



High Fidelity

INTERMATCHED
FOR SUPERB PERFORMANCE

MODEL SP-20
AMPLIFIER

RADIO CORPORATION OF AMERICA ENGINEERING PRODUCTION DEPARTMENT

HIGH FIDELITY EQUIPMENT

INSTRUCTIONS

Type SP-20 **High Fidelity Amplifier**

MI-12191

RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N. J.

ENGINEERING SPECIFICATIONS

Type

RCA SP-20 (Stock Identification MI-12191)

Description

20 watt Low Distortion Power Amplifier
for High Fidelity Reproduction of
Sound

Output Power and Distortion Ratings

20 watts at less than 0.5% harmonic
distortion from 30 to 15,000 cycles

6 watts at less than 0.5% harmonic
distortion from 20 to 20,000 cycles

Intermodulation distortion: less than
1.2% at rated output at 60 cps; and
7000 cps, amplitude ratio 4:1

Input Voltage for 20-Watt Output

From 0.45 to 10 volts depending on
setting of calibrated MAX. INPUT VOLT.
control

Frequency Response

At 10 watts output 20 to 20,000 cycles,
+0.3 db -0.2 db. Refer to figure 1

Noise Level

82 db below 20 watt level

-39 db with reference to 1.0 milliwatt

Feedback

23 db

Impedances and Voltages

Input Impedance: 100,000 ohms

Load Impedance: 4, 8, 16 ohms

Output Impedance: 0.6, 1.1, 2.0 ohms

Damping Factor: 6.7, 7.25, 8

Output Voltage: 8.9, 12.7, 17.9

Power Supply

Voltage: 105-125

Frequency: 50-60 cycles

Power Consumption: 175 watts

Tubes and Stages

1 RCA 12AU7 Input and Phase-Splitter

2 RCA 6AU6 Voltage Amplifier

4 RCA 6V6GT Power Output

1 RCA 5U4G Rectifier

Controls

Input Level - MAX. INPUT VOLT.

AC ON-OFF switch

Physical Dimensions and Weight

Length - 13-1/2 inches

Depth - 9 inches

Height - 7-1/4 inches

Weight - 26 lbs.

Cables and Plugs Supplied

Input - Standard RCA Phonoplug

Output - Cable and 4 prong Amphenol
plug 86 PM-4

Preamp. Power Supply - 5 prong Amphenol
plug 86 PM-5

Standard ac power cord 8 ft.

