

# Engineering Data

## Stromberg-Carlson No. 228 Radio Receivers

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY  
Rochester, New York

### ELECTRICAL SPECIFICATIONS

Type of Circuit.....	Superheterodyne
Tuning Ranges.....	A—540 to 1500 Kc.; B—1450 to 3500 Kc.; C—5900 to 18,000 Kc.
Number and Types of Tubes.....	1 No. 6A8, 1 No. 6K7, 1 No. 6Q7, 1 No. 6F6G, 1 No. 6G5, 1 No. 5Y4G
Voltage Rating.....	105 to 125 Volts, A. C.
Input Power Frequency.....	25 to 60 Cycles and 50 to 60 Cycles
Input Power Rating.....	56 Watts
Frequency of Intermediate Amplifier.....	465 Kilocycles

### APPARATUS SPECIFICATIONS

No. 228-H Receiver.....	50 to 60 Cycles; P-27543 Chassis; P-27557 Loud Speaker
No. 228-HB Receiver.....	25 to 60 Cycles; P-27544 Chassis; P-27557 Loud Speaker
No. 228-L Receiver.....	50 to 60 Cycles; P-27543 Chassis; P-27605 Loud Speaker
No. 228-LB Receiver.....	25 to 60 Cycles; P-27544 Chassis; P-27605 Loud Speaker

### CIRCUIT DESCRIPTION

These receivers are six tube superheterodyne receivers employing metal tubes and a highly efficient dynamic speaker. There are three tuning ranges; the limits of each tuning range are listed under the "Electrical Specifications" given above. These receivers are also equipped with a low level bass frequency compensating network, which in conjunction with the volume control circuit gives balanced reproduction at any setting of the volume control.

The various tubes are used in these receivers as follows: The No. 6A8 tube functions as both Modulator and Oscillator. The No. 6K7 tube is used in the I. F. Amplifier and the No. 6Q7 tube is used as the Demodulator, A. V. C., and Audio Amplifier tube. The No. 6F6G tube is used in the Audio Power Output Stage and the No. 6G5 tube is used for indicating resonance in the Tuning Indicator System. The No. 5Y4G is the Rectifier tube of the power supply unit.

### NORMAL VOLTAGE READINGS

The various values of voltages listed in the following table are obtained by measuring between the various tube socket contacts and the chassis base, with the tubes in their respective sockets. The receiver is, therefore, in operation when the measurements are made. Figure 1, shows the terminal layout of the sockets with the proper terminal numbers.

Voltages are given for a line voltage of 120 volts, and allowance should be made for differences when the line voltage is higher or lower. A meter having a resistance of 1000 ohms per volt should be used for measuring the D. C. voltages. Voltage values shown are those obtained on the lowest possible scale of a meter having the following ranges: 0-2.5, 0-10, 0-100, 0-250, 0-500, 0-1000 volts except when an asterisk appears after any given voltage value in which case the 250 volt scale was used.

Tube	Circuit	Cap	Terminals of Sockets								Heater Voltages Between Heater Terminals	
			1	2	3	4	5	6	7	8	Socket Terminal Numbers	Volts
6A8	Mod.—Osc.	0	0	0	+210	+65	—20	+180	<i>6.1</i>	<i>+1.6</i>	2-7	<i>6.1</i>
6K7	I. F. Amp.	0	0	0	+220	+90	+2.5	—	<i>6.1</i>	<i>+2.5</i>	2-7	<i>6.1</i>
6Q7	Dem.—A. V. C. —Audio	0	0	0	+100	0	0	+100	<i>6.1</i>	<i>+1.6</i>	2-7	<i>6.1</i>
6F6G	Audio Output	—	0	0	+210	+220	0	0	<i>6.1</i>	<i>+13</i>	2-7	<i>6.1</i>
6G5	Tuning Ind.	—	0	+2.4*	0	+220	—	<i>6.1</i>			1-6	<i>6.1</i>
5Y4G	Rectifier	—	0	0	335	—	335	—	<i>+340</i>	<i>+344</i>	7-8	<i>4.9</i>
Speaker Socket		—	<i>+340</i>	0	0	<i>+340</i>	<i>+340</i>	—	<i>+220</i>			

Receiver tuned to 1000 Kc., no signal. A. C. voltages are indicated by italics.

