

**Model 1500**  
**Powered CAMAC Crate**

**April 1980**

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# CAMAC

# 1500, 70

## equipment

## Powered CAMAC Crates

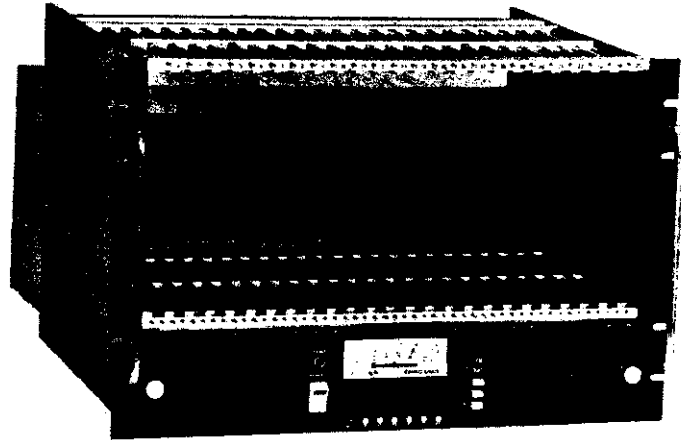
PRODUCT BRIEF

May 77

(Revised Jan. 80)

### FEATURES

- COMPLIES WITH CAMAC SPECIFICATION IEEE 583
- OPERATES FROM 100V, 120V OR 220V (STRAP SELECTABLE)
- +24V, +12V, +6V, -24V, -12V, -6V DC OUTPUTS PROVIDED
- 42A OUTPUT PROVIDED FROM +6V SOURCE
- FULL-SIZE 25 STATION CRATE
- METERING FOR VOLTAGES AND CURRENTS
- OVERVOLTAGE AND CURRENT LIMITING
- DETACHABLE POWER SUPPLY AND BLOWER UNIT
- SEPARATE RACK-MOUNTED POWER SUPPLY OPTION (1570) AVAILABLE



### GENERAL DESCRIPTION

The Model 1500 Powered CAMAC Crate fully complies with the CAMAC specification IEEE Std. 583. This CAMAC crate provides twenty-four normal stations (station numbers 1 - 24) plus one control station (station number 25). The Dataway is a multilayer printed circuit board employing contact-replaceable connector sockets with wire wrap pins. Insulated bus bars are utilized for each of the fourteen power supply lines. These bus bars are wired to a fifty contact power connector for connection to the power supply.

The blower unit is a separate modular package that mounts from the front of the CAMAC crate. Three fans draw air through front mounted filters and move it up through the modules in the crate. The front panel provides an ac power switch, a power-on lamp, and a thermal warning lamp. There are also test points for measuring the  $\pm 6$ ,  $\pm 12$  and  $\pm 24$ V sources and push-button metering to monitor the voltages and current loads for all of these sources.

The power supply is a separate modular unit, requiring only one person to install it to the pre-mounted CAMAC crate. The positive and negative supply regulators are mounted on plug-in modules, and there is an integral blower to cool critical components. The six voltage outputs are simultaneously available, however the currents are limited to a total output power of 300 watts. The  $\pm 6$ V and the  $\pm 24$ V supplies operate on a current sharing basis such that the total combined current outputs are limited to 42 amperes for the  $\pm 6$ V supplies and 6 amperes for the  $\pm 24$ V supplies.

The  $\pm 12$ V sources are limited to 3 amperes each. These sources are derived from the  $\pm 24$ V sources. Therefore, any current drain on the  $\pm 12$ V busses subtracts from the  $\pm 24$ V current capacity.

The Model 1500 includes the necessary hardware for mounting 36 contact printed circuit board edge connectors at the rear of the crate. It is also available with the power supply provided as a separate rack-mountable unit.

The Model 1570 has the same electrical characteristics as the 1500. However, the 1570 contains a separate rack-mountable power supply. This is desirable if only front access is available. The power supply is 22 cm. (8.67") high x 48.26 cm. (19") wide x 14.4 cm. (5.67") deep. The crate/fan unit portion is 31.1 cm. (12.25") high.

# Kinetic Systems

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## SPECIFICATIONS

Input voltage:	100 VAC, 120 VAC, 220 VAC (strap selectable)
Input frequency:	50-60 Hz
Outputs:	+6 volts, 42 amperes (Note 1) -6 volts, 25 amperes (Note 1) +24 volts, 6 amperes (Note 2) -24 volts, 6 amperes (Note 2) +12 volts, 3 amperes (Note 2) -12 volts, 3 amperes (Note 2)
Regulation: (line and load, 24 hr. period)	+6 volts $\pm 0.45\%$ -6 volts $\pm 0.35\%$ $\pm 24$ volts $\pm 0.15\%$ $\pm 12$ volts $\pm 0.25\%$
Stability: (6 month period)	$\pm 6$ volts $\pm 0.40\%$ $\pm 24$ volts $\pm 0.15\%$ $\pm 12$ volts $\pm 0.25\%$
Noise and Ripple:	10 mV P-P maximum
Temperature range:	0°C - 50°C (Ambient)
Temperature coefficient:	0.02% per °C maximum
Voltage adjustment:	$\pm 2\%$ minimum
Transient recovery:	50 microseconds typical
Sensing:	Remote on all outputs
Fuses:	Line input and all outputs
Protection:	Fold-back current limiting and crow-bar, all outputs
Metering:	Voltages and currents, all outputs
Dimensions: (Model 1500)	Height - 31.1 cm. (12.25") Width - 48.3 cm. (19") Depth - 52.5 cm. (20.67")
Notes:	1. Current shared to 42 amperes. 2. The $\pm 24$ volt sources are current shared to 6 amperes; also the combined current from $\pm 24$ and $\pm 12$ volt sources must not exceed 6 amperes.

## ORDERING INFORMATION

Model 1500-P1K - Powered CAMAC crate with self-contained power supply Weight: 34 kg. (75 lb.)

Model 1570-P1B - Powered CAMAC crate with separate power supply Weight: 34 kg. (75 lb.)

**NOTE:** When ordering a powered crate, please state voltage option desired. For example, "Model 1500-P1K for 120 volt operation". The unit will be marked and strapped for that voltage. The customer can change the operating voltage to agree with local line voltage by changing straps and fuse values.

Model 1500

## UNPACKING AND INSPECTION

The 1500 powered CAMAC crate includes the following units.

1. 1500-100 ventilation unit (shipped in crate assembly).
2. 1500-200 power supply with detached power cord.
3. 1500-300 crate assembly.

Remove the ventilation unit from the crate assembly. This is done by first loosening the two large captive screws on the front panel (one on each side of the ventilation unit). Then slide the ventilation unit forward.

While unpacking, check the following for possible shipping damage:

### Ventilation Unit:

1. Damage to rear connector.
2. Damage to switches or meter on the front panel.

Note: Do not re-install ventilation unit in crate assembly at this time.

### Power Supply:

1. Check external connectors and cable.
2. Check for any external damage.

### Crate Assembly:

1. Check Dataway connector.
2. Check for bent connector pins on Dataway.
3. Check for damaged module connectors.

## AC INPUT VOLTAGE SELECTION

The 1500-200 power supply operates from 100V, 120V, 200V, or 220V 50/60HZ (strap selectable) AC input voltage. Prior to operating the power supply for the first time, the input strapping should be checked. This is accomplished as follows (see Figure 1):

1. Check tag attached to power supply mounting block to assure that local supply voltage agrees with that set at the factory.
2. Remove supply cover by turning five quarter-turn fasteners on the rear of the cover.
3. Check for any internal damage.
4. Check straps on TB1 terminal strip per the following chart (see Figure 2).

<u>Nominal AC Voltage</u>	<u>Strap TB1 Terminals</u>
100V	3&4, 4&5, 7&8
120V	1&2, 2&3, 7&8
200V	3&4, 9&10
220V	2&3, 6&7

5. Replace rear cover. Tighten five quarter-turn fasteners.
6. Check that F1 and F2 agree with fuse data on supply cover.

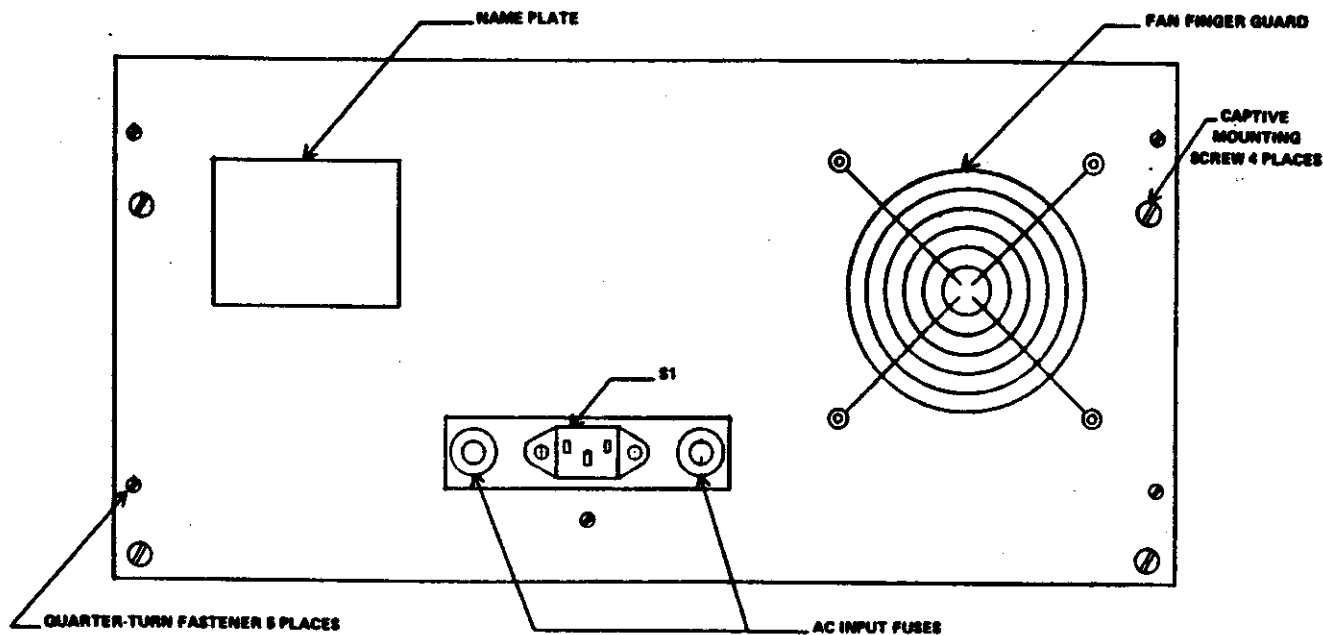


Figure 1 - Power Supply, Rear View

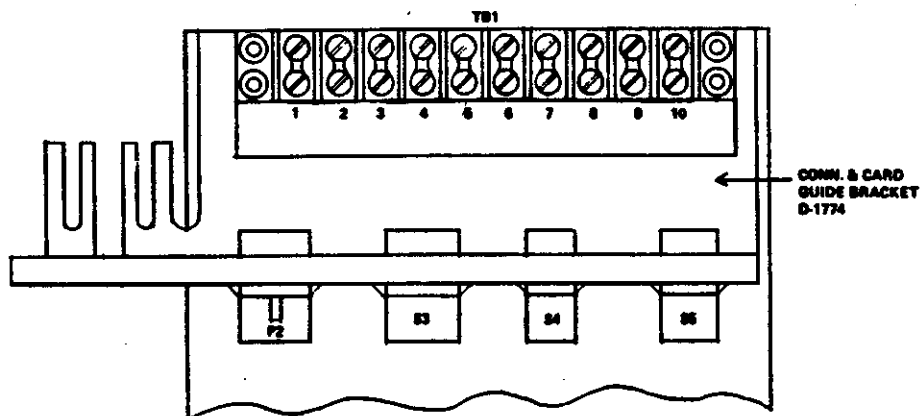


Figure 2 - Strap Selection on Terminal Strip

**INSTALLATION**

The Model 1500 powered crate mounts in any standard 19" equipment cabinet with a minimum depth of 61cm (24 inches). The crate assembly has a front-panel height of 31.1 cm (12.25 inches).

### MOUNTING THE CRATE

For ease of mounting, we recommend that the crate assembly be mounted with the power supply and ventilation unit removed.

### ADDING THE POWER SUPPLY

The power supply should be mounted as follows (see figure 3):

1. Extend the pinned slides of the crate.
2. Place the supply onto pins on the slides.
3. Connect the Dataway socket PG. 27. (Caution: Do not bend the Dataway backplane pins).
4. Push the supply against the crate and start the four captive screws.
5. Tighten the captive screws.

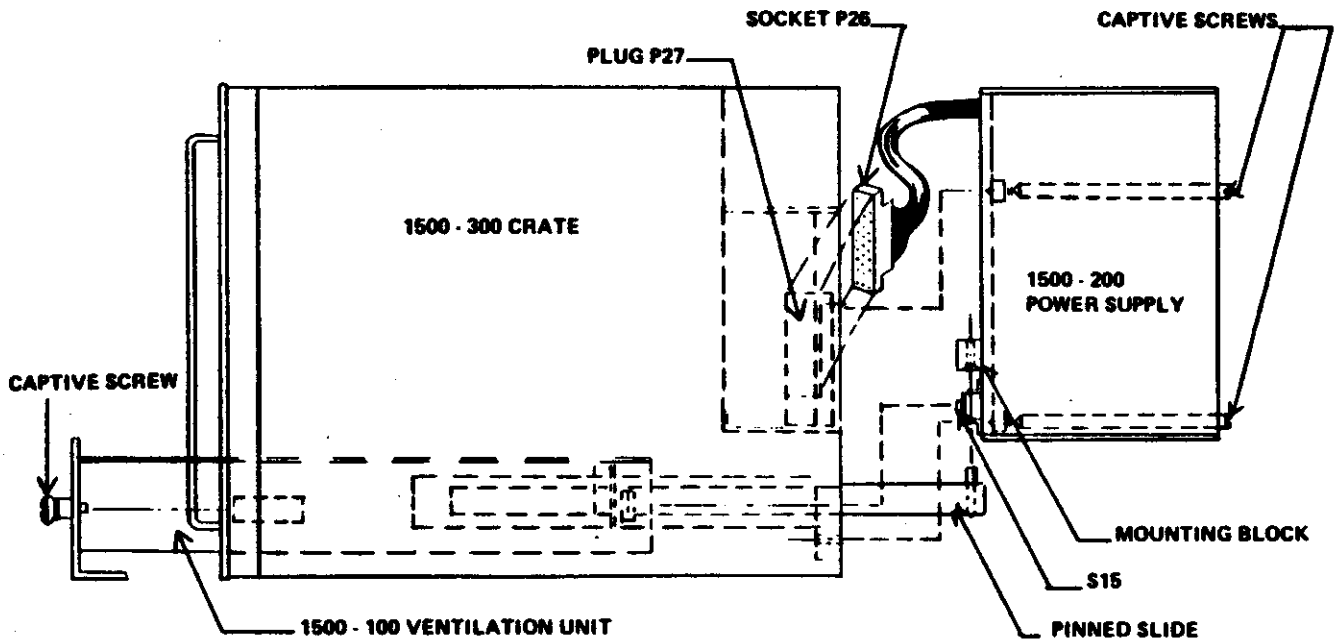


Figure 3 - Model 1500 Powered Crate Installation

### MOUNTING THE VENTILATION UNIT

The ventilation unit should be mounted as follows:

1. Insert the ventilation unit into the blower section of the crate.
2. Slide the unit into the crate until the rear connector mates with the connector on the power supply.
3. Tighten the two captive screws on the front panel of this unit.



**APPLYING POWER TO THE CRATE ASSEMBLY**

The crate is now ready for power to be applied as follows:

1. Connect the power cord to the power supply and an appropriate power source.
2. Turn the power switch to ON position (see figure 4). The ON indicator lamp on the switch should glow. The three fans on the ventilation unit and the rear power supply fan should be rotating.

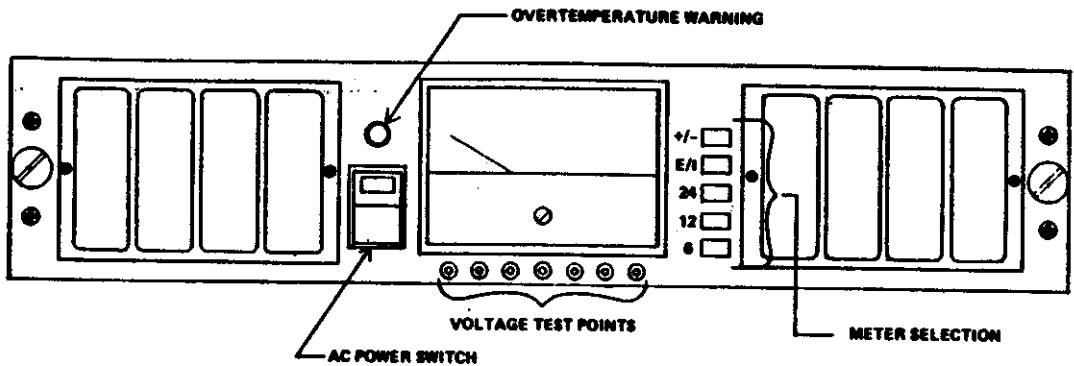


Figure 4 - Ventilation Unit Front Panel

**METERING OF VOLTAGE AND CURRENT**

Check the supply voltages with the front panel meter as indicated below.  
 Note: All voltages should be within the nominal voltage mark on the scale.

1. Press the +/- switch to its IN position.
2. Press the E/I switch to its IN position.
3. Press the 24, 12, and 6 switch IN, one at a time. Read the positive voltages on their respective ranges (see figure 5).
4. Release the +/- switch to its OUT position.
5. Press the 24, 12, and 6 switches IN, one at a time. Read the negative voltages on their respective ranges (see figure 5).

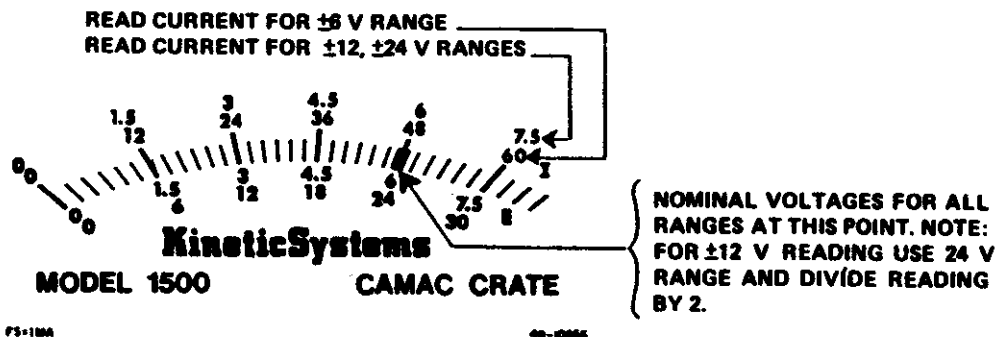


Figure 5 - Front Panel Meter Face

## Model 1500

The current drain for all six voltages can also be monitored. Switch selection is the same as for voltage monitoring, except that the E/I switch is released to its OUT position. With no modules inserted, all current ranges should read "zero". If any current is indicated (and the associated voltage is very low), the protective "high voltage crowbar" may have been activated. This is described later under "SCR CROWBAR".

Note: If the maximum current (as indicated under specifications) for any voltage range is exceeded, the power supply will go into "foldback limiting". This will result in a reduced output voltage.

### TEST POINTS

Test points for monitoring the six supply voltages are provided on the front panel of the ventilation unit. (See figure 4). Each test point is connected to a series resistor. These resistors allow grounding of any test point without affecting operation of the power supply. Any meter with 20,000 ohms/volt or higher sensitivity can be used without affecting the accuracy of the reading.

### COOLING

To decrease failure rate and prolong the life of the power supply, an uninterrupted flow of air over the critical components must be assured.

For power supply cooling, air is drawn into the front filters, through the ventilation unit, around the power transformer, across the power rectifiers, and exhausted through the pass transistor assembly. The fan in the pass transistor assembly provides this air flow.

The air in the ventilation unit is exhausted into the crate by the three fans in this unit. These fans provide the module cooling that is needed. It is important that there are no obstructions to the filters or the rear exhaust area of the power supply.

It is very important to clean the filter foam by immersing in warm, soapy water on a routine basis. Also, check periodically for free rotation of all fans.

### OPERATION

After the modules are installed, the crate is now ready for operation.

Caution: Turn the crate power OFF when inserting or removing CAMAC modules to avoid possible damage caused by momentary misalignment of contacts.

### SCR CROWBAR

Note that the +12 volt supply is derived from the +24 volt supply; also, if the +12 volt supply produces excessive voltage, it triggers the +24 volt crowbar. The same is true of the -12 volt and -24 volt supplies.

**POWER SUPPLY TROUBLE ISOLATION AND REPAIR - INTRODUCTION**

To prevent damage to the CAMAC modules it is suggested they be removed from the crate during power supply trouble diagnosis and repair. The following table is provided to assist in isolating a troubled area.

<u>Trouble Indication</u>	<u>Probable Cause</u>
Complete loss of power	F1 or F2 open, thermal cutout open, blocked air flow, clogged filters, supply overload, defective pass transistor fan.
High temperature indicator ON	Defective pass transistor fan, clogged filters, supply overload, defective thermal sensor
One voltage low	SCR protective "crowbar" triggered, defective regulator card, supply in current limiting
One voltage at zero volts	Defective power rectifier, "blown" pass transistor fuse(s), defective regulator card
All positive voltages at zero	Defective 30 volt boost supply on positive regulator card
All negative voltages at zero	Defective 30 volt boost supply on negative regulator card
Pass transistor fuse open	Pass transistor short

A low voltage condition on an output may be caused by its crowbar SCR being turned on. An SCR in the ON state will cause the regulator associated with that voltage to current limit, thereby lowering its output voltages; if an SCR were triggered by a transient condition, turning the AC power OFF for a short period of time will reset the SCR. If the condition persists, the regulator card should be suspected and checks internal to the supply are necessary.

### POWER SUPPLY SUBASSEMBLIES

The 1500-200 power supply is constructed of pluggable subassemblies; this greatly enhances repair. With the exception of the high current wires to the main filter capacitors, each subassembly is totally pluggable. Removal of a defective subassembly from the main chassis consists of unplugging cables and removal of the hold-down screws on the subassembly.

A list of the subassemblies include:

1. Transformer assembly. (Figure 6)
2. Regulator assembly mother board, B438. (Figure 7)
3. Crate interface assembly, B430. (Figure 8)
4. Cable assembly to ventilation unit. (Figure 9)
5. Pass transistor assembly (Figure 10)
6. Negative and positive and regulator cards, R500 and R501 (Figures 24 and 28, respectively).

