ENGINEERING DATA
STROMBERG-CARLSON NO. 480 RADIO RECEIVERS

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY
ROCHESTER, NEW YORK

IDENTIFICATION TABLE

Model	Input Power Frequency	Chassis	Cabinet	Speaker
480-M	50-60 Cycles	31085	31088	31087 (Bass) 31126 (Treble)
480-MB	25-60 Cycles	31086	31088	31087 (Bass) 31126 (Treble)

SPECIFICATIONS

Tuning Ranges — Frequency Modulation 40 to 44 Mc. (40,000 to 44,000 Kc.); Shortwave 5.8 to 18 Mc. (5800 to 18,000 Kc.); Standard Broadcast .54 to 1.7 Mc. (540 to 1700 Kc.)

Voltage Rating — 105 to 125 Volts

Type of Circuit — Superheterodyne with Electric Tuning

Number and Type of Tubes—20

- 2—6SK7 R. F. Amplifiers
- 1—6F8G Tuning Indicator Amplifier
- 2—6SA7 Oscillator and Modulator
- 1—6K7 I. F. Amplifier
- 3—6SK7 I. F. Amplifiers
- 1—6H6 Demodulator, A. V. C., "Q"
- 1—6SJ5 Limiter
- 1—6R7 Audio Amplifier
- 1—6H6 Demodulator
- 1—6C8G Audio Inverter
- 1—6SQ7 "Q" Tube
- 2—6L6 Power Output
- 1—6H6 Tuning Indicator Rectifier
- 1—5Z3 Rectifier
- 1—6AF6G Tuning Indicator

Input Power Rating — 225 Watts

Intermediate Frequency — 455 Kilocycles (Amplitude Modulation); 3.0 Megacycles (Frequency Modulation)

Speaker Field Coil Resistance—Approximately — 1125 Ohms (Bass); 200 Ohms (Treble)

Speaker Voice Coil Impedance at 400 Cycles—Approximately — 24 Ohms (Bass); 11 Ohms (Treble)

FEATURES

GENERAL. This is a twenty-tube, three gang, three range receiver designed for the reception of both amplitude and frequency modulated stations and is equipped with a dual coaxial speaker system. It is capable of reproducing without distortion an audio frequency range of at least 10,000 cycles.

The chassis is of the fortified type with bails provided for ease in handling and servicing. Automatic tuning is accomplished by means of a motor drive controlled by a commutator and brush assembly and the dial is of the slide rule type, edge-lighted for clear visibility without glare. Separate treble and bass controls are provided to make accurate adjustment of the tone possible.

A remote control unit is provided with this receiver which enables the user to operate the receiver at a remote point.

The power output of this receiver is excellent and the tone quality and fidelity of reproduction is finer than anything produced commercially to date.

FREQUENCY MODULATION: The "Armstrong Wide-Swing Frequency Modulation System" used in this receiver is an outstanding development in radio. It makes possible:

1. Static-Free Reception;
   Both natural and man-made static is virtually eliminated.
2. Noise free reception;
   The tube and set noises present in ordinary amplitude modulation receivers are virtually eliminated.
3. Extreme high fidelity reception;
   Noise free reproduction of an audio range limited only by the capacity of the human ear or the audio system of the receiver is possible without interference.
4. Interference free reception;
   Two stations cannot be received at the same time.

This system is patented and Stromberg-Carlson manufactures these receivers under an Armstrong license. The Federal Communications Commission has established five channels between 40 and 44 megacycles for frequency modulated transmitting stations. Since this is a comparatively high frequency, the distance over which reception is possible is limited. It should also be noted that the fidelity may be limited by telephone lines, or by program transcriptions, although this condition will, undoubtedly, be improved as time goes on.

SPEAKER SYSTEM. A coaxial dual speaker system is used in this receiver. The low frequency speaker owes much of its effectiveness to the unusually large field structure with a subsequently increased magnetic flux in the air gap. The treble speaker with its back completely enclosed is mounted directly in front of the bass speaker; both speakers are connected by means of a frequency dividing network to the receiver at an impedance of 24 ohms. The Acoustical Labyrinth is used in conjunction with this speaker system and the complete system is capable of providing a relatively even response to all tones from 65 to more than 10,000 cycles per second.

SPECIAL CIRCUITS. A tuning indicator having two apertures is used with this receiver. For tuning stations on the standard broadcast and short-wave range, one aperture is for strong signals and the other for weak signals. One aperture will close with a signal of approximately 100,000 microvolts and the other will not close even with a two volt signal. Stations on the frequency modulation range should be tuned for maximum closing of both apertures.

Iron core coils are used in the broadcast and short-wave ranges to provide greater accuracy of alignment. The audio system employs a special inverter push-pull circuit designed to provide excellent fidelity, and the chassis is thoroughly shielded throughout with an electro-statically shielded power transformer.

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AUTOMATIC TUNING. Twelve push buttons are provided from right to left; their operation is as follows:

1. Manual Control
2. Remote Control

3-9. Pre-set Stations (7)

10. Television Sound
11. Phonograph
12. "Off" Switch

Pushing any button (except the "off" button) turns the set on and tuning is accomplished by means of an electric motor, driving the regular variable capacitor to a pre-set point.

Set up is very easily accomplished by means of a switch which causes the pilot light to go out when the brush is properly located.

REMOTE CONTROL. Remote selection of stations is accomplished by simply plugging the remote control unit into the socket provided on the back of the chassis. This unit enables the user to select any one of eight favorite stations which have been previously set up on the electric tuning system of the receiver.

PHONOGRAPH OPERATION. A jack is provided on the back of the chassis into which a record player may be plugged and a push button is provided on the front of the chassis for switching from "Radio" to "Phonograph".

TELEVISION. A socket is provided on the back of the chassis into which a television receiver may be plugged and a push button is provided on the front of the chassis for switching to television so that the audio amplifier and speaker system employed in this receiver are available for use with television receivers designed for this type of sound reproduction.

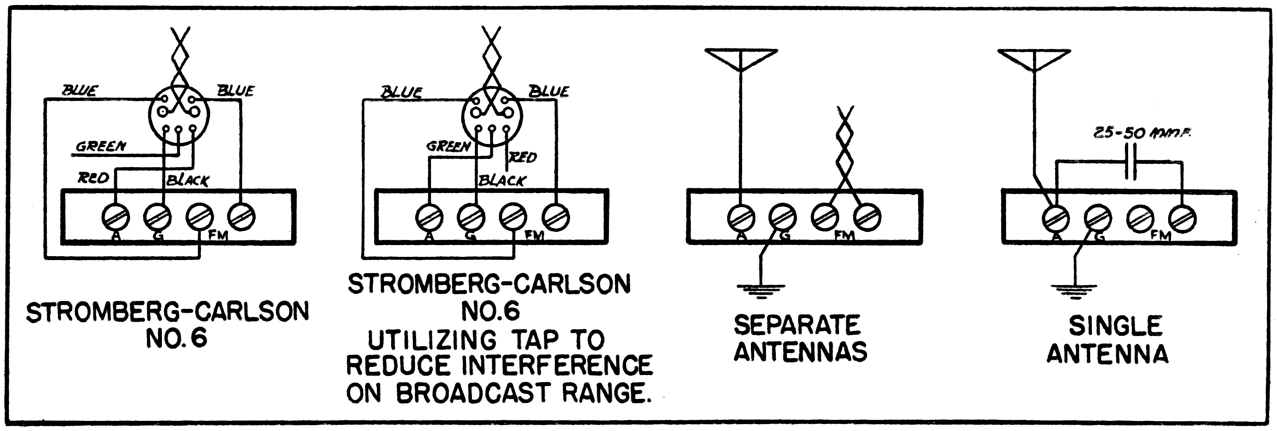
ACCESSORIES

ANTENNA. For best results use a Stromberg-Carlson No. 6 Antenna. This antenna is designed to provide improved pick-up on both the amplitude and frequency modulation bands.

