

W1HS

BROADCAST AND TELEVISION EQUIPMENT



Instructions

RADIO CORPORATION OF AMERICA, Industrial-Electronic Products

REGULATED POWER SUPPLY

TYPE WP-33B

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TYPE WP-33B

MI-26085B

INSTRUCTIONS

RADIO CORPORATION OF AMERICA

BROADCAST AND COMMUNICATIONS PRODUCTS, CAMDEN, N. J.

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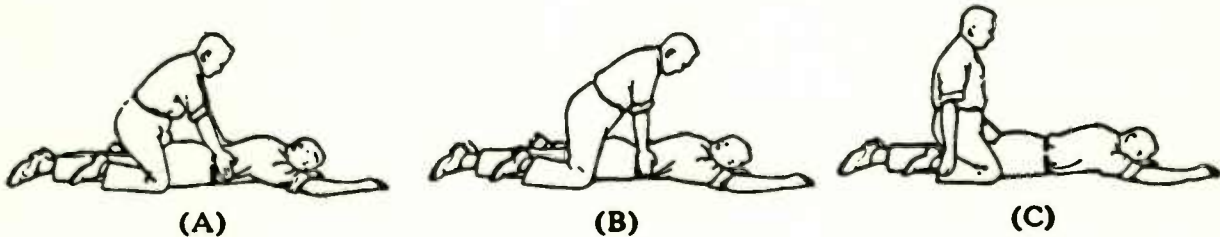
WARNING

THE VOLTAGES EMPLOYED IN THIS EQUIPMENT ARE SUFFICIENTLY HIGH TO ENDANGER HUMAN LIFE AND EVERY REASONABLE PRECAUTION HAS BEEN OBSERVED IN DESIGN TO SAFEGUARD THE OPERATING PERSONNEL. THE POWER SHOULD BE REMOVED COMPLETELY BEFORE CHANGING TUBES OR MAKING INTERNAL ADJUSTMENTS.

FIRST AID IN CASE OF ELECTRIC SHOCK

1. PROTECT YOURSELF with dry insulating material.
2. BREAK THE CIRCUIT by opening the power switch or by pulling the victim free of the live conductor.

DON'T TOUCH VICTIM WITH YOUR BARE HANDS until the circuit is broken.



3. LAY PATIENT ON STOMACH, one arm extended, the other arm bent at elbow. Turn face outward resting on hand or forearm.
4. REMOVE FALSE TEETH, TOBACCO OR GUM from patient's mouth.
5. KNEEL STRADDLING PATIENT'S THIGHS. See (A).
6. PLACE PALMS OF YOUR HANDS ON PATIENT'S BACK with little fingers just touching the lowest ribs.
7. WITH ARMS STRAIGHT, SWING FORWARD gradually bringing the weight of your body to bear upon the patient. See (B).
8. SWING BACKWARD IMMEDIATELY to relieve the pressure. See (C).
9. AFTER TWO SECONDS, SWING FORWARD AGAIN. Repeat twelve to fifteen times per minute.
10. WHILE ARTIFICIAL RESPIRATION IS CONTINUED, HAVE SOMEONE ELSE:
 - (a) Loosen patient's clothing.
 - (b) Send for doctor.
 - (c) Keep patient warm.
11. IF PATIENT STOPS BREATHING, CONTINUE ARTIFICIAL RESPIRATION. Four hours or more may be required.
12. DO NOT GIVE LIQUIDS UNTIL PATIENT IS CONSCIOUS.

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TECHNICAL SUMMARY

ELECTRICAL CHARACTERISTICS

Power Supply	105-129 volts, 50/60 cycles
Power Consumption (full load)	400 watts (maximum)
D.C. Output Voltage	260-295 volts
D.C. Output Current	250 milliamperes minimum to 600 milliamperes maximum
D.C. Regulation	Less than 0.2 volt variation from min. to max. load
Ripple (maximum)	Less than 0.01 volt peak to peak

TUBE COMPLEMENT

Rectifier, V4 to V7, inclusive	RCA-5R4GY
Voltage Regulators, V1 to V3, inclusive	RCA-6AS7G
Voltage Regulators, V9 and V10	RCA-OD3
Regulator Control, V8	RCA-6SL7GT
Starting Protector, V11	RCA Stock No. 16864

MECHANICAL SPECIFICATIONS

Height	14 inches
Width	18 $\frac{7}{8}$ inches
Depth	9 $\frac{5}{8}$ inches
Weight	82 pounds

EQUIPMENT

The RCA type WP-33B Regulated Power Supply, identified by stock number MI-26085B, includes the following items:

1. Regulated Power Supply, MI-26085B.
2. Set of RCA tubes (see tube complement).

3. Instruction Book, IB-36010-6.

The following item is available on separate order but is not required:

1. Special meter, MI-21200-C1.

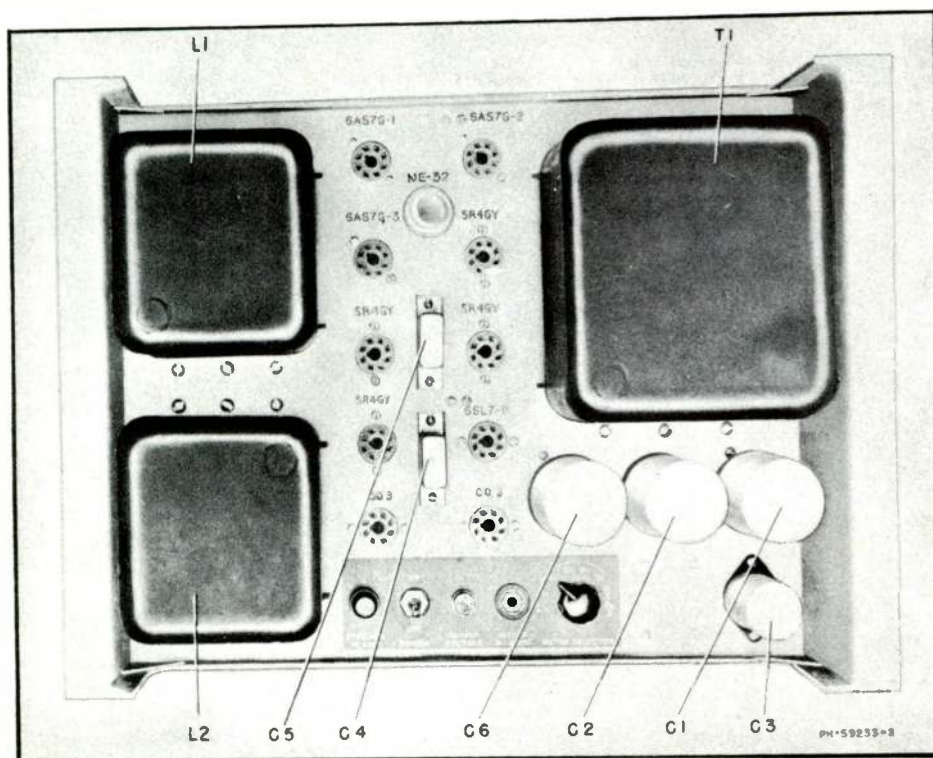


Figure 1—Type WP-33B Regulated Power Supply (Front View)

DESCRIPTION

GENERAL.—The RCA type WP-33B Regulated Power Supply is a general purpose, d-c power supply device, intended for television camera chains, laboratory or other applications where a well regulated, d-c power supply with a maximum output of 600 milliamperes at 260-295 volts, is required.

The unit is built on a recessed type chassis which results in good accessibility. The chassis is designed for mounting on a standard 19-inch relay rack. Front and rear views of the unit are shown in Figures 1, 4, and 5.

ELECTRICAL.—The RCA type WP-33B Regulated Power Supply is designed to operate from a 105-129 volt, 50-60 cycle power supply. Three taps on the primary of the power transformer have been provided to accommodate the above range of supply voltages. By using the primary tap which most nearly corresponds to the value of the supply line voltage, a constant-voltage d-c output that is independent of load or minor variations of the line voltage is maintained. A maximum output of 600 milliamperes at a voltage manually adjustable between 260 and 295 volts can be obtained.

Figure 6 shows the schematic circuit diagram of the Regulated Power Supply. Fundamentally this circuit consists of a full-wave rectifier with a two-stage, reactor-input filter and the interdependent d-c voltage regulator stages.

The full-wave rectifier operates conventionally. Four RCA type 5R4GY, full-wave rectifier tubes are used. The two plates of each of these tubes

are connected together and the tubes themselves are connected in parallel pairs. In this way, each pair (i.e. V4-V5 and V6-V7) functions as a half-wave rectifier. The d-c output from the rectifier tubes is filtered by the two-stage, reactor-input type filter consisting of chokes, L1 and L2 and capacitors, C1 and C2.

The d-c voltage regulator consists of six tubes which are used as follows: V9 and V10 are RCA type OD3, two-element, gaseous, voltage regulator tubes which act to maintain constant potentials on the d-c amplifier, V8. V8 is an RCA type 6SL7GT, dual-triode that is used as a two-stage, d-c amplifier which controls the three regulator tubes, V1, V2 and V3. V1, V2 and V3 are RCA type 6AS7G, twin-triode tubes which are connected in a parallel group in order to pass the maximum 600 milliamperes of output current. A neon bulb (V11) is connected between the grids and cathodes of the 6AS7G voltage regulator tubes to protect their grids when the unit is first turned on. The bulb is extinguished when the unit has warmed up.