In addition to the subassemblies listed above, details of the pass transistor assembly are also shown. These are:

1. Pass transistor fuse blocks (Figure 11).
2. Heatsink for +6 volt pass transistors. (Figure 12)
3. Heatsink for -6 volt pass transistors. (Figure 13)
4. Heatsink for the +24, -24, +12 and -12 transistors. (Figure 14)

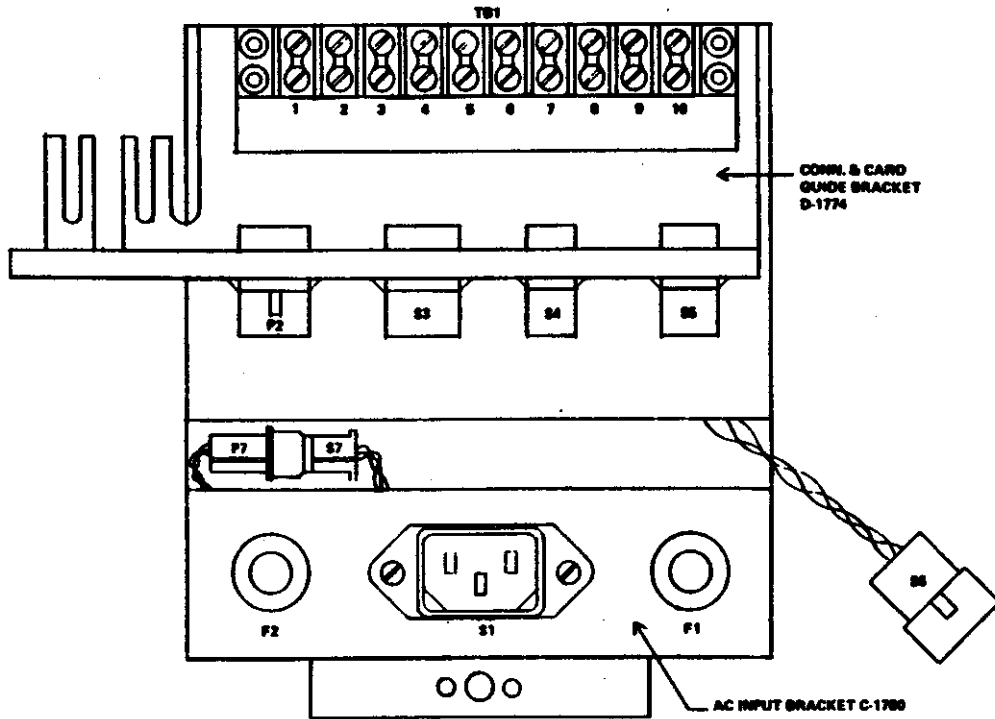


Figure 6 - Transformer Assembly

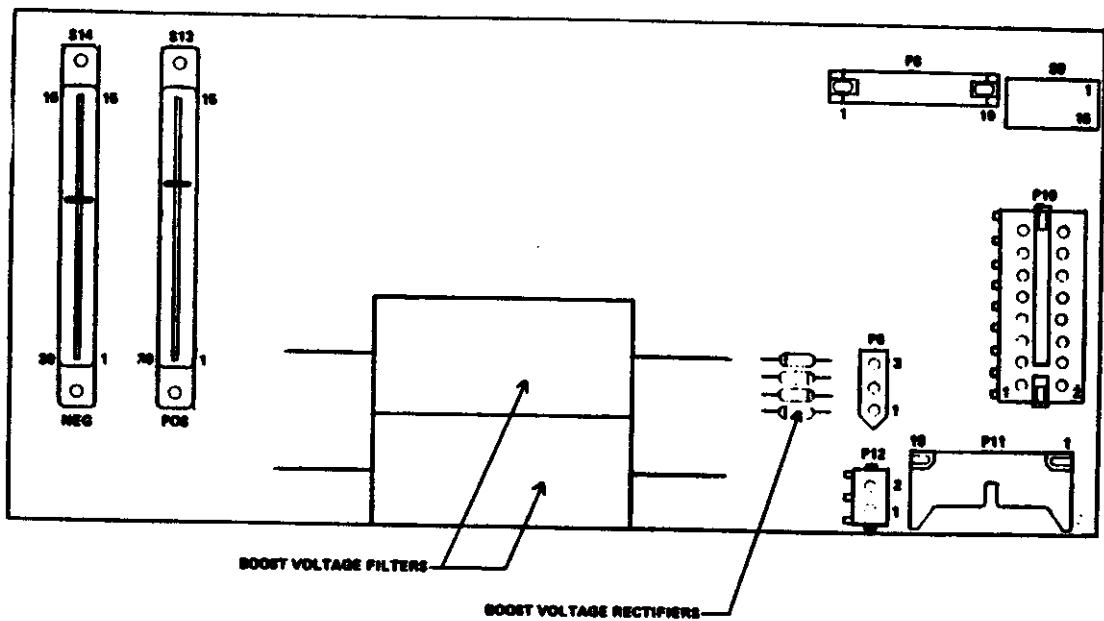


Figure 7 - Regulator Assembly Mother Board

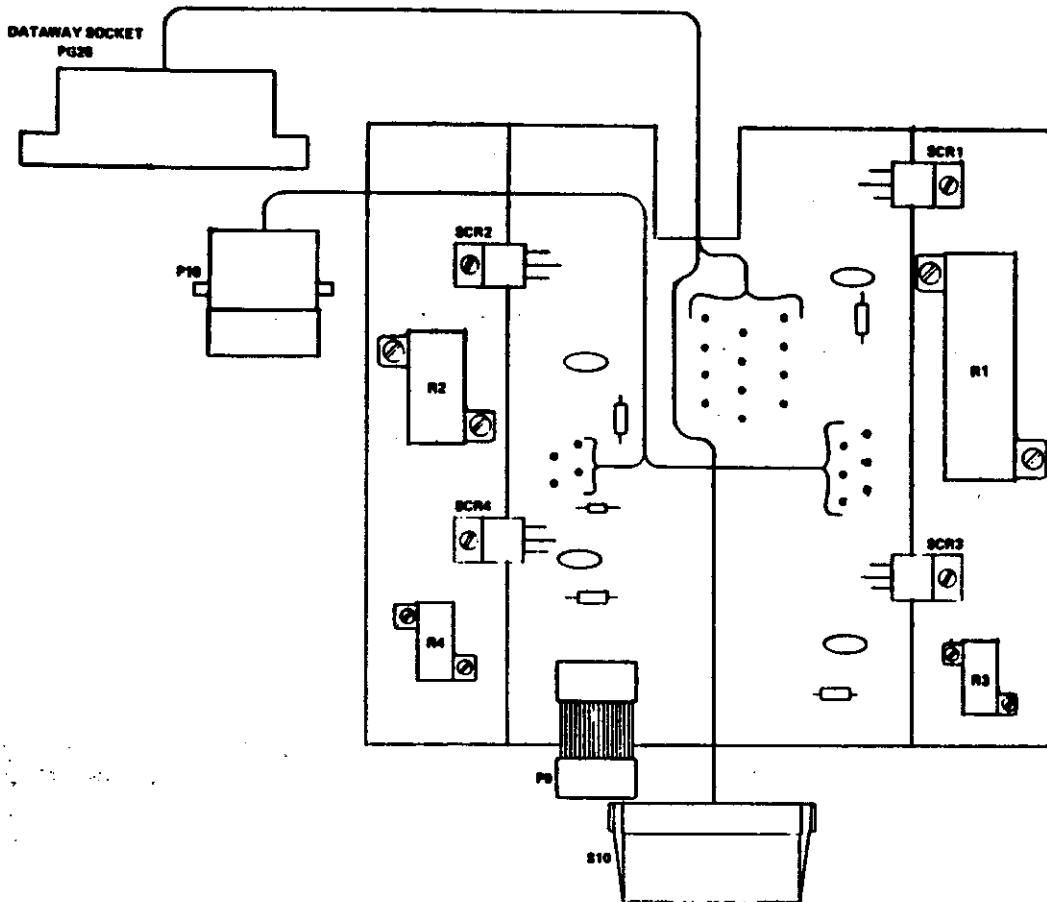


Figure 8 - Crate Interface Assembly, B430

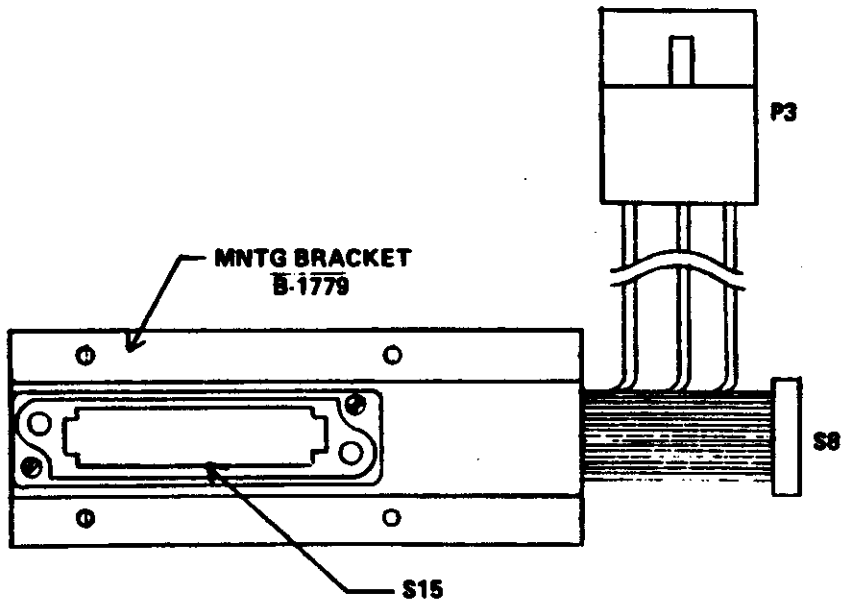


Figure 9 - Cable Assembly to Ventilation Unit

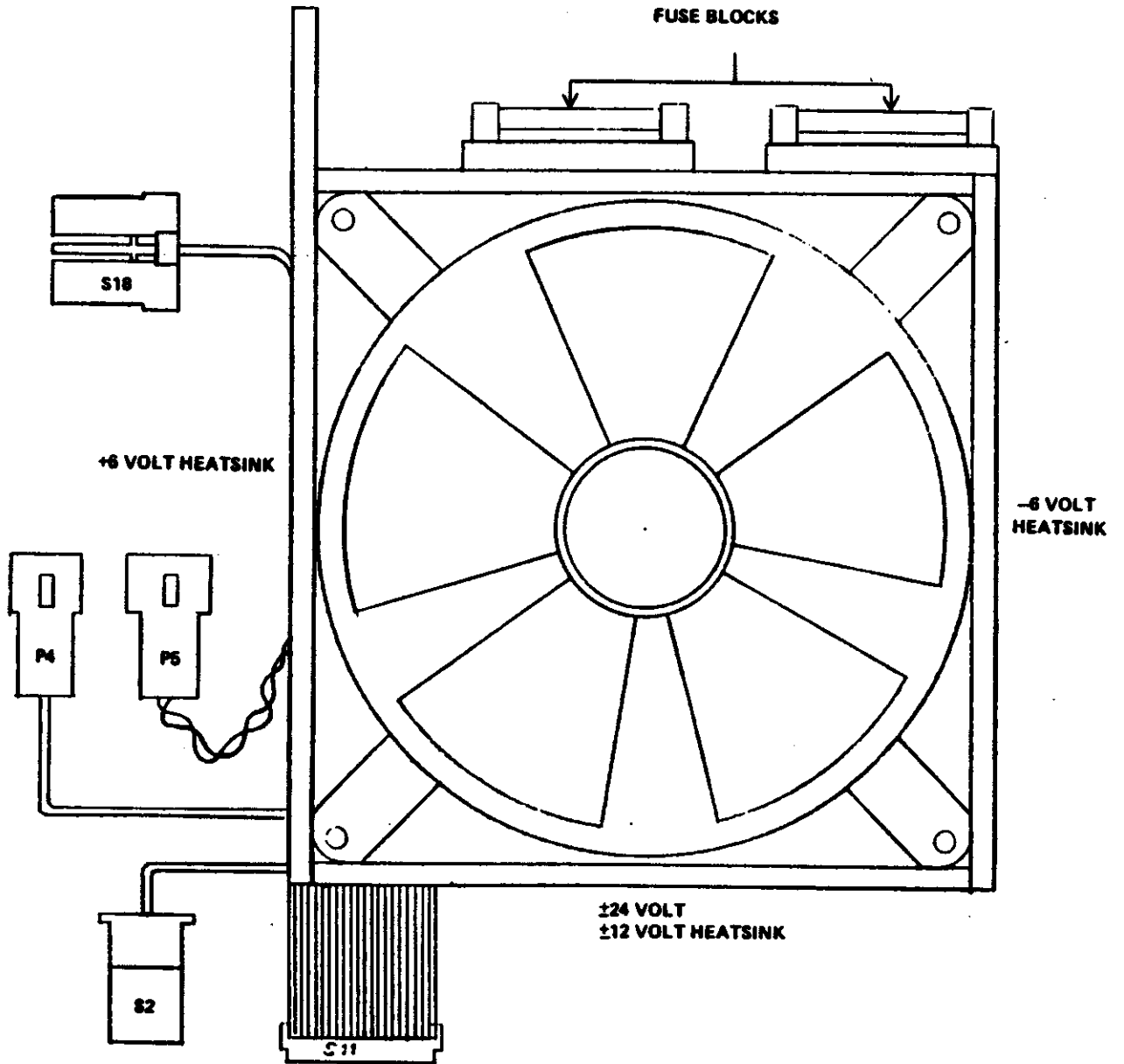


Figure 10 - Pass Transistor Assembly

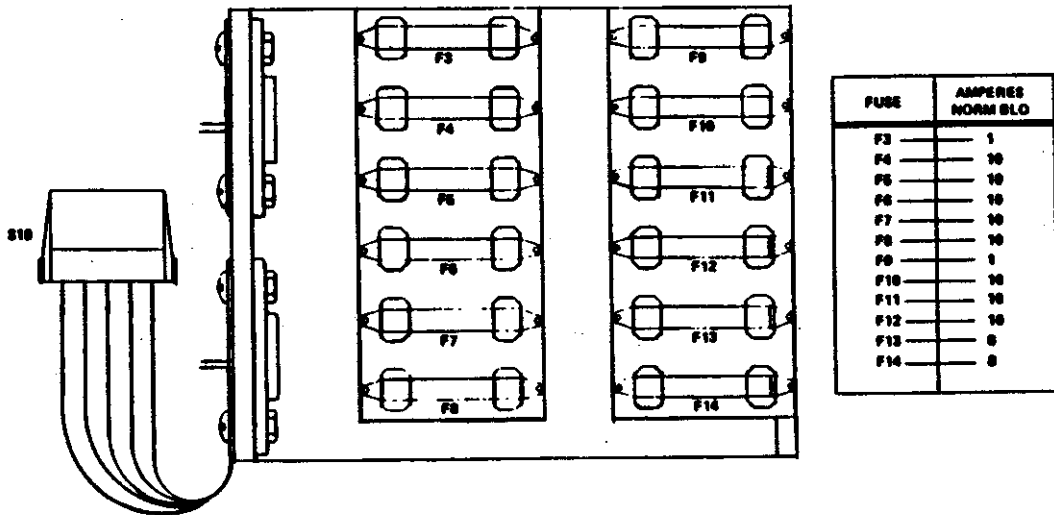


Figure 11 - Pass Transistor Fuse Blocks

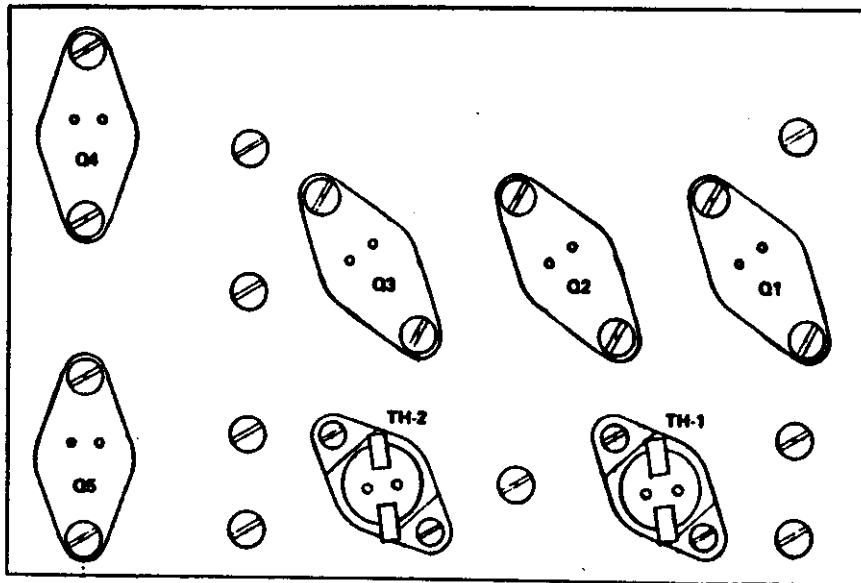


Figure 12 - Heatsink for +6 volt Pass Transistors



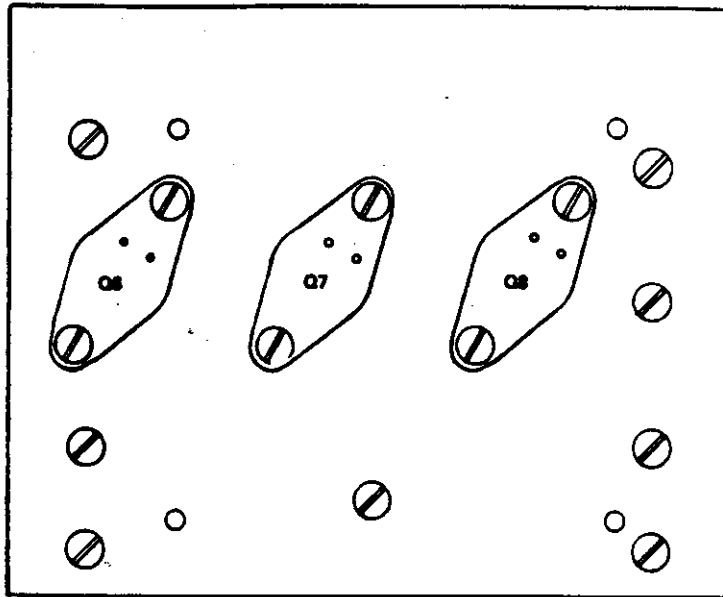


Figure 13 - Heatsink for -6 volt Pass Transistors

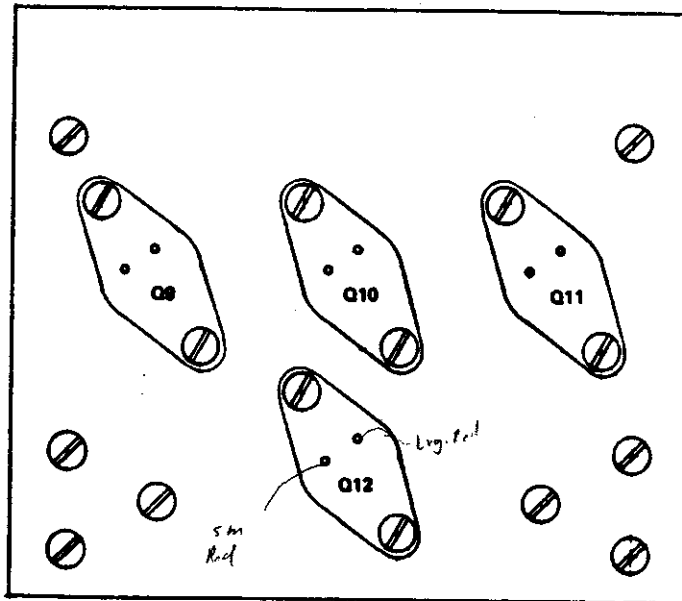


Figure 14 - Heatsinks for +24, -24, +12, -12 volt Pass Transistors

### INITIAL INTERNAL CHECKS

1. Remove the AC cord.
2. Remove power supply cover.
3. Locate pass transistor fuse blocks (see Figure 11).
4. If a fuse is open, see PASS TRANSISTOR ASSEMBLY REPAIR.
5. Replace AC cord, turn power ON.
6. Measure voltage across the main filter capacitors, C1 and C2; the no load voltage should be approximately 17V (unregulated voltage for + or -6 supplies).
7. Measure voltage across the filter capacitors, C3 and C4; the no load voltage should be approximately 45V (unregulated voltage for + or - 24 supplies).
8. If steps 6 or 7 resulted in a voltage reading of zero or substantially less than stated, see TRANSFORMER ASSEMBLY REPAIR.
9. Turn power OFF, read sections on regulator operation.

### PASS TRANSISTOR ASSEMBLY REPAIR

If after inspecting the pass transistor fuse blocks (see Figure 11), the 1 amp fuses, F3 or F9, were found open, a faulty component in the +6 regulator (fuse 3 open) or a faulty component in the -6 regulator (fuse 9 open) should be suspected. If any other fuse is open, its associated pass transistor is probably shorted and must be checked before the fuse is replaced and power restored. To check the pass transistors, the assembly must be removed from the main chassis.

### PASS TRANSISTOR ASSEMBLY REMOVAL

Caution: REMOVE AC CORD AND BLEED CURRENT FROM MAIN FILTER CAPACITORS C1, C2, C3 AND C4 BEFORE ATTEMPTING TO REMOVE ANY SUBASSEMBLY.

1. Detach power supply from crate and place on workbench.
2. Unplug S11 and S12 from regulator assembly mother board (Figure 7).
3. Disconnect P18-S18 to crate interface board (Figure 8).
4. Remove four 8-32 mounting screws from side of main chassis.
5. Lift out pass transistor assembly.

Note: IT IS NOT NECESSARY TO DISCONNECT HIGH CURRENT WIRES FROM MAIN FILTER CAPACITORS.

With the pass transistor assembly removed an ohmmeter can be used to locate the faulty transistor. Removal of the cooling fan (four 6-32 screws) is necessary for replacement of a bad transistor. Reverse the removal process to replace the pass transistor assembly.

### TRANSFORMER ASSEMBLY REPAIR

A low or zero voltage reading in steps 6 or 7 under INITIAL INTERNAL CHECKS generally indicates a faulty power rectifier diode. The power rectifiers are mounted on the AC input bracket directly beneath the transformer. The +6V diodes (MR5005) and the -6V diodes (1N3660R) are pressed into  $\frac{1}{4}$ " black

## Model 1500

anodized aluminium blocks and bused together to form a bridge. The +24V and -24V use a commercially available bridge. In either case, replacement of a rectifier requires removal of the transformer assembly from the main chassis.

### TRANSFORMER ASSEMBLY REMOVAL AND DIODE REPLACEMENT

**Caution: REMOVE AC CORD AND BLEED CURRENT FROM MAIN FILTER CAPACITORS C1, C2, C3 AND C4 BEFORE ATTEMPTING TO REMOVE ANY SUBASSEMBLY.**

1. Detach power supply from crate and place on workbench.
2. Remove regulator cards (loosen screw on side of each card before removal).
3. Unplug P3, P4 and P5 from connector bracket.
4. Unplug S6 from regulator assembly.
5. Unscrew 12 gauge blue wire from C1 (positive terminal).
6. Unscrew 12 gauge yellow wire from C2 (negative terminal).
7. Unscrew 12 gauge black wire from ground terminals of C1 and C2.
8. Unscrew 16 gauge violet wire from C3 (positive terminal).
9. Unscrew 16 gauge orange wire from C4 (negative terminal).
10. Unscrew 12 gauge black wire from ground terminals of C3 and C4.
11. Remove four  $\frac{1}{4}$ -20 Allen-head transformer mounting screws.
12. Lift transformer assembly out of main chassis.

With the assembly removed, the transformer may be separated from the AC input bracket by unplugging P7-S7, unplugging S2, and removing two 10-32 screws on the transformer. An ohmmeter may now be used to locate the faulty rectifier diode.

### Removal and replacement of swage-fit diodes:

1. Unsolder diode bus bars.
2. Remove four 6-32 diode block mounting screws (retain two TO-3 mica washers for remounting).
3. With diode block removed, use punch to drive bad diode from diode block.
4. Replace new diode by applying pressure on top outside edge. (A hollow shaft with a  $\frac{1}{4}$ " I.D. and a drill press is suggested).
5. Replace diode block on AC input bracket. (Make sure mica insulating washers and screw shoulder washers are in place).
6. Use an ohmmeter to check that the black anodized diode block and AC input bracket are not shorted.
7. Resolder diode bus bars.
8. Reconnect transformer and AC input bracket and replace assembly in the main chassis.

**Note: BLACK ANODIZED BLOCKS WITH SWAGED IN DIODES MAY BE ORDERED AS SPARE PARTS.**

### REGULATOR OPERATION

The R500 regulator card provides regulation for the -6, -12, and -24 volt sources. The R501 card regulates the +6, +12, and +24 volt sources. A brief discussion on the operation of each regulator follows.

