

BROADCAST AUDIO EQUIPMENT



Instructions

RADIO CORPORATION OF AMERICA

Broadcast and Communications Products Division

Types BA-6B and BA-6C **Limiting Amplifiers**

MI-11225-B and MI-11225-C

BROADCAST AUDIO EQUIPMENT

INSTRUCTIONS

Types BA-6B and BA-6C Limiting Amplifiers

MI-11225-B and MI-11225-C

In order to make improvements in design and effect economies in manufacture, RCA reserves the right to make changes in design, components, and specifications published herein.

RADIO CORPORATION OF AMERICA

BROADCAST AND COMMUNICATIONS PRODUCTS DIVISION

CAMDEN, NEW JERSEY

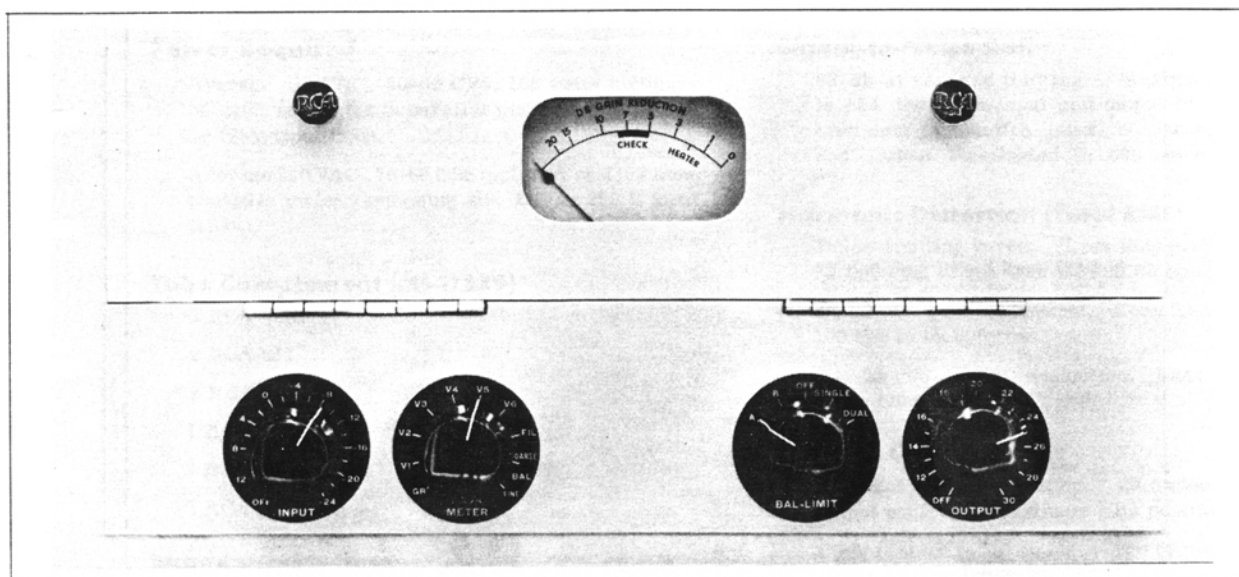


Figure 1—Types BA-6B and BA-6C Limiting Amplifiers

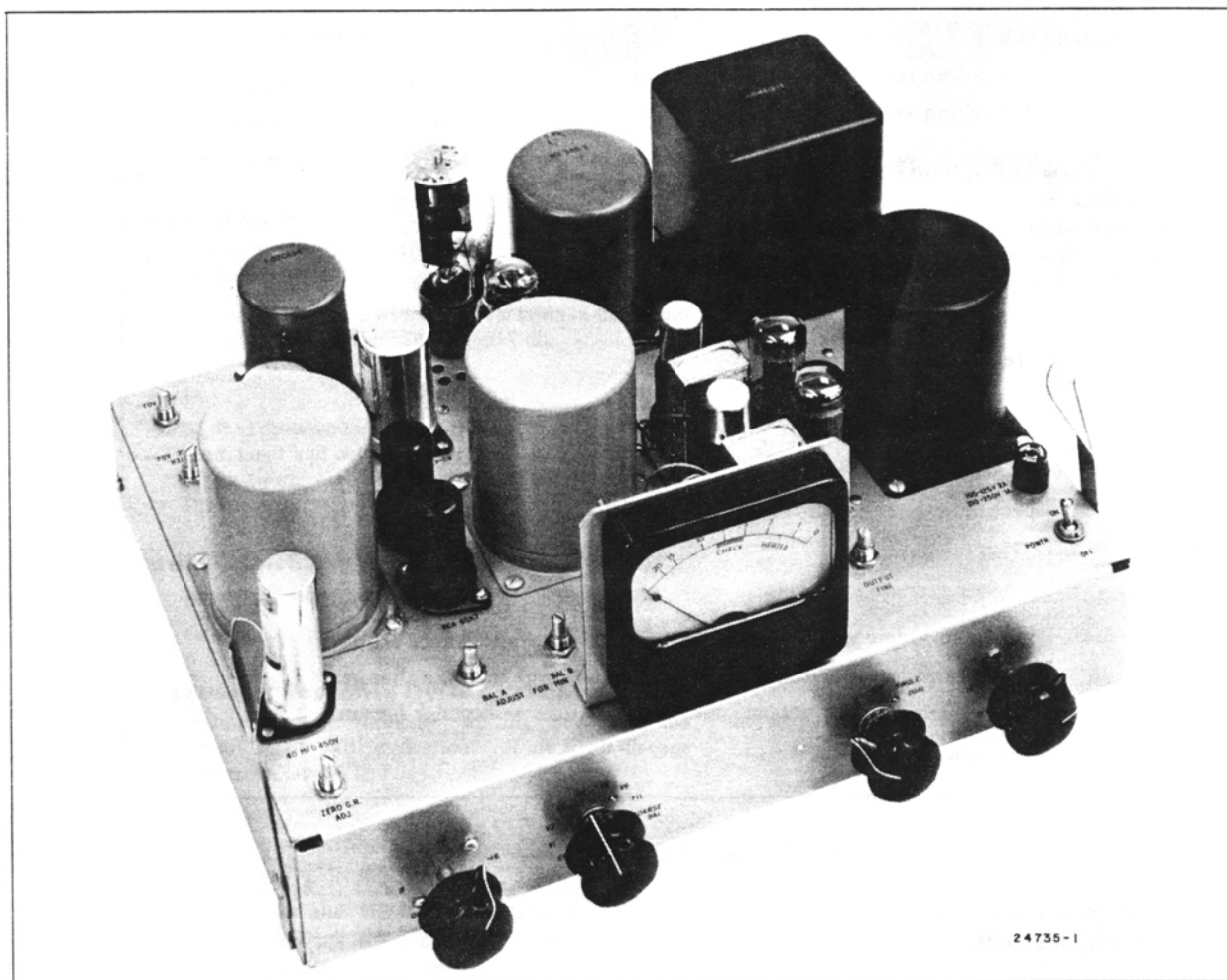


Figure 2—Types BA-6B and BA-6C Limiting Amplifiers with Front Panel Removed

TECHNICAL DATA

Power Required

Average 117 VAC, 50-60 CPS, 105 watts (primary of T103 connected in parallel when using 105, 115, or 125V input taps).

Average 230 VAC, 50-60 CPS (primary of T103 connected in series when using 210, 230 or 250 V input taps).

