **Oil thoroughly,** per instructions above.

b. Loose setscrews.

c. Weakness of drive: line voltage may be abnormally low, or motor windings damaged.

2. Motor Fails to Run, Even When It Is Entirely Disconnected from Other Wiring and Proper Voltage Is Applied Directly to the Two Ends of Its Windings. This indicates trouble in Motor windings. Unless the damage is easily seen and repaired, replace Motor, as above described.

3. Motor Is Slow in Starting.

a. **Check oiling,** as directed above. It may not have been properly done; old oil may have become gummy.

b. Changer may have been in a very cold place, and may not yet have reached room temperature. Give it a fair chance to get warmed up, before concluding that Motor is defective, and proceeding as in Paragraph 2 above.

4. Squeaks or Other Noises, During Playing of Records.

a. **Check oiling,** as directed above. (If squeaks are heard, they will usually be found to come from the records—not from the mechanism.)

b. See that all setscrews are tight.

c. Examine Motor windings; especially the shading coils which encircle a portion of each laminated pole and make the Motor self-starting. If coils have been jarred loose at any point, they may be tightened accordingly.

5. Changer Is Noisy When in Cycle. **Check oiling.**

6. Motion of Tone Arm Toward Record Pin Will Not Trip Changer Mechanism.

a. It may be found that, instead of trigger being actuated, there is stretching of Swivel Spring 95 (joining the lugs at ends of Swivel Spreaders 90 and 91), allowing the Spreaders to open. **Increase tension of Spring 95,** by bending slightly the lug on either Spreader. If this increased tension causes needle to jump across the record, needle may be a little out of vertical, radially—it may "lean" toward center of record. To remedy this, grasp Pickup arm and twist it, very slightly, in a clockwise direction, so that it stands vertical, or even leans a little in outward direction.

b. If trigger is being properly actuated, probably Cam Lever 39 is binding against Sub-Plate 41. Look for dirt or obstructions; see that rivets are working freely. If the Lever engages Cam Lever Pawl 34, so that Lift 37 forces its roller up into the groove on Cam gear 82, and if setscrews are tight, the change-cycle must operate, as Cam Gear turns.

7. Pressing "R" Button Doesn't Trip Changer Mechanism.

a. Check Push-button Switch Unit 75: see whether there is an obstruction or a bent part which prevents "R" button from going clear down to the end of its travel.

b. Examine Reject Rod 78. If it does not trip, even when properly revolved by complete depressing of "R" button, the rod has probably been bent, and must be restored in same way. **Grasp the two ends and twist it** slightly.

c. If Trigger 16 is being properly actuated but without starting a change-cycle, see directions above, Paragraph 6-b.

8. Pressing "M" Button Fails to Put Changer Mechanism Out of Action so as to Enable Manual Operation. Check Push-button Switch Unit as in preceding paragraph. First see that button goes clear down; then follow its action through Manual Rod 77.

9. Motor Stops Immediately When Phono Switch Is Turned Off During a Change-cycle (instead of continuing to run, as it should, until needle is again upon a record, and then stopping). Or—

10. Turning Phono Switch Off Fails to Stop Changer at All. Either of these two conditions would indicate failure of Cycling Switch 85. Cycling Switch operates normally to short-circuit the manual Changer Switch (which may be located in position shown at 54, or elsewhere) during change-cycle only. Such damage to Cycling Switch (not likely to occur) would necessitate returning the entire Changer to factory.

11. Changer Fails to Repeat Last Record. See Paragraph 6, above.

12. Needle Lands Properly But Fails to Move Over into Record Groove. Tone arm is normally impelled toward center of records by Lead Spring 97. Should a slight increase in its tension be found necessary, this can be easily obtained by bending the lug, to which it is attached, down against Main Plate. If tendency then appears for needle to jump across record, check angle of needle (see Paragraph 6-a above).

13. Records Fall Unevenly Upon Turntable. Seldom objectionable, this is due to Record Pin not being correctly centered between Posts. If necessary, it can be corrected as described above; see "Motor Replacement."

14. Last Record Drops on One Side Only. This suggests a Post bent out of perpendicular to Main Plate. Test with square as directed (see "Motor Replacement"). If Post must be straightened, be careful not to bend other parts.

15. Changer Continues Cycling. Due to failure of Lift 37 to fall back out of engagement with Cam Gear. Check the various rivets at which motion occurs, to find the point where friction or binding is interfering with freedom of motion.

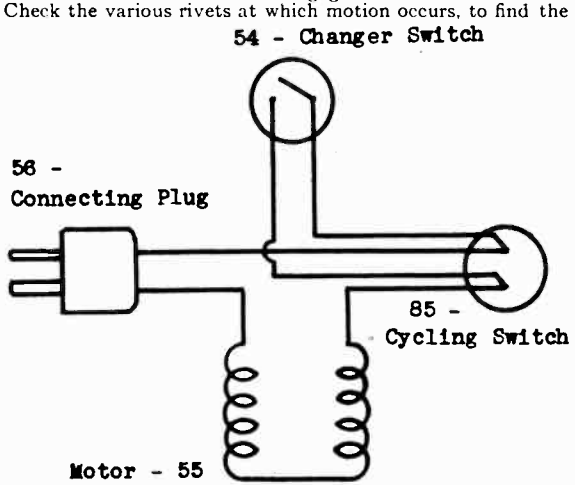


Fig. 12. Record Changer Wiring Diagram

16. Record Is Driven, But Not Heard, or Not Heard With Proper Volume. See that Pickup cord is plugged in. Check amplifier and speaker and connections to them, thoroughly. If then trouble is still suspected in pickup, test its output with a **vacuum-tube** voltmeter. Playing an average record, output should test 1 to 2.5 volts. If pickup cartridge is found not to deliver proper output, remove it and install another.

17. Selector Plate Fails to Separate Bottom Record from Stack. This is due either to a badly warped condition of the record, or to its being of a thickness very considerably different from those now in standard use. The design of both Release Levers and Record Holders is such as to accommodate a maximum variation in thickness and flatness of records, but certain records may be found which are so far out as to be impracticable for use in automatic changers.

If Necessary to Disassemble the Changer

Before attempting to remove Sub-Plate Assembly 83, detach Push-button Switch Unit 75 from Main Plate. To do this, start with Switch Unit Truss Bar 80. Then take out the screw which holds left end of Adjusting Rod Lever 94. Next remove Adjusting Rod 92 and Adjusting Rod Extension 79. Take out the screw Spring 73: then the screws holding Push-button Switch Unit 75 to Main Plate. Rods 77 and 78 can then, with due care, be extracted without bending. Free the Cam Connecting Rod 58 by loosening setscrew holding Spreader and Hub Assembly 59. Sub-Plate Assembly can then be detached without beinding parts. In reassembling, reverse the procedure.

Stock No.	Description	List Price
	AUTOMATIC RECORD-CHANGER ASSEMBLY	
RA-412	ARM—Swivel guide arm assembly (13, 88)	.75
RB-189	BRACKET—Adjusting rod bracket (86)	.10
RB-190	BRACKET—Manual and rejection rod spring bracket (76)	.10
RB-628	BUTTON—Switch push button (Pkg. of 4)	1.00
RC-1999	CLAMP—Crystal cartridge clamp and screws (Pkg. of 2)	.25
•RC-2000	COLLAR—Rear changer shaft collar and setscrew	.60
•RC-5003 / *RC-5000	CRYSTAL—Crystal cartridge assembly	6.00
RC-8146	CABLE—Pick-up cable and plug	.85
RG-109	GUIDE—Pick-up lifter guide	.40
RG-303	GROMMET—Motor mounting grommet (Pkg. of 6)	.15
RG-707	GEAR—Cam gear assembly (11, 82)	2.40
RG-708	GEAR—Drive pinion gear assembly	.75
RH-113	HINGE—Adjusting rod hinge on switch unit (Pkg. of 3)	.10
RK-069	KNOB—Changer post knob	$0.25
RM-130	MOTOR—Motor and record pin assembly with mounting accessories, 115 V., 60 cycles, 78 rpm (55)	13.60
RM-131	MOTOR—Motor and record pin assembly with mounting accessories, 115 V., 50 cycles, 78 rpm (55)	15.20
RM-132	MOTOR—Motor and record pin assembly, 115 V., 25 cycles, 78 rpm (55)	38.00
RP-158	PLATE—Tone arm lift plate	.20
RP-159	PLATE—Sub-plate and lever assembly (14, 16, 17, 32, 34, 39, 41, 42, 83)	4.40
•RG-711	GEAR—Idler gear and shoulder rivet assembly	.60
•RS-886	SCREW—Lift shoulder screw and nut	.30
RP-160	PLATE—Selector plate Assembly (Record holder and release lever)	3.80
RP-405	PIN—Tone arm hinge pin (Pkg. of 6)	.20
RP-406	POST—Front or rear changer post with mounting washer and nut (71)	.80
RP-407	POST—Swivel post with mounting washer and nut	.75
RR-932	ROLLER—Rear post spring roller (61)	.40
RR-933	ROD—Manual key rod (77)	.10
RR-934	ROD—Rejection key rod (78)	.15
RR-935	ROD—Cam connecting rod assembly (31, 35, 37, 58, 59)	1.40
RR-936	ROD—Adjusting rod assembly (79, 81, 92, 94)	1.60
RR-937	ROD—Changer connecting rod assembly (57, 72)	2.20
RR-938	REST—Tone arm rest	.20
RS-473	SPRING—Selector plate spring (Pkg. of 5)	.10
RS-474	SPRING—Release trigger spring (15) (Pkg. of 3)	.25
RS-475	SPRING—Cam connecting rod lift spring (Pkg. of 3)	.25
RS-476	SPRING—Pawl or extension rod spring (38, 79) (Pkg. of 3)	.25
RS-477	SPRING—Cam lever spring (36, 84) (Pkg. of 3)	.25
RS-478	SPRING—Rod or swivel guide arm spring (96, 87) (Pkg. of 3)	.25
RS-479	SPRING—Changer spreader spring (62) (Pkg. of 2)	$0.30
RS-480	SPRING—Swivel spreader spring (95) (Pkg. of 3)	.25
RS-481	SPRING—Manual and rejection rod spring (73) (Pkg. of 3)	.25
RS-482	SPRING—Motorboard mounting spring (Pkg. of 6)	.15
RS-483	SPRING—Adjusting screw lock spring (19) (Pkg. of 12)	.25
RS-484	SPRING—Pick-up plunger spring (Pkg. of 3)	.10
RS-485	SPRING—Pick-up lead spring (97) (Pkg. of 3)	.25
RS-486	SPRING—Hinge pin spring (Pkg. of 6)	.20
RS-512	SWIVEL—Swivel shaft and head assembly (23)	.90
RS-513	SLEEVE—Motor mounting grommet sleeve (51) (Pkg. of 3)	.25
RS-514	SWIVEL SPREADERS—Upper or lower swivel spreaders (90, 91)	.20
•RS-887 / *RS-859	SCREW—Needle screw	.10
RS-877	SCREW—Trunnion shoulder screw (Pkg. of 3)	.25
RS-878	SCREW—Motorboard mounting screw (Pkg. of 4)	.20
RS-935	SHAFT—Front changer shaft and pin (74)	.60
RS-936	SHAFT—Rear changer shaft and pin (60)	.60
RS-3053	SWITCH—OFF-ON switch with lockwasher and 16-inch leads (54)	.90
RS-3054	SWITCH—Push-button switch unit (75)	1.70
RT-918	TURNTABLE—11½-inch mahogany flock turntable for Model H-118	2.20
RT-220	TONE ARM—Tone arm assembly with lamp bracket and cord assembly	2.40
RX-070	ASSEMBLY—Pick-up plunger, sleeve and nut assembly (21, 22)	.65
RX-071	ASSEMBLY—Stop lever and hub assembly (93)	.55
RX-072	ASSEMBLY—Swivel tube and trunnion assembly (20, 24, 25)	1.00

•FOR MODEL HJ-119

*Used on previous receivers.

(Prices subject to change without notice)

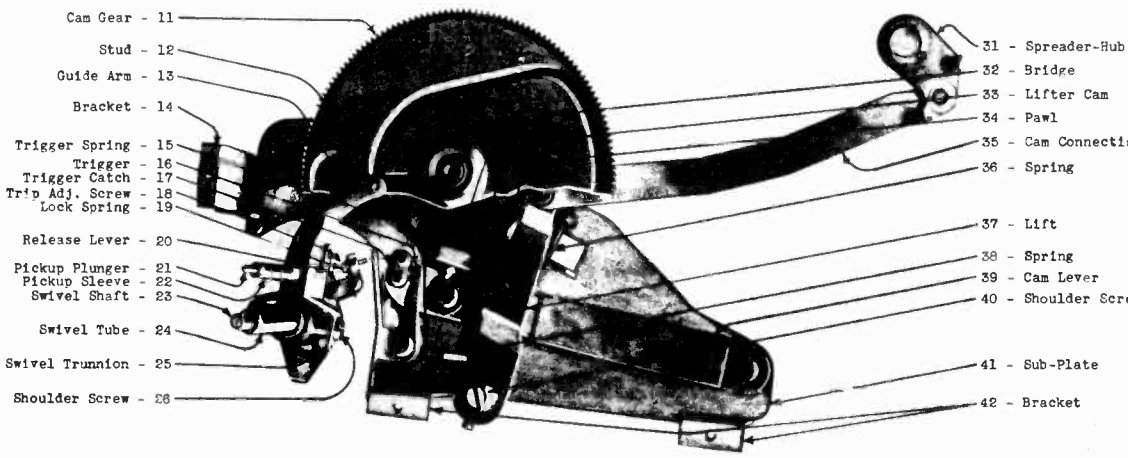


Fig. 10. Sub-Plate Assembly

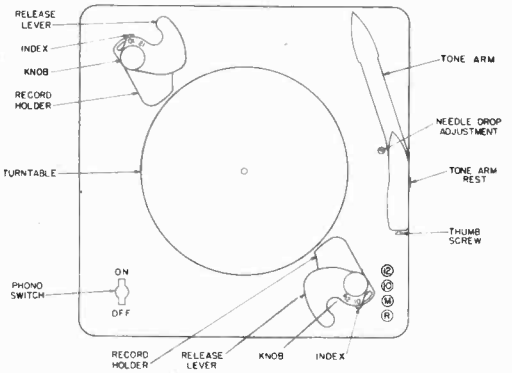


Fig. 8. Phono Compartment

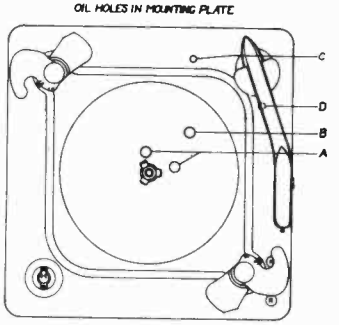


Fig. 9. Oiling Diagram

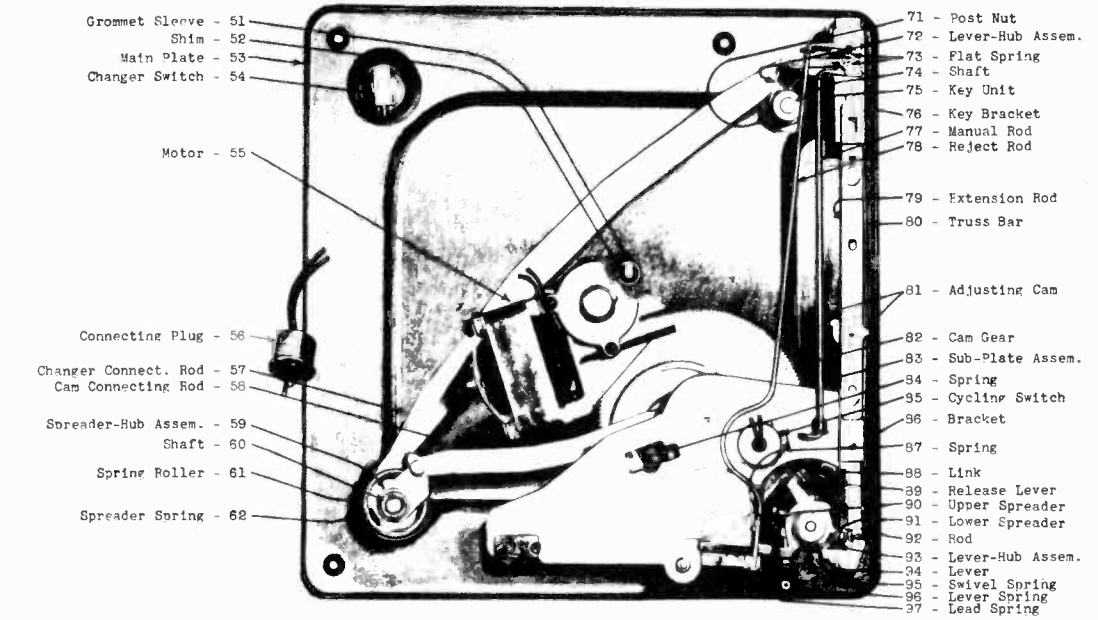


Fig. 11. Bottom View of Record Changer

The Models H-116 and H-118 contain three-band a-c-operated receivers employing eleven General Electric Pre-tested Tubes in a superheterodyne circuit. The receivers are equipped with eleven Feathertouch Tuning keys, eight of which may be set up for favorite stations. The three remaining keys allow power control, manual tuning and phonograph or television audio reception. Each model is also equipped with the new *Super* Beam-a-scope; a highly efficient, self-contained antenna circuit. Other features of design include: "Alnico" dynapower speaker, floodlighted station-key finder, visualux dial, iron-core I.F. transformers, automatic tone compensation, automatic volume control, and push-pull output.

The Model H-118 also incorporates an automatic record changer which will play either 10- or 12-inch records. A feature of the phonograph design is the automatic record-rejection mechanism which permits record rejection at any time during the reproduction by merely pressing the reject button. A high-quality crystal pick-up and tone arm assures full tone range and smooth needle tracking. A constant-speed, self-starting silent electric motor provides uniform turntable operation.

MODELS H116, H118, HJ119
MODEL HJ1005
Parts Lists

GENERAL ELECTRIC CO.

REPLACEMENT PARTS LIST

MODELS H-116 AND H-118

Stock No.	Description	List Price
	CHASSIS ASSEMBLY	
*RB-008	BOARD—Terminal board (2 lugs)	$0.10
*RB-026	BOARD—Antenna terminal board	.10
*RB-092	BOARD—Terminal board (6 terminals)	.10
*RB-093	BOARD—Terminal board (6 lugs)	.10
RB-174	BRACKET—Tuning eye bracket	.15
*RB-621	BEZEL—Pilot lamp bezel	.20
RB-1009	BOARD—Phono-terminal board	.10
RB-1010	BOARD—Loop terminal board	.10
*RC-009	CAPACITOR—.001 mfd. 600 V. paper (C-26)	.30
RC-011	CAPACITOR—.002 mfd. 600 V. paper (C-20)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-28, 31)	.25
*RC-042	CAPACITOR—.01 mfd. 1000 V. paper (C-42)	.30
*RC-051	CAPACITOR—.02 mfd. 1500 V. paper (C-38)	.30
*RC-055	CAPACITOR—.003 mfd. 600 V. paper (C-32)	.25
*RC-072	CAPACITOR—.05 mfd. 200 V. paper (C-19, 29)	.25
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-23, 35, 36)	.30
*RC-096	CAPACITOR—0.1 mfd. 200 V. paper (C-15, 33)	.30
*RC-104	CAPACITOR—0.1 mfd. 600 V. paper (C-13, 51)	.30
*RC-148	CAPACITOR—.25 mfd. 600 V. paper (C-52)	.35
RC-206	CAPACITOR—47 mmf. mica (C-14)	.35
*RC-216	CAPACITOR—47 mmf. mica (C-18, 25, 34)	.25
*RC-235	CAPACITOR—100 mmf. mica (C-24)	.25
RC-242	CAPACITOR—150 mmf. mica (C-12)	.25
*RC-293	CAPACITOR—470 mmf. mica (C-27)	.30
RC-307	CAPACITOR—750 mmf. silvered mica (C-11)	.40
RC-337	CAPACITOR—1600 mmf. mica (C-9)	.25
RC-389	CAPACITOR—4300 mmf. mica (C-10)	.40
RC-745	CONDENSER—Tuning condenser (C-1)	3.00
RC-863	CORD—Power Cord	.65
*RC-992	CUSHION—Tuning condenser cushion (Pkg. of 3)	.10
*RC-1977	CLAMP—Tuning eye clamp	.10
RC-1987	CLAMP—Ant-Osc. coil clamp (Pkg. of 2)	.05
RC-2001	CORE—Touch-tuning coil tuning core	.15
RC-5130	CAPACITOR—40 mfd. 350 V; 20 mfd. 300 V; 20 mfd. 300 V; 20 mfd. 25 V; dry electrolytic (C-41, 40, 39, 37)	2.10
RC-6512	CAPACITOR—B band padder capacitor (C-8)	$0.35
RC-6526	CAPACITOR—7-65 mmf. trimmer (C-43, 44)	.35
RC-6527	CAPACITOR—20-180 mmf. trimmer (C-45, 46, 47)	.35
RC-6528	CAPACITOR—100-490 mmf. trimmer (C-48, 49, 50)	.35
RC-8128	CABLE—Tuning eye cable for Model (H-116)	.40
RC-8147	CABLE—Tuning eye cable for Model (H-118)	.40
RF-015	FOOT—Rubber mounting foot for chassis of Model (H-116)	.05
RF-017	FOOT—Rubber mounting foot for chassis of Model (H-118) (Pkg. of 5)	.10
RK-044	KNOB—Control knob (Pkg. of 2)	.40
RK-205	KEY—Feathertouch Tuning key (Pkg. of 5)	.25
RL-084	COIL—C and D band antenna coil (L-2, 3)	.75
RL-289	COIL—B, C and D band osc. coil (L-4, 5, 6)	1.10
RL-507	BEAM-A-SCOPE—Beam-a-Scope for Model (H-116)	6.60
RL-515	BEAM-A-SCOPE—Beam-a-Scope for Model (H-118)	6.60
RL-9511	COIL—Touch Tuning trimmer coil assembly (L-7 to L-14)	2.35
RL-9513	COIL—Touch Tuning trimmer coil (Range: 1200-1550 KC) (Code—None) (L-7, 8)	.15
RL-9514	COIL—Touch Tuning trimmer coil (Range: 850-1400 KC) (Code—Red) (L-9, 10, 11)	.15
RL-9515	COIL—Touch Tuning trimmer coil (Range: 540-900 KC) (Code—Blue) (L-12, 13, 14)	.15
RN-103	NEEDLE CUP—Phono needle cup	.10
RP-133	PLUG—Loop terminal plug	.05
RP-152	PLUG—Phono motor power connector plug	.25
RQ-667	RESISTOR—2400 ohms, 2-W. carbon (R-25)	.20
*RQ-1213	RESISTOR—12 ohms, ½-W. carbon (R-27) (Pkg. of 5)	.70
*RQ-1215	RESISTOR—15 ohms, ½-W. carbon (R-15) (Pkg. of 5)	.70
*RQ-1223	RESISTOR—33 ohms, ½-W. carbon (R-40) (Pkg. of 5)	.70
*RQ-1231	RESISTOR—68 ohms, ½-W. carbon (R-28) (Pkg. of 5)	.70
*RQ-1247	RESISTOR—330 ohms, ½-W. carbon (R-5) (Pkg. of 5)	.70
*RQ-1259	RESISTOR—1000 ohms, ½-W. carbon (R-7, 12, 33, 34) (Pkg. of 5)	.70
*RQ-1279	RESISTOR—6800 ohms, ½-W. carbon (R-3) (Pkg. of 5)	$0.70
RQ-1289	RESISTOR—18,000 ohms, ½-W. carbon (C-42) (Pkg. of 5)	.70
*RQ-1291	RESISTOR—22,000 ohms, ½-W. carbon (R-1) (Pkg. of 5)	.70
*RQ-1299	RESISTOR—47,000 ohms, ½-W. carbon (R-4, 8, 10, 18, 29, 31) (Pkg. of 5)	.70
*RQ-1311	RESISTOR—150,000 ohms, ½-W. carbon (R-14, 17) (Pkg. of 5)	.70
*RQ-1315	RESISTOR—220,000 ohms, ½-W. carbon (R-9, 22, 23)	.70
*RQ-1317	RESISTOR—270,000 ohms, ½-W. carbon (R-21) (Pkg. of 5)	.70
*RQ-1331	RESISTOR—1.0 megohm, ½-W. carbon (R-2, 19, 30) (Pkg. of 5)	.70
*RQ-1339	RESISTOR—2.2 megohms, ½-W. carbon (R-11) (Pkg. of 5)	.70
*RQ-1343	RESISTOR—3.3 megohms, ½-W. carbon (R-20) (Pkg. of 5)	.70
*RQ-1347	RESISTOR—4.7 megohms, ½-W. carbon (R-16, 41) (Pkg. of 5)	.70
*RQ-1349	RESISTOR—5.6 megohms, ½-W. carbon (R-32) (Pkg. of 5)	.70
RR-351	RESISTOR—100 ohms, 3.4-W. wire wound, (R-24)	.20
RR-352	RESISTOR—2200 ohms, 2.6-W. wire wound, (R-26)	.20
*RS-236	SOCKET—Pilot lamp socket assembly	.10
*RS-252	SOCKET—Tube socket	.15
RS-255	SOCKET—Electrolytic mounting socket	.05
RS-270	SOCKET—Phono motor power connector-socket	.25
RS-423	SPRING—Knob spring (Pkg. of 10)	.25
*RS-864	THUMB SCREW—Tuning eye clamp thumb screw (Pkg. of 10)	.40
RS-1802	SHIELD—Tuning eye shield	.10
RS-1805	SHIELD—Beam-a-Scope electrostatic shield for model (H-118)	1.60
RS-1806	SHIELD—Metal shield on phono pin jack. (Pkg. of 5)	.25
RS-1807	SHIELD—Beam-a-Scope electrostatic shield for Model (H-116)	1.10
RS-3026	SWITCH—Tone control switch (S-3)	.60
RS-3027	SWITCH—Band-change switch (S-1, 2)	1.10
RS-3028	SWITCH—Feathertouch Tuning switch (S-7, 8)	3.90
RS-3055	SWITCH—Power switch on key assembly	.40
RT-112	TRANSFORMER—Power transformer 50-60 cycles (T-4)	6.40
RT-113	TRANSFORMER—Power transformer, 25 cycles (T-5)	10.60
RT-317	TRANSFORMER—1st I.F. transformer assembly (T-1)	2.00
RT-318	TRANSFORMER—2nd I.F. transformer assembly (T-2)	2.00
RT-463	TRANSFORMER—Output transformer (T-3)	1.50
RT-865	TRIMMER STRIP—Ant. tuning trimmer strip (C-43 to C-50)	1.60
RT-866	TRIMMER STRIP—B, C and D osc. and C and D ant. trimmers (C-3, 4, 5, 6, 7)	.70
RV-069	VOLUME CONTROL—2 megohm volume control (R-13)	.60
	SPEAKER ASSEMBLY	
RC-9009	CONE ASSEMBLY—Speaker cone assembly	.95
RP-129	PLUG—Speaker plug (Pkg. of 2)	.10
RS-1014	SPEAKER—14 in. P.M. speaker (complete)	6.00

REPLACEMENT PARTS LIST

MODEL HJ-1005

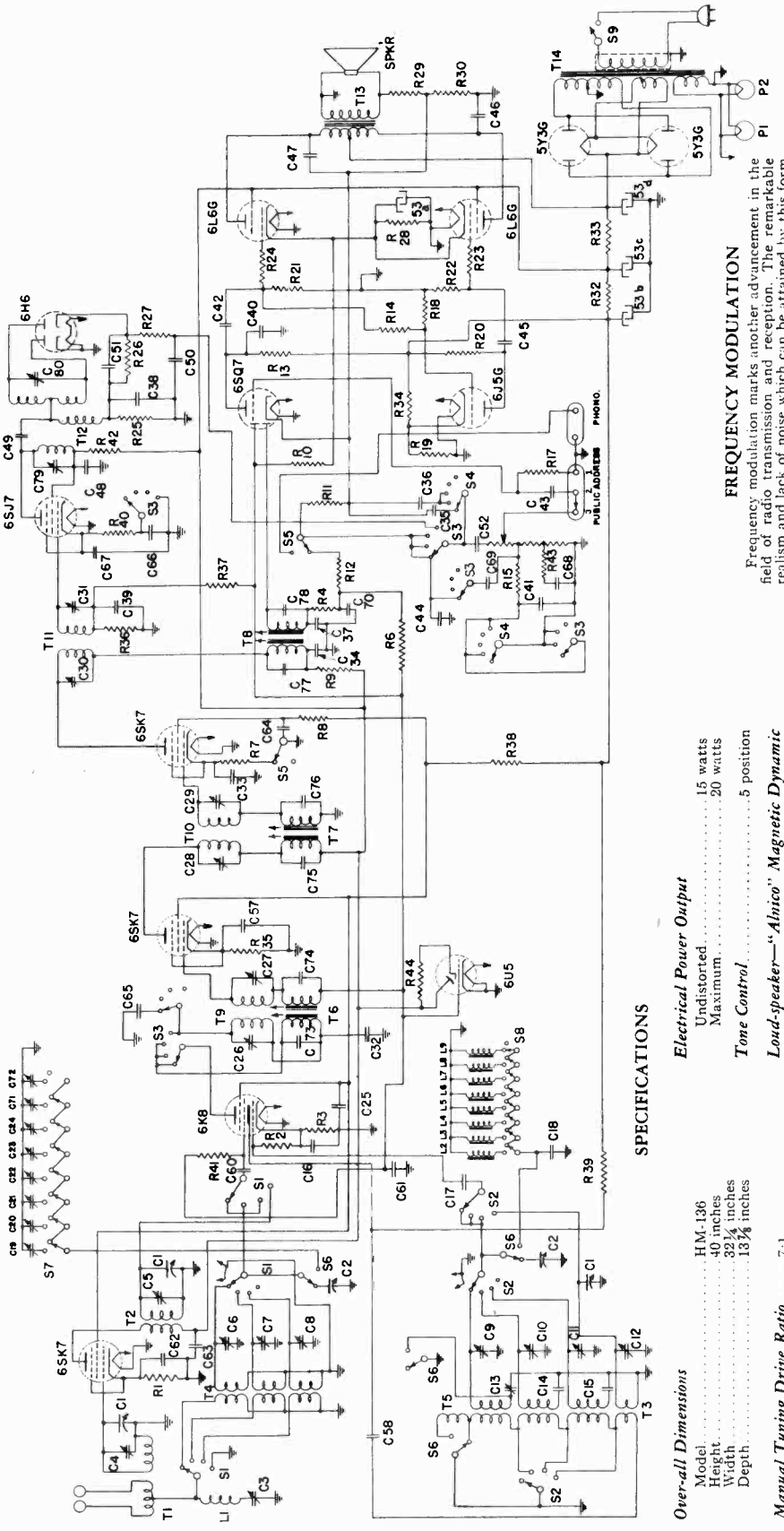
	CHASSIS ASSEMBLY	
*RB-008	BOARD—Terminal board (2 lugs)	$0.10
*RB-013	BOARD—Terminal board (2 lugs)	.10
*RB-026	BOARD—Antenna terminal board	.10
*RB-092	BOARD—Terminal board (6 terminals)	.10
*RB-093	BOARD—Terminal board (6 lugs)	.10
*RB-096	BOARD—Terminal board (3 lugs)	.10
*RB-183	BRACKET—Rear condenser mounting bracket	.05
*RB-1009	BOARD—Phono-terminal board	.10
*RC-006	CAPACITOR—.0015 mfd. 600 V. paper (C-26)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-28, 31)	.25
*RC-042	CAPACITOR—.01 mfd. 1000 V. paper (C-42)	.30
*RC-051	CAPACITOR—.02 mfd. 1000 V. paper (C-38)	.30
*RC-055	CAPACITOR—.003 mfd. 600 V. paper (C-32)	.25
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-35, 36)	.30
*RC-094	CAPACITOR—.08 mfd. 400 V. paper (C-53)	.25
*RC-096	CAPACITOR—0.1 mfd. 200 V. paper (C-15)	.30
*RC-123	CAPACITOR—0.1 mfd. 400 V. paper (C-13)	.35
*RC-147	CAPACITOR—.25 mfd. 400 V. paper (C-20, 52)	.20
*RC-206	CAPACITOR—47 mmf. mica (C-14)	.35
*RC-216	CAPACITOR—47 mmf. mica (C-18, 25)	.25
*RC-235	CAPACITOR—100 mmf. mica (C-24)	.25
RC-244	CAPACITOR—150 mmf. mica (C-12)	.25
*RC-293	CAPACITOR—470 mmf. mica (C-27)	.30
*RC-307	CAPACITOR—750 mmf. silvered mica (C-11)	.40
*RC-348	CAPACITOR—1600 mmf. mica (C-9)	.35
*RC-389	CAPACITOR—4300 mmf. mica (C-10)	.40
*RC-863	CORD—Power cord	.65
*RC-1987	CLAMP—Ant.-Osc. coil clamp (Pkg. 2)	.05
*RC-5148	CAPACITOR—20 mfd. 25 V.; 20 mfd. 250 V., 20 mfd. 250 V., 40 mfd. 250 V., dry electrolytic (C-37a, 37b, 37c, 37d)	1.75
RC-6533	CAPACITOR—Padding capacitor (C-8)	.30
RC-8161	CABLE—Tuning indicator cable	.40
*RF-015	FOOT—Rubber mounting foot for chassis	.05
*RK-044	KNOB—Control knob (Pkg. 2)	.40
*RL-084	COIL—C and D band antenna coil (L-2, 3)	.75
*RL-289	COIL—B, C and D band osc. coil (L-4, 5, 6)	1.10
*RTN-001	NUT—Volume and tone control pal nut (Pkg. 5)	.10
*RQ-667	RESISTOR—2400 ohms, 2-W. carbon (R-25)	.20
*RQ-1215	RESISTOR—15 ohms, ½ W. carbon (R-15) (Pkg. 5)	.70
*RQ-1223	RESISTOR—33 ohms, ½-W. carbon (R-40) (Pkg. 5)	.70
*RQ-1239	RESISTOR—150 ohms, ½-W. carbon (R-28) (Pkg. 5)	.70
*RQ-1245	RESISTOR—270 ohms, ½-W. carbon (R-46) (Pkg. 5)	.70
*RQ-1247	RESISTOR—330 ohms, ½-W. carbon (R-5) (Pkg. 5)	.70
*RQ-1259	RESISTOR—1000 ohms, ½-W. carbon (R-33, 34) (Pkg. 5)	.70
*RQ-1291	RESISTOR—22,000 ohms, ½-W. carbon (R-1) (Pkg. 5)	.70
*RQ-1347	RESISTOR—4.7 meg. ½-W carbon (R-41, 44) (Pkg. 5)	.70
*RQ-1487	RESISTOR—15,000 ohms, 1-W. carbon (R-45)	.20
*RR-351	RESISTOR—100 ohms, 3.4-W wire wound (R-24)	.20
*RR-352	RESISTOR—2200 ohms, 2.6-W. wire wound (R-26)	.20
*RS-223	SOCKET—Octal tube socket (Pkg. 5)	.80
*RS-236	SOCKET—Dial lamp socket assembly	.10
*RS-255	SOCKET—Electrolytic mounting socket	.05
*RS-3027	SWITCH—Band change switch (S-1, 2)	1.10
*RS-3032	SWITCH—Tone control switch (S-3)	.45
*RT-112	TRANSFORMER—50-60 cycle power transformer (T-4)	6.40
*RT-113	TRANSFORMER—25-cycle power transformer (T-5)	10.60
*RT-324	TRANSFORMER—1st I.F. transformer (T-1)	1.90
*RT-325	TRANSFORMER—2nd I.F. transformer (T-2)	2.20
RT-483	TRANSFORMER—Output transformer (T-3)	1.10
*RT-866	TRIMMER STRIP—B, C and D osc. and C and D ant. trimmers (C-3, 4, 5, 6, 7)	.70
*RT-868	TRIMMER STRIP—Ant. tuning trimmer strip (C-48, 50)	1.20
*RW-113	WASHER—Felt washers for control shifts (Pkg. 25)	.10
*RQ-1299	RESISTOR—47,000 ohms, ½-W. carbon (R-4, 8, 29) (Pkg. 5)	$0.70
*RQ-1303	RESISTOR—68,000 ohms, ½-W. carbon (R-18) (Pkg. 5)	.70
*RQ-1307	RESISTOR—100,000 ohms, ½-W. carbon (R-42) (Pkg. 5)	.70
*RQ-1311	RESISTOR—150,000 ohms, ½-W. carbon (R-23) (Pkg. 5)	.70
*RQ-1315	RESISTOR—220,000 ohms, ½-W. carbon (R-9, 22) (Pkg. 5)	.70
*RQ-1317	RESISTOR—270,000 ohms, ½-W. carbon (R-21) (Pkg. 5)	.70
*RQ-1319	RESISTOR—330,000 ohms, ½-W. carbon (R-17) (Pkg. 5)	.70
*RQ-1331	RESISTOR—1.0 meg. ½-W. carbon (R-2) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 meg. ½-W. carbon (R-11) (Pkg. 5)	.70
*RQ-1343	RESISTOR—3.3 meg. ½-W. carbon (R-20) (Pkg. 5)	.70
	CONDENSER-DIAL DRIVE ASSEMBLY	
*RB-172	BRACKET—Volume control bracket	.05
*RB-173	BRACKET—Tuning shift bracket	.20
*RB-174	BRACKET—Tuning indicator mounting bracket	.15
*RB-175	BRACKET—Reflector and pulley bracket assembly (R.H.)	.45
*RB-176	BRACKET—Reflector and pulley bracket assembly (L.H.)	.40
*RC-745	CONDENSER—Tuning condenser (C-1)	3.00
*RC-992	CUSHION—Tuning condenser cushion (Pkg. 3)	.10
*RC-1977	CLAMP—Tuning indicator clamp	.10
*RC-8127	CABLE—Condenser drive cable assembly	.20
*RC-8501	CARD—Station letter cards (1 set)	.25
*RC-8502	CARD—"Off" tab card (Pkg. 10)	.10
*RC-8503	CARD—"Manual" tab card (Pkg. 10)	.10
*RC-8504	CARD—"Phono-tele" tab card (Pkg. 10)	$0.10
*RD-409	DRUM—Condenser drive drum assembly	.30
*RD-510	DIFFUSER—Large diffuser strip	.05
*RD-511	DIFFUSER—Small diffuser strip	.10
*RE-200	ESCUTCHEON BAND — Escutcheon band-tuning	.20
*RE-201	ESCUTCHEON BAND — Escutcheon band-volume	.20
RE-209	ESCUTCHEON ASSEMBLY—Main dial escutcheon assembly	4.15
*RH-008	HAIRPIN COTTER—Tuning drive shaft retaining cotter (Pkg. 10)	.05
*RM-500	MASK—Reflector cover mask	.05
*RP-132	POINTER—Tuning pointer assembly	.25
*RP-303	PULLEY—Pulley and "C" slip assembly (Pkg. 2)	.10
*RR-926	REFLECTOR—Dial scale reflector	.15
*RS-463	SPRING—Drive cable spring (Pkg. 5)	.10
*RS-464	SPRING—Dial wheel and knob spring (Pkg. 10)	.05
*RS-864	SCREW—Tuning indicator clamp mounting thumb screw (Pkg. 10)	.40
*RS-925	SHAFT—Tuning control shaft	.05
*RS-1801	SHIELD—Dial lamp shield and reflector	.10
*RS-1802	SHIELD—Tuning indicator shield	.10
*RV-069	VOLUME CONTROL—2 megohms volume control (R-13)	.60
*RW-038	WINDOW—Celluloid station lefter window (Pkg. 25)	.10
*RW-908	WHEEL—Dial wheel assembly	.30
	TOUCH-TUNING ASSEMBLY	
*RC-2001	CORE—Touch-tuning coil tuning core	.15
RC-2011	CUSHION—Touch-tuning coil cushion	.05
*RC-6526	CAPACITOR—7-65 mmf. trimmer (C-50)	.35
*RC-6527	CAPACITOR—20-180 mmf. trimmer (C-48, 49)	.35
*RC-6528	CAPACITOR—100-490 mmf. trimmer (C-43, 45, 56)	.35
*RK-205	KEY—"Feathertouch" tuning key (Pkg. 5)	.25
RL-9516	COIL—Touch-tuning trimmer coil assembly (L-7 to L-12)	7.10
RL-9517	COIL—Touch-tuning trimmer coil (Range: 1200 to 1550 K.C.) (Code—none) (L-12)	$0.15
RL-9518	COIL—Touch-tuning trimmer coil (Range: 850 to 1400 K.C.) (Code—Red) (L-10, 11)	.15
RL-9519	COIL—Touch-tuning trimmer coil (Range: 540 to 900 K.C.) (Code—Blue) (L-7, 8, 9)	.15
*RS-3033	SWITCH—"Feathertouch" tuning switch (S-7, 8)	3.40
*RS-3055	SWITCH—Power switch on key assembly (S-5)	.40
	BEAM-A-SCOPE ASSEMBLY	
*RB-1010	BOARD—Loop terminal board	.10
RC-8162	CABLE—Beam-a-Scope drive cable (Pkg. 5)	.20
*RL-507	LOOP—Beam-a-Scope antenna (L-1)	6.60
*RP-133	PLUG—Loop terminal plug	.05
RP-319	PULLEY—Beam-a-Scope drive pulley	.20
RS-515	SPOOL—Beam-a-Scope drive spool (Pkg. 5)	.15
*RS-1807	SHIELD—Beam-a-Scope shield	1.10
RS-4004	SPRING—Beam-a-Scope drive spring (Pkg. 3)	.10
RS-9002	SHAFT—Beam-a-Scope drive shaft	.05
	SPEAKER ASSEMBLY	
*RC-9009	CONE ASSEMBLY—14-inch speaker cone assembly	.95
*RC-9010	CONE ASSEMBLY—6½-inch speaker cone assembly	.90
*RP-128	PLUG—6½-inch speaker plug	.10
*RP-129	PLUG—14-inch speaker plug	.10
*RS-1012	SPEAKER—6½-inch Dynapower speaker (complete)	3.25
*RS-1014	SPEAKER—14-inch Dynapower speaker (complete)	6.00
*RT-954	TERMINAL—Speaker lead terminal (Pkg. 10)	.10
*RX-030	ASSEMBLY—6½-inch speaker mounting assembly	.10
*RX-062	ASSEMBLY—14-inch speaker mounting washer, nut, grommet assembly	.10

* Used on previous receivers.

(Prices subject to change without notice)

MODEL HM136
Schematic, Notes

GENERAL ELECTRIC CO.



SPECIFICATIONS

Over-all Dimensions

Model	HM-136
Height	40 inches
Width	32¼ inches
Depth	13⅝ inches

Manual Tuning Drive Ratio 7:1

Electrical Specifications

115 Volts AC, 50-60 cycles, 140 watts.

Tuning Frequency Range

Frequency Modulation	39-44 MC
Short-wave	7500-22,000 KC
Police-Amateur	2400-7500 KC
Standard Broadcast	540-1700 KC

Intermediate Frequency

Frequency Modulation	2100 KC
"B," "C" and "D" Bands	455 KC

Electrical Power Output

Undistorted	15 watts
Maximum	20 watts

Tone Control ..... 5 position

Loud-speaker—"Alnico" Magnetic Dynamic

Type Cone	Curvilinear
Outside Cone Diameter	10 inches
Voice Coil Impedance (400 cycles)	3.5 ohms

Tubes

R.F. Amplifier	GE-6SK7
Converter-Oscillator	GE-6K8
I.F. Amplifiers	(2) GE-6SK7
Noise Limiter	GE-6SJ7
Discriminator	GE-6H6
Det., Aud., AVC	GE-6SQ7
Phase Inverter	GE-6J5G
Power Output	(2) GE-6L6G
Rectifier	(2) GE-5Y3G
Tuning Indicator	GE-6U5
Dial Lamp	(2) MAZDA No. 44

FREQUENCY MODULATION

Frequency modulation marks another advancement in the field of radio transmission and reception. The remarkable realism and lack of noise which can be attained by this form of transmission has created widespread interest.

Present-day broadcasting stations superimpose sound programs on the radio frequency carrier signal by varying the carrier amplitude at the sound frequency rate. This is known as amplitude modulation.

Frequency modulated signals are obtained by varying the frequency of the carrier signal at the sound frequency rate. The amount the carrier frequency is varied is representative of the strength of the sound. The use of frequency variations as high as 60 or 70 KC positive and negative (120 or 140 over-all) requires the use of specially designed wide-band R.F. and I.F. amplifier stages. Such band widths preclude the use of carrier signals in the neighborhood of the broadcast band where 120 KC would cover a considerable portion of the band. Therefore, transmission frequencies have been established in the short-wave band between 39 and 44 MC.

MODEL HM136
Voltage, Socket, Notes
Chassis Wiring

GENERAL ELECTRIC CO.

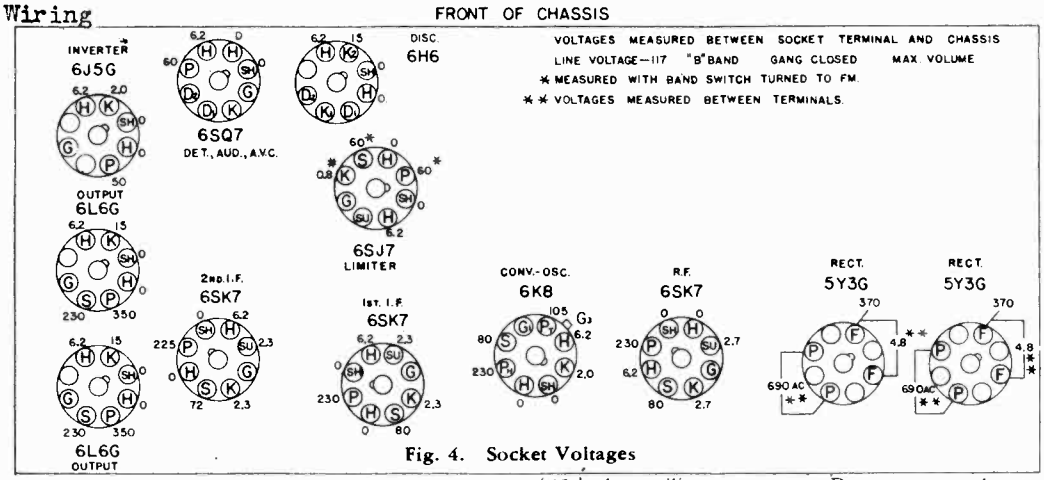


Fig. 4. Socket Voltages

GENERAL INFORMATION

The Model HM-136 is a combination frequency-modulation receiver and three-band radio using thirteen General Electric Pre-tested Tubes. Separate channels working into common tubes are employed for the detection and amplification of the frequency-modulated and amplitude-modulated R.F. and I.F. signals. An R.F. stage is employed in the frequency-modulated channel for increased sensitivity. Double interstage I.F. transformers are used with the frequency-modulated sections capacity-tuned and the amplitude-modulated sections inductively tuned. Other features of design include single-ended tubes in all stages except the converter-oscillator stage which uses a double section tube for increased stability, iron-core tuned oscillator coils for automatic station selection, noise limiter, discriminator, terminal board for conveniently connecting detector outputs to a public address system, "plug-in" type phono terminal, 10-inch curvilinear-type cone Dynapower speaker, and beam-power push-pull output.

ANTENNA

As a result of the high transmission frequencies the use of ordinary antennas for the reception of frequency-modulation signals is not satisfactory. General Electric builds a specially designed dipole antenna Model HT-9 for use with frequency-modulation receivers. For distances up to thirty miles from the transmitter a simple horizontal dipole with an over-all arm length of 10 feet 8 inches should give excellent results. The antenna should be located free of all obstructions and placed as a high as is practicable. A noticeable gain in signal strength will be obtained as antenna height is increased. Generally best results will be obtained if the dipole arms are horizontal and at right angles to the direction of the frequency-modulation station. The lead-in transmission line may be of any length up to 100 feet and should consist of low-loss antenna lead-in wire.

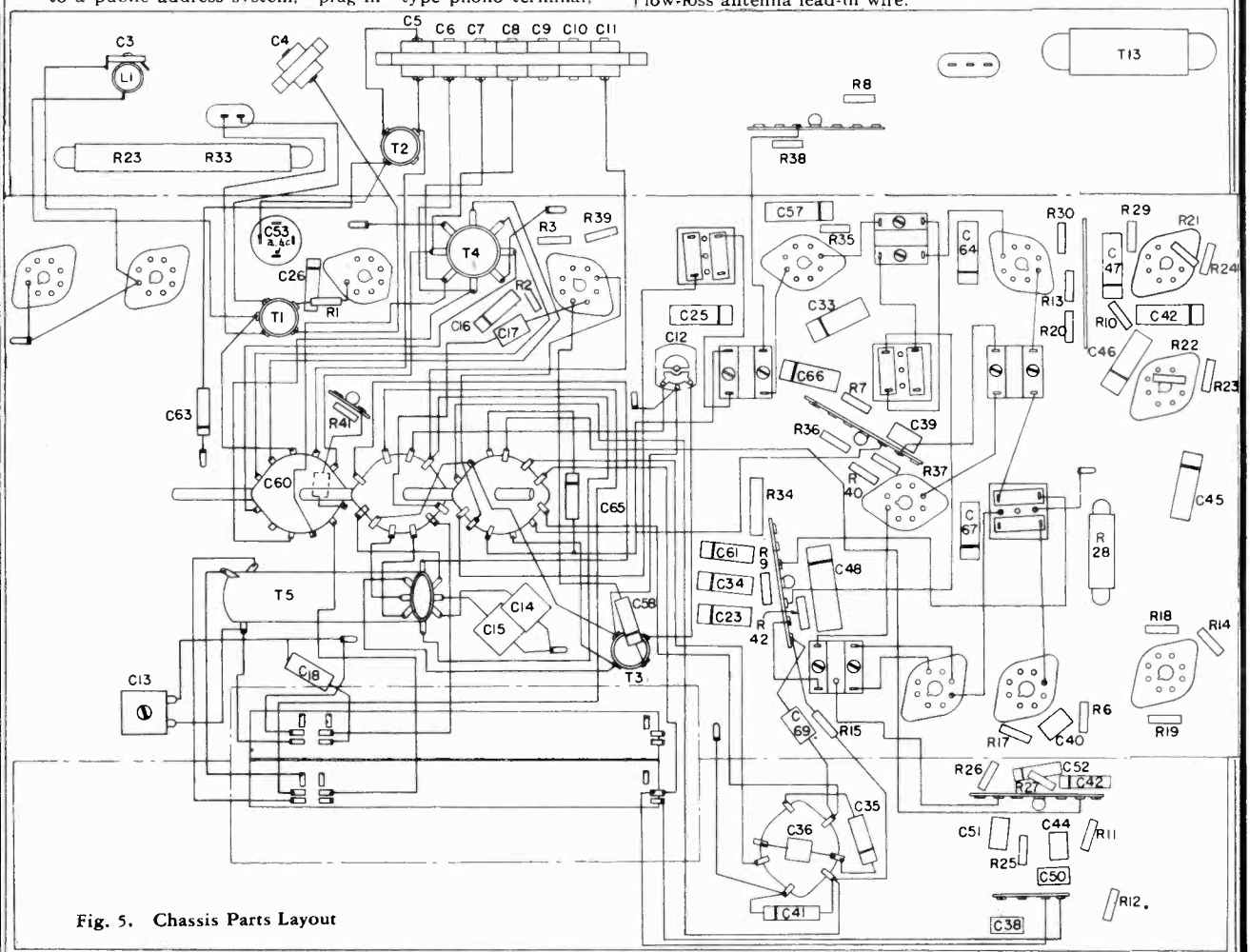


Fig. 5. Chassis Parts Layout

MODEL HM136
Alignment, Parts

GENERAL ELECTRIC CO.

AMPLITUDE MODULATION

I.F. ALIGNMENT WITH OSCILLOSCOPE

Band-switch Setting	Input Frequency	Tone Control Position	Point of Input*	Iron-core Trimmer	Comments
1. Band B	455 K.C. and 30 K.C. sweep	Bass	2nd I.F. 6SK7 Grid	3rd I.F. Sec. 3rd I.F. Pri.	Condenser gang at minimum capacity—Manual key depressed—vertical input to ground and junction of R-4 and R-12. Adjust iron core trimmers in order mentioned for a single curve of maximum amplitude. Since iron-core trimmers are at top and bottom of shield cans most effective alignment can be obtained by using two non-metallic screwdrivers simultaneously.
2. Band B	455 K.C. and 30 K.C. sweep	Bass	1st I.F. 6SK7 Grid	2nd I.F. Sec. 2nd I.F. Pri.	
3. Band B	455 K.C. and 30 K.C. sweep	Bass	Converter Grid	1st I.F. Sec. 1st I.F. Pri.	
4. Band B	455 K.C. and 30 K.C. sweep	Bass	Converter Grid	All I.F. Trimmers	

I.F. ALIGNMENT WITH OUTPUT METER

1. Band B	455 K.C. modulated	Bass	2nd I.F. 6SK7 Grid	3rd I.F. Sec. 3rd I.F. Pri.	Condenser gang at minimum capacity—Manual key depressed—output meter connected across voice coil—volume control at maximum—input as low as practical. Adjust all trimmers in order listed for maximum output. Since iron-core trimmers are at top and bottom of shield cans most effective alignment can be obtained by using two non-metallic screwdrivers simultaneously.
2. Band B	455 K.C. modulated	Bass	1st I.F. 6SK7 Grid	2nd I.F. Sec. 2nd I.F. Pri.	
3. Band B	455 K.C. modulated	Bass	Converter Grid	1st I.F. Sec. 1st I.F. Pri.	
4. Band B	455 K.C. modulated	Bass	Converter Grid	All I.F. Trimmers	

R. F. ALIGNMENT

1. Band B					Connect output meter across voice coil and depress manual key.
2. Band B	1500 K.C. modulated	Bass	Antenna Post**	Osc. (C-9) Ant. (C-6)	Tune in signal by adjusting C-9. Peak C-6 for maximum meter reading.
3. Band B	580 K.C. modulated	Bass	Antenna Post**	Osc. Padder (C-13)	Set dial pointer to 580 K.C. mark and align C-13 for maximum meter reading while rocking the gang condenser.
4. Band C	6 MC modulated	Bass	Antenna Post**	Osc. (C-10) Ant. (C-7)	Set pointer to 6 M.C. mark and align (C-10). Peak (C-7) for maximum output.
5. Band D	21 M.C. modulated	Bass	Antenna Post**	Osc. (C-11) Ant. (C-8)	Set pointer to 21 M.C. mark and align (C-11). Peak C-8 while rocking the gang condenser. The image of any signal on the D band should be 910 K.C. below input signal. Example: 21 M.C. image 20.09 M.C.

* Use "dummy" antenna consisting of .05 mfd. capacitor between signal generator and point of input.
** Use an I.R.E. "dummy" antenna as shown in Fig. 1 between the signal generator and the point of input.

Stock No.	Description	List Price
*RB-008	BOARD—Terminal board (2 lug)	$0.10
*RB-049	BOARD—Antenna terminal board	.10
RB-062	BOARD—Terminal board (6 lug)	.10
*RB-093	BOARD—Terminal board (6 lug)	.10
RB-094	BOARD—Terminal board (7 lug)	.10
RB-172	BRACKET—Volume control mounting bracket	.05
RB-173	BRACKET—Tuning drum support bracket	.20
RB-183	BRACKET—Small removable support bracket for mounting tuning condenser	.05
RB-1009	BOARD—Phono terminal board	.10
RB-1016	BOARD—External amplifier terminal	.15
*RC-006	CAPACITOR—.0015 mfd. 600 V. paper (C-35)	.25
*RC-009	CAPACITOR—.001 mfd. 600 V. paper (C-65)	.25
*RC-011	CAPACITOR—.002 mfd. 600 V. paper (C-58)	.25
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-63)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-43, 52, 68)	.25
*RC-055	CAPACITOR—.003 mfd. 600 V. paper (C-41)	.25
*RC-072	CAPACITOR—.05 mfd. 200 V. paper (C-16, 33, 57, 62)	.25
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-34, 42, 45, 64)	.30
*RC-096	CAPACITOR—0.1 mfd. 200 V. paper (C-61, 66, 67)	.30
*RC-123	CAPACITOR—0.1 mfd. 400 V. paper (C-25, 32)	.35
RC-147	CAPACITOR—.25 mfd. 400 V. paper (C-48)	.35
RC-191	CAPACITOR—.002 mfd. 1500 V. paper (C-46, 47)	.35
*RC-206	CAPACITOR—50 mmf. mica (C-17)	.35
RC-232	CAPACITOR—47 mmf. mica (C-37, 49, 50, 51, 70)	.25
RC-233	CAPACITOR—22 mmf. mica (C-39)	$0.25
*RC-235	CAPACITOR—100 mmf. mica (C-44, 69)	.25
*RC-242	CAPACITOR—150 mmf. mica (C-40, 60)	.25
RC-249	CAPACITOR—220 mmf. mica (C-38)	.25
*RC-293	CAPACITOR—470 mmf. mica (C-36)	.30
RC-307	CAPACITOR—750 mmf. mica (C-18) ±5%	.40
*RC-347	CAPACITOR—1800 mmf. mica (C-14) ±5%	.35
RC-389	CAPACITOR—4300 mmf. mica (C-15) ±5%	.40
RC-676	CAPACITOR—B band padding capacitor (C-13)	.35
*RC-681	CAPACITOR—FM oscillator air trimmer (C-12)	.90
RC-863	CABLE—Power cable	.65

*Used on previous receivers.

(Prices subject to change without notice)

MODEL HM136
Circuit Data
Alignment Procedure

GENERAL ELECTRIC CO.

LOUD-SPEAKER

In order to realize the high fidelity inherent in a frequency-modulated system or present in a well-designed amplitude-modulated system, the audio amplifiers and loud-speaker must be capable of reproducing the signal as received. Conventional conical-type cone loud-speakers because of the sharp break at the cone throat tend to cut off the higher audio frequencies. The use of a curvilinear-type cone loud-speaker in the Model HM-136 eliminates this possible suppression of the higher audio tones and excellent frequency response from 30 to 10,000 cycles per second is obtainable.

To center the voice coil, loosen the two screws which clamp the speaker spider in position. These two screws are accessible from the rear of the speaker. Shift the spider around until the voice coil is centered, then tighten the screws in position.

Phonograph or Television Audio Connections

Each receiver is equipped with a phono terminal (pin jack) to allow the convenient connection of a record player or the detector output of a television converter. General Electric plug, Stock No. RP-145 fits the pin jack. When using a crystal type pick-up, a suitable load consisting of a 100,000 ohm resistor in series with a .01 mfd. capacitor should be connected across the pick-up leads.

Public Address System Connections

A terminal board is located on the back apron of the chassis permitting easy attachment of a public address system. This provision permits feeding programs from either type of transmission into an external amplifier and loud-speaker system. Three terminals are provided and are numbered 1, 2 and 3. To connect an external amplifier to nis receiver remove the link connection between terminals No. 2 and No. 3 and reinsert between terminals No. 1 and No. 2. Connect the external amplifier between terminals No. 1 and No. 3, the ground side of the amplifier being connected to terminal No. 1. If the external amplifier input is not a high impedance type, an impedance matching network will have to be used to insure matching to the 2.0 megohm volume control.

Noise Limiter

The frequency-modulation noise limiter circuit which uses a 6SJ7 tube is essentially a fourth I.F. stage. The tube operates at low plate voltage (60 volts DC) so that plate current cut-off occurs with relatively small grid bias. A small cathode bias developed in R-40 establishes the operating point at the center of the linear portion of the grid-voltage plate-current characteristic. Normal signal input will swing the grid voltage considerably above and below the linear portion of the curve. Negative peaks of the signal voltage will be clipped off by tube cutoff. Positive peaks will be clipped off by grid bias limiting.

Since noise creates wiggles (variations) in the peaks of the carrier signal it can be eliminated by cutting off the carrier peaks. This function takes place in the noise limiter as described above providing, of course that the carrier signal is sufficiently strong to cause grid voltage swing above and below the cut-off points.

Discriminator

The discriminator circuit for a frequency-modulated signal input must secure the audio information by operating on frequency variations. Referring to the schematic diagram, Fig. 3, the frequency-modulated (FM) signal, after passing through the 6SJ7 limiter tube, is applied to the primary winding of the detector transformer (T-12). The secondary is a center tapped winding with the outer ends connected to the 6H6 detector plates as shown. Two 100,000 ohm resistors (R-25 and R-26) are connected in series across the 6H6 cathodes and it is across these resistors that the audio signal appears. The detector transformer (T-12) is tuned to the intermediate frequency (2.1 MC). An I.F. signal of 2.1 MC which is not modulated will swing the detector plates positive and negative an equal amount resulting in equal DC voltages appearing across diode resistors R-25 and R-26. Since these voltages are of opposite polarity the resultant voltage measured across the diode resistors will be zero. When the incoming I.F. signal is frequency modulated it will be swinging above and below the intermediate frequency of 2.1 MC by an amount proportional to the degree of modulation. As the modulated signal swings off the resonant frequency of 2.1 MC unequal voltages will be developed across resistors R-25 and R-26. The resultant voltage measured across both resistors will be equal to the difference between the voltage across R-25 and the voltage across R-26. This resultant voltage will vary in magnitude directly as the degree of modulation. The number of times per second the I.F. signal swings above and below the resonant point produces the audio signal. Hence, the volume of an audio signal is transmitted as the magnitude of the frequency swing of a carrier, and the frequency of an audio signal is transmitted as the rate at which the carrier frequency is swung.

ALIGNMENT PROCEDURE

Frequency Modulation

I.F. Alignment

Due to the good stability of components and the wide-band characteristics of the I.F. circuits, alignment should be unnecessary under normal operating conditions. Should I.F. alignment become necessary, it will require a cathode ray oscilloscope and a 2.1 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: GE Model TMV-97-C oscillator used in conjunction with the Frequency Modulator TMV-128-A will give a 200-300 KC sweep when operating on the 1500—3100 KC band of the test oscillator. To obtain the proper test oscillator mid-frequency (2.1 MC) the following procedure may be followed. Set "wobbler" condenser for about mid-capacity. Tune broadcast receiver to 2.1 MC. Adjust test oscillator tuning until signal is heard at maximum strength in the broadcast receiver. Connect the vertical plates of the oscilloscope across resistor R-36. A 100,000 ohm resistor should be connected in series with the high side of the oscilloscope. Using a .05 mfd. capacitor in series with the high side of the test oscillator output, insert the oscillator sweep signal into the receiver circuit first at the control grid of the 2nd I.F. 6SK7 and align transformer trimmers T-11. The resultant curve should be sharp on either side and quite broad and flat at the peak. Change the signal input to the 1st I.F. 6SK7 grid and align transformer trimmers T-10. The resultant curve should appear as the above stage only less broad at the peak. Align transformer trimmers T-9 with the signal input at the converter grid for sharpness and a flat peak. If peak will not flatten retouch the grid trimmer of transformer T-10. Do not retouch any other trimmers.

Leave the input of the oscillator sweep signal at the converter grid and connect the vertical oscilloscope plates across the resistors R-25 and R-26. Align transformer T-12 for an X-shaped crossover curve. Proper alignment of C-80 is indicated when the curve crosses about midway in the vertical plane. Proper alignment of C-79 is indicated when the sides of the curve near crossover are nearest to a straight line.

NOTE:—Keep signal input high enough so that noise limiter is functioning. This point is indicated when an increase in signal input no longer changes the size of the curve.

R.F. Alignment

Make sure the dial pointer coincides with the first division on the low frequency end of the dial scale when the gang condenser is completely closed.

1. Connect a 0-50 or 0-100 microammeter in series with the low end of R-36. A high resistance 0-10 V., D.C. voltmeter may be used instead of the microammeter. Connect the voltmeter across R-36 with a 100,000 ohm resistor in series with the high side.
2. Apply an unmodulated signal in the region of 43 megacycles to one of the antenna terminals using a 50-ohm resistor in series with the high side of the signal generator output.
3. Adjust pointer so it is set to the scale mark of the signal used and peak trimmers C-12, C-5 and C-4 progressively for maximum meter reading.

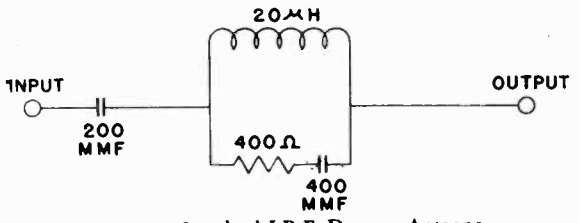


Fig. 1. Standard I.R.E. Dummy Antenna

Stock No.	Description	List Price
*RC-992	CUSHION — Tuning condenser cushion (Pkg. 3)	.10
RC-1977	CLAMP—Tuning indicator clamp and thumb screw	.10
RC-1987	CLAMP—Ant-osc. coil clamp (Pkg. 2)	.05
RC-2001	CORE—Touch Tuning coil tuning core	.15
RC-5141	CAPACITOR—40 mfd. 25 V., 30 mfd. 450 V., 20 mfd. 450 V., 20 mfd. 400 V. dry electrolytic (C-53a, 53b, 53c, 53d)	2.70
RC-6519	CAPACITOR—FM antenna trimmer (C-4)	.15
RC-7015	CONDENSER—Tuning condenser (C-1, 2)	5.50
RC-8127	CABLE—Tuning drive cable assembly	.20
RC-8137	CABLE—Tuning indicator cable	.40
RC-8501	CARD—Station letter card	.25
RC-8502	CARD—Key "Off" tab card (Pkg. 10)	.10
RC-8503	CARD—Key "Manual" tab card (Pkg. 10)	.10
RC-8504	CARD—Key "Phono-Tele" tab card (Pkg. 10)	.10
RC-9021	CONE ASSEMBLY—10 inch speaker cone assembly	2.00
RD-120	DIAL—Main dial scale	3.25
RD-409	DRUM—Tuning condenser drive drum assembly	.30
RD-510	DIFFUSER—Large diffuser strip	.05
RD-511	DIFFUSER—Small diffuser strip (Pkg. 5)	$0.10
RE-062	ESCUTCHEON—Main dial escutcheon	2.25
RE-200	ESCUTCHEON BAND—Tuning escutcheon band	.20
RE-201	ESCUTCHEON BAND—Volume escutcheon band	.20
RF-015	FOOT—Rubber foot on chassis	.05
*RG-016	GRID CLIP—6K8 grid clip (Pkg. 5)	.10
RG-756	GEAR—Band switch miter gear	
RH-008	HAIRPIN COTTER—Tuning shaft hairpin cotter (Pkg. 10)	.05
RK-044	KNOB—Tone or band switch knob (Pkg. 2)	.40
RK-205	KEY—Feathertouch Tuning key (Pkg. 5)	.25
RL-093	COIL—B, C, D, band antenna coil (T-4)	
RL-603	COIL—Wave trap coil assembly (L-1, C-3)	.60
RL-2011	COIL—B, C, D, oscillator coil (T-5)	1.60
RL-9511	COIL ASSEMBLY—Station selector coil assembly (L-2, 3, 4, 5, 6, 7, 8, 9)	2.35
RL-9513	COIL—Touch Tuning trimmer coil (Range: 1200-1550 KC) (Code—none) (L-2, 3)	.15
RL-9514	COIL—Touch Tuning trimmer coil (Range: 850-1400 KC) (Code—red) (L-4, 5, 6)	.15
RL-9515	COIL—Touch Tuning trimmer coil (Range: 540-900 KC) (Code—blue) (L-7, 8, 9)	.15
RM-504	MASK—Black felt dial scale mask	.10
RP-132	POINTER—Dial scale pointer	.25
RP-303	PULLEY—Drive cord pulley (Pkg. 2)	.10
*RQ-687	RESISTOR—15000 ohm 2 W. carbon (R-34)	.35
RQ-751	RESISTOR—180 ohm 3 W. carbon (R-28)	.30
*RQ-1215	RESISTOR—15 ohm ½ W. carbon (R-30) (Pkg. 5)	.70
RQ-1229	RESISTOR—56 ohm ½ W. carbon (R-29)	
*RQ-1243	RESISTOR—220 ohm ½ W. carbon (R-3, 19, 40) (Pkg. 5)	.70
*RQ-1247	RESISTOR—330 ohm ½ W. carbon (R-1, 7, 35) (Pkg. 5)	.70
*RQ-1259	RESISTOR—1000 ohm ½ W. carbon (R-9, 23, 24) (Pkg. 5)	.70
*RQ-1275	RESISTOR—4700 ohm ½ W. carbon (R-8) (Pkg. 5)	.70
*RQ-1277	RESISTOR—5600 ohm ½ W. carbon (R-38) (Pkg. 5)	.70
*RQ-1279	RESISTOR—6800 ohm ½ W. carbon (R-39) (Pkg. 5)	.70
*RQ-1299	RESISTOR—47,000 ohm ½ W. carbon (R-2, 4, 12, 43) (Pkg. 5)	.70
*RQ-1303	RESISTOR—68,000 ohm ½ W. carbon (R-20) (Pkg. 5)	.70
*RQ-1307	RESISTOR—100,000 ohm ½ W. carbon (R-25, 26) (Pkg. 5)	.70
*RQ-1311	RESISTOR—150,000 ohm ½ W. carbon (R-11) (Pkg. 5)	.70
*RQ-1313	RESISTOR—180,000 ohm ½ W. carbon (R-15) (Pkg. 5)	.70
*RQ-1315	RESISTOR—220,000 ohm ½ W. carbon (R-13, 21, 22, 27) (Pkg. 5)	.70
*RQ-1317	RESISTOR—270,000 ohm ½ W. carbon (R-18) (Pkg. 5)	.70
*RQ-1319	RESISTOR—330,000 ohm ½ W. carbon (R-36) (Pkg. 5)	.70
*RQ-1331	RESISTOR—1.0 megohm ½ W. carbon (R-41, 44) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohm ½ W. carbon (R-6, 37) (Pkg. 5)	.70
*RQ-1343	RESISTOR—3.3 megohm ½ W. carbon (R-14) (Pkg. 5)	$0.70
*RQ-1347	RESISTOR—4.7 megohm ½ W. carbon (R-17) (Pkg. 5)	.70
*RQ-1349	RESISTOR—5.6 megohm ½ W. carbon (R-10) (Pkg. 5)	.70
*RQ-1499	RESISTOR—47,000 ohm 1 W. carbon (R-42)	.20
RR-779	RESISTOR—4700 ohm 10 W., 3000 ohm 3.6 W. (R-32, 33)	.60
RS-236	SOCKET—Dial light socket assembly	.10
RS-252	SOCKET—Octal tube socket	.15
RS-253	SOCKET—Electrolytic mounting socket	.10
RS-463	SPRING—Drive cord tension spring (Pkg. 5)	.10
RS-464	SPRING—Dial control wheel spring (Pkg. 10)	.05
RS-925	SHAFT—Tuning drum shaft	.05
RS-931	SHAFT—Band switch extension shaft	.15
RS-1021	SPEAKER—10 inch P.M. speaker	10.25
RS-1801	SHIELD—Dial light white reflector shield	.10
RS-1802	SHIELD—Tuning indicator rubber shield	.10
RS-3040	SWITCH—Tone control switch (S-4)	.75
RS-3041	SWITCH—Band change switch (S-1, 2, 3)	1.65
RS-3042	SWITCH—Feathertouch Tuning switch (S-5, 6, 7, 8, 9)	4.00
RT-334	TRANSFORMER—1st I.F. transformer assembly (T-6)	2.00
RT-335	TRANSFORMER—2nd I.F. transformer assembly (T-7)	2.00
RT-336	TRANSFORMER—3rd I.F. transformer (T-8)	2.40
RT-472	TRANSFORMER—Output transformer (T-13)	3.15
RT-865	TRIMMER STRIP—Station selector trimmer strip (C-19, 20, 21, 22, 23, 24, 71, 72)	1.60
RT-869	TRIMMER STRIP—Antenna R.F. oscillator trimmers (C-5, 6, 7, 8, 9, 10, 11)	1.00
RT-954	TERMINAL—Speaker lead terminal (Pkg. 10)	.10
RT-1000	TRANSFORMER—50-60 cycle power transformer (T-14)	10.20
RT-2000	TRANSFORMER—FM antenna transformer (T-1)	.95
RT-2001	TRANSFORMER—FM oscillator transformer (T-3)	.85
RT-2002	TRANSFORMER—FM R.F. transformer (T-2)	.90
RT-2003	TRANSFORMER—FM 1st I.F. transformer (T-9)	.95
RT-2004	TRANSFORMER—FM 2nd I.F. transformer (T-10)	.95
RT-2005	TRANSFORMER—FM 3rd I.F. transformer (T-11)	.95
RT-2006	TRANSFORMER—4th I.F. Discrim. Transformer (T-12)	1.20
RV-075	VOLUME CONTROL—2.0 megohm volume control (R-16)	.70
RW-038	WINDOW—Station letter window (Pkg. 25)	.10
RW-113	WASHER—Felt washer for control shafts (Pkg. 25)	.10
RW-908	WHEEL—Tuning or volume wheel	.30
RX-062	ASSEMBLY—Speaker mounting assembly	.10

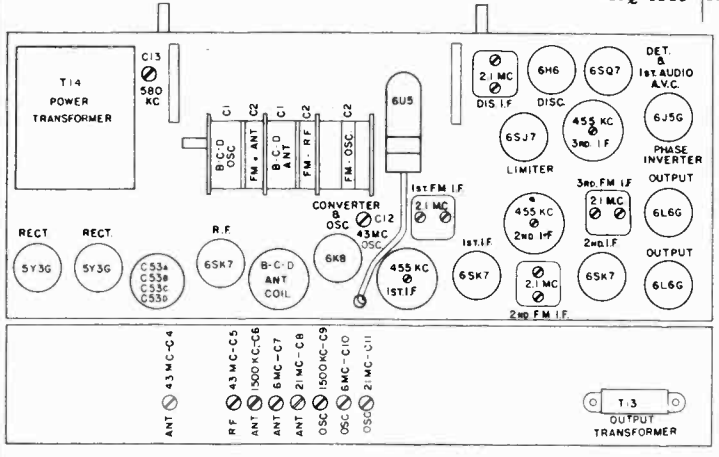


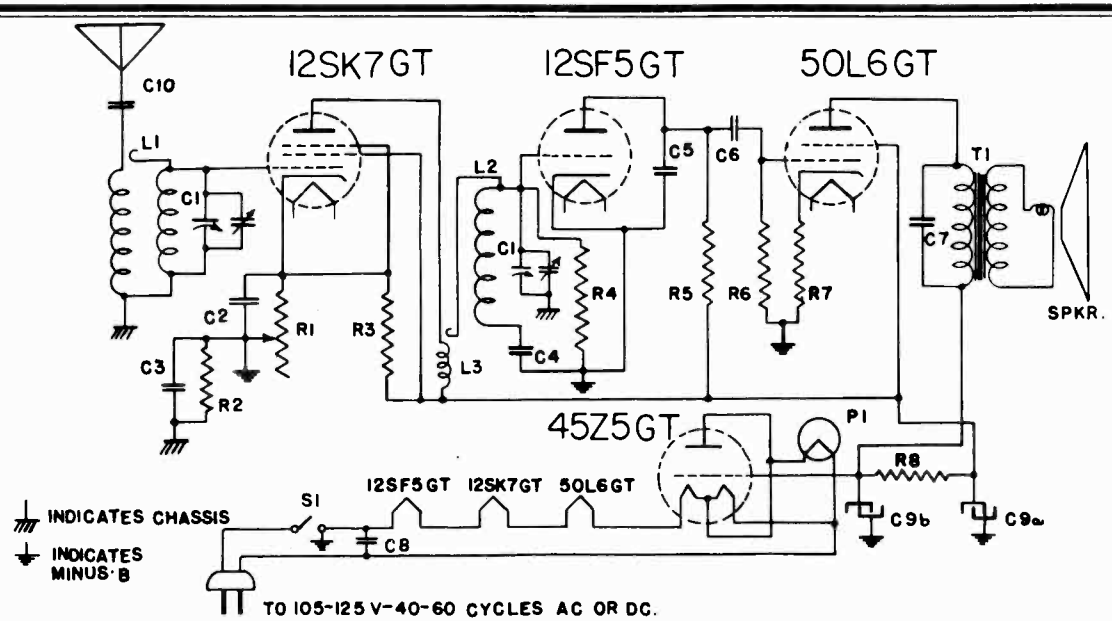
Fig. 2. Trimmer Location

*Used on previous receivers.

(Prices subject to change without notice)

Model HM-136

Insist on Genuine Factory-tested Parts, Available from Authorized Dealers



Symbol	Description	Symbol	Description	Symbol	Description
C-1	Tuning condenser	C-8	.02 mfd. paper capacitor	R-3	50,000 ohm carbon resistor
C-2	.02 mfd. paper capacitor	C-9a	16 mfd. dry electrolytic	R-4	5.6 megohms carbon resistor
C-3	0.1 mfd. paper capacitor	C-9b	16 mfd. dry electrolytic	R-5	3.0 megohms carbon resistor
C-4	.02 mfd. paper capacitor	C-10	.001 mfd. paper capacitor	R-6	1.0 megohms carbon resistor
C-5	100 mmf. mica capacitor	P-1	Dial lamp, MAZDA No. 47	R-7	150 ohms carbon resistor
C-6	.01 mfd. paper capacitor	R-1	25,000 ohm volume control	R-8	2000 ohms carbon resistor
C-7	.02 mfd. paper capacitor	R-2	250,000 ohm carbon resistor		

Fig. 2. Schematic Diagram

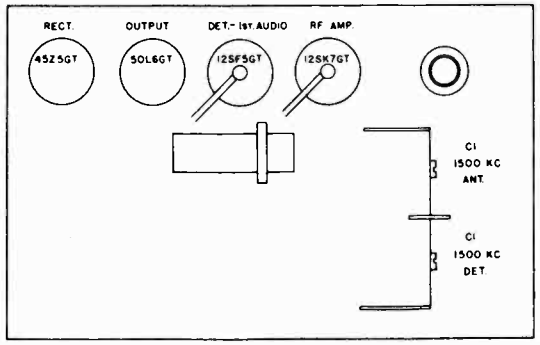


Fig. 1. Trimmer Location

Tubes

R.F. Amplifier GE-12SK7GT
Detector-Audio GE-12SF5GT
Power Output GE-50L6GT
Rectifier GE-45Z5GT

Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
105–125 AC or DC	40–60	30

Tuning Frequency Range

Band "B" ..... 540–1700 KC
Alignment Frequency ..... 1500 KC

VOLTAGE CHART

Tube No.	12SK7GT	12SF5GT	50L6GT	45Z5GT
Plate to –B Volts	110	17*	120	115 AC
Screen to –B Volts	110		120	
Cathode to –B Volts	0	0	7.5	130
Filament Volts	12.6	12.6	50	Entire filament ** 45

Voltage measured when volume control is set to maximum.

Line Voltage—115 AC. No signal input. On DC, voltages should read approximately 10 per cent lower.

*Measured on 250-volt scale—1000 ohms per voltmeter.

**Measured between socket terminal No. 2 and No. 7.

GENERAL INFORMATION

Model H-406U is a compact four-tube AC-DC tuned radio frequency receiver that tunes the broadcast band of frequencies. This model has the full approval of the Underwriters' Laboratories.

When operating from a DC source of power, it is necessary to insert the power plug with the proper polarity; otherwise, the receiver will fail to function. If any hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

ALIGNMENT

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

1. With gang condenser plates completely closed, the tuning pointer should be over the last mark on the dial.
2. Tune receiver to the 1500 KC point on the dial; then align trimmers on the gang condenser at 1500 KC for a maximum output meter reading.

Electrical Power Output

Undistorted ..... 0.9 watts
Maximum ..... 1.8 watts

Loud-speaker—"Alnico" Magnet Dynamic

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

GENERAL ELECTRIC CO.

MODEL HM171
Schematic

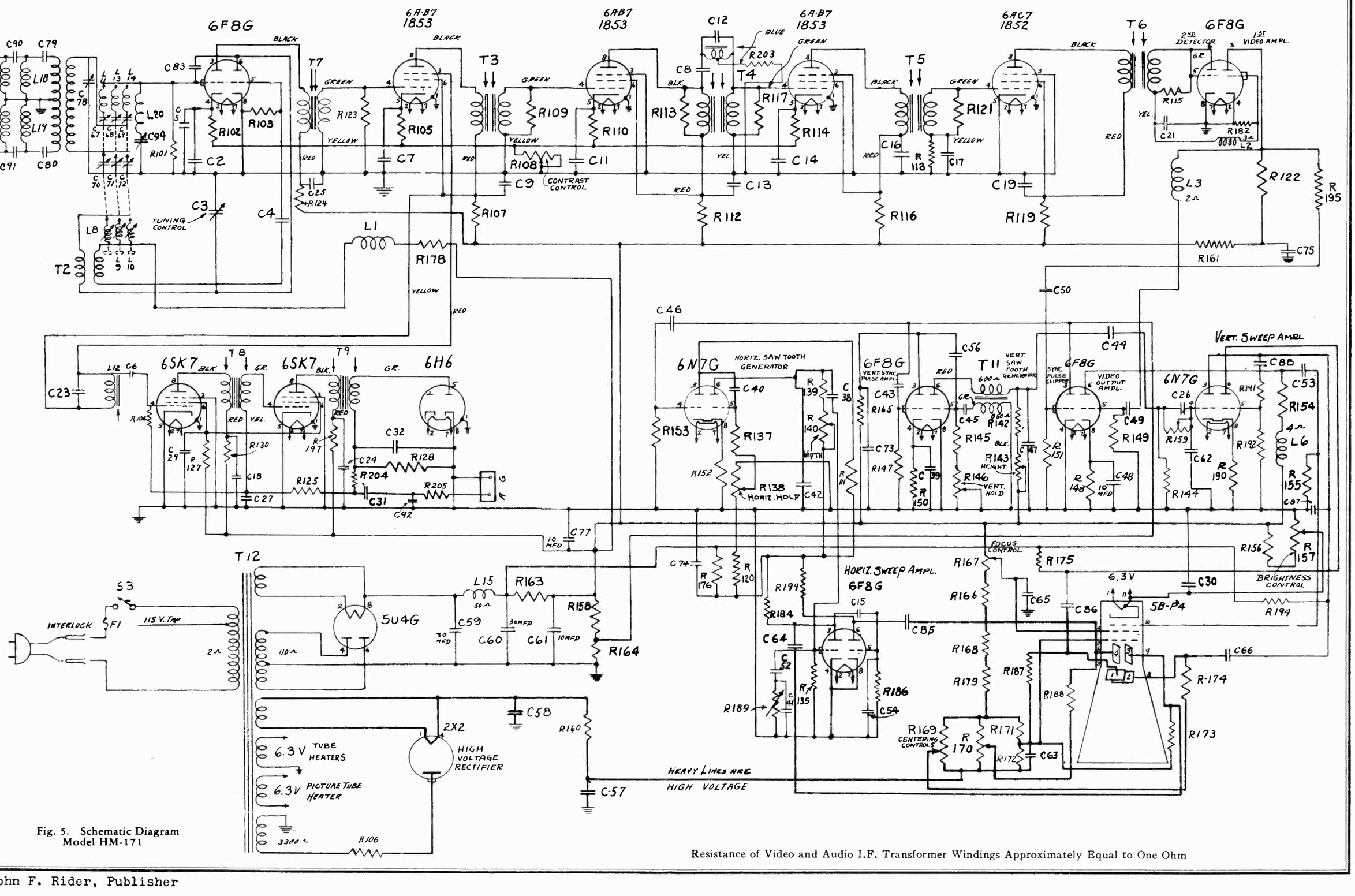


Fig. 5. Schematic Diagram
Model HM-171

Resistance of Video and Audio I.F. Transformer Windings Approximately Equal to One Ohm

MODEL HM171
MODEL HM185
Voltage,Chassis,Notes

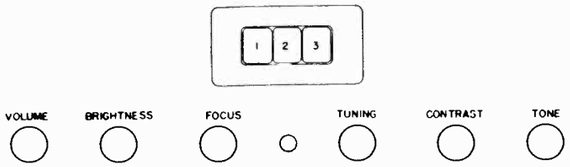


Fig. 2. Front Panel Control Location Model HM-185

(Note—Model HM-171 Control Location is same as above with Volume and Tone Controls removed.)

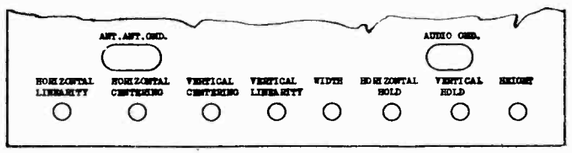


Fig. 3. Rear Cover Control Location Models HM-171 and HM-185

RECEIVER CIRCUIT DESCRIPTION

R.F. Unit

Starting at the antenna terminal posts, there follows a single-stage high-pass filter in the antenna primary to reduce video I.F. interference, a shunt capacity coupled secondary (C-78), and a video I.F. wave trap (C-95, L-20). The wave trap is broadly tuned at 11.75 MC. Any one of the three tuned circuits for each of the three television transmission bands can be connected into the secondary circuit by pressing appropriate button. The secondary circuit when properly tuned gives a broad, flat response curve.

Converter-Oscillator and Amplifier

The 6F8G converter employs one half as the oscillator and the other half as the biased first detector. The oscillator is plate-tuned with vernier tuning permitted from the front control panel through trimmer (C-3). The resultant video I.F. signal of 12.75 MC and the audio I.F. signal of 8.25 MC developed in the converter-oscillator tube circuit is coupled through transformer T-7 to the first 1853 amplifier tube.

Audio Unit

The audio I.F. signal is taken off the suppressor of this first 1853 tube. Two stages of 8.25 MC audio I.F. using 6SK7's follow. In the case of the HM-171 the audio I.F. signal is then detected and the resultant audio signal is made available at terminals for insertion into a radio output circuit. In Model HM-185 the 6SK7 stages are followed by a 6SQ7 detector and driver, and a 6F6G output stage.

Video Unit

Four stages of video I.F. follow the converter stage. The third stage incorporates a wave trap for the adjacent audio channel at 14.25 MC. The nominal pass band for these amplifiers is 12.75 to 10.75 MC. The second detector uses one half of a 6F8G connected as a diode. The other half of the 6F8G is used as the first video amplifier. The video output is coupled directly to the picture tube grid.

Sync Pulse Clipper

Sync-pulses are taken off the plate of the clipper section of the clipper and video output tube. The video signals are separate by tube cut-off since the plate voltage is only about 12 volts.

Horizontal Oscillator-output

The clipper feeds the horizontal multivibrator 6N7G directly with needle-point, negative sync pulses. C-46 blocks the flow of vertical sync pulses, into the horizontal multivibrator since they are of a low order of frequency. The horizontal sync pulses which are amplified by the first section of the 6N7G are coupled to the grid of the second section and drive the circuit into violent oscillation. Resulting plate and grid current flow sends the tube to cut-off. The sawtooth wave so generated is applied to the horizontal sweep amplifier one section of which is a phase inverter. This push-pull sweep is coupled to the horizontal deflecting plates of the picture tube. Horizontal hold is controlled by varying the charging rate of the generator circuit, through (R-138). Compensating for high frequency loss adds a means of controlling horizontal linearity which is done through R-189. Width is varied by regulating the magnitude of the charge through R-140.

Vertical Oscillator-output

The sync pulses are also coupled into the vertical oscillator 6F8G where the circuits composed of C-73 and R-165 bypasses the horizontal sync pulses. The vertical sync pulses are coupled into the vertical sweep generator circuit causing violent oscillatory swings which result in sawtooth waves. The height control (R-146) determines the magnitude of the charge before the next oscillation thus governing the height of the picture. R-146, the horizontal hold control, governs the rate of charging. The vertical linearity control (R-159) accomplishes results similar to the horizontal linearity control. The vertical sweep amplifier produces push-pull output by phase inversion and this output is applied to the vertical deflecting plates of the picture tube.

Low Voltage Rectifier

Low voltage power is obtained from a 5U4G using one stage of choke filtering and the remaining of the resistance filter type.

High Voltage Rectifier

The anode voltage of the picture tube is obtained from a single half-wave rectifier with a protective resistor in series with the transformer plate lead.

Loudspeaker

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.

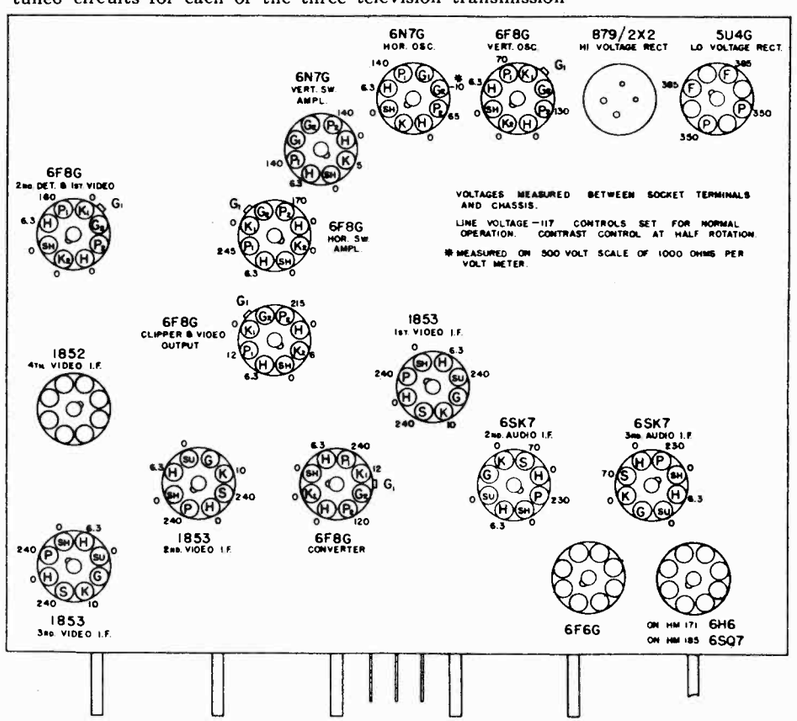


Fig. 9. Socket Voltages Models HM-171 and HM-185

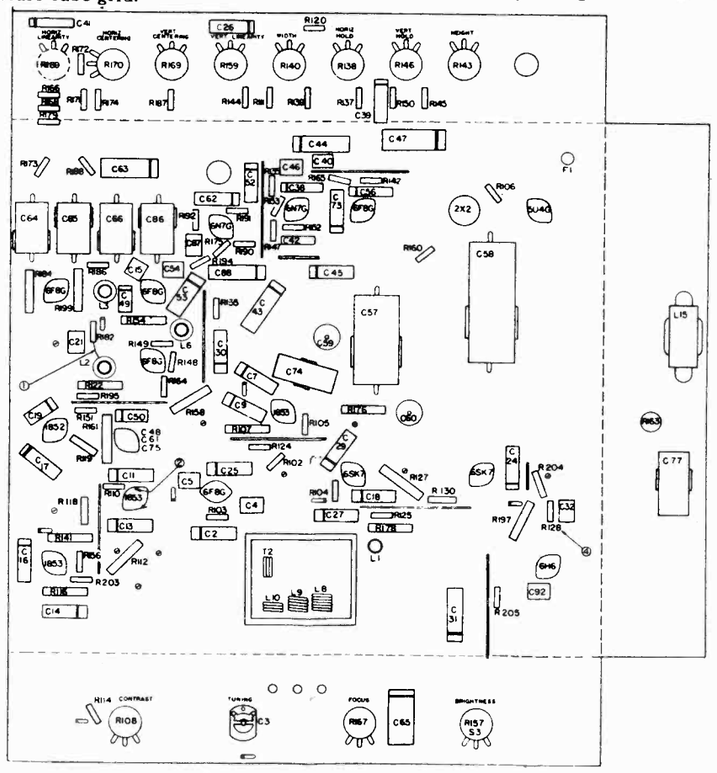


Fig. 1. Chassis Parts Layout Model HM-171

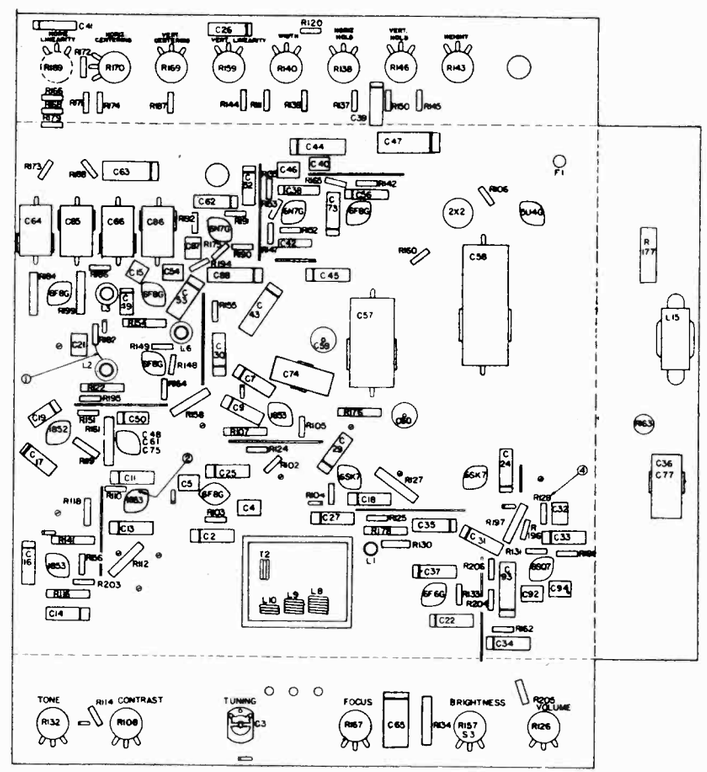


Fig. 4. Chassis Parts Layout Model HM-185

GENERAL ELECTRIC CO.

MODEL HM185
Schematic

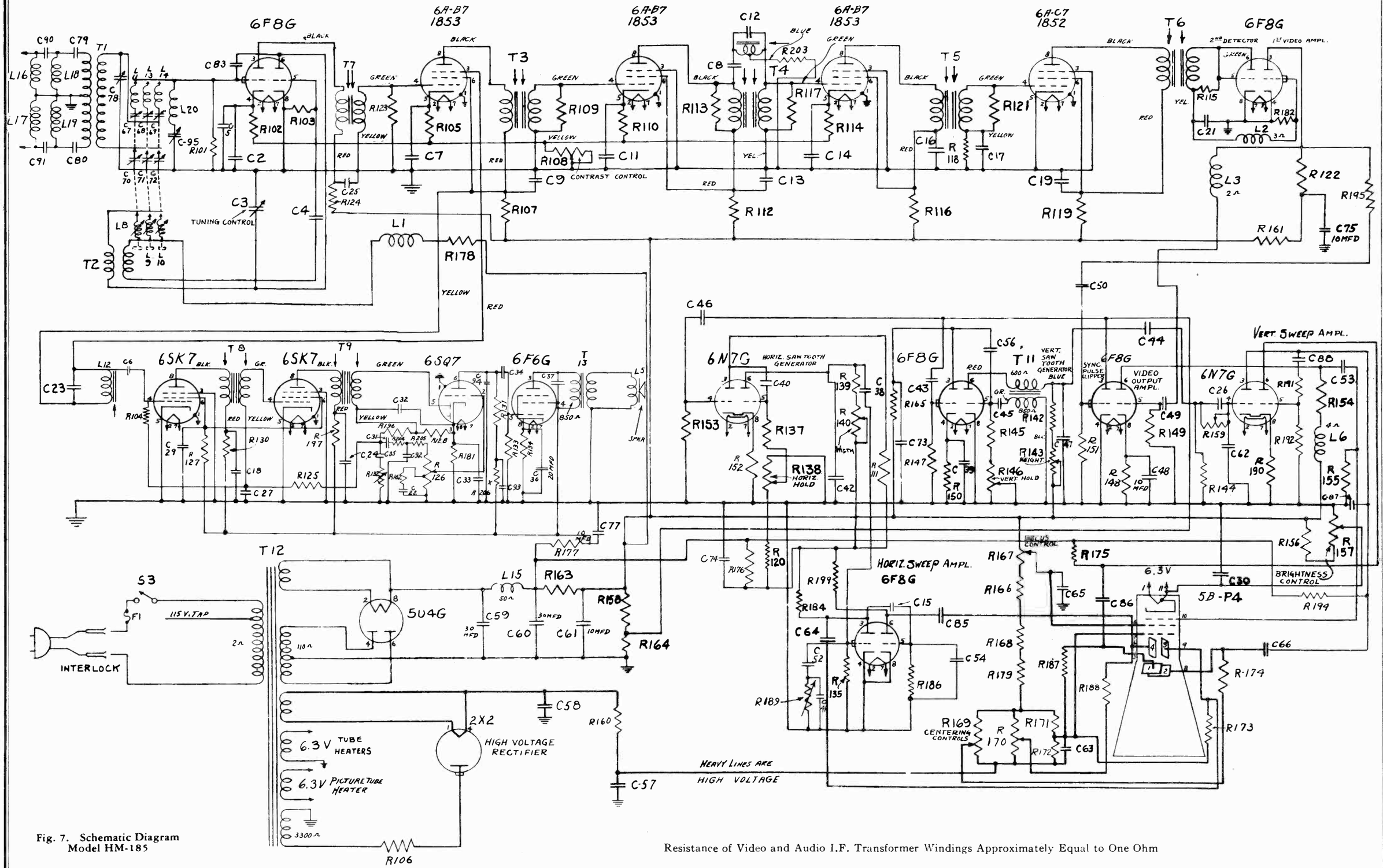


Fig. 7. Schematic Diagram
Model HM-185

Resistance of Video and Audio I.F. Transformer Windings Approximately Equal to One Ohm

MODEL HM171
MODEL HM185
Alignment

GENERAL ELECTRIC CO.

GENERAL INFORMATION

General Electric Picture Receiver and Sound Converter Model HM-171, is a table type, 17-tube, superheterodyne receiver equipped with a 5-inch, electrostatic-deflected, picture tube. The receiver works in conjunction with any radio receiver, which is designed for phonograph reproduction, to reproduce the sound portion of the television broadcast.

General Electric Television Receiver, Model HM-185 is a console type, 18-tube, superheterodyne receiver with a complete sound channel and using a 5-inch, electrostatic-deflected picture tube.

Additional design features include iron-core I.F. tuning, automatic tone compensation, automatic volume control and constant high-gain antenna coupling circuit.

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.

(C) R.F. Alignment
- (1) Cathode ray oscilloscope
- (2) Wide-band sweep oscillator capable of sweeping the following bands.
  - (a) 44 to 50
  - (b) 50 to 56
  - (c) 66 to 72

Electrical Specifications

Model	Power Supply (Volts)	Frequency (Cycles per Second)	Power Consumption (Watts)
HM-171	115–125	60	170
HM-185	115–125	60	170

Tuning Frequency Range

Band No. 1 ..... 44–50 MC.
Band No. 2 ..... 50–56 MC.
Band No. 3 ..... 66–72 MC.

Intermediate Frequencies

Television Video (Picture) ..... 12.75 MC.
Television Audio ..... 8.25 MC.

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. See Fig. 1 or 4, arrow (1).
2. 7.5–15 MC Sweep	Control grid of 1853 (2nd video I.F.)		Connect output tap of video I.F. Sweep oscillator to control grid of 1853 (2nd video I.F.) See Fig. 1 or 4, arrow (2). 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. 6, curve 1.
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 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	Same as in No. 2	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. 6, 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	Same as in No. 2	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. 6, curve 1.
7. 7.5–15 MC Sweep	Same as in No. 2	Iron cores of 3rd video transformer T-4	Adjust primary and secondary iron cores for maximum gain, flatness and proper centering. See Fig. 6, curve 1.
8. 7.5–15 MC Sweep	Converter grid, 6F8G	Iron cores of 2nd video transformer T-3	Connect low tap to grid (On top of tube). Adjust primary and secondary iron cores for maximum gain, flatness and proper centering. See Fig. 6, curve 2.
9. 7.5–15 MC Sweep	Converter grid, 6F8G	Iron cores of 1st video transformer T-7	Connect low tap to grid. Adjust iron cores for maximum gain flatness and proper centering.
10. 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 HM171
MODEL HM185
Alignment

GENERAL ELECTRIC CO.

Maximum Electrical Output

Model HM-171. (Dependent upon radio receiver output)
Model HM-185 ..... 5 watts

Loudspeaker—"Alnico" Magnetic Dynamic

Model HM-185
Cone Diameter ..... 12 inches
Voice Coil Impedance (400 cycles) ..... 3.5 ohms

Picture Size

Height ..... 3¼ inches
Width ..... 4¼ inches

Tubes

Converter-Oscillator GE-6F8G
Audio & Video I.F. Amplifier GE-1853/6AB7
2nd and 3rd Audio I.F. Amplifiers ..... (2)GE-6SK7
Det., Audio, AVC (HM-185) GE-6SQ7
Det. and AVC (HM-171) GE-6H6
Audio Output (HM-185) GE-6F6G
2nd and 3rd Video I.F. Amplifiers ..... (2)GE-1853/6AB7
4th Video I.F. Amplifier GE-1852/6AC7
Video Det. and 1st Video Amplifier GE-6F8G
Video Output and Sync. Clipper GE-6F8G
Vertical Oscillator GE-6F8G
Vertical Output GE-6N7G
Horizontal Oscillator GE-6N7G
Horizontal Output GE-6F8G
High Voltage Rectifier GE-879/2X2
Low Voltage Rectifier GE-5U4G
Picture Tube GE-5BP4

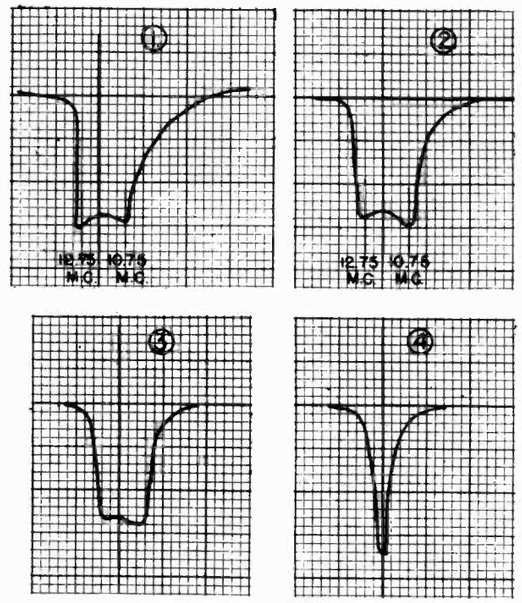


Fig. 6. Television Alignment Curves

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. 44 to 50 MC Sweep	Antenna terminals	(L-8), (C-70), (C-67)	Depress band 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. 6, curve 3.
3. 50 to 56 MC Sweep	Antenna terminals	(L-9), (C-71), (C-68)	Depress band 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. 6, curve 3.
4. 66 to 72 MC Sweep	Antenna terminals	(L-10), (C-72), (C-69)	Depress band No. 3 push button. Adjust L-10 for centering; C-72, C-69 for maximum amplitude. See Fig. 6, curve 3.

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.

AUDIO I.F. ALIGNMENT

Input Freq.	Point of Input	Adjustments	Comments
1.			Connect vertical input cable of cathode ray oscilloscope across R-128. See Fig. 1 or 4 arrow (4).
2. 7.75 to 8.75 MC Sweep	Converter grid, 6F8G	Iron cores of 4th audio I.F. transformer T-9	Align for maximum amplitude. See Fig. 6, curve 4.
3. 7.75 to 8.75	Converter grid, 6F8G	Iron cores of 3rd audio I.F. transformer T-8	Align for maximum amplitude. See Fig. 6, curve 4.
4. 7.75 to 8.75	Converter grid. 6F8G	Iron cores of 2nd audio I.F. transformer L-12	Align for maximum amplitude. See Fig. 6, curve 4.

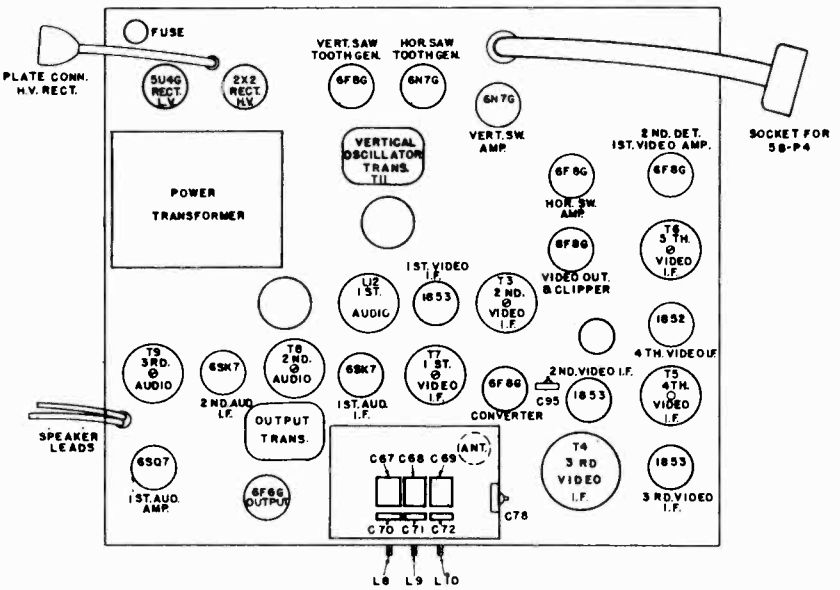


Fig. 8. Chassis Trimmer Location Models HM-171 and HM-185

ANTENNA

In general, the television antenna should be of the dipole type located as high as is practical and in an area where the horizon in the direction of the television transmitter is not obstructed by buildings or structures. A noticeable gain in signal strength will be obtained as antenna height is increased. Since television radiation reacts similarly to light waves, reflection problems arise which often modify otherwise ideal installation locations. Consideration must also be given noise sources within buildings, or ignition noises from vehicles on adjacent streets. It is usually best to locate the dipole antenna on the side of the building away from the street thus allowing the building to shield the antenna from ignition noises.

The dipole should be erected with arms parallel to the ground and at right angles to the direction of the television station. If noise or reflection interference exist it may be better to point the dipole arms in the direction of the interference.

Noise interference and poor signal strength may dictate the use of a reflector. A reflector will increase the signal strength appreciably as well as increase the horizontal directivity.

CAUTIONARY INSTRUCTIONS

Extremely high voltages (2500 volts or more) are used in the operation of this receiver; therefore, every precaution must be exercised to insure safety to the service engineer and to the customer.

The back cover while in place, protects the user and should never be removed except by a qualified television service engineer.

The power-cord plug should not be inserted in a power supply outlet until a good, solid ground connection has been properly made to the receiver chassis.

For safety, the following operations must be performed with the power plug disconnected before working on the receiver with the back cover removed:

1. Locate the 879/2X2 high voltage rectifier tube socket.
2. Unsolder the lead (color-coded brown and yellow and measuring 3300 ohms to chassis) which is connected to the 879/2X2 tube socket.
3. Thoroughly insulate the exposed end of this lead.

