

*MI-26087A  
26088A*

# BROADCAST TELEVISION EQUIPMENT

## WP-15A

### Regulated Power Supply

MI-26087-A/MI-26088-A



RADIO CORPORATION OF AMERICA  
COMMERCIAL ELECTRONIC PRODUCTS, CAMDEN, N. J.

IB-36277-1

TMK(S) ®

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## **INSTRUCTIONS**

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## TECHNICAL SUMMARY

| <b>Electrical Specifications</b>     |                                                              |
|--------------------------------------|--------------------------------------------------------------|
| <b>A-C Power Requirements</b>        |                                                              |
| Voltage                              | 98-129 volts, 50/60 cycles                                   |
| Power Consumption (full load)        | 910 watts at 117 volts                                       |
| <b>D-C Output</b>                    |                                                              |
| <b>Unregulated</b>                   |                                                              |
| Voltage                              | 400-500 nominal (see figure 9)                               |
| Current*                             | 1,500 milliamperes maximum                                   |
| Ripple Voltage                       | Less than 2 volts r.m.s.                                     |
| <b>Regulated</b>                     |                                                              |
| Voltage Adjustment Range             | 270-290 volts                                                |
| Current*                             | 200 — 1,500 milliamperes                                     |
| Regulation                           | Less than 0.2 volt variation from minimum to maximum current |
| Ripple Voltage                       | Less than 0.002 volt peak-to-peak                            |
| <b>Ambient Temperature</b>           |                                                              |
| Air at Germanium Rectifier Assembly  | 50°C (122°F) maximum                                         |
| <b>Mechanical Specifications</b>     |                                                              |
| <b>Rectifier Chassis</b>             |                                                              |
| Height                               | 7 inches                                                     |
| Width                                | 19 inches                                                    |
| Depth                                | 11 inches                                                    |
| Weight                               | 59 pounds                                                    |
| <b>Regulator Chassis</b>             |                                                              |
| Height                               | 3½ inches                                                    |
| Width                                | 19 inches                                                    |
| Depth                                | 10⅞ inches                                                   |
| Weight                               | 12 pounds                                                    |
| <b>Tube Complement</b>               |                                                              |
| 1 RCA — 12AT7                        | Cathode Follower, V6                                         |
| 1 RCA — 12AX7                        | D-C Amplifier, V5                                            |
| 1 RCA — 5651                         | Voltage Reference Tube, V4                                   |
| 3 Type — 6336 (RCA Stock No. 211419) | Voltage Regulators, V1 to V3                                 |

\*Combinations of regulated and unregulated current are possible adding up to 1,500 milliamperes maximum.

### EQUIPMENT

The RCA type WP-15A Regulated Power Supply, identified by stock numbers MI-26087-A and MI-26088-A, includes the following items:

- 1 Rectifier, MI-26087-A
- 1 Regulator, MI-26088-A
- 1 Set of tubes (see tube complement)
- 1 Time Delay Relay — Stock No. 213366

The following item is available on separate order:

- 1 Meter, MI-21200-C1 (for measuring current and voltage)

### DESCRIPTION

The WP-15A Regulated Power Supply is a general purpose d-c power source intended for television, laboratory, or other industrial applications where a well-regulated d-c power source is required.

#### Physical Characteristics

A complete WP-15A equipment consists of two chassis (a rectifier chassis, RCA stock number MI-26087-A, and a regulator chassis, RCA stock number MI-26088-A). Both chassis are of the recessed panel type, designed for mounting in a standard 19-inch relay rack. The separate chassis may be mounted



together, as in conventional systems (occupying only  $10\frac{1}{2}$  inches of rack space, six standard rack units) or they may be mounted in different locations, thus permitting centralization of power supply facilities and placement of the regulator chassis adjacent to the equipment loads. All components are arranged for maximum accessibility and ventilation; thus minimizing the possibility of personnel making contact with hot tube envelopes or high-voltage sources.

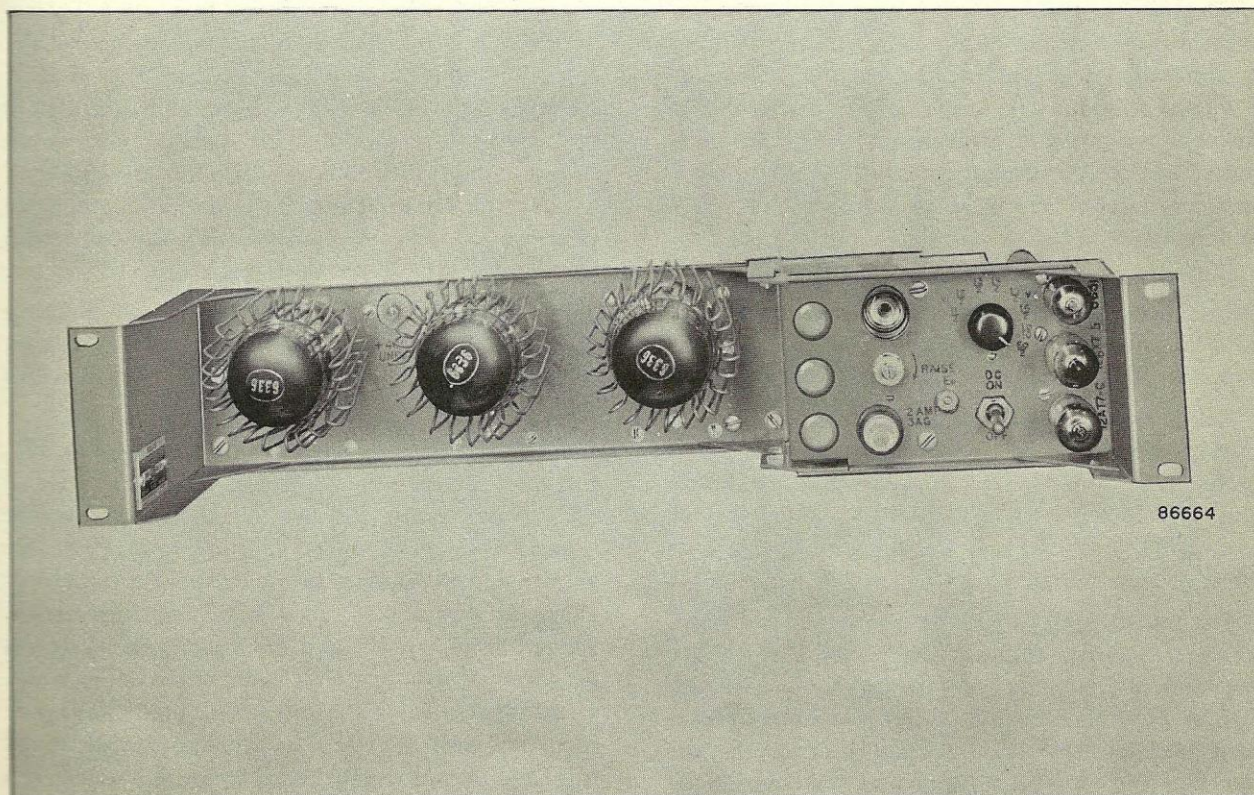
Tubes are inserted and controls are adjusted from the front of the regulator chassis, as shown in figure 1. All connecting receptacles are mounted on the rear of the units, as shown in figures 3 and 4. These connector receptacles are so wired that older type power supplies, such as RCA type WP-33B or 580-D, may be replaced without changing plug connections.

Four elongated mounting holes are provided in the flanges on each side of the chassis for mounting in the relay rack. Indicator lamps are mounted on the front and rear of each chassis to indicate the presence of high voltage.

### Circuit Description

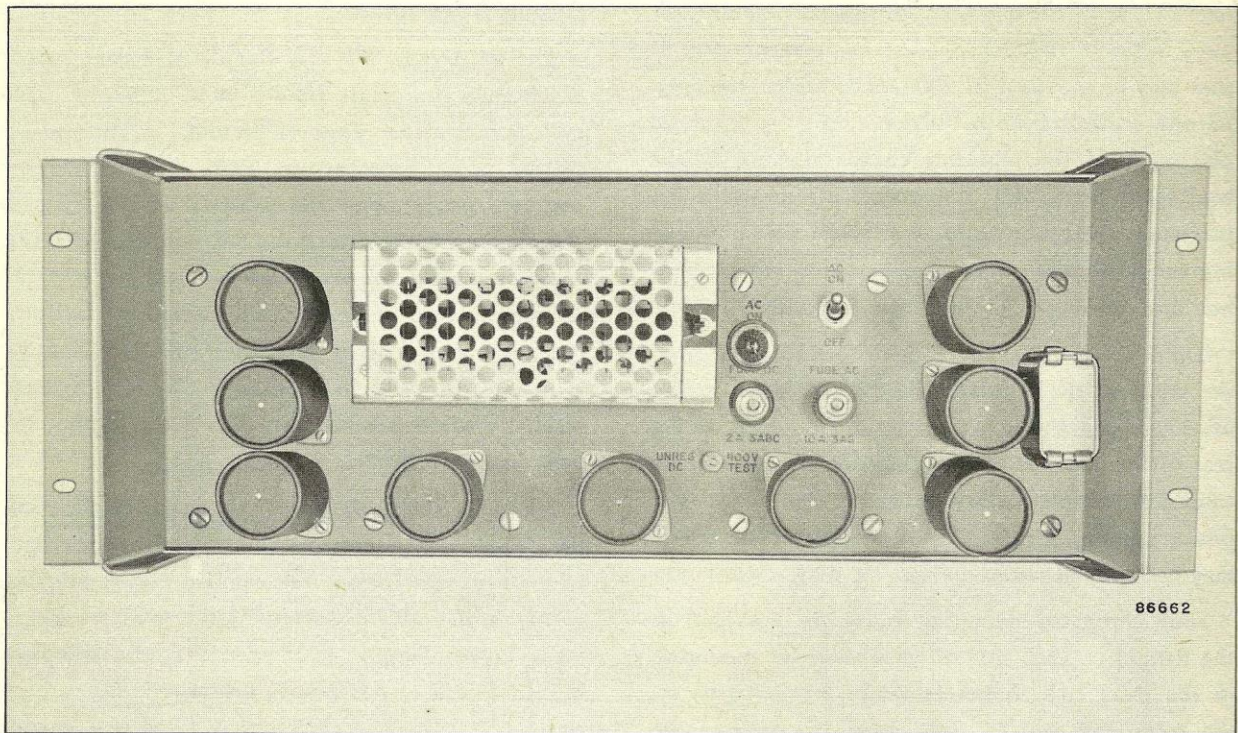
The RCA type WP-15A Regulated Power Supply is designed to operate from a 98 to 129-volt, 50/60 cycle power source. Taps are provided on the primary of the power transformer. T101 (located on the rectifier chassis), and the primary of the filament transformer, T1 (located on the regulator chassis), to accommodate the above range of supply voltages. A constant-voltage d-c output is maintained, which is independent of load or minor line voltage variations. A maximum of 1,500 milliamperes at a voltage manually adjustable between plus 270 and plus 290 volts can be obtained.

Figure 14 shows the schematic circuit of the rectifier chassis and Figure 15 shows the schematic circuit of the regulator chassis. The combined schematic diagrams display all the circuits of the WP-15A Regulated Power Supply. Fundamentally, the complete circuit consists of a full-wave bridge-type germanium rectifier, a two-stage choke-input filter and a conventional series regulating circuit.



**Figure 1. Front View WP-15A Regulator Chassis**





**Figure 2. Front View WP-15A Rectifier Chassis**

The full-wave bridge-rectifier circuit, which utilizes a germanium rectifier (RCA stock number 210348), is conventional except for the presence of chokes L103 and L104 in series in the transformer secondary. These chokes serve to decrease the rate-of-change of power line current during reversal, such that power-line interference imparted to other equipment is minimized.

Indicator lamps I101 and I102 (on the rectifier chassis), are neon lamps connected across the applied a-c voltage to indicate when a-c is present at the unit and when the power switch S101 is closed.

Relay K101 provides a means for opening or closing the secondary circuit of the rectifier transformer T101, and thereby turning off or on the d-c output from this unit. Relay K101 is controlled by both S2 (DC switch) and K1 (time delay relay) on the regulator chassis.

The series regulating circuit consists of six tubes, which are used as follows: V4, an RCA type 5651, is a miniature two-element gaseous voltage-reference tube of exceptional stability used to maintain a constant reference potential on the grid of the d-c amplifier V5. V5 is an RCA type 12AX7 twin-triode tube 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 type 6336 tubes (RCA stock num-

ber 211419), also dual-triodes, which are connected in a parallel group in order to pass the maximum, 1,500 milliamperes, of output current. V6, an RCA type 12AT7 twin-triode tube, has both of its sections connected as cathode followers and is used to set the proper cathode bias on each half of the d-c amplifier, V5. By the same cathode follower action, the two cathodes of V5 are connected to low-impedance sources resulting in extremely high gain.

