

MONITOR AMP



Type BA-4A
Monitoring and Recording
Amplifier

(MI-71223)

RADIO CORPORATION OF AMERICA
RCA VICTOR DIVISION **CAMDEN, N. J.**

BROADCAST EQUIPMENT

INSTRUCTIONS

Type BA-4A
Monitoring and Recording
Amplifier

(MI-11223)

RADIO CORPORATION OF AMERICA
RCA VICTOR DIVISION **CAMDEN, N. J.**

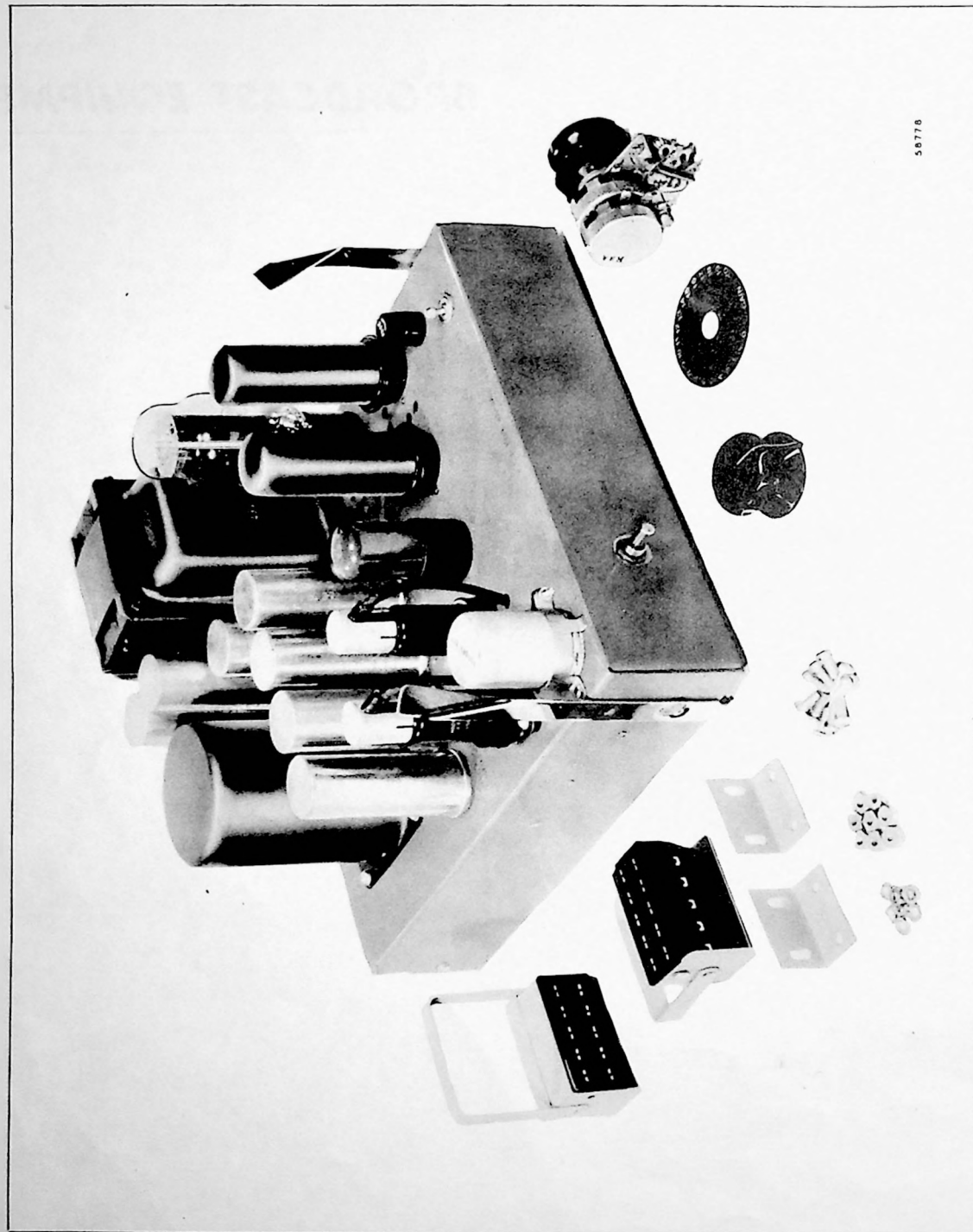


Figure 1—Type BA-4A Amplifier (front view)

TECHNICAL DATA

1

FOUR-STAGE HIGH-GAIN OPERATION

Power Supply

105 to 125 volts a-c
105 watts
50 to 60 cycles

Fuse Rating

2 amperes

Tubes

2 RCA-1620 or 2 RCA-6J7**
1 RCA-6SN7
2 RCA-1622 or 2 RCA-6L6**
1 RCA-5R4GY

Source Impedance

250 or 30 ohm source

Maximum Input Level

-27 db*

Output Impedance

600 ohms balanced
250, 15, 7½, and 5 ohms unbalanced

Physical Dimensions

Width	10¾ inches
Depth	14 inches
Height	7½ inches
Weight	21¼ pounds

Power Output

12 watts
+40.8 db with total rms distortion of less than 3%
from 50 cps to 7,500 cps.

Gain

With volume control at maximum position:

- (a) 105 ±2 db when operating from a 250-ohm source into a 15- or 600-ohm load.
- (b) 73 ±2 db when operating with bridging volume control from a 600-ohm terminated line into a 15- or 600-ohm load.

Noise Level

Total noise level measured with a 250 ohm resistor across the input terminals:

- (a) -20 db* with volume control in maximum position.
- (b) -40 db* with volume control in minimum position.

Frequency Response

±2 db from 30 cycles to 15,000 cycles operating from a 250-ohm source into a 15-ohm load.

Mounting

Rack mounting on Type BR-2A or 36-B shelves.