## ALIGNMENT DATA

All alignment adjustments are accurately made at the factory on these receivers, and ordinarily no readjustments are necessary. However, should it become necessary to make any readjustments, the alignment procedure given in the following paragraphs should be carefully followed. In order to make these aligning adjustments in an easy and satisfactory manner, it is recommended that the Stromberg-Carlson P-24608 aligning tool be used.

To accurately align the circuits in these receivers, it is necessary to use a high grade, modulated test oscillator (Signal Generator), the output voltage of which can be varied. In conjunction with this test oscillator, a sensitive output meter should be used for determining the maximum signal voltage developed across the voice coil of the loud speaker.

In making any alignment adjustments, always adjust the test oscillator's output voltage to the minimum value where a good alignment may still be obtained. Never attempt to make any alignment adjustments using a strong signal. Before proceeding with the alignment of any circuits in these receivers be sure that the "Off-On-Tone" control knob is set for maximum treble response (position where knob is rotated from its maximum counter-clockwise position, slightly clockwise to position where set turns "on"). Figure 1, shows the location of all the aligning capacitors in these receivers.

In making any alignment adjustments on these receivers, it will not be necessary to remove the chassis from the cabinet. The aligning capacitors for the intermediate frequency circuits of these receivers are easily accessible from the rear of the receiver, and the aligning capacitors for the radio frequency circuits are accessible through the aperture located in the bottom metal base plate of the chassis. These apertures are easily accessible either through the bottom of the cabinet or through the bottom of the cabinet shelf depending upon the style of cabinet. See Figure 2.

### Dial Adjustment

Before aligning the circuits of any of these receivers, the tuning dial must be properly aligned to track with the gang tuning capacitors. To check whether the dial is set correctly with respect to the gang tuning capacitor, rotate the "Station Selector" knob in a clockwise direction so that the gang tuning capacitor is set to its maximum capacity position. Then, with the gang tuning capacitor in this position, the dial pointer should center over the middle vertical line of the three vertical lines located on the glass dial and the vertical lines located on the metal pan of the dial frame. Now, rotate the "Station Selector" knob so that the dial pointer lines up with the horizontal lines located on the metal pan of the dial frame; with the pointer in this position the two horizontal center marks of the glass dial (located at approximately 9.3 megacycles on the right hand scale and 2.16 megacycles on the left hand scale) should also be in alignment with the dial pointer. If the above conditions are not obtained, loosen the four clamps which hold the glass dial to the dial pan by slightly loosening the four screws, and shift the glass dial so that a good alignment between the dial pointer, the glass dial, and alignment marks located on the metal pan of the dial frame is obtained for both the horizontal and vertical position of the dial pointer.

### Intermediate Frequency Adjustments

The intermediate frequency used in these receivers is 465 kilocycles. In making these circuit adjustments always align the circuits in the order given in these instructions.

1. Operate the "Range" switch of the receiver to the "A" range position. Set the receiver's tuning dial at its extreme low frequency position, and operate the Tone Control knob to the "Normal" position. Rotate the Volume Control knob to its maximum clockwise position (maximum volume).