This parallel group is connected in series with the output of the unit. Effectively they can be regarded as a single tube, as shown in Figure 2, which is a simplified schematic of the voltage regulator section. All by-pass and filter capacitors have been excluded from the diagram in order to simplify it. The operation of the regulator section of the Power Supply, as shown in Figure 2, is described in the following paragraphs.

The regulator tubes, V1, V2 and V3, function

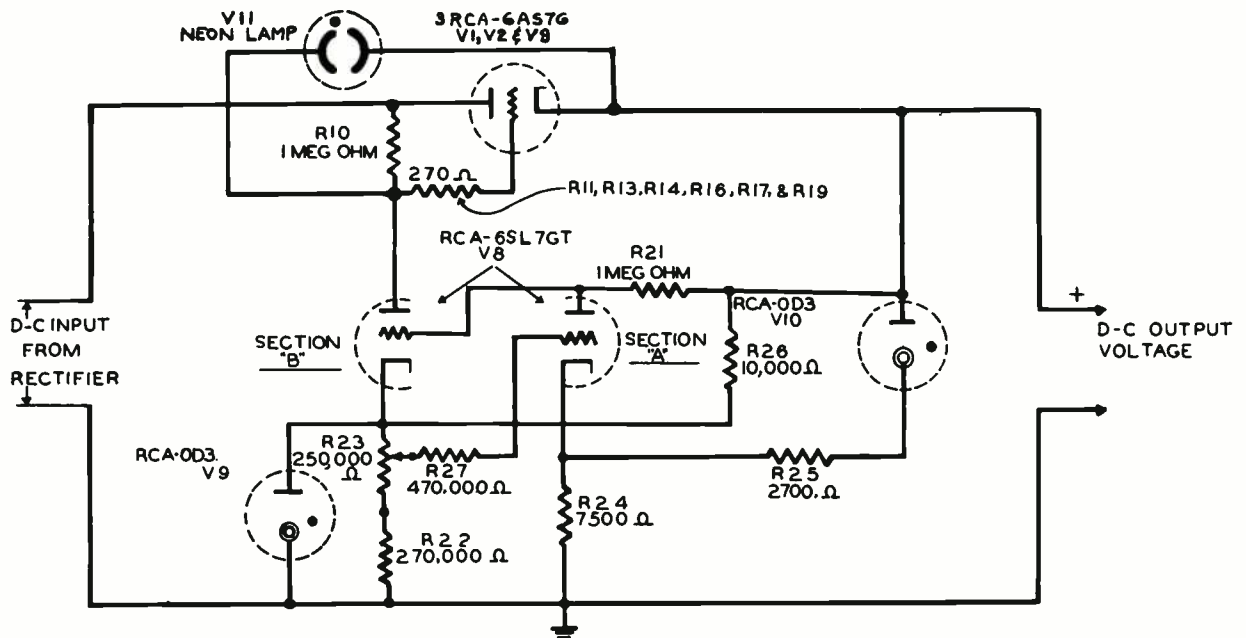


Figure 2—Voltage Regulating Circuit (Simplified Schematic, M-443754)

collectively as a variable resistance in series with the load. The effective value of this resistance (the plate to cathode resistance of the tubes) is determined by the grid voltage that is simultaneously applied to each of them. This grid voltage is determined by the voltage appearing at the plate of section "B" of the d-c amplifier tube, V8. The cathode of section "B" is maintained at a fixed potential with respect to ground by the gaseous voltage regulator tube, V9.

The regulating action of V9 is automatic and characteristic of the RCA type OD3 tube which is used. The OD3 is a two-element, gas-filled tube, the internal resistance of which varies inversely with the voltage applied across the elements of the tube. As a result the voltage drop across the tube is approximately constant irrespective of variations of the load current or variations of the voltage applied. The internal resistance of the tube is such that the voltage across the tube is constantly 150 volts, after the initial breakdown potential of 180 volts has been applied.

Inasmuch as the cathode of section "B" of the d-c amplifier tube, V8, is maintained at a fixed value by the action of the regulator tube V9, the voltage appearing at the plate of this section is governed solely by the grid voltage. The grid voltage applied to section "B," is the same as the voltage that appears at the plate of section "A," since they are connected together. The cathode of section "A" is maintained at a fixed potential with respect to the high side of the output by the action of voltage regulator tube, V10. (V10 is the same type tube and operates exactly like V9.) The voltage appearing at the plate of section "A" is determined by the grid voltage. This grid voltage is manually set by the OUTPUT VOLTAGE potentiometer, R23, which is used to adjust the output voltage of the Regulated Power Supply to any desired value within the range of 260 to 295 volts. Once the grid voltage on section "A" of the d-c amplifier tube, V8, has been set by this potentiometer, it remains at a fixed potential due to the action of the regulator tubes V9 and V10. Therefore, the only way the effective grid voltage on this section can be changed is by a change of the potential across resistor, R24.