THREE-STAGE REDUCED-GAIN OPERATION

Tubes

1 RCA-1620 or 1 RCA-6J7**
1 RCA-6SN7
2 RCA-1622 or 2 RCA-6L6**
1 RCA-5U4G

Maximum Input Level

-24 db*

Power Output

Unchanged

Frequency Response

Unchanged

Gain

With volume control at maximum position:

- (a) 71 db when operating from a 250-ohm source into a 15-ohm load.
- (b) 36 db when operating with bridging input into a 15-ohm load.

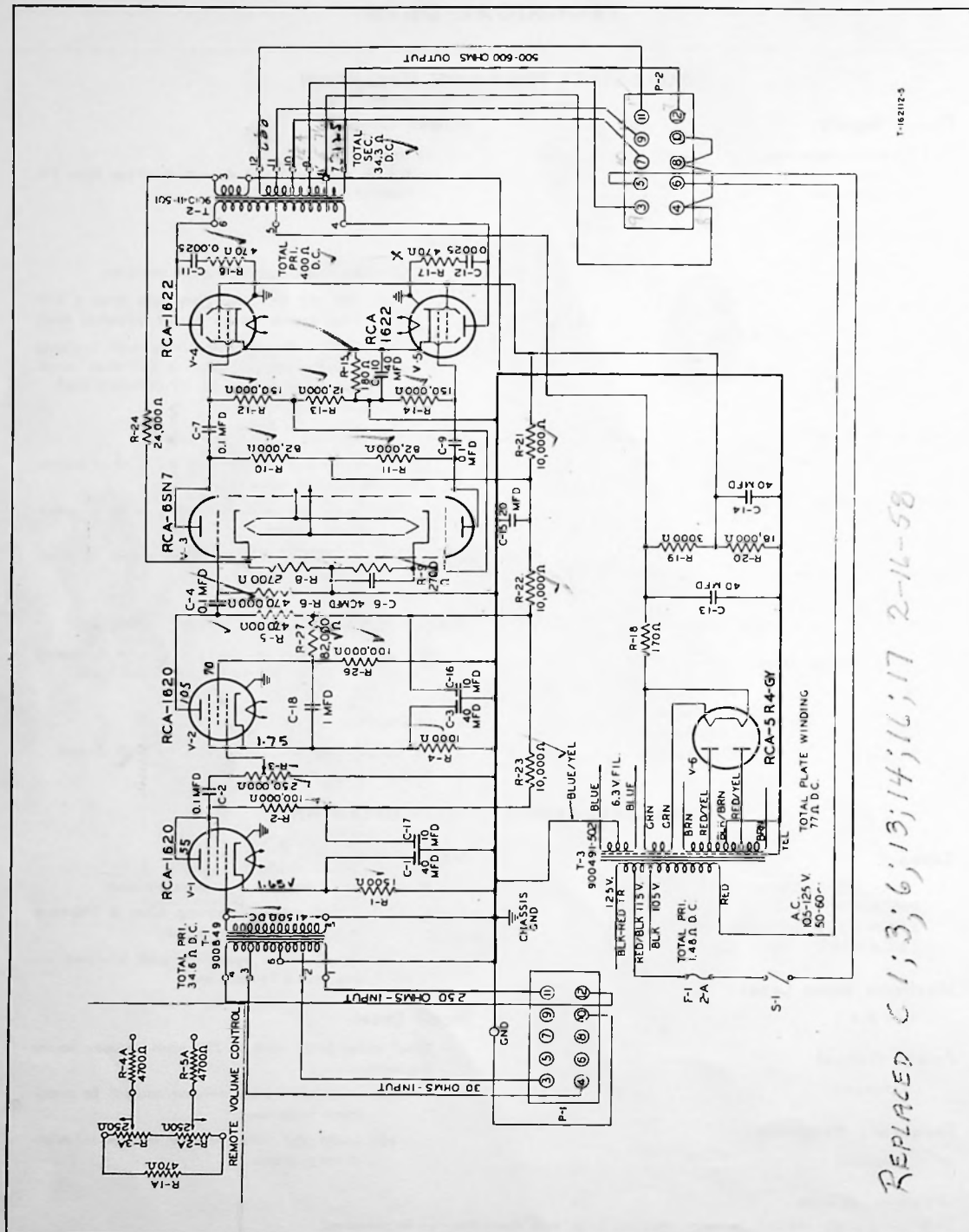
Noise Level

Total noise level with a 250 ohm resistor across the input:

- (a) -40 db* with volume control in maximum position.
- (b) -60 db* with volume control in minimum position.

* 0 db = .001 watt.

** When a slight increase in microphonics, hum, and distortion can be tolerated.



T-162112-5

DESCRIPTION

The Type BA-4A Monitoring Amplifier has been designed primarily for monitoring and recording although, in an emergency, it may be used in the program channel of a transmitter.

It is a four stage, resistance-capacitance coupled amplifier with the output stage connected in push-pull. It is built on a plug-in type chassis and plug-in type electrolytic capacitors are used to facilitate testing and servicing. The power supply is self contained and all connections are made through the plugs at the rear of the chassis.

CIRCUIT

The input transformer is tapped for a source impedance of 250 or 30 ohms balanced to ground. An RCA-1620 tube connected as a triode is used in the first stage and an RCA-1620 tube connected as a pentode in the second stage. A potentiometer in the grid circuit of the second tube provides volume control within the unit.

The third stage is an RCA-6SN7 dual-triode connected as a phase inverter to drive the output tubes. Inverse feedback voltage (which is obtained from a tertiary winding on the output transformer) is introduced at the cathode of the first half of this stage.

Two RCA-1622 beam-power output tubes, connected in push-pull, are used in the output stage. The output transformer is tapped to provide a balanced output of 600 ohms and unbalanced outputs of 250, 15, 7.5, and 5 ohms.

Power for plates and screens is obtained from an RCA-5R4GY rectifier tube used in conjunction with a power transformer and a resistance-capacitance type filter. Filament voltage is also obtained from the power transformer which is tapped for line voltages of 105, 115, and 125 volts.