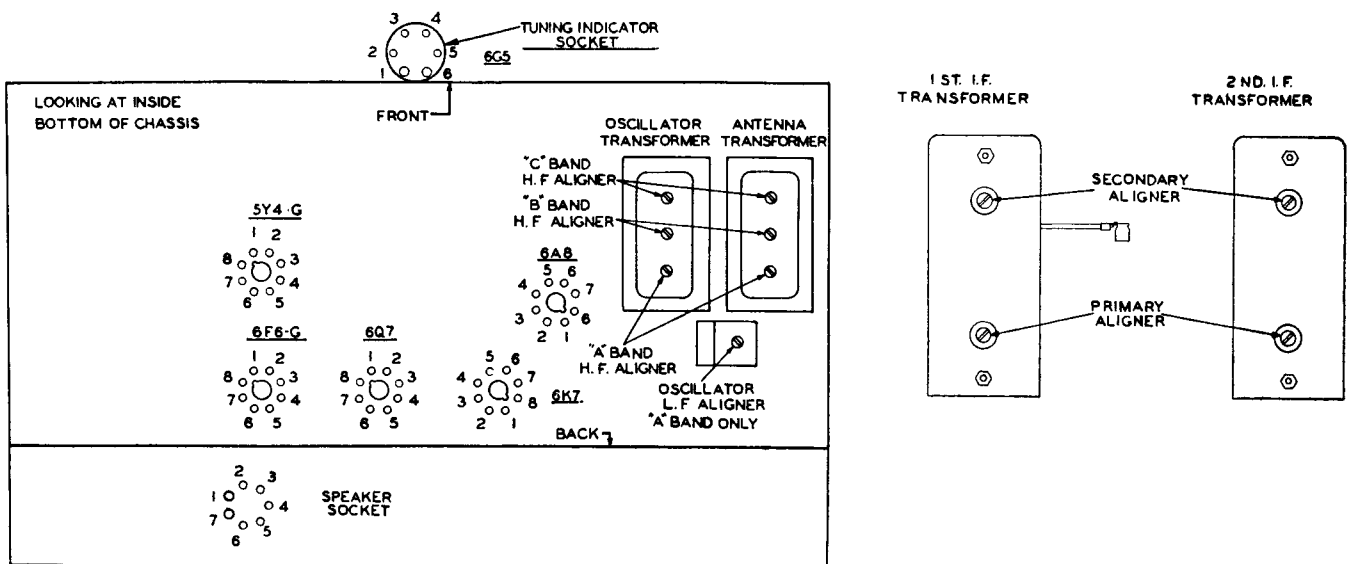


Fig. 1. Terminal Layout for Voltage Measurement Chart and Location of the Various Aligning Capacitors.

2. Apply between the chassis base (or ground binding post) of the receiver and the grid of the No. 6A8 modulator-oscillator tube, a modulated signal of 465 kilocycles from the test oscillator, using a 0.1 microfarad capacitor in series with the connection between the output terminal of the test oscillator and the grid of the No. 6A8 tube. Do not remove the chassis grid lead connecting to this tube. The ground (or low side) terminal of the test oscillator should be connected to either the chassis base or the ground binding post terminal.
3. Now, noting from Figure 1, the aligning capacitors for the first and second I. F. transformers, align the I. F. circuits in the following manner:
  - Secondary of second I. F. transformer.
  - Primary of second I. F. transformer.
  - Secondary of first I. F. transformer.
  - Primary of first I. F. transformer.
 Adjusting the circuits to obtain maximum reading on the output meter, reducing the output of the test oscillator as required.

### Radio Frequency Adjustments

The alignment of the radio frequency circuits of the various ranges in these receivers should be very carefully made and in the order specified.

#### Alignment of Short Wave Range (Also Referred to as "C" Band)

In aligning the radio frequency circuits for this range, replace the 0.1-microfarad capacitor which was placed in series with the test oscillator's output lead for the I. F. alignments, with a 400-ohm carbon type resistor. This lead should then be connected to the antenna binding post located on the rear of the receiver chassis. The ground terminal (or low side) of the test oscillator should be connected to the ground binding post on the receiver.

1. Operate the Range Switch on the receiver chassis to the "C" range position, and set the test oscillator's frequency and the receiver's tuning dial to 17 megacycles.
2. Adjust the oscillator's "C" band high frequency aligner for maximum output.
3. Adjust the antenna's "C" band high frequency aligner for maximum output, at the same time rotate the gang tuning capacitor back and forth through resonance until maximum output is obtained.

#### Alignment of Aircraft, Amateur, and Police Range (Also Referred to as "B" Band)

In aligning the radio frequency circuits for this range, use the same artificial antenna (400-ohm carbon type resistor) in series with the output terminal of the test oscillator as was used for aligning the short-wave range.