## R500 NEGATIVE REGULATOR CARD OPERATION

The three negative regulators on the R500 card each utilize an LM304 as the basic regulation element. The unregulated input voltage to all three LM304's is supplied by the rectified boost voltage. Zener diode D5 regulates the boost voltage at -32V and emitter follower Q3 drives the LM304's.

Since all three negative regulators are basically the same, the following discussion will refer only to the -6V regulator and the reader may appropriately translate the information to the -24V and -12V regulators.

The output voltage of regulator U4 is linearly dependent on the value of R6 (voltage adjustment potentiometer) and R60 giving approximately 2V for each 1K of resistance. This scale factor is set by R61. The output current capability of the LM304 is increased by emitter follower Q18 which drives transistor Q4. The collector of Q4 drives the three negative 6V pass transistors (on the pass transistor assembly) through isolation resistors R68, R69, and R70. Remote voltage sensing at the crate is employed to eliminate the effect of wire resistance in the power cable. This is accomplished by returning crate ground through card pin 4, to the LM304 ground (pin 9) and connecting pin 8 of the regulator through edge connector pin 27 to the negative 6 volt bus bar on the crate. Resistor R47 provides a low ohmic sense line connection from the regulator to negative 6V on the crate interface card when the crate is disconnected.

A considerable amount of power, under full load conditions, is dissipated in the series pass transistors. If the output is shorted, this dissipation could damage the pass transistors. Foldback current limiting is used to eliminate this situation. With current limiting, the available output current decreases as the maximum load is exceeded and the output voltage is reduced.

Normally Q17 is held in a non-conducting state by voltage divider R53, R52, and R58 (current limit adjustment potentiometer). However, when the voltage across the -6 current limit resistor R2 (located on the crate interface board) increases to where the emitter of Q17 becomes more positive than the base, Q17 turns ON and begins to shunt base drive from Q18. This causes an increase in the output current of the LM304, and it will go into current limiting at a current determined by R62.

Potentiometer R58 is factory adjusted for current foldback limit; THIS SHOULD NOT BE TURNED unless test equipment is available to properly re-adjust the maximum current fold-back point. The same is true for R15 and R11 on the -24 and -12V regulators, respectively.

Component failure in the regulator circuits could cause the voltage on the Dataway to become excessive thereby causing possible damage. A voltage crowbar is used to prevent this problem. Zener diode D2 provides a -6.2V reference on the base of Q15. Transistors Q15 and Q14 form a voltage comparator. The base and, therefore, the emitter of Q14 is controlled by voltage divider R50 and R56. As the output voltage (card pin 6) becomes more negative, the emitter of Q14 also becomes more negative. At approximately -7.5V, the emitter of Q14 is sufficiently negative to turn Q15 ON, this turns Q16 ON, driving "-6CB" (connector pin 21) to ground. Pin 21 is routed to the gate of SCR2 on the crate interface card.

With a ground potential on its gate, the SCR conducts, causing a sufficient amount of current to flow through the current limit resistor to cause the regulator to go into current limiting.

#### R501 POSITIVE REGULATOR CARD OPERATION

The three positive regulators on the R501 card each utilize an LM305 as the basic regulation element. The unregulated input voltage to all three LM305's is supplied by the rectified positive boost voltage. Zener diode D6 regulates the boost voltage at +32V, and emitter follower Q2 drives the LM305's. Since all three positive regulators are basically the same, the following discussion will refer only to the positive 6 volt regulator and the reader may appropriately translate the information to the positive 24 volt and positive 12 volt regulators.

The output voltage of U4 is determined by R46, R3 (voltage adjustment potentiometer) and R47. The resistor values are selected based on a feedback voltage of 1.8V to pin 6 of the LM305. Capacitors C15 and C16 are required to suppress oscillations in the feedback loop. Capacitor C21 compensates the internal regulator circuitry to make stability independent for all loading conditions. The output current capability of the LM305 is increased by emitter follower Q16 which drives Q4. The collector voltage for emitter follower Q4 is provided directly from the positive 6 volt rectifier which is routed through F3 on the pass transistor assembly. The emitter of Q4 (through 1.3 ohm isolation resistors) drives the five +6 pass transistors on the pass transistor assembly.

Remote voltage sensing at the crate is employed to eliminate the effect of wire resistance in the power cable. This is accomplished by returning crate ground, through card pin 24, to the LM305 ground (pin 4) and connecting the positive 6V crate bus bar (through edge connector pin 24), to the feedback resistor divider on pin 6. Resistor R60 provides a low ohmic sense line connection from the regulator to the positive 6V on the crate interface board and provides feedback when the crate is disconnected.

Foldback current limiting is used to protect the positive 6 volt regulator circuitry from overloads. Voltage divider R62, R56 (current limit adjustment potentiometer), and R65 provide a voltage bias on the base of Q17. When the voltage across the +6 current limit resistor R1 (located on the crate interface board) increases to where the emitter of Q17 becomes more negative, then the base, Q17 turns ON, shunting the output of U4. This increase in current demand causes U4 to current limit and decrease its output voltage. This condition remains until the overload is removed.

Potentiometer R56 is factory adjusted and SHOULD NOT BE TURNED unless test equipment is available to properly readjust the maximum current foldback point. The same is true for R39 and R34 on the +24V and +12V regulators.

A crowbar is used to prevent excessive voltage on the crate Dataway. The positive 6 volt crowbar functions in the following manner. Diode D4 provides a reference voltage for the voltage comparator comprised of Q14 and Q15. As the output voltage increases, the voltage at the center of divider R49 and R50 increases, causing the emitter of Q14 to rise proportionately. As the emitter

## Model 1500

of Q15 rises above the reference voltage, Q15 turns ON causing the emitter of emitter follower Q12 to rise. This positive voltage, routed through edge connector pin 22, causes SCR1 to conduct, which causes regulator U4 to current limit and thereby lower its output voltage.

On each regulator card (R500 and R501), the 12 volt pass transistor's source voltage is from the regulated 24 volt output, therefore a current sharing arrangement exists between the two voltages. Further, when the 24-volt regulator decreases its voltage because of an over-current or over-voltage condition, it reflects into the 12 volt regulator, giving the appearance the 12 volt regulator is also faulty. This shut-down ability is utilized in the 12 volt crowbar circuit. The 12V output (through a 8.2V zener) is applied to the 24V SCR voltage comparator. At approximately 15V, the SCR is turned ON, causing the 24V regulator to current limit, lowering both the 24- and 12-volt outputs.

### CONNECTOR DESIGNATIONS

The following table, in conjunction with Figure 15, is provided to clarify the interconnection of subassembly units.

<u>Connector</u>	<u>Contacts</u>	<u>Purpose</u>
P1/S1	3	AC power source
P2/S2	2	Power input for transformer
P3/S3	9	AC power control
P4/S4	4	High temperature warning and thermal cutout
P5/S5	2	AC to pass transistor fan
P6/S6	2	Boost voltage to regulators
P7/S7	2	AC voltage to + and -24V bridge
P8/S8	20	Input to metering
P9/S9	16	Current sense and SCR drive
P10/S10	16	Dataway sense to regulator assembly
P11/S11	20	Pass transistor drive
P12/S12	2	+ and -12V to regulator assembly
P13/S13	30	Positive regulator card connector
P14/S14	30	Negative regulator card connector
P15/S15	32	Power supply ventilation unit interconnect
P16/S16	20	Meter card connection
P17/S17	10	Test point and meter connection
P18/S18	10	Regulated voltage to crate interface
PG 26 & 27	50	Crate Dataway connection