Indicator lamp I1 (on the regulator chassis) is a neon lamp, visible from both sides of the chassis, used to indicate the presence of high voltage on this chassis.

The parallel group of regulating tubes (V1, V2, and V3) are connected in series with the output of the power supply. Effectively, this group may be regarded as a single tube (functioning as a variable resistance), as shown in figure 5, the simplified schematic diagram of the voltage regulator section. The d-c amplifier, V5, and the cathode follower, V6, are arranged as a negative feedback circuit, in which a fractional part of the regulated output voltage is compared with the reference voltage. Whenever the regulated output voltage changes, for any reason, the difference between it and the fixed reference voltage is amplified in V5 and is then fed to the grids of the series regulator tubes, V1, V2, and V3.



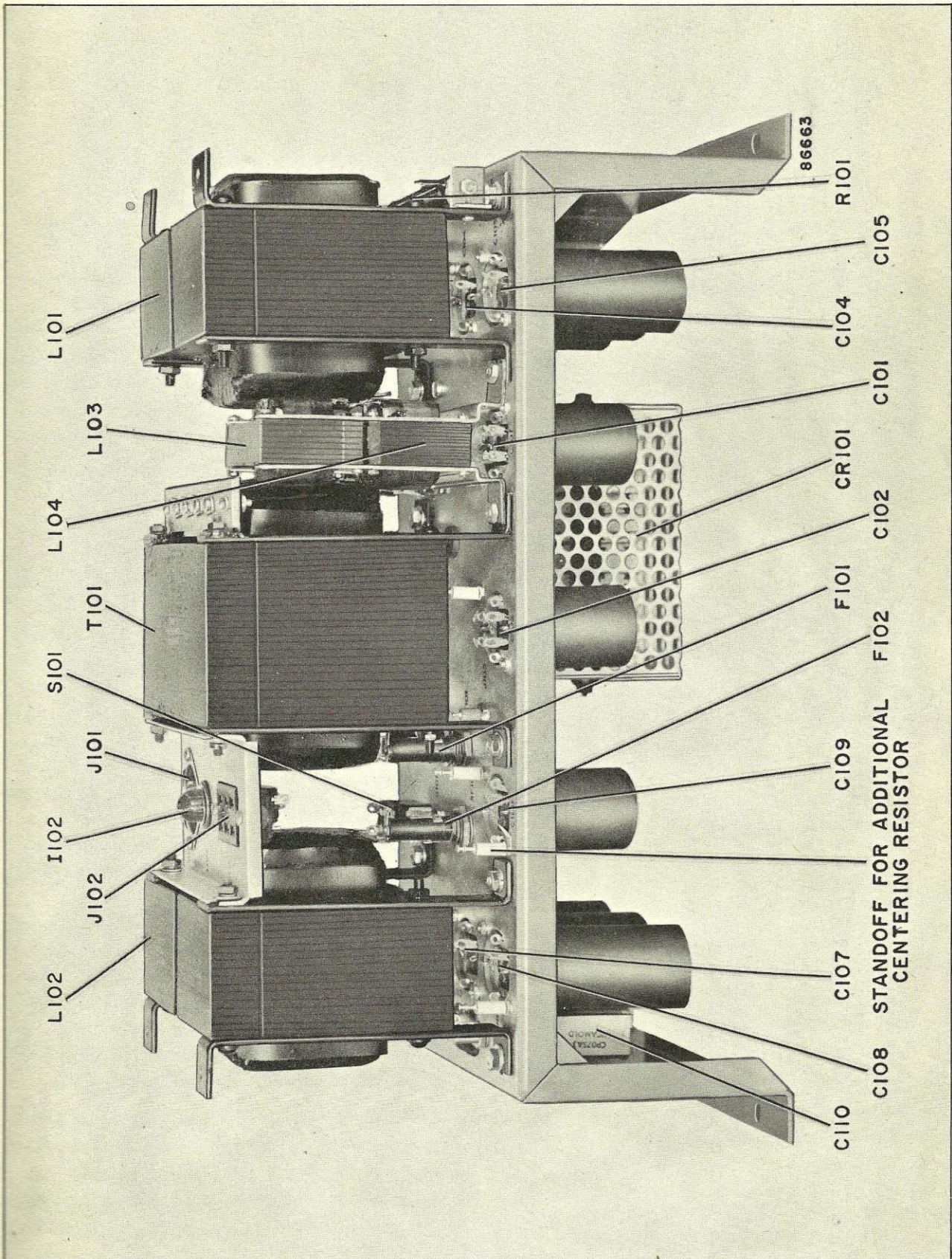


Figure 3. Left Oblique Rear View—Rectifier Chassis



Operation of the regulator circuit can be readily understood by considering the action of the cathode follower V6 and the d-c amplifier V5 when a variation in output voltage occurs. Assume that the regulated output, plus 280 volts, increases for an instant. A fraction of this increase appears at the center arm of potentiometer R38 and is fed directly to the grid of V6B.

Since V6B is a cathode follower, then by cathode follower action, the increase of grid voltage at pin 7 also appears at the cathode, pin 8. V5B is a straight-forward d-c amplifier with its grid, pin 7, connected to a fixed potential at the plate of the voltage reference tube V4. Therefore, the increase in the cathode, pin 8, voltage of V5B results in an increase in grid-to-cathode bias on V5B. This causes less current to flow through V5B, hence its plate, pin 6, voltage rises. The increase in voltage at the plate of V5B is coupled directly to the grid, pin 2, of V5A.

V6A is also a cathode follower with its grid, pin 2, connected to a positive voltage determined by the network composed of resistors R7 and R8. The cathode, pin 3, of V6A assumes a positive potential determined by the grid voltage, and this positive potential is relatively fixed. Therefore the increase in grid voltage on V5A results in a decrease in grid-to-cathode bias on V5A. This, in turn, causes V5A to draw more current, lowering its plate potential. The drop in plate potential on the plate, pin 1, of V5A is coupled directly to all the grids of the series regulator tubes, V1, V2, and V3, thus increasing the grid-to-cathode bias on these tubes, and this increase in bias causes these tubes to draw less current, resulting in an increase in plate-to-cathode voltage. The gain from potentiometer R38 to the plate, pin 1, of V5A is high, such that the increase in voltage across the series regulator tubes almost compensates for the originally assumed increase in voltage on the plus 280-volt bus. Decreased output voltage is prevented by operation of the control circuits in a manner which is similar to that just described.

The regulator tubes V1, V2, and V3, then function collectively as a variable resistance in series with the load. The effective value of this resistance (plate-to-cathode resistance of the tubes) is determined by the grid-to-cathode voltage that is simultaneously applied to each of them. This variable resistance acts automatically to maintain a constant output voltage under changing load and input conditions.

Potentiometer R38 is used to adjust the output voltage of the WP-15A Regulated Power Supply to any desired value within the range of plus 270 to plus 290 volts. The setting of R38 determines the level about which the d-c amplifier operates.

A meter jack, J4 (located on the front panel of the regulator chassis), provides means for connecting the standard RCA current and voltage indicating meter MI-21200-C1, which is available on separate order. An eight-position rotary switch, S1, (also on the regulator front panel) together with associated voltage multiplier and shunt resistors makes it possible for the meter to indicate total output current, output voltage, or the plate current of each section of the series regulating tubes (V1, V2, and V3) without interrupting the operation of the power supply.

If the MI-21200-C1 meter is plugged into the meter jack, the following measurements can be made with the meter switch in its various positions:

**TABLE 1**  
**USING THE MI-21200-C1 METER**

| <i>Position of Switch</i> | <i>Meter Indicates</i> | <i>Position of Switch</i> | <i>Meter Indicates</i> |
|---------------------------|------------------------|---------------------------|------------------------|
| 1                         | $I_p/2$ of V1A         | 5                         | $I_p/2$ of V3A         |
| 2                         | $I_p/2$ of V1B         | 6                         | $I_p/2$ of V3B         |
| 3                         | $I_p/2$ of V2A         | 7                         | $I_o/10$               |
| 4                         | $I_p/2$ of V2B         | 8                         | $E_o/2$                |

NOTE: When measuring the full load current, for example, the meter needle will be at full scale but the scale reading will indicate only 150. Therefore the scale will indicate only 1/10 the actual current flowing, thus the switch position is designated  $I_o/10$ .

Both the plate transformer (T101 on the rectifier chassis) and the filament transformer (T1 on the regulator chassis) are provided with primary taps to accommodate a range of input voltages. Factory wiring is such that the entire 125-volt primary of the filament transformer is connected across the 125-volt primary of the plate transformer. With these connections it should not normally be necessary to change tap connections at the filament transformer, except to compensate for an a-c voltage drop across a long cable connecting the rectifier and regulator units.



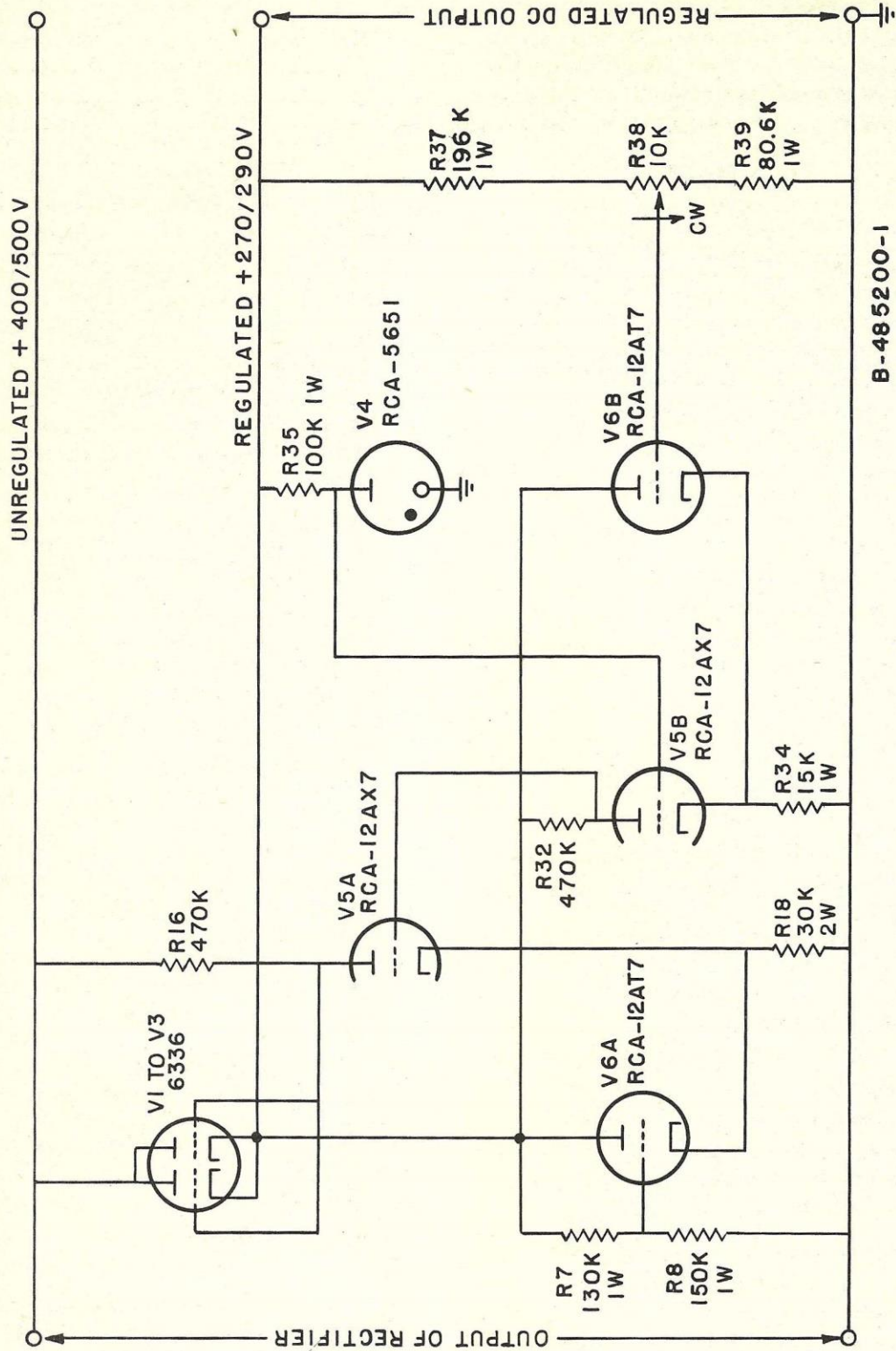


Figure 5. Simplified Schematic Diagram—Voltage Regulator Circuit

## INSTALLATION

### Location

The WP-15A Regulated Power Supply is designed to be mounted in a standard 19-inch rack. The rectifier and regulator units may be mounted in the same rack or in separate racks.

NOTE: Mounting instructions given herein are for conditions where it is desired to cool the equipment by natural convection only, and the maximum room ambient air temperature does not exceed 40°C. For ambient temperatures higher than 40°C or for conditions other than those given in these instructions, forced-air cooling must be employed. The volume of air must be sufficient to limit the ambient air temperature at the germanium rectifier to 50°C and to limit the 6336 regulator tube temperature to 250°C.