Power Supplied to External Loads

6.3 volts at 1.2 amperes AC

250 volts at 8.0 milliamperes DC

Underwriters' Laboratories Approved

Designed for use with

Preamplifier

Type SV-1, MI-12150

Loudspeakers

Type SL-8, MI-12457

Type SL-12, MI-12458

Type LC-1A, MI-11411-A

AM-FM Tuner

Type SVT-1, MI-12108

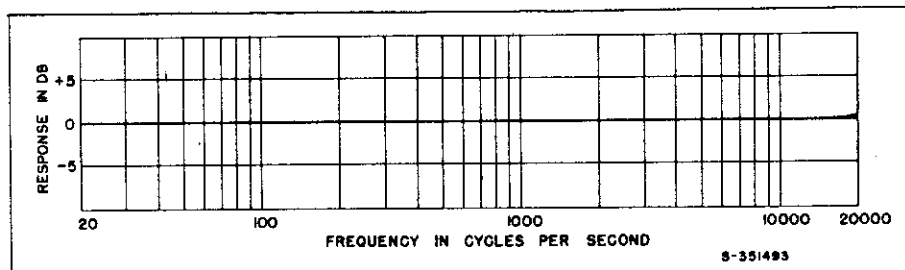


Figure 1 - Frequency Curve for SP-20 Amplifier

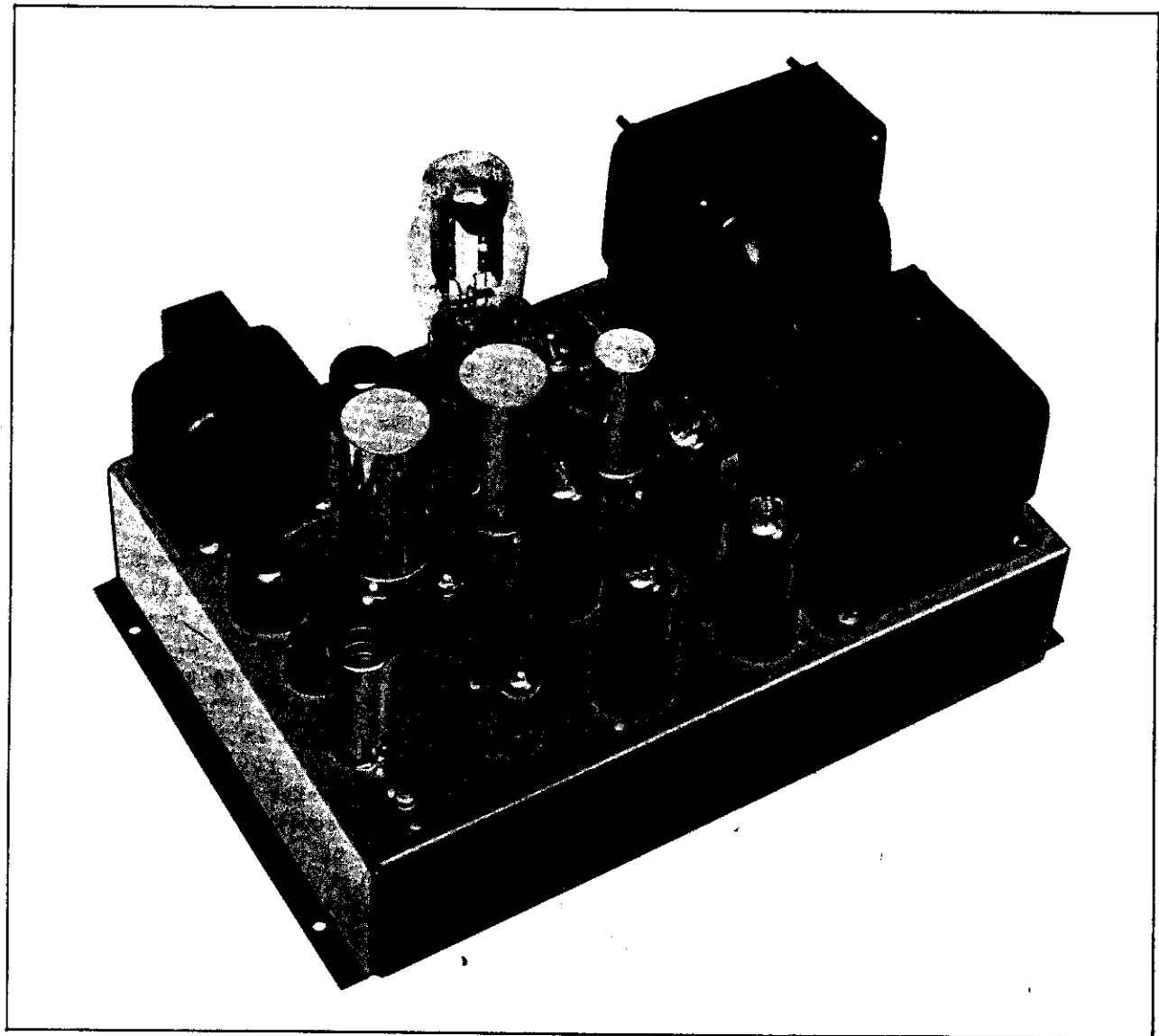


Figure 2 - 20 Watt Power Amplifier SP-20

DESCRIPTION

The Type SP-20 is a high-fidelity power amplifier designed to raise the audio output of a phono preamplifier, radio tuner, or TV set to a proper level for operating a loudspeaker. Featuring low distortion over the full audio range, the SP-20 can be used with the best loudspeaker without introducing any noticeable impairment of quality. The 20-watt power output of the unit is ample for a large sized living room, and includes all the reserve power required for the loudest musical passages.

