



# **BA23 Enclosure Maintenance**

**Order Number EK-186AB-MG-002**

**Digital Equipment Corporation**

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# Preface

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This guide provides reference, installation, and maintenance information on the BA23 enclosure. This enclosure is intended for MicroPDP-11 and MicroVAX systems.

## Intended Audience

This document is intended only for DIGITAL Field Service personnel and qualified self-maintenance customers.

## Organization

This document has three chapters and two appendixes.

Chapter 1 provides an overview of the system enclosure, describing controls, mass storage area and capacity, backplane, signal distribution, power distribution, I/O connections, and configuration guidelines.

Chapter 2 lists site preparation considerations, and shows how to install the pedestal, tabletop, and rack mount versions.

Chapter 3 describes how to remove and replace field replaceable units (FRUs). The beginning of the chapter contains a list of these FRUs.

Appendix A shows the system interconnection pinouts.

Appendix B contains a list of related documentation.

## Warnings, Cautions, and Notes

Warnings, cautions, and notes appear throughout this guide. They have the following meanings:

- WARNING** Provides information to prevent personal injury.
- CAUTION** Provides information to prevent damage to equipment or software.
- NOTE** Provides general information about the current topic.



# BA23 Enclosure Description

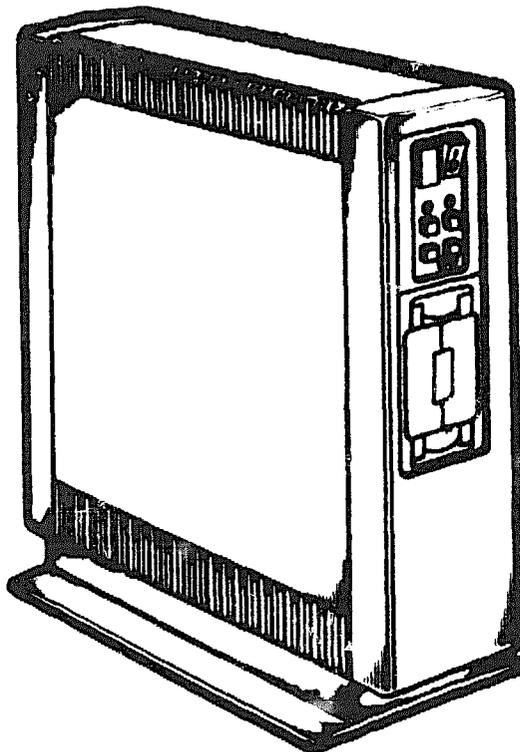
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## 1.1 Introduction

This chapter describes the BA23 enclosure, which is used in pedestal, tabletop, and rack mount installations.

Figure 1-1 shows the pedestal version.

**Figure 1-1: BA23 Enclosure, Pedestal Version (MicroVAX)**



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## 1.2 Mass Storage Device Areas

The BA23 can hold full-height and half-height 13.3-cm (5.25-in) mass storage devices, depending on the system.

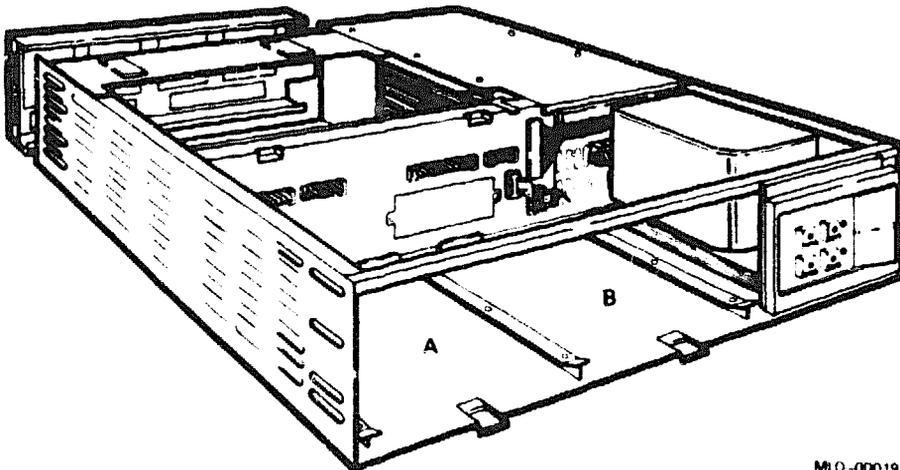
Figure 1-2 shows the two locations, A and B, that the enclosure has for these devices.

You can install one RD50-series fixed-disk drive and one removable-media drive—an RX50 diskette drive or a TK50 tape drive. You cannot install two full-height, fixed-disk drives due to power limitations.

Some systems support half-height devices. In these systems, you can install one or two RD30-series fixed-disk drives and one or two RX33 diskette drives.

You can connect external drives to the system's I/O distribution panel. The number of drives you can use depends on the space available in the I/O panel and backplane, and the amount of power available to run the drive controllers.

**Figure 1-2: BA23 Mass Storage Locations**



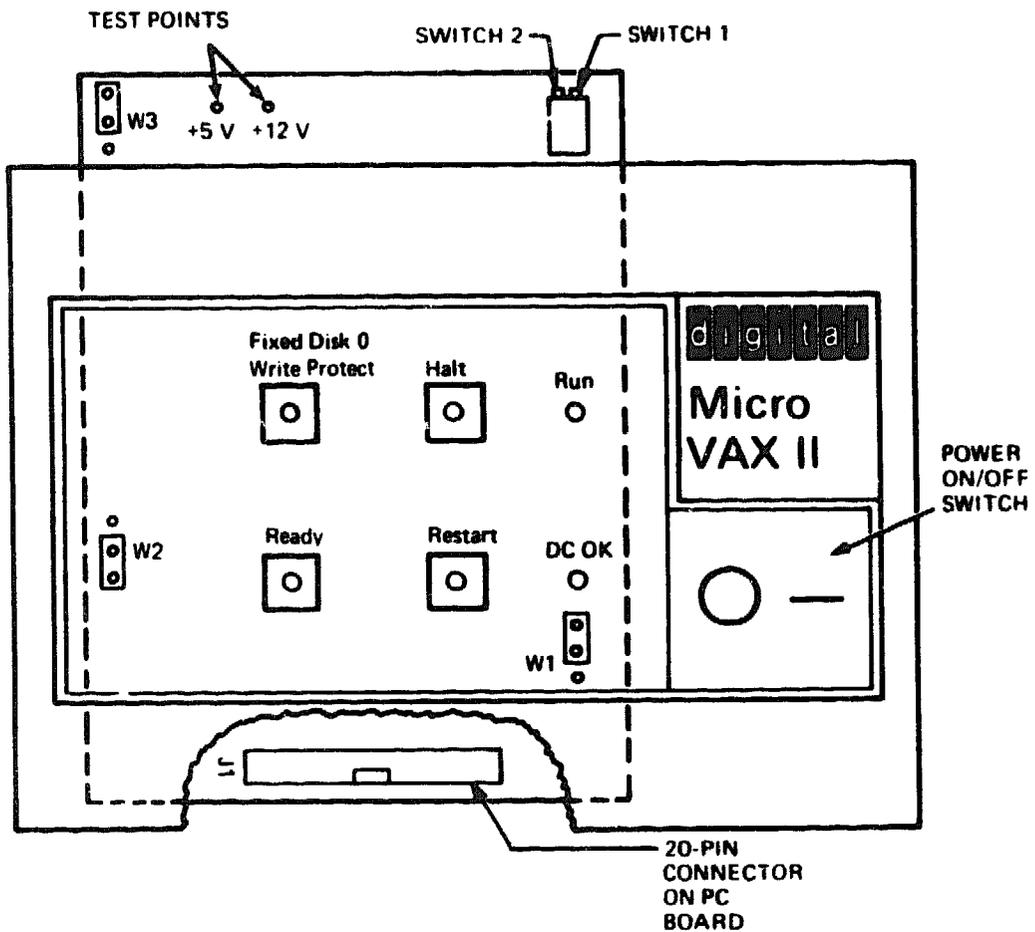
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### 1.3 Control Panel

The BA23 has either a 4- or 6-button control panel as follows:

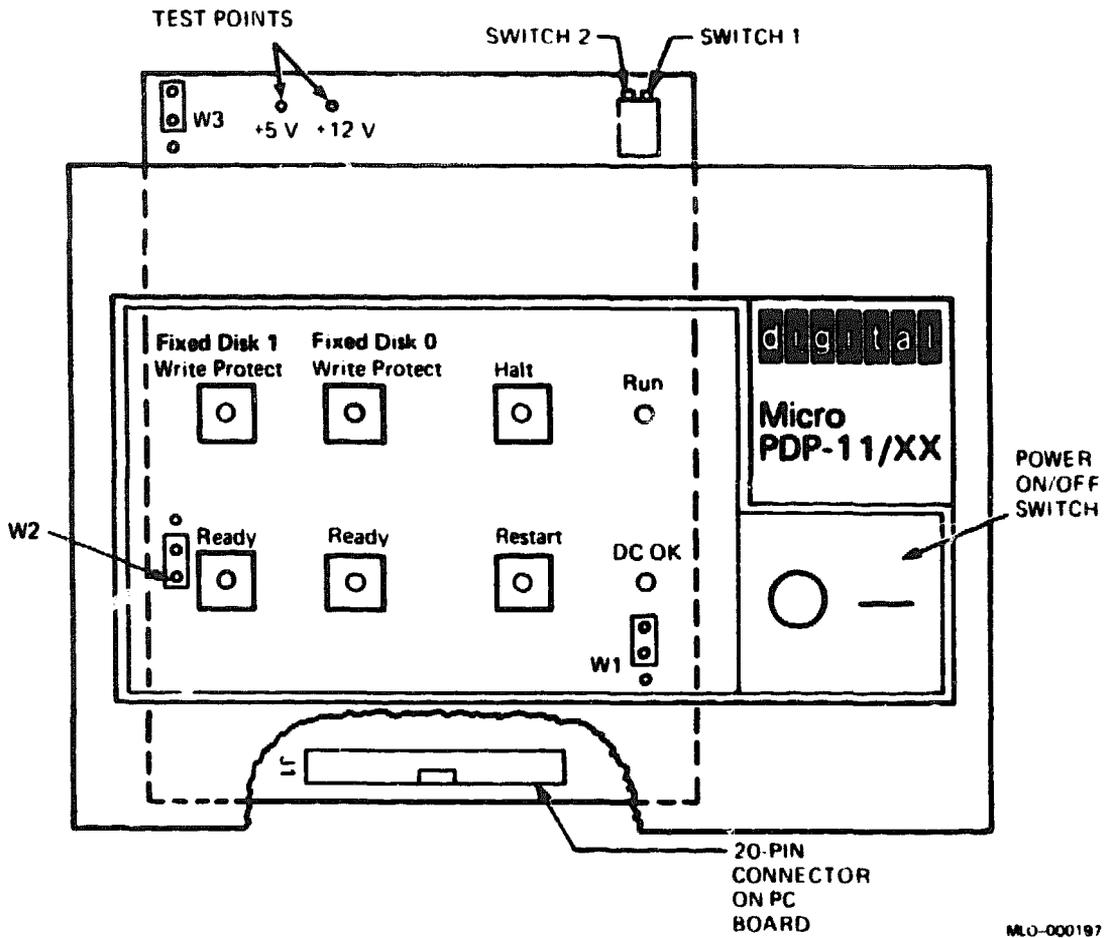
- Systems with a 4-button control panel support only full-height mass storage devices (Figure 1-3).
- Systems with a 6-button control panel support either full-height or half-height devices (Figure 1-4).

**Figure 1-3: BA23 4-Button Control Panel and PC Board (Example)**



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**Figure 1-4: BA23 6-Button Control Panel and PC Board (Example)**



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Table 1-1 describes the functions of the controls and indicators on both the 4- and 6-button control panels.

**Table 1-1: BA23 Control Panel**

| Control                       | Setting        | Description  |
|-------------------------------|----------------|--|
| On/Off                        |                | Rocker switch with orange LED indicator.   |
|                               | 1<br>LED on    | System ac power is on.   |
|                               | 0<br>LED off   | System ac power is off.  |
| DC OK                         |                | Green LED indicator.   |
|                               | On             | All dc voltages are present and within tolerance.  |
|                               | Off            | All dc voltages not present or within tolerance.   |
| Run                           |                | Green LED indicator.   |
|                               | On             | The CPU is in run mode (normal operating condition).   |
|                               | Off            | The CPU is in console mode.  |
| Halt <sup>1</sup>             |                | Pushbutton switch with red LED indicator.  |
|                               | Out<br>LED off | Puts the CPU in program I/O mode (normal position for running user software). Pushing the Halt switch <i>twice</i> (in, then out again) puts the system in console mode, where the system accepts only console commands.   |
|                               | In<br>LED on   | Stops the system. Commands cannot be entered when the button is in.  |
| Restart <sup>2</sup>          |                | Momentary-contact pushbutton switch. When you press <b>Restart</b> , the system simulates a power-down/power-up sequence in order to restart CPU operation. You can enable or disable the Restart switch, using a switch on the control panel printed circuit board. |
| Fixed Disk 0<br>Write Protect |                | Pushbutton switch with yellow LED indicator for the full-height, fixed-disk drive, or the first half-height, fixed-disk drive.   |

<sup>1</sup>You can disable the Halt switch by setting the halt enable switch on the CPU I/O insert to the disable position (dot outside of circle). In this case, pressing **Halt** turns on the orange indicator but does not halt the system.

<sup>2</sup>You can disable the Restart switch by setting the restart enable switch on the control panel printed circuit board to the disable position.

**Table 1-1 (Cont.): BA23 Control Panel**

| <b>Control</b>                | <b>Setting</b> | <b>Description</b>  |
|-------------------------------|----------------|---|
|                               | Out<br>LED off | Allows the system to read from and write to the disk (normal operating position).   |
|                               | In<br>LED on   | Prevents the system from writing to the disk. Still allows the system to read from the disk.                                  |
| Ready                         |                | Pushbutton switch with green LED indicator for the full-height, fixed-disk drive, or the first half-height, fixed-disk drive. |
|                               | Out<br>LED on  | Puts the disk on-line (normal operating position). The system can read from and write to the fixed disk.                      |
|                               | In<br>LED off  | Takes the disk off-line. The system cannot read from and write to the fixed disk.   |
| Fixed Disk 1<br>Write Protect |                | Pushbutton switch with yellow LED indicator for a second half-height, fixed-disk drive. Only on the 6-button control panel.   |
|                               | Out<br>LED off | Allows the system to read from and write to the disk (normal operating position).   |
|                               | In<br>LED on   | Prevents the system from writing to the disk. Still allows the system to read from the disk.                                  |
| Ready                         |                | Pushbutton switch with green LED indicator for a second half-height, fixed-disk drive. Only on the 6-button control panel.    |
|                               | Out<br>LED on  | Puts the disk on-line (normal operating position). The system can read from and write to the fixed disk.                      |
|                               | In<br>LED off  | Takes the disk off-line. The system cannot read from and write to the fixed disk.   |

The controls and indicators for the 4- and 6-button control panel are on a printed circuit board, shown in Figures 1-3 and 1-4. Table 1-2 describes functions of the printed circuit board components. Table 1-3 describes the jumper settings.

**Table 1-2: BA23 Control Panel PC Board Components**

| <b>Component</b>           | <b>Function</b>  |
|----------------------------|--|
| Switch 1                   | Enables the Q22-bus BEVENT timing signal and allows the line time clock to operate under software control. |
| Switch 2                   | Enables the Restart switch on the control panel.   |
| 20-pin J1 connector        | Connects the backplane assembly cable.   |
| W1, W2, W3 jumpers         | Table 1-3 lists the jumpers and pin connections.   |
| +5 V and +12 V test points | Serve as system test points.   |

**Table 1-3: BA23 Control Panel PC Board Jumpers**

| <b>Jumper</b> | <b>Pin Connection</b>             | <b>Condition</b>  |
|---------------|-----------------------------------|---|
| W1            | Top and center (factory position) | Enables RD drive 0. Used when RD drive 0 is present.  |
|               | Bottom and center                 | Disables RD drive 0. Used to prevent Ready light from turning on when RD 0 is not present.              |
| W2            | Top and center (factory position) | Enables RD drive 1. Used whether RD drive 1 is present or not.  |
|               | Bottom and center                 | Disables RD drive 1. Not used. <sup>1</sup>   |
| W3            | Top and center                    | Disables restart logic in BA23-C (bottom enclosure) in an H9642 cabinet.                                |
|               | Bottom and center                 | Enables restart logic in BA23-A (top enclosure) in an H9642 cabinet, and in the standalone BA23 system. |

<sup>1</sup>The W2 bottom and center setting is not used because RD drive 1 has no Ready light to disable.

## 1.4 Backplane Assembly

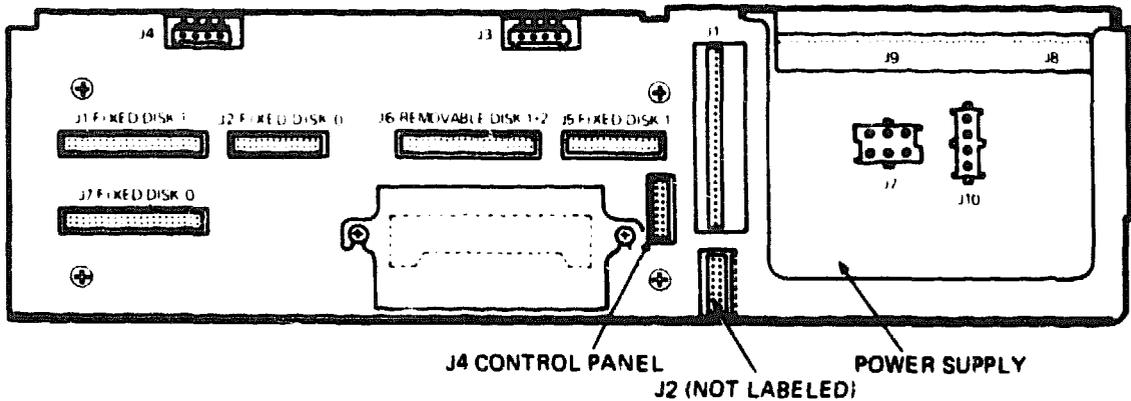
The backplane assembly for the BA23 has three major parts:

- Signal distribution panel (for mass storage devices)
- Sheet-metal mounting bracket
- Backplane (H9278)

### 1.4.1 Signal Distribution Panel

The signal distribution panel carries signals from an RQDX2 or RQDX3 controller module in the Q22-bus backplane to the mass storage devices. This panel (Figure 1-5) is the front side of the backplane assembly.

**Figure 1-5: BA23 Signal Distribution Panel**



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Table 1-4 lists the six connectors on the signal distribution panel and their functions.

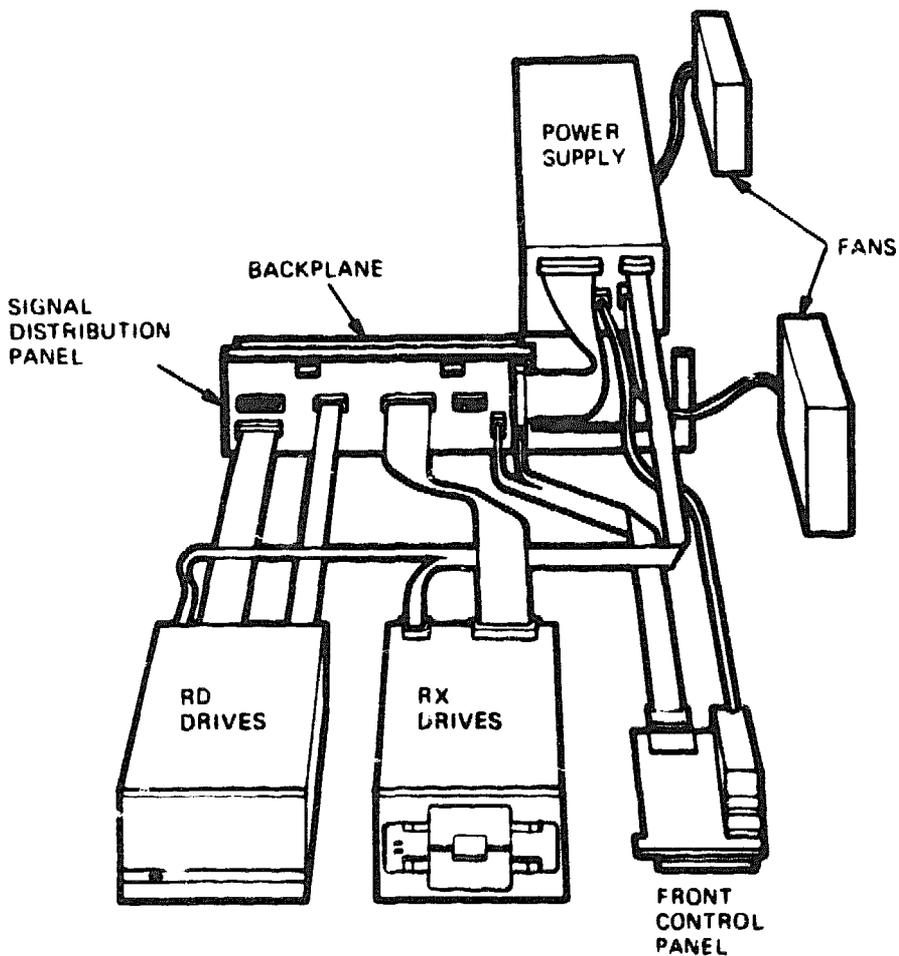
**Table 1-4: BA23 Signal Distribution Panel Connectors**

| <b>Connector</b>                    | <b>Function</b>   |
|-------------------------------------|---|
| J6 Removable Disk 1, 2              | Provides signals to an RX50 diskette drive. An RX50 contains two disk units. If the system also has a fixed-disk drive, the ROM code usually labels the RX50 drives as disk unit 1 (DUA1) and disk unit 2 (DUA2). |
| J7 Fixed Disk 0,<br>J2 Fixed Disk 0 | Provide signals to the first fixed-disk drive in port 0 (left side). The ROM code usually labels this drive as disk unit 0 (DUA0).  |
| J1 Fixed Disk 1,<br>J5 Fixed Disk 1 | Provide signals to a second fixed-disk drive. The BA23 supports this configuration only with half-height drives. The ROM code usually labels this drive as disk unit 1 (DU1).                                     |
| J4 (Control Panel)                  | Provides signals to the control panel printed circuit board.  |
| J1, J2, J3, J4                      | These connectors are not part of the signal distribution panel. They are on the backplane assembly.   |
| J7, J10                             | These connectors are not part of the signal distribution panel. They are on the power supply.   |

See Appendix A for the names of signals used by the signal distribution panel. Figure 1-6 shows an example of the connections between the signal distribution panel and the other components in a BA23.

TK50 tape drives do not connect to the signal distribution panel. A TK50 connects to its own controller via a TK50-to-M7546 interconnect cable, part of a TQK50 controller kit.

**Figure 1-6: BA23 Internal Cabling (Example)**



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## 1.4.2 Backplane

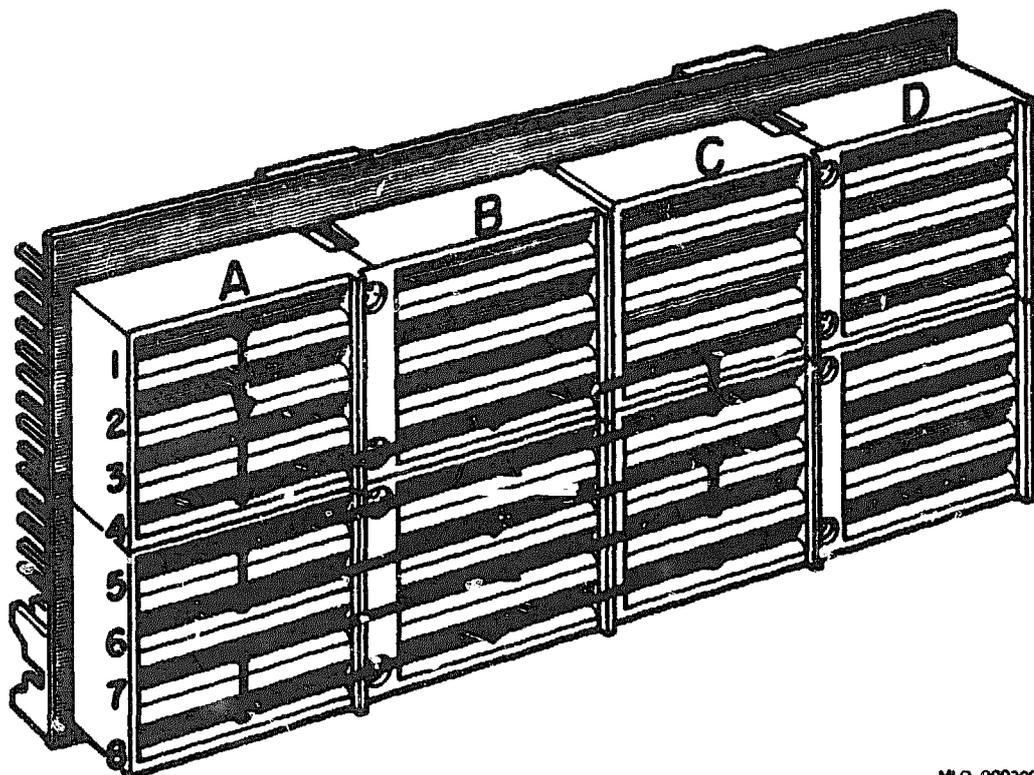
The backplane (H9278) uses the extended LSI-11 bus. The LSI-11 bus is usually called the Q22-bus, because it uses 22-bit addressing. For more information on the Q22-bus, see the CPU maintenance documentation.

The backplane has eight slots for modules compatible with the Q22-bus. Four rows (A, B, C, and D) run across each slot. Figure 1-7 shows the grant continuity for the backplane.

A *dual-height* module has connectors that fit into two rows of a backplane slot. Two dual-height modules can occupy one backplane slot.

A *quad-height* module has connectors that fit into all four rows of a backplane slot. One quad-height module occupies one backplane slot.

**Figure 1-7: BA23 Backplane Grant Continuity**



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The CD rows of slots 1, 2, and 3 are interconnected. This feature is called the private memory interconnect (PMI). To determine CPU and memory slots, see the appropriate CPU maintenance documentation.

If you install a dual-height module in the AB or CD rows of slots 4 through 8, you usually have to install another dual-height module or an M9047 grant card in the other two rows of the slot. The exception is the last dual-height module installed on the grant continuity chain. For example, a dual-height module installed in the AB rows of slot 6 does not need a grant card in the CD rows, if it is the last module in the system.

Table 1-5 lists the four connectors on the front (signal distribution panel) side of the backplane and their functions.