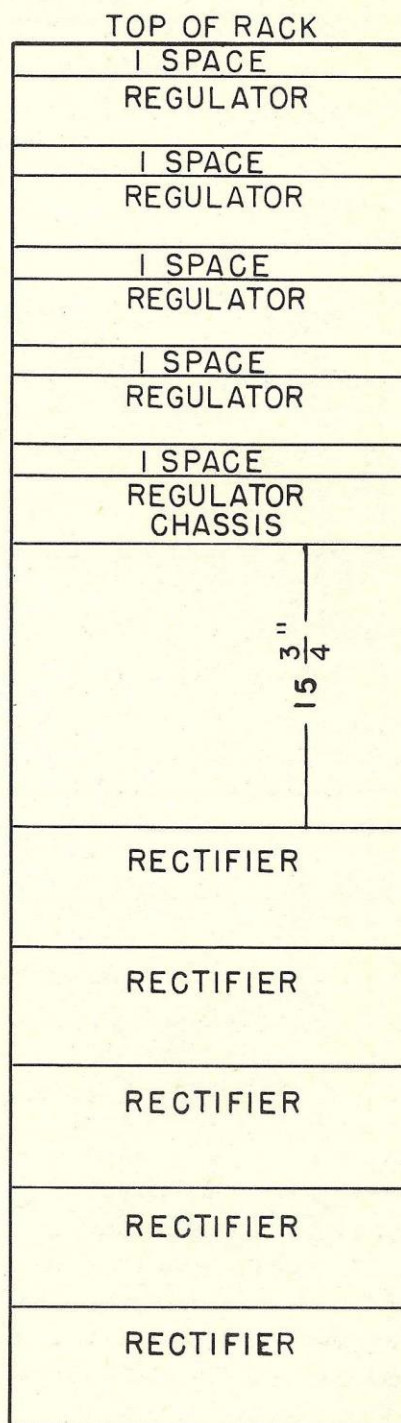
### Mounting Instructions for Natural Convection Cooling

1. Mount the rectifier and regulator units in a standard 19-inch rack such as the RCA type BR-84 Cabinet Rack. Under conditions of natural convection cooling, the maximum number of WP-15A Power Supplies which may be mounted in one rack is five. When five WP-15A's are mounted in one BR-84 rack, the rectifier units should be stacked at the bottom of the rack and the regulator units at the top, as shown in Figure 6. There should be one 1 $\frac{3}{4}$ " spacer chassis above each regulator unit. The 15 $\frac{1}{2}$ " inches of space in the middle of the rack may be used for mounting equipment such as a WP-33B or 580-D Power Supply, Focus Current Regulators, Centering Current Supplies, Power Relay Panels, and Circuit Breaker Panels.

2. Provide an opening in the top cover of the rack (if cabinet type rack is used) directly above the regulator units. (See Figure 7 for top cover modification information.)

3. Mount a ventilating type door on the rear of the rack if a door is to be used. DO NOT USE A FRONT DOOR ON THE RACK.

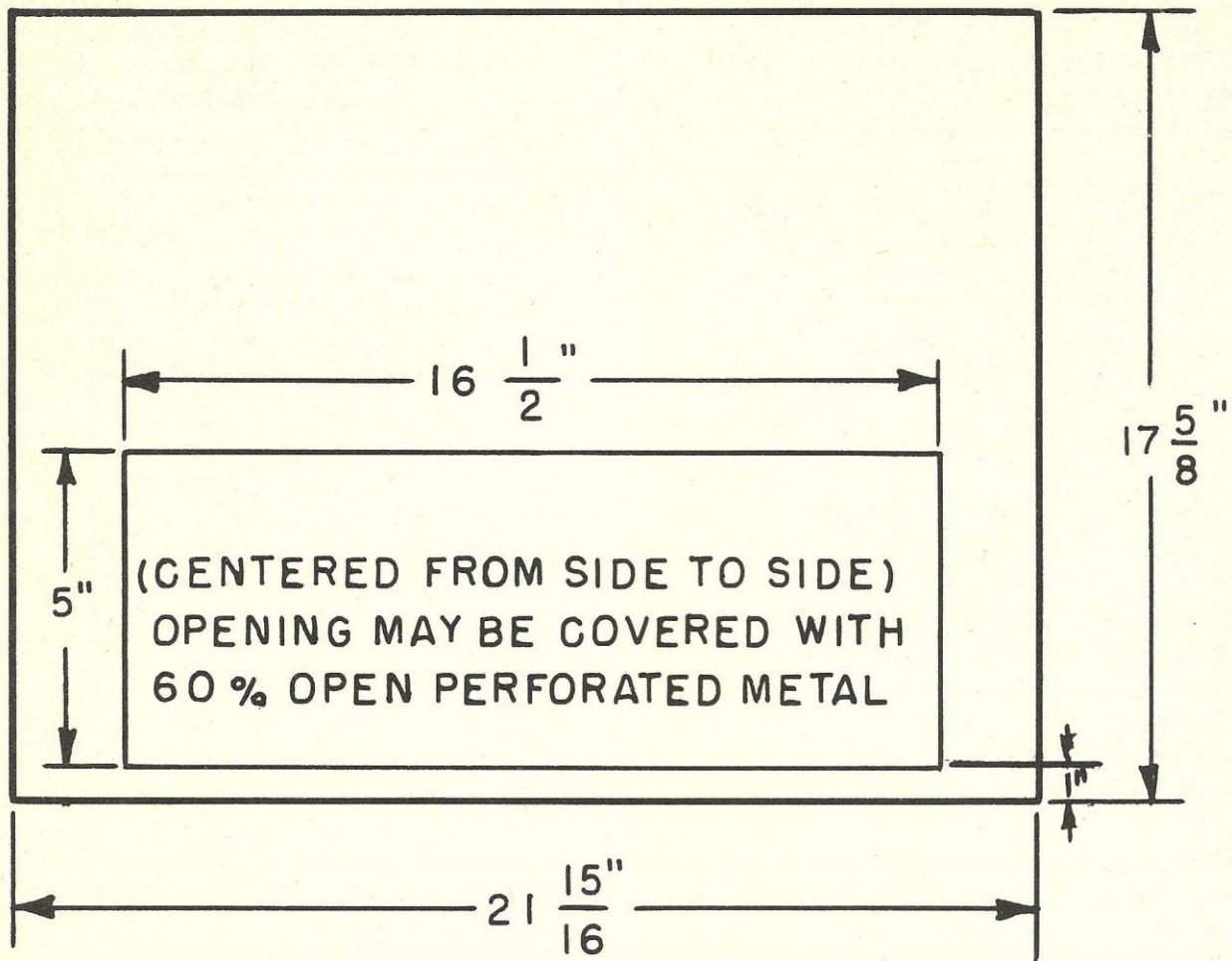
Under conditions of natural convection cooling the maximum number of regulator units which may be mounted adjacent to each other (without a 1 $\frac{3}{4}$ " inch spacer chassis) is three. It is not absolutely necessary that the regulator units be mounted at the very top of the rack. It is imperative, however, that no heat sensitive equipment be located above the regulator units.



NOTE: 1 SPACE = 1  $\frac{3}{4}$  INCHES

Figure 6. Layout of Rack with WP-15A Regulated Power Supplies Only





**Figure 7. Modification Diagram—Relay Rack Top**

In those cases where the rectifier and regulator units are to be mounted in separate racks, the same general rules for mounting in a single rack apply. In general, the regulator units should be placed at the top of the rack and in maximum groups of five with spacer chassis and three without spacer chassis. The rectifier units should be mounted at the bottom of the rack or at least not above any heat generating equipment. The maximum number of rectifier units which may be stacked together in any one rack is five. Again, these conditions apply to a convection cooled system and a maximum room ambient temperature of 40°C.

## CONNECTIONS

### WARNING

Before connecting the a-c power lines, it should be determined that the capacity of the power source lines is sufficient to handle the power supplies to be used. Each power supply requires 910 watts of power at 117 volts a-c and full load.

#### Interconnection of Rectifier and Regulator Units

A cable should be fabricated to connect the six terminals of J102 (rectifier unit) to the six terminals of J1 (regulator unit). Mating plugs are supplied for each of these jacks.



## Load Connections

Fabricate one or two cables consisting of at least six conductors each to connect the output of the regulator unit (from either J2, J3, or both) to the load equipments. The output connectors and mating plugs are provided for convenience in dividing the load among several equipments. Notice that Pins 7 and 8 of J2 are connected to one section of the d-c power switch S2. These connections are provided for convenience in interlocking an external device with the operation of this switch.

NOTE: The use of cables containing six or more conductors is recommended so as to provide for future needs when all are not used originally. (See REMOTE REFERENCE VOLTAGE.)

Refer to Figure 15, the schematic diagram of the regulator chassis, for identification of the terminals of output connectors J2 and J3. If centering current is required, see CENTERING CURRENT.

## Rectifier Unit Tap Selection

Fabricate an a-c power cable using the connector provided for J101, on the rectifier chassis. Interconnect the regulator and rectifier units. Connect to the regulator unit the actual load equipments which will be used with this supply. Apply a-c power to the rectifier unit and turn on both the d-c switch (S101) on this unit and the d-c switch (S1) on the regulator unit. When the relays in both units close, proceed as follows:

- a. Plug a standard RCA current and voltage meter (MI-21200-C1) into the meter jack, J4 (on the regulator chassis).
- b. Place switch S1 (on the regulator chassis) in the  $E_o/2$  position.
- c. Adjust the  $E_o$  control, R38 (on the front panel of the regulator chassis) to the position for which the desired voltage is indicated on the meter.
- d. Place the meter switch S1 in the  $I_o/10$  position and ascertain the load current being drawn from the regulated output. This load current must fall between the limits specified under Electrical Specifications on page 4.
- e. Place an oscilloscope across the regulated output of the supply (between the +B jack J5 and the chassis). Synchronize the oscilloscope with the power line frequency. Set the oscilloscope gain to display the ripple voltage present with a barely perceptible amplitude.

- f. As a test for an operating margin of safety, turn the  $E_o$  control to indicate an output voltage 15 volts greater than the desired operating voltage. (If the range of the control will not reach this level, use the maximum voltage obtainable.)

- g. If the ripple voltage increases abruptly under this condition, the a-c line voltage is too low for the existing tap connection at the rectifier transformer. (The equipment should be allowed to operate at least five minutes to allow some temperature stabilization.)

- h. If the results of this test are negative (excessive ripple produced), remove the a-c plug at J101, shift the wire connected to T101 with an eyelet terminal, to a lower numbered tap. Reapply a-c power and repeat the margin of safety test of f. and g.

- i. If the results of the test are still negative when the eyelet terminal is connected to tap number 2, the a-c line voltage is too low to safely operate the power supply at the load current being drawn, and must be raised or the load current reduced.

- j. Return the  $E_o$  control to the position giving the desired output voltage.

NOTE: If in order to meet the margin of safety test described in the foregoing steps, the tap connection had to be shifted to a lower tap, the following steps k. and l. may be disregarded.

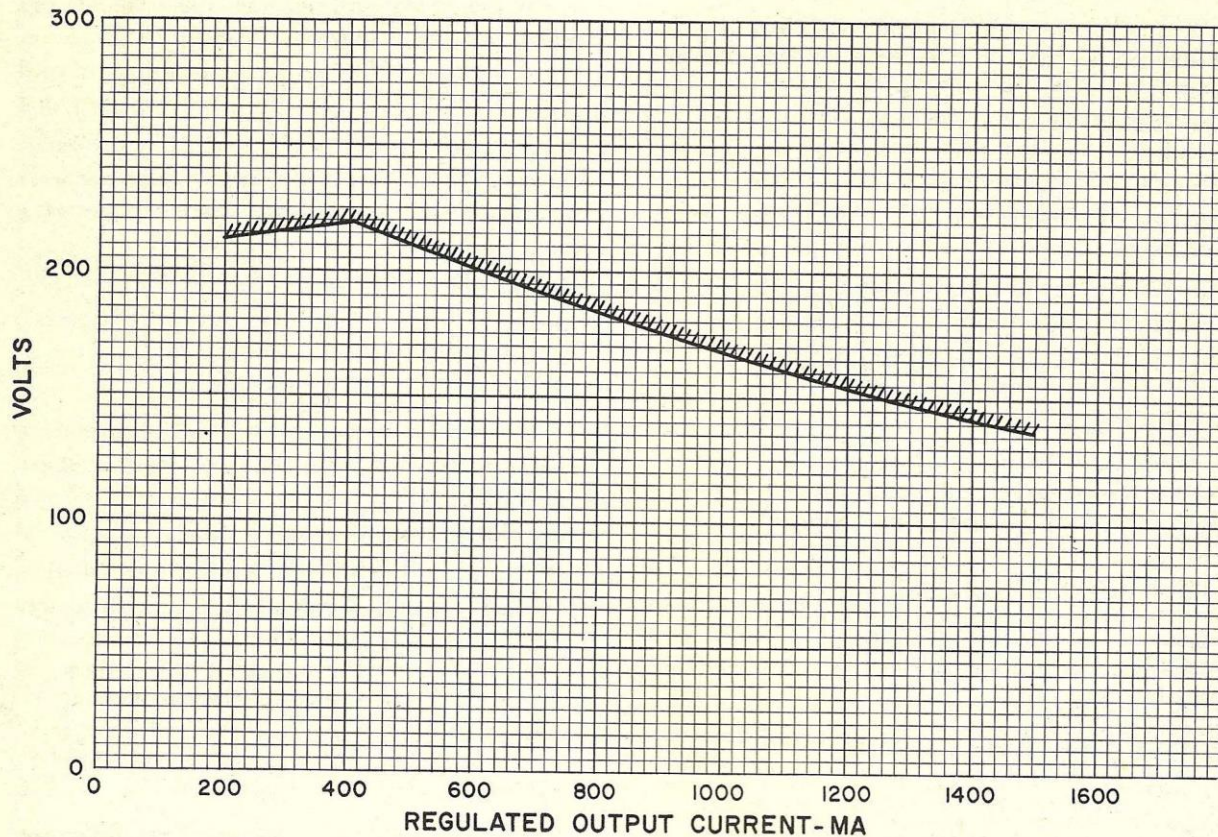
- k. With a d-c voltmeter determine the difference between the unregulated and regulated output voltages. (Use the +400-volt test point, J103, on the rectifier chassis and the +B test point, J5, on the regulator chassis.)