Since the SP-20 is intended for remote control from a pre-amplifier or tuner, the only controls it has are an ON-OFF toggle switch, and a calibrated input control marked MAX INPUT VOLT. At installation, the toggle

switch is turned on and the control is set to the marked position corresponding to the highest audio input voltage that will normally be fed into the amplifier. The switch and control are not touched again except when the unit is being serviced. During operation, a-c power switching, volume, and tone adjustments are done at the preamplifier or tuner.

For connections to other units, three sockets are provided on top of the chassis; a phono-type jack marked INPUT, a five-prong socket marked PREAMP POWER, and a four-pronged socket marked OUTPUT. The PREAMP POWER socket provides filament and plate voltages for a separate preamplifier such as the RCA SV-1 Deluxe Preamplifier. Mating plugs for the INPUT and PREAMP POWER sockets and a cable and plug for the OUTPUT socket

are included with the amplifier. The output cable has leads for connection to a 4, 8, or 16-ohm speaker.

Associated High-Fidelity Equipment

For high-fidelity performance, all other units in the sound system must be of the same high quality as the SP-20 amplifier. The pre-amplifier or tuner should have an input selector switch, volume control, separate bass and treble controls, and a female socket for connecting the SP-20 power cord to the ON-OFF switch. The loudspeaker should have an extended frequency range, and the speaker cabinet should provide adequate baffling and damping.

Either a separate tuner and pre-amplifier, or a tuner with a built-in preamplifier may be used. Suggested RCA units are the ST-1 AM-FM Tuner and SV-1 Deluxe Preamplifier, or the SVT-1 Deluxe Tuner (with built-in pre-amplifier).

For the best response use the LC-1A 15-inch Loudspeaker or extended range speakers such as the SL-8 (8-inch) or SL-12 (12-inch) units. The SC-8, SC-12, and SC-15 Speaker Cabinets are available for housing these loudspeakers and the SP-20 amplifier.

To house the tuner, record changer and preamplifier in a single cabinet, the SE-1B (birch) and SE-1M (mahogany) Equipment Cabinets are available. A matched series of black finished housings with the necessary holes and cut-outs are also available. These housings permit great flexibility of installation since they allow ready and convenient mounting of the units in the SE-1 cabinets, or may be used as individual cabinets in other types of custom installations.

INSTALLATION

Unpacking

After unpacking the amplifier examine it carefully for any damage which may have occurred in shipping. If any sign of damage is found, immediately file a claim with the carrier stating the extent of the damage.

The following items should be included with the SP-20 amplifier chassis:

- 1 set of tubes
- 1 tube shield

1 bottom cover

1 spare fuse (Type Slo-Blo 3AG, 2 amp.)

1 package of hardware containing:

- 4 wood screws #8 x 1/2 RD.HD.
- 4 machine screws #8-32 x 3/8 RD.HD.
- 4 hexnuts #8-32
- 4 lockwashers #8
- 1 output cable with plug (4 prong)
- 1 preamp power plug (5 prong)
- 1 self-addressed warranty card

The enclosed warranty card explains the 90-day guarantee against defective parts. Please read the card, fill it out, and mail it as soon as possible.

Location

Locating the equipment requires no special considerations except that ventilation must be provided to carry off tube heat, and the unit must be within reach of the inter-connecting cables. Since the amplifier will be controlled remotely from the tuner or preamp it may be placed in a spot not easily accessible during operation, such as the bottom of a loudspeaker cabinet, or behind other units in an equipment cabinet. In the RCA SC-8, SC-12, or SC-15 Speaker Cabinets the best place to mount the amplifier is just below the port opening.