Tube Complement (MI-11289)

2 RCA 6SK7

2 RCA 6J7

2 RCA 6V6GT

1 RCA 6H6

1 RCA OD3/VR150

1 RCA 5R4GY

Impedances

Source: 600/150 ohms

Input: 600/150 ohms, balanced or unbalanced

Load: 600 ohms

Input Level

Minimum: -24 dbm at limiting verge

Maximum: +14 dbm

Output Level

Maximum (limiting off) at 1000 cps:
38.5 dbm

At verge of limiting with output controls in minimum attenuation position: 29.5 dbm \pm 1 db.

Gain

54 db \pm 1 db at 1000 cps, 600-ohm source to 600-ohm load; input and output controls at minimum attenuation (max. clockwise); signal below verge of limiting.

Gain Controls

Input: 20 steps, 2 db per step

Output: 20 steps, 1 db per step

Frequency Response (1000 Cycle Reference)

Below verge of limiting: \pm 1 db, 30-15,000 cps
Up to 20 db gain reduction: +1 db to -2 db (see figure 5), 30-15,000 cps

Signal-to-Noise Ratio

83 db at verge of limiting. Maximum noise level is -54 dbm with input and output controls set at minimum attenuation (max. clockwise), and input and output terminated in 600 ohms resistance.

Harmonic Distortion (Total RMS)

Below limiting verge: Less than 0.6% from 50 to 15,000 cps. Less than 1.2% at 30 cps.

At 10 db gain reduction: Less than 0.75% from 100 cps to 15,000 cps.

At 15 db gain reduction: Less than 1.0% from 100 cps to 15,000 cps.

Limiting Characteristic

Output at verge of limiting: 29.5 dbm \pm 0.5 dbm, output control in maximum gain position.

Compression ratio above verge of limiting: 20 db into 2 db (see figure 4).

Time Constants

	ATTACK	RELEASE
Single	600 microsec.	0.33 sec.
Dual, Fast Action	600 microsec.	0.33 sec.
Dual, Slow Action	0.9 sec.	2 sec.

Signal-to-Thump Ratio

21 db minimum, 26 db average, for a series of tests made with different combinations of non-selected tubes in variable gain stage, and an increase in input level of 5 and 10 db above verge of limiting.

Dimensions and Weight

	CHASSIS	OVERALL
Length	16-3/16 inches	16-3/16 inches
Width	11-3/4 inches	14 inches
Height	3 inches	7-5/8 inches
Weight	37 pounds

Finish

Light umber gray for MI-11225-B Aluminum Epoxy for MI-11225-C

Mounting

Plug-in mounting on MI-11599 or MI-11599-B Shelf.

DESCRIPTION

Type BA-6B and BA-6C Limiting Amplifiers (Figs. 1 and 2) are used to prevent overmodulation of a transmitter by limiting the high audio peaks which occasionally occur. This limiting action permits a substantial increase in the average

modulation level, and therefore a greater transmitter range with the same carrier power.

The action of the limiting amplifier is similar to delayed automatic volume control in a radio

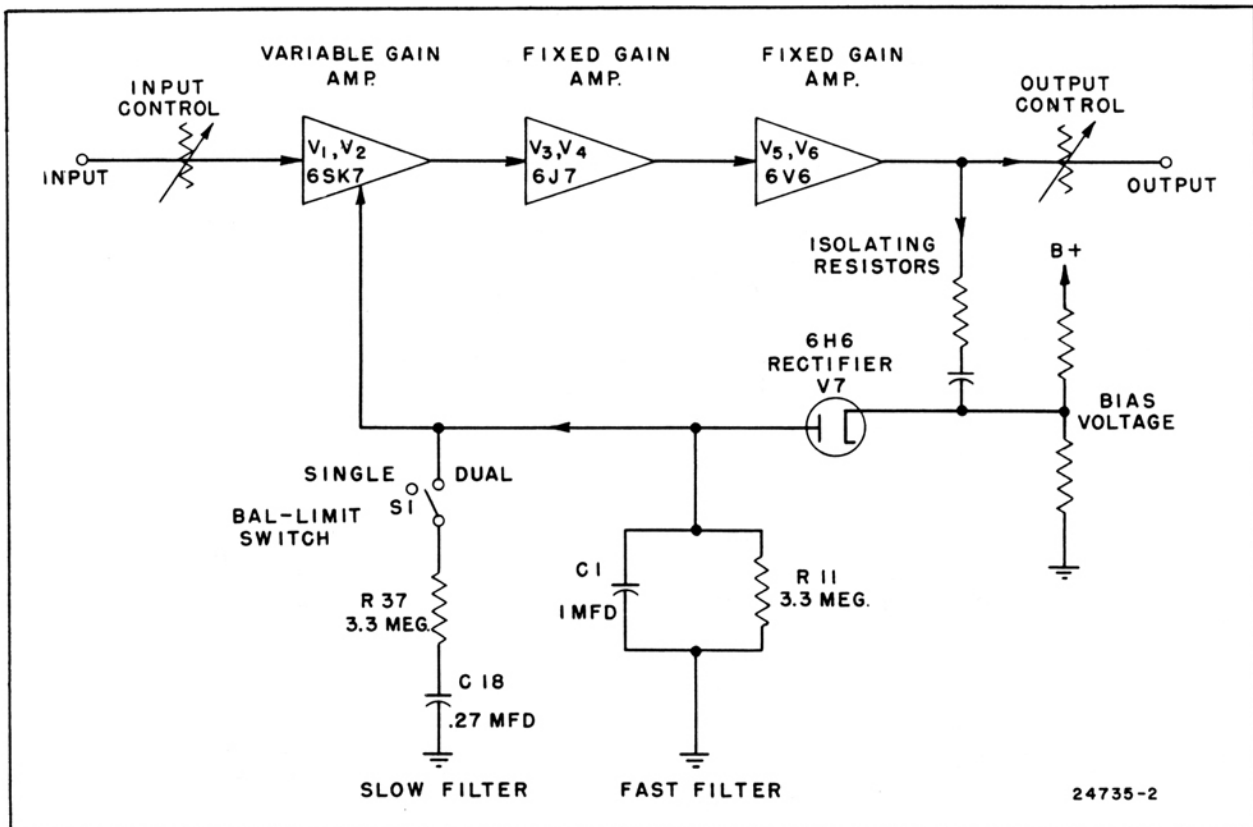


Figure 3—Simplified Block Diagram

receiver. For input signals below a specified level, the amplifier gain is not affected. Above this level, however, the gain is sharply reduced by an amount that increases with input signal strength. As a result, above the pre-determined level the amplifier output changes only slightly for large changes in input level.

The amplifier is designed for plug-in mounting (the BA-6B is mounted on an RCA MI-11599 shelf and the BA-6C is mounted on an RCA MI-11599-B shelf). Two plug-in receptacles and a hinged front panel are supplied with the amplifier for mounting on the shelf. The major operating controls are directly accessible from the front. All other controls, the tubes, and the plug-in capacitors are mounted on the top of the chassis and are accessible when the hinged front panel is opened.

CIRCUIT

As shown in the block diagram, figure 3, and the schematic diagram, figure 8, the amplifier consists of three push-pull stages using commonly available tubes. The first stage which uses two RCA 6SK7 remote-cutoff pentodes, has a variable

gain that is controlled by automatic-gain-control voltage. The RCA 6J7 and RCA 6V6 stages which follow have fixed gains. Negative feedback is applied over the two fixed-gain stages to improve frequency response, minimize distortion, and reduce instability caused by changes in tube characteristics and line voltage.