- l. Enter the load current from step d. on the graph of Figure 8 and observe whether the point corresponding to the difference voltage from step k. falls under the curve. If this point lies above the curve, the a-c line voltage is too high for the existing tap connection at the rectifier transformer. In this case shift the wire connected at T101 with an eyelet terminal, to a higher numbered tap on T101, such that the operating point falls under the curve of figure 8.

## Regulator Unit Tap Selection

Measure the filament voltage at the regulator unit. In the event that the voltage is less than 5.7 volts, the lead which is normally connected to the number 5 terminal of the filament transformer (T1) should be moved to a lower numbered terminal, making the filament voltage greater than 5.7 volts but less than 6.9 volts, preferably as near to 6.3 volts as possible.





**Figure 8. Maximum Permissible Difference Between Unregulated and Regulated Voltages**

In the event that the filament voltage is greater than 6.9 volts when the filament transformer is connected normally (connection at terminal 5), it will be necessary to shift the lead at T101 (rectifier unit) which comes from pin 7 of J102 to a lower numbered tap. The factory-made connection at No. 4 terminal on T1 should not be moved, as it supplies the proper d-c voltage to relay K101 on the rectifier chassis.

#### **Centering Current**

A connection for centering current is available through terminal number 11 of connectors J2 and J3 of the regulator chassis. Before centering current will be supplied, the jumper wire across R116 (on the rectifier chassis) must be removed.

#### **WARNING**

If the jumper wire across R116 and C109 has been removed, never turn the power supply on when a load is connected to the regulated voltage output and/or the unregulated voltage output and no centering load is connected. Under these conditions there is danger of ruining C109 and R116.

In existing systems, where centering current is required, the B+ drain of each equipment is essentially its centering current. Centering current creates no problem in these systems, since each equipment has its own power supply. However, a single WP-15A Regulated Power Supply may be used to drive several equipments simultaneously, some of which will not require centering. Typical groups of such equip-



ments are a complete monochrome camera chain, part of a color camera chain, or one or two master monitors and several distribution amplifiers.

It is possible that some combinations of loads (with and without centering) may result in a condition whereby the total B+ drain is divided, among the various centering controls involved, in such a manner that one load draws excessive centering current, resulting in a very coarse adjustment. A problem such as this may be solved by placing a shunt resistor across resistor R116 and capacitor C109 (on the rectifier chassis). The value of this shunt resistor should be such that the total current flowing through the various centering controls, in parallel with R116, will be reduced to a reasonable value. An insulated standoff and a ground lug are provided near R116 and C109.

A 15-ohm 25-watt wire wound adjustable resistor, such as RCA stock number 17688, will satisfy most centering requirements. The slide terminal of this resistor should be connected to its ground end and then adjusted to give optimum centering.

In a most extreme case, it may be necessary to place approximately 4 ohms resistance (2-watt) in series with the centering current supply lead to the TM-6 Master Monitor (in a monochrome camera chain). This 4-ohm resistor may be inserted between the number 11 terminals of connectors J3 and J4, in the camera control unit, after removing the wire which connects the two terminals.

## INTERLOCK CIRCUITS

The rectifier chassis is interlocked to the regulator chassis in such a way that opening S2 removes d-c from the output of the rectifier chassis. External interlock is obtained by means of the standard interlock circuit composed of switch S2B and terminals 7 and 8 of connector J2 (on the regulator chassis). The WP-15A Regulated Power Supply is wired in such a manner that it may be used to directly replace an RCA type WP-33B or 580-D Regulated Power Supply, except that the external interlock circuit is not connected to terminals 7 and 8 of connector J3 but only to terminals 7 and 8 of connector J2.

### Interlock Connections of Two Power Supplies for Use with Color Camera Chain

In a division of loads such as this it is important that the interlock circuit of the two power supplies be arranged so that the processing amplifier will be turned on whenever power is supplied to the camera.

Thus, the horizontal output tubes of the camera will obtain drive signals from the processing amplifier when the camera is turned on, preventing damage to the horizontal output tubes in the camera. The optional interlock circuit of Figure 13 is recommended when two WP-15A Power Supplies are used to drive a color chain when the processing amplifier and the camera are connected to different supplies.

In Figure 13 the rectifier chassis and regulator chassis shown would be supplying the color camera, and the interlocking reference unit would be the processing amplifier. The INTERLOCK RELAY (which must be ordered separately as MI-26544) is a plug-in type relay with an octal base. An octal socket could be mounted on a 1 $\frac{3}{4}$ " bath-tub chassis, along with the necessary resistors and a barrier type terminal strip. This chassis could be mounted as a separator between the two regulator units involved.

### Remote Reference Voltage

The following modification is recommended when the WP-15A Regulated Power Supply is to be used in an installation where the load is to be a long distance (of the order of several hundred feet, or where the length of cable will add appreciably to the internal impedance of the power supply unit) from the regulator chassis. The procedure for making this modification is as follows:

1. Open the lead connecting R37 to the plus 280-volt bus.
2. Connect this lead to terminal 7 or 8 of connector J3.
3. Connect the terminal used (to which R37 is now connected) to the regulated B+ terminal (in the mating plug) at the load.

NOTE: This will require an additional conductor in the cable from the regulator chassis to the load, unless all six terminals on the connecting plugs have been connected as suggested in a preceding paragraph under the heading "LOAD CONNECTIONS."

## OPERATION

### Applying Power

*CAUTION: Always be certain that radiators are in place on the three type 6336 tubes to prevent overheating of these tubes.*

After all the necessary connections have been made and the output voltage has been set as described in the "Installation" section, the power supply is ready for use. Turn on the unit by placing both switch S2



(on the regulator chassis) and switch S101 (on the rectifier chassis) in the "ON" position.

A time delay relay on the regulator chassis allows approximately 30 seconds for filament warm-up before application of d-c to the regulator tubes. In the event that S2 is turned off while the equipment is operating, only the d-c is removed from the regulator chassis, and full output voltage is restored immediately when S2 is returned to the "ON" position. However, if S101 is turned off while the equipment is operating, at least one minute should elapse before turning it back on so that the time delay relay contacts may have sufficient time to open. In the event that any tubes are changed on the regulator chassis while the unit is still warm, switch S101 should be opened and left open for at least one minute before turning it on again. An alternative would be to turn S2 off before making a tube change and then leaving S2 off for at least 30 seconds after inserting a cold tube. In this way the required 30-second warm-up is obtained manually, since the time-delay relay would have been closed all of the time.

#### Handling of 6336 Tubes

When handling the 6336 tubes, care must be taken to avoid subjecting the tubes to unnecessary shocks, vibration, etc. A drop or other shock to the tube may cause cathode flaking and cathode-to-grid shorts.

NOTE: A cathode-to-grid short may sometimes be eliminated by operating the tube beyond cutoff; +400 volts on the plate and -300 volts on the grid.

#### Checking Voltage Output and Load Current

The meter jack, J4, on the front of the regulator chassis provides a convenient means for connecting an RCA meter, stock No. MI-21200-C1, into the circuits to measure voltage output and load current while the power supply is in operation. Turn the meter selector switch, S1 (on the regulator chassis), to "E<sub>o</sub>/2" position when measuring output voltage, and to "I<sub>o</sub>/10" position when measuring total load current.

Any output voltage between plus 270 and plus 290 volts can be obtained by adjusting the voltage output potentiometer, R38 (on the front panel of the regulator chassis).

#### Centering Current

If the power supply is to be used with television or industrial equipment where centering current is required, refer to the Centering Current paragraph of the Installation section for the modification necessary.

## MAINTENANCE

#### Periodic Tube Check

All tubes should be checked periodically and when found defective should be replaced.

The plate circuits of the three series regulator tubes (V1, V2, and V3) carry the entire output current drawn by the load. Since these tubes are operated in parallel, the current flowing through each plate of these three tubes should be approximately one-sixth of the total load current, or about 250 milliamperes when the power supply is operated under maximum load. Inasmuch as the failure of any one of these tubes may produce an overload on the plates of the others, it is advisable to check the plate currents periodically by use of the RCA meter MI-21200-C1 and rotating switch S1 (on the regulator chassis) through the first six positions. The current through each plate should be one-sixth of the total load current  $\pm 10$  percent.

Greater than ten percent reduction in plate current usually indicates a loss of cathode emission. Replace the suspected tube and recheck the plate currents. Increased tube life result if the replacement tube is chosen so that the current flowing through each tube is fairly equal.

#### Rejuvenation of 6336 Tubes

In the event that the 6336 regulator tubes have been subjected to operating plate voltages without allowing sufficient warm-up time as directed under OPERATION, the cathodes may suffer damage which will ultimately cut off emission. Similarly, such damage can result from operation with less than 5.7 volts on the filaments.

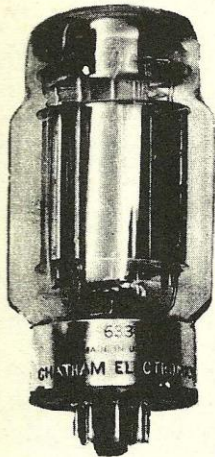
To rejuvenate the cathode when such damage has occurred, proceed as follows:

1. Remove plate voltage and apply 7.5 volts to the filament.
2. Allow the tube to operate for at least one hour with the high filament voltage.
3. Place the tube in a power supply which is not in service and connect a dummy load designed to draw about 300 ma. of current. Make certain that the filaments are connected for 6.3 volts  $\pm 5\%$ .
4. Gradually increase the current drain in increments of approximately 100 ma. If the voltage should decrease with any change in current, return to the next lower load and allow the tube to operate longer with the lower load. The load should be increased



**LOW - MU TWIN POWER TRIODE**  
**HIGH PERVEANCE - HIGH PLATE DISSIPATION**  
 TENTATIVE DATA

Chatham 6336 is a low-mu, high perveance, twin power triode of the heater-cathode type intended for use as a regulator tube in dc power supply units. The



6336 features a plate current held within  $\pm 10\%$  of bogie (Note 2) and absence of plate current drift. A hard glass envelope is used to withstand shock and high temperature. The 6336 employs a compact design in which special attention has been given to features which improve its strength both as to shock and vibration. This type utilizes a button stem which strengthens the mount structure and provides relatively wide inter-lead spacing. Because of this spacing

between leads, susceptibility to electrolysis is reduced. These features all contribute to the dependability of the 6336.