Mounting

To fasten the amplifier to a wooden mounting surface place the bottom plate supplied in the selected location and with an awl or other sharp tool mark centers for four wood screws through the holes in the plate. Place the amplifier on the plate and fasten it in place with the four wood screws supplied. If the unit is mounted in a loudspeaker cabinet be sure that the damping material and cables are dressed away from the tubes.

If the amplifier is merely to be placed on a shelf without bolting it down, fasten the bottom plate to the unit by inserting the four machine screws provided into the holes from the bottom and placing the lockwashers and hexnuts on the screws.

Installing Tubes

Before installing the tubes be sure that the ac power switch is turned off. Seat the

tubes firmly in their sockets according to the markings on the chassis and place the tube shield on the 12AU7 tube.

Connections to Type SV-1 Preamplifier or SVT-1 Tuner

To connect the amplifier to the SV-1 Preamplifier, insert the phono plug on the cable from the preamplifier into the INPUT jack, and the five-prong plug on the same cable into the jack marked PREAMP POWER on the SP-20 chassis. Connect the ac power plug of the SP-20 to the female receptacle on the preamp cable. Connect the ac power cord of the preamplifier to a 115-volt 60-cycle ac power source. For connections between the preamplifier and the tuner and phonograph refer to the instruction book supplied with the preamplifier, IB-24650.

If the Type SVT-1 Deluxe Tuner is used instead of the ST-1 Tuner and SV-1 Preamplifier, merely connect the shielded audio output cable of the tuner to the INPUT jack on the amplifier and plug the ac cord of the amplifier into one of the power receptacles on the back of the tuner. For other connections to the tuner see instruction book IB-24653 supplied with the tuner.

Connections to Preamplifiers or Tuners, Not in RCA High-Fidelity Line

For use with equipment not in the RCA high-fidelity line, a phono plug for the INPUT jack and a five-prong plug for the PREAMP POWER socket are provided. The five-prong plug is needed only if the preamplifier does not have its own power supply, and the phono plug only if the shielded audio cable from the preamplifier or tuner is not equipped with a similar plug.

To connect the five-prong plug to the filament and plate power cable from the preamplifier, strip the insulation off the ends of the cable leads for a distance of about 5/16 of an inch and tin the leads. Pull the outer shell off of the plug and insert the end of the cable through the rubber grommet in the shell from the rear. From the back of the plug, insert the B+ lead into pin number 2, the B- lead into pin number 4, the two filament leads into pins number 1 and 5 and the chassis ground lead into pin number 3

(See schematic diagram). Solder all leads securely by heating the pins thoroughly and inserting solder into the front of the pins until they are filled. After connections are completed insert the plug section into the shell and press it firmly into place. Then insert the plug into the PREAMP POWER jack on the amplifier chassis.

CAUTION: Make certain that the power requirements of the preamplifier do not exceed 6.3 volts at 1.2 amperes ac (filament) and 250 volts at 8 ma dc (plate).

To connect the phono plug to a shielded audio output cable from a tuner or preamplifier, strip the braided metal shield off the end of the cable for a distance of 5/8 of an inch, and the insulation of the inner wire for about 3/8 of an inch. Tin the end of the inner wire and insert it into the hollow pin of the plug from the back. Solder the wire in place by heating the pin thoroughly and inserting solder into the pin from the front until it is filled. Solder the braided shield of the cable to the outer section of the plug at the bottom. Make certain that the shield does not touch the inner pin or the uninsulated part of the inner wire. Finally insert the plug into the INPUT jack on the amplifier chassis.

Loudspeaker Connections

Before connecting the output cable to the loudspeaker determine the impedance of the speaker. The RCA LC-1A speaker has a 16-ohm impedance, and the SL-8 and SL-12 have 8-ohm impedances. For other loudspeakers the impedance is usually marked on the speaker or given in the instructions supplied by the manufacturer.