**Table 1-5: BA23 Backplane Connectors**

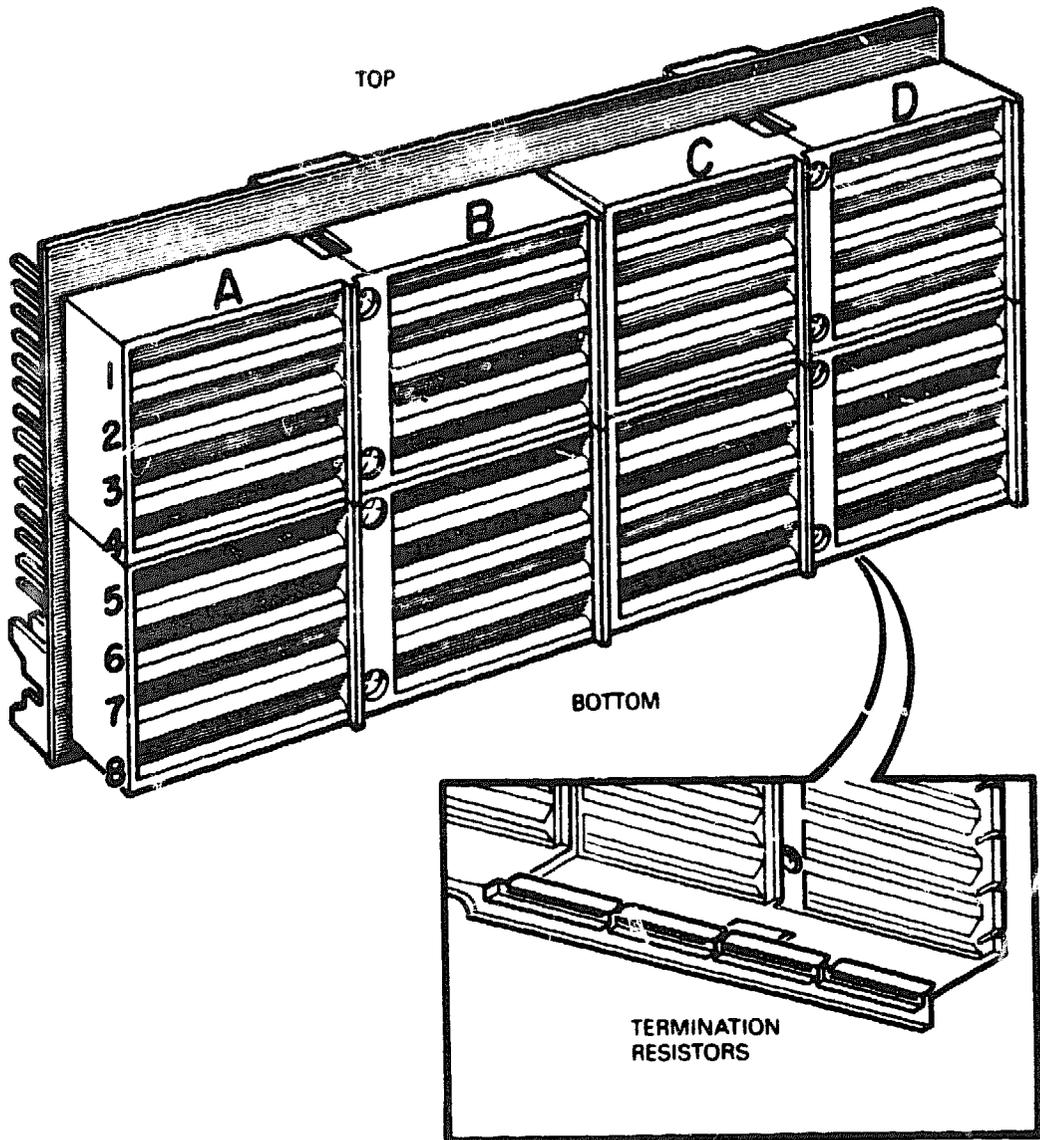
| <b>Connector</b> | <b>Function</b>   |
|------------------|---|
| J1               | Used to connect the power supply backplane cable, which carries the dc power and signals from the power supply. |
| J2               | Provides signals from an installed CPU module to the control panel PC board.                                    |
| J3 and J4        | Provide the termination point for the mass storage power cable if the system does not use mass storage devices. |

See Appendix A for the names of signals on these connectors.

The backplane supports up to 30 ac loads and 20 dc loads. An *ac load* is the amount of capacitance a module presents to a bus signal line. One ac load equals 9.35 picofarads (pf). A *dc load* is the amount of dc leakage a module presents to a bus signal line. One dc load is approximately 105 microamperes ( $\mu$ A). The backplane presents seven ac loads and no dc loads.

The H9278 backplane also includes termination resistors, on the bottom of the unit (Figure 1-8). You may have to remove these resistors if you connect the H9278 to another backplane without using the M9404 and M9405-4B backplane interconnect modules.

**Figure 1-8: H9278 Backplane Termination Resistors**

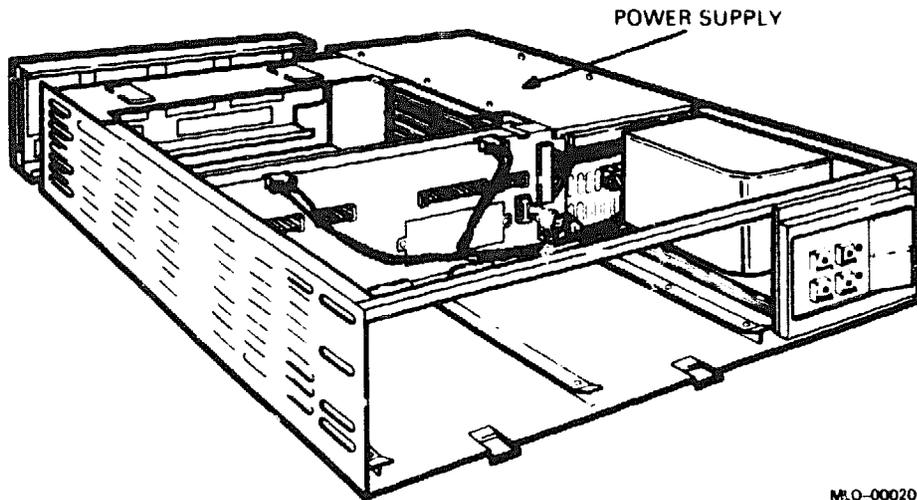


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## 1.5 Power Supply

Figure 1-9 shows the power supply for the BA23 enclosure. There are three variations of the power supply, depending on the enclosure model number: H7864, H7864A, or H7864B.

**Figure 1-9: BA23 Power Supply**



M.O-000202

The power supply regulators maintain proper output voltages against temporary fluctuations in the ac input to the power supply.

The power supply is a 230-watt (W) unit. It supplies +5 Vdc at 4.5 amps (A) to 36.0 A, and +12 Vdc at 0.0 A to 7.0 A to the following system components:

- Backplane
- Fixed-disk drive
- Diskette drive or tape drive

The power supply also sends three system control signals to the backplane, asserting two of these signals (BDCOK H and BPOK H) when the system power is stable. The third signal (BEVENT L) is an external line clock interrupt request to the CPU. The LTC switch on the control panel PC board enables the BEVENT L signal.

The power supply also has two +10 Vdc at 0.45 A fan outputs for the front and rear dc fans. You can increase the fan voltages to +12 Vdc by changing a power supply jumper. However, the KA630 CPU module's thermal and acoustical specifications are based on the +10 volt setting. The required fan power does not affect the 230 W output. Table 1-6 lists the power supply specifications.

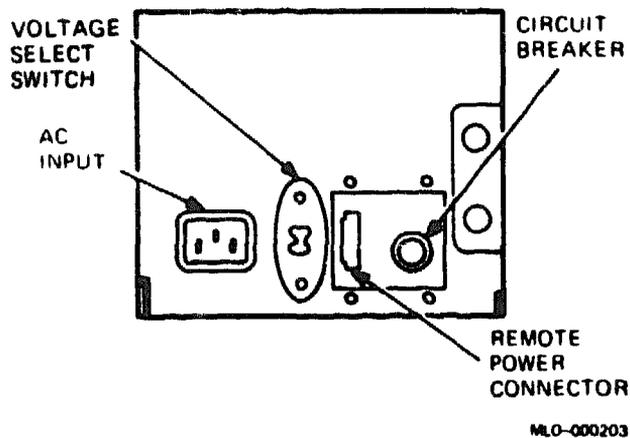
**Table 1-6: H7864 Power Supply Specifications**

| <b>Parameter</b>        | <b>Specification</b>   |
|-------------------------|--|
| <b>+5 Vdc Output</b>    |  |
| Voltage                 | +5.1 Vdc +/-2.5%   |
| Current                 | 4.5 A minimum<br>36.0 A maximum  |
| Overcurrent             | 37 A minimum (averaged over 1 msec; must not trip)<br>42 A maximum (averaged over 1 msec; must trip)   |
| <b>Ripple and noise</b> |  |
| <b>+12 Vdc Output</b>   |  |
| Voltage                 | +12.1 Vdc +/-2.5%  |
| Current                 | 0 A minimum<br>7.0 A maximum   |
| Normal overcurrent      | 7.2 A minimum (averaged over 1 msec; must not trip)<br>8.0 A maximum (averaged over 1 msec; must trip)   |
| Startup overcurrent     | 9.0 A for 10 sec minimum (must not trip)<br>10.0 A for 5 sec minimum (must not trip)<br>11.5 A for 1 sec minimum (must not trip)<br>13.0 A for 500 $\mu$ sec (must trip) |
| Ripple and noise        | 75 mV peak-to-peak maximum   |

The following controls and connectors are on the rear of the power supply (Figure 1-10):

- Remote power control connector
- IEC (International Electrical Commission) ac input connector, compatible with international power cables
- Circuit breaker to protect the input power line
- Voltage select (VOLT SEL) switch with two settings
  - 120 V = 88 to 128 Vac
  - 240 V = 176 to 256 Vac

**Figure 1-10: H7864 Power Supply (Rear View)**



The power cable for the rear fan is part of the H7864 power supply.

The front of the power supply has four connectors that provide the functions listed in Table 1-7.

**Table 1-7: BA23 Power Supply Front Connectors**

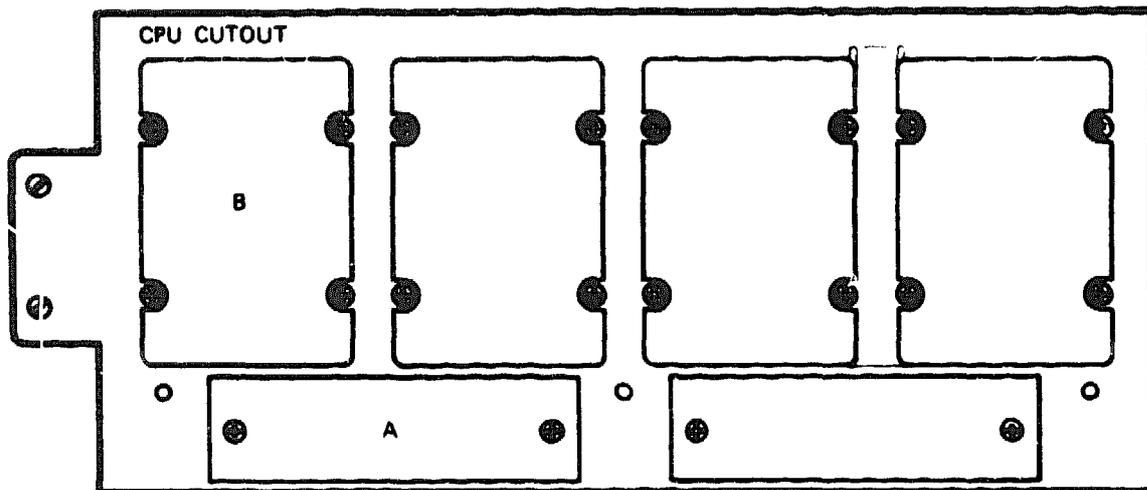
| Connector | Function  |
|-----------|---|
| J7        | Provides the power for the front control panel.   |
| J8        | Provides the signals for the mass storage power cable. This cable has two termination points on the backplane: J3 (if you do not have a removable media drive), or J4 (if you do not have an RD50-series fixed disk). |
| J9        | Provides the power for the backplane. The backplane power cable terminates at J1 of the backplane.  |
| J10       | Provides power to the fans.   |

## 1.6 I/O Panel

You use the I/O panel to connect external devices to the system. Each device connects to a module in the system through a filtered connector. You mount the connector on an insert, then install the insert in a cutout on the I/O panel. Filtered connectors and inserts are part of the option's cabinet kit.

Figure 1-11 shows the I/O panel. Usually, the CPU insert is installed in the top (or left) cutout. The I/O panel has six cutouts in two sizes, types A and B. Table 1-8 lists the size of the cutouts and the corresponding inserts.

**Figure 1-11: BA23 I/O Panel**



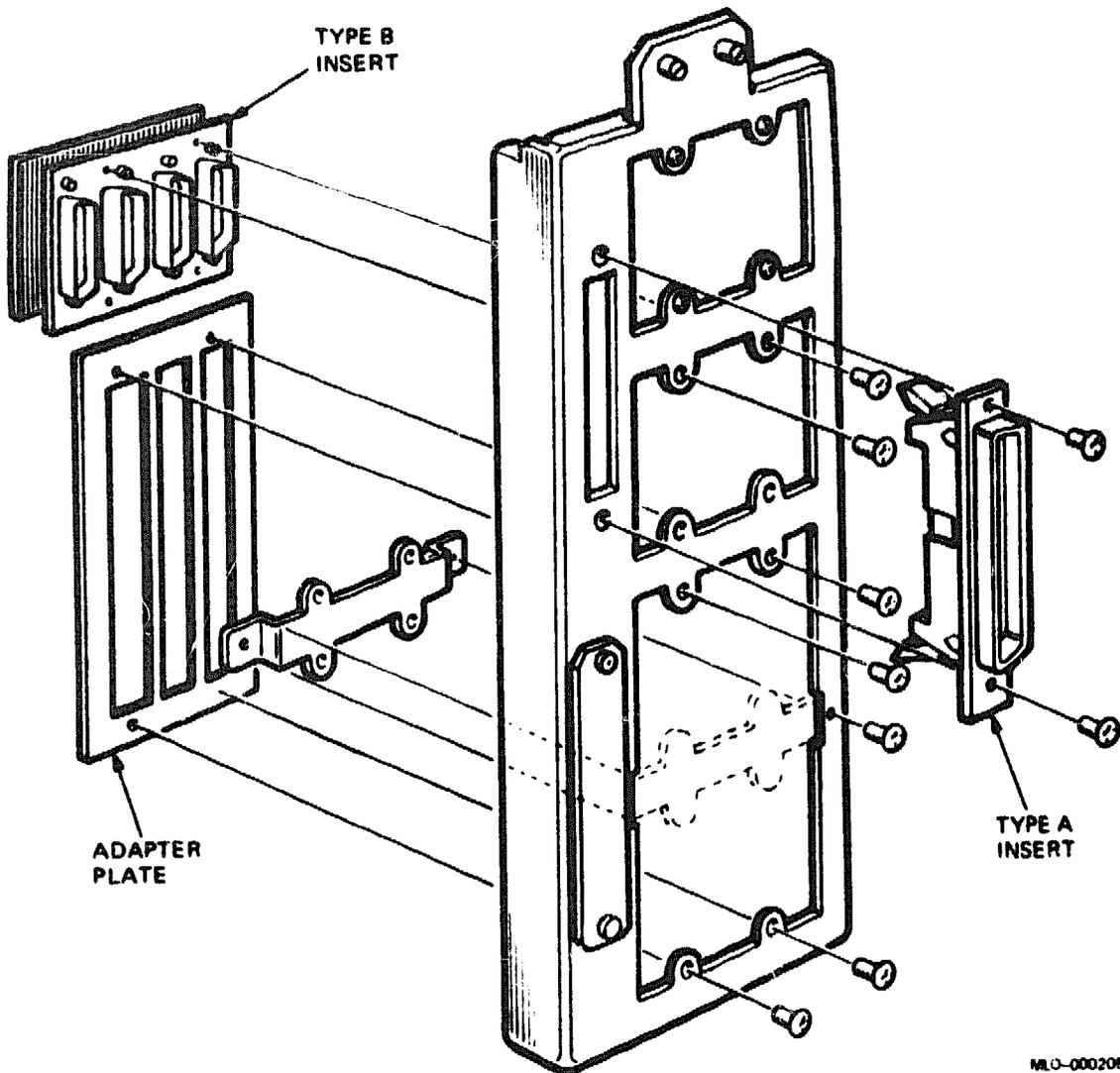
M.O-000204

**Table 1-8: BA23 Cutout and Insert Sizes**

| Type | Quantity |        | Inches     | Millimeters |
|------|----------|--------|------------|-------------|
| A    | 2        | Cutout | 0.6 x 3.2  | 15 x 81     |
|      |          | Insert | 1.0 x 4.0  | 25 x 102    |
| B    | 4        | Cutout | 2.25 x 3.2 | 57 x 81     |
|      |          | Insert | 2.5 x 3.3  | 64 x 84     |

You can install three more type A inserts by removing the bracket between the third and fourth cutouts and installing an adapter plate. Figure 1-12 shows the adapter plate with typical type A and B inserts.

**Figure 1-12: BA23 I/O Inserts and Adapter Plate**



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## **1.7 Fans**

The BA23 enclosure contains two fans:

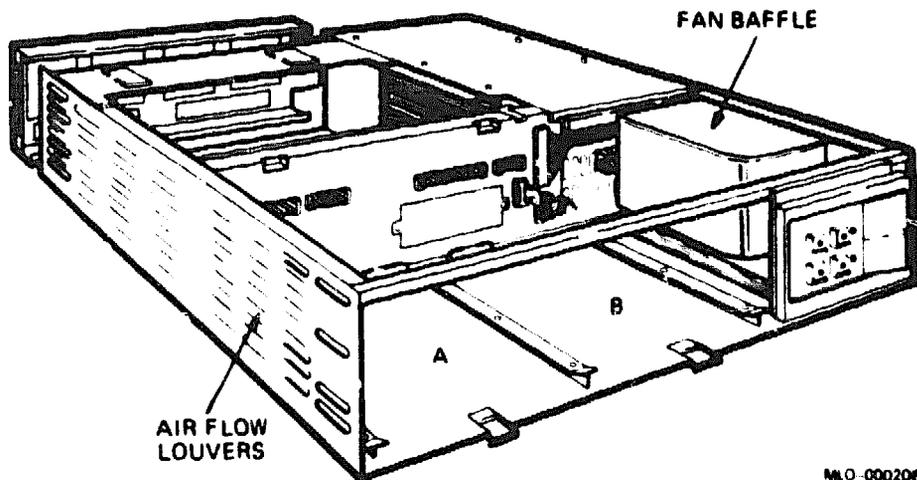
- A front fan, behind the control panel
- A rear fan, above the power supply

These fans draw air from the base of the BA23 enclosure and out through the top of the enclosure.

The BA23 enclosure models illustrated in this document contain a fan baffle over the front fan, and airflow louvers on the bottom and top of the frame (Figure 1-13). Other models do not contain the fan baffle or airflow louvers. The optimum configuration for the BA23 enclosure is:

- A front fan assembly that does not contain a fan baffle
- A frame without airflow louvers

**Figure 1-13: BA23 Front Fan Baffle and Louvered Frame**



MLO-000206

## 1.8 Configuration Guidelines

Before you change a system's configuration, consider the following factors:

- Module order in the backplane
- Module configuration
- Mass storage device configuration

If you are adding a device to a system, confirm the capacity of the system enclosure in these areas:

- Backplane
- I/O panel
- Power supply
- Mass storage devices

## 1.8.1 Module Order and Configuration

The order of modules in the backplane depends on four factors:

- Relative use of devices in the system
- Expected performance of each device relative to other devices
- Ability of a device to tolerate delays between bus requests and bus grants (delay tolerance)
- Tendency of a device to prevent devices farther from the CPU from accessing the bus

The relative use and performance of devices depends on the application. This means the order of modules also depends on the application. Most applications try to balance the use of devices. For balanced applications, use the recommended module order listed in the appropriate CPU maintenance documentation. Make sure you read the rules and guidelines discussed in the CPU documentation; they affect the recommended order.

When devices do not perform as expected, you can change the recommended order of modules to meet the needs of the application. Performance problems often involve a device that is heavily used or has a low delay tolerance. Usually, there are other heavily used devices between the problem device and the CPU. In this case, move the problem device closer to the CPU.

**NOTE:** *If the option has Q/CD jumpers, check the options documentation for the correct Q/CD jumper configurations. An incorrect jumper configuration can cause damage.*

For information on how to configure modules, refer to *Microsystems Options*.

## 1.8.2 Configuration Worksheet

Use the configuration worksheet (Figure 1-14) to make sure a configuration does not exceed a system's limits for expansion space, I/O space, power, and bus loads. If you use standard DIGITAL modules, you will not exceed the limits for bus loads. Use the configuration worksheet as follows:

1. On the worksheet, list all the devices already installed in the system.
2. List all the devices you plan to install in the system.
3. Fill in the information for each device, using the data listed in Table 1-9.

4. Add up the columns. Make sure the totals are within the limits for the enclosure.

**NOTE:** Check the appropriate CPU documentation to determine which options are supported.

**Table 1-9: Power, Bus Load, and I/O Insert Data**

| Option               | Module   | Current (Amps) |       | Power Watts | Bus Loads |     | Insert <sup>1</sup> |
|----------------------|----------|----------------|-------|-------------|-----------|-----|---------------------|
|                      |          | +5 V           | +12 V |             | AC        | DC  |                     |
| AAV11-D <sup>2</sup> | A1009    | 1.8            | 0.0   | 9.0         | 1.0       | 1.0 | -                   |
| ADV11-D <sup>2</sup> | A1008    | 3.2            | 0.0   | 16.0        | 1.0       | 1.0 | -                   |
| CXA16-M              | M3118-YA | 1.6            | 0.2   | 10.4        | 3.0       | 0.5 | -                   |
| CXB16-M              | M3118-YB | 2.0            | 0.0   | 10.0        | 3.0       | 0.5 | -                   |
| CXY08-M              | M3119-YA | 1.64           | 0.395 | 12.94       | 3.2       | 0.5 | -                   |
| DEQNA                | M7504    | 3.5            | 0.5   | 23.5        | 2.8       | 0.5 | A                   |
| DELQA                | M7516    | 2.7            | 0.5   | 19.5        | 2.2       | 0.5 | A                   |
| DFA01                | M3121-PA | 1.97           | 0.40  | 14.7        | 3.0       | 1.0 | -                   |
| DHV11                | M3104    | 4.5            | 0.55  | 29.1        | 2.9       | 0.5 | B (2)               |
| DLVEI-DP             | M8017    | 1.0            | 1.5   | 23.0        | 1.6       | 1.0 | A                   |
| DLVJ1                | M8043    | 1.0            | 0.25  | 8.0         | 1.0       | 1.0 | B                   |
| DMV11-M              | M8053    | 3.4            | 0.4   | 21.8        | 2.0       | 1.0 | A                   |
| DMV11-AP             | M8053-MA | 3.4            | 0.38  | 21.6        | 2.0       | 1.0 | B                   |
| DMV11-BP             | M8053-MA | 3.4            | 0.38  | 21.6        | 2.0       | 1.0 | A                   |
| DMV11-CP             | M8064-MA | 3.35           | 0.26  | 19.9        | 2.0       | 1.0 | B                   |
| DMV11-FP             | M8053-MA | 3.4            | 0.38  | 21.6        | 2.0       | 1.0 | A (2)               |
| DMV11-N              | M8064    | 3.4            | 0.4   | 21.8        | 2.0       | 1.0 | A                   |
| DPV11                | M8020    | 1.2            | 0.3   | 9.6         | 1.0       | 1.0 | A                   |
| DRV11                | M7941    | 0.9            | 0.0   | 4.5         | 2.8       | 1.0 | A (2)               |
| DRV11-BP             | M7950    | 1.9            | 0.0   | 9.5         | 3.3       | 1.0 | A (2)               |
| DUV11-DP             | M7951    | 1.2            | 0.39  | 10.7        | 3.0       | 1.0 | A (2)               |
| DRV11-J              | M8049    | 1.8            | 0.0   | 9.0         | 2.0       | 1.0 | A (2)               |
| DZQ11                | M3106    | 1.0            | 0.36  | 9.32        | 1.5       | 1.0 | B                   |
| DZV11                | M7957    | 1.2            | 0.39  | 10.7        | 3.9       | 1.0 | B                   |
| IEQ11                | M8634    | 3.0            | 0.0   | 15.0        | 2.0       | 1.0 | B                   |

<sup>1</sup>A = 2.5 cm x 10.0 cm (1 in x 4 in).

B = 5.0 cm x 7.5 cm (2 in x 3 in).

<sup>2</sup>Usually connected through a universal data input panel (UDIP), using a 13.13-cm (5.25-in) mass storage slot.

**Table 1-9 (Cont.): Power, Bus Load, and I/O Insert Data**

| Option               | Module                           | Current<br>(Amps) |       | Power<br>Watts | Bus Loads |     | Insert <sup>1</sup> |
|----------------------|----------------------------------|-------------------|-------|----------------|-----------|-----|---------------------|
|                      |                                  | +5 V              | +12 V |                | AC        | DC  |                     |
| KA620-AA             | M7478                            | 6.2               | 0.14  | 32.7           | 2.7       | 1.0 | -                   |
| KA630-AA             | M7606                            | 6.2               | 0.14  | 32.7           | 2.7       | 1.0 | -                   |
| KA650-AA             | M7620-A                          | 6.0               | 0.14  | 31.7           | 2.7       | 1.0 | -                   |
| KDA50-Q <sup>3</sup> | M7164                            | 6.93              | 0.0   | 34.65          | 3.0       | 0.5 | -                   |
| KDA50-Q              | M7165 <sup>4</sup><br>C or D rev | 6.57              | 0.03  | 33.21          | -         | -   | -                   |
| KDA50-Q              | M7165 <sup>4</sup><br>E rev      | 4.07              | 0.03  | 20.71          | -         | -   | -                   |
| KDF11-BE             | M8189                            | 5.5               | 0.1   | 28.7           | 2.3       | 1.1 | B                   |
| KDJ11-BC             | M8190                            | 5.5               | 0.1   | 28.7           | 2.3       | 1.1 | B                   |
| KDJ11-BF             | M8190                            | 5.5               | 0.2   | 29.9           | 2.6       | 1.0 | -                   |
| KLES1                | M7740                            | 3.0               | 0.0   | 15.0           | 2.3       | 1.0 | A                   |
| KMV11                | M7500                            | 2.6               | 0.2   | 15.4           | 3.0       | 1.0 | B                   |
| KWV11-C <sup>2</sup> | M4002                            | 2.2               | 0.013 | 11.2           | 1.0       | 1.0 | -                   |
| LPV11                | M8027                            | 0.8               | 0.0   | 4.0            | 1.4       | 1.0 | A                   |
| MRV11-D <sup>5</sup> | M7942                            | 1.6               | 0.0   | 8.0            | 3.0       | 0.5 | -                   |
| MRV11-D              | M7942                            | 2.8               | 0.0   | 14.0           | 1.8       | 1.0 | -                   |
| M9060-YA             |                                  | 5.3               | 0.0   | 26.5           | 0.0       | 0.0 | -                   |
| MS630-AA             | M7607                            | 1.0               | 0.0   | 5.0            | 0.0       | 0.0 | -                   |
| MS630-BA             | M7608                            | 1.8               | 0.0   | 9.0            | 0.0       | 0.0 | -                   |
| MS630-BB             | M7608                            | 1.8               | 0.0   | 9.0            | 0.0       | 0.0 | -                   |
| MS630-CA             | M7609                            | 3.1               | 0.0   | 15.5           | 0.0       | 0.0 | -                   |
| MS650-AA             | M7621-A                          | 2.7               | 0.0   | 13.5           | 0.0       | 0.0 | -                   |
| MSV11-JD             | M8637-D                          | 3.74              | 0.0   | 18.7           | 2.7       | 0.5 | -                   |
| MSV11-JE             | M8637-E                          | 4.1               | 0.0   | 20.5           | 2.7       | 0.5 | -                   |
| MSV11-PK             | M8067-K                          | 3.45              | 0.0   | 17.25          | 2.0       | 1.0 | -                   |
| MSV11-PL             | M8067-L                          | 3.6               | 0.0   | 17.5           | 2.0       | 1.0 | -                   |
| MSV11-QA             | M7551-AA                         | 2.4               | 0.0   | 12.0           | 2.0       | 1.0 | -                   |

<sup>1</sup>A = 2.5 cm x 10.0 cm (1 in x 4 in).