#### GENERAL DATA

|                                                                             |                |       |
|-----------------------------------------------------------------------------|----------------|-------|
| Heater, for Unipotential Cathodes:                                          |                |       |
| Voltage (AC or DC).....                                                     | 6.3 $\pm 10\%$ | volts |
| Current at 6.3 volts.....                                                   | 4.75           | amp   |
| Direct Interelectrode Capacitances<br>(Each Unit, without external shield): |                |       |
| Grid to Plate.....                                                          | 15.2           | uuf   |
| Input.....                                                                  | 13.7           | uuf   |
| Output.....                                                                 | 4.7            | uuf   |
| Heater to Cathode:                                                          |                |       |
| Triode Unit No. 1.....                                                      | 13.9           | uuf   |
| Triode Unit No. 2.....                                                      | 13.4           | uuf   |
| Grid of Unit No. 1 to Grid of<br>Unit No. 2.....                            | 0.68           | uuf   |
| Plate of Unit No. 1 to Plate of<br>Unit No. 2.....                          | 1.5            | uuf   |

#### Characteristics (Each Unit):

|                            |        |       |
|----------------------------|--------|-------|
| Plate-Supply Voltage.....  | 190    | volts |
| Cathode-Bias Resistor..... | 200    | ohms  |
| Amplification Factor.....  | 2.7    |       |
| Plate Resistance.....      | 200    | ohms  |
| Transconductance.....      | 13,500 | umhos |
| Plate Current.....         | 185    | ma    |

#### Mechanical:

|                             |                               |  |
|-----------------------------|-------------------------------|--|
| Mounting Position *.....    | Any                           |  |
| Maximum Overall Length..... | 4 3/4"                        |  |
| Maximum Seated Length.....  | 4 1/4"                        |  |
| Maximum Diameter.....       | 2-1/16"                       |  |
| Bulb.....                   | St-16 Nonex                   |  |
| Base.....                   | Short Jumbo-Shell Octal 8-Pin |  |
| Shock.....                  | 30° Hammer angle or 450 G's   |  |
| High Altitude.....          | 10,000 Ft.                    |  |
| Weight (net).....           | 4.5 oz. Max.                  |  |

\* Tube may be mounted in any position. However if tube is mounted in a horizontal position, it is recommended that it be mounted so that pin 1 and pin 4 are in a vertical plane.

#### DC AMPLIFIER

*Values are for Each Unit*

#### Maximum Ratings, Absolute Values

|                                                                                                                                                                                 |                     |                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|
| PLATE VOLTAGE.....                                                                                                                                                              | 400 max.            | volts              |
| PLATE CURRENT.....                                                                                                                                                              | 100 max.            | ma                 |
| PLATE DISSIPATION.....                                                                                                                                                          | 30 max.             | watts              |
| PEAK HEATER-CATHODE VOLTAGE:                                                                                                                                                    |                     |                    |
| Heater negative with respect to cathode                                                                                                                                         | 300 max.            | volts              |
| Heater positive with respect to cathode                                                                                                                                         | 300 max.            | volts              |
| BULB TEMPERATURE $\oplus$                                                                                                                                                       | 250 max.            | $^{\circ}\text{C}$ |
| MAXIMUM CIRCUIT VALUES:                                                                                                                                                         |                     |                    |
| Grid-Circuit Resistance:                                                                                                                                                        | 500 min. 500 K max. | ohms               |
| Cathode Resistance: Minimum cathode resistance per cathode leg shall be 27 ohms or that resistance necessary to provide 10% of the grid bias voltage, whichever is the greater. |                     |                    |

#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

|                                    | Note  | Min.   | Max.   |       |
|------------------------------------|-------|--------|--------|-------|
| Heater Current                     | 1     | 4.5    | 5.0    | amp   |
| Grid-Plate Capacitance (Each Unit) | -     | 13.7   | 16.7   | uuf   |
| Input Capacitance (Each Unit)      | -     | 11.2   | 16.2   | uuf   |
| Output Capacitance (Each Unit)     | -     | 4.2    | 5.2    | uuf   |
| Heater-Cathode Capacitance:        |       |        |        |       |
| Triode Unit No. 1                  | -     | 11.9   | 15.9   | uuf   |
| Triode Unit No. 2                  | -     | 11.4   | 15.4   | uuf   |
| Amplification Factor (Each Unit)   | 1,2,4 | 2.0    | 3.4    |       |
| Plate Current (Each Unit)          | 1,2,4 | 165    | 200    | ma    |
| Transconductance (Each Unit)       | 1,2,4 | 11,000 | 16,000 | umhos |
| Reverse Grid Current (Each Unit)   | 1,3,4 |        | 4.0    | uamp  |

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With plate-supply voltage of 190 volts, and cathode bias resistor of 200 ohms in each cathode (both triode units operating).

Note 3: With plate-supply voltage of 190 volts, and grid resistor of .5 megohm in each grid (both triode units operating).

Note 4: Readings to be taken after tube has been drawing current for at least 5 minutes.

$\oplus$  At hottest point on bulb surface

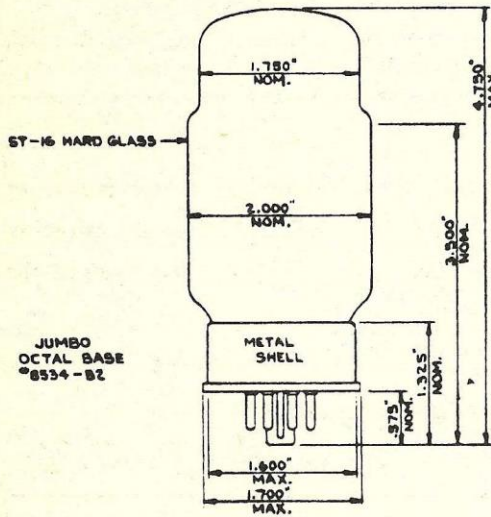
#### OPERATING NOTES

A minimum warm-up time of 30 seconds before application of plate voltage is recommended. This is especially necessary in regulator circuits where the plate of the amplifier tube ties back to the plate side of the passing tube. In such a circuit during warm-up, the passing tube grid is essentially at plate potential and the cathode is essentially at ground potential, resulting in a momentary grid bias of several hundred volts positive. This will strip the barium from the surface of the cathode leaving the tube with little or no emission. Tubes that have been abused this way can be reaged by running them for several hours with filament voltage only applied, and with  $E_f = 7.5$  v. (Continued)

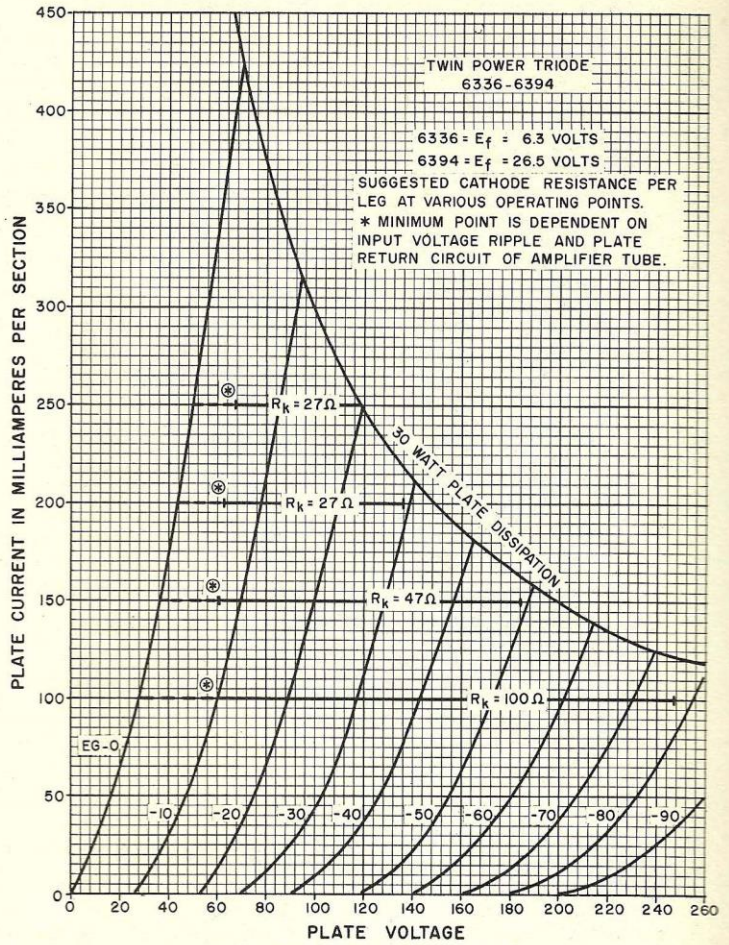


The *maximum ratings* in the tabulated data for the 6336 are limiting values above which the serviceability of the 6336 may be impaired from the viewpoint of life and satisfactory performance. Therefore, in order not to exceed these absolute ratings, the equipment designer has the responsibility of determining an average design value for each rating below the absolute value of that rating by an amount such that the absolute values will never be exceeded under any usual condition of supply-voltage variation, load variation, or manufacturing variation in the equipment itself.

**DIMENSIONAL OUTLINE**

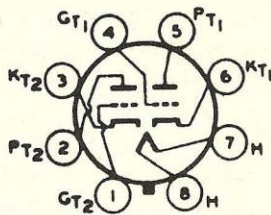


**TUBE TYPE 6336 - 6394**



*Average Plate Characteristics For Each Triode Unit of Type 6336.*

**SOCKET CONNECTIONS  
Bottom View**



8B8

- PIN 1: GRID OF UNIT No.2
- PIN 2: PLATE OF UNIT No.2
- PIN 3: CATHODE OF UNIT No.2
- PIN 4: GRID OF UNIT No.1
- PIN 5: PLATE OF UNIT No.1
- PIN 6: CATHODE OF UNIT No.1
- PIN 7: HEATER
- PIN 8: HEATER



over a period of about one hour to draw a normal load of about 1500 ma if the rejuvenation has been successful.

NOTE: The rejuvenation process is intended to reactivate cathodes damaged by operation at sub-normal temperatures, but will not extend the normal life expectancy of the tube.

### Service Hints

*Trouble Shooting the Regulator Section.* Tube

failure and deterioration will be the most likely cause of faulty operation; therefore checking all tubes should be the first step in trouble shooting the regulator section.

### Fuse Replacement

The major circuits of the WP-15A Regulated Power Supply are protected by indicating type fuses. The tables below describe these fuses and the circuits they protect.

**TABLE 2**  
**RECTIFIER CHASSIS FUSES**

| <i>Fuse Symbol</i>             | <i>Protects</i>                                        | <i>Amps.</i> | <i>Volts</i> | <i>Bussman Type</i> |
|--------------------------------|--------------------------------------------------------|--------------|--------------|---------------------|
| F101                           | Rectifier, CR101                                       | 2            | 250          | ABC-2               |
| F102                           | Power Transformer T101                                 | 10           | 32           | MDL-10              |
| <b>REGULATOR CHASSIS FUSES</b> |                                                        |              |              |                     |
| F4                             | Filament Transformer T1 (and opens unregulated output) | 2            | 125          | MDL-2               |

If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been corrected. Use only the type fuses indicated. *Do Not* substitute a glass-bodied fuse for F101, since, at the high d-c voltages involved, when this fuse

blows, an arc may be sustained such that the circuit will not be completely broken. Such an arc can cause the glass-bodied fuse to explode and damage the fuseholder.

**TABLE 3**  
**VOLTAGE MEASUREMENTS TO CHASSIS GROUND**

| <i>Load = 200 ma</i>      |                   | <i>Unregulated Voltage = 495 V DC</i> |     |        |        |     |        |        |        |
|---------------------------|-------------------|---------------------------------------|-----|--------|--------|-----|--------|--------|--------|
| <i>Tube Socket Symbol</i> | <i>Pin Number</i> |                                       |     |        |        |     |        |        |        |
|                           | 1                 | 2                                     | 3   | 4      | 5      | 6   | 7      | 8      | 9      |
| XV1                       | 210               | 493                                   | 280 | 210    | 493    | 280 | 6.3(4) | 6.3(4) | —      |
| XV2                       | 210               | 493                                   | 280 | 210    | 493    | 280 | 6.3(4) | 6.3(4) | —      |
| XV3                       | 210               | 493                                   | 280 | 210    | 493    | 280 | 6.3(4) | 6.3(4) | —      |
| XV4                       | 88                | 0                                     | —   | 0      | TIE    | —   | 0      | —      | —      |
| XV5                       | 210               | 150                                   | 152 | 6.3(5) | 6.3(5) | 150 | 87     | 88     | 6.3(5) |
| XV6                       | 280               | 150                                   | 152 | 6.3(5) | 6.3(5) | 280 | 87     | 88     | 6.3(5) |
| <i>Load = 1,500 ma</i>    |                   | <i>Unregulated Voltage = 398 V DC</i> |     |        |        |     |        |        |        |
| XV1                       | 300               | 397                                   | 310 | 300    | 397    | 310 | 6.3(4) | 6.3(4) | —      |
| XV2                       | 300               | 397                                   | 310 | 300    | 397    | 310 | 6.3(4) | 6.3(4) | —      |
| XV3                       | 300               | 397                                   | 310 | 300    | 397    | 310 | 6.3(4) | 6.3(4) | —      |
| XV4                       | 87                | 0                                     | —   | 0      | TIE    | —   | 0      | —      | —      |
| XV5                       | 300               | 150                                   | 152 | 6.3(5) | 6.3(5) | 150 | 87     | 87.5   | 6.3(5) |
| XV6                       | 282               | 150                                   | 152 | 6.3(5) | 6.3(5) | 282 | 84     | 87.5   | 6.3(5) |

- NOTES: 1. All voltages DC unless otherwise specified.  
 2. Voltage values taken at 117 v ac input, 280 v dc output.  
 3. Meter used; RCA "Senior Voltohmyst."  
 4. AC volts measured between pins 7 and 8;  
 5. AC volts measured between pins 4 and 9; } dc voltage of approximately +140 volts also present.