If it is desired, two ordinary antennas may be used, one for amplitude modulation, which should be a straight wire "L" type antenna about 75 feet long, and one for frequency modulation. This latter antenna may be a straight wire about 40 feet in length or of the dipole type with two arms approximately 5½ feet in length. The dipole antenna will exhibit a marked directional effect and should be erected as high as possible above the ground and adjusted so as to receive the desired frequency modulated stations with best results.

For average reception, a single straight wire antenna may be used for both amplitude and frequency modulation.

The various types of antennas should be connected to the No. 480 Receiver as follows:



PLAYING RECORDS. To obtain the best quality of phonograph reproduction a Stromberg-Carlson record player is recommended. They are designed for use with this receiver, and all that is necessary is to connect the record player to the single prong socket provided in the chassis and proceed to operate. The volume and tone may be controlled with the controls at the receiver, or (if such is provided) the volume control on the record player may be used.

A low impedance pick-up may also be used, but a matching transformer must be placed between the phonograph pick-up and the chassis.

HEADSET ATTACHMENT. Headphones can be very simply attached to this receiver. Ask for Pc. No. 28303 Headset Package Assembly, which comes complete with headphones and installation instructions.

CARE OF CABINET. The finish of Stromberg-Carlson Cabinets should be protected by using Stromberg-Carlson Cabinet Polish regularly. It is available in pint cans, designated as Pc. No. 28601.

Nicks and scratches of most kinds can be repaired quickly and easily by proper use of the Pc. No. 26962 Touch-Up Kit. Complete instructions are provided with each kit.

TOOLS. Stromberg-Carlson can supply all the tools required for working on these sets. For example:

SD-29 Phillips Head Screwdriver
No. 24608 Aligning Tool
Also pliers, cutters, screwdrivers, etc.

ALIGNING INFORMATION

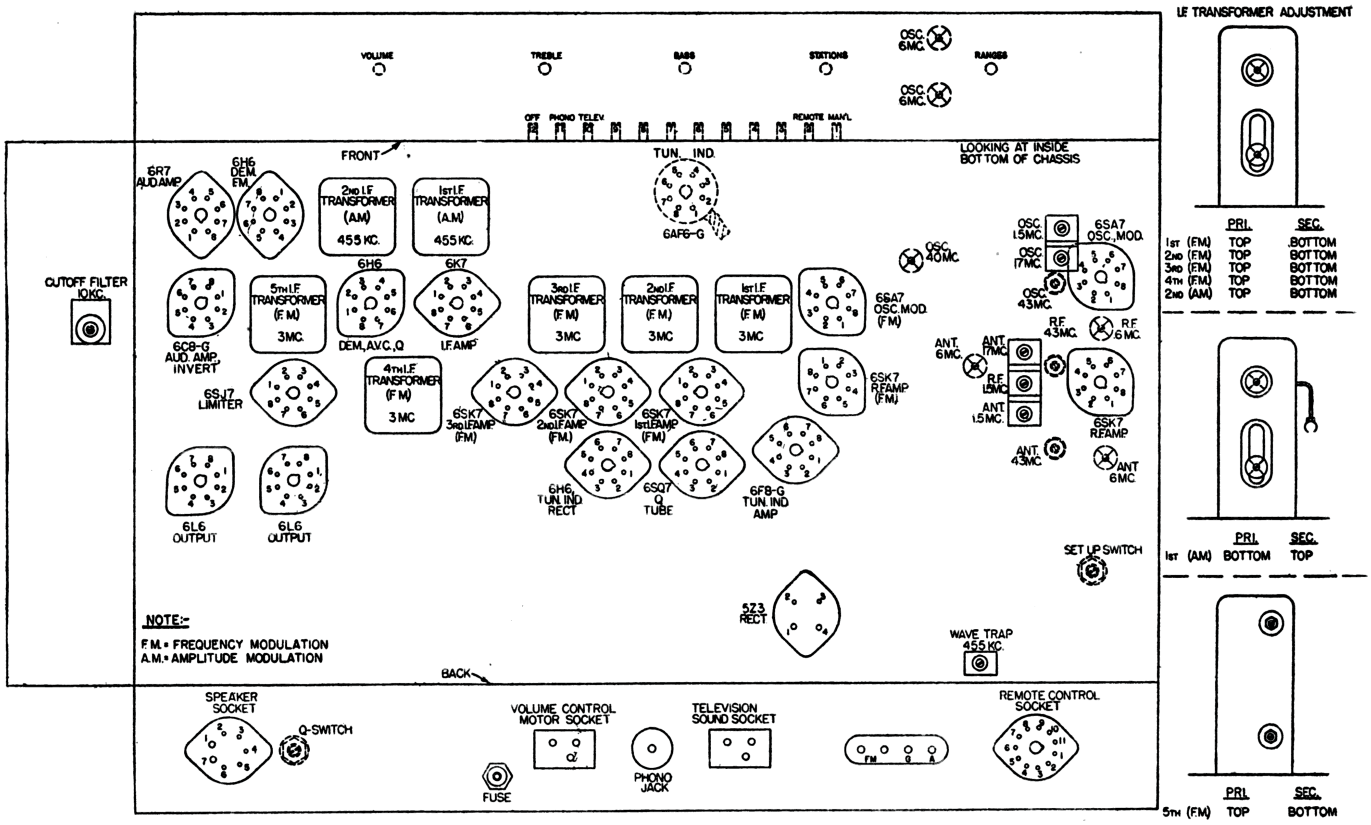
NEVER REALIGN UNLESS ABSOLUTELY NECESSARY

GENERAL. All aligning adjustments are carefully made at the factory with special equipment which is designed for aligning frequency modulation receivers. The limitations of commercial oscillographs and other ordinary test equipment are such that alignment should not be attempted in the field unless absolutely necessary.

If alignment is attempted, it will not be successful unless the instructions which follow are adhered to exactly.

The following equipment will be required:

1. Standard signal generator with sweep circuit.
2. Wide band sweep signal generator.
3. Oscillograph.
4. Microammeter "0" to 200 Microamps.



Location Chart

5. Center "0" Microammeter with 100 divisions each side of "0".

See location chart above for location of all aligning screws.

ALIGNING PROCEDURE (follow this order exactly)

I. **Dial pointer adjustment.** With the plates of the gang tuning capacitor fully engaged, set the dial pointer directly on the two vertical lines located at the extreme low frequency end of the dial scale.