The heater voltage for the variable-gain stage is obtained from a selenium rectifier to reduce hum, and the screen voltage is held constant by an OD3/VR150 voltage-regulator tube to reduce sensitivity to line-voltage fluctuations. Potentiometers in the screen and cathode circuits of this stage make it possible to balance any pair of 6SK7 tubes over the entire range of grid voltages encountered, so that thumps produced by sudden shifts of the operating point will be cancelled. Switches on the front panel provides for quick balancing adjustments without external equipment by applying an internal 60-cycle signal to the 6SK7 grids and using the front-panel meter to indicate balance (SEE PRELIMINARY ADJUSTMENTS).

The variable grid bias which controls the gain of the 6SK7 stage is obtained by rectifying part of the output voltage of the last stage with a 6H6 full-

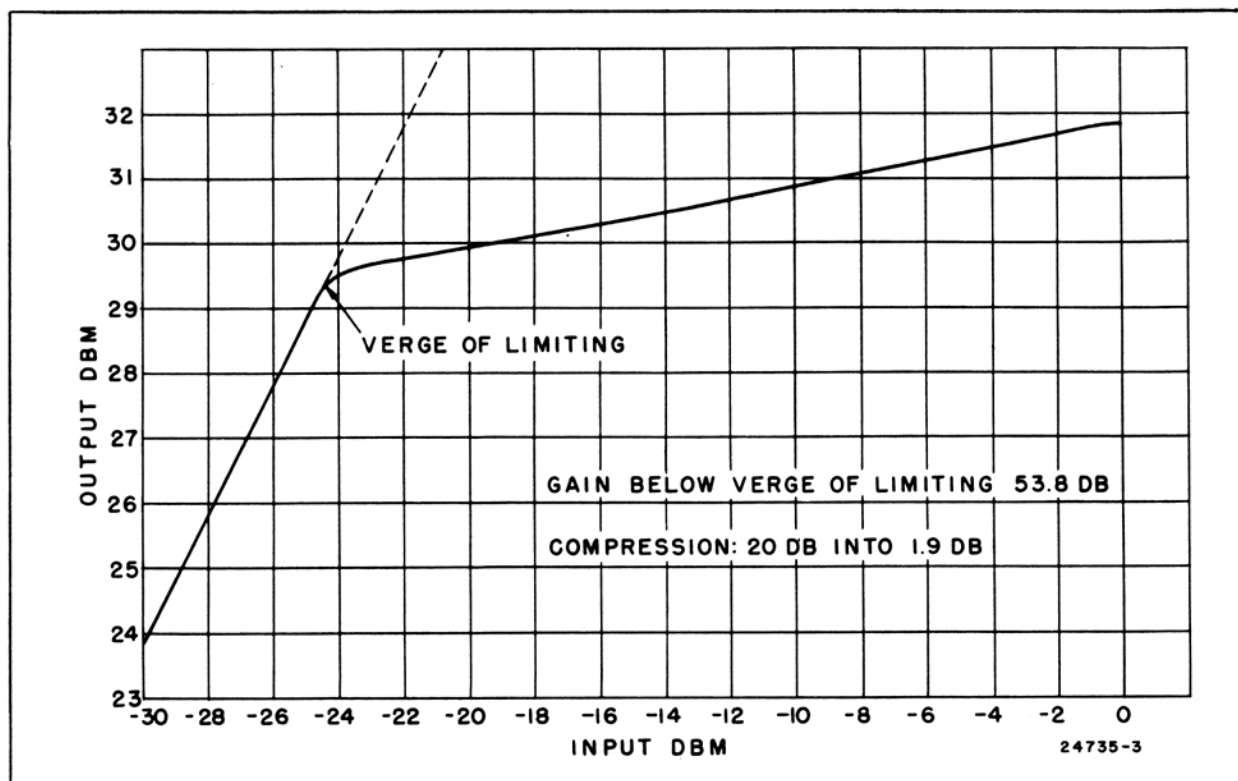


Figure 4—Limiter Characteristics

wave rectifier. Fixed positive bias on the rectifier cathodes prevents conduction until the output level exceeds the verge of limiting. The output voltage of the rectifier is fed to the grids of the 6SK7 tubes through a resistance capacitance filter which determines the attack and release times of the limiting action. A rotary switch on the front panel marked BAL-LIM permits selection of a filter having either a single or dual time constant. When this switch is in the SINGLE position, the filter

consists only of capacitor C1 and resistor R11, which are connected in parallel between the rectifier plate and ground. This filter has a fast charging time, .0006 seconds, and a relatively slow discharge time, 0.33 seconds. When S1 is in the DUAL position, the additional series combination of R37 and C18 is shunted across C1 and R11. R37 and C18 have a slow charge time of .9 seconds and a slower discharge time of 2 seconds.

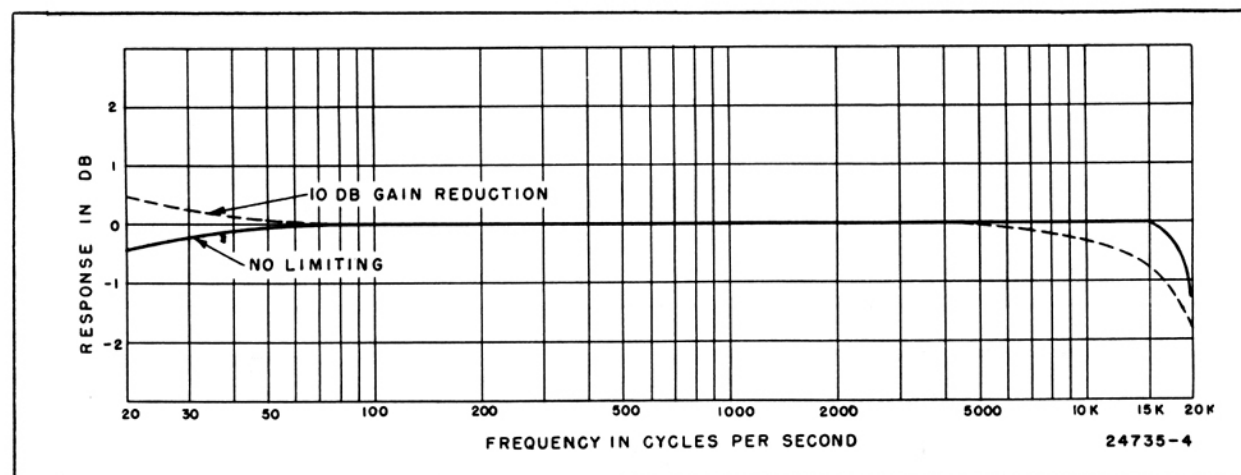


Figure 5—Frequency Response

ACTION OF SINGLE AND DUAL FILTERS

The results obtained with the single or dual filters depend on the input waveform. If the input signal contains prolonged series of peaks as shown in figure 6A and the period of the signal is much greater than the charging time of C1, the output waveforms will be approximately as shown in figures 6B and 6C. Up to time T2, the output is the same for both the SINGLE and DUAL positions of the BAL-LIM switch. The decrease in input level at T2 causes the output to drop suddenly for both switch positions. Between T2 and T3, the output level increases rapidly for the SINGLE position, but much more slowly for the DUAL position, because the discharge time of C18 is longer than that of C1.