**TABLE 4**  
**TUBE SOCKET RESISTANCE MEASUREMENTS TO CHASSIS GROUND**  
 (With load removed, and regulator unit disconnected from rectifier unit.)

| Tube<br>Socket<br>Symbol | Pin Number |      |         |      |      |         |      |      |      |
|--------------------------|------------|------|---------|------|------|---------|------|------|------|
|                          | 1          | 2    | 3       | 4    | 5    | 6       | 7    | 8    | 9    |
| XV1                      | Open       | Open | 128K    | Open | Open | 128K    | 280K | 280K | —    |
| XV2                      | Open       | Open | 128K    | Open | Open | 128K    | 280K | 280K | —    |
| XV3                      | Open       | Open | 128K    | Open | Open | 128K    | 280K | 280K | —    |
| XV4                      | 240K       | 0    | No Con. | 0    | 240K | No Con. | 0    | —    | —    |
| XV5                      | Open       | 600K | 30K     | 280K | 280K | 600K    | 260K | 15K  | 280K |
| XV6                      | 128K       | 105K | 30K     | 280K | 280K | 128K    | 75K  | 15K  | 280K |

**TABLE 5**  
**TRANSFORMER AND CHOKE**  
**RESISTANCE MEASUREMENTS (COLD)**

| Rectifier Chassis   |          |                   |
|---------------------|----------|-------------------|
| Component<br>Symbol | Terminal | Value             |
| T101                | 1 to 2   | 0.20              |
|                     | 1 to 3   | 0.19              |
|                     | 1 to 4   | 0.18              |
|                     | 1 to 5   | 0.17              |
|                     | 6 to 7   | 5.0               |
| L101, L102          | 1 to 2   | 12.0              |
| L103, L104          | 1 to 2   | 0.7               |
| Regulator Chassis   |          |                   |
| Component<br>Symbol | Terminal | Value             |
| T1                  | 1 to 2   | 3.3               |
|                     | 1 to 3   | 3.5               |
|                     | 1 to 4   | 3.8               |
|                     | 1 to 5   | 4.1               |
|                     | 6 to 7   | Too small to read |

#### Checking the Germanium Rectifier CR101

An idea of the condition of the germanium rectifier CR101 located on the rectifier chassis, may be obtained by using an RCA "Senior VoltOhmyst" vacuum tube voltmeter. Switch the VoltOhmyst to the lowest ohms scale. Connect one lead at the junction of the rectifier CR101, C110, and the common side of C101. Connect the other lead at the junction of CR101 and L103. These points are directly across one leg of CR101, (refer to schematic of the rectifier unit). Note the reading obtained; then reverse the meter leads. If both readings indicate a near shorted condition (less than 10 ohms), a defective unit is probable and a more positive check should be made with CR101 disconnected from the circuit. The foregoing procedure should be observed in checking the other three sections of CR101 at the following points:

Between the junction of CR101, C110, C101 and the junction of CR101, R117 and F101.

Between the junction of CR101, R117, F101 and the junction of CR101, R120 and L101.

Between the junction of CR101, L101, R129 and the junction of CR101 and L103.



## LIST OF PARTS

| MI-26088A REGULATOR CHASSIS |                                                                               |             |           |
|-----------------------------|-------------------------------------------------------------------------------|-------------|-----------|
| Symbol No.                  | Description                                                                   | Drawing No. | Stock No. |
| C1                          | Capacitor: electrolytic, 10/10/10/10 mf., +50% -10%, 450 v                    | 458558-10   | 98986     |
| C2                          | Capacitor: fixed, paper, 0.033 mf., ±10%, 400 v                               | 735715-169  | 73552     |
| C3                          | Capacitor: fixed, paper, 0.1 mf., ±10%, 400 v                                 | 735715-175  | 73551     |
| C4                          | Capacitor: fixed, paper, 0.47 mf., ±10%, 400 v                                | 737818-96   | 59512     |
| F4                          | Fuse: 2 amp., 125 v                                                           | 8851771-10  | 93939     |
| I1                          | Lamp: miniature bayonet base, neon                                            | 872291-9    | 101857    |
| J1                          | Connector: male, 6 contact chassis mounting                                   | 727969-3    | 51604     |
| J2, J3                      | Connector: female, 6 contact chassis mounting                                 | 727969-1    | 51594     |
| J4                          | Jack: single circuit                                                          | 8909777-1   | 18466     |
| J5                          | Connector: female, phono tip jack, red                                        | 8825451-2   | 207347    |
| K1                          | Relay: plug in type, 6.3 VAC., contacts normally open, SPST                   | 469740-26   | 213366    |
| P1                          | Connector: female, 6 contact, cable mounting                                  | 727969-4    | 51607     |
| P2, P3                      | Connector: male, 6 contact, cable mounting                                    | 727969-2    | 51595     |
| R1, R2                      | Resistor: fixed, composition, 470,000 ohms, ±10%, 1/2 w                       | 82283-94    | 502447    |
| R3                          | Resistor: fixed, composition, 200,000 ohms, ±1%, 1 w                          | 258656-27   | 211414    |
| R7                          | Resistor: fixed, composition, 130,000 ohms, ±5%, 1 w                          | 90496-210   | 512413    |
| R8                          | Resistor: fixed, composition, 150,000 ohms, ±5%, 1 w                          | 90496-211   | 512415    |
| R9                          | Resistor: fixed, composition, 220 ohms, ±10%, 1/2 w                           | 82283-54    | 502122    |
| R10 to R15                  | Resistor: fixed, composition, 5 ohms, ±1%, 1 w                                | 258256-34   | 211415    |
| R16                         | Resistor: fixed, composition, 470,000 ohms, ±10%, 1/2 w. Same as R1           | 82283-94    | 502447    |
| R17                         | Resistor: fixed, composition, 220 ohms, ±10%, 1/2 w. Same as R9               | 82283-54    | 502122    |
| R18                         | Resistor: fixed, composition, 30,000 ohms, ±5%, 2 w                           | 99126-194   | 522330    |
| R19                         | Resistor: fixed, composition, 100 ohms, ±10%, 1/2 w                           | 82283-50    | 502110    |
| R20, R21                    | Resistor: fixed, wire wound, 100 ohms ±5%, 10 w                               | 8817660-8   | 211417    |
| R22, R23                    | Resistor: fixed, composition, 100 ohms, ±10%, 1/2 w. Same as R19              | 82283-50    | 502110    |
| R24, R25                    | Resistor: fixed, wire wound, 100 ohms, ±5%, 10 w. Same as R20                 | 8817660-8   | 211417    |
| R26, R27                    | Resistor: fixed, composition, 100 ohms, ±10%, 1/2 w. Same as R19              | 82283-50    | 502110    |
| R28, R29                    | Resistor: fixed, wire wound, 100 ohms, ±5%, 10 w. Same as R20                 | 8817660-8   | 211417    |
| R30                         | Resistor: fixed, composition, 100 ohms, ±10%, 1/2 w. Same as R19              | 82283-50    | 502110    |
| R31                         | Resistor: fixed, composition, 12,000 ohms, ±5%, 1 w                           | 90496-185   | 512312    |
| R32                         | Resistor: fixed, composition, 470,000 ohms, ±10%, 1/2 w. Same as R1           | 82283-94    | 502447    |
| R33                         | Resistor: fixed, composition, 27,000 ohms, ±10%, 1/2 w                        | 82283-79    | 502327    |
| R34                         | Resistor: fixed, composition, 15,000 ohms, ±10%, 1 w                          | 90496-76    | 512315    |
| R35                         | Resistor: fixed, composition, 100,000 ohms, ±10%, 1 w                         | 90496-86    | 512410    |
| R36                         | Resistor: fixed, composition, 220 ohms, ±10%, 1/2 w. Same as R9               | 82283-54    | 502122    |
| R37                         | Resistor: fixed, carbon film, 200,000 ohms, ±1%, 1 w                          | 990187-530  | 56085     |
| R38                         | Resistor: variable, composition, 10,000 ohms, ±10%, 2 w                       | 427471-38   | 209610    |
| R39                         | Resistor: fixed, carbon film, 80,600 ohms, ±1%, 1 w                           | 990187-488  | 212079    |
| R40                         | Resistor: fixed, composition, 680,000 ohms, ±10%, 1/2 w                       | 82283-96    | 502468    |
| R41                         | Resistor: fixed, composition, 60 ohms, ±1%, 1 w                               | 258656-35   | 211416    |
| R42, R43                    | Resistor: fixed, metal film, 2 ohms, ±1%, 2 w                                 | 8882390-18  | 211422    |
| R47                         | Resistor: fixed, composition, 27,000 ohms, ±10%, 1/2 w. Same as R33           | 82283-79    | 502327    |
| R48                         | Resistor: fixed, composition, 220,000 ohms, ±10%, 1/2 w                       | 82283-90    | 502422    |
| S1                          | Switch: rotary wafer, 2 circuit, 4 section, 8 position, non-shorting contacts | 480531-1    | 211418    |
| S2                          | Switch: toggle, DPDT                                                          | 433007-4    | 99673     |
| T1                          | Transformer: filament                                                         | 992006-1    | 210760    |
| XF4                         | Holder: fuse                                                                  | 8817617-1   | 211618    |
| XI1                         | Socket: lamp                                                                  | 8861516-1   | 204539    |
| XV1 to XV3                  | Socket: tube, 8 contact                                                       | 99393-1     | 208505    |
| XV4                         | Socket: tube, 7 contact miniature                                             | 737867-14   | 94925     |
| XV5 to XV7                  | Socket: tube, 9 contact miniature                                             | 737870-14   | 94926     |
|                             | Insulator: jack, molded phenolic cup                                          | 399979-1    | 56177     |
|                             | Jewel: clear, glass, faceted male bushing                                     | 746936-47   | 211420    |
|                             | Knob: control, pointer type, black                                            | 741622-501  | 205329    |
|                             | Plate: mounting, electrolytic capacitor                                       | 85559-3     | 19984     |
|                             | Radiator: heat, helical type                                                  | 8918709-1   | 211421    |
|                             | Terminal: stand-off                                                           | 8890637-5   | 97745     |



## MI-26087A RECTIFIER ASSEMBLY

| Symbol No.   | Description                                                                            | Drawing No. | Stock No. |
|--------------|----------------------------------------------------------------------------------------|-------------|-----------|
| C101, C102   | Capacitor: electrolytic, 10/10/10/10 mf., +50% -10%, 450 v                             | 458558-10   | 98986     |
| C103 to C108 | Capacitor: electrolytic, 125 mf., +50% -10%, 350 v                                     | 458558-1    | 95914     |
| C109         | Capacitor: electrolytic, 1000 mf., +100% -10%, 25 v                                    | 458558-6    | 97639     |
| C110         | Capacitor: fixed, paper, 0.5 mf., $\pm 10\%$ , 1500 v                                  | 990485-43   | 214750    |
| CR101        | Rectifier: germanium                                                                   | 992007-1    | 210348    |
| F101         | Fuse: 2 amp., 250 v, ceramic tube                                                      | 8845660-19  | 211405    |
| F102         | Fuse: 10 amp., 32 v, glass cartridge                                                   | 8858508-19  | 212156    |
| I101, I102   | Lamp: miniature bayonet base                                                           | 872291-9    | 101857    |
| J101         | Connector: female, 6 contact, chassis mounting                                         | 187656-20   | 211406    |
| J102         | Connector: male, 2 contact, chassis mounting                                           | 727969-1    | 51594     |
| J103         | Jack: tip, red                                                                         | 8825451-2   | 207347    |
| K101         | Relay: coil, 115 v, 50/60 cy., contact, DPDT, (1 N.O., 1 N.C.)                         | 441257-4    | 211473    |
| L101, L102   | Reactor: filter                                                                        | 992005-1    | 210759    |
| L103, L104   | Reactor: 64 millihenry, at 30.5 volts RMS; resistance: 0.65 ohms, $\pm 10\%$           | 8411410-1   | 214752    |
| P101         | Connector: male, 6 contact, cable mounting                                             | 184181-3    | 65795     |
| P102         | Connector: female, 2 contact, cable mounting                                           | 727969-2    | 51595     |
| R101         | Resistor: fixed, wire wound, 10,000 ohms, $\pm 10\%$ , 50 w                            | 427230-23   | 46076     |
| R102         | Resistor: fixed, wire wound, 65 ohms, $\pm 5\%$ , 5 w                                  | 458572-19   | 205033    |
| R103 to R106 | Resistor: fixed, composition, 220,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ w               | 82283-90    | 502422    |
| R107         | Resistor: fixed, wire wound, 65 ohms, $\pm 5\%$ , 5 w. Same as R102                    | 458572-19   | 205033    |
| R108 to R111 | Resistor: fixed, composition, 220,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ w. Same as R103 | 82283-90    | 502422    |
| R112 to R115 | NOT USED.                                                                              |             |           |
| R116         | Resistor: fixed, composition, 1000 ohms, $\pm 10\%$ , 1 w                              | 90496-62    | 512210    |
| R117         | Resistor: fixed, composition, 1 meg., $\pm 10\%$ , $\frac{1}{2}$ w                     | 82283-98    | 502510    |
| R118         | Resistor: fixed, composition, 220,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ w. Same as R103 | 82283-90    | 502422    |
| R119         | NOT USED.                                                                              |             |           |
| R120         | Resistor: fixed, wire wound, 800 ohms, $\pm 5\%$ , 10 w                                | 8817660-11  | 96211     |
| R121         | NOT USED.                                                                              |             |           |
| R122, R123   | Resistor: fixed, composition, 220,000 ohms, $\pm 10\%$ , $\frac{1}{2}$ w. Same as R103 | 82283-90    | 502422    |
| S101         | Switch: toggle, DPDT                                                                   | 433007-4    | 99673     |
| T101         | Transformer: plate                                                                     |             |           |
| XF101        | Holder: fuse                                                                           | 8920191-1   | 211618    |
| XF102        | Holder: fuse                                                                           | 8817617-1   | 211618    |
| XI101, XI102 | Socket: pilot light, with jewel                                                        | 8863708-7   |           |
|              | Socket: only                                                                           |             | 56100     |
|              | Jewel: red                                                                             |             | 204667    |
|              | Cover: capacitor, for C103 to C108                                                     | 85549-8     | 72175     |
|              | Cover: capacitor, for C101, 102, 109                                                   | 85549-9     | 71783     |
|              | Grommet: rubber, $\frac{5}{8}$ " OD x $17/64$ " ID x $5/16$ " thk.                     | 57421-1     | 73155     |
|              | Plate: mounting, electrolytic capacitor                                                | 85558-3     | 18469     |