II. **Intermediate frequency adjustments** (Frequency Modulation)

1. Set the range switch to Frequency Modulation position and the volume control to "off" position.
2. Tune the set to the extreme high frequency end of the dial (44.5 megacycles).
3. Disconnect the ground side of the 10000 ohm resistor R94 and connect the "0" to 200 microammeter in series with it and ground. (This resistor is connected between terminals No. 3 and 4 of the fourth I. F. transformer.)
4. Connect the oscillograph between high side of R94 resistor and ground.
5. Connect the ground terminal of the wide band sweep signal generator to the ground terminal of the 6SK7 third I. F. tube socket.
6. Introduce a signal of 3 megacycles to the grid of the 6SK7 third I. F. tube (Terminal No. 4), using a .1 microfarad capacitor in series with the output lead of the signal generator. Keep the "0" to 200 microammeter at approximately 100 microamps.
7. Align the secondary and primary of the fourth I. F. transformer for maximum reading on the "0" to 200 microammeter.
8. Slight adjustments of the aligners may be made if necessary to obtain a symmetrical curve on the oscillograph. Try for a good curve rather than the very last bit of output.
9. Connect the output lead and the 0.1 microfarad capacitor in series with it to the grid of the 6SK7 second I. F. tube (Terminal No. 4).
10. Align the third I. F. transformer in the same manner.
11. Connect the output lead and the 0.1 microfarad capacitor in series with it to the grid of the 6SK7 first I. F. tube (Terminal No. 4).
12. Connect the ground lead to the ground terminal of the 6SK7 first I. F. tube socket.
13. Align the second I. F. transformer in the same manner.
14. Connect the output lead and the 0.1 microfarad capacitor in series with it to the grid of the 6SA7 modulator tube (Terminal No. 8).
15. Connect the ground lead to the ground terminal of the 6SA7 modulator tube socket.
16. Align the first I. F. transformer in the same manner.
17. Remove the wide band sweep signal generator.

III. **Discriminator adjustment** (Frequency Modulation)

Note: Be sure the frequency of both signal generators are the same.

1. Connect the ground terminal of the standard signal generator to the ground terminal of the 6SK7 second I. F. tube socket.
2. Introduce an unmodulated signal of 3 megacycles to the grid of the 6SK7 second I. F. tube (Terminal No. 4) using a 0.1 microfarad capacitor in series with the output lead of the standard signal generator.
3. Connect the center "0" microammeter with a .5 megohm resistor in series across one-half of the discriminator load. (From ground to the junction of the two .1 megohm resistors R28 and R29).

4. Set the attenuator on the standard signal generator for maximum output.
5. Adjust the primary of the discriminator transformer for maximum reading on the center "0" microammeter.
6. Connect the center "0" microammeter and the .5 megohm resistor in series with it across the whole discriminator load. (Terminal No. 4 of the 6H6 Demodulator tube and ground).
7. Adjust the secondary of the discriminator transformer for center "0" reading of the microammeter.
8. Vary the frequency of the standard signal generator slightly and be sure that the center "0" microammeter reads the same on each side of resonance. If not, go back and realign both primary and secondary.

IV. **Radio frequency adjustments** (Frequency Modulation)

1. Set the signal generator frequency and the receiver tuning dial to 40 megacycles.
2. Replace the 0.1 microfarad capacitor in series with the output lead from the signal generator with a 100 ohm resistor and connect it to the F. M. antenna terminal nearest to the end of the antenna and ground terminal strip.
3. Connect the ground lead to the other F. M. terminal on the antenna and ground terminal strip.
4. Adjust the oscillator 40 megacycles core aligner for maximum signal.
5. Set the signal generator frequency and the receiver tuning dial to 43 megacycles.
6. Adjust the oscillator shunt aligner for maximum signal.
7. Adjust the R. F. and antenna aligners for maximum signal on the "0" to 200 microammeter **maintaining the center "0" microammeter at "0" at all times by rotating the receiver dial slightly back and forth.**
8. Remove both meters from the circuits and resolder the 10000 ohm resistor R94 in its original position to terminal No. 4 on the fourth I. F. transformer.

V. **Intermediate frequency adjustments** (Amplitude Modulation)

Adjustment of second I. F. transformer.

1. Set the range switch to standard broadcast position.
2. Set the fidelity control in the center or "sharp" position and turn the volume control "full on".
3. Connect the oscillograph to the high side of the volume control R47.
4. Replace the 100 ohm resistor in series with the output lead from the signal generator with a 0.1 microfarad capacitor and connect it to the grid cap of the 6K7 I. F. tube. (Do not remove the grid cap from this tube.)
5. Connect the ground terminal of the signal generator to the ground terminal of the receiver.
6. Introduce a modulated signal of 455 kilocycles to the grid of the 6K7 I. F. tube.
7. Adjust the second I. F. transformer aligners for a symmetrical curve on the oscillograph in the following order:
   a. Secondary of second I. F. transformer.
   b. Primary of second I. F. transformer.
8. Set the fidelity control to the high fidelity (expanded) position and readjust the primary of the second I. F. transformer for symmetrical curve.
9. Set the fidelity control back to the center or "sharp" position.

Adjustment of first I. F. transformer.

1. Connect the output lead from the signal generator with the 0.1 microfarad capacitor in series with it to the grid of the 6SA7 Modulator Tube. (Terminal No. 4.)
2. Adjust the first I. F. transformer aligners for a symmetrical curve on the oscillograph in the following order:
   a. Secondary of first I. F. transformer.
   b. Primary of first I. F. transformer.
3. After the Amplitude Modulation I. F. adjustments have been completed, the fidelity control should be turned to the high fidelity position and a check made on the shape of the curve which should show a slight double peak.
4. Turn the fidelity control back to middle or "sharp" position.
5. Remove the oscillograph from the circuit.

VI. **Radio frequency adjustments** (Amplitude Modulation)

Short Wave Range (C Band)

1. Replace the 0.1 microfarad capacitor in series with the output lead of the signal generator with a 400 ohm resistor and connect it to the Amplitude Modulation antenna terminal on the back of the chassis.
2. Set the range switch to the short wave range position (C Band).
3. Set the signal generator frequency and the receiver tuning dial to 6 megacycles.
4. Adjust the 6 megacycle "oscillator" and "antenna" iron cores for maximum signal.
5. Set the signal generator and the receiver tuning dial to 17 megacycles.
6. Adjust the 17 megacycles "oscillator" and "antenna" aligning capacitors for maximum signal.
7. Repeat operations 3 and 4.
8. Repeat operations 5 and 6.