All adjustments not accessible with the back cover in place can be made without energizing the high-voltage circuits.

Servicing of the high-voltage circuits can be satisfactorily performed with the power-cord removed from any power supply outlet. A resistance check of the circuit components will indicate any trouble existing. (HIGH VOLTAGES SHOULD NEVER BE MEASURED.)

The "picture tube" is highly evacuated and is consequently subject to a very great air pressure. If it is broken, glass fragments will be violently expelled. Handle with care, using safety goggles and gloves.

The large end of the "picture tube" particularly that part at the rim of the viewing surface—must not be struck, scratched, or subjected to more than moderate pressure. DO NOT FORCE THE SOCKET ONTO THE TUBE OR STRAIN ANY EXTERNAL CONNECTIONS. If it fails to slip into place smoothly, investigate and remove the cause of the trouble.

REPLACEMENT PARTS LIST
Models HM-171 and HM-185

Parts Common to Both Radio and Television
Insist on Genuine Factory-tested Parts, Available from Authorized Dealers

Stock No.	Description	List Price
*RB-008	BOARD—Terminal board (2 lug)	$0.10
*RB-009	BOARD—Terminal board (1 lug)	.15
*RB-058	BOARD—Terminal board (8 lug)	.10
*RB-060	BOARD—Antenna terminal board	.10
*RB-096	BOARD—Terminal board (3 lug)	.10
*RB-821	BEZEL—Molded indicator bezel	.20
*RC-006	CAPACITOR—.0015 mfd. 600 V. paper (C-42)	.25
*RC-009	CAPACITOR—.001 mfd. 600 V. paper (C-41, 52)	.30
*RC-011	CAPACITOR—.002 mfd. 600 V. paper (C-56)	.25
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-22)	.25
*RC-028	CAPACITOR—.006 mfd. 600 V. paper (C-26, 37)	.30
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-38, 62)	.25
*RC-048	CAPACITOR—.02 mfd. 600 V. paper (C-9, 13, 16, 18, 19, 24, 25, 29, 31, 34, 39, 45, 50)	.30
*RC-049	CAPACITOR—.004 mfd. 600 V. paper (C-35)	.35
*RC-072	CAPACITOR—.05 mfd. 200 V. paper (C-2, 7, 11, 14, 17, 27)	.25
*RC-090	CAPACITOR—.04 mfd. 600 V. paper (C-73)	.30
*RC-096	CAPACITOR—0.1 mfd. 200 V. paper (C-30, 33)	.30
*RC-123	CAPACITOR—0.1 mfd. 400 V. paper (C-43, 44, 49, 53, 88, 93)	.35
RC-5139	CAPACITOR—10 mfd. 300 V., 10 mfd. 450 V., 10 mfd. 450 V., dry electrolytic (C-48, 61, 75)	$1.50
RC-5140	CAPACITOR—10 mfd. 450 V. dry electrolytic (C-74) (Also C-77 on HM-171)	.85
*RG-016	GRID CLIP—6F8G grid clip (Pkg. 5)	.10
RK-044	KNOB—Control knob (Pkg. 2)	.40
*RQ-525	RESISTOR—150,000 ohms 1 W. carbon (R-158)	.20
RQ-645	RESISTOR—680 ohms 2 W. carbon (R-134)	.20
*RQ-670	RESISTOR—3300 ohms 2 W. carbon (R-161) (Pkg. 5)	.70
*RQ-695	RESISTOR—39,000 ohms 2 W. carbon (R-127)	.20
RQ-774	RESISTOR—12,000 ohms 3 W. carbon (R-119)	.25
*RQ-1243	RESISTOR—220 ohms ½ W. carbon (R-105, 110, 114) (Pkg. 5)	.70
*RQ-1245	RESISTOR—270 ohms ½ W. carbon (R-129) (Pkg. 5)	.70
*RQ-1251	RESISTOR—470 ohms ½ W. carbon (R-148, 181) (Pkg. 5)	.70
*RQ-1259	RESISTOR—1000 ohms ½ W. carbon (R-102, 150, 152) (Pkg. 5)	.70
*RQ-1267	RESISTOR—2200 ohms ½ W. carbon (R-124, 130 on HM-171, 153, 182) (Pkg. 5)	.70
*RQ-1269	RESISTOR—2700 ohms ½ W. carbon (R-109) (Pkg. 5)	.70
*RQ-1271	RESISTOR—3300 ohms ½ W. carbon (R-113) (Pkg. 5)	.70
*RQ-1273	RESISTOR—3900 ohms ½ W. carbon (R-117, 123, 190, 203) (Pkg. 5)	.70
*RQ-1283	RESISTOR—10,000 ohms ½ W. carbon (R-164) (Pkg. 5)	.70
*RQ-1285	RESISTOR—12,000 ohms ½ W. carbon (R-115) (Pkg. 5)	.70
*RQ-1289	RESISTOR—18,000 ohms ½ W. carbon (R-101, 195) (Pkg. 5)	.70
*RC-132	CAPACITOR—0.1 mfd. 2000 V. paper (C-58)	$1.80
*RC-133	CAPACITOR—.06 mfd. 2000 V. paper (C-57)	1.60
RC-134	CAPACITOR—0.1 mfd. 1000 V. paper (C-65)	.30
RC-147	CAPACITOR—.25 mfd. 400 V. paper (C-47)	.20
*RC-157	CAPACITOR—0.5 mfd. 200 V. paper (C-63)	.40
RC-192	CAPACITOR—.003 mfd. 2000 V. paper (C-64, 66, 85, 86)	1.85
*RC-233	CAPACITOR—12 mmf. mica (C-15)	.35
*RC-229	CAPACITOR—6 mmf. mica (C-83)	.25
*RC-224	CAPACITOR—22 mmf. mica (C-4, 21)	.25
*RC-227	CAPACITOR—82 mmf. mica (C-79, 80)	.25
RC-232	CAPACITOR—47 mmf. mica (C-32, 95)	.25
*RC-235	CAPACITOR—100 mmf. mica (C-6, 46)	.25
RC-238	CAPACITOR—68 mmf. mica (C-54)	.10
*RC-242	CAPACITOR—150 mmf. mica (C-23)	.25
RC-246	CAPACITOR—180 mmf. mica (C-40)	.15
*RC-274	CAPACITOR—330 mmf. mica (C-5, 8, 87)	.30
*RC-293	CAPACITOR—470 mmf. mica (C-92)	.30
*RC-429	CAPACITOR—30 mfd. 500 V. wet electrolytic (C-59, 60)	1.35
*RC-698	CAPACITOR—R.F. padder (C-78)	.40
RC-1995	CLAMP—Ant. coil mounting clamp (Pkg. 5)	.10
RC-5138	CAPACITOR—20 mfd. 25 V., 10 mfd. 450 V., dry electrolytic (C-36, 77)	.90
*RQ-1335	RESISTOR—1.5 megohms ½ W. carbon (R-191) (Pkg. 5)	$0.70
*RQ-1339	RESISTOR—2.2 megohms ½ W. carbon (R-125, 149, 155, 166, 186) (Pkg. 5)	.70
*RQ-1341	RESISTOR—2.7 megohm ½ W. carbon (R-147) (Pkg. 5)	.70
*RQ-1349	RESISTOR—5.6 megohms ½ W. carbon (R-173, 174, 187, 188) (Pkg. 5)	.70
RQ-1420	RESISTOR—33 ohms 1 W. carbon (R-141)	.20
RQ-1460	RESISTOR—1200 ohms 1 W. carbon (R-122)	.20
*RQ-1461	RESISTOR—1500 ohms 1 W. carbon (R-176)	.20
*RQ-1471	RESISTOR—3300 ohms 1 W. carbon (R-154)	.20
*RQ-1475	RESISTOR—4700 ohms 1 W. carbon (R-107, 112, 116)	.20
RQ-1476	RESISTOR—5600 ohms 1 W. carbon (R-130 on HM-185, 197)	.20
*RQ-1485	RESISTOR—12,000 ohms 1 W. carbon (R-119)	.20
*RQ-1489	RESISTOR—18,000 ohms 1 W. carbon (R-178)	.20
*RQ-1499	RESISTOR—47,000 ohms 1 W. carbon (R-184, 199)	.20
*RS-179	SHIELD—6F8G tube shield	.15
RS-252	SOCKET—Octal tube socket	.15
RS-257	SOCKET—Electrolytic mounting socket	.05
RS-265	SOCKET—Light socket assembly	.15
RS-1011	SPEAKER—12-inch permanent magnet	4.80
RS-1803	SHIELD—6N7G tube shield and clip	.40
RT-471	TRANSFORMER—Output transformer (T-13)	1.70
RT-954	TERMINAL—Speaker lead comtact clip (Pkg. 10)	.10
*RW-101	WASHER—Felt washer for control shafts (Pkg. 10)	.05
RW-112	WASHER—Transformer shaft tension washer (Pkg. 10)	.10
RX-062	ASSEMBLY—Speaker mounting assembly	.10

* Used on previous receivers.

(Prices subject to change without notice)

REPLACEMENT PARTS LIST (Continued)

Stock No.	Description	List Price
RTC-5006	CONTROL—500,000 ohm tone control (R-132)	$0.65
RTC-5007	CONTROL—2.0 megohm variable control (R-143, 146, 159)	.75
RTC-5008	CONTROL—2.0 megohm volume control (R-126)	.75
RTC-5009	CONTROL—0.5 megohm width control (R-140)	.60
RTC-5010	CONTROL—3-20 mmf. tuning control (C-3)	1.30
RTC-6000	CARD—Television station tab No. 1 (Pkg. 10)	.05
RTC-6001	CARD—Television station tab No. 2 (Pkg. 10)	.05
RTC-6002	CARD—Television station tab No. 3 (Pkg. 10)	.05
RTC-7000	CABLE—Power cable with plugs	1.80
RTC-7001	CABLE—Picture tube cable and 11 prong socket	3.00
RTC-8000	CLAMP—Picture tube clamp (upper section)	.90
RTC-8001	CUSHION—Picture tube face cushion	1.30
RTE-100	ESCUTCHEON—Push button escutcheon	.80
RTF-100	FUSE HOLDER—Power line fuse holder	.65
RTG-100	GRID CLIP—Insulated 2 x 2 grid clip	2.00
RTG-201	GROMMET—Rubber grommet for insulating chassis hole from picture tube cable	.05
RTG-200	GROMMET—Rubber bumper on picture tube shield funnel (Pkg. 5)	.10
RTL-1000	COIL—R.F. coil (Band No. 1) (L-11)	.35
RTL-1001	COIL—R.F. coil (Band No. 2) (L-13)	.35
RTL-1002	COIL—R.F. coil (Band No. 3) (L-14)	.35
RTL-2000	COIL—Converter grid oscillator coil (T-2)	.30
RTL-2001	COIL—Converter plate oscillator coil (T-2)	.30
RTL-3000	COIL—Oscillator tuning coil (Band No. 1) (L-8)	.30
RTL-3001	COIL—Oscillator tuning coil (Band No. 2) (L-9)	.30
RTL-3002	COIL—Oscillator tuning coil (Band No. 3) (L-10)	.30
RTL-4000	CHOKE—Oscillator Plus B choke (L-1)	1.00
RTL-4001	CHOKE—1st Video choke (L-3)	.45
RTL-4002	CHOKE—Video diode choke (L-2)	.50
RTL-4003	CHOKE—Video output choke (L-6)	.50
RTL-5000	REACTOR—Plus B reactor (L-15)	1.60
RTM-1000	MASK—Picture tube mask	.35
*RQ-1293	RESISTOR—27,000 ohms ½ W. carbon (R-103) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms ½ W. carbon (R-165) (Pkg. 5)	.70
*RQ-1297	RESISTOR—39,000 ohms, ½ W. carbon (R-106) (Pkg. 5)	.70
*RQ-1299	RESISTOR—47,000 ohms ½ W. carbon (R-192, 196) (Pkg. 5)	.70
*RQ-1301	RESISTOR—56,000 ohms ½ W. carbon (R-205) (Pkg. 5)	.70
*RQ-1303	RESISTOR—68,000 ohms ½ W. carbon (R-206) (Pkg. 5)	.70
*RQ-1305	RESISTOR—82,000 ohms ½ W. carbon (R-204) (Pkg. 5)	.70
*RQ-1307	RESISTOR—100,000 ohms ½ W. carbon (R-111) (Pkg. 5)	.70
*RQ-1311	RESISTOR—150,000 ohms, ½ W. carbon (R-131, 137, 145) (Pkg. 5)	.70
*RQ-1313	RESISTOR—180,000 ohms ½ W. carbon (R-162) (Pkg. 5)	.70
*RQ-1315	RESISTOR—220,000 ohms ½ W. carbon (R-104, 118, 128, 142, 171, 172) (Pkg. 5)	.70
*RQ-1317	RESISTOR—270,000 ohms ½ W. carbon (R-160) (Pkg. 5)	.70
*RQ-1319	RESISTOR—330,000 ohms ½ W. carbon (R-175) (Pkg. 5)	.70
*RQ-1321	RESISTOR—390,000 ohms ½ W. carbon (R-194) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms ½ W. carbon (R-139) (Pkg. 5)	.70
*RQ-1327	RESISTOR—680,000 ohms ½ W. carbon (R-156) (Pkg. 5)	.70
*RQ-1331	RESISTOR—1.0 megohms ½ W. carbon (R-120, 133, 135, 144, 151, 168, 179) (Pkg. 5)	.70
RTQ-1000	RESISTOR—350 ohms 10 W. wire wound (R-177)	$1.00
RTQ-1001	RESISTOR—1100 ohms 16 W. wire wound (R-163 on HM-185)	1.40
RTQ-1002	RESISTOR—1300 ohms 16 W. wire wound (R-163 on HM-171)	1.40
RTS-100	SOCKET—Chassis power receptacle	1.00
RTS-101	SOCKET—2 x 2 tube socket (4 prong)	.95
RTS-300	SHAFT—Focus control insulated shaft	.90
RTS-301	SHAFT—Coil tuning core shaft	.15
RTS-500	SWITCH—Station selector switch (S-1)	2.80
RTS-700	STUD—4¾-in. lg. stud for mounting R-163	.10
RTS-701	SETSCREW—Headless setscrew for focus control shaft assembly (Pkg. 5)	.10
RTT-0010	TRANSFORMER—Power transformer (T-12)	14.50
RTT-2000	TRANSFORMER—Antenna transformer (T-1)	1.00
RTT-3000	TRANSFORMER—1st Video I.F. transformer (T-7)	3.80
RTT-3500	TRANSFORMER—2nd Video I.F. transformer (T-3)	3.80
RTT-4000	TRANSFORMER—3rd Video I.F. transformer (T-4)	6.00
RTT-4500	TRANSFORMER—4th Video I.F. transformer (T-5)	3.80
RTT-5000	TRANSFORMER—5th Video I.F. transformer (T-6)	3.80
RTT-7000	TRANSFORMER—1st Audio I.F. transformer (L-12)	2.25
RTT-7500	TRANSFORMER—2nd Audio I.F. transformer (T-8)	3.80
RTT-8000	TRANSFORMER—3rd Audio I.F. transformer (T-9)	3.80
RTT-9000	TRANSFORMER—Vert. oscillator transformer (T-11)	2.80
RTW-100	WASHER—Picture tube rear support washer (rubber)	.80
RTW-500	WINDOW—Picture tube safety window (HM-185)	2.05
RTW-501	WINDOW—Celluloid station letter window (Pkg. 5)	.05
RTW-502	WINDOW—Picture tube safety window (HM-171)	1.60
RTX-1000	ASSEMBLY—Wave trap assembly (L-16, 17, 18, 19)	3.10
RTX-1003	ASSEMBLY—Wave trap assembly (L-20, C-94)	.80

Parts Used in Television Only

RTB-500	PUSH BUTTON—Station selector push button	.15
RTB-1000	BOARD—Focus control insulator mounting board	.80
RTB-1001	BOARD—Centering controls insulator mounting board	.40
RTB-1002	BOARD—I.F. terminal board (8-hole square)	1.40
RTB-1500	BACK COVER—Cabinet back cover (HM-185)	.45
RTB-1501	BACK COVER—Cabinet back cover (HM-171)	.35
RTB-2000	BUSHING—Insulating bushing for mounting R-163	.05
RTB-2001	BUSHING—Station trimmer shaft bushing	.10
RTC-1000	TRIMMER STRIP—20-200 mmf. trimmers (C-70, 71,72)	.55
RTC-1001	TRIMMER STRIP—20-200 mmf. trimmers (C-67, 68, 69)	.55
RTC-5000	CONTROL—.25 megohm brightness control and power switch (R-157)	.80
RTC-5001	CONTROL—2.0 megohm centering control (R-169, 170)	.60
RTC-5002	CONTROL—2000 ohm tapered contrast control (R-108)	.60
RTC-5003	CONTROL—2.0 megohm focus control (R-167)	.60
RTC-5004	CONTROL—50,000 ohm horizontal speed control (R-138)	.60
RTC-5005	CONTROL—100,000 ohms hor. linearity control (R-189)	.60

* Used on previous receivers.

(Prices subject to change without notice)

GENERAL ELECTRIC CO.

GENERAL ELECTRIC CO.

MODEL HM225,HM226-7A
Schematic

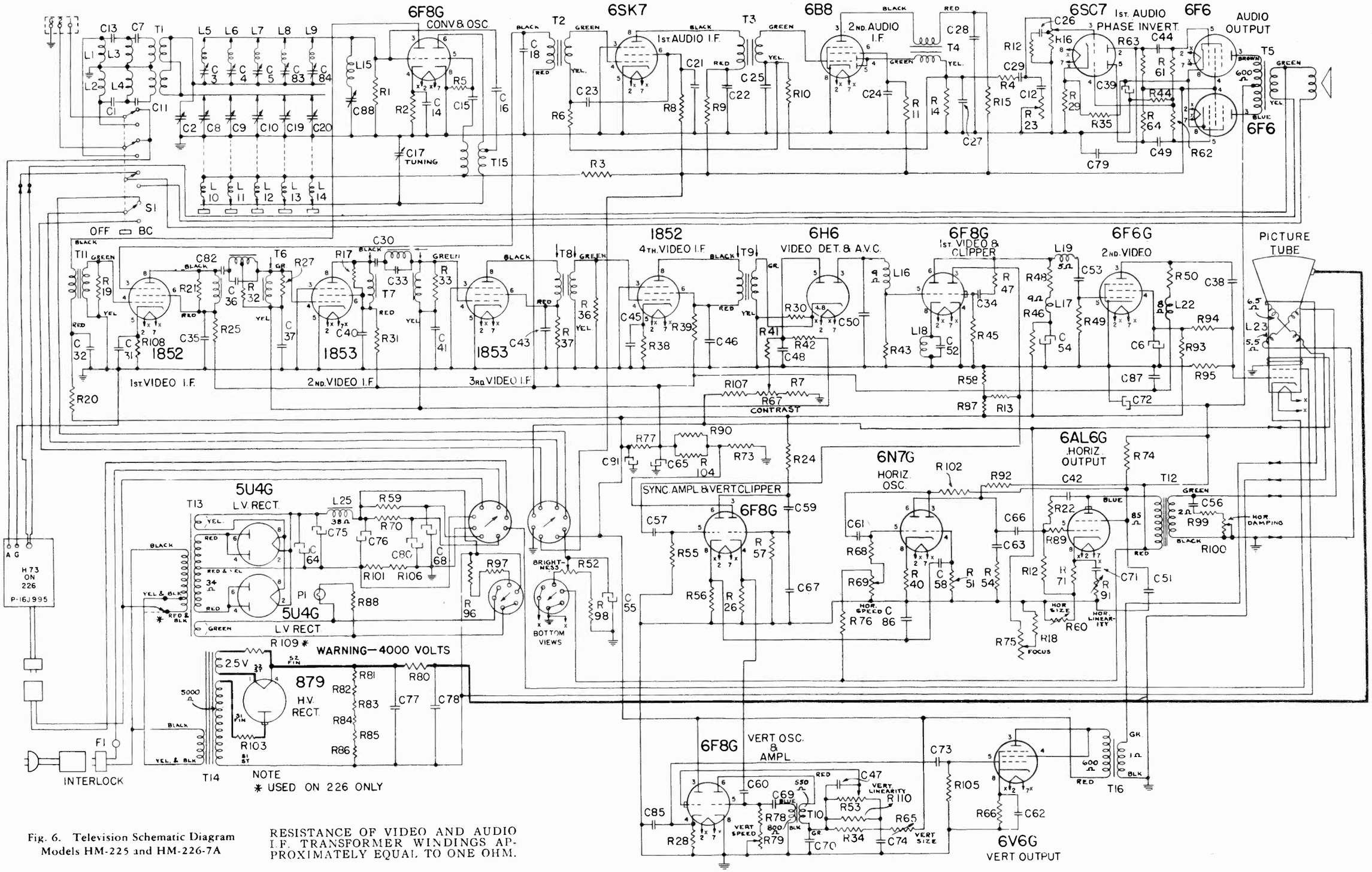


Fig. 6. Television Schematic Diagram
Models HM-225 and HM-226-7A

RESISTANCE OF VIDEO AND AUDIO I.F. TRANSFORMER WINDINGS APPROXIMATELY EQUAL TO ONE OHM.

MODELS HM225,HM226-7A
Voltage,Trimmers,Socket,Chassis
Controls, Notes

ANTENNA

In general, the television antenna should be of the dipole type located as high as is practical and in an area where the horizon in the direction of the television transmitter is not obstructed by buildings or structures. A noticeable gain in signal strength will be obtained as antenna height is increased. Since television radiation reacts similarly to light waves, reflection problems arise which often modify otherwise ideal installation locations. Consideration must also be given noise sources within buildings, or ignition noises from vehicles on adjacent streets. It is usually best to locate the dipole antenna on the side of the building away from the street thus allowing the building to shield the antenna from ignition noises.

The dipole should be erected with arms parallel to the ground and at right angles to the direction of the television station. If noise or reflection interference exist it may be better to point the dipole arms in the direction of the interference.

Noise interference and poor signal strength may dictate the use of a reflector. A reflector will increase the signal strength appreciably as well as increase the horizontal directivity.

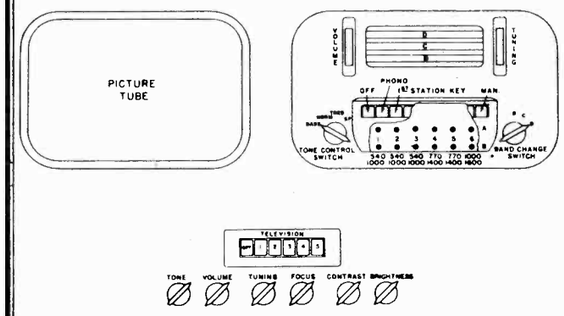


Fig. 2. Front Control Location
Model HM-226-7A

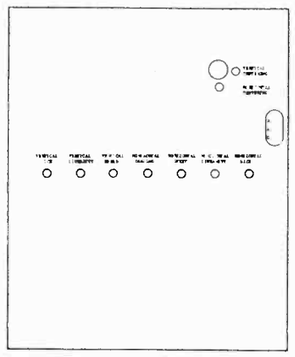


Fig. 4. Rear Control Location
Model HM-226-7A

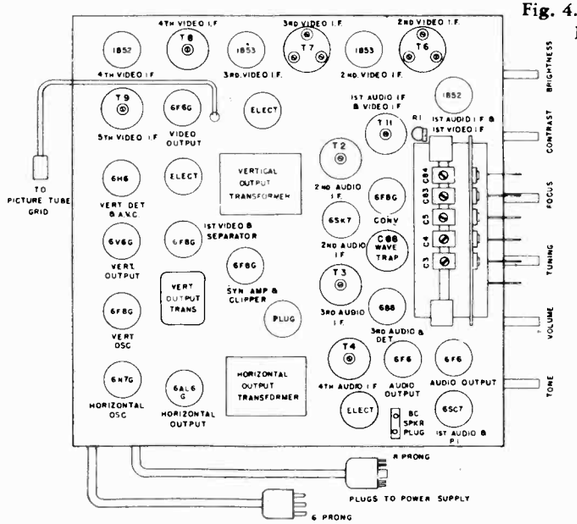


Fig. 7. Television Chassis Trimmer Location
Models HM-225 and HM-226-7A

General Electric Television Receiver, Model HM-225, is a console type, 22-tube, superheterodyne receiver equipped with a full magnetic, short, 9-inch picture tube. The rectifier-power supply is on a separate chassis mounted in the lower cabinet compartment with the speaker.

General Electric Television and Radio Receiver, Model HM-226-7A, is a console type instrument using the same television receiver as the Model HM-225 with minor alterations for use in conjunction with a 7-tube radio receiver. Model HM-226-7A is equipped with a full magnetic, short, 12-inch picture tube.

Additional design features include iron-core I.F. tuning, automatic contrast control, automatic brightness control, automatic tone compensation, automatic volume control and a constant high-gain antenna coupling circuit.

SERVICE DATA

Electrical Specifications

Model	Power Supply (Volts)	Frequency (Cycles per Second)	Power Consumption (Watts)
HM-225	115–125	60	300
HM-226-7A	115–125	60	300 (Television) 75 (Radio)

Tuning Frequency Range

Television Receiver (used in both models)
Band No. 1 . . . . . 44–50 M.C.
Band No. 2 . . . . . 50–56 M.C.
Band No. 3 . . . . . 66–72 M.C.
Band No. 4 . . . . . 78–84 M.C.
Band No. 5 . . . . . 84–90 M.C.

Tone Control

Televison Audio . . . . . Continuously variable
Radio Audio 4-position

Tubes

Television
Converter-Oscillator GE-6F8G
1st Audio I.F. Amplifier GE-6SK7
2nd Audio I.F. Amplifier GE-6B8
Audio Amplifier and Phase Inverter GE-6SC7
Audio Output . . . . . (2)GE-6F6
1st and 4th Video I.F. Amplifier . . . . (2)GE-1852/6AC7
2nd and 3rd Video I.F. Amplifier . . . . (2)GE-1853/6AB7
Video Détector and AVC GE-6H6
1st Video Amplifier and Sync. Clipper . . . GE-6F8G
2nd Video Amplifier GE-6F6G
Sync. Amplifier and Vertical Clipper GE-6F8G
Vertical Oscillator and Amplifier GE-6F8G
Horizontal Oscillator GE-6N7G
Vertical Output GE-6V6G
Horizontal Output GE-6AL6G
Low Voltage Rectifier . . . . . (2)GE-5U4G
High Voltage Rectifier GE-879/2X2
Picture Tube (HM-225) GE-MW-22-2
Picture Tube (HM-226-7A) GE-MW-31-3

Intermediate Frequencies

Television Video (Picture) . . . . . 12.75 M.C.
Television Audio . . . . . 8.25 M.C.
Radio . . . . . 455 K.C.

Maximum Electrical Output

Television Audio . . . . . 10 Watts
Radio Audio . . . . . 5 Watts

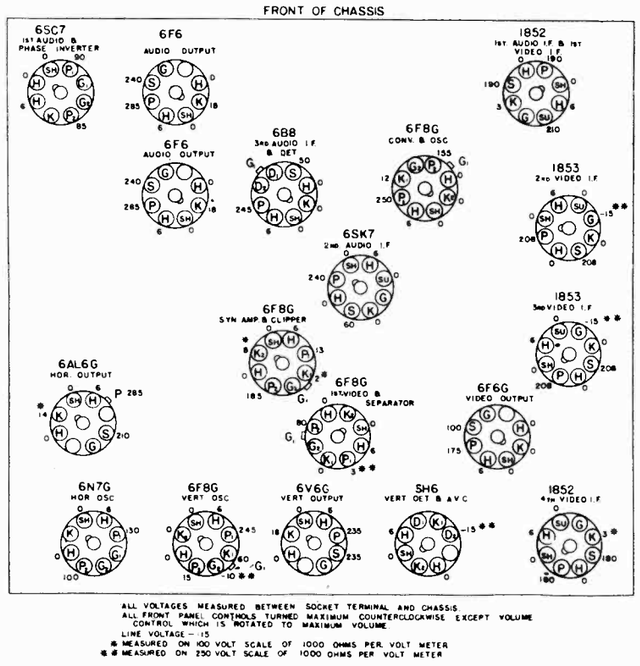


Fig. 9. Television Socket Voltages

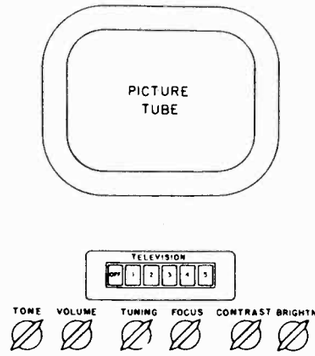


Fig. 1. Front Control Location
Model HM-225

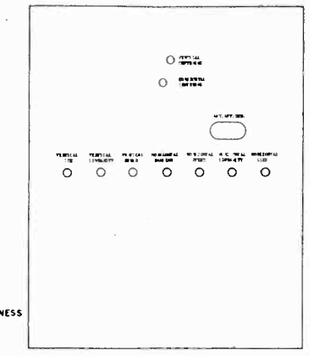


Fig. 3. Rear Control Location
Model HM-225

Picture Size

	Model HM-225	HM-226-7A
Height	5¾ inches	7½ inches
Width	7¾ inches	10 inches

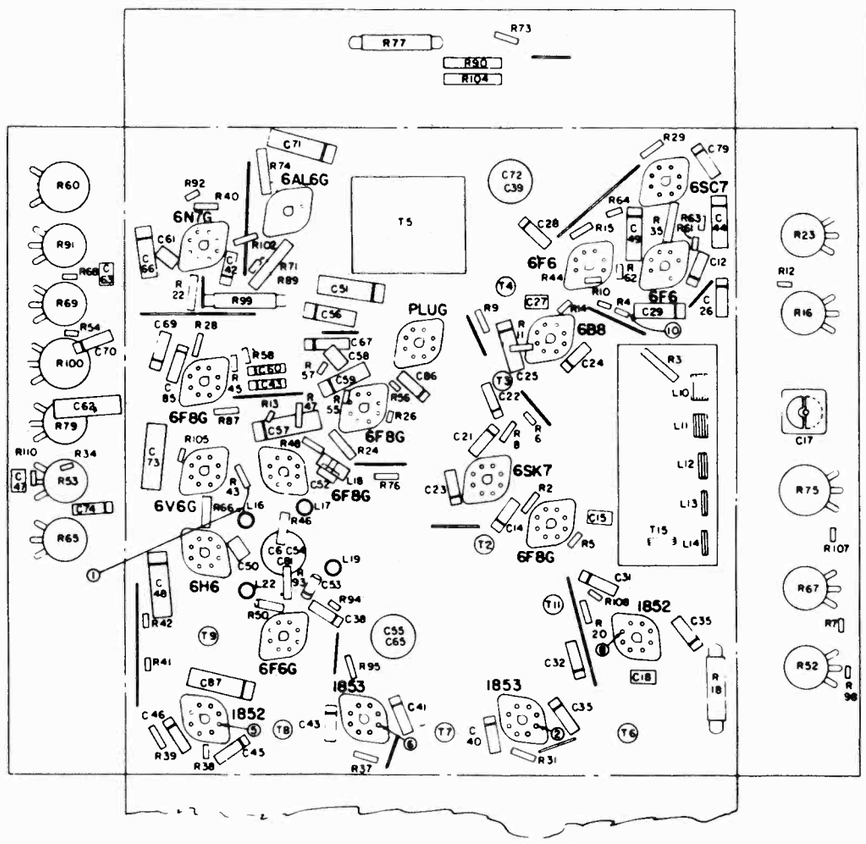


Fig. 5. Television Chassis Parts Layout
Models HM-225 and HM-226-7A

GENERAL ELECTRIC CO

MODELS HM225,HM226-7A
Video Alignment

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) 44 to 50
  - (b) 50 to 56
  - (c) 66 to 72
  - (d) 78 to 84
  - (e) 84 to 90

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. See Fig. 5, arrow one.
2. 7.5–15MC Sweep	Control grid of 1853 (2nd video I.F.)		Connect low output tap of video I.F. sweep oscillator to control grid of 1853 (2nd video I.F.). See Fig. 5, arrow two. 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 3.
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. 3 above.
5. 7.5–15 MC Sweep	Control grid of 1852 (4th video I.F.)	Iron cores of detector transformer T-9	Connect high tap of video I.F. sweep oscillator to control grid of 1852 (4th video I.F.) See Fig. 5, arrow five. (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 of 1853 (3rd video I.F.)	Iron cores of 4th video transformer T-8.	Connect low tap of video I.F. sweep oscillator to control grid of 1853 (3rd video I.F.). See Fig. 5, arrow six. Adjust iron cores for maximum gain, flatness and proper centering between markers as described in step No. 5 and illustrated in Fig. 8, curve 2.
7. 7.5–15 MC Sweep	Control grid of 1853 (2nd video I.F.)	Iron cores of 3rd video transformer T-7.	Connect low tap to grid. See Fig. 5, arrow two. 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 1852 (1st video I.F.)	Iron cores of 2nd video transformer T-6	Connect low tap to grid. See Fig. 5, arrow eight. 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 4.
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.
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.

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 $\frac{1}{16}$ of a turn.
2. 44 to 50 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 5.
3. 50 to 56 MC sweep	Antenna terminals	(L-11), (C-4), (C-9)	Depress band No. 2 push button. Leave tuning control at mid-rotation point. Adjust L-11 for centering; C-4 and C-9 for maximum amplitude. See Fig. 8, curve 5.
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 5.
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 5.
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 5.

WAVE TRAP ALIGNMENT

Signal Input	Point of Input	Adjustments	Comments
1. 11.75 MC	Antenna terminals	Wave trap trimmer, C-88	Adjust for maximum dip in oscilloscope curve.

AUDIO I. F. ALIGNMENT

Input Freq.	Point of Input	Adjustments	Comments
1.			Connect vertical input cable of cathode ray oscilloscope between junction of R-4 and C-29 and chassis. See Fig. 5, arrow ten.
2. 7.75 to 8.75 MC sweep	Control grid of 6B8	Iron cores of 4th audio I.F. transformer T-4	Align for maximum amplitude. See Fig. 8, curve 6.
3. 7.75 to 8.75	Control grid of 6SK7	Iron cores of 3rd audio I.F. transformer T-3	Align for maximum amplitude. See Fig. 8, curve 6.
4. 7.75 to 8.75	Converter grid of 6F8G	Iron cores of 2nd audio I.F. transformer T-2	Align for maximum amplitude. See Fig. 8, curve 7.

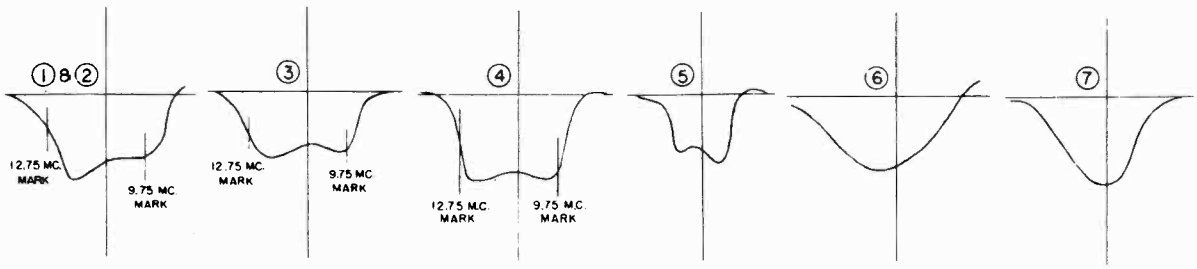


Fig. 8. Television Alignment Curves

GENERAL ELECTRIC CO.

MODELS HM225, HM226-7A
Parts List

Television Chassis Parts Common to Radio

Stock No.	Description	List Price
*RB-008	BOARD—Terminal board (2 lug)	$0.10
*RB-013	BOARD—Terminal board (2 lug)	.10
RB-023	BOARD—Terminal board (4 lug)	.10
*RB-058	BOARD—Terminal board (8 lug)	.10
*RB-060	BOARD—Ant. gnd. terminal board	.10
*RB-096	BOARD—Terminal board (3 lug)	.10
*RB-621	BEZEL—Pilot light bezel	.20
RB-1026	BOARD—Terminal board (2 lugs and 2 anchor lugs)	.05
RC-007	CAPACITOR—.001 mfd. 1500 V. paper (C-32)	.15
*RC-011	CAPACITOR—.002 mfd. 600 V. paper (C-60)	.25
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-12, 14, 21, 22, 23, 24, 26, 28, 31, 32, 35, 37, 38, 40, 41, 43, 45, 46, 79)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-74, 85, 86)	.25
*RC-048	CAPACITOR—.02 mfd. 600 V. paper (C-34, 67, 69, 70)	.30
RC-090	CAPACITOR—.04 mfd. 600 V. paper (C-56)	.30
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-29, 44, 49, 53, 59, 66)	.30
*RC-096	CAPACITOR—0.1 mfd. 200 V. paper (C-25)	.30
*RC-123	CAPACITOR—0.1 mfd. 400 V. paper (C-51, 57)	.35
*RC-147	CAPACITOR—.25 mfd. 400 V. paper (C-87)	.20
*RC-156	CAPACITOR—0.5 mfd. 100 V. paper (C-48, 71, 73)	.45
*RC-202	CAPACITOR—4 mmf. mica L.P.F. (C-16)	.25
*RC-226	CAPACITOR—10 mmf. mica (C-50)	.25
RC-233	CAPACITOR—22 mmf. mica (C-52)	.25
RC-241	CAPACITOR—33 mmf. mica L.P.F. (C-15, 36)	.20
*RC-242	CAPACITOR—150 mmf. mica (C-27, 47)	.25
RC-243	CAPACITOR—150 mmf. mica L.P.F. (C-18, 58)	.15
RC-251	CAPACITOR—220 mmf. mica L.P.F. (C-63)	.10
RC-269	CAPACITOR—330 mmf. mica L.P.F. (C-30, 92)	.20
RC-293	CAPACITOR—470 mmf. mica (C-61)	.30
RC-314	CAPACITOR—47 mmf. mica L.P.F. (C-1, 13)	.20
RC-316	CAPACITOR—56 mmf. mica L.P.F. (C-33)	.10
RC-318	CAPACITOR—82 mmf. mica L.P.F. (C-7, 11)	.15
*RC-429	CAPACITOR—30 mfd. 450 V. wet electrolytic (C-64, 68, 75, 76, 80)	1.35
RC-698	CAPACITOR—Coupling padder (C-2)	.40
RC-1995	CLAMP—Ant. transformer clamp (Pkg. 5)	.10
RC-9016	CONE ASSEMBLY—12 inch P.M. speaker cone assembly	2.20
*RG-016	GRID CLIP—6P5G control grid clip (Pkg. 5)	.10
RK-044	KNOB—Control knob and spring assembly (Pkg. 2)	.40
*RL-359	CHOKE—Filter choke (L-25)	1.50
RP-129	BOARD—Speaker plug terminal board (Pkg. 2)	.10
RQ-640	RESISTOR—240 ohms 2 W. carbon ±5% (R-71)	.25
*RQ-643	RESISTOR—270 ohms 2 W. carbon (R-35, 106)	.30
RQ-650	RESISTOR—820 ohms 2 W. carbon (R-50)	.15
*RQ-687	RESISTOR—15,000 ohms 2 W. carbon (R-46)	.35
RQ-694	RESISTOR—33,000 ohms 2 W. carbon (R-90, 104)	.15
*RQ-1215	RESISTOR—15 ohms ½ W. carbon (R-29) (Pkg. 5)	.70
*RQ-1241	RESISTOR—180 ohms ½ W. carbon (R-38, 108) (Pkg. 5)	.70
*RQ-1247	RESISTOR—330 ohms ½ W. carbon (R-89) (Pkg. 5)	.70
*RQ-1251	RESISTOR—470 ohms ½ W. carbon (R-40) (Pkg. 5)	.70
*RQ-1259	RESISTOR—1000 ohms ½ W. carbon (R-1, 7, 56, 73) (Pkg. 5)	$0.70
*RQ-1263	RESISTOR—1500 ohms ½ W. carbon (R-19, 33) (Pkg. 5)	.70
*RQ-1267	RESISTOR—2200 ohms ½ W. carbon (R-2, 9, 15, 17, 20, 25, 31, 36, 37, 39) (Pkg. 5)	.70
*RQ-1269	RESISTOR—2700 ohms ½ W. carbon (R-21, 27) (Pkg. 5)	.70
*RQ-1271	RESISTOR—3300 ohms ½ W. carbon (R-30, 43) (Pkg. 5)	.70
*RQ-1275	RESISTOR—4700 ohms ½ W. carbon (R-48) (Pkg. 5)	.70
*RQ-1279	RESISTOR—6800 ohms ½ W. carbon (R-32, 96) (Pkg. 5)	.70
*RQ-1283	RESISTOR—10,000 ohms ½ W. carbon (R-26, 42, 47, 58, 98, 107) (Pkg. 5)	.70
*RQ-1293	RESISTOR—27,000 ohms ½ W. carbon (R-5, 41) (Pkg. 5)	.70
*RQ-1299	RESISTOR—47,000 ohms ½ W. carbon (R-4, 12, 28, 54) (Pkg. 5)	.70
*RQ-1307	RESISTOR—100,000 ohms ½ W. carbon (R-8, 14, 102) (Pkg. 5)	.70
*RQ-1313	RESISTOR—180,000 ohms ½ W. carbon (R-13) (Pkg. 5)	.70
*RQ-1315	RESISTOR—220,000 ohms ½ W. carbon (R-11, 44, 61, 62, 63, 64, 68, 78, 87) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms ½ W. carbon (R-49, 72, 92, 105) (Pkg. 5)	.70
*RQ-1331	RESISTOR—1.0 megohm ½ W. carbon (R-6, 10, 34, 45, 55) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohms ½ W. carbon (R-57, 95) (Pkg. 5)	.70
*RQ-1355	RESISTOR—10 megohms ½ W. carbon (R-94) (Pkg. 5)	.70
RQ-1457	RESISTOR—820 ohms 1 W. carbon (R-66)	.10
*RQ-1483	RESISTOR—10,000 ohms 1 W. carbon (R-3, 24, 74)	.20
*RQ-1491	RESISTOR—22,000 ohms 1 W. carbon (R-97)	.20
*RQ-1497	RESISTOR—39,000 ohms 1 W. carbon (R-93)	.20
RQ-1510	RESISTOR—100,000 ohms 1 W. carbon (R-103)	.10
RQ-1520	RESISTOR—470,000 ohms 1 W. carbon (R-80)	.10
RQ-1530	RESISTOR—2.2 megohms 1 W. carbon (R-22, 81, 82, 83, 84, 85, 86)	.10
*RS-217	SOCKET—879—2 X 2 tube socket (Pkg. 5)	.50
RS-252	SOCKET—Octal tube socket	.15
RS-257	SOCKET—Electrolytic mounting socket	.05
RS-267	SOCKET—Pilot light socket	.30
RS-1023	SPEAKER—12 inch P.M. Speaker	9.10
RT-954	TERMINAL—Speaker lead contact terminal (Pkg. 10)	.10
*RW-101	WASHER—Felt washer for control knob (Pkg. 10)	.05
RW-112	WASHER—I.F. tuning shaft tension washer (Pkg. 10)	.10
*RX-030	ASSEMBLY—Speaker mounting assembly	.10
RX-063	ASSEMBLY—Electrolytic mounting assembly (washers and pal nuts)	.20

Television Chassis Parts Used in Television Only

RTB-500	KEY—Station selector key	$0.15
RTB-1502	BACK COVER—Cardboard back cover for model HM-225	.85
RTB-1503	BACK COVER—Cardboard back cover for model HM-226-7A	.95
RTB-2001	BUSHING—R.F. coil tuning bushing	.10
RTB-2500	BRACKET—Right R.F. unit support assembly	
RTB-2501	BRACKET—Left R.F. unit support assembly	
RTC-1002	TRIMMER STRIP—Front station selector trimmer strip (C-8, 9, 10, 19, 20)	.80
RTC-1003	TRIMMER STRIP—Top station selector trimmer strip (C-3, 4, 5, 83, 84)	.85
RTC-2000	CAPACITOR—.06 mfd. 4000 V. paper (C-77, 78)	2.80
RTC-3000	CAPACITOR—20 mfd. 25 V. 40 mfd. 450 V. dry electrolytic (C-39, 72)	1.75
RTC-3001	CAPACITOR—40 mfd. 25 V. dry electrolytic (C-62)	.60
RTC-3002	CAPACITOR—10 mfd. 450 V., 5 mfd. 450 V., 20 mfd. 450 V. dry electrolytic (C-6, 54, 55, 65, 81)	1.80
RTC-5005	CONTROL—100,000 ohms horizontal speed control (R-69)	.60
RTC-5007	CONTROL—2.0 megohms vertical linearity or size control (R-53, 65)	.75
RTC-5009	CONTROL—500,000 ohms vertical speed control (R-79)	.60
RTC-5011	CONTROL—10,000 ohms brightness or contrast control (R-52, 67)	.70
RTC-5012	CONTROL—200 ohms 2 W. focus control (R-75)	1.00
RTC-5013	CONTROL—1000 ohms horizontal linearity control (R-91)	.70
RTC-5014	CONTROL—0.5 megohm volume or tone control (R-16, 23)	.60
RTC-5015	CONTROL—Tuning control (C-17)	2.10
RTC-5025	CONTROL—1000 ohm horizontal size control (R-60)	.75
RTL-1003	COIL—RF coil band No. 1 (L-5)	$0.30
RTL-1004	COIL—RF coil band No. 2 (L-6)	.30
RTL-1005	COIL—RF coil band No. 3 (L-7)	.30
RTL-1006	COIL—RF coil band No. 4 (L-8)	.30
RTL-1007	COIL—RF coil band No. 5 (L-9)	.30
RTL-2002	COIL—Converter-oscillator plate coil (1½ turn) (T-15)	.30
RTL-2003	COIL—Converter-oscillator grid coil (1 turn) (T-15)	.30
RTL-3003	COIL—Oscillator tuning coil band No. 1 (L-10)	.30
RTL-3004	COIL—Oscillator tuning coil band No. 2 (L-11)	.30
RTL-3005	COIL—Oscillator tuning coil band No. 3 (L-12)	.30
RTL-3006	COIL—Oscillator tuning coil band No. 4 (L-13)	.30
RTL-3007	COIL—Oscillator tuning coil band No. 5 (L-14)	.30
RTL-4004	CHOKE—Video choke (L-19)	.75
RTL-4005	CHOKE—Video choke (L-22)	.75
RTL-4006	CHOKE—Video cathode choke (L-18)	.95
RTL-4007	CHOKE—Video diode choke (L-16, 17)	.75
RTL-5500	COIL—Focusing coil (L-24)	5.10
RTL-6000	YOKE—Deflection yoke (L-23)	12.00
RTN-001	NUT—Pal nut for all controls (Pkg. 5)	.10
RTP-001	PLUG—Female single slot plug on television chassis	.20
RTP-002	PLUG—Male plug on deflection yoke and focus cable	.40
RTQ-1003	RESISTOR—400 ohms damping (R-100)	1.00
RTQ-1004	RESISTOR—400 ohms 17.9 W. wire wound (R-70)	.85
RTQ-1005	RESISTOR—150 ohms 7.4 W. wire wound (R-18)	.55
RTQ-1006	RESISTOR—700 ohms 7.4 W. wire wound (R-77, 99)	.55
RTQ-1007	RESISTOR—1,500 ohms, 6 W.; 150 ohms, 9 W. wire wound (R-59, 101)	.85
RTQ-2010	RESISTOR—33 ohms 1 W. wire wound (R-88)	.40
RTR-001	RING—Picture tube support ring	.80
RTS-100	SOCKET—Power chassis power receptacle	1.00
RTS-102	SOCKET—Power fuse socket	
RTS-103	SOCKET—6 prong connector socket	.15
RTS-301	SHAFT—R.F. coil tuning core shaft	.15
RTS-501	SWITCH—Station selector switch	4.65
RTS-702	STUD—Focus coil adjustment stud	.15
RTS-703	SLEEVE—Picture tube rubber sleeve	.20
RTS-704	SCREW—Thumb screw for mounting picture tube bracket (Pkg. 2)	.10
RTC-6000	CARD—Station No. 1 tab card (Pkg. 10)	$0.05
RTC-6001	CARD—Station No. 2 tab card (Pkg. 10)	.05
RTC-6002	CARD—Station No. 3 tab card (Pkg. 10)	.05
RTC-6003	CARD—Station No. 4 tab card (Pkg. 10)	.05
RTC-6004	CARD—Station No. 5 tab card (Pkg. 10)	.05
RTC-6005	CARD—Station "Off" tab card (Pkg. 10)	.05
RTC-7000	CORD—Power cord assembly	1.80
RTC-7002	CABLE—Kinescope cable assembly on power chassis	1.25
RTC-7003	CABLE—Interconnecting power cable assembly (First hole from rear on right side of receiver chassis)	1.00
RTC-7004	CABLE—Interconnecting power cable assembly (Second hole from rear on right side of receiver chassis)	1.00
RTC-8002	CLAMP—Picture tube clamp	
RTC-8003	CLAMP—Deflection yoke clamp	.20
RTC-8004	CLAMP—Dry electrolytic mounting clamp (.06 mfd. 4,000 V.)	.20
RTC-8005	CUSHION—9-inch picture tube cushion	2.10
RTC-8006	CUSHION—12-inch picture tube cushion	2.40
RTE-101	ESCUTCHEON—Television station selector escutcheon	
RTG-101	GRID CLIP—6AL6G control grid clip	.35
RTG-102	GRID CAP—High voltage rectifier grid cap	2.00
RTG-202	GROMMET—Receiver chassis grommets (¾ inch dia. black)	.05
RTG-203	GROMMET—Power chassis grommet (1 inch dia.)	.05
RTG-300	GUIDE—Screwdriver guide on focus coil assembly	.05
RTI-001	INSULATOR—High voltage rectifier socket mounting board	.90
RTI-002	INSULATOR—Television station trimmer strip mounting insulator board	.05
RTI-003	INSULATOR—Stand off insulator	
RTS-705	SHIELD—Back cover tube projection shield for model HM-226-7A	$0.40
RTS-800	SPRING—Picture tube support adjustment spring (Pkg. 5)	.10
RTT-0220	TRANSFORMER—High voltage power transformer (T-14)	17.70
RTT-0221	TRANSFORMER—Low voltage power transformer (T-13)	29.95
RTT-2000	TRANSFORMER—Antenna transformer (T-1)	1.00

Parts list continued.

RTT-3001	TRANSFORMER—1st video I.F. transformer (T-11)	4.15
RTT-3501	TRANSFORMER—2nd video I.F. transformer (T-6)	6.70
RTT-4001	TRANSFORMER—3rd video I.F. transformer (T-7)	6.70
RTT-4501	TRANSFORMER—4th video I.F. transformer (T-8)	4.15
RTT-5001	TRANSFORMER—5th video I.F. transformer (T-9)	4.15
RTT-6500	TRANSFORMER—Horizontal output transformer (T-12)	15.40
RTT-6750	TRANSFORMER—Vertical output transformer (T-16)	6.00
RTT-7001	TRANSFORMER—1st audio I.F. transformer (T-2)	4.15
RTT-7501	TRANSFORMER—2nd audio I.F. transformer (T-3)	4.15
RTT-8001	TRANSFORMER—3rd audio I.F. transformer (T-4)	4.15
RTT-9000	TRANSFORMER—Vertical oscillator transformer (T-10)	2.80
RTT-9500	TRANSFORMER—Audio output transformer (T-5)	3.25
RTW-501	WINDOW—Station letter window (Pkg. 5)	.05
RTW-503	WINDOW—Safety glass window for Model HM-225	4.30
RTW-504	WINDOW—Safety glass window for Model HM-226-7A	3.50
RTX-1001	ASSEMBLY—Wave trap assembly (L-1, 2, 3, 4, C-1, 7, 11, 13)	
RTX-1003	ASSEMBLY—Wave trap assembly (L-15, C-88)	.80
RTX-2000	ASSEMBLY—Chassis mounting assembly	.20

* Used on previous radio receivers.

(Prices Subject to Change without Notice)

CAUTIONARY INSTRUCTIONS

All adjustments not accessible with the back cover in place can be made without energizing the high-voltage circuits.

Servicing of the high-voltage circuits can be satisfactorily performed with the power-cord plug removed from any power supply outlet. A resistance check of the circuit components will indicate any trouble existing. HIGH VOLTAGES SHOULD NEVER BE MEASURED.

The "picture tube" is highly evacuated and is consequently subject to a very great air pressure. If it is broken, glass fragments will be violently expelled. Handle with care, using safety goggles and gloves.

The large end of the "picture tube"—particularly that part at the rim of the viewing surface—must not be struck, scratched or subjected to more than moderate pressure. DO NOT FORCE THE SOCKET ONTO THE TUBE OR STRAIN ANY EXTERNAL CONNECTIONS. If it fails to slip into place smoothly, investigate and remove the cause of the trouble.

Extremely high voltages (4000 volts or more) are used in the operation of this receiver; therefore, every precaution must be exercised to insure safety to the service engineer and to the customer.

The back cover, while in place, protects the user and should never be removed except by a qualified television service engineer.

The power-cord plug should not be inserted in a power supply outlet until a good, solid ground connection has been properly made to the receiver chassis.

For safety, the following operations must be performed with power plug disconnected before working on the receiver with the back cover removed:

1. **Remove 879/2X2 tube from socket.**
2. **Detach top cap lead of 879/2X2 tube and insulate the contact end of this cap lead.**
3. **Ground the receiver chassis.**

TELEVISION RECEIVER CIRCUITS

The television receiver circuits are divided into the following sections:

1. R.F. Unit
2. Converter-Oscillator and Amplifier
3. Audio Unit
4. Video Unit
5. Sync Pulse Clipper—Amplifier
6. Horizontal Oscillator—Output
7. Vertical Oscillator—Output
8. Low Voltage Rectifier
9. High Voltage Rectifier

R. F. Unit

This unit, comprising all circuits between the antenna terminal posts and the converter grid, consists of a high pass filter input, a series tuned antenna coil primary, a shunt capacity coupled secondary (C-2) and a video I.F. wave trap (C-88, L-15). The wave trap is broadly tuned at 11.75 M.C. to prevent I.F. interference. Any one of the five tuned circuits for each of the five television transmission bands can be connected into the secondary circuit by pressing the appropriate button. The secondary circuit trimmers when properly tuned give a broad, flat response curve.

Converter-Oscillator and Amplifier

A plate-tuned oscillator is used with vernier tuning permitted from the front control panel through trimmer C-17. The resultant video I.F. signal of 12.75 M.C. and the audio I.F. signal of 8.25 M.C. developed in the converter-oscillator tube circuit is coupled through transformer T-11 to the 1852 amplifier tube.

Audio Unit

The audio unit is a conventional-type superheterodyne sound receiver with the I.F. stages tuned to 8.25 M.C. The audio I.F. signal is taken off through the suppressor of the 1st video I.F. tube.

Video Unit

This unit includes all the video I.F. amplifier stages, the video detector, two stages of video amplification and the picture tube input. Three wave traps are provided in this unit; one at T-6 for rejecting the audio I.F. of the adjacent television band, one at T-7 for rejecting the audio I.F. of the band concerned, and one in the cathode circuit of the 1st video, 6F8G, comprising L-18 and C-52, for removing the 12.75 M.C. video I.F. from the detected signal amplifier stages. A sensitivity control, known as contrast control, (R-67), is provided in the AVC circuits of the 6H6 video detector for varying the grid bias on the 2nd and 3rd video I.F. tubes.

D.C. reinsertion (automatic background control) is accomplished in the 2nd video 6F6G tube circuit by using part of the varying screen voltage developed across R-93 to control the picture tube grid voltage. A high impedance voltage divider, R-94 and R-95, is used and the coupling condenser, C-38, is made small to prevent low frequency variations in the plate supply from getting to the picture tube grid.

Sync-pulse Clipper—Amplifier

Sync-pulses are taken off the plate of the right section of the 1st video and clipper tube, 6F8G. The video signals are separated by tube cut-off since the plate voltage is only about 10 volts. The sync-pulses are then amplified in the sync amplifier tube and coupled through a high-pass filter to the grid of the horizontal oscillator.

Horizontal Oscillator—Output

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 cathode circuit of the 6AL6G. The degeneration resistor R-22 and series circuit across the secondary of the 6AL6G output transformer damp the output transient. Damping is adjustable through R-100.

Vertical Oscillator—Output

Vertical sync-pulses are separated from the horizontal pulses in the vertical clipper right section of 6F8G and are fed to the vertical oscillator. This oscillator is of the blocking type, transformer coupled. The generated sawtooth wave across C-70 is shaped by the vertical linearity control, R-53. The speed of the oscillator is controlled by R-79 and the length of sweep (size) is adjustable through R-65. The output is amplified and coupled to the vertical deflection coils of the picture tube.

Low-voltage Rectifier

Two 5U4G rectifiers are necessary to supply plate current which is over 300 ma. A combination of choke and resistance filters is used so that the audio and oscillator plate supplies will be free from video and sweep signals.

High-voltage Rectifier

The high voltage rectifier uses a resistance filter. The bleeder is connected across the filter input to reduce ripple. R-103 is inserted in the plate lead for protection.

GENERAL ELECTRIC CO.

MODEL HM226-7A
Radio Receiver Schematic
Socket, Voltage, Trimmers

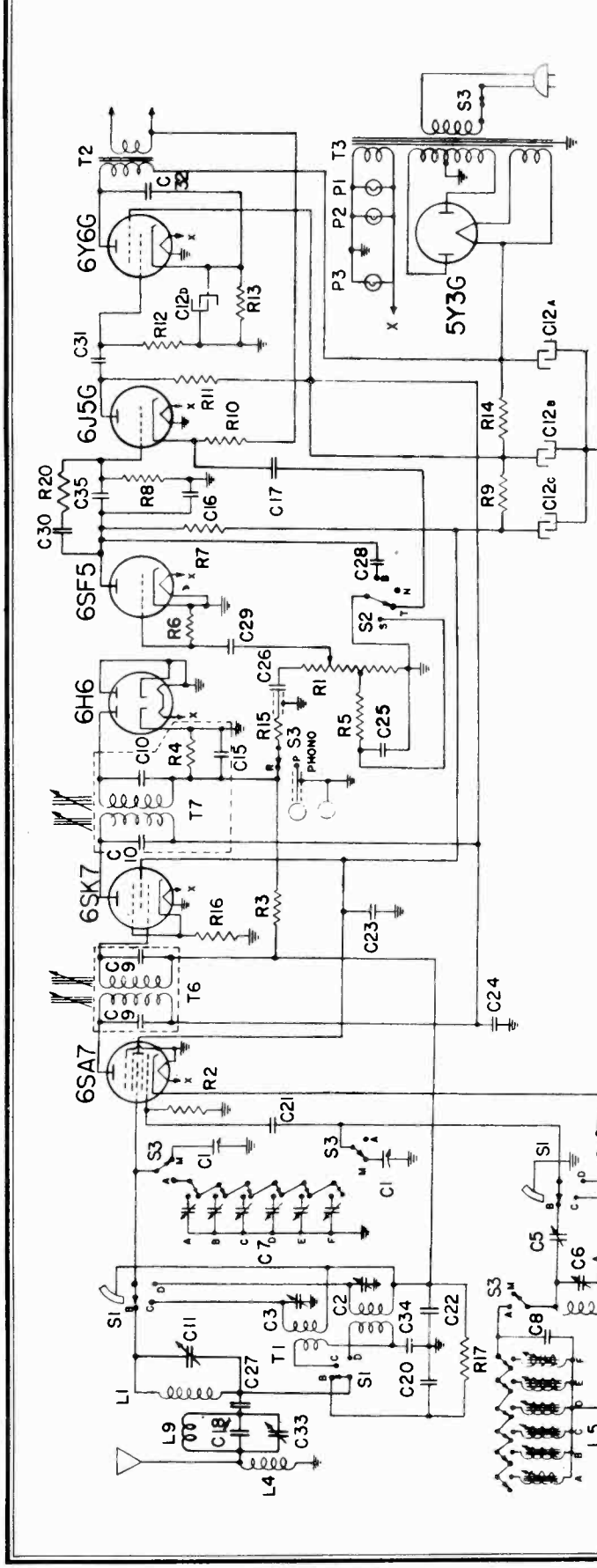
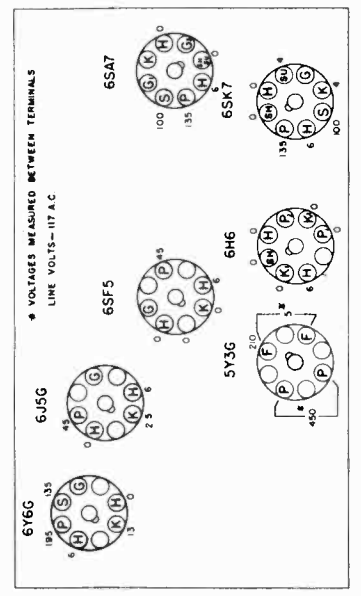


Fig. 12. Radio Schematic Diagram (Model HM-226-7A only)

Radio Receiver (used in HM-226-7A only)
Band "B" ..... 540–1600 K.C.
Band "C" ..... 2.1–6.5 M.C.
Band "D" ..... 6.25–22.5 M.C.



VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS.
Band "B." No signal input. Max. volume.

Fig. 13. Radio Chassis Socket Voltages

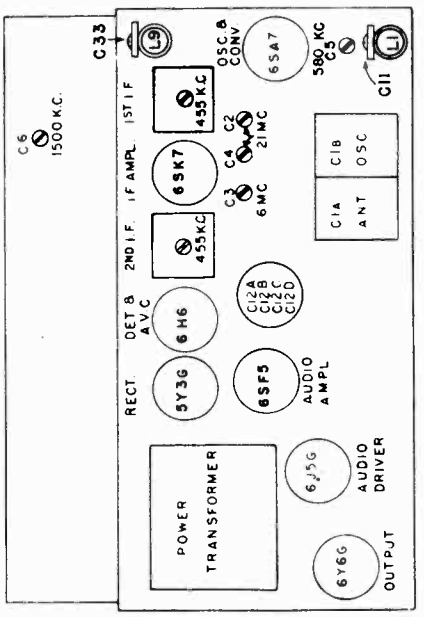


Fig. 11. Radio Chassis Trimmer Location (Model HM-226-7A)

Radio (used in HM-226-7A only)
Converter-Oscillator GE-6SA7
I.F. Amplifier GE-6SK7
Detector and AVC GE-6H6
1st Audio Amplifier GE-6SF5
2nd Audio Amplifier GE-6J5G
Audio Output GE-6Y6G
Rectifier GE-5Y3G
Dial Lamps ..... (3) MAZDA No. 44

Loud-speaker—"Alnico" Magnetic Dynamic
Type of Cone ..... Curvilinear
Cone Diameter ..... 12 inches
Voice Coil Impedance (400 cycles) 3.5 ohms

MODEL HM226-7A
Radio Chassis Wiring
Phono.Data.Power Chassis

GENERAL ELECTRIC CO.

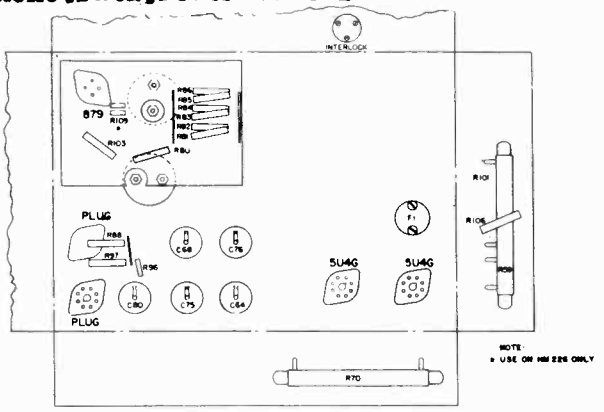


Fig. 10. Power Chassis Parts Layout

LOUD-SPEAKER

To center the voice coil, loosen the two screws which clamp the speaker spider in position. These two screws are available from the rear of the speaker. Shift the spider around until the voice coil is centered, then tighten the screws in position.

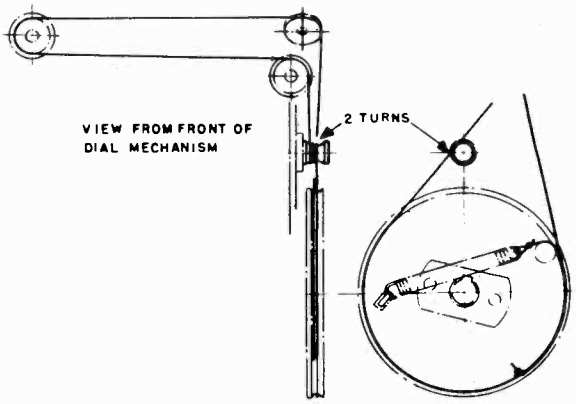


Fig. 14. Dial Drive Stringing Diagram

PHONOGRAPH CONNECTIONS

Model HM-226-7A radio receiver is equipped with a phono-terminal (pin jack) to allow the convenient connection of a record player. General Electric plug, Stock No. RP-145, fits the pin jack.

NOTE—A suitable load consisting of a 100,000 ohm resistor in series with a .01 mfd. capacitor should be connected across the pick-up leads when using a crystal-type unit.

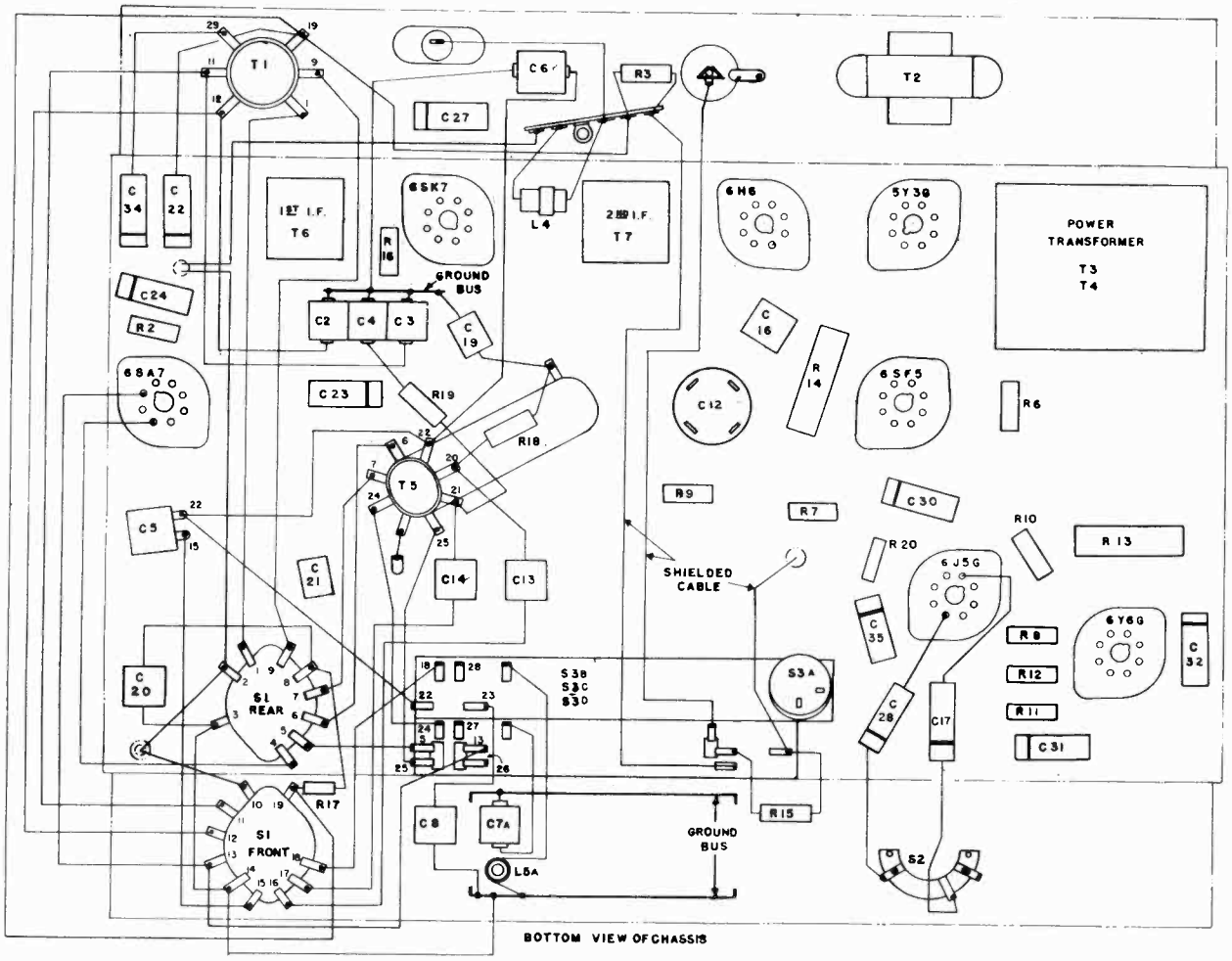


Fig. 15. Radio Chassis Parts Layout
(Model HM-226-7A only)

GENERAL ELECTRIC CO.

MODEL HM226-7A
Radio Alignment
Parts

RADIO ALIGNMENT PROCEDURE (Model HM-226-7A only)

I. F. ALIGNMENT WITH OSCILLOSCOPE

Band Switch Setting	Input Freq.	Point of Input	Dummy Antenna	Trimmer	Comments
1. Band "B"	455 K.C. Sweep	I.F. Grid	.05 Mfd. or Larger	2nd I.F. Sec. 2nd I.F. Pri. (T-7)	Gang condenser plates closed—"Manual" key depressed—connect audio input of oscilloscope to chassis and to junction of R-3 and R-15. Adjust trimmers in order mentioned for a single symmetrical curve of maximum amplitude.
2. Band "B"	455 K.C. Sweep	Converter Grid	.05 Mfd. or Larger	1st I.F. Sec. 1st I.F. Pri. (T-6)	

I. F. ALIGNMENT WITH OUTPUT METER

1. Band "B"	455 K.C. Sweep	I.F. Grid	.05 Mfd. or Larger	2nd I.F. Sec. 2nd I.F. Pri. (T-7)	Gang condenser plates closed—connect output meter across voice coil—keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output.
2. Band "B"	455 K.C. Sweep	Converter Grid	.05 Mfd. or Larger	1st I.F. Sec. 1st I.F. Pri. (T-6)	

R. F. ALIGNMENT

1. Band "B"					Close gang plates—adjust pointer to first line at left end of tuning scale. Connect output meter across voice coil—tone control on "Bass" position.
2. Band "D"	21 M.C. with Modulation	Antenna Post	I.R.E.	Osc. (C-4) Ant. (C-2)	The image of any "D" band signal should be heard 910 K.C. below signal input when (C-4) is on proper peak. Example: 18 M.C. image, 17.09 M.C. Peak (C-2) while rocking the gang condenser.
3. Band "C"	6 M.C. with Modulation	Antenna Post	I.R.E.	Ant. (C-3)	Peak for maximum output with a low input signal.
4. Band "B"	1500 K.C. with Modulation	Antenna Post	I.R.E.	Osc. (C-6) Ant. (C-11)	Align (C-6) on 1500 K.C. and peak output with (C-11).
5. Band "B"	580 K.C. with Modulation	Antenna Post	I.R.E.	Osc. Padder (C-5)	Align for maximum output with a low input signal, rocking gang condenser.
6. Band "B"	1500 K.C. with Modulation	Antenna Post	I.R.E.	Osc. (C-6) Ant. (C-11)	Retrim at 1500 K.C.

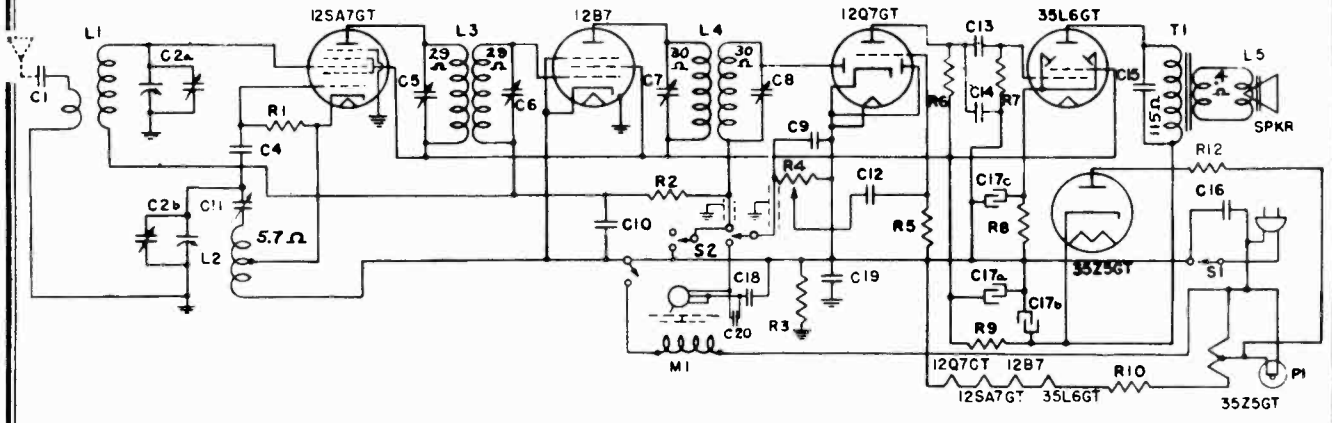
RADIO CHASSIS PARTS (Model HM-226-7A Radio) (Prices Subject to Change without Notice)

*RB-008	BOARD—Terminal board (2 lug)	$0.10	RK-044	KNOB—Radio control knob (Pkg. 2)	$0.40
*RB-009	BOARD—Terminal board (1 lug)	.15	RK-204	KEY—Station key	.10
*RB-026	BOARD—Antenna terminal board	.10	RL-083	COIL—C and D band antenna coil (T-1)	.85
*RB-046	BOARD—Terminal board (5 lug)	.15	RL-096	COIL—B band antenna coil (L-1)	
*RB-096	BOARD—Terminal board (3 lug)	.10	RL-287	COIL—Oscillator coil (T-5)	1.15
RB-098	BOARD—Ant. gnd. terminal board	.10	RL-345	CHOKE—Antenna choke (L-4)	.30
RB-625	BUSHING—Tuning control shaft bushing	.10	RL-606	COIL—Wave trap coil (L-9)	
RB-1009	BOARD—Phono terminal board	.10	RL-9510	COIL—Station selector coil assembly (L-5)	1.80
*RC-009	CAPACITOR—.001 mfd. 600 V. paper (C-35)	.30	RM-501	MASK—Dial scale mask (Pkg. 10)	.05
RC-016	CAPACITOR—.002 mfd. 600 V. paper (C-28)	.25	RP-127	POINTER—Dial pointer assembly (Pkg. 5)	.25
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-26, 30)	.25	*RP-303	PULLEY—Pulley and C clip (Pkg. 2)	.10
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-29)	.25	RQ-642	RESISTOR—220 ohms 2 W. carbon (R-13)	.20
*RC-048	CAPACITOR—.02 mfd. 600 V. paper (C-17, 25, 31)	.30	RQ-670	RESISTOR—3,300 ohms 2 W. carbon (R-14)	.35
*RC-060	CAPACITOR—.03 mfd. 600 V. paper (C-32)	.25	*RQ-1231	RESISTOR—68 ohms ½ W. carbon (R-19) (Pkg. 5)	.70
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-22, 23, 24, 34)	.30	*RQ-1239	RESISTOR—150 ohms ½ W. carbon (R-18) (Pkg. 5)	.70
*RC-096	CAPACITOR—0.1 mfd. 200 V. paper (C-27)	.30	*RQ-1251	RESISTOR—470 ohms ½ W. carbon (R-16) (Pkg. 5)	.70
*RC-206	CAPACITOR—50 mmf. wax treated mica (C-21)	.35	*RQ-1271	RESISTOR—3,300 ohms ½ W. carbon (R-10) (Pkg. 5)	.70
RC-233	CAPACITOR—22 mmf. mica (C-19)	.25	*RQ-1273	RESISTOR—3,900 ohms ½ W. carbon (R-9) (Pkg. 5)	.70
*RC-235	CAPACITOR—100 mmf. mica (C-13, 16)	.25	*RQ-1291	RESISTOR—22,000 ohms ½ W. carbon (R-2) (Pkg. 5)	.70
RC-307	CAPACITOR—750 mmf. silvered mica (C-8)	.40	*RQ-1299	RESISTOR—47,000 ohms ½ W. carbon (R-15, 17) (Pkg. 5)	.70
RC-337	CAPACITOR—1,600 mmf. mica ±5% (C-18)	.25	*RQ-1301	RESISTOR—56,000 ohms ½ W. carbon (R-5) (Pkg. 5)	.70
RC-358	CAPACITOR—2,000 mmf. mica ±5% (C-13)	.30	*RQ-1307	RESISTOR—100,000 ohms ½ W. carbon (R-11) (Pkg. 5)	.70
RC-394	CAPACITOR—4,700 mmf. mica ±5% (C-20)	.40	*RQ-1315	RESISTOR—220,000 ohms ½ W. carbon (R-7) (Pkg. 5)	.70
RC-396	CAPACITOR—5,600 mmf. mica ±5% (C-14)	.45	*RQ-1319	RESISTOR—330,000 ohms ½ W. carbon (R-12) (Pkg. 5)	.70
RC-875	CABLE—Power cable	.40	*RQ-1323	RESISTOR—470,000 ohms ½ W. carbon (R-4, 20) (Pkg. 5)	.70
RC-1987	CLAMP—Oscillator and antenna coil clamp (Pkg. 2)	.05	*RQ-1331	RESISTOR—1.0 megohm ½ W. carbon (R-8) (Pkg. 5)	.70
RC-1989	CUSHION—Condenser cushion (Pkg. 5)	.05	RQ-1339	RESISTOR—2.2 megohms ½ W. carbon (R-3) (Pkg. 5)	.70
RC-5130	CAPACITOR—40 mfd. 300 V.; 20 mfd. 300 V.; 20 mfd. 300 V.; 20 mfd. 25 V. dry electrolytic (C-12a, 12b, 12c, 12d)	2.10	*RQ-1365	RESISTOR—15 megohms ½ W. carbon (R-6) (Pkg. 5)	.70
RC-6509	CAPACITOR—B band padder (C-5)	.35	*RS-236	SOCKET—Radio dial light socket	.10
RC-6510	CAPACITOR—B band oscillator trimmer (C-6)	.20	RS-252	SOCKET—Octal tube socket	.15
RC-6523	CAPACITOR—B band antenna trimmer (C-11)	.15	RS-253	SOCKET—Electrolytic mounting socket	.10
RC-6524	CAPACITOR—Wave trap trimmer (C-33)	.20	RS-268	SOCKET—Bezel pilot lamp socket	.35
RC-7011	CONDENSER—Tuning condenser (C-1a, 1b)	2.15	*RS-401	SPRING—Drive cord spring (Pkg. 2)	.20
RC-8125	CABLE—Condenser drive cable assembly	.20	RS-924	SHAFT—Tuning control shaft	.10
RC-8141	CABLE—Power cable to radio (Power chassis end)	.60	RT-862	TRIMMER STRIP—Station selector trimmer strip (C-7a, 7b, 7c, 7d, 7e, 7f)	$1.20
RC-8500	CARD—Station letter cards (1 set)	.20	RT-863	TRIMMER STRIP—D and C antenna trimmers, D oscillator trimmer (C-2, 3, 4)	.45
RC-8505	CARD—Key manual tab card (Pkg. 10)	.05	*RT-952	TERMINAL—Speaker lead terminal (Pkg. 10)	.05
RC-8507	CARD—Key off tab card (Pkg. 10)	.05	RV-067	VOLUME CONTROL—2 megohm volume control (R-1)	.65
RC-8512	CARD—Key phono tab card (Pkg. 10)	.05	*RW-101	WASHER—Knob felt washer (Pkg. 10)	.05
RD-135	DIAL—Radio dial	.40	RW-908	WHEEL—Dial tuning volume wheel	.30
RD-407	DRUM—Condenser drive drum assembly	2.40			
RE-204	ESCUTCHEON—Station key escutcheon				
RE-205	ESCUTCHEON—Tuning and volume escutcheon				
RH-006	HAIRPIN COTTER—Tuning drive shaft hairpin cotter (Pkg. 10)	.10			
RS-3022	SWITCH—Station selector switch (S-3)	$7.60			
RS-3047	SWITCH—Tone control switch (S-2)	.40			
RS-3048	SWITCH—Band change switch (S-1)	1.00			
RT-0520	TRANSFORMER—60 cycle power transformer (T-3)	4.35			
RT-313	TRANSFORMER—1st I.F. transformer (T-6)	1.70			
RT-314	TRANSFORMER—2nd I.F. transformer (T-7)	1.90			
RT-462	TRANSFORMER—Output transformer (T-2)	1.40			

* Used on previous radio receivers.

MODEL H508
Schematic, Socket
Trimmers, Alignment

GENERAL ELECTRIC CO.



Symbol	Description	Symbol	Description	Symbol	Description
C-1	.002 mfd. paper capacitor	C-17b	40 mfd. 150 V. dry electrolytic	R-4	500,000 ohms volume control
C-2a	Antenna section tuning condenser	C-17c	20 mfd. 25 V. dry electrolytic	R-5	15 megohms carbon resistor
C-2b	Oscillator section tuning condenser	C-18	0.1 mfd. paper capacitor	R-6	470,000 ohms carbon resistor
C-4	47 mmf. mica capacitor	C-19	0.2 mfd. paper capacitor	R-7	470,000 ohms carbon resistor
C-9	470 mmf. mica capacitor	C-20	.001 mfd. paper capacitor	R-8	150 ohms carbon resistor
C-10	.05 mfd. paper capacitor	L-1	Beam-a-Scope	R-9	1200 ohms carbon resistor
C-11	B band padder	L-2	Oscillator coil	R-10	100 ohms wire wound resistor
C-12	.03 mfd. paper capacitor	L-3	1st I.F. transformer	R-12	15 ohms carbon resistor
C-13	.005 mfd. paper capacitor	L-4	2nd I.F. transformer	S-1	Power switch (on Volume Control)
C-14	330 mmf. mica capacitor	P-1	Dial Lamp MAZDA No. 47	S-2	Radio-Phono switch
C-15	.01 mfd. paper capacitor	R-1	33,000 ohms carbon resistor	T-1	Output transformer
C-16	.05 mfd. paper capacitor	R-2	2.2 megohms carbon resistor		
C-17a	30 mfd. 150 V. dry electrolytic	R-3	470,000 ohms carbon resistor		

SERVICE DATA

Over-all Dimensions

Height—10⅛ inches. Width—15¼ inches. Depth—13½ inches.

Tubes

Converter-Oscillator	GE-12SA7GT
I. F. Amplifier	GE-12B7
Det., Aud, AVC	GE-12Q7GT
Power Output	GE-35L6GT
Rectifier	GE-35Z5GT
Dial Lamp	MAZDA No. 47

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

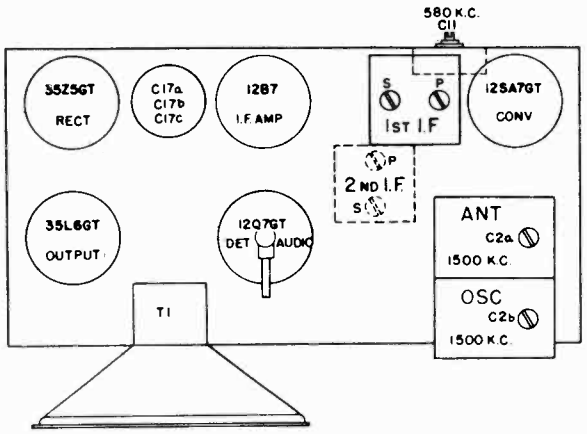


Fig. 2. Trimmer Location

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ..... 455 KC R.F. ..... 1500 and 580 KC

The location of all trimmers is shown in Fig. 2.

Electrical Specifications

Rating	Power Supply (volts)	Frequency (cycles)	Power Consumption (watts)
A-6	115	60	55
A-5	115	50	55
C-2	115	25	55

Electrical Power Output (115-line volts)

Undistorted	1.2 watts
Maximum	2.0 watts

Loud-speaker—"Alnico" Magnetic Dynamic

Outside Cone Diameter	4 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 this signal to the grid of the 12B7 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 12SA7GT and aligning the 1st I.F. transformer. Do not remove grid leads from the tubes. Finish alignment by over-all adjustments.

R.F. Alignment

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-2b) at 1500 KC and peak (C-2a) for maximum output. Change signal to 580 KC and tune receiver to signal. Peak (C-11) on the 580 KC signal by rocking the gang condenser. Retrim at 1500 KC.

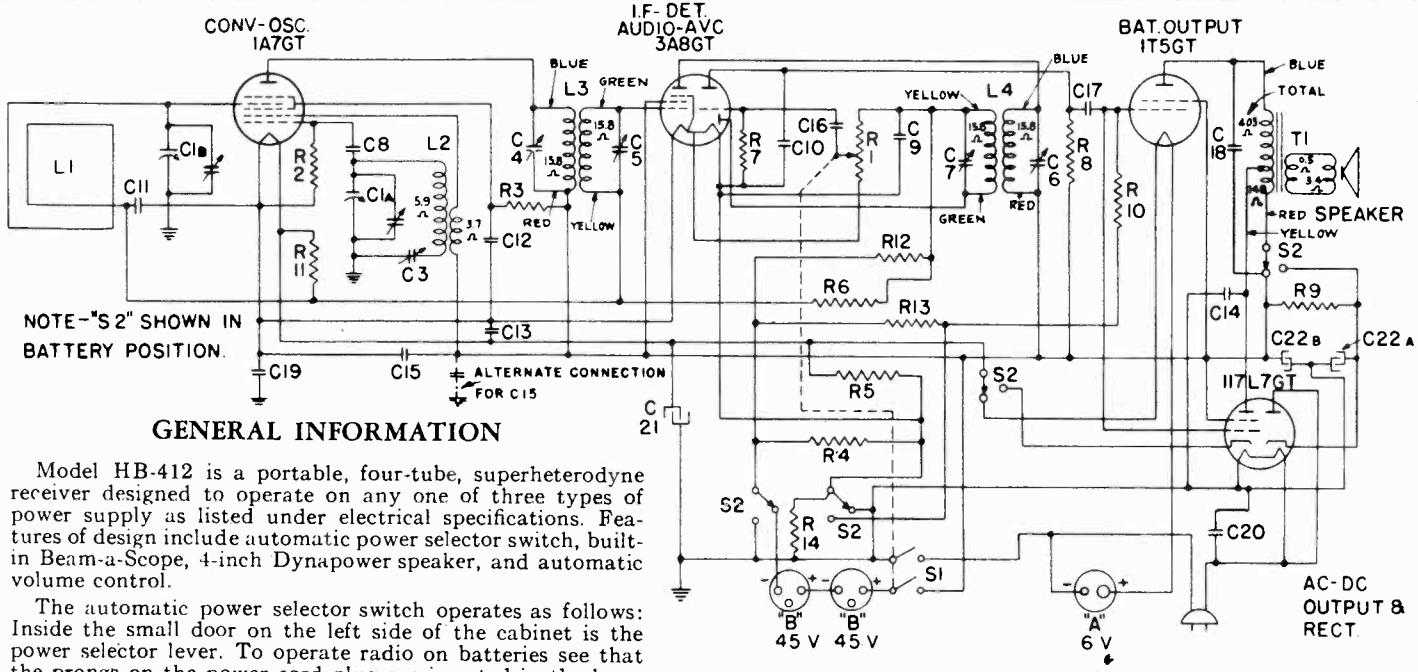


Fig. 3. Schematic Diagram

Model HB-412

Symbol	Description
C-1A	Oscillator section tuning condenser
C-1B	Antenna section tuning condenser
C-3	Oscillator padding capacitor
C-8	47 mmf. mica capacitor
C-9	220 mmf. mica capacitor
C-10	220 mmf. mica capacitor
C-11	.05 mfd. paper capacitor
C-12	0.1 mfd. paper capacitor
C-13	0.1 mfd. paper capacitor
C-14	220 mmf. mica capacitor
C-15	0.1 mfd. paper capacitor
C-16	.002 mfd. paper capacitor
C-17	.01 mfd. paper capacitor
C-18	.004 mfd. paper capacitor
C-19	0.2 mfd. paper capacitor
C-20	.01 mfd. line capacitor
C-21	100 mfd. 5 V. dry electrolytic
C-22A	40 mfd. 150 V. dry electrolytic
C-22B	20 mfd. 150 V. dry electrolytic
L-1	Beam-a-Scope
L-2	Oscillator coil
L-3	1st I.F. transformer
L-4	2nd I.F. transformer
R-1	1.0 megohm volume control
R-2	220,000 ohms carbon resistor
R-3	47,000 ohms carbon resistor
R-4	150 ohms carbon resistor
R-5	560 ohms carbon resistor
R-6	2.2 megohms carbon resistor
R-7	15 megohms carbon resistor
R-8	1.0 megohm carbon resistor
R-9	1800 ohms carbon resistor
R-10	470,000 ohms carbon resistor
R-11	3.9 megohms carbon resistor
R-12	680,000 ohms carbon resistor
R-13	1.5 megohms carbon resistor
R-14	27 ohms carbon resistor
S-1	Power switch (on volume control)
S-2	AC-DC or Battery switch
T-1	Output transformer

GENERAL INFORMATION

Model HB-412 is a portable, four-tube, superheterodyne receiver designed to operate on any one of three types of power supply as listed under electrical specifications. Features of design include automatic power selector switch, built-in Beam-a-Scope, 4-inch Dynapower speaker, and automatic volume control.

The automatic power selector switch operates as follows: Inside the small door on the left side of the cabinet is the power selector lever. To operate radio on batteries see that the prongs on the power cord plug are inserted in the lever holes and the plug pushed in until it wedges between the cabinet wall and the lever. Place the rest of the power cord in the compartment and close the door. To operate radio on an AC or DC power supply merely remove the power cord and plug from the compartment and insert in a convenience outlet.

Note: Do not press in on power selector lever while power cord is in convenience outlet.

When operating from a DC source of power, it is necessary to insert the power plug with the proper polarity; otherwise the receiver will fail to function. If any hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

When the receiver is operating on batteries it will perform as soon as it is turned on. However, when operating from an AC or DC power supply, sufficient time must be allowed for the tubes to become heated.

Audio power output is obtained from the 1T5GT on battery operation, and from the pentode section of the 117L7GT on AC or DC, 115-volt operation. The driving grids of the two tubes are in parallel. On battery operation the 117L7GT is dead due to no filament voltage, as is the case of the 1T5GT on AC-DC, 115-volt operation. A tapped primary output transformer is used to insure matching to the different load impedances of the two output tubes. If the receiver does not operate on low line voltage check 117L7GT for low plate current since its plate current energizes the 3A8GT and 1A7GT filaments; also check 1A7GT for low emission.

Precaution:

Model HB-412 when used on an AC power supply will have one side of the chassis connected directly to the line. In order to prevent injury to alignment equipment or shock to the servicemen, use an isolating transformer between the convenience outlet and the receiver power cord.

SERVICE DATA

Electrical Specifications

1. AC or DC Power Supply
   110–120 Volts, 25–60 cycles on AC, 25 watts

2. Battery Power Supply
   6-volt "A" supply, 90-volt "B" supply.

Recommended batteries for long life.
(a) "A" supply—Eveready No. 747 or equivalent
(b) "B" supply—two Eveready No. 482 or equivalent

Loud-speaker-"Alnico" Magnetic Dynamic

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

Tubes

Converter-Oscillator GE-1A7GT
I.F.—Det.—Aud.—AVC GE-3A8GT
Battery Power Output GE-1T5GT
AC-DC Power Output—Rectifier GE-117L7GT

Tuning Frequency Range . . . 550–1600 KC

Intermediate Frequency . . . . 455 KC

Maximum Power Output

Battery Operation . . . . . 275 milliwatts
AC or DC Operation . . . . . 2 watts

MODEL HB412
Voltage, Socket
Trimmers, Alignment

GENERAL ELECTRIC CO.

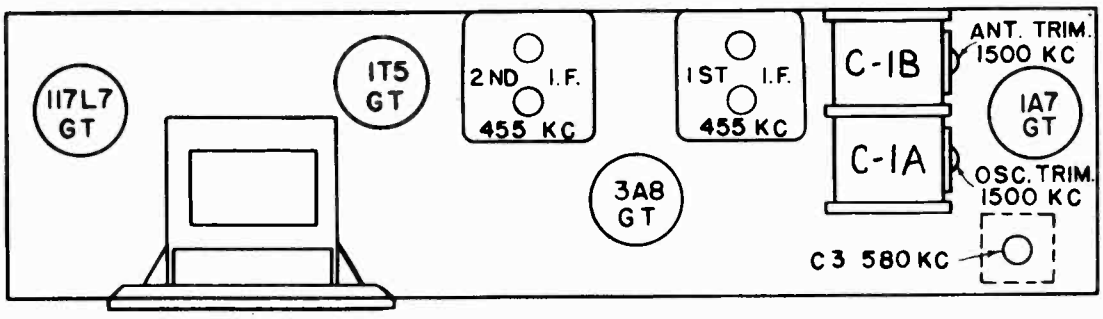


Fig. 1. Trimmer Location

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ..... 455 KC
R.F. ..... 1500 and 580 KC

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

General Alignment Notes

This receiver must be removed from the carrying case in order to perform the alignment. Special care must be exercised to place the batteries, Beam-a-Scope and chassis in the same relative positions with respect to one another as these components occupied in the case; otherwise, alignment will not be satisfactory.

I.F. Alignment

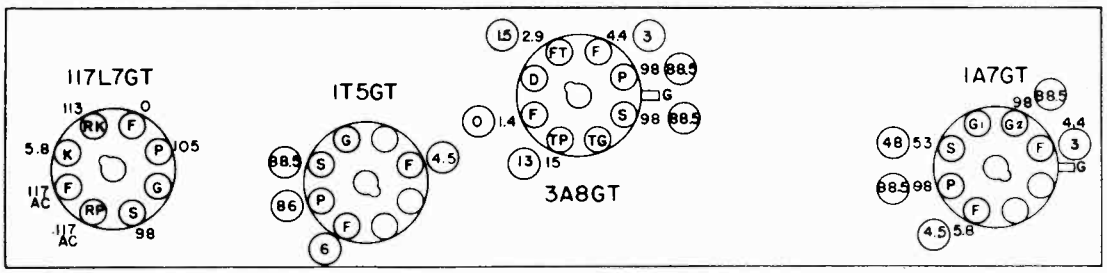
With batteries, Beam-a-Scope and chassis in position for alignment as mentioned above, and using an isolating transformer if operating from an AC power source (refer to precaution under "General Information"), set up and align as follows: Connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 KC and apply signal to the control grid of the 3A8GT tube through a .05 mfd. capacitor. Align the 2nd I.F. transformer trimmers. Next apply signal to the control grid of the 1A7GT through the same .05 mfd. capacitor and align the 1st I.F. transformer trimmers. Retouch the 2nd I.F. transformer trimmers while applying signal to the 1A7GT tube. Do not remove the grid leads from the tubes when applying the oscillator signal and keep the test oscillator output as low as a readable meter reading will permit.

R.F. Alignment

Place a one turn coupling loop not closer than six inches from the receiver Beam-a-Scope. Apply a 1500 KC signal to the coupling loop. Set pointer to 1500 KC and align the oscillator trimmer (C-1A). Peak (C-1B) for maximum output. Change test signal to 580 KC and with pointer in region of 580 KC peak (C-3) while rocking the gang condenser. Retrim at 1500 KC.

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

FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS

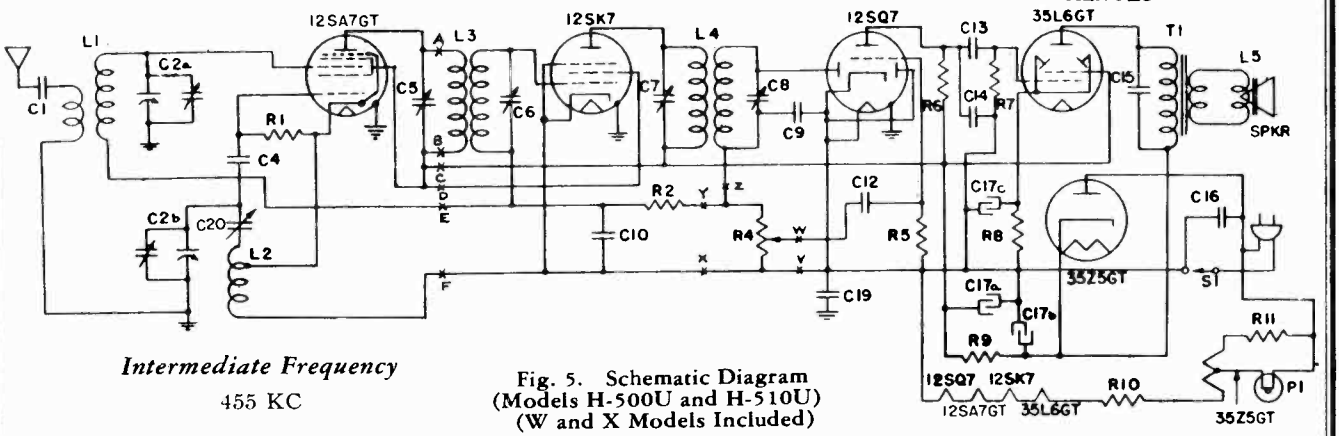
VOLTAGES MEASURED BETWEEN SOCKET TERMINAL AND CHASSIS.
VOLTAGE READINGS ENCIRCLED INDICATE VALUES OBTAINED WHEN OPERATING WITH A 6-VOLT "A" BATTERY AND A 90-VOLT "B" BATTERY.
REMAINING VOLTAGE READINGS OBTAINED WHEN OPERATING ON A 117-VOLT AC POWER SUPPLY.
READINGS GREATER THAN 50 OBTAINED ON 250-VOLT SCALE OF 1000 OHMS PER VOLT METER.

D- DIODE PLATE
F- FILAMENT
FT- FILAMENT TAP
G- CONTROL GRID
G1- OSCILLATOR GRID
G2- OSCILLATOR PLATE
K- CATHODE
P- PLATE
RK- RECTIFIER CATHODE
RP- RECTIFIER PLATE
S- SCREEN
TG- TRIODE GRID
TP- TRIODE PLATE

Fig. 2. Socket Voltages

GENERAL ELECTRIC CO.

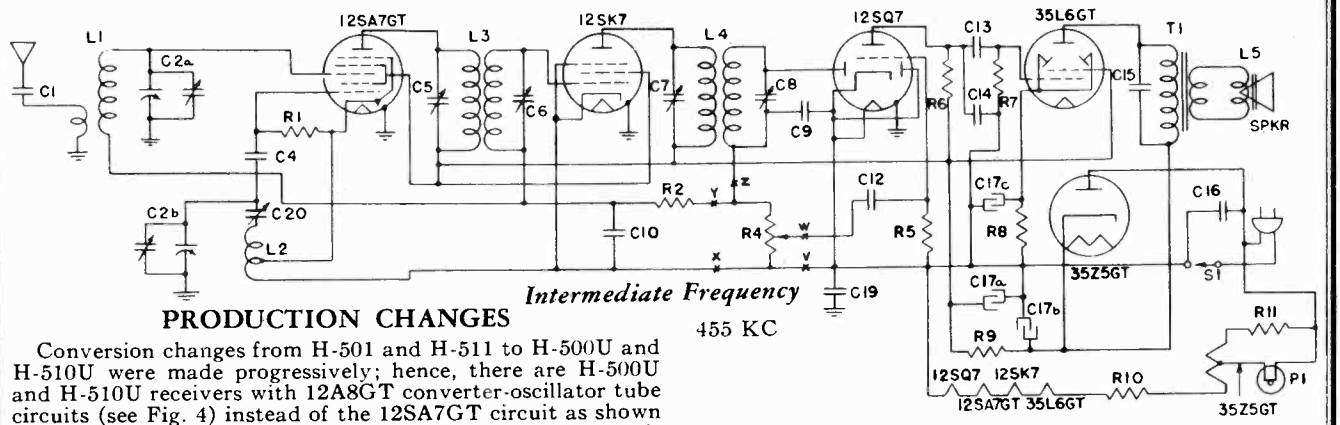
MODELS H500U, H510U (W, X) Early, Late Schematics, Changes
MODEL H520U (W, X) Schematic



Intermediate Frequency
455 KC

Fig. 5. Schematic Diagram
(Models H-500U and H-510U)
(W and X Models Included)

* Refer to Production Changes for circuits with 12A8GT tube and 2.0 megohm volume control. Lettered points indicate break-points for insertion of circuits shown in Figs. 3 and 4.



Intermediate Frequency
455 KC

* Refer to Production Changes for circuits with 2.0 megohm volume control. Lettered points indicate break-points for insertion of circuit shown in Fig. 3.

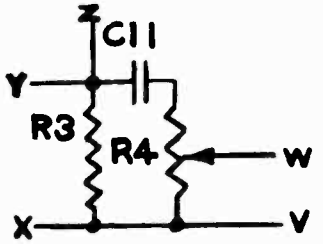
Fig. 6. Schematic Diagram
Model H-520U
(W and X Models Included)

PRODUCTION CHANGES

Conversion changes from H-501 and H-511 to H-500U and H-510U were made progressively; hence, there are H-500U and H-510U receivers with 12A8GT converter-oscillator tube circuits (see Fig. 4) instead of the 12SA7GT circuit as shown in the schematic diagram, Fig. 5. Insert the 12A8GT circuit in place of the 12SA7GT circuit for those models having a 12A8GT tube. When ordering replacement parts for the 12A8GT circuit be sure to refer to the special replacement parts list.

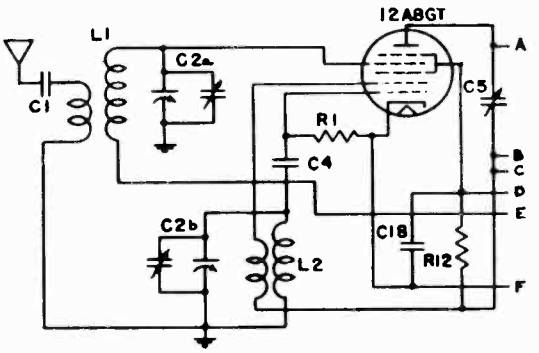
Similarly there will be found receivers of Model H-500U, H-510U and H-520U which have a 2.0 megohm volume control circuit (see Fig. 3). If such is the case insert the 2.0 megohm volume control circuit in place of the 500,000 ohm volume control circuit shown in the schematic diagram (Figs. 5 and 6). When ordering replacement parts for the 2.0 megohm volume control circuit be sure to refer to the special replacement parts list.

Capacitor (C-12) was .002 mfd. in all early production receivers. It was later changed to .03 mfd. to improve performance.



Symbol	Description
C-11	.002 mfd. paper capacitor
R-3	500,000 ohms carbon resistor
R-4	2 megohm volume control (RV-070)

Fig. 3. 2.0 Megohm Volume Control Circuit
(Refer to Production Changes)



Symbol	Description
C-1	.002 mfd. paper capacitor
C-2a	Antenna section tuning condenser } (RC-7013)
C-2b	Oscillator section tuning condenser } (RC-7013)
C-4	47 mmf. mica capacitor
C-18	.05 mfd. paper capacitor
L-1	Antenna coil (RL-085)
L-2	Oscillator coil (RL-290)
R-1	47,000 ohms carbon resistor
R-12	8200 ohms carbon resistor

Fig. 4. 12A8GT Converter-Oscillator Tube Circuit—Models H-500U and H-510U
(Refer to Production Changes)

MODELS H500U, H510U(W,X)
MODEL H520U(W,X)
Gain, Voltage, Trimmers
Coils, Socket

GENERAL ELECTRIC CO.

Color Specifications

Model	Color and Material
H-500U, 510U, 520U	Oak—Plastic
H-500UW, 510UW, 520UW	Ivory—Plastic
H-500UX, 510UX, 520UX	Onyx—Plastic

Tuning Frequency Range

Model	H-500U, 510U (W and X Models Included)	H-520U (W and X Models Included)
Range	540–1800 KC	540–1600 KC

Electrical Power Output (115-line volts)

Undistorted.....0.9
Maximum.....1.8

Loud-speaker—"Alnico" Magnetic Dynamic

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

Electrical Specifications

Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
115 Volts AC or DC	25–60	30

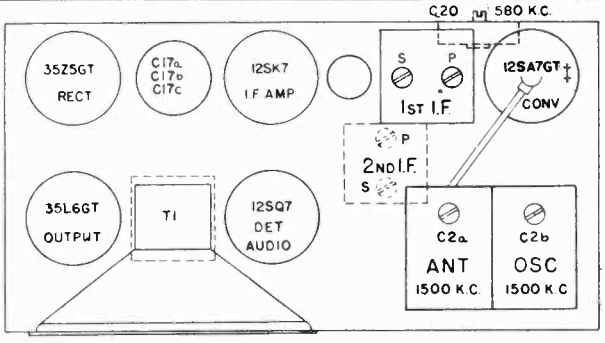


Fig. 1. Trimmer Location

‡ GE-12A8GT used on early production Model H-500U and H-510U.

COIL RESISTANCE CHART

Coil	Section	Resistance (Ohms)
Antenna Coil (H-500U, 510U)	Primary	7
	Secondary	26
Oscillator Coil (12SA7GT)	From C-20 to −B	5
Oscillator Coil (12A8GT)	Plate Section	1.9
	Grid Section	5.2
1st I.F. Transformer	Primary	29
	Secondary	29
2nd I.F. Transformer	Primary	30
	Secondary	30
Output Transformer	Primary	115
	Secondary	0.4

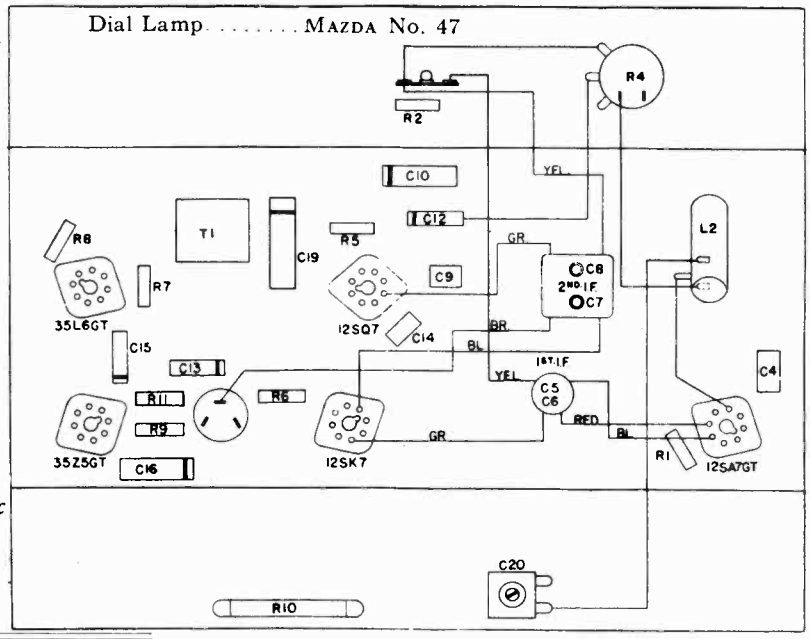


Fig. 7. Chassis Parts Layout

Special Service Information

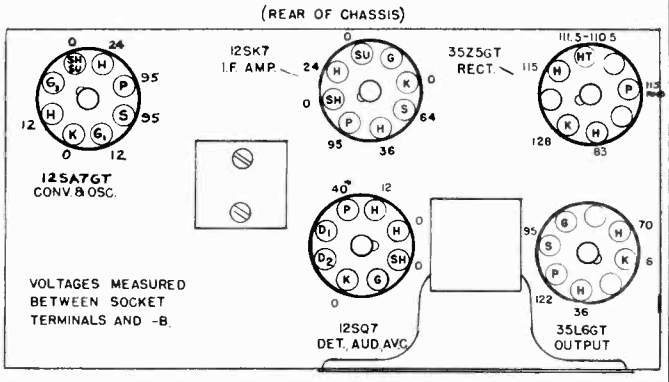
The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains — Gain
Antenna to 12SA7GT.....3 to 4 at 1000 KC
12SA7GT to 12SK7 grid.....42 at 455 KC‡
12SK7 grid to 12SQ7 detector plate.....70 at 455 KC‡

(2) 0.1 volt, 400 cycle signal across volume control will give ½ watt speaker output.‡ (Volume turned to maximum.)