1. Operate the Range Switch on the receiver chassis to the "B" range position, and set the test oscillator's frequency and the receiver's tuning dial to 3.4 megacycles.
2. Adjust the oscillator's "B" band high frequency aligner for maximum output.
3. Adjust the antenna's "B" band high frequency aligner for maximum output, and at the same time rotate the gang tuning capacitor back and forth through resonance until maximum output is obtained.

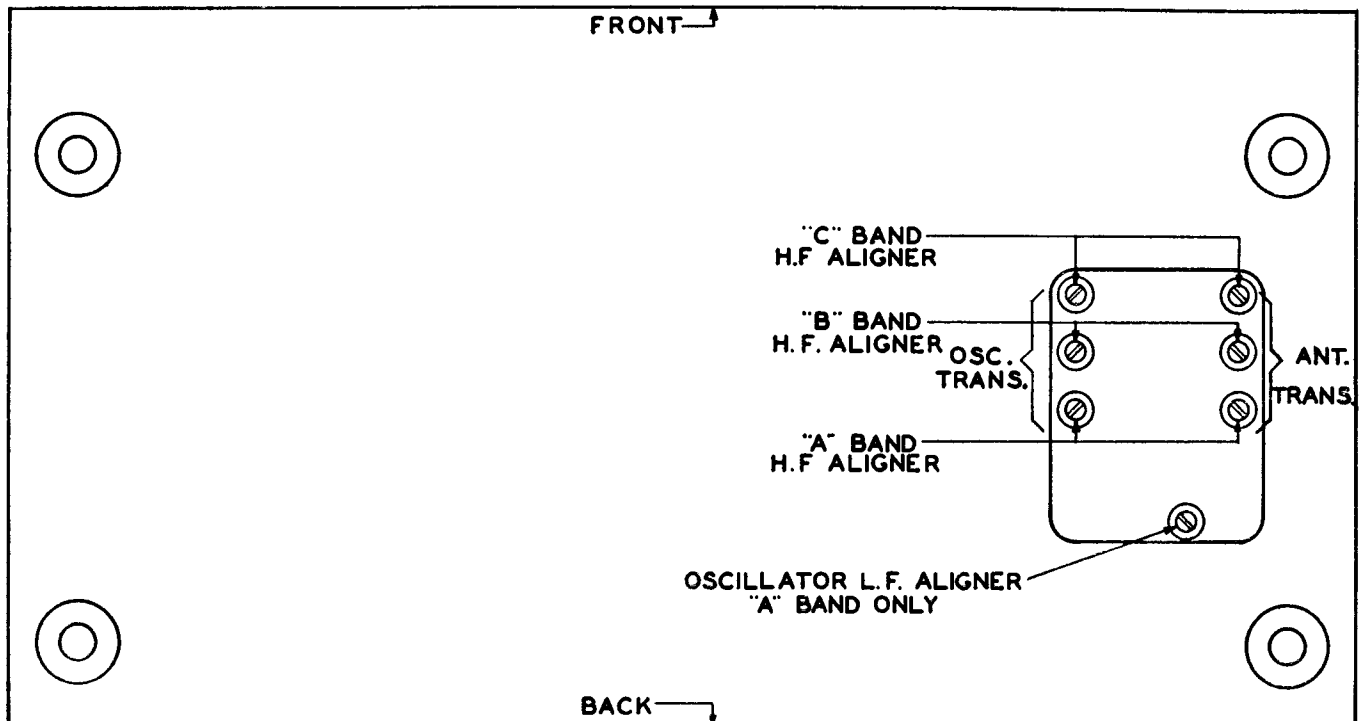


Fig. 2. View Through Chassis Mounting Shelf Showing Adjusting Screws for R. F. Aligning Capacitors.

## Alignment of Standard Broadcast Range (Also Referred to as "A" Band)

In aligning the radio frequency circuits for this range, replace the 400-ohm carbon type resistor in series with the test oscillator's output lead with a 200-micro-microfarad capacitor and align these circuits as follows:

1. Operate the Range Switch to the "A" range position and set the test oscillator's frequency and the receiver's tuning dial to 1.4 megacycles.
2. Adjust the oscillator's "A" band high frequency aligner for maximum output.
3. Adjust the antenna's "A" band high frequency aligner for maximum output.
4. Set the test oscillator's frequency and the receiver's tuning dial to 0.6 megacycles.
5. Adjust the oscillator's "A" band low frequency aligner (series aligner) for maximum output, and at the same time rotate the gang tuning capacitor slightly back and forth through resonance until maximum output is obtained.
6. Reset both the test oscillator's frequency and receiver's tuning dial to 1.4 megacycles and repeat operations Nos. 2 and 3.