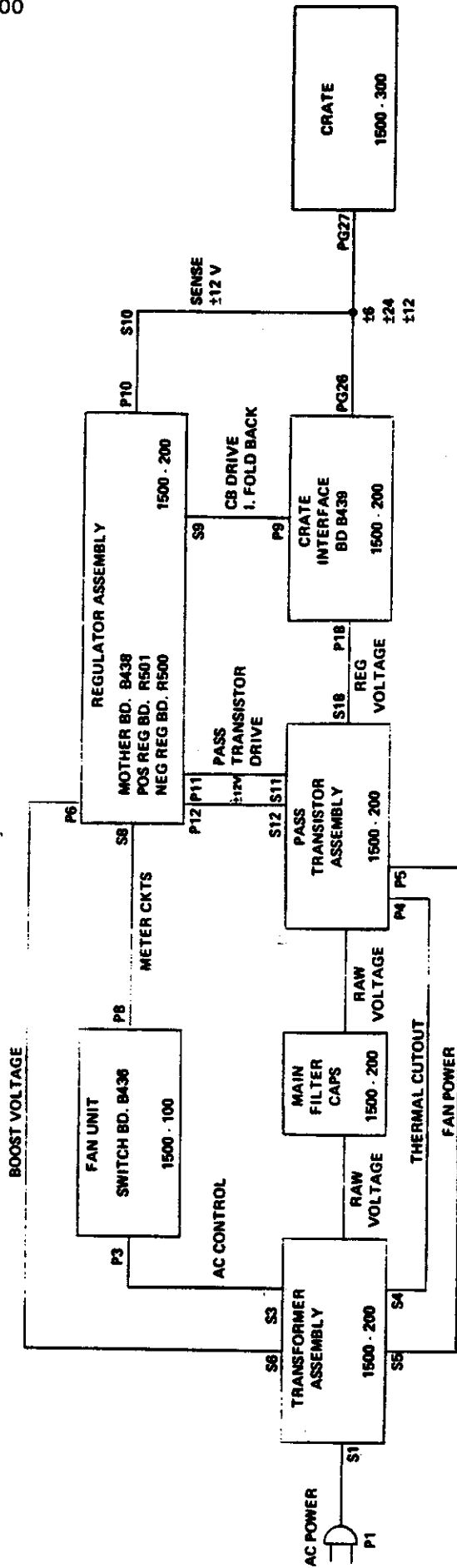


Figure 15 - Power Supply Block Diagram

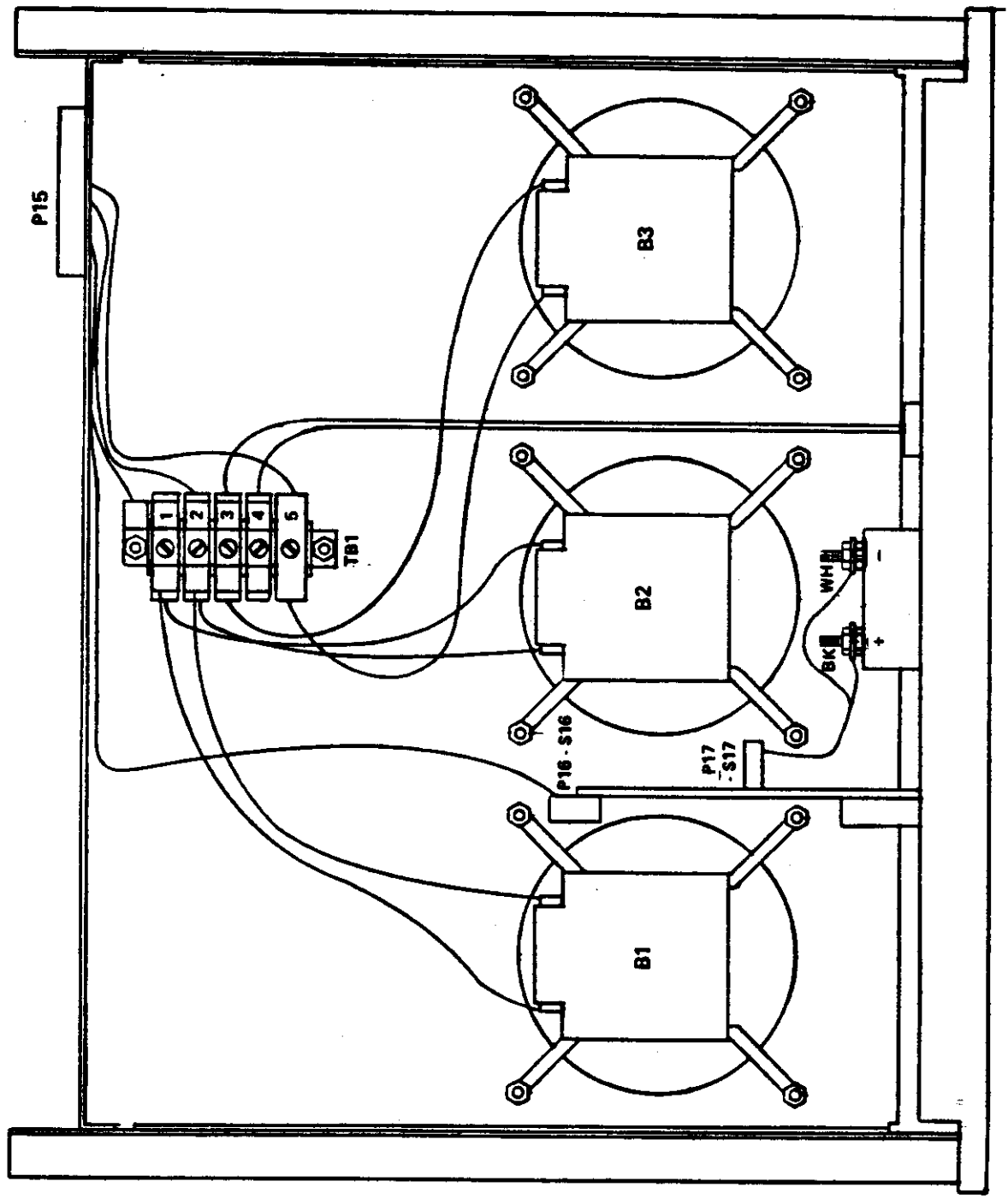


Figure 16 - Ventilation Unit, Bottom View



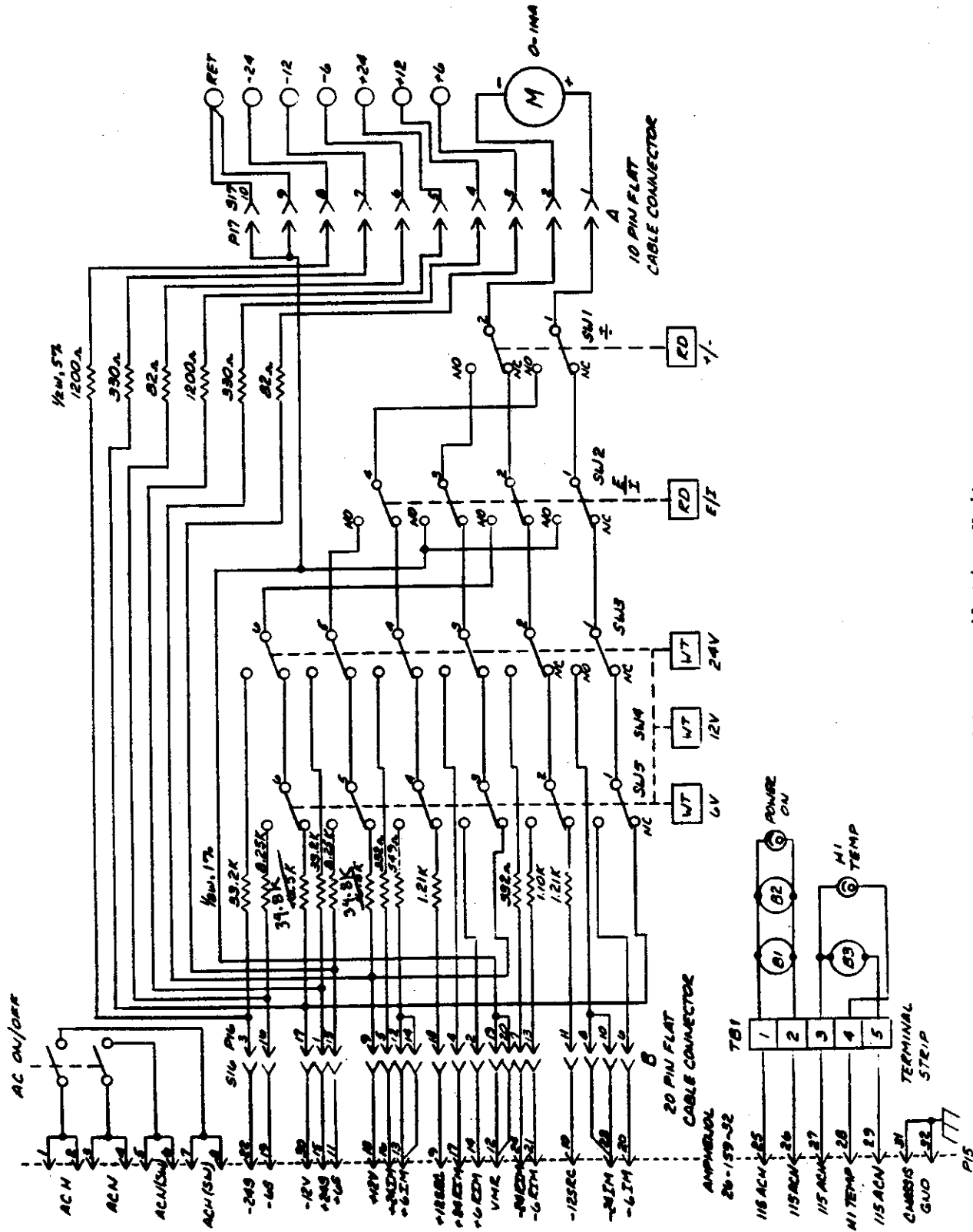


Figure 17 - Ventilation Unit

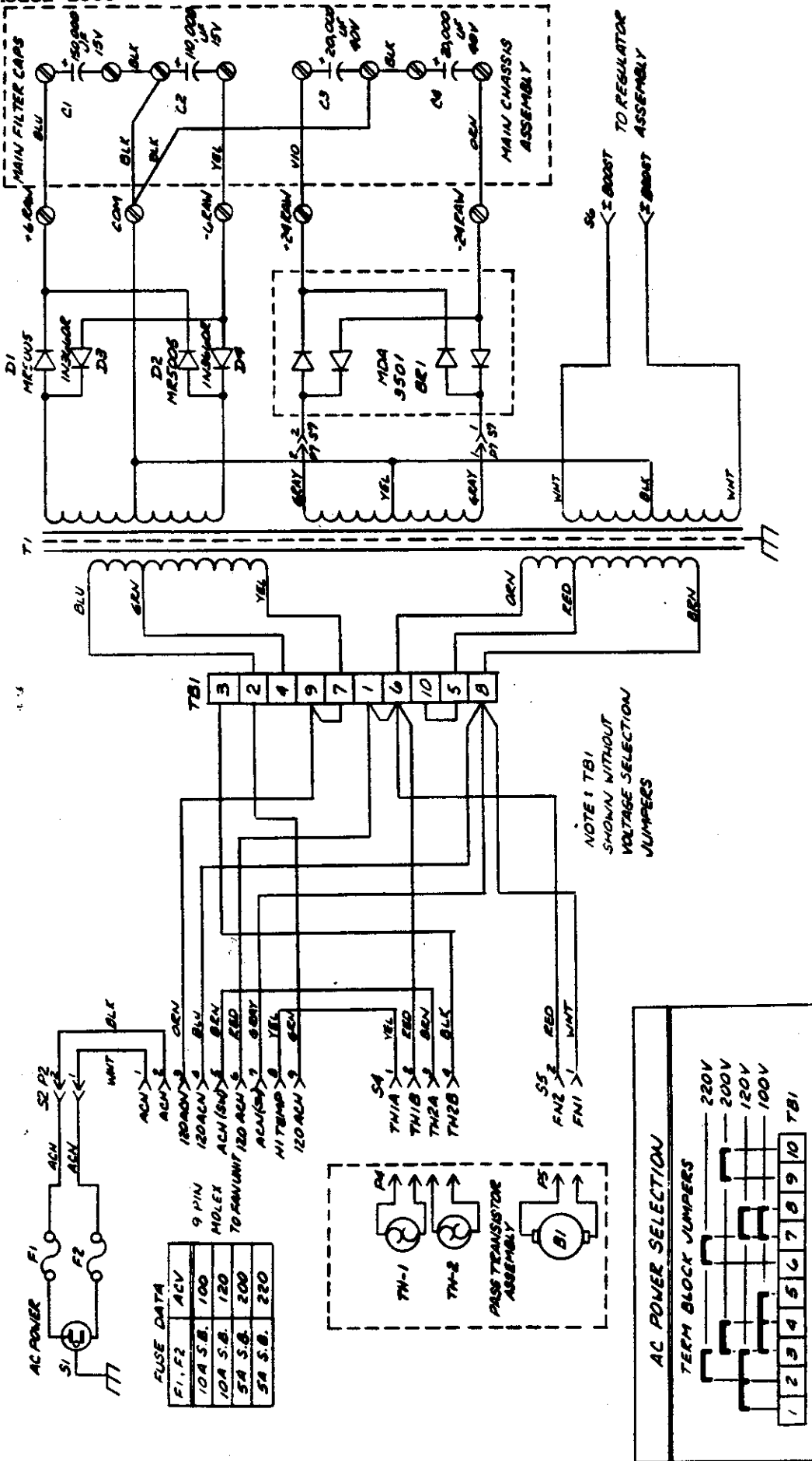


Figure 18 - Transformer Assembly

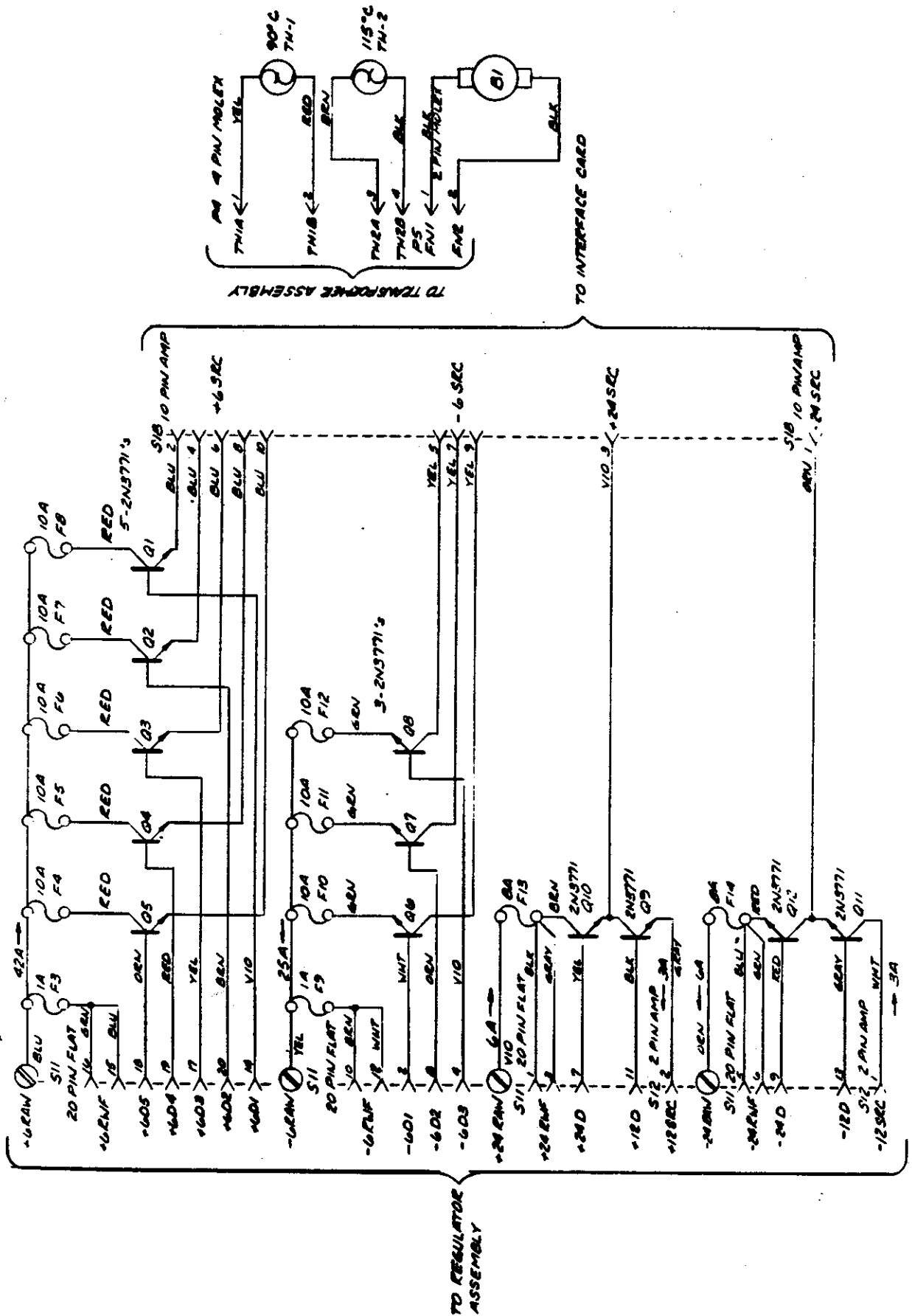
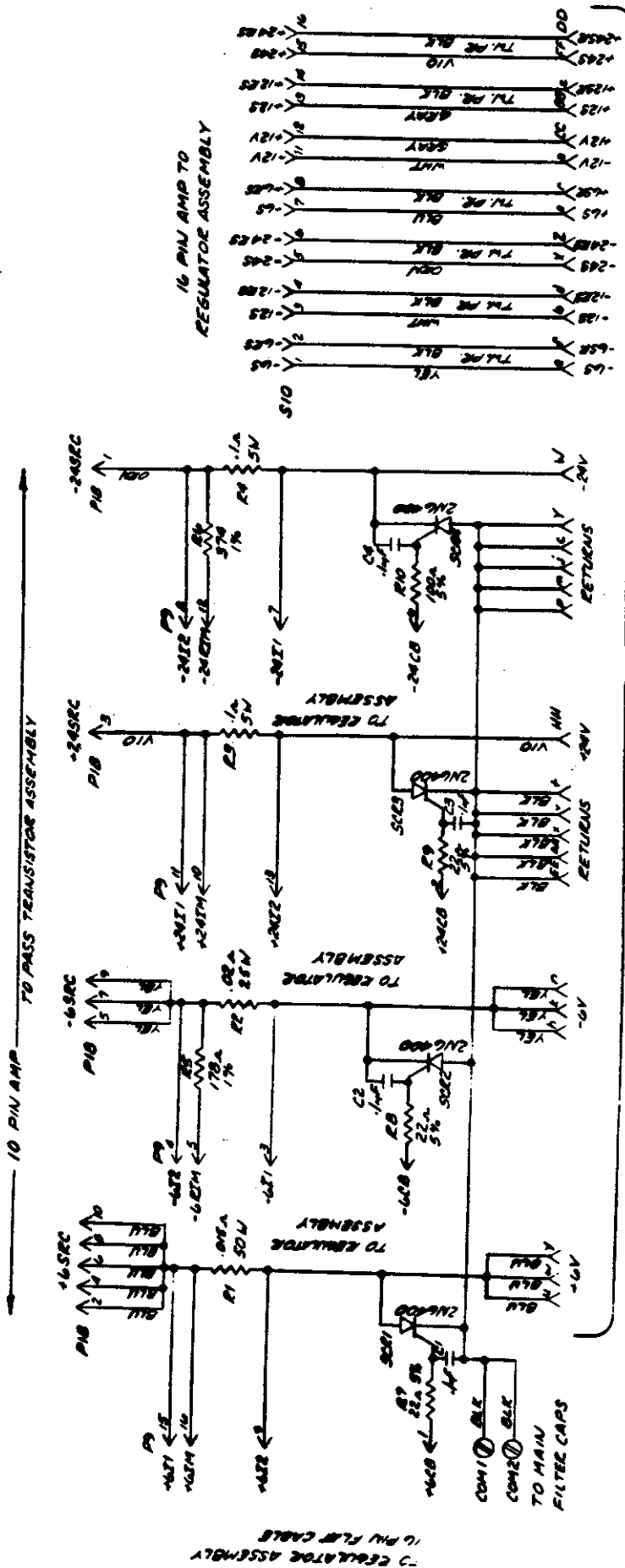


Figure 19 - Pass Transistor Assembly



DATAWAY SECRET PG 26

Figure 20 - Crate Interface Assembly - B439

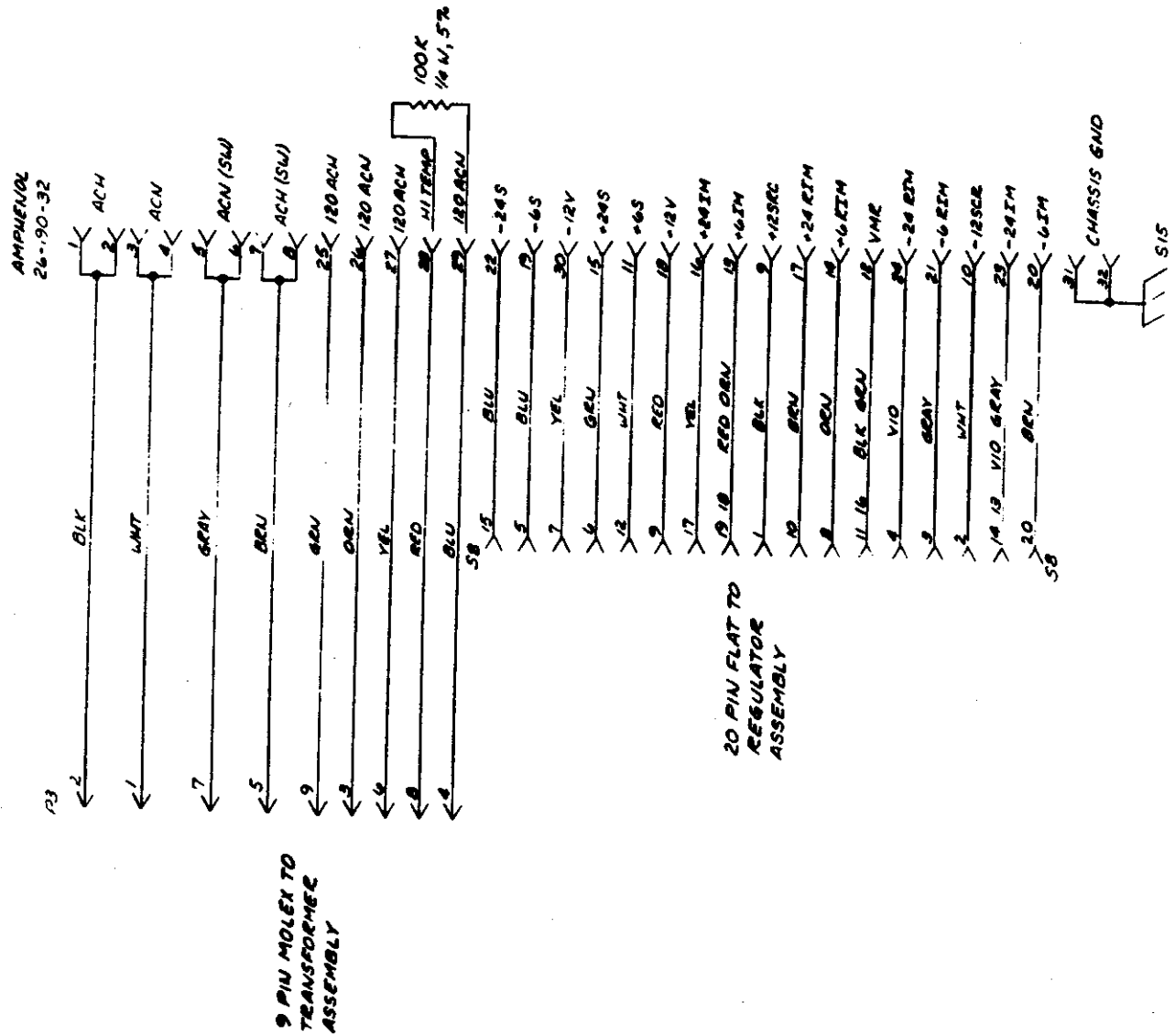


Figure 21 - Cable Assembly to Ventilation Unit

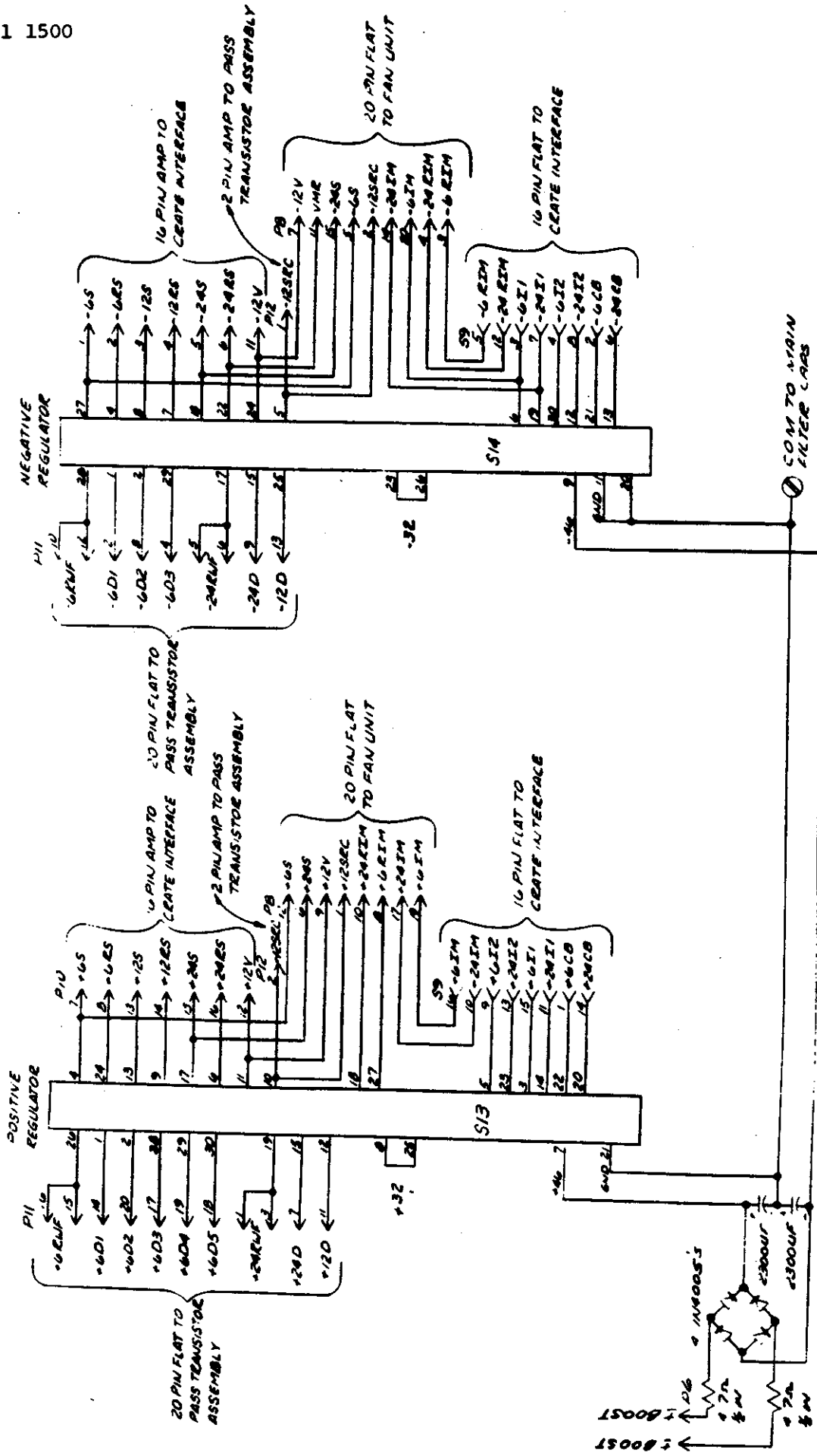


Figure 22 - Regulator Assembly Mother Board B438

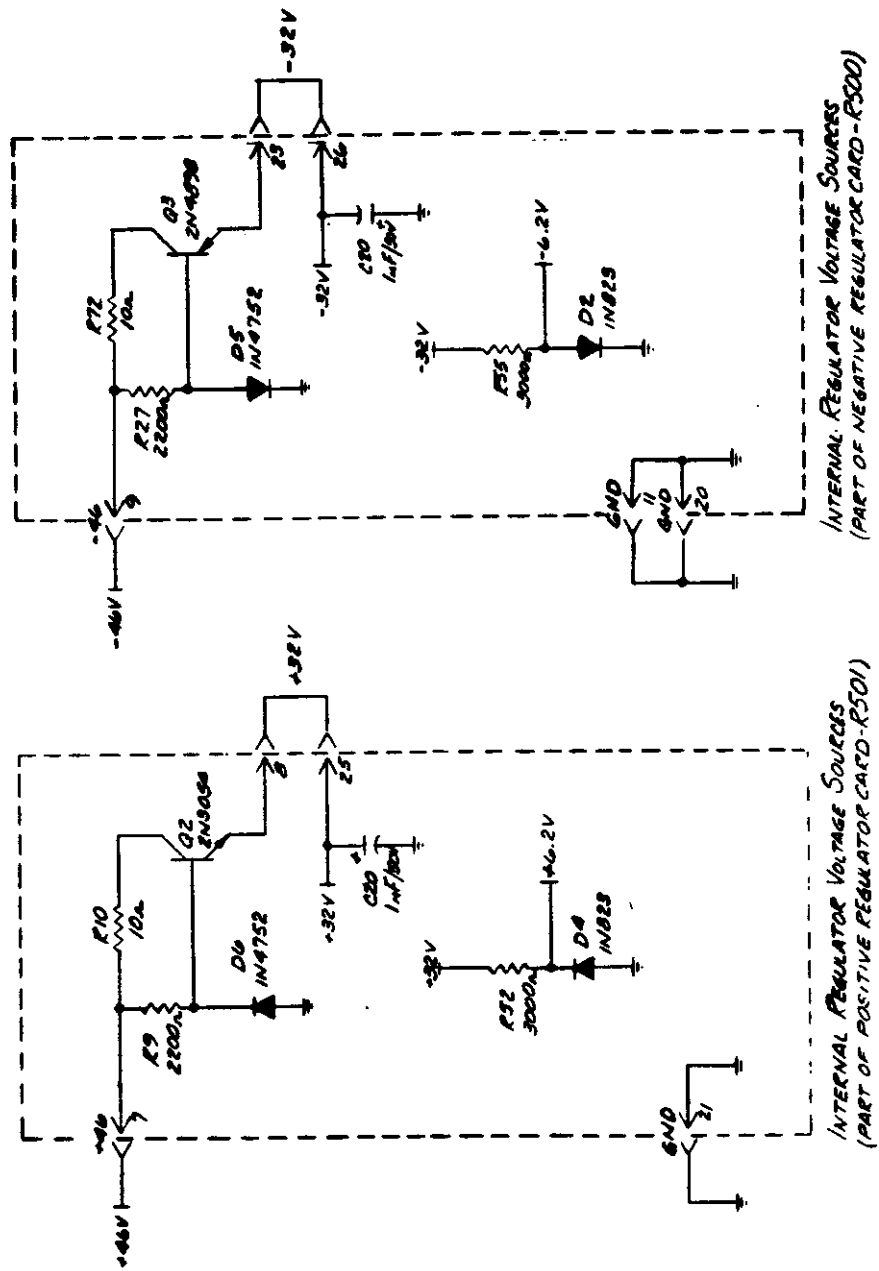


Figure 23 - Internal Regulator Voltage Sources

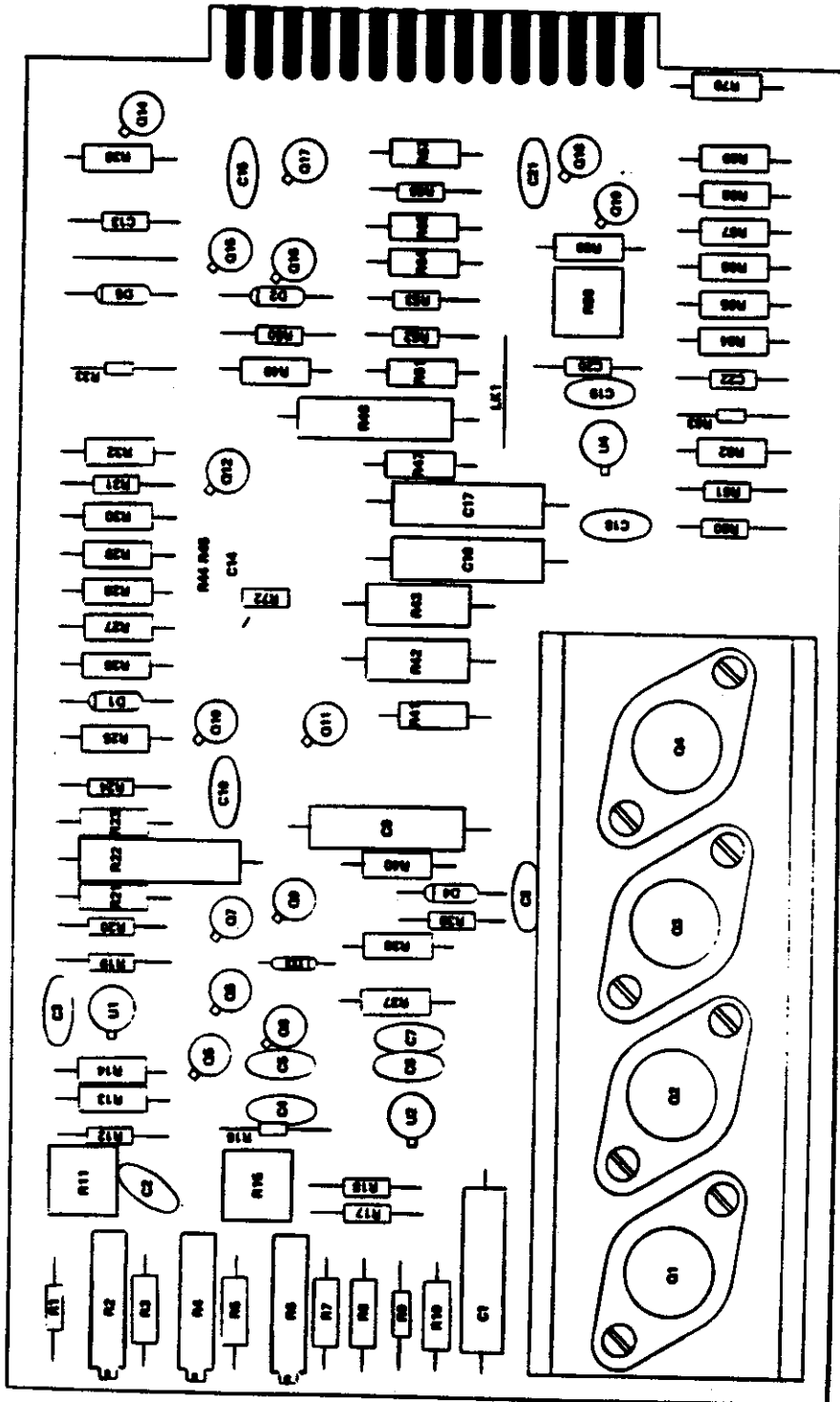


Figure 24 - Negative Regulator Board, R500



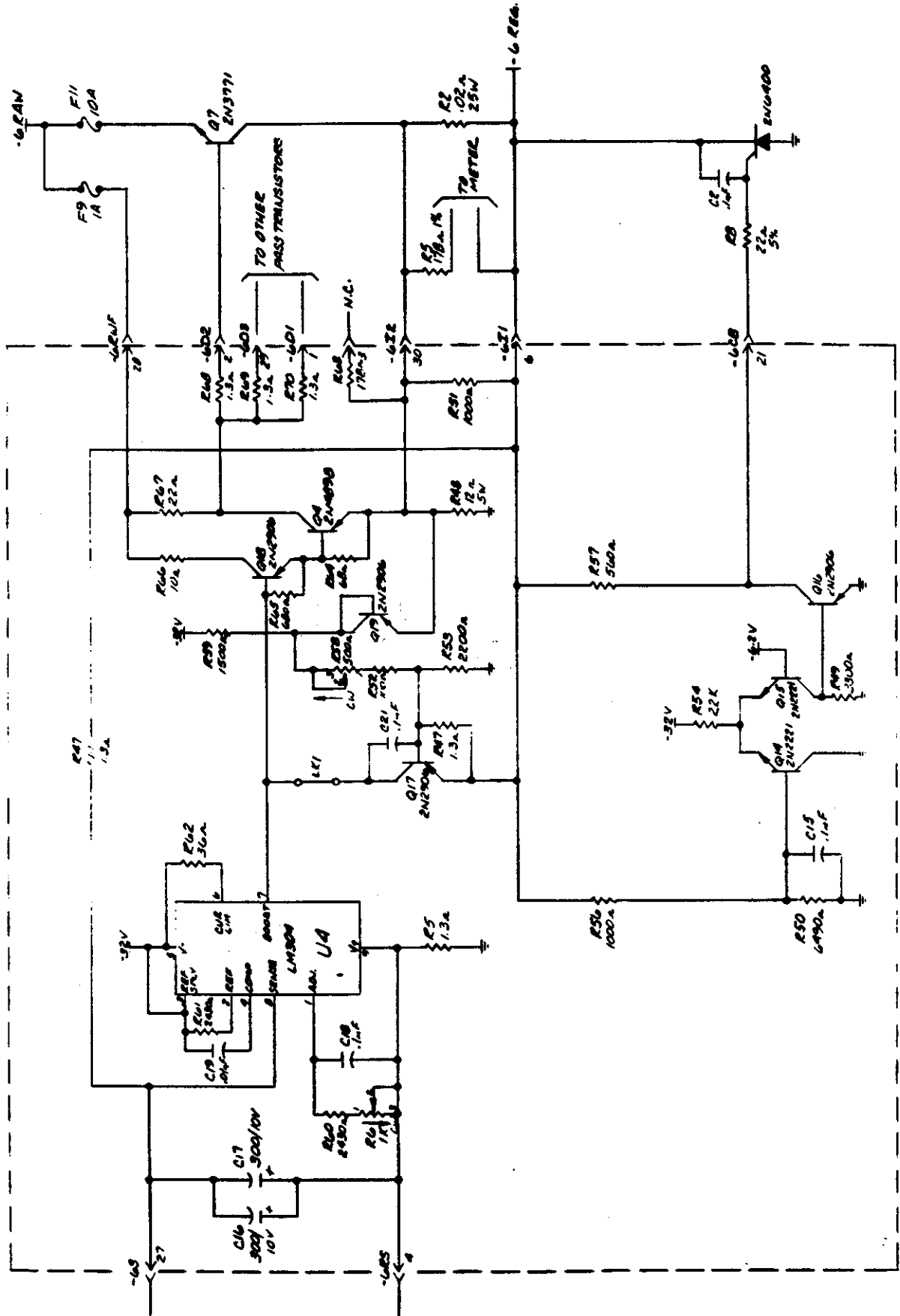
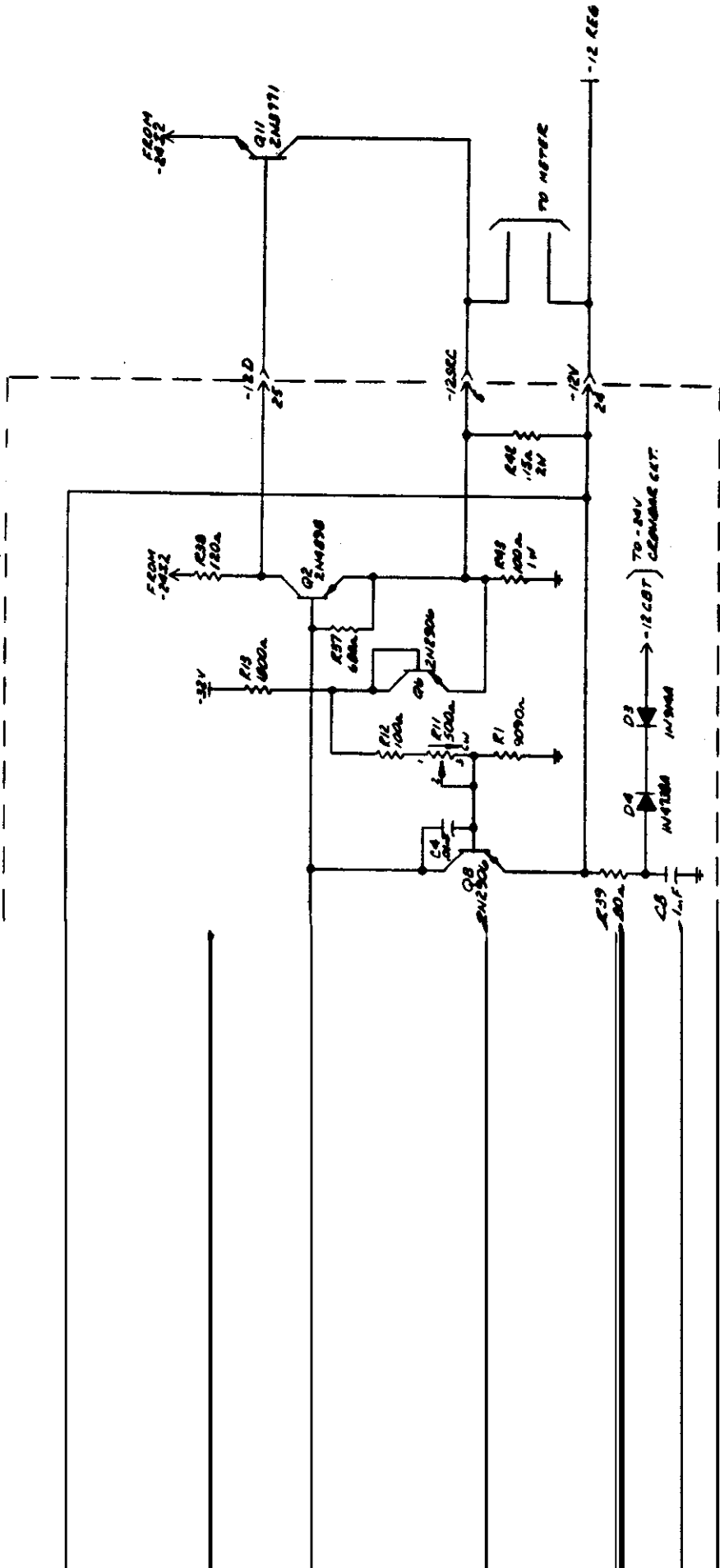