INSTALLATION

Mounting

Before putting the amplifier in use, the parts must be assembled according to the type of shelf on which it is to be mounted. Accessories necessary for mounting on both the BR-2A Shelf Assembly (MI-11598 and MI-11599) and the 36-B Shelf Assembly (MI-4682-A) are supplied with the amplifier.

The plug-in capacitors and tubes must be seated in their sockets which are stenciled to correspond

with the markings on their respective tubes or capacitors. Place the grid leads on the two RCA-1620 tubes and fit the grid shield caps over them.

Instructions for mounting the remote gain control are on page 9.

Mounting on Type BR-2A Shelf Assembly

When the amplifier is mounted on the Type BR-2A Shelf Assembly, the "L" shaped mounting brackets and plug cover assemblies are not used.

Attach the ejector handles into the holes on the side of the chassis using the pivots, hex nuts, and "c" washers supplied with the amplifier.

Assemble the sockets to two of the plug-mounting brackets and attach them to the shelf using holes that will locate them in the proper position with respect to the plugs on the amplifier. Attach a guide strip to the shelf on each side of the space which is to receive the amplifier. The brackets and guide strips, with screws and lockwashers to mount them, are supplied with the shelf. Use the 8-32 screws and lockwashers for the brackets, the number 4 self-tapping screws for the guide strips and 6-32 fillister head screws to mount the sockets.

To install the amplifier, slide it back on the shelf until the plugs engage the sockets and push back on the ejector handles to obtain a snug fit. To remove the amplifier, pull forward on the handles and slide it out.

The GAIN dial must be mounted on the panel, using the bushing, hex nut, and washer supplied with the amplifier. Assemble the parts with the head of the bushing on the inside to insure clearance. The gain control knob may be attached to the shaft after the panel is in place.

Mounting on Type 36-B Shelf Assembly

When the amplifier is to be used with the Type 36-B Shelf Assembly, assemble the capacitors, etc., as described under *Mounting*.

Mount the GAIN dial on the panel, using the bushing, hex nut, and washer supplied. Assemble the parts with the head of the bushing on the outside of the panel.

Attach the two "L" shaped brackets to the back of the amplifier chassis and fasten it to the shelf using the machine screws, lockwashers, and hex nuts supplied with the amplifier. Holes are already drilled in the shelf and the two holes on the bottom, at the front of the amplifier chassis, are tapped to receive the machine screws.

To prevent damage to wiring, attach the plug-socket covers to the sockets. This provides a handle

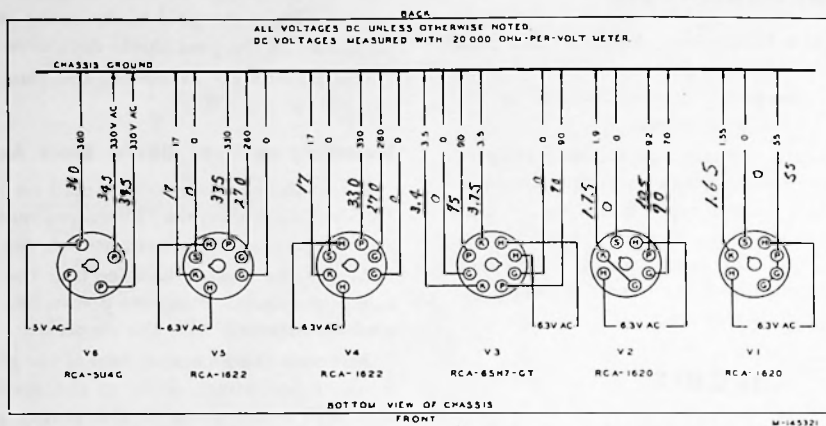


Figure 3—Tube Voltage Chart

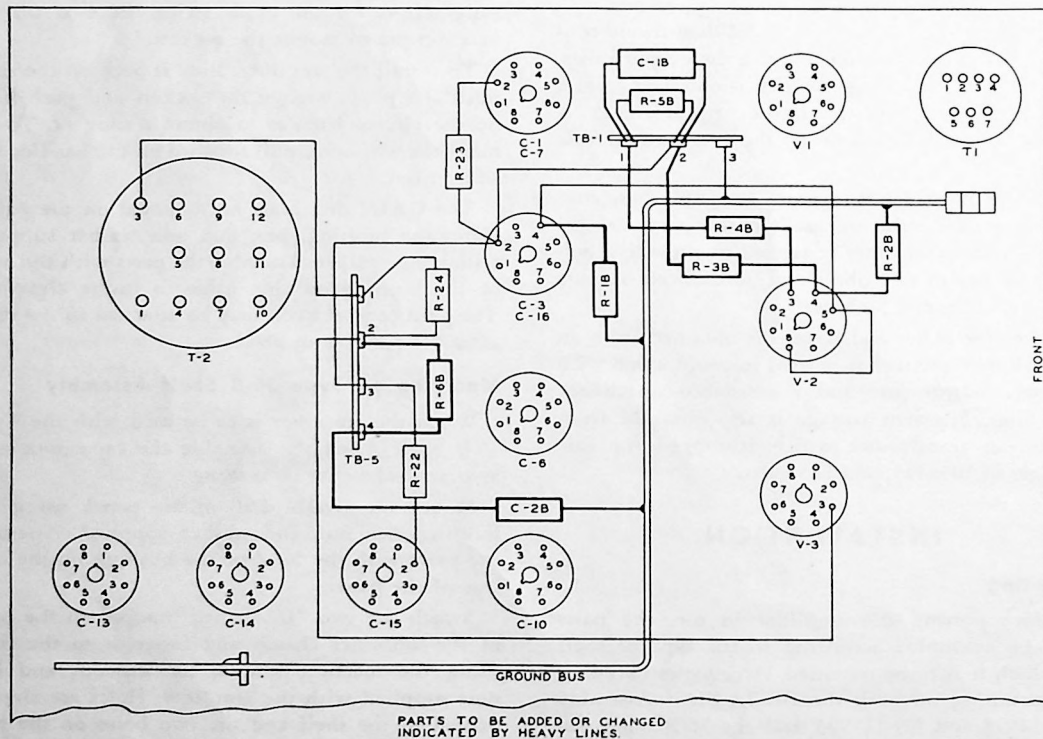


Figure 4—Partial Wiring Diagram for Compensation

to use when separating the sockets from the plugs. Use the binder-head screws supplied with the amplifier to attach them.