B = 5.0 cm x 7.5 cm (2 in x 3 in).

<sup>2</sup>Usually connected through a universal data input panel (UDIP), using a 13.13-cm (5.25-in) mass storage slot.

<sup>3</sup>KDA50-Q is a two-module set (M7164/M7165). AC and DC bus loads listed = total for both modules.

<sup>4</sup>The etch revision letter C, D, or E is part of the module part number near the handle. For example, a part number xxxxx-Ex-xx is a revision E module.

<sup>5</sup>Unpopulated module.

**Table 1-9 (Cont.): Power, Bus Load, and I/O Insert Data**

| Option   | Module   | Current<br>(Amps) |       | Power | Bus Loads |     | Insert <sup>1</sup> |
|----------|----------|-------------------|-------|-------|-----------|-----|---------------------|
|          |          | +5 V              | +12 V | Watts | AC        | DC  |                     |
| RA70     |          | 3.3               | 2.9   | 51.3  | -         | -   | -                   |
| RC25     |          | 1.0               | 2.5   | 35.0  | -         | -   | -                   |
| RD31     |          | 0.9               | 0.9   | 38.8  | -         | -   | -                   |
| RD32     |          | 0.9               | 0.6   | 33.0  | -         | -   | -                   |
| RD33     |          | 0.9               | 1.0   | 15.7  | -         | -   | -                   |
| RD51     |          | 1.0               | 1.6   | 24.2  | -         | -   | -                   |
| RD52     |          | 1.0               | 2.5   | 35.0  | -         | -   | -                   |
| RD53     |          | 0.9               | 2.5   | 34.5  | -         | -   | -                   |
| RD54     |          | 1.3               | 1.34  | 23.7  | -         | -   | -                   |
| RD54A-EA |          | 1.3               | 1.34  | 22.6  | -         | -   | -                   |
| RLV12-AP | M8061    | 5.0               | 0.10  | 26.2  | 2.7       | 1.0 | A                   |
| RQDX1    | M8639-YA | 6.4               | 0.25  | 35.0  | 2.0       | 1.0 | -                   |
| RQDX2    | M8639-YB | 6.4               | 0.1   | 33.2  | 2.0       | 1.0 | -                   |
| RQDX3    | M7555    | 2.48              | 0.06  | 13.2  | 1.0       | 1.0 | -                   |
| RQDXE    | M7513    | 0.5               | 0.0   | 2.5   | 1.0       | 0.0 | -                   |
| RX33     |          | 0.5               | 0.3   | 5.6   | -         | -   | -                   |
| RX50     |          | 0.85              | 1.8   | 25.9  | -         | -   | -                   |
| TK50     |          | 1.35              | 2.4   | 33.55 | -         | -   | -                   |
| TK50-AA  |          | 1.35              | 2.4   | 34.5  | -         | -   | -                   |
| TK50E-EA |          | 1.35              | 2.4   | 35.6  | -         | -   | -                   |
| TK70E-EA |          | 1.5               | 2.4   | 36.3  | -         | -   | -                   |
| TQK25-KA | M7605    | 4.0               | -     | 20.0  | 2.0       | 1.0 | A                   |
| TQK50    | M7546    | 2.9               | 0.0   | 14.5  | 2.8       | 0.5 | -                   |
| TSV05    | M7196    | 6.5               | 0.0   | 32.5  | 3.0       | 1.0 | A                   |
| VCB01    | M7602    | 4.6               | 1.5   | 42.0  | 3.0       | 1.0 | B                   |
| VCB02    | M7169    | 5.8               | 0.75  | 38.0  | 3.5       | 1.0 | B                   |
| VCB02    | M7168    | 3.4               | 0.0   | 17.0  | 0.0       | 0.0 | -                   |

<sup>1</sup>A = 2.5 cm x 10.0 cm (1 in x 4 in).

B = 5.0 cm x 7.5 cm (2 in x 3 in).

**Figure 1-14: BA23 Configuration Worksheet**

ADD THESE COLUMNS

| BACKPLANE SLOT | MODULE | CURRENT (A) |       | POWER (W) | I/O INSERTS |   |
|----------------|--------|-------------|-------|-----------|-------------|---|
|                |        | +5 V        | +12 V |           | B           | A |
| 1              | AB     |             |       |           |             |   |
|                | CD     |             |       |           |             |   |
| 2              | AB     |             |       |           |             |   |
|                | CD     |             |       |           |             |   |
| 3              | AB     |             |       |           |             |   |
|                | CD     |             |       |           |             |   |
| 4              | AB     |             |       |           |             |   |
|                | CD     |             |       |           |             |   |
| 5              | AB     |             |       |           |             |   |
|                | CD     |             |       |           |             |   |
| 6              | AB     |             |       |           |             |   |
|                | CD     |             |       |           |             |   |
| 7              | AB     |             |       |           |             |   |
|                | CD     |             |       |           |             |   |
| 8              | AB     |             |       |           |             |   |
|                | CD     |             |       |           |             |   |
| MASS STORAGE   |        |             |       |           |             |   |
| 1              |        |             |       |           |             |   |
| 2              |        |             |       |           |             |   |

COLUMN TOTALS: \_\_\_\_\_  
 MUST NOT EXCEED:      36.0      7.0      230      4      2\*

\*IF MORE THAN TWO TYPE A CONNECTORS ARE REQUIRED, AN ADAPTER TEMPLATE (PN 74-27740-01) MAY BE USED. THIS ALLOWS THREE ADDITIONAL TYPE A CONNECTORS BUT REDUCES THE AVAILABLE TYPE B CUTOUTS TO TWO.

MLO-000207



## Chapter 2

# Installation

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This chapter provides site preparation guidelines and installation procedures for the BA23 enclosure, including the pedestal, tabletop, and rack mount versions.

## 2.1 Preparing the Site

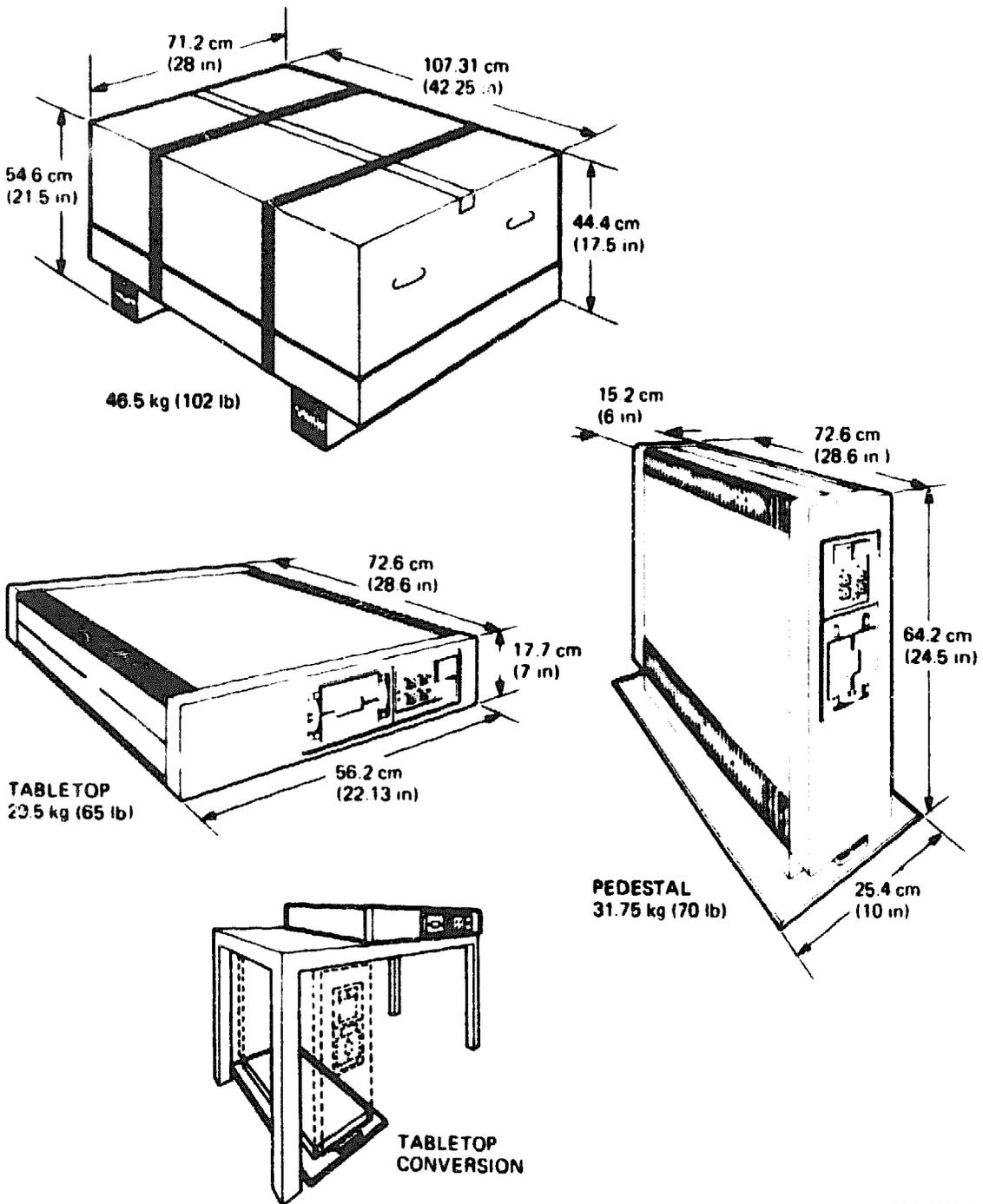
Before you unpack the BA23 enclosure shipment, verify the physical, environmental, and electrical requirements in this section.

### 2.1.1 Dimensions

Figure 2-1 shows the dimensions of the BA23 enclosure. The figure also shows the dimensions of the shipping container.

**WARNING:** *Use two people to handle the shipping container and the enclosure. The shipping container and enclosure together weigh about 46.5 kg (102 lb). The pedestal weighs 31.7 kg (70 lb); the tabletop weighs 29.5 kg (65 lb).*

**Figure 2-1: BA23 Enclosure Dimensions**



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## 2.1.2 Additional Equipment

Make sure there is sufficient space for terminals and other peripheral equipment. The temperature and humidity at which mass storage media are kept should be the same as that of the computer area.

When you plan the cable routing for multiple-terminal systems, consider factors such as safety, convenience, future expansion, and cost. You should have cabling in place and labeled before you install the system.

## 2.1.3 Acoustics

The BA23 system operating acoustic emission levels are as follows<sup>1</sup> :

$$\text{LNPE (B)}^2 = 6.1$$

$$\text{LPA (dB)}^3 = 48$$

## 2.1.4 Operating Environment

Computer systems located in office areas are subject to discharge of static electricity, temperature changes, and humidity.

You should install the system in a well-ventilated area where the temperature and humidity ranges listed in Section 2.1.7 are maintained throughout the year. Rapid temperature changes may affect system performance. Therefore, systems should not be operated near heating or cooling devices, large windows, or doors that open to the outside. Air should contain a minimum of dust and other abrasive contaminants.

## 2.1.5 Static Electricity

Static electricity can cause system failure and loss of data. To minimize static buildup, follow these guidelines:

- Maintain relative humidity of at least 40%.
- Place the system away from busy office corridors.
- Avoid using carpeting in the computer area, if possible. If carpeting is to be installed, antistatic carpeting is recommended. If carpeting is already in place, place an antistatic mat under the system.

---

<sup>1</sup> Data measured in accordance with ANSI S12 10-1985 and ISO/DIS 7779. Levels may be lower, depending on the kind and number of mass storage devices in the system.

<sup>2</sup> LNPE = Noise power emission level (A-weighted sound power level) measured in bels re 1 pw.

<sup>3</sup> LPA = Sound pressure measured in decibels at 1.0 m from the front edge of the unit and 1.5 m above the floor.

## 2.1.6 Heat Dissipation

Heat dissipates in the BA23 enclosure system at the rate of 1177.4 Btu per hour.

## 2.1.7 Temperature and Humidity Ranges

Table 2-1 shows the temperature ranges, humidity ranges, and altitude limits for systems in the BA23 enclosure.

**Table 2-1: Temperature Ranges, Humidity Ranges, and Altitude Limits**

| Parameter                  | Range   |
|----------------------------|---|
| Temperature                | Operating: <sup>1</sup> 10°C to 40°C<br>50°F to 104°F       |
|                            | Nonoperating: -40°C to 60°C<br>-40°F to 140°F               |
| Temperature rate of change | Operating: 11°C per hour maximum<br>19.8°F per hour maximum |
| Relative humidity          | Operating: 20% to 80% (noncondensing)                       |
|                            | Nonoperating: 10% to 95%                                    |
| Maximum altitude           | Operating: 2440 m (8000 ft)                                 |
|                            | Nonoperating: 4900 m (16,000 ft)                            |

<sup>1</sup>For operation above sea level, decrease the operating temperature by 1.8°C per 1000 m (or 1°F per 1000 ft).

## 2.1.8 Electrical Requirements

The power source should be adequate to handle the original system and allow for system expansion. DIGITAL recommends a dedicated circuit from the power source to each system. Additional power equipment may be required to avoid power disturbances.

Table 2-2 lists power cord information for 240 V operation of systems in the BA23 enclosure. Table 2-3 lists electrical requirements for systems in the BA23 enclosure.

**Table 2-2: 240 V Power Cords**

| <b>Power Cord Number</b> | <b>Countries</b>  |
|--------------------------|---|
| BN02A-2E                 | United Kingdom and Ireland  |
| BN03A-2E                 | Austria, Belgium, Czechoslovakia, Finland, France, Germany, Hungary, Netherlands, Norway, Poland, Portugal, Spain, and Sweden |
| BN04A-2E                 | Switzerland   |
| BN05A-2E                 | Australia and New Zealand   |
| BN06A-2E                 | Denmark   |
| BN07A-2E                 | Italy   |

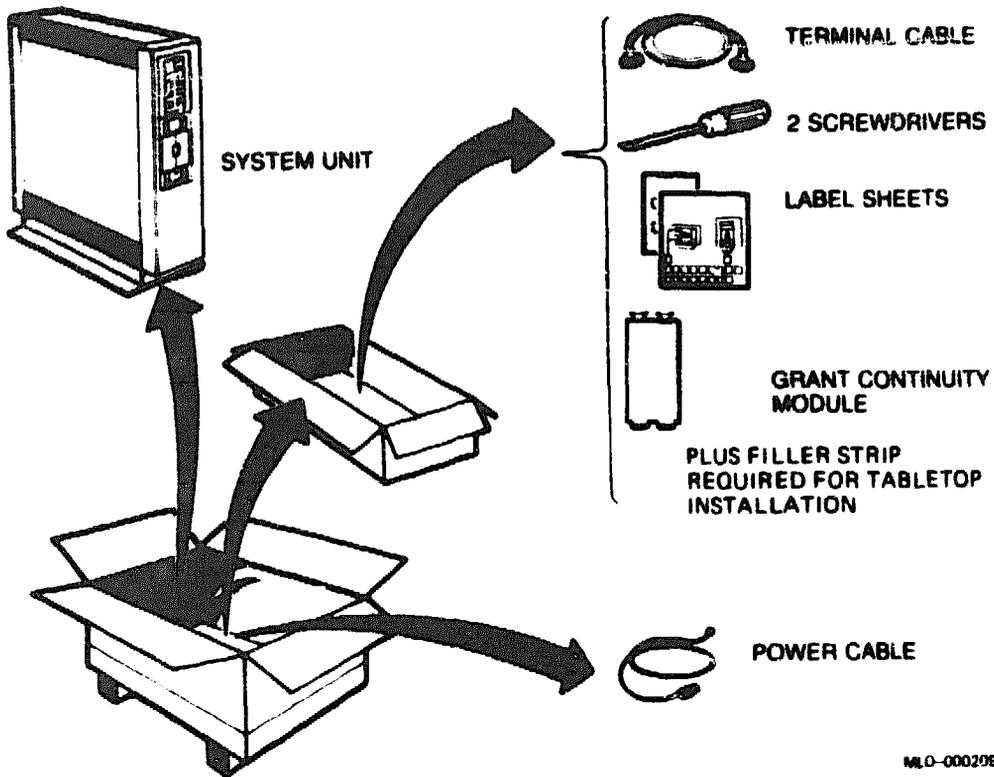
**Table 2-3: BA23 Electrical Requirements**

| <b>Nominal ac Voltage ⇒</b>                     | <b>100 Vac</b> | <b>120 Vac</b> | <b>220-240 Vac</b> |
|---|----------------|----------------|--------------------|
| Voltage range                                   | 90-110 Vac     | 104-128 Vac    | 191-256 Vac        |
| Power source phase                              | Single         | Single         | Single             |
| Nominal frequency                               | 50-60 Hz       | 50-60 Hz       | 50-60 Hz           |
| Frequency range                                 | 47-63 Hz       | 47-63 Hz       | 47-63 Hz           |
| Maximum steady state current at nominal voltage | 5.3 A          | 4.4 A          | 2.2 A              |
| Maximum steady state current at minimum voltage | 6 A            | 5.5 A          | 2.7 A              |
| Maximum inrush current                          | 100 A          | 100 A          | 100 A              |
| Maximum power consumption                       | 345 W          | 345 W          | 345 W              |

## 2.2 Unpacking the Shipment

To unpack a BA23 enclosure system, follow the steps on the installation sheet attached to the shipping container. Figure 2-2 shows the contents of the shipping carton.

**Figure 2-2: Shipping Carton Contents**



MLO-000298

The shipment may include some of the following equipment:

- Additional terminal(s)
- Printer(s)
- Modem(s)
- Cables for connecting additional devices

## **2.3 Installing the BA23 Pedestal**

Use the guidelines and procedures in the following sections to install the BA23 enclosure pedestal version. Procedures for installing the tabletop version are in Section 2.4. Procedures for installing the rack mount version are in Section 2.5.

### **2.3.1 Air Flow Considerations**

The system requires 5 cm (2 in) of clearance for ventilation on each side. Leave about 60 cm (2 ft) at the rear of the system to connect any cables, and to access the controls behind the rear cover.

After unpacking the system, use two people to move the unit to the determined location. The unit weighs 27 kg (60 lb).

### **2.3.2 Installing the Console Terminal**

Unpack the terminal and documentation. The console terminal is packed in several boxes containing the following:

- Video monitor

- Keyboard

- Documentation, including an installation guide and owner's manual

- System box (graphics terminals only)

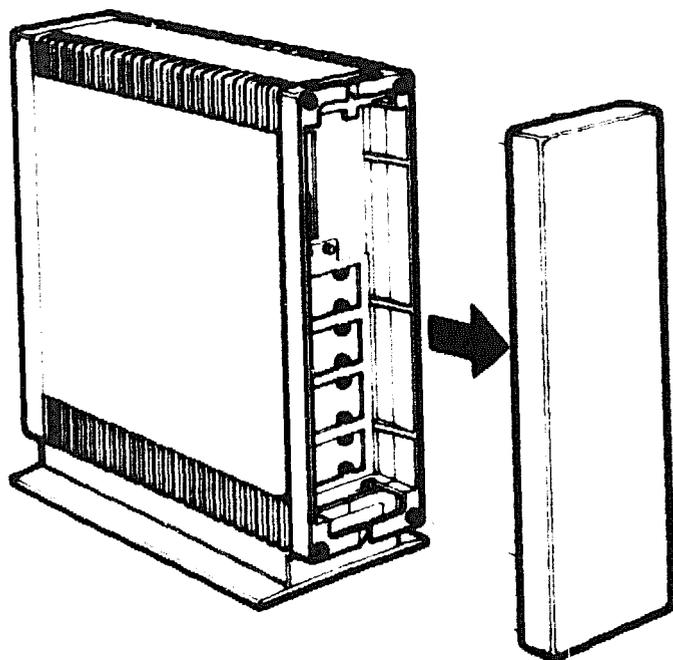
Use the instructions in the terminal installation guide to connect the components and perform the setup procedures.

### **2.3.3 Connecting the Console Terminal to the System**

Connect the console terminal to the system as follows:

1. Pull off the rear cover (Figure 2-3).

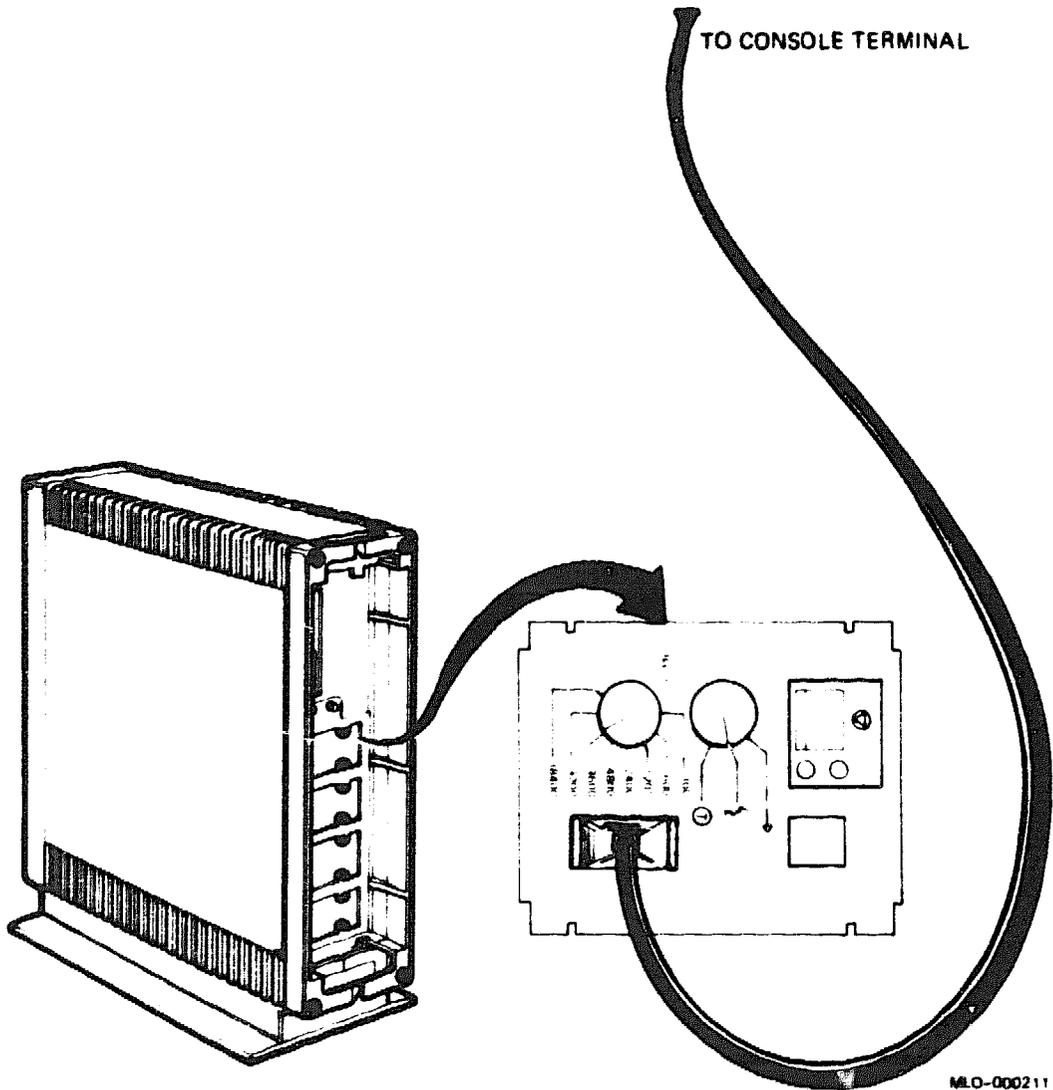
**Figure 2-3: Removing the Rear Cover**



MLO-0002 10

2. Turn off the console terminal.
3. Connect the terminal cable to the Comm Port on the rear of the terminal, according to the instructions in your terminal installation guide.
4. Connect the other end of the cable to the CPU panel on the rear of the system (Figure 2-4).

**Figure 2-4: Connecting the Console Terminal (Example)**



### **2.3.4 Connecting External Devices**

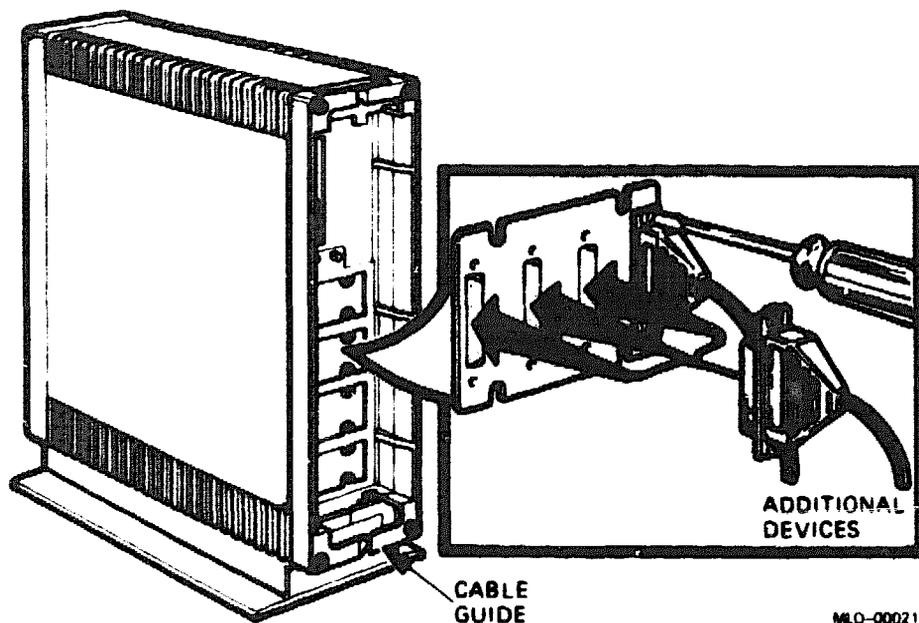
Before you connect devices to the system, test them according to the documentation provided with the device, if possible.

**WARNING:** *Turn off the devices before you connect them to the system.*

You can connect up to eight terminals and/or printers for each DHQ11 and DHV11 module, and up to four for each DZQ11 module installed in the system.

Connect the additional terminals and printers as shown in Figure 2-5.

**Figure 2-5: Connecting External Devices**



After making connections, thread all cables through the lower cable guide (Figure 2-5).

You connect modem lines to the I/O panels the same way you connect terminals and printers. The DHQ11, DHV11, and DZQ11 modules have modem control support.