The overall functioning of the regulator circuit may best be explained by considering its reaction to a variation in line voltage or load. Assume that the voltage between the high side of the output and ground is reduced at some particular instant. This would cause a reduction of the potential across resistor R24, thereby reducing the negative grid voltage applied to section "A" of the d-c amplifier tube, V8. As a result, the plate current which flows through the plate load resistor R21, is increased. Thus, the voltage drop

across R21, is increased and the plate voltage at the tube is decreased. This plate voltage is applied directly to the grid of section "B," therefore the grid of that section is made more negative and the plate current which flows through the plate load resistor, R10, is decreased. Hence, the voltage drop across R10 is decreased and the plate voltage at the tube is increased. An increase in the plate voltage of section "B" of the d-c amplifier tube, V8, drives the grids of the regulator tube (V1, V2 and V3) more positive and thus reduces the effective cathode-plate resistance. This results in a reduction of the voltage drop across the regulator tube (V1, V2 and V3) thereby increasing the voltage at the output, and thus compensating for the initial reduction originally caused by the increased load or lower line voltage. Inasmuch as this action occurs almost instantaneously, the result is a constant output voltage, independent of load or minor line variations, at all times. This regulating action also acts on ripple voltage and serves to reduce hum to the extent that the output of the unit is almost free from hum.

A jack, J2, provides means for connecting the current and voltage indicating meter, MI-21200-C1, which is available on separate order. An eight-position switch, S1, together with the associated voltage multiplier and shunt resistors, makes it possible for the special meter to indicate output current, output voltage, or the plate current of each section of the voltage regulator tubes, V1, V2 and V3, without interrupting the operation of the Regulated Power Supply. With the MI-21200-C1 meter plugged into the jack marked METER, on the front of the Regulated Power Supply, the following measurements can be made with the METER SELECTOR switch (also on the front of the unit) in its various positions:

Position of Switch	Meter Indicates
1	I—V1—A (6AS7G)
2	I—V1—B (6AS7G)
3	I—V2—A (6AS7G)
4	I—V2—B (6AS7G)
5	I—V3—A (6AS7G)
6	I—V3—B (6AS7G)
7*	I./5*
8†	E./2†

* The internal shunt resistance of the Power Supply provides full scale deflection of the meter at 750 MA. Therefore the meter indicates 1/5 of the output current, i.e., the output current equals five times the meter-scale reading.

† The internal voltage multiplier resistors of the Power Supply gives full scale deflection at 300 volts. Therefore the meter indicates 1/2 the output voltage, i.e., the output voltage equals twice the meter-scale reading.

INSTALLATION

LOCATION.—The RCA type WP-33B Regulated Power Supply should be mounted on a standard relay rack in the space most convenient with respect to the adjoining equipment.

WIRING.—The a-c line voltage should first be checked with a reliable voltmeter in order to ascertain which primary tap of the power transformer should be used. Normally the lead to the power transformer primary is connected to terminal number 3 (on the bottom of the power transformer) for operation at a line voltage of approximately 117 volts. Should the line voltage be nearer 125 volts, this connection must be unsoldered from terminal number 3 and soldered to terminal number 4, or, if the line voltage is nearer 109 volts, the connection should be soldered to terminal number 2.

The a-c input line connections to the Regulated Power Supply are made through connector, J3, which is a male connector, located at the rear of the unit. The a-c supply line must, therefore, be terminated with a standard female connector. All

other connections to the Regulated Power Supply are made through connector receptacle, J1, located at the rear of the unit. A six-contact, connector plug, J4, is supplied with the equipment. Figure 6 shows the connections to the various terminals of this plug. Connections for an interlock circuit are available through terminals 7 and 8. This circuit operates in conjunction with the POWER switch and is intended for use when the Regulated Power Supply is used with equipment which includes a high voltage power supply. A connection for a centering control is available through terminal 11 of connector plug J4. If a centering control is to be used, it is necessary to remove the wire jumper across the terminals of the 1000 mfd. capacitor, C3, before connecting a low resistance potentiometer (approximately 20-30 ohms) between terminal number 11 of connector plug J4, and ground. By doing this, output current from the filter of the Regulated Power Supply is passed through the low resistance potentiometer which can then be used as a centering control.

OPERATION

To place the RCA type WP-33B Regulated Power Supply in operation, put the POWER switch, located on the front of the unit, in the "ON" position. To check the d-c output voltage, plug the MI-21200-C1 meter into the METER jack and turn the METER SELECTOR switch to position number 8, or connect a 1,000 ohm-per

volt d-c voltmeter to the positive terminal number 10 of connector receptacle J1 and ground. Adjust the output voltage to the desired value within the available range (260 to 295 volts) by turning the OUTPUT VOLTAGE control, located on the front of the unit, in the proper direction.