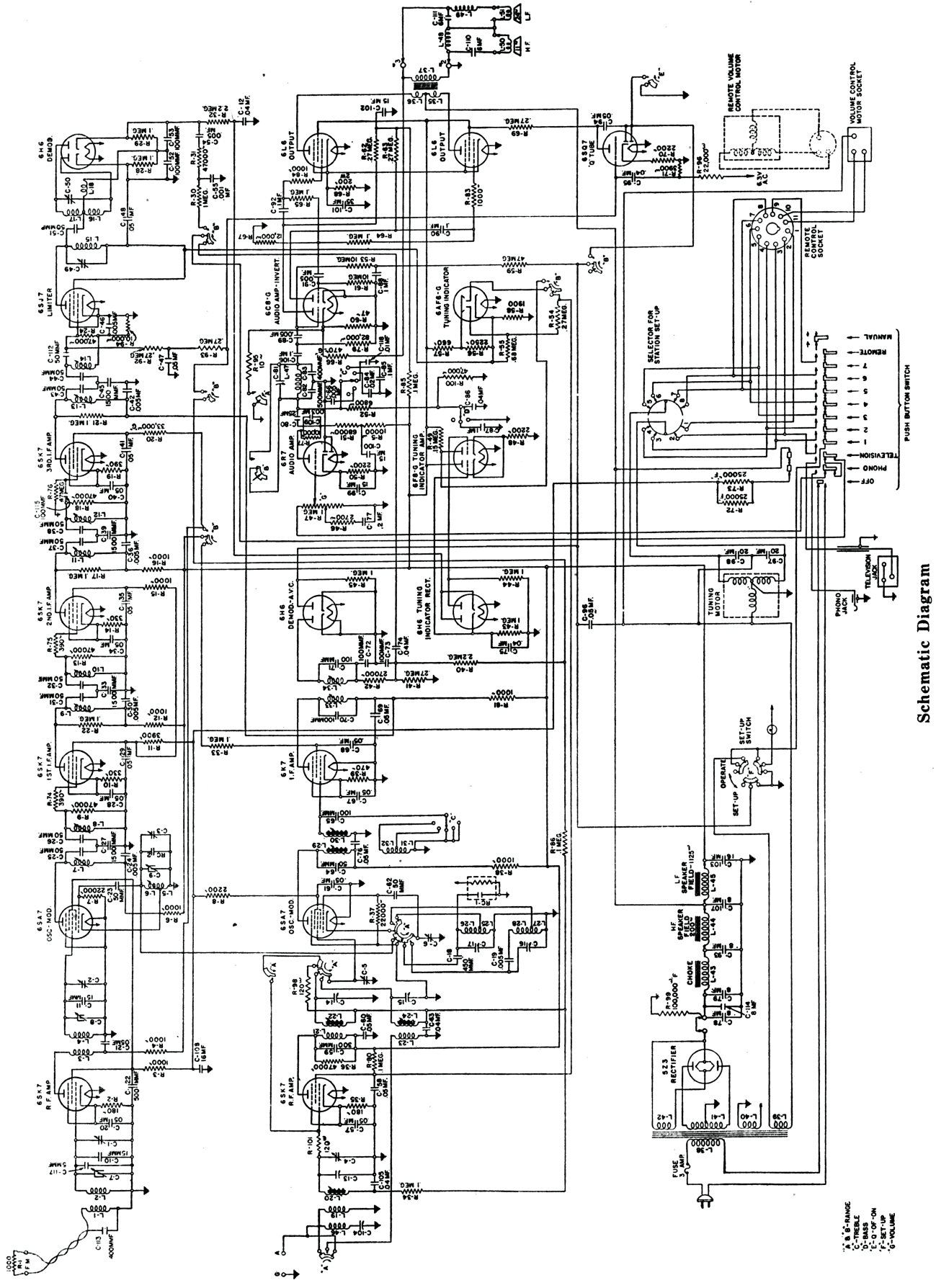
Standard Broadcast Range (A Band)

1. Replace the 400 ohm resistor in series with the output lead of the signal generator with a 200 micro-microfarad capacitor.
2. Set the range switch to the standard broadcast range (A Band).
3. Set the signal generator frequency and the receiver tuning dial to 600 kilocycles.
4. Adjust the 600 kilocycle "oscillator" , "R. F." and "Antenna" iron cores for maximum signal.
5. Set the signal generator frequency and the receiver tuning dial to 1500 kilocycles.
6. Adjust the 1500 kilocycle "oscillator", "R. F." and "Antenna" aligning capacitors for maximum signal.
7. Repeat operations 3 and 4.
8. Repeat operations 5 and 6.

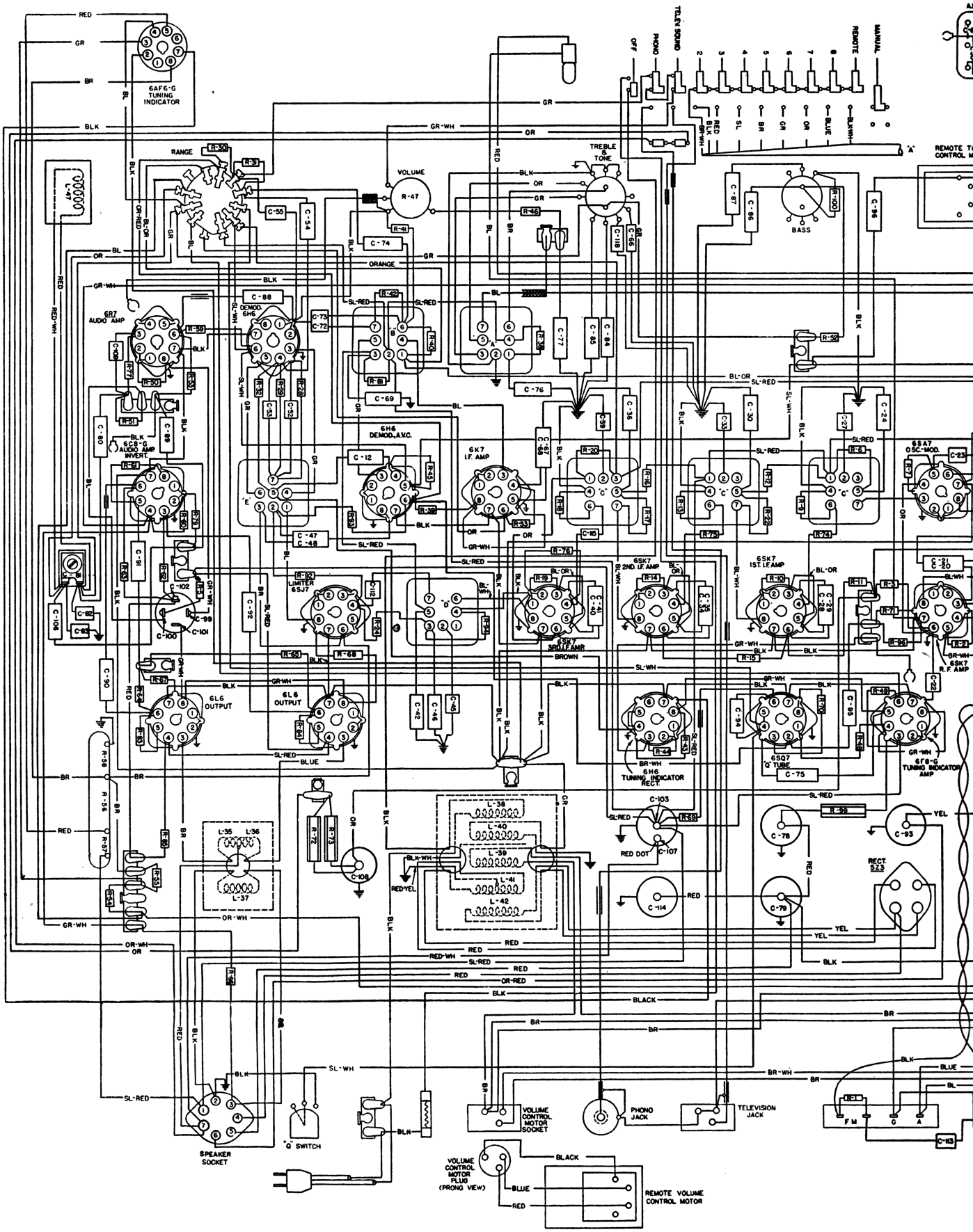
VII. **Wave trap adjustment.** (Leave the receiver connected in the same manner as when adjusting the standard broadcast range) (A Band).

1. Set the receiver's tuning dial to 1000 kilocycles.
2. Set the signal generator frequency to 455 kilocycles and introduce a fairly strong modulated signal to the receiver.
3. Adjust the wave trap aligner for minimum signal.