CONNECTIONS

All connections are made to the sockets which mate with the plugs on the amplifier chassis.

Two sockets are supplied with the amplifier each having 10 solder-type terminals which are numbered to correspond with the numbering of the plugs on the amplifier. Connections are made by soldering to these terminals.

Audio Input Connections

All audio input leads should be shielded cable or a shielded, twisted pair. They should be insulated for 200 volts and need not be larger than No. 19 AWG. To prevent undesirable pickup, the leads should not run adjacent to a-c, loudspeaker field supply, or high level audio leads.

When working from a 250-ohm source connect to terminals 11 and 12 on the plug P-1. Use terminals 3 and 4 when working from a 30 ohm source.

If the input to the amplifier is from a device which has one side grounded (such as some phonograph pickups) it will be necessary to remove the ground connection from the center tap of the amplifier input transformer primary. In this case the lead to terminal number 6 on T-1 should be disconnected and, if a ground is desired on one side of the circuit, moved to terminal number 1.

When the amplifier is used to bridge a 600- or 250-ohm line, it will be necessary to use the MI-11274-A Remote Volume control unit which is furnished with the amplifier. Instructions are on page 9.

Audio Output Connections

The secondary of the output transformer is center tapped with the center tap connected to ground. The secondary has a number of taps which are brought out to the plug P-2. The following table gives the connections for various load impedances:

AMPLIFIER OUTPUT CONNECTIONS

Load Impedance	Plug Terminal Connections
600 ohms balanced	11 and 12
15 ohms unbalanced	9 and 10
7½ ohms unbalanced	7 and 8
5 ohms unbalanced	4 and 3

55 ω
2.65 ω
125 ω

9-11
3-9
10-12

Output connections are made by soldering to the indicated terminals on the amplifier output socket.

A-C Power Connections

The a-c power connections are made to terminals 5 and 6 on the amplifier output plug P-2. The power transformer is connected for a line voltage of 115 volts. If the line voltage is normally 120 volts or higher, disconnect the 115 volt tap (red and black) and connect the 125 volt tap (black with red tracer) in its place. If the line voltage is 110 volts or lower, the 105 volt tap (black) should be connected.

Operating Voltages

Fig. 3 shows the a-c and d-c voltage readings for a typical BA-4A Amplifier operating under normal conditions with a line voltage of 115 volts. The readings were taken with a d-c 20,000 ohms-per-volt voltmeter unless otherwise stated.

FREQUENCY COMPENSATION

Circuit Modifications

In certain applications it may be desirable to provide additional gain at either the high-frequency or the low-frequency end of the audio range. This may be accomplished by the installation of resistance-capacitance networks for which a kit of parts is supplied with the amplifier.

To Increase High-Frequency Gain

To increase the gain in the high-frequency region, proceed as follows:

a. Connect resistor R-6B (1,000 ohms) across terminal 2 and terminal 4 on terminal board TB-5 as shown in figure 4. *done*

b. Connect capacitor C-2B (0.005 mfd) between terminal 4 on terminal board TB-5 and the ground bus. *done*

These operations connect resistor R-6B and capacitor C-2B in series from the cathode of the driver stage tube to ground. (See figure 9.) The portion of the amplifier frequency response curve from 1,000 cycles to 15,000 cycles will now be as shown in figure 7 and the portion from 30 cycles to 1,000 cycles will remain substantially flat.

To Increase Low-Frequency Gain

To increase the gain in the low-frequency region, refer to figure 4 and make the following changes:

a. Remove resistor R-5 and connect resistor R-4B

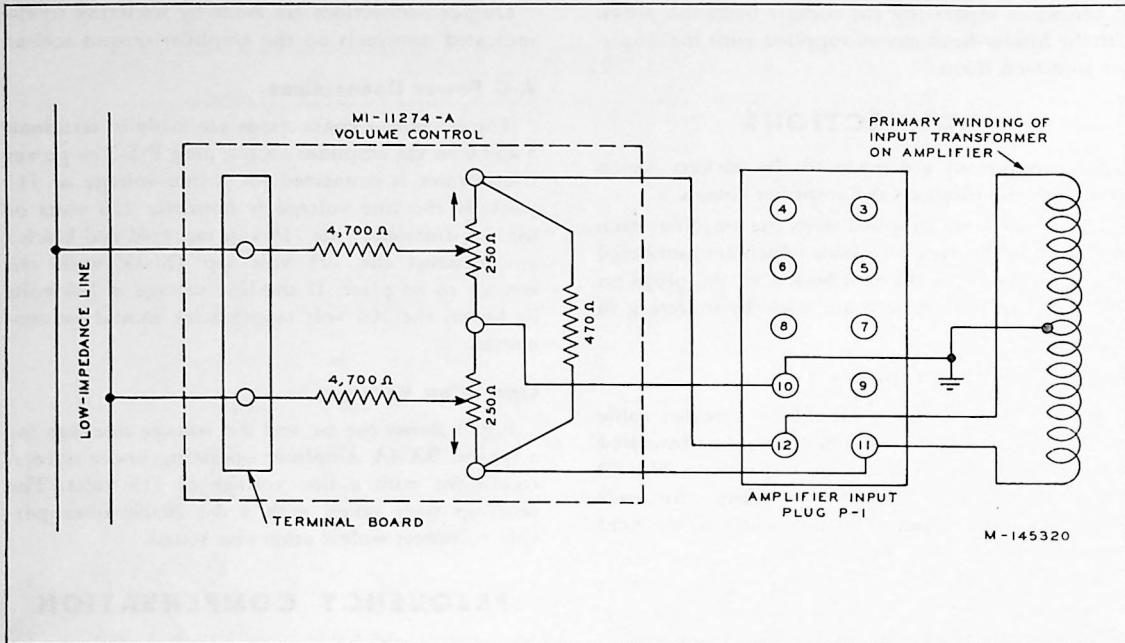


Figure 5—Remote Volume Control (schematic diagram)