MAINTENANCE

With ordinary care little attention will be required to keep the Regulated Power Supply in operation; however, the following steps should be taken to insure a continuation of optimum performance. The unit should be kept free of dust and dirt. The periodic use of a small electric hand blower is helpful in this respect. Tube failure and deterioration should be anticipated, so far as possible, by keeping a log of tube conditions. All readings should be recorded and checked against those previously obtained under the same conditions. A ten-percent reduction in plate current usually indicates a loss of filament-

emission. This may be checked by replacing the suspected tube with a new one and again noting the plate current. Regulator tubes, V1, V2 and V3 may be checked, without interrupting the operation of the Power Supply, with the MI-21200-C1 meter. It should be noted that each section of the regulator tubes V1, V2 and V3, will carry 1/6 of the total output current as indicated at position 7 of the METER SELECTOR switch. Any excessive deviation in the current indication of one section from the others is, therefore, indicative of a faulty tube.

SERVICE HINTS

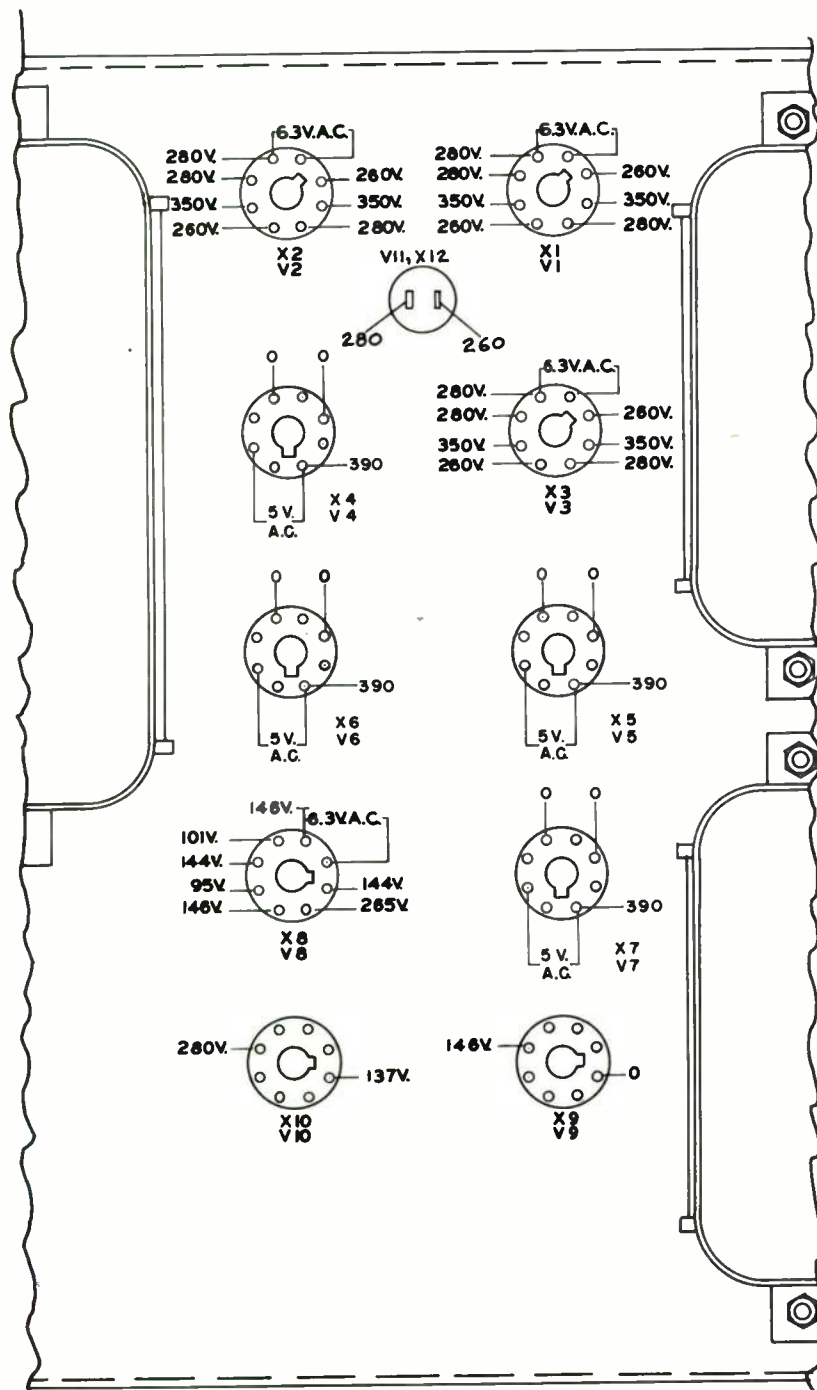
1. In case the supply line fuse, F1, blows out, check the circuit carefully for shorts before replacing the fuse. Always replace the fuse with one of the same rating (10 amperes).
2. **EXCESSIVE HUM.** — Excessive hum may be caused by operating the unit outside of its regulating limits.