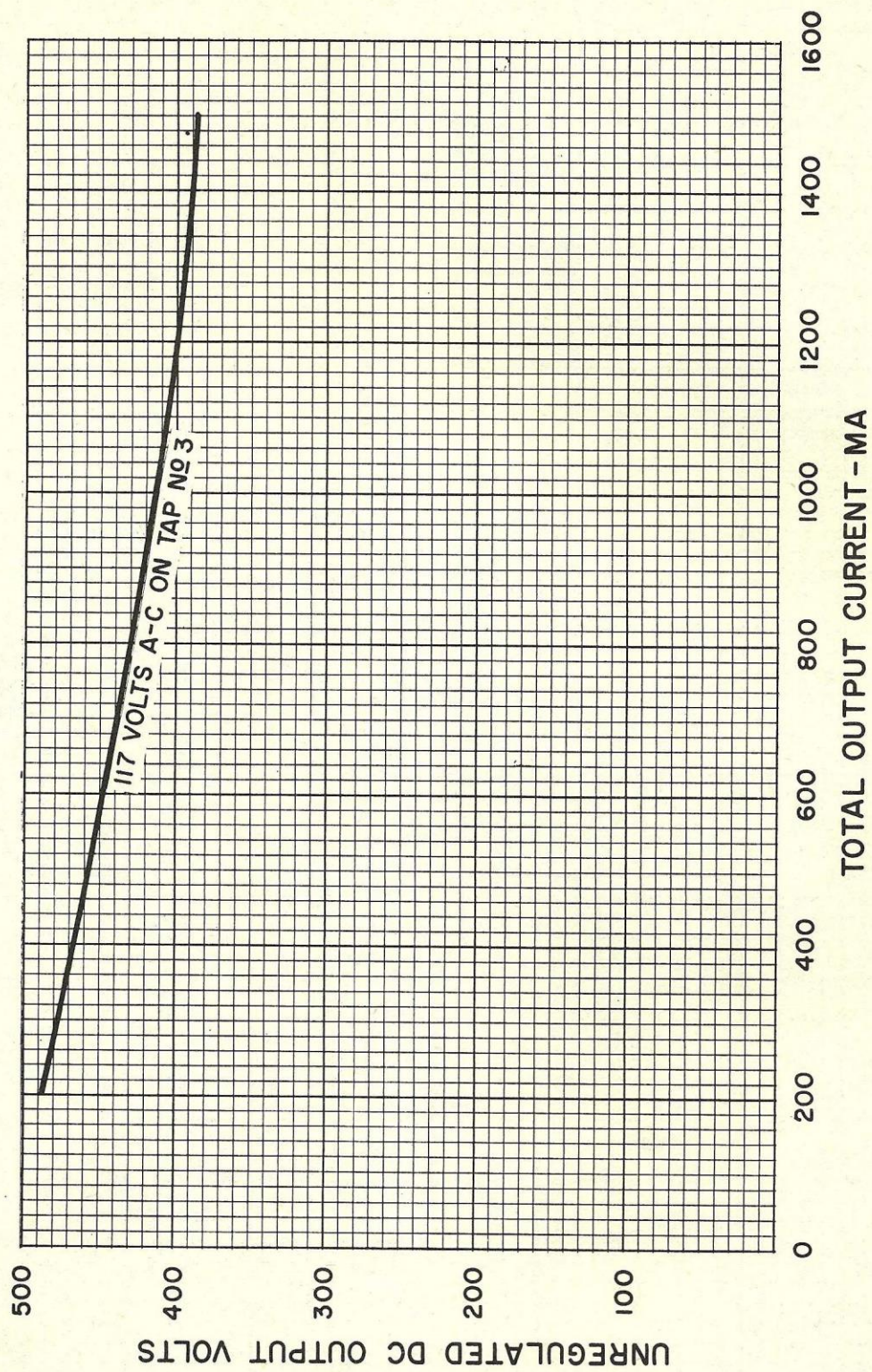
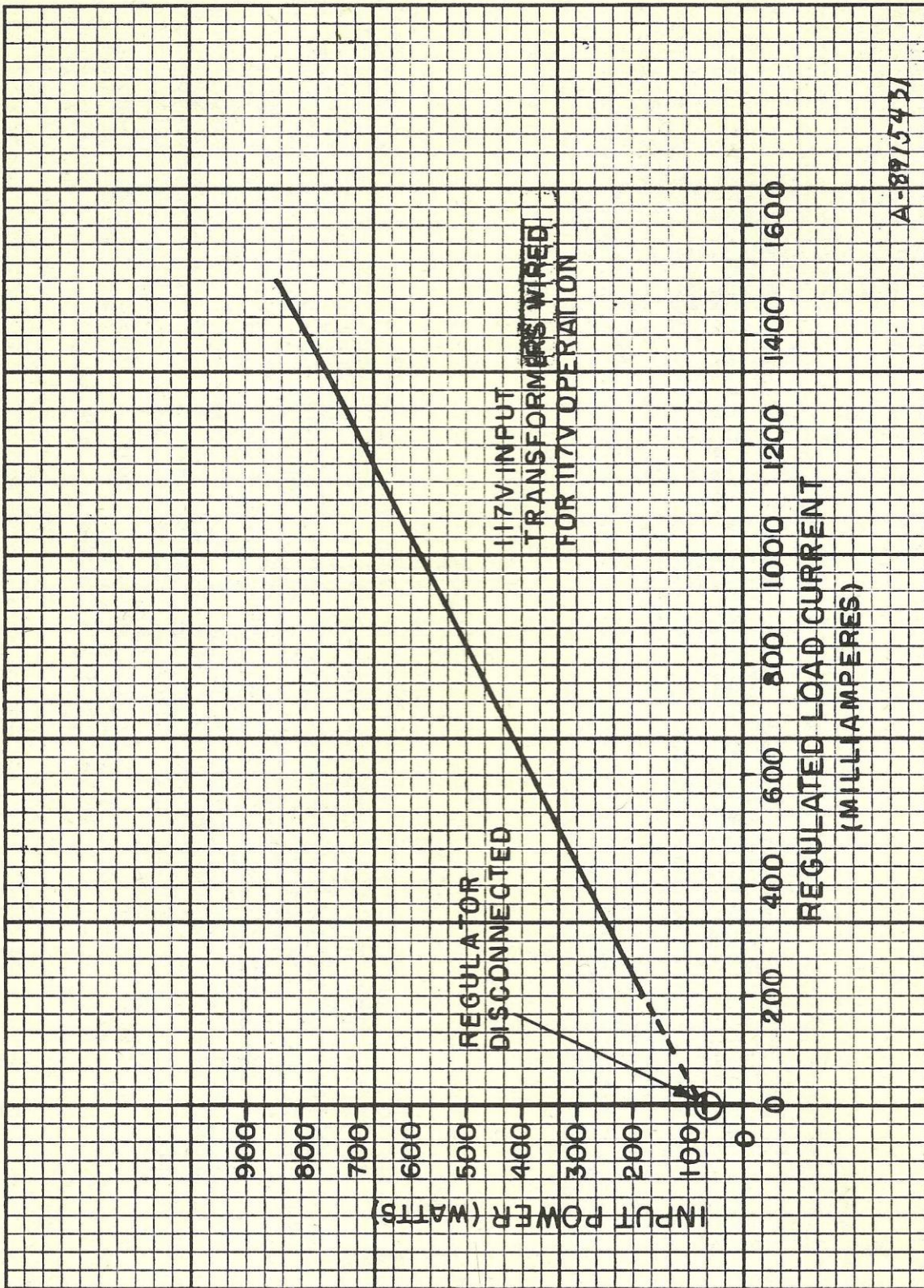


Figure 9. Curve of Regulation of Unregulated Voltage for a Typical Unit





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Figure 10. Power Consumption of a Typical Unit Showing Input Watts Versus Regulated Load Current