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

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



Bottom View of Chassis

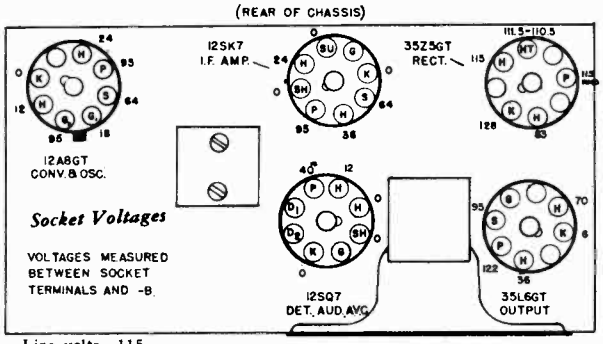
Line volts—115. No signal input. When operated on a d-c power supply, voltages are about 15% lower. Use a high resistance voltmeter.

* Measured on 500 volt scale of 1000 ohms per volt meter.

Fig. 2. Socket Voltages

Voltage, Socket, Chassis Wiring Gain, Parts List — GENERAL ELECTRIC CO. — MODELS H500, H501, H510, H511 H520, H521 (W and X)

H-500, 501, 510, 511, 520, 521 . . . . . Oak Plastic
H-500W, 501W, 510W, 511W, 520W, 521W. Ivory Plastic
H-500X, 501X, 510X, 511X, 520X, 521X . . Onyx Plastic



Socket Voltages

VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND -B.

Line volts—115.
No signal input.

BOTTOM VIEW OF CHASSIS

When operated on a DC power supply, voltages are about 15% lower. Use a high-resistance voltmeter.

*Measured on 500-volt scale of 1000 ohms per volt meter.

D_1—Diode Plate G_2—Oscillator Plate HT—Heater Tap S—Screen
D_2—Diode Plate G—Control Grid K—Cathode SU—Suppressor
G_1—Oscillator Grid H—Heater P—Plate SH—Shell

MODEL	H-500, 501, 510, 511 (W and X Models Included)	H-520, 521 (W and X Models Included)
Range	540–1800 KC	540–1600 KC

Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
115 Volts AC or DC	25–60	30

Electrical Power Output (115-line volts)

Undistorted 0.9
Maximum 1.8

Loudspeaker "Alnico" Magnetic Dynamic

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

Special Service Information

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

(1) Stage Gains

	Gain
Antenna to 12A8GT grid	5 to 5.5 at 1000 KC
12A8GT grid to 12SK7 grid	42 at 455 KC‡
12SK7 grid to 12SQ7 detector plate	60 at 455 KC‡

(2) 0.1 volt, 400 cycle signal across volume control will give ½ watt speaker output. (Volume control turned to maximum).

(3) Average DC voltage developed across oscillator grid leak . . . . . 18 volt

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

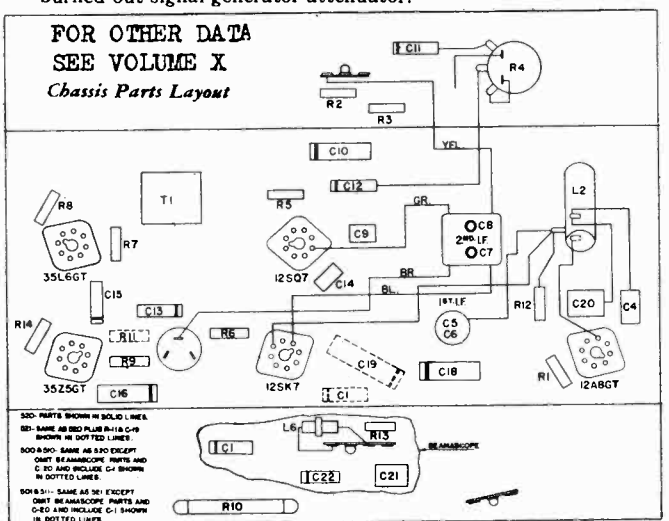
Precaution—If the signal generator is AC operated use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out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

PRODUCTION CHANGES

Capacitor (C-12) was .002 mfd. in all early production receivers. As production progressed this capacitor was changed to .03 mfd. to improve performance.

FOR OTHER DATA SEE VOLUME X

Chassis Parts Layout



Stock No.	Description	List Price
RL-291	COIL—Oscillator coil for Models H-520 and H-521 (W & X inc.) (L-2)	$0.50
RL-346	CHOKE—RF choke for Models H-520 and H-521 (W & X inc.) (L-6)	.30
RL-510	LOOP—Beam-a-Scope assembly for Models H-520 and H-521 (W & X inc.) (L-1)	.70
RL-937	LUG—Key pin binding lug (Pkg. 10)	.10
RP-134	PIN—Key pin for Models H-510, 511, 520, 521 (W & X inc.) (Pkg. 10)	.05
*RQ-1215	RESISTOR—15 ohms, ½ W. carbon (R-14) (Pkg. 5)	.70
*RQ-1283	RESISTOR—10,000 ohms, ½ W. carbon (R-13) Models H-520 and H-521 (W & X inc.) (Pkg. 5)	.70
RS-256	SOCKET—Electrolytic mounting socket for Models H-501, 511, 521 (W & X inc.)	.05
RS-257	SOCKET—Electrolytic mounting socket for Models H-500, 510, 520 (W & X inc.)	$0.05
RS-1016	SPEAKER—4-inch speaker for Models H-501, 511, 521 (W & X inc.) (L-5)	3.35
RS-1017	SPEAKER—4-inch speaker for Models H-500, 510, 520 (W & X inc.) (L-5)	3.25
RT-321	TRANSFORMER—1st IF transformer (L-3) for Models H-520 and H-521 (W & X inc.)	.95
RT-323	TRANSFORMER—1st IF transformer for Models H-500, H-501, H-510, H-511 (W & X inc.)	.90
RW-039	WINDOW—Celluloid station letter window for Models H-510, 511, 520, 521 (W & X inc.) (Pkg. 25)	.10
*RB-013	BOARD—Terminal board (2 lug) for Models H-500, 501, 510, 511 (W & X inc.)	.10
*RB-070	BOARD—Terminal board (3 lug) for Models H-520 and H-521 (W & X inc.)	.10
RB-179	BRACKET—Bracket for Beam-a-Scope frame for Models H-520 and H-521 (W & X inc.)	.10
RC-016	CAPACITOR—.002 mfd., 600 V. paper (C1, 11)	.25
*RC-060	CAPACITOR—.03 mfd., 600 V. paper (C-12)	.25
*RC-130	CAPACITOR—.2 mfd., 400 V. paper for Models H-501, 511, 521 (W & X inc.) (C-19)	.30
*RC-348	CAPACITOR—1600 mmf. mica for Models H-520, 521 (W & X inc.) (C-20)	.35
*RC-390	CAPACITOR—3900 mmf. mica for Models H-520 and H-521 (W & X inc.) (C-21)	.35
RC-1990	CLAMP—Antenna coil clamp for Models H-500, 501, 510, 511 (W & X inc.) (Pkg. 5)	.10
RC-7012	CONDENSER—Tuning condenser for Models H-510, 511, 520, 521 (W & X inc.) (C-2a, 2b)	4.00
RC-7013	CONDENSER—Tuning condenser for Models H-500, 501 (W & X inc.) (C-2a, 2b)	2.00
RC-8508	CARDS—Station letter cards for Models H-510, 511, 520, 521 (W & X inc.)	.30
RD-111	DIAL—Dial scale for Models H-500, 501, 510, 511 (W & X inc.)	.20
RD-112	DIAL—Dial scale for Models H-520 and H-521 (W & X inc.)	.20
RD-411	DRUM—Tuning condenser drive drum assembly for all models in ivory	.60
RD-414	DRUM—Tuning condenser drive drum assembly for all models in onyx	.60
RH-007	HANK—Antenna hank for Models H-500, 501, 510, 511 (W & X inc.)	.20
RK-048	KNOB—Control knob for all models in ivory	.15
RK-051	KNOB—Control knob for all models in brown	.15
RK-065	KNOB—Control knob for all models in onyx	.15
RK-206	KEY—Station selector key for Models H-510, 511, 520, 521, 510W, 511W, 520W, 521W (Pkg. 5)	.50
RK-208	KEY—Station selector key for Models H-510X, H-511X, H-520X, H-521X (Pkg. 5)	.70
RL-085	COIL—Antenna coil for Models H-500, 501, 510, 511 (W & X inc.) (L-1)	.50
RL-290	COIL—Oscillator coil for Models H-500, 501, 510, 511, (W & X inc.) (L-2)	.50

*Used on previous receivers

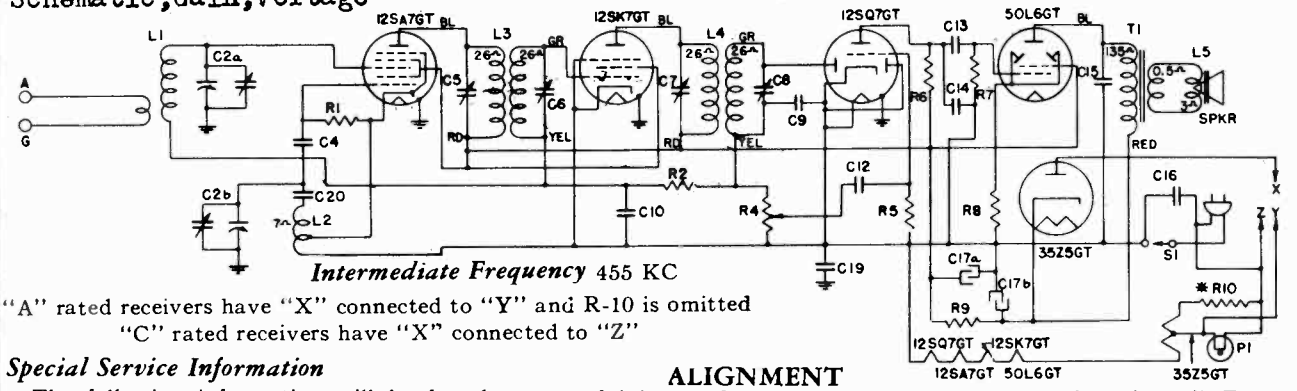
Prices subject to change without notice

(When ordering drums, knobs, or keys, specify color)

MODEL HJ514
Schematic, Gain, Voltage

GENERAL ELECTRIC CO.

Socket, Alignment, Trimmers



Intermediate Frequency 455 KC

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

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.

Stock No.	Description	List Price
*RB-008	BOARD—Terminal board (2 lug)	$0.10
*RB-179	BRACKET—Cabinet back chassis mounting bracket	.10
*RB-626	BUSHING—Tuning shaft bushing	.10
*RB-1015	BOARD—Terminal board (1 lug)	.10
RB-1102	BRACKET—Condenser mounting bracket	.10
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-13)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-15, 20)	.25
*RC-060	CAPACITOR—.03 mfd. 600 V. paper (C-12)	.25
*RC-072	CAPACITOR—.05 mfd. 200 V. paper (C-10)	.25
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-16)	.30
*RC-130	CAPACITOR—0.2 mfd. 400 V. paper (C-19)	.30
*RC-232	CAPACITOR—47 mmf. mica (C-4)	.25
*RC-274	CAPACITOR—330 mmf. mica (C-14)	.30
*RC-293	CAPACITOR—470 mmf. mica (C-9)	.30
*RC-863	CORD—Power cord	.65
RC-5159	CAPACITOR—30 mfd. 150 V; 40 mfd. 150 V; dry electrolytic (C-17a, 17b)	.70
RC-7026	CONDENSER—Tuning condenser (C-2a, 2b)	2.05
RC-8160	CABLE—Tuning condenser drive cable	.10
*RC-9015	CONE ASSEMBLY—4-inch Dynapower speaker cone assembly	.80
RD-147	DIAL—Dial scale	
*RH-111	HAIRPIN COTTER—Tuning shaft retaining cotter (Pkg. 10)	.05
*RK-074	KNOB—Volume and tuning knobs (Pkg. 5)	.50
RL-525	BEAM-A-SCOPE—Cabinet back and Beam-a-Scope assembly (L-1)	.90
RL-2025	COIL—Oscillator coil (L-2)	.30
*RTN-001	NUT—Volume and tuning control pal nut (Pkg. 5)	.10
RP-173	POINTER—Dial pointer	.20
RQ-1214	RESISTOR—13 ohms, ¼-W. carbon ±5% (R-10) (Pkg. 5)	.70
*RQ-1239	RESISTOR—150 ohms, ½-W. carbon (R-8) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms, ½-W. carbon (R-1) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms, ½-W. carbon (R-6, 7) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 meg. ½-W. carbon (R-2) (Pkg. 5)	.70
*RQ-1365	RESISTOR—15 meg. ¼-W. carbon (R-5) (Pkg. 5)	.70
*RQ-1460	RESISTOR—1,200 ohms, 1-W. carbon (R-9) (Pkg. 5)	.70
*RS-238	SOCKET—Octal tube socket	.15
RS-278	SOCKET—Dial lamp socket assembly	.30
*RS-426	SPRING—Drive cable tension spring (Pkg. 5)	.10
RS-954	SPACER—Cardboard dial spacer (Pkg. 5)	.05
RS-1030	SPEAKER—4-inch Dynapower speaker (Complete with output transformer)	$3.25
RS-4002	SPRING—Dial scale retaining spring (Pkg. 3)	.05
RS-9000	SHAFT—Tuning control shaft	.10
RT-352	TRANSFORMER—1st I.F. transformer (L-3)	.70
RT-353	TRANSFORMER—2nd I.F. transformer (L-4)	.70
RT-482	TRANSFORMER—Output transformer (T-1)	.90
RT-955	TERMINAL—Antenna or ground terminal (Pkg. 5)	.10
RV-091	VOLUME CONTROL—0.5 megohm volume control (R-4)	.80
RW-046	WINDOW—Dial scale window	.15
RW-121	WASHER—Pointer felt washer (Pkg. 10)	.05

* Used on previous receivers—(Prices subject to change without notice).

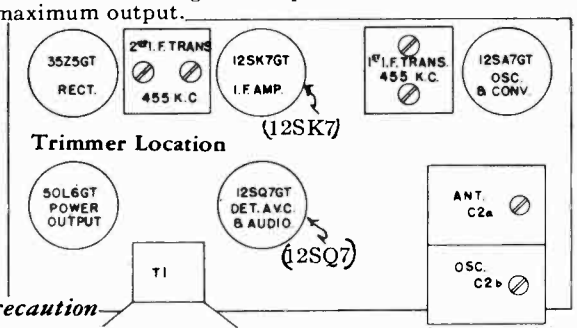
ALIGNMENT

I.F. 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. 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.

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

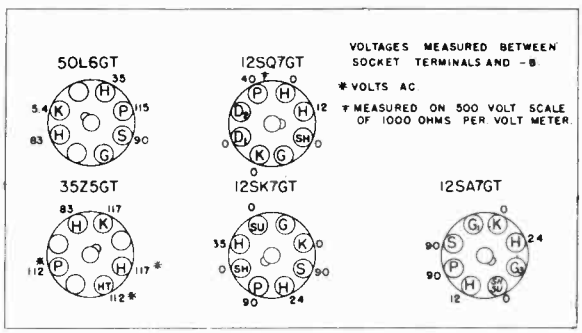
Electrical Power Output (117-line volts)

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

Loud-speaker—"Alnico" Magnetic Dynamic

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

FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS

AC LINE VOLTS-117 MAX VOLUME GANG CLOSED NO SIGNAL

Schematics, Voltage, Coils
Socket, Alignment, Gain

GENERAL ELECTRIC CO.

MODEL H502
MODELS H503, H530 to H532

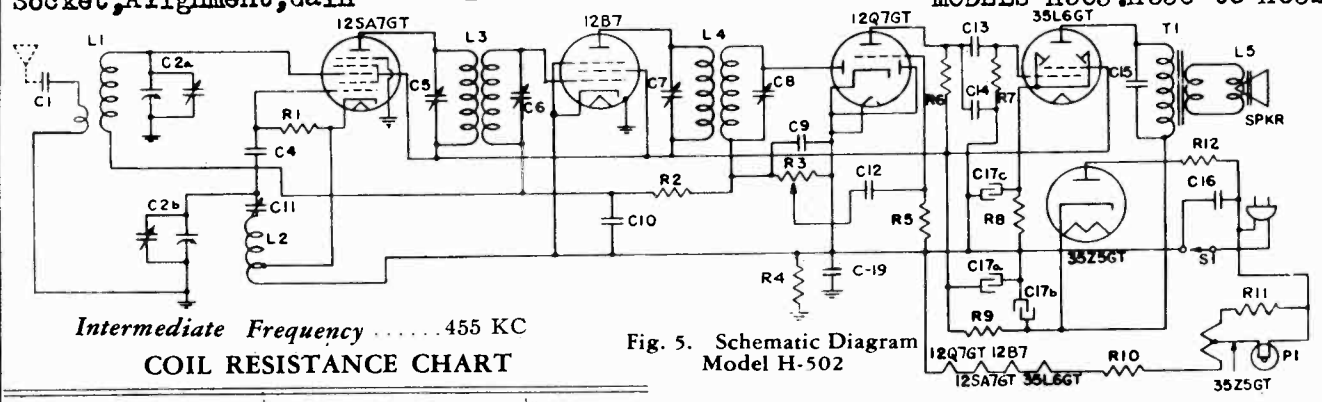


Fig. 5. Schematic Diagram Model H-502

Intermediate Frequency .....455 KC

COIL RESISTANCE CHART

Coil	Section	Resistance
Oscillator Coil	Between C-11 and -B	5 ohms
1st I.F. Transformer	Primary Secondary	29 ohms 29 ohms
2nd I.F. Transformer	Primary Secondary	30 ohms 30 ohms
Output Transformer	Primary Secondary	115 ohms 0.4 ohms

Model	Color	Material
H-502	Mahogany	Plastic
H-503	Walnut	Wood
H-530	Walnut	Wood
H-531	Maroon	Texti-leather over wood
H-532	Eggshell Gray	Texti-leather over wood

GENERAL INFORMATION

These Models are compact superheterodyne receivers using five General Electric Pre-tested Tubes. Operation is permitted on either a DC or AC source of power. Features of design include the new "Alnico" Dynapower speaker, single-ended tubes in the detector circuits, high-filament voltage tubes which eliminate line dropping resistors, and full approval of the Underwriters' Laboratories.

Model	Power Supply (Volts)	Frequency (Cycles on A-C)	Power Consumption (Watts)
H-502	115 Volts AC or DC	25–60	30
H-503, 530, 531, 532	115 Volts AC or DC	40–60	30

Electrical Power Output (115-line volts)

Undistorted.....1.2 watts
Maximum.....2.3 watts

ALIGNMENT PROCEDURE

I.F. Connect an output meter across the voice coil. Turn the Volume Control to maximum. Set test oscillator to 455 K.C. and keep the oscillator output as low as a readable meter reading will permit.

Apply this signal to the grid of the 12B7 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 12SA7GT and aligning the 1st I.F. transformer. Do not remove grid leads from the tubes. Finish alignment by overall adjustments.

R.F. Apply a 1500 K.C. 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-2b) at 1500 K.C. and peak (C-2a) for maximum output. Change signal to 580 KC and tune receiver to signal. Peak (C-11) on the 580 K.C. signal by rocking the gang condenser. Retrim at 1500 K.C.

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

	Gain
Antenna to Converter Grid	3 to 4 at 1000 KC
Converter Grid to 12B7 Grid	45 at 455 KC‡
12B7 Grid to 12Q7GT Grid	80 at 455 KC‡

(2) 0.1 volt, 400 cycle signal across volume control will give ½ watt speaker output. ‡(Volume Control turned to Maximum).

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

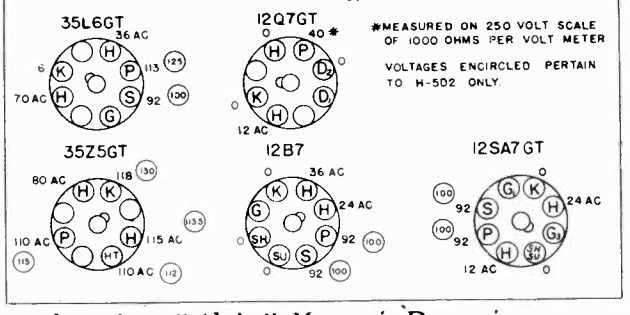
Variations of +10%, −20%, permissible.

Socket Voltages

VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND -B

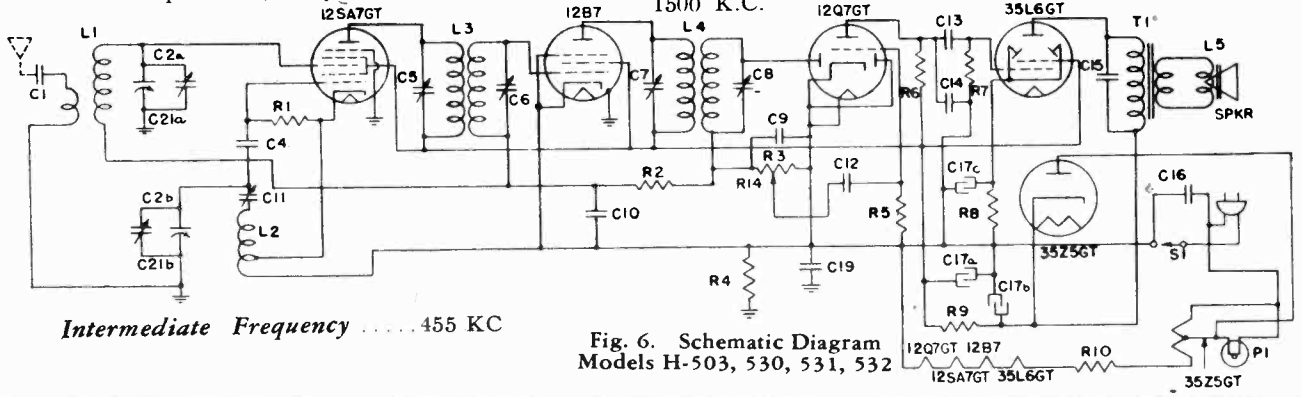
*MEASURED ON 250 VOLT SCALE OF 1000 OHMS PER VOLT METER

VOLTAGES ENCIRCLED PERTAIN TO H-502 ONLY.



Loud-speaker—"Alnico" Magnetic Dynamic

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



Intermediate Frequency .....455 KC

Fig. 6. Schematic Diagram Models H-503, 530, 531, 532

MODEL H502
MODELS H503, H530 to H532

GENERAL ELECTRIC CO.

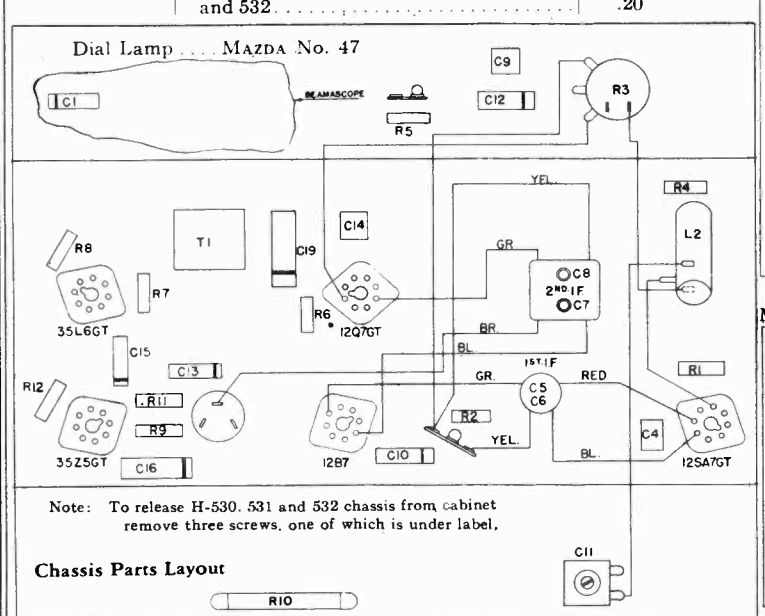
Chassis Wiring, Trimmers
Parts List

Stock No.	Description	List Price
*RB-008	BOARD—Terminal board (2 lug)	$0.10
*RB-013	BOARD—Terminal board (2 lug)	.10
RB-179	BRACKET—Bracket for "Beam-a-Scope" frame	.10
RB-193	BRACKET—Pilot light bracket for Model H-502	.05
RB-194	BRACKET—Pilot lamp bracket for Model H-503	.05
RB-915	BACK COVER—Cabinet back cover for Model H-502	1.00
RB-927	BACK COVER—Cabinet back cover for Model H-503	.10
RB-928	BACK COVER—Cabinet back cover for Models H-530, 531, and 532	.10
*RC-011	CAPACITOR—.002 mfd. 600 V. paper (C-1)	.25
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-13)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-15)	.25
*RC-060	CAPACITOR—.03 mfd. 600 V. paper (C-12)	.25
*RC-072	CAPACITOR—.05 mfd. 200 V. paper (C-10)	.25
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-16)	.30
*RC-130	CAPACITOR—0.2 mfd. 400 V. paper (C-19)	.30
*RC-216	CAPACITOR—47 mmf. mica (C-4)	.25
*RC-274	CAPACITOR—330 mmf. mica (C-14)	.30
*RC-294	CAPACITOR—470 mmf. mica (C-9)	.30
RC-676	CAPACITOR—B band padder (C-11)	.35
*RC-863	CORD—Power cord	.65
RC-5135	CAPACITOR—30 mfd. 150 V., 40 mfd. 150 V., 20 mfd. 25 V., dry electrolytic (C-17a, 17b, 17c)	1.15
RC-7019	CONDENSER—Tuning condenser for Models H-502 and 503 (C-2a, 2b)	2.05
RC-7020	CONDENSER—Tuning condenser for Models H-530, 531, and 532 (C-21a, 21b)	2.05
RC-9013	CONE ASSEMBLY—4-inch P.M. Cone Assembly for all models	.80
RD-140	DIAL—Dial scale for Models H-502 and 503	.20
RD-141	DIAL—Dial scale for Models H-530, 531, and 532	.45
RD-410	DRUM—Tuning condenser drive drum for Model H-502	.20
RD-416	DRUM—Tuning condenser drive drum for Model H-503	.35
*RG-016	GRID CLIP—Control grid clip (Pkg. 5)	.10
RK-051	KNOB—Control knob for Model H-502	.15
RK-057	KNOB—Control knob for Model H-503	$0.10
RK-071	KNOB—Control knob for Models H-530 and 532	.20

Symbol	Description	List Price
RK-072	KNOB—Control knob for Model H-531	.20
RL-518	LOOP—Beam-a-Scope assembly (L-1)	.80
RL-2018	COIL—Oscillator coil (L-2)	.40
RM-505	MASK—Drum dial felt masks for Model H-503	.05
*RQ-1215	RESISTOR—15 ohms ½ W. Carbon (R-12) (Pkg. 5)	.70
*RQ-1223	RESISTOR—33 ohms ½ W. Carbon (R-11) (Pkg. 5)	.70
*RQ-1239	RESISTOR—150 ohms ½ W. Carbon (R-8) (Pkg. 5)	.70
*RQ-1261	RESISTOR—1200 ohms ½ W. Carbon (R-9) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms ½ W. Carbon (R-1) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms ½ W. Carbon (R-4, 6, 7) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohms ½ W. Carbon (R-2) (Pkg. 5)	.70
*RQ-1365	RESISTOR—15 megohms ¼ W. Carbon (R-5) (Pkg. 5)	.70
RR-351	RESISTOR—100 ohms wire wound (R-10)	.20
*RS-238	SOCKET—Octal tube socket	.15
RS-256	SOCKET—Electrolytic mounting socket	.05
RS-258	SOCKET—Pilot lamp socket	.25
RS-263	SOCKET—12B7 tube socket	.15
RS-464	SPRING—Tuning drum spring (Pkg. 10)	.05
RS-1016	SPEAKER—4-inch P.M. speaker for Models H-503, 530, 531 and 532 (L-5)	3.35
RS-1026	SPEAKER—4-inch P.M. speaker for Model H-502 (L-5)	3.25
RT-322	TRANSFORMER—2nd I.F. transformer (L-4)	1.00
RT-343	TRANSFORMER—1st I.F. transformer (L-3)	.95
RT-465	TRANSFORMER—Output transformer for Models H-503, 530, 531 and 532 (T-1)	1.00
RT-476	TRANSFORMER—Output transformer for Model H-502 (T-1)	1.30
RV-080	VOLUME CONTROL—500,000 ohm volume control for Model H-502 (R-3)	.75
RV-081	VOLUME CONTROL—500,000 ohm volume control for Model H-503 (R-3)	.75
RV-082	VOLUME CONTROL—500,000 ohm volume control for Models H-530, 531 and 532 (R-14)	.75
RZ-170	CABINET—Brown Cabinet for Model H-502	2.95

* Used on previous receivers.

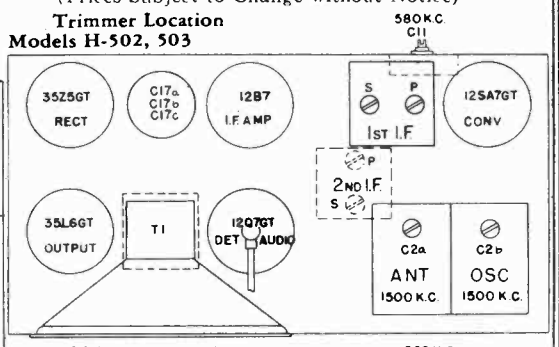
(Prices Subject to Change without Notice)



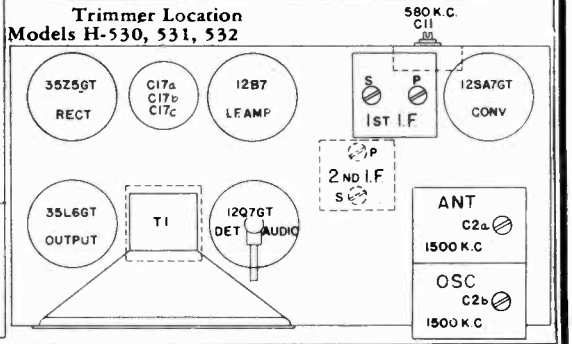
Note: To release H-530, 531 and 532 chassis from cabinet remove three screws, one of which is under label.

Chassis Parts Layout

Trimmer Location
Models H-502, 503



Trimmer Location
Models H-530, 531, 532



MODEL HB504
MODEL HB505
Schematics

GENERAL ELECTRIC CO.

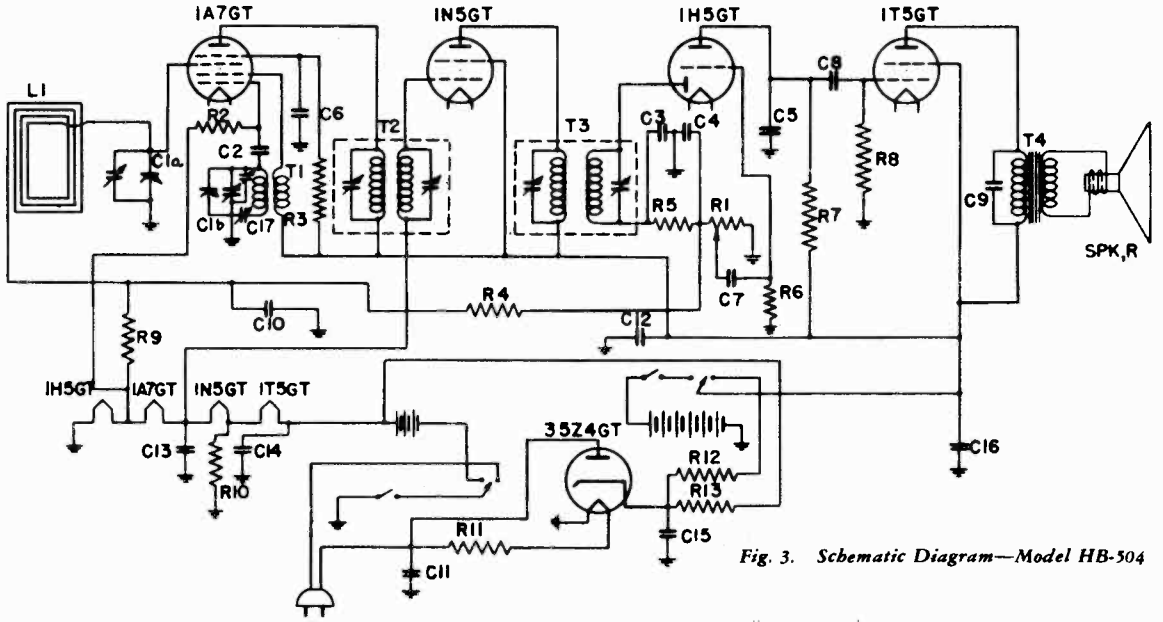


Fig. 3. Schematic Diagram—Model HB-504

Symbol	Description	Symbol	Description	Symbol	Description
C-1	Tuning Condenser	C-13	0.1 mfd., Paper Capacitor	R-7	1.0 megohms, Carbon Resistor
C-2	50 mmf. Mica Capacitor	C-14	100 mfd., 15 V. Dry Electrolytic	R-8	3.0 megohms, Carbon Resistor
C-3	100 mmf., Mica Capacitor	C-15	50 mfd., 150 V. Dry Electrolytic	R-9	3.0 megohms, Carbon Resistor
C-4	100 mmf., Mica Capacitor	C-16	20 mfd., 150 V. Dry Electrolytic	R-10	1000 ohms, Carbon Resistor
C-5	100 mmf., Mica Capacitor	C-17	600 KC. Padding Capacitor	R-11	600 ohms, Cord Dropping Resistor
C-6	.05 mfd., Paper Capacitor	L-1	Beam-a-scope	R-12	3000 ohms, Carbon Resistor
C-7	.001 mfd., Paper Capacitor	R-1	1.0 megohm, Volume Control	R-13	2500 ohms, Wire-wound Resistor
C-8	.004 mfd., Paper Capacitor	R-2	200,000 ohms, Carbon Resistor	T-1	Oscillator Coil
C-9	.002 mfd., Paper Capacitor	R-3	70,000 ohms, Carbon Resistor	T-2	1st I.F. Transformer
C-10	.05 mfd., Paper Capacitor	R-4	10 megohms, Carbon Resistor	T-3	2nd I.F. Transformer
C-11	.05 mfd., Paper Capacitor	R-5	100,000 ohms, Carbon Resistor	T-4	Output Transformer
C-12	0.1 mfd., Papér Capacitor	R-6	10 megohms, Carbon Resistor		

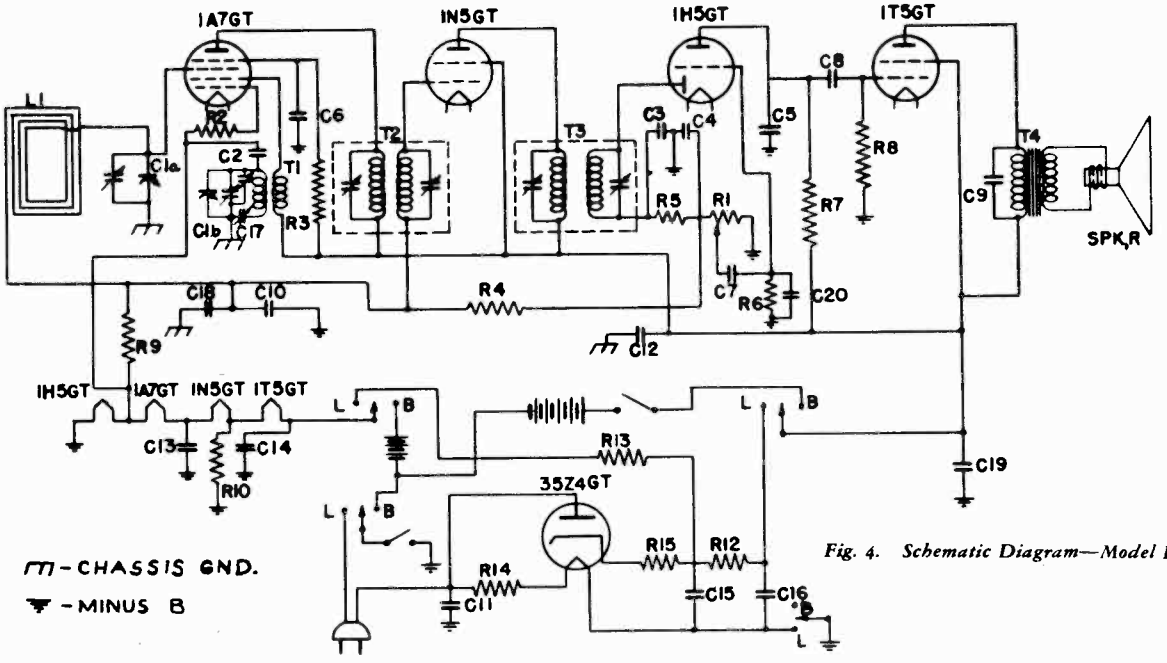


Fig. 4. Schematic Diagram—Model HB-505

Symbol	Description	Symbol	Description	Symbol	Description
C-1	Tuning Condenser	C-14	100 mfd., 15 V. Dry Electrolytic	R-6	10 megohms, Carbon Resistor
C-2	50 mmf., Mica Capacitor	C-15	50 mfd., 150 V. Dry Electrolytic	R-7	1.0 megohm, Carbon Resistor
C-3	100 mmf., Mica Capacitor	C-16	20 mfd., 150 V. Dry Electrolytic	R-8	3.0 megohms, Carbon Resistor
C-4	100 mmf., Mica Capacitor	C-17	600 KC, Padding Capacitor	R-9	3.0 megohms, Carbon Resistor
C-5	100 mmf., Mica Capacitor	C-18	.25 mfd., Paper Capacitor	R-10	1000 ohms, Carbon Resistor
C-6	.05 mfd., Paper Capacitor	C-19	.05 mfd., Paper Capacitor	R-12	3000 ohms, Carbon Resistor
C-7	.001 mfd., Paper Capacitor	C-20	100 mmf., Mica Capacitor	R-13	2500 ohms, Wire-wound Resistor
C-8	.004 mfd., Paper Capacitor	L-1	Beam-a-scope	R-14	50 ohms, Carbon Resistor
C-9	.002 mfd., Paper Capacitor	R-1	1.0 megohm, Volume Control	R-15	50 ohms, Carbon Resistor
C-10	.05 mfd., Paper Capacitor	R-2	200,000 ohms, Carbon Resistor	T-1	Oscillator Coil
C-11	.05 mfd., Paper Capacitor	R-3	70,000 ohms, Carbon Resistor	T-2	1st I.F. Transformer
C-12	0.1 mfd., Paper Capacitor	R-4	10 megohms, Carbon Resistor	T-3	2nd I.F. Transformer
C-13	0.1 mfd., Paper Capacitor	R-5	100,000 ohms, Carbon Resistor	T-4	Output Transformer

MODEL HB504
MODEL HB505
Voltage, Socket, Trimmers
Alignment, Notes

GENERAL ELECTRIC CO.

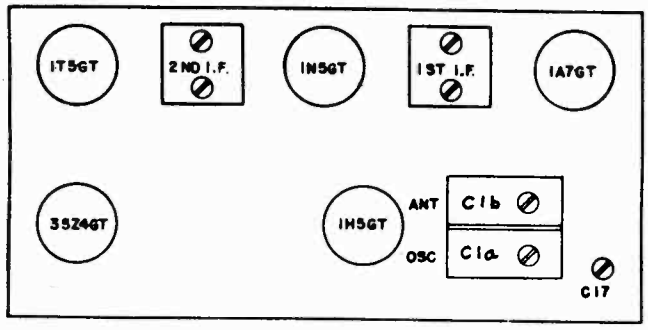
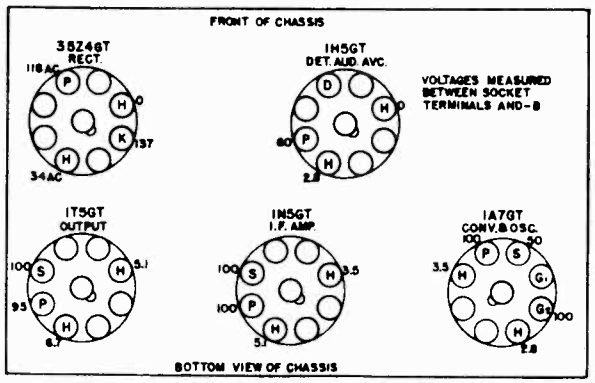


Fig. 1. Trimmer Location

Precaution: The Model HB-504 when used on an AC power supply will have one side of the chassis connected directly to the line. In order to prevent injury to the signal generator, if AC operated, or shock to the serviceman, use an isolating transformer between the convenience outlet and the receiver power cord.



Line volts—118. No signal input.
When operated on a DC power supply, voltages are about 15% lower.
Voltages measured with a 20,000 ohms per volt meter.

D—Diode Plate
G_1—Oscillator Grid
G_2—Oscillator Plate
H—Heater
K—Cathode
P—Plate
S—Screen

Fig. 2. Socket Voltages

GENERAL INFORMATION

The Models HB-504 and HB-505 are portable, five-tube, superheterodyne receivers which are designed to operate on any one of three types of power supplies as listed under electrical specifications. Features of design include automatic power selector switch, built-in Beam-a-scope, 5-inch "Alnico" magnet dynapower speaker and automatic volume control.

The automatic power selector switch operates as follows: When the door-cover at the side of the case is opened for the purpose of connecting the power cord to a convenience outlet, all batteries are automatically disconnected from the circuit. When the power cord is replaced and the door-cover is closed the radio is automatically returned to battery operation.

When operating from a DC source of power, it is necessary to insert the power plug with proper polarity; otherwise the receiver will fail to function. If any hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

Tubes

Converter and Oscillator	GE-1A7GT
I.F. Amplifier	GE-1N5GT
Det., Aud., AVC	GE-1H5GT
Power Output	GE-1T5GT
Rectifier	GE-35Z4GT

SERVICE DATA

Physical Dimensions

Models	HB-504 and HB-505
Height	9½ inches
Width	13¼ inches
Depth	6½ inches
Wt. with batteries	16¾ lbs

Tuning Control Drive Ratio 5:1

Electrical Specifications

1. AC or DC Power Supply
   105–125 Volts, 40–60 cycles on AC.
2. Battery Power Supply
   1.5 volt "A" supply, 90-volt "B" supply.
   Recommended batteries for 300-hour life:
   (a) "A" supply—Eveready No. 718 or equivalent.
   (b) "B" supply—Eveready No. 762 or equivalent.

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

Intermediate Frequency ..... 455 KC

Maximum Power Output ..... 175 milliwatts

Loud-speaker—"Alnico" Magnet Dynamic

Outside Cone Diameter—5 inches.
Voice Coil Impedance (400) cycles 4.6 ohms.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F.—455 KC Broadcast—1500 and 600 KC
The location of all trimmers is shown in Fig. 1.

General Alignment Notes

This receiver must be removed from the carrying case in order to perform the alignment. Special care must be exercised to place the batteries, Beam-a-scope and chassis in the same relative positions with respect to one another as these components occupied in the case, otherwise, alignment will not be satisfactory.

I.F. Alignment

With batteries, Beam-a-scope and chassis in position for alignment as mentioned above, connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 KC and apply signal to the control grid of the 1A7GT tube through a .05 mfd. capacitor. Do not remove the grid lead from the 1A7GT. Keep the test oscillator output as low as a readable meter reading will permit. Adjust all I.F. trimmers for maximum output.

R.F. Alignment

Place a coupling loop six inches from the receiver Beam-a-scope. Apply a 1500 KC signal to the coupling loop. Set pointer to 1500 KC and align the oscillator trimmer (C-1a). Peak (C-1b) for maximum output. Change test signal to 600 KC and with pointer in region of 600 KC peak (C-17) while rocking the gang condenser.

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. Gain‡

Antenna to Converter Grid	2.7 at 1000 K.C.
Converter Grid to 6SK7 Grid	28 at 455 K.C.
6SK7 Grid to 6SQ7 Diode Plate	87 at 455 K.C.

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

(2) Audio Gain.
.05 volts, 400 cycle signal across volume control with control set to maximum will give approximately ½ watt output at speaker.

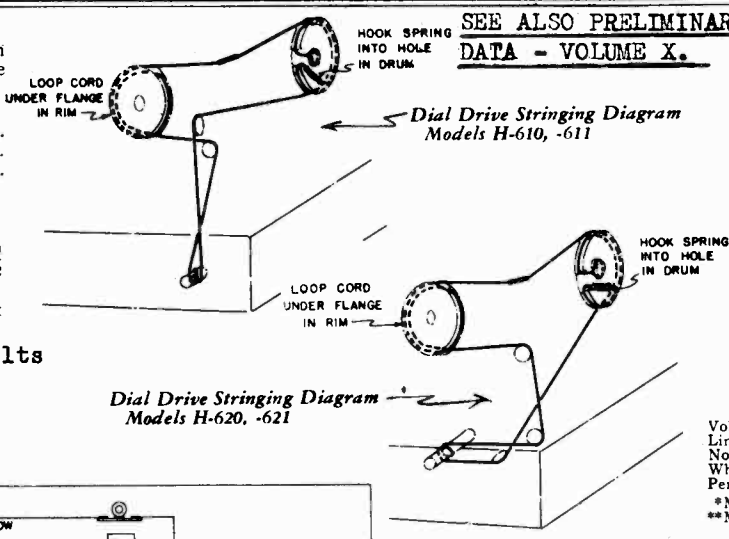
(3) DC voltage developed across oscillator grid leak averages 13 volts.

Power Consumption is 55 watts at 115 volts AC or DC . AC frequency 25 - 60 cycles.

Power Output at 117 volts line:-

Undistorted..... 1.4 watt.

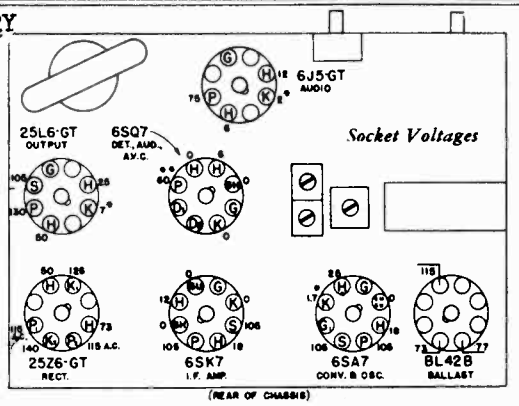
Maximum ..... 2.5 watt.



Dial Drive Stringing Diagram Models H-610, -611

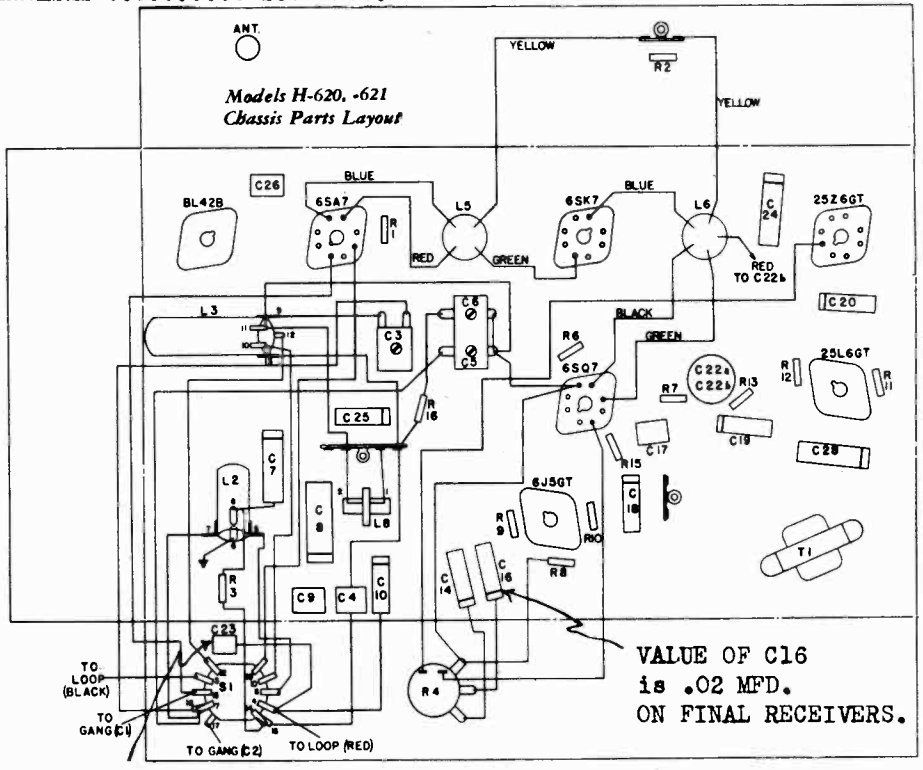
Dial Drive Stringing Diagram Models H-620, -621

SEE ALSO PRELIMINARY DATA - VOLUME X.



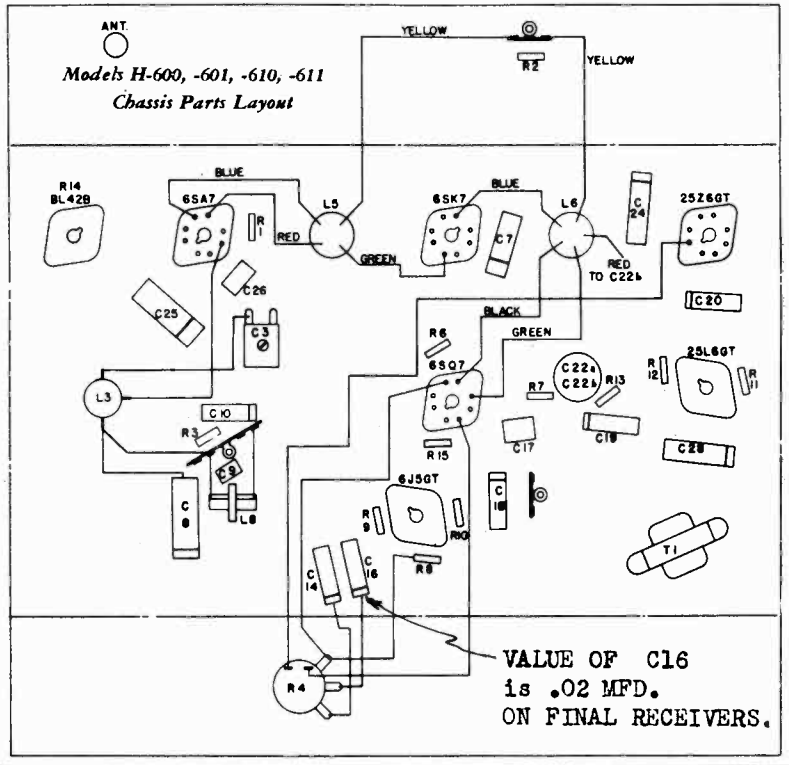
Socket Voltages

Voltages measured between socket terminal and −B.
Line Volts—115.
No signal input—Volume control at maximum.
When operated on DC power supply, voltages are about 15% lower.
Perform measurements with a high resistance voltmeter.
*Measured on 10 volt scale of a 20,000 ohms per volt meter.
**Measured on 50 volt scale of a 20,000 ohms per volt meter.



Models H-620, -621 Chassis Parts Layout

C23 is added between C10 and S1 in series with the ground with ground on final receivers.



Models H-600, -601, -610, -611 Chassis Parts Layout

MODELS H600U,H610U,H620U
H630U,H632U
MODELS H600UW,H610UW,H620UW
MODELS H600UX,H610UX,H620UX
Chassis Wiring,Trimmers
Dial Drive Data

GENERAL ELECTRIC CO.

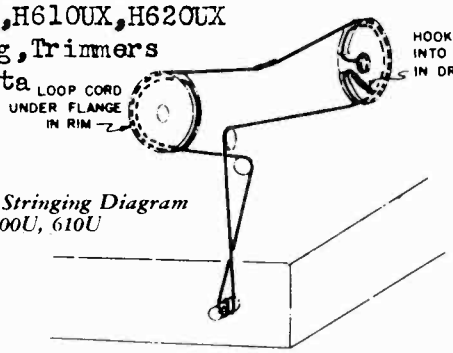


Fig. 4. Dial Drive Stringing Diagram Models H-600U, 610U

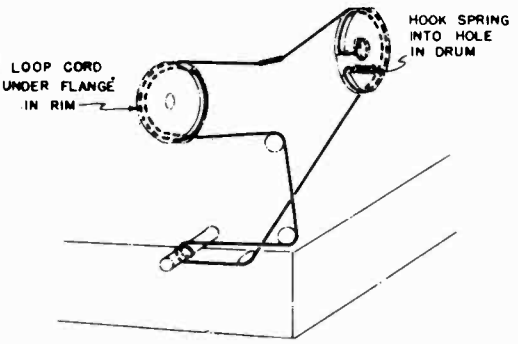


Fig. 5. Dial Drive Stringing Diagram Models H-620U, 630U, 632U

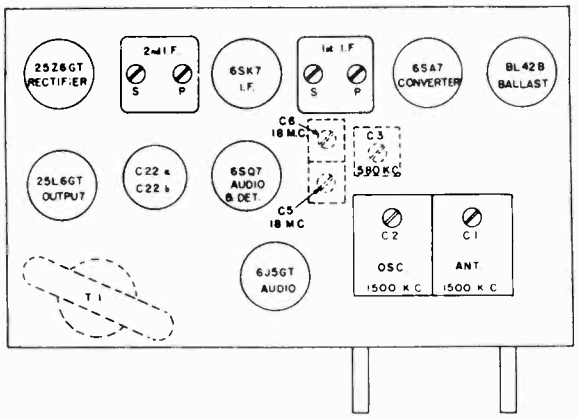


Fig. 2. Trimmer Location—Models H-620U, 630U, 632U

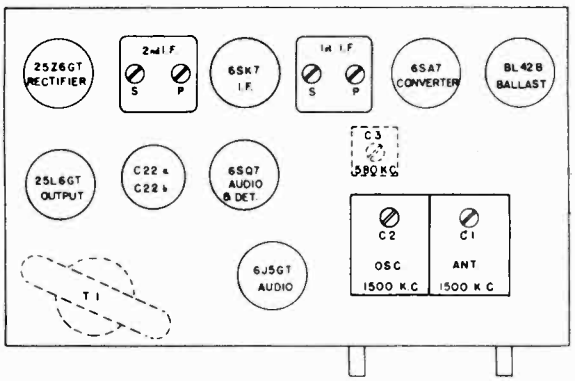


Fig. 1. Trimmer Location—Models H-600U, 610U

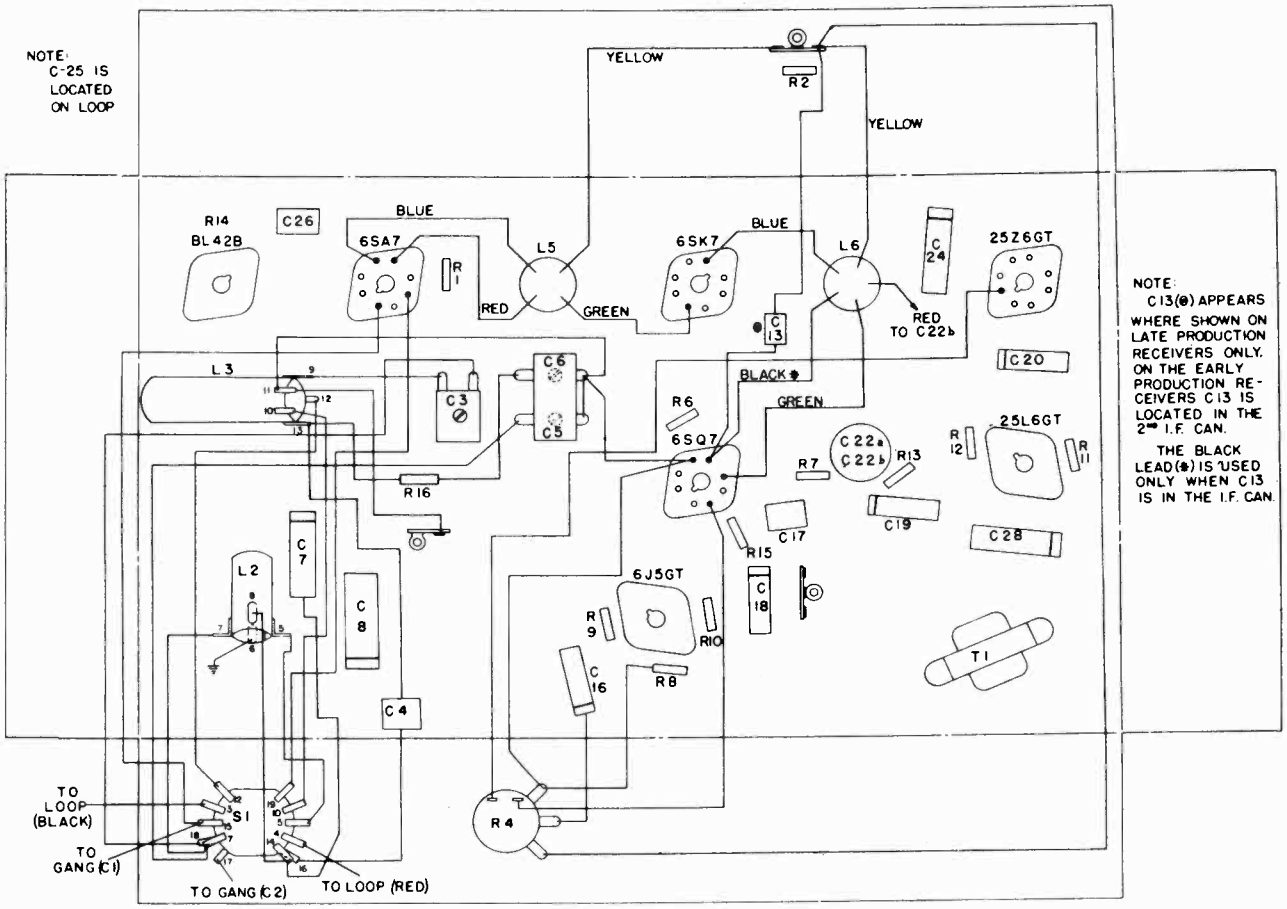


Fig. 6. Chassis Parts Layout for Models H-620U, 630U and 632U

(Chassis Parts Layout for Models H-600U and 610U are the same as above except for band switch, "D" band coils and associated parts which are omitted.)

GENERAL ELECTRIC CO

MODELS H600U, H610U, H620U (W, X)
H630U, H632U
Schematics, Voltage, Changes

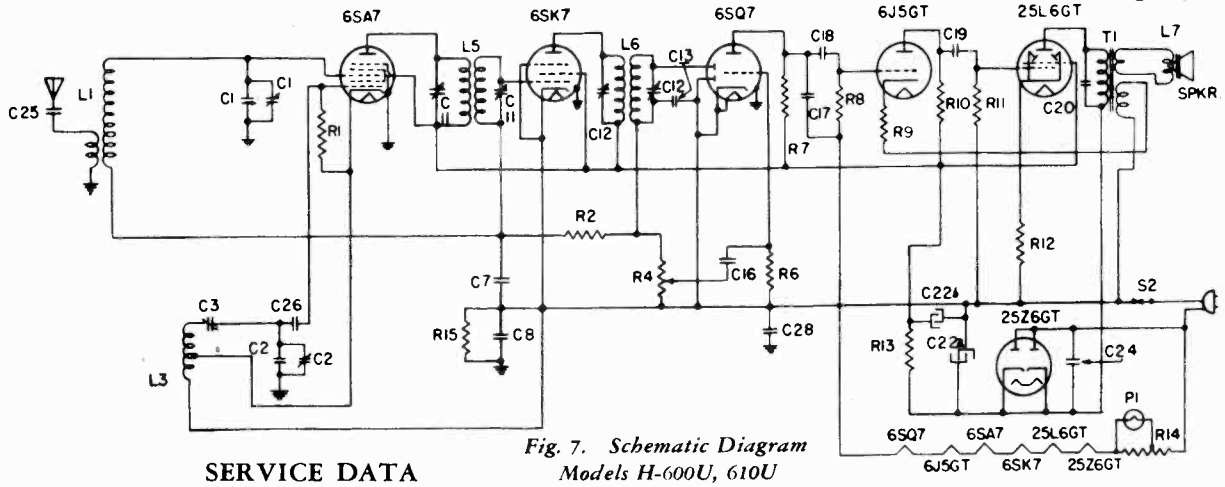


Fig. 7. Schematic Diagram Models H-600U, 610U

SERVICE DATA

Color Specifications

Model	Color	Material
H-600U, 610U, 620U	Mottled brown	Plastic
H-600UW, 610UW, 620UW	Ivory	Plastic
H-600UX, 610UX, 620UX	Onyx	Plastic
H-630U, 632U	Walnut	Wood

Electrical Specifications

Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
115 AC or DC	25–60	55

Tuning Control Drive Ratio 4:1

Tuning Frequency Range

Models	H-600U, 610U	H620U, 630U, 632U
Range	550–1600 K.C.	550–1600 K.C. 5800–18000 K.C.

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

Electrical Power Output (117 line volts)

Undistorted ..... 1.4 watts
Maximum ..... 2.5 watts

Loud-speaker—"Alnico" Magnetic Dynamic

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

Tubes

Converter and Oscillator GE-6SA7
I.F. Amplifier GE-6SK7
Det., Aud., AVC GE-6SQ7
2nd Audio Amplifier GE-6J5GT
Power Output GE-25L6GT
Rectifier GE-25Z6GT
Dial Lamp ..... MAZDA No. 44

PRODUCTION CHANGES

In changing from Models H-601, 611, 621, 631 and 633 to Models H-600U, 610U, 620U, 630U, and 632U several hundred receivers were built of the former type but labeled with the "U" series labels. These receivers can be identified by a 2.0 megohm volume control. Service information on receivers with 2.0 megohm volume controls will be found in Service Notes for Models H-600U, 610U, and 620U (EARLY), and in Service Notes for Models H-630U and 632U (EARLY).

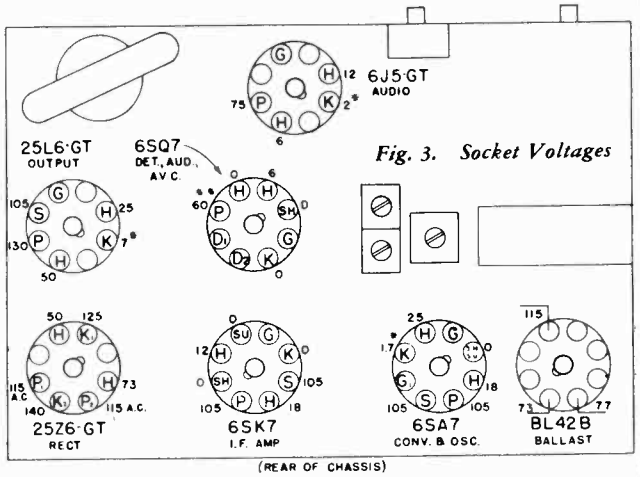


Fig. 3. Socket Voltages

Voltages measured between socket terminal and —B.
Line Volts—115.
No signal input—Volume control at maximum.
When operated on DC power supply, voltages are about 15% lower.
Perform measurements with a high resistance voltmeter.
*Measured on 10 volt scale of a 20,000 ohms per volt meter.
**Measured on 250 volt scale of a 20,000 ohms per volt meter.

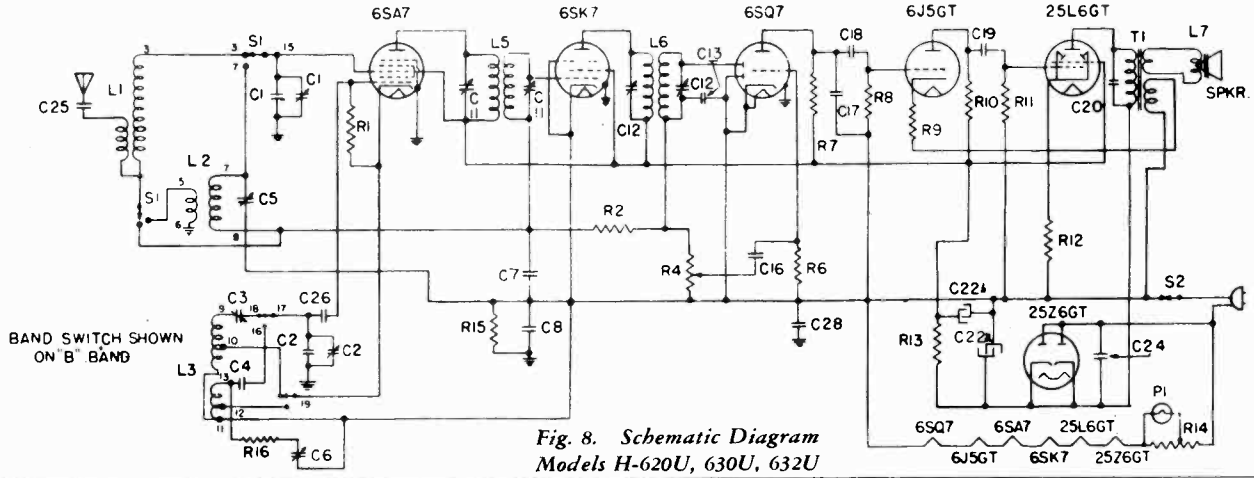


Fig. 8. Schematic Diagram Models H-620U, 630U, 632U

GENERAL INFORMATION

The above listed models are compact six-tube AC-DC superheterodyne receivers employing General Electric Pretested Tubes. Features of design include the built-in "Beam-a-Scope," 5-inch Dynapower speaker, single-ended tubes in the R.F. and I.F. circuits and automatic volume control.

Model H-610U (W & X inc.) also includes four "Feathertouch Tuning" keys.

Models H-620U (W & X inc.), H-630U and H-632U incorporate four "Feathertouch Tuning" keys and an additional frequency band permitting short-wave reception.

All models are fully approved by Underwriters' Laboratories. Model numbers ending in W or X indicate cabinet colors are in ivory or onyx respectively.

When operating from a DC source of power, it is necessary to insert the power plug with the proper polarity; otherwise, the receiver will fail to function. If excessive hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F.-455 K.C. R.F.—1500 and 580 K.C.

The location of trimmers for the above models are shown in their respective diagrams, Figs. 1 and 2.

I.F. Alignment

Connect an output meter across the voice coil. Rotate the Volume Control to maximum. Completely close the gang condenser plates and set the dial pointer to the first dial mark at the low end of the scale. Turn the band switch to "B" band on the two band receivers.

Set test oscillator to 455 K.C. and apply signal to the control grid of the 6SA7 tube through a .05 mfd. capacitor. Do not remove the 6SA7 grid lead. Keep the test oscillator output as low as a readable meter reading will permit. Adjust all I.F. trimmers for maximum meter reading.

R.F. Alignment

(1) *All models.*

Apply a 1500 K.C. 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 K.C. and peak (C-1) for maximum output. Change signal to 580 K.C. and tune receiver to signal. Peak (C-3) on the 580 K.C. signal by rocking the gang condenser. Retrim at 1500 K.C.

(2) *Models H-620U, 630U and 632U.*

Turn the band switch to "D" band after aligning on "B" band. Align (C-6) at 18 MC using an 18 M.C. signal. Peak (C-5) while rocking the gang condenser. The image of the 18 M.C. signal should be heard at approximately 17 M.C.

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. Gain‡

Antenna to Converter Grid.....2.7 at 1000 K.C.
Converter Grid to 6SK7 Grid.....28 at 455 K.C.
6SK7 Grid to 6SQ7 Diode Plate.....87 at 455 K.C.

(2) Audio Gain.

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

(3) DC voltage developed across oscillator grid leak averages 13 volts.

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

REPLACEMENT PARTS LIST
Models H-600U, 610U, 620U, 630U, and 632U
(W AND X MODELS INCLUDED)

Stock No.	Description	List Price
RA-313	CONDENSER ASSEMBLY—Tuning condenser and drive unit complete with pointer (Model H-610U)	$5.50
RA-314	CONDENSER ASSEMBLY—Tuning condenser and drive unit complete with pointer (Models H-620U, 630U, 632U)	5.70
*RB-013	BOARD—Terminal board (2 lug)	.10
*RB-041	BOARD—Terminal board (2 lug)	.10
RB-181	BRACKET—Dial scale-condenser support bracket assembly (Model H-600U)	.50
RB-182	BRACKET—Beam-a-Scope bracket	.10
RB-626	BUSHING—Tuning shaft bushing (Models H-600U, 610U)	.10
RB-918	BACK COVER—Plastic cabinet back cover for plastic models in brown	1.00
RB-919	BACK COVER—Plastic cabinet back cover for plastic models in ivory	1.60
RB-920	BACK COVER—Plastic cabinet back cover for plastic models in onyx	1.80
RB-921	BACK COVER—Cardboard cabinet back cover for Model H-630U	.15
RB-922	BACK COVER—Cardboard cabinet back cover for Model H-632U	.15
RB-1019	BOARD—5 inch speaker terminal board	.05
*RC-023	CAPACITOR—.005 mfd., 600 V. paper (C-18, 19)	.25
*RC-039	CAPACITOR—.01 mfd., 600 V. paper (C-20, 25)	.25
*RC-048	CAPACITOR—.02 mfd., 600 V. paper (C-16)	.30
*RC-072	CAPACITOR—.05 mfd., 200 V paper (C-7)	.25
*RC-092	CAPACITOR—.05 mfd., 600 V. paper (C-24)	.30
*RC-123	CAPACITOR—0.1 mfd., 400 V. paper (C-8, 28)	.35
*RC-216	CAPACITOR—47 mmf. mica (C-26)	.25
RC-293	CAPACITOR—470 mmf. mica (C-13, 17)	.30
*RC-390	CAPACITOR—3900 mmf. mica (C-4)	.35
*RC-676	CAPACITOR—"B" band padder (C-3) (Models H-620U, 630U, 632U)	.35
RC-747	CONDENSER—Tuning condenser (C-1, 2) (Model H-600U)	2.15
RC-748	CONDENSER—Tuning condenser (C-1, 2) (Model H-610U)	4.15
RC-749	CONDENSER—Tuning condenser (C-1, 2) (Models H-620U, 630U, 632U)	4.15
*RC-863	CORD—Power cord	.65
RC-1995	CLAMP—Coil clamp (Models H-620U, 630U, 632U) (Pkg. 5)	.10
RC-5136	CAPACITOR—50 mfd., 150 V.; 30 mfd., 150 V. dry electrolytic (C-22a, 22b)	1.15
RC-6515	CAPACITOR—"B" band padder (C-3) (Models H-600U, 610U)	.30
RC-6517	CAPACITOR—"D" band ant. and osc. trimmers (C-5, 6)	.30
RC-8130	CABLE—Tuning drive cable assembly (Models H-610U, 620U, 630U, 632U)	.15
RC-8131	CABLE—Tuning drive cable assembly (Model H-600U)	.15
RC-8508	CARD—Station letter card (Models H-610U, 620U, 630U, 632U)	.30
RC-9014	CONE ASSEMBLY—Speaker cone assembly (all models)	.80
RD-114	DIAL—Dial scale (Models H-600U, 610U)	.15
RD-115	DIAL—Dial scale (Models H-620U, 630U, 632U)	.20
RG-302	GROMMET—Tuning shaft drive cord surface (Pkg. 10)	.10
RH-111	HAIRPIN COTTER—Tuning shaft hairpin cotter (Pkg. 10)	.05
RK-054	KNOB—Control knob for all models in brown (Pkg. 3)	.45
RK-055	KNOB—Control knob for all models in ivory, and Models H-630U, 632U (Pkg. 5)	$0.50
RK-066	KNOB—Control knob for all models in onyx (Pkg. 3)	.45
RK-209	KEY—Station selector key (Models H-610U, 610UW, 620U, 620UW, 630U, 632U)	.15
RK-211	KEY—Station selector key (Models H-610UX, 620UX)	.20
RL-098	COIL—"D" band antenna coil (L-2) (Models H-620U, 630U, 632U)	.65
RL-520	BEAM-A-SCOPE—Beam-a-Scope assembly (L-1)	.80
RL-937	LUG—Key pin binding lug (Pkg. 10)	.10
RL-2018	COIL—Oscillator coil (L-3) (Models H-600U, 610U)	.40
RL-2021	COIL—Oscillator coil (L-3) (Models H-620U, 630U, 632U)	.75
RP-134	PIN—Station selector key pin (Models H-610U, 620U, 630U, 632U (Pkg. 10)	.05
RP-141	POINTER—Dial scale pointer (Model H-600U) (Pkg. 5)	.50
RP-142	POINTER—Dial scale pointer (Model H-610U) (Pkg. 5)	.60
RP-143	POINTER—Dial scale pointer (Models H-620U, 630U, 632U) (Pkg. 5)	.60
RP-307	PULLEY—Condenser drive cord pulley (Models H-610U, 620U, 630U, 632U) (Pkg. 5)	.25
RP-308	PULLEY—½ inch drive cord idler pulley (Models H-610U, 620U, 630U, 632U) (Pkg. 5)	.10
RP-309	PULLEY—¼ inch drive cord idler pulley (Models H-610U, 620U, 630U, 632U) (Pkg. 5)	.10
*RQ-1235	RESISTOR—100 ohms, ½ W. carbon (R-16) (Pkg. 5)	.70
*RQ-1239	RESISTOR—150 ohms, ½ W. carbon (R-12) (Pkg. 5)	.70
*RQ-1259	RESISTOR—1000 ohms, ½ W. carbon (R-13) (Pkg. 5)	.70
*RQ-1271	RESISTOR—3300 ohms, ½ W. carbon (R-9) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms, ½ W. carbon (R-1) (Pkg. 5)	.70
*RQ-1297	RESISTOR—39,000 ohms, ½ W. carbon (R-10) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms, ½ W. carbon (R-7, 11, 15) (Pkg. 5)	.70
*RQ-1331	RESISTOR—1.0 megohm, ½ W. carbon (R-8) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohm, ½ W. carbon (R-2) (Pkg. 5)	.70
*RQ-1365	RESISTOR—15 megohm, ¼ W. carbon (R-6) (Pkg. 5)	.70
RR-773	RESISTOR—Ballast resistor (BL-42-B) (R-14)	.40
RR-928	REFLECTOR—Dial scale reflector (Model H-600U)	.25
RR-929	REFLECTOR—Dial scale reflector (Model H-610U)	.30
RR-930	REFLECTOR—Dial scale reflector (Models H-620U, 630U, 632U)	.30
*RS-200	SOCKET—Octal tube socket (Pkg. 5)	.75
RS-256	SOCKET—Electrolytic mounting socket (Pkg. 5)	.25
*RS-261	SOCKET—Dial lamp socket assembly	.35
*RS-426	SPRING—Condenser drive cord spring (Pkg. 5)	.10
RS-510	SPACER—Station key spacer (Models H-610U, 620U, 630U, 632U) (Pkg. 10)	.10
RS-511	SLEEVE—Condenser bracket spacer sleeve (Pkg. 10)	.15
RS-927	SHAFT—Tuning shaft (Models H-600U, 610U)	$0.05
RS-929	SHAFT—Tuning shaft (Models H-620U, 630U, 632U)	.10
RS-1018	SPEAKER—5 inch P.M. speaker with bracket (all models except H-632U)	2.50
RS-1019	SPEAKER—5 inch P.M. speaker (Model H-632U)	3.40
RS-1809	SHIELD—Dial lamp shield for models in ivory and onyx (Pkg. 5)	.15
RS-3036	SWITCH—Band change switch	.60
RT-328	TRANSFORMER—1st I.F. transformer (L-5)	1.00
RT-329	TRANSFORMER—2nd I.F. transformer (L-6)	1.20
RT-469	TRANSFORMER—Output transformer (T-1)	1.25
RV-087	VOLUME CONTROL—500,000 ohm volume control)	.80
RW-039	WINDOW—Celluloid station letter window (All station key models) (Pkg. 25)	.10
*RW-101	WASHER—Control shaft felt washer (Pkg. 10)	.05
*RX-035	ASSEMBLY—Condenser mounting foot assembly (all station key models)	$0.15
RX-061	ASSEMBLY—Chassis mounting assembly (Models H-630U, 632U)	.10
RZ-158	CABINET—Plastic cabinet for Model H-600U	3.60
RZ-159	CABINET—Plastic cabinet for Model H-600UW	5.50
RZ-160	CABINET—Plastic cabinet for Model H-600UX	5.80
RZ-161	CABINET—Plastic cabinet for Model H-610U	3.60
RZ-162	CABINET—Plastic cabinet for Model H-610UW	5.50
RZ-163	CABINET—Plastic cabinet for Model H-610UX	5.80
RZ-164	CABINET—Plastic cabinet for Model H-620U	3.60
RZ-165	CABINET—Plastic cabinet for Model H-620UW	5.50
RZ-166	CABINET—Plastic cabinet for Model H-620UX	5.80

* Used on previous receivers.
Note: All parts listed above apply to models in ivory (W) and onyx (X) excepting cabinets, back covers, knobs, and keys. When ordering these items specify color as well as stock number.

(Prices Subject to Change without Notice)

COIL RESISTANCE CHART

Coil	Section	Resistance (Ohms)
"D" antenna coil	Primary	1.2
	Secondary	.04
"B" oscillator coil	C-3 to minus B	5
"D" oscillator coil	C-4 to minus B	1.2
1st I.F. transformer	Primary	32.4
	Secondary	32.4
2nd I.F. transformer	Primary	32.4
	Secondary	32.4
Output transformer	Primary	134
	Secondary	.4

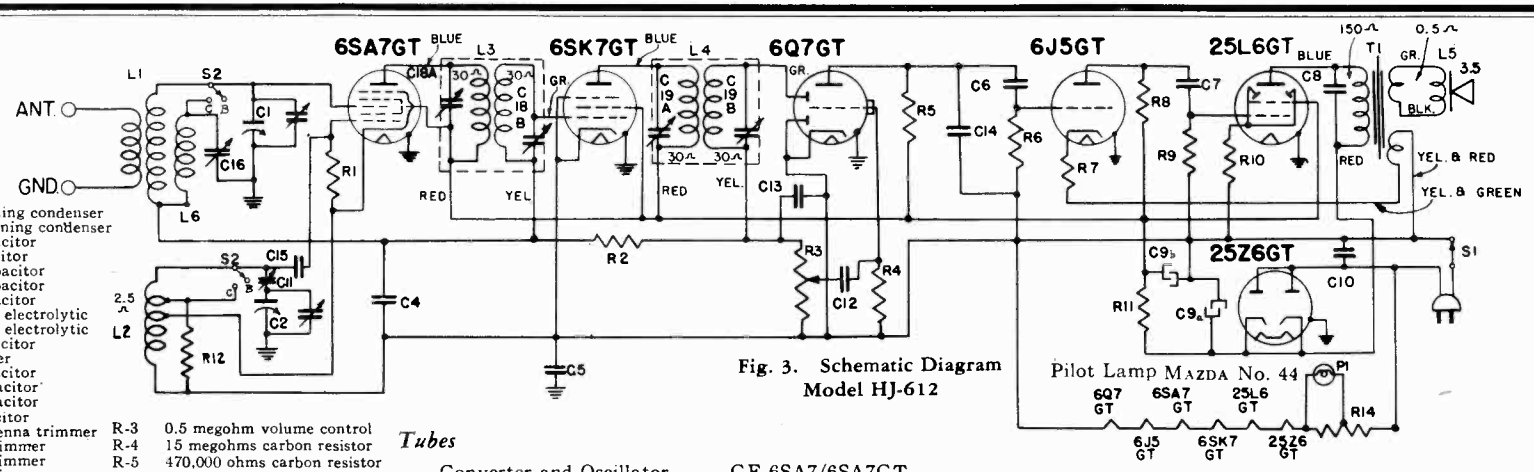


Fig. 3. Schematic Diagram
Model HJ-612

PARTS LIST

C-1	Antenna section tuning condenser	R-3	0.5 megohm volume control
C-2	Oscillator section tuning condenser	R-4	15 megohms carbon resistor
C-4	.05 Mfd. paper capacitor	R-5	470,000 ohms carbon resistor
C-5	.2 Mfd. paper capacitor	R-6	1.0 megohms carbon resistor
C-6	.005 Mfd. paper capacitor	R-7	3300 ohms carbon resistor
C-7	.005 Mfd. paper capacitor	R-8	39,000 ohms carbon resistor
C-8	.01 Mfd. paper capacitor	R-9	470,000 ohms carbon resistor
C-9a	50 Mfd., 150 V. dry electrolytic	R-10	150 ohms carbon resistor
C-9b	30 Mfd., 150 V. dry electrolytic	R-11	1000 ohms, 1 W. carbon resistor
C-10	.05 Mfd. paper capacitor	R-12	4700 ohms carbon resistor
C-11	300-675 Mmf. padder	R-14	Ballast resistor BL-42-B
C-12	.03 Mfd. paper capacitor	T-1	Output transformer
C-13	470 Mmf. mica capacitor		
C-14	220 Mmf. mica capacitor		
C-15	47 Mmf. mica capacitor		
C-16	5-40 Mmf. "C" antenna trimmer		
C-18a	50-135 Mmf. I.F. trimmer		
C-18b	50-135 Mmf. I.F. trimmer		
C-19a	50-135 Mmf. I.F. trimmer		
C-19b	50-135 Mmf. I.F. trimmer		
L-1	Beam-a-Scope		
L-2	Oscillator coil		
L-3	1st I.F. transformer		
L-4	2nd I.F. transformer		
L-5	"C" band antenna coil		
P-1	Dial lamp, MAZDA No. 44		
R-1	33,000 ohms carbon resistor		
R-2	2.2 megohms carbon resistor		

GENERAL INFORMATION

The Model HJ-612 is a compact 6-tube AC-DC superheterodyne receiver employing General Electric Pre-tested Tubes. Features of design include built-in Beam-a-Scope, airplane-type dial, broadcast and police-amateur-aircraft coverage, and automatic volume control.

When operating from a DC source of power it is necessary to insert the power plug with the proper polarity; otherwise, the receiver will fail to function. If excessive hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

ALIGNMENT PROCEDURE

I.F. Connect an output meter across the voice coil. Rotate the volume control to maximum. Completely close the gang condenser plates and set the dial pointer to the first dial mark at the low end of the scale. Throw the band switch to "BC" (up).

Set test oscillator to 455 KC and apply signal to the control grid of the 6SA7 tube through a .05 mfd. capacitor. Do not remove the 6SA7 grid lead. Keep the test oscillator output as low as a readable meter reading will permit. Adjust all I.F. trimmers for maximum meter reading.

R.F. 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 signal 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 do not connect a ground lead between the signal generator and the receiver. Align (C-2) at 1500 KC and peak (C-1) for maximum output. Change signal to 580 KC and tune receiver to signal. Peak (C-11) on the 580 KC signal by rocking the gang condenser. Retrim at 1500 KC.

Throw the band switch to "SW" band. Peak (C-16) on 2500 KC.

Tubes

Converter and Oscillator	GE-6SA7/6SA7GT
I.F. Amplifier	GE-6SK7GT
Det., Aud., AVC	GE-6Q7GT/6Q7G/6Q7
2nd Audio Amplifier	GE-6J5GT/6J5G
Power Output	GE-25L6GT
Rectifier	GE-25Z6GT/25Z6G

Power Supply Volts	Frequency (Cycles on AC)	Power Consumption (Watts)
115 AC or DC	25–60	50

Electrical Power Output (117 Line Volts)

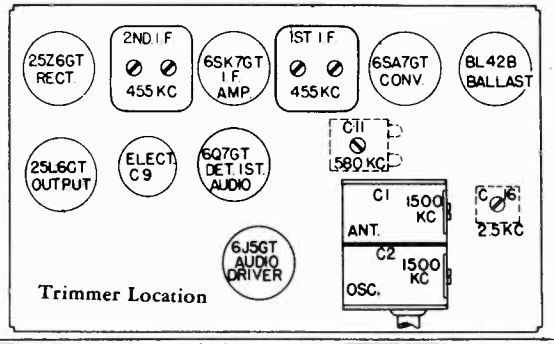
Undistorted	1.4 watts
Maximum	2.5 watts

Tuning Frequency Range

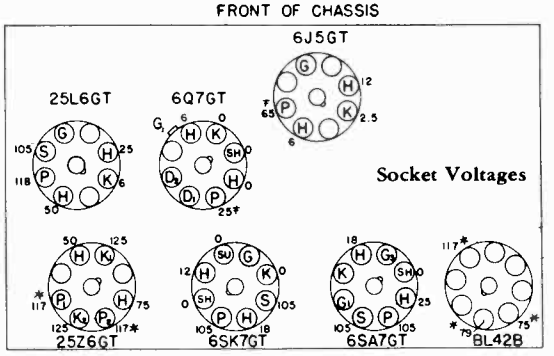
Band "B"	540–1620 KC
Band "C"	1550–3500 KC

Loud-speaker—"Alnico" Magnet Dynamic

Outside Cone Diameter	5 inches
Voice Coil Impedance (400 cycles)	3½ ohms



Intermediate Frequency ..... 455 KC



VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND MINUS B
† MEASURED ON 250 VOLT SCALE OF 1000 OHMS PER VOLT METER
* VOLTS AC.
LINE VOLTS – 117 AC GANG CLOSED MAX. VOLUME

SPECIAL SERVICE INFORMATION

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

		Gain ‡
(1)	Stage Gains	
	Antenna Post to Converter Grid	2.7 at 1000 KC
	Converter Grid to 6SK7 Grid	28 at 455 KC
	6SK7 Grid to 6Q7GT Diode Plate	87 at 455 KC
(2)	Audio Gain A 400-cycle signal of .05 volts across volume control will give approximately ½-watt speaker output. (Volume control turned to maximum.)	
(3)	DC voltage developed across oscillator grid resistor (R-1) averages 13 volts at 1000 KC.	

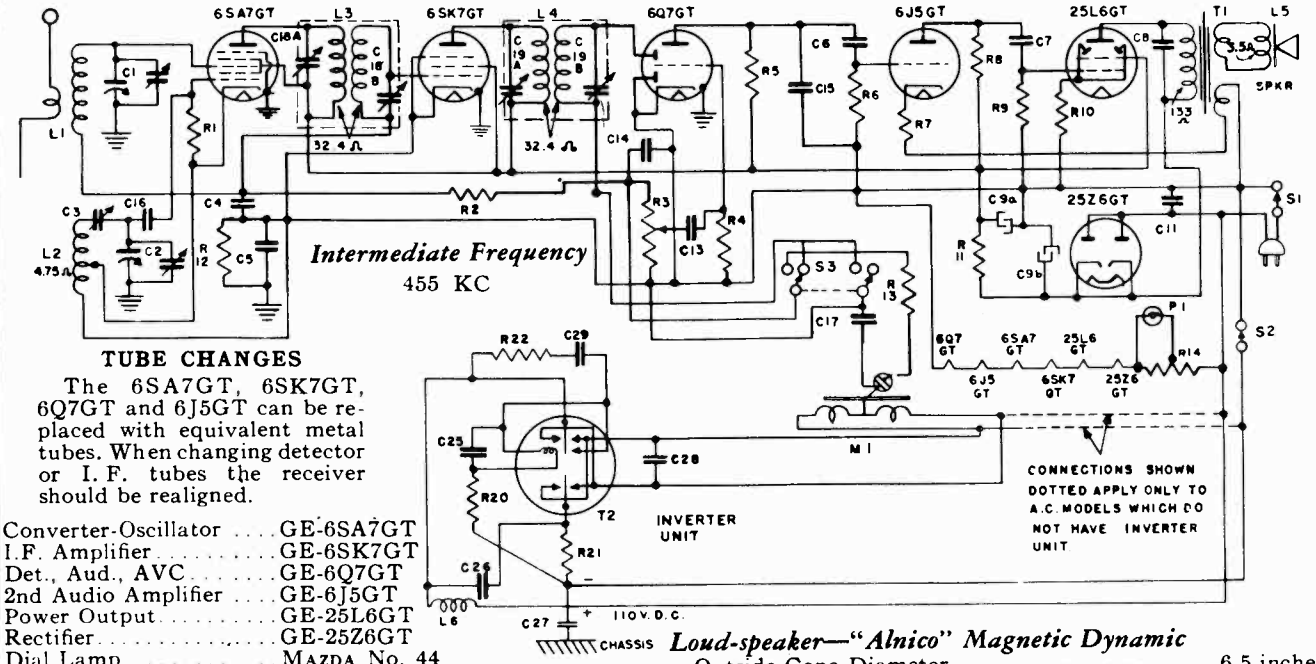
‡Variation of +10%, −20% permissible.

1-40

MODELS HJ618AC, HJ618DC
Schematic, Voltage, Gain
Alignment, Trimmers, Socket

GENERAL ELECTRIC CO.

MODELS HJ624, HJ628
Alignment



TUBE CHANGES

The 6SA7GT, 6SK7GT, 6Q7GT and 6J5GT can be replaced with equivalent metal tubes. When changing detector or I. F. tubes the receiver should be realigned.

Converter-Oscillator	GE-6SA7GT
I.F. Amplifier	GE-6SK7GT
Det., Aud., AVC	GE-6Q7GT
2nd Audio Amplifier	GE-6J5GT
Power Output	GE-25L6GT
Rectifier	GE-25Z6GT
Dial Lamp	MAZDA No. 44

GENERAL INFORMATION

Models HJ-618 AC and HJ-618 DC are compact, table-model, radio-phonograph combinations using six General Electric Pre-tested Tubes in a superheterodyne circuit. Model HJ-618 AC is designed to operate on a 60-cycle source of power as shown under electrical specifications. Model HJ-618 DC incorporates the same chassis and phonograph as the Model HJ-618 AC but includes in addition an inverter unit which will allow operation on a DC source of power.

Phonograph

Type Pick-up	Crystal
Turntable Speed	78 R.P.M.

Special Service Information

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

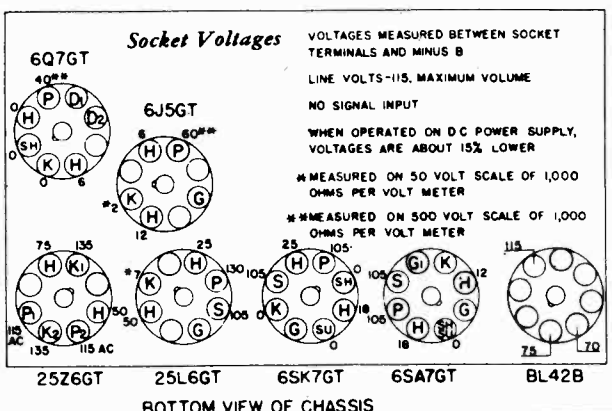
(1) Stage Gains
Antenna Post to Converter Grid—4 at 1000 KC‡
Converter Grid to 6SK7GT Grid—30 at 455 KC‡
6SK7GT Grid to 6Q7GT Det. Plate—100 at 455 KC‡

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

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

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

FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS

Loud-speaker—"Alnico" Magnetic Dynamic

Outside Cone Diameter	6.5 inches
Voice Coil Impedance (400 cycles)	3.5 ohms

NOTE—In no case should the magnet be removed from the assembled position without remagnetizing after replacing it.

Model	Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
HJ-618 AC	115 AC	60	75
HJ-618 DC	115 DC		85

Electrical Power Output

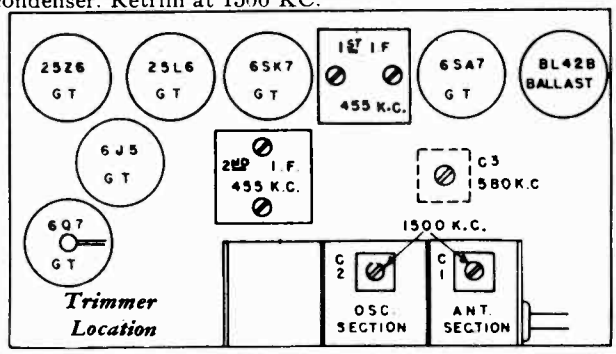
Undistorted	2.0 watts
Maximum	2.5 watts

ALIGNMENT PROCEDURE

I.F. 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. 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 on HJ-628) or (C-20 on HJ-624) for maximum output. Peak (C-3) on 580 KC while rocking the gang condenser. Retrim at 1500 KC.



GENERAL ELECTRIC CO.

MODELS HJ618AC, HJ618DC
MODELS HJ624, HJ628
MODELS H-639AC, H639DC
Parts, Phono. Switch

MODELS HJ-624 AND HJ-628

SERVICE DATA

Electrical Specifications

Model	Rating	Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
HJ-624		115 AC or DC	25–60	50
HJ-628	A6	115–125	60	75
	A5	115–125	50	75
	C2	115–125	25	90

Electrical Power Output

Undistorted ..... 2.0 watts
Maximum ..... 2.5 watts

Phonograph

Model HJ-628
Type Pick-up ..... Crystal
Turntable Speed ..... 78 R.P.M.

Loud-speaker

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. In case a voice coil needs centering 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.

MODELS *HJ-618 AC and HJ-618 DC* *HJ-624 HJ-628*

H-639 AC AND H-639 DC

Stock No.	Description	List Price
	CHASSIS ASSEMBLY	
*RB-008	BOARD—Terminal board (2 lug)	$0.10
*RB-046	BOARD—Terminal board (5 lug)	.15
RB-186	BRACKET—Volume control bracket	.10
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-6, 7)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-8)	.25
*RC-060	CAPACITOR—.03 mfd. 600 V. paper (C-13)	.25
*RC-072	CAPACITOR—.05 mfd. 200 V. paper (C-4)	.25
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-11)	.30
*RC-123	CAPACITOR—0.1 mfd. 400 V. paper (C-17)	.35
*RC-130	CAPACITOR—0.2 mfd. 400 V. paper (C-5)	.30
*RC-216	CAPACITOR—47 mmf. mica (C-16)	.25
*RC-250	CAPACITOR—220 mmf. mica (C-15)	.25
RC-293	CAPACITOR—470 mmf. mica (C-14)	.30
*RC-863	CORD—Power cord	.65
RC-1995	CLAMP—Oscillator coil clamp (Pkg. 5)	.10
RC-5145	CAPACITOR—30 mfd. 150 V.; 50 mfd. 150 V., dry electrolytic (C-9a, 9b)	.75
RC-6515	CAPACITOR—"B" band padder (C-3)	.30
RC-6530	CAPACITOR—Antenna trimmer (Model HJ-624)	
RC-9009	CONE ASSEMBLY—14-inch speaker cone assembly (Model HJ-628)	.95
RC-9010	CONE ASSEMBLY—Speaker cone assembly (Model HJ-624, H-639AC, H639DC)	$0.90
RC-9010	CONE ASSEMBLY—Speaker cone assembly *Models HJ-618 AC and HJ-618 DC*	.90
RE-068	ESCUTCHEON—Dial scale escutcheon	.65
RE-072	ESCUTCHEON—Station letter escutcheon (Model HJ-628)	
*RG-016	GRID CLIP—Tube control grid clip (Pkg. 5)	.10
RL-516	LOOP—Beam-a-Scope assembly (L-1) (Model HJ-628)	.90
RL-523	LOOP—Beam-a-Scope and cabinet back assembly (Model HJ-624)	
RL-528	LOOP—Beam-a-Scope and cabinet back assembly (L-1) HJ-618AC, HJ-618DC	$1.00
RL-2016	COIL—Oscillator coil (L-2)	.25
RN-102	NEEDLE CUP—Phonograph needle cup	.10
*RQ-1239	RESISTOR—150 ohms ½ W. carbon (R-10) (Pkg. 5)	.70
*RQ-1271	RESISTOR—3300 ohms ½ W. carbon (R-7) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms ½ W. carbon (R-1) (Pkg. 5)	.70
*RQ-1297	RESISTOR—39,000 ohms ½ W. carbon (R-8) (Pkg. 5)	.70
*RQ-1307	RESISTOR—100,000 ohms ½ W. carbon (R-13) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms, ½ W. carbon (R-5, 9, 12) (Pkg. 5)	.70
*RQ-1331	RESISTOR—1.0 megohm ½ W. carbon (R-6) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohms ½ W. carbon (R-2) (Pkg. 5)	.70
*RQ-1365	RESISTOR—15 megohms ½ W. carbon (R-4) (Pkg. 5)	.70
*RQ-1459	RESISTOR—1000 ohms 1 W. carbon (R-11)	.20
RR-773	RESISTOR—BL-42B ballast resistor (R-14)	.40
*RS-238	SOCKET—Octal tube socket	$0.15
RS-261	SOCKET—Pilot lamp socket assembly	.20
RS-1012	SPEAKER—6½-inch Alnico magnet dynamic speaker HJ-624, HJ-618AC, HJ618DC, H639AC, H-639DC	3.25
RS-1014	SPEAKER—14-inch Alnico magnet dynamic speaker (Model HJ-628)	6.00
RT-341	TRANSFORMER—1st I.F. transformer (L-3)	.80
RT-342	TRANSFORMER—2nd I.F. transformer (L-4)	.80
RT-475	TRANSFORMER—Output transformer (T-1)	1.00
RT-954	TERMINAL—Speaker contact terminal (Pkg. 10)	.10
RV-078	VOLUME CONTROL—0.5 megohm volume control (R-3)	.80
RX-062	ASSEMBLY—Speaker mounting assembly	10
	CONDENSER AND DIAL SCALE	
RC-7017	CONDENSER—Tuning condenser and reflector assembly (C-1, 2)	5.80
RD-415	DRUM—Tuning or volume control drum	.20
RF-752	FASTENER—Dial and window snap fastener (Pkg. 25)	.10
RK-209	KEY—Feathertouch tuning key for extreme left station selector	.15
RK-214	KEY—Feathertouch tuning key for all station selectors except for one on left	.10
RL-937	BINDING LUG—Station pin binding lug (Pkg. 10)	.10
RP-154	PIN—Station key adjusting pin (Pkg. 10)	.10
RP-155	POINTER—Dial scale pointer	.15
RP-156	PLATE—Reflector plate	.10
RP-313	PULLEY—Wooden idler pulley	.05
RP-314	PULLEY—Pointer drive pulley and "C" washer	.15
RS-464	SPRING—Drum tension spring (Pkg. 10)	.05
RS-470	SPRING—Drive cord idler pulley tension spring	.05
RW-043	WINDOW—Dial scale window	.15
	TONE ARM AND SWITCH ASSEMBLY Except Model HJ-624	
*RC-123	CAPACITOR—0.1 mfd. 400 V. paper (C-17)	.35
RP-505	PICKUP—Crystal pickup and leads	5.40
*RQ-1307	RESISTOR—100,000 ohms ½ W. carbon (R-13) (Pkg. 5)	.70
*RQ-1315	RESISTOR—220,000 ohms ½ W. carbon (R-15) (Pkg. 5)	.70
RS-472	SNAP RING—Tone arm spindle snap ring	.10
*RS-854	SCREW—Motor power switch set screw (Pkg. 10)	.25
RS-876	SCREW—Needle clamping screw	.25
RS-1810	SHIELD—Phono motor power switch shield	.15
RS-3051	SWITCH—Motor power switch and set screw assembly	.60
RS-3052	SWITCH—Phono switch, mounting plate and bushing assembly	2.15
RT-917	TONE ARM—Tone arm and pivot assembly	3.75

(continued)

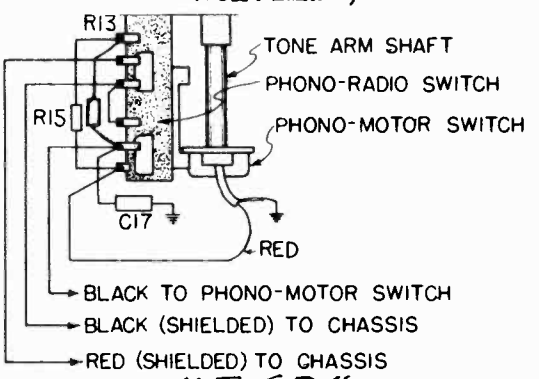


Fig. 3. Phono-Radio Switch Assembly

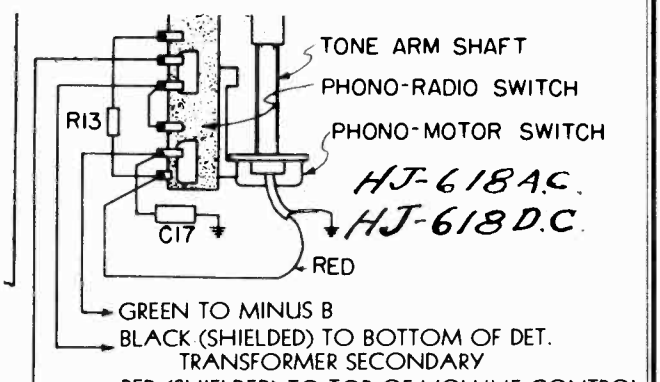


Fig. 3. Phono-Radio Switch Assembly

MODELS HJ618AC, HJ618DC
MODELS HJ624, HJ628
MODELS H639AC, H639DC

GENERAL ELECTRIC CO.

Turntable Parts

INVERTER ASSEMBLY
(Except Model HJ-624)
(continued)

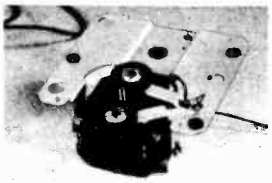
(Used only on special installations)

*RB-008	BOARD—Terminal board (2 lug)	.10
*RB-013	BOARD—Terminal board (2 lug)	.10
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-27)	.25
*RC-123	CAPACITOR—0.1 mfd. 400 V. paper (C-25, 29)	.35
RC-159	CAPACITOR—0.5 mfd. 200 V. paper (C-26)	.40
RC-5147	CAPACITOR—0.5 mfd. 200 V. line capacitor (C-28)	.45
RL-347	CHOKE—4 uh vibrator choke (L-6)	.30
*RQ-1243	RESISTOR—220 ohms ½ W. carbon (R-22) (Pkg. 5)	.70
RQ-1468	RESISTOR—2200 ohms 1 W. carbon (R-20)	.20
RR-781	RESISTOR—25 ohms 7.4 W. wire wound (R-21)	.20
RS-215	SOCKET—Vibrator socket (Pkg. 5)	.60
RV-203	VIBRATOR—Inverter unit vibrator (T-2)	5.50

MOTOR TURNTABLE ASSEMBLY

Model No. 1

(MODEL HJ-628)
MODELS HJ-618 AC, HJ-618 DC;
H-639 AC AND H-639 DC

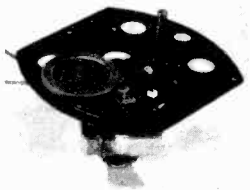


RB-187	BRACKET—Rubber-edged drive wheel bracket assembly	$0.20
RB-188	BRACKET—Rubber-edged idler wheel bracket assembly	.20
RB-627	BUSHING—Motor mounting rubber bushing (Pkg. 5)	.20
RC-5146	CAPACITOR—Pyranol capacitor Cat. 25F140	1.00
RH-112	HAIRPIN COTTER—Rubber-edged wheel locating hair-pin cotter (Pkg. 10)	.10
RM-129	MOTOR—60-cycle phono motor only	4.50
RP-157	PLATE—Motor mounting plate and spindle bearing assembly	.90
RS-471	SPRING—Idler wheel bracket tension spring (Pkg. 5)	.30
RS-934	SPINDLE—Turntable spindle and snap ring	.30
RT-916	TURNTABLE—8-inch brown flocked turntable	1.60
RW-910	WHEEL—Rubber-edged wheel	.35

MOTOR TURNTABLE ASSEMBLY

Model No. 2

(MODEL HJ-628)
MODELS HJ-618 AC HJ-618 DC
H-639 AC AND H-639 DC

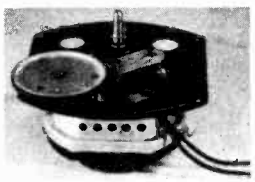


RM-133	MOTOR—60-cycle motor assembly complete	6.25
RP-165	PLATE—Main plate and turntable shaft bearing assembly	.90
RP-166	PLATE—Motor mounting plate	.30
RP-167	PLATE—Rubber-edged wheel movable plate and bearing assembly	.70
RP-316	PULLEY—60-cycle drive pulley and oil throw washer (Pkg. 2)	.25
RS-493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

MOTOR TURNTABLE ASSEMBLY

Model No. 3

HJ-618 AC AND HJ-618 DC
H-639 AC AND H-639 DC



RB-184	BRACKET—Turntable drive wheel bracket assembly	.15
RB-185	BRACKET—Lower motor bearing bracket assembly complete	.40
RF-502	FIELD—60-cycle field stator assembly complete	3.60
RF-503	FIELD—50-cycle field stator assembly complete	3.60
RF-504	FRAME—Upper motor frame assembly	.60
RM-127	MOTOR—60-cycle motor assembly complete less turntable	5.85
RM-128	MOTOR—50-cycle motor assembly complete less turntable	6.40
RP-164	PLATE—Motor mounting plate and bearing assembly	.90
RP-311	PULLEY—60-cycle motor pulley and setscrew	.20
RP-312	PULLEY—50-cycle motor pulley and setscrew	.25
RR-406	ROTOR—Rotor complete	1.55
RS-467	SPRING—Turntable drive tension spring	.10
RS-875	SETSCREW—Motor pulley setscrew (Pkg. 12)	.25
RS-932	SPINDLE—Turntable spindle and cotter	.30
RT-923	TURNTABLE—8-inch brown flocked turntable	1.60
RW-909	WHEEL—Rubber-edged drive wheel	.50
RX-065	ASSEMBLY—Turntable drive wheel bracket mounting washer, screw and nut assembly (Pkg. 5)	.20
RX-066	ASSEMBLY—Lower bearing bracket screw and nut assembly (Pkg. 3)	.05
RX-067	ASSEMBLY—Motor mounting screw, washer and grommet assembly (Pkg. 3)	.25
RX-068	ASSEMBLY—Drive wheel oil retainer, cotter and thrust washer assembly (Pkg. 5)	.10

*Used on previous receivers.