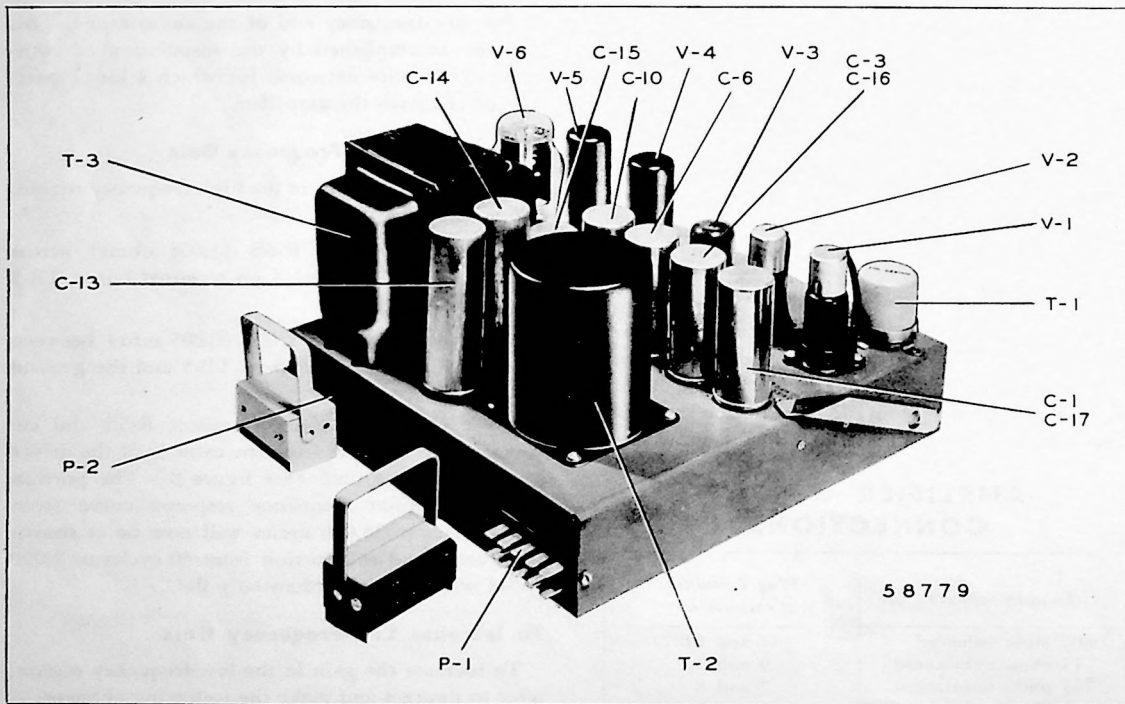


Figure 6—Type BA-4A Amplifier (rear view)

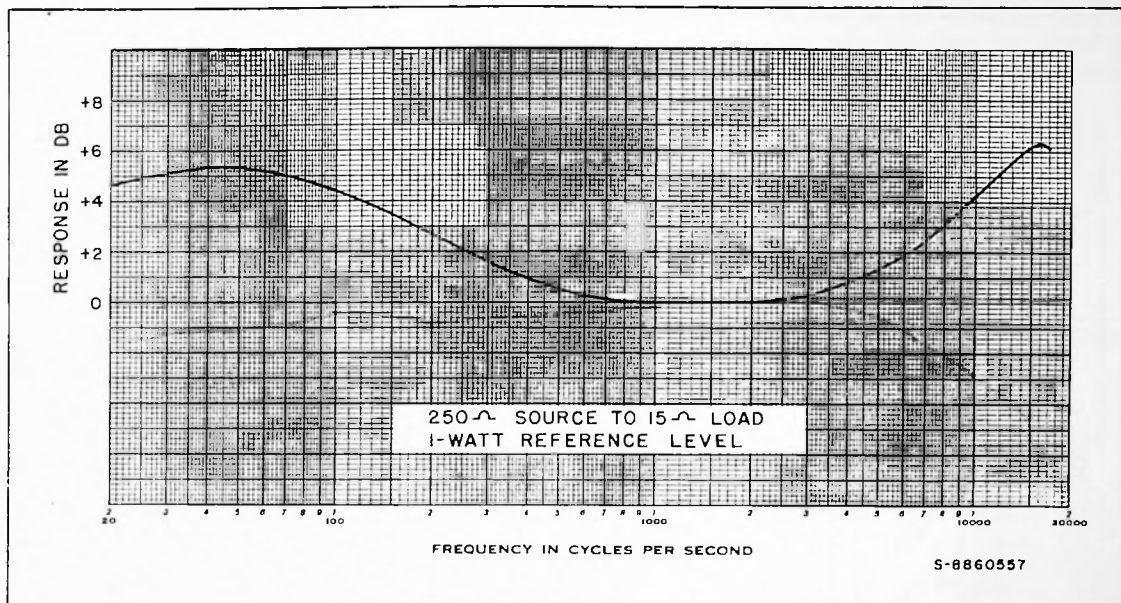


Figure 7—Frequency Response with Compensation

(56,000 ohms) from terminal 3 of tube V-2 to terminal 1 on terminal board TB-1. (Terminal 1 was formerly blank.)