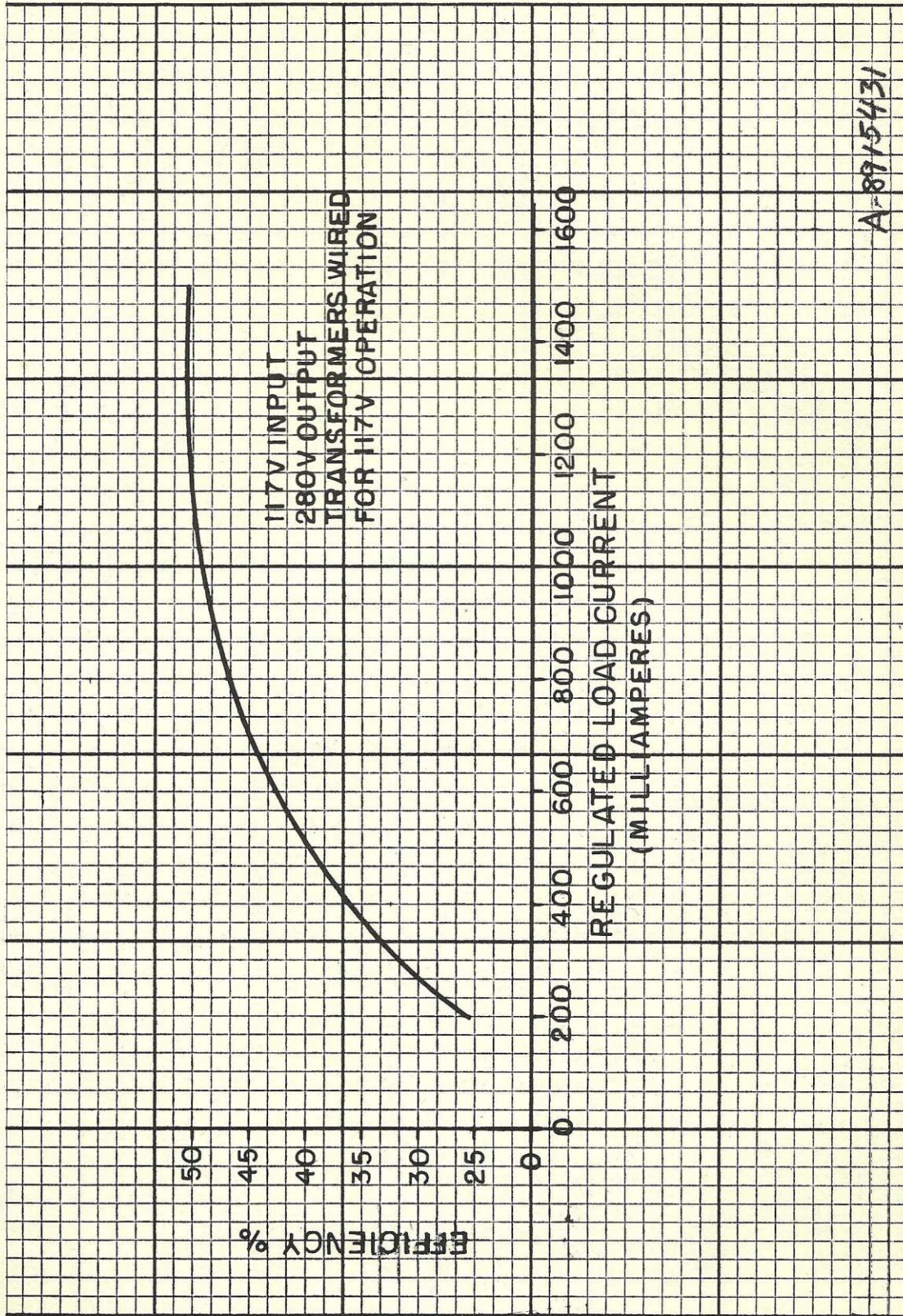


Figure 11. Efficiency Versus Load Current for a Typical Unit



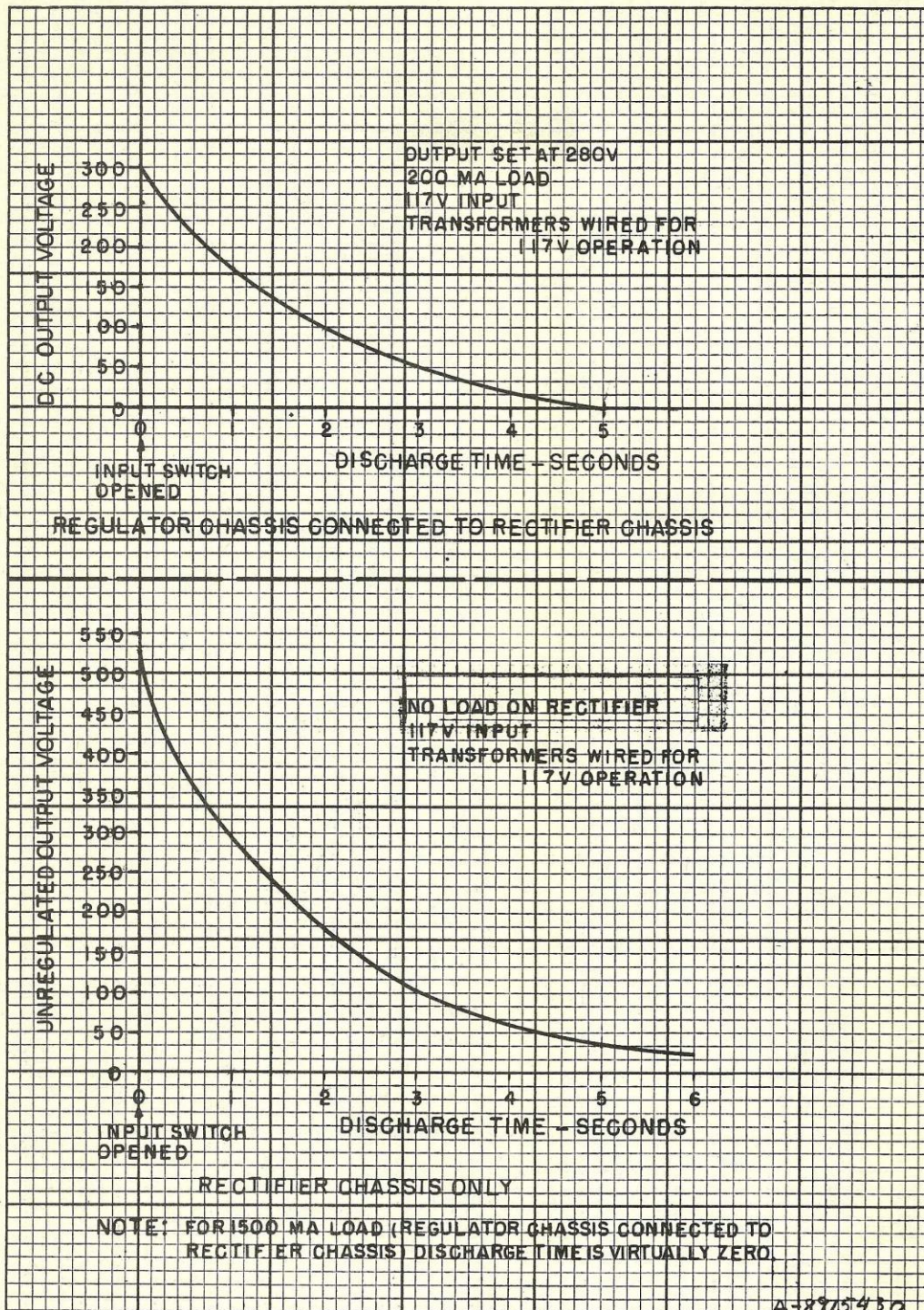
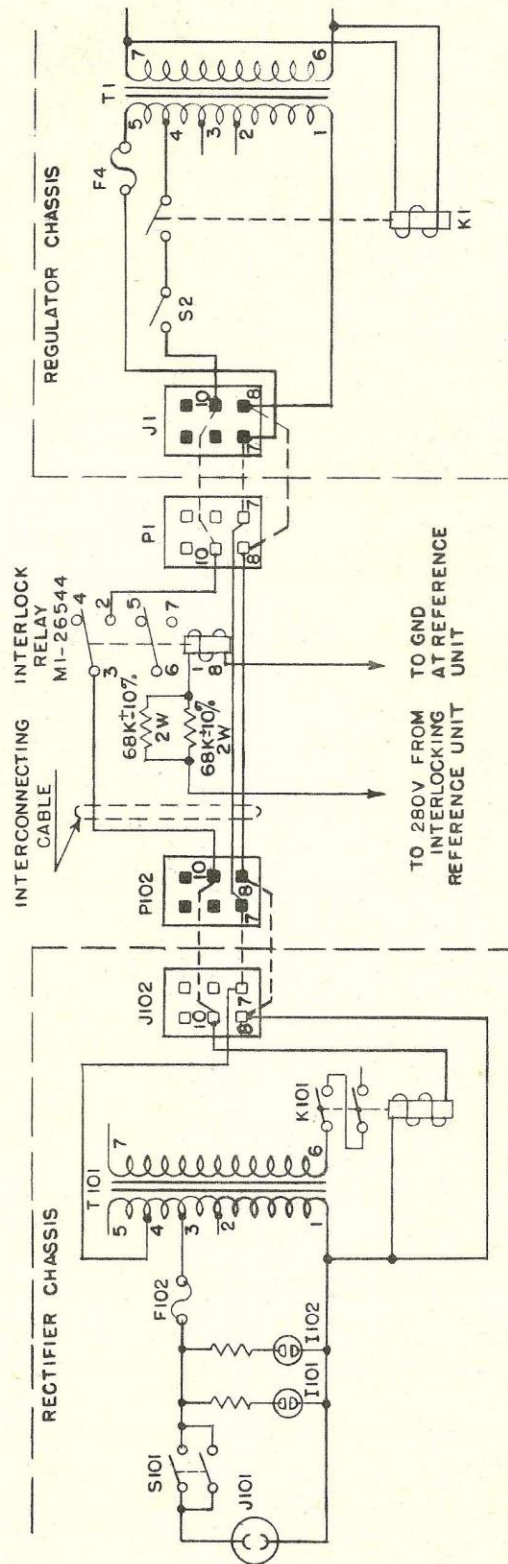


Figure 12. Capacitor Discharge Time for a Typical Unit





8414873-0

Figure 13. Method of Interlocking a WP-15A to a +280 Volt Reference Voltage



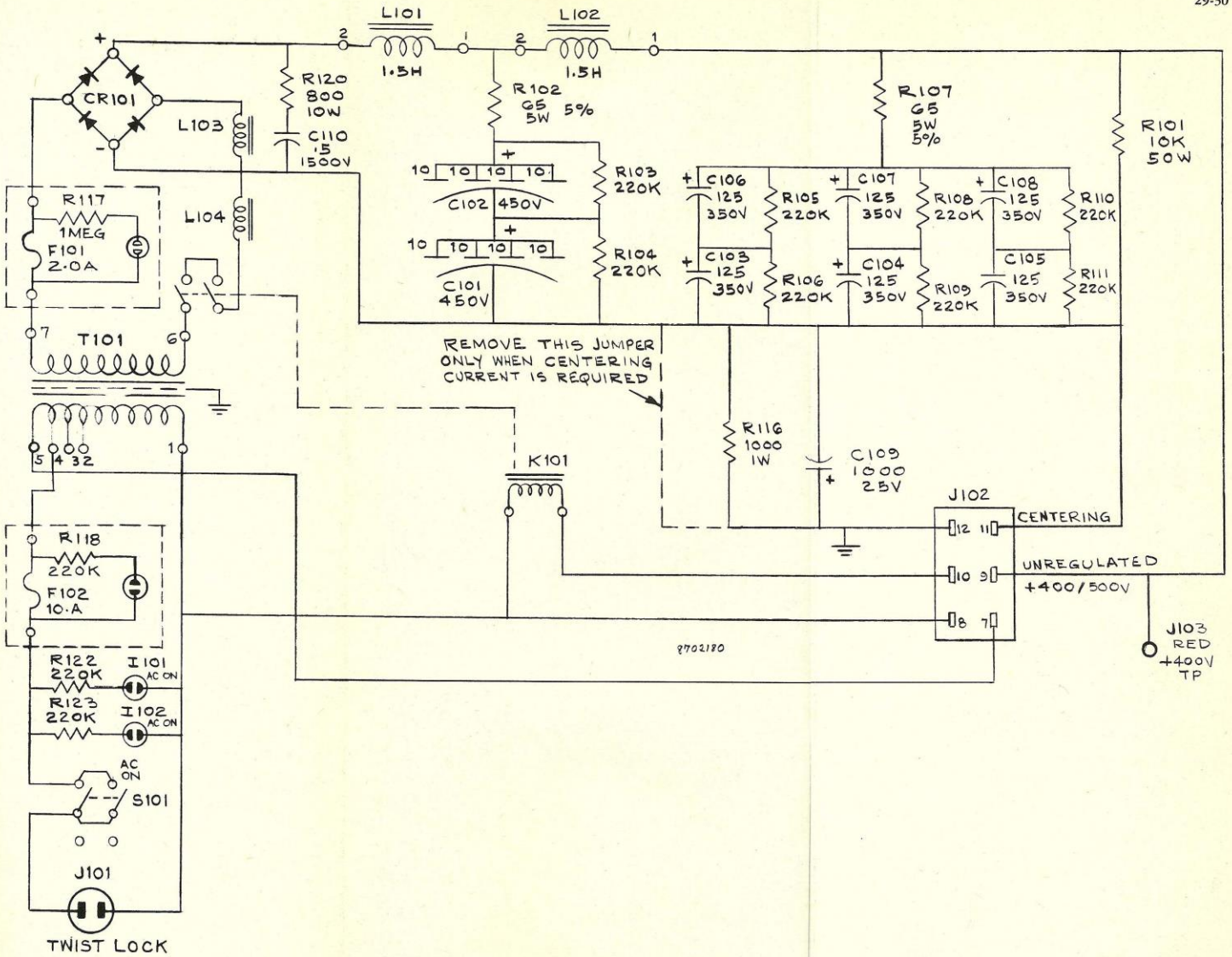


Figure 14. Schematic Diagram—Rectifier Circuit WP-15A Regulated Power Supply





## ADDENDA TO IB-36277-1 FOR THE WP-15A REGULATED POWER SUPPLY

**DISPOSITION:** To be included with and become a part of Instruction Book IB-36277-1. This Addenda applies only to WP-15A Rectifier and Regulator Units with serial numbers from 1651 to 1850. For units with serial numbers 1851 and above this Addenda may be disregarded.

**Regulator:** Disregard the Regulator Schematic Diagram of Figure 15 in IB-36277-1 and use the *Regulator Schematic Diagram* of this Addenda.

**Parts List:** Add the following items to the parts list for WP-15A Regulator Units serial numbers 1651 to 1850 ONLY:

| SYMBOL     | DESCRIPTION                                      | DRAWING NO. | STOCK NO. |
|------------|--------------------------------------------------|-------------|-----------|
| F1 to F3   | Fuse: ½ amp., 250 v., cartridge                  | 8918721-14  | 211413    |
| R4 to R6   | Resistor: fixed, composition, 1 meg., ±10%, ½ W. | 82283-98    | 502510    |
| R44 to R46 | Resistor: fixed, composition, 1 meg., ±10%, ½ W. | 82283-98    | 502510    |
| XF1 to XF3 | Holder: fuse                                     | 8920191-1   | 211618    |

**Rectifier:** Observe the following differences in connections at T101 on the *Rectifier Schematic Diagram* (Figure 14 of IB-36277-1), for rectifier units with serial numbers 1651 to 1850 ONLY:

1. Connections to tap No. 4 of T101 are made to tap No. 3.
2. Connections to tap No. 5 of T101 are made to tap No. 4.

**NOTE:** The difference in connections at T101 for units in different serial number brackets exists because the transformers in the two cases are different. As long as the original transformer remains in the unit, the factory-made connections should stay fixed, except that the connection coming from F102 may be shifted to account for line voltage conditions. (See *Rectifier Unit Tap Selection* in IB-36277-1 where reference is made to shifting the eyelet terminal).

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