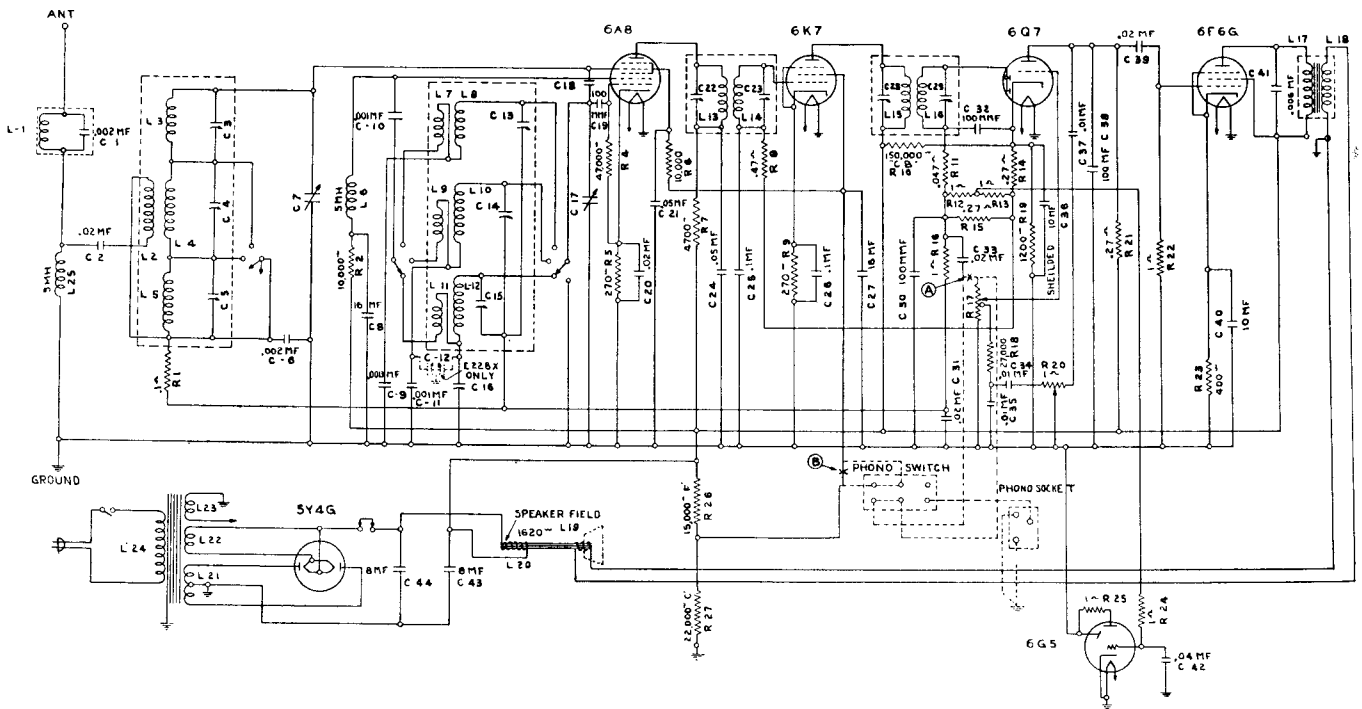