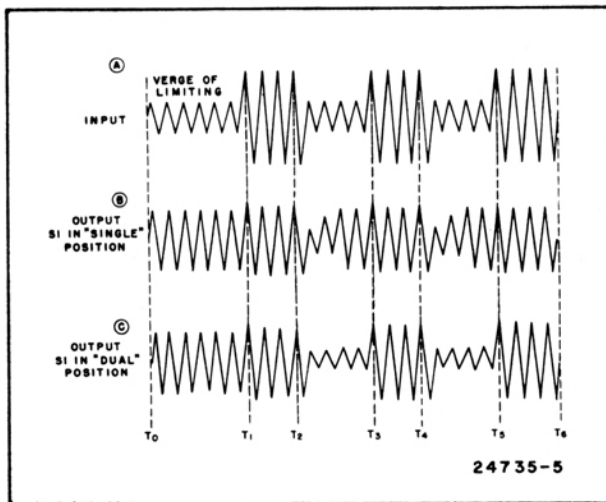


Figure 6—Output Waveforms With Prolonged Peak Input

When the input contains short single peaks as shown in figure 7, and the switch is in the DUAL position, the circuit acts as if the switch were in the SINGLE position because there is insufficient time for C18 to charge appreciably. Comparison of the waveforms in figures 6 and 7 shows that the recovery time of the dual filter is short after a single peak and long after a series of peaks. This automatically prevents noticeable holes in the program after short peaks, and rapid gain fluctuations, known as breathing or pumping, between prolonged series of peaks.

FRONT-PANEL CONTROLS

Input Control The knob at the extreme left of the panel controls a dual potentiometer R1 which is connected in the control grid circuit of the 6SK7 tubes. The resistance on each side of the potenti-

ometer is 25,000 ohms and the control is calibrated in 20 steps of 2 db. This control is provided to compensate for differences in input signal level and to vary the amount of gain reduction. The markings on the dial plate indicate the approximate input level in dbm required to reach the verge of limiting.

Meter Switch The second control on the panel is a switch (S2) for connecting the meter to various points in the circuit. The table given in the MAINTENANCE section shows the metering function for each switch position.

Bal-Limit Switch The third control on the panel is a five-position switch S1. The first two positions marked A and B are used for adjusting the balance of the two 6SK7 tubes in the variable gain stage. Use of these positions of the switch is explained under BALANCING 6SK7 TUBES under PRELIMINARY ADJUSTMENTS.

The last three positions of the switch determine the gain reduction action of the amplifier. In the OFF position, the gain control voltage is shorted to ground so that the gain of the amplifier is independent of the signal strength, and is approximately 54 db. In the SINGLE position, the output of the amplifier is limited and only the single timing circuit, consisting of C1 and R11, is connected across the rectifier output. In the DUAL position both timing circuits C1 and R11 and C18 and R37 are connected.

Output Control The fourth knob on the panel controls a bridged T attenuator (R-36) in the output circuit. This control determines the output level of the amplifier and is calibrated in 20 steps of 1 db. The numbers on the dial plate indicate the approximate output level in dbm at the verge of limiting.

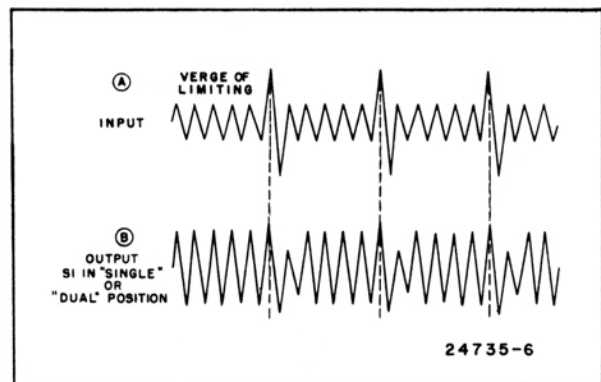


Figure 7—Output Waveforms With Single Peak Input

BEHIND-PANEL CONTROLS

Seven controls are provided in the amplifier

which do not usually require adjustment during normal operation of the amplifier. These controls are on the top of the chassis, and are accessible when the hinged front panel is opened.

On-Off Switch This switch, marked ON-OFF, turns the power on or off.

Balance A Potentiometer This control is a 100-ohm screwdriver adjusted potentiometer in the cathode circuit of the push-pull 6SK7 stage which permits balancing the 6SK7 tubes by varying the cathode voltage.

Balance B Potentiometer This control is a 10,000-ohm screwdriver adjusted potentiometer in the screen circuit of the 6SK7 stage which permits balancing the 6SK7 stage by varying the screen voltage.

Zero Adj The ZERO ADJ. control is a 100-ohm rheostat (R-47) that is connected in series with the meter when the METER switch is in the GR position. This control permits adjusting the meter to 0 gain reduction when no input signal is

applied.

Fine Output Control The FINE OUTPUT control (R35) is a 100-ohm rheostat in series with the output attenuator R-36, and is used as a vernier adjustment for the OUTPUT control.

Hum Adjustment This control is a 100-ohm potentiometer (R-63) in the filament supply circuit and is used to minimize the hum of the external preamplifier.

Heater Voltage Adj The HEATER VOLTAGE control (R-64) is a 2-ohm rheostat in the heater circuit of the 6SK7 stage. It is used to adjust the d-c heater voltage obtained from selenium rectifier SR1.

TUBE COMPLEMENT

The tubes required for the limiting amplifier are listed in the TECHNICAL DATA table. These tubes are not supplied with the amplifier but may be obtained as a complete set by ordering MI-11289.

INSTALLATION

TUBES AND PLUG-IN CAPACITORS

Before mounting the amplifier, seat the tubes and plug-in capacitors in the corresponding sockets which are identified by stencilling on the chassis. Place the grid leads on the two 6J7 tubes and fit the grid shield caps over them. To insure noise-free operation make certain that each shield makes a good electrical connection to the shell of the tube.

MOUNTING ON SHELF ASSEMBLY

Attach each of the Jones plugs supplied with the amplifier to one of the U-shaped brackets supplied with the shelf assembly as directed in the instruction book for the shelf. Then attach one of the receptacles to the shelf at the extreme left and the other at the extreme right, using the appropriate holes in the rear of the shelf. Attach a guide strip to the shelf at its extreme right and left sides. All required mounting hardware for the brackets and guide strips is supplied with the shelf.

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

Mount the front panel supplied with the amplifier as follows: Lift the latches at the rear of the lower panel section and place the panel flush against the shelf. Lower the latches to engage the side shelf supports between the latches and the

panel. The panel is hinged at the center, and the upper section engages holes in the upper horizontal shelf support by means of two catches in the panel. The panel may be closed by snapping it shut, and opened by pulling the monogrammed knobs. After the panel is mounted, push the four knobs onto the amplifier control shafts.

To position the meter, open the panel, loosen the two binder-head screws that hold the meter bracket to the chassis, and adjust the bracket until the meter face is flush with the panel. Tighten the two screws and close the panel.

CONNECTIONS

All audio leads should be shielded twisted pair insulated for 200 volts, but need not be larger than No. 19 A. W. G. All joints should be securely soldered and of low resistance. If the circuits run in conduit or duct which may be subject to moisture, a type of wire having a natural or synthetic rubber covering over the shield or lead should be used. To minimize noise pickup and cross-talk on long input circuits, the shielding of the input leads to the amplifier or rack should be covered with suitable insulation such as cotton braid and the shielding should be grounded only at the amplifier (point of lowest level). Make sure that the shields are electrically continuous and that the ground connections are perfect. Do not run the audio input leads adjacent to or laced in with a-c or high-level

audio lines.

Solder all connections to the terminals on the two Jones receptacles J1 and J2 which mate with plugs P1 and P2 respectively, as directed in the following paragraphs:

Balanced Input Connections For a 600-ohm balanced input connect the input leads to terminals 11 and 12 of input receptacle J1 and for a 150-ohm balanced input, to terminals 3 and 4 of J1.

Unbalanced Input Connections For a 600-ohm unbalanced input unsolder the jumper from terminal 3 to 2 of input transformer T1 and interconnect terminals 1 and 8 of T1. Connect the high side of the input line to terminal 11 of input receptacle J1 and the low side to terminal 12 of J1.