Figure 25 - Negative 6-volt Regulator (Part of Negative Regulator Card R500)



Regulator (Part of Negative Regulator Card R500)

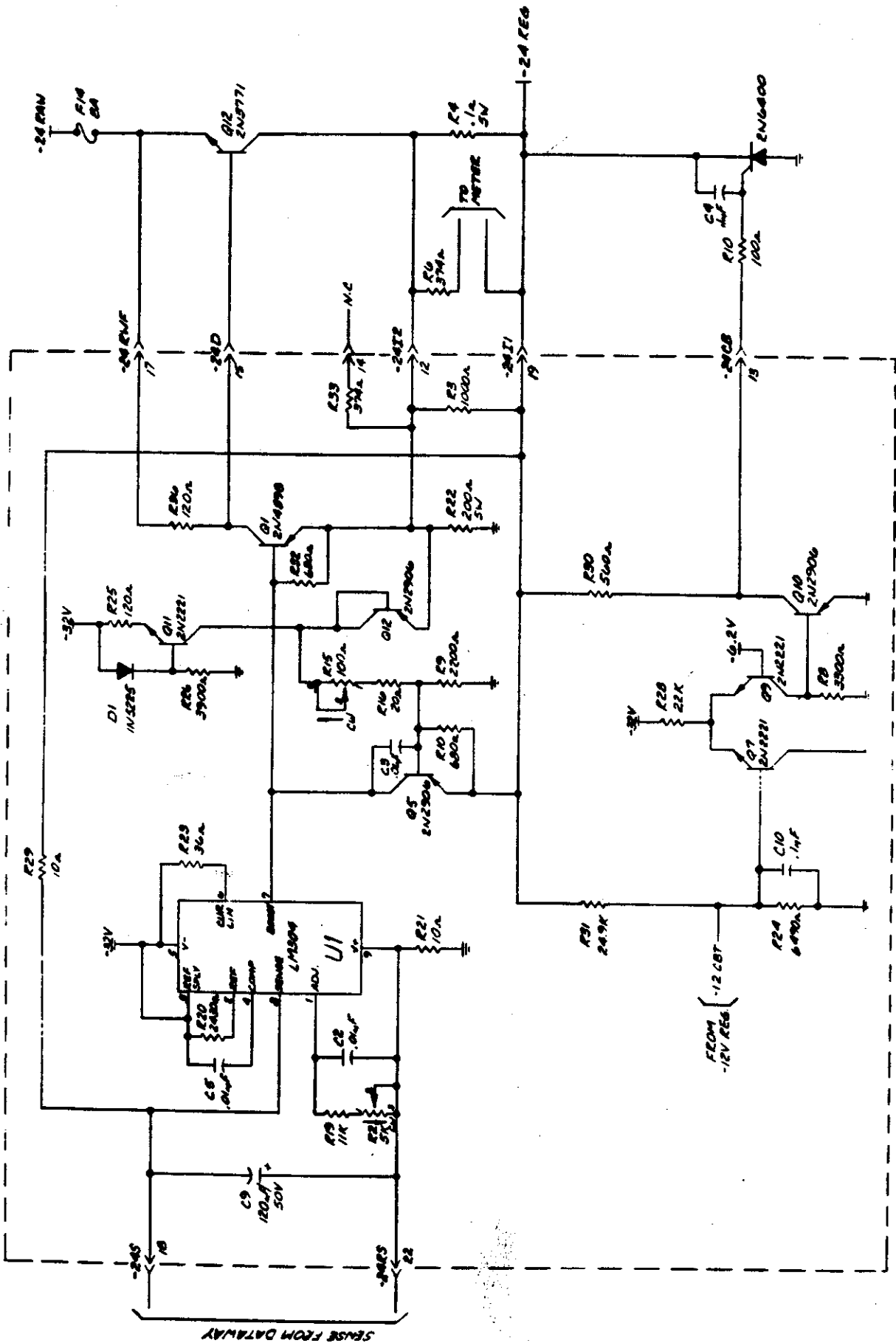


Figure 27 - Negative 24-volt Regulator (Part of Negative Regulator R500)

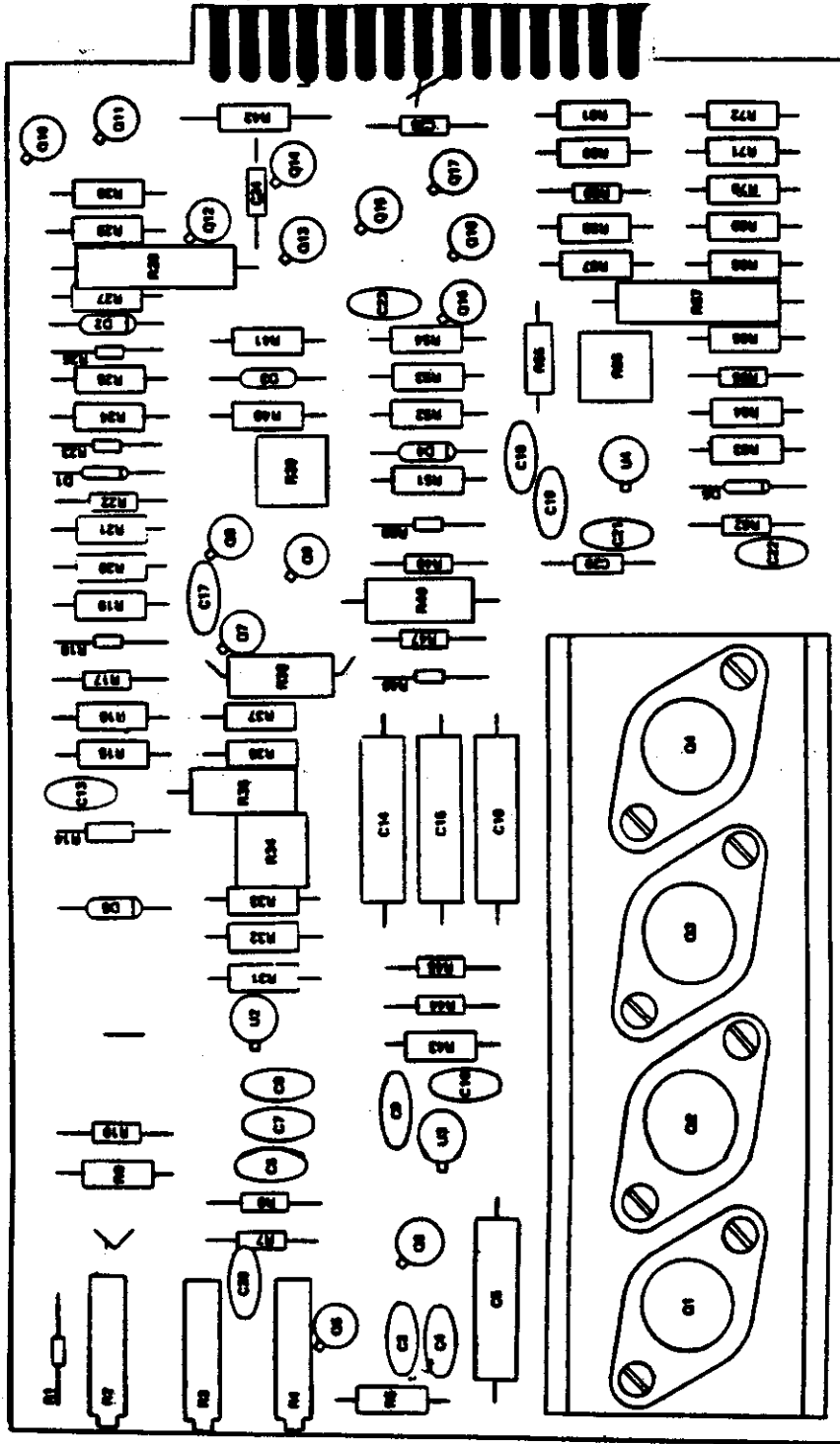


Figure 28 - Positive Regulator Board R501

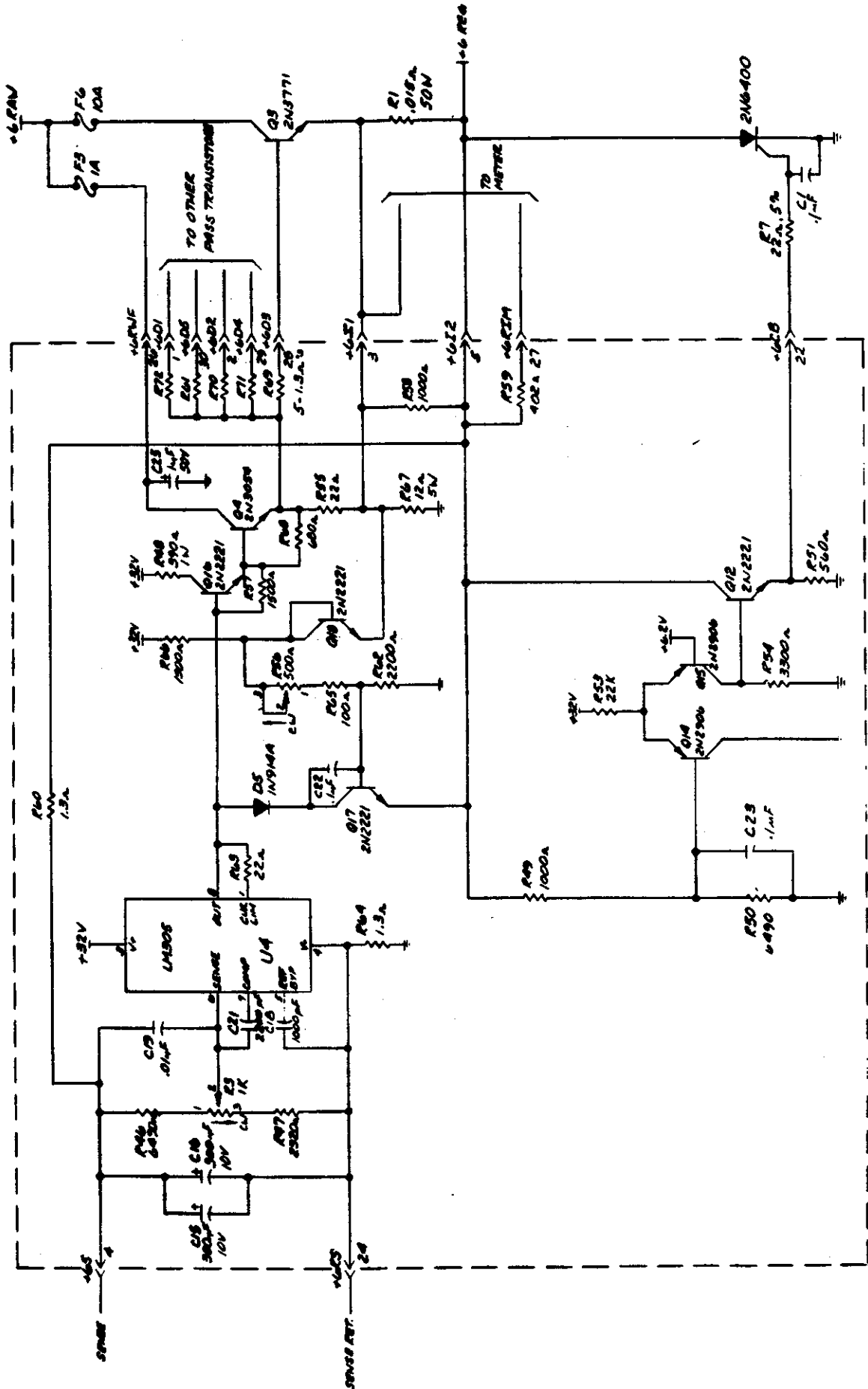
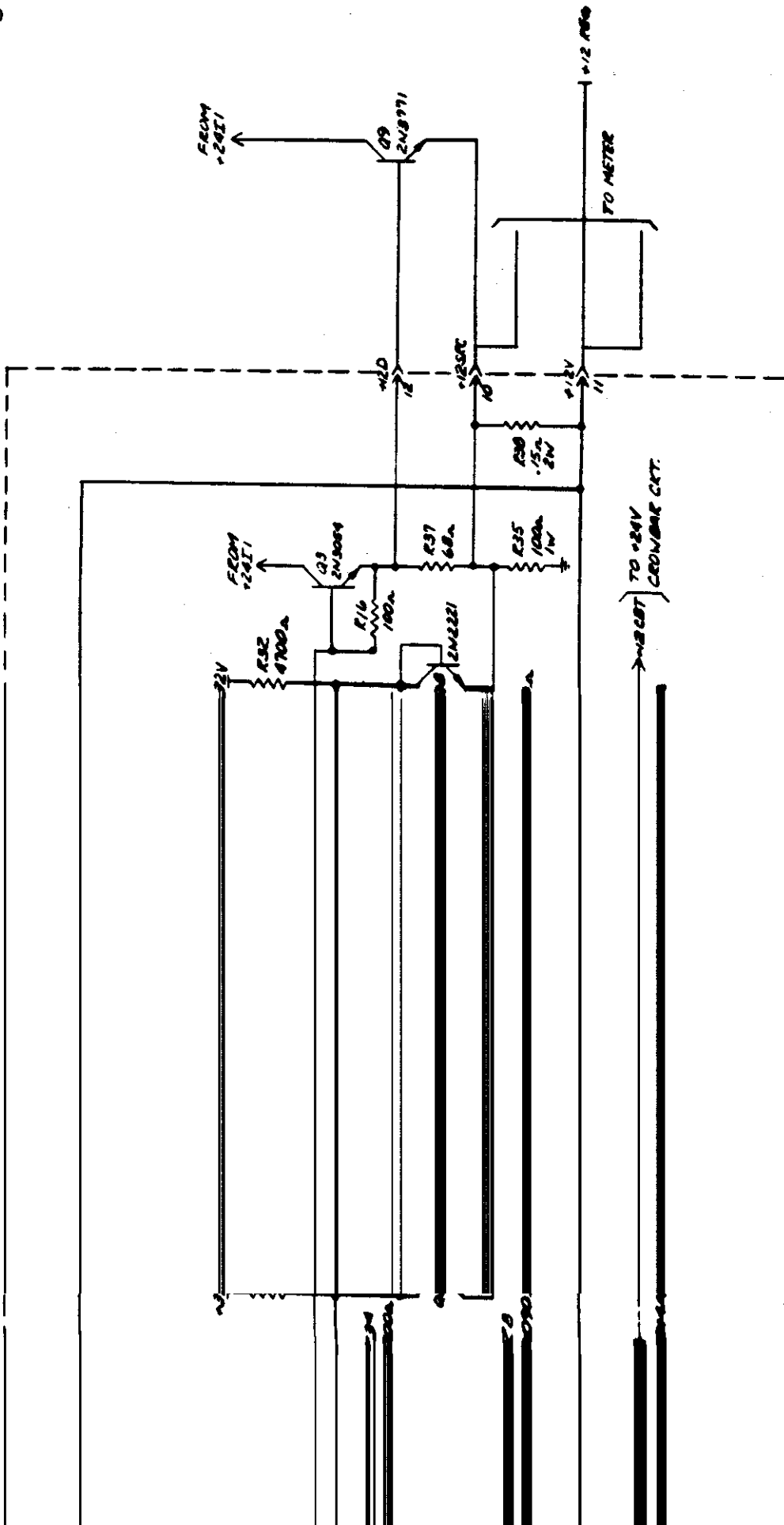


Figure 29 - Positive 6-volt Regulator (Part of Positive Regulator Card R501)



Positive Regulator Card (R501)

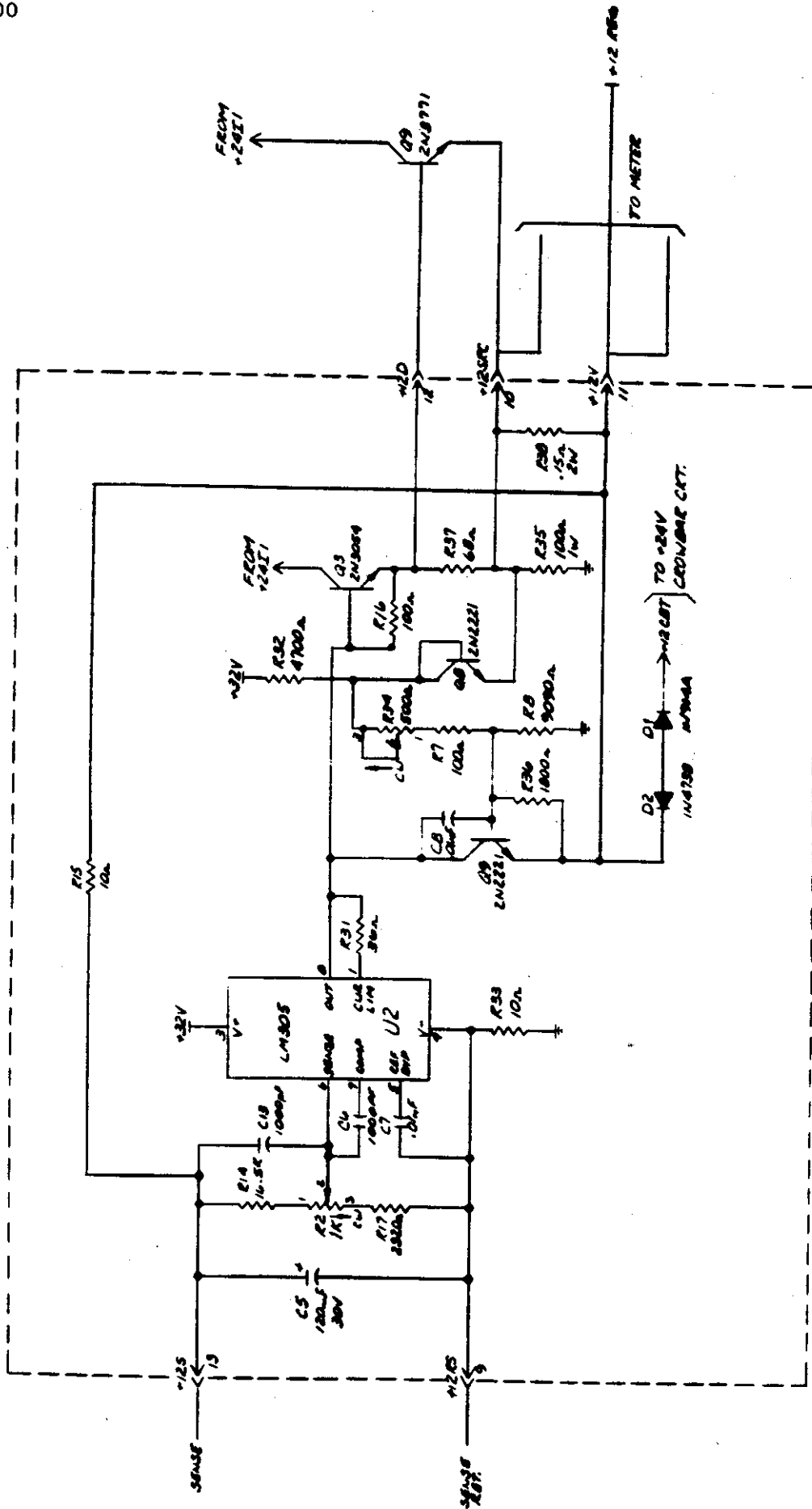


Figure 30 - Positive 12-volt Regulator (Part of Positive Regulator Card R501)

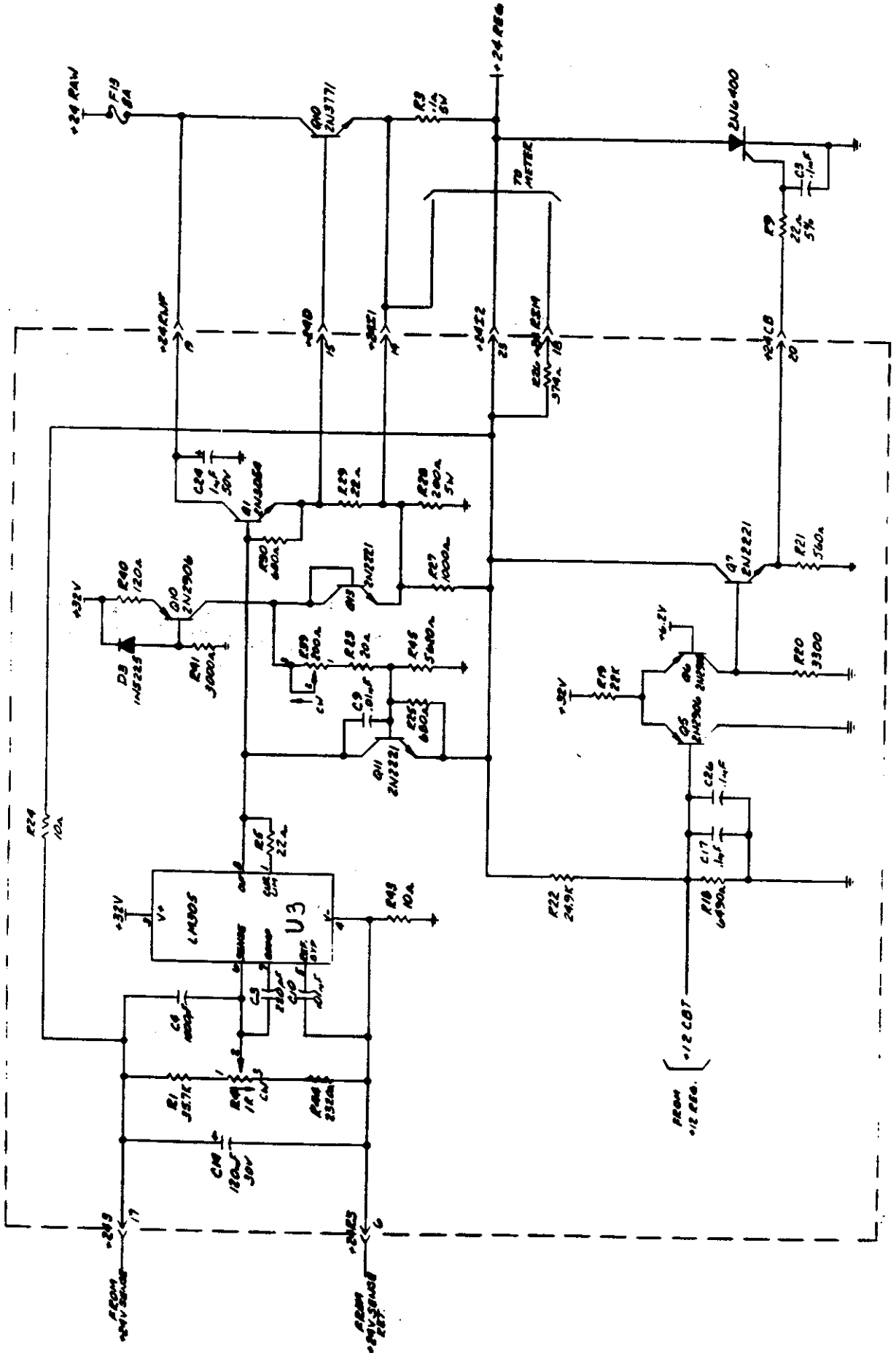


Figure 31 - Positive 24-volt Regulator (Part of Positive Regulator Card R501)



**Model 1500**

**CAMAC SPECIFICATIONS - TYPICAL POWERED CRATE**

This powered CAMAC crate meets or exceeds the specifications for a typical crate, power supply and ventilation unit, found in Appendix D of IEEE Standard 583-1975. The Model 1500 includes the following features not found on this specification:

1. The +6 volt output is rated at 42 amperes with the +6 volt -6 volt current shared to 42 amperes. The -6 volt is still rated at 25 amperes maximum.
2. The power supply and ventilation unit are separate to provide for easy installation and maintenance.