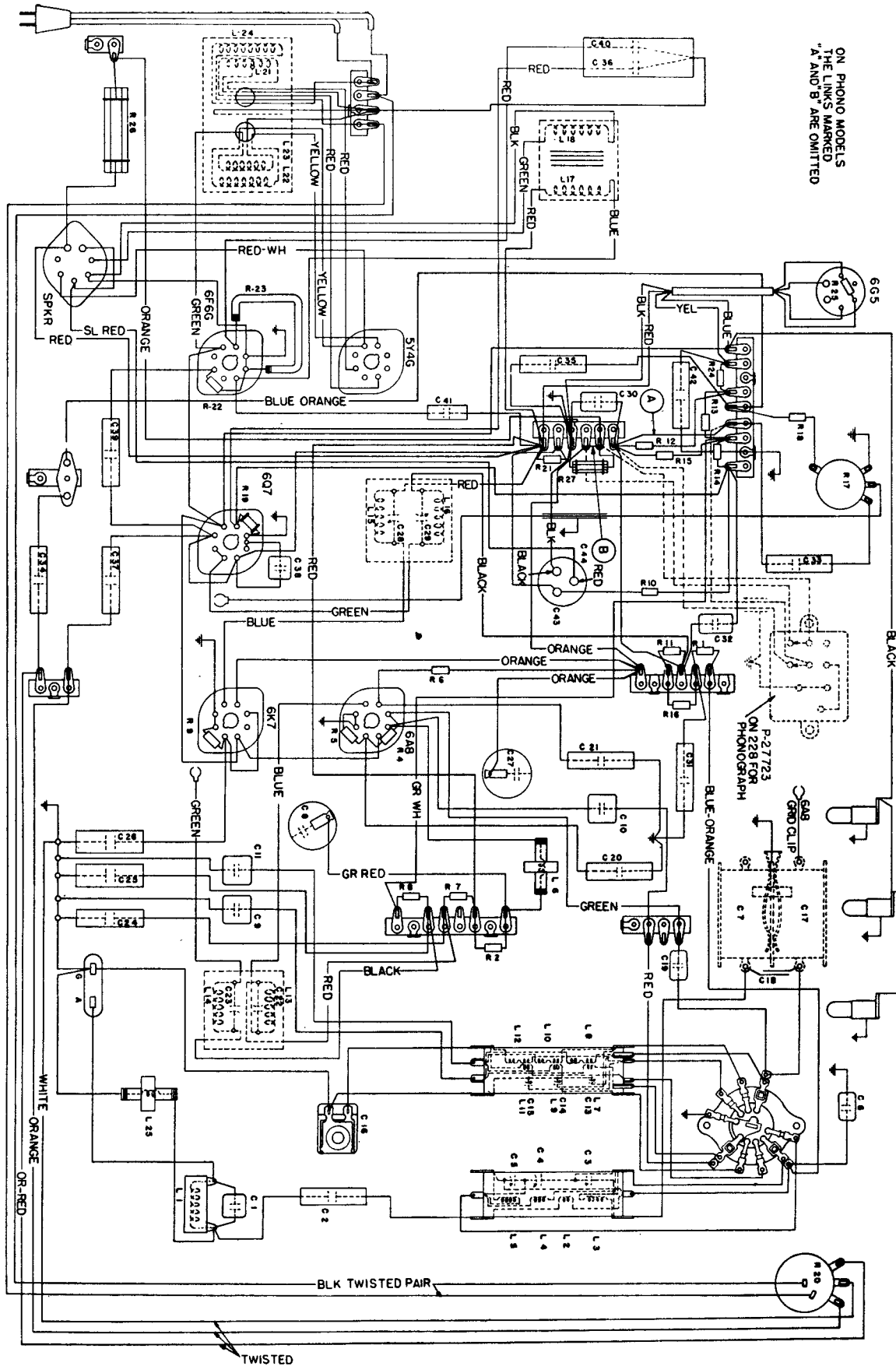
Fig. 3. Schematic Circuit of Receiver.