The output cable supplied with the amplifier has four leads color-coded as follows: black-common; brown-4 ohms; white-8 ohms; red-16 ohms. Connect the black lead to one of the speaker terminals, and connect the lead corresponding to the speaker impedance to the other terminal. Wrap the two unused leads individually with insulating tape and connect the plug on the cable to the OUTPUT jack on the amplifier.

INITIAL ADJUSTMENTS

To complete the installation, turn the power toggle switch to the ON position and

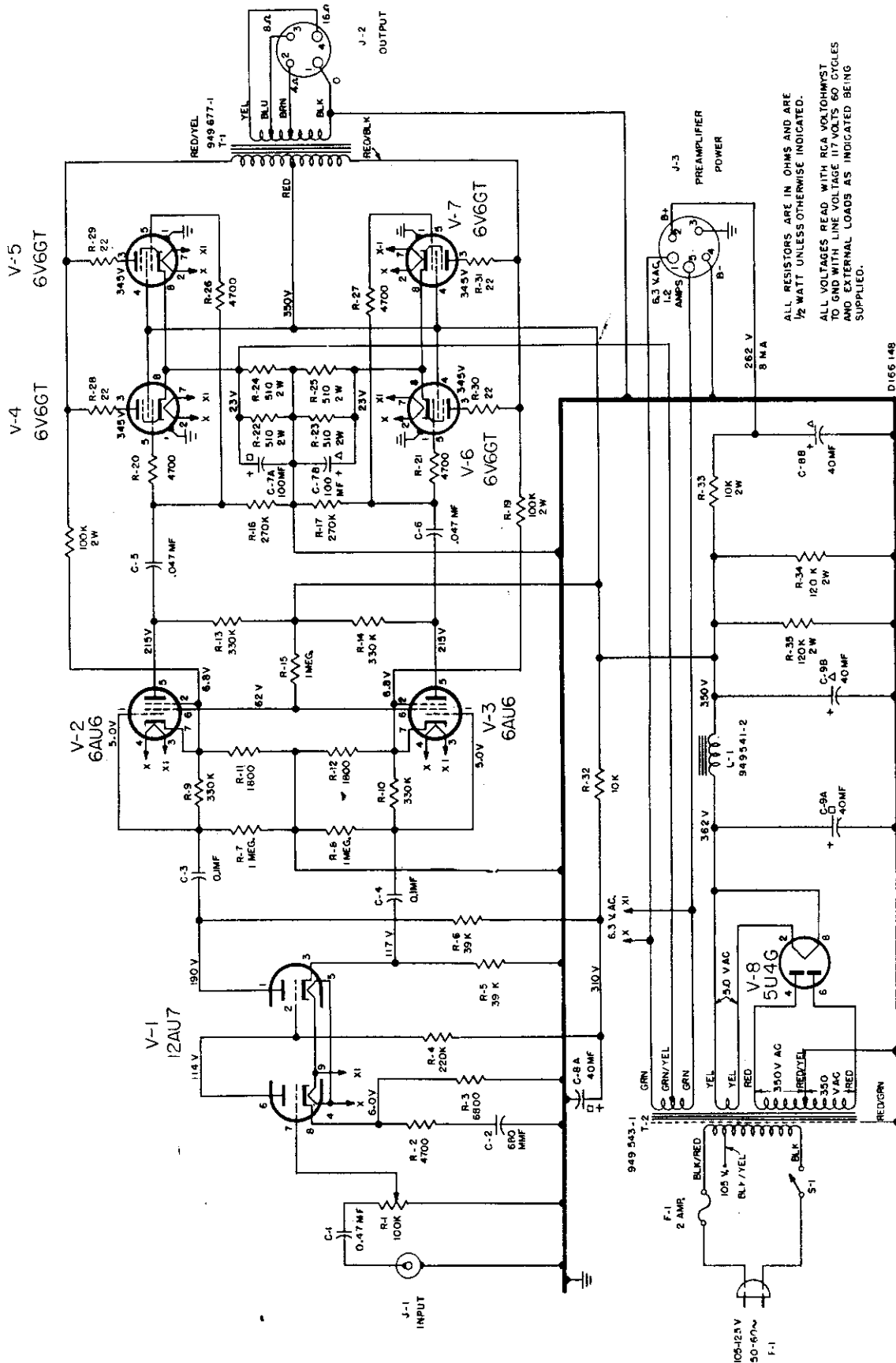


Figure 3 - Schematic of SP-20 Amplifier

set the calibrated MAX INPUT VOLT control to the marked position corresponding to the maximum undistorted output voltage of the preamplifier or tuner. To find this voltage rating for equipment not in the RCA high-fidelity line refer to the technical data supplied by the manufacturer. For the RCA SV-1 Preamplifier or SVT-1 Tuner set the control at the 0.5 v position.

OPERATION

After installation the amplifier becomes an integral part of the sound system, and the switch and input control need not be touched again except when servicing is required. During operation use the switches and controls on the preamplifier or tuner to turn the amplifier on or off and make volume and tone adjustments.

Circuit Description

The High-Fidelity 20-Watt Amplifier is a four stage resistance capacitance coupled amplifier featuring exceptionally low distortion, excellent frequency response characteristic, and inherent feedback stability. The input stage, comprising one half of a twin triode tube type 12AU7, is directly coupled to the other half of the 12AU7 tube which functions as a phase inverter of the split load type. Balance of the two output signals of the phase splitter is maintained by two precision resistors, R5 and R6. These balanced signals are fed to push-pull voltage amplifier tubes of the type 6AU6. Output of the 6AU6 tubes are fed to push-pull power amplifier tubes of the type 6V6GT. The