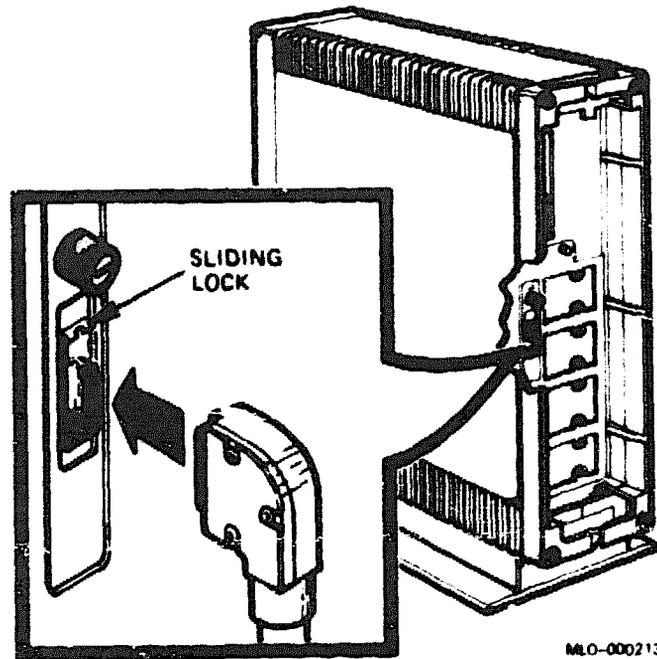
Connect the other end of the cable to the modem, as described in the modem installation guide. Make sure the modem is plugged into a power source and connected to an active phone jack.

### **2.3.5 Connecting to a Network**

You can connect the system to a network if the system contains a DELQA or DEQNA option, and if the Ethernet cabling is in place. Use the following procedure to connect to a network:

1. Using the Ethernet cable shipped with the system, connect the male end of the cable to an Ethernet connector on one of the type A inserts (Figure 2-6). Slide up the locking device on the female connector to secure the connection.

**Figure 2-6: Connecting an Ethernet Cable**



2. Connect the other end of the cable to one of the following devices:
  - An H4000 transceiver located on a traditional baseband Ethernet cable.
  - A DELNI, which can, in turn, be connected to a baseband Ethernet cable or which can connect up to eight systems in a local area network (LAN).
  - A DESTA converter, if you need to connect to a ThinWire network.

### **2.3.6 Setting Controls on the System**

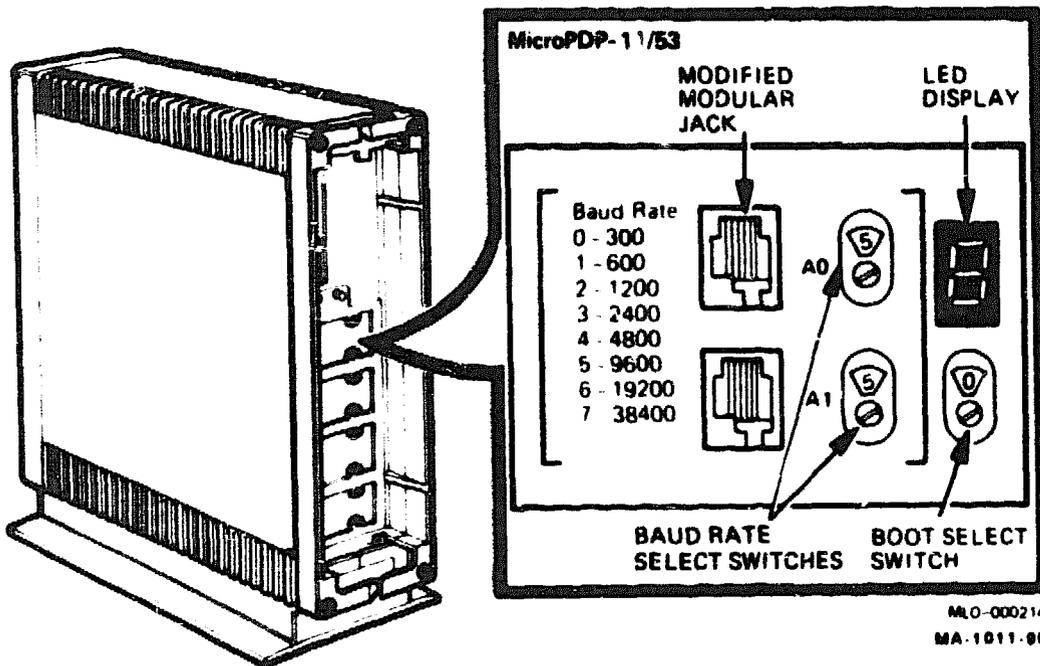
Controls on the system are in four locations:

- The CPU I/O insert on the rear of the system
- The voltage switch on the rear of the system
- The circuit breaker on the rear of the system
- The control panel on the front of the system

### 2.3.6.1 Boot Select (MicroPDP-11/53 only)

The boot select switch is on the CPU I/O insert (Figure 2-7). This 16-position rotary switch controls power-on and the language used by the system. The system is factory-positioned to autoboot from disks and tapes and to use English text. If you need to change the factory position, refer to the CPU maintenance documentation for a description of the switch settings.

Figure 2-7 Boot Select Switch (MicroPDP-11/53 only)

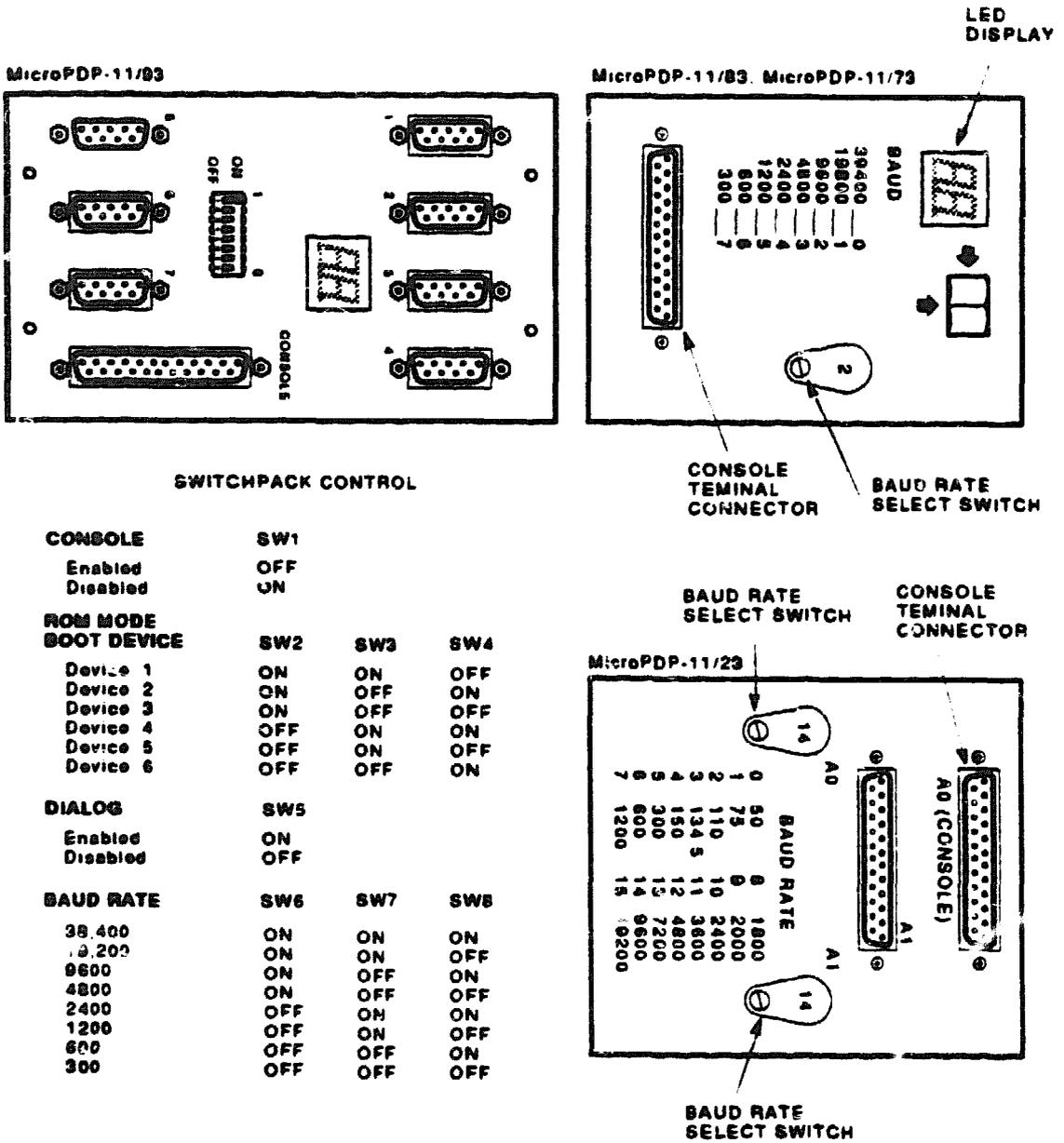


### 2.3.6.2 Setting the Baud Rate (MicroPDP-11)

The baud rate select switch(es) for the system is on the CPU I/O insert (Figure 2-8).

The factory position is 9600; confirm this setting. To change the baud rate setting, use a screwdriver to rotate the baud rate select switch(es) or use a pencil to set the switches in the switchpack. The system and the terminal must be set to the same baud rate.

**Figure 2-3 Setting the Baud Rate (MicroPDP-11)**

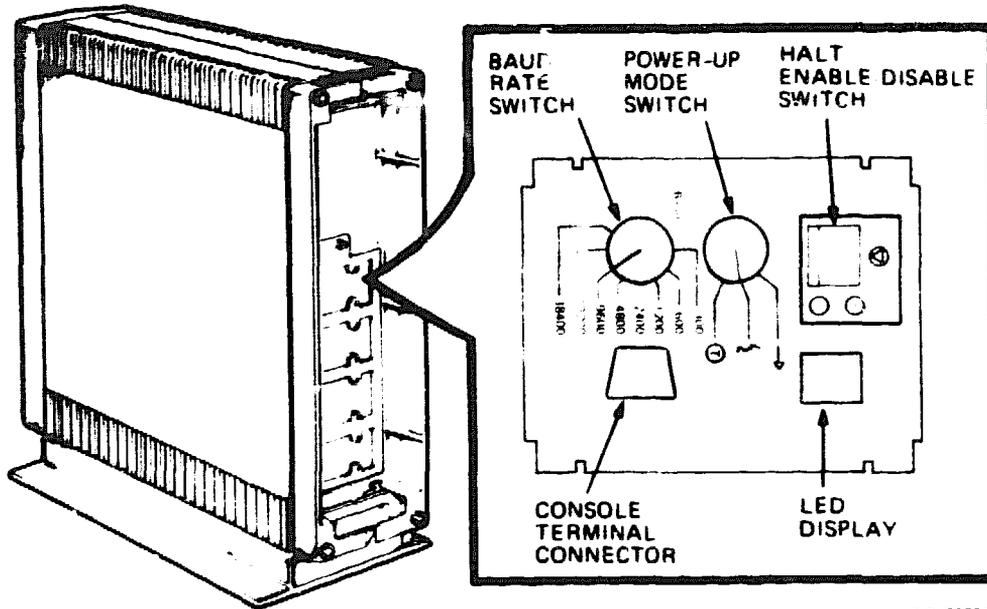


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### 2.3.6.3 Setting Controls on the CPU I/O Insert (MicroVAX)

The following controls are located on the CPU I/O insert (Figure 2-9):

Figure 2-9: CPU I/O Insert Controls (MicroVAX)



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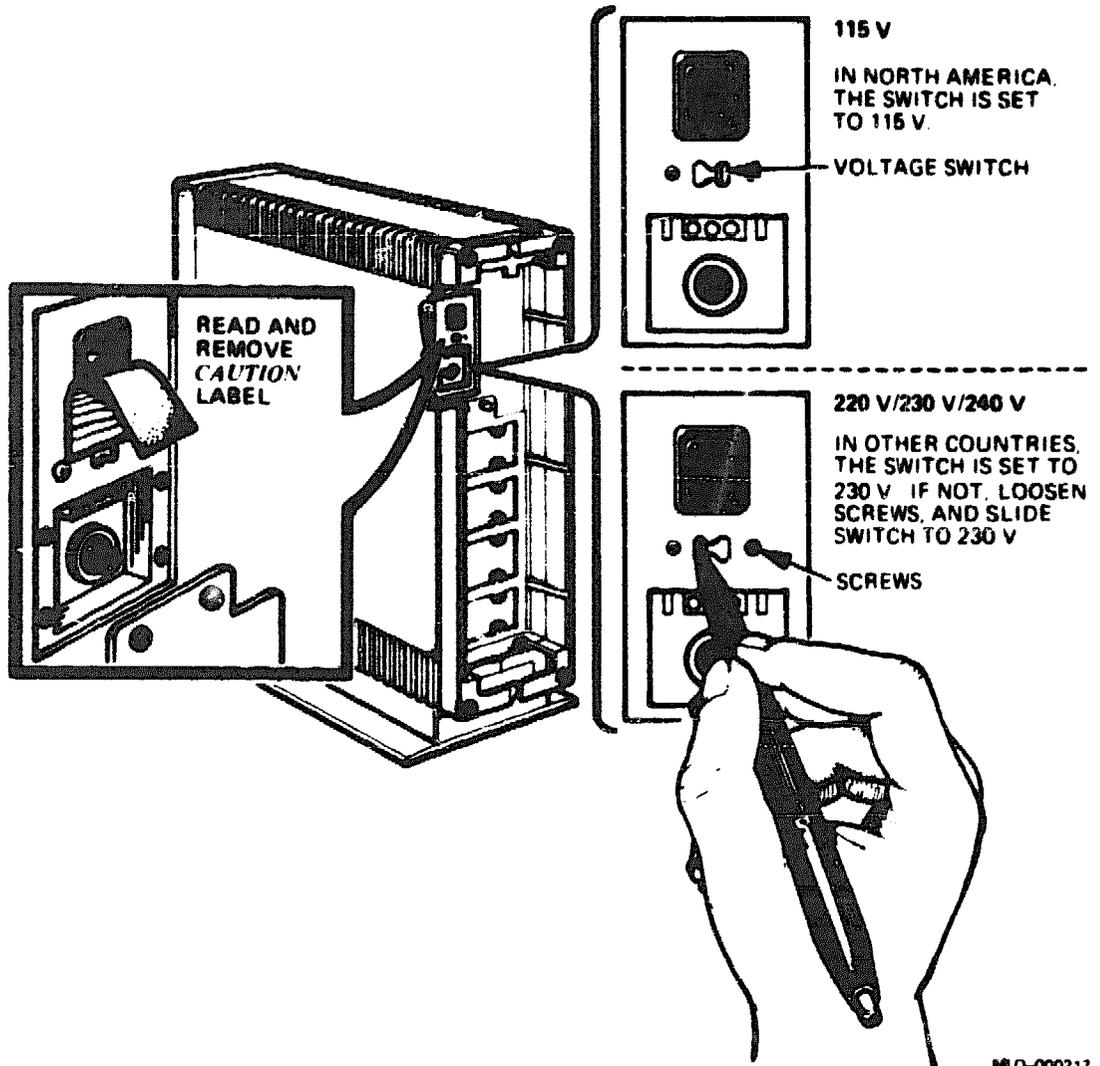
- **Halt enable/disable switch.** The factory position is halt disable (left), indicated by the  $\odot$  outside the circle. Leave the switch set to disable while you start the system for the first time and run diagnostic software to test the system. Before you install system software, move the switch to halt enable (right).
- **Power-up mode switch.** This 3-position rotary switch determines how the system powers up. The factory position is run mode, indicated by an arrow. Before you power up your system the first time, move the switch to the language inquiry mode, indicated by a human profile.
- **Baud rate.** The factory position is 9600; confirm this setting. If necessary, rotate the baud rate switch to 9600. The system and the console terminal must be set to the same baud rate.

### 2.3.6.4 Checking the Voltage Setting

**CAUTION:** *Be careful to set the voltage correctly. An incorrect voltage setting can damage the system.*

Peel back the label covering the switch to see the voltage setting (Figure 2-10). If necessary, change the switch setting to match the voltage source.

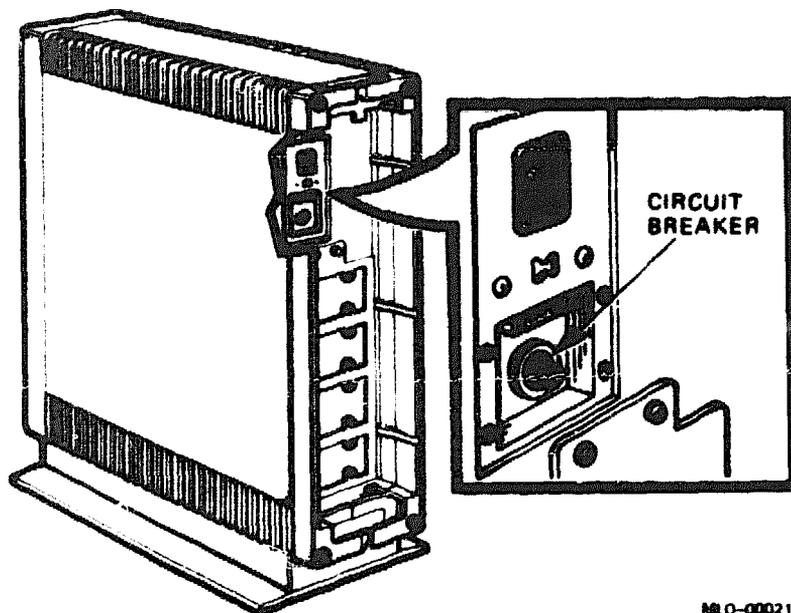
**Figure 2-10: Checking or Changing the Voltage Setting**



### 2.3.7 Checking the Circuit Breaker

Because the circuit breaker sometimes trips during shipment, confirm the position of the circuit breaker (Figure 2-11).

**Figure 2-11: Checking the Circuit Breaker**



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Press in on the circuit breaker to make sure it is in the proper position. When the circuit breaker has tripped, it sticks out and can be pushed back into position.

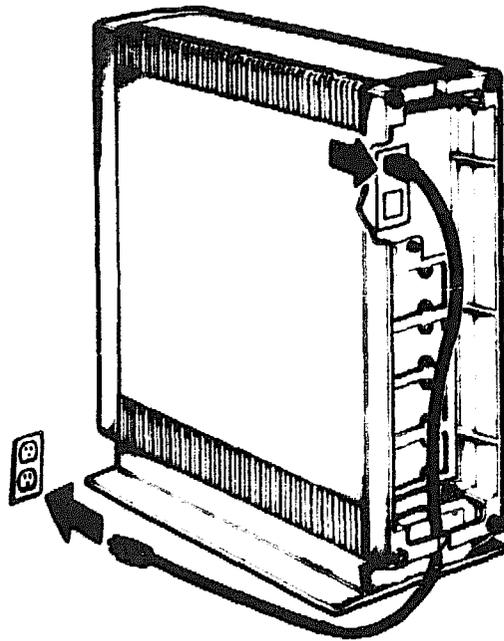
### 2.3.8 Completing the Installation

Complete the installation as follows:

1. Make sure the system on/off switch is set to off (0), and that all devices connected to the system are turned off.
2. Find the power cable packed inside the system shipping carton.
3. Make sure the pronged end of the power cable plug matches the wall outlet.
4. Connect the opposite end of the power cable to the system (Figure 2-12).
5. Plug the pronged end of the power cable into a wall outlet.

6. Attach the BA23 rear cover, making sure all cables are threaded through the guide at the bottom of the enclosure. Push the rear cover into place.
7. The installation of the BA23 enclosure is now complete. Refer to the CPU maintenance documentation for procedures on running power-up self-tests.

**Figure 2-12: Attaching the Power Cord**



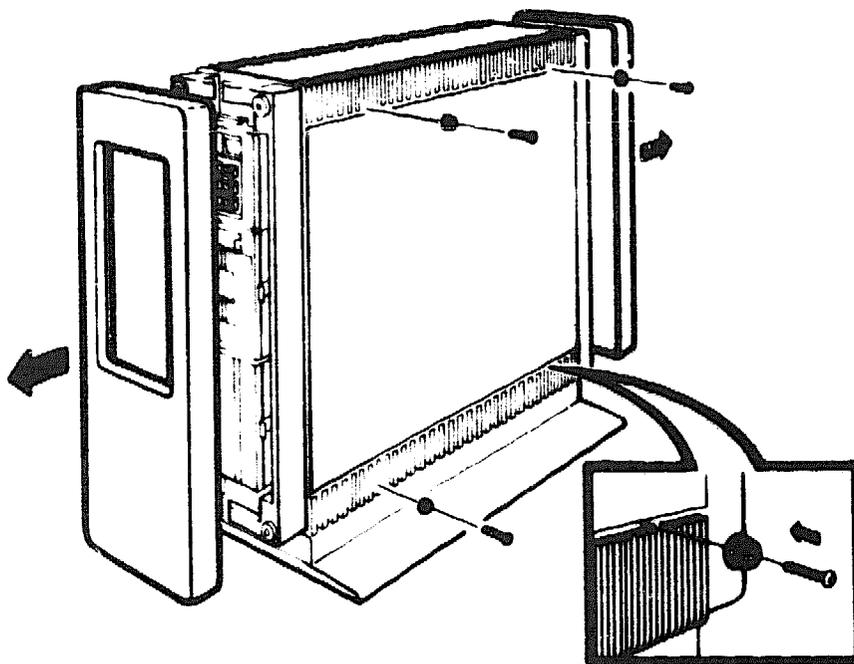
MLO-000219

## **2.4 Installing the BA23 Tabletop Version**

Use the following procedure to convert the BA23 pedestal to the tabletop version:

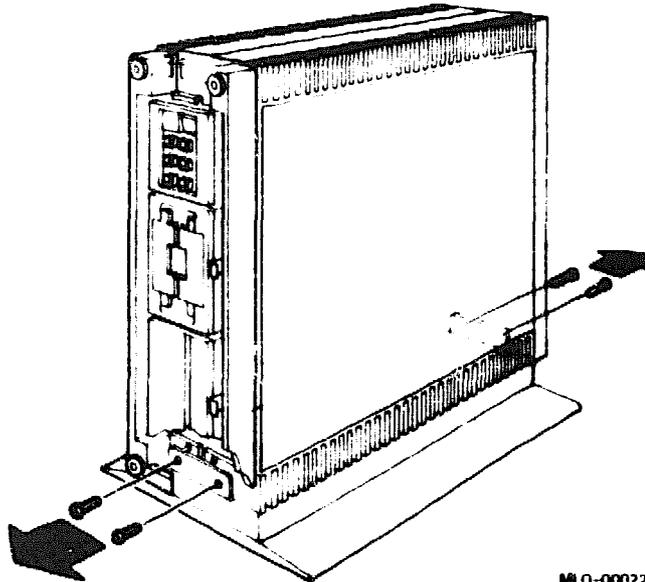
1. Remove the front and rear covers (Figure 2-13).
2. Install four rubber feet on the right side of the system (Figure 2-13).
3. Remove the four screws at the base of the system (Figure 2-14).

**Figure 2-13: Preparing the Tabletop Configuration**



MLO-000220

**Figure 2-14: Removing the Base Screws**



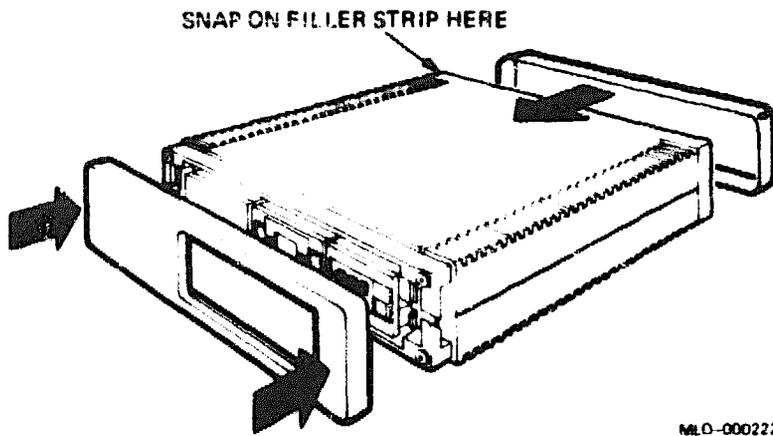
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4. Follow the air circulation guidelines for the BA23 pedestal version in Section 2.3.1. Lift the system from the footstand and place it on a table.

**WARNING:** Use two people to move the system. The system weighs 29.5 kg (65 lb).

5. Snap the filler strip (part no. 74-285010-01) onto the frame at the rear of the enclosure. The filler strip covers the space between the enclosure frame and the back cover (Figure 2-15).
6. Replace the front and rear covers (Figure 2-15).

**Figure 2-15: Completing the Tabletop Configuration**



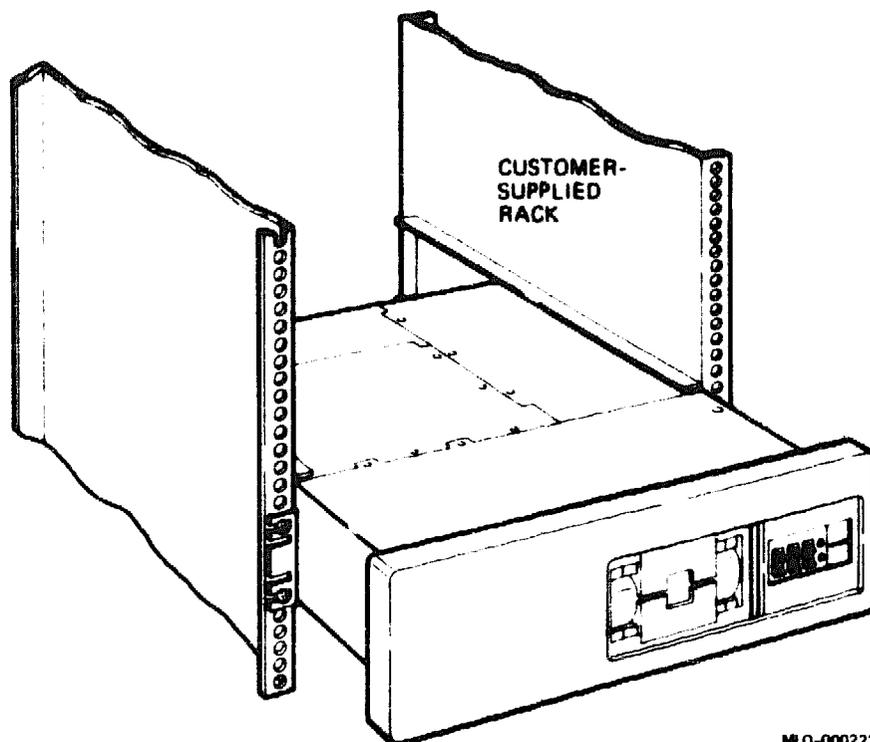
7. To complete the tabletop installation, use the same procedures as in the BA23 pedestal version, Sections 2.3.2 through 2.3.8.

## **2.5 Installing the BA23 Rack Mount Version**

Use the procedures in this section to install a BA23 rack mount version (Figure 2-16) into a standard cabinet/rack with the following dimensions:

- 48.2 cm (19 in) wide
- 63.5 cm (25 in) between vertical rails

**Figure 2-16: BA23 Rack Mount Version**

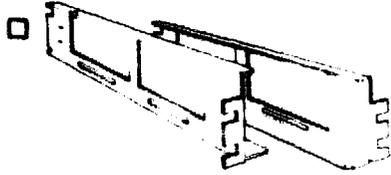
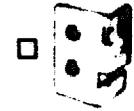
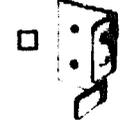


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**WARNING:** Use two people to install the rack mount system. The system weighs 29.5 kg (65 lb).