## REPLACEMENT PARTS

Piece Number	Schematic Circuit Designation	Part
23357	R27	Resistor, Type "C", 22,000 Ohms
23517	.	Tube Socket, 7 Prong
24268	.	Cord, Power Supply
24402	C25, C26	Capacitor, .1 Mfd.
24405	C42	Capacitor, .04 Mfd.
24559	C30, C32	Capacitor, Type "O", 100 Mmfd.
24994	C 21, C24	Capacitor, .05 Mfd.
25149	C34, C35, C37	Capacitor, .01 Mfd.
25150	C2, C20, C31, C33, C39	Capacitor, .02 Mfd.
25487	C10	Capacitor, Type "W", .001 Mfd.
25488	C1, C6	Capacitor, Type "W", .002 Mfd.
25489	C9	Capacitor, Type "W", .00125 Mfd.
25500	R23	Resistor, Flexible Type, 400 Ohms
25504	C19, C38	Capacitor, Type "2", 100 Mmfd.
25500	L15, L16	2nd I. F. Transformer
25513	L1	Coil Assembly, Wave Trap
25526	R26	Resistor, Type "F", 15,000 Ohms
25583	C41	Capacitor, .006 Mfd.
25539	.	Tube Socket, 8 Prong
25814	L6, L25	Coil Assembly, R. F. Choke
20029	C22, C23, C28, C29	Aligning Capacitors, I. F. Transformers
26039	C3, C4, C5	Aligning Capacitors, Antenna Transformer Assembly
26057	C7, C17	Gang Tuning Capacitors
26113	L2, L3, L4, L5	Coil Assembly, Antenna Transformer
26121	L13, L14	1st I. F. Transformer
26157	L7, L8, L9, L10, L11, L12	Coil Assembly, Oscillator Transformer
26161	C13, C14, C15	Aligning Capacitors, Oscillator Transformer Assembly
26172	.	Range Switch
26287	.	Dial Lamp
26326	R5, R9	Resistor, Type "E", 270 Ohms
26334	R19	Resistor, Type "E", 1200 Ohms
26341	R7	Resistor, Type "E", 4700 Ohms
26345	R2, R6	Resistor, Type "E", 10,000 Ohms
26353	R4, R11	Resistor, Type "E", 47,000 Ohms
26357	R1	Resistor, Type "E", .1 Megohm
26362	R14, R15, R21	Resistor, Type "E", .27 Megohm
26365	R8	Resistor, Type "E", .47 Megohm
26369	R12, R13, R16, R22, R24, R25	Resistor, Type "E", 1 Megohm
26417	C18	Capacitor, Neutralizing
26727	C11	Capacitor, Type "W", .001 Mfd., Oscillator "B" Range L. F. Padder
26747	C16	Capacitor, Oscillator "A" Range L. F. Aligner
27099	.	Pilot Lamp Socket
27289	.	Dial Assembly
27408	.	Tuning Indicator Socket and Cable
27550	L17, L18	Transformer Assembly, Audio Output
27552	C43, C44	Electrolytic Capacitor; 8 Mfd., 350 Volts, and 8 Mfd., 400 Volts
27553	C8	Electrolytic Capacitor; 16 Mfd., 200 Volts
27554	C27	Electrolytic Capacitor; 16 Mfd., 100 Volts
27555	L21, L22, L23, L24	Power Transformer (50 to 60 Cycles Chassis)
27556	L21, L22, L23, L24	Power Transformer (25 to 60 Cycles Chassis)
27610	R17	Volume Control
27615	R18	Resistor, Type "EI", 27,000 Ohms
27619	C36, C40	Electrolytic Capacitors; 10 Mfd., 25 Volts and 10 Mfd., 25 Volts
27627	.	Pilot Lamp Socket
27637	R20	Off-On-Switch and Tone Control
27640	R10	Resistor, Type "CB", 150,000 Ohms

## MISCELLANEOUS PARTS

Piece Number	Part
26296	Knob (Used on Volume, "On-Off" Switch and "Tone" Control and Station Selector Controls). Used only on No. 228-H Receivers. 3 required
27351	Knob (For Range Switch). Used only on No. 228-H Receiver
26302	Knob (For Volume Control). Used only on No. 228-L Receiver
27790	Knob (For Station Selector Control). Used only on No. 228-L Receiver
27791	Knob (For Range Swltch). Used only on No. 228-L Receiver
26384	Knob (For "On-Off" Switch and "Tone" Control). Used only on No. 228-L Receiver
26070	Felt Washer (For use on Control Shafts of No. 228-H Receiver)
26071	Felt Washer (For Use on Control Shafts of No. 228-L Receiver)



ON PHONO MODELS  
THE LINKS MARKED  
"A" AND "B" ARE OMITTED

Fig. 4. Wiring Diagram, No. 228 Receiver.