output transformer T1 is tapped for load impedances of 4, 8, and 16 ohms. Inverse feedback from the primary of the output transformer is applied through resistance networks, to the cathodes of the 6AU6 tubes. These resistance networks, consisting of R18 and R11, R19 and R12, are composed of precision resistors which maintain constant feedback.

The self-contained power supply consists of a power transformer T2 and the high voltage full wave rectifier tube type 5U4G with associated filter components. Well filtered DC is available from this power supply for an external preamplifier if desired. (Refer to figure 4 for the location of components.)

SERVICE

The SP-20 Amplifier requires a minimum of service. Standard procedures used in servicing amplifiers will be applicable to this unit. The socket terminal voltages are shown in the schematic, figure 3. Be sure that all tubes are firmly seated in the socket and all cables are properly dressed away from the tubes.

Fuse Replacement

When replacing a blown fuse, make sure that the replacement fuse is of the same type and rating. One spare fuse, Slo-Blo Type 3AG 2 amp, is supplied.

Tube Replacement

The tube types are marked on each tube and are marked on the chassis identifying each socket to facilitate installation and replacement of tubes. Tubes may be ordered separately by type number.

Replacement Parts

The following parts list is included to provide identification when ordering replacement parts. Order from your local RCA Replacement Parts Dealer giving the Stock Number and Description of the parts wanted.

LIST OF PARTS

Symbol No.	Description	Stock No.
C1	Capacitor, paper dielectric, tubular, .47 mf, $\pm 10\%$, 200 v	73787
C2	Capacitor, mica dielectric, 680 mmf, $\pm 10\%$, 500 v	39648
C3,4	Same as C1	
C5,6	Capacitor, paper dielectric, tubular, .047 mf, $\pm 10\%$, 400 v	73553
C7	Capacitor, dry electrolytic dual, 100 mf, -10% , $+250\%$, 50 v D.C. operating temp. 85°C	98645
C7A,B	Capacitor, 100 mf, 50 v (Part of C7)	