1. Check the contents of the rack mounting kit against the parts shown in Figure 2-17. If any item is missing or damaged, call the sales representative.

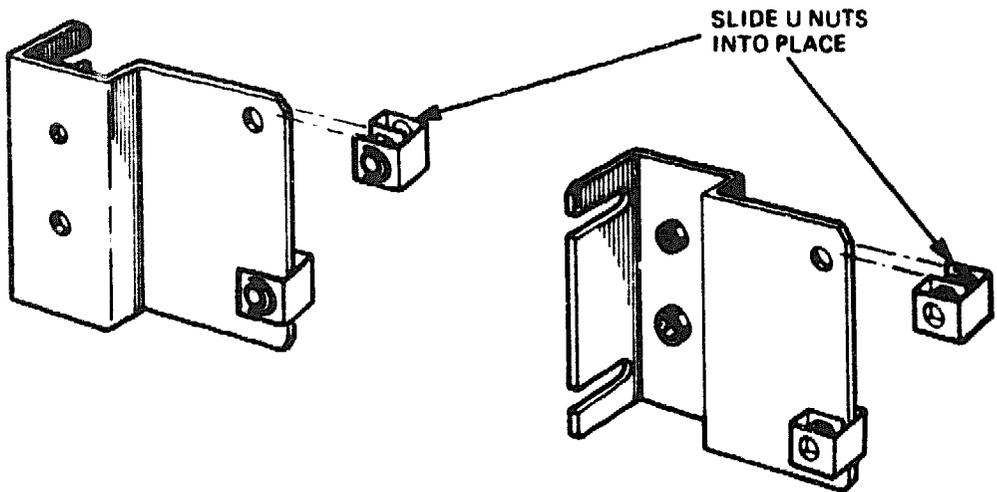
**Figure 2-17: BA23-AR Rack Mount Kit Contents**

- 
RAILS (RIGHT, LEFT) (1 EACH)  
LEFT 7428371 02  
RIGHT 7428371 01
  
- 
FRONT COVER (1)
  
- 
RIGHT REAR BRACKET (1)  
7428372 02
  
- 
LEFT REAR BRACKET (1)  
7428372 01
  
- 
STOP PLATE (1)  
7428710 01
  
- 
RIGHT FRONT BRACKET (1)  
7021543 01
  
- 
LEFT FRONT BRACKET (1)  
7430071 01
  
- 
NYLON STOP CABLE (1)
  
  
- 
PHILLIPS MACHINE SCREWS WITH LOCK WASHERS (13)
- 
PHILLIPS SCREW WITH LOCK WASHER (1)
  
- 
FLAT HEAD PHILLIPS MACHINE SCREWS (8)
- 
WASHERS (2)
  
- 
PHILLIPS SELF-TAP SCREWS (2)
- 
FASTENERS (4)
  
- 
LOCKING HEX NUT (1)
- 
U NUTS (12)

MLO-000224

2. Slide the U nuts into place on the right and left rear brackets (Figure 2-18).

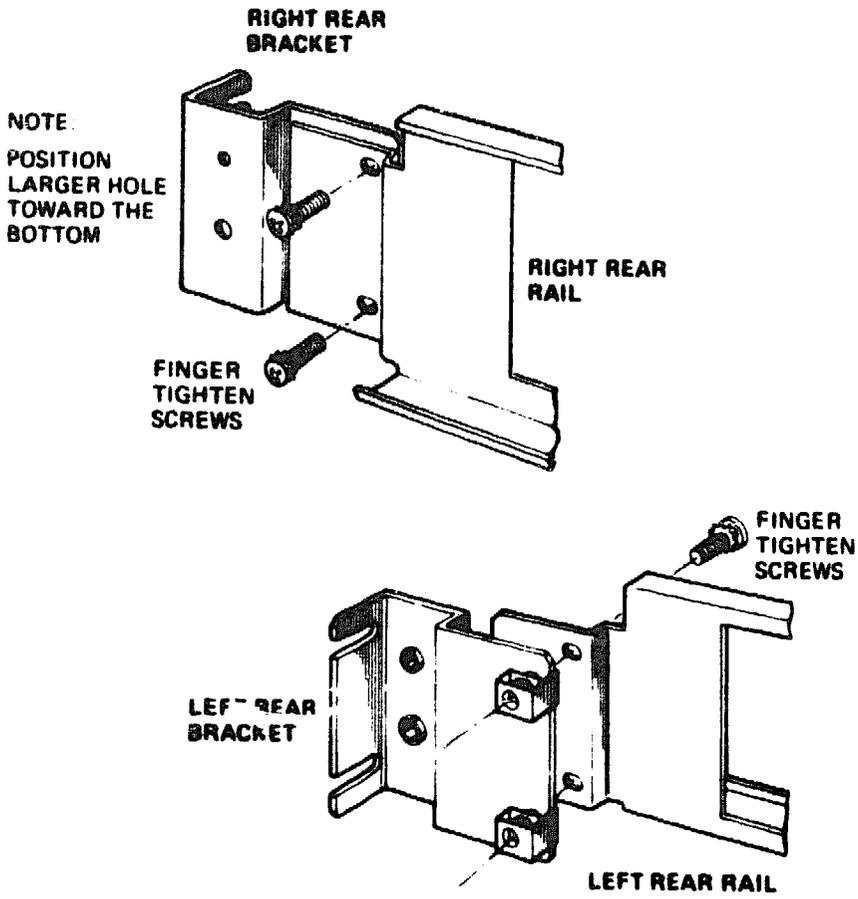
**Figure 2-18: Preparing the Brackets**



MLO-000225

3. Mount the left and right rear brackets onto the rails (Figure 2-19). Use four Phillips machine screws with lock washers.

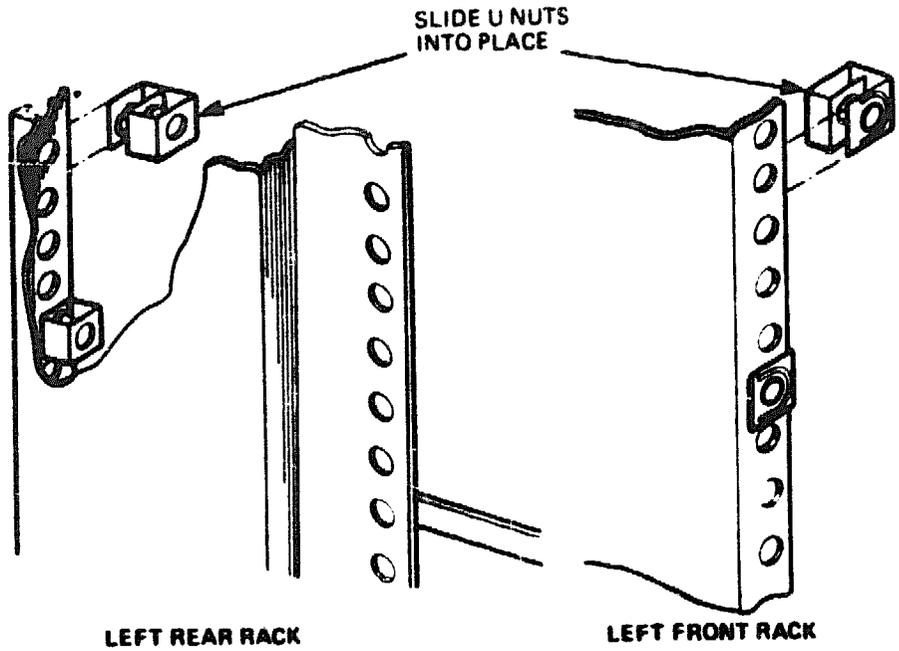
**Figure 2-19: Mounting the Brackets**



MLO-000226

4. Slide the U nuts into place on the rack (Figure 2-20).

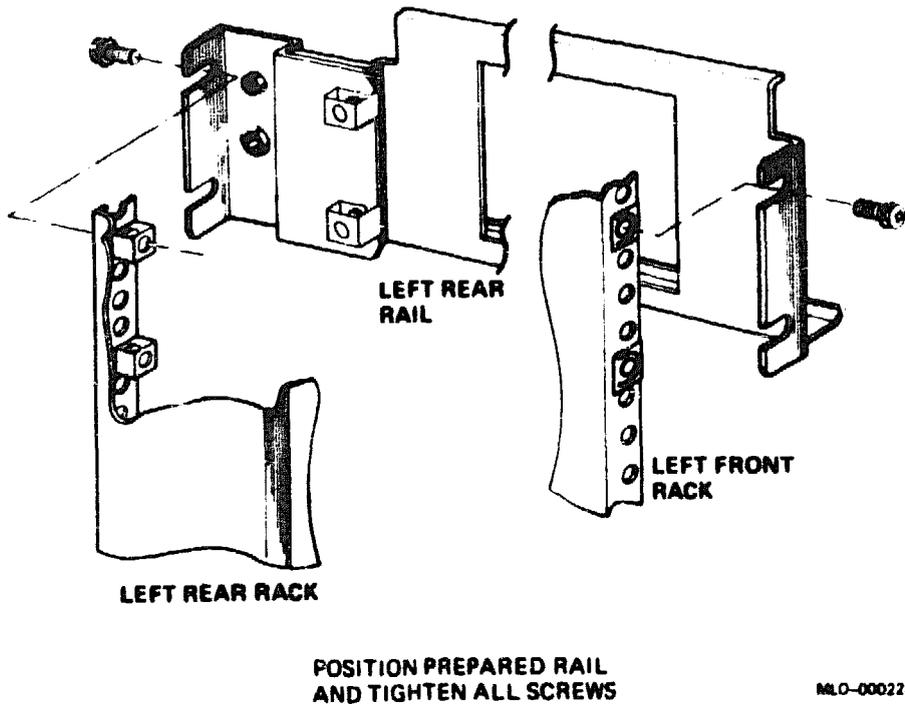
**Figure 2-20: Preparing the Rack**



MLO-000227

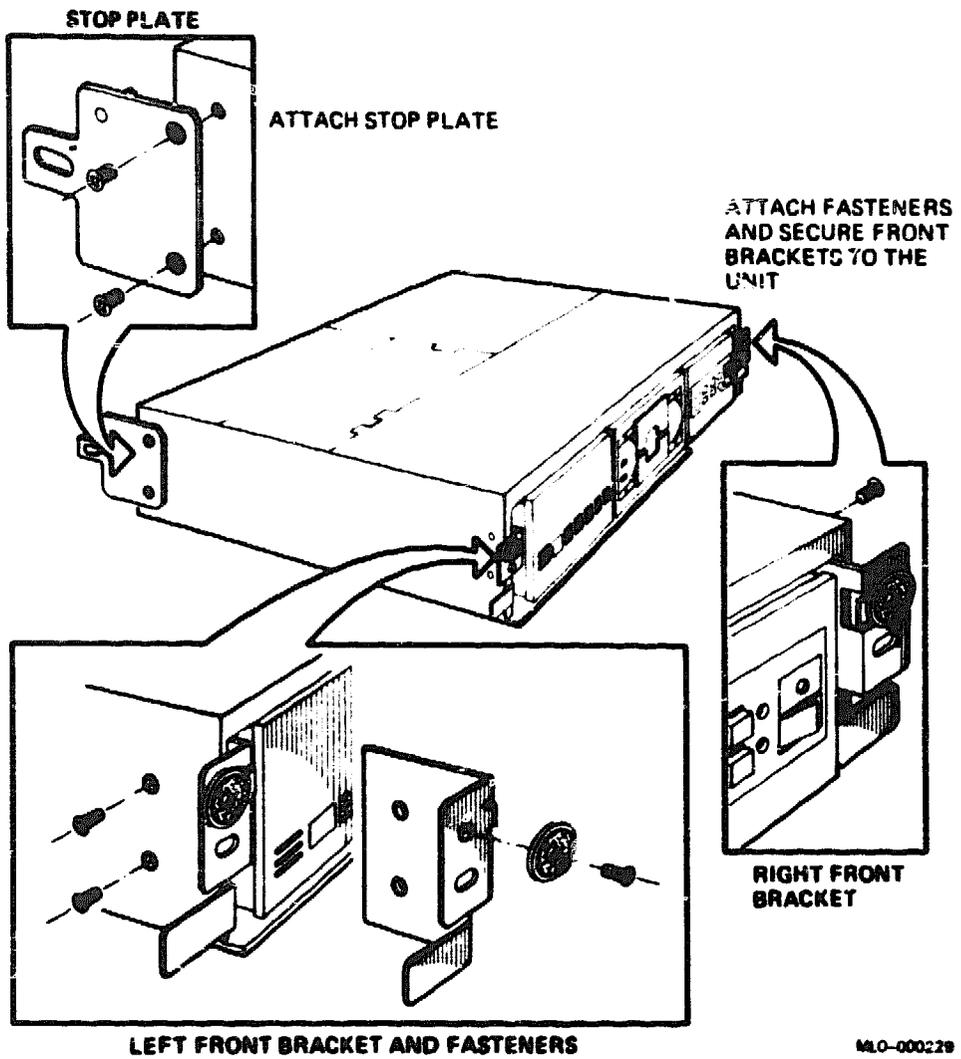
5. Mount the left rail (Figure 2-21). Use eight Phillips machine screws with lock washers.

**Figure 2-21: Mounting the Left Rail**



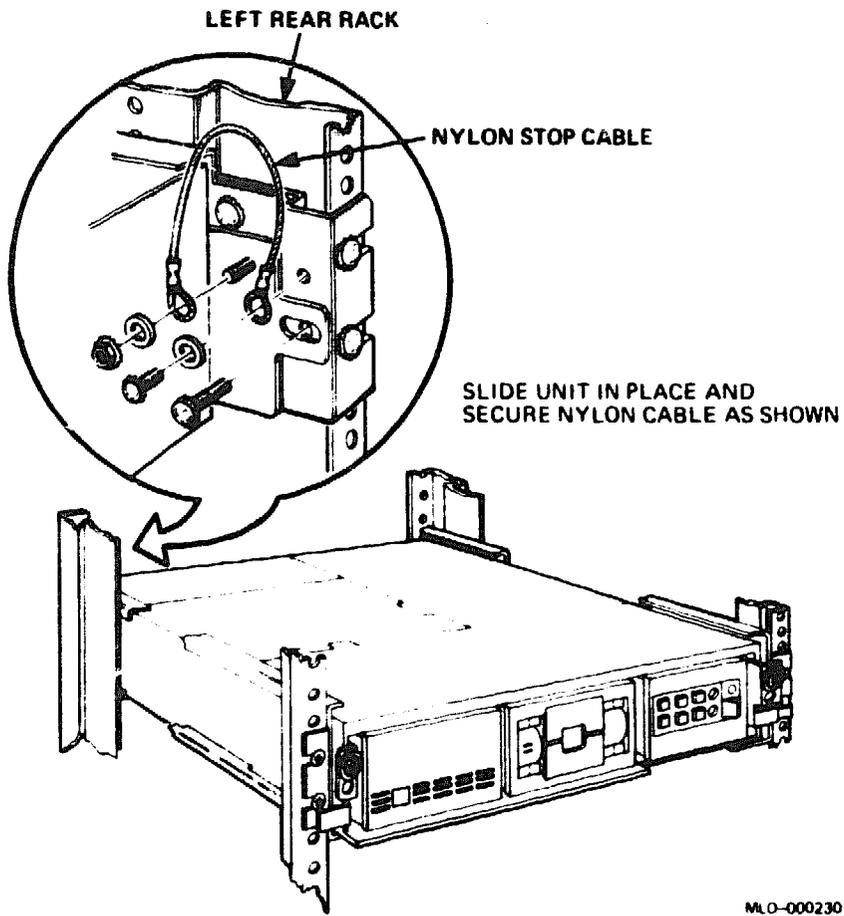
6. Repeat steps 4 and 5 to mount the right rail.
  7. Tighten all screws.
- Refer to Figure 2-22 for steps 8 through 11.
8. Mount the fasteners on the left and right front brackets. Use one flathead Phillips machine screw for each bracket.
  9. Attach the stop plate. Use two flathead Phillips machine screws.
  10. Secure the left and right front brackets to the unit. Use two flathead Phillips machine screws for each bracket.
  11. Slide the system into the rack.
  12. Attach the nylon stop cable (Figure 2-23).

**Figure 2-22: Attaching the Stop Plate and Brackets**



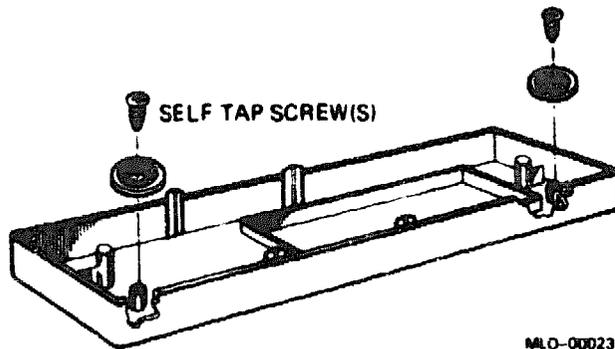
MLO-000229

**Figure 2-23: Attaching the Stop Cable**



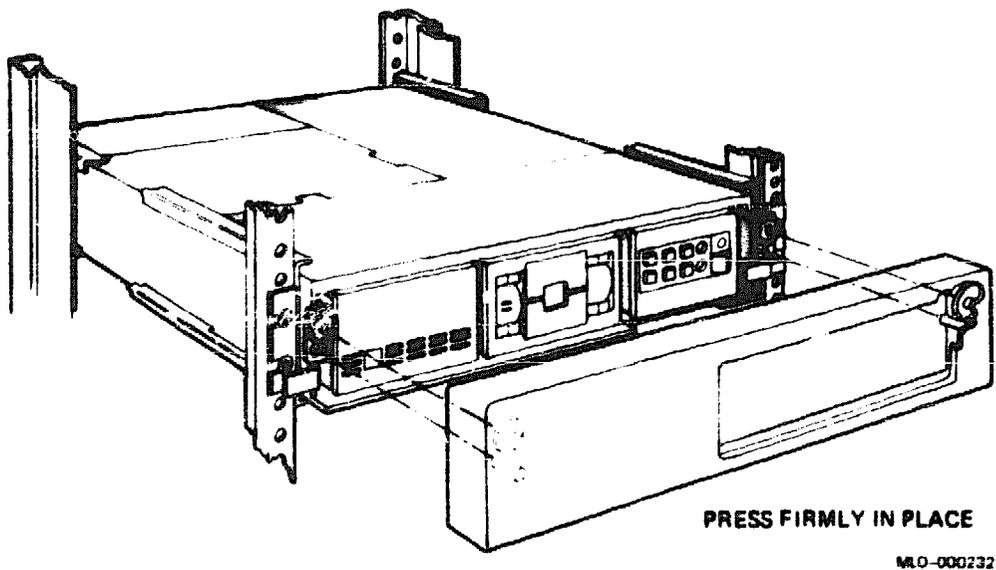
13. Mount the self-tap screws on the front cover (Figure 2-24).

**Figure 2-24: Preparing the Front Cover**



14. Attach the front cover to the system (Figure 2-25).

**Figure 2-25: Attaching the Front Cover**



15. To complete the rack mount installation, use the same procedures as in the BA23 pedestal version, Sections 2.3.2 through 2.3.8.



# FRU Removal and Replacement

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This chapter describes how to remove and replace the field replaceable units (FRUs) in the BA23 enclosure. The procedures begin with units at the front of the enclosure and proceed to those at the rear.

Each section describes the removal procedure for that FRU. Unless otherwise specified, you can install an FRU by reversing the steps in the removal procedure.

### 3.1 FRUs

Table 3-1 lists the BA23 FRUs and their part numbers. Refer to the applicable CPU documentation for CPU-specific part numbers and supported options. All options are also FRUs. Refer to *Microsystems Options* for option kit numbers.

Figure 3-1 shows the major FRUs as seen from the front of the enclosure.

#### **CAUTION:**

- *Only qualified service personnel should remove or install FRUs.*
- *Before you remove or install FRUs, power down the system and remove the ac power cord.*
- *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit when working with the internal parts of a computer system.*

**Table 3-1: BA23 FRUs**

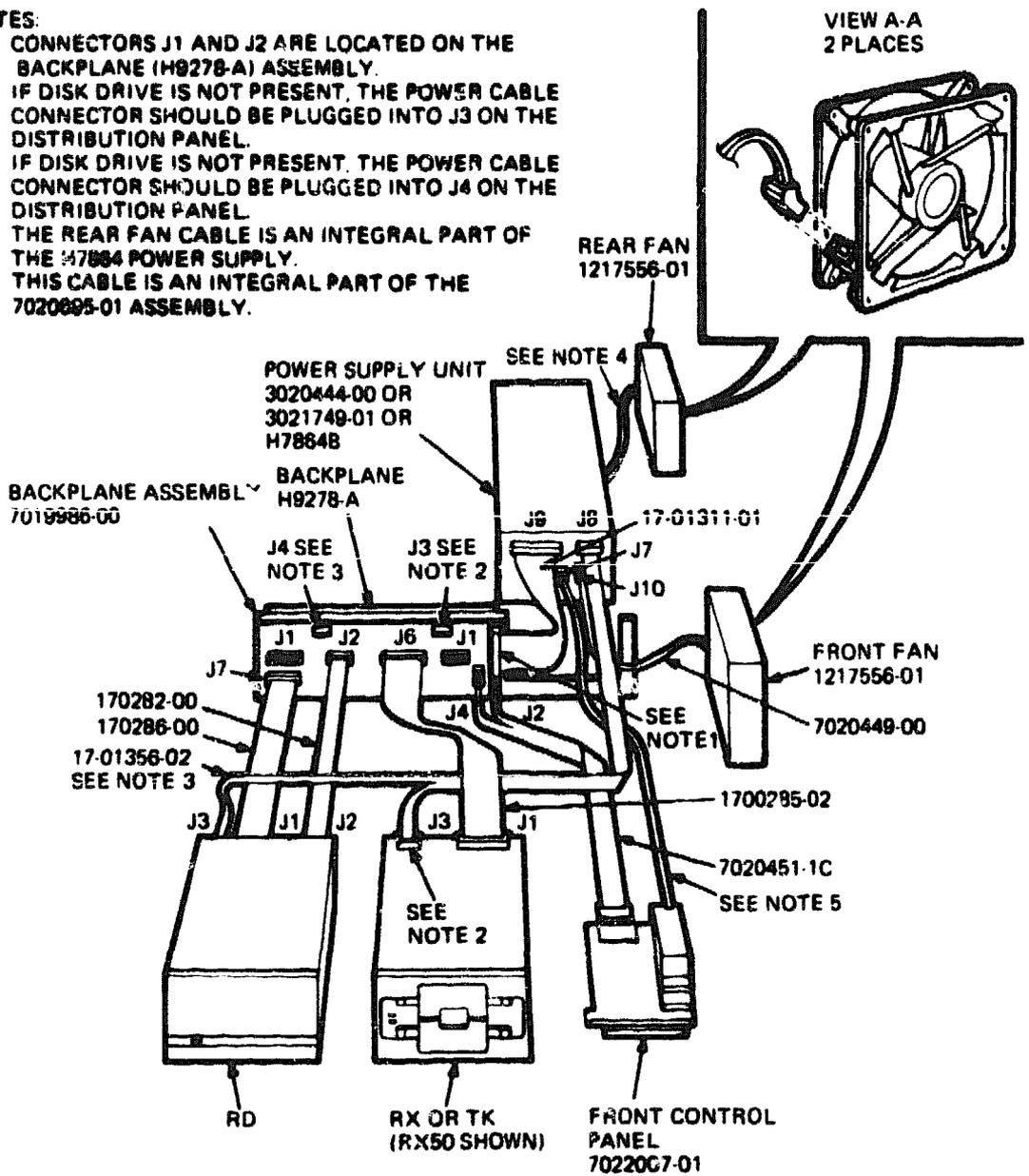
| <b>FRU</b>                                 | <b>Part Number</b> |
|--|--------------------|
| Power supply <sup>1</sup>                  |                    |
| H7864                                      | 30-20444-00        |
| H7864A                                     | 30-21749-01        |
| H7864B                                     | H7864B             |
| AC power switch with cable to power supply | 70-20434-01        |
| Adapter plate                              | 74-28684-01        |
| Backplane assembly                         | 70-19986-00        |
| Backplane dc power cable                   | 17-01311-01        |
| Battery pack for CPU I/O insert            | 12-19245-01        |
| Control panel                              | 70-22007-01        |
| Control panel cable                        | 70-20451-1C        |
| CPU I/O insert                             | 54-16744-01        |
| DC fan (front or rear)                     | 12-17556-01        |
| DC fan power cable                         | 70-20449-00        |
| Front cover (floor/table)                  | 74-27559-01        |
| Front cover (rackmount)                    | 74-27561-01        |
| Grant card                                 | M9047              |
| I/O panel                                  | 70-19979-00        |
| LED cable (20-pin)                         | 17-00712-02        |
| Loopback connectors                        | 12-15336-00        |
| MicroVAX memory interconnect cable         | 17-00716-01        |
| Pedestal (base)                            | 74-27012-0         |
| Pedestal (enclosure)                       | 70-20469-01        |
| Q22-bus backplane                          | H9278-A            |
| RD50-series signal cable (20-wire)         | 17-00282-00        |
| RD50-series signal cable (34-wire)         | 17-00286-00        |
| Rackmount kit                              | 70-22025-01        |
| Rear cover                                 | 74-27560-01        |
| RX/RD power cable                          | 17-01356-02        |
| RX50 signal cable                          | 17-00285-02        |
| Signal distribution panel                  | 54-15633-00        |
| SLU cable (10-pin)                         | 17-00624-01        |
| TK50-to-TQK50 interconnect cable           | 70-22313-01        |

<sup>1</sup>When you replace a power supply, make sure the new unit has the same part number as the old unit.

**Figure 3-1: BA23 Enclosure FRUs**

**NOTES:**

1. CONNECTORS J1 AND J2 ARE LOCATED ON THE BACKPLANE (H9278-A) ASSEMBLY.
2. IF DISK DRIVE IS NOT PRESENT, THE POWER CABLE CONNECTOR SHOULD BE PLUGGED INTO J3 ON THE DISTRIBUTION PANEL.
3. IF DISK DRIVE IS NOT PRESENT, THE POWER CABLE CONNECTOR SHOULD BE PLUGGED INTO J4 ON THE DISTRIBUTION PANEL.
4. THE REAR FAN CABLE IS AN INTEGRAL PART OF THE H7884 POWER SUPPLY.
5. THIS CABLE IS AN INTEGRAL PART OF THE 7020695-01 ASSEMBLY.