For a 150-ohm unbalanced input unsolder the wire from terminal 3 to 2 of the input transformer and interconnect terminals 6 and 8 of the input transformer. Connect the high side of the input line to terminal 3 of input receptacle J1 and the low side to terminal 4 of J1.

INPUT RECEPTACLE J1

Terminal No.	Connection
3	150-ohm input
4	150-ohm input
7	External Meter (-)
8	External Meter (+)
9	Electrical ground
10	Chassis ground
11	600-ohm input
12	600-ohm input

Output Connections: For a 600-ohm balanced or unbalanced output, make the output connections to terminals 11 and 12 on receptacle J2.

OUTPUT RECEPTACLE J2

Terminal No.	Connection
3 and 4	Filament voltage supplied to external equipment, 6.3 v, 0.6 a
5 and 6	A-C line
9	B-
10	B+ voltage for external equipment, 270 v at 7 ma
11 and 12	600-ohm output

External Meter If use of an external gain reduction meter is desired, remove the 82-ohm resistor from terminals 7 and 8 of the input plug P1. Connect the + terminal of the meter to terminal 8 on the input receptacle J1, and the - terminal to terminal 7 on J1. A meter like that used on the amplifier may be obtained from the RCA Replacement Parts Department (see LIST OF PARTS).

Power for External Preamplifier Terminals are provided to supply sufficient plate and filament power for one 6X4 preamplifier or a similar device. Make these connections to the proper terminals as listed in the table headed

AC Power Connections The power transformer (T-4) may be connected for operation with either a 105 to 125 volt or a 210 to 250 volt, 50-60 cps, power line. The connection chart below shows the connections of T4 for various input voltages.

CONNECTION CHART

A/C INPUT VOLTAGE	T-4 PRIMARY CONNECTIONS	JUMPER CONNECTIONS
105 V	1	1 - 5
105 V	2	2 - 6
110 V	1	1 - 5
110 V	3	3 - 7
125 V	1	1 - 5
125 V	4	4 - 8
* 210 V	1	4 - 4A
210 V	6	
* 230 V	1	4 - 4A
230 V	7	
* 250 V	1	4 - 4A
250 V	8	

* For 210/230/250 volt operation, fuse F1 should be 1 amp., 250 volt, Slo-blo, Stock No. 53447.

Connections for Stereo Operation In stereo systems, a separate limiting amplifier is required for each channel. In order to maintain proper balance between the left and right channels, the amplifiers must be interconnected, and a few changes must be made. Essentially the modification consists of paralleling the automatic gain control voltages of the two amplifiers and changing the capacitors and resistors of the A. G. C. network in order to maintain the same time constants.

With these changes, the gain reduction due to limiting the channel carrying the stronger signal produces a like gain reduction in the channel carrying the weaker signal, thus, the relative levels in the two channels remain unchanged.

Make the following modifications on the BA-6B or BA-6C Limiting Amplifiers for stereo operation (refer to figures 8 and 9):

1. Install a new, shielded, single-conductor cable between the secondary center tap of the input transformer T1, (terminals 12 and 13) and terminal 5 of plug P1.

2. Change capacitors C1 and C18 and resistors R11 and R37 in both amplifiers as follows:

Replace C1 with a .05 mfd, 200V, capacitor
Replace C18 with a .15 mfd, 200V, capacitor

Replace R11 and R37 with 6.8 megohm, 1/2 watt resistors.

3. Using a shielded wire, interconnect the two amplifiers with the conductor connected between the P1-5 terminals and the shield connected between the P1-9 terminals.

ADJUSTMENTS

BALANCING 6SK7 TUBES

The 6SK7 tubes should be balanced before using the equipment for the first time, and whenever the tubes have been replaced or have aged unequally. To make the adjustment, proceed as follows:

1. Open the front panel by pulling the monogrammed knobs, and turn the ON-OFF power switch on the chassis to ON. Allow the amplifier to warm up for at least 30 minutes.

2. Turn the METER switch to the FIL position and adjust the HEATER voltage control until the meter pointer is at the HEATER mark.

3. Turn the INPUT control to the OFF position.

4. Turn the METER switch to the COARSE BAL position.

5. Turn the BAL-LIM switch to position A (when balancing tubes in amplifiers connected for stereo operation, the BAL-LIMIT switch in the amplifier not being balanced should be left in either the SINGLE or DUAL time constant position). When the switch is in this position, a 60-cycle voltage is applied to the grids of the 6SK7 tubes in parallel and the amplifier output signal is disconnected from the outgoing line and switched to the meter. The output shown on the meter is due to unbalance of the 6SK7 tubes.

6. Turn the BAL A control on the chassis until the meter reading is minimum. This adjustment varies the cathode voltage of the two tubes.

7. Turn the BAL-LIM switch to position B and adjust the BAL B control on the chassis for minimum meter reading. Placing the BAL-LIM switch in the B position increases the 60-cycle voltage applied to the 6SK7 tubes, and increases the cathode bias voltage. Turning the BAL B control varies the screen voltage of the two tubes.

8. Turn the meter switch to the FINE BAL position and repeat the preceding adjustments until the meter shows no deflection in both the A and B positions of the BAL-LIM switch.

ZERO GAIN REDUCTION ADJUSTMENT

To adjust the meter to zero proceed as follows: Turn the BAL-LIM switch to OFF. Turn the METER switch to GR. Adjust the ZERO ADJ. control on top of the chassis until the meter reads 0 db (full scale).

INPUT AND OUTPUT ADJUSTMENTS

To adjust the amplifier for the desired amount of gain reduction on signal peaks, and the desired output level, proceed as follows:

1. Turn the BAL-LIM switch to the SINGLE position, and the meter switch to the GR position.

2. With a signal generator, apply a sine wave signal of approximately 1000 cycles to the amplifier input. Adjust the amplitude of this signal to the level expected on program signal peaks. (For stereo operation, feed the 1000 cps signal to both channels and adjust its amplitude to the level at which limiting is to start).

3. Adjust the INPUT control until the meter reads the amount of gain reduction that is desired on signal peaks. The maximum gain reduction used should be a compromise between the increase in average power output and loss of dynamic range. Listening tests indicate that as much as 15 to 20 db of gain reduction can be used on program material where the dynamic range is not of primary importance.

(For stereo operation, adjust the INPUT gain control on one amplifier until the gain reduction meter just starts to indicate. Note the INPUT gain control setting and then set it to OFF. Follow the same procedure for setting up the second amplifier.