(Prices subject to change without notice)

NOTE:
When ordering motor-turntable assembly parts, refer to correct model list.

GENERAL ELECTRIC CO.

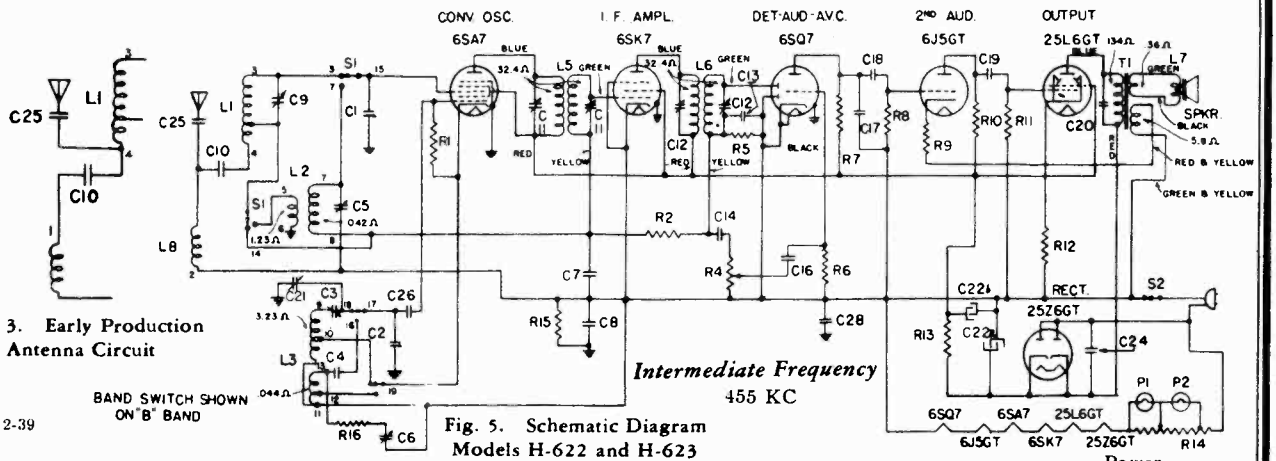


Fig. 3. Early Production Antenna Circuit

Fig. 5. Schematic Diagram Models H-622 and H-623

12-39

PRODUCTION CHANGES

Several hundred early production Model H-622 receivers were built with the antenna terminal connected as shown in Fig. 3. The remainder of these receivers were connected as shown in the schematic diagram, Fig. 5. The only difference between the two circuits is in the connection between the lower side of C-25 capacitor and the antenna circuit. Early production circuits had C-25 connected between L-1 and C-10. If hum is experienced when an outside antenna is used on these early production models with Fig. 3 antenna circuit, reverse the power plug in the power supply outlet. Should this procedure fail to attain the required results rewire C-25 into the circuit as shown in the schematic diagram, Fig. 5.

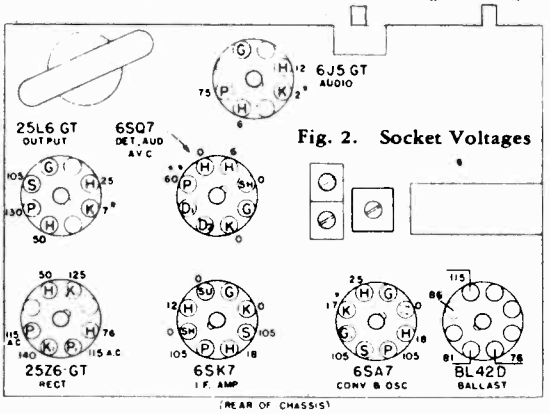


Fig. 2. Socket Voltages

*Measured on 10 volt scale of 20,000 ohms per volt meter
**Measured on 250 volt scale of 20,000 ohms per volt meter.
Line Volts—115.—No signal input.
Volume at maximum.
When operated on DC power supply, voltages are about 15 per cent lower.
All heater and ballast voltages are AC.

Power Supply Volts	Frequency (Cycles on AC)	Power Consumption (Watts)
115 AC or DC	25–60	50

Electrical Power Output (117 Line Volts)

Undistorted	1 4 watts
Maximum	2.5 watts

Loud-speaker—"Alnico" Magnet Dynamic

Outside Cone Diameter	6½ inches
Voice Coil Impedance (400 cycles)	3½ ohms

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

	Gain ‡
Antenna Post to Converter Grid	2.7 at 1000 KC
Converter Grid to 6SK7 Grid	28 at 455 KC
6SK7 Grid to 6SQ7 Diode Plate	87 at 455 KC

(2) Audio Gain
A 400 cycle signal of .05 volts across volume control will give approximately ½ watt speaker output. (Volume control turned to maximum.)

(3) DC voltage developed across oscillator grid resistor (R-1) averages 13 volts at 1000 KC.

‡Variation of +10%, −20% permissible.

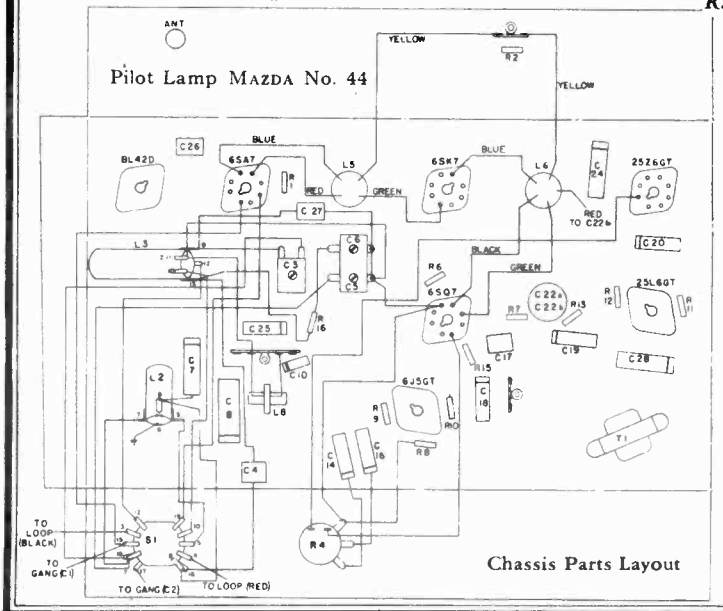
ALIGNMENT PROCEDURE

I.F. Connect an output meter across the voice coil. Rotate the volume control to maximum. Completely close the gang condenser plates and set the dial pointer to the first dial mark at the low end of the scale. Turn the band switch to "B" band (counterclockwise).

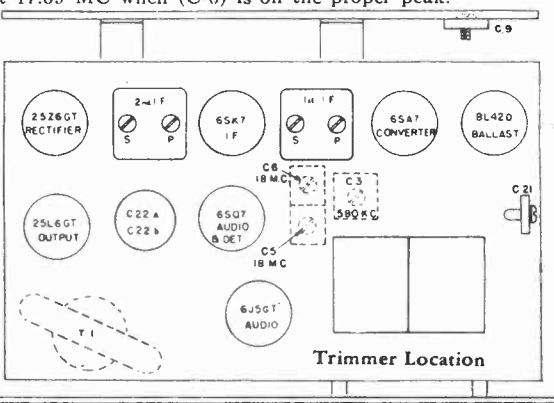
Set test oscillator to 455 KC and apply signal to the control grid of the 6SA7 tube through a .05 mfd. capacitor. Do not remove the 6SA7 grid lead. Keep the test oscillator output as low as a readable meter reading will permit. Adjust all I.F. trimmers for maximum meter reading.

R.F. 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 signal generator output which can be magnetically coupled to the receiver Beam-a-Scope. Align (C-21) at 1500 KC and peak (C-9) for maximum output. Change signal to 580 KC and tune receiver to signal. Peak (C-3) on the 580 KC signal by rocking the gang condenser. Retrim at 1500 KC.

Turn the band switch to "D" band. Align (C-6) at 18 MC using an 18 MC signal. Peak (C-5) while rocking the gang condenser. The image of the 18 MC signal should be heard at 17.09 MC when (C-6) is on the proper peak.



Chassis Parts Layout



Trimmer Location

MODELS HJ624, HJ628
Schematic, Voltage, Gain
Trimmers, Socket, Changes

GENERAL ELECTRIC CO.

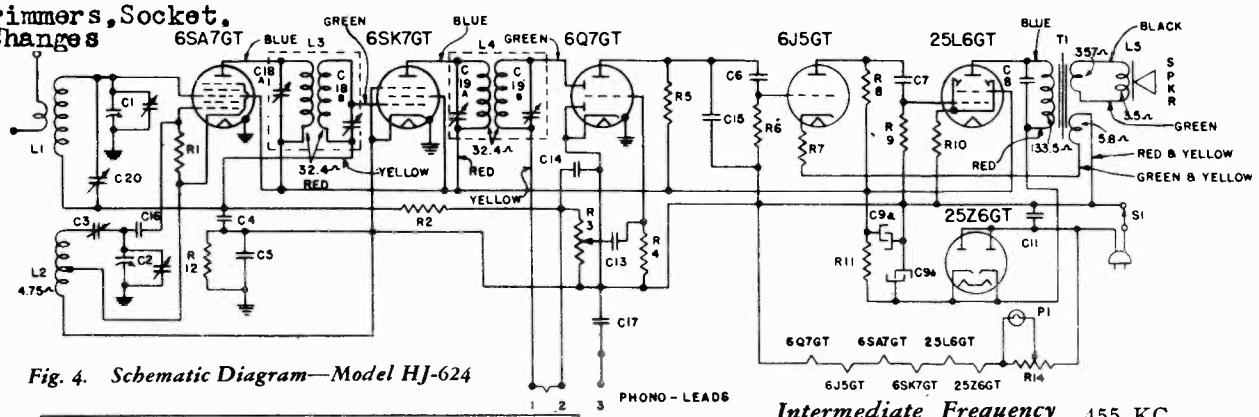
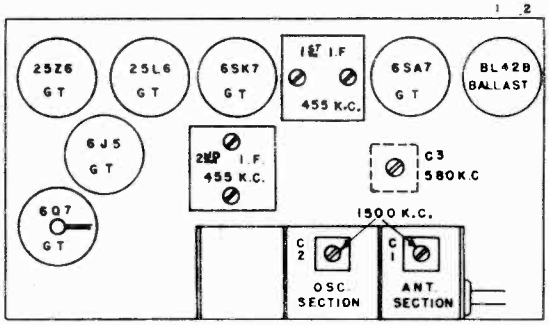


Fig. 4. Schematic Diagram—Model HJ-624



NOTE: On Model HJ-624 the antenna trimmer (C-1) on top the gang condenser is replaced with (C-20) located on the cabinet back cover.

Fig. 1. Trimmer Location

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 at 1000 KC‡
Converter Grid to 6SK7GT Grid—30 at 455 KC‡
6SK7GT Grid to 6Q7GT Det. Plate—100 at 455 KC‡

(2) Audio Gains

.06 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½ watt speaker output.

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

‡ Variations of +10%, −20% permissible

Intermediate Frequency 455 KC

Loud-speaker—"Alnico" Magnetic Dynamic

Model	HJ-624	HJ-628
Speaker Diameter	6.5 inches	14 inches
Voice Coil Impedance (400 cycles)		3.5 ohms

Tubes

Converter-Oscillator	GE-6SA7GT
I.F. Amplifier	GE-6SK7GT
Det., Aud., AVC	GE-6Q7GT
2nd Audio Amplifier	GE-6J5GT
Power Output	GE-25L6GT
Rectifier	GE-25Z6GT
Dial Lamp	MAZDA No. 44

FRONT OF CHASSIS

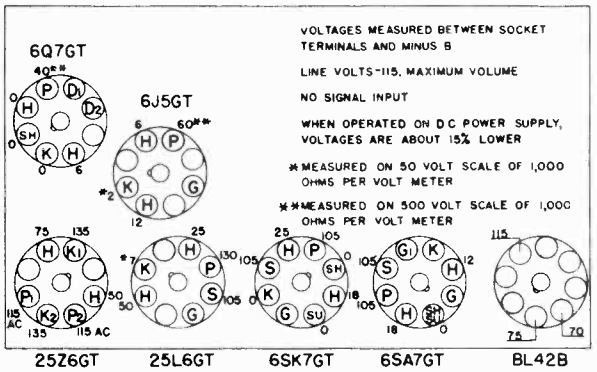


Fig. 2. Socket Voltages

BOTTOM VIEW OF CHASSIS

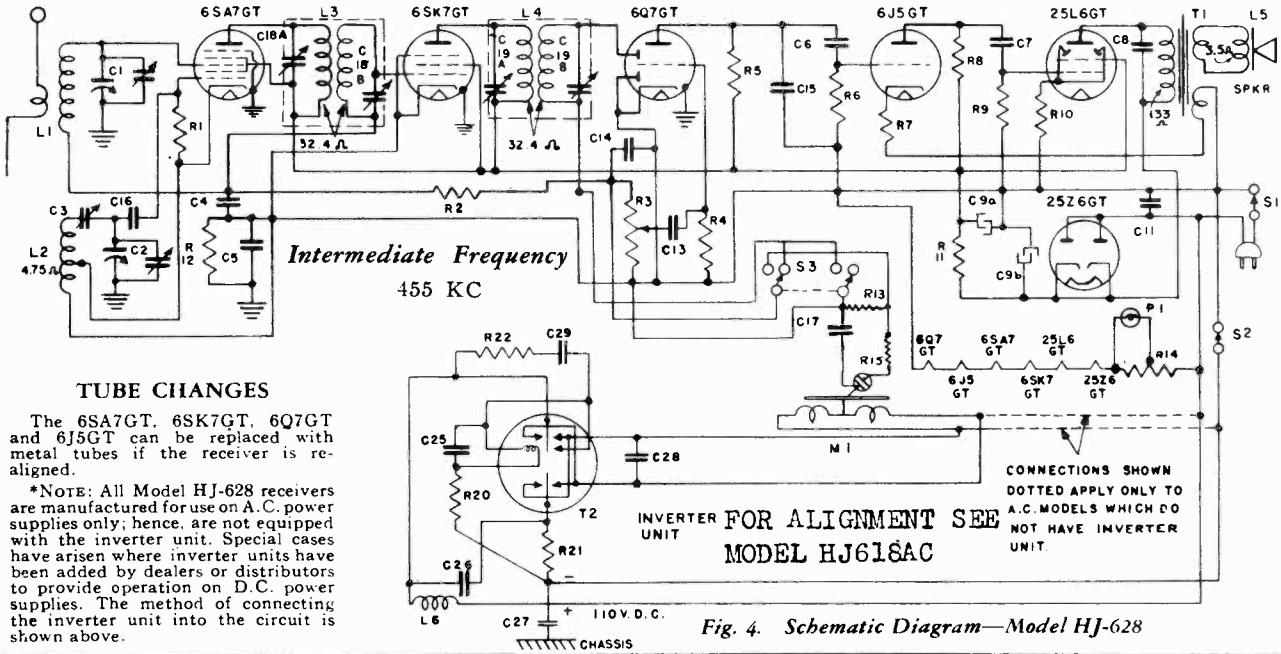


Fig. 4. Schematic Diagram—Model HJ-628

TUBE CHANGES

The 6SA7GT, 6SK7GT, 6Q7GT and 6J5GT can be replaced with metal tubes if the receiver is re-aligned.

*NOTE: All Model HJ-628 receivers are manufactured for use on A.C. power supplies only; hence, are not equipped with the inverter unit. Special cases have arisen where inverter units have been added by dealers or distributors to provide operation on D.C. power supplies. The method of connecting the inverter unit into the circuit is shown above.

H630U, H632U (Early) Schematics, Gain

MODEL H625 (Final)

GENERAL ELECTRIC CO. MODELS H630 to H633 (Final)

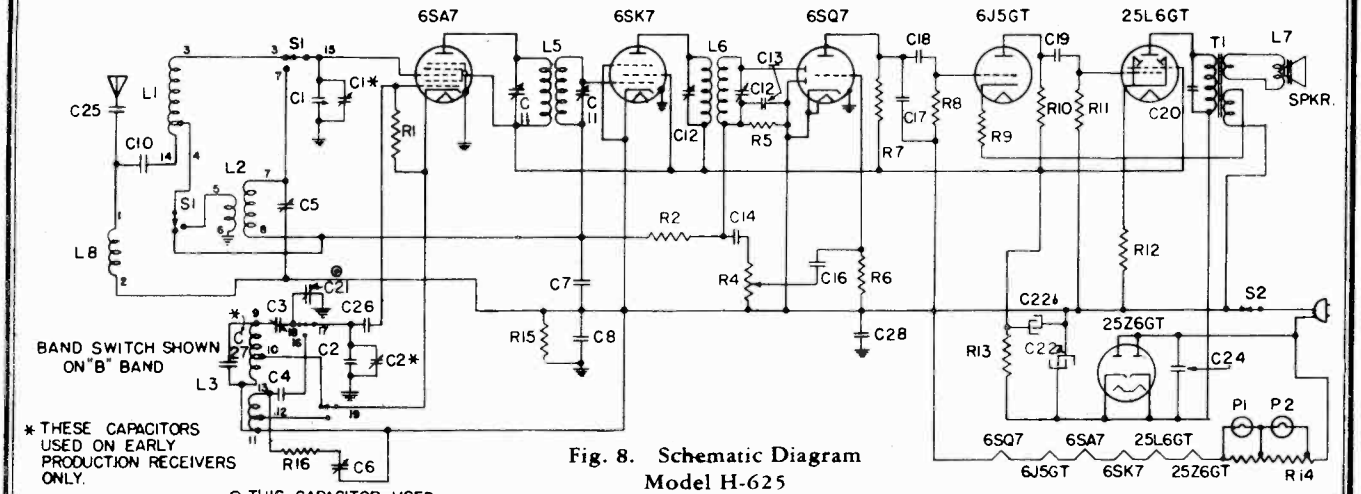


Fig. 8. Schematic Diagram Model H-625

Type Cabinet

Model H-625	Console
Models H-630, -631, -632, -633	Table Model

Tuning Control Drive Ratio 4:1

Electrical Specifications

Power Supply Volts	Frequency (Cycles on AC)	Power Consumption (Watts)
115 AC or DC	25–60	50

Tubes

Converter and Oscillator	GE-6SA7
I.F. Amplifier	GE-6SK7
Det., Aud., AVC	GE-6SQ7
2nd Audio Amplifier	GE-6J5GT
Power Output	GE-25L6GT
Rectifier	GE-25Z6GT
Pilot Lamp	MAZDA No. 44

Electrical Power Output (117 Line Volts)

Undistorted	1.4 watts
Maximum	2.5 watts*

*Tests made on Model H-625 indicate that the sound output from this receiver is approximately equal to that of an AC receiver using a conventional wound-field loud-speaker rated at 5 watts.

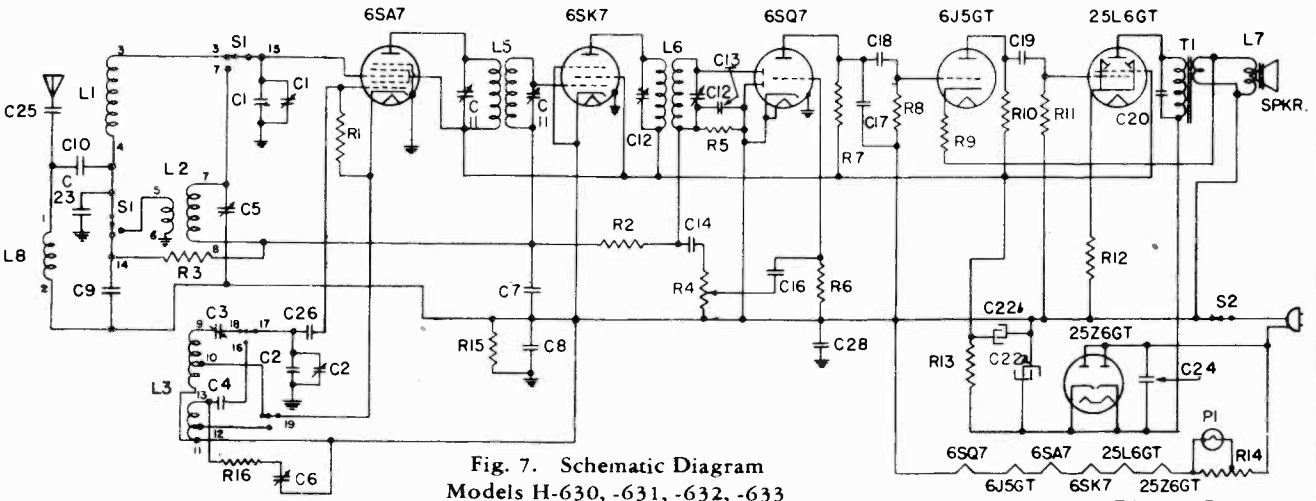


Fig. 7. Schematic Diagram Models H-630, -631, -632, -633
Models H-630U, 632U (EARLY)

Special Service Information

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

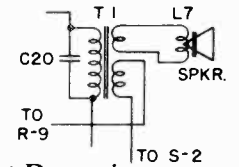
(1) Stage Gains

	Gain ‡
Antenna Post to Converter Grid	2.7 at 1000 KC
Converter Grid to 6SK7 Grid	28 at 455 KC
6SK7 Grid to 6SQ7 Diode Plate	87 at 455 KC

(2) Audio Gain
A 400 cycle signal of .05 volts across volume control will give approximately ½ watt speaker output. (Volume control turned to maximum.)

(3) DC voltage developed across oscillator grid resistor (R-1) averages 13 volts at 1000 KC.

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



Loud-speaker—"Alnico" Magnet Dynamic

Model	H-625	H-630, -631, -632, -633
Outside Cone Diameter	12 in.	5 in.
Voice Coil Impedance (400 cycles)		3½ ohms

Tuning Frequency Range

Band "B"	550–1600 KC
Band "D"	5800–18,000 KC

Intermediate Frequency ..... 455 KC

MODEL H625
MODELS H630,H633(incl.)
H630U,H632U
Chassis Wiring,Voltage
Socket,Notes

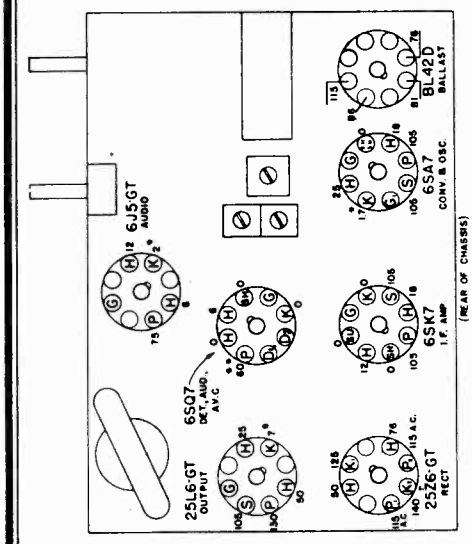
GENERAL ELECTRIC CO.

GENERAL INFORMATION

The Models H-625, H-630, H-631, H-632, and H-633 are compact six-tube AC-DC superheterodyne receivers employing General Electric Pre-tested Tubes. Features of design include built-in Beam-a-Scope, airplane-type dial, four Feathertouch Tuning keys, broadcast and short-wave coverage, and automatic volume control.

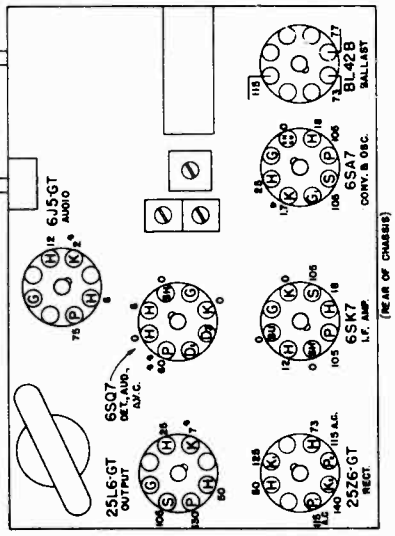
Models H-625, H-631, and H-633 are fully approved by Underwriters' Laboratories.

When operating from a DC source of power it is necessary to insert the power plug with the proper polarity; otherwise, the receiver will fail to function. If excessive hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.



BOTTOM VIEW OF CHASSIS
VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND -B

Fig. 4. Socket Voltages
Model H-625



BOTTOM VIEW OF CHASSIS
VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND -B

*Measured on 10 volt scale of 20,000 ohms per volt meter.
**Measured on 250 volt scale of 20,000 ohms per volt meter.
Line Volts—115.—No signal input.
Volume at maximum.
When operated on DC power supply, voltages are about 15 per cent lower.
All heater and ballast voltages are A.C.

Fig. 3. Socket Voltages
Models H-630,-631,-632,-633
Models H-630U and 632U (EARLY).

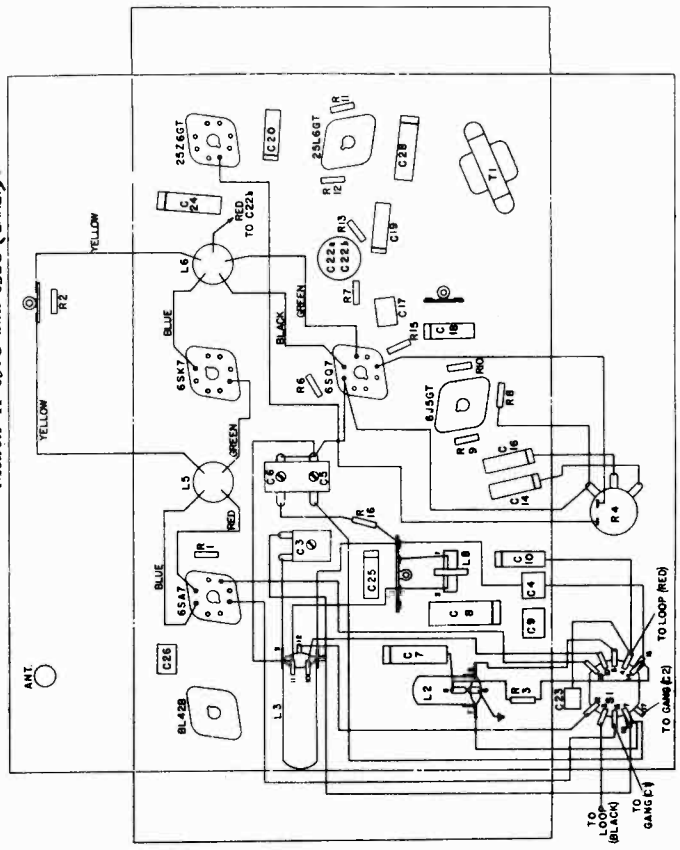


Fig. 5. Chassis Parts Layout
Models H-630, -631, -632, -633; *H-630U; H-632U* (Early).

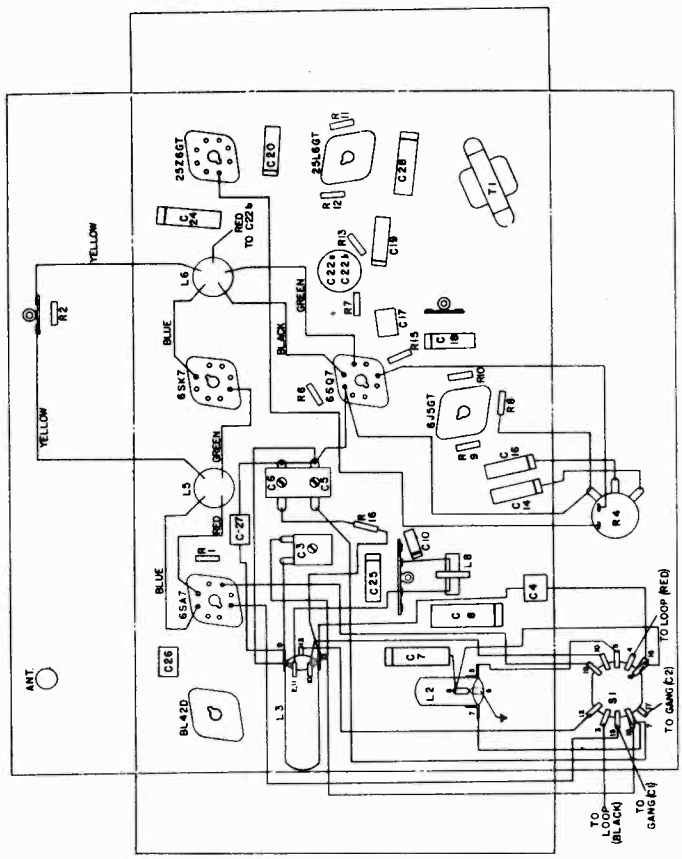


Fig. 6. Chassis Parts Layout
Model H-625

GENERAL ELECTRIC CO.

MODELS H625
MODELS H630 to H633
H630U, H632U
Alignment, Changes, Trimmers
Dial Drive Data, Parts

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ..... 455 KC
Band "B" ..... 1500 and 580 KC
Band "D" ..... 18,000 KC

The location of trimmers for the above models are shown in their respective diagrams, Figs. 1 and 2.

I.F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Completely close the gang condenser plates and set the dial pointer to the first dial mark at the low end of the scale. Turn the band switch to "B" band (counterclockwise).

Set test oscillator to 455 KC and apply signal to the control grid of the 6SA7 tube through a .05 mfd. capacitor. Do not remove the 6SA7 grid lead. Keep the test oscillator output as low as a readable meter reading will permit. Adjust all I.F. trimmers for maximum meter reading.

R.F. Alignment

(1) *Models H-630, -631, -632, -633* 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 signal 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. Change signal to 580 KC and tune receiver to signal. Peak (C-3) on the 580 KC signal by rocking the gang condenser. Retrim at 1500 KC.

Turn the band switch to "D" band. Align (C-6) at 18 MC using an 18 MC signal. Peak (C-5) while rocking the gang condenser. The image of the 18 MC signal should be heard at 17.09 MC when (C-6) is on the proper peak.

(2) *Model H-625* The same alignment procedure as above may be followed for this model excepting that final R.F. alignment on "B" band should be made after the chassis and Beam-a-Scope are properly mounted in the cabinet and interconnected. The location of the Beam-a-Scope with respect to the chassis materially affects alignment.

NOTE.—A change exists in the "B" band trimmer arrangement on late production models. "B" band antenna trimmer (C-1) is eliminated. "B" band oscillator trimmer (C-2) is moved from the top of the gang condenser to the chassis deck and renumbered (C-21) (see Fig. 2). In aligning the late production Model H-625 apply 1500 KC signal as described for H-630. Set dial pointer to 1500 KC and align (C-21) for maximum output by rocking the gang condenser. Retune to 580 KC and peak (C-3) on 580 KC signal by rocking gang condenser. Repeat at 1500 KC.

Alignment on "D" band is the same as described for Model H-630.

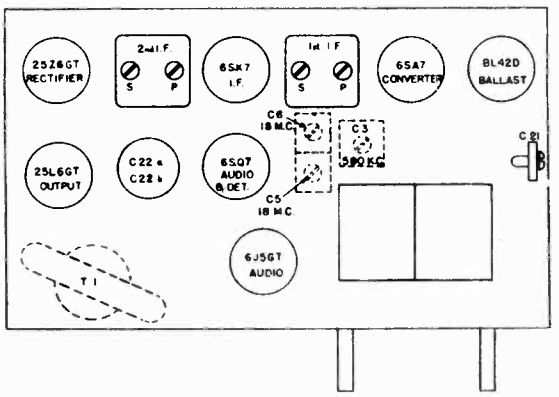
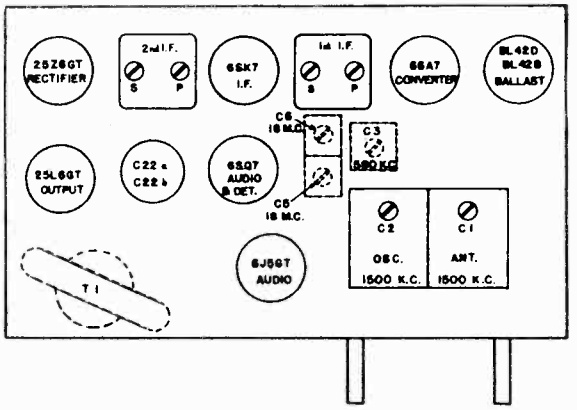


Fig. 2. Trimmer Location
(Late Production Model H-625)

PRODUCTION CHANGES

Late production models of the H-625 have certain trimmer and coil changes incorporated which should be noted when ordering replacement parts.

1. "B" band trimmers (C-1) and (C-2) on top of gang condenser are removed. (C-1) antenna trimmer is completely eliminated. (C-2) oscillator trimmer is renumbered (C-21) and mounted on chassis deck (see Fig. 2).
2. "D" band antenna coil changed from Stock No. RL-088 (Code—Red) to RL-098 (Code—Orange).



NOTE.—Models H-630, -631, -632, -633 use BL42B Ballast. Model H-625 uses BL42D Ballast.

Fig. 1. Trimmer Location
Models H-625 (Early), -630, -631, -632, -633

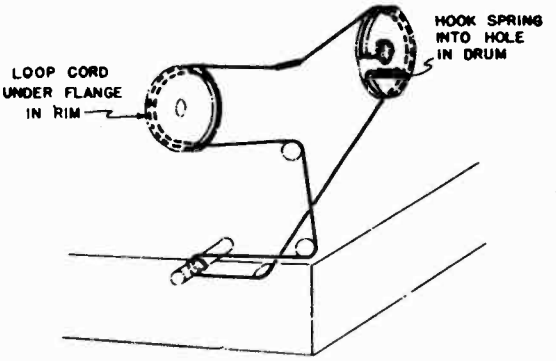


Fig. 9. Dial Drive Stringing Diagram

REPLACEMENT PARTS LIST

Stock No.	Description	List Price
	CHASSIS ASSEMBLY	
RA-314	CONDENSER ASSEMBLY—Tuning condenser and drive unit complete with pointer (Models H-630, -631, -632, -633)	$5.70
RA-315	CONDENSER ASSEMBLY—Tuning condenser and drive unit complete (Model H-625)	5.75
*RB-023	BOARD—Terminal board (4 lugs)	.10
RB-041	BOARD—Terminal board (2 lugs)	.10
RB-182	BRACKET—Beam-a-Scope bracket (Models H-630, -631, -632, -633)	.10
RB-921	BACK COVER—Cardboard cabinet back (Models H-630, -631)	.15
RB-922	BACK COVER—Cardboard cabinet back (Models H-632, -633)	.15
RB-924	BACK COVER—Cardboard cabinet back (Model H-625)	.30

MODEL H625
MODELS H630 to H633
H630U, H632U
Parts List

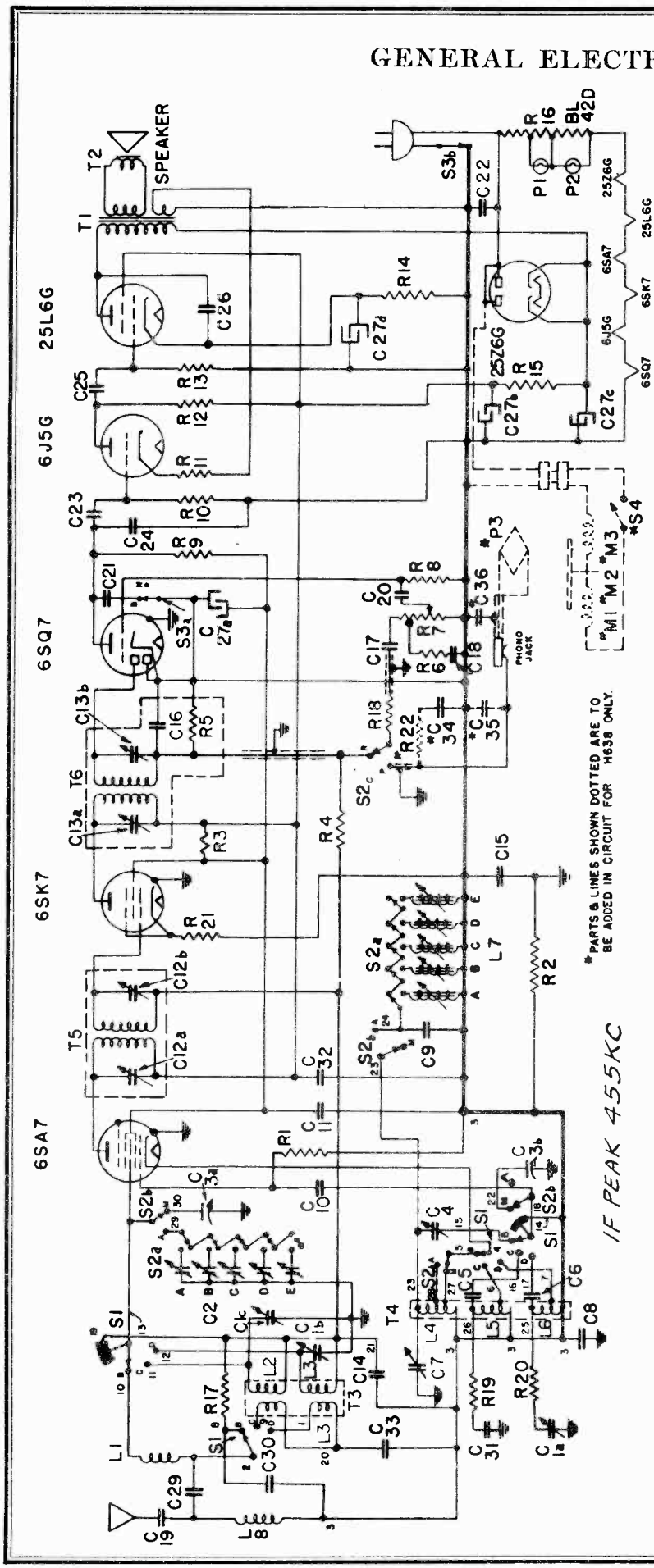
GENERAL ELECTRIC CO.

Stock No.	Description	List Price
RB-1018	BOARD—Antenna terminal board	.10
RB-1020	BOARD—Beam-a-Scope terminal board (Model H-625)	.10
*RC-011	CAPACITOR—.002 mfd. 600 V. paper (C-14)	.25
*RC-023	CAPACITOR—.005 mfd. 600 V. paper (C-18, 19)	.25
*RC-039	CAPACITOR—.01 mfd. 600 V. paper (C-10, 20, 25)	.25
*RC-048	CAPACITOR—.02 mfd. 600 V. paper (C-16)	.30
*RC-092	CAPACITOR—.05 mfd. 600 V. paper (C-7, 24)	.30
*RC-123	CAPACITOR—0.1 mfd. 400 V. paper (C-8, 28)	.35
*RC-216	CAPACITOR—47 mmf. mica (C-26)	.25
*RC-220	CAPACITOR—6 mmf. mica (C-27 on Model H-625) (C-23 on remainder of Models)	.25
*RC-250	CAPACITOR—220 mmf. mica (C-17 on Model H-625)	.25
*RC-293	CAPACITOR—470 mmf. mica (C-13) (also C-17 on Models H-630, -631, -632, -633)	.30
*RC-390	CAPACITOR—3900 mmf. mica (C-4) (also C-9 on Models H-630, -631, -632, -633)	.35
*RC-645	CAPACITOR—"B" band osc. trimmer (C-21 on late Model H-625)	.15
*RC-676	CAPACITOR—"B" band padder (C-3 on Models H-630, -631, -632, and -633)	.35
RC-749	CONDENSER—Tuning condenser (C-1, 2)	4.15
*RC-863	CORD—Power cord	.65
RC-1995	CLAMP—Oscillator coil clamp (Pkg. 5)	.10
RC-5136	CAPACITOR—50 mfd. 150 V.; 30 mfd. 150 V.; dry electrolytic (C-22a, 22b)	1.15
RC-6516	CAPACITOR—"B" band padder (C-3 on Model H-625)	.30
RC-6517	CAPACITOR—"D" band ant. and osc. trimmers (C-5, 6)	$0.30
RC-8130	CABLE—Tuning drive cable assembly	.15
RC-8508	CARD—Station letter card (1 set)	.30
RD-115	DIAL—Dial scale (Models H-630, -631, -632, -633)	.20
RD-116	DIAL—Dial scale (Model H-625)	1.00
RG-302	GROMMET—Tuning shaft drive cord grommet (Pkg. 10)	.10
RK-055	KNOB—Light oak control knob (Pkg. 5)	.50
RK-074	KNOB—Light tan control knob (Model H-625) (Pkg. 5)	.50
RK-209	KEY—Light oak station selector key (Models H-630, -631, -632, -633)	.15
RK-210	KEY—Light oak station selector key (Model H-625)	.15
RK-215	KEY—Light tan station selector key (Model H-625)	.15
RL-088	COIL—"D" band antenna coil (Code—Red) (L-2)	.65
RL-098	COIL—"D" band antenna coil (Code—Orange) (L-2)	.65
RL-295	COIL—Oscillator coil (L-3 on Models H-630, -631, -632, -633)	.70
RL-296	COIL—Oscillator coil (L-3 on Model H-625)	.70
RL-346	CHOKE—Antenna choke (L-8)	.30
RL-511	BEAM-A-SCOPE—Beam-a-Scope antenna (L-1 on Models H-630, -631, -632, -633)	.70
RL-512	BEAM-A-SCOPE—Beam-a-Scope antenna (L-1 on Model H-625)	2.95
RL-937	LUG—Key pin binding lug (Pkg. 10)	.10
RM-503	MASK—Dial scale mask (Model H-625) (Pkg. 10)	.10
RN-200	NAMEPLATE—Dial scale metal nameplate (Model H-625)	.20
RP-134	PIN—Station selector key pin (Pkg. 10)	.05
RP-143	POINTER—Dial scale pointer (Models H-630, -631, -632, -633)	.60
RP-144	POINTER—Dial scale pointer (Model H-625) (Pkg. 5)	.25
RP-307	PULLEY—Condenser drive cord pulley (Pkg. 5)	.25
RP-308	PULLEY—½ inch drive cord idler pulley (Pkg. 5)	.10
RP-309	PULLEY—$\frac{11}{16}$ inch drive cord idler pulley (Pkg. 5)	.10
*RQ-1235	RESISTOR—100 ohms, ½ W. carbon (R-16) (Pkg. 5)	.70
*RQ-1239	RESISTOR—150 ohms, ½ W. carbon (R-12) (Pkg. 5)	.70
*RQ-1259	RESISTOR—1000 ohms, ½ W. carbon R-13) (Pkg. 5)	$0.70
*RQ-1271	RESISTOR—3300 ohms, ½ W. carbon (R-9) (Pkg. 5)	.70
*RQ-1295	RESISTOR—33,000 ohms, ½ W. carbon (R-1) (Pkg. 5)	.70
*RQ-1297	RESISTOR—39,000 ohms, ½ W. carbon (R-10) (Pkg. 5)	.70
*RQ-1323	RESISTOR—470,000 ohms, ½ W. carbon (R-3, 5, 7, 11, 15) (Pkg. 5)	.70
*RQ-1331	RESISTOR—1.0 megohm, ½ W. carbon (R-8) (Pkg. 5)	.70
*RQ-1339	RESISTOR—2.2 megohms, ½ W. carbon (R-2) (Pkg. 5)	.70
*RQ-1365	RESISTOR—15 megohms, ¼ W. carbon (R-6) (Pkg. 5)	.70
RR-772	RESISTOR—BL42D ballast resistor (R-14) (Model H-625)	.45
RR-773	RESISTOR—BL42B ballast resistor (R-14) (Models H-630, -631, -632, -633)	.40
RR-930	REFLECTOR—Dial scale reflector (Models H-630, -631, -632, -633)	.30
RR-941	REFLECTOR—Dial scale reflector (Model H-625)	.30
*RS-200	SOCKET—Octal tube socket (Pkg. 5)	.75
RS-256	SOCKET—Electrolytic mounting socket (Pkg. 5)	.25
RS-261	SOCKET—Pilot lamp socket	.20
*RS-426	SPRING—Condenser drive cord spring (Pkg. 5)	.10
RS-510	SPACER—Station key spacer (Pkg. 10)	.10
RS-511	SLEEVE—Condenser bracket spacer sleeve (Pkg. 10)	.15
RS-929	SHAFT—Tuning shaft	.10
RS-3036	SWITCH—Band change switch	.60
RT-328	TRANSFORMER—1st I.F. transformer (L-5)	$1.00
RT-329	TRANSFORMER—2nd I.F. transformer (L-6)	1.20
RT-468	TRANSFORMER—Output transformer (T-1) (Models H-630, -632)	.95
RT-469	TRANSFORMER—Output transformer (T-1) (Models H-625, -631, -633)	1.25
*RT-952	TERMINAL—Loop lead contact terminal (Pkg. 10)	.05
RT-954	TERMINAL—Speaker lead terminal (Pkg. 10)	.10
RV-072	VOLUME CONTROL—2.0 megohm volume control (R-4)	.80
RW-039	WINDOW—Celluloid station letter window (Pkg. 25)	.10
*RW-101	WASHER—Control shaft felt washer (Pkg. 10)	.05
*RX-035	ASSEMBLY—Condenser mounting foot assembly	.15
RX-061	ASSEMBLY—Chassis mounting assembly	.10
	SPEAKER ASSEMBLY	
RB-1019	BOARD—5-inch speaker terminal board	.05
RC-9009	CONE ASSEMBLY—12-inch speaker cone assembly (Model H-625)	.95
RC-9014	CONE ASSEMBLY—5-inch speaker cone assembly (Model H-630, -631, -632, -633)	.80
RP-129	PLUG—Speaker plug (Model H-625) (Pkg. 2)	.10
RS-1011	SPEAKER—12-inch P.M. speaker (Model H-625)	4.80
RS-1018	SPEAKER—5-inch P.M. speaker (Models H-630, -631)	2.50
RS-1019	SPEAKER—5-inch P.M. speaker (Models H-632, -633)	3.40

*Used on previous receivers.

MODELS H634, H638, H640

GENERAL ELECTRIC CO. Schematic, Socket, Trimmers



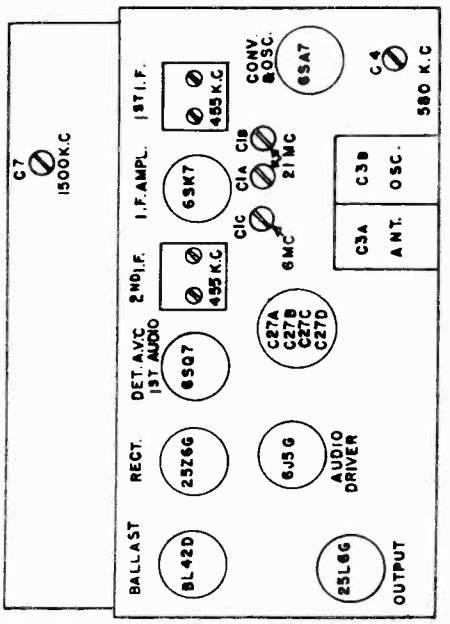


Fig. 2. Trimmer Location

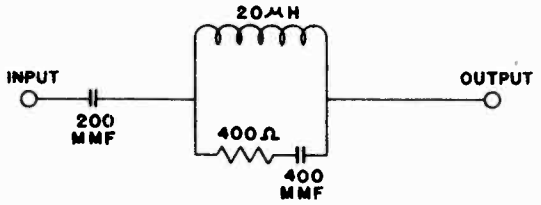
SYMBOL	DESCRIPTION
C-1a	"D" band oscillator trimmer
C-1b	"D" band antenna trimmer
C-1c	"C" band antenna trimmer
C-2a	7-65 mmf. station trimmer
C-2b	20-180 mmf. station trimmer
C-2c	20-180 mmf. station trimmer
C-2d	100-490 mmf. station trimmer
C-2e	100-490 mmf. station trimmer
C-3	Tuning condenser
C-4	"B" band oscillator padder
C-5	2000 mmf. mica capacitor ±5%
C-6	5600 mmf. mica capacitor ±5%
C-7	"B" band oscillator trimmer
C-8	0.1 mfd. paper capacitor
C-9	750 mmf. silvered mica cap ±5%
C-10	47 mmf. mica capacitor
C-11	.05 mfd. paper capacitor
C-14	.05 mfd. paper capacitor
C-15	0.1 mfd. paper capacitor
C-16	100 mmf. mica capacitor
C-17	.005 mfd. paper capacitor
C-18	.0072 mfd. paper capacitor
C-19	.005 mfd. paper capacitor
C-20	.01 mfd. paper capacitor
C-21	.0015 mfd. paper capacitor
C-22	.05 mfd. 250 V. A. C. moulded capacitor
C-23	.005 mfd. paper capacitor
C-24	100 mmf. mica capacitor
C-25	.02 mfd. paper capacitor
C-26	.01 mfd. paper capacitor
C-27a	.50 mfd. 150 V. dry electrolytic
C-27b	.50 mfd. 150 V. dry electrolytic
C-27c	.50 mfd. 150 V. dry electrolytic
C-27d	20 mfd. 25 V. dry electrolytic
C-29	0.1 mfd. paper capacitor
C-30	4700 mmf. mica capacitor ± 5%
C-31	22 mmf. mica capacitor
C-32	.05 mfd. paper capacitor
C-33	.05 mfd. paper capacitor
C-34	.01 mfd. paper capacitor
C-35	.002 mfd. paper capacitor
C-36	0.1 mfd. paper capacitor
L-1	Loop antenna
L-2	"C" band antenna coil
L-3	"D" band antenna coil
L-4	"B" band oscillator coil
L-5	"C" band oscillator coil
L-6	"D" band oscillator coil
L-7	Station coil trimmers
L-8	Antenna choke
M-1	60 cycle phono motor
M-2	50 cycle phono motor
M-3	25 cycle phono motor
R-1	22,000 ohms, carbon resistor
R-2	470,000 ohms, carbon resistor
R-3	2200 ohms, carbon resistor
R-4	2.2 megohms, carbon resistor
R-5	470,000 ohms, carbon resistor
R-6	56,000 ohms, carbon resistor
R-7	2 megohm volume control
R-8	15 megohms, carbon resistor
R-9	220,000 ohms, carbon resistor
R-10	1 megohm, carbon resistor
R-11	3300 ohms, carbon resistor
R-12	220,000 ohms, carbon resistor
R-13	470,000 ohms, carbon resistor
R-14	150 ohms, carbon resistor
R-15	560 ohms, carbon resistor
R-16	Ballast tube BL42D
R-17	47,000 ohms, carbon resistor
R-18	47,000 ohms, carbon resistor
R-19	150 ohms, carbon resistor
R-20	68 ohms, carbon resistor
R-21	390 ohms, carbon resistor
R-22	100,000 ohms, carbon resistor
P-1, 2	Dial lamp, Mazda No. 44.

Fig. 3. Schematic Diagram

MODELS H634,H638,H640
Chassis Wiring,Voltage

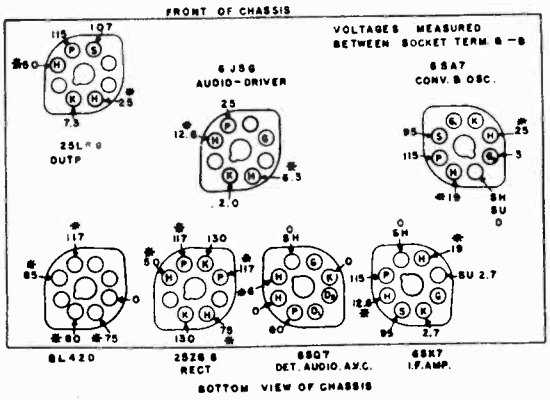
GENERAL ELECTRIC CO.

Fig. 7. I.R.E. Dummy Antenna



* Volts A.c.
Line Volts-117. No signal input. Max. volume. Gang closed. "B" band.
Volts measured on 20,000 ohms per volt-voltmeter.

Fig. 5. Socket Voltage



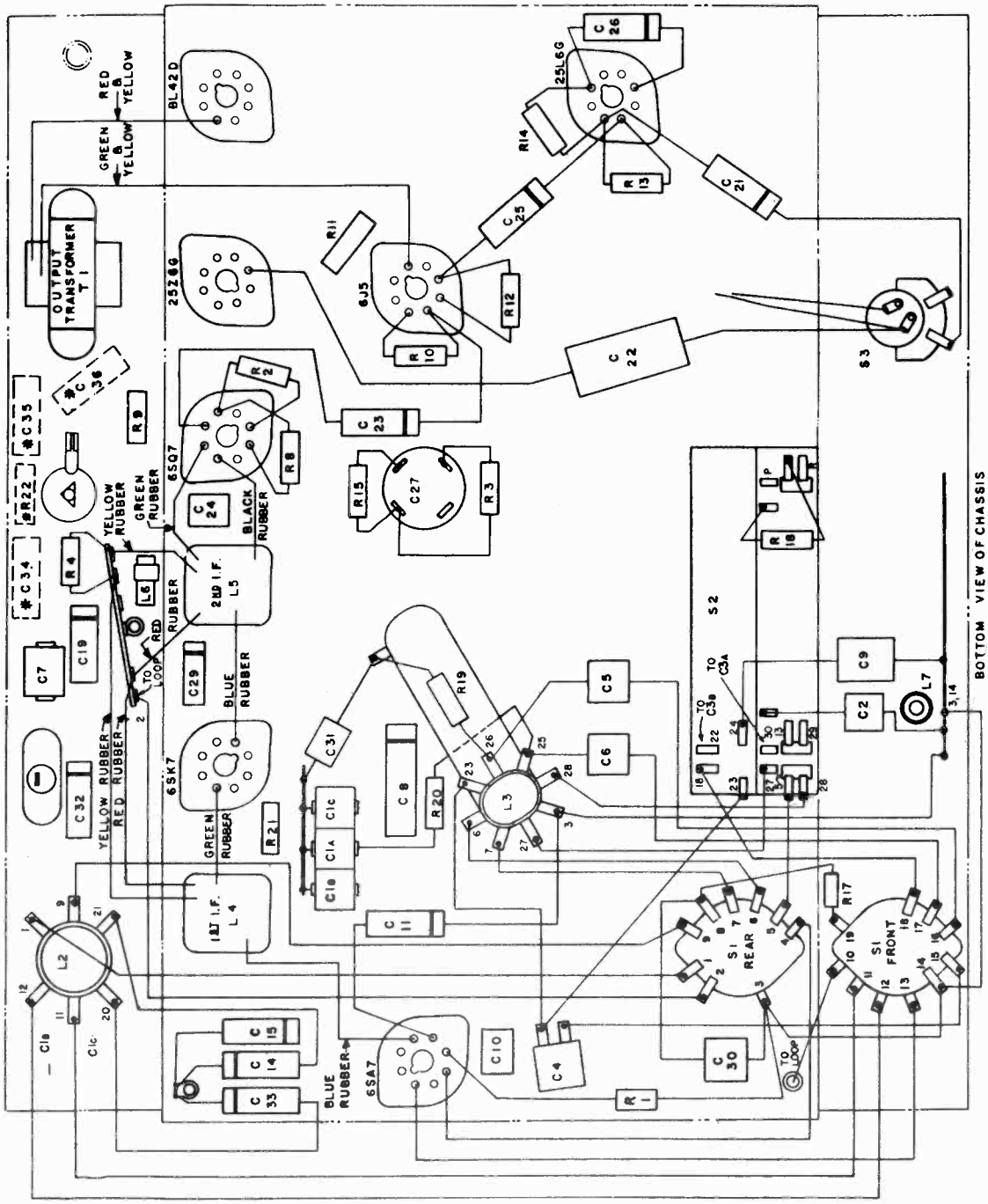


Fig. 4. Chassis Parts Layout

GENERAL ELECTRIC CO.

MODELS H634,H638,H640
Gain,Coils,Notes

SPECIFICATIONS

Physical Specifications

Model	H-634	H-638	H-640
Height	10½ in.	12 11/16 in.	10½ in.
Width	18 in.	19¾ in.	19⅝ in.
Depth	9⅝ in.	13⅝ in.	9 1/16 in.
Weight packed.	22 lbs.	37 lbs.	22 lbs

Tuning Control Drive Ratio 10:1

Electrical Specifications

MODEL	RATING	POWER SUPPLY (VOLTS)	FREQUENCY (CYCLES ON AC)	POWER CONSUMPTION (WATTS)
H-634 H-640		110–120 AC or DC	25–60	55
H-638	A6 A5 C2	115–125 AC 115–125 AC 115–125 AC	60 50 25	75 75 75

Tuning Frequency Range

Band "B" ..... 550–1600 K.C.
Band "C" ..... 2200–6500 K.C.
Band "D" ..... 6500–22000 K.C.

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

Electrical Power Output

Undistorted ..... 1.75 watts
Maximum ..... 2.7 watts

Tone Control 2-position

Loud-speaker—"Alnico" Magnet Dynamic

Model	H-634	H-638	H-640
Outside Cone Diameter	5-in.	6½ in.	6½ in.
Voice Coil Impedance	3.5 ohms at 400 cycles		

Phonograph

Model H-638
Type Pick-up ..... Crystal
Turntable Speed ..... 78 rpm.

Tubes

Converter and Oscillator GE-6SA7
I.F. Amplifier GE-6SK7
Det., Aud., AVC GE-6SQ7
Audio Driver GE-6J5G
Output GE-25L6G
Rectifier GE-25Z6G
Pilot Lamp ..... (2) MAZDA No. 44

GENERAL INFORMATION

Models H-634, H-638 and H-640 employ three-band AC-DC receivers of the superheterodyne type using six General Electric Pre-tested Tubes. Features of design include the built-in "Beam-a-Scope," the new "Alnico" dynapower speaker, seven "Feathertouch Tuning" keys, a Visualux dial, iron core oscillator trimmer coils for station keys and automatic volume control.

In addition to the above features, the Model H-638 incorporates a phonograph mechanism for reproducing recordings. The phonograph plays 10-inch or 12-inch records and is manually operated. A constant speed, self-starting, silent electric motor and high-quality crystal pick-up insure realistic reproductions.

Coil System

L-1 is the Beam-a-Scope. On "B" band, L-1 operates as a loop antenna. On "C" and "D" bands, the grid end of L-1 is effectively grounded preventing absorption spots due to loop resonance. T-3 is the "C" and "D" antenna transformer while T-4 is the oscillator transformer for all bands. All band switch and coil terminals are numbered in Fig. 3 and Fig. 4 to facilitate in locating common points.

The following table shows the coils in use for various positions of the band and manual-automatic switch:

Band-switch Position	Antenna Primary	Antenna Secondary	Oscillator Grid	Oscillator Cathode	Remarks
Manual Tuning Band "B"		L-1	L-4	Section 3 to 27 of L-4	C-3a and C-3b tuning condenser in circuit
Automatic Tuning Band "B"		L-1	L-4	Section 3 to 28 of L-4	C-2 and L-7 trimmers and coils in circuit
Band "C"	L-2	L-2	L-5	Section 3 to 6 of L-5	L-1 and L-4 effectively grounded through C-14 and C-4 respectively
Band "D"	L-3	L-3	L-6	Section 3 to 7 of L-6	L-1, L-2 secondary grounded through C-14. L-4, L-5 grounded through C-4 and C-5 respectively

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 before replacing it.

Phonograph or Television Audio Connections

These receivers are equipped with a phono-terminal (pin jack) to allow the convenient connection of record players or television audio channels. General Electric plug, Stock No. RP-145, fits the pin jack. The Model H-638 uses the plug connection from phonograph to radio and this plug may be readily removed to allow use of other record players, sound equipment or television sound converters.

Note—A suitable load consisting of a 100,000-ohm resistor and a .01 mfd. capacitor should be connected across the pick-up leads when using a crystal-type unit.

Alignment Procedure

The alignment procedure is given in table form
Use a standard I.R.E. "dummy" antenna, Fig. 7, in making all R.F. alignments. The relative position of the Beam-a-Scope with respect to the chassis materially affects R.F. alignment on "B" band; therefore, final R.F. alignment on "B" band should be made after the chassis and Beam-a-Scope are mounted in the cabinet.

Special Service Information

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

(1) Stage Gains
  (a) Antenna Post to Converter Grid
    Band "B" ..... 3.5 to 4.0
    Band "C" ..... 3.0 to 3.5
    Band "D" ..... 1.3 to 3.0
  (b) Converter Grid to 6SK7 Grid ..... 60 at 455 K.C.‡
  (c) 6SK7 Grid to 6SQ7 Det. Plate ..... 35 at 455 K.C.‡
(2) A 400-cycle signal of .05 volts across the volume control will give ½ watt speaker output.‡ (Volume control turned to maximum.)
(3) Average DC voltage developed across oscillator grid resistor (R1).
    Band "B" ..... 6 to 8 volts
    Band "C" ..... 5 to 10 volts
    Band "D" ..... 2 to 5 volts

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

MODELS H634,H638,H640
Alignment,Phono.Data
Dial Drive

GENERAL ELECTRIC CO.

ALIGNMENT PROCEDURE

I.F. Alignment with Oscilloscope

Band Switch Setting	Input Freq.	Point of Input	Dummy Antenna	Trimmer	Comments
1. Band "B"	455 K.C. Sweep	I.F. Grid and Minus B	.05 mfd. or Larger	2nd I.F. Sec. (C-13b) 2nd I.F. Pri. (C-13a)	Gang condenser plates closed—"manual" key depressed—connect audio input of oscilloscope to minus B and to the junction of R-4 and R-18. Adjust trimmers in order mentioned for a single symmetrical curve of maximum amplitude. The resultant curve is shown in Fig. 1.
2. Band "B"	455 K.C. Sweep	Converter Grid and Minus B	.05 mfd. or Larger	1st I.F. Sec. (C-12b) 1st I.F. Pri. (C-12a)	
I.F. Alignment with Output Meter					
1. Band "B"	455 K.C. with Modulation	I.F. Grid and Minus B	.05 mfd. or Larger	2nd I.F. Sec. (C-13b) 2nd I.F. Pri. (C-13a)	Gang condenser plates closed—connect output meter across voice coil—keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output.
2. Band "B"	455 K.C. with Modulation	Converter Grid and Minus B	.05 mfd. or Larger	1st I.F. Sec. (C-12b) 1st I.F. Pri. (C-12a)	
R. F. Alignment					
1. Band "B"					Close gang plates adjust pointer to first line at left end of tuning scale. Connect output meter across voice coil—tone control on "Bass" position
2. Band "B"	580 K.C. with Modulation	Antenna Post	I.R.E.	Osc. Padder (C-4)	Set dial pointer to 580 K.C. and tune in signal with (C-4)
3. Band "B"	1500 K.C. with Modulation	Antenna Post	I.R.E.	Osc. (C-7)	Peak trimmer for maximum output while rocking the gang condenser
4. Band "B"	580 K.C. with Modulation	Antenna Post	I.R.E.	Osc. Padder (C-4)	Retrim for maximum output with a low input signal rocking gang condenser
5. Band "C"	6 M.C. with Modulation	Antenna Post	I.R.E.	Ant. (C-1c)	Peak for maximum output with a low input signal
6. Band "D"	21 M.C. with Modulation	Antenna Post	I.R.E.	Osc. (C-1a) Ant. (C-1b)	The image of any "D" band signal should be heard 910 K.C. below signal input when (C-1a) is on proper peak. Example: 15 M.C. image—14.09 M.C. Peak (C-1b) while rocking the gang condenser

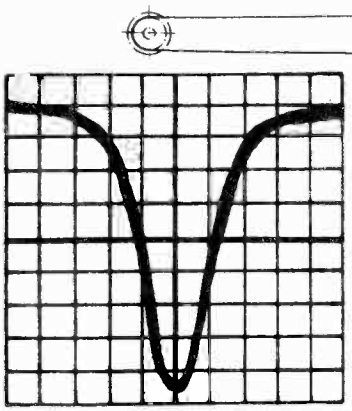


Fig. 1. Over-all I.F. Curve Taken on G-E Oscilloscope OFM-1

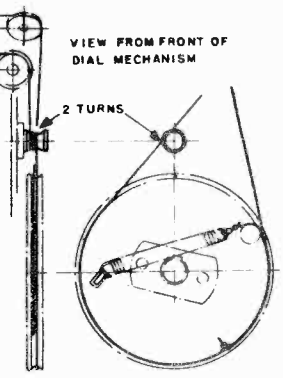


Fig. 6. Dial Drive Stringing Diagram

PHONOGRAPH MECHANISM (H-638)

The phonograph mechanism used in this receiver has been designed to be as simple as possible and give long and trouble-free performance. Under normal operating conditions service difficulties should be negligible. Occasionally, however, certain adjustments may be required.

Trip Mechanism

The trip mechanism is of simple design and consists of a latch bar connected to the motor switch and a trip lever. The latch is held closed by means of a spring between the latch bar and the trip lever. The motor switch is mechanically connected to the latch bar so that when the trip mechanism is released, the motor switch is in the "Off" position. Be sure this latch bar mechanism works freely without binding.

The trip is actuated by an adjustable arm on the trip lever. When the eccentric groove in the record swings the tone arm back and forth, it pushes the latch out of engagement.

Crystal Pick-up

The crystal pick-up employs a crystal element which is coupled to a light needle chuck. The needle movement bends the crystal element thus generating voltage by the piezo-electric effect. The voltage developed is dependent upon the needle movement amplitude and the load resistance.

The crystal cartridge is a factory-sealed unit and no adjustments are provided. The cartridge is held in the tone arm by means of two screws. The pick-up and tone-arm assembly should require very little servicing and if treated with reasonable care should perform its function without attention for long periods of time.

Symbol	Description
C-1	Antenna section tuning condenser
C-2	Oscillator section tuning condenser
C-3	"B" band padding capacitor
C-4	3900 mmf. mica condenser ±5%
C-5	3–30 mmf. "D" antenna trimmer
C-6	3–20 mmf. "D" oscillator trimmer
C-7	3–20 mmf. "B" oscillator trimmer
C-8	0.1 mfd. paper capacitor
C-9	0.1 mfd. paper capacitor
C-10	.01 mfd. paper capacitor
C-13	220 mmf. mica capacitor
C-14	.05 mfd. paper capacitor
C-15	30 mfd. 250 V. dry electrolytic
C-16	.02 mfd. paper capacitor
C-17	220 mmf. mica capacitor
C-18	.005 mfd. paper capacitor
C-19	.03 mfd. paper capacitor
C-20	.01 mfd. paper capacitor
C-21	0.1 mfd. paper capacitor
C-22a	40 mfd. 250 V. electrolytic
C-22b	20 mfd. 250 V. electrolytic
C-22c	20 mfd. 250 V. electrolytic
C-24	.05 mfd. paper capacitor
C-25	.01 mfd. paper capacitor
C-26	47 mmf. mica capacitor
C-28	0.1 mfd. paper capacitor
C-29	.001 mfd. paper capacitor (used on H-736 only)
C-29	.002 mfd. paper capacitor (used on H-708 only)
C-30	.01 mfd. paper capacitor
C-31	.0072 mfd. paper capacitor
C-32	0.1 mfd. paper capacitor
L-1	Beam-a-Scope
L-2	"D" antenna coil
L-3	"B-D" oscillator coil
L-5	1st I.F. transformer
L-6	2nd I.F. transformer
L-8	1½ mh. antenna choke
M-1	60 cycle phono motor
M-2	50-cycle phono motor
M-3	25-cycle phono motor
P-1, -2	Dial lamps, MAZDA No. 44
P-3	Crystal pick-up
R-1	33,000 ohms carbon resistor
R-2	2.2 megohms carbon resistor
R-3	3900 ohms carbon resistor
R-4	0.5 megohm volume control
R-6	1.5 megohms carbon resistor
R-7	470,000 ohms carbon resistor
R-8	1.0 megohms carbon resistor
R-9	3300 ohms carbon resistor
R-10	39,000 ohms carbon resistor
R-11	470,000 ohms carbon resistor
R-12	220 ohms 1 W. carbon resistor
R-13	3300 ohms 2 W. carbon resistor
R-15	470,000 ohms carbon resistor
R-16	27 ohms carbon resistor
R-18	33,000 ohms carbon resistor
R-19a	33 ohms, 3.5 W. wire wound
R-19b	20 ohms, 2.5 W. wire wound
R-20	22 ohms, 2 W. carbon resistor
R-21	100,000 ohms carbon resistor
S-1	Band switch
S-2	Power switch on volume control
S-3	Radio-Phono switch
S-4	Tone control
S-5	Motor power switch
T-1	Output transformer

Phonograph

Model	H-708
Type	Automatic Record Changer
Record Capacity	
10-inch	8
12-inch	7
Type Pick-up	Crystal
Turntable Speed	78 R.P.M.

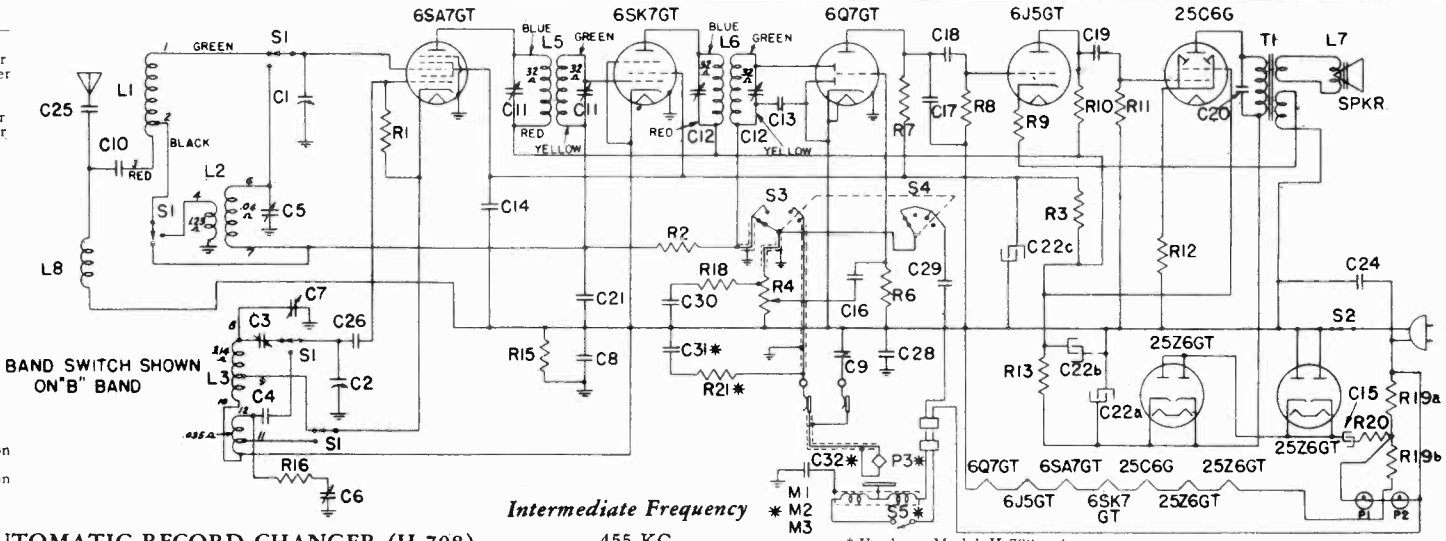


Fig. 5. Schematic Diagram

AUTOMATIC RECORD CHANGER (H-708)
SEE (G69) PAGE 10-9.

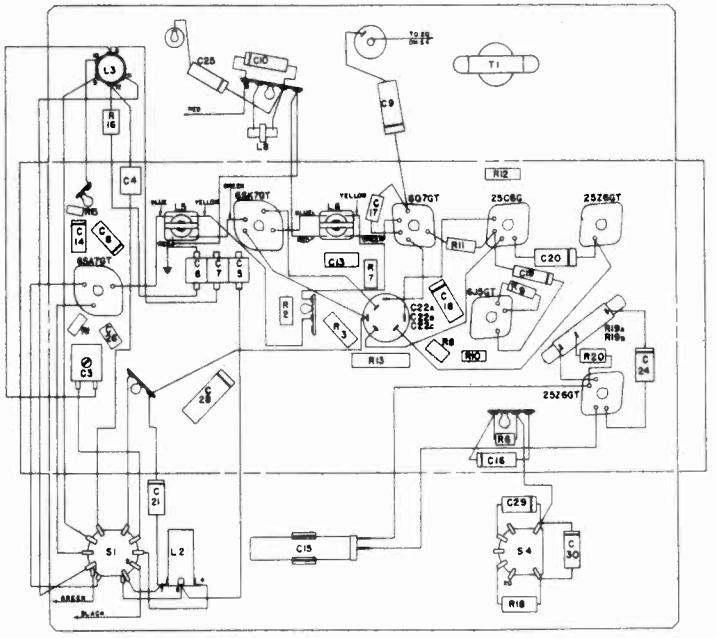


Fig. 4. Chassis Parts Layout

Electrical Specifications

Model	Rating	Power Supply (Volts)	Frequency (Cycles per second)	Power Consumption (Watts)
H-736		115	25–60	65
H-708	A6	115	60	90
	A5	115	50	90
	C2	115	25	90

Electrical Power Output

Undistorted	3.5 watts
Maximum	4.5 watts

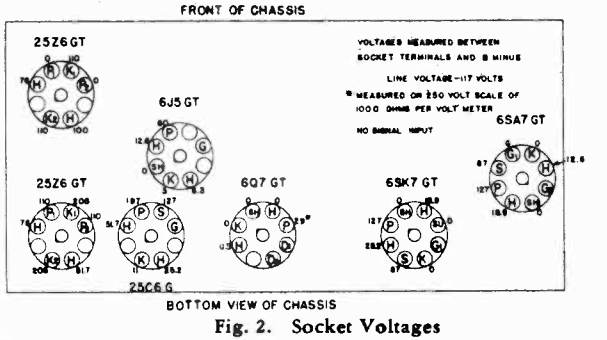


Fig. 2. Socket Voltages

MODELS H708,H736,HJ737
Alignment,Trimmers,Gain
Circuit Data,Notes

GENERAL ELECTRIC CO.

GENERAL INFORMATION

Models H-736 and H-708 employ two-band AC receivers of the superheterodyne type using seven General Electric Pretested Tubes. Features of design include the voltage doubler rectifier circuit, 12-inch Dynapower speaker, built-in Beam-a-Scope, "plug-in" type terminal for connecting a record player or television sound channel, six mechanical type "Feather-touch Tuning" keys and beam power output.

Model H-708 also contains an automatic-record-changing phonograph mechanism. High-quality reproduction is assured with a crysfal pick-up and constant-speed, self-starting, silent electric motor.

Voltage Doubler

The voltage doubler circuit used in Models H-736 and H-708 operates in the following manner; refer to Schematic Diagram Fig. 5. When the B minus side of the power line is positive the right-hand 25Z6GT rectifier will conduct charging up electrolytic capacitor (C-15) to near line voltage. On the reverse cycle when the B minus side of the power line is negative, the line voltage will add to the charge on (C-15) and will charge up electrolytic capacitor (C-22a) through the left-hand 25Z6GT rectifier to nearly twice line voltage. The series resistor (R-20) is inserted as a protective device for both rectifier tubes.

Phonograph or Television Sound Connections

These receivers are equipped with a phono-terminal (pin jack) to allow the convenient connection of a record player or television sound channel. General Electric plug, Stock No. RP-145, fits the pin jack. The Model H-708 uses the plug connection from pick-up to radio and this plug may be readily removed to allow use of another record player or a television sound converter.

NOTE: When using a crystal pick-up other than the one supplied with the Model H-708, a suitable load consisting of a 47,000-ohm resistor in series with a .0072-mfd. capacitor should be connected across the pick-up leads.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F.	455 KC
"B" Band	1500 and 580 KC
"D" Band	18,000 KC

The location of trimmers for the above models is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Completely close the gang condenser plates and set the dial pointer to the first dial mark on the left-hand end of the broadcast scale. Turn the band switch to "B" band (counterclockwise) and the tone control to "Radio-Bass" (extreme counterclockwise).

Set test oscillator to 455 KC and apply signal to the control grid of the 6SA7GT tube through a .05 mfd. capacitor. Do not remove the 6SA7GT grid lead. Keep the test oscillator output as low as a readable meter reading will permit. Adjust all I.F. trimmers (C-11 and C-12) for maximum meter reading.

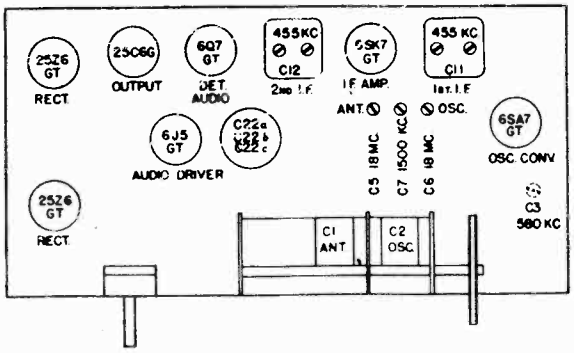


Fig. 1. Trimmer Location

R.F. Alignment

Apply R.F. signals through a standard I.R.E. dummy antenna to the antenna post on the rear apron of the chassis. The Beam-a-Scope must be connected for R.F. alignment and since its relative position with respect to the chassis materially affects the alignment on "B" band, it is advisable to perform the alignment when the chassis and Beam-a-Scope are properly mounted in the cabinet.

Align (C-3) on 580 KC when gang condenser is turned to the 580 KC dial mark. Peak (C-7) on 1500 KC while rocking gang condenser. Repeak (C-3) on 580 KC while rocking gang condenser.

Turn band switch to "D" band and turn gang condenser to 18 MC dial mark. Align (C-6) on 18 MC and peak (C-5) while rocking the gang condenser. The image of any "D" band signal should be heard 910 KC below the input signal when (C-6) is on the proper peak. Example: 18 MC image—17.09 MC.

Special Service Information

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

(1) Stage Gains
  (a) Antenna Post to Converter Grid—10 at 1000 KC‡
  (b) Converter Grid to 6SK7 Grid—30 at 455 KC‡
  (c) 6SK7 Grid to 6Q7 Det. Plate—77 at 455 KC‡

(2) A 400-cycle signal of .06 volts across the volume control will give ½ watt speaker output.‡ (Volume turned to maximum.)

(3) Average DC voltage developed across oscillator grid resistor (R-1)—6 volts.

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

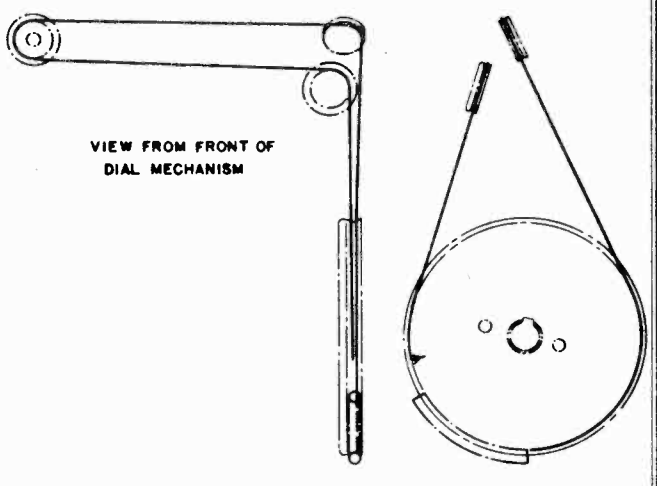


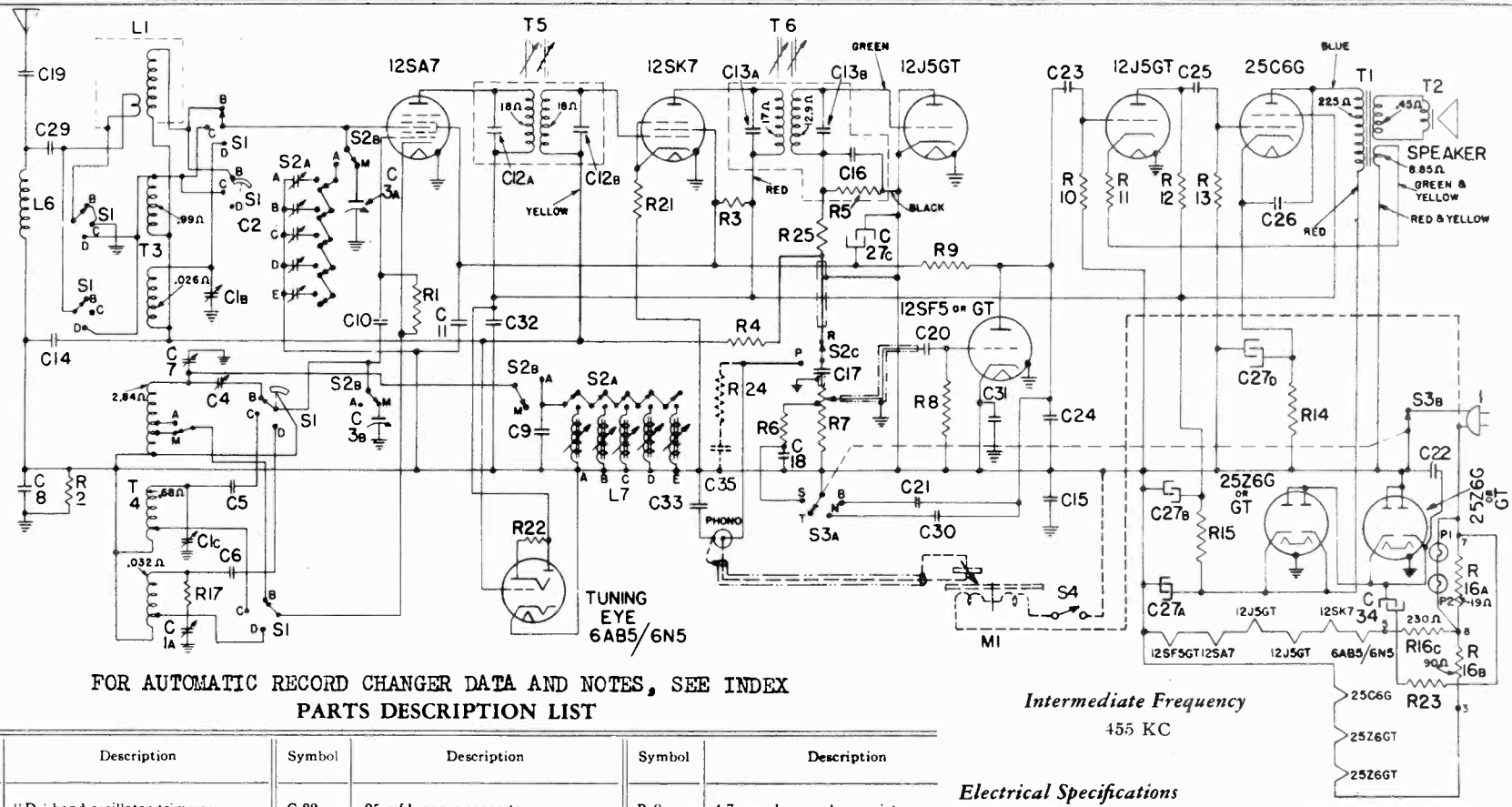
Fig. 3. Drive Cord Arrangement

Loud-speaker—"Alnico" Magnetic Dynamic

Outside Cone Diameter	12 inches
Voice Coil Impedance (400 cycles)	3.5 ohms

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.



FOR AUTOMATIC RECORD CHANGER DATA AND NOTES, SEE INDEX

PARTS DESCRIPTION LIST

Symbol	Description	Symbol	Description	Symbol	Description
C-1A	"D" band oscillator trimmer	C-22	.05 mfd. paper capacitor	R-8	4.7 megohms carbon resistor
C-1B	"D" band antenna trimmer	C-23	.005 mfd. paper capacitor	R-9	220,000 ohms carbon resistor
C-1C	"C" band oscillator trimmer	C-24	100 mmf. mica capacitor	R-10	1.0 megohm carbon resistor
C-2A	7–65 mmf. station selector trimmer	C-25	.02 mfd. paper capacitor	R-11	3300 ohms carbon resistor
C-2B	20–180 mmf. station selector trimmer	C-26	.01 mfd. paper capacitor	R-12	220,000 ohms carbon resistor
C-2C	20–180 mmf. station selector trimmer	C-27A	40 mfd. 250 V. dry electrolytic	R-13	330,000 ohms carbon resistor
C-2D	100–490 mmf. station selector trimmer	C-27B	20 mfd. 250 V. dry electrolytic	R-14	220 ohms 1 W. carbon resistor
C-2E	100–490 mmf. station selector trimmer	C-27C	20 mfd. 250 V. dry electrolytic	R-15	3300 ohms 3 W. carbon resistor
C-3A	Antenna section tuning condenser	C-27D	20 mfd. 25 V. dry electrolytic	R-16A	19 ohms ballast resistor
C-3B	Oscillator section tuning condenser	C-29	.01 mfd. paper capacitor	R-16B	90 ohms ballast resistor
C-4	300–675 mmf. "B" band padder	C-30	.001 mfd. 1000 V. paper capacitor	R-16C	230 ohms ballast resistor
C-5	2400 mmf mica capacitor ±5%	C-31	.01 mfd. paper capacitor	R-17	33 ohms carbon resistor
C-6	5600 mmf. mica capacitor ±5%	C-32	.05 mfd. paper capacitor	R-21	47 ohms carbon resistor
C-7	"B" band oscillator trimmer	C-33	0.1 mfd. paper capacitor	R-22	1.0 megohm carbon resistor
C-8	.08 mfd. paper capacitor	C-34	30 mfd. 250 V. dry electrolytic	R-23	30 ohms 4 W. wire resistor
C-9	750 mmf. silvered mica capacitor	C-35	.02 mfd. paper capacitor	R-24	100,000 ohms carbon resistor
C-10	47 mmf. mica capacitor	L-1	Beam-a-Scope	R-25	47,000 ohms carbon resistor
C-11	.05 mfd. paper capacitor	L-6	Antenna Choke	S-1	Band change switch
C-14	0.1 mfd. paper capacitor	P-1, 2	Dial lamp, MAZDA No. 44	S-2A	Station selector switch
C-15	0.1 mfd. paper capacitor	R-1	33,000 ohms carbon resistor	S-2B	Manual switch
C-16	100 mmf. mica capacitor	R-2	470,000 ohms carbon resistor	S-2C	Phono switch
C-17	.005 mfd. paper capacitor	R-3	3300 ohms 1 W. carbon resistor	S-3A	Tone switch
C-18	.0072 mfd. paper capacitor	R-4	2.2 megohms carbon resistor	S-3B	Power switch
C-19	.005 mfd. paper capacitor	R-5	470,000 ohms carbon resistor	S-4	Phono motor switch
C-20	.01 mfd. paper capacitor	R-6	56,000 ohms carbon resistor		
C-21	.0032 mfd. paper capacitor	R-7	2.0 megohms volume control		

Intermediate Frequency

455 KC

Electrical Specifications

Model	Rating	Power Supply (Volts)	Frequency (Cycles per Second)	Power Consumption (Watts)
HJ-905		115	25–60	85
HJ-908	A6	110–125	60	95
	A5	110–125	50	95
	C2	110–125	25	110

Electrical Power Output

Undistorted ..... 4.5 watts
Maximum ..... 6 watts

Loud-speaker—"Alnico" Magnetic Dynamic

Outside Cone Diameter ..... 12 inches
Voice Coil Impedance (400 cycles) ..... 3.5 ohms

ALIGNMENT PROCEDURE

I.F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Completely close the gang condenser plates and set the dial pointer to the first dial mark on the left-hand end of the broadcast scale. Turn the band switch to "B" band (counterclockwise) and the tone control to "Normal."

Set test oscillator to 455 KC and apply signal to the control grid of the 12SA7 tube through a .05 mfd. capacitor. Do not remove the 12SA7 grid lead. Keep the test oscillator output as low as a readable meter reading will permit. Adjust all I.F. trimmers (C-12 and C-13) for maximum meter reading.

R.F. Alignment

Apply R.F. signals through a standard I.R.E. dummy antenna to the antenna post on the rear apron of the chassis. The Beam-a-Scope must be connected for R.F. alignment and since its relative position with respect to the chassis materially affects the alignment on "B" band, it is advisable to perform the alignment when the chassis and Beam-a-Scope are properly mounted in the cabinet.

Align (C-4) on 580 KC when gang condenser is turned to the 580 KC dial mark. Peak (C-7) on 1500 KC while rocking gang condenser. Repeak (C-4) on 580 KC while rocking gang condenser.

Turn band switch to "D" band and turn gang condenser to 21 MC dial mark. Align (C-1A) on 21 MC and peak (C-1B) while rocking the gang condenser. The image of any "D" band signal should be heard 910 KC below the input signal when (C-1A) is on the proper peak. Example: 21 MC image —20.09 MC.

Turn band switch to "C" band and set pointer at 6 MC dial mark. Align (C-1C) on 6 MC while rocking the gang condenser.

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:

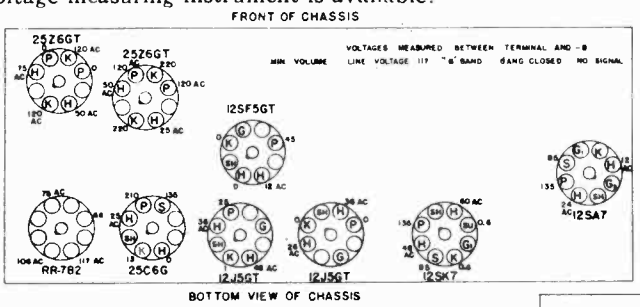


Fig. 2. Socket Voltages

Tuning Frequency Range

Broadcast.....550–1600 KC
Short-wave.....2300–22,000 KC

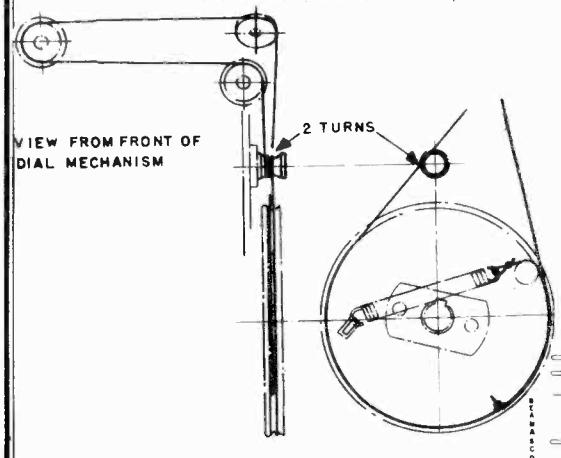


Fig. 3. Drive Cord Arrangement

(1) Stage Gains

(a) Antenna Post to Converter Grid—12 at 1000 KC‡

(b) Converter Grid to 12SK7 Grid—60 at 455 KC‡

(c) 12SK7 Grid to 12J5GT Det. Grid—85 at 455 KC‡

(2) A 400-cycle signal of .04 volts across the volume control will give ½ watt speaker output.‡ (Volume turned to maximum.)

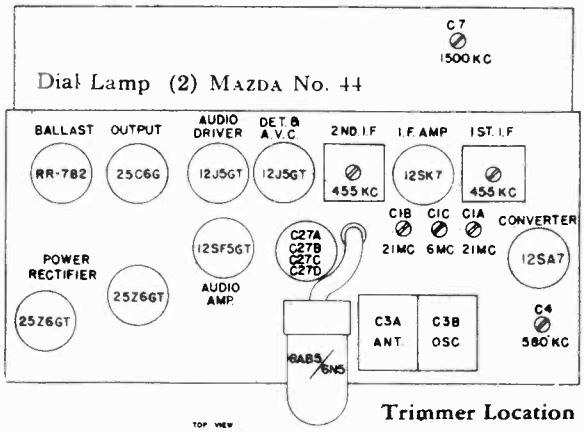
(3) DC voltage developed across oscillator grid resistor (R-1)—11 volts at 1000 KC.

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

Loud-speaker

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

NOTE: In no case should the magnet be removed from the assembled position without remagnetizing after replacing it.



Trimmer Location

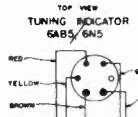


Fig. 4. Chassis Parts Layout

Electrical Specifications HM-21
Record Player Oscillator

Rating	Power Supply (Volts)	Frequency (Cycles per Second)	Power Consumption (Watts)
A6	115–125	60	30
A5	115–125	50	30

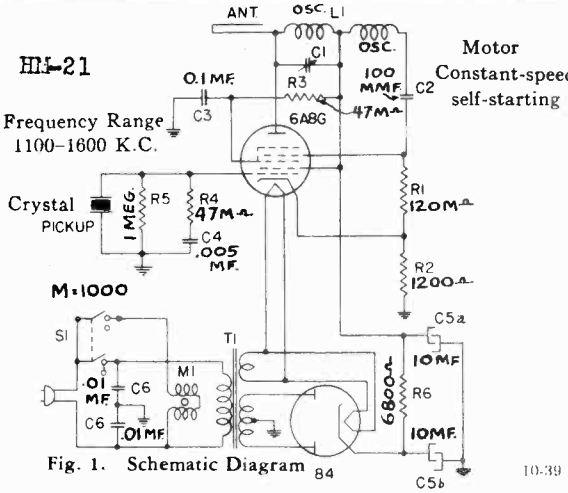


Fig. 1. Schematic Diagram 84 10-39

GENERAL INFORMATION

The Model HM-21 Wireless Record Player is a two-tube transmitter using a type 84 tube as a rectifier and a type 6A8G as an oscillator. Audio modulation is applied to the control grid of the 6A8G from a properly loaded crystal pickup circuit. The oscillator operates over a range of 1100–1600 kilocycles and the frequency is adjusted by the tuning trimmer (C-1). This trimmer is set to operate at approximately 1500 K.C. at the factory.

The turntable is driven at 78 revolutions per minute by a constant-speed, self-starting induction motor. The motor is properly lubricated at the factory for long operation and should not require attention under normal weather conditions.

The power control is a three-position switch. When this control is turned to the extreme counterclockwise position, all power is removed from the record player. When switched to the center position, power is applied to both the motor and the transmitter. When turned to the extreme clockwise position, power is still supplied to the transmitter but is removed from the motor. This last position provides a means of stopping turntable rotation without letting the tubes cool down from operating temperature.

FREQUENCY ADJUSTMENT

To adjust the frequency of the oscillator turn the tuning trimmer which is accessible through a hole in the bottom cover near the power control knob. This is a screwdriver control. Clockwise rotation of the trimmer raises the frequency while counterclockwise rotation lowers the frequency. Since the electrical capacity of the hand may detune the transmitter somewhat if rested on the record player during adjustment, it is best to rest the record player on the edge of a table or bench with the tuning trimmer side of the record player just far enough out from the edge to allow screwdriver adjustment of the tuning trimmer.

MODELS HJ-905, HJ-908.
GENERAL INFORMATION

Models HJ-905 and HJ-908 employ three-band AC receivers of the superheterodyne type using nine General Electric Pre-tested Tubes. Features of design include the voltage doubler rectifier circuit, 14-inch Dynapower speaker, built-in *Super* Beam-a-scope, "plug-in" type terminal for connecting a record player or television sound channel, seven "Feathertouch Tuning" keys and beam power output.

Model HJ-908 also contains an automatic-record-changing phonograph mechanism. High-quality reproduction is assured with a crystal pick-up and constant-speed, self-starting, silent electric motor.

Model HJ-908B is the same as Model HJ-908 except in bleached mahogany cabinet.

Voltage Doubler

The voltage doubler circuit used in Models HJ-905 and HJ-908 operates in the following manner: refer to Schematic Diagram Fig. 5. When the B minus side of the power line is positive the right-hand 25Z6GT rectifier will conduct charging up electrolytic capacitor (C-34) to near line voltage. On the reverse cycle when the B minus side of the power line is negative the line voltage will add to the charge on (C-34) and will charge up electrolytic capacitor (C-27A) through the left-hand 25Z6GT rectifier to nearly twice line voltage. The series resistor (R-23) is inserted as a protective device for both rectifier tubes.

Phonograph or Television Sound Connections

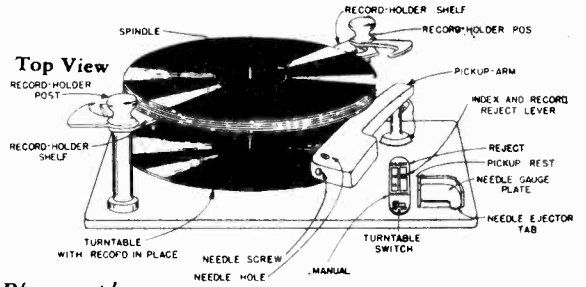
These receivers are equipped with a phono-terminal (pin jack) to allow the convenient connections of a record player or television sound channel. General Electric plug, Stock No. RP-145, fits the pin jack. The Model HJ-908 uses the plug connection from pick-up to radio and this plug may be readily removed to allow use of another record player or a television sound converter.

FEATHERTOUCH TUNING ADJUSTMENTS

When peaking the antenna trimmer of either of the first two left-hand station keys care must be exercised not to open the trimmer so far that tuning to the oscillator frequency results. If this occurs the tuning indicator shadow sector will vanish and a false indication will be given of tuning.

FOR OTHER AUTOMATIC RECORD CHANGER DATA SEE G69 VOL. X PAGE 9.

AUTOMATIC RECORD CHANGER (HJ-908)



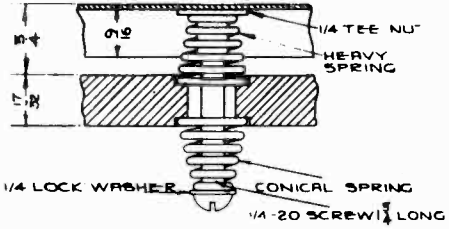
Phonograph

Model	HJ-908
Type	Automatic Record Changer
Record Capacity	
10-inch	8
12-inch	7
Type Pick-up	Crystal
Turntable Speed	78 R.P.M.

General Information

Model HJ-908 radio-phonograph combination is equipped with an automatic record changer. The turntable is driven through a friction drive wheel mounted on the turntable spindle. It is important that the drive motor spindle and rubber tires on the main driving wheel and idler pulley be kept clean and free from oil, grease, dirt or any foreign matter. Any quick-drying naphtha is satisfactory for cleaning these parts. The drive motor bearing is lubricated from an oil well filled and sealed at the factory. It should not require lubrication in the field. The turntable is not removable from the spindle without removing the tapered pin "24" which fastens the rubber-tired driving wheel to the spindle. Once the pin is removed, the driving wheel can be slipped off the spindle and the turntable and spindle assembly lifted upward from the motor board. Caution should be exercised not to bend the spindle. The spindle bearing should be oiled and the cup and ball thrust bearing oiled and checked for proper position.

MOTOR BOARD MOUNTING

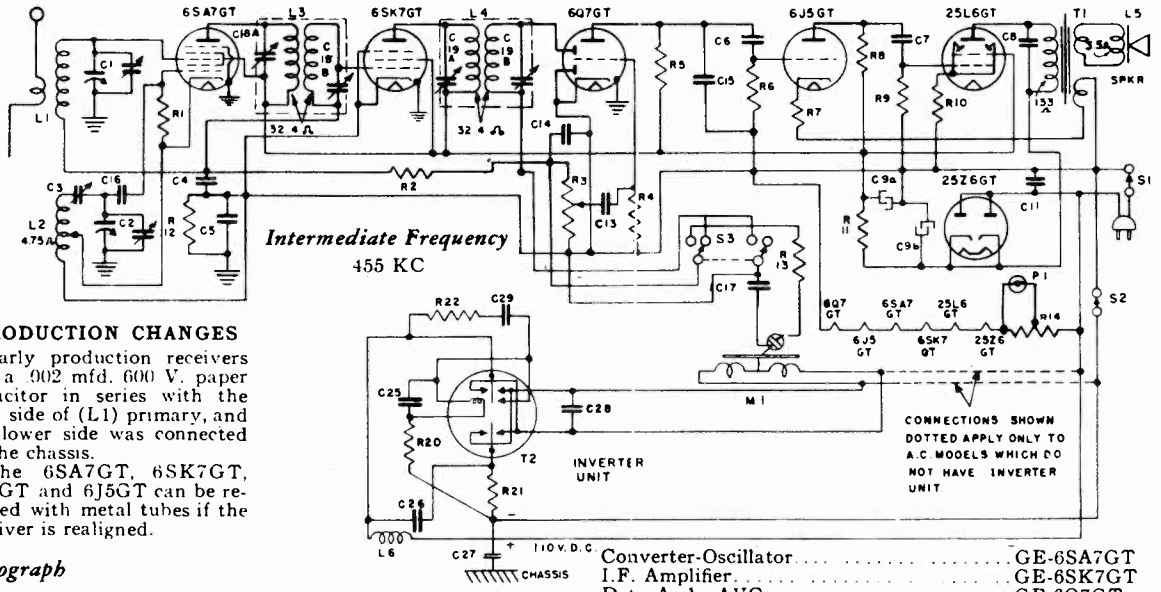


Mounting Details of Automatic Record Changer

MODELS H639AC, H639DC
Schematic, Gain, Voltage

GENERAL ELECTRIC CO.

Socket, Alignment, Trimmers
Phono. Sw. Assembly



Intermediate Frequency
455 KC

PRODUCTION CHANGES

Early production receivers had a .002 mfd. 600 V. paper capacitor in series with the high side of (L1) primary, and the lower side was connected to the chassis.

The 6SA7GT, 6SK7GT, 6Q7GT and 6J5GT can be replaced with metal tubes if the receiver is realigned.

Phonograph

Models	H-639 AC and H-639 DC
Type Pick-up	Crystal
Turntable Speed	78 R.P.M.

Special Service Information

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

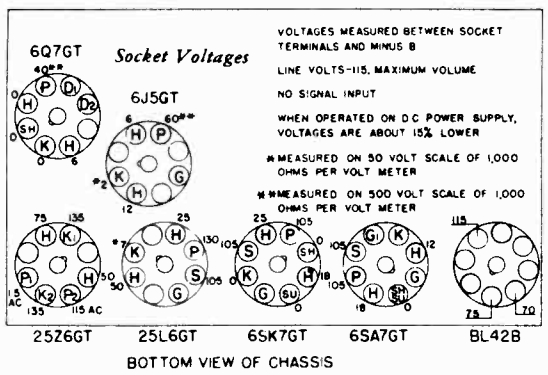
(1) Stage Gains
Antenna Post to Converter Grid—4 at 1000 KC‡
Converter Grid to 6SK7GT Grid—30 at 455 KC‡
6SK7GT Grid to 6Q7GT Det. Plate—100 at 455 KC‡

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

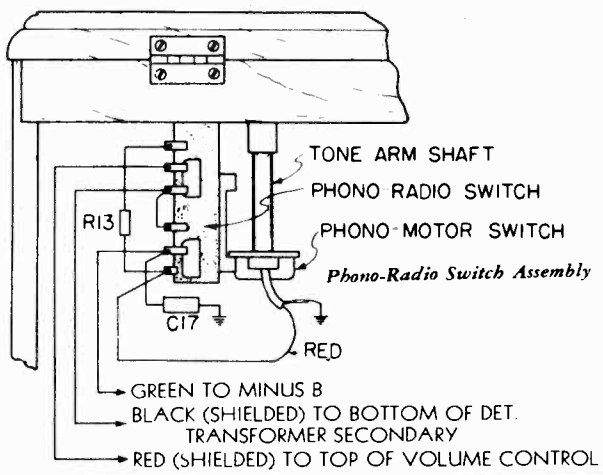
(3) DC voltage developed across oscillator grid resistor (R-1) averages 12 volts.

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

FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS



Converter-Oscillator	GE-6SA7GT
I.F. Amplifier	GE-6SK7GT
Det., Aud., AVC	GE-6Q7GT
2nd Audio Amplifier	GE-6J5GT
Power Output	GE-25L6GT
Rectifier	GE-25Z6GT
Dial Lamp	MAZDA No. 44

Model	Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
H-639 AC	115 AC	60	75
H-639 DC	115 DC		85

Electrical Power Output

Undistorted	2.0 watts
Maximum	2.5 watts

Loudspeaker—"Alnico" Magnetic Dynamic

Outside Cone Diameter	6.5 inches
Voice Coil Impedance (400 cycles)	3.5 ohms

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.

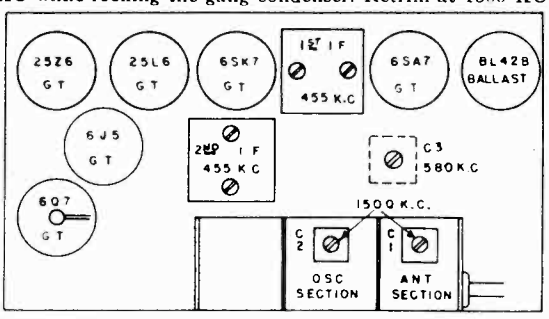
NOTE—In no case should the magnet be removed from the assembled position without remagnetizing after replacing it.

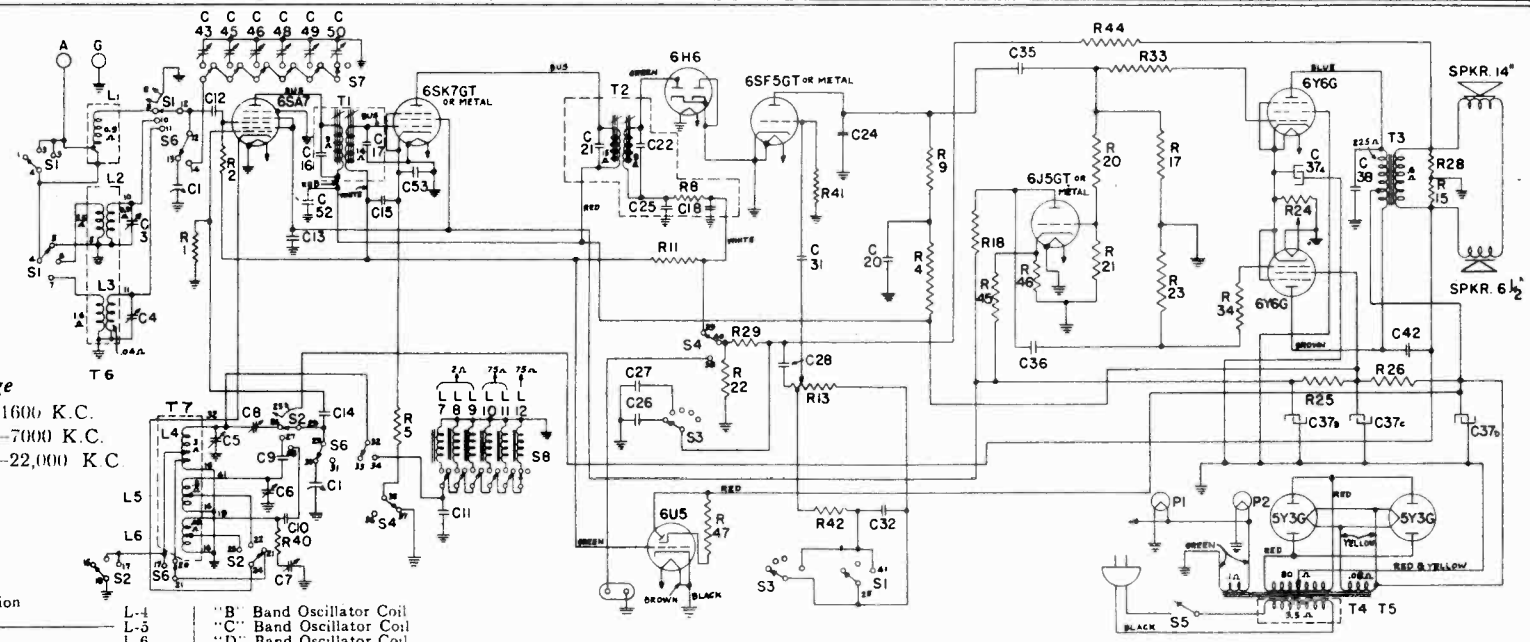
ALIGNMENT PROCEDURE

I.F. 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. 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-3) for maximum output. Peak (C-3) on 580 KC while rocking the gang condenser. Retrim at 1500 KC.