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## 3.2 Modules

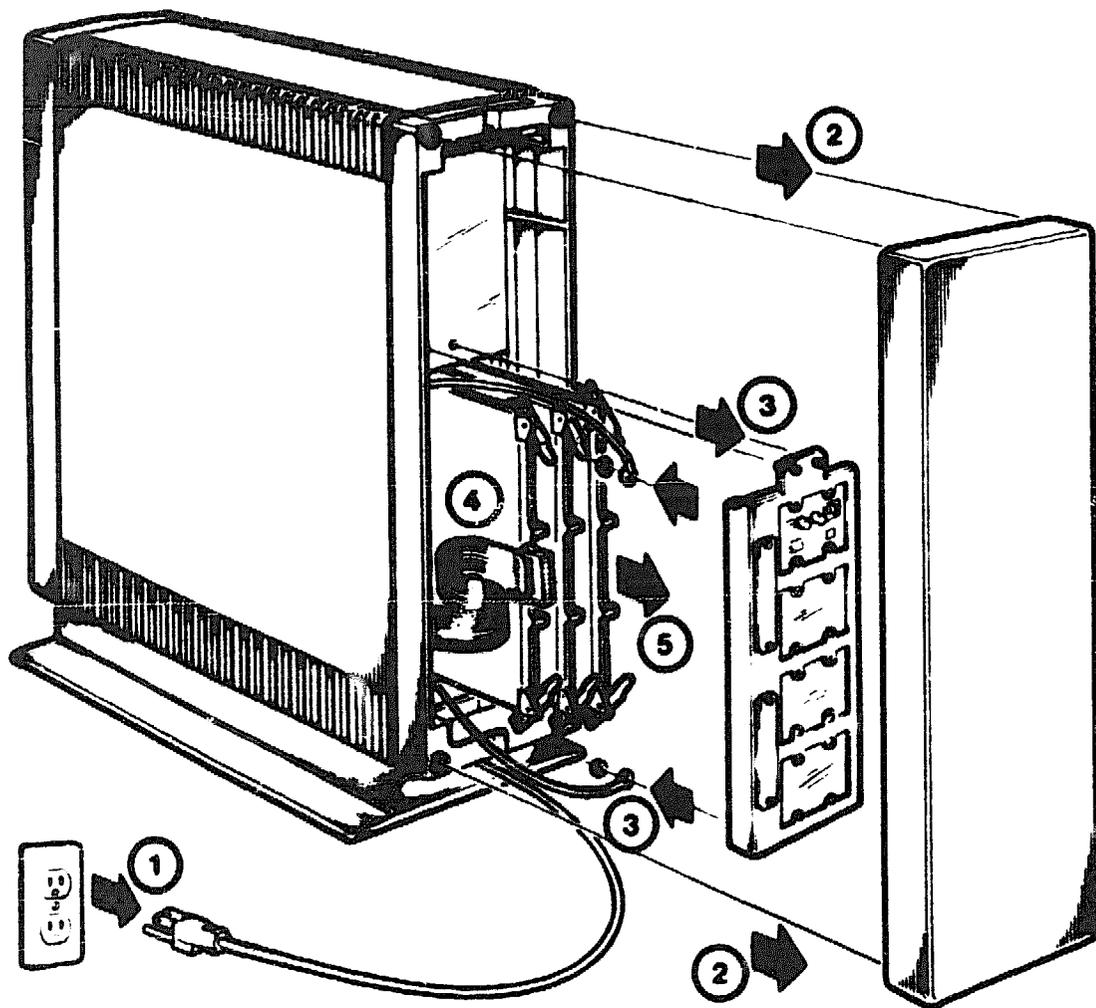
### CAUTION:

- *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit when working with modules.*
- *Remove and install modules carefully, to avoid damaging the modules or changing switch settings.*
- *New modules come wrapped in special antistatic packaging material, with a silica gel packet to prevent damage from moisture. Use both materials to protect any modules you store, transport, or return.*
- *Dual-height modules: If you use dual-height Q22-bus modules in slots 2 or 3 of the BA23 backplane, you must install them in the AB rows. If you do not install modules in these AB rows, you must install a grant continuity card in row A. You can install dual-height memory modules only in the CD rows of slots 2 and 3.*
- *If you install a dual-height module in slots 4 through 8, you must install:  
(1) a grant continuity card (M9407) in rows A or C of the same slot, or  
(2) a second dual-height module in the same slot.*

Use the following procedure to remove modules from the BA23 enclosure (Figure 3-2):

1. Turn off the system and unplug the ac power cord from the wall outlet.
2. Remove the rear cover. Label and disconnect all cables.
3. Loosen the two screws that hold the I/O panel in place. Swing the assembly open and remove the ground strap screws.
4. Note the orientation of the red stripe on each cable on the I/O panel. Label and disconnect the cables from the I/O panel.

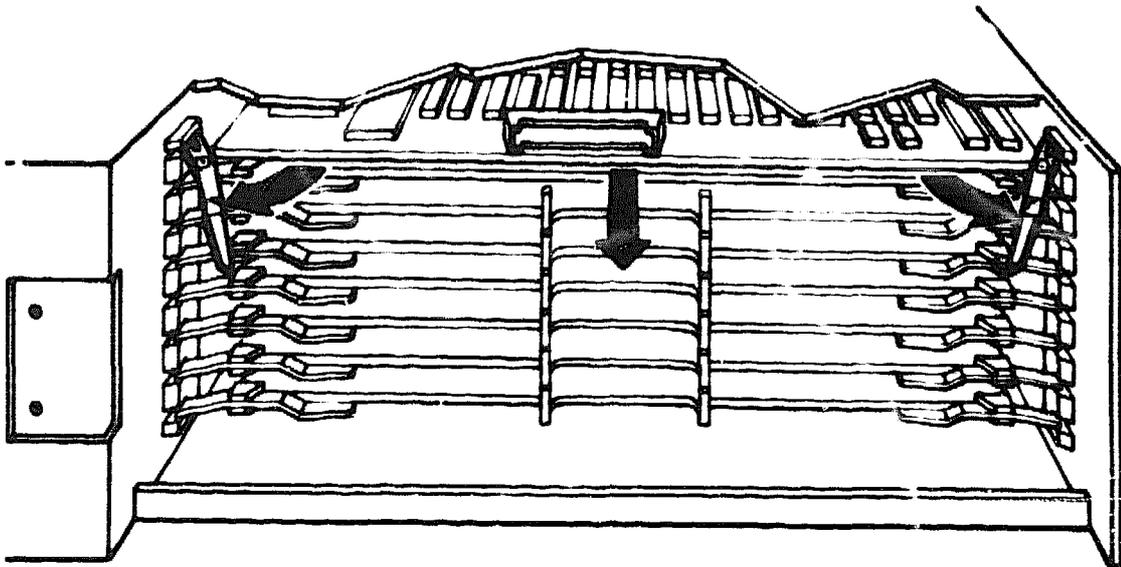
**Figure 3-2: Removing Modules**



MLO-000234

5. Unlock the module release levers by simultaneously pulling out the right and left levers (Figure 3-3).

**Figure 3-3: Releasing the Ejector Levers**



MLO-000235

6. Slide the module partially out of the backplane. Note the orientation of the red stripe on any cable connected to the module. Label and disconnect any cables from the module.
7. Note the module's location in the backplane, then remove the module.

Use the following procedure to install modules:

1. Make sure you correctly set any jumpers and switches on a new module. Compare the settings to the old module or refer to the user's or installation guide supplied with the new module.
2. Reverse steps 1 through 6 of the removal procedure.
3. Retest the system to confirm that the system is working correctly.

### **3.3 Control Panel**

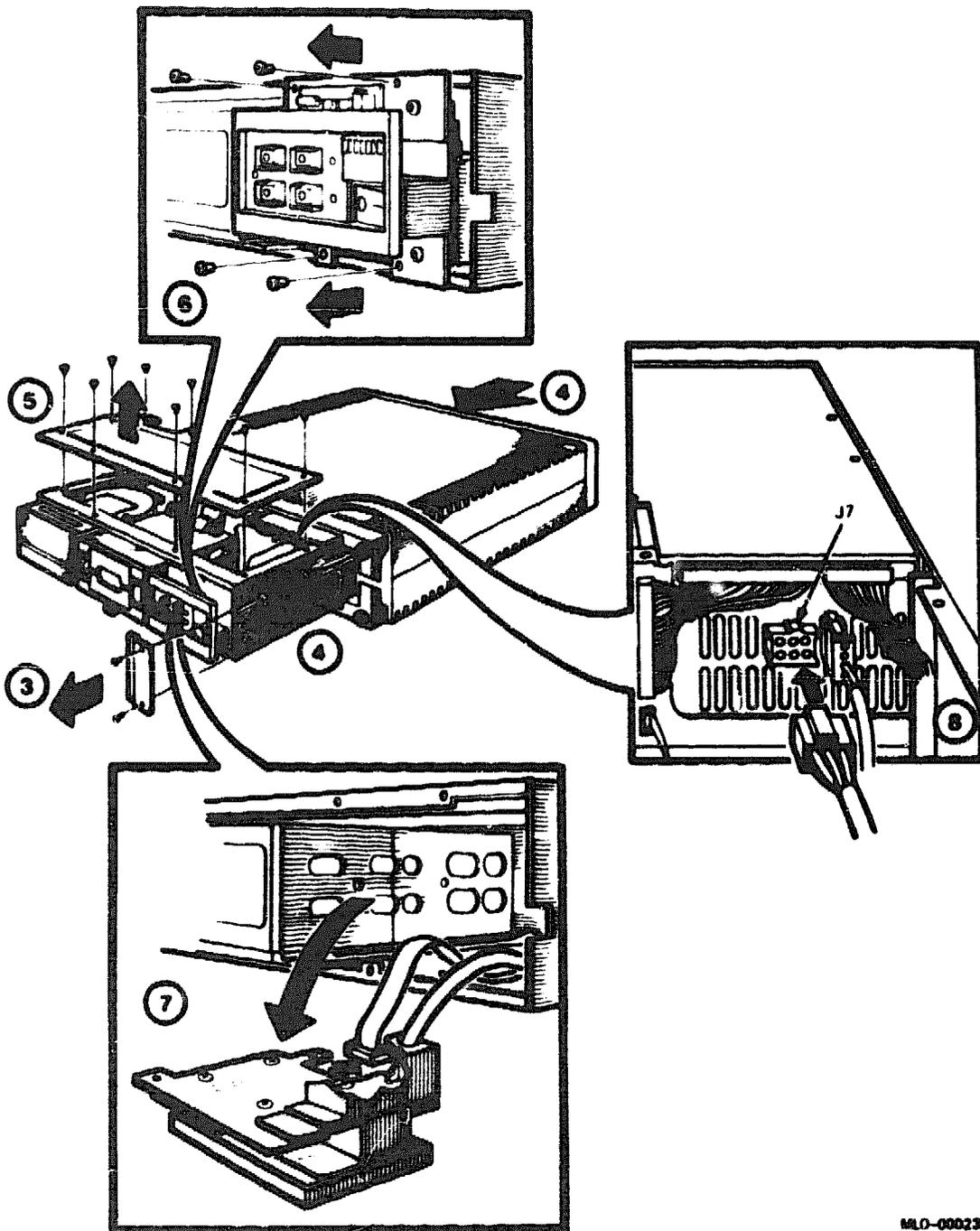
Remove the control panel as follows:

1. Turn off the system and unplug the ac power cord from the wall outlet.
2. Remove the front plastic cover by holding each end and pulling the cover away from the system.

Refer to Figure 3-4 for steps 3 through 8.

3. Remove the front retaining bracket.
4. Push the BA23 frame forward.

**Figure 3-4: Accessing the Control Panel**



MLO-000238

5. Remove the storage cover.
6. Remove the four screws on the control panel assembly.
7. Disconnect the Berg connector from the control panel.
8. Disconnect the power supply connector from J7 on the power supply.

### **Installation Note**

After installing a control panel, make sure the LTC switch and the restart enable switch on the control panel's printed circuit board are in the out position.

## **3.4 Mass Storage Devices**

Use the procedures in Sections 3.4.1 through 3.4.3 to remove drives and interconnect cables.

### **3.4.1 RX- and TK-Series Drives**

Remove an RX-series diskette drive or TK-series tape drive as follows:

#### **CAUTION:**

- *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit when working with mass storage devices.*
- *RX- and TK-series drives are single FRUs. Do not try to take them apart or remove their printed circuit boards. You must use special test equipment to make any drive adjustments.*
- *Do not turn off the system with a TK-series cartridge in place. Never put your hands or other objects in the cartridge opening.*

1. Turn off the system and unplug the ac power cord from the wall outlet. Remove the front and rear covers.

Refer to Figure 3-5 for steps 2 through 6. The figure shows an RX50 drive.

2. Remove the front retaining bracket.
3. Push the BA23 frame forward.
4. Remove the storage cover.
5. Disconnect the signal cable and dc power cable from the drive by pulling straight up on the connectors.
6. Push down on the release tab, slide the drive forward, and remove.

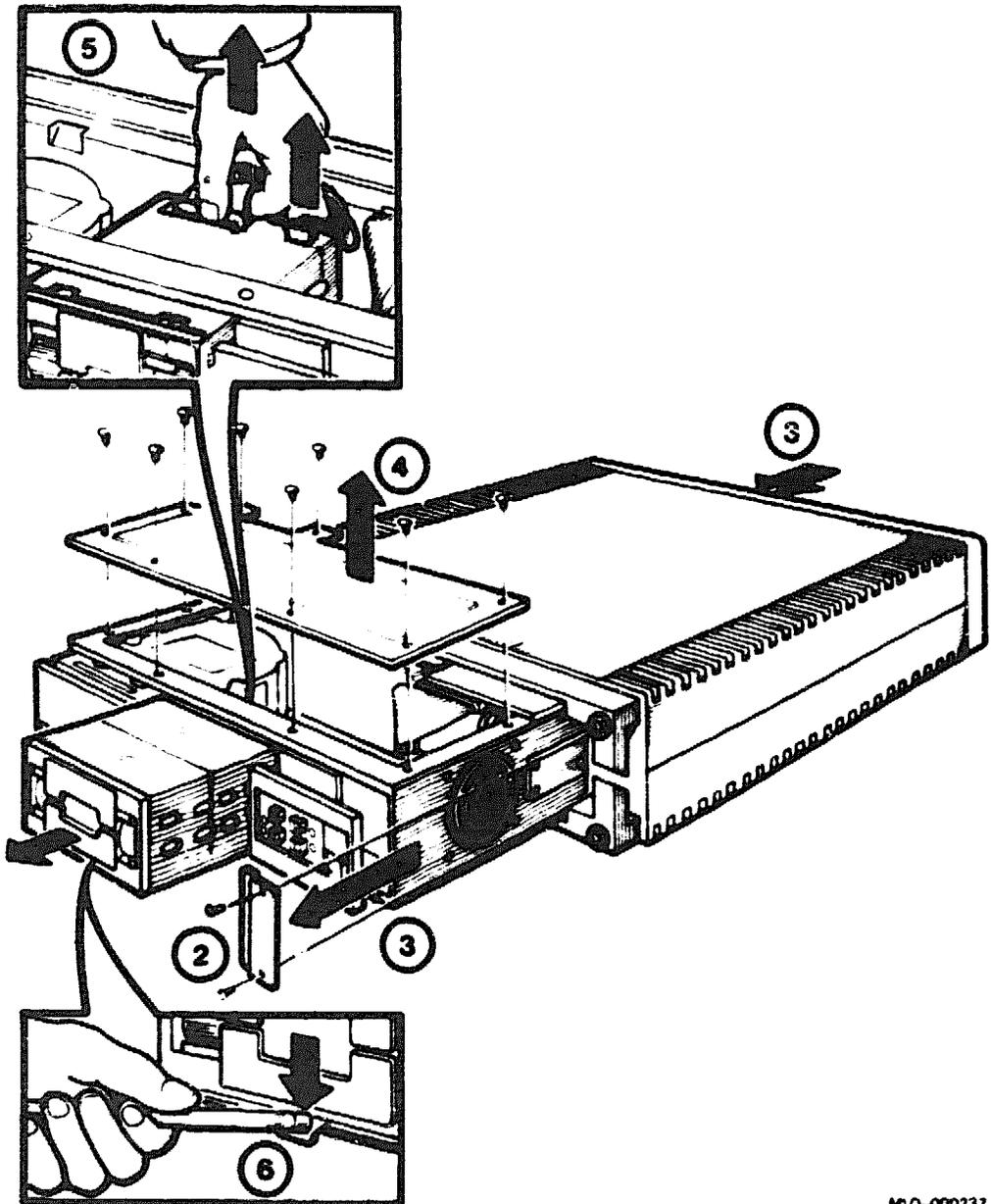
### **RX-Series Installation Note**

Remove the cardboard shipping insert from a newly installed RX50 drive. Before returning a defective drive, install the shipping insert.

### **TK-Series Installation Note**

If the BA23 did not have a TK-series drive before, make sure you install the new access door shipped with the drive. Do not use the access door that came with the enclosure.

**Figure 3-5: Accessing the Diskette or Tape Drive**



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## 3.4.2 RD-Series Fixed-Disk Drives

Remove an RD-series fixed-disk drive as follows:

### CAUTION:

- *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit when working with mass storage devices.*
- *Handle any fixed-disk drive with care. Dropping or bumping the drive can damage the disk surface.*

1. Remove both covers. Unplug the ac power cord from the wall outlet.

Refer to Figure 3-6 for steps 2 through 6. The figure shows an RD51 drive.

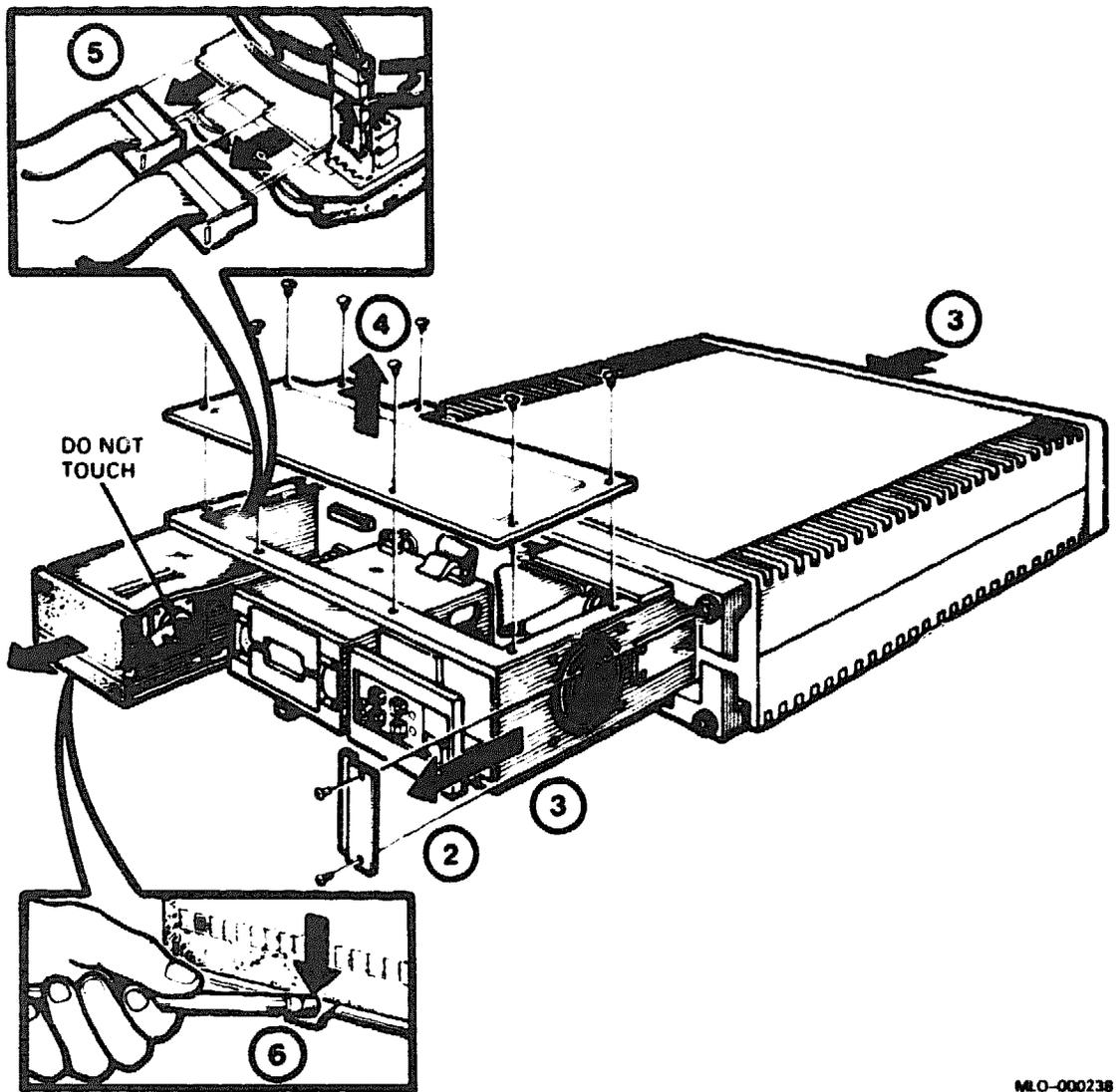
2. Remove the front retaining bracket.
3. Push the BA23 frame forward.
4. Remove the storage cover.

**CAUTION:** *Do not touch the exposed head positioner flag on the front right side of the RD51 fixed-disk drive. Doing so can cause the head positioner flag to rotate, resulting in damage to the drive.*

5. Remove the power plug and two ribbon cables from the RD-series drive.
6. Push down on the release tab, then slide the drive forward and remove.
7. If you are returning a drive, pack the drive in the replacement disk drive's shipping carton. If you do not have the shipping carton, you can order one from DIGITAL.

See *Microsystems Options* for procedures on removing mass storage device FRUs.

**Figure 3-6: Removing a Disk Drive (Example)**



MLO-000238

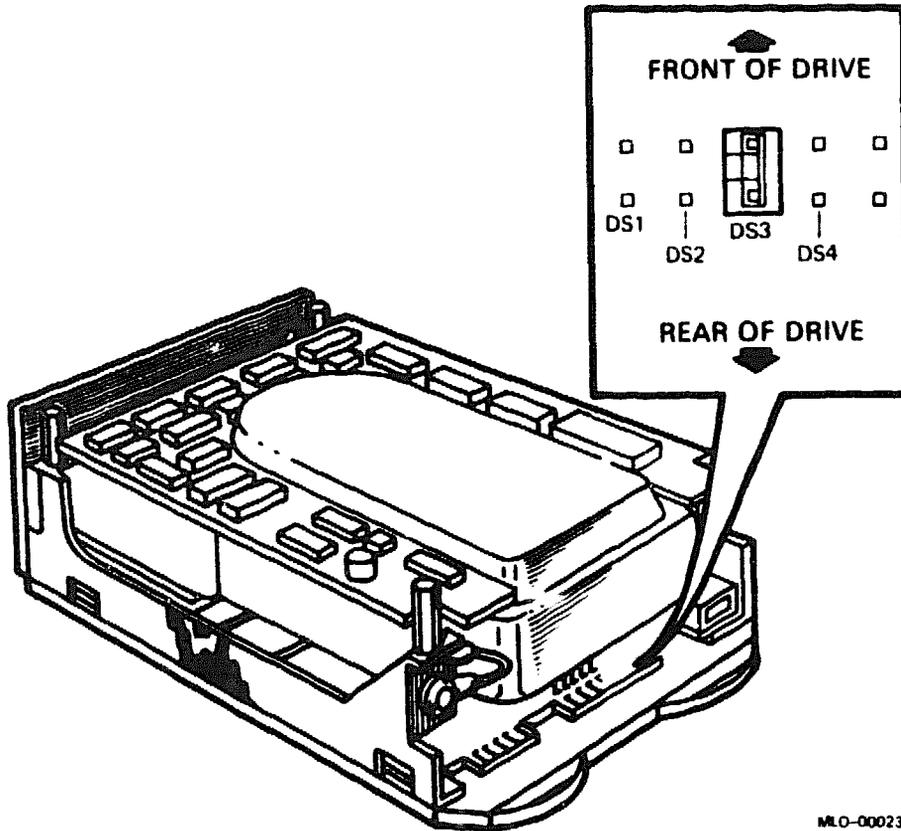
### **Installation Notes**

You must format a newly installed RD-series drive before you test the system and use the drive. You have to format a fixed-disk drive only when you replace a complete drive assembly.

Before you format a drive, write-protect any other RD-series drives in the system. Remember to write-enable these drives when formatting is complete.

To configure an RD-series drive as DU0 or DUA0, make sure the jumper clip is set at DS3. Figure 3-7 shows the jumper clip on an RD52 drive.

**Figure 3-7: RD-Series Jumper Clip (Example)**



MLO-000239

### 3.4.3 Interconnect Cables for Mass Storage Devices

The TK-series tape drive has an interconnect cable that runs to the TQK controller module. RD- and RX-series disk drives have an interconnect cable that runs to the RQDX controller module.

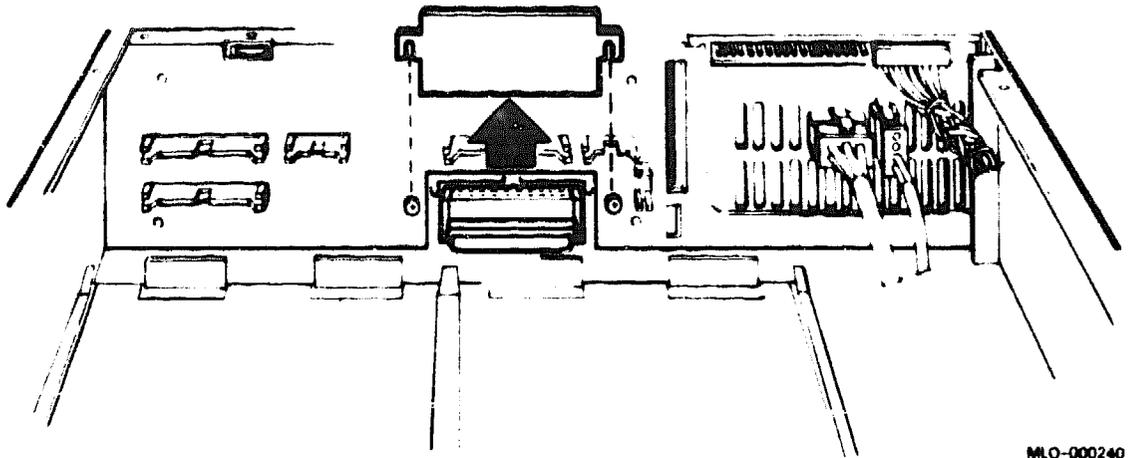
These interconnect cables are routed through the access door area on the signal distribution panel, and under the modules in the card cage.

After you remove the drive(s) from the BA23 enclosure, remove the interconnect cable(s) as follows:

1. Release the TQK interconnect cable from the wire tie that holds the cable to the access door on the signal distribution panel.

2. Remove the two screws that hold the access door to the signal distribution panel. Remove the access door (Figure 3-8).

**Figure 3-8: Removing the Access Door**



3. Disconnect the RQDX interconnect cable behind the access door opening. Move the cable to the side, to provide working room.
4. Remove the module (if any) in slot 8 of the backplane.
5. Pull the interconnect cable(s) from the rear of the enclosure through the access door opening, backplane, and card cage.

### **Installation Notes**

Push the cable through from the front of the enclosure to the rear.