NOTE: Terminal board TB-1 stands vertically on the chassis but is shown in the horizontal position in figure 4 for the sake of clarity. Terminal 1 is at the top, terminal 2 in the middle, and terminal 3 at the bottom.

b. Remove resistor R-27 and replace it with resistor R-3B (150,000 ohms) connecting it from terminal 4 on tube V-2 to terminal 2 on terminal board TB-1.

c. Connect capacitor C-1B (.015 mfd) and resistor R-5B (82,000 ohms) in parallel across terminals 1 and 2 on terminal board TB-1.

d. Remove resistor R-26 and replace it with resistor R-2B (56,000 ohms) connecting it from terminal 4 on tube V-2 to the ground bus.

e. Remove resistor R-4 and replace it with resistor R-1B (750 ohms) connecting it from terminal 4 on capacitor C-16 to the ground bus.

When these changes have been made, the portion of the frequency response curve between 20 cycles and 1,000 cycles will be as shown in figure 7 and the portion from 1,000 cycles to 15,000 cycles will remain substantially flat.

These changes will alter the operating voltages of the second stage RCA-1620 tube approximately as follows:

Pin P to ground (E_p) 50 volts
 Pin G to ground (E_g) 42 volts
 Pin K to ground (E_k) 1 volt

Refer to figure 3. Use a 20,000 ohms-per-volt voltmeter to check voltages.

NOTE: It is important to remember that when the power output level at 60 cycles is 12 watts, the power output level between 1,000 cycles and 15,000 cycles is only 3.8 watts. This means that when the alterations outlined above have been made, the effective power output rating of the amplifier (except for some of the very low frequencies) actually has been reduced to 3.8 watts.

Both the high-frequency and low-frequency gain may be increased in the same amplifier resulting in a frequency response curve as shown in figure 7.

OVERALL GAIN REDUCTION

For special applications it may be desirable to operate the BA-4A Amplifier at a lower gain. This may be done by disconnecting the second stage of the amplifier as follows:

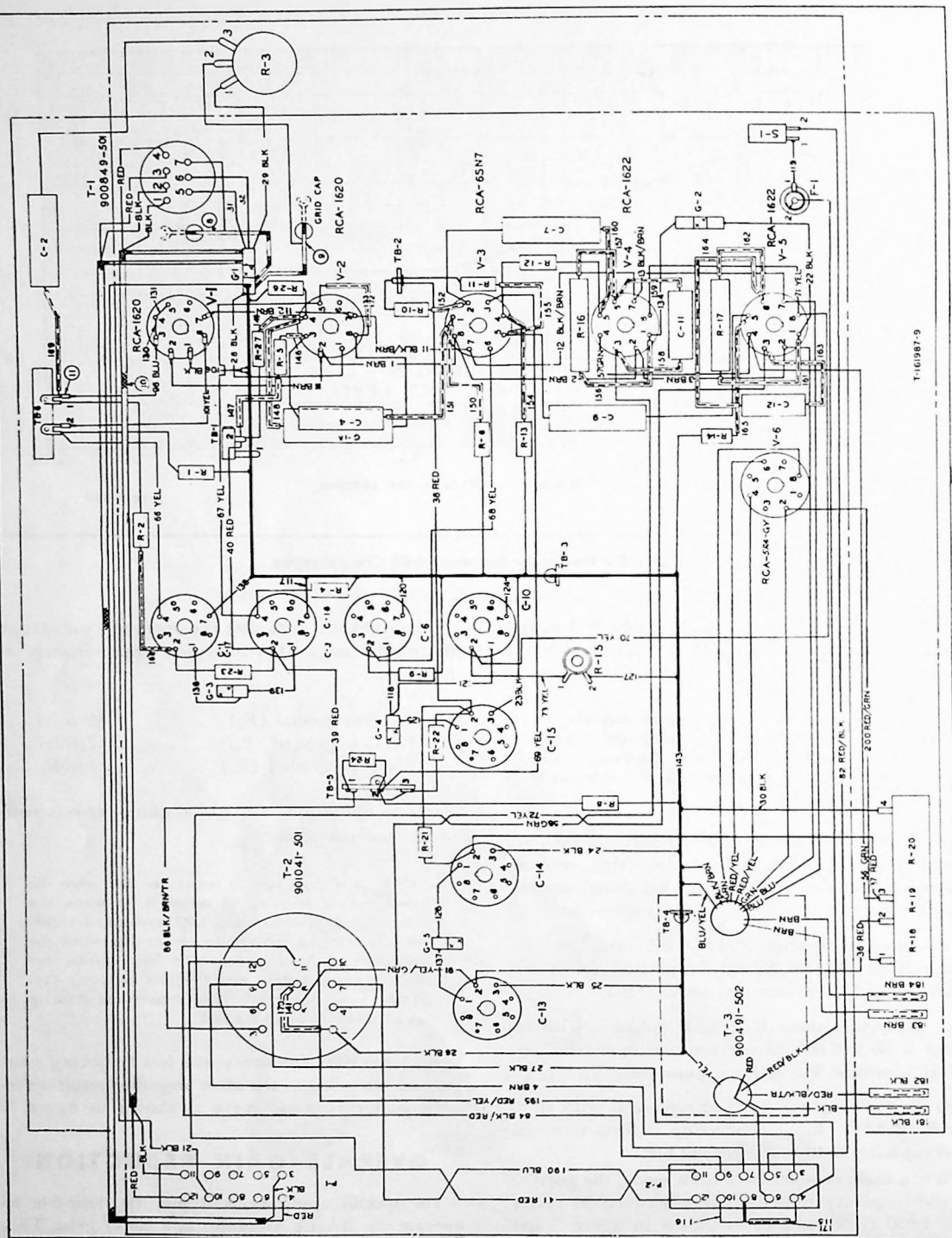


Figure 8—Type BA-4A Amplifier (wiring diagram)