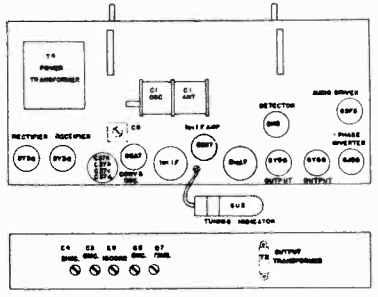


Tuning Frequency Range

Band "B" . . . 540–1600 K.C.
Band "C" . . . . 2300–7000 K.C.
Band "D" . . . . 7000–22,000 K.C.

Symbol	Description
C-1	Tuning Condenser
C-3	3–30 mmf. "C" Antenna Trimmer
C-4	3–30 mmf. "D" Antenna Trimmer
C-5	5–40 mmf "B" Oscillator Trimmer
C-6	3–30 mmf. "C" Oscillator Trimmer
C-7	3–30 mmf. "D" Oscillator Trimmer
C-8	560 mmf. Padding Capacitor
C-9	1600 mmf. Mica Capacitor
C-10	4300 mmf Mica Capacitor
C-11	750 mmf. Mica Capacitor
C-12	150 mmf. Mica Capacitor
C-13	0.1 mfd. Paper Capacitor
C-14	47 mmf. Mica Capacitor
C-15	0.1 mfd. Paper Capacitor
C-16	175 mmf. I.F. Capacitor
C-17	85 mmf. I.F. Capacitor
C-18	47 mmf Mica Capacitor
C-20	25 mfd. Paper Capacitor
C-21	85 mmf. I.F. Capacitor
C-22	175 mmf. I.F. Capacitor
C-24	100 mmf. Mica Capacitor
C-25	47 mmf. Mica Capacitor
C-26	.0015 mfd. Paper Capacitor
C-27	470 mmf. Mica Capacitor
C-28	.01 mfd. Paper Capacitor
C-31	.01 mfd. Paper Capacitor
C-32	.003 mfd. Paper Capacitor
C-35	.05 mfd. Paper Capacitor
C-36	.05 mfd. Paper Capacitor
C-37A	20 mfd. 25 V. Dry Electrolytic
C-37B	20 mfd. 250 V. Dry Electrolytic
C-37C	20 mfd. 250 V. Dry Electrolytic
C-37D	40 mfd. 250 V. Dry Electrolytic
C-38	.02 mfd. 1000 V. Paper Capacitor
C-42	.01 mfd. 1000 V. Paper Capacitor
C-43	100–490 mmf. Station Trimmer
C-45	100–490 mmf. Station Trimmer
C-46	100–490 mmf. Station Trimmer
C-48	20–180 mmf. Station Trimmer
C-49	20–180 mmf. Station Trimmer
C-50	7–65 mmf. Station Trimmer
C-52	.25 mfd. Paper Capacitor
C-53	.08 mfd. Paper Capacitor
L-1	Beam-a-Scope
L-2	"C" Band Antenna Coil
L-3	"D" Band Antenna Coil
L-4	"B" Band Oscillator Coil
L-5	"C" Band Oscillator Coil
L-6	"D" Band Oscillator Coil
L-7, 8, 9	Station Oscillator Coils (Code Blue)
L-10, 11	Station Oscillator Coils (Code Red)
L-12	Station Oscillator Coil (Code None)
P-1, 2	Dial Lamp, MAZDA No. 44
R-1	22,000 ohms Carbon Resistor
R-2	1.0 megohm Carbon Resistor
R-4	47,000 ohms Carbon Resistor
R-5	330 ohms Carbon Resistor
R-8	47,000 ohms Carbon Resistor
R-9	220,000 ohms Carbon Resistor
R-11	2.2 megohms Carbon Resistor
R-13	2 megohms Volume Control
R-15	15 ohms Carbon Resistor
R-17	330,000 ohms Carbon Resistor
R-18	68,000 ohms Carbon Resistor
R-20	3.3 megohms Carbon Resistor
R-21	270,000 ohms Carbon Resistor
R-22	220,000 ohms Carbon Resistor
R-23	150,000 ohms Carbon Resistor
R-24	100 ohms 3.4 W. Wire Wound
R-25	2400 ohms 2 W. Carbon Resistor
R-26	2200 ohms 2.6 W. Wire Wound
R-28	150 ohms Carbon Resistor
R-29	47,000 ohms Carbon Resistor
R-33	1000 ohms Carbon Resistor
R-34	1000 ohms Carbon Resistor
R-40	33 ohms Carbon Resistor
R-41	4.7 megohms Carbon Resistor
R-42	100,000 ohms Carbon Resistor
R-44	4.7 megohms Carbon Resistor
R-45	15,000 ohms 1 W. Carbon Resistor
R-46	270 ohms Carbon Resistor
R-47	1.0 megohm Carbon Resistor
S-1, 2	Band Switch
S-3	Tone Switch
S-4	Phono Switch
S-5	Power Switch
S-6	Manual Switch
S-7, 8	Feathertouch Tuning Switch
T-1	1st I.F. Transformer
T-2	2nd I.F. Transformer
T-3	Output Transformer
T-4	50-60 cycle Power Transformer
T-5	25 cycle Power Transformer

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



Tubes

Converter and Oscillator	GE 6SA7
I.F. Amplifier	GE-6SK7/6SK7GT
Detector and AVC	GE-6H6
Audio Driver	GE-6SF5/6SF5GT
Phase Inverter	GE-6J5G/6J5GT/6J5
Power Output	(2) GE-6Y6G
Rectifier	(2) GE-5Y3G
Tuning Indicator	GE-6U5
Dial Lamp	(2) MAZDA No 44

GENERAL INFORMATION

The Model HJ-1005 is a three-band a-c operated **receiver** employing ten General Electric Pre-tested Tubes in a **super**-heterodyne circuit. This receiver is equipped with nine "Feathertouch" Tuning Keys, six of which may be set up for favorite stations. The three remaining keys allow power control manual tuning and phonograph or television audio reception. The new *Super* Beam-a-scope, which is a highly efficient self-contained antenna circuit, is standard equipment on this model. Other features of design include: **Dual** Dynapower speakers, floodlighted station key finder, visualux dial, iron core I.F. transformers, automatic tone compensation, automatic volume control and push-pull output.

Electrical Specifications

Rating "A"—110–125 volts, 50–60 cycles, 125 watts
Rating "C"—110–125 volts, 25–60 cycles, 125 watts

Electrical Power Output

Undistorted	8.5 watts
Maximum	10 watts

Loud-speakers—"Alnico" Magnetic Dynamic

Outside Cone Diameters	12-in and 6½-in.
Voice Coil Impedances	3.5 ohms

MODEL HJ1005
Chassis Wiring, Voltage Socket

GENERAL ELECTRIC CO.

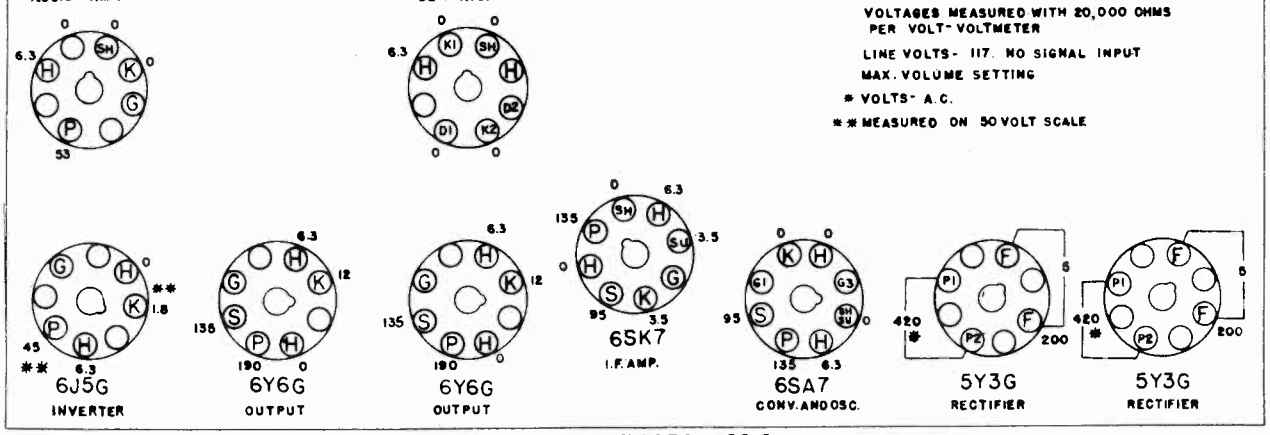
FRONT OF CHASSIS

D_1—Diode Plate No. 1
D_2—Diode Plate No. 2
F—Filament
G—Control Grid
G_1—Oscillator Grid
G_2—Converter Grid
H—Heater

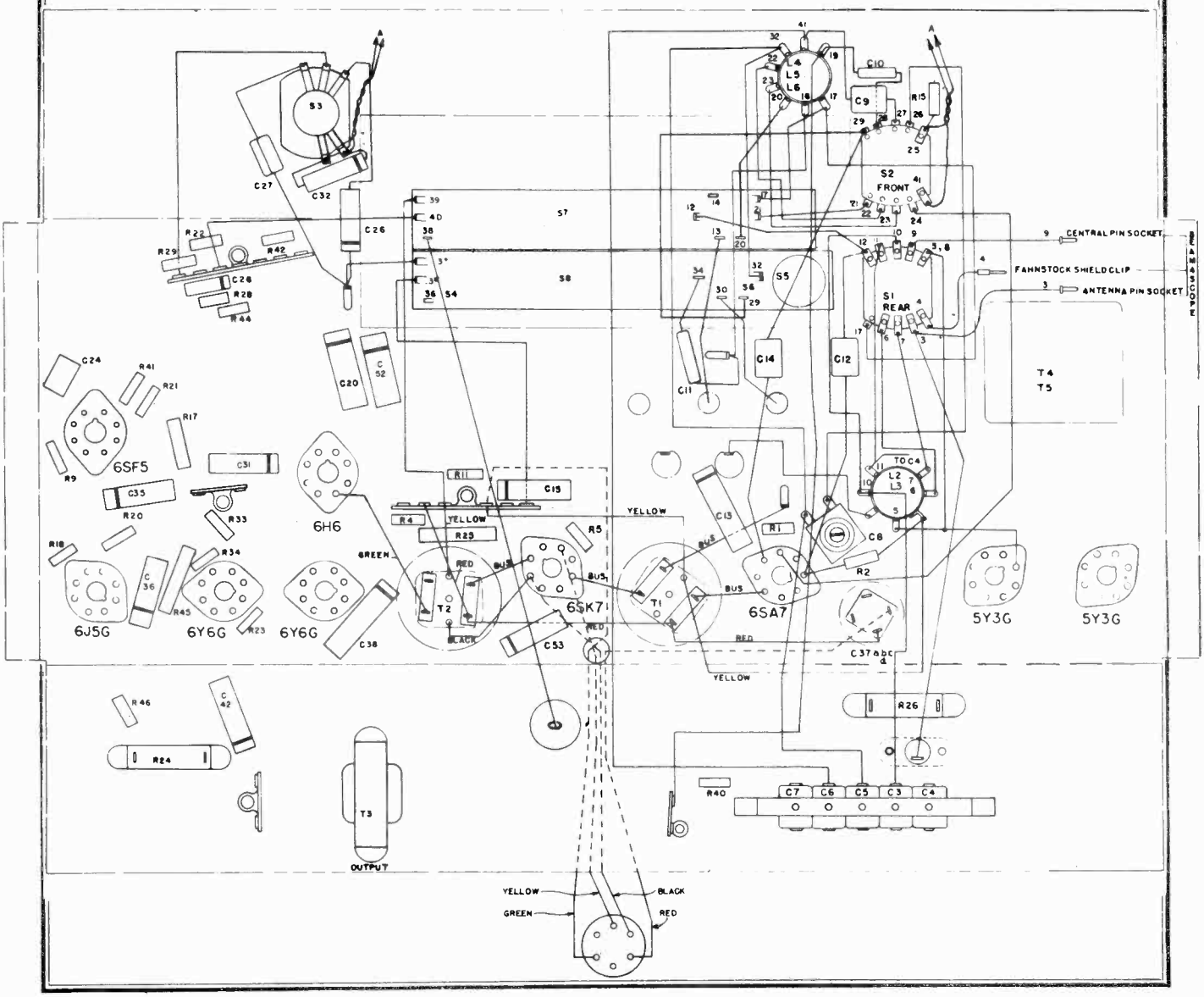
K—Cathode
P—Plate
P_1, P_2—Rectifier Plates
S—Screen
SH—Shell
SU—Suppressor

VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS

VOLTAGES MEASURED WITH 20,000 OHMS PER VOLT VOLTMETER
LINE VOLTS - 117. NO SIGNAL INPUT
MAX. VOLUME SETTING
* VOLTS A.C.
** MEASURED ON 50 VOLT SCALE

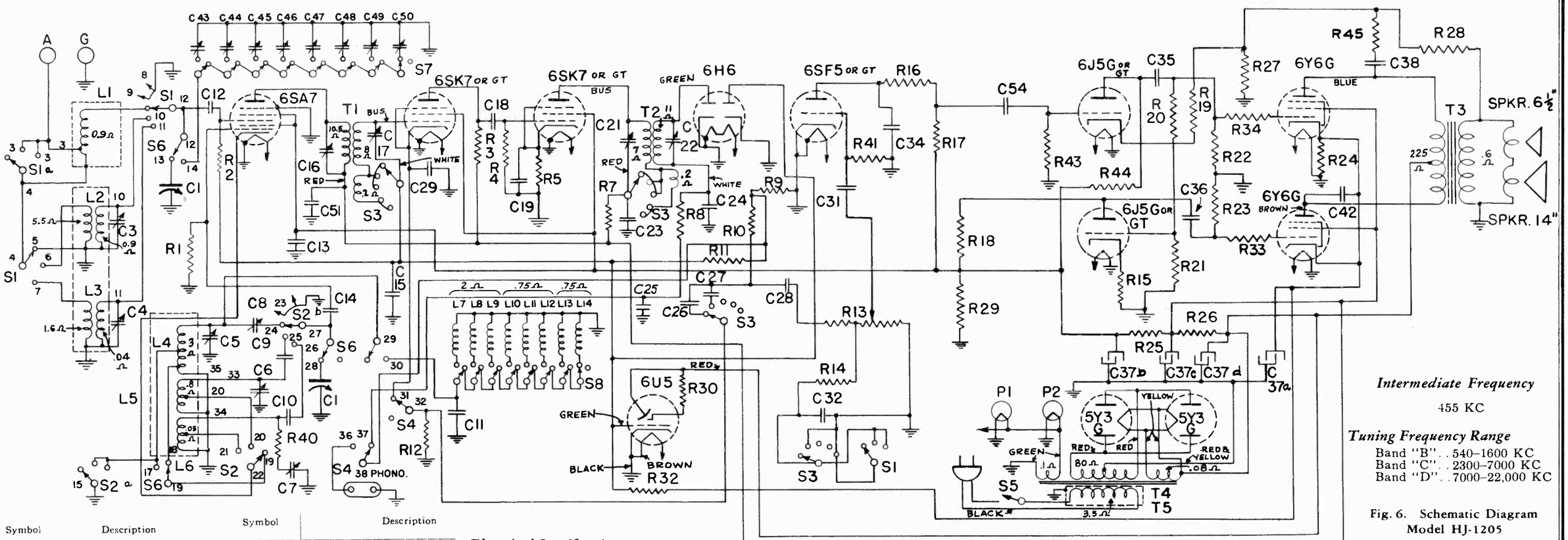


BOTTOM VIEW OF CHASSIS



GENERAL ELECTRIC CO.

MODEL HJ1205
Schematic, Voltage, Socket, Coils



Intermediate Frequency

455 KC

Tuning Frequency Range

Band "B"..540–1600 KC
Band "C"..2300–7000 KC
Band "D"..7000–22,000 KC

Fig. 6. Schematic Diagram Model HJ-1205

Symbol	Description	Symbol	Description
C-1	Tuning Capacitor		
C-3	"C" Band Antenna Trimmer	L-7, -8	Tuning Coils (No code)
C-4	"D" Band Antenna Trimmer	L-9, -10, -11	Tuning Coils (Code—Red)
C-5	"B" Band Oscillator Trimmer	L-12, -13, -14	Tuning Coils (Code—Blue)
C-6	"C" Band Oscillator Trimmer	R-1	22,000 ohms, Carbon Resistor
C-7	"D" Band Oscillator Trimmer	R-2	1.0 megohm, Carbon Resistor
C-8	"B" Band Padder	R-3	6800 ohms, Carbon Resistor
C-9	1600 mmf. Mica Capacitor ±5%	R-4	47,000 ohms, Carbon Resistor
C-10	4300 mmf. Mica Capacitor ±5%	R-5	330 ohms, Carbon Resistor
C-11	750 mmf. Silvered Mica Capacitor ±5%	R-7	1000 ohms, Carbon Resistor
C-12	150 mmf. Mica Capacitor	R-8	47,000 ohms, Carbon Resistor
C-13	0.1 mfd. Paper Capacitor	R-9	220,000 ohms, Carbon Resistor
C-14	47 mmf. Mica Capacitor	R-10	47,000 ohms, Carbon Resistor
C-15	0.1 mfd. Paper Capacitor	R-11	2.2 megohms, Carbon Resistor
C-18	47 mmf. Mica Capacitor	R-12	470 ohms, Carbon Resistor
C-19	.05 mfd. Paper Capacitor	R-13	2 megohm Volume Control
C-23	.05 mfd. Paper Capacitor	R-14	150,000 ohms, Carbon Resistor
C-24	100 mmf. Mica Capacitor	R-15	3300 ohms, Carbon Resistor
C-25	47 mmf. Mica Capacitor	R-16	47,000 ohms, Carbon Resistor
C-26	.001 mfd. Paper Capacitor	R-17	150,000 ohms, Carbon Resistor
C-27	470 mmf. Mica Capacitor	R-18	47,000 ohms, Carbon Resistor
C-28	.01 mfd. Paper Capacitor	R-19	3300 ohms, Carbon Resistor
C-29	.05 mfd. Paper Capacitor	R-20	1.5 megohms, Carbon Resistor
C-31	.01 mfd. Paper Capacitor	R-21	270,000 ohms, Carbon Resistor
C-32	.003 mfd. Paper Capacitor	R-22	220,000 ohms, Carbon Resistor
C-34	47 mmf. Mica Capacitor	R-23	220,000 ohms, Carbon Resistor
C-35	.05 mfd. Paper Capacitor	R-24	100 ohms, 3.4 W. Wire Wound
C-36	.05 mfd. Paper Capacitor	R-25	2400 ohms, or 3300 ohms 2 W. Resistor Carbon
C-37a	20 mfd. 25 V. Dry Electrolytic		
C-37b	20 mfd. 300 V. Dry Electrolytic	R-26	2200 ohms, 2.6 W. Wire Wound
C-37c	20 mfd. 300 V. Dry Electrolytic	R-27	56 ohms, Carbon Resistor
C-37c	40 mfd. 350 V. Dry Electrolytic	R-28	100 ohms, Carbon Resistor
C-38	.01 mfd. 1000 V. Paper Capacitor	R-29	47,000 ohms, Carbon Resistor
C-42	.01 mfd. 1000 V. Paper Capacitor	R-30	1.0 megohm, Carbon Resistor
C-43	7-65 mmf. Antenna Trimmer	R-32	5.6 megohms, Carbon Resistor
C-44	7-65 mmf. Antenna Trimmer	R-33	1000 ohms, Carbon Resistor
C-45	20-180 mmf. Antenna Trimmer	R-34	1000 ohms, Carbon Resistor
C-46	20-180 mmf. Antenna Trimmer	R-40	33 ohms, Carbon Resistor
C-47	20-180 mmf. Antenna Trimmer	R-41	4.7 megohms, Carbon Resistor
C-48	100-490 mmf. Antenna Trimmer	R-43	220,000 ohms, Carbon Resistor
C-49	100-490 mmf. Antenna Trimmer	R-44	150,000 ohms, Carbon Resistor
C-50	100-490 mmf. Antenna Trimmer	R-45	2200 ohms Carbon Resistor
C-51	0.1 mfd. Paper Capacitor	P-1, -2	Pilot Lights, Mazda No. 44
C-54	.05 mfd. Paper Capacitor	S-1	Antenna Band Switch
L-1	Beam-a-Scope	S-2	Oscillator Band Switch
L-2	"C" Band Antenna Coil	S-3	Tone Switch
L-3	"D" Band Antenna Coil	S-4	Phono Switch
L-4	"B" Band Oscillator Coil	S-5	Power Switch
L-5	"C" Band Oscillator Coil	S-6	Manual Switch
L-6	"D" Band Oscillator Coil	S-7	Antenna Section Touch Tuning Switch
		S-8	Oscillator Section Touch Tuning Switch

Electrical Specifications

Rating "A"—110–125 volts, 50–60 cycles, 130 watts
Rating "C"—110–125 volts, 25–60 cycles, 130 watts

Electrical Power Output

Undistorted.....8.5 watts
Maximum.....10 watts

Tubes

Converter and Oscillator.....GE-6SA7
1st I.F. Amplifier.....GE-6SK7/6SK7GT
2nd I.F. Amplifier.....GE-6SK7/6SK7GT
Detector and A.V.C.....GE-6H6
Audio Amplifier.....GE-6SF5/6SF5GT
Audio Driver.....GE-6J5G/6J5GT
Audio Inverter.....GE-6J5G/6J5GT
Audio Power Amplifier.....(2)GE-6Y6G
Tuning Indicator.....GE-6U5
Rectifier.....(2)GE-5Y3G
Dial Lamp.....(4)Mazda No. 44

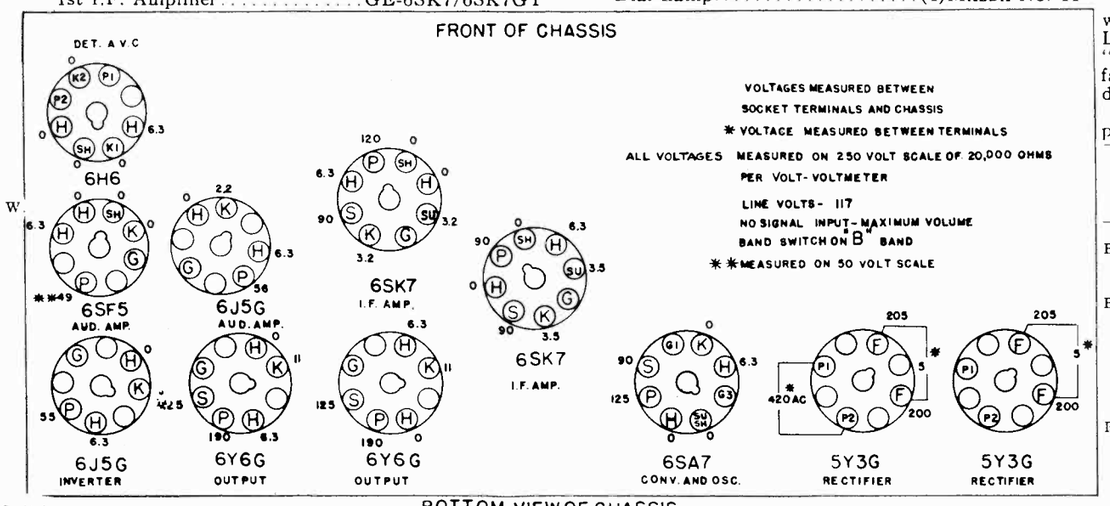


Fig. 7. Socket Voltages

Loud-speakers—"Alnico" Magnetic Dynamic

Outside Cone Diameters.....12 in. and 6½ in.
Voice Coil Impedances.....3.5 ohms

The voice coils are 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.

Coil System

The "C" and "D" band antenna coils, L-2 and L-3 are wound on a single coil form as shown in Fig. 6. L-4, L-5 and L-6 compose the oscillator transformer for the "B" "C" and "D" bands. All switch points are numbered in Fig. 6 to facilitate in locating these switch points on the pictorial wiring diagram, Fig. 5.

The table opposite gives the coils in use for the various positions of the band switch.

Band-switch Position	Antenna Primary	Antenna Secondary	Oscillator Primary	Oscillator Secondary
Band "B"	Lower portion of L1	Upper portion of L1	Lower portion of L4	Upper portion of L4
Band "C"	L2 Primary (L1 Primary shorted)	L2 Secondary (Grid end of L1 to ground)	Lower portion of L5	Upper portion of L5 (High side of L4 to ground through R15. Mid tap of L4 to ground)
Band "D"	L3 Primary (L1 Primary shorted)	L3 Secondary (Grid end of L1 to ground. L2 secondary to ground)	Lower portion of L6	Upper portion of L6 (High side of L4 and L5 to groundthrough R15. Mid tap of L4 to ground)

GENERAL ELECTRIC CO.

MODEL HJ1205

SPECIAL SERVICE INFORMATION

Chassis Wiring, Gain

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

(1) Stage Gains ‡

(a) Antenna Post to Converter Grid
Band "B" (Beam-a-Scope connected)*—3 at 1000 KC
Band "C" (Beam-a-Scope disconnected)**—3 at 4 MC
Band "D" (Beam-a-Scope disconnected)**—3 at 18 MC

(b) Converter Grid to 1st 6SK7 Grid . . .30 at 455 KC
(c) 1st 6SK7 Grid to 2nd 6SK7 Grid . . .6 at 455 KC
(d) 2nd 6SK7 Grid to 6H6 Det. Plate . . .70 at 455 KC

(2) A 400-cycle signal of .04 volts across volume control will give ½-watt speaker output.‡ (Volume Control turned to maximum.)

(3) Average DC voltage developed across oscillator grid resistor (R1) with gang closed.
Band "B" 6.5 volts
Band "C" 7 volts
Band "D" 2.8 volts

‡ Variations of +10%, −20% permissible.
* Use I.R.E. dummy antenna.
**Use 70 mmf. capacitor between signal generator and antenna post.

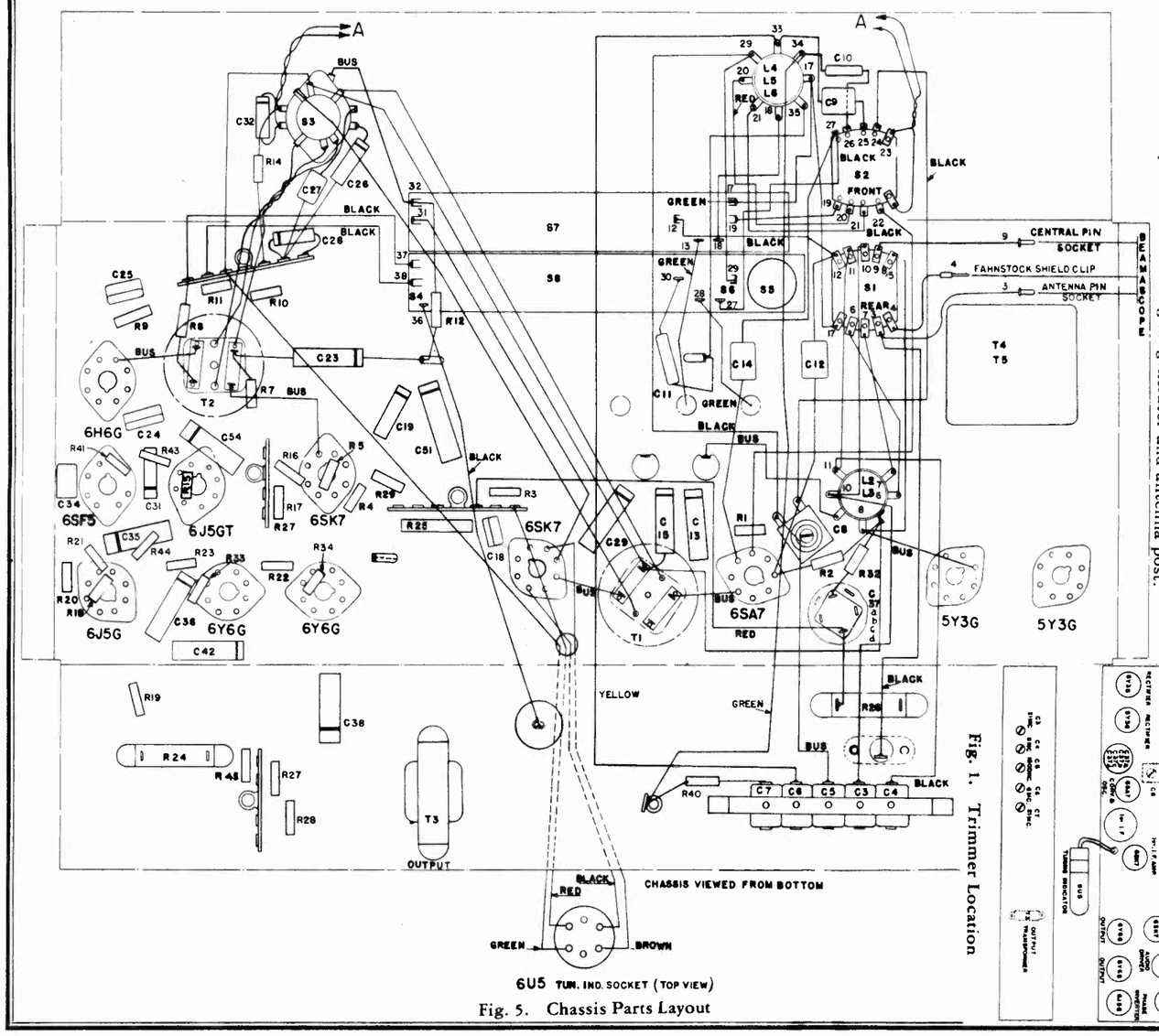


Fig. 1. Trimmer Location

Fig. 5. Chassis Parts Layout

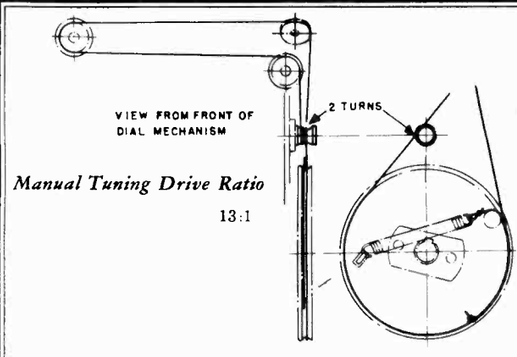


Fig. 3. Dial Drive Stringing Diagram

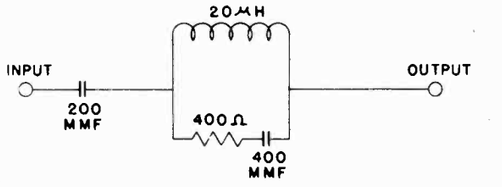
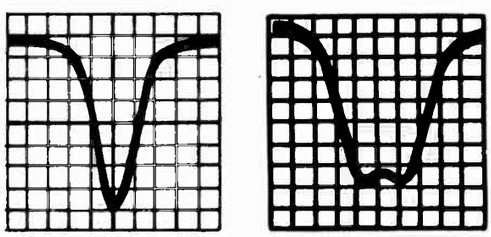


Fig. 4. I.R.E. Dummy Antenna

Alignment Procedure

The alignment procedure is given in table form on this and opposite pages. Use the designated "dummy" antenna in making each individual alignment. I.F. alignment may be performed with the chassis removed from the cabinet and the Beam-a-Scope disconnected. R.F. alignment on "C" and "D" bands should be performed with the Beam-a-Scope disconnected and a 70 mmf. mica capacitor between the signal generator and the point of input. R.F. alignment on "B" band should be performed with the chassis and Beam-a-Scope mounted in the cabinet and properly connected.



(a) Sharp Position (b) Expanded Position

Fig. 2. I.F. Curves Taken on G-E Oscilloscope OFM-1

I.F. ALIGNMENT WITH OSCILLOSCOPE*

	Band-switch Setting	Input Frequency	Tone Control Position	Point of Input	Trimmer	Comments
1.	Band B	455 KC and 30 KC Sweep	Bass	1st I.F. 6SK7 Grid	2nd I.F. Sec. 2nd I.F. Pri.	Condenser gang at minimum capacity—vertical input to ground and junction at R-8, R-9, and R-10. Adjust trimmers in order mentioned for a single curve of maximum amplitude. The resulting curve on the "Bass" position is shown in Fig. 2a.
2.	Band B	455 KC and 30 KC Sweep	Bass	Converter 6SA7 Grid	1st I.F. Sec. 1st I.F. Pri.	
3.	Band B	455 KC and 30 KC Sweep	Bass	Converter 6SA7 Grid	All I.F. Trimmers	
4.	Band B	455 KC and 30 KC Sweep	Treble I	Converter 6SA7 Grid		The expanded curve taken with tone control at "Treble I" is shown in Fig. 2b. Excess sensitivity over "Bass" tone position indicates regeneration.

I.F. ALIGNMENT WITH OUTPUT METER*

1.	Band B	455 KC Modulated	Bass	1st I.F. 6SK7 Grid	2nd I.F. Sec. 2nd I.F. Pri.	Condenser gang at minimum capacity—manual key depressed—output meter connected across voice coil—volume control at maximum—input as low as practical. Adjust all trimmers in order listed for maximum output.
2.	Band B	455 KC Modulated	Bass	Converter 6SA7 Grid	1st I.F. Sec. 1st I.F. Pri.	
3.	Band B	455 KC Modulated	Bass	Converter 6SA7 Grid	All I.F. Trimmers	NOTE—Do not attempt alignment in the expanded position.

* Use "dummy" antenna consisting of .05-mfd. capacitor between signal generator and point of input.

R.F. ALIGNMENT

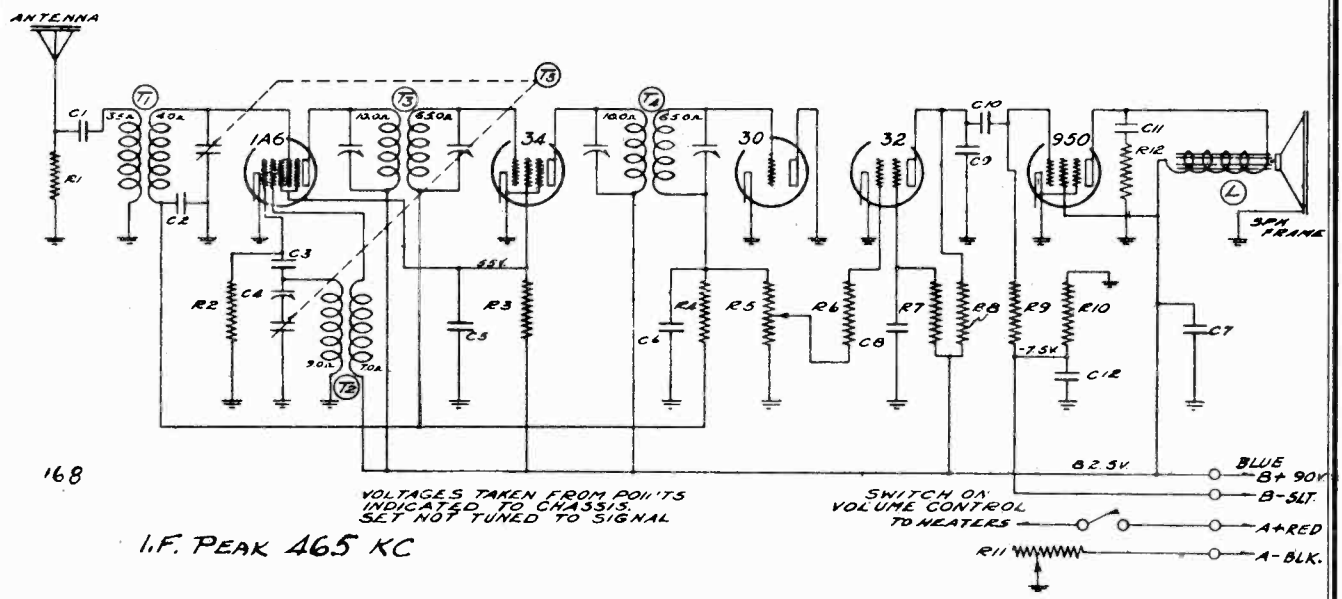
1.	Band B					Mechanically adjust dial pointer to first line at left-hand end of dial scale with condenser gang fully meshed. Connect output meter across voice coil.
2.	Band C	6 MC Modulated	Bass	Antenna Post**	Osc. (C-6) Ant. (C-3)	Set pointer to 6 MC mark and align (C-6). Peak (C-3) for maximum output.
3.	Band D	21 MC Modulated	Bass	Antenna Post**	Osc. (C-7) Ant. (C-4)	Set pointer to 21 MC mark and align (C-7). Peak C-4 while rocking gang condenser. The image of any signal on the "D" band should be 910 KC below input signal. Example: 15 MC image 14.09 MC.
4.	Band B	580 KC Modulated	Bass	Antenna Post***	Osc. Padder (C-8)	Set dial pointer to 580 MC mark and tune in signal with (C-8).
5.	Band B	1500 KC Modulated	Bass	Antenna Post***	Osc. (C-5)	Adjust (C-5) for maximum output in vicinity of 1500 KC while rocking gang condenser.
6.	Band B	580 KC Modulated	Bass	Antenna Post***	Osc. Padder (C-8)	Retrim (C-8).
7.	Band B	1500 KC Modulated	Bass	Antenna Post***	Osc. (C-5)	Repeak (C-5).

** Use a "dummy" antenna consisting of 70-mmf. capacitor between signal generator and point of input with "Beam-a-Scope" disconnected.
*** Use an I.R.E. "dummy" antenna as shown in Fig. 7 between signal generator and the point of input.

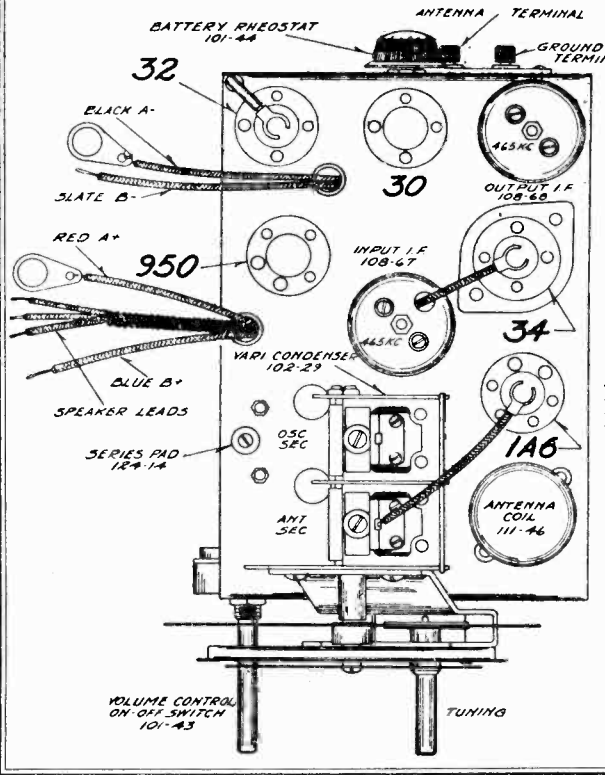
MODEL 522

GOODYEAR TIRE & RUBBER CO., INC.

Schematic, Voltage
Socket, Trimmers
Alignment



No.	Part No.	Description
		RESISTORS
R1	130-17	10M Ohm - ⅛ Watt - 20% - 20 Volt - Carbon
R2	130-52	50M Ohm - ⅛ Watt - 20% - 10 Volt - Carbon
R3	130-17	10M Ohm - ⅛ Watt - 20% - 20 Volt - Carbon
R4	130-38	2 Meg Ohm - ⅛ Watt - 20% 100 Volt - Carbon
R5	101-43	1 Meg Ohm Volume Control and Switch
R6	130-52	50M Ohm - ⅛ Watt - 20% 10 Volt - Carbon
R7	130-19	1 Meg Ohm - ⅛ Watt - 20% 100 Volt - Carbon
R8	130-9	200M Ohm - ⅛ Watt - 20% - 20 Volt - Carbon
R9	130-19	1 Meg Ohm - ⅛ Watt - 20% 100 Volt - Carbon
R10	130-93	450 Ohm - ⅛ Watt - 10% 10 Volt - Carbon
R11	101-44	4.75 Ohms - Rheostat
R12	130-52	50M Ohm - ⅛ Watt - 20% 10 Volt - Carbon
		CONDENSERS
C1	100-11	.01 x 400 Volt - 25%
C2	100-22	.05 x 200 Volt - 25%
C3	129-12	.00025 Mica - MT - 20%
C4	124-14	Series Pad
C5	100-9	.05 x 200 Volt - 25%
C6	129-5	.0001 Mica - MT - 20%
C7	100-6	.25 x 200 Volt
C8	100-9	.05 x 200 Volt - 25%
C9	129-2	.0005 Mica - MT - 20%
C10	100-11	.01 x 400 Volt - 25%
C11	100-11	.01 x 400 Volt - 25%
C12	119-22	10.0 Mfd. x 25 Volts - Working Voltage
		PARTS
T1	111-46	Antenna Coil
T2	110-36	Oscillator Coil
T3	108-67	Input I.F. Coil 465 K.C.
T4	108-68	Output I.F. Coil 465 K.C.
T5	102-29	Two Gang Condenser
L	114-19	Six Inch Magnetic Speaker



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

1. With volume control full on and with variable condenser at its minimum capacity position, plates entirely out of mesh, and with external oscillator set at 465 K.C. connected in series with a .1 mfd. condenser, to the grid of the 1A6 tube (cap at top of tube), adjust I.F. transformers, parts number 108-67 and 108-68, to resonance. Both of these transformers have two (2) adjustments each, they are accessible from the tops of the cans (for location see top view).

Use as a resonance indicator an output meter connected across the outside terminals of the speaker or by means of an adapter to the plate and screen of the type 950 output tube. Maximum deflection of the volt meter indicates resonance.

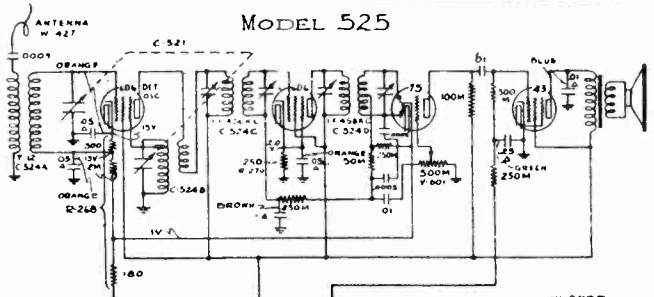
Use only enough signal to get a readily readable output.

A low range output meter or the low scale of a multi-range meter should be used.

BROADCAST BAND ALIGNMENT:

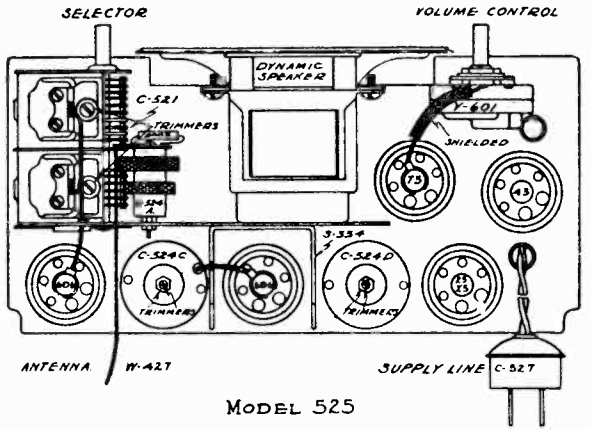
1. Set external oscillator to 1720 K.C. and connect it in series with a 200 mmfd. condenser to the antenna and ground posts.
   (a) With variable condenser in its minimum capacity position, plates entirely out of mesh, adjust oscillator trimmer (rear section of variable condenser) to resonance.
   (b) Re-set external oscillator to 1400 K.C. Rotate variable condenser, pick up signal and adjust antenna trimmer (front section of variable condenser) to resonance.
   (c) Re-set external oscillator to 600 K.C., move dial pointer to 600 K.C., and adjust series pad, part number 124-14 (see top view), to resonance. While making this adjustment, slowly rock variable condenser to and fro until maximum output is obtained.
   (d) Check for sensitivity at 1400, 1000, 600 K.C. DO NOT BEND PLATES.

MODEL 525



IF PEAK 456 KC

DECIMALS ARE MICROFARADS
WHOLE NUMBERS ARE OHMS
NUMBERS PREFIXED BY LETTERS ARE PARTS
VOLTAGES ARE FROM POINTS INDICATED TO CHASSIS GROUND VOLUME CONTROL ON FULL MEASURED ON A C
⏚ CHASSIS GROUND
Δ CONDENSERS IN ONE UNIT C-520



MODEL 525

NOTE—CONNECTING CORD OF SET GETS WARM IN NORMAL OPERATION. DO NOT BECOME ALARMED.

Make sure that all tubes are pushed firmly in their proper sockets and that the clips are securely fasteneed to the caps on the tops of the tubes.

That the aerial is stretched out and that the connections to an outdoor antenna (if used) are good.

If necessary to change tubes or service chassis, **UNDER NO CIRCUMSTANCES REMOVE BACK OR CHASSIS WITHOUT FIRST REMOVING PLUG FROM LIGHT SOCKET.**

To remove chassis from cabinet, pull off knobs from front, remove back (held with screws to case). Remove four mounting screws, then chassis can be slipped out of ease.

Should it be necessary, at any time, to rebalance this set the procedure is as follows. Attach a 456 kilocycle oscillator to the grid of the 6D6 tube in back of the variable condenser and adjust the trimming condensers of the I. F. transformers to maximum deflection on an output meter connected across the primary of the speaker input transformer. While adjusting these trimmers, the variable condenser should be at the maximum capacity position—at the extreme right of its rotation.

Next disconnect the antenna wire and connect an oscillator in series with a 75 mmf. condenser to the antenna coil. Rotate the condenser plates to the minimum capacity position—extreme left turn, and adjust the trimmer condenser of the rear section of the variable condenser to resonance with an oscillator set at 1725 kilocycles, then adjust the condenser of the front section of the variable condenser to resonance. Align at 1400—1200—1000—800—600—530 kilocycles, bend slotted plates of variable condenser if necessary.

MODELS 685, 686 Runs 1 and 2.

TUBE COMPLEMENT

consists of the latest "Metal-Glass" tubes which are interchangeable with metal tubes. They are as follows:

1-Type 6L7 Pentagrid Mixer, First Detector.
1-Type 6C5 Oscillator.
1-Type 6K7 Remote Cut-off Pentode, I.F. Amplifier (465 K.C.).
1-Tvpe 6Q7 Duplex Diode Triode Second Detector, A.V.C. and First Audio.
1-Type 6F6 Pentode Output Amplifier.
1-Type 5Y3 or 5W4 High Vacuum Rectifier. (Note: 5Y3 available in "Metal-Glass" only.)
1-Type 6G5 Cathode-Ray Tuning Indicator. (Note: 6G5 available in all glass only)

The tube complement of the model 685 is as follows:

1-Type 6L7 Pentagrid Mixer, First Detector.
1-Type 6C5 Oscillator.
1-Type 6K7G Remote Cut-off Pentode, I.F. Amplifier (465 K.C.).
1-Type 6Q7G Duplex Diode Triode Second Detector, A.V.C. and First Audio.
1-Type 6F6G Pentode Output Amplifier.
1-Type 5Y3 High Vacuum Rectifier.

SERVICE NOTES:

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

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

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

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

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

ALIGNING INSTRUCTIONS:

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

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

DUMMY ANTENNAS:

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

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

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

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

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

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

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

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

BROADCAST BAND ALIGNMENT:

535 to 1720 Kilocycles

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

SHORT WAVE BAND ALIGNMENT:

5.2 to 18.3 Megacycles

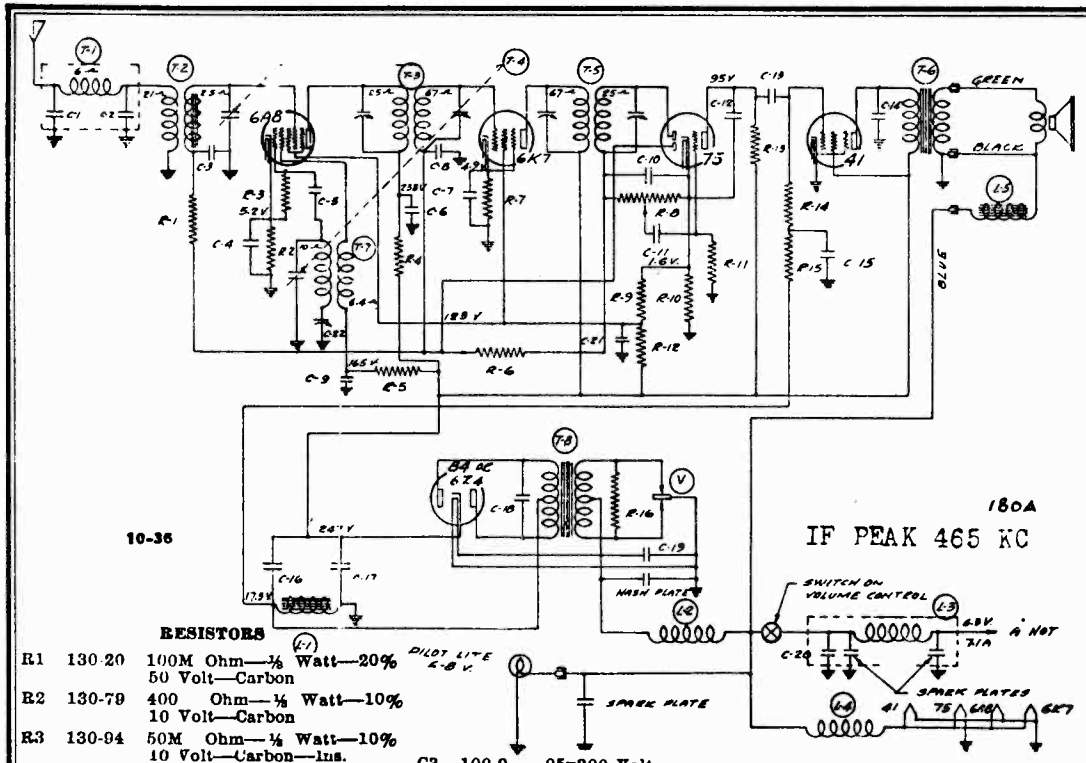
1. With band changing switch in the short wave position, extreme right of its rotation, and with external oscillator set at 17 megacycles and connected in series with "Dummy 3" to the tan antenna and black ground lead, make the following adjustments:
   (a) Move dial pointer to 17 megacycles and adjust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

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

MIDDLE WAVE BAND ALIGNMENT:

1695 to 5500 Kilocycles

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



RESISTORS

R1	130-20	100M Ohm—⅛ Watt—20% 50 Volt—Carbon
R2	130-79	400 Ohm—⅛ Watt—10% 10 Volt—Carbon
R3	130-94	50M Ohm—⅛ Watt—10% 10 Volt—Carbon—Ins.
R4	130-23	2M Ohm—⅛ Watt—20% 10 Volt—Carbon
R5	130-42	20M Ohm—⅛ Watt—20% 100 Volt—Carbon—Ins.
R6	130-68	1 Meg Ohm—⅛ Watt—10% 20 Volt—Carbon
R7	130-79	400 Ohm—⅛ Watt—10% 10 Volt—Carbon
R8	101-41	500M Ohm—Volume Control and Switch
R9	130-106	50M Ohm—⅛ Watt—10% 100 Volt—Carbon—Ins.
R10	130-101	600 Ohm—⅛ Watt—10% 10 Volt—Carbon—Ins.
R11	130-68	1 Meg Ohm—⅛ Watt—10% 20 Volt—Carbon
R12	130-95	12M Ohm—⅛ Watt—10% 100 Volt—Carbon
R13	130-3	500M Ohm—⅛ Watt—20% 100 Volt—Carbon
R14	130-5	300M Ohm—⅛ Watt—20% 10 Volt—Carbon
R15	130-45	250M Ohm—⅛ Watt—20% 20 Volt—Carbon—Ins.
R16	130-84	200 Ohm—⅛ Watt—20% 10 Volt—Carbon—Ins.

CONDENSERS

C1	129-3	.00002 Mica—"0"—20%
C2	129-49	.00009 Mica—"0"—5%
C3	100-9	.05x200 Volt
C4	100-6	.25x200 Volt
C5	129-21	.0002 Mica—"MT"—"0"—20%
C6	100-1	.1 x400 Volt 50%—10%
C7	100-33	.1 x200 Volt 50%—10%
C8	100-9	.05x200 Volt 25%—25%
C9	100-1-B	.1 x400 Volt 50%—10%
C10	129-12	.00025 Mica—"MT"—"0"—20%
C11	100-9	.05 x200 Volt 25%—25%
C12	129-5	.0001 Mica—"MT"—"0"—20%
C13	116-15	.05 x400 Volt
C14	116-15	.007x800 Volt
C15	100-33	.1x200 Volt 50%—10%
C16	119-20	8.0 Mfd. Electrolytic Condenser—350 Working Volts
C17	119-20	4.0 Mfd. Electrolytic Condenser—350 Working Volts
C18	100-36	.01x1400 Volt—10%
C19	100-35	.5 x 200 Volt 50%—10%
C20	100-35	.5 x 200 Volt 50%—10%
C21	100-33	.1 x 200 Volt 50%—10%
C22	124-17	Single Padder J-4-S

NOTE: C-13 and C-14 in one unit—part number 116-15.

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION
VOLUME VIII

PARTS

T1	111-48	Antenna Filter Coil Assembly
T2	111-47	Antenna Coil Assembly
T3	108-69	Input I.F. Coil—465 K.C.
T4	102-27	Two Gang Variable Condenser
T5	108-70	Output I.F. Coil—465 K.C.
T6	105-22	Output Transformer
T7	110-37	Oscillator Coil Assembly
T8	104-51	Power Transformer
L1	105-23	Filter Choke
L2	105-19	"A" Choke
L3	105-25	"A" Filter Assembly
L4	105-24	"A" Choke
L5	114-34	5¼" Speaker (Field resistance 4 ohms)
V		Vibrator

CONNECTIONS TO BATTERY:

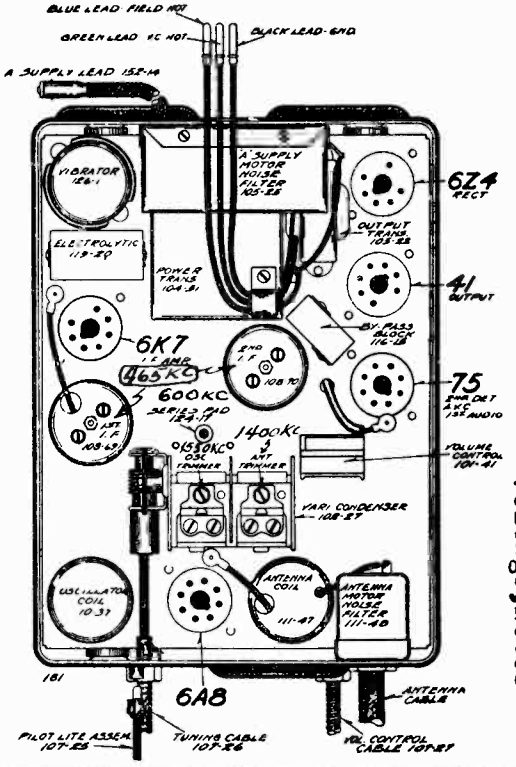
The battery cable, number 152-2, (red wire with fuse receptacle at one end and terminal lug at other end) must be connected to battery terminal of ammeter. At the same time connect ammeter capacitor, number 148-3, to battery terminal of ammeter, other end of condenser to any convenient grounded screw on back of instrument panel. Make certain that insulating sleeve is slipped over fuse when fuse is placed in receptacle, before connecting to short battery cable from receiver.

ANTENNA CONNECTION:

The antenna is connected to the receiver by means of the antenna cable. The antenna wire is the single black wire projecting from the end of the cable. Splice this wire to the roof antenna lead and ground the pig-tail shielding as close to the corner post of the car as possible.

GENERATOR INTERFERENCE:

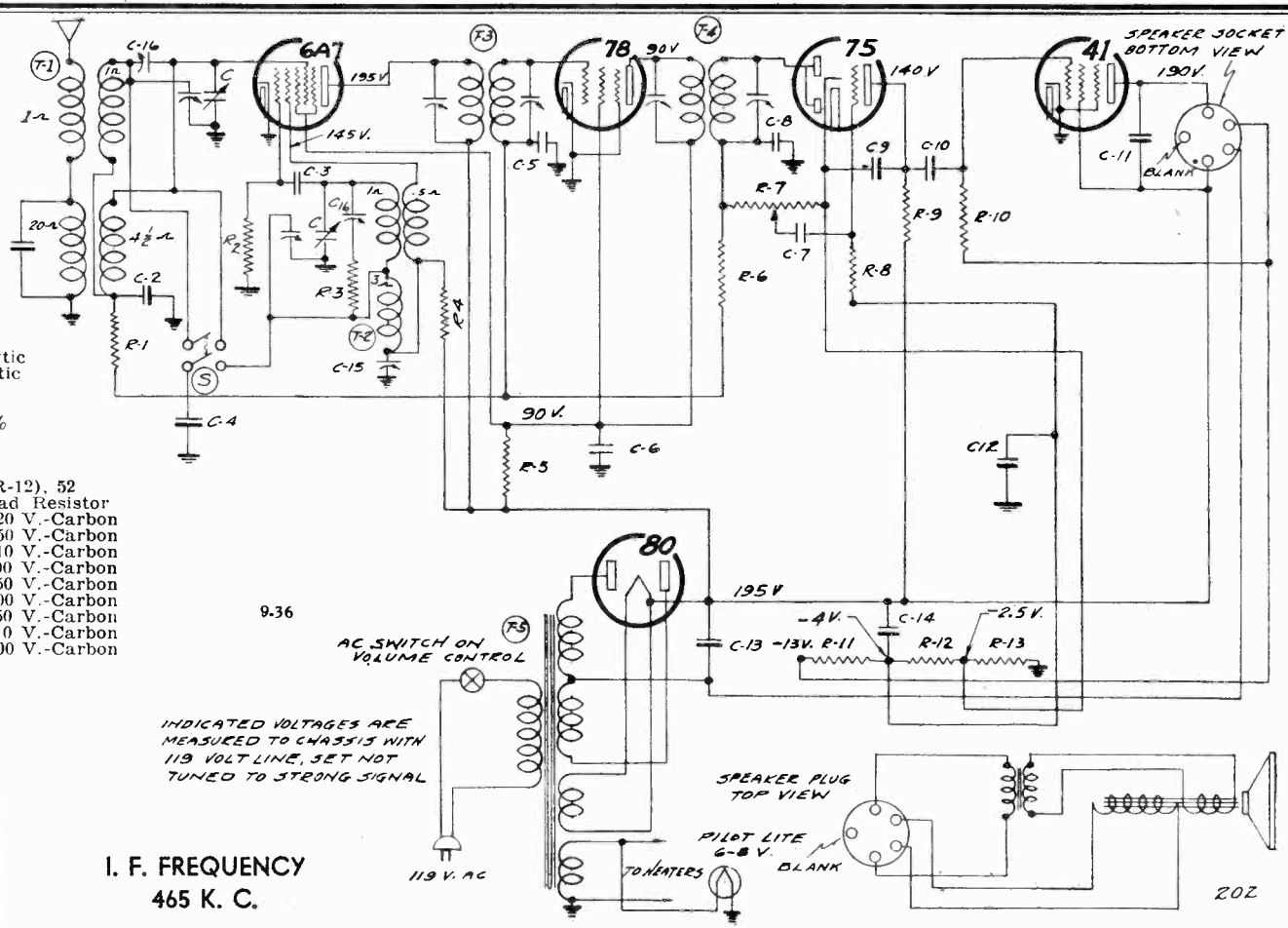
Remove the generator cutout mounting screw and fasten the condenser (148-1) bracket on the generator cutout mounting lug. Replace the cutout mounting screw and tighten down securely. Connect the condenser lead to the battery terminal of the cutout The generator condenser is absolutely necessary as it is used to eliminate a high pitched whining noise which would otherwise be heard as the motor is accelerated.



LIST OF REPAIR PARTS

(Serial No. 6E248475 and up)

Part No.	Schematic Reference	Description
		CONDENSERS
100-6	C-12. C-6	.25 x200 Volt Tubular—Without Bracket
100-9	C-5	.05 x200 Volt Tubular
100-11	C-10. C-7	.01 x400 Volt Tubular
100-19	C-11	.006x600 Volt Tubular
100-26	C-2	.02 x400 Volt
103-6	C-13	8 Mfd. x 350 Volt Electrolytic
103-7	C-14	8 Mfd. x 300 Volt Electrolytic
129-5	C-9	.0001 Mica—Type O—20%
129-12	C-8	.00025 Mica—Type O—20%
129-61	C-4	.0017 Mica—Type W—2½%
129-62	C-3	.00003 Mica—Type O—10%
129-63	C-1	.0004 Mica—Type W—10%
		RESISTORS
106-26	R-11. R-12. R-13	220 Ohm (R-11), 33 Ohm (R-12), 52 Ohm (R-13), Metal Clad Resistor
130-12	R-2	50M Ohm-1/3 Watt-20%- 20 V.-Carbon
130-20	R-9	100M Ohm-1/3 Watt-20%- 50 V.-Carbon
130-22	R-4	5M Ohm-1/3 Watt-20%- 10 V.-Carbon
130-77	R-5	10M Ohm- 1 Watt-20%-100 V.-Carbon
130-100	R-10	150M Ohm-1/3 Watt-20%- 50 V.-Carbon
130-110	R-6	1 Meg Ohm-1/10 Wt.-10%-100 V.-Carbon
130-111	R-1	100M Ohm-1/10 Wt.-20%- 50 V.-Carbon
130-112	R-3	100 Ohm-1/10 Wt.-20%- 10 V.-Carbon
130-113	R-8	2 Meg Ohm-1/10 Wt.-20%-100 V.-Carbon



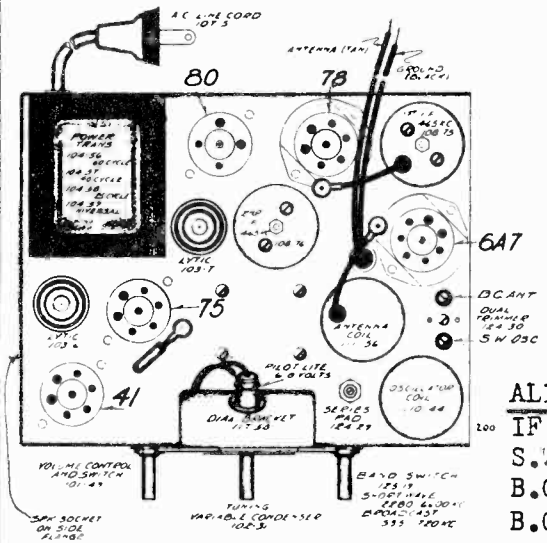


FIG. 1—TOP VIEW

I. F. FREQUENCY
465 K. C.

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL.VIII.

ALIGNMENT FREQUENCIES

IF:- 465 KC (I.F.) Dummy Adjust IF Trimmers.
S.W.Osc:- 6.6 MC (I.F.) Dummy Adjust S.W. Osc.
B.C. Osc:- 1720 KC (B.C.) Dummy .. B.C.Osc.
B.C.Ant.:- 1550 KC (B.C.) Dummy .. B.C.Ant.
600 KC .. .. Series Pad.
S.W.Ant :- 6 MC (S.W.) Dummy .. S.W.Ant (On rear section of variable).

DUMMY ANTENNAS:

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

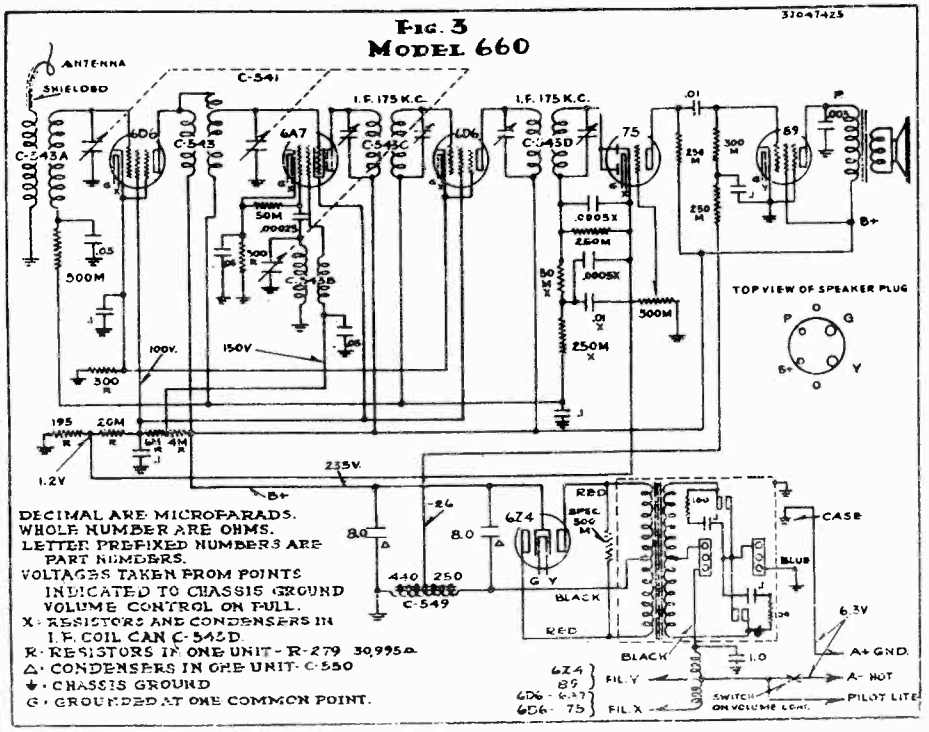
(Broadcast)—Consists of a 200 mmfd. condenser and a 20 ohm resistor connected in series with each other and in series with the external oscillator.

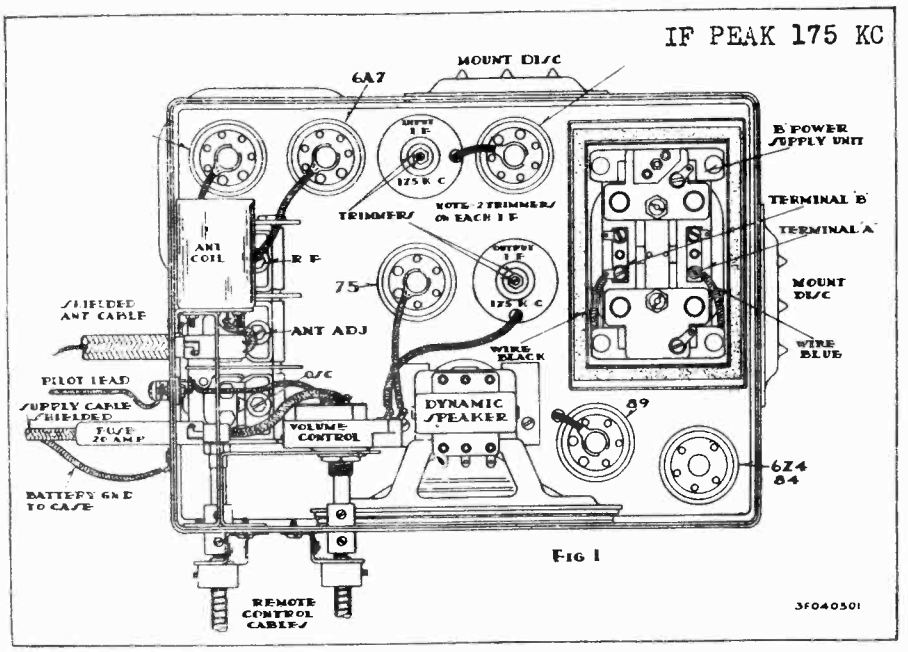
(Short Wave)—Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

GOODYEAR TIRE & RUBBER CO., INC.

MODEL 660
Schematic, Socket
Trimmers

FIG. 3
MODEL 660





SCHEMATIC CIRCUIT DIAGRAM

MODEL 660 AUTORADIO

PARTS LIST

Part No.	Description	List Price Each
A 660	Battery Cable—Plug Type.	1.75
B 104	Cable Shaft Brackets	.35
B 660	Antenna Cable—Plug Type	.80
C 106	Shaft Couplings	.35
C 117	"A" Choke—Small	.25
C 118	"A" Choke—Large	.35
C 144	Dual .1-200 Volt Condenser	.35
C 152	.00025 Mica Condenser	.20
C 155	.0005 Mica Condenser	.20
C 522	.01-400 Volt Condenser	.25
C 531A	Dual .05 Condenser	.30
C 535	Dual .1—200 Volt Condenser	.35
C 541B	3 Gang Condenser	3.75
C 543	R.F. Coil	.80
C 543A	Antenna Coil	.80
C 543B	Oscillator Coil	.70
C 543C	Input I.F. Transformer	1.25
C 543D	Output I.F. Transformer with Parts	2.50
C 547	.1-200 Volt Condenser	.30
C 549	690 Ohm Choke	1.40
C 550	8-8 Mfd. Electrolytic Condenser	2.25
C 551	1 Mfd.—120 Volt Condenser	.35
C 553	.05-200 Volt Condenser	.25
C 554	.5 Mfd. Generator Condenser	.50
R 232A	Special 500M Ohm Resistor Identified with 2 Yellow Dots	.35
R 279	30,995 Ohm Resistor	.60
R 281	100 Ohm Resistor	.20
S 338	18" Volume Control Shaft.	1.25
S 339	18" Selector Control Shaft	1.25
S 338S	Special 24" Volume Control Shaft	1.50
S 339S	Special 24" Selector Control Shaft	1.50
V 660	Complete "B" Unit—OAK	8.00
V 603	Volume Control	1.50
660	Remote Control Head Complete Less Shafts	5.00
	20 Ampere Fuses	.10
	Mounting Bolts	.10
	All carbon resistors	.20
	All sockets	.20
	Dynamic speakers	5.00

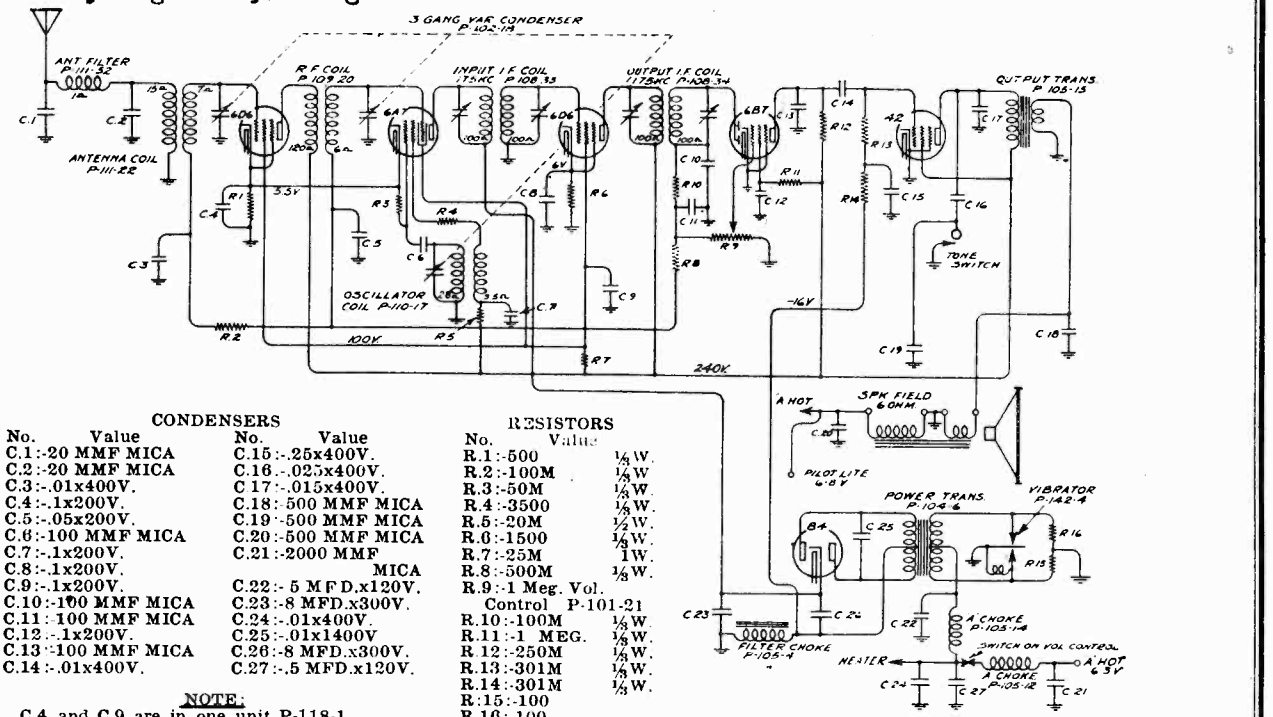
prices subject to change without notice

First Series Model 660 - Serial Numbers 3F04051 - 23J047424.
Vibrator Heads Only $4.00

MODEL 680
Schematic, Socket Trimmers, Alignment, Voltage

GOODYEAR TIRE & RUBBER CO., INC.

MODEL 680



CONDENSERS

No.	Value	No.	Value
C.1	:-20 MMF MICA	C.15	:-.25x400V.
C.2	:-20 MMF MICA	C.16	:-.025x400V.
C.3	:-.01x400V.	C.17	:-.015x400V.
C.4	:-.1x200V.	C.18	:-500 MMF MICA
C.5	:-.05x200V.	C.19	:-500 MMF MICA
C.6	:-100 MMF MICA	C.20	:-500 MMF MICA
C.7	:-.1x200V.	C.21	:-2000 MMF MICA
C.8	:-.1x200V.	C.22	:- 5 MFD.x120V.
C.9	:-.1x200V.	C.23	:-8 MFD.x300V.
C.10	:-100 MMF MICA	C.24	:-.01x400V.
C.11	:-100 MMF MICA	C.25	:-.01x1400V
C.12	:-.1x200V.	C.26	:-8 MFD.x300V.
C.13	:-100 MMF MICA	C.27	:-.5 MFD.x120V.
C.14	:-.01x400V.		

NOTE:
C.4 and C.9 are in one unit P-118-1
C.7 and C.8 are in one unit P-118-1
C.26 and C.23 are in one unit P-119-17
R.16 and R.15 are in one unit P-106-6
Numbers prefixed by letter "P" are part numbers.
Voltages taken from points indicated to chassis ground. Vol. control on full, no signal.

RESISTORS

No.	Value	
R.1	:-500	⅓ W.
R.2	:-100M	⅓ W
R.3	:-50M	⅓ W.
R.4	:-3500	⅓ W.
R.5	:-20M	½ W.
R.6	:-1500	⅓ W.
R.7	:-25M	1 W.
R.8	:-500M	⅓ W.
R.9	:-1 Meg. Vol. Control P-101-21	
R.10	:-100M	⅓ W
R.11	:-1 MEG.	⅓ W.
R.12	:-250M	⅓ W.
R.13	:-301M	⅓ W.
R.14	:-301M	⅓ W.
R.15	:-100	
R.16	:-100	

Serial No. 60001 up.

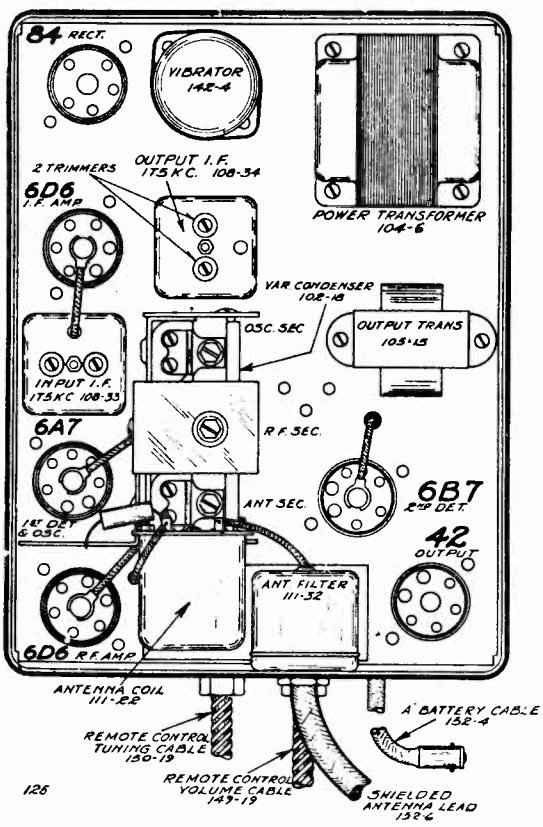
IF PEAK 175 KC.

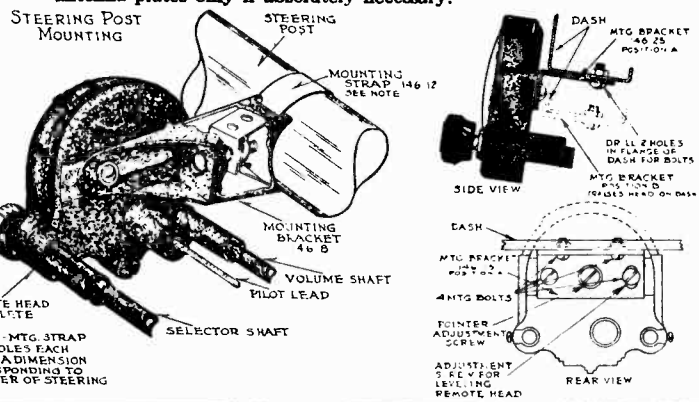
DUMMY ANTENNAS:
The dummy antennas referred to in the following instructions are:
"I.F. Dummy" —A .1 mfd. condenser connected in series with the test oscillator output lead.
"Broadcast Dummy"—A 200 mmfd. condenser connected in series with the output lead of the test oscillator.

I.F. ALIGNMENT:
1. With variable condenser in its minimum capacity position (plates entirely out of mesh) and with volume control full on, connect test oscillator set at 175 K.C., in series with I.F. dummy antenna, to the grid cap of the type 6A7 tube.
2. Adjust trimmer condensers of both input (108-33) and output (108-34) I.F. transformers to resonance with oscillator. See top view for location of these transformers. There are two adjustments on each and they are accessible from the top of the transformer shield and should be adjusted with an insulated screw driver.

BROADCAST ALIGNMENT:
1. With variable condenser in its minimum capacity position, connect test oscillator set at 1550 K.C. and in series with broadcast dummy, to the antenna lead of receiver.
2. Adjust oscillator trimmer of variable condenser to resonance (this adjustment is on the end section of the three gang condenser—see top view).
3. Shift test oscillator to 1400 K.C. and pick up signal by rotating condenser and adjust R.F. (center) and antenna (front) trimmers to resonance, see top view.

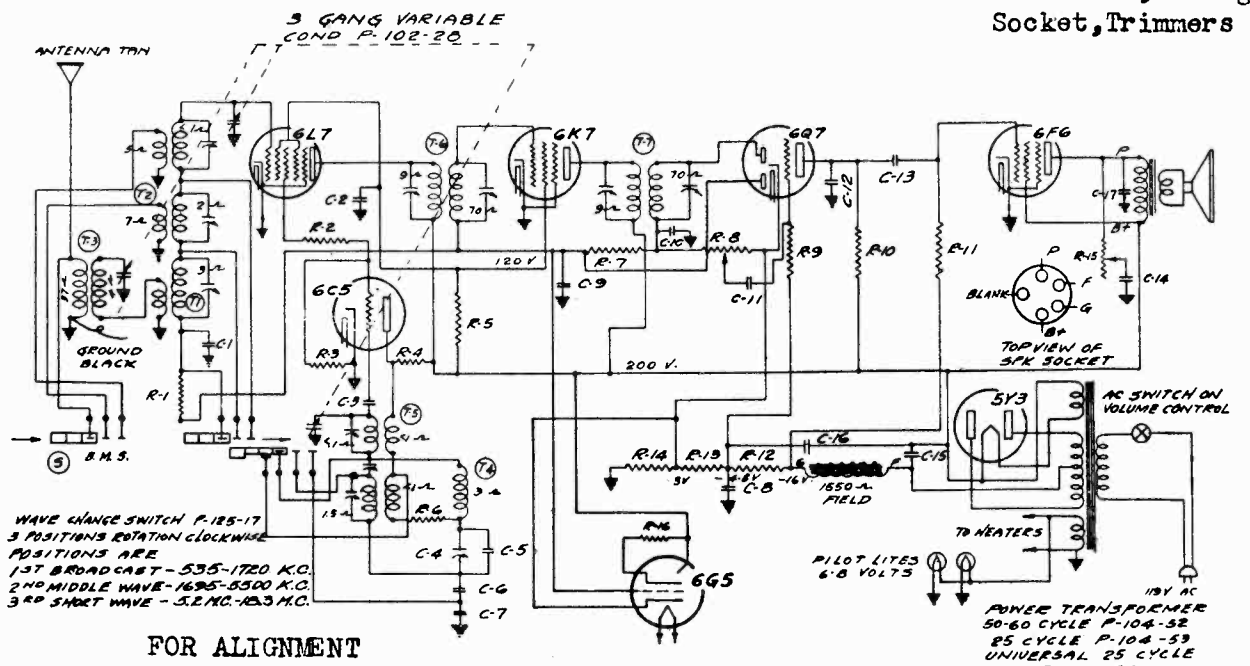
(a) Check for sensitivity at 1000, 800 and 600 K.C. by setting test oscillator to these frequencies and picking up the signal by rotating variable condenser. Under no circumstances bend plates of oscillator section, bend R.F. and antenna plates only if absolutely necessary.





GOODYEAR TIRE & RUBBER CO., INC.

MODELS 685,686,
Runs 1,2
Schematic, Voltage
Socket, Trimmers

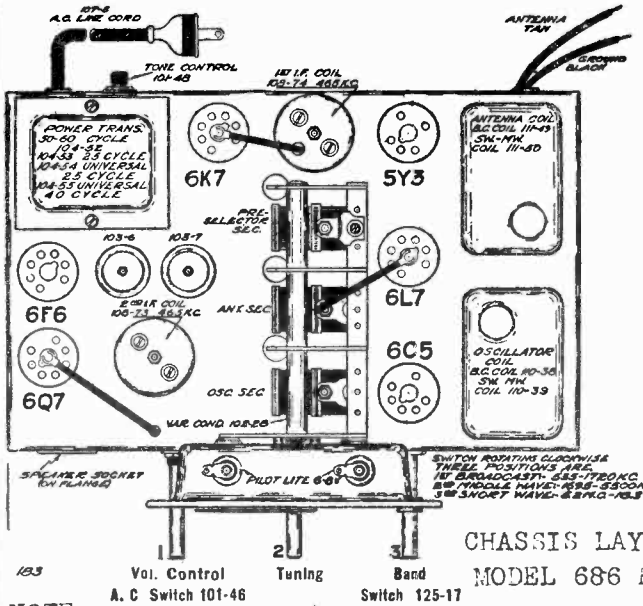


FOR ALIGNMENT
SEE INDEX

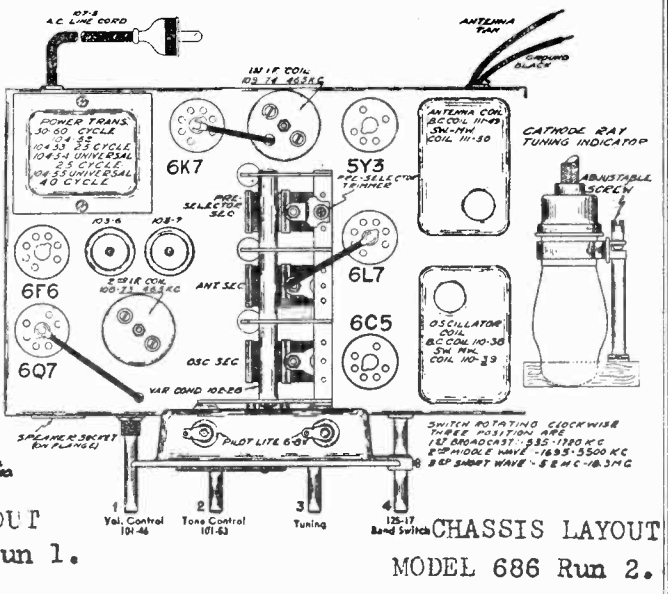
IF PEAK 465 KC

No.	Part No.	Description
		RESISTORS
R1	130-20	100M Ohm—⅛ Watt—20% —50 Volt—Carbon
R2	130-105	150 Ohm—⅛ Watt—20% —10 Volt—Carbon
R3	130-12	50M Ohm—⅛ Watt—20% —10 Volt—Carbon
R4	130-104	9M Ohm—1 Watt—20%—100 Volt—Carbon
R5	130-104	9M Ohm—1 Watt—20%—100 Volt—Carbon
R6	130-27	50 Ohm—⅛ Watt—20%—3 Volt—Carbon
R7	130-19	1 Meg Ohm—⅛ Watt—20%—100 Volt—Carbon
R8	101-46	1 Meg Ohm—Volume Control
R9	130-4	3 Meg Ohm—⅛ Watt—20%—100 Volt—Carbon
R10	130-103	100M Ohm—⅛ Watt—20% —50 Volt—Carbon
R11	130-102	500M Ohm—⅛ Watt—10% —50 Volt—Carbon
R12, R13, R14	106-26	220 Ohm, 32 Ohm, 52 Ohm
R15	101-53	50M Ohm—Tone Control
R16	130-110	1 Meg Ohm—1/10 Watt—10%—100 Volt—Carbon
		CONDENSERS
C1	100-22	.05 x 200 Volt—25%
C2	100-1	.1 x 400 Volt—25%
C3	129-39	.00005 Mica (MT—0)—20%
C4	124-28	Series Pad (80—225)
C5	129-56	.00055 Mica (MT—0)—10%
C6	129-55	.0034 Mica (MW—W)—2½%
C7	129-54	.003 Mica (MW—W)—2½%
C8	100-20	.1 x 200 Volt—25%
C9	100-22	.05 x 200 Volt—25%
C10	129-12	.00025 Mica (MT—0)—20%
C11	100-11	.01 x 400 Volt—25%
C12	129-2	.0005 Mica (MT—0)—20%
C13	100-11	.01 x 400 Volt—25%
C14	100-27	.025 x 600 Volt—25%
C15	103-6	8 Mfd. x 350 Volt Electrolytic
C16	103-7	8 Mfd. x 300 Volt Electrolytic
C17	100-25	.002 x 600 Volt—20%
		PARTS
T1	111-49	Broadcast Antenna Coil
T2	111-50	S.W.—M.W. Antenna Coil
T3	111-51	B.C.—Pre-Selector Coil Assem.
T4	110-38	B.C. Oscillator Coil
T5	110-39	S.W.—M.W Oscillator Coil
T6	108-74	Input I.F.—465 K.C.
T7	108-73	Output I.F.—465 K.C.
S	125-17	Band Switch

TUNING INDICATOR NOT USED WITH SOME SETS



CHASSIS LAYOUT
MODEL 686 Run 1.



CHASSIS LAYOUT
MODEL 686 Run 2.

NOTE:-
Model 685 does not have tone control or tuning indicator and uses 2 metal and four glass tubes.

MODEL 770 — Alignment, Trimmers

Schematic, Voltage — GOODYEAR TIRE & RUBBER CO., INC. — Socket

ALIGNMENT FREQUENCIES

IF - 465 KC Four trimmers.

BC - BC Series Pad at 600 KC
Osc.(3), RF (2), Ant.(1)
at 1400 KC

SW - Osc.(8), RF(7), Ant.(6) at
17 MC.

INT.-MW Series Pad at 1800 KC
RF(5), Ant.(4), Osc.(9) at
5MC.

Re-check broadcast alignment and if it is found necessary to re-adjust either R.F. or antenna trimmers, repeat the 17 M.C. short wave and 5 M.C. intermediate wave adjustments.

Dummy Antennas

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

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

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

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII

Serial No. 5J154150 and up

CONDENSERS

No.	Part No.	Value
C.1	100-9	.05x200 V.
C.2	100-6	.25x200 V.
C.3	129-22	.0014 Mica
C.4	129-21	.0002 Mica
C.5	100-24	.25x400 V.
C.6	100-20	.1x200 V.
C.7	129-29	.0038 Mica
C.8	129-31	.000025 M.
C.9	129-30	.0014 Mica
C.10	129-28	.00064 M.
C.11	100-13	.05x400 V.
C.12	100-9	.05x200 V.
C.13	129-47	.00004 M.
C.14	100-20	.1x200 V.
C.15	100-11	.01x400 V.
C.16	100-13	.05x400 V.
C.17	103-4	16 mfd. x350 V.
C.18	100-6	.25x200 V.
C.19	103-8	14 mfd. x400 V.
C.20	129-2	.0005 Mica
C.21	129-47	.00004 M.
C.22	129-21	.0002 Mica
C.23	100-9	.05x200 V.

RESISTORS

No.	Value
R.1	100M 1/3 W.
R.2	180 1/3 W.
R.3	500 1/3 W.
R.4	50M 1/3 W.
R.12	250M 1/3 W.
R.13	750M 1/5 W.
R.14	100 1/3 W.
R.15	250M 1/3 W.
R.16	100M 1/3 W.
R.17	5000 1/3 W.
R.18	250M 1/3 W.
R.19	50M 1/3 W.
R.5	12M 1.0 W.
R.6	15M 2.0 W.
R.7	500M W. W. 1/5 W.
R.8	1 meg. Vol. Control P-101-37
R.9	1 meg. 1/5 W.
R.10	250M 1/2 W.
R.11	300M Tone control P-101-38

I. F. FREQUENCY
465 K. C.

BC SERIES PAD

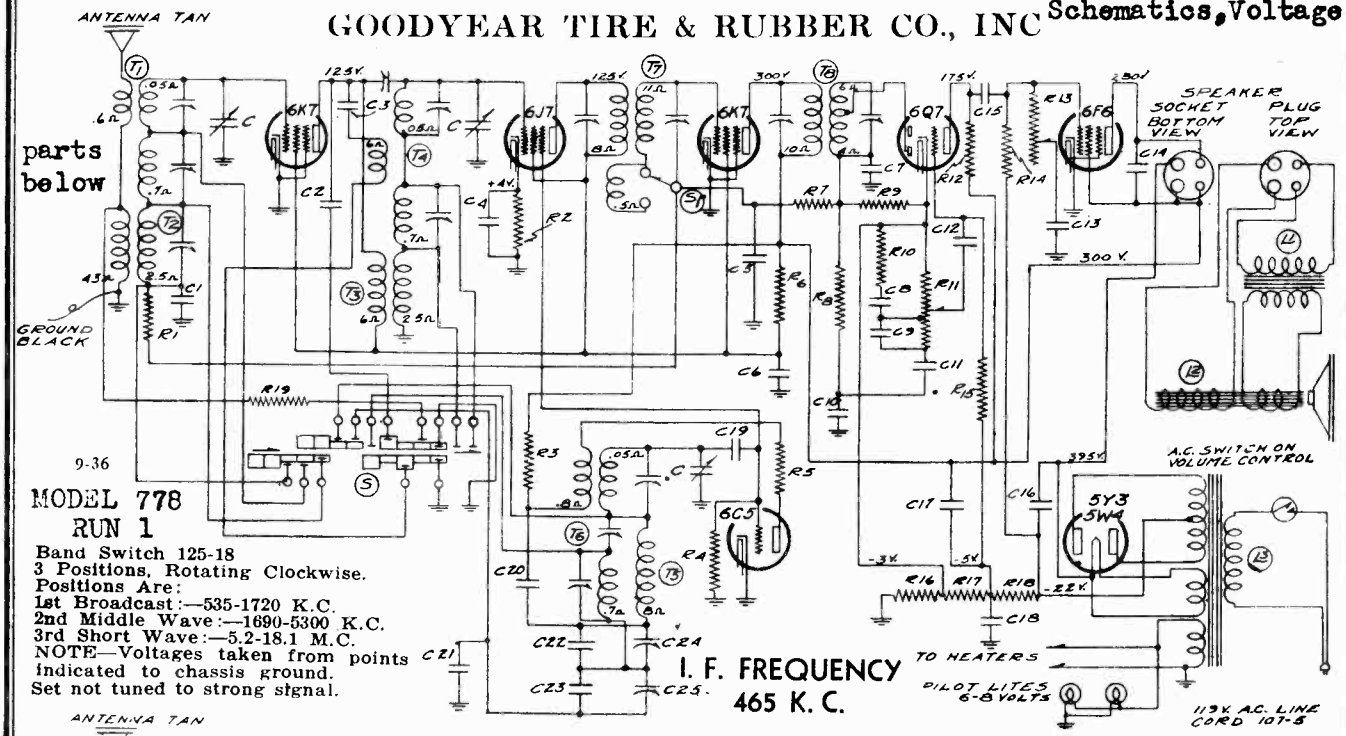
MW SERIES PAD (SERIES 8 ONLY)

I.F. ADJUSTMENT 465 KC.

I.F. ADJUSTMENT 465 KC.

MODEL 778, Runs 1, 2
Schematics, Voltage

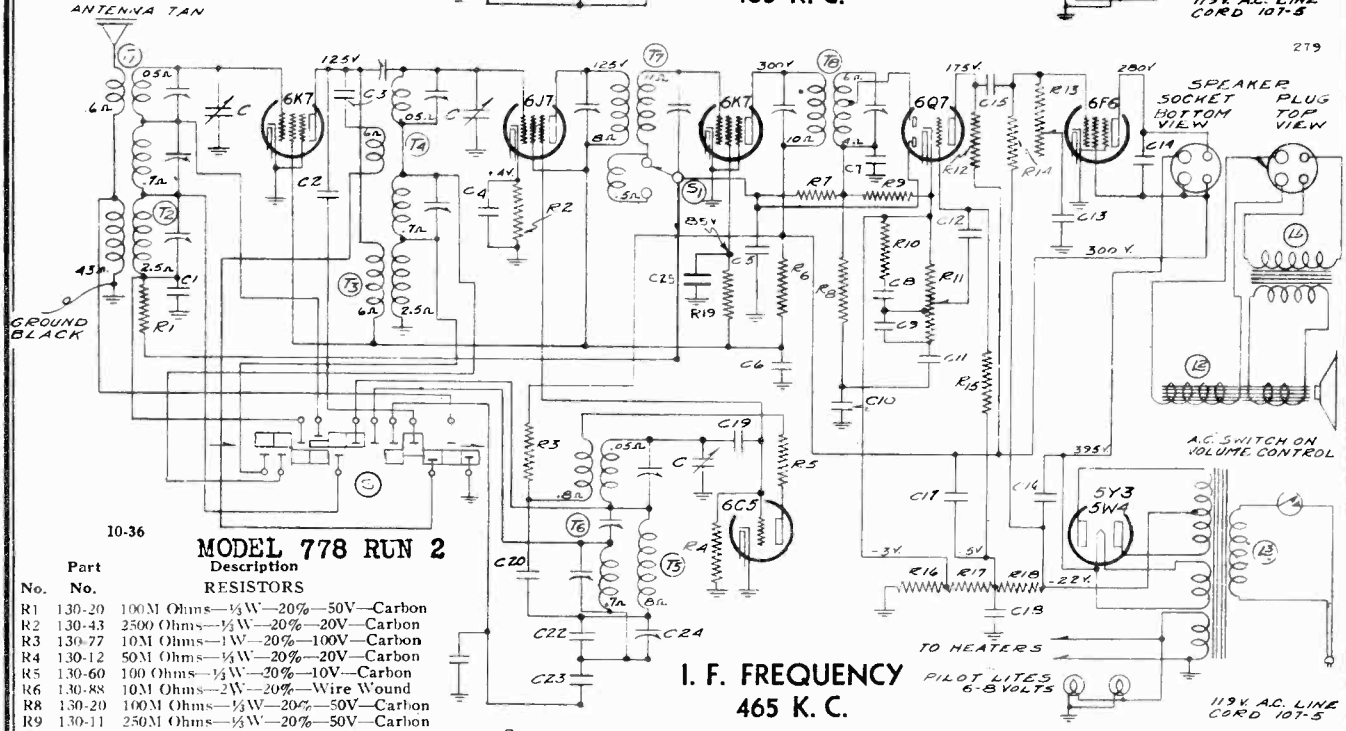
GOODYEAR TIRE & RUBBER CO., INC



9-36

MODEL 778 RUN 1

Band Switch 125-18
3 Positions, Rotating Clockwise.
Positions Are:
1st Broadcast:—535-1720 K.C.
2nd Middle Wave:—1690-5300 K.C.
3rd Short Wave:—5.2-18.1 M.C.
NOTE—Voltages taken from points indicated to chassis ground.
Set not tuned to strong signal.



10-36

MODEL 778 RUN 2

Part No.	Description
	RESISTORS
R1 130-20	100M Ohms—1/3W—20%—50V—Carbon
R2 130-43	2500 Ohms—1/3W—20%—20V—Carbon
R3 130-77	10M Ohms—1W—20%—100V—Carbon
R4 130-12	50M Ohms—1/3W—20%—20V—Carbon
R5 130-60	100 Ohms—1/3W—20%—10V—Carbon
R6 130-88	10M Ohms—2W—20%—Wire Wound
R8 130-20	100M Ohms—1/3W—20%—50V—Carbon
R9 130-11	250M Ohms—1/3W—20%—50V—Carbon
R10 130-22	5600 Ohms—1/3W—20%—10V—Carbon
R11 101-47	1 megOhms—Vol. Con. with AC Switch
R12 130-20	100M Ohms—1/3W—20%—50V—Carbon
R13 101-38	100M Ohms—Tone Con. with Fid. Sw.
R14 130-3	500M Ohms—1/3W—20%—100V—Carbon
R15 130-38	2 megOhms—1/3W—20%—100V—Carbon
R16 106-27	38 Ohms—10% Muter Resistor
R17 106-27	28 Ohms—10% Muter Resistor
R18 106-27	220 Ohms—10% Muter Resistor
	NOTE: R16, R17, R18 in one unit—part 106-27.
	CONDENSERS
C 102-30	One section of three gang var. cond.
C1 100-9	.05—200 Volt—25%
C2 129-59	.0003 Mica—MT—0—5%
C3 129-39	.00005 Mica—MT—0—20%
C4 100-9	.05—200 Volt—25%
C5 100-9	.05—200 Volt—25%
C7 129-5	.0001 Mica—MT—0—20%
C8 100-9	.05—200 Volt—25%
C9 129-2	.0005 Mica—MT—0—20%
C10 129-60	.00015 Mica—MT—0—20%
C12 100-11	.01—400 Volt—25%
C13 100-26	.02—400 Volt—25%
C14 100-32	.0005—1000 Volt—20%
C15 100-11	.01—400 Volt—25%
C16 103-8	14 mfd.—400 Volt Electrolytic
C17 103-6	8 mfd.—350 Volt Electrolytic
C19 129-31	.000025 Mica—MT—0—15%
C20 100-13	.05—400 Volt—25%
C22 129-57	.0005 Mica—MT—0—5%
	PARTS
T1 111-54	M.W. and S.W. Antenna Coil Assem.
T2 111-55	Broadcast Antenna Coil Assem.
T3 109-30	Broadcast R.F. Coil Assem.
T4 109-29	M.W. and S.W. R.F. Coil Assem.
T5 110-43	Broadcast Osc. Coil Assem.
T6 110-42	M.W. and S.W. Osc. Coil Assem.
T7 108-64	Input I.F. Coil—465 Kc.
T8 108-63	Output I.F. Coil—465 Kc.
L1 -	Output Transformer (on speaker)
L2 114-36	8" Speaker (Field Resis. 1250 Ohms)
L3 104-27	Power Transformer (50-60 Cycle)
S 125-18	Band Switch
S1 101-38	Fidelity Switch on Tone Control

PARTS RUN 1 ONLY

R7	130-3	500M ohms—1/3 Watt—20%—100 Volt—Carbon
R19	130-27	50 ohms—1/3 Watt—20%—Carbon

C6	100-24B	.25—400 Volt—20%
C11	100-9	.05—200 Volt—25%
C18	100-6B	.25—200 Volt—20%
C21	129-54	.003 Mica—MW—W—2½%
C22	129-57	.0005 Mica—MT—0—5%
C23	129-58	.0021 Mica—MW—W—5%
C24	124-18	Padder, 175 mmf. working capacity.
C25	124-18	Padder, 300 mmf. working capacity.
		Note: C24, C25 in one unit—part No. 124-18.

PARTS RUN 2 ONLY

R7	130-38	2 megOhms—1/3W—20%—100V—Carbon
R19	130-76	30M Ohms—1/3W—20%—10V—Carbon
C6	100-41	.25—400 Volt—20%
C11	100-22	.05—200 Volt—25%
C18	100-46	.25—200 Volt—20%
C21	129-69	.0023 Mica—MW—W—2½%
C23	129-55	.0034 Mica—MW—W—2½%
C24	124-34	Padder, 200 mmf. working capacity
C25	100-11	.01 x 400 Volt—25%

MODEL 778, Runs 1, 2
Alignment, Trimmers
Socket, Notes

GOODYEAR TIRE & RUBBER CO., INC.

60 Cycle 75 Watt 105-115 Volt

1. Vol. Control A.C. Switch 101-47
2. Tone Control Fidelity SW 101-38
3. Tuning
4. Band switch 125-18

CONVENTIONAL ALIGNMENT

SEE SPECIAL SECTION VOL. VIII

Dummy Antennas

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

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

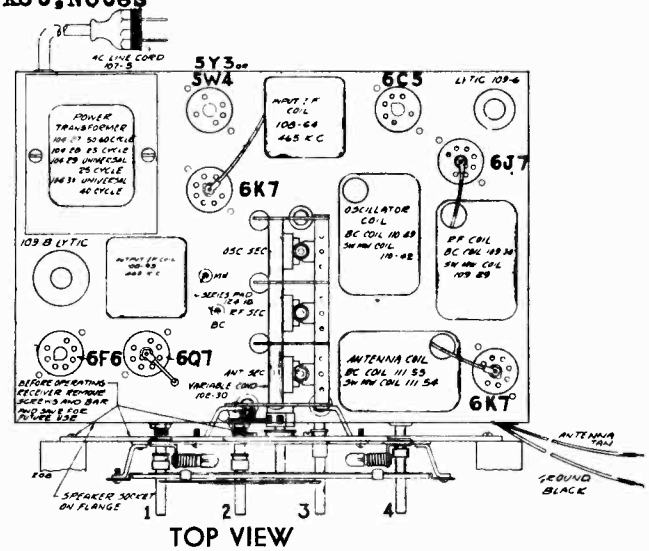
(Intermediate and Short Wave)—Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

IF at 465 KC.

BC Series pad at 600 KC Run 1 (5) Run 2 (3). Osc.(4), RF (6), Ant. (7) at 1400 KC.

SW Osc.(1), RF (8), Ant.(9) at 17MC

INT. (RUN 1)
RF (10), Ant.(11), Osc.(2) at 1800 KC.
(RUN 2)
RF (10), Ant.(5), Osc.(2) at 5 MC.



TOP VIEW

DESCRIPTION

The tube complement of this chassis is as follows:

1—Type 6K7 Remote cut-off pentode R.F. amplifier
1—Type 6J7—pentode first detector.
1—Type 6C5 Oscillator
1—Type 6K7 Remote cut-off pentode I.F. amplifier (465 K.C.)
1—Type 6Q7 duplex diode pentode second detector, A.V.C. and audio.
1—Type 6F6—pentode output amplifier.
1—Type 5Y3 or 5W4—high vacuum rectifier.

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

SERVICE NOTES

All voltages are to be measured with 119 volts on the primary of the power transformer.

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

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

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

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

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

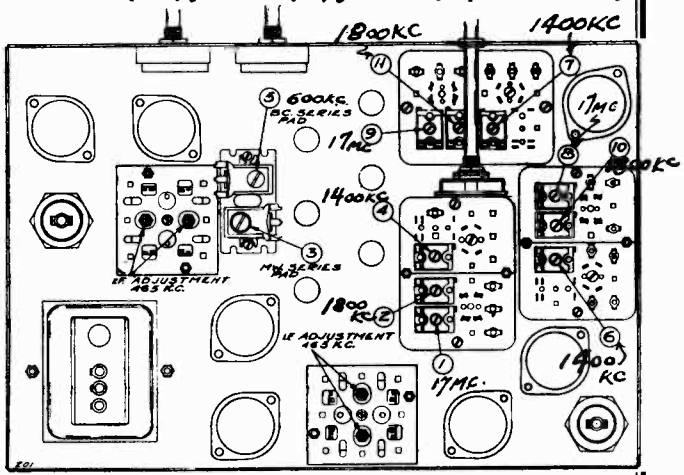
RUN 1 ONLY

NOTE: Chassis with serial numbers from 6C229300 to 6D242726 were equipped with a fuse in the primary circuit of the power transformer and supplied with a type 5Z4 rectifier tube.

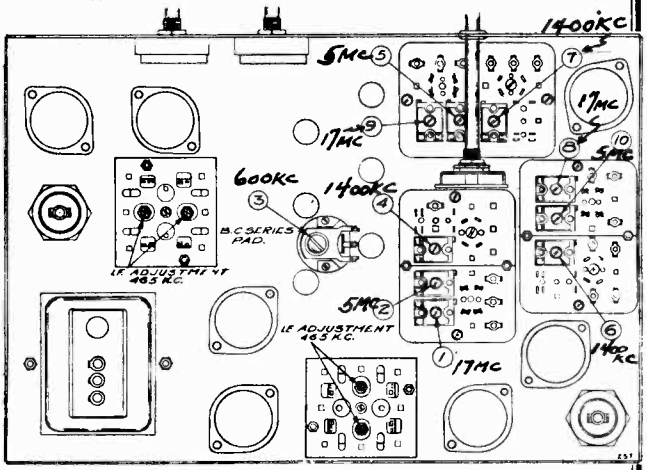
This fuse is made accessible for replacement by removing fuse cover located on back flange of chassis, replace only with a 2 ampere fuse. If replacement fuse blows out, check tubes, (particularly 5Z4 rectifier) circuit, repair or replace defective tubes or parts.