- Excessive hum can be caused by a defective rectifier tube, V4, V5, V6 or V7.
- Excessive hum accompanied by high output voltage can be caused by a defective d-c amplifier tube, V8.
3. **HIGH VOLTAGE.** — High voltage may be caused by a defective voltage regulator tube, V9

or V10, or by a defective d-c amplifier tube, V8.

4. LOW VOLTAGE.—Low voltage may be caused by a defective rectifier tube, V4, V5, V6 or V7; by a defective voltage regulator tube V1, V2 or V3; or by a defective d-c amplifier tube, V8.

5. TUBE VOLTAGES. — The voltages shown in Figure 3 are those at which the various tubes operate under conditions as indicated. A twenty-percent deviation from these values, when taken with a 20,000 (or higher) ohms-per-volt voltmeter, is indicative of some trouble in the unit.



NOTE:— ALL VOLTAGES MEASURED TO GROUND UNLESS OTHERWISE INDICATED.

— ALL VOLTAGES D.C. UNLESS OTHERWISE INDICATED.

— VOLTAGE VALUES TAKEN AT: 117 V.A.C. INPUT, 280 V.D.C. OUTPUT, 600 MA LOAD.

— METER USED: RCA "VOLT-OHMYST"

Figure 3—Socket Voltage Diagram (P-728971)

REPLACEMENT PARTS LIST

When ordering replacement parts, please give Symbol, Description, and Stock Number of each item ordered.

The part which will be supplied against an order for a replacement item may not be an exact du-

plicate of the original part; however, it will be a satisfactory replacement, differing only in minor mechanical or electrical characteristics. Such differences will in no way impair the operation of the equipment.

SYMBOL NO.	DESCRIPTION	STOCK NO.
C1, C2	Capacitor—Fixed Oil, 9 mfd +20% -10%, 600 volts	51593
C3	Capacitor—Dry Electrolytic, 1000 mfd, 25 volts	59891
C4, C5	Capacitor—Fixed Oil, 1 mfd ±10%, 600 volts	56124
C6	Same as C1	
C7	Capacitor—Fixed Oil, 0.1 mfd ±10%, 400 volts	56184
C8	Capacitor—Fixed Oil, 0.01 mfd ±10%, 600 volts	51628
C9	Capacitor—Fixed, Paper Oil, 0.5 mfd ±10%, 600 volts	59892
F1	Fuse—5 amperes	37883
J1	Connector—Female—6 Contact	51594
J2	Jack—Meter Jack	18466
J3	Connector—Male—2 Contact	48743
J4	Connector—Male—6 Contact	51595
L1, L2	Reactor—Filter	51587
R1	Resistor—Fixed Wire Wound, 50 ohms, ±2%, 1 watt	51596
R2	Resistor—Fixed Carbon Film, 0.2 megohm, ±1%, 1 watt	56085
R3	Resistor—Fixed Wire Wound, 2 ohms, ±2%, 1 watt	51597
R4 thru R9	Resistor—Fixed Wire Wound, 10 ohms, ±2%, 1 watt	51598
R10	Resistor—Fixed Composition—1 megohm, ±10%, 1 watt	71993
R11	Resistor—Fixed Composition—270 ohms, ±10%, 1 watt	30497
R12	Resistor—Fixed Composition—10 ohms, ±10%, 1 watt	512010
R13, R14	Same as R11	
R15	Same as R12	
R16, R17	Same as R11	
R18	Same as R12	
R19	Same as R11	
R20	Resistor—Fixed Composition—1000 ohms, ±10%, 1 watt	71916
R21	Same as R10	
R23	Resistor—Variable—Carbon—250,000 ohms, ±10%, 2 watts	51589
R24	Resistor—Fixed Wire Wound—7500 ohms, ±10%, 10 watts	76266
R25	Resistor—Fixed Composition—2700 ohms, ±10%, 2 watts	33855
R26	Resistor—Fixed Wire Wound—10,000 ohms, ±10%, 10 watts	51869
R27	Resistor—Fixed Composition—470,000 ohms ±10%, 1 watt	72521
R28	Resistor—Fixed Composition—150,000 ohms, ±10%, 1 watt	31895
R29	Resistor—Fixed Composition—270,000 ohms, ±10%, 1 watt	19232
R30	Resistor—Fixed Composition—220,000 ohms, ±10%, 1 watt	512422
R31	Resistor—Fixed Wire Wound—500 ohms, ±5%, 5 watts	48201
R32	Resistor—Fixed Composition—100,000 ohms ±10%, 2 watts	522410
S1	Switch—Meter Selector Switch, Rotary—2 Section, 8 Position, Single Pole, Non-Shorting	51590
S2	Switch—Power "ON-OFF"—Toggle Switch DPST, 6 amperes, 250 volts	69949
T1	Transformer—Power	57436
X1 thru X10	Socket—Tube—8 Contact	68590
X11	Holder—Fuse Holder	58933
X12	Socket—Lamp	43163
	Insulator—Cup Insulator for J2	56177
	Knob—Meter Selector Switch	30075
	Lamp—Neon—1 watt	16864