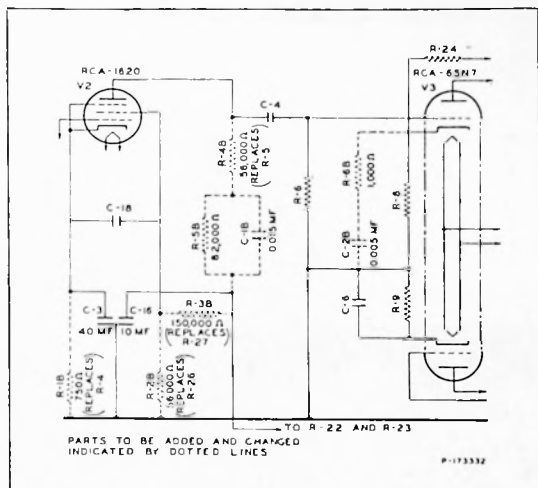


Figure 9—Partial Schematic Diagram for Compensation

a. Remove the grid lead from the grid cap of the second stage RCA-1620 tube (V-2) and remove the tube from its socket.

b. Tape the clip on the end of the grid lead to prevent a short circuit.

c. Disconnect capacitor C-4 from terminal number 1 on the third-stage RCA-1620 tube (V-3) by unsoldering the capacitor lead at the tube socket.

d. Connect a suitable length of wire from terminal number 2 on the variable resistor R-3 to terminal number 1 on the third-stage RCA-6SN7 tube.

These operations disconnect the second stage of the amplifier and connect the output of the first stage to the grid of the third stage. The unit will now operate as a three-stage amplifier with the same characteristics as the normal four-stage amplifier except as noted under *Technical Data for Three Stage Operation* on page 1.

REMOTE VOLUME CONTROL

The MI-11274-A Volume Control is designed to provide a high-resistance bridging input circuit for connection between any low-impedance source and the 250-ohm input terminals of an amplifier.

This control consists of a 250-ohm dual potentiometer, a 470-ohm resistor, two 4,700-ohm resistors, and a terminal board assembled as shown in figure 5. The control is designed for panel mounting.

The use of one of these units makes it possible

to pick up program material conveniently from any zero-level program bus or other low impedance terminated line without disturbing the operating characteristics of the line.

TECHNICAL DATA*

Input Impedance

10,000 ohms (approx.)

Insertion Loss

32 db when bridging a 600-ohm line and operating into a 250-ohm amplifier input.

Output Impedance

250 ohms (volume control in maximum position).

Dimensions and Weight

Overall dimensions (not including shaft):

Height	2 3/8 inches
Width	1 1/2 inches
Weight	4 1/2 ounces

* For remote volume control only

Installation

To mount the MI-11274-A Volume Control, drill a 7/16-inch diameter hole in the panel at the desired location and install the control assembly by means of the nuts and washers supplied.

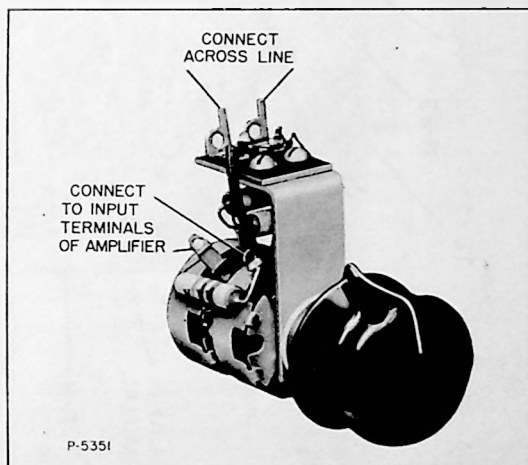
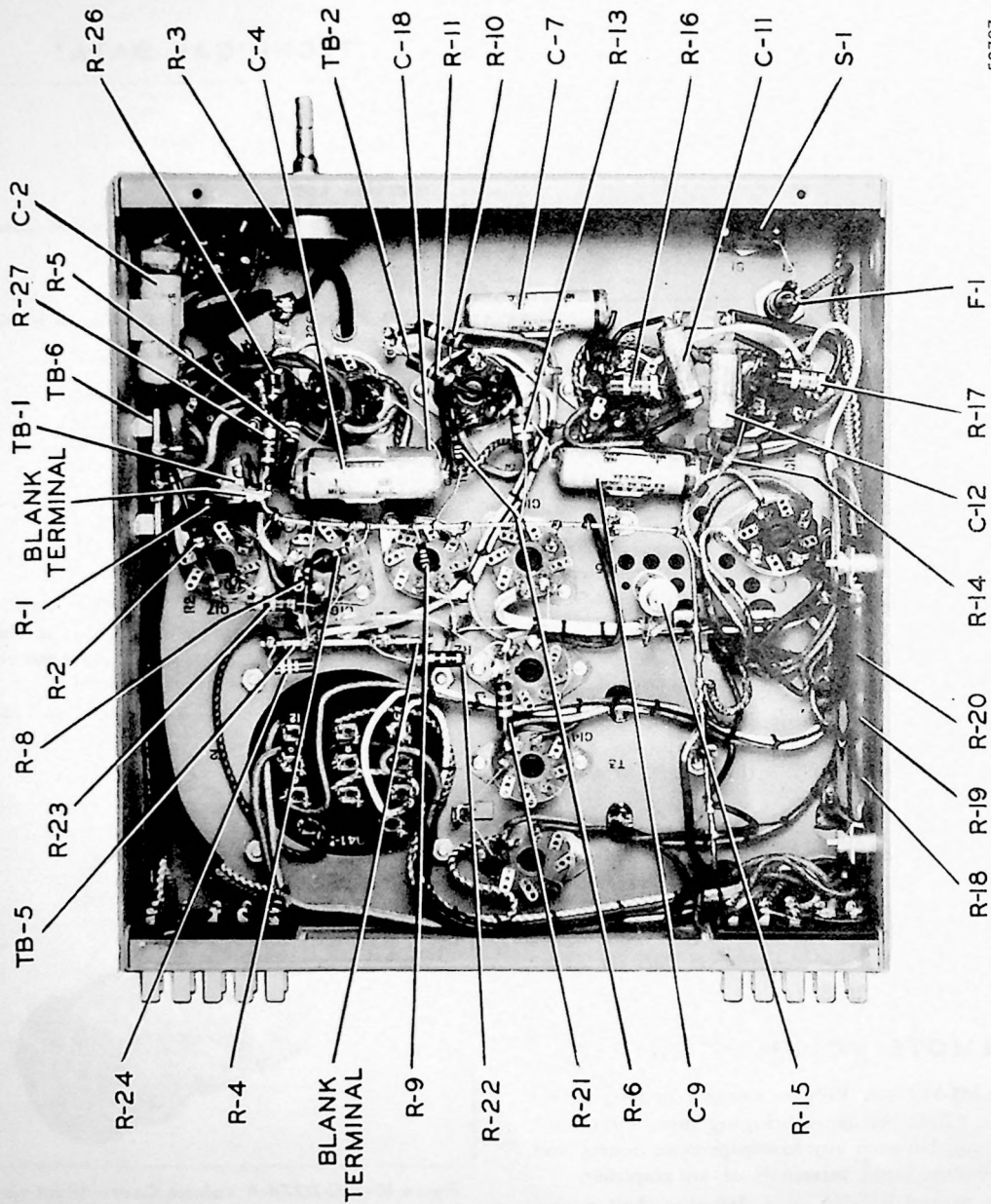