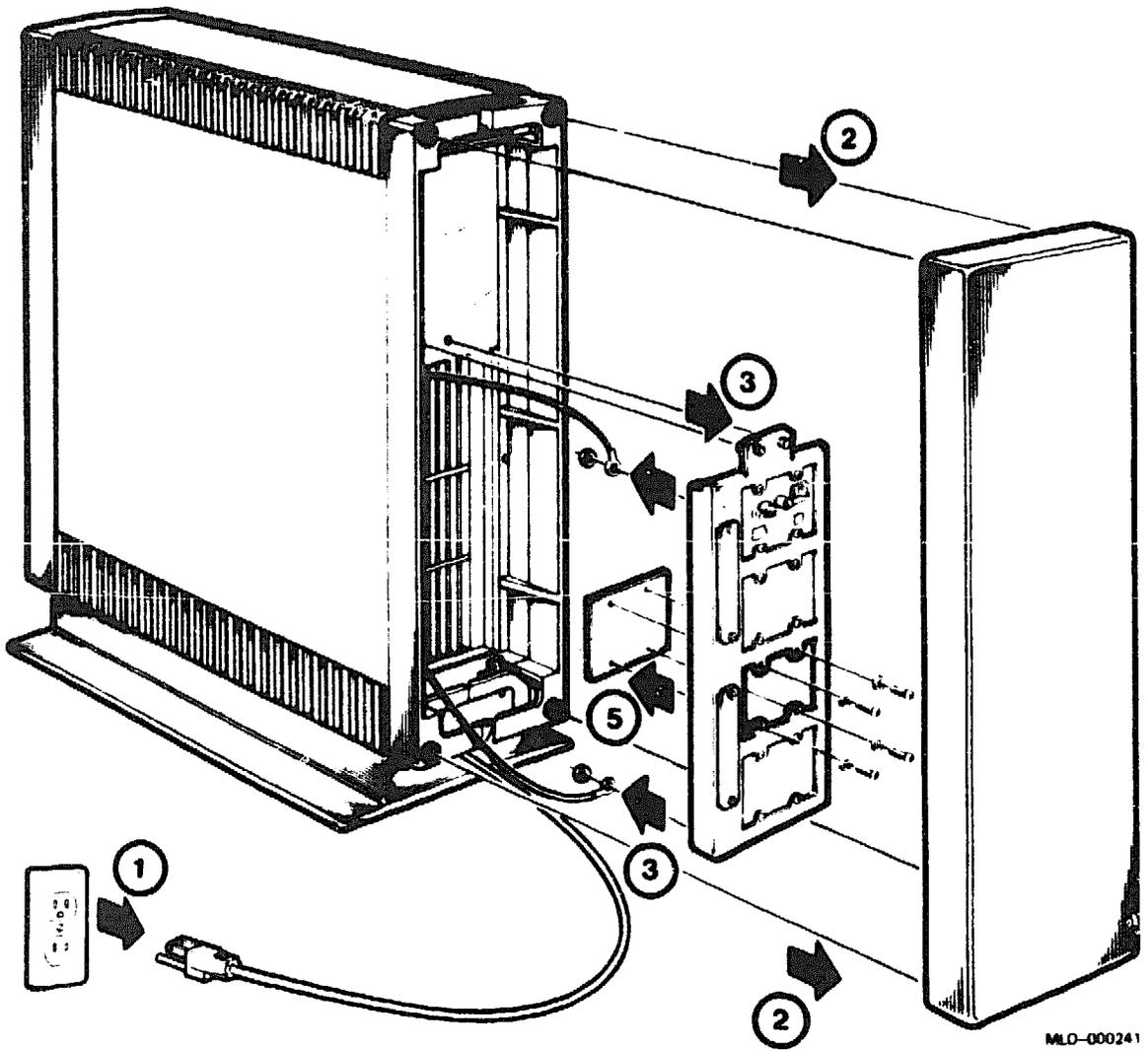
The TQK interconnect cable has a "THIS SIDE UP" marking on one side. Make sure the striped side of the cable is nearest the front fan in the enclosure.

## **3.5 CPU I/O Insert**

Remove the CPU I/O insert as follows (refer to Figure 3-9 for steps 1 through 5):

1. Turn off the system and unplug the ac power cord from the wall outlet.
2. Remove the rear cover. Label and disconnect all external cables connected to the CPU I/O insert.
3. Loosen the two screws that hold the I/O panel in place. Swing the I/O panel open and remove the ground strap screws.
4. Note the orientation of the red stripe on each internal cable connected to the CPU I/O insert. Disconnect the cables from the CPU I/O insert.
5. Remove the screws that hold the CPU I/O insert to the I/O panel. Remove the CPU I/O insert, using the example of a type-B insert removal shown in Figure 3-9.

**Figure 3-9: Removing the CPU I/O Insert**



## **3.6 Backplane Assembly**

Remove the backplane assembly as follows (Figures 3-10 through 3-13):

1. Turn off the system and unplug the ac power cord from the wall outlet.

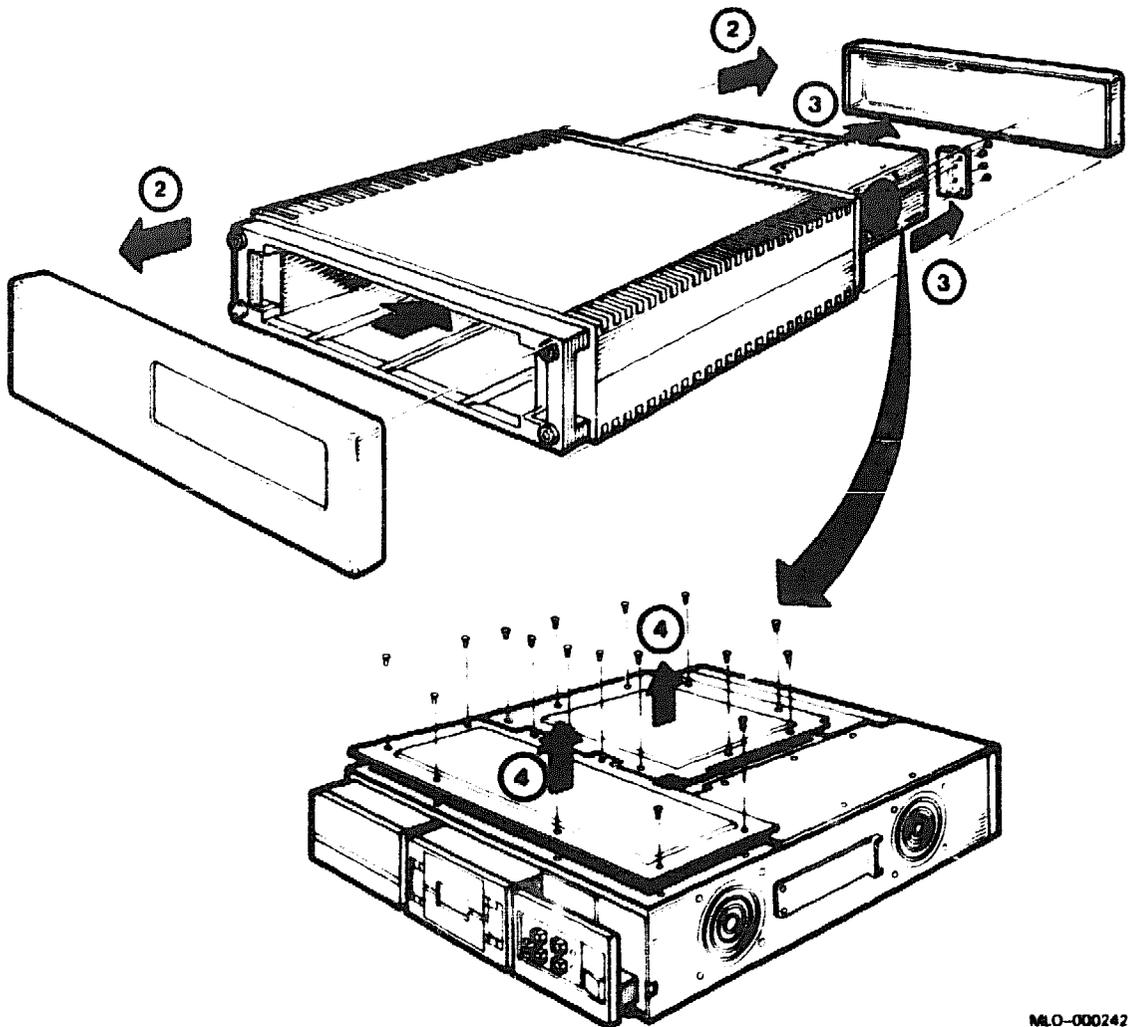
Refer to Figure 3-10 for steps 2 through 4.

2. Remove the front and rear covers. Disconnect and label all cables.
3. Remove the rear retaining bracket and slide the BA23 frame completely out.
4. Remove both the storage cover and the logic cover.

On older systems (Figure 3-10), the logic cover has eight screws and does not extend to the frame at the rear.

On newer systems, the logic cover has four screws and extends to the frame at the rear. The logic cover slides onto the frame by means of two tabs.

**Figure 3-10: Removing the Retaining Bracket and Covers**



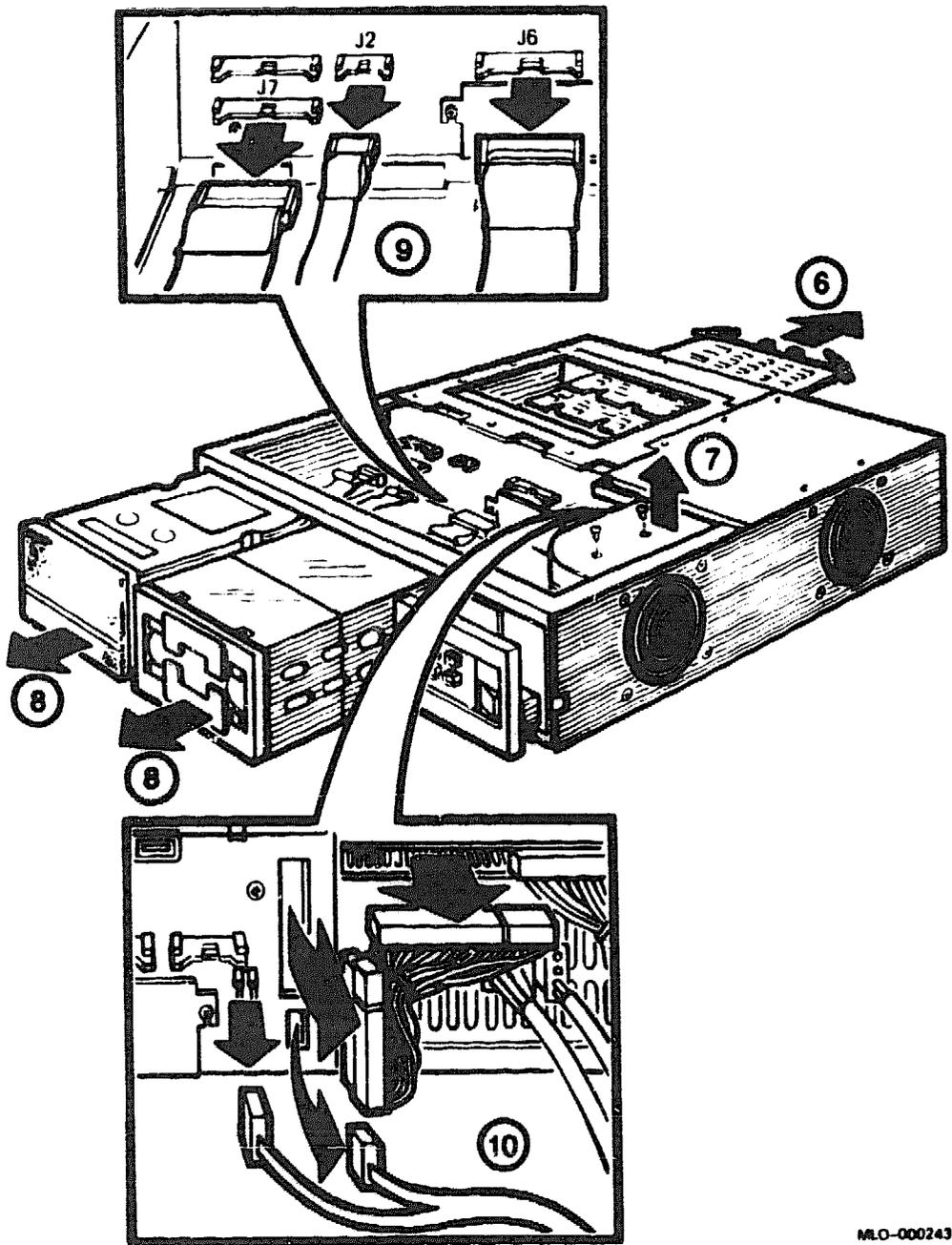
MLO-000242

5. Open the rear I/O panel by loosening the two captive screws. Refer to Figure 3-9, step 3. Note the orientation of the red stripe on any cables connected to the panel. Label and disconnect the cables.

Refer to Figure 3-11 for steps 6 through 10.

6. Note the location of all modules, then remove them.
7. On some systems, remove the baffle from the front fan.
8. Remove any mass storage devices. See Section 3.4.
9. Remove the RX- and RD-series signal cables from J6, J2, and J7 on the signal distribution panel.
10. Remove all power supply connectors and front control panel connectors from J1, J4, and J2 on the signal distribution panel, and from J9 on the power supply.

**Figure 3-11: Accessing the Backplane**

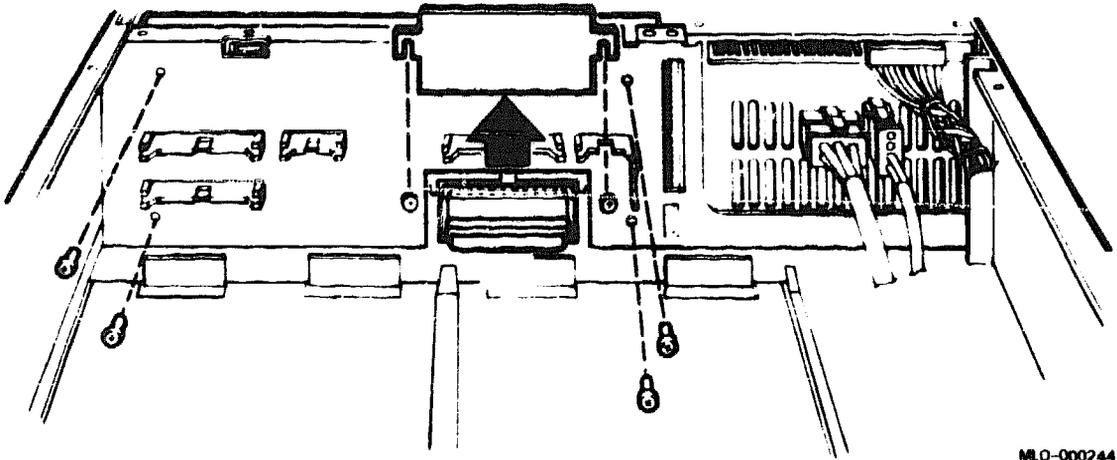


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Refer to Figure 3-12 for steps 11 and 12.

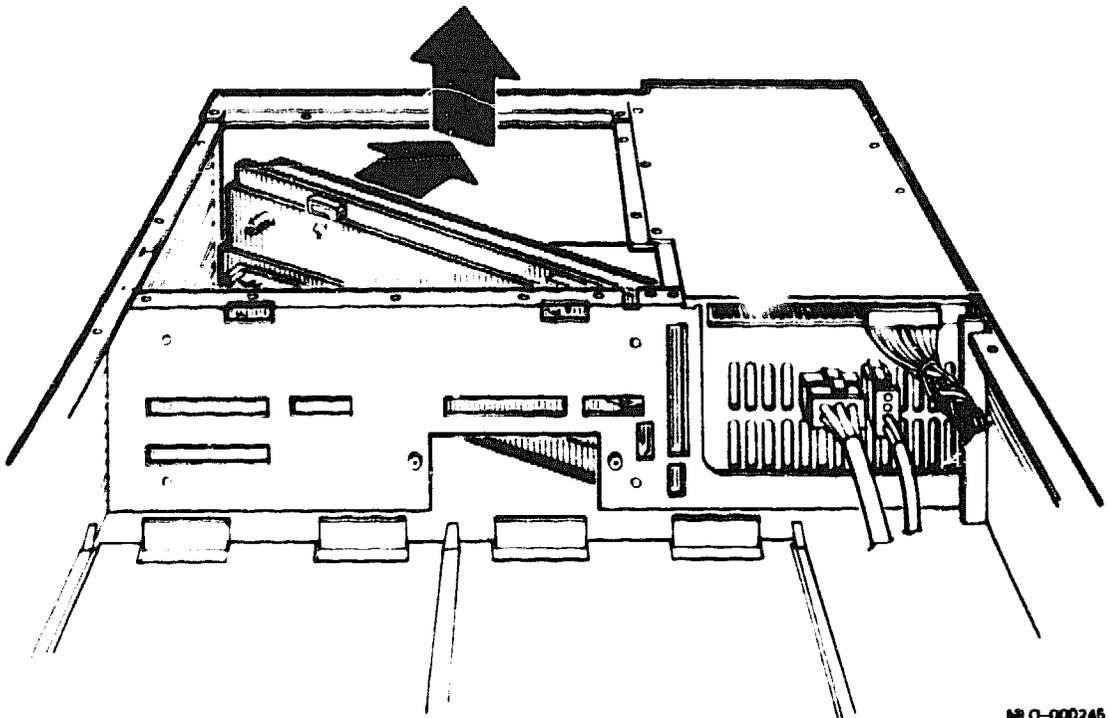
11. Loosen the two screws on the access door. Remove the access door and disconnect the cable(s) from the backplane.
12. Remove the four screws that hold the backplane in place.

**Figure 3-12: Removing the Backplane Screws**



13. Pivot the left side (CD rows) of the backplane assembly 45 degrees toward the rear, then lift the backplane straight up (Figure 3-13).

**Figure 3-13: Removing the Backplane**



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### **3.7 Power Supply**

The power supply does not have any replaceable printed circuit boards. You cannot adjust the power supply. The +5 Vdc and +12 Vdc regulators are fixed.

When you replace the power supply, make sure the new unit has the same part number as the old unit (Table 3-1).

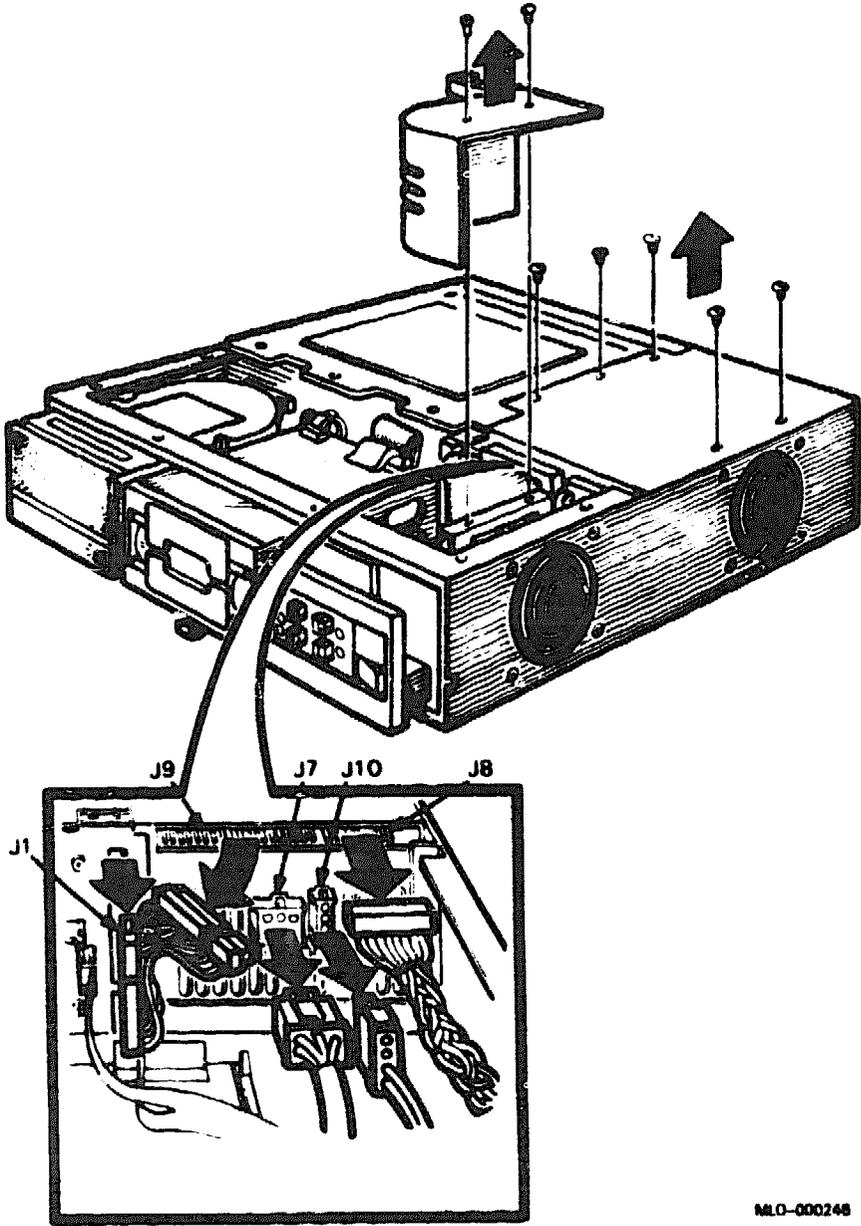
Remove the power supply as follows (refer to Figure 3-14 for cable locations):

1. Turn off the system and unplug the ac power cord from the wall outlet.
2. Remove the front and rear covers, the retaining bracket, and the mass storage cover using the procedure in Section 3.6, steps 2 through 4.

Refer to Figure 3-14 for steps 3 through 7.

3. On some systems, remove the fan baffle and baffle holder from the front fan.
4. Disconnect the backplane's power cable from J9 on the power supply and J1 on the signal distribution panel.
5. Disconnect the mass storage power cable from J8 on the power supply.
6. Disconnect the front fan's power cable from J10 on the power supply. Disconnect the control panel's power cable from J7. Both connectors are keyed and have a locking assembly.
7. Remove the five screws holding the power supply to the BA23.

**Figure 3-14: Power Supply Cables**

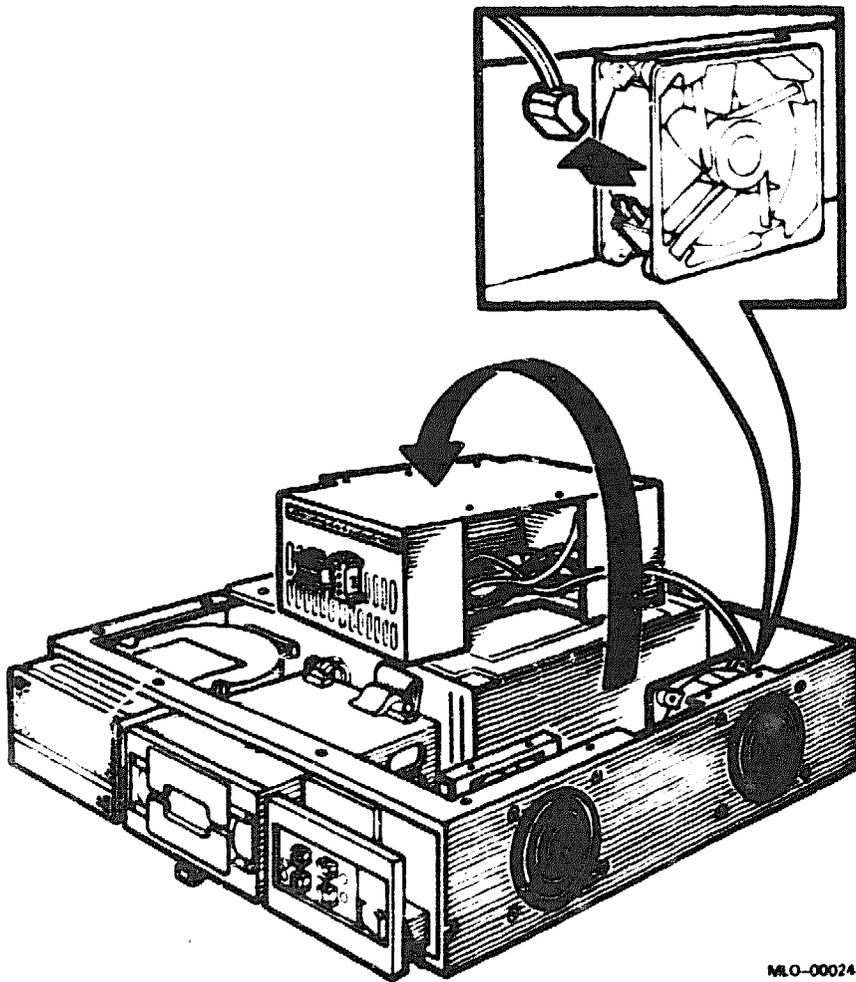


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Refer to Figure 3-15 for steps 8 and 9.

8. Lift the power supply assembly out of the BA23 and place it on top of the card cage.
9. Disconnect the power connector from the rear fan.

**Figure 3-15: Removing the Power Supply**



MLG-000247

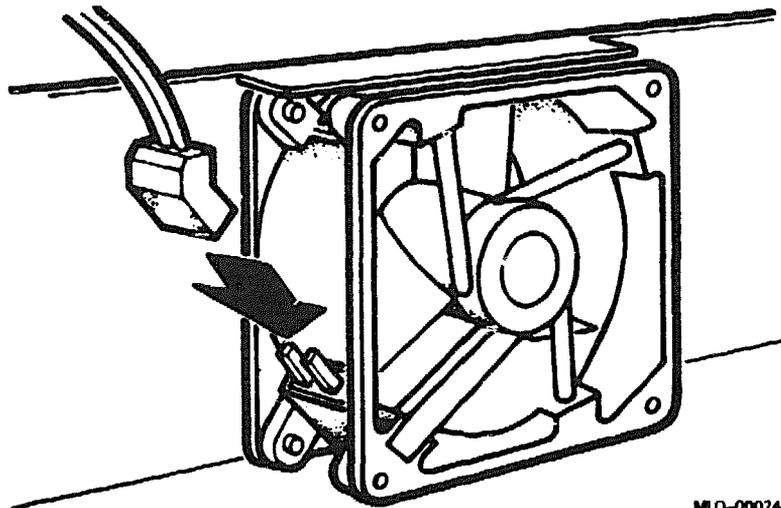
## Installation

Install the power supply as follows:

1. Place the new power supply on top of the card cage. Connect the rear fan's power cable.

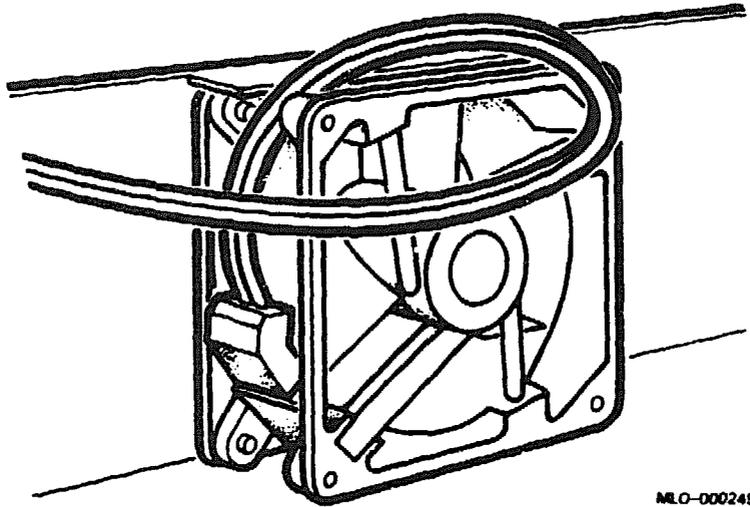
**CAUTION:** *The rear fan's power cable is not keyed. Make sure the curve of the connector matches the curve of the fan housing (Figure 3-16).*

**Figure 3-16: Fan Housing Connection**



2. Place the power supply in position. Make sure you route the rear fan cable over the top of the rear fan (Figure 3-17).
3. To complete the installation, reverse steps 1 through 8 of the removal procedure.