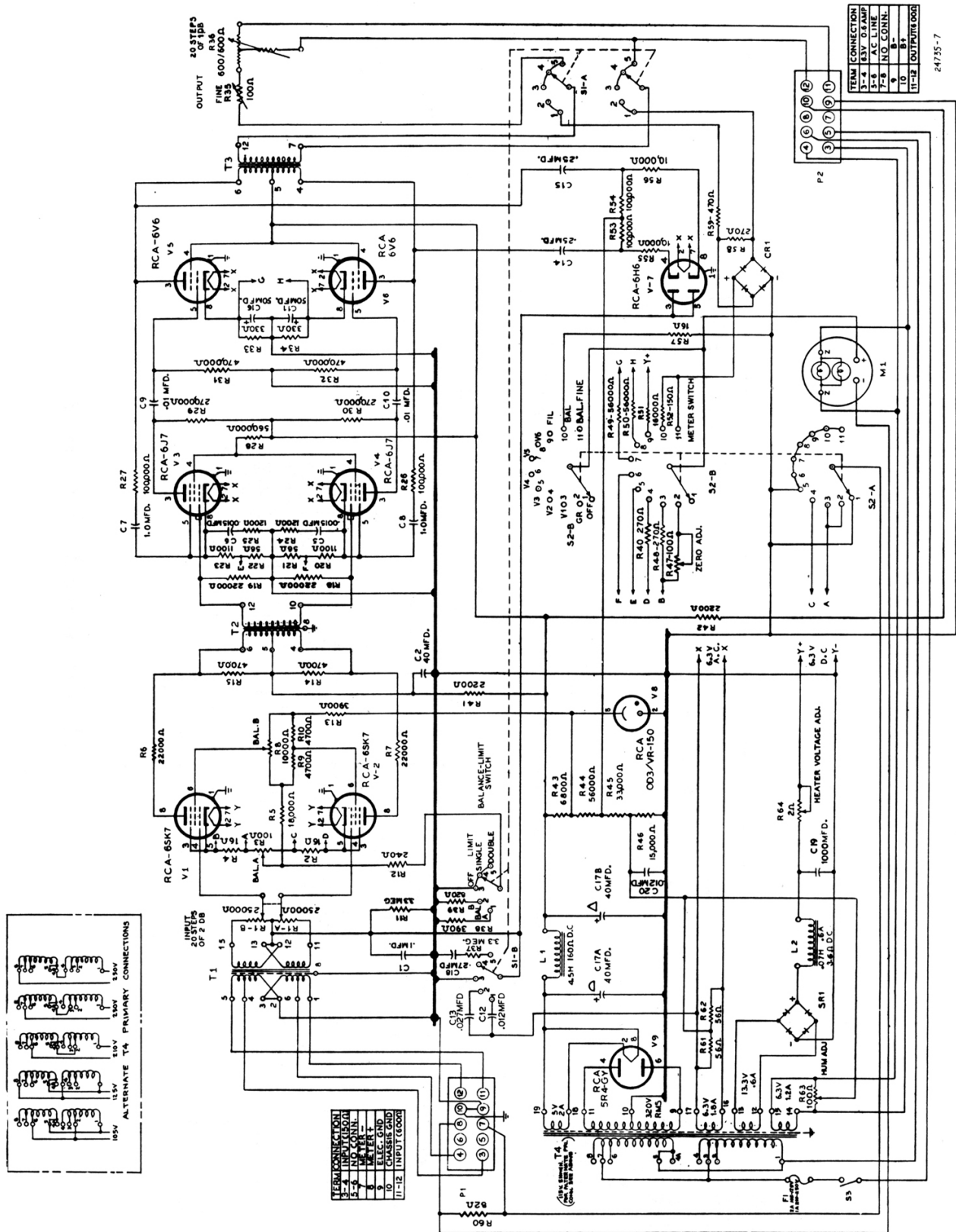


Figure 8—Schematic Diagram

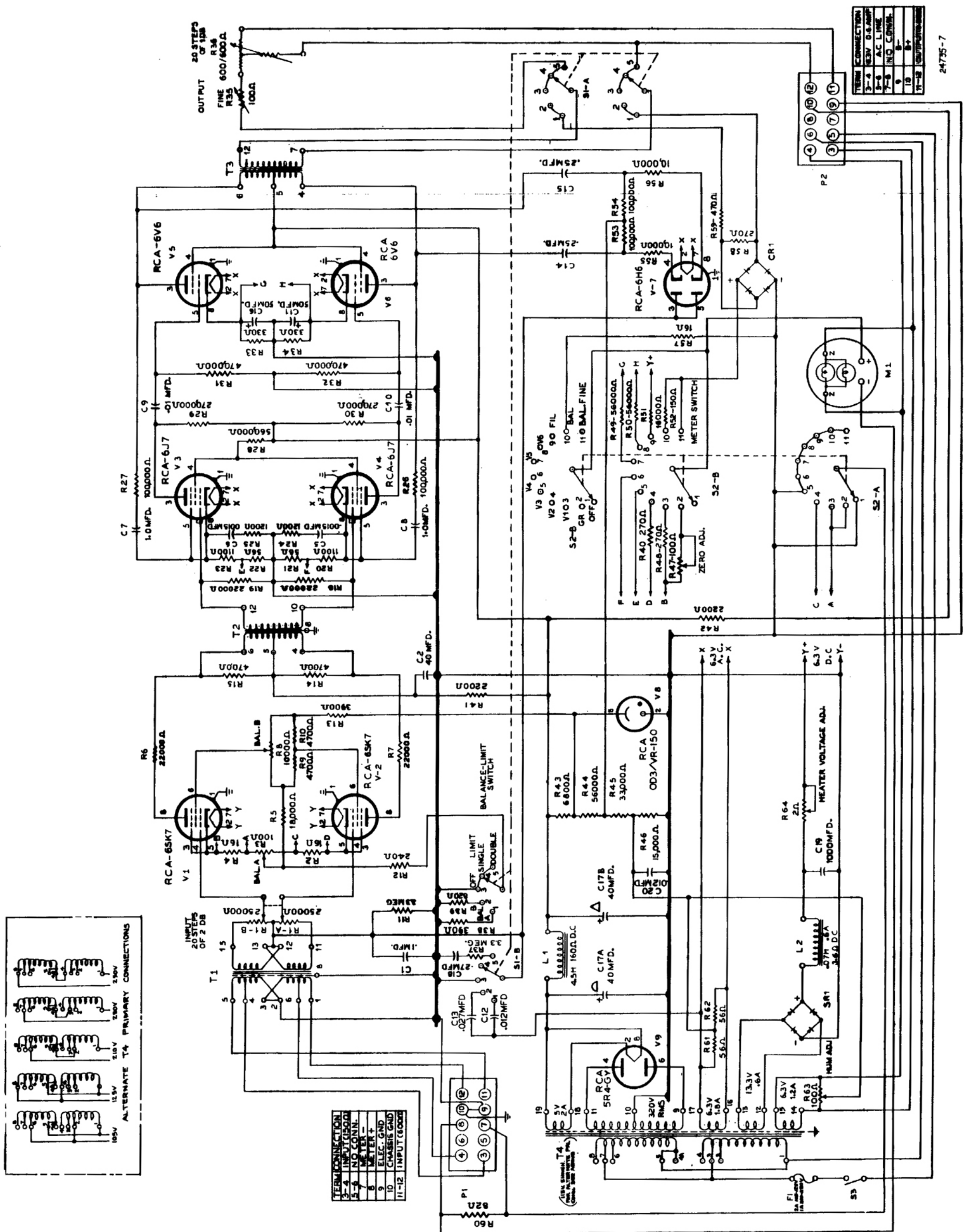


Figure 8—Schematic Diagram

NOTE: THE FOLLOWING WIRES ARE TWISTED PAIRS
OF SOCKETS.

NOTE 4: WIRE NO. 151 TO BE OF SUFFICIENT LENGTH TO PERMIT REMOVAL OF REAR SECTION OF REAR.

NOTE 5: MOUNT C8, C14 AND C15 ON RUBBER WAFER.