NEVER ATTEMPT TO REPLACE FUSE WITHOUT FIRST DISCONNECTING POWER.

NEVER REPLACE WITH FUSE OTHER THAN 2 AMPERE RATING.



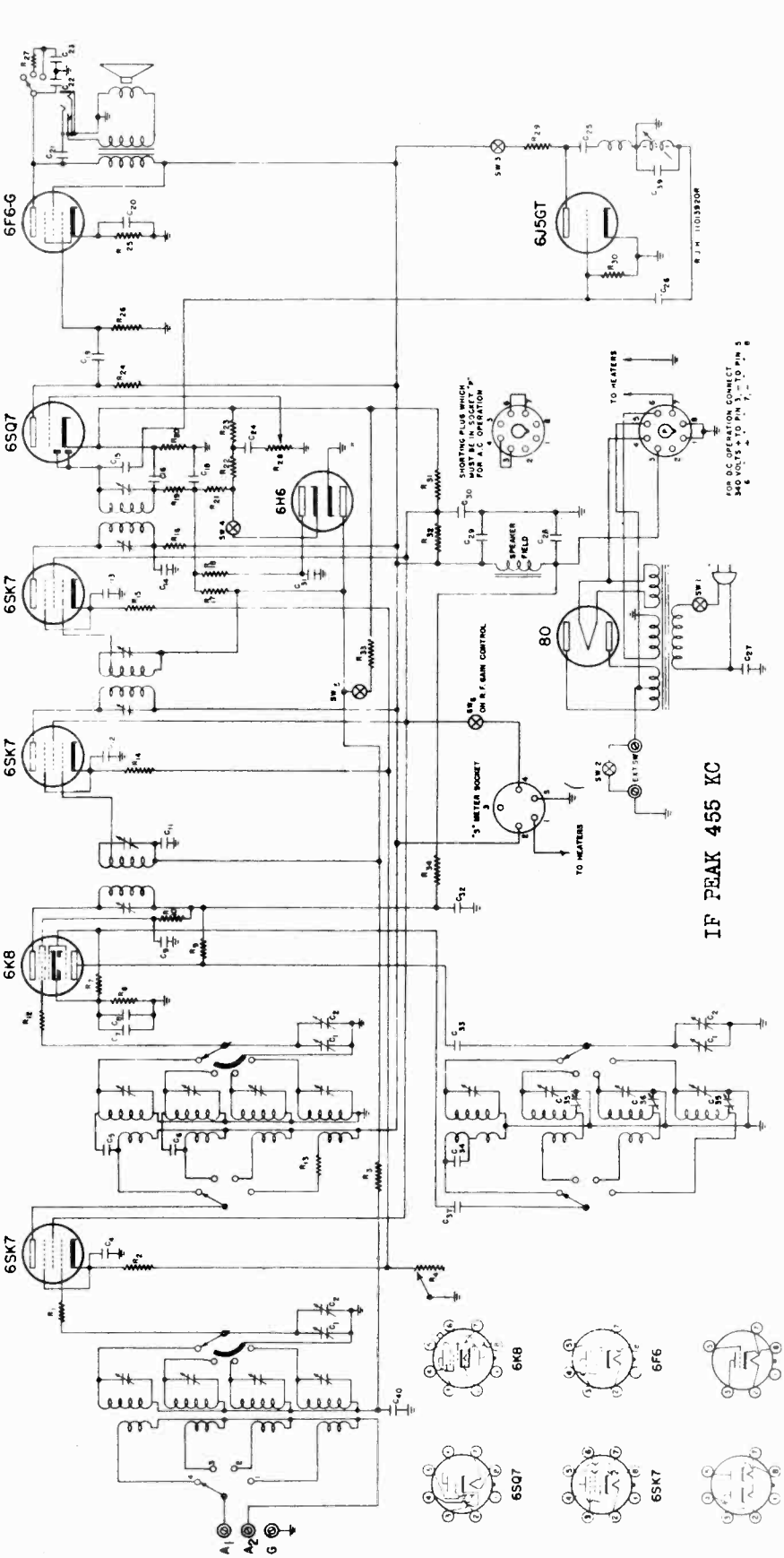
RUN 1 BOTTOM VIEW SHOWING TRIMMERS



RUN 2 BOTTOM VIEW SHOWING TRIMMERS

THE HALLICRAFTERS INC.

MODEL S20-R
Schematic, Notes



Unless otherwise specified the S20R Receiver operates on 100-125 volt 50-60 cycle current. A universal model is available on special order for operation on 110-250 volt, 25-60 cycle current.

SKY-CHAMPION MODEL - S20-R

TUBE LINE-UP

6SK7	R. F. Amplifier
6K8	1st Detector-Mixer H.F. Oscillator
6SK7	1st I.F. Amplifier
6SK7	2nd I.F. Amplifier
6SQ7	2nd Detector, A.V.C. 1st stage of audio
6F6G	2nd audio output stage
6H6	Automatic Noise Limiter
6J5GT	Beat Frequency Oscillator
80	Rectifier

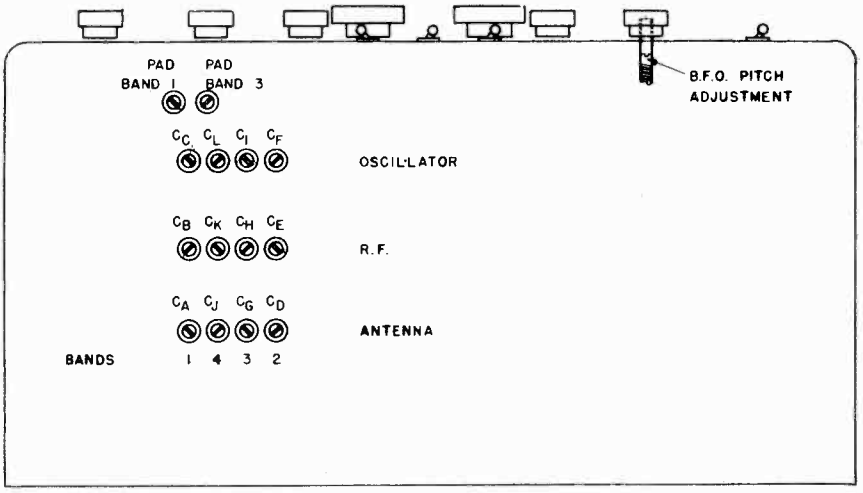
The Model S20R Receiver draws 65 watts at 115 volts 60 cycle alternating current.

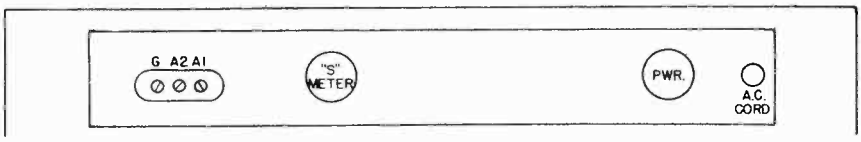
MODEL S20-R
Socket, Trimmers
Parts

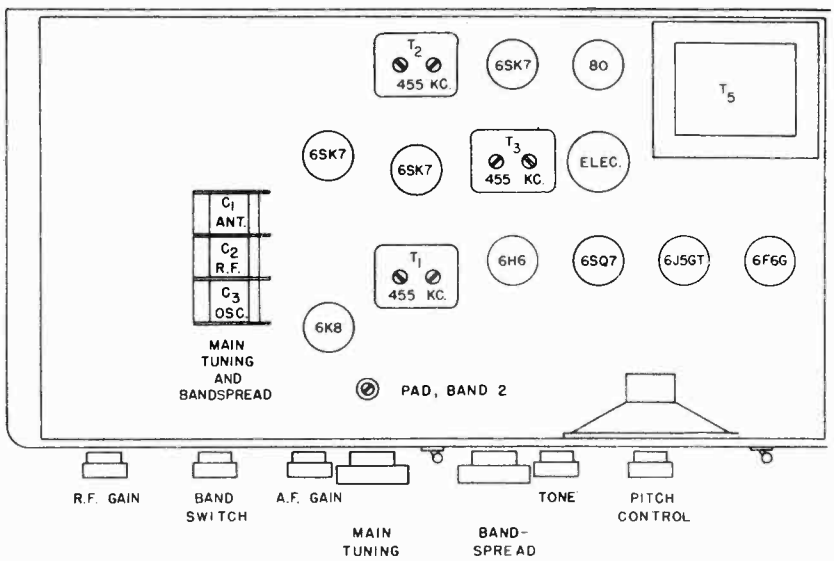
THE HALLICRAFTERS INC.

FREQUENCY RANGE

Band	Coverage
1	540 KC to 1,770 KC
2	1.72 MC to 5.4 MC
3	5.3 MC to 15.7 MC
4	15.2 MC to 44. MC







SWITCHES

SW1 - AC On-Off On Tone Control Switch
SW2 - Send Receive Switch
SW3 - BFO On-Off
SW4 - ANL On-Off
SW5 - AVC On-Off
SW6 - "S" Meter On R.F. Gain Control

RESISTORS

NO.	OHMS	WATTAGE
1	30	1/3
2	200	"
3	100,000	"
4	10,000	R.F. Gain
7	50,000	1/3
8	200	"
9	20,000	1
10	30,000	1
12	30	1/3
13	500	"
14	1,000	"
15	300	"
16	1,000	"
17	2,000,000	"
18	1,000,000	"
19	50,000	"
20	100	1/3
21	100,000	"
22	250,000	"
23	250,000	"
24	250,000	"
25	500	1
26	500,000	1/3
27	5,000	1
28	500,000	A.F. Gain
29	15,000	1-1/2
30	50,000	1/3
31	13,000	1-1/2
32	10,000	3
33	150	1/3
34	10,000	1-1/2

CONDENSERS

NO.	CAPACITY	VOLTAGE	TYPE
1	400 mmf	Main tuning	
2	27 "	Band Spread	
4	.05 mfd	200	
5	25 mmf		Ceramic
6	5 "		"
7	.002 mfd		Mica
8	.05 "	200	
9	.02 "	400	
11	.02 "	400	
12	.05 "	200	
13	.05 "	200	
14	.02 "	400	
15	2 mmf		Twisted Pair
16	50 "		Mica
18	50 "		"
19	.02 mfd	400	
20	10 "	25	Electrolytic
21	.01 "	400	
22	.01 "	800	
23	.02 mfd	600	
24	.02 "	400	
25	.01 "	400	
26	100 mmf		Mica
27	.01 mfd	800	
28	30 "	450	Electrolytic
29	10 "	400	"
30	.1 "	200	
31	.05 "	200	
32	10 "	450	Electrolytic
33	100 mmf		Ceramic
34	105 "		"
35	2400 and 450 "		Pad
36	1400 "		"
37	.002 mfd		Mica
39	.0005 "		"
40	.05 "	200	

THE HALLICRAFTERS INC.

MODEL S20-R
Alignment, Antenna Notes
MODEL SX-25
Antenna Notes

ANTENNA

The Sky Champion has an antenna input circuit which will allow the use of either a doublet or Marconi (inverted "L") antenna. The approximate antenna input impedance of the S20R is 400 ohms.

A very serviceable antenna will be the inverted "L", or Marconi type. This antenna should be approximately 75 feet long overall, including the lead-in to the set. Satisfactory operation of the Sky Champion is obtained throughout its tuning range with this type of antenna and because of that fact as well as its ease of construction it is highly recommended.

With the inverted "L" type of antenna A_2 must remain connected to G for best operation. While a ground connection is usually not necessary it might prove to be helpful in reducing noise. A cold water pipe or 6' foot rod driven in moist soil will be a very satisfactory ground when connected to the G terminal on the receiver. Connections to a radiator or gas piping are not recommended.

Should a doublet antenna be used it is suggested that a transmission line of 400 ohms value of impedance be constructed so that a most efficient transfer of energy is obtained. The commercially available all wave doublet antennas are usually provided with a coupling transformer which matches the transmission line to the receiver. This transformer connects to the A_1 and A_2 terminals on the antenna strip. The half-wave length-doublet antenna cut for a particular frequency can be computed by the following formula.

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

or for example, a half wave 20 meter or 14 megacycle antenna would be

$$\frac{463}{14} \text{ or } 33.7 \text{ feet long overall}$$

This type of antenna is broken in the center with an insulator and has the transmission line connected to each resulting quarter wave section at that point. This antenna is a very good performer, in a direction broadside to its length, only on the relatively narrow group of frequencies for which it was cut. It does not function well on harmonic frequencies.

When using either type of doublet antennas the transmission line should be connected to A_1 and A_2 binding posts. The wire connecting the A_2 to ground or G can be left connected if the performance of the receiver is improved.

ALIGNMENT PROCEDURE

455 KC, Intermediate-Frequency Alignment.
Have the controls set as follows:
AF and RF gain controls for maximum volume.
B.F.O. switch in the "OFF" position.
Set band switch to #2 band.
Set main dial to 2 megacycles, band spread to zero.

Remove 6K8 grid cap and connect the hot side of your 455 KC generator to this tube. Connect the ground terminal of the signal generator to the chassis of the receiver. Now feed a 455 KC signal into the receiver. Adjust all I.F. transformer trimmers on T1, T2, T3, for maximum gain.

R. F. ALIGNMENT

Re-connect the grid cap to the 6K8 tube. Connect the hot side of the generator to the A_1 antenna terminal on the rear of the chassis through a 400 ohm resistor. Be sure a jumper is connected to A_2 and G. Leave signal generator ground connected to the chassis of the receiver.

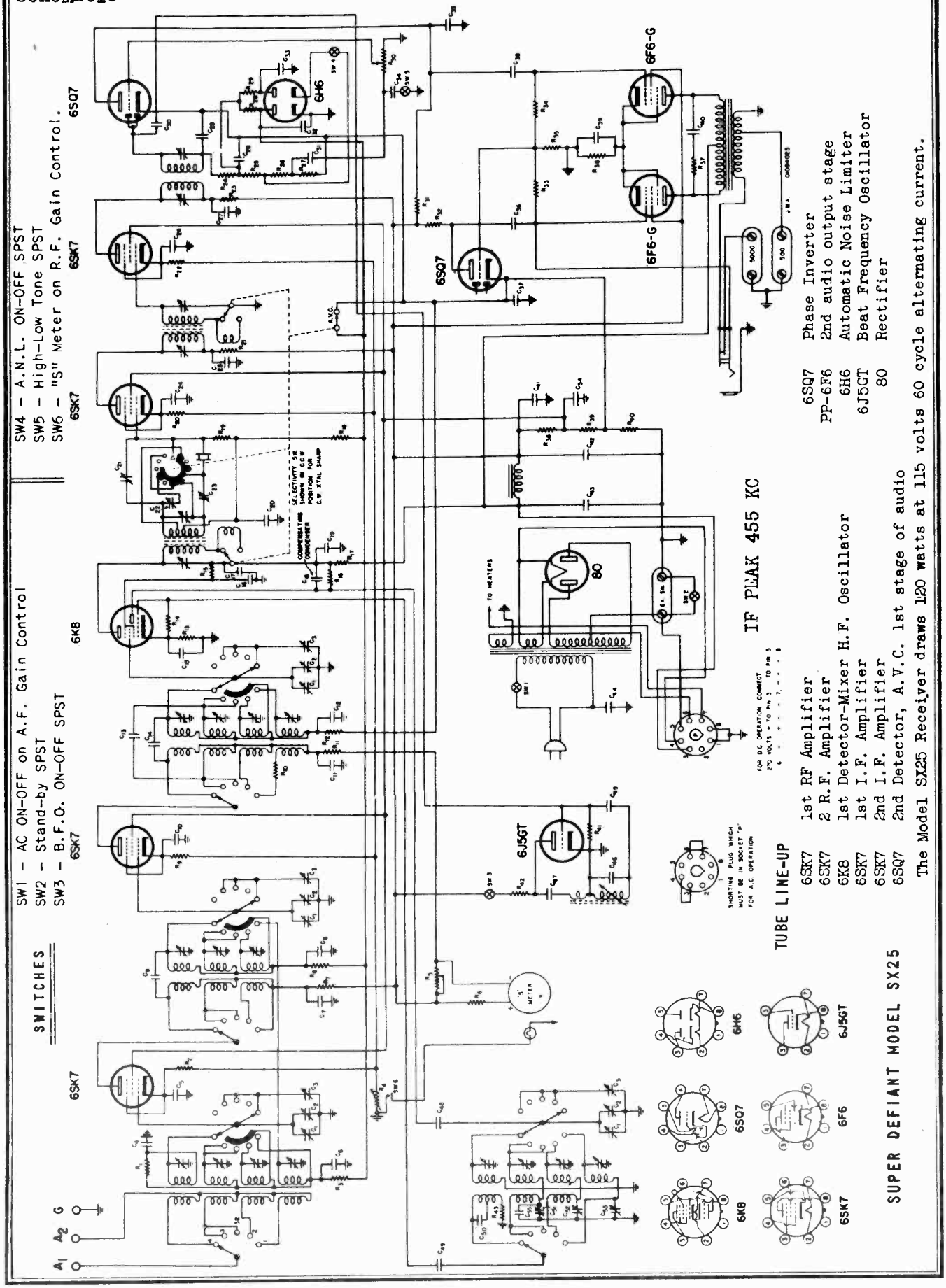
The location of the following trimmers and padders can be determined by referring to the top and bottom chassis views. All pad adjustments are for the low frequency end of each band while the trimmers are for the high frequency ends.

In order to get at the RF trimmers the guarantee card can be removed by placing a knife under the small snap fasteners holding it in place. So that most satisfactory adjustment of the trimmers and padders can be made, it is advisable to "Rock" the condenser gang across the signal being delivered by the generator until that particular circuit has been accurately peaked at all frequencies except 1400 KC and 4 MC.

Bands	Trim at	Pad at
1	1400 KC Adjust C_A C_B C_C	600 KC Adjust Pad Band 1
2	4 MC Adjust C_D C_E C_F	2 MC Adjust Pad Band 2 (Top Chassis)
3	14 MC Adjust C_G C_H C_I	7 MC Adjust Pad Band 3
4	34 MC Adjust C_J C_K C_L	17 MC No pad on this Band

MODEL SX-25, Super Defiant
Schematic

THE HALLICRAFTERS INC.



THE HALLICRAFTERS INC.

MODEL SX-25, Super Defiant
Alignment, Trimmers, Parts
Frequency Meter Tuning

FREQUENCY METER TUNING

Around the outer edge of the main tuning dial the amateur bands for which "Frequency Meter Tuning" is available are marked with the red numerals; 10 - 20 - 40 and 80. Set the red line beneath these numerals directly opposite the hair-line on the window and switch to the correct band. The band spread scale will indicate correct frequency within the limits of the accuracy of the setting and calibration.

The band spread dial of the SX25 Model is calibrated so that the operator may determine quite closely the frequency of the signal to which he is listening on the 10 to 80 meter amateur bands inclusive. The outer edge of this dial is marked off in 100 divisions for additional ease in logging and locating stations.

BAND 3B -- Special reference is called to this position of the Band Switch so that no confusion will be experienced. Band 3B is the same as Band 3 and is used in order to have the band spreading of the 40 meter band accomplished through approximately the same number of degrees on the Band Spread Scale as occupied by the other amateur bands for which calibration appears. When the Band Switch is placed in position 3B another section of the band spread condenser is paralleled in the circuit. Band 3 main scale calibration will read somewhat high when the Band Switch is set on 3B.

Note: The accuracy of the main dial calibration will hold only if the BAND SPREAD condenser is set at minimum capacity, or the position indicated by 100 on the Band Spread dial which has been approached by turning the Band Spread Knob in a clockwise direction, or to the right, as far as it will go.

CONDENSERS

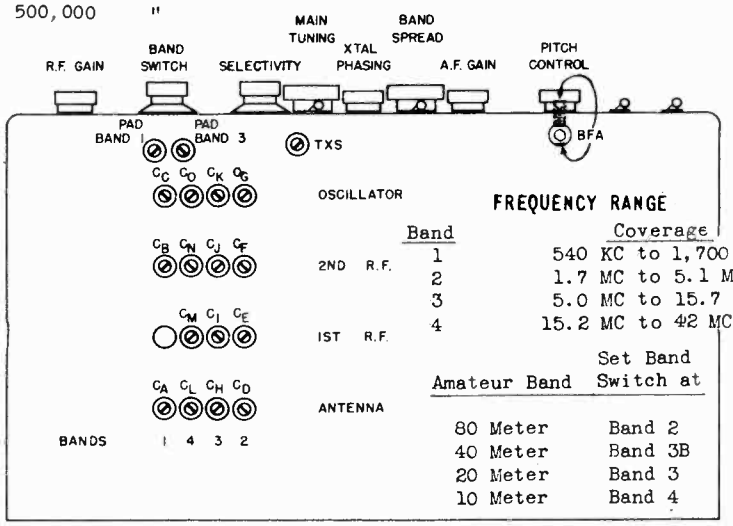
NO.	CAPACITY	VOLTAGE	TYPE
C1	Main Tuning Gang		
2	2 PL.Bd.Spr.Sec.		
3	5 " " " "		
4	.01 mfd	200	Paper
5	.05 mfd	200	
6	.05 mfd	200	Paper
7	.02 mfd	400	Paper
8	.05 mfd	200	Paper
9	35 mmfd		Ceramicon
10	.05 mfd	200	Paper
11	.02 mfd	400	Paper
12	.05 mfd	200	Paper
13	5 mmfd		Ceramicon
14	35 mmfd		Ceramicon
15	.05	200	
16	.05 mfd	400	Paper
17	.02 mfd	400	Paper
18	4.5 mmfd		Compensating
19	10 mfd	350	Electrolytic
20	.05 mfd	200	Paper
21	25 mmfd		Phasing
22	1.5 to 18 mmfd	"TXS"	Trimmer
23	1.5 to 18 mmfd		Trimmer
24	.05 mfd	200	Paper
25	.02 mfd	400	Paper
26	.05 mfd	200	Paper
27	.02 mfd	400	Paper
28	50 mmfd		Mica
29	100 mmfd		Mica
30	3 mmfd		Twisted Pair
31	.02 mfd	400	Paper
32	.02 mfd	400	Paper
33	.05 mfd	200	Paper
34	.002 mfd	1,600	Tubular Oil
35	250 mfd		Mica
36	.05 mfd	400	Paper
37	10 mfd	25	Electrolytic
38	.05 mfd	400	Paper
39	10 mfd	25	Electrolytic
40	.002 mfd	1,600	Tubular Oil
41	.1 mfd	400	Paper
42	10 mfd	350	Electrolytic
43	30 mfd	350	Electrolytic
44	.01 mfd	600	Paper
45	100 mmfd		Mica
46	500 mmfd		Mica
47	.02 mfd	400	Paper
48	105 mmfd		Ceramicon
49	.002 mfd		Mica
50	105 mmfd		Ceramicon
51	2300 mmfd		Dual Pad
52	1400 mmfd		Single Pad
53	450 mmfd		Dual Pad
54	.1 mfd	200	Paper
55	700 mmfd		Mica

RESISTORS

NO.	OHMS	WATTAGE
R1	100,000	1/3
2	400	"
3	100,000	"
4	10,000	R. F. Gain
5	500	S Meter
6	100	1/3
7	3,000	"
8	100,000	"
9	400	"
10	500	"
11	3,000	"
12	100,000	"
13	400	"
14	50,000	"
15	30,000	1
16	15,000	1
17	4,000	1
18	100,000	1/3
19	500,000	"
20	800	1/3
21	3,000	"
22	1,000	"
23	3,000	1/3
24	50,000	"
25	250,000	"
26	100,000	"
27	250,000	"
28	2,000,000	"
29	1,000,000	"
30	500,000	A.F. Gain
31	250,000	1/3
32	250,000	1/3
33	250,000	"
34	250,000	"
35	200,000	"
36	250	1
37	20,000	1
38	15,000	1
39	15,000	1
40	150	1/3
41	50,000	"
42	20,000	1
43	8	1/3

ANTENNA

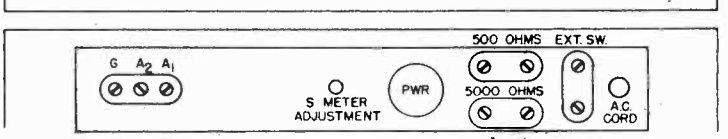
SEE ANTENNA DATA
FOR MODEL S20-R



FREQUENCY RANGE

Band	Coverage
1	540 KC to 1,700 KC
2	1.7 MC to 5.1 MC
3	5.0 MC to 15.7 MC
4	15.2 MC to 42 MC

Amateur Band	Set Band Switch at
80 Meter	Band 2
40 Meter	Band 3B
20 Meter	Band 3
10 Meter	Band 4



Bands	Trim at	Pad at
1	1500 KC Adjust C_A C_B C_C	600 KC Adjust Pad Band 1
2	14 MC Adjust C_H C_I C_J C_K	6 MC Adjust Pad Band 3
3	4 MC Adjust C_D C_E C_F C_G	1.8 MC Adjust Pad Band 2 (Top Chassis)
4	30 MC Adjust C_L C_M C_N C_O	1B MC No pad on this Band

MODEL SX-25 Super Defiant
Alignment Procedure, Notes

THE HALLICRAFTERS INC.

"S" METER

When the R.F. gain control is advanced until a switch is heard to operate, a light will appear behind the translucent scale of the meter itself. Only when this light is on will the meter indicate in "S" units. When so adjusted the meter can be used as a resonance indicator. With the R.F. gain control backed off from maximum the meter is still in the circuit but will not indicate carrier level accurately. On the rear apron of the chassis is the "S" meter adjustment screw. To set the "S" meter, disconnect the antenna and have the R.F. Gain Control on full and the selectivity switch in the "I.F. SHARP A.V.C. ON" position. Now, adjust this knurled knob until the meter reads zero. Reconnecting the antenna and tuning in a station will show its relative carrier intensity.

The 500 and 5000 ohm terminals are for connections to a loud speaker or other load of those impedance values. The matching SX25 speaker should be connected to the 5000 ohm strip. When headphones are plugged into the phone jack the 5000 ohm speaker connection is automatically disconnected.

The "EXT. SWITCH" terminal strip is for external switch provisions should the receiver be controlled by a remote switch or relay. The SEND-REC switch on the panel must be in the Send Position when an external relay is used for stand-by operation.

Unless otherwise specified the SX25 Receiver operates on 100-125 volt 50-60 cycle current. A universal model is available on special order for operation on 110-250 volt, 25-60 cycle current.

ALIGNMENT PROCEDURE

455 KC, Intermediate-Frequency Alignment.
Have the controls set as follows:
AF and RF gain controls for maximum volume.
B.F.O. switch in the "ON" position.
Set band switch to #2 band.
Set main dial to 2 megacycles, band spread to 100.
Selectivity switch in "AVC OFF" xtal phone position.

Remove the 6K8 tube grid cap. Connect a 1 megohm resistor between grid cap and grid of 6K8 tube. Now connect the hot side of the signal generator to the grid of the 6K8 tube through a .1 MFD condenser. Connect the ground terminal of the signal generator to the chassis of the receiver. Remove modulation from generator and feed a 455 KC signal into the receiver and set the pitch control to give a beat note of approximately 1000 cycles. Adjust all I.F. transformer trimmers for maximum gain with the exception of the secondary trimmer on transformer T1. Identified on top chassis view as T1S. In adjusting this trimmer it will be noted that the output reaches a maximum goes through a dip and then back to maximum again. Wobbulate the IF frequency and align to the dip between the two maximum points. A distinct change in the crystal note sounding like an apparent broadening of the crystal action will be noted when the correct adjustment has been reached. At this point in the alignment it is necessary to make an adjustment on the phasing control as follows: Tune the signal generator so that its signal will go through zero beat and then to the other side of zero beat until a signal of approximately 5000 cycles is heard in the speaker or headphones. Now carefully adjust the "PHASING CONTROL" until this signal is reduced in volume to a minimum. Reset the signal generator to its original frequency and recheck the adjustment of T1S. Now repeak carefully the other trimmers on I.F. transformers for maximum gain. Place the selectivity switch in the "CW. XTAL" position leaving all controls on the receiver as previously adjusted. Again wobbulate the frequency of the signal generator carefully through the very narrow range of the crystal peak. Adjust small trimmer through hole in the bottom plate marked "TXS" until the sharp crystal peak reaches maximum output. At this point the crystal is extremely sharp and maximum output is possible. If this setting gives too sharp crystal filter action this "TXS" trimmer can be adjusted counter-clockwise for broader crystal response to suit the operator.

B.F.O. ADJUSTMENT

In the center of the "PITCH CONTROL" shaft, after the knob has been removed, you will find a recessed screw for adjustment of the Beat Frequency Oscillator.

Before rotating this screw with a suitable screw-driver loosen the set screw on this shaft. This set screw can be reached through a hole in the bottom plate directly under the B.F.O. Assembly marked "BFA".

Now tune in a signal on the receiver with the BFO off. Exact resonance can be determined with the controls so adjusted that the "S" meter will indicate. After you have assured yourself that you have the signal properly tuned in place the selectivity switch in anyone of the three "AVC OFF" positions. Turn the BFO switch to the "ON" position. You now can adjust the screw in the center of the pitch control shaft until a beat note is heard. Tighten the set screw through the bottom plate, replace the knob and the BFO adjustment is completed.

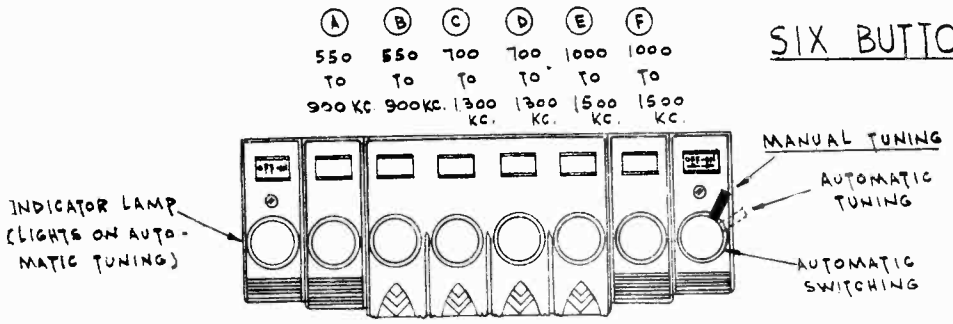
R. F. ALIGNMENT

Re-connect the grid cap to the 6K8 tube. Connect the hot side of the generator to the A_1 antenna terminal on the rear of the chassis. Be sure a jumper is connected to A_2 and G. Leave signal generator ground connected to the chassis of the receiver.

The location of the following trimmers and padders can be determined by referring to the top and bottom chassis views. All pad adjustments are for the low frequency end of each band while the trimmers are for the high frequency ends.

In order to get at the RF trimmers the guarantee card can be removed by placing a knife under the small snap fasteners holding it in place. So that most satisfactory adjustment of the trimmers and padders can be made, it is advisable to "Rock" the condenser gang across the signal being delivered by the generator until that particular circuit has been accurately peaked.

SIX BUTTON AUTOMATIC TUNER

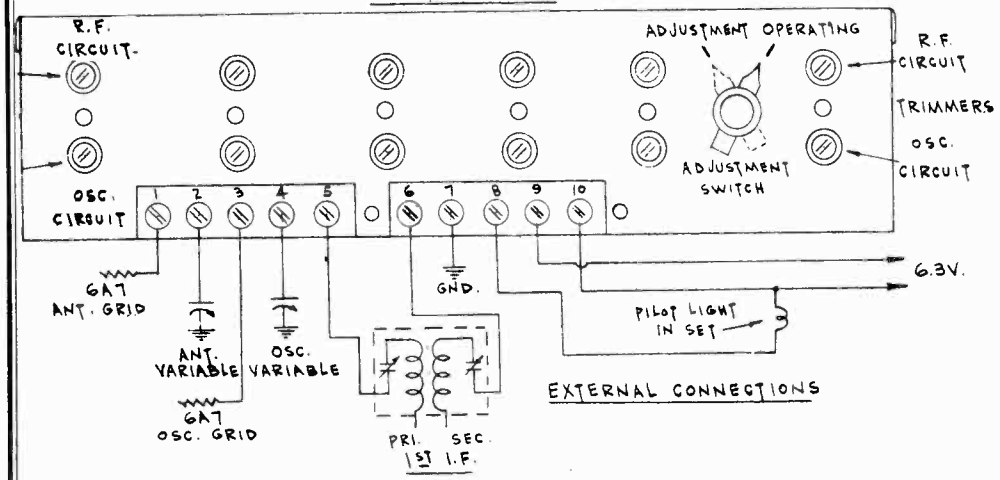


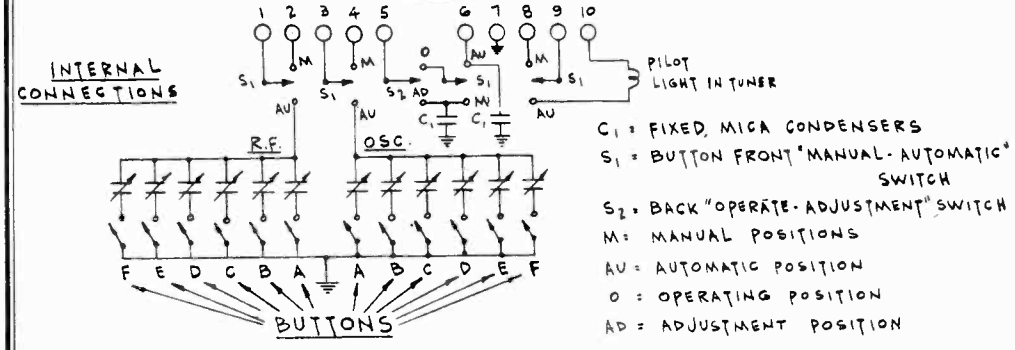
NOTE:-THE ADJUSTMENT SWITCH AND I.F. CONNECTIONS WERE ELIMINATED FROM THIS CIRCUIT, THEREFORE, OMIT ANYTHING PRETAINING TO THEM.

This push button assembly is for convenience and rapidity in the selection of favorite stations. Use preferably on strong local stations of good quality or the major networks. It in no way affects the operation of the normal manual tuning control, located below the dial which is used as heretofore, but is rather an adjunct for convenience.

F	E	D	C	B	A
1000 To 1500 KC.	1000 To 1500 KC.	700 To 1300 KC.	700 To 1300 KC.	550 To 900 KC.	550 To 900 KC.

REAR VIEW





C_1 = FIXED MICA CONDENSERS
S_1 = BUTTON FRONT "MANUAL-AUTOMATIC" SWITCH
S_2 = BACK "OPERATE-ADJUSTMENT" SWITCH
M = MANUAL POSITIONS
AU = AUTOMATIC POSITION
O = OPERATING POSITION
AD = ADJUSTMENT POSITION

CHOOSING THE STATIONS FOR AUTOMATIC TUNING Before any adjustment, select the six stations desired. Check their frequency and choose them so that two are from the low frequency end of the broadcast band, two are from the middle frequency and two are of the higher frequencies. Note that all trimmers in the back are marked with the range they cover. Be sure that each set of trimmers is used for only a station within its range.

In most cases this should accommodate the six most popular stations. Occasionally three stations might be desired in one frequency group. Since there are only two buttons available, the least important station will have to be tuned in by the manual control. The chosen stations should be lined up on the buttons in the order of their frequency with the lowest frequency on the left hand side, the next higher frequency to the right of it and so on until the highest frequency station is on the furthest right hand button.

Remove the two small wood screws and take off the front escutcheon. Insert in the order chosen and in the correct windows, the station call letters desired behind the little celluloid windows.

ADJUSTMENT FOR A PARTICULAR BUTTON Each button is wired up to a particular trimmer set in the back. The back adjustment is approximately directly behind its button. For example,- the last button nearest one end of the cabinet is adjusted by the last trimmer nearest that same end of the cabinet. Again, the third button from one end of the cabinet is adjusted by the third set of trimmer screws from that same end.

METHOD OF STATION ADJUSTMENT Having picked the station desired, the button for it and the trimmer screws behind the button, the next step is adjustment of the trimmers to actually receive the desired station. Turn back the switch to ADJUSTMENT position. Tune in manually the desired station and leave there. Turn the front automatic button switch to right or automatic position (left button will light up). Turn bottom screw of trimmer (oscillator) until desired station is heard. Switch back and forth between manual and automatic positions for easy identification of the desired station. Turn volume control up.

CAUTION - It is usually necessary at the beginning to arbitrarily screw top or RF trimmer in fairly tight to right. Sometimes a loud " guttering " or oscillation will be heard as lower, oscillator, screw is turned. When this occurs, tighten up (turn right, clockwise) the upper RF trimmer and then continue adjusting the oscillator until desired station is heard. The actual receiving of the station will always first have to be accomplished by the oscillator trimmer.

After the station is heard, tune upper trimmer for maximum response.

Repeat both trimmer adjustments for greater accuracy.

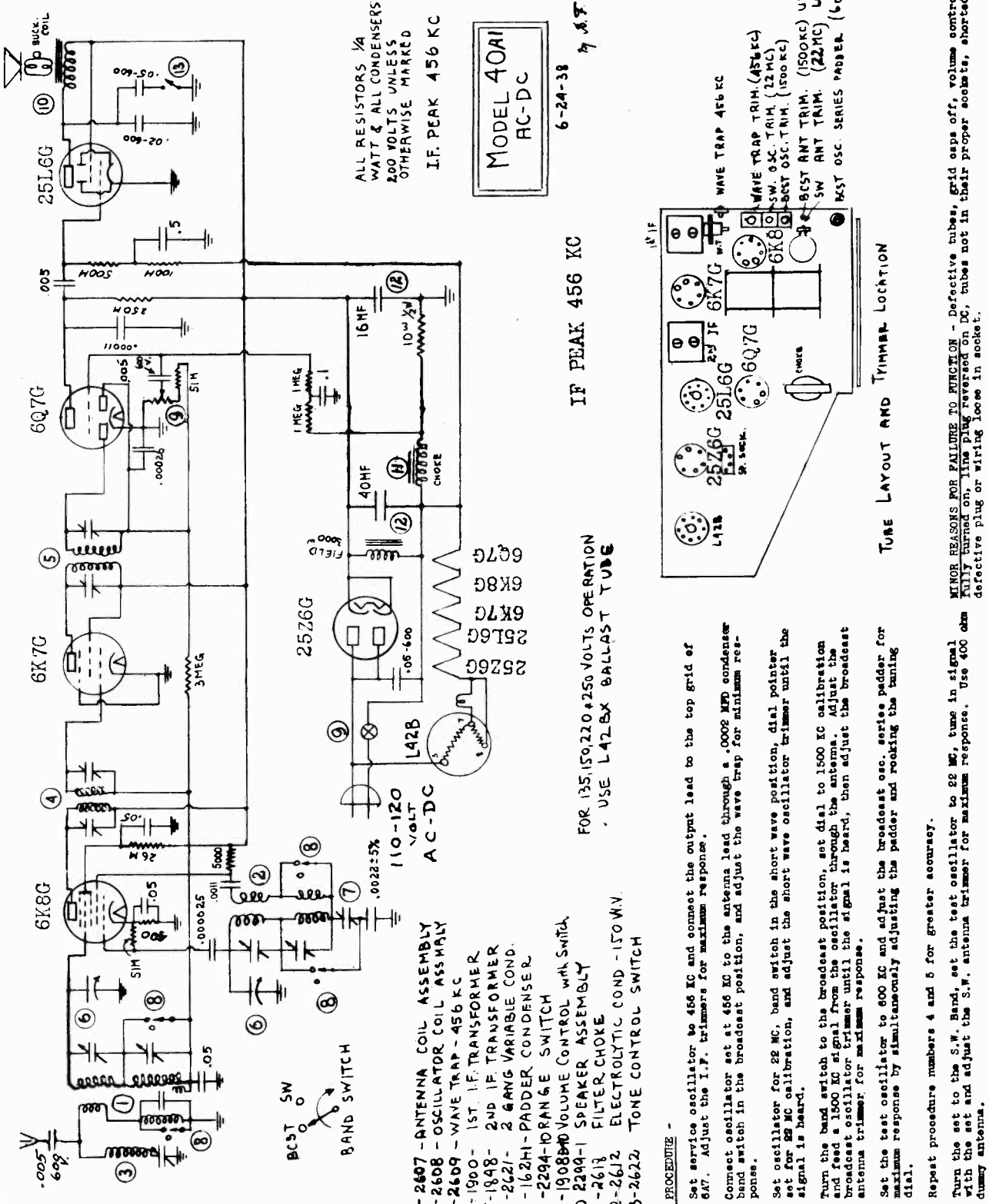
Continue to the next button and adjust its bottom and top trimmers behind it.

After all trimmers have been adjusted, turn back switch to OPERATION position and leave there in that position henceforth.

The receiver is now ready for use. The front button switch will instantly permit use of either automatic or manual tuning without any interaction or dependence of one upon the other

MODEL 40A1
Schematic, Socket
Alignment, Trimmers

HALSON RADIO & TELEVISION INC.



ALIGNMENT PROCEDURE -

(1) Set service oscillator to 456 KC and connect the output lead to the top grid of 6K7. Adjust the I.F. trimmers for maximum response.

(2) Connect oscillator set at 456 KC to the antenna lead through a .0002 MFD condenser. Set band switch in the broadcast position, and adjust the wave trap for minimum response.

(3) Set oscillator for 22 MC, band switch in the short wave position, dial pointer set for 22 MC calibration, and adjust the short wave oscillator trimmer until the signal is heard.

(4) Turn the band switch to the broadcast position, set dial to 1500 KC calibration and feed a 1500 KC signal from the oscillator through the antenna. Adjust the broadcast oscillator trimmer until the signal is heard, then adjust the broadcast antenna trimmer for maximum response.

(5) Set the test oscillator to 600 KC and adjust the broadcast osc. series padder for maximum response by simultaneously adjusting the padder and rocking the tuning dial.

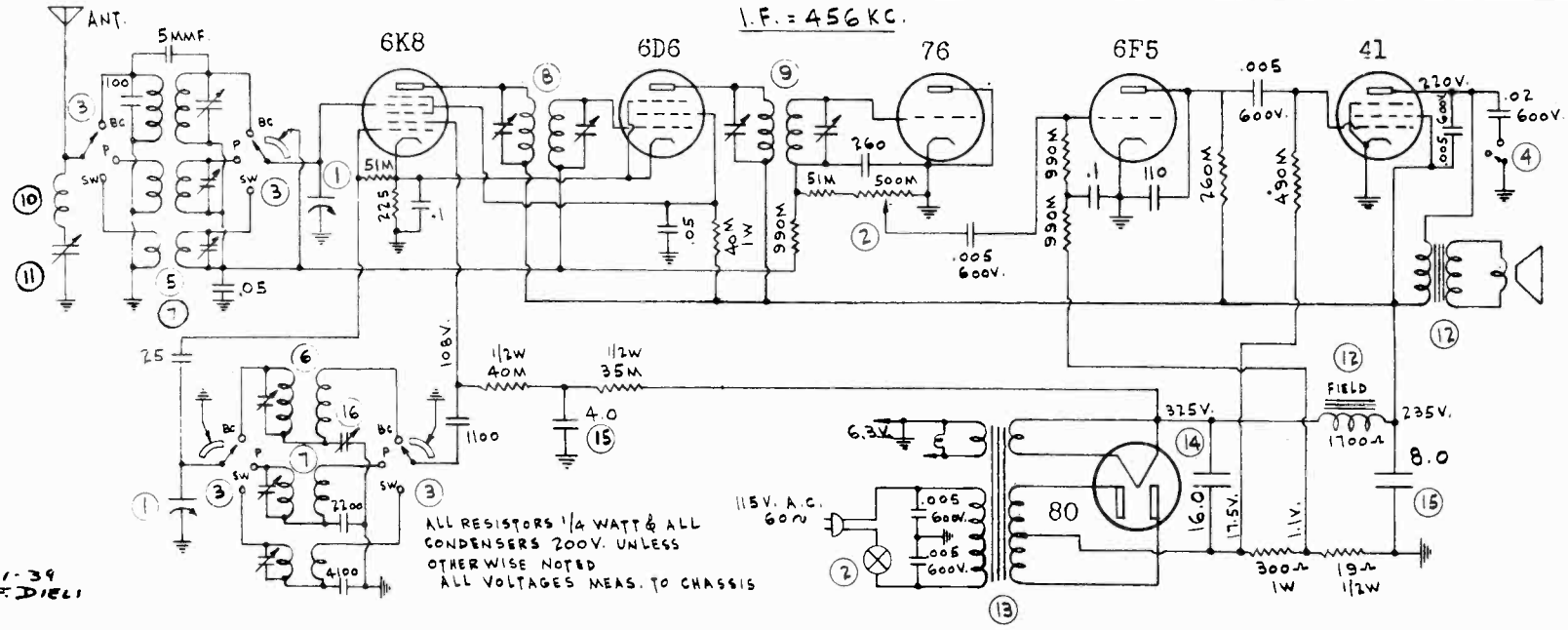
(6) Repeat procedure numbers 4 and 5 for greater accuracy.

(7) Turn the set to the S.W. Band, set the test oscillator to 22 MC, tune in signal with the set and adjust the S.W. antenna trimmer for maximum response. Use 400 ohm dummy antenna.

MINOR REASONS FOR FAILURE TO FUNCTION - Defective tubes, grid caps off, volume control not fully turned on, line plug reversed on DC, tubes not in their proper sockets, shorted aerial defective plug or wiring loose in socket.

HALSON RADIO & TELEVISION INC.

MODEL 40B2X
Schematic, Socket Alignment, Trimmers



1 = 2468 - VARIABLE CONDENSER 495 MMFD.
2 = 1508E - VOLUME CONTROL & SWITCH
3 = 2345A - RANGE SWITCH
4 = 1439C - TONE CONTROL SWITCH
5 = 2468 - ANTENNA COIL ASSEMBLY
6 = 2469 - OSCILLATOR " "
7 = 2490 - ANT.-OSC. " " (POLICE BAND)
8 = 1900L - I.F. TRANSFORMER - 1ST - 456 K.C.
9 = 1842P - " " - 2ND - "
10 = 2297-1 - WAVE TRAP COIL - 456 KC.
11 = 2337-1 - " " " TRIMMER
12 = 2272-1 - SPEAKER ASSEMBLY
13 = 2311 - POWER TRANSFORMER - 115V.-60~
14 = 2353 - ELECT. COND. (WET) 16MFD. 450V.
15 = 2308-2 - " " 8-4 MFD. 350V.
16 = 1621-1 PADDER COND. 200-685 MMFD.

ALIGNMENT PROCEDURE

(1) Set service oscillator to 456 kc and connect the output lead to the top grid of 6A7. Adjust trimmers for maximum response.

(2) Connect oscillator set at 456 kc to the antenna lead through a .0002 mfd. condenser; variable condenser closed, and adjust wave trap trimmer for minimum response. Band switch to be in broadcast position.

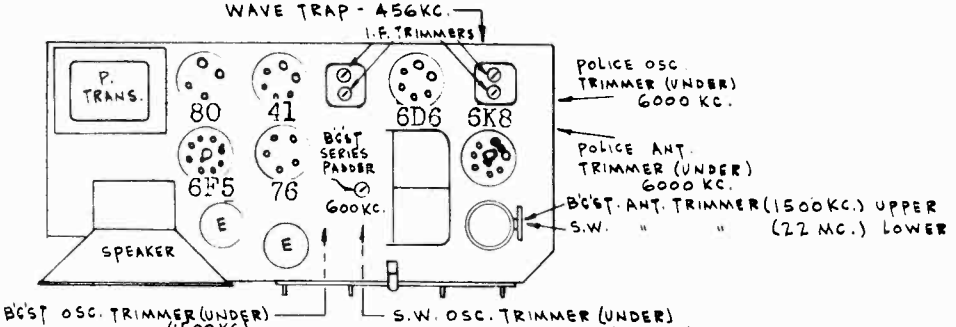
(3) Turn band selector to the short wave band, set the test oscillator to 22 mc and connect to antenna lead through 400 ohm dummy antenna. Set dial pointer to 22 mc and adjust short wave oscillator trimmer until signal is heard. Then adjust short wave antenna trimmer for maximum response.

(4) Turn band selector to police band, set test oscillator to 6000 kc, connect to antenna lead through 400 ohm dummy antenna. Set dial pointer to 6000 kc and adjust police oscillator trimmer until signal is heard. Then adjust broadcast antenna trimmer for maximum response.

(5) Turn band selector to broadcast band, set test oscillator to 1500 kc, connect to antenna lead through a .0002 mfd. condenser. Set dial at 1500 kc and adjust broadcast oscillator trimmer until signal is heard. Then adjust broadcast antenna trimmer for maximum response.

(6) With band selector in broadcast position, set test oscillator to 600 kc and adjust broadcast oscillator series padder for maximum response by simultaneously adjusting the padder and rocking the tuning dial.

(7) Repeat procedures 5 and 6 for greater accuracy.

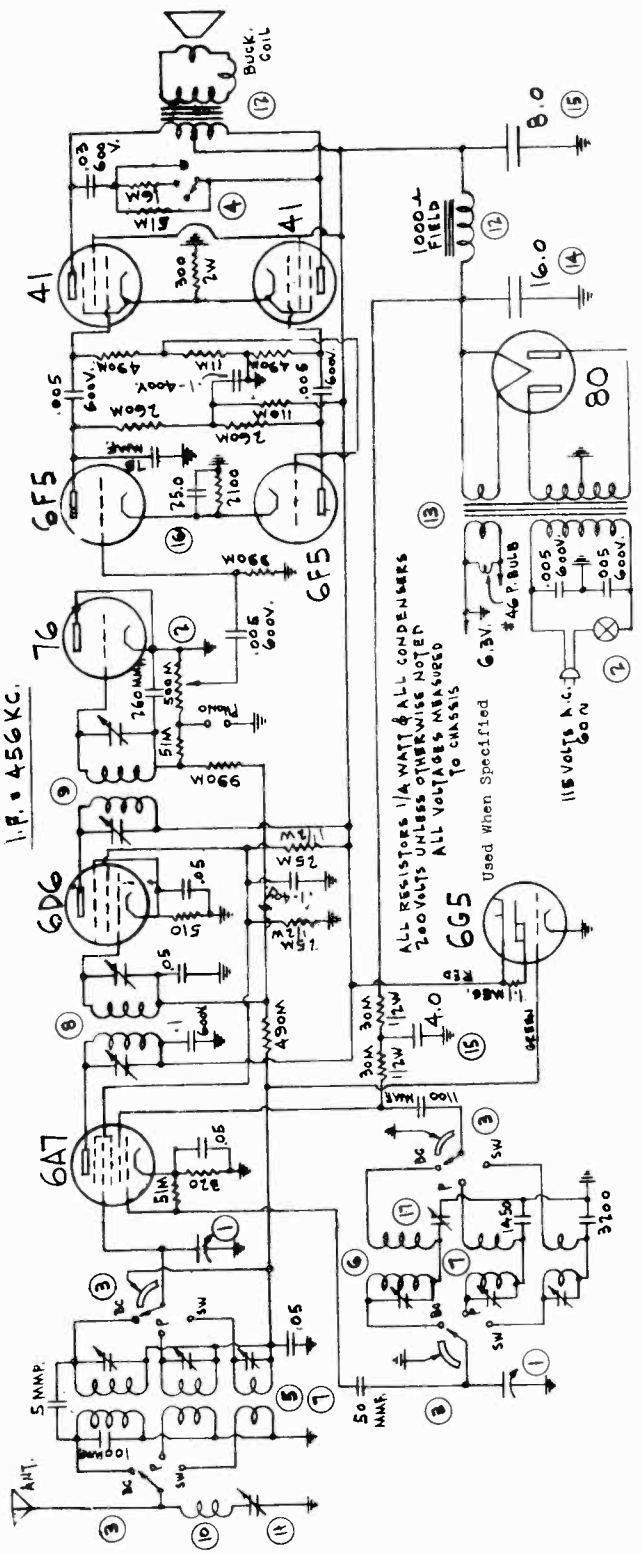


TUBE LAYOUT & TRIMMER LOCATIONS

MINOR REASONS FOR FAILURE TO FUNCTION - Defective tubes, grid caps off, volume control not fully turned on, tubes not in their proper sockets, shorted antenna, defective plug or wiring loose in socket.

MODEL 40C3X
Schematic, Socket Alignment, Trimmers

HALSON RADIO & TELEVISION INC.



1 = 2290-3 - VARIABLE CONDENSER - 496 MMFD.
2 = 1908D-3 - VOLUME CONTROL & SWITCH
3 = 2345 - RANGE SWITCH
4 = 2346 - TONE CONTROL SWITCH
5 = 2347 - ANTENNA COIL ASSEMBLY
6 = 2348 - OSCILLATOR " "
7 = 2009 - ANT.-OSC. " " (POLICE BAND)
8 = 2382-1 - I.F. TRANSFORMER - 1ST - 456 KC.
9 = 1848 - " " -2ND - " " "
10 = 2297-1 - WAVE TRAP COIL - 456 KC.
11 = 2337-1 - " " TRIMMER
12 = 2356-2- SPEAKER ASSEMBLY
13 = 2351-1 - POWER TRANSFORMER - 115V.-60~
14 = 2368 - ELECT. COND. (WET) 16 MFD - 450V.
15 = 2308-2 - " " 8-4 MFD. - 350V.
16 = 2369 - " " 25 MFD. - 15V.
17 = 1621-1 - PADDER COND. 200-685 MMFD.

ALIGNMENT PROCEDURE

(1) Set service oscillator to 456 kc and connect the output lead to the top grid of 6A7. Adjust trimmers for maximum response.

(2) Connect oscillator set at 456 kc to the antenna lead through a .0002 mfd. condenser; variable condenser closed, and adjust wave trap trimmer for minimum response. Band switch to be in broadcast position.

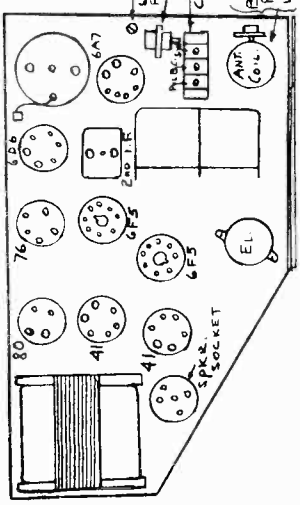
(3) Turn band selector to the short wave band, set the test oscillator to 22 mc and connect to antenna lead through 400 ohm dummy antenna. Set dial pointer to 22 mc and adjust short wave oscillator trimmer until signal is heard. Then adjust short wave antenna trimmer for maximum response.

(4) Turn band selector to police band, set test oscillator to 6000 kc, connect to antenna lead through 400 ohm dummy antenna. Set dial pointer to 6000 kc and adjust police oscillator trimmer until signal is heard. Then adjust police antenna trimmer for maximum response.

(5) Turn band selector to broadcast band, set test oscillator to 1500 kc, connect to antenna lead through a .0002 mfd. condenser. Set dial at 1500 kc and adjust broadcast oscillator trimmer until signal is heard. Then adjust broadcast antenna trimmer for maximum response.

(6) With band selector in broadcast position, set test oscillator to 600 kc and adjust broadcast oscillator series padder for maximum response by simultaneously adjusting the padder and rocking the tuning dial.

(7) Repeat procedures 5 and 6 for greater accuracy.



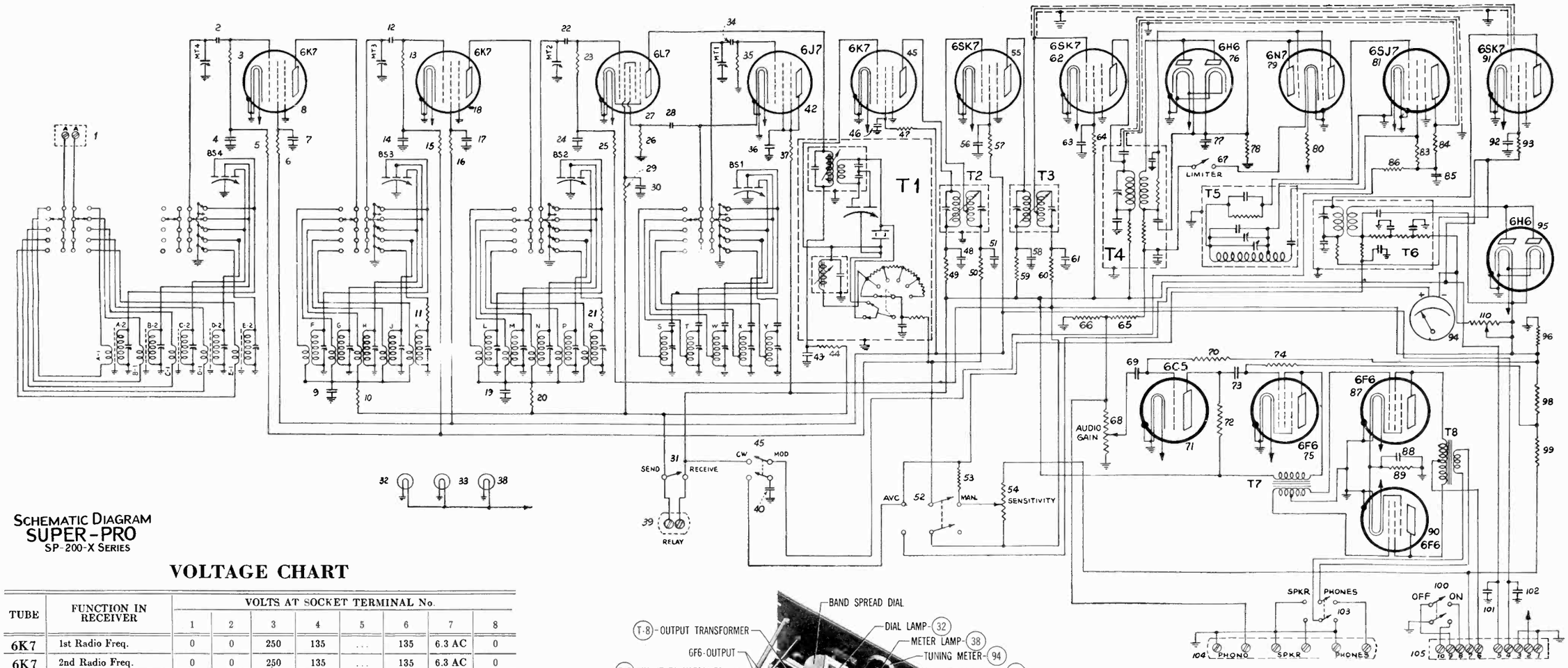
TUBE LAYOUT & TRIMMER LOCATION

F.J.D. 9-7-39

MINOR REASONS FOR FAILURE TO FUNCTION - Defective tubes, grid caps off, volume control not fully turned on, tubes not in their proper sockets, shorted antenna, defective plug or wiring loose in socket.

HAMMARLUND MFG. CO., INC.

MODELS SP210X,SPR210X,SP220X,SPR220X
SP210SX,SPR210SX,SP220SX,SPR220SX
SP210LX,SPR210LX,SP220LX,SPR220LX
Schematic,Voltage,Socket,Chassis
S.P.U. Schematic



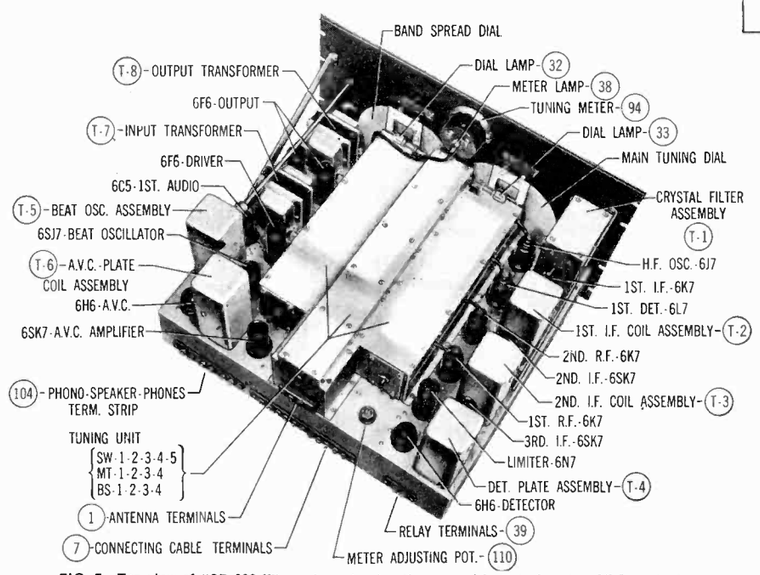


FIG. 7—Top view of "SP-200-X" receiver showing the general layout of parts. All important parts are labeled. Encircled numbers correspond to numbers appearing in the circuit diagram.

FIG. 12—Standard "Super-Pro" power supply for use with electro-dynamic speaker. Special models have filter choke connected in place of the speaker field.

SCHEMATIC DIAGRAM
SUPER-PRO
SP-200-X SERIES

VOLTAGE CHART

TUBE	FUNCTION IN RECEIVER	VOLTS AT SOCKET TERMINAL No.							
		1	2	3	4	5	6	7	8
6K7	1st Radio Freq.	0	0	250	135	...	135	6.3 AC	0
6K7	2nd Radio Freq.	0	0	250	135	...	135	6.3 AC	0
6L7	1st Detector	0	0	250	115	...	...	6.3 AC	0
6J7	High Freq. Oscillator	0	0	160	160	160	...	6.3 AC	...
6K7	1st I.F. Amplifier	0	0	250	135	0	...	6.3 AC	0
6SK7	2nd I.F. Amplifier	0	0	0	—43.	0	135	6.3 AC	25.
6SK7	3rd I.F. Amplifier	0	0	0	—2.	0	100	6.3 AC	240
6N7	Noise Limiter	0	0	+.4	—.2	—.2	+.4	4.0 AC	—.2
6H6	2nd Detector	0	0	—.2	+.4	—.2	...	6.3 AC	+.4
6SK7	AVC Amplifier	0	0	0	—2.	0	110	6.3 AC	240
6H6	AVC	0	0	—3.2	—3.4	—3.2	...	6.3 AC	—3.4
6SJ7	Beat Oscillator	0	0	0	—.1	0	40.	6.3 AC	155.
6C5	1st A.F. Amplifier	0	0	110	...	...	—3.3	6.3 AC	0
6F6	A.F. Driver	0	0	240	240	...	—20.	6.3 AC	0
6F6	P.P. A.F. Output	0	0	380	380	0	...	6.3 AC	38.
6F6	P.P. A.F. Output	0	0	380	380	0	...	6.3 AC	38.

Measurements were made on 115 volt AC line, with line voltage adjustment set at 115 volt tap. Set sensitivity and audio gain controls at minimum. A.V.C. Manual Switch should be in manual position. CW-MOD Switch in C.W. position, Limiter Switch in "On" position, and "Send-Receive" switch in receive position. D.C. readings were obtained with voltmeter having a resistance of 1000 ohms per volt. Use chassis as a common terminal. Voltages within ± 10% are satisfactory. The 6.3 volt A.C. filament reading is obtained between chassis and terminal No. 2 on strip. Terminal No. 10 on strip is blank except when used for battery operation.

CIRCUIT ARRANGEMENT

TWO-STAGE T.R.F. AMPLIFIER: For maximum sensitivity, high image ratio, and low noise level, the "SP-200" has two stages of tuned radio frequency amplification ahead of the mixer stage. The antenna input circuit is electrostatically shielded from

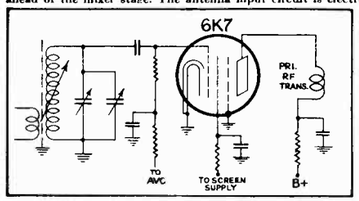


FIG. 2—Circuit diagram of first T.R.F. amplifier showing the electrostatic shield which reduces noise pickup.

the grid circuit of the first tube. This permits the use of low impedance transmission lines between the antenna and the receiver with a minimum of noise pick-up. When lines or lead-ins of the two wire type having an impedance of approximately 100 ohms are employed, no matching transformer is necessary. The input impedance of the receiver is approximately 112 ohms. The two tuned R.F. stages are employed on all bands covered by the receiver. Both inductive and capacitive trimming are employed in all signal frequency circuits.

OSCILLATOR AND MIXER: Two separate tubes are employed in the oscillator and mixer stages to improve stability and prevent pulling. There is a very respectable gain in the mixer stage which tends to minimize any noise that may be generated in the rest of the receiver. In fact, the gain in this stage is so great that the noise contributed by the following stages is negligible.

BAND SPREAD: In order to maintain relatively uniform band spread in the various tuning ranges of the receiver, every gang of the band spread condenser is subdivided into three sections. This allows the use of a proper sized condenser for maximum spread regardless of the position of the wave change switch. There are approximately 85 degrees spread for each of the important amateur bands, and there is also a corresponding spread over the other frequencies outside the amateur band.

CRYSTAL FILTER UNIT: The crystal filter used in the "Super-Pro" is an exclusive HAMMARLUND development and will be found only in HAMMARLUND receivers. This new filter has five ranges of selectivity varying from broad for phone reception, to knife-edge selectivity for single signal code reception. There are three positions for voice reception, and two for C.W. telegraph. The output of the filter is relatively constant over the entire selectivity range and has, therefore, little effect on "S"

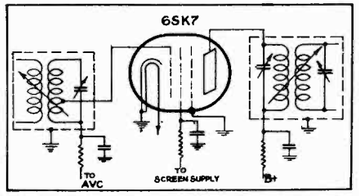


FIG. 3—Typical I.F. amplifier circuit with variable selectivity characteristics. Each circuit has isolating resistor and condenser to assure stability.

meter readings. Selectivity in the crystal filter circuit is not varied by detuning the load circuit. All circuits remain exactly in tune and selectivity is varied by changing the "Q" of the load circuit. This, together with the balanced phasing condenser, eliminates interlocking of controls and changes in filter gain when the selectivity is varied. Every precaution has been taken to effectively shield all circuits so that there is no feed-back or instability to impair the performance on even the highest frequencies. Stability is further insured by employing isolating resistor networks in every circuit that offers the slightest path for feed-back.

I.F. AMPLIFIER: There are three I.F. amplifier stages in the "SP-200." This elaborate amplifier is required in order to obtain a very high degree of selectivity. Special transformers are employed to hold down the gain per stage in order to maintain a high degree of selectivity and maximum stability. The band width of the I.F. amplifier is controlled by a cam arrangement which varies the coupling in two of the I.F. transformers. The I.F. channel is variable from 16 kc. down to 3 kc. with the crystal filter out of the circuit. The crystal filter, when in the circuit, is variable down to better than 100 cycles. Thus, full range selectivity is available. This wide degree of variable selectivity permits the operator to select the band width providing highest quality reproduction with a minimum of interference. In the "SP-200," the band width can be adjusted to suit operating conditions.

AVC SYSTEM: The automatic volume control system in the "SP-200" is extremely efficient. Both R.F. stages and the first two I.F. stages are automatically controlled by the incoming signal in order to compensate for variation in signal strength due to fading. This system is very fast in operation and will hold a rapidly fading signal to a relatively constant output. Special amplifier and rectifier stages are employed in order to obtain maximum efficiency.

BEAT FREQUENCY OSCILLATOR: The beat frequency oscillator circuit is designed to effectively heterodyne signals of various magnitudes. This oscillator is of the electron coupled type and is thoroughly isolated from the rest of the receiver. Careful selection of circuit values has resulted in excellent stability.

SECOND DETECTOR: A 6H6 connected in a half-wave rectifier circuit is employed for the second detector. The proper selection of circuit values in this circuit has resulted in a minimum of distortion. This circuit is more or less conventional and complete technical details are available by referring to the diagram.

NOISE LIMITER: The noise limiter in the "SP-200" is the latest development in audio peak limiting devices. It is designed to work with or without the AVC system and will follow variations in incoming signal strength. It is automatic and needs no adjustment. The limiter is designed to cut off interference of the automobile ignition nature at a point equal to approximately 100% modulation of the carrier of the signal being received. This provides for reception of 100% modulated signals without seriously affecting the quality of the voice or music. It must be remembered that this limiter will only limit interference of very short pulse duration. Such interference, as caused by auto ignition systems and similar disturbances will be reduced to a negligible quantity.

A.F. AMPLIFIER: The audio frequency channel of the series 200 "Super-Pro," is designed for high quality reproduction. The first stage is a 6C5 triode voltage amplifier. The second stage is a single 6F6 triode connected and used as a driver for the output amplifier which is a pair of 6F6's operated in push-pull, class AB. The rated output of this amplifier is approximately 14 watts. The fine quality of the A.F. amplifier in the "Super Pro" is particularly apparent when the band width control is set in the wide position. There is no tone control in this amplifier and none is needed. The A.F. portion of the "Super-Pro" will respond equally well to both low and high frequencies. Attenuation of the higher frequencies is accomplished by narrowing the I.F. band width. In this manner, the band width control serves to control tone.

POWER SUPPLY: The power supply for the "SP-200" is an extra heavy duty unit designed to furnish filament plate and grid bias voltages. The power supply is a separate unit confiected to the receiver by a flexible cable. Being a separate unit, the power supply introduces a minimum of hum in the receiver and also reduces the overall temperature rise of the receiver, and thus permits better stability. The high voltage rectifier in the power supply is a 5Z3 connected in a full wave circuit with a two-section filter consisting of 32 mf. capacity and a 15 henry filter choke. The field of the speaker serves as a second filter choke in standard model receivers. In special models, a choke is mounted in the power supply to take the place of the speaker field. Grid bias for the entire receiver is supplied by an 80 rectifier tube operating from a tap on the high

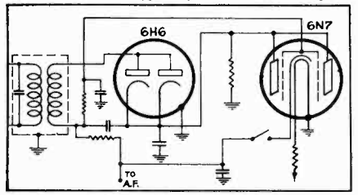


FIG. 4—"Super-Pro" noise limiter designed to reduce automobile ignition interference and other disturbances having similar characteristics.

voltage secondary. The C-Bias supply also has a multi-section filter consisting of three 8 mf. condensers, and three resistors. The primary of the standard power supply has three taps for operation on 105, 115, and 125 volt power lines. A fuse is also provided to guard against damage in cases of overload.

CALIBRATION: The main tuning dial of the "Super-Pro" is calibrated for all frequencies covered by the receiver. In the process of manufacture, every effort is made to maintain accuracy and, as a result, the accuracy of the calibration is guaranteed to be within ½ of 1% of the highest frequency of the band in use. When using the calibrated dial, it should be remembered that the figures are intended as a tuning guide and not for frequency measuring purposes.

"S" METER: The "S" meter in the "Super-Pro" was designed to provide greatest satisfaction to the operator. It is, in no way, limited by fixed, factory-made adjustments. A variable control on the rear of the chassis allows the operator to set the maximum reading of the meter to conform with his particular system of reporting signal strength in "S" numbers. The meter can be adjusted to read "S-9" on any signal from 10 to 10,000 microvolts. It is adjusted at the factory to indicate "S-9" on a 25 microvolt signal, but as pointed out above, this can readily be changed. Another feature is the centrally located scale. This is much more convenient than a scale that starts at the extreme left of the meter dial, and brings the indicating pointer well out in the clear. Special meter design has also eliminated the possibility of damage due to an extremely strong signal.

SELECTIVITY

The selectivity curves shown are representative curves made on a sample receiver and will hold reasonably true for all models. These curves were taken with the signal generator operating at the intermediate frequency and these curves will maintain throughout the entire range of the receiver, except at the very low frequency end of the broadcast band where the R.F. selectivity has a very slight narrowing effect. The selectivity of the "Super-Pro" is divided into two distinct ranges. In Fig. 5, appear the wide band curves. These curves were made at 4 different positions of the band width control. However, the actual selectivity obtainable is continuously variable between curves 3 and 16. Particular attention should be paid to the steepness of the sides of these curves. They are relatively straight and do not have the usual flare at the outer limits. This means that there will be less background interference from stations operating either higher or lower in frequency than the station being received. The advantage of having continuously variable selectivity over relatively wide limits in a receiver is readily apparent when one considers that the operator has absolute control and can adjust the receiver to compensate for almost any degree of interference that may be present. For example, when interference is not serious, the band width control can be set to the widest position and permit high quality reproduction of either voice or music. In other cases where interference is present, the band width control can be adjusted to the point where selectivity is just sufficient to eliminate interference. This adjustment provides maximum fidelity with a minimum of interference. It also permits the operator to utilize the extreme sensitivity of the "Super-Pro." Even in crowded bands, the selectivity can be adjusted to a point where interference is not bothersome and the sensitivity can be turned up to provide reception of extremely weak signals with marked clarity.

In Fig. 6, the variable selectivity crystal filter curves are illustrated. It will be noticed that the crystal filter fills in the gap very nicely between position "3" of the band width control and what would normally be maximum crystal selectivity for code reception. This variable selectivity crystal filter is an exclusive HAMMARLUND development and will be found only in a HAMMARLUND receiver. The crystal filter has five ranges of selectivity. The first three are intended for phone reception. The widest position of these, however, will permit good quality music under conditions where interference would, in most cases, make reception impossible. Positions four and five are for CW code reception and provide the usual single signal response.

SENSITIVITY

The sensitivity of the "Super-Pro" is exceptional and, in the majority of cases, limited only by noise picked up by the antenna system. Internal receiver noise has been held down to an extremely low value so that the limiting factors in the receiver itself are the noises originating in the first tube and its associated tuned circuit. The gain in the R.F. amplifier is adjusted so as to reduce the effective noise originating in the following tubes and tuned circuits. The result of this proper circuit design is a very

favorable signal-to-noise ratio on even very weak signals. Since sensitivity depends, to a great extent, upon overall noise level, the variable selectivity characteristics of the "Super-Pro" becomes doubly important, for, by narrowing the band width, noise can be reduced and thus better sensitivity is available.

PERFORMANCE

The "Super-Pro" is available to cover several frequency ranges. Such information as is given in this book will pertain to all models. The two standard models have the following tuning ranges:

SP-200	SP-200-S
540 – 1160 kc.	1250 – 2500 kc.
1160 – 2500 kc.	2.5 – 5 mc.
2.5 – 5 mc.	5 – 10 mc.
5 – 10 mc.	10 – 20 mc.
10 – 20 mc.	20 – 40 mc.

Other models are available to cover low frequencies in the neighborhood of 150 to 400 kc. as well as certain higher frequencies. In the two standard models, there is a convenient overlap of bands. The main tuning dial is calibrated in megacycles for the three high frequency bands, and in kilocycles for the two low frequency bands. Every effort is made to maintain a high degree of accuracy in calibrating the receiver and it is guaranteed to be at least ½ of 1% of the highest frequency of the band in use.

The sensitivity of the new "Super-Pro" is truly remarkable. By careful circuit design, the overall set noise has been held down to a minimum, thus making it possible to receive extremely weak signals with favorable signal-to-noise ratio. The variable selectivity feature of the "Super-Pro" permits the operator to make full use of the extreme sensitivity even under most severe conditions of interference. Selectivity can be adjusted to cut down interference within very close limits. The advantages of variable selectivity are tremendous when one considers that conditions of interference are not always the same. Under certain conditions, it may be possible to use quite a wide band width and thus enjoy improved tone, as well as easier tuning. Under other conditions, where interference is quite bad, the band width can be narrowed just enough to eliminate interference and in that case, the best possible fidelity that can be obtained without too much interference, is available. In a case where there is practically no interference from other stations, the band width can be adjusted to its widest point and high fidelity reception can be enjoyed.

AVC action in the "Super-Pro" is very efficient. Actual measurements on a sample receiver prove that a very great change in input is required to produce a 2 to 1 change in output. This means that rapidly fading signals can be held to a relatively constant output.

Images (two-spot tuning) on the "Super-Pro" have been eliminated, except in extremely rare cases. The average image ratio will be found to be in the neighborhood of 175,000 to 1 at 1 mc.; 65,000 to 1 at 2 mc.; 34,000 to 1 at 3.5 mc.; 10,000 to 1 at 7 mc.; 1,900 to 1 at 14 mc.; and 150 to 1 at 28 mc.

The audio frequency amplifier in the "Super-Pro" has a rated output of approximately 14 watts. It is capable of excellent quality reproduction. It will be found that the available output power is greatly in excess of that required when the receiver is used for communication purposes. Greatest intelligibility will be obtained on weak signals when the audio gain is kept down, not because of any amplifier limitation, but because the overall noise level will be too great a shock to the ear and make it difficult to follow the desired signal.

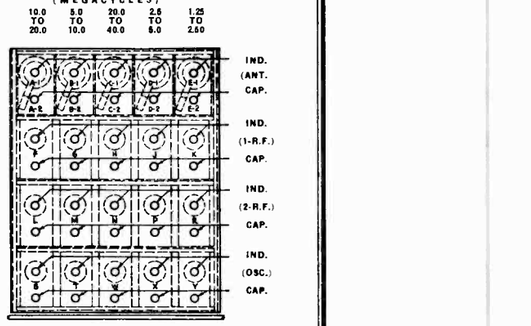
OPERATION

Although the "Super-Pro" is a highly technical piece of apparatus, with quite a large number of controls, it is relatively easy to operate. There are 15 controls on the panel. However, they are not all used at the same time. The number of controls necessary for operation will depend on the type of service for which the receiver is being used. The major controls are the band switch, main tuning, band spread, and audio gain. The remaining controls are brought into play as conditions demand their use. Assuming that the speaker, power supply and antenna have been connected according to instructions, the various controls should be set in the following positions: crystal selectivity, off; "phasing" on zero; "band width" on 6; "limiter," off; switch under the limiter control in "AVC" position; "sensitivity," maximum (10); band spread dial on 100; "signal" switch, on "modulation"; the toggle switch just beneath, should be set on "Speaker"; "audio gain" on 6; send-receive switch on "Rec."; beat oscillator on zero. Then, turn the main switch in the center of the panel marked "On-and-Off" to the on position. This puts the entire receiver in operation. The band switch should be adjusted to either the broadcast band or the next highest frequency band. This should permit reception of local stations and allow the operator to familiarize himself with various adjustments. The band width control should be adjusted to provide the most pleasing tone when there is no serious interference. Otherwise, it should be adjusted to the point providing best tone quality with a minimum of interference. The beat oscillator is turned on when the "signal" switch is in the "CW" position. The beat oscillator control varies the pitch of the heterodyne. This feature is used for code reception and for locating weak signals. The "limiter" control turns the noise limiter on and off. The noise limiter is most valuable on the shorter waves where automobile ignition interference is more serious. So far, we have considered the receiver adjustments necessary for phone reception. For code reception, the "AVC-Man." control should be set in the "Man." position and the sensitivity control turned down to provide proper sensitivity. On strong signals, this control should not be turned all the way on because there will be a tendency to overload the receiver. Volume is controlled with the "audio gain" control and not with the "sensitivity" control. The crystal filter is very effective and easy to operate because of its excellent stability. The first three positions are generally used for phone reception and will serve for code reception where interference is not severe. The last two positions are for code reception exclusively. When the crystal selectivity control is adjusted for optimum selectivity, the phasing control should be used to reject heterodyne interference or "whistle." The receiver can be temporarily silenced by turning the "Send-Receive" switch in the "Send" position. This allows the receiver to be ready for instant service and is more commonly called the "stand by switch" when the receiver is used for communication purposes. All tuning can be done with the main tuning control. In this case, the band spread dial is left at 100. The band spread dial operates so as to spread out a narrow band of frequencies in the neighborhood of the frequency at which the main dial is set. The band spread dial works continuously throughout the entire range of the receiver except on the lowest frequency bands. In this manner, many short wave broadcast or amateur bands can be spread out over the band spread dial for easy tuning. The wave ranges of the receiver are so arranged that when the band spread and main dial are set for 80 meter amateur band reception the 40-meter band as well as the other amateur bands will appear on the band spread dial merely by turning the wave change switch. This is a great convenience and eliminates the necessity for searching each time for the amateur band which is to be covered by the band spread dial. For ear-phone operation, ear-phones are plugged into the terminal strip so marked on the rear of the chassis, and a switch on the front panel changes the receiver from ear-phone to loud speaker operation

The next feature for consideration is the "S" Meter. This is used to judge relative signal levels and also as a tuning indicator. Maximum reading of the meter always indicates that the receiver is in exact tune with the station. The meter is calibrated in "S" units from 1 to 9, and the relative reading on any particular signal can be changed by re-setting the meter control adjustment which is located toward the rear of the chassis. The chassis drawing shows the position of this adjustment. A suggested method of adjusting the meter would be to tune in a signal of moderate strength. If you are accustomed to calling this signal, "S-8" or "S-9," then adjust the meter control so that it indicates that value. This adjustable meter arrangement allows the operator to provide reports consistent with his usual system of reporting. No amount of explaining will teach the operator exactly how to control a receiver. Experience is absolutely necessary in order to obtain best results.

H.F. OSCILLATOR AND R.F. ALIGNMENT

Connect the output of the test oscillator to the "A.A." terminal strip. Connect the output meter to the speaker voice coil terminals. The controls on the front panel should be set as follows: (1) Band Change Switch on 540–1160 K.C. (2) Main Tuning Dial on 1100 K.C. (3) Band Spread Dial on 100. (4) Sensitivity Control "To Produce appropriate output meter reading." (5) Audio Gain Control "Full On." (6) C.W.-MOD switch on "MOD." (7) A.V.C.-MANUAL Switch on "MANUAL." (8) SEND-RECEIVE Switch on "RECEIVE." (9) "Phones-Speaker" Switch on "PHONES."



Turn the receiver over, bottom side up, placing a small block of wood under the rear of the switch section to protect the shield cans and tubes. The main tuning unit bottom plate should remain in place while H.F. oscillator and R.F. adjustments are being made. In order to facilitate the alignment of these stages, we have indicated in dotted lines, the coil positions beneath the bottom cover plate, together with all capacity and inductance adjusters. Capacity adjusting condensers are located on the coil bases and inductance adjusters extend through the top of each coil. The coil markings correspond to the designations on the schematic wiring diagram. Set the test oscillator to produce a 2.5 MC. signal. Adjust the trimmer capacitor "Y" until a peak reading is obtained in the output meter. Now set the main tuning condenser dial to 1.26 MC. and adjust the test oscillator for a 1.26 MC. signal. Turn the inductance adjustment on coil "Y" for a peak reading on the output meter. As these two adjustments react on each other it will be necessary to repeat them until no further change in either capacity or inductance is necessary. This realignment should only be done after making sure that the calibration of main dial is incorrect.

Turn the main tuning dial to 2.5 MC. and set the test oscillator for 2.5 MC. signal. Adjust each capacitor on coil "R"-"K"-"E2" in the order named, for peak reading on the output meter. The Sensitivity control should be adjusted so that no overloading occurs and an appropriate reading on the output meter is maintained. Now set the main tuning dial at 1.26 MC. and the test oscillator on the same frequency and turn the "inductance adjustments" on coil "R"-"K"-"E4" for peak reading on the output meter. These adjustments are also interlocking and should be repeated until no further improvement can be noticed. This completes the H.F. Oscillator and R.F. coil alignment for the frequency range of 1.25 to 2.50 MC.

The alignment procedure of the H.F. Oscillator and R.F. coils in the remaining frequency ranges is exactly the same as outlined for the 1.25–2.50 MC. band. Test oscillator frequencies and main tuning dial settings vary as follows:

Range	*Capacity Frequency*	*Condensers*	*Inductance Frequency*	*Coils*
1.25 to 2.50 MC.	2.5 MC.	Y-R-K-E2	1.26 MC.	Y-R-K-E1
2.5 to 5.0 MC.	5.0 MC.	X-P-J-D2	2.5 MC.	X-P-J-D1
20.0 to 40.0 MC.	40 MC.	W-N-H-C2	20 MC.	W-N-H-C1
5.0 to 10.0 MC.	10.0 M.C.	T-M-G-B2	5.0 M.C.	T-M-G-B1
10.0 to 20.0 MC.	20.0 M.C.	S-L-F-A2	10.0 M.C.	S-L-F-A1

I. F. ALIGNMENT

The following adjustments should only be attempted after making certain that the I.F. channel of the receiver is out of alignment.

The alignment of the I.F. amplifier may be checked as follows: Connect a low reading (1 volt) output meter across the voice coil terminals. Connect a test oscillator (modulated at 400 cycles or less) to the antenna terminals of the receiver. Set the crystal selectivity switch on Number 1, the phasing control on the arrow, and the band-width control at 3. With the AVC-MANUAL switch on "manual" and the A.F. gain at 10, adjust the sensitivity control for an output meter reading of approximately 1 volt, with the test signal tuned accurately. Now, check the settings of the I.F. tuning condenser on T-2, T-3, and T-4 (*DO NOT DISTURB* the screw tuning adjustments of the Crystal Filter T-1). Then reduce the A.F. gain to protect the output meter and throw the AVC-MANUAL to "AVC" and turn the sensitivity control to 10. Then adjust T-6 for maximum "S" meter reading. This can be done most satisfactorily by adjusting the input from the test oscillator to produce an "S" reading of approximately 8.

To check the alignment of the Crystal Filter T-1, an oscillograph and sweep frequency oscillator are required. First adjust the sweep frequency oscillator to exact agreement with the crystal resonant frequency with the Crystal Selectivity switch on Number 5, and the phasing control on the arrow. Then, set the switch on Number 1 and adjust the lower screw on T-1 for maximum height, and the upper screw for symmetry of oscillograph image.

HAMMARLUND MFG. CO., INC.

MODEL 200 Series
Assembly, Selectivity Curves

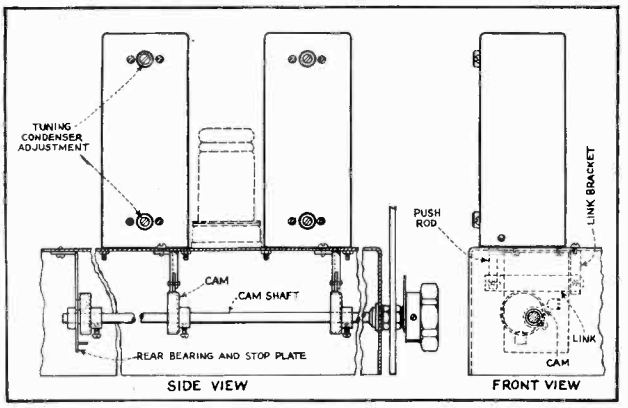
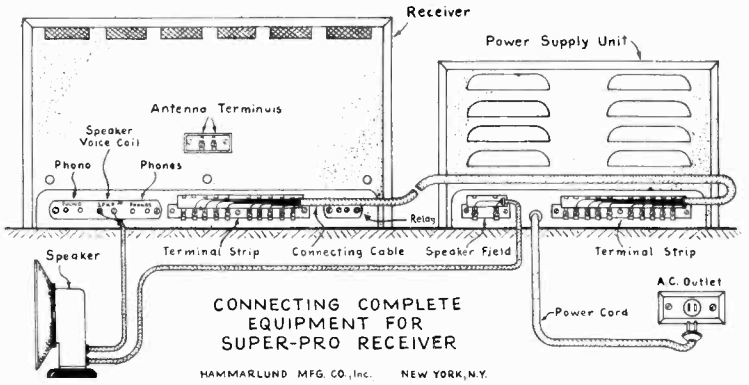
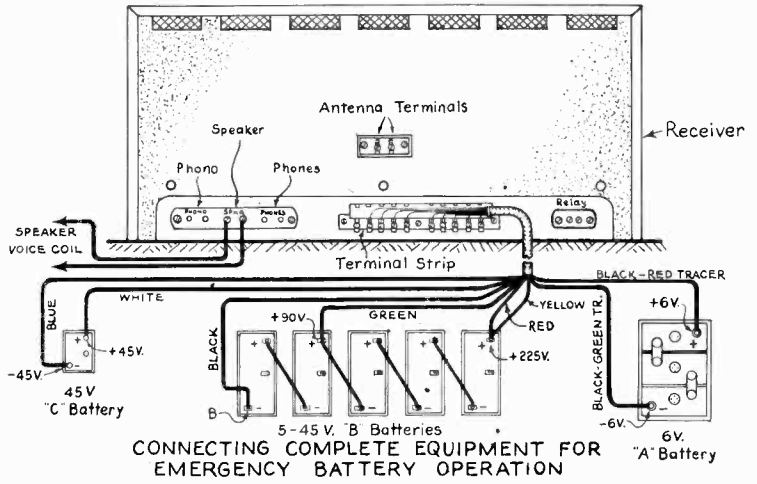


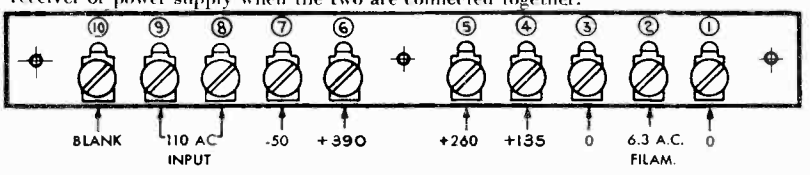
FIG. 1—Band width control which varies selectivity and permits the operator to adjust the receiver for best quality obtainable with minimum interference.



The two drawings on this page show the proper method of connecting the receiver, power supply, and speaker together. The drawing above shows a standard installation, while the diagram below indicates receiver connections when batteries furnish the power. Protective covers are furnished for all important terminal strips and they should always be in place.



Drawing below provides voltage readings at the various terminals on either the receiver or power supply when the two are connected together.



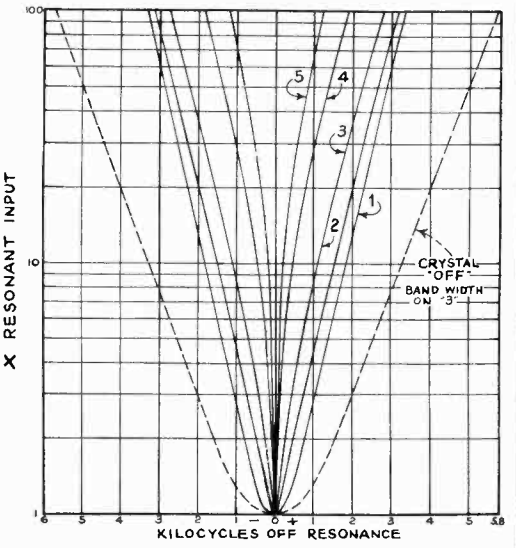


FIG. 6—Variable crystal filter selectivity curves showing five positions of the control switch. Positions 1, 2 and 3 are intended for voice reception. Position 1 is broad enough to permit reception of music. Positions 4 and 5 are for single signal code reception.

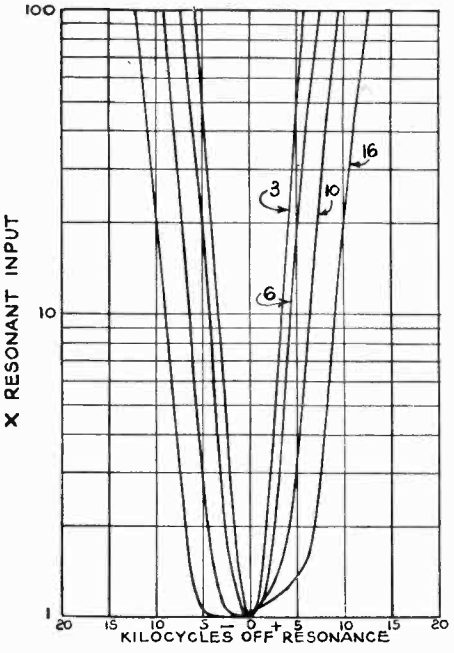


FIG. 5—I.F. curves taken at four positions of the band width control. The actual selectivity of the I.F. amplifier is continuously variable between curves 3 and 16. Particular attention should be paid to the sharp cut-off which greatly reduces back-ground interference.

MODEL 200 Series
Notes, Parts

HAMMARLUND MFG. CO., INC.

ANTENNA REQUIREMENTS

The input of the Series 200 "Super-Pro" is approximately 112 ohms. This means that for best results, the antenna should be coupled to the receiver by means of a low impedance transmission line. The doublet type antenna produces best results. Any well-known low impedance lead-in cable can be used with satisfaction. The use of low impedance lead-ins provides less chance for the lead-in itself to pick up extraneous noises. The low impedance lead-in, together with the electrostatic shield built into the antenna coil of the receiver, reduces noise to a minimum. It must be remembered that every antenna has a period of resonance and works best at that frequency. When erecting a doublet antenna, it is advisable to arrange its physical dimensions so that it will resonate in the band of frequencies where most sensitivity is desired. Care taken in designing and erecting an antenna will pay for itself many times in superior results.

DESIGN

The general design of the new "Super-Pro" embraces over five years of extensive research and experimentation. Individual components in the majority of cases have been specially designed for this receiver. The tuning inductors contained in the tuning unit are individually wound on low-loss forms. There are 20 in this group. Each coil has its own form and is mounted on an Isolantite base. This base also accommodates the variable trimming capacitor. All oscillator trimmers are of the air dielectric type and add considerably to the overall stability of the receiver. High stability mica trimmers are employed in the R.F. circuits.

The band change switch is especially designed for the "Super-Pro" and is unlike any other switch used for this purpose. The cam-operated knives contact stationary fingers and complete the circuit. Thus, no moving part carries current to cause noise or stray coupling. All contacts are silver-plated and will provide years of reliable service. The contacts are designed and placed so that the capacity between them is reduced to a negligible amount. This eliminates frequency drift due to change in dielectric constant during temperature rise. The I.F. transformers in the "Super-Pro" are designed particularly for this receiver. Each coil is wound on an Isolantite form and the coupling between them is mechanically variable to provide control of selectivity. Air dielectric trimmers are employed for maximum stability. Each grid coil in the I.F. unit is tapped near the low potential end so that changes in tubes will not affect the alignment of the receiver. This method also permits the use of a large number of stages operating at relatively low gain in order to obtain a maximum degree of selectivity without instability that might exist with a small number of stages operating at maximum gain.

SUPER-PRO MODELS AND PRICES

Code	Type	Tuning Range	Speaker	List Price
SP-210-X	Crystal	15-560 Meters	Jensen 10" Dynamic	$465.00
SPR-210-X	Crystal Rack	15-560 Meters	Jensen 10" Dynamic	482.50
SP-220-X	Crystal	15-560 Meters	Jensen 12" High Fidelity	490.00
SPR-220-X	Crystal Rack	15-560 Meters	Jensen 12" High Fidelity	507.50
SP-210-SX	Crystal	7½-240 Meters	Jensen 10" Dynamic	465.00
SPR-210-SX	Crystal Rack	7½-240 Meters	Jensen 10" Dynamic	482.50
SP-220-SX	Crystal	7½-240 Meters	Jensen 12" High Fidelity	490.00
SPR-220-SX	Crystal Rack	7½-240 Meters	Jensen 12" High Fidelity	507.50
SP-210-LX	Crystal	*15-2000 Meters	Jensen 10" Dynamic	465.00
SPR-210-LX	Crystal Rack	*15-2000 Meters	Jensen 10" Dynamic	482.50
SP-220-LX	Crystal	*15-2000 Meters	Jensen 12" High Fidelity	490.00
SPR-220-LX	Crystal Rack	*15-2000 Meters	Jensen 12" High Fidelity	507.50
PSC-10	Speaker cabinet finished to match receiver			8.50

Above prices cover 110-115-125 volt, 50 to 60 cycle models with tubes, crystal, and speaker. Receiver and power supply enclosed in wrinkle finished table type metal cabinets. Special models for 50-60 cycles with universal type power supply tapped for 115, 125, 140, 230, and 250 volts, also available at no increase in price. Twenty-five cycle models, $20.00 additional.

* In this model, the 1000 to 2000 meter band is substituted for the 60 to 120 meter band.

Receiver in cabinet measures 21½" wide, 15¼" deep, and 12¼" high. Power supply in cabinet measures 13" wide, 7½" deep, and 8½" high. Rack models fit standard 19" relay racks. Shipping weight approximately 110 pounds.

(Prices subject to change without notice)

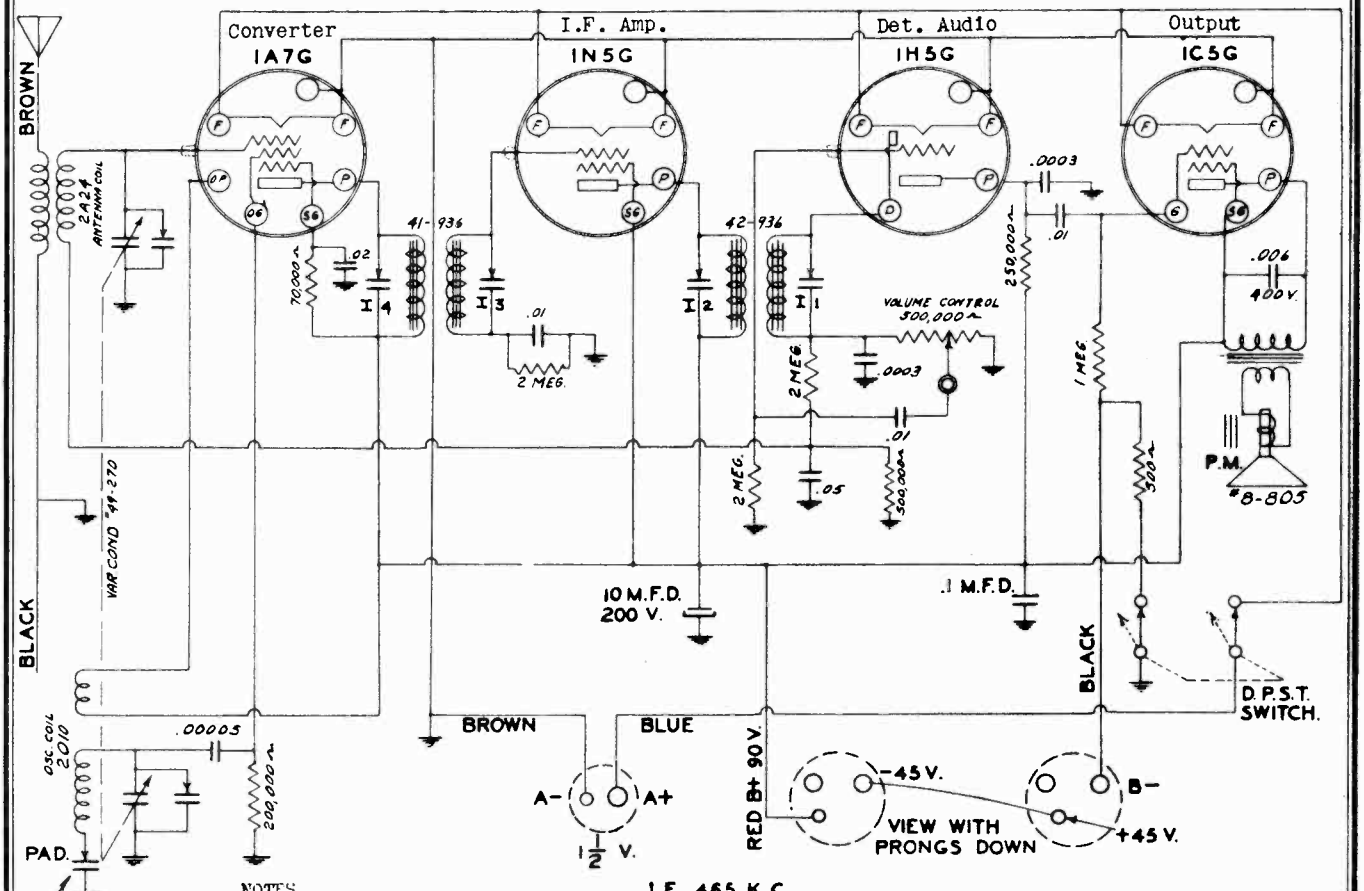
"SUPER-PRO" MODEL SP-200-SX PARTS LIST

(This parts list should be used to identify parts shown in the illustrations)

Schematic Designation	DESCRIPTION — RECEIVER PARTS	Part No.
A1	Antenna Input Coil Assembly 10.0 to 20.0 m.c.	SA-46
A2	Antenna Output Coil Assembly 10.0 to 20.0 m.c.	SA-110
B1	Antenna Input Coil Assembly 5.0 to 10.0 m.c.	SA-47
B2	Antenna Output Coil Assembly 5.0 to 10.0 m.c.	SA-113
C1	Antenna Input Coil Assembly 20.0 to 40.0 m.c.	SA-46
C2	Antenna Output Coil Assembly 20.0 to 40.0 m.c.	SA-130
D1	Antenna Input Coil Assembly 2.5 to 5.0 m.c.	SA-48
D2	Antenna Output Coil Assembly 2.5 to 5.0 m.c.	SA-116
E1	Antenna Input Coil Assembly 1250 to 2500 k.c.	SA-49
E2	Antenna Output Coil Assembly 1250 to 2500 k.c.	SA-136
F	1st R.F. Coil Assembly 10.0 to 20.0 m.c.	SA-111
G	1st R.F. Coil Assembly 5.0 to 10.0 m.c.	SA-114
H	1st R.F. Coil Assembly 20.0 to 40.0 m.c.	SA-131
J	1st R.F. Coil Assembly 2.5 to 5.0 m.c.	SA-117
K	1st R.F. Coil Assembly 1250 to 1160 k.c.	SA-137
L	2nd R.F. Coil Assembly 10.0 to 20.0 m.c.	SA-111
M	2nd R.F. Coil Assembly 5.0 to 10.0 m.c.	SA-114
N	2nd R.F. Coil Assembly 20.0 to 40.0 m.c.	SA-131
P	2nd R.F. Coil Assembly 2.5 to 5.0 m.c.	SA-117
R	2nd R.F. Coil Assembly 1250 to 2500 k.c.	SA-137
S	High Frequency Osc. Coil Assembly 10.0 to 20.0 m.c.	SA-112
T	High Frequency Osc. Coil Assembly 5.0 to 10.0 m.c.	SA-115
W	High Frequency Osc. Coil Assembly 20.0 to 40.0 m. c.	SA-132
X	High Frequency Osc. Coil Assembly 2.5 to 5.0 m.c.	SA-118
Y	High Frequency Osc. Coil Assembly 1250 to 2500 k.c.	SA-138
T-1	Crystal filter assembly (465 kc.)	SA-178
T-2, T-3	1st and 2nd, I.F. Transformer Coil Assembly	SA-166
T-4	Detector plate coil assembly	SA-167
T-5	Beat oscillator coil assembly	SA-169
T-6	A.V.C. Plate coil assembly	SA-168
T-7	Push-Pull Input Transformer	4827
T-8	Push-Pull Output Transformer	4828
1	Antenna terminal strip	3842
2-12-22-106-	Capacitor Fixed Mica type 600 mmf.	6073
28	Capacitor Fixed Silver type 95 mmf.	6195
34	Capacitor Fixed Silver type 50 mmf.	6074
77	Capacitor Fixed Mica type 50 mmf.	6199
9-19-69	Capacitor Fixed Tubular type .02 mf. 500 V.	6176
4-14-24	Capacitor Fixed Tubular type .01 mf. 500 V.	6175
7-17-30-36-13-46-48-51-56-58-61-63-73-85-92	Capacitor Fixed Tubular type .05 mf. 500 V.	6174
40-101-102	Capacitor Fixed Tubular type .25 mf. 400 V.	3820
88	Capacitor Dry Electrolytic 40 mf. 150 V.	6171
80	Resistor 4 ohms wire wound 5 watt	4921
89	Resistor 750 ohms wire wound 10 watt	3836
96	Resistor 300 ohms metallized ½ watt	6169
98	Resistor 1,700 ohms metallized ½ watt	4947
10-20-44-6-47-49-57-59-16	Resistor 2,000 ohms metallized ½ watt	6160
99	Resistor 3,000 ohms metallized 1 watt	3809
86	Resistor 5,000 ohms metallized ½ watt	4814
5-15-25-50-60	Resistor 10,000 ohms metallized ½ watt	6165
37	Resistor 12,000 ohms metallized 2 watt	4840
29	Resistor 25,000 ohms metallized 2 watt	3999
35-26-66-84	Resistor 50,000 ohms metallized ½ watt	6075
64-72-93	Resistor 50,000 ohms metallized 1 watt	6166
65	Resistor 75,000 ohms metallized ½ watt	4914
78	Resistor 250,000 ohms metallized ½ watt	4912
3-13-23-70-74-83	Resistor 500,000 ohms metallized ½ watt	6076
53	Resistor 2,000,000 ohms metallized ½ watt	4920
8-18-45	Tube socket 6K7	4922
55-62-91	Tube socket 6SK7	4923
76-95	Tube socket 6H6	6111
79	Tube socket 6N7	4924
81	Tube socket 6SJ7	4925
71	Tube socket 6C5	4926
75-87-90	Tube socket 6F6	6108
27	Tube socket 6L7	4927
42	Tube socket 6J7	4928
32-33	Dial lamps 6.3 volt .15 amp.	3920
38	Meter lamp 6.3 volt .15 amp. Bayonet type	6036
94	Tuning meter	4903
100	Off-on Switch	2983
52-103	AVC-MANUAL and SPEAKER-PHONES Switch	2990
41	CW-MOD Switch	4915
31	Send-Receive Switch	4917
67	Limiter switch	4916
54	Sensitivity control 50,000 ohm	4918
68	Audio Gain Control 250,000 ohm	4919
39	Relay terminal strip	4904
104	Phono-Speaker-Phones terminal strip	4905
105	Connecting terminal strip	3838
110	Meter adjusting potentiometer 1,000 W wire wound	4932
1	Power transformer 110 volts 60 cycle A.C.	4801
2	Filter choke	2981
3	A.C. input Cord and Plug	3900
4	Fuse Block for 2A. fuse	3859
5	Line Voltage Adjusting Strip	3858
6	Speaker Field Terminal Strip	3840
7	Connecting Terminal Strip	3838
8-9-10	Filter Condenser 16 mfd. electrolytic 450 volts	3832
11	Filter Condenser 8-8-8 mfd. electrolytic 450 volts	3834
12	Resistor 18,000 ohms (2 taps)	3997
13	Resistor 18,000 ohms (1 tap)	4946
14	Tube socket 80	4837
15	Tube socket 5Z3	3828
16	1 mf. paper filter condenser	4945

HOWARD RADIO CO.

MODEL 12B
Schematic, Notes



NOTES

When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.

I.F. 465 K.C.

HOWARD RADIO CO.		
MODEL 12-B		
10-27-39.	DWG. NO. D64-715	
DWN. BY.	CHKD. BY.	APPVD. BY.
R.B.M.		

SPEAKER = Permanent Magnet SIZE = 5"

V.C.IMP. (400CPS) = 4 Ohms

FIELD = P M

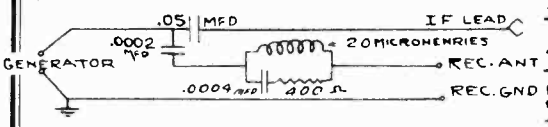
POWER SUPPLY 90 V. "B" - 1½ V. "A" "B" drain - 10 mils. "A" drain - 250 mils.

POWER OUTPUT - (MAX.) = 360MW upo 180mw

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.

See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.

The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.



SERVICE NOTES

It is necessary that the IN5G tube be shielded. See that the shield is firmly in place around the bottom portion of the tube.

The intermediate frequency of this receiver is 465 KC.