## Typical Crate Mounted Power Supply and Ventilation Unit With Crate/Power Supply Interface Housing

### D1. General

The power supply described herein is suitable for use with the Standard Modular Instrumentation and Digital Interface System (CAMAC).

This description is written in the form of a specification for the convenience of those who wish to use it for that purpose.

Due to the high operational reliability required, only the highest quality components should be employed. All semiconductor components shall be silicon and shall be encapsulated in metal or ceramic, hermetically sealed, cases. Components shall not be used beyond their design ratings. The supply shall be designed with a life expectancy of at least 5 yr. See Fig D1 for block diagram. Wiring to the right of PG-26 is not considered part of the power supply.

### D2. Input

For 120 V nominal voltage, the input voltage range shall be 103 to 129 volts. For other nominal voltages the input voltage range shall be the nominal + 10 percent to - 12 percent.

Line frequency range shall be the nominal (60 Hz in the U.S.)  $\pm 3$  Hz.

### D3. Output

The supply is to provide four dc outputs with at least the following current ratings:

<u>Voltage Volts</u>	<u>Current Amperes</u>
+ 6.00	0-25
- 6.00	0-25
+24.00	0-6
-24.00	0-6

The four outputs shall be simultaneously available, but the currents may be limited to a minimum total output power of 294 W. The  $\pm 6.0$  V supplies shall operate on a current sharing basis, such that the total combined current outputs may be limited to 25 A. Likewise, the  $\pm 24$  V supplies shall be current shared and may be limited to a total combined current output of 6 A. Rated output current shall also be available to loads connected between the positive outputs and the negative outputs.

If the output power demanded should exceed a safe operating value, the supply shall protect itself.

Remote sensing shall be utilized on all outputs of this power supply. Remote sense points can be expected to be within 305 mm of the crate connector, PG-27. All wiring shall be in accordance with Fig D1.

### D4. Regulation and Stability

(1) During a 24 h period the  $\pm 6.0$  V outputs shall vary by not more than  $\pm 0.5$  percent due to changes of input voltage and output current within the specified ranges.

(2) During a 24 h period the  $\pm 24$  V outputs shall vary by not more than  $\pm 0.2$  percent due to changes of input voltage and output current within the specified ranges.

(3) The long-term stability shall be such that, after a 24 h warmup, over a six month period for constant load, line, and ambient temperature conditions, the  $\pm 6.0$  V output shall drift not more than  $\pm 0.5$  percent; the  $\pm 24$  V outputs shall drift not more than  $\pm 0.3$  percent. (See Figs D3 and D4)

### D5. Noise and Ripple

Noise and ripple, as measured on an oscilloscope of dc to 50 MHz bandwidth, shall not exceed 15 mV peak-to-peak.

## D6. Temperature and Temperature Coefficient

The ambient temperature range is from 0°C to 50°C without derating. Ambient temperature as used throughout this specification shall be taken at a location that is not affected by the temperature of the power supply.

The output voltage coefficients for changes in ambient temperatures between 0°C and 50°C shall not exceed 0.02 percent per °C.

## D7. Voltage Adjustment

The output voltage shall be adjustable over a nominal range of at least  $\pm 2$  percent by means of screwdriver adjustments accessible through the rear or top of the supply. The maximum error in resetting each output voltage shall be  $\pm 0.5$  percent.

## D8. Recovery Time and Turn-on— Turn-off Transients

The outputs shall recover to within  $\pm 0.2$  percent of their steady state values within 1 ms for any change within the specified input voltage and for a 50 percent rated load current change. The peak output excursions during 1 ms shall not exceed  $\pm 5$  percent of rated voltage for such line or load changes and shall be proportionately less for smaller changes.

Response to input voltage changes or to  $\pm 5$  percent bus line voltage changes shall be non-oscillatory.

From turn-on the power supply output shall stabilize to within  $\pm 1$  percent of its final value within 1 min for constant line, load, and ambient temperature. The turn-on and turn-off transients shall not exceed 20 percent of the nominal voltage.

## D9. Magnetic Field Effects

A magnetic field of 50 G in any direction shall not cause performance characteristic variations of more than  $\pm 0.5$  percent.

## D10. Power Transformers

The power transformers shall be constructed with an electrostatic shield which is connected to the core.

## D11. Terminals

All wiring shall be as shown in Fig D1.

(1) When designed for use with 117 V ac mains, a three-wire power cord of approximately 1.5 m in length shall be included. It shall have a NEMA Cap, 5-15P. The power cord may be permanently attached to the power supply, or alternatively, may terminate in a NEMA Connector Body 5-15R, mating with a NEMA Inlet 5-15P on the power supply.

(2) The dc output power shall be supplied via a connector (PG-26) as designated in Fig D1, or mating equivalent. Wire size, socket types, and pin assignments are specified in Fig D1.

## D12. Protection

(1) The input of the supply shall be protected with a fuse of adequate rating in each side of the line. The fuses shall be readily accessible.

(2) The output of the supply shall be short-circuit protected by means of an electronic circuit. The current limiting threshold shall be set at least 0.2 A above the specified maximum output currents. The output voltage shall be resumed after the short has been removed. A continuous short circuit shall not damage the supply or blow a fuse.

(3) The output shall be protected by limiting circuits so that under no conditions will the  $\pm 24$  V outputs exceed 34 V or the  $\pm 6.0$  V outputs exceed 7.5 V. Operation of the overvoltage protection shall not damage the power supply.

(4) In no case shall a failure of any supply cause an increase in voltage of any other supply by more than 20 percent.

(5) The power supply shall not damage itself, and the conditions of D12(3) shall apply if the power supply is turned on with any or all pins of PG-26 disconnected.

(6) Thermal protection circuits shall be provided to disable the supply when the temperature exceeds a safe operating value.

The maximum safe operating temperature, as measured at the thermal switch, shall be specified on the schematic circuit diagram.

### D13. Crate Ventilation

This power supply shall include fans and mechanical assembly to provide forced air ventilation of a CAMAC crate. Air flow of at least  $12 \text{ ft}^3/\text{min}$  shall be directed into each of four equal crate sections extending from front to back. The air flow impedance of densely packed CAMAC modules in all twenty-five stations shall be considered in determining the minimum air flow rate.

Air shall be drawn from directly in front of the rack in which the assembly is mounted. Air filters, allowing a visual inspection from the front, shall be included. The air shall be channeled in such a way that it does not experience an appreciable temperature rise due to the heat of the power supply. The unit shall include a POWER ON-OFF switch. The switching shall be such that the fans must operate whenever the power supply is operating.

### D14. Mounting

The supply shall be constructed for rack mounting immediately below a CAMAC crate in such a fashion that the ventilation requirements of this specification are achieved.

(1) Fig D2 specifies several outline dimensions and component locations to which the unit must adhere.

(2) Interface housing units (see Fig D5) mechanically adapt CAMAC crates from various sources to this power supply. They also house and protect PG-27, power busing, and the dataway connectors.

An interface housing unit is not a part of this specification. The power supply shall, however, be provided with four #10-32 captive screws in the positions shown in Fig D2 as a means of securing to an interface housing unit.

(3) The panel height of the supply is not specified. Panel height is at a premium in rack space. Trade offs between panel height and power supply costs should be optimized.

### D15. Monitoring

(1) Front panel metering shall be provided to monitor the four dc voltages and their current loads. The metering shall be accurate to  $\pm 2.5$  percent full scale.

The meter scales shall be calibrated with full scales of 120-135 per cent of nominal voltage and rated current values and shall have labeled markers at nominal voltage values and at rated current values.

(2) A front panel neon lamp (or suitable solid state indicator) wired as shown in Fig D1 shall be provided to indicate the ac power on condition.

(3) A front panel thermal warning light, wired as shown in Fig D1, shall be provided. It shall light whenever the temperature within the supply exceeds a value  $20^\circ\text{C}$  below the maximum safe operating temperature.

### D16. Mechanical Construction

(1) Insulating materials such as printed wiring boards shall be flame retardant.

(2) All components shall be accessible for testing and replacement.

(3) All integrated circuits shall be mounted in high-quality integrated circuit sockets.

(4) Markings: Major components such as solid state devices, transformers (including leads), large capacitors, controls, and terminals shall be marked in the most readable position in the unit with respect to their identification on the schematic diagram.

## D17. Circuit Diagram

Two copies of the schematic circuit diagram, which include component values, shall be provided with each supply. All semiconductor components shall be designated by Electronic Industries Association numbers or in nomenclature commonly used by semiconductor manufacturers or shall be directly replaceable by the same. Where special types are used, the schematic diagram or instruction book shall recommend a semiconductor manufacturer's equivalent that will provide satisfactory performance.

## D18. Finish

All front panel metal surfaces shall be finished with a baked-on enamel or with an equally hard, chip-resistant, material. All surfaces not seen from the front may be finished similarly, or may be finished with nickel plate, iridite or other material that will assure good electrical contact and that, where necessary, is passivated against atmospheric corrosion or against electrolysis when in contact with copper or with other common finishes.

Numerals 1-25, representing station numbers in a CAMAC crate, and to identify modules inserted into a crate which may be mounted immediately above the supply, shall be printed on the front panel near the top edge. They shall be in consecutive order from left to right as viewed from the front with the numeral 13 at the front panel centerline, and shall be positioned at 17.2 mm intervals. The numerals shall be at least 4 mm in height.

## D19. Test Conditions

Crate wiring between PG-27 and the Dataway power bus shall be simulated by 305 mm of lead. Sense leads and test-load leads shall be attached at this distance from PG-27, and measurements to determine adherence to these specifications shall be made at this point. Users are alerted to the fact that, in practice, performance will depend upon the actual positions of sense points and the reactive nature of loads.

## D20. Optional Feature—Status Bit

A Status Bit to indicate whether the power unit is functioning normally may be provided. This optional feature, when provided, shall be standardized as follows:

(1) The Status Bit source shall be a relay which provides contact closure when in the alarm condition; shorting the Status Bit line to the power-unit chassis. Under normal operating conditions, the Status Bit line shall be an open circuit in the power unit.

Contact rating shall be minimally 50 V, 500 mA.

(2) The Status Bit alarm condition shall indicate that any one of the following conditions exist:

- (a) Any one of the voltages supplied by the unit is outside of specified voltage range.
- (b) Any one or combination of supplies is being loaded beyond specified current range.
- (c) The thermal warning switch is in the alarm condition.

The Status Bit may indicate additional alarm conditions at the option of the manufacturer, but (a), (b), and (c) must minimally be included.

(3) In the power unit, the Status Bit shall be wired to contact K of PG-26 and to a front panel 50CM coaxial connector.

## D21. Figures

Fig D1 interconnection block diagram.

Fig D2 outline dimensions and illustrated unit.

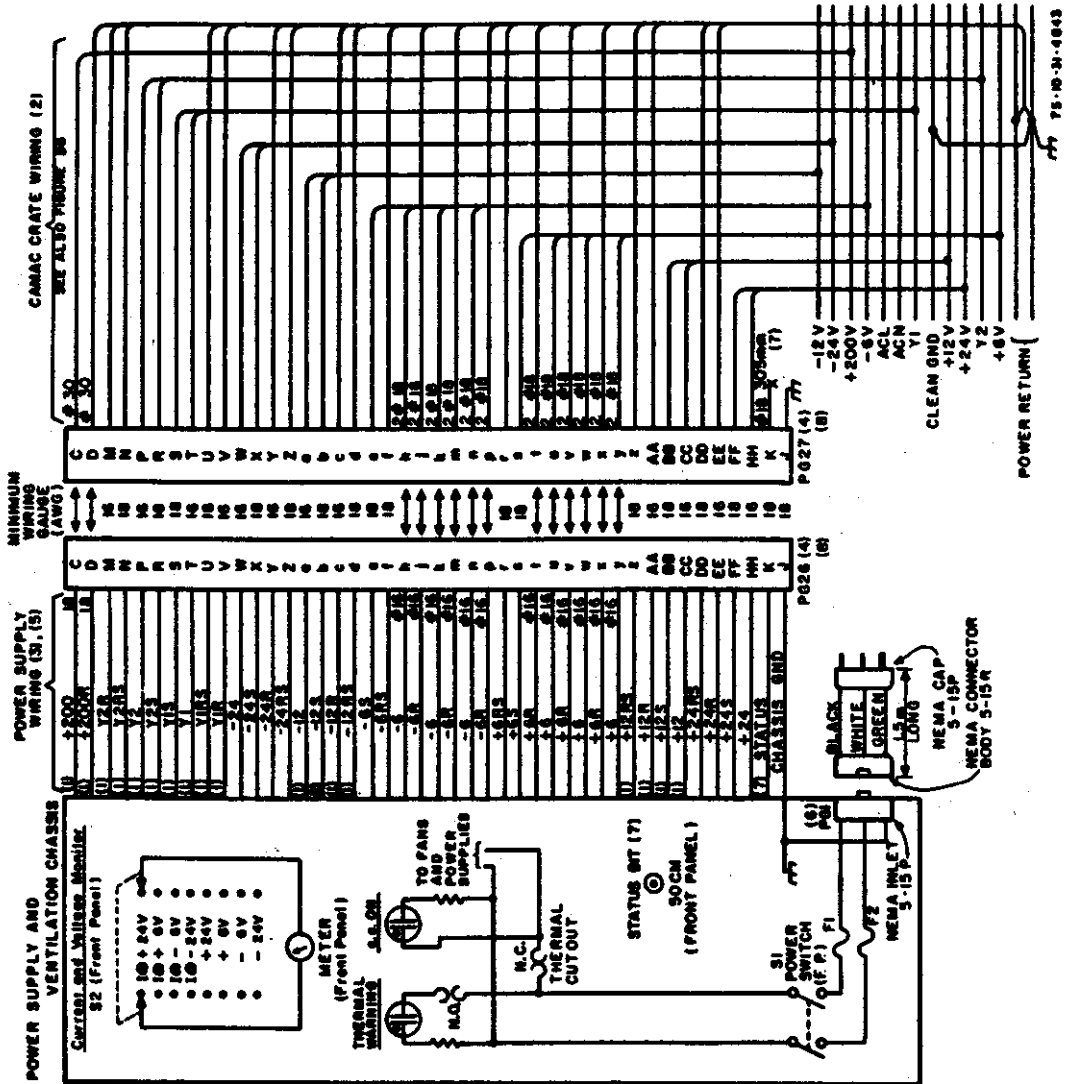
Fig D3 Time and voltage characteristics  $\pm 6$  V.

Fig D4 Time and voltage characteristics,  $\pm 24$  V

Fig D5 Interface housing unit

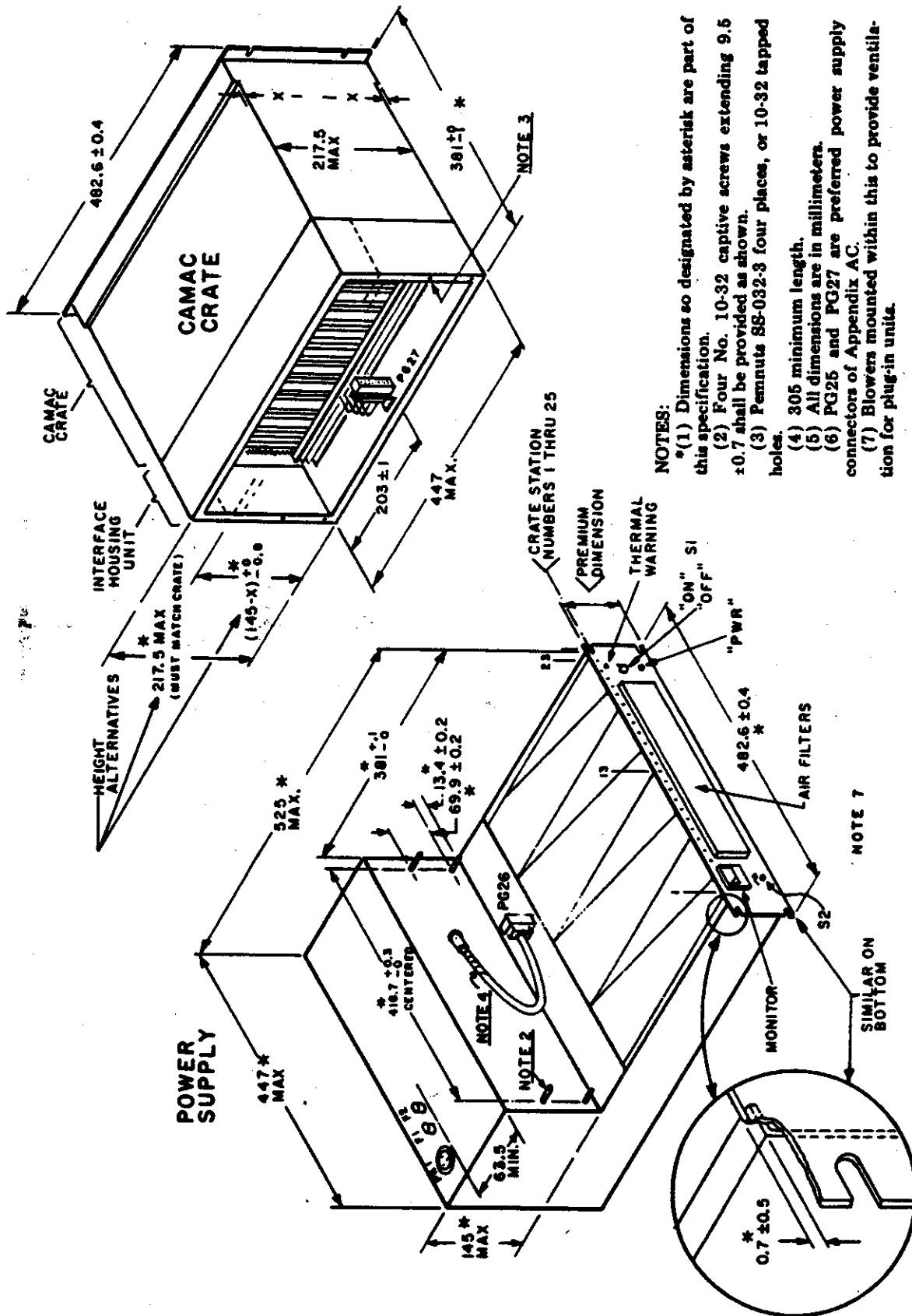
Fig D6 Typical Power buses and power return bus, feed and sense wiring (see note below).

NOTE: The information on Figs D5 and D6 indicate preferred practice for fabrication and assembly of CAMAC crate wiring and the interface housing unit. It is presented here because of the intimate relationship between these and the power supply and ventilation unit.



- NOTES:**
- (1) Optional voltages. Pins reserved for optional voltages not supplied by this unit. If wired, minimum wire gauges shown pertain.
  - (2) All pins wired as shown. PG-27 and CAMAC crate wiring are not provided with this power supply.
  - (3) Sufficient length, positioning, and flexibility to mate with crate connector mounted as shown in Fig D2 (minimum length, 305 mm)
  - (4) PG-26—Fixed Member (crate connector) with socket contacts in accordance with Appendix C of IEEE Std 583.  
PG-27—Free Member (power supply connector) with pin contacts in accordance with Appendix C of IEEE Std 583.  
Other connectors fully mateable with these and with at least 18 A per contact rating may be used.
  - (5) 24 indicates 24 V line  
24 R indicates 24 V return line  
24 S indicates 24 V sense line  
24 RS indicates 24 V return sense line  
and so forth for other voltages
  - (6) PG-1 optional
  - (7) Optional feature, Section 7.
  - (8) Polarization of connectors PG-26 and PG-27 is to be provided by the use of two guide pins in the corner holes of one end and two guide sockets in the corner holes of the other end of each connector block, in accordance with Appendix C of IEEE Std 583.

Fig D1  
Interconnection Block Diagram



- NOTES:
- (1) Dimensions so designated by asterisk are part of this specification.
  - (2) Four No. 10-32 captive screws extending 9.5 ± 0.7 shall be provided as shown.
  - (3) Penn nuts SS-032-3 four places, or 10-32 tapped holes.
  - (4) 305 minimum length.
  - (5) All dimensions are in millimeters.
  - (6) PG26 and PG27 are preferred power supply connectors of Appendix AC.
  - (7) Blowers mounted within this to provide ventilation for plug-in units.