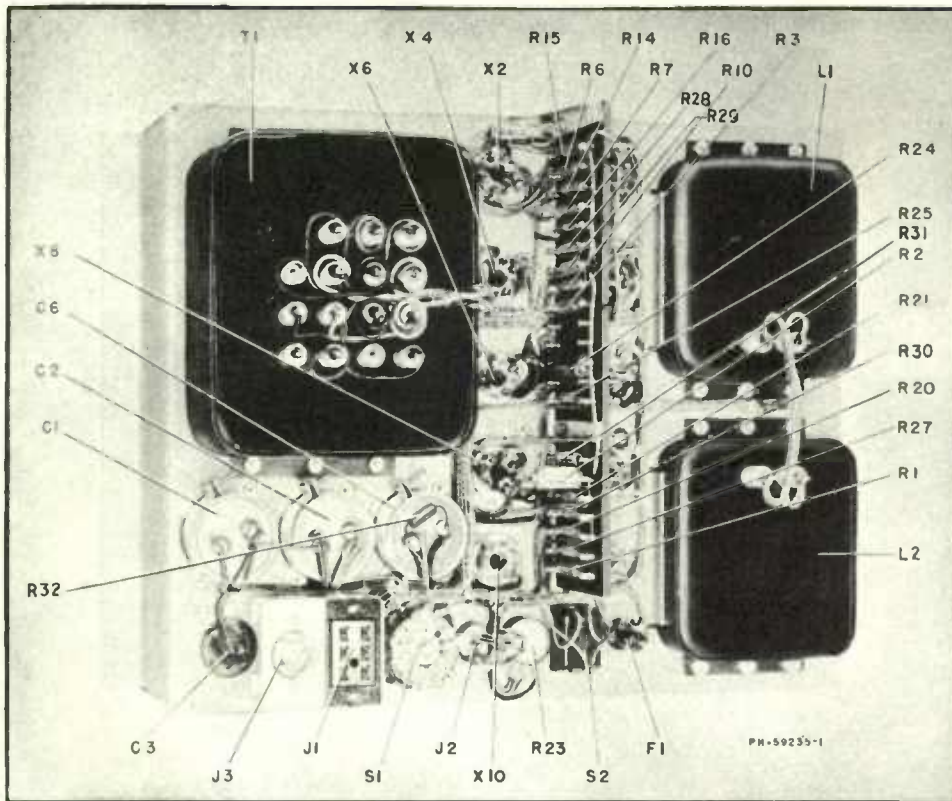


Figure 4—Type WP-33B Regulated Power Supply (Left Oblique Rear View)