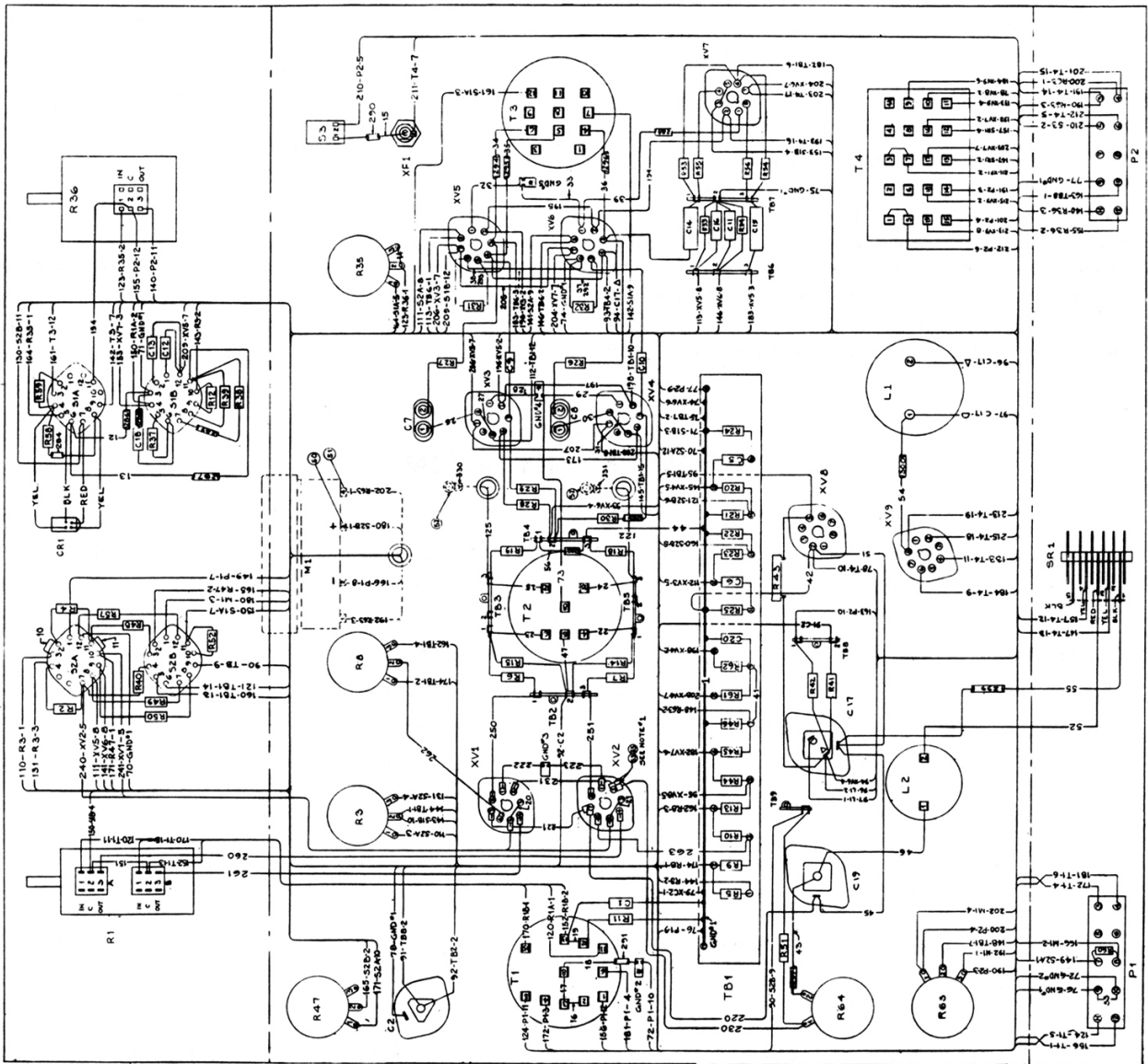


Figure 9—Wiring Diagram

Disconnect the 1000 cps input signal and set both INPUT gain controls to their previously noted settings. During normal operation, the BAL-LIMIT switches of both amplifiers should be set to the same positions, e. g. , SINGLE or DUAL).

4. Adjust the OUTPUT control until the output is at the required level for 100 percent modulation of the transmitter. If this level cannot be set exactly with the OUTPUT control, adjust the FINE OUTPUT control on the chassis.

USE OF SINGLE OR DUAL FILTERS

After all adjustments are completed, apply a program signal to the amplifier input and make listening tests with the BAL-LIM switch in the SINGLE and DUAL positions. Finally, set the switch in the position giving the desired results.

EXTERNAL PREAMP HUM ADJUSTMENT

If the limiting amplifier is used to supply power for an external preamplifier, turn the HUM adjustment potentiometer on the top of the chassis until the hum in the output of the preamplifier is minimum.

MAINTENANCE

USE OF METER

The METER switch permits testing the amplifier circuit with the meter on the front panel. The metering function for each position of the switch is shown in the following table. Unless otherwise noted in the table, no input signal is applied to the amplifier.

CLEANING

The Limiting Amplifier should receive the care usually given to high-quality audio equipment, such as regular cleaning and inspection. Perform the following operations regularly:

1. Clean the tube prongs and the contacts of the sockets.

2. Clean the prongs of the plug-in capacitors and the contacts of the capacitor sockets.

3. Clean the prongs of the amplifier connection plugs with a clean dry cloth. Do not use abrasive. Clean the plug receptacles approximately every two months by removing the amplifier from the receptacles. This action automatically cleans the receptacle contacts by wiping action of the springs. Plug the amplifier in and pull it out several times to obtain sufficient cleaning action.

METER INDICATIONS

Meter Switch Position	Operating Conditions	Normal Meter Reading	Significance
OFF (two position) GR BAL-LIM sw. OFF BAL-LIM sw. at A BAL-LIM sw. at B Input signal applied and BAL-LIM sw. at SINGLE or DUAL	No deflection Full scale 5 db approx. 10 db approx. 0 to full scale depending on signal strength ZERO ADJ. correct BAL A circuit normal BAL B circuit normal db gain reduction
V1 to V6	BAL-LIM sw. OFF	Within check band	Cathode current of tube normal
HEATER	At HEATER mark	DC heater voltage for 6SK7 stage is 6.5 ± 0.1 v
COARSE and FINE BAL	INPUT control OFF BAL-LIM sw. at A or B	No deflection	6SK7 stage balanced

4. Clean the contacts of the INPUT and OUTPUT attenuators. Press the catch near the rear end of the INPUT or OUTPUT attenuator, turn the rear-end cover sufficiently to release it, and pull the cover off. Apply Davenoil to the exposed contacts, rotate the shaft, and if any dark streaks appear wipe off the contacts. Repeat this procedure until the contacts are clean, then apply a thin film of Davenoil. Press the catch nearest the front of the INPUT attenuator and remove the rear section of the attenuator exposing the front-section contacts. Clean these contacts in the same manner. Replace the rear section and back cover of the INPUT attenuator and the back cover of the OUTPUT attenuator and lock each in place.

REPLACING METER LAMPS

The meter scale is illuminated by two series-

connected 3.2-volt panel lamps (Type 42) mounted on the inside of a removable plate on the bottom of the meter. To replace the lamps, open the front panel and remove the two binder-head screws that hold the meter bracket to the chassis. Remove the screw in the center of the bottom plate on the meter and take out the plate. After changing the lamps, replace the plate and the screw, position the bracket so that the meter is flush with the panel, and fasten the bracket in place with the screws.

TYPICAL OPERATING VOLTAGES

Approximate operating voltages for an amplifier with no input signal applied are given in the following table. These voltages should be obtained when the a-c line voltage is 115 volts, and the d-c voltages are measured with a 20,000 ohms-per-volt meter. All voltages are measured to ground except the a-c filament voltages.