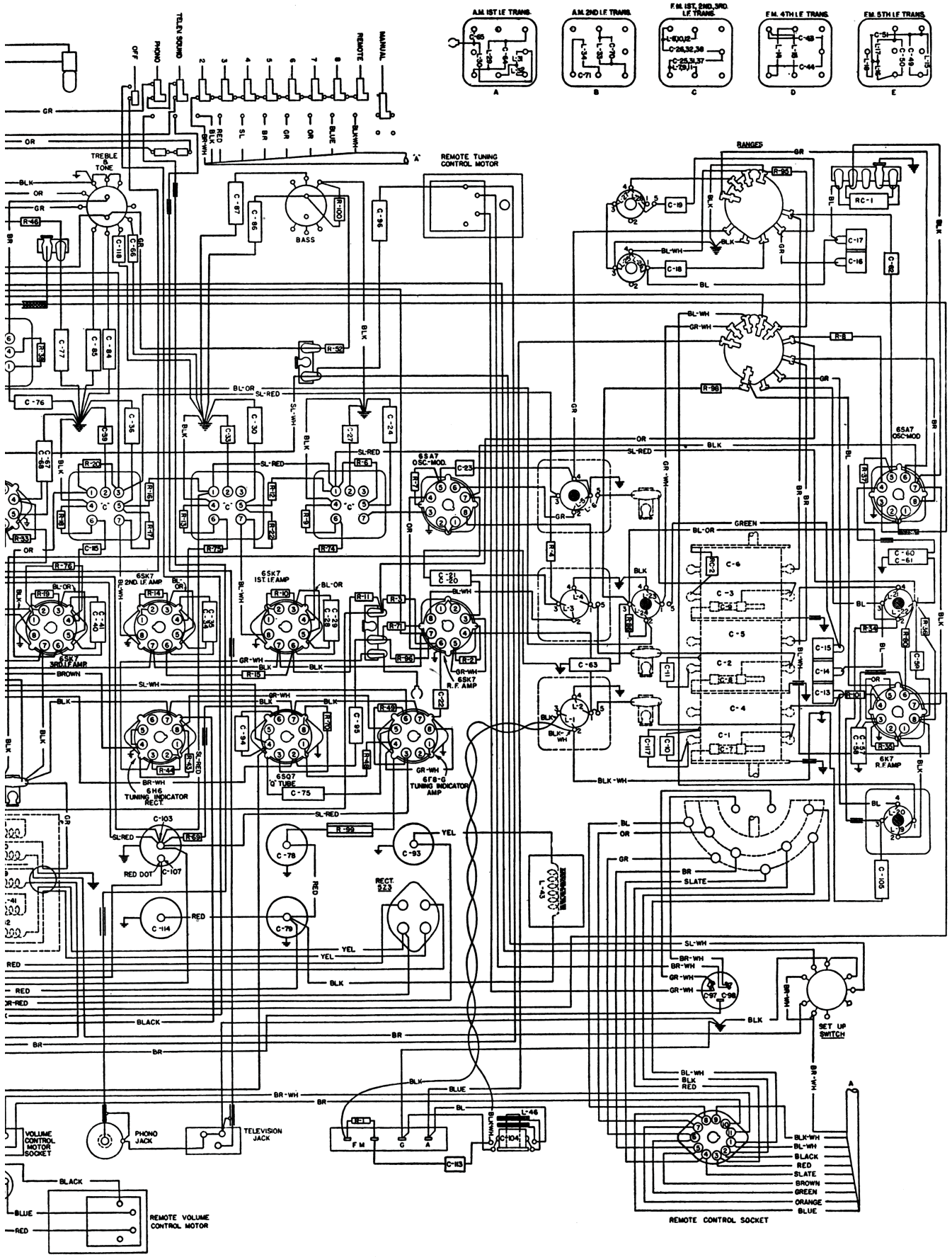
IMPORTANT: Do not go back and touch up any adjustments previously made. If the receiver is not in proper alignment after completing the adjustments outlined above, go back and start over again and follow the instructions through to the finish.



Schematic Diagram



Wiring Diagram



Wiring Diagram

ADJUSTING DIAL LAMP

The dial on this receiver is edge-lighted, and for proper illumination it is very important that the dial light be adjusted so that the filament is exactly opposite the edge of the glass.

To make this adjustment simply slide the pilot light socket back and forth on its mounting bracket until maximum illumination is obtained.

NORMAL VOLTAGE READINGS

Take all voltage readings with chassis operating and tuned manually to 1000 kilocycles or 43 megacycles—no signal.

The upper figures shown in the table are with the range switch set to the standard broadcast range and tuned to approximately 1000 kilocycles—no signal.

The lower figures shown in the table are with the range switch set to the frequency modulation position and tuned to approximately 43 megacycles—no signal.

Use a line voltage of 125 volts or make allowance for any slight variation.

Use a good high resistance voltmeter having a resistance of at least 1000 ohms per volt. Take all D. C. readings on the 500 volt scale except when an asterisk appears. Read from indicated terminals to chassis base. See location chart on Page 3 for position of terminals.

A. C. voltages are indicated by italics.

Tube	*Circuit*	*Range Switch Set To*	*Cap*	*TERMINALS OF SOCKETS* 1	2	3	4	5	6	7	8
		A. M.	—	0	0	+1*	—	+1*	+68	*6.5*	0
6SK7	R. F. Amp. (F. M.)	F. M.	—	0	0	+3*	—	+3*	+135	*6.5*	+265
		A. M.	—	0	0	+290	+70	—	0	*6.5*	0
6SA7	Mod. and Osc. (F. M.)	F. M.	—	0	0	+280	+120	—	0	*6.5*	0
		A. M.	—	0	0	+2*	—	+2*	+70	*6.5*	+290
6SK7	1st I. F. Amp. (F. M.)	F. M.	—	0	0	+4*	—	+4*	+110	*6.5*	+265
		A. M.	—	0	0	+2*	—	+2*	+55	*6.5*	+290
6SK7	2nd I. F. Amp. (F. M.)	F. M.	—	0	0	+3*	—	+3*	+90	*6.5*	+270
		A. M.	—	0	0	0	—	0	0	*6.5*	+285
6SK7	3rd I. F. Amp. (F. M.)	F. M.	—	0	0	+6*	—	+6*	+150	*6.5*	+260
		A. M.	—	0	0	0	—	0	+95	*6.5*	+95
6SJ7	Limiter (F. M.)	F. M.	—	0	0	0	—	0	+90	*6.5*	+95
		A. M.	—	0	0	—	—	—	—	*6.5*	0
6H6	Demod. (F. M.)	F. M.	—	0	0	—	—	—	—	*6.5*	0
		A. M.	—	0	0	+2*	—	—	+130	*6.5*	0
6SQ7	"Q" (F. M.)	F. M.	—	0	0	+2*	—	—	+120	*6.5*	0
		A. M.	—	0	0	—	—	—	—	*6.5*	—
6H6	Tun. Ind. Rect. (F. M.)	F. M.	—	0	0	—	—	—	—	*6.5*	—
		A. M.	0	0	0	+295	+11**	—	+200	*6.5*	+11**
6F8G	Tun. Ind. Amp. (F. M.)	F. M.	0	0	0	+275	+10**	—	+185	*6.5*	+10**
		A. M.	—	0	0	+2*	—	+2*	+90	*6.5*	+290
6SK7	R. F. Amp. (A. M.)	F. M.	—	0	0	+2*	—	+2*	+80	*6.5*	+275
		A. M.	—	0	0	+290	+70	—	0	*6.5*	0
6SA7	Mod. and Osc. (A. M.)	F. M.	—	0	0	+275	+135	—	+100	*6.5*	0
		A. M.	0	0	0	+285	+115	+4*	+290	*6.5*	+4*
6K7	I. F. Amp. (A. M.)	F. M.	0	0	0	+260	0	0	0	*6.5*	0
	Demod., A. V. C.,	A. M.	—	0	0	—	0	—	—	*6.5*	0
6H6	"Q" (A. M.)	F. M.	—	0	0	—	0	—	—	*6.5*	0
		A. M.	0	0	0	+90	0	0	—	*6.5*	+3*
6R7	Audio Amp.	F. M.	0	0	0	+85	0	0	—	*6.5*	+3*
		A. M.	0	0	0	+35	—	—	+35	*6.5*	0
6C8G	Audio Inv.	F. M.	0	0	0	+35	—	—	+35	*6.5*	0
		A. M.	—	0	0	+415	+290	—	—	*6.5*	+20**
6L6G	Output	F. M.	—	0	0	+410	+275	—	—	*6.5*	+20**
		A. M.	—	0	0	+415	+290	—	—	*6.5*	+20**
6L6G	Output	F. M.	—	0	0	+410	+275	—	—	*6.5*	+20**
		A. M.	—	+495	*480*	*480*	+495	—	—	*5*	—
5Z3	Rectifier	F. M.	—	+495	*480*	*480*	+495	—	—	*5*	—
		A. M.	—	—	0	+65	+90	+250	—	*6.5*	+95
6AF6G	Tun. Ind.	F. M.	—	—	0	+60	+185	+235	—	*6.5*	+90
		A. M.	—	+290	0	0	+495	+495	+486	+425	—
	Speaker Socket	F. M.	—	+275	0	0	+495	+495	+486	+420	—