Fig D2  
 Outline Dimension and  
 Illustrative Unit

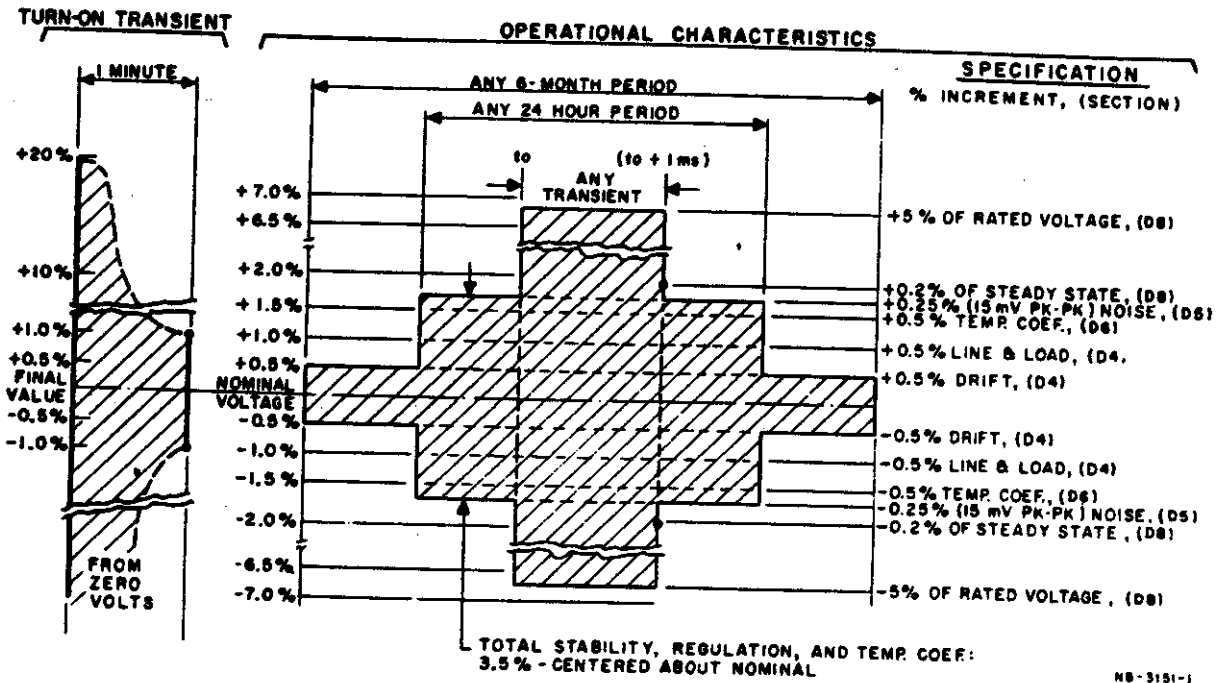


Fig D3  
Time and Voltage Characteristics, ±6 V

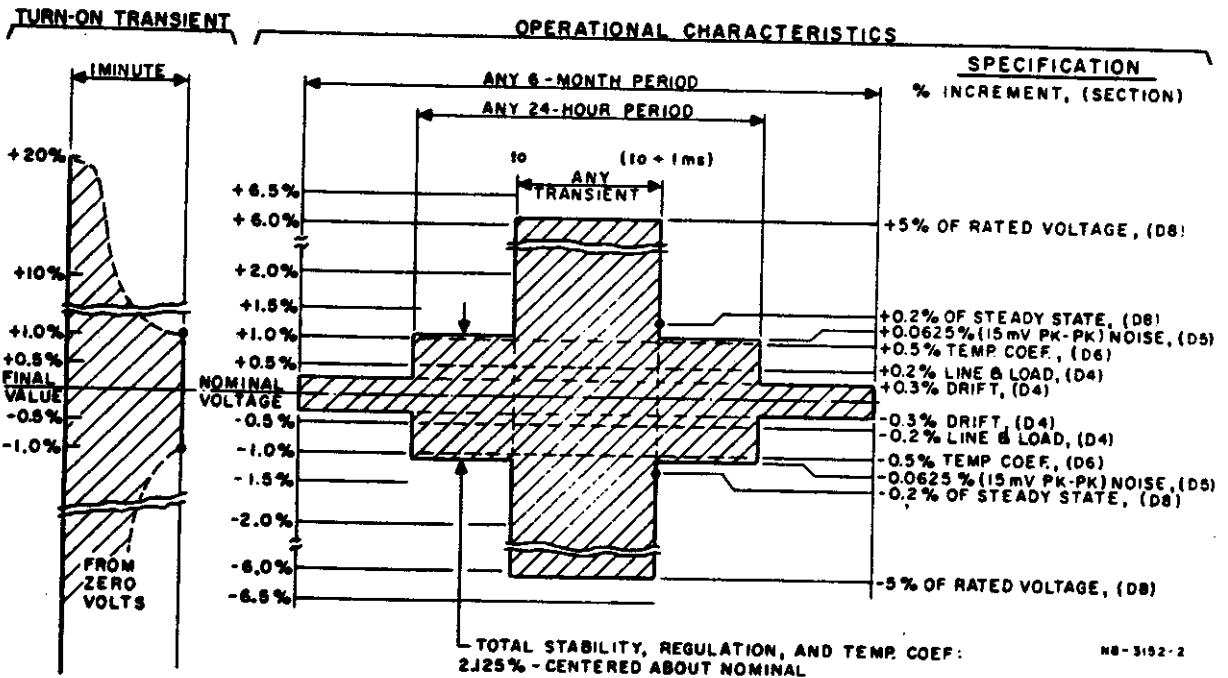
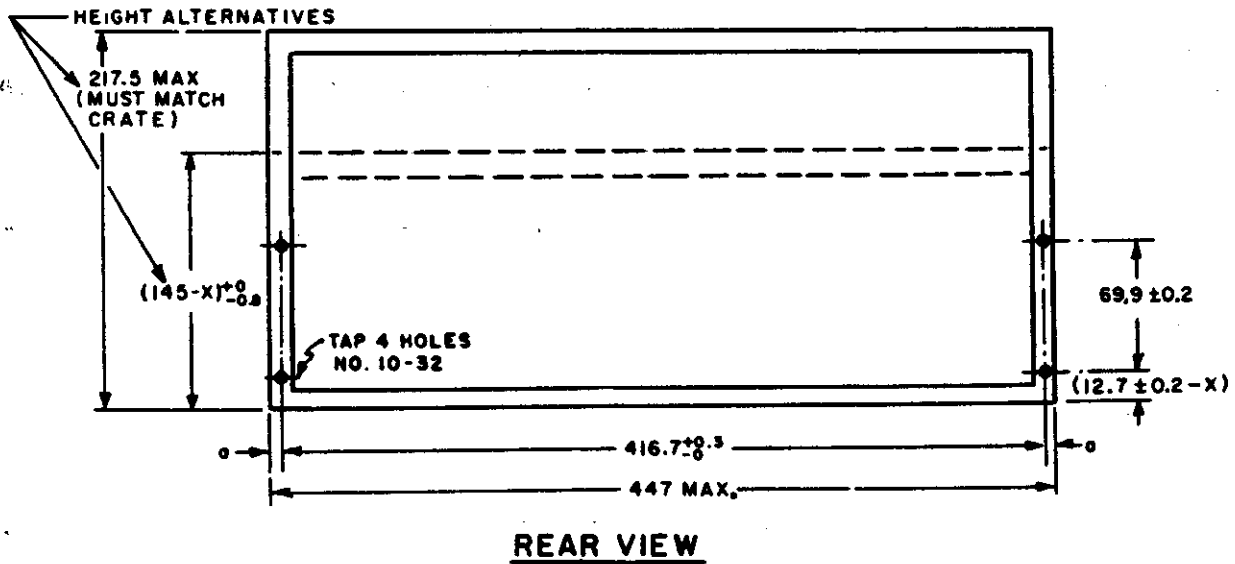
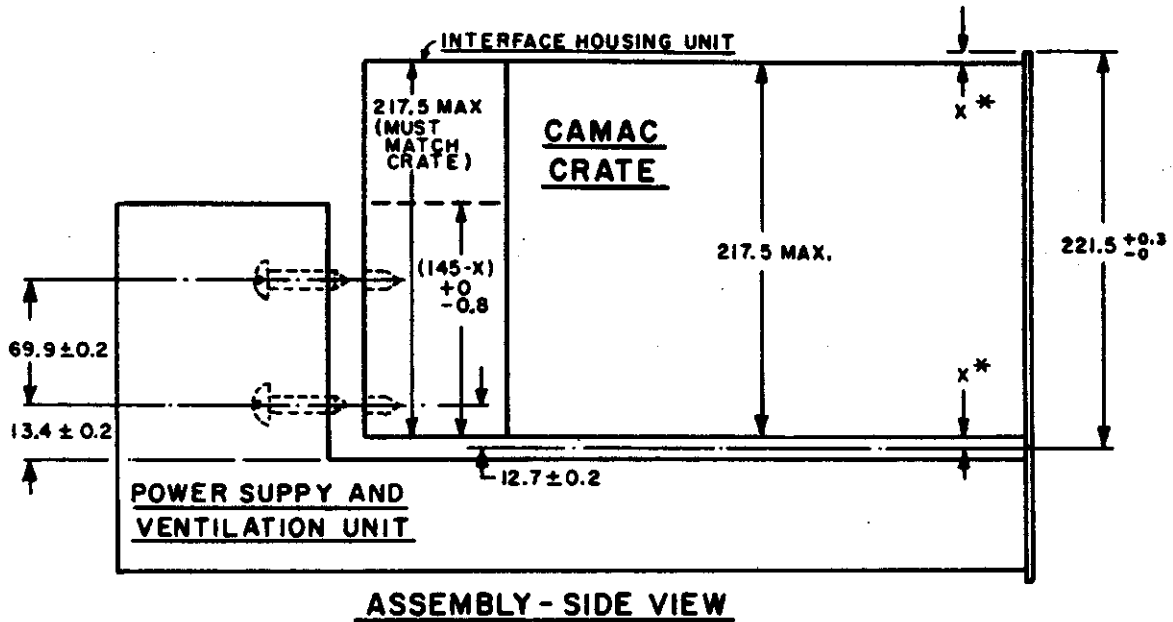


Fig D4  
Time and Voltage Characteristics, ±24 V





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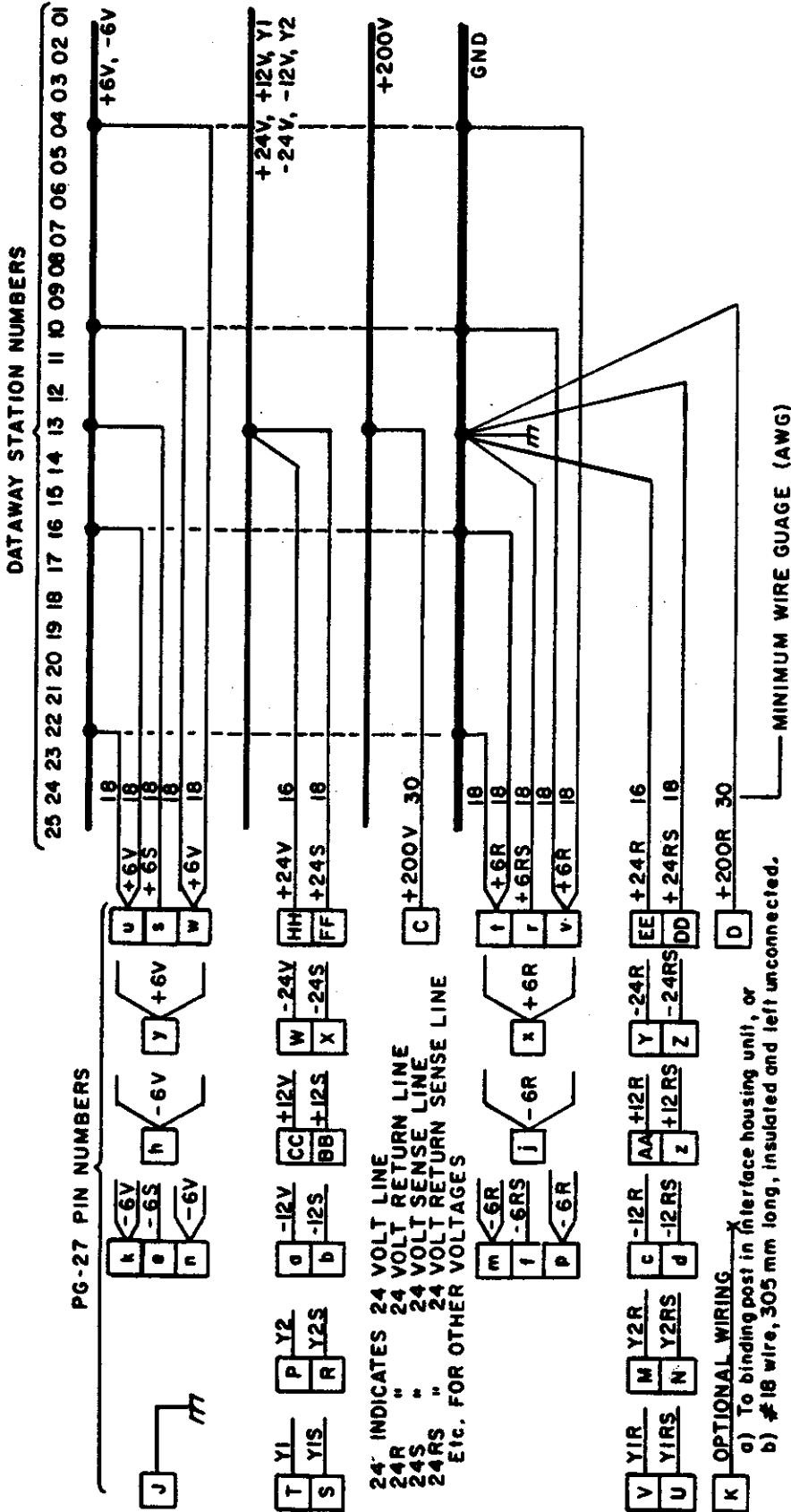
**NOTES:**

(1) Power section and ventilation section may be separable.

(2) Power section need not extend upward at rear of crate as shown; if not, brackets for attaching to rear of interface housing unit must be provided.

\*Dimension varies with crates from different manufacturers.

**Fig D5**  
**Interface Housing Unit**



NB-3157-3

NOTES:  
 (1) Suitable Connectors are Described in Appendix C of IEEE Std 583.  
 (2) See note at the bottom of Section D21.

Fig D6  
 Typical Power Buses and Power Return Bus, Feed, and Sense Wiring.

## WARRANTY

All KineticSystems Corporation equipment is warranted against defects in workmanship and material under normal use and service for a period of two years from the date of shipment. KSC will repair or replace, at KSC's option, any equipment found to be defective in workmanship or material within two years of shipment. Repair charges will be applicable from two years after delivery with repair charges varying, depending on the complexity of the equipment. This warranty covers all such items delivered after March 1, 1978.

Equipment purchased by KineticSystems Corporation for resale will carry the original equipment manufacturers' warranty.

The equipment warranty outside the continental U.S.A. or Switzerland is limited to repair of the equipment and excludes shipping, custom's clearance, or any other charges.

Equipment for repair must be returned prepaid to KSC. Transportation charges for shipping the equipment to KSC shall be paid by the customer, while transportation charges for the return of the repaired equipment shall be paid by KSC except as indicated in the previous paragraph and will be made on a UPS basis, where available, or parcel post insured. Premium methods of shipment are available at customer's expense and will be used only when requested. If KSC selects the carrier, KSC will not thereby assume any liability in connection with the shipment nor shall the carrier be in any way construed to be the agent of KSC.

No equipment will be accepted for credit or exchange without the prior approval of KSC. Contact the Repair Service Center in your area for a return authorization number.

All customers (except European) please ship units to:

KineticSystems Corporation  
Repair Service  
11 Maryknoll Drive  
Lockport, Illinois 60441  
Telephone (815) 838-0005  
TWX 910 638-2831

In Europe ship all units to:

Kinetic Systems International S.A.  
Repair Service  
6 Chemin de Tavernay  
1218 Geneva, Switzerland  
Telephone (022) 98 44 45  
Telex 289 622 KSI CH

The following steps should be taken when returning a unit:

1. Contact KineticSystems and discuss the problem with an engineer.
2. Obtain a return authorization (RA) number.
3. Initiate a purchase order for the estimated repair charge if the equipment is out of warranty.
4. Ship the equipment to KineticSystems with the RA number, a description of the problem, and the name of the technical contact person.

OF MATERIALS FOR PK1500100 1500-100

PARTS LIS

QTY	COMPONENT	DESCRIPTION	QUANTITY/	U/M
			ASSEMBLY	
	FA1500100	KSC VERSION CAMAC CRT FAN UNIT	1.000	EA
	AS1500100	1500-100 TESTING	1.000	EA
	WO1500100	1500-100 ASSEMBLY	1.000	EA
5	CHA1500100	MAIN CHASSIS ASSEMBLY	1.000	EA
.6	CL941007	4" EXHAUST FAN GOULD #904-2337	3.000	EA
.6	CO919055	PIN POLAR. AMPHENOL #26-159-32	1.000	EA
.6	CO991063	STYLE 1 QUICK CONN TERM GB SER	5.000	EA
.6	CO991064	STYLE 3 QUICK CONN TERM GB SER	4.000	EA
.6	CO991065	STYLE 6 QUICK CONN TERM GB SER	1.000	EA
.6	HD901058	#4 SPCR 1/4" HH SMITH #2340	2.000	EA
.6	HD901062	4-40 CLINCH NUT PEM #CLS 4402	2.000	EA
.6	HD901123	TENS CLIP CEL911-7050 TYPE30-1	4.000	EA
.6	HD911016	4-40 X 1/2 BND HD	2.000	EA
.6	HD911032	6-32 X 3/8 BND HD	12.000	EA
.6	HD911051	6-32 X 5/8 BINDER HD	2.000	EA
.6	HD912003	#6-32 KEPNUT	14.000	EA
.6	HD913023	#6-3/8 FLT WASHER NEWRK31F2139	2.000	EA
.6	HD915004	BLD RIV 1/8 DOME HD PCI#603035	17.000	EA
.6	HD931019	5P BARRIER STRIP CURTIS#GBS-5	1.000	EA
.6	HD941600	CRATE VENT UNIT DIVIDER B-1600	2.000	EA
.6	HD941602	VENT UNIT CHAS LFT SIDE C-1602	1.000	EA
.6	HD941603	VENT UNIT CHAS RGHT SIDE C1603	1.000	EA
.6	HD941604	CRATE VENT UNIT CHAS TOP D1604	1.000	EA
.6	FPA1500100	FRONT PANEL ASSEMBLY	1.000	EA
.6	CO919005	TEST PT #JHNSN 105-1043-001BLK	1.000	EA
.6	CO919082	LG TST PT WHT EFJ 105104101	6.000	EA
.6	HD901031	4-40X1/4HEX THRD SPCR HHS 2330	4.000	EA
.6	HD911015	2-56 X 3/16 BND HD	8.000	EA
.6	HD911017	6-32 X 1/4 BND HD	4.000	EA
.6	HD911035	4-40X1/4 PHIL PAN HDMS BLK OXI	4.000	EA
.6	HD911075	CAPT PANEL SCREW UNICORP#4240	2.000	EA
.6	HD911087	2-56X3/16 PH PAN HD MS BLK OXD	4.000	EA
.6	HD911088	6-32X3/8 PH PAN HD MS BLK OXDE	4.000	EA
.6	HD912014	CAPT PNL RETAIN UNICORP#41R19	2.000	EA
.6	HD941599	CRATE VENT UNIT FRNT PNL D1599	1.000	EA
.6	HD941820	VENT UNIT FLTR GRIL FRT B-1820	2.000	EA
.6	HD941821	VENT UNIT FILT GRIL REAR B1821	2.000	EA
.6	HD941822	METER MOUNT BRACKET B-1822	1.000	EA
.6	LI951004	INDICAT LITE LEECRAFT#36N2311	1.000	EA
.6	MS991026	METER TRIPLET STYLE 320-R	1.000	EA
.6	MS991027	4.125X2.875X3/16 INDUSTRIALFOAM	2.000	EA
.6	MS991029	4.125X2.875X1/4 SQ SCREEN	2.000	EA
.6	SW911034	2 POLE FORMA MS#AML36FRB4AC01	1.000	EA
.6	SW991008	ROCKER W/RED LENS #AML56-N10RW	1.000	EA
.6	B436	VENTILATION UNIT FP SWITCH BD	1.000	EA
.6	CO911019	10P HEADER-STR SPECTRA#800-591	1.000	EA
.6	CO919048	20POS RT ANGL MNT 3M 3492-1002	1.000	EA
.6	HD290404	FP SUPPORT BRKT A-404	1.000	EA
.6	HD911006	4-40 X 1/4 BND HD	4.000	EA
.6	HD912002	#4-40 KEPNUT	1.000	EA
.6	PC302436	PCB B436 VENT UNIT FP SWITCH	1.000	EA
.6	RE111101	1/8W 1% 1.10K	1.000	EA

## BILL OF MATERIALS FOR PK1500100 1500-100

PARTS LIST

LEVEL	COMPONENT	DESCRIPTION	QUANTITY/ ASSEMBLY	U/M
.....6	RE111211	1/8W 1% 1.21K	2.000	EA
.....6	RE111652	1/8W 1% 16.5K	2.000	EA
.....6	RE113320	1/8W 1% 332 OHM RN55D3320F	2.000	EA
.....6	RE113322	1/8W 1% 33.2K	2.000	EA
.....6	RE115490	1/8W 1% 549 OHM	1.000	EA
.....6	RE118251	1/8W 1% 8.25K	2.000	EA
.....6	RE320820	1/2W 5% 82 OHM	2.000	EA
.....6	RE321201	1/2W 5% 1200 OHM	2.000	EA
.....6	RE323300	1/2W 5% 330 OHM	2.000	EA
.....6	SW911032	5POS PB CNTRALB#2KBM1112001320	1.000	EA

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BILL OF MATERIALS FOR W01500200  
1500-200 ASSEMBLY

PARTS LIST REV #

ITEM NO	QUANTITY	DESCRIPTION	PART NO
1	1	MAIN CHASSIS ASSEMBLY	CHA1500210
2	1	110000UF15V MALY#CGS114U015W4	CA 2151109
3	1	150000UF15Y MALY CGS154U015X4	CA 2151509
4	2	20000UF40V SPRG36DX203G040BC2	CA 240209
5	1	4.5" FINGER GUARD 760-9601-43	CL 949000
6	1	20 POS FLT CBL CO 3M 3421 600	CO 911016
7	1	10P SOCKET 3M#3473-6000	CO 911021
8	6	3/16 F QUICK SLIDE 18-22GA IN	CO 991049
9	16	1/4 F QUICKSLIDE 18-22GA W/IN	CO 991050
10	4	INS RING TERM.PANDUIT#PV10-10	CO 991059
11	9	ROLLPIN HARRIS#51-028-125-075	HD 901116
12	2	CARD GUIDE (P.S.)WALDOM #E-45	HD 901117
13	4	RETAINER 10-32 UNICORP #42R21	HD 901118
14	4	SPRING UNICORP #SF-2 STANDARD	HD 901119
15	17	4-40 X 1/4 BND HD	HD 911006
16	4	8-32 X 1/2 FLAT HD	HD 911046
17	4	1/4-20X4 1/2 HEXHD BOLT THR3/	HD 911070
18	4	NYLON FLT WASHER HH SMITH 267	HD 913022
19	5	1/4 TURN FASTENER DZUS AJ3-25	HD 915000
20	5	SNAP RING DZUS #3 RING	HD 915001
21	4	TYPE SA SPRING DZUS #S3-150	HD 915002
22	8	BLIND RIVIT 3/32 #AK-34-BS-25	HD 915003
23	4	BLD RIV 1/8 DOME HD PCI#60303	HD 915004
24	2	CHASSIS-LOCATOR BLOCK A-1641	HD 941641
25	1	P.S. CHASSIS BASE PLATE D-169	HD 941699
26	4	10-32 PS MNT SCRW A-1775	HD 941775
27	1	1500-200 CAP. MNT PLATE A-178	HD 941787
28	1	POWER SUPPLY CHASSIS D-1788	HD 941788
29	1	PS CHASSIS (COVER&BACK) D-179	HD 941795
30	1	SMALL CAP MNTG PLATE A-1834	HD 941834
31	1	B439 INSULATION INSERT A-1894	HD 941894
32	1	TRANSFORMER ASSEMBLY	SUB1500211
33	1	3P LN RECPT SWITCHCRT #EAC-30	CO 919023
34	1	3POS CONNPLG MOLEX #03-09-203	CO 919024
35	1	2 POS RECPT MOLEX #03-09-1021	CO 919072
36	1	9 POS RECPT MOLEX #03-09-1092	CO 919073
37	1	4 POS RECPT MOLEX #03-09-1040	CO 919074
38	1	2P W/MNT EARS MOLEX#03-09-202	CO 919079
39	17	INS RING TERMAL T&B TYPE RA56	CO 991058
40	10	INS RING TERM.PANDUIT#PV10-10	CO 991059