**Figure 3-17: Rear Fan Cable Position**



### **3.8 Rear Fan**

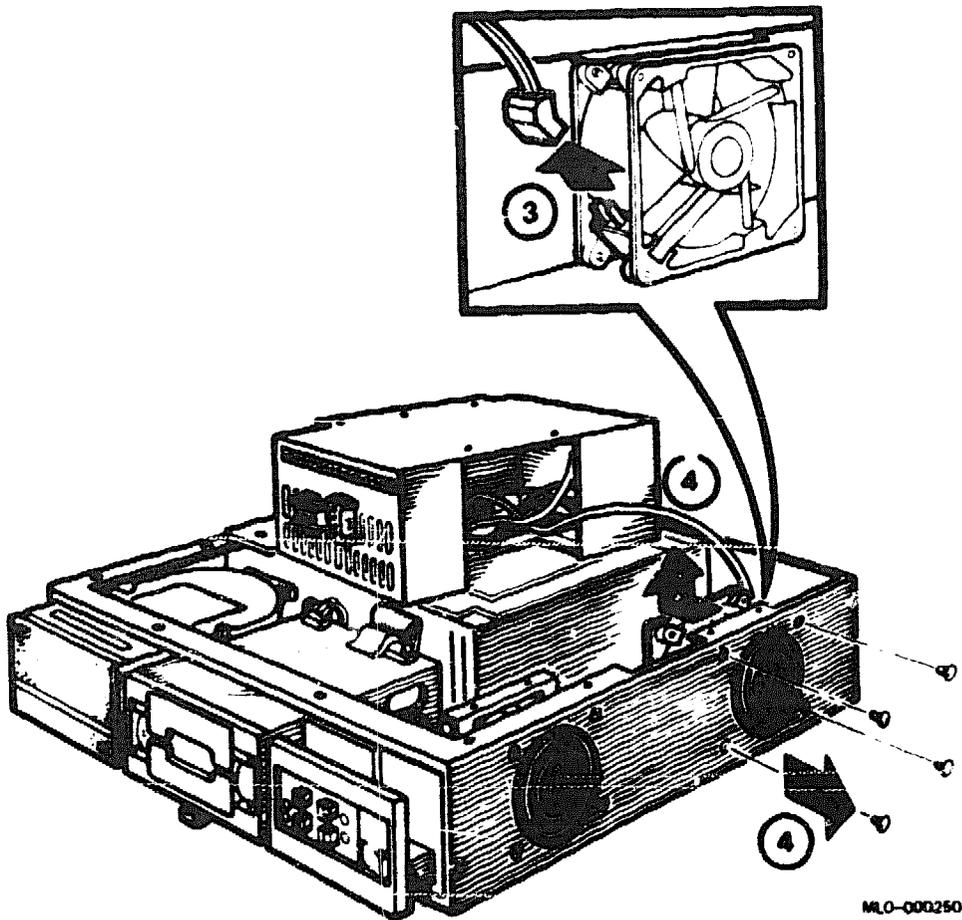
Remove the rear fan as follows:

- 1. Turn off the system and unplug the ac power cord from the wall outlet.**
- 2. Refer to Figure 3-10, steps 2 and 3. Remove the front and rear covers. Label and disconnect all cables. Remove the rear retaining bracket and slide the BA23 frame out of the rear of the enclosure.**

Refer to Figure 3-18 for steps 3 and 4.

- 3. Remove the power supply and disconnect the rear fan power connector (Section 3.7).**
- 4. Remove the four screws and spacers that hold the fan to the BA23. Remove the fan.**

**Figure 3-18: Removing the Rear Fan**



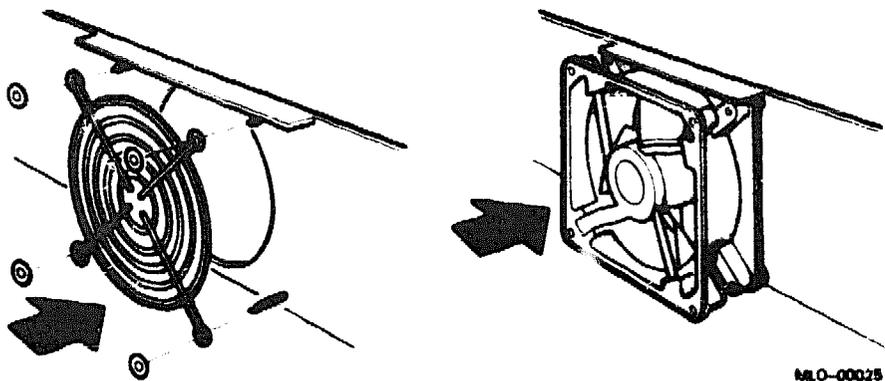
MLO-000250

### **Installation**

Install the rear fan as follows (refer to Figure 3-19 for steps 1 and 2):

1. Align the fan guard to the screw holes. Insert the screws. Make sure the cross members of the fan guard face the inside of the unit, as shown. Place the spacers on the screws.
2. Align the fan by placing the screw holes over the spacers. Tighten the screws. Make sure the fan is oriented as shown. The fan must draw air away from the power supply.
3. To complete the installation, reverse steps 1 through 3 of the removal procedure.

**Figure 3–19: Installing the Rear Fan**



### **3.9 Front Fan**

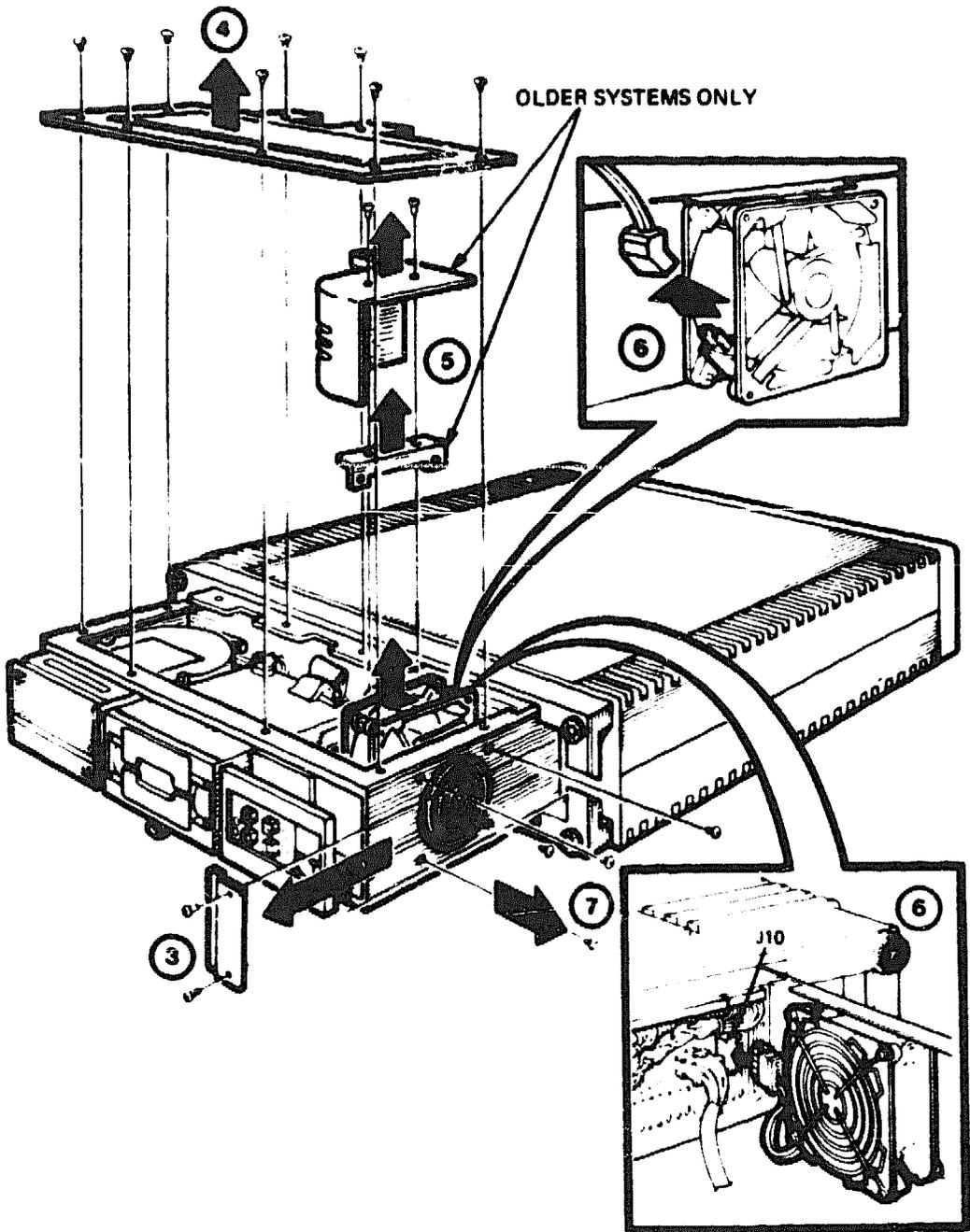
Remove the front fan as follows:

1. Turn off the system and unplug the ac power cord from the wall outlet.
2. Remove the front cover.

Refer to Figure 3–20 for steps 3 through 7.

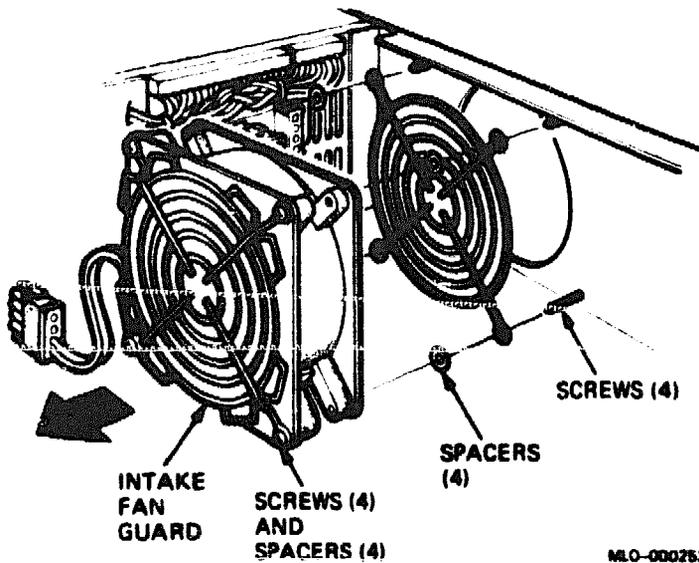
3. Remove the front retaining bracket and push the BA23 frame forward.
4. Remove the storage cover.
5. On some systems, remove the fan baffle and the baffle mounting from the front fan.
6. Disconnect the front fan power cord from J10 on the power supply and from the fan.
7. Remove the four screws (with spacers) that hold the fan and fan guard in place.
8. Remove the fan (Figure 3–21).

**Figure 3-20: Accessing the Front Fan**



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**Figure 3-21: Removing the Front Fan**



### **Installation**

Install the front fan as follows:

1. Remove the power cable and intake fan guard from the old fan for use on the new fan.

**CAUTION:** *The front fan's power cable is not keyed. Make sure the curve of the connector matches the curve of the fan housing, as shown in figure 3-20, step 5.*

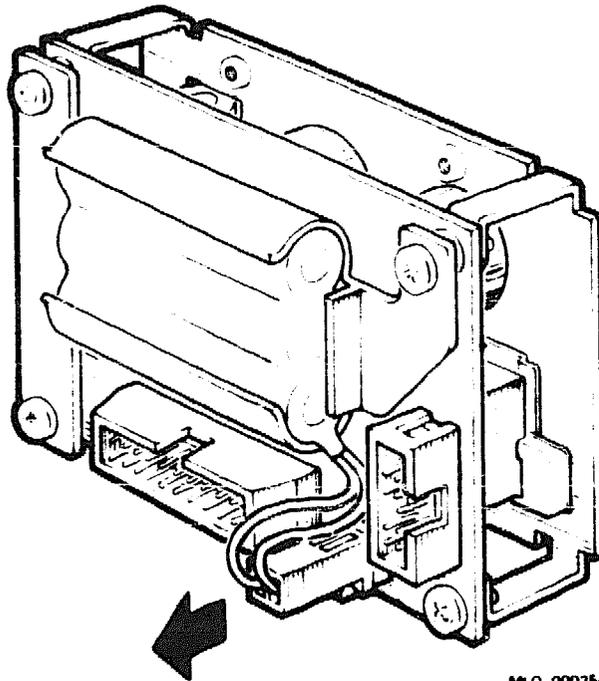
2. Assemble the components in the order shown in Figure 3-21, from left to right: the four screws, four spacers, the intake fan guard you removed from the old fan, four spacers, the inside fan guard, then four screws.
3. Attach the complete fan assembly to the BA23 frame, using the order and orientation shown in Figure 3-21. The fan must draw air away from the mass storage area.

### 3.10 MicroVAX Battery Backup Unit (BBU)

Remove the battery backup unit (BBU) for the time-of-year clock in MicroVAX systems as follows:

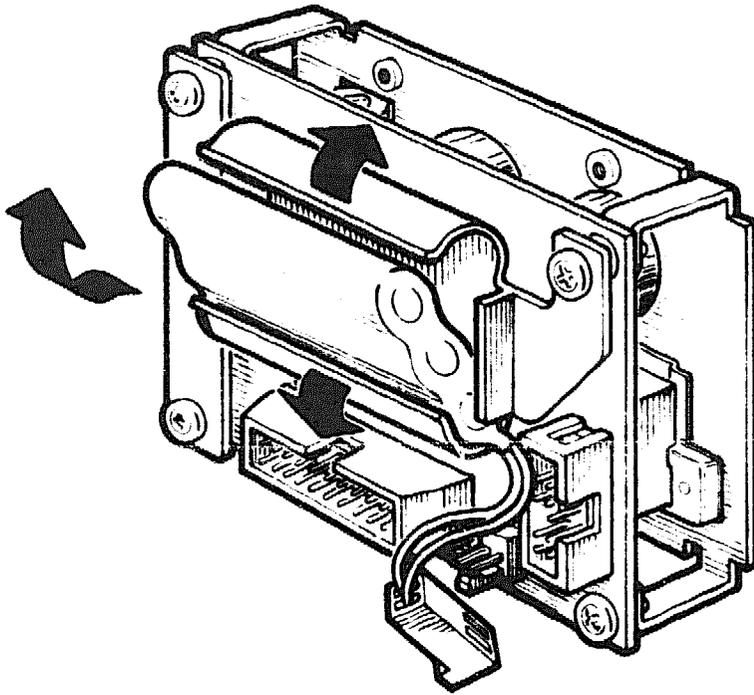
1. Perform steps 1 through 4 in Section 3.5 to access the rear of the CPU I/O insert.
2. Disconnect the BBU cable from the CPU I/O insert (Figure 3-22).

**Figure 3-22: Disconnecting the Battery Backup Unit**



3. Carefully spread the plastic BBU holder and pop out the battery backup unit (Figure 3-23).

**Figure 3-23: Removing the Battery Backup Unit**



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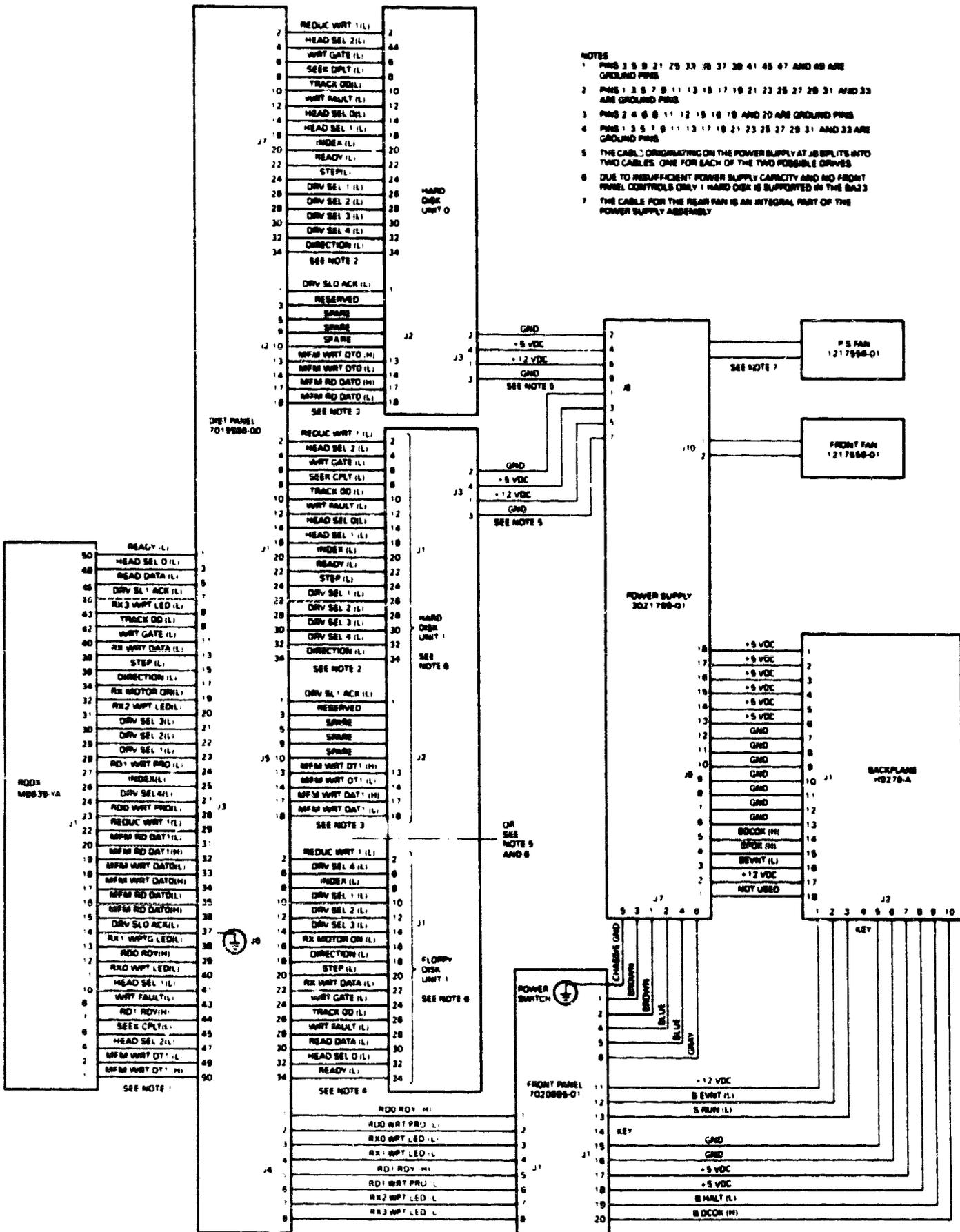
## Appendix A

# BA23 System Interconnection Pinouts

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Figure A-1 shows the system interconnection pinouts for the BA23 enclosure.

**Figure A-1: BA23 System Interconnection Pinouts**





## Appendix B

# Related Documentation

The following documents contain information relating to MicroVAX or MicroPDP-11 systems.

| Document Title                                  | Order Number |
|---|--------------|
| <b>Modules</b>                                  |              |
| CXA16 Technical Manual                          | EK-CAB16-TM  |
| CXY08 Technical Manual                          | EK-CXY08-TM  |
| DEQNA Ethernet User's Guide                     | EK-DEQNA-UG  |
| DHV11 Technical Manual                          | EK-DHV11-TM  |
| DLV11-J User's Guide                            | EK-DLV1J-UG  |
| DMV11 Synchronous Controller Technical Manual   | EK-DMV11-TM  |
| DMV11 Synchronous Controller User's Guide       | EK-DMV11-UG  |
| DPV11 Synchronous Controller Technical Manual   | EK-DPV11-TM  |
| DPV11 Synchronous Controller User's Guide       | EK-DPV11-UG  |
| DRV11-J Interface User's Manual                 | EK-DRV1J-UG  |
| DRV11-WA General Purpose DMA User's Guide       | EK-DRVWA-UG  |
| DZQ11 Asynchronous Multiplexer Technical Manual | EK-DZQ11-TM  |
| DZQ11 Asynchronous Multiplexer User's Guide     | EK-DZQ11-UG  |
| DZV11 Asynchronous Multiplexer Technical Manual | EK-DZV11-TM  |
| DZV11 Asynchronous Multiplexer User's Guide     | EK-DZV11-UG  |
| IEU11-A/IEQ11-A User's Guide                    | EK-IEUQ1-UG  |
| KA630-AA CPU Module User's Guide                | EK-KA630-UG  |
| KA640-AA CPU Module User's Guide                | EK-KA640-UG  |
| KA650-AA CPU Module User's Guide                | EK-KA650-UG  |
| KDA50-Q CPU Module User's Guide                 | EK-KDA5Q-UG  |
| KDJ11-B CPU Module User's Guide                 | EK-KDJ1B-UG  |
| KDJ11-D/S CPU Module User's Guide               | EK-KDJ1D-UG  |
| KDF11-BA User's Guide                           | EK-KDFEB-UG  |

| <b>Document Title</b>   | <b>Order Number</b> |
|---|---------------------|
| <b>Modules</b>  |                     |
| KMV11 Programmable Communications Controller User's Guide     | EK-KMV11-UG         |
| KMV11 Programmable Communications Controller Technical Manual | EK-KMV11-TM         |
| LSI-11 Analog System User's Guide                             | EK-AXV11-UG         |
| Q-Bus DMA Analog System User's Guide                          | EK-AV11D-UG         |
| RQDX2 Controller Module User's Guide                          | EK-RQDX2-UG         |
| RQDX3 Controller Module User's Guide                          | EK-RQDX3-UG         |
| <b>Disk and Tape Drives</b>                                   |                     |
| RA60 Disk Drive Service Manual                                | EK-ORA60-SV         |
| RA60 Disk Drive User's Guide                                  | EK-ORA60-UG         |
| RA81 Disk Drive Service Manual                                | EK-ORA81-SV         |
| RA81 Disk Drive User's Guide                                  | EK-ORA81-UG         |
| SA482 Storage Array User's Guide (for RA82)                   | EK-SA482-UG         |
| SA482 Storage Array Service Manual (for RA82)                 | EK-SA482-SV         |
| RC25 Disk Subsystem User's Guide                              | EK-ORC25-UG         |
| RC25 Disk Subsystem Pocket Service Guide                      | EK-ORC25-PS         |
| RRD50 Subsystem Pocket Service Guide                          | EK-RRD50-PS         |
| RRD50 Digital Disk Drive User's Guide                         | EK-RRD50-UG         |
| RX33 Technical Description Manual                             | EK-RX33T-TM         |
| RX50-D, -R Dual Flexible Disk Drive Subsystem Owner's Manual  | EK-LEP01-OM         |
| TK50 Tape Drive Subsystem User's Guide                        | EK-LEP05-UG         |
| TS05 Tape Transport Pocket Service Guide                      | EK-TSV05-PS         |
| TS05 Tape Transport Subsystem Technical Manual                | EK-TSV05-TM         |
| TS05 Tape Transport System User's Guide                       | EK-TSV05-UG         |

| <b>Document Title</b>                                       | <b>Order Number</b> |
|---|---------------------|
| <b>Systems</b>  |                     |
| MicroPDP-11 Special Systems Maintenance                     | EK-182AA-MG         |
| MicroVAX Special Systems Maintenance                        | EK-181AA-MG         |
| 630QB Maintenance Print Set                                 | MP-02071-01         |
| 630QE Maintenance Print Set                                 | MP-02219-01         |
| 630QY Maintenance Print Set                                 | MP-02065-01         |
| 630QZ Maintenance Print Set                                 | MP-02068-01         |
| BA23 Enclosure Maintenance                                  | EK-186AB-MG         |
| BA123 Enclosure Maintenance                                 | EK-188AA-MG         |
| BA213 Enclosure Maintenance                                 | EK-189AA-MG         |
| BA214 Enclosure Maintenance                                 | EK-190AA-MG         |
| BA215 Enclosure Maintenance                                 | EK-191AA-MG         |
| H9642 Cabinet Maintenance                                   | EK-187AA-MG         |
| H9644 Cabinet Maintenance                                   | EK-221AA-MG         |
| KA630 CPU System Maintenance                                | EK-178AA-MG         |
| KA640 CPU System Maintenance                                | EK-179AA-MG         |
| KA650 CPU System Maintenance                                | EK-180AA-MG         |
| KDF11-B CPU System Maintenance                              | EK-245AA-MG         |
| KDJ11-D CPU System Maintenance                              | EK-246AA-MG         |
| KDJ11-B CPU System Maintenance                              | EK-247AA-MG         |
| KDJ11-E CPU System Maintenance                              | EK-403AA-MM         |
| MicroPDP-11 Hardware Information Kit (for BA23)             | 00-ZYAAA-GZ         |
| MicroPDP-11 Hardware Information Kit (for BA123)            | 00-ZYAAB-GZ         |
| MicroPDP-11 Hardware Information Kit (for H9642)            | 00-ZYAAE-GZ         |
| MicroPDP-11 Hardware Information Kit (for BA213)            | 00-ZYAAS-GZ         |
| Microsystems Options  | EK-192AA-MG         |
| Microsystems Site Preparation Guide                         | EK-067AB-PG         |
| MicroVAX II Hardware Information Kit (for BA23)             | 00-ZNAAA-GZ         |
| MicroVAX II Hardware Information Kit (for BA123)            | 00-ZNAAB-GZ         |
| MicroVAX II Hardware Information Kit (for H9642)            | 00-ZNAAE-GZ         |
| MicroVAX 3500 Customer Hardware Information Kit             | 00-ZNAES-GZ         |
| MicroVAX 3600 Customer Hardware Information Kit (for H9644) | 00-ZNAEF-GZ         |
| VAXstation 3200 Owner's Manual (BA23)                       | EK-154AA-OW         |
| VAXstation 3500 Owner's Manual (BA213)                      | EK-171AA-OW         |
| VAXstation II/GPX Owner's Manual (BA23)                     | EK-106AA-OW         |
| VAXstation II/GPX Owner's Manual (BA123)                    | EK-105AA-OW         |

| <b>Document Title</b>                                    | <b>Order Number</b> |
|--|---------------------|
| <b>Diagnostics</b>                                       |                     |
| DEC/X11 Reference Card                                   | AV-F145A-MC         |
| DEC/X11 User's Manual                                    | AC-F053D-MC         |
| XXDP User's Manual                                       | AZ-GNJAA-MC         |
| XXDP DEC/X11 Programming Card                            | EK-OXXDP-MC         |
| MicroVAX Diagnostic Monitor Ethernet Server User's Guide | AA-FNTAC-DN         |
| MicroVAX Diagnostic Monitor Reference Card               | AV-FMXAA-DN         |
| MicroVAX Diagnostic Monitor User's Guide                 | AA-FM7AB-DN         |
| <b>Networks</b>  |                     |
| Ethernet Transceiver Tester User's Manual                | EK-ETHTT-UG         |
| VAX/VMS Networking Manual                                | AA-Y512C-TE         |
| VAX NI Exerciser User's Guide                            | AA-HI06A-TE         |



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