VOLTAGE TABLE

TUBE	PLATE		SCREEN		HEATER		CATHODE	
	Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	Pin No.	Volts
V1, V2 RCA 6SK7	8	135 dc	6	103 dc	2 & 7	6.5 dc	5	5.15 dc
V3, V4, RCA 6J7	3	71 dc	4	42 dc	2 & 7	6.3 dc	8	1.18 dc
V5, V6, RCA 6V6	3	275 dc	4	285 dc	2 & 7	6.3 dc	8	13.1 dc
V7, RCA 6H6	3 & 5	0 dc	-	-	2 & 7	6.3 dc	4 & 8	66 dc
V8, RCA OD3/VR150	5	155 dc	-	-	-	-	2	0 dc
V9, RCA 5R4GY	4 & 6	315 ac	-	-	2 & 8	5.0 ac	-	-

LIST OF PARTS

The following parts list is included to provide identification when ordering replacement parts. 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 form or size from the original parts but will be completely interchangeable with them.

SYMBOL NO.	DESCRIPTION	STOCK NO.
C1	Capacitor, molded paper, 0.1 mf, $\pm 10\%$, 200 V	110607
C2	Capacitor, dry electrolytic, 40 mf, -10% , $+50\%$, 450 V	
C5, 6	Capacitor, molded paper, .0015 mf, $\pm 10\%$, 600 V	

SYMBOL NO.	DESCRIPTION	STOCK NO.
C7, 8	Capacitor, fixed, paper, 1 mf, -10% , $+20\%$, 600 V	212552
C9, 10	Capacitor, molded paper, 0.01 mf, $\pm 10\%$, 600 V	
C11, C16	Capacitor, dry electrolytic, 50 mf, -10% , $+250\%$, 25 V	

LIST OF PARTS (Cont'd.)

SYMBOL NO.	DESCRIPTION	STOCK NO.	SYMBOL NO.	DESCRIPTION	STOCK NO.
C12	Capacitor, molded paper, .012 mf, $\pm 10\%$, 200 V		R26, 27	Resistor, fixed carbon, film type, 100,000 ohms, $\pm 1\%$, 1 W	207032
C13	Capacitor, molded paper, .027 mf, $\pm 10\%$, 400 V		R28	Resistor, fixed, comp., 560,000 ohms, $\pm 10\%$, 1 W	
C14, 15	Capacitor, fixed, paper, .25 mf, -10% , $+20\%$,	229929	R29, 30	Resistor, fixed, comp., 270,000 ohms, $\pm 10\%$, 1 W	
C17A, B	40-40 mf, 450 V	102913	R31, 32	Resistor, fixed comp., 470,000 ohms, $\pm 10\%$, 1 W	
C18	Capacitor, molded paper, .27 mf, $\pm 10\%$, 200 V		R33, 34	Resistor, fixed comp., 330 ohms, $\pm 5\%$, 2 W	
C19	Capacitor, dry electrolytic, 1000 mf, -10% , $+250\%$, 25 V	97639	R35	Same as R3	
C20	Same as C12		R36	Resistor, variable, attenuator pad, wire-wound, 600/600 ohms	59783
CR1	Rectifier, meter, d-c reverse voltage 2.25 V, d-c forward current 10 ma	59793	R37	Resistor, fixed comp., 3.3 megohms, $\pm 10\%$, 1 W	
F1	Fuse, 2 amperes	3883	R38	Resistor, fixed comp., 390 ohms, $\pm 5\%$, 1 W	
J1, 2	Connector, input or output, 10 contacts, female	49032	R39	Resistor, fixed comp., 820 ohms, $\pm 5\%$, 1 W	
L1	Reactor, plate supply, iron core	59791	R40	Resistor, fixed comp., 270 ohms, $\pm 5\%$, 1 W	
L2	Reactor, heater supply, iron core	59792	R41, 42	Resistor, fixed comp., 2200 ohms, $\pm 10\%$, 1 W	
M1	Meter, db gain reduction, scale 0 to 20	213714	R43	Resistor, fixed, wire-wound, 6800 ohms, $\pm 10\%$, 10 W	93749
P1, 2	Plug, input or output, 10 contacts, male	51928	R44	Resistor, fixed comp., 56,000 ohms, $\pm 5\%$, 1 W	
R1A, B	Resistor, variable, dual 25,000 ohms per section	59779	R45	Resistor, fixed comp., 33,000 ohms, $\pm 5\%$, 1 W	
R2	Resistor, fixed, comp., 16 ohms, $\pm 5\%$, 1 W		R46	Resistor, fixed comp., 15,000 ohms, $\pm 5\%$, 1 W	
R3	Resistor, variable, wire-wound, 100 ohms, $\pm 10\%$, 4 W	50937	R47	Same as R3	
R4	Same as R2		R48	Same as R40	
R5	Resistor, fixed comp., 18,000 ohms, $\pm 5\%$, 1 W		R49, 50	Same as R44	
R6, 7	Resistor, fixed comp., 22,000 ohms, $\pm 5\%$, 1 W		R51	Resistor, fixed carbon, film type, 16,000 ohms, $\pm 1\%$, 1 W	211456
R8	Resistor, variable, wire-wound, 10,000 ohms, 4 W	212341	R52	Resistor, fixed comp., 150 ohms, $\pm 5\%$, 1 W	
R9, 10	Resistor, fixed comp., 4700 ohms, $\pm 5\%$, 1 W		R53, 54	Resistor, fixed comp., 100,000 ohms, $\pm 10\%$, 1 W	
R11	Resistor, fixed, comp., 3.3 megohms, $\pm 10\%$, 1 W		R55, 56	Resistor, fixed comp., 10,000 ohms, $\pm 10\%$, 1 W	
R12	Resistor, fixed comp., 240 ohms, $\pm 5\%$, 1 W		R57	Resistor, fixed, comp., 16 ohms, $\pm 5\%$, 1 W.	
R13	Resistor, fixed comp., 3900 ohms, $\pm 5\%$, 1 W				

LIST OF PARTS (Cont'd.)

SYMBOL NO.	DESCRIPTION	STOCK NO.
R14, 15	Same as R9	
R18, 19	Same as R6	
R20	Resistor, fixed carbon, film type, 1100 ohms, $\pm 1\%$, 1 W	59781
R21, 22	Resistor, fixed comp., 56 ohms, $\pm 5\%$, 1 W	
R23	Same as R20	
R24, 25	Resistor, fixed comp., 1200 ohms, $\pm 5\%$, 1 W	
S1A, B	Switch, BAL-LIM, rotary 2 sections, 3 positions, 4 circuits	59785
S2A, B	Switch, METER, rotary, 2 sections, 12 positions, 4 circuits	59786
S3	Switch, power, toggle, S. P. S. T., 3 amperes, 250 V, a-c or d-c	48791
SR1	Rectifier, selenium, bridge, input 18 V ac, output 12.5 V dc at .780 amps	59504
T1	Transformer, input	59787
T2	Transformer, interstage	59788
T3	Transformer, output	43679
T4	Transformer, power, 105/125, 210/250V, 50/60 cycles	229930

SYMBOL NO.	DESCRIPTION	STOCK NO.
R58	Same as R40	
R59	Resistor, fixed comp., 470 ohms, $\pm 10\%$, 1 W	
R60	Resistor, fixed comp., 82 ohms, $\pm 5\%$, 1 W	
R61, 62	Same as R21	
R63	Same as R3	
R64	Resistor, variable, wire-wound, 2 ohms, $\pm 10\%$, 4 W	59784
XF1	Holder, fuse	48894
XV1, 2	Socket, tube, 8 contacts	28413
XV3 to XV9	Socket, tube, 8 contacts	50367
	Knob	27990
	Handle, ejector, left	52403
	Handle, ejector, right	52404
	Lamp, meter	99931