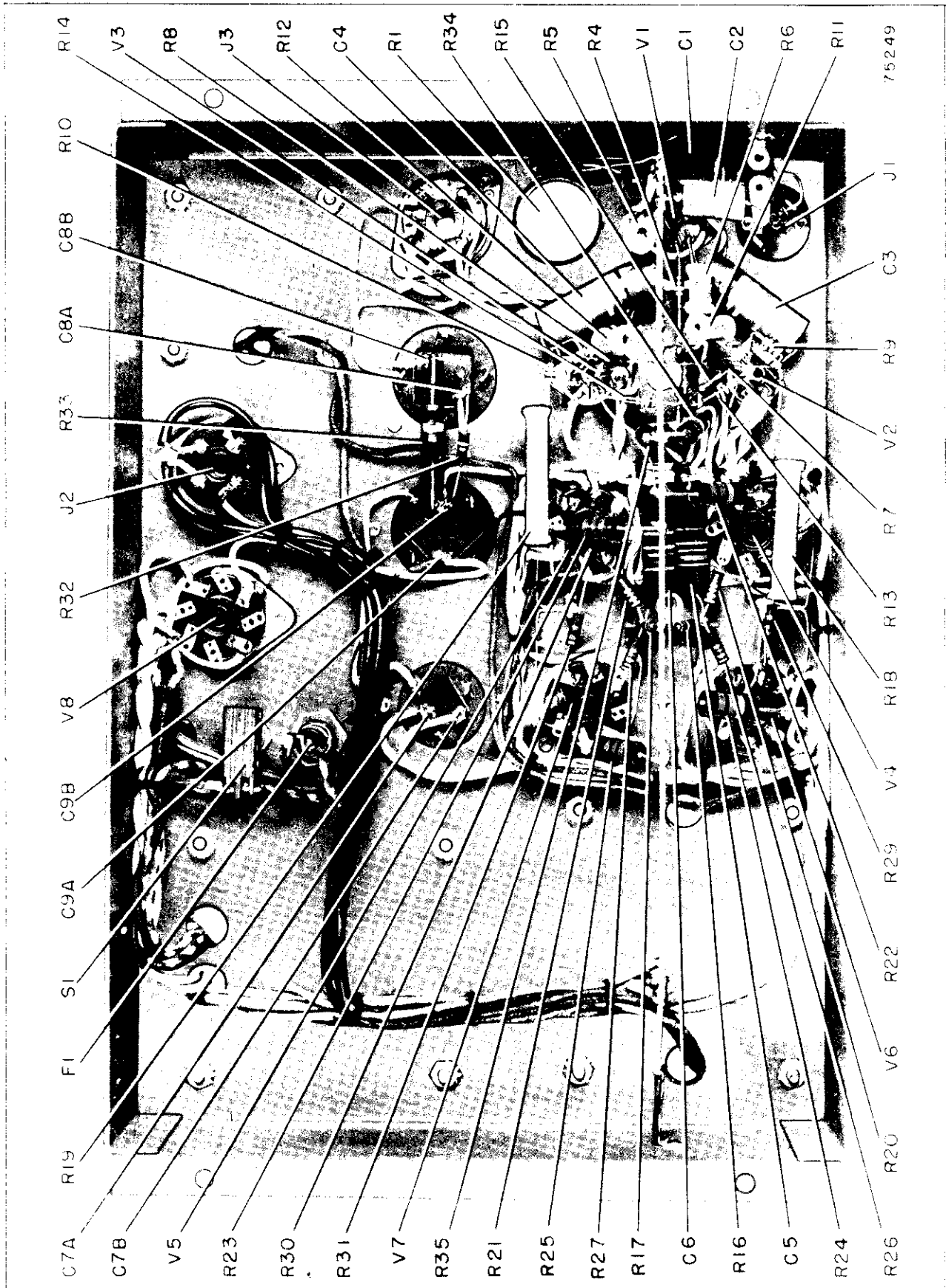


Figure 4 - Bottom View of Chassis