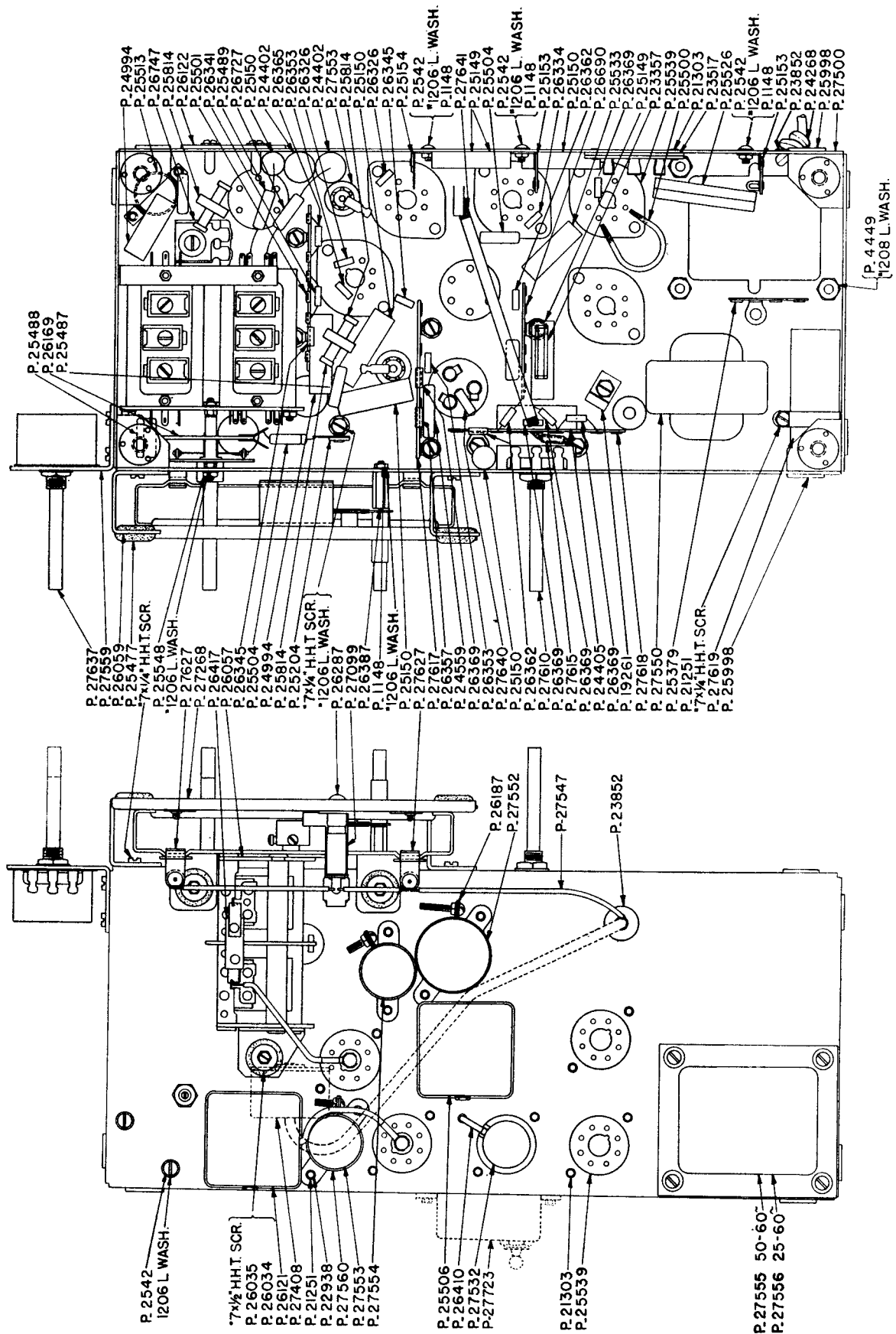


Fig. 5. Chassis Assembly.