Figure 10—MI-11274-A Volume Control (front view)

REPLACEMENT PARTS

The following list of parts is included to provide identification when ordering replacement parts.



59797

Figure 11—Type BA-4A Amplifier (subchassis view)

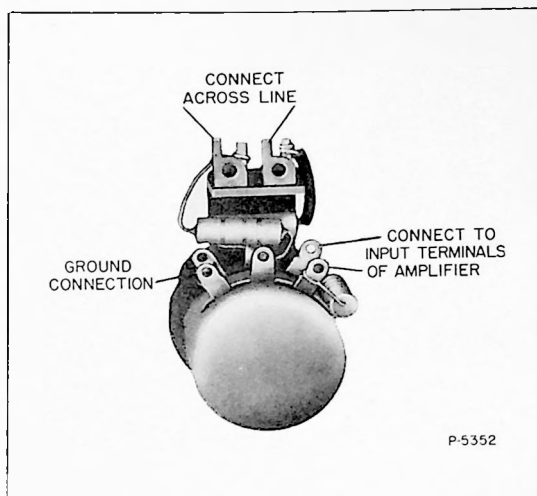


Figure 12—MI-11274-A Volume Control (rear view)

Order from *RCA Replacement Parts Department, Camden, New Jersey*, giving the *Stock Number* and *Description* of the parts wanted. Replacement parts supplied may be slightly different in size or form from the original parts but will be completely interchangeable with them.

LIST OF PARTS

Symbol	Description	Stock No.
C-1, C-3, C-16, C-17	Capacitor, plug-in	39461
C-2, C-4, C-7, C-9	Capacitor, 0.1 mfd, 500 volts	65635
C-6, C-10	Capacitor, plug-in, 40 mfd, 150 volts	39459
C-11, C-12	Capacitor, .0025 mfd, 1000 volts	30850
C-13, C-14	Capacitor, plug-in, 40 mfd, 450 volts	39457
C-15	Capacitor, plug-in, 20 mfd, 450 volts	39597
C-18	Capacitor, 1 mfd, 150 volts	18416
F-1	Fuse, 2 amperes	3883
P-1, P-2	Connector, male	48788
R-1	Resistor, 15,000 ohms, ½ watt	69716
R-2, R-26	Resistor, 100,000 ohms, ½ watt	19234
R-3	Resistor, variable, 250,000 ohms	52964
R-4	Resistor, 1,000 ohms, ½ watt	69723

LIST OF PARTS (Cont.)

Symbol	Description	Stock No.
R-5	Resistor, 47,000 ohms, 1 watt	48660
R-6	Resistor, 470,000 ohms, ½ watt	60068
R-8, R-9	Resistor, 2,700 ohms, ½ watt	19793
R-10, R-11, R-27	Resistor, 82,000 ohms, 1 watt	60066
R-12, R-14	Resistor, 150,000 ohms, ½ watt	48695
R-13	Resistor, 12,000 ohms, 2 watts	50862
R-15	Resistor, 180 ohms	44154
R-16, R-17	Resistor, 470 ohms, 2 watts	19478
R-18, R-19, R-20	Resistor, three section	44155
R-21, R-22, R-23	Resistor, 10,000 ohms, 1 watt	61360
R-24	Resistor, 24,000 ohms, 1 watt	48661
S-1	Switch, power supply	48791
T-1	Transformer, input	19957
T-2	Transformer, output	43679
T-3	Transformer, power	44068
	Cap, tube shield	12110
	Cushion, socket mounting	45470
	Holder, fuse, for F-1	48894
	Handle, ejector, left hand	52403
	Handle, ejector, right hand	52404
	Plate, dial	53458
	Socket, capacitor, for C-1 and C-17, C-3 and C-16, C-6, C-10, C-13, C-14, C-15	45368
	Socket, tube, for V-2, V-3, V-4, V-5, V-6	31319
	Socket, floating, for V-1	28413
Remote Volume Control		
R-1A	Resistor, 470 ohms, ½ watt	30499
R-2A, R-3A	Volume control, two section	18552
R-4A, R-5A	Resistor, 4700 ohms, ½ watt	30494
	Knob, volume control	17268
Frequency Compensation Kit		
C-1B	Capacitor, .015 mfd, 1,000 volts	30856
C-2B	Capacitor, .005 mfd, 1,000 volts	70648
R-1B	Resistor, 750 ohms, ½ watt	19785
R-2B, R-4B	Resistor, 56,000 ohms, ½ watt	30650
R-3B	Resistor, 150,000 ohms, ½ watt	30493
R-5B	Resistor, 82,000 ohms, ½ watt	8064
R-6B	Resistor, 1,000 ohms, ½ watt	34766