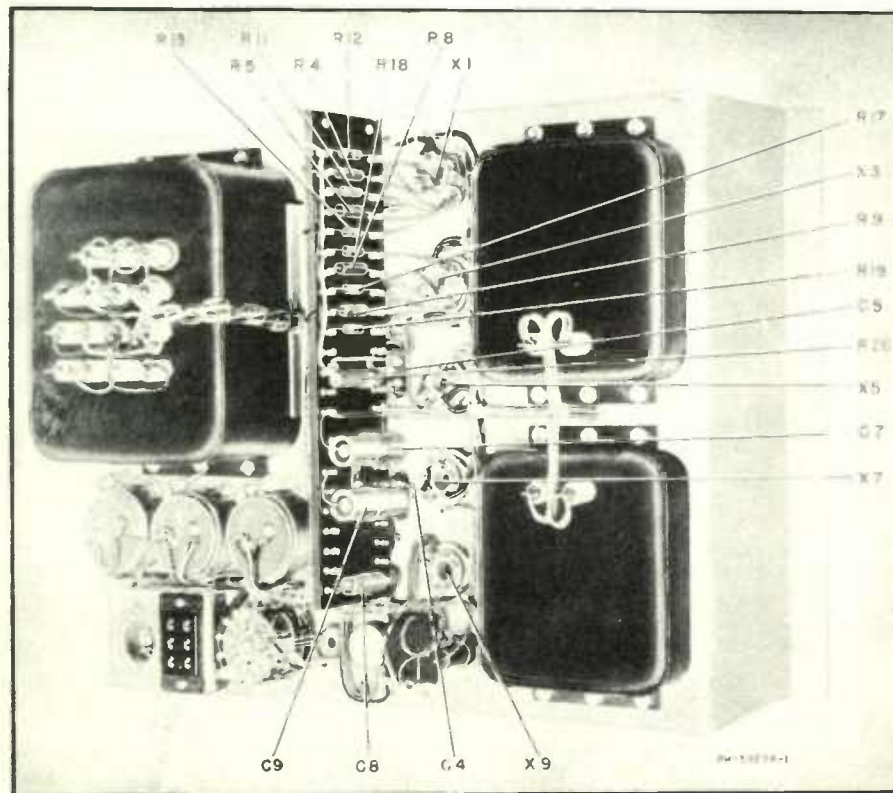
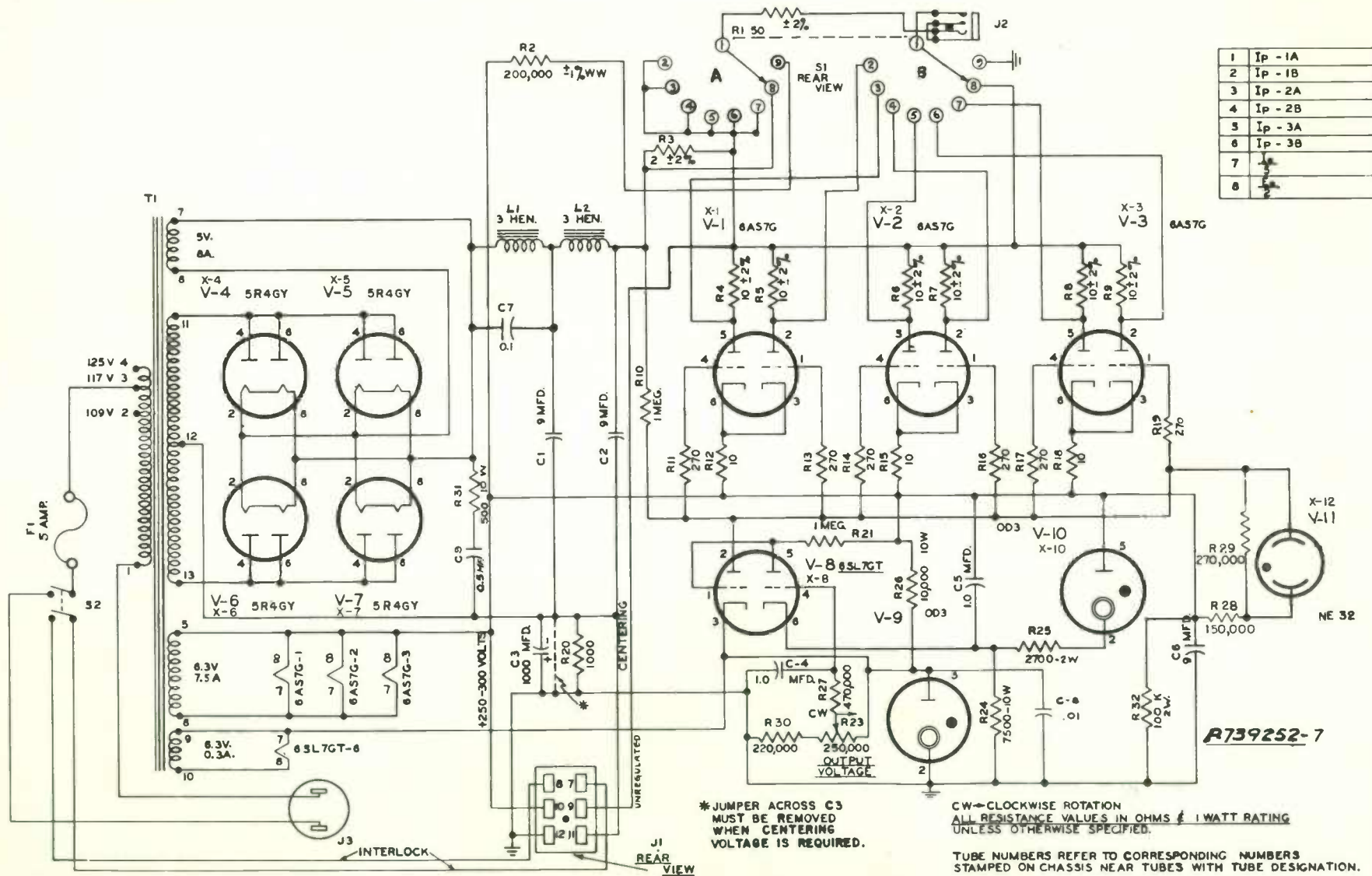


Figure 5—Type WP-33B Regulated Power Supply (Right Oblique Rear View)

Figure 6—Regulated Power Supply Schematic (P-739252)





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