*Read on lowest possible scale of voltmeter.
**Read on 100 volt scale of voltmeter.

CONTINUITY TEST

Remove all tubes and disconnect the receiver from the power supply before making continuity test.

Test speaker socket with speaker left out.

Leave speaker plug in socket for all other tests. (If a speaker is not available when checking continuity the speaker socket may be shorted by using two pieces of bus wire and shorting together terminals 1, 6 and 7 and terminals 4 and 5 of the speaker socket. (See location chart on Page 3 for position and numbering of terminals.) **Caution: Be sure to remove the two shorting wires when the continuity test is completed.**

Use a good meter capable of measuring up to several megohms.

The resistances given are often approximate owing to electrolytic capacitors in the circuit. When this is the case, be sure to reverse the test leads and read the highest resistance.

Read from indicated terminals to chassis base unless otherwise specified.

See location chart on Page 3 for position and numbering of terminals.

			TERMINALS OF SOCKETS							
Tube	*Circuit*	*Cap*	1	2	3	4	5	6	7	8
6SK7	R. F. Amp. (F. M.)	—	S	S	180¶	S	180¶	A	S	O
6SA7	Osc. and Mod. (F. M.)	—	S	S	6000¶	A	22000¶	S	S	S
6SK7	1st I. F. Amp. (F. M.)	—	S	S	330¶	390¶	330¶	B	S	6000¶
6SK7	2nd I. F. Amp. (F. M.)	—	S	S	330¶	390¶	330¶	C	S	6000¶
6SK7	3rd I. F. Amp. (F. M.)	—	S	S	390¶	470000¶	390¶	D	S	5000¶
6SJ7	Limiter (F. M.)	—	S	S	S	57000¶	S	1900¶	S	1900¶
6H6	Demod. (F. M.)	—	S	S	100000¶	200000¶	100000¶	1M	S	S
6SQ7	"Q" Tube (F. M.)	—	S	600000¶	2200¶	E	E	280000¶	S	S
6H6	Tun. Ind. Rect. (F. M.)	—	S	S	1M	2.4M	2.4M	O	S	1M
6F8G	Tun. Ind. Amp. (F. M.)	1M	S	S	5000¶	2000¶	1M	150000¶	S	2200¶
6SK7	R. F. Amp. (A. M.)	—	S	S	180¶	F	180¶	90000¶	S	5000¶
6SA7	Osc. and Mod. (A. M.)	—	S	S	6000¶	G	22000¶	H	S	I
6K7	I. F. Amp. (A. M.)	7¶	S	S	5000¶	J	470¶	K	S	470¶
6H6	Demod., A. V. C., "Q" (A. M.)	—	S	S	300000¶	S	900000¶	500000¶	S	S
6R7	Audio Amp.	1M	S	S	100000¶	S	S	1.5M	S	2200¶
6C8G	Audio Inv.	1M	S	S	350000¶	47¶	10M	350000¶	S	S
6L6	Output	—	S	S	5000¶	5000¶	150000¶	150000¶	S	200¶
6L6	Output	—	S	S	5000¶	5000¶	150000¶	150000¶	S	200¶
5Z3	Rectifier	—	5000¶	30¶	30¶	5000¶	—	—	—	—
6AF6G	Tun. Ind.	—	O	S	200000¶	L	4200¶	O	S	1900¶
—	Speaker Socket	—	5000¶	S	S	O	90000¶	90000¶	300000¶	—

Symbols used on chart are as follows: ¶—ohms; M—megohms; S—short; O—open.

A. Push in any "Pre-set Station" Button ---------- 18,000 Ohms
Push in "Phono" Button ---------- 300,000 Ohms
Push in "Television" Button ---------- 300,000 Ohms

B. Push in any "Pre-set Station" Button ---------- 20,000 Ohms
Push in "Phono" Button ---------- 400,000 Ohms
Push in "Television" Button ---------- 400,000 Ohms

C. Push in any "Pre-set Station" Button ---------- 30,000 Ohms
Push in "Phono" Button ---------- 400,000 Ohms
Push in "Television" Button ---------- 400,000 Ohms

D. Range switch in standard broadcast position ---------- "Open"
Range switch in short-wave position ---------- "Open"
Range Switch in frequency modulation position ---------- 38,000 Ohms

E. "Q" Switch "On"
Range switch in standard broadcast position ---------- "Open"
Range switch in short-wave position ---------- "Open"
Range Switch in frequency modulation position ---------- 1 Megohm

"Q" Switch "Off"

Range switch in standard broadcast, short-wave and frequency modulation positions ---------- "Short"
Set up switch in "Set up" position "Short"
Set up switch in "Operate" position ---------- 1 Megohm

F. Range switch in standard broadcast position ---------- 3 Megohms
Range switch in short-wave position ---------- 3 Megohms

	Range switch in frequency modulation position	550,000 Ohms
G.	Push in any "Pre-set Station" Button	20,000 Ohms
	Push in "Phono" Button	400,000 Ohms
	Push in "Television" Button	400,000 Ohms
H.	Range switch in standard broadcast position	"Short"
	Range switch in short-wave position	"Short"
	Range switch in frequency modulation position	"Open"
I.	Range switch in standard broadcast position	3.5 Megohms
	Range switch in short-wave position	3.5 Megohms
	Range switch in frequency modulation position	"Open"
J.	Range switch in standard broadcast position	100,000 Ohms
	Range switch in short-wave position	100,000 Ohms
	Range switch in frequency modulation position	"Open"
K.	Range switch in standard broadcast position	5,000 Ohms
	Range switch in short-wave position	5,000 Ohms
	Range switch in frequency modulation position	"Open"
L.	Range switch in standard broadcast position	900,000 Ohms
	Range switch in short-wave position	900,000 Ohms
	Range switch in frequency modulation position	1.5 Megohms