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BILL OF MATERIALS FOR W01500200  
1500-200 ASSEMBLY

PARTS LIST REV #

ITEM NO	QUANTITY	DESCRIPTION	PART NO
41	2	INS RING TERML T&B TYPE RB56	CO 991062
42	2	IN3660R DIODE MOTOROLA	DI 103660
43	2	MR 5005 DIODE MOTOROLA	DI 105005
44	1	DIODE BRIDGE MDA 3501 35A 100	DI 901017
45	2	3AG 10A SLO-BLO LITL FUSE 31301	FU 912011
46	2	3AG FUSE HLDR LITFU #342001AL	FU 919001
47	2	6-32X1/4 HEX TRD SPCR HHS 232	HD 901061
48	1	PURSE LK TIE RICHCO STL-3N-45	HD 901133
49	2	4-40 X 3/8 BND HD	HD 911007
50	2	6-32 X 3/16 BND HD	HD 911025
51	8	6-32 X 3/8 BND HD	HD 911032
52	4	1/4-20 X 1/2" ALLEN HD M.S.	HD 911073
53	1	10-32X3/4 FLAT HEAD S.S.MS	HD 911085
54	2	#4-40 KEPNUT	HD 912002
55	1	#10-32 KEPNUT	HD 912005
56	8	#6 NYLON SHOULDER WASHER #266	HD 913017
57	4	1/4 LOCKWASHERS	HD 913018
58	1	TYPE SA SPRING DZUS #S3-150	HD 915002
59	2	BLIND RIVIT 3/32 #AK-34-BS-25	HD 915003
60	2	SELFCLINCH STUD PEM FHS-632-8	HD 915005
61	1	10 POS TERM BLOCK CINCH 10-14	HD 931021
62	2	TERM BLOCK JUMPER CINCH 140J-	HD 939002
63	2	10P MARKR STRP CINCH#MS-10-14	HD 939007
64	1	CONN&CARD GUIDE BRACKET D-177	HD 941774
65	2	PS DIODE HEATSINK A-1776	HD 941776
66	1	AC INPUT BRACKET C-1780	HD 941780
67	2	RECTIFIER DIODE BUS BAR A-178	HD 941781
68	1	AC INPUT BRACKET SUPPORT A182	HD 941829
69	1	TERMINAL BLOCK COVER A-188	HD 941885
70	1	POWER XFORMER GM&ELEC GME381-	XF 911000
71	1	PASS TRANSISTOR ASSEMBLY	SUB1500212
72	1	4" EXHAUST FAN GOULD #903-232	CL 941003
73	1	20 POS FLT CBL CO 3M 3421 600	CO 911016
74	1	2POS MATE&LOK SKT #1-480318-0	CO 919059
75	2	2POS MATE&LOK SKT #1-480318-0	CO 919059
76	1	2POS MATE&LOK PIN #1-480319-0	CO 919060
77	1	2 POS RECPT MOLEX #03-09-1023	CO 919075
78	1	4 POS PLUG MOLEX #03-09-2040	CO 919077
79	1	2 POS PLUG MOLEX #03-09-2022	CO 919078
80	12	TO-3 TRANSMT MICRO 18PTI1HDWO	CO 921030

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BILL OF MATERIALS FOR W01500200  
1500-200 ASSEMBLY

PARTS LIST REV #

ITEM NO	QUANTITY	DESCRIPTION	PART NO
81	20	.093 FEM TERML MOLEX 02091118	CO 991018
82	1	PULL TAB 3M #3490-2	CO 991028
83	2	SOCKET AMP #60619-1	CO 991032
84	1	10POS SKT HOUSING #1-480285-	CO 991039
85	12	20-14GA PIN AMP #60620-1	CO 991042
86	12	SOLDER LUG HH SMITH #1416-6	CO 991048
87	3	INS RING TERM.PANDUIT#PV10-10	CO 991059
88	2	INS RING TERM.PANDUIT#PV14-10	CO 991060
89	2	3AG FUSE 1AMP LITTLFUSE 31200	FU 912001
90	8	3AG 10A NORMAL BLO #312010	FU 912008
91	2	3AG 8A NORMAL BLO #312008	FU 912009
92	2	3AG FUSEBLOK LITTLEFUSE 35700	FU 919003
93	10	TIWRAP 3/4" PANDUIT #PLT-IM-C	HD 901026
94	4	8-32X1 HEX M/F SPACER HHS#828	HD 901122
95	5	CABLE TIE ANCHOR PANDUIT TA15	HD 901132
96	24	6/32 X 1/2 BND HD	HD 911009
97	6	6-32 X 1/4 BND HD	HD 911017
98	14	6-32 X 3/8 BND HD	HD 911032
99	4	8-32 X 3/8 BND HD	HD 911033
100	4	4-40 X 1/8 BINDER HD	HD 911055
101	8	6-32X3/8 PH FLT HD MS	HD 911084
102	24	#6-32 KEPNUT	HD 912003
103	12	T0-3 MICA WASHER 3935	HD 913010
104	2	FAN MNTG BLOCKS A-1664	HD 941664
105	1	+6V MNTG PLATE B-1665	HD 941665
106	1	-6V MNTG PLATE B-1666	HD 941666
107	1	12&24V MNTG PLATE B-1667	HD 941667
108	1	FUSE MNTG PLATE B-1668	HD 941668
109	2	HEATSINK B-1678	HD 941678
110	2	FAN UNIT MNTG BLOCKS - FRONT	HD 941804
111	1	90-C THRMSTAT ELW 3450-88-14	SW 931000
112	1	115-C THRMSTAT ELW#3450-88-16	SW 931001
113	12	2N3771 NPN SILICON POWER	XS 103771
114	1	CABLE TO FAN UNIT ASSEMBLY	SUB1500213
115	1	20 POS FLT CBL CO 3M 3421 600	CO 911016
116	1	SKT POLAR. AMPHENOL #26-190-3	CO 919056
117	1	9 CKT FLUG MOLEX #03-09-2092	CO 919071
118	9	.093 M TERML MOLEX #02-09-211	CO 991016
119	1	SOLDER LUG HH SMITH #1416-6	CO 991048
120	2	4-40 X 3/8 BND HD	HD 911007



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BILL OF MATERIALS FOR W01500200  
1500-200 ASSEMBLY

PARTS LIST REV #

ITEM NO	QUANTITY	DESCRIPTION	PART NO
121	1	AMPH CON MNTG BRACKET B-1779	HD 941779
122	1	NEGATIVE RECULATOR BOARD	R500
123	7	.01UF RD CW15C103M/CS15C103M	CA 150103
124	5	.1UF REDCAP CR20D104ZC	CA 150104
125	2	300/10V MAL #MTP337M010P1C	CA 210307
126	2	120/30V MAL #MTP127M030P1C	CA 230127
127	3	1UF/50V10%PT MLY#TAS105K050P1	CA 250105
128	3	10PIN IC SOCKET #TO-51023-GT	CO 921027
129	4	TO-66 TRANSMT MICRO 18PTI2WOB	CO 921029
130	1	1N914A/1N4446	DI 100914
131	1	1N823A 6.2V 400MW	DI 200823
132	1	1N5225 3V 20%	DI 215225
133	1	1N4738A 8.2V 5% 1W	DI 234738
134	1	1N4752 33V 5% 1W	DI 234752
135	1	.1 JUMPER#JO.100X0.250B24 SQI	HD 901074
136	4	MICA INS. WAFER TO-66 HHS#628	HD 901098
137	14	TO-18 CASE SPRDR PAD #201-15	HD 901103
138	3	.6 JUMP SQUIRE.600X0.125PVC18	HD 901136
139	8	4-40 X 1/2 BND HD	HD 911016
140	8	#4-40 KEPNUT	HD 912002
141	1	HEATSINK R500/R501 B-1696	HD 941696
142	3	LM304H/NAT MLM304G/MOT 1500	IC 100304
143	1	PCB R500 NEGATIVE REGULATOR	PC 300500
144	2	10000OHM 3/4" RECT MULTI#43P10	PT 201001
145	1	100 OHM 3/8"SQ 1T SPECT 63P10	PT 601000
146	2	500 OHM 1T 3/8"SQ SPECT 63P50	PT 605000
147	1	50000OHM 3/4" WIREWOUND #43P50	PT 905001
148	1	1/8W 1% 20 OHM	RE 110200
149	1	1/8W 1% 178 OHM	RE 111780
150	1	1/8W 1% 374 OHM	RE 113740
151	2	1/4W 1% 100 OHM	RE 211000
152	1	1/4W 1% 1000 OHM	RE 211001
153	1	1/4W 1% 11K	RE 211102
154	2	1/4W 1% 2200 OHM	RE 212201
155	4	1/4W 1% 2430 OHM	RE 212431
156	1	1/4W 1% 24.9K OHM	RE 212492
157	1	1/4W 1% 5620 OHM	RE 215621
158	2	1/4W 1% 6490 OHM	RE 216491

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BILL OF MATERIALS FOR W01500200  
1500-200 ASSEMBLY

PARTS LIST REV #

ITEM NO	QUANTITY	DESCRIPTION	PART NO
159	1	1/4W 5% 10 OHM	
160	1	1/4W 5% 680 OHM	RE 220100
161	5	1/2W 5% 10 OHM	RE 226800
162	5	1/2W 5% 1.3 OHM	RE 320100
163	1	1/2W 5% 22 OHM	RE 320139
164	3	1/2W 5% CARBON 36 OHM	RE 320220
165	1	1/2W 5% 68 OHM	RE 320360
166	2	1/2W 5% 1000 OHM	RE 320680
167	3	1/2W 5% 120 OHM	RE 321001
168	1	1/2W 5% 1500 OHM	RE 321200
169	1	1/2W 5% 1800 OHM	RE 321501
170	1	1/2W 5% 2200 OHM	RE 321801
171	2	1/2W 5% 22K	RE 322201
172	1	1/2W 5% 3K OHM	RE 322202
173	2	1/2W 5% 3300 OHM	RE 323001
174	1	1/2W 5% 3900 OHM	RE 323301
175	2	1/2W 5% 560 OHM	RE 323901
176	4	1/2W 5% 680 OHM	RE 325600
177	1	2W 5% .15 OHM WIRE WOUND	RE 326800
178	1	2W 5% 100 OHM WIRE WOUND	RE 520158
179	1	5W 5% 12 OHM WIRE WOUND	RE 521000
180	1	5W 5% 200 OHM WIRE WOUND	RE 620120
			RE 622000
181	5	2N2221 NPN	
182	9	2N2906 FNP	XS 102221
183	4	2N4898 FNP	XS 202906
			XS 204898
184	1	POSITIVE REGULATOR BOARD	R501
185	1	100PF/100V/10% #CN15A101K	
186	3	1000PF RD CW15C102K/CN15C102K	CA 150101
187	5	.01UF RD CW15C103M/CS15C103M	CA 150102
188	4	.1UF REDCAP CR20D104ZC	CA 150103
189	1	220PF REDCAP CW15C221K	CA 150104
190	1	2200PF REDCAP CW15C222K	CA 150221
191	2	300/10V MAL #MTP337M010P1C	CA 150222
192	2	120/30V MAL #MTP127M030P1C	CA 210307
193	3	1UF/50V10%PT MLY#TAS105K050P1	CA 230127
			CA 250105
194	3	8PIN IC SOCKET #TO-5820-GT	CO 921026
195	2	1N914A/1N4446	
196	1	1N823A 6.2V 400MW	DI 100914
197	1	1N5225 3V 20%	DI 200823
198	1	1N4738A 8.2V 5% 1W	DI 215225
199	1	1N4752 33V 5% 1W	DI 234738
			DI 234752
200	1	.2JUMPER #JO.200X.0.125PVC22	HD 901027

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BILL OF MATERIALS FOR W01500200  
1500-200 ASSEMBLY

PARTS LIST REV #

ITEM NO	QUANTITY	DESCRIPTION	PART NO
201	14	TO-18 CASE SPRDR PAD #201-15	HD 901103
202	8	4-40 X 1/2 BND HD	HD 911016
203	8	#4-40 KEPNUT	HD 912002
204	1	HEATSINK R500/R501 B-1696	HD 941696
205	3	LM305H/NAT MLM305G/MOT 1500	IC 100305
206	1	PCB R501 POSITIVE REGULATOR	PC 300501
207	3	1000OHM 3/4" RECT MULTI#43P10	PT 201001
208	1	200 OHM 1T 3/8"SQ SPECT 63P20	PT 602000
209	2	500 OHM 1T 3/8"SQ SPECT 63P50	PT 605000
210	1	1/8W 1% 20 OHM	RE 110200
211	1	1/8W 1% 3650 OHM	RE 113651
212	1	1/8W 1% 374 OHM	RE 113740
213	3	1/8W 1% 6490 OHM	RE 116491
214	2	1/4W 1% 100 OHM	RE 211000
215	1	1/4W 1% 1000 OHM	RE 211001
216	1	1/4W 1% 16.5K (RN60DI652F)	RE 211652
217	1	1/4W 1% 2200 OHM	RE 212201
218	3	1/4W 1% 2320 OHM	RE 212321
219	1	1/4W 1% 24.9K OHM	RE 212492
220	1	1/4W 1% 402 OHM	RE 214020
221	1	1/4W 1% 5620 OHM	RE 215621
222	1	1/4W 1% 9090 OHM	RE 219091
223	1	1/4W 5% 10 OHM	RE 220100
224	4	1/2W 5% 10 OHM	RE 320100
225	7	1/2W 5% 1.3 OHM	RE 320139
226	4	1/2W 5% 22 OHM	RE 320220
227	1	1/2W 5% CARBON 36 OHM	RE 320360
228	1	1/2W 5% 68 OHM	RE 320680
229	1	1/2W 5% 100 OHM	RE 321000
230	2	1/2W 5% 1000 OHM	RE 321001
231	1	1/2W 5% 120 OHM	RE 321200
232	1	1/2W 5% 1200 OHM	RE 321201
233	2	1/2W 5% 1500 OHM	RE 321501
234	1	1/2W 5% 1800 OHM	RE 321801
235	1	1/2W 5% 2200 OHM	RE 322201
236	2	1/2W 5% 22K	RE 322202
237	2	1/2W 5% 3K OHM	RE 323001
238	2	1/2W 5% 3300 OHM	RE 323301
239	1	1/2W 5% 4700 OHM	RE 324701
240	2	1/2W 5% 560 OHM	RE 325600
241	3	1/2W 5% 680 OHM	RE 326800
242	1	1W 5% 390 OHM	RE 423900
243	1	2W 5% .15 OHM WIRE WOUND	RE 520158

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BILL OF MATERIALS FOR W01500200  
1500-200 ASSEMBLY

PARTS LIST REV #

ITEM NO	QUANTITY	DESCRIPTION	PART NO
244	1	5W 5% 12 OHM WIRE WOUND	RE 620120
245	1	5W 5% 200 OHM WIRE WOUND	RE 622000
246	9	2N2221 NPN	XS 102221
247	4	2N3054 NPN	XS 103054
248	5	2N2906 PNP	XS 202906
249	1	MOTHER BOARD	B438
250	2	2300UF50V MALDRY TCG232U050N3	CA 250238
251	2	30POS PC CO VIKING #2AH15/1AV	CO 912008
252	1	3POS TERML AS MOLEX 09-18-503	CO 919010
253	1	20 POS STRGHT MT 3M #3492-200	CO 919039
254	1	20POS RT ANGL MNT 3M 3492-100	CO 919048
255	1	2 PIN AMP HEADER AMP #350209-	CO 919069
256	1	16PIN AMP HEADER AMP# 350214-	CO 919070
257	1	16 PIN IC SKT AMP 2-640358-4	CO 921002
258	2	POLARIZG KEY VIKG#091-0024-00	CO 991054
259	1	INS RING TERM.PANDUIT#PV14-10	CO 991060
260	4	1N4005 (1 AMP)	DI 104005
261	2	4-40X1/4HEX THRD SPCR HHS 233	HD 901031
262	2	2" CABLE TIE PANDUIT # PLT2M	HD 901114
263	8	1/4 HIX M/F THRD SPCR HHS 821	HD 901115
264	1	PURSE LK TIE RICHCO STL-3N-45	HD 901133
265	6	4-40 X 3/16 BND HD	HD 911005
266	1	PCB B438 1500 MOTHER BOARD	PC 302438
267	1	CRATE INTERFACE CARD	B439
268	4	.1UF REDCAP CR20D104ZC	CA 150104
269	2	16P DIP TO RIBBON 3M 3416-000	CO 911005
270	2	AMP GUIDE PIN AMP #200833-4	CO 919033
271	1	CONN BLOCK SKT AMP #200277-4	CO 919051
272	38	SOCKET CONTACTS AMP #66101-1	CO 919054
273	1	AMP 16 POS SKT AMP #1-480438-	CO 919076
274	2	AMP GUIDE SOCKET AMP #200835-	CO 921010
275	24	SOCKET AMP #60619-1	CO 991032
276	1	10POS PIN HOUSING #1-480339-0	CO 991041
277	38	4706 STRNRELEF MOLEX02-09-210	CO 991055
278	8	4811 STRNRELEF MOLEX16-02-003	CO 991056
279	4	INS RING TERM.PANDUIT#PV10-10	CO 991059
280	8	TIWRAP 3/4" PANDUIT #PLT-IM-C	HD 901026

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BILL OF MATERIALS FOR W01500200  
1500-200 ASSEMBLY

PARTS LIST REV #

ITEM NO	QUANTITY	DESCRIPTION	PART NO
281	4	4-40 X 1/4 BND HD	HD 911006
282	8	2-56 X 3/16 BND HD	HD 911015
283	4	4-40 X 5/16 BHMS	HD 911043
284	2	10-32 X 3/8 BRASS BINDER HEAD	HD 911064
285	2	#10-32 KEPNUT	HD 912005
286	2	#10-32 HEXNUT BRASS SAM HARRI	HD 912017
287	4	#4 NYL SHLDR WASHR B51547F01	HD 913011
288	4	LG MICA WASHER MOT B08853A001	HD 913012
289	1	HEATSINK B-1700	HD 941700
290	1	SCR HEATSINK B-1766	HD 941766
291	1	PCB B439 CRATE INTERFACE	PC 302439
292	1	1/8W 1% 178 OHM	RE 111780
293	1	1/8W 1% 374 OHM	RE 113740
294	2	1/4W 5% 22 OHM	RE 220220
295	2	1/4W 5% 100 OHM	RE 221000
296	2	5W 3% .1 OHM DALE RH-5	RE 840019
297	1	25W 3% .02 OHM DALE RH-25	RE 840028
298	1	50W 3% .015 OHM DALE RH-50	RE 840157
299	4	SCR 2N6400 RCA RECTIFIER	XS 406400

L OF MATERIALS FOR PK1500300 1500-300

PARTS LIS

EL	COMPONENT	DESCRIPTION	QUANTITY/	U/M
			ASSEMBLY	
	FA1500300	KSC VERSION CAMAC CRATE	1.000	AK
	AS1500300	1500-300 TESTING	1.000	EA
4	WO1500300	1500-300 ASSEMBLY	1.000	EA
.5	CHA1500310	MAIN CRATE ASSEMBLY 1500-300	1.000	EA
.6	CO991033	SPADE LUG INS. #5-6/18-22GA.	2.000	EA
.6	CO991050	1/4 F QUICKSLIDE 18-22GA W/INS	2.000	FA
.6	HD901125	DRAWER SLIDE GRANT A-13-9	1.000	EA
.6	HD901126	5/16 RD HDL ATM10397-8-1032-25	2.000	EA
.6	HD901127	3/16X11/8 ROLL PIN SAMUEL HARRIS	2.000	EA
.6	HD911003	4-40 X 3/8 FLT HD	5.000	EA
.6	HD911006	4-40 X 1/4 BND HD	6.000	EA
.6	HD911016	4-40 X 1/2 BND HD	18.000	EA
.6	HD911068	8-32 X 3/8" F.H.M.S.	14.000	EA
.6	HD911071	8-32 X 1/4 FL HD MACHINE SCREW	8.000	EA
.6	HD911079	#6X1/2"SELF TAPPING FLT HD SCR	8.000	EA
.6	HD911080	8-32X7/16 FLAT HD M.S.	2.000	EA
.6	HD911081	8-32X1/4 FILLISTER HD MS	2.000	EA
.6	HD911082	10-32X3/8 FLT HD MS	4.000	EA
.6	HD911083	6-32X3/4 BND HD MS	2.000	EA
.6	HD911084	6-32X3/8 PH FLT HD MS	25.000	EA
.6	HD912006	8-32 CLINCH NUT PEM CLS-832-2	6.000	EA
.6	HD915004	BLD RIV 1/8 DOME HD PCI#603035	3.000	EA
.6	HD931020	4POS BARRIER STRIP	1.000	EA
.6	HD941782	BLOWR UN TO CRT MNT BLK A-1782	2.000	EA
.6	HD941783	PS TO CRT UPPER MNT BLK A-1783	2.000	EA
.6	HD941784	PS TO CRT LOWER MNT BLK A-1784	2.000	EA
.6	HD941785	CAMAC CRT INTER CVR-TOP C-1785	1.000	EA
.6	HD941789	CAMAC CRT RT END PANEL C-1789	1.000	EA
.6	HD941790	CAMAC CRT INTER CVR-BTM C-1790	1.000	FA
.6	HD941792	CRATE BTM FRONT MNT BAR C-1792	1.000	EA
.6	HD941793	CRATE TOP FRONT MNT BAR C-1793	1.000	EA
.6	HD941794	CRATE TOP REAR MNTG BAR C-1794	1.000	EA
.6	HD941803	CRATE RT HANDLE MTG BKT C-1803	1.000	EA
.6	HD941805	CRATE LT HANDLE MTG BKT C-1805	1.000	EA
.6	HD941807	CARD GUIDE NYLON CRATE 8-1807	2.000	EA
.6	HD941808	CRATE BOTTOM PLATE D-1808	1.000	EA
.6	HD941809	REAR CONN MTNG BAR -TOP D-1809	1.000	EA
.6	HD941813	CRATE END PNL LFT SIDE D-1813	1.000	EA
.6	HD941814	CRATE BTM PLATE MTG ANG B-1814	2.000	EA
.6	HD941815	DATAWAY CONN MTG BRCKET B-1815	1.000	EA
.6	HD941816	BTM REAR CONN MTG PANEL D-1816	1.000	EA
.6	HD941844	CAMAC CRATE TOP RACK D 1844	1.000	FA
.6	HD941845	CAMAC CRATE BOTTOM RACK D 1845	1.000	EA
5	B442	MOTHER BOARD MULTILAYER	1.000	EA
.6	CO912000	PC EDGE 43/86WW AMP 4-530396-7	25.000	EA
.6	CO919008	CONNECTOR BLOCK AMP #201358-1	1.000	EA
.6	CO919033	AMP GUIDE PIN AMP #200833-4	2.000	EA
.6	CO919053	PIN CONTACTS AMP #66099-1	45.000	EA
.6	CO919083	PIN CONTACT 14AWG AMP66359-1	12.000	FA
.6	CO921010	AMP GUIDE SOCKET AMP #200835-4	2.000	EA
.6	CO991050	1/4 F QUICKSLIDE 18-22GA W/INS	6.000	EA
.6	HD901124	25P BUS BAR 1025-0.677-25-T-IS	14.000	EA

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L OF MATERIALS FOR PK1500300 1500-300

PARTS LIS

EL	COMPONENT	DESCRIPTION	QUANTITY/ U/M ASSEMBLY
..6	PC302442	PCB B442 MULTILAYER PC BD 1500	1.000 EA