The trimmers and padding condenser adjustments are accessible through bottom of cabinet.

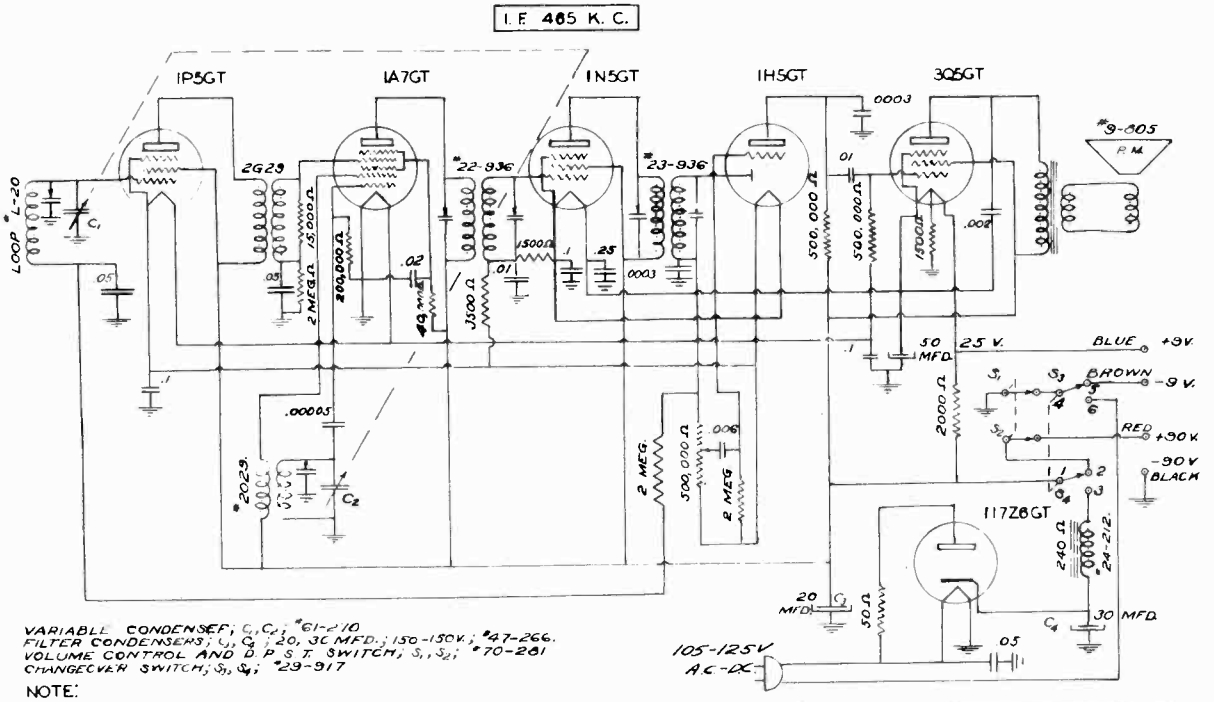
Color code of battery leads:- Red B+90; Black B-; Brown A-; Blue A + 1½ V.

RECOMMEND BATTERY KITS

	EVEREADY	BURGESS	
1½ V. "A" 1 Required	740	20-F	For greater economy use two "A" cells in PARALLEL. Connect plus to plus and minus to minus.
45 V. "B" 2 Required	749	D60	
Combination "A" and "B" Single Unit.	746	17GD60	Use Adapter

MODEL 14ACB
MODEL 700
Schematics

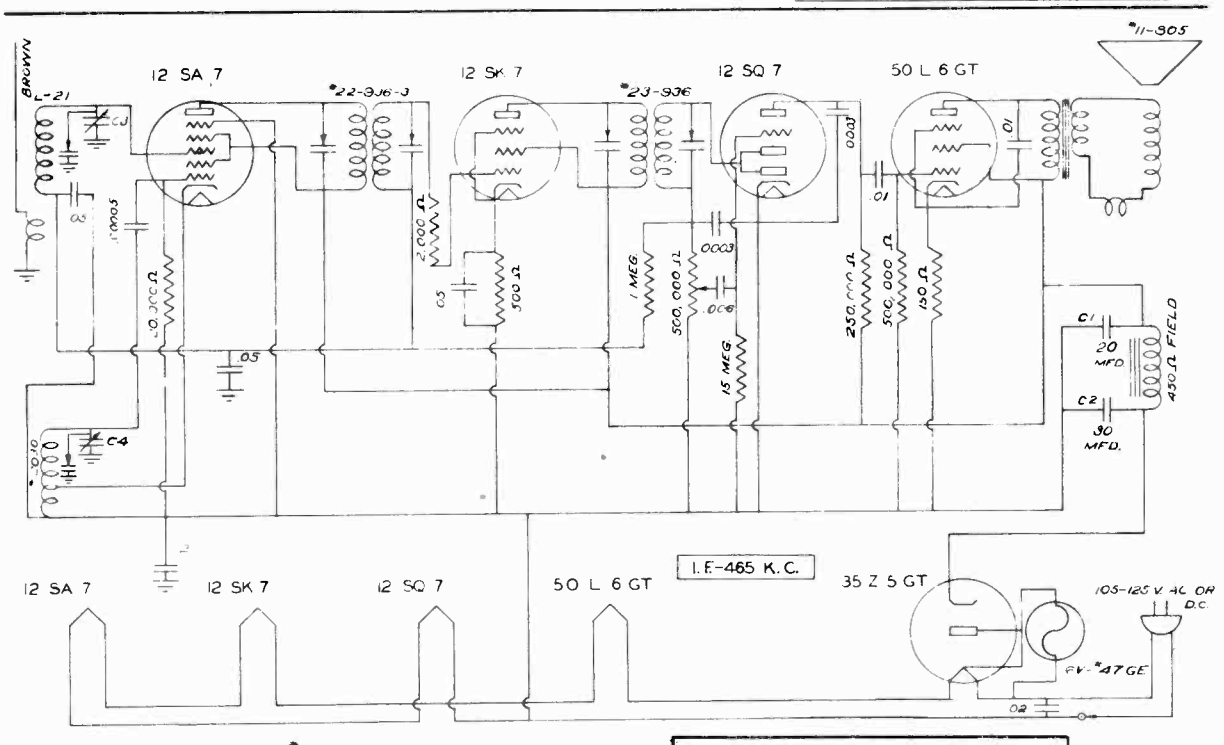
HOWARD RADIO CO.



VARIABLE CONDENSER; C_1, C_2; *61-210
FILTER CONDENSERS; C_3, C_4; 20, 30 MFD.; 150-150V.; *47-266.
VOLUME CONTROL AND D.P.S.T. SWITCH, S_1, S_2; *70-281
CHANGEOVER SWITCH; S_3, S_4; *29-917

NOTE:
SWITCH SHOWN IN POSITION FOR BATTERY OPERATION. FOR A.C. OR D.C. OPERATION, SWITCH CONNECTS TERMINAL 4 TO 6 AND 1 TO 3.

MODEL 14ACB		
DWG. NO. D77-715		3-29-40
DWN. BY	CHKD. BY	APPVD. BY
JWO		

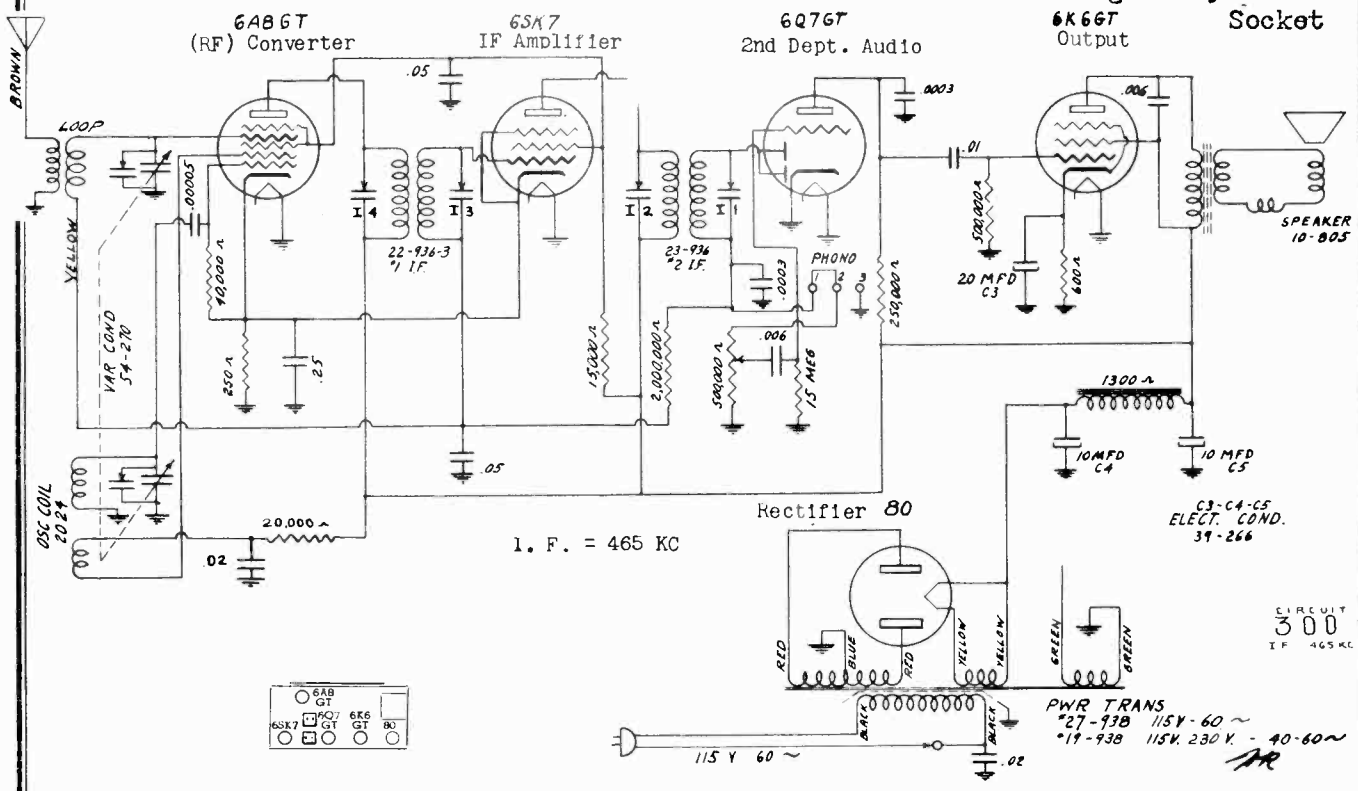


C_1, C_2—20-30 MFD 150-150 V. *47-268.
C_3, C_4—VARIABLE CONDENSER *62-270.
VOLUME CONTROL AND SWITCH *69-281.

MODEL 700	
D76-715	3-26-40

HOWARD RADIO CO.

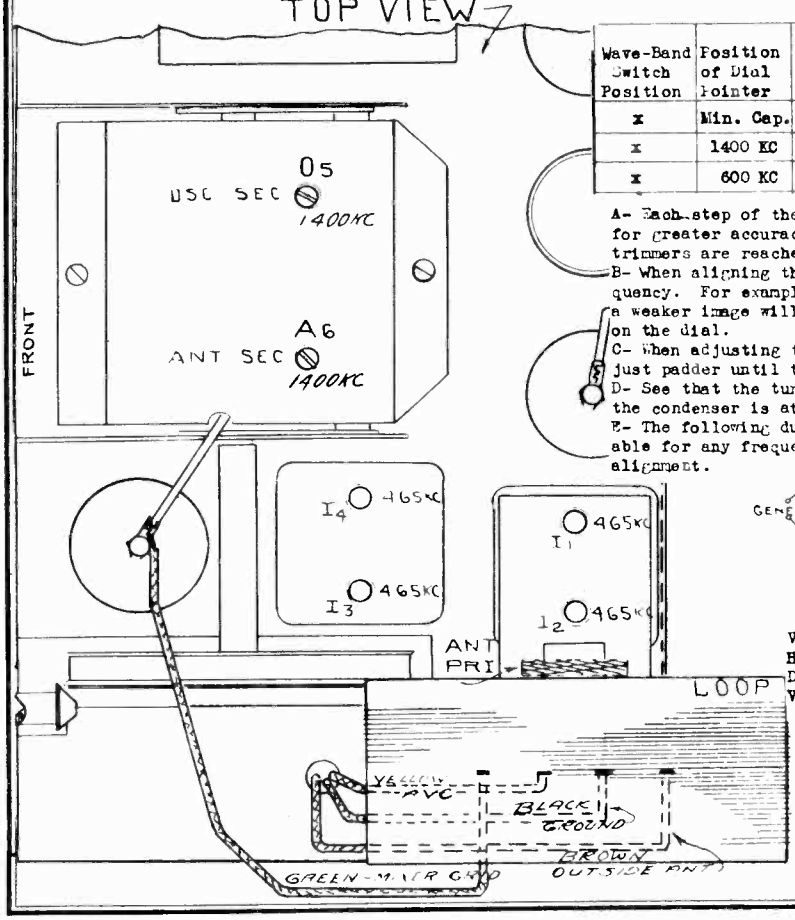
MODEL 300
Schematic, Voltage
Alignment, Trimmers
Socket



POWER SUPPLY - (Standard Models) = AC 105-120 V. 60 Cycles
CONSUMPTION 50 WATTS
POWER OUTPUT - (MAX.) = 2.7 W. upo = 1.5 W.

SPEAKER = Electrodynamic SIZE = 5"
V.C.IMP. (400CPS) = 4 Ohms
FIELD = 1300 Ohms

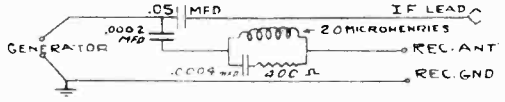
TOP VIEW



ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
x	Min. Cap.	465 KC	6A8 Grid	A,E	I_1 I_2 I_3 I_4	IF
x	1400 KC	1400 KC	Brown lead	D	O_5 A_6	Osc. & Ant.
x	600 KC	600 KC	Brown lead		CUT PLATE	OSC. SECTION

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.
E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.



SOCKET VOLTAGE READINGS
Voltage taken from ground with line voltage at - 117 AC.
High voltage reading off rectifier = 275 V.
Drop across speaker field = 75 V.
Voltage taken with 1,000 Ohm per volt meter -

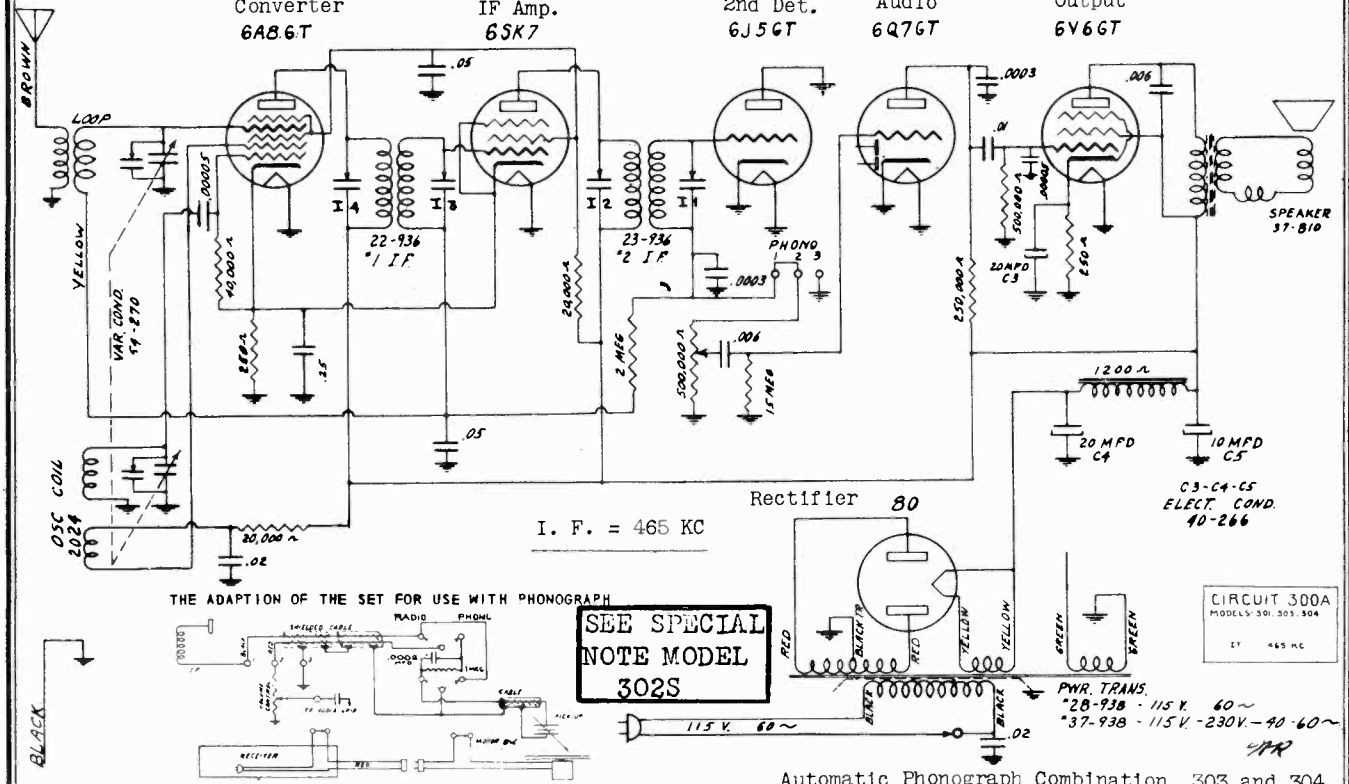
TUBE	FUNCTION	CATH ODE.	GRID	PLATE
6A8 GT	Mixer	4.5	105	195 OR 185
6SK7	IF	4.5	105	195
6Q7 GT	Det.	x	x	60
6K6 GT	Output	16	195	185

MODELS 300A, 301, 303
301APC, 304

HOWARD RADIO CO.

Schematic, Voltage
Alignment, Trimmers

Converter 6A8.6T | IF Amp. 6SK7 | 2nd Det. 6J5GT | Audio 6Q7GT | Output 6V6GT



I. F. = 465 KC

THE ADAPTION OF THE SET FOR USE WITH PHONOGRAPH

SEE SPECIAL NOTE MODEL 302S

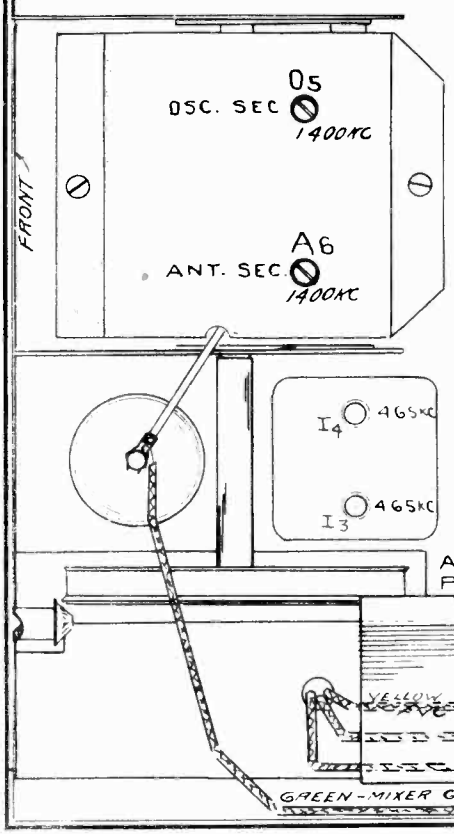
BLACK

Automatic Phonograph Combination, 303 and 304, employing Chassis type 300 A

POWER SUPPLY - (Standard Models) = 105 to 120 V. 60 Cycle.
CONSUMPTION 60 WATTS + 30 W.APC.
POWER OUTPUT - (MAX.) = 6 W. upo 4w

SPEAKER = Electro-dynamic SIZE = 12"
V.C. IMP. (400 CPS) = 6 Ohms FIELD = 1200 Ohms

TOP VIEW

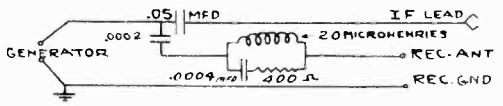


ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
x	Min. Cap.	465 KC	6A8 Grid	A,E	I_1 I_2 I_3 I_4	IF
x	1400 KC	1400 KC	Brown lead	D	O_5 A_6	Osc., & Ant.
x	600 KC	600 KC	Brown lead		CUT PLATE	OSC. SECTION

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 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.
E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.



SOCKET VOLTAGE READINGS
Voltage taken from ground with line voltage at - 117 AC:
High voltage reading off rectifier = 330 V.
Drop across speaker field = 90 V.
Voltage taken with 1,000 Ohm per volt meter -

TUBE	FUNCTION	CATH ODE.	SCR. GRID	PLATE
6A8 GT	Mixer	4	112	235 OR 150
6SK7	IF	4	112	235
6J5 GT	Det.	x	x	x
6Q7 GT	Audio	x	x	38
6V6 GT	Output	11	240	230

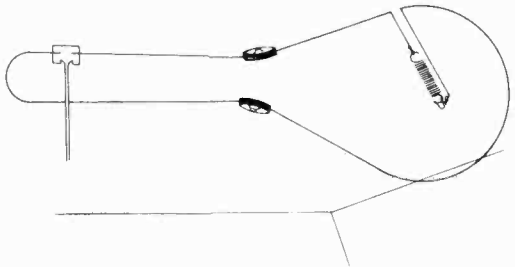
HOWARD RADIO CO.

MODEL 300 Series
MODEL 500 Series
Dial and Tuner Data

Dial Mechanism
300 Series

THE TUNING CONTROL

To provide smooth push button tuning with a minimum amount of effort the tuning shaft has a spring return which disengages the rubber friction drive from the large drive pulley after the tuning knob has been held down while tuning the set manually. There is no adjustment required on this mechanism.



THE ABOVE DIAGRAM SHOWS THE EXACT DRIVE CORD ARRANGEMENT IN CASE A REPLACEMENT IS REQUIRED. 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.

The drive string running from one pulley across the dial plate to the other pulley may be slightly higher at its point of mounting to the tuning hand, this will maintain a slight downward pull on the hand to avoid wobble. Another cause of wobble would be caused by crimping the lugs of hand around the string in such a manner that the string would be out of line.

A slight amount of petroleum jelly along the top edge of the dial will provide a smoother travel of the hand. Arrange the long section of the hand straight and with sufficient clearance from the dial plate face to avoid scratching the numerals.

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 PUSH BUTTONS must extend straight outward. If a chassis is removed, see that the push-button screw shanks are not bent so as to bind against the openings in the cabinet panel.

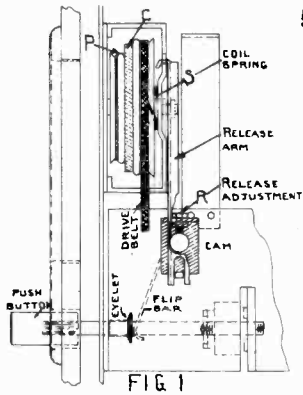


FIG. 1

500 Series Dial Mechanism

FIG. 1. SHOWS THE DIAL DRIVE MECHANISM IN ITS NORMAL STATIONARY POSITION ENGAGED FOR MANUAL TUNING. THE CORK ASSEMBLY C IS FRICTIONED AGAINST THE FACE OF STRING PULLEY P, DUE TO PRESSURE OF COIL SPRING S. THE PUSH BUTTON IS NOT PRESSED IN, LEAVING A SMALL GAP BETWEEN THE BRASS EYELET AND THE FLIP BAR.

FIG. 2. SHOWS THE PUSH BUTTON ON ITS WAY IN, AT THE VERY START OF WHICH THE EYELET MOVES THE FLIP BAR, CAUSING THE RELEASE ARM TO OVERCOME THE COIL SPRING TENSION AND DRAW THE CORK CLUTCH AWAY FROM THE STRING PULLEY FACE, POINT G. ALL OF THIS ACTION TAKES PLACE BEFORE THE PUSH BUTTON SCREW STARTS TO ACTUATE THE VARIABLE CONDENSER.

THE OBJECT OF THE ABOVE MECHANISM OF COURSE IS TO ELIMINATE THE PRESSURE THAT OTHERWISE WOULD BE REQUIRED IF THE MANUAL TUNING CONTROL HAD TO BE SPUN AROUND WHEN USING THE PUSH BUTTONS.

THE SCREW ADJUSTMENT R, FIG. 1, WILL PROVIDE THE PROPER AMOUNT OF CLUTCH RELEASE CLEARANCE AT G, FIG. 2.

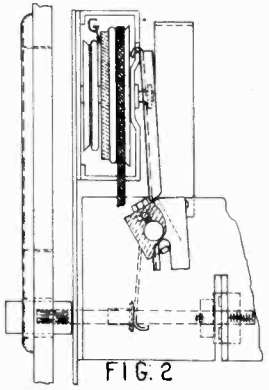


FIG. 2

LACK OF SMOOTHNESS in dial operation may be due to:

- Too much tension on dial string.
- Incorrect adjustment with release action causing drag. (See adjustment R).
- Fly wheel will rub on cabinet shelf if the rubber cushion is not in place beneath chassis.
- See that dial light sockets do not touch top edge of tuning hand as it moves across dial plate.
- Do not adjust the belt to a greater tension than is necessary.
- Slipping of the dial mechanism may be due to any of the above items or lack of sufficient cork friction which in turn may be due to weakness in tension spring S (Fig. 1) or a tight bearing at this point.

SETTING-UP THE PUSH BUTTONS

300 Series 500 Series

1. Leave the set turned on at least 15 minutes before making settings.
2. Decide upon the six stations that you want to tune in automatically.

It is preferable to set the lower frequency stations, starting with the button on the right.

3. Tune the station with the regular tuning knob, making certain the station is EXACTLY IN TUNE, then with the fingers loosen the push button with a twist to the left of about one-half turn, now push the button ALL THE WAY IN.
4. Carefully release button and tighten it with a twist to the right.
5. Repeat above procedure for the other five buttons for five other stations and insert station letter tab in position for each button.

THE PUSH BUTTONS WILL ONLY OPERATE CORRECTLY WHEN THEY ARE OPERATED WITH A FIRM, QUICK THRUST, KEEPING FINGER ON BUTTON UNTIL DIAL POINTER COMES TO A STOP.

THE STRING TENSION of the drive string is maintained by the coil spring on the large drive pulley FIG. 4.

THE PUSH BUTTONS must extend straight outward, before a chassis is mounted in the cabinet, see that the push-button screw shanks are not bent so as to bind against the escutcheon holes.

THE DRIVE BELT tension is very easily obtained between the tuning shaft and the pulley by raising or lowering the frame when the two screws B, B (Fig. 3) are loosened. Do not get the belt too tight. The belt runs directly on the tuning shaft, the rubber grommet on the shaft is merely acting as a guide.

TO REPLACE THE DRIVE BELT (1) remove screws B, B and D, D from frame, permitting frame to be disassembled (2) loosen set screws holding lead fly wheel on tuning shaft. This will allow tuning shaft to be pulled out to loop the belt in place.

THE REPLACEMENT OF THE CORK clutch is also accomplished by removing screws B, B and D, D.

THE TUNING HAND should be set to the end calibration line above 550 KC when the condenser is at maximum capacity.

The drive string running from one pulley across the dial plate to the other pulley will be higher at the point of mounting on the tuning hand, this will maintain a slight downward pull on the tuning hand which will prevent wobble. Another cause of wobble would be in crimping the lugs around the string causing the string to be out of line.

A slight amount of petroleum jelly along the top edge of the dial plate is beneficial. Arrange the long section of the hand so it will not scratch the dial numbers.

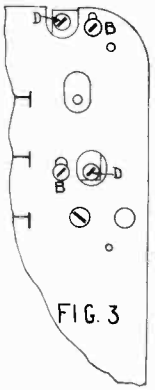


FIG. 3

(Four stations for Series 300)

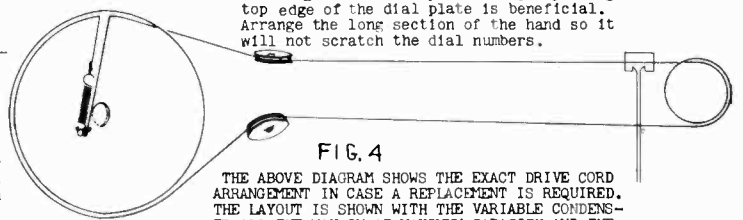


FIG. 4

THE ABOVE DIAGRAM SHOWS THE EXACT DRIVE CORD ARRANGEMENT IN CASE A REPLACEMENT IS REQUIRED. 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.

(Four stations for 300 Series)

MODEL 301APC MODEL 518APC
MODEL 302APC MODEL 520APC
MODEL 308APC MODEL 580APC

HOWARD RADIO CO. Automatic Phono.Data

INSTALLATION AND OPERATING INSTRUCTIONS
AUTOMATIC PHONOGRAPH COMBINATION

INSTALLATION

PREPARING FOR OPERATION - Remove the bracket "A" securing the pickup and needle mechanism. This bracket is shown in place in Figure 1. It is held to the motorboard by means of a screw "B". Remove the screw, lift off the bracket and replace screw in motorboard to cover hole. Then remove red bolts "C" and "D" which hold the motorboard secure during shipment. These are also shown in Figure 1. When these bolts are removed it will allow the wood strips to be taken out. "E" and "F".

The two record holder posts (See Figure 6) are covered with paper held in place by rubber bands as is also the pickup. Remove these paper coverings.

THE SCREWS THAT HOLD THE RADIO CHASSIS ARE LOOSENED JUST ENOUGH TO ALLOW THE WOOD STRIPS (USED IN SHIPMENT) TO BE REMOVED. CAUTION: ONLY A SMALL AMOUNT OF TURNING OF THE WING SCREWS IS NECESSARY. IF THEY ARE TOO LOOSE THE CHASSIS WILL DROP OUT OF POSITION AND THE PUSH BUTTONS WILL NOT OPERATE PROPERLY.

LOCATION: The instrument should be located near an electric outlet and on a level surface. The cabinet should not be located near a source of heat such as a radiator or register. If the cabinet is placed parallel to a wall, at least an inch space should exist between the back of the cabinet and the wall, for best tone quality. The instrument must be installed in a level position for proper operation of the phonograph.

POWER SUPPLY: Unless otherwise specified on the chassis and on the power transformer, the standard receiver is to be operated from an alternating current only - (105 to 120 Volts, 60 cycle).

SPEED REGULATION: There are no adjustments on the Phonograph Motor for speed regulation since the design of the motor is for a constant speed, similar to an electric clock. Be certain that the power line frequency is the same as specified on the motor frame, the standard models being 60 cycle.

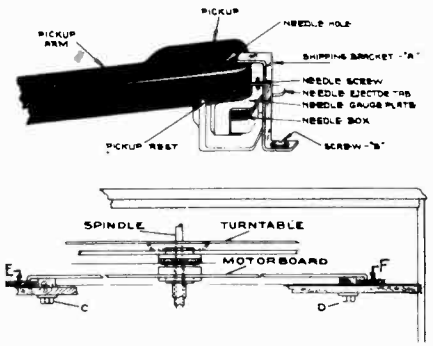


Figure 1 - Unpacking

PHONOGRAPH INSTRUCTIONS

CAUTIONS - 1. NEVER USE FORCE TO START OR STOP THE MOTION OF ANY PART OF THE RECORD-CHANGING MECHANISM OR PICKUP ARM.

2. THE USE OF RECORDS WHICH HAVE BECOME WARPED OR DAMAGED THROUGH IMPROPER CARE MAY CAUSE THE MECHANISM TO JAM AND DAMAGE THE INSTRUMENT. IN ADDITION, RECORDS WHICH HAVE BECOME WARPED WILL SLIDE ON ONE ANOTHER WHEN PLAYING, RESULTING IN UNSATISFACTORY REPRODUCTION.

3. THIS INSTRUMENT IS NOT RECOMMENDED FOR PLAYING 10-INCH AND 12-INCH RECORDS IN MIXED SEQUENCE. IF THE USER DESIRES THIS SERVICE HE MUST BE POSITIVE THAT ALL RECORDS ARE PERFECTLY FLAT AND FREE FROM WARP. THE INDEX AND RECORD REJECT LEVER MUST BE SET AT "10" AND AFTER PLAYING THE LAST SELECTION THE PICKUP WILL COME DOWN IN POSITION FOR A 10-INCH RECORD AND REPEAT THE PLAYING OF THIS LAST RECORD ON A 10-INCH DIAMETER UNLESS THE TURNTABLE SWITCH IS TURNED OFF. ANY JAMMING OF THE MECHANISM UNDER THESE CONDITIONS INDICATES THAT THE RECORDS USED ARE NOT PERFECTLY FLAT OR THAT THEIR EDGES ARE NOT SUFFICIENTLY SMOOTH TO PERMIT NORMAL OPERATION OF THE SEPARATORS IN DROPPING EACH RECORD IN SEQUENCE ONTO THE TURNTABLE.

4. DO NOT LEAVE RECORDS ON THE RECORD HOLDER POSTS, AS THEY ARE LIABLE TO WARP. KEEP YOUR RECORDS IN A RECORD FILE (ALBUM OF CABINET) WHEN NOT IN USE. IF ANY RECORDS SHOULD BECOME WARPED, PLACE THEM ON A FLAT SURFACE WITH A FLAT HEAVY ARTICLE, SUCH AS A LARGE BOOK, ON TOP AND LEAVE THEM IN THIS POSITION FOR A FEW DAYS.

ONLY LOAD YOUR RECORDS ON THE RECORD HOLDER SHELVES AFTER THE PICKUP IS IN ITS REST POSITION AND THE TURNTABLE STOPPED WITH TURNTABLE SWITCH AT "OFF".

TURNTABLE SWITCH: The Turntable Switch is a toggle type located in the front of the index plate on the motorboard (See Figure 6). It is used to start and stop the motor.

INDEX LEVER: The Index Lever moves in a small arc in the slot in the index plate. (See Figure 6). The plate is labeled for four positions of the lever - "Manual" "12", "10" and "Reject". If a single record is to be played the automatic record-changing feature will not be used and the Index Lever should be set to the "Manual" position.

If either 10 or 12-inch records are to be played automatically the index lever must be moved to the position indicating the size records that are to be played. If 10-inch records are to be played, or 10 and 12 inch mixed, the Index Lever must be set at "10" and if 12-inch records are to be played, the lever must be set at "12". To reject a record being played, or to start the record-changing cycle in case the record just played does not have the standard eccentric or spiral changing groove simply push the lever to the "REJECT" position and let go. The pickup will raise up and swing outwards and the next record will drop down. Upon releasing the lever, it will automatically return to the "10" position. If you are playing a series of 12-inch records, the lever should be returned to the "12" position after rejecting a record. Keep the lever in its "MANUAL" position when not actually playing records automatically.

Before operating the phonograph, either automatically or manually, be sure that the Pickup Arm is down at playing level and can be easily moved by hand. If not, the Index Lever will be in "10" or "12" and an "eject cycle" must be completed to bring the arm down. To do this, turn the Power switch on the radio panel to "ON" position, then throw the turntable switch "ON". The turntable will start to revolve and the cycle of motion of the pickup Arm will be resumed. When the Pickup Arm comes down, turn off the turntable switch.

TO OPERATE THE PHONOGRAPH: To play records, set the radio Power switch to the "ON" position. With the Index Lever at Manual and the pickup resting on the support over the needle gauge plate, arm in groove, loosen the needle screw and drop a needle, point first, through the needle hole in the pickup. (See Figures 1 and 6). The needle will be stopped in the right position by the needle gauge plate. Press gently on top of pickup to seat it squarely on the gauge plate. Then tighten the needle screw with your fingers.

Lift the Record Holder shelves, Figure 6, with the fingers underneath and revolve to clear the record circle, also push back the lever sticking up adjacent to the rear record holder post. You now have clear access to the turntable. Place the first record upon the turntable with the spindle protruding through the center of the record.

Swing the shelves back into position down in place and load up. For automatic operation seven 10-inch records or six 12-inch records may be stacked on the record holder shelves.

It is not recommended to mix 10 and 12 inch records for automatic operation. Records should never be stacked higher than the spindle.

STEP BY STEP PROCEDURE FOR OPERATING PHONOGRAPH

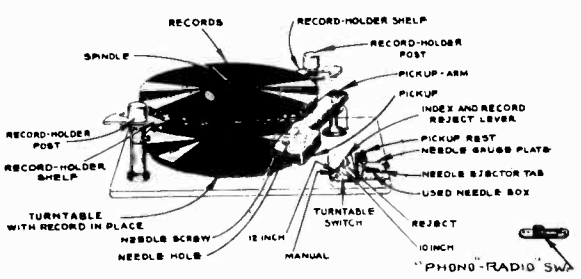


Figure 6

A. TO PLAY 10" OR 12" RECORDS INDIVIDUALLY:

1. Move Index Lever to "Manual" position. See Figure 6.
2. Make sure the pickup arm is resting in its groove with pickup over used needle box. See Figures 1 and 6.
3. Lift the record holder shelves and swing outwards. See Figure 6.
4. Push back the vertical lever near the rear record holder post.
5. Place single record on turntable.
6. Turn power on at receiver, and switch to "Phono" position.
7. Turn on turntable switch. See Figure 6. The turntable will start revolving. Wait till it has reached its normal speed.
8. Lift pickup arm and carefully place needle in first groove of record.
9. Adjust "Volume" and "Tone" as for radio. The same controls are used.

The phonograph will not shut off until the turntable switch (Figure 6) or the Receiver switch is turned off.

To repeat the selection on records with the center changing groove, set index lever to the 10" or 12" position depending upon which size record is being played.

MODEL 210A
Push-Button Adapter
Schematic

HOWARD RADIO CO.

MODEL 301APC MODEL 518APC
MODEL 302APC MODEL 520APC
MODEL 308APC MODEL 580APC

Automatic Phono Data

B. TO PLAY 10" OR 12" RECORDS SO THAT RECORDS WILL CHANGE AUTOMATICALLY AFTER EACH SELECTION.

1. Move index lever to "Manual" position. Fig. 6.
2. Make sure the pickup arm is resting in groove with pickup over reject needle cup. Figs. 1 and 6.
3. Place first record on turntable as for individual playing.
4. Swing the record holder shelves inward into place down on their posts and extending over the turntable. Fig. 6.
5. Stack any amount up to seven 10-inch records on the record holder shelves.
6. Turn power on at receiver, and switch to "Phono" position.
7. Turn on turntable switch. Fig. 6.
8. With index lever still in the "Manual" position lift pickup arm and lower to first groove of record.
9. Move index lever to 10 or 12 inch position depending on the size records being played.
10. Adjust volume and tone as for radio.

Records with the center changing groove will change automatically at the end of each selection until the end of the last record is reached. The last record will repeat itself until the Turntable Switch or Power-Tone control is turned off. To bring down another record at any time during playing of series, push the index lever, (Fig. 6) to "Reject" and let go. Bring back to "12" if you are playing 12-inch records.

CAUTION: DO NOT STOP THE TURNTABLE WITH TURNTABLE SWITCH OR POWER-TONE KNOB UNTIL THE PICKUP IS DOWN AT THE END OF A CYCLE.

TO CHANGE NEEDLE: To change needle, place the pickup over the Needle Gauge Plate, with the pickup Arm resting in the support groove, loosen the Needle Screw, press down the Needle Ejector Tab to drop the needle into the Used Needle Box (Figs. 1 and 6). Allow the gauge plate to return to its normal position. Drop a new needle point first, into the needle hole, press gently on pickup to seat it squarely on gauge plate and tighten the needle screw with your fingers.

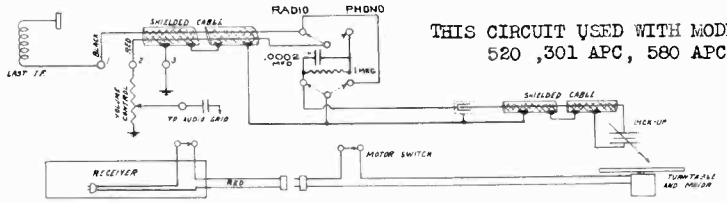
NEEDLES: Good needles are essential to best reproduction. It is advisable to use medium-tone needles and these may be purchased from your Retail Store. Do not reinsert a used needle in the pickup. Change your needles frequently, worn needles distort reproduction and may damage the records. A rack for holding needle books will be found at the back of the compartment under the lid. To enply used needles from the needle box, lift the pickup and move to left out of the way, then tilt up used needle box at front and lift out of its hole in the motorboard. Press the ejector tab to open the lid; to replace, slide the lug on the back into its groove in the motor board and press the box into plate.

RECORDS: Handle your phonograph records carefully. It is advisable to purchase your records from The Retail Store where you may have them played over on an instrument of this type. Keep your records in a record album or lay them flat when not in use. Never leave them on the Record-Holder shelves. Electrically transcribed records are best. Worn or poorly transcribed records result in distortion. Records with the eccentric or spiral center groove are necessary for automatic operation, either change or repeat.

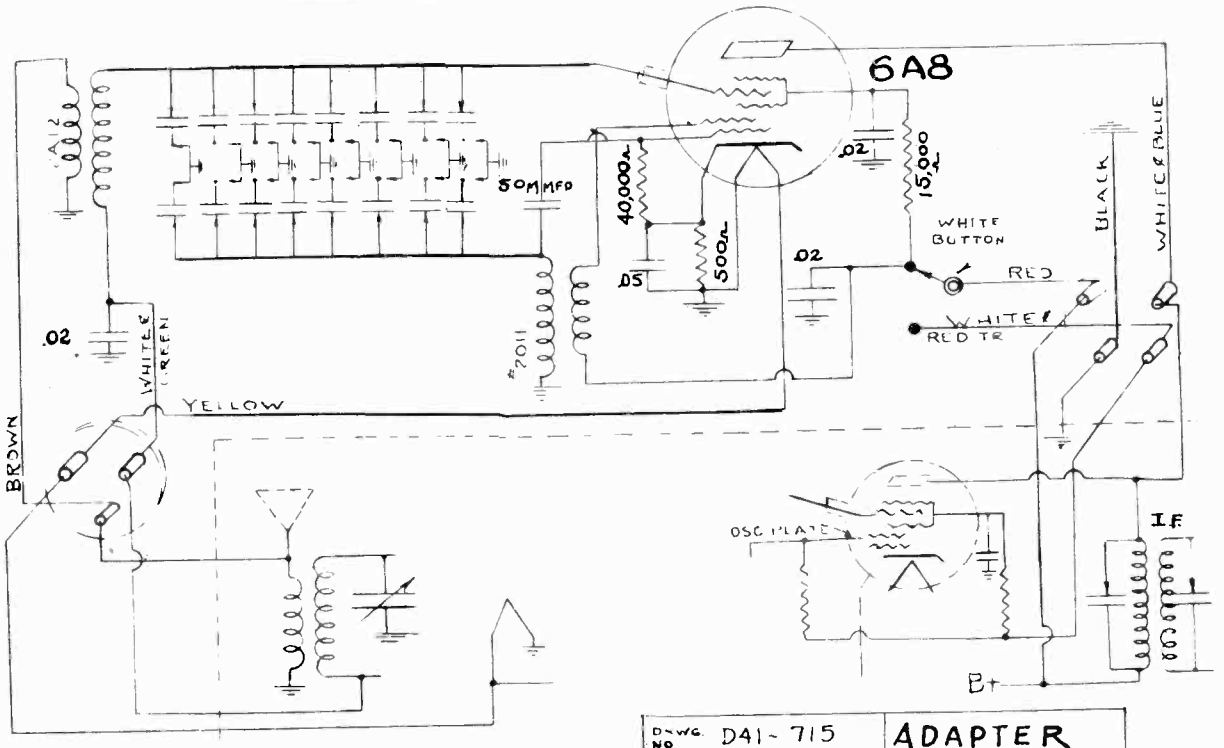
LUBRICATION: Petrolatum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gear of record posts. Light machine oil should be used in the tone arm vertical bearing, record post bearings, and all other bearings of various levers on underside of motorboard.

Apply a few drops of light machine oil to the motor spindle bearing. The oil hole has a screw plug. Do not allow oil or grease to come in contact with rubber mounting of tone arm base, rubber bumper, or rubber spindle cap.

FOR SERVICE REFERENCE THE FUNDAMENTAL RADIO-PHONOGRAPH ELECTRICAL CIRCUIT IS SHOWN BELOW.



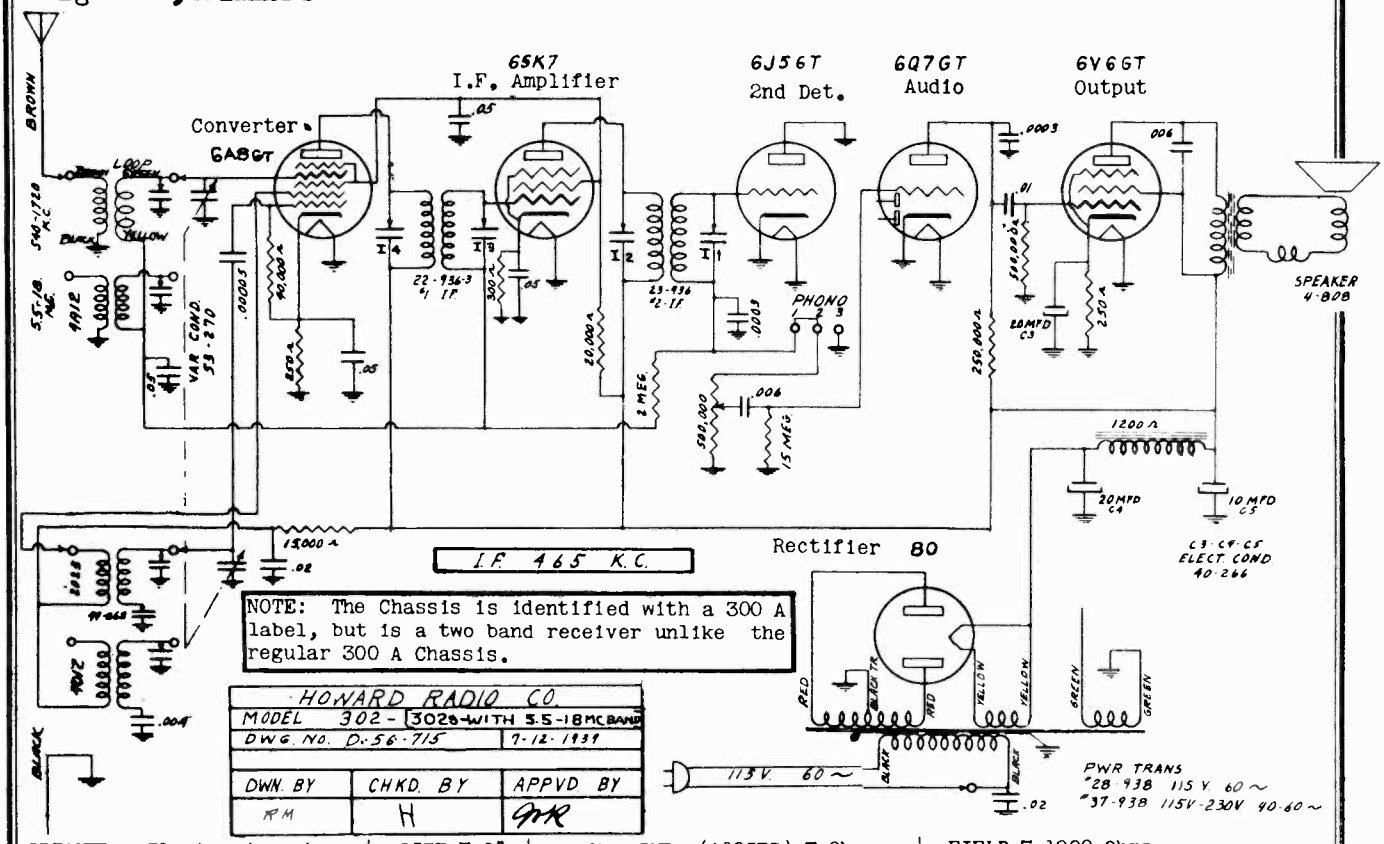
THIS CIRCUIT USED WITH MODELS:
520 ,301 APC, 580 APC



DWG NO D41-715	ADAPTER	
MODEL 210A WITH SWITCH IN SG. CIRCUIT		
		DATE 1 & 57

MODELS 302S, 302APC
Schematic, Voltage
Alignment, Trimmers

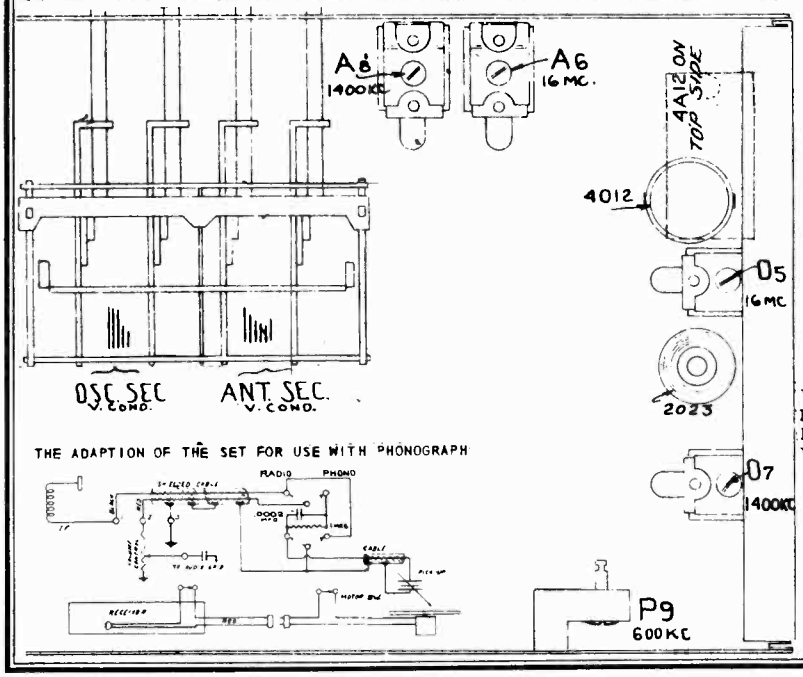
HOWARD RADIO CO.



SPEAKER = Electro-dynamic | SIZE = 8" | V.C.IMP. (400CPS) = Ohms | FIELD = 1200 Ohms
POWER SUPPLY - (Standard Models) = 105-120 V. 60 Cycle CONSUMPTION 60 WATTS
POWER OUTPUT- (MAX.) = 6 W. upo '4 W.

ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
BC	Min. Cap.	465 KC	6A8 Grid	A,E	I_1 I_2 I_3 I_4	IF
SW	16 MC	16 MC	Brown lead	B,D	O_5 A_6	Osc. Ant.
BC	1400 KC	1400 KC	Brown lead		O_7 A_8	Osc. Ant.
BC	600 KC	600 KC	Brown lead	C	P_9	Osc. Pad.



THE ADAPTION OF THE SET FOR USE WITH PHONOGRAPH

NOTES

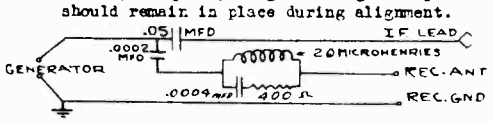
A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.

B- When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 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.

E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.

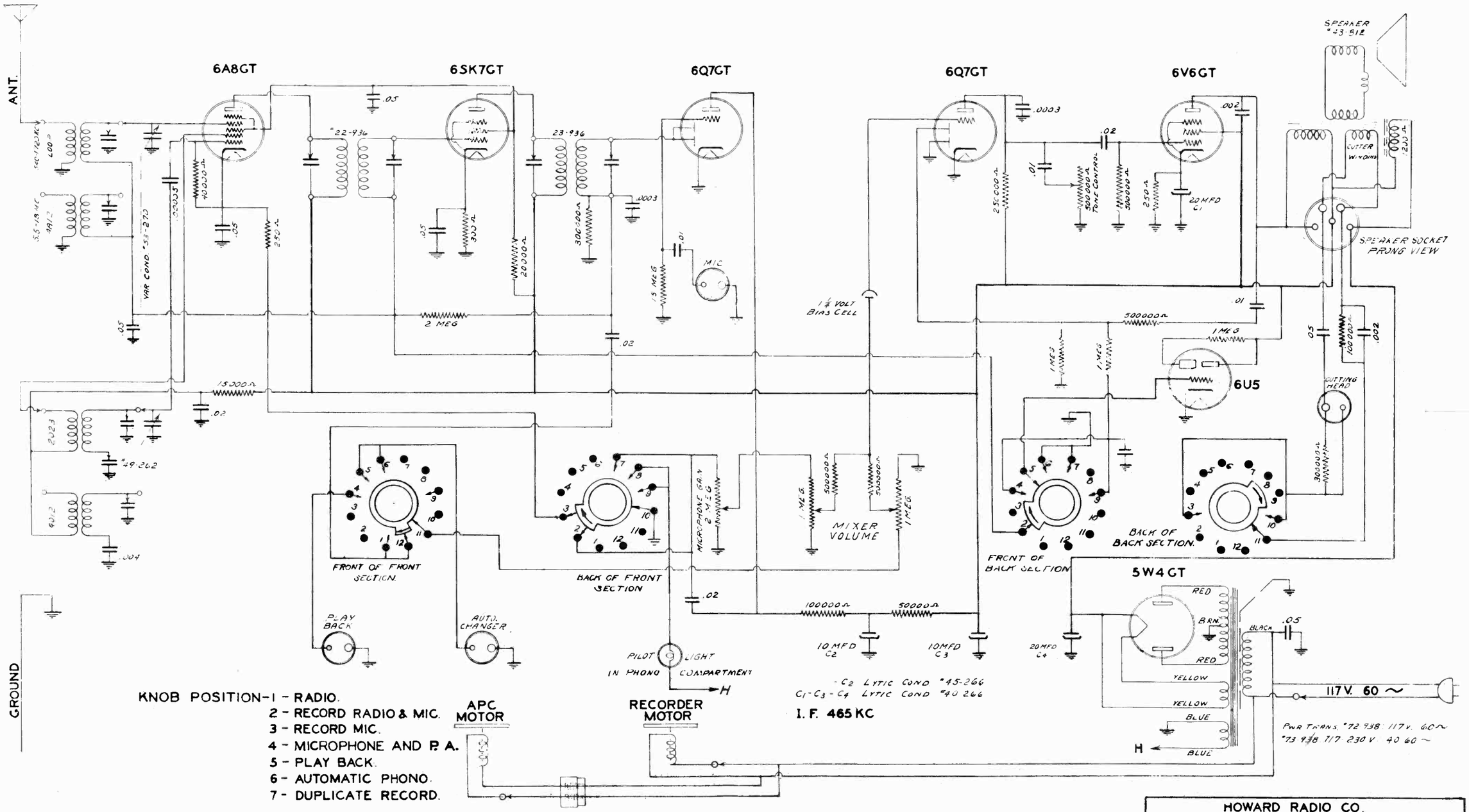


SOCKET VOLTAGE READINGS
Voltage taken from ground with line voltage at - 117 AC
High voltage reading off rectifier = 330V.
Drop across speaker field = 90 V.
Voltage taken with 1,000 Ohm per volt meter -

TUBE	FUNCTION	CATH. to SG.	GRID	PLATE
6A8 GT	Mixer	4	112	235 OR 150
6SK7	IF.	4	112	235
6J5 GT	Det.	x	x	x
6Q7 GT	Audio	x	x	38
6V6 GT	Output	11	240	230

MODELS 302R(RA), 302RT
Schematic

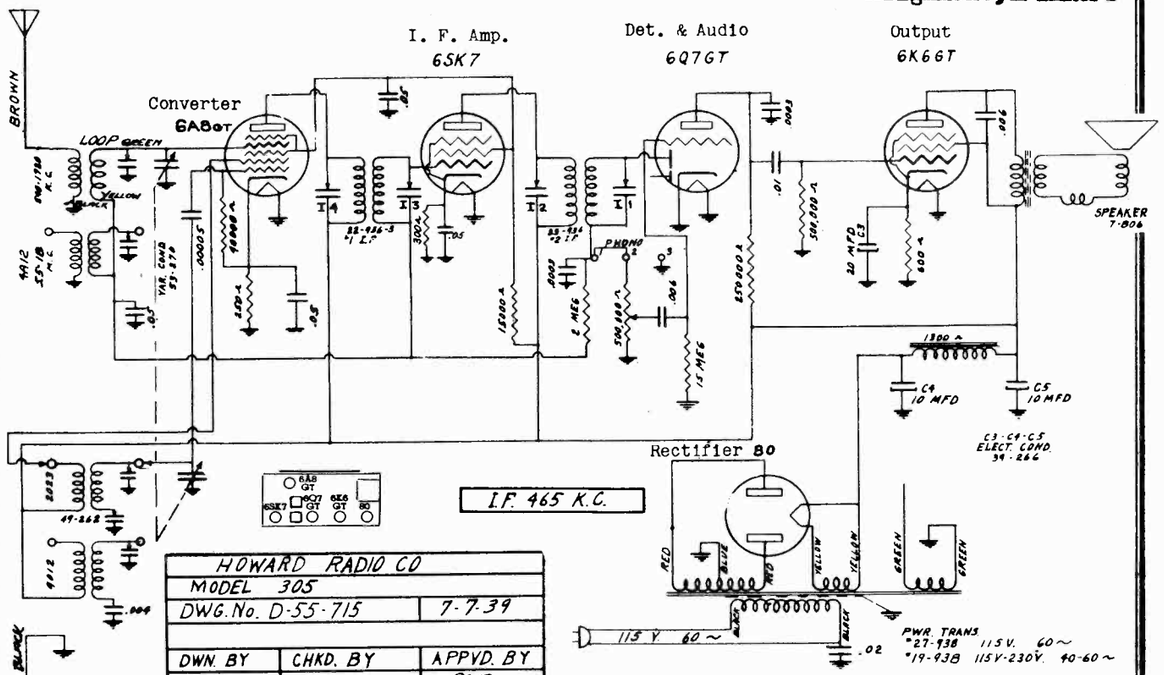
HOWARD RADIO CO.



HOWARD RADIO CO.	
MODELS 302 R. (RA), 302 RT	
DWG. NO. C71-715	2-21-40

MODEL 305
Schematic, Voltage
Alignment, Trimmers

HOWARD RADIO CO.

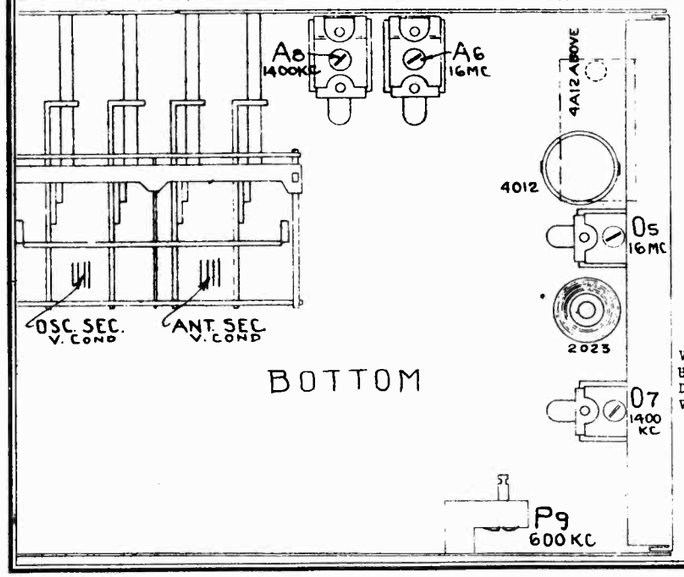


HOWARD RADIO CO		
MODEL 305		
DWG. No. D-55-715	7-7-39	
DWN. BY	CHKD. BY	APPVD. BY
RBM	H	GHR

SPEAKER = Electro-dynamic SIZE = 6" V.C.IMP.(400CPS) = 4 Ohms FIELD = 1300 Ohms
POWER SUPPLY - (Standard Models) = 105-120 V. 60 Cycle CONSUMPTION 50 WATTS
POWER OUTPUT - (MAX.) = 2.7 W. upo 1.5W

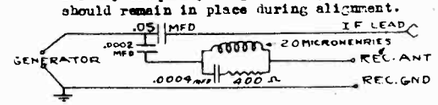
ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
BC	Min. Cap.	465 KC	6A8 Grid	A,E	I_1 I_2 I_3 I_4	IF
SW	16 MC	16 MC	Brown lead	B,D	O_5 A_6	Osc. Ant.
BC	1400 KC	1400 KC	Brown lead		O_7 A_8	Osc. Ant.
BC	600 KC	600 KC	Brown lead	C	P_9	Osc. Pad.



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 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.
E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.

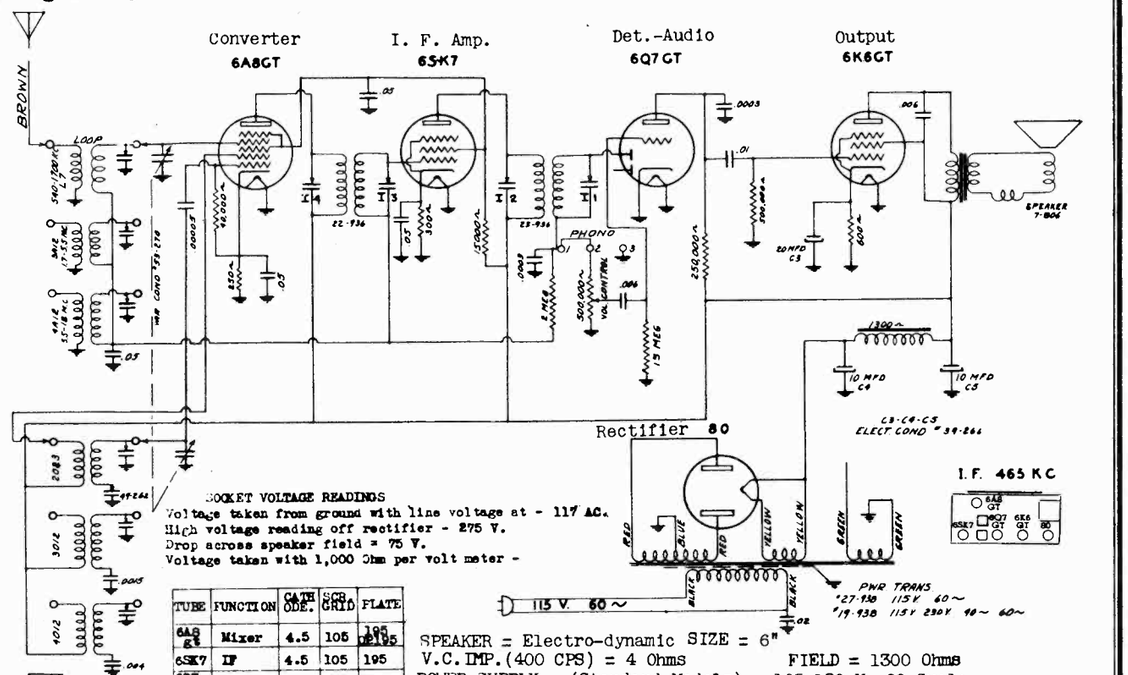


SOCKET VOLTAGE READINGS
Voltage taken from ground with line voltage at - 117 AC
High voltage reading off rectifier - 275 V.
Drop across speaker field = 75 V.
Voltage taken with 1,000 Ohm per volt meter -

TUBE	FUNCTION	CATH ODE.	SCR GRID	PLATE
6A8 GT	Mixer	4.5	105	195 OR 195
6SK7	IF	4.5	105	195
6Q7 GT	Det.			60
6K6 GT	Output	16	195	185

MODEL 306
Schematic, Voltage
Alignment, Trimmers

HOWARD RADIO CO.

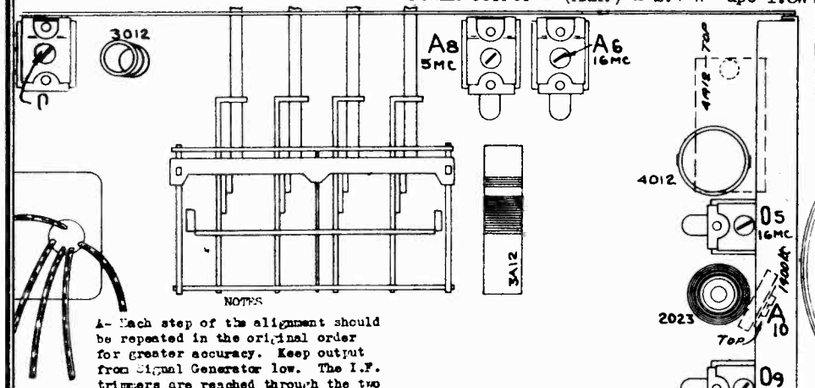


SOCKET VOLTAGE READINGS
Voltage taken from ground with line voltage at - 117 AC.
High voltage reading off rectifier - 275 V.
Drop across speaker field = 75 V.
Voltage taken with 1,000 Ohm per volt meter -

TUBE	FUNCTION	CATH ODE.	SCR GRID	PLATE
6A8 GT	Mixer	4.5	105	195 OR 195
6SK7	IF	4.5	105	195
6Q7 GT	Det.			60
6K6 GT	Output	16	195	185

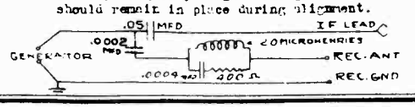
SPEAKER = Electro-dynamic SIZE = 6" FIELD = 1300 Ohms
V.C. IMP. (400 CPS) = 4 Ohms
POWER SUPPLY - (Standard Models) = 105-120 V. 60 Cycle
CONSUMPTION 50 WATTS
POWER OUTPUT - (MAX.) = 2.7 w upo 1.5w

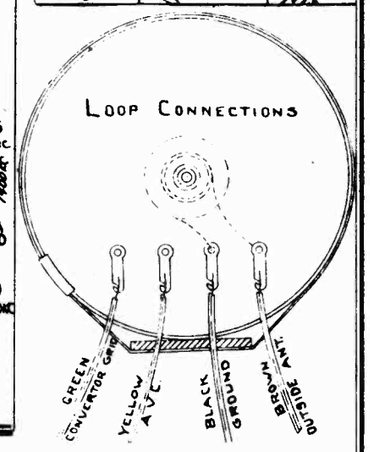
HOWARD RADIO CO.		
MODEL 306		
DWG. NO. D62-715		10-13-39
DWN. BY	CHKD. BY.	APPVD. BY
RBM		GHR



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 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.
E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.



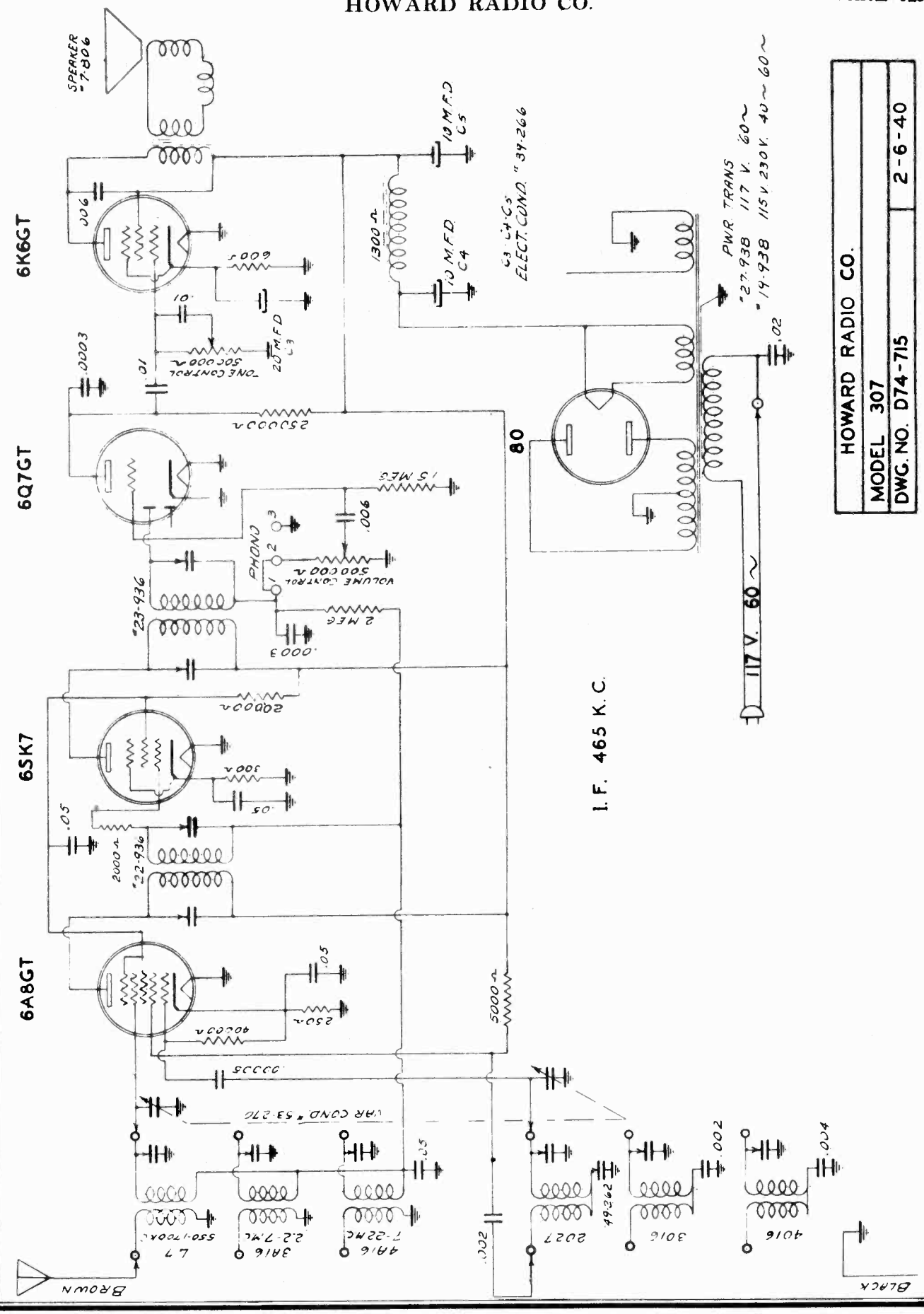


ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
BC	Min. Cap.	465 KC	6A8 Grid	A,E	I_1 I_2 I_3 I_4	IF
SW	16 MC	16 MC	Brown lead	B,D	O_5 A_6	Osc. Ant.
PB	5 MC	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.

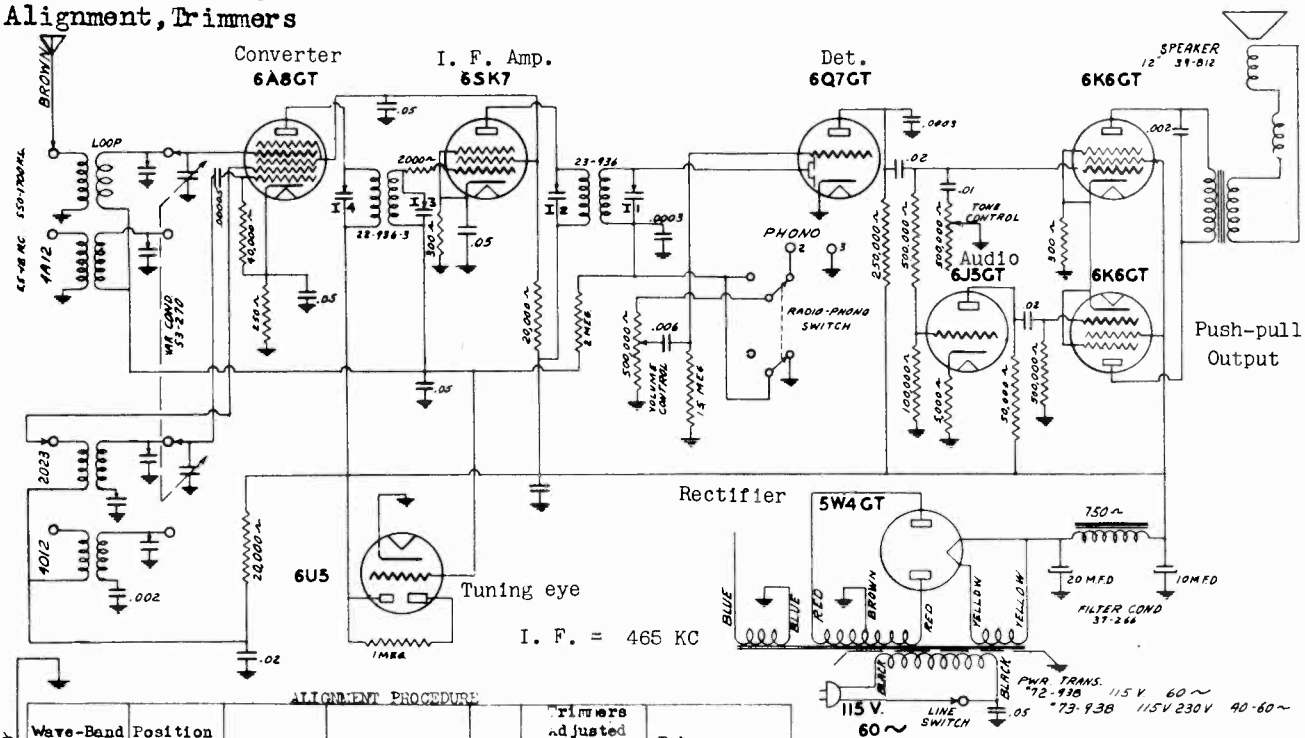
MODEL 307
Schematic

HOWARD RADIO CO.



MODELS 308APC, 308C, 308TT
Schematic, Voltage
Alignment, Trimmers

HOWARD RADIO CO.



ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers adjusted (In order shown)	Trimmer Function
BC	Min. Cap.	465 KC	6A8 Grid	A,E	I_1 I_2 I_3 I_4	IF
SW	16 MC	16 MC	Brown lead	B,D	O_5 A_6	Osc. Ant.
BC	1400 KC	1400 KC	Brown lead		O_7 A_8	Osc. Ant.
BC	600 KC	600 KC	Brown lead	C	P_9	Osc. Pad.

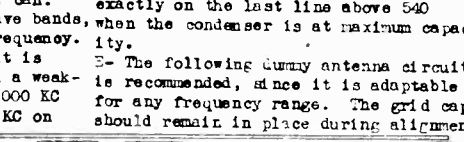
A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.

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.

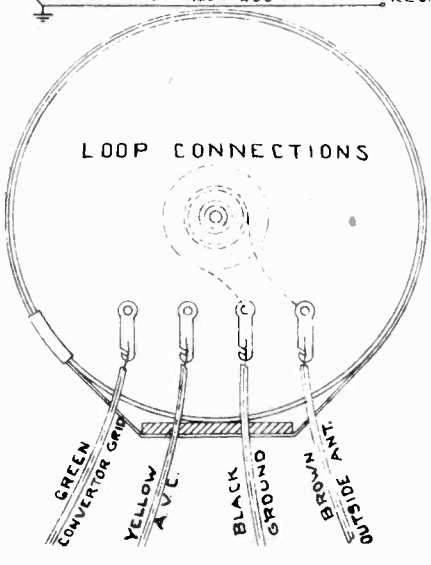
C- When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.

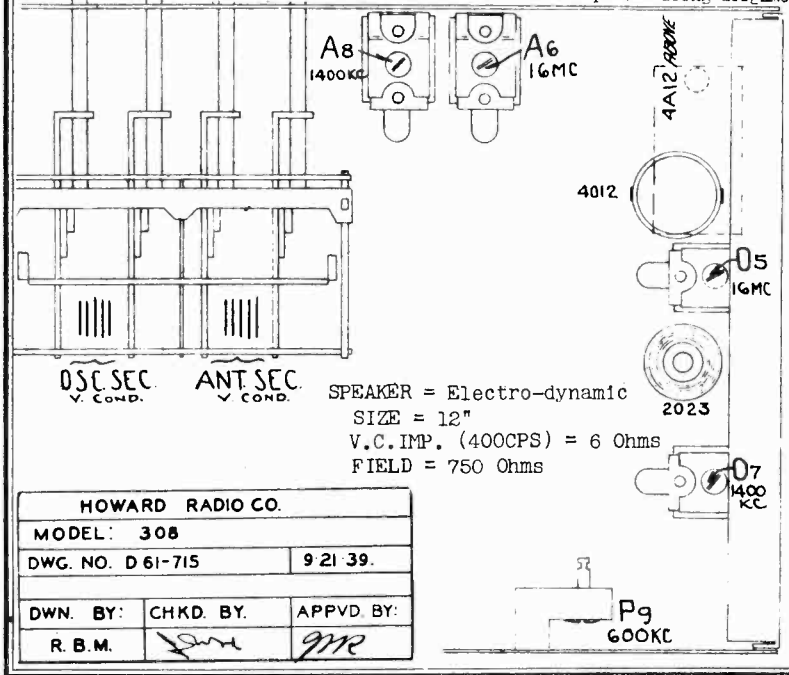
D- See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.

E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.



POWER SUPPLY - (Standard Models) = 105-120 V. 60 Cycle
CONSUMPTION 70 WATTS + 30APC
POWER OUTPUT - (MAX.) = 7.5 W. upo 4.5W.





SPEAKER = Electro-dynamic
SIZE = 12"
V.C.IMP. (400CPS) = 6 Ohms
FIELD = 750 Ohms

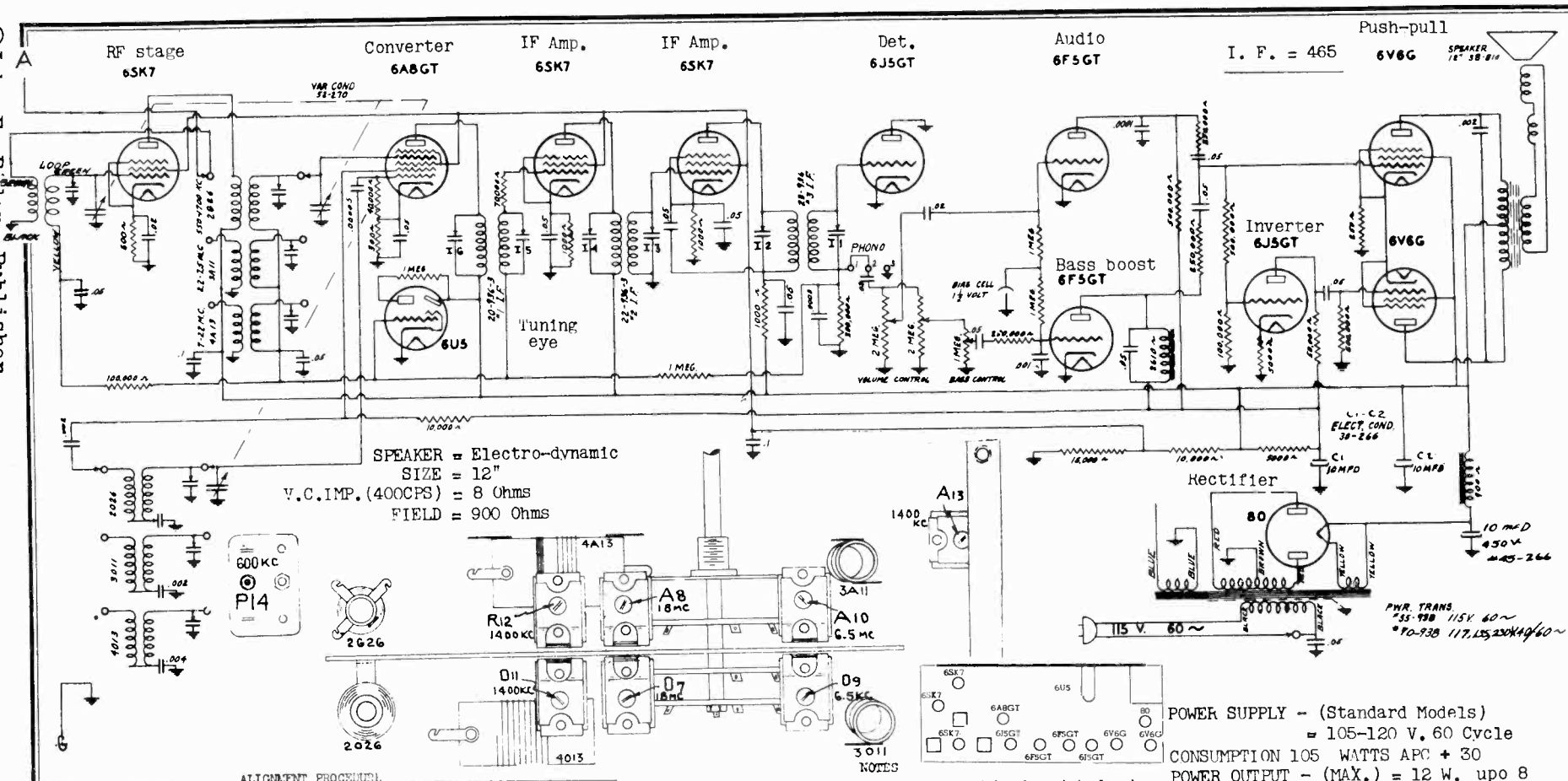
SOCKET VOLTAGE READINGS
Voltage taken from ground with line voltage at - 117 AC
High voltage reading off rectifier = 315 V.
Drop across speaker field = 75 V.
Voltage taken with 1,000 Ohm per volt meter -

TUBE	FUNCTION	CATH ODE.	SCR. GRID	PLATE
6A8 GT	Mixer	4	105	235 OR 105
6SK7	IF	3	105	235
6Q7 GT	Det.	x	x	70
6J5 GT	Inverter	7	x	150
6K6 GT	Output	18	240	230
6K6 GT	"	18	240	230

HOWARD RADIO CO.		
MODEL: 308		
DWG. NO. D 61-715		9 21 39.
DWN. BY:	CHKD. BY.	APPVD. BY:
R. B. M.		

HOWARD RADIO CO.

MODELS 518, 518S, 518APC
Schematic, Voltage, Socket Alignment, Trimmers



POWER SUPPLY - (Standard Models)
= 105-120 V. 60 Cycle
CONSUMPTION 105 WATTS APC + 30
POWER OUTPUT - (MAX.) = 12 W. upo 8

ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
BC	Min. Cap.	465 KC	6AB Grid	A,E	I_1 I_2 I_3 I_4 I_5 I_6	IF
SW	18 MC	18 MC	Ant. Post	B,D	O_7 A_8	Osc., Ant.
PB	6.5 MC	6.5 MC	Ant. Post		O_9 A_{10}	Osc., Ant.
BC	1400 KC	1400 KC	Ant. Post		O_{11} R_{12} A_{13}	Osc. RF, Ant.
BC	600 KC	600 KC	Ant. Post	C	P_{14}	Osc. Pad.

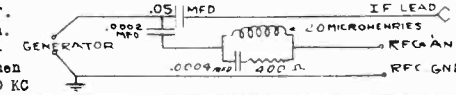
A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.

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.

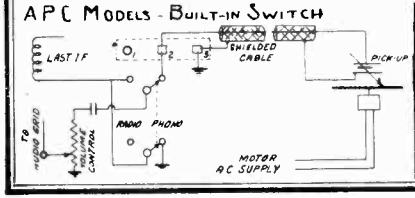
E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.



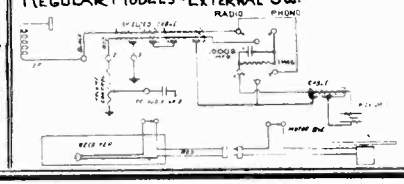
MODEL: 518		
DWG. NO. C-59-715		8-3-39
DWN. BY	CHKD. BY	APPVD. BY
RBM	H	HRH

THE ADAPTION OF THE SET FOR USE WITH PHONOGRAPH

APC MODELS - BUILT-IN SWITCH



REGULAR MODELS - EXTERNAL SW.



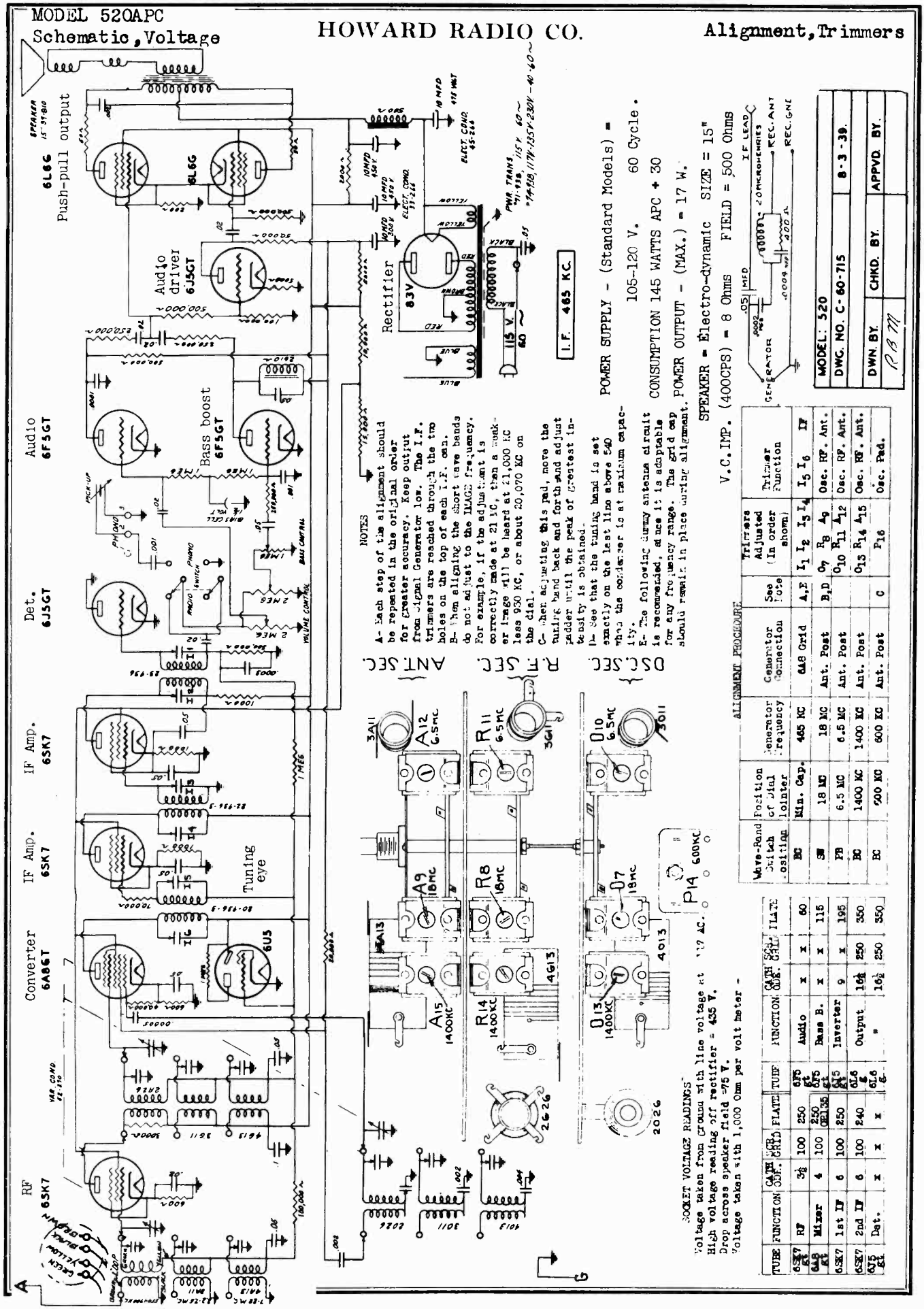
SOCKET VOLTAGE READINGS
Voltage taken from ground with line voltage at = 117 AC.
High voltage reading off rectifier - 340 V.
Drop across speaker field - 95 V.
Voltage taken with 1,000 Ohm per volt meter -

TUBE	FUNCTION	CATH ODE.	SCR GRID	PLATE	TUBE	FUNCTION	CATH ODE.	SCR GRID	PLATE
6SK7 ½	RF.	8	100	245	6F5 ½	Audio	x	x	65
6A8 ½	Mixer	4	100	245 OP135	6F5 ½	Bass B.	x	x	200
6SK7	1st IF	5	100	245	6J5 ½	Inverter	6	x	120
6SK7	2nd IF	5	100	240	6V6 ½	Output	16½	245	235
6J5 ½	Det.	x	x	x	6V6 ½	"	16½	245	235

MODEL 520APC
Schematic, Voltage

HOWARD RADIO CO.

Alignment, Trimmers



ALIGNMENT PROCEDURE

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
BC	Min. Cap.	465 KC	6A8 Grid	A,E	I_1 I_2 I_3 I_4 I_5 I_6	IF
SW	18 MC	18 MC	Ant. Post	B,D	O_7 R_8 A_9	Osc. RF, Ant.
PB	6.5 MC	6.5 MC	Ant. Post		O_{10} R_{11} A_{12}	Osc. RF, Ant.
BC	1400 KC	1400 KC	Ant. Post		O_{13} R_{14} A_{15}	Osc. RF, Ant.
BC	600 KC	600 KC	Ant. Post	C	P_{16}	Osc. Pad.

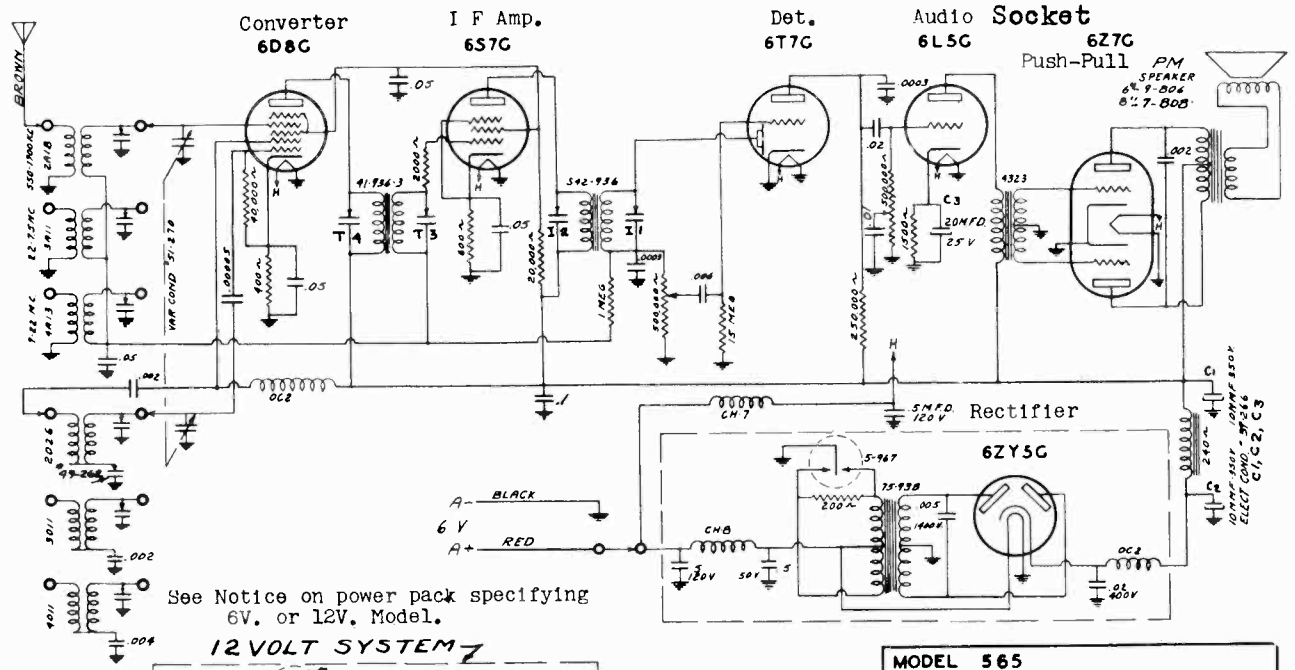
SOCKET VOLTAGE READINGS

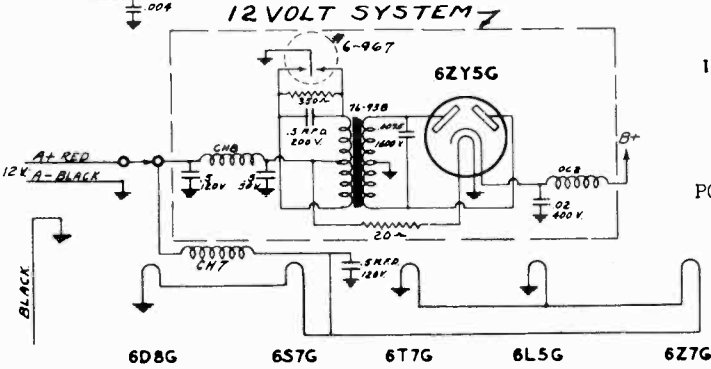
Voltage taken from Ground with line voltage at 117 A.C.
High voltage reading off rectifier = 435 V.
Drop across speaker field =75 V.
Voltage taken with 1,000 Ohm per volt meter -

TUBE	FUNCTION	CATH. CODE	GRID	PLATE	TUBE	FUNCTION	CATH. CODE	SCR. GRID	PLATE
6SK7	RF	3½	100	250	6F5	Audio	x	x	60
6A8	Mixer	4	100	250	6F5	Bass B.	x	x	115
6SK7	1st IF	6	100	250	6J5	Inverter	9	x	195
6SK7	2nd IF	6	100	240	6L6	Output	16½	250	350
6J5	Det.	x	x	x	6L6	"	16½	250	350

HOWARD RADIO CO.

MODEL 565(6v.,12v)
Schematics, Voltage
Alignment, Trimmers
Socket





I.F. 465 K.C.

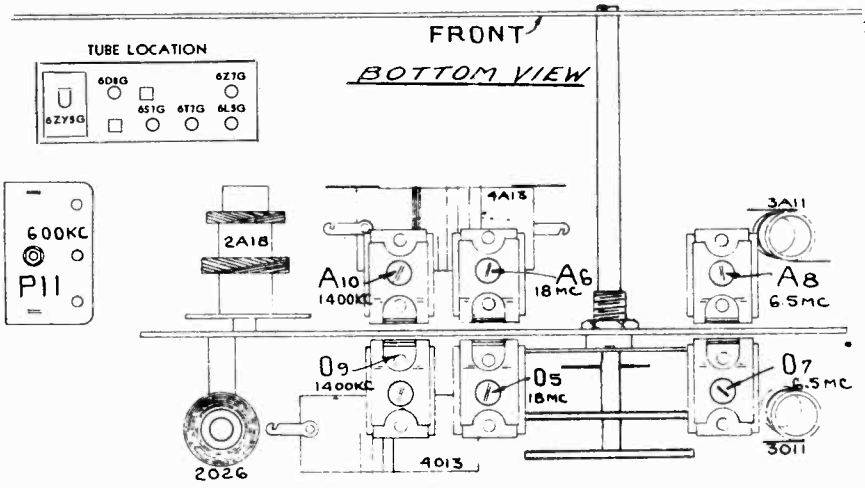
MODEL 565		
DWG. NO. D63-715		10-20-39
DWN. BY.	CHKD. BY	APPVD. BY
R B M		

POWER SUPPLY - (Standard Models) = 6 Volt & 12 Volt

DRAIN 2.4 Amps. With 6V. Models
and 1.4 Amps. With 12V. Models

POWER OUTPUT - (MAX.) = 2W.

SPEAKER = Permanent Magnet SIZE = 6" & 8"
V.C.IMP.(400CPS) = 6 Ohms FIELD - PM



NOTES

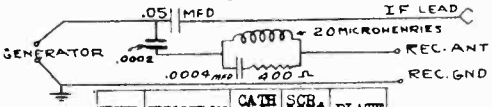
A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.

B- When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 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.

E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.



ALIGNMENT PROCEDURE

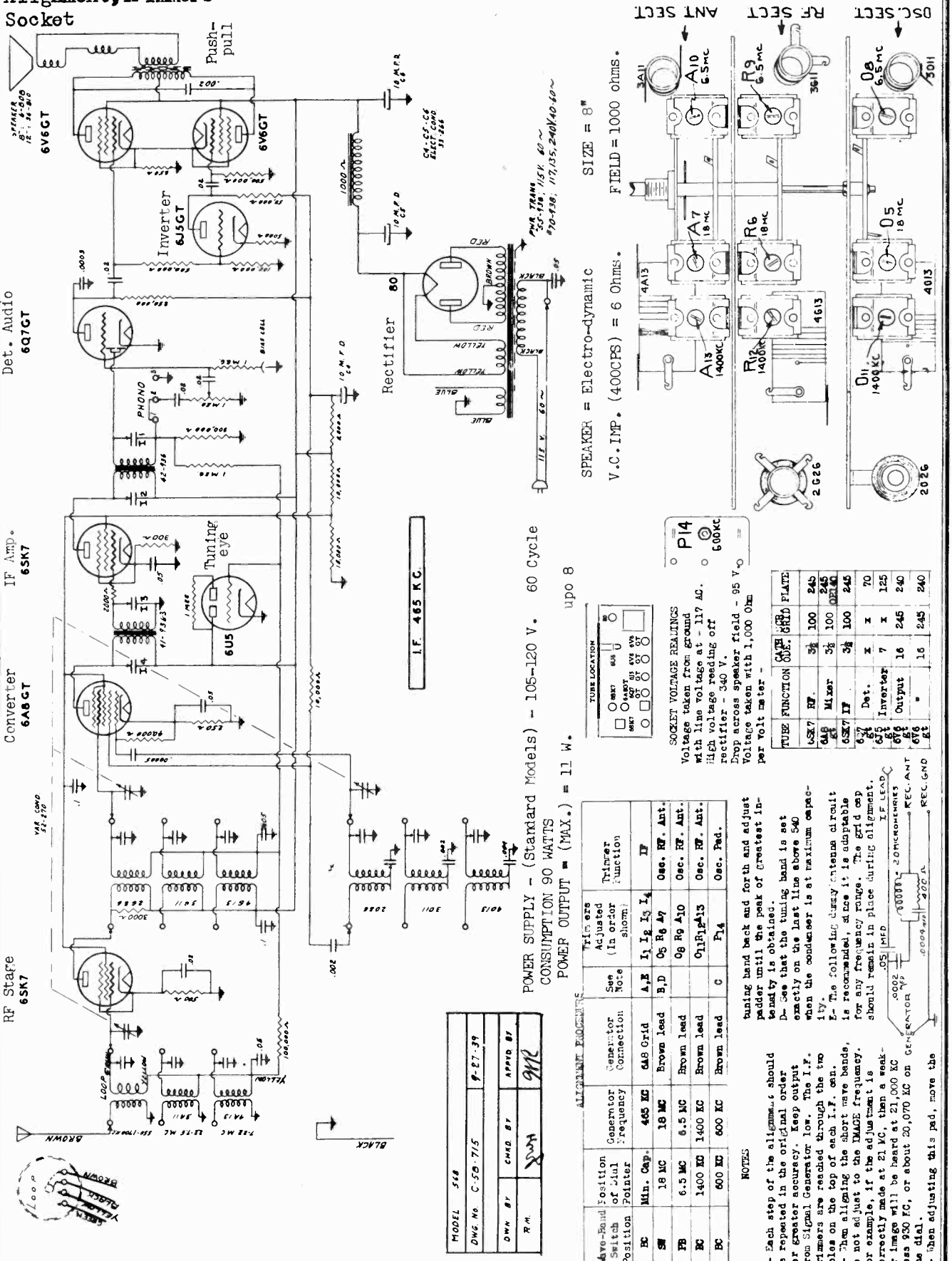
Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
BC	Min. Cap.	465 KC	6D8 Grid	A,E	I_1 I_2 I_3 I_4	IF
SW	18 MC	18 MC	Brown lead	B,D	O_5, A_6	Osc., Ant.
PB	6.5 MC	6.5 MC	Brown lead		O_7 A_8	Osc., Ant.
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.

SOCKET VOLTAGE →

TUBE	FUNCTION	CATH ODE.	SCR. GRID	PLATE
6D8G	Mixer	3	70	145 OR 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 568
Schematic, Voltage
Alignment, Trimmers
Socket

HOWARD RADIO CO.



TUBE	FUNCTION	CATH. OHMS	GRID	PLATE
6SK7	RF.	3/4	100	245
6A8	Mixer	3/4	100	245
6SK7	IF	3/4	100	245
6Q7	Det.	M	M	70
6U5	Inverter	7	M	125
6V6	Output	16	245	240
6V6	"	16	245	240

Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimers Adjusted (In order shown)	Trimer Function
BC	Min. Cap.	465 KC	6A8 Grid	A,B	I_1 I_2 I_3 I_4	IF
SW	18 MC	18 MC	Brown lead	B,D	O_5 R_8 A_7	Osc. RF. Ant.
FB	6.5 MC	6.5 MC	Brown lead		O_8 R_9 A_{10}	Osc. RF. Ant.
BC	1400 KC	1400 KC	Brown lead		O_{11} R_{12} A_{13}	Osc. RF. Ant.
BC	600 KC	600 KC	Brown lead	C	P_{14}	Osc. Pad.

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 21 MC, then a weaker Image will be heard at 21,000 KC less 930 KC, or about 20,070 KC on the dial.

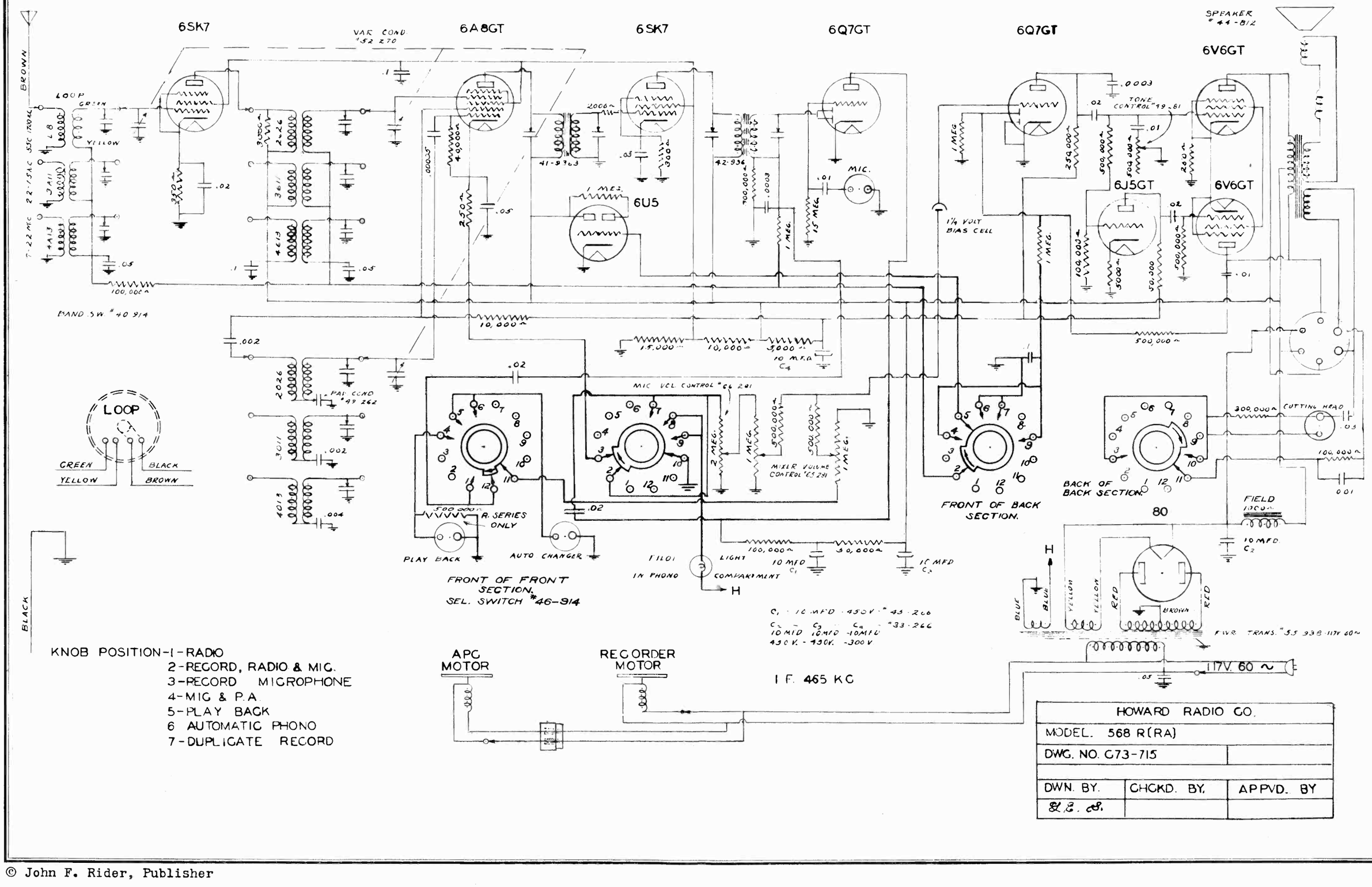
C- When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.

D- See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.

E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.

MODEL 568R(RA)
Schematic

HOWARD RADIO CO.

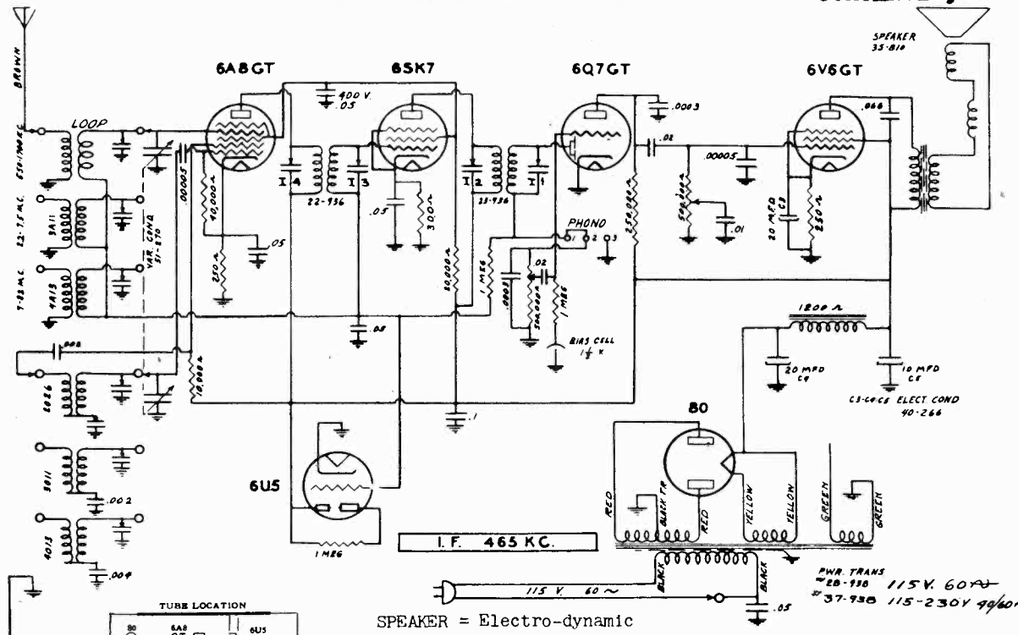


HOWARD RADIO CO.		
MODEL. 568 R(RA)		
DWG. NO. G73-715		
DWN. BY.	CHCKD. BY.	APPVD. BY
E. E. C.		