Other tests not shown on chart—

Phono jack to chassis base	
Push in "Phono" button	1 Megohm
Push in any "Pre-set" Station button	"Open"
Television jack to chassis base	
Terminal No. 1 (this is the terminal located nearest to the bottom of the chassis) Push in "Television" button	1 Megohm
Terminal Nos. 2 and 3	"Short"
Amplitude Modulation Antenna Terminal to chassis base	"Short"
Amplitude Modulation Ground Terminal to chassis base	"Short"
Frequency Modulation Terminals to chassis base	"Open"
Between Frequency Modulation Terminals	1,000 Ohms
Terminals of A. C. Plug to chassis base	"Open"
Between terminals of A. C. Plug—	
Push in "Off" button	"Open"
Push in any other button	1.5 Ohms

INSTRUCTIONS FOR SETTING UP PUSH BUTTONS

IMPORTANT: The stations selected should be local or favorite stations which give good reception at all times. Frequency Modulated Stations, as well as Amplitude Modulation Stations, may be set up on the push buttons by simply using the appropriate button determined by the position of the Frequency Modulated Station on the dial.

Set up stations in the daytime to avoid unnecessary interference.

Allow the set to run for about twenty minutes before setting up stations.

Always use the tuning indicator unit when setting up stations in order to determine when the station is exactly in tune.

Seven stations may be set up for push buttons located on the front of the receiver and eight stations may be set up on the remote control unit. The same seven stations which were set up for the buttons on the front of the receiver must also be used on the remote control unit and the eighth station which is chosen for the remote control unit must be of a lower frequency than any of the other stations which have been set up.

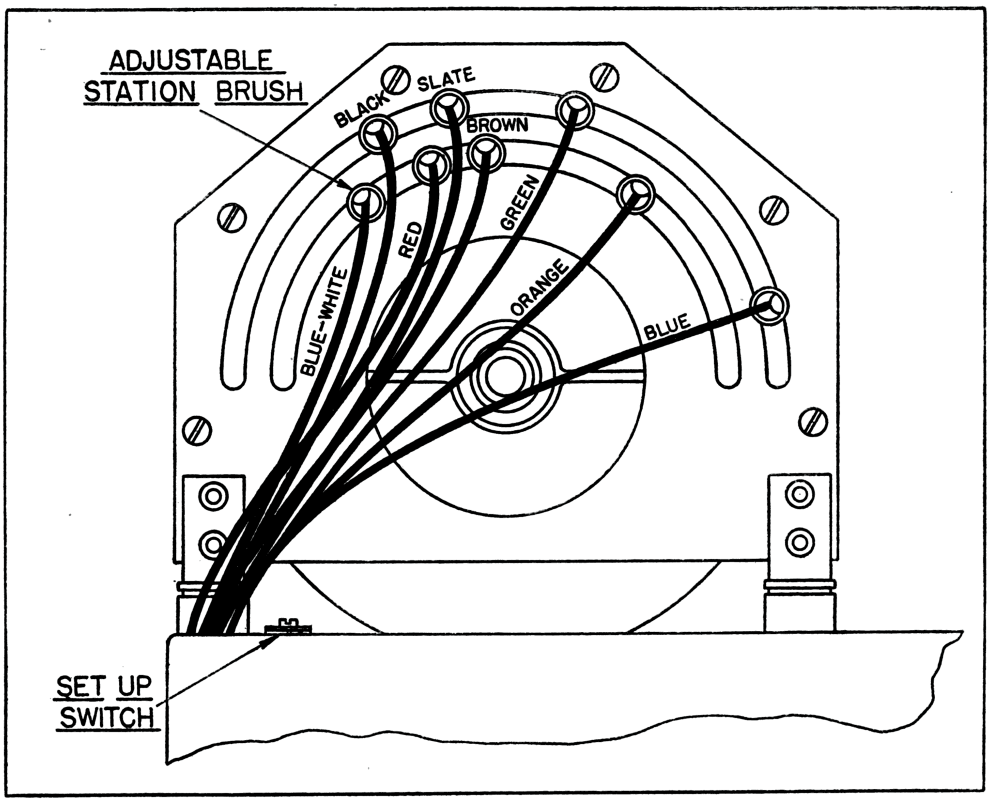
1. Put the call letters of the selected stations in place above the push buttons. **The stations should be arranged according to frequency with the highest frequency at the right and the lowest frequency at the left, just as on the dial.** (The call letters will be found inside the envelope stapled inside or underneath the cabinet).
2. Remove the metal escutcheon and transparent strip from the remote control unit. Put the station call letters in place so that the station having the highest frequency is nearest to the volume control buttons and then in successive order according to frequency. Replace the metal escutcheon, transparent strip and three screws. (The call letters for the remote control unit are included in the P-31424 Remote Control Package Assembly.)
3. Set the "Treble" control in normal position.
4. Turn the set-up switch (located on the base just back of the brush and commutator assembly) to the set-up position. (The slot in the screw should point toward "set-up").
5. Push the button of the highest frequency station to be set up (button No. 3) and then tune in that station manually. **Be sure the station is exactly "in tune" by tuning carefully and watching the cathode ray indicator.**
6. Slide the brush to which the blue wire is connected until it is over the slot in the commutator. Then

Push Button No.	Purpose	Color of wire on brush
1	Manual	—
2	Remote	—
3	Highest frequency station	Blue
4	Next lower frequency station	Orange
5	Next lower frequency station	Green
6	Next lower frequency station	Brown
7	Next lower frequency station	Slate
8	Next lower frequency station	Red
9	Lowest frequency station on receiver	Black
10	Telev. button on receiver Lowest frequency button on remote control unit	Blue White
11	Phonograph	
12	Off	

See diagram of adjustable brushes and set-up switch on Page 10.

adjust it very carefully until the pilot light goes out. This indicates exact adjustment.

7. Repeat operations 4 and 5 for each station. Work from right to left or from the higher to the lower frequencies in accordance with the table below:
8. Turn the set-up switch back to the "Operate" position.
9. Check the operation of all the push buttons to be sure that each has been accurately set up. If it is necessary to readjust any of the buttons, follow the procedure given above.



Adjustable Station Brushes and Set Up Switch

REPLACEMENT PARTS

Capacitors

Piece No.	Circuit Designation	Part
24402	C-85, 87, 88, 90 92, 106	.1 mf. Capacitor
24405	C-12, 63, 74, 75, 85, 86, 105	.04 mf. Capacitor
24541	C-117	.5 mf.
24994	C-69, 76, 94, 96	.05 mf. Capacitor
25150	C-84	.02 mf. Capacitor
25389	C-77	.2 mf. Capacitor
25487	C-55	.001 mf. Capacitor
26512	C-72, 73	2—100 mmf. Capacitor
27108	C-20, 21, 28, 29, 34, 35, 40, 41	2—.05 mf. Capacitor
27305	C-23, 62, 112	50 mmf. Capacitor
27538	C-19	.005 mf. Capacitor
28568	C-52, 53, 115	100 mmf. Capacitor
27577	C-10	15 mmf. Capacitor
28841	C-27, 33, 39, 45	1500 mmf. Capacitor
29269	C-109	.003 mf. Capacitor
29283	C-11	15 mmf. Capacitor
29286	C-59	300 mmf. Capacitor
29371	C-22, 32	2—500 mmf.Capacitor
29373	C-83, 113	400 mmf. Capacitor
29973	C-80	.25 mf. Capacitor
30322	C-24, 30, 36, 42, 46, 54, 66, 89, 91	.005 mf. Capacitor
31330	C-18	470 mmf. Capacitor
27143	C-13, 14, 15	Aligning Capacitor (3 unit)
30503	C-16, 17	Aligning Capacitor (2 unit)
31374	C-81	Aligning Capacitor (1 unit)
30311	C-7, 8, 9	Aligning Capacitor (air trimmer)
31207	C-1, 2, 3, 4, 5, 6	Variable Capacitor
30539	C-97, 98	Electrolytic Capacitor, 2—20 mfs., 110 V. (A. C.)
31335	C-99, 100, 101, 102	Electrolytic Capacitor, 2—15 mfs., 200 V.; 1—20 mf., 25 V.; 1—40 mf., 25 V.
31405	C-78, 79, 93 114	Electrolytic Capacitor, 1—8 mf., 500 V.
31406	C-108	Electrolytic Capacitor, 1—16 mf., 300 V.
31495	C-103, 107	Electrolytic Capacitor, 1—16 mf., 300 V.; 1—8 mf., 450 V.