Alignment, Trimmers

HOWARD RADIO CO.

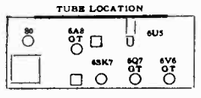
MODEL 575
Schematic, Voltage



SPEAKER = Electro-dynamic
SIZE = 6½" V.C.IMP. (400CPS) = 4 Ohms FIELD = 1200 Ohms

POWER SUPPLY - (Standard Models) = 105-120V. 60 Cycle
CONSUMPTION 50 WATTS
POWER OUTPUT - (MAX.) = 6W. upo 4W.

TUBE LOCATION



MODEL 575		
DWG. NO D-59-715		7-25-39
DWN. BY	CHKD BY	APPVD BY
RM	H	

Tubes:

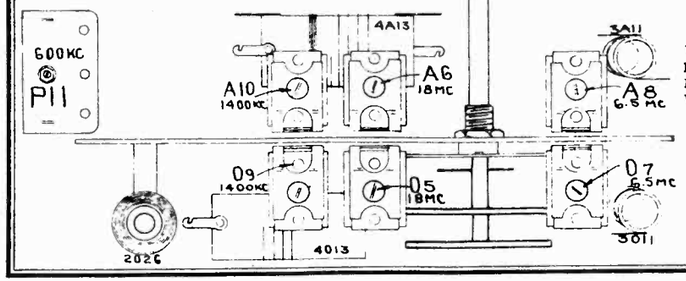
6A8GT Converter	6V6GT Output
6SK7 I. F. Amp.	6U5 Tuning Eye
6Q7GT Det.-Audio	80 Rectifier

ALIGNMENT PROCEDURE

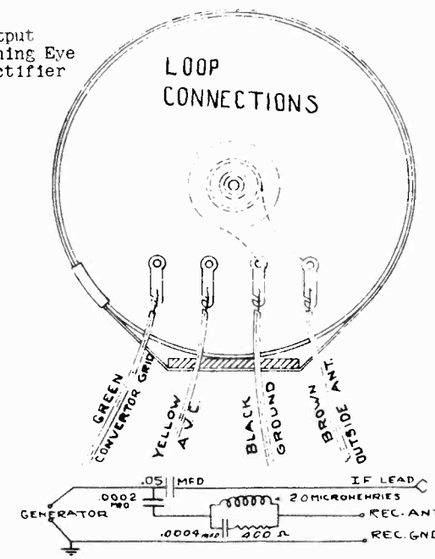
Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
BC	Min. Cap.	465 KC	6A8 Grid	A,E	I_1 I_2 I_3 I_4	IF
SW	18 MC	18 MC	Brown lead	B,D	O_5, A_6	Osc., Ant.
PB	6.5 MC	6.5 MC	Brown lead		O_7 A_8	Osc., Ant.
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.

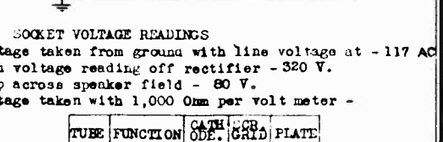
NOTES

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 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.
E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.



LOOP CONNECTIONS



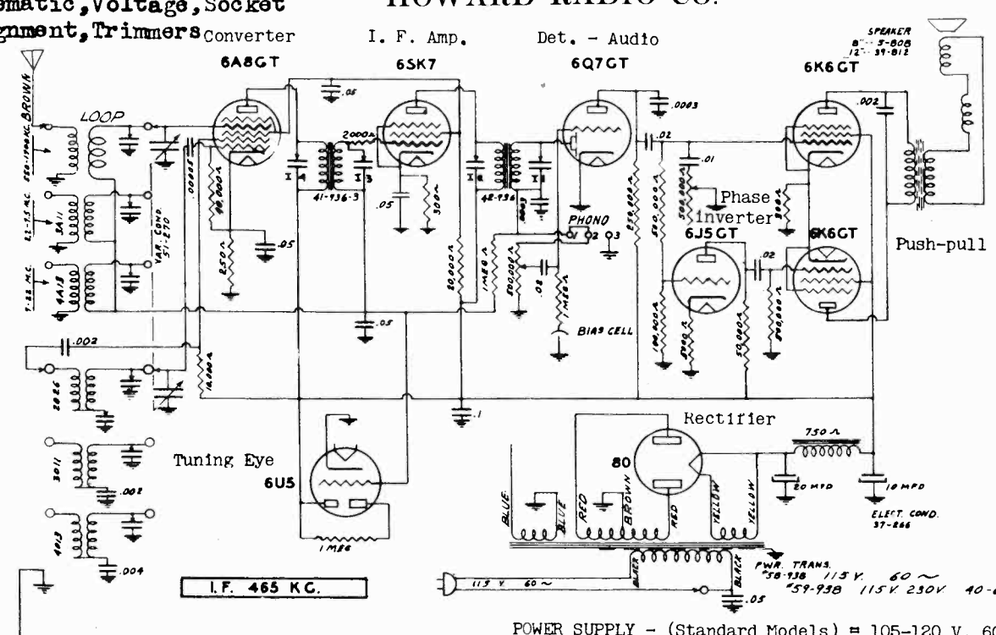


SOCKET VOLTAGE READINGS
Voltage taken from ground with line voltage at - 117 AC
High voltage reading off rectifier - 320 V.
Drop across speaker field - 80 V.
Voltage taken with 1,000 Ohm per volt meter -

TUBE	FUNCTION	CATH ODE.	SCR GRID	PLATE
6A8 GT	Mixer	3½	107	235 OR 180
6SK7	IF	4	107	235
6Q7 GT	Det.	x	x	70
6V6 GT	Output	11	240	225

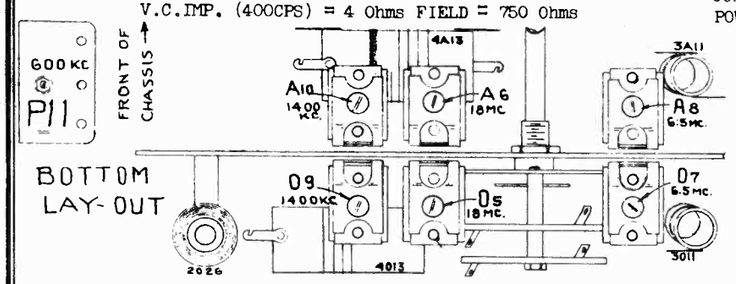
MODELS 580, 580C, 580APC
Schematic, Voltage, Socket
Alignment, Trimmers

HOWARD RADIO CO.



SPEAKER = Electro-dynamic SIZE = 8" & 12"
V.C.IMP. (400CPS) = 4 Ohms FIELD = 750 Ohms

POWER SUPPLY - (Standard Models) = 105-120 V. 60 Cycle
CONSUMPTION 75 WATTS APC + 30
POWER OUTPUT - (MAX.) = 7.5W upo 5

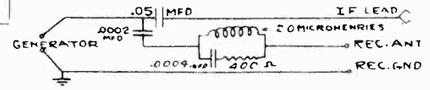


ALIGNMENT PROCEDURE

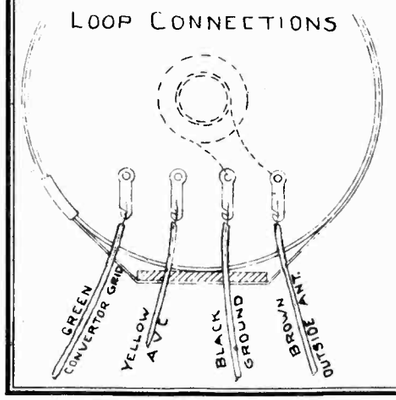
Wave-Band Switch Position	Position of Dial Pointer	Generator Frequency	Generator Connection	See Note	Trimmers Adjusted (In order shown)	Trimmer Function
BC	Min. Cap.	465 KC	6A8 Grid	A,E	I_1 I_2 I_3 I_4	IF
SW	18 MC	18 MC	Brown lead	B,D	O_5, A_6	Osc., Ant.
PB	6.5 MC	6.5 MC	Brown lead		O_7 A_8	Osc., Ant.
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.

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 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.
E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid cap should remain in place during alignment.

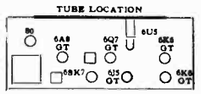


LOOP CONNECTIONS



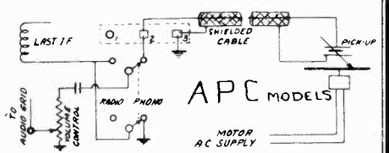
SOCKET VOLTAGE READINGS
Voltage taken from ground with line voltage at -117 AC.
High voltage reading off rectifier =305 V.
Drop across speaker field = 70 V.
Voltage taken with 1,000 Ohm per volt meter -

TUBE LOCATION

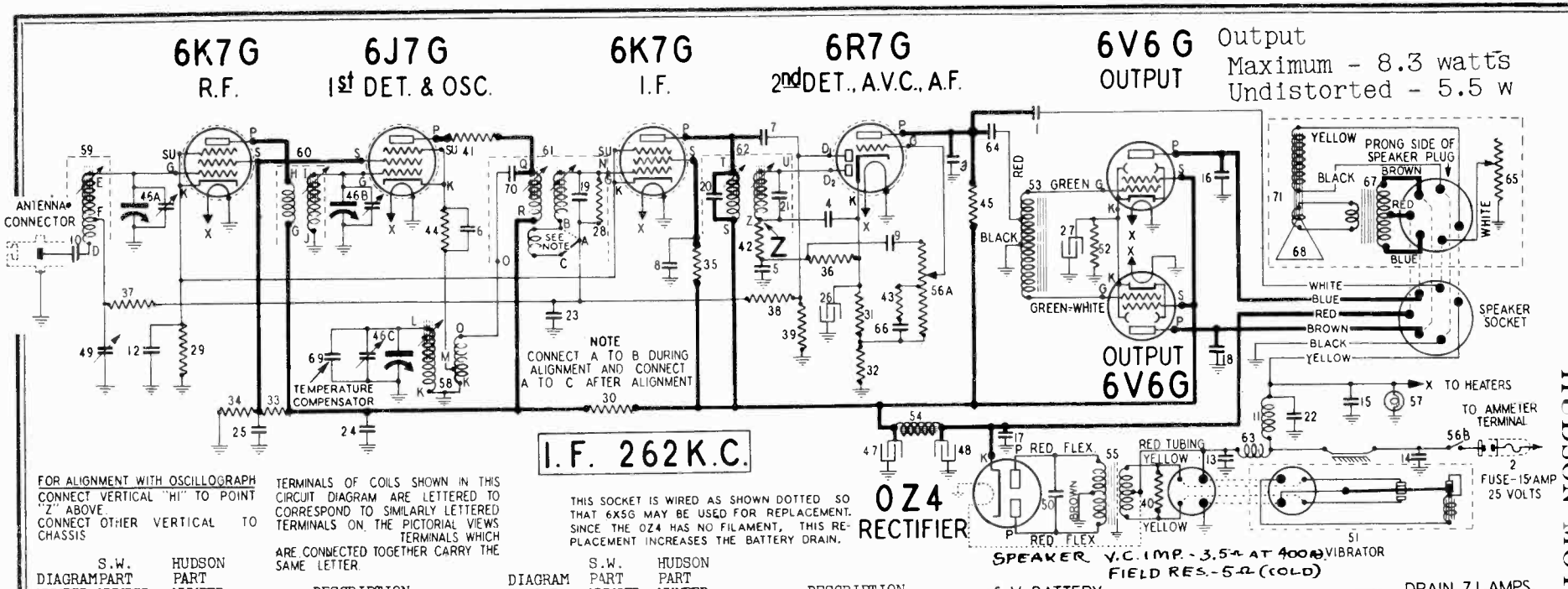


TUBE	FUNCTION	CATH ODE.	SCR GRID	PLATE
6A8 GT	Converter	4	110	235 OR 175
6SK7	IF	3½	110	235
6Q7 GT	Det.	x	x	70
6J5 GT	Invert	8	x	140
6K6 GT	Output	18	235	225
6K6 GT	"	18	235	225

THE ADAPTION OF THE SET FOR USE WITH PHONOGRAPH



HUDSON MOTOR CAR CO.
MODEL DB39
Schematic, Voltage Socket



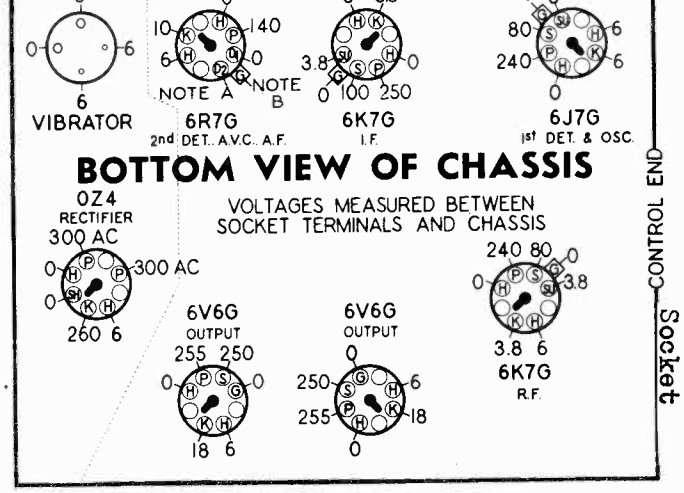
FOR ALIGNMENT WITH OSCILLOGRAPH CONNECT VERTICAL "HI" TO POINT "Z" ABOVE. CONNECT OTHER VERTICAL TO CHASSIS

TERMINALS OF COILS SHOWN IN THIS CIRCUIT DIAGRAM ARE LETTERED TO CORRESPOND TO SIMILARLY LETTERED TERMINALS ON THE PICTORIAL VIEWS. TERMINALS WHICH ARE CONNECTED TOGETHER CARRY THE SAME LETTER.

THIS SOCKET IS WIRED AS SHOWN DOTTED SO THAT 6X5G MAY BE USED FOR REPLACEMENT. SINCE THE 0Z4 HAS NO FILAMENT, THIS REPLACEMENT INCREASES THE BATTERY DRAIN.

DIAGRAM NUMBER	S.W. PART NUMBER	HUDSON PART NUMBER	DESCRIPTION
1----		83007	BO-158446--Condenser-paper.02 mfd. 600V.
2----		83207	BO-158496--Fuse 15 amp. 25 volt
3-4-5--		83539	BO-158447--Condenser - mica 260 mmfd.
6----		84282	BO-158449--Condenser-.001 mfd.mica (10%)
7----		85061	BO-158450--Condenser - mica 51 mmfd.
8----		88026	BO-158451--Condenser-paper.02 mfd. 400V.
9-10--		88030	BO-158452--Condenser-paper.01 mfd. 400V.
11---		88183	BO-158499--"A" choke coil (short)
12---		88193	BO-158453--Condenser-paper.25 mfd. 150V.
13-14--		88195	BO-158454--Condenser-paper .5 mfd. 150V.
15-16-17-18		88205	BO-158455--Condenser - mica 2100 mmfd.
19-20-21		88233	BO-158444--Condenser-110 mmfd. mica (5%)
22---		88298	BO-158456--Condenser-.25 mfd. 150 volt
23---		88534	BO-158457--Condenser-paper.05 mfd. 150V.
24---		88682	BO-158458--Condenser-paper .1 mfd. 400V.
25---		89421	BO-158459--Condenser-paper .1 mfd. 200V.
26-27---		110377	BO-158460--Cond.-elect. 10 mfd. 35 volt
28---		110591	BO-158494--Resistor-680,000 ohms ½ watt
29---		112963	BO-158470--Resistor - 330 ohm 1/4 watt
30---		112964	BO-158471--Resistor - 1500 ohm 1/4 watt
31-32---		112965	BO-158472--Resistor - 2000 ohm 1/4 watt
33---		112967	BO-158473--Resistor - 71000 ohm 1 watt
34---		112968	BO-158474--Resistor - 80000 ohm 1/4 watt
35---		112969	BO-158475--Resistor-100,000 ohm ½W.(10%)
36---		112970	BO-158476--Resistor-330,000 ohm 1/4 watt
37---		112971	BO-158477--Resistor-470,000 ohm 1/4 watt
38---		112972	BO-158478--Resistor - 1 megohm 1/4 watt
39---		112973	BO-158479--Resistor - 1.5 meg. 1/4 watt
40---		112976	BO-158480--Resistor - wire wound 220 ohms 1/2 watt (10%)
41---		112977	BO-158481--Resistor-470 ohm 1/4 watt(10%)
42---		112982	BO-158485--Resistor - 27000 ohm 1/4 watt
43---		112988	BO-158490--Resistor-60000 ohm ½ W. (10%)
44-----		112989	BO-158491--Resistor - 9500 ohm ½W. (10%)
45-----		112990	BO-158495--Resistor -27000 ohm 1/2 watt
46A to 46C		114243	BO-158464--Condenser - variable gang
47-48----		114258	BO-158461--Cond.-elect. 8 mfd. 450 volt
49-----		114259	BO-158462--Condenser - padding
50-----		114277	BO-158463--Condenser - oil impreg. .01 mfd. 2000 volts
51-----		114300	BO-158505--Vibrator
52-----		114335	BO-158493--Resistor - wire wound 430 ohms 2 watt (10%)
53-----		114350	BO-158507--Transformer - audio input
54-----		114352	BO-158508--Choke - filter (iron core)
55-----		114354	BO-158509--Transformer - power
56A - 56B		114363	BO-158530--Volume control 400,000 ohms; with flex. shft. & switch
57-----		114401	BO-158537--Dial lamp - 6 volt
58-----		114404	BO-158511--Oscillator coil
59-----		114406	BO-158512--Antenna coil
60-----		114410	BO-158513--R. F. coil
61-----		114411	BO-158514--Transformer - 1st I.F.
62-----		114415	BO-158516--Transformer - 2nd I.F.
63-----		114435	BO-158517--"A" choke coil (long)
64-----		114449	BO-158465--Condenser-paper.25 mfd. 400V.
65-----		114481	BO-158542--Tone control (100,000 ohms)
66-----		114482	BO-158466--Condenser - molded .005 mfd. 400 volts
67---M-		114488	BO-158546--Transformer - output
68---M-		114489	BO-158547--Cone - voice coil assembly (for M-115036 speaker)
69-----		114499	BO-158469--Condenser - temperature compensating - for oscillator
70-----		114523	BO-158443--Condenser - mica 300 mmfd.5%
71---M-		115036	BO-158549--Speaker - dynamic (8 inch) (for custom Model DB-39)

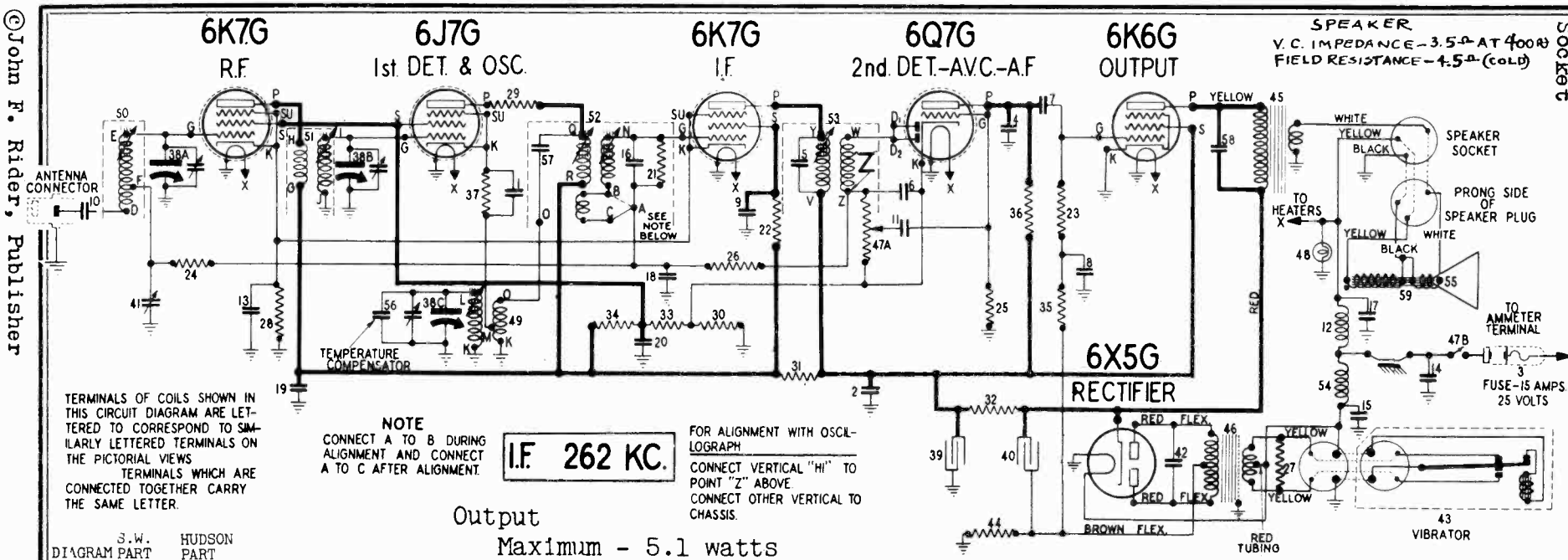
6 V. BATTERY — DRAIN 7.1 AMPS.



IMPORTANT:- Use a high resistance voltmeter of at least 1000 ohms per volt.
NOTE A:- Due to the high resistance in this circuit only a slight deflection of the voltmeter will be obtained. This voltage which is 10 volts is measured across resistors No. 31 and 32.
NOTE B:- The bias for the control grid of the triode section of the 6R7G is 5 volts measured across resistor No. 32.

MODEL SA39
Schematic, Voltage
Socket

HUDSON MOTOR CAR CO.



TERMINALS OF COILS SHOWN IN THIS CIRCUIT DIAGRAM ARE LETTERED TO CORRESPOND TO SIMILARLY LETTERED TERMINALS ON THE PICTORIAL VIEWS

TERMINALS WHICH ARE CONNECTED TOGETHER CARRY THE SAME LETTER.

NOTE
CONNECT A TO B DURING ALIGNMENT AND CONNECT A TO C AFTER ALIGNMENT.

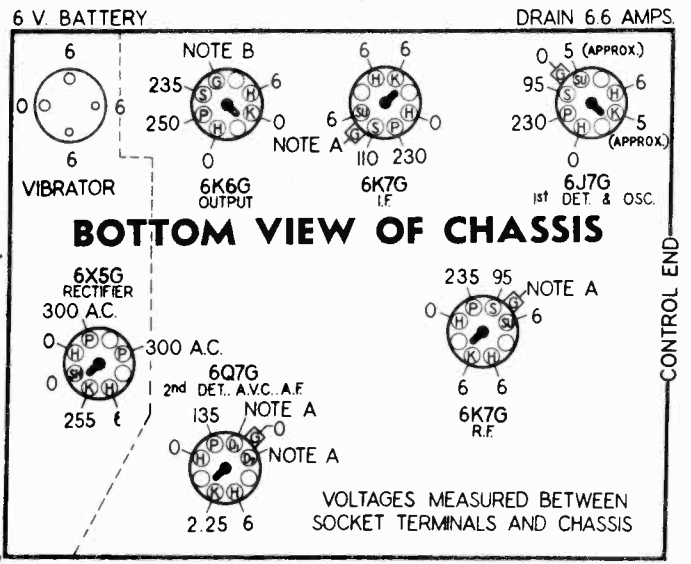
I.F. 262 KC.

FOR ALIGNMENT WITH OSCILLOGRAPH
CONNECT VERTICAL "HI" TO POINT "Z" ABOVE.
CONNECT OTHER VERTICAL TO CHASSIS.

Output

Maximum - 5.1 watts
Undistorted - 2.6 watts

DIAGRAM NUMBER	S.W. PART NUMBER	HUDSON PART NUMBER	DESCRIPTION
1-2---	81156	B0-158445	--Condenser - mica .001 mfd.
3---	83207	B0-158496	--Fuse 15 amp. 25 volt
4---	83763	B0-158448	--Cond.-mica, 110 mmf. (10%)
5---	88233	B0-158444	--Cond.-mica, 110 mmfd. (5%)
6---	85394	B0-158467	--Condenser - mica 500 mmfd.
7-8-9--	88026	B0-158451	--Condenser - .02 mfd. 400V.
10-11--	88030	B0-158452	--Condenser - .01 mfd. 400V.
12---	88183	B0-158499	--"A" choke coil (short)
13---	88193	B0-158453	--Condenser - .25 mfd. 150V.
14-15--	88195	B0-158454	--Condenser - .5 mfd. 150 V.
16---	88253	B0-158444	--Cond.-110 mmfd. mica (5%)
17---	88298	B0-158456	--Condenser - .25 mfd. 150V.
18---	88534	B0-158457	--Condenser - .05 mfd. 150V.
19---	88682	B0-158458	--Condenser - .1 mfd. 400 V.
20---	89421	B0-158459	--Condenser - .1 mfd. 200 V.
21---	110591	B0-158494	--Resistor - carb. 680,000 ohms 1/4 watt
22---	112969	B0-158475	--Resistor - insulated 100,000 ohms 1/4 W. (10%)
23-24--	112971	B0-158477	--Resistor - insulated 470,000 ohms 1/4 watt
25---	112972	B0-158478	--Resistor - insulated 1 meg. 1/4 watt
26---	112973	B0-158479	--Resistor - insulated 1.5 meg. 1/4 watt
27---	112976	B0-158480	--Resistor - wire wound 220 ohms ½ watt (10%)
28-29--	112977	B0-158481	--Resistor - insulated 470 ohms ½ watt (10%)
30---	112979	B0-158482	--Resistor - insulated 800 ohms ½ watt (10%)
31---	112980	B0-158483	--Resistor - insulated 1000 ohms 1/4 watt
32---	112981	B0-158484	--Resistor - insulated 1500 ohms 1/2 watt
33---	112983	B0-158486	--Resistor - insulated 33,000 ohms ½ W. (10%)
34---	112984	B0-158487	--Resistor - insulated 33,000 ohms 2 W. (10%)
35---	112985	B0-158488	--Resistor - insulated 68,000 ohms 1/4 watt
36---	112987	B0-158489	--Resistor - insulated 220,000 ohms 1/4 watt
37---	112989	B0-158491	--Resistor - carbon 9,500 ohms 1/4 watt (10%)
38A to C--	114243	B0-158464	--Condenser - variable gang
39-40---	114258	B0-158461	--Cond.-elect. 8 mfd. 450 V.
41---	114259	B0-158462	--Condenser - padding
42---	114277	B0-158463	--Condenser - oil filled .01 mfd. 2000 volts
43---	114300	B0-158505	--Vibrator
44---	114334	B0-158492	--Resistor-360 oh. 2 W.(10%)
45---	114348	B0-158506	--Transformer - output
46---	114354	B0-158509	--Transformer - power
47A - 47B-	114364	B0-158531	--Vol. Cont. (500,000 ohms) flex. shaft & switch
48---	114401	B0-158537	--Dial lamp - 6 volt
49---	114404	B0-158511	--Oscillator coil
50---	114406	B0-158512	--Antenna coil
51---	114410	B0-158513	--R. F. Coil
52---	114411	B0-158514	--Transformer - 1st I.F.
53---	114413	B0-158515	--Transformer - 2nd I.F.
54---	114435	B0-158517	--"A" choke coil (long)
55---	R-114487	B0-158545	--Cone - voice coil assembly for R-115023 speaker
56---	114499	B0-158469	--Condenser-temp.comp.-osc.
57---	114523	B0-158443	--Cond.-mica 300 mmfd. 5%
58---	114528	B0-158468	--Condenser - .005 mfd.600V.
59---	R-115023	B0-158548	--Speaker-dynamic (6 inch) (for DeLuxe Model SA-39)



IMPORTANT: Use high resistance voltmeter of at least 1000 ohms/volt.
NOTE A: The bias voltage on the grids of the 6K7G R.F.; 6K7G I.F. and the diode plates of the 6Q7G tube is 2.45 volts measured across resistor No. 30.
NOTE B: The bias voltage on the grid of the 6K6G is -17 volts measured across resistor No. 44.

ALIGNMENT PROCEDURE

THIS MATERIAL APPLIES TO BOTH MODELS SA-39 AND DB-39 UNLESS OTHERWISE INDICATED BY NOTES BELOW.

TO PROPERLY ALIGN THESE RECEIVERS IT IS ESSENTIAL THAT YOU FOLLOW THIS PROCEDURE EXACTLY.

BEFORE ALIGNING THE I. F. TRANSFORMERS THE GREEN-WHITE JUMPER LOCATED UNDER THE FIRST I. F. TRANSFORMER MUST BE CONNECTED AS SHOWN IN FIGURES 2 AND 4 OTHERWISE ALIGNMENT WILL BE INCORRECT.

AFTER ALIGNING THE I.F. TRANSFORMERS. TRANSFER THE GREEN-WHITE JUMPER LOCATED UNDER THE FIRST I. F. TRANSFORMER. TO ITS ORIGINAL POSITION.

1– Connect the output meter across the speaker voice coil or
(a) For Model SA-39, connect between the plate of the 6K6G and chassis in series with a .1 mfd. condenser.
(b) For Model DB-39, connect between the plates of the two 6V6G output tubes.
NOTE:- The more sensitive type of meter should be connected across the voice coil.

2– Connect the ground lead of the signal generator to the receiver chassis and leave it connected in this manner throughout the entire alignment procedure.

3– Turn the volume control to the maximum volume position.

4– With the gang condenser in full mesh, set the pointer to the end of the calibration slot on the low frequency end of the dial scale. This can be done by loosening the set screw in the dial cord drive drum, (see "K" in figure 5 on page 11) holding the gang condenser in full mesh and turning the drum until the pointer is correctly set. Then retighten the set screw in the dial drum.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECTION OF SIG. GEN. OUTPUT TO RECEIVER	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.01 MFD CONDENSER	CONTROL GRID OF 6J7G TUBE	262 KC.	ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL	1–2	1ST I. F.	IMPORTANT: CHANGE JUMPER ON BOTTOM OF 1ST I.F. TRANSFORMER TO CONNECT TERMINALS A & B INSTEAD OF A & C. (SEE FIGURE 1 OR 3 ON PAGE 9.) ADJUST FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT. (TRIMMER NO. 4 IN MODEL DB-39 ONLY)
				3–4	2ND I.F.	
CONNECT A 125 MMFD. MICA CONDENSER TO THE END OF THE SIGNAL GENERATOR LEAD. CONNECT THE OTHER END OF THE CONDENSER TO POINT "X" SHOWN IN FIGURES 1 OR 3 ON PAGE 9.			1350 KC.	5	OSCILLATOR (SHUNT CONDENSER)	IMPORTANT: CHANGE JUMPER ON BOTTOM OF 1ST I.F. TRANSFORMER TO CONNECT TERMINALS A & C INSTEAD OF A & B. (SEE TRIMMER LOCATION CHART ON PAGE 9) ADJUST TRIMMER TO BRING IN SIGNAL.
SAME AS ABOVE			TUNE TO 1350 KC. GENERATOR SIGNAL	6	ANTENNA (SHUNT CONDENSER)	ADJUST FOR MAXIMUM OUTPUT.
				7	R.F. (SHUNT CONDENSER)	
SAME AS ABOVE			TUNE TO 600 KC. GENERATOR SIGNAL	8	ANTENNA COMPENSATOR (SERIES CONDENSER)	ADJUST FOR MAXIMUM OUTPUT. TRY TO INCREASE OUTPUT BY DETUNING TRIMMER AND RETUNING RECEIVER DIAL UNTIL MAXIMUM OUTPUT IS OBTAINED.
SAME AS ABOVE		800 KC.	TUNE TO 800 KC. GENERATOR SIGNAL	9	ANTENNA (IRON CORE)	ADJUST FOR MAXIMUM OUTPUT.
				10	R.F. (IRON CORE)	
SAME AS ABOVE			TUNE TO 1350 KC. GENERATOR SIGNAL	6	ANTENNA (SHUNT CONDENSER)	ADJUST FOR MAXIMUM OUTPUT.
				7	R.F. (SHUNT CONDENSER)	
SAME AS ABOVE			TUNE TO 600 KC. GENERATOR SIGNAL	8	ANTENNA COMPENSATOR (SERIES CONDENSER)	ADJUST FOR MAXIMUM OUTPUT. TRY TO INCREASE OUTPUT BY DETUNING TRIMMER AND RETUNING RECEIVER DIAL UNTIL MAXIMUM OUTPUT IS OBTAINED.

AFTER THE SET IS INSTALLED IN THE CAR, TUNE IN A FAIRLY WEAK STATION NEAR 600 KC. AND ADJUST TRIMMER 8 FOR MAXIMUM OUTPUT.

TRIMMER LOCATION CHARTS FOR MODEL SA-39.

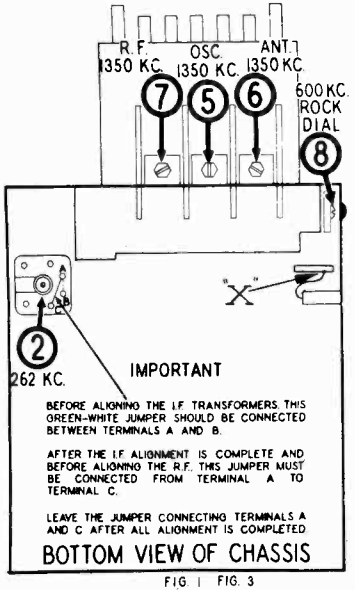


FIG. 1 FIG. 3

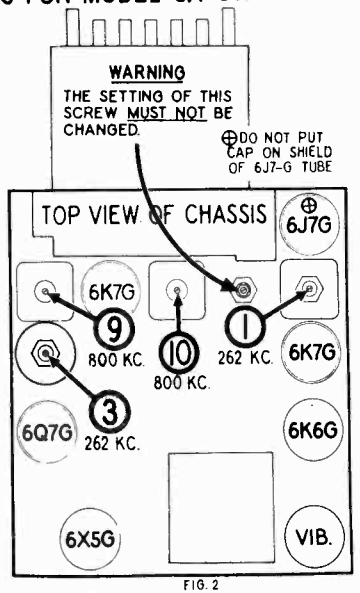
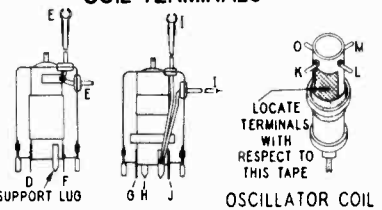


FIG. 2

COIL TERMINALS



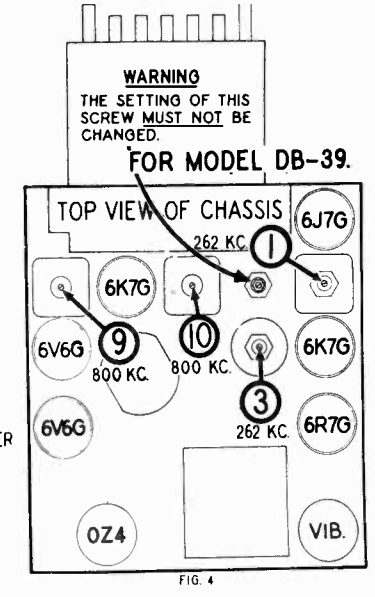
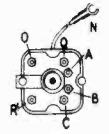


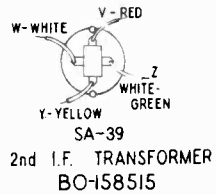
FIG. 4



1st I.F. TRANSFORMER
BO-158514

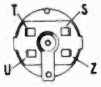
DB-39

2nd I.F. TRANSFORMER
BO-158516



SA-39

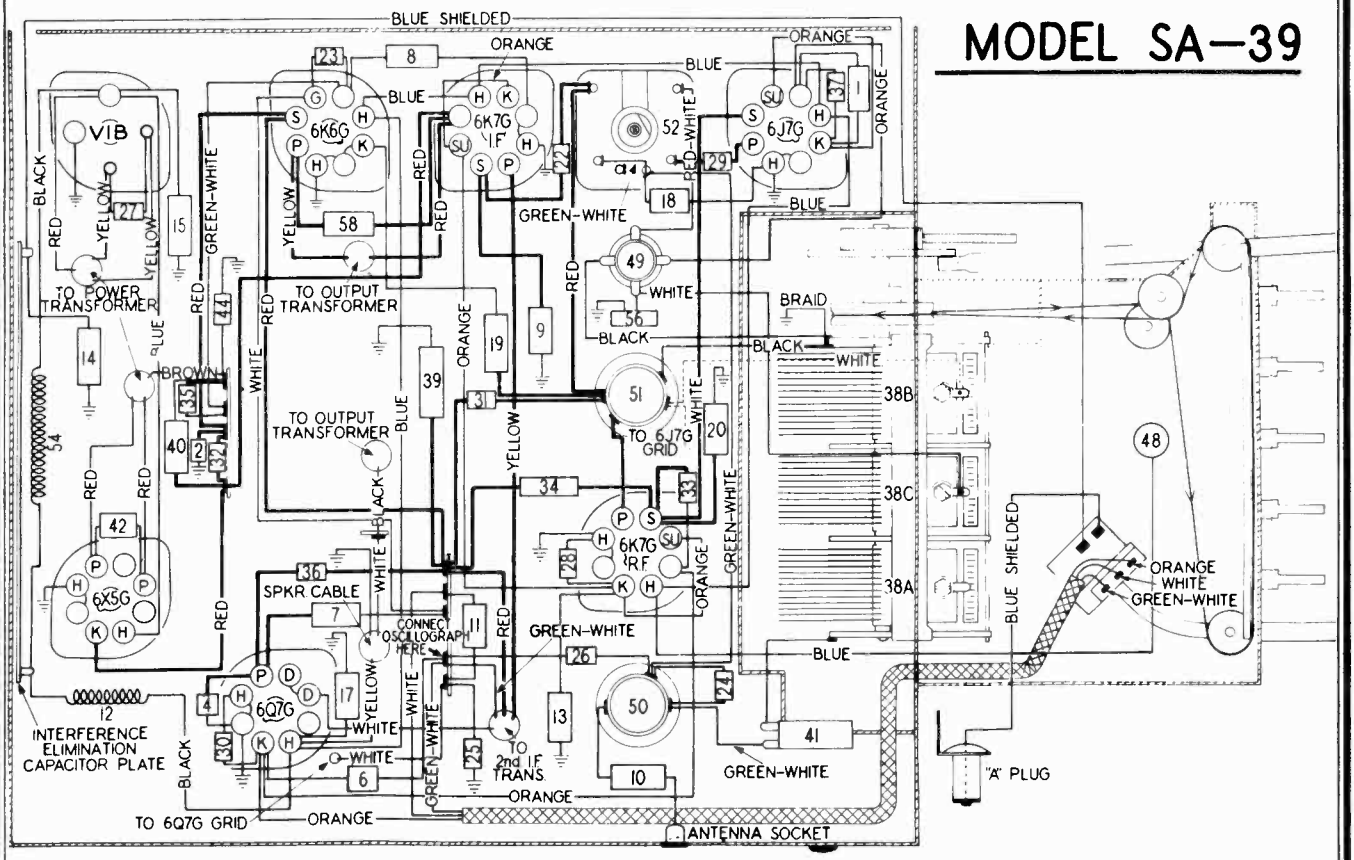
2nd I.F. TRANSFORMER
BO-158515



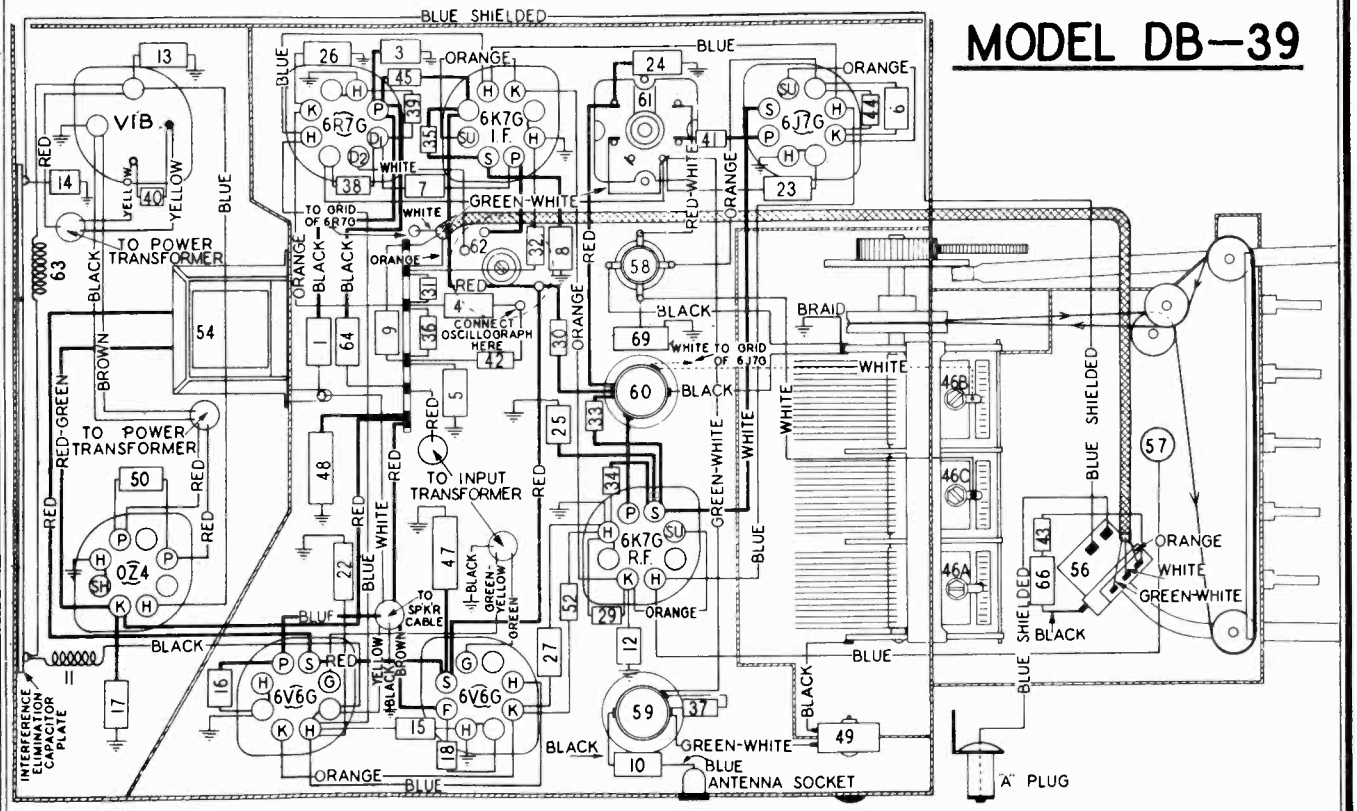
MODEL DB39
MODEL SA39
Chassis Wiring

HUDSON MOTOR CAR CO.

MODEL SA—39



MODEL DB—39



HUDSON MOTOR CAR CO.

MODEL DB39
MODEL SA39
Dial and Tuner
Data, Notes

ADDITIONAL SERVICE DATA

HOW TO REPLACE THE DIAL POINTER DRIVE CORD

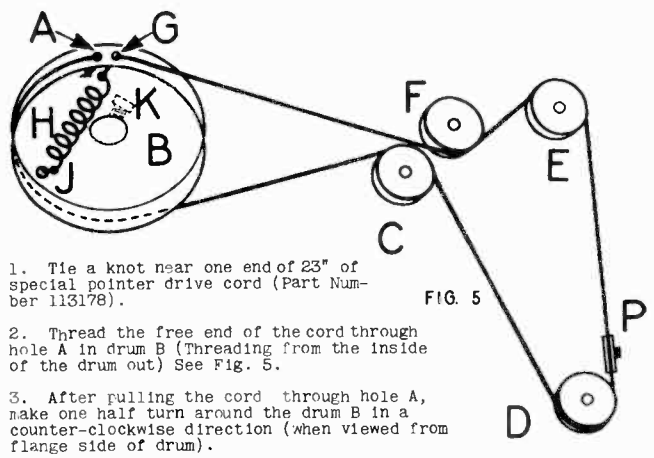


FIG. 5

1. Tie a knot near one end of 23" of special pointer drive cord (Part Number 113178).

2. Thread the free end of the cord through hole A in drum B (Threading from the inside of the drum out) See Fig. 5.

3. After pulling the cord through hole A, make one half turn around the drum B in a counter-clockwise direction (when viewed from flange side of drum).

4. Continuing, draw the cord over to the back of pulley C and around to pulley D. From this point continue across to pulley E and around to pulley F.

5. Go around pulley F and up to the top of drum B to hole G.

6. Draw the cord through hole G and tie it to the end of tension spring H in such a manner that when the spring is clipped to lug J, the spring will be extended to approximately 7/8 inch.

HOW TO SET UP THE PUSH BUTTONS.

To set up the push buttons, proceed as follows:

1. Turn on the set and allow it to operate for at least one-quarter hour before attempting to set up the push buttons.

2. Select the five stations to which the buttons are to be set. Be sure to select nearby, powerful stations, since weak signals will generally give better results when tuned in manually. Any button may be set to any desired station.

3. Grasp the tuning knob and pull it out, (outward movement is slight, about 1/8 inch) so that the drive pinion engages the condenser drive gear and the set may be tuned manually.

4. Tune in the station to which you wish to set the particular button. Be sure to tune in the station correctly by TUNING TO THE POINT WHERE THE PROGRAM IS HEARD WITH THE LEAST HISS OR DISTORTION, AND NOT TO THE POINT OF GREATEST VOLUME.

5. Grasp the push button being set up, and turn it to the left (counter-clockwise) about one whole turn.

6. Push this button all the way in, and keeping it pushed in, turn right (clockwise) until reasonably tight.

7. Set up the remaining four buttons in a similar manner.

8. Label each button with the call letters of the stations you have selected, using the call letter tabs and celluloid covers packed with your receiver. Insert the call letter tab in the recess in the push button, and cover it with the celluloid tab.

9. To use your push button tuner, first push in the tuning knob. Then push in the button labelled with the call letters of the desired station. Be sure to push the button all the way in.

AUDIO OSCILLATION IN MODEL DB-39 RECEIVER.

Occasionally audio oscillation or howl may be encountered in this model. This is caused by an audio voltage being fed back to the audio section of receiver from the speaker cord. The remedy is to locate the speaker cord away from the 6R7-G and 6V6-G tubes, holding it in place with a rubber band if necessary.

INCORRECT TUNING OF PUSH BUTTONS

Occasionally a receiver may be found which will not tune-in stations accurately when push button tuning is used. The causes and remedies for this are as follows:

1. Push buttons incorrectly set-up. Remedy: Reset the button to the desired station being sure to tune in the station carefully.

2. Extreme sharpness of tuning of the receiver. Remedy: The green-white jumper wire on the bottom of the 1st I. F. transformer may be improperly connected. The correct connection for normal operation of the receiver is shown in Fig. 1 (Terminals A and C should be connected together.

LOW SENSITIVITY

Low sensitivity may be due to improper adjustment of the antenna compensator, trimmer #8 (see alignment procedure page). This trimmer is accessible without removing the set from the car. When the readjustment of the compensator is necessary, care should be taken that the antenna, if of the under-car type, is clean and free of accumulation of mud or slush which would alter its capacity and lower its resistance. In such cases, the antenna and its insulators should be washed, and preferably, allowed to dry before making adjustment. Doing this sharpens the tuning of the compensator and makes possible an accurate setting.

FAILURE OF RECEIVER TO OPERATE

Failure of the receiver to operate may be due to one or more causes. When a receiver is found in such condition, its parts should be checked as follows:

1-FUSE

The fuse may be burned out or making poor contact. In cases of burnout, replace with another 15 Ampere fuse. If second fuse fails, remove receiver from car and investigate condition of vibrator and receiver circuits. DO NOT USE A HIGHER RATING FUSE.

2-TUBES

Unfasten the trunk clamps holding the speaker case cover. This will enable you to reach the tubes. Check to see that all tubes are in their proper sockets. One or more tubes may be defective. To determine their condition, remove them from the receiver and test with a tube tester, or if a tube tester is not available, replace the tubes, one at a time, with tubes known to be good, until the defective tube is located.

3-VIBRATOR

Improper operation of the vibrator is usually evidenced by one of the following symptoms: Receiver blows fuses, receiver is dead or weak, reception is intermittent, reception is noisy and unsteady. To check the vibrator, replace the suspected unit with a new vibrator. Do not attempt to adjust the defective unit.

4-CIRCUIT

Failures within the basic circuits of the receiver may be isolated by a systematic test procedure. The receiver should be removed from the car and placed where it will be readily accessible. The top cover and speaker case cover should be removed from the case. The defect in the receiver can then be located by means of continuity, voltage, or stage analysis, using a signal generator.

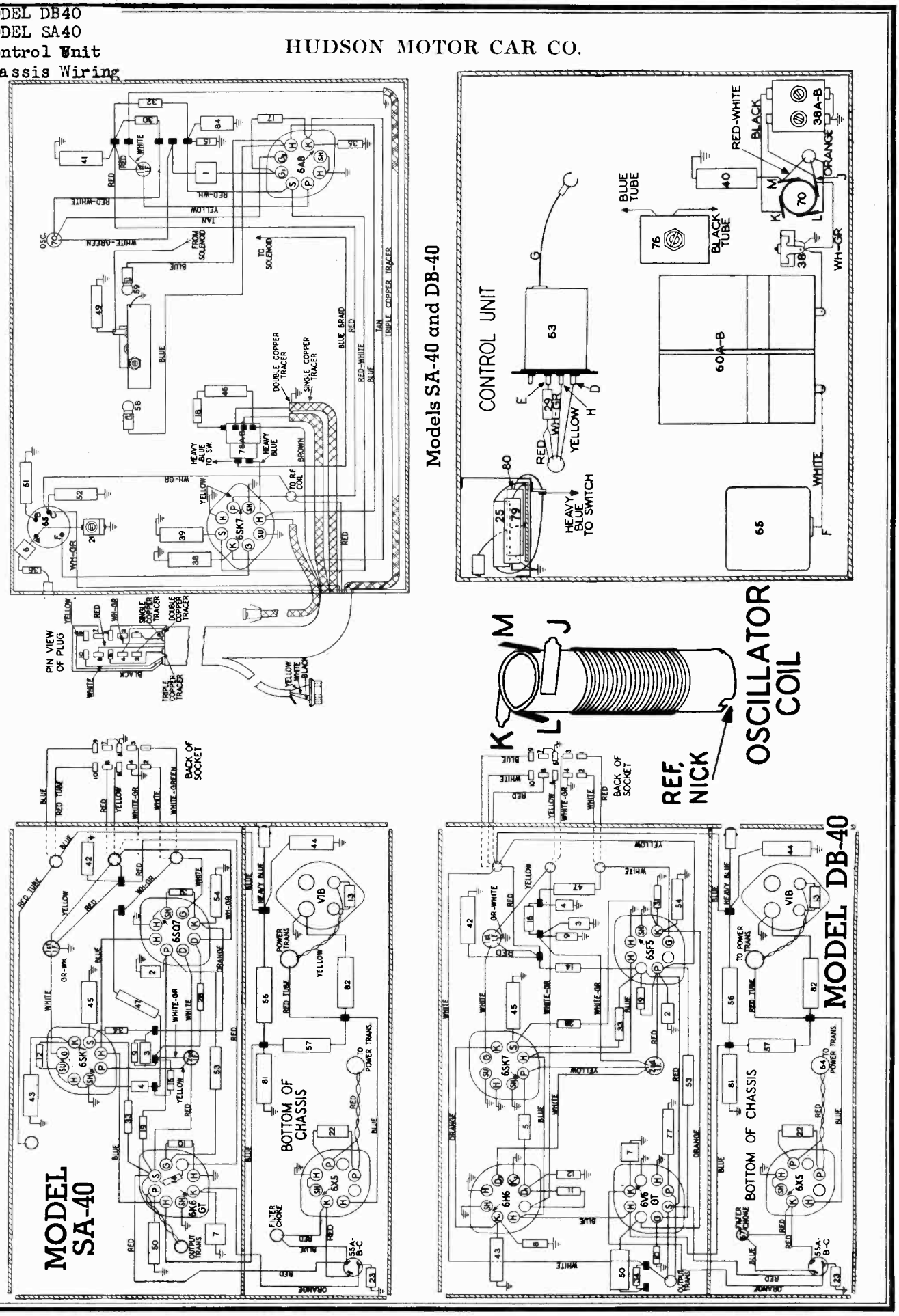
When checking the receiver, using a signal generator, a signal is fed progressively into the I. F. and R. F. stages of the receiver, until the defective stage is located, and a continuity or voltage check may then be given that stage to isolate the defective unit or circuit.

ADJUSTMENT OF IRON CORES IN COILS.

The Antenna, R. F., and Oscillator coils have adjustable iron cores. Any adjustment of these cores will necessarily change the inductance of the coils and therefore extreme caution must be exercised where adjustment becomes necessary. THE CORE OF THE OSCILLATOR COIL MUST NOT BE ADJUSTED AT ANY TIME. The correct method of adjusting the R. F. and antenna coil cores is adequately covered under "Alignment Instructions"

MODEL DB40
MODEL SA40
Control Unit
Chassis Wiring

HUDSON MOTOR CAR CO.



HUDSON MOTOR CAR CO.

MODEL DB40
Schematic, Voltage

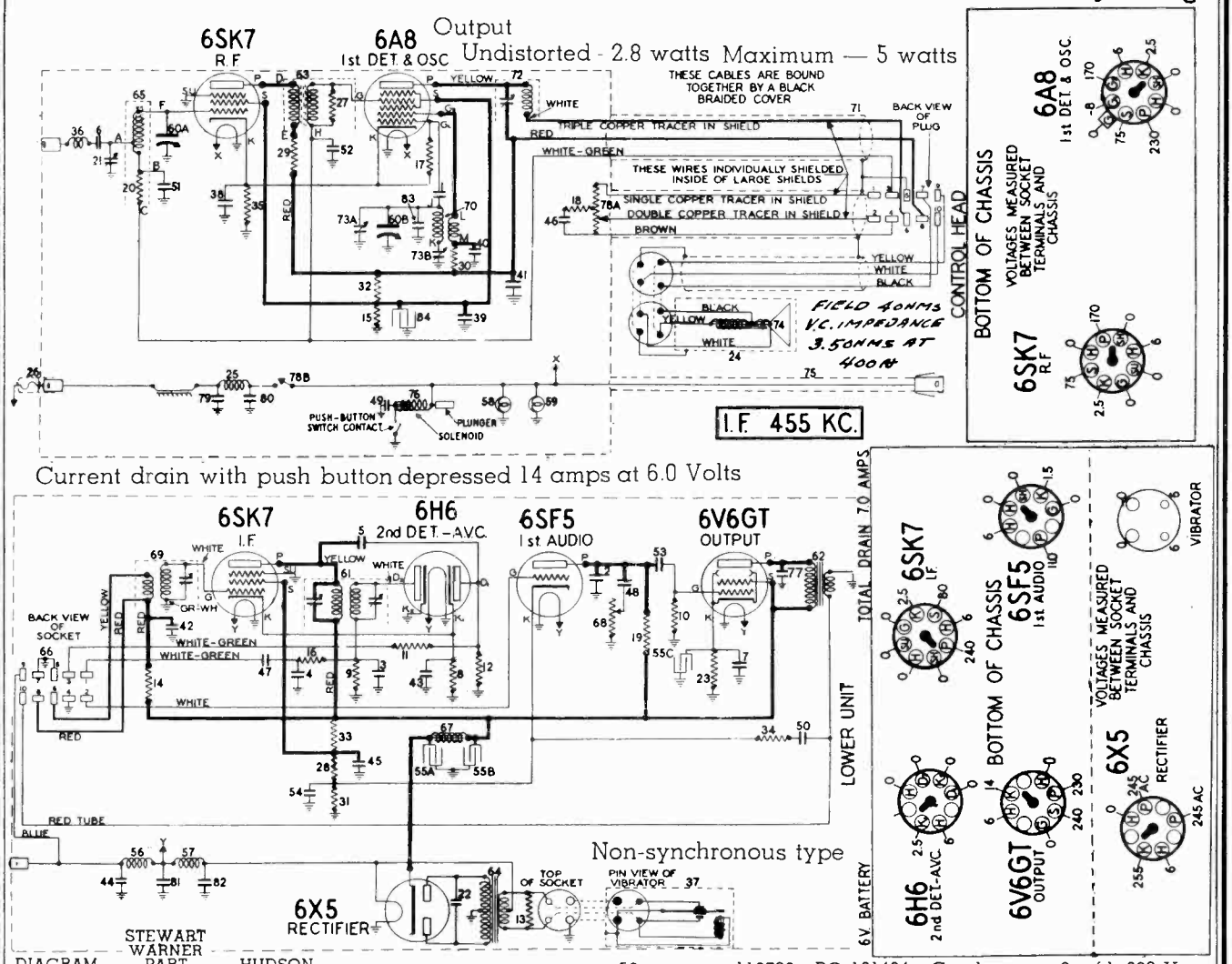
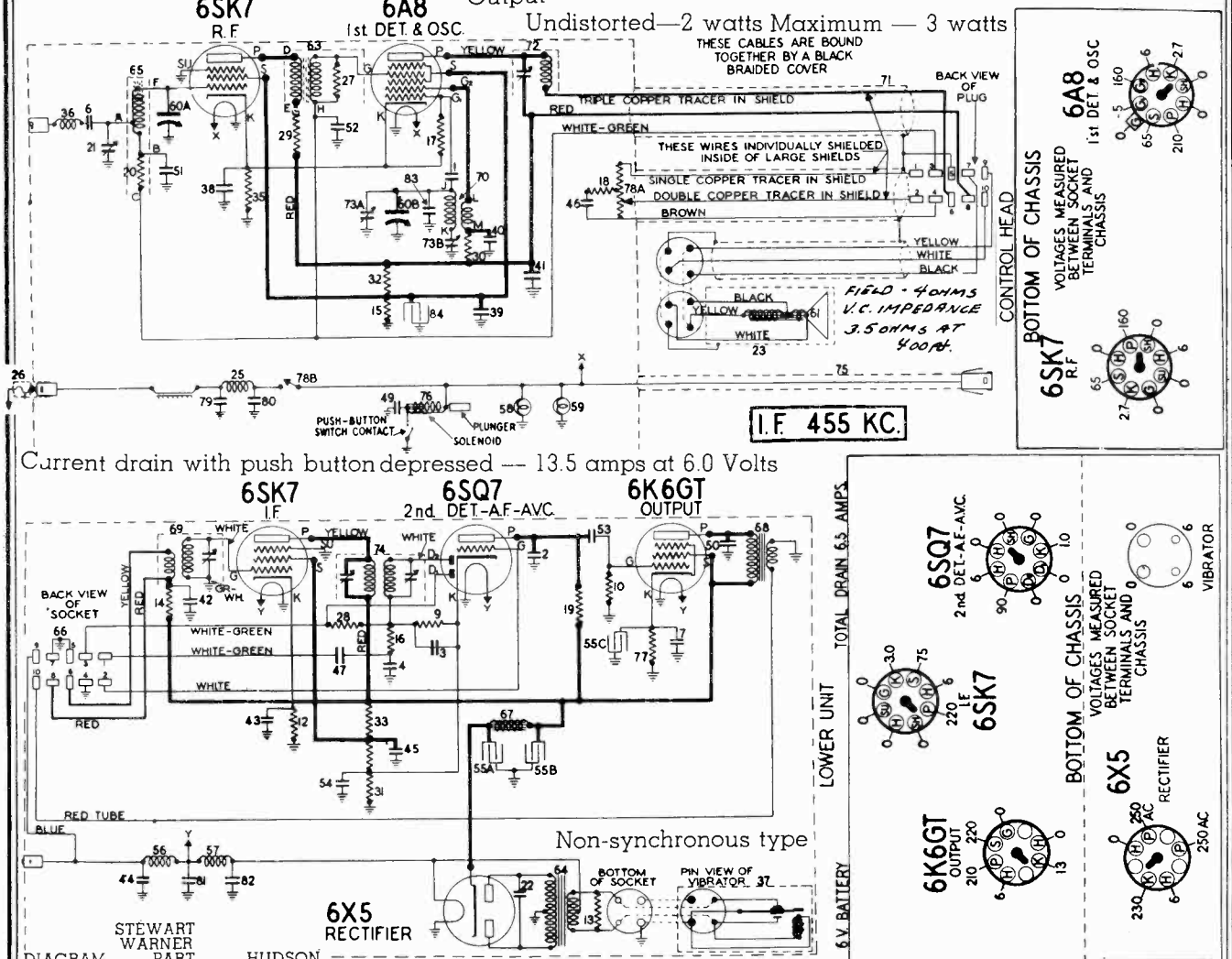


DIAGRAM NUMBER	STEWART WARNER PART NUMBER	HUDSON PART NUMBER	DESCRIPTION
1-2	83539	BO-158447	Condenser - mica 260 mmfd.
3-4	83783	BO-158448	Condenser - mica 110 mmfd.
5	85061	BO-158450	Condenser - mica 51 mmfd.
6-7	88205	BO-158455	Condenser - mica 2100 mmfd.
8	112963	BO-158470	Resistor - 330 ohms 1/4 W.
9	112970	BO-158478	Resistor - 330,000 ohms 1/4 W.
10	112971	BO-158477	Resistor - 470,000 ohms 1/4 W.
11 12	112973	BO-158479	Resistor - 1.5 meg. 1/4 W.
13	112976	BO-158480	Resistor - 220 ohms 1/2 W.
14	112980	BO-158483	Resistor - 1000 ohms 1/4 W.
15-16	112986	BO-161476	Resistor - 100,000 ohms 1/4 W.
17-18-19	112987	BO-158489	Resistor - 220,000 ohms 1/4 W.
20	112993	BO-161477	Resistor - 470,000 ohms 1/10W.
21	113468	BO-161460	Condenser - trimmer
22	114277	BO-158463	Condenser - .01 mfd. 2000 V.
23	114335	BO-158493	Resistor - 430 ohms 2 Watt W.W.
24	M-115073	BO-161559	Speaker - dynamic 8"
25	116035	BO-161492	Choke coil (in A supply lead)
26	116049	BO-170420	Fuse - 20 amps 25 volts
27	116052	BO-161478	Resistor - 33,000 ohms 1/10 W.
28	116058	BO-161479	Resistor - 47,000 ohms 1/4 W.
29	116073	BO-161480	Resistor - 10,000 ohms 1/2 W.
30	116074	BO-161481	Resistor - 22,000 ohms 1 W.
31	116078	BO-161482	Resistor - 560 ohms 1/4 W.
32-33	116087	BO-161483	Resistor - 47,000 ohms 1 W.
34	116091	BO-161486	Resistor - 6,800 ohms 1/4 W.
35	116095	BO-161488	Resistor - 220 ohms 1/4 W.
36	118726	BO-161580	Antenna motor noise choke
37	116202	BO-161493	Vibrator
38 to 45	116625	BO-161461	Condenser - .1 mfd. 600 V.
46-47-48	116640	BO-161462	Condenser - .01 mfd. 600 V.
49	116647	BO-161463	Condenser - .004 mfd. 600 V.
50	116706	BO-161464	Condenser - .2 mfd. 600 V.
51-52	116819	BO-161465	Condenser - .05 mfd. 600 V.
53	116893	BO-161466	Condenser - .02 mfd. 600 V.
54	117022	BO-161467	Condenser - .002 mfd. 600 V.
55A to 55C	117314	BO-161468	Condenser - electrolytic Section A — 10 mfd. 450 V. Section B — 10 mfd. 450 V. Section C — 10 mfd. 35 V.
56-57	117332	BO-161495	Choke coil
58-59	117499	BO-71550	—Dial lamp - mazda No. 55
60A-60B	117883	BO-161470	Condenser - variable tuning
61	117898	BO-161496	Transformer - 2nd I.F.
62	117912	BO-161497	Transformer - output
63	117919	BO-161498	Transformer - R.F.
64	117923	BO-161499	Transformer - power
65	117939	BO-161500	Coil - antenna
66	117944	BO-161501	Socket - 10 terminal
67	117952	BO-161502	Filter choke
68	117965	BO-161503	Tone control
69	117972	BO-161505	Transf. - 1st I.F. (lower unit)
70	117975	BO-161506	Coil - oscillator
71	118001	BO-161508	Cable & Plug - 10 terminal
72	118113	BO-161509	Transformer - 1st I.F. (upper unit)
73A-73B	118117	BO-161471	Condenser - 2 section - oscillator trimmer & padder
74	M-118119	BO-161562	Cone & Voice coil for M-115073 speaker
75	118140	BO-161511	"A" cable connecting units
76	118143	BO-161528	Magnet (coil only)
77	118194	BO-161472	Condenser - .006 mfd. 600 V.
78A-78B	118216	BO-161513	Volume control
79-80-81-82	118225	BO-161473	Condenser - .5 mfd. 150 V.
83	118332	BO-161474	Condenser - temp. compen'tg.
84	118485	BO-161475	Condenser - 4 mfd. 200 V.

MODEL SA40
Schematic, Voltage

HUDSON MOTOR CAR CO.



Current drain with push button depressed — 13.5 amps at 6.0 Volts

DIAGRAM NUMBER	STEWART WARNER PART NUMBER	HUDSON PART NUMBER	DESCRIPTION
1-2	83539	BO-158447	Condenser - mica 260 mmfd.
3-4	83783	BO-158448	Condenser - mica 110 mmfd.
6-7	88205	BO-158455	Condenser - mica 2100 mmfd.
9	112970	BO-158478	Resistor - 330,000 ohms 1/4 W.
10	112971	BO-158477	Resistor - 470,000 ohms 1/4 W.
12	112977	BO-158481	Resistor - 470 ohms 1/4 W.
13	112976	BO-158480	Resistor - 220 ohms 1/2 W.
14	112980	BO-158483	Resistor - 1000 ohms 1/4 W.
15-16	112986	BO-161476	Resistor - 100,000 ohms 1/4 W.
17-19	112987	BO-158489	Resistor - 220,000 ohms 1/4 W.
18	118210	BO-161490	Resistor - 50,000 ohms 1/4 W.
20	112993	BO-161477	Resistor - 470,000 ohms 1/10 W.
21	113468	BO-161460	Condenser - trimmer
22	114277	BO-158463	Condenser - .01 mfd. 2000 V.
23	U-115072	BO-161558	Speaker - 6" dynamic
25	116035	BO-161492	Choke coil - "A" supply lead
26	116049	BO-170420	Fuse - 20 amps 25 volts
27	116052	BO-161478	Resistor - 33,000 ohms 1/10 W.
28	116090	BO-161485	Resistor - 3.3 meg. 1/4 W.
29	116073	BO-161480	Resistor - 10,000 ohms 1/2 W.
30	116074	BO-161481	Resistor - 22,000 ohms 1 W.
31-35	116078	BO-161482	Resistor - 560 ohms 1/4 W.
32-33	116087	BO-161483	Resistor - 47,000 ohms 1 W.
34	116089	BO-161484	Resistor - 47,000 ohms 1/2 W.
36	118726	BO-161580	Antenna motor noise choke.
37	116202	BO-161493	Vibrator
38 to 45 inc.	116625	BO-161461	Condenser - 1 mfd. 600 V.
46-47	116640	BO-161462	Condenser - .01 mfd. 600 V.
49	116647	BO-161463	Condenser - .004 mfd. 600 V.
50	117571	BO-161469	Condenser - .008 mfd. 600 V.
51-52	116819	BO-161465	Condenser - .05 mfd. 600 V.
53	116893	BO-161466	Condenser - .02 mfd. 600 V.
54	117022	BO-161467	Condenser - .002 mfd. 600 V.
55A to 55C	117314	BO-161468	Condenser - electrolytic Section A — 10 mfd. 450 V. Section B — 10 mfd. 450 V. Section C — 10 mfd. 35 V.
56-57	117332	BO-161495	"A" choke
58-59	117499	BO-71550	Dial lamp - mazda No. 55
60A-60B	117883	BO-161470	Condenser - variable tuning
61	U-118205	BO-161563	Cone and Voice coil for U-115072 speaker
63	117919	BO-161498	Transformer - R.F.
64	117923	BO-161499	Transformer - power
65	117939	BO-161500	Coil - antenna
66	117944	BO-161501	Socket - 10 contact
67	117952	BO-161502	Filter choke
68	117979	BO-161507	Transformer - output
69	117972	BO-161505	Transformer - 1st I.F. (lower unit)
70	117975	BO-161506	Coil - oscillator
71	118001	BO-161508	Cable and Plug assembly (10 terminals)
72	118113	BO-161509	Transformer - 1st I.F. (control unit)
73A-73B	118117	BO-161471	Condenser - 2 section - oscillator trimmer & padder
74	118118	BO-161510	Transformer - 2nd I.F.
75	118140	BO-161511	"A" cable connecting units
76	118143	BO-161528	Magnet (coil only)
77	118126	BO-161487	Resistor - 500 ohms 1 Watt
78A-78B	118216	BO-161513	Volume control with switch
79-80-81-82	118225	BO-161473	Condenser - .5 mfd. 600 V.
83	118332	BO-161474	Condenser - temperature compensating
84	118485	BO-161475	Condenser - 4 mfd. 200 V. electrolytic

LOW SENSITIVITY

In cases of low sensitivity not traceable to weak tubes or defective parts, check the setting of the antenna trimmer. If the set has been aligned using any dummy antenna other than the 80 mmfd. condenser recommended, the setting of this condenser will be off considerably.

In all cases, the trimmer should be adjusted to the regular car aerial. Install the set in the automobile and connect it to its antenna. Do not mount the control unit, but place it in some accessible place. Tune in a weak station, near 1400 KC, remove the plug button covering the antenna trimmer from the case, and adjust this trimmer for maximum volume.

Another possible cause of low sensitivity is mis-alignment of the I. F. transformers caused by the upper and lower units being aligned at different times, since one I. F. trimmer is on the control unit and the balance are in the lower unit. To correct this, realign both units of the receiver as described under "Alignment Procedure".

REPLACING TUBES IN CONTROL HEAD

1. Remove the two Phillips screws at the bottom of the instrument panel grill. Lift out the grill.
2. Remove the four machine screws holding the speaker plate.
3. Insert a screwdriver blade in the slot in the front of the control head and pry off the lower cover. This will give access to the 6A8 and 6SK7 tubes.

HUM

A possible source of hum difficult to trace, is caused when the lower end of the volume control accidentally becomes grounded in the control unit, in addition to the ground which is made in the lower radio unit. Removing the accidental ground in the control head will clear up this difficulty.

IGNITION NOISE

If ignition noise is excessive, first make sure the installation man has performed all the operations described in paragraphs 20 and 21

Additional bonnet grounding strips (Stewart-Warner Part No. 118718, Hudson Part No. BO-161417) may be helpful in further reducing ignition interference. The best location for these can be determined by grounding the hood to the body at various points with a knife. If the grounding strip is located at a point 10½ inches from the center of the car, install an additional strip at a point 23¼ inches from the center as shown in Fig. B.

A change has been incorporated in the radios now being built to reduce ignition noise. This change can be made in the field by a radio service man if excessive noise is still encountered after following all previous instructions.

One antenna motor noise choke (Hudson Part No. BO-161580, Stewart-Warner Part No. 118726) is required and full instructions to make this change are given here.

INSTALLATION OF ANTENNA CHOKE

The antenna noise choke (Stewart-Warner Part No. 118726, Hudson Part No. BO-161580) is a single layer choke coil wound on a ceramic body which looks like an insulated resistor. It is to be installed inside the control unit in place of the resistor connected in series with the antenna lead on early sets. Later sets already have the choke.

Remove the top cover of the control unit. Check whether a resistor or small choke connects to the blue antenna lead. (See Fig. 1.) If it is a choke wound on a resistor body, the change has already been made. If you find a plain, insulated resistor connected to a terminal lug to which the blue wire from the antenna socket is connected, proceed with the change. This resistor has a value of 68 ohms and can be identified by its blue body, grey end and black dot.

Remove the resistor.

Remove the two screws holding the antenna socket to the case.

The antenna trimmer must now be connected to a different terminal on the antenna coil. This trimmer is the one which can be adjusted through the side of the case. A bare wire runs from the antenna coil terminal A, through the top trimmer lug to the control grid of the 6SK7 tube.

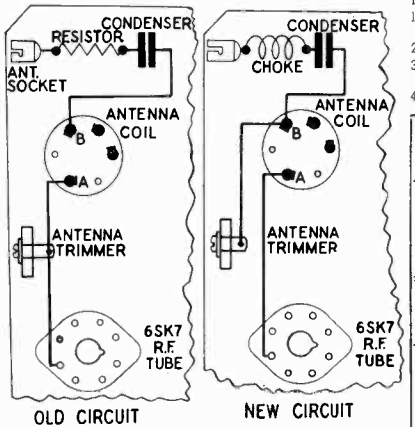


FIG. 1. Diagram Illustrating Recommended Antenna Circuit Changes

Disconnect this wire from the antenna coil terminal and from the trimmer terminal. Slip a piece of spaghetti tubing over this wire and re-connect it to the same lug on the antenna coil. (Marked A in Figure 1.)

Connect the trimmer condenser to the antenna coil terminal nearest the corner of the chassis. (Marked B in Figure 1.) This is the terminal to which the antenna series mica condenser connects.

Replace the antenna socket using the two mounting screws.

Solder the choke to the terminals from which you removed the resistor (see Fig. 1).

Check to see that the wiring of the unit has not been pushed over so as to interfere with the dial drive cord.

After this change is made, it is absolutely essential to realign the antenna trimmer. This must be done with a signal generator and an 80 mmfd. condenser in series with the antenna lead and the signal generator. **If any other capacity is used, adjustment will be incorrect.**

The antenna trimmer can and should be aligned to the regular car aerial. To do this we suggest connecting the radio in the car so it will operate but without mounting the control unit in place on the instrument panel. Arrange it so you can get at the antenna trimmer easily. Tune in a weak station near 1400 kc. on the dial and adjust the antenna trimmer for maximum volume.

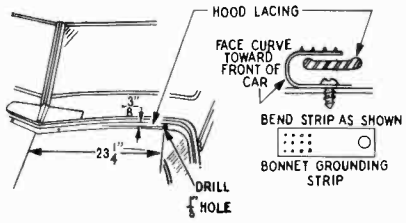


Fig. B. Bonnet Grounding Strip Mounting Details

ALIGNMENT PROCEDURE

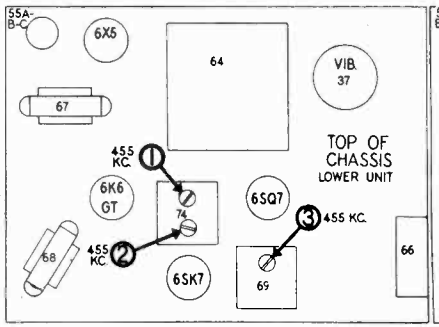
For alignment an output meter and accurately calibrated signal generator are required.

1. Connect the output meter across the voice coil or between the plate of the output tube and chassis in series with a .1 mfd. condenser. The more sensitive type of meter should be connected across the voice coil.
2. Remove only the top cover of the lower unit and the bottom cover of the control unit.
3. Connect the ground lead of the signal generator to the receiver chassis and leave it connected in this manner through the entire alignment procedure.
4. Turn the volume control to maximum volume position and leave it throughout the entire alignment procedure.

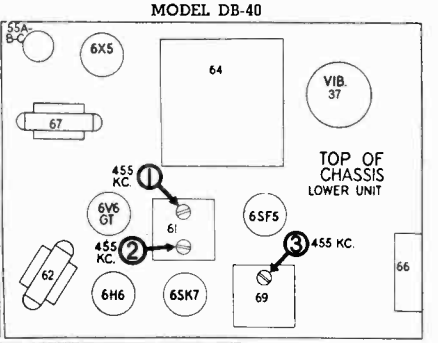
DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECTION OF SIG. GEN. OUTPUT TO RECEIVER	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.1 MFD. CONDENSER	CONTROL GRID OF 6A8	455 KC.	ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL	1-2	2nd I.F. LOWER UNIT	ADJUST FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT.
				3	1st I.F. LOWER UNIT	
				4	1st I.F. CONT. UNIT	
80 MMFD. MICA CONDENSER	ANTENNA CONNECTION ON SET	1580 KC.	SET SO THAT GANG COND. IS ENTIRELY OUT OF MESH	5	OSCILLATOR (SHUNT) CONDENSER	CAREFULLY ADJUST FOR MAXIMUM OUTPUT.
80 MMFD. MICA CONDENSER	ANTENNA CONNECTION ON SET	1400 KC.	ACCURATELY TUNE TO 1400 KC. GENERATOR SIGNAL	6	ANTENNA (SHUNT) CONDENSER UNDER PLUG BUTTON ON END OF CONTROL UNIT	ADJUST FOR MAXIMUM OUTPUT.
80 MMFD. MICA CONDENSER	ANTENNA CONNECTION ON SET	600 KC.	TUNE TO 600 KC. GENERATOR SIGNAL	7	OSCILLATOR (SERIES) CONDENSER	ADJUST FOR MAXIMUM OUTPUT. TRY TO INCREASE OUTPUT BY DETUNING TRIMMER AND RETUNING RECEIVER DIAL.
Now repeat adjustments made on trimmer numbers 5, 6 and 7.						

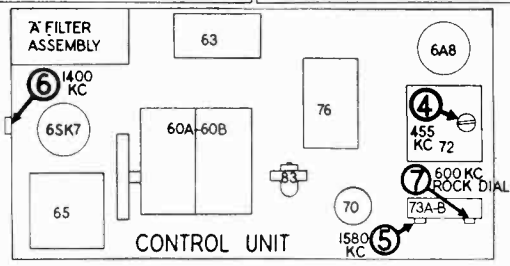
After the set has been installed in the car, tune in a fairly weak station near 1400 KC, and adjust trimmer No. 6 under the plug button on the end of the control head until maximum volume is obtained.

MODEL SA-40



MODEL DB-40





SETTING UP STATIONS

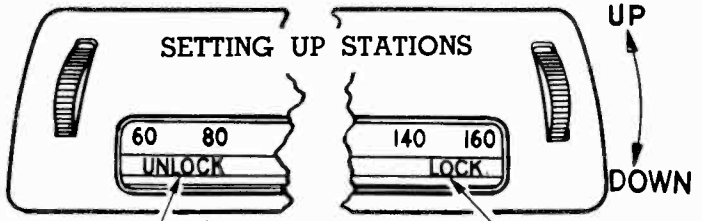


FIG. 2. Locking and Unlocking Mechanisms

TO UNLOCK: Turn Manual Tuning Control DOWN about 70 to 100 strokes AFTER word UNLOCK appears. Turn until control turns hard after turning easily. NEVER FORCE CONTROL AFTER THIS POINT IS REACHED.

TO LOCK: Turn Manual Tuning Control UP about 70 to 100 strokes AFTER word LOCK appears. Turn until control turns hard after turning easily. NEVER FORCE CONTROL AFTER THIS POINT IS REACHED.

The new Hudson Feathertouch Control can be set to stations without any tools. This design has a tremendous advantage over other types of tuners, in that any button can be set to any station. The buttons can be set in any order and one or more buttons later reset without changing the settings of the remaining ones.

IMPORTANT PRECAUTION: In order to assure perfect results you must observe all instructions. One very important precaution during set-up is to never touch a button already set while control unit is unlocked. For example, if some buttons are set and while working on the remainder you accidentally touch one already set, the setting on this button will change. This will necessitate resetting of the button accidentally touched.

HOW TO SET UP PUSH BUTTONS

(a) Operate set for about ten minutes before setting up buttons.

(b) TO UNLOCK TUNING MECHANISM: Rotate right (tuning) control downwards until word UNLOCK shows at the left side of dial. Continue to turn until wheel tightens. (70 to 100 strokes will be required). A more complete description of this procedure, is given below under the heading "Unlocking Tuning Mechanism."

(c) Tune in desired station with (tuning) control.

(d) Hold down the button selected and move tuning control up and down leaving it in position where tone is deepest. Release button.

(e) Follow same procedure for other buttons. IMPORTANT After setting any button, it must not be touched until after mechanism has been locked as in (f). Otherwise it is necessary to reset it as in (c) and (d).

(f) LOCK TUNING MECHANISM: Rotate tuning control upwards until word LOCK appears at right side of dial. Continue to turn until wheel tightens (70 to 100 strokes will be required). A complete description of the locking operation is also given below.

(g) Insert station call letter tab in front of each button The tabs are inserted by flexing them and allowing them to snap into place in the buttons.

SETTING UP EARLY RADIOS

Some of the earliest radios produced require a slightly different set-up procedure than given above. This same procedure can be used on later sets though it is not necessary.

After unlocking the tuning mechanism, proceed as follows for each button:

1. Tune station in manually.
2. Now hold the manual tuning control and push the button to be set up several times.
3. After pushing and releasing button several times, hold button down and again tune station carefully by turning manual tuning control back and forth slightly.
4. Repeat for other buttons.

The essential difference between this procedure and the one given above is that the button is pushed and released several times in quick succession after desired station is tuned in but before final tuning adjustment is made.

UNLOCKING TUNING MECHANISM

In setting up this mechanism, you must understand the action of the control during locking and unlocking.

The unlocking operation begins AFTER the tuning control is turned to the point where the word UNLOCK appears. To complete the unlocking operation, the tuning control must be turned quite a bit AFTER this point is reached. When unlocking begins, the tuning control may turn quite hard, but then it begins to turn quite easily. You must continue to turn it downwards until it again turns hard. Because of the high gear ratio, it may require 18 to 24 complete turns of the tuning control to reach this point. Since you can turn this control only a quarter of a turn at a time, it may require 70 to 100 strokes of the finger on the control to completely unlock the mechanism. The tuning control will NOT reach a definite stop when the mechanism is unlocked. However, when the control turns easily for quite a while, then turns harder, the unlocked position is reached. In this position the tuning control will spring back when you take your finger off after turning it. At this point, the tuning indicator will function if you turn the tuning control back (up). IMPORTANT: WHEN THIS POSITION IS REACHED, DO NOT FORCE THE TUNING CONTROL FURTHER DOWN.

LOCKING TUNING MECHANISM

The locking action begins when you continue to turn the tuning control upwards after the work LOCK appears.

The action is much the same as described under UNLOCKING and it will require as many turns of the tuning control to lock the mechanism as were needed to unlock it.

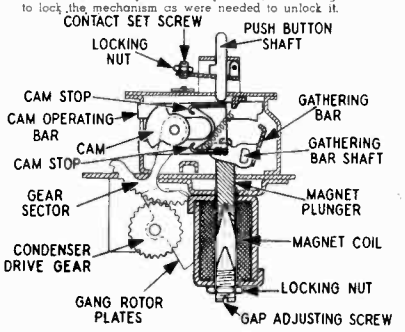


FIG. 3. Magnet Plunger in "OUT" Position

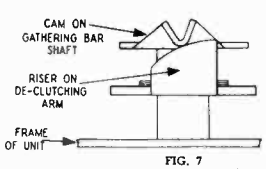


FIG. 7
Correct Position of Cam on Riser

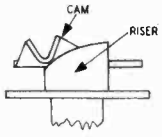


FIG. 8
Position of Cam Too Low

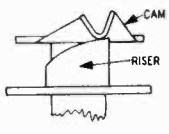


FIG. 9
Position of Cam Too High

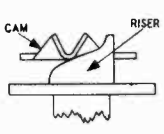


FIG. 10
Correct Position of Cam on Alternate Type Riser

HOW THE "FEATHERTOUCH TUNER" OPERATES

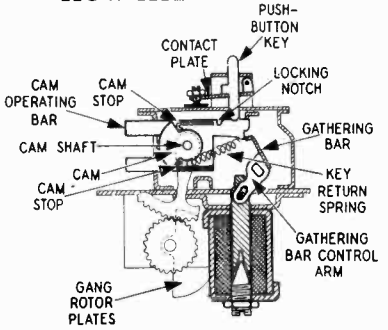


FIG. 4. Magnet Plunger in "IN" Position

Refer to Fig. 3 and Fig. 4. When a push button is depressed, it makes mechanical contact with the cam operating bar located under it, and depresses the bar so that the gathering bar can make contact with it. At the same time, the key forces the contact plate downward, making electrical contact through the contact screw. When the contact screw makes contact, it energizes the winding of the magnet assembly causing the plunger to be drawn completely into the magnet as shown in Fig. 4. The plunger is mechanically coupled to the gathering bar and gathering bar shaft, so that when the plunger is drawn into the magnet, it causes the gathering bar to be forced ahead. The gathering bar engages the cam operating bar which is depressed by the push button key and drives it forward as shown in Fig. 4. This position of the cam operating bar is indicated by the ends of the cam operating bar extending from the mechanism frame (see Fig. 6). When the cam operating bar moves forward, the cam stops attached to the bar, engage the cam, rotating it until it is in the position indicated in Fig. 4. The rotation of the cam causes the cam shaft and gear segment to rotate likewise, rotating the gang condenser to a position corresponding to the station to which this particular key is set.

HOW THE "LOCKING-UP" MECHANISM WORKS

The cam shaft assembly consists primarily of a shaft on which five cams are alternately spaced between friction collars. On the clutch end of this bar is a short threaded section upon which screws the collar which is part of the clutch and clutch spring assembly. When the cams are locked, this threaded collar is turned upon the threaded section of this cam shaft, exerting pressure upon the cams and friction collars, thus locking them securely in position. When the cams are unlocked, this threaded collar is turned so as to unscrew it and exert a minimum of pressure on the cams and friction collars. The only pressure then exerted upon the cams to hold them in position is that exerted by a spring washer near the threaded end of the shaft. Thus the cams are held so they cannot move of their own accord, but are still loose enough to permit them to be set to correspond to the desired station.

The threaded collar is connected through the clutch to the manual tuning control, permitting adjustment of the cams from outside the tuning unit.

OPERATION OF CLUTCH AND DE-CLUTCH ARM

The clutch mechanism of this tuner (see Fig. 6) functions every time a push button is depressed. Its purpose is to de-couple the manual tuning control and its associated gears from the automatic portion of the tuner when tuning electrically. The clutch is a dual unit, providing positive mechanical coupling between the manual tuning gears and the cam shaft, and it also has a leather friction disc which operates in conjunction with the positive coupling element to remove excessive backlash when tuning mechanically.

When the plunger is drawn into the magnet, turning the gathering bar shaft, the cam attached to the shaft (Fig. 6) moves downward on the riser of the de-clutch arm, releasing the pressure on the de-clutch arm, which bears against the inside section of the clutch. When this pressure is released, the clutch return spring contracts, separating the two halves of the clutch, thus disengaging the manual tuning gears.

When the push button is again released, allowing the plunger to be withdrawn from the magnet, the cam on the gathering bar shaft moves upward on the de-clutch arm riser, again exerting pressure on the de-clutch arm, and in turn on the clutch, thus engaging the two clutch sections, and making manual tuning possible.

BINDING BETWEEN SECTOR AND PINION GEARS: Excessive friction between these gears can be reduced by changing the position of the pinion gear so that the set screw indicated in Fig. 6 points upward when the gang is completely closed. (See Fig. 6). This draws the pinion gear slightly farther away from the gear sector, reducing the pressure between them.

COUNTER-WEIGHT STRIKES CASE: Should the gang counter-weight strike the wrap-around case, loosen the four screws holding the tuning mechanism to the chassis and shift the tuning mechanism slightly so counter-weight clears case. Keep in mind that the case side may be pulled in slightly when the cover is put on. If the case is warped inward, bend it slightly outward till counter-weight does not strike it.

SLIPPING CLUTCH (BACKLASH)

A slipping clutch is indicated by excessive backlash during manual tuning. First check to see that the correct plunger return spring is used.

The correct type of spring may be determined from the following table giving the dimensions of the three types of springs which have been used.

	Number of Turns	Length of Body	Overall Length	Outside Diameter
CORRECT SPRING	36	7/8"	1 3/8"	3/4"
LIGHT SPRING	34 or more	5/8"	1 1/4"	3/4"
HEAVY SPRING	24	1 1/2"	1 5/8"	5/8"

If the unit has the light or heavy spring, replace it with correct one (Stewart-Warner Part No. 118154, Hudson Part No. BO-161529). When changing springs, it is also desirable to replace the magnet assembly if it does not have the Locking Nut and Gap Adjusting Screw shown in Fig. 6. However, this is only necessary when there is insufficient pull of the solenoid to operate the mechanism.

Next check the position of the cam on the end of the gathering bar shaft (copper plated shaft) with relation to the riser of the de-clutch arm **while the plunger is out.** See Fig. 6 and Fig. 7. The cam should be halfway up the curved portion of the riser as shown in Fig. 7.

If the cam is not halfway up the riser while plunger is out, as shown in Fig. 7 loosen the two Bristol set screws in the retaining collar on the other end of the gathering bar shaft and move the retaining collar on the shaft until the cam is properly positioned on the riser. A special set screw wrench (Stewart-Warner Part No. 112484) is needed to fit the Bristol set screws.

In all cases where slipping clutches are reported, check to see that there is no excessive friction in the gang condenser, dial or gang condenser drive gears. See section on "Binding".

TUNER TROUBLES AND REMEDIES

SET TUNES IMPROPERLY

If the set fails to tune in stations properly, first check the set-up of the various buttons. If the set-up is incorrect, the set will tune consistently to the same point, and this condition can be remedied by resetting the buttons.

If the set will not tune in stations, although the plunger tends to move, make sure the Bristol headed set screws in the retaining collar are tight. This is the collar which is almost touched by the condenser drive gear sector when the condenser plates are unmeshed. A loose set screw may strike the unit frame, causing the plunger to stick in either the IN or OUT position.

If the set fails to tune properly and the dial stops at different points when approaching the station from opposite ends of the dial the mechanism may not be properly locked up (see "Locking Tuning Mechanisms"). The next step is to check for binding of the mechanism (see section on "Binding"). This trouble also may occur if the pulling force of the magnet is not great enough. This may occur when the battery voltage is low (below 5 volts). It may also be due to too large a gap between the plunger and the pole piece of the magnet assembly. On later sets the gap can be adjusted as described in paragraphs 5 and 6 of "Replacing Magnet Coil Assembly". The adjustable magnet assemblies are identified by the Gap Adjusting Screw and Locking Nut shown in Fig. 6.

In the early type of magnet assemblies, the gap is not adjustable. If one of these magnets is found to have insufficient pull, the remedy is installation of the new type magnet assembly. However, before replacing a magnet assembly, make sure that improper tuning is not due to low battery voltage or the other causes mentioned above.

MECHANISM WHERE TUNING CONTROL FAILS TO REACH STOP DURING UNLOCKING

This is probably due to the shearing off of the "C" washer on the clutch end of the cam shaft (See Fig. 6.) On the earlier mechanisms, this "C" washer holding the clutch and gear assembly to the shaft was made of a fairly soft steel. Occasionally these washers may shear off if the customer continues turning the tuning wheel after the mechanism has become completely unlocked. This continued turning forces the gear and clutch assembly against the "C" washer, shearing it off completely. You can replace this washer with the new hardened washer (Stewart-Warner Part No. 118676, Hudson Part No. BO-161579). This can be done without removing the tuning unit from the case. First lock the mechanism, then remove the nuts holding the triangular plate on the clutch end of the tuner. Unhook the plunger return spring so that no pressure will be exerted by the clutch. The washer can now be removed and a new washer installed.

On all early sets, replace this "C" washer even if the old one is still all right.

Shearing or partial shearing of this washer may cause slipping of the clutch or sticking of the plunger in the OUT position.

If a bronze washer is present between the "C" washer and the gear, remove it and discard it. If a steel washer is present, it must be left in place. On early mechanisms, a ⅛" steel washer was used in this position and it must be left in place.

BINDING

If the radio tunes improperly, check for binding in the dial and tuning mechanisms. Below are enumerated some of the reasons for binding:

RUBBING LIGHT DIFFUSION PLATE: Two types of light diffusion plates were used, the new type being riveted to the cover, while the old type is mounted on the unit itself. (See Fig. 5) If the new type light diffusion plate, which is

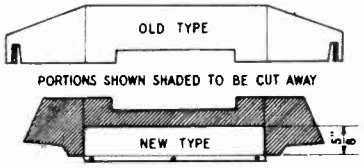


FIG. 5. Illustration Showing Method of Cutting Light Diffusion Plate

mounted in the cover of the control head rubs against the dial scale due to warping of the celluloid, cut this plate as shown by the shading in Fig. 5. This can be done without removing the shield from the cover. In some early units, this diffusion plate was mounted on the unit itself. In this case, enlarge the notch fitting over the dial lamp wire as shown in Fig. 5. Exercise care when enlarging the notch, as the celluloid is quite brittle and may break. Then cement the diffusion plate to the front of the contact plate assembly so that the shield rests flat against this metal plate.

ENDS OF DRUM RUBBING BRACKETS: The dial drum should have a slight amount of end play. If it doesn't, it may be binding. This may be due to improper placement of the volume control mounting bracket. To correct this difficulty loosen the two screws holding this bracket and move this bracket slightly farther away from the drum.

Similar binding may also be due to a loose end cap on the dial drum. In this case, force the cap back on the drum and punch-mark the cap to hold it in place on the dial drum.

In a few cases it may be found that dial end bearing is out of line or slightly off center. The bearing can generally be bent slightly to restore it to its proper position. If this cannot be done, replace the dial scale assembly.

Binding of the drum on the mounting brackets may be due to the fact that the control units fitted too tightly in early cars. This causes the escutcheon to be forced sideways, thus pressing on the tuning controls, which may move the dial drum brackets. This binding can generally be eliminated by bending the brackets slightly outward.

Similar difficulties will be encountered if the control head is not properly installed. When mounting the head, tighten the wing nuts evenly, so the control head will not have a tendency to bind against the dash opening, which would push the escutcheon against the controls.

DRIVE PULLEY STRIKING ANTENNA COIL SHIELD: Check to see that the dial drive pulley is properly located on condenser shaft. Its bushing should touch the condenser pinion gear.

Also, the antenna coil shield can may be moved slightly away from the drum by loosening the two nuts holding down the can.

It may also be possible to move the entire tuning unit slightly away from the shield can. Loosen the four screws holding down the unit and shift it.

CHASSIS WIRING IMPROPERLY PLACED: If the leads from the on-off switch and other leads in the vicinity of the "A" filter assembly are not properly located, they may interfere with free motion of the dial cord or the condenser drive gear sector. Dress these leads so that they cannot touch these moving parts.

STICKING MAGNET PLUNGERS

If the automatic tuning mechanism does not operate but manual tuning is possible, the plunger may be stuck in the OUT position. (See Fig. 3). If manual tuning control turns easily but does not tune stations, the plunger may be stuck in the "IN" position (See Fig. 4). A loose set screw on the retaining collar on the gathering bar shaft, may strike the frame and cause the plunger to stick so check the set screws first.

If the plunger sticks when the plunger is all the way in, it is sticking against the conical pole piece of the magnet assembly.

On the later sets, the gap between the plunger and the pole piece is adjustable. Adjustable magnets are identified by the gap adjusting screw and locking nut on the end of the magnet assembly. (See Fig. 6.) In these sets, loosen the locking nut on the rear of the magnet and turn the gap adjusting screw outward (counter-clockwise) one-half turn, and re-tighten the locking nut. If this sticking occurs in early units, replace the magnet with the newer type assembly. Read the paragraph "Replacing Magnet Coil Assembly" for instructions for replacing and adjusting the magnet assembly.

The plunger may stick in the OUT position, if the "C" washer on the clutch end of the cam shaft (Fig. 6) is totally or partially sheared off. Check this washer, and if found defective, replace with the hardened type of washer, (Stewart-Warner Part No. 118676, Hudson Part No. BO-161579), See Fig. 6 of page 14. A faulty "C" washer allows the plunger to come out too far, and also allows the cam to reach a position too high on the de-clutch arm riser (See Fig. 9).

After checking the "C" washer, check the adjustment of the cam on the riser, as explained under "SLIPPING CLUTCH".

If the cam is too far up on the riser (See Fig. 9) it lets the plunger come out of the magnet too far and this may cause sticking. If the cam is not far enough up on the riser (See Fig. 8) the clutch may slip.

If the position of the cam is correct as shown in Fig. 7 but the plunger still sticks loosen the two screws holding down the magnet and shift it slightly until the plunger moves freely, then retighten the screws. If this does not clear up the difficulty, replace the entire magnet assembly.

REPLACING MAGNET COIL ASSEMBLY
(Stewart-Warner Part No. 118177, Hudson Part No. BO-161517)

To replace a magnet coil assembly, proceed as follows:

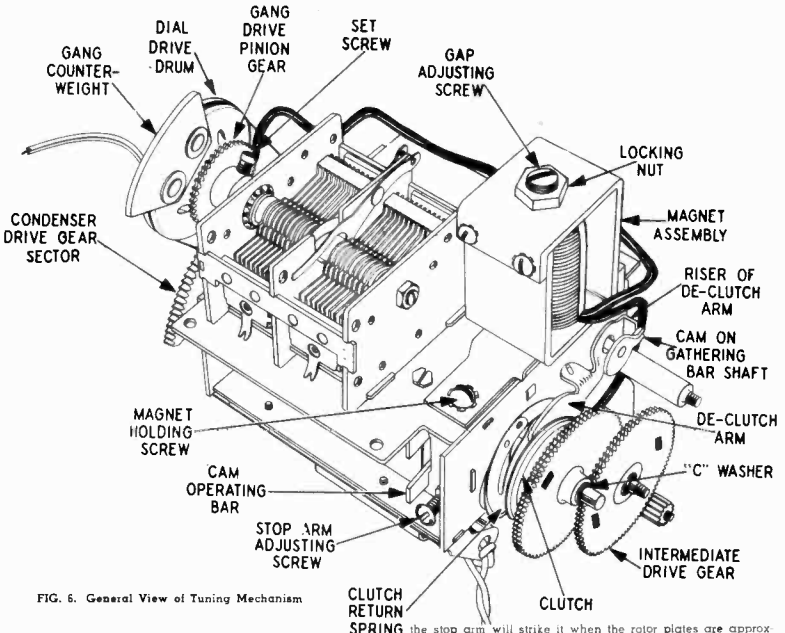


FIG. 6. General View of Tuning Mechanism

1. Remove top and bottom covers of tuning unit. Unsolder red and black magnet wires from points to which they connect.
2. Take out two round headed screws holding magnet to mounting plate.
3. Lift off old magnet assembly and install new assembly.
4. When replacing this magnet assembly, before tightening the screws holding down the unit, check to see that the plunger moves freely inside the magnet coil. If it has a tendency to bind, shift the position of the magnet slightly, until the plunger moves freely, then tighten down the holding screws.
5. It is now necessary to set the large adjusting screw on the top of the new magnet. Loosen the nut and turn the screw out several turns. Now push down one of the push button shafts next to the drum dial. Then with a screwdriver, push the plunger into the magnet as far as it will go.
6. While holding the plunger in **very tightly**, you can now release the push button shaft and turn the magnet adjusting screw in, until you feel the screw striking the plunger. When this happens, back the screw out one complete turn and retighten the locking nut. **This adjustment must be made very carefully since if the threads are tight, it is difficult to notice the exact point where the screw strikes the plunger.**

IMPORTANT: To get proper adjustment, a push button shaft must be depressed before pushing in the plunger so that the plunger operates the tuning mechanism as indicated by one of the cam operating bars extending from the frame (Fig. 6). If the above adjustment is done while the power is on the unit, the plunger will pull in by itself as soon as you depress one of the push button shafts. It is then merely necessary to hold the plunger in tightly with a screwdriver and **release the push button shaft.** The adjustment can then be made.

STOP ARM ADJUSTING SCREW

The function of this screw (Fig. 6) is to prevent damage to the gang condenser plates when the rotor plates are fully opened. This screw is adjusted so that the stop arm on the cam shaft will strike it just before the gang condenser plates open so far as to strike the stationary plates. Set this screw so the stop arm will strike it when the rotor plates are approximately ⅛" from the stator plates. Then tighten the locking nut so as to hold the screw in this position.

There is also a fixed stop whose purpose it is to stop the condenser plates just before they strike the fixed plates when the plates are fully meshed. This fixed stop is part of the frame assembly. When the gang condenser or any of its associated parts are replaced or otherwise adjusted, before tightening the set screws holding the condenser drive pinion gear to the shaft, set the rotor plates so that their upper edges are flush with the top edges of the stator plates. Then turn the condenser drive gear segment until the stop arm on the cam shaft strikes the fixed stop on the frame, then tighten the set screws. When this adjustment is properly made, and when the stop arm adjusting screw is correctly set, no strain is put on the rotor plates of the condenser in either the open or closed position of the gang condenser.

ADJUSTMENT OF CONTACT SCREW

The contact screw, once properly set, seldom requires readjustment. Improper adjustment may be identified by the following symptoms:

CONTACT SCREW TOO FAR IN: When a push button key is depressed, the magnet will operate, but the cam operating bar may not be pushed through as shown in Fig. 6.

CONTACT SCREW TOO FAR OUT: This may permit the push button key to exert too much pressure on the cam operating bar and cause it to stick.

Chattering of the mechanism may be caused when the screw is either too far in or too far out. Adjust the screw until the unit operates properly when any one of the push buttons is depressed.

POSITION OF GANG CONDENSER COUNTER-WEIGHT

Refer to Fig. 14. The purpose of the counter-weight shown in this illustration is to counter balance the weight of the gang condenser. To function properly, the weight must be in the position illustrated in Fig. 14 when the gang condenser is closed. When the weight is in this correct position the edge of the weight nearest the set screw is approximately straight up and down with the gang condenser fully meshed. When replacing the dial drive drum, always check to see that this weight is in the position described above, or the tuning unit may not operate satisfactorily.

MODEL DB40
MODEL SA40
Dial Drive Data

HUDSON MOTOR CAR CO.

REMOVING TUNING UNIT CHASSIS FROM CASE

1. Pry off bottom cover, utilizing screwdriver slot at front of case.
2. Remove four self-tapping screws holding down top cover and pry cover off.
3. Unsolder the blue wire extending from the on-off switch to the "A" choke assembly.
4. Remove two screws holding antenna receptacle to case. Also remove the screw holding down the cable grounding plate. Then remove four screws holding chassis assembly to case.
5. The entire tuning unit chassis can now be lifted from the case.

REMOVING TUNING MECHANISM FROM CHASSIS

1. Unsolder the green-white and the white wire from the gang condenser.
2. Unsolder brown cable wire from low end of volume control.
3. Unsolder gray rubber covered shielded wire (2 copper tracers) from center terminal of volume control.
4. Unsolder gray rubber covered shielded wire (1 copper tracer) from high end of volume control.
5. Unsolder blue wire from on-off switch on volume control. Also unsolder shielding from volume control bracket.
6. Unsolder 2 blue pilot light wires at 6A8 socket.
7. Unsolder ground of .05 mfd. condenser from frame of tuning mechanism. Mechanism can now be lifted out.

HOW TO REPLACE THE DIAL DRIVE CORD

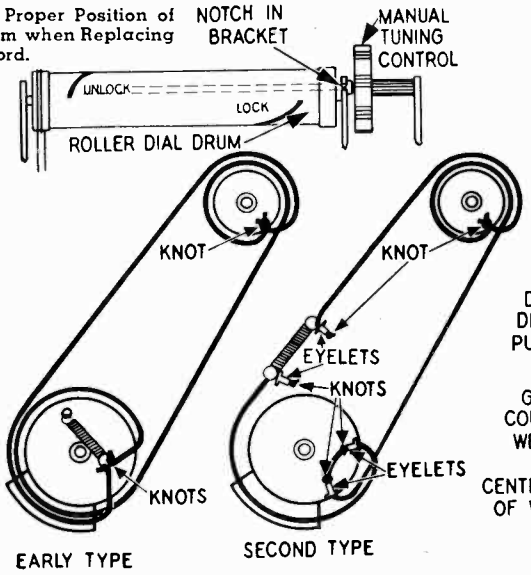


FIG. 11. Proper Position of Dial Drum when Replacing Drive Cord.

FIG. 12
Early Type
Dial Drive System

FIG. 13
Second Type
Dial Drive System

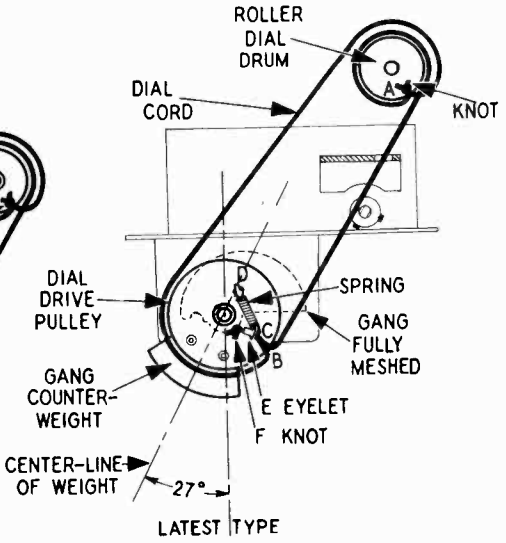


FIG. 14
Details of Latest Type
Dial Drive Systems

Three dial drive systems are illustrated here. The method marked "Second Type" (Fig. 13) can be used in sets originally using the "Early Type" (Fig. 12). The second type is preferable to the early type.

The method marked "Latest Type" (Fig. 14) is the best but uses a different Dial Drive Pulley. Therefore early type or second type drives **cannot** be restrung as shown for latest type unless a new Dial Drive Pulley (Stewart-Warner Part No. 118176, Hudson Part No. BO-161539) is installed.

The dial cord in the latest type dial drive can be replaced as follows:

1. Remove chassis from case as described on this page.
2. Remove the antenna coil shield can by removing the two nuts holding it to the chassis. This will give access to the dial drive drum.
3. Refer to Fig. 11. Rotate the dial so the word "UNLOCK" is directly in line with the reference notch in the right hand dial support bracket. Block the dial in this position, using a small block of rubber or other soft material which will not mar or damage the dial.
4. Rotate the gang condenser so its plates are fully meshed. (See Fig. 14.) Keep the gang in this position until the dial cord has been replaced.
5. About 26 inches of dial drive cord (Stewart-Warner Part No. 113178, Hudson Part No. BO-158521) are required. Tie a large knot in the center of this dial cord.
6. Pass both ends of the cord outward through hole A in the roller dial drum. (Fig. 14.)
7. Pass one end of the dial drive cord clockwise around the roller dial drum, through the hole in the support bracket and through hole B in the dial drive pulley.
8. Pass the other end of the cord counter-clockwise around the roller dial drum, counter-clockwise around the dial drive pulley and inward through hole B in the dial drive pulley.
9. At this point, make sure that the gang is fully meshed that the counter-weight is in the proper position, and the dial is in the position shown in Fig. 11. Otherwise calibration will be incorrect.
10. Tie a spring to the ends of the dial drive cord inside the dial drive pulley so that the cord extends about 3/8 inch inside the pulley when the cord is pulled taut. See Fig. 14. This illustration shows the recommended method of fastening the spring using an eyelet. Fasten the other end of the spring to the tab D on the pulley. The spring should be stretched only very slightly when in place. Too much spring tension may cause binding.
11. Remove the material used to hold the dial in position as described in Step 2. If the above procedure has been followed, the calibration of the dial will be correct when the unit is replaced in the case.