Coils, Transformers and Speakers

Piece No.	Circuit Designation	Part
30942	L-25, 26	Oscillator Coil (Broadcast)
31046	L-23, 24	Antenna Coil (Short Wave)
31187	L-27, 28	Oscillator Coil (Short Wave)
31188	L-1, 2	Antenna Coil (Freq. Mod.)
31189	L-3, 4	R. F. Coil (Freq. Mod.)
31190	L-5, 6	Oscillator Coil (Freq. Mod.)
31461	L-19, 20, 21, 22	R. F. and Antenna Coils (Broadcast)
31194	L-29, 30, 31, 32, C-64, 65	1st I. F. Transformer (Amp. Mod.)
31195	L-33, 34, C70, 71	2nd I. F. Transformer (Amp. Mod.)
31196	(L7, 8, C-25, 26) (L-9, 10, C-31, 32) (L-11, 12, C-37, 38)	1st I. F., 2nd I. F. and 3rd I. F. Transformers (Freq. Mod.)
31197	L-13, 14, C-43, 44	4th I. F. Transformer (Freq. Mod.)
31198	L-15, 16, 17, 18, C-49, 50	Discriminator I. F. Transformer (Freq. Mod.)
30124	L-46	Wave Trap
26704	L-43	Filter Choke
31348	L-47	Cut-Off Filter
31205	L-35, 36, 37	Output Transformer
31181	L-38, 39, 40, 41, 42	Power Transformer 50/60 Cycles
31182	L-38, 39, 40, 41, 42	Power Transformer 25/60 Cycles
31087		Speaker (Bass)
31126		Speaker (Treble)
31127		Field Coil (Treble Speaker)
31145		Field Coil (Bass Speaker)
24780		Cone (Bass Speaker)
31131		Cone (Treble Speaker)

Controls and Knobs

27313		Fidelity Switch
28824		"Q" Switch
29280		Bass Switch
30249	R-47	Volume Control
30327		Set-up Switch
31180		Off Switch and P. B. Assembly
31183		Range Switch
31184		Audio Switch
27800		Plain Knob
27801		Knob with Arrow
27628		Felt Washer for Knob

Resistors

26309	R-95	10 Ohm Resistor
26317	R-60	47 Ohm Resistor
26322	R-98, 101	120 Ohm Resistor
26324	R-2, 35	180 Ohm Resistor
26327	R-10, 14	330 Ohm Resistor
26328	R-19, 74, 75	390 Ohm Resistor
26329	R-39	470 Ohm Resistor
26333	R-1, 3, 4, 6, 12, 15, 16, 38, 81, 83 84	1000 Ohm Resistor
26337	R-8, 48, 50, 70	2200 Ohm Resistor
26338	R-46	2700 Ohm Resistor
26340	R-11, 71	2900 Ohm Resistor
26343	R-52	6800 Ohm Resistor
26345	R-5, 77, 94	10,000 Ohm Resistor
26346	R-67	12,000 Ohm Resistor
26349	R-7, 37, 96	22,000 Ohm Resistor
26350	R-42	27,000 Ohm Resistor
26353	R-9, 13, 18, 24, 31, 36, 100	47,000 Ohm Resistor
26355	R-31	68,000 Ohm Resistor
26356	R-79	82,000 Ohm Resistor
26357	R-17, 21, 22, 28, 29, 33, 34, 64, 80, 85, 86	.1 Megohm Resistor
26359	R-49	.15 Megohm Resistor
26362	R-41, 54, 62, 63, 69, 92, 93	.27 Megohm Resistor
26365	R-76	.47 Megohm Resistor
26367	R-55	.68 Megohm Resistor
26369	R-30, 43, 44, 45	1 Megohm Resistor
26373	R-32, 40	2.2 Megohm Resistor
26381	R-53, 61	10 Megohm Resistor
27125	R-72, 73	25,000 Ohm Resistor, 1 Watt
28956	R-68	200 Ohm Resistor, I. R. C.
29090	R-59, 65	47 Megohm Resistor
31138	R-20	33,000 Ohm Resistor
31215	R-66	470 Ohm Resistor
31378	R-56, 57, 58	"B" Voltage Divider
31523	R-99	100,000 Ohm Resistor, 1 Watt

Miscellaneous

SD-67		Dial Drive Cord
SD-75		Screw for Mounting P. B. Escutcheon
690		Speed Nut for Brush Holder
16220		Screw for Mounting Brush Terminal
25156		3 Amp. Fuse
26287		Pilot Lamp
26678		3-Prong Socket
27958		Fuse Holder
28652		Power Supply Cord
29162		Spring for Brushes
29166		"C" Washer for Mounting Brush Holders
29235		Pulley for Volume Control Drive
29627		Spring for Volume Control Drive Cord
29628		Spring for Dial Drive Cord
29786		Pilot Lamp Socket
30151		8-Prong Socket
30152		7-Prong Socket
30153		4-Prong Socket
30169		Station Call Letters
30172		Dial Escutcheon
30176		P. B. Escutcheon
30224		Phono Plug
30225		Guard for Phono Jack
30226		Phono Jack
30265		Pulley for Tuning Unit
30269		Rubber Corner Mounting for Dial Glass
30275		Cord for Dial Pointer
30276		Dial Pointer
30286		Commutator Assembly
30292	R-C1	Compensator
30295		Brush Holder
30296		Shouldered Washer for Brush Holder
30297		Brush (Outside Slot)
30298		Terminal Used on Brush
30341		Screw for Mounting Dial Escutcheon
30385		Brush (Inside Slot)
31146		Motor for Tuning Unit, 50/60 Cycles
31147		Motor for Tuning Unit, 25 Cycles
31185		Shield Assembly for Freq. Mod. Coils
31209		Motor for Volume Control, 50/60 Cycles
31211		Arm Assembly
31216		Tuning Indicator Cable
31219		Speaker Dividing Network
31223		11-Prong Socket
31326		Cable—Push Button Unit to Plug
31331		Antenna and Ground Terminal Strip
31340		Dial
31377	RC-2	Compensator
31379		Motor for Volume Control, 25 Cycle
31418		Drive Shaft for Volume Control Motor
31424		Remote Control Unit

Tools and Accessories

24608		Aligning Tool
28601		Cabinet Polish
26962		Furniture Touch-Up Kit
28303		Headphone Package Assembly